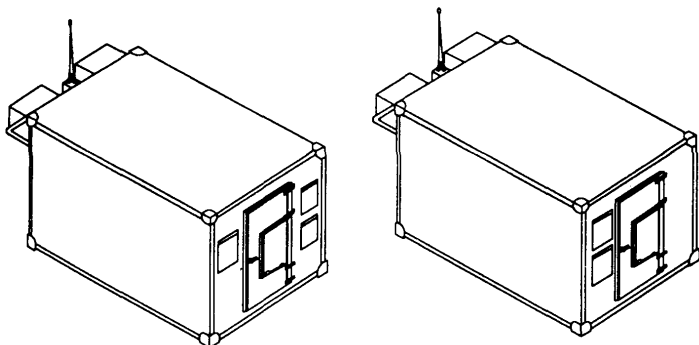
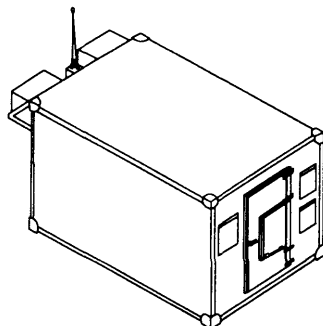


**DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE MANUAL**

**COMMUNICATION SYSTEM,
CONTROL ELEMENT,
CENTRAL PROCESSOR**



**AN/TYQ-30 (V) 1
(NSN 5895-01-280-3568) (EIC: HYK)**



**AN/TYQ-30 (V) 2 POWER
(NSN 5895-01-280-3567) (EIC: HYL)**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY
1 APRIL 1995**

EQUIPMENT DESCRIPTION	
ENVIRONMENTAL CONTROL UNIT	
PRINTERS	
PROCESSORS	
WORKSTATION	
TELEPHONE	
UNINTERRUPTIBLE POWER SOURCE	
POWER DISTRIBUTION	
SIGNAL DISTRIBUTION	



5

SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1

DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2

IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3

IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

4

SEND FOR HELP AS SOON AS POSSIBLE

5

AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING**HIGH VOLTAGE**

208 volts ac, 120 volts ac, and 288 (+144 to -144) volts dc are used in this equipment. These voltages can kill on contact. Observe the following precautions:

- Before connecting primary power or the signal cables, connect a ground strap from the ground lug on the power entry panel to earth ground. Do not remove this ground strap until the signal cables and primary power cable have been disconnected.
- Never work on the equipment unless there is another person nearby who is familiar with the operation and the hazards of the equipment and who can administer first aid. When operators aid the technicians, the operators must be warned about dangerous areas.
- Whenever possible, the input power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.
- Be careful not to contact the 208 volt ac, 115 volt ac, or 144 volt dc connections when installing or servicing the equipment. Avoid all open terminals, power ports, and live circuits.
- Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through the vital organs of the body.
- If a circuit breaker does not stay in ON position when closed, do not attempt to close it repeatedly. That could create an overload situation hazardous to personnel and equipment. Instead, investigate the cause of the problem. Correct situation before attempting to close the breaker again.

WARNING

Do not be misled by the term "LOW VOLTAGE." Potentials as low as 50 volts may cause DEATH under adverse conditions.

RF RADIATION

RF energy is present near the antenna during radio transmission. Maintain at least 30 inches between shelter antenna and personnel during transmission.

WARNING

RF ENERGY IS PRESENT NEAR THE ANTENNA DURING TRANSMISSION. MAINTAIN AT LEAST 30 INCHES BETWEEN VEHICULAR ANTENNA AND PERSONNEL DURING TRANSMISSIONS.

WARNING



HIGH VOLTAGE

EXISTS AT CONNECTOR J1 ON VEHICULAR MOUNTING ADAPTER. AVOID PERSONNEL INJURY: BE SURE J1 IS COVERED OR CAPPED WHEN NOT IN USE.

WARNING

Death or serious injuries can result:

- **When antenna tip caps are not installed on antennas.**
- **When a tied-down antenna hits a fixed object such as an overhead bridge, tree limb, etc. Flying antenna parts might strike nearby personnel.**

WARNING**HEAVY EQUIPMENT**

Much of this equipment weighs over 35 pounds and can cause serious injury if lifted or carried alone. Observe the following safety precautions:

- **MULTIPLE PERSON LIFT**

Some equipment items bear warnings that multiple person lift is required. Do not attempt to lift, carry, or move these items by yourself. Get help.

- **MECHANICAL LIFT**

Some equipment items bear warnings that mechanical lift is required. Do not attempt to lift, carry, or move these items without the specified mechanical lift device.

USE OF COMPRESSED AIR

Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent a chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 pounds per square inch gauge (30 psig) and then only with effective chip guarding and personnel protective equipment (industrial safety glasses and full faceshield).

USE OF CLEANING SOLVENT

Trichlorotrifluoroethane, trichloroethane and similar chemical solvents will no longer be used for ordinary cleaning of equipment. These substances threaten public health and the environment by destroying ozone in the earth's upper atmosphere. Suitable nonhazardous cleaning materials will be used instead, such as a clean cloth, water and mild detergent.

For First Aid, refer to FM 21-11.

OPS SHELTER FOLD-DOWN STEP HAZARD

If the 30(V)1 OPS shelter is on a 5-ton truck, follow this WARNING.

The shelter tiedown cable (right rear) obstructs the bottom fold-down step on the outside wall of the shelter. When using this fold-down step, the soldier's boot may become entangled between the cable and the shelter wall, thus causing a safety hazard (trip/fall).

D

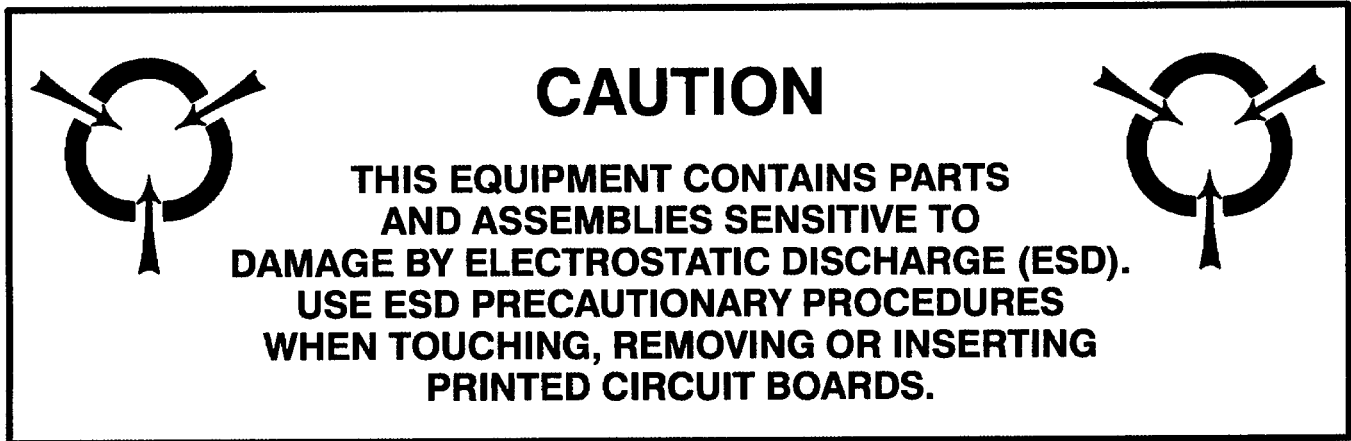
WARNING

- **HIGH VOLTAGES ARE PRESENT IN THE WORKSTATION.** Avoid touching the power supply or CRT areas and any items that may retain electrical charge or accumulate heat (capacitors, heat sinks, CRT, etc.).
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed or panels are open to avoid electrical shock.
- The ac power source must be properly grounded and extension cords should not be used. In addition to being a personnel safety hazard, improper grounding may cause erroneous operation and damage to equipment.
- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.** Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.
- **Multiple person lift required.** Do not attempt to lift, carry, or move the equipment by yourself. Get help.
- **HIGH VOLTAGES ARE PRESENT IN THE PRINTERS.** Avoid touching the power supply area and any items that may retain electrical charge or accumulate heat (i.e., capacitors, motors, heat sinks, etc.).
- **HIGH VOLTAGES ARE PRESENT IN THE UPS.** Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).
- **Multiple person lift required for inverter and battery assemblies.** Do not attempt to lift, carry, or move these assemblies by yourself. Get help.
- **Shorting cables against chassis or metal battery retainers may cause fire or explosion,** resulting in serious injury to personnel and damage to equipment.
- **Batteries contain toxic material and corrosive fluids.** If battery leakage is observed, wear rubber gloves and apron to avoid injury.
- **DO NOT PRY AT BATTERY WITH SHARP OBJECTS.** Battery case can be easily damaged, releasing dangerous toxic and corrosive materials.
- **HIGH VOLTAGES ARE PRESENT IN THE PROCESSOR.** Avoid touching any area that may retain electrical charge or accumulate heat (capacitors, heat sinks, fan motors, etc.).
- **HIGH VOLTAGES ARE PRESENT IN THE INPUT POWER FILTER ASSEMBLY EVEN WHEN POWER IS OFF.** Avoid touching filter modules until they have been safely grounded. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.
- The fumes of trichlorotrifluoroethane used for cleaning this equipment can cause severe irritation or injury.
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed, panels are open, or cables are disconnected to avoid electrical shock.
- **HIGH VOLTAGES ARE PRESENT IN THE PRINTERS.** Avoid touching the power supply area and any items that may retain electrical charge or accumulate heat (i.e., capacitors, motors, heat sinks, etc.). The print heads may become hot after heavy use. Avoid touching until cooled.

WARNING

- **The shelter must be properly grounded. In addition to being a personnel safety hazard, improper grounding may cause erroneous operation and damage to equipment.**
- **Each Environmental Control Unit (ECU) weighs approximately 270 pounds. Use four persons or mechanical lifting device to lift or move ECU. Mechanical lifting device is recommended.**
- **Battery assemblies supply HIGH VOLTAGE to the control assembly. Disconnect control assembly cables before removing cover or replacing parts to avoid electrical shock.**

F



**ESD
CLASS 1**

GENERAL HANDLING PROCEDURES FOR ESDS ITEMS

- USE WRIST GROUND STRAPS OR MANUAL GROUNDING PROCEDURES.
- KEEP ESDS ITEMS IN PROTECTIVE COVERING WHEN NOT IN USE.
- GROUND ALL ELECTRICAL TOOLS AND TEST EQUIPMENT.
- PERIODICALLY CHECK CONTINUITY AND RESISTANCE OF GROUNDING SYSTEM.
- USE ONLY METALIZED SOLDER SUCKERS.
- HANDLE ESDS ITEMS ONLY IN PROTECTED AREAS.

MANUAL GROUNDING PROCEDURES

- MAKE CERTAIN EQUIPMENT IS POWERED DOWN.
- TOUCH GROUND PRIOR TO REMOVING ESDS ITEMS.
- TOUCH PACKAGE OF REPLACEMENT ESDS ITEMS TO GROUND BEFORE OPENING.
- TOUCH GROUND PRIOR TO INSERTING REPLACEMENT ESDS ITEMS.

ESD PROTECTIVE PACKAGING AND LABELING

- INTIMATE COVERING OF ANTISTATIC MATERIAL WITH AN OUTER WRAP OF EITHER TYPE 1 ALUMINIZED MATERIAL OR CONDUCTIVE PLASTIC FILM, OR HYBRID LAMINATED BAGS HAVING AN INTERIOR OF ANTISTATIC MATERIAL WITH AN OUTER METALIZED LAYER.
- LABEL WITH SENSITIVE ELECTRONIC SYMBOL AND CAUTION NOTE.

CAUTION

Devices such as CMOS, NMOS, MNOS, VMOS, HMOS, thin-film resistors PMOS, and MOSFET used in many equipments can be damaged by static voltages present in most repair facilities. Most of the components contain internal gate protection circuits that are practically effective, but sound maintenance practice and the cost of equipment failure in time and money dictate careful handling of all electrostatic sensitive components.

The following precautions should be observed when handling all electrostatic sensitive components and units containing such components.

CAUTION

Failure to observe all of these precautions can cause permanent damage to the electrostatic sensitive device. This damage can cause the device to fail immediately or at a later date when exposed to an adverse environment.

STEP

1 Turn off and/or disconnect all power and signal sources and loads used with the unit.

STEP

2 Place the unit on grounded conductive work surfaces.

STEP

3 Ground the repair operator using a conductive wrist strap or other device using a 1-M series resistor to protect the operator.

STEP

4 Ground any tools (including soldering equipment) that will contact the unit. Contact with the operator's hand provides a sufficient ground for tools that are otherwise electrically isolated.

STEP

5 All electrostatic sensitive replacement components are shipped in conductive foam or tubes and must be stored in the original shipping container until installed.

STEP

6 When these devices and assemblies are removed from the unit, they should be placed on the conductive work surface or in conductive containers.

STEP

7 When not being worked on, wrap disconnected circuit boards in aluminum foil or in plastic bags that have been coated or impregnated with a conductive material.

STEP

8 Do not handle these devices unnecessarily or remove from their packages until actually used or tested.

CAUTION

- This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.
- Do not power down the monitor while a test sequence is executing or data in Random Access Memory (RAM) may be destroyed.
- To avoid electrical shorts or similar problems, promptly remove any hardware of other foreign matter dropped into the equipment.
- Never place spillable containers on or near the equipment.
- Ensure that the correct circuit card assemblies and interconnect cables are used and that they are securely installed.
- Avoid using power circuits serving other devices, which may cause low voltage or voltage fluctuations or introduce noise. These unstable conditions may cause intermittent printer operation.
- Ensure that system fan components are assembled as noted during removal or cooling and Tempest performance may be degraded.
- To avoid electrical shorts, gear damage, belt binding, or similar problems, promptly remove any hardware or other foreign matter dropped into the printer.
- Ensure that the correct Circuit Card Assemblies (CCAs) and interconnect cables are used and that they are securely installed. Tempest and non-Tempest CCAs are not interchangeable.
- Use no lubricants in the printer, especially on the carriage rails. Printer failure and permanent damage to the carriage bearings may result if any lubrication is applied to the carriage rails.
- Place clean foam pad under printer before returning printer to normal upright position or Wire Driver (AWDR) circuit card assemblies mounted under printer may be damaged.
- End cap spring catches are riveted in place. Do not try to remove, or equipment will be damaged.
- Ensure that rear panel cables do not bind or jam as control assembly is pulled out, or cables may be damaged.
- Handle rear cover carefully to avoid damage to telephone circuit card assembly or attaching wires.
- An LED can easily be pulled from its lens, requiring replacement of the LED assembly. Handle associated wiring carefully to avoid damage to nearby LED assemblies.
- Do not pierce or nick insulation on wiring when using multimeter probes or wiring may be damaged.
- Front panel protective cover can be easily damaged by rough handling. Mounting screws may also damage cover if installed too tightly.

CAUTION

- Failure to torque within limits given will degrade system hardness critical item (HCI) integrity.
- Handle front panel carefully to avoid damaging wiring and front panel components.
- Separate identification plate from front panel by carefully prying edges of plate toward the middle, changing positions frequently, to avoid bending or breaking plate.
- Handle top cover carefully to avoid damaging wiring and components.
- Carefully separate bellows frame from shelter to avoid damaging sponge-type weather seal between frame and shelter.
- Ensure that rear panel cables do not bind or jam as control assembly is pushed in, or cables may be damaged:
- Repeated attempts to start the UPS when a fault exists may result in an electrical fire. Reset circuit breaker only once, and if it trips again, locate and correct fault before trying another reset.
- Damage to fiber-optic cables can be avoided by using the following guidelines:
 - Ensure that cable is not kinked or bent sharply.
 - Avoid subjecting cable to sharp blows.
 - Do not twist or otherwise stress cable.
 - When removing cable, hold cable firmly and only turn spin nut on connector.
 - When installing cable, ensure that no cross-threading occurs.
- Do not overtighten setscrews in block clamp. Setscrews can be easily stripped.
- Ensure each bolt is started fingertight, and that ECU does not move excessively from side to side or ECU internal mounting nutplates will be damaged.
- Support control module while only partially installed in AIR CONDITIONER CONTROL MODULE box or temperature sensing line may be damaged.
- Do not attempt to remove linear plate CCA with sensor until driver and dummy driver CCAs are removed. The plate CCA with sensor is the plate CCA with the 2-wire cable connected near the top of the CCA. This CCA is normally in rear amplifier module.
- Do not attempt to separate driver CCA from dummy driver CCA. Separating these two CCAs will cause equipment damage.

**Direct Support And General Support Maintenance Manual
COMMUNICATION SYSTEM, CONTROL ELEMENT
CENTRAL PROCESSOR AN/TYQ-30(V)1 (NSN 5895-01-280-3568) (EIC: HYK)
AND
CENTRAL PROCESSOR AN/TYQ-30(V)2 (NSN 5895-01-280-3567) (EIC: HYL)**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LM-LT, Fort Monmouth, New Jersey 07703-5007.

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

VOLUME 1. THEORY, TROUBLESHOOTING, AND MAINTENANCE PROCEDURES

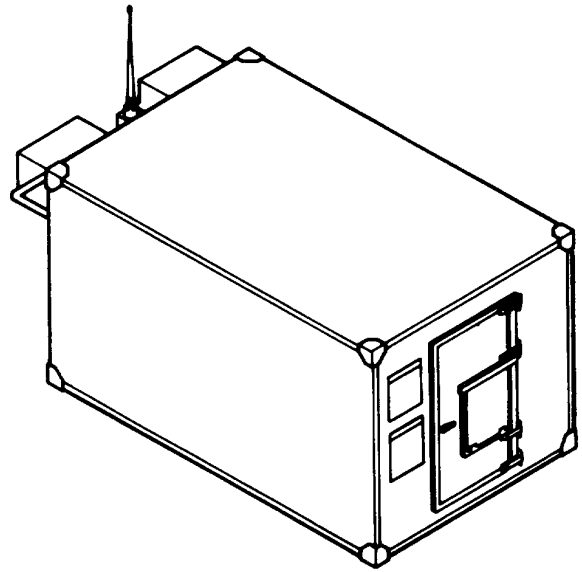
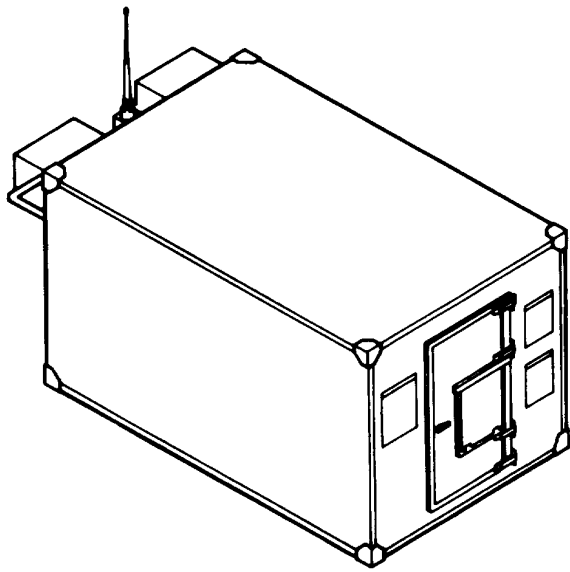
	Page
Chapter 1	INTRODUCTION 1-1
Section I	General Information 1-1
II	Equipment Description and Data 1-2
III	Repair Parts; Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment 1-9
Chapter 2	ENVIRONMENTAL CONTROL UNIT 2-1
Section I	Principles of Operation 2-1
II	Troubleshooting 2-3
III	Maintenance Procedures 2-11
Chapter 3	DOT MATRIX PRINTERS 3-1
Section I	Principles of Operation 3-1
II	Troubleshooting 3-6
III	Maintenance Procedures 3-20

* This manual supersedes TM 11-5895-1392-34 dated September 1991.

		Page
Chapter 4	PROCESSOR ASSEMBLY	4-1
Section I	Principles of Operation.....	4-2
Section II	Troubleshooting	4-6
Section III	Maintenance Procedures	4-17
Chapter 5	WORKSTATION	5-1
Section I	Principles of Operation.....	5-2
Section II	Troubleshooting	5-4
Section III	Maintenance Procedures	5-23
Chapter 6	TELEPHONE SET	6-1
Section I	Principles of Operation.....	6-2
Section II	Troubleshooting	6-4
Section III	Maintenance Procedures	6-10
Chapter 7	UNINTERRUPTIBLE POWER SOURCE	7-1
Section I	Principles of Operation.....	7-2
Section II	Troubleshooting	7-9
Section III	Maintenance Procedures	7-24
Chapter 8	POWER DISTRIBUTION SYSTEMS.....	8-1
Section I	Principles of Operation.....	8-2
Section II	Troubleshooting	8-12
Section III	Maintenance Procedures	8-72
Chapter 9	SIGNAL DISTRIBUTION SYSTEMS	9-1
Section I	Principles of Operation.....	9-2
Section II	Troubleshooting	9-11
Section III	Maintenance Procedures	9-25
APPENDIX A	REFERENCES.....	A-1
APPENDIX B	EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST	B-1
Section I	Introduction	B-1
Section II	Expendable Supplies and Materials List.....	B-2
ABBREVIATIONS AND ACRONYMS		Acronyms-1
GLOSSARY		Glossary-1
ALPHABETICAL INDEX		Index-1
FOLDOUT ILLUSTRATIONS		FP-1

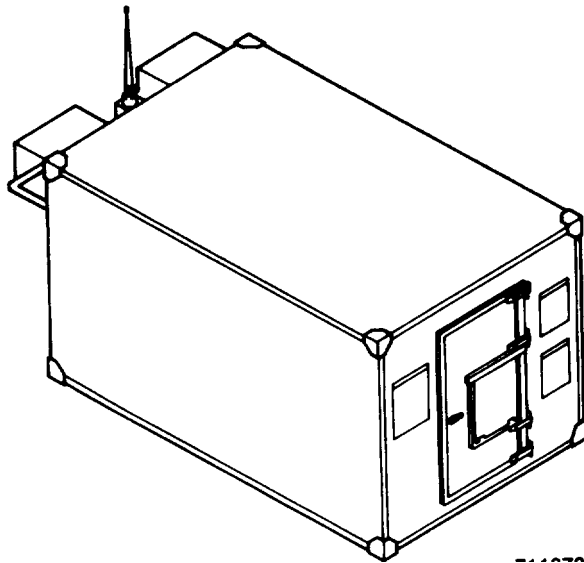
VOLUME 2. WIRING/INTERCONNECT DATA

INTRODUCTION	ii
Scope	ii
Drawing Descriptions	ii
Drawing Arrangement	ii
Cross-Referencing	ii
DRAWING LIST	iii
UNIT REFERENCE DESIGNATOR TO DRAWING NUMBER INDEX	v
UNIT NAME TO DRAWING NUMBER INDEX	vii
CABLE REFERENCE DESIGNATOR TO DRAWING NUMBER INDEX	ix
CABLE NAME TO DRAWING NUMBER INDEX	xv
DRAWINGS	xx



7118789

Communication System, Control Element, Central Processor AN/TYQ-30(V1)



7118788

7118788

Communication System, Control Element, Central Processor AN/TYQ30(V2)

**CHAPTER 1
INTRODUCTION**

Para		Page
Section I	General Information	1-2
1-1	Scope.....	1-2
1-1.1	Type of Manual	1-2
1-1.2	Model Numbers and Equipment Name.....	1-2
1-1.3	Purpose of Equipment	1-2
1-2	Consolidated Index of Army Publications and Blank Forms	1-3
1-3	Maintenance Forms, Records, and Reports	1-3
1-3.1	Reports of Maintenance and Unsatisfactory Equipment.....	1-3
1-3.2	Report of Item and Packaging Discrepancies	1-3
1-3.3	Transportation Discrepancy Report (SF 361)	1-3
1-4	Reporting Equipment Improvement Recommendations (EIRs)	1-3
1-5	Destruction of Army Materiel to Prevent Enemy Use.....	1-3
1-6	Administrative Storage or Shipment	1-3
1-7	Warranty Information	1-3
1-8	List of Abbreviations and Acronyms.....	1-3
1-9	Nomenclature Cross-Reference List	1-4
1-10	Glossary.....	1-9
Section II	Equipment Description and Data	1-9
1-11	Equipment Characteristics, Capabilities, and Features	1-9
1-12	Location and Description of AN/TYQ-30(V)1/2 Major Components	1-10
1-12.1	AN/TYQ-30(V)1 System: ADP Shelter (Top)/OPN Shelter (Bottom).....	1-10
1-12.2	AN/TYQ-30(V)2 System: ADP Shelter.....	1-11
1-12.3	AN/TYQ-30(V)1/2 Remote Terminal Cluster (3).....	1-12
1-13	Location and Description of ADP Shelter (1) Major Components.....	1-13
1-13.1	ADP Shelter (1) Rear Exterior Components	1-13
1-13.2	ADP Shelter (1) Roadside Interior Components.....	1-14
1-13.2.1	ADP Shelter Power Rack (1A2) Components	1-19
1-13.3	ADP Shelter (1) Curbside Interior Components.....	1-20
1-13.3.1	ADP Shelter Equipment Rack (1A3) Components	1-22
1-13.4	ADP Shelter (1) Front Interior Components.....	1-24
1-13.4.1	ADP Shelter (1) Front Exterior Components	1-26
1-14	Location and Description of OPN Shelter (4) Major Components	1-27
1-14.1	OPN Shelter (4) Rear Exterior Components.....	1-27
1-14.2	OPN Shelter (4) Roadside Interior Components	1-28
1-14.2.1	OPN Shelter Equipment Rack (4A3) Components	1-30
1-14.3	OPN Shelter (4) Curbside Interior Components	1-32
1-14.3.1	OPN Shelter Power Rack (4A2) Components	1-34
1-14.4	OPN Shelter (4) Front Interior Components	1-36
1-14.4.1	AN/TYQ-30(V)1 OPN Shelter (4) Front Exterior Components	1-38
1-15	Location and Description of AN/TYQ-30(V)1/2 Line Replaceable Unit (LRU) Major Components	1-39
1-15.1	Dot Matrix Printer (1A7A3, 3A2, 4A9, 4A22) Major Components.....	1-39
1-15.2	Processor Assembly Major Components.....	1-42

1-15.2.1	Communications Processor Assembly (1A3A3A4A1, 1A3A3A6A1) Major Components	1-42
1-15.2.2	Data Base Management Processor Assembly (1A3A3A5A1) Major Components.....	1-49
1-15.3	Workstation (1A8, 1A9, 3A3, 3A4, 4A7, 4A8, 4A15, 4A19) Major Components.....	1-56
1-15.4	Telephone Set (1A12, 1A13, 4A12, 4A13, 4A20, 4A21) Major Components	1-62
1-15.5	Power Rack (1A2, 4A2) Major Components.....	1-63
1-15.5.1	UPS Control Assembly (1A2A1A1, 4A2A1A1) Major Components	1-63
1-15.5.2	UPS Input Assembly (1A2A2A4, 4A2A2A4) Major Components.....	1-66
1-15.5.3	UPS Inverter Assembly (1A2A2A1/A2/A3, 4A2A2A1/A2/A3) Major Components.....	1-67
1-15.5.4	UPS Battery Assembly (1A2A1A3/A4, 1A2A2A5, 4A2A1A3/A4, 4A2A2A5) Major Components.....	1-69
1-15.5.5	UPS Main Power Filter Assembly (1A2A1A2, 4A5A1) Major Components.....	1-70
1-15.6	Power Distribution System.....	1-72
1-15.6.1	Power Entry Panel (1A1, 4A1) Major Components.....	1-72
1-15.6.2	ADP Shelter Power Distribution Unit (1A17) Major Components	1-76
1-15.6.3	OPN Shelter Power Distribution Unit (4A17) Major Components.....	1-80
1-15.6.4	ADP Shelter AC Filter Assembly (1A3A1A4).....	1-83
1-15.7	Signal Distribution System	1-84
1-15.7.1	ADP Shelter Signal/Video Entry Panel (1A4) Major Components	1-84
1-15.7.2	OPN Shelter Signal Entry Panel (4A4) Major Components.....	1-85
1-15.7.3	ADP Shelter Red Patch Panel (1A3A3A1) Major Components	1-86
1-15.7.4	ADP Shelter Black Patch Panel (1A3A1A1) Major Components.....	1-88
1-15.7.5	OPN Shelter Red Patch Panel (4A3A1) Major Components	1-90
1-15.7.6	OPN Shelter Black Patch Panel (4A3A2) Major Components.....	1-91
1-16	Differences Between Models	1-92
1-17	Equipment Data	1-92
1-18	Equipment Configuration	1-92
1-19	Safety, Care, and Handling.....	1-92
SECTION III	Repair Parts; Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment	1-92
1-20	Common Tools and Equipment	1-92
1-21	Special Tools, TMDE, and Support Equipment	1-92
1-22	Repair Parts.....	1-92

SECTION I. GENERAL INFORMATION

1-1. SCOPE

1-1.1. Type of Manual: Intermediate Direct Support and General Support Maintenance Manual.

1-1.2. Model Numbers and Equipment Name: Communication System, Control Element, Central Processors AN/TYQ-30(V)1 (5895-01-280-3568) and AN/TYQ-30(V)2 (5895-01-280-3567) (AN/TYQ-30(V)1/2).

1-1.3. Purpose of Equipment. The AN/TYQ-30(V)1 is used to support a signal brigade. It provides the capabilities to plan, engineer, and control the tactical Communication-Electronics (C-E) assets of the subordinate signal units. The AN/TYQ-30(V)1 is housed in two modified S-280 shelters: one Automatic Data Processing (ADP) shelter and one Operations (OPN) shelter. The ADP shelter houses processing equipment, two local workstations, and associated modems to operate six remote workstations. The OPN shelter houses four remote workstations. A Remote Terminal Cluster (RTC) may be cabled to the ADP shelter to provide two additional remote workstations. The OPN shelter and RTC operate up to 1000 meters from the ADP shelter. The RTC equipment is transported in transit cases inside the ADP shelter.

The AN/TYQ-30(V)2 is an intermediate management facility that will normally be deployed at the Echelons Above Corps (EAC) area signal battalion and used by personnel of the battalion S-3. The AN/TYQ-30(V)1 is housed in a single modified S-280 shelter that provides two local workstations and associated modems to operate two remote workstations. An RTC may be cabled to the ADP shelter to provide the two remote workstations. The RTC equipment is transported in transit cases inside the ADP shelter.

1-2. CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS

1-3.1. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update.

1-3.2. Reporting of Item and Packaging Discrepancies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/SECNAVINST 4355.18/AFR 400-54/MCO 4430.3J.

1-3.3. Transportation Discrepancy Report (TDR) (SF 361). Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your AN/TYQ-30(V)1 or AN/TYQ-30(V)2 shelter needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ED-CFO, Fort Monmouth, New Jersey 07703-5007. We'll send you a reply.

1-5. DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-6. ADMINISTRATIVE STORAGE

Administrative storage of equipment issued to and used by Army activities will have Preventive Maintenance Checks and Services (PMCS) performed before storing. When removing the equipment from administrative storage, the PMCS checks should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in TM 11-5895-1392-12.

1-7. WARRANTY INFORMATION

Communication System, Control Element, Central Processors AN/TYQ-30(V)1/2 are warranted by Electrospace Systems, Inc. The terms and conditions of the warranty are outlined in TB 11-5895-1392. Refer to the warranty Technical Bulletin (TB) to determine if item is under warranty.

1-8. LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviations are spelled out and acronyms are defined the first time they appear in text. In addition, a complete list of abbreviations and acronyms is provided in the back of this technical manual.

1-9. NOMENCLATURE CROSS-REFERENCE LIST

The common names for all equipment items are used throughout this technical manual. The following table provides a cross-reference between the common names and the official nomenclature.

Common (TM) Name	Official Nomenclature
AC Distribution Circuit Card Assembly (CCA) AC Filter Adapter/Interface CCA ADP Shelter	Circuit Card Assembly, AC Distribution Filter Assembly, AC A3093491 Circuit Card Assembly, Adapter/Interface Shelter, Non-expandable, ADP, S-712/TYQ-30(V); AN/TYQ-30(V)1 ADP Shelter; AN/TYQ-30(V)2 Shelter
Alarm Cable Alarm CCA	See Digital I/O Cable See Digital I/O CCA
Antenna Antenna Entry Panel (AEP) AN/TYQ-30(V)1/2	Antenna, Vehicular AS-1729/VRC or AS-3684/VRC Electrical Assembly, Antenna Entry Communication System, Control Element, Central Processor AN/TYQ-30(V) 1 or AN/TYQ-30(V) 2
AN/TYQ-30(V)1	Communication System, Control Element, Central Processor AN/TYQ-30 (V) 1
AN/TYQ-30(V)2	Communication System, Control Element, Central Processor AN/TYQ-30 (V) 2
Asynchronous/Multiplexer CCA Audio Assembly Black Patch Panel	Circuit Card Assembly, Asynchronous Multiplexer Electrical Assembly, Audio Patch Panel Assembly, Black, AN/TYQ-30 Patch Panel Assembly, Black, OPN
Cable	Cable Assembly
Central Processor Unit (CPU) CCA	Cable set
Chair	Circuit Card Assembly, Processor
Chassis	Chair, Workstation A3092898
Clock	Chassis, Q-Bus A3092942
Color Graphics Monitor	Clock, Panel, SC-C-681411
Communications Processor (CP)	Monitor, Color Graphics A3092946-1
	Workstation, Ruggedized A3092946
	Processor Assembly A3093579-2 or A3093579-3

1-9. NOMENCLATURE CROSS-REFERENCE LIST - Continued

Common (TM) Name	Official Nomenclature
Connector	Connector, Electrical, Plug Connector, Electrical, Radio Frequency Connector, Electrical, Receptacle
Control Panel CCA (ACPL CCA)	Circuit Card Assembly, Control Panel
CPU CCA	Circuit Card Assembly, Processor
CPU/Motherboard CCA	Circuit Card Assembly, CPU/Motherboard
Data Base Management Processor (DBMP)	Processor Assembly A3093579-1
DC Filter	Filter Assembly, DC A3093990
Digital I/O Cable	Cable, Digital Input/Output
Digital I/O CCA	Circuit Card Assembly, Digital Input/Output
Digital-to-Digital Converter (DSDI)	Digital-to-Digital Converter, CV-4068A/TTC-39
Digital Subscriber Voice Terminal (DSVT)	Terminal, Digital Subscriber Voice TSEC/KY-68
Disk Controller CCA	Circuit Card Assembly, Disk Drive Controller
Disk Drive	Disk Drive Assembly A3093568 or A3105820
Disk Drive Assembly	Disk Drive Assembly A3105777 or A3105821
Display CCA	Disk Drive, 42-Megabyte
Dot Matrix Printer	Circuit Card Assembly, Display
Environmental Control Unit (ECU)	See Printer
ECU Control Module	Air Conditioner, Horizontal, Compact, 18000 BTU/Hr, 208 Volts, 3-Phase, 50/60 Hertz, KECO Model F18H-3SA (NSN 4120-01-237-4663)
Equipment Drawer	Electrical Assembly, ECU Control
Equipment Rack	Drawer, Equipment
Ethernet Cable	Rack Assembly, Equipment-AN/TYQ-30(V) 1/2
Ethernet Controller CCA	Rack Assembly, Equipment-OPN
Ethernet Interface CCA	Kit, Cabinet, Ethernet
Ethernet Controller CCA	Circuit Card Assembly, Ethernet Controller
Ethernet Interface CCA	Circuit Card Assembly, Ethernet Interface

1-9. NOMENCLATURE CROSS-REFERENCE LIST - Continued

Common (TM) Name	Official Nomenclature
Ethernet Station Adapter (ESTA)	Adapter, Ethernet Station A3093482
Fiber-Optic Cable Assembly (FOCA)	Cable Assembly, Fiber-Optic CX-13295/G
Fiber-Optic Entry Panel (FOEP)	Entry Panel, Fiber-Optic
Fiber-Optic Ethernet Repeater (FOER)	Repeater, Ethernet, Fiber-Optic A3093483-1 or A3105799
First Aid Kit	Kit, First Aid A3092931
Front Panel	Front Panel Assembly
Front Panel I/O Filter CCA	Circuit Card Assembly, Front Panel 110 Filter
Graphics Controller CCA	Circuit Card Assembly, Graphics Controller
Ground Rod	Ground Rod, MX-148/G
Ground Strap	Ground Strap, CS-B-539494
Group Data Assembly	Electrical Assembly, Group Data
Group Modem (GM)	Modem, Digital Data MD-1026(P)/G
Handset	Handset, H-250 or H-350
Hard Copy Printer Transportable Unit (HCP TU)	Transit Case Assembly, Printer/Keyboard/Mouse
Intercom	Station, Intercommunication LS-147F/FI
Interconnecting Box	Interconnecting Box J-3513A/U
Interrupter CCA (APHO CCA)	Circuit Card Assembly, Interrupter
Jack	Jack Assembly, Bantam-Style
Keyboard	Jack Assembly, Coaxial
Knob	Jack Assembly, Twinaxial
KY-57	Patch Jack, 16 Circuit
KY-57 Mount	Workstation Keyboard Assembly
Ladder	Knob, Control
Lightweight Digital Facsimile (LDF)	Voice Encryption Device, TSEC/KY-57
	Mounting Base, Electrical MT-4626/VRC
	Ladder Assembly, Vehicular Boarding, Modified A3093124
	Lightweight Digital Facsimile AN/UXC-7

1-9. NOMENCLATURE CROSS-REFERENCE LIST - Continued

Common (TM) Name	Official Nomenclature
Loop Group Multiplexer (LGM) Loopback Plug	Multiplexer TD-1235(P)/TTC Loopback Plug, Multiplexer A3105797 Loopback Plug, RS-232 A3093536-2
Main Light Assembly	Light Assembly, Fluorescent/Incandescent
Main Power Filter	Power Filter Assembly A3093550
Memory CCA	Circuit Card Assembly, Memory
Meter Module	Circuit Card Assembly, Meter Module
Monitor CCA	Circuit Card Assembly, Digital Input/Output
Mouse	Workstation Mouse Assembly
Multiplexer Cabinet Kit	Kit, Cabinet, Multiplexer
Multiplexer CCA	Circuit Card Assembly, Asynchronous/Multiplexer
Non-Tempest Printer	Printer, Dot Matrix A3093566-1
OPN Shelter	Shelter, Non-expandable, OPN, S-713/TYQ-30(Y)
Oscillator CCA	Circuit Card Assembly, Oscillator
Parallel Interface (APAR) CCA	Circuit Card Assembly, Parallel Interface
Patchcord	Cord, Patch, Coaxial A3093532
	Cord, Patch, RS-232 A3093536-1
	Cord, Patch, Twinaxial A3093531-1
	Cord, Patch, Twinaxial A3093531-2
	Cord, Patch, VF, Dual A3093533
	Cord, Patch, VF, Single A3093534
Pencil Sharpener	Sharpener, Pencil, SC-C-539503
Power Control CCA	Circuit Card Assembly, Power Control
Power Distribution CCA	Circuit Card Assembly, Power Distribution
Power Distribution Unit (PDU)	Electrical Assembly, Power Distribution Unit
Power Entry Panel (PEP)	Electrical Assembly, Power Entry
Power Supply Assembly	Power Supply Assembly
Power Supply CCA (ACL CCA)	Circuit Card Assembly, Power Supply
Power Supply Module	Module, Power Supply

1-9. NOMENCLATURE CROSS-REFERENCE LIST - Continued

Common (TM) Name	Official Nomenclature
Printer Control CCA (APTR/MPTR CCA)	Circuit Card Assembly, Printer Control
Processor CCA (ECPU CCA)	Circuit Card Assembly, Processor
Radio	Radio Set AN/VRC-90 or AN/VRC-46
Radio Mount	Mounting Base, Radio MT-1029/VRC or MT-6352/VRC
Radio Shelf	Shelf, Radio
Rear Panel I/O Filter CCA	Circuit Card Assembly, Rear Panel I/O Filter
Red Patch Panel	Patch Panel Assembly, Red, AN/TYQ-30
	Patch Panel Assembly, Red, OPN
Remote Optical Assembly (ROA)	Converter, Optical, CV-3895/G
Remote Terminal Cluster (RTC)	Remote Terminal Cluster Assembly A3105807
Repeater/Station Adapter (RSA)	Electrical Assembly, Fiber-Optic Ethernet Repeater A3092780-1 or A3092780-2
RSA Transit Case	Case, Transit, A3092901
RSA TU	Case Assembly, Transit, Repeater/Station Adapter A3092655
RT-524	Receiver-Transmitter RT-524/VRC or 524A/VRC
Signal Control CCA	Circuit Card Assembly, Signal Control
Signal Entry Panel (SEP)	Electrical Assembly, Signal Entry (OPN Shelter)
Signal/Video Entry Panel (SVEP)	Entry Panel, Signal/Video (ADP Shelter)
Sledgehammer	Hammer, Sledge, SC-539503
Spotlight	Light Assembly, Incandescent
Switching Regulator CCA (ACH CCA)	Circuit Card Assembly, Switching Regulator
Tape Controller CCA	Circuit Card Assembly, Tape Drive Controller
Tape Drive	Transport, Magnetic Tape A3093510
Tape Drive Assembly	Tape Drive Assembly A3105778
Telephone	Telephone Set TA-1041/TYQ or TA-1041A/TYQ
Telephone CCA	circuit Card Assembly, Telephone A3093175
Tempest Printer	Printer, Dot Matrix A3093566-2
Tiedown Buckle	Strap Assembly, Tiedown, Buckle

1-9. NOMENCLATURE CROSS-REFERENCE LIST - Continued

Common (TM) Name	Official Nomenclature
Tiedown Strap Tool Kit	Strap Assembly, Tiedown Tool Kit, Electronic Equipment, TK-101/G Tool Kit, Electronic Equipment, TK-105
Uninterruptible Power Source (UPS)	Power Source, Uninterruptible A3093580
UPS Battery Assembly	Battery Assembly, UPS A3093580-4
UPS Cables	Cable Set, Power Rack Interconnect A3093419
UPS Control Assembly	Control Assembly, UPS A3093580-1
UPS Input Assembly	Input Assembly, UPS A3093580-2
UPS Inverter Assembly	Inverter Assembly, UPS A3093580-3
Vehicular Power Adapter (VPA)	Vehicular Power Adapter HYP-57/TSEC
Wastebasket	Basket, Wastepaper, SC-D-539454
Wire Driver CCA (AWDR CCA)	Circuit Card Assembly, Wire Driver
Workstation (WS)	Workstation, Ruggedized A3092946
WS Transit Case	Monitor, Color Graphics A3092946-1 Case, Transit A3093496-2
WS TU	Case Assembly, Transit, Workstation
42-MB Disk	Disk Drive, 42 Megabyte

1-10. GLOSSARY

A complete glossary is provided in the back of this technical manual. The glossary lists and defines all nonstandard terms used in this manual.

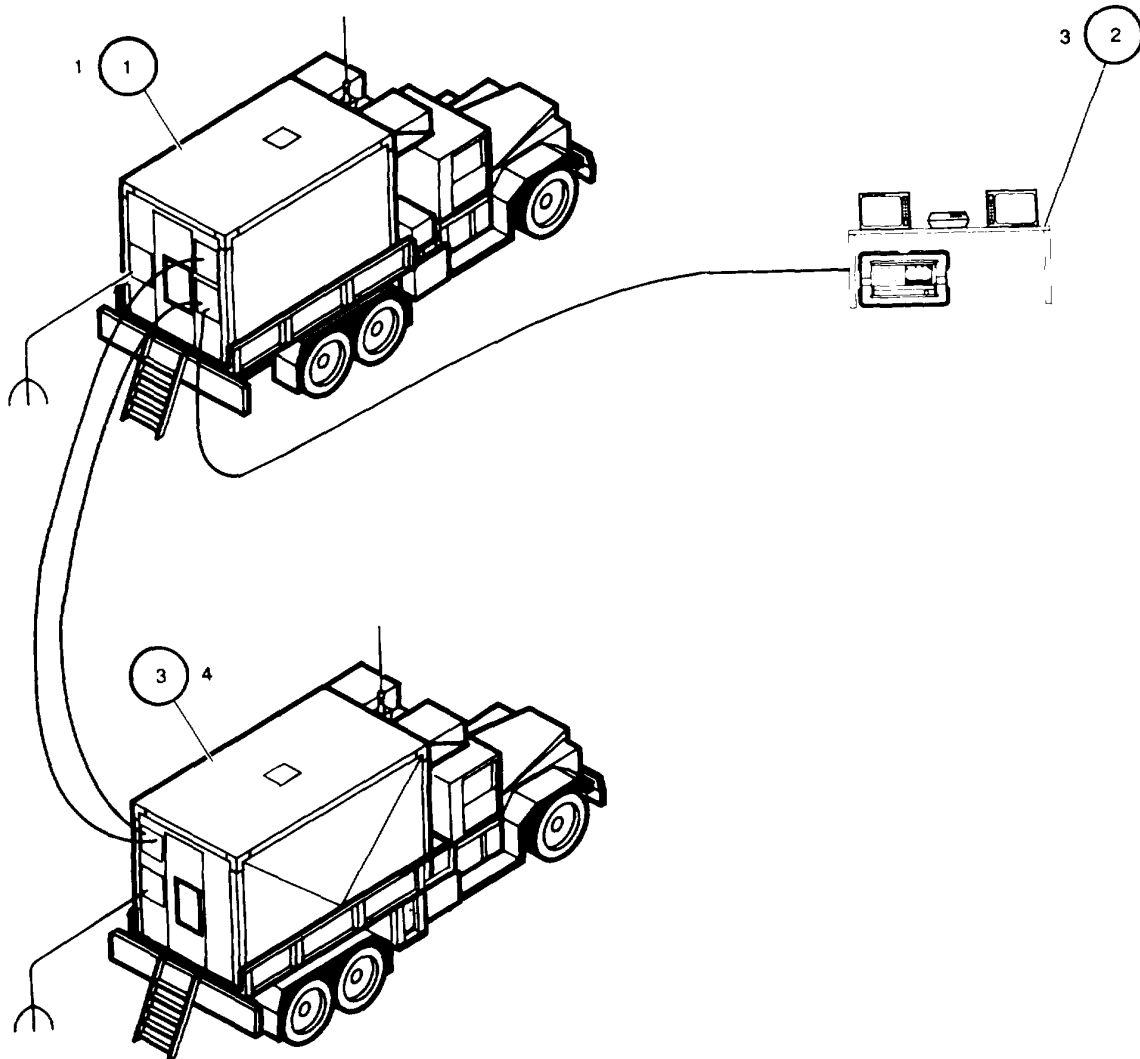
SECTION II. EQUIPMENT DESCRIPTION AND DATA

1-11. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

Refer to TM 11-5895-1392-12 for a description of AN/TYQ-30(V)1/2 system characteristics, capabilities, and features.

1-12. LOCATION AND DESCRIPTION OF AN/TYQ-30(V)1/2 MAJOR COMPONENTS

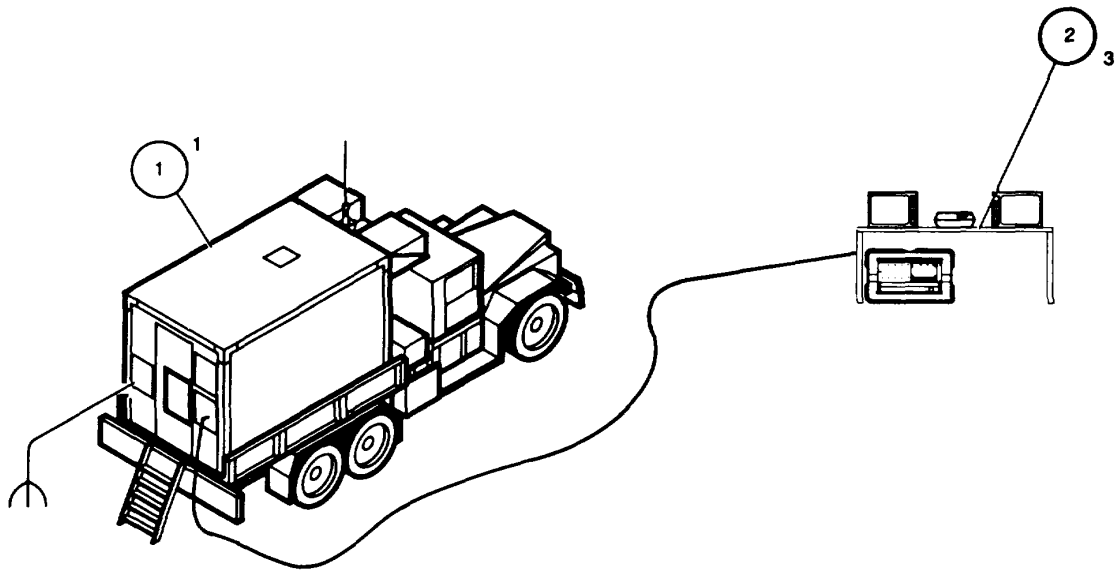
1-12.1. AN/TYQ-30(V)1 System: ADP Shelter (Top)/OPN Shelter (Bottom)



7118790

KEY	NAME	FUNCTION
(1)	ADP SHELTER (UNIT 1)	Provides controlled environment for primary AN/TYQ-30(V)1 ADP equipment. Includes two operator terminals. Provides two operator terminals at remote location.
(2)	REMOTE TERMINAL CLUSTER (UNIT 3)	
(3)	OPN SHELTER (UNIT 4)	Provides controlled environment for four operator terminals.

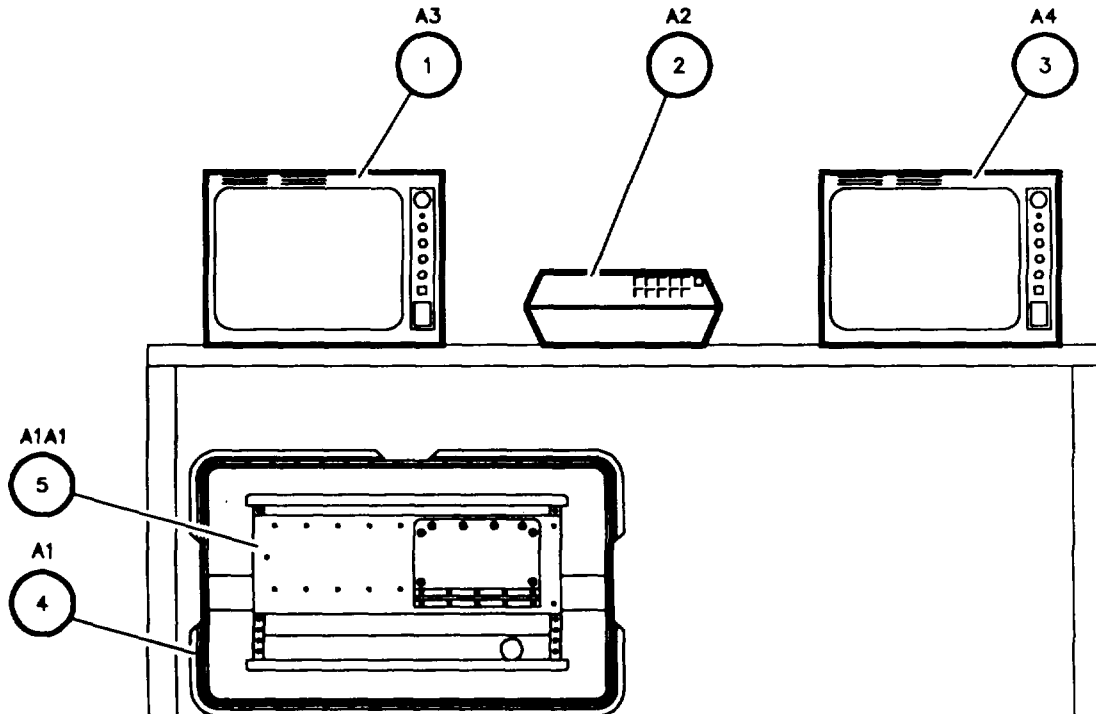
1-12.2. AN/TYQ-30(V)2 System: ADP Shelter



7118791

KEY	NAME	FUNCTION
(1)	ADP SHELTER (UNIT 1)	Provides controlled environment for primary AN/TYQ-30(V)2 ADP equipment. Includes two operator terminals. Provides two additional operator terminals at remote location.
(2)	REMOTE TERMINAL CLUSTER (UNIT 3)	

1-12.3. AN/TY30(V)1/2 Remote Terminal Cluster (3)



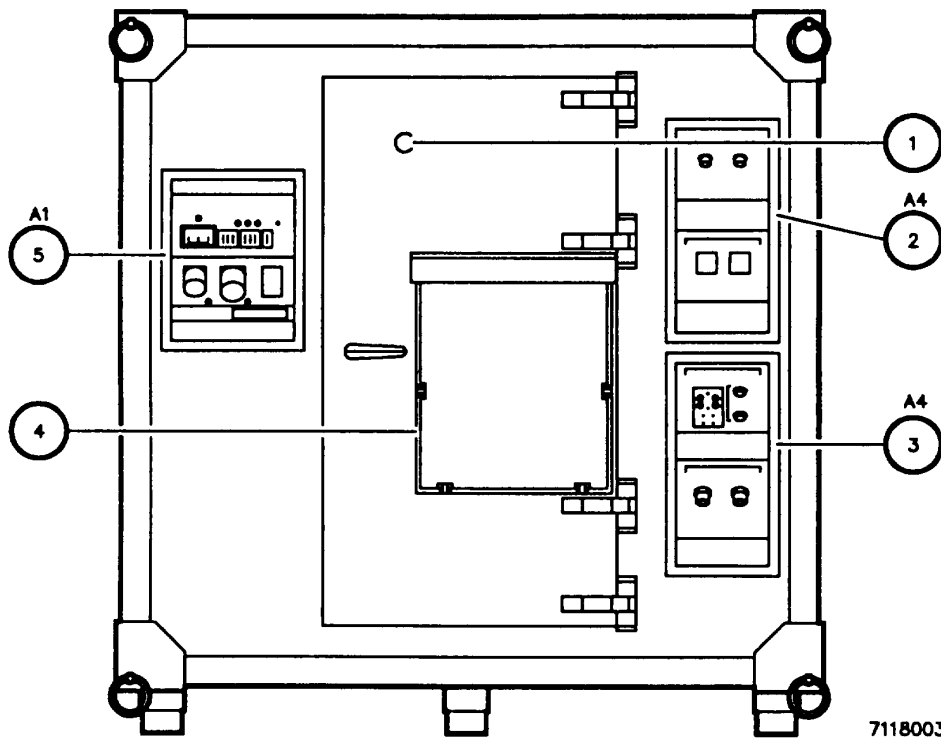
71181207

KEY	NAME	FUNCTION
(1)	WORKSTATION 1 A3	Provides operator interface to processors in ADP shelter, through RSA.
(2)	TEMPEST PRINTER A2	Tempest qualified printer, approved for use outside EMI shelter. Provides hard copy printout under control of workstation 1.
(3)	WORKSTATION 2 A4	Provides operator interface to processors in ADP shelter, through RSA.
(4)	RSA TRANSPORTABLE UNIT A1	Transport case assembly. Provides mounting and storage for RSA (A1A1). Also stores cables (W2-W3) during transport.
(5)	RSA A1A1	Interfaces workstations for ADP shelter. RSA contains FOER and ESTA.

NOTE
The RTC is transported in the ADP shelter.

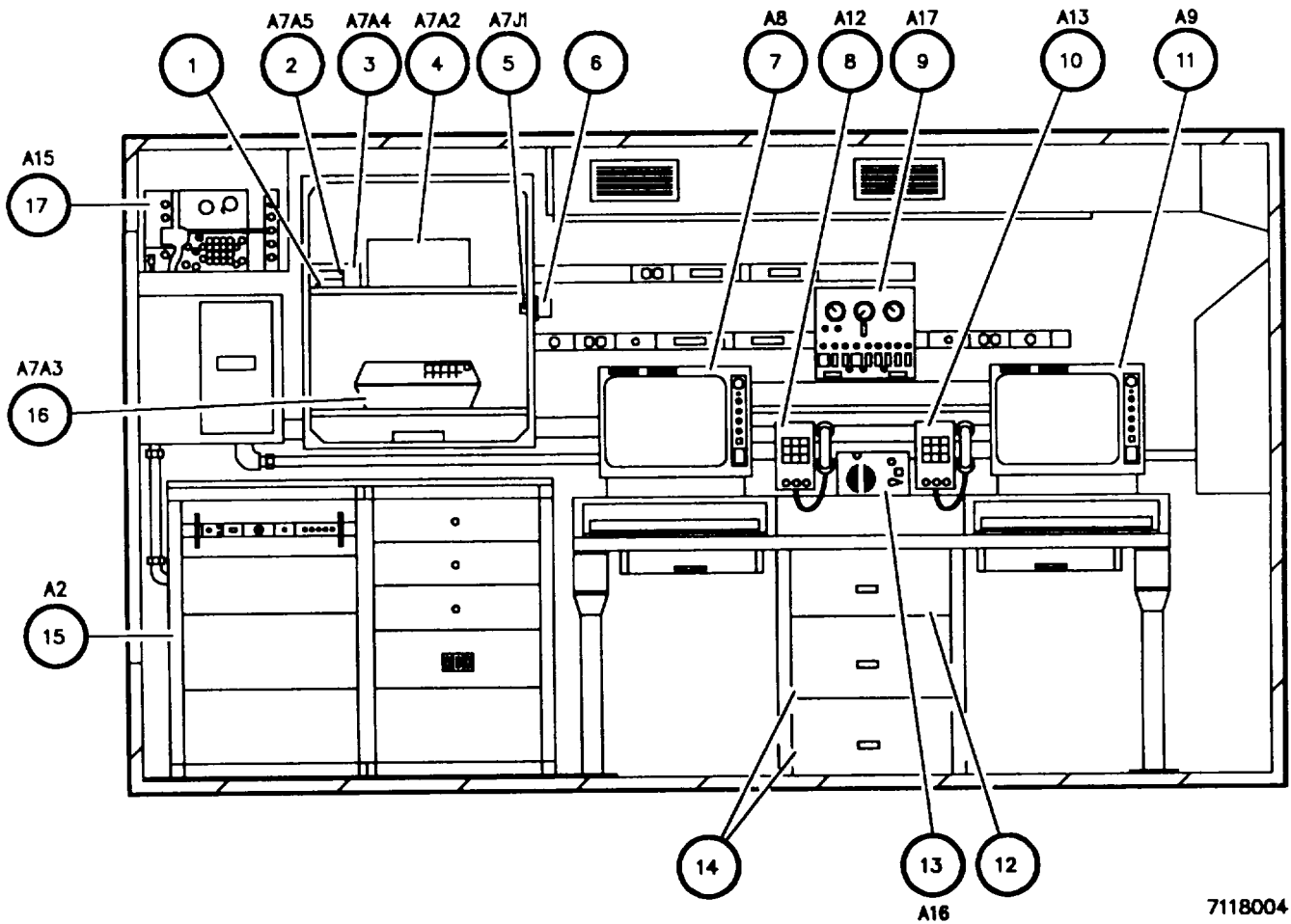
1-13. LOCATION AND DESCRIPTION OF ADP SHELTER (1) MAJOR COMPONENTS

1-13.1. ADP Shelter (1) Rear Exterior Components



KEY	NAME	FUNCTION
(1)	VIEWPORT	Provides means of viewing persons seeking entrance with door closed.
(2)	FOEP A4	Provides connection for fiber-optic cables.
(3)	SVEP A4	Provides connection for intercom, 26-pair, and dual coaxial cables.
(4)	FILTER DOOR	Provides access to shelter filter.
(5)	PEP A1	Provides controls for main input power and connections for main power cable, auxiliary power cable, ground cable, and convenience outlet.

1-13.2. ADP Shelter (1) Roadside Interior Components

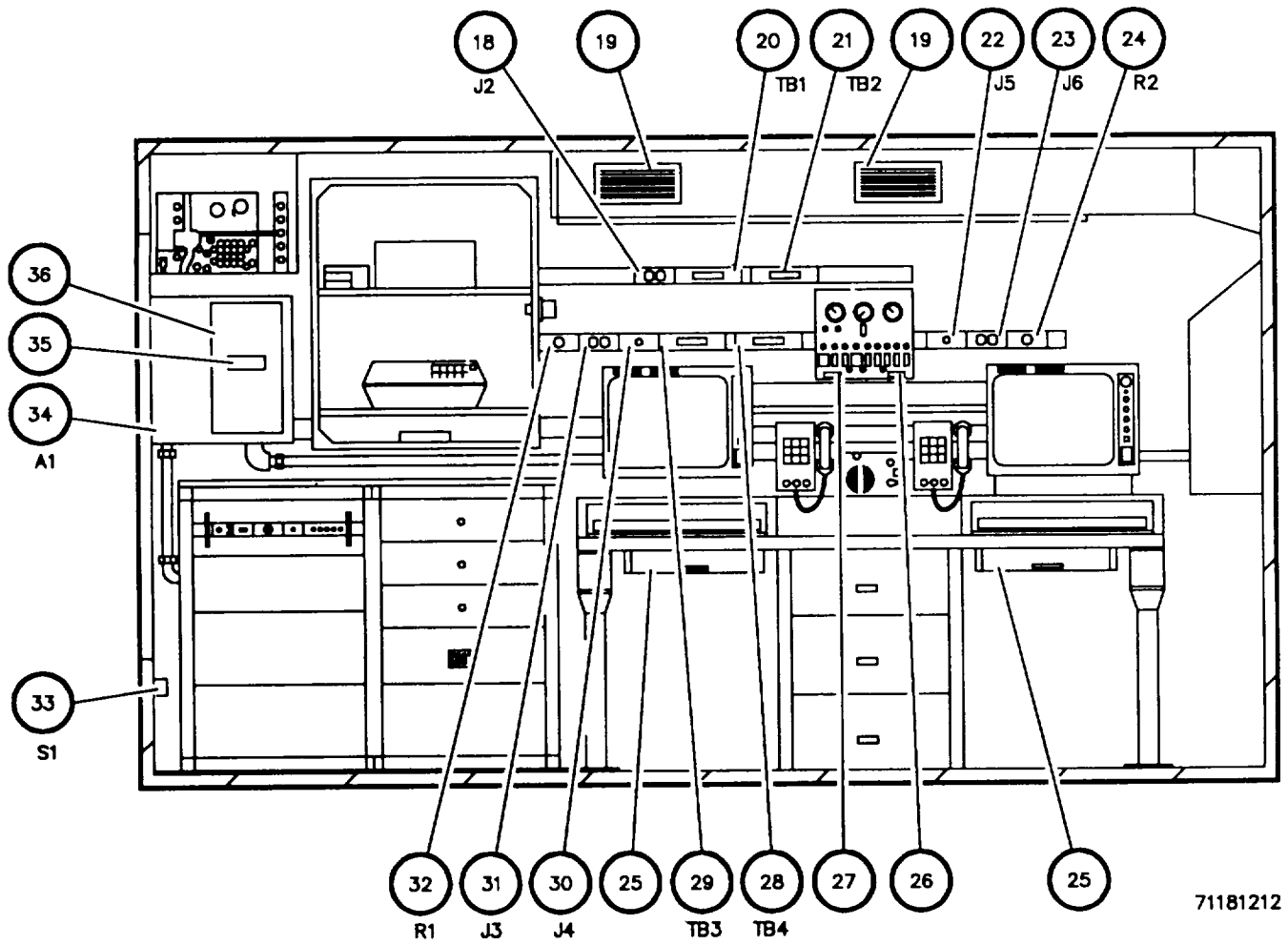


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1-13.2. ADP Shelter (1) Roadside Interior Components - Continued

KEY	NAME	FUNCTION
(1)	MT-4626	Mounting base for TSEC/KY-57 and HYP-57A/TSEC.
(2)	TSEC/KY-57 AND	TSEC/KY-57 provides on-line encryption/decryption for all classifications of HYP-57A/TSEC A7A5 traffic. HYP-57A converts 28 Vdc into power required by TSEC/KY-57.
(3)	DC FILTER A7A4	Provides filtered 28 Vdc to radio set and HYP-57A/TSEC.
(4)	LDF A7A2	Provides digital facsimile communications. Accesses tactical switched network via a DSVT or radio network via FM radio.
(5)	AC RECEPTACLE A7J1	Provides ac power for printer and LDF.
(6)	CLOCK	Resettable, battery-operated clock provides time of day.
(7)	WORKSTATION WS1 A8	Provides operator interface to processors. Also functions as system console for maintenance, system control, and status display. Includes color graphics monitor, keyboard, and mouse.
(8)	TELEPHONE A12	With associated DSVT, provides secure voice link for use by operating personnel.
(9)	PDU A17	Controls ac power to all equipment except ECUs. Also provides overload protection for controlled equipment.
(10)	TELEPHONE A13	With associated DSVT, provides secure voice link for operating personnel at WS2.
(11)	WORKSTATION WS2 A9	Provides operator interface to processors. Includes color graphics monitor, keyboard, and mouse.
(12)	EQUIPMENT DRAWER	Provides lockable storage for patch cables, loopback plugs, manuals, etc.
(13)	INTERCOM A16	Provides two-way voice communication to other intercom units (maximum of 7).
(14)	KEYBOARD/MOUSE STORAGE DRAWERS	Provide cushioned storage space for workstation keyboards and mice. Also provides storage for four incandescent lamps, two in each drawer. Additional space may be used as desired.
(15)	POWER RACK A2	Contains components of UPS.
(16)	NON-TEMPEST PRINTER A7A3	Provides hard copy printout of operator-selected data.
(17)	FM RADIO A15	Provides long-range FM radio voice communication (may be AN/VRC-46 or AN/VRC-90).
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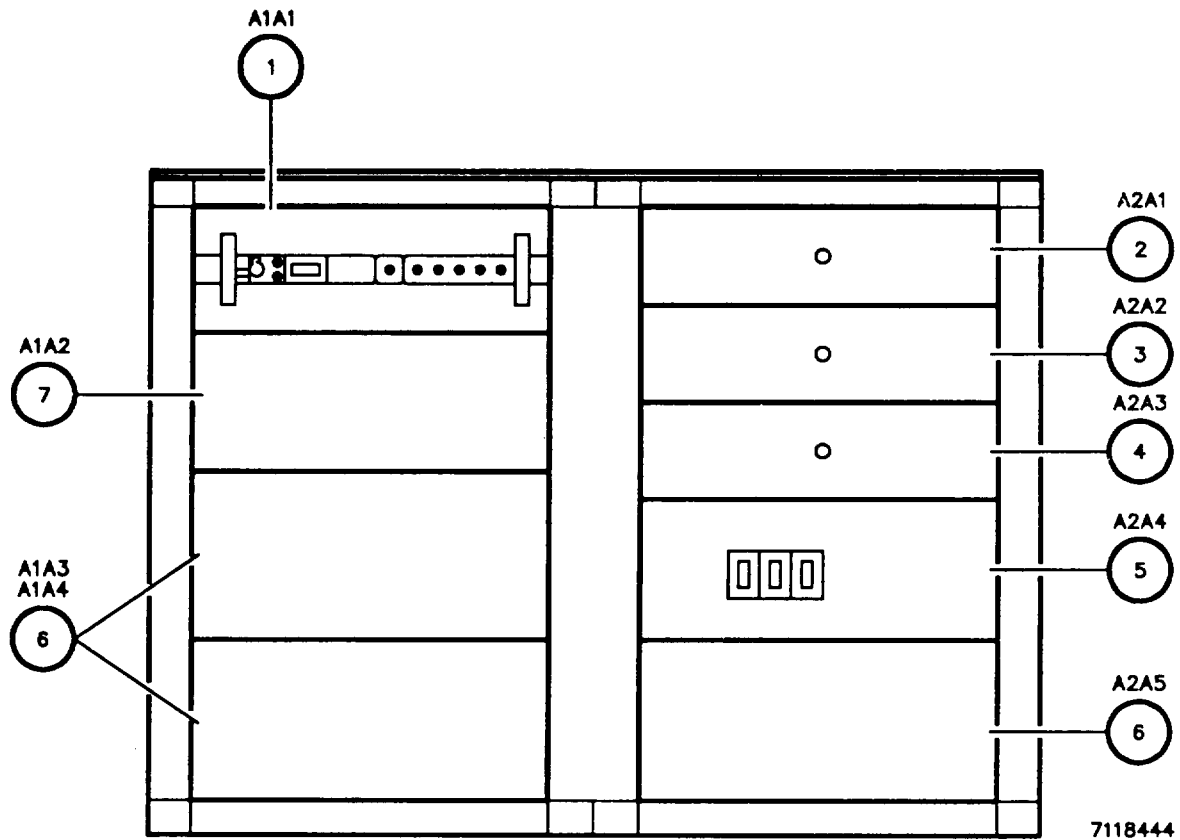
1-13.2. ADP Shelter (1) Roadside Interior Components - Continued



1-13.2. ADP Shelter (1) Roadside Interior Components - Continued

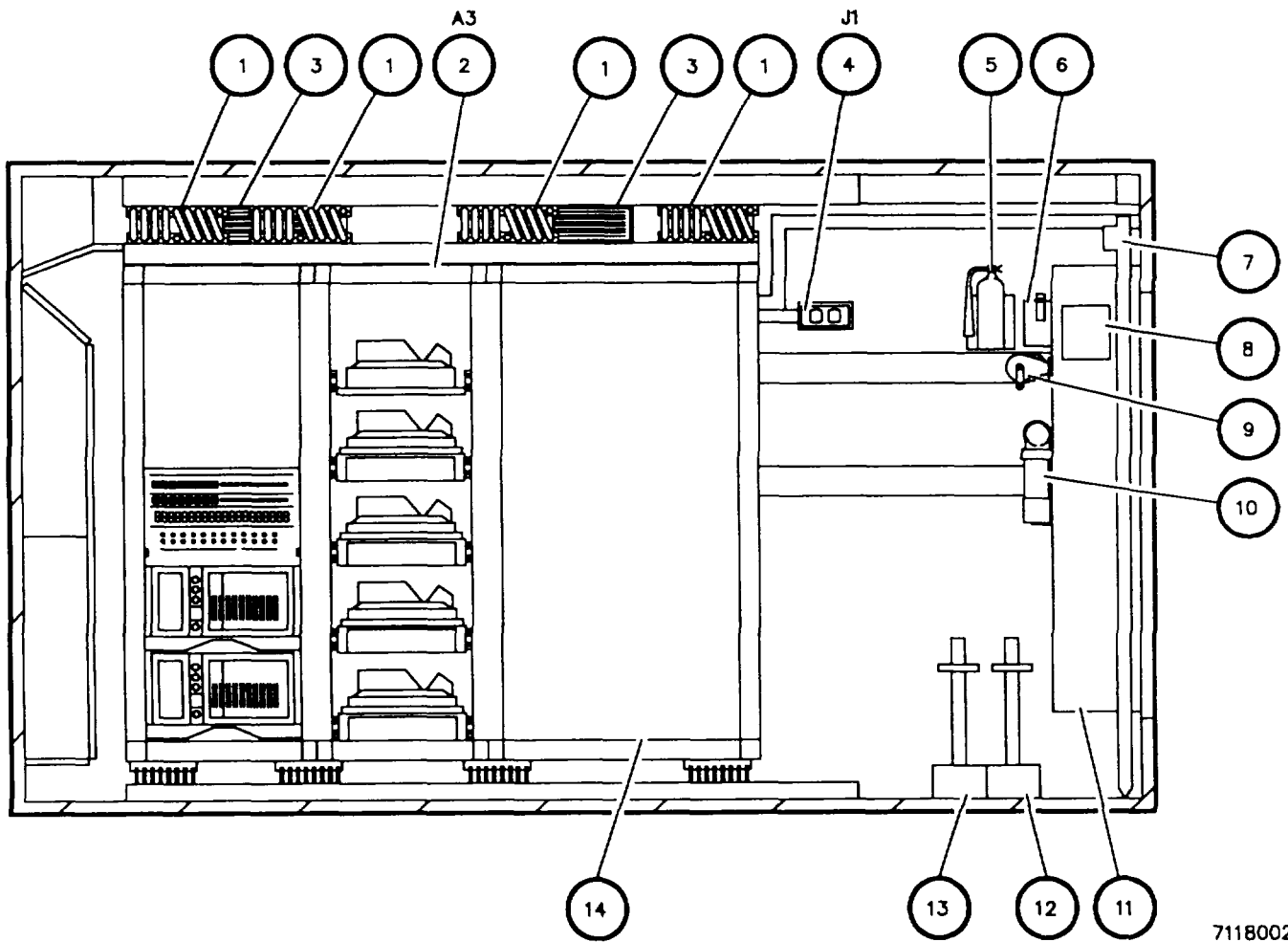
KEY	NAME	FUNCTION
(18)	AC RECEPTACLE J2	Convenience outlet for test equipment, etc.
(19)	AIR CONDITIONER DUCTS	Distribute conditioned air from roadside environmental control unit A10.
(20)	TERMINAL BOARD TB1	Provides wiring point for receptacles J1 (curbside) and J2.
(21)	TERMINAL BOARD TB2	Provides wiring connection point for receptacle A7J1.
(22)	DC RECEPTACLE J5	Provides 28 Vdc power for workstation WS2 telephone.
(23)	AC RECEPTACLE J6	Provides ac power for workstation WS2 and intercom.
(24)	DIMMER R2	Controls brightness of ceiling-mounted spotlight DS4 above WS2.
(25)	WORKSTATION SHELVES	Slide-mounted shelves provide mounting space for workstation keyboards.
(26)	CAUTION DECAL	Provides hazard warning: CAUTION HIGH CURRENT INSIDE.
(27)	CAUTION DECAL	Provides hazard warning: CAUTION 208 VOLTS AC INSIDE.
(28)	TERMINAL BOARD TB4	Provides wiring point for dc wiring to dimmers and dc filter.
(29)	TERMINAL BOARD TB3	Provides wiring point for receptacles J3 and J6.
(30)	DC RECEPTACLE J4	Provides dc power to WS1 telephone A12.
(31)	AC RECEPTACLE J3	Provides ac power to workstation WS1.
(32)	DIMMER R1	Controls brightness of ceiling-mounted spotlight DS3 above workstation WS1.
(33)	DOOR SWITCH S1	Enabled only when BLACKOUT toggle switch on PDU in NORMAL. When enabled and door open, switches overhead white lights to red (blackout).
(34)	POWER ENTRY BOX A1	Covers PEP components.
(35)	CAUTION DECAL	Provides hazard warning: CAUTION 208 VOLTS AC INSIDE.
(36)	POWER ENTRY BOX ACCESS PANEL	Provides access to power entry box internal components.
1-17/(1-18 blank)		

1-13.2.1. ADP Shelter Power Rack (1A2) Components



KEY	NAME	FUNCTION
(1)	UPS CONTROL ASSEMBLY A1A1	Provides controls, system monitoring, and fault indications for UPS.
(2)	UPS INVERTER A A2A1	Provides single-phase ac power or, in event of line failure, battery power. Also provides inverter failure indication.
(3)	UPS INVERTER B A2A2	Provides single-phase ac power or, in event of line failure, battery power. Also provides inverter failure indication.
(4)	UPS INVERTER C A2A3	Provides single-phase ac power or, in event of line failure, battery power. Also provides inverter failure indication.
(5)	UPS INPUT ASSEMBLY A2A4	Filters and distributes 3-phase line to inverters. Also provides overload protection for inverters.
(6)	UPS BATTERY ASSEMBLIES A1A3, A1A4, A2A5	Provide +144 Vdc to inverters in event of line failure.
(7)	MAIN POWER FILTER A1A2	Filters 3-phase line ac power input to UPS.

1-13.3. ADP Shelter (1) Curbside Interior Components



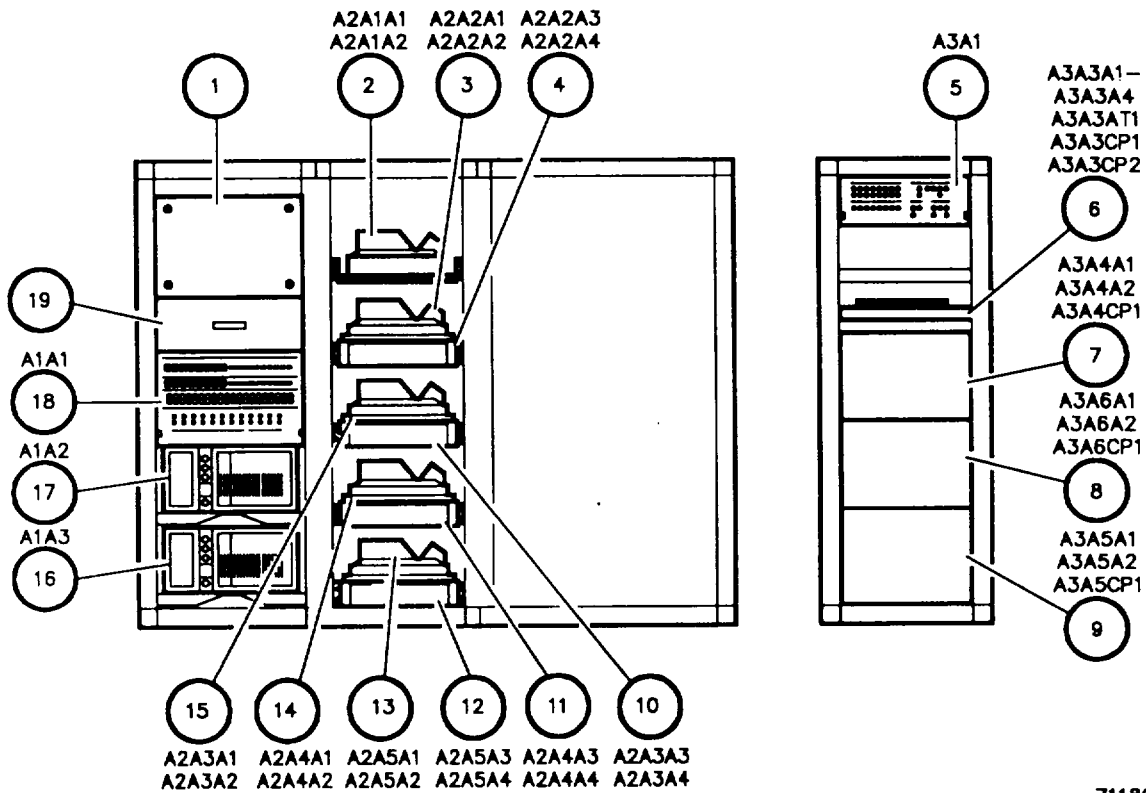
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KEY	NAME	FUNCTION
(1)	SHOCK ISOLATORS	Isolate equipment rack (3) from shock and vibration.
(2)	EQUIPMENT RACK A3	Provides mounting for ADP and telephone equipment. Contains five slide-mounted shelves.
(3)	AIR DUCT	Distributes curbside ECU conditioned air.
(4)	RECEPTACLE J1	Convenience outlets. Provide power for test equipment, etc.
(5)	FIRE EXTINGUISHER	Provided to extinguish electrical fires.
(6)	FIRST AID KIT	Provided for medical emergencies.

1-13.3. ADP Shelter (1) Curbside Interior Components - Continued

KEY	NAME	FUNCTION
(7)	GROUND RODS	Provide earth ground for shelter.
(8)	TRANSPORT PLATE	Provides instruction for loading RTC transport cases into shelter for transport.
(9)	PENCIL SHARPENER	Provided to sharpen pencils.
(10)	FLASHLIGHT	Provided for emergency lighting.
(11) Also	BLOCK OFF BRACKET ASSEMBLY	Removable cover assembly. Covers signal and fiber-optic entry panels. provides mounting for flashlight, first aid kit, and pencil sharpener.
(12)	AXE	Provided as a cutting tool, primarily for emergency exit.
(13)	SLEDGEHAMMER	Provided to hammer grounding rods into ground.
(14)	CLOSEOUT PANEL	Provides access to cabling and wiring within equipment rack bay 3.

1-13.3.1. ADP Shelter Equipment Rack (1A3) Components



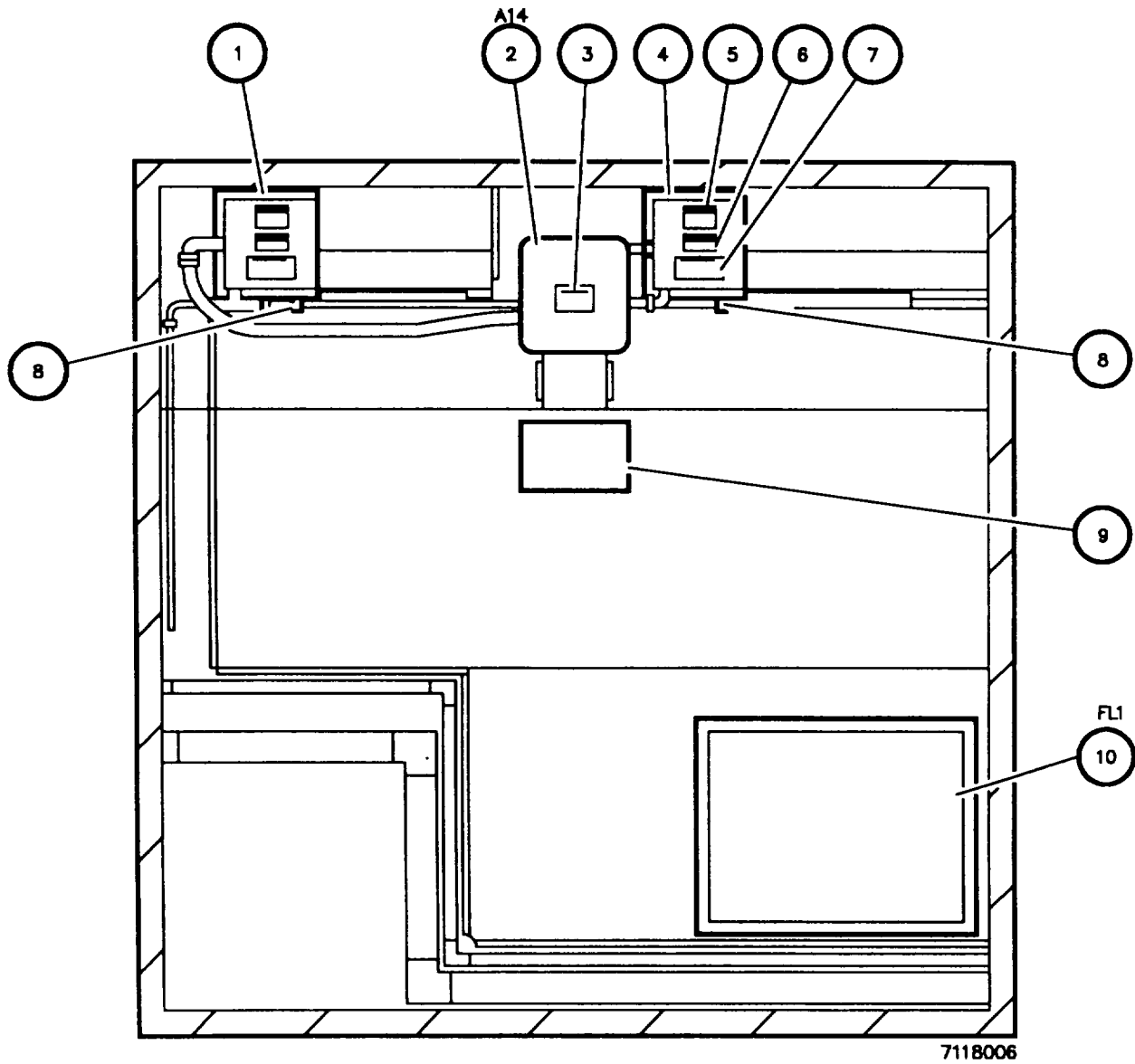
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KEY	NAME	FUNCTION
(1)	BLANK PANEL	Provides access to black patch panel cables and equipment rack power distribution.
(2)	DSVT 9 AND 10 front,	Encrypt and decrypt voice signals for telephones. DSVT 9 (A2A1A1) in front,
(3)	DSVT 7 and 8	Encrypt and decrypt signals for two associated DSDIs. DSVT 7 (A2A2A1) in front, DSVT 8 (A2A2A2) behind.
(4)	DSDI 7 and 8	Provide interface between communications processor CP1 and a ssociated DSVT 7 and 8. DSDI 7 (A2A2A3) in front, DSDI 8 (A2A2A4) behind. May be patched to CP2 at black patch panel.
(5)	RED PATCH PANEL A3A1	Permits routing of unencrypted (red) data and voice signals to applicable equipment.

1-13.3.1. ADP Shelter Equipment Rack (1A3) Components - Continued

KEY	NAME	FUNCTION
(6)	FOER, ESTA, T-CONNECTORS, AND TERMINATOR	Interface remote workstations (in RTC and OPN shelter) to processors and workstation in ADP shelter. FOER 1 (A3A3A1, RTC interface) in front, FOER 2 (A3A3A3, OPN shelter interface) behind. Associated ESTA (A3A3A2, A3A3A4) immediately behind each FOER. T-connectors A3A3CP1 and A3A3CP2 connect to FOER 1. Terminator A3A3AT1 connects to t-connector A3A3CP1 behind FOER 2.
(7)	CP2, ESTA, AND T-CONNECTOR	CP2 (A3A4A1) provides backup for CP1. May be patched into data communications at red patch panel. ESTA (A3A4A2) mounted to CP2 rear panel provides interface to local Ethernet loop. T-connector (A3A4CP1) connects to ESTA.
(8)	CP1, ESTA, AND T-CONNECTOR	CP1 (A3A6A1) controls and monitors operation of all AN/TYQ-30 automatic data processing equipment. ESTA (A3A6A2) mounted to rear panel provides interface to local Ethernet loop. T-connector (A3A6CP1) connects to ESTA.
(9)	DBMP, ESTA, AND T-CONNECTOR	DBMP (A3A5A1) generates and stores control data for external tactical switching network, under operator control. ESTA (A3A5A2) mounted to rear panel provides interface to local Ethernet loop. T-connector (A3A5CP1) connects to ESTA.
(10)	SDI 5 AND 6	Provide interface between communications processor CP1 and associated DSVT 5 and 6. DSDI 5 (A2A3A3) in front, DSDI 6 (A2A3A4) behind. May be patched to CP2 at black patch panel.
(11)	DSDI 3 AND 4	Provide interface between communications processor CP1 and associated DSVT 3 and 4. DSDI 3 (A2A4A3) in front, DSDI 4 (A2A4A4) behind. May be patched to CP2 at black patch panel.
(12)	DSDI 1 AND 2	Provide interface between communications processor CP1 and associated DSVT 1 and 2. DSDI 1 (A2A5A3) in front, DSDI 2 (A2A5A4) behind. May be patched to CP2 at black patch panel.
(13)	DSVT 1 AND 2	Encrypt and decrypt signals for two associated DSDIs. DSVT 1 (A2A5A1) in front, DSVT 2 (A2A5A2) behind.
(14)	DSVT 3 AND 4	Encrypt and decrypt signals for two associated DSDIs. DSVT 3 (A2A4A1) in front, DSVT 4 (A2A4A2) behind.
(15)	DSVT 5 AND 6	Encrypt and decrypt signals for two associated DSDIs. DSVT 5 (A2A3A1) in front, DSVT 6 (A2A3A2) behind.
(16)	GM A1A3	Provides interface with modulation (diphase, dipulse, bipolar, or Non-Return to Zero (NRZ)) signals on cable side.
(17)	LGM A1A2	Multiplexes up to 16 digital traffic channels into 1 digital group.
(18)	BLACK PATCH PANEL A1A1 applicable	Permits routing of incoming and outgoing encrypted (black) data to equipment.
(19)	EQUIPMENT DRAWER	Provides lockable storage space for manuals, tools, etc.

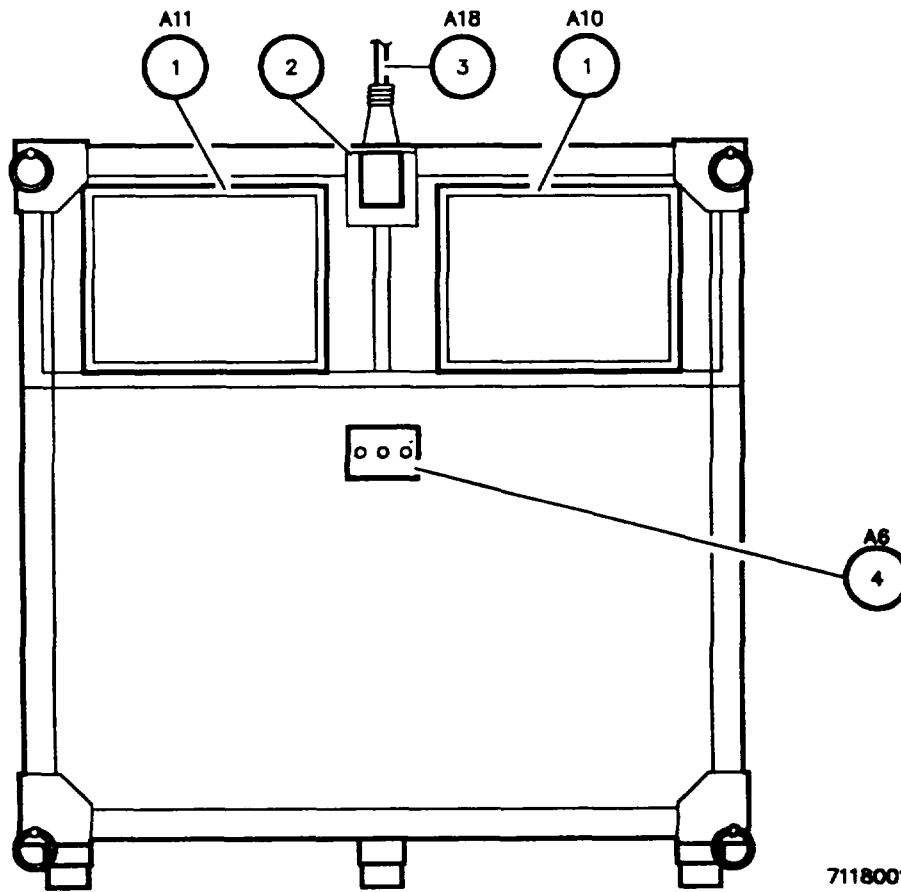
1-13.4. ADP Shelter (1) Front Interior Components



1-13.4. ADP Shelter (1) Front Interior Components - Continued

KEY	NAME	FUNCTION
(1)	AIR CONDITIONER FEEDTHRU, ROADSIDE	Provides access to roadside ECU cable connectors and controls.
(2)	ECU CONTROL BOX A14	Contains two ECU control modules for curbside and roadside ECU control. Swing-open cover provides access to modules.
(3)	DECAL	<p>AIR CONDITIONER CONTROL MODULE</p> <p>OPEN DOOR TO ACCESS:</p> <ul style="list-style-type: none"> • TEMPERATURE SELECTOR SWITCH • MODE SELECTOR SWITCH • COMPRESSOR CIRCUIT BREAKER <p>REFER TO TM 5-4120-384-14 FOR COMPLETE OPERATING INSTRUCTIONS.</p>
(4)	AIR CONDITIONER FEEDTHRU, CURBSIDE	Provides access to curbside ECU controls and cable connectors.
(5)	DECAL	<p style="text-align: center;">WARNING</p> <p>KEEP ALL COVERS, DRAWERS, DOORS CLOSED DURING NORMAL OPERATION TO MAINTAIN EMI/EMC INTEGRITY. EQUIPMENT GENERATES, USES, AND CAN RADIATE RF ENERGY WHICH MAY INTERFERE WITH RADIO COMMUNICATIONS.</p>
(6)	DECAL	<p style="text-align: center;">CAUTION</p> <p style="text-align: center;">208 VOLTS AC INSIDE.</p>
(7)	DECAL	<p>AIR CONDITIONER FEEDTHRU</p> <p>OPEN TO ACCESS:</p> <ul style="list-style-type: none"> • CONTROL CIRCUIT BREAKER • POWER CONNECTOR • GROUND STUD • LOW PRESSURE CUTOUT SWITCH • HIGH PRESSURE CUTOUT SWITCH <p>FRESH AIR VENT OPEN → ← CLOSE</p>
(8)	FRESH AIR VENT CONTROL	Adjusts fresh air vent on front of externally mounted ECU, controlling mix of fresh and recirculated air.
(9)	AEP ACCESS PANEL	Provides access to AEP connectors and to ECU temperature sensors.
(10)	ECU INLET FILTER FL1	Filters recirculated air.
		1-25

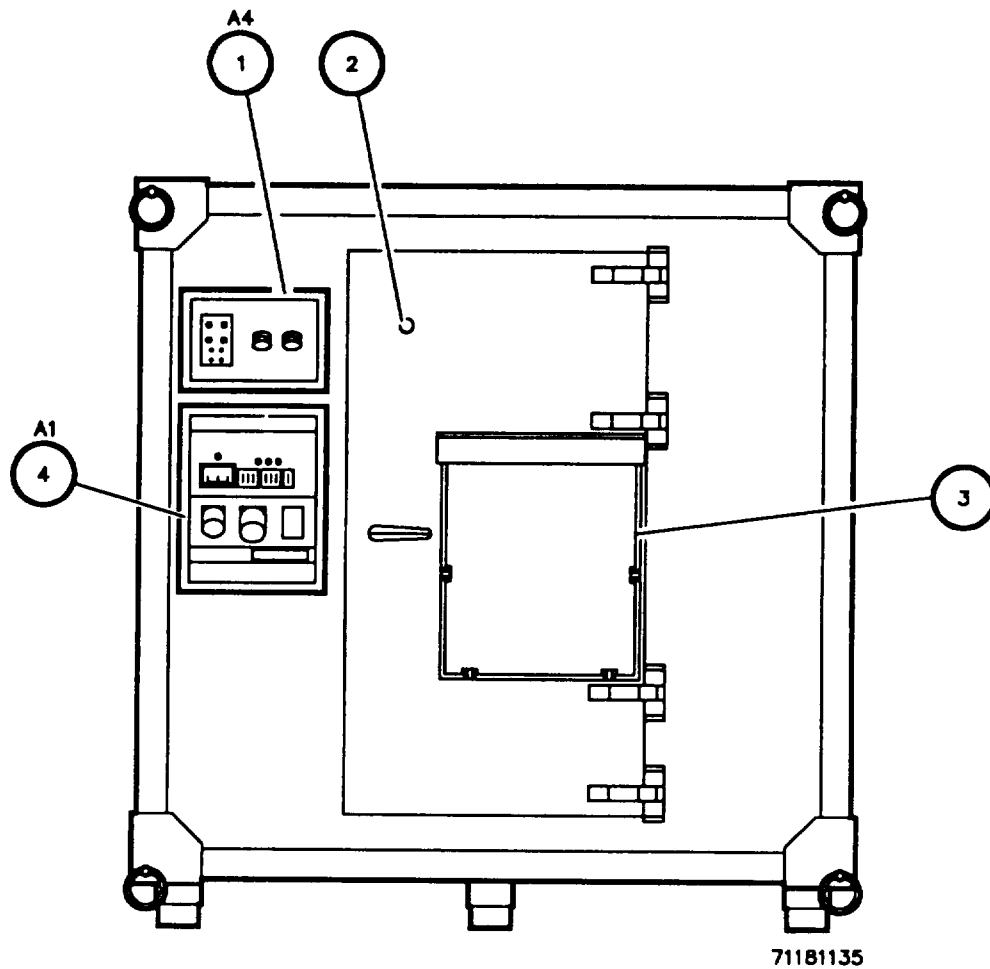
1-13.4.1. ADP Shelter (1) Front Exterior Components



KEY	NAME	FUNCTION
(1)	ECUs A10, A11	Condition (heat or cool) shelter interior ambient air.
(2)	ANTENNA MOUNTING BRACKET	Provides mounting for FM radio antenna.
(3)	RADIO ANTENNA A18	Radiates signals during transmission and collects signals when receiving.
(4)	AEP A6	Provides connection of antenna Radio Frequency (RF) cable, matching unit control cable, and ground cable.

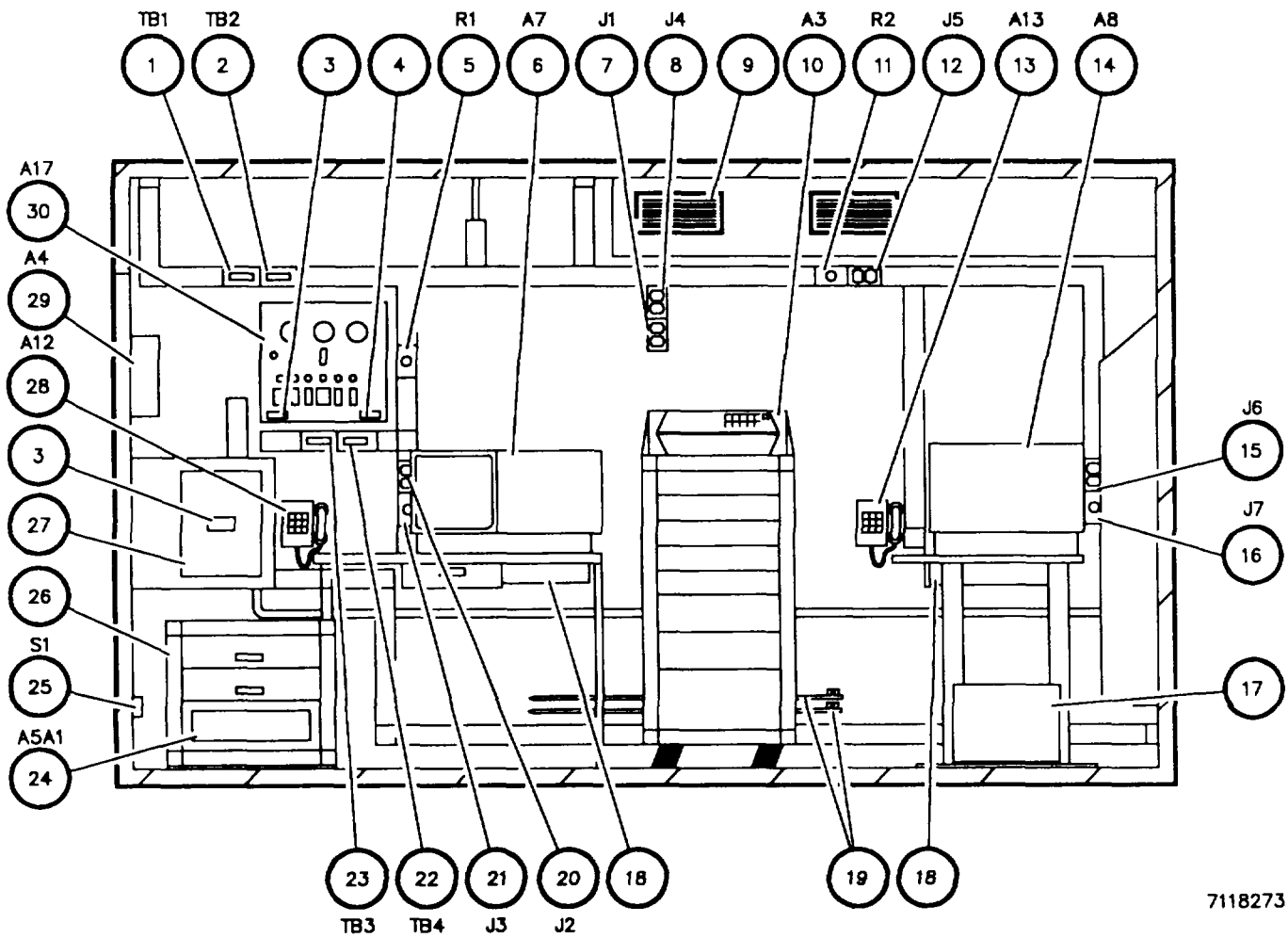
1-14. LOCATION AND DESCRIPTION OF OPN SHELTER (4) MAJOR COMPONENTS

1-14.1. OPN Shelter (4) Rear Exterior Components



KEY	NAME	FUNCTION
(1)	SEP A4	Provides connection for intercom, 26-pair, and fiber-optic cables.
(2)	VIEWPORT	Provides closed door viewing of persons outside shelter.
(3)	FILTER DOOR	Provides access to shelter air filter.
(4)	PEP A1	Provides controls for main input power and connections for main power cable, auxiliary power cable, ground cable, and convenience outlet.

1-14.2. OPN Shelter (4) Roadside Interior Components



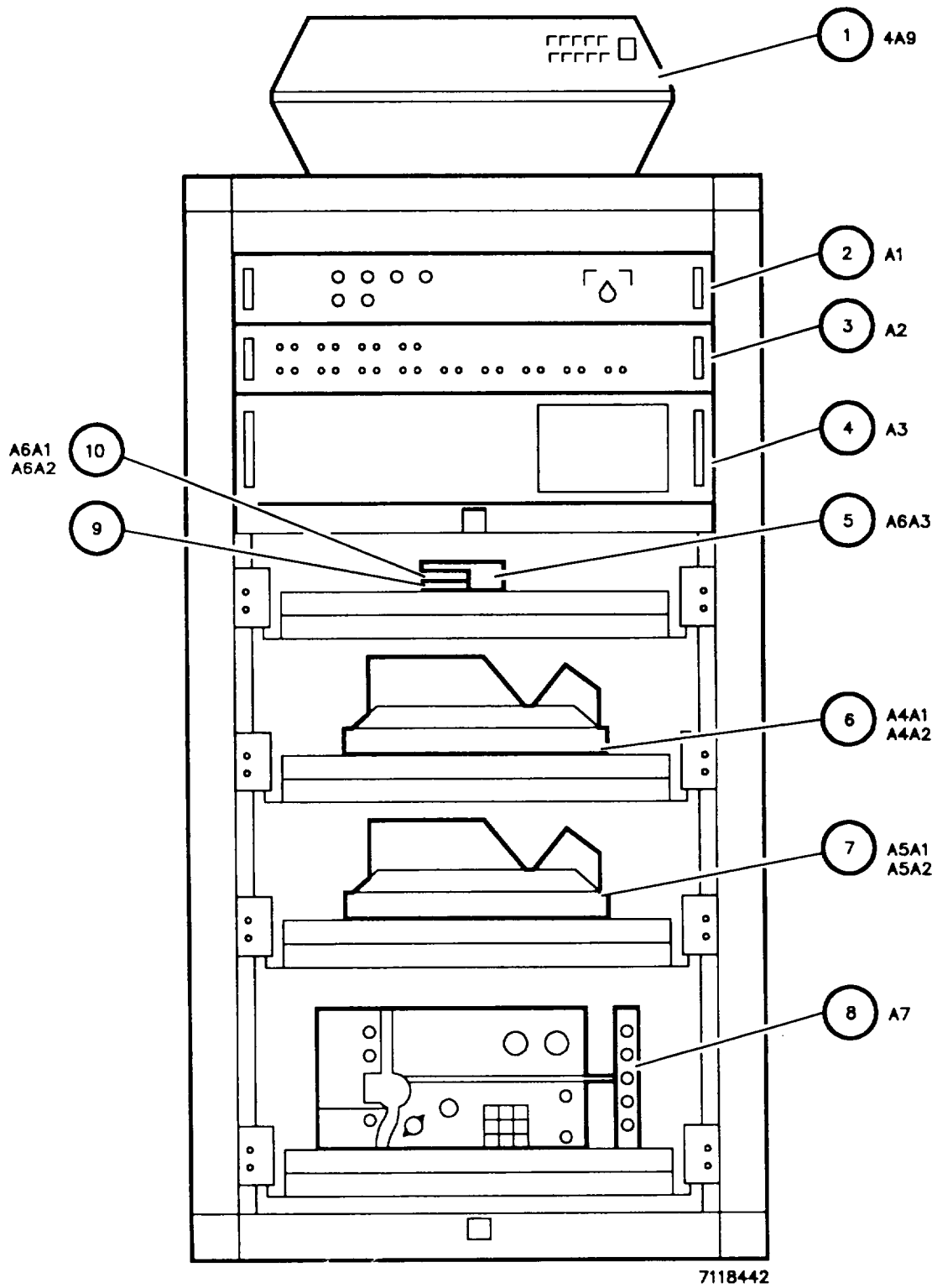
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KEY	NAME	FUNCTION
(1)	TERMINAL BOARD TB1	Provides wiring point for workstation dimmer controls R1-R4.
(2)	TERMINAL BOARD TB2	Provides wiring point for dc wiring to dc filter and dc receptacles J3, J7, J10, J13.
(3)	DECAL	CAUTION: 208 VOLTS AC INSIDE
(4)	DECAL	CAUTION: HIGH CURRENT INSIDE
(5)	DIMMER R1	Controls brightness of ceiling-mounted WS1 spotlight.
(6)	WORKSTATION WS1 A7	Provides operator interface to ADP processors in ADP shelter. Includes color graphics monitor, keyboard, and mouse.
(7)	AC RECEPTACLE J1	Provides ac power for RSA in equipment rack.
(8)	AC RECEPTACLE J4	Provides ac power to roadside printer A9 on top of equipment rack.

1-14.2. OPN Shelter (4) Roadside Interior Components - Continued

KEY	NAME	FUNCTION
(9)	AIR DUCT	Distributes roadside ECU-conditioned air.
(10)	EQUIPMENT RACK A3	Provides mounting for printer, ADPE, and radio equipment. Contains seven slide-mounted shelves.
(11)	DIMMER R2	Controls brightness of ceiling-mounted WS2 spotlight.
(12)	AC RECEPTACLE J5	Roadside convenience outlet for test equipment, etc.
(13)	TELEPHONE A13	With associated DSVT, provides secure voice link for use by operating personnel at WS1.
(14)	WORKSTATION WS2 A8	Provides operator interface to processors in ADP shelter. Includes color graphics monitor, keyboard, and mouse.
(15)	AC RECEPTACLE J6	Provides ac power for workstation WS2 A8.
(16)	DC RECEPTACLE J7	Provides dc power for telephone A13.
(17)	SAFE	Provides secure storage for hard disk drive assemblies, tape cartridges, and KYK-13/TSEC fill device.
(18)	MOUSE/KEYBOARD STORAGE DRAWER	Provides storage for keyboards and mouses during transport.
(19)	GROUND RODS	Provide earth ground for shelter.
(20)	AC RECEPTACLE J2	Provides ac power for workstation WS1.
(21)	DC RECEPTACLE J3	Provides dc power for telephone A12.
(22)	TERMINAL BOARD TB4	Provides wiring point for convenience receptacles.
(23)	TERMINAL BOARD TB3	Provides wiring point for roadside workstation and convenience ac receptacles.
(24)	MAIN POWER FILTER A5A1	Filters 3-phase line ac power.
(25)	DOOR SWITCH S1	Enabled when BLACKOUT toggle switch on PDU is in NORMAL. Switches white overhead lights to red (blackout) when shelter door opened.
(26)	EQUIPMENT DRAWERS	Provide lockable storage for manuals, etc.
(27)	POWER ENTRY BOX	Provides access to internal components on power entry box. ACCESS PANEL
(28)	TELEPHONE A12	With associated DSVT, provides secure voice link for personnel at WS1 A7.
(29)	SIGNAL ENTRY BOX A4	Covers internal components of signal entry panel.
(30)	PDU A17	Controls ac power to all equipment except ECUs and UPS. Also provides overload protection for controlled equipment.
		1-29

1-14.2.1. OPN Shelter Equipment Rock (4A3) Components



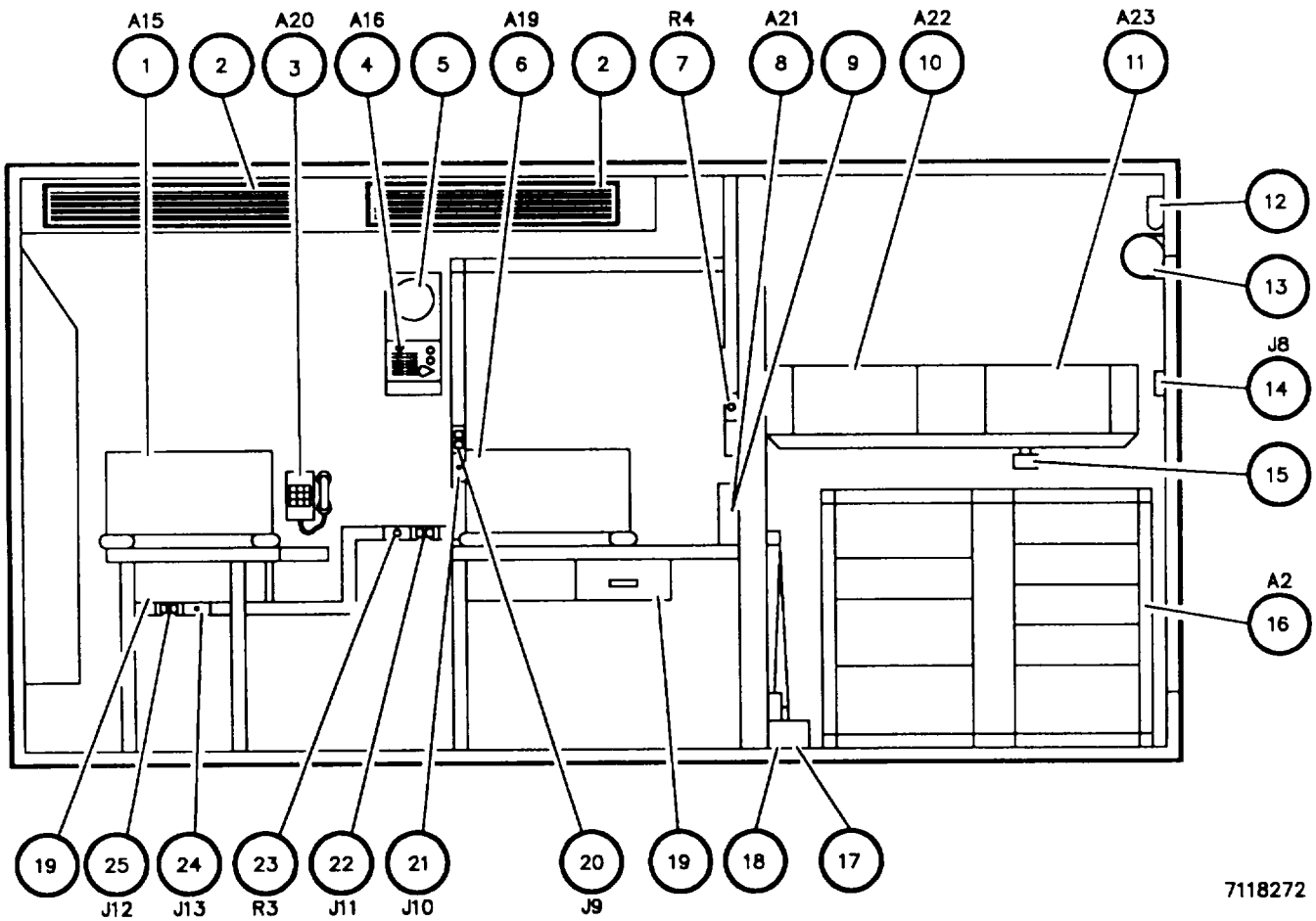
1-14.2.1. OPN Shelter Equipment Rack (4A3) Components - Continued

KEY	NAME	FUNCTION
(1)	Tempest PRINTER 4A9	Provides hard copy printout of operator-selected data. Not subassembly of equipment rack 4A3.
(2)	RED PATCH PANEL A1	Permits routing of unencrypted (red) data and voice signals to applicable equipment.
(3)	BLACK PATCH PANEL A2	Permits routing of incoming and outgoing encrypted (black) data to applicable equipment.
(4)	RSA A3	Interfaces remote workstations in OPN shelter to ADP shelter processors. The RSA includes a FOER and ESTA.
(5)	DC FILTER A6A3	Provides filtered 28 Vdc power for radio set and HYP-57A/TSEC.
(6)	DSVT 1 AND 2	Encrypt and decrypt voice signals for extension telephones 1 and 2. DSVT 1 (A4A1) in front, DSVT 2 (A4A2) behind.
(7)	DSVT 3 AND 4	Encrypt and decrypt voice signals for extension telephones 3 and 4. DSVT 3 (A5A1) in front, DSVT 4 (A5A2) behind. DSVT 4 may be patched to LDF at red patch panel.
(8)	FM RADIO A7	Provides long-range FM radio voice communication (may be AN/VRC-46 or AN/VRC-90). (See NOTE.)
(9)	MOUNTING ADAPTER MT-4626/VRC	Mounting assembly for TSEC/KY-57 and HYP-57A/TSEC. Contains no active components. (See NOTE.)
(10)	TSEC/KY-57 AND HYP-57A/TSEC	KY-57 (A6A1) provides on-line encryption/decryption for all classifications of traffic. HYP-57A (A6A2) converts 28 Vdc to required KY-57 power. (See NOTE.)

NOTE

FM radios and associated KY-57 and mounts are not usually authorized for the OPN shelter.

1-14.3. OPN Shelter (4) Curbside Interior Components



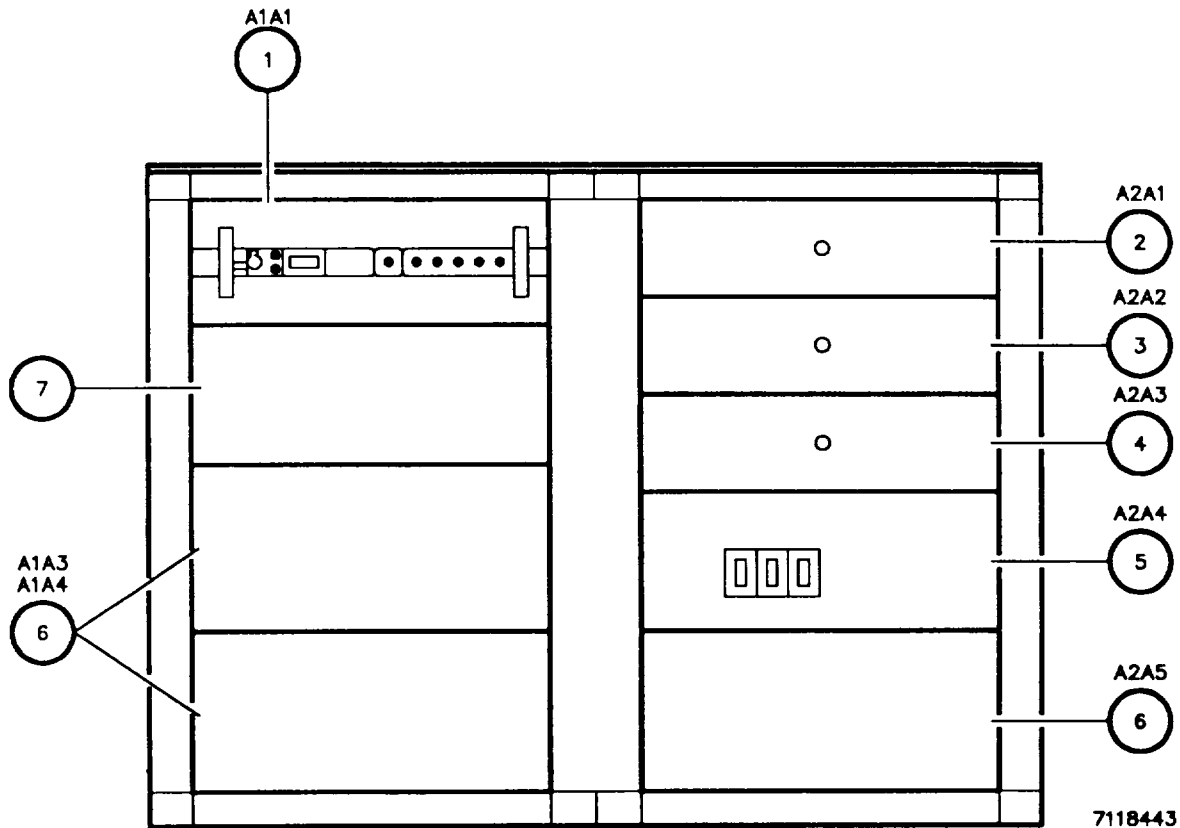
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KEY	NAME	FUNCTION
(1)	WS3 A15	Provides operator interface to ADP processors in ADP shelter. Includes color graphics monitor, keyboard, and mouse. In software, this is WS5.
(2)	AIR DUCT	Distributes roadside ECU-conditioned air.
(3)	TELEPHONE A20	With associated DSVT, provides secure voice link for use by operating personnel at WS3.
(4)	INTERCOM A16	Provides two-way voice communication to other intercoms (maximum of 7).
(5)	CLOCK	Settable, battery-operated clock provides time of day.

1-14.3. OPN Shelter (4) Curbside Interior Components - Continued

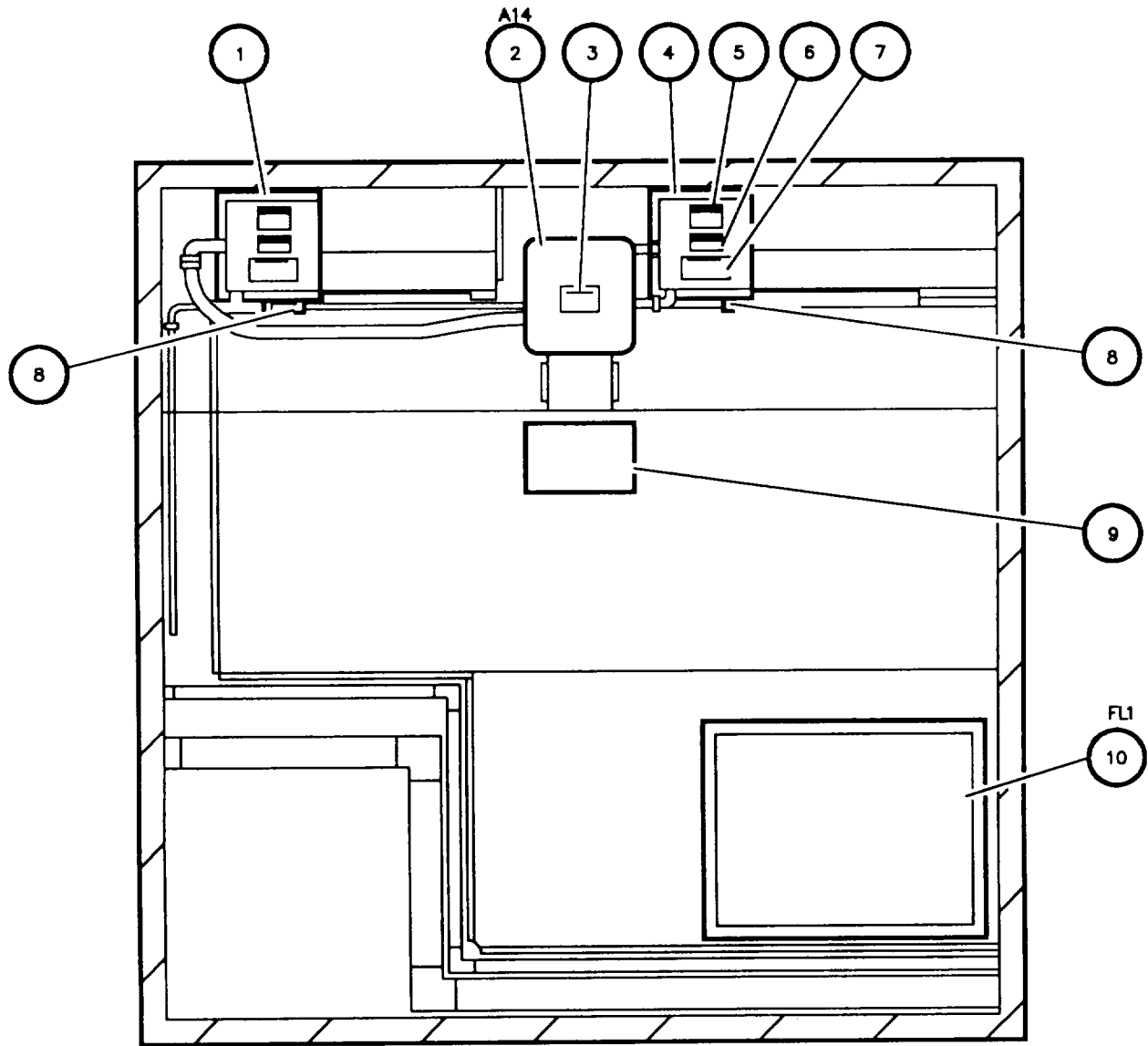
KEY	NAME	FUNCTION
(6)	WS4 A19	Provides operator interface to processors in ADP shelter. Includes color graphics monitor, keyboard, and mouse. In software, this is WS6.
(7)	DIMMER R4	Controls brightness of ceiling-mounted spotlight above work-station WS4.
(8)	TELEPHONE A21	With associated DSVT, provides secure voice link for operating personnel at WS4.
(9)	FIRST AID KIT	Provided for medical emergencies.
(10)	TEMPEST PRINTER A22	Provides hard copy printout of operator-selected data.
(11)	LDF A23	(See NOTE.) Provides digital facsimile communications. Accesses tactical switched network via a DSVT and radio network via FM radio.
(12)	FLASHLIGHT	Provides emergency lighting.
(13)	FIRE EXTINGUISHER	Provided to extinguish electrical fires.
(14)	AC RECEPTACLE J8	Provides ac power to curbside printer A22 and LDF A23.
(15)	PENCIL SHARPENER	Provided to sharpen pencils.
(16)	POWER RACK A2	Contains components of UPS.
(17)	SLEDGEHAMMER	Provided to hammer grounding rods into ground.
(18)	AXE	Provided as a cutting tool, primarily for emergency exit.
(19)	WORKSTATION KEYBOARD/ MOUSE STORAGE DRAWERS	Slide-mounted drawers to store keyboards and mice during transport.
(20)	AC RECEPTACLE J9	Provides ac power for workstation WS4 and intercom.
(21)	DC RECEPTACLE J10	Provides dc power for WS4 telephone A21.
(22)	AC RECEPTACLE J11	Curbside convenience outlet for test equipment, etc.
(23)	DIMMER R3	Controls brightness of ceiling-mounted spotlight above work-station WS3.
(24)	DC RECEPTACLE J13	Provides power to WS3 telephone A20.
(25)	AC RECEPTACLE J12	Provides ac power for workstation WS3.
<p>NOTE LDF is not usually authorized for the OPN shelter.</p>		

1-14.3.1. OPN Shelter Power Rack (4A2) Components



KEY	NAME	FUNCTION
(1)	CONTROL ASSEMBLY A1A1	Provides controls, system monitoring, and fault indications for UPS.
(2)	INVERTER A A2A1	Provides single-phase ac power or, in event of line failure, battery power. Also provides inverter failure indication.
(3)	INVERTER B A2A2	Provides single-phase ac power or, in event of line failure, battery power. Also provides inverter failure indication.
(4)	INVERTER C A2A3	Provides single-phase ac power or in event of line failure, battery power. Also provides inverter failure indication.
(5)	INPUT ASSEMBLY A2A4	Filters and distributes 3-phase line input to inverters. Also provides overload protection for inverters.
(6)	BATTERY ASSEMBLIES A1A3, A1A4, A2A5	Provide ± 144 Vdc to inverters in event of line failure.
(7)	EQUIPMENT DRAWER	Provides lockable storage for manuals, etc.

1-14.4. OPN Shelter (4) Front Interior Components



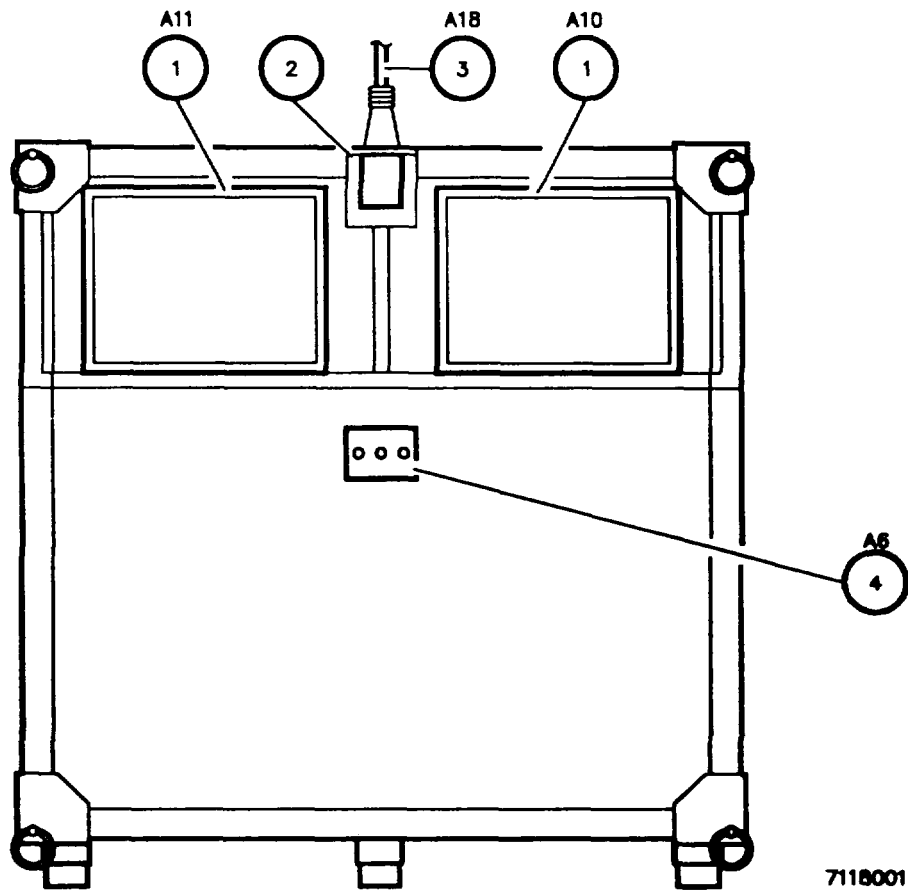
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1-14.4. OPN Shelter (4) Front Interior Components - Continued

KEY	NAME	FUNCTION
(1)	AIR CONDITIONER FEEDTHRU, ROADSIDE	Provides access to roadside ECU cable connectors and controls.
(2)	ECU CONTROL BOX A14	Contains two ECU control modules for curbside and roadside ECU control. Swing-open cover provides access to modules.
(3)	DECAL	AIR CONDITIONER CONTROL MODULE OPEN DOOR TO ACCESS: <ul style="list-style-type: none"> • TEMPERATURE SELECTOR SWITCH • MODE SELECTOR SWITCH • COMPRESSOR CIRCUIT BREAKER REFER TO TM 5-4120-384-14 FOR COMPLETE OPERATING INSTRUCTIONS.
(4)	AIR CONDITIONER FEEDTHRU, CURBSIDE	Provides access to curbside ECU controls and cable connectors.
(5)	DECAL	<p style="text-align: center;">WARNING</p> <p>KEEP ALL COVERS, DRAWERS, DOORS CLOSED DURING NORMAL OPERATION TO MAINTAIN EMI/EMC INTEGRITY. EQUIPMENT GENERATES, USES, AND CAN RADIATE RF ENERGY WHICH MAY INTERFERE WITH RADIO COMMUNICATIONS.</p>
(6)	DECAL	<p style="text-align: center;">CAUTION</p> <p style="text-align: center;">208 VOLTS AC INSIDE.</p>
(7)	DECAL	AIR CONDITIONER FEEDTHRU OPEN TO ACCESS: <ul style="list-style-type: none"> • CONTROL CIRCUIT BREAKER • POWER CONNECTOR • GROUND STUD • LOW PRESSURE CUTOUT SWITCH • HIGH PRESSURE CUTOUT SWITCH FRESH AIR VENT OPEN → ← CLOSE
(8)	FRESH AIR VENT CONTROL	Adjusts fresh air vent on front of externally mounted ECU, controlling mix of fresh and recirculated air.
(9)	AEP ACCESS PANEL	Provides access to AEP connectors and to ECU temperature sensors.
(10)	ECU INLET FILTER FL1	Filters recirculated air.
		1-37

1-14.4.1. AN/TYQ-30(V)1 OPN Shelter (4) Front Exterior Components



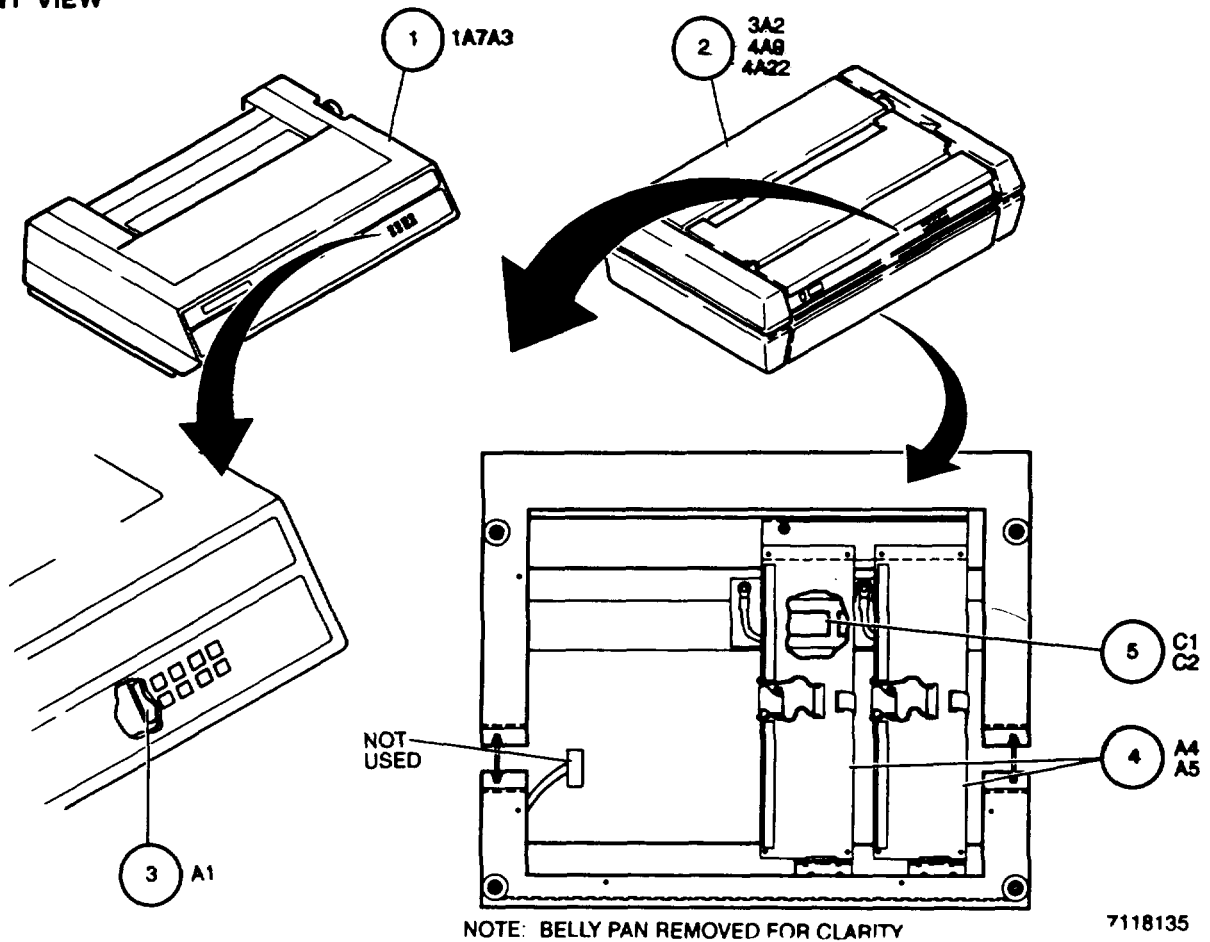
KEY	NAME	FUNCTION
(1)	ECUs A10, All	Condition (heat or cool) shelter interior ambient air.
(2)	ANTENNA MOUNTING BRACKET	Provides mounting for FM radio antenna. (See NOTE.)
(3)	RADIO ANTENNA A18	Radiates signals during transmission and collects signals when receiving. (See NOTE.)
(4)	AEP A6	Provides connection of antenna RF cable, matching unit control cable, and ground cable.

NOTE
Antenna is not usually authorized for OPN shelter.

1-15. LOCATION AND DESCRIPTION OF AN/TYQ-30(V)1/2 UNE REPLACEABLE UNIT (LRU) MAJOR COMPONENTS

1-15.1. Dot Matrix Printer (1A7A3, 3A2, 4A9, 4A22) Major Components

FRONT VIEW



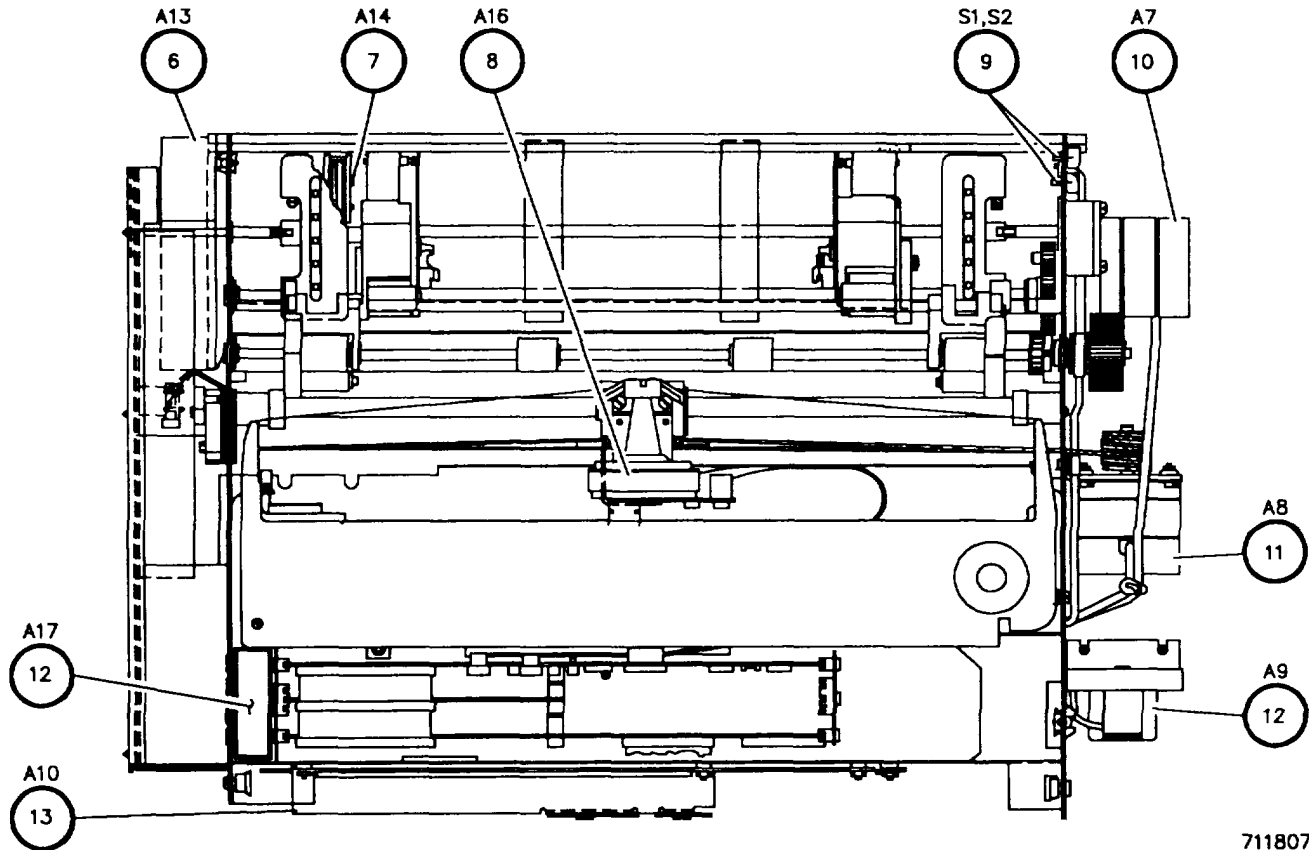
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KEY	NAME	FUNCTION
(1)	NON-TEMPEST PRINTER 1A7A3	Provides hard copy printout of operator-selected data.
(2)	TEMPEST PRINTER 3A2, 4A9, 4A22	Provides hard copy printout of operator-selected data.
(3)	CONTROL PANEL (ACPL) CCA A1	Provides interface between printer front panel switches and ECPU CCA. Also contains two Light Emitting Diode (LED) units for two-character control panel display.
(4)	TEMPEST PRINTER WIRE DRIVER (AWDR) CCA A4, A5	Two identical circuit cards that provide drive signal and voltages to control wires in print head. See key Q for non-Tempest printer.
(5)	TEMPEST PRINTER AC FILTER CAPACITORS C1, C2	Two identical capacitors that filter drive signals to print head. Not used in non-Tempest printer.

1-15.1. Dot Matrix Printer (1 A7A3, 3A2, 4A9, 4A22) Major Components - Continued

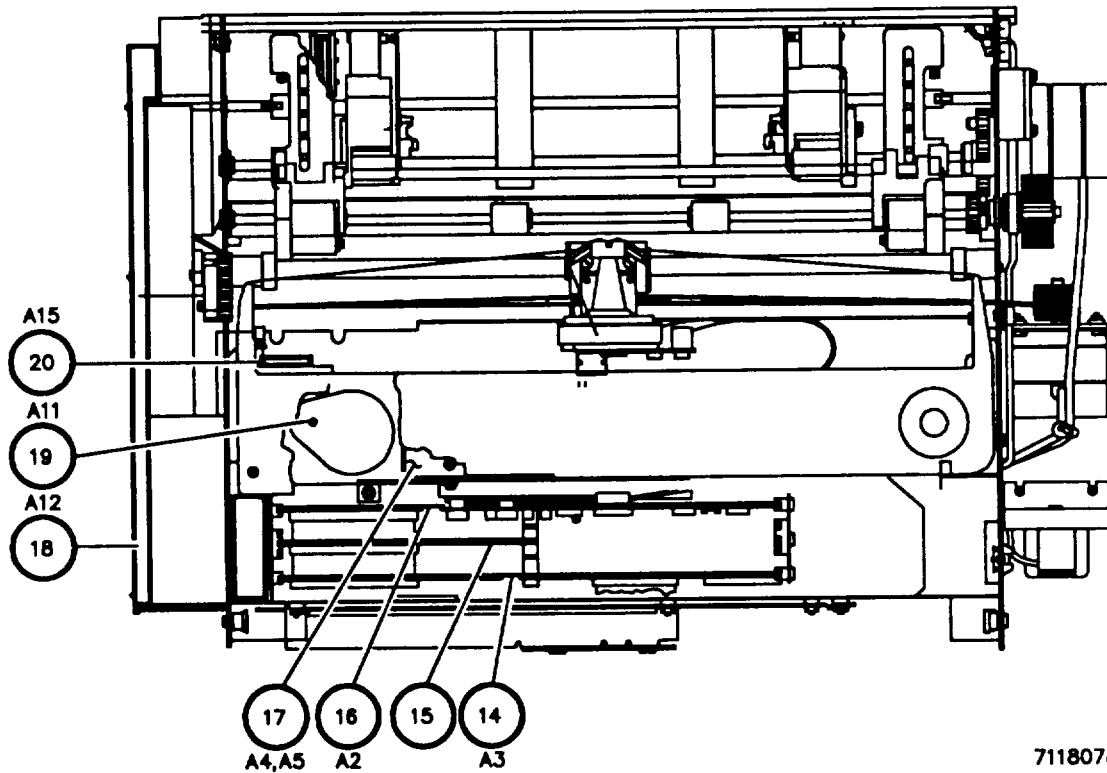
TOP VIEW



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KEY	NAME	FUNCTION
(6)	RFI FILTER BOX ASSEMBLY A13	Filters Radio Frequency Interference (RFI) from input voltage.
(7)	PAPER OUT SWITCH A14	Provides signal to APTR/MPTR CCA when paper runs out.
(8)	PRINT HEAD A16	Eighteen-wire print head, controlled by AWDR CCAs, that strikes ribbon and paper to generate print characters.
(9)	LOAD AND PROGRAM SWITCHES S1, S2	Switches used to configure printer.
(10)	PAPER MOTOR A7	Provides automatic paper advance as directed by APTR/MPTR CCA.
(11)	CARRIAGE MOTOR A8	Provides automatic carriage positioning as directed by APTR/MPTR CCA.
(12)	FAN MOTORS A9, A17	Provide cooling for printer components, A9 right side, A17 left side. A17 normally used only in Tempest printer.
(13)	POWER SUPPLY (ACL) CCA A10	Provides filtered power for +40, +16, +8, and -16 Vdc buses. Also provides regulated +5, +12, -12, and +28 Vdc and

1-1 5.1. Dot Matrix Printer (1 A7A3, 3A2, 4A9, 4A22) Major Components - Continued
 TOP VIEW - Continued

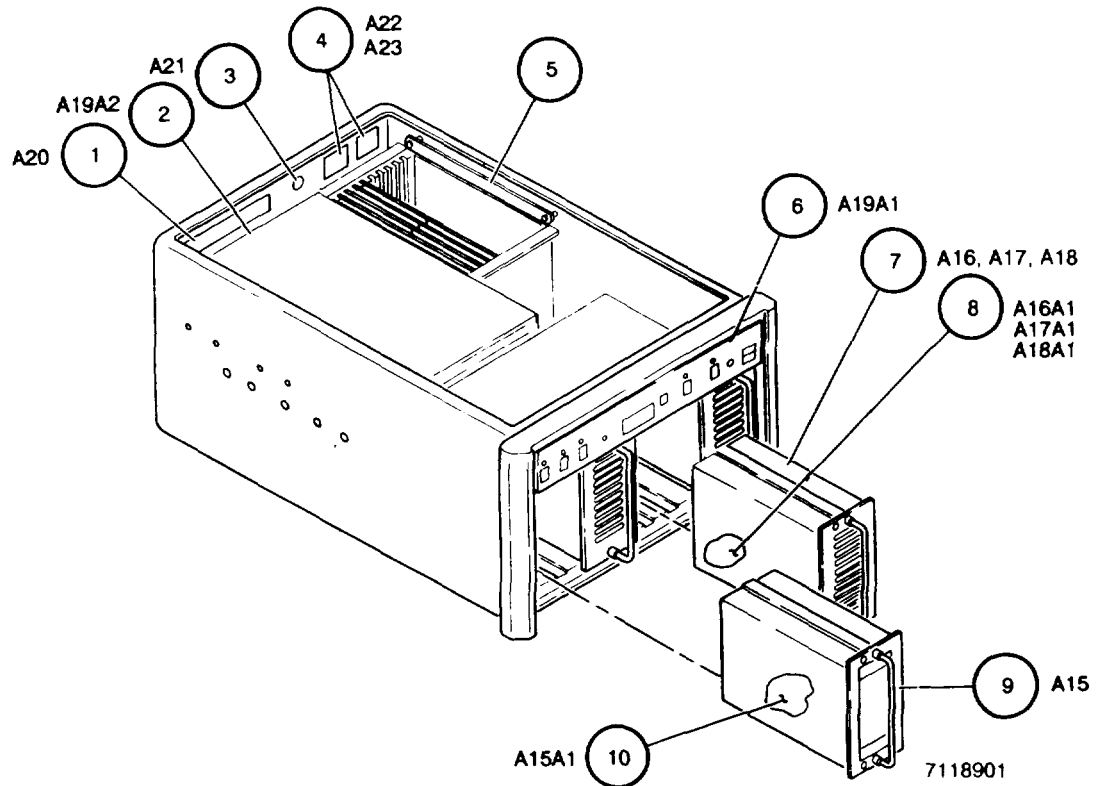


KEY	NAME	FUNCTION
(14)	PROCESSOR (ECPU) CCA A3	Provides printer CPU and interface control functions.
(15)	PARALLEL INTERFACE (APAR) CCA	Not used in this application.
(16)	PRINTER CONTROL (APTR/MPTR) CCA A2	Controls all printer action directed by ECPU CCA.
(17)	NON-TEMPEST PRINTER WIRE DRIVER (AWDR) CCA A4, A5	Two identical circuit cards that provide drive signal and voltages to control wires in print head. See key (for Tempest printer.
(18)	SWITCHING REGULATOR (ACH) CCA A12	A switching regulator that uses an input voltage of 85 to 132 volts Root Mean Square (rms) to generate 150 watts of average dc power.
(19)	RIBBON MOTOR A11	Provides automatic ribbon advance as directed by APTR/MPTR CCA.
(20)	INTERRUPTER (APHO) CCA A15	Generates a 'HOME" signal for APTR CCA when carriage is positioned at extreme left side of printer.

1-15.2. Processor Assembly Major Components

1-15.2.1. Communications Processor Assembly (1A3A3A4A1, 1A3A3A6A1) Major Components

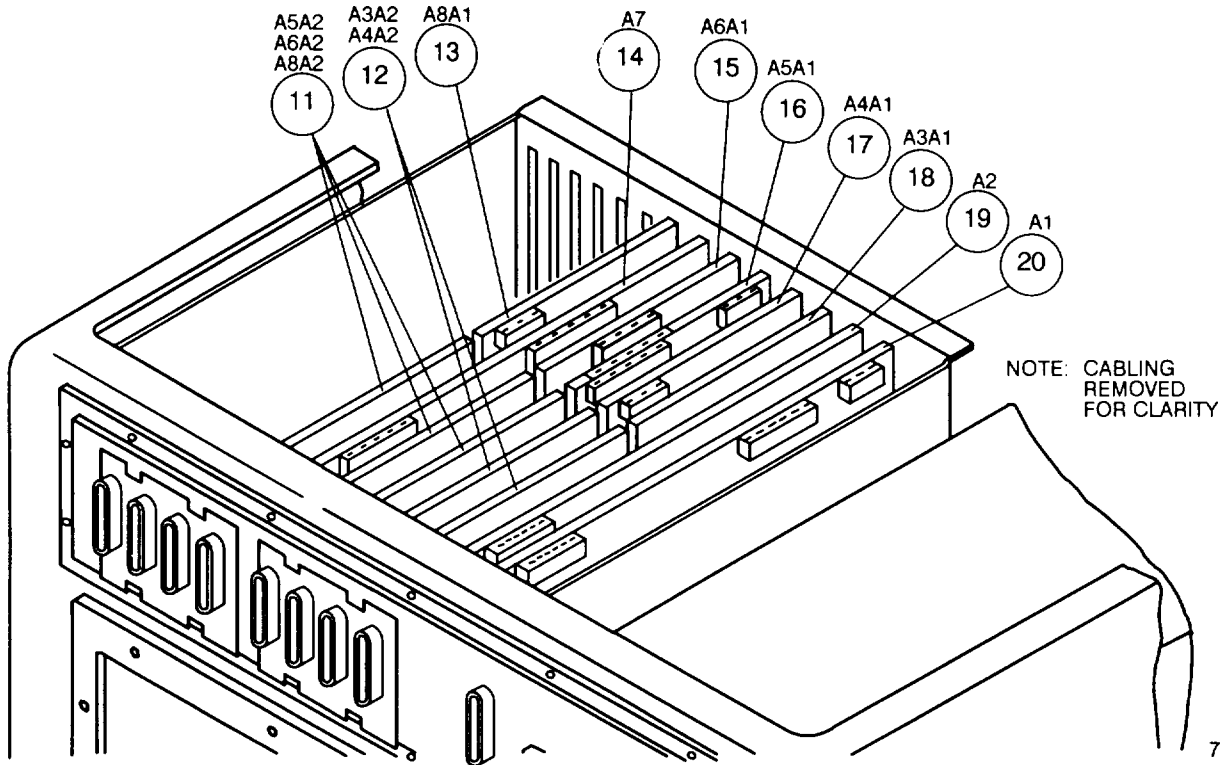
FRONT VIEW



KEY	NAME	FUNCTION
(1)	ETHERNET CABINET KIT A20	Provides rear panel Ethernet cable connector cabling interface to Ethernet controller CCA.
(2)	POWER SUPPLY ASSEMBLY A19A2	Provides power, power distribution, and control for processor.
(3)	DIGITAL I/O CABLE A21	Provides rear panel digital cable connector cabling interface to digital I/O CCA.
(4)	MULTIPLEXER CABINET KIT A22, A23	Two separate assemblies that each provide four rear panel cable connectors and cabling interface to multiplexer CCA.
(5)	Q-BUS CARD CAGE	Provides physical mounting and connection points for processor circuit card assemblies.
(6)	FRONT PANEL ASSEMBLY A19A1	Provides processor/operator interface.
(7)	DISK DRIVE ASSEMBLY A16, A17, A18	One of three; houses disk drive.
(8)	DISK DRIVE A16A1, A17A1, A18A1	Disk drives 1 and 2 provide 175 megabytes and disk drive 3 provides 622 megabytes of unformatted storage.
(9)	TAPE DRIVE ASSEMBLY A15	Houses magnetic tape drive.
(10)	MAGNETIC TAPE DRIVE A15A1	Provides 94.5 megabytes of serial access storage.

1-15.2.1. Communications Processor Assembly (1A3A3A4A1, 1A3A3A6A1) Major Components-Continued

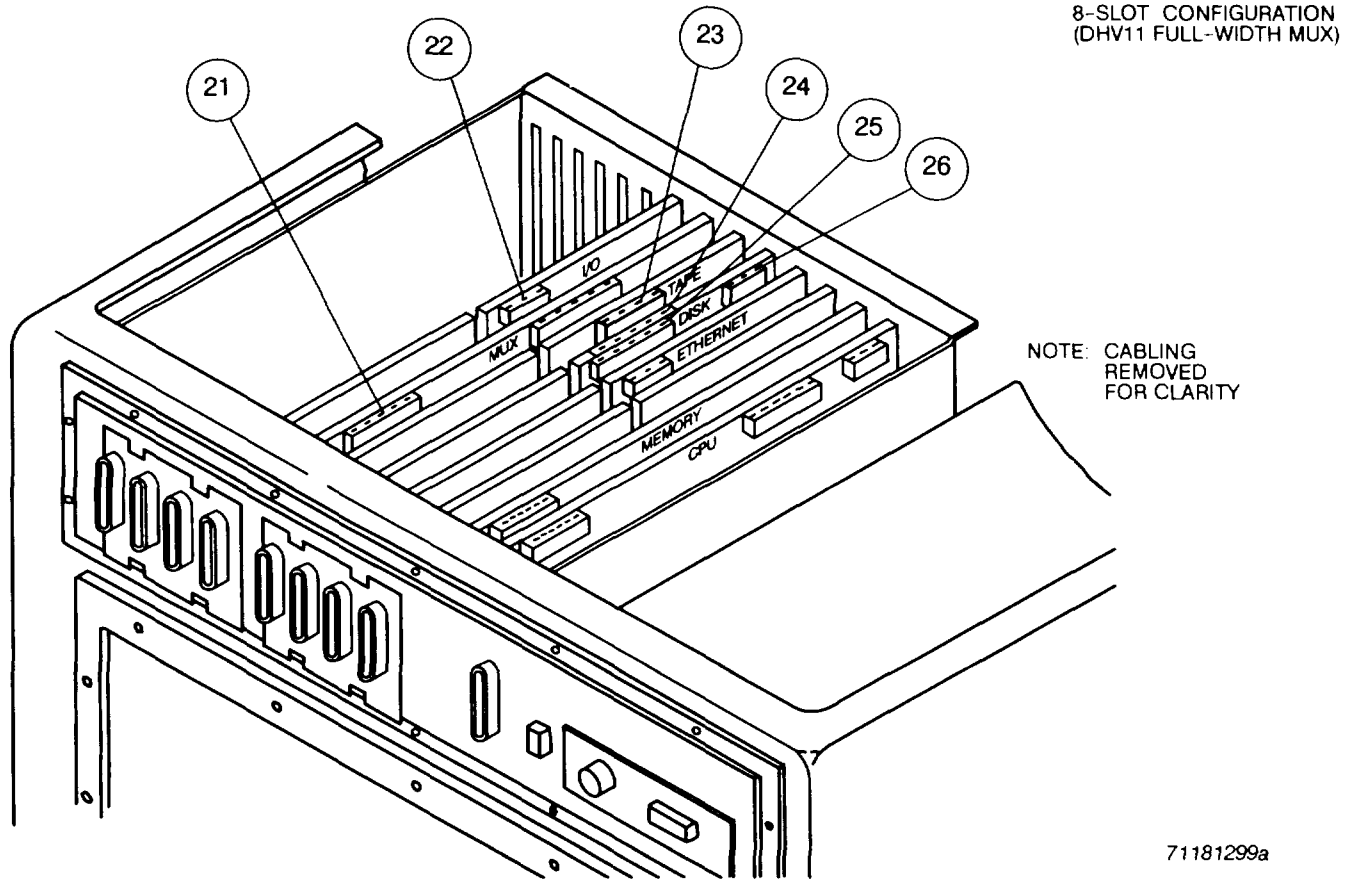
CARD CAGE VIEW



KEY	NAME	FUNCTION
(11)	GRANT ANCHOR BOARDS A5A2, A6A2, A8A2	Provides backplane continuity circuits and mounting channel for CCA sharing same card cage slot.
(12)	ANCHOR BOARD A3A2, A4A2	Provides mounting channel for CCA sharing same card cage slot.
(13)	DIGITAL I/O CCA A8A1	Provides 16 contact closure input lines.
(14)	MULTIPLEXER CCA A7 or A7A1	Provides eight independent RS-423A or RS-232C compatible full-duplex asynchronous data channels. May be full-width CCA (A7) or half-width CCA (A7A1), with I/O board (A7A2).
(15)	TAPE CONTROLLER CCA A6A1	Provides interface between CPU and tape drive assembly.
(16)	DISK CONTROLLER CCA A5A1	Provides interface between CPU and disk drive assembly.
(17)	ETHERNET CONTROLLER CCA A4A1	Provides interface between CPU and Ethernet Local Area Network (LAN)
(18)	GRANT BOARD A3A1	Grant board provides backplane continuity circuit.
(19)	MEMORY CCA A2	Provides 8 megabytes of Error-Correction Circuit (ECC) memory.
(20)	CPU CCA A1	Provides 32-bit microprocessor, floating point coprocessor, boot/diagnostic Read-Only Memory (ROM), and Q-bus map/interface.

1-15.2.1. Communications Processor Assembly (1A3A3A4A1, 1A3A3A6A1) Major Components-Continued

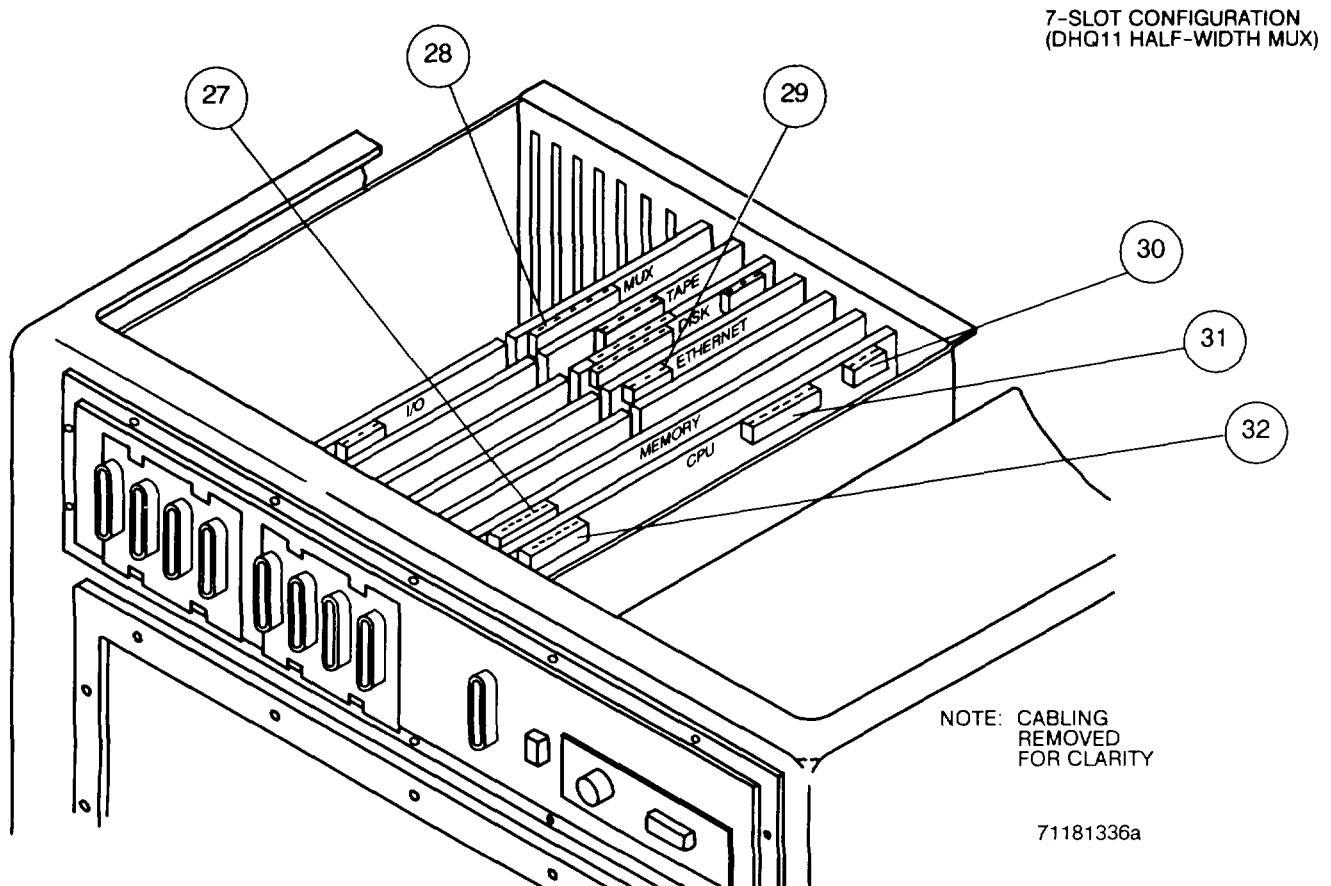
CARD CAGE VIEW



KEY	NAME	FUNCTION
(21)	MULTIPLEXER CCA CONNECTOR	On full-width multiplexer CCA (A7), provides termination on CCA for multiplexer cabinet kit cable to J1-J4. On half-width multiplexer CCA (A7A1), this connector is located below J5-J8 cable.
(22)	DIGITAL I/O CCA CONNECTOR	Provides termination on CCA for digital I/O cable assembly (701372-0100) (J9).
(23)	TAPE CONTROLLER CCA CONNECTOR	Provides termination on CCA for CONTROLLER ribbon cable 701311-0036.
(24)	DISK CONTROLLER CCA CONNECTOR	Provides termination on CCA for DISK CONTROLLER ribbon cable 701308-0033.
(25)	DISK CONTROLLER CCA CONNECTOR	Provides termination on CCA for DATA ribbon cable 701307-0036.
(26)	DISK CONTROLLER CCA CONNECTOR	Provides termination on CCA for DISK ribbon cable 701313-0046.

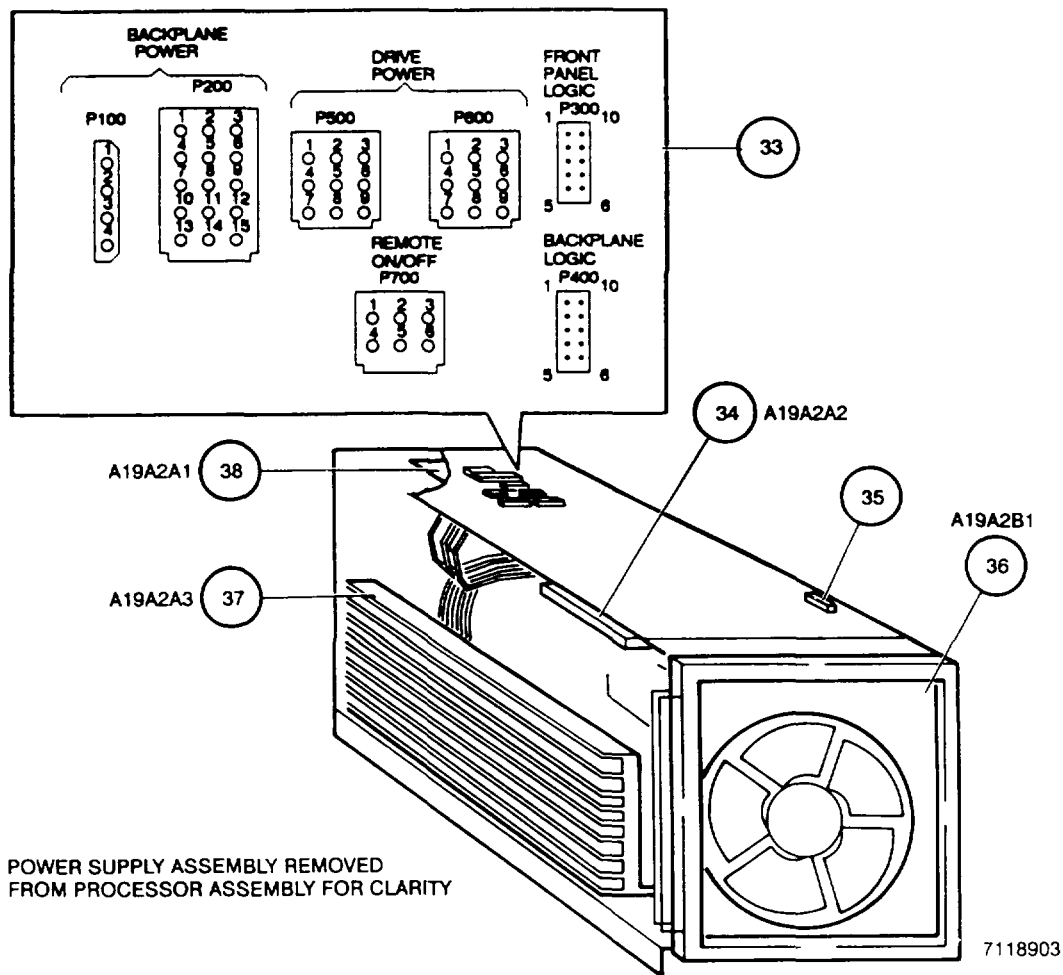
1-15.2.1. Communications Processor Assembly (1A3A3A4A1, 1A3A3A6A1) Major Components-Continued

CARD CAGE VIEW - Continued



KEY	NAME	FUNCTION
(27)	MEMORY CCA CONNECTOR	Provides termination on CCA for ribbon cable (17-00716-01) jumper between CPU and memory CCA(s).
(28)	MULTIPLEXER CCA CONNECTOR	Provides termination on CCA for multiplexer cabinet kit cable (9107747-01) (J5-J8). On half-width multiplexer CCA (A7A1), the J1-J4 connector is located below J5-J8 connector.
(29)	ETHERNET INTERFACE CONNECTOR	Provides termination on CCA for Ethernet cabinet kit cable (70-21202-01).
(30)	CPU CCA CONNECTOR	Provides termination on CCA for MICRO VAX 10-wire ribbon cable 701310-0037.
(31)	CPU CCA CONNECTOR	Provides termination on CCA for MICRO VAX 20-wire ribbon cable 701309-0036.
(32)	CPU CCA CONNECTOR	Provides termination on CCA for RIBBON CABLE (17-00716-01) jumper between CPU and memory CCA.

1-15.2.1. Communications Processor Assembly (1A3A3A4A1, 1A3A3A6A1) Major Components - Continued
POWER SUPPLY ASSEMBLY VIEW

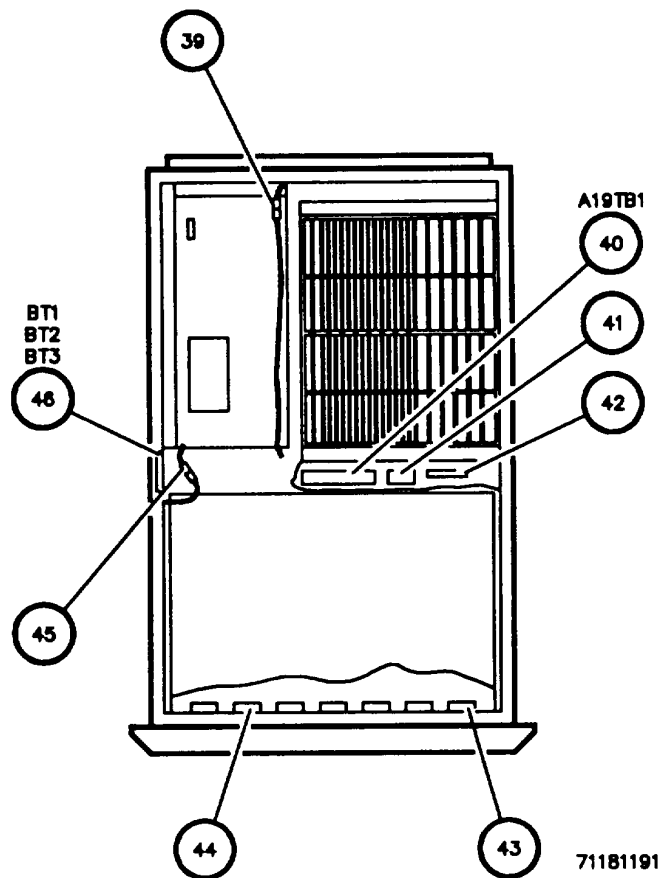


NOTE: POWER SUPPLY ASSEMBLY REMOVED FROM PROCESSOR ASSEMBLY FOR CLARITY

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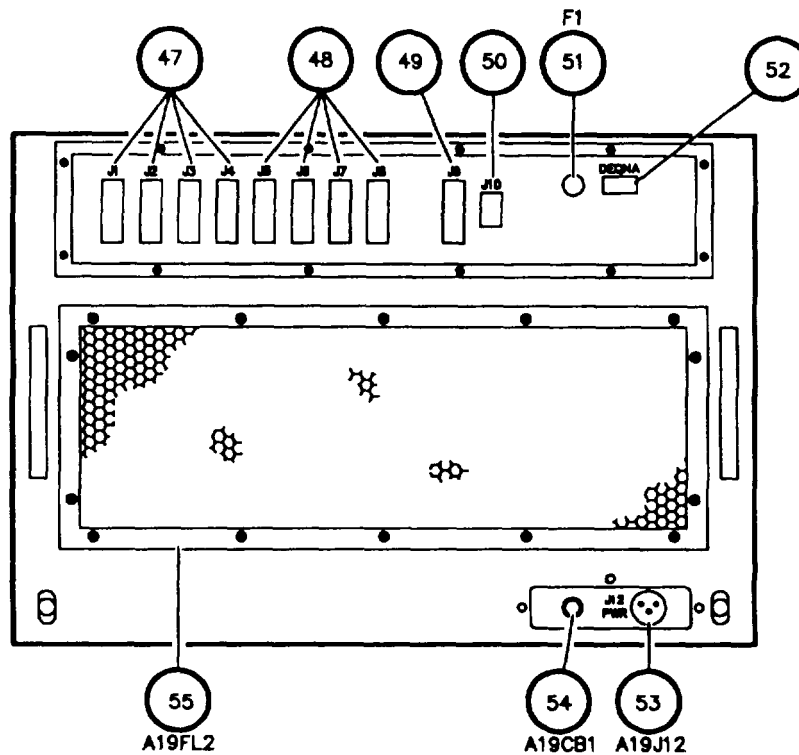
KEY	NAME	FUNCTION
(33)	POWER OUTPUT CONNECTORS P100-P700	Distribute power to processor subassemblies.
(34)	AC DISTRIBUTION CCA A19A2A2	Controls ac input voltage and monitors power status.
(35)	AC IN CONNECTOR	Connects ac input power to power supply assembly.
(36)	POWER SUPPLY FAN A19A2B1	Provides power supply assembly cooling air.
(37)	POWER SUPPLY MODULE A19A2A3	Provides dc voltages for processor operation.
(38)	POWER DISTRIBUTION CCA A19A2A1	Provides power output connectors.

1-15.2.1. Communications Processor Assembly (1 A3A3A4A1, 1 A3A3A6A1) Major Components -
Continued
TOP VIEW



KEY	NAME	FUNCTION
(39)	P900 CONNECTOR	Connects +12 Vdc to fan assemblies B1 and B2.
(40)	TERMINAL BOARD A19TB1	Connects +5 Vdc to card cage assembly backplane.
(41)	CONNECTOR J101	Connects +5, +12, and -12 Vdc to card cage assembly backplane.
(42)	CONNECTOR J1	Connects backplane logic to power supply.
(43)	CONNECTOR P601	Connects POWER ON/OFF switch to remote ON/OFF solid-state relay in power supply assembly.
(44)	CONNECTOR P701	Connects backup battery unit output to front panel assembly operator controls.
(45)	CONNECTOR P702	Connects backup battery unit output to time-of-year clock on CPU CCA and front panel assembly operator controls.
(46)	BATTERIES BT1, BT2, BT3	Three rechargeable type AA batteries that provide power to maintain data and time in processor when processor power is off. Automatically recharged when processor power is on.

1-15.2.1. Communications Processor Assembly (1A3A3A4A1, 1A3A3A6A1) Major Components -
Continued
REAR PANEL VIEW

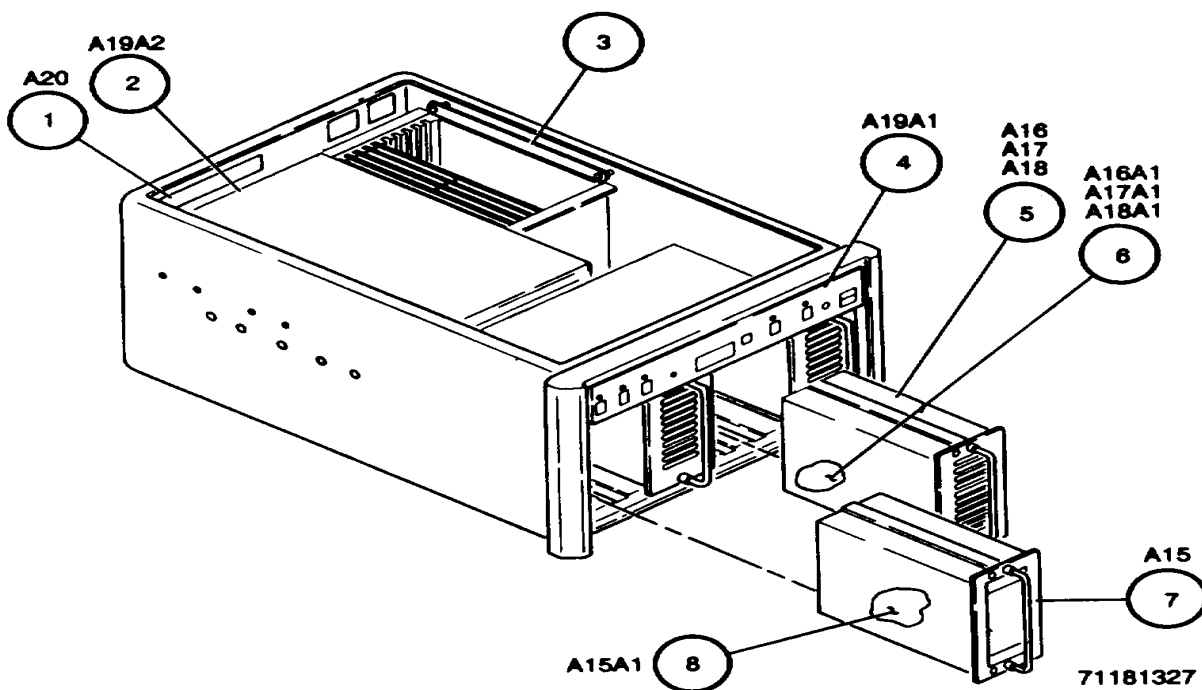


71181268

KEY	NAME	FUNCTION
(47)	CONNECTORS J1-J4	Part of multiplexer cabinet kit (A23). Provide I/O between red patch panel and multiplexer CCA for channels 1-4.
(48)	CONNECTORS J5-J8	Part of multiplexer cabinet kit (A22). Provide I/O between red patch panel and multiplexer CCA per channels 5-8.
(49)	CONNECTOR J9	Part of digital I/O cable (A20). Provides I/O between red patch panel and digital I/O CCA for alarm circuits.
(50)	CONNECTOR J10	Console I/O connector. Provides I/O between red patch panel and CPU CCA for console interface.
(51)	FUSE F1	Provides overload protection for ESTA.
(52)	DEQNA CONNECTOR	Part of Ethernet cabinet kit (A20). Provides I/O between ESTA and Ethernet interface CCA.
(53)	PWR CONNECTOR A19J12	Connects ac power source to processor.
(54)	CIRCUIT BREAKER A19CB1	Provides overvoltage protection for processor.
(55)	EXHAUST AIR FILTER A19FL2	Prevents dirt and dust from entering processor.

1-15.2.2. Data Base Management Processor Assembly (1A3A3A5A1) Major Components

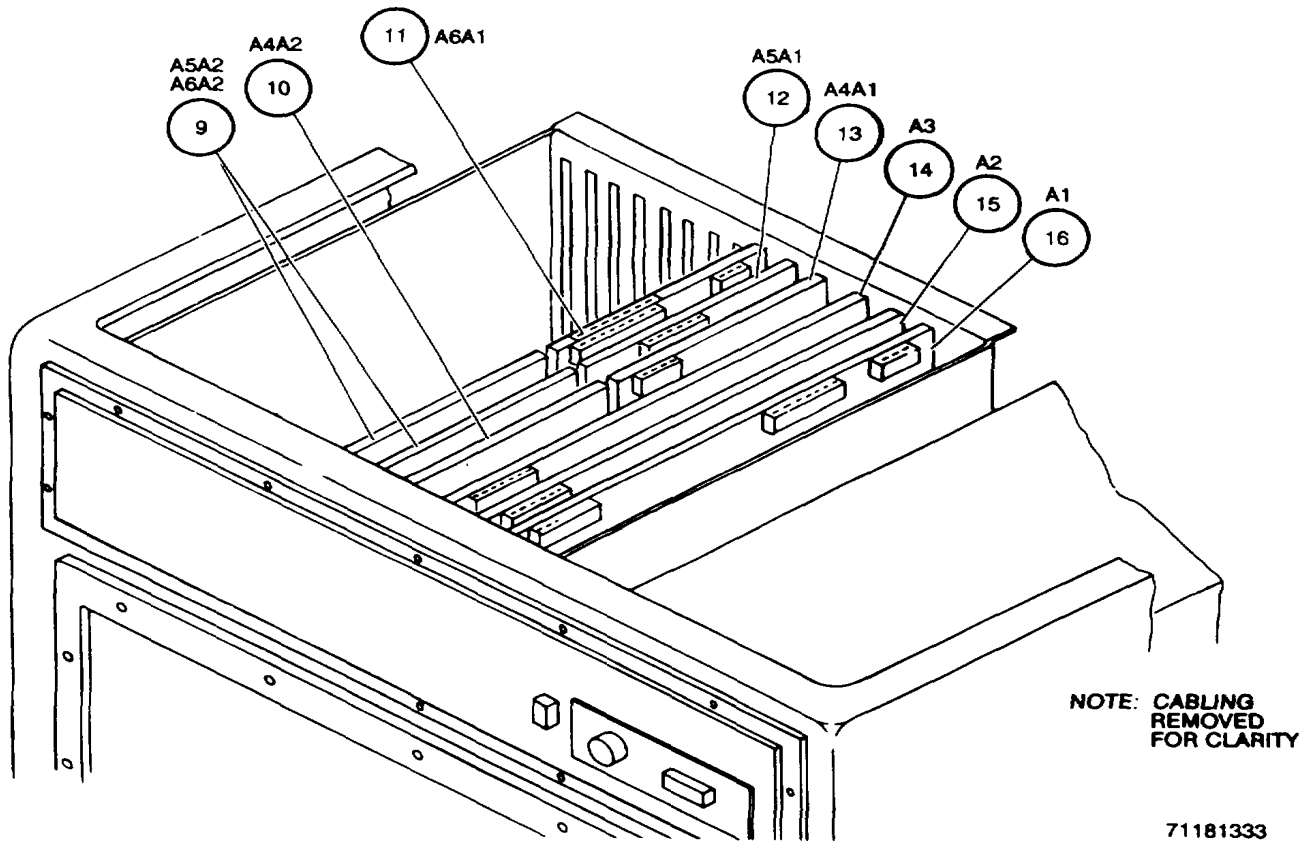
FRONT VIEW



KEY	NAME	FUNCTION
(1)	ETHERNET CABINET KIT A20	Provides rear panel Ethernet cable connector cabling interface to Ethernet controller CCA .
(2)	POWER SUPPLY ASSEMBLY A19A2	Provides power, power distribution, and control for processor.
(3)	Q-BUS CARD CAGE	Provides physical mounting and connection points for processor circuit card assemblies.
(4)	FRONT PANEL ASSEMBLY A19A1	Provides processor/operator interface.
(5)	DISK DRIVE ASSEMBLY A16, A17, A18	One of three; houses disk drive.
(6)	DISK DRIVE A16A1, A17A1, A18A1	Disk drives 1 and 2 provide 175 megabytes and disk drive 3 provides 622 megabytes of unformatted storage.
(7)	TAPE DRIVE ASSEMBLY A15	Houses magnetic tape drive.
(8)	MAGNETIC TAPE DRIVE A15A1	Provides 94.5 megabytes of serial access storage.

1-15.2.2. Data Base Management Processor Assembly (1A3A3A5A1) Major Components - Continued

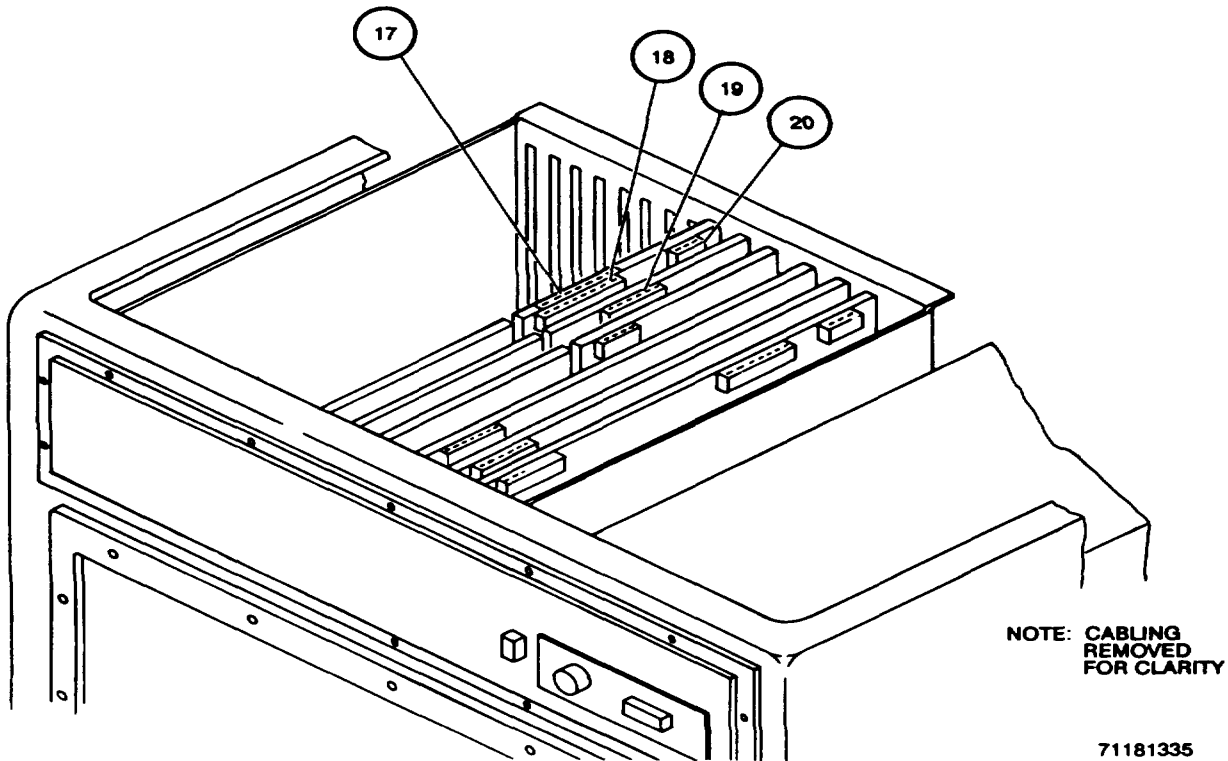
CARD CAGE VIEW



KEY	NAME	FUNCTION
(9)	GRANT ANCHOR BOARDS A5A2, A6A2	Provide backplane continuity circuits and mounting channel for CCA sharing same card cage slot.
(10)	ANCHOR BOARD A4A2	Provides mounting channel for CCA sharing same card cage slot.
(11)	DISK CONTROLLER CCA A6A1	Provides interface between CPU and disk drive assembly.
(12)	TAPE CONTROLLER CCA A5A1	Provides interface between CPU and tape drive assembly.
(13)	ETHERNET CONTROLLER CCA A4A1	Provides interface between CPU and Ethernet Local Area Network (LAN).
(14)	MEMORY CCA 2 A3	Memory CCA 2. Same as memory CCA 1.
(15)	MEMORY CCA 1 A2	Provides 8 megabytes of Error-Correction Circuit (ECC) memory.
(16)	CPU CCA A1	Provides 32-bit microprocessor, floating point coprocessor, boot/diagnostic Read-Only Memory (ROM), and Q-bus map/interface.

1-15.2.2. Data Base Management Processor Assembly (1A3A3A5A1) Major Components - Continued

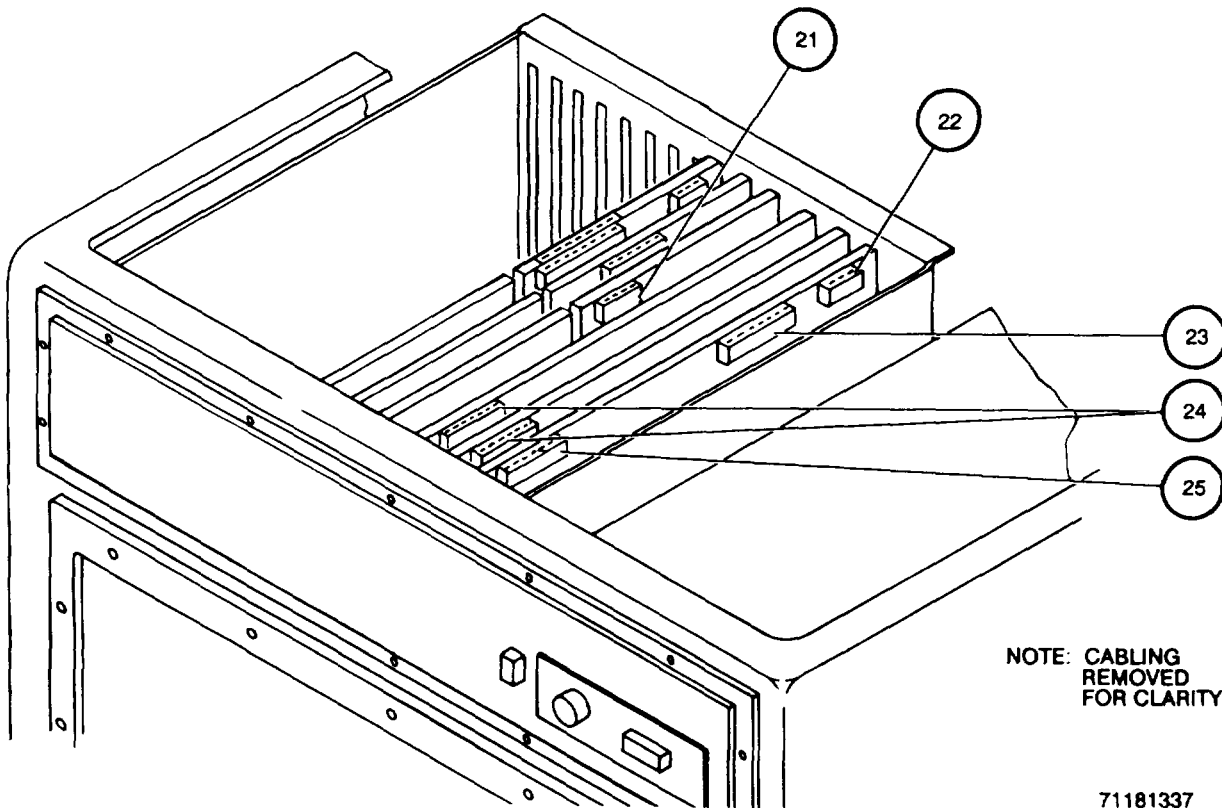
CARD CAGE VIEW - Continued



KEY	NAME	FUNCTION
(17)	DISK CONTROLLER CCA CONNECTOR	Provides termination on CCA for DISK CONTROLLER ribbon cable 701308-0033.
(18)	DISK CONTROLLER CCA CONNECTOR	Provides termination on CCA for DATA ribbon cable 701307-0036.
(19)	TAPE CONTROLLER CCA CONNECTOR	Provides termination on CCA for CONTROLLER ribbon cable 701311-0036.
(20)	DISK CONTROLLER CCA CONNECTOR	Provides termination on CCA for DISK ribbon cable 701313-0046.

1-15.2.2. Data Base Management Processor Assembly (1A3A3A5A1) Major Components - Continued

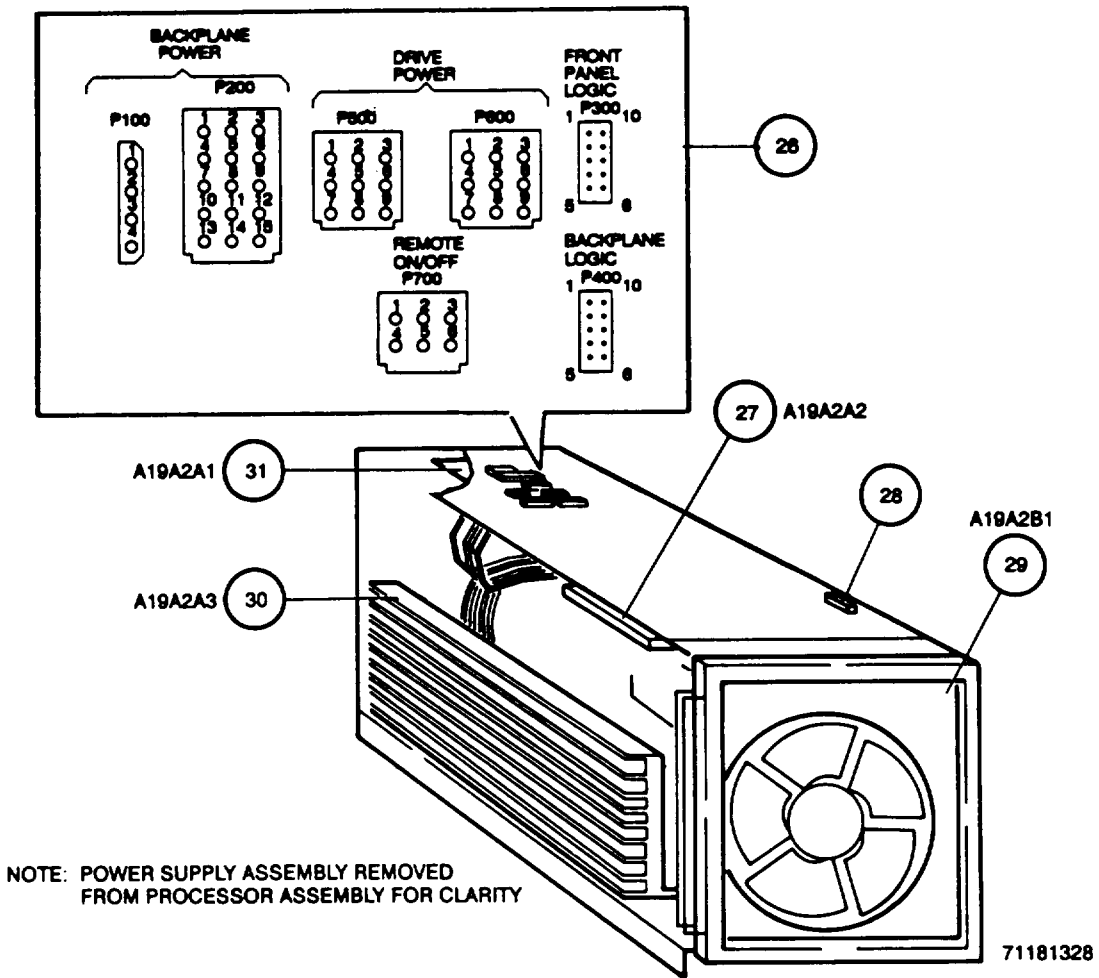
CARD CAGE VIEW - Continued



KEY	NAME	FUNCTION
(21)	ETHERNET INTERFACE CCA CONNECTOR	Provides termination on CCA for Ethernet cabinet kit cable (70-21202-01).
(22)	CPU CCA CONNECTOR	Provides termination on CCA for MICRO VAX 10-wire ribbon cable 701310-0037.
(23)	CPU CCA CONNECTOR	Provides termination on CCA for MICRO VAX 20-wire ribbon cable 701309-0036.
(24)	MEMORY CCA CONNECTOR	Provides termination on CCA for ribbon cable (17-00716-01) jumper between CPU and memory CCA(s).
(25)	CPU CCA CONNECTOR	Provides termination on CCA for ribbon cable (17-00716-01) jumper between CPU and memory CCA.

1-15.2.2. Data Base Management Processor Assembly (1A3A3A5A1) Major Components - Continued

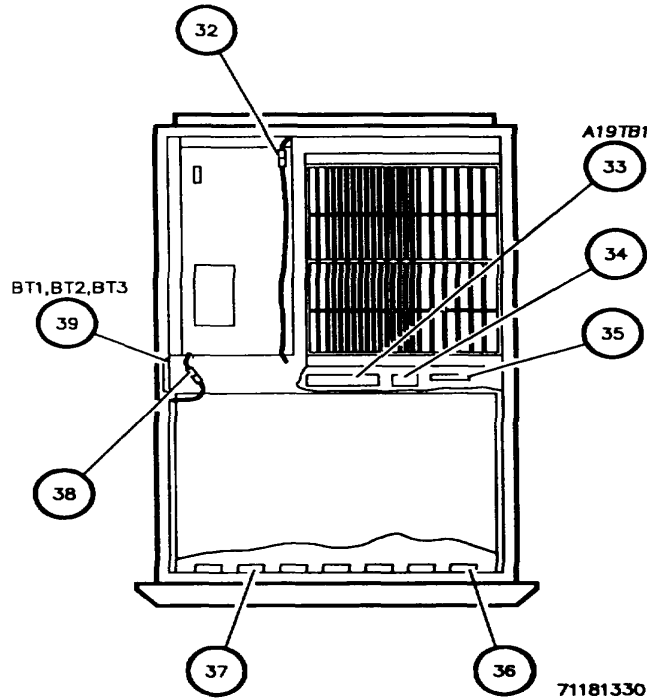
POWER SUPPLY ASSEMBLY VIEW



KEY	NAME	FUNCTION
(26)	POWER OUTPUT CONNECTORS P100-P700	Distribute power to processor subassemblies.
(27)	AC DISTRIBUTION CCA A19A2A2	Controls ac input voltage and monitors power status.
(28)	AC IN CONNECTOR	Connects ac input power to power supply assembly.
(29)	POWER SUPPLY FAN A19A2B1	Provides power supply assembly cooling air.
(30)	POWER SUPPLY MODULE A19A2A3	Provides dc voltages for processor operation.
(31)	POWER DISTRIBUTION CCA A19A2A1	Provides power output connectors.

1-15.2.2. Data Base Management Processor Assembly (1A3A3A5A1) Major Components - Continued

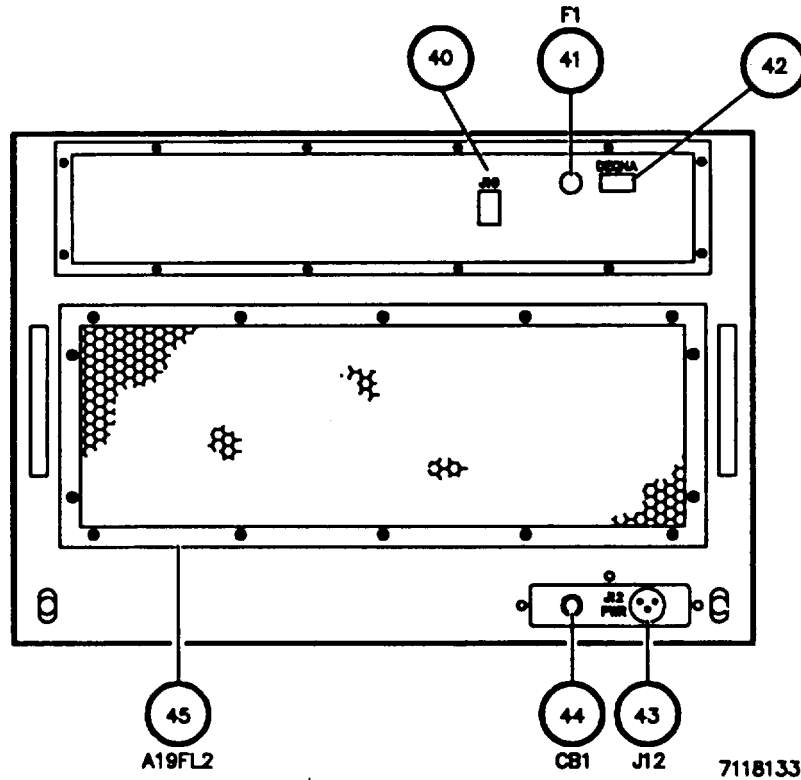
TOP VIEW



KEY	NAME	FUNCTION
(32)	CONNECTOR P900	Connects +12 Vdc to fan assemblies B1 and B2.
(33)	TERMINAL BOARD A19TB1	Connects +5 Vdc to card cage assembly backplane.
(34)	CONNECTOR J101	Connects +5, +12, and -12 Vdc to card cage assembly backplane.
(35)	CONNECTOR J1	Connects backplane logic to power supply.
(36)	CONNECTOR P601	Connects POWER ON/OFF switch to remote ON/OFF solid-state relay in power supply assembly.
(37)	CONNECTOR P701	Connects backup battery unit output to front panel assembly operator controls.
(38)	CONNECTOR P702	Connects backup battery unit output to time-of-year clock on CPU CCA and front panel assembly operator controls.
(39)	BATTERIES BT1, BT2, BT3	Three rechargeable type AA batteries that provide power to maintain data and time in processor when processor power is off. Automatically recharged when processor power is on.

1-15.2.2. Data Base Management Processor Assembly (1A3A3A5A1) Major Components - Continued

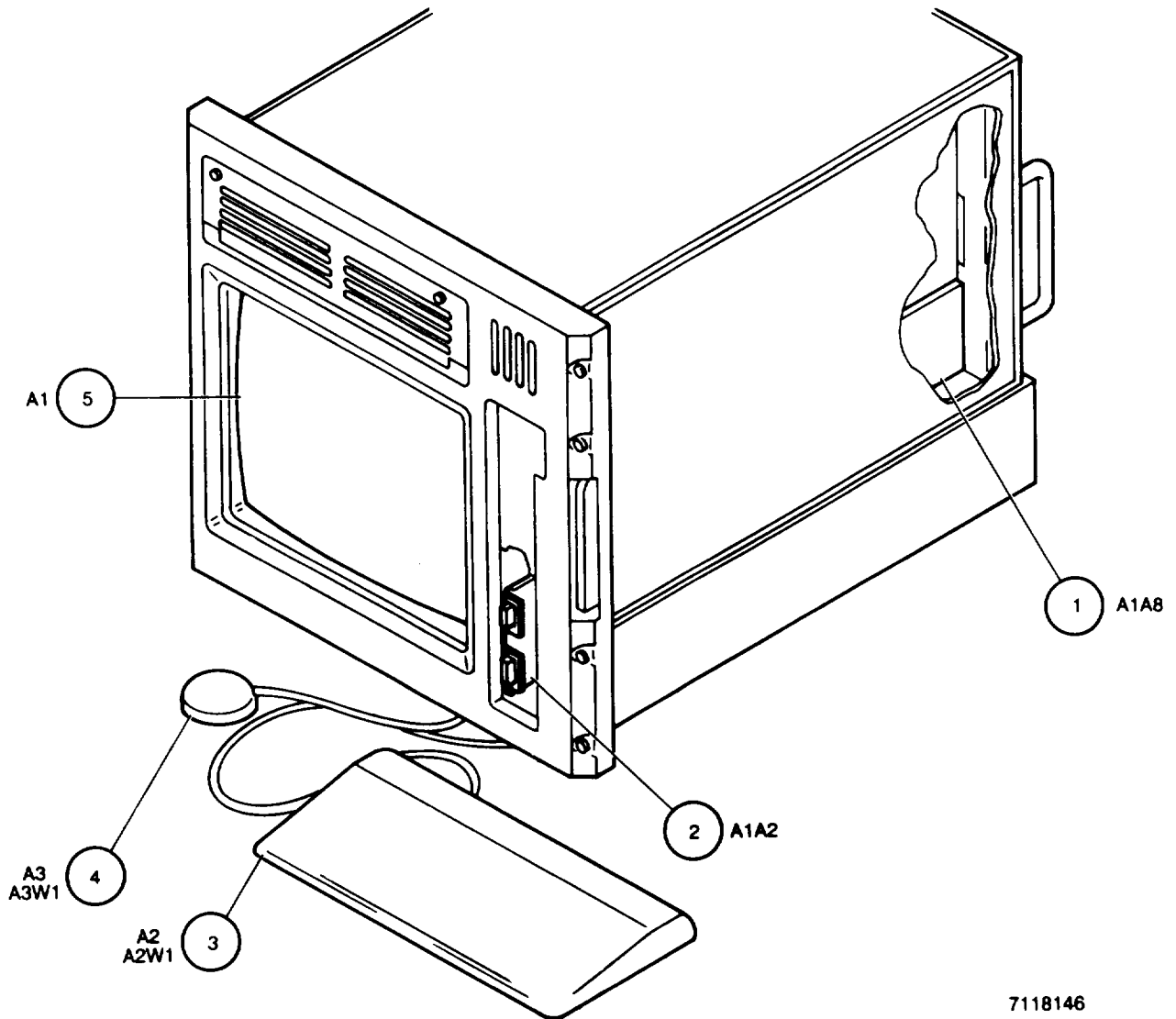
REAR PANEL VIEW



KEY	NAME	FUNCTION
(40)	CONNECTOR J10	Provides 110 between red patch panel and processor CPU CCA for console interface.
(41)	FUSE F1	Provides overload protection for ESTA.
(42)	DEQNA CONNECTOR	Part of Ethernet cabinet kit (A20). Provides I/O between ESTA and Ethernet interface CCA.
(43)	PWR CONNECTOR J12	Connects ac power source to processor.
(44)	CIRCUIT BREAKER CB1	Provides overvoltage protection for processor.
(45)	EXHAUST AIR FILTER A19FL2	Prevents dirt and dust from entering processor.

1-15.3. Workstation (1A8, 1A9, 3A3, 3A4, 4A7, 4A8, 4A15, 4A19) Major Components

FRONT VIEW

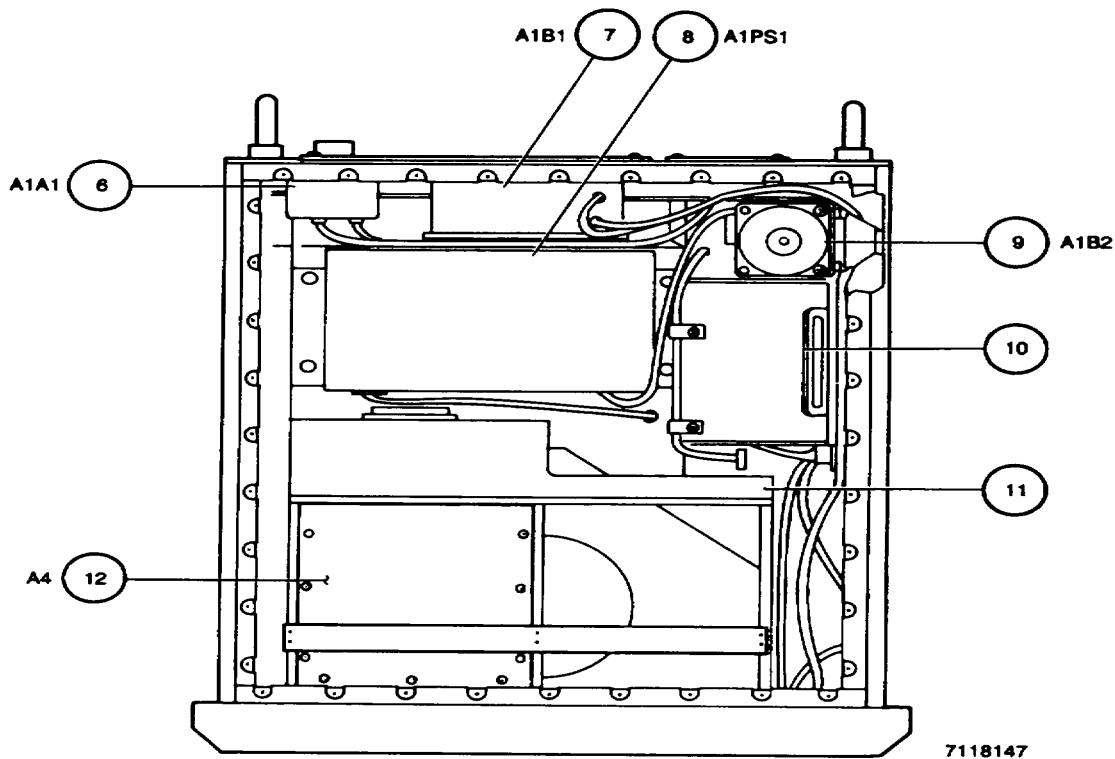


7118146

KEY	NAME	FUNCTION
(1)	REAR PANEL I/O FILTER CCA A1A8	Provides Electromagnetic Interference (EMI) filtering for communications and printer connections.
(2)	FRONT PANEL I/O FILTER CCA A1A2	Provides EMI filtering for mouse and keyboard connections.
(3)	KEYBOARD A2 AND CABLE A2W1	Provides user interface for entry of data into system.
(4)	MOUSE A3 AND MOUSE CABLE A3W1	Provides user interface for movement of CRT screen cursor and other software-defined functions.
(5)	MONITOR A1	High-resolution color monitor.

1-15.3. Workstation (1A8, 1A9, 3A3, 3A4, 4A7, 4A8, 4A15, 4A19) Major Components - Continued

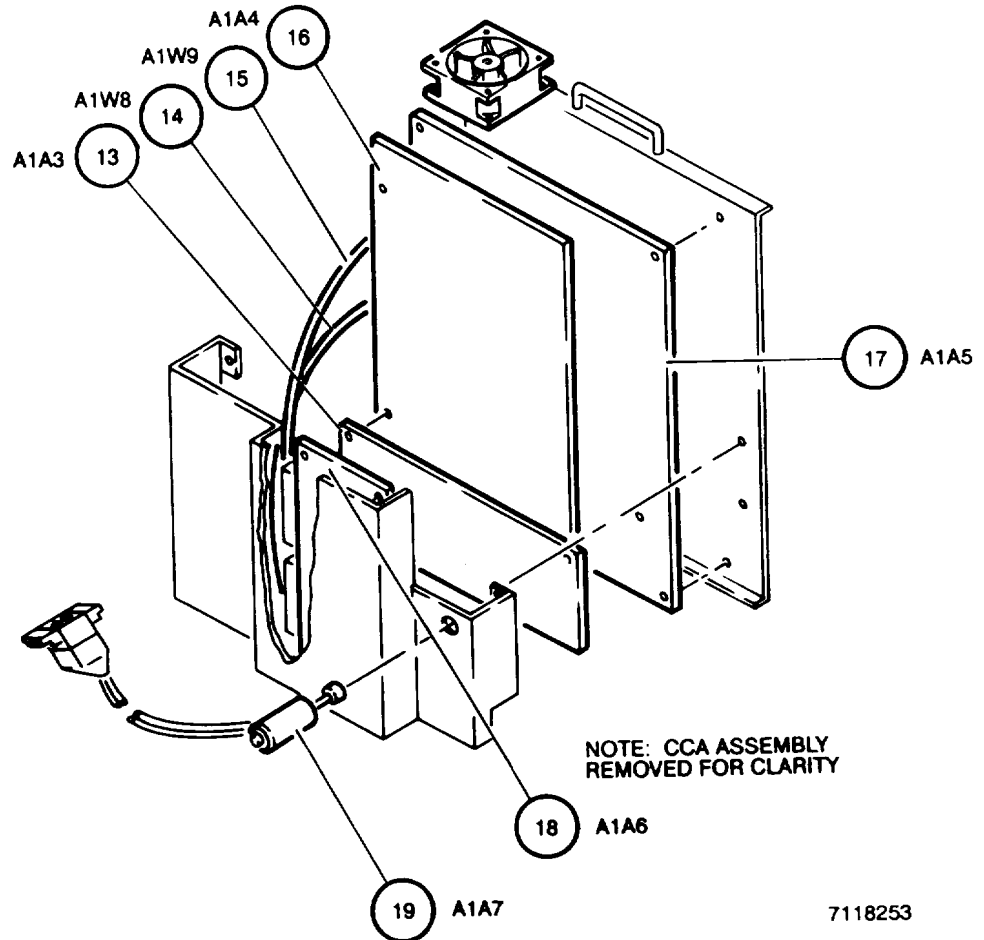
MONITOR TOP VIEW



KEY	NAME	FUNCTION
(6)	EMI POWER LINE FILTER A1A1	Filters RFI from input voltage.
(7)	SYSTEM FAN A1B1	Provides flow of ambient air for monitor component cooling.
(8)	POWER SUPPLY ASSEMBLY ALPS1	Converts 10 Vac, 60-Hz input power to +5, +9, +12, and -12 Vdc for power and control functions.
(9)	CCA FAN ASSEMBLY A1B2	Provides cooling air for monitor CCA assembly components.
(10)	CCA ASSEMBLY	Provides mounting and protection for monitor circuit card assemblies.
(11)	DISK TRAY ASSEMBLY	Provides mounting and interface for 42-megabyte disk drive.
(12)	42-MEGABYTE DISK DRIVE A4	Provides local storage and boot device (in system console workstation only).

1-15.3. Workstation (1A8, 1A9, 3A3, 3A4, 4A7, 4A8, 4A15, 4A19) Major Components - Continued

MONITOR CCA ASSEMBLY VIEW

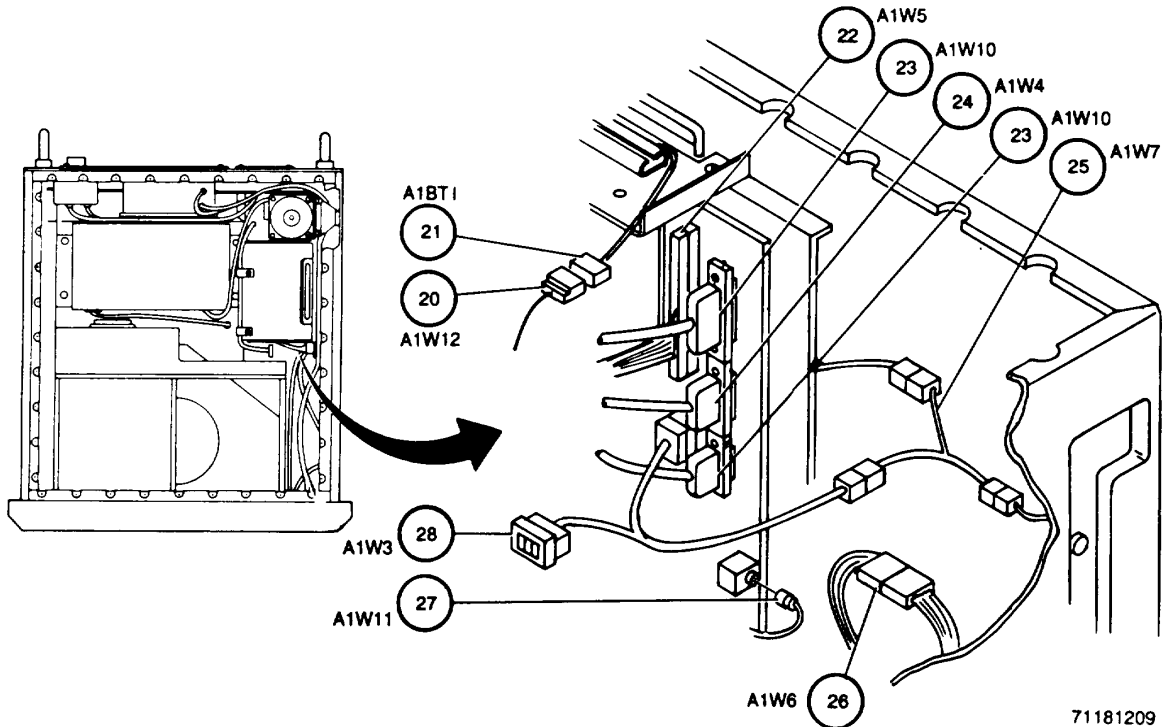


7118253

KEY	NAME	FUNCTION
(13)	MEMORY CCA A1A3	Provides additional 16 megabytes of Random Access Memory (RAM).
(14)	ETHERNET CCA CABLE (503761-001) A1W8	Connects Ethernet controller CCA to CPU/motherboard CCA.
(15)	ETHERNET CCA CABLE (503761-002) A1W9	Connects Ethernet Controller CCA to CPU/motherboard CCA.
(16)	GRAPHICS CONTROLLER CCA A1A4	Provides graphics interface for color CRT.
(17)	CPU/MOTHERBOARD CCA A1A5	Provides CPU, graphics coprocessor, disk drive controller, and 2 megabytes of RAM.
(18)	ETHERNET CONTROLLER CCA A1A6	Provides interface for Ethernet and LAN.
(19)	HALT SOLENOID A1A7	Activated when front panel HALT switch is pressed.

1-15.3. Workstation (1A8, 1A9, 3A3, 3A4, 4A7, 4A8, 4A15, 4A19) Major Components - Continued

MONITOR FRONT RIGHT CORNER CABLES VIEW

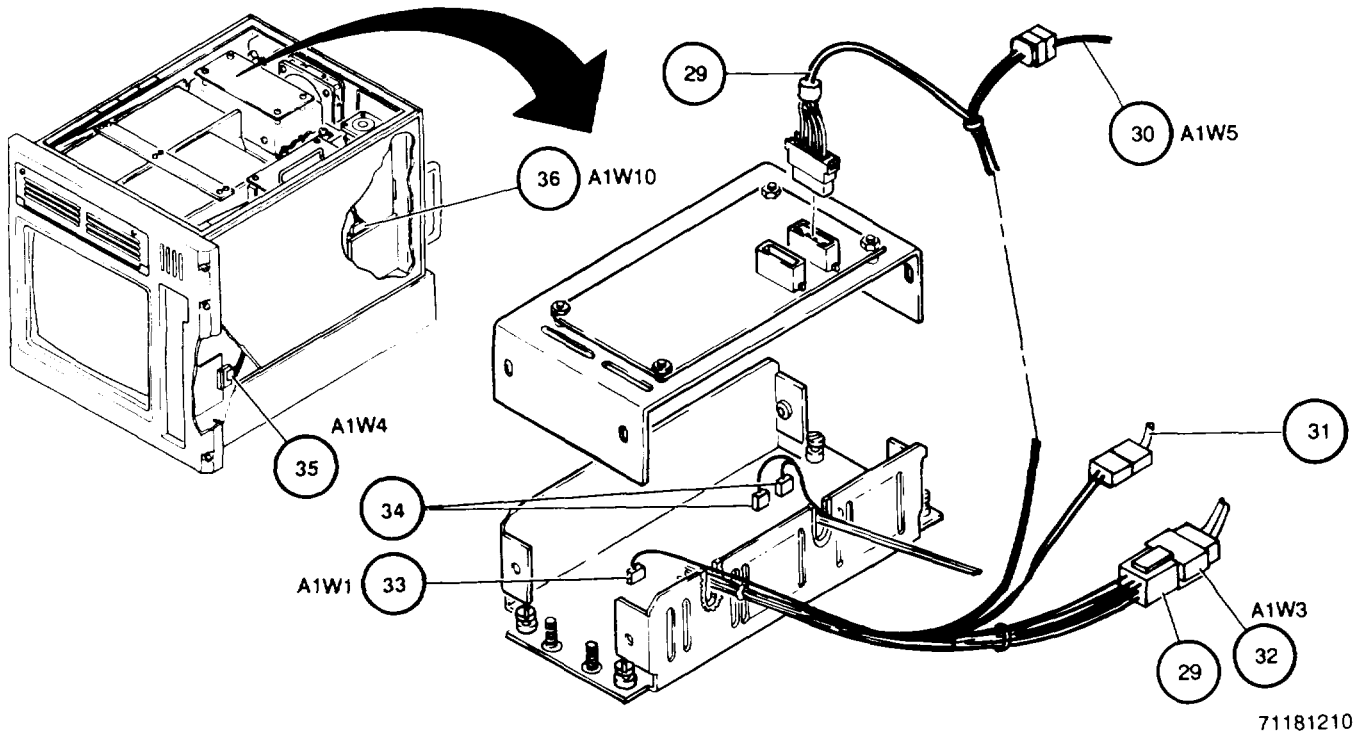


71181209

KEY	NAME	FUNCTION
(20)	BATTERY CABLE (504903-001) A1W12	Connects time/date backup battery to CPU/motherboard.
(21)	BATTERY ASSEMBLY A1BT1	Rechargeable battery pack that provides power to maintain essential data when workstation power is off. Automatically recharged when workstation power is on.
(22)	DISK DRIVE CABLE (503752-001) A1W5	Connects disk drive to CPU/motherboard and power supply assembly.
(23)	I/O PORT CABLE (503716-001) A1W10	Connects rear panel I/O filter to CPU/motherboard (top connector J2; bottom J1).
(24)	VIDEO/KEYBOARD CABLE (503710-001) A1W4	Connects front panel I/O filter to CPU/motherboard and CRT R, G, B (red, green, blue) input connectors.
(25)	HALT SWITCH CABLE (504378-001) A1W7	Connects front panel HALT switch wiring to halt solenoid and dc power cable (503769-002).
(26)	BRIGHT/CONTRAST CABLE (504213-001) A1W6	Connects front panel brightness and contrast control wiring to CRT.
(27)	ETHERNET CABLE (503760-001) A1W11	Connects rear panel Ethernet connector to CPU/motherboard.
(28)	DC POWER CABLE (503769-002) A1W3	Connects power supply assembly to CPU/motherboard and to halt switch cable (504378-001).

1-15.3. Workstation (1A8, 1A9, 3A3, 3A4, 4A7, 4A8, 4A15, 4A19) Major Components - Continued

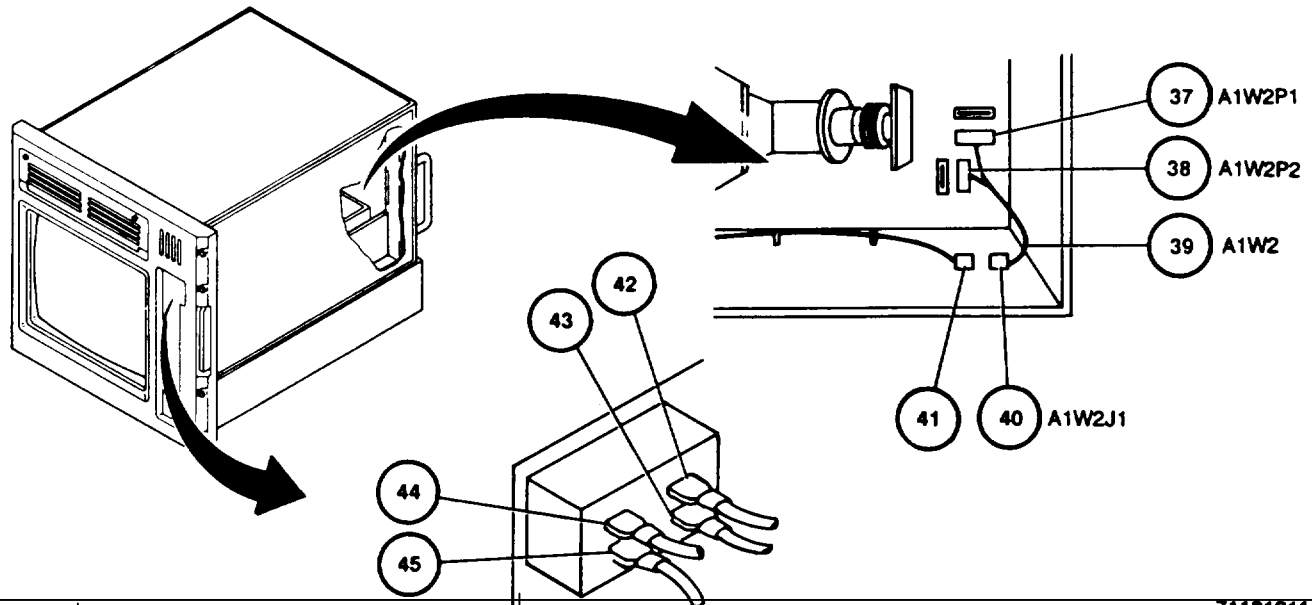
MONITOR POWER SUPPLY ASSEMBLY CABLE VIEW



KEY	NAME	FUNCTION
(29)	POWER SUPPLY WIRING HARNESS	Connects power supply dc output to disk drive cable (503752-001), dc power cable (503769-002), and to termination board (on top of power supply).
(30)	DISK DRIVE CABLE (503752-001) A1W5	Connects dc power to disk drive.
(31)	CCA FAN ASSEMBLY WIRING	Connects CCA fan assembly to CCA fan cable (504173-001).
(32)	DC POWER CABLE (503769-002) A1W3	Connect dc power to CPU/motherboard and halt solenoid cable (504378-001).
(33)	CCA ASSEMBLY FAN CABLE (504173-001) A1W1	Connects dc power to CCA fan assembly.
(34)	AC CONNECTORS E7 AND E8	Part of ac power cable (503753-001); connects ac power to power supply assembly.
(35)	VIDEO/KEYBOARD CABLE (503710-001) A1W4	Connects front panel I/O filter CCA to CPU/motherboard and CRT R, G, B input connectors.
(36)	I/O PORT CABLE (503716-001) A1W10	Connects rear panel I/O filter CCA to CPU/motherboard.

1-15.3. Workstation (1A8, 1A9, 3A3, 3A4, 4A7, 4A8, 4A15, 4A19) Major Components - Continued

MONITOR AC DISTRIBUTION CABLES VIEW

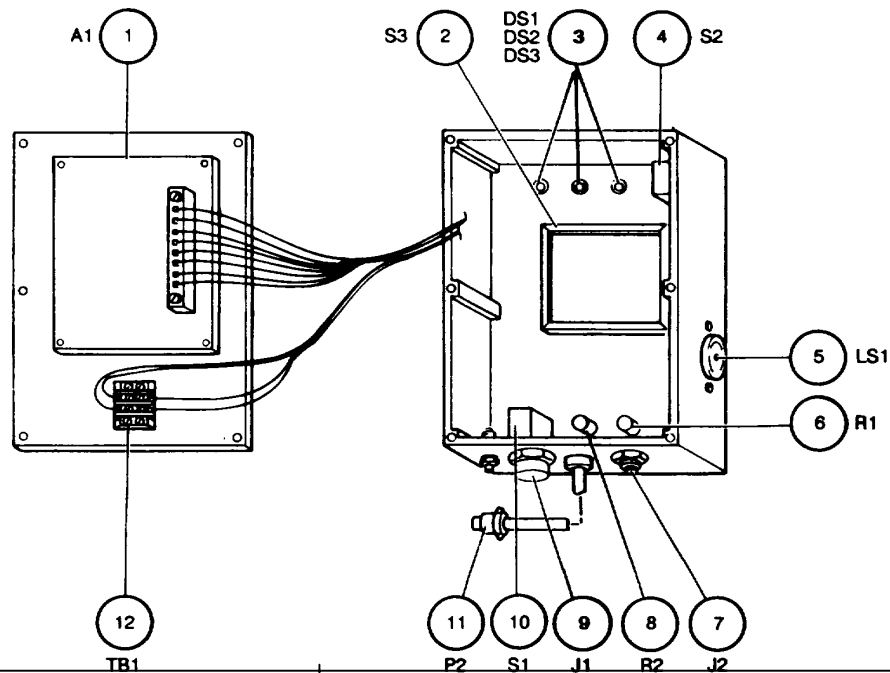


71181211

KEY	NAME	FUNCTION
(37)	AC MONITOR CABLE (504237-001) A1W2P1	Connects ac monitor cable to CRT connector P04.
(38)	AC MONITOR CABLE (504237-001) A1W2P2	Connects ac monitor cable to CRT connector P09.
(39)	AC MONITOR CABLE (504237-001) A1W2	Connects ac power to CRT.
(40)	AC MONITOR CABLE (504237-001) A1W2J1	Connects ac monitor cable to ac power cable (503753-001) P1.
(41)	AC POWER CABLE (503753-001)	Connects ac power to ac monitor cable (504237-001).
(42)	AC POWER CABLE CB1-1 CONNECTOR E5	Part of ac power cable (503753-001); connects power from line filter (HOT) to circuit breaker CB1.
(43)	AC POWER CABLE CB1-2 CONNECTOR E2	Part of ac power cable (503753-001); connects power from line filter (HOT) to circuit breaker CB1.
(44)	AC POWER CABLE CB1-3 CONNECTOR E6	Part of ac power cable (503753-001); connects power from circuit breaker CB1 into workstation.
(45)	AC POWER CABLE CB1-4 CONNECTOR E4	Part of ac power cable (503753-001); connects power from circuit breaker CB1 into workstation.

1-15.4. Telephone Set (1 A12, 1A13, 4A12, 4A13, 4A20, 4A21) Major Components

INTERIOR VIEW



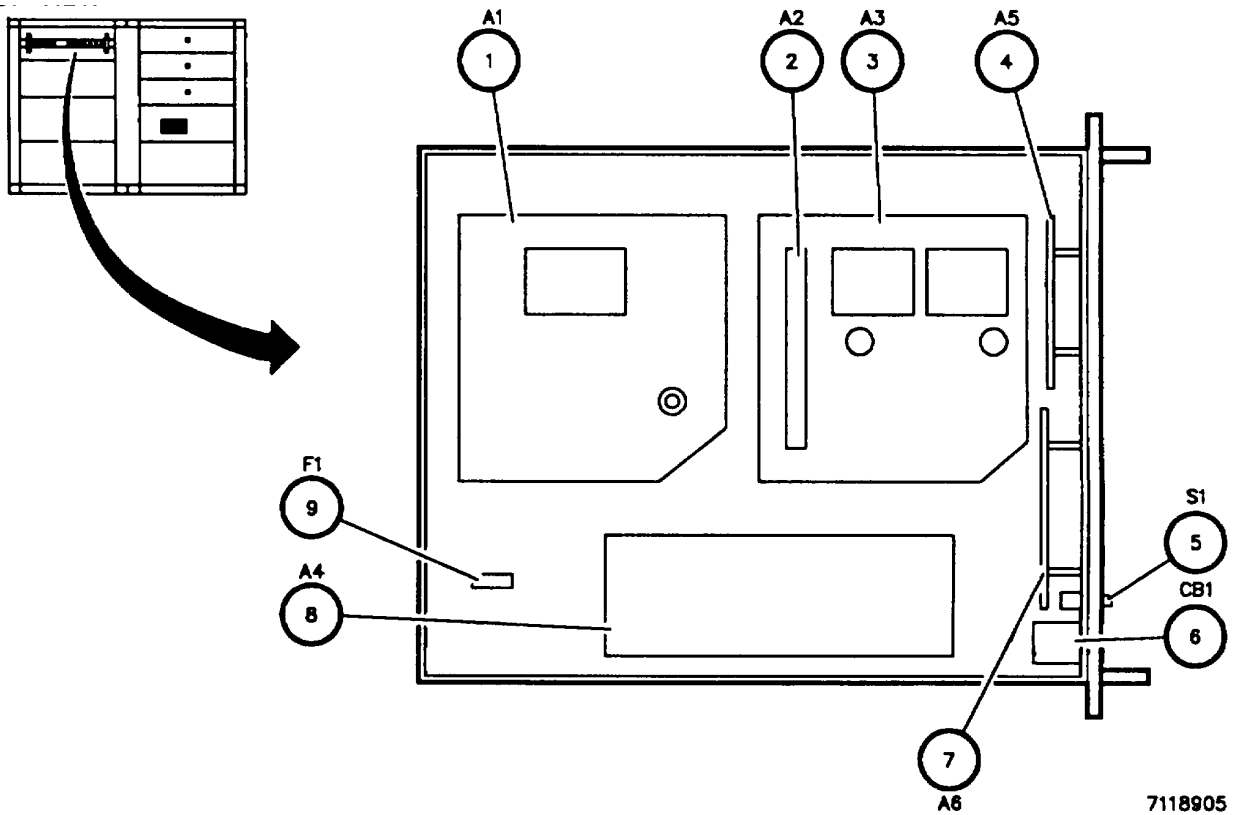
7118904

KEY	NAME	FUNCTION
(1)	TELEPHONE CCA A1	Provides all status sensing and control functions.
(2)	KEYBOARD S3	Provides operator control of telephone functions.
(3)	LED ASSEMBLIES DS1-DS3	Provide visual indication of various telephone functions.
(4)	LAMP TEST SWITCH S2	Controls current used to test LED assemblies.
(5)	ALARM UNIT LS1	Provides audible alarm when incoming call is received.
(6)	RING/VOLUME RESISTOR R1	Controls alarm unit volume.
(7)	HANDSET CONNECTOR J2	Connects handset to telephone.
(8)	VOLUME/AUDIO RESISTOR R2	Controls headset volume.
(9)	SIGNAL CONNECTOR J1	Provides signal connection between telephone and associated KY-58.
(10)	OFF-HOOK SWITCH S1	Provides mode selection.
(11)	POWER CABLE CONNECTOR P2	Connects telephone to 28 Vdc power source.
(12)	TERMINAL BOARD TB1	Interfaces external and internal wiring.

1-15.5. Power Rack (1A2, 4A2) Major Components

1-15.5.1. UPS Control Assembly (1A2A1A1, 4A2A1A1) Major Components

TOP VIEW

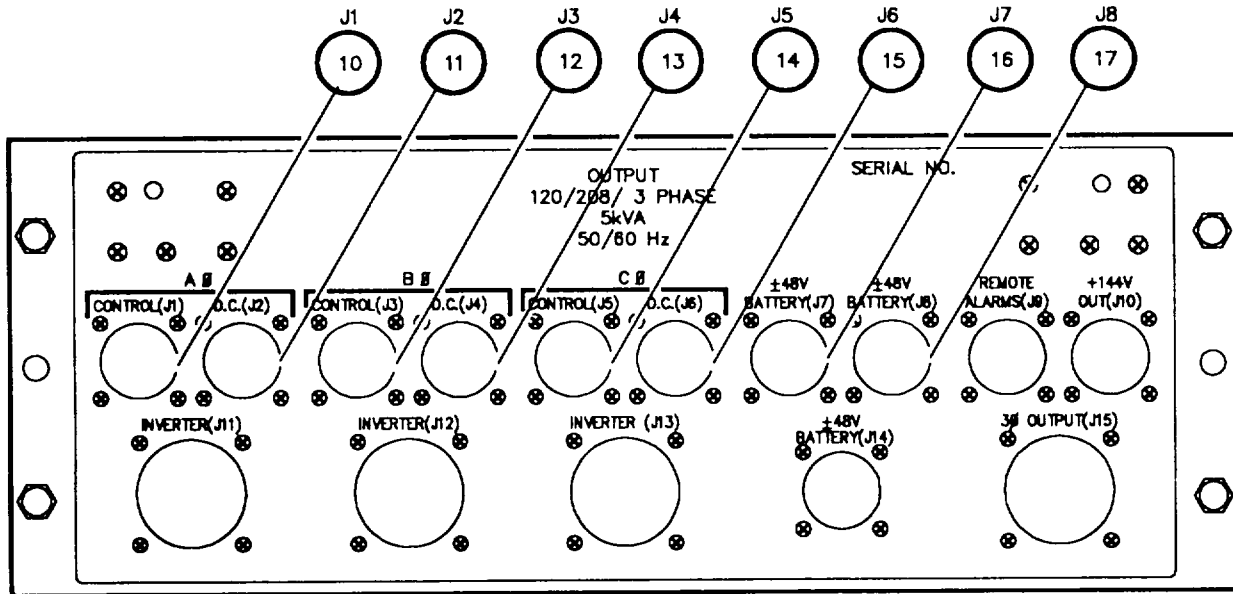


7118905

KEY	NAME	FUNCTION
(1)	ADAPTER/INTERFACE CCA A1	Provides interface for error signals, battery voltage distribution, and bypass control circuitry.
(2)	OSCILLATOR CCA A2	Provides three-phase outputs for UPS inverter assemblies. Allows selection of 50 Hz or 60 Hz.
(3)	SIGNAL CONTROL CCA A3	Provides circuitry to balance oscillator, +12.0 Vdc bias power supplies, and control audible alarm and status indicators.
(4)	DISPLAY CCA A5	Provides status LED indicators.
(5)	METER SELECT SWITCH S1	Selects UPS input or output ac voltage to be displayed on meter module.
(6)	BATTERY CIRCUIT BREAKER CB1	Applies battery power to system when set to ON.
(7)	METER MODULE A6	Provides readout of system voltages selected using METER SELECT switch.
(8)	POWER CONTROL CCA A4	Provides auxiliary bias voltages for all UPS control circuitry.
(9)	FUSE F1	Protects control assembly circuitry.

1-15.5.1. UPS Control Assembly (1A2A1A1, 4A2A1A1) Major Components - Continued

REAR PANEL VIEW

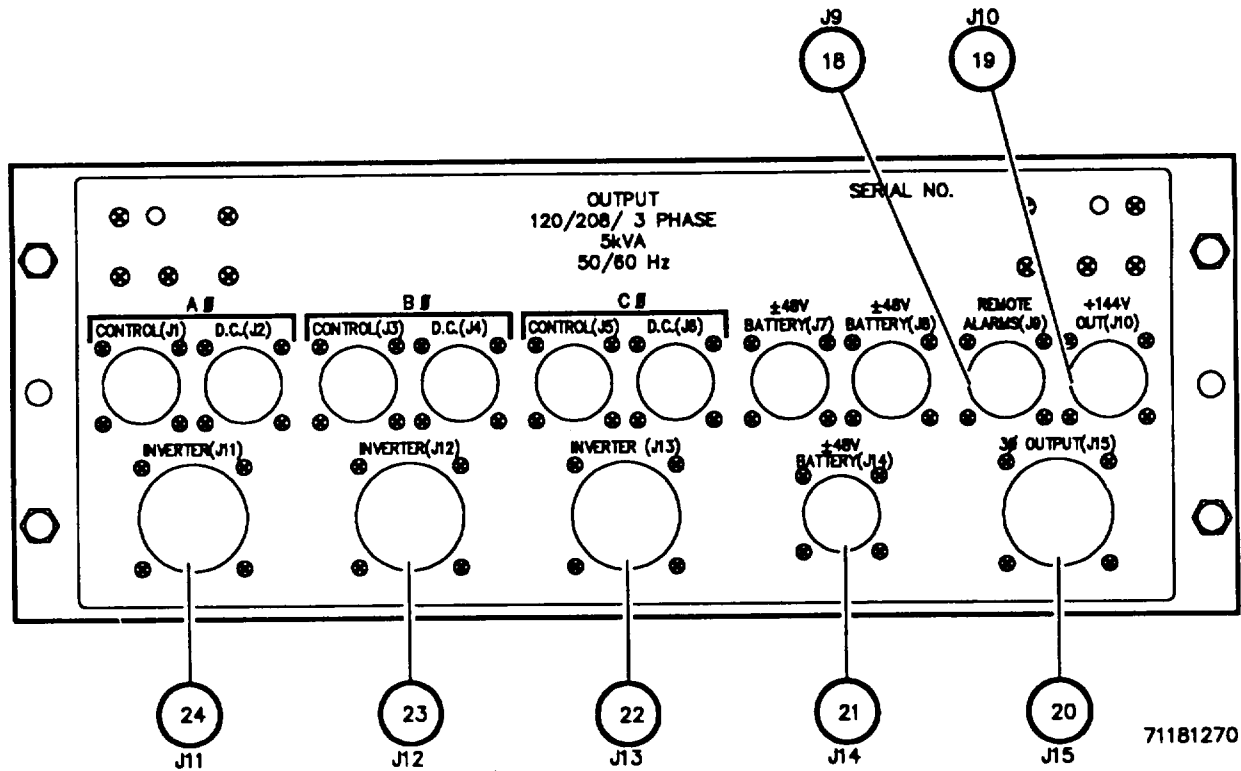


71181269

KEY	NAME	FUNCTION
(10)	A0 CONTROL CONNECTOR J1	Connects control assembly control signals to A phase inverter assembly.
(11)	A0 DC CONNECTOR J2	Connects A phase inverter assembly battery charge voltage to control assembly which controls charging of battery assembly.
(12)	B0 CONTROL CONNECTOR J3	Connects control assembly control signals to B phase inverter assembly.
(13)	B0 DC CONNECTOR J4	Connects B phase inverter assembly battery charge voltage to control assembly which controls charging of battery assembly.
(14)	C0 CONTROL CONNECTOR J5	Connects control assembly control signals to C phase inverter assembly.
(15)	C0 DC CONNECTOR J6	Connects C phase inverter assembly battery charge voltage to control assembly which controls charging of battery assembly.
(16)	± 48V BATTERY CONNECTOR J7	Connects battery assembly output to control assembly.
(17)	± 48V BATTERY CONNECTOR J8	Connects battery assembly output to control assembly.

1-15.5.1. UPS Control Assembly (1A2A1A1, 4A2A1A1) Major Components - Continued

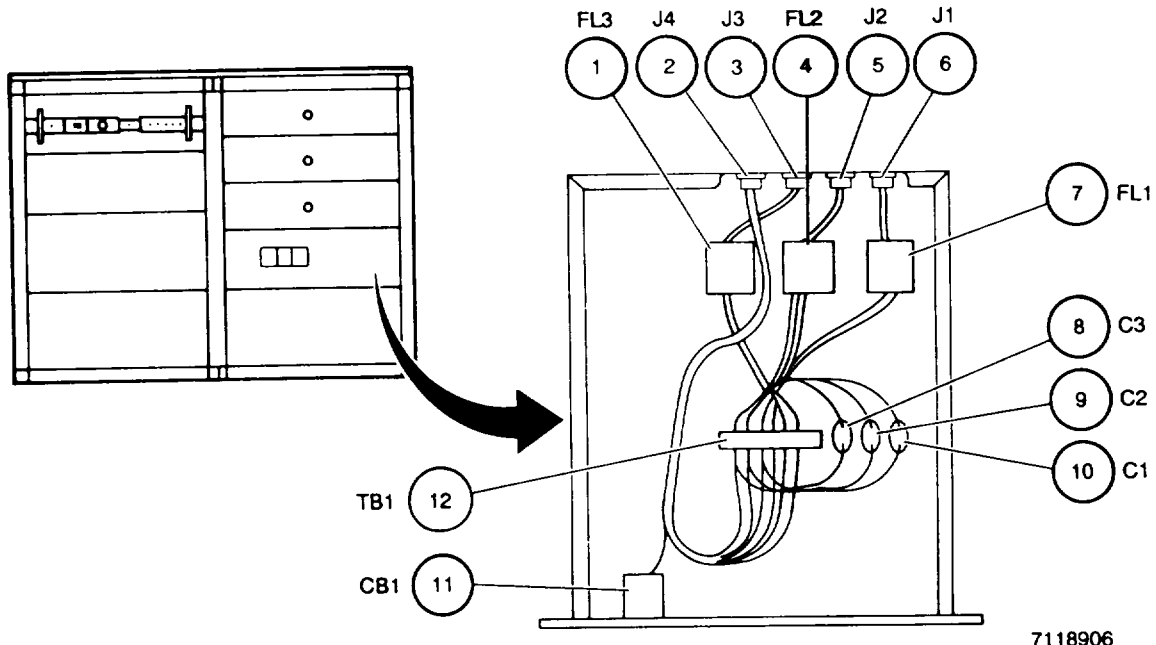
REAR PANEL VIEW - Continued



KEY	NAME	FUNCTION
(18)	REMOTE ALARMS CONNECTOR J9	Provides output connector to system for line fail, bypass, and low battery alarm status signals.
(19)	+144V OUT CONNECTOR J10	Connects sum of battery assembly outputs to system.
(20)	+ 30 OUTPUT CONNECTOR J15	Connects UPS conditioned output voltage to system.
(21)	± 48V BATTERY CONNECTOR J14	Connects battery assembly output to control assembly.
(22)	INVERTER IN CONNECTOR J13	Connects output of C phase inverter assembly to control assembly.
(23)	INVERTER IN CONNECTOR J12	Connects output of B phase inverter assembly to control assembly.
(24)	INVERTER IN CONNECTOR J11	Connects output of A phase inverter assembly to control assembly.

1-15.5.2. UPS Input Assembly (1A2A2A4, 4A2A2A4) Major Components

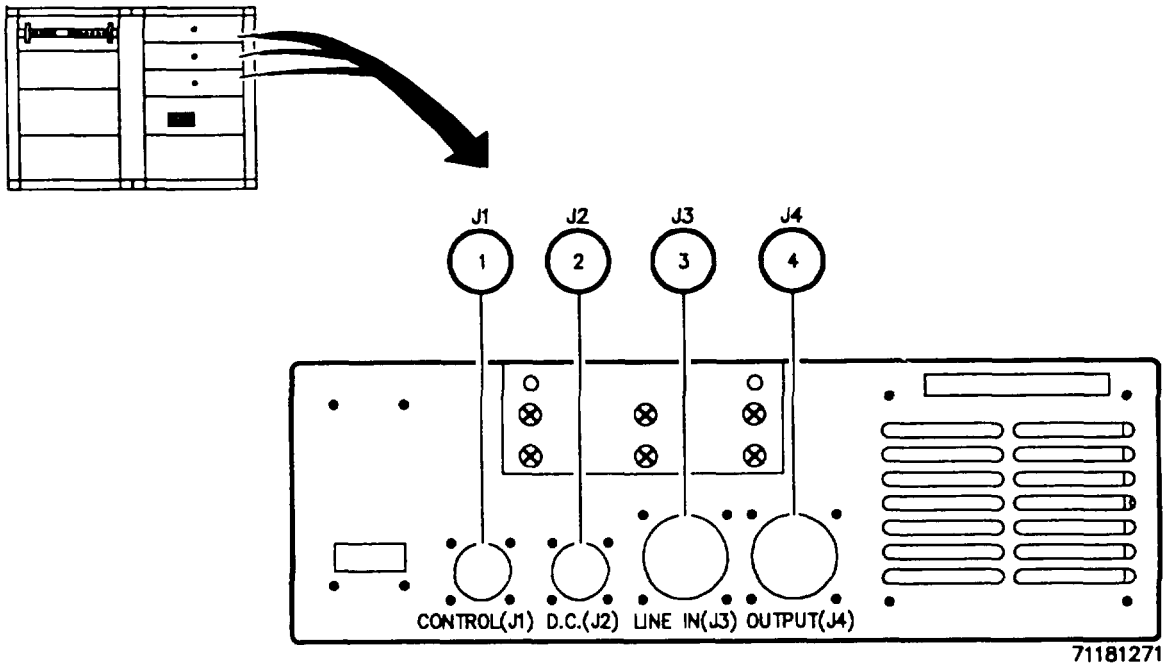
TOP VIEW



KEY	NAME	FUNCTION
(1)	EMI FILTER C FL3	Filters EMI from C phase input.
(2)	30 INPUT CONNECTOR J4	Connects 3-phase power from main power filter.
(3)	C0 LINE CONNECTOR J3	Connects C phase power to C phase inverter assembly.
(4)	EMI FILTER B FL2	Filters EMI from B phase input.
(5)	B0 LINE CONNECTOR J2	Connects B phase power to B phase inverter assembly.
(6)	A0 LINE CONNECTOR J1	Connects A phase power to A phase inverter assembly.
(7)	EMI FILTER A FL1	Filters EMI from A phase input.
(8)	CAPACITOR C C3	Filters C phase input line noise.
(9)	CAPACITOR B C2	Filters B phase input line noise.
(10)	CAPACITOR A C1	Filters A phase input line noise.
(11)	3 PHASE LINE CIRCUIT BREAKER CB1	Turns line current to the UPS ON/OFF.
(12)	TERMINAL BOARD TB1	Provides interconnect wiring point.

1-15.5.3. UPS Inverter Assembly (1A2A2A1/A2/A3, 4A2A2A1/A2/A3) Major Components

REAR PANEL VIEW

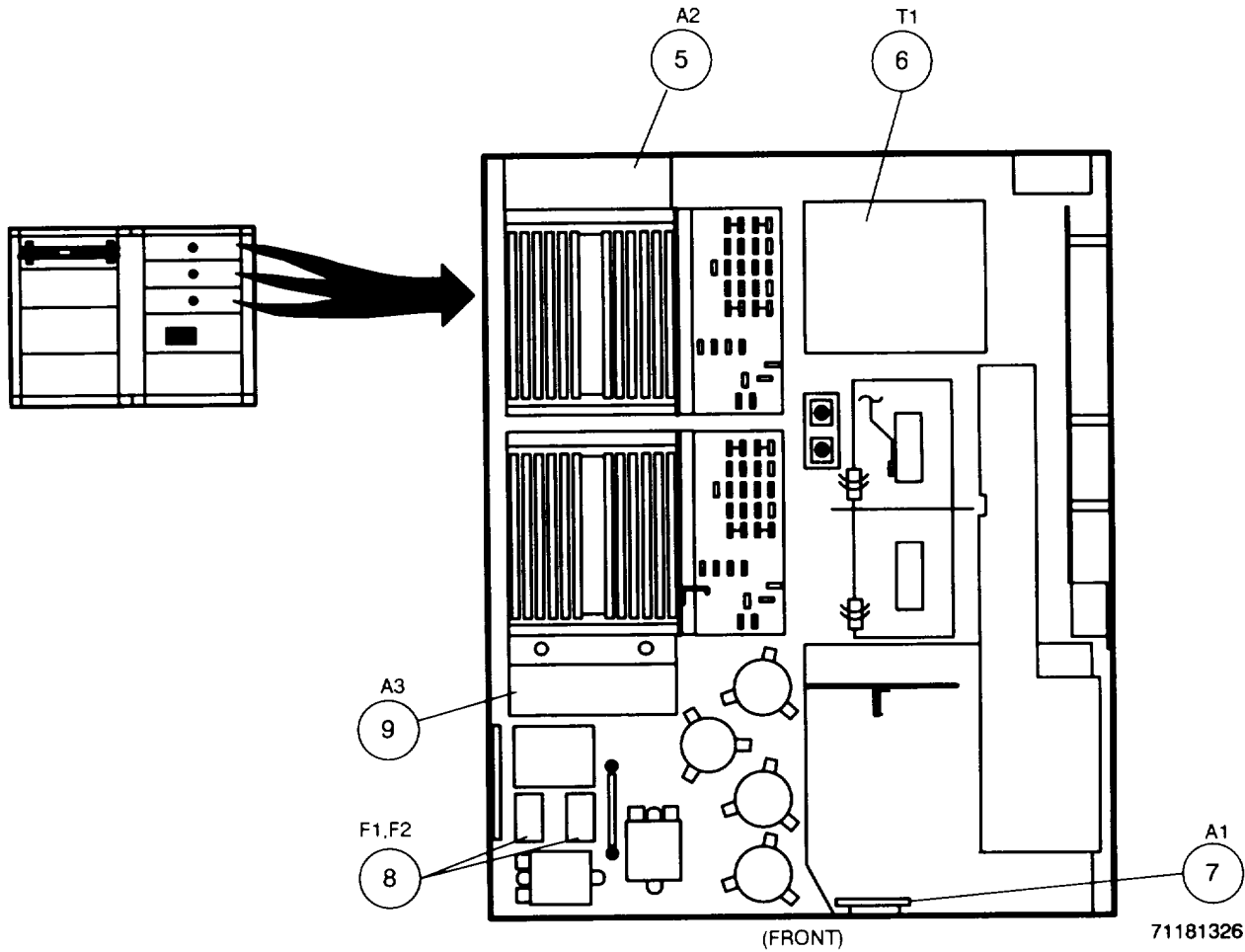


71181271

KEY	NAME	FUNCTION
(1)	CONTROL CONNECTOR J1	Connects control assembly control signals to inverter assembly.
(2)	D.C. CONNECTOR J2	Connects inverter assembly battery charge voltage to control assembly.
(3)	LINE IN CONNECTOR J3	Connects appropriate phase (A, B, or C) voltage from input assembly to inverter assembly.
(4)	OUTPUT CONNECTOR J4	Connects inverter assembly output to control assembly.

1-15.5.3. UPS Inverter Assembly Assembly (1A2A2A1/A2/A3, 4A2A2A1/A2/A3) Major Components-Continued

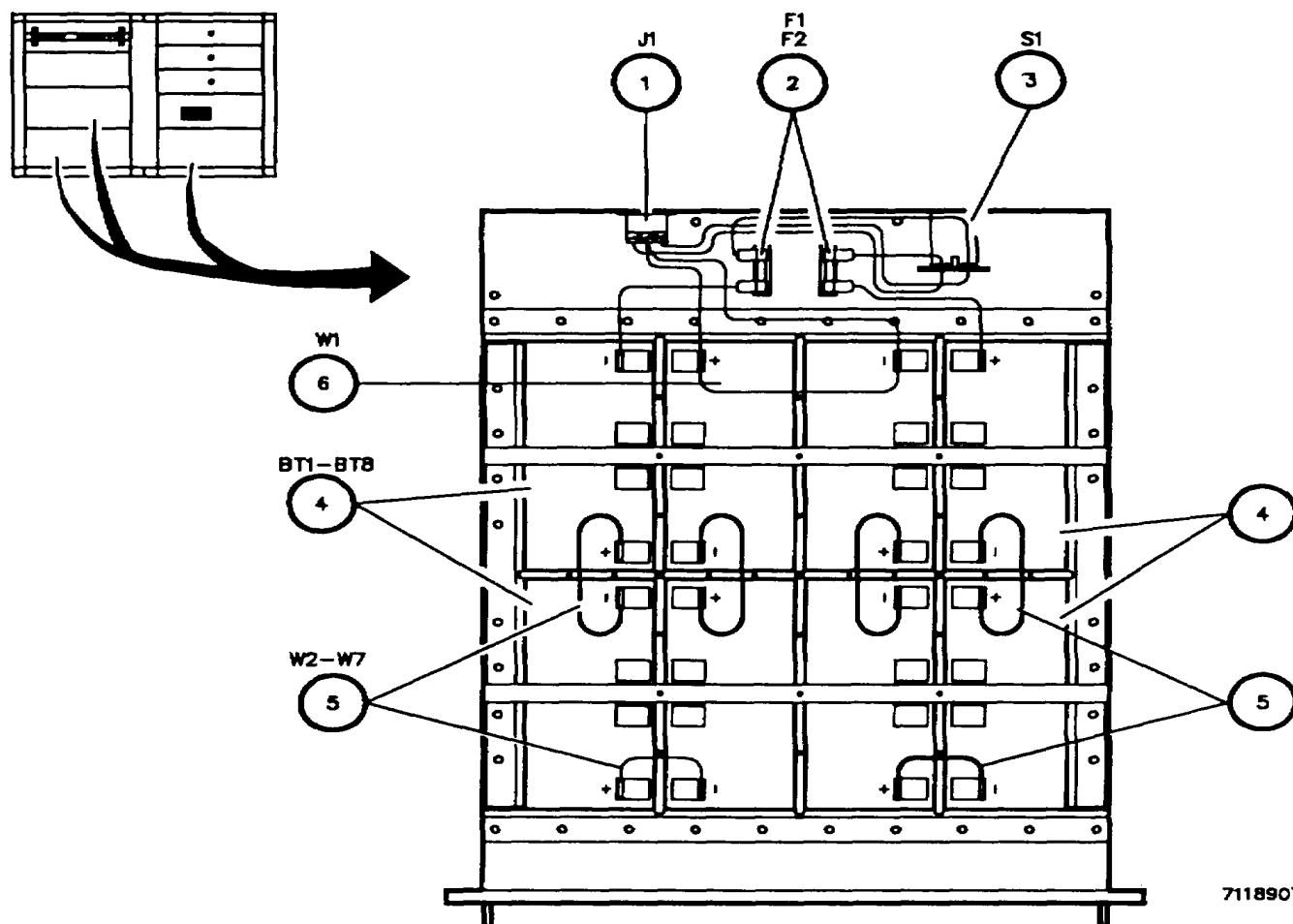
TOP VIEW



KEY	NAME	FUNCTION
(5)	FAN ASSEMBLY A2	Exhaust fan. With fan A3, provides cooling airflow for power modules.
(6)	OUTPUT TRANSFORMER T1	Output transformer.
(7)	INDICATOR CCA A1	Contains indicator lamp that lights when inverter fault is detected.
(8)	FUSES F1, F2	Provide overload protection for bias power supply.
(9)	FAN ASSEMBLY A3	Intake fan. With fan A2, provides cooling airflow for power modules.

1-15.5.4. UPS Battery Assembly (1A2A1A3/A4, 1A2A2A5, 4A2A1A3/A4, 4A2A2A5) Major Components

TOP VIEW

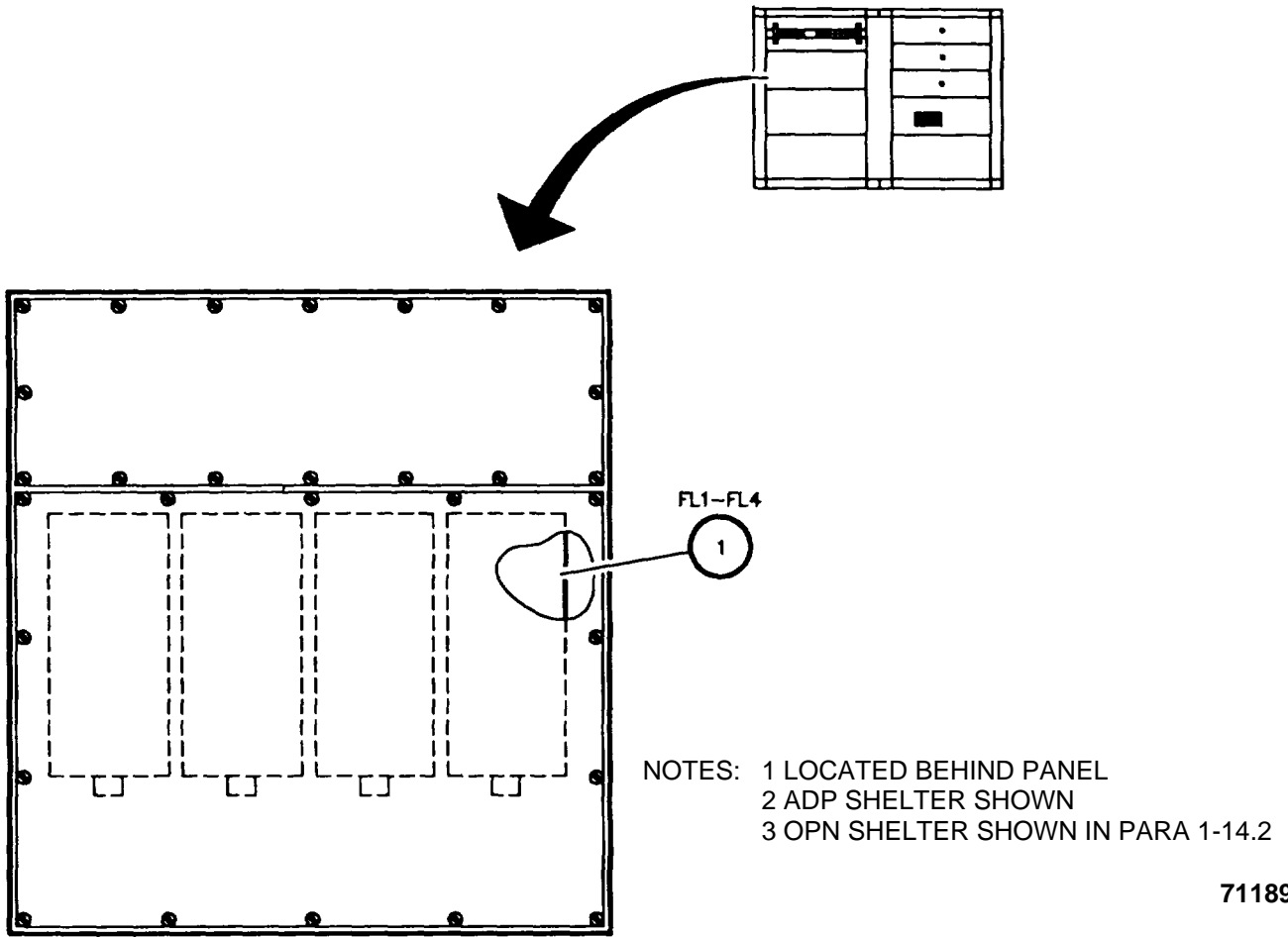


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KEY	NAME	FUNCTION
(1)	+48V BATT CONNECTOR J1	Connects battery assembly to control assembly (A2A1A1).
(2)	FUSES F1, F2	Provide overcurrent protection.
(3)	BATTERY SWITCH S1	Provides safety switch that removes high-current dc from rear panel battery connector pins.
(4)	STORAGE BATTERIES BT1-BT8	Eight identical lead-calcium batteries that provide subsystem power in the event of power line loss.
(5)	JUMPER CABLE ASSEMBLIES W2-W7	Connect BT1-BTB into two 48-volt batteries.
(6)	JUMPER CABLE W1	Connects the two 48-volt batteries into one 96-volt battery.

1-15.5.5. UPS Main Power Filter Assembly (1A2A1 A2, 4A5A1) Major Components

TOP VIEW



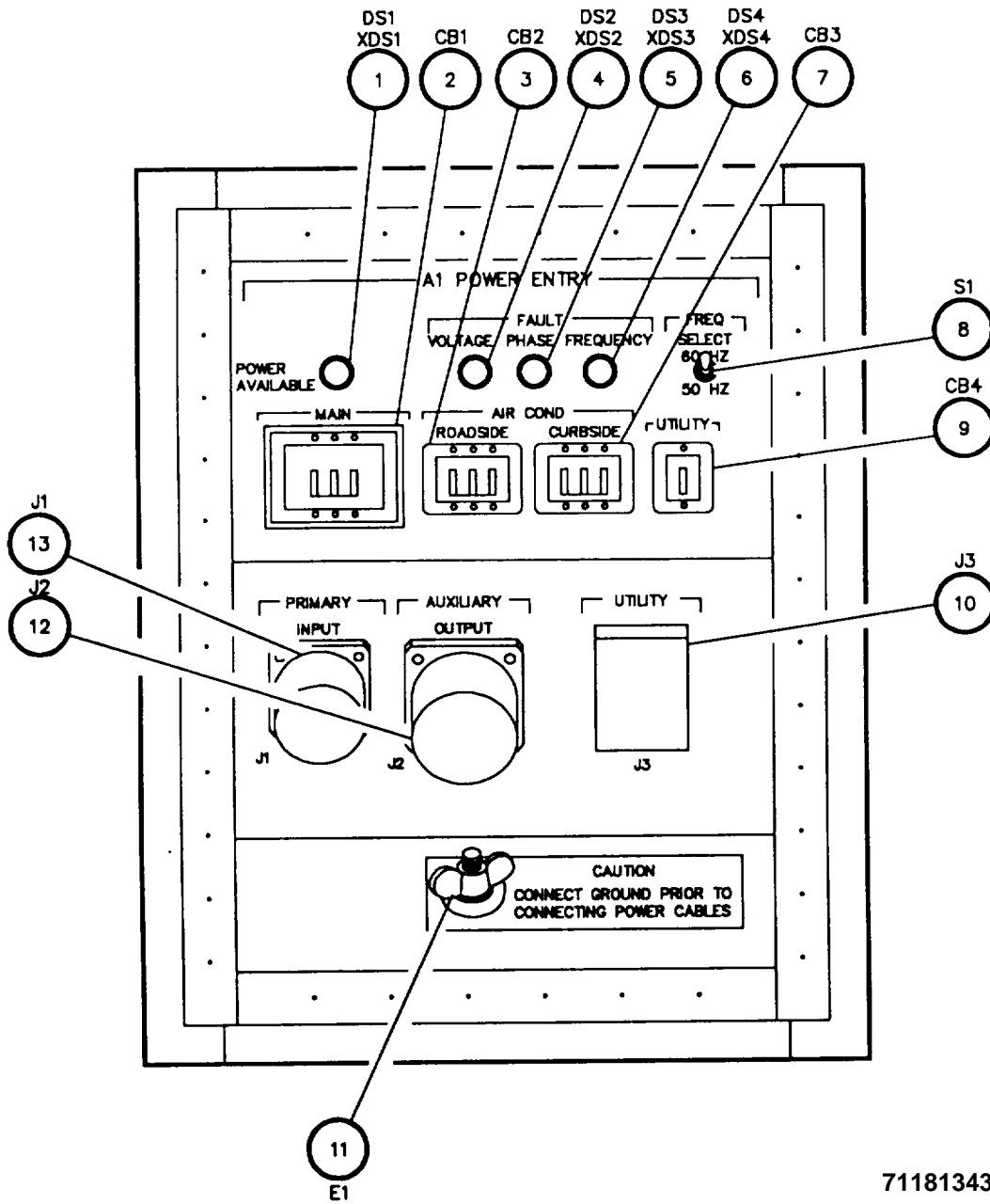
7118910

KEY	NAME	FUNCTION
(1)	FILTER MODULES FL1-FL4	Four identical filter modules that filter all shelter ac power, except ECU power. Apply filtered 3-phase ac power to UPS and filtered phase B to PDU for bypass lighting.

1-15.6. Power Distribution System

1-15.6.1. Power Entry Panel (1A1, 4A1) Major Components

FRONT PANEL VIEW



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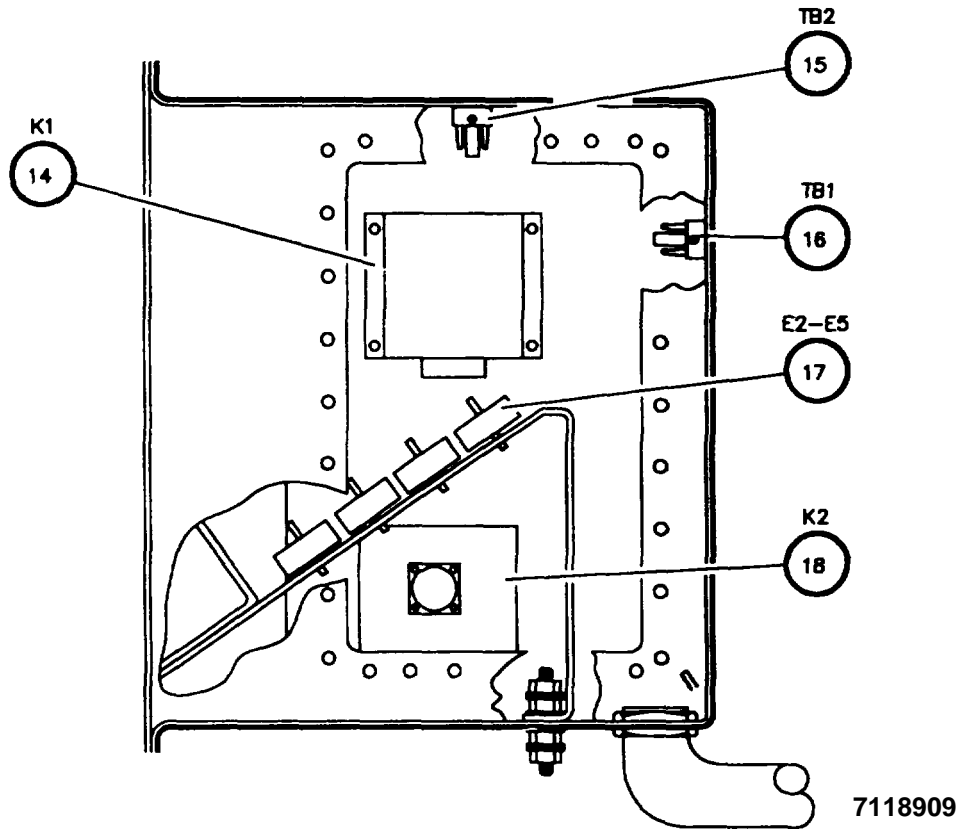
1-15.6.1. Power Entry Panel (1A1, 4A1) Major Components - Continued

Front Panel View - Continued

KEY	NAME	FUNCTION
(1)	POWER AVAILABLE LAMP DS1 AND HOUSING XDS1	Press-to-test lamp assembly. Lights (green) to indicate prime ac power to MAIN circuit breaker is within tolerance.
(2)	MAIN CIRCUIT BREAKER CB1	On/off switch; provides overload protection for all internal equipment and circuits up to 100 amperes.
(3)	AIR COND ROADSIDE CIRCUIT BREAKER CB2	On/off switch; provides overload protection for roadside ECU.
(4)	FAULT VOLTAGE LAMP DS2 AND HOUSING XDS2	Lights (red) during fault condition and remains lighted until fault is corrected.
(5)	FAULT PHASE LAMP DS3 AND HOUSING XDS3	Lights (red) during fault condition and remains lighted until fault is corrected.
(6)	FAULT FREQUENCY LAMP DS4 AND HOUSING XDS4	Lights (red) during fault condition and remains lighted until fault is corrected.
(7)	AIR COND CURBSIDE CIRCUIT BREAKER CB3	On/off switch; provides overload protection for curbside ECU.
(8)	FREQ SELECT 60 HZ/50 HZ TOGGLE SWITCH S1	Selects 60-Hz or 50-Hz operating frequency.
(9)	UTILITY CIRCUIT BREAKER CB4	Provides overload protection for equipment connected to UTILITY outlet.
(10)	UTILITY OUTLET J3	Provides 120 Vac power for external equipment.
(11)	GROUNDING STUD E1	Connects to ground strap from grounding rod.
(12)	AUXILIARY OUTPUT CONNECTOR J2	Provides 120/208 Vac, 50/60-Hz, 3-phase power.
(13)	PRIMARY INPUT CONNECTOR J1	Connects 120/208 Vac, 50/60-Hz, 3-phase generator power to shelter equipment.

1-15.6.1. Power Entry Panel (1A1, 4A1) Major Components- Continued

ACCESS PANEL VIEW

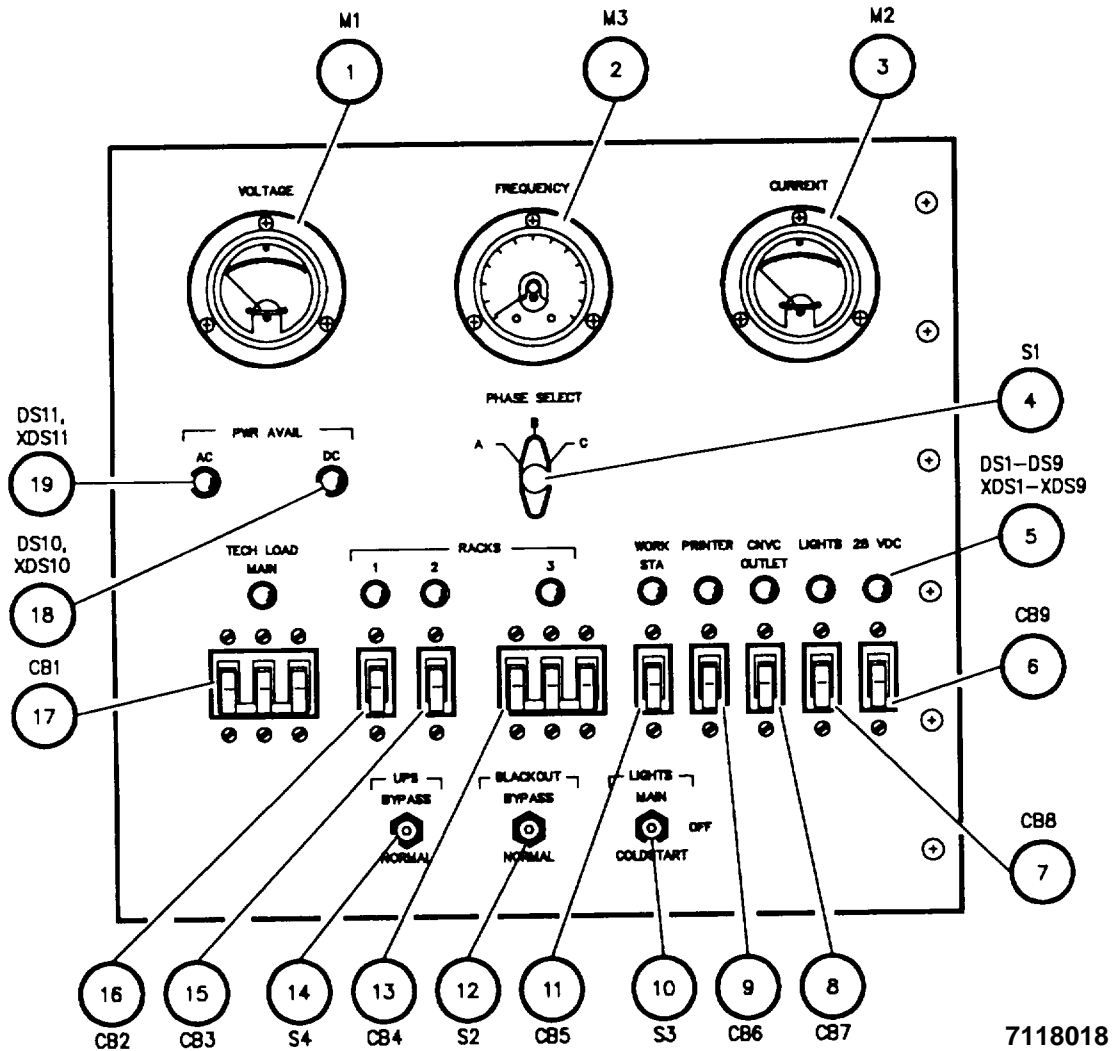


NOTE: PEP ACCESS COVER
REMOVED FOR CLARITY.

KEY	NAME	FUNCTION
(14)	POWER MONITOR K1	Monitors prime ac power voltage, frequency, and phase.
(15)	TERMINAL BOARD TB2	Provides wiring connection point for ac ground distribution.
(16)	TERMINAL BOARD TB1	Provides wiring connector point for input neutral distribution, and some A phase distribution.
(17)	SURGE ARRESTORS E2-E5	Provides protection against input voltage spikes.
(18)	CONTACTOR K2	Applies power to UPS power filter assembly and PEP circuit breakers under control of power monitor K1.

1-15.6.2. ADP Shelter Power Distribution Unit (1A17) Major Components

Front Panel View



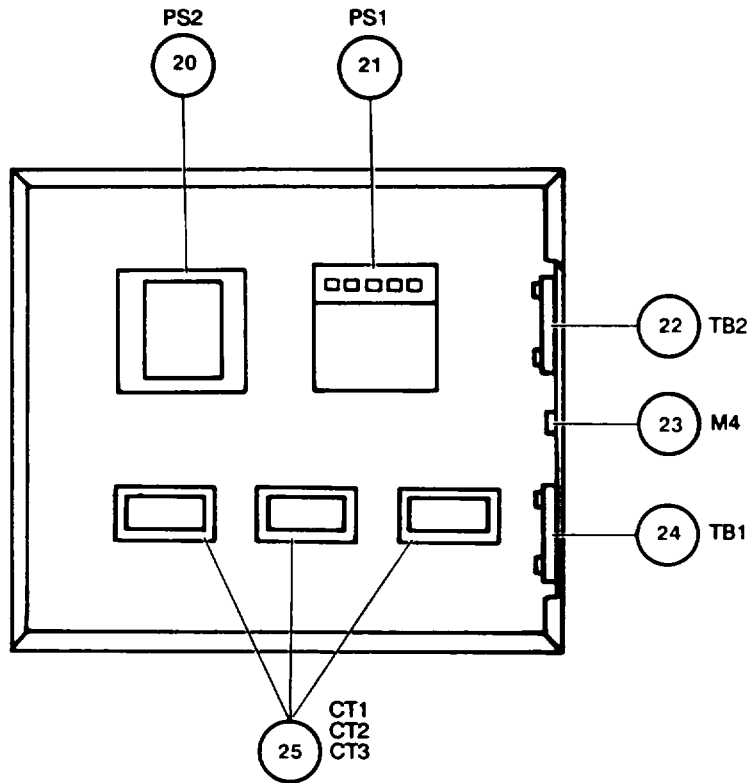
KEY	NAME	FUNCTION
(1)	VOLTAGE METER M1	Displays ac voltage in phase selected by PHASE SELECT switch.
(2)	FREQUENCY METER M3	Displays frequency in phase selected by PHASE SELECT switch.
(3)	CURRENT METER M2	Displays ac current in phase selected by PHASE SELECT switch.
(4)	PHASE SELECT SWITCH S1	Selects phase A, B, or C for measuring voltage, frequency, or current.
(5)	INDICATOR LAMPS DS1-DS9 AND HOUSINGS XDS1-XDS9	Push-to-test indicators with replaceable lamps that light (green) when power at output side of associated circuit breaker.

1-15.6.2. ADP Shelter Power Distribution Unit (1A17) Major Components - Continued

KEY	NAME	FUNCTION
(6)	28VDC CIRCUIT BREAKER CB9	Provides overload protection for 28 Vdc circuit.
(7)	LIGHTS CIRCUIT BREAKER CB8	Provides overload protection for main lighting system.
(8)	CNVC OUTLET CIRCUIT BREAKER CB7	Provides overload protection for convenience outlets.
(9)	PRINTER CIRCUIT BREAKER CB6	Provides overload protection for printer, intercom, and LDF.
(10)	LIGHTS MAIN/OFF/ COLDSTART TOGGLE SWITCH S3	Selects fluorescent (MAIN) or incandescent (COLDSTART) overhead lights. Also disables both (OFF).
(11)	WORK STA CIRCUIT BREAKER CB5	Provides overload protection for workstations.
(12)	BLACKOUT BYPASSI NORMAL TOGGLE SWITCH S2	Used to enable or bypass door interlock switch. Normal position turns off white overhead lights and turns on red black-out lights when shelter door is open. BYPASS position allows white overhead lights to remain on when shelter door is open.
(13)	RACKS 3 CIRCUIT BREAKER CB4	Provides overload protection for equipment in data rack A3A3.
(14)	UPS BYPASS/NORMAL TOGGLE SWITCH S4 outlets when UPS is OFF.	Applies UPS (NORMAL) or prime power (BYPASS) phase B to PDU. BYPASS used only to allow operation of lights and convenience
(15)	RACKS 2 CIRCUIT BREAKER CB3	Provides overload protection for equipment in data rack A3A2.
(16)	RACKS 1 CIRCUIT BREAKER CB2	Provides overload protection for equipment in data rack A3A1.
(17)	TECH LOAD MAIN CIRCUIT BREAKER CB1	Main PDU on/off switch; applies ac to CB2-CB8.
(18)	PWR AVAIL DC LAMP DS10 AND HOUSING XDS10	Push-to-test indicator with replaceable lamp that lights (green) when PS1 is providing 28 Vdc.
(19)	PWR AVAIL AC LAMP DS11 AND HOUSING XDS11	Push-to-test indicator with replaceable lamp that lights (green) when phase B 120 Vdc is applied to CB1.

1-15.6.2. ADP Shelter Power Distribution Unit (1A17) Major Components - Continued

INTERIOR VIEW



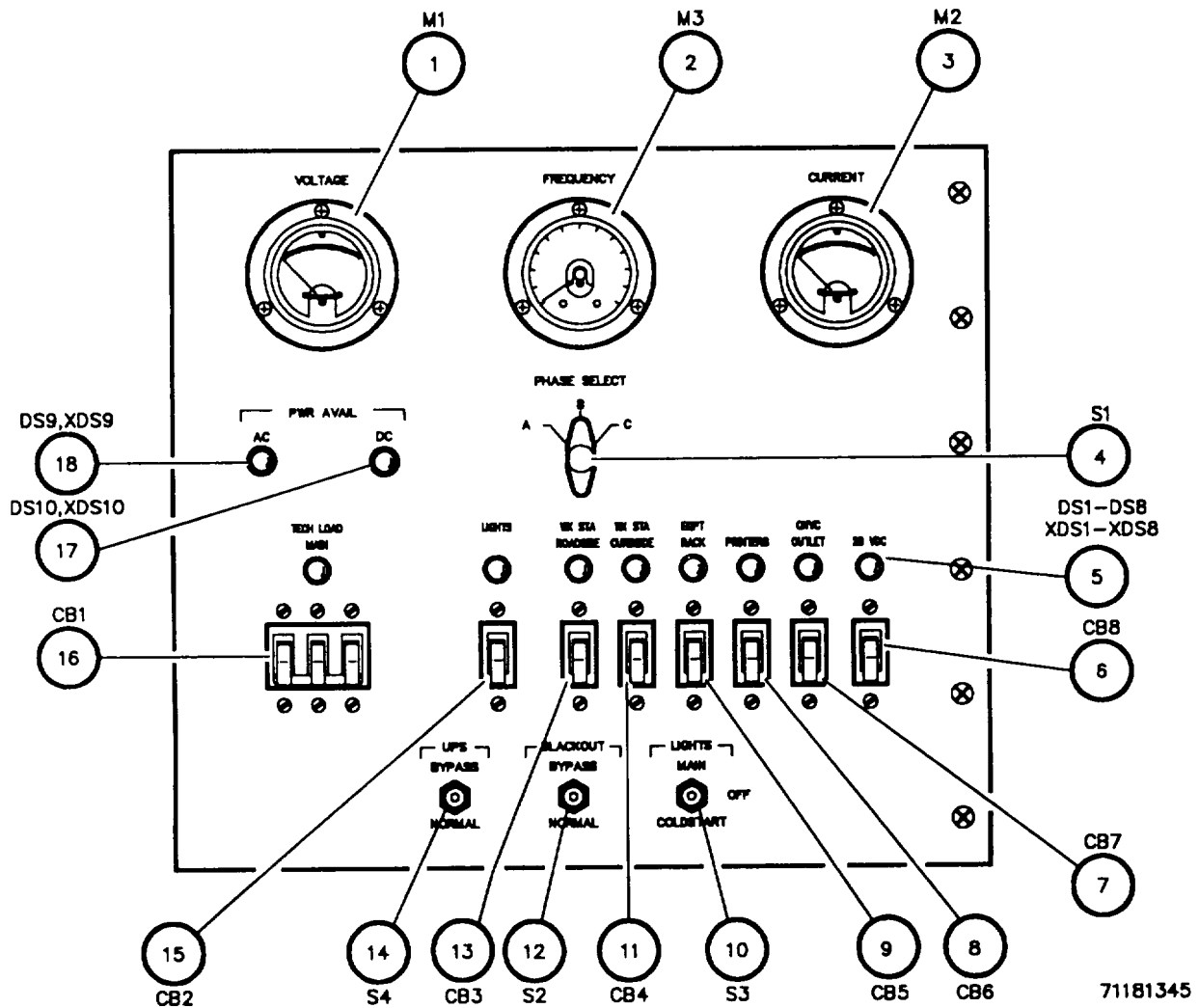
NOTE: PDU DOOR OPENED FOR CLARITY

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KEY	NAME	FUNCTION
(20)	POWER SUPPLY PS2	Converts UPS +144 Vdc to 28 Vdc for radio and KY-57 operation.
(21)	POWER SUPPLY PS1	Converts UPS C-phase ac input to 28 Vdc for time totalizing meter M4.
(22)	TERMINAL BOARD TB2	Provides wiring connection point for main filter bypass lighting input, UPS +144 Vdc common, and UPS neutral input.
(23)	TIME METER M4	Indicates total time that phase C ac has been applied to PDU.
(24)	TERMINAL BOARD TB1	Provides wiring connection point for UPS 3-phase ac input and UPS +144 Vdc input.
(25)	CURRENT TRANSFORMERS CT1-CT3	Provides samples of UPS 3-phase ac load current, through PHASE SELECT switch S1, to current meter M2.

1-15.6.3. OPN Shelter Power Distribution Unit (4A17) Major Components

FRONT PANEL VIEW



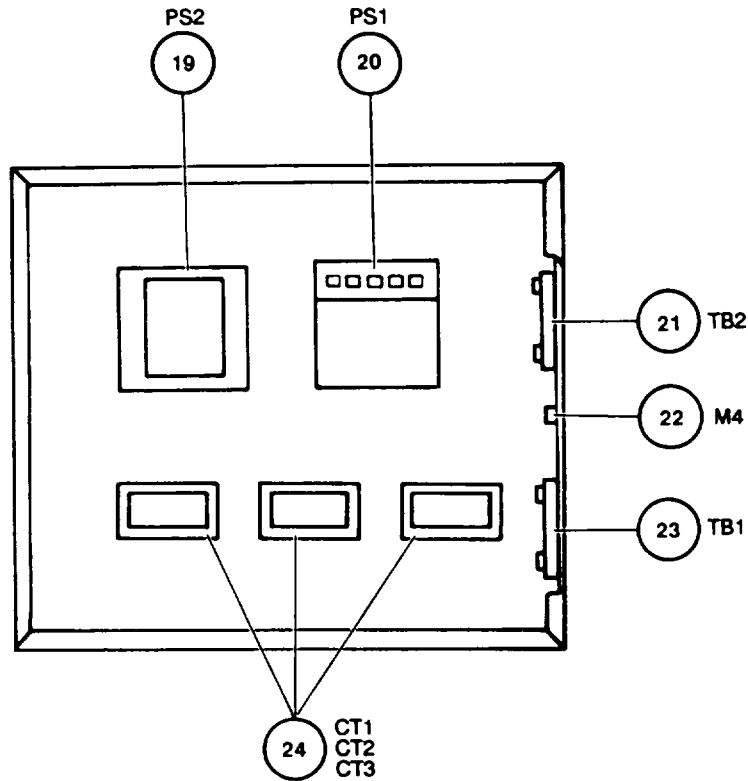
KEY	NAME	FUNCTION
(1)	VOLTAGE METER M1	Displays ac voltage in phase selected by PHASE SELECT switch.
(2)	FREQUENCY METER M3	Displays frequency in phase selected by PHASE SELECT switch.
(3)	CURRENT METER M2	Displays ac current in phase selected by PHASE SELECT switch.

1-15.6.3. OPN Shelter Power Distribution Unit (4A17) Major Components - Continued

KEY	NAME	FUNCTION
(4)	PHASE SELECT SWITCH S1	Selects phase A, B, or C for measuring voltage, frequency, or current.
(5)	INDICATORS DS1-DS8 AND HOUSINGS XDS1-XDS8	Push-to-test indicators (XDS1-XDS8) with replaceable lamps (DS1-DS8) that light (green) when power at output of associated circuit breaker.
(6)	28 VDC CIRCUIT BREAKER CB8	Provides overload protection for 28 Vdc circuit. Lamp lights when circuit breaker is set to ON.
(7)	CNVK OUTLET CIRCUIT BREAKER CB7	Provides overload protection for convenience outlets.
(8)	PRINTERS CIRCUIT BREAKER CB6	Provides overload protection for printer, intercom, and LDF.
(9)	EQPT RACK CIRCUIT BREAKER CB5	Provides overload protection for equipment in equipment rack.
(10)	ULIGHTS MAIN/OFF COLDSTART TOGGLE SWITCH S3	Selects fluorescent (MAIN) or incandescent (COLDSTART) overhead lights, or disables both (OFF).
(11)	WK STA CURBSIDE CIRCUIT BREAKER CB4	Provides overload protection for curbside workstations.
(12)	BLACKOUT BYPASS/ NORMAL TOGGLE SWITCH S2	Used to enable or bypass door interlock switch. Normal position turns off white overhead lights and turns on red black-out lights when shelter door is open. BYPASS position allows white overhead lights to remain on when shelter door is open.
(13)	WK STA ROADSIDE CIRCUIT BREAKER CB3	Provides overload protection for roadside workstations.
(14)	UPS BYPASS/NORMAL TOGGLE SWITCH S4	Applies UPS (NORMAL) or prime power (BYPASS) phase B to PDU. BYPASS used only to apply power to lights and convenience outlets when UPS is OFF.
(15)	LIGHTS CIRCUIT BREAKER CB2	Provides overload protection for main lighting system.
(16)	TECH LOAD MAIN CIRCUIT BREAKER CB1	Main PDU on/off switch; applies ac to CB1-CB8.
(17)	PWR AVAIL DC LAMP DS10 AND HOUSING XDS10	Push-to-test indicator (XDS10) with replaceable lamp (DS10) that lights when PS1 is providing 28 Vdc.
(18)	PWR AVAIL AC LAMP DS9 AND HOUSING XDS9	Push-to-test indicator (XDS9) with replaceable lamp (DS9) that lights (green) when phase B ac is applied to CB1.

1-15.6.3. OPN Shelter Power Distribution Unit (4A17) Major Components - Continued

INTERIOR VIEW

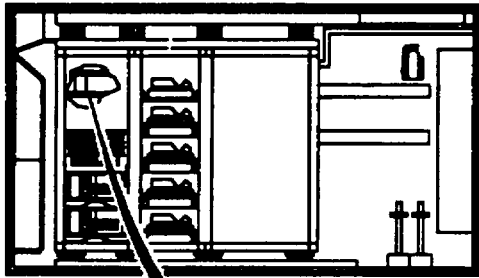


NOTE: PDU DOOR OPENED FOR CLARITY 71181137

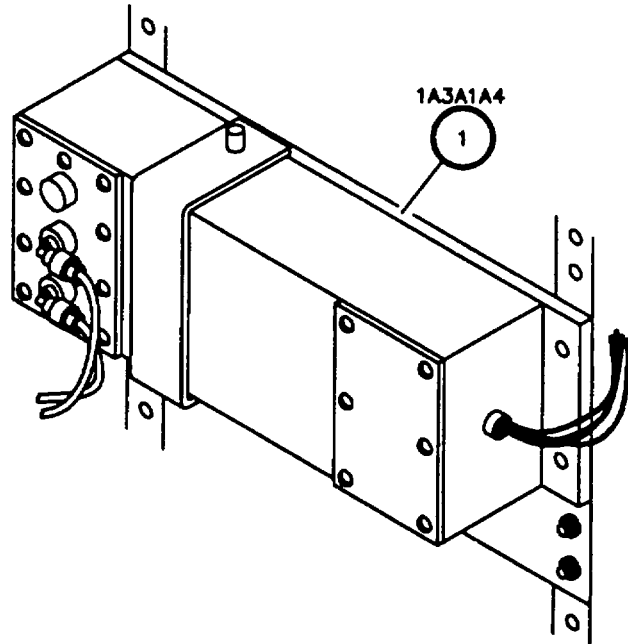
KEY	NAME	FUNCTION
(19)	POWER SUPPLY PS2	Converts UPS +144 Vdc to 28 Vdc for radio and KY-57 operation.
(20)	POWER SUPPLY PS1	Converts UPS C-phase ac input to 28 Vdc for time totalizing meter M4.
(21)	TERMINAL BOARD TB2	Provides wiring connection point for main filter bypass lighting input, UPS +144 Vdc common, and UPS neutral input.
(22)	TIME METER M4	Indicates total time that phase C ac power has been applied to CB1.
(23)	TERMINAL BOARD TB1	Provides wiring connection point for UPS 3-phase ac input and UPS +144 Vdc input.
(24)	CURRENT TRANSFORMERS CT1-CT3	Provides samples of UPS 3-phase ac load current, through PHASE SELECT switch S1, to CURRENT meter M2.

1-15.6.4. ADP Shelter AC Filter Assembly (1A3A1A4)

TOP VIEW



NOTE: LOCATED BEHIND
ACCESS PANEL



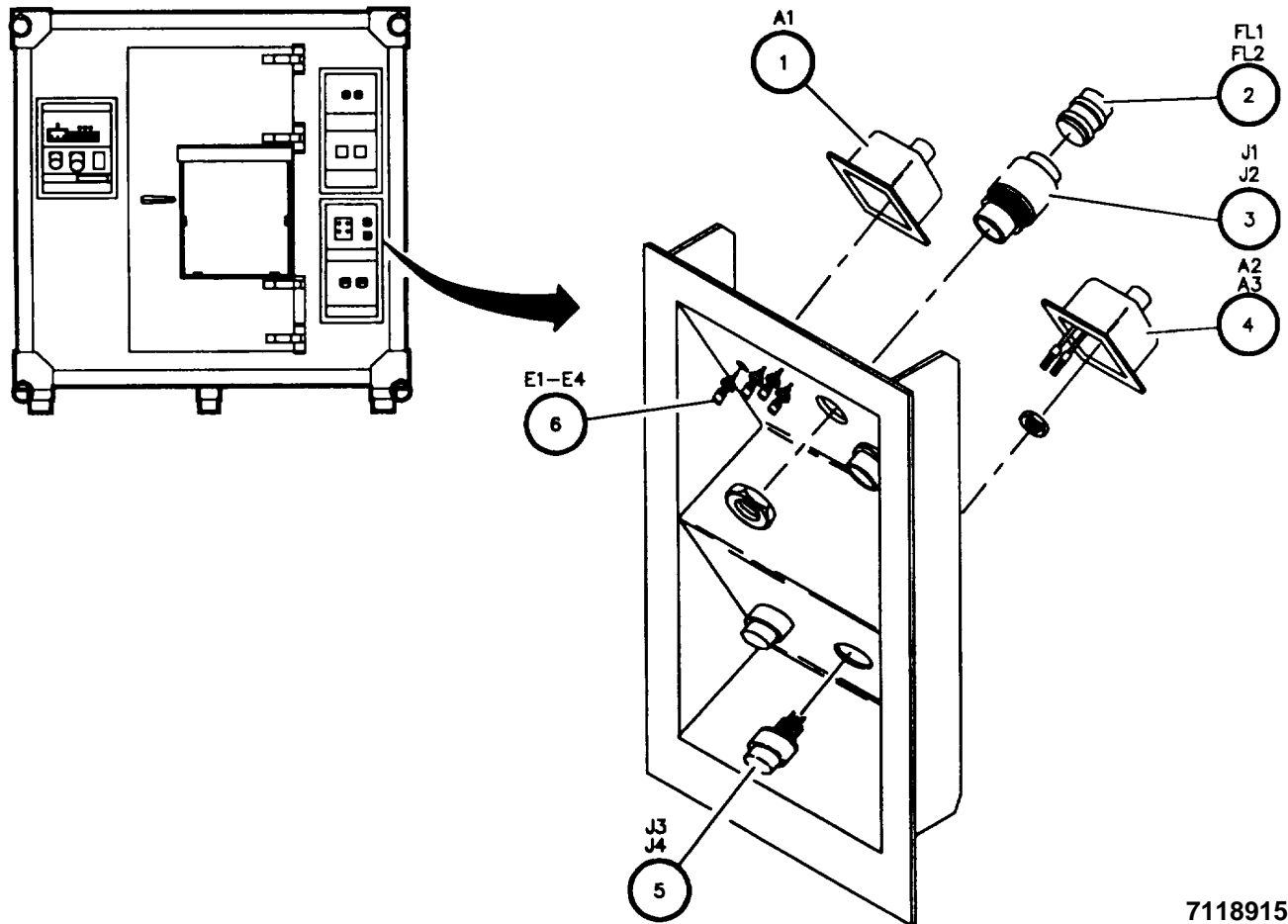
71181272

KEY	NAME	FUNCTION
(1)	AC FILTER ASSEMBLY 1A3A1A4	Provides EMI filtering to prevent GM and LGM feedback from reaching power source and other units. Also provides cable connections for GM and LGM power cables.

1-15.7. Signal Distribution System

1-15.7.1. ADP Shelter Signal/Video Entry Panel (1A4) Major Components

EXTERIOR VIEW

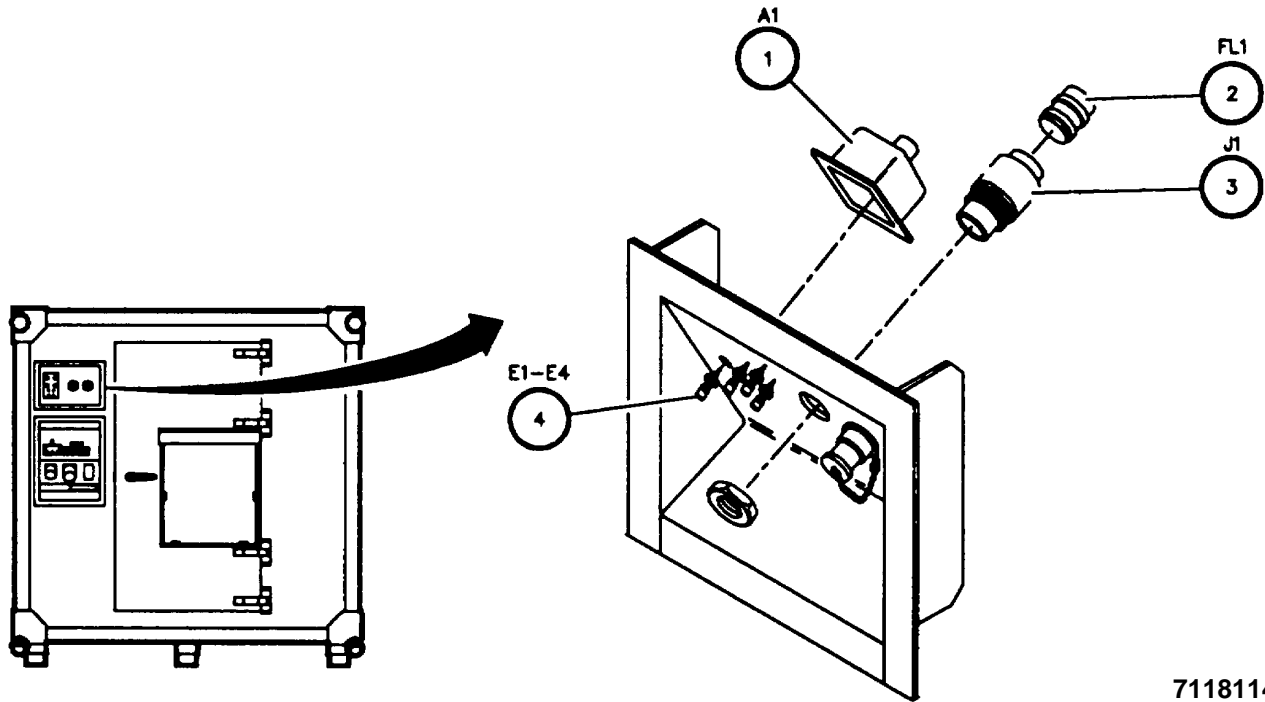


7118915

KEY	NAME	FUNCTION
(1)	AUDIO ASSEMBLY AI	Provides signal entry for four intercom channels.
(2)	EMI FILTER ADAPTERS FL1, FL2	Provide system EMI protection for J1 and J2.
(3)	SURGE ARRESTER ASSEMBLIES J1, J2	Provide protection against external power spikes and connectors for external 26-pair cables.
(4)	GROUP DATA ASSEMBLIES A2, A3	Two identical assemblies that provide signal entry for two group data cables.
(5)	ELECTRICAL CONNECTORS J3, J4	Provide cable connection for group data cables.
(6)	BINDING POSTS EI-E4	Provide connection for external intercom units.

1-15.7.2. OPN Shelter Signal Entry Panel (4A4) Major Components

EXTERIOR VIEW

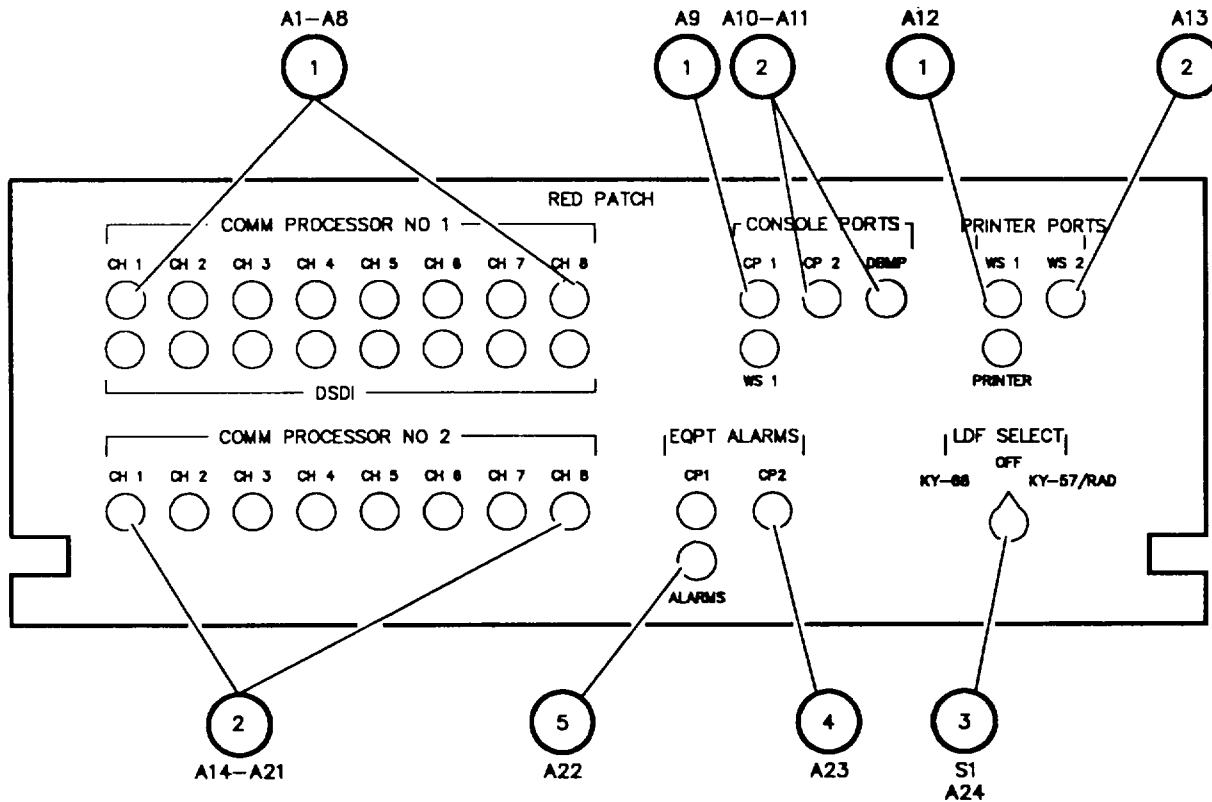


71181141

KEY	NAME	FUNCTION
(1)	AUDIO ASSEMBLY A1	Provides signal entry for four intercom channels.
(2)	EMI FILTER ADAPTER FL1	Provides system EMI protection for J1 and J2.
(3)	SURGE ARRESTER ASSEMBLY J1	Provides protection against external power spikes and connector for external 26-pair cable.
(4)	BINDING POSTS E1-E4	Provide connection for external intercom units.

1-15.7.3. ADF Shelter Red Patch Panel (1A3A3A1) Major Components

FRONT PANEL VIEW

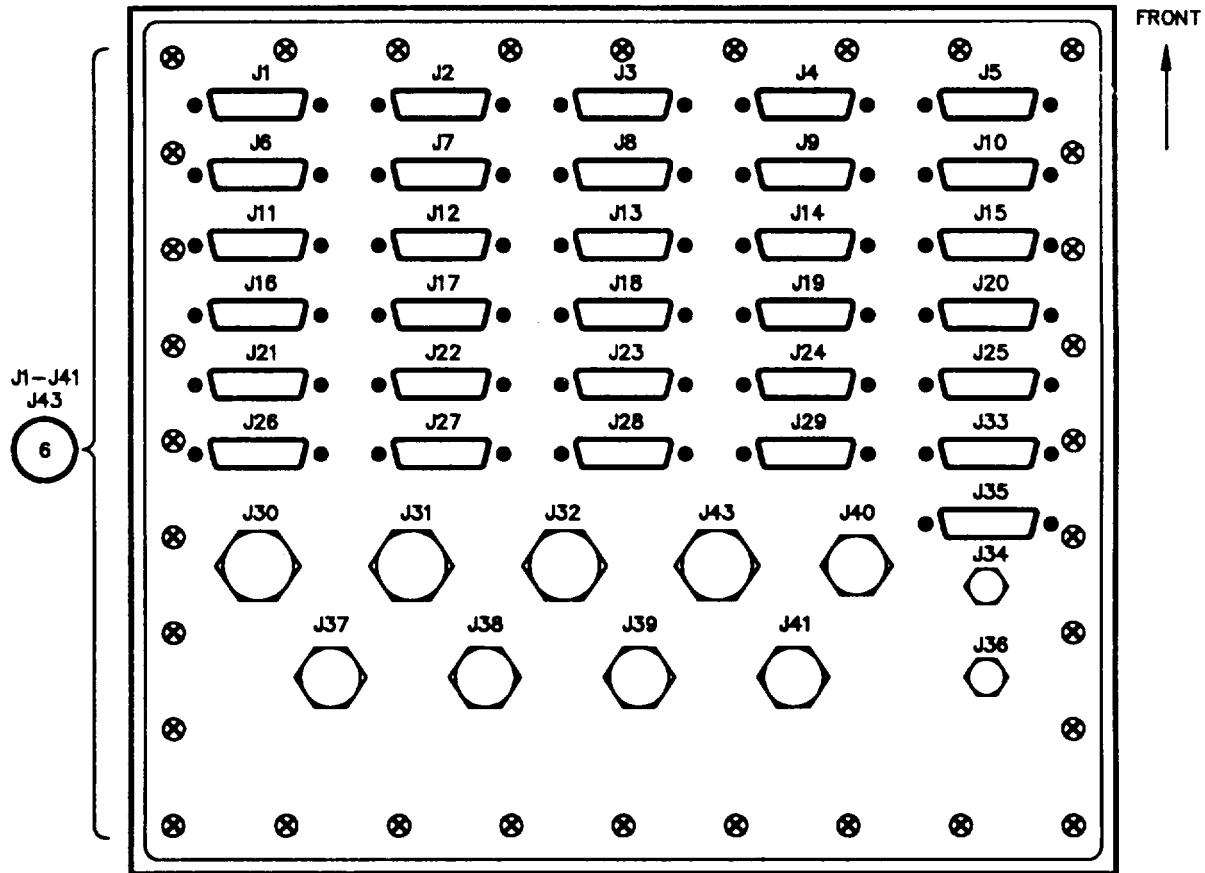


7118916

KEY	NAME	FUNCTION
(1)	DUAL PATCH-TO-CONNECTOR ASSEMBLY A1-A9, A12	Ten identical assemblies that provide patching for associated communications processor (CP1), DSDI, workstation, printer, and alarm circuits. Each includes associated connectors and wiring.
(2)	SINGLE PATCH-TO-CONNECTOR ASSEMBLY A10, A11, A13-A21	Eleven identical assemblies that provide patching for associated CP2, DSDI, workstation, printer, and alarm circuits. Each includes associated connector and wiring.
(3)	LDF SELECT SWITCH ASSEMBLY A24	Provides front panel switching of LDF signal routing. Includes select switch S1, associated connectors, and wiring.
(4)	ALARM CABLE ASSEMBLY-1 A23	Single-type patch jack to one cable connector. Provides patching between CP2 and system alarms. Includes associated connector and wiring.
(5)	ALARM CABLE ASSEMBLY-2 A22	Dual-type patch jack and two cable connectors. Provides patching between CP1 and system alarms. Includes associated connectors and wiring.

1-15.7.3. ADP Shelter Red Patch Panel (1 A3A3A1) Major Components - Continued

TOP PANEL VIEW

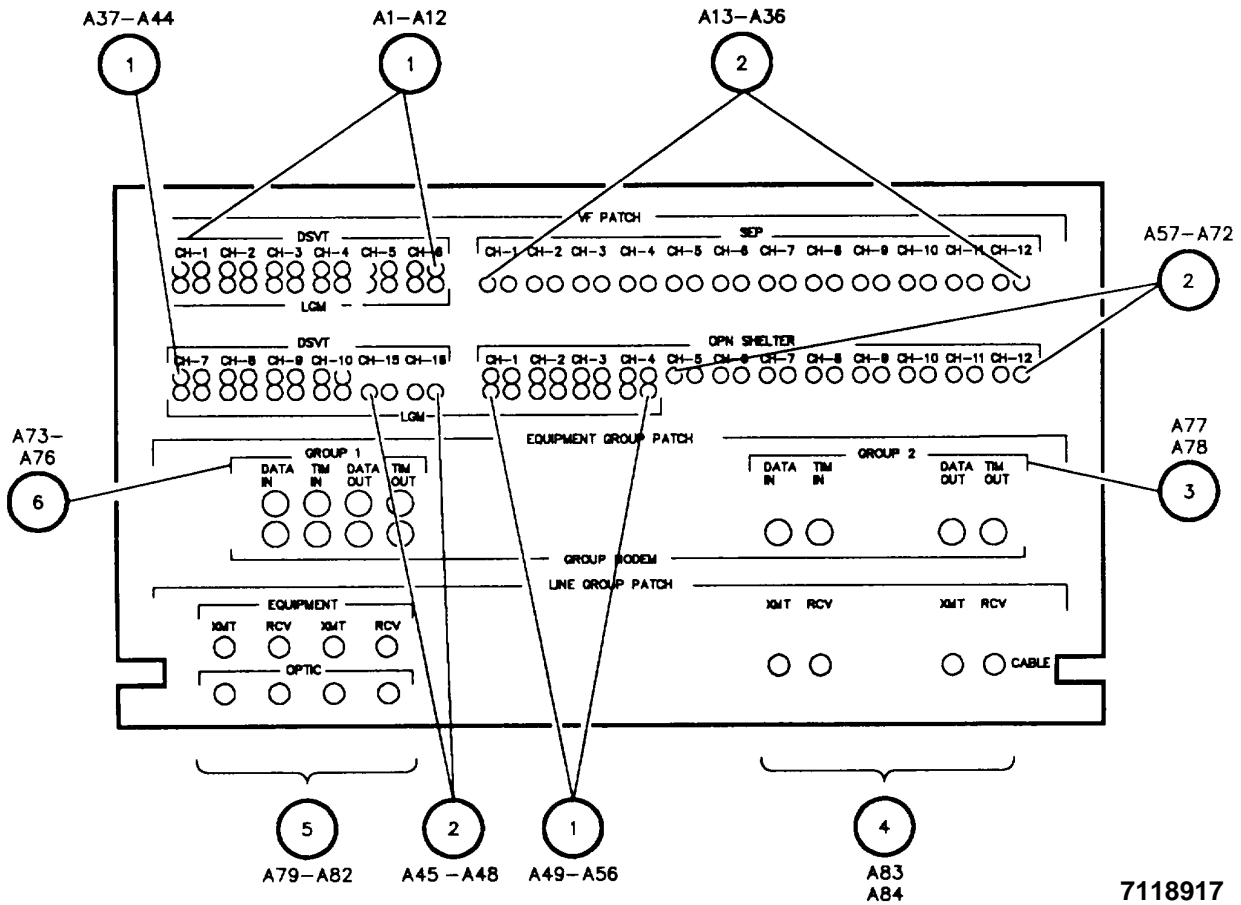


71181273

KEY	NAME	FUNCTION
(6)	CONNECTORS J1-J41, J43	Provide connections to workstations, processors, printer, telephone, LDF, UPS, GM, LGM, DSDIs, radio set, and jumper plug. Each connector replaced as part of associated jack or switch assembly (A1-A24).

1-15.7.4. ADP Shelter Black Patch Panel (1A3A1A1) Major Components

FRONT PANEL VIEW

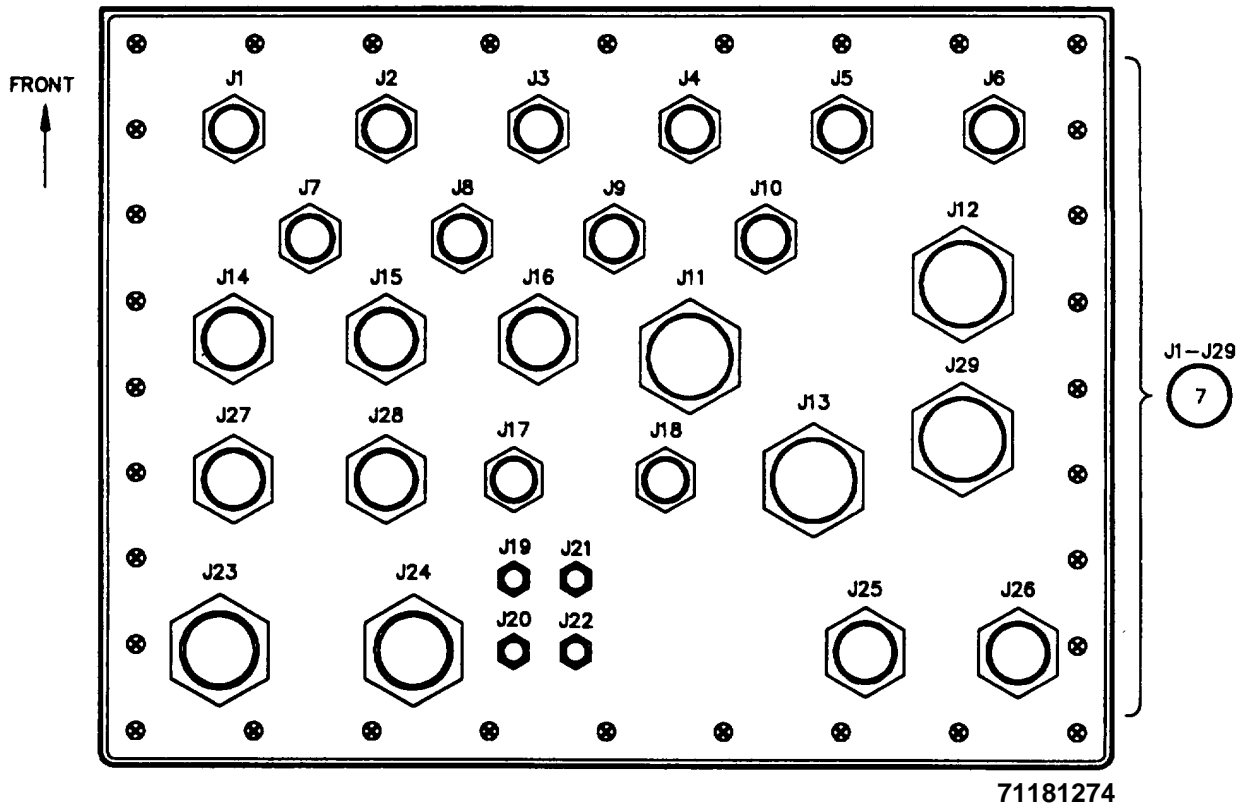


7118917

KEY	NAME	FUNCTION
(1)	DUAL BANTAM-TYPE PATCH JACK ASSEMBLY A1-A12, A37-A44, A49-A56	Twenty-eight identical assemblies that provide Voice Frequency (VF) patching between LGM and associated DSVT.
(2)	SINGLE BANTAM-TYPE PATCH JACK ASSEMBLY A13-A36, A45-A48, A57-A72	Forty-four identical assemblies that provide VF patching for DSVT CH-15 and CH-16, signal entry panel CH-1 to CH-12, and OPN SHELTER CH-5 to CH-12.
(3)	SINGLE TWINAXIAL PATCH JACK ASSEMBLY A77, A78	Two patch jack assemblies that provide equipment group patching to group 2 of GM.
(4)	SINGLE COAXIAL PATCH JACK ASSEMBLY A83, A84	Two patch jack assemblies that provide line group patching to GROUP DATA connector on SVEP.
(5)	DUAL COAXIAL PATCH JACK ASSEMBLIES A79-A82	Four patch jack assemblies that normally connect GM to ROA.
(6)	DUAL TRIAXIAL PATCH JACK ASSEMBLIES A73-A76	Four patch jack assemblies that normally connect LGM to GM group 1.

1-15.7.4. ADP Shelter Black Patch Panel (1A3A1A1) Major Components - Continued

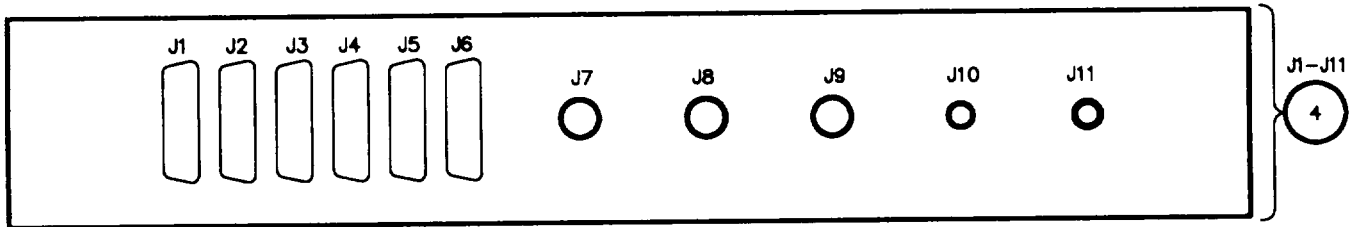
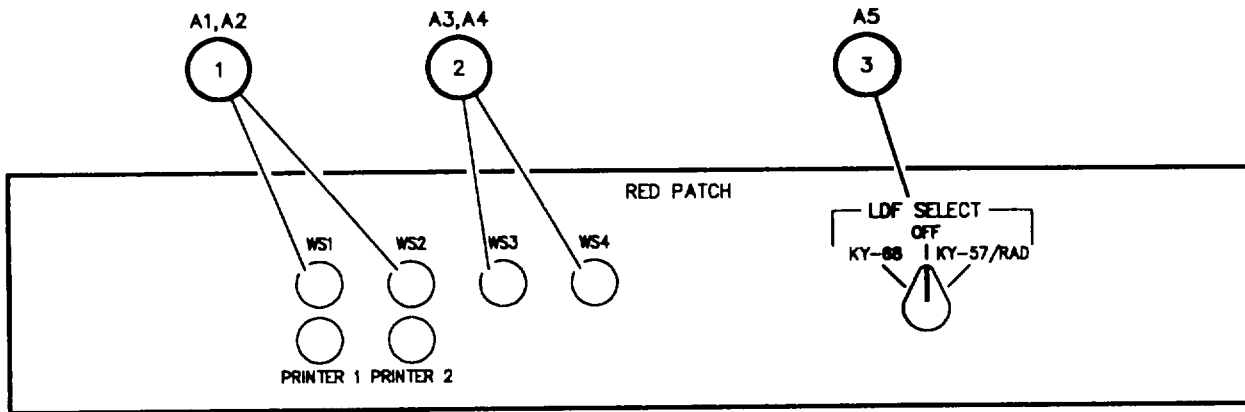
TOP PANEL VIEW



KEY	NAME	FUNCTION
(7)	CONNECTORS J1-J29	Provide connections to DSVTs, SVEP, LGM, GM, intercom, and FOEP.

1-15.7.5. OPN Shelter Red Patch Panel (4A3A1) Major Components

FRONT VIEW (TOP)/REAR VIEW (BOTTOM)

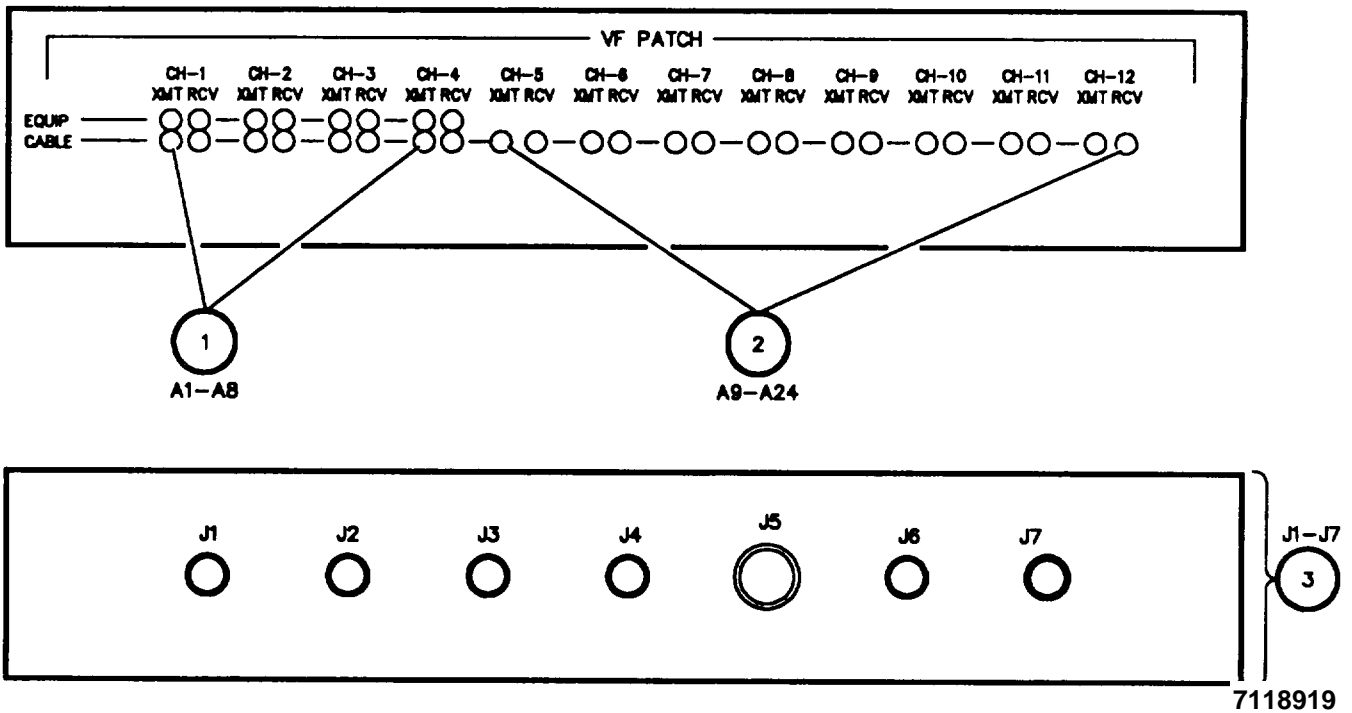


7118918

KEY	NAME	FUNCTION
(1)	DUAL PATCH-TO-CONNECTOR ASSEMBLIES A1, A2	Two identical assemblies that provide patching for workstations WS1 and WS2 and printers 1 and 2. Each includes jack, associated connectors, and wiring.
(2)	SINGLE PATCH-TO-CONNECTOR ASSEMBLIES A3, A4	Two identical assemblies that provide patching for workstations WS3 and WS4 and printers 1 and 2. Each includes jack, associated connectors, and wiring.
(3)	LDF SELECT SWITCH ASSEMBLY A5	Provides front panel switching of LDF signal routing. Includes select switch S1, associated connectors, and wiring.
(4)	CONNECTORS J1-J11 DSVT, and radio set.	Provide connections to LDF, telephone, printers, workstations, Each replaced as part of associated assembly (A1-A5).

1-15.7.6. OPN Shelter Black Patch Panel (4A3A2) Major Components

FRONT VIEW (TOP)/REAR VIEW (BOTTOM)



KEY	NAME	FUNCTION
(1)	DUAL BANTAM-TYPE PATCH JACK ASSEMBLY A1-A8	Four identical assemblies that provide VF patching for four DSVTs.
(2)	SINGLE BANTAM-TYPE PATCH JACK ASSEMBLY A9-A24	Sixteen identical assemblies which provide VF patching for CH-5 to CH-12.
(3)	CONNECTORS J1-J7	Provide connections to LDF, telephone, printers, workstations, DSVTs, and radio set.

1-16. DIFFERENCES BETWEEN MODELS

Refer to TM 11-5895-1392-12 for a description of AN/TYQ-30(V)1 and AN/TYQ-30(V)2 system differences.

NOTE

The AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system, except where noted.

1-17. EQUIPMENT DATA

Refer to TM 11-5895-1392-12 for equipment dimensions, power requirements, and related data.

1-18. EQUIPMENT CONFIGURATION

Central processors AN/TYQ-30(V)1 and AN/TYQ-30(V)2 each have only one operating configuration.

1-19. SAFETY, CARE, AND HANDLING

General safety information is provided on the warning and caution pages at the front of this technical manual. Specific warnings and cautions are included in the procedures of the maintenance chapters where applicable. Become familiar with the general safety precautions before operating this equipment or performing any maintenance procedures. While performing maintenance, observe all specific safety information.

**SECTION III. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT, AND
DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT**

1-20. COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

1-21. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools are listed and illustrated in the Repair Parts and Special Tools List (RPSTL) (TM 11-5894-1392-34P) covering direct support and general support maintenance of the AN/TYQ-30(V)1/2.

Maintenance tools and equipment as authorized by the Maintenance Allocation Chart (MAC) (see TM 11-5895-1392-12, Appendix B) for direct support and general support maintenance are as follows:

- Tool Kit, Electronic Equipment, TK-105/G, NSN 5180-00-610-8177
- Workstation Kit, Electrostatic Control, NSN 4940-01-087-3458
- Digital Multimeter, AN/PSM-45, NSN 6625-01-139-512
- Additional Cable Repair Tools, as listed in MAC Attachment 1.

1-22. REPAIR PARTS

Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 11-5894-1392-34P, covering direct support and general support maintenance for the AN/TYQ-30(V)1/2.

CHAPTER 2

ENVIRONMENTAL CONTROL UNIT

Para		Page
Section I	Principles of Operation	2-1
2-1	Introduction.....	2-1
2-2	Theory of Operation	2-2
Section II	Troubleshooting.....	2-3
2-3	Introduction.....	2-3
2-4	General Instructions	2-3
2-4.1	Introduction.....	2-3
2-4.2	Inspection Procedures.....	2-3
2-4.3	Troubleshooting Procedures	2-3
2-4.4	Maintenance Procedures	2-4
2-5	Equipment Setup.....	2-4
2-6	Symptom Index	2-6
2-7	Troubleshooting Table.....	2-6
Section III	Maintenance Procedures	2-11
2-8	Replace ECU.....	2-11
2-9	Replace ECU Control Module	2-30
2-10	Replace ECU Control Cable Plug	2-40
2-11	Replace ECU Control Cable Receptacle.....	2-43
2-12	Remove/Repair/Install ECU Control Cable Wiring	2-46
2-13	Remove/Install ECU Blanking Plate.....	2-48

SECTION I. PRINCIPLES OF OPERATION

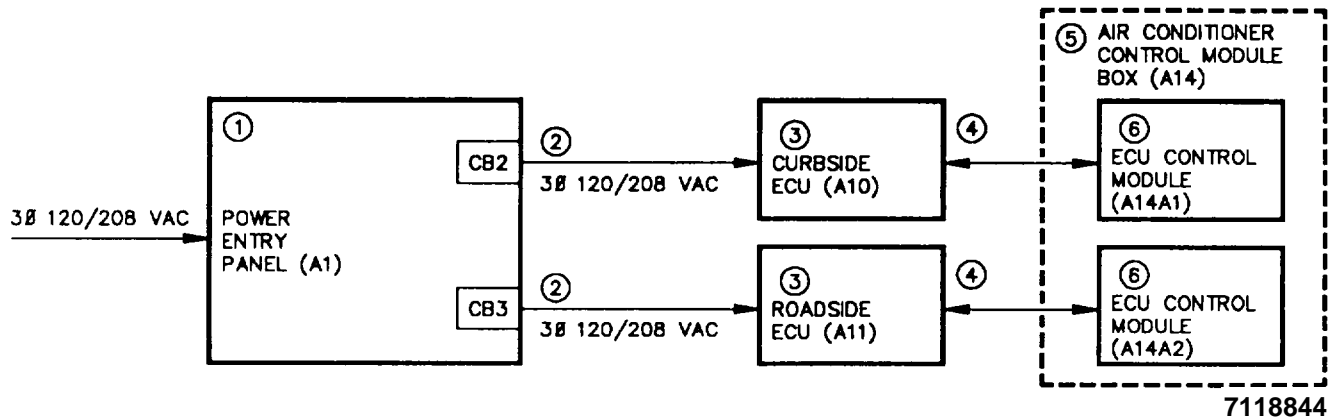
2-1. INTRODUCTION

This section provides the theory of operation for the Environment Control Units (ECUs) of the Communication System, Control Element, Central Processors AN/TYQ-30(V)1/2.

NOTE

The AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ(V)2 system, except where noted.

2-2. THEORY OF OPERATION



- | | |
|---|--|
| (1) POWER ENTRY PANEL (A1)
CIRCUIT BREAKERS | Provides AIR COND circuit breakers CB2 (CURBSIDE) and CB3 (ROADSIDE) to control 3-phase power input to curbside and roadside ECUs. |
| (2) POWER DISTRIBUTION CABLES | Distribute 3-phase ac voltage from Power Entry Panel (PEP) breakers to POWER INPUT connector J1 on ECU. |
| (3) CURBSIDE/ROADSIDE ECUs
(A10/A11) | Two identical ECUs that provide shelter heating and cooling. |
| (4) ECU CONTROL CABLES | Connect ECU to ECU control modules. |
| (5) AIR CONDITIONER CONTROL
MODULE BOX (A14) | Located on inside front wall of shelter; provides mount for ECU control modules. |
| (6) ECU CONTROL MODULES
(A14A1/A14A2) | Contain operating controls for externally mounted air conditioners. |

SECTION II. TROUBLESHOOTING

2-3. INTRODUCTION

This section provides setup, test, fault isolation, and direct support and general support maintenance procedures for the AN/TYQ-30(V)1/2 ECU.

2-4. GENERAL INSTRUCTIONS

2-4.1. Introduction

- a. Troubleshooting and repair should be performed only by experienced technicians who are familiar with the equipment and capable of ensuring that procedures are correctly accomplished.
- b. Maintenance personnel should read all inspection, troubleshooting, and maintenance instructions before attempting to troubleshoot or repair the equipment.

2-4.2. Inspection Procedures

- a. Visually inspect all wiring and all electronic assemblies and their components for obvious damage. Check for open connections, shorts, burning, discoloration, brittle or cracked insulation, or charring. If damage is noted, carefully inspect related components for similar damage to help identify the cause of the damage.
- b. When removed, visually inspect all Circuit Card Assemblies (CCAs) for signs of excess heat, such as charred, burned, discolored, cracked, or broken components. Inspect all printed wire etching on CCAs for apparent breaks, cuts, nicks, or signs of lifting from the card. Inspect CCA connectors for cracked or broken insulation and for missing, loose, bent, or broken pins. Inspect contacts of CCA edge connectors to ensure that they are not broken, scratched, nicked, cut, or dirty. Clean dirty contacts.
- c. Inspect all chassis connectors for broken, scratched, dented, or damaged housings; missing hardware; and missing or damaged connector pins.
- d. Operate each switch to all positions to ensure that it operates freely and smoothly and that all contacts appear to mate when they should. Ensure that all switch detents operate positively and firmly. Inspect knobs for breaks or cracks.

2-4.3. Troubleshooting Procedures

Perform troubleshooting as follows:

- a. Observe reported symptom or repeat failed diagnostic test to verify reported fault.
- b. Using symptom index (table 2-1) and troubleshooting table (table 2-2), perform steps required to isolate fault to a part or assembly and perform first specified corrective action.
- c. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- d. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action.
- e. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- f. Repeat steps d and e until fault is corrected or it becomes necessary to refer unit to next higher level of maintenance.

2-4.4. Maintenance Procedures

- a. The equipment documented in this manual is typical. The equipment you are repairing may contain minor variations (location and number of cable ties, cable markers, lockwashers, etc.) which do not affect the essential procedural steps given.
- b. While performing maintenance procedures, cut and remove cable ties whenever needed. Note and record the number and location of the cable ties removed to aid installation.
- c. Bag and tag hardware (screws, washers, etc.) during removal procedures to aid installation.
- d. Tag connectors and wires during removal procedures to ensure correct reconnection.
- e. If during removal of an assembly it is observed that wires, cables, or connectors attached to that assembly are loose, reinstall or reconnect the loose item and repeat troubleshooting procedure to verify repair.

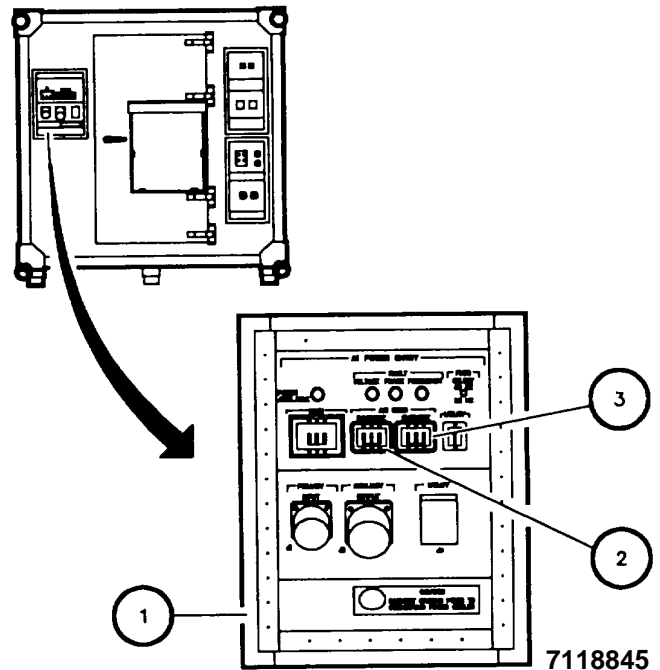
2-5. EQUIPMENT SETUP

- 1. Perform normal system turn-on, excluding turn-on of suspect ECU. Refer to TM 11-5895-1392-12.

WARNING

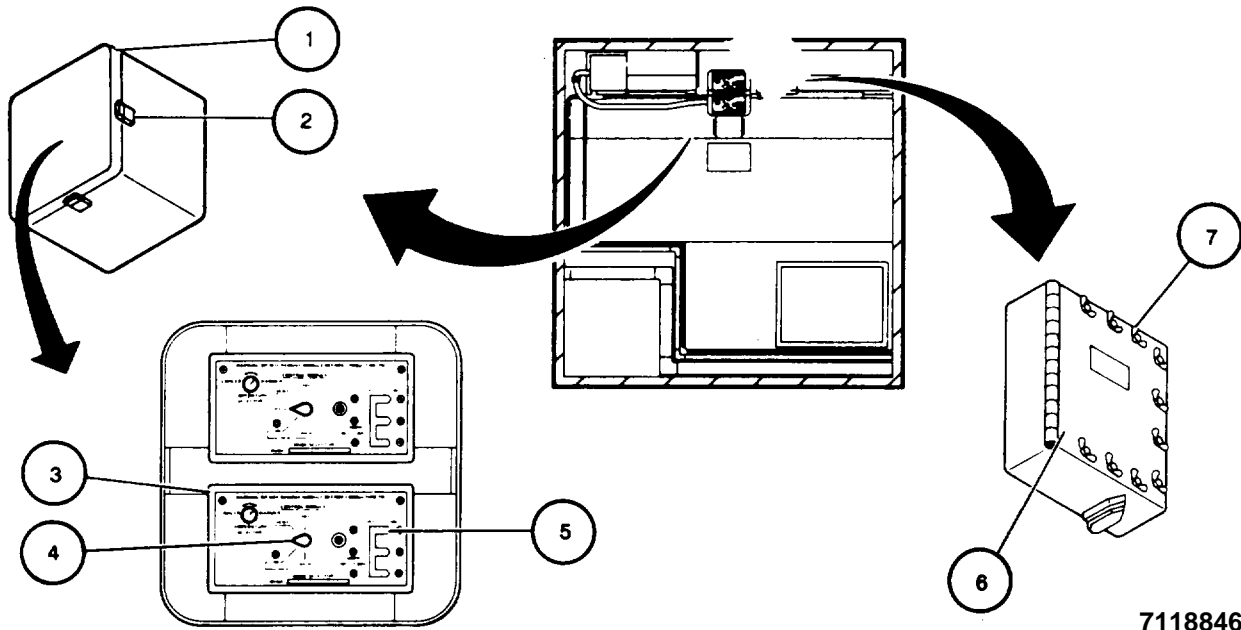
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

- 2. Working at PEP (1), ensure that AIR COND ROADSIDE (2) or AIR COND CURBSIDE (3) circuit breaker, as appropriate, is set to OFE



2-5. EQUIPMENT SETUP - Continued

3. Working at AIR CONDITIONER CONTROL MODULE door (1), unfasten three fasteners (2) and open door.
4. Working at ECU control module (3) for ECU under repair (top control module is curbside), set MODE SELECTOR switch (4) and COMPR CIRCUIT BKR circuit breaker (5) to OFF
5. Working at AIR CONDITIONER FEEDTHRU door (6) for ECU under repair, loosen ten 1/4-turn fasteners (7) and open door.



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2-6. SYMPTOM INDEX

The symptom index for the ECU subsystem is provided in table 2-1. Unless otherwise indicated, all symptoms are for either the ADP or OPN shelter. Simply check the table for the fault condition and go to the referenced troubleshooting procedure in Table 2-2, Environmental Control System Troubleshooting.

Table 2-1. Environmental Control Symptom Index

NUMBER	SYMPTOM	PAGE
1	AIR COND (CURBSIDE/ROADSIDE) breaker on PEP trips.....	2-8
2	ECU motor not operating, no breakers tripped	2-9
3	ECU not cooling properly.....	2-10
4	ECU not heating properly	2-10

2-7. TROUBLESHOOTING TABLE

WARNING

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.**
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed, panels are open, or cables are disconnected to avoid electrical shock.**
- **The shelter must be properly grounded. In addition to being a personnel safety hazard, improper grounding may cause erroneous operation and damage to equipment.**

CAUTION

- **Never place spillable containers on or near the equipment.**
- **To avoid electrical shorts or similar problems, promptly remove any hardware or other foreign matter dropped into the equipment.**

2-7. TROUBLESHOOTING TABLE - Continued

NOTE

- Replacement of an ECU is a difficult and time-consuming task. Perform ECU operator maintenance in accordance with TM 5-4120-384-14 before proceeding with troubleshooting. Note that the troubleshooting provided in this manual directs the technician to test ECU power and control cabling prior to replacement, to avoid ECU replacement, if possible.
- When performing troubleshooting procedures, especially during electrical checks, be alert for intermittent as well as good/bad conditions.
- Be sure that plugs, jacks, cables, and components are completely and positively engaged. When reconnecting these items, guard against bending pins and inverting or offsetting connection of unkeyed connectors.
- Instructions that refer to right, left, front, or rear are given as if viewing the ECU from the control panel, looking toward the rear of the ECU.

Troubleshooting procedures for the environmental control subsystem are provided in table 2-2. The table consists of three columns and is used as follows:

1. MALFUNCTION: Indicates equipment fault as described in symptom index. Look in TEST OR INSPECTION column for required fault isolation steps.
2. TEST OR INSPECTION: Indicates step(s) to be taken to isolate fault to a specific part or assembly. If equipment passes a test or inspection step, go to next step. If equipment fails a test or inspection, look in CORRECTIVE ACTION column for repair steps.
3. CORRECTIVE ACTION: Indicates authorized adjustment or repair for an isolated fault. When action is completed, repeat action or diagnostic test that initially identified fault to confirm repair. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action. If all steps are completed and fault persists, refer equipment to next higher level of maintenance.

2-7. TROUBLESHOOTING TABLE - Continued

Table 2-2. Environmental Control System Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. AIR COND (CURBSIDE/ROADSIDE) BREAKER ON PEP TRIPS		<p style="text-align: center;"><u>WARNING</u></p> <p>HIGH VOLTAGES ARE PRESENT IN EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed, panels are open, or cables are disconnected to avoid electrical shock.</p> <p>Step 1. Perform equipment setup for ECU under repair (roadside or curbside, as required) (para 2-5). Working through appropriate AIR CONDITIONER FEEDTHRU, disconnect power cable from ECU. Set the following switches/breakers for ECU under repair:</p> <ul style="list-style-type: none"> <li>• AIR CONDITIONER CONTROL MODULE COMPR CIRCUIT BKR - ON <li>• AIR CONDITIONER CONTROL MODULE MODE SELECTOR - COOL <li>• PEP AIR COND (ROADSIDE or CURBSIDE) - ON <p>a. If AC COND breaker trips, go to step 2.</p> <p>b. If AC COND breaker does not trip, proceed to step 3.</p> <p>Step 2. Check ECU power cable connector for opens, shorts, corrosion, or any other damage.</p> <p>a. Replace ECU power cable connector (para 8-45).</p> <p>b. Troubleshoot power distribution system. Refer to power distribution system troubleshooting in chapter 8.</p> <p>Step 3. Remove ECU control module for ECU under repair (roadside or curbside, as required) (para 2-9). Working through appropriate AIR CONDITIONER FEEDTHRU, disconnect ECU control cable from ECU. Using ECU control cable diagram as a guide (volume 2), check for damage to plug, receptacle, or cable.</p> <ul style="list-style-type: none"> <li>a. Replace faulty ECU control cable plug (para 2-10). <li>b. Replace faulty ECU control cable receptacle (para 2-11). <li>c. Remove/repair/install faulty ECU control cable wiring (para 2-12).

2-7. TROUBLESHOOTING TABLE - Continued

Table 2-2. Environmental Control System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. AIR COND (CURBSIDE/ROADSIDE) BREAKER ON PEP TRIPS - Continued	Step 4. Troubleshoot ECU. Refer to TM 5-4120-384-14.	Replace faulty ECU (para 2-8).
2. ECU MOTOR NOT OPERATING, NO BREAKERS TRIPPED	<u>WARNING</u>	
HIGH VOLTAGES ARE PRESENT IN EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed, panels are open, or cables are disconnected to avoid electrical shock.		
Step 1. Perform equipment setup for ECU under repair (roadside or curbside, as required) (para 2-5). Working through appropriate AIR CONDITIONER FEEDTHRU, disconnect ECU power cable P1 from ECU.	<ul style="list-style-type: none"> • Working at ECU control module, set COMPR CIRCUIT BKR to ON. • Working at PEP, set AIR COND (ROADSIDE or CURBSIDE) circuit breaker to ON. • Using a multimeter, check for the presence of 202 to 220 Vac between P1-A to P1-B, P1-A to P1-C, and P1-B to P1-C. <ul style="list-style-type: none"> a. If correct voltages not present, go to step 2. b. If correct voltages present, go to step 3. 	
Step 2. Check ECU power cable connector for opens, shorts, corrosion, or any other damage.	<ul style="list-style-type: none"> a. Replace ECU power cable connector (para 8-45). b. Troubleshoot power distribution system. Refer to power distribution system troubleshooting in chapter 8. 	
Step 3. Remove ECU control module for ECU under repair (roadside or curbside, as required) (para 2-9). Working through appropriate AIR CONDITIONER FEEDTHRU, disconnect ECU control from ECU. Using ECU control cable diagram as a guide (volume 2), check for damage to plug, receptacle, or cable.		

2-7. TROUBLESHOOTING TABLE - Continued

Table 2-2. Environmental Control System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. ECU MOTOR NOT OPERATING, NO BREAKERS TRIPPED - Continued	Step 3. (Continued)	<ul style="list-style-type: none"> a. Replace faulty ECU control cable plug (para 2-10). b. Replace faulty ECU control cable receptacle (para 2-11). c. Remove/repair/install faulty ECU control cable wiring (para 2-12).
	Step 4. Troubleshoot ECU. Refer to TM 5-4120-384-14.	Replace faulty ECU (para 2-8).
3. ECU NOT COOLING PROPERLY		<u>WARNING</u>
		HIGH VOLTAGES ARE PRESENT IN EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed, panels are open, or cables are disconnected to avoid electrical shock.
	Step 1. Remove ECU control module for ECU under repair (roadside or curbside, as required) (para 2-9). Working through appropriate AIR CONDITIONER FEEDTHRU, disconnect ECU control from ECU. Using ECU control cable diagram as a guide (volume 2), check for damage to plug, receptacle, or cable.	<ul style="list-style-type: none"> a. Replace faulty ECU control cable plug (para 2-10). b. Replace faulty ECU control cable receptacle (para 2-11). c. Remove/repair/install faulty ECU control cable wiring (para 2-12).
	Step 2. Troubleshoot ECU. Refer to TM 5-4120-384-14.	Replace faulty ECU (para 2-8).
4. ECU NOT HEATING PROPERLY		Perform troubleshooting procedure for Malfunction 3, ECU Not Cooling Properly.

SECTION III. MAINTENANCE PROCEDURES

2-8. REPLACE ECU

This task cover:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precaution:**WARNING**

Each ECU weighs approximately 270 pounds. Use four persons or mechanical lifting device to lift or move ECU. Mechanical lifting device is recommended.

NOTE

Replace curbside and roadside ECUs the same way, except where noted. Curbside ECU is shown.

Materials/Part: Silicon sealant; ECU closeout panel (optional).

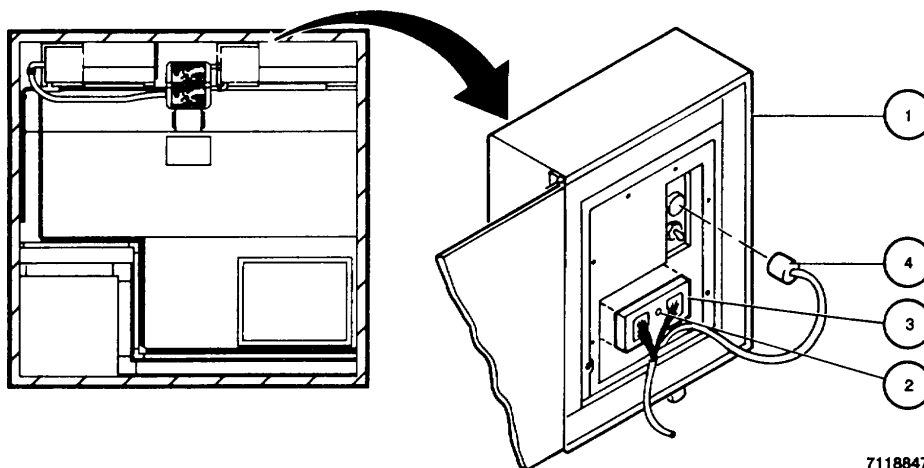
Equipment Conditions: PEP AIR COND ROADSIDE or CURBSIDE circuit breaker set to OFF, as applicable.

Preliminary Procedures:

1. If working on curbside ECU, remove antenna and antenna matching unit (refer to TM 11-5895-1392-12).
2. Remove roadside or curbside ECU control module (para 2-9), as applicable.

REMOVAL

1. Working inside shelter AIR CONDITIONER FEEDTHRU box (1), loosen captive screw (2) and disconnect ECU control cable (3) and ECU power cable (4) from ECU.

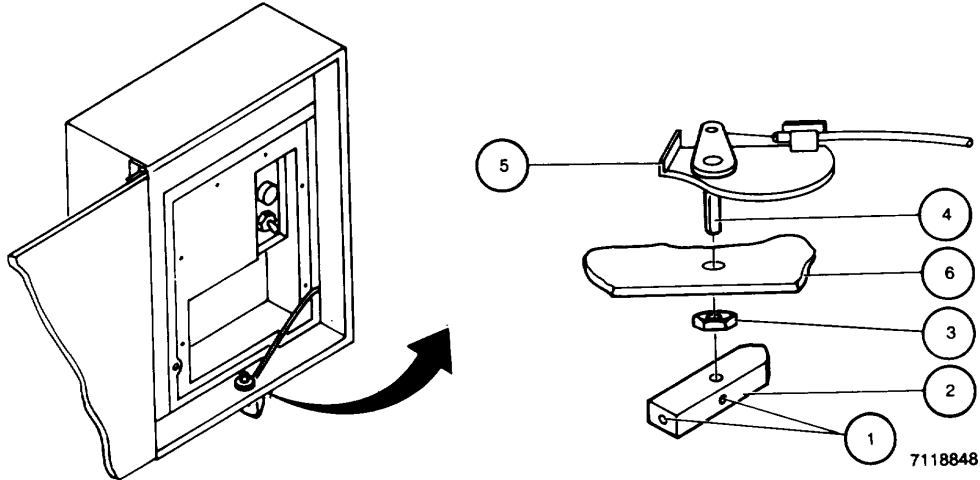


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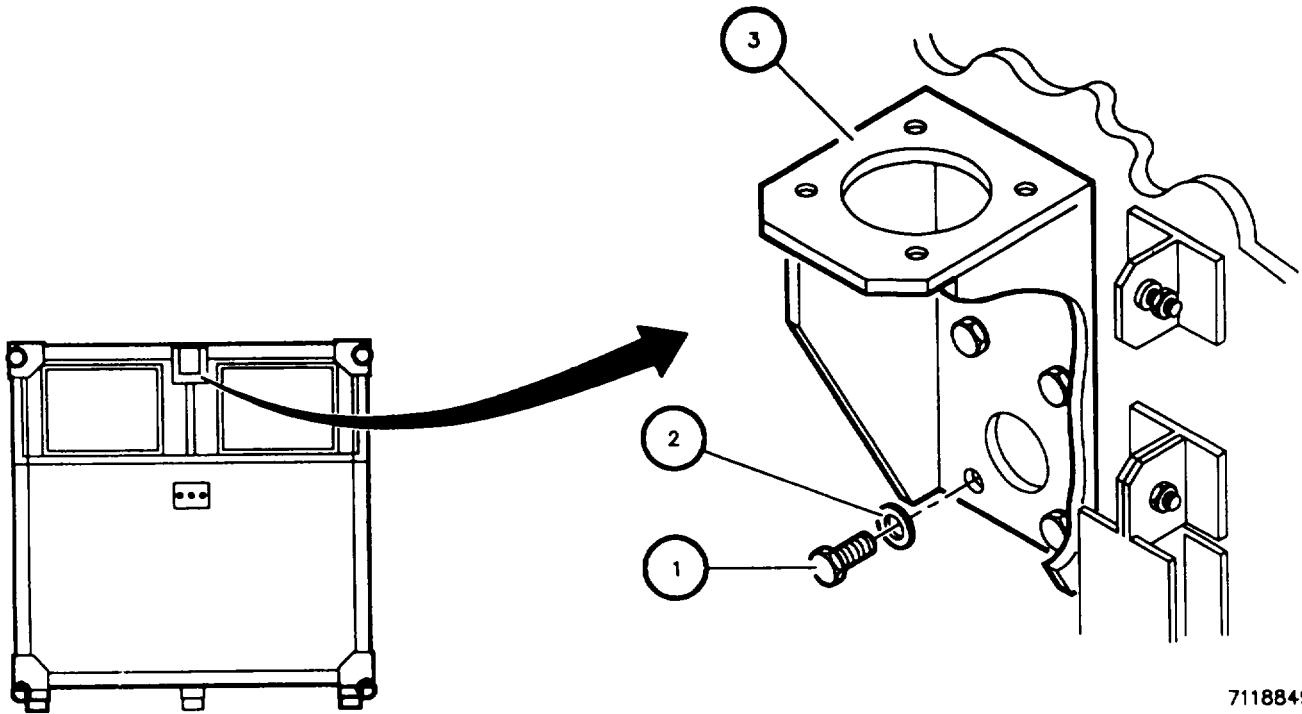
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2-8. REPLACE ECU - Continued

2. Loosen two setscrews (1).
3. Remove knob (2) and nut (3) from shaft (4).
4. Pull damper cable assembly (5) upward and remove from AIR CONDITIONER FEEDTHRU box (6).



5. If working on curbside ECU, working outside shelter between curbside and roadside ECUs, remove four bolts (1) and washers (2).
6. Remove antenna mount (3).



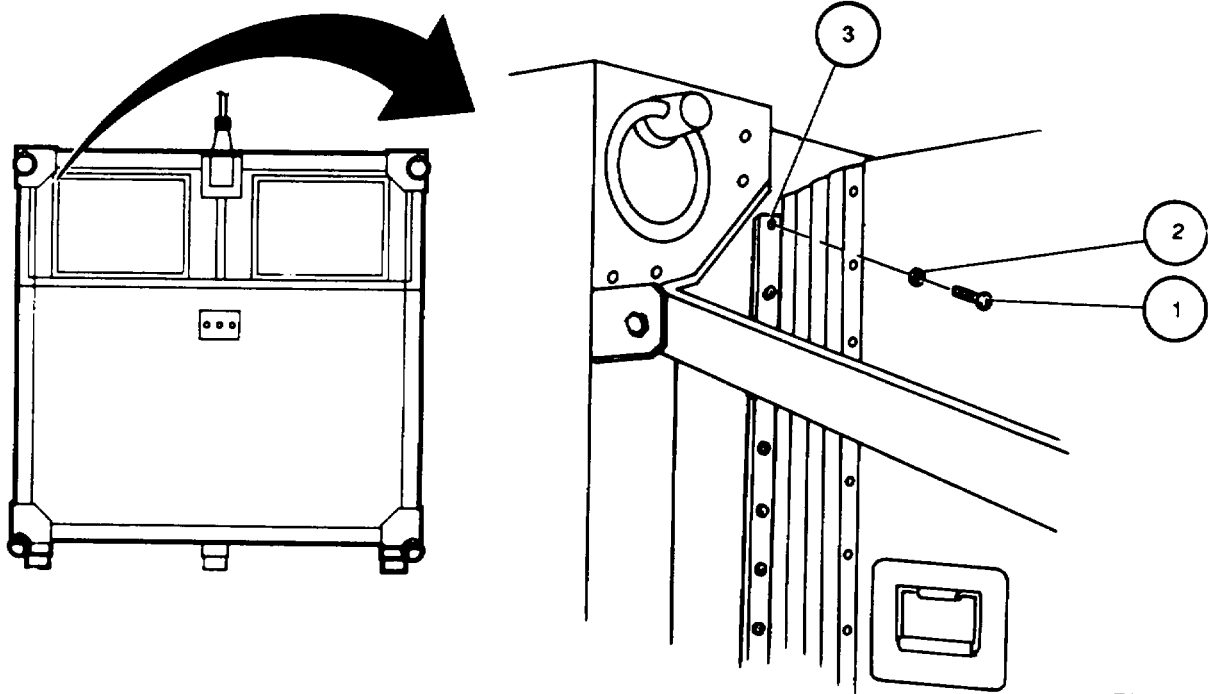
2-8. REPLACE ECU - Continued

7. Remove 42 screws (1) and washers (2) from bellows frame (3) at shelter wall.

CAUTION

Carefully separate bellows frame from shelter to avoid damaging sponge-type weather seal between frame and shelter.

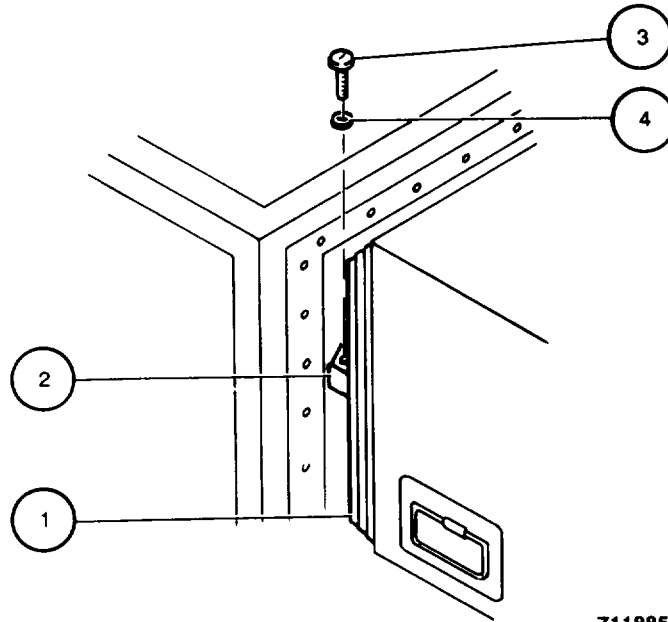
8. Carefully separate bellows frame (3) from shelter wall.



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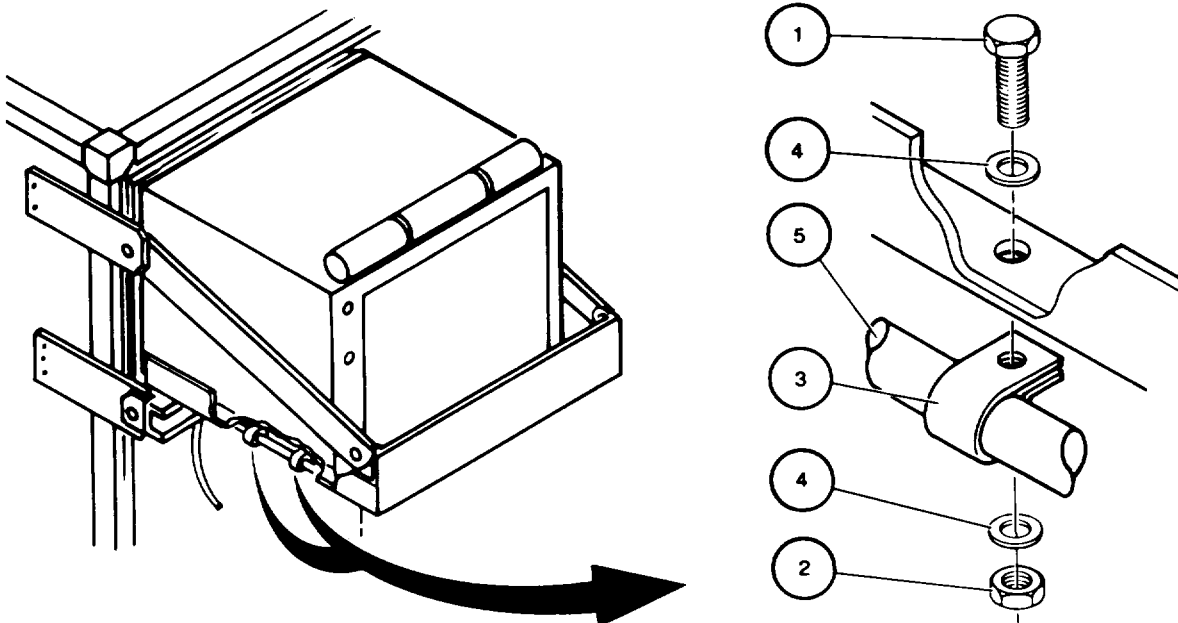
2-8. REPLACE ECU - Continued

9. Working between shelter wall and ECU, position bellows frame (1) to access bellows (2) center connection to shelter wall.
10. Remove nine screws (3) and washers (4) from bellows (2), freeing bellows from shelter wall.



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11. Working under ECU, remove two bolts (1), nuts (2), hose clamps (3), and four washers (4) from drain hose (5).



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2-8. REPLACE ECU - Continued

12. Working under ECU, remove four bolts (1), outer washers (2), large inner washers (3), metal tube spacers (4), plastic tube spacers (5), and eight rubber mounts (6).

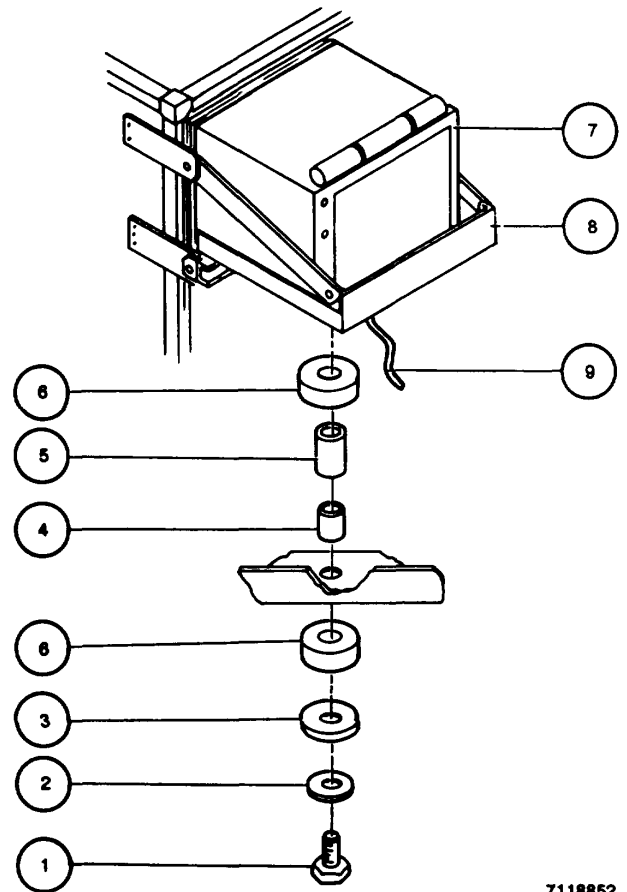
WARNING

Each ECU weighs approximately 270 pounds. Use four persons or mechanical lifting device to lift or move ECU. Mechanical lifting device is recommended.

13. Carefully remove ECU (7) from ECU mounting frame (8), routing drain hose (9) from mounting frame.

NOTE

If replacement ECU is not available for installation, install ECU blanking plate (para 2-13).



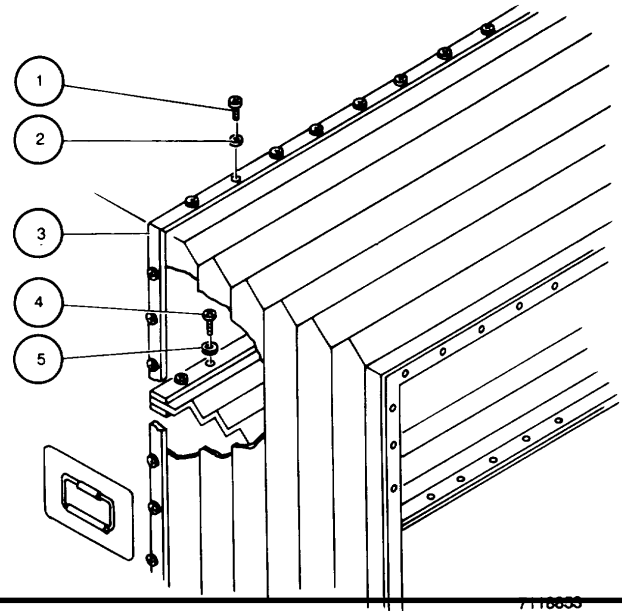
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2-8. REPLACE ECU - Continued

NOTE

- Steps 14 through 37 cover removal of ECU/shelter adapters. If adapter removal is not required, end removal procedure now.
- Retain parts removed for installation on replacement ECU, unless instructed otherwise.

14. Working on replaced ECU, remove 38 screws (1) and washers (2) at outer edge of bellows (3).
15. Remove 11 screws (4) and washers (5); remove bellows (3).

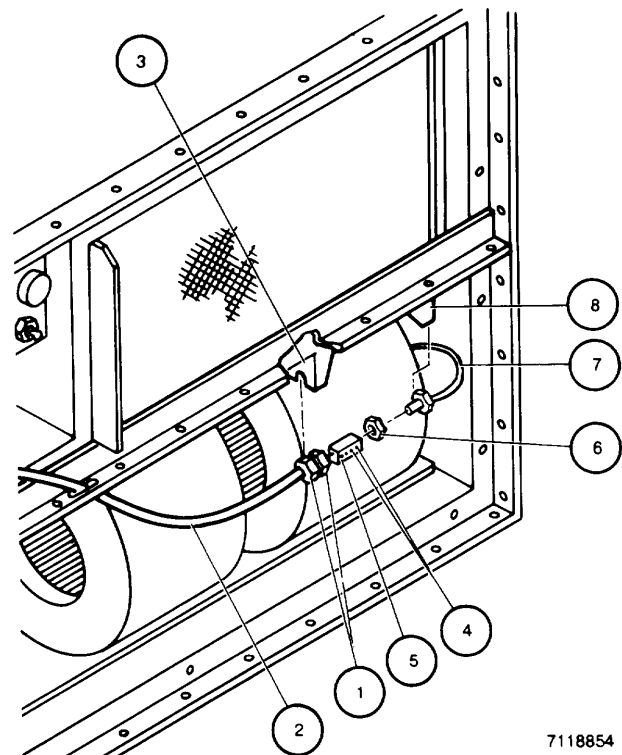


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NOTE

Damper extension cable is connected to damper control cable so that ECU damper can be operated from inside the shelter.

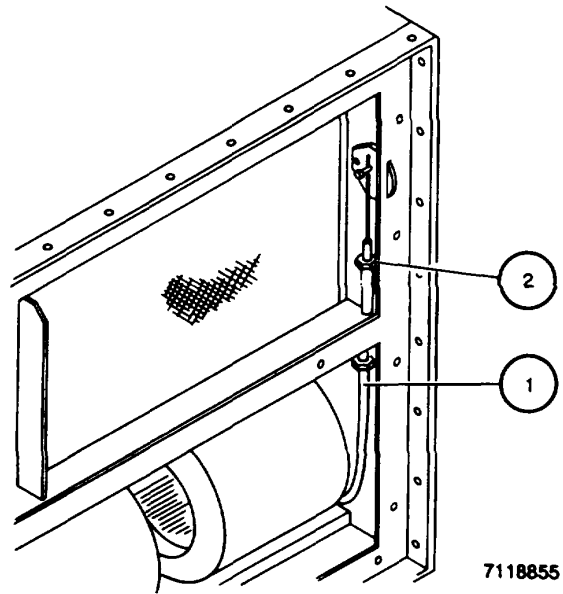
16. Loosen two nuts (1) and slide damper extension cable (2) from left bracket (3).
17. Loosen two setscrews (4) on right half of block clamp (5) and remove damper extension cable (2), with block clamp attached, from left bracket (3).
18. Remove outer nut (6) and remove damper control cable (7) from right bracket (8).



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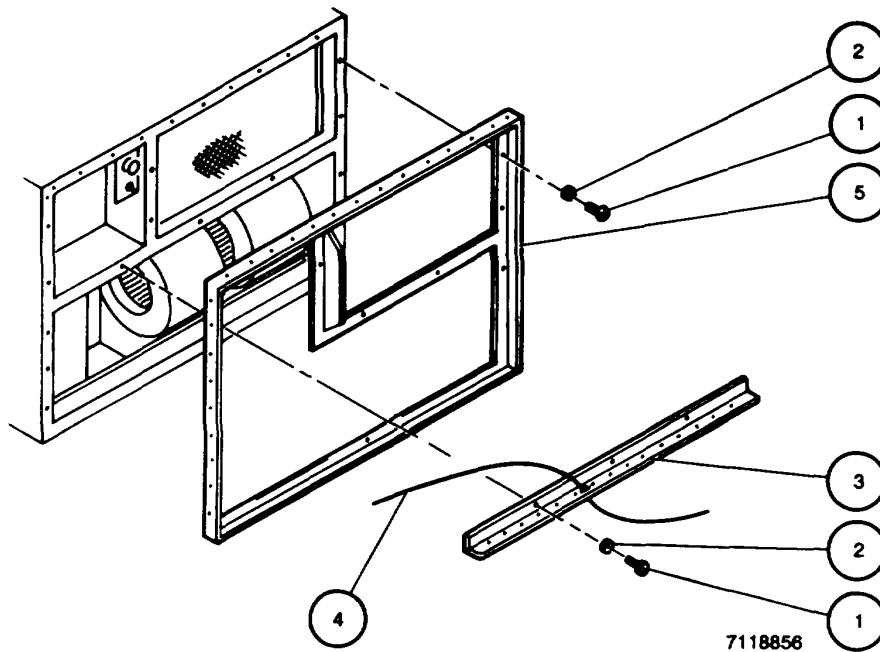
2-8. REPLACE ECU - Continued

19. Insert damper control cable (1) through hole in chassis and reinstall outer nut (2).



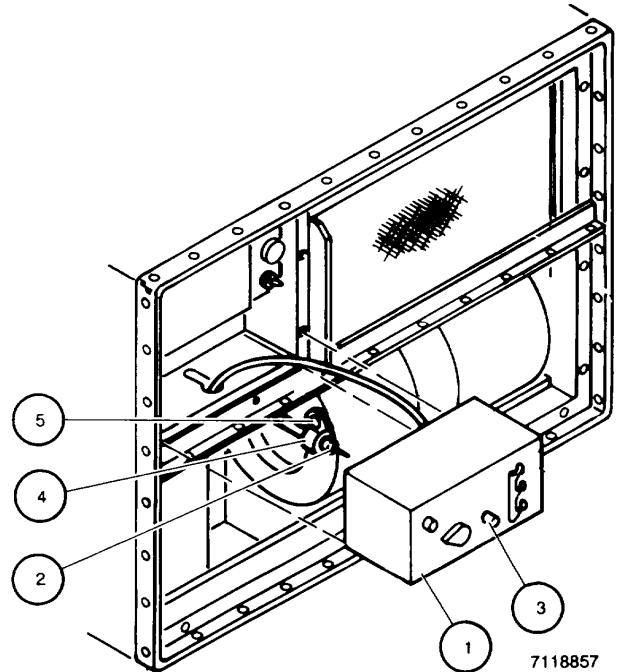
20. Remove 20 screws (1) and washers (2).

21. Remove angle bracket (3) (with damper extension cable (4) attached) and bellows mounting frame (5).

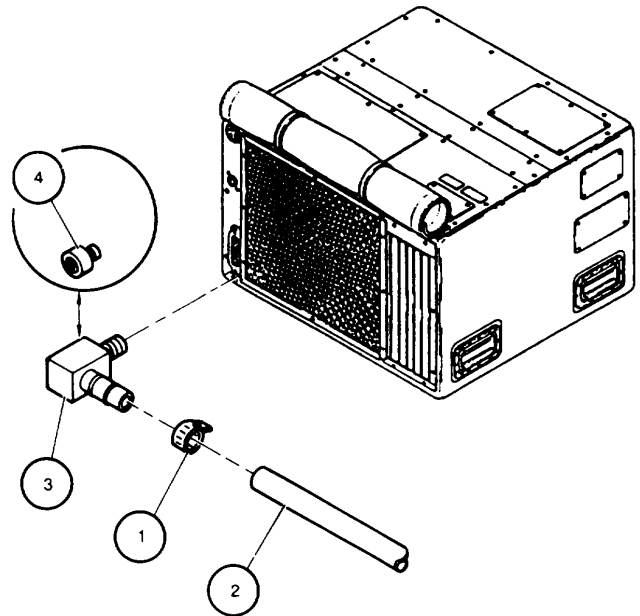


2-8. REPLACE ECU - Continued

22. Place ECU control module (1), removed in preliminary procedure, in installed position, carefully routing sensing bulb (2) through chassis into ECU.
23. Tighten captive screw (3).
24. Position sensing bulb (2) into two clamps (4) and tighten two screws (5)

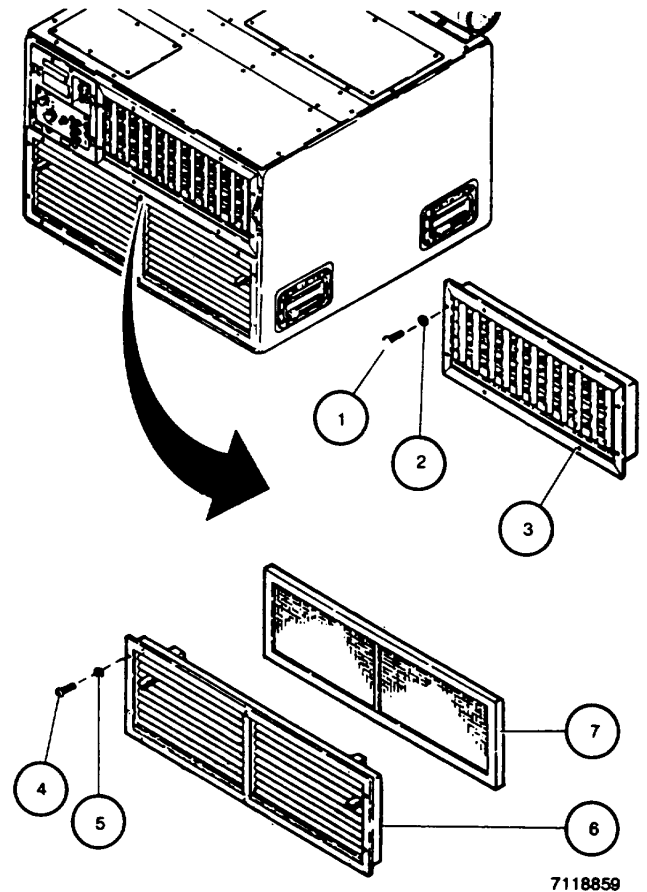


25. Working at left rear bottom corner of replaced ECU, remove clamp (1) and drain hose (2).
26. Remove elbow (3).
27. Remove drain plug (4) from replacement ECU and install it in replaced ECU.



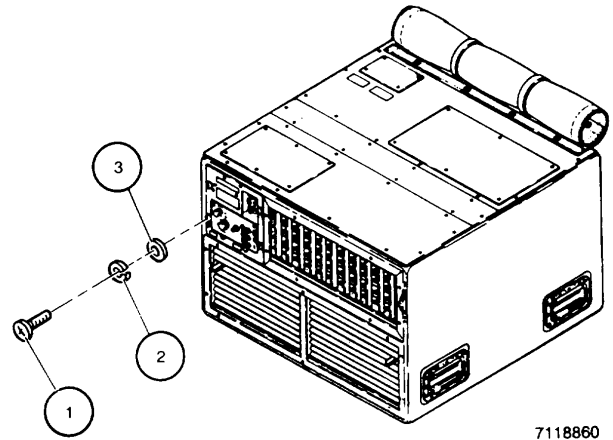
2-8. REPLACE ECU Continued

28. Working at replacement ECU front panel, remove eight screws (1) and lockwashers (2).
29. Remove supply air louver (3).
30. Remove eight screws (4) and lockwashers (5).
31. Remove return air louver (6) and filter (7).
32. Working on replaced ECU, place and hold return air louver (6) and filter (7) in installed position.
33. Install eight screws (4) and lockwashers (5).
34. Place and hold supply air louver (3) in installed position.
35. Install eight screws (1) and lockwashers (2).



2-8. REPLACE ECU - Continued

36. Working at replacement ECU, remove ground screw (1) lockwasher (2) and washer (3).
37. Working at ECU being replaced, install ground screw (1) lockwasher (2) and washer (3).

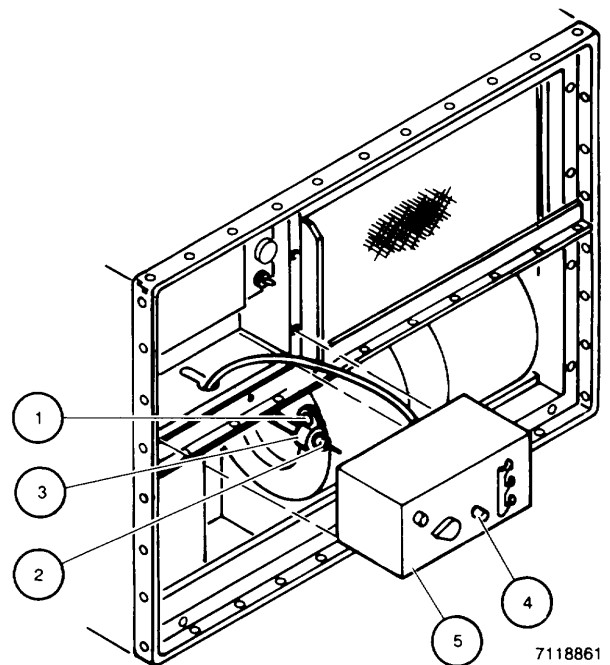


INSTALLATION

NOTE

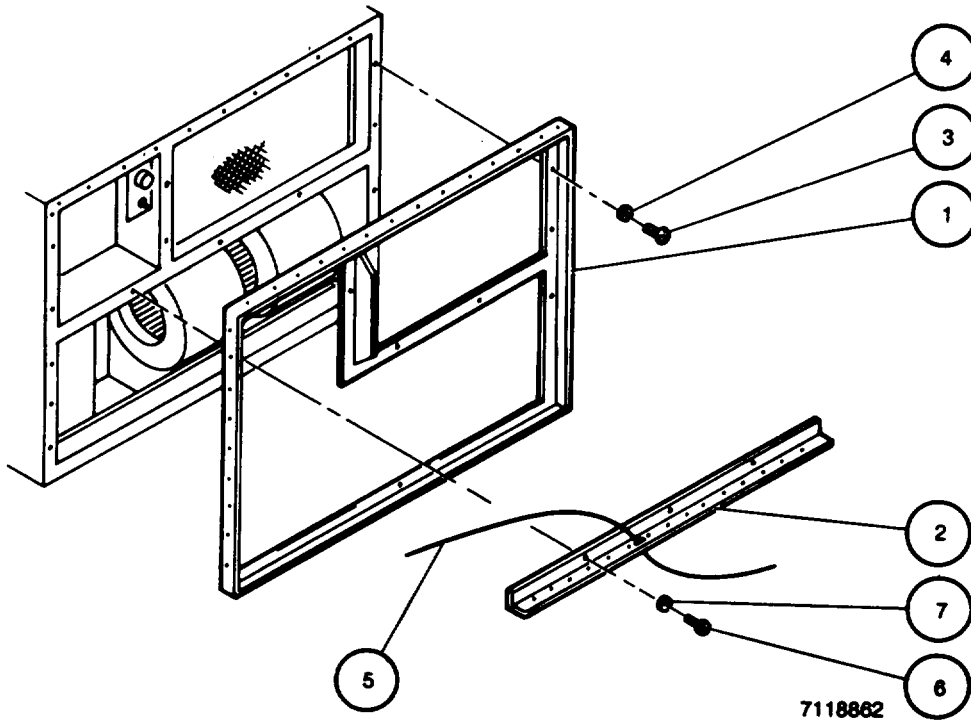
Steps 1 through 31 cover installation of ECU/shelter adapters. If adapters are already installed, go to step 32.

1. Working on replacement ECU, loosen two screws (1) and slip sensing bulb (2) from two clamps (3).
2. Loosen captive screw (4).
3. Carefully pull control module (5) from ECU, routing sensing bulb (2) through chassis and out of ECU.



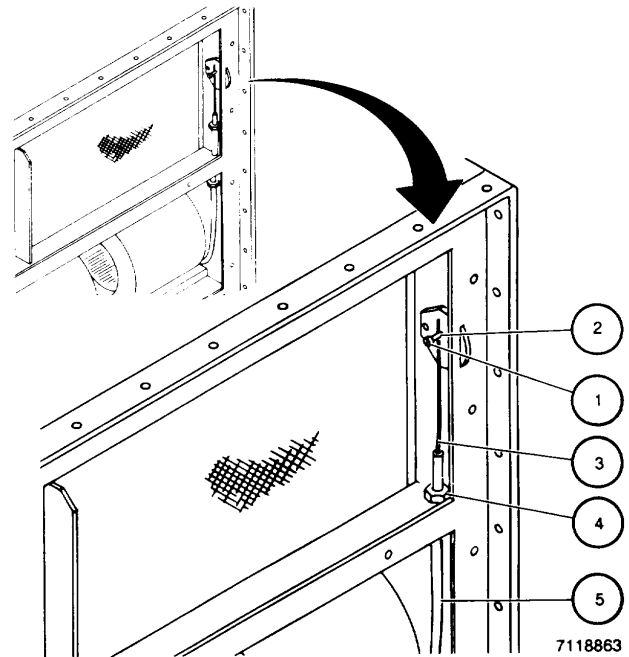
2-8. REPLACE ECU - Continued

4. Apply thin bead of silicon sealant on bellows mounting frame (1) and angle bracket (2) surfaces that will mate with ECU.
5. Place and hold bellows mounting frame (1) in installed position.
6. Install 10 screws (3) and lockwashers (4).
7. Place and hold angle bracket (2) (with damper extension cable (5) attached) in installed position.
8. Install three screws (6) and washers (7).

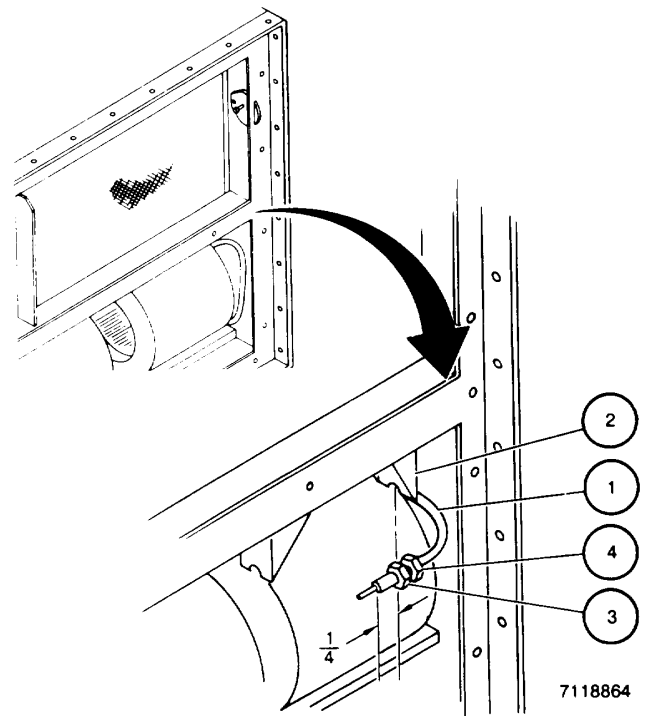


2-8. REPLACE ECU - Continued

9. Loosen screw (1) in blind rivet nut (2).
10. Remove control wire (3) from blind rivet nut (2); retighten screw (1).
11. Remove nut (4) securing damper control cable (5) to chassis.
12. Remove damper control cable (5) from hole in chassis.

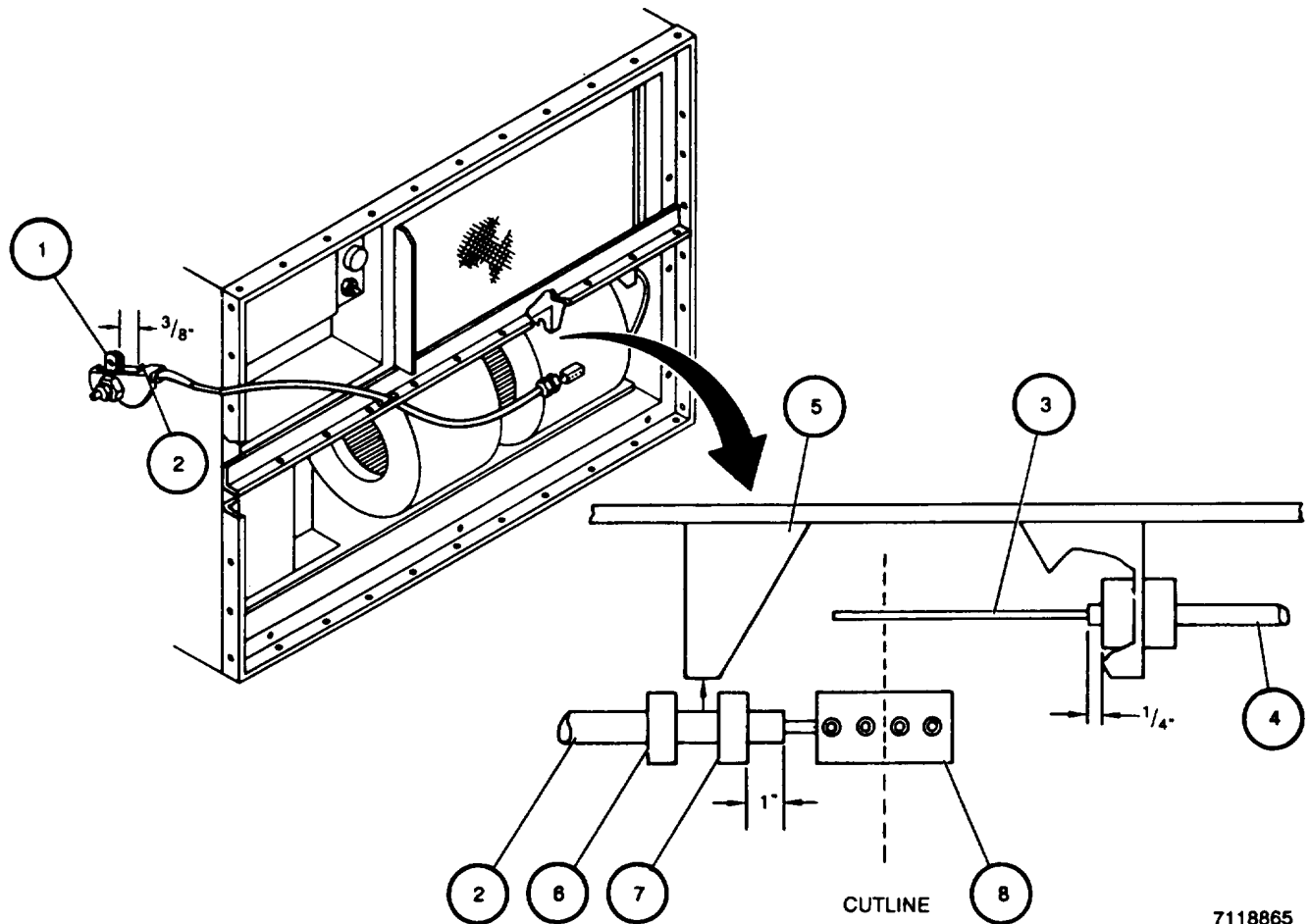


13. Install damper control cable (1) in right bracket (2) and reinstall nut (3) on cable end.
14. Adjust two nuts (3, 4) so that outer edge of left nut (3) is 1/4 inch from damper control cable (1) end. Tighten two nuts (3, 4) to secure damper control cable (1) to right bracket (2).



2-8. REPLACE ECU - Continued

15. Position control lever (1) on damper extension cable (2) 3/8 inch from cable end (as shown).
16. Push control wire (3) fully into damper control cable (4); ensure that damper is fully open.
17. Aline damper extension cable (2) at left bracket (5) (do not install until damper control cable has been cut) so that one nut (6) is left and the other nut (7) is right of bracket.
18. Adjust right nut (7) so that its right edge is approximately 1 inch from damper extension cable (2) end.
19. Cut control wire (3) in damper control cable (4), as required, so that when cut, control wire will seat fully into block clamp (8), ensuring that requirements of steps 15 and 16 are maintained.



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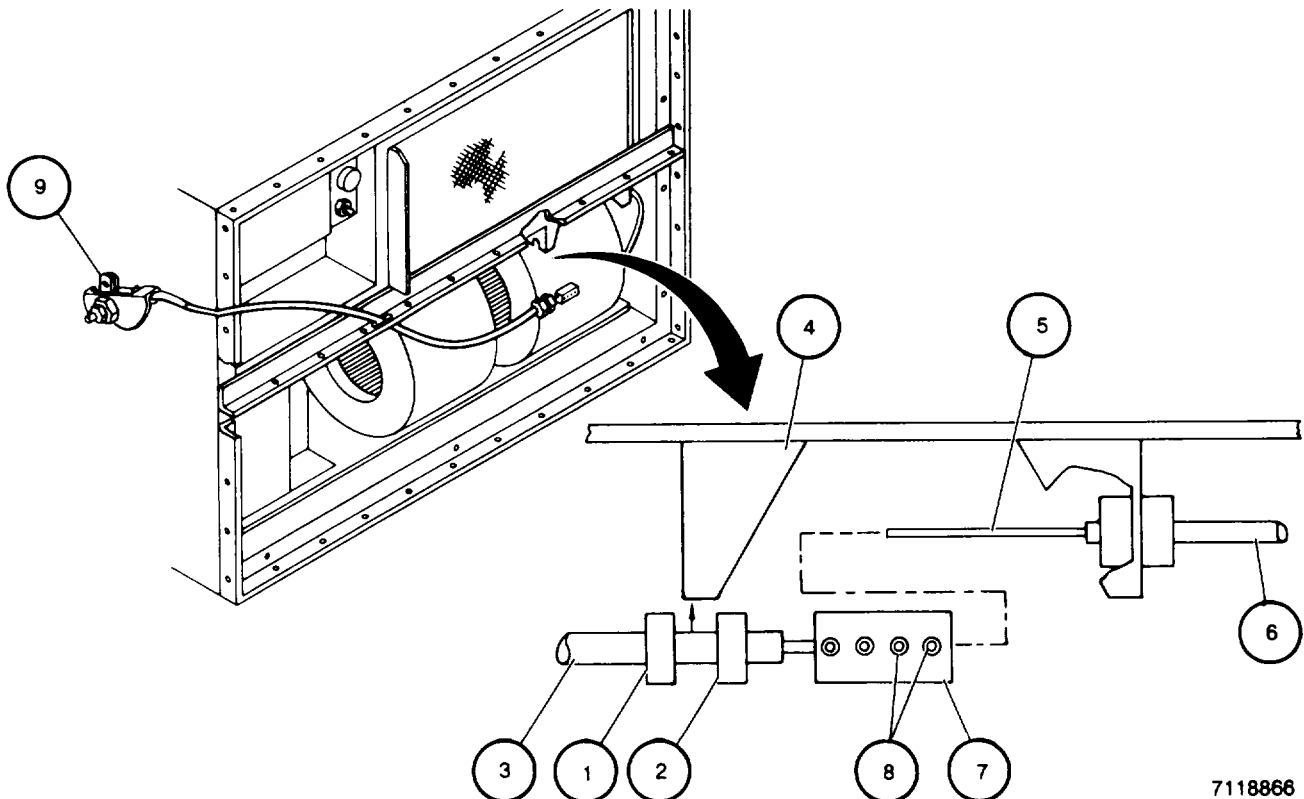
2-8. REPLACE ECU - Continued

20. Adjust nuts (1, 2), as required, and install damper extension cable (3) into left bracket (4) and control wire (5) in damper control cable (6) into block clamp (7).

CAUTION

Do not overtighten setscrews in block clamp. Setscrews can be easy stripped.

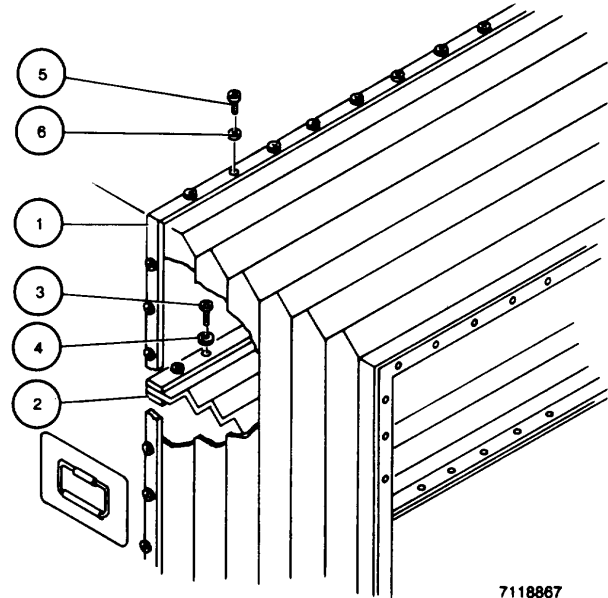
21. Tighten two setscrews (8) on right half of block clamp (7), until resistance is met.
22. Tighten nuts (1, 2).
23. Check that damper opens when control lever (9) is pulled outward and closes when control lever is pushed inward. Repeat, as required, to ensure that operation is correct and that block clamp (7) securely holds control wire (5).
- a. If operation is correct, go to step 26.
 - b. If operation is not correct, go to next step.
24. Loosen two setscrews (8) and reinstall control wire (5) into block clamp (7).
25. Tighten two setscrews (8) slightly tighter than done in step 21. Go to step 23.



7118866

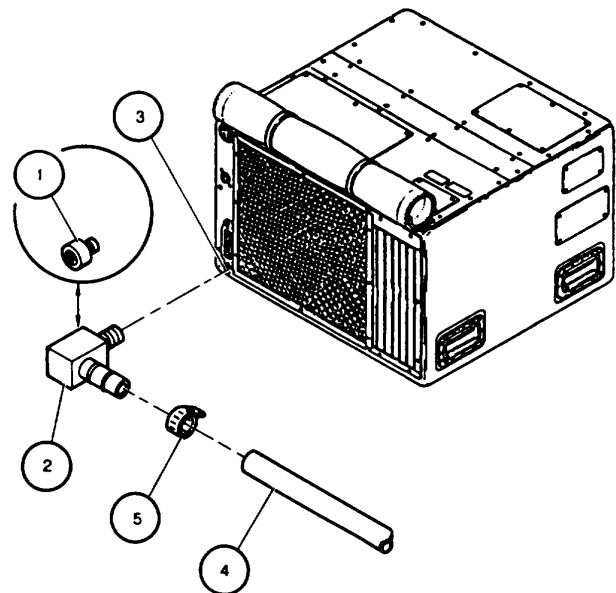
2-8. REPLACE ECU - Continued

26. Place and hold bellows (1) in installed position.
27. Working inside bellows (1) at angle bracket (2), install 11 screws (3) and washers (4).
28. Working around outer edge of bellows (1), install 38 screws (5) and washers (6).



7118867

29. Working at left rear bottom corner of ECU, remove and retain drain plug (1), as required.
30. Install elbow (2) in drain plug hole (3), with elbow positioned toward right.
31. Install hose (4) on elbow (2) using hose clamp (5).



7118868

2-8. REPLACE ECU - Continued

WARNING

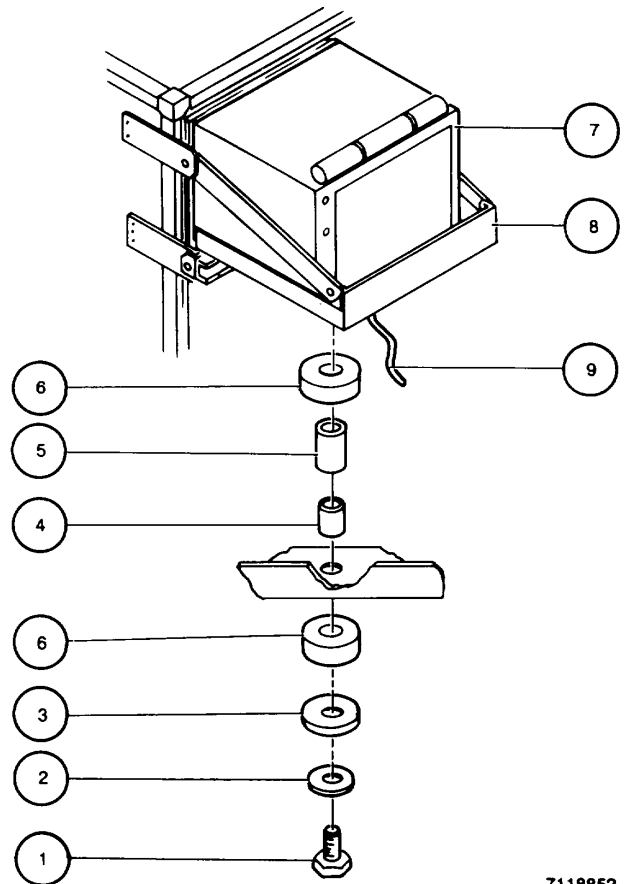
Each ECU weighs approximately 270 pounds. Use four persons or mechanical lifting device to lift or move ECU. Mechanical lifting device is recommended.

32. Position and hold ECU (7) approximately 1 inch above ECU mounting frame (8), routing drain hose (9) into installed position.
33. Place rubber mount (6) between ECU (7) and ECU mounting frame (8).

CAUTION

Ensure each bolt is started fingertight, and that ECU does not move excessively from side to side or ECU internal mounting nutplates will be damaged.

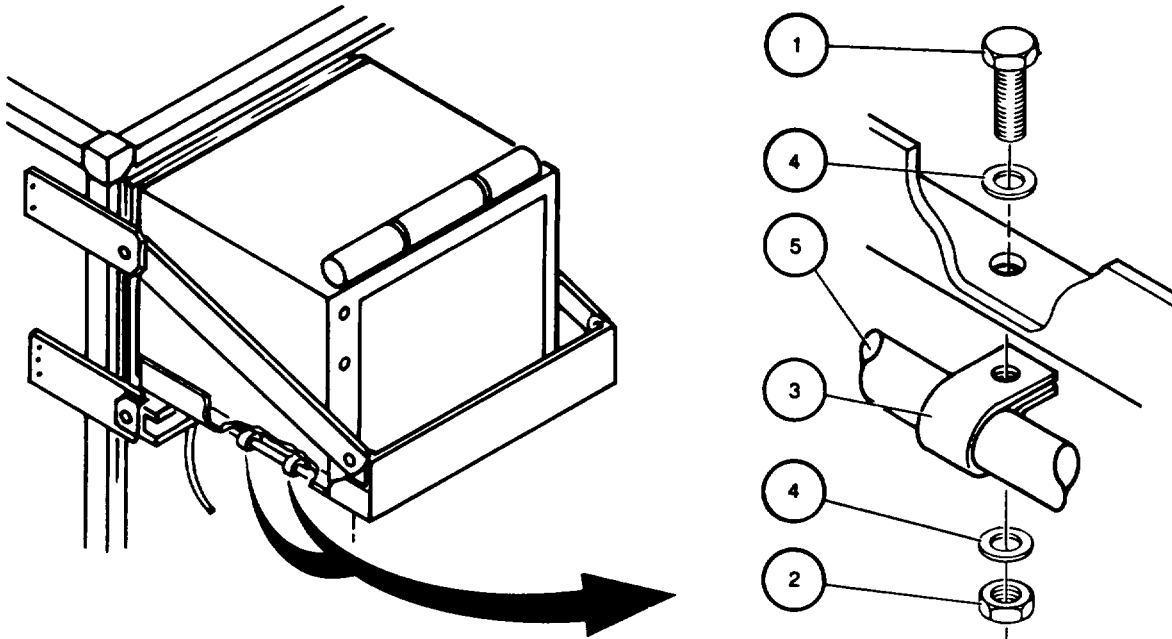
34. Moving ECU, as required, finger start bolt (1) with outer washer (2), large inner washer (3), rubber mount (6), metal tube spacer (4), and plastic tube spacer (5).
35. Repeat steps 33 and 34 for remaining ECU mounting bolts.
36. Carefully lower ECU (7) onto ECU mounting frame (8).
37. Tighten four bolts (1).



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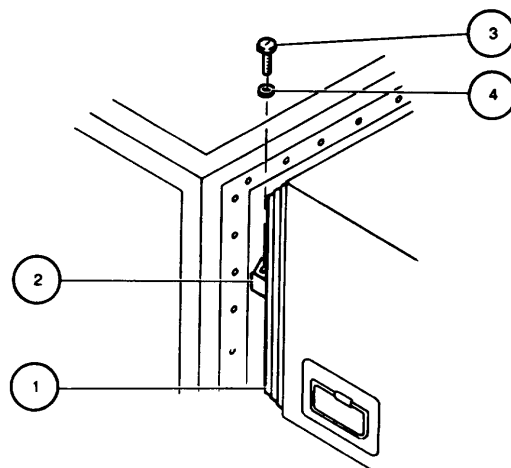
2-8. REPLACE ECU - Continued

38. Working under ECU, position two cable clamps (3) on drain hose (5).
39. Place and hold drain hose (5) in installed position.
40. Install two bolts (1), nuts (2), and four washers (4) to secure two clamps (3) to ECU frame.



71181236

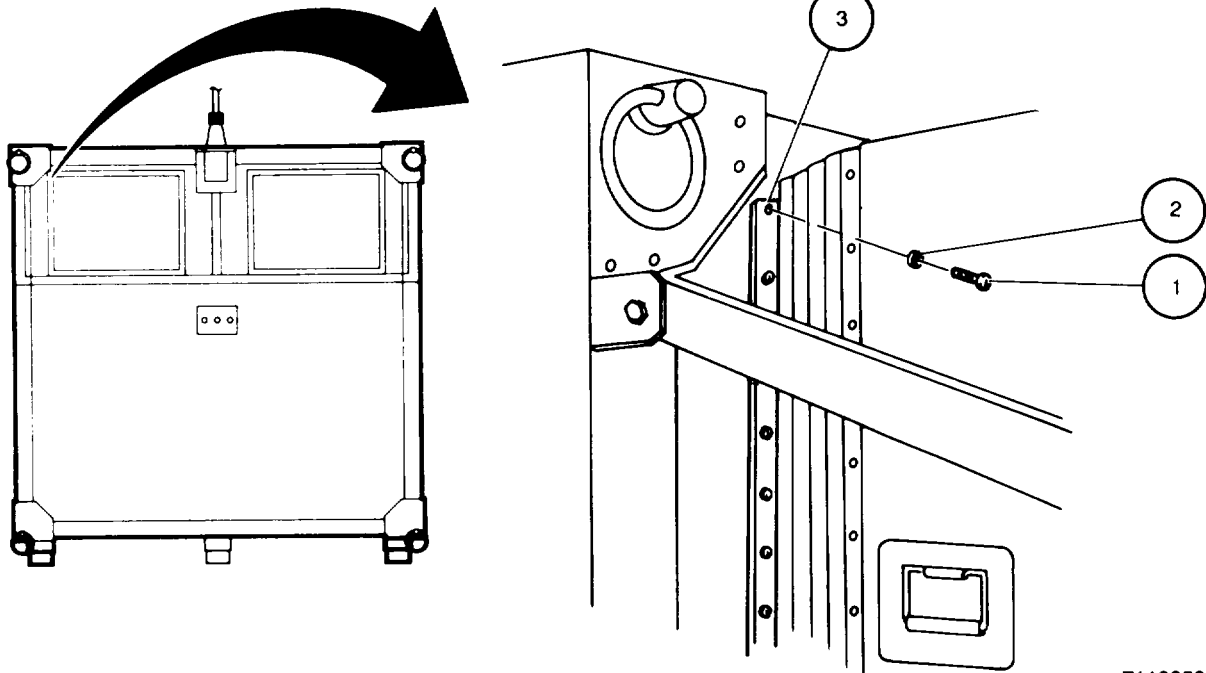
41. Position bellows frame (1) to access inside bellows (2).
42. Install nine screws (3) and washers (4) to secure bellows (2) to shelter.



7118851

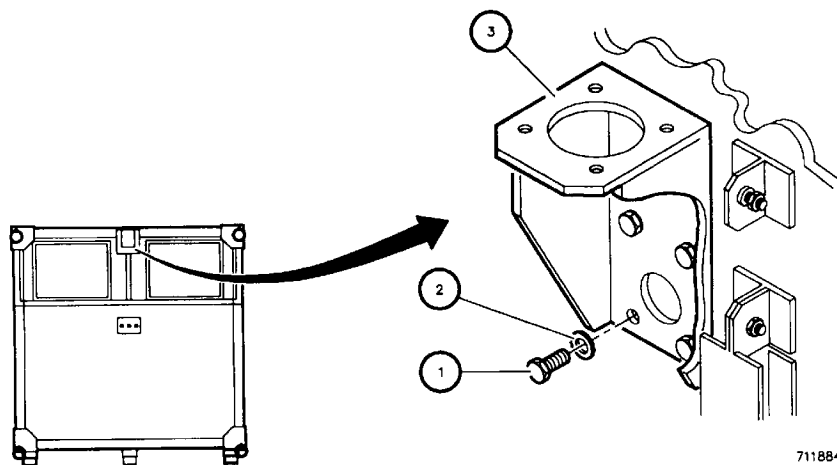
2-8. REPLACE ECU - Continued

43. Place bellows frame (3) in installed position.
44. Install 42 screws (1) and washers (2).



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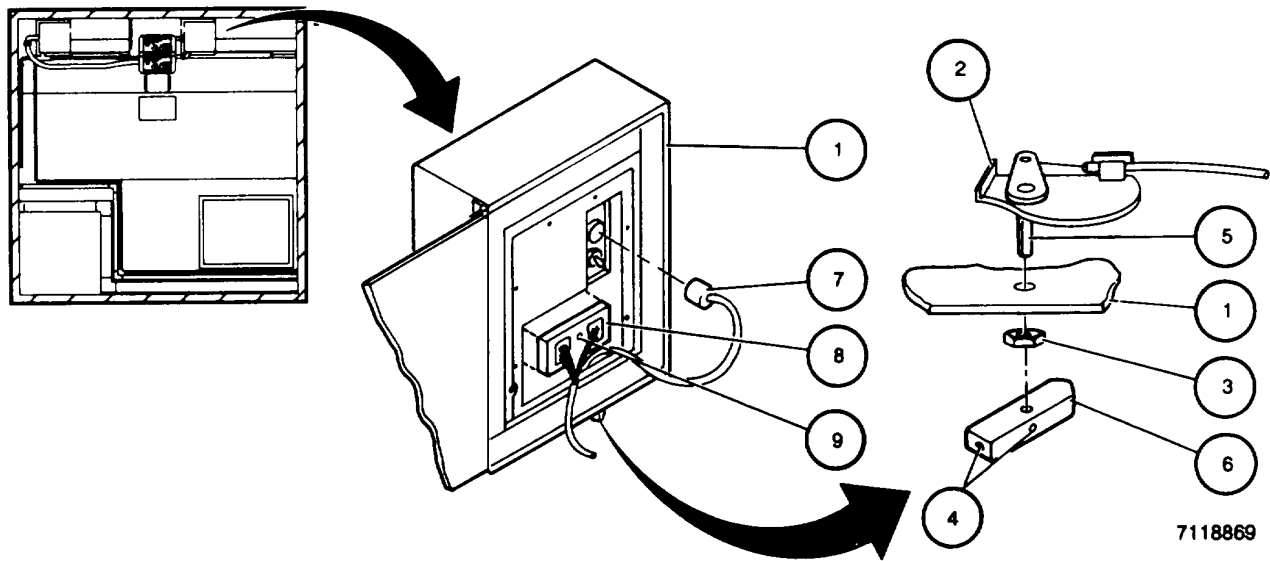
45. If working on curbside ECU, working between curbside and roadside ECU, place antenna mount (3) in installed position.
46. Install four bolts (1) and washers (2).



7118849

2-8. REPLACE ECU - Continued

47. Working inside shelter under AIR CONDITIONER FEEDTHRU box (1), place damper cable assembly (2) in installed position.
48. Install nut (3) and knob (6) on shaft (5).
49. Tighten two setscrews (4).
50. Connect ECU power cable (7) and control cable (8) to ECU.
51. Tighten captive screw (9).



FOLLOW-ON MAINTENANCE:

1. If working on curbside ECU, install antenna and antenna matching unit (refer to TM 11-5895-1392-12).
2. Install roadside or curbside ECU control module (para 2-9), as applicable.

2-9. REPLACE ECU CONTROL MODULE

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precaution:

WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.

NOTE

- Replace curbside and roadside ECU control modules the same way. Roadside control module is shown.
- Technician B assists Technician A where directed during the procedure. If no technician designated, either technician may perform the step.

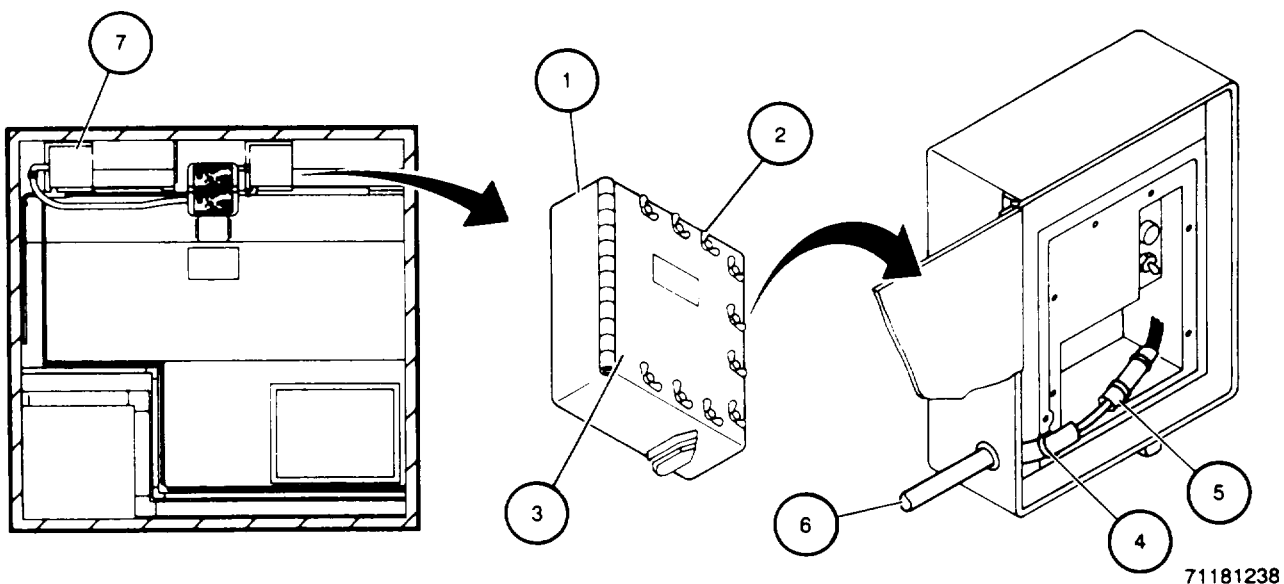
Personnel Required: Two

Materials/Parts: Caulking compound

Equipment Condition: PEP AIR COND ROADSIDE or CURBSIDE circuit breaker set to OFF, as applicable. Preliminary Procedure: Perform equipment setup (para 2-5) for ECU under repair.

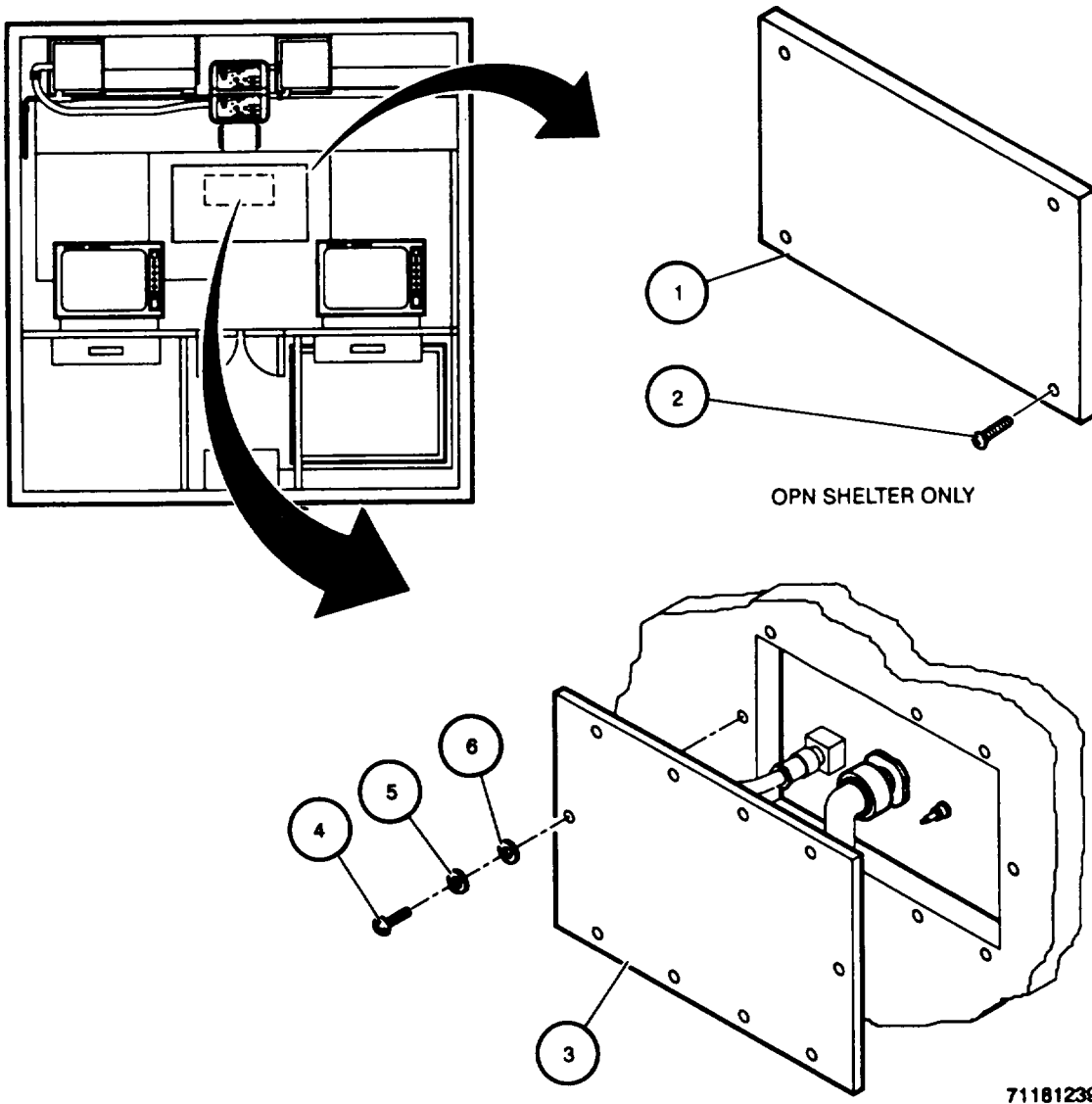
REMOVAL

1. Working at curbside AIR CONDITIONER FEEDTHRU box (1), loosen 10 fasteners (2) and open door (3).
2. Loosen and slide nut (4) up wiring harness (5) away from conduit (6).
3. Repeat steps 1 and 2 for roadside AIR CONDITIONER FEEDTHRU box (7).



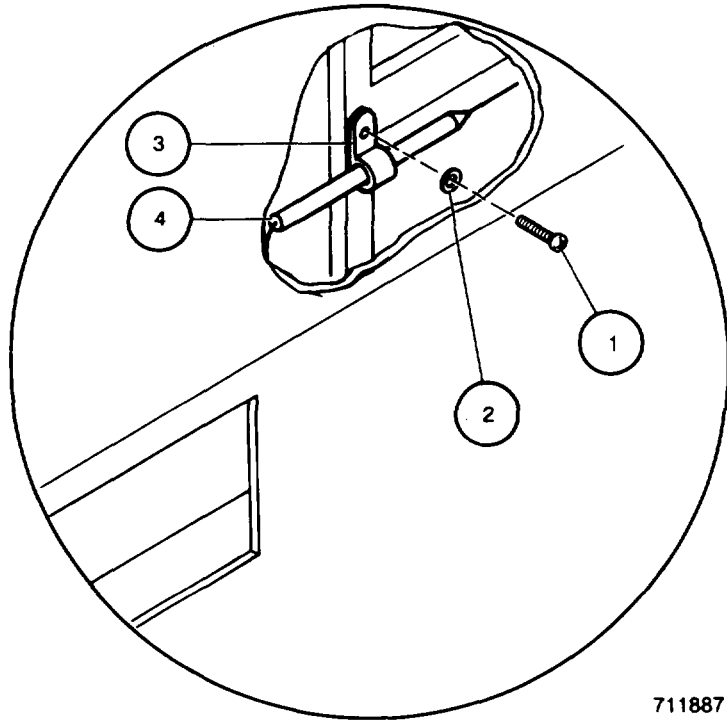
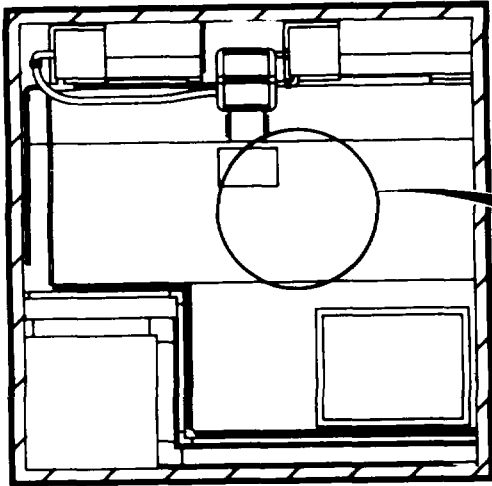
2-9. REPLACE ECU CONTROL MODULE - Continued

4. If working on ADP shelter, go to step 7.
5. Technician B: Working at front interior wall, support bulletin board (1).
6. Technician A: Remove four screws (2) and bulletin board (1).
7. Working at antenna access panel (3), remove 10 screws (4), washers (5), and lockwashers (6).
8. Remove antenna access panel cover (3).



2-9. REPLACE ECU CONTROL MODULE - Continued

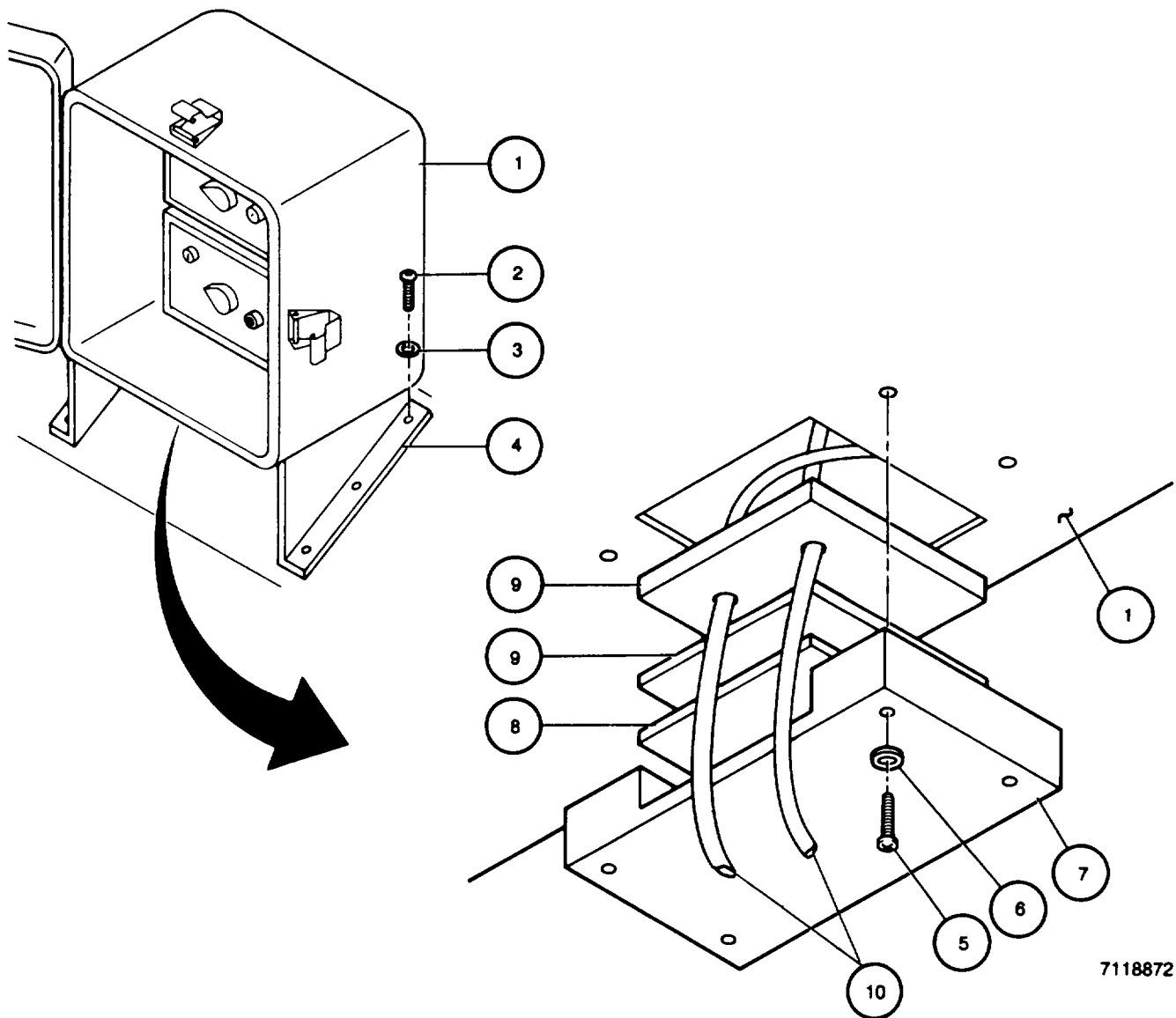
9. Working through antenna access panel, remove screw (1), washer (2), and clamp (3), freeing temperature sensing bulb (4) from shelter wall.



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2-9. REPLACE ECU CONTROL MODULE - Continued

10. Technician A: Working under AIR CONDITIONER CONTROL MODULE box (1), remove six screws (2) and washers (3) from right and left support brackets (4) (right side shown).
11. Technician B: Rotate and hold bottom of AIR CONDITIONER CONTROL MODULE box (1) outward.
12. Technician A: Working under AIR CONDITIONER CONTROL MODULE box (1), remove four screws (5) and washers (6).
13. Technician A: Remove clamp (7), shim (8), and two Electromagnetic Interference (EMI) gaskets (9), removing caulking compound from temperature sensing lines (10), as required.



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2-9. REPLACE ECU CONTROL MODULE - Continued

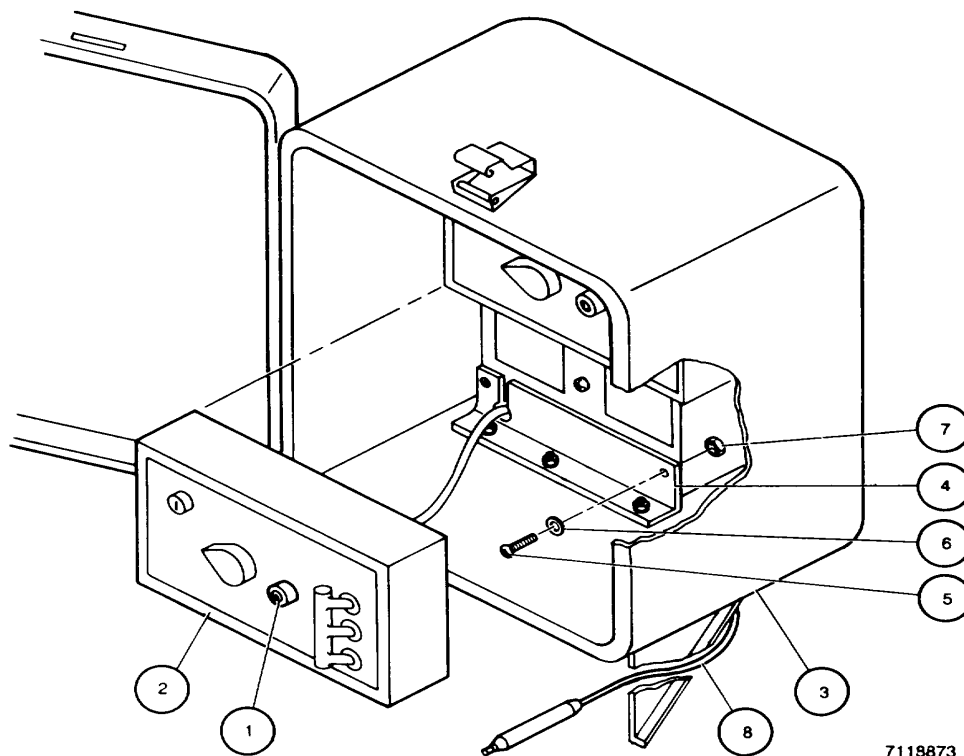
CAUTION

Support control module while only partially installed in AIR CONDITIONER CONTROL MODULE box or temperature sensing line may be damaged.

NOTE

Top control module operates curbside ECU. Bottom control module operates roadside ECU.

14. Technician A: Loosen captive screw (1) on control module (2).
15. Technician B: Carefully remove control module (2) from AIR CONDITIONER CONTROL MODULE box (3) far enough to access bracket (4). Hold control module (2) until it can be removed completely.
16. Technician A: Remove five screws (5), washers (6), and locknuts (7).
17. Technician A: Remove bracket (4).
18. Technician A: Remove control module (2), routing temperature sensing line (8) from hole in shelter wall and AIR CONDITIONER CONTROL MODULE box (3).



7119873

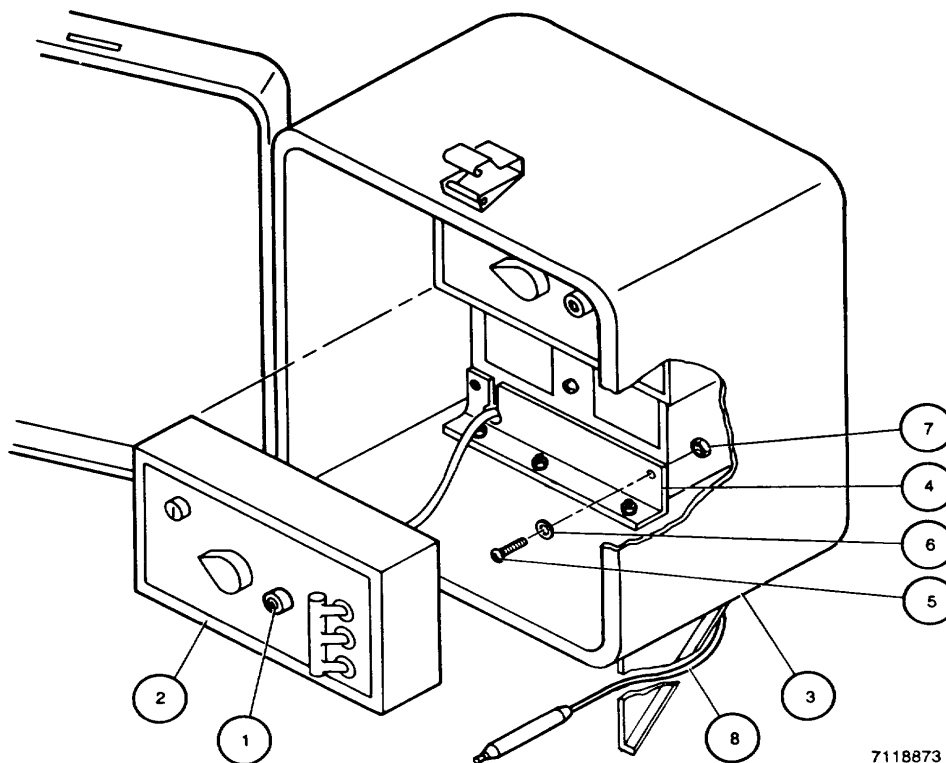
2-9. REPLACE ECU CONTROL MODULE - Continued

INSTALLATION

CAUTION

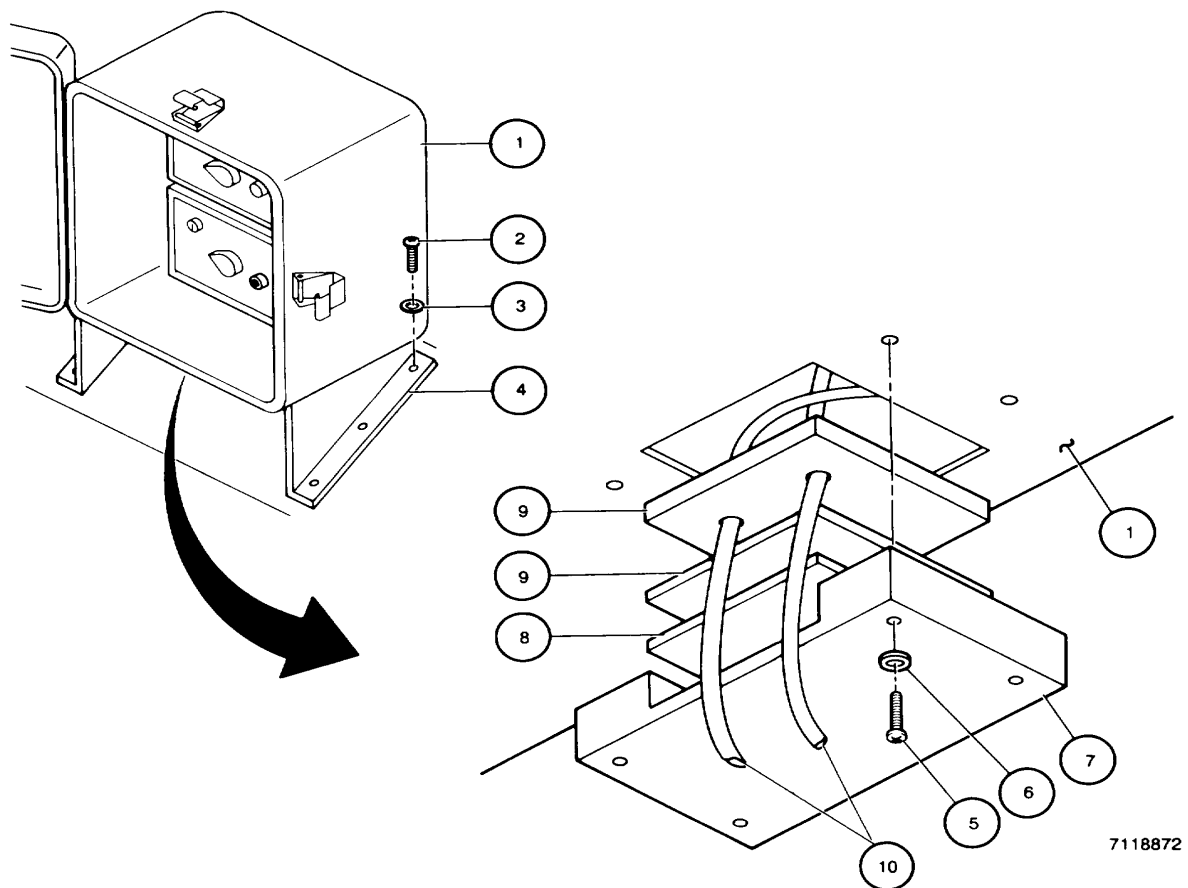
Support control module while only partially installed in AIR CONDITIONER CONTROL MODULE box or temperature sensing line may be damaged.

1. Technician B: Position and hold control module (2) near AIR CONDITIONER CONTROL MODULE box (3) so that temperature sensing line (8) can be installed. Continue supporting control module (2) until it can be fully mounted in AIR CONDITIONER CONTROL MODULE box (3).
2. Technician A: Route temperature sensing line (8) through AIR CONDITIONER CONTROL MODULE box (3) and into hole in shelter wall.
3. Technician A: Place bracket (4) in installed position.
4. Technician A: Install five screws (5), washers (6), and locknuts (7).
5. Technician B: Place control module (2) in installed position in AIR CONDITIONER CONTROL MODULE box (3).
6. Technician A: Tighten captive screw (1) on control module (2).



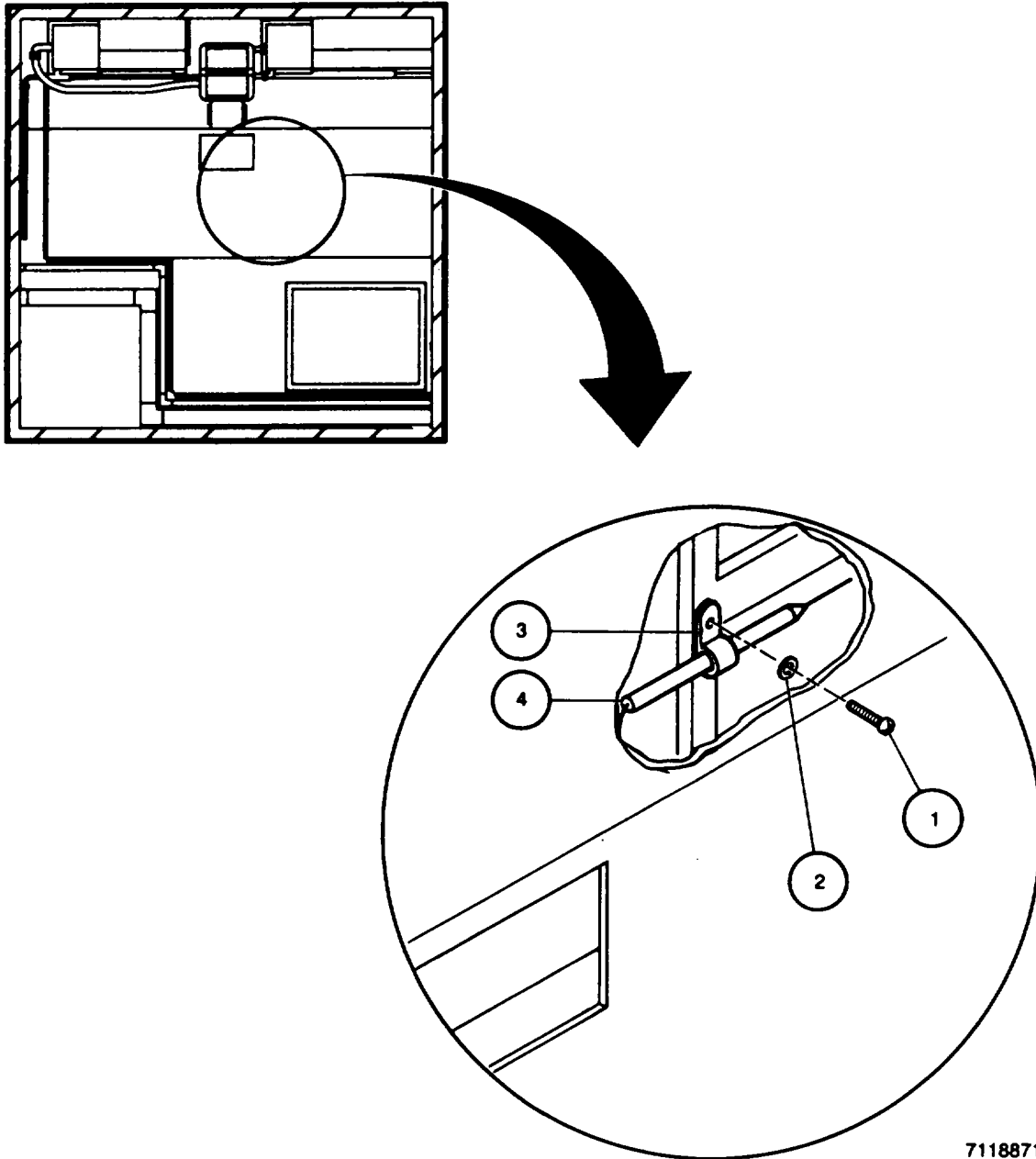
2-9. REPLACE ECU CONTROL MODULE - Continued

7. Technician B: Rotate and hold bottom of AIR CONDITIONER CONTROL MODULE box (1) outward.
8. Technician A: Working under AIR CONDITIONER CONTROL MODULE box (1), place and hold clamp (7), shim (8), and two EMI gaskets (9) in installed position, routing temperature sensing lines (10) through EMI gasket holes.
9. Technician A: Install four screws (5) and washers (6).
10. Technician A: Apply caulking compound to area, as required.
11. Technician B: Place and hold AIR CONDITIONER CONTROL MODULE box (1) in installed position. Release hold when mounting hardware installed.
12. Technician A: Working under AIR CONDITIONER CONTROL MODULE box (1), install six screws (2), washers (3), and locknuts (4).



2-9. REPLACE ECU CONTROL MODULE - Continued

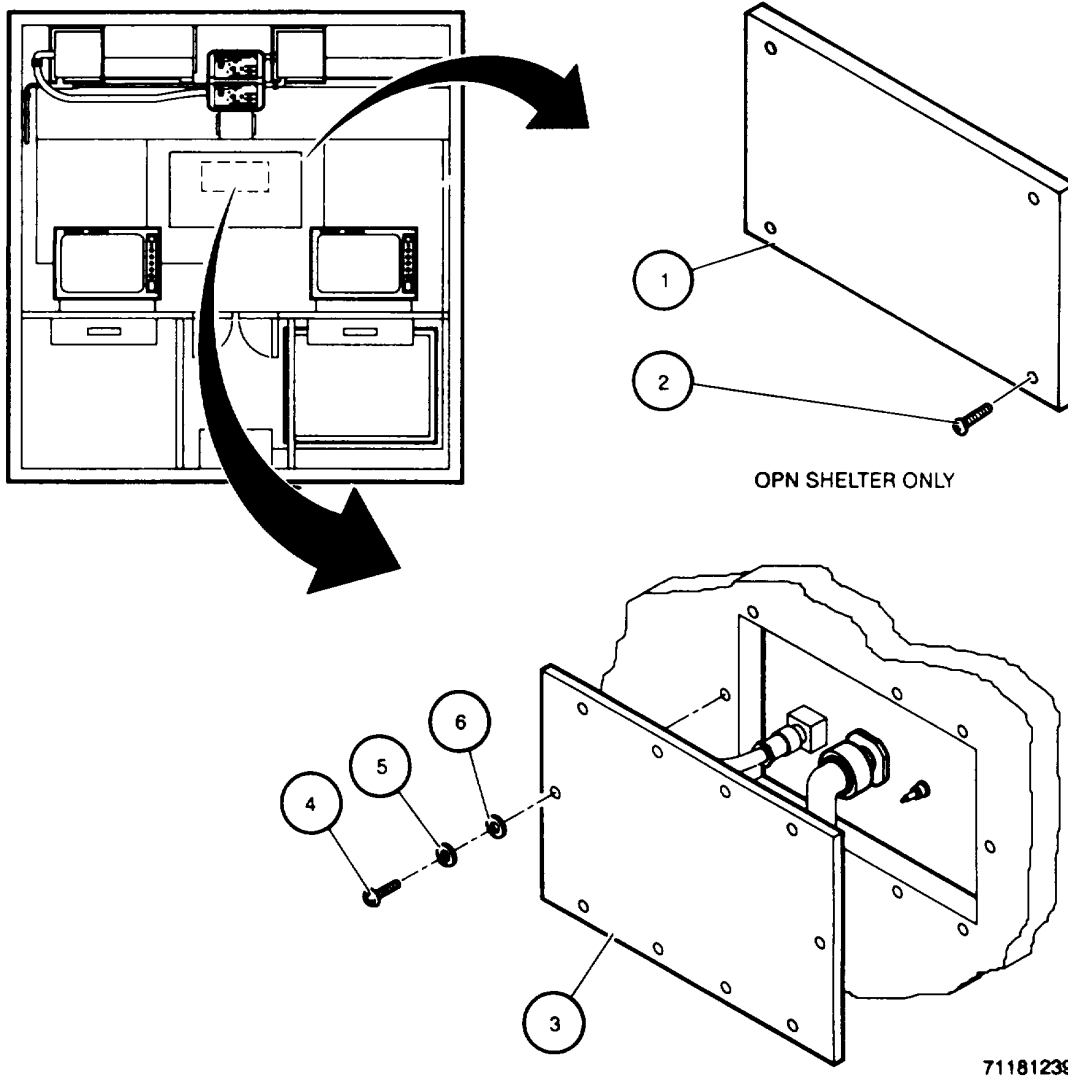
13. Working through antenna access panel, place and hold clamp (3) and temperature sensing bulb (4) in installed position.
14. Install screw (1) and washer (2).



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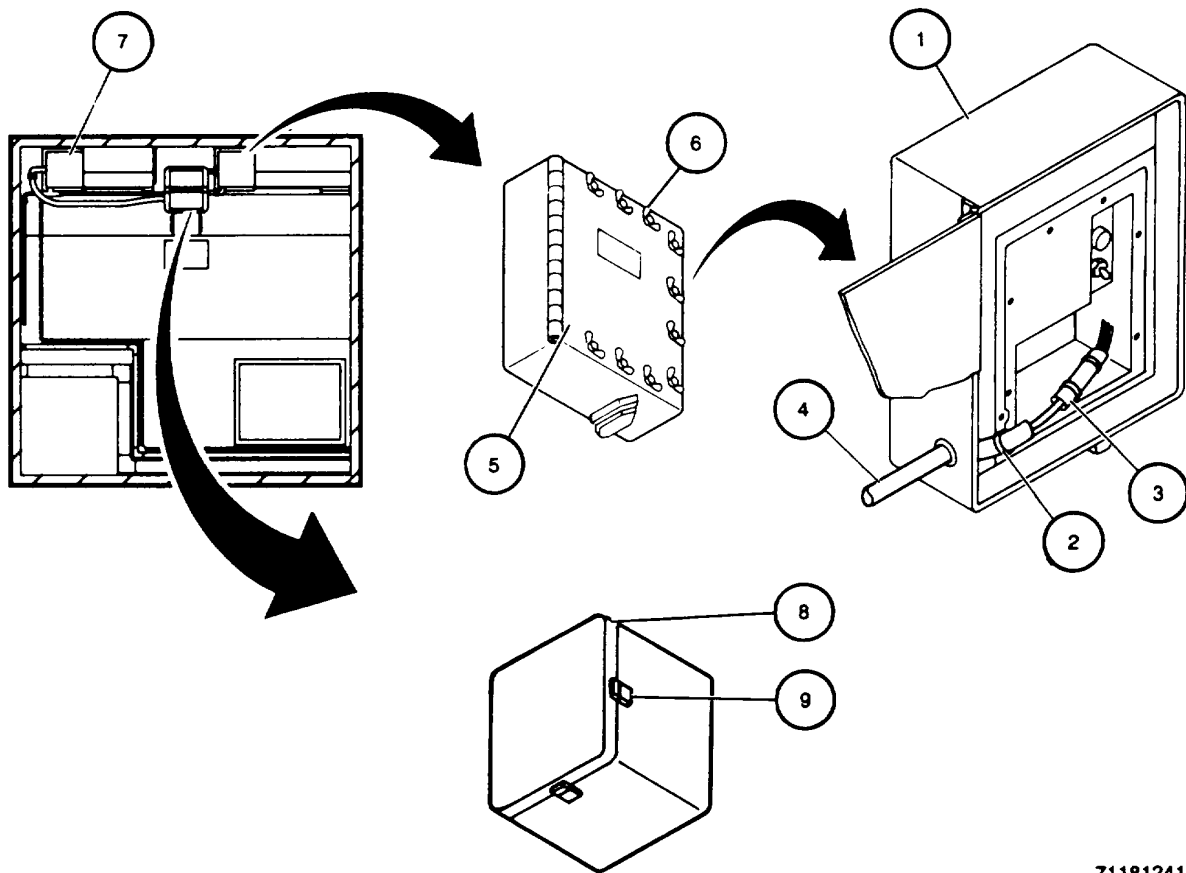
2-9. REPLACE ECU CONTROL MODULE - Continued

15. Place and hold antenna access panel cover (3) in installed position.
16. Install 10 screws (4), lockwashers (5), and washers (6).
17. If working on ADP shelter, go to step 20,
18. Technician B: Working at interior front wall, place and hold bulletin board (1) in installed position.
19. Technician A: Install four screws (2).



2-9. REPLACE ECU CONTROL MODULE - Continued

20. Working at curbside AIR CONDITIONER FEEDTHRU box (1), slide nut (2) down wiring harness (3) and install on conduit (4).
21. Close AIR CONDITIONER FEEDTHRU door (5).
22. Tighten 10 fasteners (6).
23. Repeat steps 20 through 22 for roadside AIR CONDITIONER FEEDTHRU door (7).
24. Close AIR CONDITIONER CONTROL MODULE door (8).
25. Fasten three fasteners (9).



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2-10. REPLACE ECU CONTROL CABLE PLUG

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.

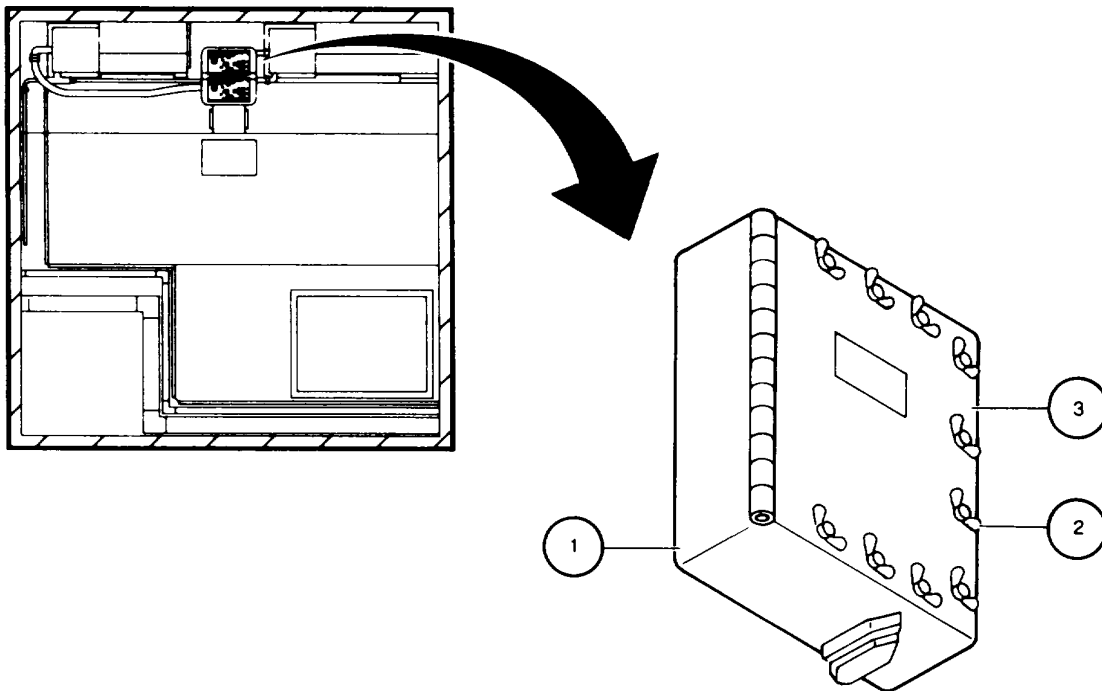
NOTE

Replace curbside and roadside ECU control cable connector plug the same way. Curbside ECU control cable connector plug is shown.

Equipment Conditions: PEP AIR COND ROADSIDE or CURBSIDE circuit breaker set to OFF, as applicable.

REMOVAL

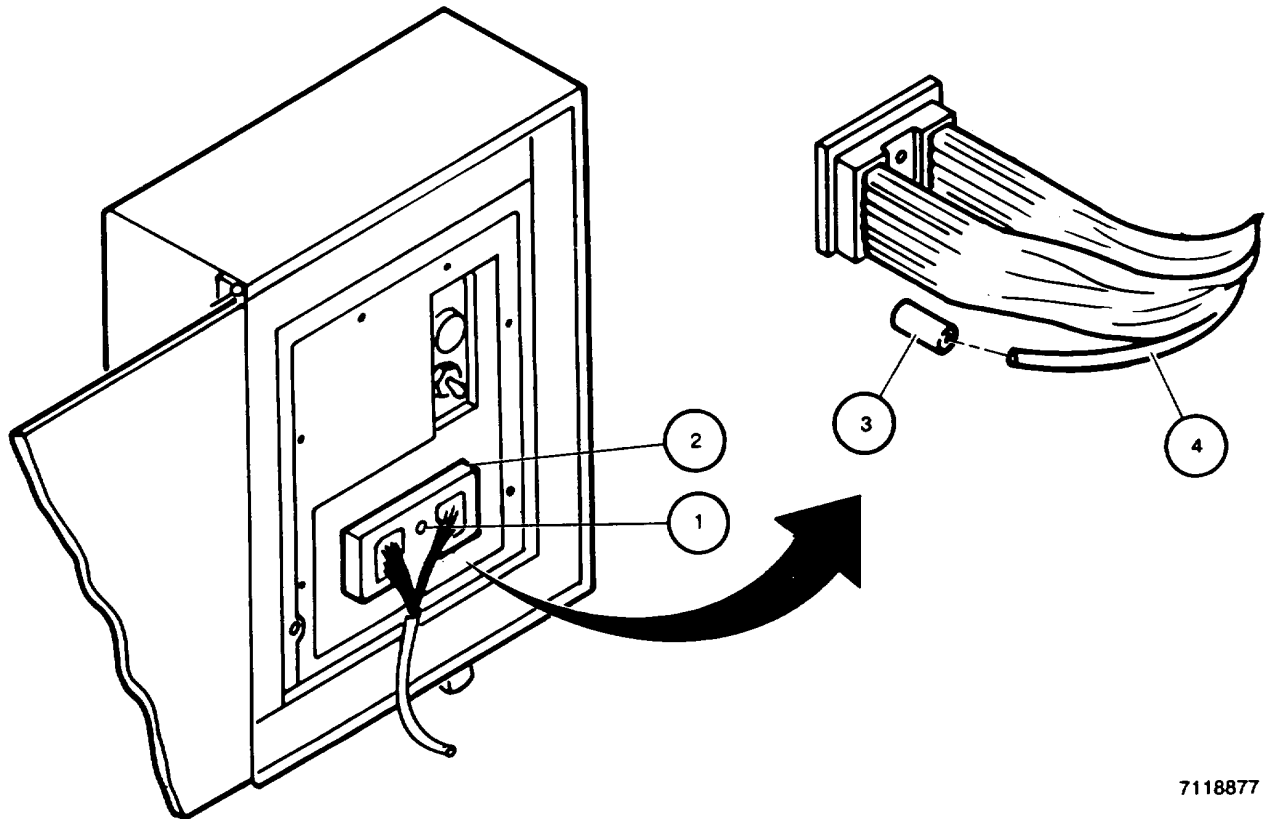
1. Working at AIR CONDITIONER FEEDTHRU box (1), loosen 10 fasteners (2).
2. Open access door (3).



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2-10. REPLACE ECU CONTROL CABLE PLUG - Continued

3. Loosen captive screw (1) and disconnect plug (2).
4. Remove insulation sleeving (3) from all wires (4).
5. Tag, unsolder, and remove all wires (4) from plug (2).
6. Remove plug (2).



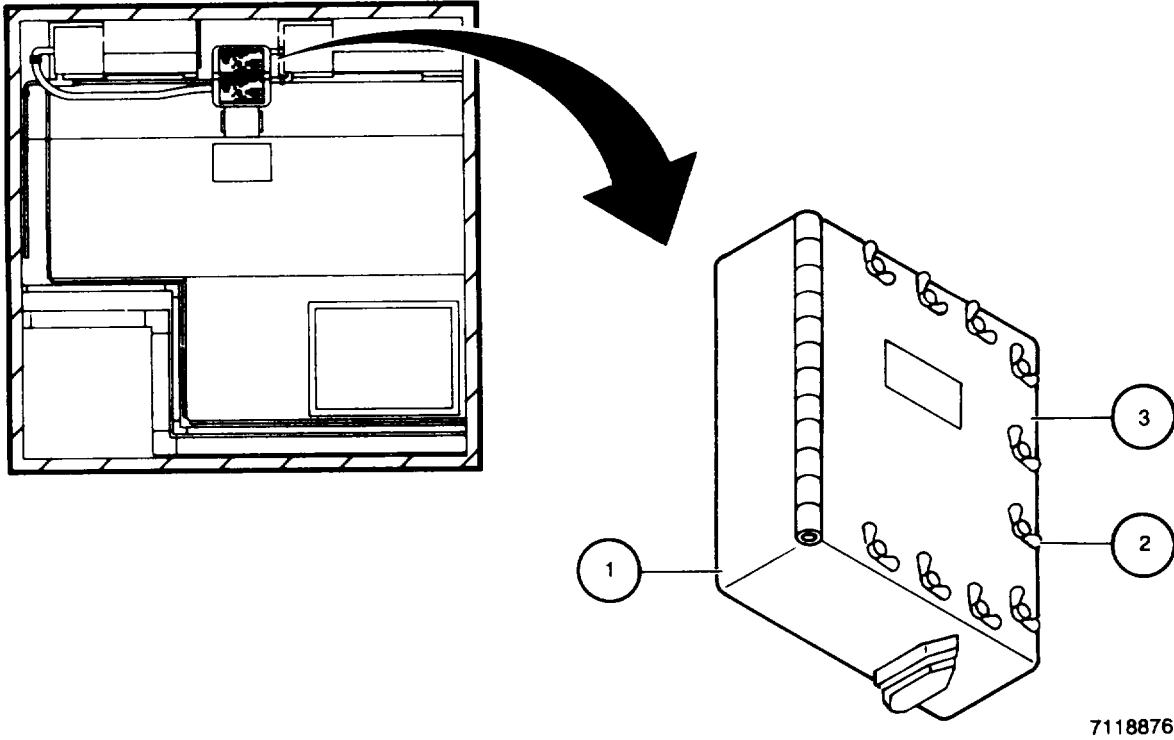
7118877

INSTALLATION

1. Form and dress all wires (4).
2. Position insulation sleeving (3) on all wires (4), so that wire ends are exposed for soldering.
3. Solder wires (4) to plug (2), as tagged. Remove tags.
4. Position and shrink insulation sleeving (3).
5. Install plug (2).
6. Tighten captive screw (1).

2-10. REPLACE ECU CONTROL CABLE PLUG - Continued

7. Working at ECU AIR CONDITIONER FEEDTHRU box (1), close access door (3).
8. Tighten 10 fasteners (2).



2-11. REPLACE ECU CONTROL CABLE RECEPTACLE

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

NOTE

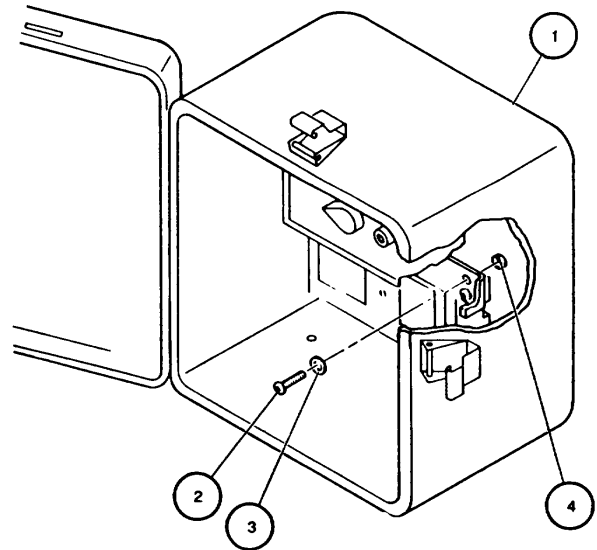
Replace curbside and roadside ECU control cable receptacle the same way. Curbside control cable receptacle is shown.

Equipment Conditions: PEP AIR COND ROADSIDE or CURBSIDE circuit breaker set to OFF, as applicable.

Preliminary Procedure: Remove roadside or curbside ECU control module (para 2-9), as applicable.

REMOVAL

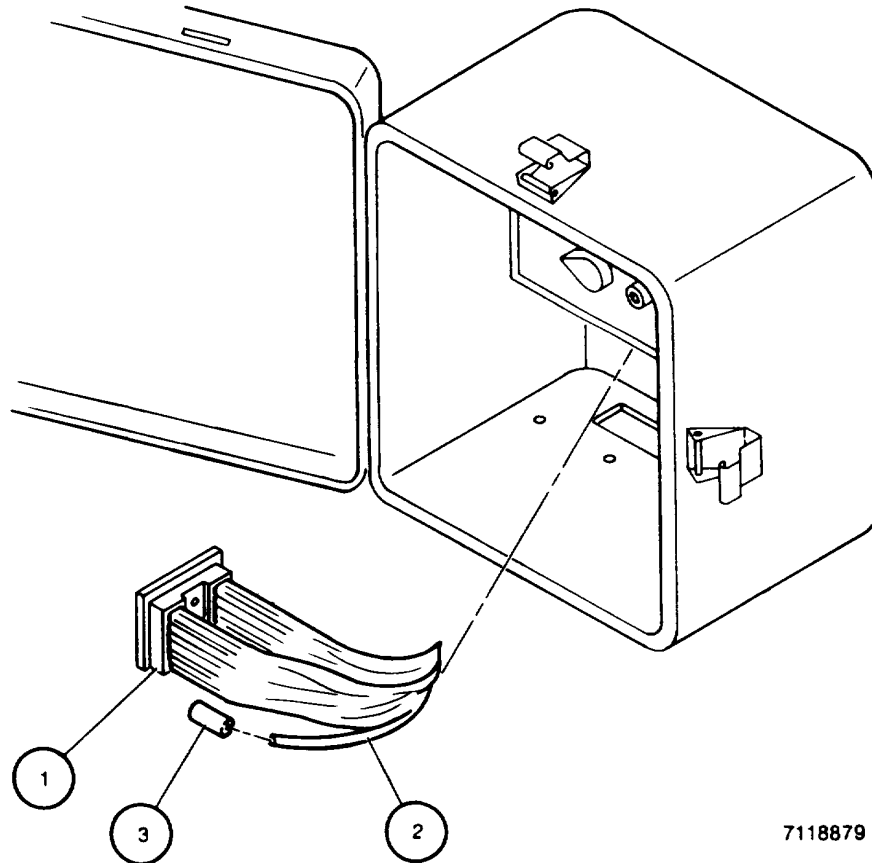
1. Working inside AIR CONDITIONER CONTROL MODULE box (1), remove two screws (2), washers (3), and locknuts (4).



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2-11. REPLACE ECU CONTROL CABLE RECEPTACLE - Continued

2. Position receptacle (1) to access wires (2).
3. Remove insulation sleeving (3) from all wires (2).
4. Tag, unsolder, and remove all wires (2) from receptacle (1).



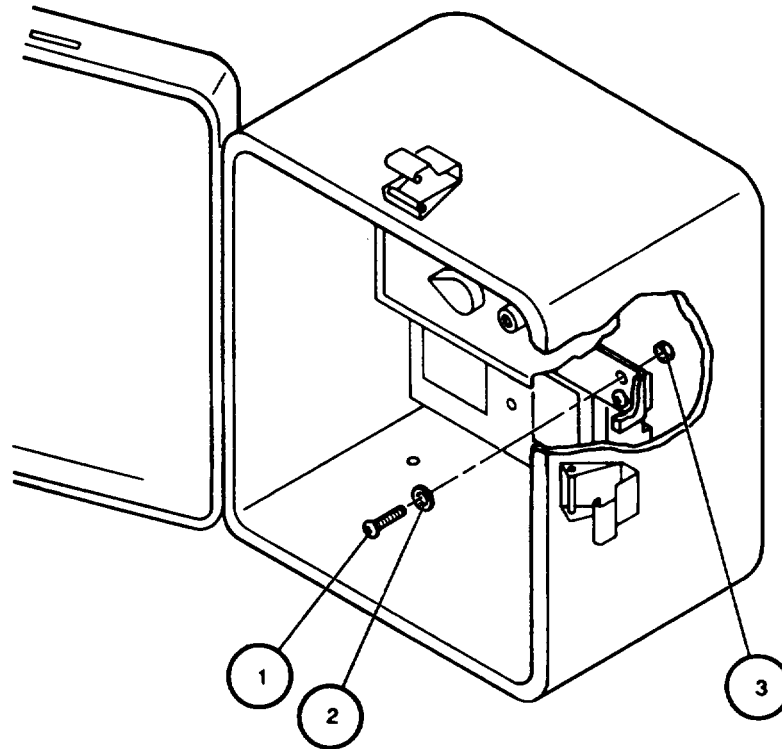
7118879

INSTALLATION

1. Form and dress wires (2).
2. Position insulation sleeving (3) on all wires (2), so that wire ends are exposed for soldering.
3. Solder wires (2) to receptacle (1), as tagged. Remove tags.
4. Position and shrink insulation sleeving (3).
5. Place receptacle (1) in installed position.

2-11. REPLACE ECU CONTROL CABLE RECEPTACLE - Continued

6. Install two screws (1), washers (2), and locknuts (3).



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FOLLOW-ON MAINTENANCE: Install roadside or curbside ECU control module (para 2-9). as applicable.

2-12. REMOVE/REPAIR/INSTALL ECU CONTROL CABLE WIRING

This task covers:	a. Removal	b. Repair	c. Installation
-------------------	------------	-----------	-----------------

INITIAL SETUP

General Safety Precaution:

WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.

NOTE

Replace curbside and roadside ECU control cable wiring the same way. Curbside control cable wiring is shown.

Equipment Conditions: PEP AIR COND ROADSIDE or CURBSIDE circuit breaker set to OFF, as applicable.

Preliminary Procedures:

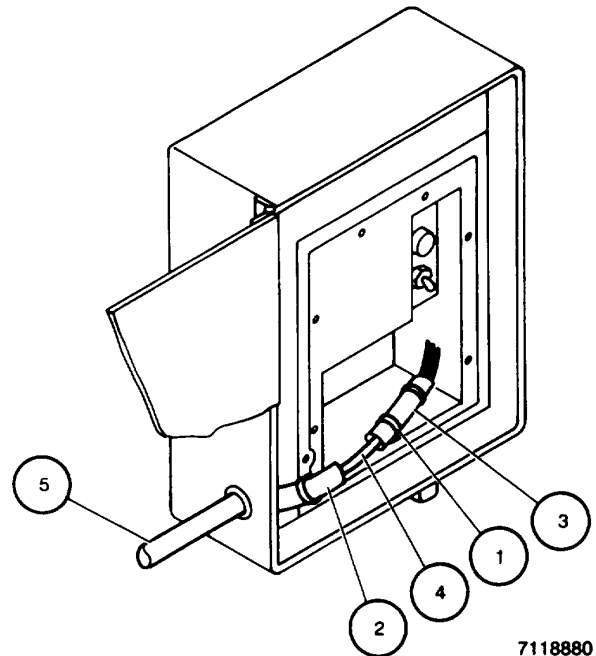
1. Remove roadside or curbside ECU control cable plug (para 2-13), as applicable.
2. Remove roadside or curbside ECU control cable receptacle (para 2-11), as applicable.

REMOVAL

NOTE

Note and record number and locations of cable ties, insulation sleeving, and wire markers to aid installation.

1. Cut and remove cable ties (1), insulation sleeving (2), and wire markers (3), as required, while routing ECU control cable (4) from conduit (5).
2. Remove ECU control cable (4).



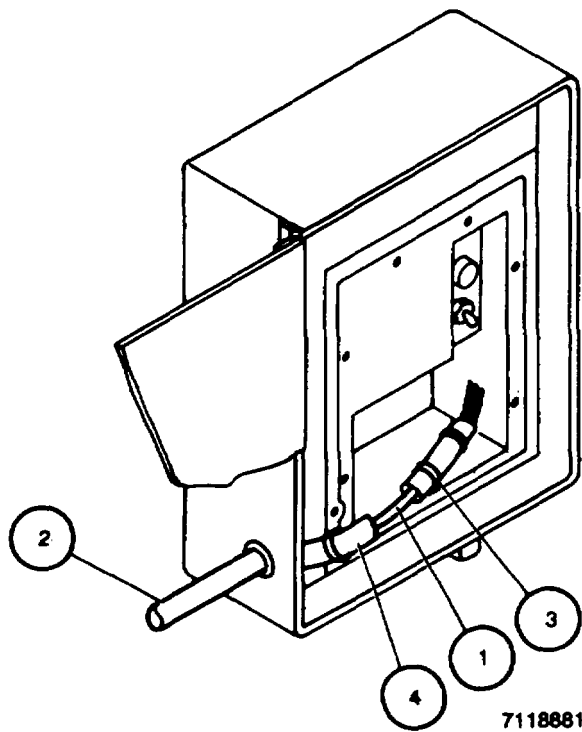
7118880

2-12. REMOVE/REPAIR/INSTALL ECU CONTROL CABLE WIRING - Continued**REPAIR**

Repair cable in accordance with instructions in ECU control cable diagram and wire list (volume 2).

INSTALLATION

1. Route ECU control cable (1) into conduit (2) between AIR CONDITIONER CONTROL MODULE box and AIR CONDITIONER FEEDTHRU box.
2. Install cable ties (3) and insulation sleeving (4) as noted during removal.

**FOLLOW-ON MAINTENANCE:**

1. Install roadside or curbside ECU control cable plug (para 2-13), as applicable.
2. Install roadside or curbside ECU control cable receptacle (para 2-11), as applicable.

2-13. REMOVE/INSTALL ECU BLANKING PLATE

This task covers: a. Removal b. Installation

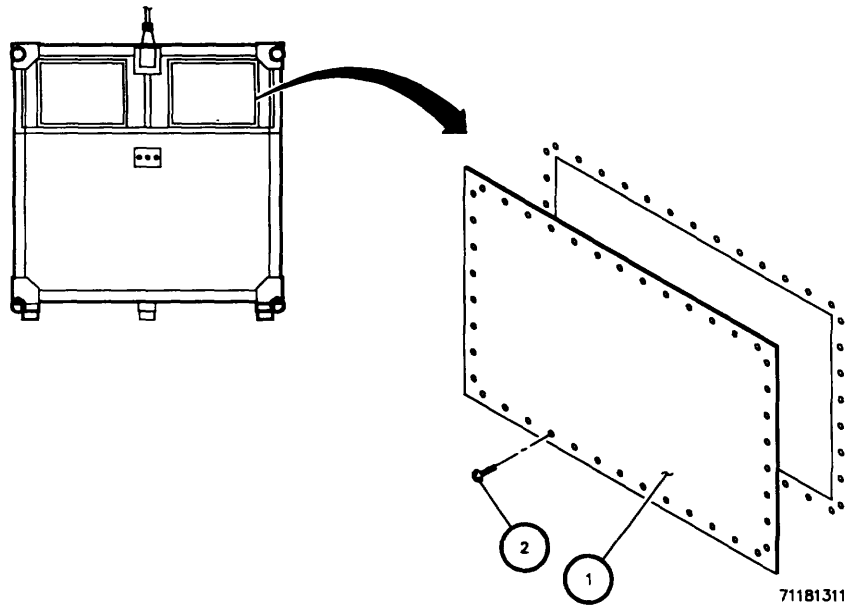
INITIAL SETUP**NOTE**

ECU blanking plate is provided to cover ECU opening in shelter wall when ECU is removed and replacement is not readily available.

Preliminary Procedure: Remove ECU (para 2-8).

REMOVAL

1. Remove 42 screws (2).
2. Remove blanking plate (1).

**INSTALLATION**

1. Place and hold blanking plate (1) in installed position.
2. Install 42 screws (2).

FOLLOW-ON MAINTENANCE: Install ECU (para 2-8).

CHAPTER 3
DOT MATRIX PRINTERS

Para		Page
Section I	Principles of Operation	3-2
3-1	Introduction	3-2
3-2	Theory of Operation	3-2
Section II	Troubleshooting	3-6
3-3	Introduction	3-6
3-4	General Instructions	3-6
3-4.1	Introduction	3-6
3-4.2	Inspection Procedures	3-6
3-4.3	Troubleshooting Procedures	3-6
3-4.4	Maintenance Procedures	3-7
3-5	Equipment Setup	3-8
3-6	Symptom Index	3-9
3-7	Troubleshooting Table	3-10
Section III	Maintenance Procedures	3-20
3-8	Remove/Install Front Cover Assembly (Tempest Printer)	3-20
3-9	Remove/Install Top Cover Assembly (Non-Tempest Printer)	3-24
3-10	Remove/Install Belly Pan Assembly (Tempest Printer)	3-28
3-11	Remove/Install Bottom Cover Assembly (Non-Tempest Printer)	3-29
3-12	Remove/Install End Caps (Tempest Printer)	3-30
3-13	Remove/Install Rear Cover Assembly (Tempest Printer)	3-32
3-14	Remove/Install Support Assembly Front Bracket	3-35
3-15	Remove/Install Support Assembly Top Bracket (Non-Tempest Printer)	3-37
3-16	Replace Processor (ECPU) or Printer Control (APTR/MPTR) CCA	3-38
3-17	Replace Power Supply (ACL) CCA	3-40
3-18	Replace Switching Regulator (ACH) CCA	3-41
3-19	Replace Wire Driver (AWDR) CCA (Non-Tempest Printer)	3-43
3-20	Replace Wire Driver (AWDR) CCA (Tempest Printer)	3-46
3-21	Replace Control Panel (ACPL) CCA	3-49
3-22	Replace Interrupter (APHO) CCA	3-51
3-23	Replace RFI Filter Box Assembly	3-53
3-24	Replace Ribbon Motor	3-55
3-25	Replace Left Fan Assembly	3-56
3-26	Replace Right Fan Assembly	3-57
3-27	Replace Carriage Cable Assembly	3-58
3-28	Replace Carriage Motor	3-62
3-29	Replace Paper Motor Assembly	3-63
3-30	Replace LOAD or PROGRAM Switch Assembly	3-64
3-31	Replace Paper Out Switch	3-65
3-32	Replace Line Filter (Tempest Printer)	3-67
3-33	Adjust Interrupter (APHO) CCA	3-68
3-34	Adjust Carriage Cable	3-70
3-35	Adjust Paper Drive Belt	3-71
3-36	Printer Self-Test - Offline	3-72

SECTION I. PRINCIPLES OF OPERATION

3-1. INTRODUCTION

This section provides the theory of operation for the dot matrix printers used in the Communication System, Control Element, Central Processors AN/TYQ-30(V)1/2. The printers described are non-Tempest Dot Matrix Printer A3093566-1 and Tempest Dot Matrix Printer A30935662.

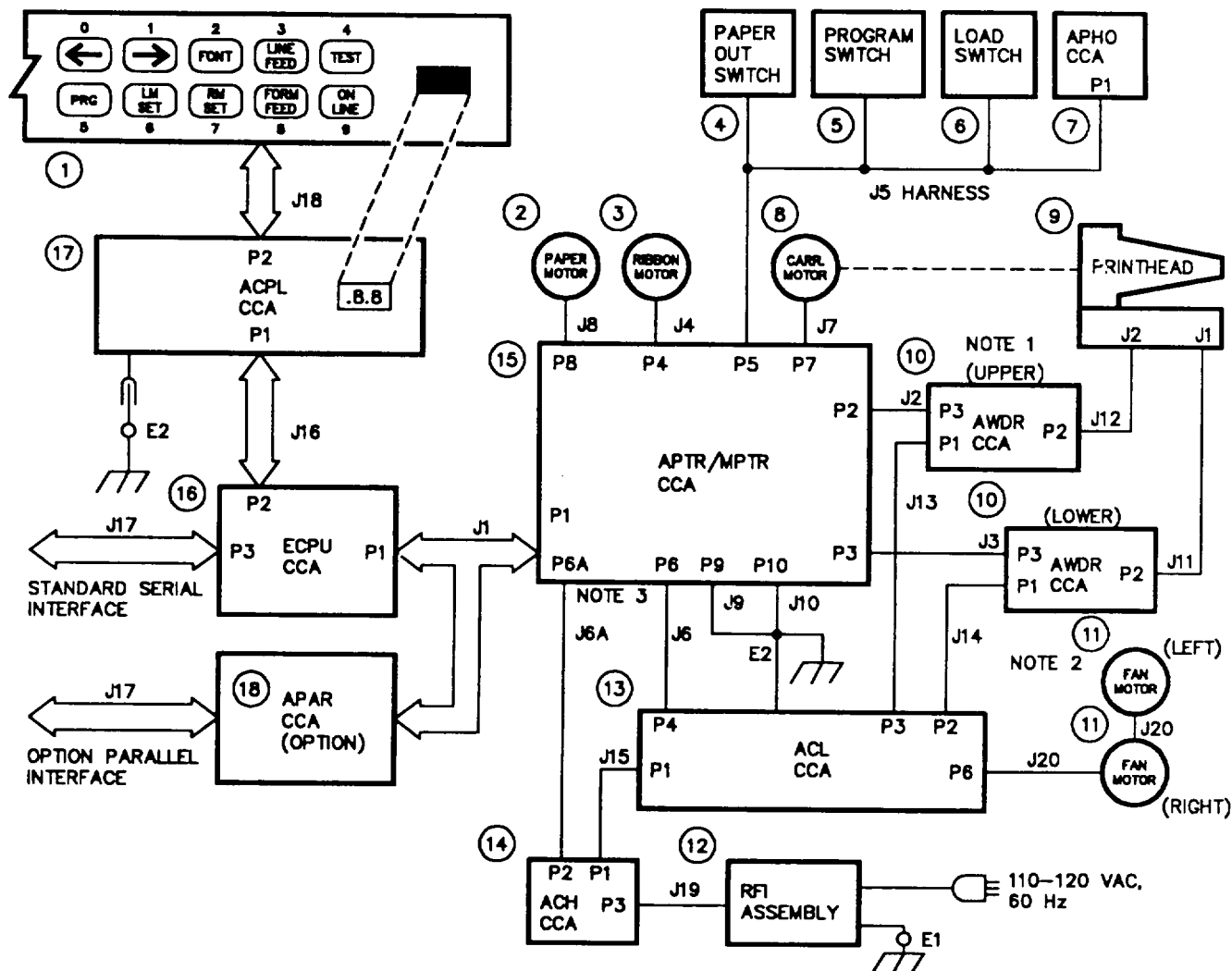
NOTE

The AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ(V)2 system, except where noted.

3-2. THEORY OF OPERATION

- | | | |
|------|-------------------------|--|
| (1) | CONTROL PANEL | Permits operator selection of printer functions. |
| (2) | PAPER MOTOR | Provides automatic paper advance as directed by printer control (APTR/MPTR) Circuit Card Assembly (CCA). |
| (3) | RIBBON MOTOR | Provides automatic ribbon advance as directed by APTR/ MPTR CCA. |
| (4) | PAPER OUT SWITCH | Provides signal to APTR/MPTR CCA when paper runs out. |
| (5) | PROGRAM SWITCH | Used with LOAD switch to configure printer for use. |
| (6) | LOAD SWITCH | Used with PROGRAM switch to configure printer for use. |
| (7) | INTERRUPTER (APHO) CCA | Generates a home signal for APTR/MPTR CCA when carriage is positioned at extreme left side of printer. |
| (8) | CARRIAGE MOTOR | Provides automatic carriage positioning as directed by APTR/MPTR CCA. |
| (9) | PRINT HEAD | An 18-wire print head, controlled by AWDR CCAs, that strikes ribbon and paper to generate print characters. |
| (10) | WIRE-DRIVER (AWDR) CCA | Two identical circuit cards that, directed by APTR/MPTR CCA, provide drive signal and voltages to control wires in print head. One CCA controls pins 1-9; other CCA controls pins 10-18. |
| (11) | FAN MOTOR | Two-speed cooling fan that operates at low speed when printer is idle or at high speed during printing. |
| (12) | RFI FILTER BOX ASSEMBLY | Filters Radio Frequency Interference (RFI) from input voltage. |

3-2. THEORY OF OPERATION - Continued



NOTE: 1. TEMPEST PRINTER HAS RIGHT AND LEFT AWDR WITH IN-UNE FILTER CAPACITORS.

2. TEMPEST PRINTER HAS RIGHT AND LEFT FANS; NONTEMPEST PRINTER MAY HAVE RIGHT AND LEFT FANS.

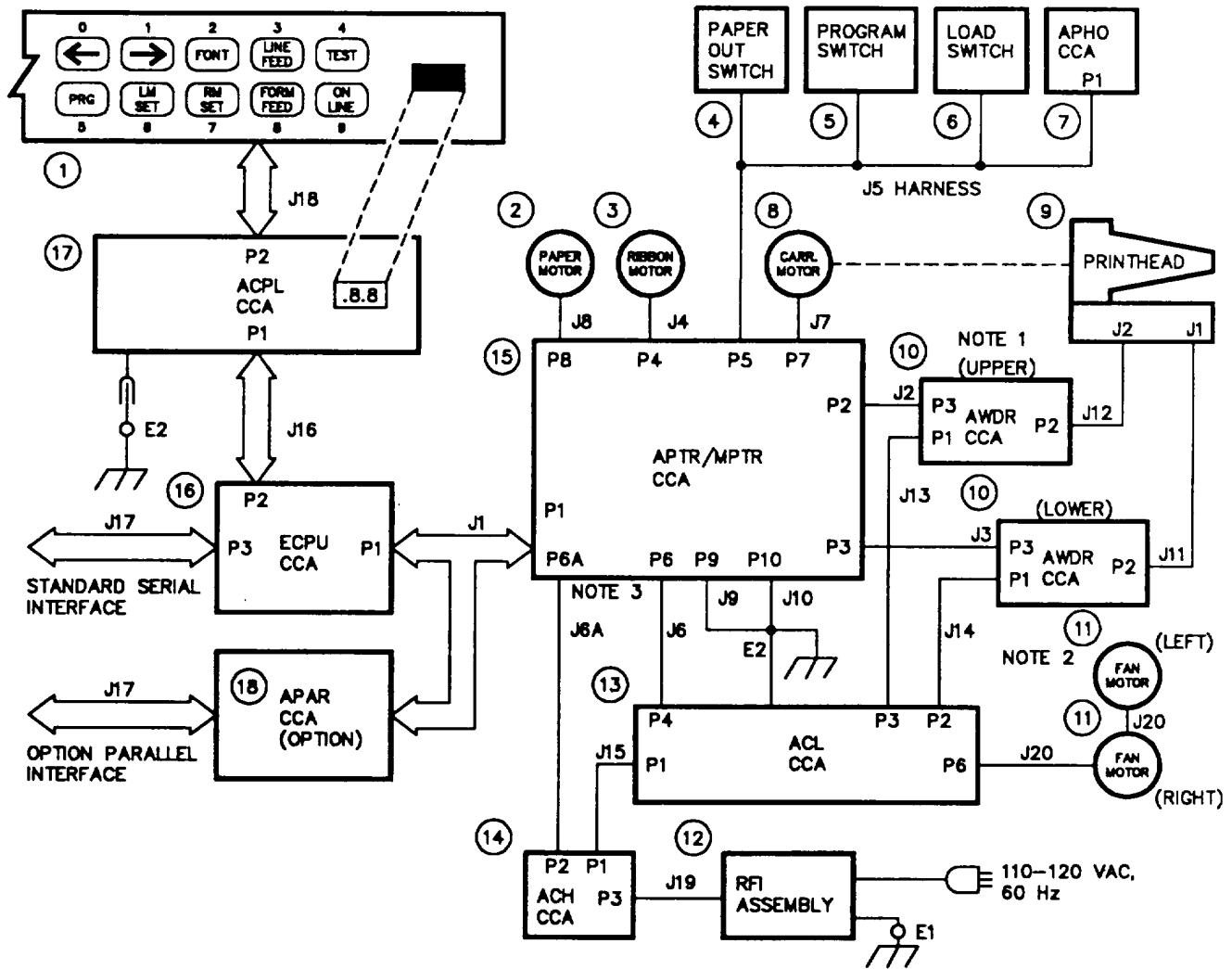
3. TWO CABLE CONNECTORS, J6 AND J6A. MATE WITH SINGLE CCA CONNECTOR LABELED P6 AND P6A.

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3-2. THEORY OF OPERATION - Continued

- | | | |
|------|---------------------------------|--|
| (13) | POWER SUPPLY (ACL) CCA | Provides filtered power for +40.0 Vdc, +16.0 Vdc, +8.0 Vdc, and -16.0 Vdc buses. Also provides regulated +5.0 Vdc, +12.0 Vdc, -12.0 Vdc, +28.0 Vdc, and power to fan, bell, and power-up circuits. |
| (14) | SWITCHING REGULATOR (ACH) CCA | Switching regulator that uses an input voltage of 85 to 132 volts rms to generate 150 watts of average dc power. |
| (15) | PRINTER CONTROL (APTR/MPTR) CCA | Controls all printer action directed by ECPU CCA. Controls paper drive, carriage advance, ribbon advance, and print head through AWDR CCAs. Also contains sensor lines for software switches, paper out, and carriage home conditions. |
| (16) | PROCESSOR (ECPU) CCA | <p>Provides Central Processing Unit (CPU) functions that include the following:</p> <ul style="list-style-type: none"> • Central Processing Unit - Performs arithmetic operations, controls instruction processing, and provides timing and interrupt signals. • Direct Memory Access (DMA) - Permits APTR/MPTR CCA to directly access memory, bypassing CPU. • Universal Asynchronous Receive/Transmit (UART) - Provides interface between printer's word-parallel controller and serial RS-232C inputs. • Random Access Memory (RAM) - Integrated circuits that provide temporary memory storage for CPU. • Read-Only Memory (ROM) - Integrated circuits containing software program for CPU. • RS-232C Driver and Receiver - Permit printer to accept data and control serial source. |
| (17) | CONTROL PANEL (ACPL) CCA | Provides interface between printer front panel switches and ECPU CCA. Also contains two Light Emitting Diode (LED) units for two-character control panel display. |
| (18) | PARALLEL INTERFACE (APAR) CCA | Not used in this application. |

3-2. THEORY OF OPERATION - Continued



- NOTE: 1. TEMPEST PRINTER HAS RIGHT AND LEFT AWDR WITH IN-UNE FILTER CAPACITORS
2. TEMPEST PRINTER HAS RIGHT AND LEFT FANS; NONTEMPEST PRINTER MAY HAVE RIGHT AND LEFT FANS.
3. TWO CABLE CONNECTORS, JO AND 6A. MATE WTH SINGLE CCA CONNECTOR LABELED P6 AND P6A.

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SECTION II. TROUBLESHOOTING

3-3. INTRODUCTION

This section provides procedures required to set up, test, fault isolate, and repair the Non-Tempest Printer and Tempest Printer printers at the direct support maintenance level.

3-4. GENERAL INSTRUCTIONS

3-4.1. Introduction

- a. Troubleshooting and repair should be performed only by experienced technicians who are familiar with the equipment and capable of ensuring that procedures are correctly accomplished.
- b. Maintenance personnel should read all inspection, troubleshooting, and maintenance instructions before attempting to troubleshoot or repair the equipment.

3-4.2. Inspection Procedures

- a. Visually inspect all wiring and all electronic assemblies and their components for obvious damage. Check for open connections, shorts, burning, discoloration, brittle or cracked insulation, or charring. If damage is noted, carefully inspect related components for similar damage to help identify the cause of the damage.
- b. When removed, visually inspect all Circuit Card Assemblies (CCAs) for signs of excess heat, such as charred, burned, discolored, cracked, or broken components. Inspect all printed wire etching on CCAs for apparent breaks, cuts, nicks, or signs of lifting from the card. Inspect CCA connectors for cracked or broken insulation and for missing, loose, bent, or broken pins. Inspect contacts of CCA edge connectors to ensure that they are not broken, scratched, nicked, cut or dirty. Clean dirty contacts.
- c. Inspect all chassis connectors for broken, scratched, dented, or damaged housings; missing hardware; and missing or damaged connector pins.
- d. Operate each switch to all positions to ensure that it operates freely and smoothly and that all contacts appear to mate when they should. Ensure that all switch detents operate positively and firmly. Inspect knobs for breaks or cracks.

3-4.3. Troubleshooting Procedures

- a. Observe reported symptom or repeat failed diagnostic test to verify reported fault. Procedures to set up printer for maintenance are provided in paragraph 3-5. An internal self-test executes each time the printer is turned on. A printer self-test may be executed when printer is placed off-line (para 3-36).
- b. Using symptom index (table 3-1) and troubleshooting table (table 3-2), perform steps required to isolate fault to a part or assembly and perform first specified corrective action.
- c. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- d. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action.
- e. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.

3-4.3. Troubleshooting Procedures - Continued

- f. Repeat steps d and e until fault is corrected or it becomes necessary to refer unit to next higher level of maintenance.

3-4.4. Maintenance Procedures

- a. The equipment documented in this manual is typical. The equipment you are repairing may contain minor variations (location and number of cable ties, cable markers, lockwashers, etc.) which do not affect the essential procedural steps given.
- b. While performing maintenance procedures, cut and remove cable ties whenever needed. Note and record the number and location of the cable ties removed to aid installation.
- c. Bag and tag hardware (screws, washers, etc.) during removal procedures to aid installation.
- d. Tag connectors and wires during removal procedures to ensure correct reconnection.
- e. If during removal of an assembly it is observed that wires, cables, or connectors attached to that assembly are loose, reinstall or reconnect the loose item and repeat troubleshooting procedure to verify repair.

3-5. EQUIPMENT SETUP

WARNING

- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed or panels are open to avoid electrical shock.
- **HIGH VOLTAGES ARE PRESENT IN THE PRINTERS.** Avoid touching the power supply area and any items that may retain electrical charge or accumulate heat (i.e., capacitors, motors, heat sinks, etc.).

1. Working at left rear corner of printer, set power ON/OFF switch (1) to OFF
2. Install paper and ribbon. Refer to TM 11-5895-1392-12.
3. Install power cable (2) in rear panel power connector (3).

CAUTION

Avoid using power circuits serving other devices, which may cause low voltage or voltage fluctuations or introduce noise. These unstable conditions may cause intermittent printer operation.

4. Connect power cable (2) to approved 115 Vac, 60-Hz power source.
5. Set power ON/OFF switch (1) to ON and observe front-panel display:
 - a. If On or LO is displayed on front panel, components checked by self-test are operational.
 - b. If any other code is displayed, go to symptom index (table 3-1).
6. Perform Printer Self-Test - Offline (para 3-36).

3-6. SYMPTOM INDEX

The symptom index for the non-Tempest printer and Tempest printer is provided in table 3-1. Simply check the table for the fault condition or failed diagnostic test result and go to the referenced troubleshooting procedure in Table 3-2, Dot Matrix Printer Troubleshooting.

Table 3-1. Dot Matrix Printer Symptom Index

NUMBER	SYMPTOM	PAGE
1	No power applied with power switch set to on.....	3-11
2	Printer not executing self-test.....	3-12
3	Garbled printout.....	3-13
4	Carriage does not move	3-13
5	Wavy print columns	3-14
6	No printing - Carriage moves	3-14
7	Incomplete characters	3-15
8	Paper not feeding	3-16
9	Line spacing uneven.....	3-16
10	Ribbon not advancing.....	3-17
11	Fan not running	3-17
12	Constant paper out indication.....	3-18
13	Incorrect front panel operation	3-18
14	No front panel display, constant audible alarm.....	3-18
15	No front panel display, no audible alarm	3-18
16	Cannot call up program menu	3-18
17	Front panel displays fault code with first digit of C	3-19
18	Front panel displays fault code P1, P2, P3, or P4.....	3-19
19	Front panel displays fault code PC.....	3-19
20	Print head drifts to right margin	3-19

3-7. TROUBLESHOOTING TABLE

WARNING

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.** Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.
- **HIGH VOLTAGES ARE PRESENT IN THE PRINTERS.** Avoid touching the power supply area and any items that may retain electrical charge or accumulate heat (capacitors, motors, heat sinks, etc.). The print head may become hot after heavy use. Avoid touching until cooled.
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed or panels are open to avoid electrical shock.
- The ac power source must be properly grounded and extension cords should not be used. In addition to being a personnel safety hazard, improper grounding may cause erroneous operation and damage to equipment.

CAUTION

- This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.
- To avoid electrical shorts, gear damage, belt binding, or similar problems, promptly remove any hardware or other foreign matter dropped into the printer.
- Never place spillable containers on or near the equipment.
- Ensure that the correct Circuit Card Assemblies (CCAs) and interconnect cables are used and that they are securely installed. Tempest and non-Tempest CCAs are not interchangeable.
- Use no lubricants in the printer, especially on the carriage rails. Printer failure and permanent damage to the carriage bearings may result if any lubrication is applied to the carriage rails.

NOTE

- When performing troubleshooting procedures, especially during electrical checks, be alert for intermittent as well as good/bad conditions.
- Be sure plugs, jacks, cables, and integrated circuits are completely and positively engaged. When reconnecting these items, guard against bending pins and inverting or offsetting connection of unkeyed connectors.
- Instructions that refer to right, left, front, or rear are given as if viewing the printer from the control panel, looking toward the rear of the printer.

3-7. TROUBLESHOOTING TABLE - Continued

Troubleshooting for the non-Tempest and Tempest printers is provided in table 3-2. The table consists of three columns and is used as follows:

- 1. **MALFUNCTION:** Indicates equipment fault as described in symptom index. Look in TEST OR INSPECTION column for required fault isolation steps.
- 2. **TEST OR INSPECTION:** Indicates step(s) to be taken to isolate fault to a specific part or assembly. If equipment passes a test or inspection step, go to next step. If equipment fails a test or inspection, look in CORRECTIVE ACTION column for repair steps.
- 3. **CORRECTIVE ACTION:** Indicates authorized adjustment or repair for an isolated fault. When action is completed, repeat action or diagnostic test that initially identified fault to confirm repair. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action. If all steps are completed and fault persists, refer equipment to next higher level of maintenance.

Table 3-2. Dot Matrix Printer Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. NO POWER APPLIED WITH POWER SWITCH SET TO ON		
	Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between ACL CCA, ACH CCA, and RFI assembly is secure.	Securely install cabling.
	Step 2. Check ACL CCA by replacing with a known good ACL CCA (pare 3-17).	Replace faulty ACL CCA.
	Step 3. Check ACH CCA by replacing with a known good ACH CCA (para 3-18).	Replace faulty ACH CCA.
	Step 4. Check RFI assembly by replacing with a known good RFI assembly (para 3-23).	a. Replace faulty RFI assembly. b. Refer to next higher level of maintenance.

3-7. TROUBLESHOOTING TABLE - Continued

Table 3-2. Dot Matrix Printer Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. PRINTER NOT EXECUTING SELF-TEST	<p>Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between ACL CCA, ACH CCA, APTR/MPTR CCA, ACPL CCA, and ECPU CCA is secure.</p>	<p>Securely install cabling.</p>
	<p>Step 2. Check that ECPU CCA LED is on or flickering and that all APTR/MPTR CCA LEDs are on.</p>	<p>a. If ECPU CCA LED and APTR/MPTR CCA +5V LEDs are off, replace faulty ACL CCA (para 3-17).</p> <p>b. If ECPU CCA LED is off and all APTR/MPTR CCA LEDs are on, replace faulty ECPU CCA (para 3-16).</p> <p>c. If ECPU CCA LED is on or flickering, and any other APTR/MPTR CCA LED is off, replace faulty APTR/MPTR CCA (para 3-16).</p> <p>d. Refer to next higher level of maintenance.</p>
		<p>7118072</p>
	<p>Step 3. Check ACPL CCA by replacing with a known good ACPL CCA (para 3-21).</p>	<p>a. Replace faulty ACPL CCA.</p> <p>b. Refer to next higher level of maintenance.</p>

3-7. TROUBLESHOOTING TABLE - Continued

Table 3-2. Dot Matrix Printer Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. GARBLED PRINTOUT	<p>Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between AWDR CCAs, APTR/MPTR CCA, ACL CCA, and ECPU CCA is secure.</p>	<p>Securely install cabling.</p>
	<p>Step 2. Check ECPU CCA by replacing with a known good ECPU CCA (para 3-16).</p>	<p>Replace faulty ECPU CCA.</p>
	<p>Step 3. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).</p>	<p>Replace faulty APTR/MPTR CCA.</p>
	<p>Step 4. Check ACL CCA by replacing with a known good ACL CCA (para 3-17).</p>	<p>Replace faulty ACL CCA.</p>
	<p>Step 5. Check both AWDR CCAs, as required, by replacing each in turn with a known good AWDR CCA (para 3-19 or 3-20).</p>	<p>a. Replace faulty AWDR CCA. b. Refer to next higher level of maintenance.</p>
4. CARRIAGE DOES NOT MOVE	<p>Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between carriage motor, APTR/MPTR CCA, and ECPU CCA is secure.</p>	<p>Securely install cabling.</p>
	<p>Step 2. Check carriage motor by replacing with a known good carriage motor (para 3-28).</p>	<p>Replace faulty carriage motor.</p>
	<p>Step 3. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).</p>	<p>Replace faulty APTR/MPTR CCA.</p>

37. TROUBLESHOOTING TABLE - Continued

Table 3-2. Dot Matrix Printer Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. CARRIAGE DOES NOT MOVE - Continued	Step 4. Check ECPU CCA by replacing with a known good ECPU CCA (para 3-16).	<ul style="list-style-type: none"> a. Replace faulty ECPU CCA. b. Refer to next higher level of maintenance.
5. WAVY PRINT COLUMNS	Step 1. Check carriage cable adjustment (para 3-34).	<ul style="list-style-type: none"> a. If required, adjust carriage cable. b. Replace carriage cable (para 3-27).
	Step 2. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between APTR/MPTR CCA, APHO CCA, and carriage motor is secure.	Securely install cabling.
	Step 3. Check APHO CCA adjustment (para 3-33).	Adjust APHO CCA, as required.
	Step 4. Check APHO CCA by replacing with a known good APHO CCA (para 3-22).	Replace faulty APHO CCA.
	Step 5. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).	<ul style="list-style-type: none"> a. Replace faulty APTR/MPTR CCA. b. Refer to next higher level of maintenance.
6. NO PRINTING - CARRIAGE MOVES	Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between APTR/MPTR CCA, AWDR CCAs, ACL CCA, ACH CCA, and ECPU CCA is secure.	Securely install cabling.

3-7. TROUBLESHOOTING TABLE - Continued

Table 3-2. Dot Matrix Printer Troubleshooting - CONT

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION								
<p>6. NO PRINTING - CARRIAGE MOVES - Continued</p> <p>Step 2. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16). <div style="padding-left: 40px;">Replace faulty APTR/MPTR CCA.</div> </p> <p>Step 3. Check ACL CCA by replacing with a known good ACL CCA (para 3-17). <div style="padding-left: 40px;">Replace faulty ACL CCA.</div> </p> <p>Step 4. Check ACH CCA by replacing with a known good ACH CCA (para 3-18). <div style="padding-left: 40px;">Replace faulty ACH CCA.</div> </p> <p>Step 5. Check both AWDR CCAs, as required, by replacing each in turn with a known good AWDR CCA (para 3-19 or 3-20). <div style="padding-left: 40px;">a. Replace faulty AWDR CCA.</div> <div style="padding-left: 40px;">b. Refer to next higher level of maintenance.</div> </p> <p>7. INCOMPLETE CHARACTERS</p> <p>Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between APTR/MPTR CCA, AWDR CCAs, ACL CCA, ACH CCA, and ECPU CCA is secure. <div style="padding-left: 40px;">Securely install cabling.</div> </p> <p>Step 2. Check both AWDR CCAs, as required, using symptoms (a) or (b), by replacing each in turn with a known good AWDR CCA (para 3-19 or 3-20).</p> <table style="margin-left: 40px; border: none;"> <tr> <td style="padding-right: 10px;">a. AWDR A4</td> <td style="padding-right: 10px;">Missing:</td> <td style="padding-right: 20px;">Top 2 horizontal bars of "E", Top bar of "T",</td> <td>Top bar of "F", Top bar of "Z"</td> </tr> <tr> <td>b. AWDR A5</td> <td>Missing:</td> <td>Crossbar of "A", Bottom bar of "L",</td> <td>Lower bar of "F", Bottom bar of "Z"</td> </tr> </table> <div style="padding-left: 40px;">Replace faulty AWDR CCA.</div> <p>Step 3. Check ACL CCA by replacing with a known good ACL CCA (para 3-17). <div style="padding-left: 40px;">a. Replace faulty ACL CCA.</div> <div style="padding-left: 40px;">b. Refer to next higher level of maintenance.</div> </p>	a. AWDR A4	Missing:	Top 2 horizontal bars of "E", Top bar of "T",	Top bar of "F", Top bar of "Z"	b. AWDR A5	Missing:	Crossbar of "A", Bottom bar of "L",	Lower bar of "F", Bottom bar of "Z"
a. AWDR A4	Missing:	Top 2 horizontal bars of "E", Top bar of "T",	Top bar of "F", Top bar of "Z"					
b. AWDR A5	Missing:	Crossbar of "A", Bottom bar of "L",	Lower bar of "F", Bottom bar of "Z"					
3-15								

3-7. TROUBLESHOOTING TABLE - Continued

Table 3-2. Dot Matrix Printer Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. INCOMPLETE CHARACTERS - Continued	Step 4. Check ACH CCA by replacing with a known good ACH CCA (para 3-18).	Replace faulty ACH CCA.
	Step 5. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).	Replace faulty APTR/MPTR CCA.
8. PAPER NOT FEEDING	Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between APTR/MPTR CCA and paper motor is secure.	Securely install cabling.
	Step 2. Check paper motor by replacing with a known good paper motor assembly (para 3-29).	Replace faulty paper motor.
	Step 3. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).	<ul style="list-style-type: none"> a. Replace faulty APTR/MPTR CCA. b. Refer to next higher level of maintenance.
9. LINE SPACING UNEVEN	Step 1. Check paper motor drive belt adjustment (para 3-35).	Adjust paper motor drive belt, if required.
	Step 2. Check paper motor by replacing with a known good paper motor assembly (para 3-29).	<ul style="list-style-type: none"> a. Replace faulty paper motor. b. Refer to next higher level of maintenance.

3-7. TROUBLESHOOTING TABLE - Continued

Table 3-2. Dot Matrix Printer Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
10. RIBBON NOT ADVANCING	<p>Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between APTR/MPTR CCA and ribbon motor is secure.</p>	<p>Securely install cabling.</p>
	<p>Step 2. Check ribbon motor by replacing with a known good ribbon motor (para 3-24).</p>	<p>Replace faulty ribbon motor.</p>
	<p>Step 3. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).</p>	<p>a. Replace faulty APTR1MPTR CCA. b. Refer to next higher level of maintenance.</p>
11. FAN NOT RUNNING	<p>Step 1. Remove right end cap assembly (Tempest printer) (para 3-12) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between APTR/MPTR CCA and fan assembly is secure.</p>	<p>Securely install cabling.</p>
	<p>Step 2. Check fan assembly by replacing with a known good fan assembly (para 3-25 or 3-26).</p>	<p>Replace faulty fan assembly.</p>
	<p>Step 3. Check ACL CCA by replacing with a known good ACL CCA (para 3-17).</p>	<p>a. Replace faulty ACL CCA. b. Refer to next higher level of maintenance.</p>

3-7. TROUBLESHOOTING TABLE - Continued

Table 3-2. Dot Matrix Printer Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
12. CONSTANT PAPER OUT INDICATION	Step 1. Check paper out switch by replacing with a known good paper out switch (para 3-31).	Replace faulty paper out switch.
	Step 2. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).	a. Replace faulty APTR/MPTR CCA. b. Refer to next higher level of maintenance.
13. INCORRECT FRONT PANEL OPERATION	Step 1. Check ACPL CCA by replacing with a known good ACPL CCA (para 3-21).	Replace faulty ACPL CCA.
	Step 2. Check ECPU CCA by replacing with a known good ECPU CCA (para 3-16).	Replace faulty ECPU CCA.
	Step 3. Check APTR/MPTR CCA by replacing with known good CCA (para 3-16).	Replace faulty APTR/MPTR CCA (para 3-16).
	Step 4. Check LOAD and/or PROGRAM switches by replacing with a known good switch (para 3-30).	a. Replace faulty switch. b. Refer to next higher level of maintenance.
14. NO FRONT PANEL DISPLAY, CONSTANT AUDIBLE ALARM	Refer to Malfunction 13, Incorrect Front Panel Operation.	
15. NO FRONT PANEL DISPLAY, NO AUDIBLE ALARM	Refer to Malfunction 13, Incorrect Front Panel Operation.	
16. CANNOT CALL UP PROGRAM MENU	Refer to Malfunction 13, Incorrect Front Panel Operation.	

3-7. TROUBLESHOOTING TABLE - Continued

Table 3-2. Dot Matrix Printer Troubleshooting - CONT

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION
<p>17. FRONT PANEL DISPLAYS FAULT CODE WITH FIRST DIGIT OF C</p>
<p>Check ECPU CCA by replacing with a known good ECPU CCA (para 3-16).</p>
<ul style="list-style-type: none"> a. Replace faulty ECPU CCA. b. Refer to next higher level of maintenance.
<p>18. FRONT PANEL DISPLAYS FAULT CODE P1, P2, P3, OR P4</p>
<p>Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).</p>
<ul style="list-style-type: none"> a. Replace faulty APTR/MPTR CCA. b. Refer to next higher level of maintenance.
<p>19. FRONT PANEL DISPLAYS FAULT CODE PC</p>
<p>Step 1. Remove front cover (Tempest printer) (para 3-8) or support assembly top bracket (non-Tempest printer) (para 3-15). Check that cabling between APTR/MPTR CCA, APHO CCA, and carriage motor is secure.</p>
<p>Securely install cabling.</p>
<p>Step 2. Check APHO CCA adjustment (para 3-33).</p>
<p>Adjust APHO CCA, as required.</p>
<p>Step 3. Check APHO CCA by replacing with a known good APHO CCA (para 3-22).</p>
<p>Replace faulty APHO CCA.</p>
<p>Step 4. Check APTR/MPTR CCA by replacing with a known good APTR/MPTR CCA (para 3-16).</p>
<ul style="list-style-type: none"> a. Replace faulty APTR/MPTR CCA. b. Refer to next higher level of maintenance.
<p>20. PRINT HEAD DRIFTS TO RIGHT MARGIN</p>
<p>Refer to Malfunction 19, Front Panel Displays Fault Code PC.</p>

SECTION III. MAINTENANCE PROCEDURES**3-8. REMOVE/INSTALL FRONT COVER ASSEMBLY (TEMPEST PRINTER)**

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precautions:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

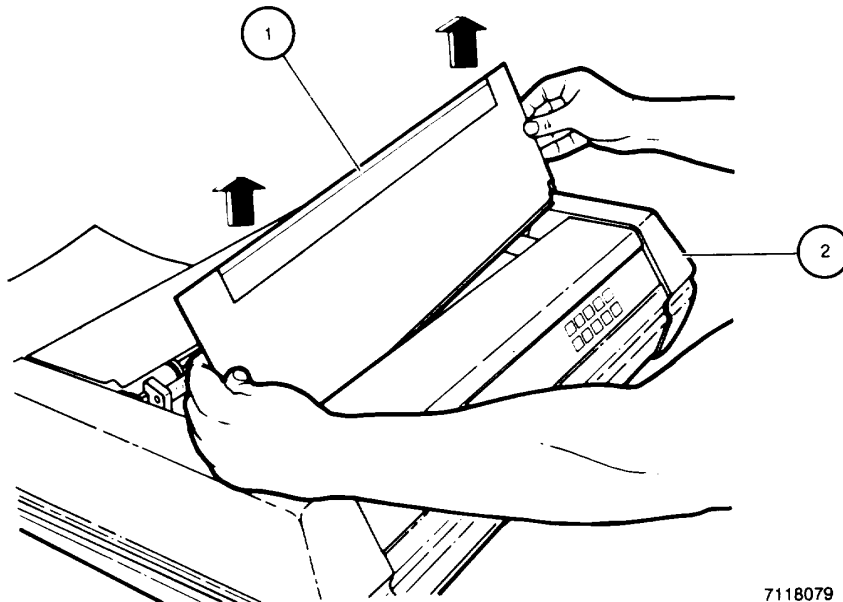
Equipment Configuration: Printer removed from system and placed on firm, clean surface.

Preliminary Procedures:

1. Remove ribbon cartridge. Refer to TM 11-5895-1392-12.
2. Remove belly pan assembly (para 3-10).

REMOVAL

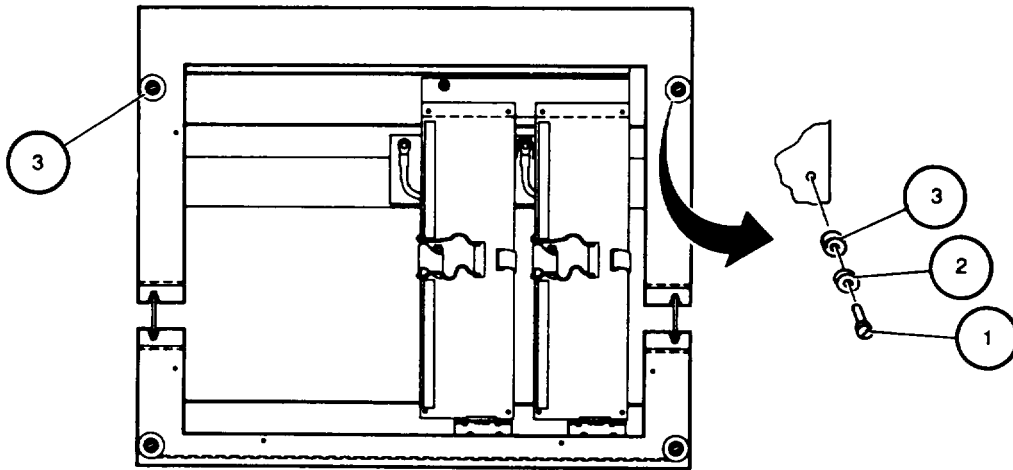
1. Raise paper shield (1) to vertical position.
2. Lift and remove paper shield (1) from hinge sockets in left and right end caps (2).



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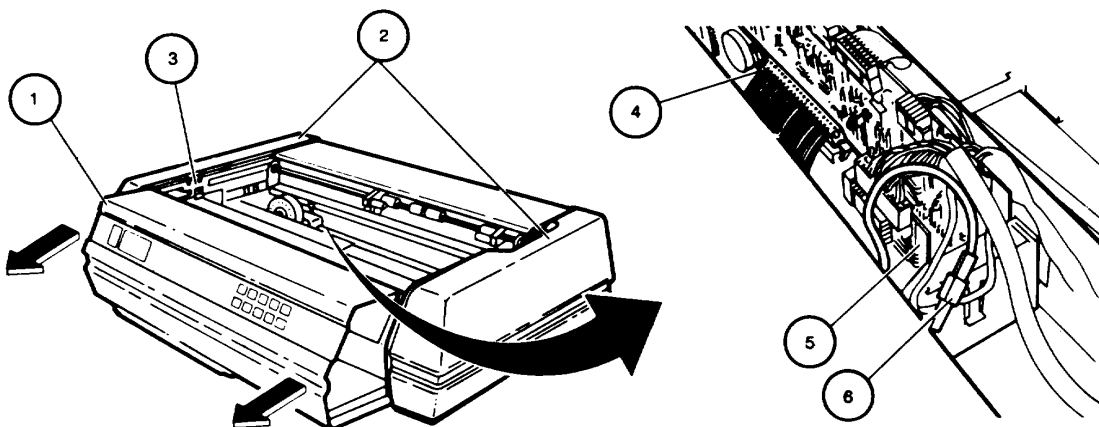
3-8. REMOVE/INSTALL FRONT COVER ASSEMBLY (TEMPEST PRINTER) - Continued

3. Stand printer up on rear panel.
4. Remove two screws (1), washers (2), and front rubber feet (3).
5. Set printer in normal upright position.



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6. Lift top front edge of cover (1) near end caps (2) to disengage from two end cap notches (3).
7. Slide cover (1) forward approximately 2 inches.
8. Tag and disconnect ribbon cable (4) and ground cable (6) from ECPU CCA (5).
9. Slide cover (1) forward and remove from printer.

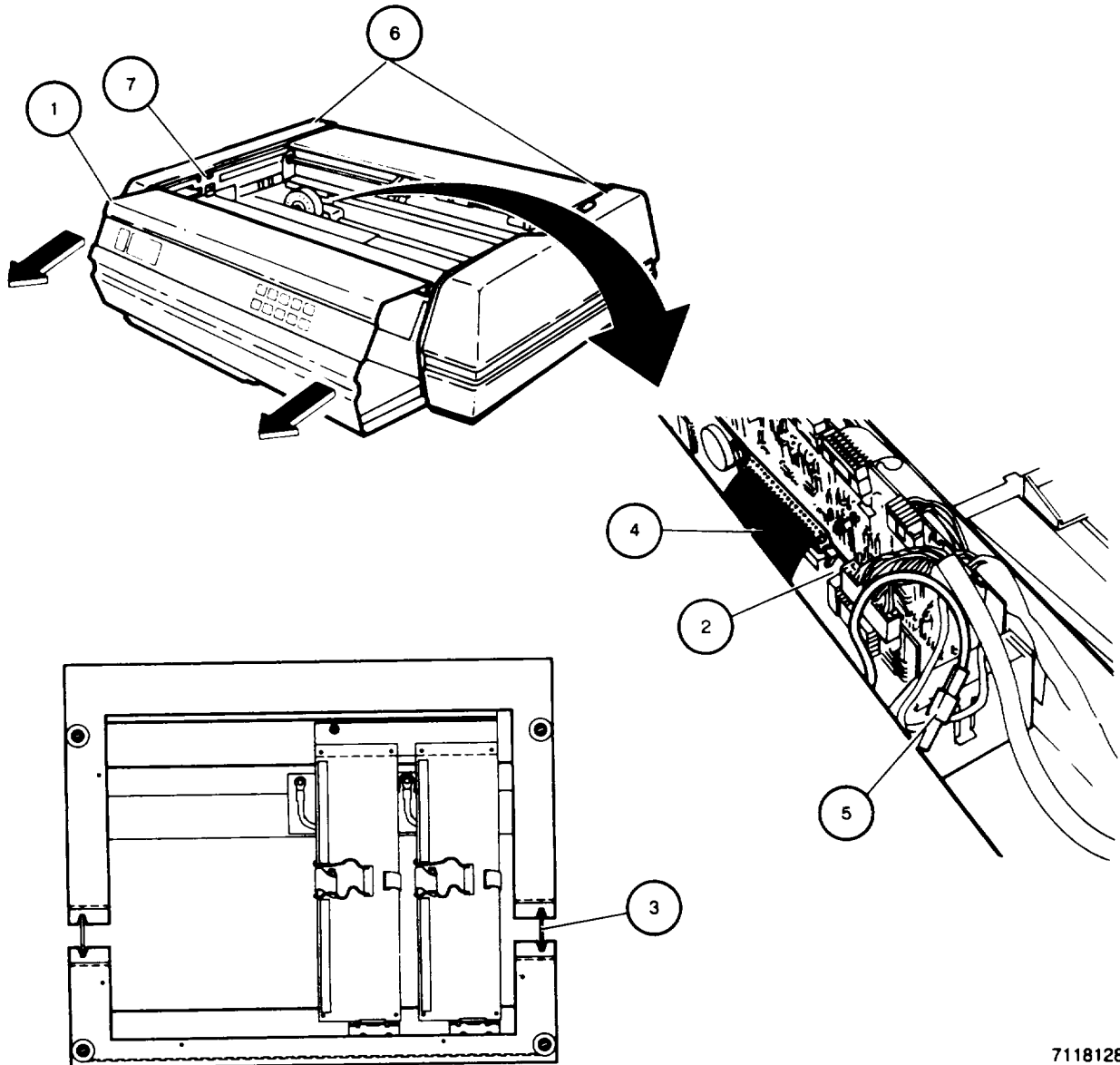


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3-8. REMOVE/INSTALL FRONT COVER ASSEMBLY (TEMPEST PRINTER) - Continued

INSTALLATION

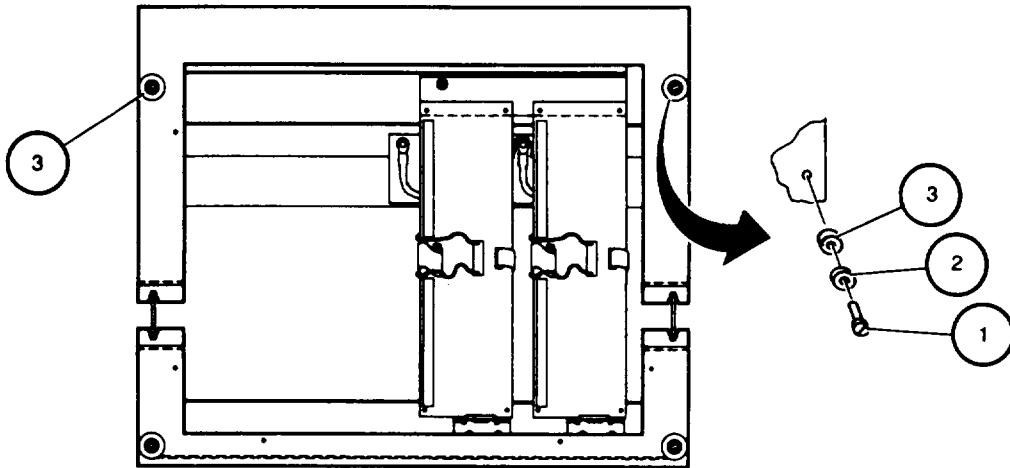
1. Slide front cover (1) onto front of printer until about 2 inches from ECPU CCA (2).
2. Connect ribbon cable (4) and ground cable (5) to ECPU CCA (2) as tagged. Remove tags.
3. Lift top front edge of front cover (1) near end caps (6), slide forward, and engage two end cap notches (7).
4. Ensure that front cover engages two brackets (3) in chassis bottom.



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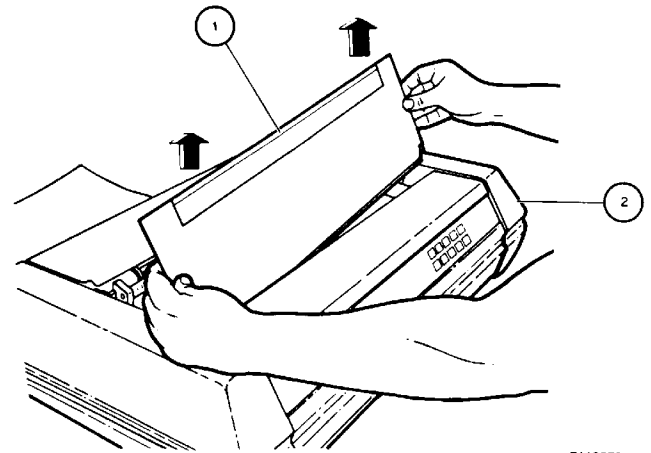
3-8. REMOVE/INSTALL FRONT COVER ASSEMBLY (TEMPEST PRINTER) - Continued

5. Stand printer up on rear panel.
6. Install two screws (1), washers (2), and front rubber feet (3).
7. Set printer in normal upright position.



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8. Position paper shield (1) to engage hinge sockets in left and right end caps (2).
9. Lower paper shield (1) into normal operating position.



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FOLLOW-ON MAINTENANCE:

1. Install belly pan assembly (para 3-10).
2. Install ribbon cartridge. Refer to TM 11-5895-1392-12.

3-9. REMOVE/INSTALL TOP COVER ASSEMBLY (NON-TEMPEST PRINTER)

This task covers: a. Removal b. Installation

INITIAL SETUP**General Safety Precautions:****CAUTION**

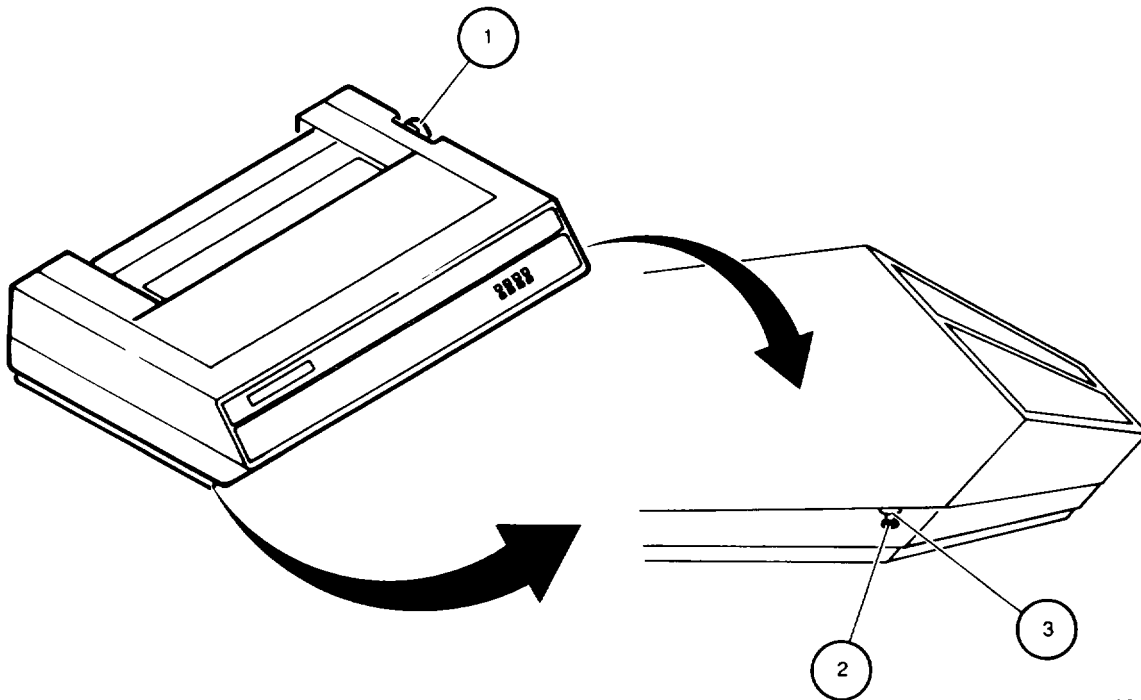
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Printer removed from system and placed on firm, clean surface.

Preliminary Procedure: Remove ribbon cartridge. Refer to TM 11-5895-1392-12.

REMOVAL

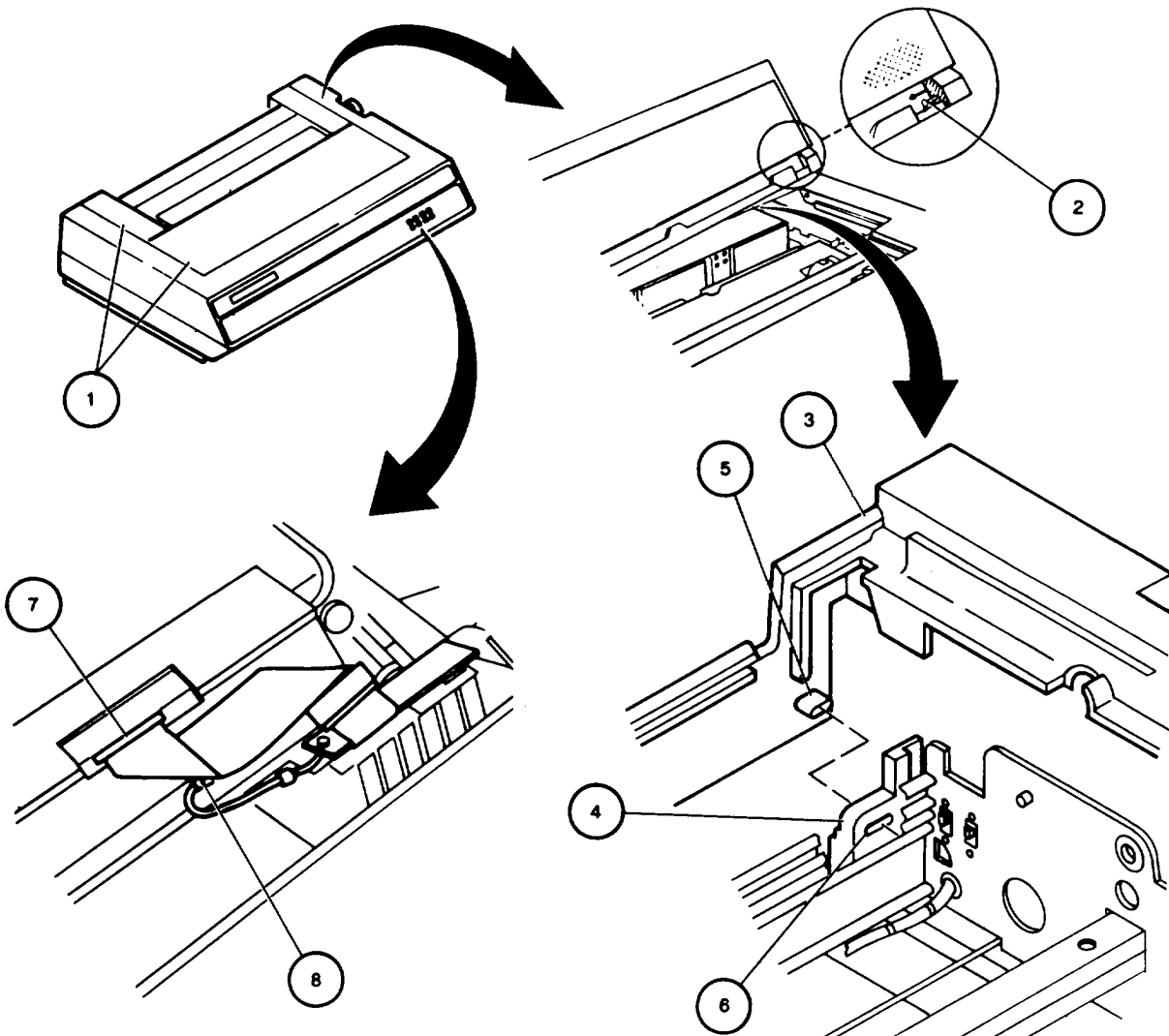
1. Remove platen knob (1).
2. Working at sides of printer using needle-nosed pliers, pull down pins (2) in both right and left cover fasteners (3) (left side shown).



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3-9. REMOVE/INSTALL TOP COVER ASSEMBLY (NON-TEMPEST PRINTER) - Continued

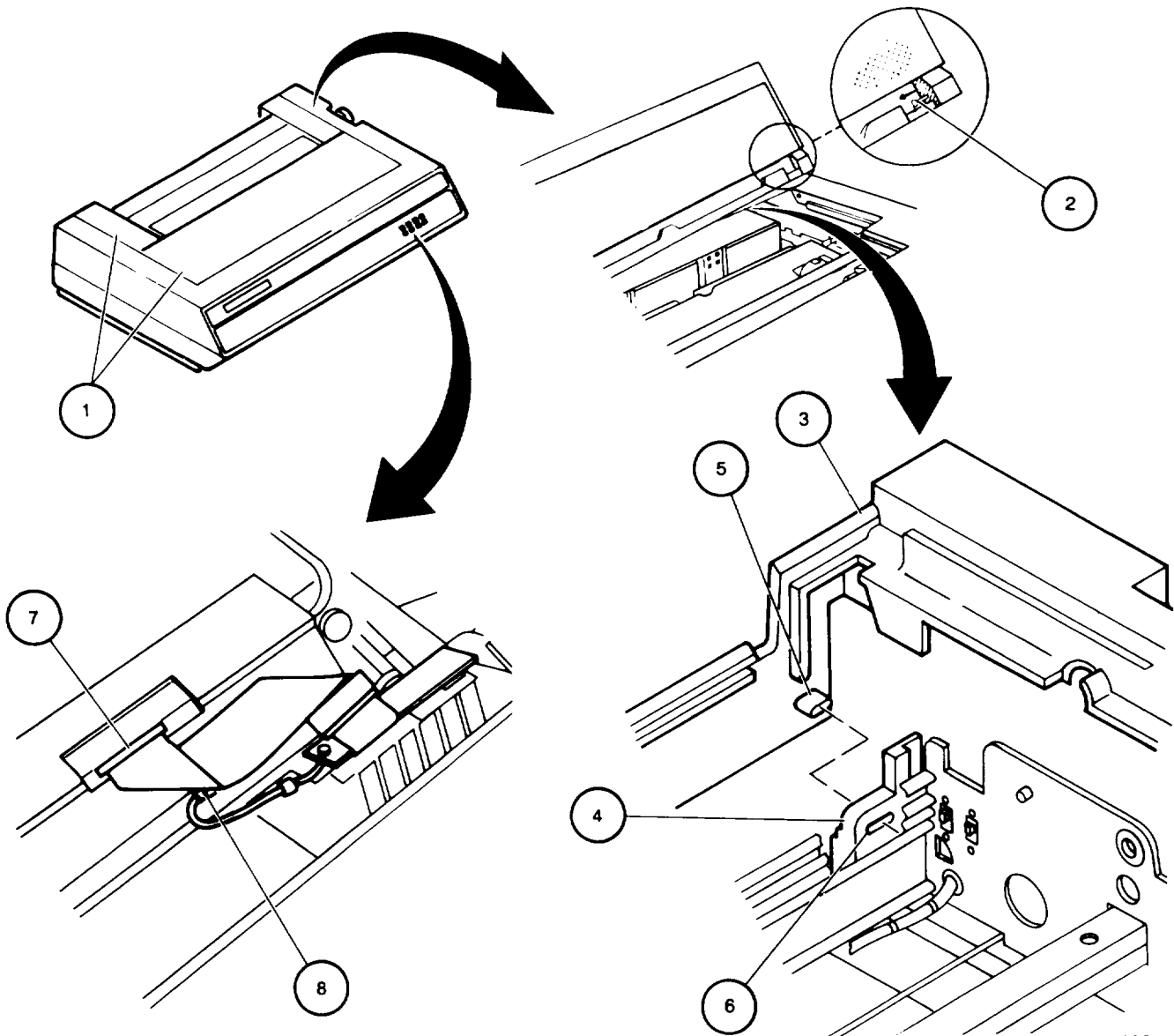
3. Working at rear panel, lift and remove front and rear paper shields (1) by pulling right or left spring-loaded hinge pins (2) on each paper shield (rear shield right pin shown).
4. Pull top cover (3) while pushing top edge of bottom cover (4) forward, disengaging top cover retaining tab (5) from bottom cover slot (6). Pull top cover upward.
5. Repeat step 4 for left side of rear panel.
6. Position top cover (3) to access cables (7 and 8).
7. Tag and disconnect ribbon cable (7) (cable not keyed) and ground cable (8).
8. Remove top cover (3).



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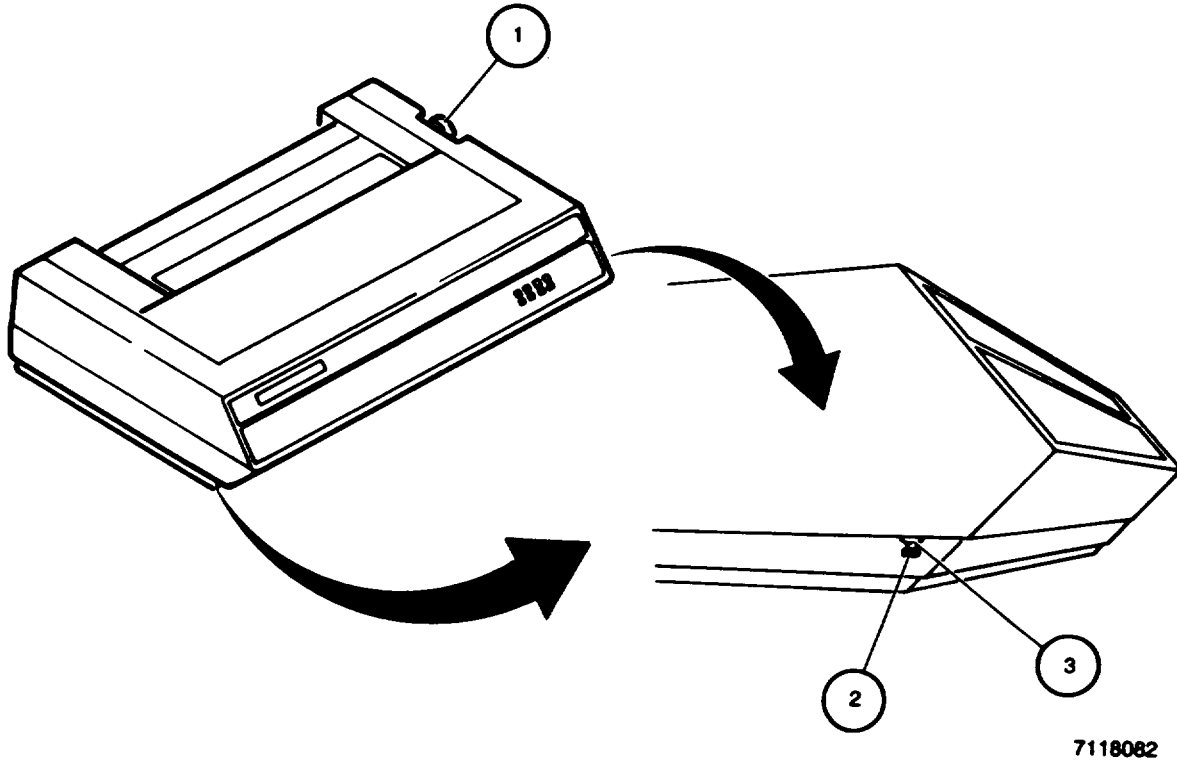
3-9. REMOVE/INSTALL TOP COVER ASSEMBLY (NON-TEMPEST PRINTER) - Continued**INSTALLATION**

1. Position top cover (3) so cables (7 and 8) can be connected.
2. Connect ribbon cable (7) and ground cable (8) as tagged. Remove tags.
3. Working at rear panel, position top cover (3) so that two retaining tabs (5) in top cover engage two slots (6) in bottom cover (4) (right side shown).
4. Install front and rear paper shields (1), ensuring that right and left spring-loaded hinge pins (2) latch.



3-9. REMOVE/INSTALL TOP COVER ASSEMBLY (NON-TEMPEST PRINTER) - Continued

5. While holding top cover in place, tap pins (2) in both right and left top cover fasteners (3) until they snap in place (left side shown).
6. Install platen knob (1).



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2-23-90

3-10. REMOVE/INSTALL BELLY PAN ASSEMBLY (TEMPEST PRINTER)

This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precautions:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Printer removed from system and placed on firm, clean surface.

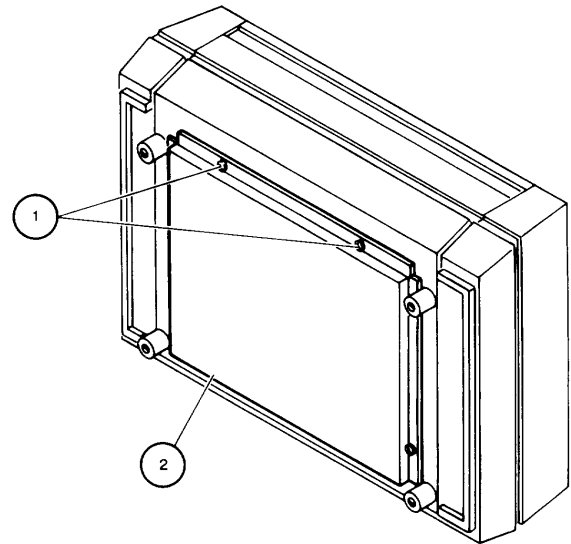
REMOVAL

1. Stand printer up on rear panel.
2. Loosen eight captive screws (1) and remove belly pan (2).

CAUTION

Place clean foam pad under printer before returning printer to normal upright position or wire drive (AWDR) Circuit Card Assemblies (CCAs) mounted under printer may be damaged.

3. Set printer in normal upright position.



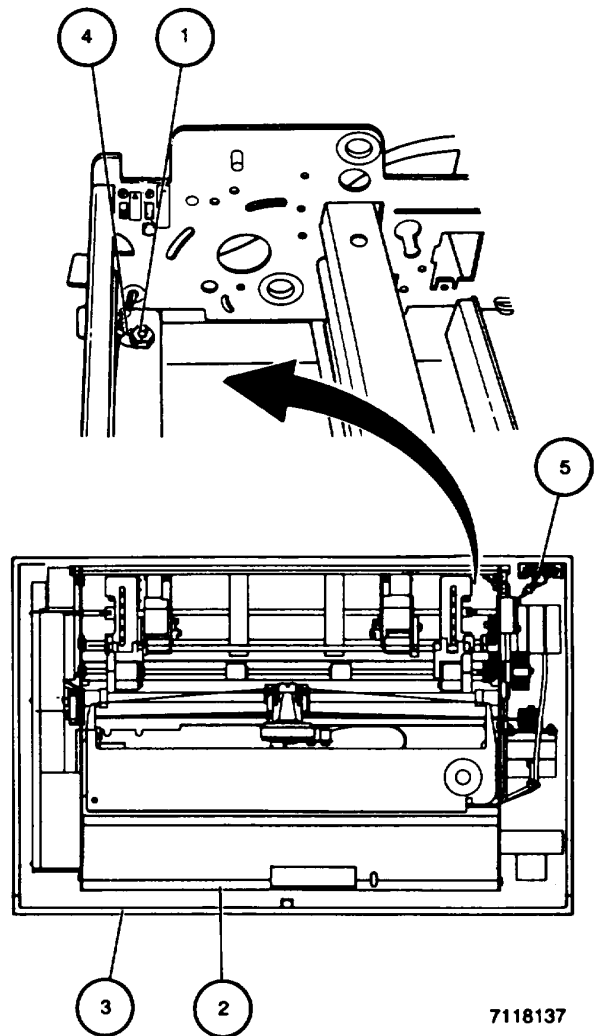
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INSTALLATION

1. Stand printer up on rear panel.
2. Place belly pan (2) in installed position.
3. Tighten eight captive screws (1).

3-11. REMOVE/INSTALL BOTTOM COVER ASSEMBLY (NON-TEMPEST PRINTER)**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Preliminary Procedure:** Remove top cover assembly (non-Tempest printer) (para 3-9).**REMOVAL**

1. Loosen four nuts (1) (right rear shown).
2. Slide chassis (2) forward in bottom cover (3) so four nuts (1) enter four keyholes (4).
3. Lift and remove chassis (2) from bottom cover (3), guiding rear panel connector plate (5) from bottom cover.

**INSTALLATION**

1. Position chassis (2) into bottom cover (3) so that four nuts (1) enter four keyholes (4), guiding rear panel connector plate (5) into bottom cover.
2. Slide chassis (2) toward rear of bottom cover (3) so that four nuts (1) engage chassis.
3. Tighten four nuts (1).

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FOLLOW-ON MAINTENANCE: Install top cover assembly (non-Tempest printer) (para 3-9).

3-12. REMOVE/INSTALL END CAPS (TEMPEST PRINTER)

This task covers:

a. Removal

b. Installation

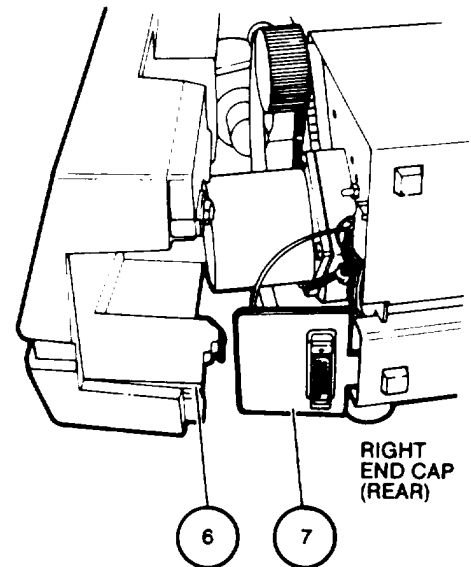
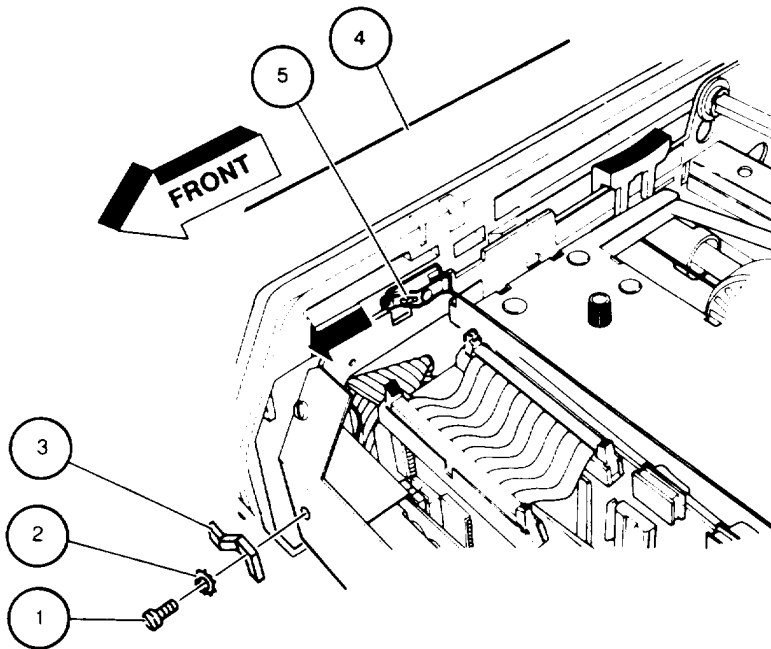
INITIAL SETUP**NOTE**

- Replace right and left end caps the same way, except where noted. Left end cap is shown.
- During front cover assembly removal, also loosen rear rubber foot at bottom of printer that is nearest end cap being removed.

Preliminary Procedure: Remove front cover assembly (para 3-8).

REMOVAL

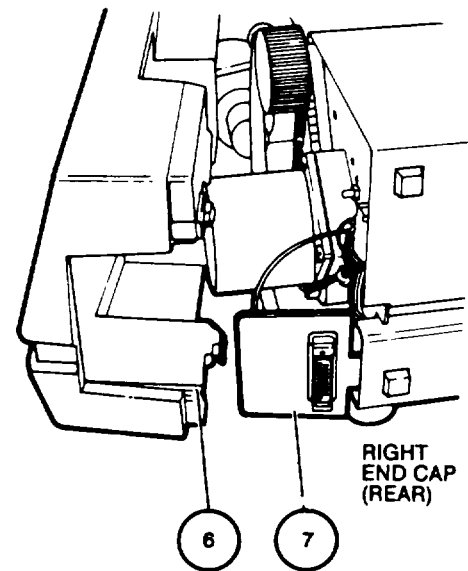
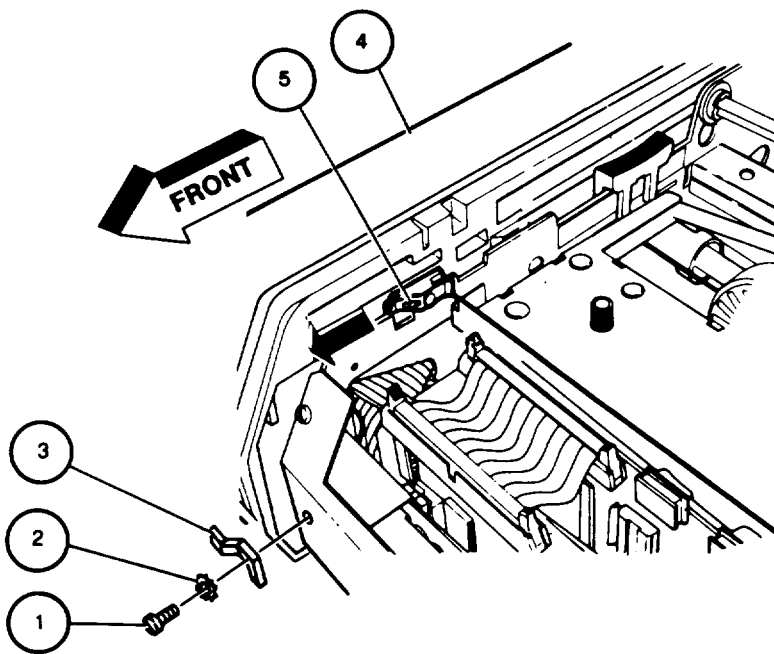
1. Remove screw (1), lockwasher (2), and end cap retainer (3).
2. Slide end cap (4) toward front of printer until top and bottom spring catches (5) (front top shown) clear frame. If removing right end cap, ensure that rear cover connector plate (7) slides from grooves (6) in end cap.



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3-12. REMOVE/INSTALL END CAPS (TEMPEST PRINTER) - Continued**INSTALLATION**

1. Position left end cap (4) against frame and slide toward rear of printer so that top and bottom spring catches (5) (front top shown) will engage frame. If installing right end cap, ensure that rear cover connector plate (7) slides into grooves (6) in end cap.
2. Install screw (1), lockwasher (2), and end cap retainer (3).



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FOLLOW-ON MAINTENANCE: Install front cover assembly (para 3-8), tightening all rubber feet loosened in preliminary procedure.

3-13. REMOVE/INSTALL REAR COVER ASSEMBLY (TEMPEST PRINTER)

This task covers: a. Removal b. Installation

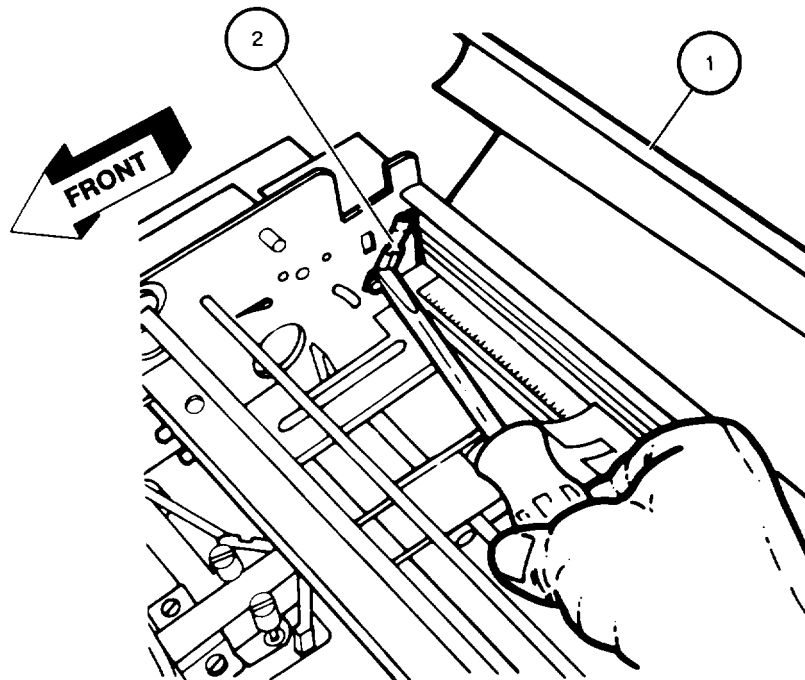
INITIAL SETUP**General Safety Precautions:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Printer removed from system and placed on firm, clean surface.

REMOVAL

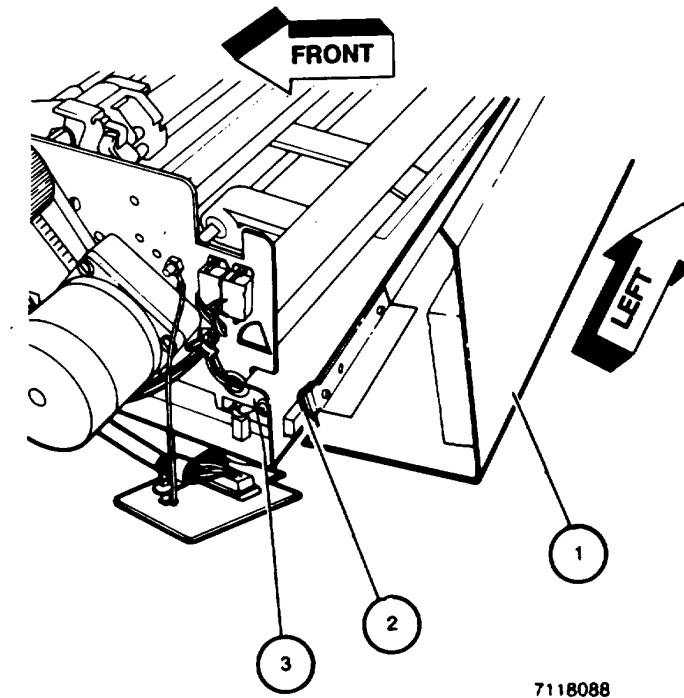
1. Raise and hold rear cover (1) in vertical position.
2. Disconnect ground cable (2).



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3-13. REMOVE/INSTALL REAR COVER ASSEMBLY (TEMPEST PRINTER) - Continued

3. Push rear cover (1) toward left side of printer until right hinge bracket (2) clears slot in right side frame (3). Remove cover.



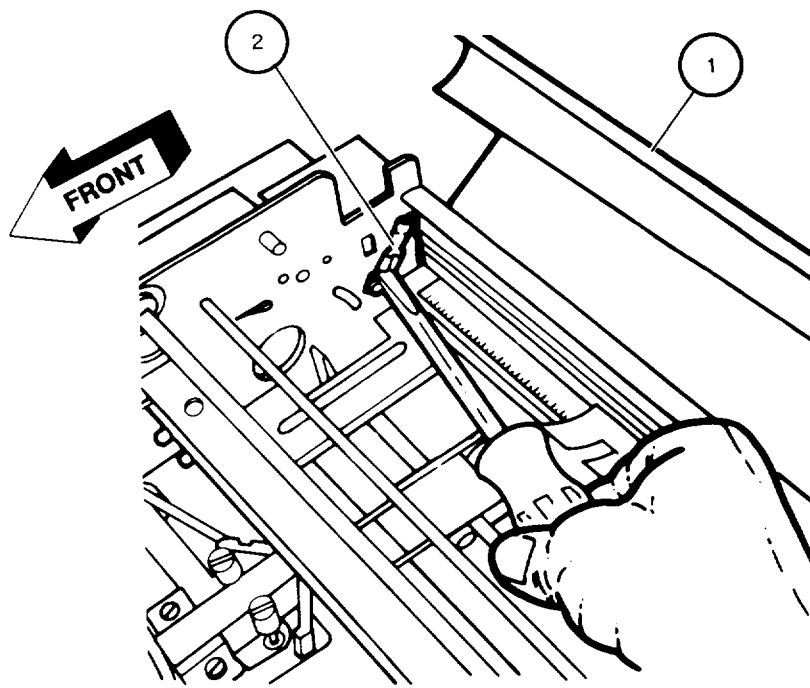
7118088

INSTALLATION

1. Position rear cover (1) so that left hinge bracket (2) engages slot in left side frame (3).
2. Push rear cover (1) toward left side of printer.
3. Place right side of cover (2) in installed position.

3-13. REMOVE/INSTALL REAR COVER ASSEMBLY (TEMPEST PRINTER) - Continued

4. Connect ground cable (2).
5. Lower rear cover (1) into normal operating position.



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3-14. REMOVE/INSTALL SUPPORT ASSEMBLY FRONT BRACKET

This task covers:

a. Removal

b. Installation

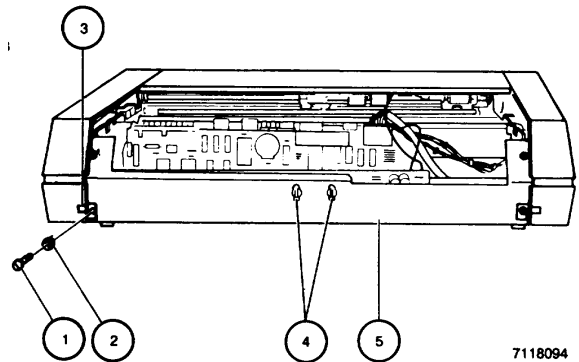
INITIAL SETUP

Preliminary Procedures:

1. If working on Tempest printer, remove front cover assembly (para 3-8).
2. If working on non-Tempest printer, remove support assembly top bracket (para 3-15).

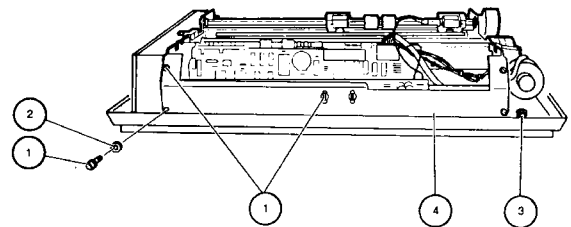
REMOVAL

1. If working on non-Tempest printer, go to step 5.
2. Remove four screws (1) and lockwashers (2) and two retainers (3) (left side screws shown).
3. Remove two screws (4).
4. Remove bracket (5). Task complete.



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5. Remove six screws (1) and lockwashers (2) (left side screws shown).
6. Remove locknut (3) from both right and left ends of bracket (4).
7. Lift chassis and remove bracket (4). Task complete.

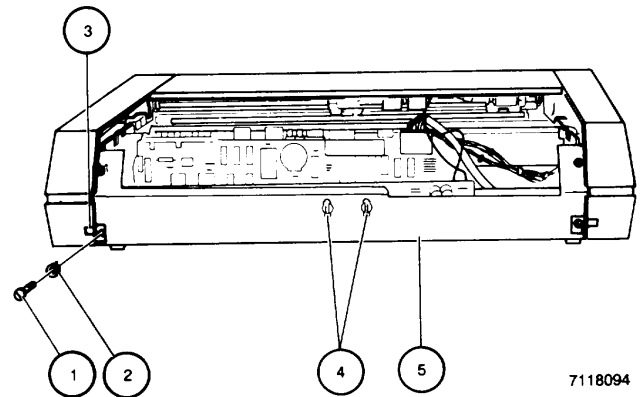


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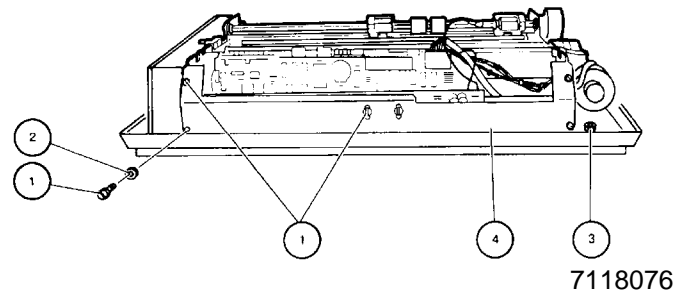
3-14. REMOVE/INSTALL SUPPORT ASSEMBLY FRONT BRACKET - Continued

INSTALLATION

1. If working on non-Tempest printer, go to step 5.
2. Place bracket (5) in installed position.
3. Install four screws (1) and lockwashers (2) and two retainers (3) (left side screws shown).
4. Install two screws (4). Task complete.



5. Place bracket (4) in installed position.
6. Install locknuts (3) at right and left ends of bracket (4).
7. Install six screws (1) and lock-washers (2) (left side screws shown). Task complete.



FOLLOW-ON MAINTENANCE:

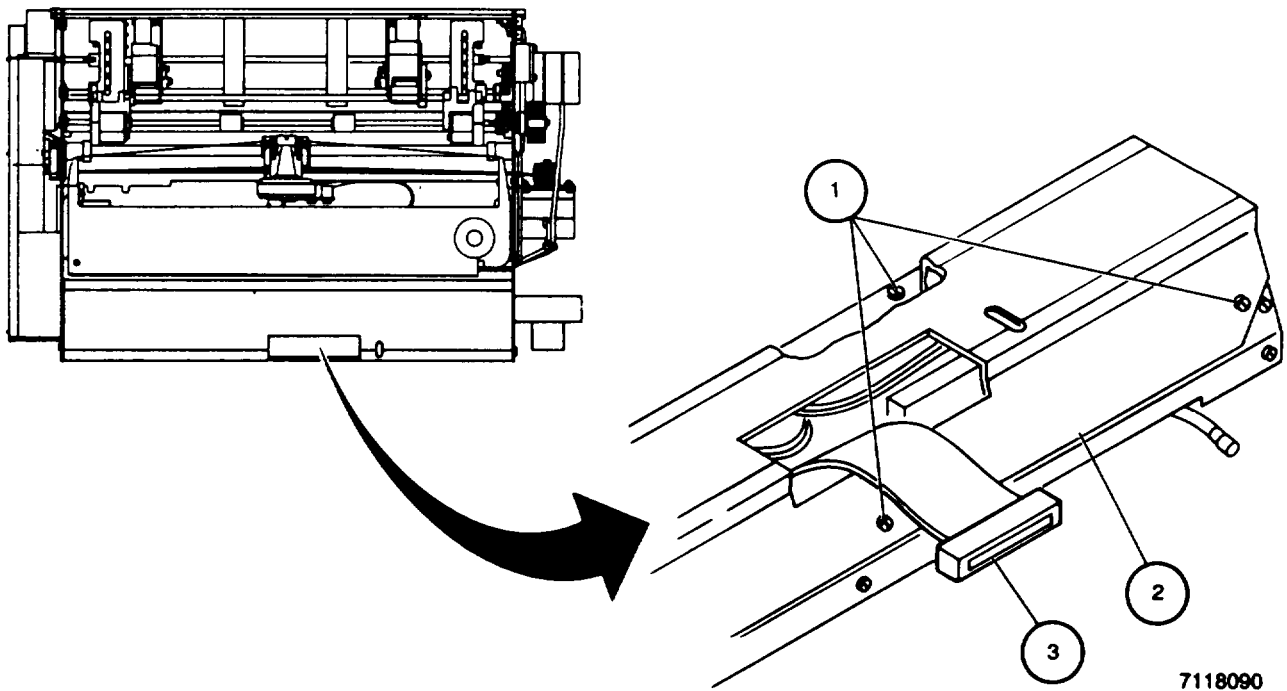
1. If working on Tempest printer, install front cover assembly (para 3-8).
2. If working on non-Tempest printer, install support assembly top bracket (para 3-15).

3-15. REMOVE/INSTALL SUPPORT ASSEMBLY TOP BRACKET (NON-TEMPEST PRINTER)

This task covers:

a. Removal

b. Installation

INITIAL SETUP**Preliminary Procedure:** Remove top cover assembly (para 3-9).**REMOVAL**

1. Loosen five screws (1) (right side screws shown).
2. Remove top bracket (2), guiding ribbon cable (3) through opening in bracket.

INSTALLATION

1. Place top bracket (2) in installed position, ensuring that ribbon cable (3) is routed through opening in bracket.
2. Engage and tighten five screws (1) (right side screws shown).

FOLLOW-ON MAINTENANCE: Install top cover assembly (para 3-9).

3-16. REPLACE PROCESSOR (ECPU) OR PRINTER CONTROL (APTR/MPTR) CCA

This task covers: a. Removal b. Installation

INITIAL SETUP

NOTE

Replace Tempest or non-Tempest printer ECPU or APTR/MPTR CCAs the same way, except where noted. ECPU CCA is shown.

Preliminary Procedures:

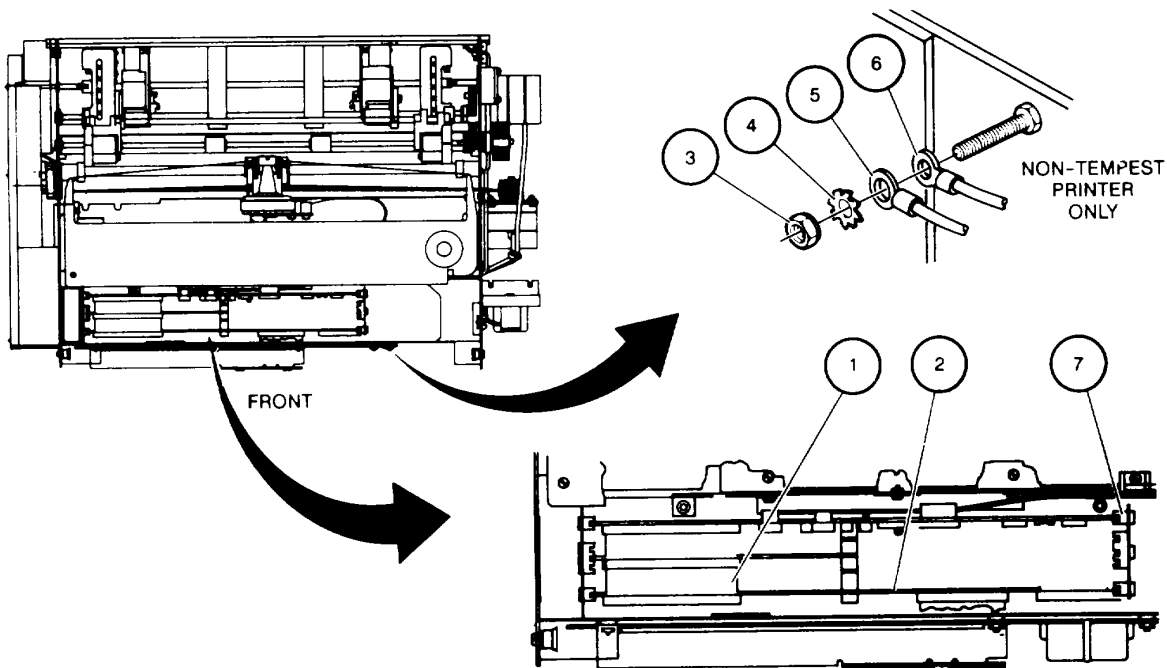
1. If working on Tempest printer, remove front cover assembly (para 3-8).
2. If working on non-Tempest printer, remove support assembly top bracket (para 3-15).

REMOVAL

NOTE

Some connectors have built-in ejectors for quick disconnect. Press small levers on connectors outward to disconnect.

1. Tag and disconnect all cables (1) from top edge of CCA (2).
2. If working on non-Tempest printer, remove nut (3), star washer (4), ground cable (5), and braided shield cable (6).
3. Remove CCA (2) from support assembly (7).

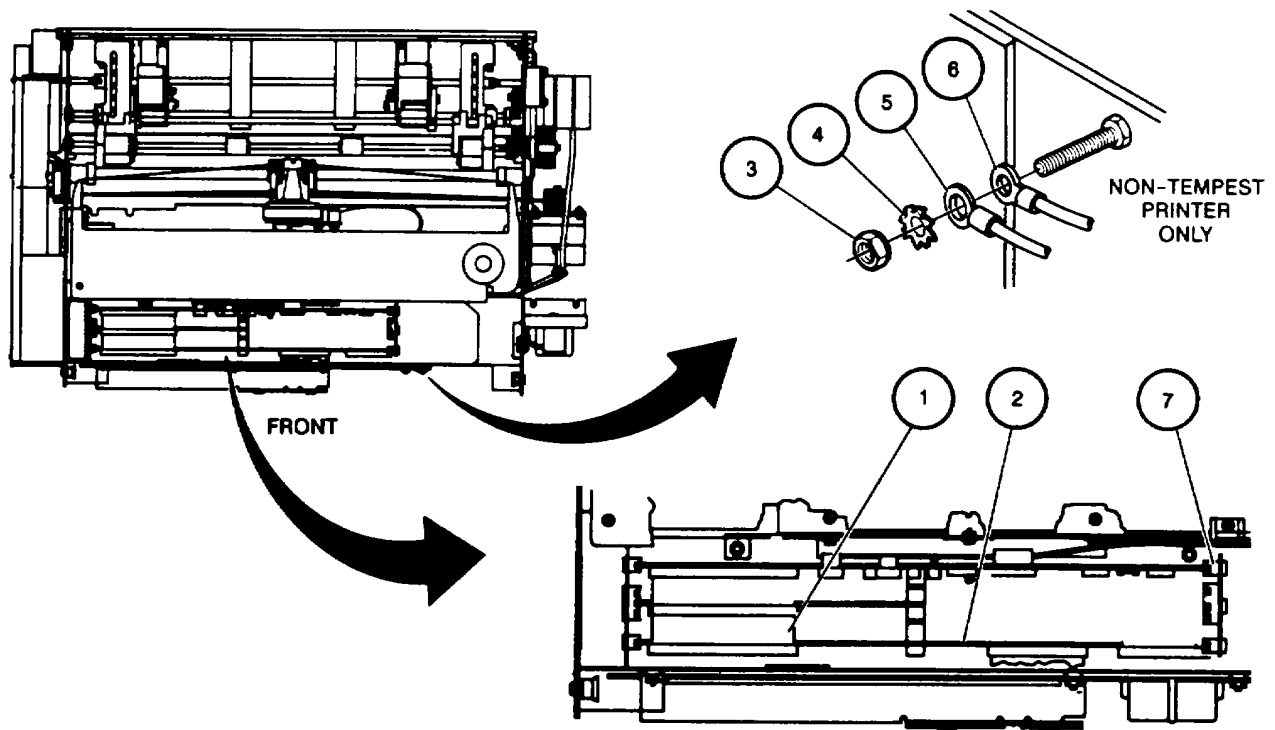


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3-16. REPLACE PROCESSOR (ECPU) OR PRINTER CONTROL (APTR/MPTR) CCA - Continued

INSTALLATION

1. Install CCA (2) in support assembly (7).
2. Connect all cables (1) along top edge of CCA (2) as tagged. Remove tags.
3. If working on non-Tempest printer, install nut (3), star washer (4), ground cable (5), and braided shield cable (6).



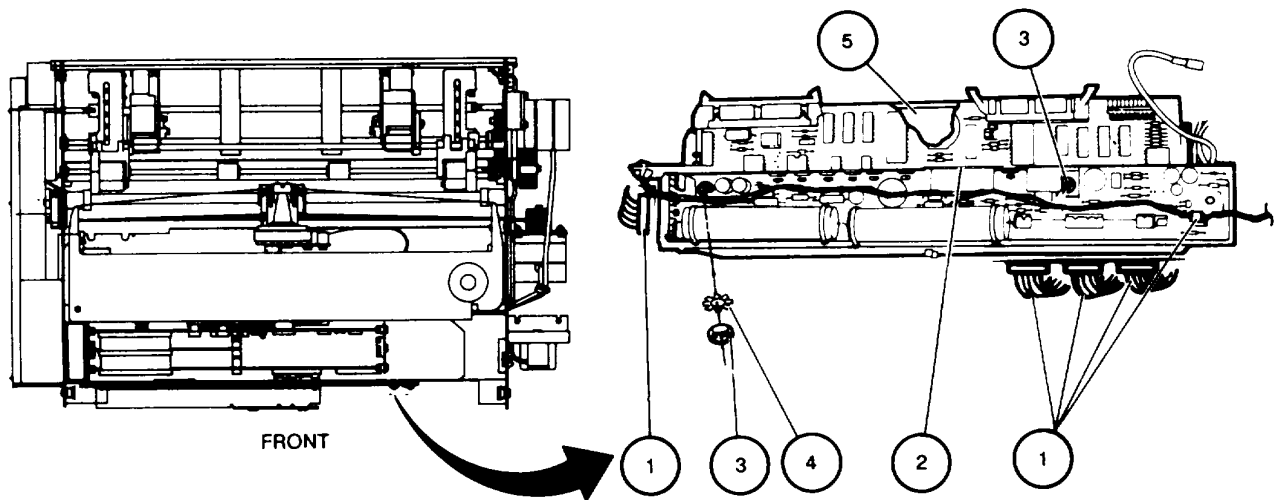
7118100

FOLLOW-ON MAINTENANCE:

1. If working on Tempest printer, install front cover assembly (para 3-8).
2. If working on non-Tempest printer, install support assembly top bracket (para 3-15).

3-17. REPLACE POWER SUPPLY (ACL) CCA**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Preliminary Procedure:** Remove support assembly front bracket (para 3-14).**REMOVAL**

1. Working at front of printer, tag and disconnect five cables (1) from ACL CCA (2).
2. (If working on non-Tempest printer, lift chassis before proceeding.) Remove three nuts (3) and star washers (4).
3. Remove ACL CCA (2) and insulation (5).



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INSTALLATION

1. Place and hold insulation (5) and ACL CCA (2) in installed position.
2. (If working on non-Tempest printer, lift chassis before proceeding.) Install three nuts (3) and star washers (4).
3. Connect five cables (1) to ACL CCA (2) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install support assembly front bracket (para 3-14).

3-18. REPLACE SWITCHING REGULATOR (ACH) CCA

This task covers: **a. Removal** **b. Installation**

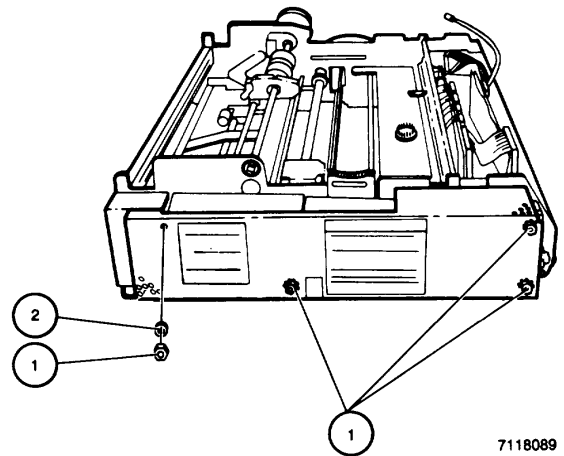
INITIAL SETUP

Preliminary Procedures:

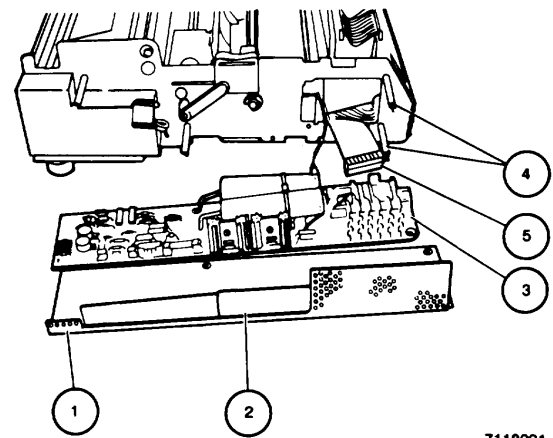
1. If working on Tempest printer, remove front cover assembly (para 3-8).
2. If working on Tempest printer, remove left end cap assembly (para 3-12).
3. If working on non-Tempest printer, remove bottom cover assembly (para 3-11).

REMOVAL

1. Remove four nuts (1) and lock-washers (2).



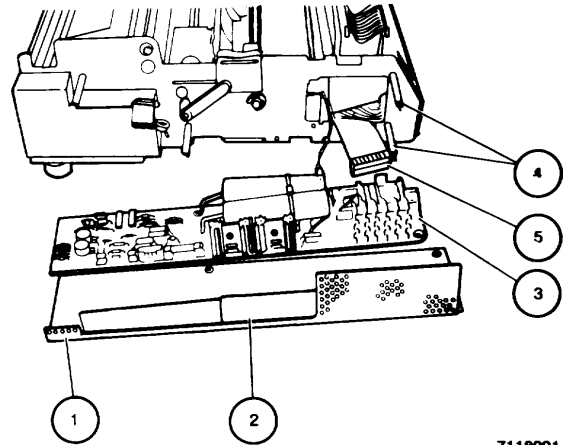
2. Remove RFI shield (1) and insulation paper (2).
3. Remove ACH CCA (3) from printer standoffs (4) and position to access cables (5).
4. Tag and disconnect cables (5) from ACH CCA (3). Remove ACH CCA.



3-18. REPLACE SWITCHING REGULATOR (ACH) CCA - Continued

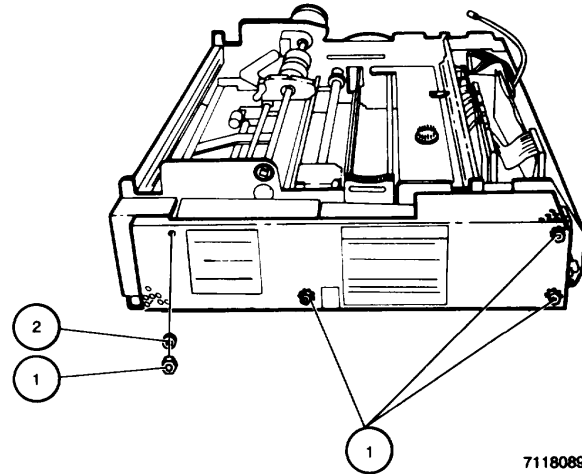
INSTALLATION

1. Position ACH CCA (3) at printer and connect cables (5) as tagged. Remove tags.
2. Install ACH CCA (3) on printer standoffs (4).
3. Install insulation paper (2) and RFI shield (1).



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4. Install four nuts (1) and lock-washers (2).



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FOLLOW-ON MAINTENANCE:

1. If working on Tempest printer, install left end cap assembly (para 3-12).
2. If working on Tempest printer, install front cover assembly (para 3-8).
3. If working on non-Tempest printer, install bottom cover assembly (para 3-11).

3-19. REPLACE WIRE DRIVER (AWDR) CCA (NON-TEMPEST PRINTER)

This task covers:

a. Removal

b. Installation

INITIAL SETUP**NOTE**

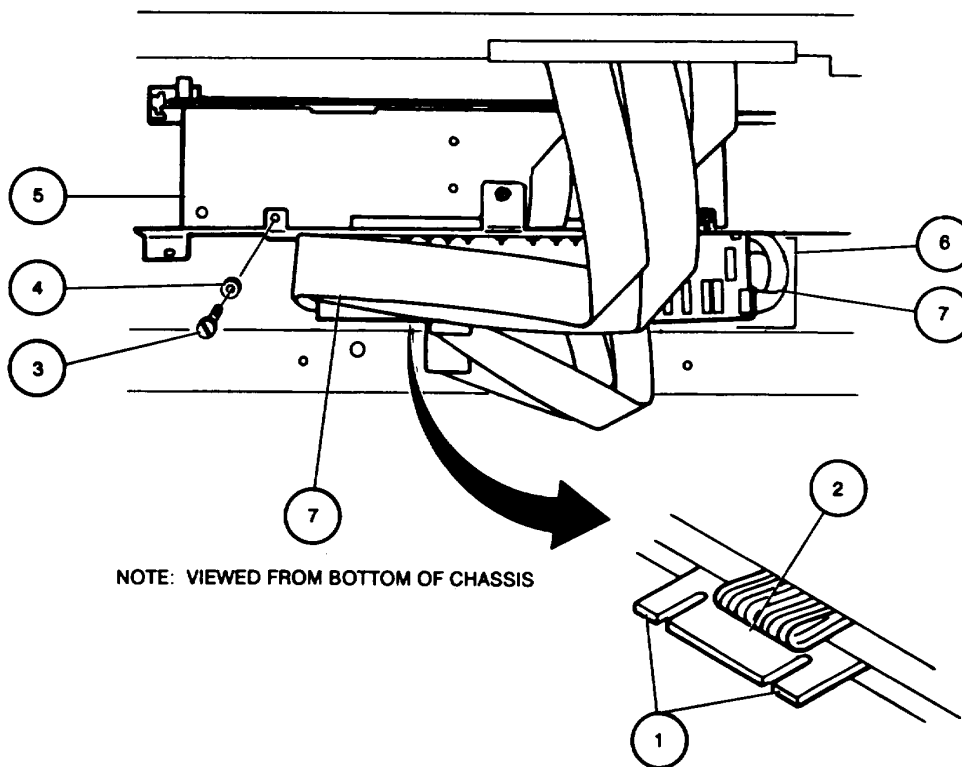
Replace upper AWDR CCA and lower AWDR CCA the same way, except where noted. Upper AWDR CCA is shown.

Equipment Condition: Print head positioned fully to the left.

Preliminary Procedure: Remove bottom cover assembly (para 3-11).

REMOVAL

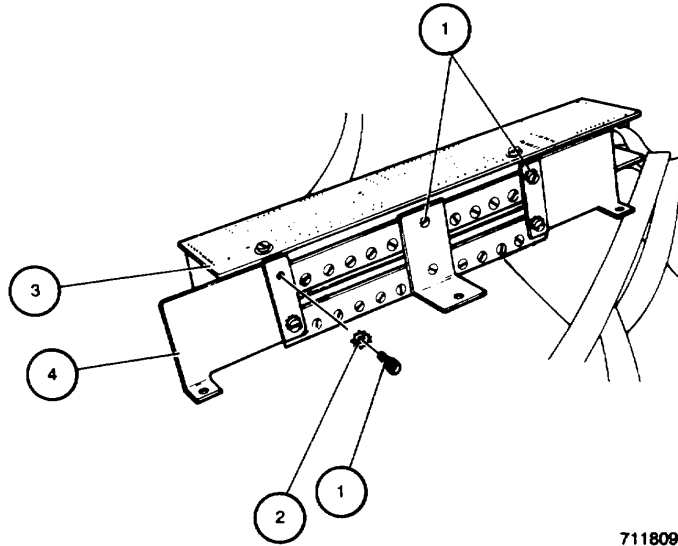
1. Working at bottom of printer, press two tabs (1) on ribbon clip (2) and push out through top of printer.
2. Remove three screws (3) and lockwashers (4) (along top edge of AWDR assembly (5)).
3. Pull out AWDR assembly (5) and insulation paper (6) far enough to access cables (7).
4. Tag and disconnect cables (7) and remove AWDR assembly (5).



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3-19. REPLACE WIRE DRIVER (AWDR) CCA (NON-TEMPEST PRINTER) - Continued

5. Remove three screws (1) and lockwashers (2) securing upper AWDR CCA (3).
6. Remove upper AWDR CCA (3) from AWDR assembly (4).



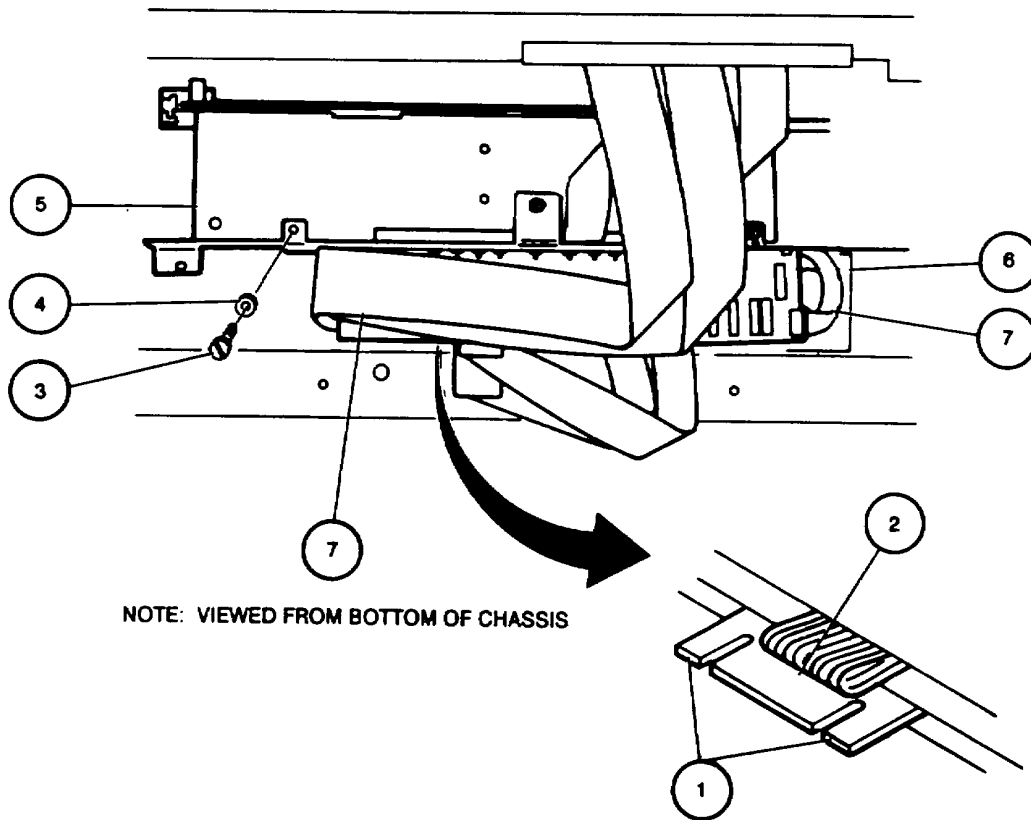
7118097

INSTALLATION

1. Install upper AWDR CCA (3) in AWDR assembly (4).
2. Install three screws (1) and lockwashers (2).

3-19. REPLACE WIRE DRIVER (AWDR) CCA (NON-TEMPEST PRINTER) - Continued

3. Working at bottom of printer, position AWDR assembly (5) so cables (7) can be connected.
4. Connect cables (7) as tagged. Remove tags.
5. Install insulation paper (6) and AWDR assembly (5) into chassis.
6. Install three screws (3) and lockwashers (4) (along top edge of AWDR assembly (5)).
7. Working at top of printer, push ribbon cable clip (2) through top of printer, ensuring that two tabs (1) engage at bottom of printer.



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FOLLOW-ON MAINTENANCE: Install bottom cover assembly (para 3-11).

3-20. REPLACE WIRE DRIVER (AWDR) CCA (TEMPEST PRINTER)

This task covers:

a. Removal

b. Installation

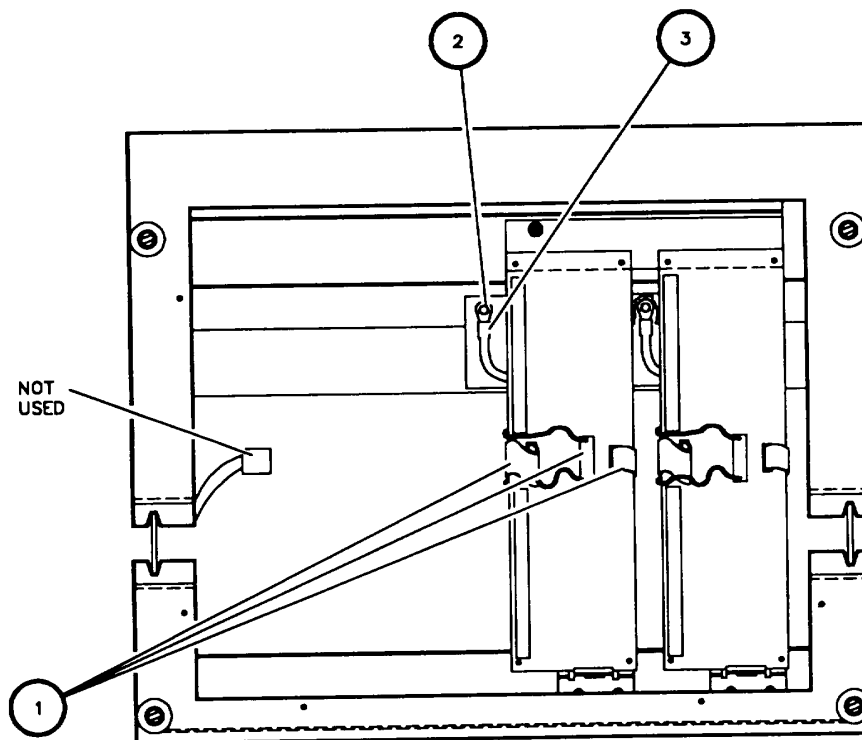
INITIAL SETUP**NOTE**

Replace right AWDR CCA and left AWDR CCA the same way. Left AWDR CCA is shown.

Preliminary Procedure: Remove front cover assembly (para 3-8).

REMOVAL

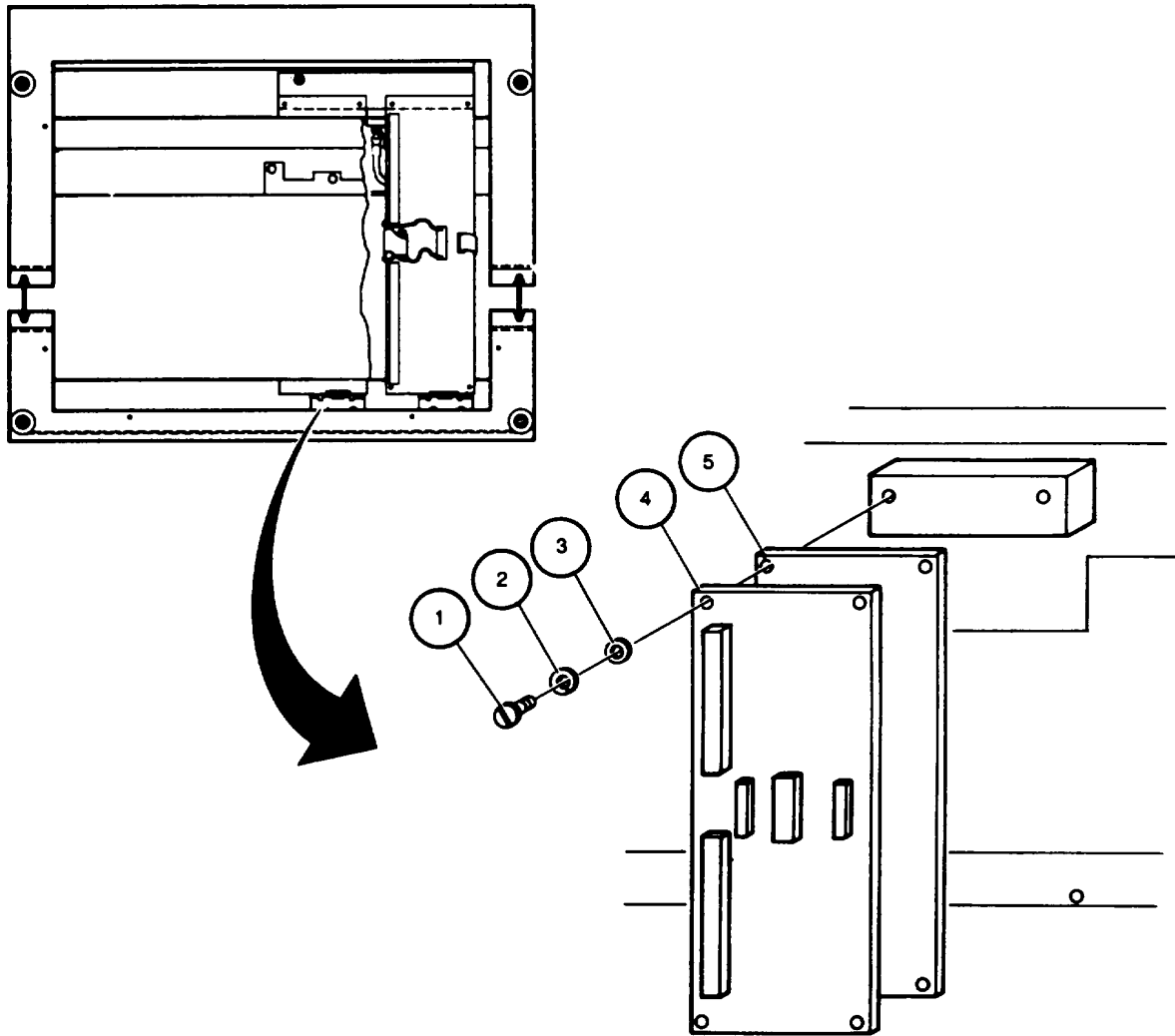
1. Stand printer up on rear panel.
2. Tag and disconnect three cables (1).
3. Loosen screw (2) and remove ground strap (3).

**BOTTOM VIEW**

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3-20. REPLACE WIRE DRIVER (AWDR) CCA (TEMPEST PRINTER) - Continued

4. Remove four screws (1), lockwashers (2), and washers (3).
5. Remove AWDR CCA (4) and insulation paper (5).



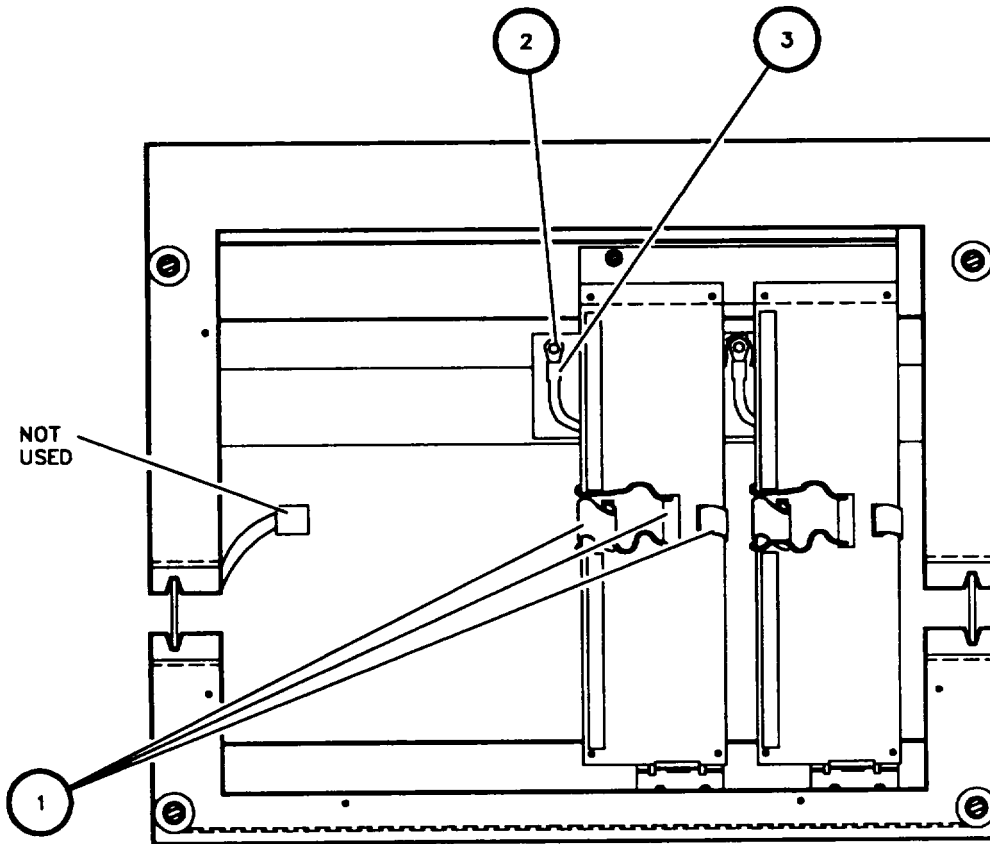
7118084

INSTALLATION

1. Position AWDR CCA (4) and insulation paper (5) in installed position, ensuring that cables are accessible for connection.
2. Install four screws (1), lockwashers (2), and washers (3).

3-20. REPLACE WIRE DRIVER (AWDR) CCA (TEMPEST PRINTER) - Continued

3. Connect three cables (1) as tagged. Remove tags.
4. Position ground strap (3) under screw (2).
5. Tighten screw (2).



BOTTOM VIEW

7118071

FOLLOW-ON MAINTENANCE: Install front cover assembly (para 3-8).

3-21. REPLACE CONTROL PANEL (ACPL) CCA

This task covers:

a. Removal

b. Installation

INITIAL SETUP**NOTE**

Replace non-Tempest and Tempest printer ACPL CCA the same way, except where noted. Tempest printer ACPL CCA is shown.

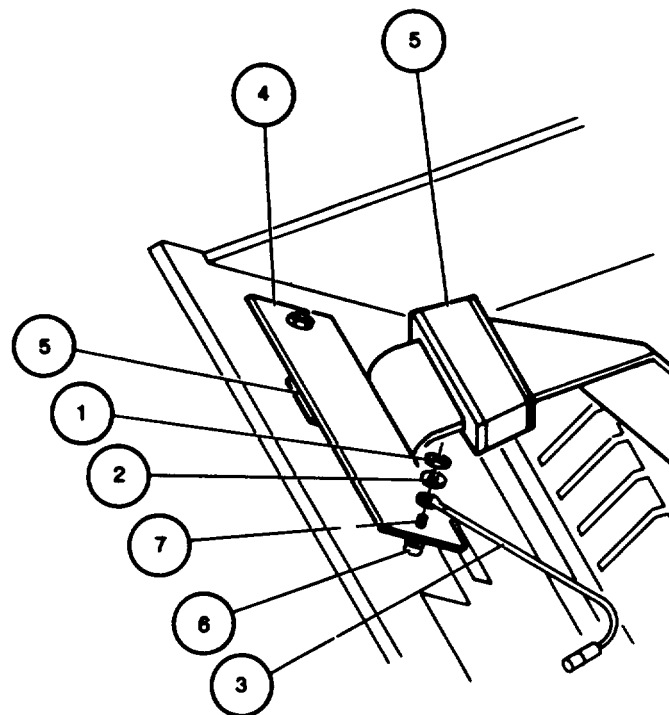
Preliminary Procedures:

1. If working on Tempest printer, remove front cover assembly (para 3-8).
2. If working on non-Tempest printer, remove top cover assembly (para 3-9).

REMOVAL**NOTE**

Non-Tempest printer uses two screws instead of two nuts.

1. Working inside front cover, remove two nuts (1), lockwashers (2), and ground cable (3).
2. Lift ACPL CCA (4) and disconnect two ribbon cables (5).
3. If working on Tempest printer, remove and retain two standoffs (6) from two screw studs (7).



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3-21. REPLACE CONTROL PANEL (ACPL) CCA - Continued

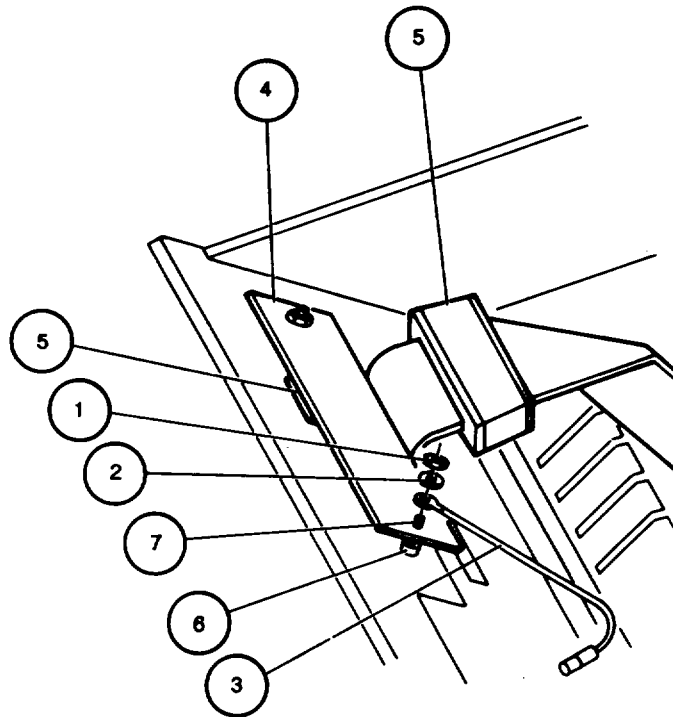
INSTALLATION

1. If working on Tempest printer, install two standoffs (6) on two screw studs (7).
2. Connect two ribbon cables (5) to ACPL CCA (4).
3. Place ACPL CCA (4) and ground cable (3) in installed position.

NOTE

Non-Tempest printer uses two screws instead of two nuts.

4. Install two nuts (1) and lockwashers (2).



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FOLLOW-ON MAINTENANCE:

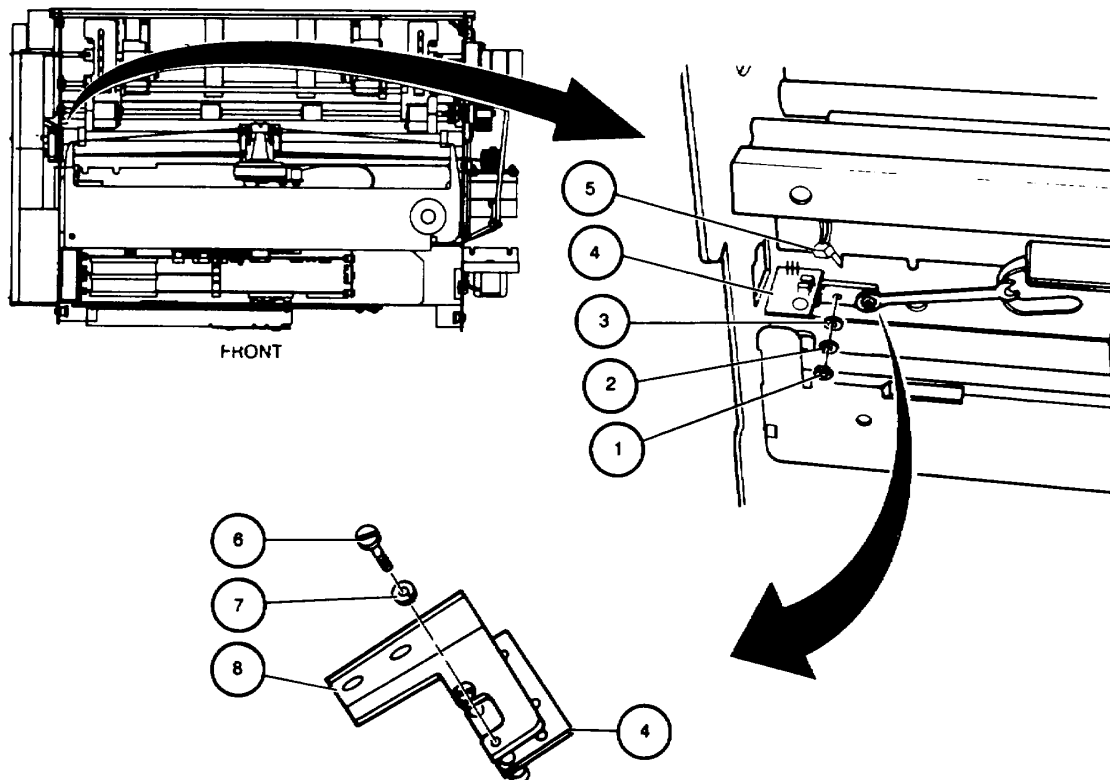
1. If working on Tempest printer, install front cover assembly (para 3-8).
2. If working on non-Tempest printer, install top cover assembly (para 3-9).

3-22. REPLACE INTERRUPTER (APHO) CCA**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Preliminary Procedures:**

1. If working on Tempest printer, remove front cover assembly (para 3-8).
2. If working on non-Tempest printer, remove top cover assembly (para 3-9).

REMOVAL

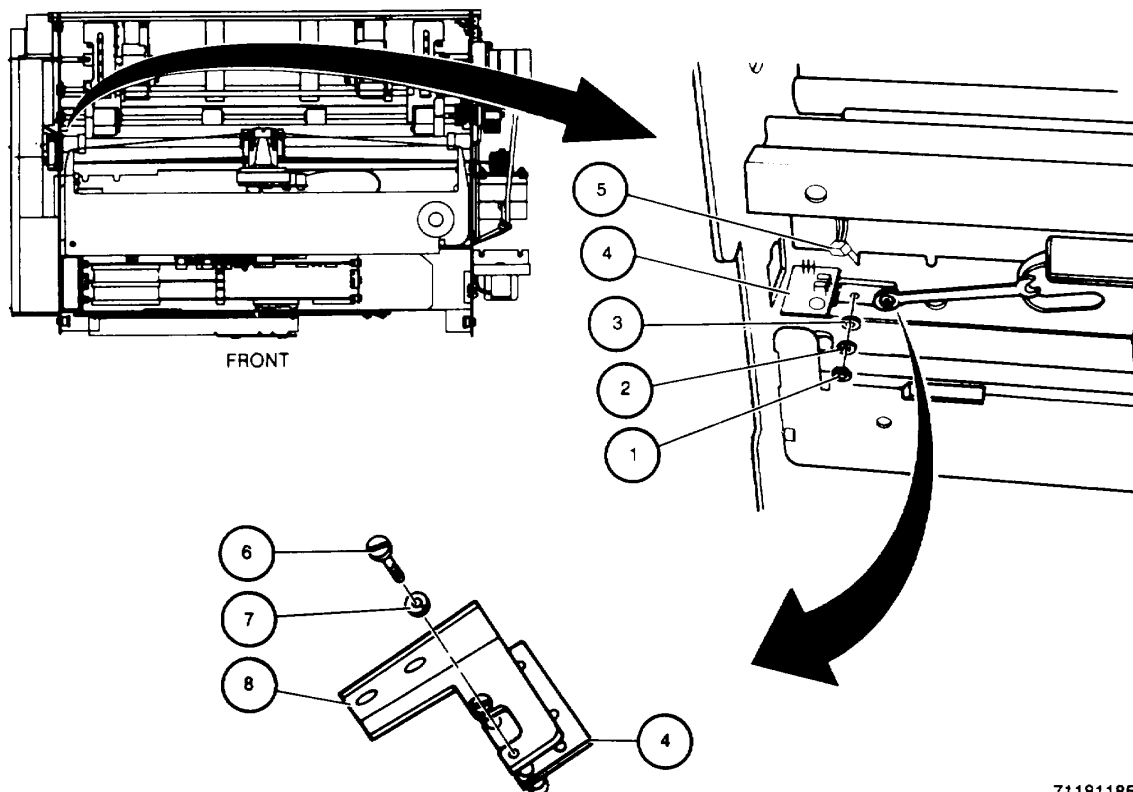
1. Working inside top of printer, position carriage to far right side of printer.
2. Remove two nuts (1), lockwashers (2), and washers (3).
3. Position APHO CCA (4) to access cable (5).
4. Disconnect cable (5).
5. Remove two screws (6), lockwashers (7), and mounting bracket (8) from APHO CCA (4).



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3-22. REPLACE INTERRUPTER (APHO) CCA - Continued**INSTALLATION**

1. Install mounting bracket (8) on APHO CCA (4) using two screws (6) and lockwashers (7).
2. Connect cable (5).
3. Place APHO CCA (4) in installed position.
4. Install two nuts (1), lockwashers (2), and washers (3).



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FOLLOW-ON MAINTENANCE:

1. Adjust interrupter (APHO) CCA (para 3-33).
2. If working on Tempest printer, install front cover assembly (para 3-8).
3. If working on non-Tempest printer, install top cover assembly (para 3-9).

3-23. REPLACE RFI FILTER BOX ASSEMBLY

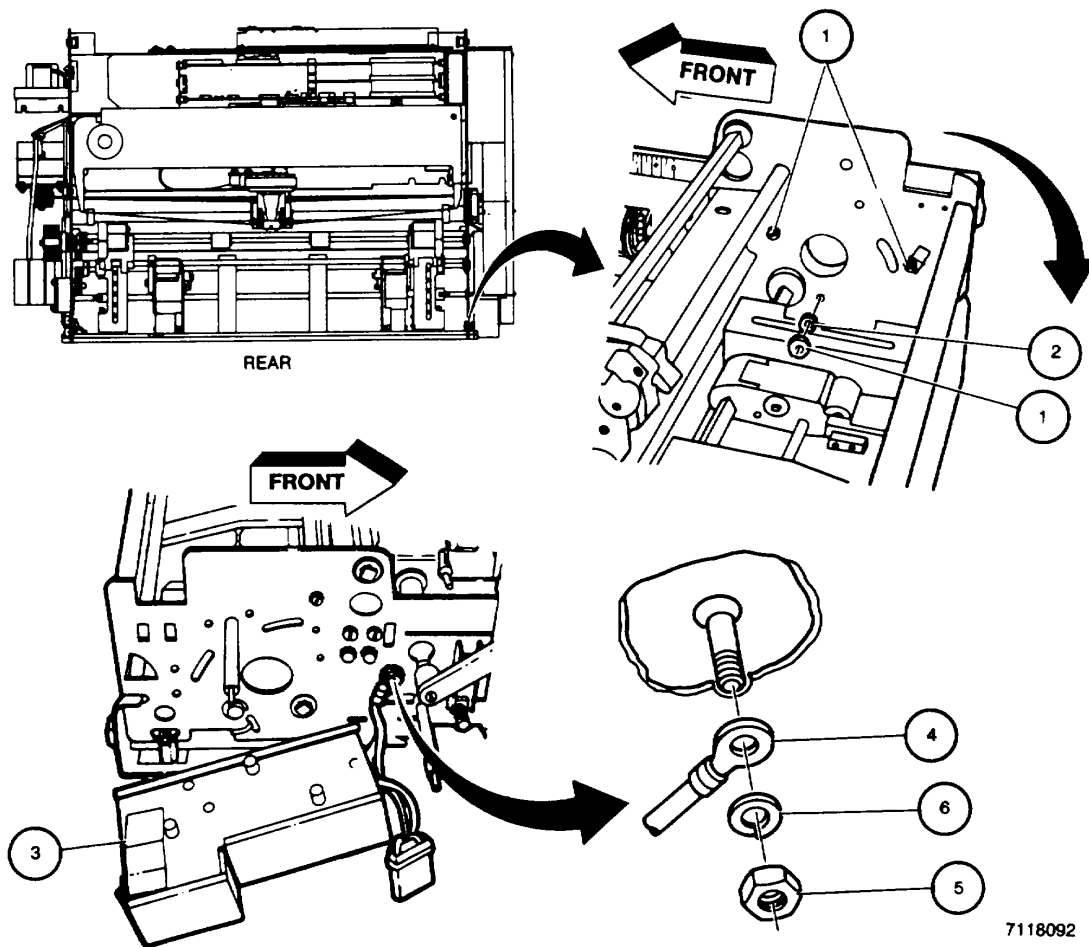
This task covers: a. Removal b. Installation

INITIAL SETUP

Preliminary Procedure: Remove switching regulator (ACH) CCA (para 3-18).

REMOVAL

1. Working inside left rear corner of printer, remove three screws (1) and lockwashers (2).
2. Position RFI assembly (3) to access ground cable (4).
3. Remove nut (5), lockwasher (6), and ground cable (4) from chassis.
4. Remove RFI filter box assembly (3).

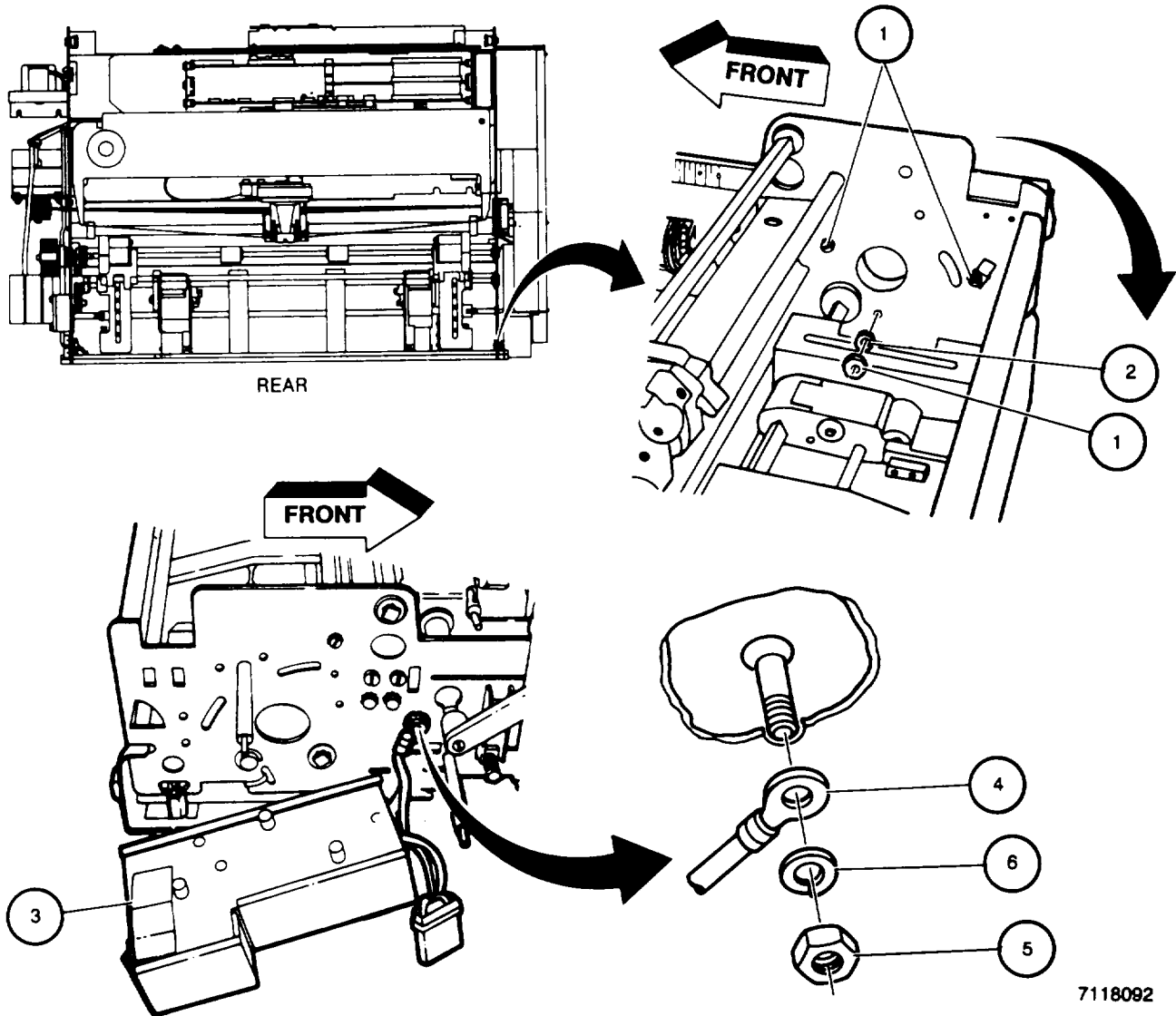


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3-23. REPLACE RFI FILTER BOX ASSEMBLY - Continued

INSTALLATION

1. Position RFI filter box assembly (3) so ground cable (4) can be connected.
2. Install ground cable (4) using nut (5) and lockwasher (6).
3. Place RFI filter box assembly (3) in installed position.
4. Install three screws (1) and lockwashers (2).



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FOLLOW-ON MAINTENANCE: Install switching regulator (ACH) CCA (para 3-18).

3-24. REPLACE RIBBON MOTOR

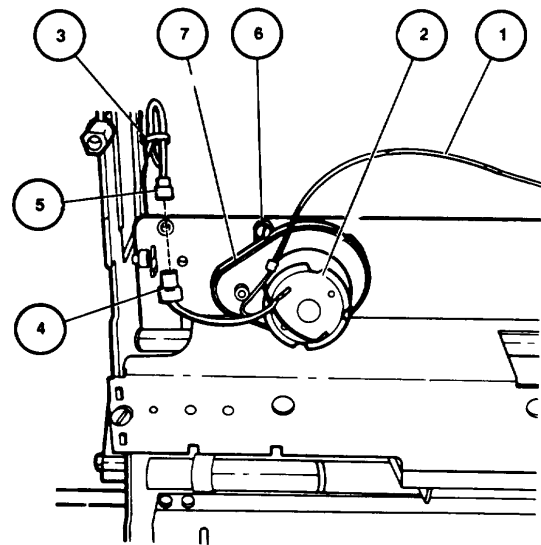
This task covers: **a. Removal** **b. Installation**

INITIAL SETUP**Preliminary Procedures:**

1. If working on Tempest printer, remove front cover assembly (para 3-8).
 2. If working on non-Tempest printer, remove bottom cover assembly (para 3-11).
-

REMOVAL

1. Working at front of printer, tag and disconnect two-wire ribbon motor wiring (1) from APTR/MPTR CCA connector P4.
2. If working on non-Tempest printer, tag, unsolder, and remove wiring (1) from ribbon motor (2) and printer.
3. Working inside bottom of printer, cut and remove cable tie (3) and disconnect ribbon motor cable (4) from wiring connector (5).
4. Remove screw (6), brace (7), and ribbon motor (2) by turning it counterclockwise.

**BOTTOM VIEW**

7118102

INSTALLATION

1. Place ribbon motor (2) and brace (7) in installed position, routing ribbon motor wiring (1) toward APTR/MPTR CCA connector P4.
2. Install screw (6).
3. Connect ribbon motor cable (4) to wiring connector (5).
4. Install cable tie (3).
5. Working at front of printer, connect two-wire ribbon motor wiring (1) to APTR/MPTR CCA connector P4.

FOLLOW-ON MAINTENANCE:

1. If working on Tempest printer, install front cover assembly (para 3-8).
2. If working on non-Tempest printer, install bottom cover assembly (para 3-11).

3-25. REPLACE LEFT FAN ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP

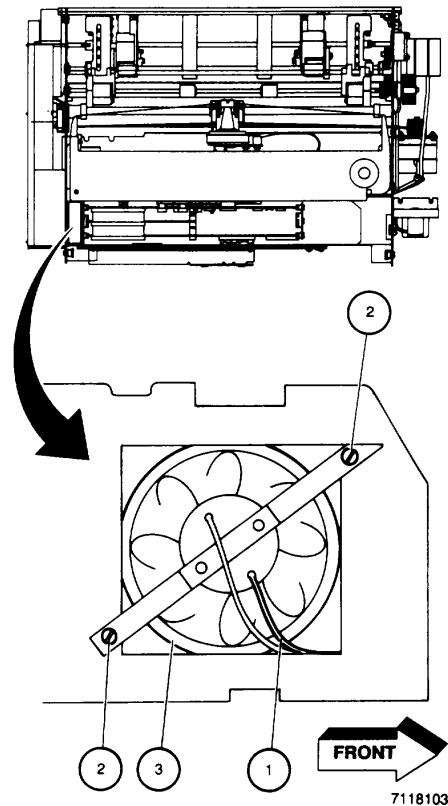
Preliminary Procedure: Remove switching regulator (ACH) CCA (para 3-18).

REMOVAL

1. Tag and disconnect cable (1) from ACL CCA connector P6.
2. Remove two screws (2) and fan assembly (3).

INSTALLATION

1. Place fan assembly (3) in installed position.
2. Install two screws (2).
3. Connect cable (1) to ACL CCA connector P6 as tagged. Remove tag.



FOLLOW-ON MAINTENANCE: Install switching regulator (ACH) CCA (para 3-18).

3-26. REPLACE RIGHT FAN ASSEMBLY**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Preliminary Procedures:**

1. Remove support assembly front bracket (para 3-14).
2. Remove bottom cover assembly (para 3-11).

REMOVAL

1. Tag and disconnect cable (1) from ACL CCA connector P6.

NOTE

Cable to fan assembly must be cut to completely remove fan assembly. If fan assembly is being removed to access other hardware, go to step 3.

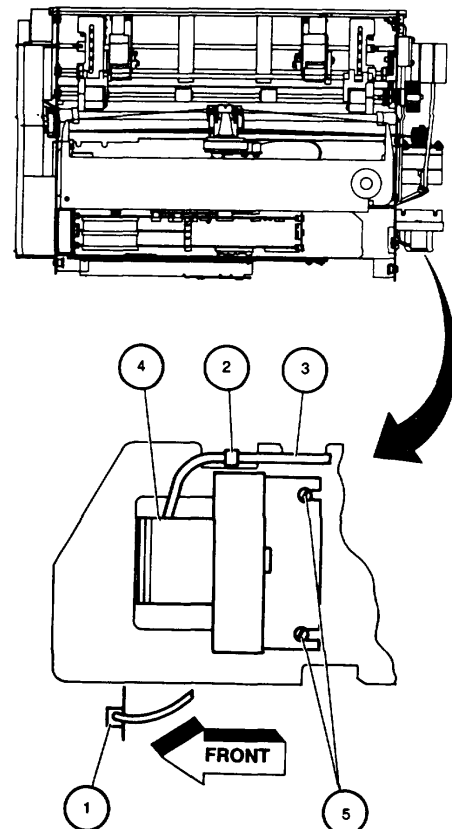
2. Cut and remove cable tie (2) and cable (3) to free fan assembly (4).
3. Loosen two screws (5) and slide fan assembly (4) toward front of printer; then tilt to remove.

INSTALLATION

1. Place fan assembly (4) in installed position, routing cable (3) through hole in chassis.
2. Tighten two screws (5).
3. Connect cable (1) to ACL CCA connector P6 as tagged. Remove tag.
4. Install new cable tie (2) to secure cable (3) to fan assembly (4).

FOLLOW-ON MAINTENANCE:

1. Install bottom cover assembly (para 3-11).
2. Install support assembly front bracket (para 3-14).



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3-27. REPLACE CARRIAGE CABLE ASSEMBLY

This task covers: **a. Removal** **b. Installation**

INITIAL SETUP

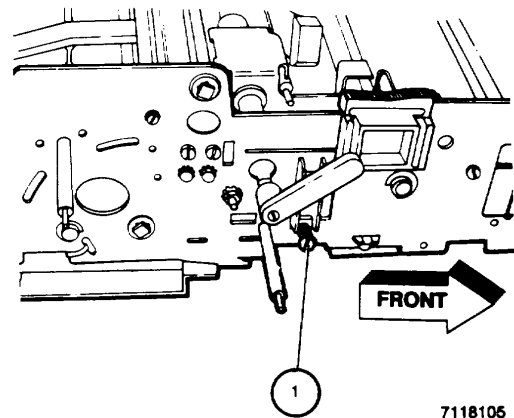
Materials/Parts: Cable clamp, 5/8 in. by 3/4 in.

Preliminary Procedures:

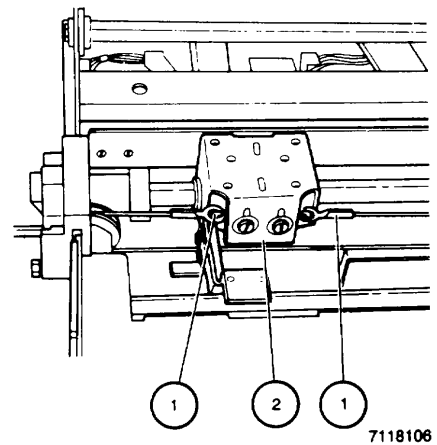
1. Remove print head. Refer to TM 11-5895-1392-12.
2. If working on Tempest printer, remove right and left end caps (para 3-12).
3. Remove switching regulator (ACH) CCA (para 3-18).

REMOVAL

1. Working at left side of printer, loosen turnaround bracket adjustment screw (1).

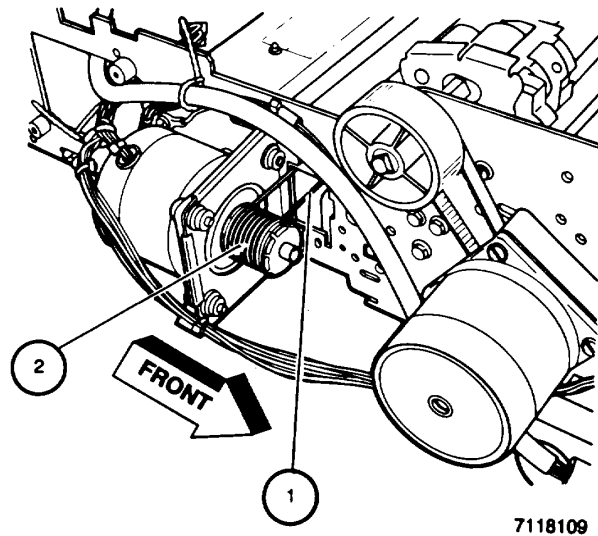


2. Working at top of printer, unhook carriage cable (1) from right and left side of carriage assembly (2).



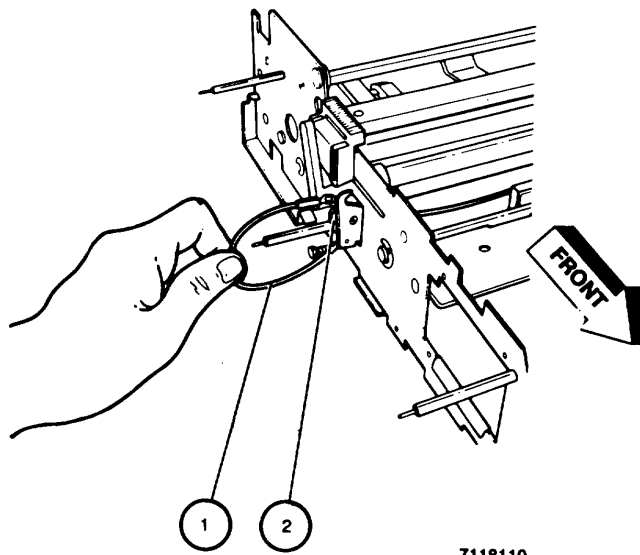
3-27. REPLACE CARRIAGE CABLE ASSEMBLY - Continued

3. Working at right side of printer, disengage carriage cable (1) from capstan (2).



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4. Working at left side of printer, disengage carriage cable (1) from roller (2).
5. Remove carriage cable (1).



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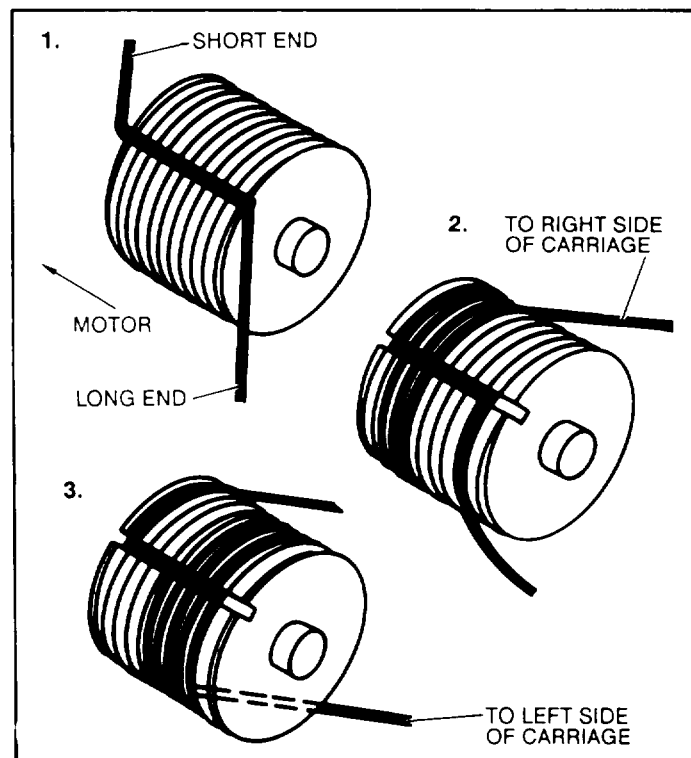
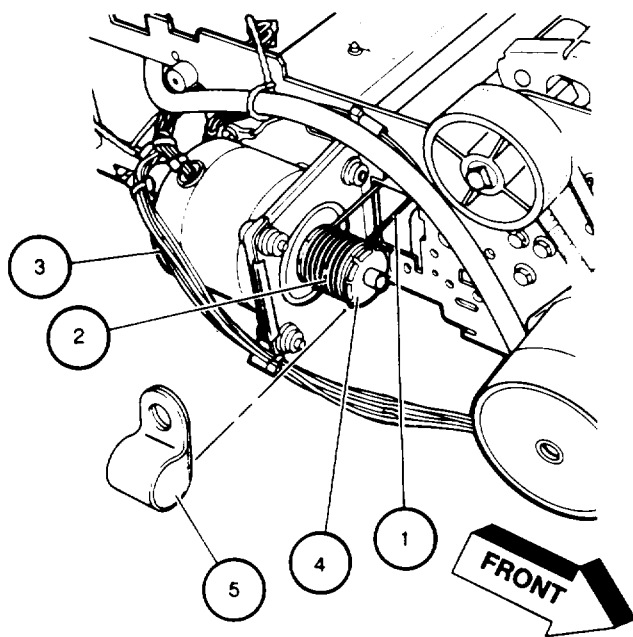
3-27. REPLACE CARRIAGE CABLE ASSEMBLY - Continued

INSTALLATION

NOTE

- Dot marking on carriage cable identifies short and long cable ends.
- Dot marking on capstan locates proper placement of carriage cable on capstan.

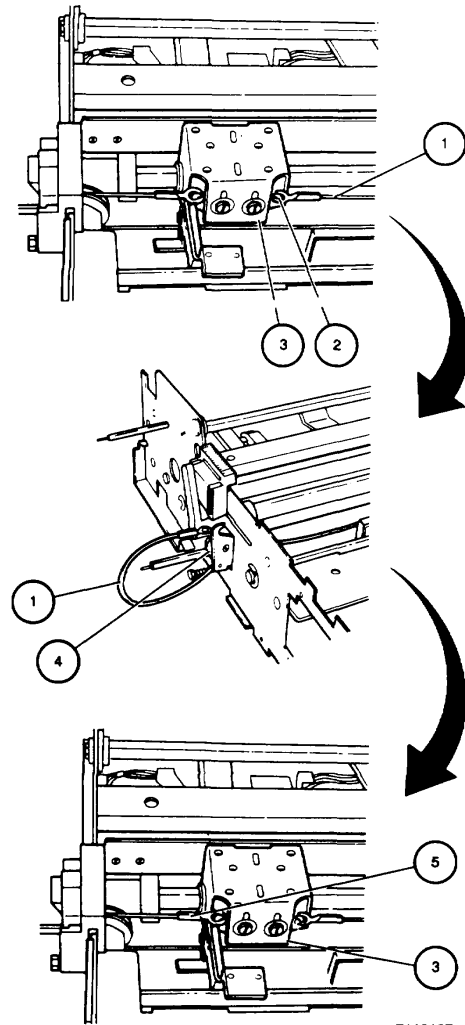
1. Aline dot on carriage cable (1) with dot in capstan slot (2) with short end of cable toward motor (3).
2. Seat carriage cable (1) in capstan slot (2) as aligned.
3. Beginning with second thread of capstan nearest motor and turning clockwise, wrap short end of carriage cable (1) around capstan (4), as shown.
4. Beginning with second thread of capstan furthest from motor and turning counterclockwise, wrap long end of carriage cable (1) around capstan (4), as shown.
5. Slip cable clamp (5/8 in. by 3/4 in.) (5) over capstan (4) to prevent cable (1) from unwinding.



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3-27. REPLACE CARRIAGE CABLE ASSEMBLY - Continued

6. Route carriage cable (1) ends into printer.
7. Hook short cable end eyelet (2) on right side of carriage assembly (3).
8. Route long cable end (1) around roller (4) so that cable will exit toward carriage assembly (3) from top of roller.
9. Hook long cable end eyelet (5) on left side of carriage assembly (3).
10. Remove cable clamp installed to prevent carriage cable from unwinding.



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FOLLOW-ON MAINTENANCE:

1. Adjust carriage cable (para 3-34).
2. Install switching regulator (ACH) CCA (para 3-18).
3. If working on Tempest printer, install right and left end caps (para 3-12).
4. Install and adjust print head. Refer to TM 11-5895-1392-12.

3-28. REPLACE CARRIAGE MOTOR

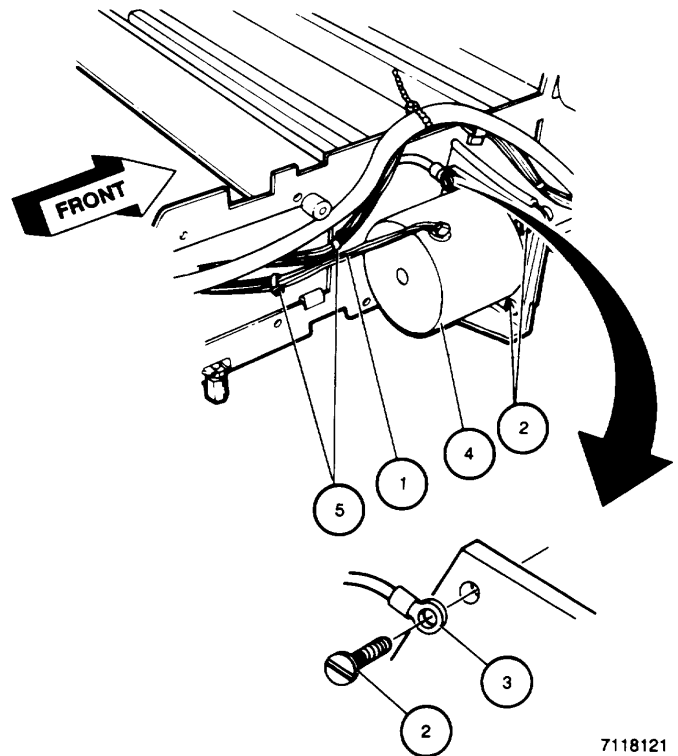
This task covers: a. Removal b. Installation

INITIAL SETUP**Preliminary Procedures:**

1. Remove carriage cable assembly (para 3-27).
 2. Remove right fan assembly (para 3-26) for access only. Do not cut fan assembly cabling.
-

REMOVAL

1. Working at front of printer, disconnect carriage motor wiring harness (1) from APTR/MPTR CCA connector P7.
2. Working at right side of printer, remove four screws (2) and ground cable (3).
3. Remove carriage motor (4), cutting cable ties (5), as required, and routing wiring harness (1) from frame.



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INSTALLATION

1. Working at right side of printer, place and hold carriage motor (4) in installed position, ensuring that wiring harness (1) is properly routed into frame.
2. Install four screws (2) and ground cable (3).
3. Working at front of printer, connect carriage motor wiring harness (1) to APTR/MPTR CCA connector P7.
4. Install cable ties (5) as required.

FOLLOW-ON MAINTENANCE:

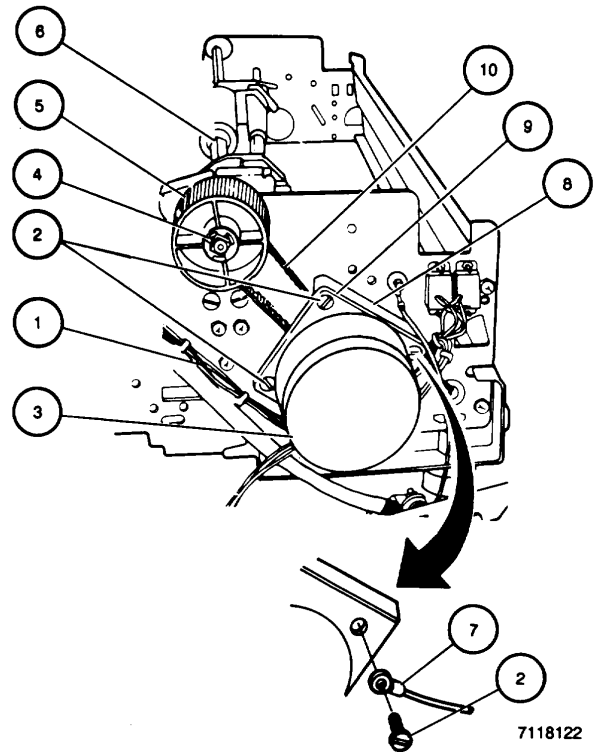
1. Install carriage cable assembly (para 3-27).
2. Install right fan assembly (para 3-26).

3-29. REPLACE PAPER MOTOR ASSEMBLY**This task covers:****a. Removal****b. Installation****INITIAL SETUP**

Preliminary Procedure: Remove right fan assembly (para 3-26) for access only. Do not cut fan assembly cabling.

REMOVAL

1. Working at front of printer, tag and disconnect paper motor wiring harness (1) from APTR/MPTR CCA connector P8.
2. Loosen four screws (2) that secure paper motor (3) to frame.
3. If working on Tempest printer, remove retaining ring (4) and knob (5) from shaft (6).
4. Remove four screws (2), ground strap (7), paper motor (3), spacer (8), nutplate (9), and drive belt (10).

**INSTALLATION**

1. Position drive belt (10) on shaft (6).
2. Assemble paper motor (3), nutplate (9), and spacer (8).
3. Place and hold paper motor (3), nutplate (9), and spacer (8) in installed position, ensuring that drive belt (10) is fitted on paper motor capstan.
4. Install four screws (2) and ground strap (7).
5. If working on Tempest printer, install knob (5) and retaining ring (4) on shaft (6).
6. Working at front of printer, connect paper motor wiring harness (1) to APTR/MPTR CCA connector P8.

FOLLOW-ON MAINTENANCE:

1. Perform paper drive belt tension adjustment (para 3-35).
2. Install right fan assembly (para 3-26).

3-30. REPLACE LOAD OR PROGRAM SWITCH ASSEMBLY**This task covers:****a. Removal****b. Installation****INITIAL SETUP****NOTE**

Replace **LOAD** switch and **PROGRAM** switch assemblies the same way. **LOAD** switch is shown.

Preliminary Procedures:

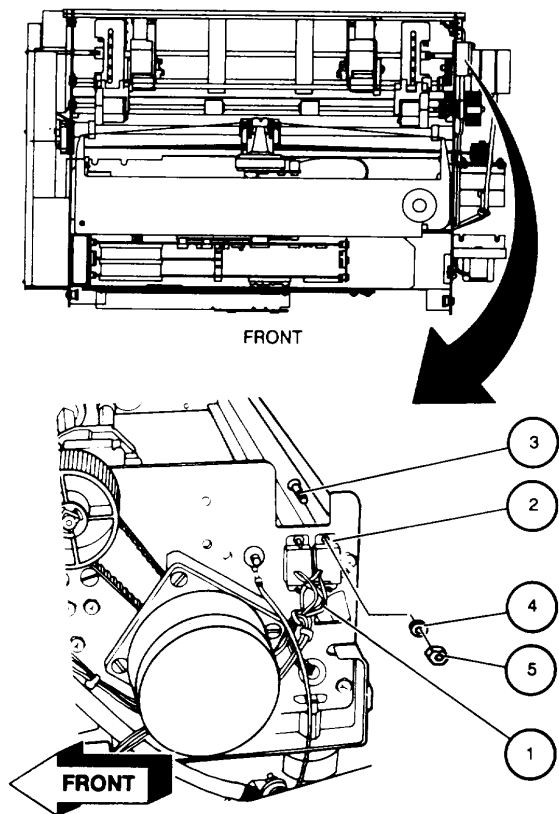
1. If working on Tempest printer, remove right end cap (para 3-12).
2. If working on non-Tempest printer, remove top cover assembly (para 3-9).

REMOVAL

1. Tag, unsolder, and remove wires (1) from switch (2).
2. Remove two screws (3), washers (4), and nuts (5).
3. Remove switch (2).

INSTALLATION

1. Place switch (2) in installed position.
2. Install two screws (3), washers (4), and nuts (5).
3. Solder wires (1) to switch (2) as tagged. Remove tags.



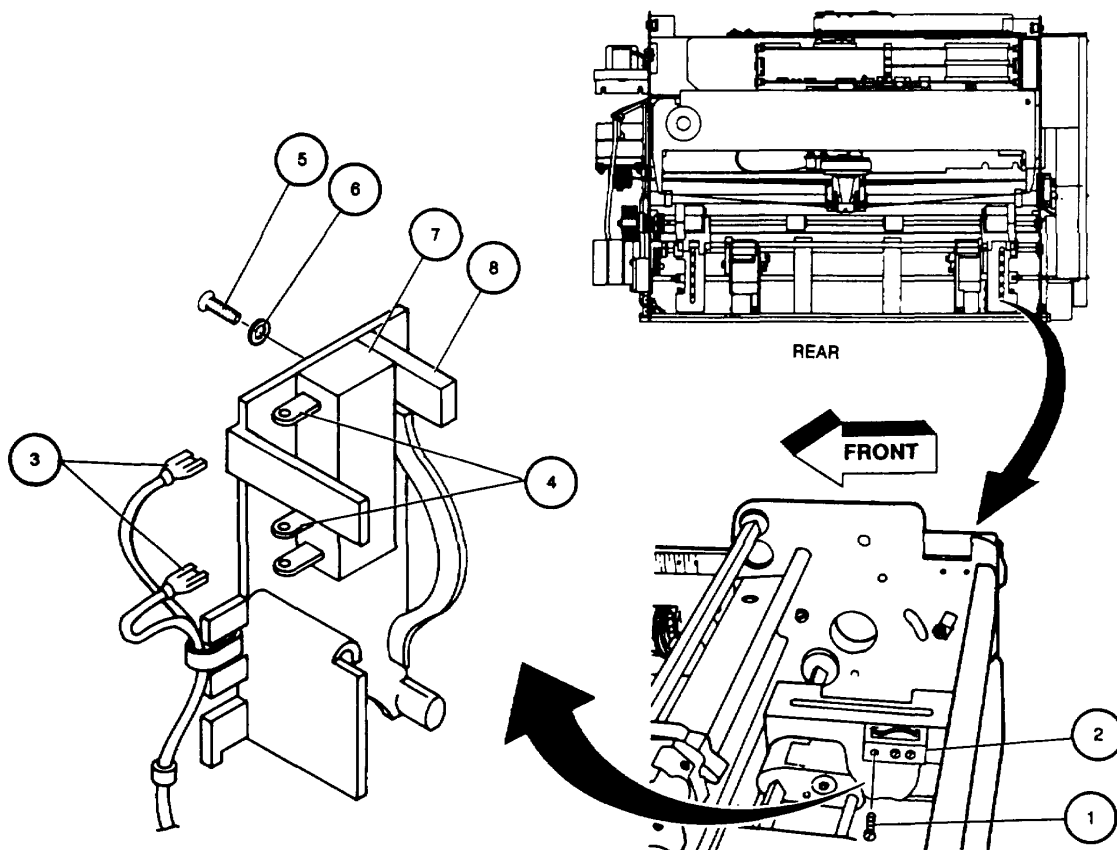
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FOLLOW-ON MAINTENANCE:

1. If working on Tempest printer, install right end cap (para 3-12).
2. If working on non-Tempest printer, install top cover assembly (para 3-9).

3-31. REPLACE PAPER OUT SWITCH**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Preliminary Procedure:** If working on Tempest printer, remove rear cover (para 3-13).**REMOVAL**

1. If working on non-Tempest printer, remove rear paper shield.
2. Working at left rear corner of printer, remove self-tapping screw (1).
3. Position switch assembly (2) to access two spade connectors (3).
4. Tag and disconnect two spade connectors (3) from two switch terminals (4).
5. Remove two screws (5) and washers (6).
6. Remove switch (7) from mounting bracket (8).

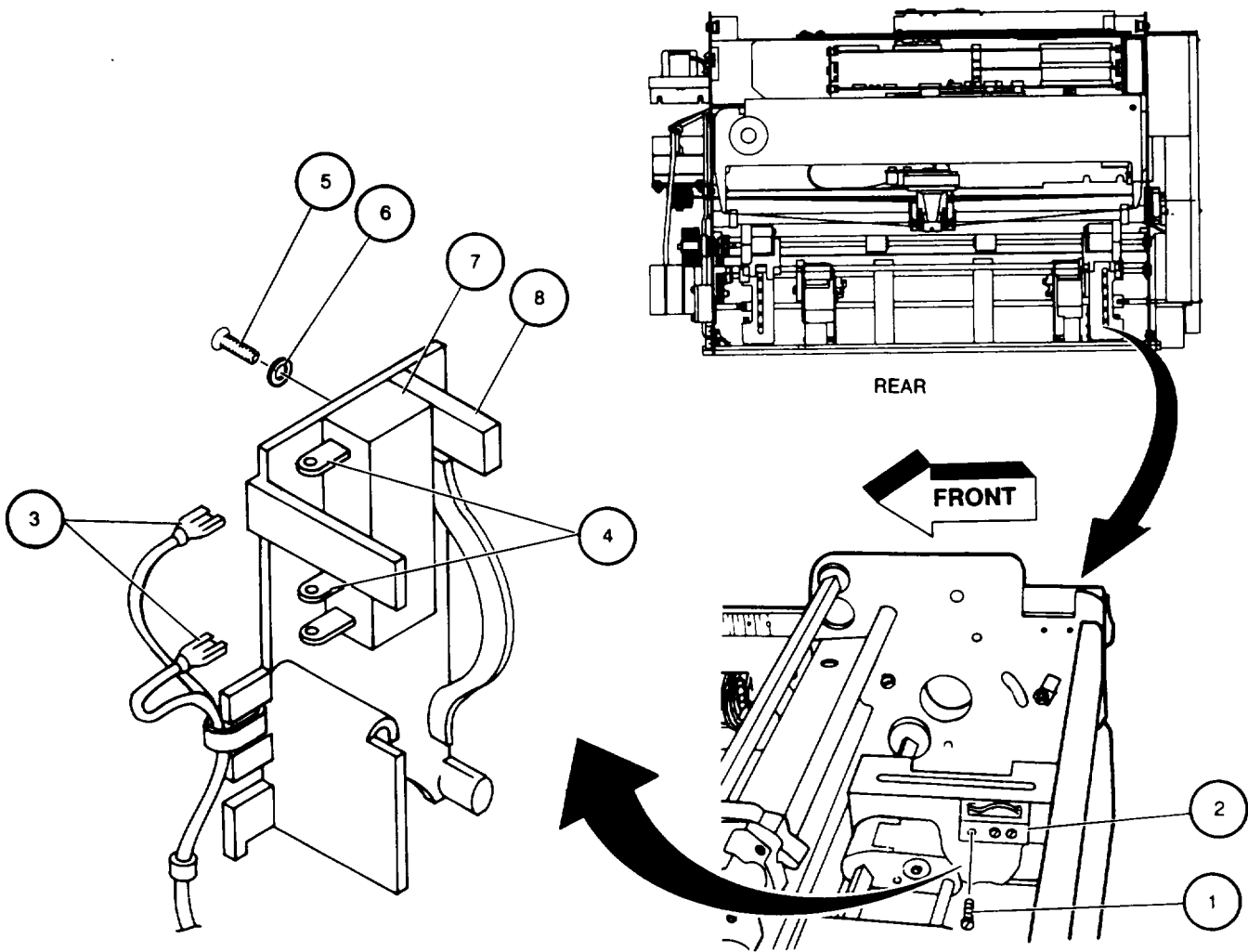


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3-31. REPLACE PAPER OUT SWITCH - Continued

INSTALLATION

1. Position switch (7) in mounting bracket (8),
2. Install two screws (5) and washers (6).
3. Connect two spade connectors (3) to two switch terminals (4) as tagged. Remove tags.
4. Place and hold switch assembly (2) in installed position.
5. Install self-tapping screw (1).



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FOLLOW-ON MAINTENANCE: If working on Tempest printer, install rear cover (para 3-13).

3-32. REPLACE LINE FILTER (TEMPEST PRINTER)

This task covers:

a. Removal

b. Installation

INITIAL SETUP**NOTE**

Replace right and left line filters the same way. Left line filter is shown.

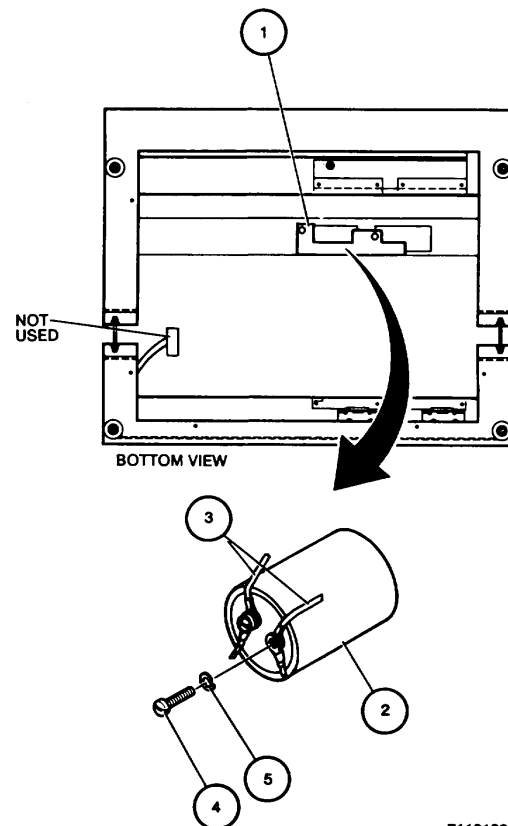
Preliminary Procedures: Remove right and left wire driver (AWDR) CCAs (para 3-20).

REMOVAL

1. Working at printer bottom, remove bracket (1), which will be loose after AWDR CCA removal.
2. Position filter (2) to access four cables (3).
3. Remove two screws (4), lock-washers (5), and four cables (3). Tag four cables.
4. Remove filter (2).

INSTALLATION

1. Position filter (2) so four cables (3) can be installed.
2. Install four cables (3) as tagged and secure with two screws (4) and lockwashers (5). Remove tags.
3. Place filter (2) and bracket (1) in installed position.



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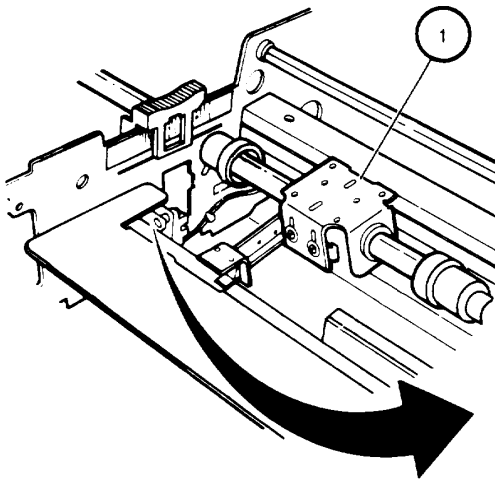
FOLLOW-ON MAINTENANCE: Install right and left wire driver (AWDR) CCAs (para 3-20).

3-33. ADJUST INTERRUPTER (APHO) CCA

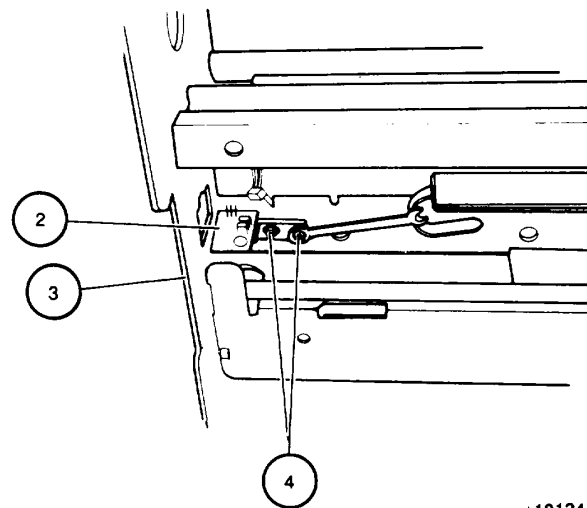
This task covers: **Adjustment**

ADJUSTMENT

1. Open paper shield.
2. Position carriage (1) to far right side of printer.
3. Check that outer edge (nearest chassis left side frame) of photoelectric unit (2) is 0.83 to 0.87 in. (21.1 to 22.1 mm) from inside surface of left side frame (3).
 - a. If unit position is within limits given, go to step 7.
 - b. If unit position is not within limits given, go to next step.
4. Loosen two bracket nuts (4).
5. Position assembly so that outer edge of photoelectric unit (2) is 0.83 to 0.87 in. (21.1 to 22.1 mm) from inside surface of left side frame (3).
6. Tighten two bracket nuts (4). Repeat step 3.



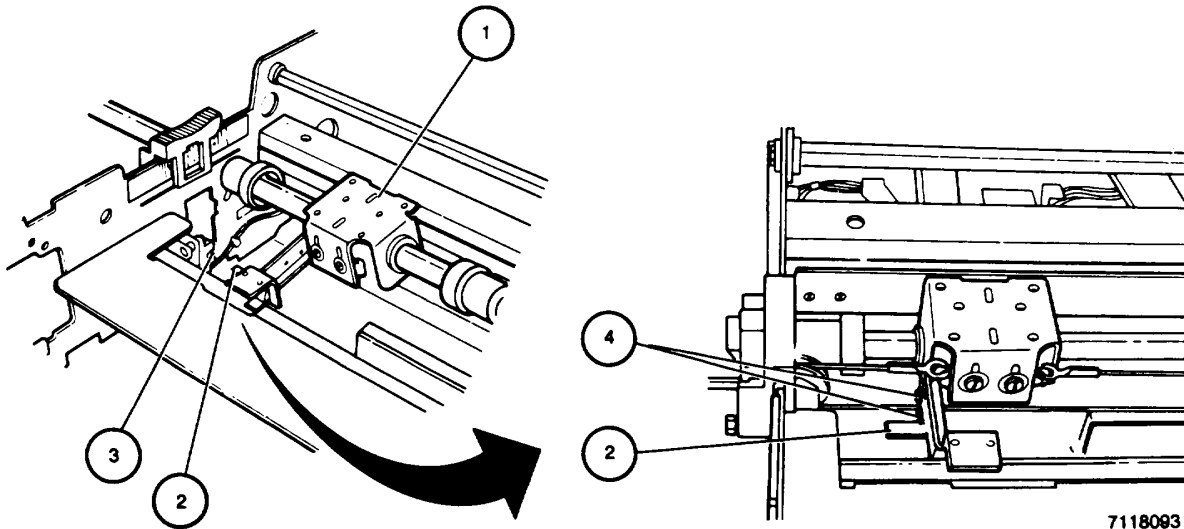
NOTE: PRINthead REMOVED FOR CLARITY



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3-33. ADJUST INTERRUPTER (APHO) CCA - Continued

7. Position carriage (1) fully to left side of printer.
8. Check that interrupter flag (2) is centered (up and down axis) in photoelectric unit slot (3).
 - a. If flag is correctly positioned, go to step 13.
 - b. If flag is not correctly positioned, go to next step.
9. Loosen two screws (4).
10. Position and hold interrupter flag (2) centered in photoelectric unit slot (3).
11. Tighten two screws (4).
12. Repeat step 8.
13. Close paper shield. Task complete.



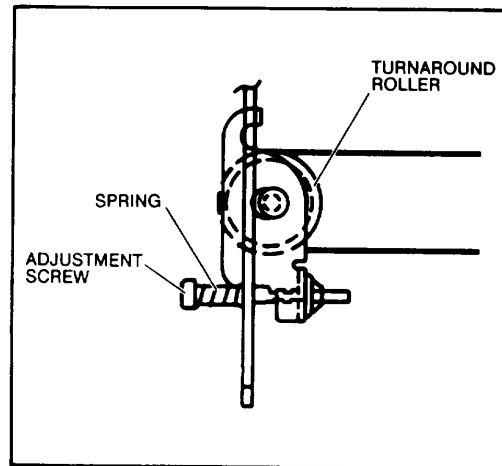
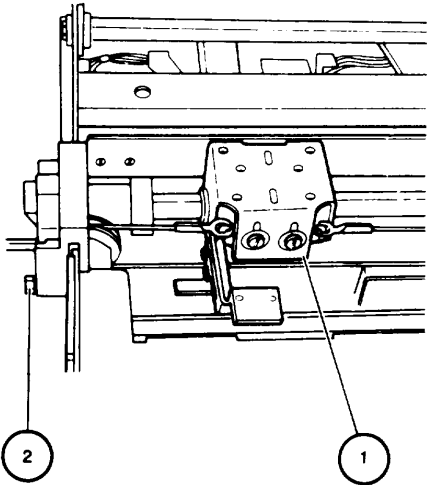
NOTE: PRINTHEAD REMOVED FOR CLARITY

3-34. ADJUST CARRIAGE CABLE

This task covers: **Adjustment**

ADJUSTMENT

1. Open paper shield.
2. Position carriage (1) to extreme right side of printer.
3. Using finger or pencil, press center of carriage cable (1) and check that moderate pressure gives deflection of approximately 1/4 inch.
 - a. If measurement is within limits given, task is complete.
 - b. If measurement is not within limits given, go to next step.
4. Remove switching regulator (ACH) CCA (para 3-18).
5. Working at left side of printer, adjust turnaround bracket assembly screw (2).
6. Move carriage (1) back and forth between right and left carriage stops several times to ensure all cable slack is removed. Repeat steps 2 and 3.



NOTE: PRINthead REMOVED FOR CLARITY

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FOLLOW-ON MAINTENANCE: If removed, install switching regulator (ACH) CCA (para 3-18).

3-35. ADJUST PAPER DRIVE BELT

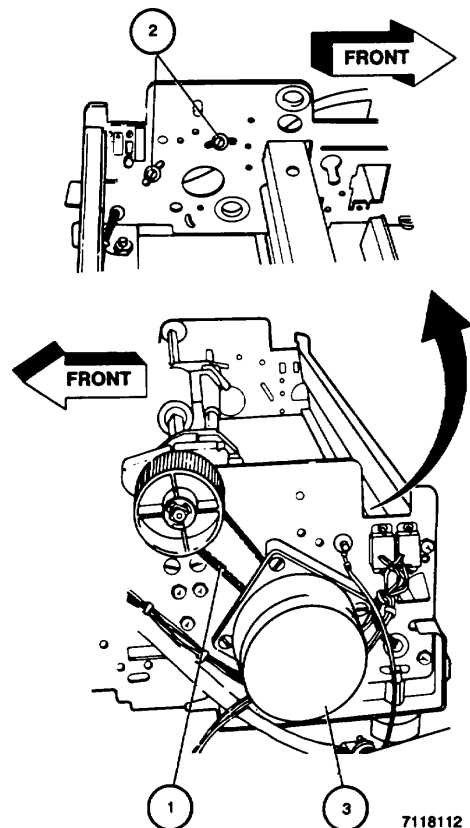
This task covers: Adjustment

INITIAL SETUP**Preliminary Procedures:**

1. If working on Tempest printer, remove right end cap (para 3-12).
 2. If working on non-Tempest printer, remove top cover assembly (para 3-9).
-

ADJUSTMENT

1. Using finger or pencil, press center of belt (1) and check that moderate pressure gives deflection of approximately 1/4 inch.
 - a. If measurement is within limits given, task is complete.
 - b. If measurement is not within limits given, go to next step.
2. Loosen three screws (2) securing paper drive motor (3).
3. Using finger or pencil at center of belt (1), position and hold paper drive motor (3) so that moderate force gives a deflection of approximately 1/4 inch.
4. With proper belt tension set, tighten three screws (2).
5. Repeat step 1.

**FOLLOW-ON MAINTENANCE:**

1. If working on Tempest printer, install right end cap (para 3-12).
2. If working on non-Tempest printer, install top cover assembly (para 3-9).

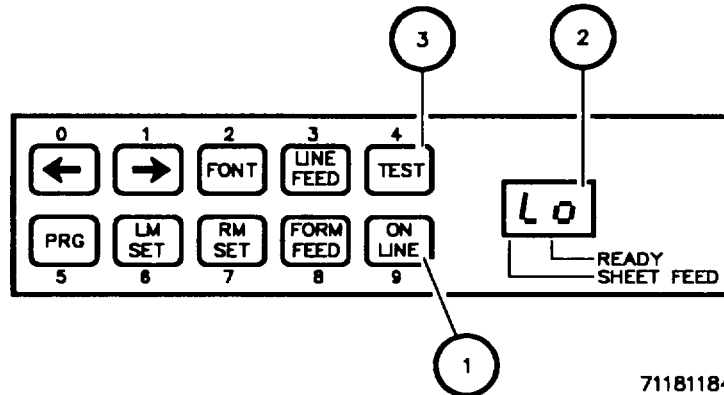
3-36. PRINTER SELF-TEST - OFFLINE

This task covers: **Test**

INITIAL SETUP

Preliminary Procedure: Perform equipment setup (para 3-5).

TEST



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1. Working at front panel, press ON LINE pushbutton (1), as required, so that Lo appears on printer display (2).
2. Press and hold TEST pushbutton (3) and observe the following:
 - a. A tone briefly sounds.
 - b. Printer resets carriage to far left margin (Home position).
 - c. Test pattern (shown below) begins printing and continues as long as TEST pushbutton (3) is held down.

```
!"# $%.&' () *+, -./ 012 345 678 9:; <=> ?@A BCD EFG HIJ KLM NOP
"#$%&' ()* +,- ./0 123 456 789 :;< =>? @AB CDE FGH IJK LMN OPQ
#$% &' ()*+ ,-. /01 234 567 89: ;<= >?@ ABC DEF GHI JKL MNO PQR
```

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3. Release TEST pushbutton (3) and observe the following:
 - a. Printer displays .8.8 (all LED segments lighted), indicating that self-test has been initiated.
 - b. A tone briefly sounds.
 - c. If no faults, Lo will be displayed.
 - d. If any other code is displayed, go to symptom index (table 3-1).

CHAPTER 4
PROCESSOR ASSEMBLY

Para		Page
Section I	Principles of Operation	4-2
4-1	Introduction.....	4-2
4-2	Theory of Operation	4-2
Section II	Troubleshooting.....	4-6
4-3	Introduction.....	4-6
4-4	General Instructions	4-6
4-4.1	Introduction.....	4-6
4-4.2	Inspection Procedures.....	4-6
4-4.3	Troubleshooting Procedures	4-6
4-4.4	Maintenance Procedures	4-7
4-5	Equipment Setup	4-7
4-6	Symptom Index	4-8
4-7	Troubleshooting Table.....	4-9
Section III	Maintenance Procedures	4-17
4-8	Remove/Install Processor Card Cage.....	4-17
4-9	Replace Fan Assembly	4-21
4-10	Remove/Install Power Supply Mounting Bracket and Cover.....	4-24
4-11	Replace Processor Tape Drive Case/Tape Transport Assembly	4-27
4-12	Replace Processor Disk Drive Case/Disk Drive.....	4-29
4-13	Replace Digital I/O Cable	4-31
4-14	Replace Ethernet Cabinet Kit.....	4-33
4-15	Replace Multiplexer Cabinet Kit A or B	4-34
4-16	Replace Rear Air Filter	4-36
4-17	Replace Circuit Card Assembly or Grant Anchor Board	4-37
4-18	Replace Circuit Breaker	4-38
4-19	Replace Power Supply Assembly.....	4-39
4-20	Replace Power Supply Module	4-44
4-21	Replace AC Distribution CCA.....	4-48
4-22	Replace Power Distribution CCA	4-49
4-23	Replace Power Supply Assembly Fan	4-52
4-24	Replace Wiring Harness 701273-0100	4-53
4-25	Replace Wiring Harness 701274-0100	4-55
4-26	Replace Wiring Harness 701327-0100	4-58
4-27	Replace Switched AC Out or AC Input Wiring	4-60
4-28	Replace Front Panel Assembly	4-62
4-29	Power Supply Assembly Test.....	4-63
4-30	Remove/Install Top Cover.....	4-66

SECTION I. PRINCIPLES OF OPERATION

4-1. INTRODUCTION

This section provides the theory of operation for the Data Base Management Processor (DBMP) and Communications Processor (CP) used in the Communications System, Control Element, Central Processors AN/TYQ-30(1/2).

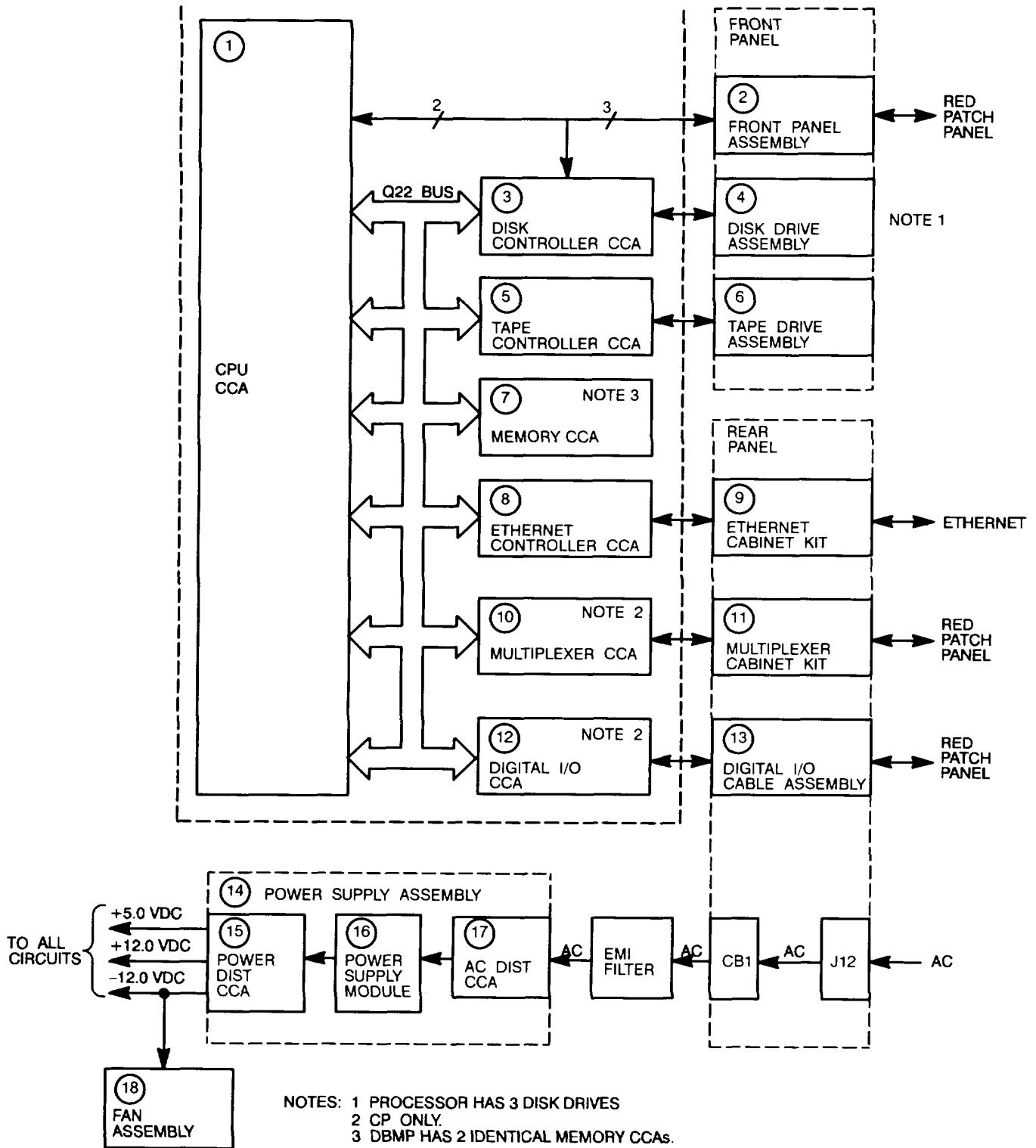
NOTE

The AN/TYQ-30(1 system's ADP shelter and AN/TYQ-30(2) system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and the AN/TYQ-30(0)2 system, except where noted.

4-2. THEORY OF OPERATION

- | | | |
|------|-------------------------|--|
| (1) | CPU CCA | Interfaces with front panel, permitting operator selection of modes, baud rates, and functions. Provides interface, monitor, and control of processor operation through Q22 bus. |
| (2) | FRONT PANEL ASSEMBLY | Panel that permits operator selection of modes, baud rates, and functions. Also provides RS-232 interface for system workstation. |
| (3) | DISK CONTROLLER CCA | Interfaces high-capacity disk drives to Central Processor Unit (CPU). |
| (4) | DISK DRIVE ASSEMBLY | Three high-capacity disk drives. Drives 1 and 2 provide 175 megabytes and drive 3 provides 622 megabytes of unformatted storage, with average access time of less than 27 milliseconds. |
| (5) | TAPE CONTROLLER CCA | Interfaces tape drive to CPU. |
| (6) | TAPE DRIVE ASSEMBLY | Dc-powered 22-track tape transport system. Controlled by tape controller Circuit Card Assembly (CCA), provides 94.5 megabytes of serial access storage. |
| (7) | MEMORY CCA | DBMP has two and CP has one Memory CCA. Each CCA provides 8 megabytes of Error Correction Circuit (ECC) memory. |
| (8) | ETHERNET CONTROLLER CCA | Provides interface to Ethernet network. Perform Direct Memory Access (DMA) transfers to and from CPU. Provides serialization, formatting, error checking, and encoding of message packets for transmission and reception on Ethernet at 10-megabit per second data rate. |
| (9) | ETHERNET CABINET KIT | Provides interface from Ethernet controller CCA to processor rear panel and provides Electromagnetic Interference (EMI) filtering. |
| (10) | MULTIPLEXER CCA | Used on CP only. Provides eight independent, full-duplex, asynchronous, RS-423A- or RS-232C-compatible data channels. |

4-2. THEORY OF OPERATION - Continued

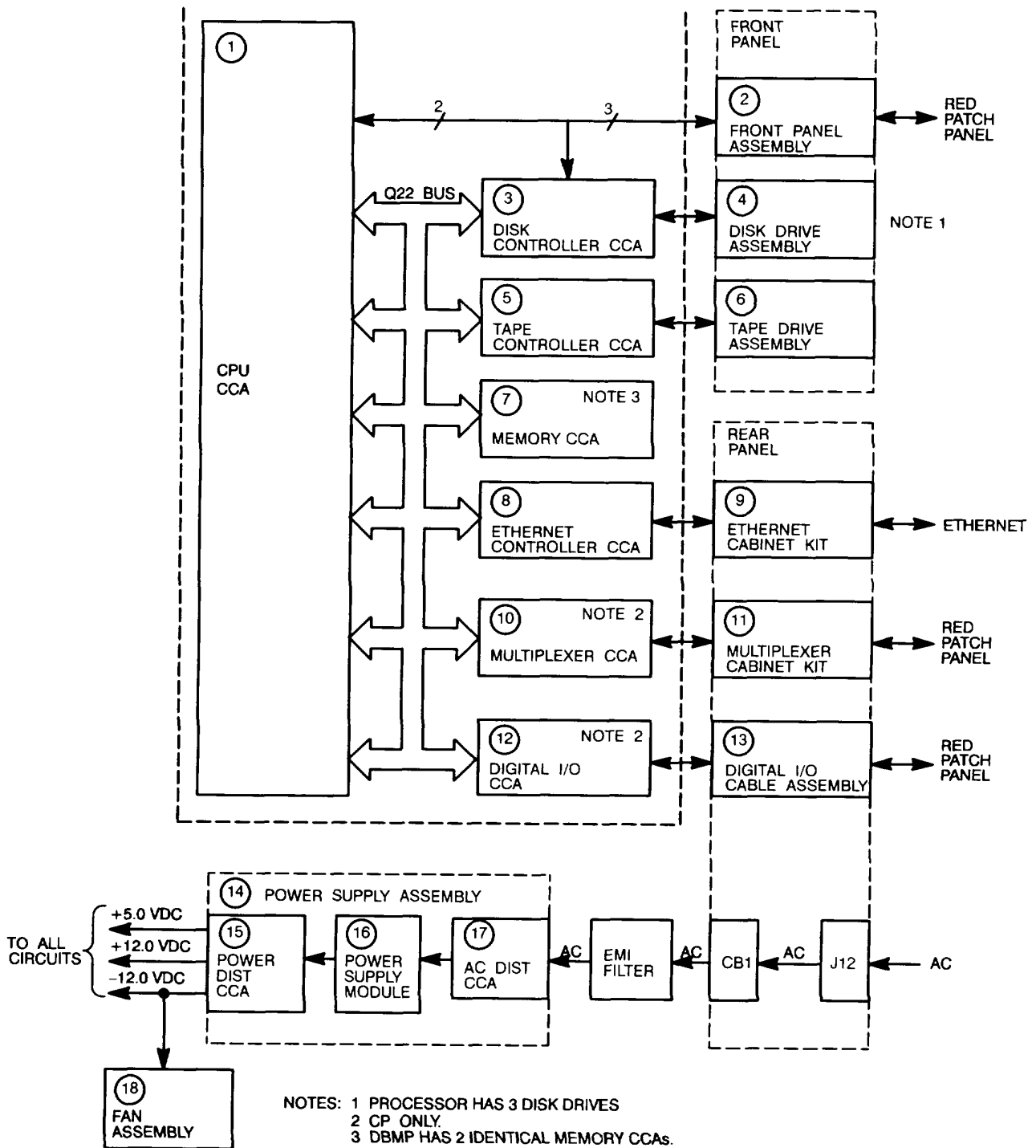


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4-2. THEORY OF OPERATION - Continued

- | | | |
|------|----------------------------|---|
| (11) | MULTIPLEXER CABINET KIT | Used on CP only. Provides two identical, four-connector assemblies that interface multiplexer CCA to processor rear panel and provide EMI filtering. |
| (12) | DIGITAL I/O CCA | Used on CP only. Provides 16 independent contact closure input lines. Normally high inputs are latched when contact closure forces input low. Latches are read and reset when CPU responds to input-generated interrupts. |
| (13) | DIGITAL I/O CABLE ASSEMBLY | Provides interface between digital Input/Output (I/O) CCA and processor rear panel. |
| (14) | POWER SUPPLY ASSEMBLY | Provides shock-mounted chassis for power supply components. |
| (15) | POWER DISTRIBUTION CCA | Provides connectors to distribute power to processor. |
| (16) | POWER SUPPLY MODULE | A 500-watt power supply that generates +5.0 Vdc (75 amps), +12.0 Vdc (15 amps), +12.0 Vdc (6 amps), and -12.0 Vdc (15 amps). |
| (17) | AC DISTRIBUTION CCA | Controls ac input voltage, provides front panel remote ON/OFF function, and contains power fail detect logic. |
| (18) | FAN ASSEMBLY | Consists of two fans that provide cooling for card cage components. |

4-2. THEORY OF OPERATION - Continued



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SECTION II. TROUBLESHOOTING

4-3. INTRODUCTION

This section provides procedures required to set up, test, and fault isolate the DBMP or CP at the direct support maintenance level.

4-4. GENERAL INSTRUCTIONS

4-4.1. Introduction

- a. Troubleshooting and repair should be performed only by experienced technicians who are familiar with the equipment and capable of ensuring that procedures are correctly accomplished.
- b. Maintenance personnel should read all inspection, troubleshooting, and maintenance instructions before attempting to troubleshoot or repair the equipment.

4-4.2. Inspection Procedures

- a. Visually inspect all wiring and all electronic assemblies and their components for obvious damage. Check for open connections, shorts, burning, discoloration, brittle or cracked insulation, or charring. If damage is noted, carefully inspect related components for similar damage to help identify the cause of the damage.
- b. When removed, visually inspect all Circuit Card Assemblies (CCAs) for signs of excess heat, such as charred, burned, discolored, cracked, or broken components. Inspect all printed wire etching on CCAs for apparent breaks, cuts, nicks, or signs of lifting from the card. Inspect CCA connectors for cracked or broken insulation and for missing, loose, bent, or broken pins. Inspect contacts of CCA edge connectors to ensure that they are not broken, scratched, nicked, cut or dirty. Clean dirty contacts.
- c. Inspect all chassis connectors for broken, scratched, dented, or damaged housings; missing hardware; and missing or damaged connector pins.
- d. Operate each switch to all positions to ensure that it operates freely and smoothly and that all contacts appear to mate when they should. Ensure that all switch detents operate positively and firmly. Inspect knobs for breaks or cracks.

4-4.3. Troubleshooting Procedures

- a. Observe reported symptom or repeat failed diagnostic test to verify reported fault.
- b. Using symptom index (table 4-1) and troubleshooting table (table 4-2), perform steps required to isolate fault to a part or assembly and perform first specified corrective action.
- c. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- d. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action.
- e. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- f. Repeat steps d and e until fault is corrected or it becomes necessary to refer unit to next higher level of maintenance.

4-4.4. Maintenance Procedures

- a. The equipment documented in this manual is typical. The equipment you are repairing may contain minor variations (location and number of cable ties, cable markers, lockwashers, etc.) which do not affect the essential procedural steps given.
- b. While performing maintenance procedures, cut and remove cable ties whenever needed. Note and record the number and location of the cable ties removed to aid installation.
- c. Bag and tag hardware (screws, washers, etc.) during removal procedures to aid installation.
- d. Tag connectors and wires during removal procedures to ensure correct reconnection.
- e. If during removal of an assembly it is observed that wires, cables, or connectors attached to that assembly are loose, reinstall or reconnect the loose item and repeat troubleshooting procedure to verify repair.

4-5. EQUIPMENT SETUP**WARNING**

- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.**
- **HIGH VOLTAGES ARE PRESENT IN THE PROCESSOR. Avoid touching any area that may retain electrical charge or accumulate heat (capacitors, heat sinks, fan motors, etc.).**

Processor testing and troubleshooting are performed with unit installed in the equipment rack. Refer to TM 11-5895-1392-12 for processor turn-on and diagnostic tests.

4-6. SYMPTOM INDEX

The symptom index for the processor is provided in table 4-1. Simply check the table for the fault condition or failed diagnostic test result and go to the referenced troubleshooting procedure in Table 4-2, Processor Troubleshooting.

Table 4-1. Processor Symptom Index

NUMBER	SYMPTOM	PAGE
1	DC OK indicator not lighted with POWER ON/OFF switch set to ON.....	4-10
2	Fan B1 and/or B2 fails to operate.....	4-12
3	Power supply fan fails to operate	4-12
4	Front panel assembly not operating properly	4-12
NOTE		
Symptoms 5 through 11 are a result of diagnostic testing by organizational maintenance. Replacement of associated CCA or assembly did not correct the fault.		
5	CPU CCA failure indicated.....	4-13
6	Memory CCA failure indicated.....	4-13
7	Disk drive failure indicated	4-14
8	Tape drive failure indicated	4-14
9	Ethernet controller CCA failure indicated	4-15
10	Multiplexer CCA failure indicated	4-15
11	Digital I/O CCA failure indicated.....	4-16
4-8		

4-7. TROUBLESHOOTING TABLE**WARNING**

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.** Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed or panels are open to avoid electrical shock.
- **HIGH VOLTAGES ARE PRESENT IN THE PROCESSOR.** Avoid touching any area that may retain electrical charge or accumulate heat (capacitors, heat sinks, fan motors, etc.).
- **Multiple person lift required.** Do not attempt to lift, carry, or move the equipment by yourself. Get help.

CAUTION

- This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.
- To avoid electrical shorts or similar problems, promptly remove any hardware or other foreign matter dropped into the equipment.
- Never place spillable containers on or near the equipment.
- Ensure that the correct circuit card assemblies and interconnect cables are used and that they are securely installed.

NOTE

- When performing troubleshooting procedures, especially during electrical checks, be alert for intermittent as well as good/bad conditions.
- Be sure that plugs, jacks, cables, and integrated circuits are completely and positively engaged. When reconnecting these items, guard against bending pins and inverting or offsetting connection of unkeyed connectors.
- Instructions that refer to right, left, front, or rear are given as if viewing the monitor from the front panel, looking toward the rear of the unit.

4-7. TROUBLESHOOTING TABLE - Continued

Troubleshooting procedures for the processor are provided in table 4-2. The table consists of three columns and is used as follows:

- 1. **MALFUNCTION:** Indicates equipment fault as described in symptom index. Look in TEST OR INSPECTION column for required fault isolation steps.
- 2. **TEST OR INSPECTION:** Indicates step(s) to be taken to isolate fault to a specific part or assembly. If equipment passes a test or inspection step, go to next step. If equipment fails a test or inspection, look in CORRECTIVE ACTION column for repair steps.
- 3. **CORRECTIVE ACTION:** Indicates authorized adjustment or repair for an isolated fault. When action is completed, repeat action or diagnostic test that initially identified fault to confirm repair. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action. If all steps are completed and fault persists, refer equipment to next higher level of maintenance.

Table 4-2. Processor Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION								
<p>1. DC OK INDICATOR NOT LIGHTED WITH POWER ON/OFF SWITCH SET TO ON</p>	<p>Step 1. Remove top cover (para 4-30). (Leave top cover off until repair complete.) Unplug AC IN connector from top of power supply assembly (para 1-15.2). Reset rear panel circuit breaker. Verify continuity between following:</p> <table style="margin-left: 40px;"> <tr> <td style="text-align: right;"><u>J12 PWR</u></td> <td style="text-align: left;"><u>AC IN Connector</u></td> </tr> <tr> <td style="text-align: right;">LINE (A)</td> <td style="text-align: left;">Pin 3</td> </tr> <tr> <td style="text-align: right;">NEU (C)</td> <td style="text-align: left;">Pin 1</td> </tr> <tr> <td style="text-align: right;">GND (B)</td> <td style="text-align: left;">Pin 2</td> </tr> </table> <p>a. If continuity is bad, go to step 2. b. If continuity is good, go to step 3.</p>	<u>J12 PWR</u>	<u>AC IN Connector</u>	LINE (A)	Pin 3	NEU (C)	Pin 1	GND (B)	Pin 2	<p>Step 2. Remove circuit breaker (para 4-18). Verify continuity through circuit breaker.</p> <p>a. Replace faulty circuit breaker. b. Refer processor to next higher level of maintenance.</p>
<u>J12 PWR</u>	<u>AC IN Connector</u>									
LINE (A)	Pin 3									
NEU (C)	Pin 1									
GND (B)	Pin 2									

4-7. TROUBLESHOOTING TABLE - Continued

Table 4-2. Processor Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION						
1.	DC OK INDICATOR NOT LIGHTED WITH POWER ON/OFF SWITCH SET TO ON - Continued	<p>Step 3. Reconnect power cable to rear panel connector J12 PWR. Perform processor power supply assembly test (para 4-29).</p> <p>Replace faulty processor power supply assembly component(s).</p>						
WARNING								
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.								
Step 4.	<p>Disconnect power cable from processor rear panel connector J12. Working at rear of front panel, disconnect cable J601 from connector P601 (para 1-15.2). With POWER ON/OFF switch set to ON, verify continuity between P601-1 and P601-3.</p>	<p>Replace faulty front panel assembly (para 4-28).</p>						
Step 5.	<p>Remove power supply assembly mounting bracket and cover (para 4-10). Disconnect REMOTE ON/OFF cable (WHT and BLK twisted pair) from ac distribution CCA connector J4. Verify continuity between the following (para 1-15.2):</p>	<table border="0"> <thead> <tr> <th><u>REMOTE ON/OFF Connector</u></th> <th><u>Power Distribution CCA Plug P700</u></th> </tr> </thead> <tbody> <tr> <td>Pin 1 (BLK)</td> <td>Pin 1</td> </tr> <tr> <td>Pin 2 (WHT)</td> <td>Pin 4</td> </tr> </tbody> </table>	<u>REMOTE ON/OFF Connector</u>	<u>Power Distribution CCA Plug P700</u>	Pin 1 (BLK)	Pin 1	Pin 2 (WHT)	Pin 4
<u>REMOTE ON/OFF Connector</u>	<u>Power Distribution CCA Plug P700</u>							
Pin 1 (BLK)	Pin 1							
Pin 2 (WHT)	Pin 4							
<p>Replace faulty power distribution CCA (para 4-22).</p>								
Step 6.	<p>Check ac distribution CCA by replacing with a known good ac distribution CCA (para 4-21).</p>	<p>a. Replace faulty ac distribution CCA.</p> <p>b. Refer processor to next higher level of maintenance.</p>						

4-7. TROUBLESHOOTING TABLE - Continued

Table 4-2. Processor Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. FAN B1 AND/OR B2 FAILS TO OPERATE		
WARNING		
HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.		
Step 1.	Remove top cover (para 4-30). Disconnect cable J900 from connector P900 (para 1-15.2). Apply power to processor (refer to TM 11-5895-1392-12). Check for approximately 11.5 to 12.5 Vdc in cable J900.	
	If voltage is correct, replace fan assembly (para 4-9).	
Step 2.	Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	
	<ul style="list-style-type: none"> a. Replace faulty power supply assembly component(s). b. Refer processor to next higher level of maintenance. 	
3. POWER SUPPLY FAN FAILS TO OPERATE		
	Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	
	<ul style="list-style-type: none"> a. Replace faulty power supply assembly component(s). b. Replace faulty power supply assembly fan (para 4-23). c. Replace faulty power supply assembly (para 4-19). 	
4. FRONT PANEL ASSEMBLY NOT OPERATING PROPERLY		
Step 1.	Check front panel assembly by replacing with a known good front panel assembly (para 4-28).	
	Replace faulty front panel assembly.	
Step 2.	Check CPU CCA by replacing with a known good CPU CCA (para 4-17).	
	Replace faulty CPU CCA.	
4-12		

4-7. TROUBLESHOOTING TABLE - Continued

Table 4-2. Processor Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. FRONT PANEL ASSEMBLY NOT OPERATING PROPERLY - Continued		
Step 3.	Perform power supply assembly test (para 4-29).	
a.	Replace faulty power supply assembly component(s).	
b.	Refer processor to next higher level of maintenance.	
5. CPU CCA FAILURE INDICATED		
Step 1.	Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	
	Replace faulty power supply assembly component(s).	
Step 2.	Check continuity of associated wiring harness(es). Refer to processor interconnect diagram (FO-1).	
a.	Replace or repair wiring harness (para 4-24 thru 4-27).	
b.	Refer processor to next higher level of maintenance.	
6. MEMORY CCA FAILURE INDICATED		
Step 1.	Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	
	Replace faulty power supply assembly component(s).	
Step 2.	Check CPU CCA by replacing with a known good CPU CCA (para 4-17).	
	Replace faulty CPU CCA.	
Step 3.	Check continuity of associated wiring harness(es). Refer to processor interconnect diagram (FO-1).	
a.	Replace or repair wiring harness (para 4-24 thru 4-27).	
b.	Refer processor to next higher level of maintenance.	

4-7. TROUBLESHOOTING TABLE- Continued

Table 4-2. Processor Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. DISK DRIVE FAILURE INDICATED	Step 1. Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	Replace faulty power supply assembly component(s).
	Step 2. Check CPU CCA by replacing with a known good CPU CCA (para 4-17).	Replace faulty CPU CCA.
	Step 3. Check continuity of associated wiring harness(es). Refer to processor interconnect diagram (FO-1).	
	a. Replace or repair wiring harness (para 4-24 thru 4-27).	
	b. Refer processor to next higher level of maintenance.	
8. TAPE DRIVE FAILURE INDICATED	Step 1. Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	Replace faulty power supply assembly component(s).
	Step 2. Check CPU CCA by replacing with a known good CPU CCA (para 4-17).	Replace faulty CPU CCA.
	Step 3. Check continuity of associated wiring harness(es). Refer to processor interconnect diagram (FO-1).	
	a. Replace or repair wiring harness (para 4-24 thru 4-27).	
	b. Refer processor to next higher level of maintenance.	

4-7. TROUBLESHOOTING TABLE - Continued

Table 4-2. Processor Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. ETHERNET CONTROLLER CCA FAILURE INDICATED	Step 1. Check Ethernet cabinet kit by replacing with a known good Ethernet cabinet kit (para 4-14).	Replace faulty Ethernet cabinet kit.
	Step 2. Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	Replace faulty power supply assembly component(s).
	Step 3. Check CPU CCA by replacing with a known good CPU CCA (para 4-17).	Replace faulty CPU CCA.
	Step 4. Check continuity of associated wiring harness(es). Refer to processor interconnect diagram (FO-1).	
	a. Replace or repair wiring harness (para 4-24 thru 4-27).	
	b. Refer processor to next higher level of maintenance.	
10. MULTIPLEXER CCA FAILURE INDICATED	Step 1. Check multiplexer cabinet kit by replacing with a known good multiplexer cabinet kit (para 4-15).	Replace faulty multiplexer cabinet kit.
	Step 2. Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	Replace faulty power supply assembly component(s).

4-7. TROUBLESHOOTING TABLE - Continued

Table 42. Processor Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
10. MULTIPLEXER CCA FAILURE INDICATED - Continued		
Step 3.	Check CPU CCA by replacing with a known good CPU CCA (para 4-17) .	Replace faulty CPU CCA.
Step 4.	Check continuity of associated wiring harness(es). Refer to processor interconnect diagram (FO-1).	<ul style="list-style-type: none"> a. Replace or repair wiring harness (para 4-24 thru 4-27). b. Refer processor to next higher level of maintenance.
11. DIGITAL I/O CCA FAILURE INDICATED		
Step 1.	Check digital I/O cable by replacing with a known good digital I/O cable (para 4-13).	Replace faulty digital I/O cable.
Step 2.	Perform power supply assembly test (para 4-29). (Leave top cover off until repair complete.)	Replace faulty power supply assembly component(s).
Step 3.	Check CPU CCA by replacing with a known good CPU CCA (para 4-17).	Replace faulty CPU CCA.
Step 4.	Check continuity of associated wiring harness(es). Refer to processor interconnect diagram (FO-1).	<ul style="list-style-type: none"> a. Replace or repair wiring harness (para 4-24 thru 4-27). b. Refer processor to next higher level of maintenance.

SECTION III. MAINTENANCE PROCEDURES

4-8. REMOVE/INSTALL PROCESSOR CARD CAGE

This task covers:	a. Removal	b. Installation
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INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure:

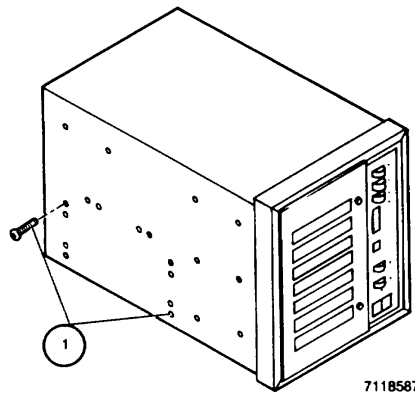
1. Remove power supply assembly (para 4-19).
 2. Remove wiring harness 701274-0100 (para 4-25).
-

REMOVAL

WARNING

Multiple person lift required. Do not attempt to lift, carry, or move the equipment by yourself. Get help.

1. Set processor on right side panel.
2. Working at bottom panel, remove eight screws (1).
3. Set processor in normal upright position.



4-17

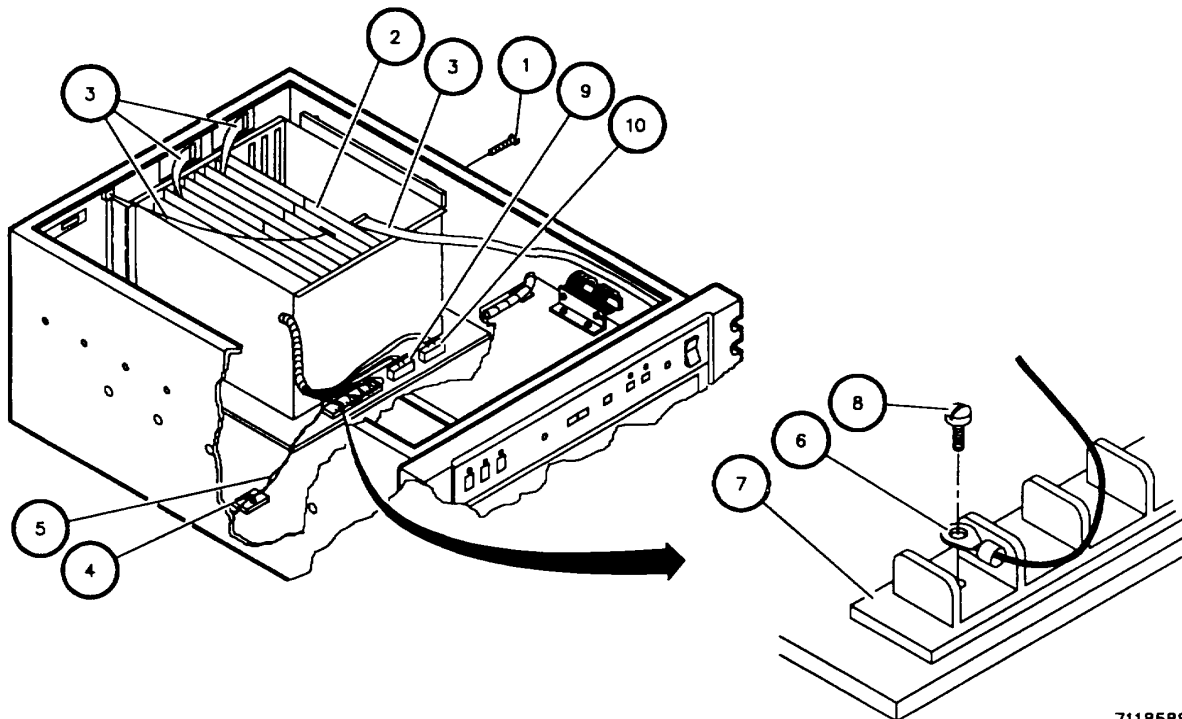
4-8. REMOVE/INSTALL PROCESSOR CARD CAGE - Continued

4. Working at right side panel, remove four screws (1).

NOTE

- **Note and record pin 1 orientation (red conductor) of all ribbon cables disconnected to aid installation.**
- **CP only: Note and record orientation of digital I/O cable in digital I/O CCA connector to aid installation.**

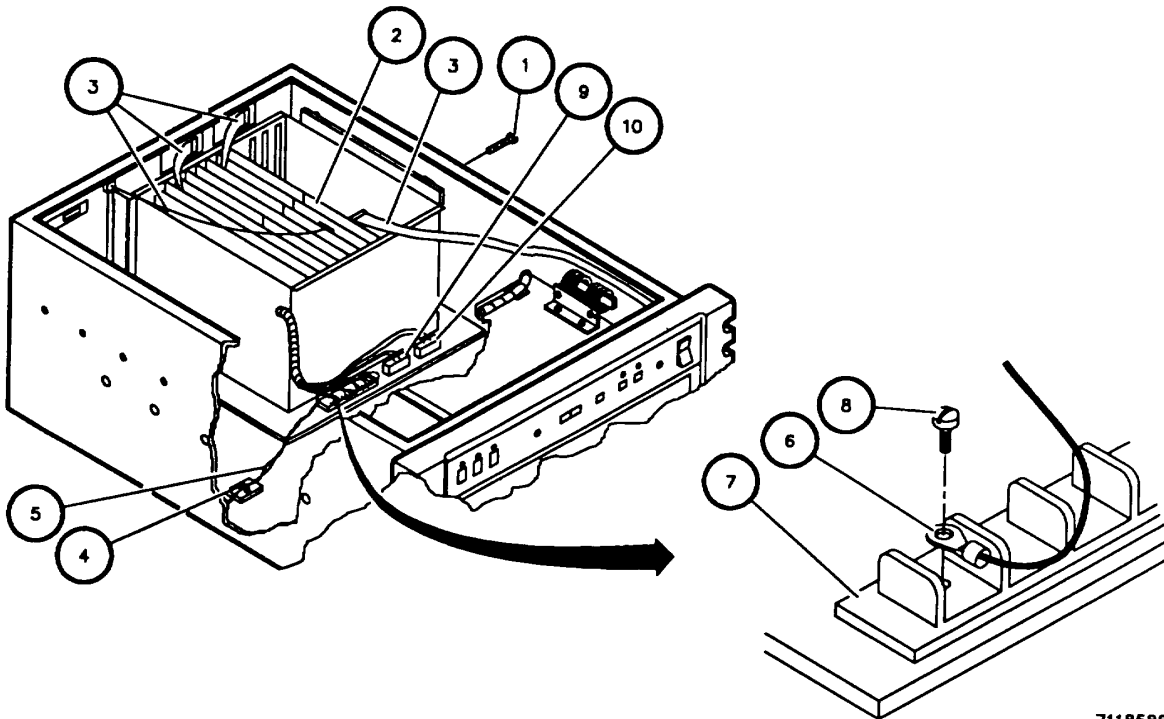
5. Working at top of card cage (2), tag and disconnect all cables (3) from circuit card assemblies (para 1-15.2).
6. Cut and remove cable ties (4), as required, freeing red and black wires (5) from chassis.
7. Carefully lift card cage (2) from chassis and position to access backplane connections, moving cables out of the way, as required.
8. Tag 11 wires (6) connected to TB1 (7).
9. Remove 11 screws (8) and wires (6) from TB1 (7).
10. Tag and disconnect cables from connectors P101 (9) and J1 (10).
11. Remove card cage (2).



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4-8. REMOVE/INSTALL PROCESSOR CARD CAGE - Continued**INSTALLATION**

1. Position card cage (2) so cables can be connected to backplane.
2. Install 11 screws (8) and wires (6) on TB1 (7) as tagged. Remove tags.
3. Install cables to connectors P101 (9) and J1 (10) as tagged. Remove tags.
4. Carefully place card cage (2) in installed position, moving cables out of the way, as required.
5. Using cable ties (4), secure red and black wires (5) to chassis.
6. Connect all cables (3) to circuit card assemblies as tagged (para 1-15.2). Remove tags.
7. Working at right side panel, install four screws (1).

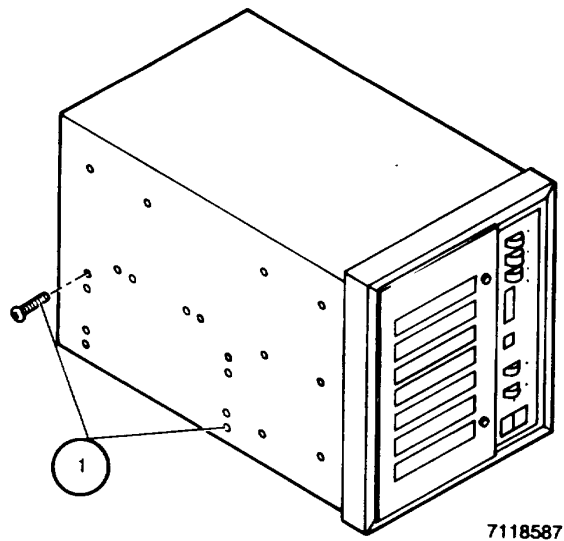


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4-8. REMOVE/INSTALL PROCESSOR CARD CAGE - Continued**WARNING**

Multiple person lift required. Do not attempt to lift, carry, or move the equipment by yourself. Get help.

8. Set processor on right side panel.
9. Working at bottom panel, install eight screws (1).
10. Set processor in normal upright position.

**FOLLOW-ON MAINTENANCE:**

1. Install wiring harness 701274-0100 (para 4-25).
2. Install power supply assembly (para 4-19).

4-9. REPLACE FAN ASSEMBLY

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

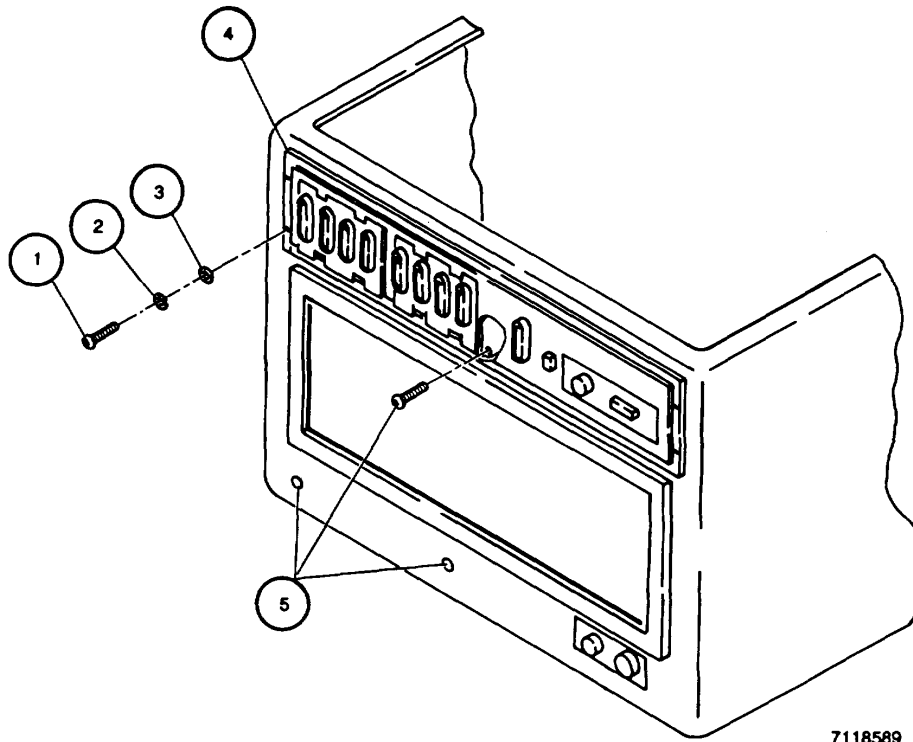
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove processor card cage (para 4-8).

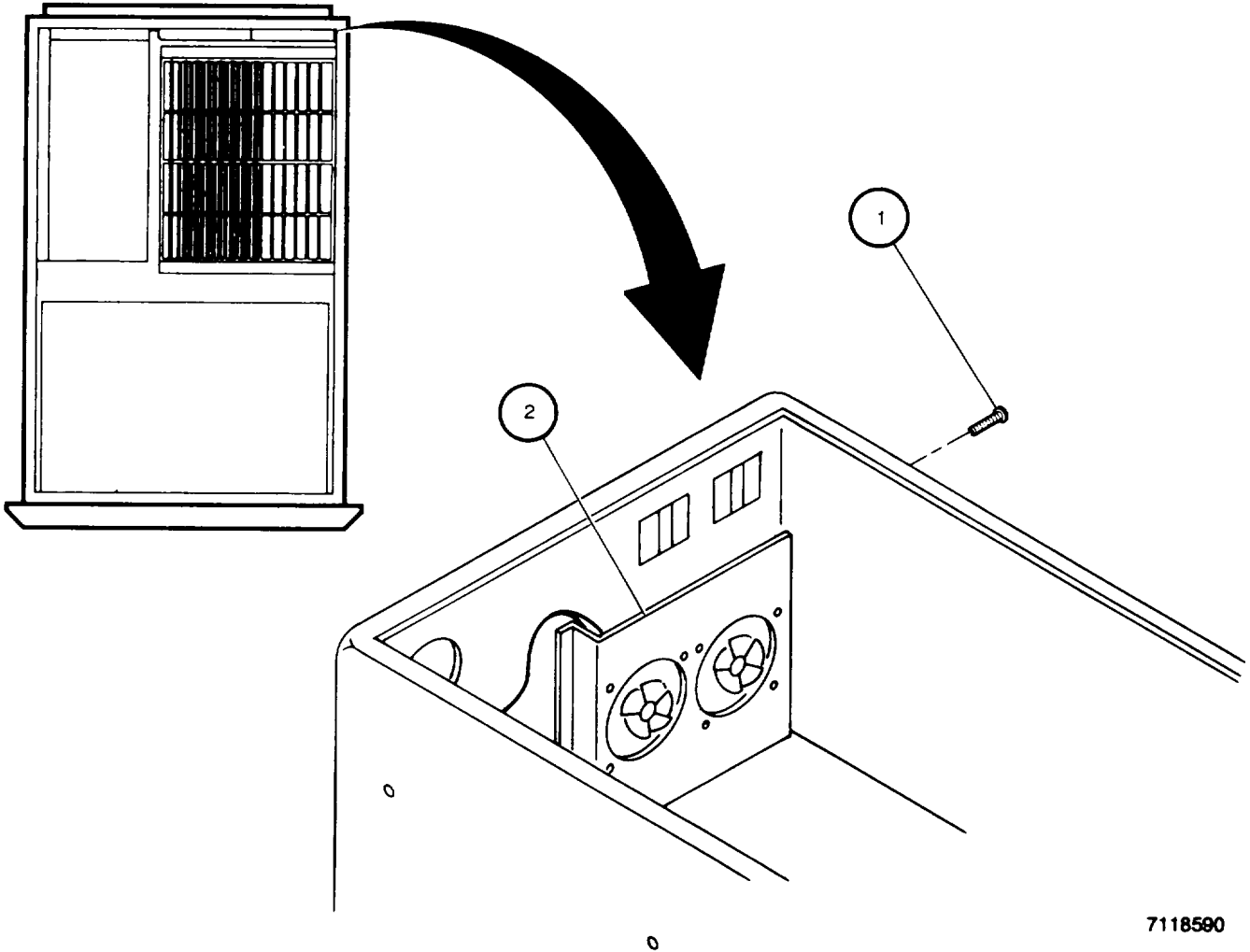
REMOVAL

1. Working at rear panel, remove 12 screws (1), lockwashers (2), and washers (3).
2. Position connector bracket (4) to access screw (5) behind bracket.
3. Remove three screws (5).



4-9. REPLACE FAN ASSEMBLY- Continued

4. Working at right side panel, remove two screws (1).
5. Remove fan assembly (2).



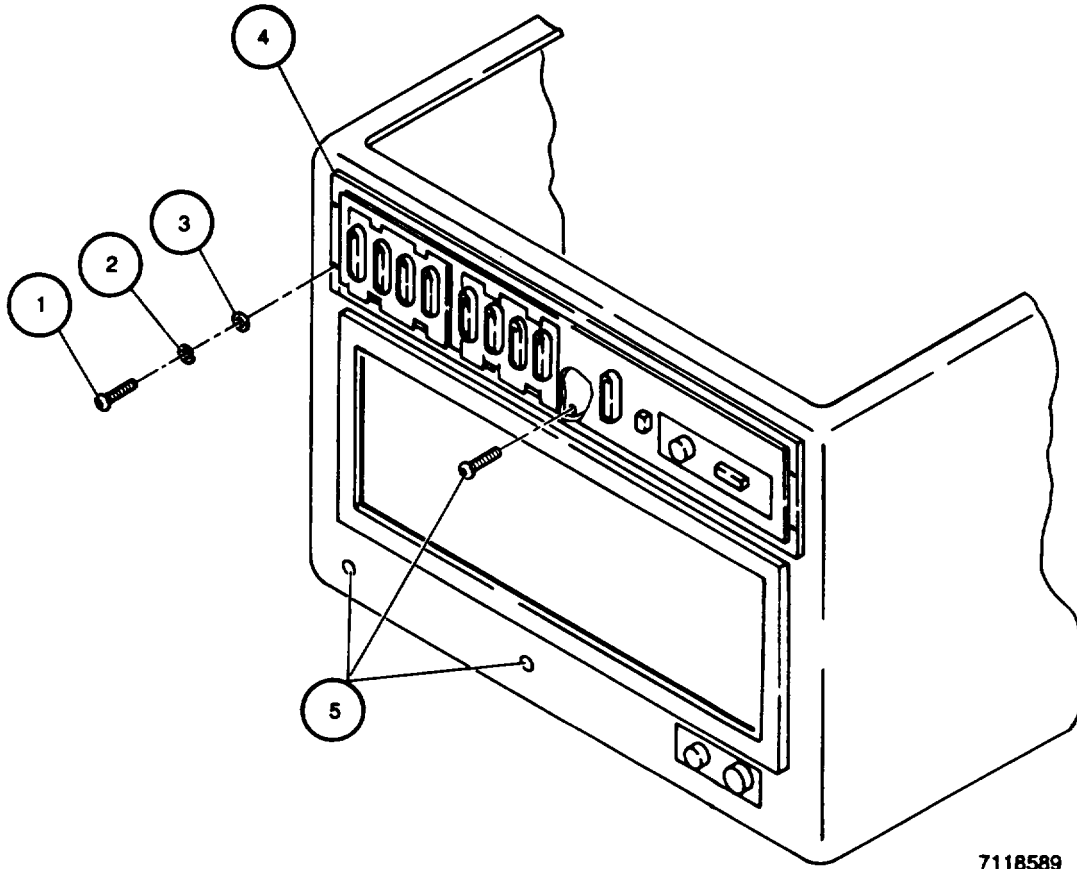
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INSTALLATION

1. Place fan assembly (2) in installed position.
2. Working at right side panel, install two screws (1).

4-9. REPLACE FAN ASSEMBLY - Continued

3. Working at rear panel, install three screws (5).
4. Place connector bracket (4) in installed position.
5. Install 12 screws (1), lockwashers (2), and washers (3).



FOLLOW-ON MAINTENANCE: Install processor card cage (para 4-8).

4-10. REMOVE/INSTALL POWER SUPPLY MOUNTING BRACKET AND COVER

This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precaution:****CAUTION**

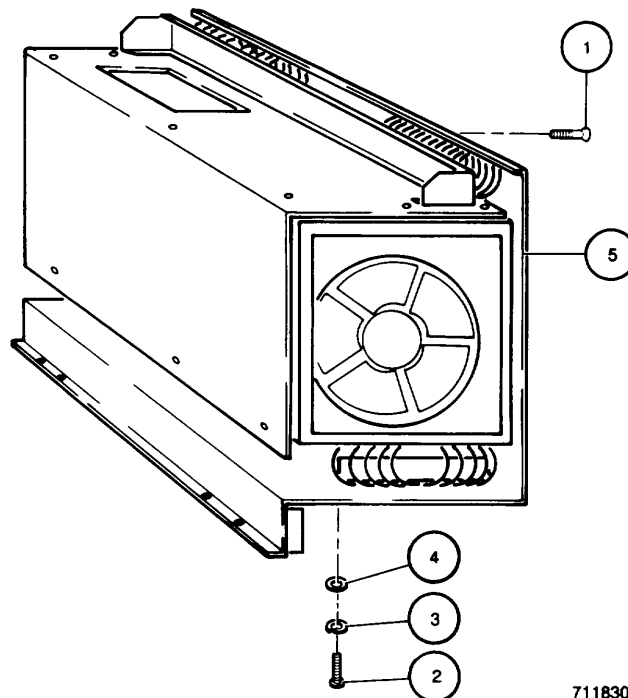
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove power supply assembly (para 4-19).

REMOVAL

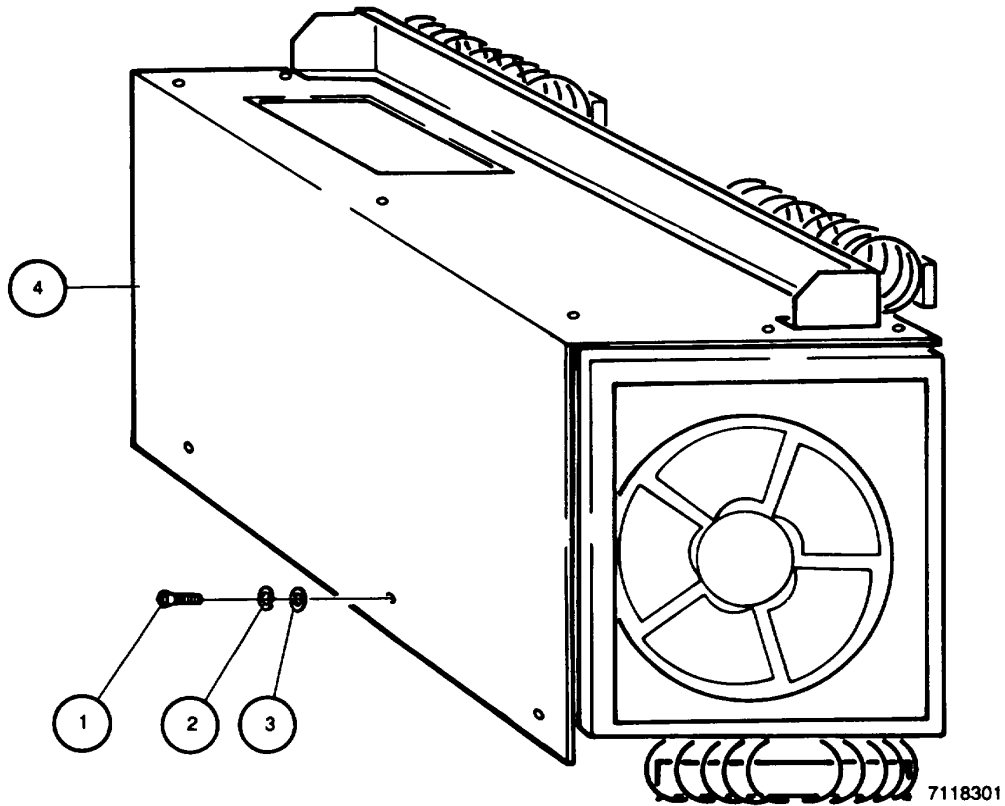
1. Remove four recessed-head screws (1).
2. Remove four screws (2), lockwashers (3), and washers (4).
3. Remove mounting bracket (5).



7118300

4-10. REMOVE/INSTALL POWER SUPPLY MOUNTING BRACKET AND COVER - Continued

4. Remove 11 screws (1), lockwashers (2), and washers (3).
5. Remove power supply cover (4).

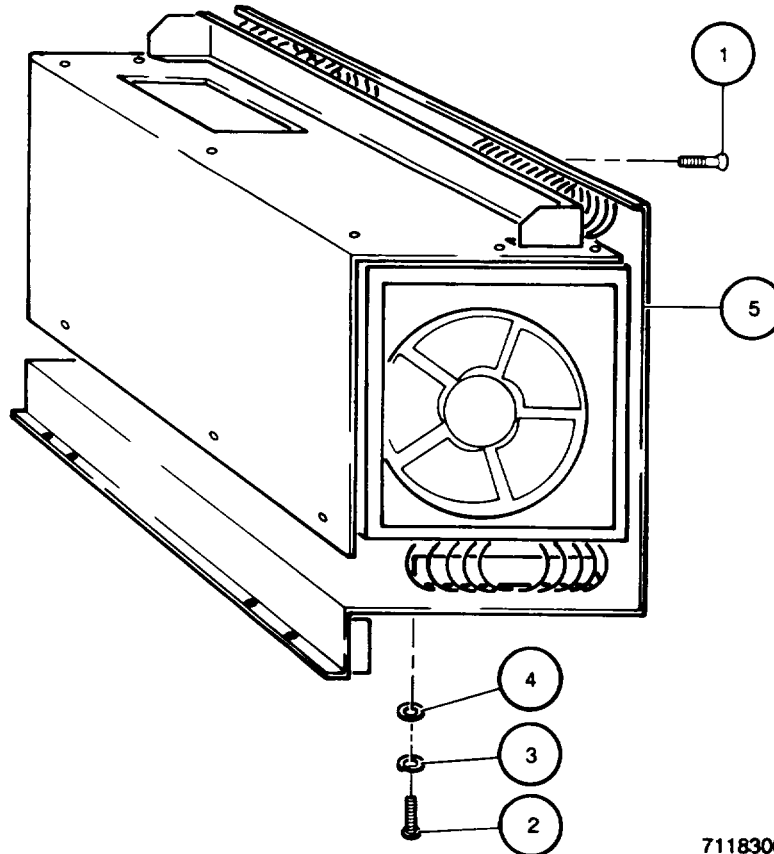


INSTALLATION

1. Place power supply cover (4) in installed position.
2. Install 11 screws (1), lockwashers (2), and washers (3).

4-10. REMOVE/INSTALL POWER SUPPLY MOUNTING BRACKET AND COVER - Continued

3. Place mounting bracket (5) in installed position.
4. Install four screws (2), lockwashers (3), and washers (4).
5. Install four recessed-head screws (1).



7118300

FOLLOW-ON MAINTENANCE: Install power supply assembly (para 4-19).

4-11. REPLACE PROCESSOR TAPE DRIVE CASE/TAPE TRANSPORT ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

- Removal of tape transport assembly from tape drive case isolates each assembly for replacement, as required.
- Tape transport assembly may contain classified information. Handle, ship, and store in accordance with approved security procedures.

Equipment Configuration: Tape drive assembly placed on a firm, clean surface.

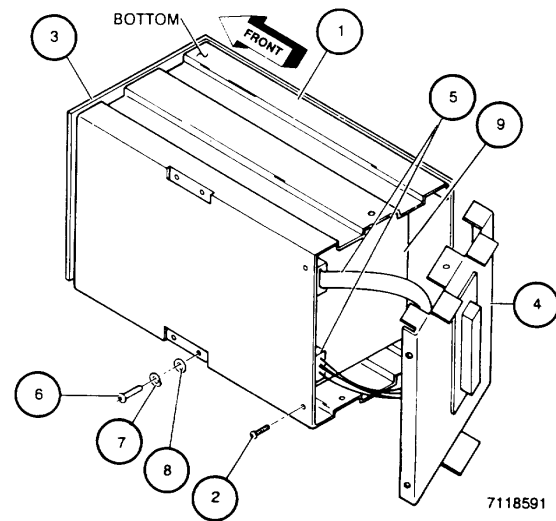
REMOVAL

1. Position tape drive case (1) on workbench as shown.

NOTE

Front cover and right side cover form a single assembly, the front-right side cover.

2. Remove 10 screws (2) (left side shown) securing front-right side cover (3) and rear cover (4) to tape drive case (1).
3. Remove front-right side cover (3) and position rear cover (4) to access cables (5).
4. Tag and disconnect two cables (5).
5. Remove rear cover (4).
6. Remove four screws (6), lockwashers (7), and washers (8).
7. Carefully remove tape transport assembly (9) from tape drive case (1).



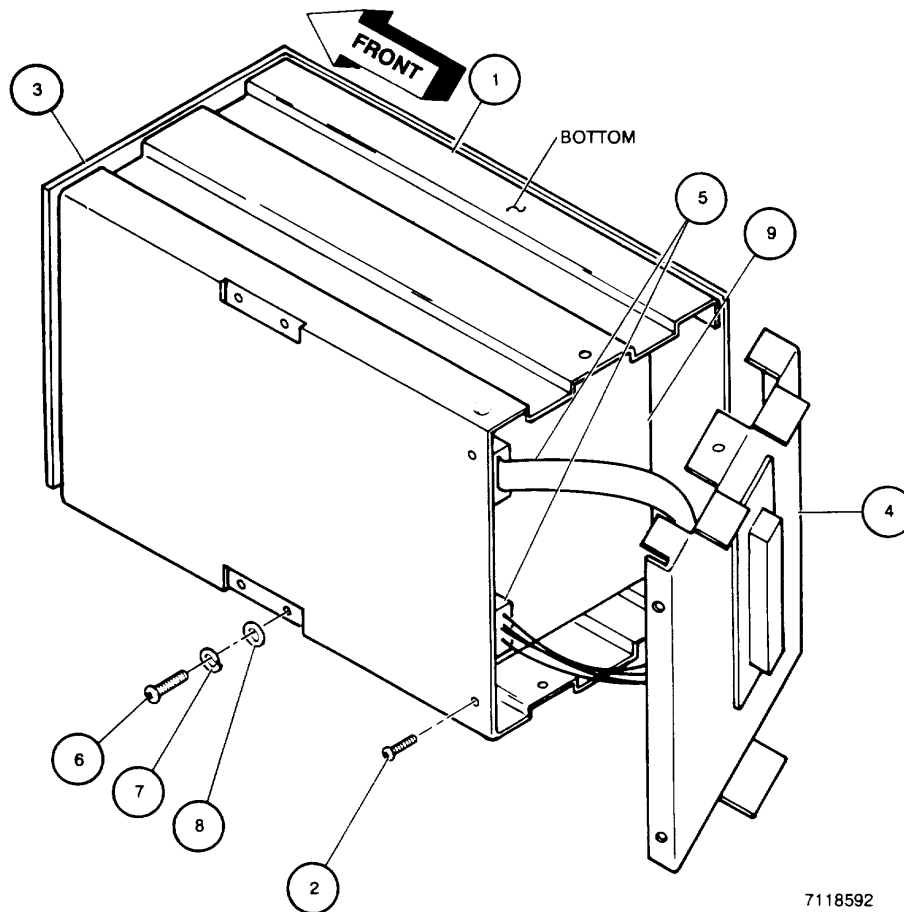
NOTE

Retain case (1) when returning a faulty disk drive. The case is not provided with the replacement disk drive.

4-11. REPLACE PROCESSOR TAPE DRIVE CASE/TAPE TRANSPORT ASSEMBLY - Continued

INSTALLATION

1. Carefully place tape transport assembly (9) in tape drive case (1) (as shown).
2. Install four screws (6), lockwashers (7), and washers (8).
3. Position rear cover (4) so that cables (5) can be connected.
4. Connect two cables (5), as tagged. Remove tags.
5. Place front-right side cover (3) in installed position.
6. Place rear cover (4) in installed position.
7. Install 10 screws (2) (left side shown).



7118592

4-12. REPLACE PROCESSOR DISK DRIVE CASE/DISK DRIVE

This task covers: a. Removal b. Installation

INITIAL SETUP

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

- Removal of disk drive from disk drive case isolates each assembly for replacement, as required.
- Disk drives may contain classified information. Handle, ship, and store in accordance with approved security procedures.

Equipment Configuration: Disk drive assembly placed on a firm, clean surface.

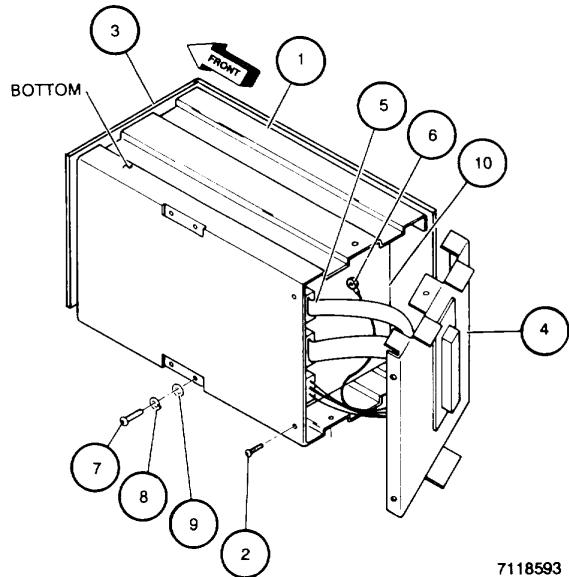
REMOVAL

1. Position disk drive case (1) on workbench as shown.

NOTE

Front cover and right side cover form a single assembly, the front-right side cover.

2. Remove 12 screws (2) (left side shown) securing front-right side cover (3) and rear cover (4) to disk drive case (1).
3. Remove front-right side cover (3) and position rear cover (4) to access cables (5).
4. Tag and disconnect three cables (5) and ground lug (6).
5. Remove rear cover (4).
6. Remove four screws (7), lockwashers (8), and washers (9).
7. Carefully remove disk drive (10) from disk drive (1).



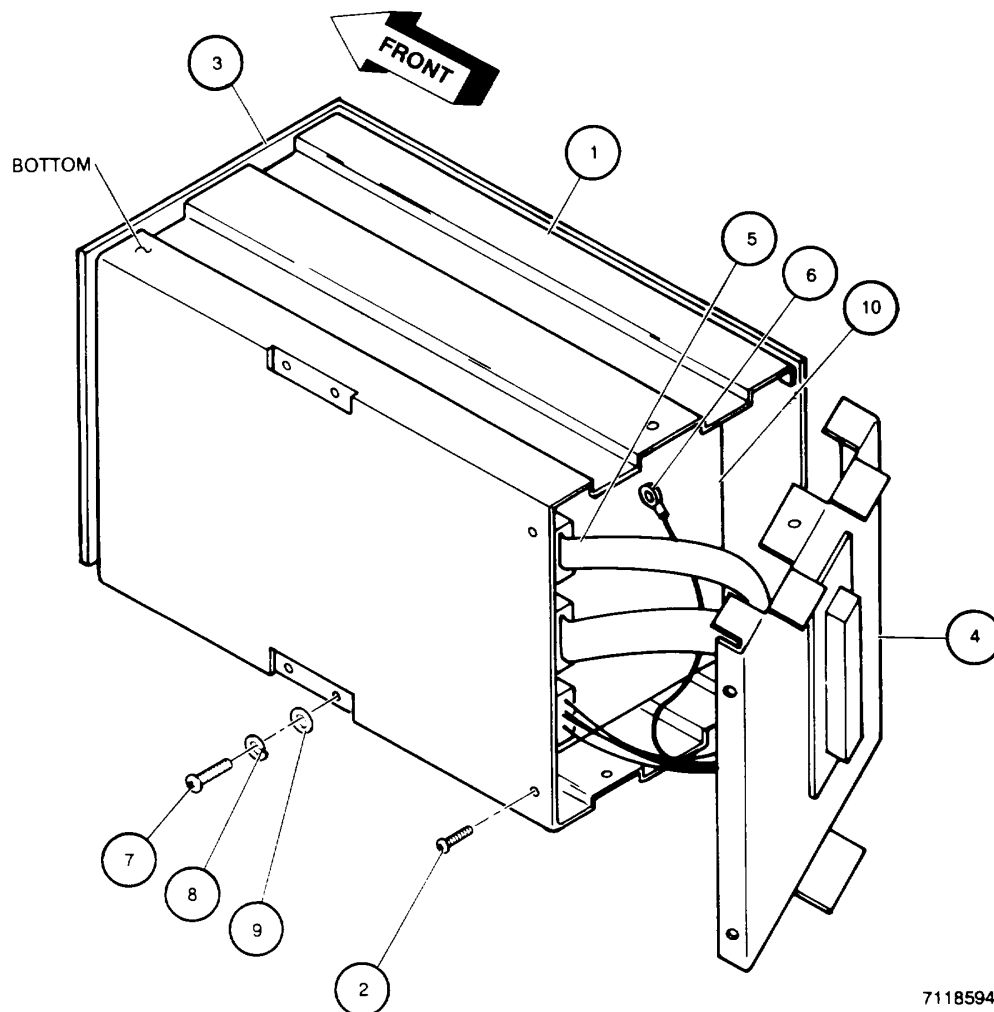
7118593

NOTE

Retain case (1) when returning a faulty disk drive. The case is not provided with the replacement disk drive.

4-12. REPLACE PROCESSOR DISK DRIVE CASE/DISK DRIVE - Continued**INSTALLATION**

1. Carefully place disk drive (10) in disk drive case (1) (as shown).
2. Install four screws (7), lockwashers (8), and washers (9).
3. Position rear cover (4) so that cables (5) can be connected.
4. Connect three cables (5) and ground lug (6), as tagged. Remove tags.
5. Place front-right side cover (3) in installed position.
6. Place rear cover (4) in installed position.
7. Install 12 screws (2) (left side shown).



4-13. REPLACE DIGITAL I/O CABLE

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

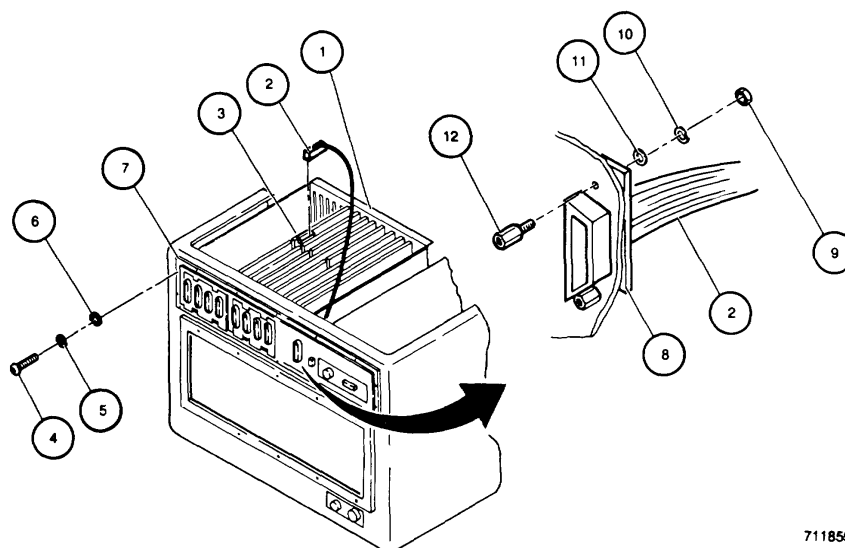
Preliminary Procedure: Remove top cover (para 4-30).

REMOVAL

NOTE

Note and record orientation of digital I/O cable in digital I/O CCA connector to aid installation.

1. Working at top of card cage (1), disconnect digital 110 cable (2) from digital I/O CCA (3).
2. Working at rear panel, remove 12 screws (4), lockwashers (5), and washers (6).
3. Carefully position connector bracket (7) to access cable connector (8).
4. Remove two nuts (9), lockwashers (10), washers (11), and standoffs (12).
5. Remove digital I/O cable (2).

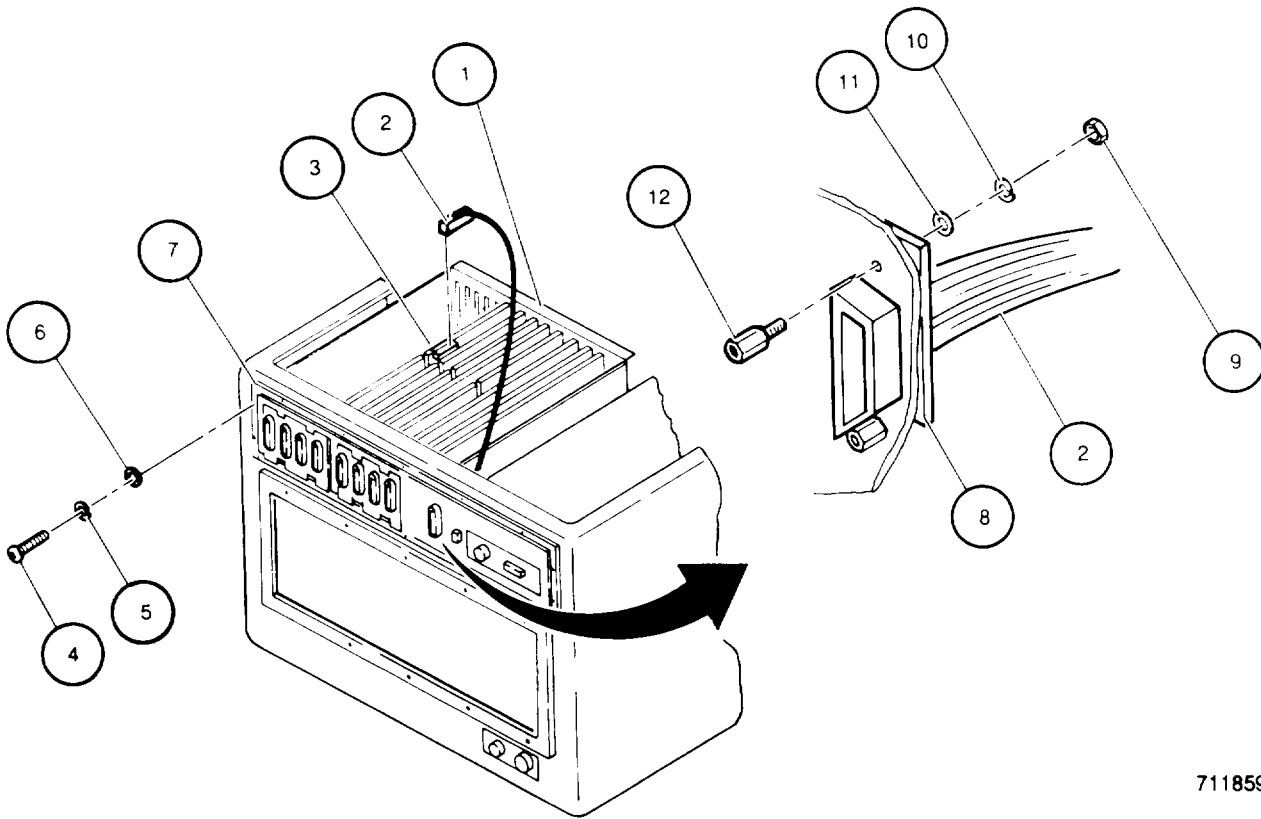


7118595

4-13. REPLACE DIGITAL I/O CABLE - Continued

INSTALLATION

1. Place digital I/O cable (2) in installed position, with cable connector (8) in connector bracket (7).
2. Install two nuts (9), lockwashers (10), washers (11), and standoffs (12).
3. Place connector bracket (7) in installed position.
4. Install 12 screws (4), lockwashers (5), and washers (6).
5. Working at top of card cage (1), connect digital I/O cable (2) to digital I/O CCA (3).



7118595

FOLLOW-ON MAINTENANCE: Install top cover (para 4-30).

4-14. REPLACE ETHERNET CABINET KIT

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

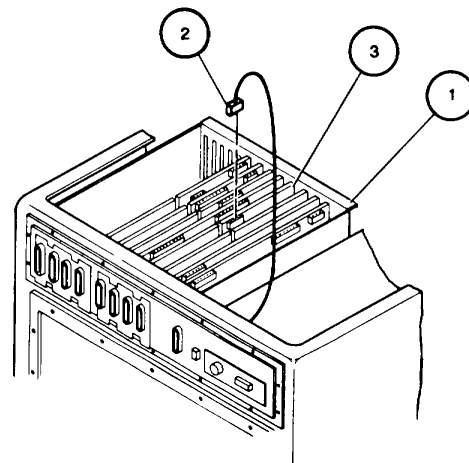
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure:

3. Remove top cover (para 4-30).
4. If installed in equipment back, remove Ethernet station adapter. Refer to TM 11-5895-1392-12.

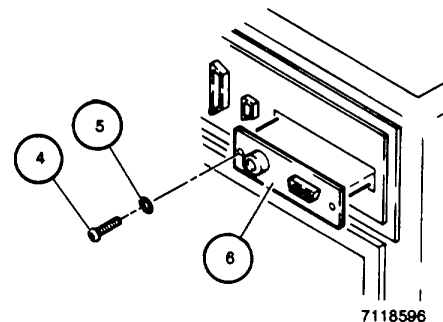
REMOVAL

1. Working at top of card cage (1), disconnect Ethernet cable (2) from Ethernet controller CCA (3).
2. Working at rear panel, remove two screws (4) and internal tooth lockwashers (5).
3. Remove Ethernet cabinet kit (6), routing Ethernet cable (2) from rear panel.



INSTALLATION

1. Place Ethernet cabinet kit (6) in installed position.
2. Install two screws (4) and internal tooth lockwashers (5).
3. Working at top of card cage (1), connect Ethernet cable (2) to Ethernet controller CCA (3).



FOLLOW-ON MAINTENANCE:

1. If installed in equipment rack, install Ethernet station adapter. Refer to TM 11-5895-1392-12.
2. Install top cover (para 4-30).

4-15. REPLACE MULTIPLEXER CABINET KIT A OR B

This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precaution:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

Replace multiplexer cabinet kit A (J1-J4) or B (J5-J8) the same way. Multiplexer cabinet kit B is shown.

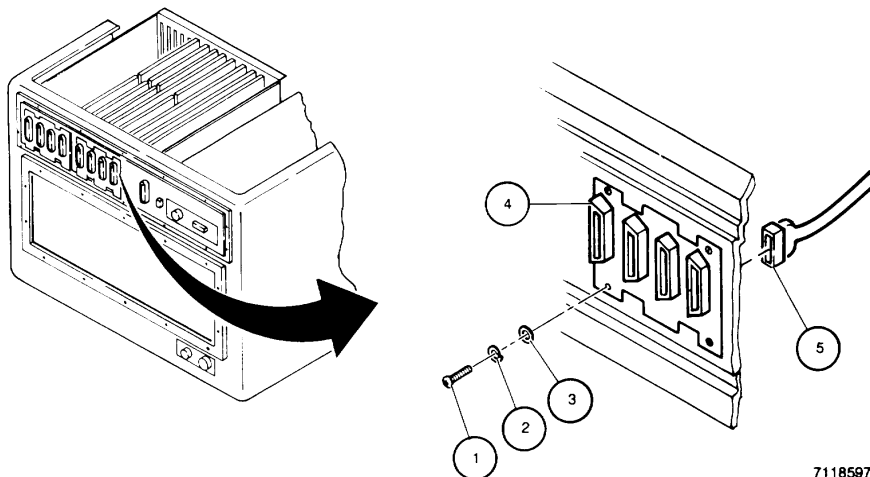
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedures:

1. Remove processor. Refer to TM-11-5895-1392-12.
2. Remove top cover (para 4-30).

REMOVAL

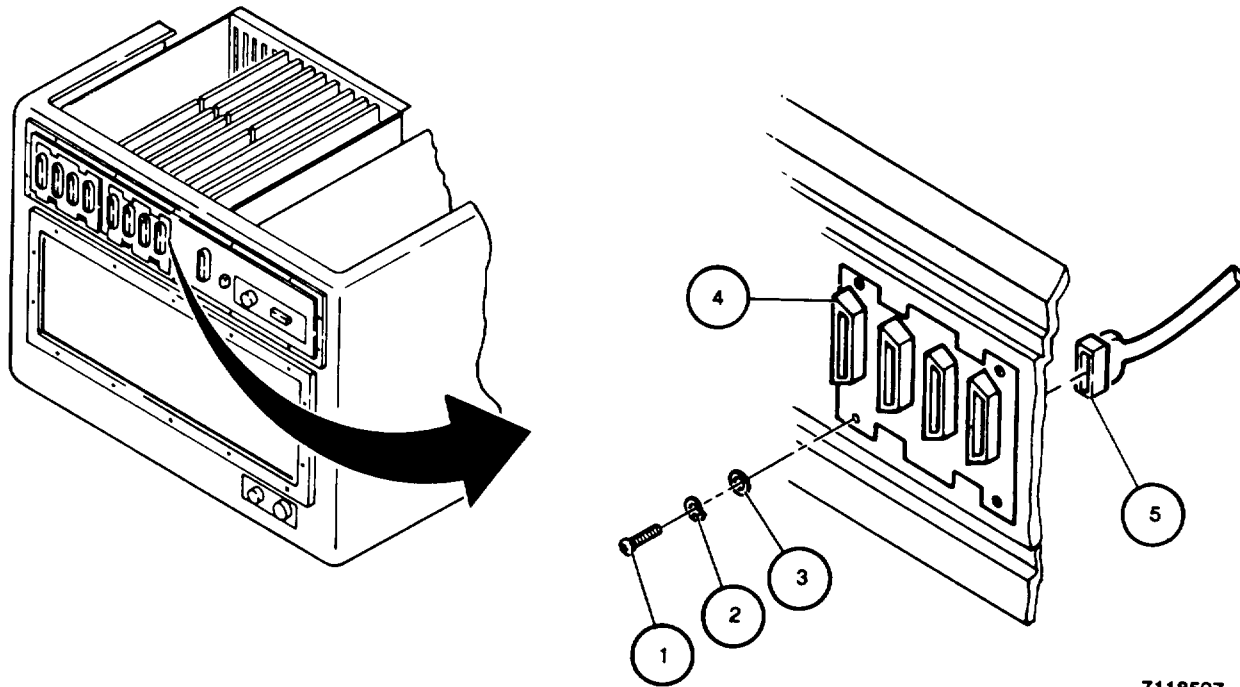
1. Working at rear panel, remove four screws (1), lockwashers (2), and washers (3).
2. Position multiplexer cabinet kit (4) to access ribbon cable (5).
3. Disconnect ribbon cable (5).
4. Remove multiplexer cabinet kit (4).



7118597

4-15. REPLACE MULTIPLEXER CABINET KIT A OR B - Continued**INSTALLATION**

1. Connect ribbon cable (5) to multiplexer cabinet kit (4).
2. Place multiplexer cabinet kit (4) in installed position.
3. Install four screws (1), lockwashers (2), and washers (3).



7118597

FOLLOW-ON MAINTENANCE:

1. Install top cover (para 4-30).
2. Install processor. Refer to TM 11-5895-1392-12.

4-16. REPLACE REAR AIR FILTER

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedures:

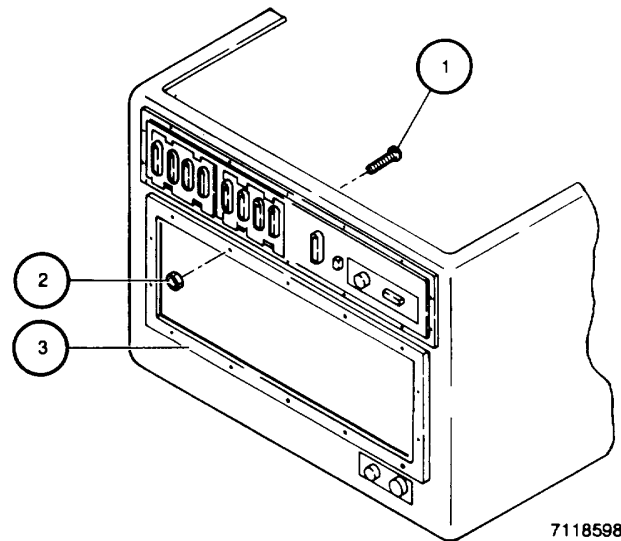
1. Remove power supply assembly (para 4-19).
2. Remove fan assembly (para 4-9).

REMOVAL

1. Working at rear panel, remove 14 screws (1) and nuts (2).
2. Remove filter (3).

INSTALLATION

1. Place filter (3) in installed position.
2. Install 14 screws (1) and nuts (2).



FOLLOW-ON MAINTENANCE:

1. Install fan assembly (para 4-9).
2. Install power supply assembly (para 4-19).

4-17. REPLACE CIRCUIT CARD ASSEMBLY OR GRANT ANCHOR BOARD

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precaution:**CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

Replacement of CCAs or grant, anchor, or grant/anchor boards is the same, except where noted. Digital I/O CCA is shown.

Equipment Configuration: Processor installed in equipment rack.

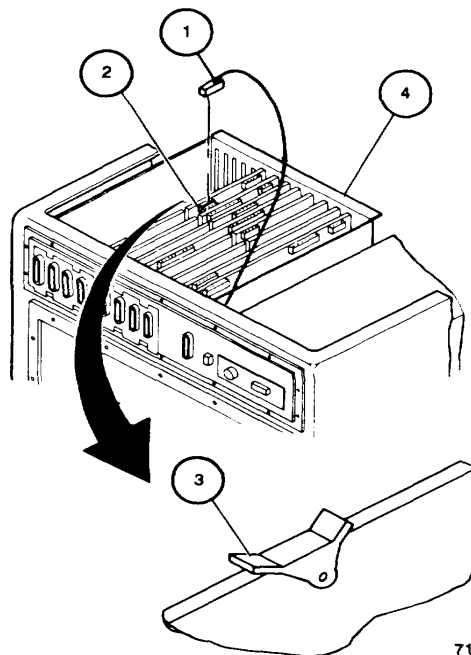
Preliminary Procedure: Remove top cover (para 4-30).

REMOVAL

NOTE

- Note and record pin 1 orientation (red conductor) of all ribbon cables disconnected to aid installation.
- CP only: Note and record orientation of digital I/O cable in digital I/O CCA connector to aid installation.

1. Move or tag and disconnect any cable(s) (1) that block circuit card (2) removal (para 1-15.2).
2. Grasp handle(s) (3) on circuit card (2).
3. Pull upward and remove circuit card (2) from card cage (4).



7118599

INSTALLATION

1. Grasp handle(s) (3) on circuit card (2) and slide card into card cage (4), ensuring that card engages backplane without jamming or binding.
2. Install any cable(s) (1) removed to access circuit card (2) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install top cover (para 4-30). If disk controller CCA is replaced, configure controller (TM 11-5895-1392-12). If Ethernet controller CCA is replaced, inform system operator that processor has new Ethernet address.

4-18. REPLACE CIRCUIT BREAKER

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

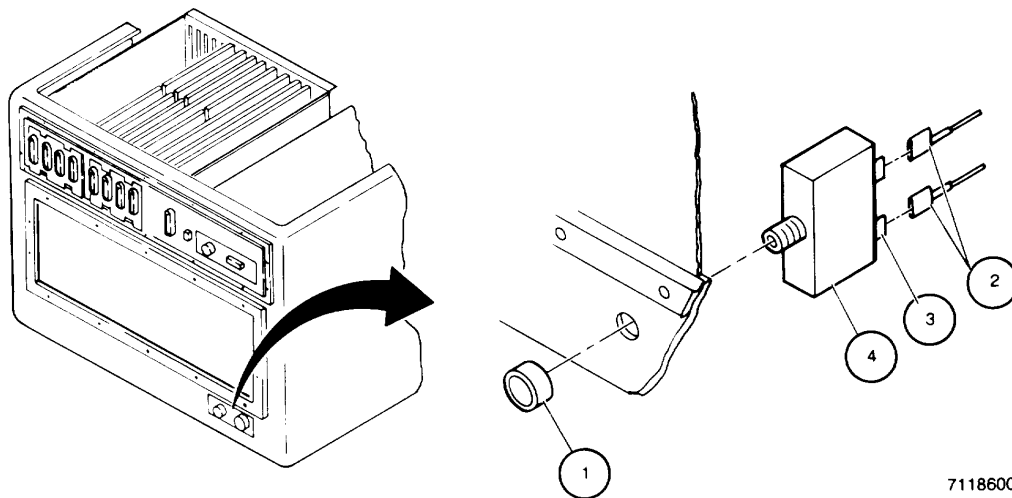
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove power supply assembly (para 4-19).

REMOVAL

1. Working at rear panel, remove nut (1).
2. Working inside rear panel, unplug two spade connectors (2) from two terminal lugs (3).
3. Remove circuit breaker CB1 (4).



INSTALLATION

1. Place circuit breaker CB1 (4) in installed position.
2. Plug two spade connectors (2) onto two terminal lugs (3).
3. Working at rear panel, install nut (1).

FOLLOW-ON MAINTENANCE: Install power supply assembly (para 4-19).

41 9. REPLACE POWER SUPPLY ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

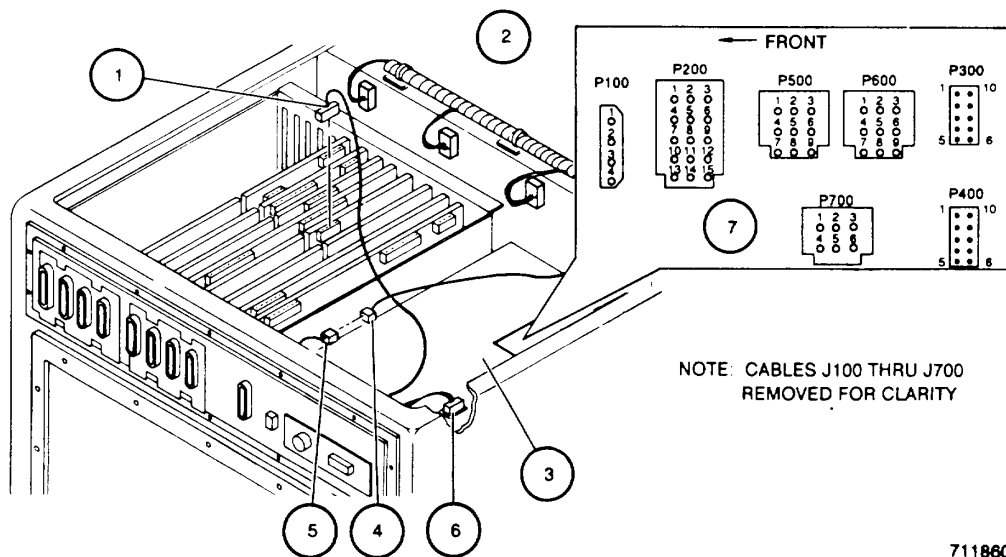
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedures:

1. Remove processor. Refer to TM 11-5895-1392-12.
2. Remove top cover (para 4-30).

REMOVAL

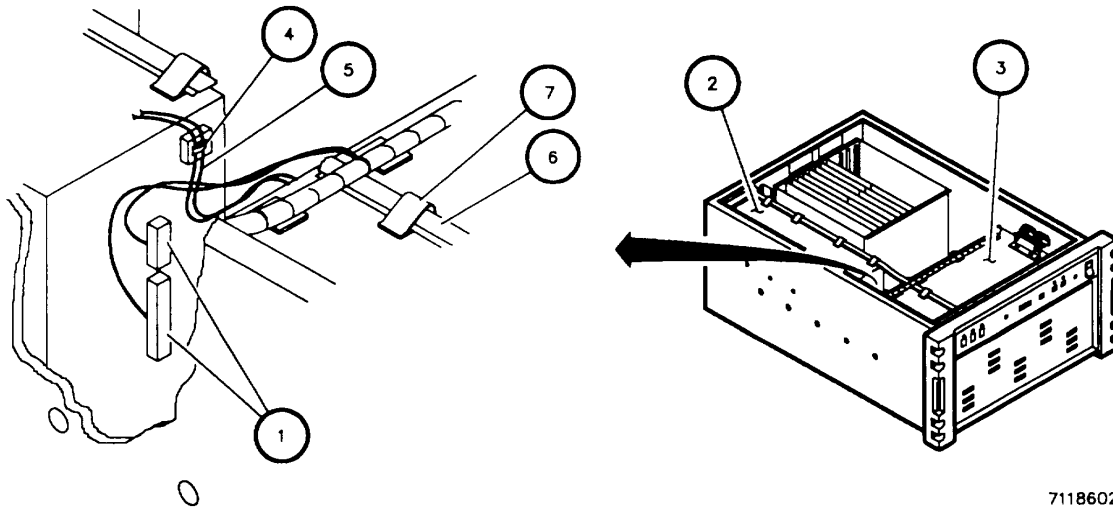
1. Working at rear of card cage, disconnect Ethernet cable (1) from Ethernet CCA (2).
2. Working on top of power supply assembly (3), tag and disconnect cable J900 (4) from system fan connector (5).
3. Tag and disconnect ac input power connector (6).
4. Tag and disconnect seven cables (not shown for clarity) connected to power distribution CCA output connectors (P100 thru P700) (7) on top of power supply assembly (3).



7118601

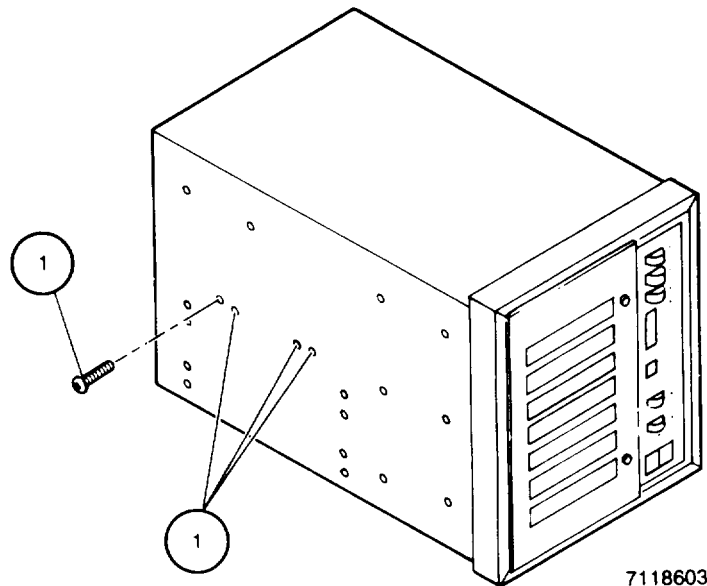
4-19. REPLACE POWER SUPPLY ASSEMBLY - Continued

5. Tag and disconnect two cables (1) connected between power supply assembly (2) and mass storage assembly (3).
6. Cut and remove cable ties (4), as required, to clear all cables (5) from power supply assembly (2).
7. Remove ribbon cables (6) on top of power supply assembly (2) from cable clips (7).



7118602

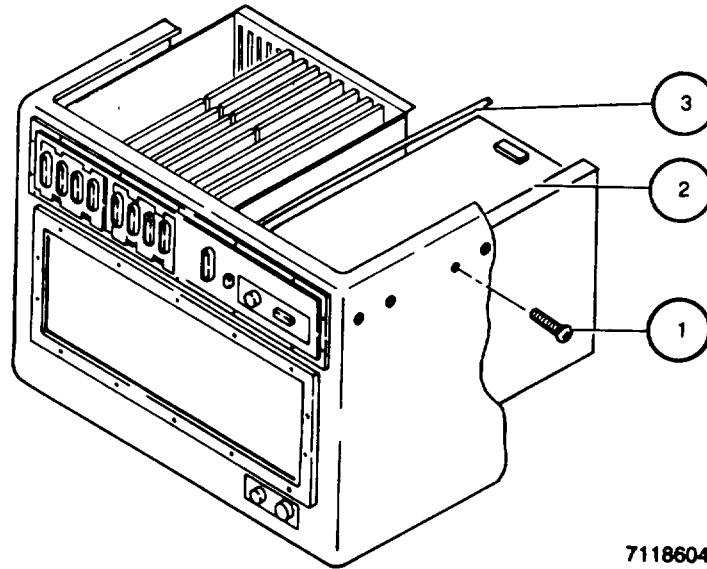
8. Set processor on right side panel.
9. Remove four screws (1).
10. Set processor in normal upright position.



7118603

4-19. REPLACE POWER SUPPLY ASSEMBLY - Continued

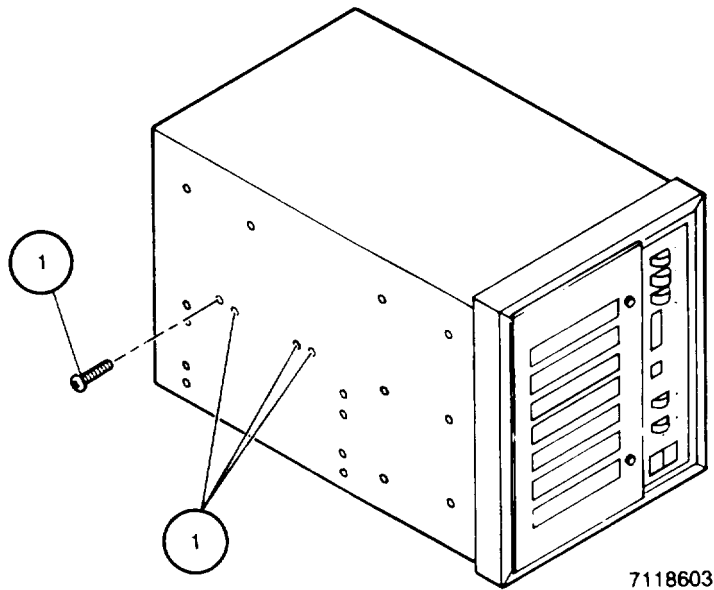
11. Working at left side panel, remove four screws (1).
12. Carefully remove power supply assembly (2) from chassis, moving cables (3) out of the way, as required.

**INSTALLATION**

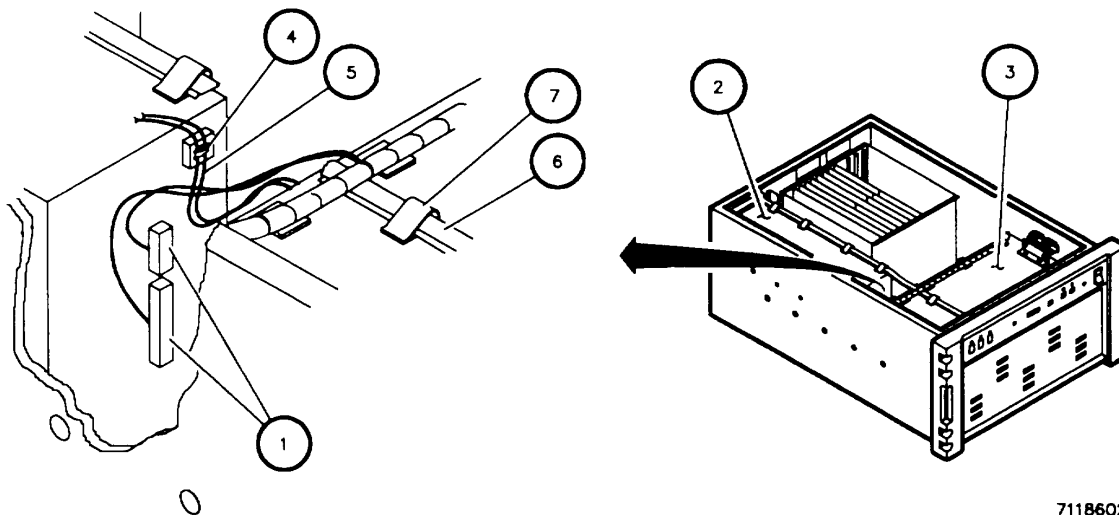
1. Carefully position power supply assembly (2) in installed position, moving cables (3) out of the way, as required.
2. Working at left side panel, install four screws (1).

4-19. REPLACE POWER SUPPLY ASSEMBLY - Continued

3. Set processor on right side panel.
4. Install four screws (1).
5. Set processor in normal upright position.

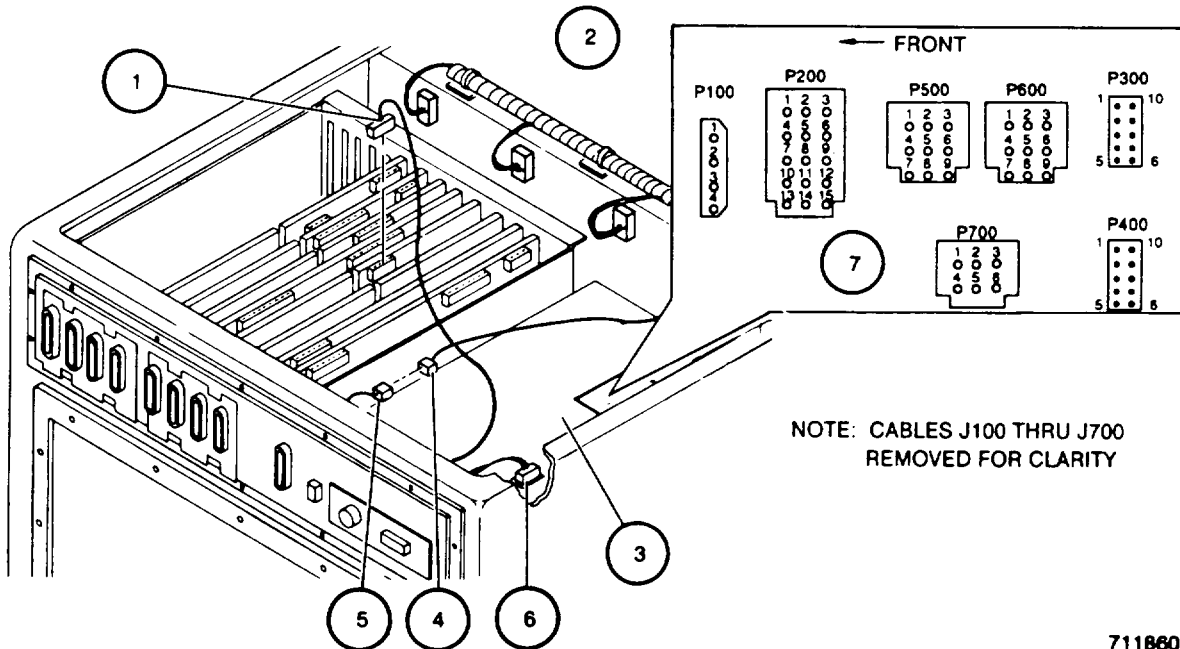


6. Working at top of power supply assembly (2), install ribbon cables (6) into cable clips (7).
7. Connect two cables (1) between power supply assembly (2) and mass storage assembly (3), as tagged. Remove tags.
8. Install cable ties (4), as required, to secure cables (5).



4-19. REPLACE POWER SUPPLY ASSEMBLY - Continued

9. Working on top of power supply assembly (3), connect seven cables (not shown for clarity) connected to power distribution CCA output connectors (P100 thru P700) (7) on top of power supply assembly (3).
10. Connect cable J900 (4) to system fan connector (5).
11. Connect ac input power connector (6).
12. Working at card cage, connect Ethernet cable (1) to Ethernet CCA (2).



7118601

FOLLOW-ON MAINTENANCE:

1. Install top cover (para 4-30).
2. Install processor. Refer to TM 11-5895-1392-12.

4-20. REPLACE POWER SUPPLY MODULE

This task covers: a. Removal b. Installation

INITIAL SETUP**General Safety Precaution:****CAUTION**

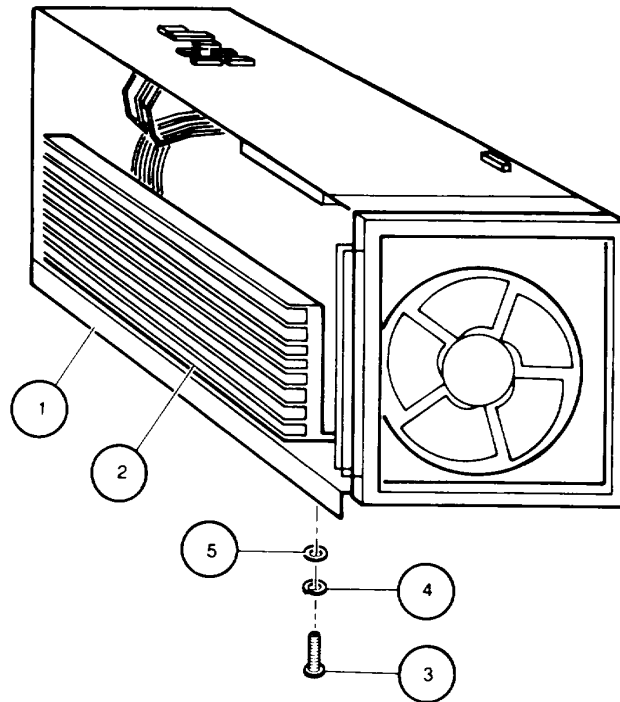
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove power supply ac distribution CCA (para 4-21).

REMOVAL

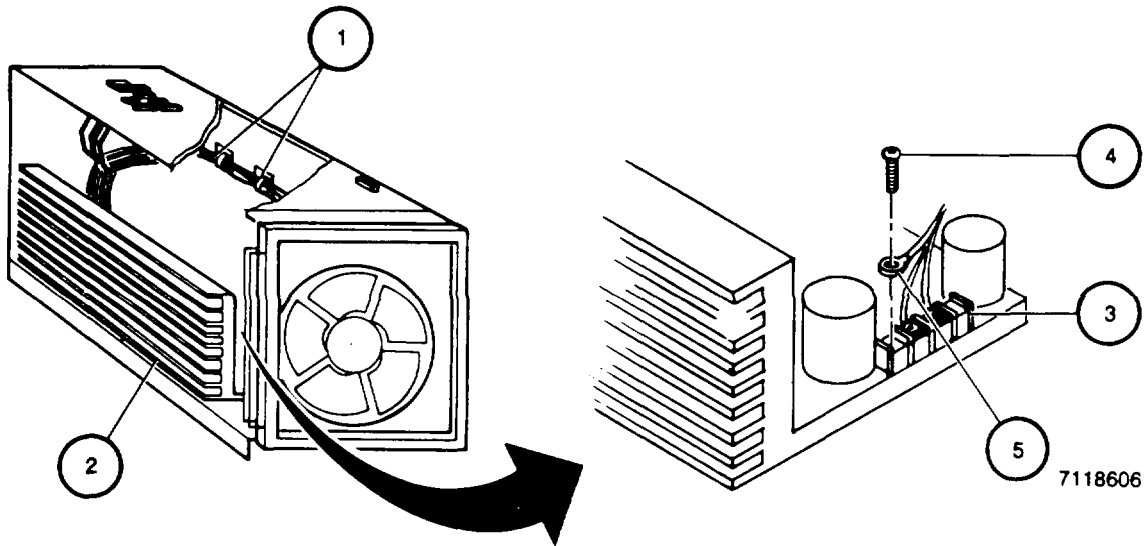
1. Position power supply assembly (1) to access power supply module (2) mounting screws (3).
2. Remove four screws (3), lockwashers (4), and washers (5).



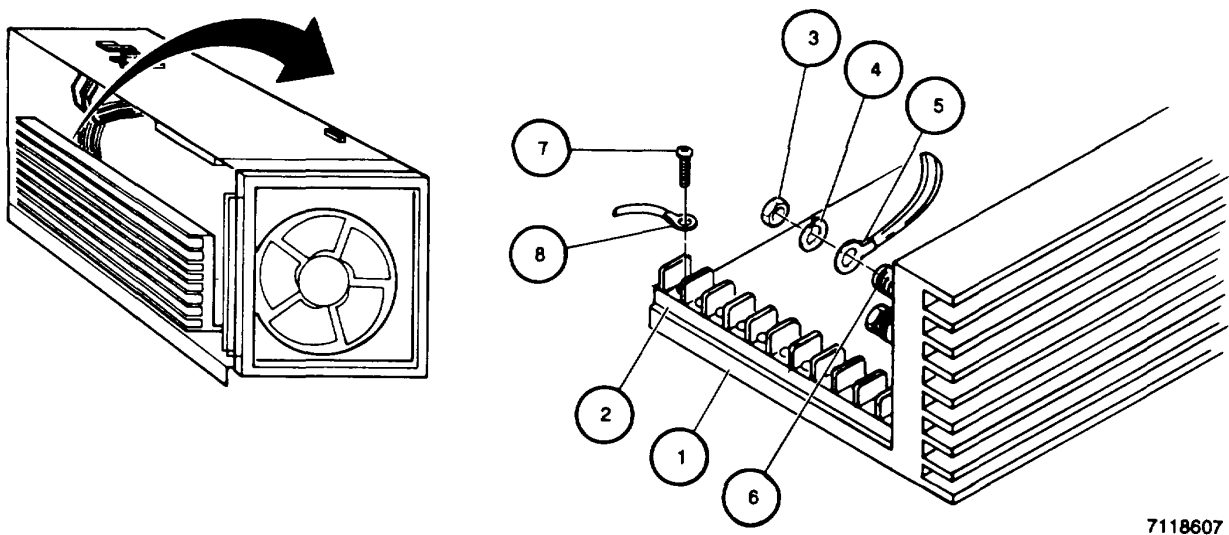
7118605

4-20. REPLACE POWER SUPPLY MODULE - Continued

3. Working inside right panel, cut and remove two cable ties (1).
4. Pull rear end (nearest fan) of module (2) outward to access TB1 (3).
5. Remove three screws (4) and three wires (5) from TB1 (3). Tag wires.



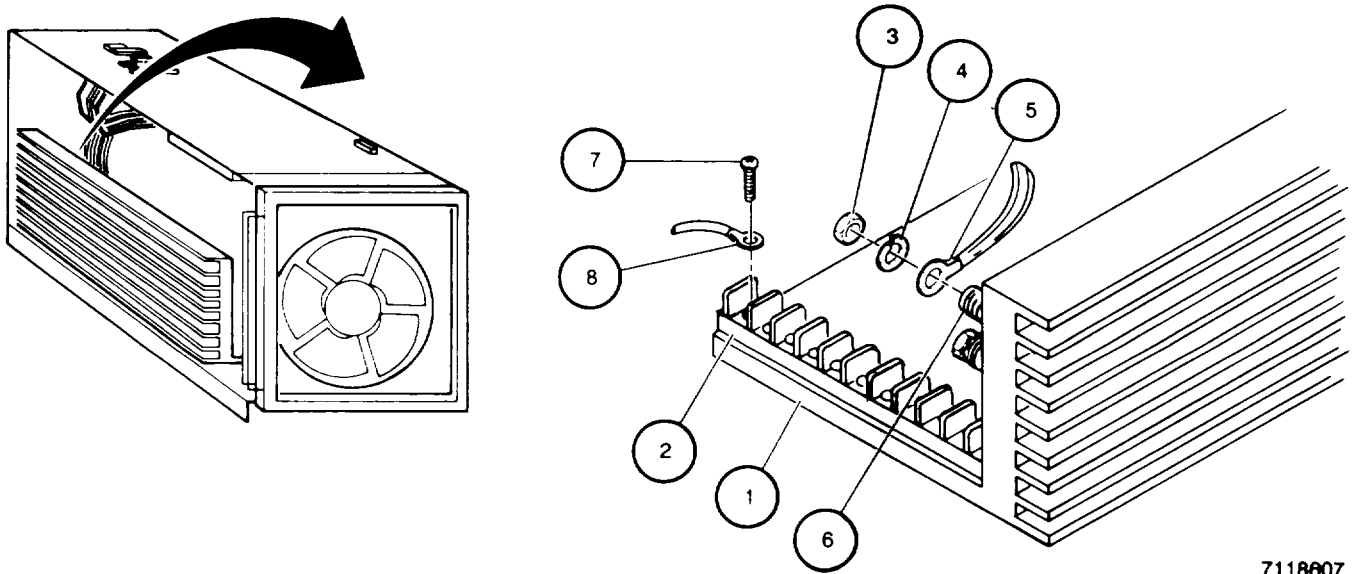
6. Pull front end of module (1) outward to access TB2 (2).
7. Remove two nuts (3), lockwashers (4), and cable lugs (5) from two terminals (6).
8. Remove seven screws (7) and all wires (8) from TB2 (2). Tag wires (8).
9. Remove module (1).



4-20. REPLACE POWER SUPPLY MODULE - Continued

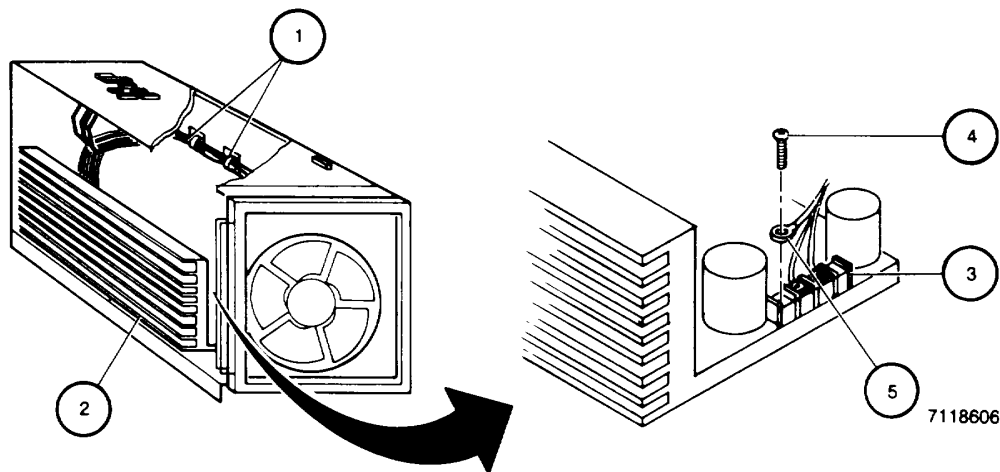
INSTALLATION

1. Place module (1) in installed position.
2. Install seven screws (7) and all wires (8) on TB2 (2) as tagged. Remove tags.
3. Install two nuts (3), lockwashers (4), and cable lugs (5) on two terminals (6) as tagged. Remove tags.



7118607

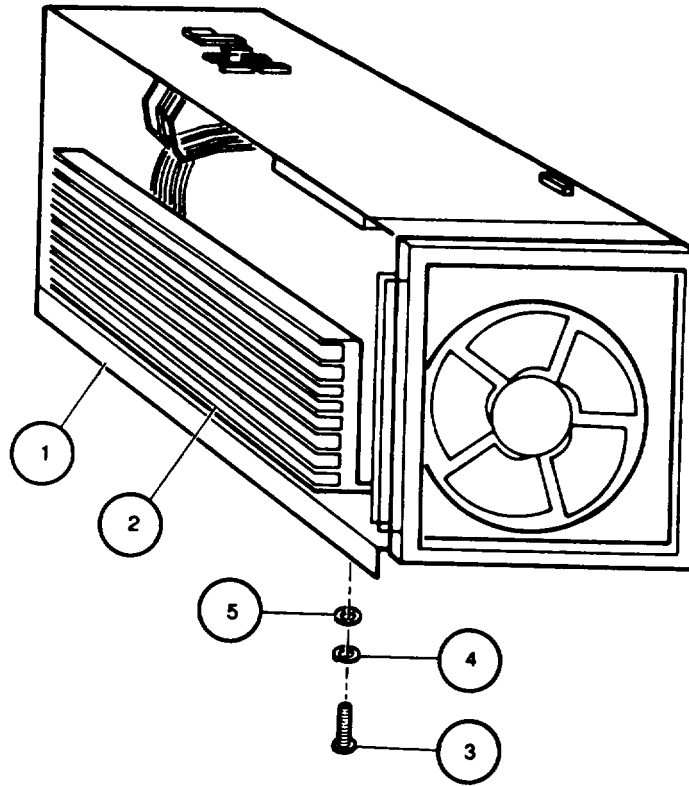
4. Position module (2) to assess TB1 (3).
5. Install three screws (4) and three wires (5) on TB1 (3) as tagged. Remove tags.
6. Working inside right panel, install two cable ties (1).



7118606

4-20. REPLACE POWER SUPPLY MODULE - Continued

7. Position power supply assembly (1) to access power supply module (2) mounting screw (3) locations.
8. Install four screws (3), lockwashers (4), and washers (5).



7118605

FOLLOW-ON MAINTENANCE: Install power supply ac distribution CCA (para 4-21).

4-21. REPLACE AC DISTRIBUTION CCA

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove power supply mounting bracket and cover (para 4-10).

REMOVAL

1. Working at top cover, remove four screws (1).
2. Position ac distribution CCA (2) to access cables (3).

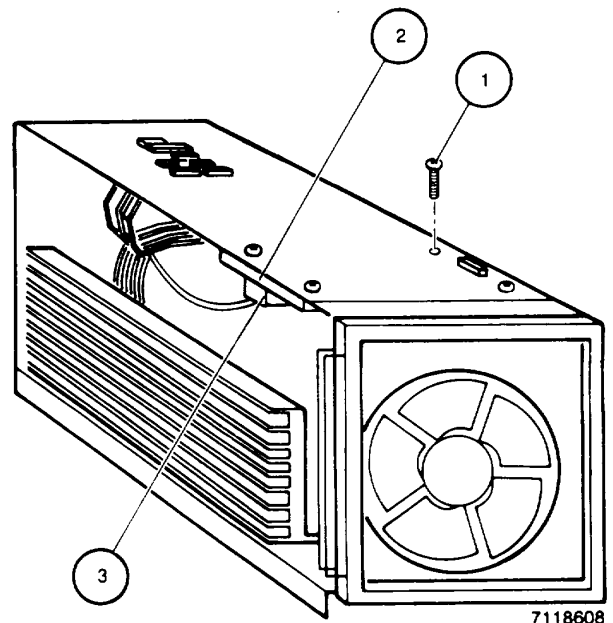
NOTE

Connector J6 on ac distribution CCA is not used; two cables are installed in connector J4.

3. Tag and disconnect six cables (3).
4. Remove CCA (2).

INSTALLATION

1. Connect six cables (3) to CCA (2) as tagged. Remove tags.
2. Place ac distribution CCA (2) in installed position.
3. Install four screws (1).



7118608

FOLLOW-ON MAINTENANCE: Install power supply mounting bracket and cover (para 4-10).

4-22. REPLACE POWER DISTRIBUTION CCA

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

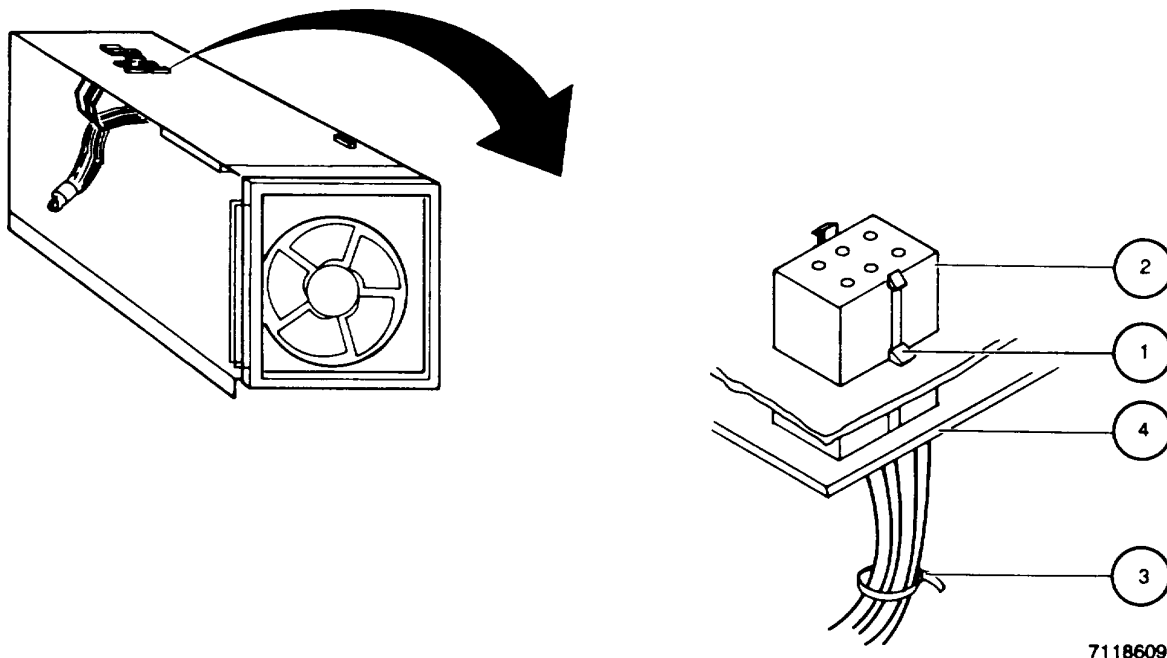
Preliminary Procedure: Remove power supply module (para 4-20).

REMOVAL

NOTE

Power distribution CCA is held to panel by connector receptacles only.

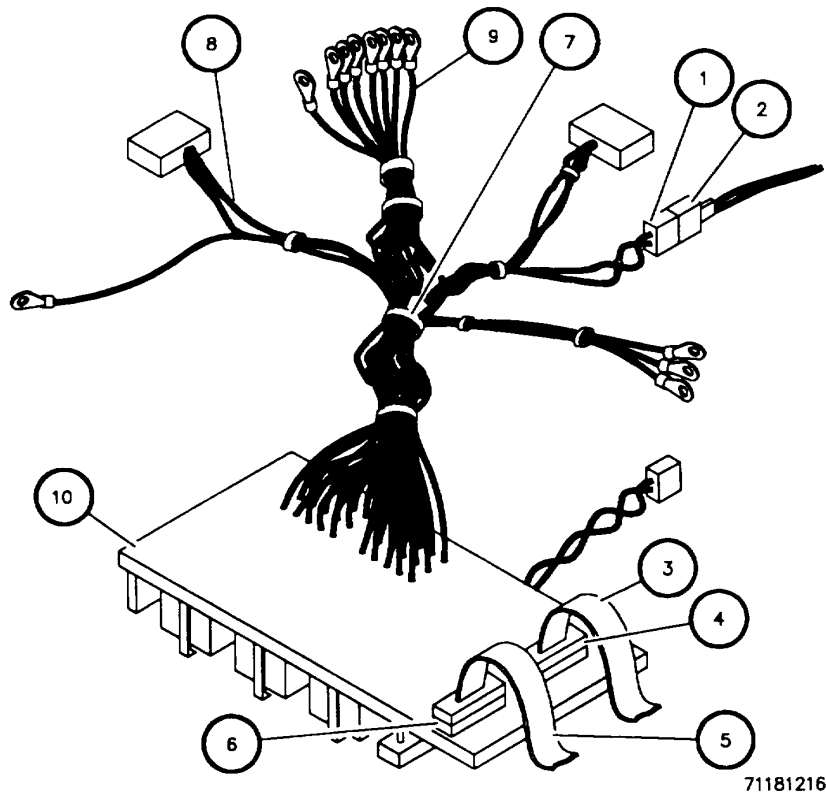
1. Press two flanges (1) on each of five connector receptacles (2) so that each flange disengages panel.
2. Push each connector receptacle (2) from panel.
3. Cut and remove cable ties (3), as required, and position power distribution CCA (4) to access wiring.



7118609

4-22. REPLACE POWER DISTRIBUTION CCA - Continued

4. Tag and disconnect power distribution CCA wiring harness fan connector (1) from power supply fan assembly connector (2).
5. Tag and remove ribbon cable (704010-0013) (3) from J8 (4).
6. Tag and remove ribbon cable (704010-0013) (5) from J9 (6).
7. Cut and remove cable ties (7), as required, to remove switched ac out wiring (8) (wires between TB1, TB2, and connector J4) from power distribution CCA wiring harness (9).
8. Remove power distribution CCA (10).



71181216

INSTALLATION

1. Connect ribbon cable (704010-0013) (3) to J8 (4) as tagged. Remove tag.
2. Connect ribbon cable (704010-0013) (5) to J9 (6) as tagged. Remove tag.
3. Connect power distribution CCA wiring harness fan connector (1) to power supply fan assembly connector (2), as tagged. Remove tags.
4. Using cable ties (7), as required, attach switched ac out wiring (8) to power distribution CCA wiring harness (9).

4-13. REPLACE DIGITAL I/O CABLE

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

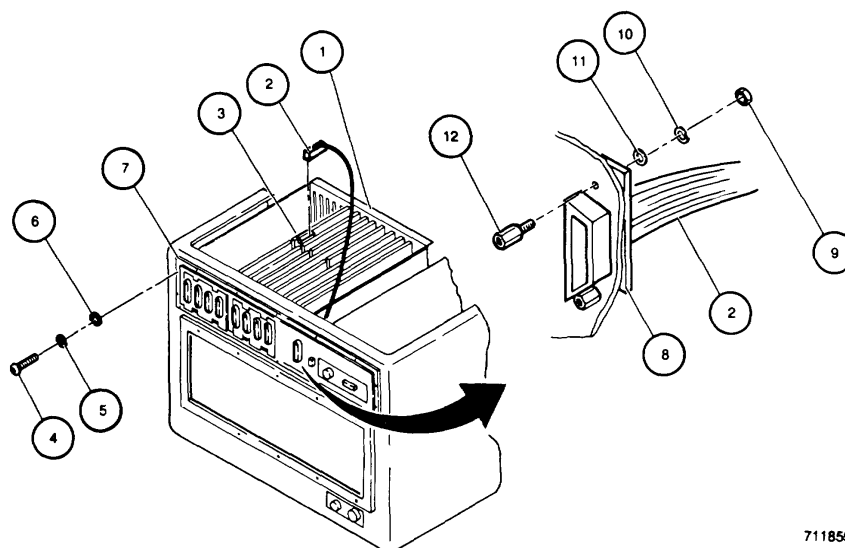
Preliminary Procedure: Remove top cover (para 4-30).

REMOVAL

NOTE

Note and record orientation of digital I/O cable in digital I/O CCA connector to aid installation.

1. Working at top of card cage (1), disconnect digital 110 cable (2) from digital I/O CCA (3).
2. Working at rear panel, remove 12 screws (4), lockwashers (5), and washers (6).
3. Carefully position connector bracket (7) to access cable connector (8).
4. Remove two nuts (9), lockwashers (10), washers (11), and standoffs (12).
5. Remove digital I/O cable (2).

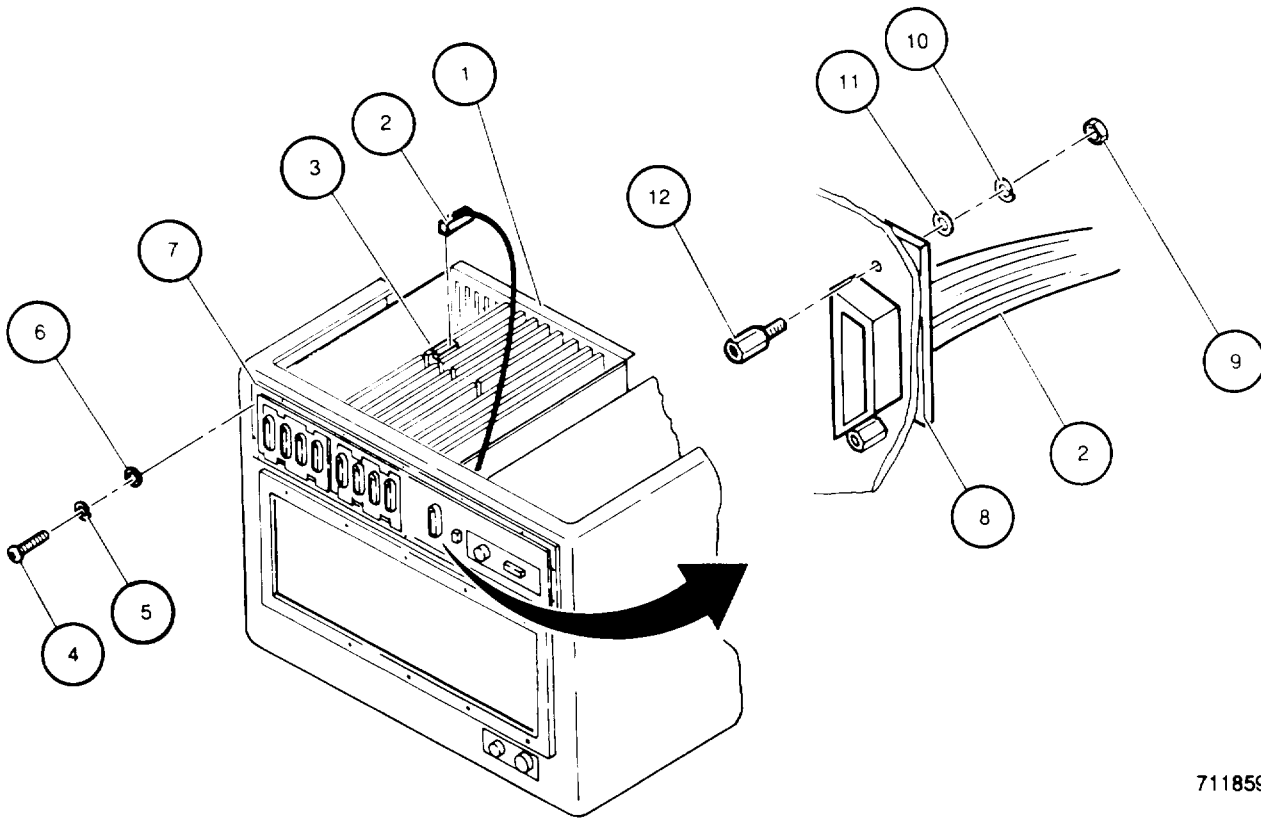


7118595

4-13. REPLACE DIGITAL I/O CABLE - Continued

INSTALLATION

1. Place digital I/O cable (2) in installed position, with cable connector (8) in connector bracket (7).
2. Install two nuts (9), lockwashers (10), washers (11), and standoffs (12).
3. Place connector bracket (7) in installed position.
4. Install 12 screws (4), lockwashers (5), and washers (6).
5. Working at top of card cage (1), connect digital I/O cable (2) to digital I/O CCA (3).



7118595

FOLLOW-ON MAINTENANCE: Install top cover (para 4-30).

4-14. REPLACE ETHERNET CABINET KIT**This task covers:****a. Removal****b. Installation****INITIAL SETUP****General Safety Precaution:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

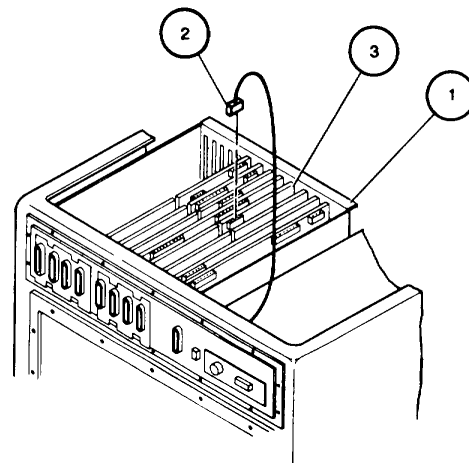
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure:

3. Remove top cover (para 4-30).
4. If installed in equipment back, remove Ethernet station adapter. Refer to TM 11-5895-1392-12.

REMOVAL

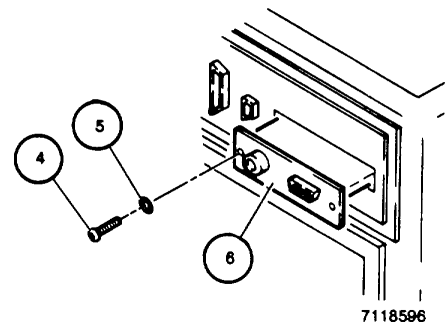
1. Working at top of card cage (1), disconnect Ethernet cable (2) from Ethernet controller CCA (3).
2. Working at rear panel, remove two screws (4) and internal tooth lockwashers (5).
3. Remove Ethernet cabinet kit (6), routing Ethernet cable (2) from rear panel.

**INSTALLATION**

1. Place Ethernet cabinet kit (6) in installed position.
2. Install two screws (4) and internal tooth lockwashers (5).
3. Working at top of card cage (1), connect Ethernet cable (2) to Ethernet controller CCA (3).

FOLLOW-ON MAINTENANCE:

1. If installed in equipment rack, install Ethernet station adapter. Refer to TM 11-5895-1392-12.
2. Install top cover (para 4-30).



7118596

4-15. REPLACE MULTIPLEXER CABINET KIT A OR B

This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precaution:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

Replace multiplexer cabinet kit A (J1-J4) or B (J5-J8) the same way. Multiplexer cabinet kit B is shown.

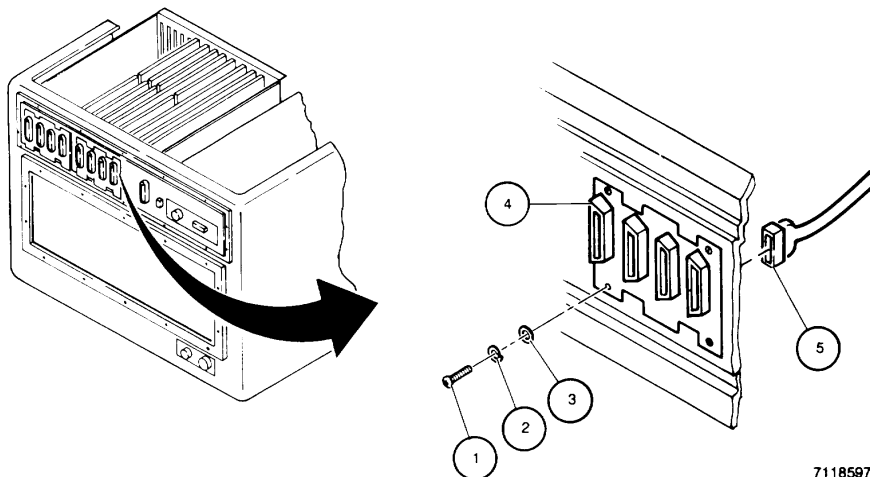
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedures:

1. Remove processor. Refer to TM-11-5895-1392-12.
2. Remove top cover (para 4-30).

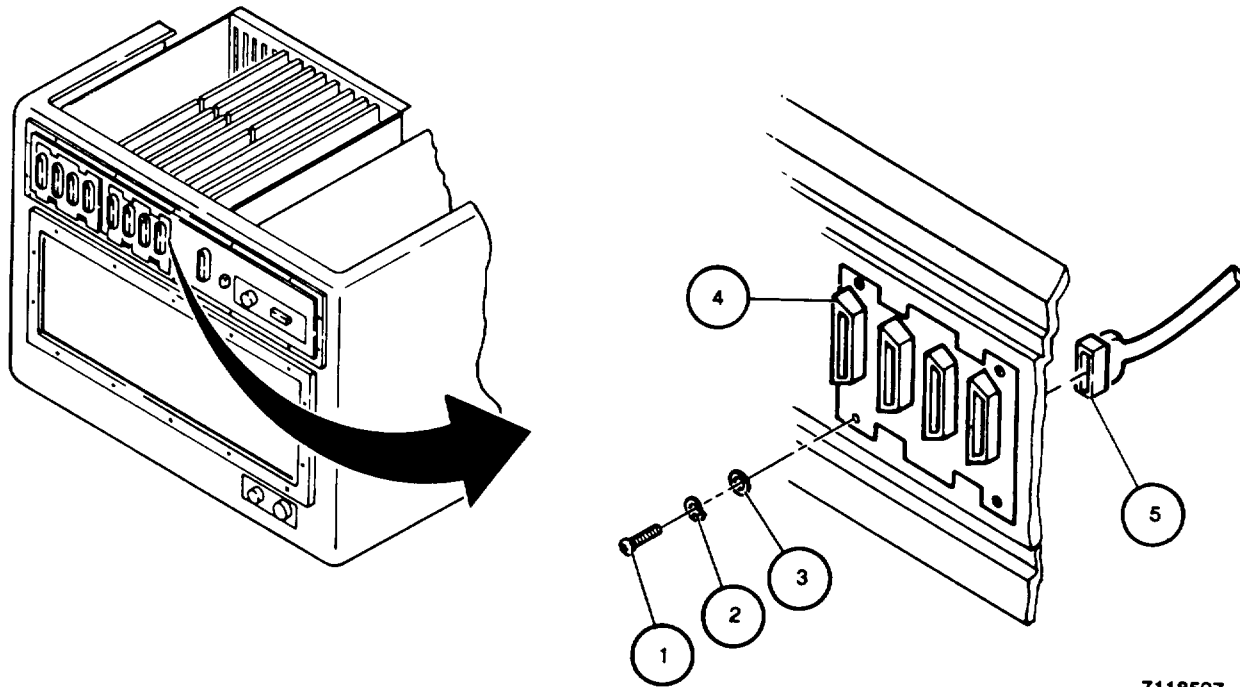
REMOVAL

1. Working at rear panel, remove four screws (1), lockwashers (2), and washers (3).
2. Position multiplexer cabinet kit (4) to access ribbon cable (5).
3. Disconnect ribbon cable (5).
4. Remove multiplexer cabinet kit (4).



4-15. REPLACE MULTIPLEXER CABINET KIT A OR B - Continued**INSTALLATION**

1. Connect ribbon cable (5) to multiplexer cabinet kit (4).
2. Place multiplexer cabinet kit (4) in installed position.
3. Install four screws (1), lockwashers (2), and washers (3).



7118597

FOLLOW-ON MAINTENANCE:

1. Install top cover (para 4-30).
2. Install processor. Refer to TM 11-5895-1392-12.

4-16. REPLACE REAR AIR FILTER

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedures:

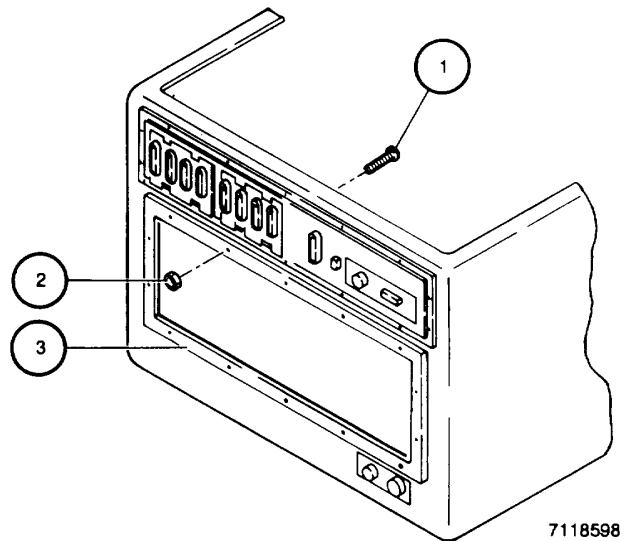
1. Remove power supply assembly (para 4-19).
2. Remove fan assembly (para 4-9).

REMOVAL

1. Working at rear panel, remove 14 screws (1) and nuts (2).
2. Remove filter (3).

INSTALLATION

1. Place filter (3) in installed position.
2. Install 14 screws (1) and nuts (2).



FOLLOW-ON MAINTENANCE:

1. Install fan assembly (para 4-9).
2. Install power supply assembly (para 4-19).

4-17. REPLACE CIRCUIT CARD ASSEMBLY OR GRANT ANCHOR BOARD

This task covers: a. Removal b. Installation

INITIAL SETUP**General Safety Precaution:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

Replacement of CCAs or grant, anchor, or grant/anchor boards is the same, except where noted. Digital I/O CCA is shown.

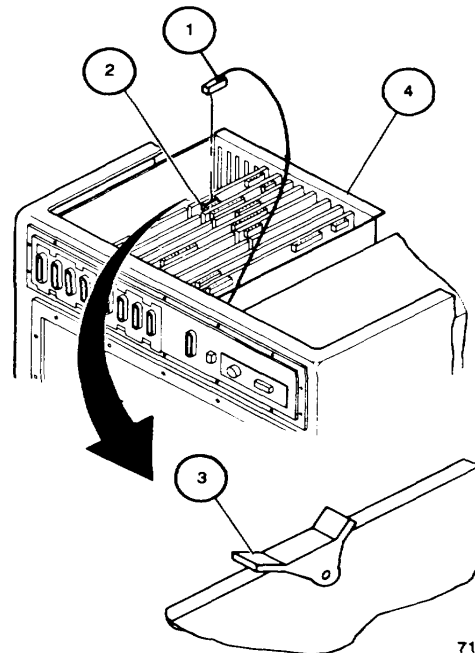
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove top cover (para 4-30).

REMOVAL**NOTE**

- Note and record pin 1 orientation (red conductor) of all ribbon cables disconnected to aid installation.
- CP only: Note and record orientation of digital I/O cable in digital I/O CCA connector to aid installation.

1. Move or tag and disconnect any cable(s) (1) that block circuit card (2) removal (para 1-15.2).
2. Grasp handle(s) (3) on circuit card (2).
3. Pull upward and remove circuit card (2) from card cage (4).

**INSTALLATION**

1. Grasp handle(s) (3) on circuit card (2) and slide card into card cage (4), ensuring that card engages backplane without jamming or binding.
2. Install any cable(s) (1) removed to access circuit card (2) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install top cover (para 4-30). If disk controller CCA is replaced, configure controller (TM 11-5895-1392-12). If Ethernet controller CCA is replaced, inform system operator that processor has new Ethernet address.

4-18. REPLACE CIRCUIT BREAKER

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

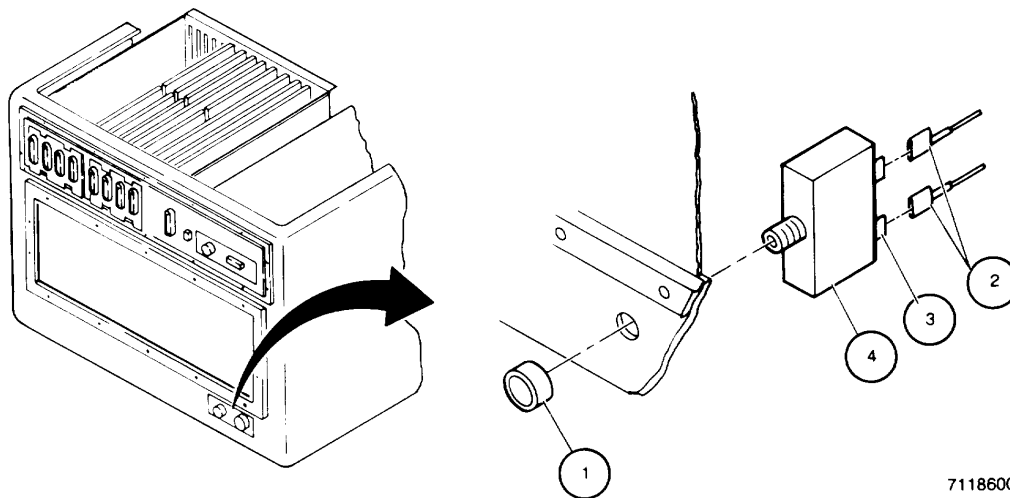
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove power supply assembly (para 4-19).

REMOVAL

1. Working at rear panel, remove nut (1).
2. Working inside rear panel, unplug two spade connectors (2) from two terminal lugs (3).
3. Remove circuit breaker CB1 (4).



7118600

INSTALLATION

1. Place circuit breaker CB1 (4) in installed position.
2. Plug two spade connectors (2) onto two terminal lugs (3).
3. Working at rear panel, install nut (1).

FOLLOW-ON MAINTENANCE: Install power supply assembly (para 4-19).

41 9. REPLACE POWER SUPPLY ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

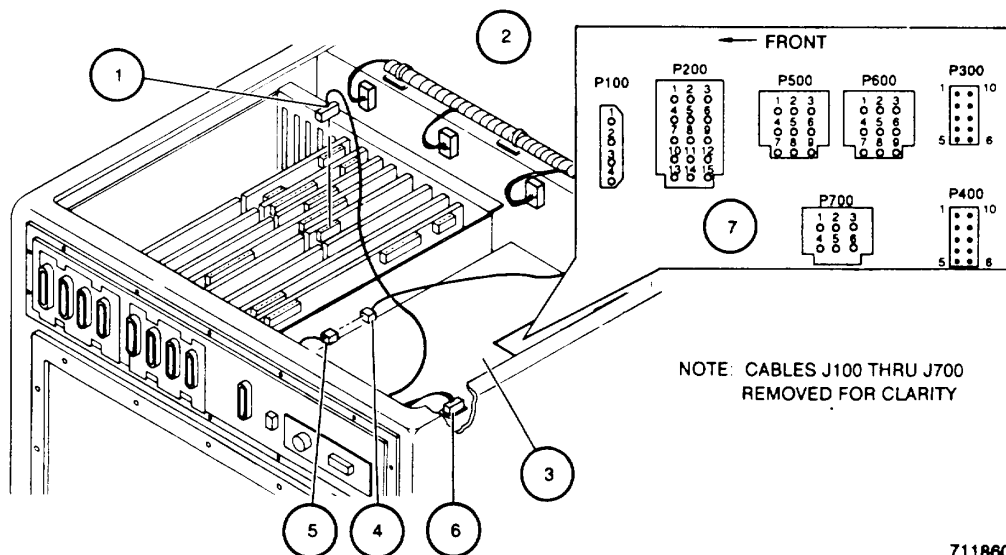
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedures:

1. Remove processor. Refer to TM 11-5895-1392-12.
2. Remove top cover (para 4-30).

REMOVAL

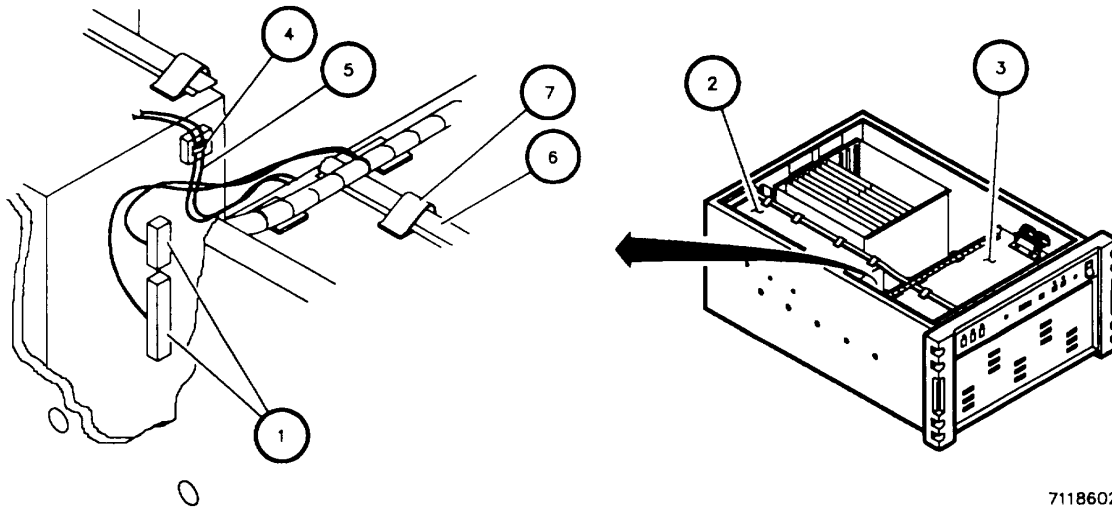
1. Working at rear of card cage, disconnect Ethernet cable (1) from Ethernet CCA (2).
2. Working on top of power supply assembly (3), tag and disconnect cable J900 (4) from system fan connector (5).
3. Tag and disconnect ac input power connector (6).
4. Tag and disconnect seven cables (not shown for clarity) connected to power distribution CCA output connectors (P100 thru P700) (7) on top of power supply assembly (3).



7118601

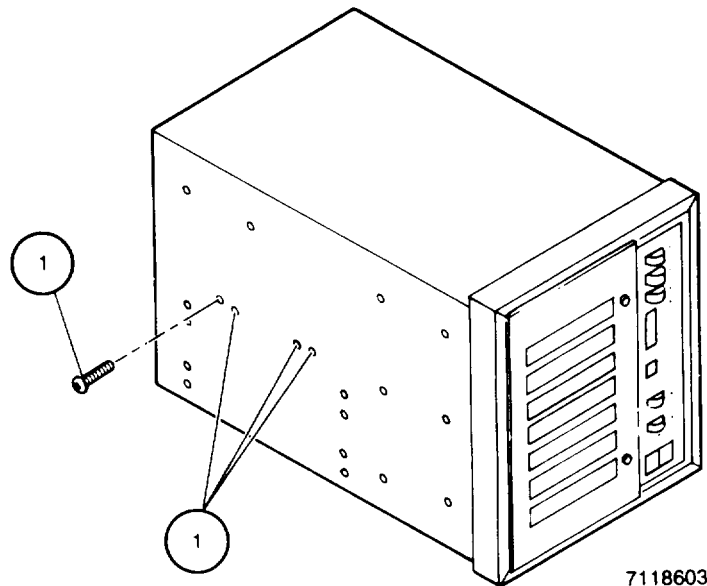
4-19. REPLACE POWER SUPPLY ASSEMBLY - Continued

5. Tag and disconnect two cables (1) connected between power supply assembly (2) and mass storage assembly (3).
6. Cut and remove cable ties (4), as required, to clear all cables (5) from power supply assembly (2).
7. Remove ribbon cables (6) on top of power supply assembly (2) from cable clips (7).



7118602

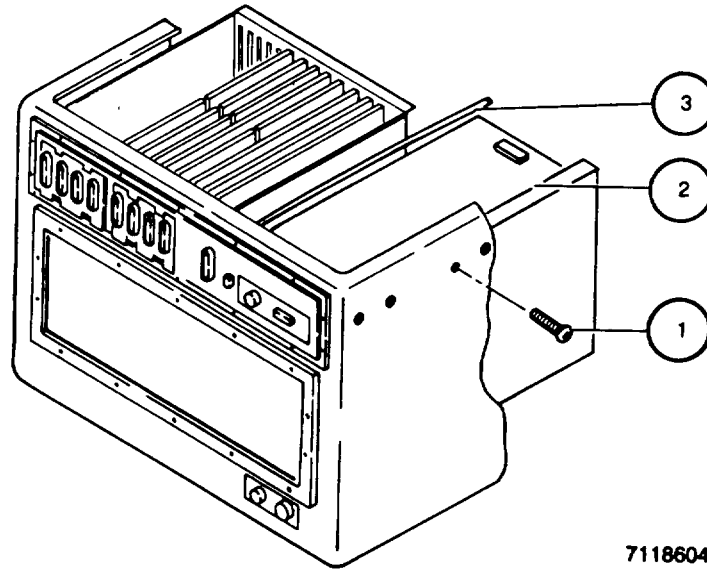
8. Set processor on right side panel.
9. Remove four screws (1).
10. Set processor in normal upright position.



7118603

4-19. REPLACE POWER SUPPLY ASSEMBLY - Continued

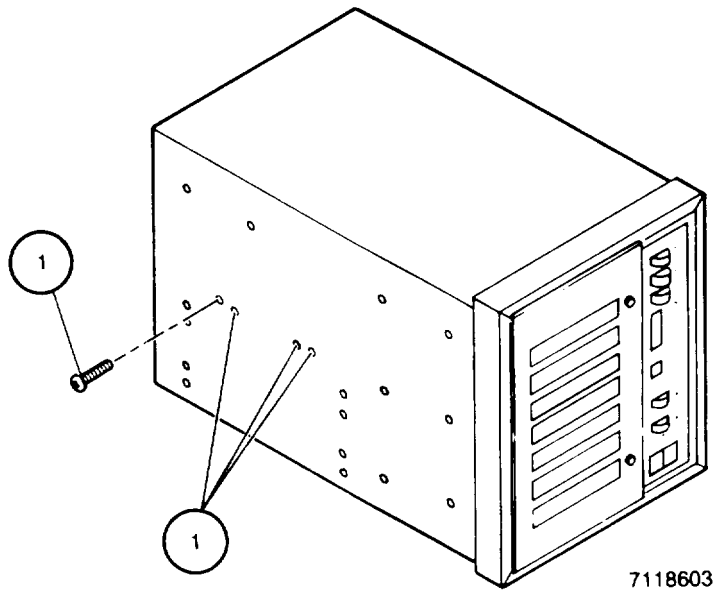
11. Working at left side panel, remove four screws (1).
12. Carefully remove power supply assembly (2) from chassis, moving cables (3) out of the way, as required.

**INSTALLATION**

1. Carefully position power supply assembly (2) in installed position, moving cables (3) out of the way, as required.
2. Working at left side panel, install four screws (1).

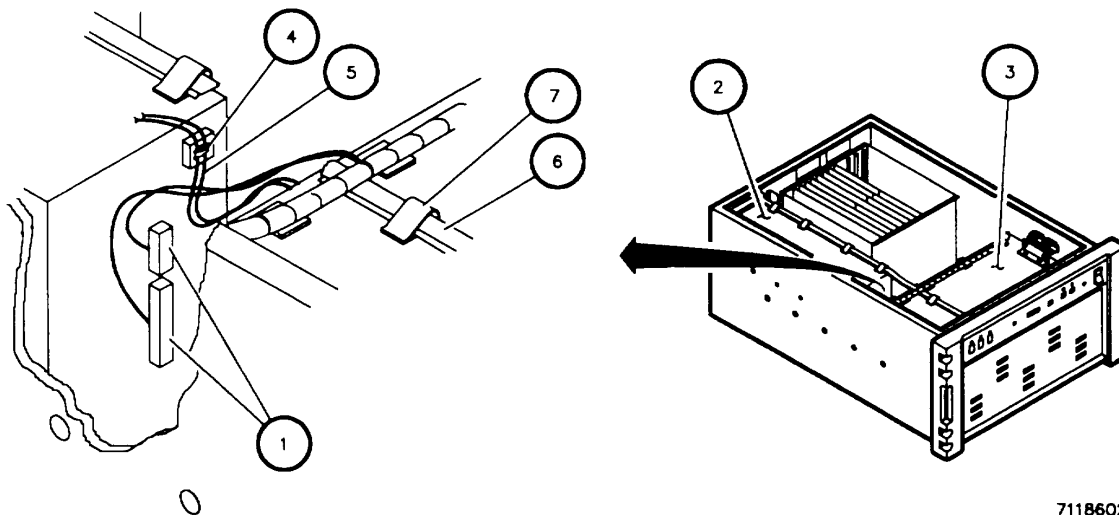
4-19. REPLACE POWER SUPPLY ASSEMBLY - Continued

3. Set processor on right side panel.
4. Install four screws (1).
5. Set processor in normal upright position.



7118603

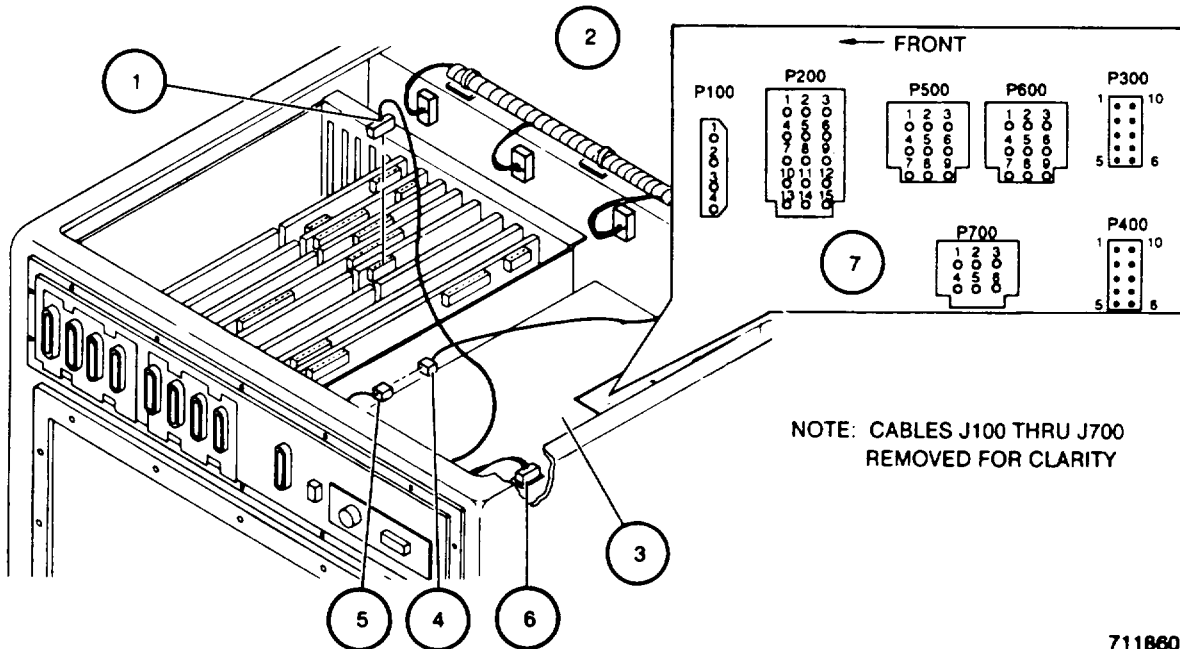
6. Working at top of power supply assembly (2), install ribbon cables (6) into cable clips (7).
7. Connect two cables (1) between power supply assembly (2) and mass storage assembly (3), as tagged. Remove tags.
8. Install cable ties (4), as required, to secure cables (5).



7118602

4-19. REPLACE POWER SUPPLY ASSEMBLY - Continued

9. Working on top of power supply assembly (3), connect seven cables (not shown for clarity) connected to power distribution CCA output connectors (P100 thru P700) (7) on top of power supply assembly (3).
10. Connect cable J900 (4) to system fan connector (5).
11. Connect ac input power connector (6).
12. Working at card cage, connect Ethernet cable (1) to Ethernet CCA (2).



7118601

FOLLOW-ON MAINTENANCE:

1. Install top cover (para 4-30).
2. Install processor. Refer to TM 11-5895-1392-12.

4-20. REPLACE POWER SUPPLY MODULE

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

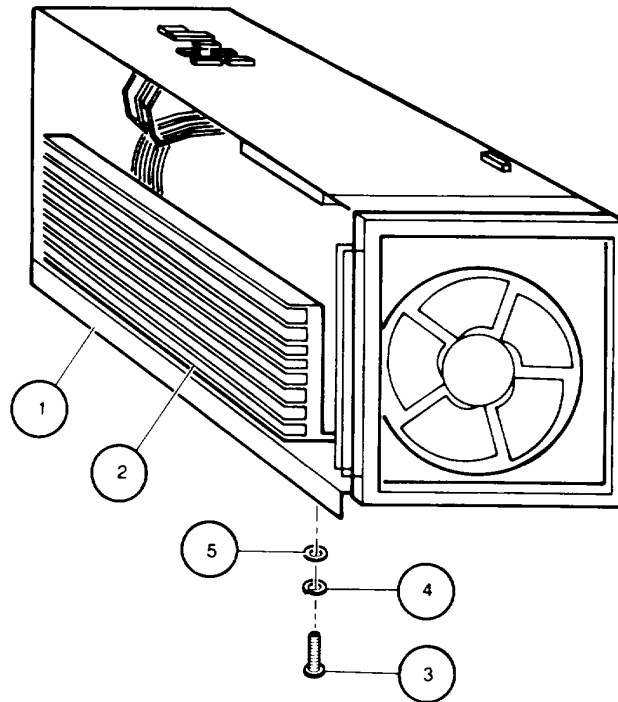
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove power supply ac distribution CCA (para 4-21).

REMOVAL

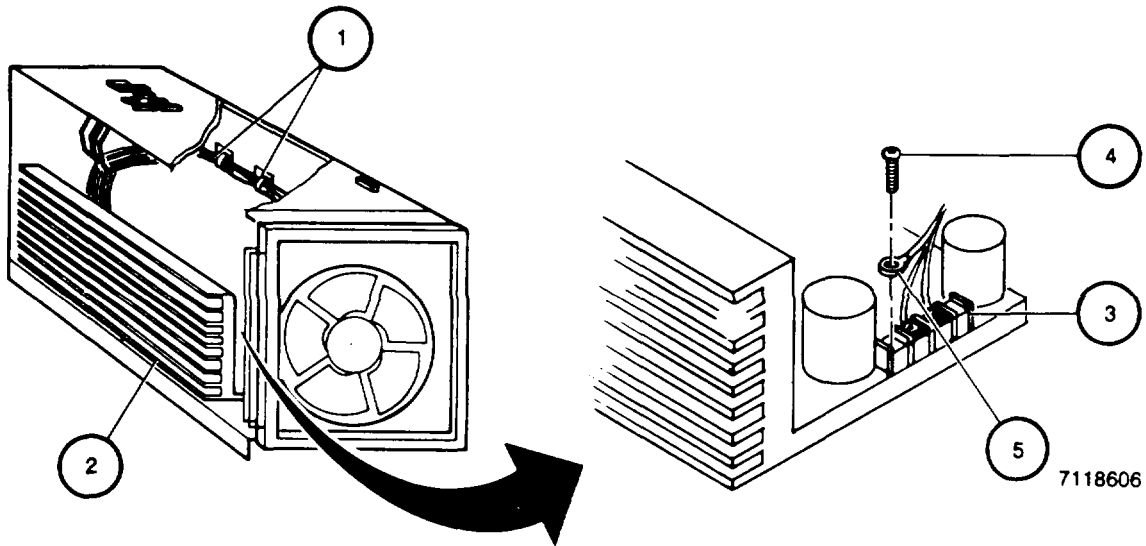
1. Position power supply assembly (1) to access power supply module (2) mounting screws (3).
2. Remove four screws (3), lockwashers (4), and washers (5).



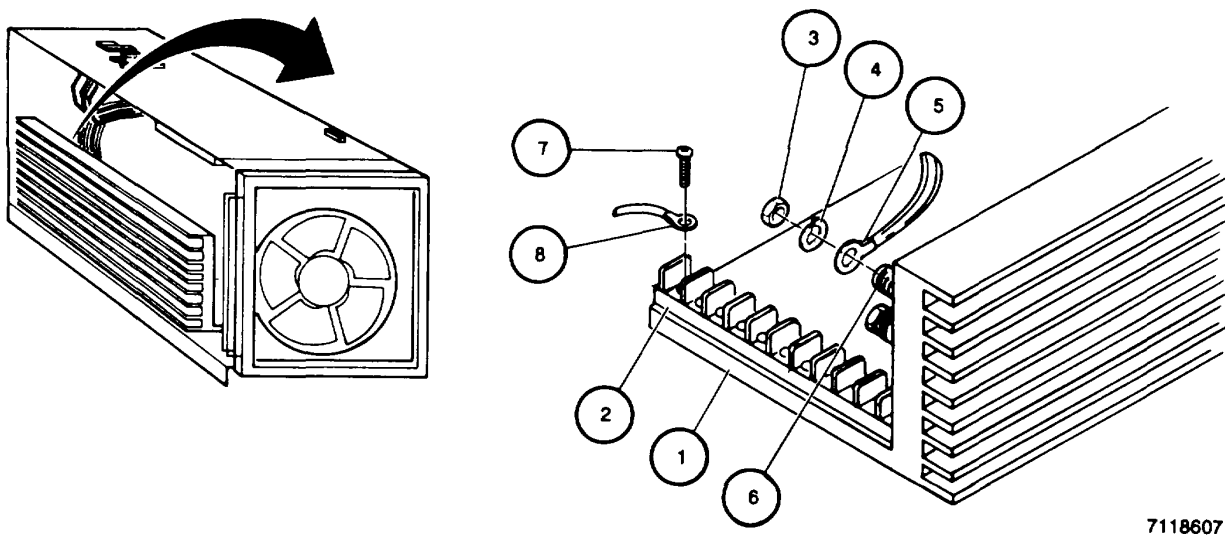
7118605

4-20. REPLACE POWER SUPPLY MODULE - Continued

3. Working inside right panel, cut and remove two cable ties (1).
4. Pull rear end (nearest fan) of module (2) outward to access TB1 (3).
5. Remove three screws (4) and three wires (5) from TB1 (3). Tag wires.



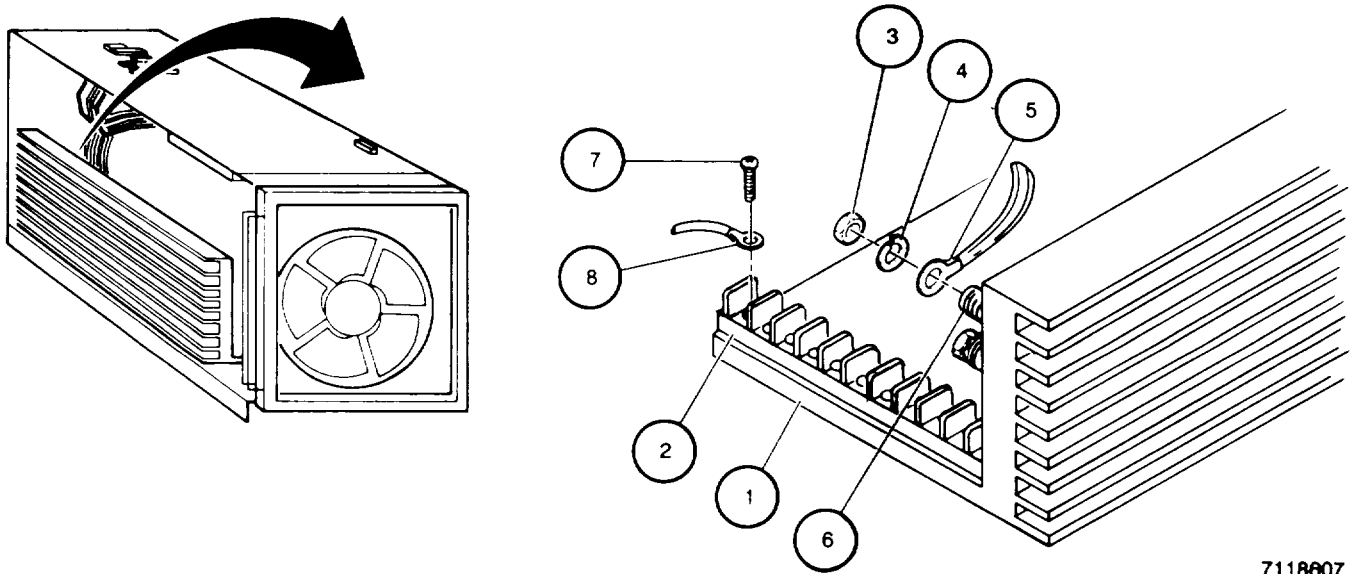
6. Pull front end of module (1) outward to access TB2 (2).
7. Remove two nuts (3), lockwashers (4), and cable lugs (5) from two terminals (6).
8. Remove seven screws (7) and all wires (8) from TB2 (2). Tag wires (8).
9. Remove module (1).



4-20. REPLACE POWER SUPPLY MODULE - Continued

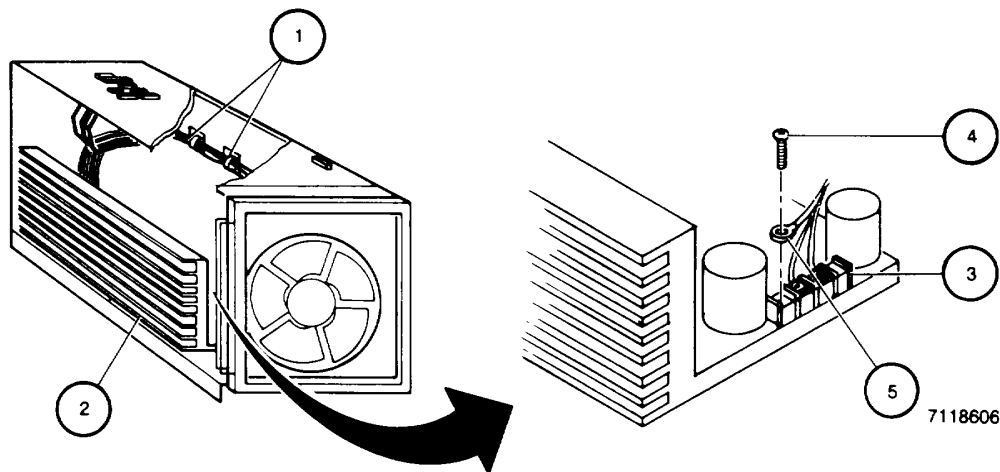
INSTALLATION

1. Place module (1) in installed position.
2. Install seven screws (7) and all wires (8) on TB2 (2) as tagged. Remove tags.
3. Install two nuts (3), lockwashers (4), and cable lugs (5) on two terminals (6) as tagged. Remove tags.



7118607

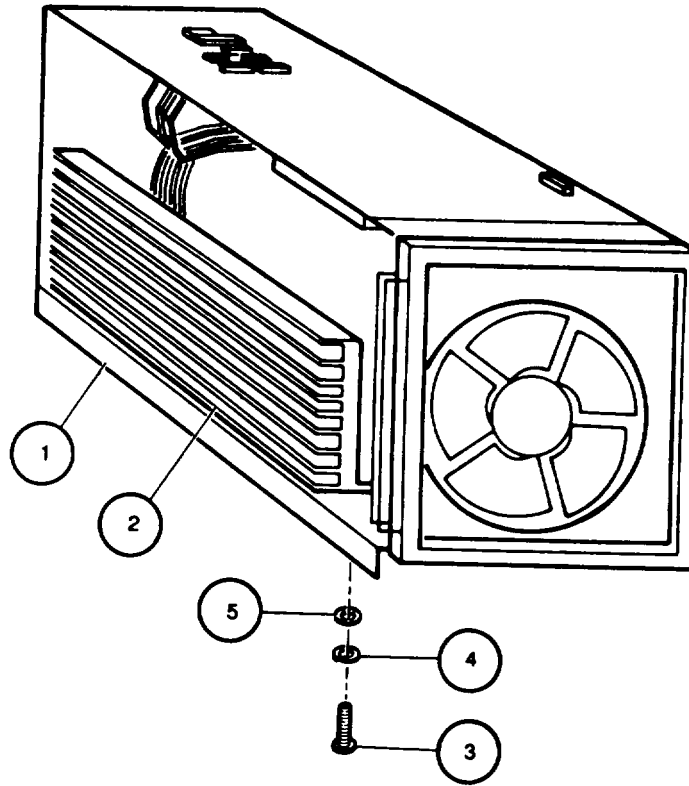
4. Position module (2) to assess TB1 (3).
5. Install three screws (4) and three wires (5) on TB1 (3) as tagged. Remove tags.
6. Working inside right panel, install two cable ties (1).



7118606

4-20. REPLACE POWER SUPPLY MODULE - Continued

7. Position power supply assembly (1) to access power supply module (2) mounting screw (3) locations.
8. Install four screws (3), lockwashers (4), and washers (5).



7118605

FOLLOW-ON MAINTENANCE: Install power supply ac distribution CCA (para 4-21).

4-21. REPLACE AC DISTRIBUTION CCA

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove power supply mounting bracket and cover (para 4-10).

REMOVAL

1. Working at top cover, remove four screws (1).
2. Position ac distribution CCA (2) to access cables (3).

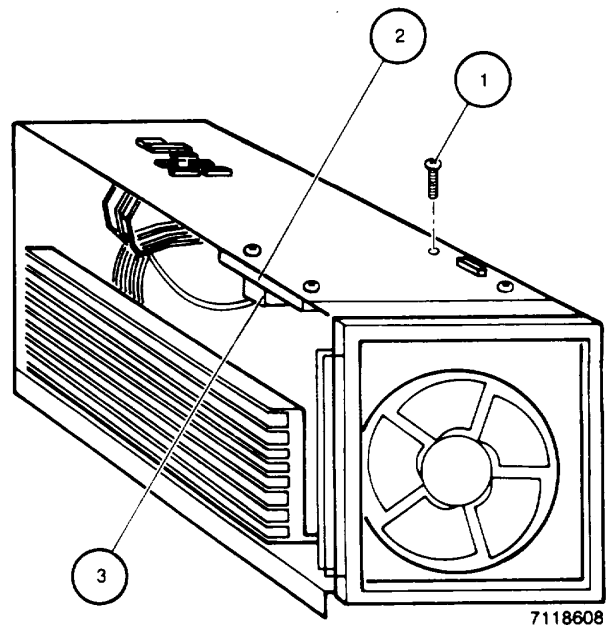
NOTE

Connector J6 on ac distribution CCA is not used; two cables are installed in connector J4.

3. Tag and disconnect six cables (3).
4. Remove CCA (2).

INSTALLATION

1. Connect six cables (3) to CCA (2) as tagged. Remove tags.
2. Place ac distribution CCA (2) in installed position.
3. Install four screws (1).



FOLLOW-ON MAINTENANCE: Install power supply mounting bracket and cover (para 4-10).

4-22. REPLACE POWER DISTRIBUTION CCA

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precaution:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

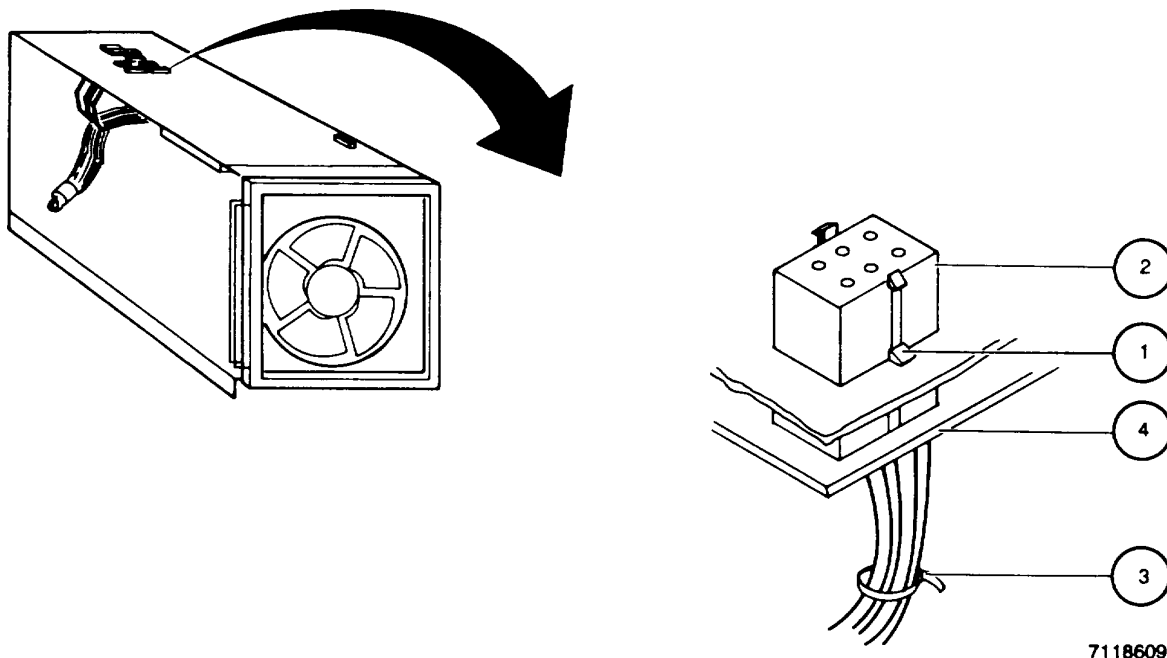
Preliminary Procedure: Remove power supply module (para 4-20).

REMOVAL

NOTE

Power distribution CCA is held to panel by connector receptacles only.

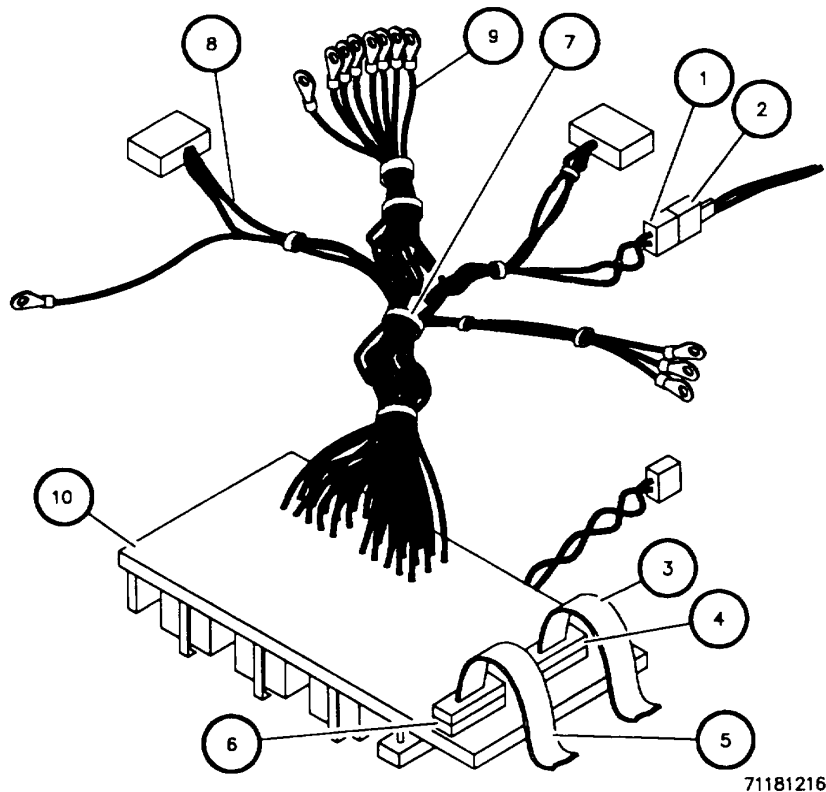
1. Press two flanges (1) on each of five connector receptacles (2) so that each flange disengages panel.
2. Push each connector receptacle (2) from panel.
3. Cut and remove cable ties (3), as required, and position power distribution CCA (4) to access wiring.



7118609

4-22. REPLACE POWER DISTRIBUTION CCA - Continued

4. Tag and disconnect power distribution CCA wiring harness fan connector (1) from power supply fan assembly connector (2).
5. Tag and remove ribbon cable (704010-0013) (3) from J8 (4).
6. Tag and remove ribbon cable (704010-0013) (5) from J9 (6).
7. Cut and remove cable ties (7), as required, to remove switched ac out wiring (8) (wires between TB1, TB2, and connector J4) from power distribution CCA wiring harness (9).
8. Remove power distribution CCA (10).



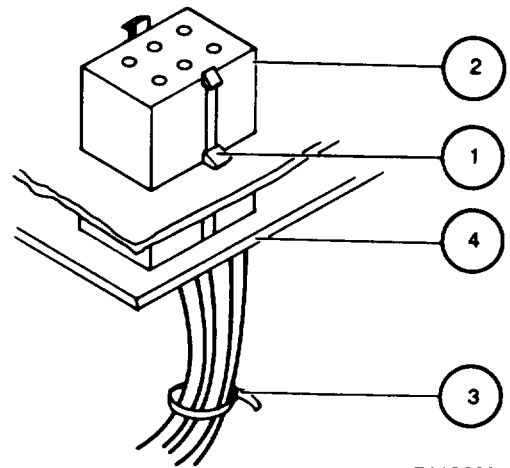
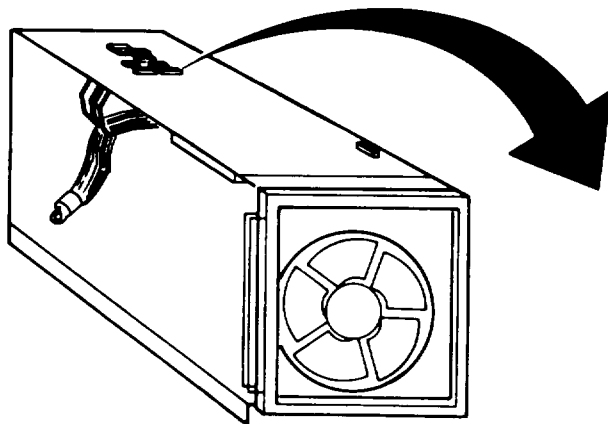
71181216

INSTALLATION

1. Connect ribbon cable (704010-0013) (3) to J8 (4) as tagged. Remove tag.
2. Connect ribbon cable (704010-0013) (5) to J9 (6) as tagged. Remove tag.
3. Connect power distribution CCA wiring harness fan connector (1) to power supply fan assembly connector (2), as tagged. Remove tags.
4. Using cable ties (7), as required, attach switched ac out wiring (8) to power distribution CCA wiring harness (9).

4-22. REPLACE POWER DISTRIBUTION CCA - Continued

5. Place power distribution CCA (4) in installed position.
6. Press power distribution CCA (4) into panel so that two flanges (1) on each of five connector receptacles (2) fully engage panel.
7. Install cable ties (3), as required.



7118609

FOLLOW-ON MAINTENANCE: Install power supply module (para 4-20).

4-23. REPLACE POWER SUPPLY ASSEMBLY FAN

 This task covers: a. Removal b. Installation

INITIAL SETUPGeneral Safety Precaution:**CAUTION**

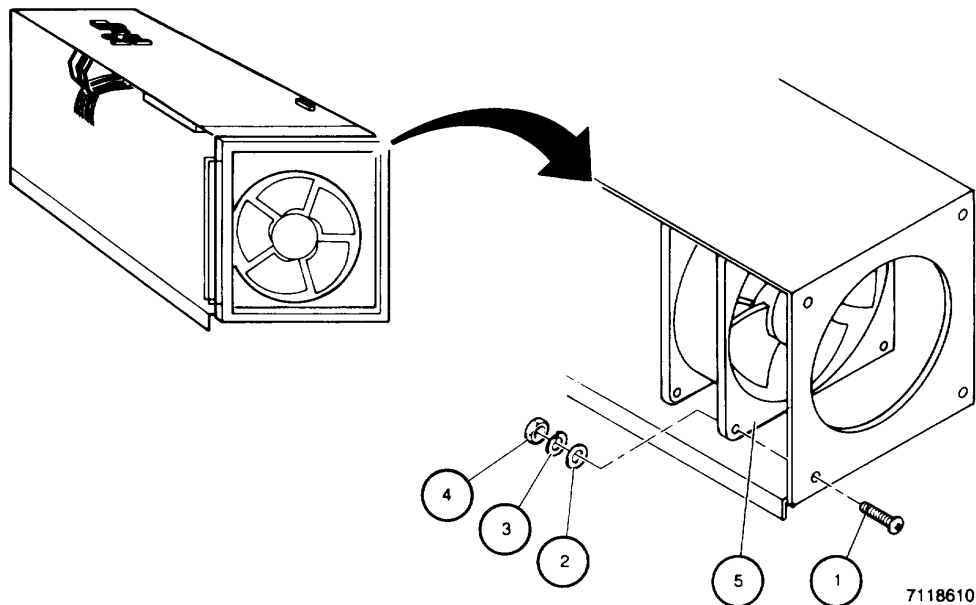
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove power supply module (para 4-20).

REMOVAL

1. Remove four screws (1), washers (2), lockwashers (3), and nuts (4).
2. Remove fan (5).

**INSTALLATION**

1. Place fan (5) in installed position.
2. Install four screws (1), washers (2), lockwashers (3), and nuts (4).

FOLLOW-ON MAINTENANCE: Install power supply module (para 4-20).

4-24. REPLACE WIRING HARNESS 701273-0100

This task covers: a. Removal b. Installation

INITIAL SETUP**General Safety Precaution:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

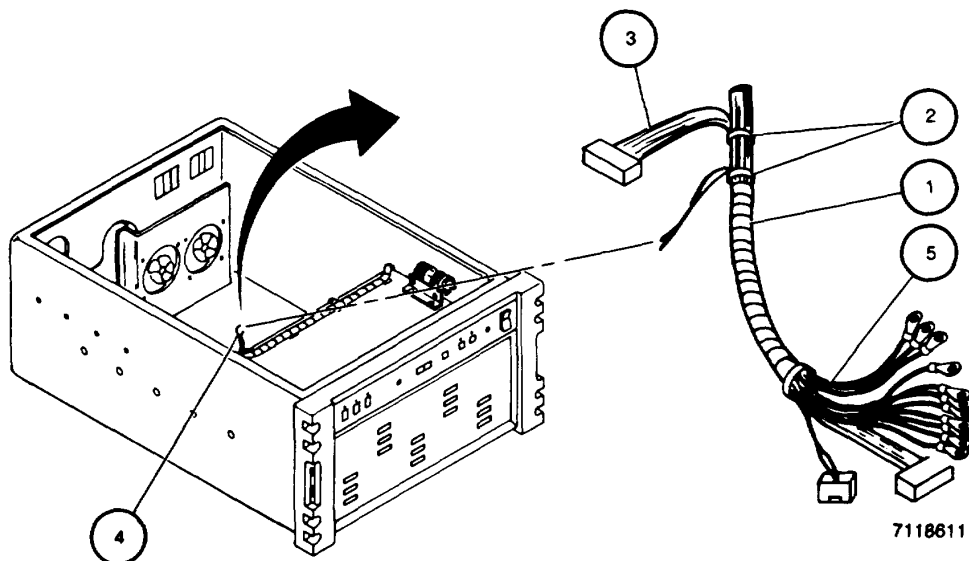
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove processor card cage (para 4-8).

REMOVAL**NOTE**

Note and record position of cable(s) as they are removed to aid in installation.

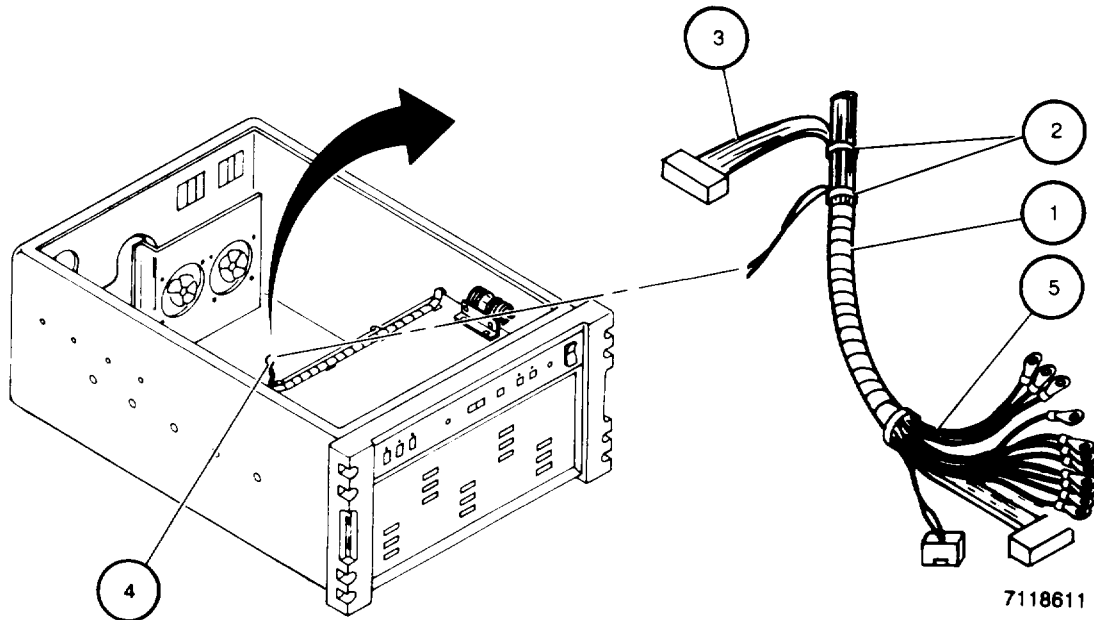
1. Remove plastic spiral wrap (1) and cable ties (2), as required, to remove ribbon cable (704010-0029) (3) and wiring harness (701327-0100) (4) from wiring harness (701273-0100) (5).
2. Remove wiring harness (701273-0100) (5). (Harness consists of wiring, connector J200, and terminal lugs).



4-24. REPLACE WIRING HARNESS 701273-0100 - Continued

INSTALLATION

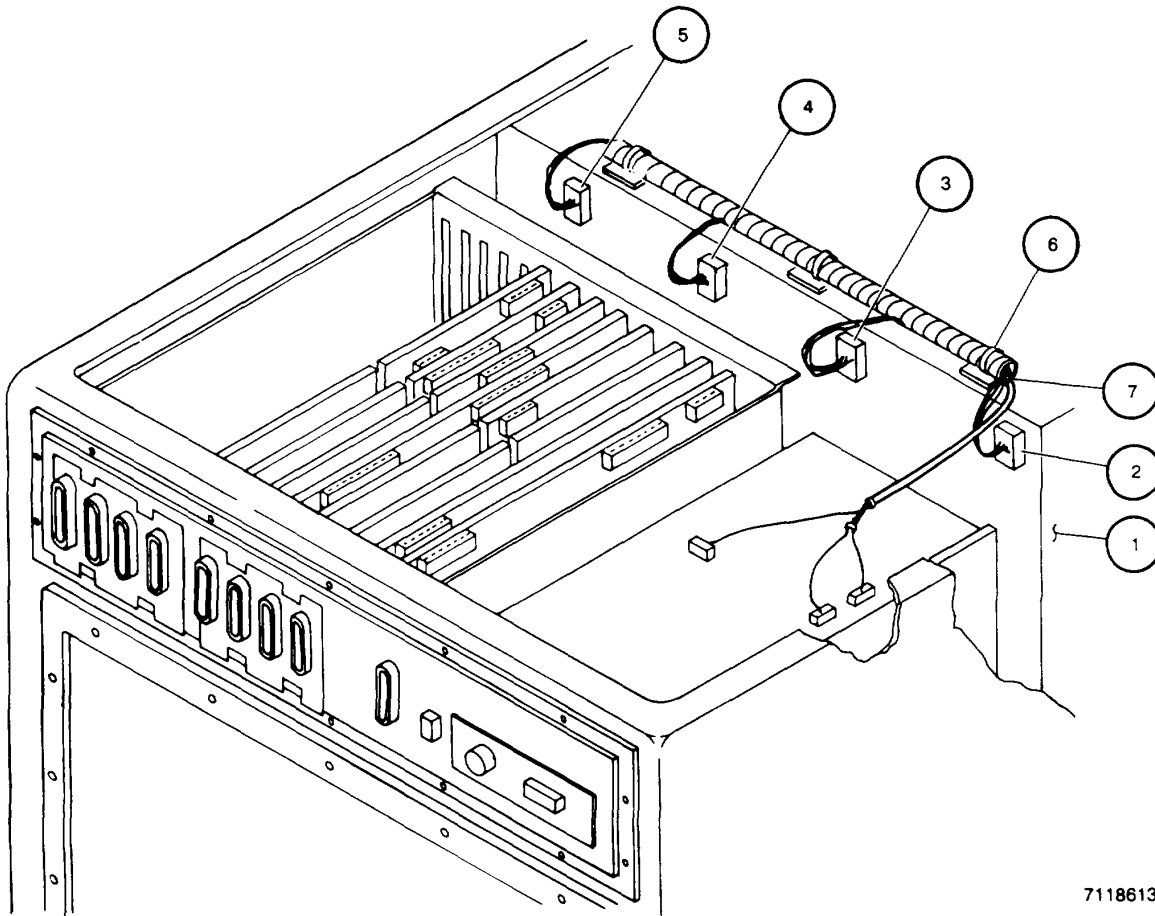
1. Assemble wiring harness (701273-0100) (5), ribbon cable (704010-0029) (3), and wiring harness (701327-0100) (4) as noted during removal.
2. Install plastic spiral wrap (1) and cable ties (2), as required.



FOLLOW-ON MAINTENANCE: Install processor card cage (para 4-8).

4-25. REPLACE WIRING HARNESS 701274-01 00 - Continued

3. Working at rear of mass storage assembly (1), disconnect wiring harness (701274-0100) connectors TK50 (2), DRO (3), DR1 (4), and DR2 (5).
4. Cut and remove cable ties (6), as required, to remove wiring harness (7). (Harness consists of wiring and connectors J500, J600, TK50, DRO, DR1, and DR2.)



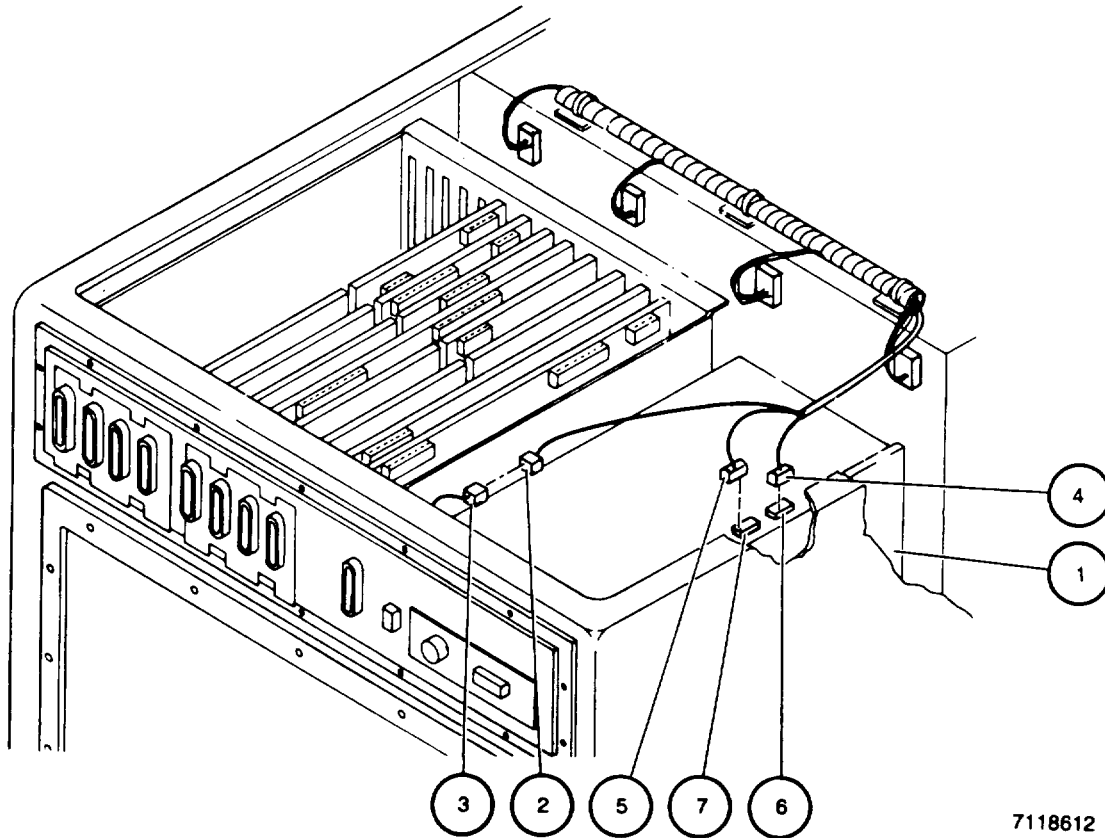
7118613

INSTALLATION

1. Route wiring harness (7) into chassis, as noted during removal.
2. Working at rear of mass storage assembly (1), connect wiring harness (701274-0100) connectors TK50 (2), DRO (3), DR1 (4), and DR2 (5).
3. Install cable ties (6), as required.

4-25. REPLACE WIRING HARNESS 70127401 00 - Continued

4. Working at top of power supply assembly (1), connect wiring harness connectors J500 (4) and J600 (5) to power supply assembly connectors P500 (6) and P600 (7) as tagged. Remove tags.
5. Connect wiring harness connector J900 (2) to fan assembly connector (3) as tagged. Remove tags.



FOLLOW-ON MAINTENANCE: Install top cover (para 4-30).

4-26. REPLACE WIRING HARNESS 701327-0100

This task covers: a. Removal b. Installation

INITIAL SETUP

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

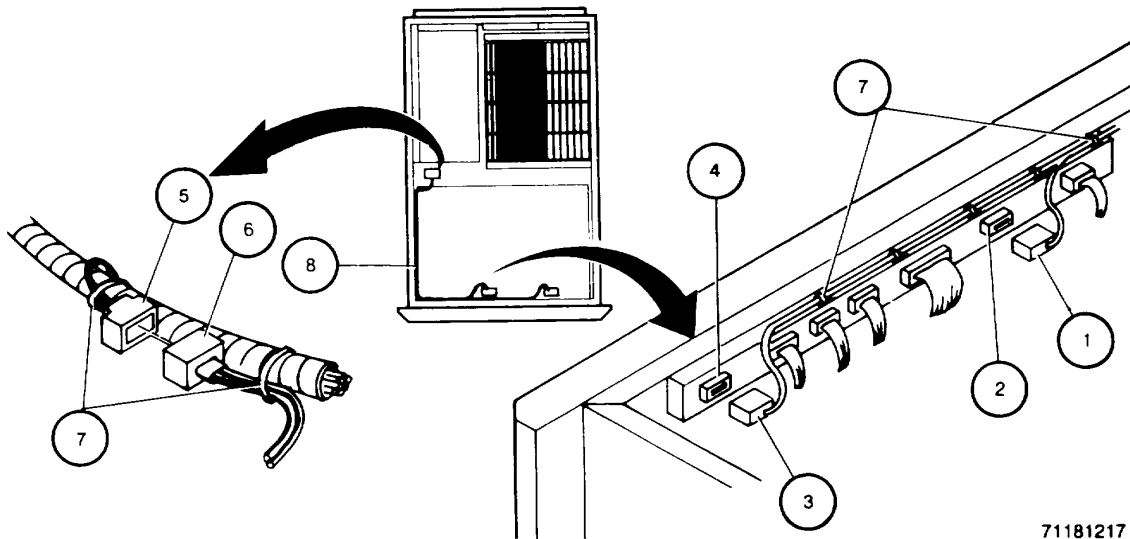
Preliminary Procedure: Remove wiring harness 701273-0100 (para 4-24).

REMOVAL

NOTE

Note and record position of cable(s) as they are removed to aid in installation.

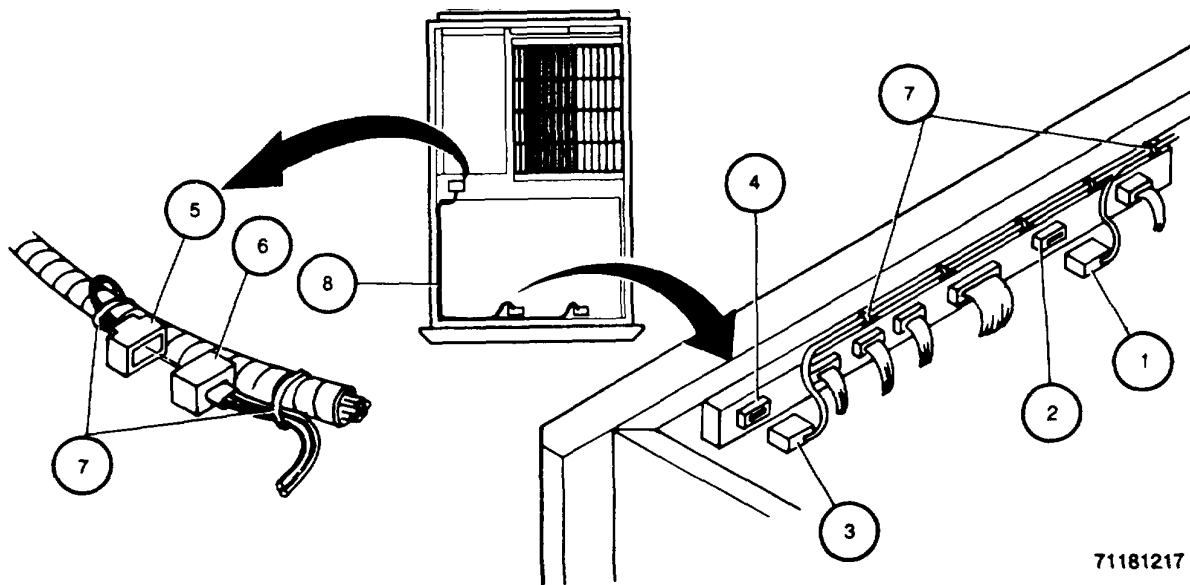
1. Working at rear of front panel, tag and disconnect wiring harness connector J701 (1) from connector P701 (2).
2. Tag and disconnect wiring harness connectors J601 (3) from connector P601 (4).
3. Tag and disconnect wiring harness connector J702 (5) from battery assembly connector P702 (6).
4. Cut and remove cable ties (7), as required, to remove wiring harness (8) from chassis. (Harness consists of wiring and connectors J100, J101, J601, J700, J701, J702, and J900.)



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4-26. REPLACE WIRING HARNESS 701327-0100 - Continued**INSTALLATION**

1. Route wiring harness (8) into chassis.
2. Working at rear of front panel, connect wiring harness connector J701 (1) to connector P701 (2) as tagged. Remove tag.
3. Connect wiring harness connector J601 (3) to connector P601 (4) as tagged. Remove tag.
4. Connect wiring harness connector J702 (5) to battery assembly connector P702 (6) as tagged. Remove tag.
5. Install cable ties (7), as required.



FOLLOW-ON MAINTENANCE: Install wiring harness 701273-0100 (para 4-24).

4-27. REPLACE SWITCHED AC OUT OR AC INPUT WIRING**This task covers:****a. Removal****b. Installation****INITIAL SETUP****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

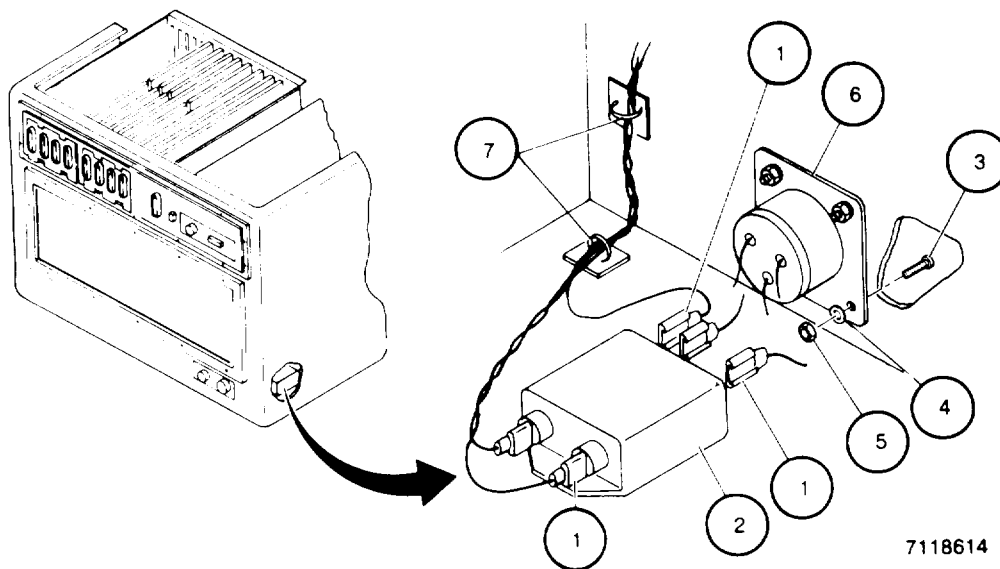
Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedures:

1. If working on switched ac out wiring, remove power distribution CCA (para 4-22). Switched ac out wiring is removed when task complete.
2. If working on ac input wiring, remove circuit breaker (para 4-18).

REMOVAL

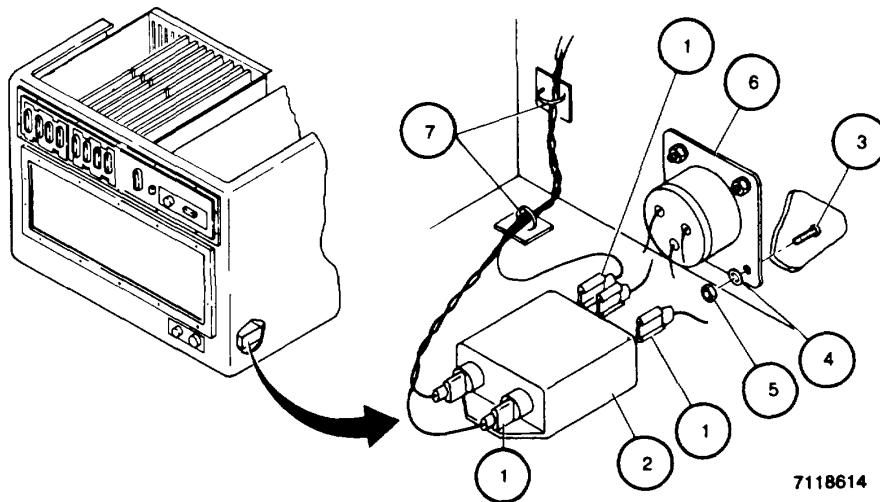
1. Working inside bottom left rear corner of chassis, tag and disconnect wiring (1) from EMI filter (2).
2. Working at rear panel, remove four screws (3), lockwashers (4), and washers (5) from PWR connector J12 (6).
3. Remove PWR connector J12 (6) and wiring (1) from chassis.
4. Tag and remove wiring (1) from PWR connector J12 (6), cutting and removing cable ties (7), as required.



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4-27. REPLACE SWITCHED AC OUT OR AC INPUT WIRING - Continued**INSTALLATION**

1. Install wiring (1) in PWR connector J12 (6) as tagged. Remove tags.
2. Working at rear panel, place PWR connector J12 (6) in installed position.
3. Install four screws (3), lockwashers (4), and washers (5).
4. Working inside bottom left rear corner of chassis, connect all wiring (1) to EMI filter (2) as tagged. Remove tags.
5. Install cable ties (7), as required.

**FOLLOW-ON MAINTENANCE:**

1. If working on switched ac out wiring, install power distribution CCA (para 4-22). Switched ac out wiring is installed when task complete.
2. If working on ac input wiring, install circuit breaker (para 4-18).

4-28. REPLACE FRONT PANEL ASSEMBLY**This task covers:****a. Removal****b. Installation****INITIAL SETUP****General Safety Precaution:****CAUTION**

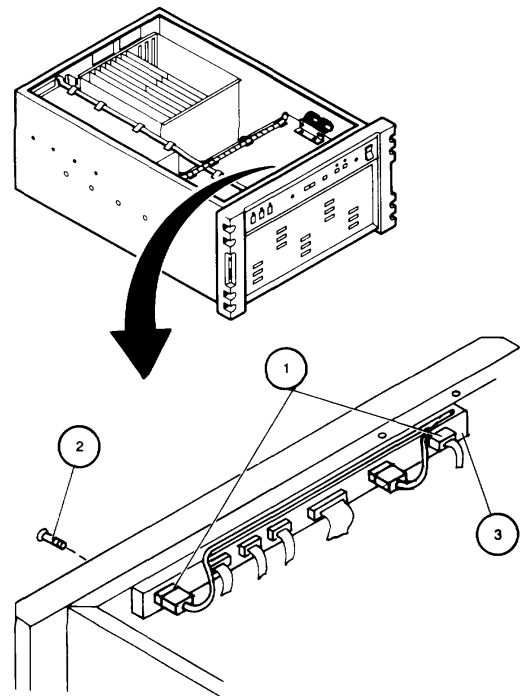
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedure: Remove top cover (para 4-30).

REMOVAL

1. Working inside front panel, tag and disconnect cables J101 through J701 (1).
2. Working at front panel, remove 12 screws (2).
3. Remove front panel assembly (3).

**INSTALLATION**

1. Place front panel assembly (3) in installed position.
2. Install 12 screws (2).
3. Working inside front panel, install cables J101 through J701 (1) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install top cover (para 4-30). 7118816

4-29. POWER SUPPLY ASSEMBLY TEST

This task covers: Test

INITIAL SETUP**General Safety Precautions:****WARNING**

- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED, Work carefully if covers are removed or panels are open to avoid electrical shock.**
- **HIGH VOLTAGES ARE PRESENT IN THE PROCESSOR. Avoid touching any area that may retain electrical charge or accumulate heat (capacitors, heat sinks, fan motors, etc.).**

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Processor installed in equipment rack.

Preliminary Procedures:

1. Remove top cover (para 4-30).
 2. Apply power to processor. Refer to TM 11-5895-1392-12.
-

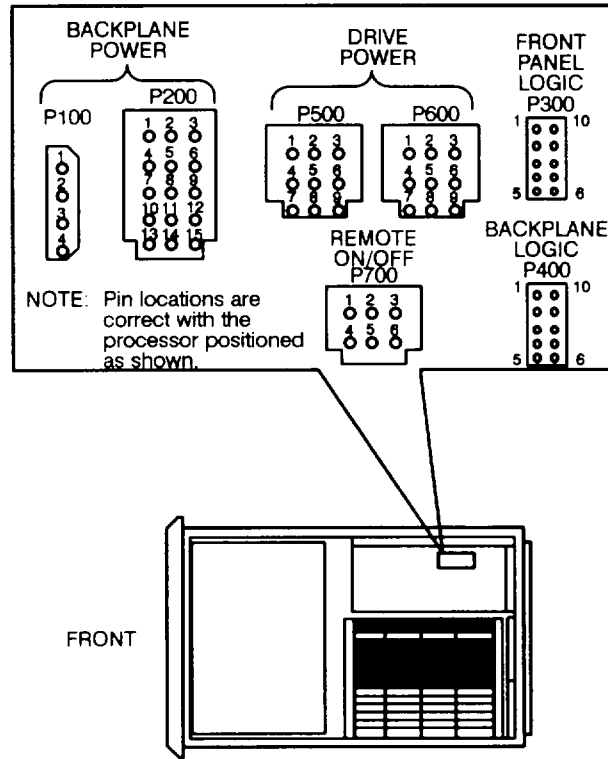
TEST**CAUTION**

Do not pierce or nick insulation on wiring when using multimeter probes or wiring may be damaged.

NOTE

- Checks need only be performed at power supply assembly output connectors that supply areas where faults are suspected.
 - Maintain load on power supply to avoid distorted readings. Disconnect one cable (J100, J200, J300, J400, J500 and J600) at a time, check power output at power supply assembly output connector, and reconnect cable before proceeding to next check.
 - If J700 is disconnected, the processor shuts down. Check P700 remote on/off by carefully probing along wires of J700 into connector, ensuring that insulation is not damaged by probe.
1. Working at top of power supply assembly, disconnect cable from output connector to be checked.

4-29. POWER SUPPLY ASSEMBLY TEST - Continued



P500/600 Drive Power		P700 Remote On/Off	
1	+ 5V	1	Remote On/Off
2	+ 5V	2	N/C
3	GND	3	-12V (-Fan)
4	GND	4	Remote On/Off
5	N/C	5	N/C
6	GND	6	Gnd (+ Fan)
7	GND		
8	+ 12V		
9	+ 12V		

P200 Backplane Power		P300 Front Panel Logic		P100 Backplane Power	
1	+ 5V	1	HALT	1	+ 12V
2	+ 5V	2	ENABLE	2	GND
3	GND	3	BOOT	3	GND
4	+ 5V	4	/BOOT	4	-12V
5	N/C	5	N/C		
6	GND	6	RUN		
7	+ 5V	7	GND		
8	N/C	8	PWR		
9	GND	9	LTC		
10	+ 5V	10	N/C		
11	N/C				
12	GND				
13	+ 5V				
14	GND				
15	GND				

P400 Backplane Logic	
1	N/C
2	N/C
3	BDCOKH
4	BHALTL
5	BEVENTL
6	BPOKH
7	N/C
8	SRUNL
9	GND
10	GND

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4-29. POWER SUPPLY ASSEMBLY TEST - Continued

2. Using multimeter, check power supply assembly output connector for voltage outputs listed (see opposite page).
 - a. If power output is correct, go to step 3.
 - b. If power output is incorrect, go to step 6.
3. Reconnect cable to power supply assembly output connector.
4. Repeat steps 1 and 2 for remaining power supply assembly output connectors, as required.
5. Remove power from processor. Test is complete.
6. Remove power and disconnect power cable from processor.
7. Remove power supply assembly mounting bracket and cover (para 4-10).
8. Using multimeter, check continuity of wiring to faulty power supply assembly output connector.
 - a. If continuity is good, replace power supply module (para 4-20).
 - b. If continuity is bad, replace power distribution CCA (para 4-22).
 - c. If fault persists, replace faulty power supply assembly (para 4-19).

FOLLOW-ON MAINTENANCE: Install top cover (para 4-30).

4-30. REMOVE/INSTALL TOP COVER

This task covers: a. Removal b. Installation

INITIAL SETUP**General Safety Precautions:****WARNING**

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.**
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.**
- **HIGH VOLTAGES ARE PRESENT IN THE PROCESSOR. Avoid touching any area that may retain electrical charge or accumulate heat (capacitors, heat sinks, fan motors, etc.).**

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

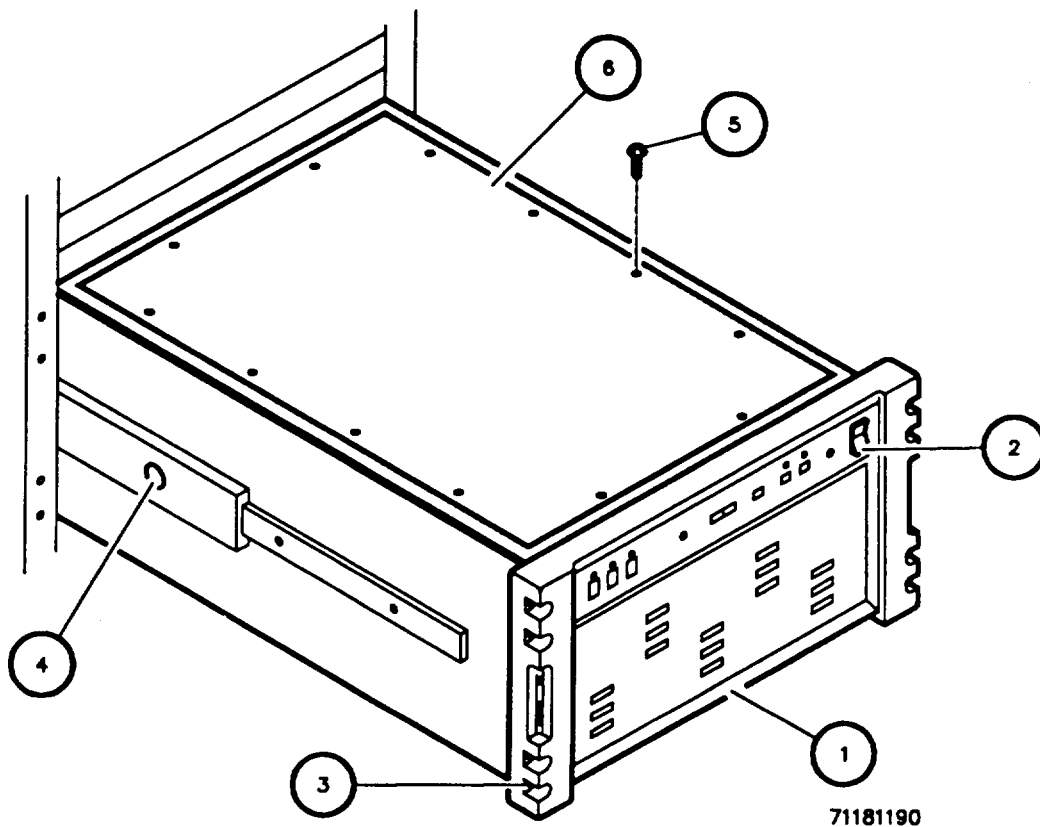
NOTE

Remove/install top cover on DBMP and all CPs the same way. Top cover shown is typical.

Equipment Configuration: Installed in equipment rack.

4-30. REMOVE/INSTALL TOP COVER - Continued**REMOVAL**

1. Working at rack A3A3, ensure processor (1) power switch (2) is set to OFF.
2. Loosen eight captive screws (3).
3. Pull processor (1) out until right and left slide rail locks (4) engage (left lock shown).
4. Remove 12 screws (5).
5. Remove top cover (6).

**INSTALLATION**

1. Place top cover (6) in installed position.
2. Install 12 screws (5).
3. Press right and left slide rail locks (4) (left lock shown) and push processor (1) fully into rack.
4. Tighten eight captive screws (3).

CHAPTER 5 WORKSTATION

Para		Page
Section I	Principles of Operation	5-2
5-1	Introduction.....	5-2
5-2	Theory of Operation	5-2
Section II	Troubleshooting.....	5-4
5-3	Introduction.....	5-4
5-4	General Instructions	5-4
5-4.1	Introduction.....	5-4
5-4.2	Inspection Procedures.....	5-4
5-4.3	Troubleshooting Procedures	5-4
5-4.4	Maintenance Procedures	5-5
5-5	Equipment Setup.....	5-5
5-6	Symptom Index	5-7
5-7	Troubleshooting Table.....	5-8
Section III	Maintenance Procedures	5-23
5-8	Remove/Install Top/Bottom Cover Assembly.....	5-23
5-9	Remove/Install CCA Assembly	5-25
5-10	Remove/Install CCA Assembly Bracket	5-29
5-11	Replace Power Supply Assembly.....	5-30
5-12	Replace Memory CCA.....	5-33
5-13	Replace Graphics Controller CCA.....	5-34
5-14	Replace CPU/Motherboard CCA.....	5-35
5-15	Replace Ethernet Interface CCA.....	5-36
5-16	Replace EMI Power Line Filter.....	5-38
5-17	Replace AC IN Voltage Indicator.....	5-41
5-18	Replace DEGAUSS or HALT Switch.....	5-43
5-19	Replace BRIGHTNESS and CONTRAST Potentiometers.....	5-45
5-20	Replace Halt Solenoid.....	5-47
5-21	Replace Circuit Breaker CB1	5-48
5-22	Replace CCA Assembly Fan.....	5-49
5-23	Replace System Fan	5-50
5-24	Replace Disk Tray Assembly	5-53
5-25	Replace Front Panel I/O Filter CCA	5-56
5-26	Replace Rear Panel I/O Filter CCA.....	5-58
5-27	Replace Ethernet CCA Cable Assembly (503761-001 or 503761-002).....	5-60
5-28	Replace Ethernet Cable Assembly (503760-001).....	5-61
5-29	Replace DC Power Cable Assembly (503769-002)	5-64
5-30	Replace Video/Keyboard Cable Assembly (503710-001).....	5-66
5-31	Replace I/O Port Cable Assembly (503716-001)	5-69
5-32	Replace Internal Disk Drive Cable Assembly (503752-001)	5-70
5-33	Replace CCA Assembly Fan Cable Assembly (504173-001)	5-71
5-34	Replace Bright/Contrast Control Cable Assembly (504213-001).....	5-72
5-35	Replace AC Monitor Cable Assembly (504237-001).....	5-74
5-36	Replace Halt Switch Cable Assembly (504378-001).....	5-77

5-37	Replace Auxiliary Inlet Filter.....	5-79
5-38	Power Supply Test.....	5-80
5-39	Fixed Disk Verifier test.....	5-81
5-40	AC Power Test.....	5-82
5-41	Diagnostic Test.....	5-86
5-42	Replace Front Panel Wiring and/or Connectors.....	5-90

SECTION I. PRINCIPLES OF OPERATION

5-1. INTRODUCTION

This section provides the theory of operation for the Workstation, A3092946, used in the Communications System, Control Element, Central Processors AN/TYQ-30(V)1/2.

NOTE

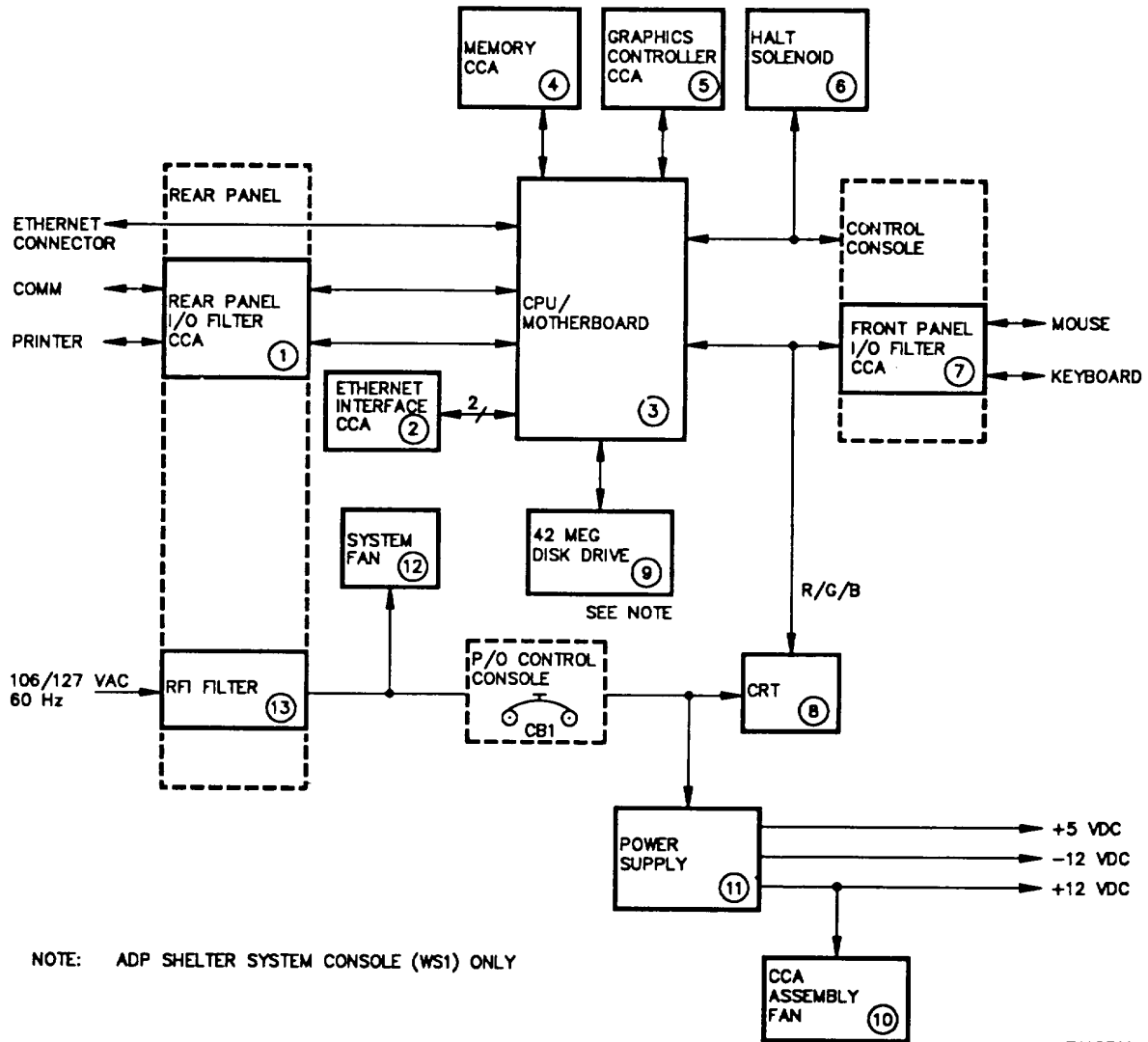
The AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and the AN/TYQ-30(V)2 system, except where noted.

5-2. THEORY OF OPERATION

- | | | |
|------|----------------------------|--|
| (1) | REAR PANEL I/O FILTER CCA | Provides Electromagnetic Interference (EMI) filtering for communications and printer connections. |
| (2) | ETHERNET INTERFACE CCA | Provides high-performance functions that interface the workstation to the Ethernet Local Area Network (LAN). |
| (3) | CPU/MOTHERBOARD CCA | Contains the Central Processor Unit (CPU), floating-point coprocessor, disk controller, and 2 megabytes of Random Access Memory (RAM). |
| (4) | MEMORY CCA | Provides an additional 16 megabytes of RAM. |
| (5) | GRAPHICS CONTROLLER CCA | Provides graphics interface for workstation. |
| (6) | HALT SOLENOID | Supplies momentary pulse to CPU, stopping operational program and placing workstation in console mode. |
| (7) | FRONT PANEL I/O FILTER CCA | Provides EMI filtering for mouse and keyboard connections. |
| (8) | CRT | Shock-mounted, high-resolution, 15-inch color monitor screen. |
| (9) | 42-MEGABYTE DISK DRIVE | Used as data storage and system boot device (system console only, normally WS1). |
| (10) | CCA ASSEMBLY FAN | Supplies cooling air for Circuit Card Assembly (CCA). |

5-2. THEORY OF OPERATION - Continued

- (11) POWER SUPPLY Converts 110 Vac to +5.0, +12.0, and -12.0 Vdc for computer power and control functions.
- (12) SYSTEM FAN Supplies cooling air for workstation chassis.
- (13) RFI FILTER Filters Radio Frequency Interference (RFI) from input voltage.



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SECTION II. TROUBLESHOOTING

5-3. INTRODUCTION

This section provides procedures required to set up, test, fault isolate, and repair the workstation at the direct support maintenance level.

5-4. GENERAL INSTRUCTIONS

5-4.1. Introduction

- a. Troubleshooting and repair should be performed only by experienced technicians who are familiar with the equipment and capable of ensuring that procedures are correctly accomplished.
- b. Maintenance personnel should read all inspection, troubleshooting, and maintenance instructions before attempting to troubleshoot or repair the equipment.

5-4.2. Inspection Procedures

- a. Visually inspect all wiring and all electronic assemblies and their components for obvious damage. Check for open connections, shorts, burning, discoloration, brittle or cracked insulation, or charring. If damage is noted, carefully inspect related components for similar damage to help identify the cause of the damage.
- b. When removed, visually inspect all Circuit Card Assemblies (CCAs) for signs of excess heat, such as charred, burned, discolored, cracked, or broken components. Inspect all printed wire etching on CCAs for apparent breaks, cuts, nicks, or signs of lifting from the card. Inspect CCA connectors for cracked or broken insulation and for missing, loose, bent, or broken pins. Inspect contacts of CCA edge connectors to ensure that they are not broken, scratched, nicked, cut or dirty. Clean dirty contacts.
- c. Inspect all chassis connectors for broken, scratched, dented, or damaged housings; missing hardware; and missing or damaged connector pins.
- d. Operate each switch to all positions to ensure that it operates freely and smoothly and that all contacts appear to mate when they should. Ensure that all switch detents operate positively and firmly. Inspect knobs for breaks or cracks.

5-4.3. Troubleshooting Procedures

Perform troubleshooting as follows:

- a. Observe reported symptom or repeat failed diagnostic test to verify reported fault.
- b. Using symptom index (table 5-1) and troubleshooting table (table 5-2), perform steps required to isolate fault to a part or assembly and perform first specified corrective action.
- c. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- d. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action.
- e. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- f. Repeat steps d and e until workstation is repaired or it becomes necessary to refer unit to next higher level of maintenance.

5-4.4. Maintenance Procedures

- a. The equipment documented in this manual is typical. The equipment you are repairing may contain minor variations (location and number of cable ties, cable markers, lockwashers, etc.) which do not affect the essential procedural steps given.
- b. While performing maintenance procedures, cut and remove cable ties whenever needed. Note and record the number and location of the cable ties removed to aid installation.
- c. Bag and tag hardware (screws, washers, etc.) during removal procedures to aid installation.
- d. Tag connectors and wires during removal procedures to ensure correct reconnection.
- e. If during removal of an assembly it is observed that wires, cables, or connectors attached to that assembly are loose, reinstall or reconnect the loose item and repeat troubleshooting procedure to verify repair.

5-5. EQUIPMENT SETUP**WARNING**

- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.**
- **HIGH VOLTAGES ARE PRESENT IN THE WORKSTATION. Avoid touching the power supply or CRT areas and any items that may retain electrical charge or accumulate heat (capacitors, heat sinks, CRT. etc.).**

NOTE

If workstation is installed in ADP or OPN shelter, refer to TM 11-5895-1392-12 for turn-on and checkout procedures.

5-5. EQUIPMENT SETUP - Continued

1. Working at front panel, open (pull out) AC IN circuit breaker (CB1) (1), if required.
2. Connect mouse cable (2) and keyboard cable (3) to workstation.
3. Working at rear panel, install power cable (4).
4. Install nut (5), two washers (6), and ground cable (7).
5. Connect 26-ohm terminator (8) to Ethernet connector (9). If 26-ohm terminator is not available, use T-adapter with two 50-ohm terminators.

CAUTION

Avoid using power circuits serving other devices, which may cause low voltage or voltage fluctuations or introduce noise. These unstable conditions may cause intermittent operation.

6. Connect power cable (4) to approved 115 Vac, 60-Hz power source.

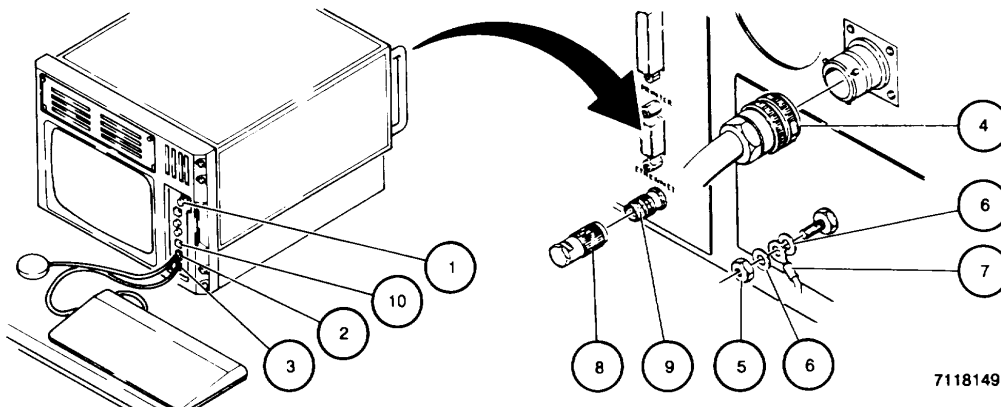
CAUTION

Do not power down the monitor while a test sequence is executing or data in Random Access Memory (RAM) may be destroyed.

7. Close (push in) AC IN circuit breaker (CB1)(1). Observe that within approximately 3 minutes, the workstation displays test countdown (F through 1), and the following prompt: -83 boot sys
8. Press HALT switch (10). Observe that error messages, if any, and console prompt (> >) are displayed.

NOTE

- **Hard error messages are preceded by a double question mark (??).**
 - **Soft error (status) messages are preceded by a single question mark (?).**
- a. If no ?? displayed, components checked by self-test are operational.
 - b. If ?? displayed, go to diagnostic test (para 5-41).



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5-6. SYMPTOM INDEX

The symptom index for the workstation is provided in table 5-1. Simply check the table for the fault condition or failed diagnostic test result and go to the referenced troubleshooting procedure in Table 5-2, Workstation Troubleshooting.

Table 5-1. Workstation Symptom Index

NUMBER	SYMPTOM	PAGE
1	AC IN indicator does not come on when CB1 closed.....	5-10
2	Self-test fails to run after power applied.....	5-11
3	Circuit breaker CB1 trips	5-12
4	Start-up self-test indicates error	5-12
5	Replacement of Ethernet interface CCA does not correct "NI" fault	5-12
6	Replacement of graphics controller CCA does not correct "4PLN" fault.....	5-13
7	Replacement of disk drive does not correct "HDC" fault.....	5-13
8	Replacement of CPU/motherboard does not correct "DZ" fault	5-14
9	Replacement of CPU/motherboard does not correct "MONO" fault	5-15
10	Replacement of CPU/motherboard does not correct "IT, FP, MM, NVR, or CLK" fault	5-15
11	Replacement of memory CCA does not correct "MEM" fault.....	5-15
12	No image on workstation.....	5-15
13	Front panel controls not operating properly.....	5-17
14	DEGAUSS switch not operating properly.....	5-18
15	HALT switch not operating properly	5-18
16	CONTRAST control not operating properly.....	5-19
17	BRIGHTNESS control not operating properly	5-20
18	System fan not operating properly.....	5-20
19	CCA assembly fan not operating properly.....	5-21
20	Software not booting manually or automatically.....	5-21
21	Operational program not executing properly	5-22
22	Mouse or keyboard does not work properly after replacement by operator	5-22
23	Printer does not work properly but no printer fault is displayed.....	5-22

5-7. TROUBLESHOOTING TABLE**WARNING**

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.** Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.
- **HIGH VOLTAGES ARE PRESENT IN THE WORKSTATION.** Avoid touching the power supply or CRT areas and any items that may retain electrical charge or accumulate heat (capacitors, heat sinks, CRT, etc.).
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed or panels are open to avoid electrical shock.
- The ac power source must be properly grounded, and extension cords should not be used. In addition to being a personnel safety hazard, improper grounding may cause erroneous operation and damage to equipment.

CAUTION

- This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.
- Do not power down the workstation while a test sequence is executing or data in Random Access Memory (RAM) may be destroyed.
- To avoid electrical shorts or similar problems, promptly remove any hardware or other foreign matter dropped into the equipment.
- Never place spillable containers on or near the equipment.
- Ensure that the correct circuit card assemblies and interconnect cables are used and that they are securely installed.

5-7. TROUBLESHOOTING TABLE - Continued**NOTE**

- **performing troubleshooting procedures, especially during electrical checks, be alert for intermittent as well as good/bad conditions.**
- **sure that plugs, jacks, cables, and integrated circuits are completely and positively engaged. When reconnecting these items, guard against bending pins and inverting or offsetting connection of unkeyed connectors.**
- **Instructions that refer to right, left, front, or rear are given as if viewing the workstation from the front panel, looking toward the rear of the unit.**

Troubleshooting procedures for the workstation are provided in table 5-2. The table consists of three columns and is used as follows:

1. **MALFUNCTION:** Indicates equipment fault as described in symptom index. Look in TEST OR INSPECTION column for required fault isolation steps.
2. **TEST OR INSPECTION:** Indicates step(s) to be taken to isolate fault to a specific part or assembly. If equipment passes a test or inspection step, go to next step. If equipment fails a test or inspection, look in CORRECTIVE ACTION column for repair steps.
3. **CORRECTIVE ACTION:** Indicates authorized adjustment or repair for an isolated fault. When action is completed, repeat action or diagnostic test that initially identified fault to confirm repair. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action. If all steps are completed and fault persists, refer equipment to next higher level of maintenance.

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

1. AC IN INDICATOR DOES NOT COME ON WHEN CB1 CLOSED

Step 1. Perform ac power test (para 5-40).

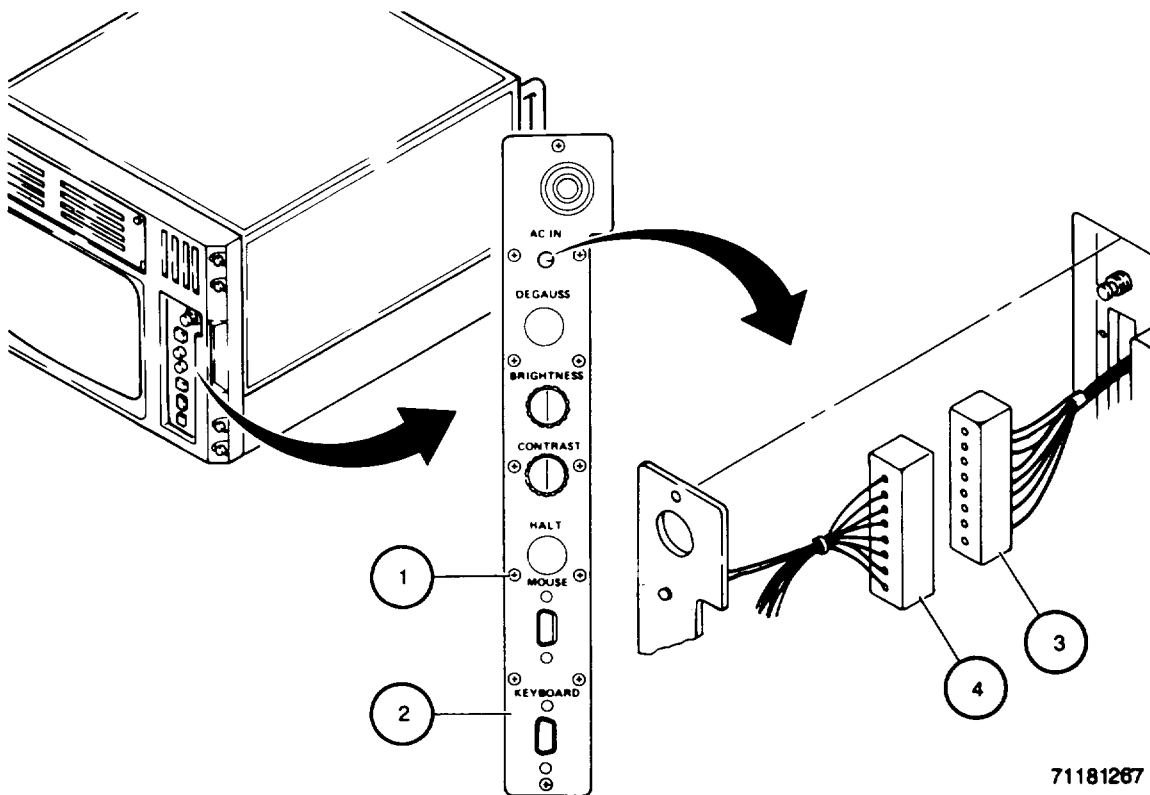
Perform corrective action as directed by ac power test.

WARNING

HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.

Step 2. Open CB1 (pull out). Remove 12 screws (1) and carefully pull faceplate (2) forward to access wiring. (Leave faceplate extended until repair is complete.) Access, note, and tag bright/contrast control cable (504213-001) P1-1 by referencing wire (RED) to wiring connector J1 (4) pin 1. Disconnect bright/contrast control cable (504213-001) connector P1 (3) from wiring connector J1 (4). Perform equipment setup and power-up (para 5-5). With CB1 closed (push in), check for 4.5 to 5.5 Vdc between pins 1 (tagged) and 2 of connector P1 (3).

If voltage is correct, replace faulty AC IN indicator (para 5-17)



5-7. TROUBLESHOOTING TABLE- Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. AC IN INDICATOR DOES NOT COME ON WHEN CB1 CLOSED - Continued		
WARNING		
HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.		
Step 3.	Remove bright/contrast control cable assembly (504213-001) (para 5-34). Check cable continuity (FO-2)	Replace faulty bright/contrast control cable assembly (504213-001)
Step 4.	Disconnect bright/contrast control cable assembly (504213-001) connector P1 from front panel wiring connector J1. Check wiring and connector for continuity (FO-2).	Replace faulty front panel wiring and/or connector (para 5-42)
Step 5.	Remove ac monitor cable assembly (504237-001) (para 5-35). Check cable continuity (FO-2).	<ul style="list-style-type: none"> a. Replace faulty ac monitor cable assembly (504237-001). b. Refer to next higher level of maintenance.
2. SELF-TEST FAILS TO RUN AFTER POWER APPLIED		
Step 1.	Perform power supply test (para 5-38).	If test fails, replace power supply assembly (para 5-11)
Step 2.	Remove dc power cable assembly (503769-002) (para 5-29). Check cable continuity (FO-2).	Replace faulty dc power cable assembly.
Step 3.	Remove halt switch cable assembly (504378-001) (para 5-36). Check cable continuity (FO-2).	Replace faulty halt switch cable assembly (504378-001)

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. SELF-TEST FAILS TO RUN AFTER POWER APPLIED - Continued		
Step 4.	Check CPU/motherboard by replacing with a known good CPU/motherboard (para 5-14).	
	a. Replace faulty CPU/motherboard CCA.	
	b. Refer to next higher level of maintenance.	
3. CIRCUIT BREAKER CB1 TRIPS		
Step 1.	Remove top cover (para 5-8). With power cable disconnected from rear panel and CB1 closed (push in), verify continuity between CB1 terminals CB1-2 (E2) and CB1-4 (E4), and CB1 -1 (E5) and CB1-3 (E6). With CB1 open (pull out), verify that CB1 is free of shorts.	
	Replace faulty circuit breaker CB1 (para 5-21)	
Step 2.	Perform ac power test (para 5-40).	
	a. Perform corrective action as directed by ac power test.	
	b. Refer to next higher level of maintenance.	
4. START-UP SELF-TEST INDICATES ERROR		
	Perform diagnostic test (para 5-41)	
	Perform corrective action as directed by diagnostic test.	
5. REPLACEMENT OF ETHERNET INTERFACE CCA DOES NOT CORRECT "NI" FAULT		
Step 1.	Check that system Ethernet cable or 26-ohm terminator (or T-adaptor with two 50-ohm terminators) is connected to rear panel ETHERNET connector.	
	a. Connect system Ethernet cable to rear panel ETHERNET connector.	
	b. Remove/repair/install system Ethernet (coaxial) cable (refer to chapter 9).	
	c. Install 50-ohm terminator to rear panel ETHERNET connector.	

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. REPLACEMENT OF ETHERNET INTERFACE CCA DOES NOT CORRECT "NI" FAULT - Continued		
Step 2.	Remove CCA assembly (para 5-9). Check continuity of Ethernet cable assembly (503760-001) from rear panel ETHERNET connector to coaxial connector P1.	Replace faulty Ethernet cable assembly (503760-001) (para 5-28).
Step 3.	Remove Ethernet CCA cable assemblies (503761-001 and 503761-002) (para 5-27). Check cable continuity (FO-2).	Replace faulty Ethernet CCA cable assemblies (503761-001 and 503761-002)
Step 4.	Check CPU/motherboard CCA by replacing with a known good CPU/motherboard CCA (para 5-14).	<ul style="list-style-type: none"> a. Replace faulty CPU/motherboard CCA. b. Refer to next higher level of maintenance.
6. REPLACEMENT OF GRAPHICS CONTROLLER CCA DOES NOT CORRECT "4PLN" FAULT		
Step 1.	Remove video/keyboard cable assembly (503710-001) (para 5-30). Check cable continuity (FO-2).	Replace faulty video/keyboard cable assembly (503710-001)
Step 2.	Check CPU/motherboard CCA by replacing with a known good CPU/motherboard CCA (para 5-14).	<ul style="list-style-type: none"> a. Replace faulty CPU/motherboard CCA. b. Refer to next higher level of maintenance.
7. REPLACEMENT OF DISK DRIVE DOES NOT CORRECT "HDC" FAULT		
Step 1.	Remove disk tray assembly (para 5-24). (Leave disk tray assembly out until repair complete.) Check continuity of internal disk drive cable assembly (503752-001).	Replace faulty internal disk drive cable assembly (503752-001) (para 5-32).

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. REPLACEMENT OF DISK DRIVE DOES NOT CORRECT "HDC" FAULT - Continued		
WARNING		
HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.		
NOTE		
Pin 1 in connector P3 is pin nearest connector key.		
Step 2.	Perform equipment setup and power-up (para 5-5). Working at power supply connector P3 (disconnected from internal disk drive cable assembly (503752-001) connector J1), measure 4.5 to 5.5 Vdc between P3-4 and P3-3 (GND), and 11.5 to 12.5 Vdc between P3-1 and P3-2 (GND).	Replace faulty power supply assembly (para 5-11)
Step 3.	Check CPU/motherboard CCA by replacing with a known good CPU/motherboard CCA (para 5-14).	<ul style="list-style-type: none"> a. Replace faulty CPU/motherboard CCA. b. Refer to next higher level of maintenance.
8. REPLACEMENT OF CPU IMOTHERBOARD DOES NOT CORRECT "DZ" FAULT		
Step 1.	Remove Input/Output (I/O) port cable assembly (503716-001) (para 5-31). Check cable continuity (FO-2).	Replace faulty I/O port cable assembly (503716-001)
Step 2.	Check rear panel I/O filter CCA assembly by replacing with a known good rear panel I/O filter CCA assembly (para 5-26).	<ul style="list-style-type: none"> a. Replace faulty rear panel I/O filter CCA assembly. b. Refer to next higher level of maintenance.

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. REPLACEMENT OF CPU/MOTHERBOARD DOES NOT CORRECT "MONO" FAULT		
	Remove video/keyboard cable assembly (503710-001) (para 5-30). Check cable continuity (FO-2).	<ul style="list-style-type: none"> a. Replace faulty video/keyboard cable assembly (503710-001). b. Refer to next higher level of maintenance.
10. REPLACEMENT OF CPU/MOTHERBOARD DOES NOT CORRECT "IT, FP, MM, NVR, OR CLK" FAULT		
Step 1.	Perform power supply test (para 5-38).	If test fails, replace power supply assembly (para 5-11)
Step 2.	Remove dc power cable assembly (503769-002) (para 5-29). Check cable continuity (FO-2).	<ul style="list-style-type: none"> a. Replace faulty dc power cable assembly. b. Refer to next higher level of maintenance.
11. REPLACEMENT OF MEMORY CCA DOES NOT CORRECT "MEM" FAULT		
	Check CPU/motherboard CCA by replacing with a known good CPU/motherboard CCA (para 5-14)	<ul style="list-style-type: none"> a. Replace faulty CPU/motherboard CCA. b. Refer to next higher level of maintenance.
12. NO IMAGE ON WORKSTATION		
Step 1.	Perform ac power test (para 5-40).	Perform corrective action as directed by ac power test.
Step 2.	Perform power supply test (para 5-38).	If test fails, replace power supply assembly (para 5-11)

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
12. NO IMAGE ON WORKSTATION - Continued		
Step 3.	Check graphics controller CCA by replacing with a known good graphics controller CCA (para 5-13).	Replace faulty graphics controller CCA.
Step 4.	Check CPU/motherboard CCA by replacing with a known good CPU/motherboard CCA (para 5-14)	Replace faulty CPU/motherboard CCA.
Step 5.	Remove video/keyboard cable assembly (503710-001) (para 5-30). Check cable continuity (FO-2).	Replace faulty video/keyboard cable assembly (503710-001)
Step 6.	Remove dc power cable assembly (503769-002) (para 5-29). Check cable continuity (FO-2).	Replace faulty dc power cable assembly.
Step 7.	Remove bright/contrast control cable assembly (504213-001) (para 5-34). Check cable continuity (FO-2)	Replace faulty bright/contrast control cable assembly (504213-001)
Step 8.	Disconnect bright/contrast control cable assembly (504213-001) connector P1 from front panel wiring connector J1. Check wiring and connector for continuity.	Replace faulty front panel wiring and/or connector (para 5-42)
Step 9.	Remove ac monitor cable assembly (504237-001) (para 5-35). Check cable continuity (FO-2).	<ul style="list-style-type: none"> a. Replace faulty ac monitor cable assembly (504237-001). b. Refer to next higher level of maintenance.

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION

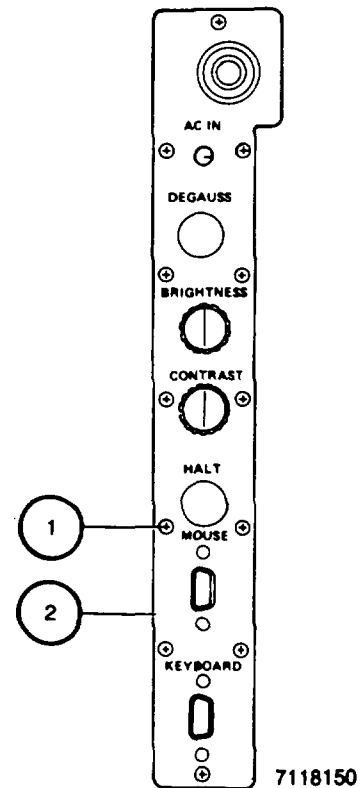
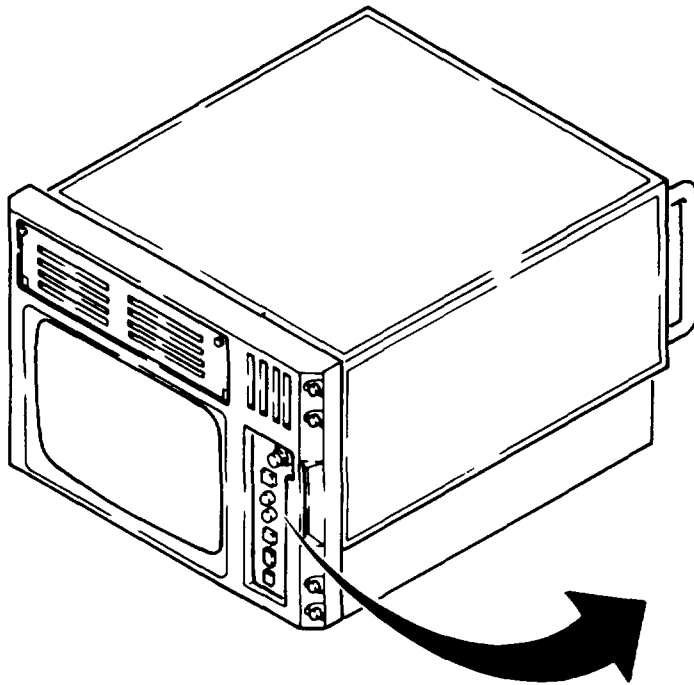
13. FRONT PANEL CONTROLS NOT OPERATING PROPERLY

WARNING

HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.

Open CB1 (pull out). Disconnect ac power cable from ac power source. Remove 12 screws (1) and carefully pull faceplate (2) forward to access wiring. Check that all wiring and cabling to faceplate components are secure. (Leave faceplate extended until repair is complete.)

- a. Securely install wiring and cabling.
- b. If fault persists, leave faceplate open and refer to specific switch or control not working properly.



5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
14. DEGAUSS SWITCH NOT OPERATING PROPERLY		
Step 1.	Perform Malfunction 13, Front Panel Controls Not Operating Properly, before proceeding.	Securely install wiring and cabling as directed in corrective action.
Step 2.	Disconnect degauss switch wiring connector P2 from ac power cable (503753-001) connector J1. With DEGAUSS switch pressed, check for continuity between pins P2-2 (BLK) and P2-3 (WHT) of degauss switch wiring connector.	<ul style="list-style-type: none"> a. Replace faulty DEGAUSS switch (para 5-18). b. Replace faulty degauss switch wiring and/or connector (para 5-42).
Step 3.	Remove ac monitor cable assembly (504237-001) (para 5-35). Check cable continuity (FO-2)	<ul style="list-style-type: none"> a. Replace faulty ac monitor cable assembly (504237- 001). b. Refer to next higher level of maintenance.
15. HALT SWITCH NOT OPERATING PROPERLY		
Step 1.	Perform Malfunction 13, Front Panel Controls Not Operating Properly, before proceeding.	Securely install wiring and cabling as directed in corrective action.
Step 2.	Disconnect halt switch wiring connector P1 from halt switch cable assembly (504378-001) connector J1. With HALT switch pressed, test continuity between P1-1 and P1-2 of halt switch wiring connector.	<ul style="list-style-type: none"> a. Replace faulty HALT switch (para 5-18). b. Replace faulty halt switch wiring and/or connector (para 5-42).
Step 3.	Remove halt switch cable assembly (504378-001) (para 5-36). Check cable continuity (FO-2).	Replace faulty halt switch cable assembly (504378-001)

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
15. HALT SWITCH NOT OPERATING PROPERLY - Continued		
Step 4.	Check halt solenoid by replacing with a known good halt solenoid (para 5-20).	Replace faulty halt solenoid.
Step 5.	Remove dc power cable assembly (503769-002) (para 5-29). Check cable continuity (FO-2).	<ul style="list-style-type: none"> a. Replace faulty dc power cable assembly. b. Refer to next higher level of maintenance.
16. CONTRAST CONTROL NOT OPERATING PROPERLY		
Step 1.	Perform Malfunction 13, Front Panel Controls Not Operating Properly, before proceeding.	Securely install wiring and cabling as directed in corrective action.
Step 2.	Working with faceplate extended, disconnect bright/contrast wiring connector J1 from bright/contrast control cable assembly (504213-001) P1. Rotate CONTRAST control and measure uniformly changing variable resistance between J1-3 (GRY) and J1-5 (BLU) of control wiring connector.	<ul style="list-style-type: none"> a. Replace faulty CONTRAST control (para 5-19). b. Replace faulty bright/contrast control wiring and/or connector (para 5-42).
Step 3.	Remove bright/contrast control cable assembly (504213-001) (para 5-34). Check cable continuity (FO-2)	<ul style="list-style-type: none"> a. Replace faulty bright/contrast control cable assembly (504213-001). b. Replace faulty front panel wiring and/or connectors (para 5-42). c. Refer to next higher level of maintenance.

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
17. BRIGHTNESS CONTROL NOT OPERATING PROPERLY		
Step 1.	Perform Malfunction 13, Front Panel Controls Not Operating Properly, before proceeding.	Securely install wiring and cabling as directed in corrective action.
Step 2.	Working with faceplate extended, disconnect bright/contrast wiring connector J1 from bright/contrast control cable assembly (504213-001) P1. Rotate BRIGHTNESS control and measure uniformly changing variable resistance between J1-6 (GRN) and J1-8 (ORN) of control wiring connector.	<ul style="list-style-type: none"> a. Replace faulty BRIGHTNESS control (para 5-19). b. Replace faulty bright/contrast control wiring and/or connector (para 5-42).
Step 3.	Remove bright/contrast control cable assembly (504213-001) (para 5-34). Check cable continuity (FO-2)	<ul style="list-style-type: none"> a. Replace faulty bright/contrast control cable assembly (504213-001). b. Replace faulty front panel wiring and/or connectors (para 5-42). c. Refer to next higher level of maintenance.
18. SYSTEM FAN NOT OPERATING PROPERLY		
WARNING		
HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.		
Step 1.	Remove top cover (para 5-8). Perform equipment setup and power-up (para 5-5). Check for 106 to 127 Vac at system fan power input terminals.	If voltage is correct, replace system fan (para 5-23)
Step 2.	Perform ac power test (para 5-40).	<ul style="list-style-type: none"> a. Perform corrective action as directed by ac power test. b. Refer to next higher level of maintenance.

5-7. TROUBLESHOOTING TABLE - Continued

Table 5 2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
19. CCA ASSEMBLY FAN NOT OPERATING PROPERLY		
WARNING		
HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.		
Step 1.	Remove top cover (para 5-8). Perform equipment setup and power-up (para 5-5). Disconnect CCA assembly fan cable (504173-001) connector J2 from CCA assembly fan connector P1. Measure 11.5 to 12.5 Vdc between CCA assembly fan cable connector J2-1 (RED) and J2-2 (BLK)(GND).	If voltage is correct, replace CCA assembly fan (para 5-22)
Step 2.	Perform power supply test (para 5-38).	If test fails, replace power supply assembly (para 5-11)
Step 3.	Remove CCA assembly fan cable assembly (504173-001) (para 5-33). Check cable continuity (FO-2).	<ul style="list-style-type: none"> a. Replace faulty CCA assembly fan cable (504173-001). b. Refer to next higher level of maintenance.
20. SOFTWARE NOT BOOTING MANUALLY OR AUTOMATICALLY		
Step 1.	Perform diagnostic test (para 5-41).	Perform corrective action as directed by diagnostic test.
Step 2.	Perform power supply test (para 5-38).	<ul style="list-style-type: none"> a. If test fails, replace power supply assembly (para 5-11). b. Perform Malfunction 2, Self-Test Fails to Run After Power Applied, beginning with step 2.
Step 3.	Perform ac power test (para 5-40).	<ul style="list-style-type: none"> a. Perform corrective action as directed by ac power test. b. Refer to next higher level of maintenance.

5-7. TROUBLESHOOTING TABLE - Continued

Table 5-2. Workstation Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
21. OPERATIONAL PROGRAM NOT EXECUTING PROPERLY		
Perform Malfunction 20, Software Not Booting Manually or Automatically.		
22. MOUSE OR KEYBOARD DOES NOT WORK PROPERLY AFTER REPLACEMENT BY OPERATOR		
Step 1.	Check front panel I/O filter CCA by replacing with a known good I/O filter CCA (para 5-25).	Replace faulty front panel I/O filter CCA.
Step 2.	Remove video/keyboard cable assembly (503710-001) (para 5-30). Check cable continuity (FO-2).	Replace faulty video/keyboard cable assembly (503710-001)
Step 3.	Check CPU/motherboard CCA by replacing with a known good CPU/motherboard CCA (para 5-14).	<ul style="list-style-type: none"> a. Replace faulty CPU/motherboard CCA. b. Refer to next higher level of maintenance.
23. PRINTER DOES NOT WORK PROPERLY BUT NO PRINTER FAULT IS DISPLAYED		
Step 1.	Check rear panel I/O filter CCA by replacing with a known good rear panel I/O filter CCA (para 5-26).	Replace faulty rear panel I/O filter CCA.
Step 2.	Remove I/O port cable assembly (503716-001) (para 5-31). Check cable continuity (FO-2).	Replace faulty I/O port cable assembly (503716-001)
Step 3.	Check CPU/motherboard CCA by replacing with a known good CPU/motherboard CCA (para 5-14).	<ul style="list-style-type: none"> a. Replace faulty CPU/motherboard CCA. b. Refer to next higher level of maintenance.

SECTION III. MAINTENANCE PROCEDURES

5-8. REMOVE/INSTALL TOP/BOTTOM COVER ASSEMBLY

This task covers:

a. Removal

b. Installation.

INITIAL SETUP
General Safety Precautions:**WARNING**

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.** Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.
- **Multiple person lift required.** Do not attempt to lift, carry, or move the equipment by yourself. Get help.

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

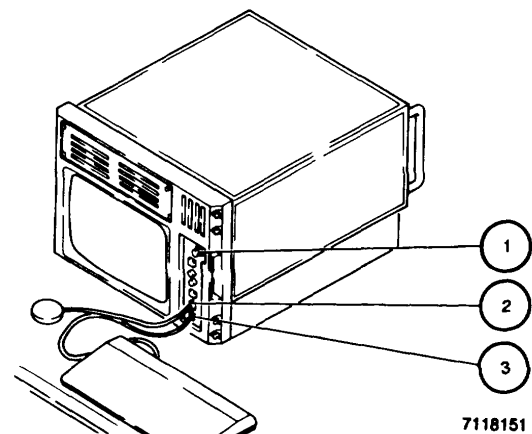
NOTE

Remove/install top and bottom covers the same way, except where noted. Top cover is shown.

Equipment Configuration: Workstation placed on firm, clean surface.

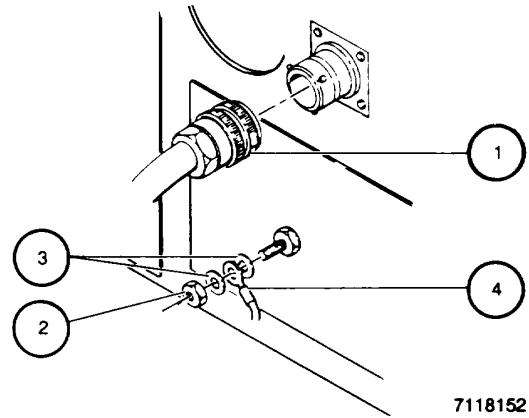
REMOVAL

1. Working at front panel, set power circuit breaker CB1 (1) to off (pull out).
2. Disconnect mouse cable (2) and keyboard cable (3).



5-8. REMOVE/INSTALL TOP/BOTTOM COVER ASSEMBLY - Continued

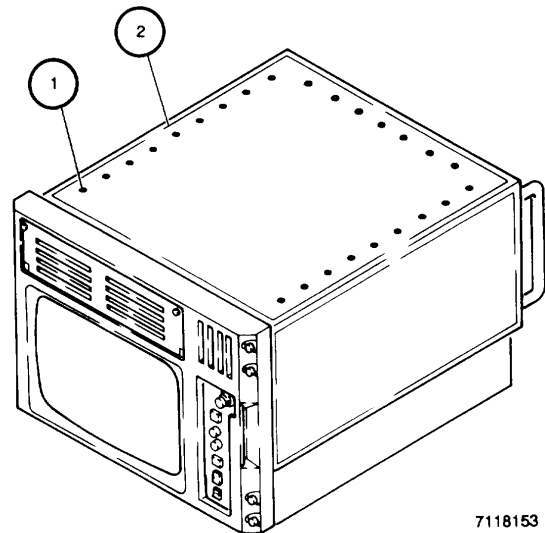
3. Working at rear panel, disconnect ac power cable (1).
4. Remove nut (2), two washers (3), and ground cable (4), as required.



NOTE

Bottom cover has 34 quarter-turn fasteners.

5. Loosen 35 quarter-turn fasteners (1).
6. Remove top cover (2).



INSTALLATION

1. Place top cover (2) in installed position.
2. Tighten 35 quarter-turn fasteners (1).

5-9. REMOVE/INSTALL CCA ASSEMBLY

This task covers: a. Removal b. Installation.

INITIAL SETUP

General Safety Precautions:

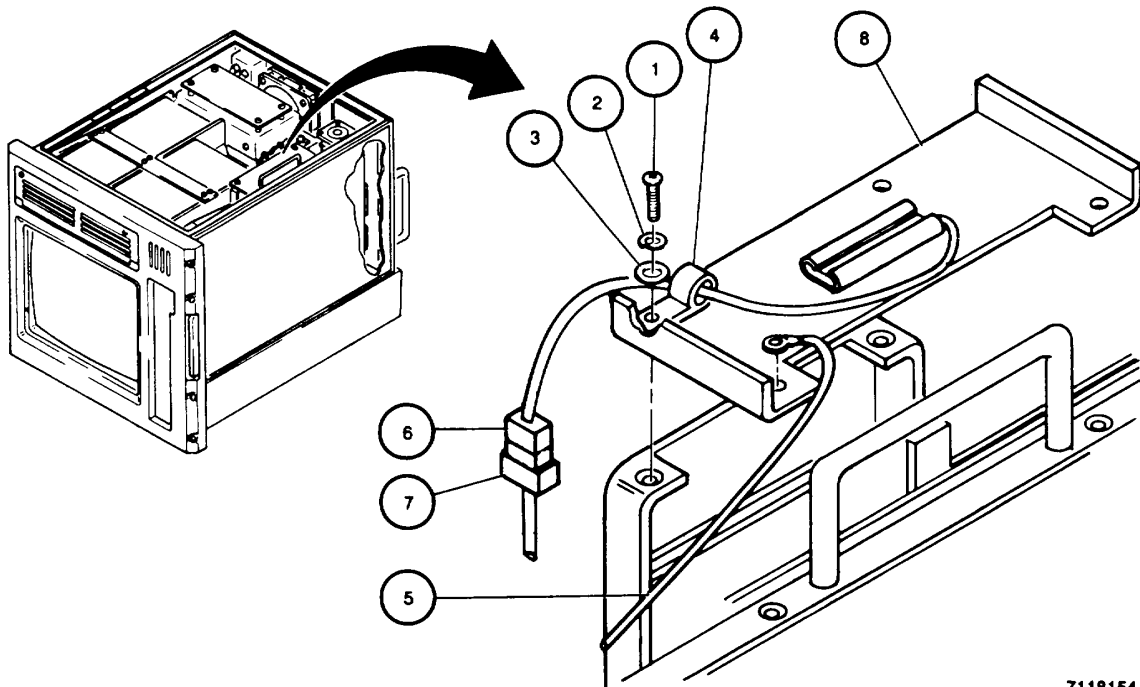
CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Preliminary Procedure: Remove disk tray assembly (para 5-24).

REMOVAL

1. Remove four screws (1), lockwashers (2), washers (3), cable clamp (4), and ground strap (5).
2. Tag and disconnect battery connector (6) from battery cable (504903-001) J2 (7).
3. Remove cover (8).



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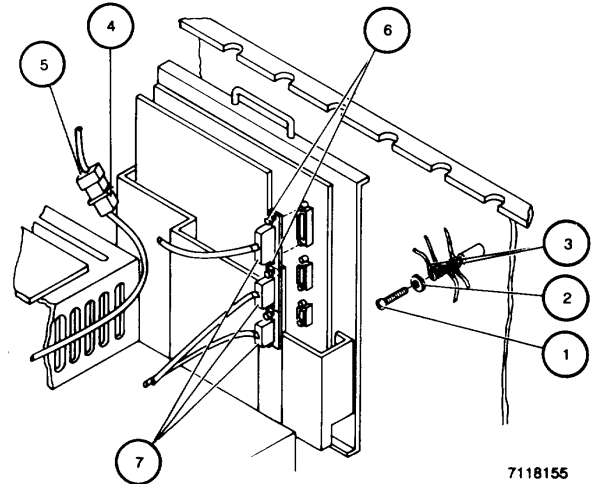
5-9. REMOVE/INSTALL CCA ASSEMBLY - Continued

4. Working inside right side panel, remove screw (1), washer (2), and six ground straps (3) from right panel.
5. Tag and disconnect CCA fan wiring connector P1 (4) from fan cable (504173-001) connector J1 (5).

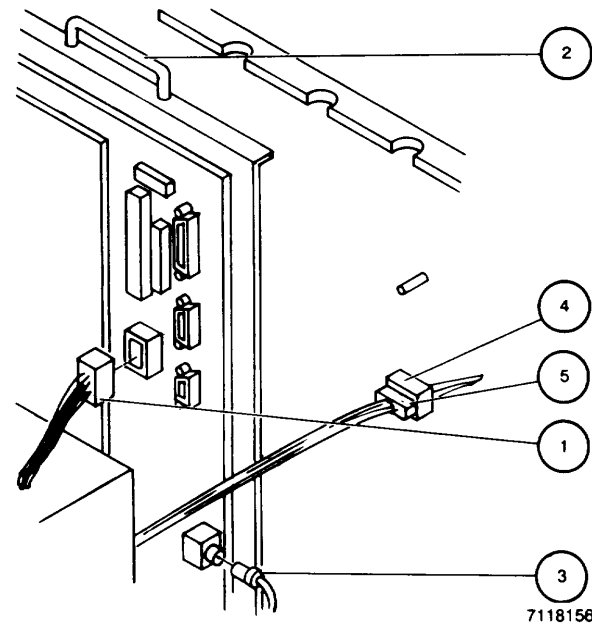
NOTE

Carefully raise CCA assembly, as required, to access connectors.

6. Loosen two captive screws (6) on three cable connectors (7)
7. Tag and disconnect cable (503716-001; 503710-001) connectors (7).



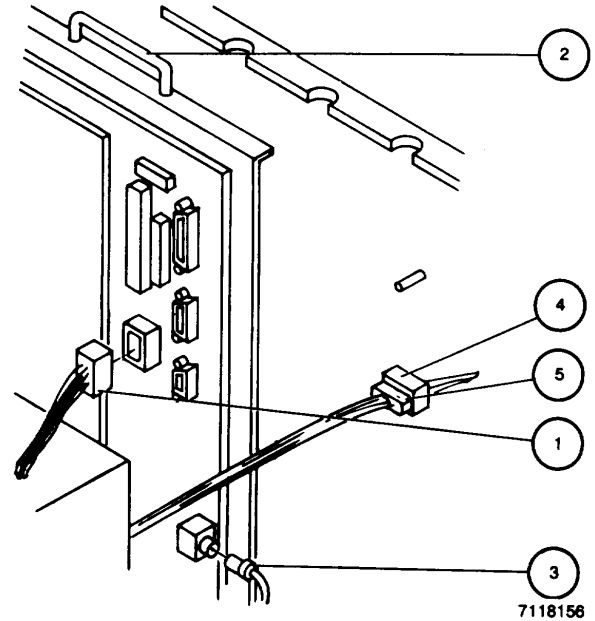
8. Tag and disconnect dc power cable (503769-002) connector P1 (1).
9. Carefully raise CCA assembly (2) to access coaxial cable (503760-001) (3).
10. Disconnect coaxial cable (3).
11. Tag and disconnect halt switch cable connector (504378-001) P2 (4) from halt solenoid connector (504386-001) J1 (5).
12. Remove CCA assembly (2).



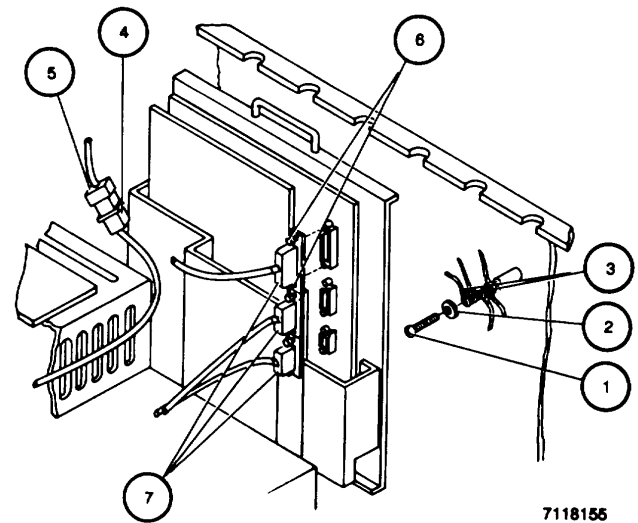
5-9. REMOVE/INSTALL CCA ASSEMBLY- Continued

INSTALLATION

1. Position CCA assembly (2) into right and left guides so that coaxial cable (503760-001) (3) can be connected.
2. Connect coaxial (503760-001) cable (3).
3. Connect halt switch cable connector (504378-001) P2 (4) to halt solenoid connector (504386-001)
4. Connect dc power cable connector (503769-002) P1 (1). Remove tags.
5. Carefully lower CCA assembly (2) into chassis.

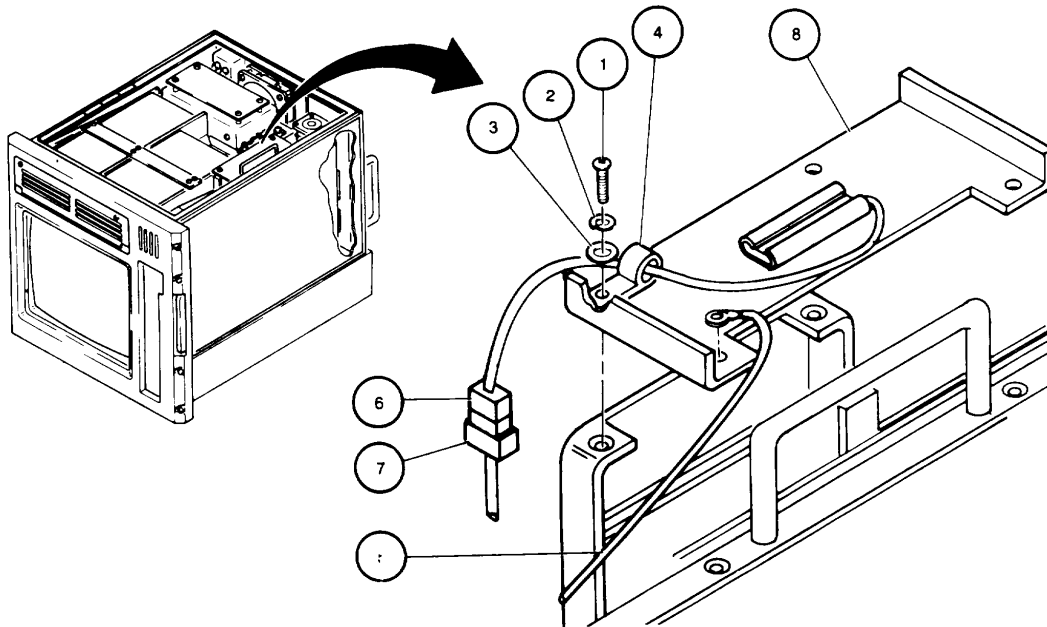


6. Connect three cable (503716-001; 503710-001) connectors (7) and secure by tightening two captive screws (6) on each connector. Remove tags.
7. Connect CCA fan wiring connector P1 (4) to fan cable (504173-001) connector J1 (5).
8. Install screw (1), washer (2), and six ground straps (3) on right side panel.



5-9. REMOVE/INSTALL CCA ASSEMBLY - Continued

9. Place cover (8) in installed position.
10. Install four screws (1), lockwashers (2), washers (3), cable clamp (4), and ground strap (5) .
11. Connect battery connector (6) to battery cable (504903-001) J2 (7).



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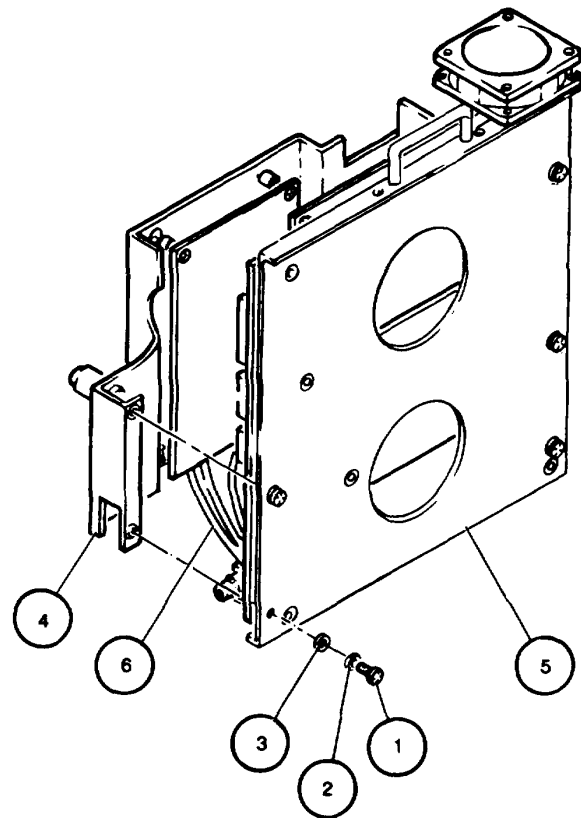
FOLLOW-ON MAINTENANCE: Install disk tray assembly (para 5-24).

5-10. REMOVE/INSTALL CCA ASSEMBLY BRACKET**This task covers:****a. Removal****b. Installation.****INITIAL SETUP****General Safety Precautions:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary. Preliminary Procedure: Remove CCA assembly (para 5-9).

REMOVAL

1. Remove five screws (1), lockwashers (2) and washers (3).
2. With CCA assembly positioned as shown, carefully pry sides of bracket (4) from baseplate (5).
3. Carefully separate and place bracket (4) and baseplate (5), still attached by cables (6) on grounded conductive work surface.



7118157

INSTALLATION

1. Position bracket (4) on base plate (5), ensuring that cables (6) do not block engagement and that bracket feet are positioned under the CPU/motherboard insulation.
2. Install five screws (1), lockwashers, (2), and washers (3).

FOLLOW-ON MAINTENANCE: Install CCA assembly (para 5-9).

5-11. REPLACE POWER SUPPLY ASSEMBLY

This task covers:

a. Removal

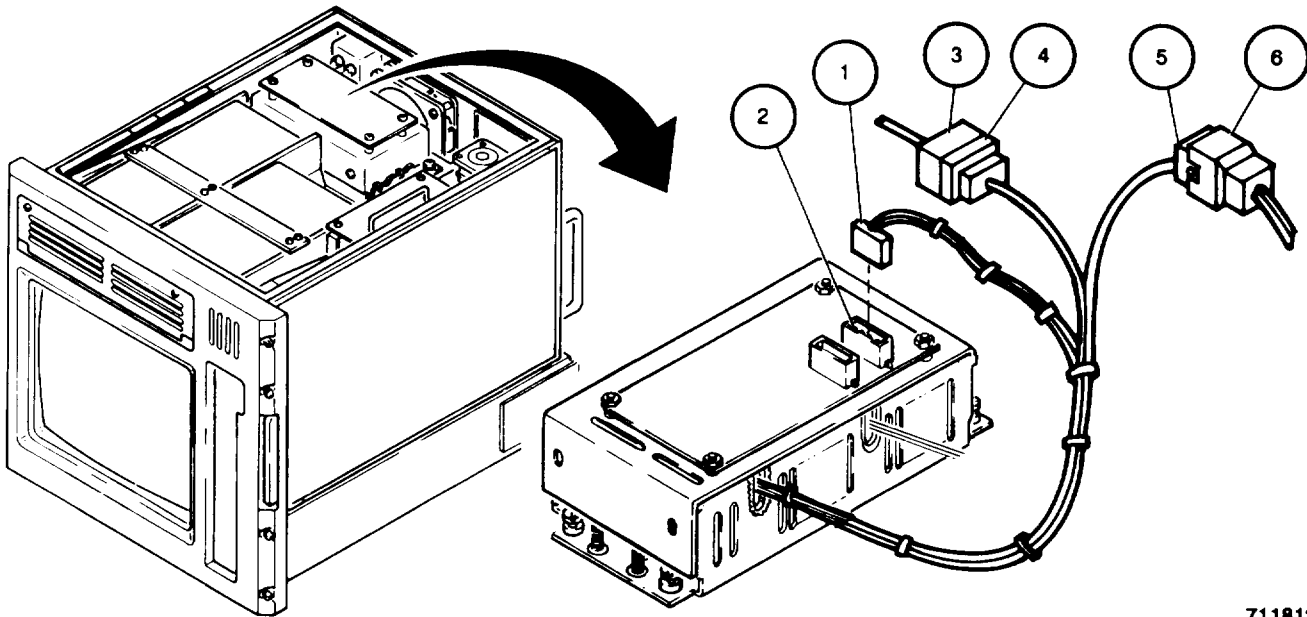
b. Installation.

INITIAL SETUP

Preliminary Procedure: Remove disk tray assembly (para 5-24).

REMOVAL

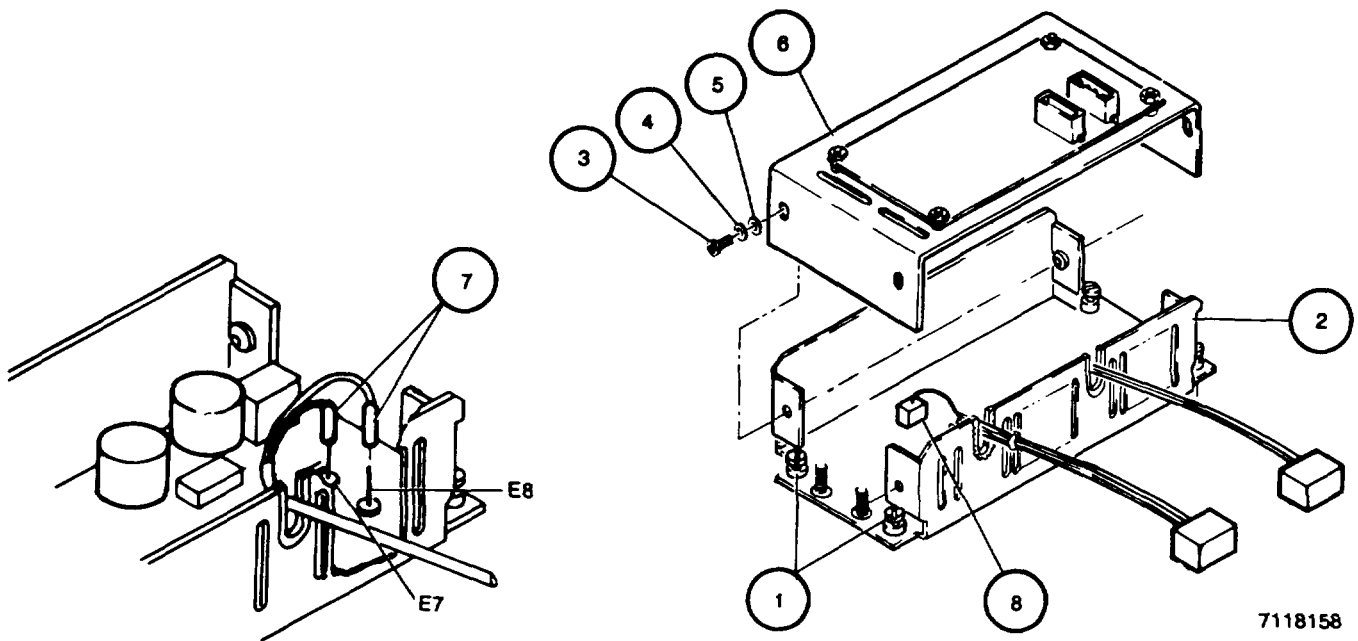
1. Working at power supply, disconnect power supply wiring harness connector P6 (1) from termination board connector (2).
2. Disconnect CCA fan assembly connector (3) from CCA assembly fan cable assembly (504173-001) connector J2 (4).
3. Disconnect power supply wiring harness connector P4 (5) from dc power cable assembly (503769-002) connector J1 (6).



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5-11. REPLACE POWER SUPPLY ASSEMBLY - Continued

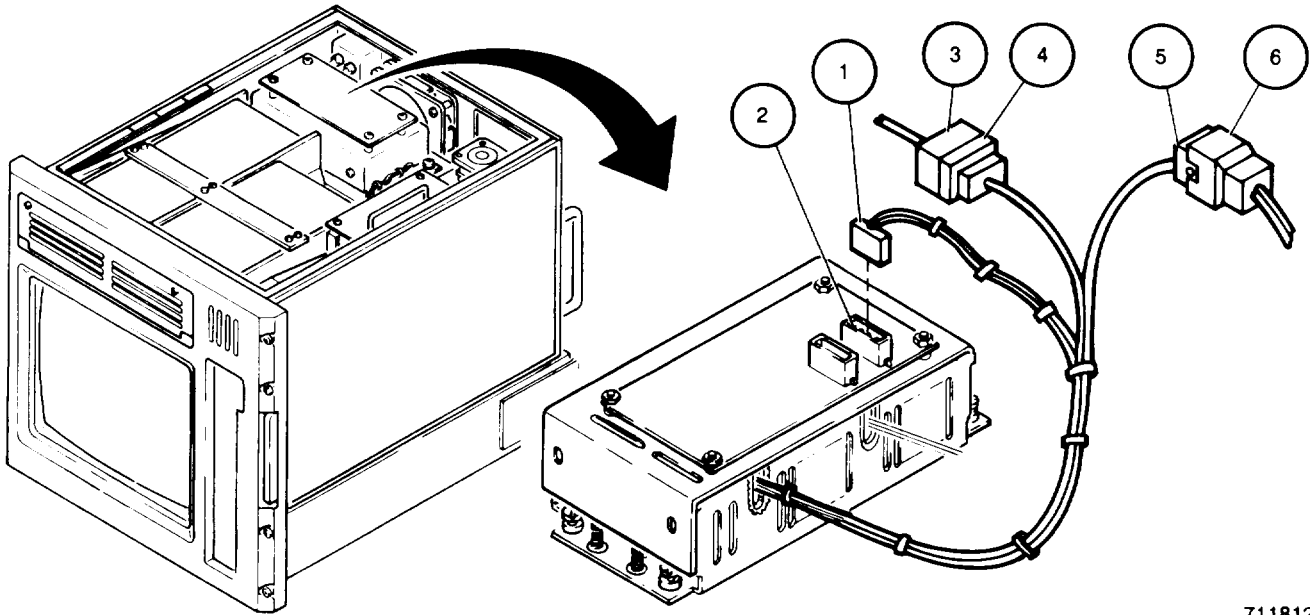
4. Loosen two captive screws (1) on each end of power supply (2).
5. Lift power supply (2) to access cover mounting screws (3).
6. Remove two screws (3), lockwashers (4), and washers (5) from each end of power supply (2).
7. Remove cover (6).
8. Tag and disconnect ac power cable (503753-001) connectors E7 and E8 (7).
9. Tag and disconnect CCA assembly fan cable (504173-001) connector J1 (8).
10. Remove power supply (2).

**INSTALLATION**

1. Connect ac power cable (503753-001) connectors E7 and E8 (7) to power supply (2), as tagged. Remove tags.
2. Connect CCA assembly fan cable (504173-001) connector J1 (8) to power supply (2), as tagged. Remove tags.
3. Place cover (6) in installed position.
4. Install two screws (3), lockwashers (4), and washers (5) in each end of power supply (2).
5. Place power supply (2) in installed position.
6. Tighten two captive screws (1) at each end of power supply (2).

5-11. REPLACE POWER SUPPLY ASSEMBLY - Continued

7. Connect power supply wiring harness connector P4 (5) to dc power cable assembly (503769-002) connector J1 (6).
8. Connect CCA fan assembly connector (3) to CCA fan cable assembly (504173-001) connector J2 (4)
9. Connect power supply wiring harness connector P6 (1) to termination board connector (2).



71181231

FOLLOW-ON MAINTENANCE: Install disk tray assembly (para 5-24)

5-12. REPLACE MEMORY CCA

This task covers:

a. Removal

b. Installation.

INITIAL SETUP

General Safety Precautions:

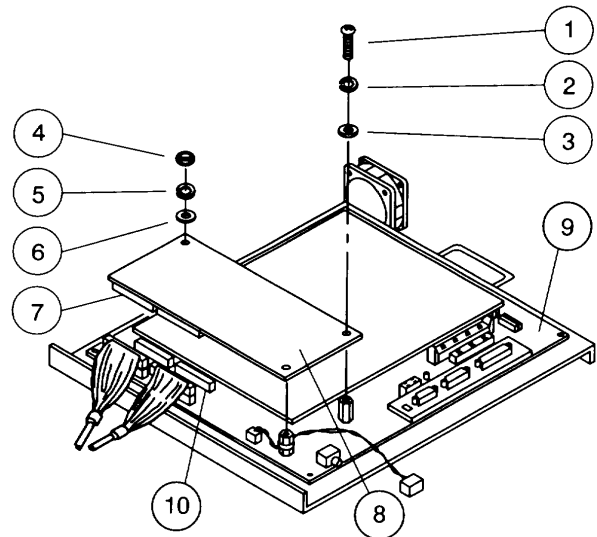
CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See safety Summary.

Preliminary Procedure: Remove CCA assembly bracket (para 5-10).

REMOVAL

1. Working inside CCA assembly, remove two screws (1), lockwashers (2), and washers (3).
2. Remove nut (4), lockwasher (5), and washer (6).
3. Carefully unseat connector (7) on memory CCA (8) from receptacle (10) on CPU/motherboard CCA (9) to remove memory CCA.



INSTALLATION

1. Carefully seat connector (7) on memory CCA (8) into receptacle (10) on CPU/motherboard CCA (9).
2. Install nut (4), lockwasher (5), and washer (6).
3. Install two screws (1), lockwashers (2), and washers (3).

FOLLOW-ON MAINTENANCE: Install CCA assembly bracket (para 5-10)

5-13. REPLACE GRAPHICS CONTROLLER CCA

This task covers: a. Removal b. Installation.

INITIAL SETUP

General Safety Precautions:

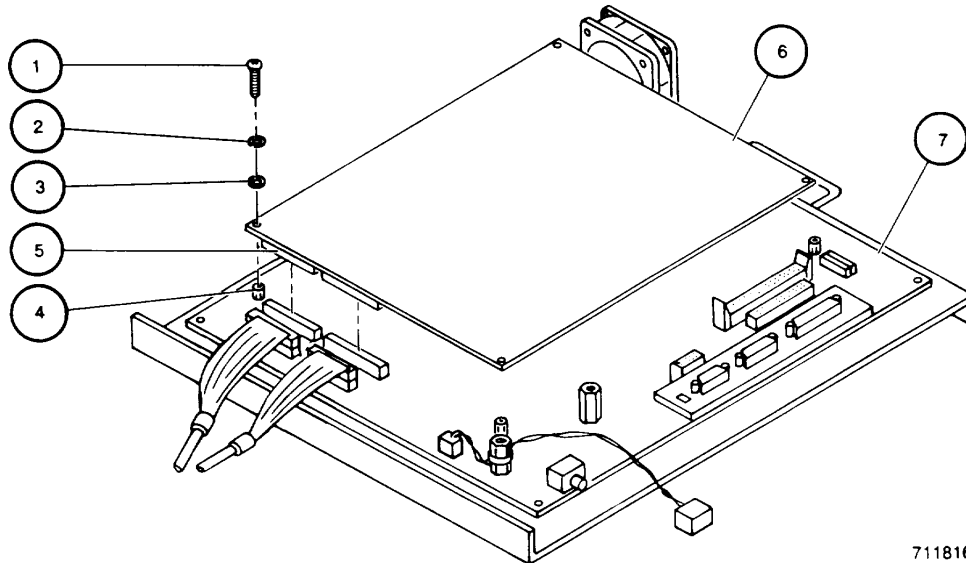
CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Preliminary Procedure: Remove memory CCA (para 5-12).

REMOVAL

1. Working inside CCA assembly, remove four screws (1), lockwashers (2), and washers (3) from standoffs (4).
2. Carefully unseat connector (5) on graphics controller CCA (6) from CPU/motherboard CCA (7) to remove graphics controller CCA.



7118160

INSTALLATION

1. Carefully seat connector (5) on graphics controller CCA (6) into CPU/motherboard CCA (7).
2. Install four screws (1), lockwashers (2), and washers (3) into standoffs (4).

FOLLOW-ON MAINTENANCE: Install memory CCA (para 5-12).

5-14. REPLACE CPU/MOTHERBOARD CCA

This task covers: **a. Removal** **b. Installation.**

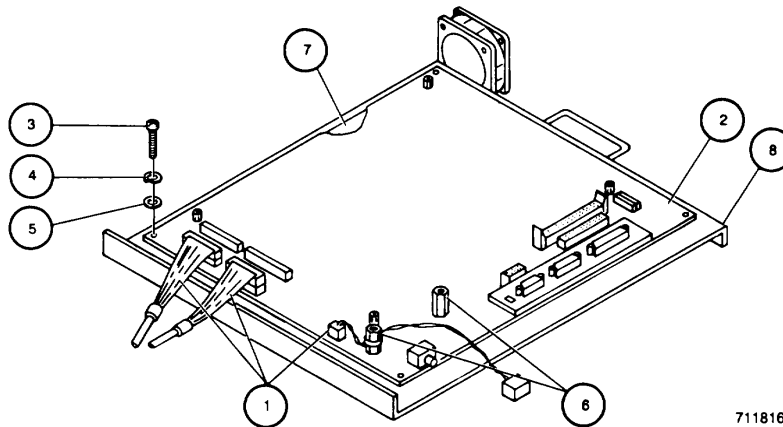
INITIAL SETUP**General Safety Precautions:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary. Preliminary Procedure: Remove graphics controller CCA (para 5-13).

Preliminary Procedure: Remove GRAPHICS CONTROLLER CCA (para 5-13).

REMOVAL

1. Working inside CCA assembly, tag and remove three cable assemblies (1) from CPU/motherboard CCA (2). Cut and remove cable ties, as required.
2. Remove five screws (3), lockwashers (4), and washers (5) and two standoffs (6).
3. Remove CPU/motherboard CCA (2) and insulator sheet (7) from baseplate (8).



7118161

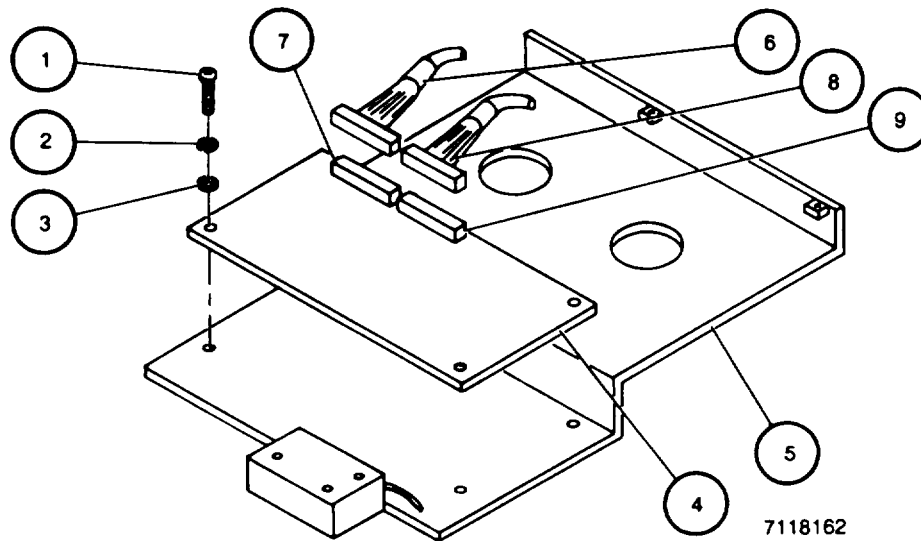
INSTALLATION

1. Position insulator sheet (7) and CPU/motherboard CCA (2) on baseplate (8).
2. Install five screws (3), lockwashers (4), and washers (5) and two standoffs (6).
3. Install three cable assemblies (1) on CPU/motherboard CCA (2) as tagged. Remove tags.
4. Install cable ties, as required.

FOLLOW-ON MAINTENANCE: Install graphics controller CCA (para 5-13).

5-15. REPLACE ETHERNET INTERFACE CCA - Continued**INSTALLATION**

1. Connect Ethernet CCA cable assembly (503761-001) connector P1 (6) to CCA connector J1 (7).
2. Connect Ethernet CCA cable assembly (503761-002) connector P2 (8) to CCA connector J2 (9).
3. Position CCA (4) in baseplate (5).
4. Install four screws (1), lockwashers (2), and washers (3).



FOLLOW-ON MAINTENANCE: Install CCA assembly bracket (para 5-10). Inform system operator that workstation has new Ethernet address.

5-16. REPLACE EMI POWER UNE FILTER

This task covers:

a. Removal

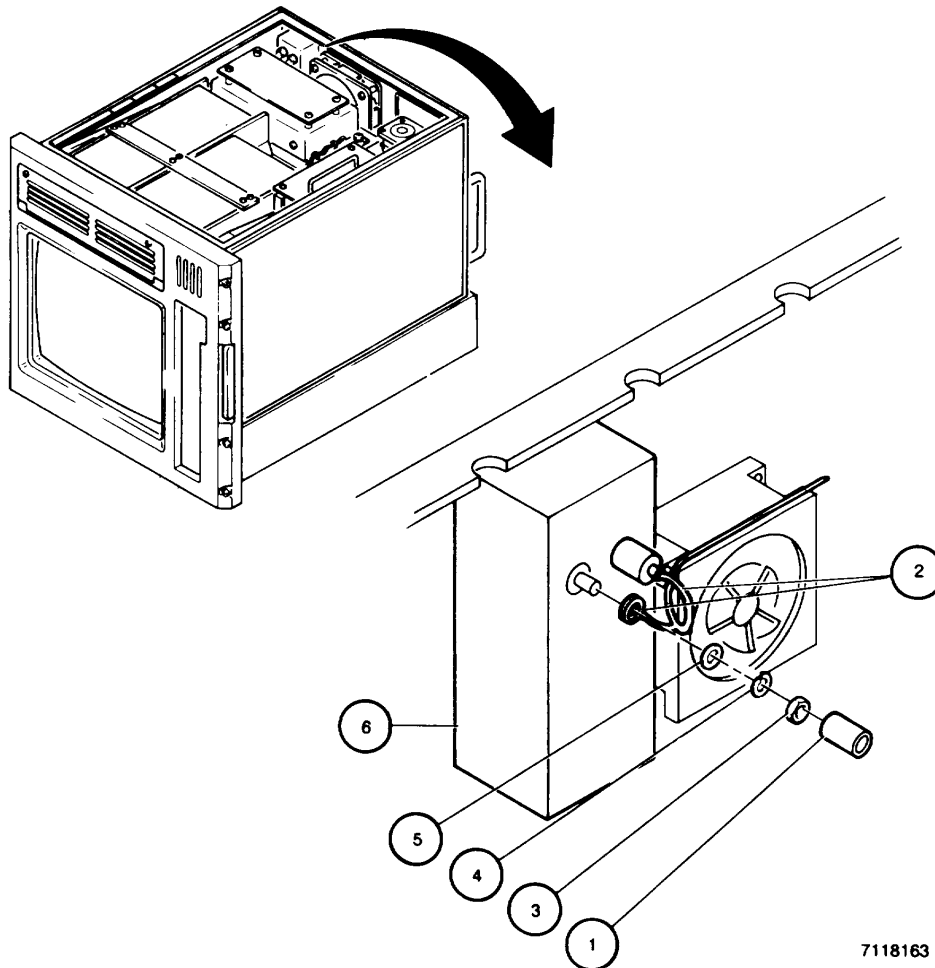
b. Installation.

INITIAL SETUP

Preliminary Procedure: Remove top cover assembly (para 5-8).

REMOVAL

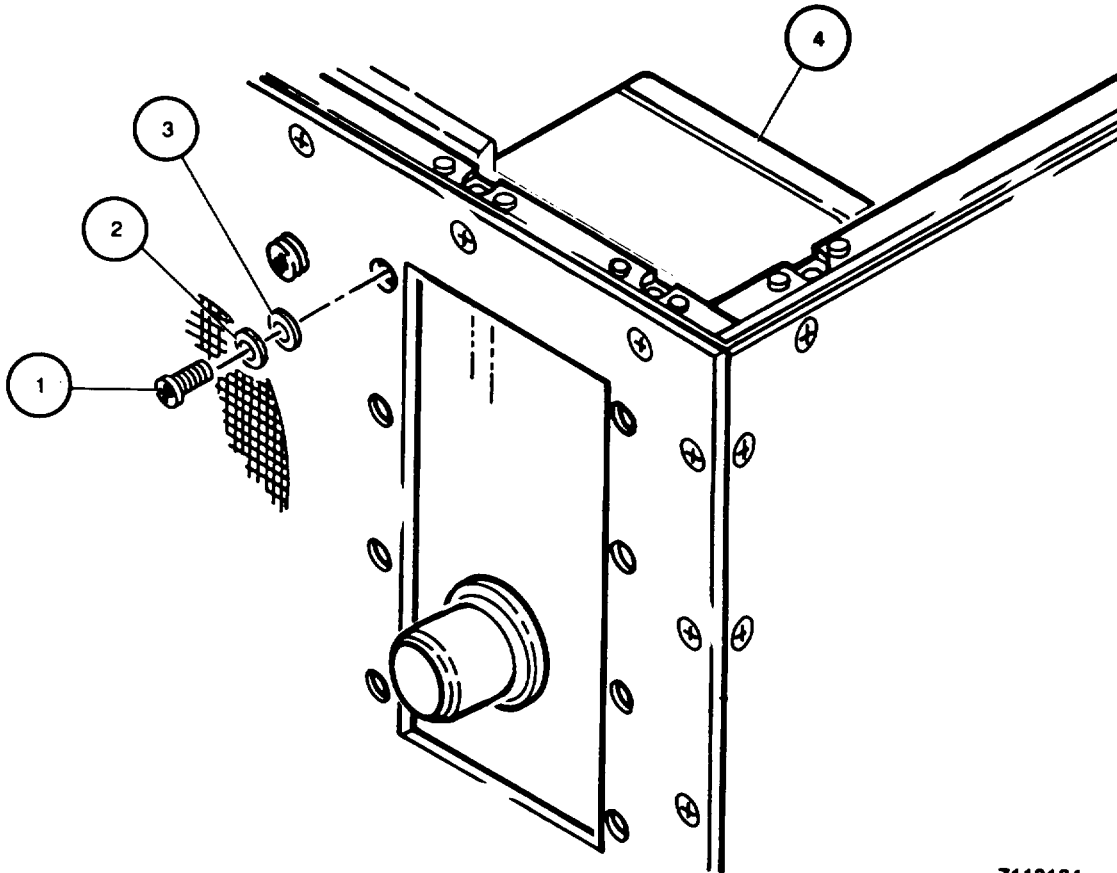
1. Working inside rear panel, cut and remove insulation sleeving (1) from two cables (2).
2. Remove two nuts (3), lockwashers (4), washers (5), and cables (2) from EMI power line filter (6).



7118163

5-16. REPLACE EMI POWER LINE FILTER - Continued

3. Working at rear panel, remove eight screws (1), lockwashers (2), and washers (3).
4. Remove EMI power line filter (4).



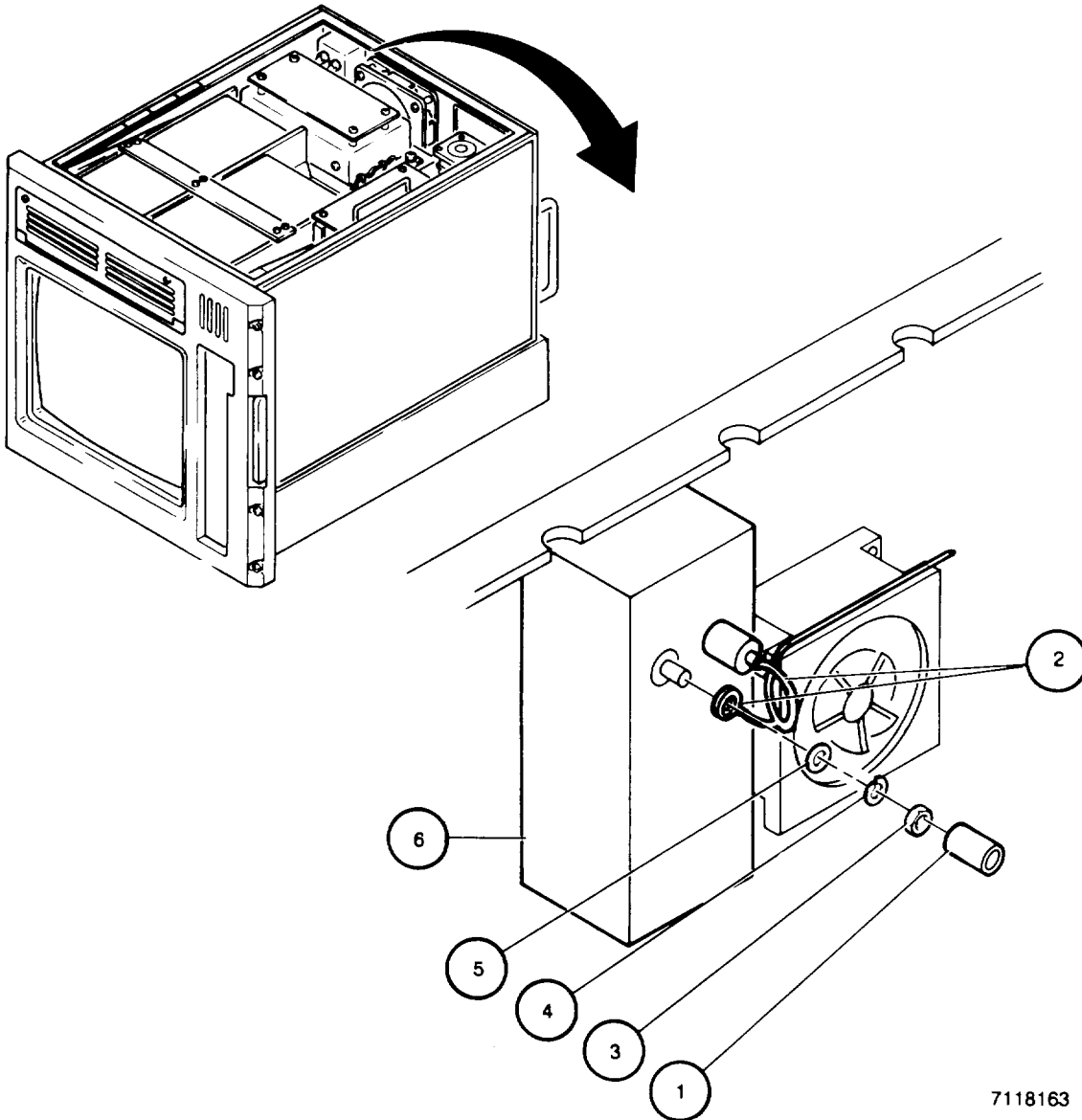
7118164

INSTALLATION

1. Place EMI power line filter (4) in installed position.
2. Install eight screws (1), lockwashers (2), and washers (3).

5-1 6. REPLACE EMI POWER LINE FILTER - Continued

3. Working inside rear panel, install new insulation sleeving (1) on two cables (2).
4. Install two nuts (3), lockwashers (4), washers (5), and cables (2) on EMI power line filter (6).
5. Position and shrink insulation sleeving (1).



7118163

FOLLOW-ON MAINTENANCE: Install top cover assembly (para 5-8).

5-17. REPLACE AC IN VOLTAGE INDICATOR

This task covers:

a. Removal

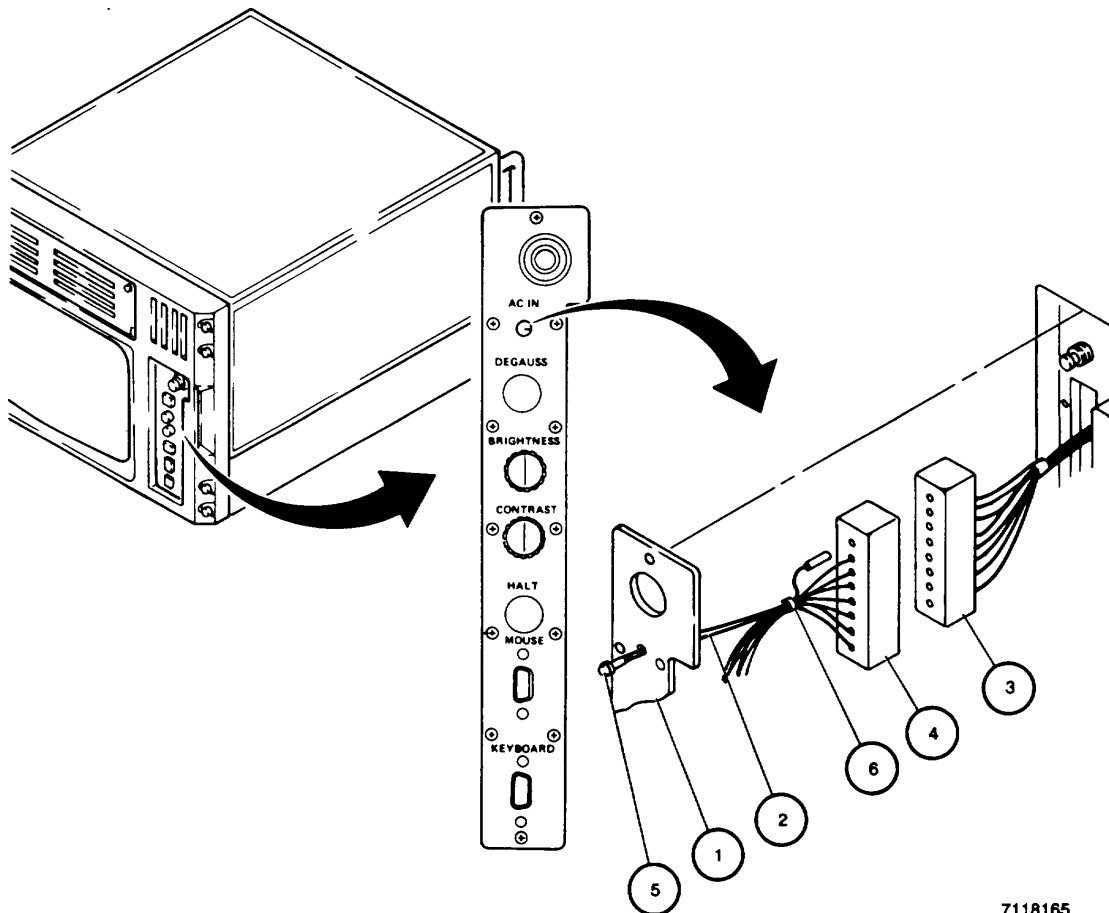
b. Installation

INITIAL SETUP

Preliminary Procedure: Remove front panel I/O filter CCA (para 5-25).

REMOVAL

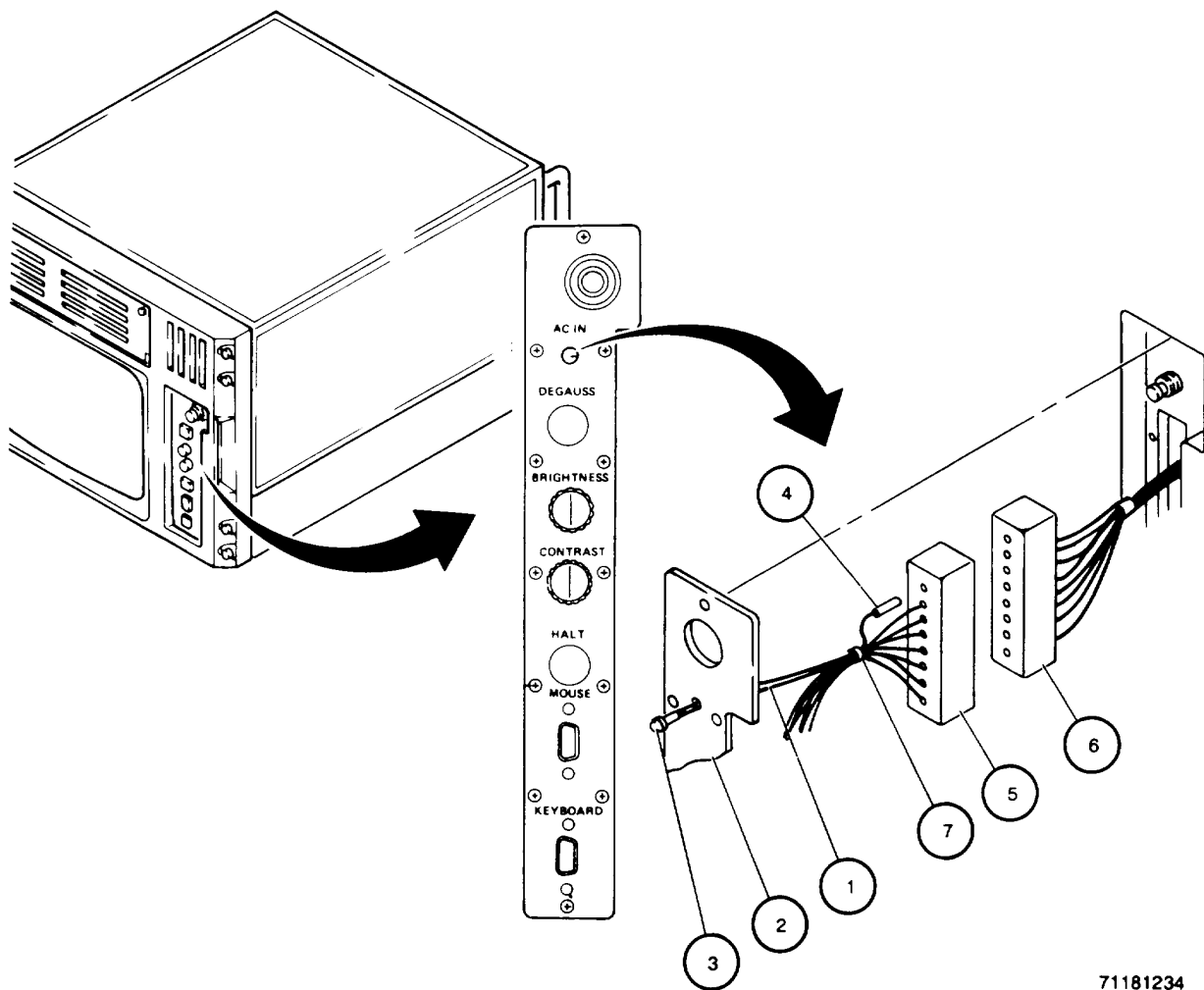
1. Carefully position faceplate (1) to access wiring (2).
2. Carefully pull wiring (2) outward and disconnect bright/contrast control cable (504213-001) connector (3) from wiring connector (4).
3. Remove wiring (2) from wiring connector (4) (pin 1 (RED) and pin 2 (BLK)).
4. Firmly grasp indicator (5) and remove from faceplate (1), cutting and removing cable ties (6), as required.



7118165

5-17. REPLACE AC IN VOLTAGE INDICATOR - Continued**INSTALLATION**

1. Route wiring (1) through faceplate (2) and seat indicator (3) into faceplate.
2. Form and dress wiring (1).
3. Install new connector contacts (4) on wiring (1).
4. Install wiring (1) in wiring connector (5) (pin 1 (RED) and pin 2 (BLK)).
5. Connect bright/contrast control cable (504213-001) connector (6) wiring connector (5).
6. Install cable ties (7), as required.



71181234

FOLLOW-ON MAINTENANCE: Install front panel I/O filter CCA (para 5-25).

5-18. REPLACE DEGAUSS OR HALT SWITCH

This task covers:

a. Removal

b. Installation

INITIAL SETUP

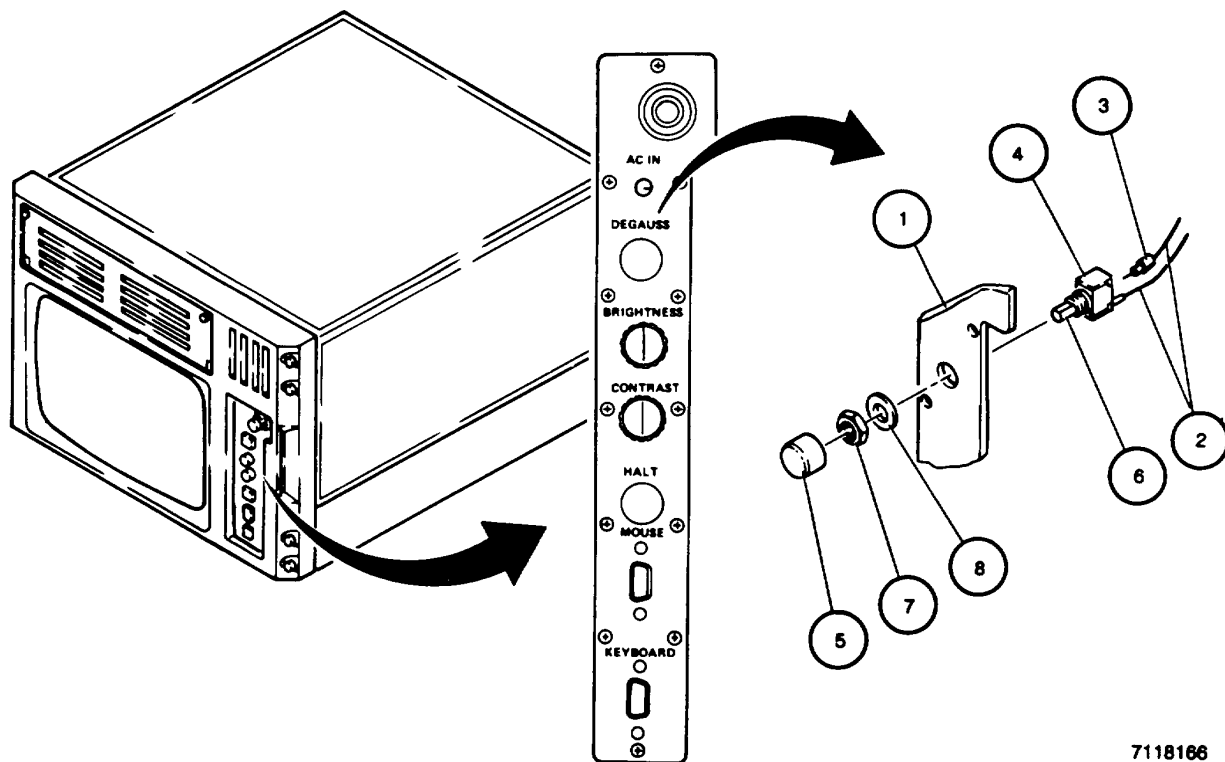
NOTE

Replace DEGAUSS and HALT switches the same way. DEGAUSS switch is shown.

Preliminary Procedure: Remove front panel I/O filter CCA (para 5-25).

REMOVAL

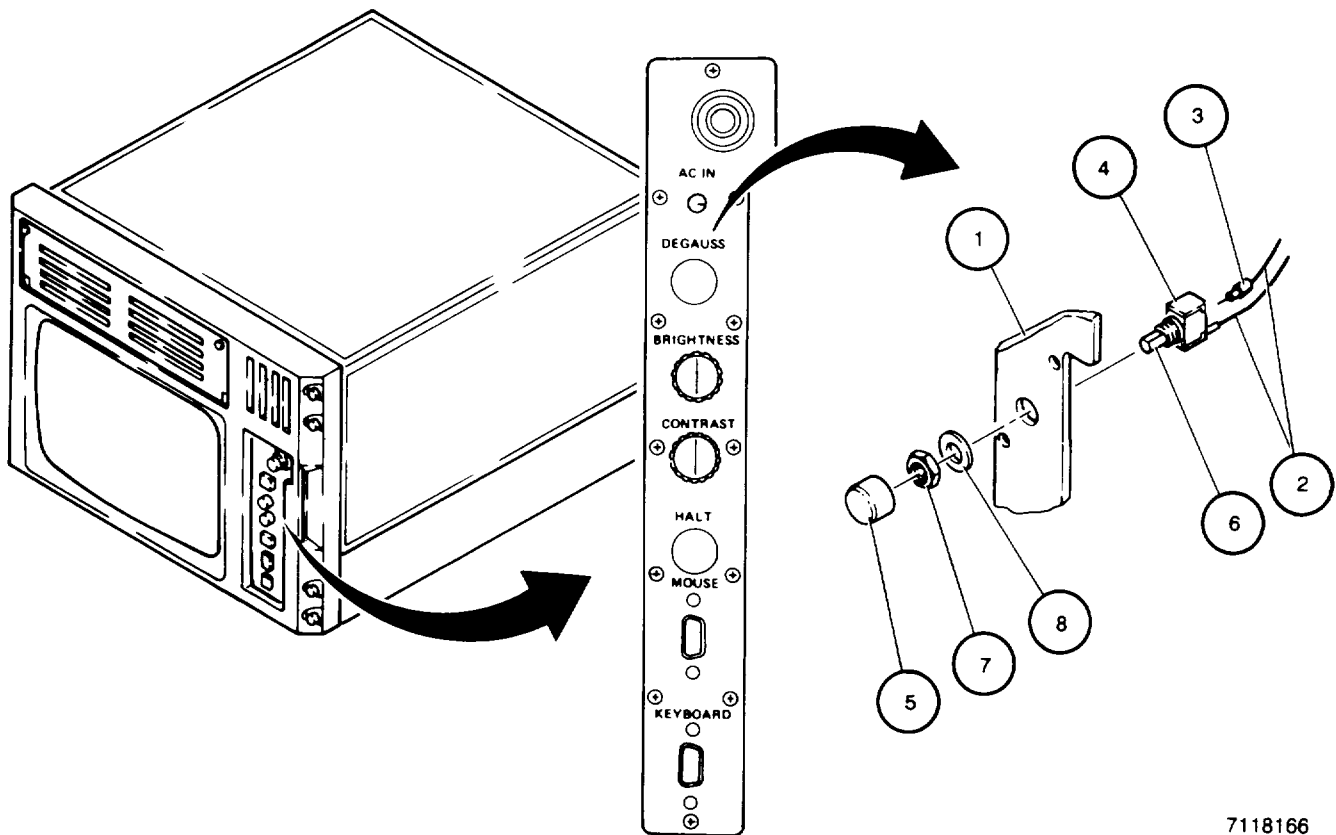
1. Carefully position faceplate (1) to access switch wiring (2).
2. Cut and remove insulation sleeving (3) from switch wiring (2).
3. Tag, unsolder, and remove switch wiring (2) from switch (4).
4. Firmly grasp and pull switch button (5) to remove it from shaft (6).
5. Remove nut (7) and washer (8).
6. Remove switch (4).



7118166

5-18. REPLACE DEGAUSS OR HALT SWITCH - Continued**INSTALLATION**

1. Place switch (4) in installed position on faceplate (1).
2. Install nut (7) and washer (8).
3. Press switch button (5) fully onto shaft (6).
4. Form and dress switch wiring (2). Install new lengths of insulation sleeving (3) on switch wiring (2), leaving wire ends exposed for soldering.
5. Solder switch wiring (2) to switch (4) as tagged. Remove tags.
6. Position and shrink insulation sleeving (3).



7118166

FOLLOW-ON MAINTENANCE: Install front panel I/O filter CCA (para 5-25).

5-19. REPLACE BRIGHTNESS AND CONTRAST POTENTIOMETERS

This task covers: a. Removal b. Installation

INITIAL SETUP

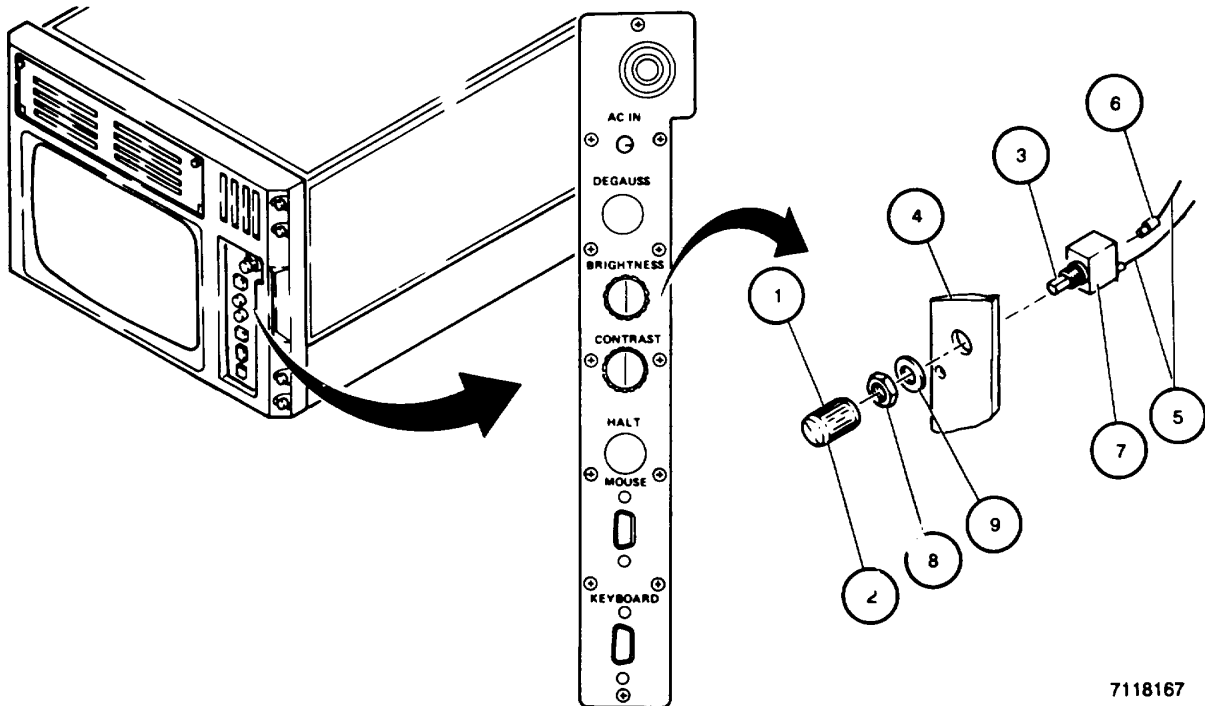
NOTE

Replace **BRIGHTNESS** and **CONTRAST** potentiometers the same way. **BRIGHTNESS** potentiometer is shown.

Preliminary Procedure: Remove front panel I/O filter CCA (para 5-25).

REMOVAL

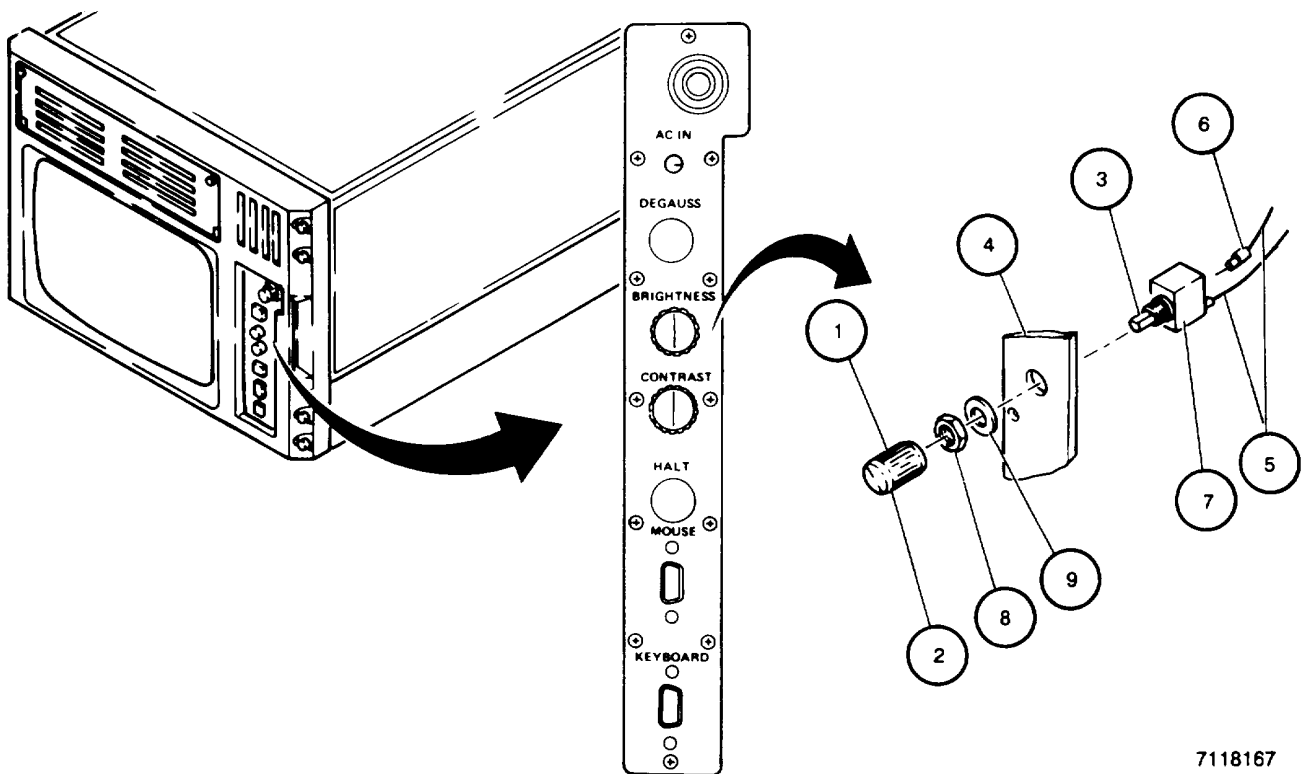
1. Loosen setscrew (1) on knob (2).
2. Firmly grasp and pull knob (2) from shaft (3).
3. Carefully position faceplate (4) to access wiring (5).
4. Cut and remove insulation sleeving (6) from wiring (5).
5. Tag, unsolder, and remove wiring (5) from potentiometer (7).
6. Remove nut (8), lockwasher (9), and potentiometer (7).



7118167

5-19. REPLACE BRIGHTNESS AND CONTRAST POTENTIOMETERS - Continued**INSTALLATION**

1. Place potentiometer (7) in installed position on faceplate (4).
2. Install nut (8) and lockwasher (9).
3. Press knob (2) fully onto shaft (3). Tighten setscrew (1).
4. Form and dress wiring (5). Install new lengths of insulation sleeving (6) on wiring (5), leaving wire ends exposed for soldering.
5. Solder wiring (5) to potentiometer (7) as tagged. Remove tags.
6. Position and shrink insulation sleeving (6).



7118167

FOLLOW-ON MAINTENANCE: Install front panel I/O filter CCA (para 5-25).

5-20. REPLACE HALT SOLENOID

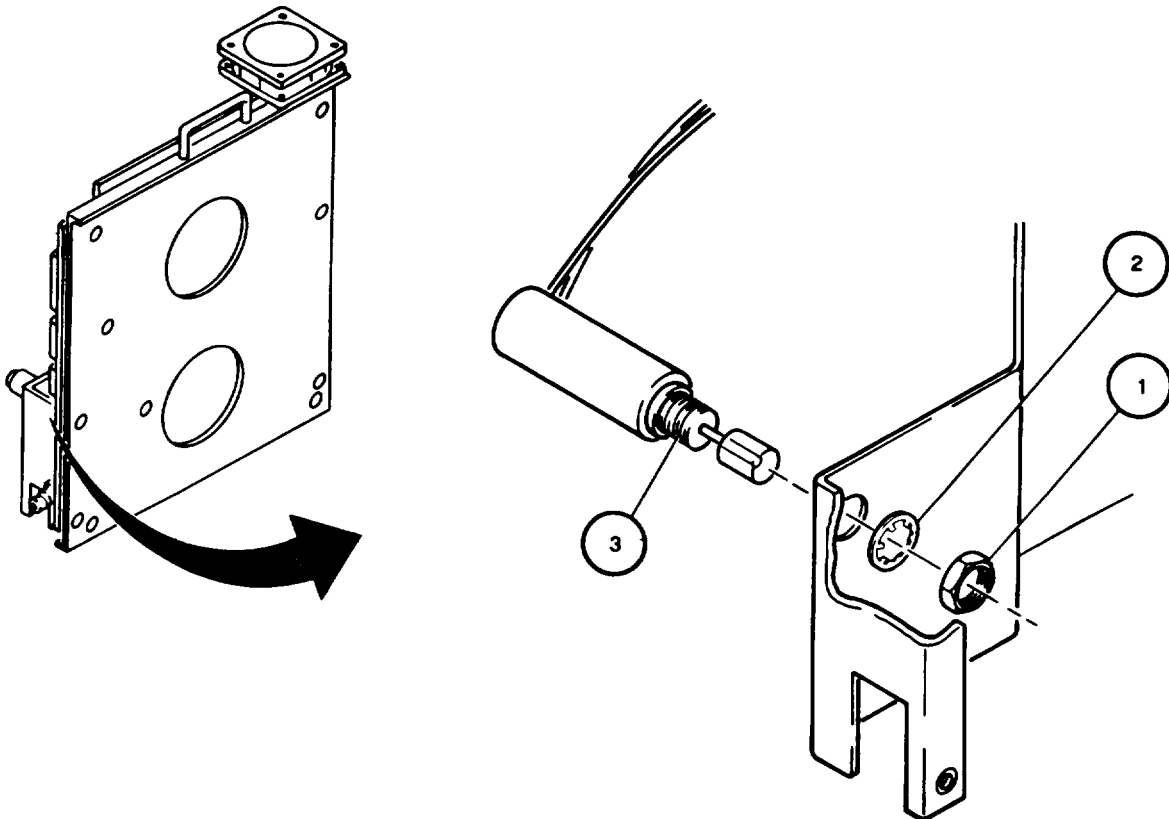
This task covers: a. Removal b. Installation

INITIAL SETUP

Preliminary Procedure: Remove CCA assembly (para 5-9).

REMOVAL

1. Remove nut (1) and lockwasher (2).
2. Remove solenoid (3).



7118168

INSTALLATION

1. Place solenoid (3) in installed position.
2. Install nut (1) and lockwasher (2).

FOLLOW-ON MAINTENANCE: Install CCA assembly (para 5-9).

5-21. REPLACE CIRCUIT BREAKER CB1

 This task covers: a. Removal b. Installation

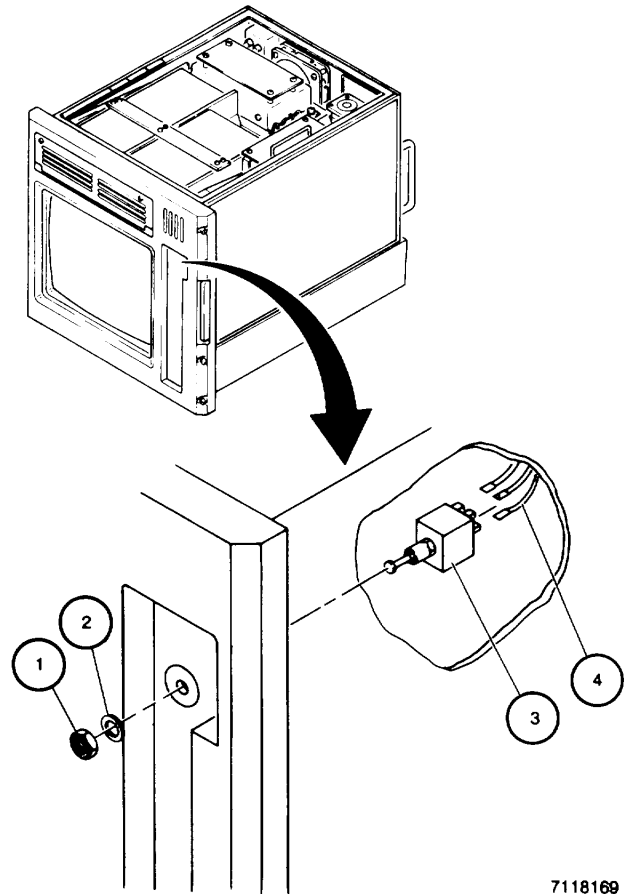
INITIAL SETUP**General Safety Precautions:****WARNING**

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

Preliminary Procedure: Remove top cover assembly (para 5-8).

REMOVAL

1. Working at front panel, remove nut (1) and washer (2).
2. Remove CB1 (3) from rear of front panel to access wiring (4).
3. Tag and remove wiring (4) to remove CB1 (3).

**INSTALLATION**

1. Install wiring (4) on CB1 (3) as tagged. Remove tags.
2. Place CB1 (3) in installed position.
3. Install nut (1) and washer (2).

7118169

FOLLOW-ON MAINTENANCE: Install top cover assembly (para 5-8).

5-22. REPLACE CCA ASSEMBLY FAN

This task covers:

a. Removal

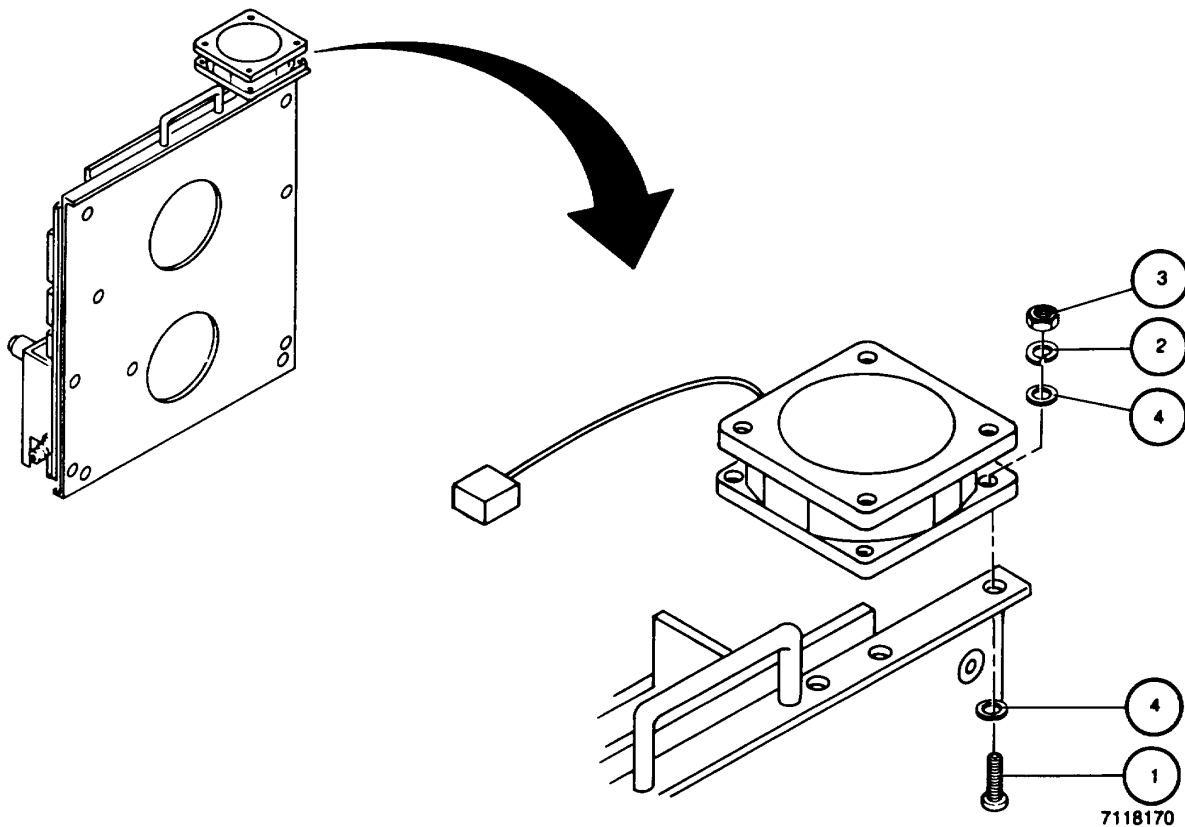
b. Installation

INITIAL SETUP

Preliminary Procedure: Remove CCA assembly (para 5-9).

REMOVAL

1. Remove two screws (1), lockwashers (2), and nuts (3) and four washers (4).
2. Remove fan (5).



INSTALLATION

1. Place fan (5) in installed position.
2. Install two screws (1), lockwashers (2), and nuts (3) and four washers (4).

FOLLOW-ON MAINTENANCE: Install CCA assembly (para 5-9).

5-23. REPLACE SYSTEM FAN

This task covers:

a. Removal

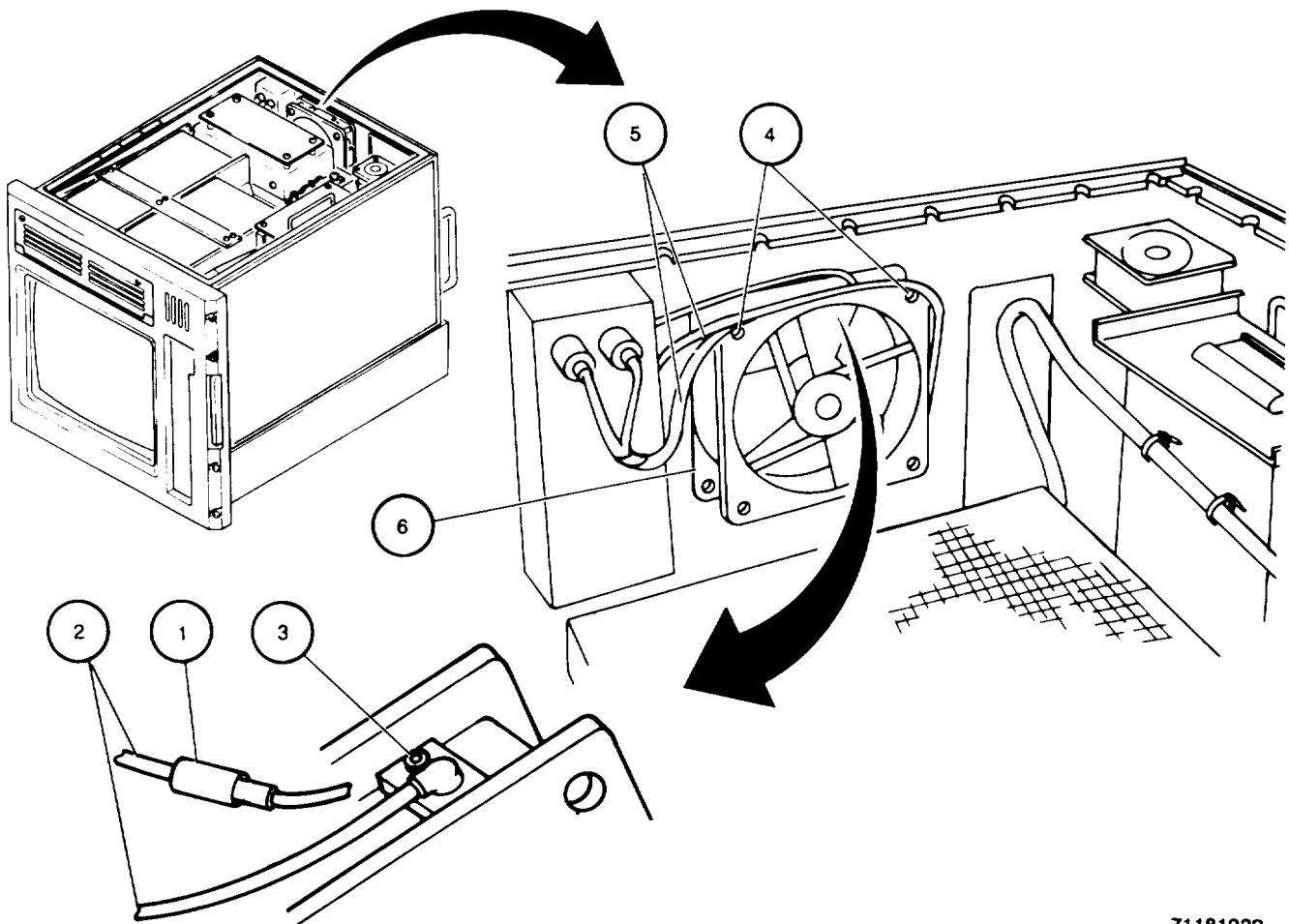
b. Installation

INITIAL SETUP

Preliminary Procedure: Remove power supply assembly (para 5-11).

REMOVAL

1. Working on inside rear panel, cut and remove insulation sleeving (1) from two wires (2).
2. Tag, unsolder, and remove two wires (2) from fan assembly terminals (3).
3. Cut and remove cable ties (4) securing cables (5) to fan assembly (6).



71181232

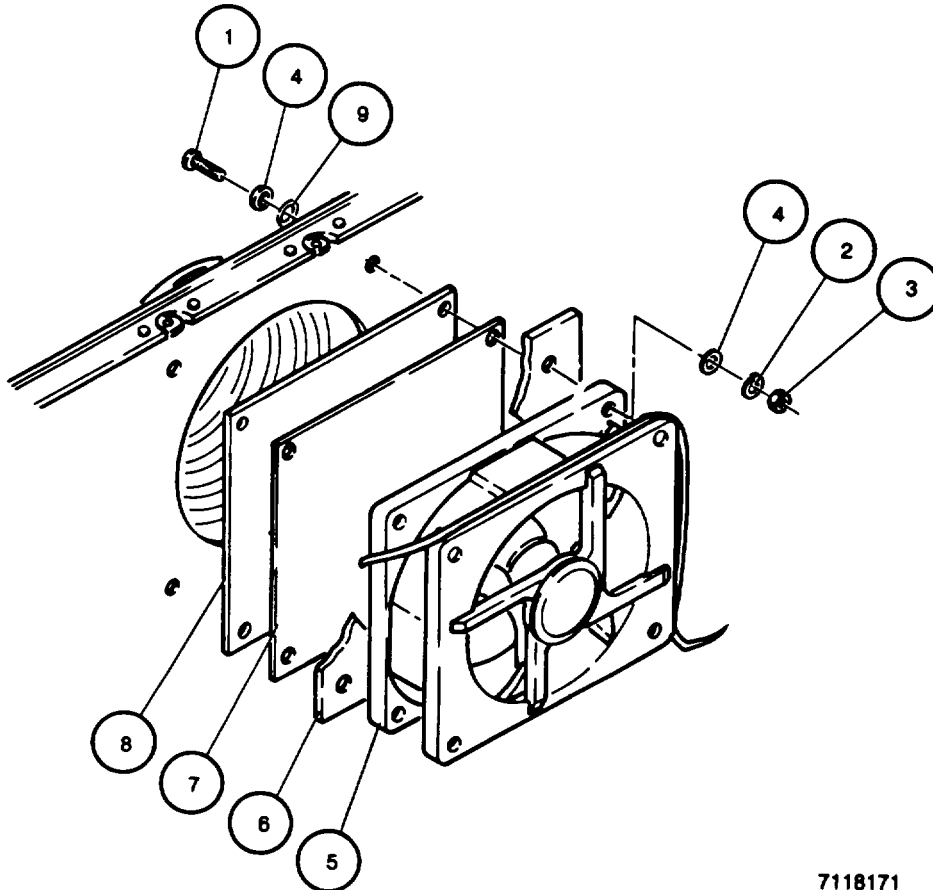
5-23. REPLACE SYSTEM FAN - Continued

4. Remove four screws (1), lockwashers (2), and nuts (3) and eight washers (4).

NOTE

Note and record position of fan assembly and Tempest screens as you remove them to aid in installation.

5. Remove fan assembly (5), screen plate (6), 90-degree Tempest screen (7), 45-degree Tempest screen (8), and grille (9).



7118171

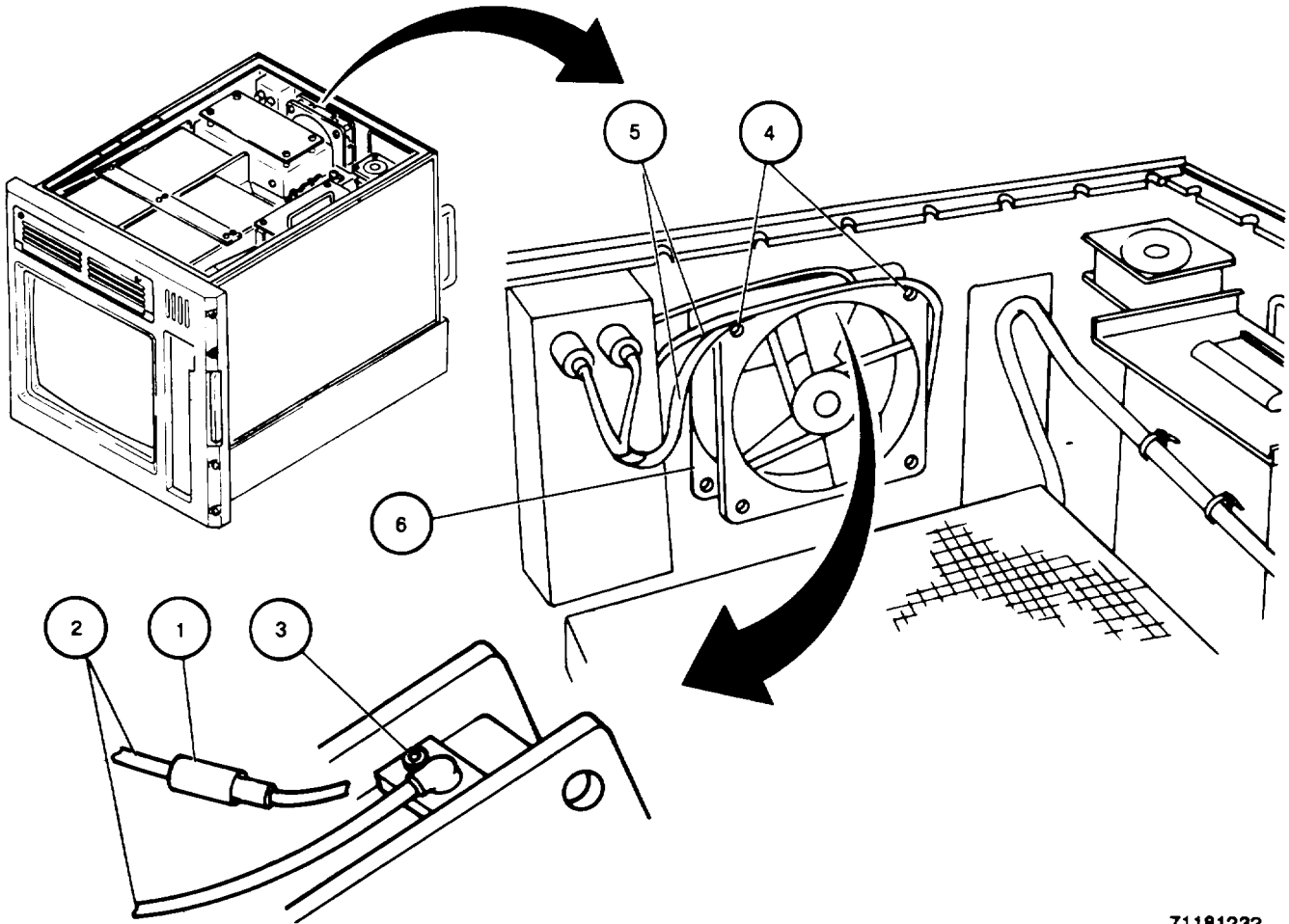
INSTALLATION**CAUTION**

Ensure that system fan components are assembled as noted during removal or cooling and Tempest performance may be degraded.

1. Place and hold fan assembly (5), screen plate (6), 90-degree Tempest screen (7), 45-degree Tempest screen (8), and grille (9) in installed position.
2. Install four screws (1), lockwashers (2), and nuts (3) and eight washers (4).

5-23. REPLACE SYSTEM FAN - Continued

3. Form and dress two wires (2).
4. Install new insulation sleeving (1) on two wires (2), leaving wire ends exposed for soldering.
5. Solder two wires (2) to fan assembly terminals (3), as tagged. Remove tags.
6. Position and shrink insulation sleeving (1).
7. Install cable ties (4), as required, to secure cables (5) to fan assembly (6).



71181232

5-24. REPLACE DISK TRAY ASSEMBLY

This task covers:

a. Removal

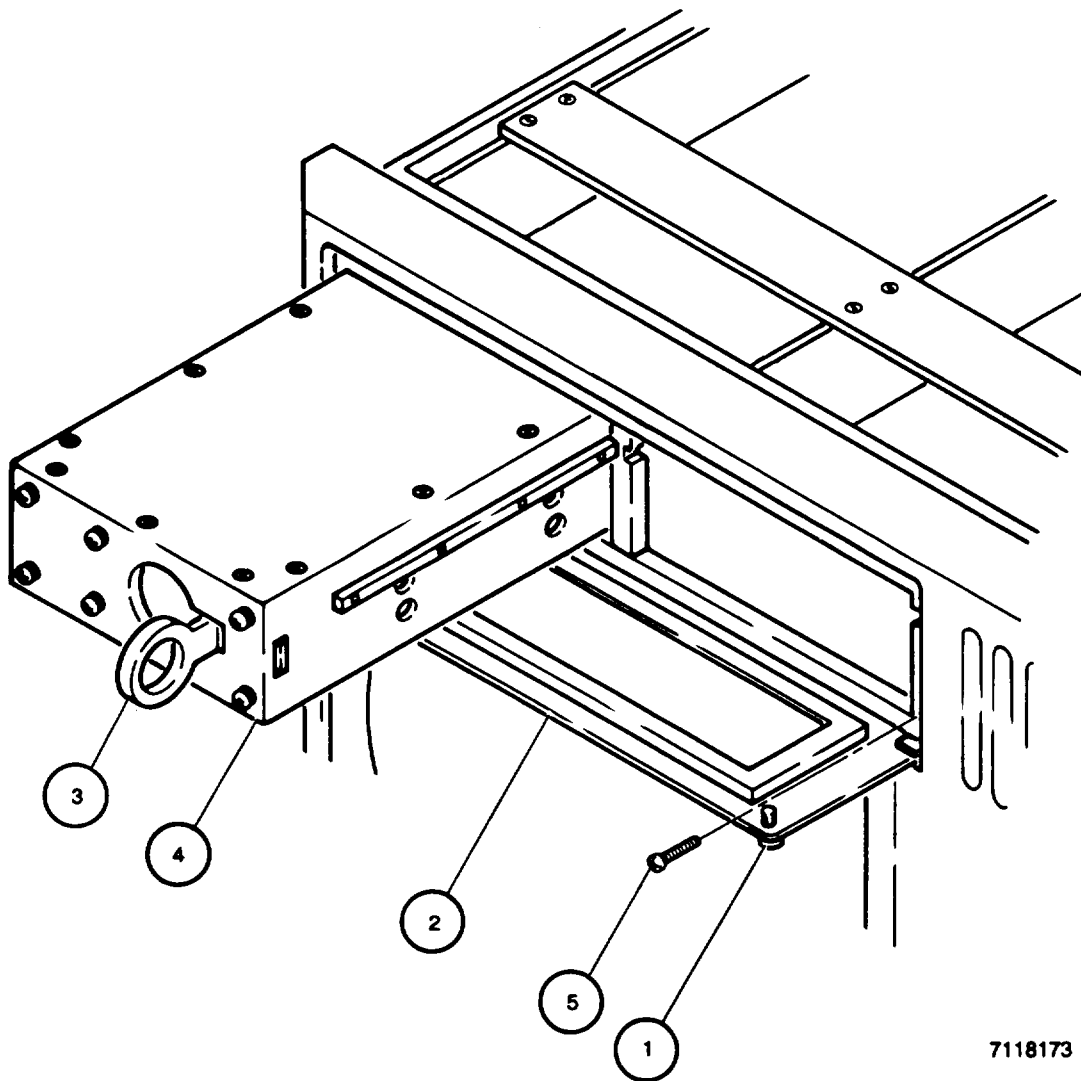
b. Installation

INITIAL SETUP

Preliminary Procedure: Remove top cover assembly (para 5-8).

REMOVAL

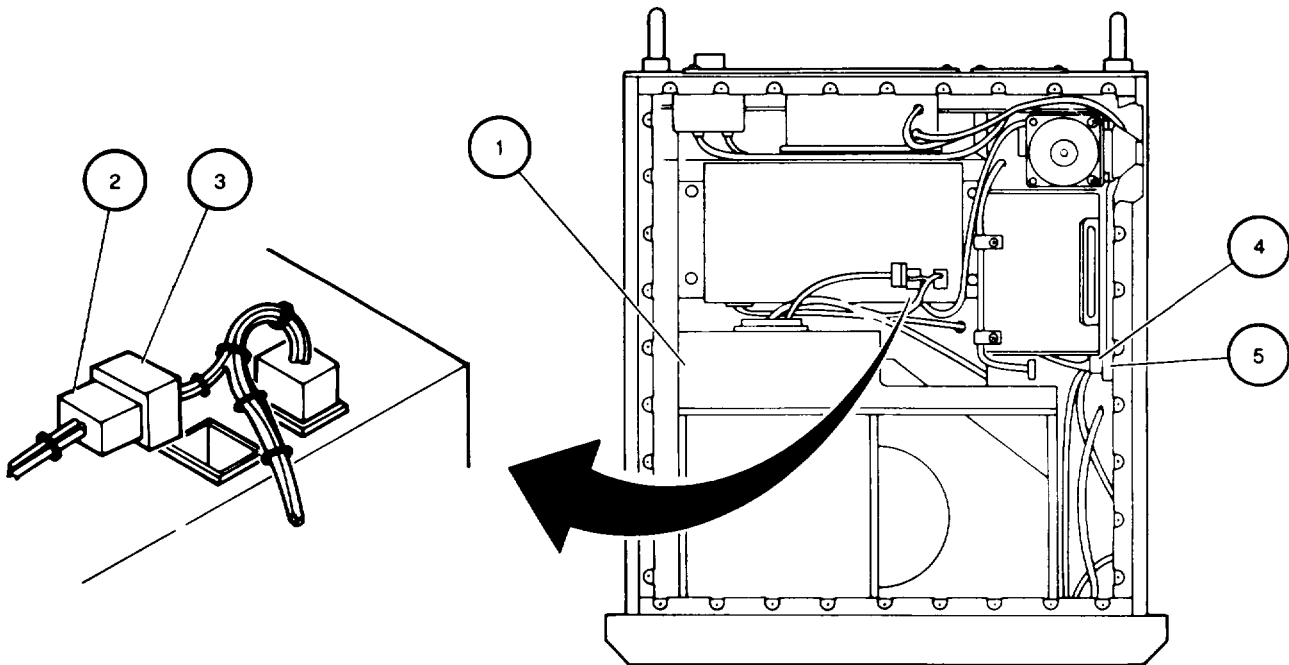
1. Loosen two captive screws (1) and open disk drive access door (2).
2. If disk drive is installed, grasp retaining latch (3) and pull disk drive (4) from workstation.
3. Remove four screws (5).



7118173

5-24. REPLACE DISK TRAY ASSEMBLY - Continued

4. Lift disk tray assembly (1) from top of workstation to access cables.
5. Disconnect internal disk drive cable assembly (503752-001) connector J1 (2) from power supply wiring harness connector P3 (3).
6. Disconnect internal disk drive cable assembly (503752-001) connector P1 (4) from CPU/motherboard CCA (5).
7. Remove disk tray assembly (1) from workstation, cutting and removing cable ties, as required.



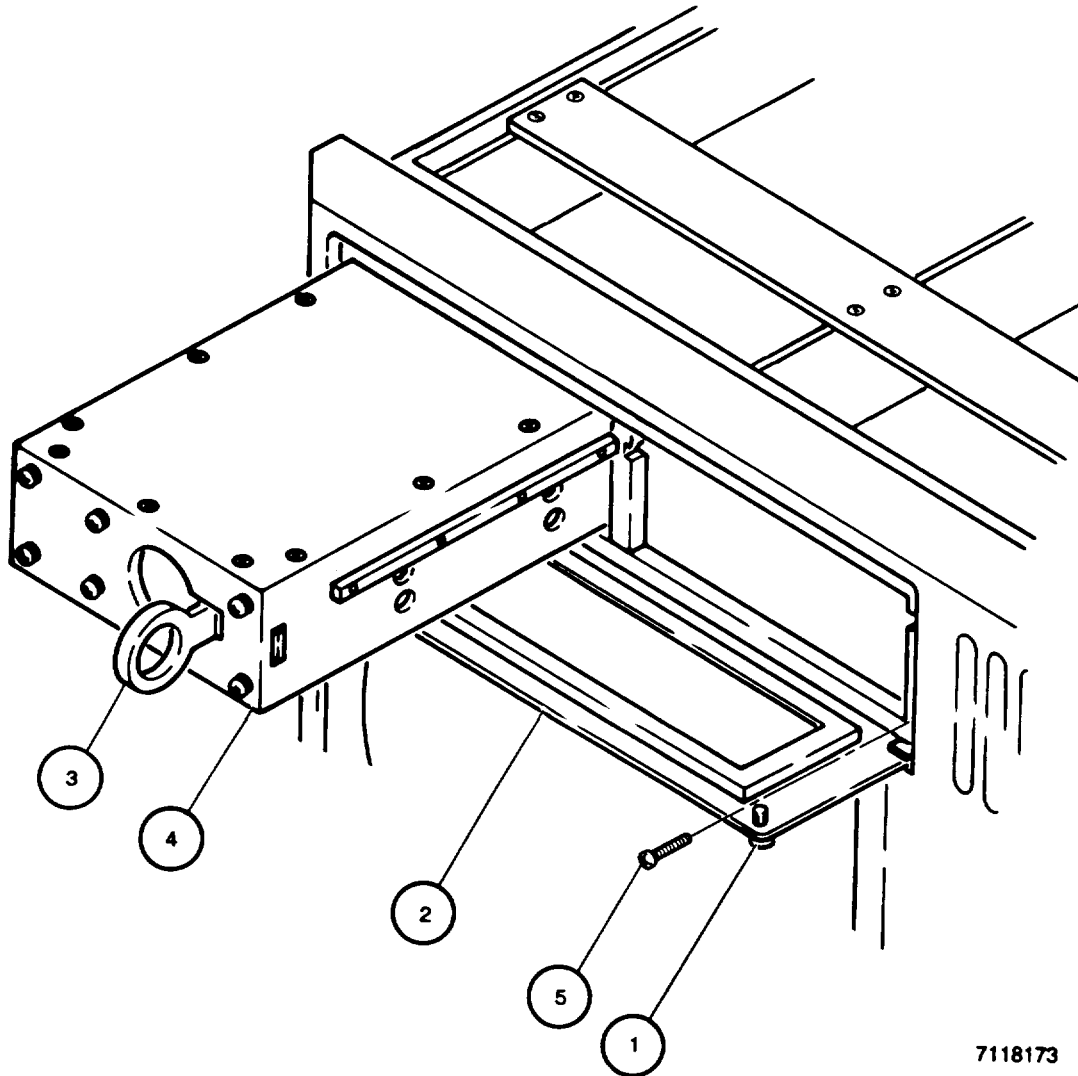
7118172

INSTALLATION

1. Place disk tray assembly (1) into installed position.
2. Connect internal disk drive cable assembly (503752-001) connector P1 (4) to CPU/motherboard CCA (5).
3. Connect internal disk drive cable assembly (503752-001) connector J1 (2) to power supply wiring harness connector P3 (3).
4. Install cable ties, as required.

5-24. REPLACE DISK TRAY ASSEMBLY - Continued

5. Loosen two captive screws (1) and open disk drive access door (2), as required.
6. Install four screws (5).
7. With retaining latch (3) positioned toward the right, push disk drive (4) into workstation, as required. Ensure that retaining latch (3) is engaged.
8. Close disk drive access door (2) and tighten two captive screws (1).



7118173

FOLLOW-ON MAINTENANCE: Install top cover assembly (para 5-8).

5-25. REPLACE FRONT PANEL I/O FILTER CCA

This task covers:

a. Removal

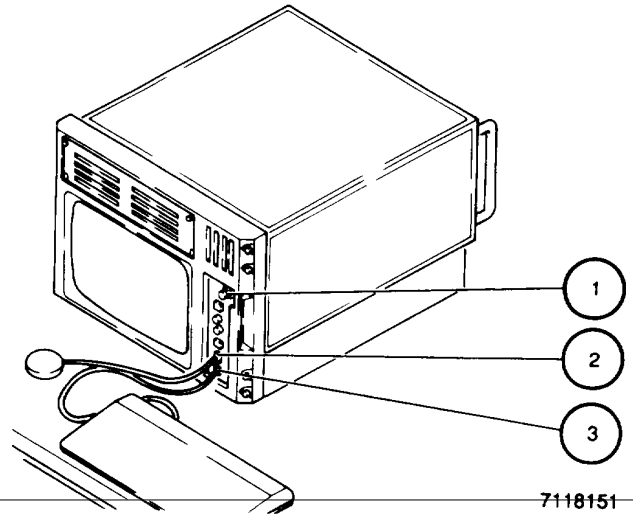
b. Installation

INITIAL SETUP**General Safety Precautions:****WARNING**

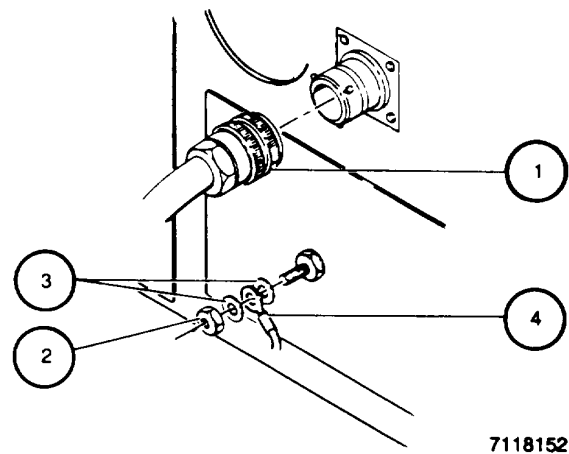
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

REMOVAL

1. Working at front panel, set circuit breaker CB1 (1) to off (pull out).
2. Disconnect mouse cable (2) and keyboard cable (3).

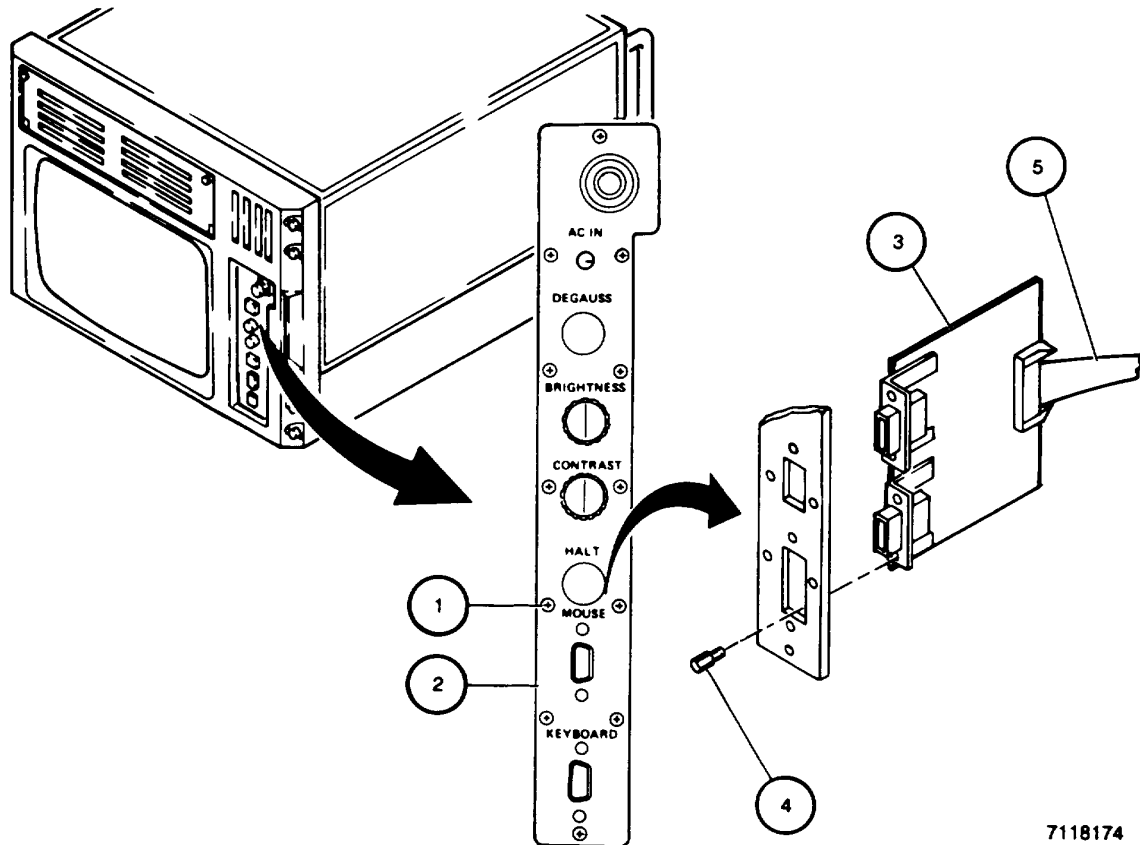


3. Working at rear panel, disconnect ac power cable (1).
4. Remove nut (2), two washers (3), and ground cable (4), as required.



5-25. REPLACE FRONT PANEL I/O FILTER CCA - Continued

5. Working at front panel, remove 12 screws (1).
6. Carefully pull faceplate (2) outward from chassis to access filter CCA (3).
7. Remove four standoffs (4) from MOUSE and KEYBOARD connectors.
8. Pull filter CCA (3) from faceplate (2) and position to access video/keyboard cable (503710-001) (5).
9. Disconnect video/keyboard cable (503710-001) (5) to remove filter CCA (3).



7118174

INSTALLATION

1. Connect video/keyboard cable (503710-001) (5) to filter CCA (3).
2. Position filter CCA (3) against faceplate (2).
3. Install four standoffs (4) in MOUSE and KEYBOARD connectors.
4. Carefully place faceplate (2) in installed position.
5. Install 12 screws (1).

5-26. REPLACE REAR PANEL I/O FILTER CCA

This task covers:

a. Removal

b. Installation

INITIAL SETUP

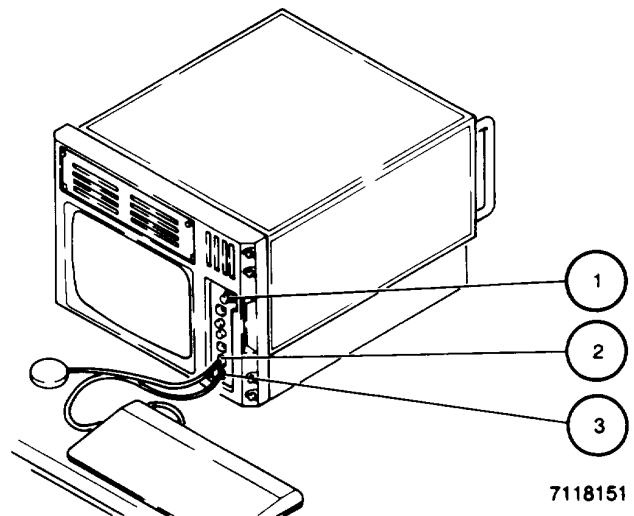
General Safety Precautions:

WARNING

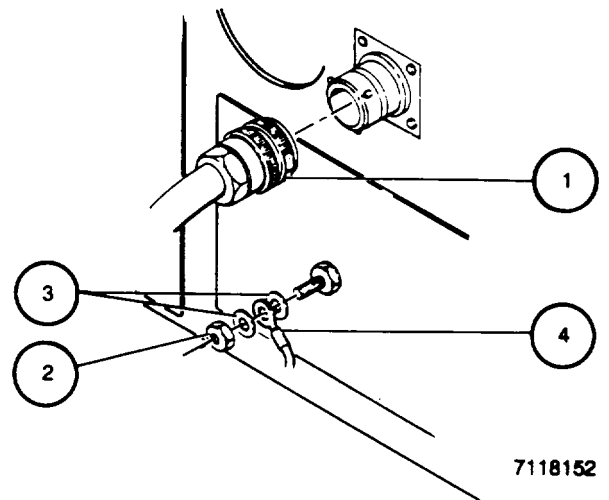
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT, Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

REMOVAL

1. Working at front panel, set circuit breaker CB1 (1) to off (pull out).
2. Disconnect mouse cable (2) and keyboard cable (3).

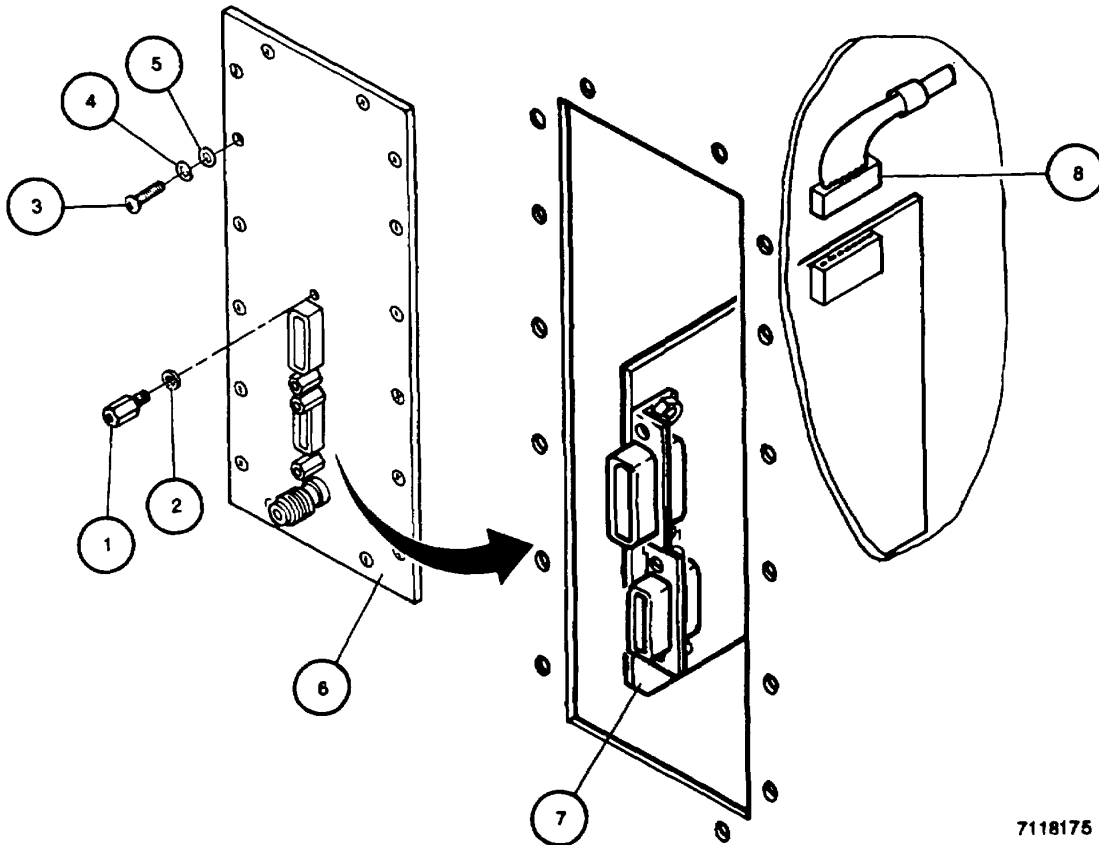


3. Working at rear panel, disconnect ac power cable (1).
4. Remove nut (2), two washers (3), and ground cable (4), as required.



5-26. REPLACE REAR PANEL /O0 FILTER CCA- Continued

5. Working at rear panel, remove four standoffs (1) and washers (2).
6. Remove 16 screws (3), lockwashers (4), and washers (5).
7. Carefully pull plate (6) from rear panel to access filter CCA (7).
8. Disconnect I/O port cable (503716-001) (8) to remove filter CCA (7).



7118175

INSTALLATION

1. Connect I/O port cable (503716-001) (8) to filter CCA (7).
2. Position filter CCA (7) against plate (6).
3. Install four standoffs (1) and washers (2).
4. Carefully place plate (6) in installed position.
5. Install 16 screws (3), lockwashers (4), and washers (5).

5-27. REPLACE ETHERNET CCA CABLE ASSEMBLY (503761-001 OR 503761-002)**This task covers:****a. Removal****b. Installation****INITIAL SETUP****NOTE**

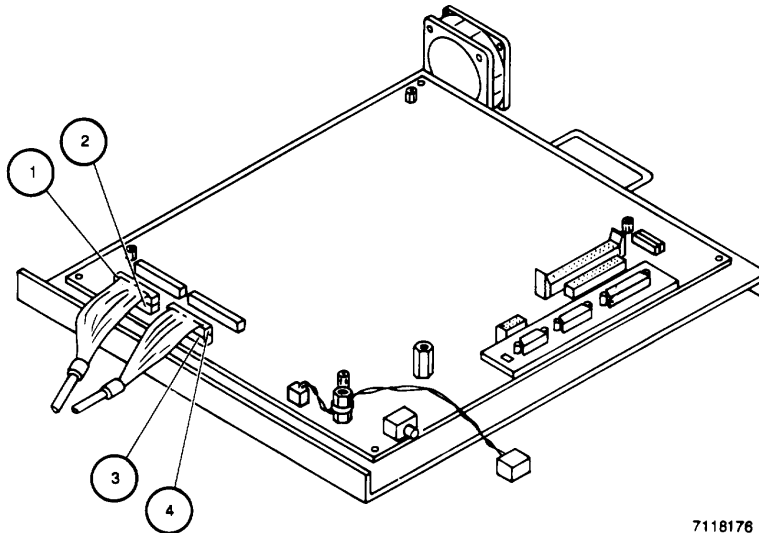
Replace cable assembly 503761-001 or 503761-002 the same way. Both cable assemblies shown.

Preliminary Procedures:

1. Remove Ethernet interface CCA (para 5-15).
2. Remove graphics controller CCA (para 5-13).

REMOVAL

Disconnect Ethernet CCA cable assembly (503761-001) P2 (1) from CCA connector (2) or Ethernet CCA cable assembly (503761-002) P2 (3) from CCA connector (4).



7118176

INSTALLATION

Connect Ethernet CCA cable assembly (503761-001) P2 (1) to CCA connector (2) or Ethernet CCA cable assembly (503761-002) P1 (3) to CCA connector (4).

FOLLOW-ON MAINTENANCE:

1. Install Ethernet interface CCA (para 5-15).
2. Install graphics controller CCA (para 5-13).

5-28. REPLACE ETHERNET CABLE ASSEMBLY (503760-001)

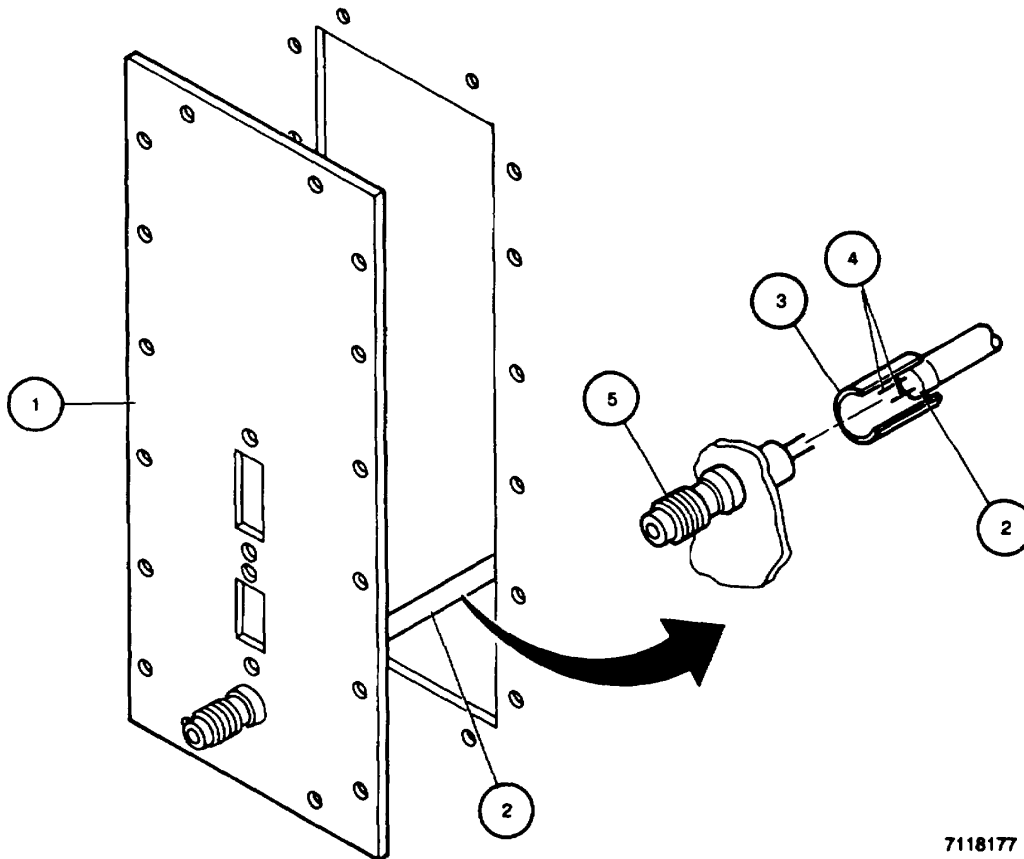
This task covers:**a. Removal****b. Installation**

INITIAL SETUP**Preliminary Procedures:**

1. Remove CCA assembly (para 5-9).
 2. Remove rear panel I/O filter CCA (para 5-26).
-

REMOVAL

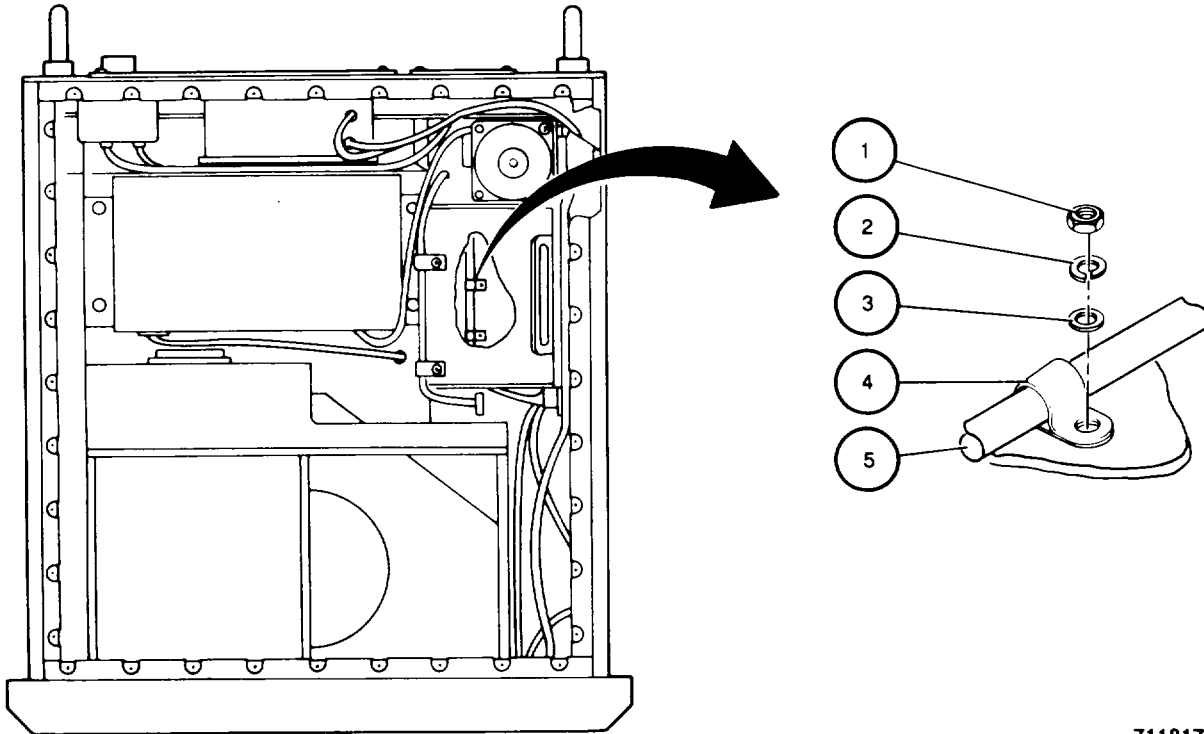
1. Carefully position I/O panel (1) to access cable (2).
2. Remove insulation sleeving (3).
3. Tag, unsolder, and remove wires (4) from connector (5).



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5-28. REPLACE ETHERNET CABLE ASSEMBLY (503760-001) - Continued

4. Working inside top cover at bottom of chassis, remove three nuts (1), lockwashers (2), washers (3), and cable clamps (4).
5. Remove cable (5).



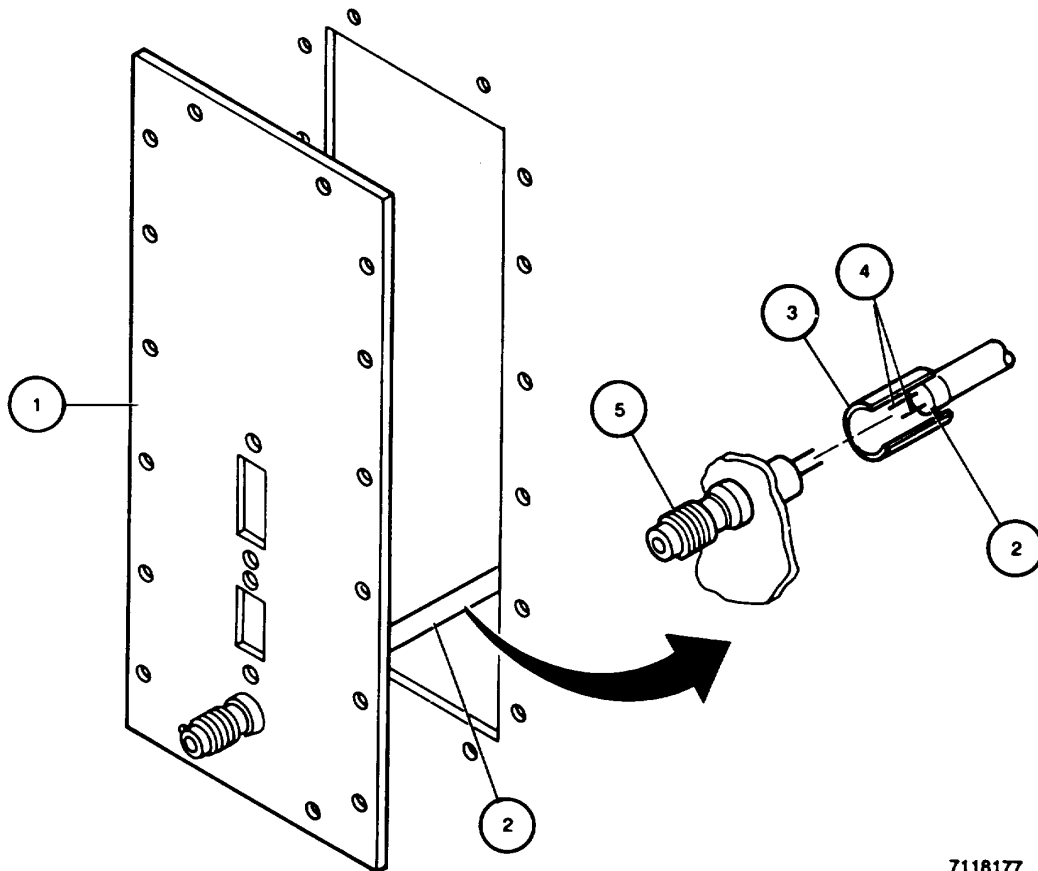
7118178

INSTALLATION

1. Place cable (5) and cable clamps (4) in installed position.
2. Install three nuts (1), lockwashers (2), washers (3), and cable clamps (4).

5-28. REPLACE ETHERNET CABLE ASSEMBLY (503760-001) - Continued

3. Install new insulation sleeving (3) on cable (2).
4. Position I/O panel (1) to access connector (5).
5. Solder wires (4) to connector (5) as tagged. Remove tags.
6. Position and shrink insulation sleeving (3).



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FOLLOW-ON MAINTENANCE:

1. Install CCA assembly (para 5-9).
2. Install rear panel I/O filter CCA (para 5-26).

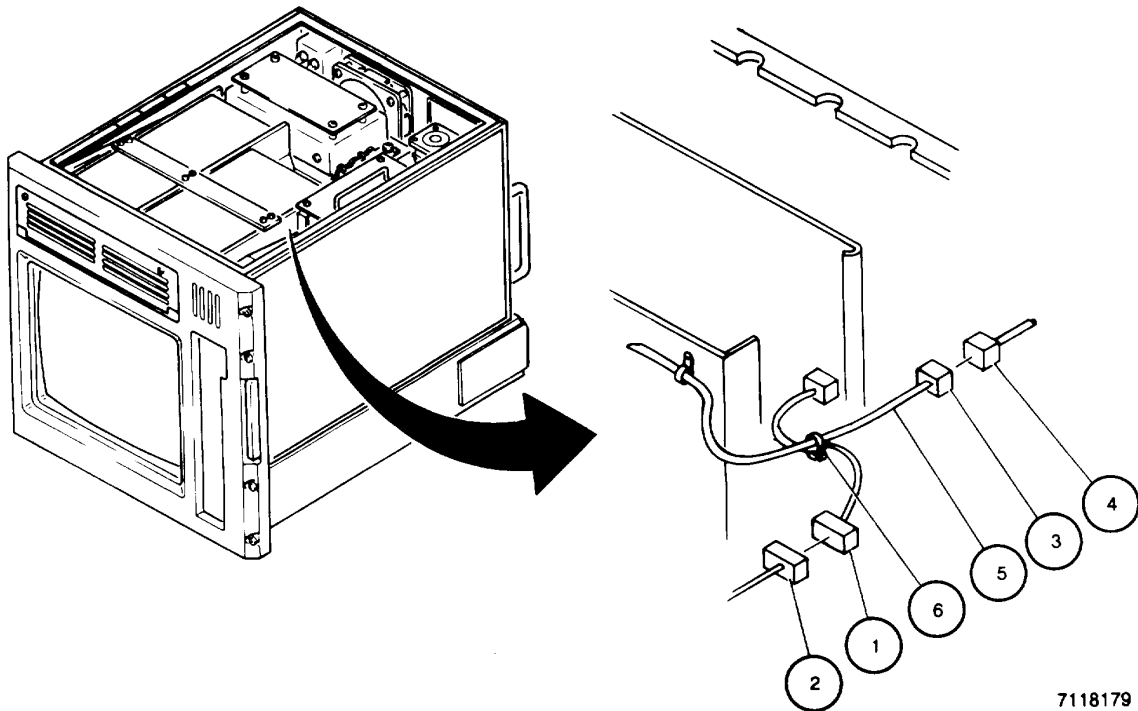
5-29. REPLACE DC POWER CABLE ASSEMBLY (503769-002)

This task covers:**a. Removal****b. Installation**

INITIAL SETUP**Preliminary Procedure:** Remove CCA assembly (para 5-9).

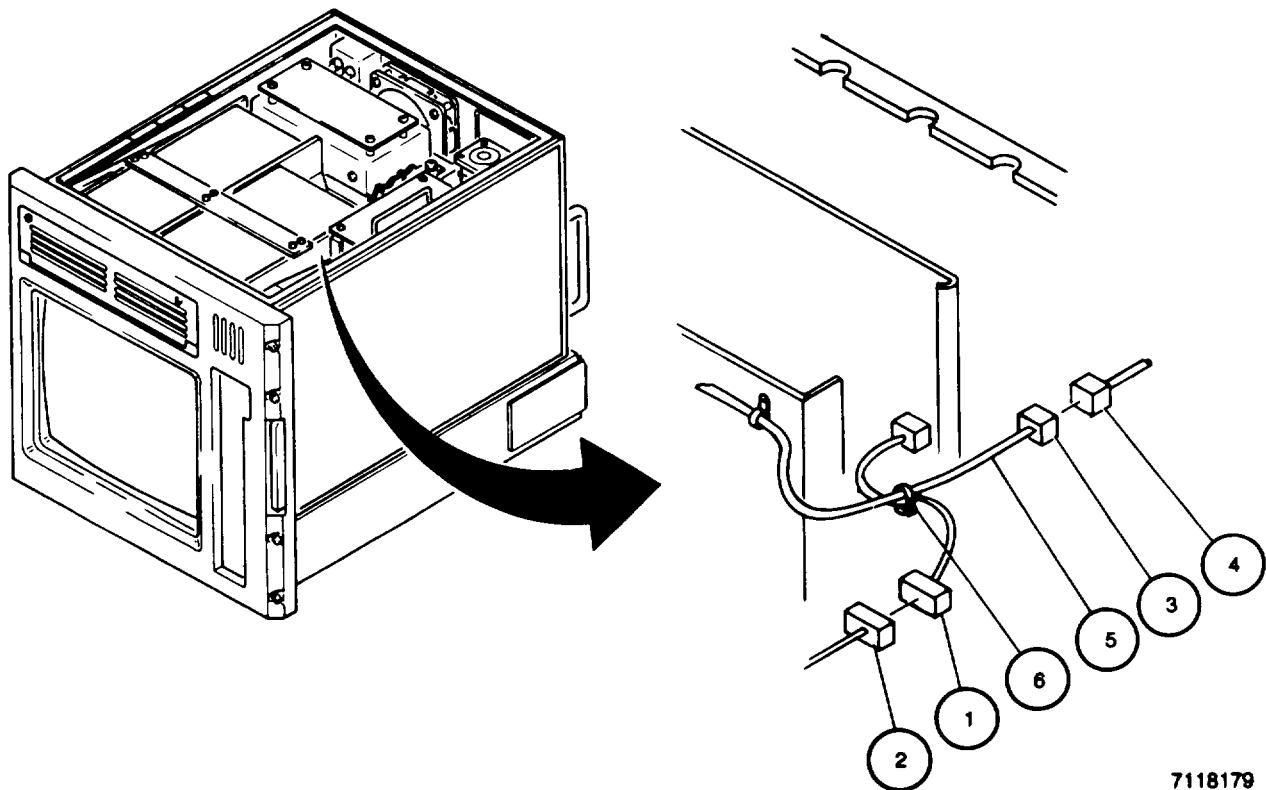
REMOVAL

1. Working inside top cover, tag and disconnect dc power cable connector J1 (1) from power supply wiring harness connector P4 (2).
2. Tag and disconnect dc power cable connector J2 (3) from halt switch cable (504378-001) connector P1 (4).
3. Remove dc power cable (5), removing cable ties (6), as required.



5-29. REPLACE DC POWER CABLE ASSEMBLY (503769-002) - Continued**INSTALLATION**

1. Route dc power cable (5) into installed position.
2. Connect dc power cable connector J2 (3) to halt switch cable (504378-001) connector P1 (4).
3. Connect dc power cable connector J1 (1) to power supply wiring harness connector P4 (2). Remove tags.
4. Install cable ties (6) as required.



FOLLOW-ON MAINTENANCE: Install CCA assembly (para 5-9).

5-30. REPLACE VIDEO/KEYBOARD CABLE ASSEMBLY (50371 0-001)

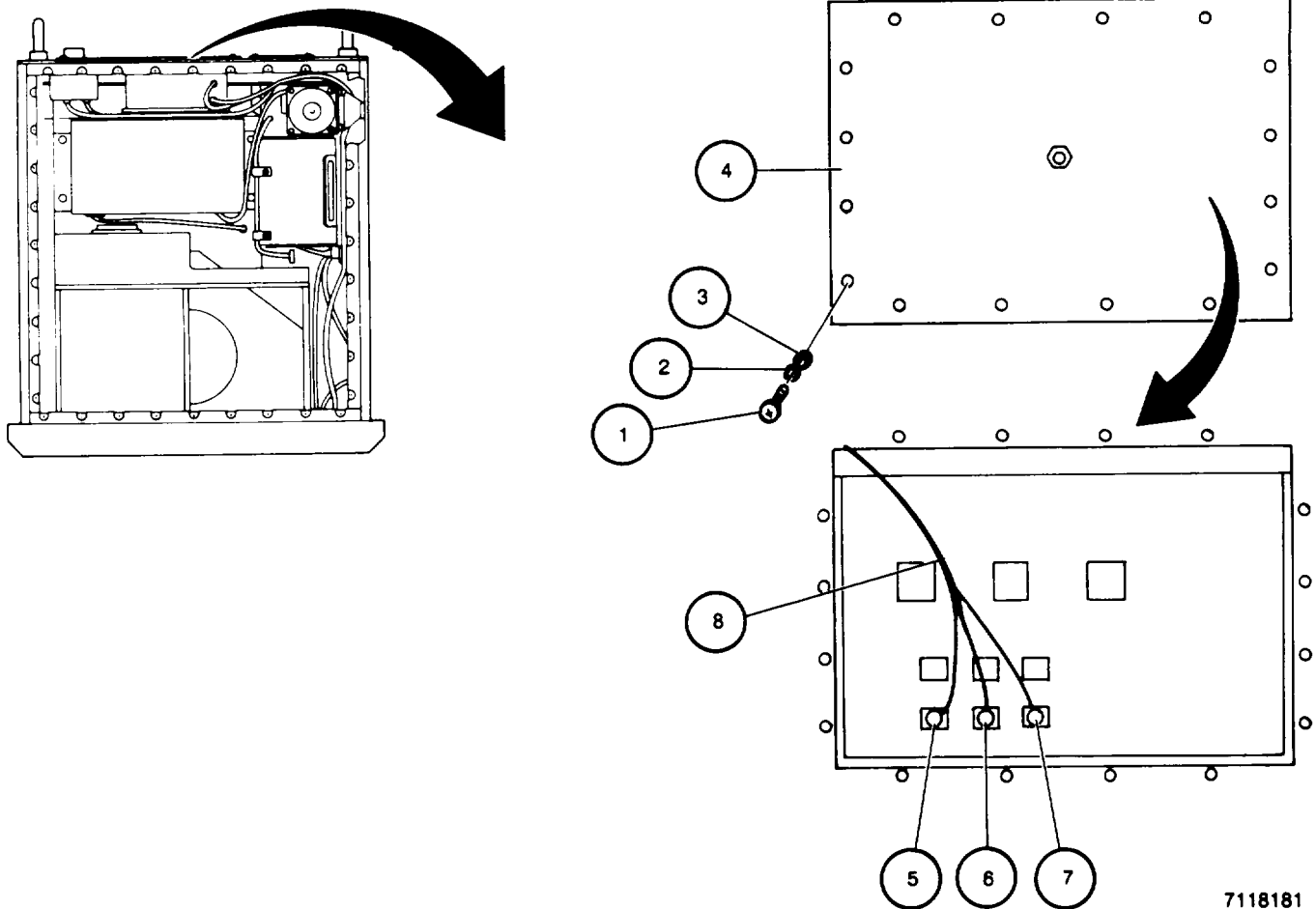
This task covers: a. Removal b. Installation

INITIAL SETUP

Preliminary Procedure: Remove CCA assembly (para 5-9). -

REMOVAL

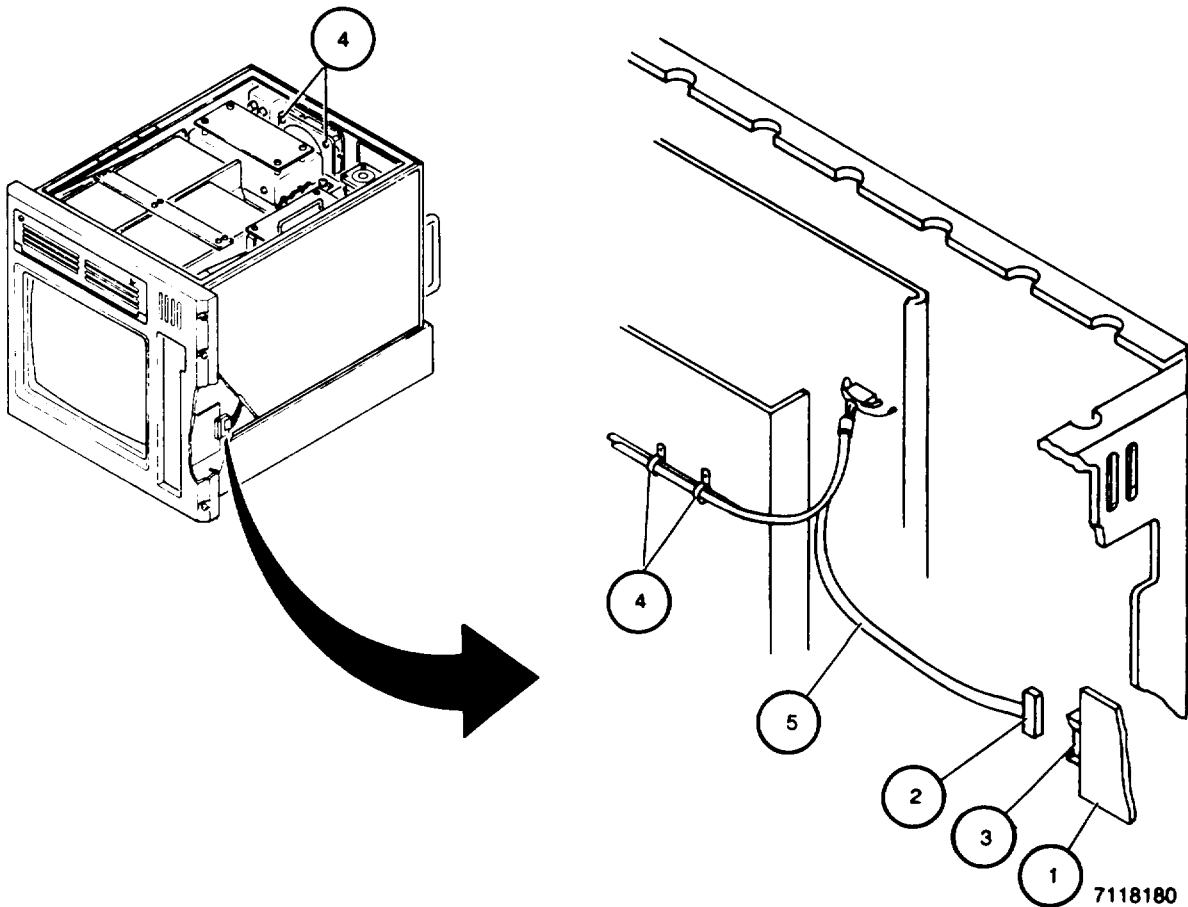
1. Working at rear panel, remove 16 screws (1), lockwashers (2), and washers (3).
2. Remove rear access panel (4).
3. Tag and disconnect video/keyboard cable (8) connectors P2 (5) (GRN), P1 (6) (RED), and P3 (7) (BLU).



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5-30. REPLACE VIDEO/KEYBOARD CABLE ASSEMBLY (503710-001) - Continued

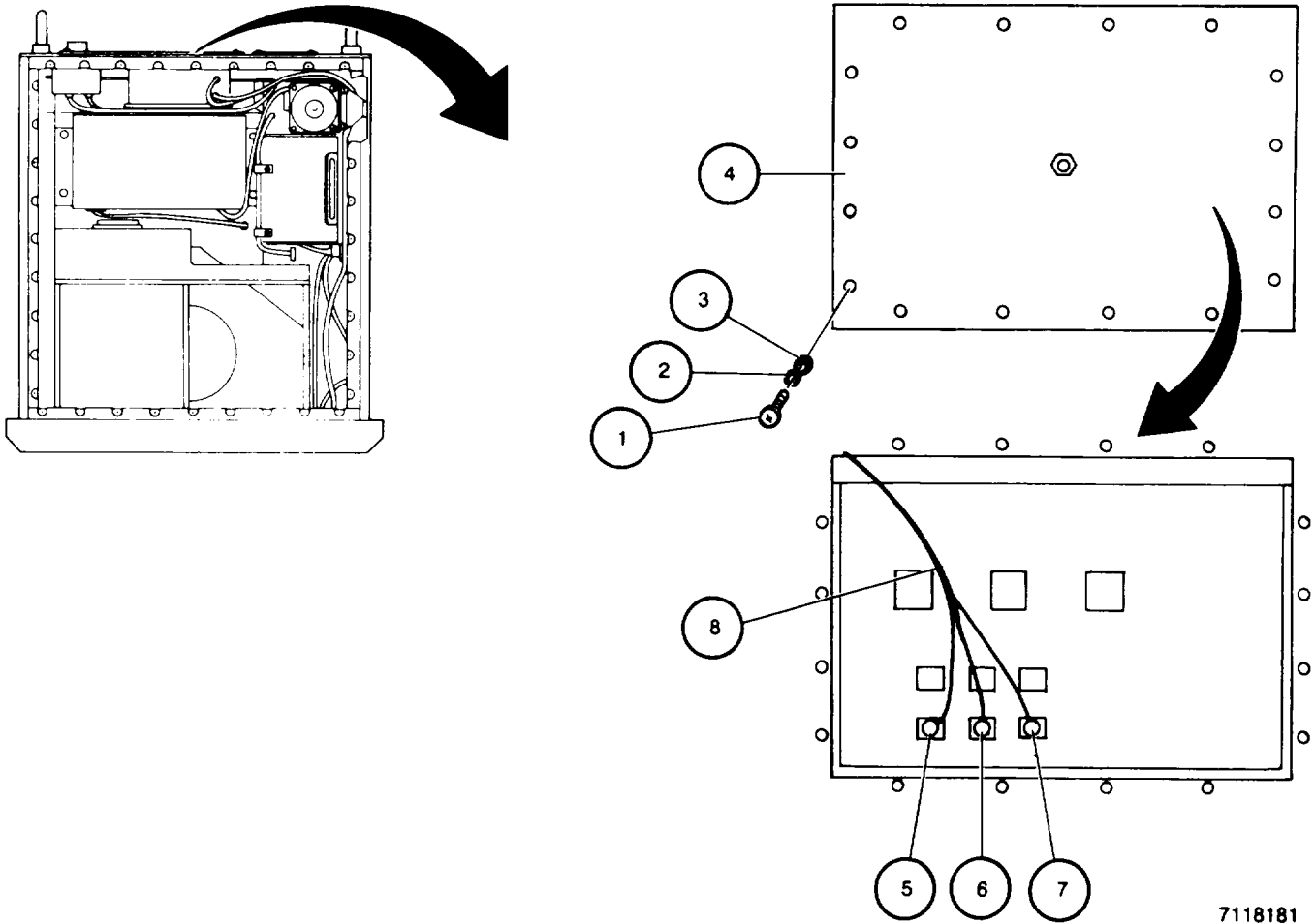
4. Working at rear of front panel I/O filter CCA (1), disconnect video/keyboard cable connector J2 (2) from front panel I/O filter CCA connector P1 (3).
5. Cut and remove cable ties (4), as required, to remove video/keyboard cable (5) from workstation.

**INSTALLATION**

1. Route video/keyboard cable (5) into workstation.
2. Working at rear of front panel I/O filter CCA (1), connect video/keyboard cable connector J2 (2) to front panel I/O filter CCA connector P1 (3).
3. Install cable ties (4), as required.

5-30. REPLACE VIDEO/KEYBOARD CABLE ASSEMBLY (503710-001) - Continued

4. Working at rear panel, connect video/keyboard cable (8) connectors P2 (5) (GRN), P1 (6) (RED), and P3 (7) (BLU) as tagged. Remove tags.
5. Place and hold rear access panel (4) in installed position.
6. Install 16 screws (1), lockwashers (2), and washers (3).



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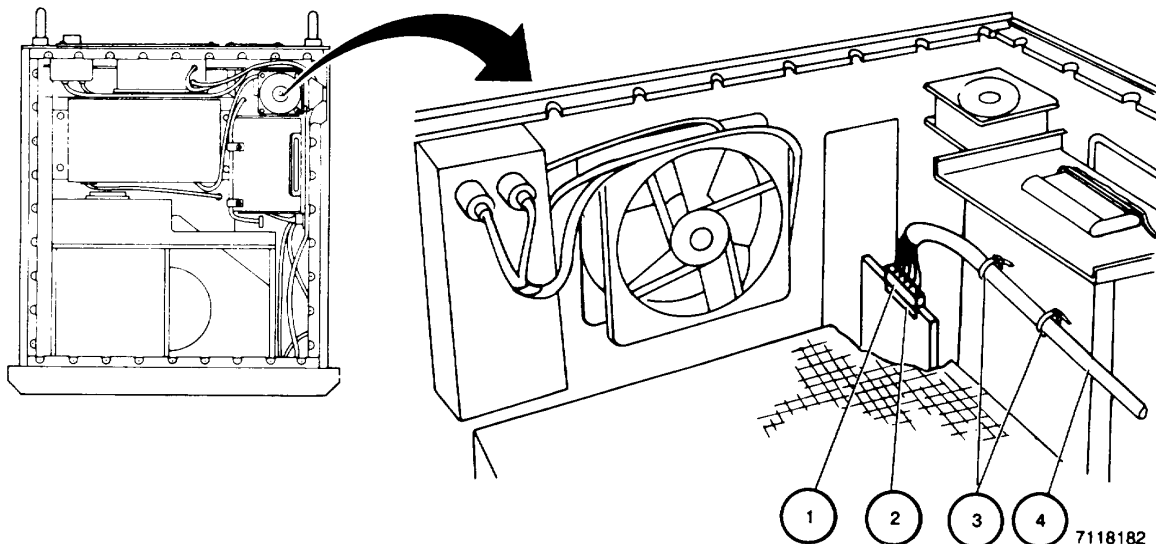
FOLLOW-ON MAINTENANCE: Install CCA assembly (para 5-9).

5-31. REPLACE I/O PORT CABLE ASSEMBLY (503716-001)**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Preliminary Procedures:**

1. Remove power supply assembly (para 5-11).
2. Remove CCA assembly (para 5-9).

REMOVAL

1. Disconnect I/O port cable connector P1 (1) from rear panel filter CCA connector J1 (2).
2. Remove two cable ties (3).
3. Remove I/O port cable (4).

**INSTALLATION**

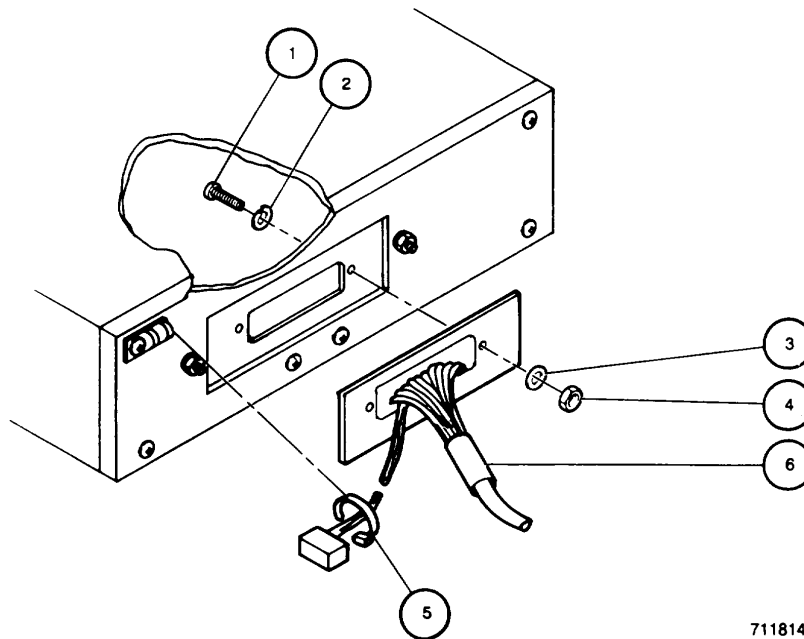
1. Route I/O port cable (4) into installed position.
2. Connect I/O port cable connector P1 (1) to rear panel filter CCA connector J1 (2).
3. Install two new cable ties (3).

FOLLOW-ON MAINTENANCE:

1. Install power supply assembly (para 5-11).
2. Install CCA assembly (para 5-9).

5-32. REPLACE INTERNAL DISK DRIVE CABLE ASSEMBLY (503752-001)**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Preliminary Procedure:** Remove disk tray assembly (para 5-24).**REMOVAL**

1. Remove two screws (1), lockwashers (2), washers (3), and nuts (4).
2. Cut and remove cable tie (5).
3. Remove disk drive cable (6).



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INSTALLATION

1. Place and hold disk drive cable (6) in installed position.
2. Install two screws (1), lockwashers (2), washers (3), and nuts (4).
3. Install new cable tie (5).

FOLLOW-ON MAINTENANCE: Install disk tray assembly (para 5-24).

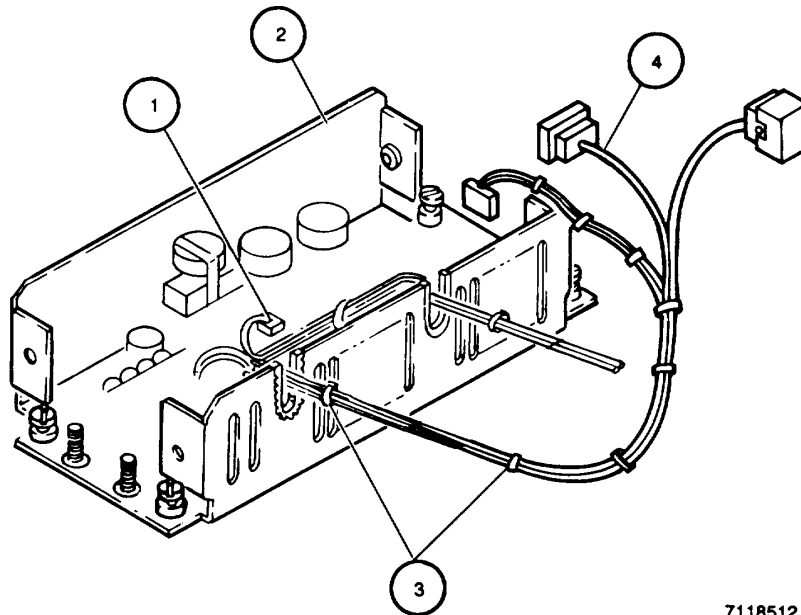
5-33. REPLACE CCA ASSEMBLY FAN CABLE ASSEMBLY (504173-001)

This task covers:**a. Removal****b. Installation**

INITIAL SETUP**Preliminary Procedure:** Remove power supply assembly (para 5-11).

REMOVAL

1. Working inside power supply assembly, disconnect fan cable connector J1 (1) from power supply (2).
2. Cut and remove cable ties (3), as required.
3. Remove fan cable (4).



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INSTALLATION

1. Place fan cable (4) in installed position.
2. Connect fan cable connector J1 (1) to power supply (2).
3. Install new cable ties (3), as required.

FOLLOW-ON MAINTENANCE: Install power supply assembly (para 5-11).

5-34. REPLACE BRIGHT/CONTRAST CONTROL CABLE ASSEMBLY (504213-001)

This task covers:

a. Removal

b. Installation

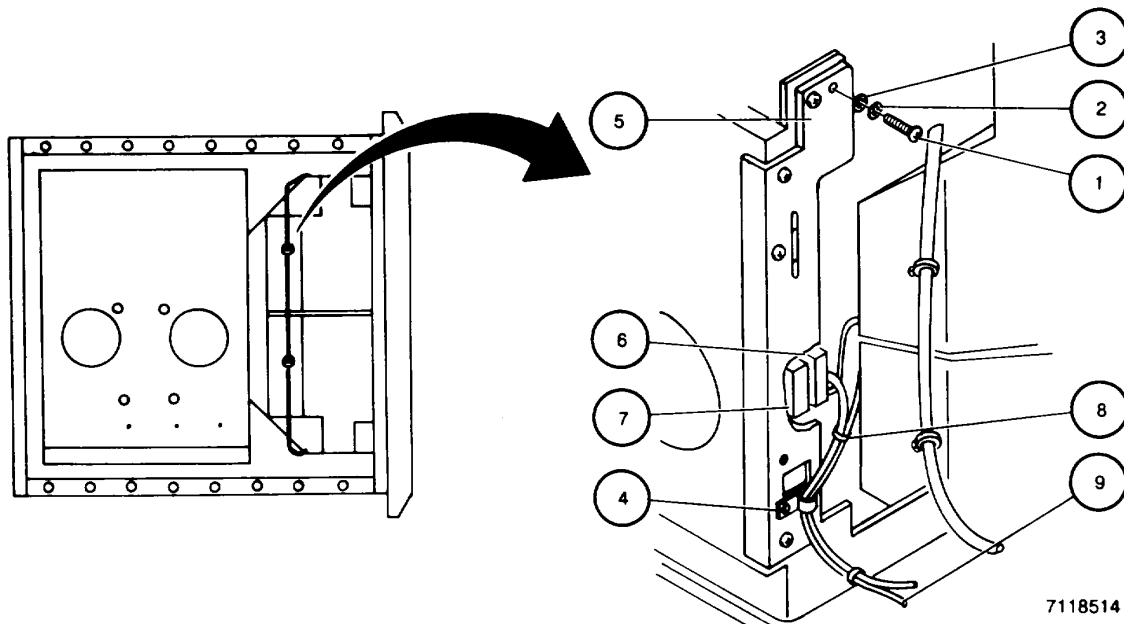
INITIAL SETUP**Preliminary Procedures:**

1. Remove front panel I/O filter assembly (para 5-25).
2. Remove bottom cover (para 5-8).

REMOVAL**WARNING**

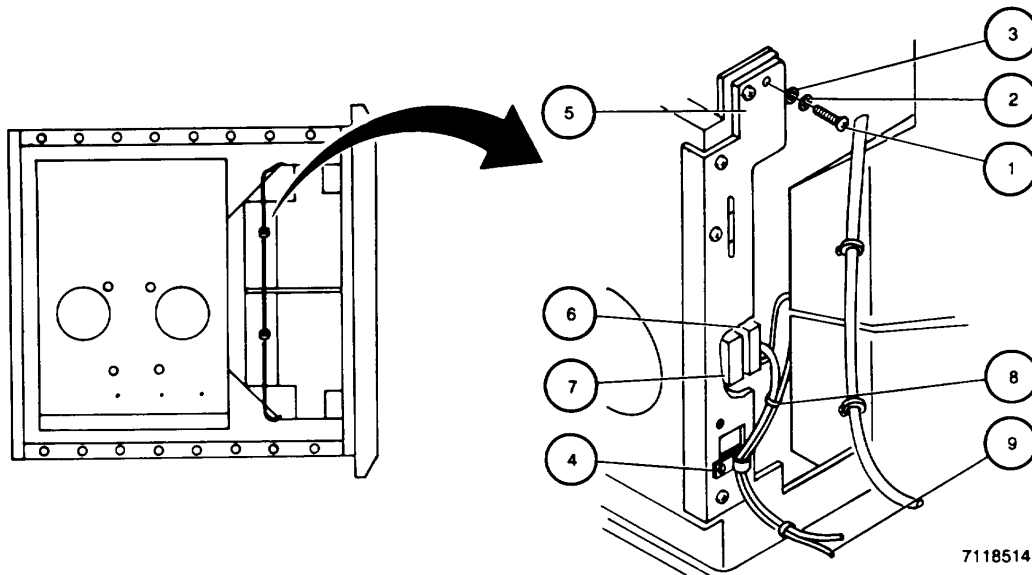
Multiple person lift required. Do not attempt to lift, carry, or move the equipment by yourself. Get help.

1. Set workstation on right side panel.
2. Working inside bottom cover, remove eight screws (1), lockwashers (2), and washers (3) and one cable clamp (4).
3. Remove bracket (5).
4. Disconnect bright/contrast cable connector P2 (6) from workstation connector P07 (7).
5. Cut and remove cable ties (8), as required, to free bright/contrast cable (9) from chassis.



5-34. REPLACE BRIGHT/CONTRAST CONTROL CABLE ASSEMBLY (504213-001) - Continued**INSTALLATION**

1. Working inside bottom cover, place bright/contrast cable (9) in installed position.
2. Connect bright/contrast cable connector P2 (6) to workstation connector P07 (7).
3. Place bracket (5) in installed position.
4. Install eight screws (1), lockwashers (2), and washers (3) and one cable clamp (4).
5. Install cable ties (8), as required.

**FOLLOW-ON MAINTENANCE:**

1. Install bottom cover (para 5-8).
2. Install front panel I/O filter assembly (para 5-25).

5-35. REPLACE AC MONITOR CABLE ASSEMBLY (504237-001)

This task covers:

a. Removal

b. Installation

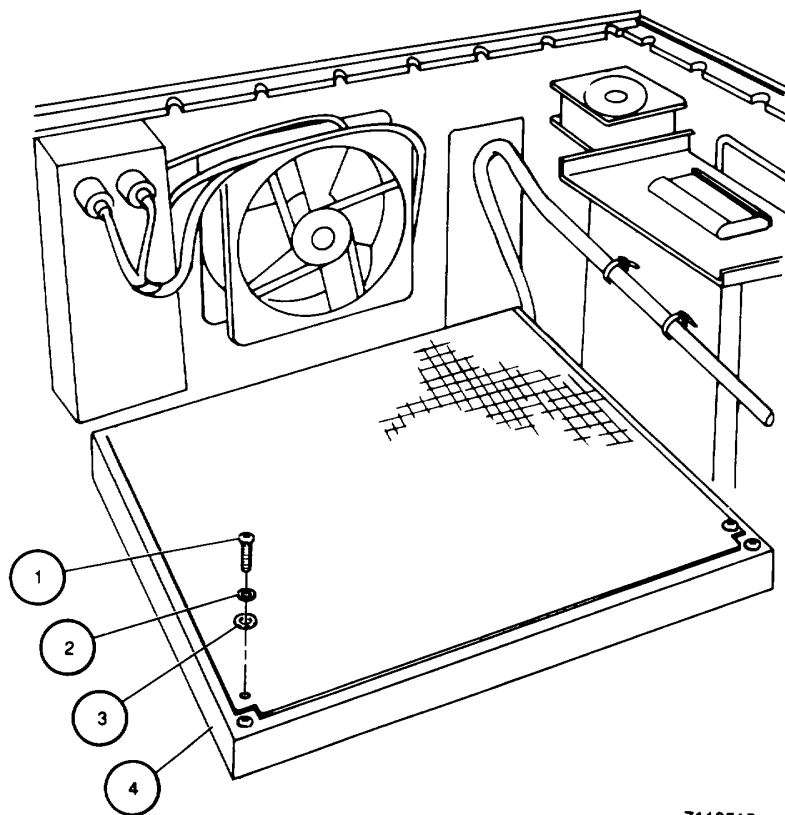
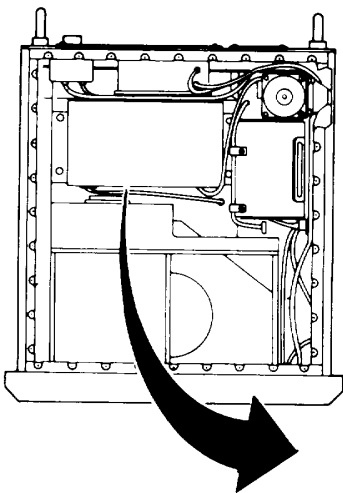
INITIAL SETUP**Preliminary Procedure:** Remove power supply assembly (para 5-11).**REMOVAL**

1. Working inside top cover, remove two screws (1), lockwashers (2), and washers (3) (left side shown).

WARNING

HIGH VOLTAGES ARE PRESENT IN THE WORKSTATION. Avoid touching the power supply or CRT areas and any items that may retain electrical charge or accumulate heat (capacitors, heat sinks, CRT, etc.).

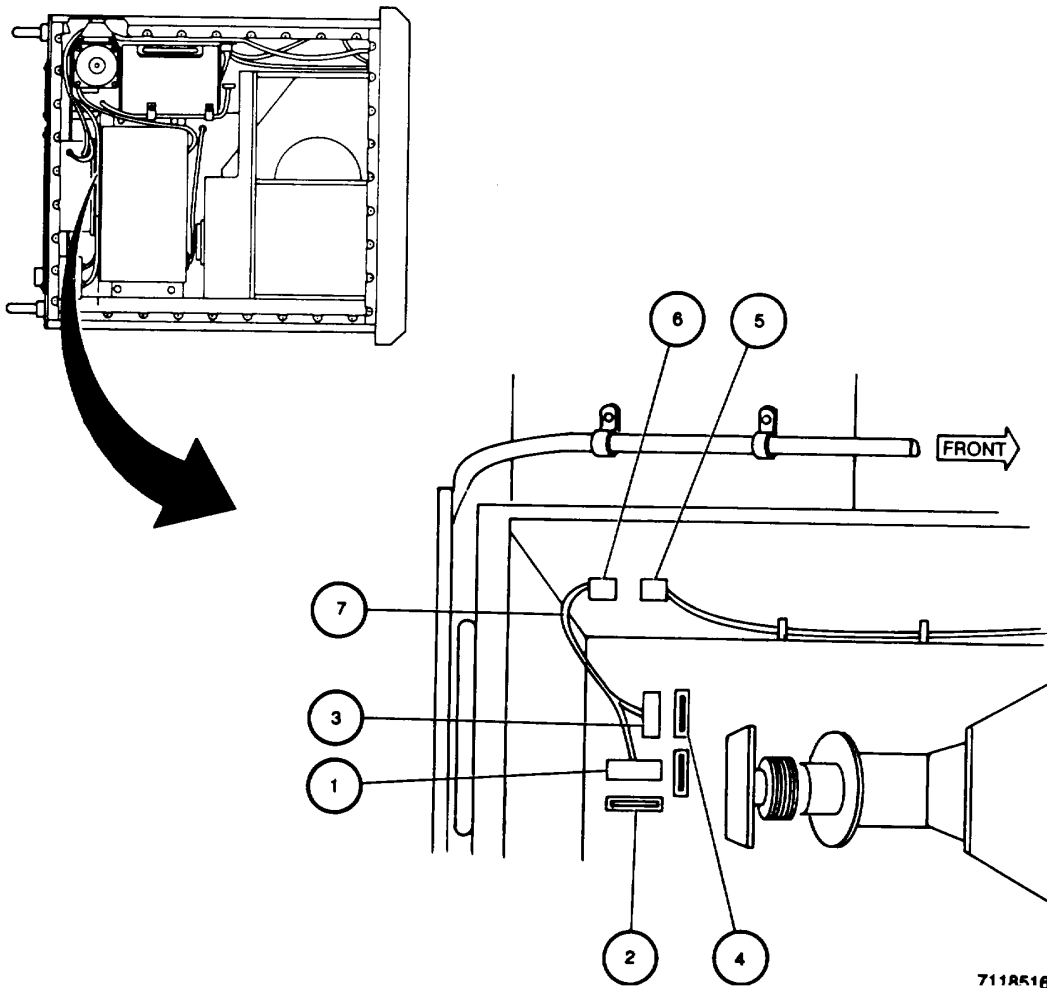
2. Remove screen (4).



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5-35. REPLACE AC MONITOR CABLE ASSEMBLY (504237-001) - Continued

3. Unplug ac monitor cable connector P1 (1) from workstation connector P04 (2).
4. Unplug ac monitor cable connector P2 (3) from workstation connector P09 (4).
5. Working inside internal chassis right rear corner, disconnect ac harness (503753-001) connector P1 (5) from ac monitor cable connector J1 (6).
6. Remove ac monitor cable (7).

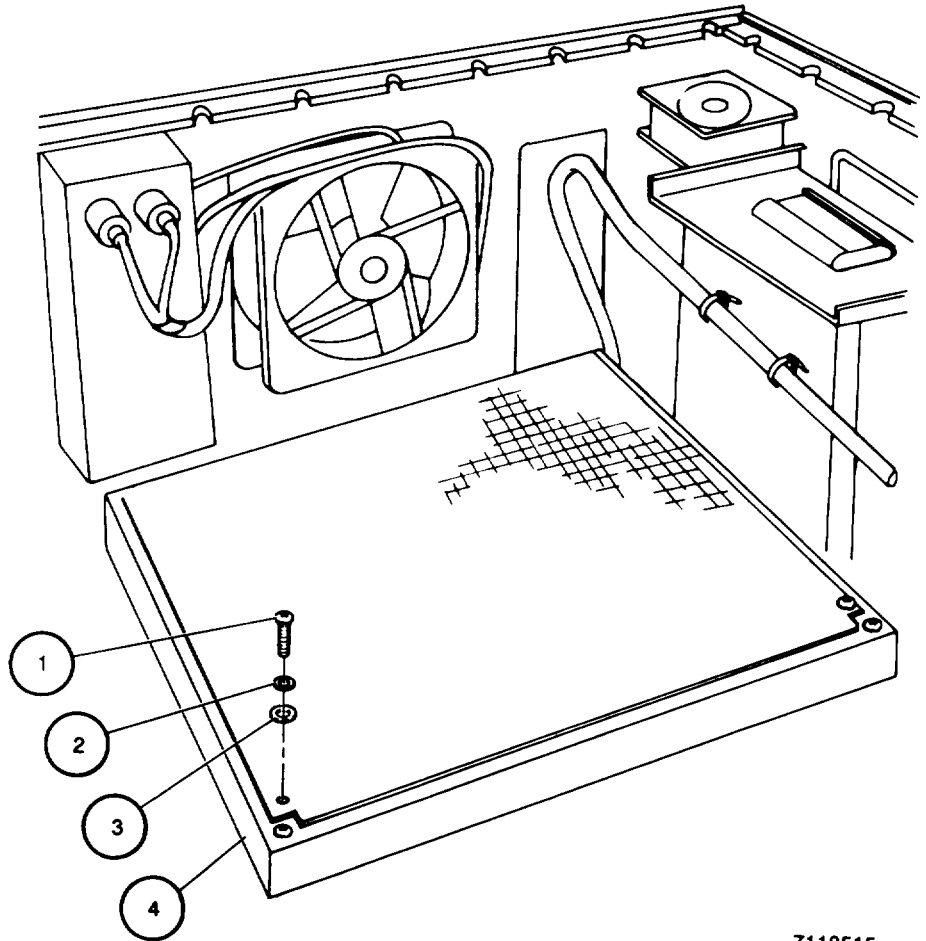
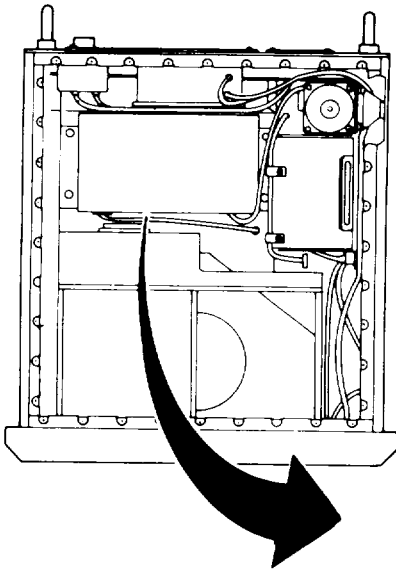


INSTALLATION

1. Place ac monitor cable (7) in installed position.
2. Plug ac monitor cable connector P. (1) into workstation connector P04 (2).
3. Plug ac monitor cable connector P2 (3) into workstation connector P09 (4).
4. Connect ac harness (503753-001) connector P1 (5) to ac monitor cable connector J1 (6). 5-75

5-35. REPLACE AC MONITOR CABLE ASSEMBLY (504237-001) - Continued

5. Place screen (4) in installed position.
6. Install two screws (1), lockwashers (2), and washers (3), ensuring that power supply mounting holes are not blocked by screen (4).



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FOLLOW-ON MAINTENANCE: Install power supply assembly (para 5-11).

5-36. REPLACE HALT SWITCH CABLE ASSEMBLY (504378-001)

This task covers:

a. Removal

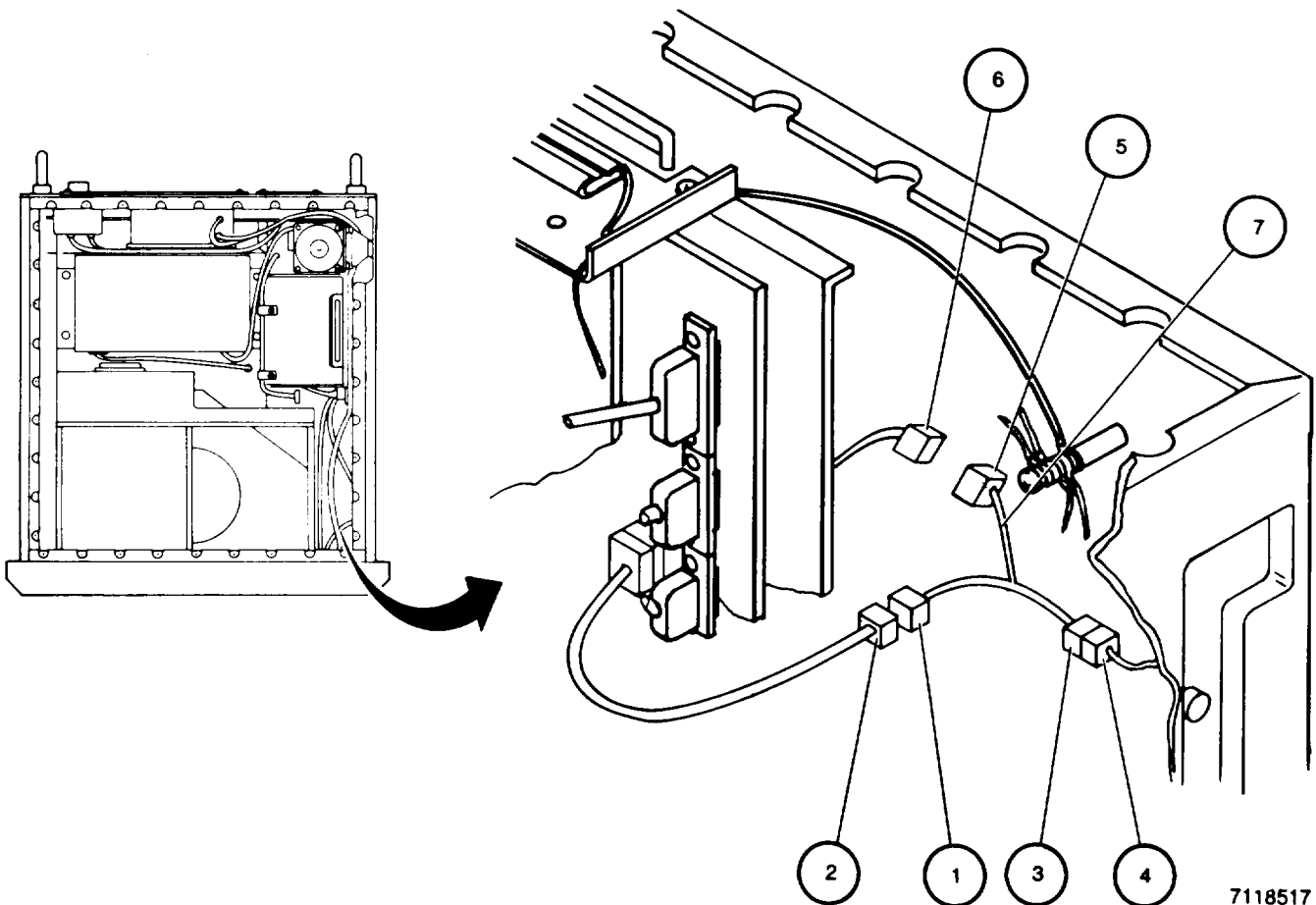
b. Installation

INITIAL SETUP

Preliminary Procedure: Remove disk tray assembly (para 5-24).

REMOVAL

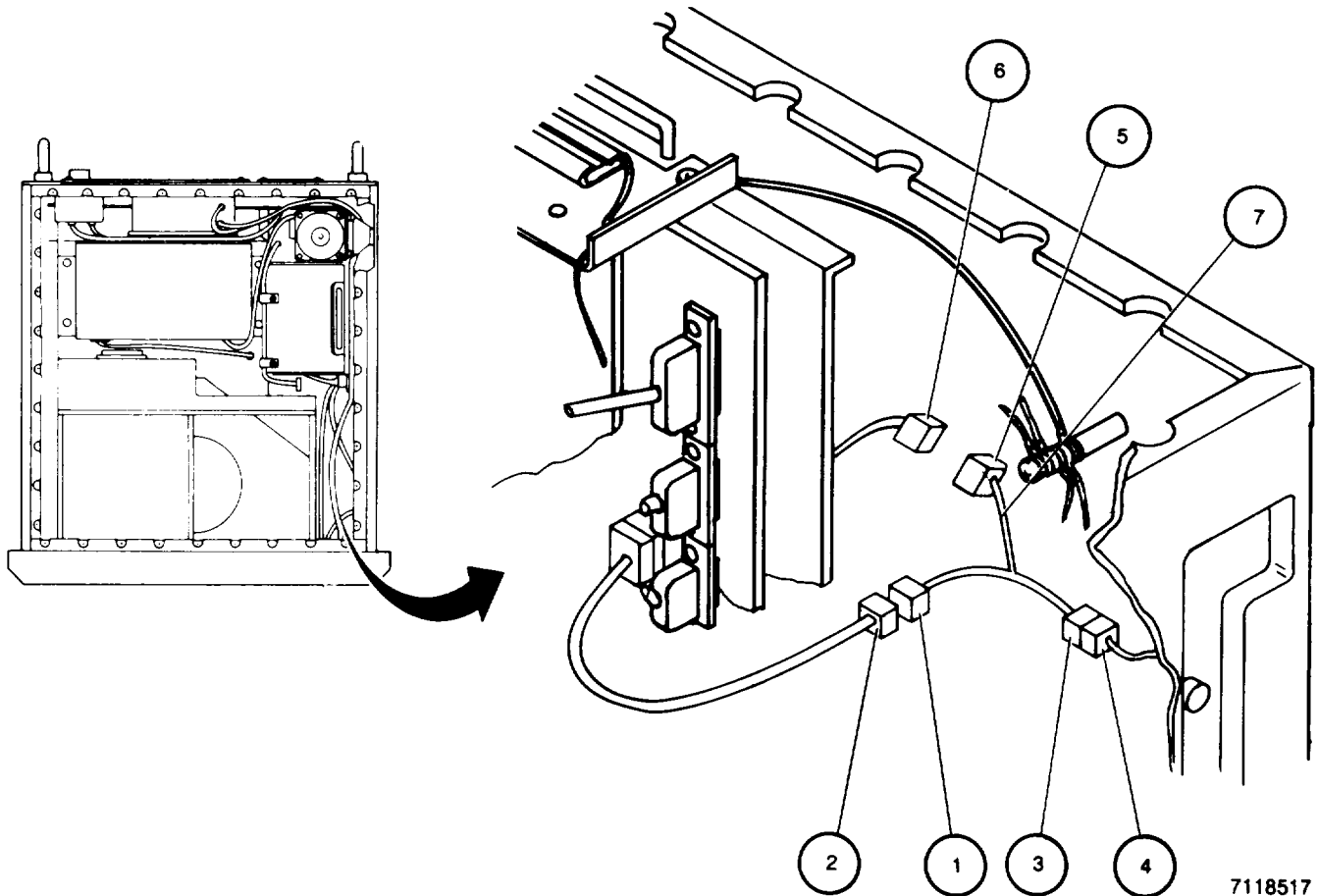
1. Working inside top cover, tag and disconnect halt switch cable connector P1 (1) from dc power cable (503769-002) connector J2 (2).
2. Tag and disconnect halt switch cable connector J1 (3) from halt switch wiring harness connector P1 (4).
3. Tag and disconnect halt switch cable connector P2 (5) from halt switch solenoid wiring (504386-001) connector J1 (6).
4. Remove halt switch cable (7).



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5-36. REPLACE HALT SWITCH CABLE ASSEMBLY (504378-001) - Continued**INSTALLATION**

1. Place halt switch cable (7) in installed position.
2. Connect halt switch cable connector P2 (5) to halt switch solenoid wiring (504386-001) connector J1 (6).
3. Connect halt switch cable connector J1 (3) to halt switch harness connector P1 (4).
4. Connect halt switch cable connector P1 (1) to dc power cable (503769-002) connector J1 (2).



FOLLOW-ON MAINTENANCE: Install disk tray assembly (para 5-24).

5-37. REPLACE AUXILIARY INLET FILTER

This task covers:

a. Removal

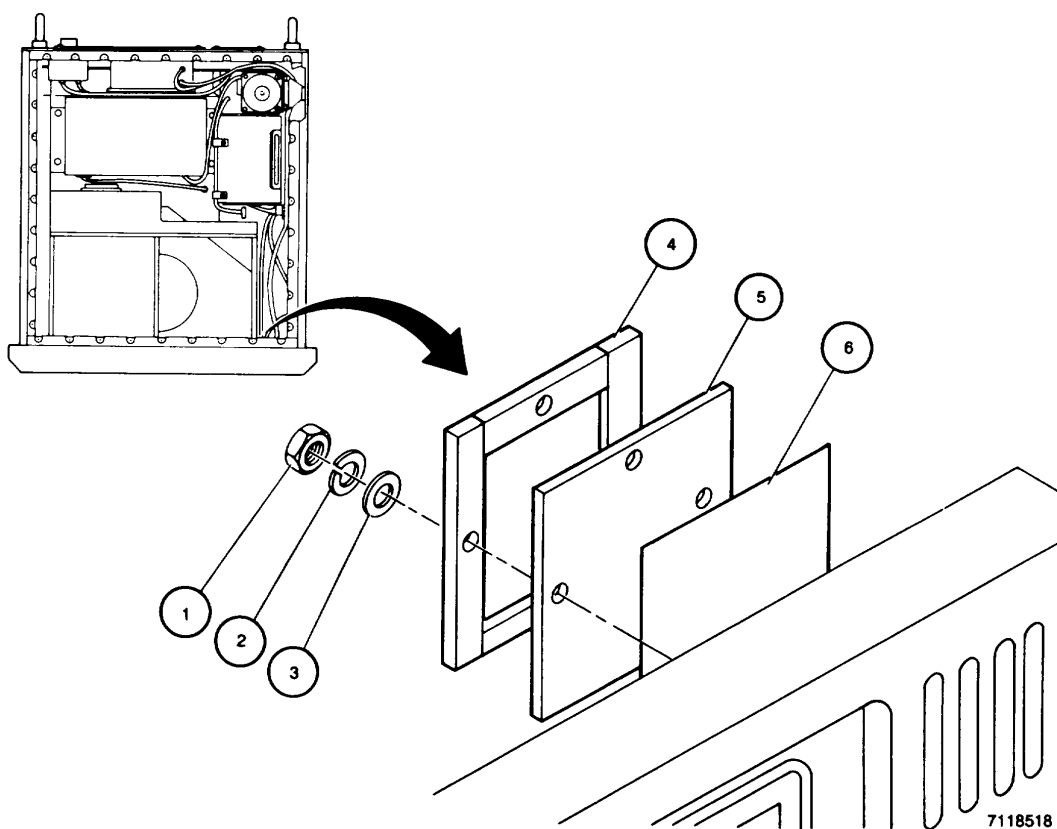
b. Installation

INITIAL SETUP

Preliminary Procedure: Remove top cover assembly (para 5-8).

REMOVAL

1. Working inside top cover, remove four nuts (1), lockwashers (2), and washers (3).
2. Remove filter plate (4), filter (5), and Tempest screen (6).



INSTALLATION

1. Place filter plate (4), filter (5), And Tempest screen (6) in installed position.
2. Install four nuts (1), lockwashers (2). and washers (3).

FOLLOW-ON MAINTENANCE: Install top cover assembly (pare 5-8).

5-38. POWER SUPPLY TEST

This task covers: **Test**

INITIAL SETUP**Preliminary Procedures:**

1. Remove disk tray assembly (para 5-24). (Leave disk tray assembly out of workstation until maintenance is complete.)
 2. Perform equipment setup and power-up (para 5-5).
-

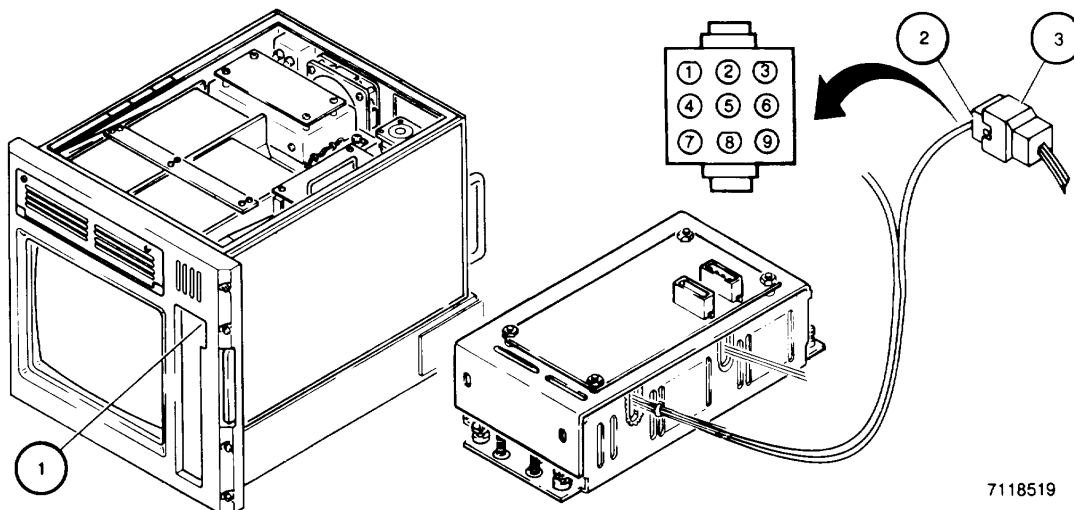
TEST**WARNING**

HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.

1. Close AC IN circuit breaker C81 (1) (push in).
2. Working at power supply wiring harness connector P4 (2) (connected to dc power cable assembly (503769-002) connector P1 (3)), check for the following voltages:

<u>Connector P4</u>	<u>Voltage</u>
Pin 4 (yellow)	-10. 8 to -13. 2 Vdc
Pins 5 and 6 (red)	+4. 5 to +5. 5 Vdc
Pin 7 (brown)	+10. 8 to +13. 3 Vdc
Pin 9 (gray)	-8. 1 to -9. 9 Vdc

3. Open AC IN circuit breaker CB1 (1) (pull out).



FOLLOW-ON MAINTENANCE: Install disk tray assembly (para 5-24).

5-40. AC POWER TEST

This task covers: **Test**

INITIAL SETUP**WARNING**

HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.

CAUTION

Do not power down the monitor while a test sequence is executing or data in Random Access Memory (RAM) may be destroyed.

NOTE

This procedure is provided to quickly check ac voltages between workstation rear panel power cable and output side of AC IN circuit breaker (CB1).

Preliminary Procedures:

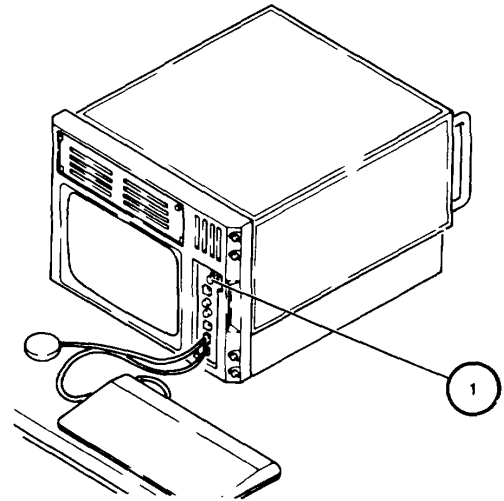
1. Remove disk tray assembly (para 5-24). (Leave disk tray assembly out of workstation until repair is complete.)
2. Perform equipment setup and power-up (para 5-5).

TEST**NOTE**

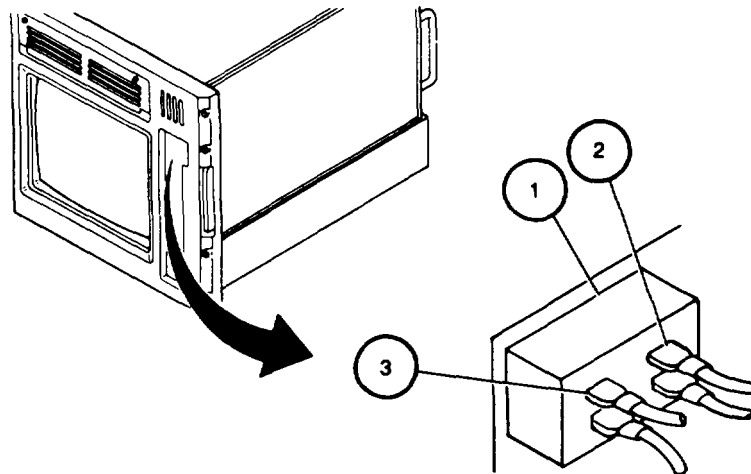
- **If workstation is already operating and all previously selected diagnostic tests are complete, go to step 2.**
- **Hard error messages are preceded by a double question mark (??).**
- **Soft error (status) messages are preceded by a single question mark (?).**

5-40. AC POWER TEST - Continued

1. Close (push in) AC IN circuit breaker CB1 (1). Observe that within approximately 3 minutes, the workstation displays test countdown (F through 1), any error messages, and the following prompt: >>>
 - a. If no ?? displayed, components checked by startup self-test are operational. Proceed to step 2.
 - b. If ?? displayed or startup self-test will not run, proceed to step 2.



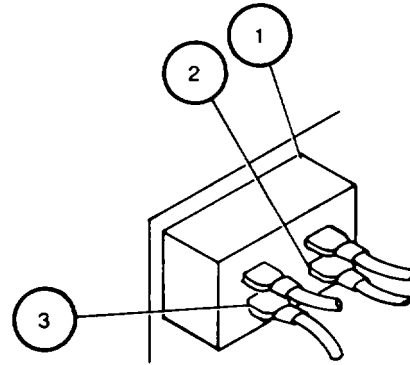
2. Working at circuit breaker CB1 (1) output terminals, check for presence of 106 to 127 Vac between CB1-1 (E5) (HOT) (2) and CB1-3 (E6) (3).
 - a. If voltage is present, ac power test is complete. Proceed to follow-on maintenance.
 - b. If voltage is not present, go to step 3.



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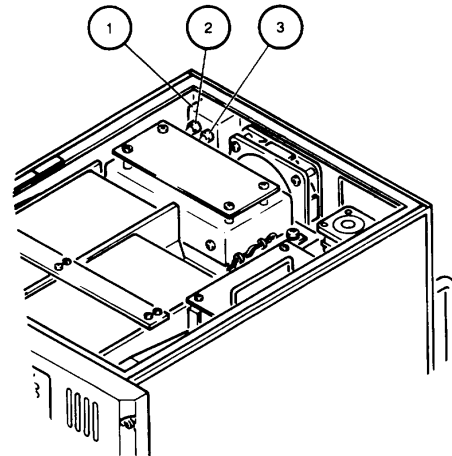
5-40. AC POWER TEST - Continued

3. Working at circuit breaker CB1 (1) input terminals, check for presence of 106 to 127 Vac between CB1-2 (E2) (HOT) (2) and CB1-4 (E4) (3).
 - a. If voltage is present, replace faulty circuit breaker CB1 (para 5-21).
 - b. If voltage is not present, go to step 4.



71181227

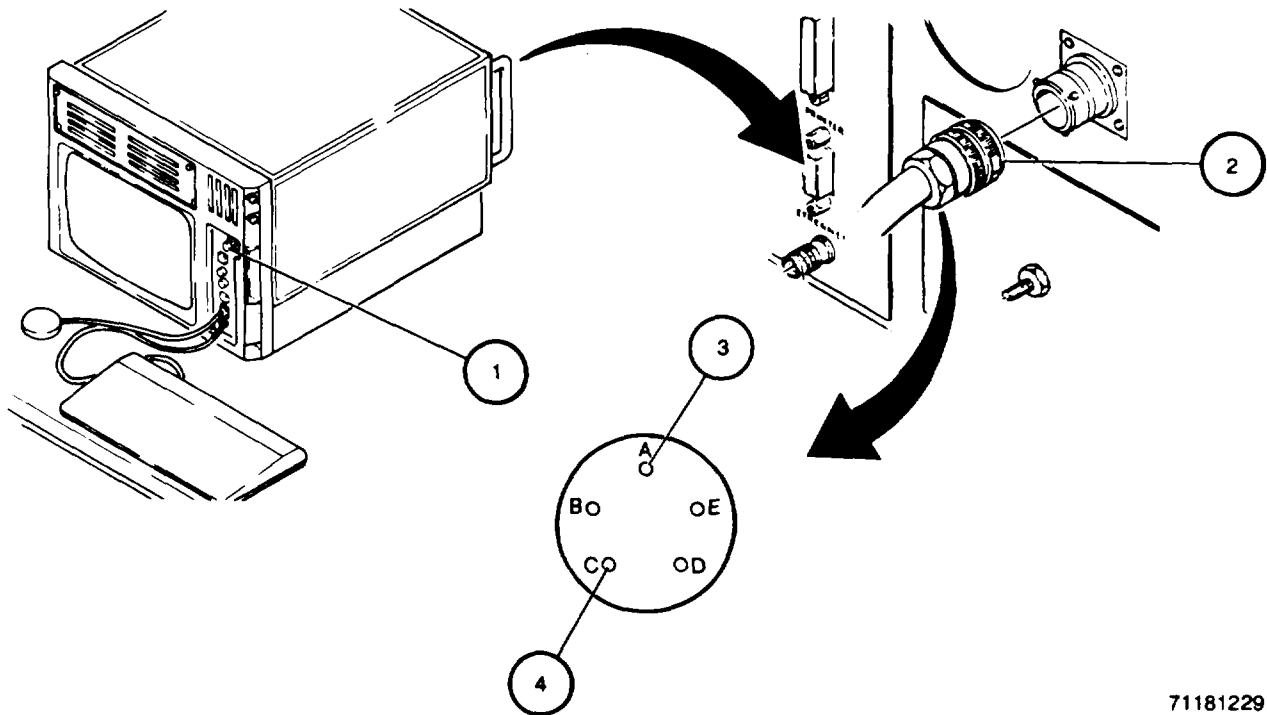
4. Working at EMI power line filter (1) output terminals, check for presence of 106 to 127 Vac between LFI-2 (WHT) (NEUT) (2) and LFI-1 (BLK)(HOT) (3).
 - a. If voltage is present, ac power harness is faulty. Refer to next higher level of maintenance.
 - b. If voltage is not present, go to step 5.



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5-40. AC POWER TEST - Continued

5. Open (pull out) AC IN circuit breaker CB1 (1). Disconnect power cable (2) from rear panel. Check for presence of 106 to 127 Vac between power cable connector pin A (HOT) (3) and pin C (GND) (4).
 - a. If voltage is present, replace faulty EMI power line filter (para 5-16).
 - b. If voltage is not present, troubleshoot power cable or power source. Refer to Chapter 8, Power Distribution Systems.



71181229

FOLLOW-ON MAINTENANCE:

1. If test completed without error, return . o troubleshooting step that directed performance of this test and continue troubleshooting.
2. If test directed replacement of an assembly, repeat ac power test (para 5-40) to verify repair. Perform diagnostic test (para 5-41).

5-41. DIAGNOSTIC TEST

 This task covers: Test

INITIAL SETUP

CAUTION

Do not power down the workstation while a test sequence is executing or data in Random Access Memory (RAM) may be destroyed.

NOTE

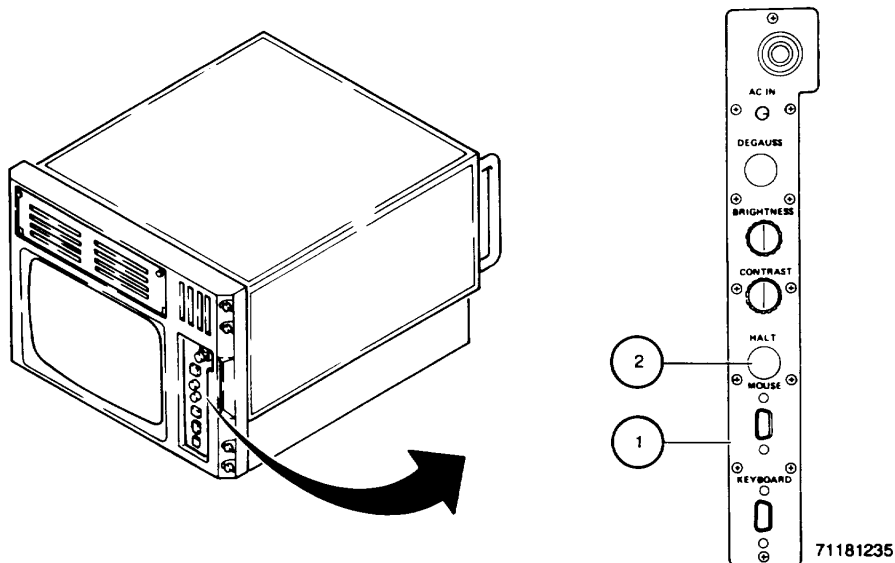
- This procedure is provided to allow the operator to select and execute Read-Only Memory (ROM)-resident diagnostic programs which more fully test workstation operation.
- Do not run diagnostic test if an operating program is running in the workstation. Perform program shutdown before proceeding. Refer to TM 11-7010-248-10.
- Technician must read the entire diagnostic test before attempting to perform it. The test generates multiple displays, many of which are software development tools that the technician does not use; therefore, no operator actions are required.

Preliminary Procedure: Perform equipment setup and power-up (para 5-5).

TEST

1. If console prompt (> > >) is not displayed, press front panel HALT switch (2) to place workstation in console mode (local). The following console prompt should appear: > > >

If prompt does not appear, refer to Table 5-2, Workstation Troubleshooting, Malfunction 20, Software Not Booting Manually or Automatically, step 2, and proceed with troubleshooting, as required.



5-41. DIAGNOSTIC TEST - Continued

NOTE

- Refer to Table 5-3, Example Test Result Features, for an explanation of diagnostic test activities.
 - Hard error messages are preceded by a double question mark (??).
 - Soft error (status) messages are preceded by a single question mark (?).
 - The instruction to type: "TEST 0 and press RETURN" in the following step means enter the word TEST, followed by the number 0 (zero), then press the RETURN key. This entry format is used with all workstation diagnostic testing.
2. Working at workstation keyboard, type: "TEST 0" and press RETURN. Observe that within approximately 15 minutes, the workstation displays a summary of diagnostic tests, any error messages, and the following prompt:
> > >
- a. If no ?? displayed, components checked by diagnostic test are operational. Test is complete.
 - b. If ?? displayed, go to step 3.

NOTE

- A consecutive series of devices may be tested with one command by entering the device identifiers for the first and last suspect device in sequence displayed.
 - The instruction to type: "TEST (device identifier hexadecimal number) and press RETURN" in the following step means enter the word TEST, followed by the hexadecimal number (F through 1), then press the RETURN key.
3. Using device test selection table (table 5-4), select test for device with '??' error indicator. Working at workstation keyboard, type: "TEST (device identifier hexadecimal number) and press RETURN".
- a. If a test is successful, no question marks (??) or error messages will be displayed, and the console prompt will reappear: > > >. Test is complete.
 - b. If a test is not successful, an error message will be displayed before the console prompt is returned. Using device mnemonics table (table 5-5), replace workstation component that testing has indicated is faulty.
4. Repeat diagnostic test after workstation component is replaced to verify repair.

5-41. DIAGNOSTIC TEST - Continued

Table 5-3. Example Test Result Features

ERROR INDICATOR	DEVICE IDENTIFIER	HEX NUMBER	DEVICE MNEMONIC	DEVICE STATUS	DECIMAL NUMBER	ELAPSED TIME
??	F	XXXX	MONO	XXXX. XXXX	XX	XXX: XX: XX
	C	XXXX	DZ	XXXX. XXXX	XX	XXX: XX: XX
	B	XXXX	MEM	XXXX. XXXX	XX	XXX: XX: XX
	7	XXXX	HDC	XXXX. XXXX	XX	XXX: XX: XX
	6	XXXX	TPC	XXXX. XXXX	XX	XXX: XX: XX
(Note 1)	4	XXXX	4PLN	XXXX. XXXX	XX	XXX: XX: XX
(Note 2)	1	XXXX	NI	XXXX. XXXX	XX	XXX: XX: XX

EXPLANATION OF TEST RESULT COLUMNS:

- Column 1: ERROR INDICATOR - If error occurs, double question mark (??) is displayed.
- Column 2: DEVICE IDENTIFIER - Hexadecimal numbers which identify devices tested. Devices are defined in device test selection table (table 5-4).
- Column 3: HEX NUMBER - Four-digit hexadecimal number; software development data only.
- Column 4: DEVICE MNEMONIC - Mnemonic symbols which identify devices tested. Devices and possible corrective actions are listed in device mnemonics table (table 5-5).
- Column 5: DEVICE STATUS - Eight-digit number field; software development data only.
- Column 6: DECIMAL NUMBER - Two-digit decimal number; software development data only.
- Column 7: ELAPSED TIME - Test elapsed time display.
- Note 1: The workstation screen will display graphics test patterns. No operator response required.
- Note 2: The workstation screen will again display graphics test patterns. The screen will then go blank for approximately 6 minutes. No operator response required.

5-41. DIAGNOSTIC TEST- Continued

Table 5-4. Device Test Selection

Identifier	Description
F	Base Video
E	System Clock
D	Nonvolatile RAM
C	Serial Line Controller
B	Memory
A	Memory Management Unit
9	Floating Point Unit
8	Interval Timer
7	Disk Controller
6	Tape Controller
5	Interrupt Controller and Thin Wire Ethernet ID ROM
4	Graphics Coprocessor
3	(not used)
2	(not used)
1	Thin Wire Ethernet Interconnect Module

Table 5-5. Device Mnemonics

MNEMONIC	DEVICE	REPLACE
MONO	Base Video	CRT (next level of maintenance)
CLK	System Clock	CPU/motherboard CCA (para 5-14)
4PLN	Graphics Coprocessor	Graphics controller CCA (para 5-13)
NVR	Nonvolatile RAM	CPU/motherboard CCA (para 5-14)
DZ	Serial Line Controller	CPU/motherboard CCA (para 5-14)
MEM	Memory	Memory CCA (para 5-12)
HDC	Disk Controller	CPU/motherboard CCA (para 5-14)
MM	Memory Management	CPU/motherboard CCA (para 5-14)
FP	Floating Point	CPU/motherboard CCA (para 5-14)
IT	Interval Timer	CPU/motherboard CCA (para 5-14)
TPC	Tape Controller	CPU/motherboard CCA (para 5-14)
NI	Ethernet Interface	Ethernet interface CCA (para 5-15)

5-42. REPLACE FRONT PANEL WIRING AND/OR CONNECTORS

This task covers: a. Removal b. Installation

INITIAL SETUP**CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

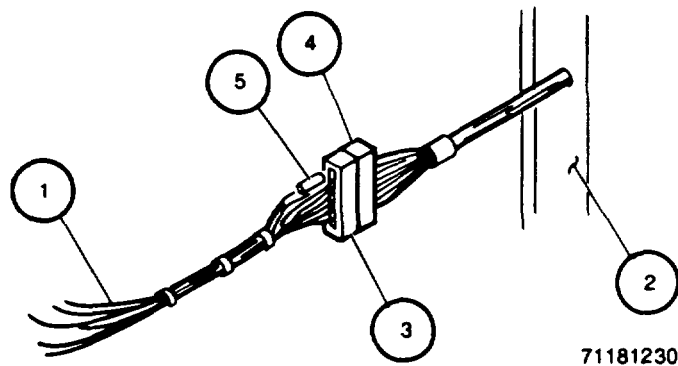
Replace front panel wiring and/or connectors for **BRIGHTNESS** control, **CONTRAST** control, **AC IN** indicator, **DEGAUSS** switch, and **HALT** switch the same way. Front panel wiring and connector for **BRIGHTNESS** and **CONTRAST** controls is shown.

Preliminary Procedures:

1. If working on either **BRIGHTNESS** or **CONTRAST** control wiring/connector, remove both controls (para 5-19).
 2. If working on **AC IN** indicator wiring/connector, remove **AC IN** indicator (para 5-17).
 3. If working on **DEGAUSS** switch wiring/connector, remove **DEGAUSS** switch (para 5-18).
 4. If working on **HALT** switch wiring/connector, remove **HALT** switch (para 5-18).
-

5-42. REPLACE FRONT PANEL WIRING AND/OR CONNECTORS - Continued**REMOVAL**

1. Pull front panel wiring (1) outward through faceplate opening (2) to access front panel wiring connector (3).
2. Disconnect front panel wiring connector (3) from associated cable assembly connector (4).
3. Tag and remove wiring (1) from front panel wiring connector (3).
4. Remove front panel wiring connector (3).
5. Inspect connector contacts (5). If bent, corroded, or otherwise damaged, cut and remove damaged contacts.

**INSTALLATION**

1. If wires (1) are damaged, obtain replacement wire of correct color and gauge.
2. Measure and cut new wire(s) (1) to replace damaged wire(s).
3. Crimp new connector contacts (5), as required, on wire (1) ends that attach to front panel wiring connector (3).
4. Form and dress wire(s) (1) that attach to front panel component.
5. Install wire(s) (1) into front panel wiring connector (3), as tagged. Remove tags.
6. Connect front panel wiring connector (3) to associated cable assembly connector (4). Place cable assembly connector (4) into chassis through faceplate opening (2).

5-42. REPLACE FRONT PANEL WIRING AND/OR CONNECTORS - Continued

FOLLOW-ON MAINTENANCE:

1. If working on either BRIGHTNESS or CONTRAST control wiring/connector, install both controls (para 5-19).
2. If working on AC IN indicator wiring/connector, install AC IN indicator (para 5-17).
3. If working on DEGAUSS switch wiring/connector, install DEGAUSS switch (para 5-18).
4. If working on HALT switch wiring/connector, install HALT switch (para 5-18).

**CHAPTER 6
TELEPHONE SET**

Para		Page
Section I	Principles of Operation	6-2
6-1	Introduction.....	6-2
6-2	Theory of Operation	6-2
Section II	Troubleshooting.....	6-4
6-3	Introduction.....	6-4
6-4	General Instructions	6-4
6-4.1	Introduction.....	6-4
6-4.2	Inspection Procedures.....	6-4
6-4.3	Troubleshooting Procedures	6-4
6-4.4	Maintenance Procedures	6-5
6-5	Equipment Setup.....	6-5
6-6	Symptom Index	6-5
6-7	Troubleshooting Table.....	6-6
Section III	Maintenance Procedures	6-10
6-8	Remove/Install Telephone Set Rear Cover.....	6-10
6-9	Replace Telephone CCA.....	6-13
6-10	Replace Alarm Unit	6-14
6-11	Replace Keyboard.....	6-15
6-12	Replace LED Assemblies DS1-DS3.....	6-16
6-13	Replace Receptacle J2	6-18
6-14	Replace Receptacle J1	6-20
6-15	Replace Resistor R1 or R2.....	6-23
6-16	Replace Switch S1 or S2.....	6-25
6-17	Replace Terminal Board TB1	6-27
6-18	Replace ADP Shelter Telephone A12 or A13	6-28
6-19	Replace OPN Shelter Telephone A12, A13, or A20.....	6-35
6-20	Replace OPN Shelter Telephone A21.....	6-38

SECTION I. PRINCIPLES OF OPERATION

6-1. INTRODUCTION

This section provides the theory of operation for the telephone sets used in the Communication System, Control Element, Central Processors AN/TYQ-30(V)1/2. The telephone sets described are TA-1041/TYQ and TA-1041A/TYQ. All descriptions apply equally to both telephone sets; the only difference between them is the placement of the handset hanger bracket.

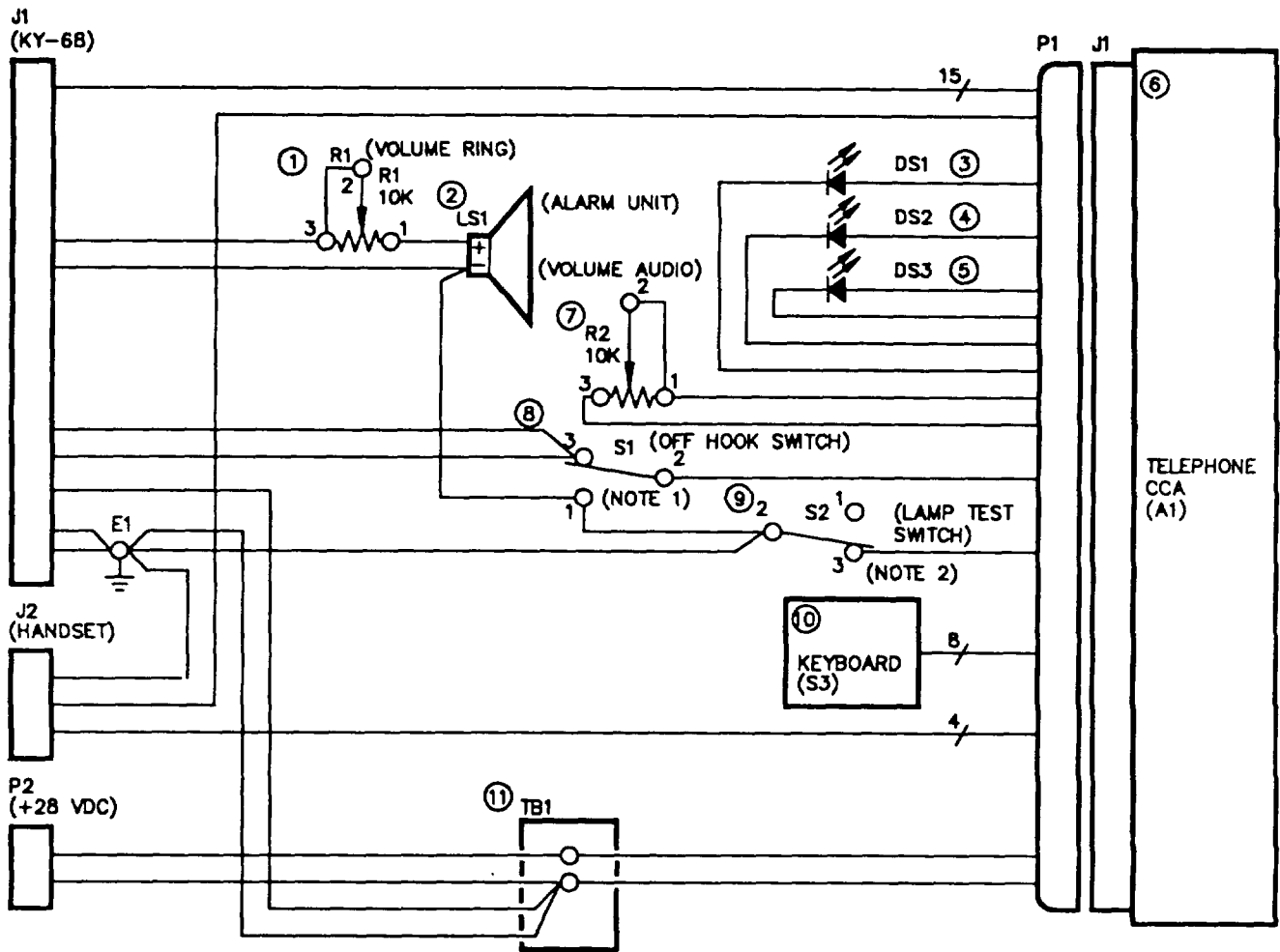
NOTE

The AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ(V)2 system, except where noted.

6-2. THEORY OF OPERATION

- | | | |
|------|---|---|
| (1) | VOLUME/RING RESISTOR R1 | Controls alarm unit volume. |
| (2) | ALARM UNIT | Provides an audible alarm when incoming call signal is received. |
| (3) | LOCAL/OFF HOOK
LED ASSEMBLY DS1 | Flashes when OFF HOOK switch (S1) set to OFF HOOK position. Constantly on when phone being used locally. |
| (4) | RING/BUSY LED
ASSEMBLY DS2 | Flashes when phone being rung in voice mode. Constantly on when associated Digital Secure Voice Terminal (DSVT) or any data device is off-hook. |
| (5) | NONSECURE WARNING (NSW)
LED ASSEMBLY DS3 | Flashes when an off-hook DSVT is operating in a non-secure mode. Constantly on if a DSVT is off-hook and has not been initialized. |
| (6) | TELEPHONE CCA (AI) | Provides all condition-sensing and control functions. |
| (7) | VOLUME/AUDIO
RESISTOR R2 | Controls headset volume. |
| (8) | OFF HOOK SWITCH S1 | Provides mode selection. |
| (9) | LAMP TEST SWITCH S2 | Controls current to circuit that tests Light Emitting Diode (LED) assemblies. |
| (10) | KEYBOARD S3 | Provides operator control of telephone functions. |
| (11) | TERMINAL BOARD TB1 | Provides hardwire connection to telephone for power cable. |

6-2. THEORY OF OPERATION - Continued



NOTES: 1 ON HOOK SWITCH POSITION SHOWN.
2 NO TEST SWITCH POSITION SHOWN.

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SECTION II. TROUBLESHOOTING

6-3. INTRODUCTION

This section provides procedures required to set up, test, and fault isolate the telephone set at the direct support maintenance level.

6-4. GENERAL INSTRUCTIONS

6-4. 1. Introduction

- a. Troubleshooting and repair should be performed only by experienced technicians who are familiar with the equipment and capable of ensuring that procedures are correctly accomplished.
- b. Maintenance personnel should read all inspection, troubleshooting, and maintenance instructions before attempting to troubleshoot or repair the equipment.

6-4. 2. Inspection Procedures

- a. Visually inspect all wiring and all electronic assemblies and their components for obvious damage. Check for open connections, shorts, burning, discoloration, brittle or cracked insulation, or charring. If damage is noted, carefully inspect related components for similar damage to help identify the cause of the damage.
- b. When removed, visually inspect all Circuit Card Assemblies (CCAs) for signs of excess heat, such as charred, burned, discolored, cracked, or broken components. Inspect all printed wire etching on CCAs for apparent breaks, cuts, nicks, or signs of lifting from the card. Inspect CCA connectors for cracked or broken insulation and for missing, loose, bent, or broken pins. Inspect contacts of CCA edge connectors to ensure that they are not broken, scratched, nicked, cut, or dirty. Clean dirty contacts.
- c. Inspect all chassis connectors for broken, scratched, dented, or damaged housings; missing hardware; and missing or damaged connector pins.
- d. Operate each switch to all positions to ensure that it operates freely and smoothly and that all contacts appear to mate when they should. Ensure that all switch detents operate positively and firmly. Inspect knobs for breaks or cracks.

6-4. 3. Troubleshooting Procedures

- a. Observe reported symptom or repeat failed diagnostic test to verify reported fault.
- b. Using symptom index (table 6-1) and troubleshooting table (table 6-2), perform steps required to isolate fault to a part or assembly and perform first specified corrective action.
- c. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- d. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action.
- e. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- f. Repeat steps d and e until telephone set is repaired or it becomes necessary to refer unit to next higher level of maintenance.

6-4. 4. Maintenance Procedures

- a. The equipment documented in this manual is typical. The equipment you are repairing may contain minor variations (location and number of cable ties, cable markers, lockwashers, etc.) which do not affect the essential procedural steps given.
- b. While performing maintenance procedures, cut and remove cable ties whenever needed. Note and record the number and location of the cable ties removed to aid installation.
- c. Bag and tag hardware (screws, washers, etc.) during removal procedures to aid installation.
- d. Tag connectors and wires during removal procedures to ensure correct reconnection.
- e. If during removal of an assembly it is observed that wires, cables, or connectors attached to that assembly are loose, reinstall or reconnect the loose item and repeat troubleshooting procedure to verify repair.

6-5. EQUIPMENT SETUP

There is no equipment setup requirement for the telephone set. The telephone set contains only one active device, the telephone CCA. Testing and fault isolation are limited to checking continuity of associated components and replacement of the telephone CCA.

6-6. SYMPTOM INDEX

The symptom index for the telephone set is provided in table 6-1. Simply check the table for the fault condition or failed diagnostic test result and go to the referenced troubleshooting procedure in Table 6-2, Telephone Set Troubleshooting.

Table 6-1. Telephone Set Symptom Index

NUMBER	SYMPTOM	PAGE
1	All LED indicators fail lamp test.....	6-7
2	One or two LED indicators fail lamp test.....	6-7
3	Alarm unit fails to signal incoming call	6-7
4	Telephone fails to perform keyboard-selected functions	6-8
5	No voice reception or sidetone on handset.....	6-8
6	LOCAL/OFF HOOK LED indicator fails to light in off-hook mode	6-9

6-7. TROUBLESHOOTING TABLE

CAUTION

- This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.
- To avoid electrical shorts or similar problems, promptly remove any hardware or other foreign matter dropped into the equipment.
- Never place spillable containers on or near the equipment.

NOTE

- When performing troubleshooting procedures, especially during electrical checks, be alert for intermittent as well as good/bad conditions.
- Be sure that plugs, jacks, cables, and integrated circuits are completely and positively engaged. When reconnecting these items, guard against bending pins and inverting or offsetting connection of unkeyed connectors.
- Instructions that refer to right, left, front, or rear are given as if viewing the telephone set from the front panel, looking toward the rear of the unit.

Troubleshooting procedures for the telephone set are provided in table 6-2. The table consists of three columns and is used as follows:

- | | | |
|----|---------------------|---|
| 1. | MALFUNCTION: | Indicates equipment fault as described in symptom index. Look in TEST OR INSPECTION column for required fault isolation steps. |
| 2. | TEST OR INSPECTION: | Indicates step(s) to be taken to isolate fault to a specific part or assembly. If equipment passes a test or inspection step, go to next step. If equipment fails a test or inspection, look in CORRECTIVE ACTION column for repair steps. |
| 3. | CORRECTIVE ACTION: | Indicates authorized adjustment or repair for an isolated fault. When action is completed, repeat action or diagnostic test that initially identified fault to confirm repair. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action. If all steps are completed and fault persists, refer equipment to next higher level of maintenance. |

6-7. TROUBLESHOOTING TABLE - Continued

Table 6-2. Telephone Set Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. ALL LED INDICATORS FAIL LAMP TEST		
Step 1.	Check telephone CCA by replacing with a known good telephone CCA (para 6-9). Replace faulty telephone CCA.	
Step 2.	Remove telephone set rear cover (para 6-8). Check that LAMP TEST switch S2 (para 1-15. 4) has continuity as follows:	
	<u>Switch Position</u>	<u>Test Points</u>
	Normal	Pins 2 and 1
	Actuated	Pins 2 and 3
	a.	Replace faulty LAMP TEST switch S2 (para 6-16).
	b.	Refer to next higher level of maintenance.
2. ONE OR TWO LED INDICATORS FAIL LAMP TEST		
Step 1.	Check LED assembly by replacing with a known good LED assembly (para 6-12). Replace faulty LED assembly.	
Step 2.	Check telephone CCA by replacing with a known good telephone CCA (para 6-9). a. Replace faulty telephone CCA. b. Refer to next higher level of maintenance.	
3. ALARM UNIT FAILS TO SIGNAL INCOMING CALL		
Step 1.	Remove telephone set rear cover (para 6-8). Tag and remove wires from resistor R1 (para 1-15. 4). Check resistor R1 resistance between pins 1 and 3 as follows:	
	<u>Control Position</u>	<u>Resistance</u>
	Fully clockwise	10. 0 to 10. 5 kilohms
	Fully counterclockwise	0 to 500 ohms
		Replace faulty resistor R1 (para 6-15).
Step 2.	Check alarm unit by replacing with a known good alarm unit (para 6-10). Replace faulty alarm unit.	

6-7. TROUBLESHOOTING TABLE - Continued

Table 6-2. Telephone Set Troubleshooting-CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION						
3. ALARM UNIT FAILS TO SIGNAL INCOMING CALL - Continued								
Step 3.	Remove telephone set rear cover (para 6-8). Check that connections to terminal board TB1 (para 1-15. 4) are clean, tight, and undamaged.	Clean, tighten, or, if required, replace terminal board TB1 (para 6-17).						
Step 4.	Remove telephone set rear cover (para 6-8). Check continuity of receptacle J1 (para 1-15. 4). Refer to interconnect diagram (FO-3).	<ul style="list-style-type: none"> a. Replace faulty receptacle J1 (para 6-14). b. Refer to next higher level of maintenance. 						
4. TELEPHONE FAILS TO PERFORM KEYBOARD-SELECTED FUNCTIONS								
Step 1.	Check telephone CCA by replacing with a known good telephone CCA (para 6-9).	Replace faulty telephone CCA.						
Step 2.	Check keyboard by replacing with a known good keyboard (para 6-11).	<ul style="list-style-type: none"> a. Replace faulty keyboard. b. Refer to next higher level of maintenance. 						
5. NO VOICE RECEPTION OR SIDETONE ON HANDSET								
Step 1.	Remove telephone set rear cover (para 6-8). Tag and remove wires from resistor R2 (para 1-15. 4). Check resistor R1 resistance between pins 1 and 3 as follows:	<table border="0"> <thead> <tr> <th><u>Control Position</u></th> <th><u>Resistance</u></th> </tr> </thead> <tbody> <tr> <td>Fully clockwise</td> <td>10. 0 to 10. 5 kilohms</td> </tr> <tr> <td>Fully counterclockwise</td> <td>0 to 500 ohms</td> </tr> </tbody> </table>	<u>Control Position</u>	<u>Resistance</u>	Fully clockwise	10. 0 to 10. 5 kilohms	Fully counterclockwise	0 to 500 ohms
<u>Control Position</u>	<u>Resistance</u>							
Fully clockwise	10. 0 to 10. 5 kilohms							
Fully counterclockwise	0 to 500 ohms							
Replace faulty resistor R2 (para 6-15).								
Step 2.	Check telephone CCA by replacing with a known good telephone CCA (para 6-9).	Replace faulty telephone CCA.						

6-7. TROUBLESHOOTING TABLE - Continued

Table 62. Telephone Set Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. NO VOICE RECEPTION OR SIDETONE ON HANDSET - Continued		
Step 3.	Remove telephone set rear cover (para 6-8). Check continuity of receptacle J1 (para 1-15. 4). Refer to interconnect diagram (FO-3).	Replace faulty receptacle J1 (para 6-14).
Step 4.	Remove telephone set rear cover (para 6-8). Check continuity of receptacle J2 (para 1-15. 4). Refer to interconnect diagram (FO-3).	<ul style="list-style-type: none"> a. Replace faulty receptacle J2 (para 6-13). b. Refer to next higher level of maintenance.
6. LOCAL/OFF HOOK LED INDICATOR FAILS TO LIGHT IN OFF-HOOK MODE		
Step 1.	Check telephone CCA by replacing with a known good telephone CCA (para 6-9).	Replace faulty telephone CCA.
Step 2.	Remove telephone set rear cover (para 6-8). Check that OFF HOOK switch S1 (para 1-15. 4) has continuity as follows:	
	<u>Switch Position</u>	<u>Test Points</u>
	Normal	Pins 2 and 1
	Actuated	Pins 2 and 3
	<ul style="list-style-type: none"> a. Replace faulty OFF HOOK switch S1 (para 6-16). b. Refer to next higher level of maintenance. 	

SECTION III. MAINTENANCE PROCEDURES

6-8. REMOVE/INSTALL TELEPHONE SET REAR COVER

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precautions:

CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

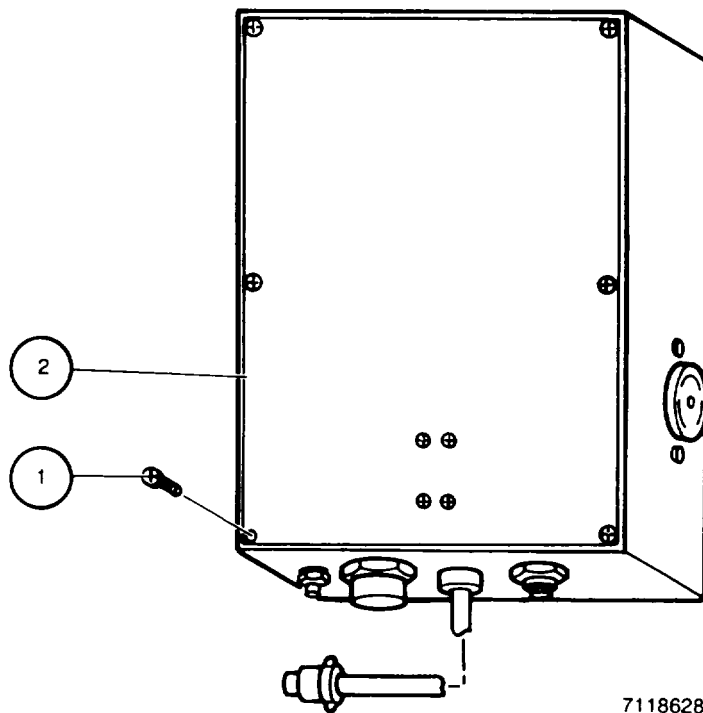
Preliminary Procedure: Remove telephone (para 6-18 through 6-20).

REMOVAL

CAUTION

Handle rear cover carefully to avoid damage to telephone circuit card assembly or attaching wires.

1. Remove six screws (1) from rear cover (2).

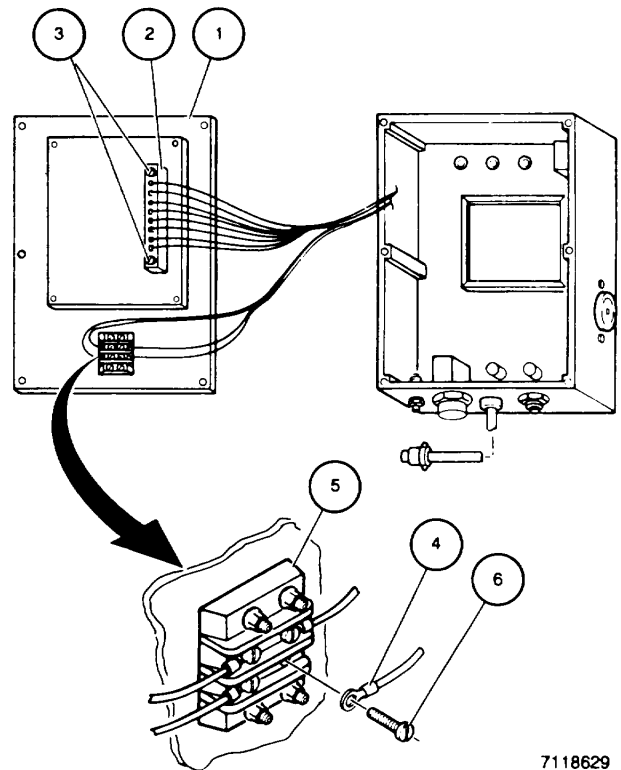


6-8. REMOVE/INSTALL TELEPHONE SET REAR COVER - Continued

CAUTION

Handle rear cover carefully to avoid damage to telephone circuit card assembly or attaching wires.

2. Carefully position rear cover (1) to access P1 (2).
3. Alternately and evenly loosen two captive screws (3) on P1 (2).
4. Disconnect P1 (2).
5. Tag six wires (4) connected to TB1 (5).
6. Remove four screws (6) and six wires (4) from TB1 (5).
7. Remove rear cover (1).



INSTALLATION

1. Position rear cover (1) so that wires (4) can be connected.
2. Using four screws (6), install six wires (4) to TB1 (5) as tagged. Remove tags.
3. Connect P1 (2).
4. Alternately and evenly tighten two captive screws (3) on P1 (2).

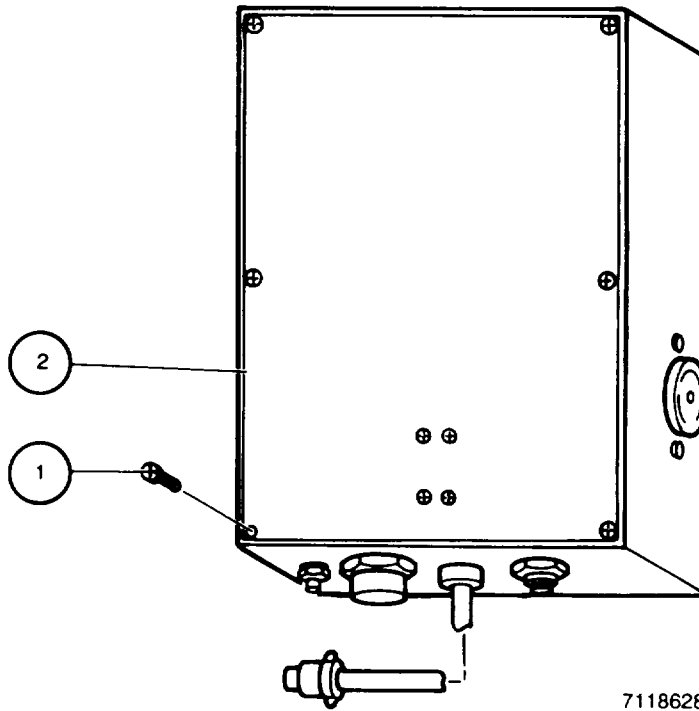
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6-8. REMOVE/INSTALL TELEPHONE SET REAR COVER - Continued

CAUTION

Handle rear cover carefully to avoid damage to telephone circuit card assembly or attaching wires.

5. Carefully place rear cover (2) in installed position.
6. Install six screws (1).



FOLLOW-ON MAINTENANCE: Install telephone (para 6-18 through 6-20).

6-10. REPLACE ALARM UNIT

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precautions:

CAUTION

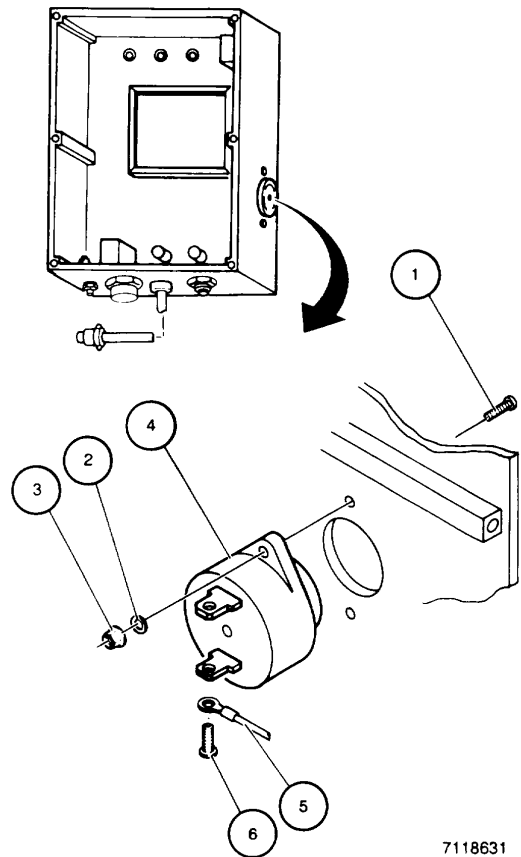
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Telephone placed on firm, clean surface.

Preliminary Procedure: Remove telephone set rear cover (para 6-8).

REMOVAL

1. Working at side panel, remove two screws (1), washers (2), and locknuts (3).
2. Position alarm unit (4) to access wires (5).
3. Tag three wires (5).
4. Remove two screws (6) and three wires (5).
5. Remove alarm unit (4).



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INSTALLATION

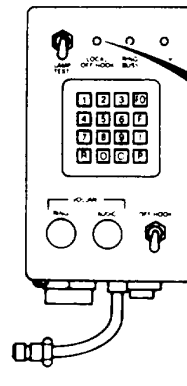
1. Using two screws (6), install three wires (5) to alarm unit (4) as tagged. Remove tags.
2. Place alarm unit (4) in installed position.
3. Install two screws (1), washers (2), and locknuts (3).

FOLLOW-ON MAINTENANCE: Install telephone set rear cover (para 6-8)

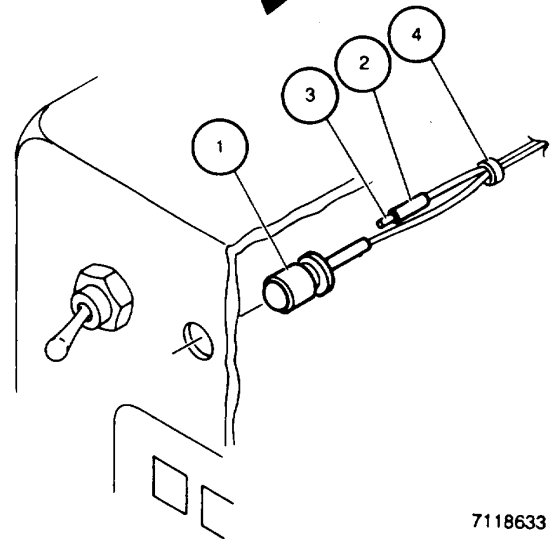
6-12. REPLACE LED ASSEMBLIES DS1-DS3 - Continued**REMOVAL****CAUTION**

An LED can easily be pulled from its lens, requiring replacement of the LED assembly. Handle associated wiring carefully to avoid damage to nearby LED assemblies.

1. Working at front panel, press and remove LED assembly (1) from rear of front panel.
2. Slide insulation sleeving (2) up wires (3) to expose solder connection, cutting and removing cable ties (4), as required.
3. Tag, unsolder, and remove two wires (3).
4. Remove LED assembly (1).

**INSTALLATION**

1. Ensure that insulation sleeving (2) is installed on two wires (3).
2. Form and dress two wires (3).
3. Solder two wires (3) to LED assembly (1) as tagged. Remove tags.
4. Position insulation sleeving (2) over solder connection.
5. Applying firm pressure on LED assembly (1), press LED assembly into rear of front panel until lens shoulder engages panel.
6. Install new cable ties (4), as required.



7118633

FOLLOW-ON MAINTENANCE: Install telephone set rear cover (para 6-8).

6-13. REPLACE RECEPTACLE J2

This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precautions:****CAUTION**

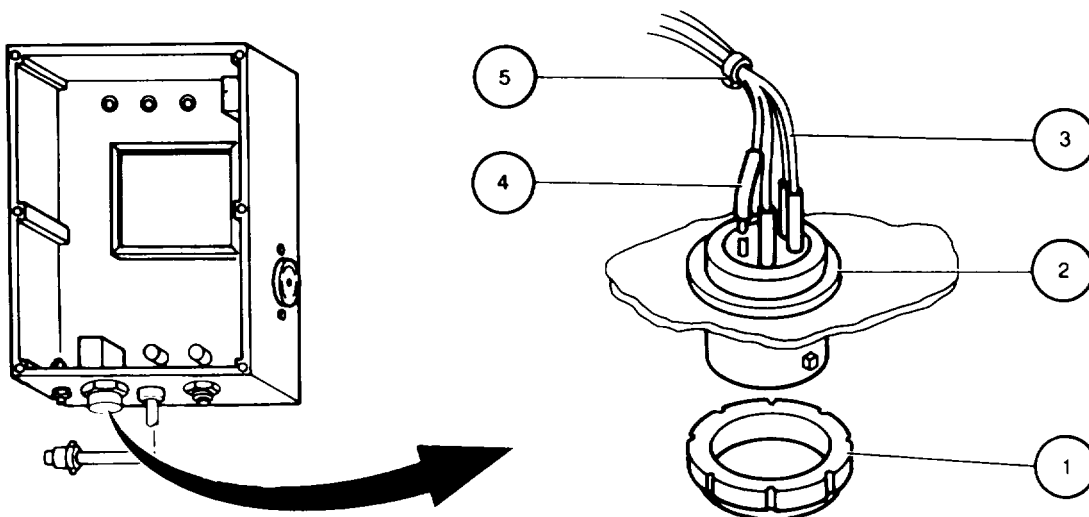
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Telephone placed on firm, clean surface.

Preliminary Procedure: Remove telephone set rear cover (para 6-8).

REMOVAL

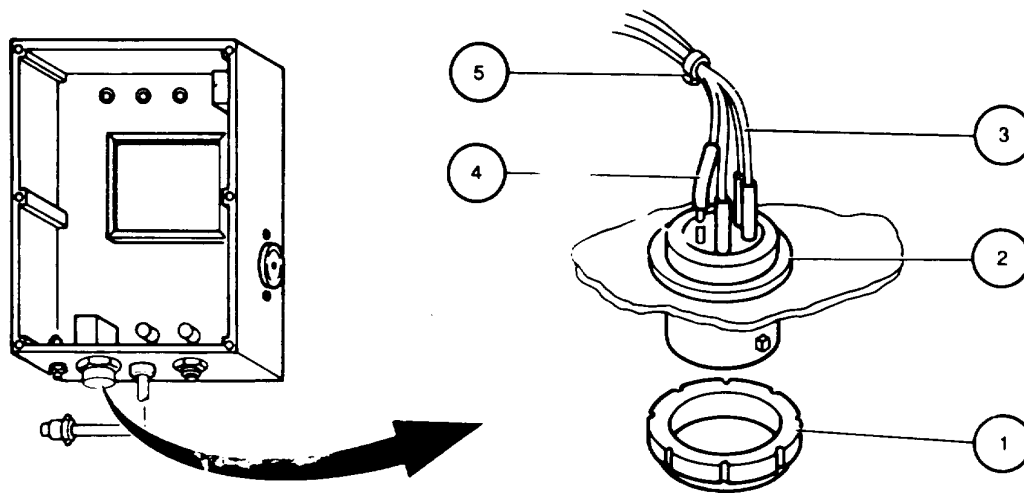
1. Working at bottom panel, remove jamnut (1) from receptacle J2 (2).
2. Position receptacle J2 (2) to access wires (3).
3. Slide insulation sleeving (4) up wires (3) to expose solder connection, cutting and removing cable ties (5), as required.
4. Tag, unsolder, and remove six wires (3).
5. Remove receptacle J2 (2).



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6-13. REPLACE RECEPTACLE J2 - Continued**INSTALLATION**

1. Ensure that insulation sleeving (4) is installed on six wires (3).
2. Form and dress six wires (3).
3. Solder six wires (3) to receptacle J2 (2) as tagged. Remove tags.
4. Position insulation sleeving (4) over solder connection.
5. Place receptacle J2 (2) in installed position.
6. Install jamnut (1).
7. Install cable ties (5), as required.

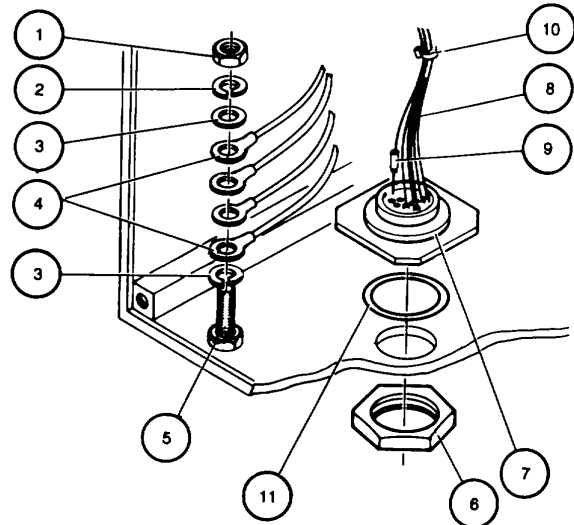
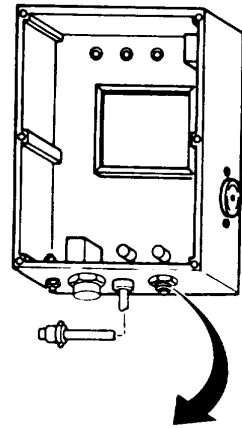


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FOLLOW-ON MAINTENANCE: Install telephone set rear cover (para 6-8).

6-14. REPLACE RECEPTACLE J1 - Continued

3. Working inside front panel, remove nut (1), lockwasher (2), two washers (3), and five terminal lugs (4) from ground terminal (5).
4. Working at bottom panel, remove jamnut (6) from receptacle J1 (7).
5. Position receptacle J1 (7) to access 22 wires (8).
6. Slide insulation sleeving (9) up wires (8) to expose connection, cutting and removing cable ties (10), as required.
7. Tag and remove all wires (8) from receptacle J1 (7).
8. Remove receptacle J1 (7) with O-ring (11) which may be seated in J1.



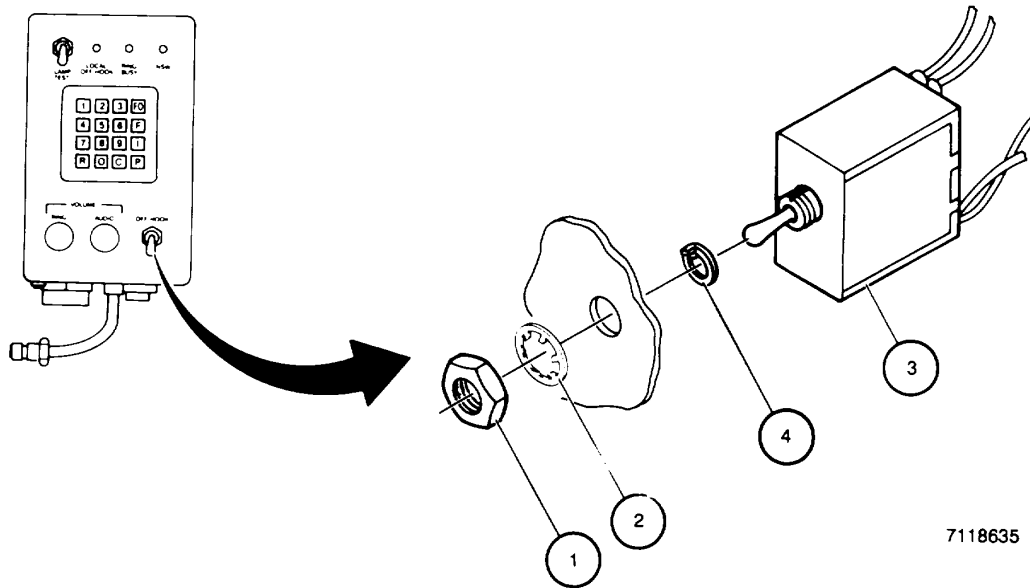
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INSTALLATION

1. Ensure that insulation sleeving (9) is installed on 22 wires (8).
2. Install 22 wires (8) to receptacle J1 (7) as tagged. Remove tags.
3. Position insulation sleeving (9) over connection.
4. Place receptacle J1 (7) in installed position, seating O-ring (11) in J1 as required.
5. Install jamnut (6).
6. Install cable ties (10), as required.
7. Install nut (1), lockwasher (2), two washers (3), and five terminal lugs (4) on ground terminal (5).

6-14. REPLACE RECEPTACLE J1 - Continued

8. Place lockring (4) and switch S1 (3) in installed position.
9. Working at front panel, install nut (1) and internal tooth lockwasher (2).



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FOLLOW-ON MAINTENANCE: Install telephone set rear cover (para 6-8).

6-15. REPLACE RESISTOR R1 OR R2

This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precautions:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

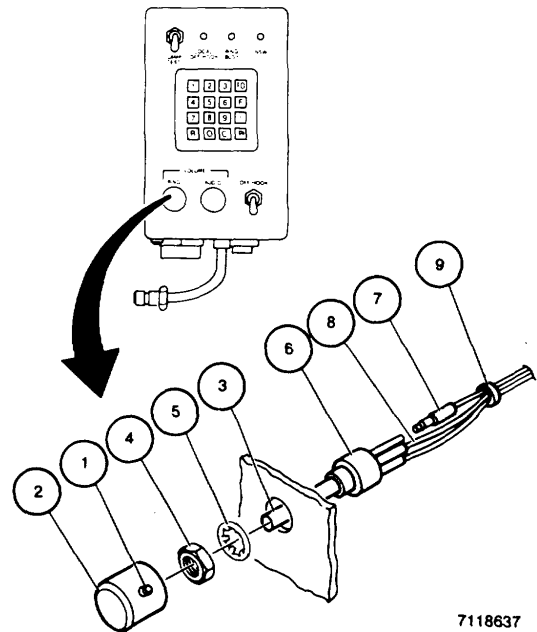
Replace resistor R1 or R2 the same way. Resistor R1 is shown.

Equipment Configuration: Telephone placed on firm, clean surface.

Preliminary Procedure: Remove telephone set rear cover (para 6-8).

REMOVAL

1. Working at front panel, loosen two setscrews (1) on knob (2).
2. Remove knob (2) from shaft (3).
3. Remove nut (4) and internal tooth lockwasher (5) from resistor R1 (6).
4. Remove resistor R1 (6) from rear of front panel.
5. Slide insulation sleeving (7) up wires (8) to expose connection, cutting and removing cable ties (9), as required.
6. Tag, unsolder, and remove three wires (8).
7. Remove resistor R1 (6).

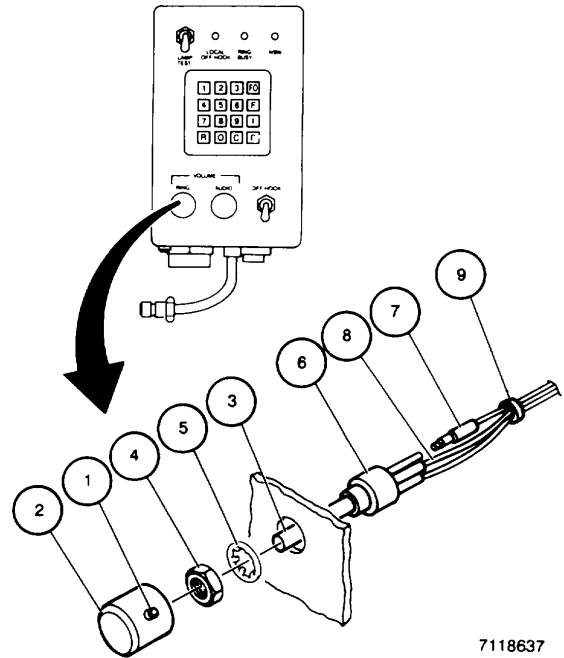


7118637

6-15. REPLACE RESISTOR R1 OR R2 - Continued

INSTALLATION

1. Ensure that insulation sleeving (7) is installed on three wires (8).
2. Form and dress three wires (8).
3. Solder three wires (8) to resistor R1 (6) as tagged. Remove tags.
4. Position insulation sleeving (7) over solder connection.
5. Install cable ties (9), as required.
6. Place resistor R1 (6) in installed position.
7. Working at front panel, install nut (4) and internal tooth lockwasher (5).
8. Install knob (2) on shaft (3).
9. Tighten two setscrews (1).



7118637

FOLLOW-ON MAINTENANCE: Install telephone set rear cover (para 6-8).

6-16. REPLACE SWITCH S1 OR S2

This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precautions:****CAUTION**

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

NOTE

Replace switch S1 or S2 the same way. Switch S1 is shown.

Equipment Configuration: Telephone placed on firm, clean surface.

Preliminary Procedure: Remove telephone set rear cover (para 6-8).

6-16. REPLACE SWITCH S1 OR S2- Continued**REMOVAL**

1. Working at front panel, remove nut (1) and internal tooth lockwasher (2) from switch S1 (3).
2. Remove switch S1 (3) and lockring (4) from rear of front panel and position to access wires (5).
3. Tag wires (5).

NOTE

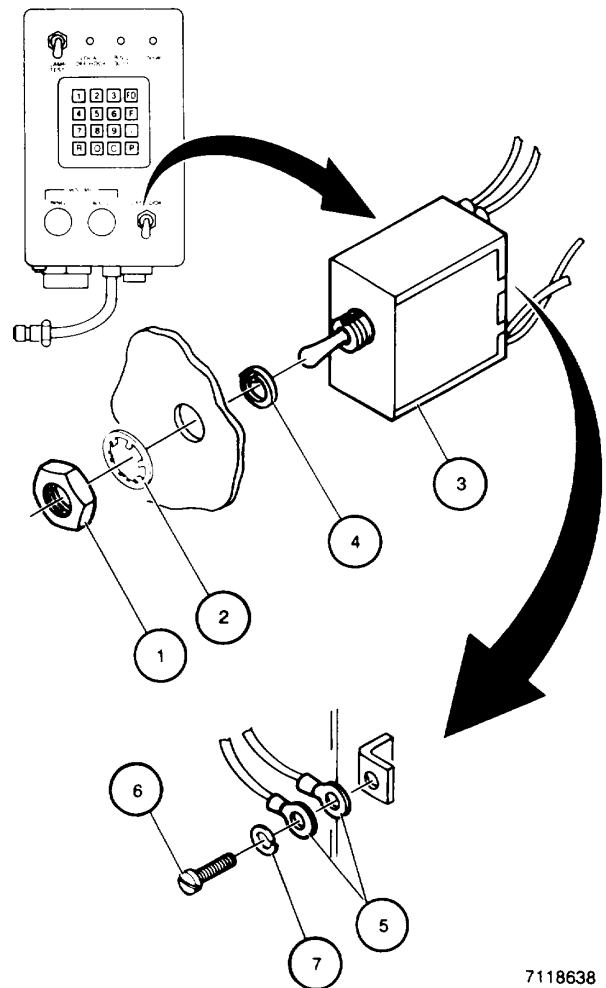
Switch S2 has three wires secured by two screws and lockwashers.

4. Remove three screws (6), lockwashers (7), and five wires (5) from switch S1 (3).
5. Remove switch S1 (3).

INSTALLATION**NOTE**

Switch S2 has three wires secured by two screws and lockwashers.

1. Using three screws (6) and lockwashers (7), install five wires (5) to switch S1 (3) as tagged. Remove tags.
2. Place lockring (4) and switch S1 (3) in installed position.
3. Working at front panel, install nut (1) and internal tooth lockwasher (2).



7118638

FOLLOW-ON MAINTENANCE: Install telephone set rear cover (para 6-8).

6-17. REPLACE TERMINAL BOARD TB1

 This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precautions:****CAUTION**

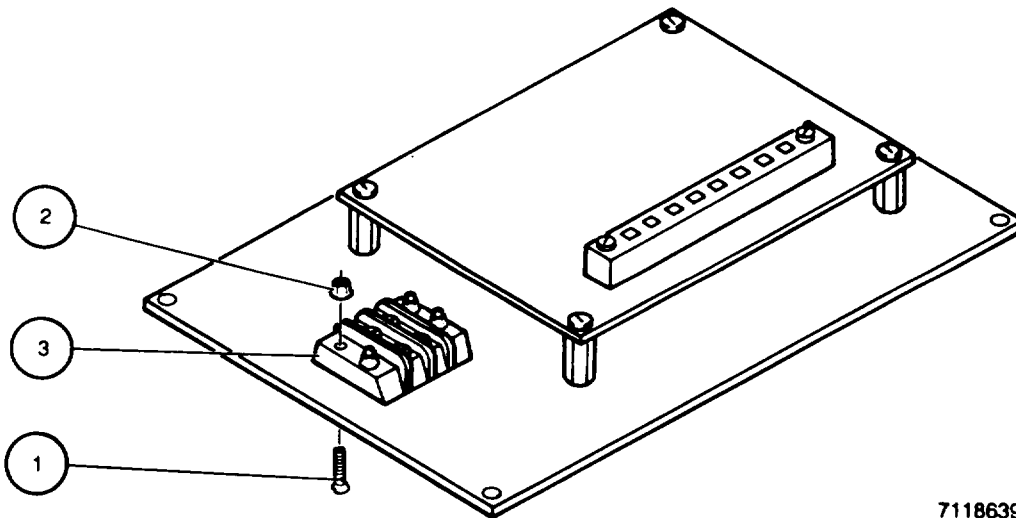
This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.

Equipment Configuration: Telephone placed on firm, clean surface.

Preliminary Procedure: Remove telephone set rear cover (para 6-8).

REMOVAL

1. Working at rear cover, remove four screws (1) and locknuts (2).
2. Remove TB1 (3).



7118639

INSTALLATION

1. Place TB1 (3) in installed position.
2. Install four screws (1) and locknuts (2).

FOLLOW-ON MAINTENANCE: Install telephone set rear cover (para 6-8).

6-18. REPLACE ADP SHELTER TELEPHONE A12 OR A13

This task covers:

a. Removal

b. Installation

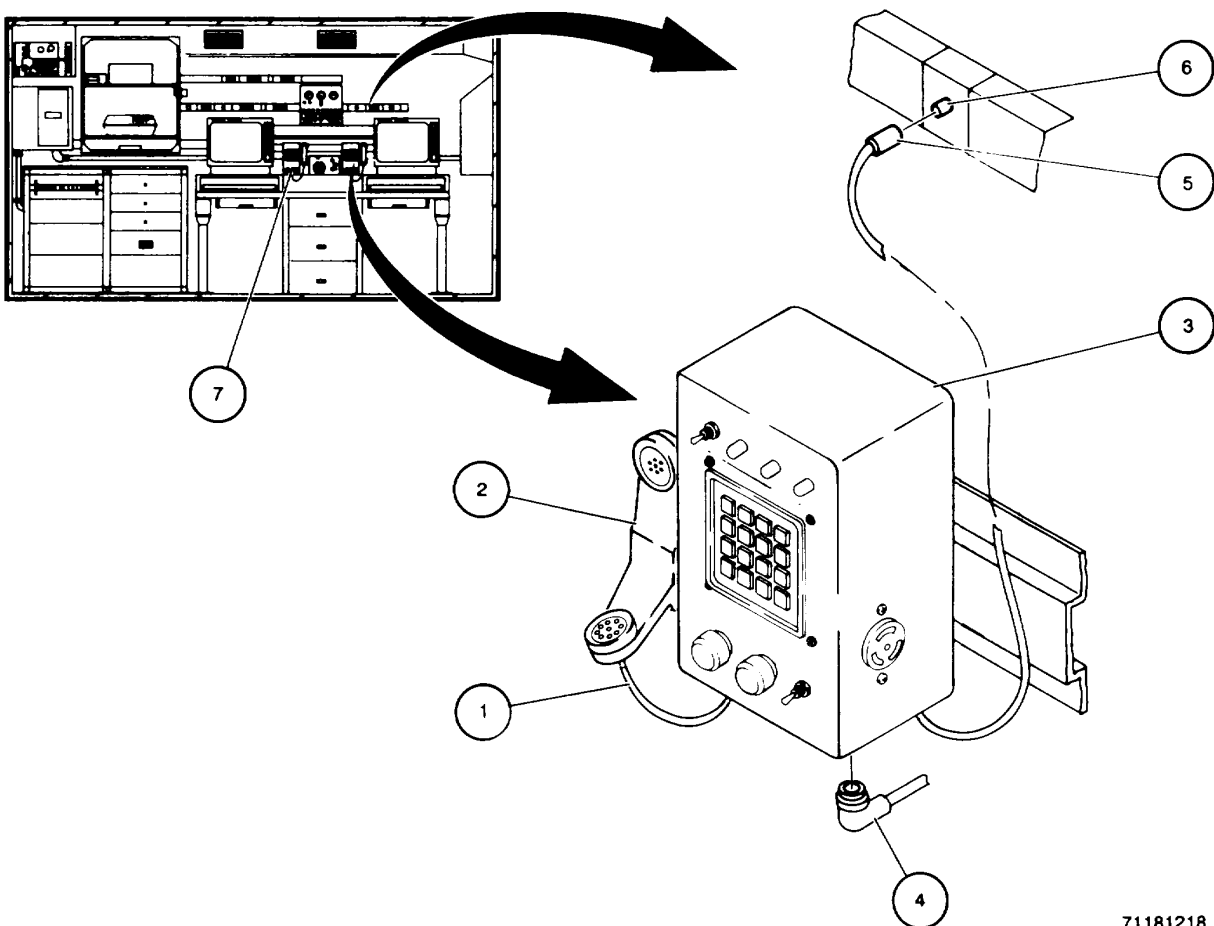
INITIAL SETUP

NOTE

Replacement of telephone set A12 (left) and A13 (right) is the same, except where noted. Telephone set A13 is shown.

REMOVAL

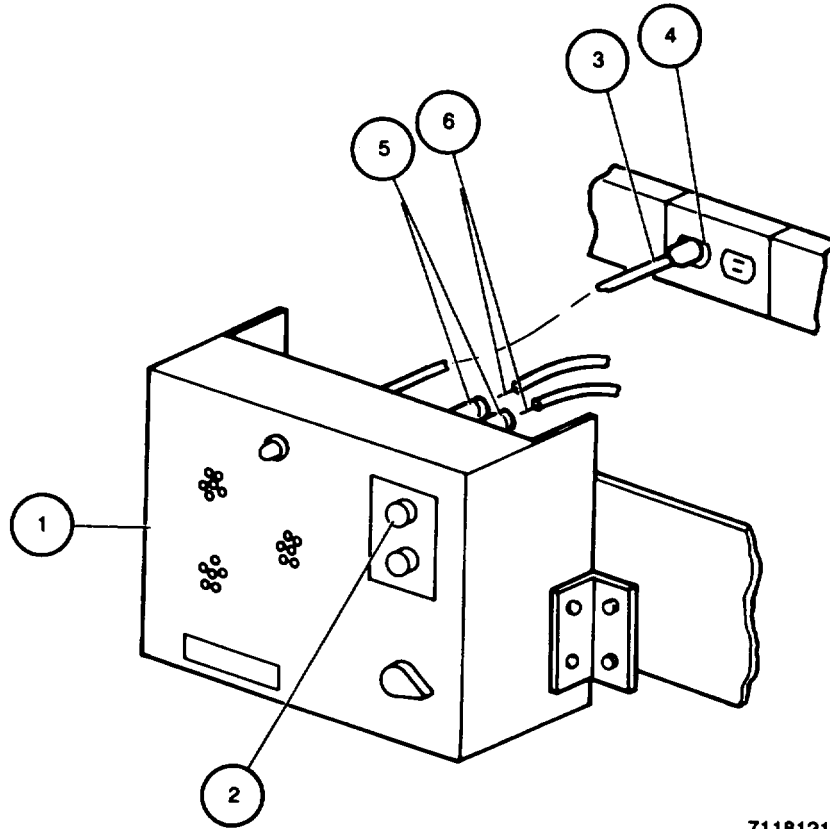
1. Disconnect handset cable (1) and remove handset (2) from right telephone (3).
2. Disconnect signal cable (4) from right telephone (3).
3. Disconnect right telephone (3) power cable (5) from dc power receptacle (6).
4. Repeat steps 1 through 3 for left telephone (7).



71181218

6-18. REPLACE ADP SHELTER TELEPHONE A12 OR A13 - Continued

5. Working at intercom (1), turn SEND ON/OFF control (2) to OFF (fully counterclockwise).
6. Disconnect intercom (1) power cable (3) from ac power receptacle (4).
7. Working at intercom (1), press two binding posts (5) and remove two wires (6). Tag two wires (6).



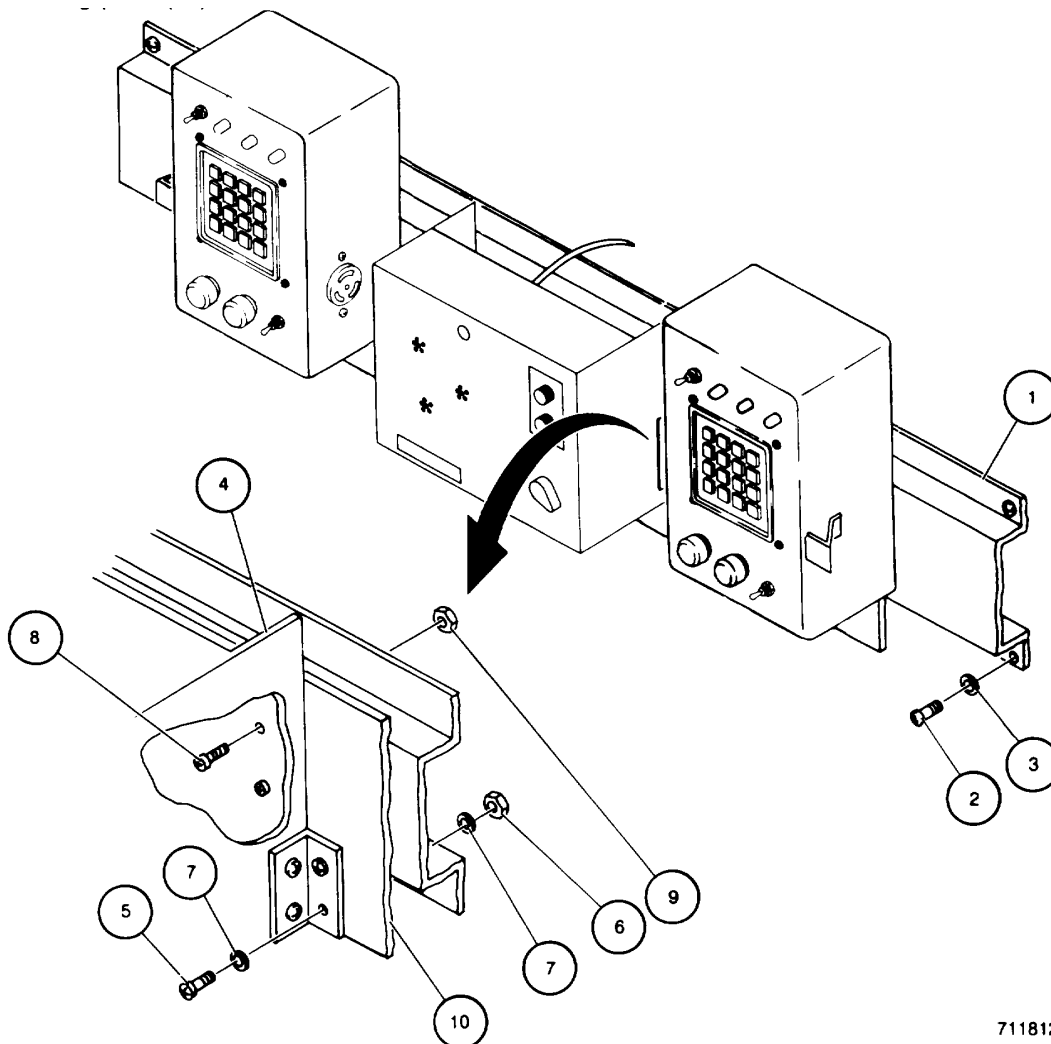
71181219

6-18. REPLACE ADP SHELTER TELEPHONE A12 OR A13 - Continued

NOTE

Right and left telephone sets and intercom are all secured to a single wall-mounting bracket.

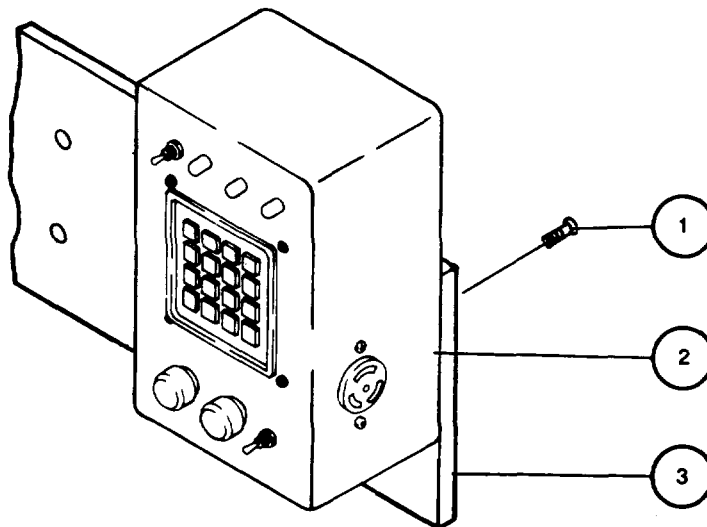
8. While supporting wall-mounting bracket (1), remove two screws (2) and washers (3) from each end of mounting bracket (right end shown).
9. Position assembly to access rear of wall-mounting bracket (1).
10. Working at intercom (4), remove four screws (5), four locknuts (6), and eight washers (7) (right side shown).
11. Remove intercom (4).
12. Remove four screws (8) and locknuts (9) and remove wall-mounting bracket (1) from telephone mounting plate (10).



71181220

6-18. REPLACE ADP SHELTER TELEPHONE A12 OR A13 - Continued

13. Remove four screws (1) and telephone (2) from telephone mounting plate (3) (right telephone shown).



71181221

INSTALLATION

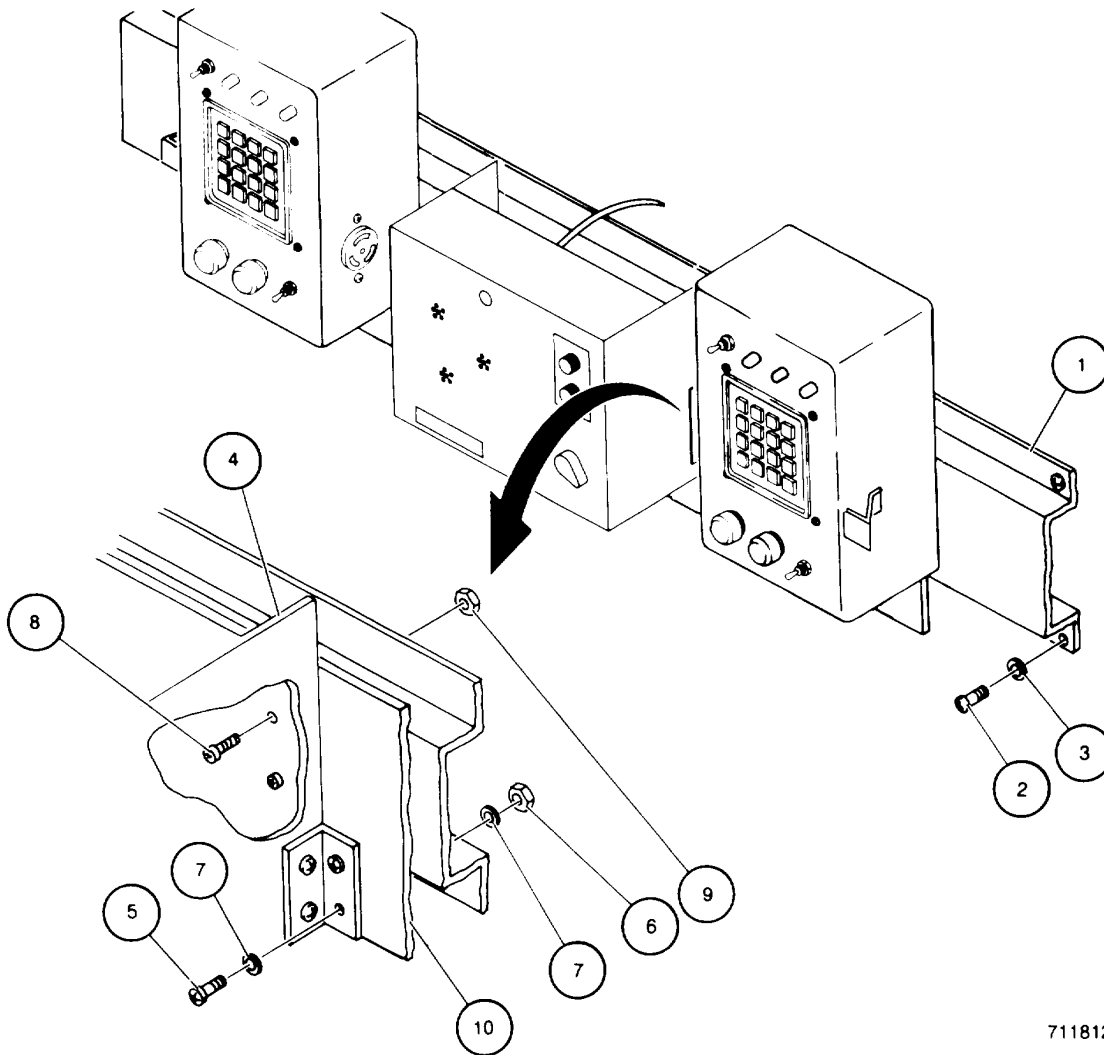
1. Position telephone (2) on telephone mounting plate (3) (right telephone shown).
2. Install four screws (1).

6-18. REPLACE ADP SHELTER TELEPHONE A12 OR A13 - Continued

NOTE

Right and left telephone sets and intercom are all secured to a single wall-mounting bracket.

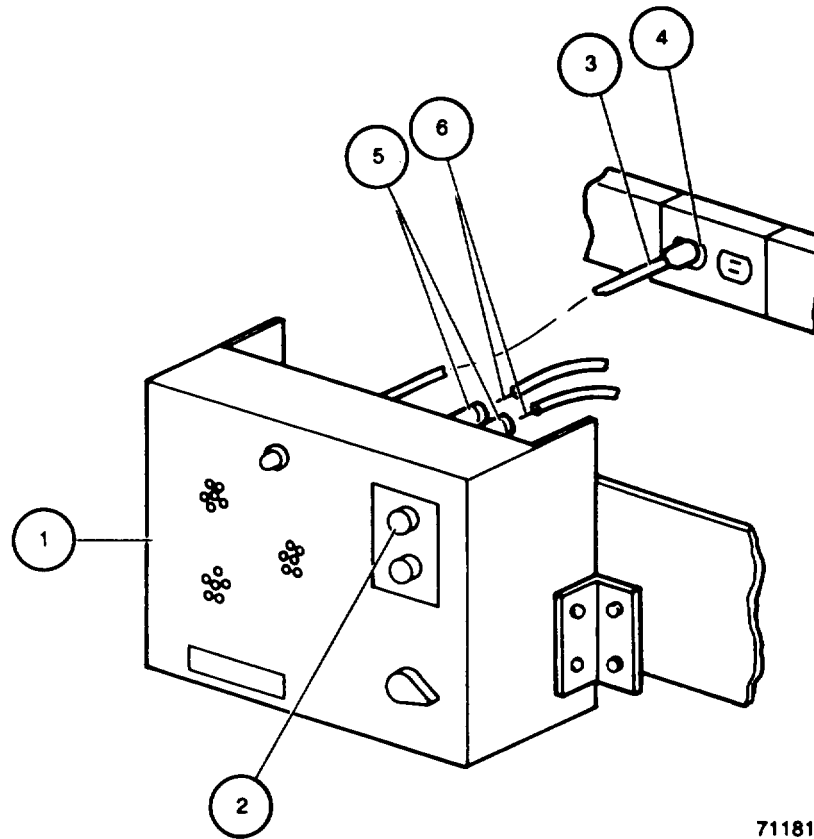
3. Position wall-mounting bracket (1) on telephone mounting plate (10) (with both telephones attached).
4. Install four screws (8) and locknuts (9).
5. Place intercom (4) in installed position.
6. Install four screws (5), four locknuts (6), and eight washers (7) (right side shown).
7. Place and hold wall-mounting bracket (1) in installed position (with both telephones and intercom attached).
8. Install two screws (2) and washers (3) at each end of mounting bracket (1) (right end shown).



71181220

6-18. REPLACE ADP SHELTER TELEPHONE A12 OR A13- Continued

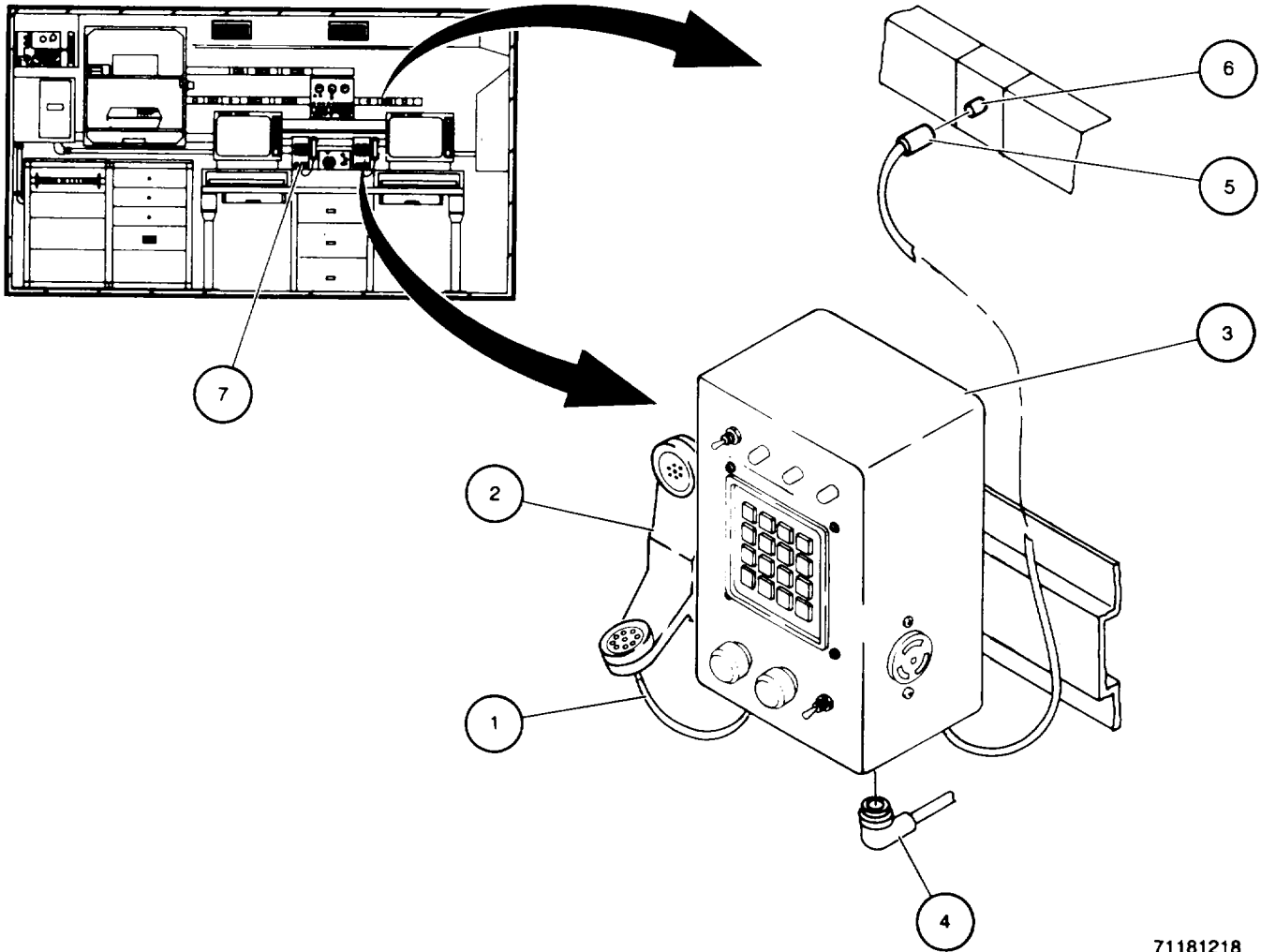
9. Working at intercom (1), press and hold two binding posts (5) and install two wires (6), as tagged. Remove tags.
10. Ensure that SEND ON/OFF control (2) is turned to OFF (fully counterclockwise).
11. Connect intercom (1) power cable (3) to ac power receptacle (4).



71181219

6-18. REPLACE ADP SHELTER TELEPHONE A12 OR A13 - Continued

12. Connect signal cable (4) to right telephone (3).
13. Connect right telephone (3) power cable (5) to dc power receptacle (6).
14. Connect handset cable (1) and hang handset (2) on right telephone (3).
15. Repeat steps 12 through 14 for left telephone (7).



71181218

6-19. REPLACE OPN SHELTER TELEPHONE A12, A13, OR A20

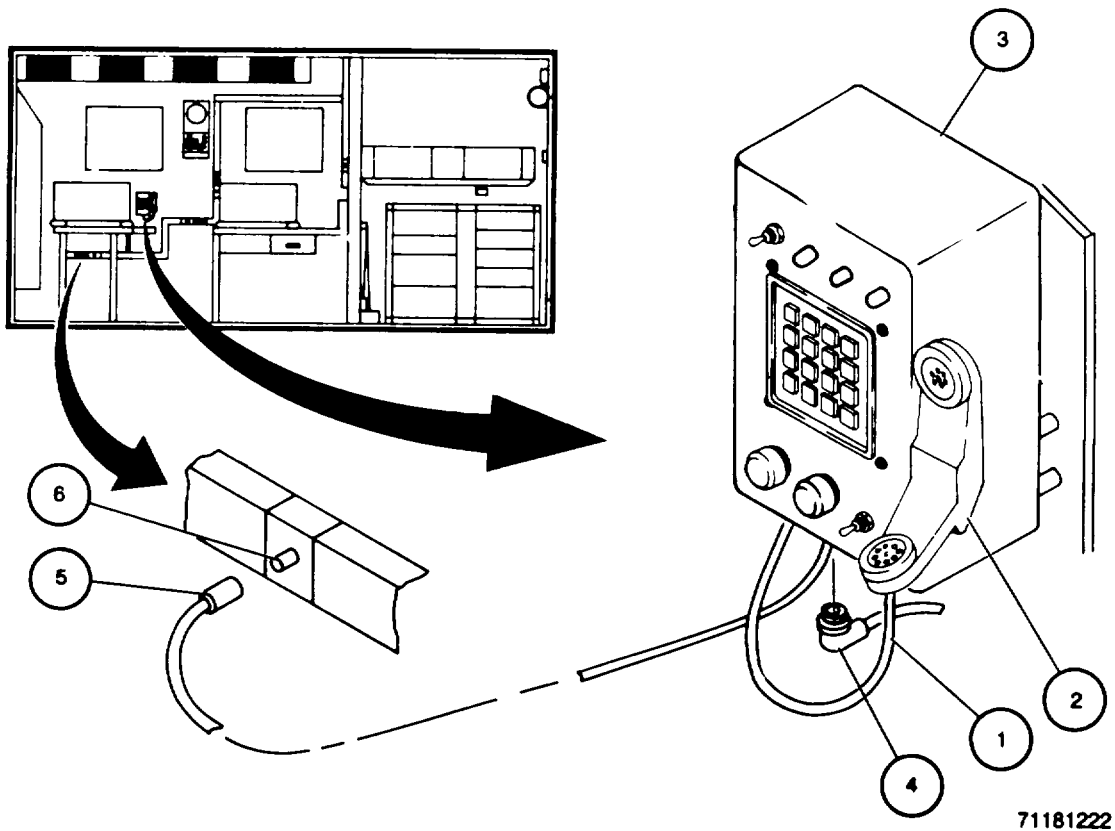
This task covers:**a. Removal****b. Installation**

INITIAL SETUP**NOTE**

Replacement of telephone set A12, A13, and A20 is the same, except where noted.
Telephone set A20 is shown.

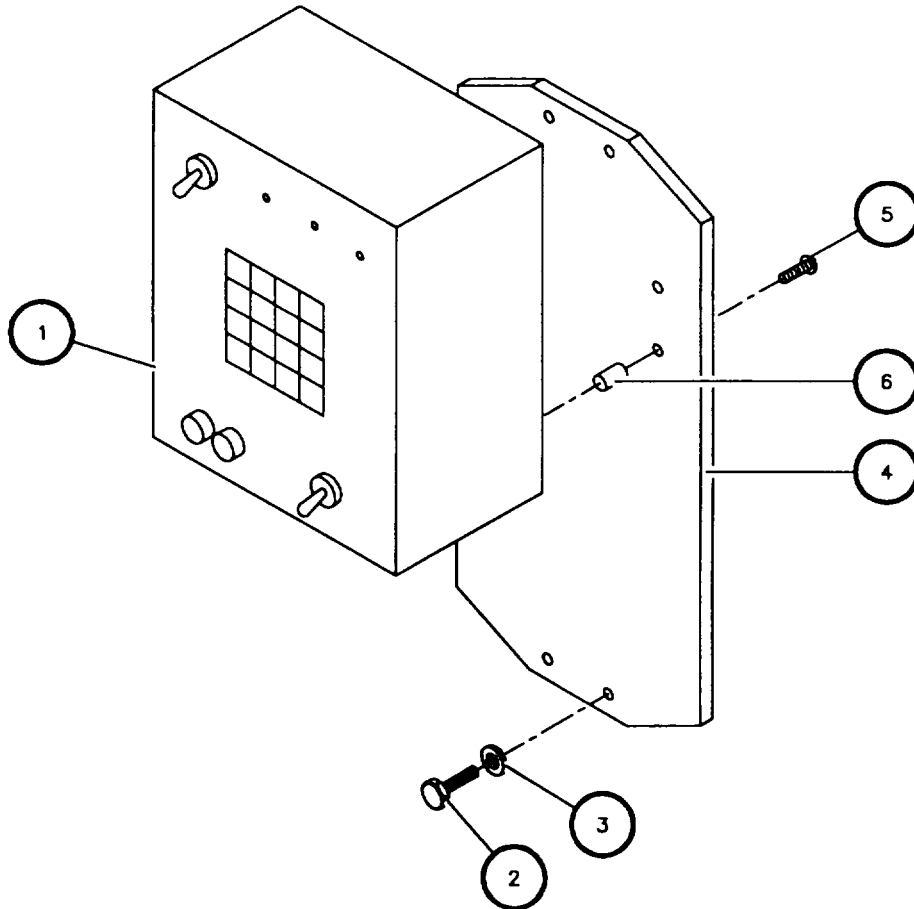
REMOVAL

1. Disconnect handset cable (1) and remove handset (2) from telephone (3).
2. Disconnect signal cable (4).
3. Disconnect telephone power cable (5) from dc power receptacle (6) (A13 and A20: under workstation table).



6-19. REPLACE OPN SHELTER TELEPHONE A12, A13, OR A20 - Continued

4. While supporting telephone (1), remove four bolts (2) and washers (3).
5. Remove telephone (1) with mounting plate attached (4).
6. Remove four screws (5), four spacers (6), and mounting plate (4) from telephone (1).



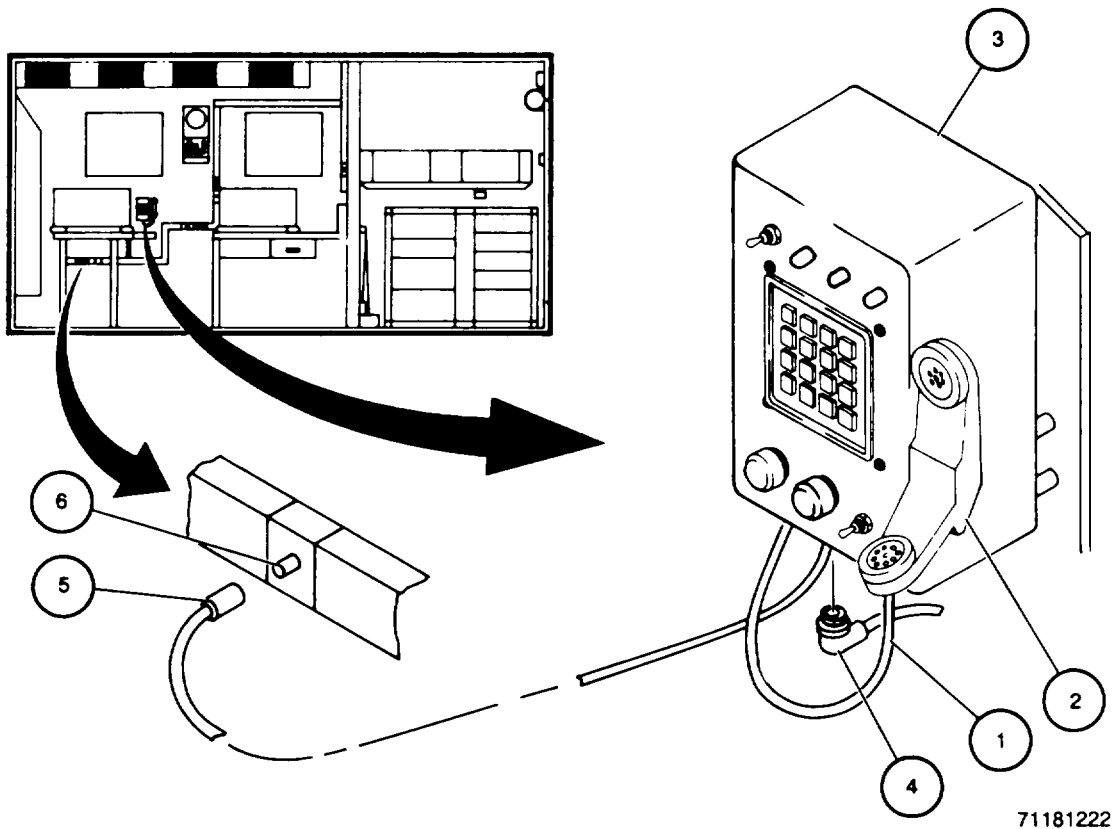
71181092

INSTALLATION

1. Secure mounting plate (4) to telephone (1) using four screws (5) and spacers (6).
2. Place and hold telephone (1) (with mounting plate attached) in installed position.
3. Install four bolts (2) and washers (3).

6-19. REPLACE OPEN SHELTER TELEPHONE A12, A13, OR A20 - Continued

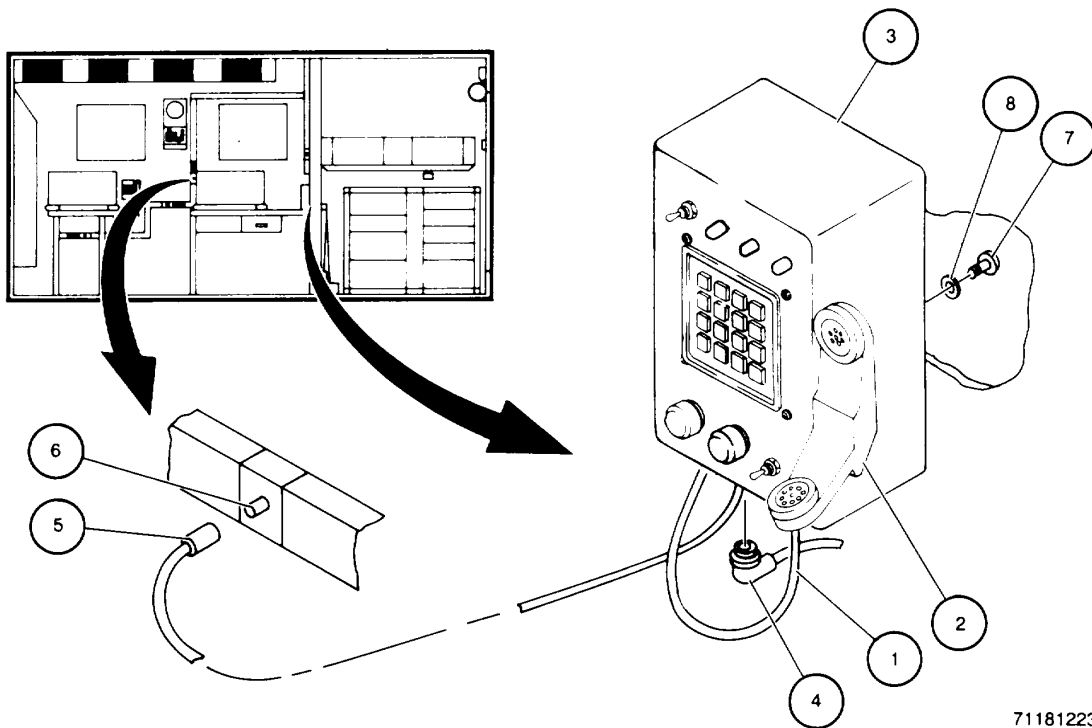
4. Connect signal cable (4).
5. Connect telephone power cable (5) to dc power receptacle (6).
6. Connect handset cable (1) and hang handset (2) on telephone (3).



71181222

6-20. REPLACE OPN SHELTER TELEPHONE A21**This task covers:****a. Removal****b. Installation****REMOVAL**

1. Disconnect handset cable (1) and remove handset (2) from telephone (3).
2. Disconnect signal cable (4).
3. Disconnect telephone power cable (5) from dc power receptacle (6) (behind workstation).
4. Remove four screws (7) and washers (8).
5. Remove telephone (3).



71181223

INSTALLATION

1. Place and hold telephone (3) in installed position.
2. Install four screws (7) and washers (8).
3. Connect handset cable (1) and hang handset (2) on telephone (3).
4. Connect telephone power cable (5) to dc power receptacle (6).
5. Connect signal cable (4).

CHAPTER 7 UNINTERRUPTIBLE POWER SOURCE

Para		Page
Section I	Principles of Operation	7-2
7-1	Introduction.....	7-2
7-2	Theory of Operation	7-2
7-2.1	UPS System Description	7-2
7-2.2	UPS Control Assembly Description.....	7-4
7-2.3	UPS Input Assembly Description	7-6
7-2.4	UPS Battery Assembly Description.....	7-8
Section II	Troubleshooting.....	7-9
7-3	Introduction.....	7-9
7-4	General Instructions	7-9
7-4.1	Introduction.....	7-9
7-4.2	Inspection Procedures.....	7-9
7-4.3	Troubleshooting Procedures	7-9
7-4.4	Maintenance Procedures	7-10
7-5	Equipment Setup.....	7-10
7-6	Symptom Index	7-13
7-7	Troubleshooting Table.....	7-13
Section III	Maintenance Procedures	7-24
7-8	Replace UPS Control Assembly.....	7-24
7-9	Remove/Install Control Assembly Top Cover.....	7-29
7-10	Replace Control Assembly Oscillator CCA	7-34
7-11	Replace Control Assembly Signal Control CCA.....	7-35
7-12	Replace Control Assembly Meter Module	7-36
7-13	Replace Control Assembly Adapter/Interface CCA.....	7-38
7-14	Replace Control Assembly Power Control CCA.....	7-41
7-15	Replace Control Assembly Display CCA.....	7-42
7-16	Replace Control Assembly Bypass Relay K1.....	7-43
7-17	Replace Control Assembly Cable Connectors J1-J15	7-44
7-18	Replace Control Assembly BATTERY Circuit Breaker CB1	7-46
7-19	Replace Control Assembly Fuse/Fuseholder.....	7-49
7-20	Replace Control Assembly 50HZ/60HZ Select Switch Assembly	7-50
7-21	Replace Input, Inverter, or Battery Assembly.....	7-51
7-22	Remove/Install Input, Inverter, or Battery Assembly Top Cover	7-54
7-23	Replace Input Assembly Rear Panel Cable Connectors J1-J4.....	7-57
7-24	Replace Input Assembly Circuit Breaker CB1.....	7-58
7-25	Replace Input Assembly EMI Filters EMI-1, EMI-2, and EMI-3.....	7-60
7-26	Replace Input Assembly Terminal Board TB1	7-61
7-27	Replace Input Assembly Capacitors C1-C3.....	7-62
7-28	Replace Battery Assembly Fuse/Fuseholder	7-63
7-29	Replace Battery Assembly Batteries BA1-BA8	7-67
7-30	Replace Battery Assembly Rear Panel Cable Connector J1	7-71
7-31	Replace Battery Assembly BATTERY SWITCH	7-74

7-32	Replacing Battery Assembly Cables	7-77
7-33	Repair Power Pack Interconnect Cable Set W506-W520	7-80
7-34	Test Input Assembly	7-82
7-35	Test Battery Assembly	7-86
7-36	Remove/Install Inverter Assembly Rear Amplifier Module	7-88
7-37	Replace Inverter Assembly Fuse/Fuseholder	7-94
7-38	Replace Inverter Assembly Rear Panel Connectors J1-J4	7-95
7-39	Replace Inverter Assembly Bypass Indicator CCA A1	7-96
7-40	Replace Inverter Assembly Rear Fan Assembly A2	7-97
7-41	Replace Inverter Assembly Front Fan Assembly A3	7-98
7-42	Replace Inverter Assembly Output Transformer T1	7-105

SECTION I. PRINCIPLES OF OPERATION

7-1. INTRODUCTION

This section provides the theory of operation for the Uninterruptible Power Source (UPS) used in the Communications System, Control Element, Central Processors AN/TYQ-30(V)1/2

NOTE

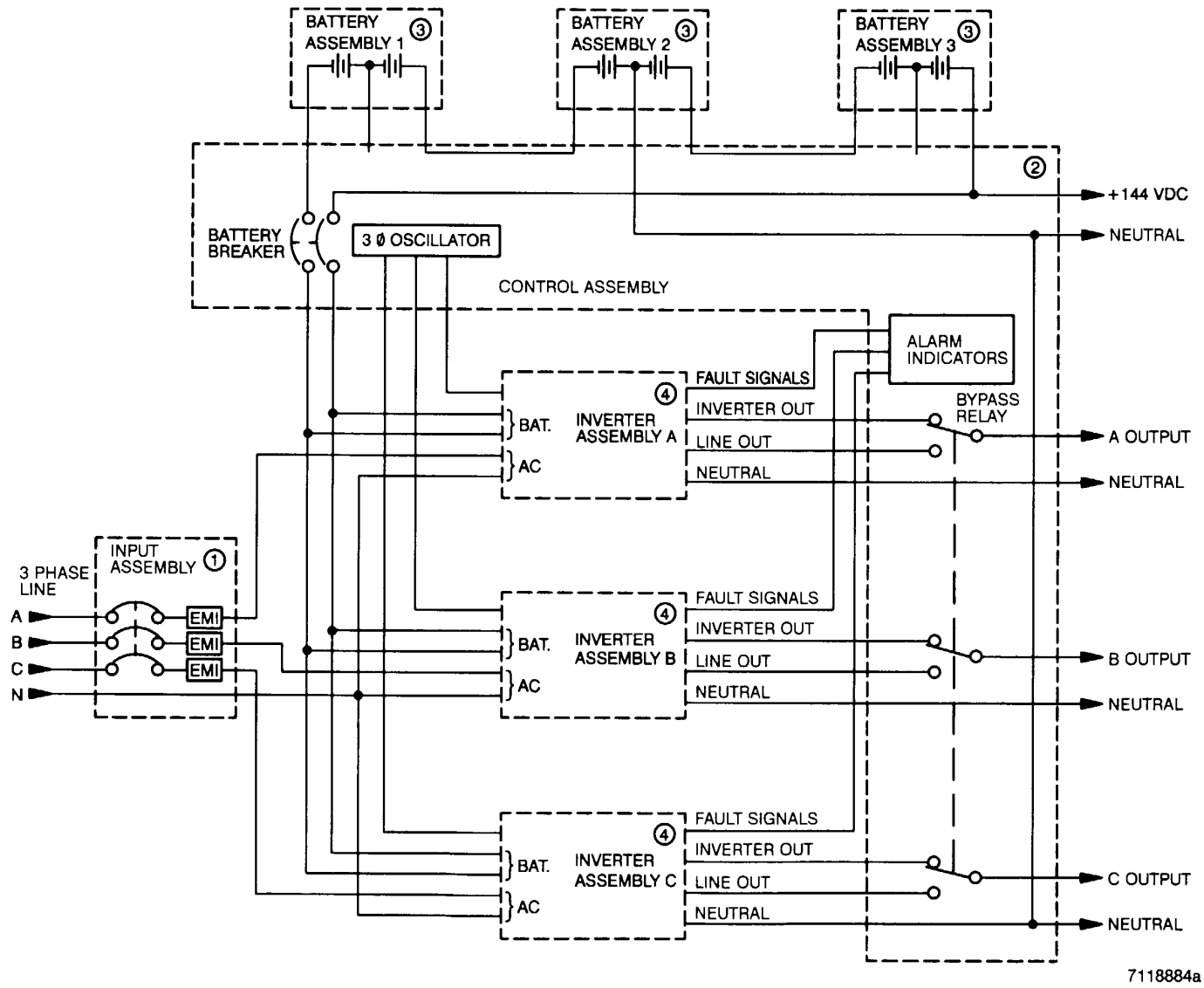
The AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(2 system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system, except where noted.

7-2. THEORY OF OPERATION

7-2.1. UPS System Description

- | | | |
|-----|-------------------|--|
| (1) | INPUT ASSEMBLY | Filters and distributes ac line voltage phase A to inverter assembly A, phase B to inverter assembly B, and phase C to inverter assembly C. |
| (2) | CONTROL ASSEMBLY | Provides interface control and power routing circuitry; monitors system and reports errors. |
| (3) | BATTERY ASSEMBLY | Three identical assemblies, which each output + 48 Vdc to the control assembly, for backup when an ac line voltage failure occurs. Also supplies + 144 volts dc (see FO-7 and FO-8). |
| (4) | INVERTER ASSEMBLY | Three identical assemblies, which each output a low-distortion, conditioned sine wave from either single-phase ac line voltage or battery power inputs. Also contains a battery charger that charges an associated battery assembly. |

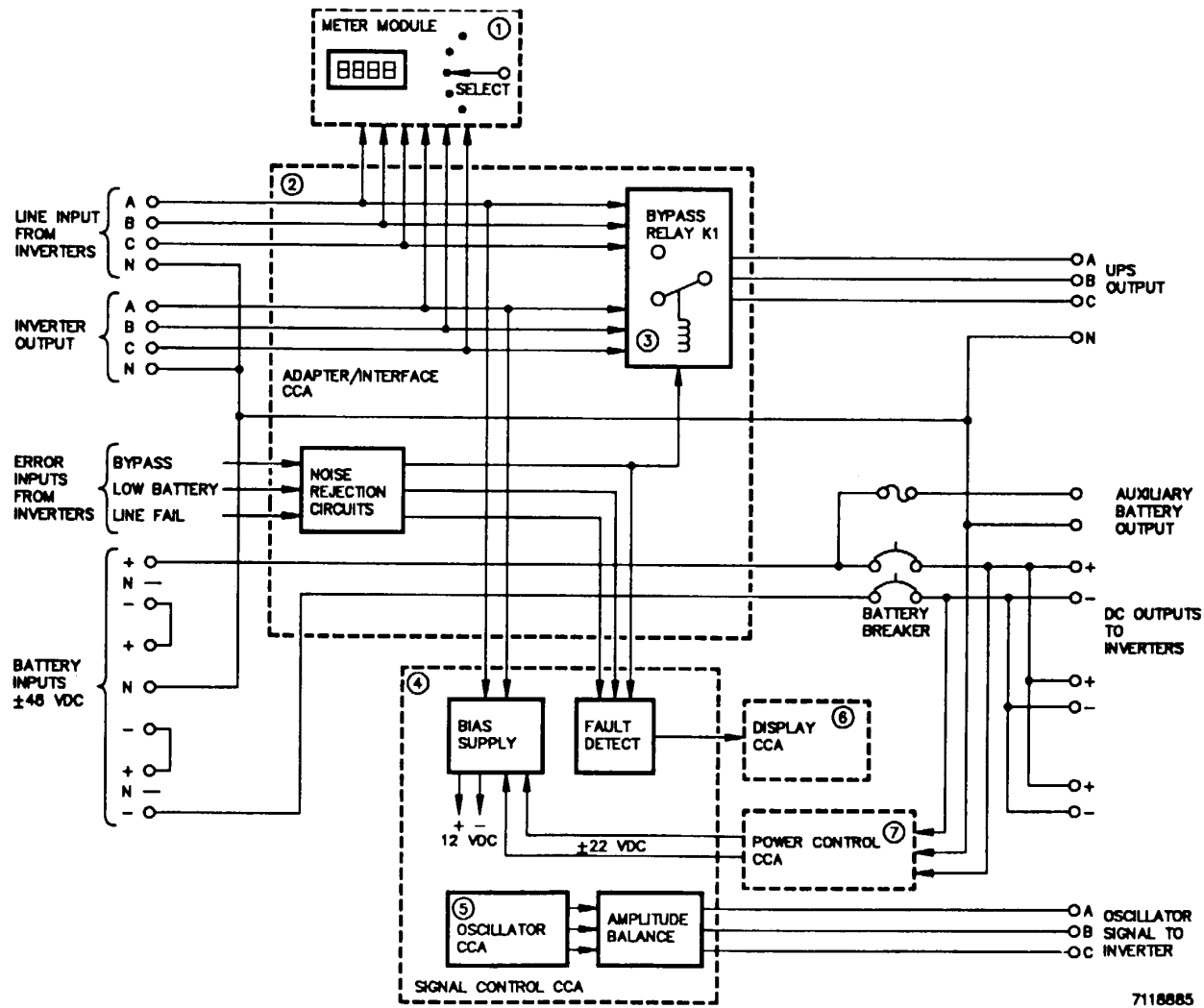
7-2.1. UPS System Description - Continued



7-2.2. UPS Control Assembly Description

- | | | |
|-----|-----------------------|--|
| (1) | METER MODULE | Provides digital readout of selected system voltages. |
| (2) | ADAPTER/INTERFACE CCA | Provides interface to inverter assembly error and bypass control signals and battery assembly voltage distribution. |
| (3) | BYPASS RELAY K1 | Switches UPS output between conditioned inverter outputs and ac line voltage input, depending upon control signals from inverter assemblies. |
| (4) | SIGNAL CONTROL CCA | Monitors ac line input and inverter assembly outputs to generate +12 Vdc bias voltages that power control circuitry. Senses ac line voltage failure and monitors operation of amplifier module, generating control signals for status and fault indicators and audible alarm on display Circuit Card Assembly (CCA). |
| (5) | OSCILLATOR CCA | Provides 3-phase outputs for UPS inverter assemblies. Allows selection of 50 Hz or 60 Hz. |
| (6) | DISPLAY CCA | Provides front-panel status indicators and audible alarm. |
| (7) | POWER CONTROL CCA | Provides auxiliary bias voltages for all UPS control circuitry when batteries are mistakenly turned on before ac line voltage is applied. |

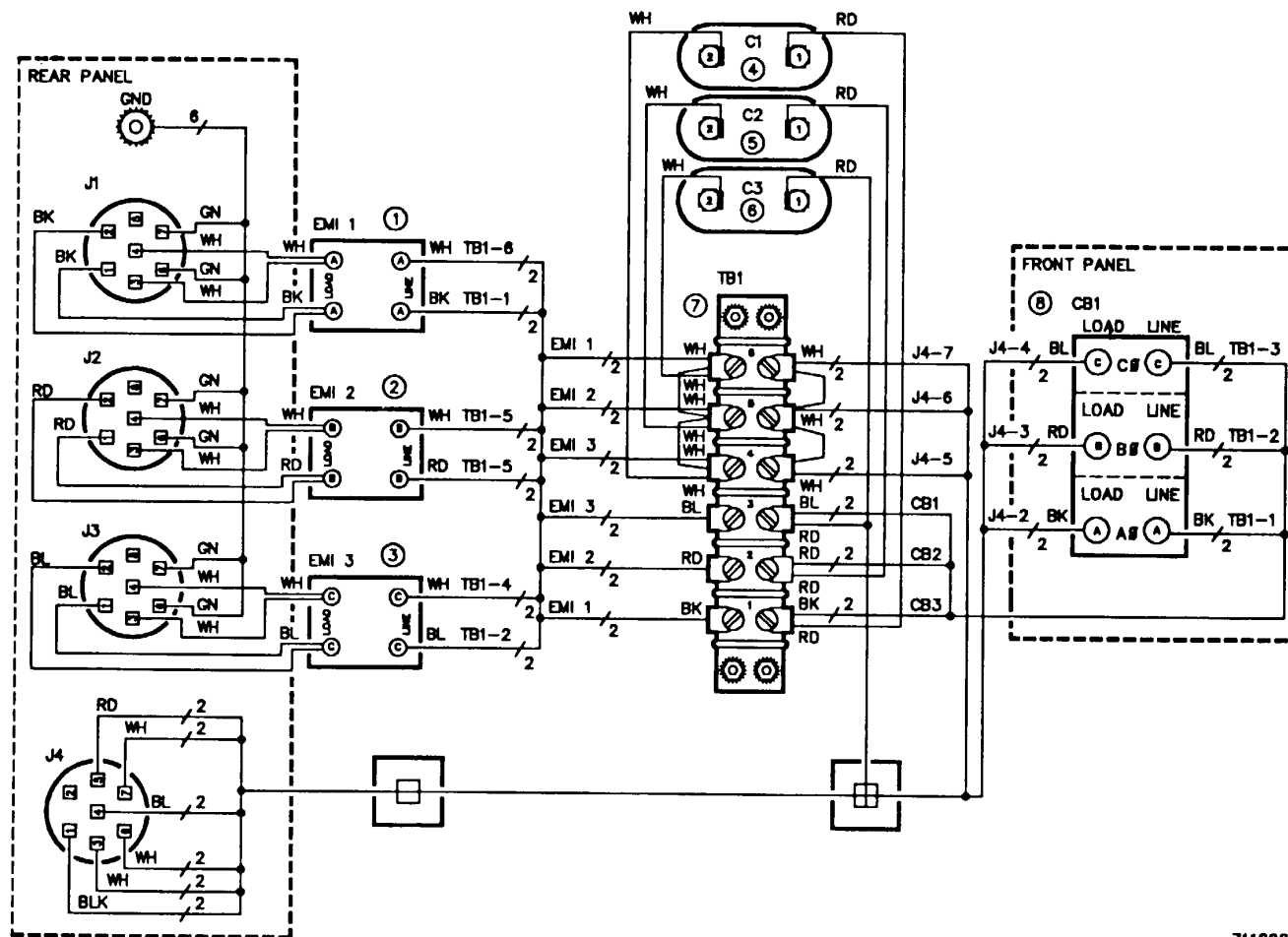
7-2.2. UPS Control Assembly Description - Continued



7-2.3. UPS Input Assembly Description

- | | | |
|-----|---|---|
| (1) | FILTER EMI-1 | Filters Electromagnetic Interference (EMI) from ac line voltage, phase A. |
| (2) | FILTER EMI-2 | Filters EMI from ac line voltage, phase B. |
| (3) | FILTER EMI-3 | Filters EMI from ac line voltage, phase C. |
| (4) | CAPACITOR C1 | Filters noise from ac line voltage, phase A. |
| (5) | CAPACITOR C2 | Filters noise from ac line voltage, phase B. |
| (6) | CAPACITOR C3 | Filters noise from ac line voltage, phase C. |
| (7) | TERMINAL BOARD TB1 | Divides line power for distribution to UPS inverter assemblies. |
| (8) | 3-PHASE LINE CIRCUIT
BREAKER CB1, CB2, CB3 | Controls input assembly power. |

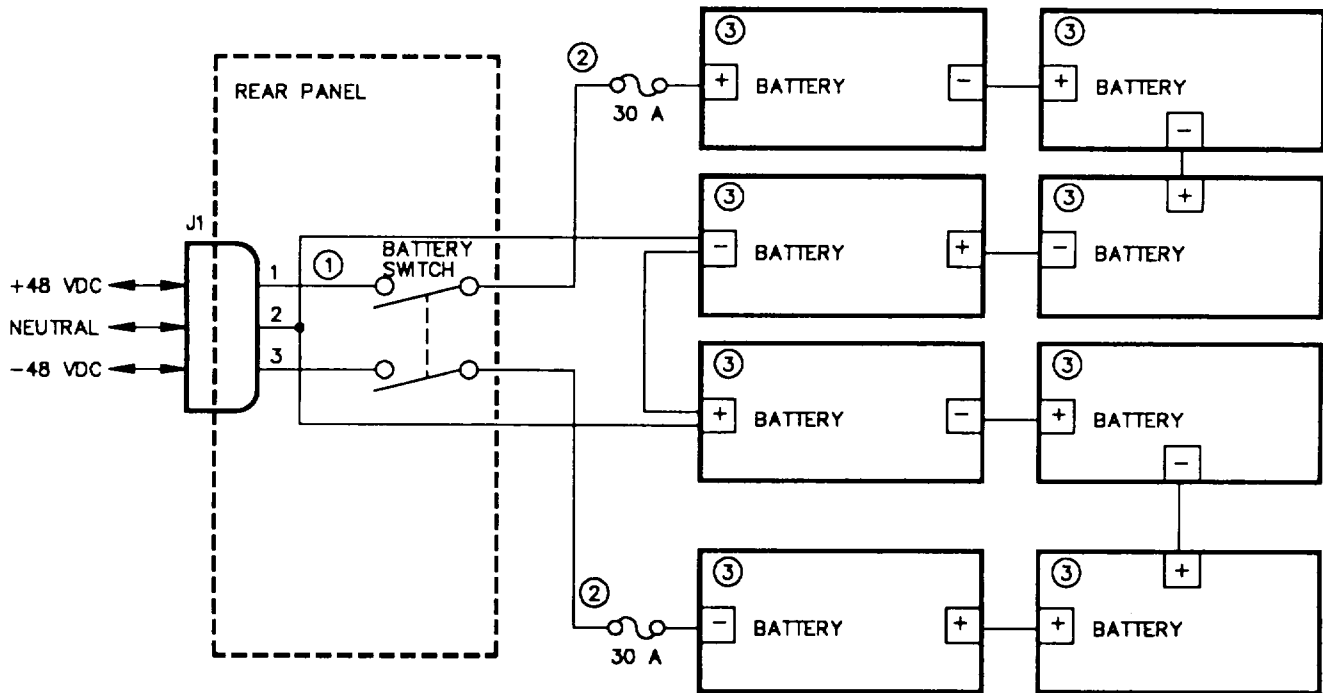
7-2.3. UPS Input Assembly Description - Continued



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7-2.4. UPS Battery Assembly Description

- (1) BATTERY SWITCH Located on battery assembly rear panel; a safety switch that controls battery assembly +48 Vdc output.
- (2) FUSE Two identical 30-amp fuses.
- (3) BATTERY Eight identical 12-volt batteries jumpered into two series-connected, four-battery strings. One battery string outputs +48 Vdc; the other outputs -48 Vdc. Battery assembly outputs are sent to control assembly.



7118887

SECTION II. TROUBLESHOOTING

7-3. INTRODUCTION

This section provides procedures required to set up, test, fault isolate, and repair the UPS at the direct support maintenance level.

7-4. GENERAL INSTRUCTIONS

7-4.1. Introduction

- a. Troubleshooting and repair should be performed only by experienced technicians who are familiar with the equipment and capable of ensuring that procedures are correctly accomplished.
- b. Maintenance personnel should read all inspection, troubleshooting, and maintenance instructions before attempting to troubleshoot or repair the equipment.

7-4.2. Inspection Procedures

- a. Visually inspect all wiring and all electronic assemblies and their components for obvious damage. Check for open connections, shorts, burning, discoloration, brittle or cracked insulation, or charring. If damage is noted, carefully inspect related components for similar damage to help identify the cause of the damage.
- b. When removed, visually inspect all Circuit Card Assemblies (CCAs) for signs of excess heat, such as charred, burned, discolored, cracked, or broken components. Inspect all printed wire etching on CCAs for apparent breaks, cuts, nicks, or signs of lifting from the card. Inspect CCA connectors for cracked or broken insulation and for missing, loose, bent, or broken pins. Inspect contacts of CCA edge connectors to ensure that they are not broken, scratched, nicked, cut or dirty. Clean dirty contacts.
- c. Inspect all chassis connectors for broken, scratched, dented, or damaged housings; missing hardware; and missing or damaged connector pins.
- d. Operate each switch to all positions to ensure that it operates freely and smoothly and that all contacts appear to mate when they should. Ensure that all switch detents operate positively and firmly. Inspect knobs for breaks or cracks.

7-4.3. Troubleshooting Procedures

- a. Observe reported symptom or repeat failed diagnostic test to verify reported fault.
- b. Using symptom index (table 7-1) and troubleshooting table (table 7-2), perform steps required to isolate fault to a part or assembly and perform first specified corrective action.
- c. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- d. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action.
- e. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- f. Repeat steps d and e until fault is corrected or it becomes necessary to refer unit to next higher level of maintenance.

7-4.4. Maintenance Procedures

- a. The equipment documented in this manual is typical. The equipment you are repairing may contain minor variations (location and number of cable ties, cable markers, lockwashers, etc.) which do not affect the essential procedural steps given.
- b. While performing maintenance procedures, cut and remove cable ties whenever needed. Note and record the number and location of the cable ties removed to aid installation.
- c. Bag and tag hardware (screws, washers, etc.) during removal procedures to aid installation.
- d. Tag connectors and wires during removal procedures to ensure correct reconnection.
- e. If during removal of an assembly it is observed that wires, cables, or connectors attached to that assembly are loose, reinstall or reconnect the loose item and repeat troubleshooting procedure to verify repair.

7-5. EQUIPMENT SETUP

WARNING

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.**
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.**
- **HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).**

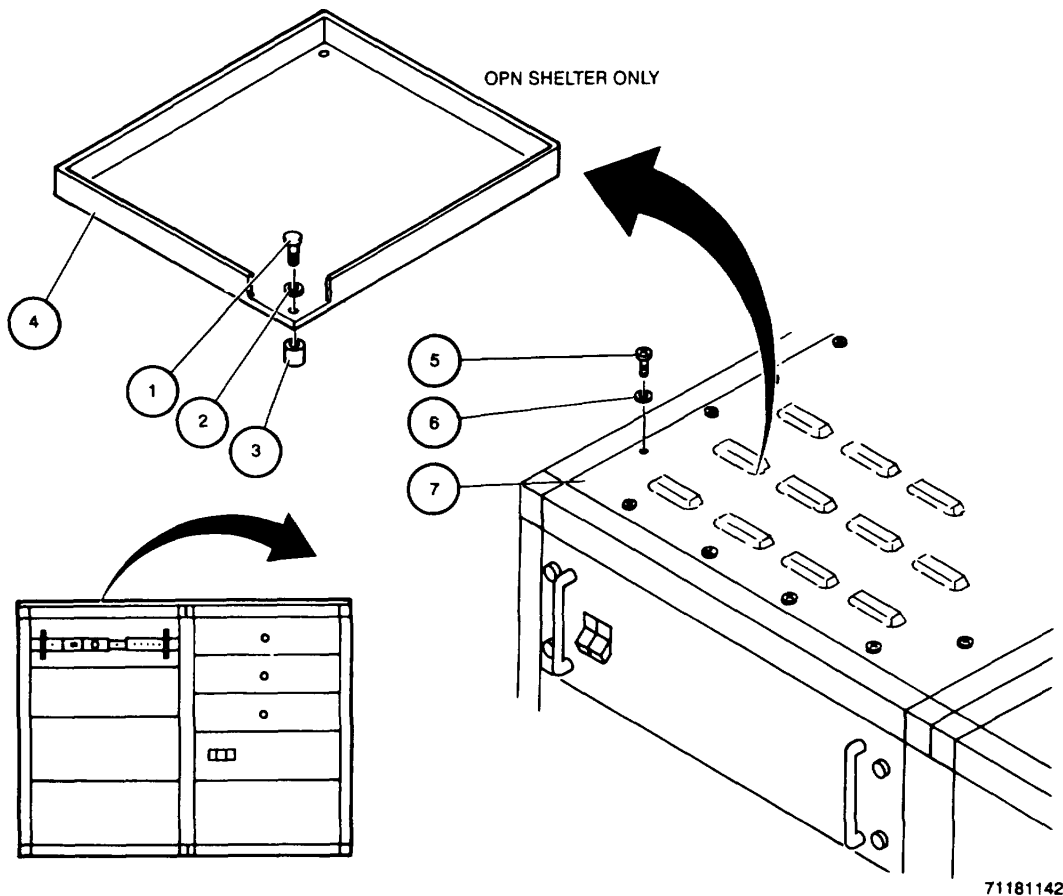
UPS troubleshooting will be performed with all UPS components installed in equipment racks. The following procedure is provided to extend any UPS assembly on its equipment rack slides when required during troubleshooting or maintenance. The control assembly, which requires slightly different handling to protect its rear panel cable connectors, is shown.

7-5. EQUIPMENT SETUP - Continued

NOTE

- Perform equipment setup if and when directed to do so during troubleshooting procedures.
- Setup for ADP and OPN shelters is the same except where noted. OPN shelter is shown.

1. Perform normal system shutdown. Refer to TM 11-5895-1392-12.
2. Perform bypass lighting turn-on. Refer to TM 11-5895-1392-12.
3. If working on control assembly only:
 - a. (OPN shelter only) Working at top of rack A2 left bay, remove four screws (1), washers (2), and spacers (3), and remove paper tray (4).
 - b. Working at top of rack A2 left bay, remove 16 screws (5) and lockwashers (6) (ADP shelter); remove 12 screws (5) and lockwashers (6) (OPN shelter).
 - c. Remove left bay top cover (7).



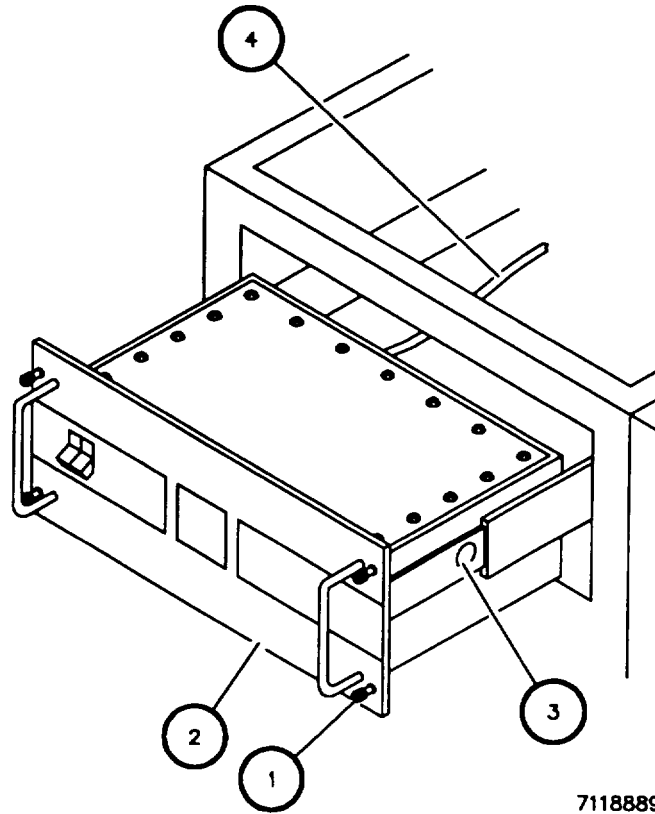
7-5. EQUIPMENT SETUP - Continued

4. Working at front panel, loosen four captive screws (1).

CAUTION

Ensure that rear panel cables do not bind or jam as control assembly is pulled out, or cables may be damaged.

5. Pull assembly (2) out until right and left slide rail locks (3) engage, hand feeding rear cables (4) through rack, as required.



7118889

7-6. SYMPTOM INDEX

The symptom index for the UPS is provided in table 7-1. Simply check the table for the fault condition or failed diagnostic test result and go to the referenced troubleshooting procedure in Table 7-2, UPS Troubleshooting.

Table 7-1. UPS Symptom Index

NUMBER	SYMPTOM	PAGE
1	UPS line fail condition indicated	7-15
2	UPS bypass condition indicated - Inverter(s) BYPASS indicator lighted.....	7-17
3	UPS bypass condition indicated - Inverter(s) BYPASS indicator off.....	7-17
4	UPS low battery condition indicated.....	7-18
5	UPS audible alarm does not stop - All other conditions normal	7-20
6	UPS output frequency out of range with input frequency.....	7-21
7	UPS control assembly battery breaker does not turn on batteries.....	7-21
8	UPS inverter output out of range.....	7-22

7-7. TROUBLESHOOTING TABLE

WARNING

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.**
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.**
- **Multiple person lift required. Do not attempt to lift, carry, or move the equipment by yourself. Get help.**
- **HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).**
- **Batteries contain toxic material and corrosive fluids. If battery leakage is observed, wear rubber gloves and apron to avoid injury.**

7-7. TROUBLESHOOTING TABLE - Continued

CAUTION

- This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting circuit card assemblies. See Safety Summary.
- To avoid electrical shorts or similar problems, promptly remove any hardware or other foreign matter dropped into the equipment.
- Never place spillable containers on or near the equipment.
- Ensure that the correct circuit card assemblies and interconnect cables are used and that they are securely installed.

NOTE

- When performing troubleshooting procedures, especially during electrical checks, be alert for intermittent as well as good/bad conditions.
- Be sure plugs, jacks, cables, and integrated circuits are completely and positively engaged. When reconnecting these items, guard against bending pins and inverting or offsetting connection of unkeyed connectors.
- Instructions that refer to right, left, front, or rear are given as if viewing the UPS from the front panel, looking toward the rear of the unit.

Troubleshooting procedures for the UPS are provided in table 7-2. The table consists of three columns and is used as follows:

- | | | |
|----|---------------------|---|
| 1. | MALFUNCTION: | Indicates equipment fault as described in symptom index. Look in TEST OR INSPECTION column for required fault isolation steps. |
| 2. | TEST OR INSPECTION: | Indicates step(s) to be taken to isolate fault to a specific part or assembly. If equipment passes a test or inspection step, go to next step. If equipment fails a test or inspection, look in CORRECTIVE ACTION column for repair steps. |
| 3. | CORRECTIVE ACTION: | Indicates authorized adjustment or repair for an isolated fault. When action is completed, repeat action or diagnostic test that initially identified fault to confirm repair. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action. If all steps are completed and fault persists, refer equipment to next higher level of maintenance. |

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. UPS LINE FAIL CONDITION INDICATED		
Step 1.	Check that ac line power source is correctly connected and applied to shelter. Refer to TM 11-5895-1392-12.	Correctly connect and apply ac line power source to shelter.
Step 2.	Using control assembly METER SELECT switch (para 1-13.2.1 or 1-14.3.1), check for meter readings of 105 to 135 Vac at switch positions LINE A, LINE B, and LINE C.	<ul style="list-style-type: none"> a. If not within tolerance, go to step 3. b. If within tolerance, go to step 6.
Step 3.	Perform UPS input assembly test (para 7-34).	<ul style="list-style-type: none"> a. Perform corrective action as directed by input assembly test. b. Replace faulty input assembly (para 7-21). c. Troubleshoot power distribution system (chapter 8).
Step 4.	Visually inspect control assembly rear panel connectors for damage.	Replace faulty control assembly connector (J1-J15) (para 7-17).
Step 5.	Using power rack diagram in volume 2 as a guide, check continuity of associated UPS power rack interconnect cable(s).	<ul style="list-style-type: none"> a. Repair faulty UPS power pack interconnect cable(s) (para 7-33). b. Replace faulty control assembly (para 7-8). c. If fault persists, refer to next higher level of maintenance.

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. UPS LINE FAIL CONDITION INDICATED - Continued		
CAUTION		
<p>Repeated attempts to start the UPS when a fault exists may result in an electrical fire. Reset circuit breaker only once; if it trips again, locate and correct fault before trying another reset.</p>		
Step 6.	<p>Check that power comes on normally after resetting UPS input assembly 3 PHASE LINE circuit breaker (set breaker OFF, then ON again) (para 1-13.2.1 or para 1-14.3.1).</p>	<p>If power does not come on normally or circuit breaker trips, set 3 PHASE LINE circuit breaker to OFF and go to step 7.</p>
Step 7.	<p>Check control assembly fuse by replacing with a known good fuse (para 7-19). Replace faulty fuse.</p>	
Step 8.	<p>Check control assembly oscillator CCA by replacing with a known good oscillator CCA (para 7-10). Replace faulty oscillator CCA.</p>	
Step 9.	<p>Check control assembly signal control CCA by replacing with a known good signal control CCA (para 7-11). Replace faulty signal control CCA.</p>	
Step 10.	<p>Visually inspect control assembly rear panel connectors for damage. Replace faulty control assembly connector (J1-J15) (para 7-17).</p>	
Step 11.	<p>Using UPS interconnect diagram in volume 2 as a guide, check continuity of associated UPS power rack interconnect cable(s).</p> <ul style="list-style-type: none"> a. Repair faulty UPS power rack interconnect cable(s) (para 7-33). b. Replace faulty control assembly (para 7-8). c. If fault persists, refer to next higher level of maintenance. 	
7-16		

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. UPS BYPASS CONDITION INDICATED - INVERTER(S) BYPASS INDICATOR LIGHTED		
Step 1.	Check that bypass condition is canceled when control assembly BYPASS RESET button is pressed (para 1-13.2.1 or 1-14.3.1).	Bypass operation canceled by reset.
Step 2.	If inverter assembly BYPASS indicator on, check that inverter assemblies' fan is operating (para 1-13.2.1 or 1-14.3.1).	<ul style="list-style-type: none"> a. Refer to Malfunction 8, UPS Inverter Assembly Output Out of Range. b. If fault persists, refer to next higher level of maintenance.
3. UPS BYPASS CONDITION INDICATED - INVERTER(S), BYPASS INDICATOR OFF		
Step 1.	Check that bypass condition is canceled when control assembly BYPASS RESET button is pressed (para 1-13.2.1 or 1-14.3.1).	Bypass operation canceled by reset.
Step 2.	Perform equipment setup for control assembly (para 7-5). Disconnect cables from A phase inverter assembly (A2A2A1). Check that bypass condition is canceled when control assembly BYPASS RESET button is pressed (para 1-13.2.1 or 1-14.3.1).	<ul style="list-style-type: none"> a. Refer to Malfunction 8, UPS Inverter Assembly Output Out of Range. b. If fault persists, go to step 5.
Step 3.	Reconnect inverter assembly cables disconnected in step 2. Disconnect cables from B phase inverter assembly (A2A2A2). Check that bypass condition is canceled when control assembly BYPASS RESET button is pressed (para 1-13.2.1 or 1-14.3.1).	<ul style="list-style-type: none"> a. Refer to Malfunction 8, UPS Inverter Assembly Output Out of Range. b. If fault persists, go to step 5.

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. UPS BYPASS CONDITION INDICATED - INVERTER(S) BYPASS INDICATOR OFF - Continued		
Step 4.	Reconnect inverter assembly cables disconnected in step 3. Disconnect cables from C phase inverter assembly (A2A2A3). Check that bypass condition is canceled when control assembly BYPASS RESET button is pressed (para 1-13.2.1 or 1-14.3.1).	
a.	Refer to Malfunction 8, UPS Inverter Assembly Output Out of Range.	
b.	If fault persists, go to step 5.	
Step 5.	Using UPS interconnect diagram in volume 2 as a guide, check continuity of associated UPS power rack interconnect cable(s).	
	Repair faulty UPS power rack interconnect cable(s) (para 7-33).	
Step 6.	Visually inspect control assembly rear panel connectors for damage.	
a.	Replace faulty control assembly connector (J1-J15) (para 7-17).	
b.	If fault persists, refer to next higher level of maintenance.	
4. UPS LOW BATTERY CONDITION INDICATED		
Step 1.	Check that BATTERY switch on UPS control assembly is set to ON (para 1-13.2.1 or 1-14.3.1).	
	Set BATTERY switch to ON, as required, and verify that LOW BATTERY indicator on UPS control assembly goes out within 30 seconds.	
Step 2.	Check that BATTERY SWITCH on rear panel of each UPS battery assembly is set to ON (para 1-15.5.4). Perform equipment setup procedure (para 7-5) to access rear panels.	
	Set UPS battery assembly BATTERY SWITCH to ON, as required, and verify that LOW BATTERY indicator on UPS control assembly goes out within 30 seconds.	

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. UPS LOW BATTERY CONDITION INDICATED - Continued		
NOTE		
If step 3 fails after charging batteries for 24 hours, go to step 4.		
Step 3.	Set 3 PHASE LINE circuit breaker on UPS input assembly to OFF, quickly verify that batteries maintain power to shelter on all three phases, then set circuit breaker back to ON (para 1-13.2.1 or 1-14.3.1).	
	Set 3 PHASE LINE circuit breaker to ON, run UPS for 24 hours to recharge batteries, and repeat step 3.	
Step 4.	Perform equipment setup for UPS control assembly (para 7-5). For each cable in turn, disconnect, perform required measurement, and reconnect cable from connectors J7, J8, and J14:	
	<u>Test Points</u>	<u>Measurement</u>
	Pin 1 to Pin 2	81 to 111 Vdc
	Pin 1 to Pin 3	41 to 55 Vdc
	Pin 2 to Pin 3	41 to 55 Vdc
	Perform step 9 for battery assembly associated with cable where measurement failed (J7 - A2A1A3, J8 - A2A1A4, J14 - A2A2A5).	
Step 5.	Check control assembly signal control CCA by replacing with a known good signal control CCA (para 7-11).	
	Replace faulty signal control CCA.	
Step 6.	Check control assembly adapter/interface CCA by replacing with a known good adapter/interface CCA (para 7-13).	
	Replace faulty adapter/interface CCA.	
Step 7.	Check control assembly display CCA by replacing with a known good display CCA (para 7-15).	
	Replace faulty display CCA.	

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. UPS LOW BATTERY CONDITION INDICATED - Continued		
Step 8.	Visually inspect control assembly rear panel connectors for damage.	
a.	Replace faulty control assembly connector (J1-J15) (para 7-17).	
b.	Replace faulty control assembly (para 7-8).	
c.	If faulty persists, refer to next higher level of maintenance.	
Step 9.	Perform UPS batter/ assembly test (para 7-35).	
a.	Perform corrective action as directed by battery assembly test (para 7-35).	
b.	Replace faulty battery assembly (para 7-21).	
c.	If fault persists, refer to next higher level of maintenance.	
5. UPS AUDIBLE ALARM DOES NOT STOP - ALL OTHER CONDITIONS NORMAL		
Step 1.	Check control assembly display CCA by replacing with a known good display CCA (para 7-15).	
	Replace faulty display CCA.	
Step 2.	Check control assembly signal control CCA by replacing with a known good signal control CCA (para 7-11).	
	Replace faulty signal control CCA.	
Step 3.	Check control assembly adapter/interface CCA by replacing with a known good adapter/interface CCA (para 7-13).	
a.	Replace faulty adapter/interface CCA.	
b.	Replace faulty control assembly (para 7-8).	
7-20		

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION								
6. UPS OUTPUT FREQUENCY OUT OF RANGE WITH INPUT FREQUENCY										
Step 1.	Check that control assembly 50HZ/60HZ select switch (para 1-13.2.1 or 1-14.3.1) and power entry panel 50HZ/60HZ switch (para 1-15.6.1) are both set to 60 HZ.	Set switches to correct position.								
Step 2.	Check control assembly oscillator CCA by replacing with a known good oscillator CCA (para 7-10).	Replace faulty oscillator CCA.								
Step 3.	Check control assembly signal control CCA by replacing with a known good signal control CCA (para 7-11).	Replace faulty signal control CCA.								
Step 4.	Check 50HZ/60HZ select switch (para 1-13.2.1 or 1-14.3.1) for continuity.	<ul style="list-style-type: none"> a. Replace faulty 50HZ/60HZ select switch (para 7-20). b. Replace control assembly (para 7-8). 								
7. UPS CONTROL ASSEMBLY BATTERY BREAKER DOES NOT TURN ON BATTERIES										
Step 1.	Perform equipment setup for UPS control assembly (para 7-5). For each cable in turn, disconnect, perform the required measurement, and reconnect the cable from connector J7, J8, and J14:	<table border="0"> <thead> <tr> <th><u>Test Points</u></th> <th><u>Measurement</u></th> </tr> </thead> <tbody> <tr> <td>Pin 1 to Pin 2</td> <td>81 to 111 Vdc</td> </tr> <tr> <td>Pin 1 to Pin 3</td> <td>41 to 55 Vdc</td> </tr> <tr> <td>Pin 2 to Pin 3</td> <td>41 to 55 Vdc</td> </tr> </tbody> </table>	<u>Test Points</u>	<u>Measurement</u>	Pin 1 to Pin 2	81 to 111 Vdc	Pin 1 to Pin 3	41 to 55 Vdc	Pin 2 to Pin 3	41 to 55 Vdc
<u>Test Points</u>	<u>Measurement</u>									
Pin 1 to Pin 2	81 to 111 Vdc									
Pin 1 to Pin 3	41 to 55 Vdc									
Pin 2 to Pin 3	41 to 55 Vdc									
	Perform step 4 for battery assembly associated with cable where measurement failed (J7 - A2A1A3, J8 - A2A1A4, J14 - A2A2A5).									
Step 2.	Remove control assembly top cover (para 7-9). Check battery voltage ± 50 to ± 55 Vdc at BATTERY circuit breaker input terminals (para 1-15.5.4).	Replace control assembly power control CCA (para 7-14).								

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. UPS CONTROL ASSEMBLY BATTERY BREAKER DOES NOT TURN ON BATTERIES - Continued		
Step 3.	Check battery voltage of ± 50 to ± 55 Vdc at BATTERY circuit breaker output terminals (para 1-15.5.4) when BATTERY circuit breaker is set to ON.	<ul style="list-style-type: none"> a. Replace control assembly BATTERY circuit breaker (para 7-18). b. If fault persists, replace UPS control assembly (para 7-8).
Step 4.	Perform UPS battery assembly test (para 7-35).	<ul style="list-style-type: none"> a. Perform corrective action as directed by battery assembly test (para 7-35). b. Replace faulty battery assembly (para 7-21). c. If fault persists, refer to next higher level of maintenance.
8. UPS INVERTER ASSEMBLY OUTPUT OUT OF RANGE		
Step 1.	Remove inverter top cover (para 7-22). Inspect inverter interior and components for evidence of arcing or burning, such as smoke deposits, or charred or burned components or wiring.	If evidence of arcing or burning is detected, replace faulty inverter assembly (para 7-21).
Step 2.	Inspect connectors on each external cable for damage, or missing or loose contacts.	Repair cable connectors as required (para 7-23).
Step 3.	Inspect rear panel connectors on inverter assembly for damage, or missing or broken contacts.	Replace rear panel connectors as required (para 7-38).
Step 4.	Inspect bypass indicator CCA for damage.	Replace faulty bypass indicator CCA (para 7-39).
Step 5.	Using digital voltmeter, check fuses F1 and F2 for 1.0 ohm resistance or less.	Replace faulty fuse F1 or F2 (para 7-37).

7-7. TROUBLESHOOTING TABLE - Continued

Table 7-2. UPS Troubleshooting - CONT

MALFUNCTION

**TEST OR INSPECTION
CORRECTIVE ACTION**

8. UPS INVERTER ASSEMBLY OUTPUT OUT OF RANGE - Continued

Step 6. Using digital voltmeter, check for continuity (1 ohm or less) between the following terminals on transformer T1:

- Terminal 1 to terminal 2
- Terminal 1 to terminal 3
- Terminal 1 to terminal 4
- Terminal 2 to terminal 3
- Terminal 2 to terminal 4
- Terminal 3 to terminal 4

If continuity is not measured between all specified pairs, replace faulty transformer T1 (para 7-42).

Step 7. Disconnect one wire from each fan assembly (A2 rear and A3 front). Using digital voltmeter, check for 200 ohms or less resistance between terminals on each fan assembly.

Replace faulty fan assembly (para 7-40 or 7-41).

Step 8. Check inverter assembly by replacing with known good inverter assembly (para 7-21).

- a. Replace faulty inverter assembly (para 7-21).
- b. Refer to next higher level of maintenance.

SECTION III. MAINTENANCE PROCEDURES

7-8. REPLACE UPS CONTROL ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precautions:**WARNING**

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.** Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.
- **HIGH VOLTAGES ARE PRESENT IN THE UPS.** Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed or panels are open to avoid electrical shock.

NOTE

Replace ADP and OPN shelter control assembly the same way, except where noted. OPN shelter control assembly shown.

Equipment Configuration: Installed in equipment rack.

Preliminary Procedures:

1. Perform normal system shutdown. Refer to TM 11-5895-1392-12.
2. Perform bypass lighting turn-on. Refer to TM 11-5895-1392-12.

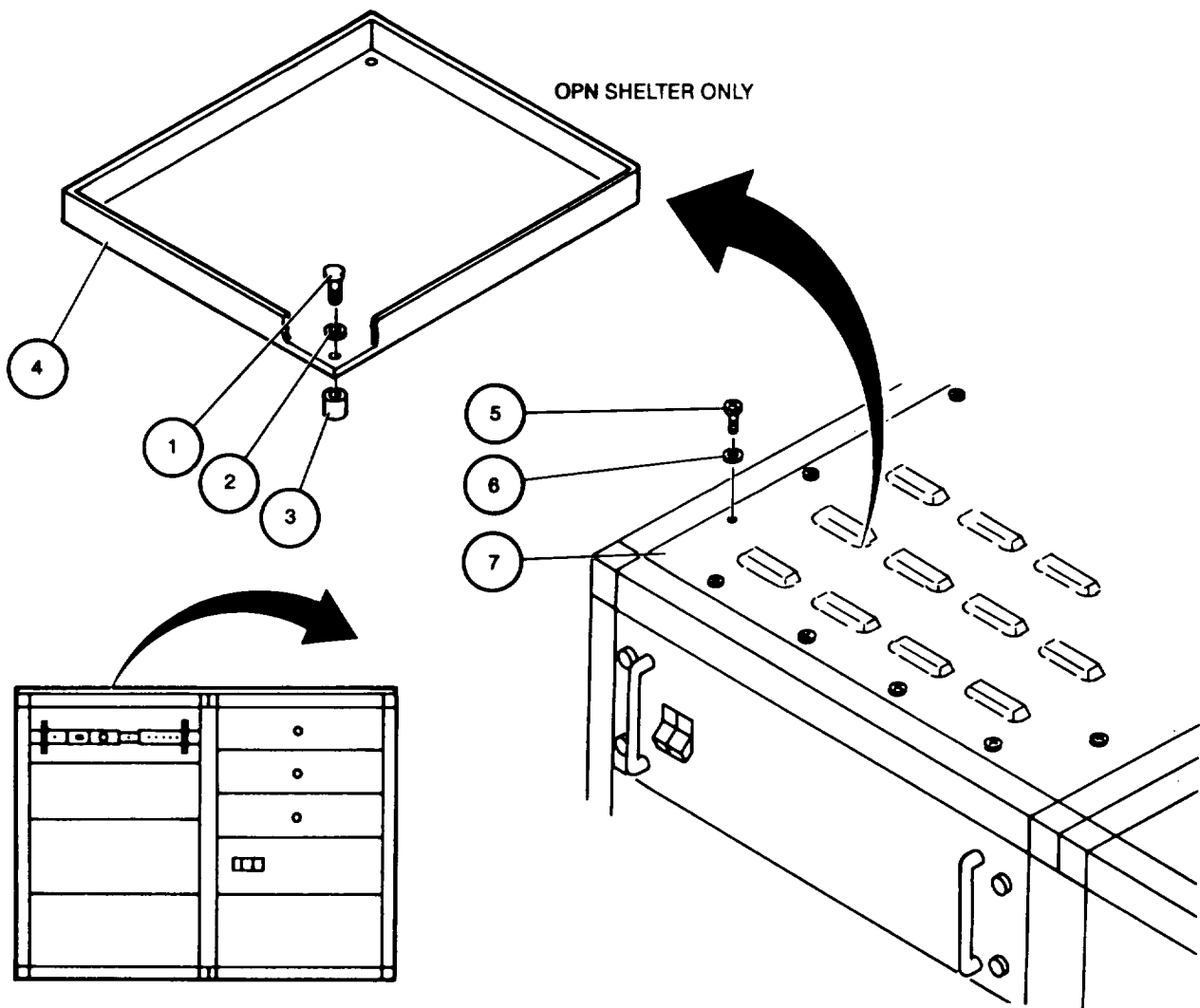
7-8. REPLACE UPS CONTROL ASSEMBLY- Continued

REMOVAL

NOTE

If working on ADP shelter, go to step 2.

1. Working at top of rack A2 left bay, remove four screws (1), washers (2), and spacers (3) and paper tray (4).
2. Remove 16 screws (5) and lockwashers (6) (ADP shelter); remove 12 screws (5) and lockwashers (6) (OPN shelter).
3. Remove left bay top cover (7).



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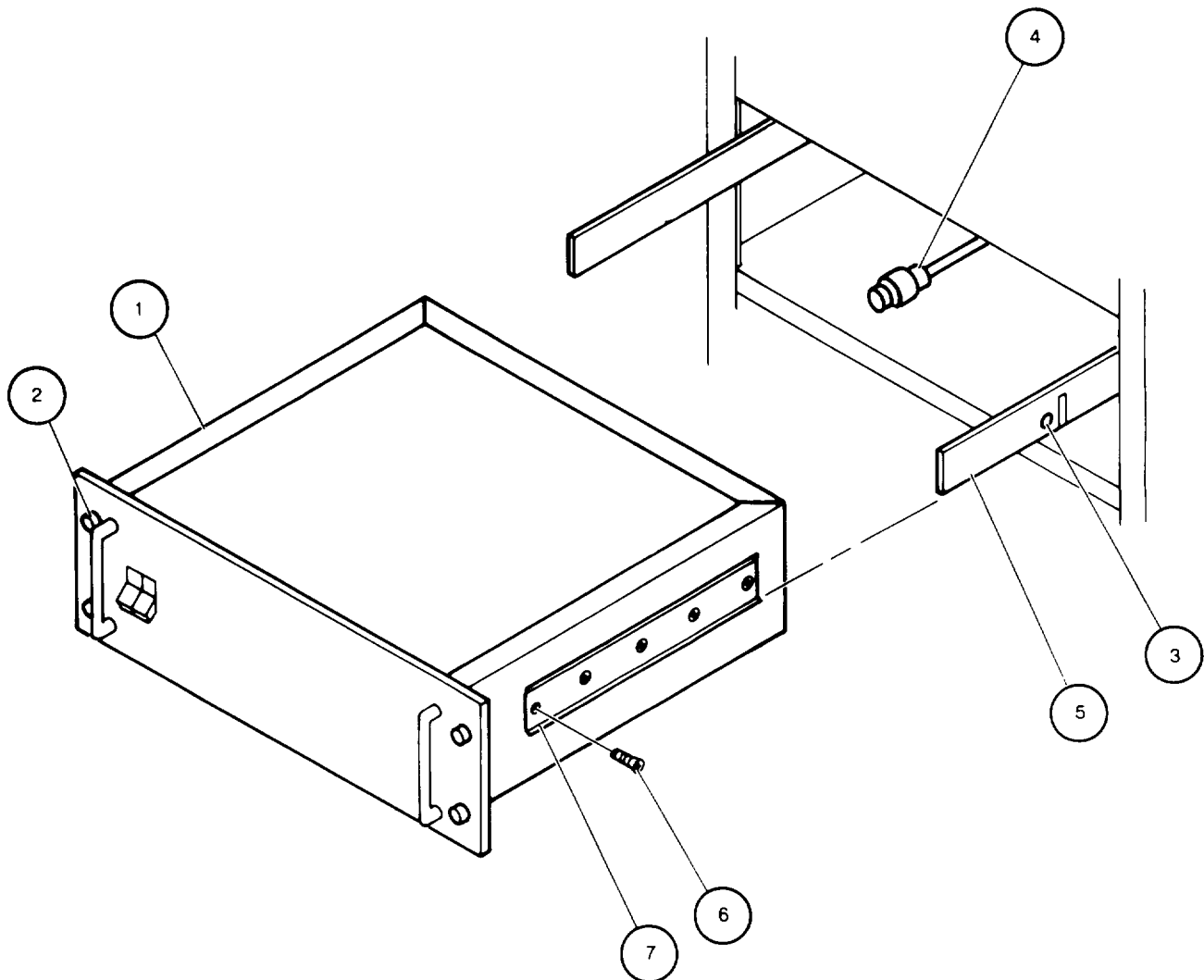
7-8. REPLACE UPS CONTROL ASSEMBLY - Continued

4. Working at control assembly (1) front panel, loosen four captive screws (2).

CAUTION

Ensure that rear panel cables do not bind or jam as control assembly is pulled out, or cables may be damaged.

5. Pull control assembly (1) out until right and left slide rail locks (3) engage, hand feeding rear panel 14 cables (4) through rack, as required.
6. Tag and disconnect 14 cables (4) from rear panel.
7. Press rail locks (3) and slide control assembly (1) out and off of slide rails (5).
8. Remove five screws (6) from both right and left rack slides (7).
9. Remove two rack slides (7).



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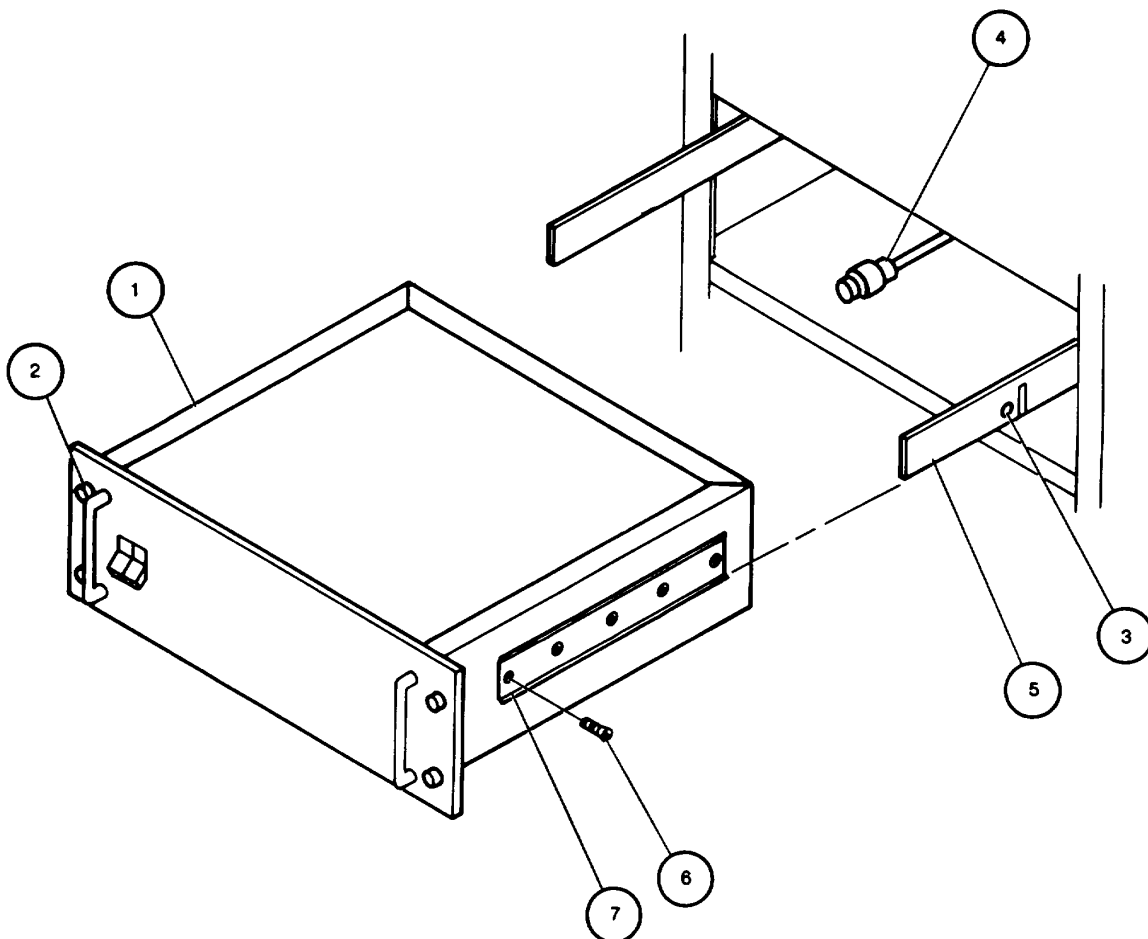
7-8. REPLACE UPS CONTROL ASSEMBLY - Continued**INSTALLATION**

1. Install two rack slides (7) using five screws (6) for each slide.
2. Line up rack slides (7) with slide rails (5) and slide control assembly (1) into slide rails until rail locks (3) engage.
3. Reconnect 14 cables (4) to rear panel, as tagged. Remove tags.

CAUTION

Ensure that rear panel cables do not bind or jam as control assembly is pushed in, or cables may be damaged.

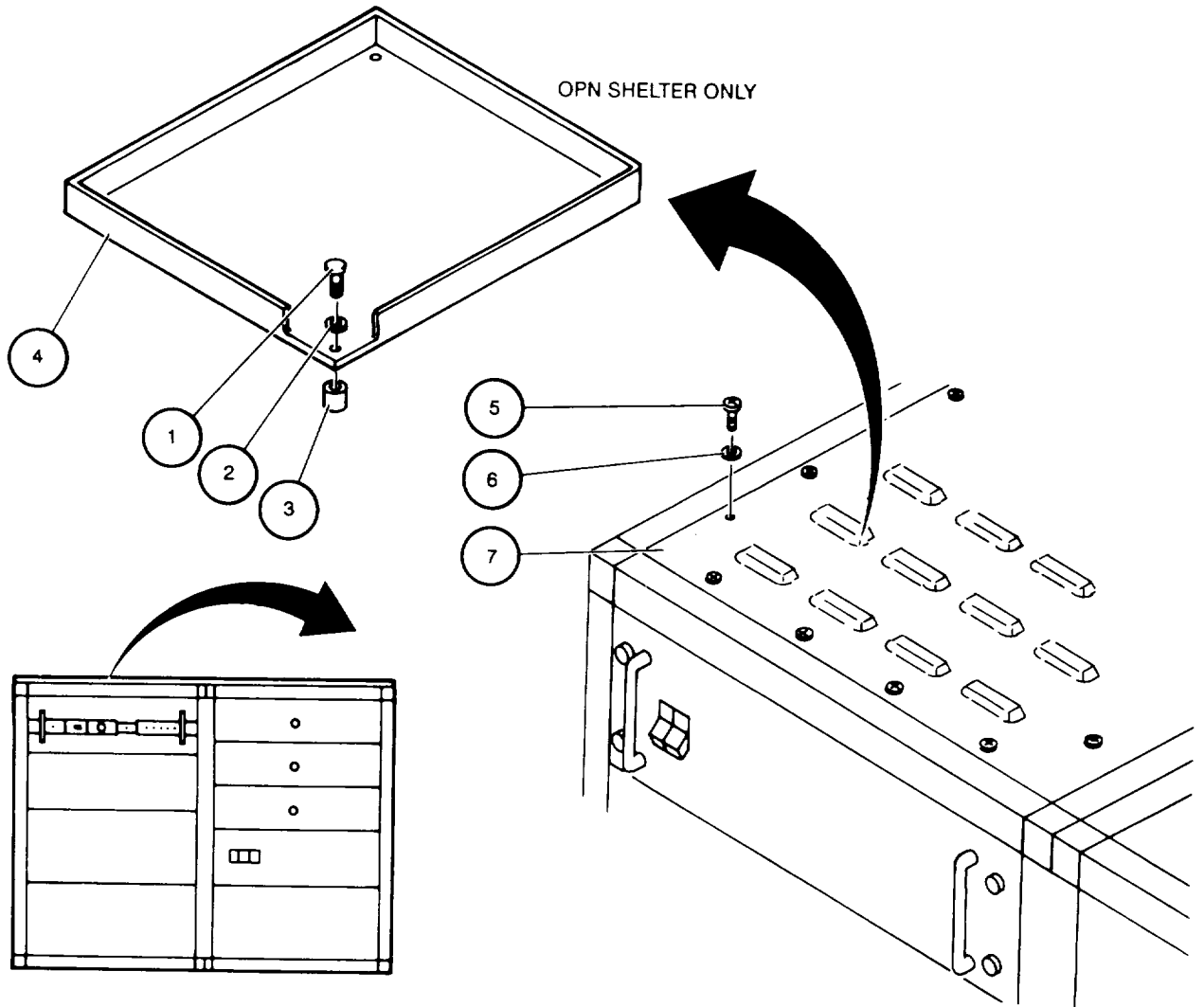
4. Press right and left slide rail locks (3) and push control assembly (1) fully into rack, hand feeding rear panel cables (4) through rack, as required.
5. Tighten four captive screws (2).



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7-8. REPLACE UPS CONTROL ASSEMBLY - Continued

6. Working at rack A2 left bay, place left bay top cover (7) in installed position.
7. Install 16 screws (5) and lockwashers (6) (ADP shelter); install 12 screws (5) and lockwashers (6) (OPN shelter). If working on ADP shelter, task complete.
8. Place paper tray (4) in installed position.
9. Install four screws (1), washers (2), and spacers (3).



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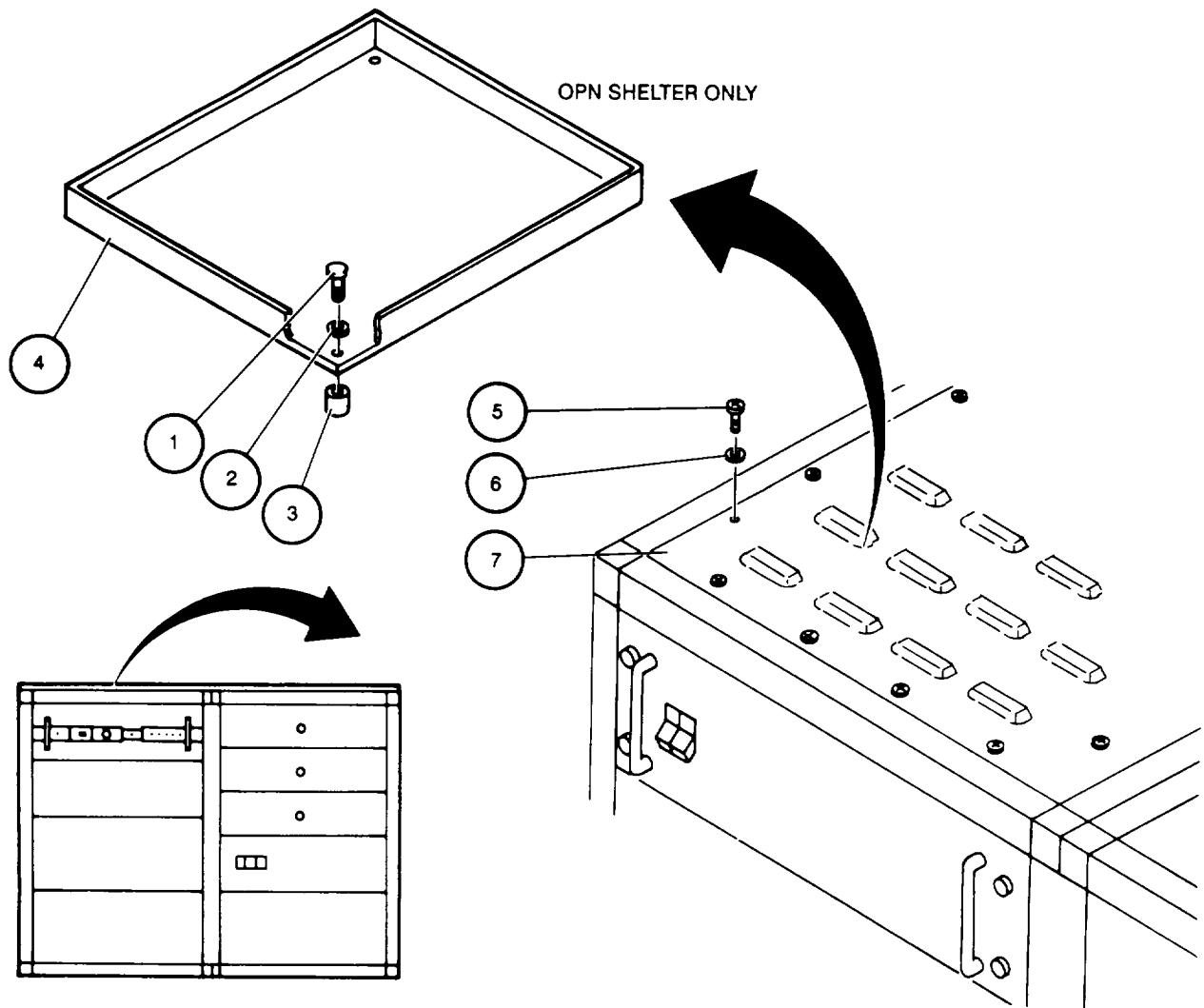
7-9. REMOVE/INSTALL CONTROL ASSEMBLY TOP COVER - Continued

REMOVAL

NOTE

If working on ADP shelter, go to step 2.

1. Working at top of rack A2 left bay, remove four screws (1), washers (2), and spacers (3) and paper tray (4).
2. Remove 16 screws (5) and lockwashers (6) (ADP shelter); remove 12 screws (5) and lockwashers (6) (OPN shelter).
3. Remove left bay top cover (7).



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7-9. REMOVE/INSTALL CONTROL ASSEMBLY TOP COVER - Continued

4. Working at front panel, loosen four captive screws (1).

CAUTION

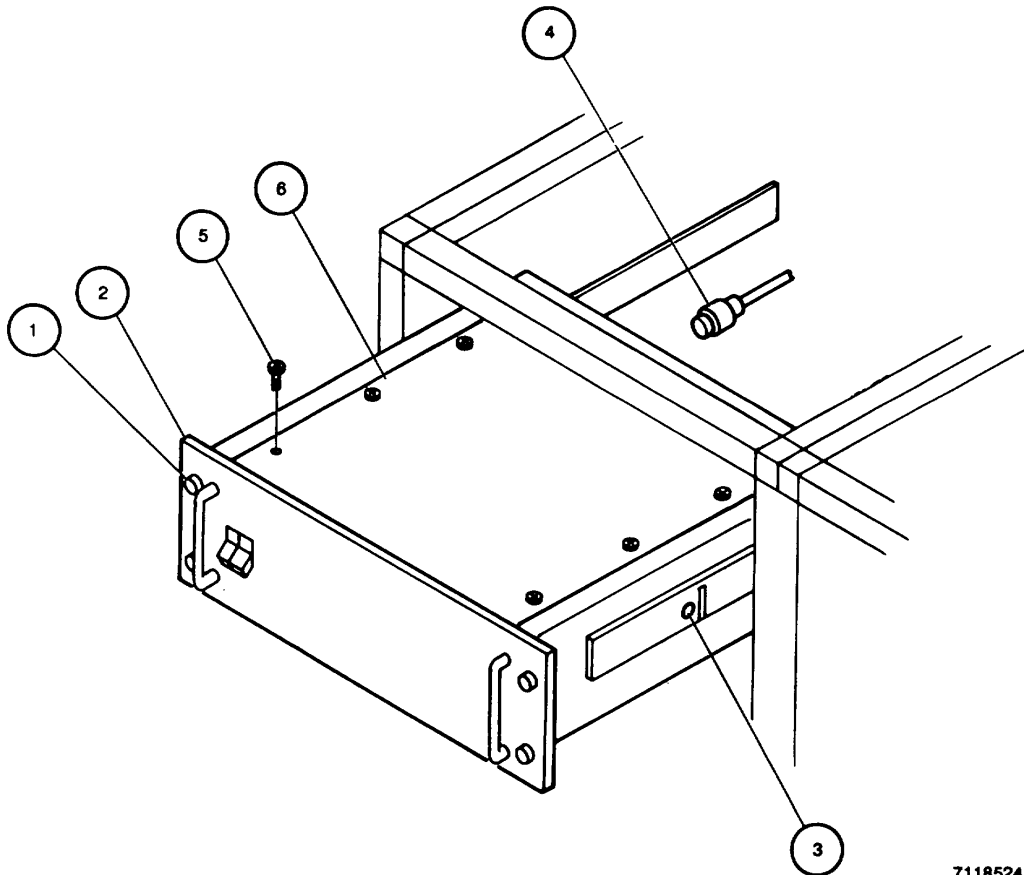
Ensure that rear panel cables do not bind or jam as control assembly is pulled out, or cables may be damaged.

5. Pull control assembly (2) out until right and left slide locks (3) engage, hand feeding 14 cables (4) through rack, as required.

WARNING

Battery assemblies supply HIGH VOLTAGE to the control assembly. Disconnect control assembly cables before removing cover or replacing parts to avoid electrical shock.

6. Tag and disconnect 14 cables (4) from control assembly (2) rear panel.
7. Remove eight screws (5).
8. Remove top cover (6).



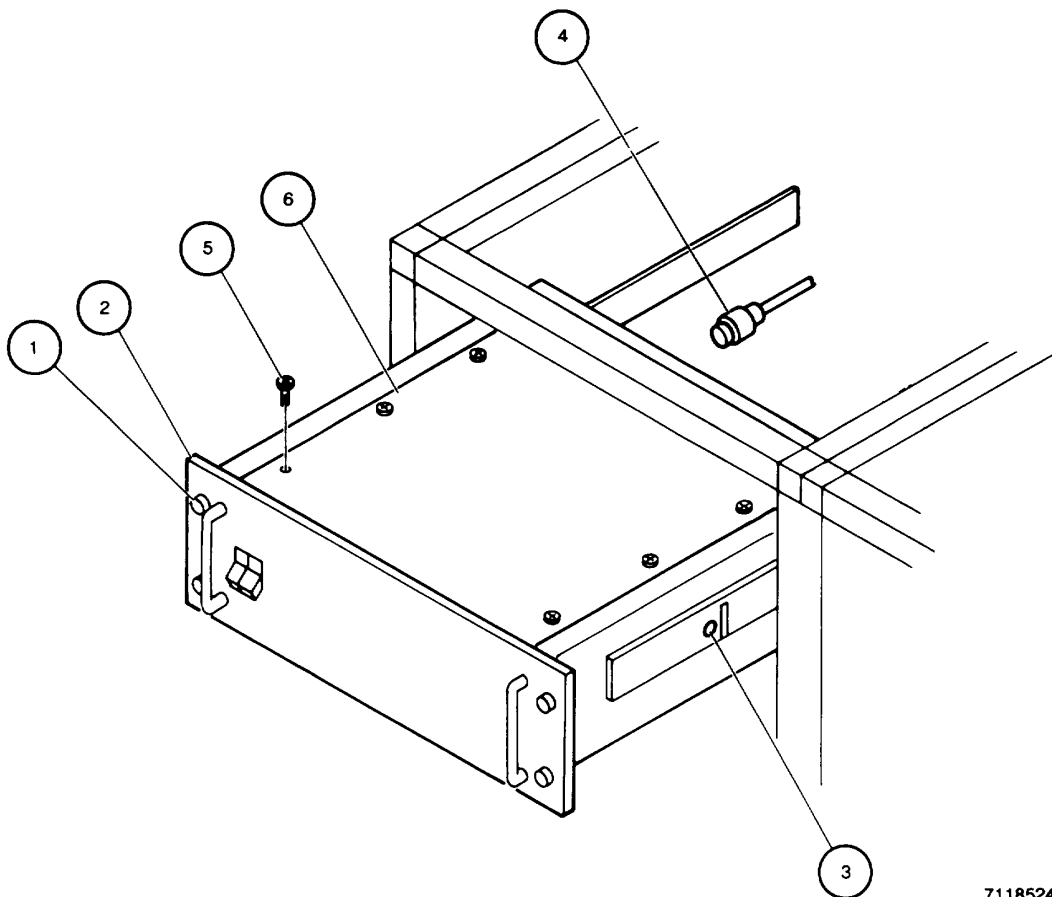
7-9. REMOVE/INSTALL CONTROL ASSEMBLY TOP COVER - Continued**INSTALLATION**

1. Place top cover (6) in installed position.
2. Install eight screws (5).
3. Connect 14 cables (4) to control assembly (2) rear panel.

CAUTION

Ensure that rear panel cables do not bind or jam as control assembly is pushed in, or cables may be damaged.

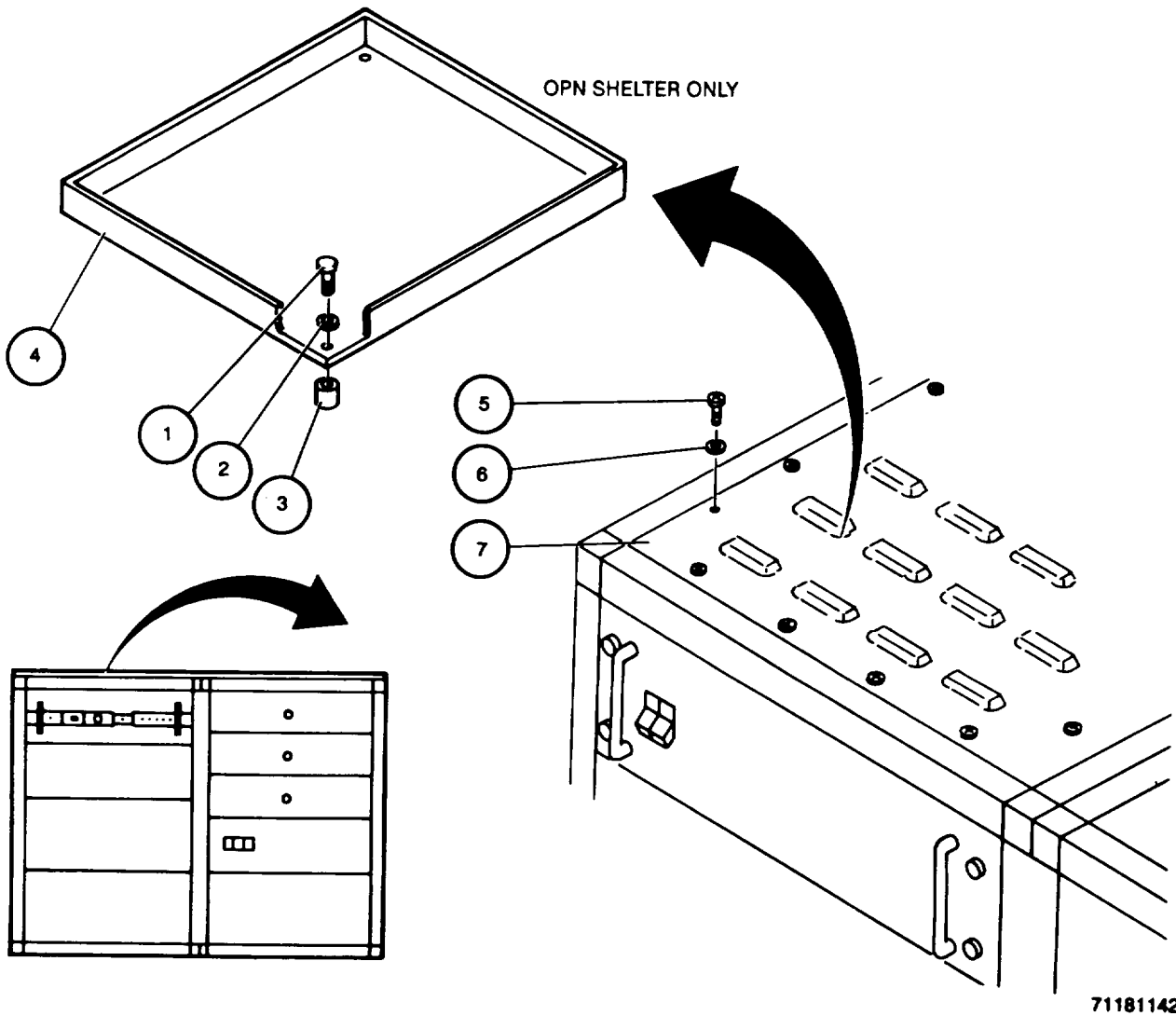
4. Press right and left slide locks (3) and push control assembly (2) fully into rack, hand feeding cables (4) into rack, as required.
5. Tighten four captive screws (1).



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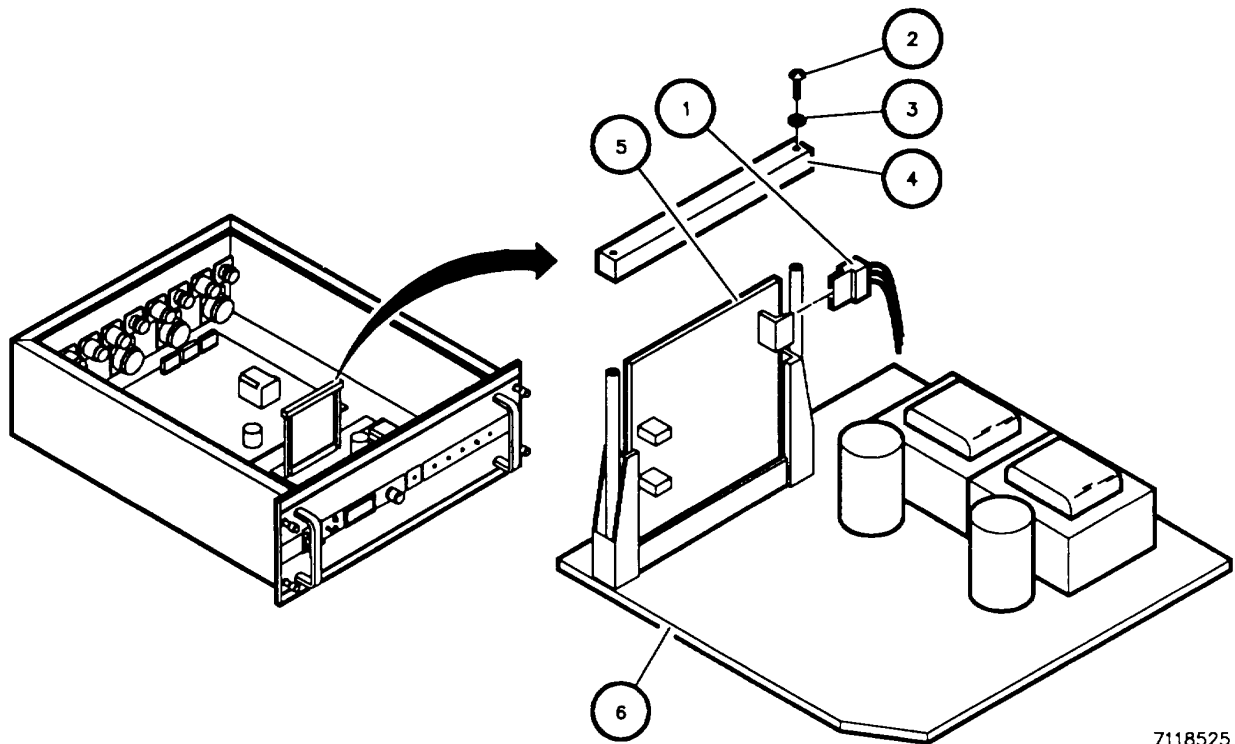
7-9. REMOVE/INSTALL CONTROL ASSEMBLY TOP COVER - Continued

6. Working at rack A2 left bay, place left bay top cover (7) in installed position.
7. Install 16 screws (5) and lockwashers (6) (ADP shelter); install 12 screws (5) and lockwashers (6) (OPN shelter). If working on ADP shelter, task complete.
8. Place paper tray (4) in installed position.
9. Install four screws (1), washers (2), and spacers (3).



7-10. REPLACE CONTROL ASSEMBLY OSCILLATOR CCA**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Equipment Configuration:** Installed in equipment rack.**Preliminary Procedure:** Remove control assembly top cover (para 7-9).**REMOVAL**

1. Working inside top cover, tag and disconnect cable (1).
2. Remove two screws (2), lockwashers (3), and retaining bar (4).
3. Remove oscillator CCA (5) from signal control CCA (6).



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INSTALLATION

1. Seat oscillator CCA (5) in signal control CCA (6).
2. Install two screws (2), lockwashers (3), and retaining bar (4).
3. Connect cable (1) as tagged. Remove tag.

FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-11. REPLACE CONTROL ASSEMBLY SIGNAL CONTROL CCA

This task covers: a. Removal b. Installation

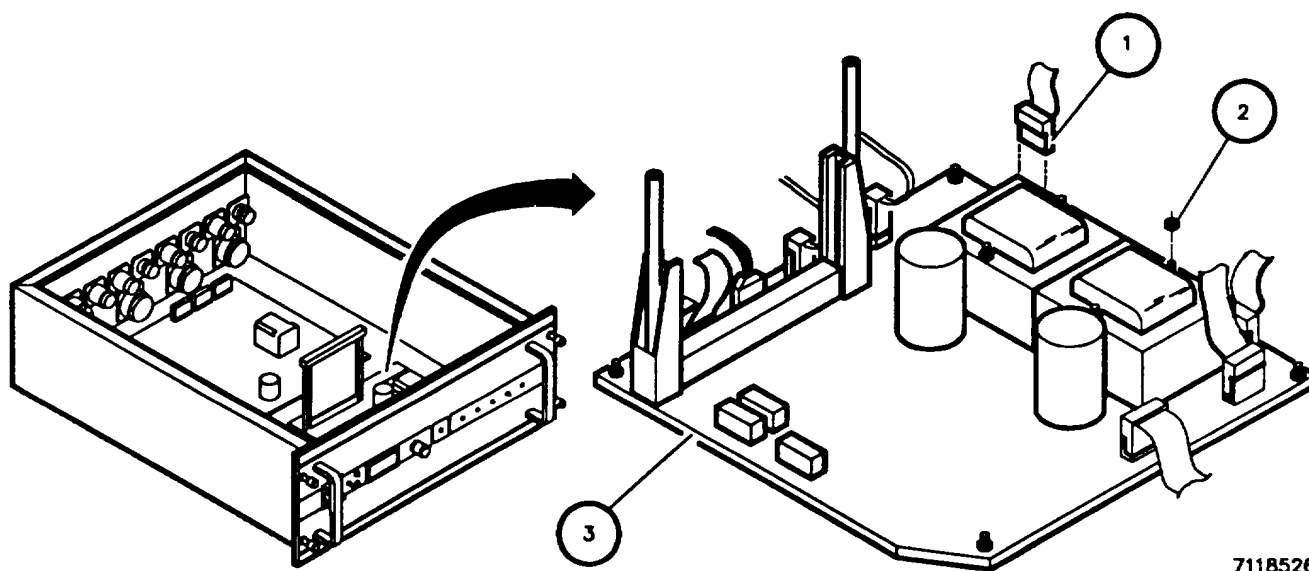
INITIAL SETUP

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove control assembly oscillator CCA (para 7-10).

REMOVAL

1. Working inside top cover, tag and disconnect eight cables (1).
2. Remove four locknuts (2).
3. Remove signal control CCA (3).



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INSTALLATION

1. Place signal control CCA (3) in installed position.
2. Install four locknuts (2).
3. Connect eight cables (1) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install control assembly oscillator CCA (para 7-10).

7-12. REPLACE CONTROL ASSEMBLY METER MODULE

This task covers: a. Removal

b. Installation

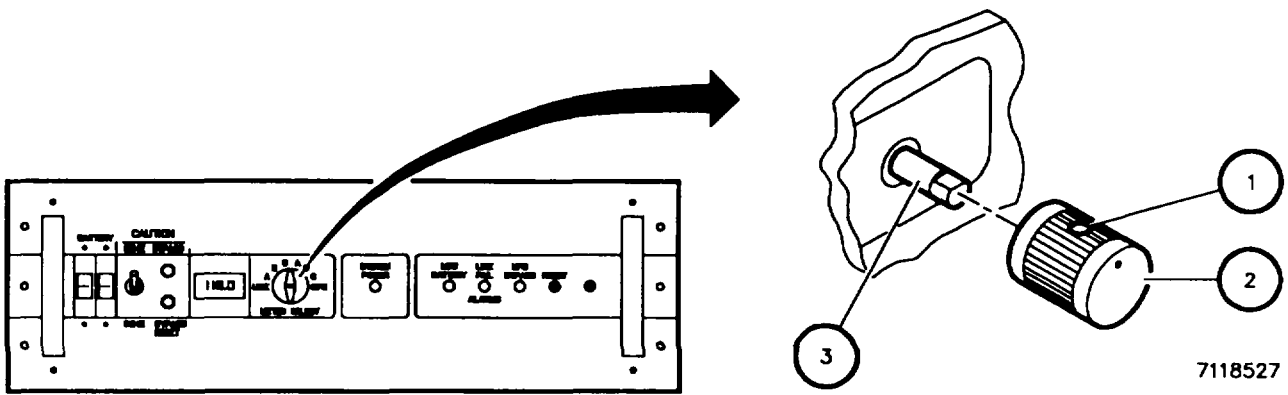
INITIAL SETUP

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove control assembly top cover (para 7-9).

REMOVAL

1. Working at front panel, loosen two setscrews (1).
2. Remove knob (2) from shaft (3).

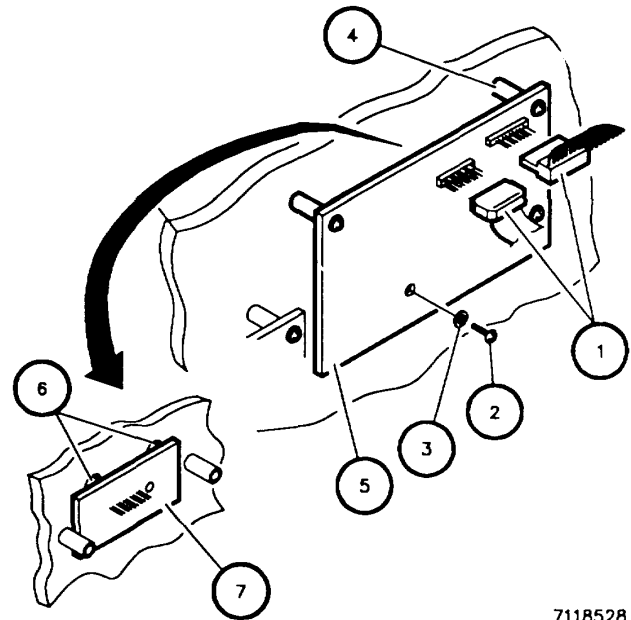


3. Working inside front panel, tag and disconnect two cables (1).
4. Remove four screws (2), plastic washers (3), and standoffs (4).
5. Remove meter module (5).

NOTE

Meter module and voltmeter are replaced as a set.

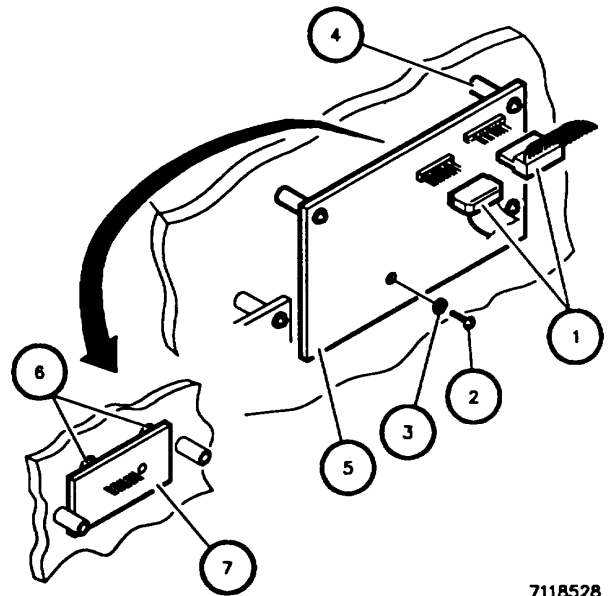
6. Release two clamps (6).
7. Remove voltmeter (7) from panel and connect to meter module (5).



7-12. REPLACE CONTROL ASSEMBLY METER MODULE - Continued

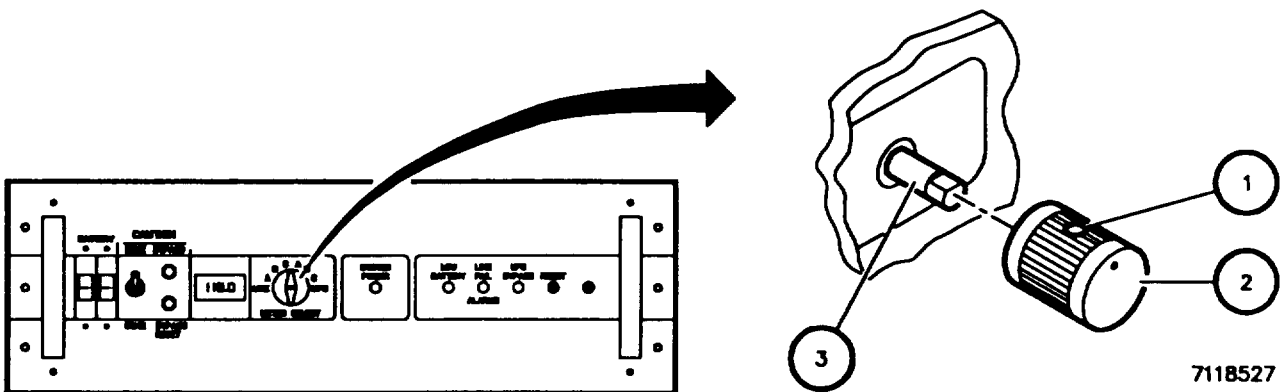
INSTALLATION

1. Remove voltmeter (7) from meter module (5).
2. Install voltmeter (7) in front panel, ensuring that two clamps (6) are engaged.
3. Place meter module (5) in installed position, ensuring that voltmeter (7) is engaged.
4. Install four screws (2), plastic washers (3), and standoffs (4).
5. Connect two cables (1) as tagged. Remove tags.



7118528

6. Place knob (2) on shaft (3).
7. Tighten two setscrews (1).



7118527

FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-13. REPLACE CONTROL ASSEMBLY ADAPTER/INTERFACE CCA

This task covers: a. Removal b. Installation

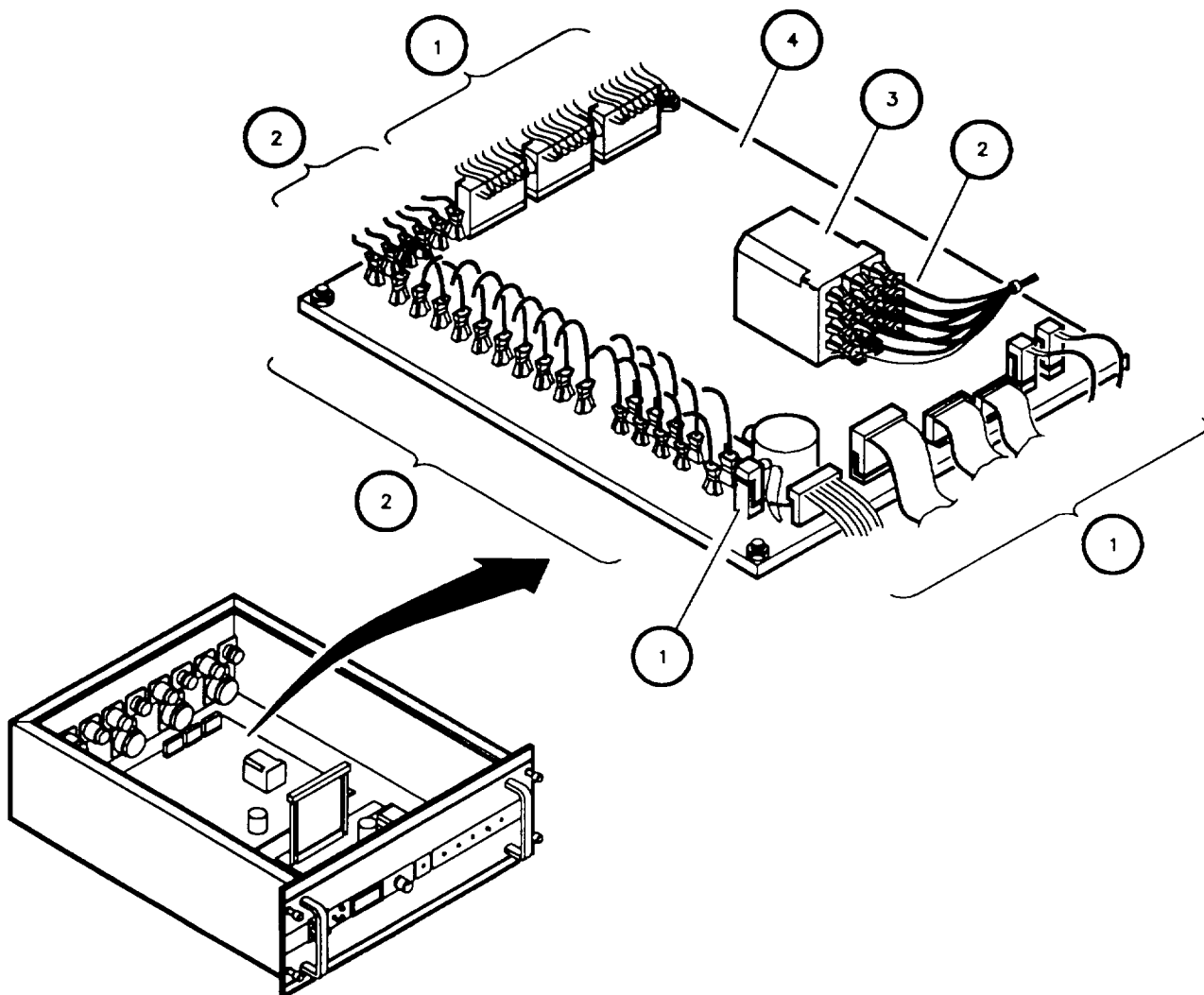
INITIAL SETUP

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove control assembly top cover (para 7-9).

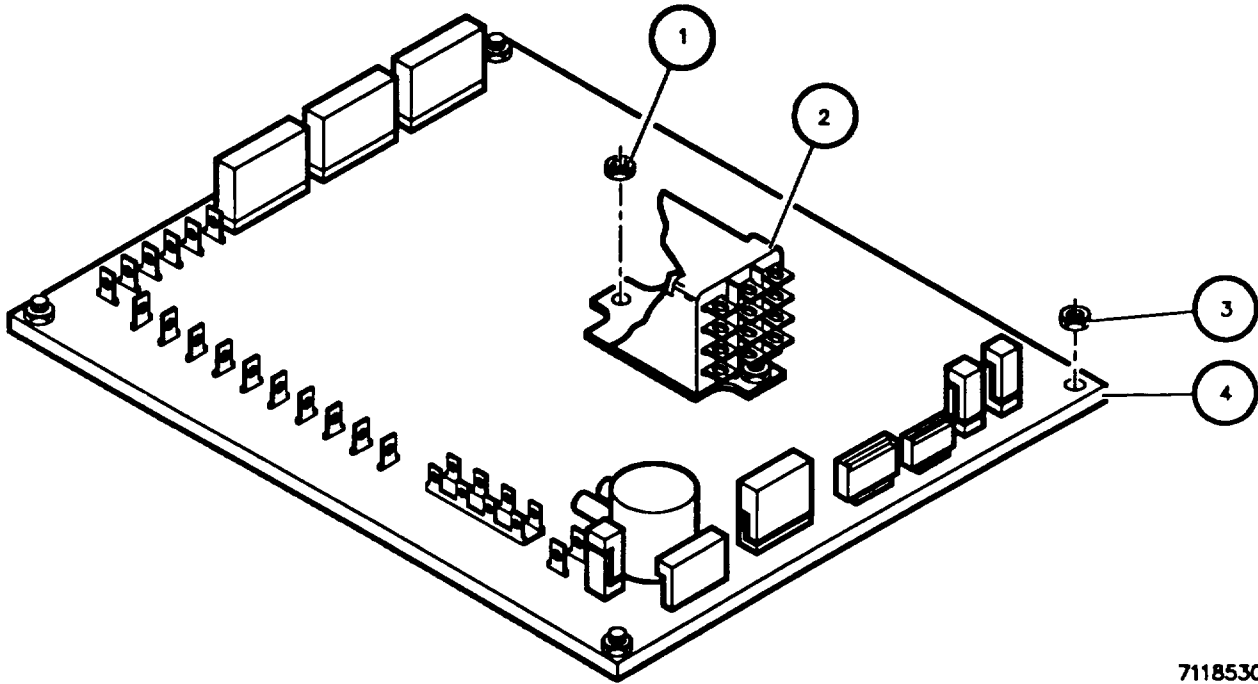
REMOVAL

1. Working inside top cover, tag and disconnect 10 cables (1).
2. Tag and disconnect all wires (2) from relay K1 (3) and adapter/interface CCA (4).



7-13. REPLACE CONTROL ASSEMBLY ADAPTER/INTERFACE CCA - Continued

3. Remove two locknuts (1) and relay K1 (2).
4. Remove four locknuts (3) and adapter/interface CCA (4).



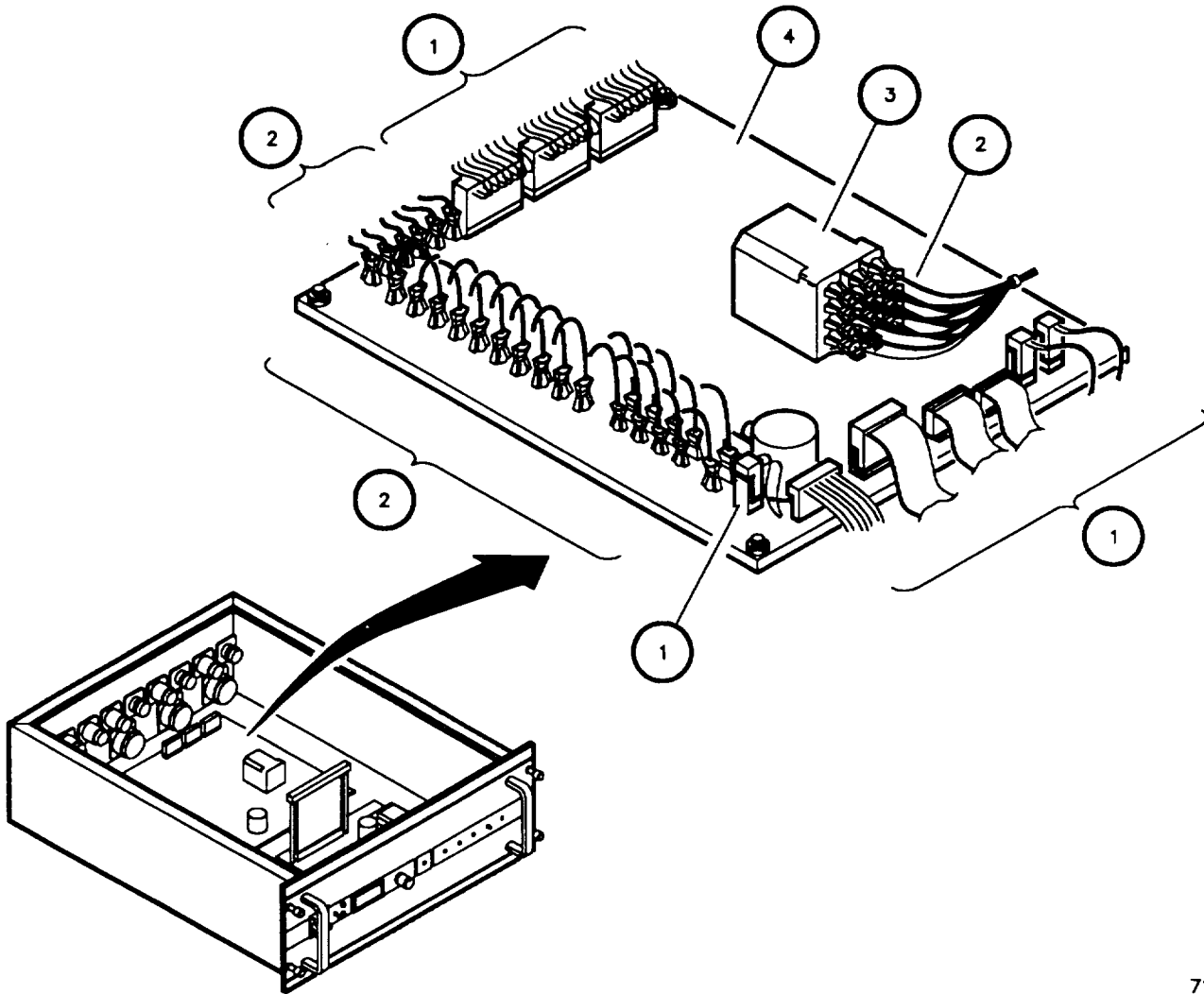
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INSTALLATION

1. Place adapter/interface CCA (4) in installed position.
2. Install four locknuts (3).
3. Place relay K1 (2) in installed position.
4. Install two locknuts (1).

7-13. REPLACE CONTROL ASSEMBLY ADAPTER/INTERFACE CCA - Continued

5. Working inside top cover, connect 10 cables (1) as tagged. Remove tags.
6. Connect all wires (2) to relay K1 (3) and adapter/interface CCA (4) as tagged. Remove tags.



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FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-14. REPLACE CONTROL ASSEMBLY POWER CONTROL CCA

This task covers: a. Removal b. Installation

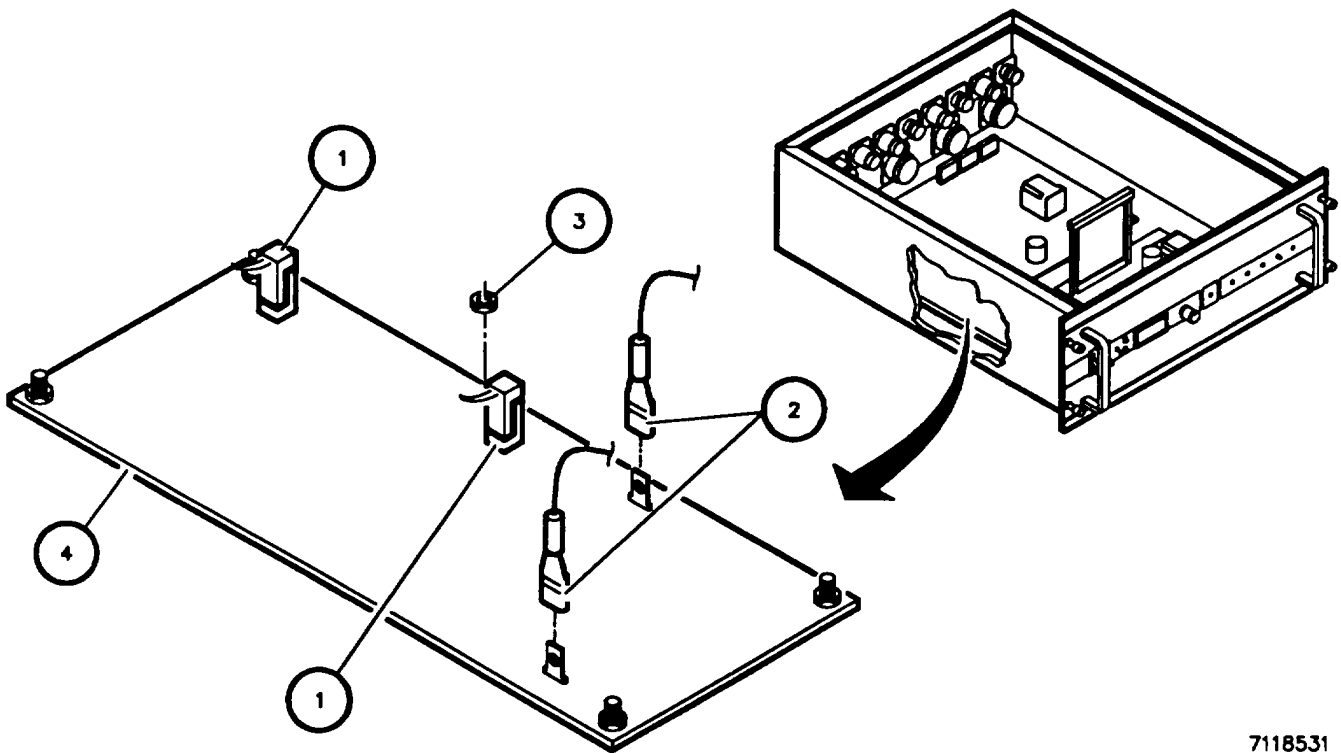
INITIAL SETUP

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove control assembly top cover (para 7-9).

REMOVAL

1. Working inside top cover, tag and disconnect two cables (1) and two ground straps (2).
2. Remove six locknuts (3).
3. Remove power control CCA (4).



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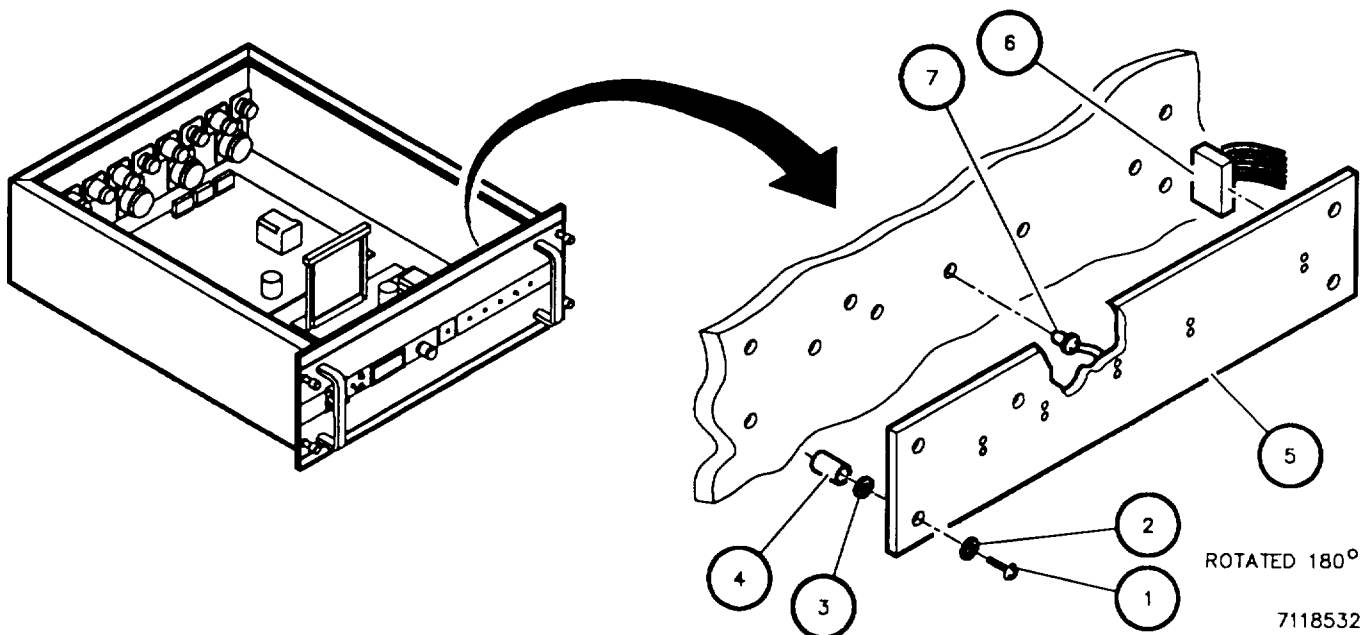
INSTALLATION

1. Place power control CCA (4) in installed position.
2. Install six locknuts (3).
3. Connect two cables (1) and two ground straps (2) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-15. REPLACE CONTROL ASSEMBLY DISPLAY CCA**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Equipment Configuration:** Installed in equipment rack.**Preliminary Procedure:** Remove control assembly top cover (para 7-9).**REMOVAL**

1. Working inside front panel, remove five screws (1), external tooth lockwashers (2), plastic washers (3), and standoffs (4).
2. Position display CCA (5) to access cable (6), ensuring that light emitting diode (LED) indicators (7) disengage from front panel without binding.
3. Tag and disconnect cable (6).
4. Remove display CCA (5).

**INSTALLATION**

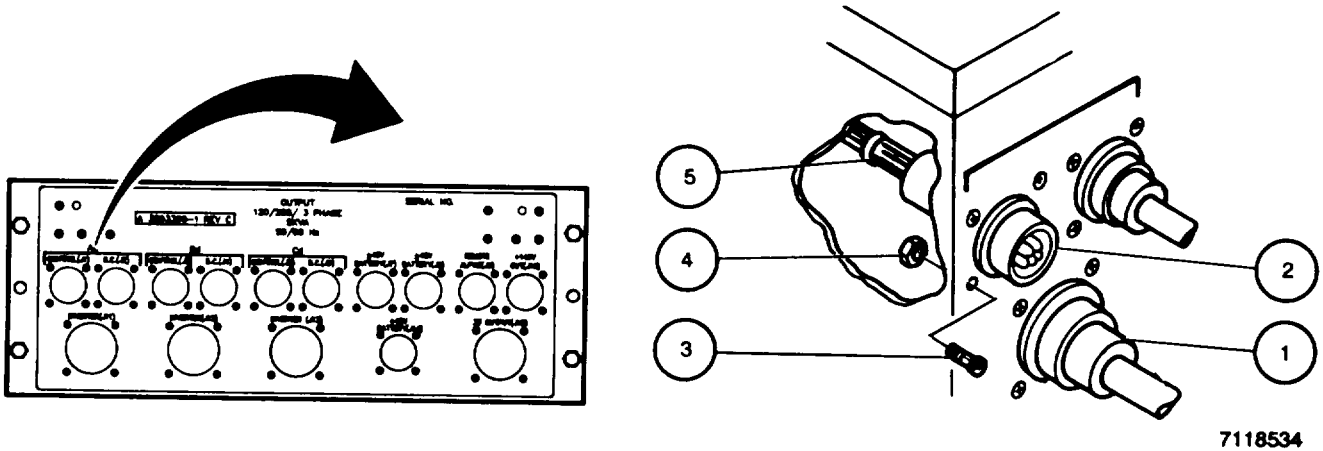
1. Connect cable (6) to display CCA (5).
2. Place display CCA (5) in installed position, ensuring that LED indicators (7) engage front panel.
3. Install five screws (1), external tooth lockwashers (2), plastic washers (3), and standoffs (4).

FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-17. REPLACE CONTROL ASSEMBLY CABLE CONNECTORS J1J15 - Continued

INSTALLATION

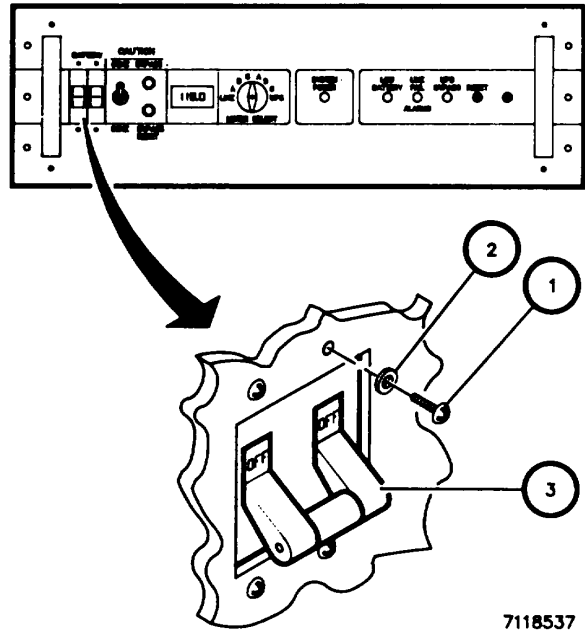
1. Install wiring (5) in cable connector (2) as tagged. Remove tags.
2. Place cable connector (2) in installed position.
3. Install four screws (3) and locknuts (4).
4. Install cable (1) in cable connector (2).
5. Repeat steps 2 through 4 for any cable connectors removed for access.



FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-18. REPLACE CONTROL ASSEMBLY BATTERY CIRCUIT BREAKER CB1 - Continued

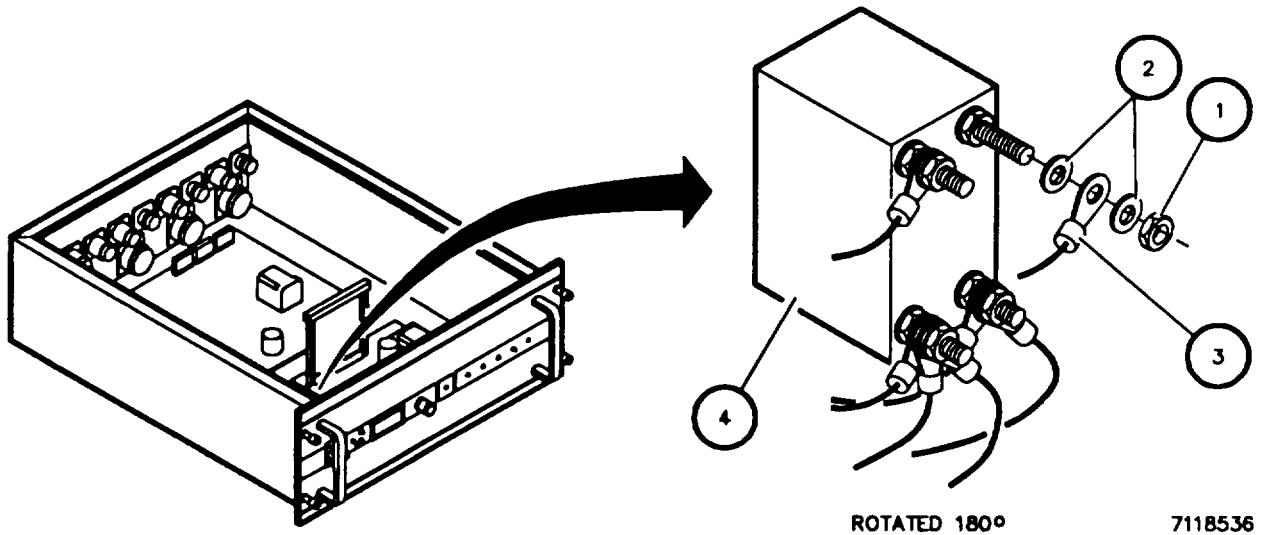
3. Working at front panel, remove four screws (1) and plastic washers (2).
4. Remove circuit breaker (3) from rear of front panel.



INSTALLATION

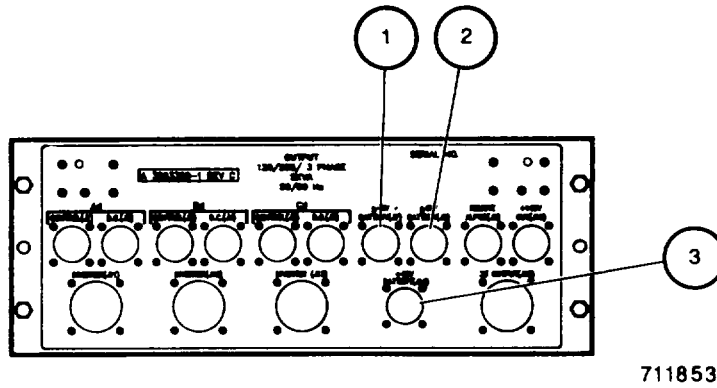
1. Place circuit breaker (3) in installed position.
2. Install four screws (1) and plastic washers (2).

3. Working inside front panel, install four nuts (1), eight washers (2), and seven wires (3) on circuit breaker (4).



7-18. REPLACE CONTROL ASSEMBLY BATTERY CIRCUIT BREAKER CB1 - Continued

4. Working at rear panel, connect cables to connectors J7 (1), J8 (2), and J14 (3).



FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-19. REPLACE CONTROL ASSEMBLY FUSE/FUSEHOLDER

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Equipment Configuration: Installed in equipment rack.

NOTE

Replace fuses F1 and F2 and their respective fuseholders the same way. Fuse F1 and its fuseholder are shown.

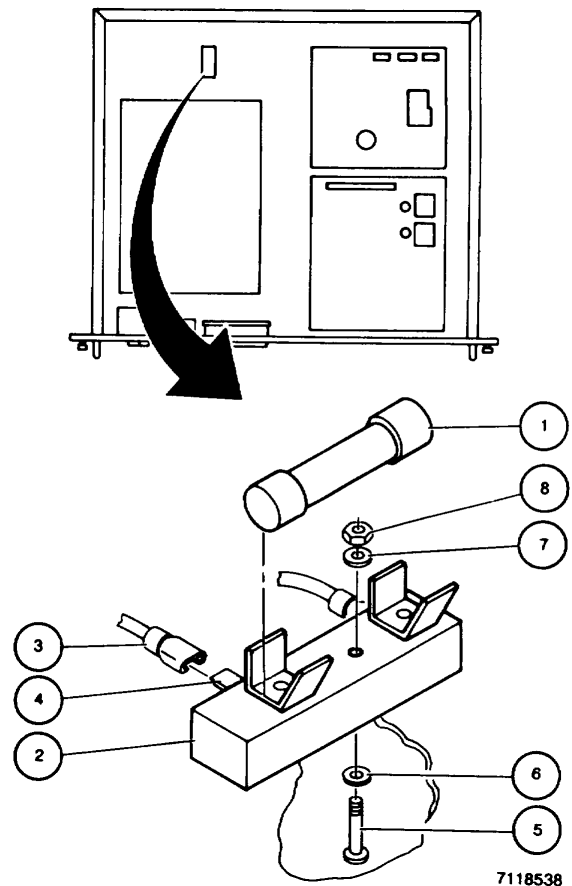
Preliminary Procedure: Remove control assembly top cover (para 7-9).

REMOVAL

1. Working inside top cover, remove fuse (1).
2. If replacing fuseholder (2), tag and disconnect two spade connectors (3) from two terminals (4).
3. Remove screw (5), washer (6), internal tooth lockwasher (7), and nut (8).
4. Remove fuseholder (2).

INSTALLATION

1. If replacing fuse only, go to step 4.
2. Place fuseholder (2) in installed position.
3. Install screw (5), washer (6), internal tooth lockwasher (7), and nut (8).
4. Connect spade connectors (3) to two terminals (4), as tagged. Remove tags.
5. Install fuse (1).



FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-20. REPLACE CONTROL ASSEMBLY 50HZ/60HZ SELECT SWITCH ASSEMBLY

This task covers:

a. Removal

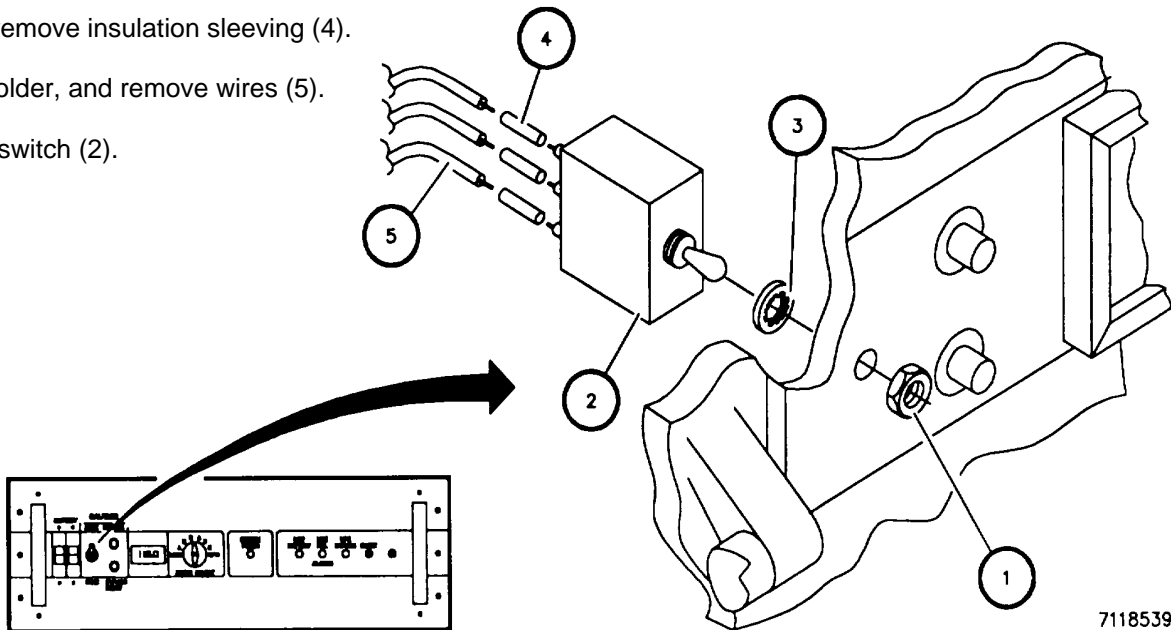
b. Installation

INITIAL SETUP

Equipment Configuration: Installed in equipment rack.**Preliminary Procedure:** Remove control assembly top cover (para 7-9).

REMOVAL

1. Working at front panel, remove nut (1).
2. Remove switch (2) and internal tooth lockwasher (3) from rear of front panel.
3. Cut and remove insulation sleeving (4).
4. Tag, unsolder, and remove wires (5).
5. Remove switch (2).



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INSTALLATION

1. Position new insulation sleeving (4) on wires (5).
2. Solder wires (5) to switch (2) as tagged. Remove tags.
3. Position and shrink insulation sleeving (4).
4. Position switch (2) and internal tooth lockwasher (3) into rear of front panel.
5. Install nut (1).

FOLLOW-ON MAINTENANCE: Install control assembly top cover (para 7-9).

7-21. REPLACE INPUT, INVERTER, OR BATTERY ASSEMBLY

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precautions:**WARNING**

Multiple person lift required for inverter and battery assemblies. Do not attempt to lift, carry, or move these assemblies by yourself. Get help.

NOTE

Replace input, inverter, and battery assemblies the same way, except where noted. Battery assembly is shown.

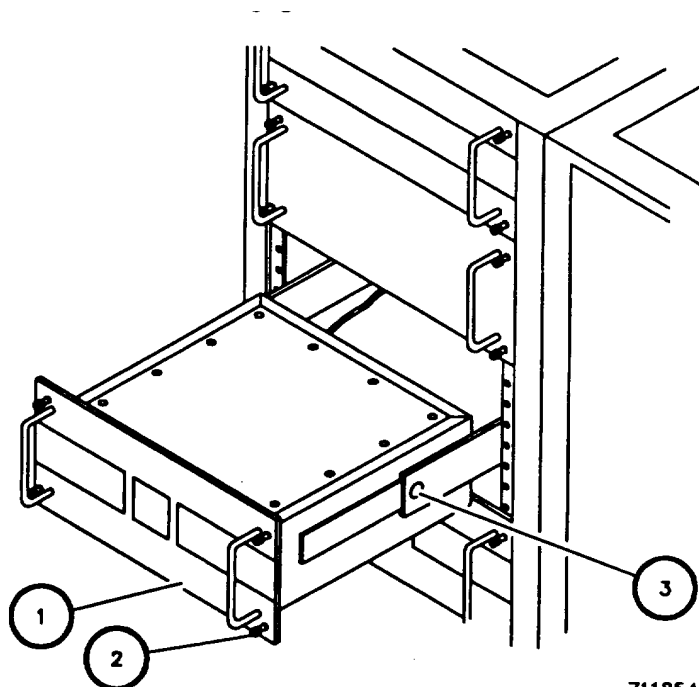
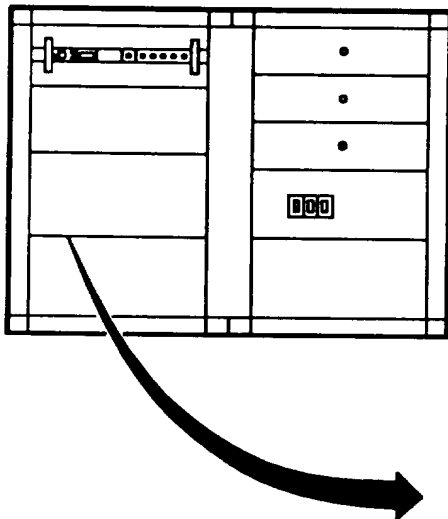
Equipment Configuration: Installed in equipment rack.

Preliminary Procedures:

1. Perform normal system shutdown. Refer to TM 11-5895-1392-12.
2. Perform bypass lighting turn-on. Refer to TM 11-5895-1392-12.

REMOVAL

1. Working at desired assembly (1), loosen four captive screws (2) (battery assembly shown).
2. Pull assembly (1) out until right and left slide rail locks (3) engage.



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7-21. REPLACE INPUT, INVERTER, OR BATTERY ASSEMBLY- Continued

3. If working on battery assembly, set rear panel BATTERY SWITCH ON/OFF switch (1) to OFF.

WARNING

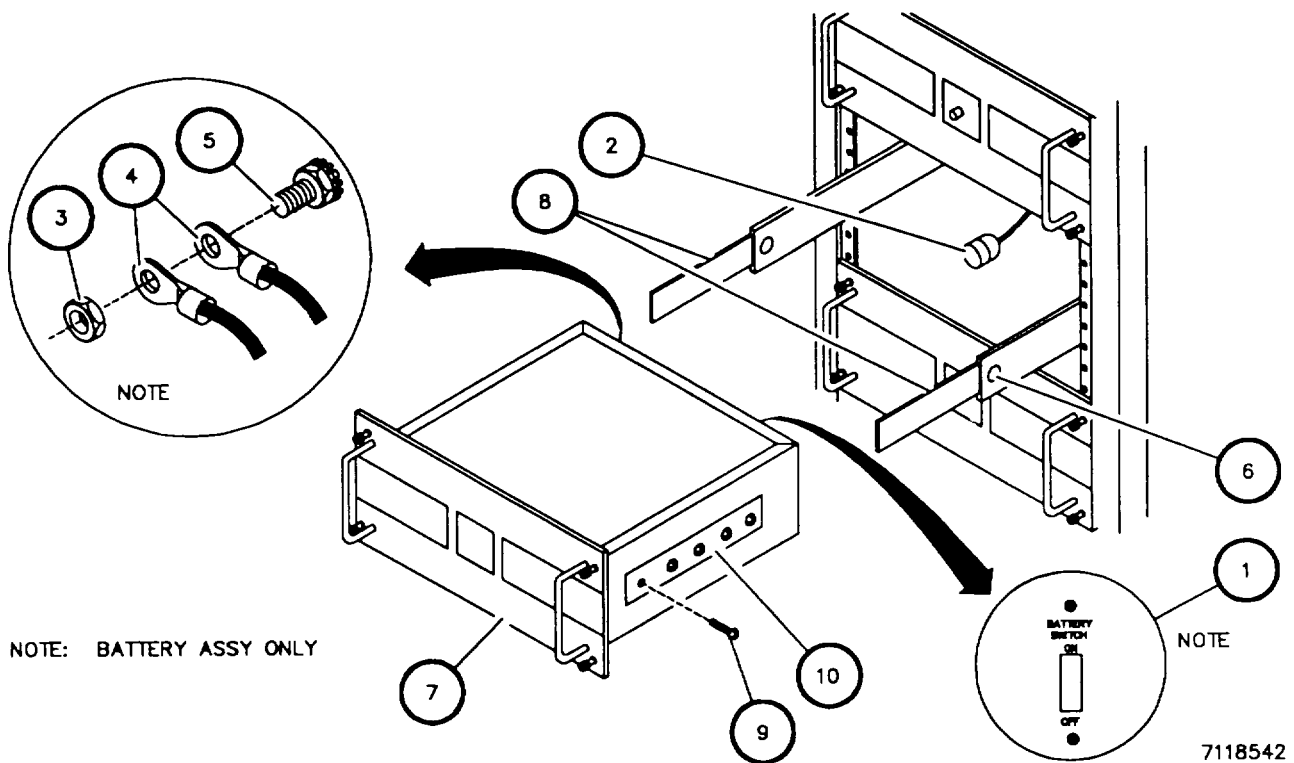
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

4. Disconnect cables (2) from rear panel.
5. If working on battery assembly, remove locknut (3) and two ground straps (4) from ground lug (5).

WARNING

Multiple person lift required for inverter and battery assemblies. Do not attempt to lift, carry, or move these assemblies by yourself. Get help.

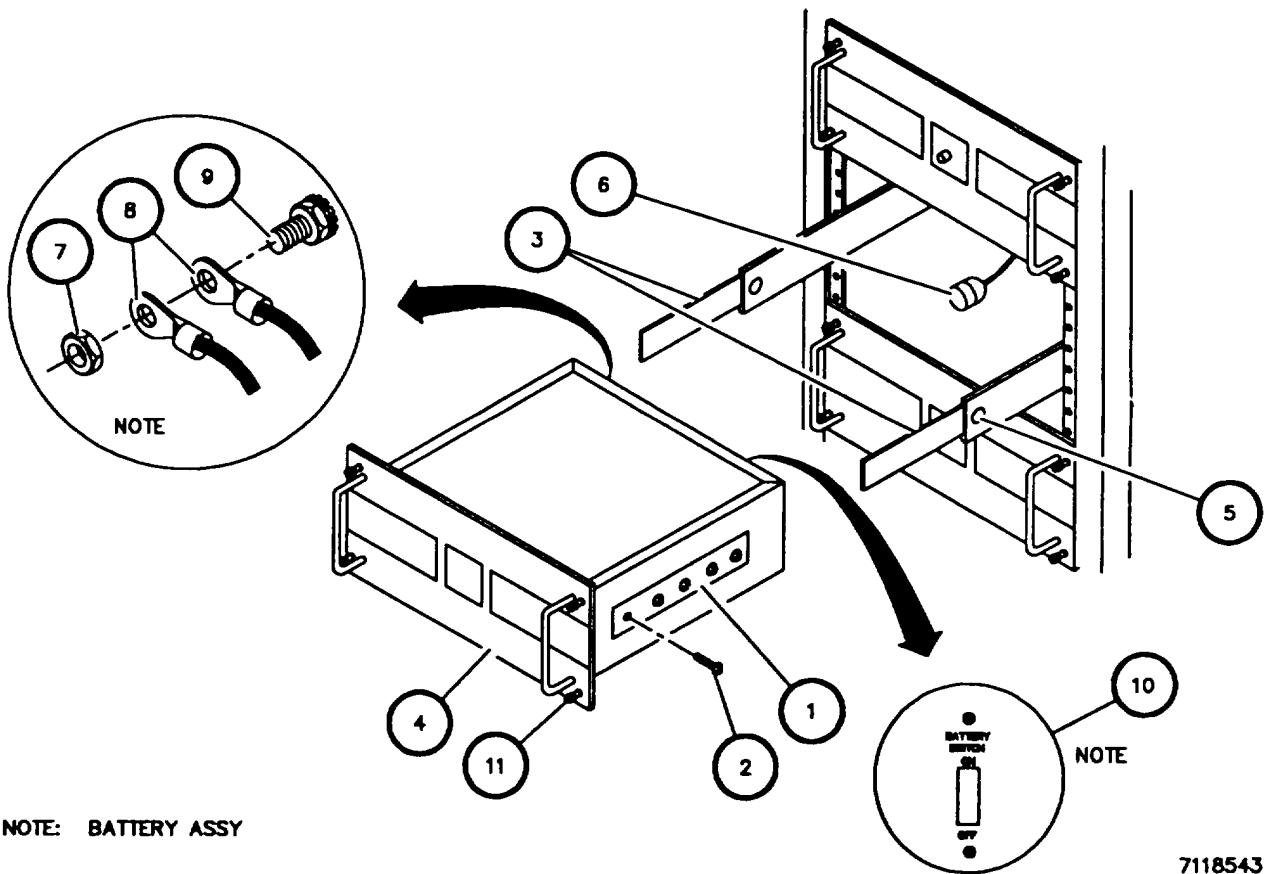
6. Press rail locks (6) and slide assembly (7) out and off of slide rails (8).
7. Remove five screws (9) from both right and left rack slides (10).
8. Remove two rack slides (10).



7-21. REPLACE INPUT, INVERTER, OR BATTERY ASSEMBLY - Continued

INSTALLATION

1. Install two rack slides (1) using five screws (2) for each slide.
2. Line up rack slides (1) with slide rails (3) and slide assembly (4) into slide rails until rail locks (5) engage.
3. Reconnect cables (6) to rear panel.
4. If working on battery assembly, install locknut (7) and two ground cables (8) on ground lug (9).
5. If working on battery assembly, set rear panel BATTERY SWITCH ON/OFF switch (10) to ON.
6. Press right and left slide rail locks (5) and push assembly (4) fully into rack.
7. Tighten four captive screws (11).



7-22. REMOVE/INSTALL INPUT, INVERTER, OR BATTERY ASSEMBLY TOP COVER

This task covers: a. Removal b. Installation

INITIAL SETUP**General Safety Precautions:****WARNING**

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.** Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.
- **HIGH VOLTAGES ARE PRESENT IN THE UPS.** Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed or panels are open to avoid electrical shock.

NOTE

- Remove/install input, inverter, and battery assembly top covers the same way. Battery assembly is shown.
- If assembly is already removed from rack, omit Removal steps 1 through 4 and Installation steps 3 through 6.

Equipment Configuration: Installed in equipment rack.

Preliminary Procedures:

1. Perform normal system shutdown. Refer to TM 11-5895-1392-12.
 2. Perform bypass lighting turn-on. Refer to TM 11-5895-1392-12.
-

7-22. REMOVE/INSTALL INPUT, INVERTER, OR BATTERY ASSEMBLY TOP COVER - Continued

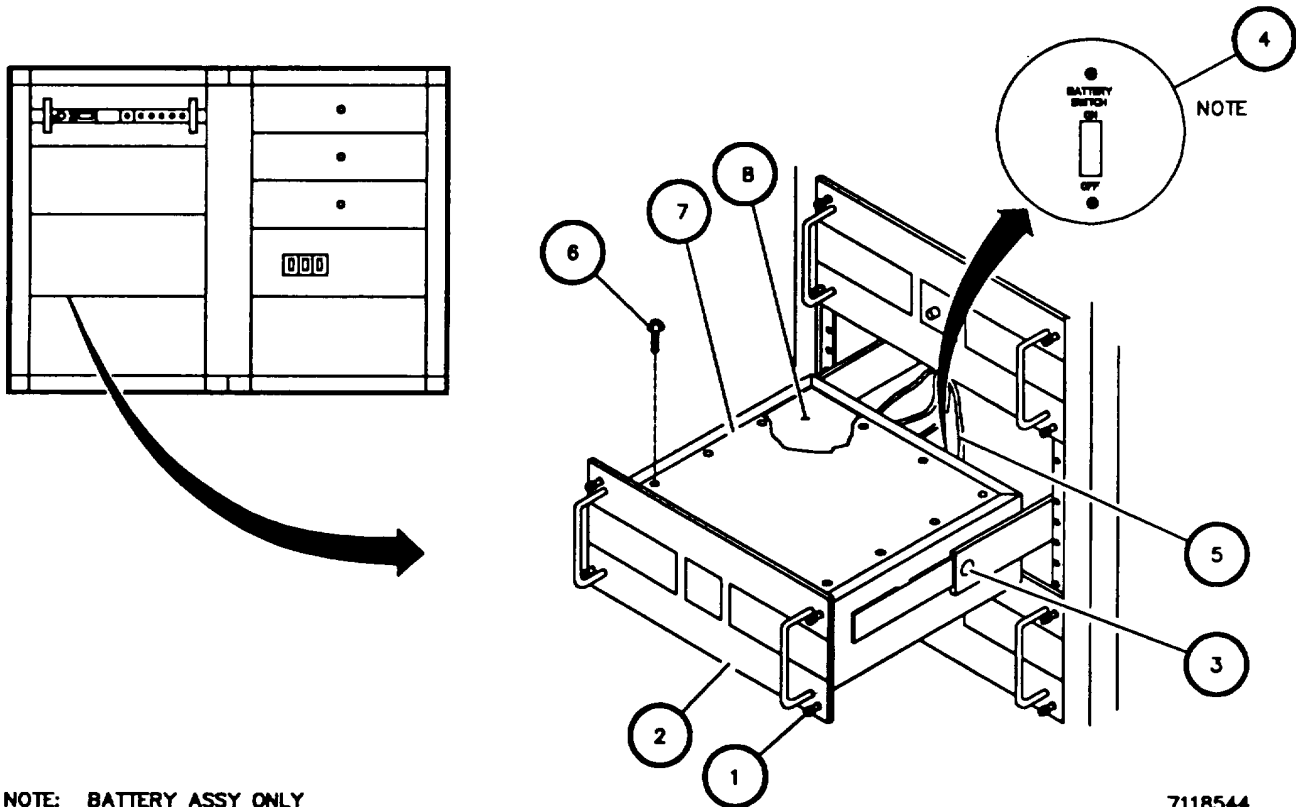
REMOVAL

1. Working at desired assembly, loosen four captive screws (1) (battery assembly shown).
2. Pull assembly (2) out until right and left slide locks (3) engage.
3. If working on battery assembly, set rear panel BATTERY SWITCH ON/OFF switch (4) to OFF.

WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

4. Disconnect cables (5) from rear panel.
5. Remove eight screws (6) (10 screws for inverter assembly only).
6. Remove top cover (7).
7. Remove insulator pad (8) (battery assembly only).



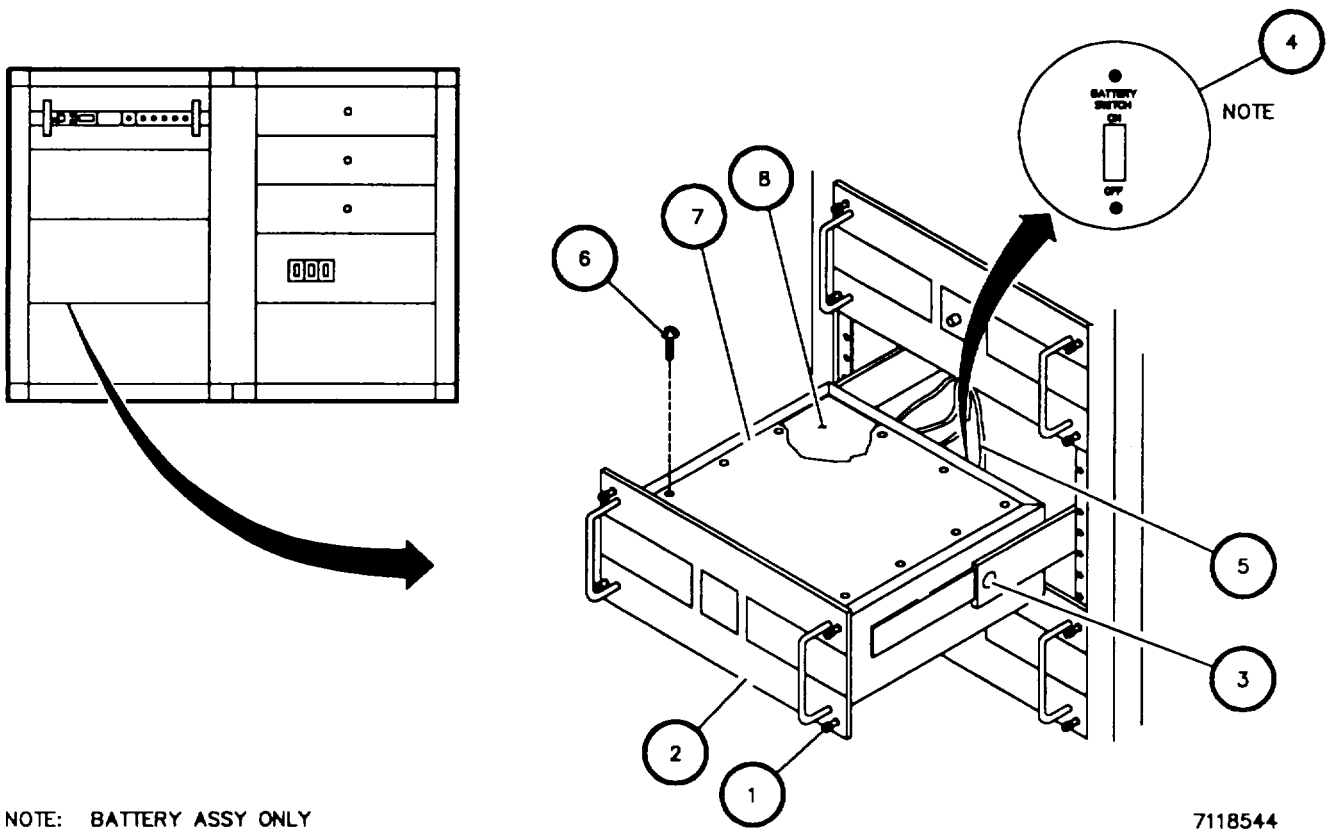
NOTE: BATTERY ASSY ONLY

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7-22. REMOVE/INSTALL INPUT, INVERTER, OR BATTERY ASSEMBLY TOP COVER - Continued

INSTALLATION

1. Place insulator pad (8) (battery assembly only) and top cover (7) in installed position.
2. Install eight screws (6).
3. Reconnect cables (5) to rear panel.
4. If working on battery assembly, set rear panel BATTERY SWITCH ON/OFF switch (4) to ON.
5. Press right and left slide locks (3) and push assembly (2) fully into rack.
6. Tighten four captive screws (1).



NOTE: BATTERY ASSY ONLY

7118544

7-23. REPLACE INPUT ASSEMBLY REAR PANEL CABLE CONNECTORS J1-J4

This task covers: a. Removal b. Installation

INITIAL SETUP

NOTE

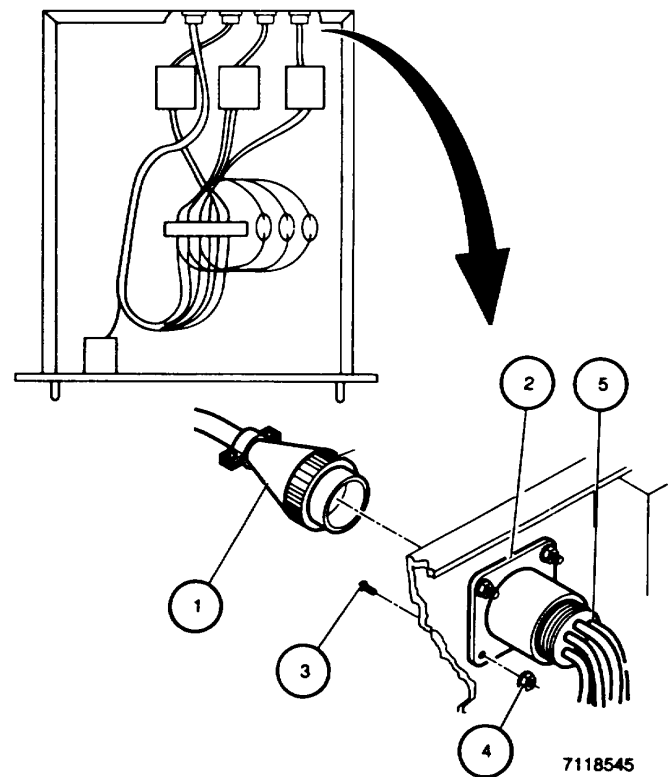
Replace cable connectors J1-J4 the same way. Cable connector J1 is shown.

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove input assembly top cover (para 7-22).

REMOVAL

1. Working at rear panel, remove cable (1) from cable connector (2).
2. Remove four screws (3) and locknuts (4).
3. Remove cable connector (2) from inside of rear panel.
4. Tag and remove wiring (5) from cable connector (2).
5. Remove cable connector (2).



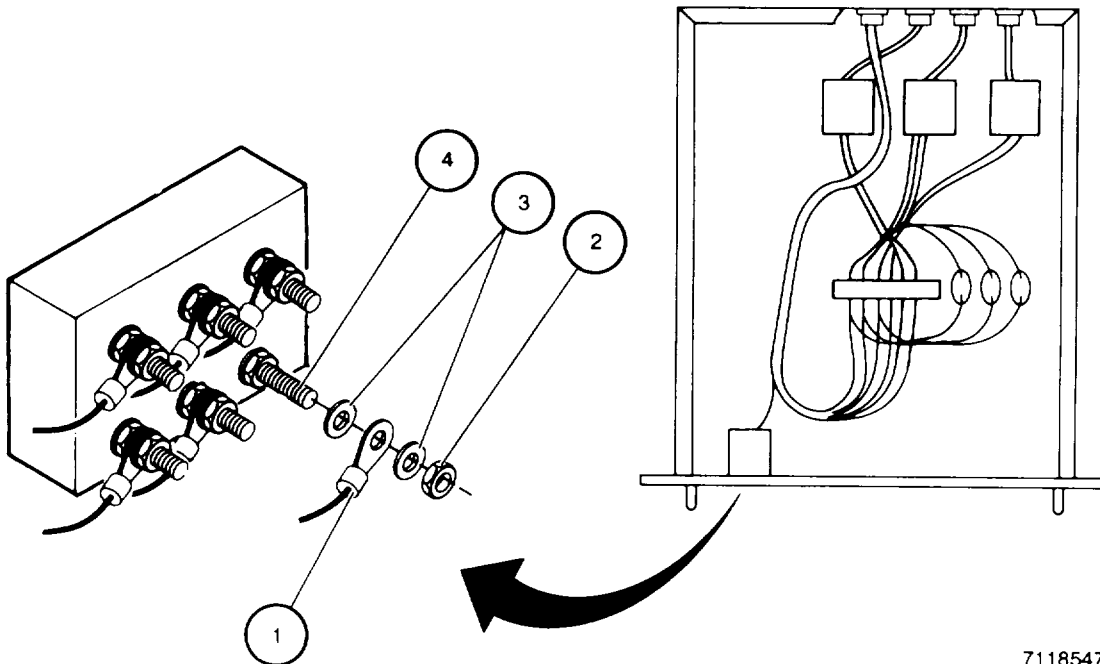
INSTALLATION

1. Install wiring (5) in cable connector (2) as tagged. Remove tags.
2. Place cable connector (2) in installed position.
3. Install four screws (3) and locknuts (4).
4. Install cable (1) in cable connector (2).

FOLLOW-ON MAINTENANCE: Install input assembly top cover (para 7-22).

7-24. REPLACE INPUT ASSEMBLY CIRCUIT BREAKER CB1**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Equipment Configuration:** Installed in equipment rack.**Preliminary Procedure:** Remove input assembly top cover (para 7-22).

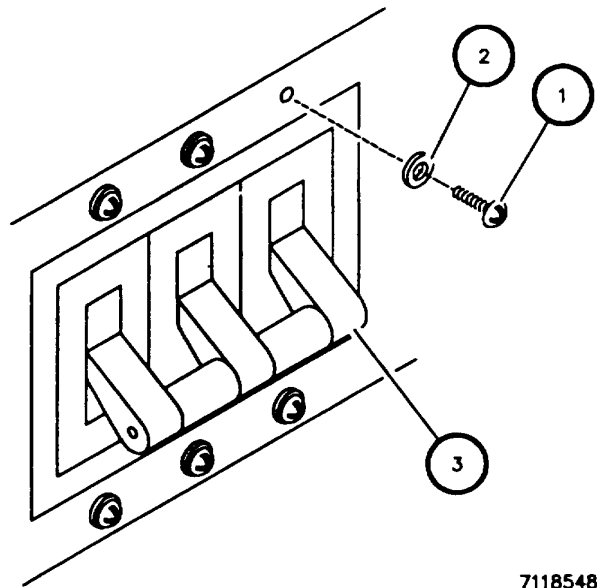
1. Working inside front panel, tag six cables (1).
2. Remove six nuts (2), 12 washers (3), and six cables (1) from circuit breaker terminal lugs (4).



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7-24. REPLACE INPUT ASSEMBLY CIRCUIT BREAKER CB1 - Continued

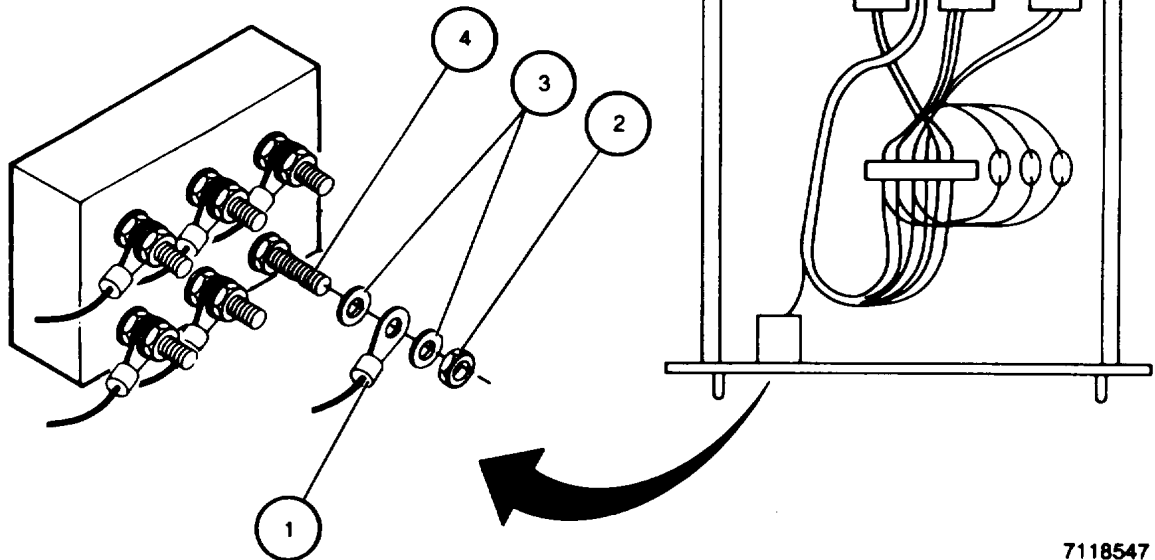
3. Working at front panel, remove six screws (1) and plastic washers (2).
4. Remove circuit breaker (3) from rear of front panel.



INSTALLATION

1. Place circuit breaker (3) in installed position.
2. Install six screws (1) and plastic washers (2).

3. Working inside front panel, install six nuts (2), 12 washers (3), and six cables (1) on circuit breaker terminal lugs (4) as tagged. Remove tags.



FOLLOW-ON MAINTENANCE: Install input assembly top cover (para 7-22).

7-25. REPLACE INPUT ASSEMBLY EMI FILTERS EMI-1, EMI-2, AND EMI-3**This task covers:****a. Removal****b. Installation****INITIAL SETUP****NOTE**

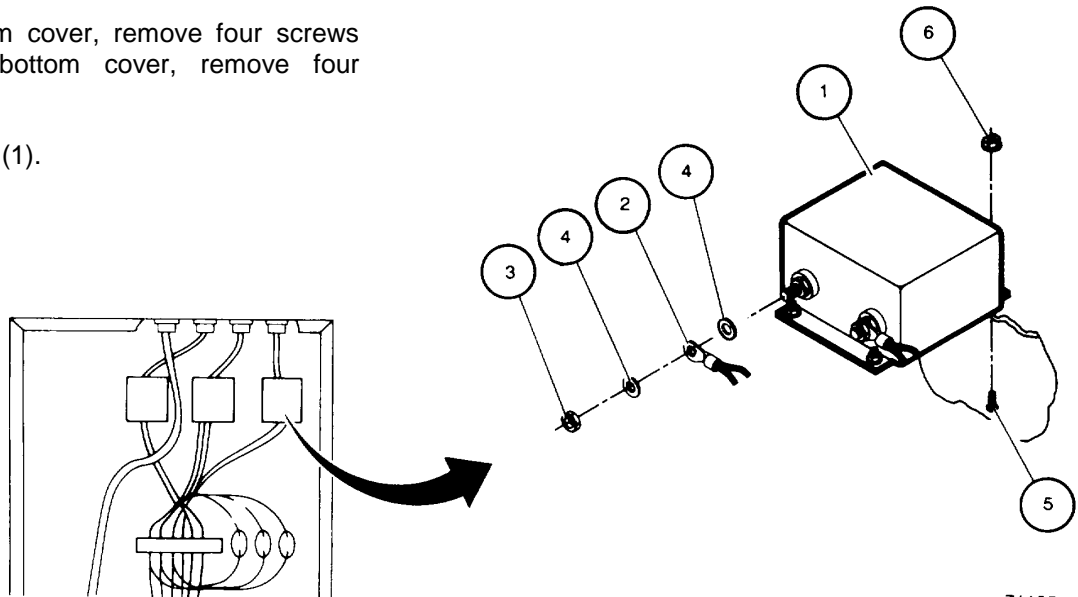
Replace EMI filters EMI-1, EMI-2, and EMI-3 the same way. EMI filter EMI-1 is shown.

equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove input assembly top cover (para 7-22).

REMOVAL

1. Working at EMI filter (1), tag four cables (2).
2. Remove four nuts (3); eight washers (4), and cables (2).
3. Working at bottom cover, remove four screws (5) and inside bottom cover, remove four locknuts (6).
4. Remove EMI filter (1).



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INSTALLATION

1. Place EMI filter (1) in installed position.
2. Working at bottom cover, install four screws (5) and inside bottom cover, install four locknuts (6).
3. Install four nuts (3), washers (4), and cables (2) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install input assembly top cover (para 7-22).

7-26. REPLACE INPUT ASSEMBLY TERMINAL BOARD TB1

This task covers:

a. Removal

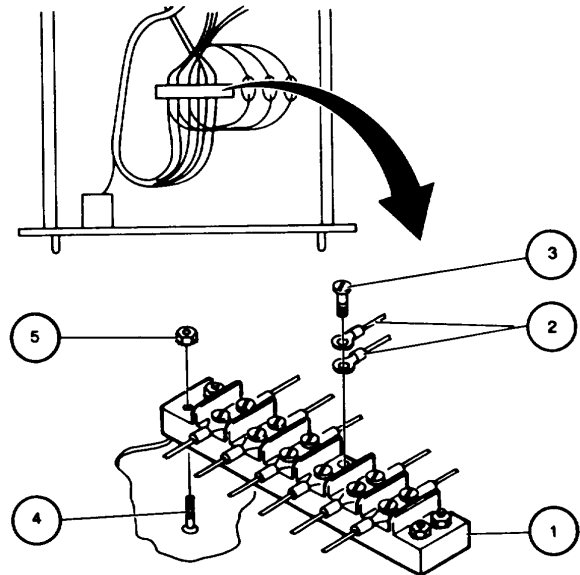
b. Installation

INITIAL SETUP

Equipment Configuration: Installed in equipment rack.**Preliminary Procedure:** Remove input assembly top cover (para 7-22).

REMOVAL

1. Working at terminal board (1), tag 18 cables (2).
2. Remove 12 screws (3) and 18 cables (2) from terminal board (1).
3. Working at bottom panel, remove four screws (4) and inside bottom panel, remove four locknuts (5).
4. Remove terminal board (1).



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INSTALLATION

1. Place terminal board (1) in installed position.
2. Working at bottom panel, install four screws (4) and inside bottom panel, install four locknuts (5).
3. Install 12 screws (3) and 18 cables (2) to terminal board (1) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install input assembly top cover (para 7-22).

7-27. REPLACE INPUT ASSEMBLY CAPACITORS C1-C3**This task covers:****a. Removal****b. Installation****INITIAL SETUP****NOTE**

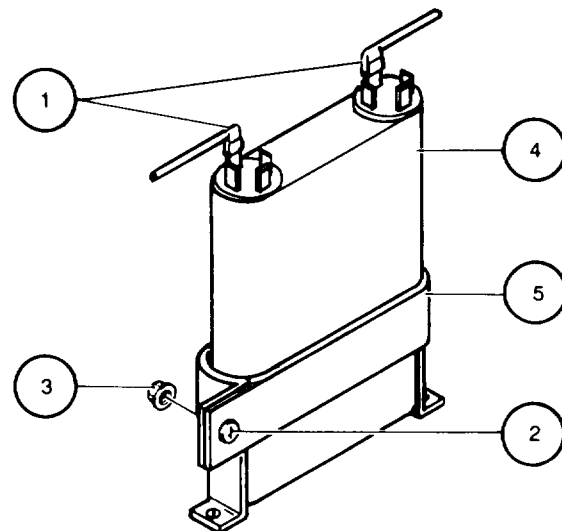
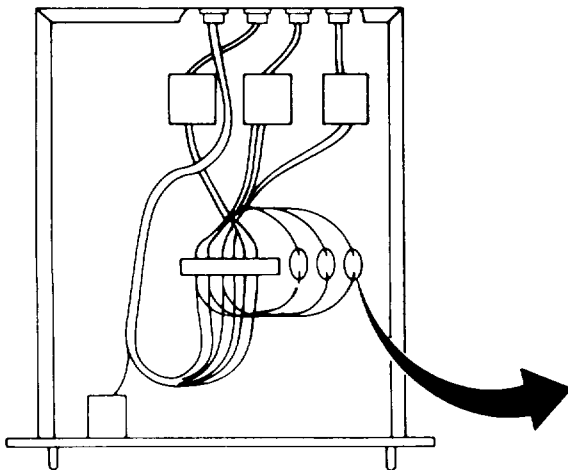
Replace capacitors C1-C3 the same way. Capacitor C1 is shown.

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove input assembly top cover (para 7-22).

REMOVAL

1. Tag and remove two wires (1).
2. Loosen screw (2) and locknut (3).
3. Remove capacitor (4) from retainer (5).



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INSTALLATION

1. Position capacitor (4) in retainer (5).
2. Tighten screw (2) and locknut (3).
3. Install two wires (1) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install input assembly top cover (para 7-22).

7-28. REPLACE BATTERY ASSEMBLY FUSE/FUSEHOLDER

This task covers:**a. Removal****b. Installation**

INITIAL SETUP**WARNING**

HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).

NOTE

Replace fuses F1 and F2, and their respective fuseholders, the same way. Fuse F1 and its fuseholder are shown.

Materials/Parts: Electrical tape.

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove battery assembly top cover (para 7-22).

7-28. REPLACE BATTERY ASSEMBLY FUSE/FUSEHOLDER - Continued

REMOVAL

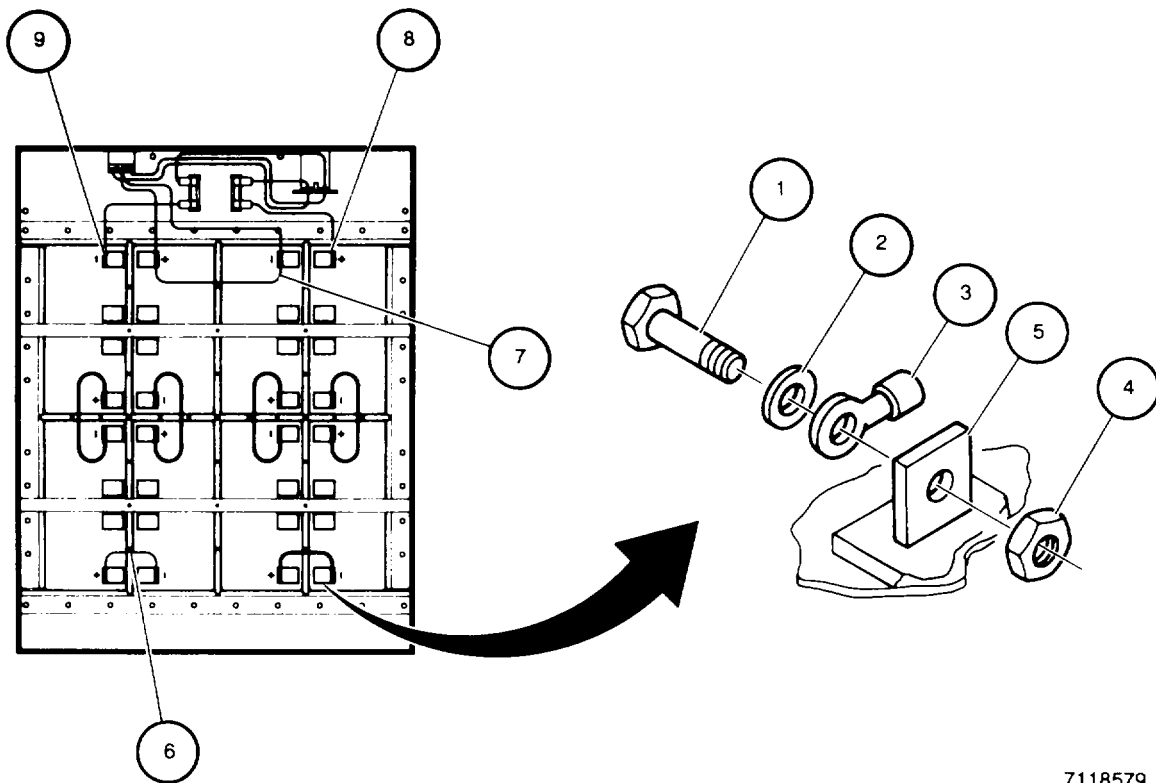
WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

NOTE

Perform steps 1 through 4 to reduce battery output to a lower, less dangerous level.

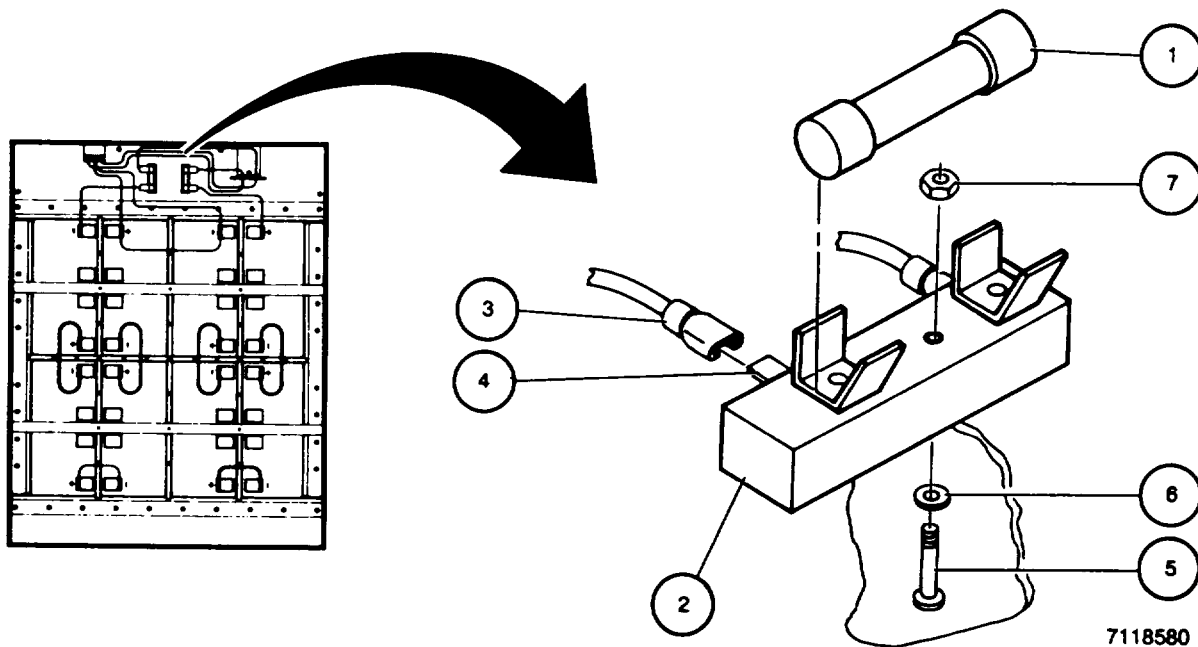
1. Working inside top cover, carefully remove hexbolt (1), washer (2), cable (3), and nut (4) from terminal (5). Wrap cable end (3) with electrical tape to help prevent shorting.
2. Repeat step 1 for opposite end of cable (3).
3. Repeat steps 1 and 2 for cables (6) and (7).
4. Repeat step 1 for cables (8) and (9).



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7-28. REPLACE BATTERY ASSEMBLY FUSE/FUSEHOLDER - Continued

5. Remove fuse (1).
6. If replacing fuseholder (2), tag and disconnect two spade connectors (3) from two terminals (4).
7. Remove screw (5), lockwasher (6), and nut (7).
8. Remove fuseholder (2).

**INSTALLATION**

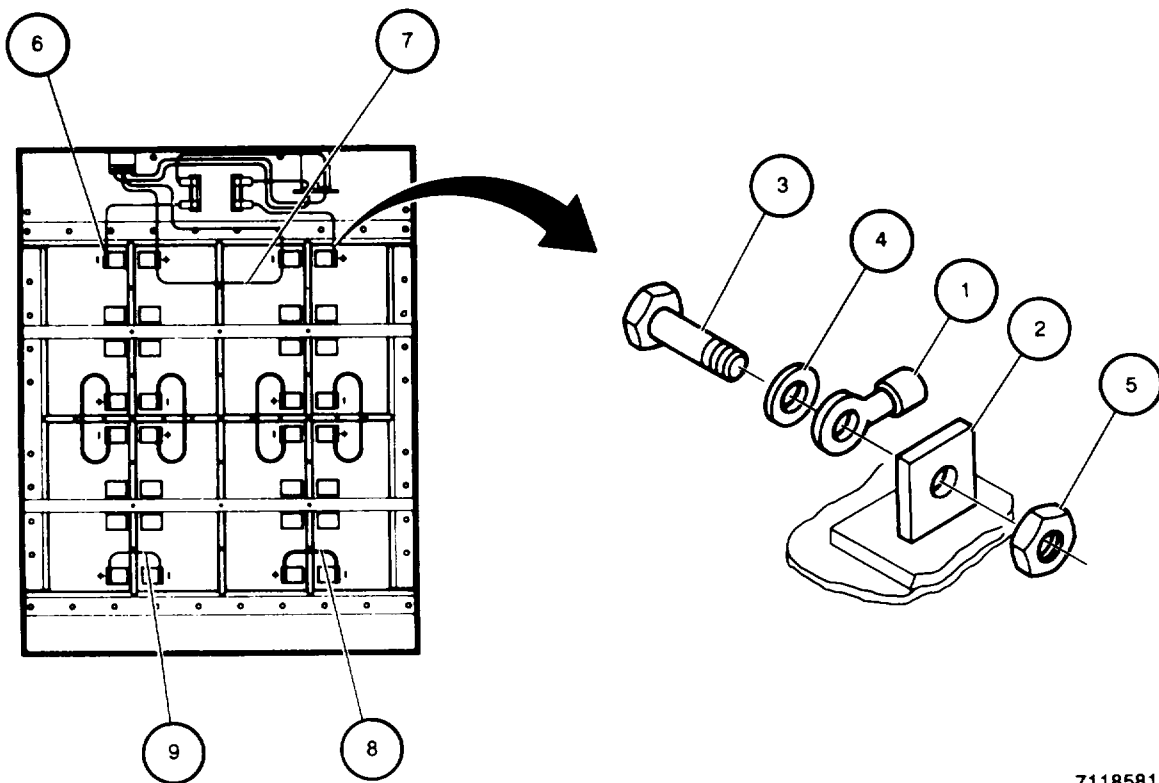
1. If replacing fuse only, go to step 5.
2. Place fuseholder (2) in installed position.
3. Install screw (5), lockwasher (6), and nut (7).
4. Connect two spade connectors (3) to two terminals (4) as tagged. Remove tags.
5. Install fuse (1).

7-28. REPLACE BATTERY ASSEMBLY FUSE/FUSEHOLDER - Continued

WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

6. Remove electrical tape from cable end (1).
7. Connect cable (1) to terminal (2) using hexbolt (3), washer (4), and nut (5).
8. Repeat steps 6 and 7 for cable (6).
9. Repeat steps 6 and 7 for both ends of cables (7), (8), and (9).



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FOLLOW-ON MAINTENANCE: Install battery assembly top cover (para 7-22).

7-29. REPLACE BATTERY ASSEMBLY BATTERIES BA1-BA8

This task covers:**a. Removal****b. Installation**

INITIAL SETUP**Equipment Configuration**: Installed in equipment rack.**WARNING**

- **HIGH VOLTAGES ARE PRESENT IN THE UPS.** Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).
- **Batteries contain toxic material and corrosive fluids.** If battery leakage is observed, wear rubber gloves and apron to avoid injury.

NOTE

Replace batteries BA1-BA8 the same way. Left rear battery is shown.

Materials/Parts: Electrical tape, caulking.**Equipment Configuration**: Installed in equipment rack.**Preliminary Procedure**: Remove battery assembly top cover (para 7-22).

7-29. REPLACE BATTERY ASSEMBLY BATTERIES BA1-BA8 - Continued

REMOVAL

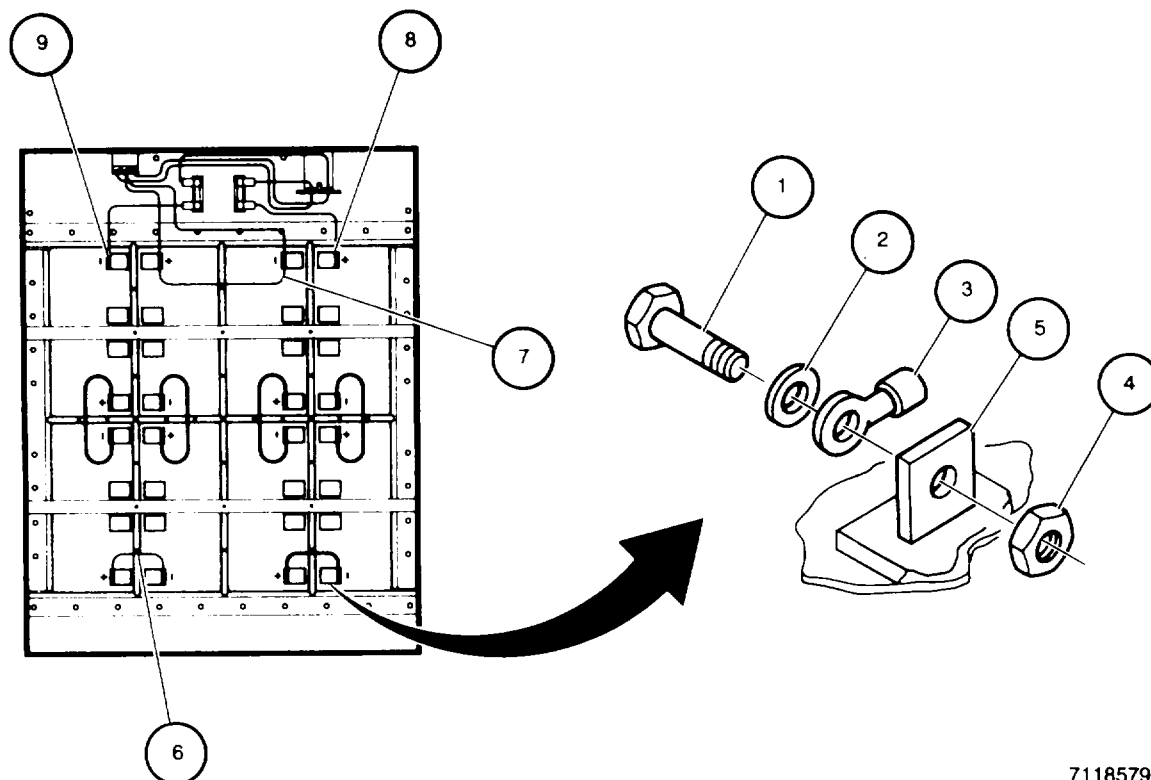
WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

NOTE

Perform steps 1 through 4 to reduce battery output to a lower, less dangerous level.

1. Working inside top cover, carefully remove hexbolt (1), washer (2), cable (3), and nut (4) from terminal (5). Wrap cable end (3) with electrical tape to help prevent shorting.
2. Repeat step 1 for opposite end of cable (3).
3. Repeat steps 1 and 2 for cables (6) and (7).
4. Repeat step 1 for cables (8) and (9).
5. Repeat step 1 for all other cables connected to battery being replaced.



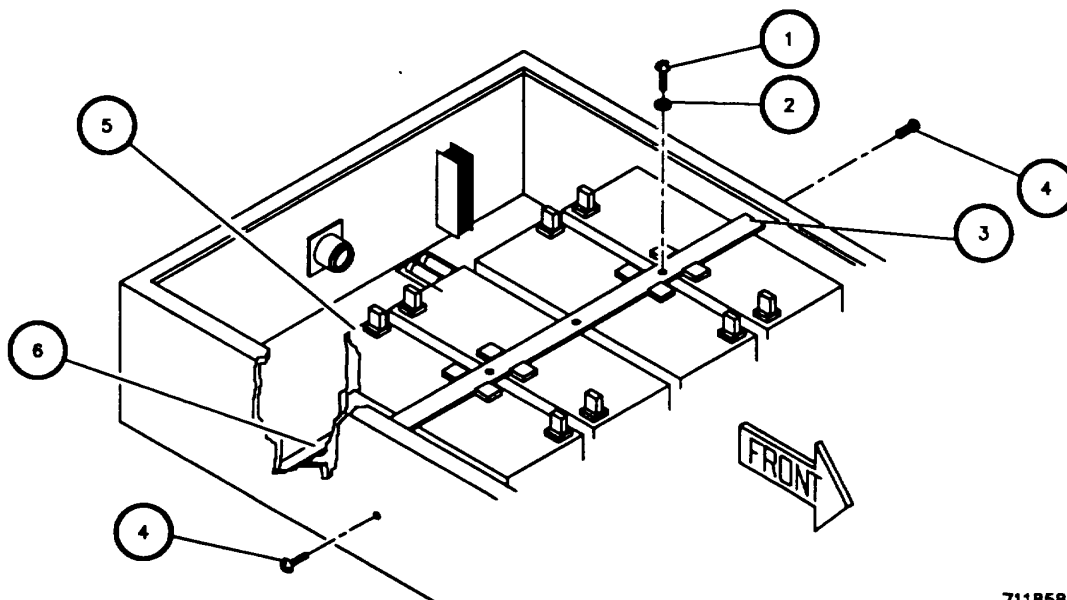
7118579

7-29. REPLACE BATTERY ASSEMBLY BATTERIES BA1-BA8 - Continued

6. Remove three screws (1) and lockwashers (2) across top of retainer bar (3).
7. Remove two screws (4) from ends of retainer bar (3).
8. Lift, rotate, and remove retainer bar (3), ensuring that retainer bar does not touch battery terminals.

WARNING

- **DO NOT PRY AT BATTERY WITH SHARP OBJECTS.** Battery case can be easily damaged, releasing dangerous toxic and corrosive materials.
 - **Batteries contain toxic material and corrosive fluids.** If battery leakage is observed, wear rubber gloves and apron to avoid injury.
9. Carefully remove battery (5), cutting and removing caulking around battery base (6), as required.



7118582

INSTALLATION

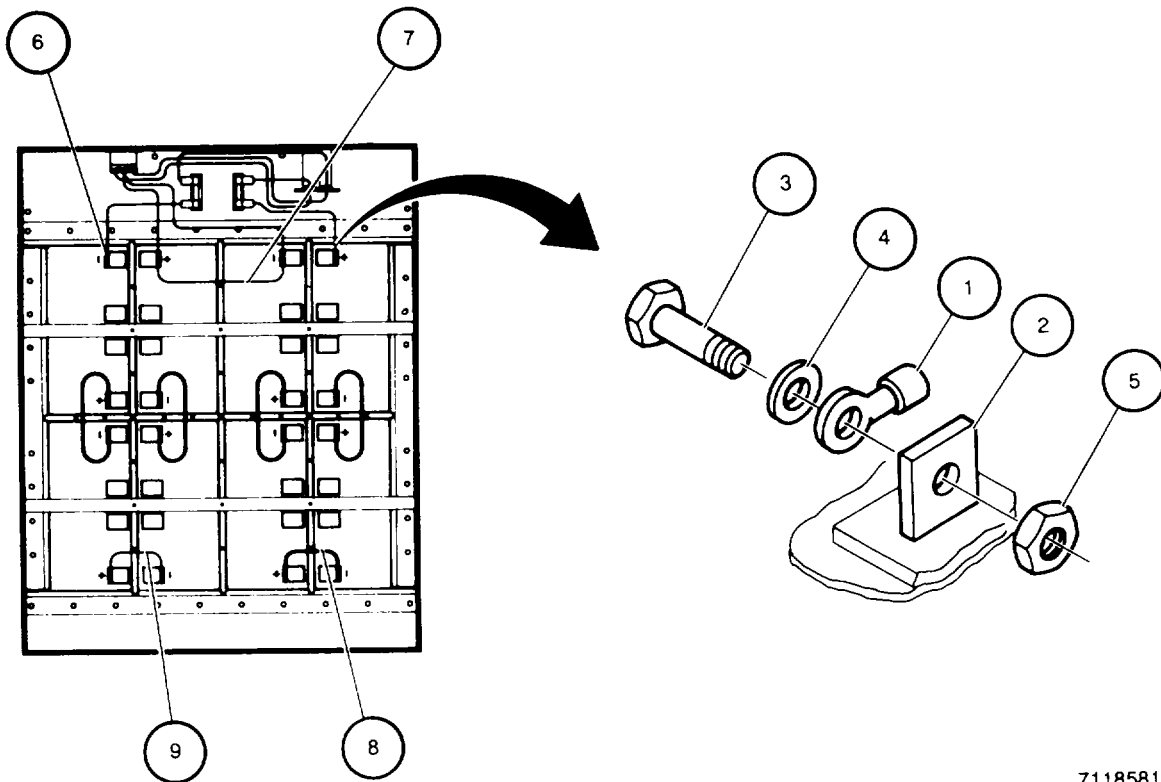
1. Scrape and clean caulking from battery base (6), as required.
2. Carefully place battery (5) in installed position.
3. Place retainer bar (3) in installed position, ensuring that retainer bar does not touch battery terminals.
4. Install three screws (1) and lockwashers (2) across top of retainer bar (3).
5. Install two screws (4) at ends of retainer bar (3).
6. Apply fresh caulking around battery base (6).

7-29. REPLACE BATTERY ASSEMBLY BATTERIES BA1-BA8 - Continued

WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

7. Remove electrical tape from cable end (1).
8. Connect cable (1) to terminal (2) using hexbolt (3), washer (4), and nut (5).
9. Repeat steps 7 and 8 for cable (6).
10. Repeat steps 7 and 8 for both ends of cables (7), (8), and (9).
11. Repeat steps 7 and 8 for all cables removed from replaced battery.



7118581

FOLLOW-ON MAINTENANCE: Install battery assembly top cover (para 7-22).

7-30. REPLACE BATTERY ASSEMBLY REAR PANEL CABLE CONNECTOR J1

This task covers: a. Removal b. Installation

INITIAL SETUP

WARNING

HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).

Materials/Parts: Electrical tape.

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove battery assembly top cover (para 7-22).

REMOVAL

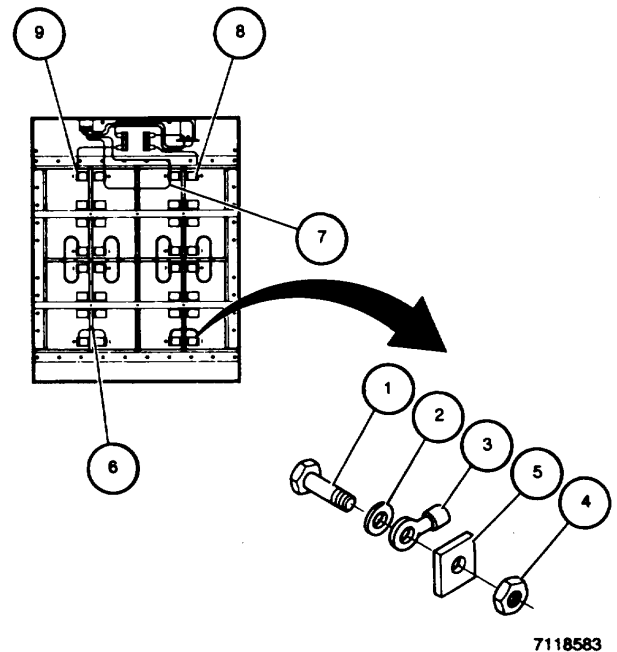
WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

NOTE

Perform steps 1 through 4 to reduce battery output to a lower, less dangerous level.

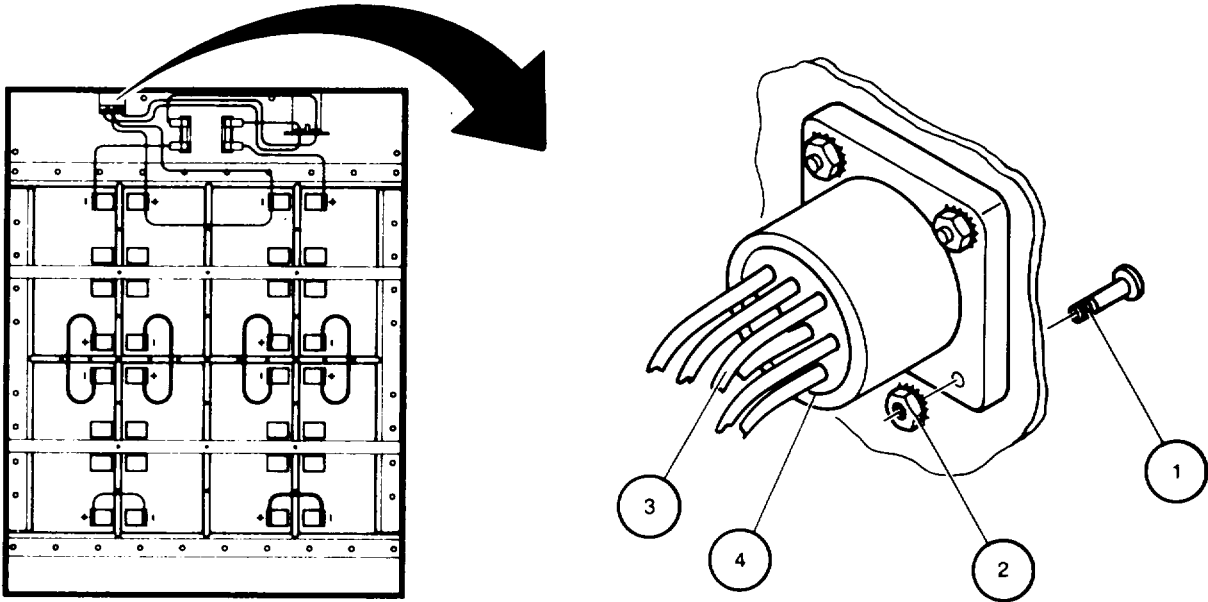
1. Working inside top cover, carefully remove hexbolt (1), washer (2), cable (3), and nut (4) from terminal (5). Wrap cable end (3) with electrical tape to help prevent shorting.
2. Repeat step 1 for opposite end of cable (3).
3. Repeat steps 1 and 2 for cables (6) and (7).
4. Repeat step 1 for cables (8) and (9).



7118583

7-30. REPLACE BATTERY ASSEMBLY REAR PANEL CABLE CONNECTOR J1 - Continued

5. Working at rear panel, remove four screws (1) and locknuts (2).
6. Tag and disconnect wiring (3) from cable connector (4).
7. Remove cable connector (4).



7118584

INSTALLATION

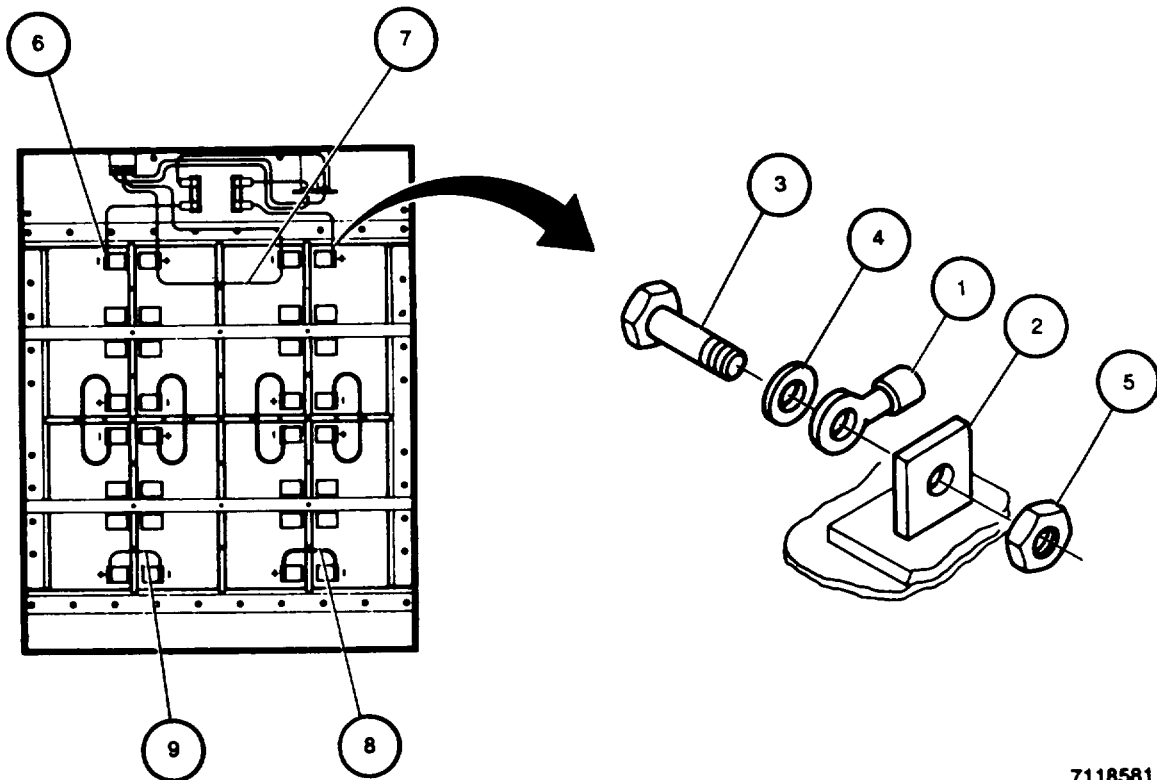
1. Install wiring (3) in cable connector (4).
2. Place cable connector (4) in installed position.
3. Install four screws (1) and locknuts (2).

7-30. REPLACE BATTERY ASSEMBLY REAR PANEL CABLE CONNECTOR J1 - Continued

WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

4. Remove electrical tape from cable end (1).
5. Connect cable (1) to terminal (2) using hexbolt (3), washer (4), and nut (5).
6. Repeat steps 4 and 5 for cable (6).
7. Repeat steps 4 and 5 for both ends of cables (7), (8), and (9).



7118581

FOLLOW-ON MAINTENANCE: Install battery assembly top cover (para 7-22).

7-31. REPLACE BATTERY ASSEMBLY BATTERY SWITCH

This task covers: a. Removal b. Installation

INITIAL SETUP

WARNING

HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).

Materials/Parts: Electrical tape.

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove battery assembly top cover (para 7-22).

REMOVAL

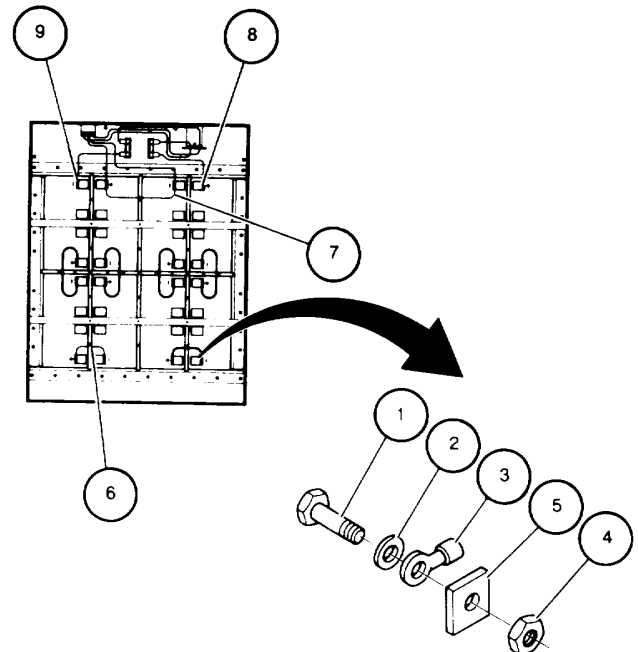
WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

NOTE

Perform steps 1 through 4 to reduce battery output to a lower, less dangerous level.

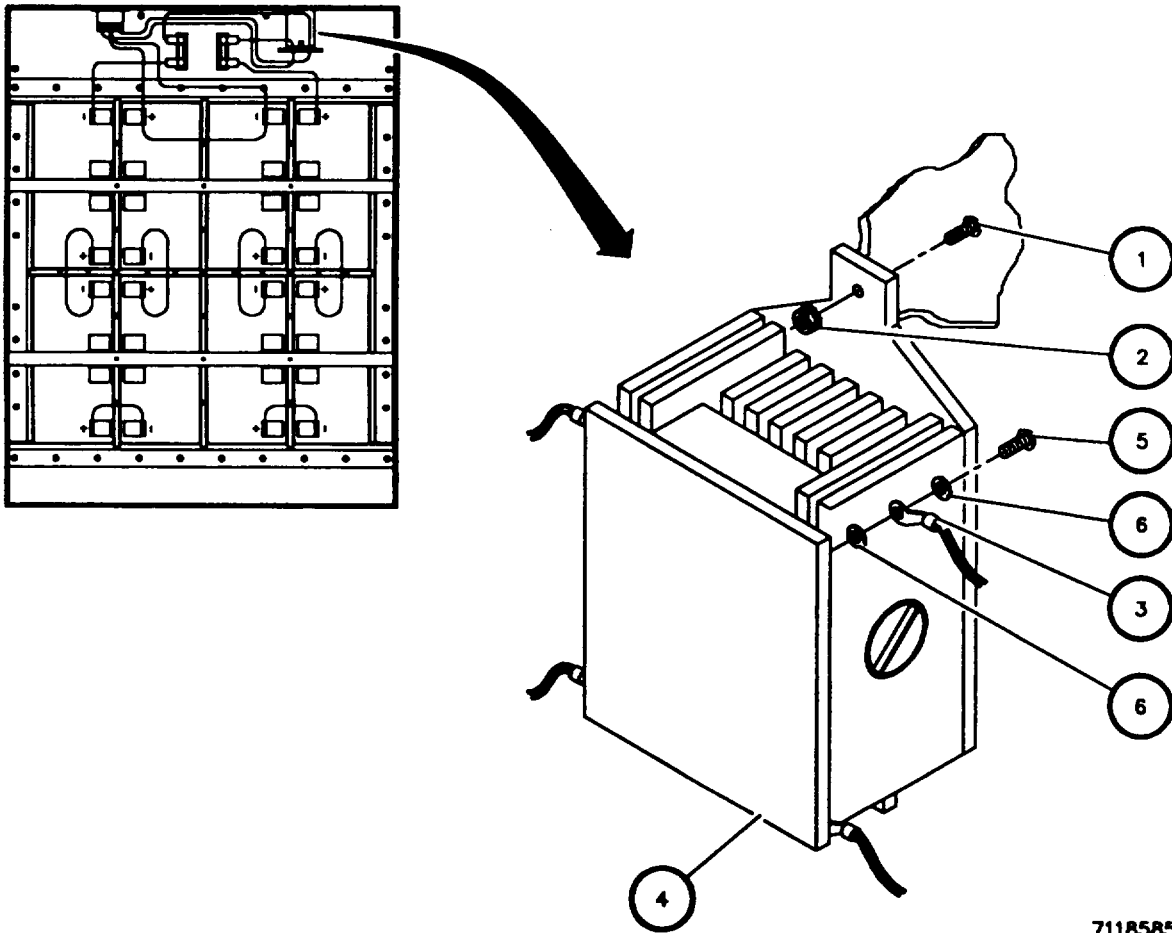
1. Working inside top cover, carefully remove hexbolt (1), washer (2), cable (3), and nut (4) from terminal (5). Wrap cable end (3) with electrical tape to help prevent shorting.
2. Repeat step 1 for opposite end of cable (3).
3. Repeat steps 1 and 2 for cables (6) and (7).
4. Repeat step 1 for cables (8) and (9).



7118583

7-31. REPLACE BATTERY ASSEMBLY BATTERY SWITCH - Continued

5. Working at rear panel, remove two screws (1) and locknuts (2).
6. Tag four cables (3) attached to switch (4).
7. Remove four screws (5), eight washers (6), and four cables (3).
8. Remove switch (4).



7118585

INSTALLATION

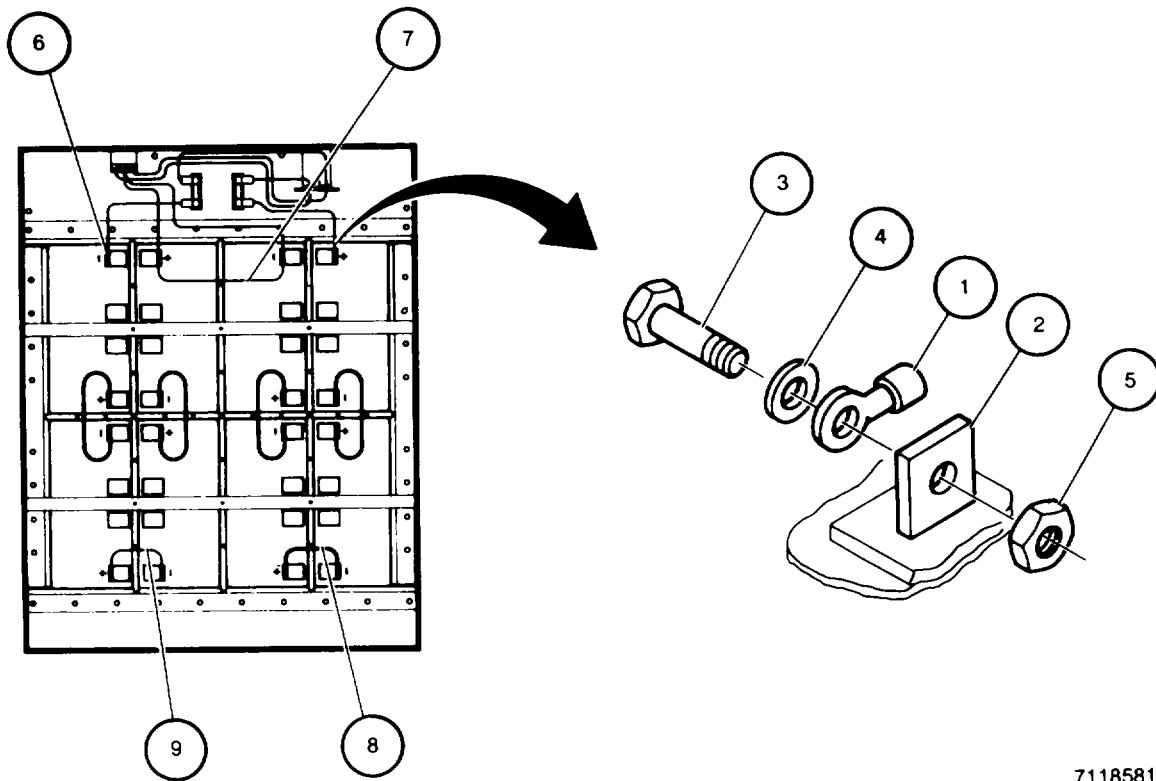
1. Install four cables (3) to switch (4) as tagged, using four screws (5) and eight washers (6). Remove tags.
2. Place switch (4) in installed position.
3. Install two screws (1) and locknuts (2).

7-31. REPLACE BATTERY ASSEMBLY BATTERY SWITCH - Continued

WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

4. Remove electrical tape from cable end (1).
5. Connect cable (1) to terminal (2) using hexbolt (3), washer (4), and nut (5).
6. Repeat steps 4 and 5 for cable (6).
7. Repeat steps 4 and 5 for both ends of cables (7), (8), and (9).



7118581

FOLLOW-ON MAINTENANCE: Install battery assembly top cover (para 7-22).

7-32. REPLACE BATTERY ASSEMBLY CABLES

This task covers: a. Removal b. Installation

INITIAL SETUP**WARNING**

HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).

NOTE

Replace battery assembly cables the same way, taking required safety precautions. Cable replacement shown is typical.

Materials/Parts: Electrical tape.

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove battery assembly top cover (para 7-22).

7-32. REPLACE BATTERY ASSEMBLY CABLES - Continued

REMOVAL

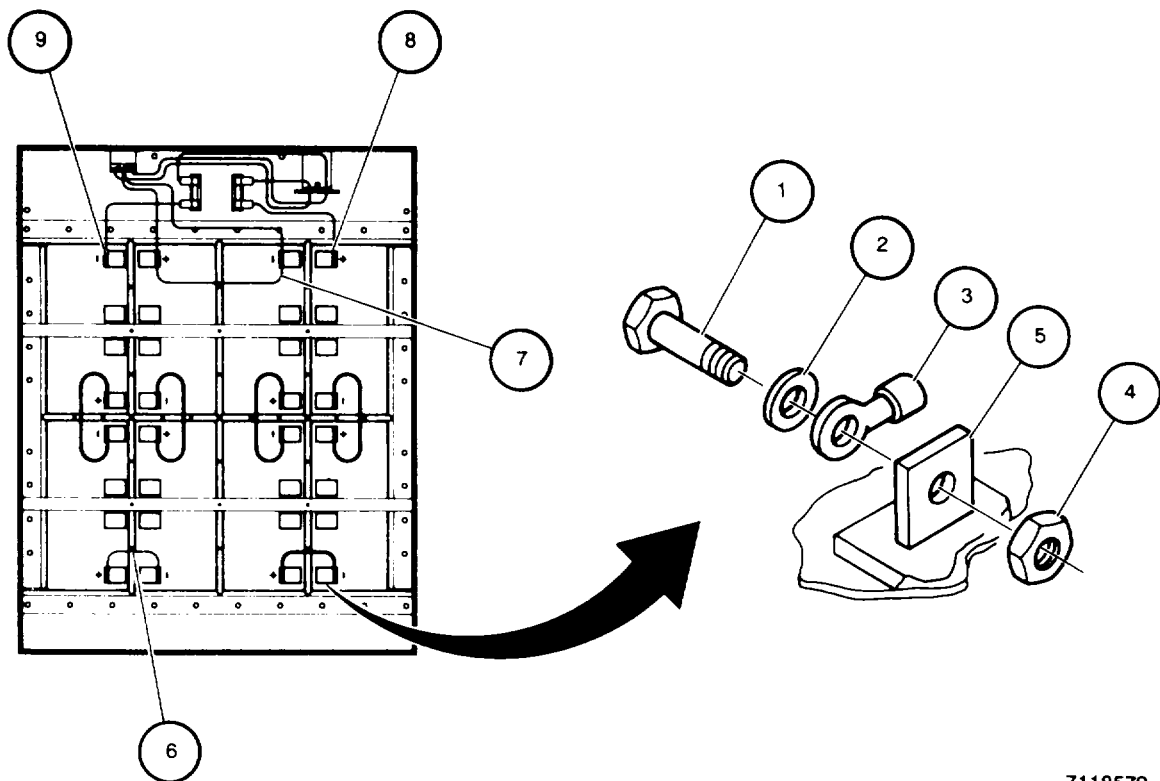
WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

NOTE

- Perform steps 1 through 4 to reduce battery output to a lower, less dangerous level.
- If faulty cable was removed in steps 1 through 4, omit step 5.

1. Working inside top cover, carefully remove hexbolt (1), washer (2), cable (3), and nut (4) from terminal (5). Wrap cable end (3) with electrical tape to help prevent shorting.
2. Repeat step 1 for opposite end of cable (3).
3. Repeat steps 1 and 2 for cables (6) and (7).
4. Repeat step 1 for cables (8) and (9).
5. Repeat steps 1 and 2, as required, for faulty cable.



7118579

7-32. REPLACE BATTERY ASSEMBLY CABLES - Continued

INSTALLATION

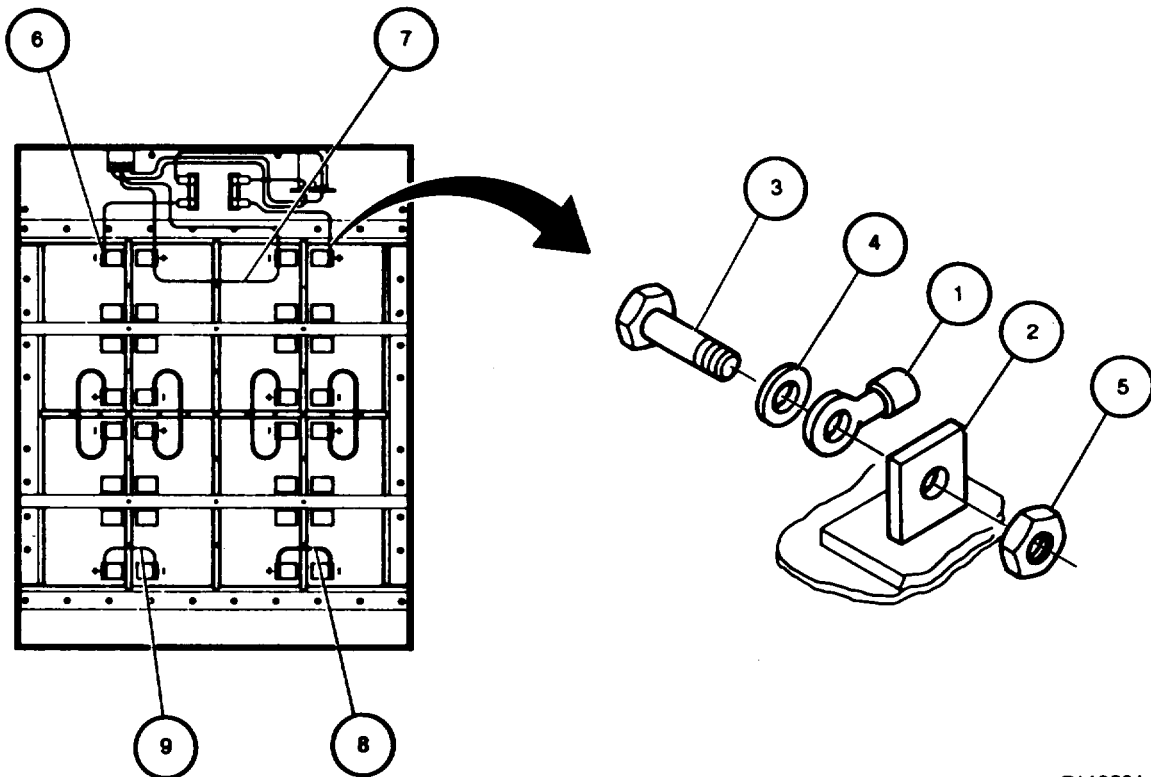
WARNING

Shorting cables against chassis or metal battery retainers may cause fire or explosion, resulting in serious injury to personnel and damage to equipment.

NOTE

If faulty cable was installed in steps 1 through 4, omit step 5.

1. Remove electrical tape from cable end (1).
2. Connect cable (1) to terminal (2) using hexbolt (3), washer (4), and nut (5).
3. Repeat steps 1 and 2 for cable (6).
4. Repeat steps 1 and 2 for both ends of cables (7), (8), and (9).
5. Repeat steps 1 and 2 for all cables removed from replaced battery.



7118581

FOLLOW-ON MAINTENANCE: Install battery assembly top cover (para 7-22).

7-33. REPAIR POWER PACK INTERCONNECT CABLE SET W506W520

This task covers: a. Removal b. Installation

INITIAL SETUP**NOTE**

Repair of UPS power pack interconnect cable assemblies is limited to replacement of cable connectors. Connector replacement shown is typical.

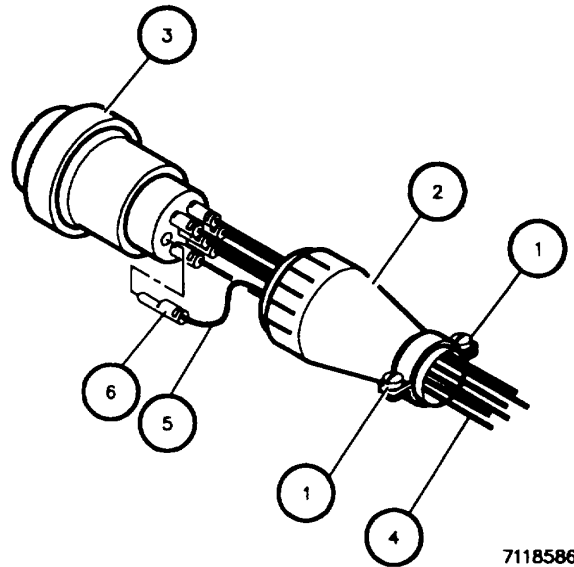
Equipment Configuration: Installed in equipment rack.

Preliminary Procedures:**NOTE**

Using UPS interconnect diagram in volume 2 as a guide, determine where desired cable assembly is connected on UPS assemblies. Remove UPS assemblies where desired cable assembly is connected. Refer to chapter 7 index for the required task(s).

REMOVAL

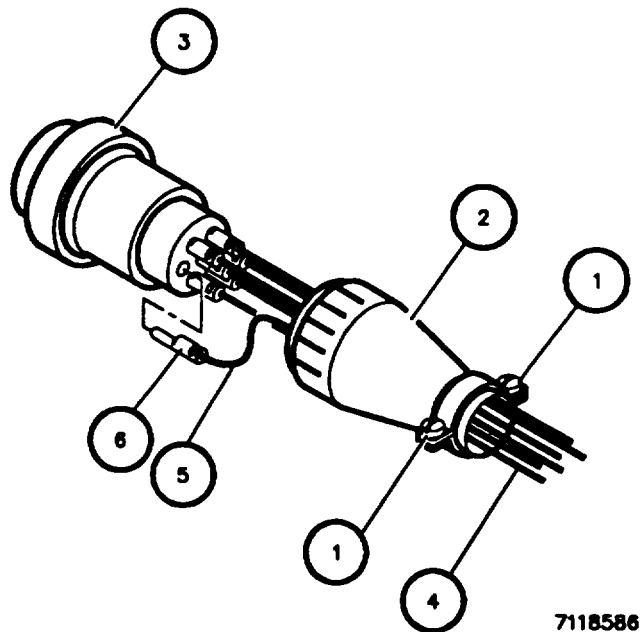
1. Loosen two screws (1).
2. Unscrew cable clamp (2) from plug (3).
3. Slide cable clamp (2) up cable (4) to allow access to wires (5) installed in plug (3).
4. Tag and remove wires (5) and contacts (6) from plug (3). Remove plug.
5. Cut and remove contacts (6) from wires (5).
6. Remove cable clamp (2) from cable (4).



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7-33. REPAIR POWER PACK INTERCONNECT CABLE SET W506-W520 - Continued**INSTALLATION**

1. Slide cable clamp (2) up cable (4) to allow access to wires (5).
2. Form and dress wires (5).
3. Install contacts (6) on wires (5).
4. Install wires (5) with contacts (6) in plug (3) as tagged. Remove tags.
5. Slide cable clamp (2) down cable (4) and screw onto plug (3).
6. Tighten two screws (1).
7. Check UPS cable assembly continuity. If fault persists, refer to chapter 8 for emergency cabling procedures.



FOLLOW-ON MAINTENANCE: Install UPS assemblies removed to access UPS cable assembly. Refer to chapter 7 index for required task(s).

7-34. TEST INPUT ASSEMBLY

This task covers: Test

INITIAL SETUP

WARNING

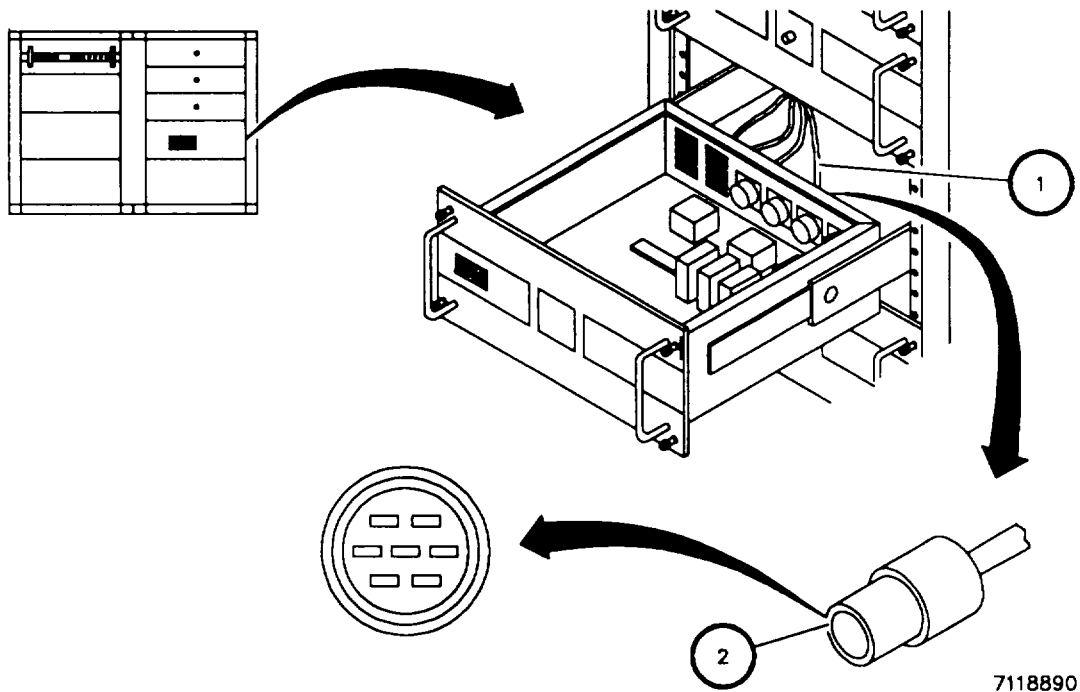
HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove input assembly top cover (para 7-22).

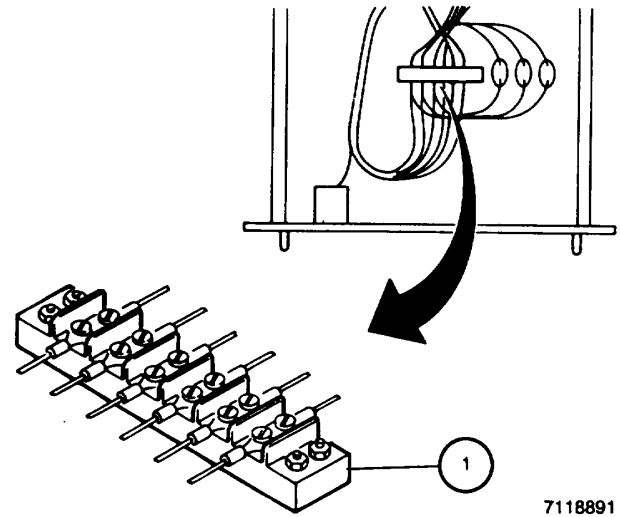
TEST

1. Disconnect four cables (1) from input assembly rear panel. Do not reconnect cables until test completed.
2. Inspect connectors (2) on four cables (1). If damaged, repair cables (para 7-23).

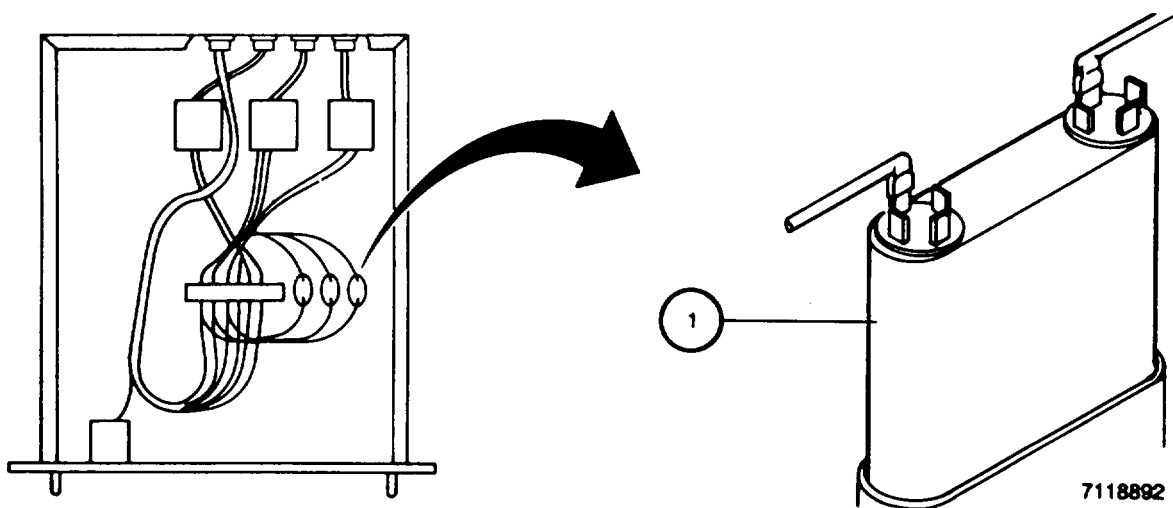


7-34. TEST INPUT ASSEMBLY- Continued

3. Inspect TB1 (1) for loose or damaged connections. Tighten loose connections. Replace TB1 (para 7-26), as required.

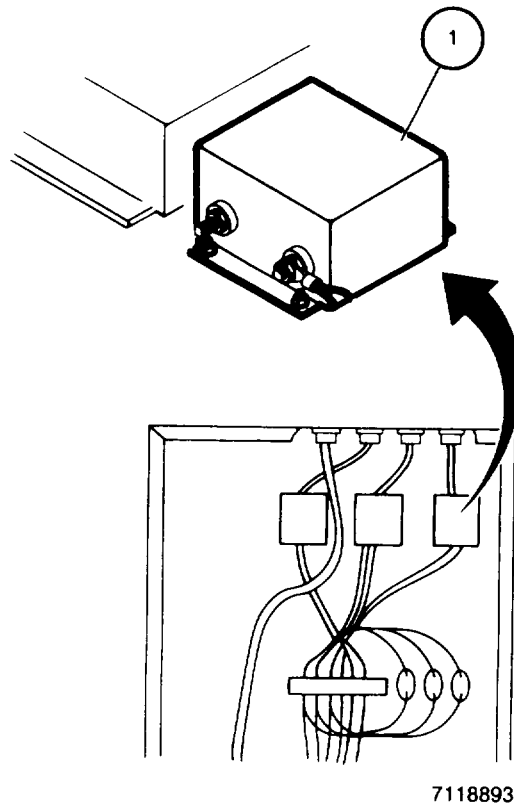


4. Disconnect one lead of capacitor C1 (1) from circuit. Using multimeter set to highest ohm setting, place positive (+) probe on terminal where lead was disconnected. Place negative (-) probe on other capacitor terminal. Multimeter should indicate reading greater than 10 megohms. If not, replace shorted capacitor (para 7-27).
5. Reconnect capacitor (1) to circuit.
6. Repeat steps 4 and 5 for capacitors C2 and C3.



7-34. TEST INPUT ASSEMBLY - Continued

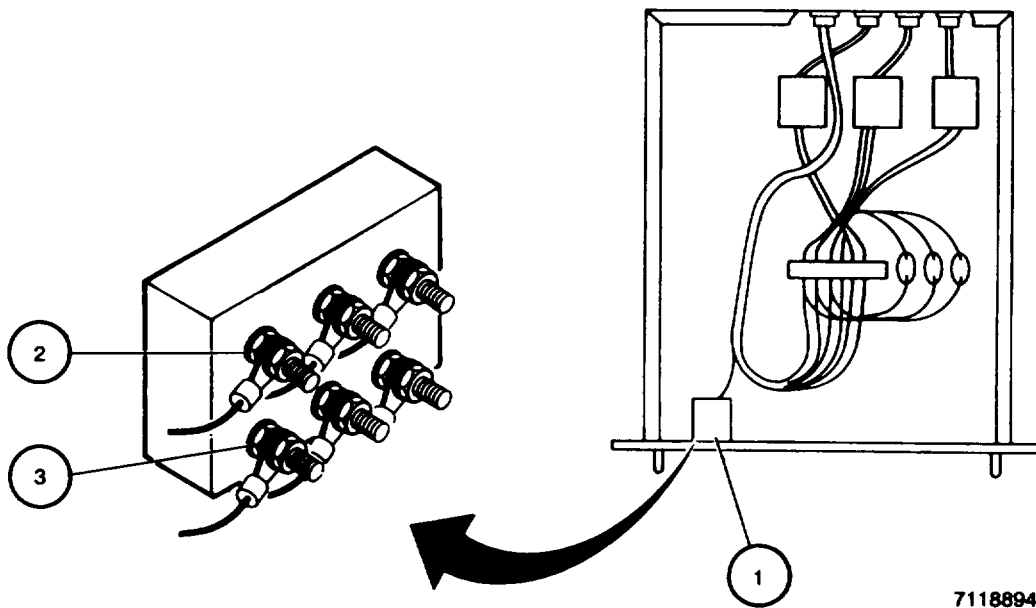
7. Disconnect leads from one side of filter EMI-1 (1) from circuit. Using multimeter set to highest ohm setting, place positive (+) probe on terminal where lead was disconnected. Place negative (-) probe on other filter terminal. Multimeter should indicate reading greater than 10 megohms. If not, replace shorted EMI filter (para 7-25).
8. Reconnect EMI filter (1) to circuit.
9. Repeat steps 7 and 8 for filters EMI-2 and EMI-3.



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7-34. TEST INPUT ASSEMBLY - Continued

10. Set 3 PHASE LINE circuit breaker (1) to OFF. Verify that there is no continuity between LINE (2) and LOAD (3) terminals of CB1. If defective, replace input assembly circuit breaker CB1 (para 7-24).
11. Set 3 PHASE LINE circuit breaker (1) to ON. Verify that there is continuity between LINE (2) and LOAD (3) terminals of CB1. If defective, replace input assembly circuit breaker CB1 (para 7-24).
12. Reconnect four cables disconnected in step 1 to input assembly rear panel connectors.



FOLLOW-ON MAINTENANCE: Install input assembly top cover (para 7-22) if all maintenance actions complete.

7-35. TEST BATTERY ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP**WARNING**

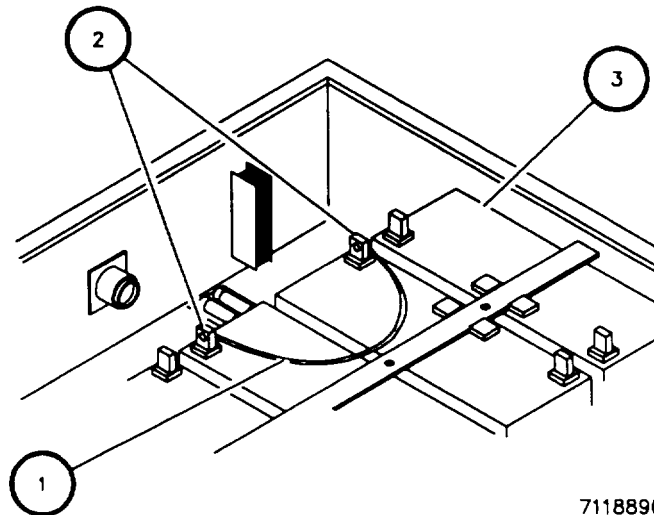
HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.).

Equipment Configuration: Installed in equipment rack.

Preliminary Procedure: Remove battery assembly top cover (para 7-22).

TEST

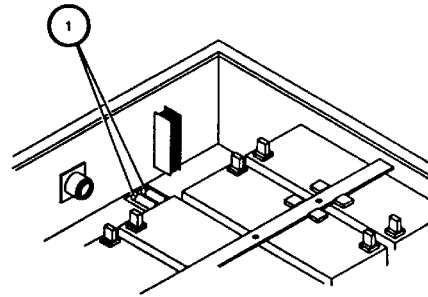
1. Inspect cables (1) and cable connections (2) between batteries (3) for tightness and damage. If loose, tighten cables. If damaged, replace faulty battery assembly cables (para 7-32).



7118896

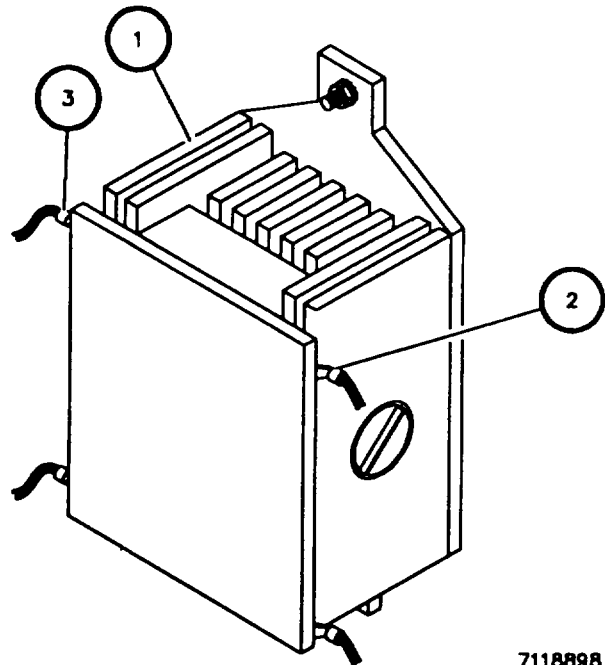
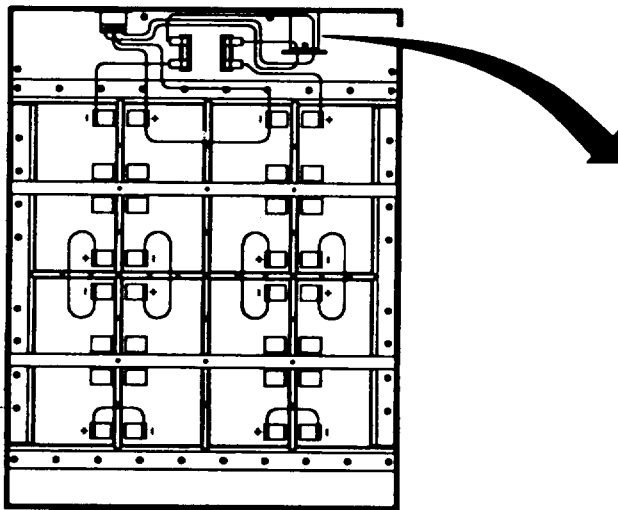
7-35. TEST BATTERY ASSEMBLY - Continued

2. Remove two battery assembly fuses (1) (para 7-28). Using multimeter, check that both fuses have continuity. If not, replace faulty fuse(s). Reinstall fuses (para 7-28).



7118897

3. Set BATTERY SWITCH (1) to OFF. Verify that there is no continuity between input (2) and output (3) terminals of BATTERY SWITCH (1). If defective, replace battery assembly BATTERY SWITCH (para 7-31).
4. Set BATTERY SWITCH (1) to ON. Verify that there is continuity between input (2) and output (3) terminals of BATTERY SWITCH (1). If defective, replace battery assembly BATTERY SWITCH (para 7-31).



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FOLLOW-ON MAINTENANCE: Install battery assembly top cover (para 7-22) if all maintenance actions complete.

7-36. REMOVE/INSTALL INVERTER ASSEMBLY REAR AMPLIFIER MODULE

This task covers: a. Removal b. Installation

INITIAL SETUP

Materials/Parts: Adhesive

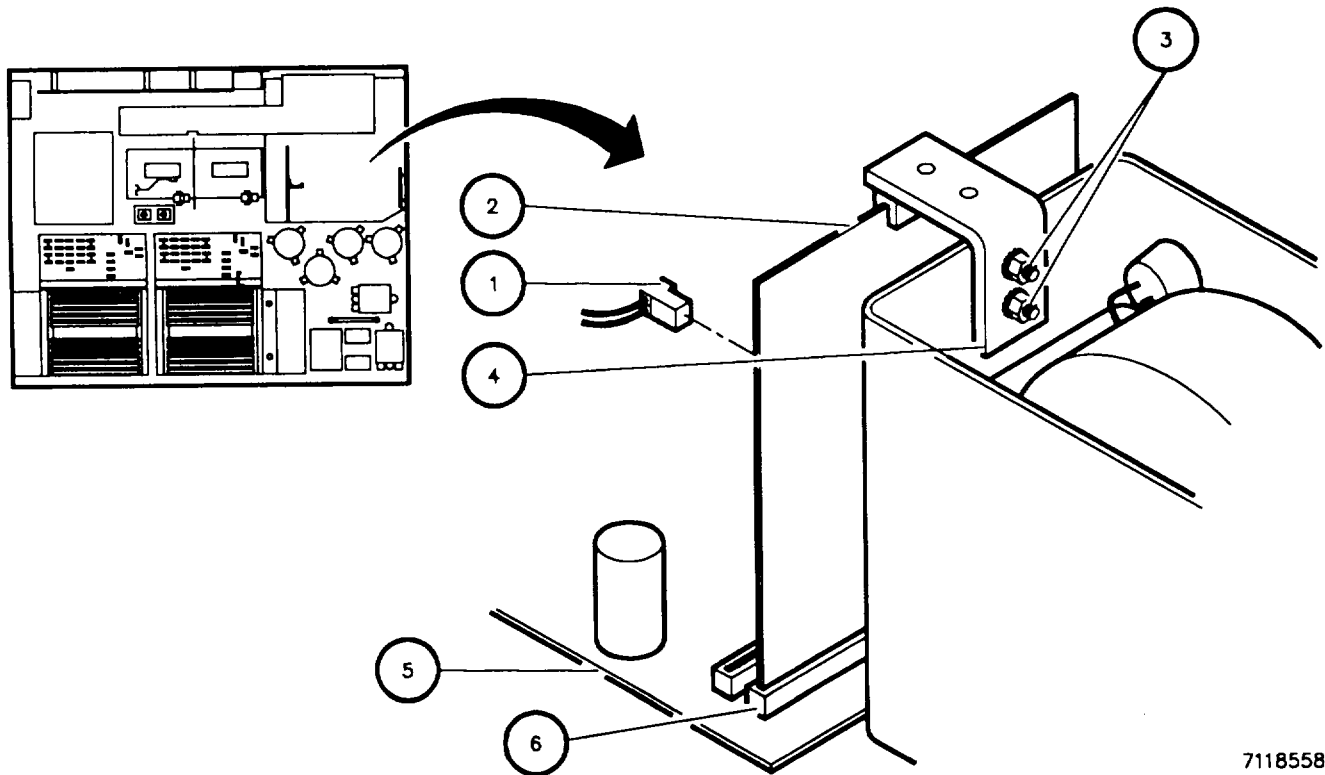
Equipment Configuration: Removed from equipment rack and placed on clean, firm surface.

Preliminary Procedures:

1. Remove inverter assembly from rack (para 7-21).
2. Remove inverter assembly top cover (para 7-22).

REMOVAL

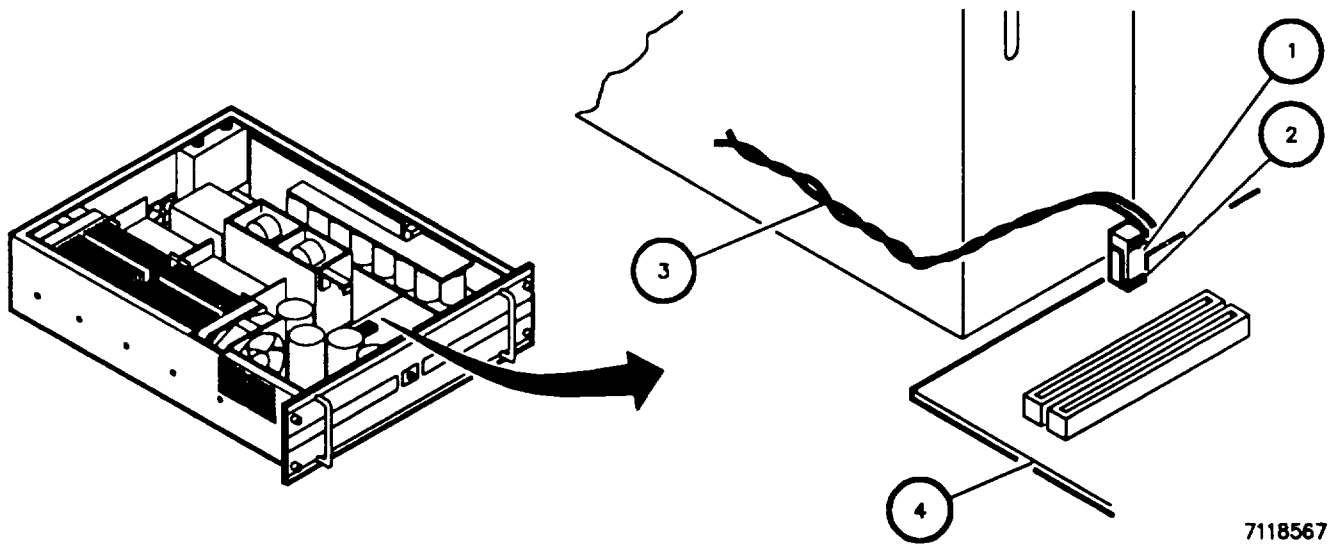
1. Working inside top cover, disconnect cable (1) from differential amplifier CCA (2).
2. Loosen two locknuts (3) holding retainer (4).
3. Remove retainer (4).
4. Remove differential amplifier CCA (2) from connector J6 (6) on signal control CCA (5).



7118558

7-36. REMOVE/INSTALL INVERTER ASSEMBLY REAR AMPLIFIER MODULE - Continued

5. Locate switching plate sensor cable (3).
6. Cut and remove any cable ties securing sensor cable (3) to wiring harness.
7. Tag and disconnect sensor cable connector P1 (1) from connector J10 (2) on signal control CCA (4).



7-36. REMOVE/INSTALL INVERTER ASSEMBLY REAR AMPLIFIER MODULE - Continued

8. At front amplifier module (1), lift insulation paper (2) at left edge to access amplifier module plate CCAs (3).

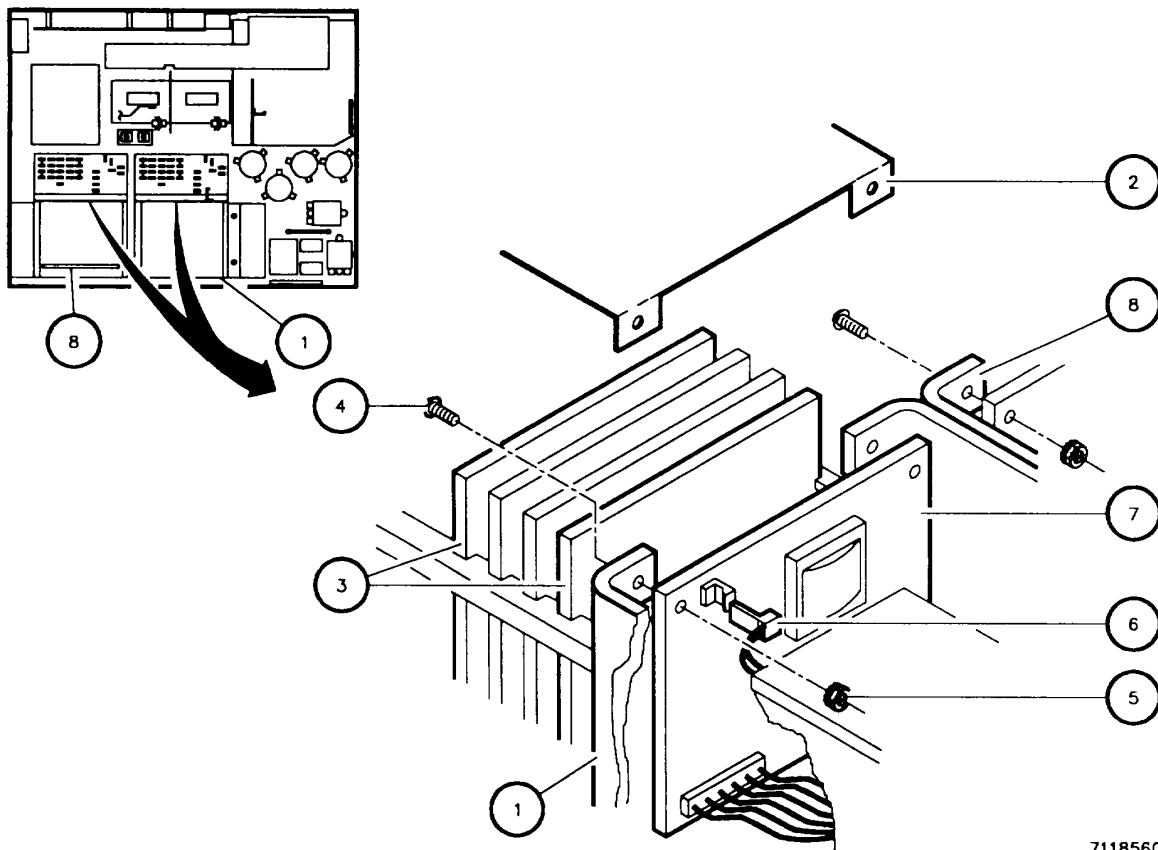
CAUTION

Do not attempt to remove linear plate CCA with sensor until driver and dummy driver CCAs are removed. The plate CCA with sensor is the plate CCA with the 2-wire cable connected near the top of the CCA. This CCA is normally in rear amplifier module.

NOTE

Note and record position of each plate to aid in replacement.

9. Remove all plate CCAs (3), except plate CCA with sensor, by grasping each plate CCA and rocking it from side to side while pulling upward.
10. Remove two screws (4), locknuts (5), and insulation paper (2).
11. Repeat steps 7 through 10 for rear amplifier module (8).
12. Disconnect cable (6) from driver CCA (7) in front amplifier module (1).



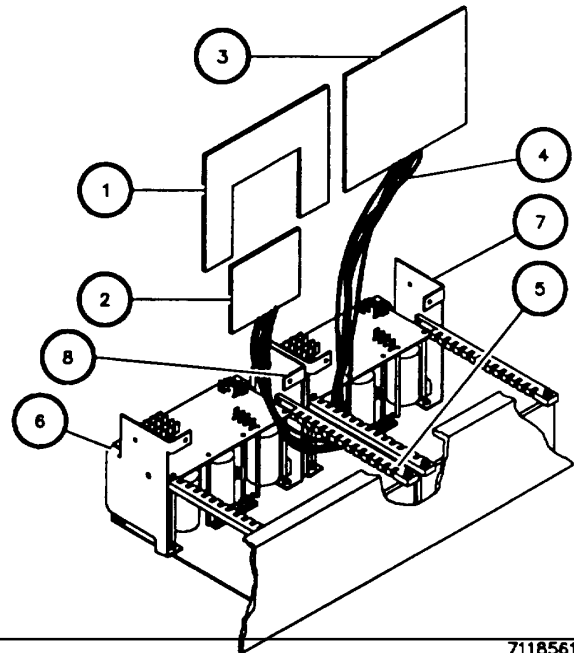
7118560

7-36. REMOVE/INSTALL INVERTER ASSEMBLY REAR AMPLIFIER MODULE - Continued

CAUTION

Do not attempt to separate driver CCA from dummy driver CCA. Separating these two CCAs will cause equipment damage.

13. Remove dummy driver mounting plate (1) from dummy driver CCA (2) in rear amplifier module (6).
14. Remove driver CCA (3) from front amplifier module (7) and dummy driver CCA (2) from rear amplifier module (6), routing dummy driver CCA and wiring (4) under amplifier module CCA guides (5).
15. Remove plate CCA with sensor by grasping plate and rocking it from side to side while pulling upward.

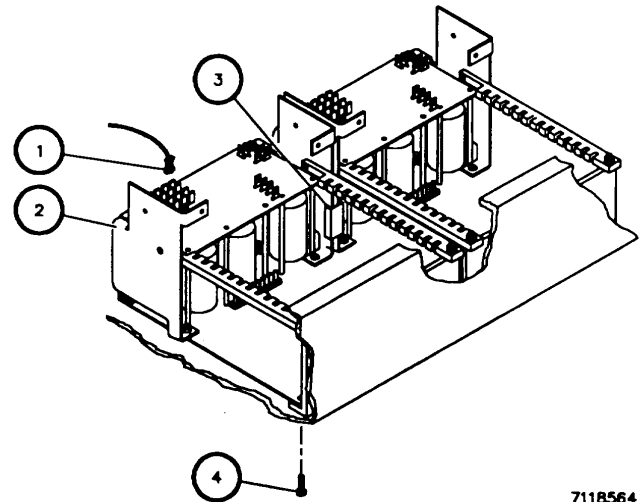


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16. Tag and disconnect all wires (1) from rear amplifier module (2).
17. Remove plastic bracket (3).
18. Working at bottom panel, remove nine screws (4).
19. Remove rear amplifier module (2).

INSTALLATION

1. Place amplifier module (2) in installed position.
2. Working at bottom panel, install nine screws (4).
3. Install all wires (1) as tagged. Remove tags.
4. Apply light coat of adhesive to inner surface of plastic bracket (3).
5. Place bracket (3) in installed position.



7118564

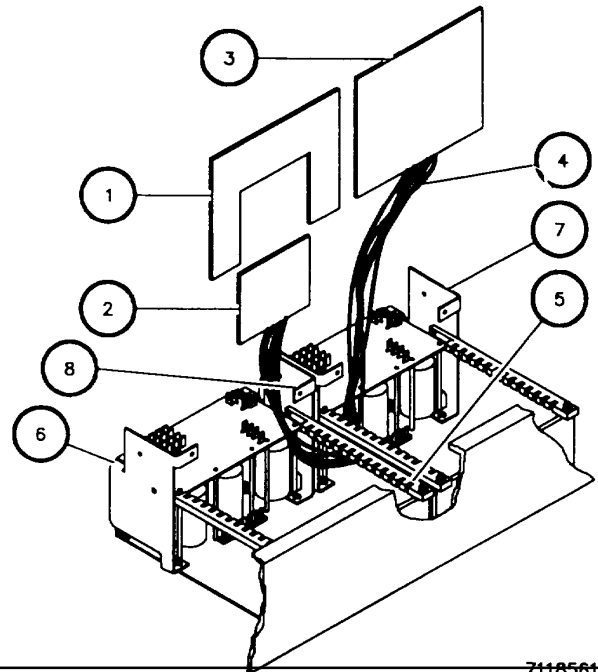
7-36. REMOVE/INSTALL INVERTER ASSEMBLY REAR AMPLIFIER MODULE - Continued

6. Install plate CCA with sensor in correct slot. Route sensor cable under dummy driver mounting bracket (8).

CAUTION

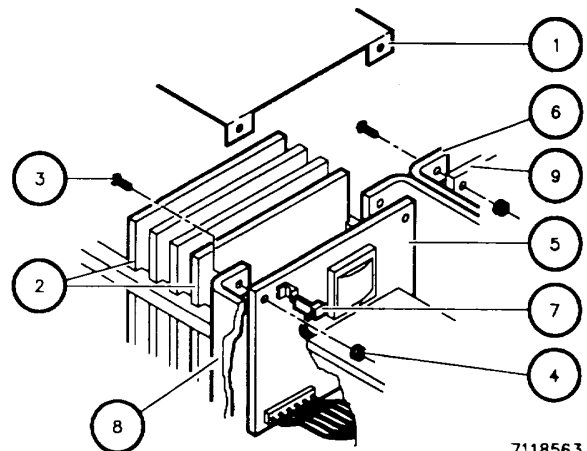
Do not attempt to separate driver CCA from dummy driver CCA. Separating these two CCAs will cause equipment damage.

7. Route dummy driver CCA (2) and wiring (4) under amplifier module CCA guides (5).
8. Install dummy driver CCA (2) in mounting plate (1). Install dummy driver CCA and mounting plate in installed position.
9. Install driver CCA (3) in installed position.



7118561

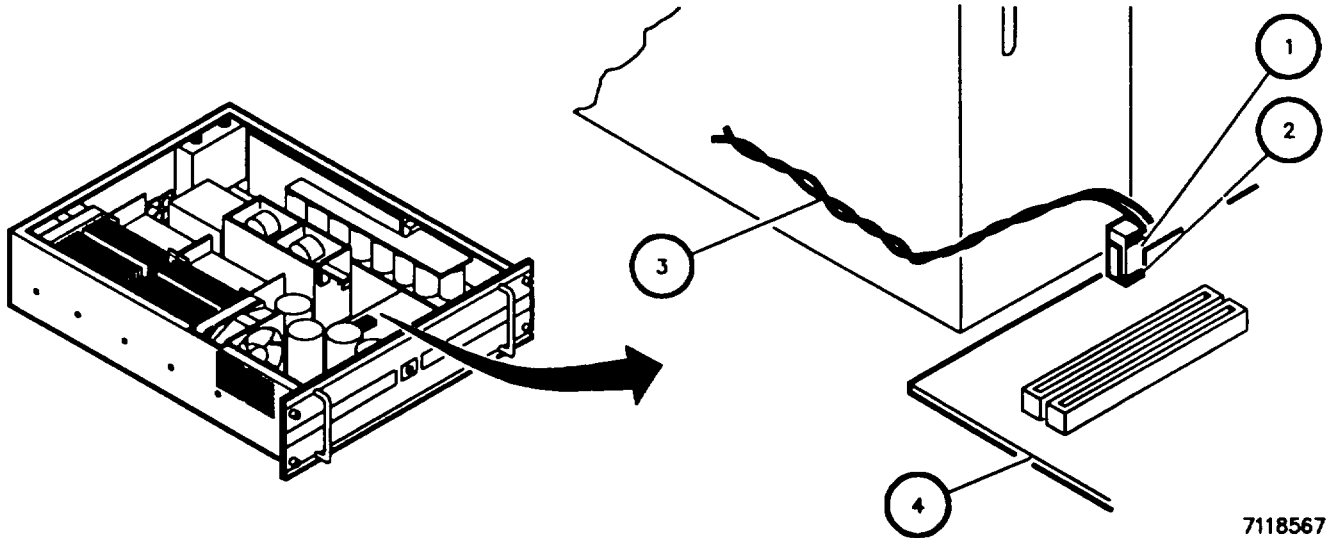
10. Connect cable (7) to driver CCA (5) in front amplifier module (8).
11. Place insulation paper (1) in installed position.
12. Install two screws (3) and locknuts (4).
13. Install remaining plate CCAs (2), ensuring that each plate CCA is in correct slot and cleanly mates with backplane.
14. Repeat steps 11 through 13 for rear amplifier module (6) and dummy driver mounting plate (9).



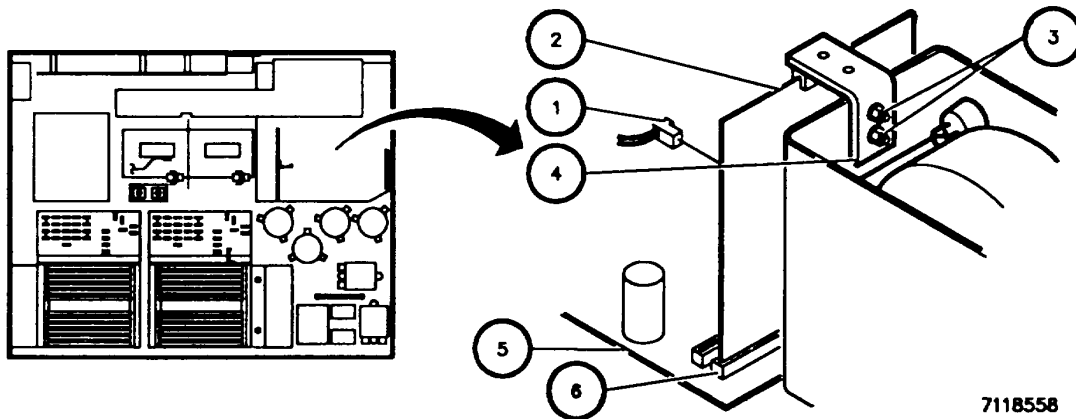
7118563

7-36. REMOVE/INSTALL INVERTER ASSEMBLY REAR AMPLIFIER MODULE - Continued

15. Route sensor cable (3) along wiring harness to signal control CCA (4), installing new cable ties as required.
16. Connect sensor cable connector P1 (1) to signal control CCA connector J10 (2) and remove tags.



17. Install differential amplifier CCA (2) into connector J6 (6) on signal control CCA (5).
18. Place retainer (4) in installed position, then tighten two locknuts (3).
19. Connect cable (1) to differential amplifier CCA (2).



FOLLOW-ON MAINTENANCE:

1. Install inverter assembly top cover (para 7-22).
2. Install inverter assembly in equipment rack (para 7-21).

7-37. REPLACE INVERTER ASSEMBLY FUSE/FUSEHOLDER

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Equipment Configuration: Installed in equipment rack.

NOTE

Replace fuses F1 and F2 and their respective fuseholders the same way. Fuse F1 and its fuseholder are shown.

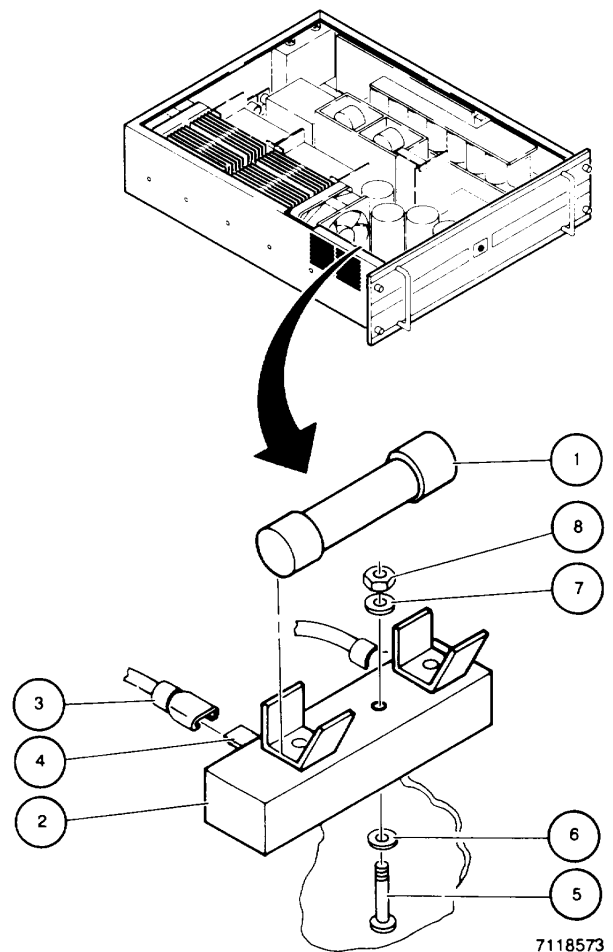
Preliminary Procedure: Remove inverter assembly top cover (para 7-22).

REMOVAL

1. Working inside top cover, remove fuse (1).
2. If replacing fuseholder (2), tag and disconnect two spade connectors (3) from two terminals (4).
3. Remove screw (5), washer (6), internal tooth lockwasher (7), and nut (8).
4. Remove fuseholder (2).

INSTALLATION

1. If replacing fuse only, go to step 4.
2. Place fuseholder (2) in installed position.
3. Install screw (5), washer (6), internal tooth lockwasher (7), and nut (8).
4. Connect two spade connectors (3) to two terminals (4), as tagged. Remove tags.
5. Install fuse (1).



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FOLLOW-ON MAINTENANCE: Install inverter assembly top cover (para 7-22).

7-38. REPLACE INVERTER ASSEMBLY REAR PANEL CABLE CONNECTORS J1-J4**This task covers:****a. Removal****b. Installation****INITIAL SETUP****NOTE**

Replace cable connectors J1-J4 the same way. Cable connector J1 is shown.

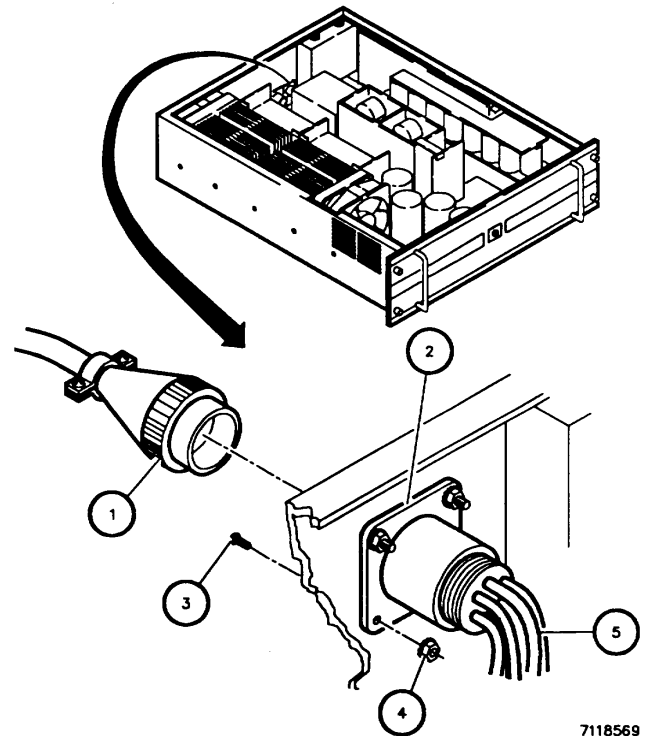
Equipment Configuration: Removed from equipment rack and placed on clean, firm surface.

Preliminary Procedure:

1. If replacing J1 or J2, remove inverter assembly rear amplifier module (para 7-36).
2. If replacing J3 or J4, remove inverter assembly output transformer T1 (para 7-42).

REMOVAL

1. Working at rear panel, remove cable (1) from cable connector (2).
2. Remove four screws (3) and locknuts (4).
3. Remove cable connector (2) from inside of rear panel.
4. Tag and remove wiring (5) from cable connector (2).
5. Remove cable connector (2).



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INSTALLATION

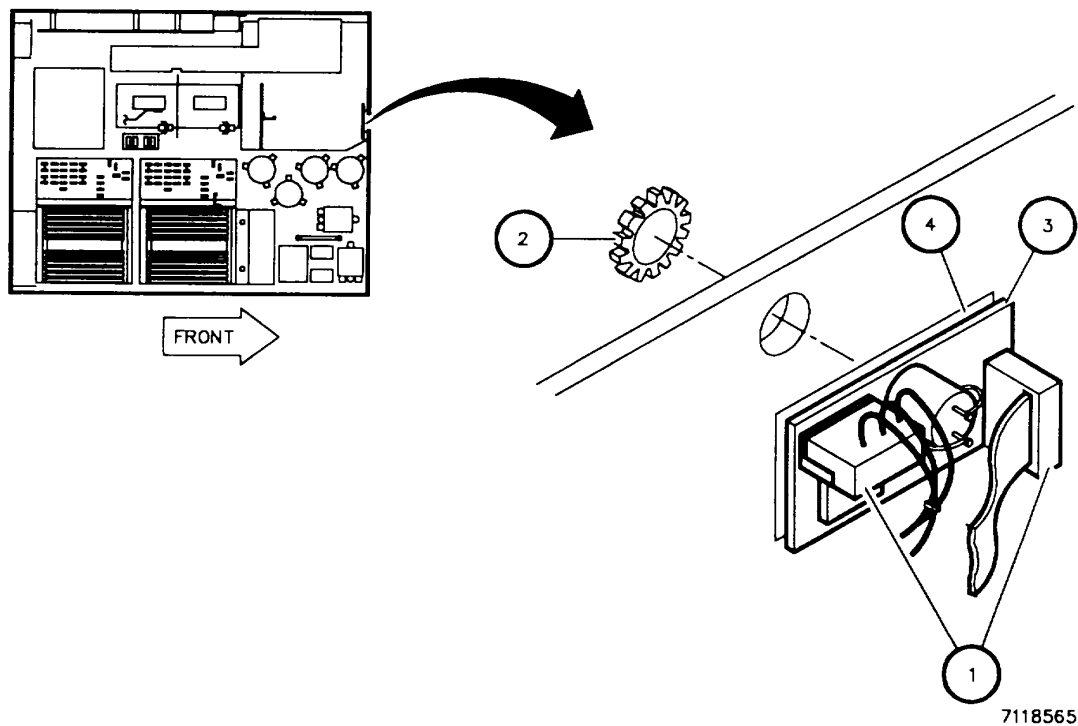
1. Install wiring (5) in cable connector (2) as tagged. Remove tags.
2. Place cable connector (2) in installed position.
3. Install four screws (3) and locknuts (4).
4. Install cable (1) in cable connector (2).

FOLLOW-ON MAINTENANCE:

1. For J1 or J2, install inverter assembly rear amplifier module (para 7-36).
2. For J3 or J4, install inverter assembly output transformer T1 (para 7-42).

7-39. REPLACE INVERTER ASSEMBLY BYPASS INDICATOR CCA AI**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Equipment Configuration:** Installed in equipment rack.**Preliminary Procedure:** Remove inverter assembly top cover (para 7-22).**REMOVAL**

1. Working inside front panel, tag and disconnect two cables (1) from bypass indicator CCA (3).
2. Working at front panel, remove nut (2).
3. Remove bypass indicator CCA (3) and insulation paper (4).

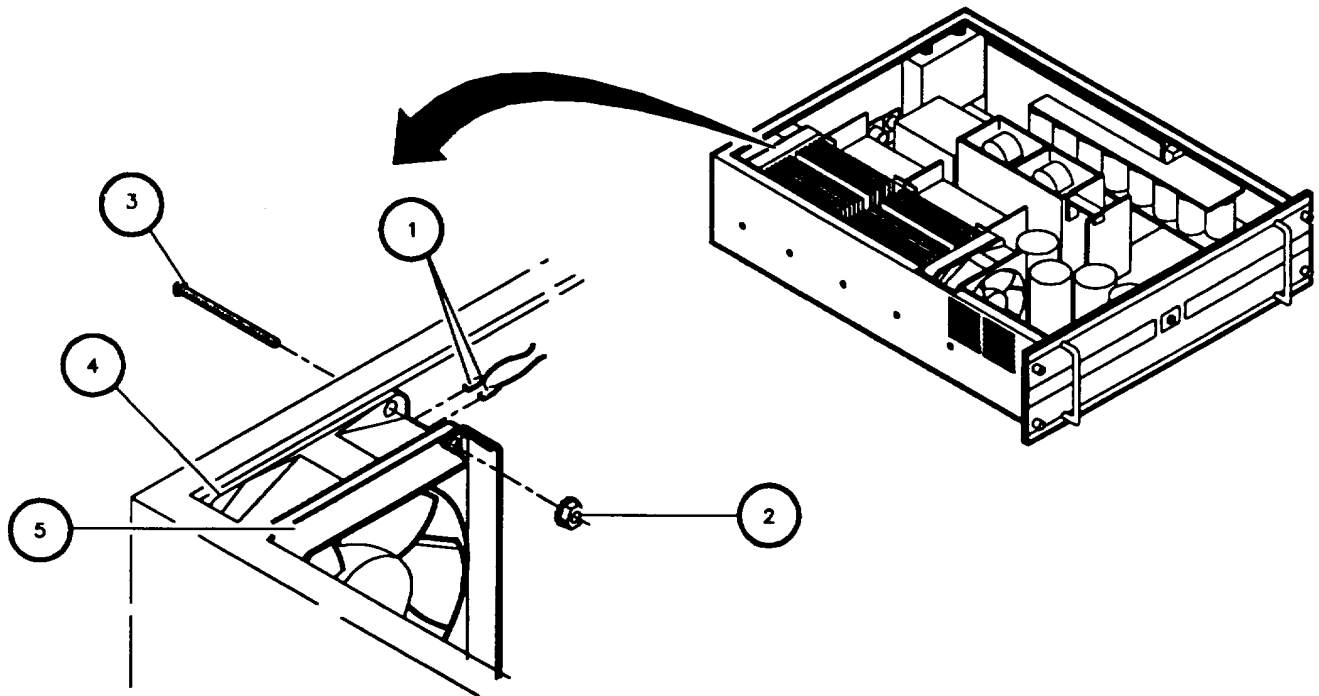
**INSTALLATION**

4. Place insulation paper (4) and bypass indicator CCA (3) in installed position.
5. Working at front panel, install nut (2).
6. Working inside front panel, connect two cables (1) to bypass indicator CCA (3) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install inverter assembly top cover (para 7-22).

7-40. REPLACE INVERTER ASSEMBLY REAR FAN ASSEMBLY A2**This task covers:****a. Removal****b. Installation****INITIAL SETUP****Equipment Configuration:** Removed from equipment rack and placed on clean, firm surface.**Preliminary Procedure:** Remove inverter assembly rear amplifier module (para 7-36).**REMOVAL**

1. Working inside top cover, disconnect two wires (1) from fan assembly (4).
2. Remove four locknuts (2) and mounting screws (3).
3. Remove fan assembly (4) and shroud (5).



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INSTALLATION

1. Place fan assembly (4) and shroud (5) in installed position.
2. Install four screws (3) and locknuts (2).
3. Connect two wires (1) to fan assembly (4).

FOLLOW-ON MAINTENANCE: Install inverter assembly rear amplifier module (para 7-36).

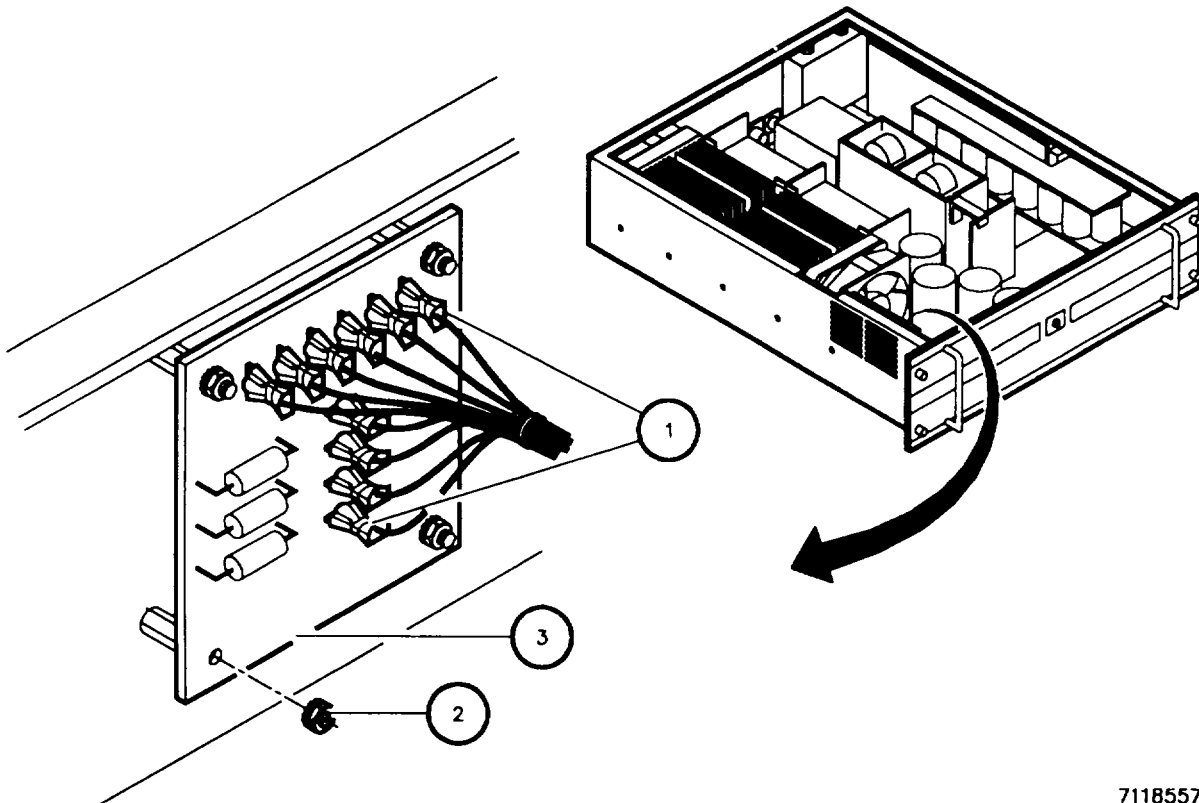
7-41. REPLACE INVERTER ASSEMBLY FRONT FAN ASSEMBLY A3

This task covers:**a. Removal****b. Installation**

INITIAL SETUP**Equipment Configuration:** Installed in equipment rack.**Preliminary Procedure:** Remove inverter assembly top cover (para 7-22).

REMOVAL

1. Working inside left side panel, tag and disconnect 10 wires (1) from in-rush CCA (3).
2. Remove four locknuts (2) and remove in-rush CCA (3).



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7-41. REPLACE INVERTER ASSEMBLY FRONT FAN ASSEMBLY A3 - Continued

WARNING

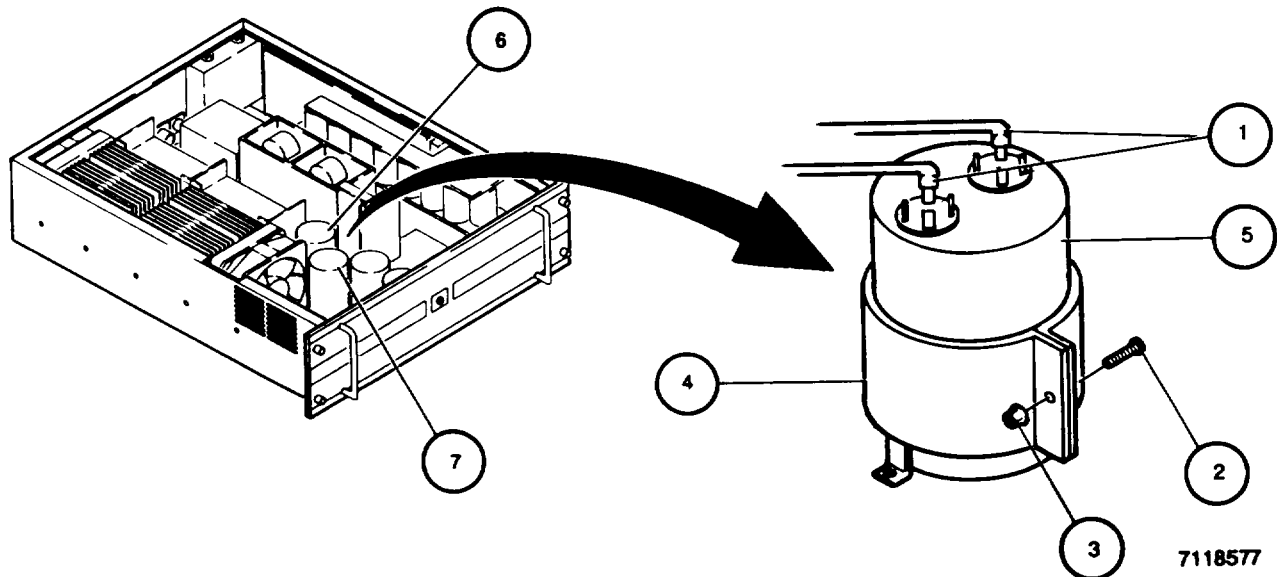
HIGH VOLTAGES ARE PRESENT IN THE UPS. Avoid touching any items that may retain electrical charge or accumulate heat (capacitors, batteries, heat sinks, transformers, etc.)

3. Locate capacitors C1 (6) and C2 (7).

NOTE

Capacitors C1 and C2 are removed the same way. Perform steps 4 through 6 for each capacitor.

4. Working inside top cover, tag and disconnect wires (1) from capacitor (5).
5. Loosen screw (2) and locknut (3) on retainer (4).
6. Remove capacitor (5).



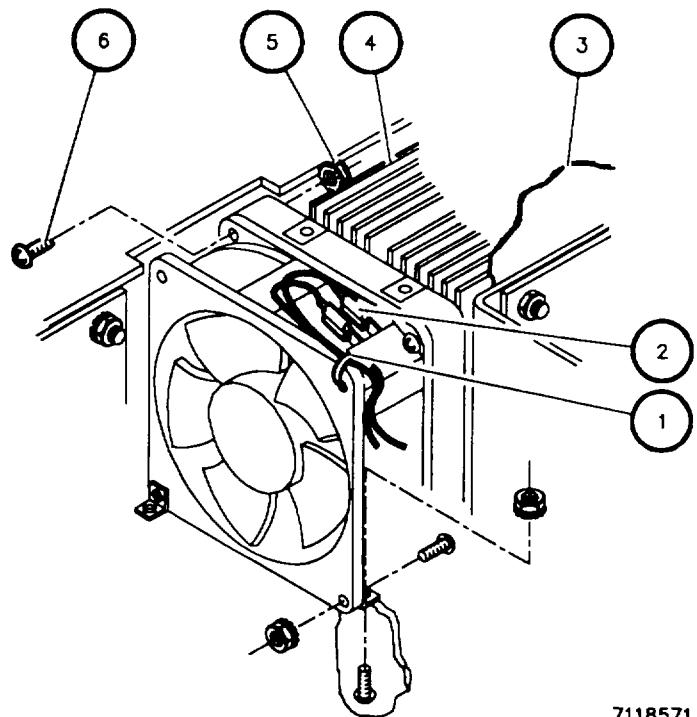
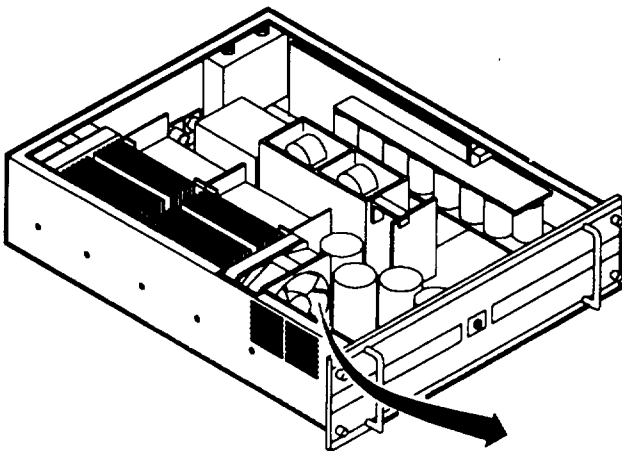
7-41. REPLACE INVERTER ASSEMBLY FRONT FAN ASSEMBLY A3 - Continued

7. Cut and remove cable tie (1).
8. Disconnect two wires (2).
9. Lift insulation paper (3) at left edge of front amplifier module to access plate CCAs (4).

NOTE

Note and record location of each plate CCA removed to aid in installation.

10. To access fan locknuts (5), remove plate CCAs (4), as required, by grasping plate and gently rocking it side to side while pulling upward.
11. Remove top two locknuts (5) and mounting screws (6).



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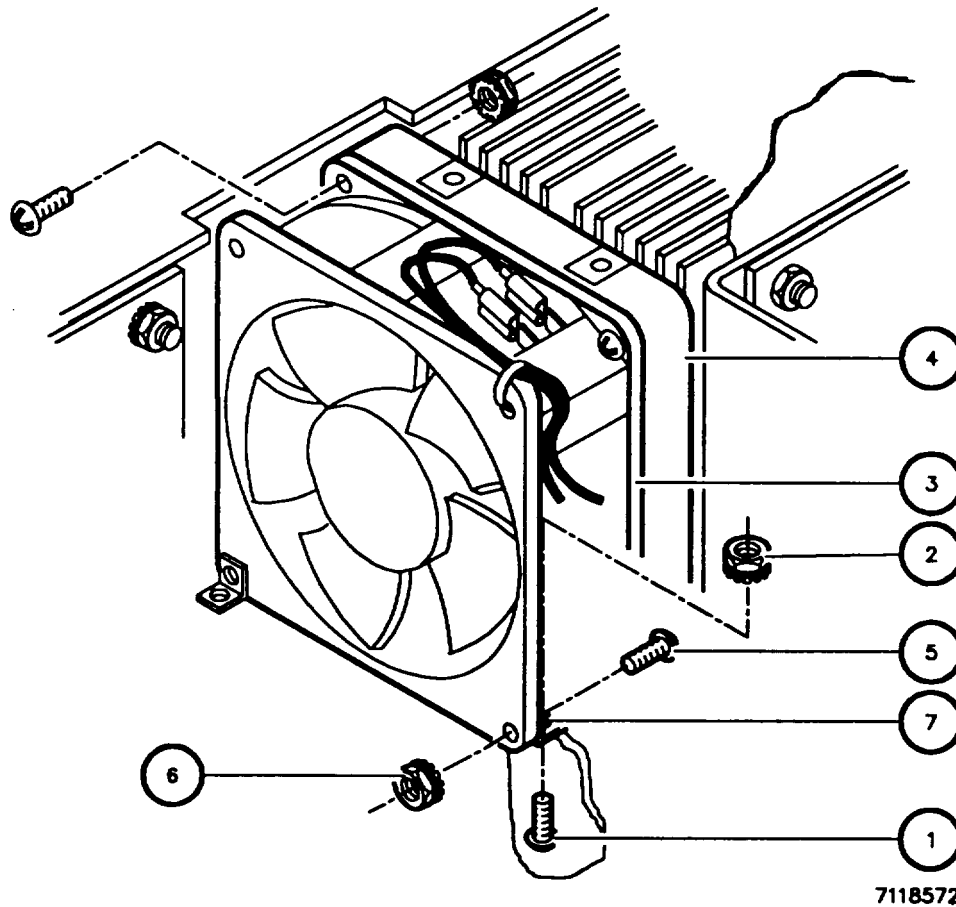
7-41. REPLACE INVERTER ASSEMBLY FRONT FAN ASSEMBLY A3 - Continued

12. Working at bottom panel, remove one screw (1) and two locknuts (2).

NOTE

Side panel prevents removal of screw (1) nearest left side rail.

13. Remove fan assembly (3) and shroud (4).
 14. Remove two locknuts (6), screws (5), and brackets (7). Retain for installation.

**INSTALLATION**

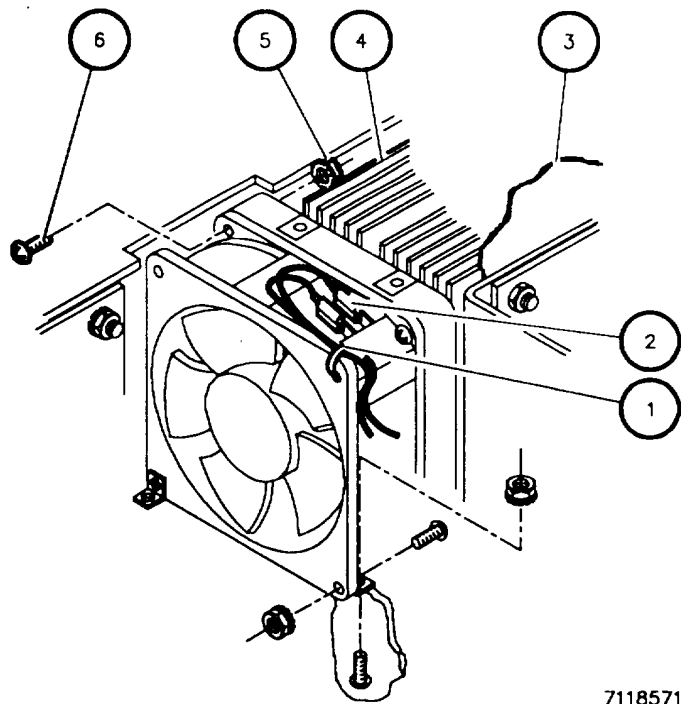
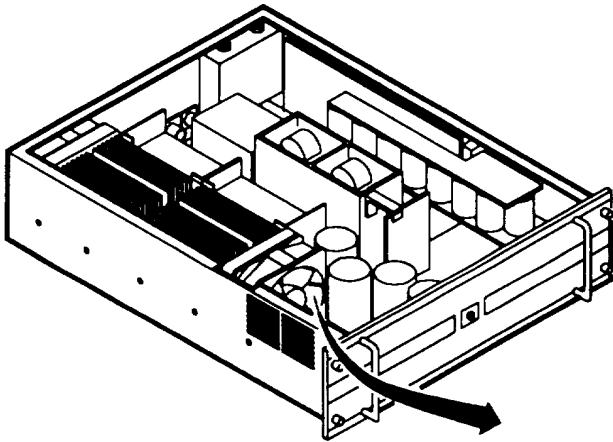
1. Install two brackets (7) on replacement fan assembly (3) using two screws (5) and locknuts (6).
2. Place fan assembly (3) and shroud (4) in installed position.
3. Install one screw (1) and two locknuts (2).

NOTE

Side panel prevents removal of screw (1) nearest left side rail.

7-41. REPLACE INVERTER ASSEMBLY FRONT FAN ASSEMBLY A3 - Continued

4. Install two top mounting screws (6) and locknuts (5).
5. Install plate CCAs (4) removed for access, ensuring that each is in correct slot and cleanly mates with backplane connector.
6. Position insulation paper (3) under edge of left side panel.
7. Connect two wires (2).
8. Install new cable tie (1).



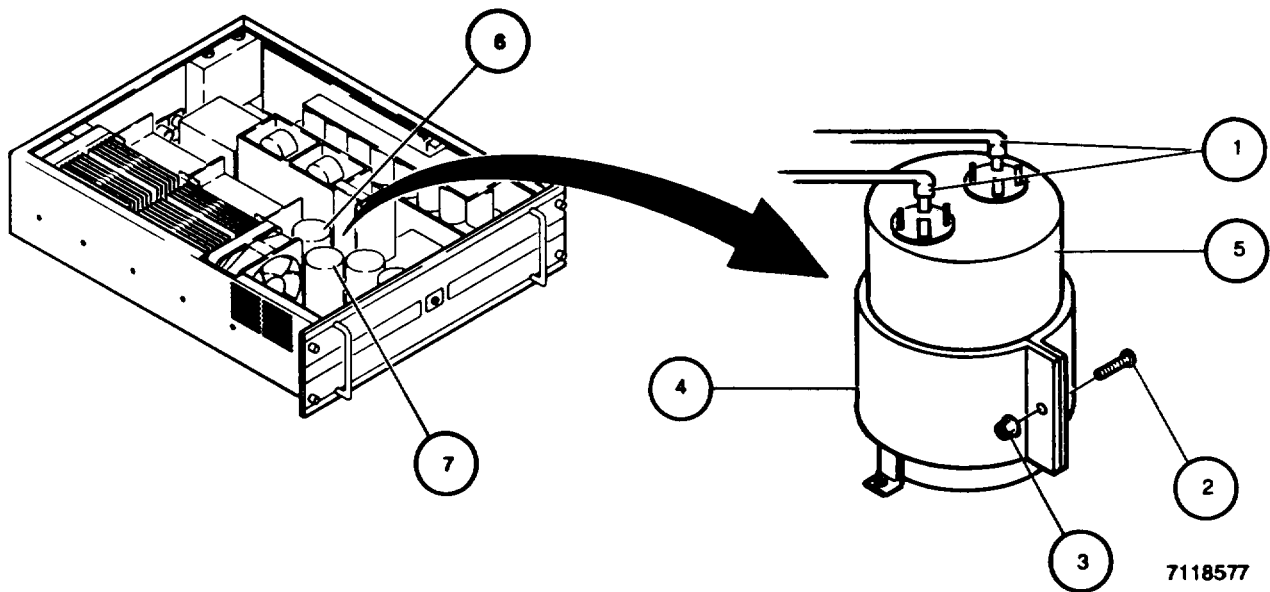
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7-41. REPLACE INVERTER ASSEMBLY FRONT FAN ASSEMBLY A3 - Continued

NOTE

Install capacitors C1 (6) and C2 (7) the same way. Perform steps 9 through 11 for each capacitor.

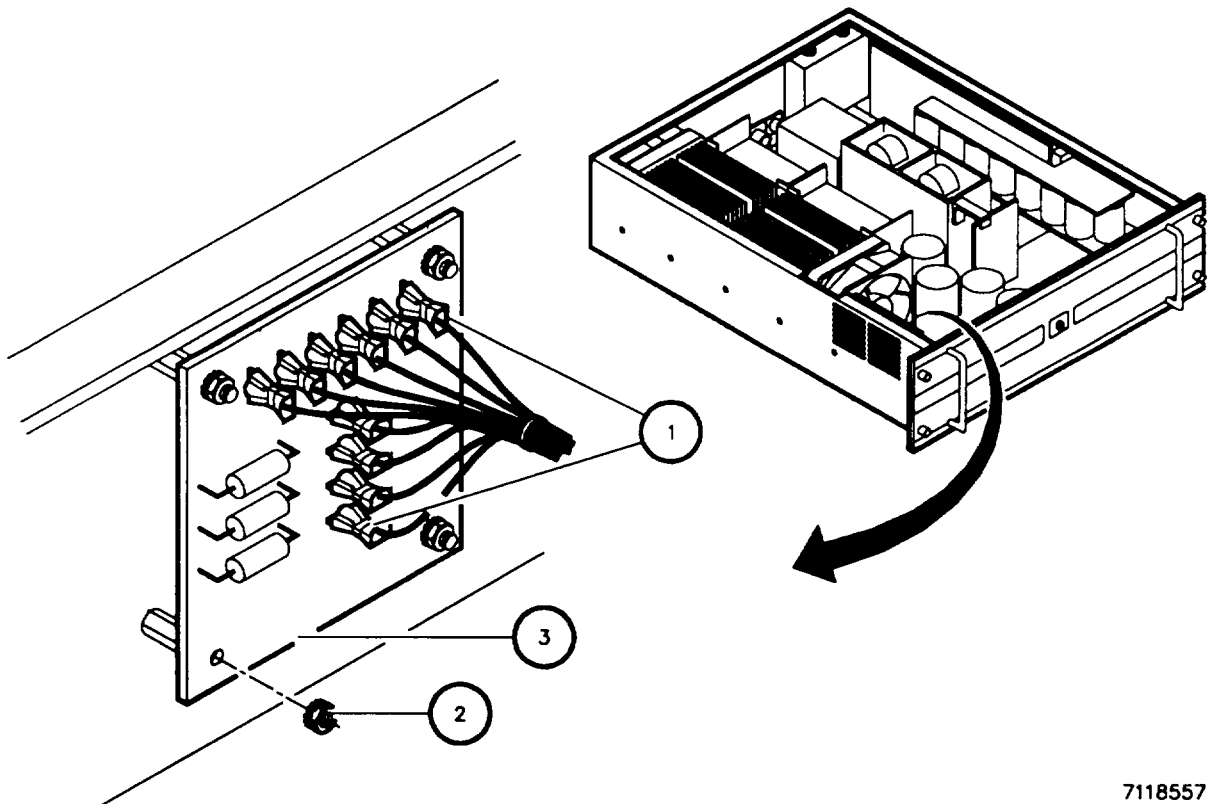
9. Position capacitor (5) into retainer (4).
10. Tighten screw (2) and locknut (3).
11. Connect wires (1) as tagged. Remove tags.



41. REPLACE INVERTER ASSEMBLY FRONT FAN ASSEMBLY A3 - Continued

12. Place in-rush CCA (3) in installed position.
13. Install and tighten four locknuts (2).
14. Connect 10 wires (1) to in-rush CCA (3) as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install inverter assembly top cover (para 4-22).



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7-42. REPLACE INVERTER ASSEMBLY OUTPUT TRANSFORMER T1

This task covers:

a. Removal

b. Installation

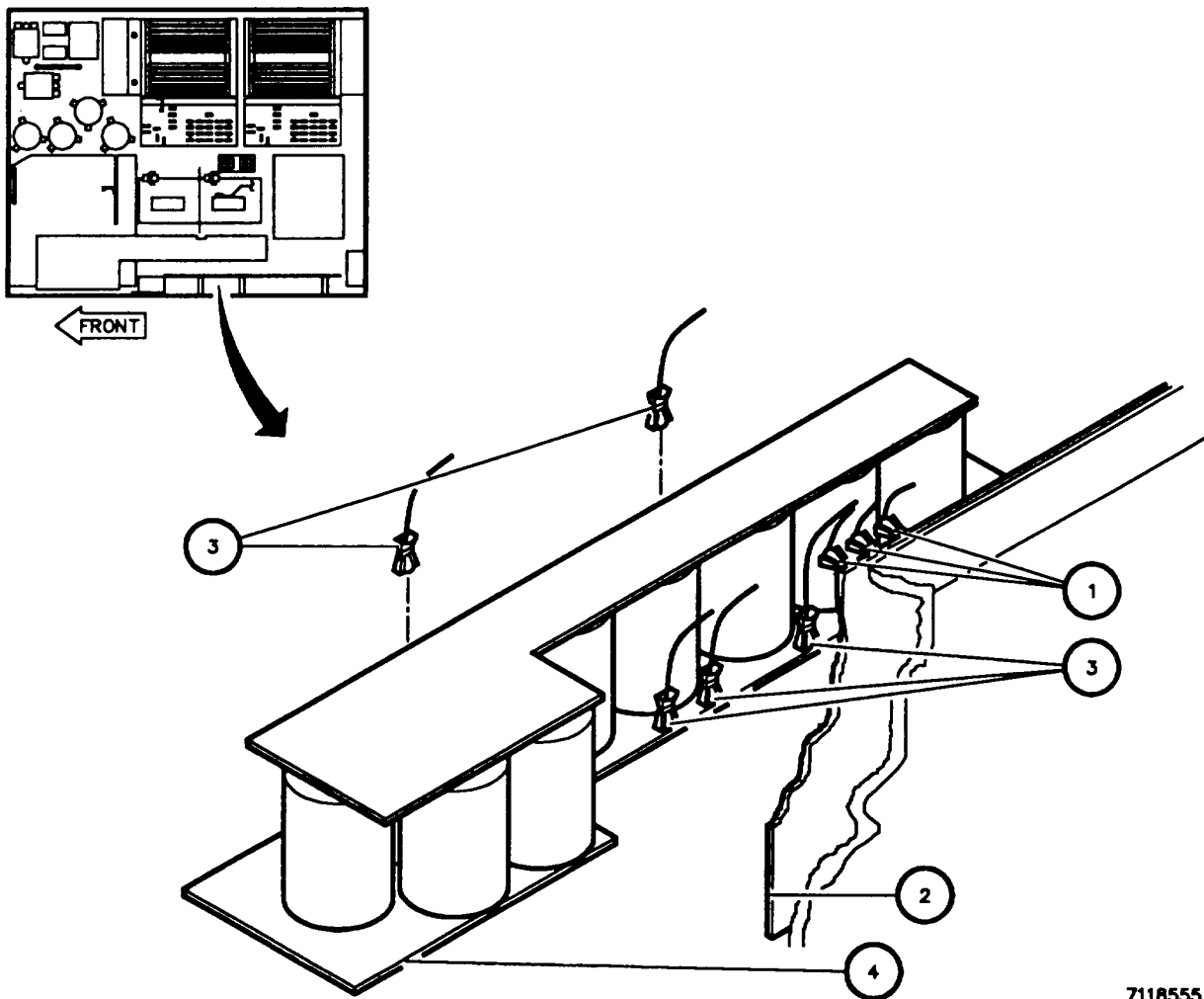
INITIAL SETUP

Equipment Configuration: Removed from equipment rack and placed on clean, firm surface.

Preliminary Procedure: Remove rear amplifier module (para 7-36).

REMOVAL

1. Working inside right side panel, tag and disconnect wires (1) from power control CCA (2), as required, to access wires (3) on capacitor CCA (4).
2. Tag and disconnect five wires (3) from capacitor CCA (4).



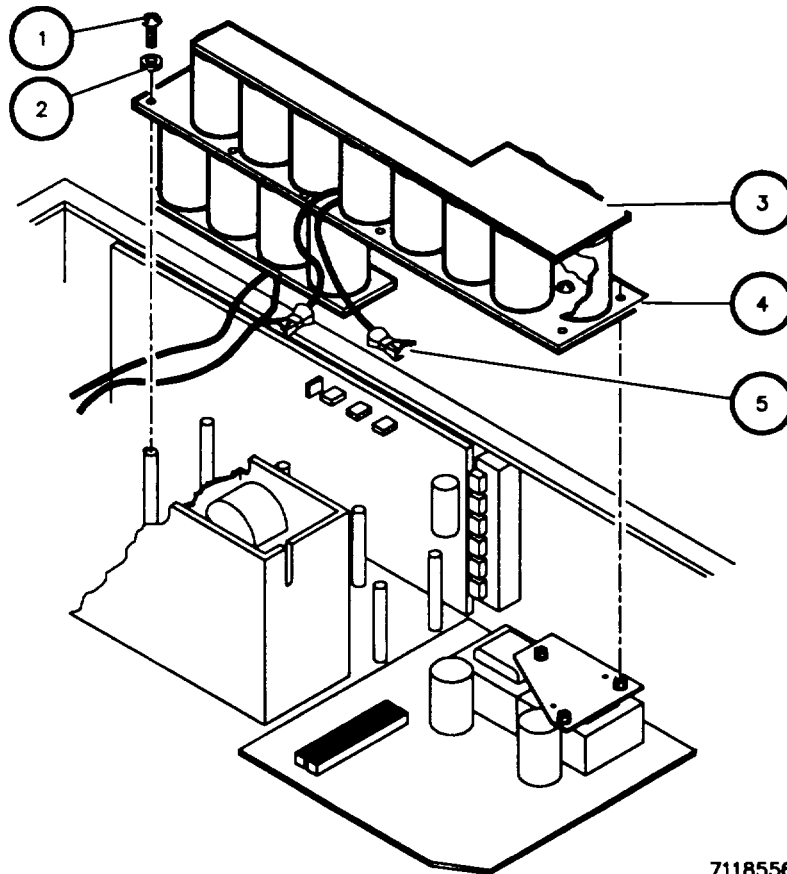
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7-42. REPLACE INVERTER ASSEMBLY OUTPUT TRANSFORMER T1 - Continued

NOTE

Plastic cover is glued onto tops of capacitors on capacitor CCA. Remove only as required to access screws.

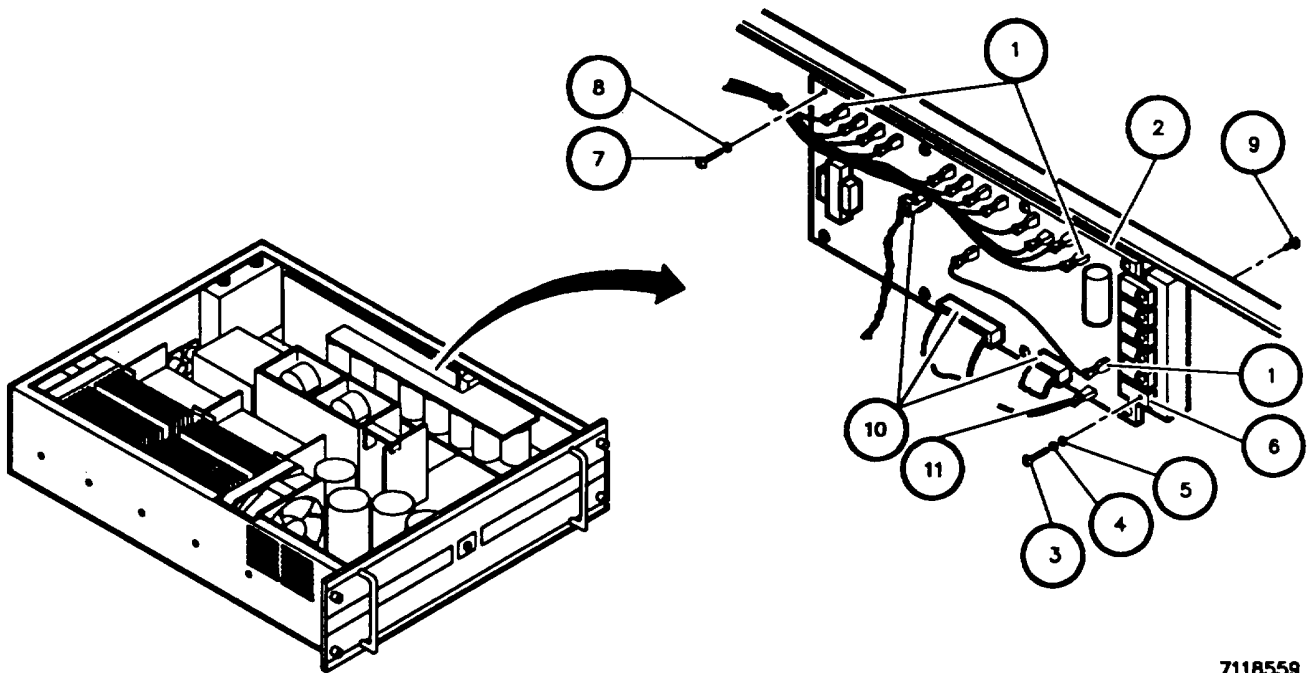
3. Remove 11 screws (1) and internal tooth lockwashers (2), removing plastic cover (3) as required to access screws.
4. Remove capacitor CCA (4), ensuring that wires (5) are routed out of capacitor CCA.



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7-42. REPLACE INVERTER ASSEMBLY OUTPUT TRANSFORMER T1 - Continued

5. Working inside right side panel, tag and disconnect wires (1) along top edge of power control CCA (2).
6. Remove six screws (3), washers (4), shoulder washers (5), and insulator pads (6).
7. Remove four screws (7) and internal tooth lockwashers (8).
8. Working at right side panel, remove two screws (9).
9. Lift power control CCA (2), as required, to access and disconnect three cable connectors (10) and one wire (11).
10. Remove power control CCA (2).



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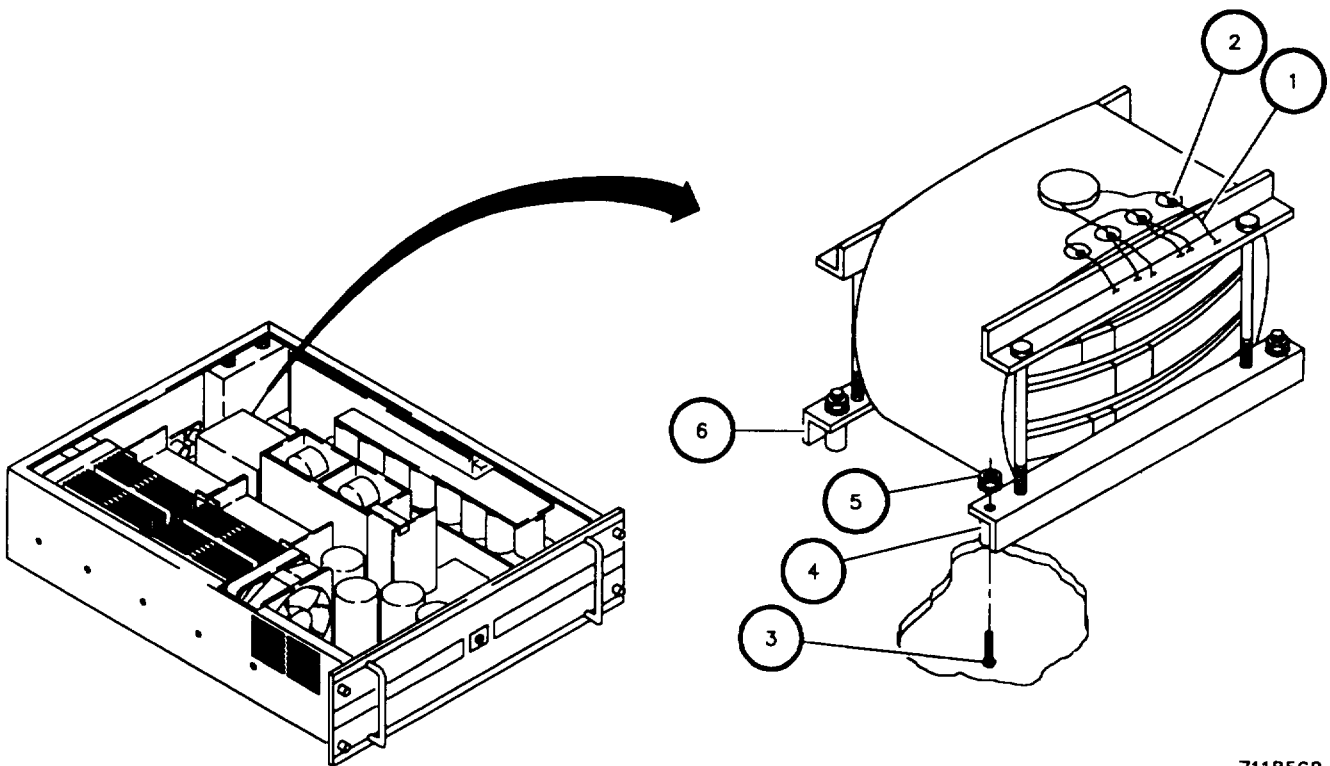
7-42. REPLACE INVERTER ASSEMBLY OUTPUT TRANSFORMER T1 - Continued

11. At transformer T1 (6), tag, unsolder, and remove six wires (1) from four terminal lugs (2).
12. Set and hold inverter assembly on left side panel.
13. Working at bottom panel, support transformer T1 (6) while removing four screws (3), standoffs (4), and locknuts (5).

NOTE

Standoffs and locknuts are inside chassis.

14. Set inverter in normal upright position.
15. Remove transformer T1 (6).



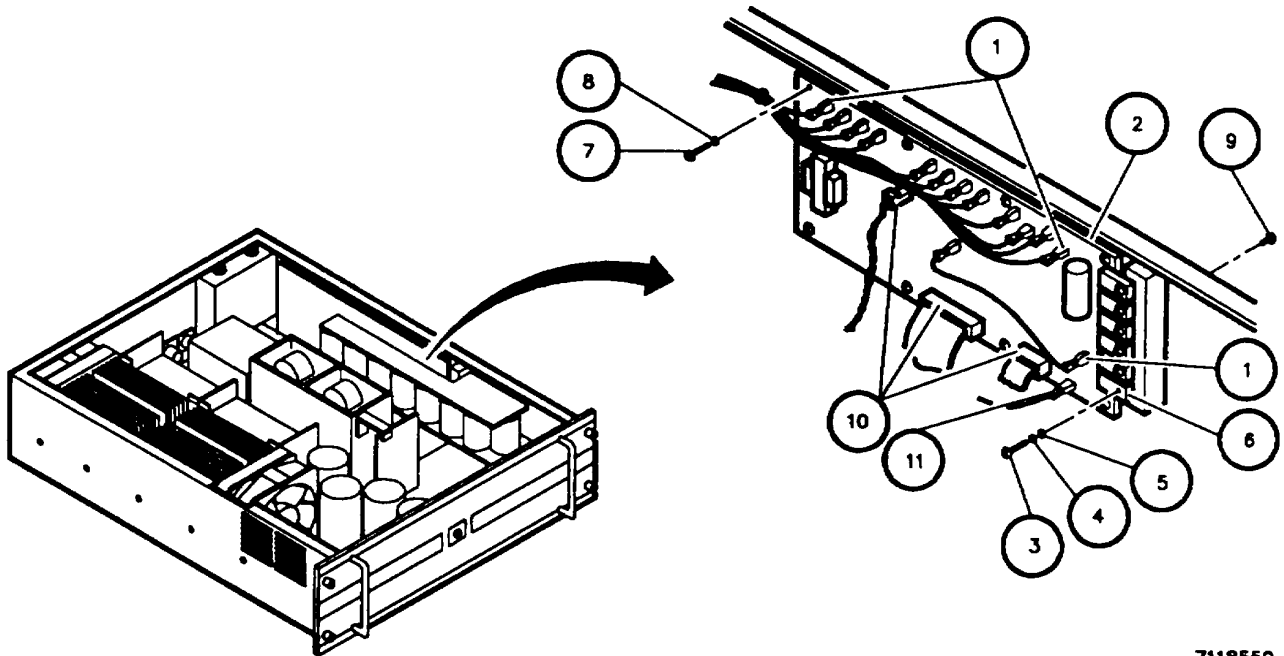
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INSTALLATION

1. Set and hold inverter assembly on left side panel.
2. Place and hold transformer T1 (6) in installed position.
3. Install four standoffs (4), screws (3), and locknuts (5).
4. Set inverter assembly in normal upright position.
5. Solder six wires (1) to four terminal lugs (2), as tagged. Remove tags.

7-42. REPLACE INVERTER ASSEMBLY OUTPUT TRANSFORMER T1 - Continued

6. Connect three cable connectors (10) and one wire (11) to power control CCA (2).
7. Place power control CCA (2) in installed position.
8. Install six screws (3), washers (4), shoulder washers (5), and insulator pads (6).
9. Install four screws (7) and internal tooth lockwashers (8).
10. Working at right side panel, install two screws (9).
11. Connect wires (1) along top edge of power control CCA (2). as tagged. Remove tags.



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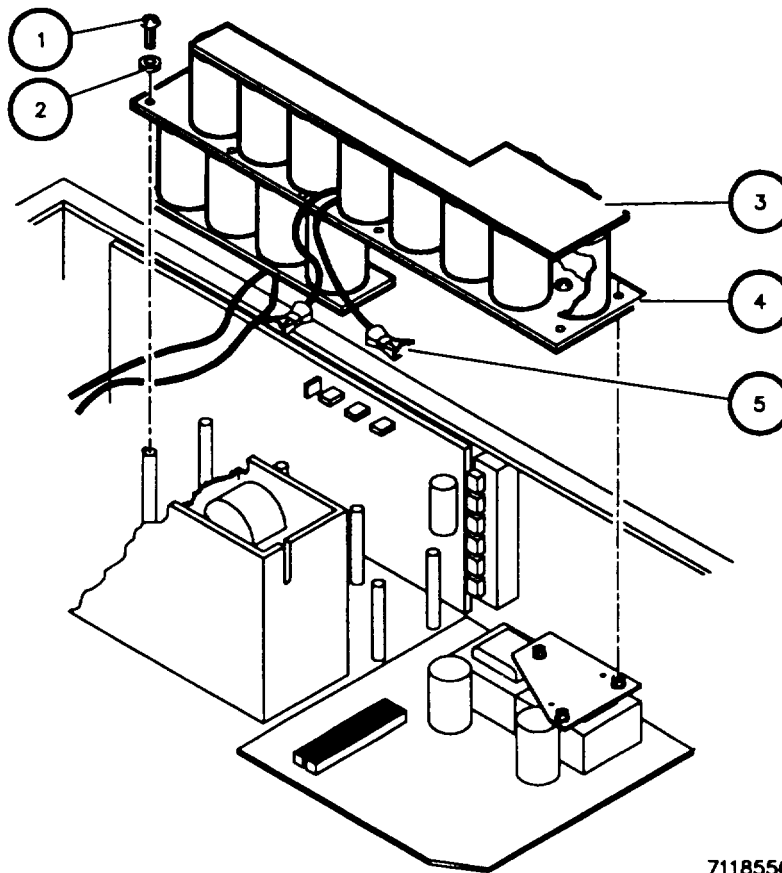
7-42. REPLACE INVERTER ASSEMBLY OUTPUT TRANSFORMER T1 - Continued

12. Route wires (5) through capacitor CCA (4).

NOTE

Placing screws and lockwashers into capacitor CCA prior to placing capacitor CCA into installed position will simplify installation.

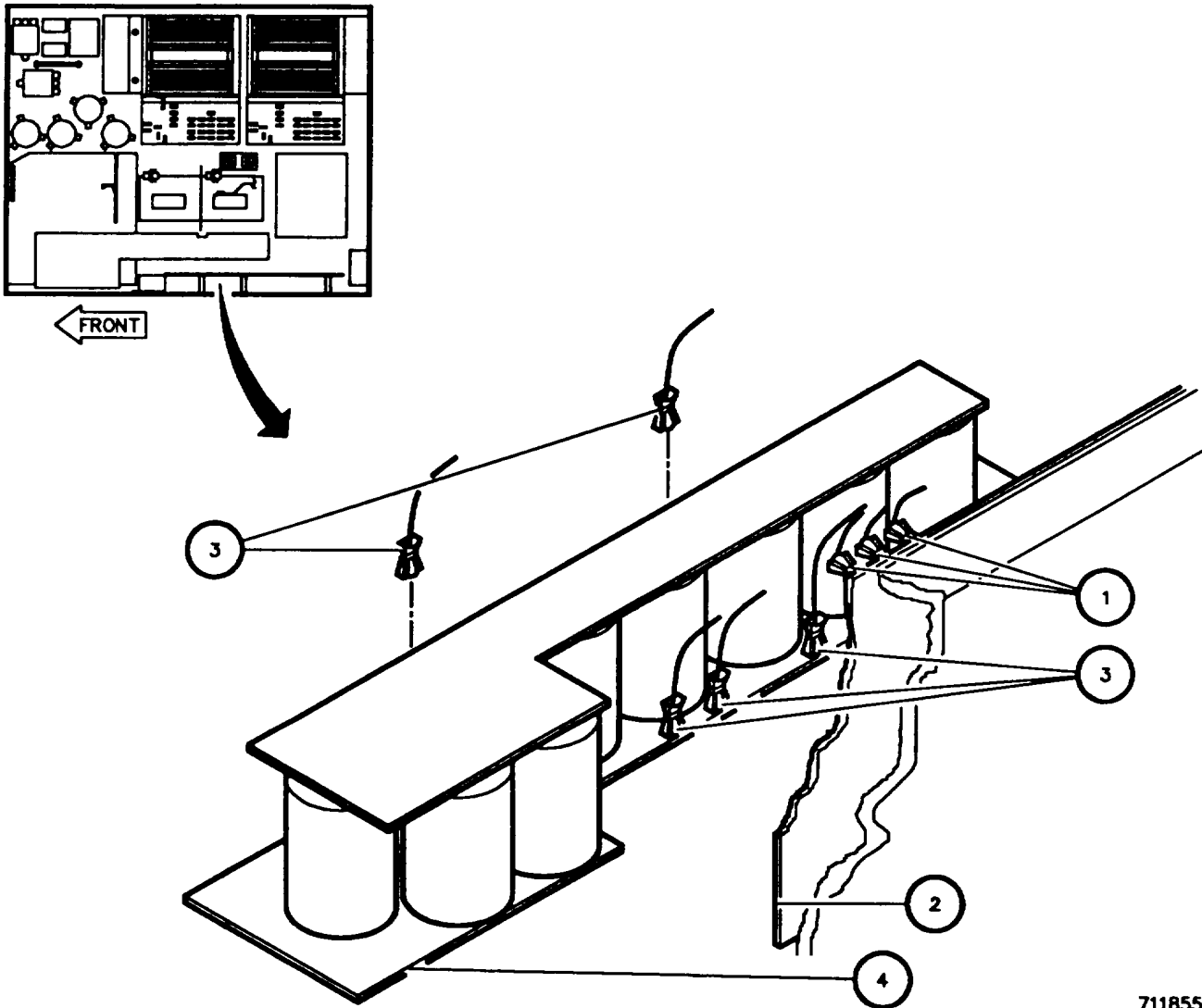
13. Place capacitor CCA (4) in installed position, ensuring that wires (5) are not trapped under CCA.
14. Install 11 screws (1) and internal tooth lockwashers (2), lifting plastic cover (3) as required to access screws.



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7-42. REPLACE INVERTER ASSEMBLY OUTPUT TRANSFORMER T1 - Continued

15. Connect five wires (3) to capacitor CCA (4), as tagged. Remove tags.
16. Connect wires (1) to power control CCA (2), as tagged, that were removed to access wires (3) on capacitor CCA (4). Remove tags.



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FOLLOW-ON MAINTENANCE: Install inverter assembly rear amplifier module (para 7-36).

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**CHAPTER 8
POWER DISTRIBUTION SYSTEMS**

Para		Page
Section I	Principles of Operation	8-2
8-1	Introduction.....	8-2
8-2	Theory of Operation	8-2
8-2.1	ADP Shelter Power Distribution.....	8-2
8-2.2	OPN Shelter Power Distribution	8-4
8-2.3	Power Entry Panel.....	8-6
8-2.4	ADP Shelter Power Distribution Unit.....	8-7
8-2.5	OPN Shelter Power Distribution Unit.....	8-9
Section II	Troubleshooting.....	8-12
8-3	Introduction.....	8-12
8-4	General Instructions	8-12
8-4.1	Introduction.....	8-12
8-4.2	Inspection Procedures.....	8-12
8-4.3	Troubleshooting Procedures	8-12
8-4.4	Maintenance Procedures	8-13
8-5	Equipment Setup	8-13
8-6	Symptom Index	8-13
8-7	Troubleshooting Table.....	8-16
Section III	Maintenance Procedures	8-72
8-8	Remove/Install PEP Access Panel.....	8-72
8-9	Replace PEP Circuit Breaker CB1	8-73
8-10	Replace PEP Circuit Breakers CB2-CB4	8-74
8-11	Replace PEP Power Monitor K1.....	8-79
8-12	Replace PEP Power Contactor K2.....	8-80
8-13	Replace PEP Indicator Housing DS1	8-83
8-14	Replace PEP Indicator Housings DS2-DS4	8-85
8-15	Replace PEP Surge Arrestors E2-E5.....	8-87
8-16	Replace PEP Receptacle J1 or J2	8-88
8-17	Replace PEP Receptacle J3	8-90
8-18	Replace PEP Switch S1	8-93
8-19	Replace PEP Terminal Board TB1 or TB2.....	8-95
8-20	Replace ADP Shelter Main Power Filter Assembly.....	8-98
8-21	Replace OPN Shelter Main Power Filter Assembly	8-101
8-22	Replace Main Power Filter Assembly Filter Modules.....	8-104
8-23	Open/Close PDU Front Panel	8-109
8-24	Remove/Install PDU Front-Panel Protective Guard	8-110
8-25	Replace PDU Ac-Dc Converter PS1	8-111
8-26	Replace PDU Dc-Dc Converter PS2.....	8-112
8-27	Replace PDU Ac Current Transformers CT1-CT3	8-114
8-28	Replace PDU Meters M1-M3	8-118
8-29	Replace PDU Meter M4	8-121
8-30	Replace PDU Switch S1.....	8-122

Para		Page
8-31	Replace PDU Switches S2-S4	8-123
8-32	Replace PDU Circuit Breakers	8-125
8-33	Replace PDU Indicator Housings.....	8-127
8-34	Replace PDU Terminal Board TB1 or TB2	8-129
8-35	Replace Main Light Assembly	8-132
8-36	Replace Main Light Assembly Ballast	8-135
8-37	Replace Main Light Assembly Fluorescent Lampholder	8-138
8-38	Replace Main Light Assembly Incandescent Lampholder.....	8-140
8-39	Replace Workstation Spotlight Assembly	8-142
8-40	Replace ADP Shelter Ac Filter Assembly.....	8-145
8-41	Replace Dc Filter Assembly	8-150
8-42	Replace Wall-Mounted Ac Receptacles	8-153
8-43	Replace Wall-Mounted Dc Receptacles.....	8-154
8-44	Replace Wall-Mounted Dimmer Controls	8-155
8-45	Replace ECU Power Cable Connector	8-157
8-46	Replace Door Limit Switch S1	8-160
8-47	Replace ADP Shelter Equipment Rack Receptacles	8-161
8-48	Repair Power Cables	8-163
8-49	Remove/Repair/Install Point-to-Point Wiring.....	8-166

SECTION I. PRINCIPLES OF OPERATION

8-1. INTRODUCTION

This section provides the theory of operation for the power distribution circuits in the Automatic Data Processing (ADP) and Operations (OPN) shelters of the Communication System, Control Element, Central Processors AN/TYQ-30(V)1/2.

NOTE

The AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ(V)2 system, except where noted.

8-2. THEORY OF OPERATION

8-2.1. ADP Shelter Power Distribution. A block diagram of the ADP shelter power distribution is shown in figure FO-4. Complete wiring diagrams and point-to-point wire lists are included in Volume 2, Cabling and Wiring Data. Refer to figure FO-4.

- | | | |
|-----|--|--|
| (1) | POWER ENTRY PANEL | Accepts prime power 3-phase input. Provides 3-phase power directly to Environmental Control Units (ECUs) and main power filter. Also provides 3-phase and 1-phase power for external loads. Wiring to main filter is through conduit for shielding. |
| (2) | ENVIRONMENTAL CONTROL UNIT CURBSIDE (A10) AND ROADSIDE (All) | Wiring connection point for 3-phase power between PEP and ECU control modules. Also contains overload switch that can interrupt power to ECU components. ECU power is unfiltered; therefore, PEP-to-ECU wiring and ECU-to-ECU control wiring is enclosed in conduit for shielding. |

8-2.1. ADP Shelter Power Distribution - Continued

- | | | |
|------|------------------------------|---|
| (3) | ECU CONTROL MODULE | Applies 3-phase ac power from PEP to ECU operating components. Also contains controls to adjust and regulate ECU operation. |
| (4) | MAIN POWER FILTER A2A1A2 | Filters all shelter ac power, except ECU power. Applies filtered 3-phase ac power to Uninterruptible Power Source (UPS) and filtered phase B power to Power Distribution Unit (PDU) for bypass lighting. |
| (5) | UNINTERRUPTIBLE POWER SOURCE | Provides regulated 3-phase ac power from either 3-phase input or internal batteries. In case of prime power loss, allows full operation for 10 minutes or more. Also provides +144 Vdc from batteries and status signals (alarms) to red patch panel. UPS is described in detail in chapter 7 of this technical manual. |
| (6) | POWER DISTRIBUTION UNIT | Provides circuit breakers and indicators to control and monitor power to all equipment except ECUs. Also converts input +144 Vdc to +28 Vdc. |
| (7) | TERMINAL BOARD A3A1TB1 | Wiring point for phase C ac power to left (forward) equipment rack A3A1. This rack contains Group Modem (GM) and Loop Group Multiplexer (LGM). |
| (8) | AC FILTER A3A1A5 | Provides Electromagnetic Interference (EMI) filtering to isolate GM and LGM from ac power source and other units. Also provides cable jacks for GM and LGM power cables. |
| (9) | TERMINAL BOARD A3A2TB1 | Wiring point for phase C ac power to center equipment rack A3A2. This rack contains 8 Digital-to-Digital Converters (DSDIs) and 10 Digital Secure Voice Terminals (DSVTs). |
| (10) | RACK 2 RECEPTACLES | Provide ac power connection points for eight DSDI power cables. |
| (11) | TERMINAL BOARD A3A3TB1 | Wiring point for 3-phase ac power to right (aft) equipment rack A3A3. This rack contains two Fiber-Optic Ethernet Repeaters (FOERs) and two (AN/TYQ-30(V)2) or three (AN/TYQ-30(V)1) processor units. |
| (12) | RACK 3 RECEPTACLES | Provide ac power connection points for FOER and processor unit power cables. |
| (13) | TERMINAL BOARDS TB1-TB4 | Wall-mounted terminal boards. Provide wiring points for ac and dc power distribution. |
| (14) | AC RECEPTACLES J1-J6 | Wall-mounted duplex outlets. Provide ac power connection points for workstations, intercom, and test equipment. |

8-2.1. ADP Shelter Power Distribution - Continued

- | | | |
|------|---|---|
| (15) | AC RECEPTACLE A7J1 | Duplex outlet mounted in printer rack A7. Provides ac power connection point for printer and Lightweight Digital Facsimile (LDF) power cables. |
| (16) | DOOR LIMIT SWITCH S1 | Door-operated switch. Enabled only when BLACKOUT toggle switch S2 on PDU is in NORMAL position. When enabled and door open, applies 120 Vac to red blackout lamps in main light assemblies DS1 and DS2. When enabled and door closed, applies 120 Vac to LIGHTS MAIN/COLDSTART toggle switch S3 in PDU. |
| (17) | MAIN LIGHT ASSEMBLIES
DS1 AND DS2 | Ceiling-mounted main light assemblies. Contain fluorescent (main) lamps, white incandescent (coldstart) lamps, and red incandescent (blackout) lamps. |
| (18) | DIMMERS R1 AND R2 | Workstation spotlight dimmer controls mounted on wall near workstations. When PDU switches select MAIN lights, adjust ac voltage applied to workstation spotlights. |
| (19) | WORKSTATION SPOTLIGHT
ASSEMBLIES DS3 AND DS4 | Incandescent light assemblies mounted to ceiling over each workstation. Enabled only when PDU controls select MAIN lights. When enabled, ac input voltage controlled by dimmers R1 and R2. |
| (20) | DC FILTER A7A4 | Filter mounted in printer rack A7. Provides EMI filtering between PDU dc power and radio and KY-57 power supplies. Also provides cable jack for radio power cable W129. |
| (21) | DC RECEPTACLES J3 AND J6 | Mounted on wall near telephone sets. Provide dc power connection point for telephone set power cords. |

8.2.2. OPN Shelter Power Distribution. A block diagram of the OPN shelter power distribution is shown in figure FO-5. Complete wiring diagrams and point-to-point wire lists are included in Volume 2, Cabling and Wiring Data. Refer to figure FO-5.

- | | | |
|-----|--|---|
| (1) | POWER ENTRY PANEL | Accepts prime power 3-phase input. Provides 3-phase power directly to ECUs and main power filter. Also provides 3-phase and 1-phase power for external loads. Wiring to main filter is through conduit for shielding. |
| (2) | ENVIRONMENTAL CONTROL UNIT
ROADSIDE (A10) AND
CURBSIDE (A11) | Wiring connection point for 3-phase power between PEP and ECU control modules. Also contains overload switch that can interrupt power to ECU components. ECU power is unfiltered; therefore, PEP-to-ECU wiring and ECU-to-ECU control wiring are enclosed in conduit for shielding. |

8-2.2. OPN Shelter Power Distribution - Continued

- | | | |
|------|--|---|
| (3) | ECU CONTROL MODULE | Applies 3-phase ac power from PEP to ECU operating components. Also contains controls to adjust and regulate ECU operation. |
| (4) | MAIN POWER FILTER A5A3 | Filters all shelter ac power, except ECU power. Applies filtered 3-phase ac power to UPS and filtered phase E power to PDU for bypass lighting. |
| (5) | UNINTERRUPTIBLE POWER SOURCE | Provides regulated 3-phase ac power from either 3-phase input or internal batteries. In case of prime power loss, will allow full operation for 10 minutes or more. Also provides +144 Vdc from batteries and status signals (alarms) to red patch panel. UPS is described in detail in chapter 7 of this technical manual. |
| (6) | POWER DISTRIBUTION UNIT | Provides circuit breakers and indicators to control and monitor power to all equipment except ECUs. Also converts input +144 Vdc to +28 Vdc. |
| (7) | TERMINAL BOARDS TB1-TB4 | Wall-mounted terminal boards. Provide wiring points for ac and dc power distribution. |
| (8) | AC RECEPTACLES J1-J6, J8, J9, J11, AND J12 | Wall-mounted duplex outlets. Provide ac power connection points for all equipment except ECUs. |
| (9) | DOOR LIMIT SWITCH S1 | Door-operated switch. Enabled only when BLACKOUT toggle switch S2 on PDU is in NORMAL position. When enabled and door open, applies 120 Vac to red blackout lamps in main light assemblies DS1 and DS2. When enabled and door closed, applies 120 Vac to LIGHTS MAIN/COLDSTART toggle switch S3 in PDU. |
| (10) | MAIN LIGHT ASSEMBLIES DS1 AND DS2 | Ceiling-mounted main light assemblies. Contain fluorescent (main) lamps, white incandescent (coldstart) lamps, and red incandescent (blackout) lamps. |
| (11) | DIMMERS R1-R4 | Workstation spotlight dimmer controls mounted on wall near workstations. When PDU switches select MAIN lights, adjust ac voltage applied to workstation spotlights. |
| (12) | WORKSTATION SPOTLIGHT ASSEMBLIES DS3-DS6 | Incandescent light assemblies mounted to ceiling over each workstation. Enabled only when PDU controls select MAIN lights. When enabled, ac input voltage controlled by dimmers R1-R4. |
| (13) | DC FILTER A3A8A3 | Filter mounted in equipment rack A3 tray, next to KY-57. Provides EMI filtering between PDU dc power and radio and KY-57 power supplies. Also provides cable jack for radio power cable W129. |

8-2.2. OPN Shelter Power Distribution - Continued

- (14) DC RECEPTACLES J3, J7, J10, AND J13 Mounted on wall near telephone sets. Provide dc power connection point for telephone set power cords.

8-2.3. Power Entry Panel. The same PEP is used in the ADP shelter and the OPN shelter. A block diagram of this PEP is shown in figure FO-6. A complete wiring diagram and point-to-point wire list are included in Volume 2, Cabling and Wiring Data. Refer to figure FO-6.

- (1) PRIMARY INPUT RECEPTACLE J1 Provides cable connection point for prime power input cable.
- (2) TERMINAL BOARD TB2 Provides wiring connection point for ac ground distribution. Wired to input ground stud E1 and shelter ground stud E6.
- (3) TERMINAL BOARD TB1 Provides wiring connection point for input neutral distribution and for some phase A distribution.
- (4) GROUND STUD E1 Front panel ground. Provides connection point for ground strap to external earth ground. Mechanically connected to PEP frame. Wired to ground stud E6 and ground terminal board TB2.
- (5) SURGE ARRESTORS E2-E5 Provide protection against input voltage spikes. Switch overvoltage to ground.
- (6) FREQ SELECT SWITCH S1 Front-panel toggle switch. Selects 60-Hz or 50-Hz operation for power monitor K1.
- (7) POWER MONITOR K1 At initial power application, monitors prime input ac power voltage, frequency, and phase angles. Lights green POWER AVAILABLE lamp DS1 and closes power contactor K2 if input within range. Lights appropriate red FAULT lamp if out-of-range condition detected. After initial closure, K2 holding contacts bypass monitor K1 control.
- (8) MAIN CIRCUIT BREAKER CB1 Applies 3-phase prime power to J2 AUXILIARY OUTPUT connector and to input of K2 power contactor.
- (9) AUXILIARY OUTPUT RECEPTACLE J2 Provides prime 3-phase ac power to external load.
- (10) POWER CONTACTOR K2 Main power contactor. On initial power application, controlled by power monitor K1. When operated by K1, contactor K2 applies prime 3-phase ac power to external main power filter and to circuit breakers CB2, CB3, and CB4. After initial closure, holding contacts on K2 bypass K1 control.
- (11) POWER AVAILABLE LAMP DS1 Front-panel green indicator lamp. Lighted by power monitor K1 when input voltage, frequency, and phase angles are within range.

8-2.3. Power Entry Panel - Continued

- | | | |
|------|---------------------------------------|--|
| (12) | FAULT LAMPS DS2, DS3, AND DS4 | Front-panel red indicator lamps. Lighted by power monitor K1 to indicate prime 8C input power voltage, frequency, or phase rotation fault. |
| (13) | AIR COND CIRCUIT BREAKERS CB2 AND CB3 | When contactor K2 closed, apply 3-phase ac power to ECU. CB2 controls roadside ECU A10; CB3 controls curbside ECU A11. |
| (14) | UTILITY CIRCUIT BREAKER CB4 | When contactor K2 closed, applies phase C ac power to UTILITY receptacle J3. |
| (15) | UTILITY RECEPTACLE J3 | When contactor K2 and UTILITY circuit breaker CB4 closed, provides phase C ac power to external load. Contains TEST and RESET switches to test power interrupter. |
| (16) | GROUND STUD E6 | Ground stud on inside frame. Provides earth ground connection point for internal shelter ground distribution. Mechanically grounded to PEP frame. Wired to input ground stud E1 and ground terminal board TB2. |

8-2.4. ADP Shelter Power Distribution Unit. A block diagram of the ADP shelter PDU is shown in figure FO-7. A complete wiring diagram and point-to-point wire list are included in Volume 2, Cabling and Wiring Data. Refer to figure FO-7.

- | | | |
|-----|----------------------------|--|
| (1) | TERMINAL BOARD TB1 | Triple-function wiring terminal board. Provides wiring connection point for UPS 3-phase ac input, UPS +144 Vdc input, and shelter ac neutral. |
| (2) | TERMINAL BOARD TB2 | Triple-function wiring terminal board. Provides wiring connection point for main filter bypass lighting input, UPS +144 Vdc common, and UPS neutral input. |
| (3) | DC PWR AVAIL LAMP DS11 | Front-panel green indicator lamp. Lighted when +28 Vdc output of dc-dc converter PS2 is present. |
| (4) | 28 VDC CIRCUIT BREAKER CB9 | When closed, applies +28 Vdc output of dc-dc converter PS2 to indicator lamp DS9 and external dc distribution. |
| (5) | INDICATOR LAMPS DS1-DS9 | Front-panel green circuit breaker indicators: Under normal conditions, lighted when associated circuit breaker closed. DS1-DS8 are 120 Vac; DS9 is 28 Vdc. |

8-2.4. ADP Shelter Power Distribution Unit - Continued

- | | | |
|------|------------------------------------|--|
| (6) | UPS BYPASS/NORMAL TOGGLE SWITCH S4 | Allows operation of shelter lighting when UPS not operating. Selects source of phase B 120 Vac input to LIGHTS circuit breaker CB8. BYPASS (up) position applies phase B bypass input from main power filter. NORMAL (down) position applies phase B input from UPS. |
| (7) | CURRENT TRANSFORMERS CT1-CT3 | Provide samples of load current on UPS 3-phase ac input to CURRENT meter M2 through PHASE SELECT switch S1. Do not provide current sample of phase B when UPS BYPASS/NORMAL switch in BYPASS. |
| (8) | PHASE SELECT SWITCH S1 | Selects ac phase to be monitored by meters M1, M2, and M3. Connects current samples from current transformers CT1, CT2, and CT3 to CURRENT meter M2. Connects CB1 input to VOLTAGE meter M1 and FREQUENCY meter M3. |
| (9) | CURRENT METER M2 | Monitors load current in ac phase selected by PHASE SELECT switch S1. |
| (10) | FREQUENCY METER M3 | Monitors frequency of ac phase selected by PHASE SELECT switch S1. Consists of two parts: front-panel meter and internal frequency transducer. Both items replaced as unit. |
| (11) | VOLTAGE METER M1 | Monitors voltage of ac phase selected by PHASE SELECT switch S1. |
| (12) | AC-DC CONVERTER PS1 | Converts UPS phase C 120 Vac input to 28 Vdc for time-totalizing meter M4. |
| (13) | TIME METER M4 | Time-totalizing meter mounted on side panel. Operates whenever UPS phase C is applied, providing total operating hours. |
| (14) | TECH LOAD MAIN CIRCUIT BREAKER CB1 | When UPS BYPASS/NORMAL toggle switch S4 is in NORMAL, applies 3-phase ac power to circuit breakers CB2-CB8. When switch S4 is in BYPASS, applies phase B only. |
| (15) | AC PWR AVAIL LAMP DS10 | Front-panel green indicator lamp. Lighted when phase B ac power present at CB1 input. |
| (16) | LIGHTS CIRCUIT BREAKER CB8 | When closed, applies phase B ac power to BLACKOUT BYPASS/NORMAL toggle switch S2. |
| (17) | RACKS 3 CIRCUIT BREAKER CB4 | When closed, applies 3-phase ac power to equipment rack 3 (FOER and processor units). |

8-2.4. ADP Shelter Power Distribution Unit - Continued

- | | | |
|------|---|--|
| (18) | RACKS 2 CIRCUIT BREAKER CB3 | When closed, applies phase C ac power to equipment rack 2 (DSDI and DSVT). |
| (19) | RACKS 1 CIRCUIT BREAKER CB2 | When closed, applies phase C ac power to equipment rack 1 (GM and LGM). |
| (20) | CNVC OUTLETS CIRCUIT BREAKER CB7 | When closed, applies phase A ac power to wall-mounted ac receptacles J1 and J2 (convenience outlets). |
| (21) | PRINTER CIRCUIT BREAKER CB6 | When closed, applies phase B ac power to ac receptacle A7J1 in printer rack (printer and LDF). |
| (22) | WORK STA CIRCUIT BREAKER CB5 | When closed, applies phase B ac power to wall-mounted ac receptacles J3 and J6 (workstations and intercom). |
| (23) | BLACKOUT BYPASS/NORMAL TOGGLE SWITCH S2 | Enabled only when LIGHTS circuit breaker CB8 is ON. When enabled, BYPASS position applies phase B ac power to LIGHTS MAIN/COLDSTART switch S3. In NORMAL position, applies phase B ac to door limit switch S1. |
| (24) | LIGHTS MAIN/COLDSTART TOGGLE SWITCH S3 | Enabled only when BLACKOUT toggle switch S2 is in BYPASS position or door limit switch S1 is closed. When enabled, COLDSTART position applies phase B ac power to incandescent lamps in main light assembly. MAIN position applies phase B ac power to fluorescent lamps in main light assemblies (DS1 and DS2) and, through dimmer controls R1 and R2, to workstation spotlights (DS3 and DS4). |
| (25) | DC-DC CONVERTER PS2 | Converts UPS +144 Vdc to +28 Vdc for radio and KY-57. The +28 Vdc output is applied to CB9 and DC PWR AVAIL lamp DS1 1. |

8-2.5. OPN Shelter Power Distribution Unit. A block diagram of the OPN shelter PDU is shown in figure FO-8. A complete wiring diagram and point-to-point wire list are included in Volume 2, Cabling and Wiring Data Refer to figure FO-8.

- | | | |
|-----|------------------------|--|
| (1) | TERMINAL BOARD TB1 | Triple-function wiring terminal board. Provides wiring connection point for UPS 3-phase ac input, UPS +144 Vdc input, and shelter ac neutral. |
| (2) | TERMINAL BOARD TB2 | Triple-function wiring terminal board. Provides wiring connection point for main filter bypass lighting input, UPS +144 Vdc common, and UPS neutral input. |
| (3) | DC PWR AVAIL LAMP DS10 | Front-panel green indicator lamp. Lighted when +28 Vdc output of dc-dc converter PS2 is present. |

8-2.5. OPN Shelter Power Distribution Unit - Continued

- | | | |
|------|------------------------------------|--|
| (4) | 28 VDC CIRCUIT BREAKER CB8 | When closed, applies +28 Vdc output of dc-dc converter PS2 to indicator lamp DS8 and external dc distribution. |
| (5) | INDICATOR LAMPS DS1-DS8 | Front-panel green circuit breaker indicators. Under normal conditions, lighted when associated circuit breaker closed. DS1-DS7 are 120 Vac; DS8 is 28 Vdc. |
| (6) | UPS BYPASS/NORMAL TOGGLE SWITCH S4 | Allows operation of shelter lighting when UPS not operating. Selects source of phase B 120 Vac input to LIGHTS circuit breaker CB2. BYPASS (up) position applies phase B bypass input from main power filter. NORMAL (down) position applies phase B input from UPS. |
| (7) | CURRENT TRANSFORMERS CT1-CT3 | Provide samples of load current on UPS 3-phase ac input to CURRENT meter M2 through PHASE SELECT switch S1. Do not provide current sample of phase B when UPS BYPASS/NORMAL switch in BYPASS. |
| (8) | PHASE SELECT SWITCH S1 | Selects ac phase to be monitored by meters M1, M2, and M3. Connects current samples from current transformers CT1, CT2, and CT3 to CURRENT meter M2. Connects CB1 input to VOLTAGE meter M1 and FREQUENCY meter M3. |
| (9) | CURRENT METER M2 | Monitors load current in ac phase selected by PHASE SELECT switch S1. |
| (10) | FREQUENCY METER M3 | Monitors frequency of ac phase selected by PHASE SELECT switch S1. Consists of two parts: front-panel meter and internal frequency transducer. Both items replaced as unit. |
| (11) | VOLTAGE METER M1 | Monitors voltage of ac phase selected by PHASE SELECT switch S1. |
| (12) | AC-DC CONVERTER PS1 | Converts UPS phase C 120 Vac input to 28 Vdc for time-totalizing meter M4. |
| (13) | TIME METER M4 | Time-totalizing meter mounted on side panel. Operates whenever UPS phase C is applied, providing total operating hours. |
| (14) | TECH LOAD MAIN CIRCUIT BREAKER CB1 | When UPS BYPASS/NORMAL toggle switch S4 is in NORMAL, applies 3-phase ac power to circuit breakers CB2-CB8. When switch S4 is in BYPASS, applies phase B only. |
| (15) | AC PWR AVAIL LAMP DS9 | Front-panel green indicator lamp. Lighted when phase B ac power present at CB1 input. |

8-2.5. OPN Shelter Power Distribution Unit - Continued

- | | | |
|------|---|--|
| (16) | LIGHTS CIRCUIT BREAKER CB2 | When closed, applies phase B ac power to BLACKOUT BYPASS/NORMAL toggle switch S2. |
| (17) | WK STA ROADSIDE CIRCUIT BREAKER CB3 | When closed, applies phase A ac power to wall-mounted ac receptacles J3 and J6 (roadside workstations). |
| (18) | WK STA CURBSIDE CIRCUIT BREAKER CB4 | When closed, applies phase B ac power to wall-mounted ac receptacles J1 and J12 (curbside workstations). |
| (19) | CNVC OUTLETS CIRCUIT BREAKER CB7 | When closed, applies phase B ac power to wall-mounted ac receptacles J5 and J11 (convenience outlets). |
| (20) | PRINTER CIRCUIT BREAKER CB6 | When closed, applies phase C ac power to wall-mounted ac receptacles J4 and J8 (printers and LDF). |
| (21) | EQPT RACK CIRCUIT BREAKER CB5 | When closed, applies phase B ac power to wall-mounted ac receptacle J1 (repeater/station adapter). |
| (22) | BLACKOUT BYPASS/NORMAL TOGGLE SWITCH S2 | Enabled only when LIGHTS circuit breaker CB2 is ON. When enabled, BYPASS position applies phase B ac power to LIGHTS MAIN/COLDSTART switch S3. In NORMAL position, applies phase B ac to door limit switch S1. |
| (23) | LIGHTS MAIN/COLDSTART TOGGLE SWITCH S3 | Enabled only when BLACKOUT toggle switch S2 is in BYPASS position or door limit switch S1 is closed. When enabled, COLDSTART position applies phase B ac power to incandescent lamps in main light assembly. MAIN position applies phase B ac power to fluorescent lamps in main light assemblies (DS1 and DS2) and, through dimmer controls R1 and R2, to workstation spotlights (DS3 and DS4). |
| (24) | DC-DC CONVERTER PS2 | Converts UPS +144 Vdc to +28 Vdc for radio and KY-57. The +28 Vdc output is applied to CB8 and DC PWR AVAIL lamp DS10. |

SECTION II. TROUBLESHOOTING

8-3. INTRODUCTION

This section provides procedures required to set up, test, fault isolate, and repair the ADP and OPN shelter power distribution circuits at the direct support maintenance level.

8-4. GENERAL INSTRUCTIONS

8-4.1. Introduction

- a. Troubleshooting and repair should be performed only by experienced technicians who are familiar with the equipment and capable of ensuring that procedures are correctly accomplished.
- b. Maintenance personnel should read all inspection, troubleshooting, and maintenance instructions before attempting to troubleshoot or repair the equipment.

8-4.2. Inspection Procedures

- a. Visually inspect all wiring and all electronic assemblies and their components for obvious damage. Check for open connections, shorts, burning, discoloration, brittle or cracked insulation, or charring. If damage is noted, carefully inspect related components for similar damage to help identify the cause of the damage.
- b. When removed, visually inspect all Circuit Card Assemblies (CCAs) for signs of excess heat, such as charred, burned, discolored, cracked, or broken components. Inspect all printed wire etching on CCAs for apparent breaks, cuts, nicks, or signs of lifting from the card. Inspect CCA connectors for cracked or broken insulation and for missing, loose, bent, or broken pins. Inspect contacts of CCA edge connectors to ensure that they are not broken, scratched, nicked, cut or dirty. Clean dirty contacts.
- c. Inspect all chassis connectors for broken, scratched, dented, or damaged housings; missing hardware; and missing or damaged connector pins.
- d. Operate each switch to all positions to ensure that it operates freely and smoothly and that all contacts appear to mate when they should. Ensure that all switch detents operate positively and firmly. Inspect knobs for breaks or cracks.

8-4.3. Troubleshooting Procedures

- a. Observe reported symptom or repeat failed diagnostic test to verify reported fault.
- b. Using symptom index (table 8-1) and troubleshooting table (table 8-2), perform steps required to isolate fault to a part or assembly and perform first specified corrective action.
- c. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- d. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action.
- e. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- f. Repeat steps d and e until fault is corrected or it becomes necessary to refer unit to next higher level of maintenance.

8-4.4. Maintenance Procedures

- a. The equipment documented in this manual is typical. The equipment you are repairing may contain minor variations (location and number of cable ties, cable markers, lockwashers, etc.) which do not affect the essential procedural steps given.
- b. While performing maintenance procedures, cut and remove cable ties whenever needed. Note and record the number and location of the cable ties removed to aid installation.
- c. Bag and tag hardware (screws, washers, etc.) during removal procedures to aid installation.
- d. Tag connectors and wires during removal procedures to ensure correct reconnection.
- e. If during removal of an assembly it is observed that wires, cables, or connectors attached to that assembly are loose, reinstall or reconnect the loose item and repeat troubleshooting procedure to verify repair.

8-5. EQUIPMENT SETUP

WARNING

HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.

Work carefully if covers are removed or panels are open to avoid electrical shock.

1. Connect all internal and external cables for normal operation.
2. Refer to TM 11-5895-1392-12 and perform turn-on procedure for appropriate shelter to point where first trouble symptom is noted.

8-6. SYMPTOM INDEX

The symptom index for ADP and OPN shelter power distribution is provided in table 8-1. Unless otherwise indicated, all symptoms are for either the ADP or OPN shelter. Simply check the table for the fault condition or failed diagnostic test result and go to the referenced troubleshooting procedure in Table 8-2, Power Distribution System Troubleshooting.

8-6. SYMPTOM INDEX - Continued

Table 8-1. Power Distribution Symptom Index

NUMBER	SYMPTOM	PAGE
1	Prime power source overloads when prime power applied to PEP.....	8-18
2	POWER AVAILABLE lamp on PEP not lighted.....	8-18
3	FREQUENCY FAULT lamp on PEP lighted.....	8-19
4	VOLTAGE FAULT or PHASE FAULT lamp on PEP lighted	8-20
5	MAIN circuit breaker on PEP trips.....	8-20
6	AIR COND breaker on PEP trips.....	8-22
7	UTILITY breaker on PEP trips.....	8-23
8	No voltage at PEP AUXILIARY OUTPUT receptacle.....	8-24
9	No voltage at PEP UTILITY receptacle.....	8-25
10	TEST switch on PEP does not remove voltage from UTILITY receptacle	8-25
11	RESET switch on PEP does not restore voltage to UTILITY receptacle	8-25
12	ECU motor not operating.....	8-25
13	ECU not cooling properly.....	8-27
14	ECU not heating properly	8-27
15	UPS meter indicates UPS line input out-of-range	8-27
16	UPS meter indicates UPS output out-of-range	8-29
17	DC PWR AVAIL lamp on PDU not lighted when UPS BATTERY breaker ON	8-29
18	VOLTAGE meter on PDU indicates out-of-range input from UPS	8-30
19	VOLTAGE meter on PDU indicates out-of-range bypass input	8-31
20	VOLTAGE meter on PDU has no indication on any phase.....	8-33
21	FREQUENCY meter on PDU has no indication on any phase	8-33
22	FREQUENCY meter on PDU indicates out-of-range input from UPS.....	8-34
23	FREQUENCY meter on PDU indicates out-of-range bypass input.....	8-34
24	AC PWR AVAIL lamp on PDU not lighted.....	8-34
25	TECH LOAD MAIN breaker on PDU trips	8-35
26	ADP shelter RACKS 1 breaker on PDU trips	8-36
27	ADP shelter RACKS 2 breaker on PDU trips	8-37

8-6. SYMPTOM INDEX - Continued

Table 8-1. Power Distribution Symptom Index - CONT

NUMBER	SYMPTOM	PAGE
28	ADP shelter RACKS 3 breaker on PDU trips	8-38
29	ADP shelter WORK STA, PRINTER, or CNVC OUTLETS breaker on PDU trips	8-39
30	OPN shelter WK STA ROADSIDE, WK STA CURBSIDE, PRINTERS, EQPT RACK, or CNVC OUTLETS breaker on PDU trips	8-40
31	LIGHTS breaker on PDU trips	8-41
32	28 VDC breaker on PDU trips	8-50
33	Breaker indicator lamp on PDU not lighted when breaker is ON	8-51
34	ADP shelter, no voltage at group modem	8-52
35	ADP shelter, no voltage at loop group multiplexer	8-53
36	ADP shelter, no voltage at digital-to-digital converters.....	8-54
37	ADP shelter, no voltage at rack 3 ac receptacle	8-55
38	ADP shelter, no voltage at printer/LDF ac receptacle	8-56
39	OPN shelter, no voltage at repeater/station adapter.....	8-57
40	No voltage at workstation	8-58
41	No voltage at radio mounting base.....	8-59
42	No voltage at telephone set.....	8-60
43	No blackout lights, BLACKOUT switch in NORMAL, door open	8-60
44	One blackout light not on.....	8-62
45	No main lights, BLACKOUT switch in NORMAL, door closed	8-63
46	No coldstart lights, BLACKOUT switch in NORMAL, door closed	8-63
47	No main or coldstart lights, BLACKOUT switch in NORMAL	8-64
48	No main lights, BLACKOUT switch in BYPASS.....	8-65
49	No coldstart lights, BLACKOUT switch in BYPASS	8-65
50	No main or coldstart lights, BLACKOUT switch in BYPASS	8-66
51	No main or coldstart lights, BLACKOUT switch in NORMAL or BYPASS.....	8-67
52	No main, coldstart, or blackout lights	8-67
53	No fluorescent lights, workstation spotlights on	8-68
54	No workstation spotlights, fluorescent lights on	8-68

8-6. SYMPTOM INDEX - Continued

Table 8-1. Power Distribution Symptom Index - CONT

NUMBER	SYMPTOM	PAGE
55	One fluorescent light not on	8-69
56	One workstation spotlight not on, dimmer maximum	8-70
57	One coldstart light not on	8-70
58	No brightness control on one workstation spotlight.....	8-71
59	Blackout lights on with door closed	8-71

8-7. TROUBLESHOOTING TABLE

WARNING

- **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.**
- **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.**
- **The shelter must be properly grounded. In addition to being a personnel safety hazard, improper grounding may cause erroneous operation and damage to equipment.**

CAUTION

- **Never place spillable containers on or near the equipment.**
- **To avoid electrical shorts or similar problems, promptly remove any hardware or other foreign matter dropped into the equipment.**

8-7. TROUBLESHOOTING TABLE - Continued

NOTE

- When performing troubleshooting procedures, especially during electrical checks, be alert for intermittent as well as good/bad conditions.
- When panels are opened or covers removed, inspect interior components for damage, loose wiring, etc. Replace any damaged components and tighten loose connections. Then proceed with troubleshooting.
- Be sure that plugs, jacks, cables, and integrated circuits are completely and positively engaged. When reconnecting these items, guard against bending pins and inverting or offsetting connection of unkeyed connectors.
- (ADP or OPN) in a reference to a schematic or wire list indicates that there are separate drawings for each shelter. Be sure to reference the correct schematic or wire list.

Troubleshooting procedures for the power distribution circuits are provided in table 8-2. This table consists of three columns and is used as follows:

1. MALFUNCTION: Indicates equipment fault as described in symptom index. Look in TEST OR INSPECTION column for required fault isolation steps.
2. TEST OR INSPECTION: Indicates step(s) to be taken to isolate fault to a specific part or assembly. If equipment passes a test or inspection step, go to next step. If equipment fails a test or inspection, look in CORRECTIVE ACTION column for repair steps.
3. CORRECTIVE ACTION: Indicates authorized adjustment or repair for an isolated fault. When action is completed, repeat action or diagnostic test that initially identified fault to confirm repair. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action. If all steps are completed and fault persists, refer equipment to next higher level of maintenance.

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. PRIME POWER SOURCE OVERLOADS WHEN PRIME POWER APPLIED TO PEP		<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p> <p>Step 1. Remove PEP access panel (para 8-8).</p> <p>Step 2. Disconnect wiring from CB1 input. Refer to PEP schematic diagram in volume 2. Check CB1 input side for shorts and opens.</p> <p style="padding-left: 40px;">Replace faulty CB1 (para 8-9).</p> <p>Step 3. Check for shorted surge arrestor E2, E3, E4, or E5.</p> <p style="padding-left: 40px;">Replace faulty surge arrestor (para 8-15).</p> <p>Step 4. Disconnect wiring connector P1 from power monitor K1. Check power monitor K1 input wiring for shorts and opens.</p> <p style="padding-left: 40px;">Repair faulty wiring (para 8-49).</p> <p>Step 5. Check power monitor K1 for input shorts and opens.</p> <p style="padding-left: 40px;">Replace faulty power monitor K1 (para 8-11).</p> <p>Step 6. Check for shorts in wiring between J1 and P1, CB1, E2, E3, E4, and E5. Refer to PEP schematic diagram in volume 2.</p> <p style="padding-left: 40px;">Repair faulty wiring (para 8-49).</p>
2. POWER AVAILABLE LAMP ON PEP NOT LIGHTED		<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p> <p>Step 1. Remove PEP access panel (para 8-8).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. POWER AVAILABLE LAMP ON PEP NOT LIGHTED - Continued		
Step 2.	Check indicator DS1 housing.	Replace defective indicator DS1 housing (para 8-13).
Step 3.	Check wiring to K1 power monitor and to indicator DS1 housing. Refer to PEP schematic diagram in volume 2.	Repair faulty wiring (para 8-49).
Step 4.	Check power monitor K1 by replacing with known good unit (para 8-11).	Replace faulty power monitor K1.
3. FREQUENCY FAULT LAMP ON PEP LIGHTED		
<p>WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 1.	Remove PEP access panel (para 8-8).	
Step 2.	Check continuity through FREQ SELECT switch S1.	Replace faulty switch S1 (para 8-18).
Step 3.	Check continuity through indicator DS2 housing.	Replace faulty indicator DS2 housing (para 8-14).
Step 4.	Check wiring to FREQ SELECT switch S1 and wiring to FREQUENCY FAULT indicator DS2 housing. Refer to PEP schematic diagram in volume 2.	Repair faulty wiring (para 8-49).
Step 5.	Check power monitor K1 by replacing with known good unit (para 8-11).	Replace faulty power monitor K1.

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. VOLTAGE FAULT OR PHASE FAULT LAMP ON PEP LIGHTED		
<p style="text-align: center;">WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 1.	Remove PEP access panel (para 8-8).	
Step 2.	Check wiring to indicator that is lighted. Refer to PEP schematic diagram in volume 2.	
	Repair faulty wiring (para 8-49).	
Step 3.	Check power monitor K1 by replacing with known good unit (para 8-11).	
	Replace faulty power monitor K1.	
5. MAIN CIRCUIT BREAKER ON PEP TRIPS		
<p style="text-align: center;">WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 1.	At PEP, set MAIN breaker to OFF. At power rack, loosen four captive fasteners on UPS input assembly front panel. Slide UPS input assembly out of rack. Disconnect cable from AC INPUT J4 on UPS input assembly. At PEP, set MAIN breaker to ON.	
	If MAIN breaker trips, refer to UPS troubleshooting in chapter 7 of this technical manual.	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. MAIN CIRCUIT BREAKER ON PEP TRIPS - Continued		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 2.	Remove main power filter assembly (para 8-20). Check disconnected wires for shorts and opens. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
Step 3.	Remove each main power filter module FL1 through FL4 in turn, and check for shorts or opens (para 8-22).	Replace faulty filter module.
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 4.	Remove PEP access panel (para 8-8). Tag and disconnect five PEP to main power filter wires W438-W442. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check wires W438-W442 for shorts and opens.	Repair faulty wiring (para 8-49).
Step 5.	In PEP, tag and disconnect all wires from CB1 output. Refer to PEP schematic diagram in volume 2. Check CB1 for shorts and opens.	Replace faulty circuit breaker CB1 (para 8-9).
Step 6.	In PEP, tag and disconnect all wires from receptacle J2. Refer to PEP schematic diagram in volume 2. Check receptacle J2 for shorts and opens.	Replace faulty receptacle J2 (para 8-16).
8-21		

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. MAIN CIRCUIT BREAKER ON PEP TRIPS - Continued		
Step 7.	In PEP, tag and disconnect all wires from CB2, CB3, and CB4. Refer to PEP schematic diagram in volume 2. Check CB2, CB3, and CB4 for shorts and opens.	Replace faulty circuit breaker CB2, CB3, or CB4 (para 8-10).
Step 8.	In PEP, tag and disconnect all wires from power contactor K2. Refer to PEP schematic diagram in volume 2. Check contactor K2 for shorts and opens.	Replace faulty power contactor K2 (para 8-12).
Step 9.	Check PEP point-to-point wiring for shorts and opens.	Repair faulty wiring (para 8-49).
6. AIR COND BREAKER ON PEP TRIPS		
<p>WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 1.	On PEP, set AIR COND (ROADSIDE or CURBSIDE) breaker to OFF. At (roadside or curbside) AIR CONDITIONER FEEDTHRU, loosen ten 1/4-turn fasteners and open cover (para 1-13.4 or 1-14.4). Working through feedthrough, disconnect power cable connector A10P1 (roadside ECU) or A11P1 (curbside ECU) from ECU receptacle J1. Be sure that disconnected cable does not touch shelter wall or any ground point.	
<p>WARNING HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.</p>		
Step 2.	At PEP, set tripped AIR COND breaker to ON.	If breaker does not trip, refer to ECU troubleshooting in chapter 2 of this technical manual.

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. AIR COND BREAKER ON PEP TRIPS - Continued		
<p>WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 3.	Remove PEP access panel (para 8-8).	
Step 4.	In PEP, tag and disconnect wiring from output of tripped CB2 (roadside ECU) or CB3 (curbside ECU). Check breaker for shorts and opens. Refer to PEP schematic diagram in volume 2.	
	Replace faulty circuit breaker CB2 or CB3 (para 8-10).	
Step 5.	Check ECU power connector A10P1 (roadside ECU) or A11P1 (curbside ECU) for shorts and opens (para 1-13.4 or 1-14.4). Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	
	Replace faulty ECU power cable connector A10P1 or A11P1 (para 8-45).	
Step 6.	Check wiring between PEP and A10P1 (roadside ECU) or A11P1 (curbside ECU) wiring for shorts and opens. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	
	Repair faulty wiring (para 8-49).	
7. UTILITY BREAKER ON PEP TRIPS		
<p>WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 1.	Remove PEP access panel (para 8-8).	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. UTILITY BREAKER ON PEP TRIPS - Continued		
Step 2.	Disconnect wiring from output side of CB4. Refer to PEP schematic diagram in volume 2. Check CB4 for shorts and opens.	Replace faulty circuit breaker CB4 (para 8-10).
Step 3.	Disconnect wiring from receptacle J3. Refer to PEP schematic diagram in volume 2. Check receptacle J3 for shorts and opens.	Replace faulty receptacle J3 (para 8-17).
Step 4.	Check wiring from CB4 to J3.	Repair faulty wiring (para 8-49).
8. NO VOLTAGE AT PEP AUXILIARY OUTPUT RECEPTACLE		
<p>WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 1.	Remove PEP access panel (para 8-8).	
Step 2.	Check wiring to J2. Refer to PEP schematic diagram in volume 2.	Repair faulty wiring (para 8-49).
Step 3.	Check receptacle J2 for continuity.	Replace faulty receptacle J2 (para 8-16).
8-24		

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. NO VOLTAGE AT PEP UTILITY RECEPTACLE	<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>	<p>Step 1. Remove PEP access panel (para 8-8).</p> <p>Step 2. Check wiring to receptacle J3. Refer to PEP schematic diagram in volume 2. Repair faulty wiring (para 8-49).</p> <p>Step 3. Check receptacle J3. Replace faulty receptacle J3 (para 8-17).</p>
10. TEST SWITCH ON PEP DOES NOT REMOVE VOLTAGE FROM UTILITY RECEPTACLE		Replace faulty receptacle J3 (para 8-17).
11. RESET SWITCH ON PEP DOES NOT RESTORE VOLTAGE TO UTILITY RECEPTACLE		Replace faulty receptacle J3 (para 8-17).
12. ECU MOTOR NOT OPERATING	<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>	<p>Step 1. Set AIR COND (ROADSIDE or CURBSIDE) breaker on PEP to OFF. Loosen ten 1/4-tum fasteners on AIR CONDITIONER FEEDTHRU for ECU not operating. Open feedthrough door and disconnect ECU power cable from J1 on ECU.</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
12. ECU MOTOR NOT OPERATING - Continued		
<p>WARNING HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.</p>		
Step 2.	Set AIR COND (ROADSIDE or CURBSIDE) breaker on PEP to ON. Check on P1 of disconnected ECU power cable for 202 to 220 Vac from pins A to B, A to C, and B to C.	<p>If correct voltages present, refer to ECU troubleshooting in chapter 2 of this technical manual.</p>
<p>WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 3.	Remove PEP access panel (para 8-8). Check CB2 (roadside ECU) or CB3 (curbside ECU) for continuity.	<p>Replace faulty circuit breaker CB2 or CB3 (para 8-10).</p>
Step 4.	Check continuity of PEP wiring from CB2 (roadside) or CB3 (curbside) to CB1. Refer to PEP schematic diagram in volume 2.	<p>Repair faulty wiring (para 8-49).</p>
Step 5.	Check continuity of wiring from PEP to ECU connector A10P1 (roadside) or A11P1 (curbside). Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	<p>Repair faulty wiring (para 8-49).</p>
Step 6.	Check connector A10P1 (roadside) or A11P1 (curbside).	<p>Replace faulty ECU power cable connector A10P1 or A11P1 (para 8-45).</p>
<p>8-26</p>		

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
13. ECU NOT COOLING PROPERLY		Refer to ECU troubleshooting in chapter 2 of this technical manual.
14. ECU NOT HEATING PROPERLY		Refer to ECU troubleshooting in chapter 2 of this technical manual.
15. UPS METER INDICATES UPS LINE INPUT OUT-OF-RANGE		<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	Step 1.	Set MAIN circuit breaker on PEP to OFF. Loosen four captive fasteners in UPS input assembly front panel. Slide input assembly out of rack to gain access to rear panel. Disconnect AC INPUT cable connector A2P1 from UPS input assembly rear panel.
		<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.</p>
	Step 2.	At PEP, set MAIN breaker to ON. Check on P1 of UPS input power cable connector A2P1 for 114 to 132 Vac between pins 2 and 5, 3 and 5, 4 and 5. If all voltages correct, refer to UPS troubleshooting in chapter 7 of this technical manual.

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
15. UPS METER INDICATES UPS LINE INPUT OUT-OF-RANGE - Continued		
<p>WARNING HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 3.	Remove PEP access panel (para 8-8). Check circuit breaker CB1 operation.	Replace faulty circuit breaker CB1 (para 8-9).
Step 4.	Check PEP wiring to CB1 input. Refer to PEP schematic diagram in volume 2.	Repair faulty wiring (para 8-49).
Step 5.	Check wiring from PEP to UPS input connector A2P1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
Step 6.	Check UPS ac input cable connector A2P1.	Replace faulty connector A2P1 (para 8-49).
Step 7.	Remove main power filter assembly (para 8-20). Check disconnected wires for shorts and opens. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
Step 8.	Check main power filter modules for shorts and opens.	Replace faulty filter module (para 8-22).
8-28		

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
16. UPS METER INDICATES UPS OUTPUT OUT-OF-RANGE	Refer to UPS troubleshooting in chapter 7 of this technical manual.	
17. DC PWR AVAIL LAMP ON PDU NOT LIGHTED WHEN UPS BATTERY BREAKER ON		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 1. Set BATTERY breaker on UPS control assembly front panel to OFF. Perform equipment setup for UPS control assembly (para 7-5). Disconnect dc output cable connector A2P2 from J10 on UPS control assembly.		
WARNING		
HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.		
Step 2. Set BATTERY breaker on UPS control assembly to ON. Check on J10 of UPS control assembly for presence of 135 to 165 Vdc from pin 1 (+) to pin 2 (-).		
If voltage low or missing, refer to UPS troubleshooting in chapter 7 of this technical manual.		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Check wiring continuity from PDU to A2P2-1 and A2P2-2. Refer to (ADP or OPN) shelter power distribution diagram in volume 2.		
Repair faulty wiring (para 8-49).		

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
17. DC PWR AVAIL LAMP ON PDU NOT LIGHTED WHEN UPS BATTERY BREAKER ON - Continued	Step 4. In PDU, check wiring continuity from TB1-1 and TB2-2 to dc-dc converter PS2 input. Refer to (ADP or OPN) PDU schematic diagram in volume 2.	Repair faulty wiring (para 8-49).
	Step 5. In PDU, check wiring continuity from dc-dc converter PS2 output to TB2, CB9, and DS11 (ADP) or TB2, CB8, and DS10 (OPN). Refer to (ADP or OPN) PDU schematic in volume 2.	Repair faulty wiring (para 8-49).
	Step 6. Check dc-dc converter PS2 by replacing with known good unit (para 8-26).	Replace faulty dc-dc converter PS2.
18. VOLTAGE METER ON PDU INDICATES OUT-OF-RANGE INPUT FROM UPS	WARNING	HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. Set BATTERY breaker on UPS control assembly and 3-PHASE LINE breaker on UPS input assembly to OFF. Perform equipment setup for UPS control assembly (para 7-5). Disconnect A2P3 from 30 OUTPUT connector J15 on UPS control assembly rear panel.	WARNING
	HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED. Work carefully if covers are removed or panels are open to avoid electrical shock.	Step 2. Set 3-PHASE LINE breaker on UPS input assembly and BATTERY breaker on UPS control assembly to ON. At J15 30 OUTPUT on UPS control assembly, check for 114 to 132 Vac from pins 1 to 7, 2 to 7, and 3 to 7.
	If ac voltage low or missing, refer to UPS troubleshooting in chapter 7 of this technical manual.	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
18. VOLTAGE METER ON PDU INDICATES OUT-OF-RANGE INPUT FROM UPS - Continued		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 3.	At PDU, open front panel and remove front-panel protective guard (para 8-24).	
Step 4.	Check wiring continuity from A2P3 to TB1 and TB2 in PDU. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
Step 5.	Check continuity through rotary switch S1 in PDU. Refer to (ADP or OPN) PDU schematic in volume 2.	Replace faulty switch S1 (para 8-30).
Step 6.	Check continuity through toggle switch S4 in PDU.	Replace faulty switch S4 (para 8-31).
Step 7.	Check continuity of PDU wiring for missing or low phase from TB1 and TB2 to rotary switch S1. Refer to (ADP or OPN) PDU schematic diagram in volume 2.	Repair faulty wiring (para 8-49).
19. VOLTAGE METER ON PDU INDICATES OUT-OF-RANGE BYPASS INPUT		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 1.	At PDU, open front panel and remove front-panel protective guard (para 8-24).	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
19. VOLTAGE METER ON PDU INDICATES OUT-OF-RANGE BYPASS INPUT - Continued	Step 2. Set PHASE SELECT switch S1 to B. Check continuity through S1. Refer to (ADP or OPN) PDU schematic in volume 2.	Replace faulty switch S1 (para 8-30).
	Step 3. Set UPS switch S4 to BYPASS. Check continuity through S4. Refer to (ADP or OPN) PDU schematic in volume 2.	Replace faulty switch S4 (para 8-31).
	Step 4. Check meter wiring continuity from M1 to SI and TB1. Refer to (ADP or OPN) PDU schematic in volume 2.	Repair faulty wiring (para 8-49).
	Step 5. Check phase B wiring continuity from S1 to CB1, CB1 to S4, and S4 to T81. Refer to (ADP or OPN) PDU schematic in volume 2.	Repair faulty wiring (para 8-49).
	Step 6. Check neutral wiring continuity from S4 to TB1 and TB2. Refer to (ADP or OPN) PDU schematic in volume 2.	Repair faulty wiring (para 8-49).
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
	Step 7. Remove main power filter assembly (para 8-20). Check disconnected wires for shorts and opens. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
	Step 8. Check main power filter modules for shorts and opens.	Replace faulty filter module (para 8-22).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
20. VOLTAGE METER ON PDU HAS NO INDICATION ON ANY PHASE	<p>Step 1. Observe AC PWR AVAIL lamp on PDU. If AC PWR AVAIL lamp lighted, replace meter M1 (para 8-28).</p> <p>Step 2. Observe FREQUENCY meter M3 on PDU while setting PHASE SELECT switch S1 to each phase. If FREQUENCY meter M3 indicates correct frequency on any phase, replace VOLTAGE meter M1 (para 8-28).</p> <p>Step 3. In PDU, check wiring from S1 to M1 and TB1 to M1. Repair faulty wiring (para 8-49).</p>	
21. FREQUENCY METER ON PDU HAS NO INDICATION ON ANY PHASE	<p>Step 1. Observe VOLTAGE meter M1 while setting PHASE SELECT switch S1 to each phase. If VOLTAGE meter M1 indicates voltage, proceed to step 2. If VOLTAGE meter M1 indicates no voltage on any phase, go to Malfunction 20.</p>	
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 2.	At PDU, open front panel and remove front-panel protective guard (para 8-24).	
Step 3.	In PDU, check wiring from VOLTAGE meter M1 to frequency transducer K1 and FREQUENCY meter M3. Refer to (ADP or OPN) PDU schematic diagram in volume 2. Repair faulty wiring (para 8-49).	
Step 4.	Check FREQUENCY meter M3 by replacing with known good meter (para 8-28). Replace FREQUENCY meter M3.	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
22. FREQUENCY METER ON PDU INDICATES OUT-OF-RANGE INPUT FROM UPS	<p>Shut down system operation. Then shut down UPS. At PEP, set MAIN breaker to ON. At UPS, set BATTERY breaker to OFF and 3-PHASE INPUT breaker to OFF. Verify that prime power source is providing the correct frequency. At PDU, set UPS toggle switch S4 to BYPASS and PHASE SELECT switch S1 to B. Check FREQUENCY meter M3 on PDU for correct frequency indication.</p>	<p>If PDU FREQUENCY meter M3 indicates the correct frequency, refer to UPS troubleshooting in chapter 7 of this technical manual.</p> <p>If PDU FREQUENCY meter M3 indicates wrong frequency, replace FREQUENCY meter M3 (para 8-28).</p>
23. FREQUENCY METER ON PDU INDICATES OUT-OF-RANGE BYPASS INPUT	<p>Check for correct frequency from prime power source.</p>	<p>If prime power input frequency is correct, replace FREQUENCY meter M3 in PDU (para 8-28).</p> <p>If prime power source frequency is not correct, refer to troubleshooting for prime power source.</p>
24. AC PWR AVAIL LAMP ON PDU NOT LIGHTED	WARNING	<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 1. At PDU, open front panel and remove front-panel protective guard (para 8-24).</p>	
	<p>Step 2. In PDU, check wiring from CB1 input to ac available indicator housing (DS10 in ADP PDU, DS9 in OPN PDU). Refer to (ADP or OPN) PDU schematic diagram in volume 2.</p>	
	<p>Repair faulty wiring (para 8-49).</p>	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
24. AC PWR AVAIL LAMP ON PDU NOT LIGHTED - Continued	Step 3. In PDU, check ac available indicator housing (DS10 in ADP PDU, DS9 in OPN PDU).	Replace faulty ac available indicator housing DS10 in ADP PDU or DS9 in OPN PDU (para 8-33).
25. TECH LOAD MAIN BREAKER ON PDU TRIPS	WARNING	HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. At PDU, open front panel and remove front-panel protective guard (para 8-24).	
	Step 2. In PDU, tag and disconnect wiring from CB1 output. Refer to (ADP or OPN) PDU schematic diagram in volume 2. Check CB1 for shorts and opens.	Replace faulty circuit breaker CB1 (para 8-32).
	Step 3. Check indicator DS1 housing for shorts and opens.	Replace faulty indicator DS1 housing (para 8-33).
	Step 4. Tag and disconnect wiring from inputs of CB2-CB8 (ADP shelter PDU) or CB2-CB7 (OPN shelter PDU), one at a time. Check each circuit breaker for shorts and opens. Refer to (ADP or OPN) PDU schematic diagram in volume 2.	Replace faulty circuit breaker CB2, CB3, CB4, CB5, CB6, CB7, or CB8 (para 8-32).
	Step 5. Check continuity of PDU wiring from CB1 to CB2-CB8 (ADP shelter PDU) or CB2-CB7 (OPN shelter PDU). Refer to (ADP or OPN) PDU schematic diagram in volume 2.	Repair faulty wiring (para 8-49).

8-7. TROUBLESHOOTING TABLE -Continued

Table 82. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
26. ADP SHELTER RACKS 1 BREAKER ON PDU TRIPS		
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. At PDU, set RACKS 1 breaker to OFF. At rack 1, disconnect GM and LGM power cables from ac filter A3A1A5. Check power cables for shorts and opens.	Repair faulty GM or LGM power cable (para 8-48).
	Step 2. Remove wiring cover from ac filter A3A1A5. Tag and disconnect ac input wiring. Refer to ADP shelter equipment rack schematic in volume 2. Check filter for shorts and opens.	Replace faulty ac filter A3A1A5 (para 8-48).
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24).	
	Step 4. In PDU, tag and disconnect wiring from CB2 output. Refer to ADP PDU schematic diagram in volume 2. Check PDU to rack 1 ac filter A3A1A5 wiring for shorts and opens. Refer to ADP shelter power distribution diagram in volume 2.	Repair faulty wiring (para 8-49).
	Step 5. In PDU, check CB2 for shorts and opens.	Replace faulty circuit breaker CB2 (para 8-32).
	Step 6. In PDU, check indicator DS2 housing for shorts and opens.	Replace faulty indicator DS2 housing (para 8-33).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
26. ADP SHELTER RACKS 1 BREAKER ON PDU TRIPS - Continued		
Step 7. In PDU, check wiring between CB2 and indicator DS1 housing. Refer to ADP PDU schematic in volume 2.	Repair faulty wiring (para 8-49).	
27. ADP SHELTER RACKS 2 BREAKER ON PDU TRIPS		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 1. At PDU, set RACKS 2 breaker to OFF. At rack 2. disconnect all DSDI power cables from ac receptacles. Check each DSDI power cable for shorts and opens.	Repair faulty DSDI power cable (para 8-48).	
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24).		
Step 3. Tag and disconnect wiring from breaker CB3 output. Refer to ADP shelter PDU schematic diagram in volume 2. Check breaker CB3 for shorts and opens.	Replace faulty circuit breaker CB3 (para 8-32).	
Step 4. Check indicator DS3 housing for shorts and opens. Refer to ADP shelter PDU schematic diagram in volume 2.	Replace faulty indicator DS3 housing (para 8-33).	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
27. ADP SHELTER RACKS 2 BREAKER ON PDU TRIPS - Continued		
Step 5.	Tag and disconnect PDU to rack 2 wiring at terminal board TB1 in rack 2. Refer to ADP shelter power distribution schematic in volume 2. Check PDU to rack 2 wiring for shorts and opens.	Repair faulty wiring (para 8-49).
Step 6.	Tag and disconnect input wiring from one rack 2 ac receptacle at a time. Check each disconnected receptacle for shorts and opens. Refer to ADP shelter equipment rack schematic in volume 2.	Replace faulty ac receptacle (para 8-47).
Step 7.	Check rack 2 terminal board to ac receptacle wiring for shorts and opens. Refer to ADP shelter equipment rack schematic in volume 2.	Repair faulty wiring (para 8-49).
28. ADP SHELTER RACKS 3 BREAKER ON PDU TRIPS		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 1.	At PDU, open front panel and remove front-panel protective guard (para 8-24).	
Step 2.	Tag and disconnect wiring from breaker CB4 output. Refer to ADP shelter PDU schematic diagram in volume 2. Check breaker CB4 for shorts and opens.	Replace faulty circuit breaker CB4 (para 8-32).
Step 3.	Check indicator DS4 housing for shorts and opens. Refer to ADP shelter PDU schematic diagram in volume 2.	Replace faulty indicator DS4 housing (para 8-33).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
28. ADP SHELTER RACKS 3 BREAKER ON PDU TRIPS - Continued	Step 4. Tag and disconnect PDU to rack 3 wiring at terminal board TB1 in rack 3. Refer to ADP shelter power distribution schematic in volume 2. Check PDU to rack 3 wiring for shorts and opens.	Repair faulty wiring (para 8-49).
	Step 5. Tag and disconnect input wiring from one rack 3 ac receptacle at a time. Check each disconnected receptacle for shorts and opens. Refer to ADP shelter equipment rack schematic in volume 2.	Replace faulty ac receptacle (para 8-47).
	Step 6. Check rack 3 terminal board to receptacle wiring for shorts and opens. Refer to ADP shelter equipment rack schematic in volume 2.	Repair faulty wiring (para 8-49).
29. ADP SHELTER WORK STA, PRINTER, OR CNVC OUTLETS BREAKER ON PDU TRIPS	Step 1. Disconnect unit power cables from receptacles controlled by tripped breaker. Refer to ADP shelter power distribution schematic in volume 2. Check power cables for shorts and opens.	Repair faulty power cables (para 8-48).
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
	Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24).	
	Step 3. Tag and disconnect output wiring from tripped breaker. Refer to ADP shelter PDU schematic in volume 2. Check tripped breaker for shorts and opens.	Replace faulty circuit breaker (para 8-32).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
29. ADP SHELTER WORK STA, PRINTER, OR CNVC OUTLETS BREAKER ON PDU TRIPS - Continued	Step 4. In PDU, check indicator housing associated with tripped breaker for shorts and opens. Refer to ADP shelter PDU schematic in volume 2.	Replace faulty indicator housing (para 8-33).
	Step 5. Check wiring between PDU breaker and ac receptacle for shorts and opens. Refer to ADP shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
	Step 6. Check receptacles for shorts and opens. Refer to ADP shelter power distribution schematic in volume 2.	Replace faulty ac receptacle (para 8-42).
30. OPN SHELTER WK STA ROADSIDE, WK STA CURBSIDE, PRINTERS, EQPT RACK, OR CNVC OUTLETS BREAKER ON PDU TRIPS	Step 1. Disconnect unit power cables from receptacles controlled by tripped breaker. Refer to OPN shelter power distribution schematic in volume 2. Check power cables for shorts and opens.	Repair faulty power cables (para 8-48).
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
	Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24).	
	Step 3. Tag and disconnect output wiring from tripped breaker. Refer to OPN shelter PDU schematic in volume 2. Check tripped breaker for shorts and opens.	Replace faulty circuit breaker (para 8-32).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
30. OPN SHELTER WK STA ROADSIDE, WK STA CURBSIDE, PRINTERS, EQPT RACK, OR CNVC OUTLETS BREAKER ON PDU TRIPS - Continued	<p>Step 4. In PDU, check indicator housing associated with tripped breaker for shorts and opens. Refer to OPN shelter PDU schematic in volume 2.</p>	<p>Replace faulty indicator housing (para 8-33).</p>
	<p>Step 5. Check PDU-to-ac receptacle wiring for shorts and opens. Refer to OPN shelter power distribution schematic in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>
	<p>Step 6. Check ac receptacles for shorts and opens. Refer to OPN shelter power distribution schematic in volume 2.</p>	<p>Replace faulty ac receptacle (para 8-42).</p>
31. LIGHTS BREAKER ON PDU TRIPS		
	NOTE	
	<p>Steps 1 through 7 will isolate the fault to a portion of the lighting circuit. These steps will reference further isolation steps to locate the specific component.</p>	
	<p>Step 1. Open shelter door. At PDU, set BLACKOUT toggle switch S2 to NORMAL and LIGHTS toggle switch S3 to COLDSTART. Then set LIGHTS circuit breaker to ON. If LIGHTS circuit breaker trips, go to step 2. If LIGHTS breaker does not trip, go to step 3.</p>	
	<p>Step 2. Close shelter door. At PDU, set LIGHTS breaker to ON. If LIGHTS breaker trips, go to step 10. If LIGHTS breaker does not trip, go to step 16.</p>	
	<p>Step 3. Close shelter door. If LIGHTS BREAKER on PDU trips, go to step 4. If LIGHTS breaker does not trip, go to step 5.</p>	
	<p>Step 4. At PDU, set LIGHTS toggle switch to MAIN. Then set LIGHTS breaker to ON. If LIGHTS breaker trips, go to step 23. If LIGHTS breaker does not trip, go to step 27.</p>	
	<p>Step 5. At PDU, set LIGHTS toggle switch to MAIN. If LIGHTS breaker trips, go to step 6. If LIGHTS breaker does not trip, go to step 7.</p>	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
31. LIGHTS BREAKER ON PDU TRIPS - Continued		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 6.	At PDU, open front panel and remove front-panel protective guard (para 8-24).	In PDU, disconnect wires W446 and W453 from toggle switch S3. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check each disconnected wire for shorts and opens. If main light circuit (W446) shows short, go to step 33. If spotlight circuit (W453) shows short, go to step 42. If neither shows short, go to step 47.
Step 7.	At PDU, set BLACKOUT toggle switch S2 to BYPASS. If LIGHTS breaker does not trip, lighting circuits are good. If LIGHTS breaker trips, go to step 8.	
Step 8.	In PDU, disconnect wires from toggle switch S2. Refer to (ADP or OPN) shelter PDU schematic in volume 2. Check toggle switch S2 in PDU for shorts and opens.	Replace faulty toggle switch S2 in PDU (para 8-31).
Step 9.	In PDU, check wiring from toggle switch S2 to toggle switch S3. Refer to (ADP or OPN) shelter PDU schematic in volume 2. Check wiring for shorts and opens.	Repair faulty wiring (para 8-49).
		Refer to next higher level of maintenance.
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 10.	At PDU, open front panel and remove front-panel protective guard (para 8-24).	Disconnect wires from output side (contact 2) of LIGHTS circuit breaker (CB8 in ADP shelter PDU, CB2 in OPN shelter PDU). Refer to (ADP or OPN) shelter PDU schematic in volume 2. Check breaker for shorts and opens.

37. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
31. LIGHTS BREAKER ON PDU TRIPS - Continued		
	Replace faulty LIGHTS circuit breaker CB8 in ADP shelter PDU or CB2 in OPN shelter PDU (para 8-32).	
Step 11. In PDU, tag and disconnect wires from toggle switch S2. Refer to (ADP or OPN) PDU schematic in volume 2. Check switch S2 for shorts and opens.		Replace faulty toggle switch S2 (para 8-31).
Step 12. In PDU, check LIGHTS breaker indicator housing (DS8 in ADP PDU, DS7 in OPN PDU).		Replace faulty LIGHTS breaker indicator housing DS8 in ADP PDU or DS7 in OPN PDU (para 8-33).
Step 13. In PDU, check wiring from LIGHTS breaker (CB8 in ADP PDU, CB2 in OPN PDU) to toggle switch S2 and to LIGHTS breaker indicator housing (DS8 in ADP PDU, DS7 in OPN PDU). Refer to (ADP or OPN) PDU schematic in volume 2.		Repair faulty wiring (para 8-49).
Step 14. Tag and disconnect wires from door limit switch S1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check door limit switch S1 for shorts and opens.		Replace faulty door limit switch S1 (para 8-46).
Step 15. Check wiring from toggle switch S2 in PDU to door limit switch S1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.		Repair faulty wiring (para 8-49).
		Refer to next higher level of maintenance.

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
31. LIGHTS BREAKER ON PDU TRIPS - Continued		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 16.	At PDU, set LIGHTS breaker to OFF. At main light assembly DS1, remove ballast cover (para 8-36). In DS1, check blackout lampholder XDS1 for shorts and opens. Refer to main light assembly wire list in volume 2.	Replace faulty incandescent lampholder XDS1 (para 8-38).
Step 17.	At main light assembly DS1, check wiring from TB1 to blackout lampholder XDS1. Refer to main light assembly wire list in volume 2.	Repair faulty wiring (para 8-49).
Step 18.	At main light assembly DS2, remove ballast cover (para 8-36). In DS2, check blackout lampholder XDS1 for shorts and opens. Refer to main light assembly wire list in volume 2.	Replace faulty incandescent lampholder (para 8-38).
Step 19.	At main light assembly DS2, check wiring from TB1 to blackout lampholder XDS1. Refer to main light assembly wire list in volume 2.	Repair faulty wiring (para 8-49).
Step 20.	Tag and disconnect wires from door limit switch S1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check door limit switch S1 for shorts and opens.	Replace faulty door limit switch S1 (para 8-46).
Step 21.	Check wiring from door limit switch S1 to TB1 in main light assembly DS1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
31. LIGHTS BREAKER ON PDU TRIPS - Continued		
Step 22. Check blackout lamp wiring from TB1 in DS1 to TB1 in DS2. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).	Refer to next higher level of maintenance.
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 23. At PDU, open front panel and remove front-panel protective guard (para 8-24). In PDU, disconnect wires from BLACKOUT toggle switch S2. Refer to (ADP or OPN) PDU schematic in volume 2. Check switch S2 in PDU for shorts and opens.	Replace faulty PDU toggle switch S2 (para 8-31).	
Step 24. In PDU, tag and disconnect wires from LIGHTS toggle switch S3. Refer to (ADP or OPN) PDU schematic in volume 2. Check switch S3 for shorts and opens.	Replace faulty PDU toggle switch S3 (para 8-31).	
Step 25. Tag and disconnect wires from door limit switch S1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check door limit switch S1 for shorts and opens.	Replace faulty door limit switch S1 (para 8-46).	
Step 26. Check wiring from door limit switch S1 to PDU toggle switches S2 and S3. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).	Refer to next higher level of maintenance.

8-7. TROUBLESHOOTING TABLE - Continued

Table 82. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
31. LIGHTS BREAKER ON PDU TRIPS - Continued		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 27. At PDU, set LIGHTS breaker to OFF. At main light assembly DS1, remove ballast cover (para 8-36). Check coldstart lampholder XDS2 for shorts and opens. Refer to main light assembly wire list in volume 2.	Replace faulty incandescent lampholder XDS2 (para 8-38).	
Step 28. At main light assembly DS1, check wiring from TB1 to coldstart lampholder XDS2. Refer to main light assembly wire list in volume 2.	Repair faulty wiring (para 8-49).	
Step 29. At main light assembly DS2, remove ballast cover (para 8-36). Check coldstart lampholder XDS2 for shorts and opens. Refer to main light assembly wire list in volume 2.	Replace faulty incandescent lampholder XDS2 (para 8-38).	
Step 30. At main light assembly DS2, check wiring from TB1 to coldstart lampholder XDS2. Refer to main light assembly wire list in volume 2.	Repair faulty wiring (para 8-49).	
Step 31. Check coldstart lamp wiring from TB1 in DS1 to TB1 in DS2. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).	

8-7. TROUBLESHOOTING TABLE - Continued*Table 8-2. Power Distribution System Troubleshooting - CONT*

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION
31. LIGHTS CIRCUIT BREAKER ON PDU TRIPS - Continued
WARNING
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
<p>Step 32. Open PDU front panel and remove front-panel protective cover (para 8-24). Check coldstart wiring from LIGHTS toggle switch S3 in PDU to TB1 in main light assembly DS1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.</p>
Repair faulty wiring (para 8-49).
Refer to next higher level of maintenance.
<p>Step 33. In PDU, disconnect wires from LIGHTS toggle switch S3. Refer to (ADP or OPN) shelter PDU schematic in volume 2. Check toggle switch S3 in PDU for shorts and opens.</p>
Replace faulty toggle switch S3 in PDU (para 8-31).
<p>Step 34. At main light assembly DS1, remove ballast cover (para 8-36). Check fluorescent lampholders XDS3 and XDS4 for shorts and opens. Refer to main light assembly wire list in volume 2.</p>
Replace faulty fluorescent lampholder XDS3 or XDS4 (para 8-37).
<p>Step 35. At main light assembly DS1, check wiring from TB1 to fluorescent lampholders XDS3 and XDS4. Refer to main light assembly wire list in volume 2. Repair faulty wiring (para 8-49).</p>
<p>Step 36. At main light assembly DS1, check ballast assembly for shorts and opens. Refer to main light assembly wire list in volume 2.</p>
Replace faulty ballast assembly (para 8-36).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
31. LIGHTS CIRCUIT BREAKER ON PDU TRIPS - Continued		
Step 37.	At main light assembly DS2, remove ballast cover (para 8-36). Check fluorescent lampholders XDS3 and XDS4 for shorts and opens. Refer to main light assembly wire list in volume 2.	Replace faulty fluorescent lampholder XDS3 or XDS4 (para 8-37).
Step 38.	At main light assembly DS2, check wiring from TB1 to fluorescent lampholders XDS3 and XDS4. Refer to main light assembly wire list in volume 2.	Repair faulty wiring (para 8-49).
Step 39.	At main light assembly DS2, check ballast assembly for shorts and opens. Refer to main light assembly wire list in volume 2.	Replace faulty ballast assembly (para 8-36).
Step 40.	Check fluorescent (main) lamp wiring from TB1 in DS1 to TB1 in DS2. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
Step 41.	Check main fluorescent lamp wiring from LIGHTS toggle switch S3 in PDU to TB1 in main light assembly DS1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49). Refer to next higher level of maintenance.
Step 42.	At TB4 in ADP shelter or TB1 in OPN shelter, disconnect wires to spotlight dimmer controls. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check wire from terminal board to switch S3 in PDU for shorts and opens.	Repair faulty wiring (para 8-49).
Step 43.	Determine faulty spotlight circuit by checking each for shorts and opens. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. When faulty circuit is determined, go to step 44.	

8-7. TROUBLESHOOTING TABLE - Continued

Table 82. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
31. LIGHTS CIRCUIT BREAKER ON PDU TRIPS - Continued		
Step 44.	Remove spotlight assembly in faulty circuit (para 8-39). Check spotlight assembly for shorts and opens.	Replace faulty spotlight assembly.
Step 45.	Check dimmer control in faulty circuit for shorts and opens. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Replace faulty dimmer control (para 8-44).
Step 46.	Check wiring from terminal board to dimmer and dimmer to spotlight assembly for shorts and opens.	Repair faulty wiring (para 8-49). Refer to next higher level of maintenance.
Step 47.	In PDU, tag and disconnect wires from toggle switch S3. Refer to (ADP or OPN) PDU schematic in volume 2. Check switch S3 for shorts and opens.	Replace faulty PDU toggle switch S3 (para 8-31). Refer to next higher level of maintenance.

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
32. 28 VDC BREAKER ON PDU TRIPS		
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. At PDU, set 28 VDC breaker to OFF. Disconnect radio power cable W129 from dc filter and from radio mount. Check cable W129 for shorts and opens.	Repair faulty cable W129 (para 8-49).
	Step 2. At dc filter, remove wiring cover from filter. Check filter for shorts and opens.	Replace faulty dc filter (para 8-41).
	Step 3. Disconnect input wires from dc receptacles, one at a time. Check each disconnected dc receptacle for shorts and opens. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Replace faulty dc receptacle (para 8-43).
	Step 4. Disconnect dc filter and dc receptacle input wiring at wall-mounted terminal board. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check disconnected wiring for shorts and opens.	Repair faulty wiring (para 8-49).
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 5. At PDU, open front panel and remove front-panel protective guard (para 8-24). In PDU, disconnect wires from 28 VDC breaker CB9 (ADP shelter PDU) or CB8 (OPN shelter PDU). Refer to (ADP or OPN) shelter PDU schematic diagram in volume 2. Check breaker for shorts and opens.	Replace faulty circuit breaker CB9 in ADP PDU or CB8 in OPN PDU (para 8-32).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
32. 28 VDC BREAKER ON PDU TRIPS - Continued	Step 6. Check PDU to wall-mounted dc terminal board wiring for shorts and opens. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
33. BREAKER INDICATOR LAMP ON PDU NOT LIGHTED WHEN BREAKER IS ON	WARNING	
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 1. At PDU, open front panel and remove front-panel protective guard (para 8-24).		
Step 2. Check wiring continuity from breaker to housing for unlighted lamp. Refer to (ADP or OPN) PDU schematic in volume 2.	Repair faulty wiring (para 8-49).	
Step 3. Check continuity of indicator housing for unlighted lamp. Refer to (ADP or OPN) PDU schematic in volume 2.	Replace faulty indicator housing (para 8-33).	
Step 4. Check continuity of breaker for unlighted lamp. Refer to (ADP or OPN) PDU schematic in volume 2.	Replace faulty breaker (para 8-32).	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
34. ADP SHELTER, NO VOLTAGE AT GROUP MODEM		
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. At PDU, set RACKS 1 breaker to OFF. At equipment rack 1, disconnect GM power cable from GM and from ac filter A3A1A5. Check cable continuity.	Repair faulty GM power cable (para 8-48).
	Step 2. At rack 1, remove wiring cover from ac filter A3A1A5 (para 8-40). Check filter A3A1A5 for continuity.	Replace faulty ac filter A3A1A5 (para 8-40).
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Disconnect output wires from RACKS 1 circuit breaker CB2. Check breaker CB2.	Replace faulty circuit breaker CB2 (para 8-32).
	Step 4. Check wiring continuity from breaker CB2 in PDU to equipment rack 1 ac filter A3A1A5. Refer to ADP shelter power distribution schematic and ADP shelter equipment rack schematic in volume 2.	Repair faulty wiring (para 8-49).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
35. ADP SHELTER, NO VOLTAGE AT LOOP GROUP MULTIPLEXER		
		WARNING
		<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 1. At PDU, set RACKS 1 breaker to OFF. At equipment rack 1, disconnect LGM power cable from LGM and from ac filter A3A1A5. Check cable continuity.</p>	<p>Repair faulty LGM power cable (para 8-48).</p>
	<p>Step 2. At rack 1, remove wiring cover from ac filter A3A1A5 (para 8-40). Check filter A3A1A5 for continuity.</p>	<p>Replace faulty ac filter A3A1A5 (para 8-40).</p>
		WARNING
		<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Disconnect output wires from RACKS 1 circuit breaker CB2. Check breaker CB2.</p>	<p>Replace faulty circuit breaker CB2 (para 8-32).</p>
	<p>Step 4. Check wiring continuity from breaker CB2 in PDU to equipment rack 1 ac filter A3A1A5. Refer to ADP shelter power distribution schematic and ADP shelter equipment rack schematic 'in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
36. ADP SHELTER, NO VOLTAGE AT DIGITAL-TO-DIGITAL CONVERTERS		
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before making any continuity measurements. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. At PDU, set RACKS 2 breaker to OFF. Disconnect power cable from DSDI and from ac receptacle. Check cable continuity P1 (receptacle end) to P2 (DSDI end). Refer to cable assembly diagram in volume 2.	Repair faulty DSDI power cable (para 8-48).
	Step 2. Check ac receptacle for DSDI with no power. Refer to ADP shelter equipment rack schematic in volume 2.	Replace faulty rack 2 ac receptacle (para 8-47).
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Disconnect output wires from RACKS 2 circuit breaker CB3. Check breaker CB3.	Replace faulty circuit breaker CB3 (para 8-32).
	Step 4. Check wiring continuity from breaker CB3 in PDU to equipment rack 2 receptacle for DSDI with no power. Refer to ADP shelter power distribution schematic and ADP shelter equipment rack schematic in volume 2.	Repair faulty wiring (para 8-49).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
37. ADP SHELTER, NO VOLTAGE AT RACK 3 AC RECEPTACLE		
		WARNING
		<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 1. At PDU, set RACKS 3 breaker to OFF. At rack 3, check ac receptacle with no voltage.</p>	
		<p>Replace faulty rack 3 ac receptacle (para 8-47).</p>
		WARNING
		<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24). Check RACKS 3 breaker CB4 for continuity. Refer to ADP shelter PDU schematic in volume 2.</p>	
		<p>Replace faulty circuit breaker CB4 (para 8-32).</p>
	<p>Step 3. Check wiring continuity from PDU breaker CB4 to rack 3 ac receptacle with no voltage. Refer to ADP shelter power distribution schematic and ADP shelter equipment rack schematic in volume 2.</p>	
		<p>Repair faulty wiring (para 8-49).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
38. ADP SHELTER, NO VOLTAGE AT PRINTER/LDF AC RECEPTACLE		
		WARNING
		<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 1. At PDU, set PRINTER breaker to OFF. Check printer/LDF ac receptacle A7J1. Refer to ADP shelter power distribution schematic in volume 2.</p>	<p>Replace faulty ac receptacle (para 8-42).</p>
		WARNING
		<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24). Check continuity of PRINTER breaker CB6.</p>	<p>Replace faulty circuit breaker CB6 (para 8-32).</p>
	<p>Step 3. Check wiring continuity from PDU to printer/LDF ac power receptacle A7J1. Refer to ADP shelter power distribution schematic in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 82. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
39. OPN SHELTER, NO VOLTAGE AT REPEATER/STATION ADAPTER		
		WARNING
		<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 1. At PDU, set EQPT RACK breaker to OFF. Disconnect repeater/station adapter power cable at both ends (para 1-14.2.1). Check continuity of disconnected power cable, P1 to P2. Refer to repeater/station adapter power cable assembly diagram in volume 2.</p>	<p>Repair faulty repeater/station adapter power cable (para 8-48).</p>
	<p>Step 2. Check repeater/station adapter ac receptacle J1. Refer to OPN shelter power distribution schematic in volume 2.</p>	<p>Replace faulty ac receptacle J1 (para 8-42).</p>
		WARNING
		<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Check continuity of EQPT RACK breaker CB5.</p>	<p>Replace faulty circuit breaker CB5 (para 8-32).</p>
	<p>Step 4. Check wiring continuity from PDU to repeater/station adapter ac receptacle J1. Refer to OPN shelter power distribution schematic in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
40. NO VOLTAGE AT WORKSTATION		
		<p>WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p> <p>Step 1. At workstation with no power, disconnect power cable at workstation and at wall-mounted ac receptacle. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check continuity of disconnected power cable, P1 to P2. Refer to power cable assembly diagram in volume 2.</p> <p style="padding-left: 40px;">Repair faulty workstation power cable (para 8-48).</p> <p>Step 2. Check wall-mounted ac receptacle.</p> <p style="padding-left: 40px;">Replace faulty wall-mounted ac receptacle (para 8-42).</p> <p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p> <p>Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Check circuit supplying this ac power receptacle for continuity. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.</p> <p style="padding-left: 40px;">Replace faulty circuit breaker (para 8-32).</p> <p>Step 4. Check wiring continuity from PDU to this power receptacle. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.</p> <p style="padding-left: 40px;">Repair faulty wiring (para 8-49).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table -2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
41. NO VOLTAGE AT RADIO MOUNTING BASE		
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 1. At PDU, set 28 VDC breaker to OFF. Disconnect dc power cable W129 from dc filter and from radio mounting base. Check cable W129 for continuity, P1 to P2. Refer to W129 schematic in volume 2.		Repair faulty dc power cable W129 (para 8-48).
Step 2. On PDU, set 28 VDC breaker to OFF. At dc filter, remove wiring cover (para 8-41). Check filter for continuity. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.		Replace faulty dc filter (para 8-41).
WARNING		
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.		
Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Check 28 VDC circuit breaker CB9 in ADP shelter PDU or CB8 in OPN shelter PDU for continuity. Refer to (ADP or OPN) shelter PDU schematic in volume 2.		Replace faulty 28 VDC breaker CB9 or CB8 (para 8-32).
Step 4. Check wiring continuity from PDU to dc filter input. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.		Repair faulty wiring (para 8-49).

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
42. NO VOLTAGE AT TELEPHONE SET		
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. At PDU, set 28 VDC breaker to OFF. Remove cover of wall-mounted dc receptacle supplying telephone set that has no power (para 8-43). Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Check wall-mounted dc receptacle.	Replace faulty wall-mounted dc receptacle (para 8-43).
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24). Check continuity of 28 VDC circuit breaker CB9 in ADP shelter PDU or CB8 in OPN shelter PDU. Refer to (ADP or OPN) shelter PDU schematic in volume 2.	Replace faulty 28 VDC breaker CB9 or CB8 (para 8-32).
	Step 3. Check wiring continuity from PDU to wall-mounted dc receptacle with no voltage. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
43. NO BLACKOUT LIGHTS, BLACKOUT SWITCH IN NORMAL, DOOR OPEN		
	Step 1. On PDU, set BLACKOUT toggle switch to BYPASS and LIGHTS toggle switch to MAIN. If any main fluorescent lights or workstation spotlights are on, proceed to step 2. If no main lights or spotlights are on, go to Malfunction 52, No Main, Coldstart, or Blackout Lights.	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<p>43. NO BLACKOUT LIGHTS, BLACKOUT SWITCH IN NORMAL, DOOR OPEN - Continued</p>		
<p>WARNING</p>		
<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 2.	At main light DS1, remove ballast cover (para 8-36). Check blackout lampholder XDS1.	Replace faulty incandescent lampholder XDS1 (para 8-38).
Step 3.	At DS1, check wiring continuity TB1-1 to blackout lampholder XDS1 Refer to main light assembly wire list in volume 2.	Repair/replace faulty wiring (para 8-49).
Step 4.	Check wiring continuity from DS1TB1-1 to door limit switch S1-1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
Step 5.	Check continuity of door limit switch S1-1 to S1-2 with door open.	Replace faulty door limit switch S1 (para 8-46).
<p>WARNING</p>		
<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
Step 6.	At PDU, open front panel and remove front-panel protective guard (para 8-24). Check continuity of BLACKOUT toggle switch S2. Refer to (ADP or OPN) shelter PDU schematic in volume 2.	Replace faulty toggle switch S2 in PDU (para 8-31).

8-7. TROUBLESHOOTING TABLE - Continued

Table 82. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<p>43. NO BLACKOUT LIGHTS, BLACKOUT SWITCH IN NORMAL, DOOR OPEN - Continued</p>	<p>Step 7. Check door limit switch S1.</p> <p>Replace faulty door limit switch S1 (para 8-46).</p> <p>Step 8. Check wiring continuity from PDU to door limit switch S1 and from door limit switch S1 to TB1-1 in main light assembly DS1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>
<p>44. ONE BLACKOUT LIGHT NOT ON</p>	<p>WARNING</p>	<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
<p>Step 1. On PDU, set LIGHTS circuit breaker to OFF. At main light assembly with unlighted blackout lamp, remove ballast cover (para 8-36).</p>	<p>Step 2. At light assembly with unlighted blackout lamp, check blackout incandescent lampholder XDS1.</p>	<p>Replace faulty incandescent lampholder XDS1 (para 8-38).</p>
<p>Step 3. At light assembly with unlighted blackout lamp, check wiring continuity from TB1 to blackout lamp socket XDS1. Refer to main light assembly wire list in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>	
<p>Step 4. If unlighted blackout lamp is in light assembly DS2, check blackout wiring from DS1 to DS2. Refer to (ADP or OPN) shelter power distribution schematic or main light assembly wire list in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>	

8-7. TROUBLESHOOTING TABLE - Continued

Table 82. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
45. NO MAIN LIGHTS, BLACKOUT SWITCH IN NORMAL, DOOR CLOSED	<p>Step 1. Set all workstation spotlight dimmer controls to maximum (fully clockwise). Observe workstation spotlights. If any workstation spotlight is on, go to Malfunction 53, No Fluorescent Lights, Workstation Spotlights On. If no workstation spotlights are on, proceed to step 2 below.</p>	<p>Step 2. At PDU, set LIGHTS toggle switch to COLDSTART. Observe coldstart lights. If no coldstart lights are on, go to Malfunction 47, No Main or Coldstart Lights, BLACKOUT Switch in NORMAL. If any coldstart lights are on, go to step 3 below.</p>
WARNING		
<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
<p>Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set LIGHTS toggle switch to MAIN. Check continuity through LIGHTS toggle switch S3. Refer to (ADP or OPN) PDU schematic in volume 2.</p>		
<p>Replace faulty LIGHTS toggle switch S3 (para 8-31).</p>		
46. NO COLDSTART LIGHTS, BLACKOUT SWITCH IN NORMAL, DOOR CLOSED	<p>Step 1. At PDU, set LIGHTS toggle switch to MAIN. Observe main lights. If any main lights are on, proceed to step 2 below. If no main lights are on, go to Malfunction 47, No Main or Coldstart Lights, BLACKOUT Switch in NORMAL.</p>	
WARNING		
<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
<p>Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set LIGHTS toggle switch to COLDSTART. Check continuity through LIGHTS toggle switch S3. Refer to (ADP or OPN) PDU schematic in volume 2.</p>		
<p>Replace faulty LIGHTS toggle switch S3 (para 8-31).</p>		

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
46. NO COLDSTART LIGHTS, BLACKOUT SWITCH IN NORMAL, DOOR CLOSED - Continued	<p>Step 3. At main light DS1, remove ballast cover (para 8-36). Check continuity of wiring from LIGHTS toggle switch S3 in PDU to TB1-3 in main light assembly DS1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>
47. NO MAIN OR COLDSTART LIGHTS, BLACKOUT SWITCH IN NORMAL	<p>Step 1. At PDU, set BLACKOUT toggle switch to BYPASS and LIGHTS toggle switch to COLDSTART. If any coldstart lights are on, proceed to step 2 below. If no coldstart lights are on, go to Malfunction 51, No Main or Coldstart Lights, BLACKOUT Switch in NORMAL or BYPASS.</p>	<p>WARNING</p>
<p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>		
<p>Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set BLACKOUT switch to NORMAL. Check continuity through BLACKOUT toggle switch S2. Refer to (ADP or OPN) PDU schematic in volume 2.</p>	<p>Replace faulty BLACKOUT toggle switch S2 (para 8-31).</p>	
<p>Step 3. With door open, check continuity of door limit switch S1 contacts 2 to 4.</p>	<p>Replace faulty door limit switch S1 (para 8-46).</p>	
<p>Step 4. Check wiring continuity from PDU switches S2 and S3 to door limit switch S1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.</p>	<p>Repair faulty wiring (para 8-49).</p>	

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
48. NO MAIN LIGHTS, BLACKOUT SWITCH IN BYPASS	<p>Step 1. Set all workstation spotlight dimmer controls to maximum (fully clockwise). Observe workstation spotlights. If any workstation spotlight is on, go to Malfunction 53, No Fluorescent Lights, Workstation Spotlights On. If no workstation spotlights are on, proceed to step 2 below.</p> <p>Step 2. At PDU, set LIGHTS toggle switch to COLDSTART. Observe coldstart lights. If no coldstart lights are on, go to Malfunction 50, No Main or Coldstart Lights, BLACKOUT Switch in BYPASS. If any coldstart lights are on, go to step 3 below.</p>	<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p> <p>Step 3. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set LIGHTS toggle switch S3 to MAIN. Check continuity through toggle switch S3. Refer to (ADP or OPN) PDU schematic in volume 2.</p> <p style="padding-left: 40px;">Replace faulty toggle switch S3 (para 8-31).</p>
49. NO COLDSTART LIGHTS, BLACKOUT SWITCH IN BYPASS	<p>Step 1. At PDU, set LIGHTS toggle switch to MAIN. Observe main lights. If any main lights are on, proceed to step 2 below. If no main lights are on, go to Malfunction 50, No Main or Coldstart Lights, BLACKOUT Switch in BYPASS.</p>	<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p> <p>Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set LIGHTS toggle switch to COLDSTART. Check continuity through toggle switch S3. Refer to (ADP or OPN) PDU schematic in volume 2.</p> <p style="padding-left: 40px;">Replace faulty toggle switch S3 (para 8-31).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
49. NO COLDSTART LIGHTS, BLACKOUT SWITCH IN BYPASS - Continued	Step 3. At main light DS1, remove ballast cover (para 8-36). Check continuity of wiring from S3 in the PDU to DS1TB1-3. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
50. NO MAIN OR COLDSTART LIGHTS, BLACKOUT SWITCH IN BYPASS	Step 1. At PDU, set BLACKOUT toggle switch to NORMAL and LIGHTS toggle switch to COLDSTART. If any coldstart lights are on, proceed to step 2 below. If no coldstart lights are on, go to Malfunction 51, No Main or Coldstart Lights, BLACKOUT Switch in NORMAL or BYPASS.	WARNING
	HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.	
	Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set BLACKOUT toggle switch to BYPASS. In PDU, check continuity through BLACKOUT toggle switch S2. Refer to (ADP or OPN) PDU schematic in volume 2.	Replace faulty toggle switch S2 in PDU (para 8-31).
	Step 3. In PDU, check wiring continuity from toggle switch S2 to toggle switch S3. Refer to (ADP or OPN) PDU schematic in volume 2.	Repair faulty wiring (para 8-49).

8-7. TROUBLESHOOTING TABLE - Continued

Table -2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
51. NO MAIN OR COLDSTART LIGHTS, BLACKOUT SWITCH IN NORMAL OR BYPASS	<p>Step 1. Open shelter door. At PDU, set BLACKOUT toggle switch to NORMAL. If blackout lights are on, proceed to step 2. If blackout lights are not on, go to Malfunction 52, No Main, Coldstart, or Blackout Lights.</p>	<p>WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 2. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set BLACKOUT toggle switch to NORMAL. Check continuity of BLACKOUT toggle switch S2 in normal. Set BLACKOUT toggle switch to BYPASS. Check continuity of BLACKOUT toggle switch S2 in bypass. Refer to (ADP or OPN) PDU schematic in volume 2.</p>	<p>Replace faulty toggle switch S2 in PDU (para 8-31).</p>
52. NO MAIN, COLDSTART, OR BLACKOUT LIGHTS		<p>WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p>
	<p>Step 1. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set LIGHTS circuit breaker to ON. In PDU, check continuity through LIGHTS circuit breaker CB8 (ADP shelter) or CB2 (OPN shelter).</p>	<p>Replace faulty breaker (para 8-32).</p>
	<p>Step 2. In PDU, check continuity through toggle switch S2 in both positions. Refer to (ADP or OPN) PDU schematic in volume 2.</p>	<p>Replace faulty toggle switch S2 in PDU (para 8-31).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
52. NO MAIN, COLDSTART, OR BLACKOUT LIGHTS - Continued	Step 3. In PDU, check wiring continuity from LIGHTS circuit breaker to BLACKOUT toggle switch S2. Refer to (ADP or OPN) PDU schematic in volume 2.	Repair faulty wiring (para 8-49).
	Step 4. In PDU, check wiring continuity from TECH LOAD MAIN circuit breaker CB1 to LIGHTS circuit breaker (CB8 in ADP, CB2 in OPN). Refer to (ADP or OPN) PDU schematic in volume 2.	Repair faulty wiring (para 8-49).
53. NO FLUORESCENT LIGHTS, WORKSTATION SPOTLIGHTS ON	WARNING	HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. At PDU, open front panel and remove front-panel protective guard (para 8-24). Set LIGHTS toggle switch to MAIN. In PDU, check continuity through LIGHTS toggle switch S3. Refer to (ADP or OPN) PDU schematic in volume 2.	Replace faulty toggle switch S3 in PDU (para 8-31).
	Step 2. At main light assembly DS1, remove ballast cover (para 8-36). Check wiring continuity from PDU to TB1 in main light assembly DS1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
54. NO WORKSTATION SPOTLIGHTS, FLUORESCENT LIGHTS ON	Repair wire W453 from A17S3-1 to TB4-1 in ADP shelter or TB1-1 in OPN shelter (para 8-49). Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	

8-7. TROUBLESHOOTING TABLE - Continued

Table 82. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
55. ONE FLUORESCENT LIGHT NOT ON		<p style="text-align: center;">WARNING</p> <p>HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.</p> <p>Step 1. On PDU, set LIGHTS circuit breaker to OFF.</p> <p>Step 2. At main light assembly with unlighted fluorescent lamp, remove ballast cover (para 8-36). Check fluorescent lampholders XDS3 and XDS4. Replace faulty fluorescent lampholder (para 8-37).</p> <p>Step 3. Check wiring from TB1 to fluorescent lampholders and to ballast assembly. Refer to main light assembly wire list in volume 2. Repair faulty wiring (para 8-49).</p> <p>Step 4. Check ballast assembly for continuity. Refer to main light assembly wire list in volume 2. Replace faulty ballast assembly (para 8-36).</p> <p>Step 5. If DS2 is the main light assembly with unlighted fluorescent lamps, check wiring from DS1TB1 to DS2TB1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2. Repair faulty wiring (para 8-49).</p>

8-7. TROUBLESHOOTING TABLE - Continued

Table 8-2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
56. ONE WORKSTATION SPOTLIGHT NOT ON, DIMMER MAXIMUM		
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. On PDU, set LIGHTS circuit breaker to OFF. Remove cover over dimmer control for unlighted spotlight (para 8-44). Check dimmer continuity. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Replace faulty dimmer control (para 8-44).
	Step 2. Remove spotlight assembly for unlighted spotlight (para 8-39). Check spotlight assembly.	Replace faulty spotlight assembly (para 8-39).
	Step 3. Remove cover from wall-mounted TB4 in ADP shelter or TB1 in OPN shelter. Check continuity from dimmer to spotlight TB1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
	Step 4. Check continuity of wiring from spotlight to spotlight. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
57. ONE COLDSTART LIGHT NOT ON		
		WARNING
		HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.
	Step 1. On PDU, set LIGHTS circuit breaker to OFF. At main light assembly with unlighted coldstart lamp, remove ballast cover (para 8-36). Check coldstart lampholder XDS2.	Replace faulty incandescent lampholder XDS2 (para 8-38).

8-7. TROUBLESHOOTING TABLE - Continued

Table -2. Power Distribution System Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
57. ONE COLDSTART LIGHT NOT ON - Continued	Step 2. In main light assembly, check wiring from TB1 to coldstart lampholder XDS2. Refer to main light assembly wire list in volume 2.	Repair faulty wiring (para 8-49).
	Step 3. Check wiring continuity from DS1TB1 to DS2TB1. Refer to (ADP or OPN) shelter power distribution schematic in volume 2.	Repair faulty wiring (para 8-49).
58. NO BRIGHTNESS CONTROL ON ONE WORKSTATION SPOTLIGHT		Replace dimmer control for that spotlight (para 8-44). Refer to (ADP or OPN) shelter power distribution schematic in volume 2.
59. BLACKOUT LIGHTS ON WITH DOOR CLOSED		Replace door limit switch S1 (para 8-46).

SECTION III. MAINTENANCE PROCEDURES

8-8. REMOVE/INSTALL PEP ACCESS PANEL

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precautions:

WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.

Preliminary Procedures:

1. Perform normal system shutdown. Refer to TM 11-5895-1392-12.
 2. Shut off power source and disconnect power cable from PEP PRIMARY INPUT connector J1. Refer to TM 11-5895-1392-12.
-

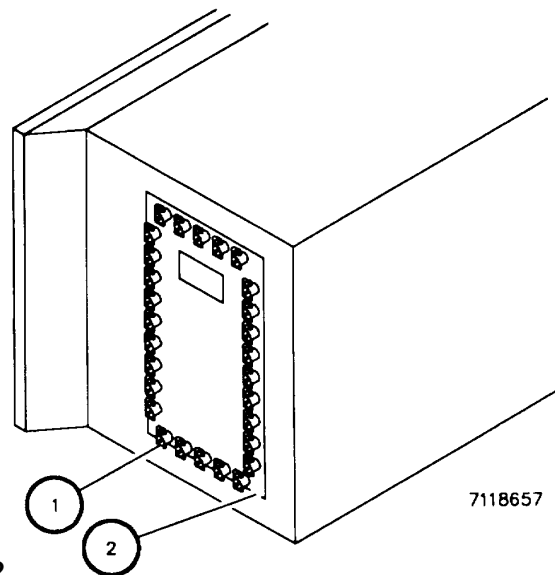
REMOVAL

1. Loosen 28 fasteners (1).
2. Remove access panel (2).



INSTALLATION

1. Place access panel (2) in installed position.
2. Tighten 28 fasteners (1).



8-72

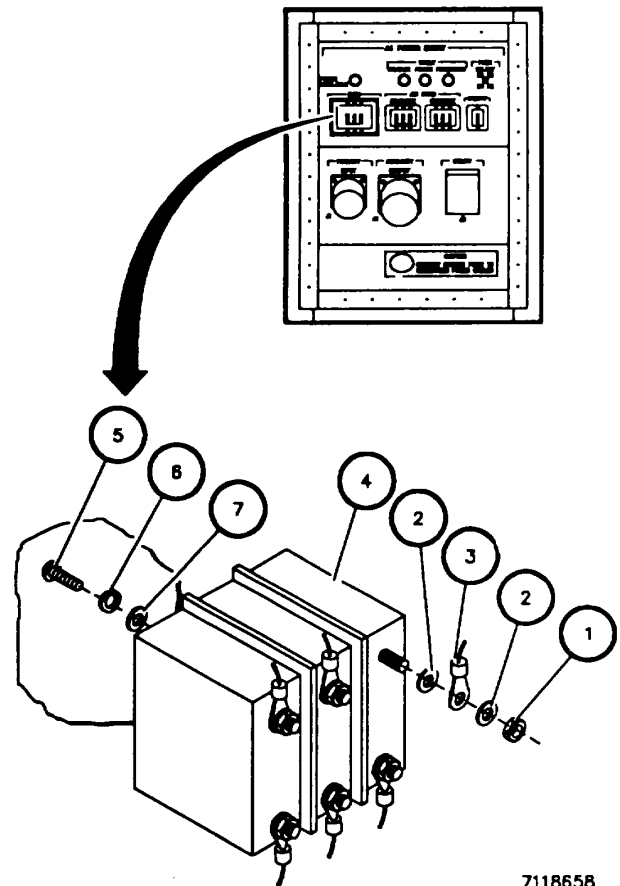
8-9. REPLACE PEP CIRCUIT BREAKER CB1**This task covers:****a. Removal****b. Installation****INITIAL SETUP**

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP access panel (para 8-8).

REMOVAL

1. Working inside PEP front panel, remove six nuts (1) and 12 washers (2) and all cables (3) from CB1 (4). Tag cables (3).
2. Working at front panel, remove six screws (5), lockwashers (6), and washers (7).
3. Remove CB1 (4).

**INSTALLATION**

1. Place CB1 (4) in installed position.
2. Install six screws (5), lockwashers (6), and washers (7).
3. Install all cables (3) on CB1 (4) as tagged, using six nuts (1) and 12 washers (2). Remove tags.

FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8).

7118658

8-10. REPLACE PEP CIRCUIT BREAKERS CB2-CB4

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

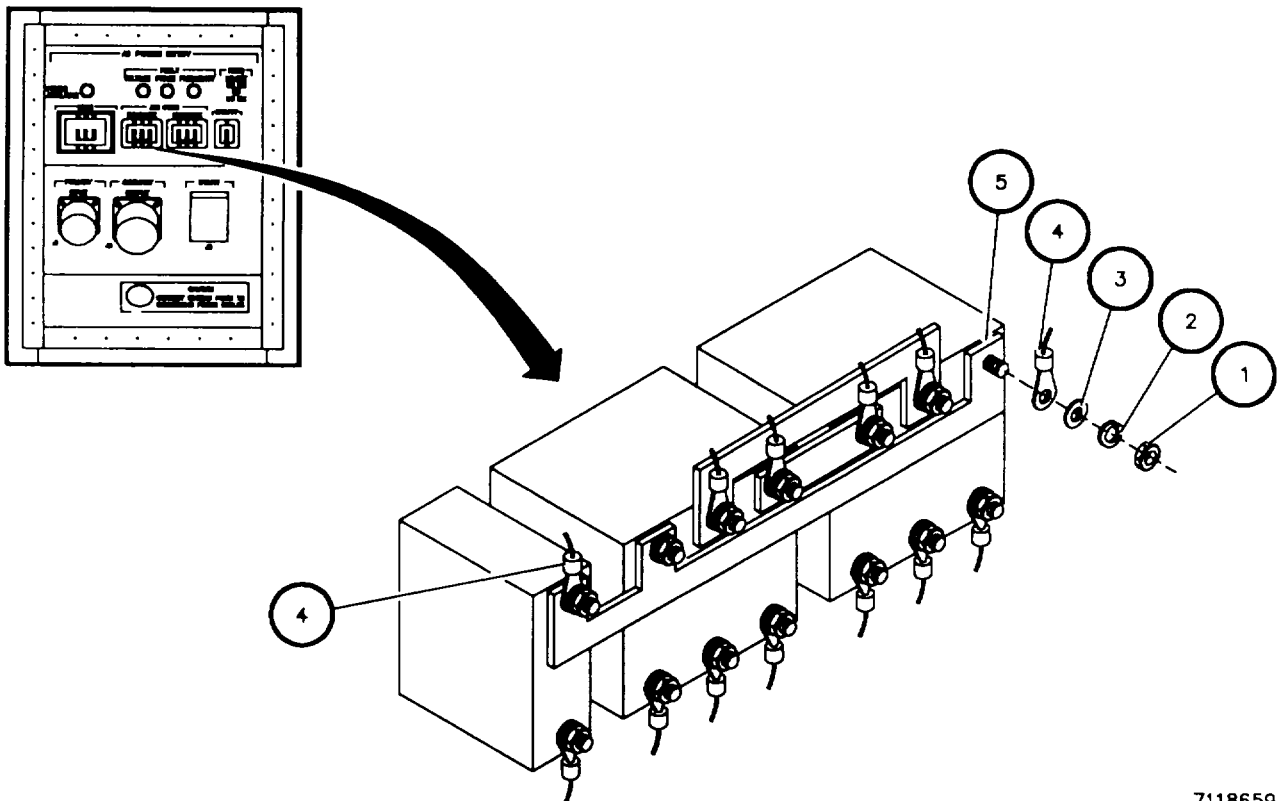
Circuit breakers CB2-CB4 are linked by bus bars. Replace circuit breakers CB2-CB4 the same way, except where noted. CB2 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP access panel (para 8-8).

REMOVAL

1. Working inside PEP front panel, remove three nuts (1), lockwashers (2), and washers (3), two cables (4), and one long bus bar (5).
2. Tag two cables (4).



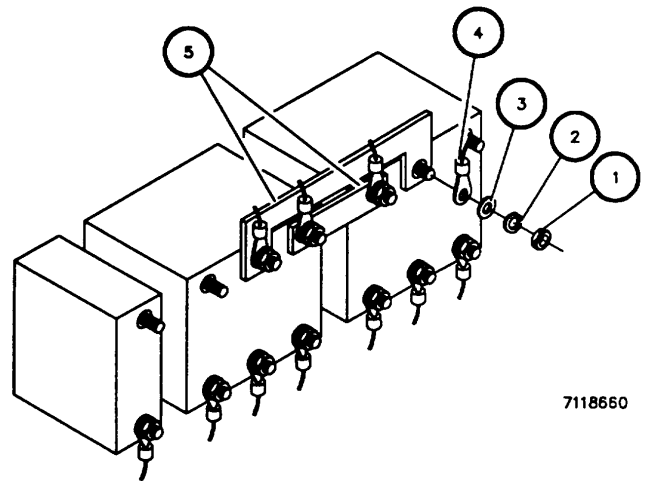
7118659

8-10. REPLACE PEP CIRCUIT BREAKERS CB2 C'4 - Continued

NOTE

If replacing CB4, go to step 5.

3. Remove four nuts (1), lockwashers (2), washers (3), and cables (4) and two bus bars (5).
4. Tag four cables (4).

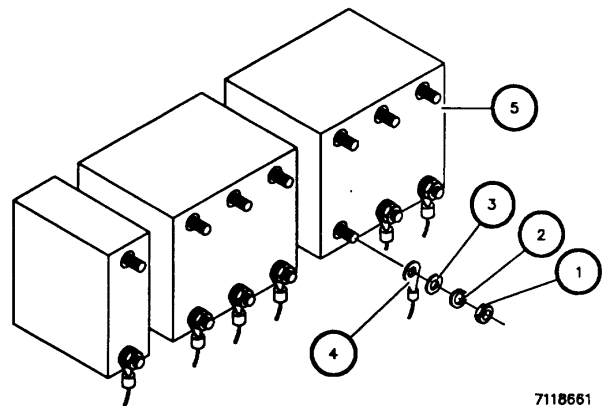


7118660

NOTE

CB4 has only one cable and set of attaching hardware.

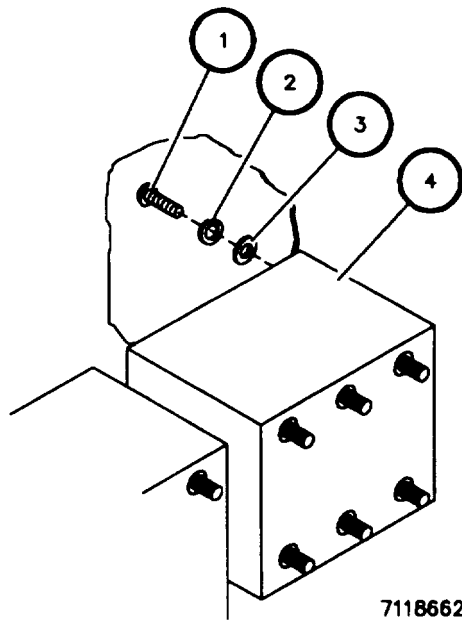
5. Remove nuts (1), lockwashers (2), washers (3), and cables (4) from bottom of circuit breaker (5).
6. Tag cables (4).



7118661

8-10. REPLACE PEP CIRCUIT BREAKERS CB2-CB4 - Continued**NOTE****CB4 has only two screws.**

7. Working at PEP front panel, remove six screws (1), lockwashers (2), and washers (3).
8. Remove circuit breaker (4).

**INSTALLATION**

1. Working at front panel, place circuit breaker (4) in installed position.

NOTE**CB4 has only two screws.**

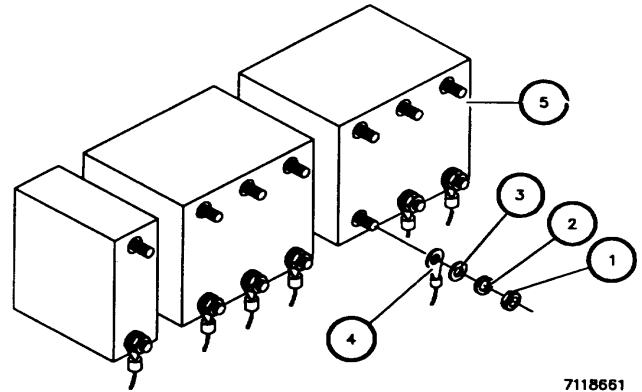
2. Install six screws (1), lockwashers (2), and washers (3).

8-10. REPLACE PEP CIRCUIT BREAKERS CB2 CB4 - Continued

NOTE

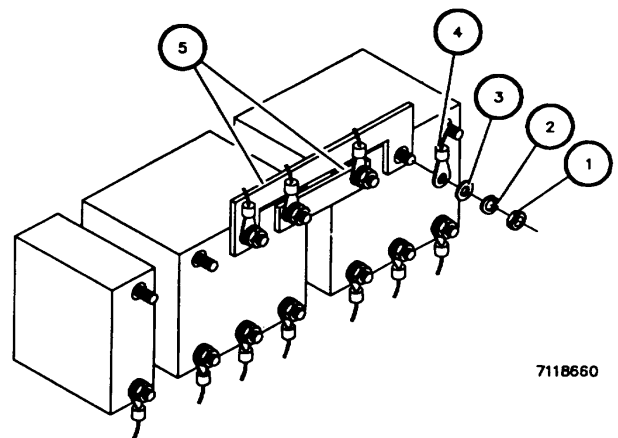
CB4 has only one cable and set of attaching hardware.

- Working inside PEP front panel, install cables (4) to bottom of circuit breaker (5), as tagged, using nuts (1), lockwashers (2), and washers (3). Remove tags.

**NOTE**

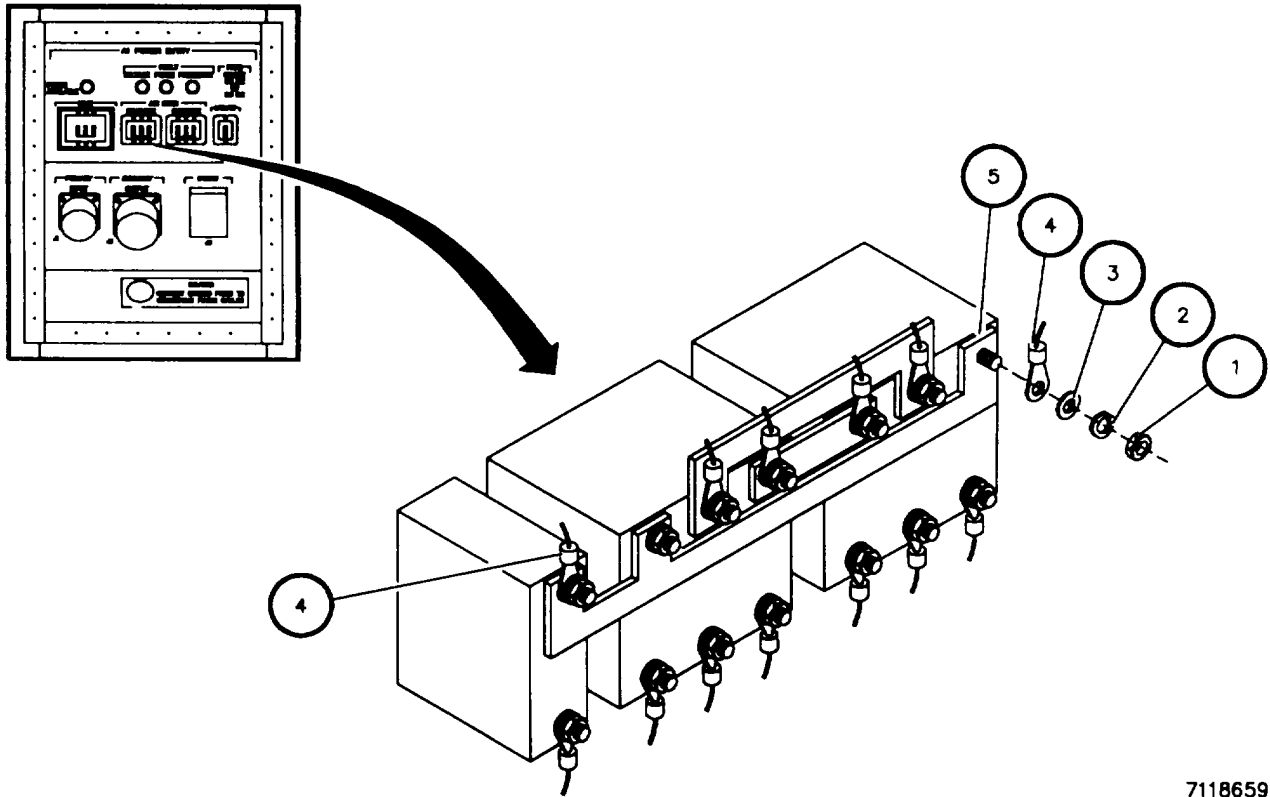
If replacing CB4, go to step 5.

- Install two bus bars (5) and four cables (4) as tagged, using four nuts (1), lockwashers (2), and washers (3). Remove tags.



81 0. REPLACE PEP CIRCUIT BREAKERS CB2-CB4 - Continued

5. Install one long bus bar (5) and two cables (4) as tagged, using three nuts (1), lockwashers (2), and washers (3). Remove tags.



7118659

FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8).

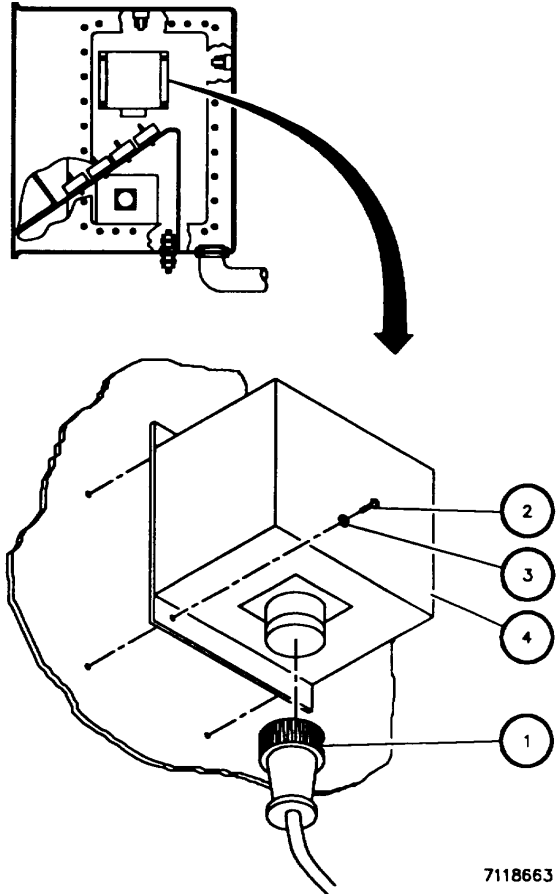
8-11. REPLACE PEP POWER MONITOR K1**This task covers:****a. Removal****b. Installation****INITIAL SETUP**

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP access panel (para 8-8).

REMOVAL

1. Working inside roadside panel, disconnect cable (1).
2. Remove four screws (2) and washers (3).
3. Remove power monitor K1 (4).

**INSTALLATION**

1. Place power monitor K1 (4) in installed position.
2. Install four screws (2) and washers (3).
3. Connect cable (1).

7118663

FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8).

8-12. REPLACE PEP POWER CONTACTOR K2

This task covers:

a. Removal

b. Installation

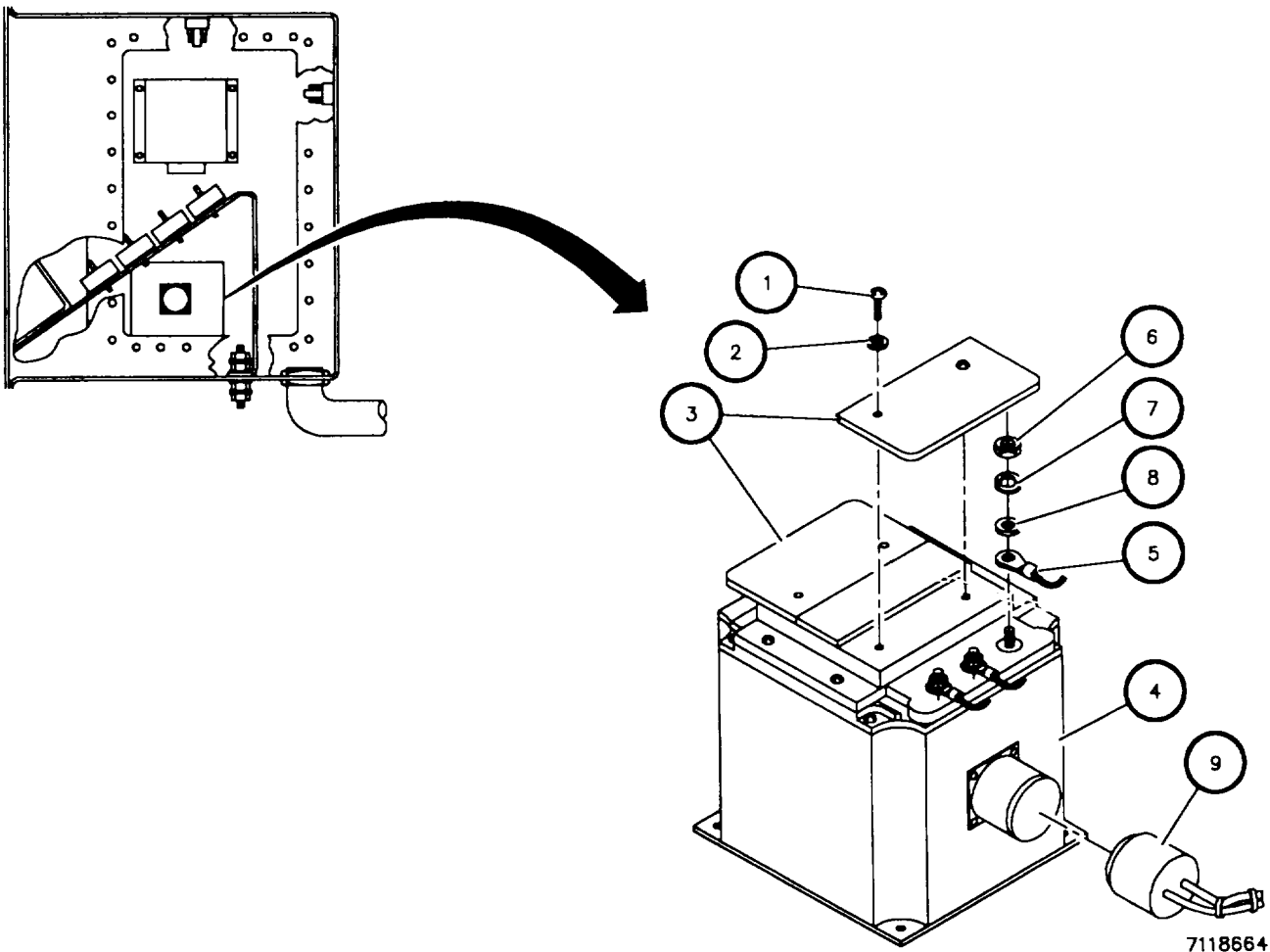
INITIAL SETUP

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP access panel (para 8-8).

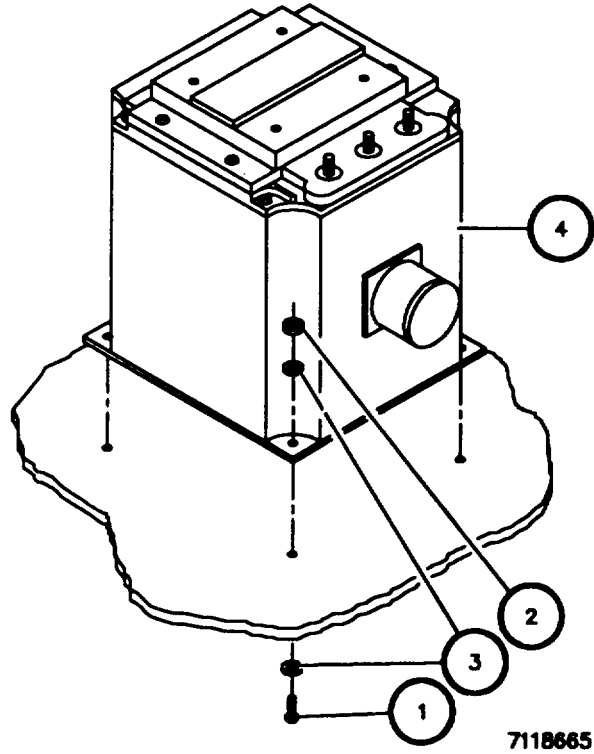
REMOVAL

1. Remove four screws (1) and washers (2) and two covers (3) from contactor K2 (4).
2. Tag six cables (5).
3. Remove six nuts (6), lockwashers (7), washers (8), and cables (5).
4. Disconnect cable (9) from contactor K2 (4).



8-12. REPLACE PEP POWER CONTACTOR K2 - Continued

5. Remove four screws (1) and locknuts (2) and eight washers (3).
6. Remove contactor K2 (4).

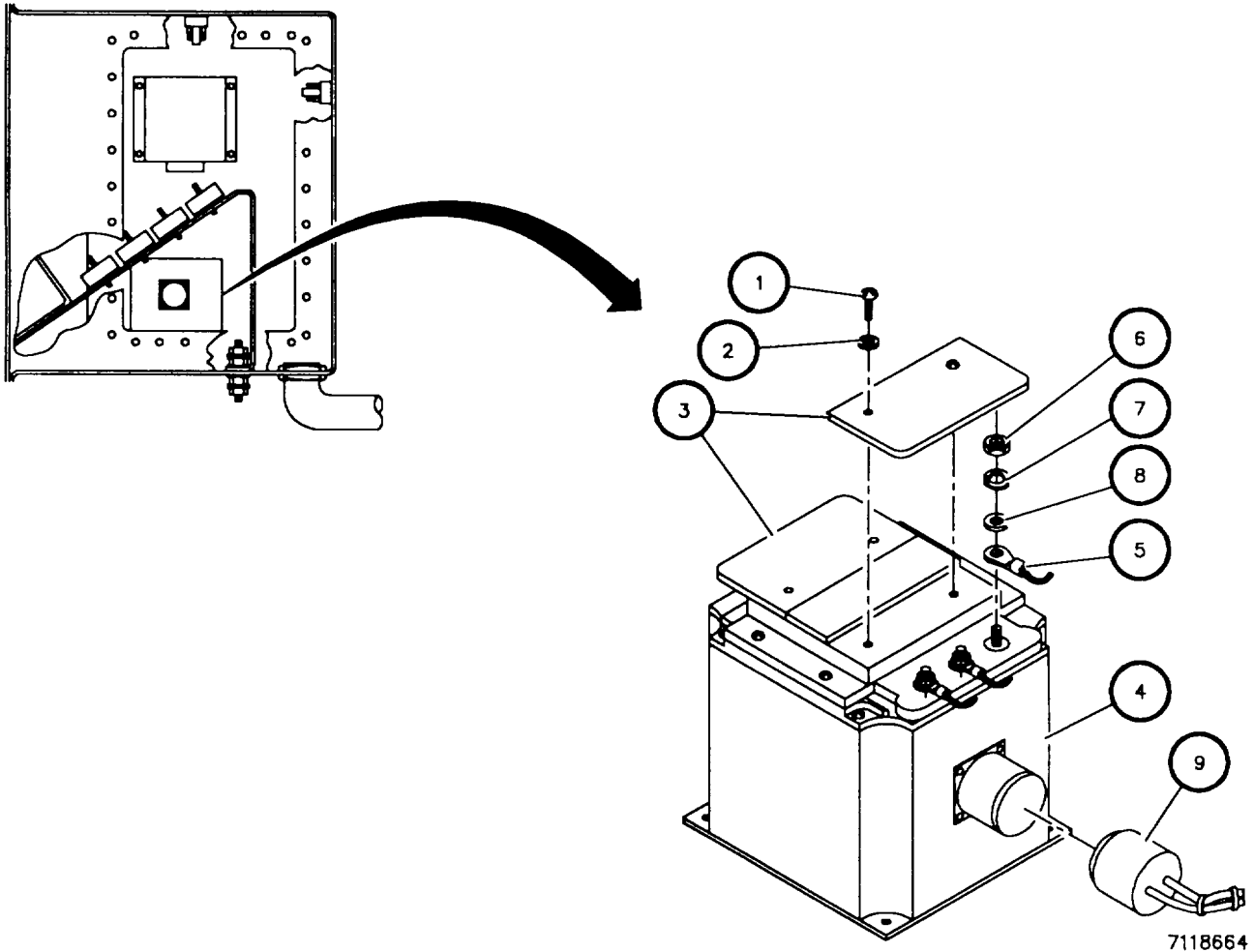


INSTALLATION

1. Place contactor K2 (4) in installed position.
2. Install four screws (1) and locknuts (2) and eight washers (3).

8-12. REPLACE PEP POWER CONTACTOR K2 - Continued

3. Install six cables (5) to contactor K2 (4) as tagged, using six nuts (6), lockwashers (7) and washers (8). Remove tags.
4. Place two covers (3) in installed position.
5. Install four screws (1) and washers (2).
6. Connect cable (9) to contactor K2 (4).



FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8).

8-13. REPLACE PEP INDICATOR HOUSING DS1

This task covers:

a. Removal

b. Installation

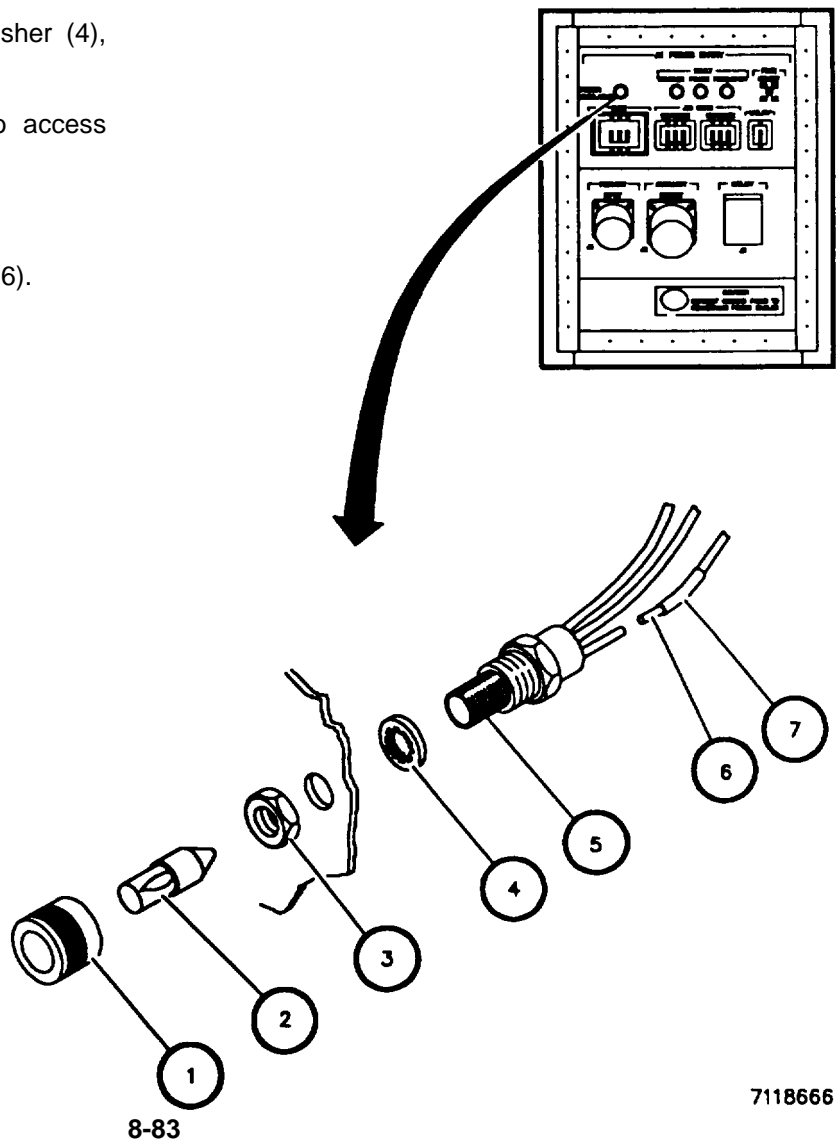
INITIAL SETUP

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP access panel (para 8-8).

REMOVAL

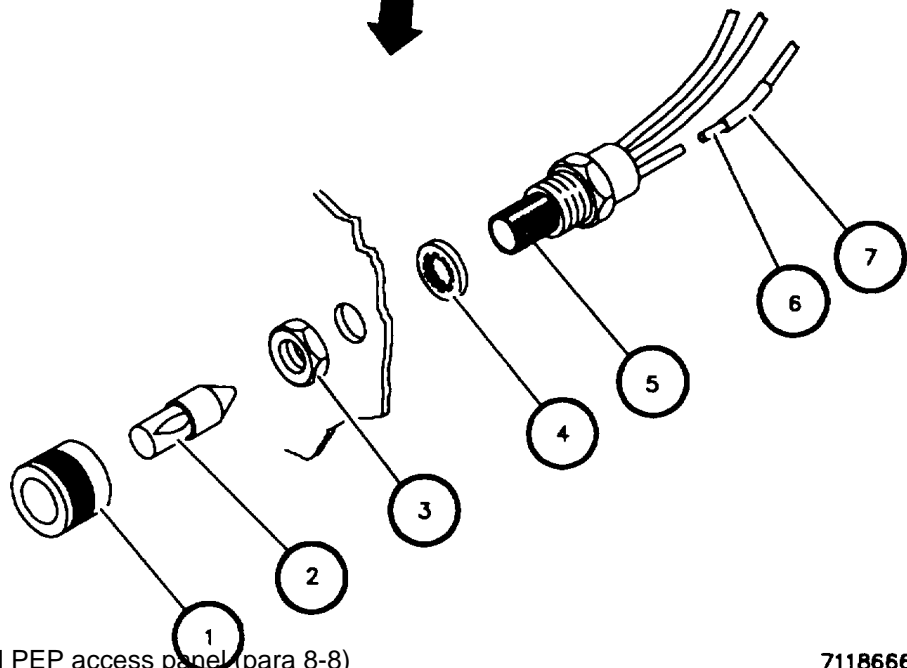
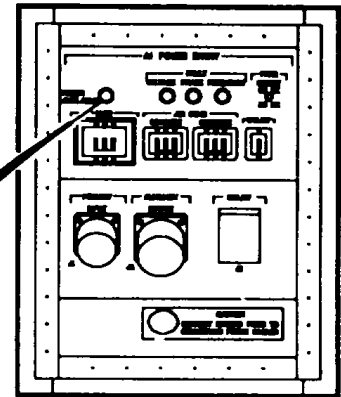
1. Working at front panel, remove indicator lens (1) and lamp (2).
2. Remove nut (3), internal tooth lockwasher (4), and indicator housing DS1 (5).
3. Position indicator housing DS1 (5) to access three wires (6).
4. Remove insulation sleeving (7).
5. Tag, unsolder, and remove three wires (6).
6. Remove indicator housing DS1 (5).



8-13. REPLACE PEP INDICATOR HOUSING DS1 - Continued

INSTALLATION

1. Form and dress three wires (6).
2. Position new insulation sleeving (7) on three wires (6) so that wire ends are exposed for soldering.
3. Solder three wires (6) to indicator housing DS1 (5) as tagged. Remove tags.
4. Position and shrink insulation sleeving (7).
5. Place internal tooth lockwasher (4) and indicator housing DS1 (5) in installed position.
6. Install nut (3), lamp (2), and indicator lens (1).



FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8)

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8-14. REPLACE PEP INDICATOR HOUSINGS DS2-DS4

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

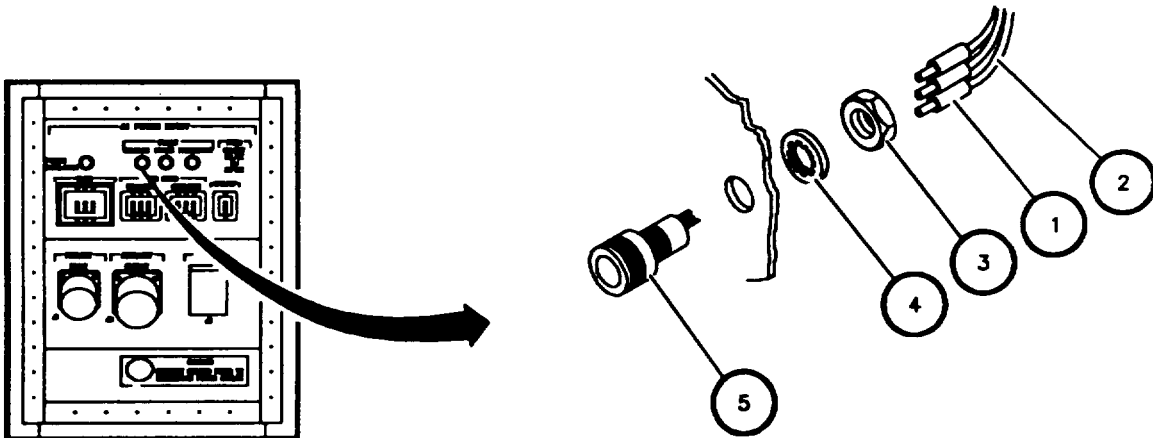
Replace indicator housings DS2-DS4 the same way. Indicator housing DS2 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP circuit breakers CB2-CB4 (para 8-10).

REMOVAL

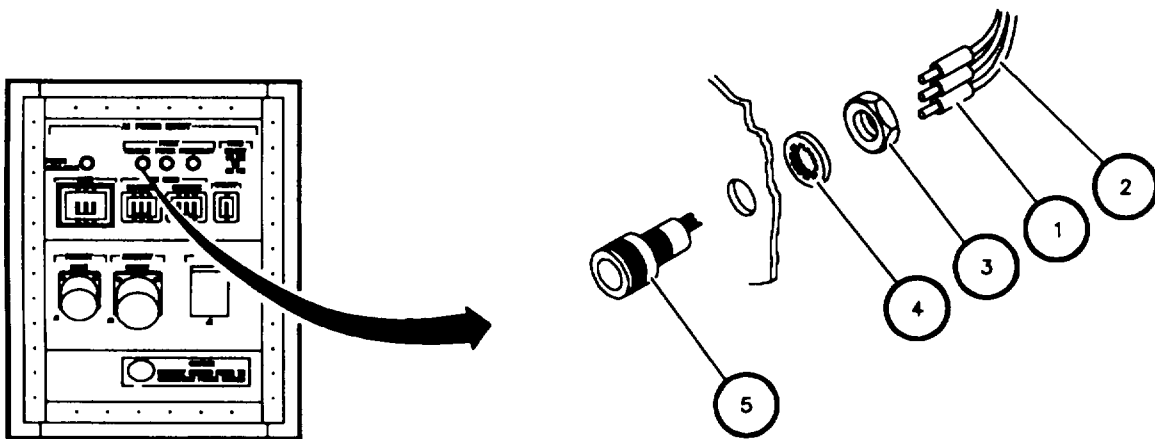
1. Working inside front panel, remove insulation sleeving (1) from three wires (2).
2. Tag, unsolder, and remove three wires (2).
3. Remove nut (3), internal tooth lockwasher (4), and indicator housing DS2 (5).



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8-14. REPLACE PEP INDICATOR HOUSINGS DS2-DS4 - Continued**INSTALLATION**

1. Place indicator housing (5) in installed position.
2. Install internal tooth lockwasher (4) and nut (3).
3. Form and dress three wires (2).
4. Position new insulation sleeving (1) on three wires (2) so that wire ends are exposed for soldering.
5. Solder three wires (2) to indicator housing DS2 (5) as tagged. Remove tags.
6. Position and shrink insulation sleeving (1).



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FOLLOW-ON MAINTENANCE: Install PEP circuit breakers CB2-CB4 (para 8-10).

8-15. REPLACE PEP SURGE ARRESTORS E2-ES**This task covers:****a. Removal****b. Installation****INITIAL SETUP****NOTE**

Replace surge arrestors E2-E5 the same way. Surge arrestor E5 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

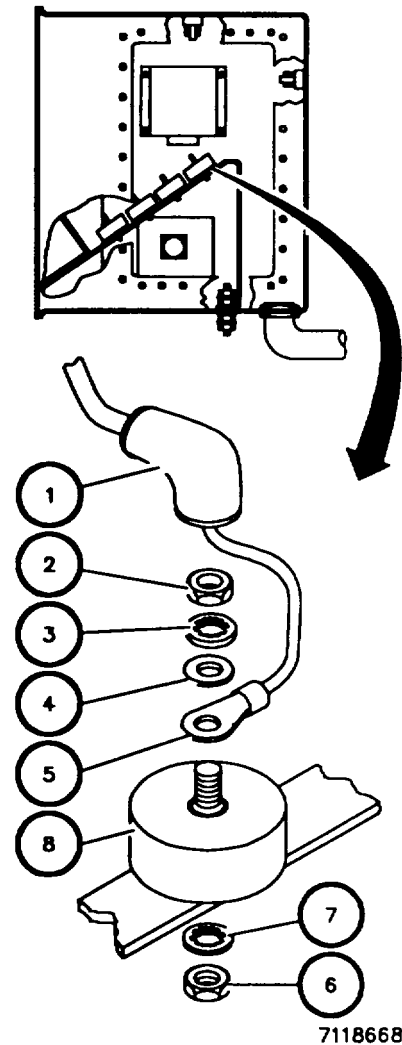
Preliminary Procedure: Remove PEP access panel (para 8-8).

REMOVAL

1. Pull back rubber boot (1) to expose connection.
2. Remove nut (2), internal tooth lockwasher (3), washer (4), and cable (5). Tag cable (5).
3. Remove nut (6) and internal tooth lockwasher (7).
4. Remove surge arrestor (8).

INSTALLATION

1. Place surge arrestor (8) in installed position.
2. Install nut (6) and internal tooth lockwasher (7).
3. Install cable (5) surge arrestor (8) as tagged, using nut (2), internal tooth lockwasher (3) and washer (4). Remove tag.
4. Place rubber boot (1) in installed position.



FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8).

8-16. REPLACE PEP RECEPTACLE J1 OR J2

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

Replace receptacle J1 or J2 the same way, except when noted. Receptacle J2 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedures:

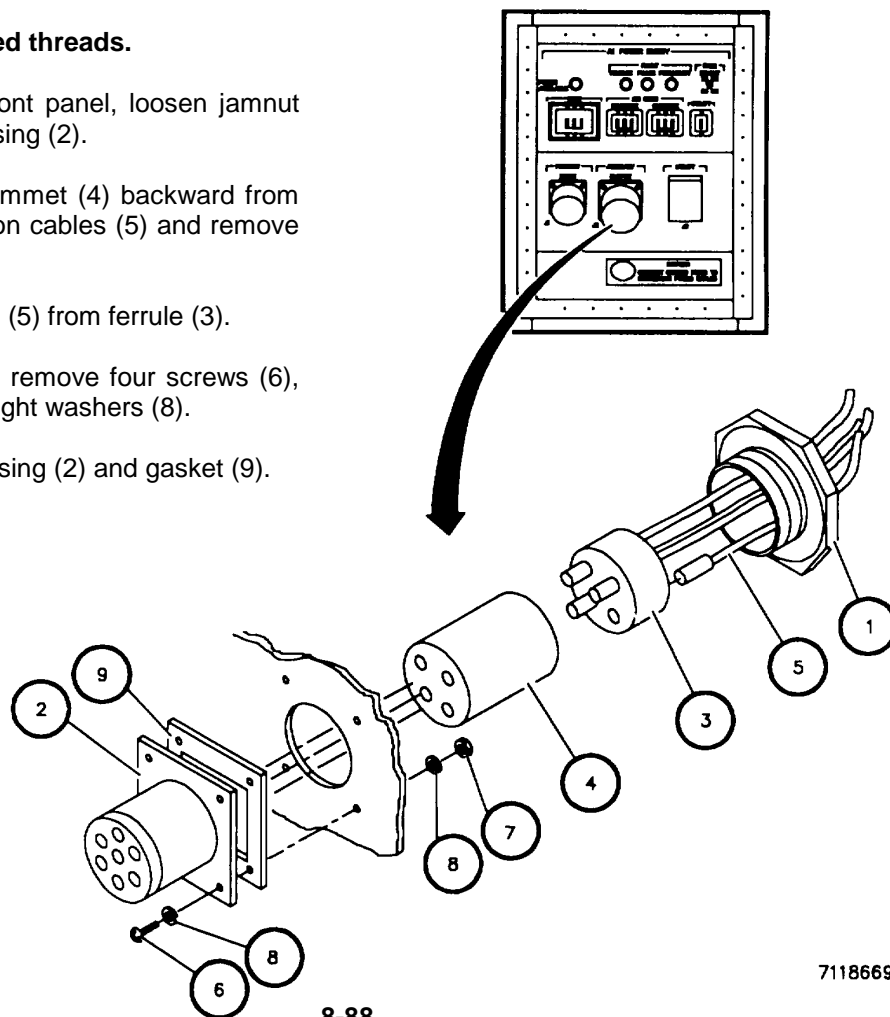
1. Remove PEP access panel (para 8-8).
2. If replacing receptacle J1, remove main circuit breaker CB1 (para 8-9).

REMOVAL

NOTE

Jamnut has left-handed threads.

1. Working inside PEP front panel, loosen jamnut (1) from connector housing (2).
2. Pull ferrule (3) and grommet (4) backward from connector housing (2) on cables (5) and remove grommet.
3. Tag and remove cables (5) from ferrule (3).
4. Working at front panel, remove four screws (6), four locknuts (7), and eight washers (8).
5. Remove connector housing (2) and gasket (9).



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8-1 6. REPLACE PEP RECEPTACLE J1 OR J2 - Continued

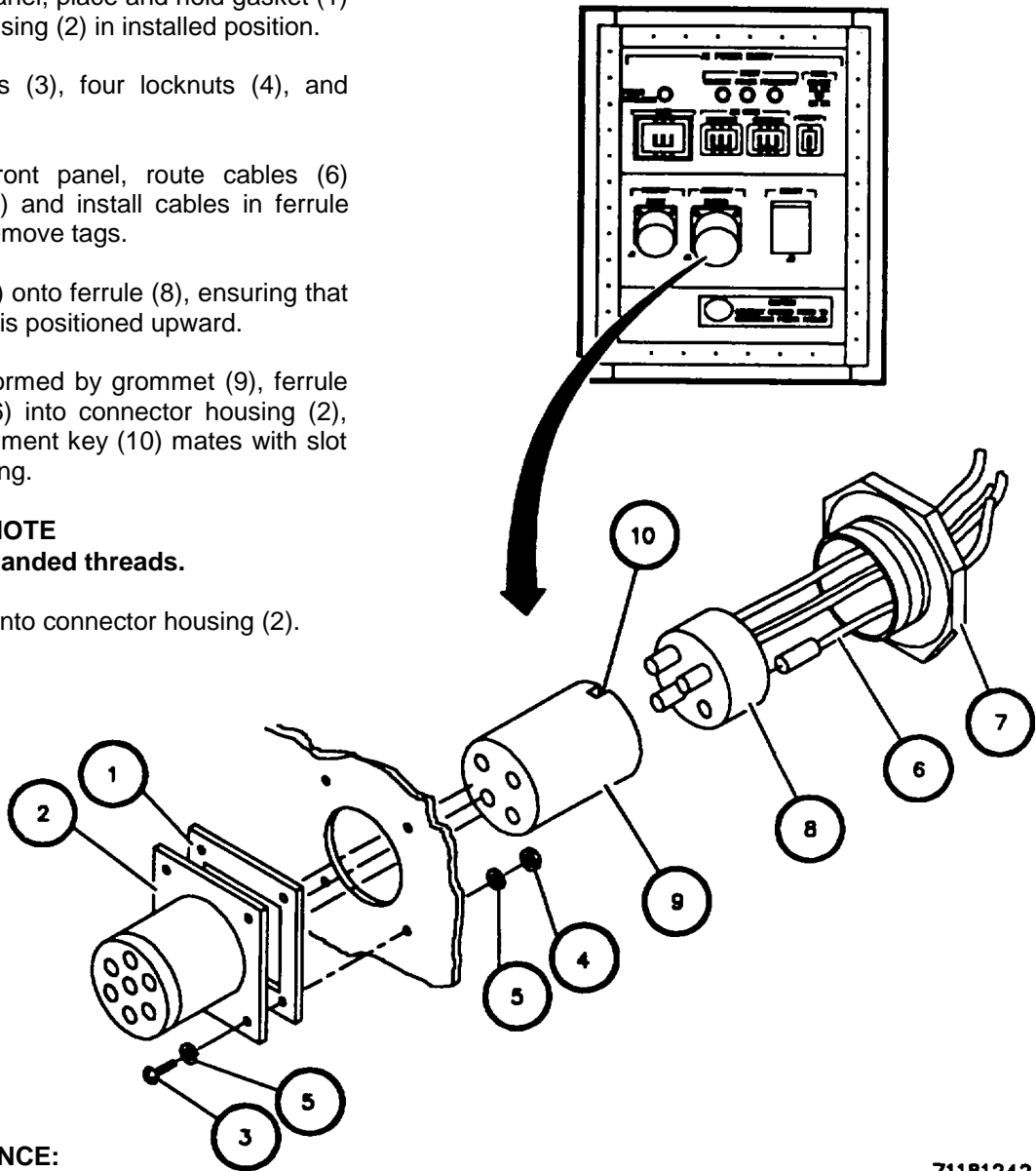
INSTALLATION

1. Working at front panel, place and hold gasket (1) and connector housing (2) in installed position.
2. Install four screws (3), four locknuts (4), and eight washers (5).
3. Working inside front panel, route cables (6) through jamnut (7) and install cables in ferrule (8), as tagged. Remove tags.
4. Install grommet (9) onto ferrule (8), ensuring that alignment key(10) is positioned upward.
5. Install assembly formed by grommet (9), ferrule (8), and cables (6) into connector housing (2), ensuring that alignment key (10) mates with slot in connector housing.

NOTE

Jamnut has left-handed threads.

6. Install jamnut (7) onto connector housing (2).



FOLLOW-ON MAINTENANCE:

71181242

1. If replacing receptacle J1, install main circuit breaker CB1 (para 8-9)
2. Install PEP access panel (para 8-8).

8-17. REPLACE PEP RECEPTACLE J3

This task covers:

a. Removal

b. Installation

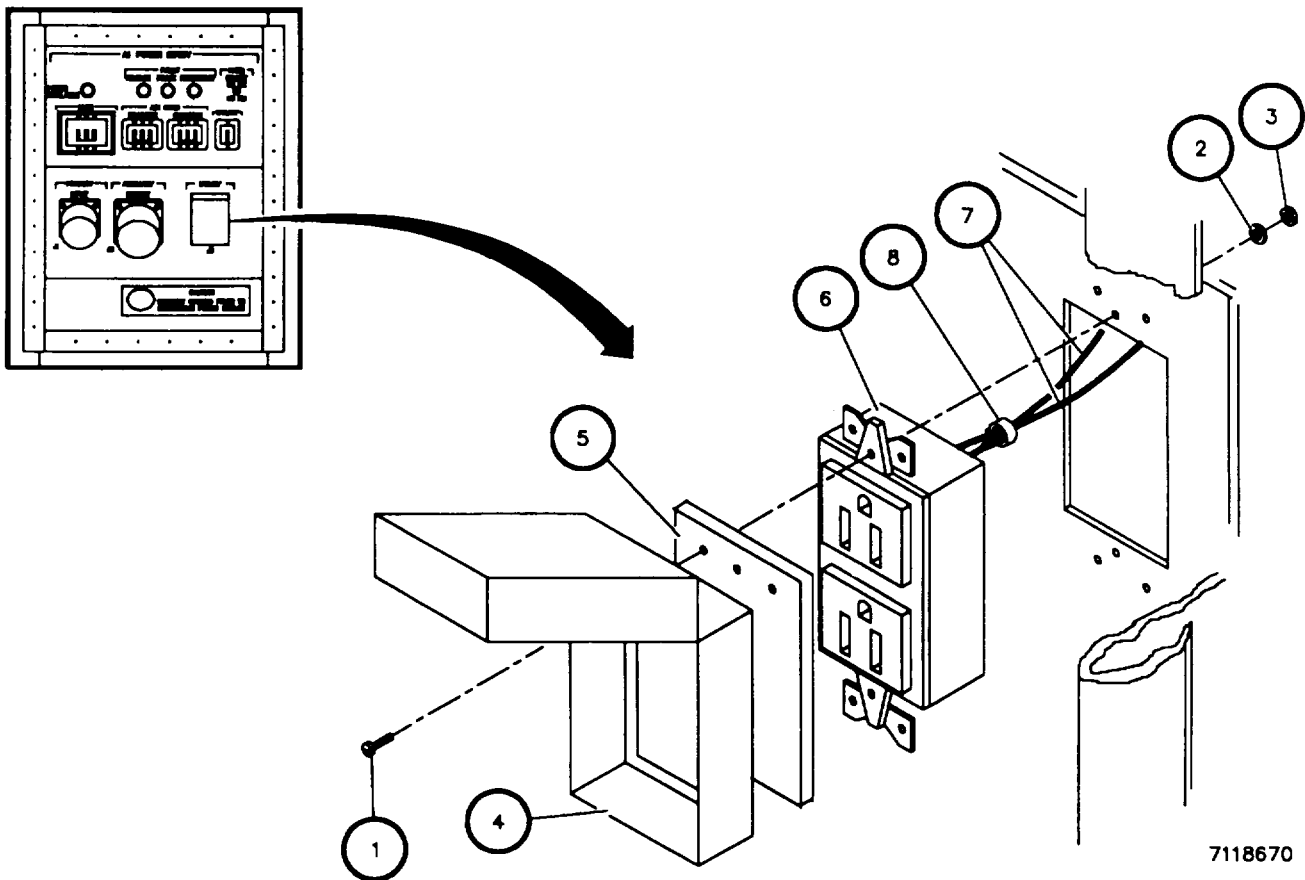
INITIAL SETUP

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP access panel (para 8-8).

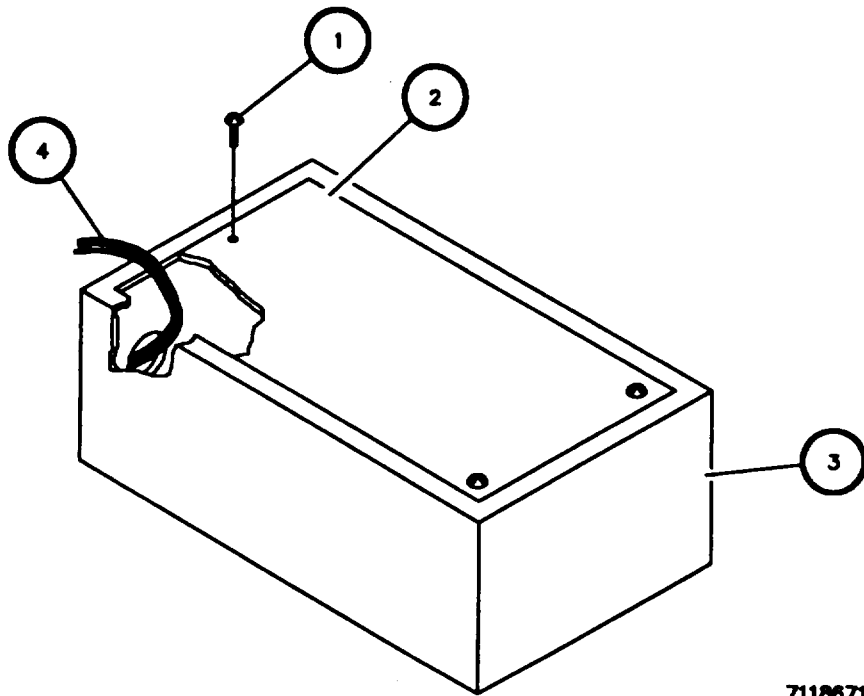
REMOVAL

1. Working at front panel, remove six screws (1), washers (2), and locknuts (3).
2. Remove receptacle cover (4) and gasket (5).
3. Pull receptacle (6) outward to access wires (7), cutting and removing cable ties (8), as required.



817. REPLACE PEP RECEPTACLE J3 - Continued

4. Remove three screws (1).
5. Remove rear cover (2) from receptacle (3).
6. Tag, unsolder, and remove five wires (4).
7. Remove receptacle (3).



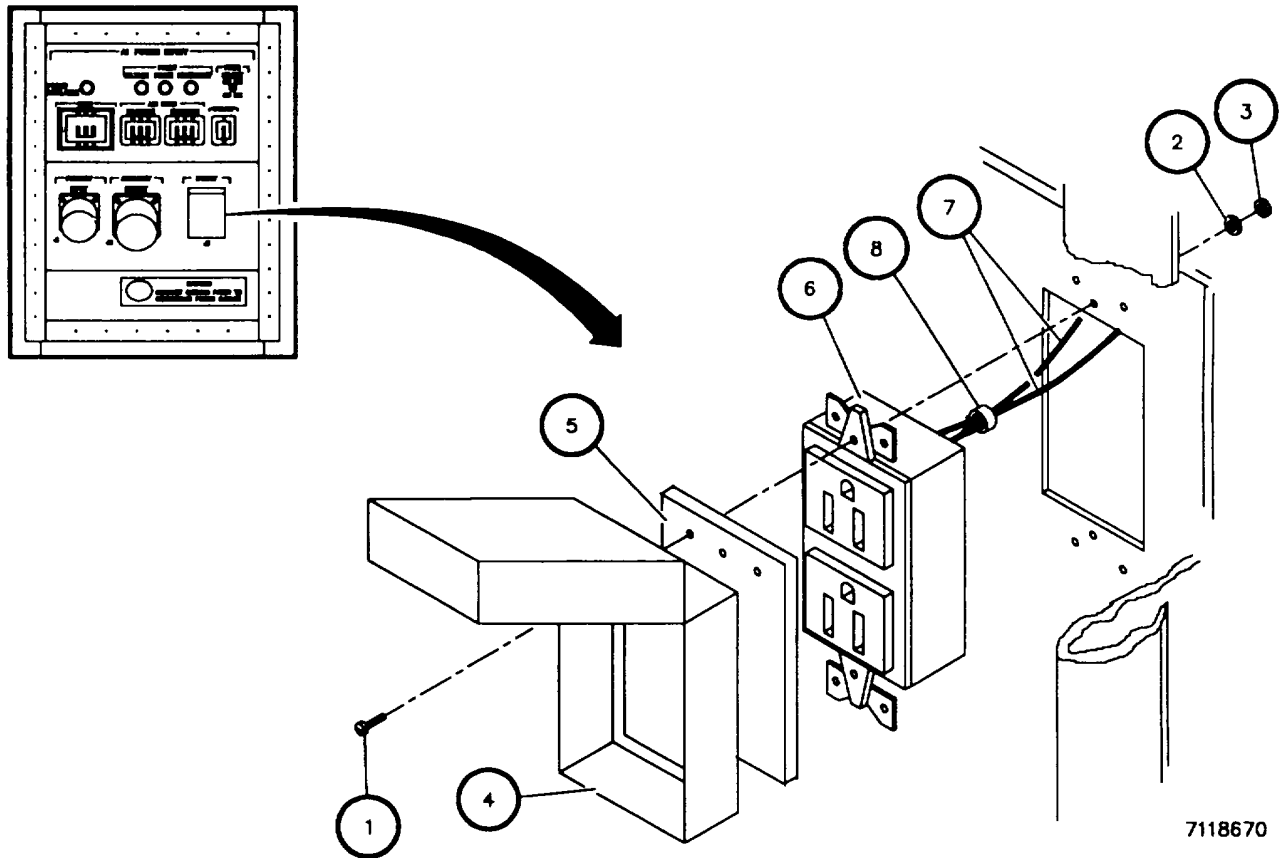
7118671

INSTALLATION

1. Remove three screws (1) and rear cover (2) from rear of replacement receptacle (3), as required.
2. Form and dress five wires (4).
3. Solder five wires (4) to receptacle (3) as tagged. Remove tags.
4. Place rear cover (2) in installed position.
5. Install three screws (1).

8-17. REPLACE PEP RECEPTACLE J3 - Continued

6. Place receptacle (6), gasket (5), and receptacle cover (4) in installed position.
7. Install six screws (1), washers (2), and locknuts (3).
8. Install cable ties (8) on wires (7), as required.



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FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8).

8-18. REPLACE PEP SWITCH S1

This task covers: a. Removal

b. Installation

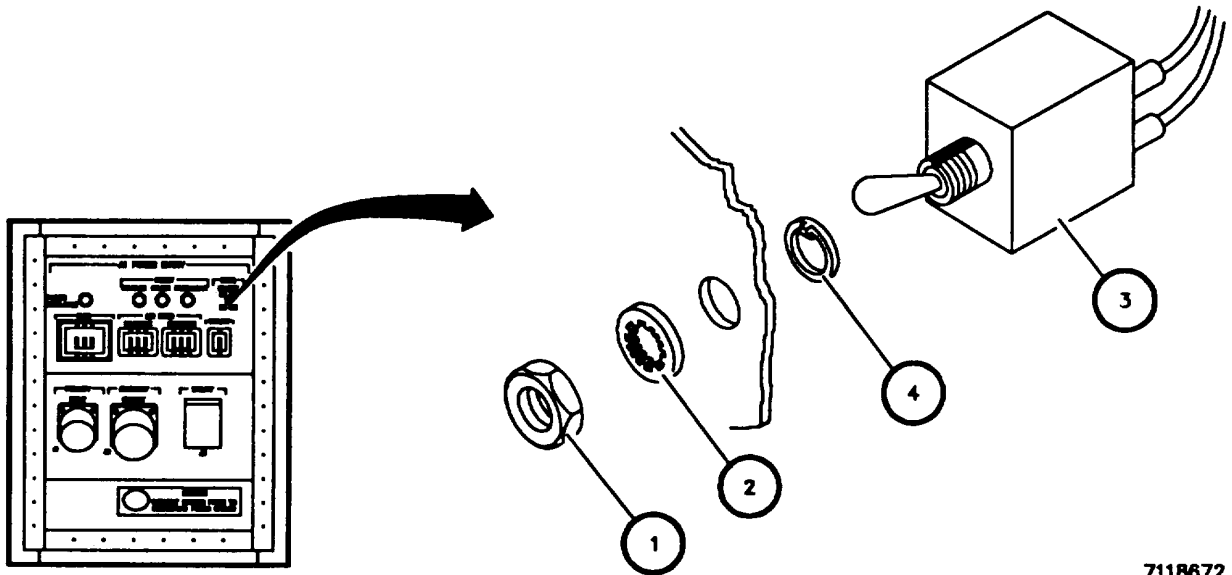
INITIAL SETUP

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP access panel (para 8-8).

REMOVAL

1. Working at front panel, remove nut (1) and internal tooth lockwasher (2).
2. Remove switch S1 (3) and lockring (4) from rear of front panel.



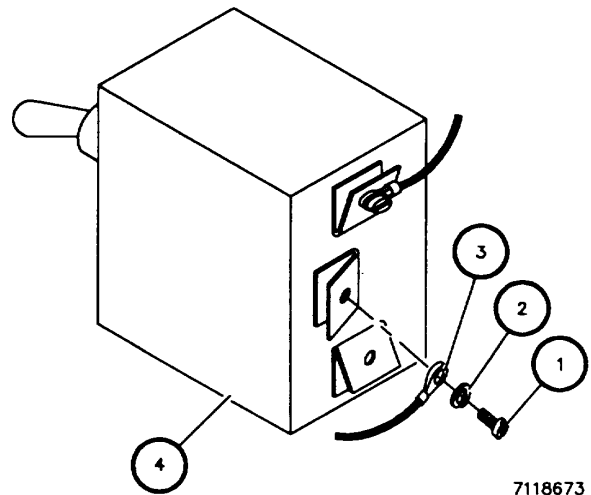
7118672

8-18. REPLACE PEP SWITCH S1 - Continued

3. Working inside front panel remove two screws (1), lockwashers (2), and wires (3) from switch S1 (4). Tag two wires (3).
4. Remove switch S1 (4).

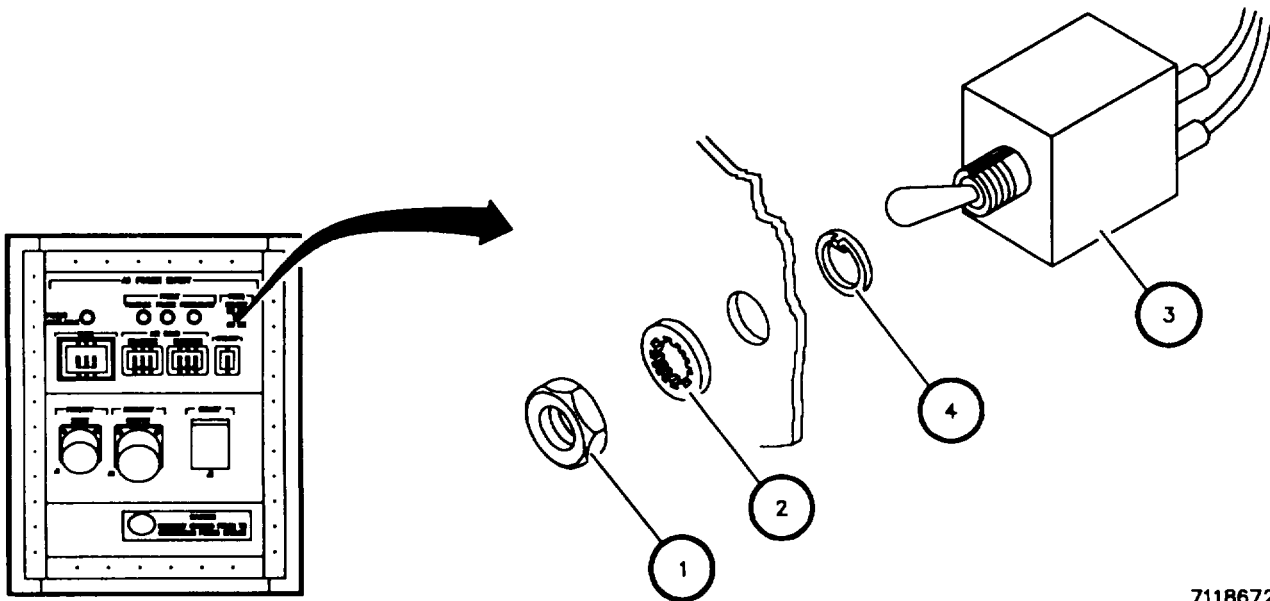
INSTALLATION

1. Install two wires (3) on switch S1 (4) as tagged, using two screws (1) and lockwashers (2). Remove tags.



7118673

2. Place locking (4) and switch S1 (3) in installed position.
3. Working at front panel, install nut (1) and internal tooth lockwasher (2) on switch S1 (3).



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FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8).

8-19. REPLACE PEP TERMINAL BOARD TB1 OR TB2

This task covers: a. Removal

b. Installation

INITIAL SETUP

NOTE

Replace terminal board TB1 or TB2 the same way. Terminal board TB1 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PEP access panel (para 8-8).

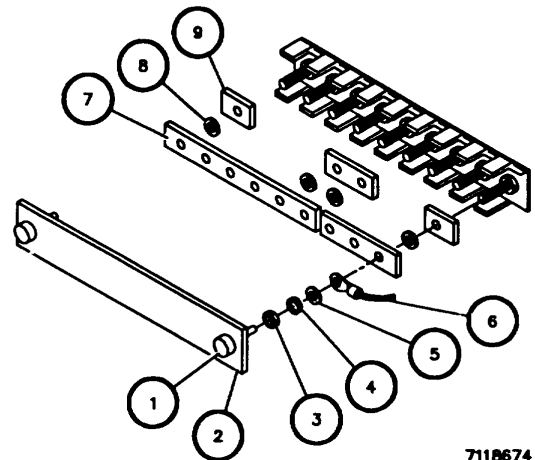
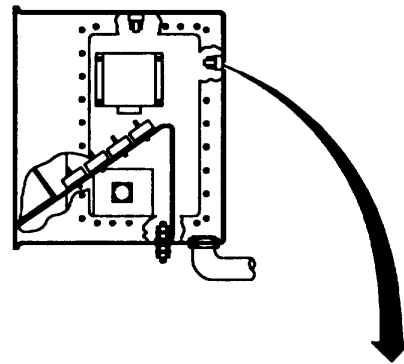
REMOVAL

1. Working at rear panel, loosen two captive fasteners (1).
2. Remove terminal board cover (2).
3. Remove eight nuts (3), lockwashers (4), and washers (5).

NOTE

Note and record number and location of cables, bus bars, washers, and insulators removed in step 4 to aid installation.

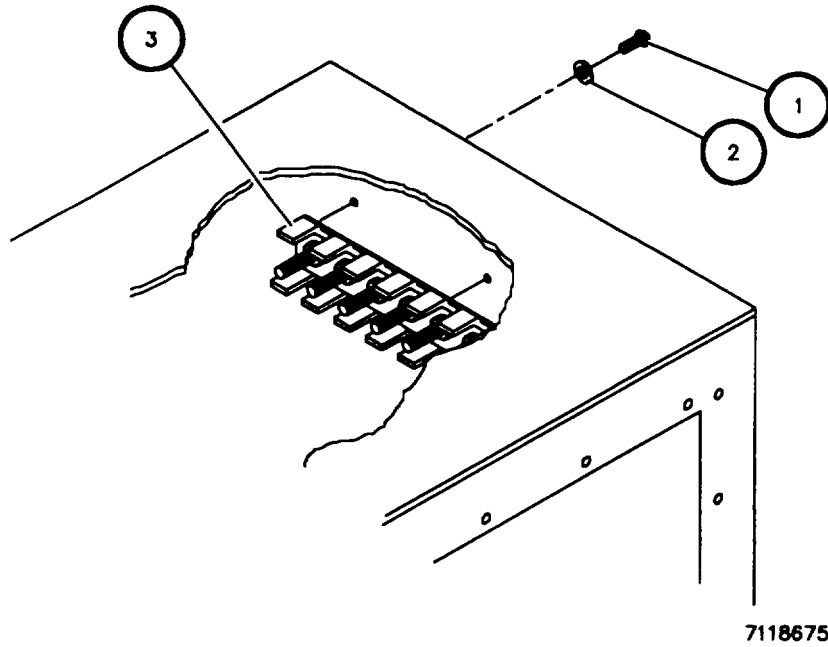
4. Tag and remove cables (6), bus bars (7), washers (8), and insulators (9).



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8-19. REPLACE PEP TERMINAL BOARD TB1 OR TB2 - Continued

5. Remove three screws (1) and washers (2).
6. Remove terminal board (3).

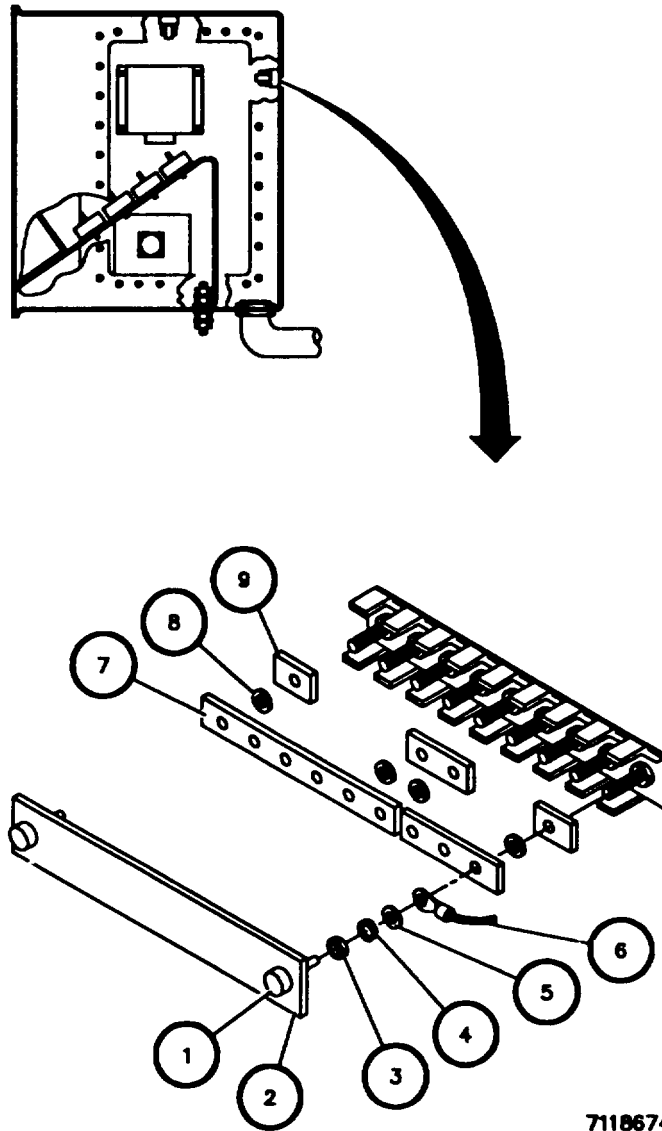


INSTALLATION

1. Place terminal board (3) in installed position.
2. Install three screws (1) and washers (2).

8-19. REPLACE PEP TERMINAL BOARD TB1 OR TB2 - Continued

3. Install cables (6), bus bars (7), washers (8), and insulators (9) as noted and tagged during removal, using eight nuts (3), lockwashers (4), and washers (5). Remove tags.
4. Place terminal board cover (2) in installed position.
5. Tighten two captive fasteners (1).



FOLLOW-ON MAINTENANCE: Install PEP access panel (para 8-8).

8-20. REPLACE ADP SHELTER MAIN POWER FILTER ASSEMBLY

This task covers: a. Removal

b. Installation

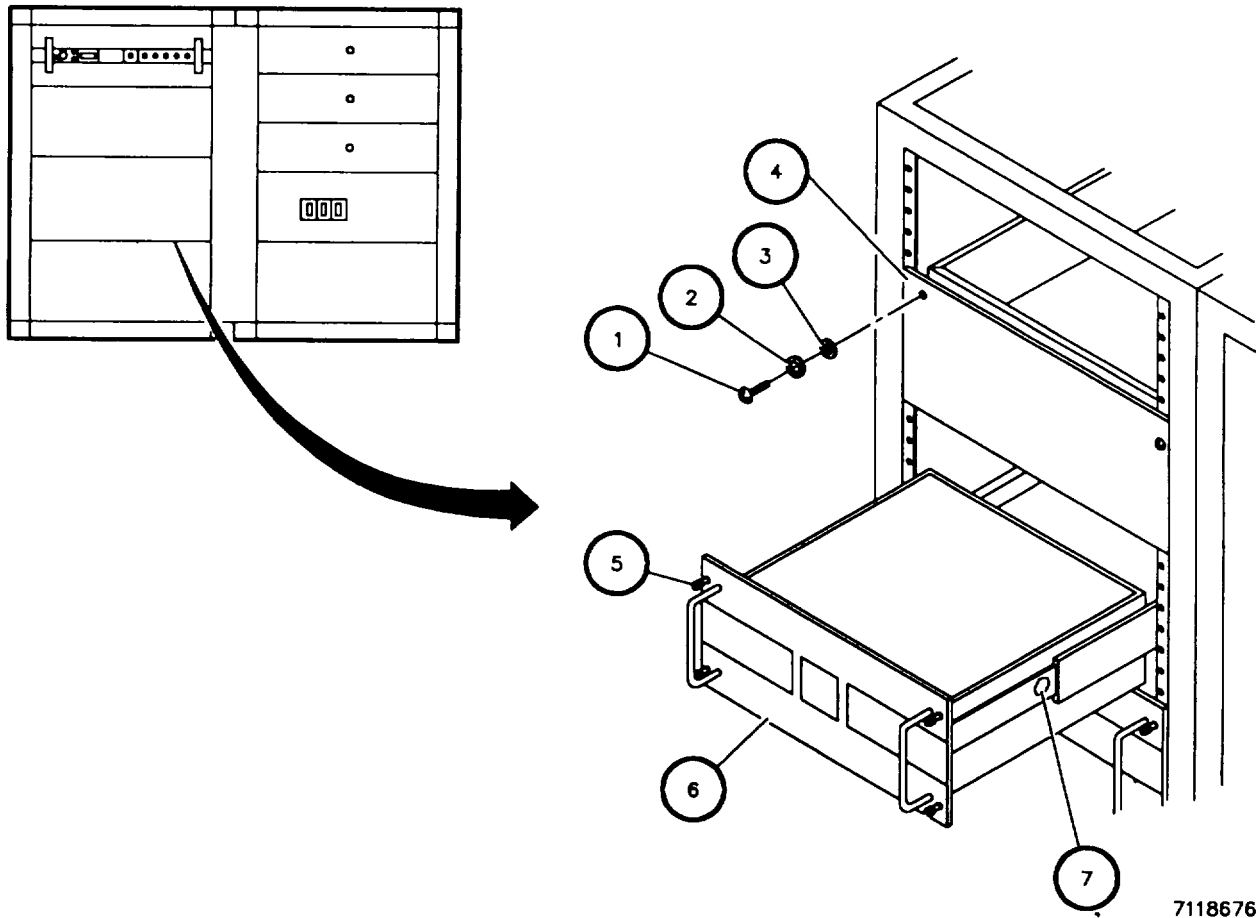
INITIAL SETUP

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove four main power filter assembly filter modules (para 8-22).

REMOVAL

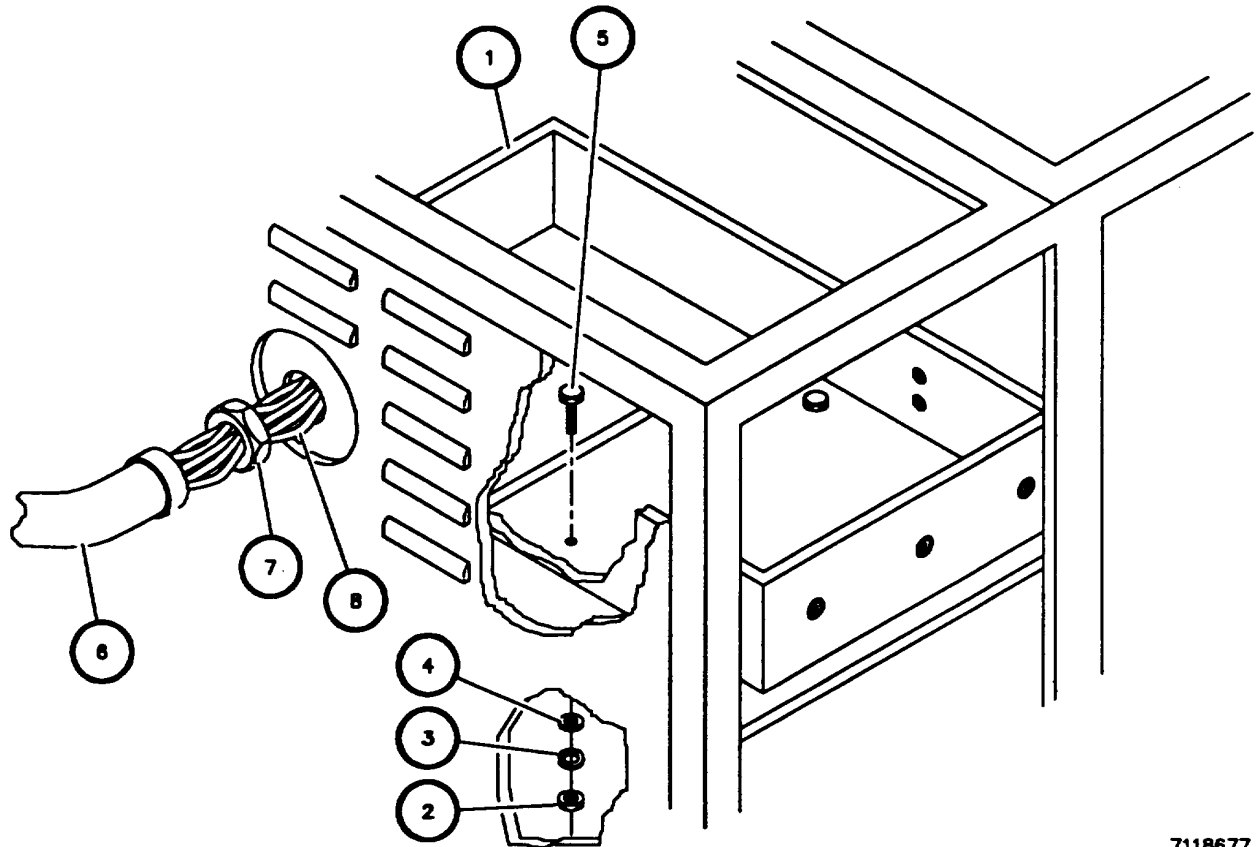
1. Remove two screws (1), lockwashers (2), and washers (3) and power filter panel (4).
2. Loosen four captive screws (5) on UPS battery assembly (6).
3. Pull UPS battery assembly (6) out until right and left slide rail locks (7) engage.



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8-20. REPLACE ADP SHELTER MAIN POWER FILTER ASSEMBLY - Continued

4. Working under main power filter assembly (1), remove four nuts (2), lockwashers (3), washers (4), and bolts (5).
5. Position main power filter assembly (1) to access conduit (6).
6. Loosen jamnut (7).
7. Pull conduit (6) and cabling (8) from main power filter assembly (1).
8. Remove main power filter assembly (1).



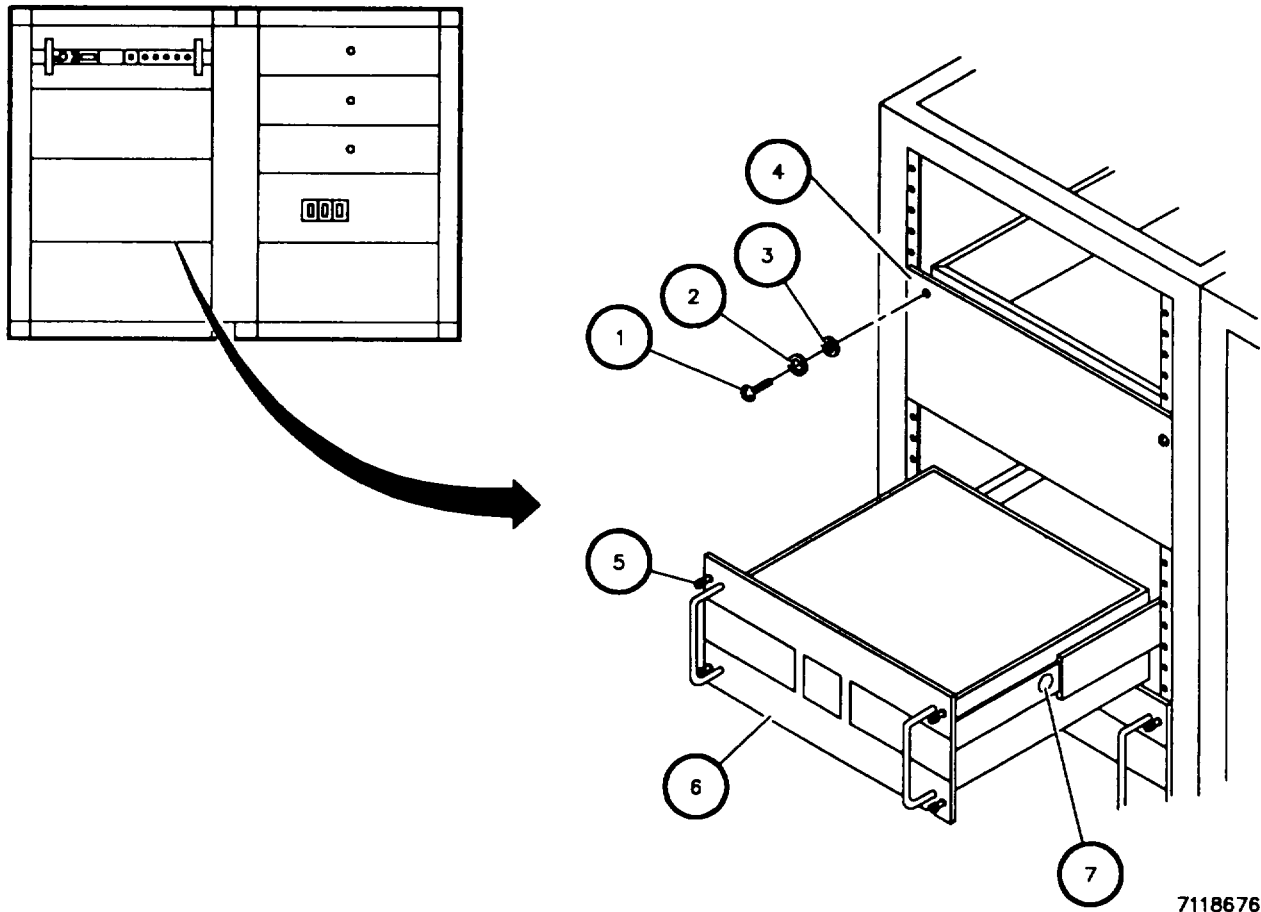
7118677

INSTALLATION

1. Place main power filter assembly (1) in installed position.
2. Working through access hole in rack A2 left bay side panel, route cabling (8) into main power filter assembly (1).
3. Attach conduit (6) to main power filter assembly (1) and tighten jamnut (7).
4. Working under main power filter assembly (1), install four nuts (2), lockwashers (3), washers (4), and bolts (5).

8-20. REPLACE ADP SHELTER MAIN POWER FILTER ASSEMBLY - Continued

5. Place power filter panel (4) in installed position.
6. Install two screws (1), lockwashers (2), and washers (3).
7. Press right and left slide rail locks (7), and push UPS battery assembly (6) fully into rack.
8. Tighten four captive screws (5).



FOLLOW-ON MAINTENANCE: Install four main power filter assembly filter modules (para 8-22).

8-21. REPLACE OPN SHELTER MAIN POWER FILTER ASSEMBLY

This task covers: a. Removal

b. Installation

INITIAL SETUP

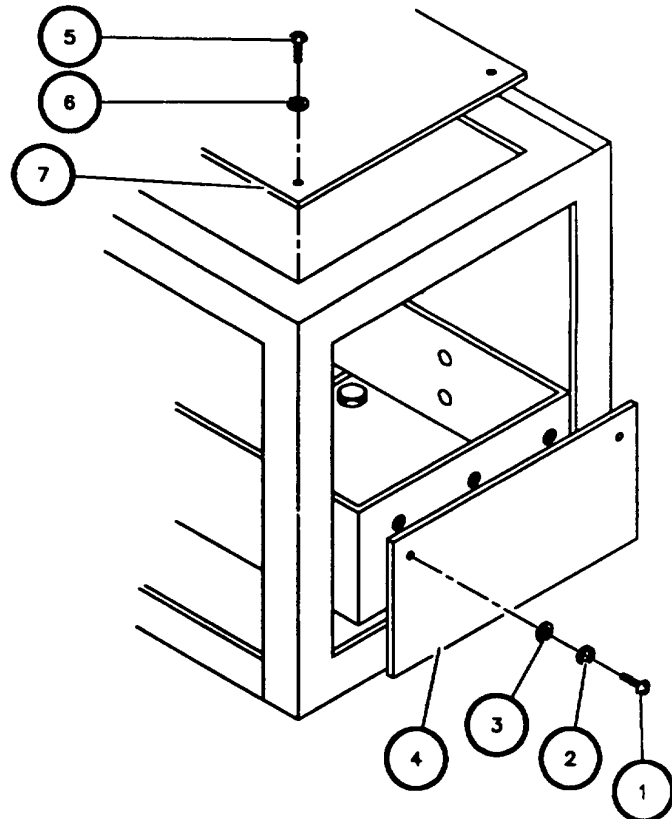
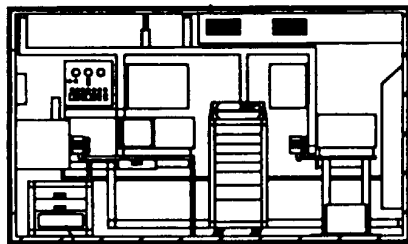
Personnel Required: Two

Equipment Configuration: Shelter power off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove four main power filter assembly filter modules (para 8-22).

REMOVAL

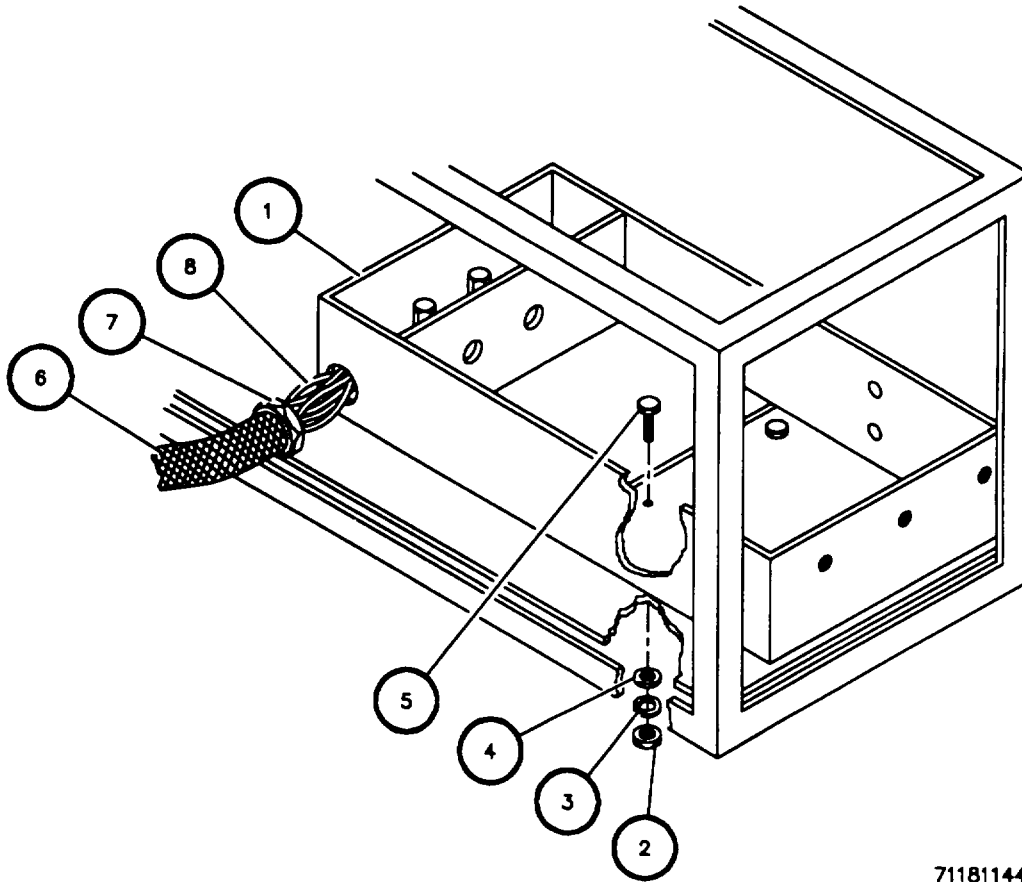
1. Working at rack A5, remove two screws (1), lockwashers (2), washers (3), and power filter panel (4).
2. Remove four screws (5) and washers (6) and rack A5 top cover (7).



711B1143

8-21. REPLACE OPN SHELTER MAIN POWER FILTER ASSEMBLY - Continued

3. Working under power filter assembly (1), remove four nuts (2), lockwashers (3), washers (4), and bolts (5).
4. Position power filter assembly (1) to access conduit (6).
5. Loosen jamnut (7).
6. Pull conduit (6) and cabling (8) from power filter assembly (1).
7. Remove power filter assembly (1).



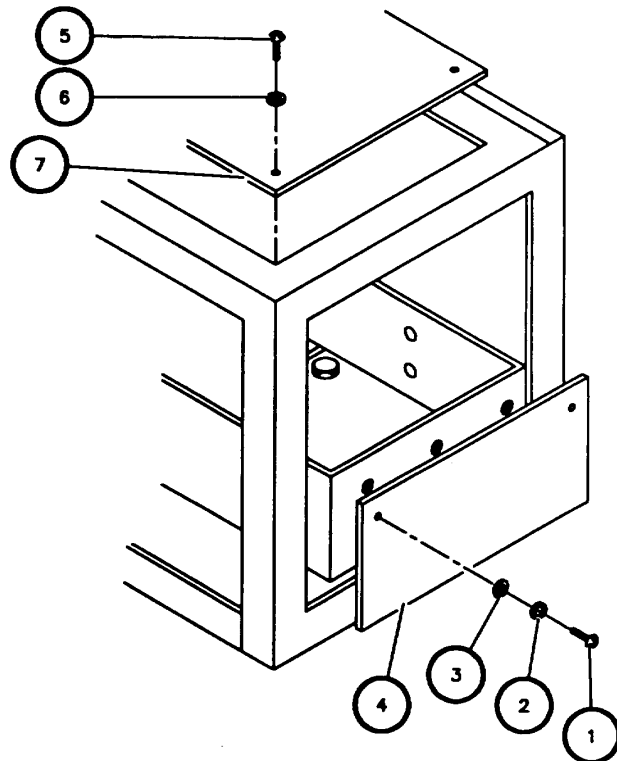
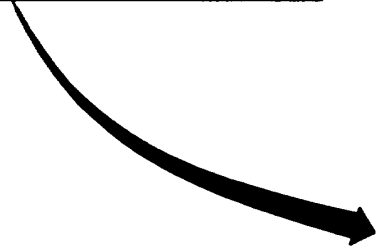
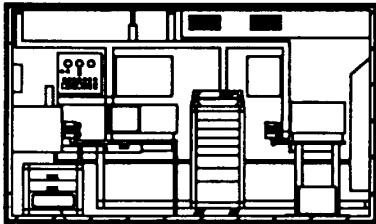
71181144

INSTALLATION

1. Place power filter assembly (1) in installed position.
2. Working at left side of rack A5, route cabling (8) into power filter assembly (1).
3. Attach conduit (6) to power filter assembly (1) and tighten jamnut (7).
4. Working under power filter assembly (1), installed four nuts (2), lockwashers (3), washers (4), and bolts (5).

8-21. REPLACE OPN SHELTER MAIN POWER FILTER ASSEMBLY- Continued

5. Place power filter assembly (4) in installed position.
6. Install two screws (1), lockwashers (2), and washers (3).
7. Place rack A5 top cover (7) in installed position.
8. Install four screws (5) and washers (6).



71181143

FOLLOW-ON MAINTENANCE: Install four main filter assembly filter modules (para 8-22).

8-22. REPLACE MAIN POWER FILTER ASSEMBLY FILTER MODULES

This task covers: a. Removal

b. Installation

INITIAL SETUP**General Safety Precautions:****WARNING**

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

NOTE

Replace ADP and OPN shelter filter modules FL1-FL4 the same way, except where noted. ADP shelter filter module FL1 is shown.

Preliminary Procedures:

1. If working on ADP shelter, remove UPS control assembly (para 7-8).
2. If working on OPN shelter, remove two drawers from rack A5. Refer to TM 11-5895-1392-12.

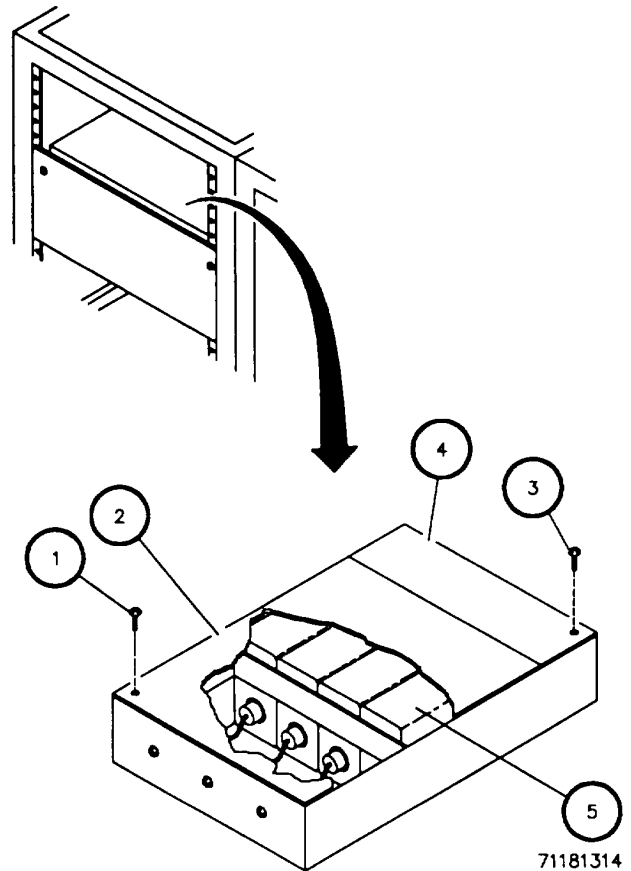
REMOVAL

1. Working at power filter top cover, remove 14 screws (1) from large cover plate (2) and 16 screws (3) from small cover plate (4).

WARNING

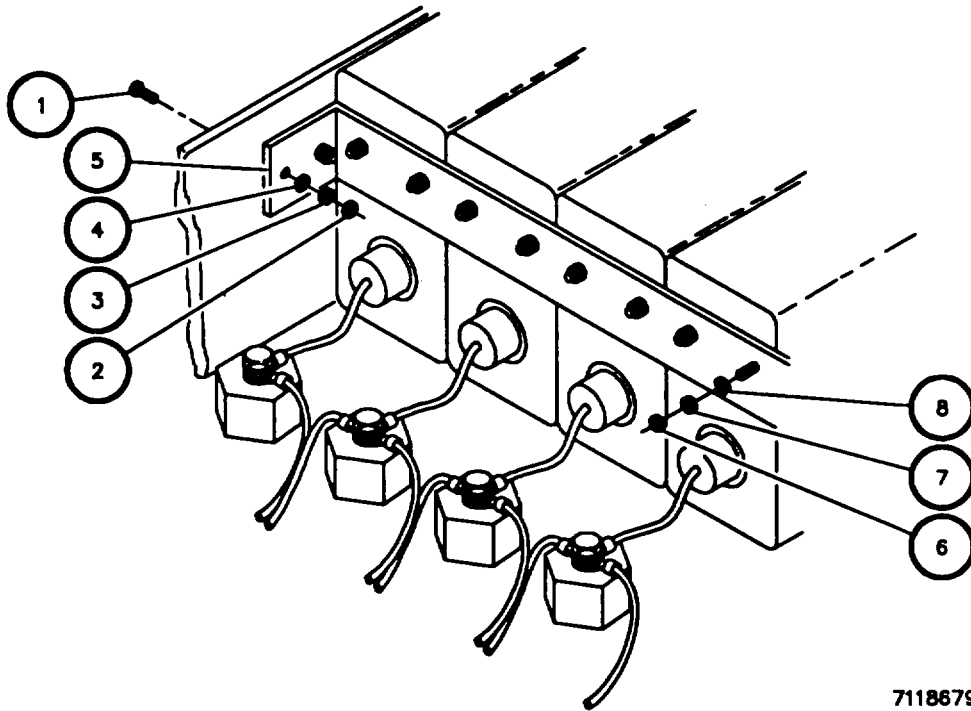
HIGH VOLTAGES ARE PRESENT IN THE INPUT POWER FILTER ASSEMBLY EVEN WHEN POWER IS OFF. Avoid touching filter modules until they have been safely grounded. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

2. Remove large cover plate (2) and small cover plate (4).
3. Discharge filter modules FL1-FL4 (5) by shorting filter module terminals to chassis.



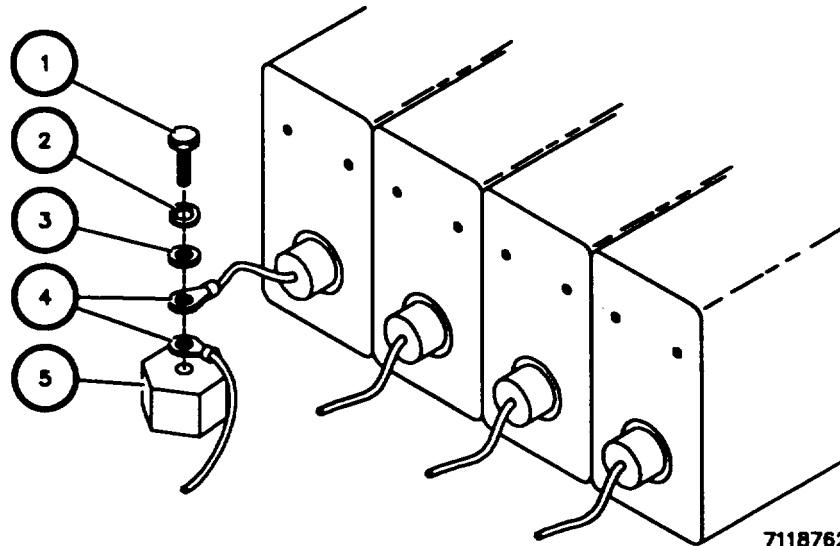
8-22. REPLACE MAIN POWER FILTER ASSEMBLY FILTER MODULES - Continued

4. Remove two screws (1), nuts (2), lockwashers (3), and washers (4) from both right and left ends of retainer (5) (left side shown).
5. Remove eight nuts (6), lockwashers (7), and washers (8).
6. Remove retainer (5).



7118679

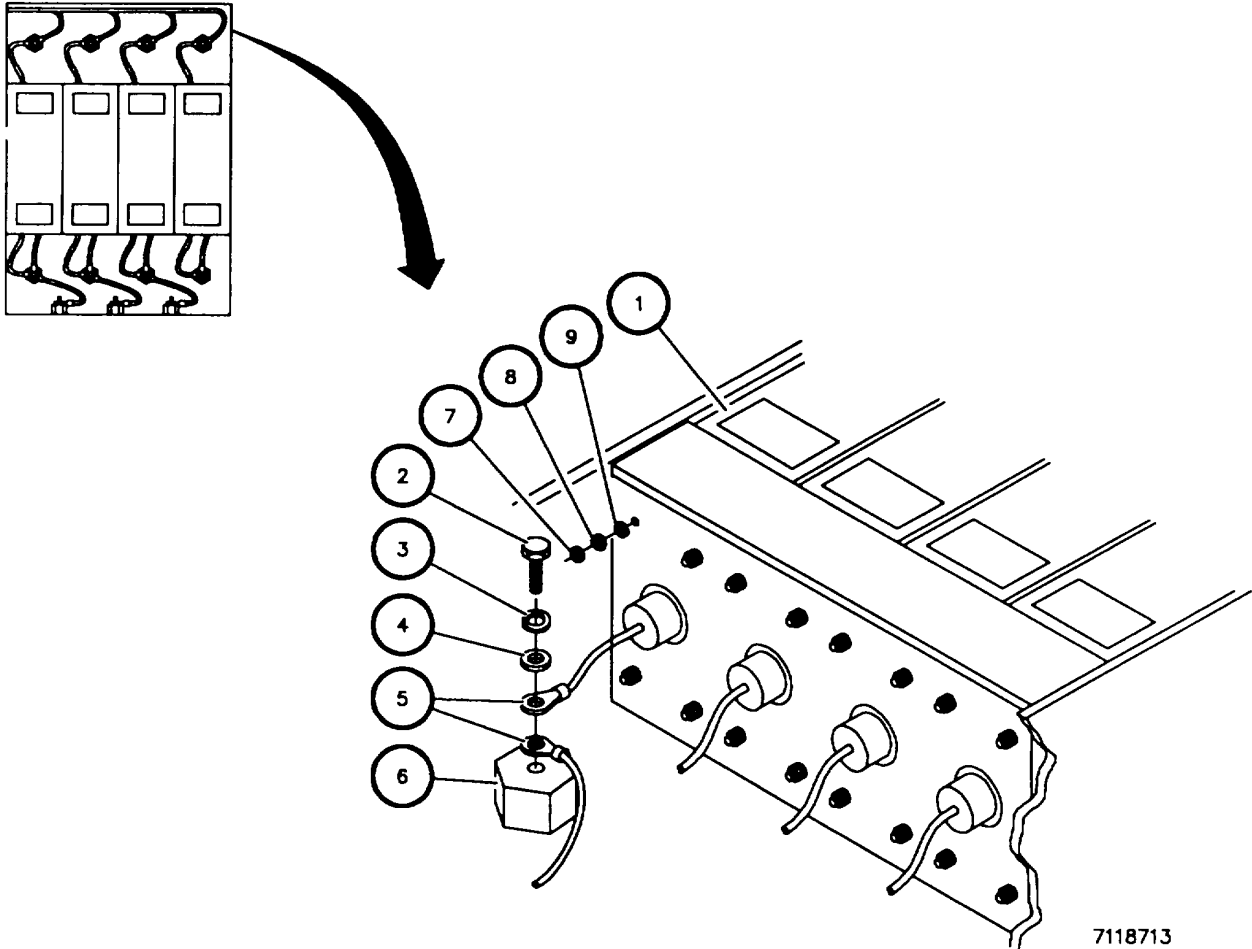
7. Remove bolt (1), lockwasher (2), washer (3), and all cables (4) from terminal (5). Tag cables (4).



7118762

8-22. REPLACE MAIN POWER FILTER ASSEMBLY FILTER MODULES - Continued

8. Working at rear of filter module (1), remove bolt (2), lockwasher (3), washer (4), and all cables (5) from terminal (6). Tag cables (5).
9. Remove four nuts (7), lockwashers (8), and washers (9).
10. Remove filter module (1).



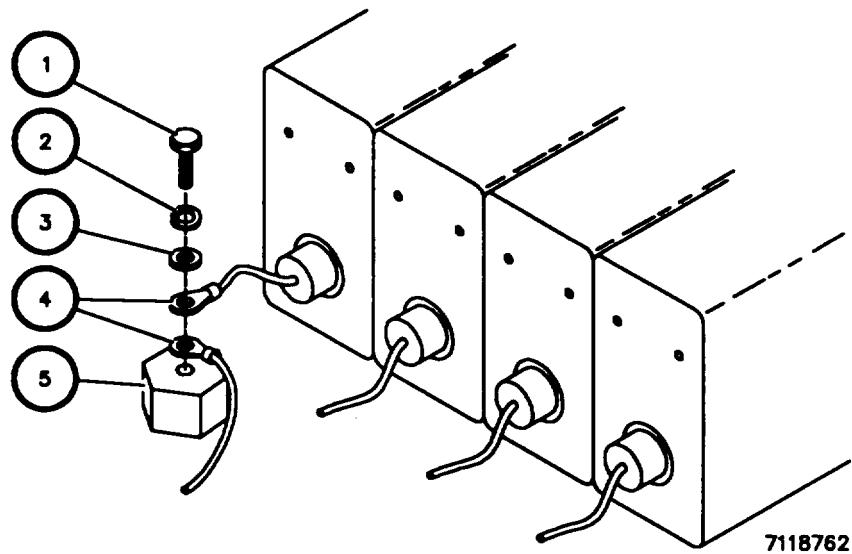
7118713

INSTALLATION

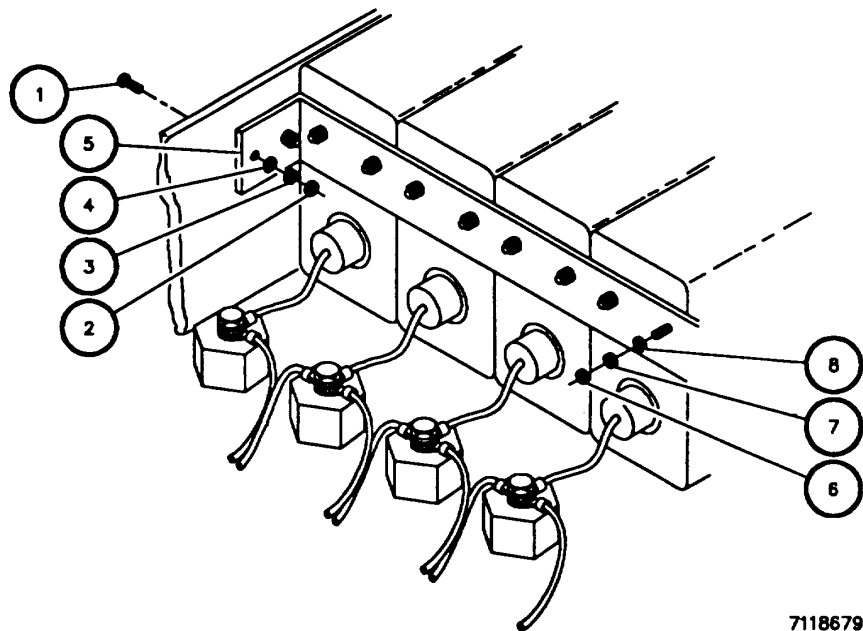
1. Place filter module (1) in installed position.
2. Working at rear of filter module (1), install four nuts (7), lockwashers (8), and washers- (9).
3. Install bolt (2), lockwasher (3), washer (4), and all cables (5), as tagged, to terminal (6). Remove tags.

8-22. REPLACE MAIN POWER FILTER ASSEMBLY FILTER MODULES - Continued

4. Working at front of filter module, install bolt (1), lockwasher (2), washer (3), and all cables (4), as tagged, to terminal (5). Remove tags.

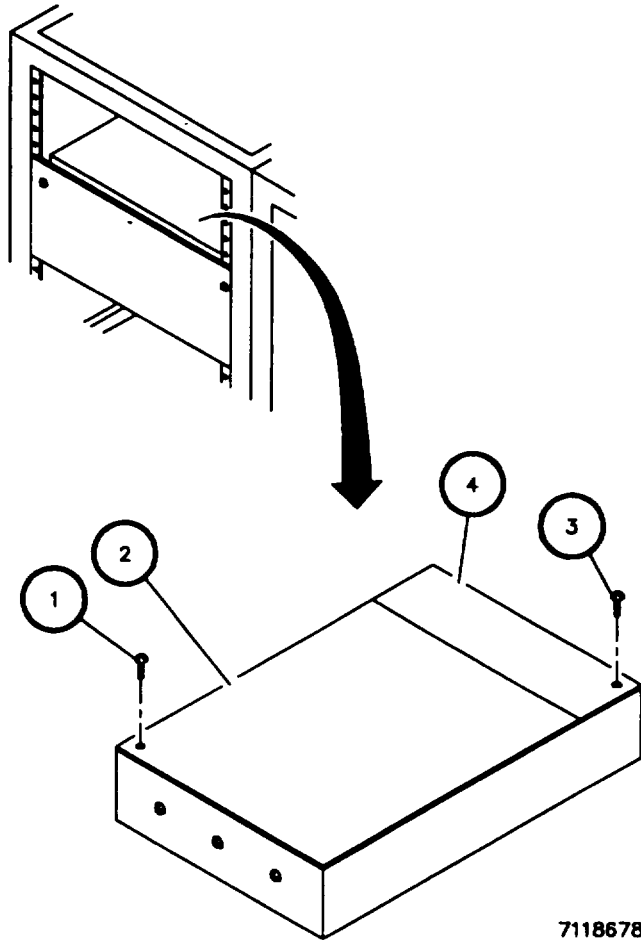


5. Place retainer (5) in installed position.
6. Install two screws (1), nuts (2), lockwashers (3), and washers (4) at both right and left ends of retainer (5) (left side shown).
7. install eight nuts (6), lockwashers (7), and washers (8).



8-22. REPLACE MAIN POWER FILTER ASSEMBLY FILTER MODULES - Continued

8. Place large cover plate (2) and small cover plate (4) in installed position.
9. Install 14 screws (1) in large cover plate (2) and 16 screws (3) in small cover plate (4).

**FOLLOW-ON MAINTENANCE:**

1. If working on ADP shelter, install UPS control assembly (para 7-8).
2. If working on OPN shelter, install two drawers in rack A5. Refer to TM 11-5895-1392-12.

8-23. OPEN/CLOSE PDU FRONT PANEL

This task covers: a. Open b. Close

INITIAL SETUP

General Safety Precautions:

WARNING

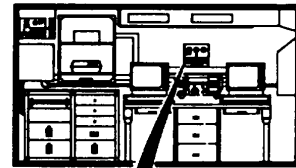
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

Preliminary Procedures:

1. Perform normal system shutdown. Refer to TM 11-5895-1392-12.
2. Shut off power source and disconnect power cable from PEP PRIMARY INPUT connector J1. Refer to TM 11-5895-1392-12.

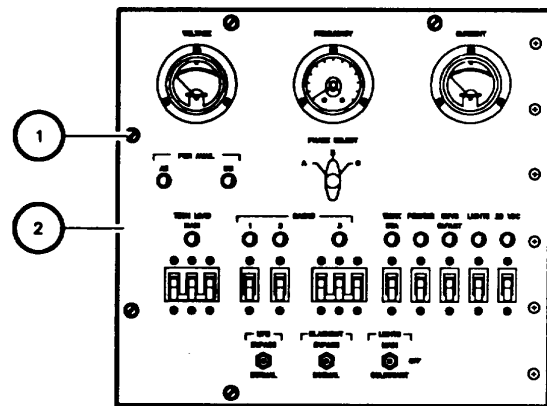
OPEN

1. Loosen six captive screws (1).
2. Open PDU front panel (2).



CLOSE

1. Close PDU front panel (2).
2. Tighten six captive screws (1).



7118680

8-24. REMOVE/INSTALL PDU FRONT-PANEL PROTECTIVE GUARD

This task covers: a. Removal

b. Installation

INITIAL SETUP

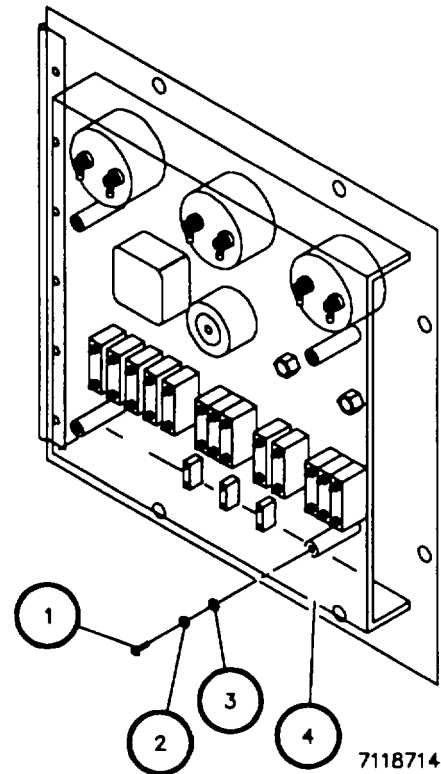
Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Open PDU front panel (para 8-23).

REMOVAL**CAUTION**

Front panel protective cover can be easily damaged by rough handling. Mounting screws may also damage cover if installed too tightly.

1. Working inside front panel, remove four screws (1), lockwashers (2), and washers (3).
2. Carefully remove protective cover (4).

**INSTALLATION**

1. Carefully place protective cover (4) in installed position.
2. Install four screws (1), lockwashers (2), and washers (3), ensuring that screws are tightened only as required to collapse lockwasher.

FOLLOW-ON MAINTENANCE: Close PDU front panel (para 8-23).

8-25. REPLACE PDU AC-DC CONVERTER PS1

This task covers: a. Removal

b. Installation

INITIAL SETUP

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

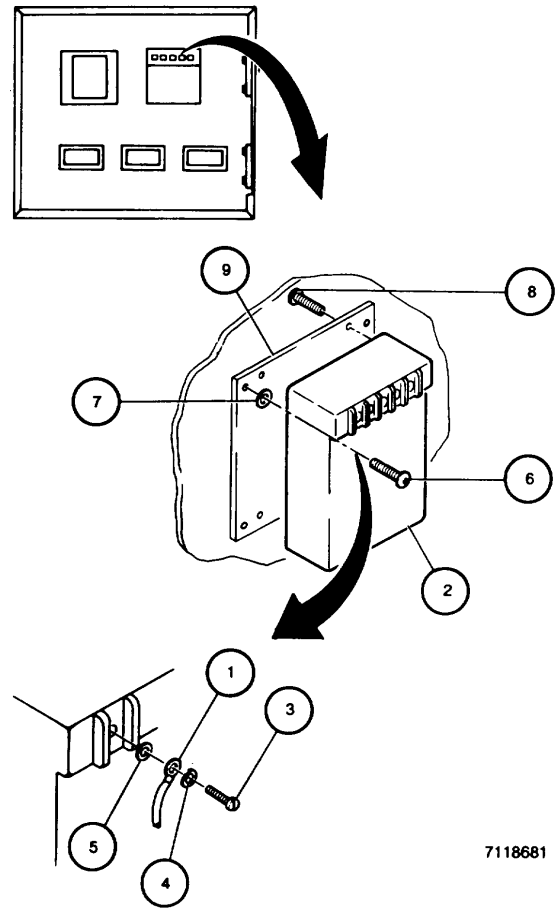
Preliminary Procedure: Open PDU front panel (para 8-23).

REMOVAL

1. Tag four wires (1) connected to PS1 (2).
2. Remove four screws (3), lockwashers (4), washers (5). And wires (1).
3. Remove four screws (6) and washers (7).
4. Remove PS1 (2).
5. Remove four screws (8) and mounting plate (9) from PS1 (2).

INSTALLATION

1. Install mounting plate (9) on PS1 (2) using four screws (8).
2. Place PS1 (2) in installed position.
3. Install four screws (6) and washers (7).
4. Install four wires (1) to PS1 (2) as tagged, using four screws (3), lockwashers (4), and washers (5). Remove tags.



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FOLLOW-ON MAINTENANCE: Close PDU front panel (para 8-23).

8-26. REPLACE PDU DC-DC CONVERTER PS2**This task covers:** a. Removal

b. Installation

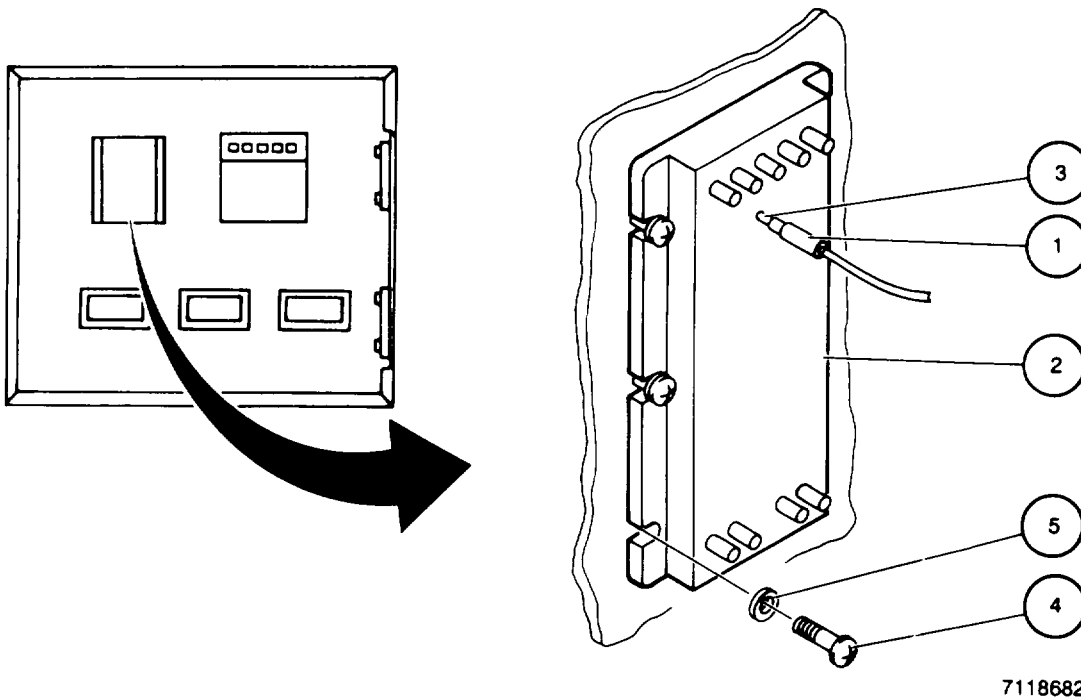
INITIAL SETUP

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Open PDU front panel (para 8-23).

REMOVAL

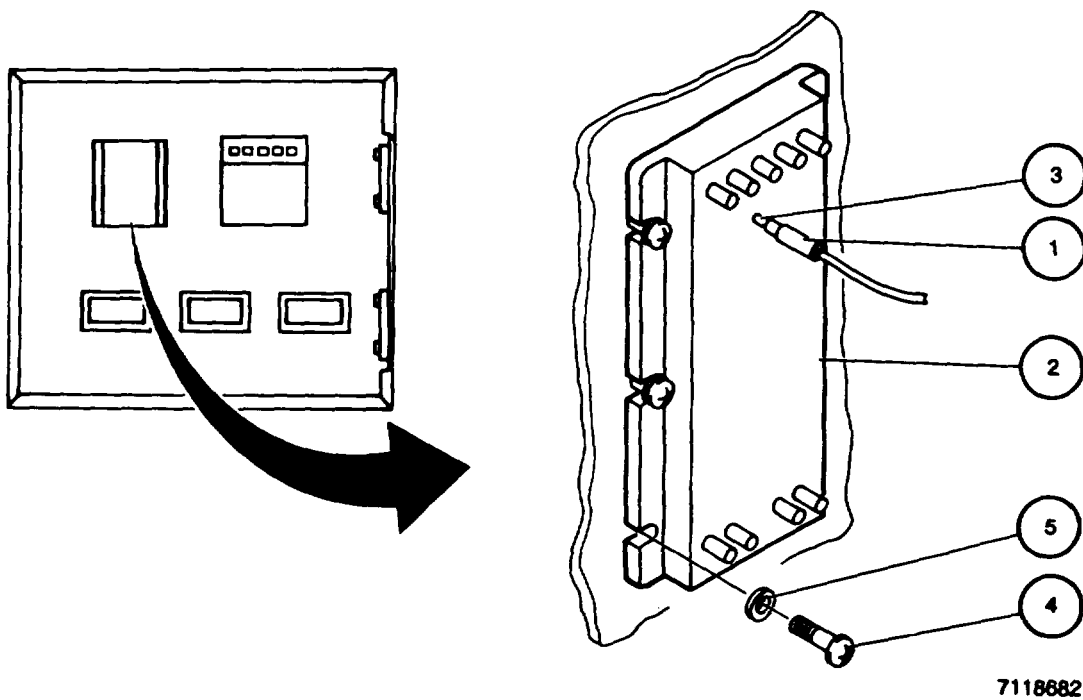
1. Remove insulation sleeving (1) from wires (3) connected to PS2 (2).
2. Tag, unsolder, and remove five wires (3).
3. Remove six screws (4) and washers (5).
4. Remove PS2 (2).



7118682

8-26. REPLACE PDU DC-DC CONVERTER PS2 - Continued**INSTALLATION**

1. Place PS2 (2) in installed position.
2. Install six screws (4) and washers (5).
3. Form and dress five wires (3).
4. Position new insulation sleeving (1) on five wires (3) so that wire ends are exposed for soldering.
5. Solder five wires (3) to PS2 (2) as tagged. Remove tags.
6. Position and shrink insulation sleeving (1).



FOLLOW-ON MAINTENANCE: Close PDU front panel (para 8-23).

8-27. REPLACE PDU AC CURRENT TRANSFORMERS CT1-CT3

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

Replace current transformers CT1-CT3 the same way, except where noted. CT1 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

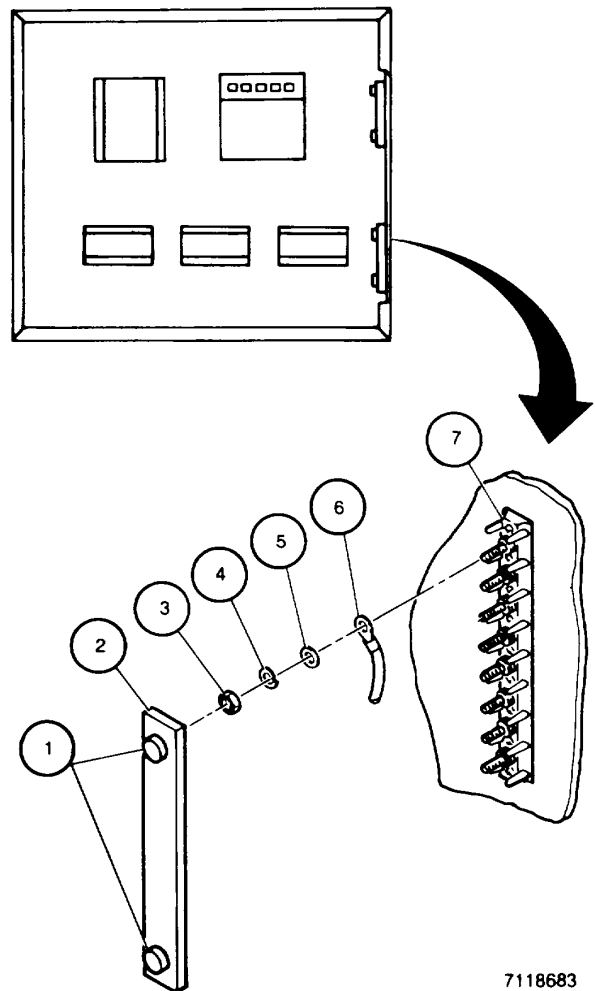
Preliminary Procedure: Open PDU front panel (para 8-23).

REMOVAL

1. Working at TB1, loosen two captive fasteners (1).
2. Remove terminal board cover (2).

NOTE

- If working on CT1, remove W405E12-0 from terminal TB1-6.
 - If working on CT2, remove W488E12-2 from terminal TB1-7.
 - If working on CT3, remove W489E12-6 from terminal TB1-8.
3. Remove nut (3), lockwasher (4), washer (5), and wire (6) from required TB1 terminal (7).



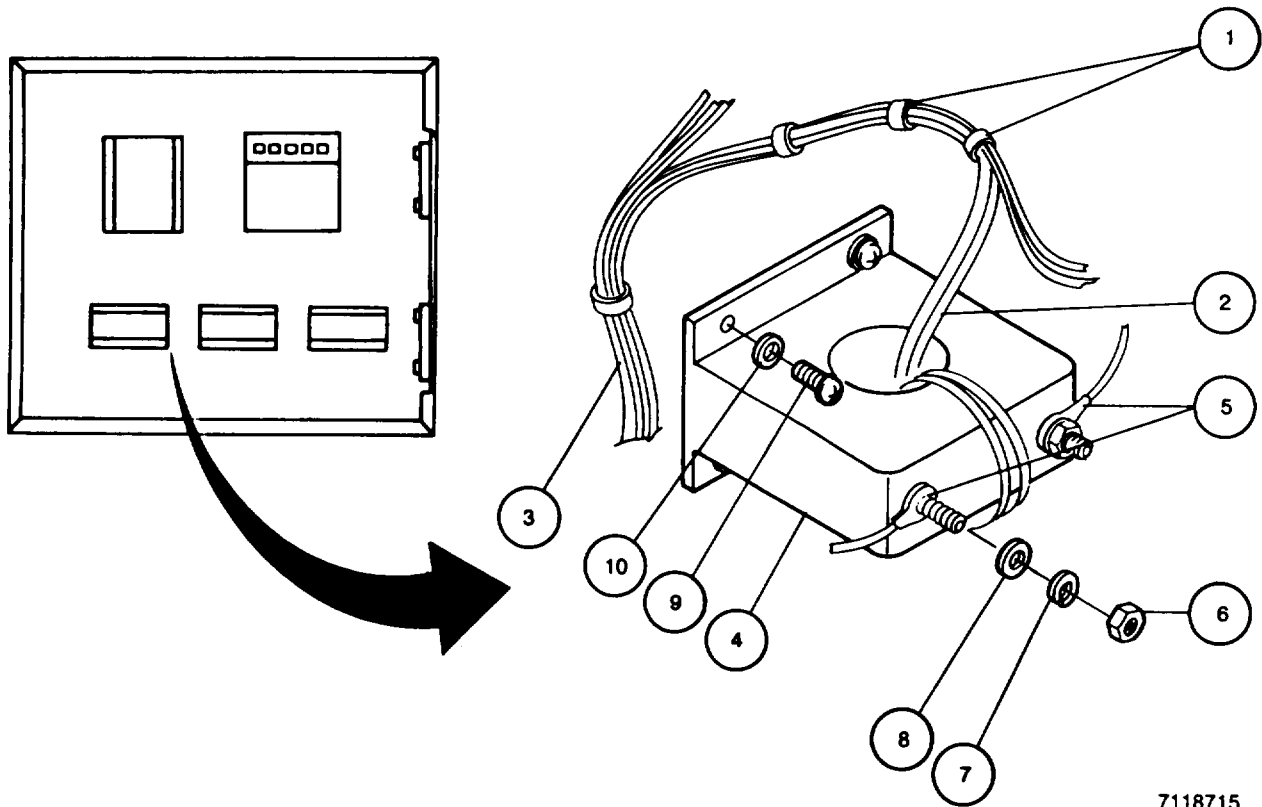
7118683

8-27. REPLACE PDU AC CURRENT TRANSFORMERS CT1-CT3 - Continued

NOTE

Note and record location and number of cable ties removed to aid installation.

4. Cut and remove cable ties (1), as required, to remove wire (2) from wiring harness (3) and current transformer (4) being replaced (CT1 shown).
5. Remove wire (2) from current transformer (4).
6. Tag all wires (5) connected to current transformer (4).
7. Remove two nuts (6), lockwashers (7), and washers (8) and all wires (5) from current transformer (4).
8. Remove four screws (9) and washers (10).
9. Remove current transformer (4).

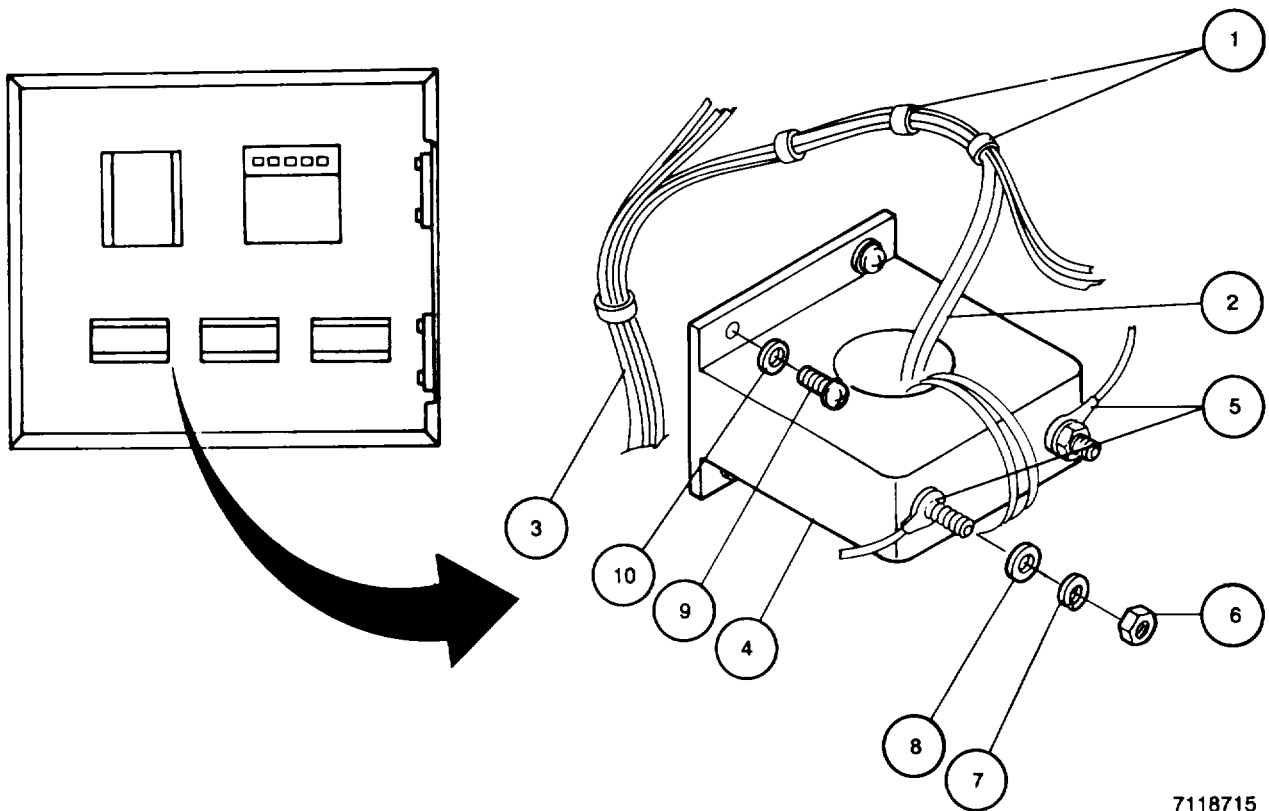


7118715

8-27. REPLACE PDU AC CURRENT TRANSFORMERS CT1-T3 - Continued

INSTALLATION

1. Place current transformer (4) in installed position.
2. Install four screws (9) and washers (10).
3. Install all wires (5) to current transformer (4) as tagged, using two nuts (6), lockwashers (7), and washers (8).
4. Wrap wire (2) around current transformer (4) twice and route along wiring harness (3) toward TB1.
5. Install cable ties (1) as noted during removal.

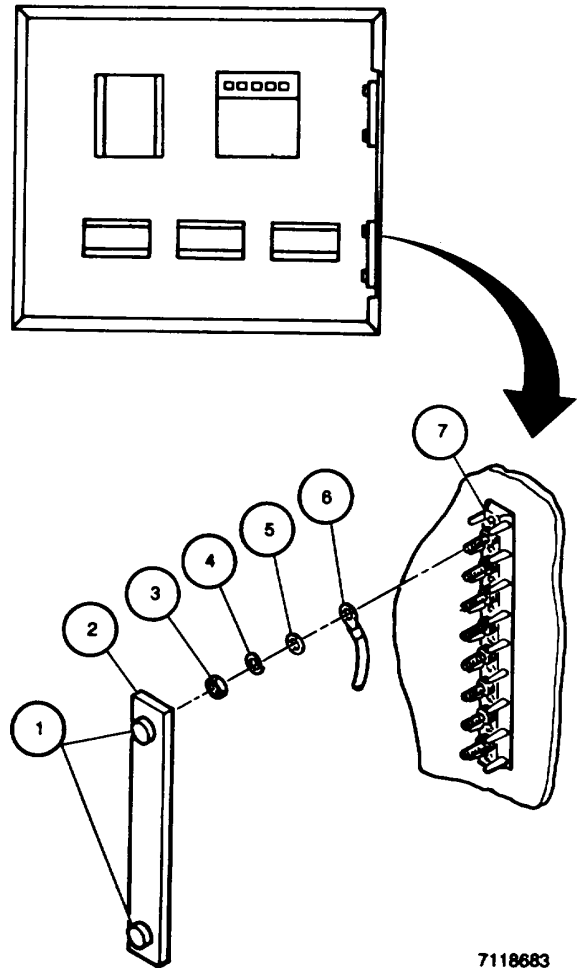


7118715

8-27. REPLACE PDU AC CURRENT TRANSFORMERS CT1-CT3 - Continued

NOTE

- If working on CT1, install W405E12-0 on terminal TB1-6.
 - If working on CT2, install W488E12-2 on terminal TB1-7.
 - If working on CT3, install W489E12-6 on terminal TB1-8.
6. Working at TB1, install wire (6) to TB1 terminal (7) as tagged, using nut (3), lockwasher (4), and washer (5).
 7. Place terminal board cover (2) in installed position.
 8. Tighten two captive fasteners (1).



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FOLLOW-ON MAINTENANCE: Close PDU front panel (para 8-23).

8-28. REPLACE PDU METERS M1-M3

This task covers:

a. Removal

b. Installation

INITIAL SETUP**NOTE**

Replace meters M1-M3 the same way, except where noted. M3 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

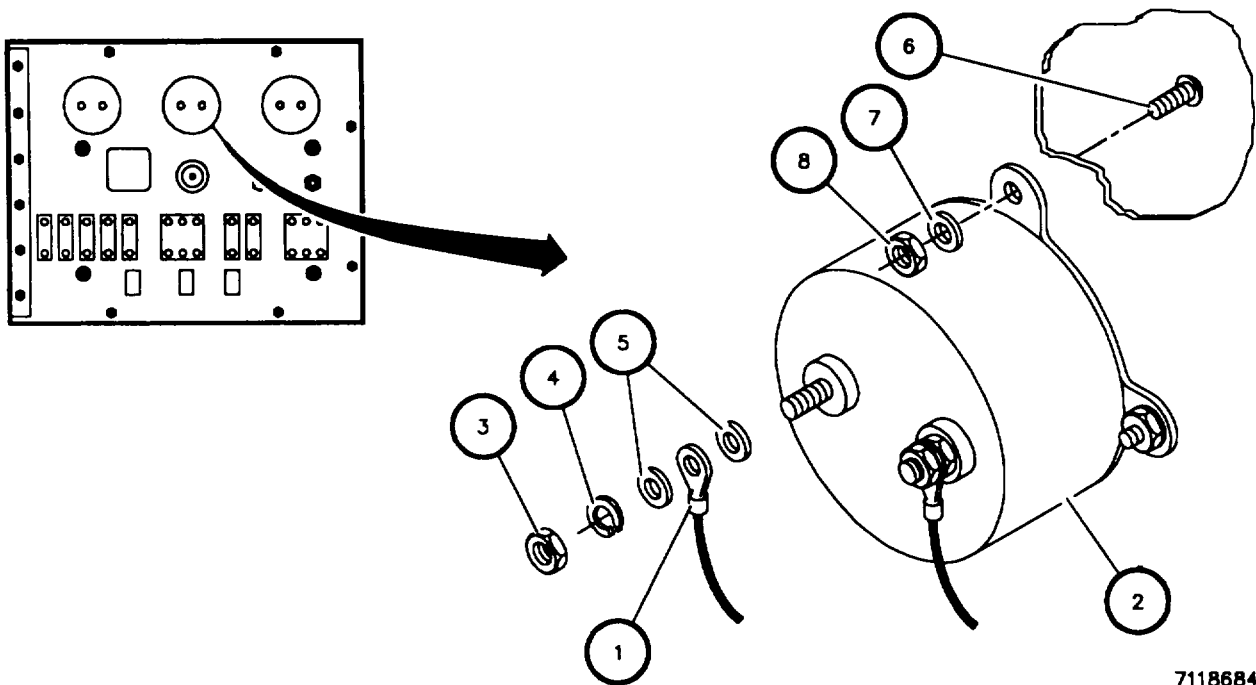
Preliminary Procedure: Remove PDU front panel protective guard (para 8-24).

REMOVAL

1. Tag all wires (1) connected to meter (2).
2. Remove two nuts (3) and lockwashers (4), four washers (5), and all wires (1) from meter (2).
3. Remove three screws (6), washers (7), and locknuts (8).
4. Remove meter (2).

NOTE

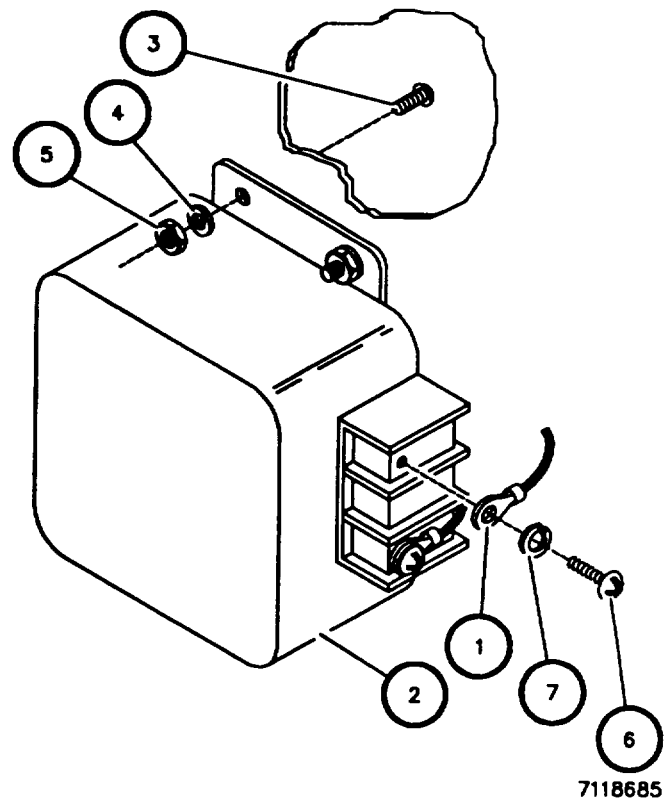
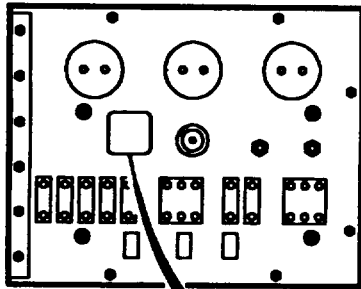
Meter M3 and frequency transducer are replaced as a set. If working on M3, proceed to step 5.



7118684

8-28. REPLACE PDU METERS M1-M3 - Continued

5. Tag five wires (1) connected to frequency transducer (2).
6. Remove six screws (3), washers (4), and locknuts (5).
7. Remove frequency transducer (2) and position to access five wires (1).
8. Remove four screws (6) and lockwashers (7) and five wires (1). Remove frequency transducer (2).

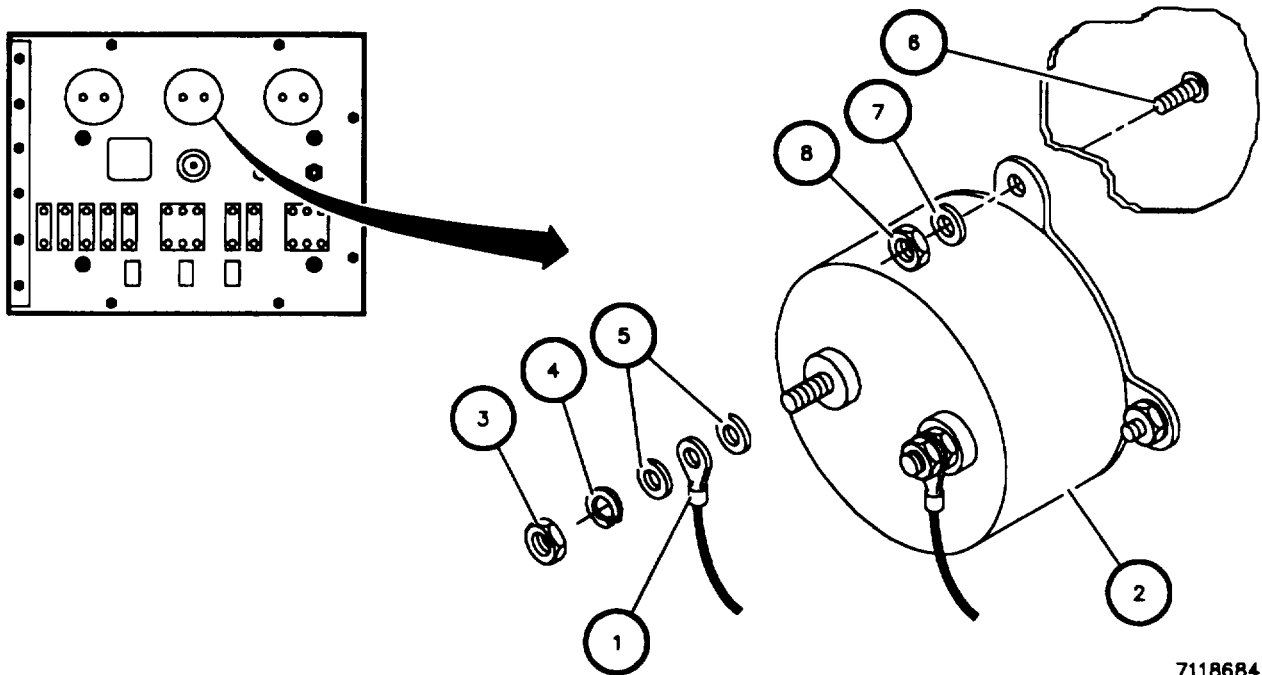
**INSTALLATION****NOTE**

If working on meters M2 or M3, go to step 4.

1. Install five wires (1) to frequency transducer (2) as tagged, using four screws (6) and lockwashers (7). Remove tags.
2. Place frequency transducer (2) in installed position.
3. Install six screws (3), washers (4), and locknuts (5).

8-28. REPLACE PDU METERS M1-M3 - Continued

4. Place meter (2) in installed position.
5. Install three screws (6), washers (7), and locknuts (8).
6. Install all wires (1) to meter (2) as tagged, using two nuts (3) and lockwashers (4) and four washers (5). Remove tags.



7118684

FOLLOW-ON MAINTENANCE: Install PDU front panel protective guard (para 8-24).

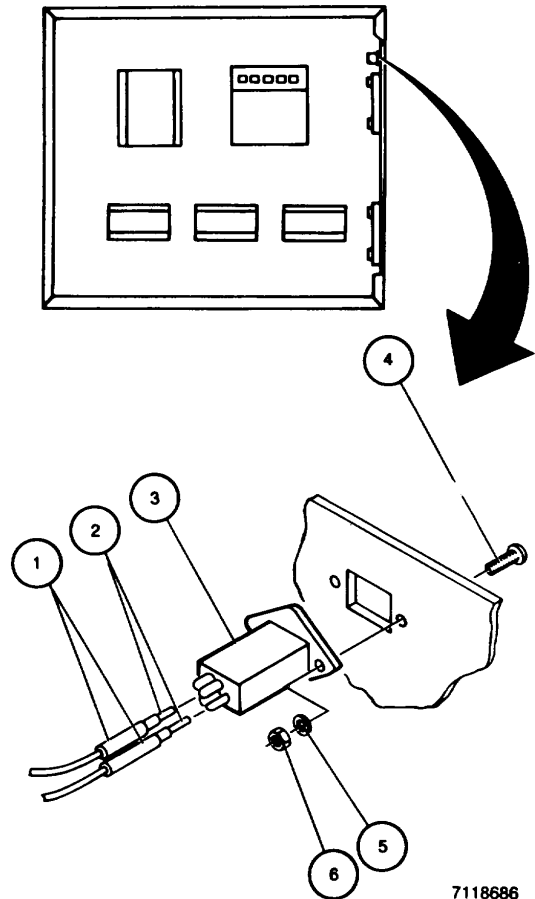
8-29. REPLACE PDU METER M4**This task covers:****a. Removal****b. Installation****INITIAL SETUP**

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Open PDU front panel (para 8-23).

REMOVAL

1. Remove insulation sleeving (1) from two wires (2).
2. Tag, unsolder, and remove two wires (2) from meter (3).
3. Remove two screws (4), washers (5), and locknuts (6).
4. Remove meter (3).

**INSTALLATION**

1. Place meter (3) in installed position.
2. Install two screws (4), washers (5), and locknuts (6).
3. Form and dress two wires (2).
4. Position new insulation sleeving (1) on two wires (2) so that wire ends are exposed for soldering.
5. Solder two wires (2) to meter (3) as tagged. Remove tags.
6. Position and shrink insulation sleeving (1).

FOLLOW-ON MAINTENANCE: Close PDU front panel (para 8-23).

8-30. REPLACE PDU SWITCH S1

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

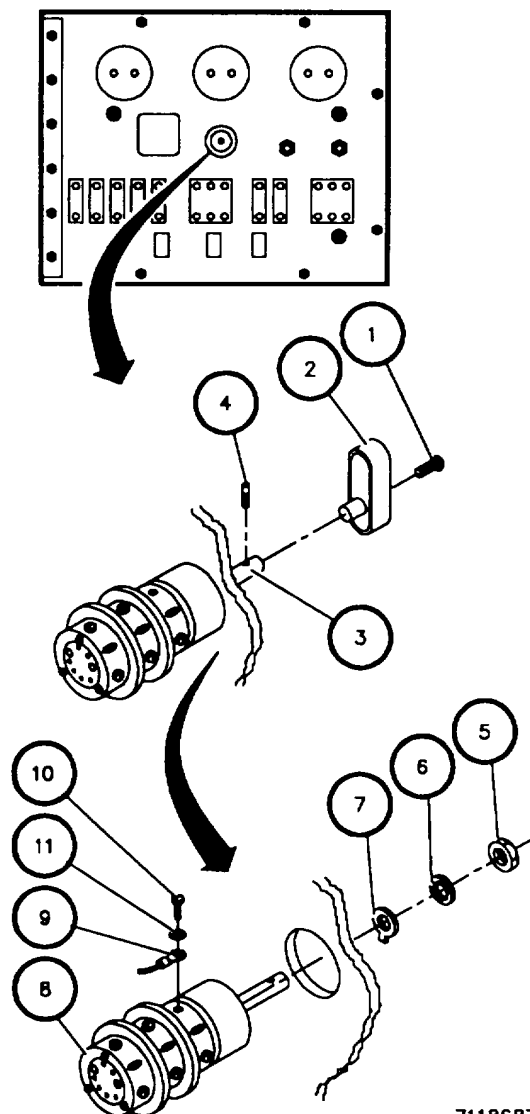
Preliminary Procedure: Remove PDU front panel protective guard (para 8-24).

REMOVAL

1. Working at outside front panel, remove screw (1) and knob (2) from shaft (3).
2. Remove threaded key (4) from shaft (3).
3. Remove nut (5), internal tooth lockwasher (6), key washer (7), and switch (8) from panel.
4. Working inside front panel, tag eight wires (9).
5. Remove eight screws (10), lockwashers (11), and wires (9) and remove switch (8).

INSTALLATION

1. Working inside front panel, install eight wires (9) to switch (8), as tagged, using eight screws (10) and lockwashers (11). Remove tags.
2. Place and hold switch (8) in installed position.
3. Working at outside front panel, install key washer (7), internal tooth lockwasher (6), and nut (5).
4. Install threaded key (4) fully into shaft (3).
5. Install knob (2) on shaft (3) and install screw (1).



7118687

FOLLOW-ON MAINTENANCE: Install PDU front panel protective guard (para 8-24).

8-31. REPLACE PDU SWITCHES 5254

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

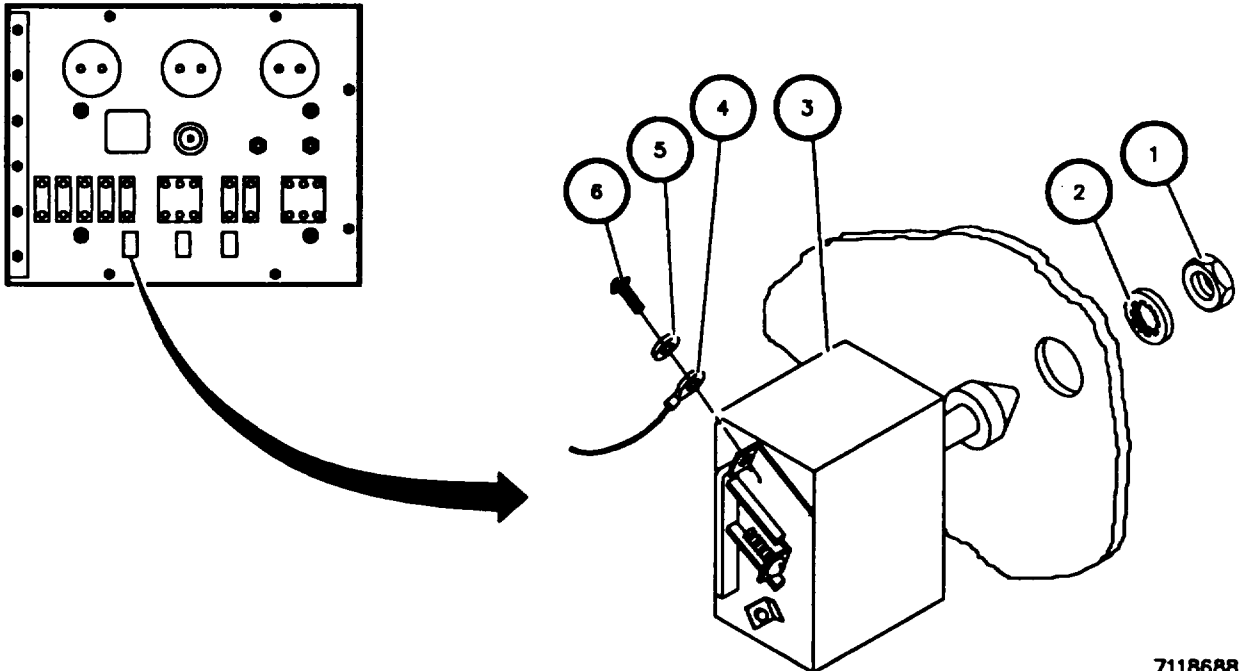
Replace switches S2-S4 the same way. Switch S2 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PDU front panel protective guard (para 8-24).

REMOVAL

1. Working at front panel, remove nut (1) and internal tooth lockwasher (2) from switch (3).
2. Position switch (3) to access wires (4).
3. Tag all wires (4) connected to switch (3).
4. Remove screws (6), lockwashers (5), and wires (4) from switch (3).
5. Remove switch (3).

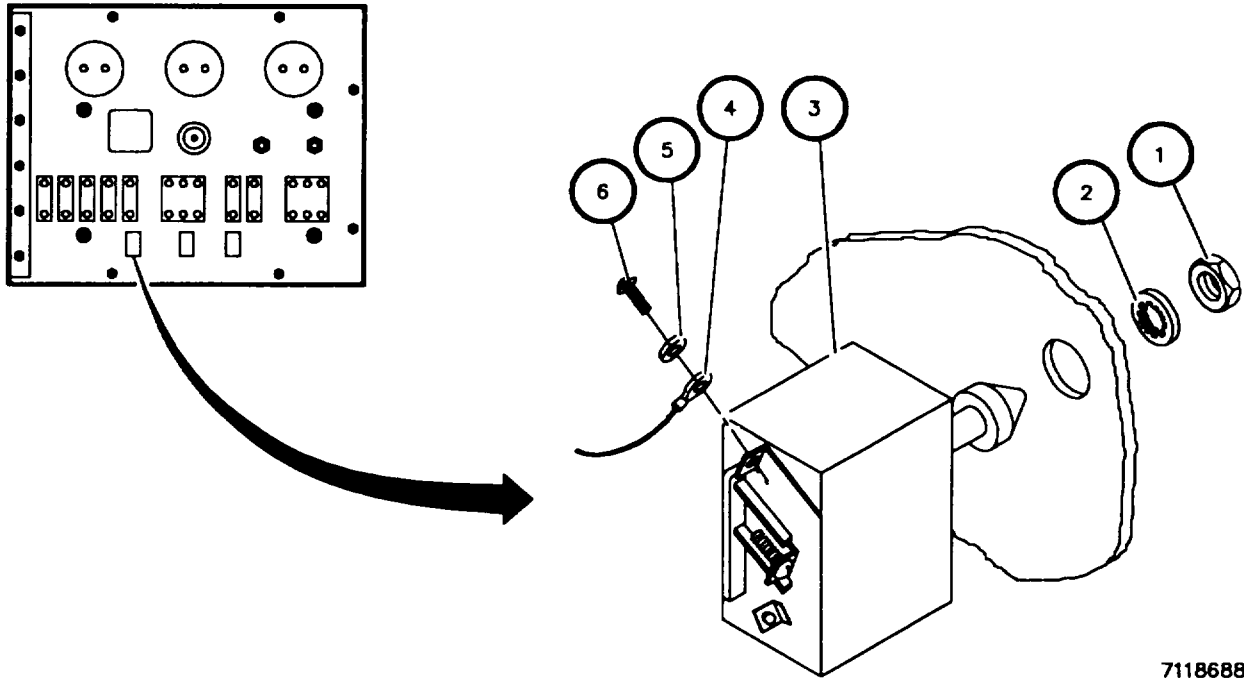


7118688

8-31. REPLACE PDU SWITCHES S2-S4 - Continued

INSTALLATION

1. Install wires (4) to switch (3) as tagged, using screws (6) and lockwashers (5), as required. Remove tags.
2. Place switch (3) in installed position.
3. Working at front panel, install nut (1) and internal tooth lockwasher (2).



7118688

FOLLOW-ON MAINTENANCE: Install PDU front panel protective guard (para 8-24).

8-32. REPLACE PDU CIRCUIT BREAKERS

NOTE

Replace ADP shelter circuit breakers CB1-CB9 and OPN shelter circuit breakers CB1-CB8 the same way, except where noted. ADP shelter CB1 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY(INPUT connector J1 disconnected.

Preliminary Procedure: Remove PDU front panel protective guard (para 8-24).

REMOVAL

1. Working inside front panel, tag all wires (1) connected to circuit breaker (2).

NOTE

- Circuit breakers CB1 and CB4 (ADP shelter) and CB1 (OPN shelter) have six screws.
- Circuit breakers CB2, CB3, and CB5-CB9 have two screws.

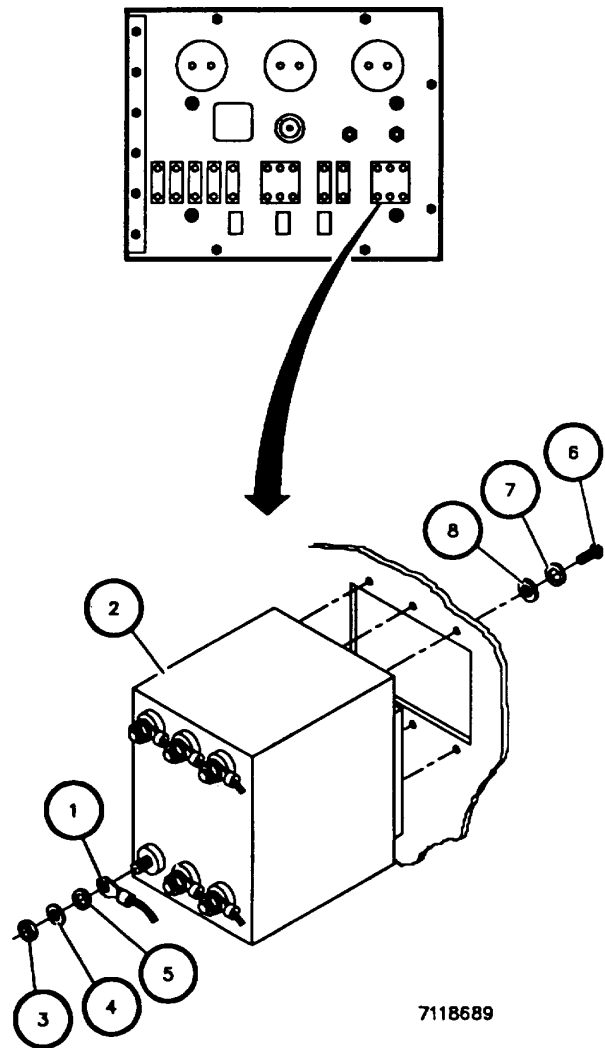
2. Remove nuts (3), lockwashers (4), washers (5), and all wires (1) from circuit breaker (2).

NOTE

- Circuit breakers CB1 and CB4 (ADP shelter) and CB1 (OPN shelter) have six screws.
- Circuit breakers CB2, CB3, and CB5-CB9 have two screws.

3. Working at front panel, remove six screws (6), lockwashers (7), and washers (8).

4. Remove circuit breaker (2).



7118689

8-32. REPLACE PDU CIRCUIT BREAKERS - Continued

INSTALLATION

1. Working at front panel, place circuit breaker (2) in installed position.

NOTE

- Circuit breakers CB1 and CB4 (ADP shelter) and CB1 (OPN shelter) have six screws.

- Circuit breakers CB2, CB3, and CB5-CB9 have two screws.

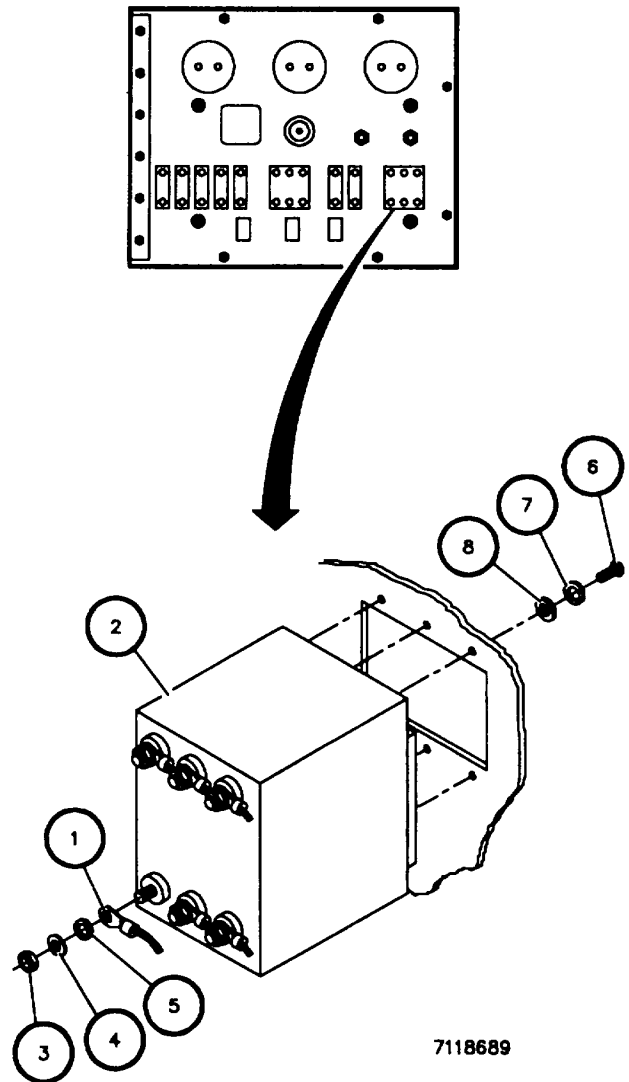
2. Install six screws (6), lockwashers (7), and washers (8).

NOTE

- Circuit breakers CB1 and CB4 (ADP shelter) and CB1 (OPN shelter) have six screws.

- Circuit breakers CB2, CB3, and CB5-CB9 have two screws.

3. Working inside front panel, install all wires (1) to circuit breaker (2) as tagged, using nuts (3), lockwashers (4), and washers (5).



7118689

FOLLOW-ON MAINTENANCE: Install PDU front panel protective guard (para 8-24).

8-33. REPLACE PDU INDICATOR HOUSINGS

This task covers: a. Removal b. Installation

INITIAL SETUP

NOTE

Replace ADP shelter indicator housing DS1-DS11 and OPN shelter indicator housing DS1-DS10 the same way, except where noted. ADP shelter DS1 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Remove PDU front panel protective guard (para 8-24).

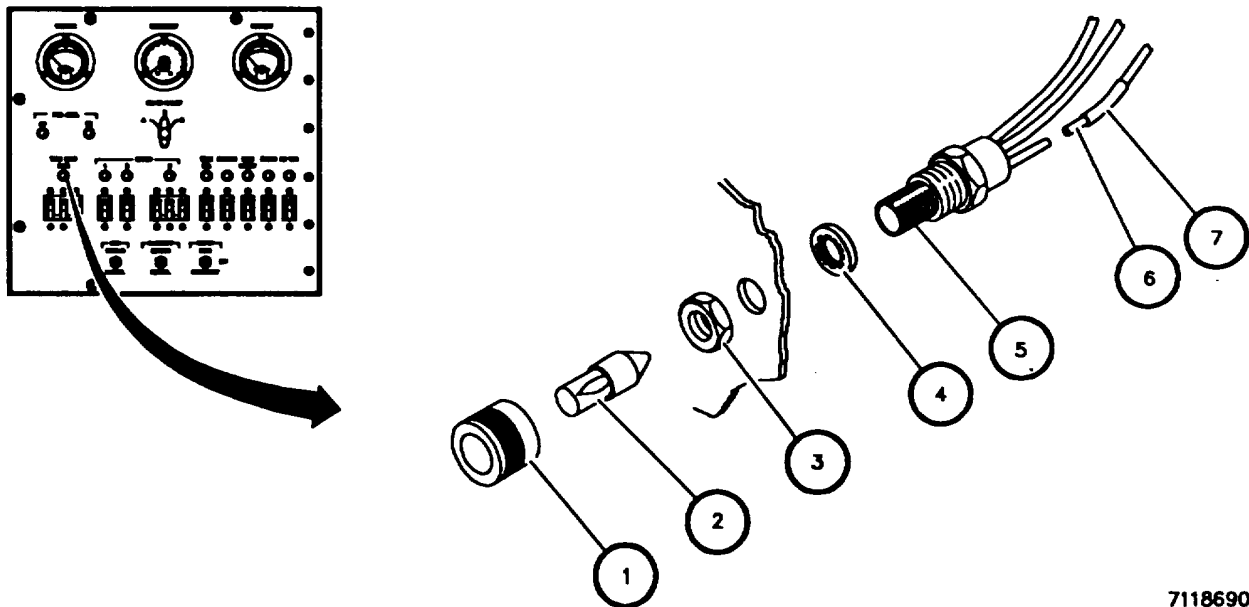
REMOVAL

1. Working at front panel, unscrew and remove indicator lens (1) and lamp (2).
2. Remove nut (3), internal tooth lockwasher (4), and indicator housing DS1 (5) from panel.
3. Position indicator housing DS1 (5) to access wires (6).
4. Remove insulation sleeving (7).

NOTE

The number of wires connected to each indicator housing may be different.

5. Tag, unsolder, and remove wires (6).
6. Remove indicator housing DS1 (5).

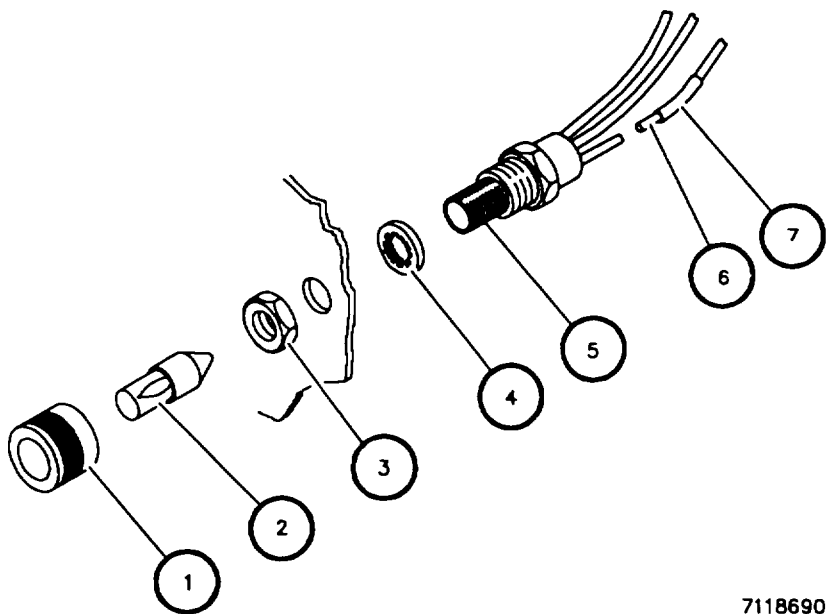
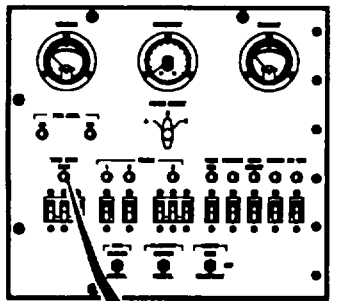


7118690

8-33. REPLACE PDU INDICATOR HOUSINGS - Continued**INSTALLATION****NOTE**

The number of wires connected to each indicator housing may be different.

1. Form and dress wires (6).
2. Position new insulation sleeving (7) on wires (6) so that wire ends are exposed for soldering.
3. Solder wires (6) to indicator housing DS1 (5) as tagged. Remove tags.
4. Position and shrink insulation sleeving (7).
5. Place internal tooth lockwasher (4) and indicator housing DS1 (5) in installed position.
6. Install nut (3), lamp (2), and indicator lens (1).



7118690

FOLLOW-ON MAINTENANCE: Install PDU front panel protective guard (para 8-24).

8-34. REPLACE PDU TERMINAL BOARD TB1 OR TB2

This task covers:

a. Removal

b. Installation

INITIAL SETUP**NOTE**

Replace terminal boards TB1 and TB2 the same way. TB1 is shown.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

Preliminary Procedure: Open PDU front panel (para 8-23).

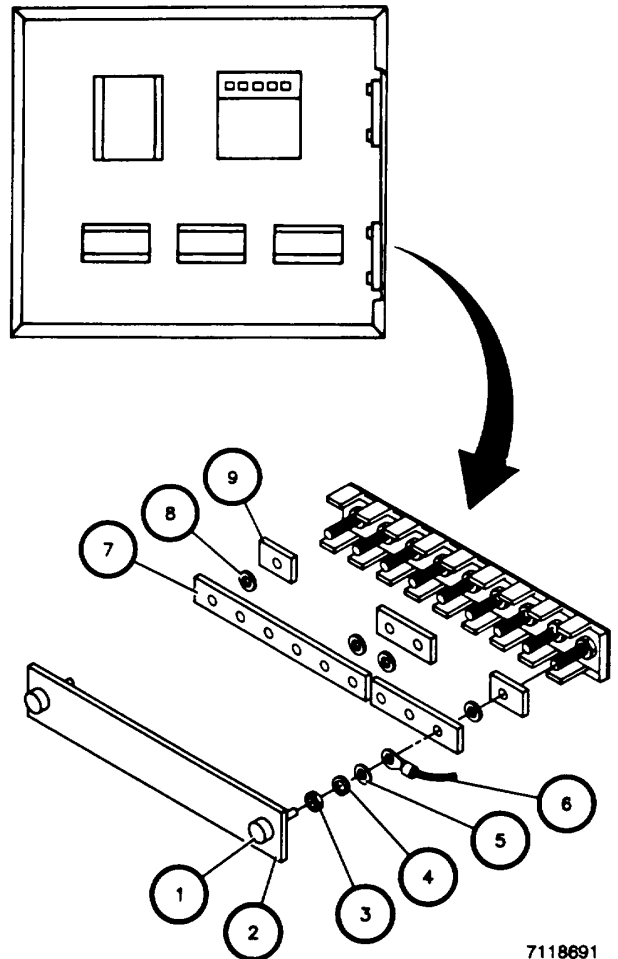
REMOVAL

1. Working inside right panel, loosen two captive fasteners (1).
2. Remove terminal board cover (2).
3. Remove eight nuts (3), lockwashers (4), and washers (5).

NOTE

Note and record number and location of cables, bus bars, and insulators removed in step 4 to aid installation.

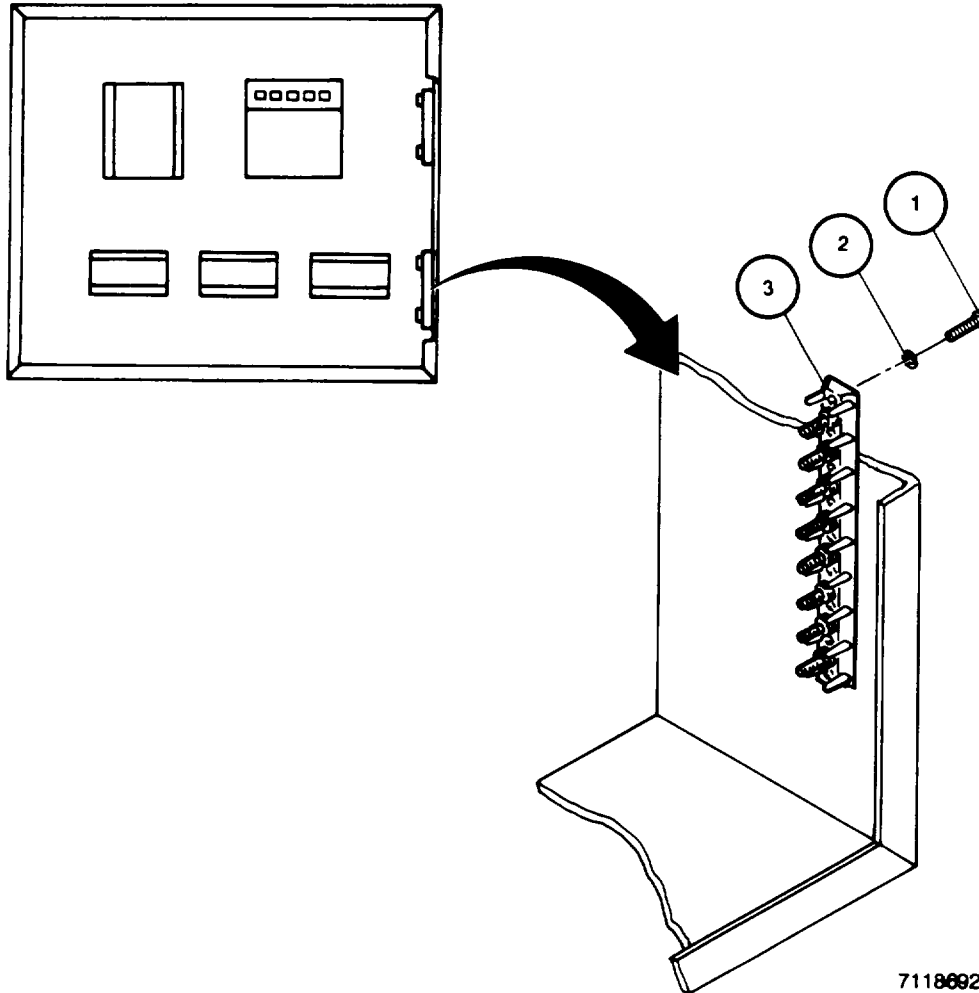
4. Tag and remove cables (6), bus bars (7), washers (8), and insulators (9).



7118691

834. REPLACE PDU TERMINAL BOARD TB1 OR TB2 - Continued

5. Remove two screws (1) and lockwashers (2).
6. Remove terminal board (3).



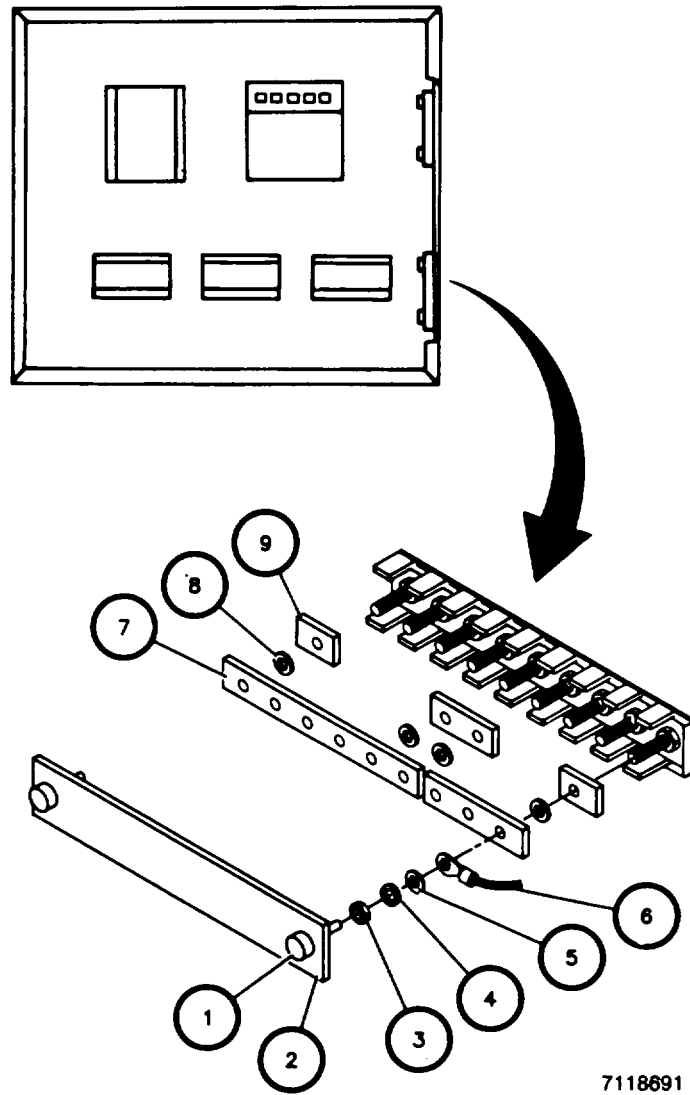
7118692

INSTALLATION

1. Place terminal board (3) in installed position.
2. Install two screws (1) and lockwashers (2).

134. REPLACE PDU TERMINAL BOARD TB1 OR TB2 - Continued

3. Install cables (6), bus bars (7), washers (8), and insulators (9) as noted and tagged during removal, using eight nuts (3), lockwashers (4), and washers (5). Remove tags.
4. Place terminal board cover (2) in installed position.
5. Tighten two captive fasteners (1).



7118691

FOLLOW-ON MAINTENANCE: Close PDU front panel (para 8-23).

8-35. REPLACE MAIN LIGHT ASSEMBLY

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precautions:**WARNING**

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

NOTE

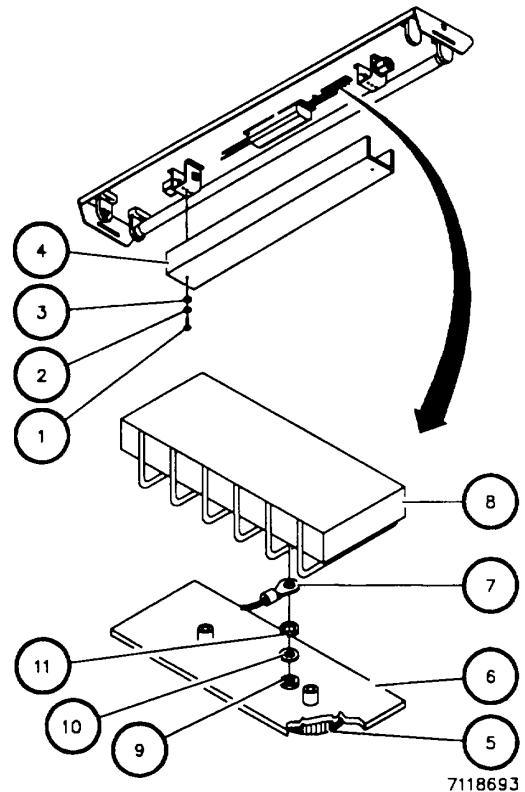
There are two main light assemblies in the shelter. Replace both assemblies the same way. Assembly shown is typical.

Equipment Condition: PDU LIGHTS circuit breaker set to OFF.

Preliminary Procedure: Remove main light assembly fluorescent and incandescent lamps. Refer to TM 11-5895-1392-12.

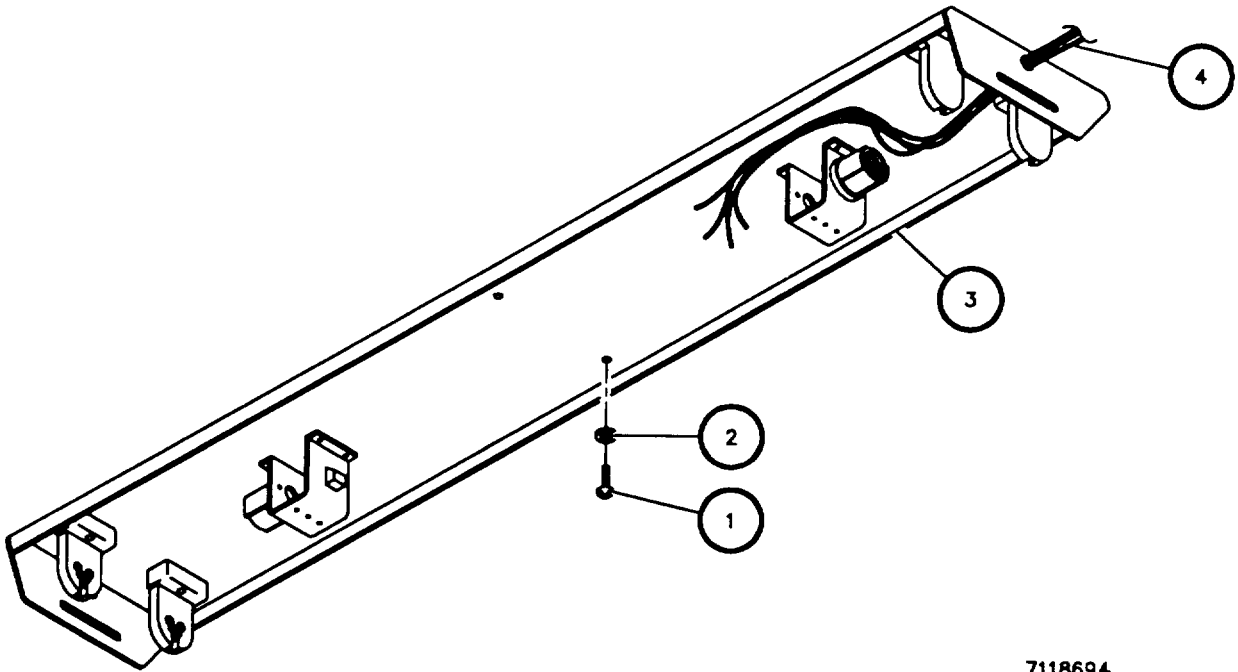
REMOVAL

1. Remove two screws (1), washers (2), and lockwashers (3).
2. Remove ballast cover (4).
3. Loosen two captive screws (5).
4. Remove terminal board cover (6).
5. Tag all wires (7) connected to TB1 (8).
6. Remove five nuts (9), lockwashers (10), and washers (11) and all wires (7) from TB1 (8).



8-35. REPLACE MAIN LIGHT ASSEMBLY- Continued

7. Remove six screws (1) and washers (2).
8. Remove light assembly (3), routing wiring harness (4) from assembly.



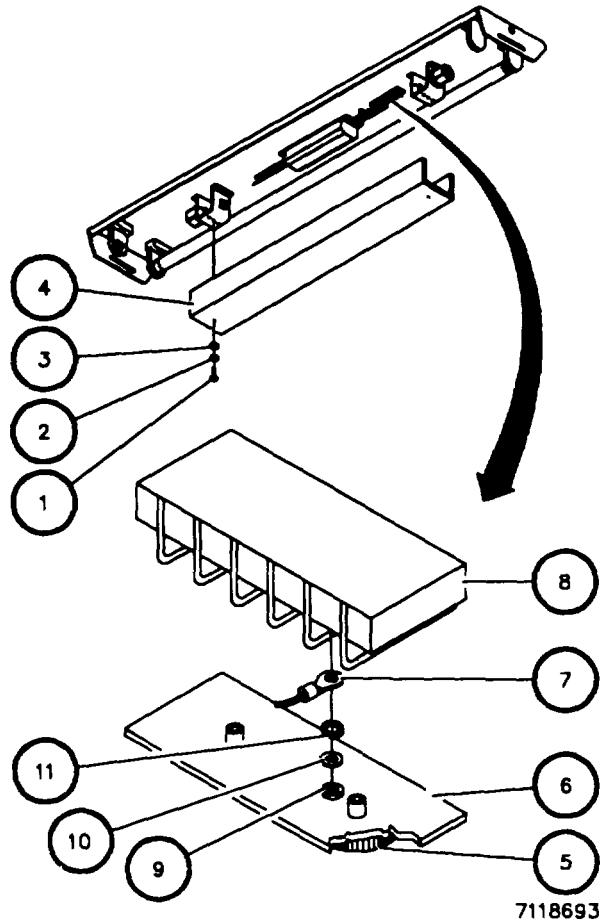
7118694

INSTALLATION

1. Route wiring harness (4) into light assembly (3).
2. Place light assembly (3) in installed position.
3. Install six screws (1) and washers (2).

8-35. REPLACE MAIN LIGHT ASSEMBLY- Continued

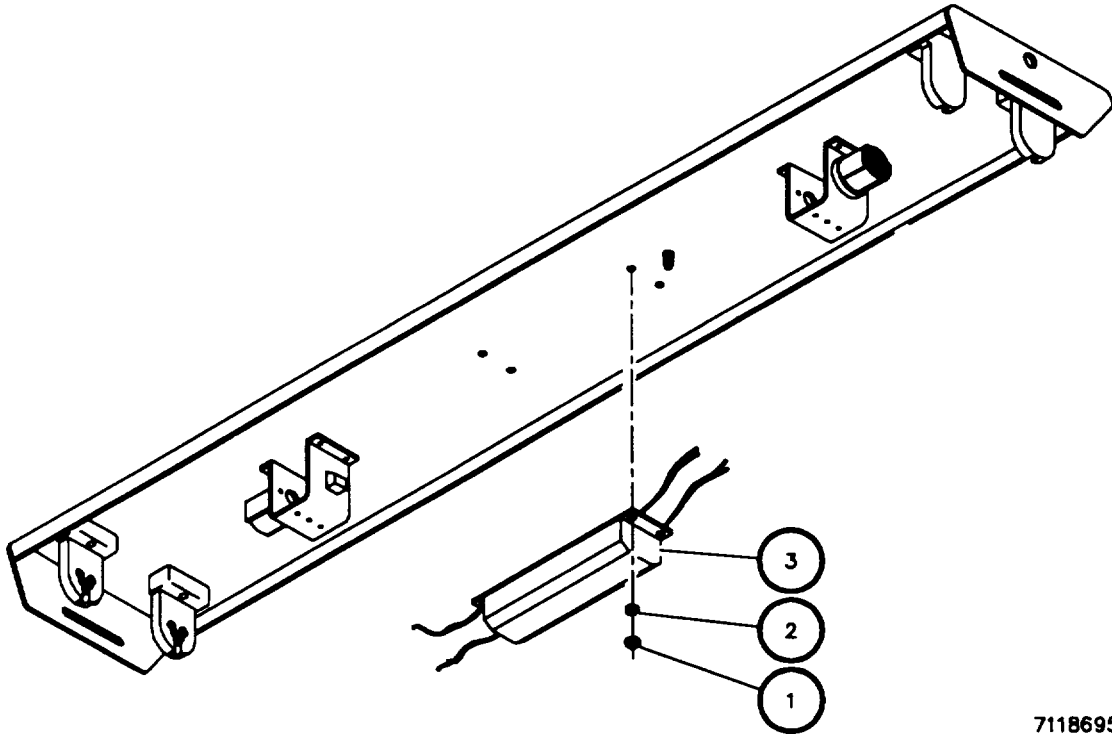
4. Install all wires (7) to TB1 (8) as tagged, using five nuts (9), lockwashers (10), and washers (11). Remove tags.
5. Place terminal board cover (6) in installed position.
6. Tighten two captive screws (5).
7. Place ballast cover (4) in installed position.
8. Install two screws (1), washers (2), and lockwashers (3).



FOLLOW-ON MAINTENANCE: Install main light assembly fluorescent and incandescent lamps. Refer to TM 11-5895-1392-12.

8-36. REPLACE MAIN LIGHT ASSEMBLY BALLAST - Continued

7. Remove four locknuts (1) and washers (2).
8. Remove ballast (3).



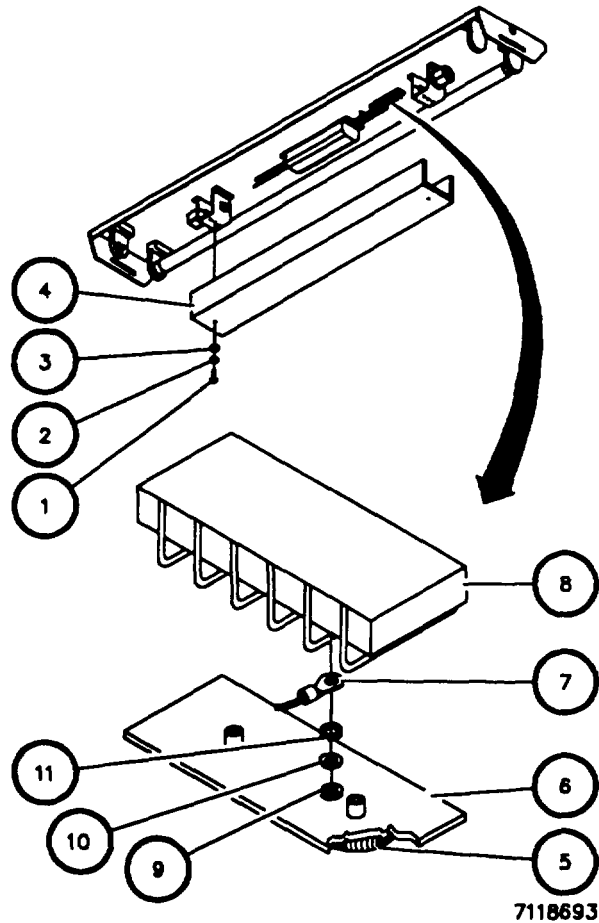
7118695

INSTALLATION

1. Place ballast (3) in installed position.
2. Install four locknuts (1) and washers (2).

8-36. REPLACE MAIN LIGHT ASSEMBLY BALLAST- Continued

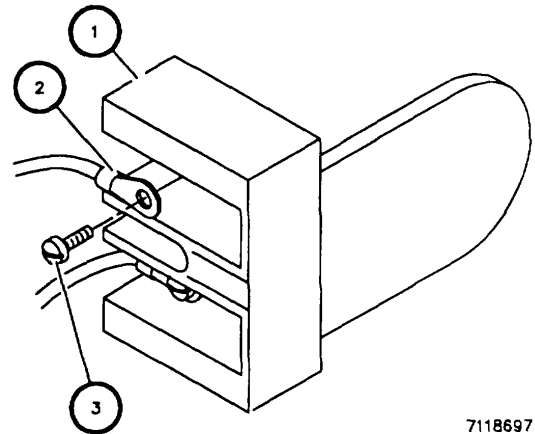
3. Install two ballast wires (7) on TB1 (8) as tagged, using two nuts (9), lockwashers (10), and washers (11). Remove tags.
4. Place terminal board cover (6) in installed position.
5. Tighten two captive screws (5).
6. Place ballast cover (4) in installed position.
7. Install two screws (1), washers (2), and lockwashers (3).



FOLLOW-ON MAINTENANCE: Install four main light assembly fluorescent lampholders (para 8-37).

8-37. REPLACE MAIN LIGHT ASSEMBLY FLUORESCENT LAMPHOLDER - Continued

4. Position lampholder (1) to access wires (2).
5. Tag two wires (2).
6. Remove two screws (3) and wires (2).
7. Remove lampholder (1).

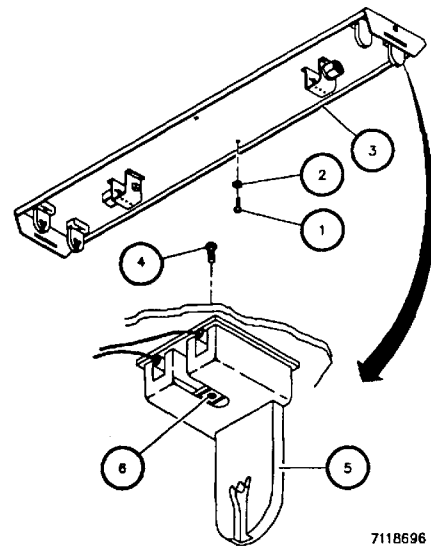


7118697

INSTALLATION

1. Install two wires (2) on lampholder (1) as tagged, using two screws (3). Remove tags.

2. Place lampholder (5) in installed position, ensuring that retaining nut (6) fits in slot in lampholder (5).
3. Tighten screw (4), ensuring that lampholder (5) is squarely aligned with light assembly (3).
4. Place light assembly (3) in installed position.
5. Install six screws (1) and washers (2).

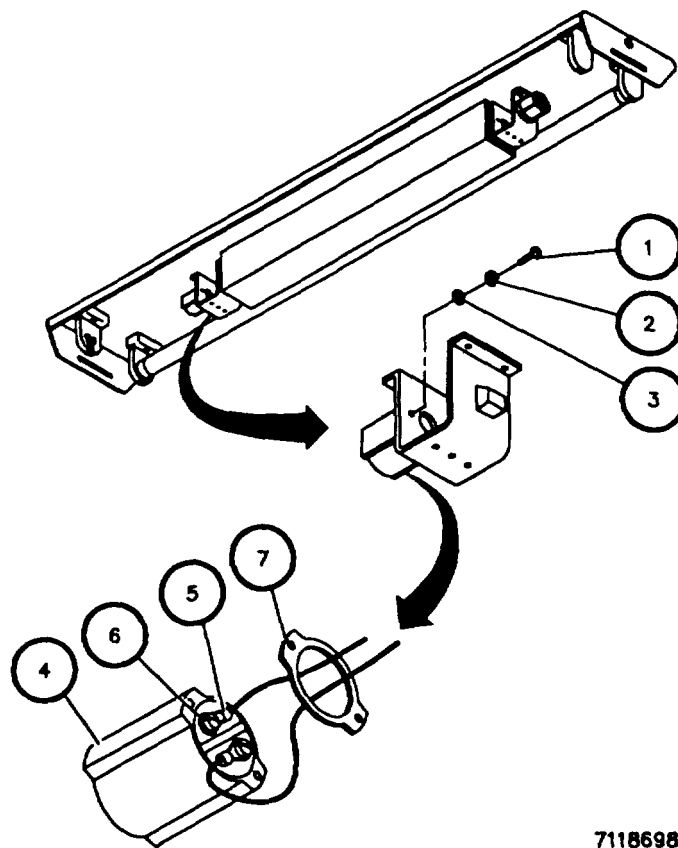


7118696

FOLLOW-ON MAINTENANCE: Install main light assembly fluorescent and incandescent lamps. Refer to TM 11-5895-1392-12.

8-38. REPLACE MAIN LIGHT ASSEMBLY INCANDESCENT LAMPHOLDER - Continued**INSTALLATION**

1. Place and hold gasket (7) against lampholder (4).
2. Install two wires (5) on lampholder (4) as tagged, using two screws (6). Remove tags.
3. Place gasket (7) and lampholder (4) in installed position.
4. Install two screws (1), lockwashers (2), and washers (3).



7118698

FOLLOW-ON MAINTENANCE: Install main light assembly fluorescent and incandescent lamps. Refer to TM 11-5895-1392-12.

8-39. REPLACE WORKSTATION SPOTLIGHT ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precautions:

WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

NOTE

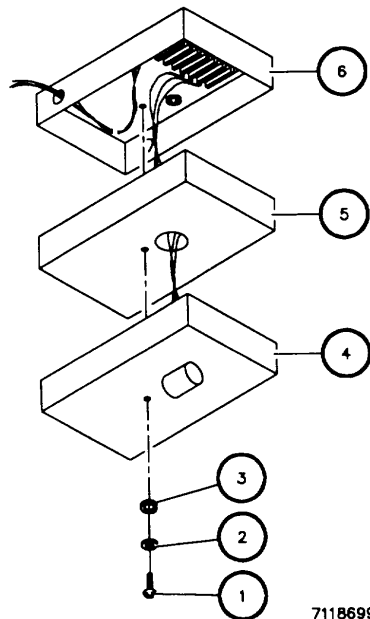
There are two workstation spotlight assemblies in the ADP shelter and four in the OPN shelter. Replace all workstation spotlight assemblies the same way. Assembly shown is typical.

Equipment Condition: PDU LIGHTS circuit breaker set to OFF.

Preliminary Procedure: Remove workstation spotlight assembly incandescent lamp. Refer to TM 11-5895-1392-12.

REMOVAL

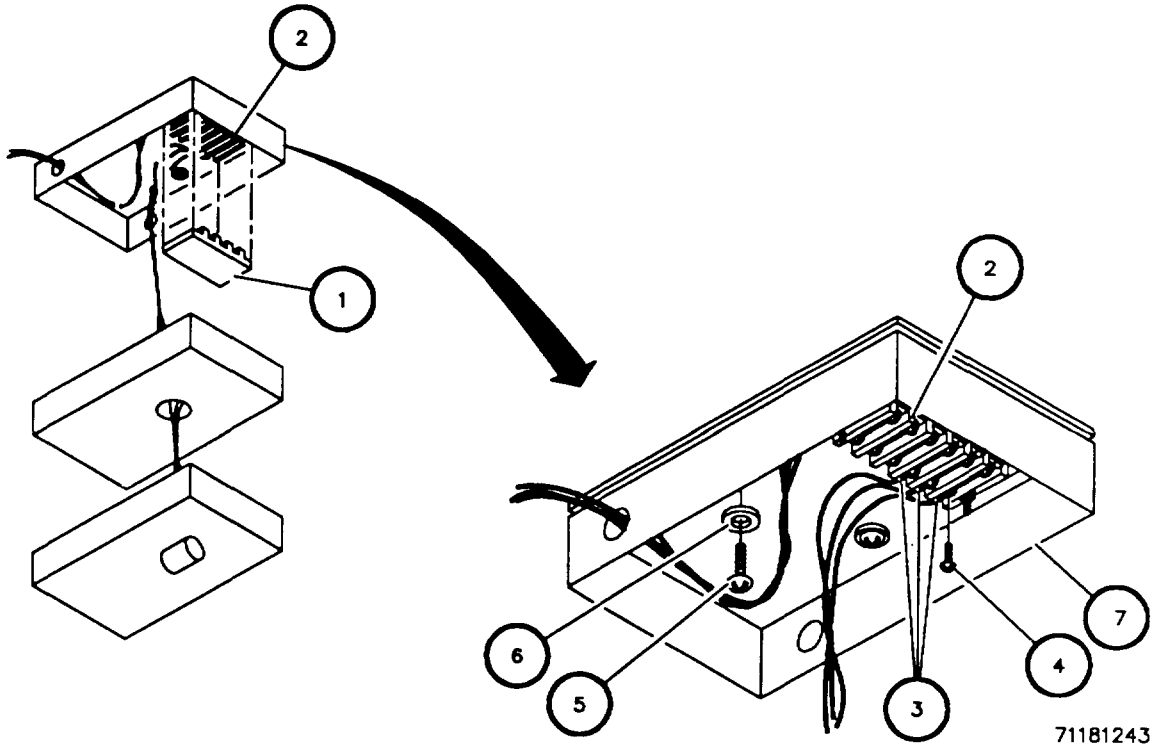
1. Remove screw (1), lockwasher (2), and washer (3), and lower cover (4) and insulation pad (5) from spotlight assembly (6).



7118699

8-39. REPLACE WORKSTATION SPOTLIGHT ASSEMBLY - Continued

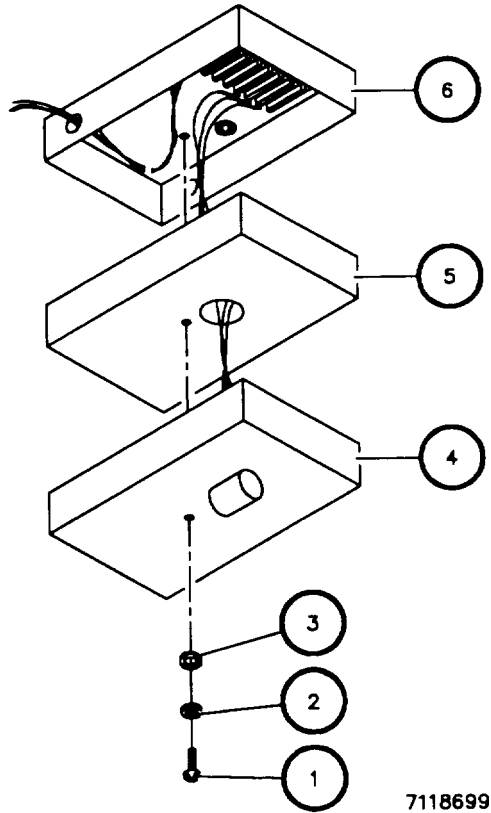
2. Remove rubber cover (1) from TB1 (2).
3. Tag 10 wires (3) connected to TB1 (2).
4. Remove six screws (4) and 10 wires (3) from TB1 (2).
5. Remove two screws (5) and washers (6).
6. Remove spotlight assembly (7), routing wires (3) from assembly.

**INSTALLATION**

1. Route wires (3) into spotlight assembly (7).
2. Place and hold spotlight assembly (7) in installed position.
3. Install two screws (5) and washers (6).
4. Install 10 wires (3) to TB1 (2) as tagged, using six screws (4). Remove tags.
5. Install rubber cover (1) on TB1 (2).

8-39. REPLACE WORKSTATION SPOTLIGHT ASSEMBLY - Continued

6. Place and hold cover (4) and insulation pad (5) in installed position on spotlight assembly (6).
7. Install screw (1), lockwasher (2), and washer (3).



FOLLOW-ON MAINTENANCE: Install workstation spotlight assembly incandescent lamp. Refer to TM 11-5895-1392-12.

8-40. REPLACE ADP SHELTER AC FILTER ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP

General Safety Precautions:

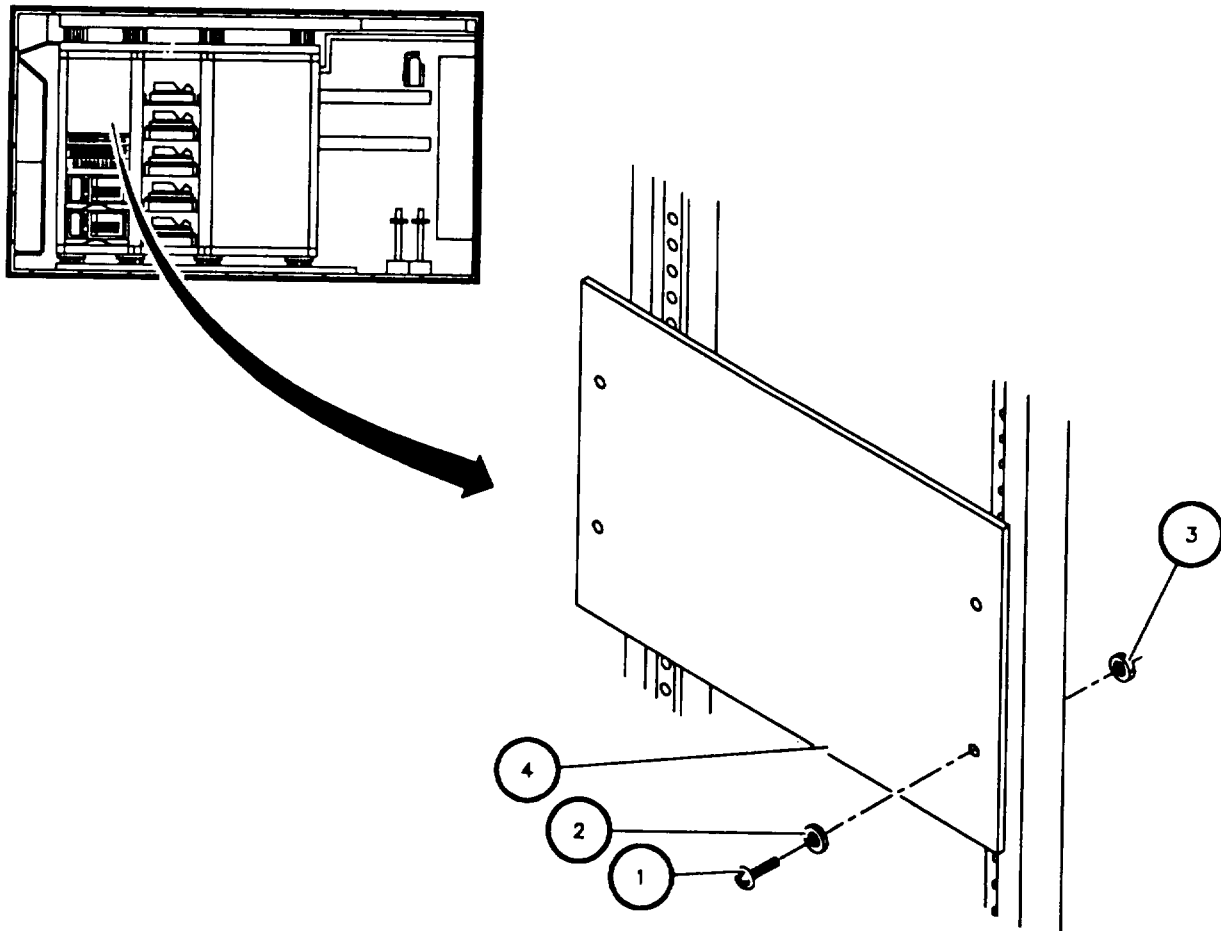
WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

Equipment Conditions: PDU RACKS 3 circuit breaker set to OFF.

REMOVAL

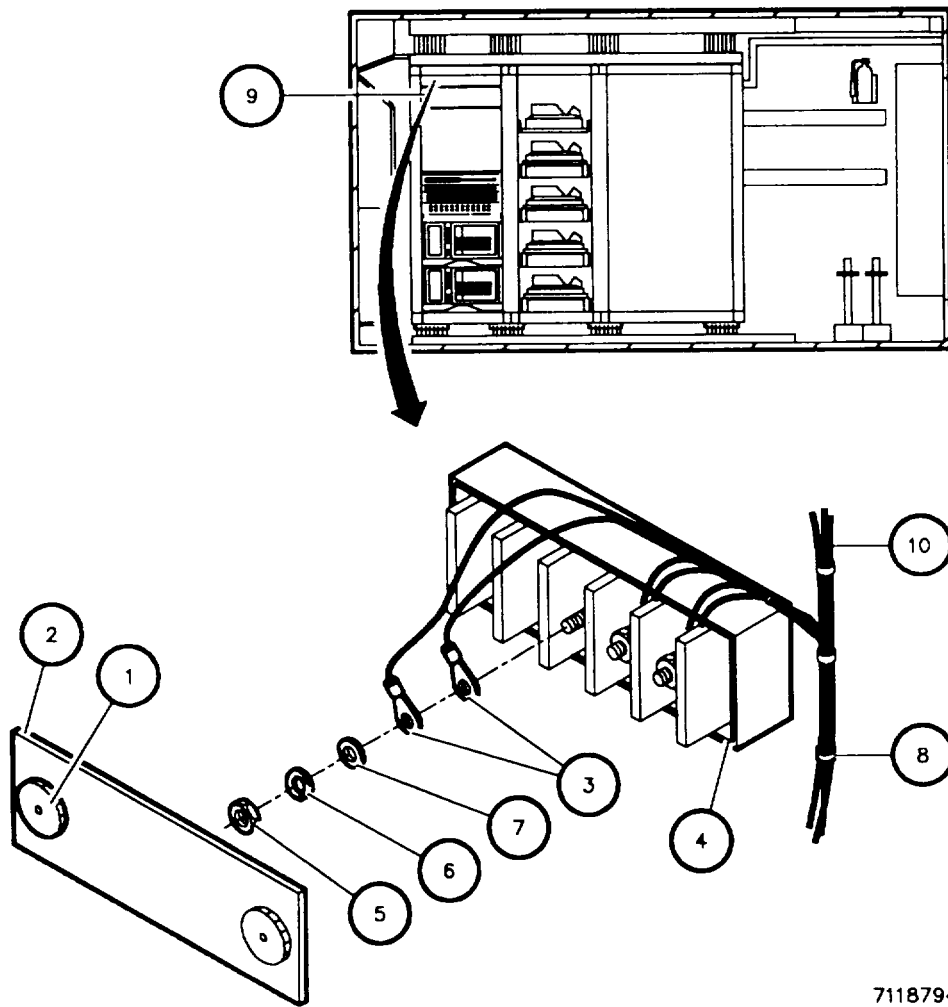
1. Working at A3A1 EQPT RACK BAY 1, remove four screws (1), washers (2), and locknuts (3) and access panel (4).



71181145

8-40. REPLACE ADP SHELTER AC FILTER ASSEMBLY - Continued

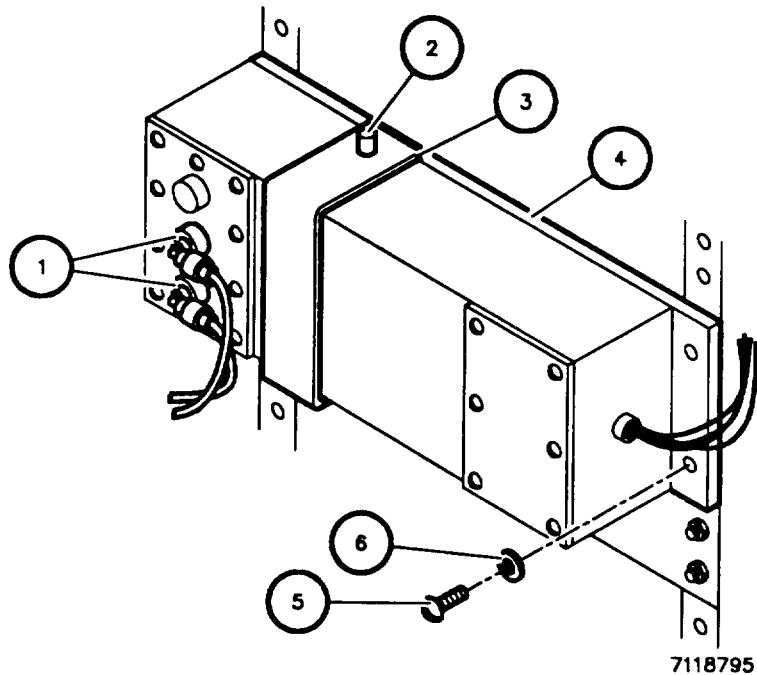
2. Loosen two captive screws (1) on TB1 cover (2).
3. Tag six wires (3) connected to TB1 (4).
4. Remove three nuts (5), lockwashers (6), washers (7), and six wires (3).
5. Cut and remove cable ties (8), as required, to isolate wires (3) to ac filter (9) from wiring harness (10).



7118794

8-40. REPLACE ADP SHELTER AC FILTER ASSEMBLY- Continued

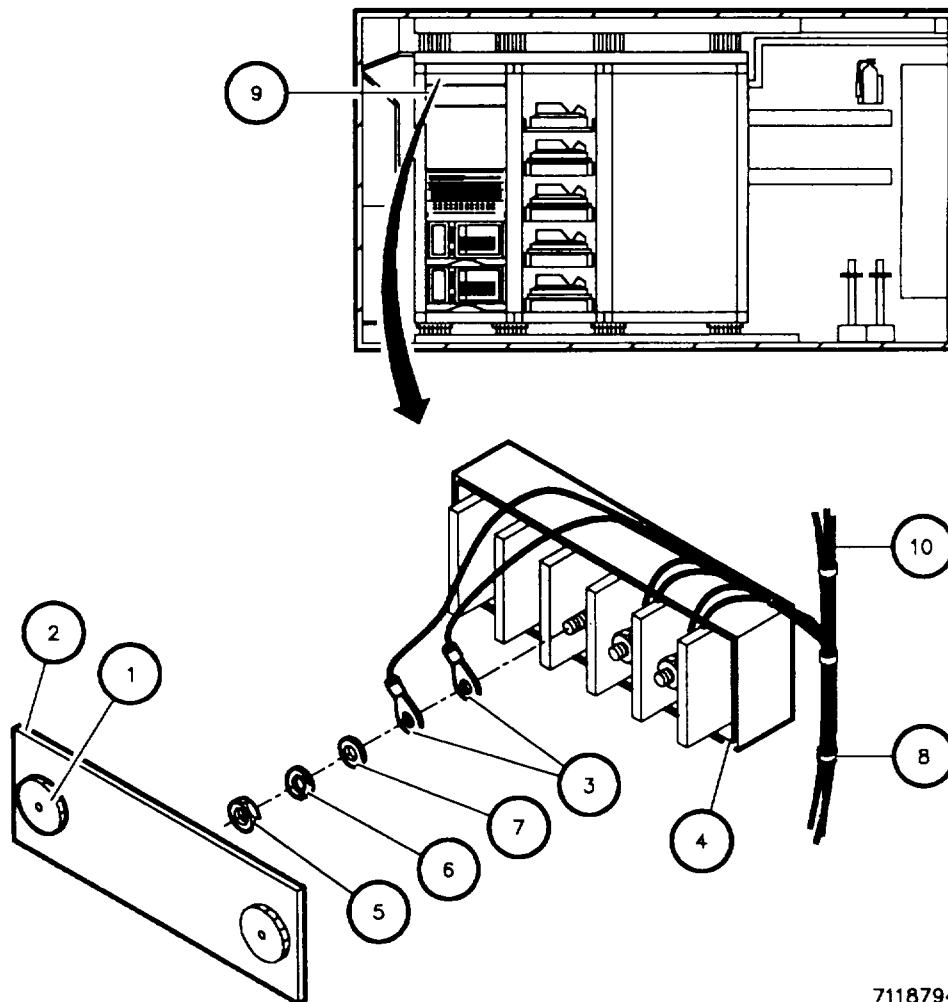
6. Tag and disconnect two cables (1).
7. Loosen two captive screws (2).
8. Remove bracket (3).
9. While supporting ac filter (4), remove two screws (5) and washers (6), and ac filter.

**INSTALLATION**

1. Place and hold ac filter (4) in installed position.
2. Install two screws (5) and washers (6).
3. Place bracket (3) in installed position.
4. Tighten two captive screws (2).
5. Connect two cables (1) as tagged. Remove tags.

8-40. REPLACE ADP SHELTER AC FILTER ASSEMBLY - Continued

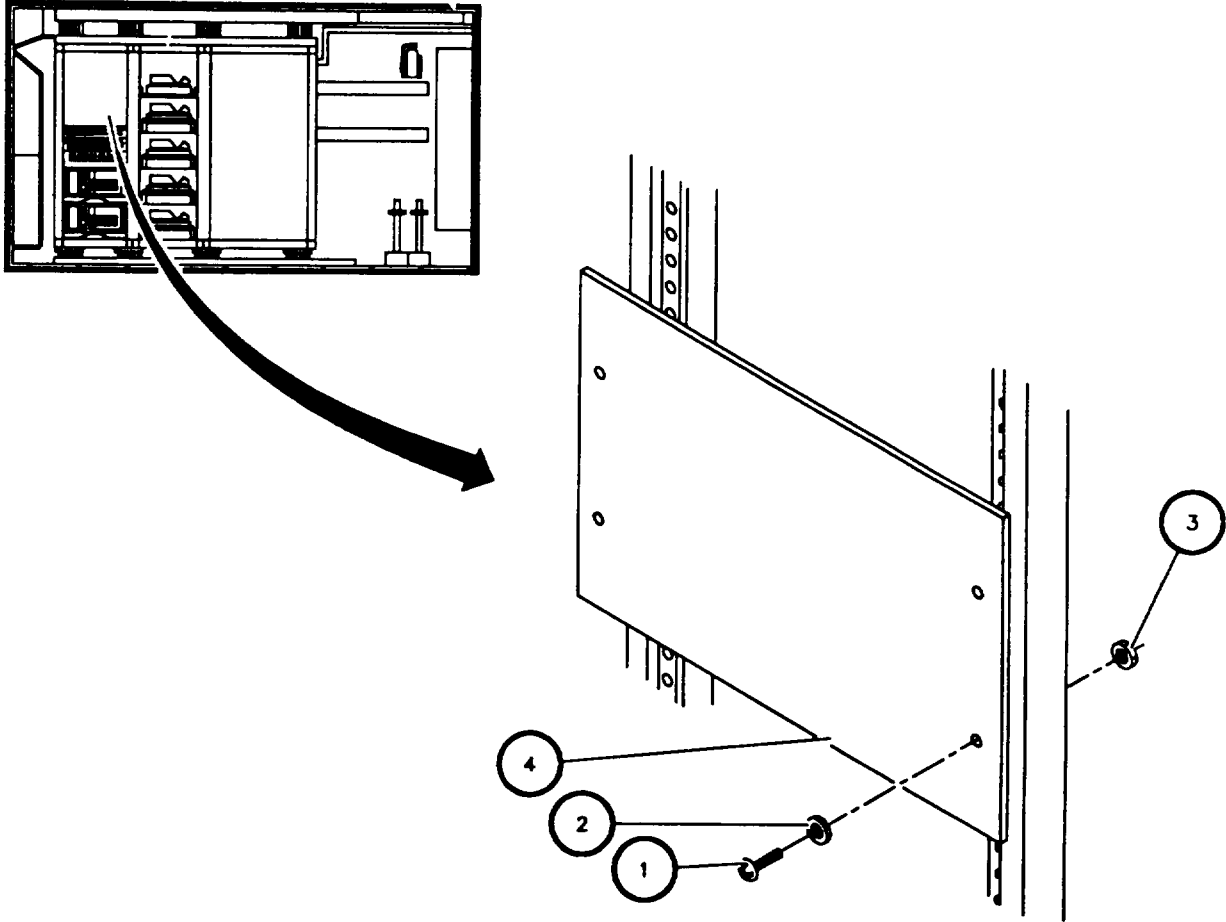
6. Route wires (3) from ac filter (9) to TB1 (4).
7. Connect six wires (3) to TB1 (4), as tagged, using three nuts (5), lockwashers (6), and washers (7). Remove tags.
8. Place TB1 cover (2) in installed position, and tighten two captive screws (1).
9. Install cable ties (8), as required, to secure wires (3) from ac filter (9) to wiring harness (10).



7118794

8-40. REPLACE ADP SHELTER AC FILTER ASSEMBLY- Continued

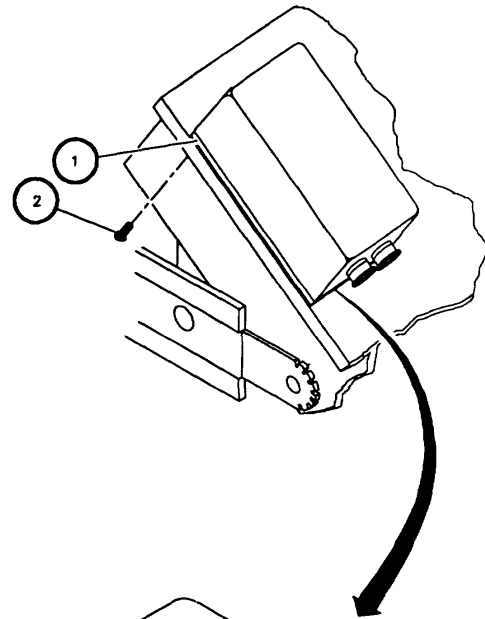
10. Place and hold access panel (4) in installed position.
11. Install four screws (1), washers (2), and locknuts (3).



71181145

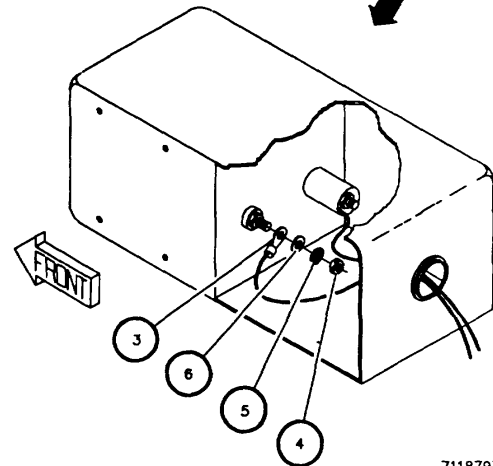
8-41. REPLACE DC FILTER ASSEMBLY - Continued

5. While holding dc filter (1), remove eight screws (2).
6. Position dc filter (1) to access two wires (3).
7. Tag two wires (3).
8. Remove two nuts (4), lockwashers (5), washers (6), and wires (3).
9. Remove dc filter (1).



INSTALLATION

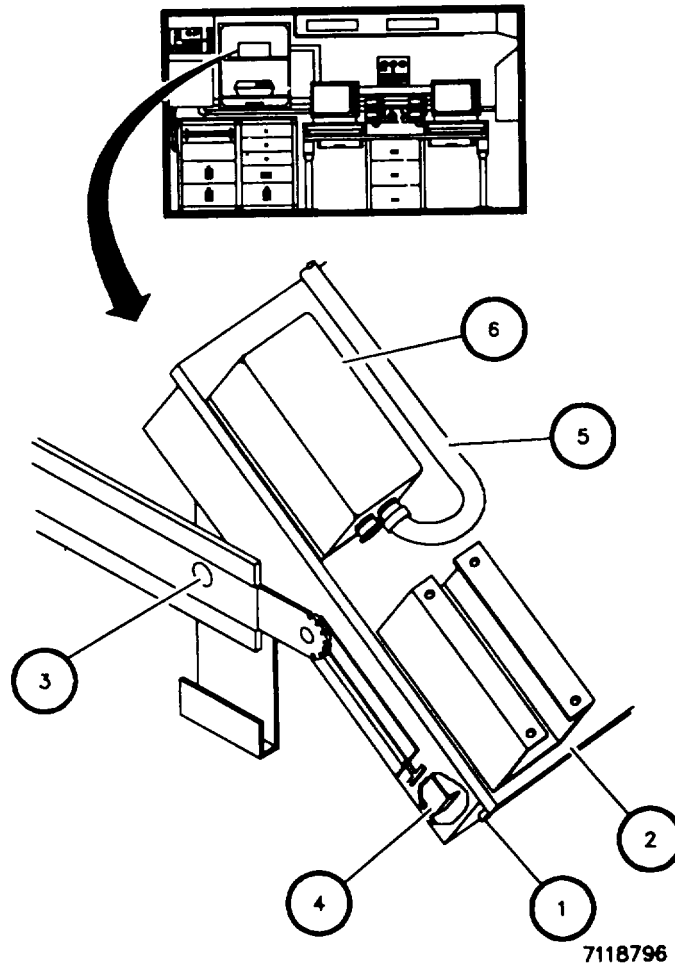
1. Install two wires (3) to dc filter (1) as tagged, using two nuts (4), lockwashers (5), and washers (6). Remove tags.
2. Position and hold dc filter (1) in installed position.
3. Install eight screws (2).



7118797

8-41. REPLACE DC FILTER ASSEMBLY - Continued

4. Connect cable (5) to dc filter (6).
5. If working on ADP shelter, pull tilt latch handles (4) at right and left sides of LDF shelf (2), and rotate rear edge of LDF shelf to normal position.
6. Press both right and left rail stops (3) and slide in LDF shelf (2).
7. Tighten two captive screws (1).



8-42. REPLACE WALL-MOUNTED AC RECEPTACLES**This task covers:****a. Removal****b. Installation****INITIAL SETUP****General Safety Precautions:****WARNING**

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

NOTE

Replace all wall-mounted ac power receptacles the same way, except where noted. Power receptacle shown is typical.

Equipment Conditions: Associated PDU circuit breakers set to OFF.

REMOVAL

1. Remove screw (1).
2. Remove faceplate (2).
3. Remove two screws (3).
4. Position receptacle (4) to access wires (5).

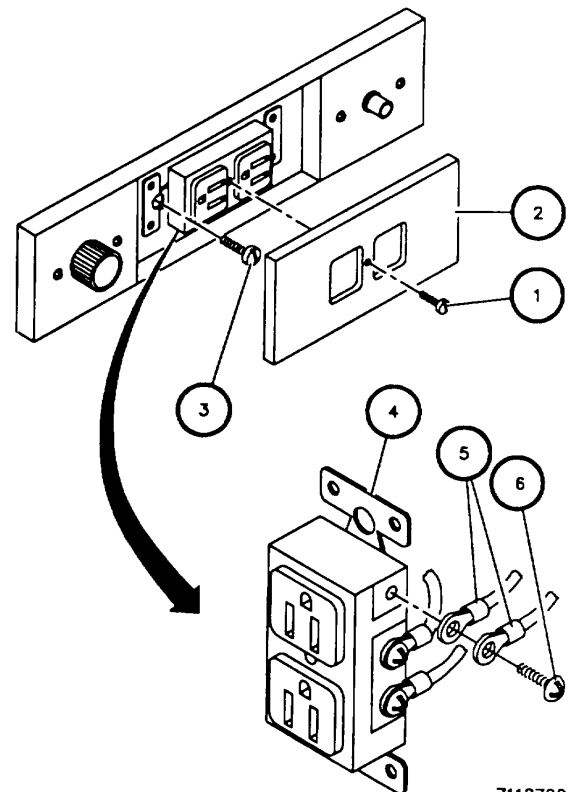
NOTE

Some receptacles have three wires secured with three screws.

5. Tag six wires (5).
6. Remove five screws (6) and six wires (5).
7. Remove receptacle (4).

INSTALLATION

1. Install six wires (5) to receptacle (4) as tagged, using five screws (6). Remove tags.
2. Place receptacle (4) in installed position.
3. Install two screws (3).
4. Place faceplate (2) in installed position.
5. Install screw (1).



8-43. REPLACE WALL-MOUNTED DC RECEPTACLES**This task covers:****a. Removal****b. Installation****INITIAL SETUP****General Safety Precautions:****WARNING**

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

NOTE

Replace all wall-mounted dc power receptacles the same way. Power receptacle shown is typical.

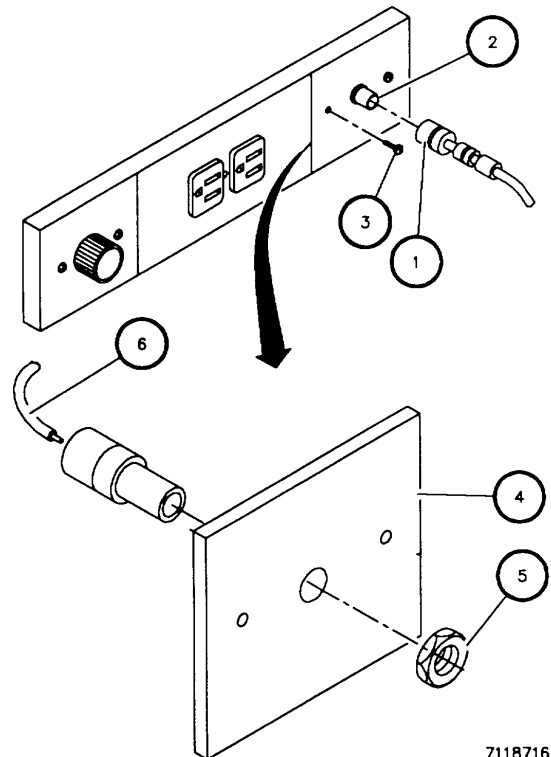
Equipment Conditions: Associated PDU circuit breakers set to OFF.

REMOVAL

1. Disconnect cable (1) from receptacle (2).
2. Remove two screws (3).
3. Remove faceplate (4).
4. Remove jamnut (5) and faceplate (4) from receptacle (2).
5. Tag and remove wires (6).
6. Remove receptacle (2).

INSTALLATION

1. Install wires (6) in receptacle (2) as tagged. Remove tags.
2. Install faceplate (4) and jamnut (5) on receptacle (2).
3. Place faceplate (4) in installed position.
4. Install two screws (3).
5. Install cable (1).



7118716

844. REPLACE WALL-MOUNTED DIMMER CONTROLS**This task covers:****a. Removal****b. Installation****INITIAL SETUP****General Safety Precautions:****WARNING**

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

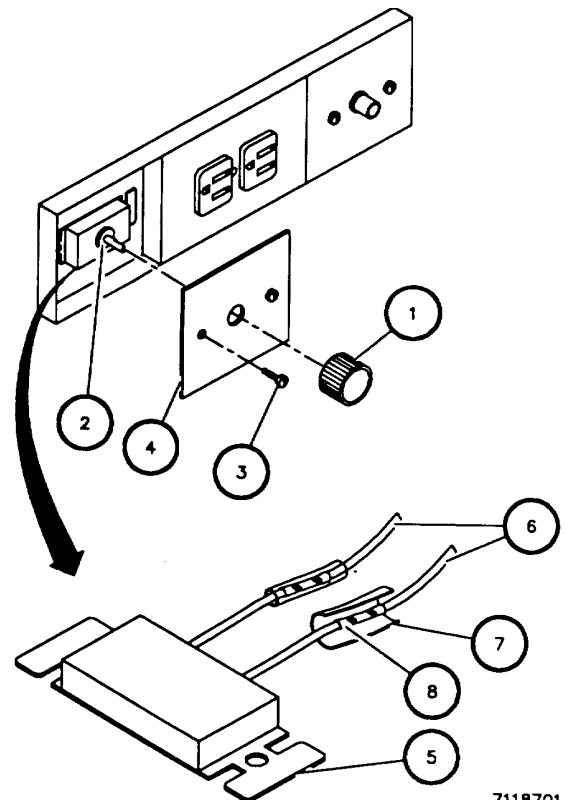
NOTE

Replace all wall-mounted dimmer controls the same way. Dimmer control shown is typical.

Equipment Conditions: Associated PDU circuit breakers set to OFF.

REMOVAL

1. Remove knob (1) from shaft (2).
2. Remove two screws (3) and faceplate (4).
3. Pull dimmer (5) forward to access two wires (6).
4. Remove two lengths of insulation sleeving (7).
5. Working at wiring harness side of crimp splice (8), cut two wires (6) as closely to crimp splice as possible.
6. Remove dimmer (5).

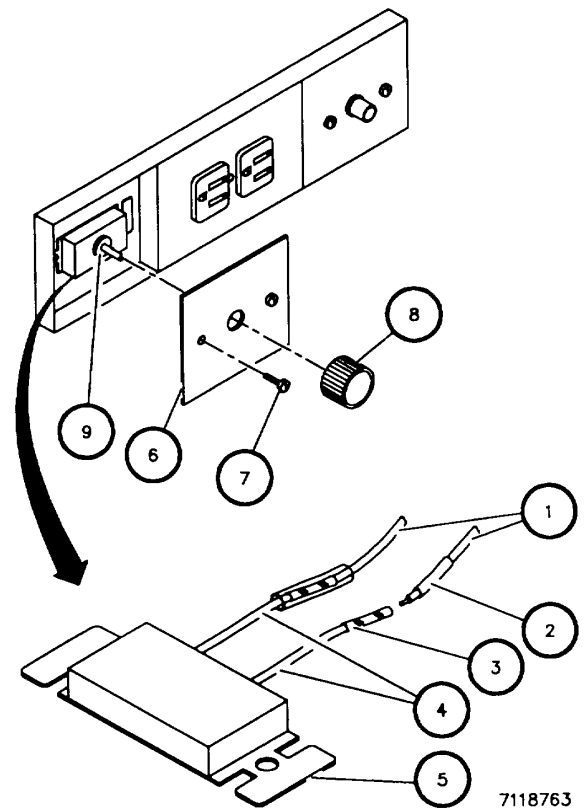


7118701

8-44. REPLACE WALL-MOUNTED DIMMER CONTROLS - Continued

INSTALLATION

1. Form and dress two harness wires (1).
2. Place two lengths of insulation sleeving (2) on two harness wires (1), so that wire ends can be spliced.
3. Using two crimp splices (3), connect two harness wires (1) to two dimmer wires (4).
4. Position and shrink insulation sleeving (2).
5. Place and hold dimmer (5) and faceplate (6) in installed position.
6. Install two screws (7).
7. Install knob (8) on shaft (9).



8-45. REPLACE ECU POWER CABLE CONNECTOR

This task covers:

a. Removal

b. Installation

INITIAL SETUP**General Safety Precautions:****WARNING**

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

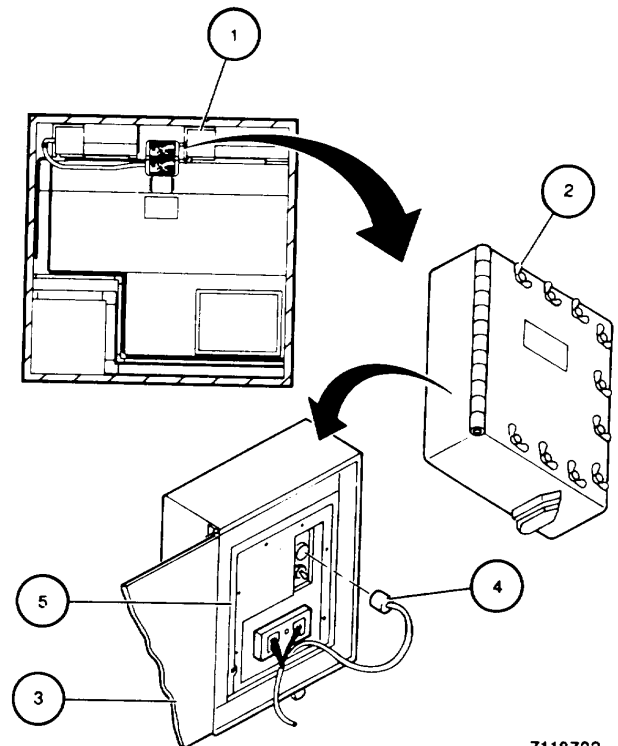
NOTE

There are two ECUs in the shelter. Replace ECU power cable connector for both ECUs the same way. Cable connector shown is typical.

Equipment Conditions; PEP AIR COND ROADSIDE or CURBSIDE circuit breaker set to OFF, as applicable.

REMOVAL

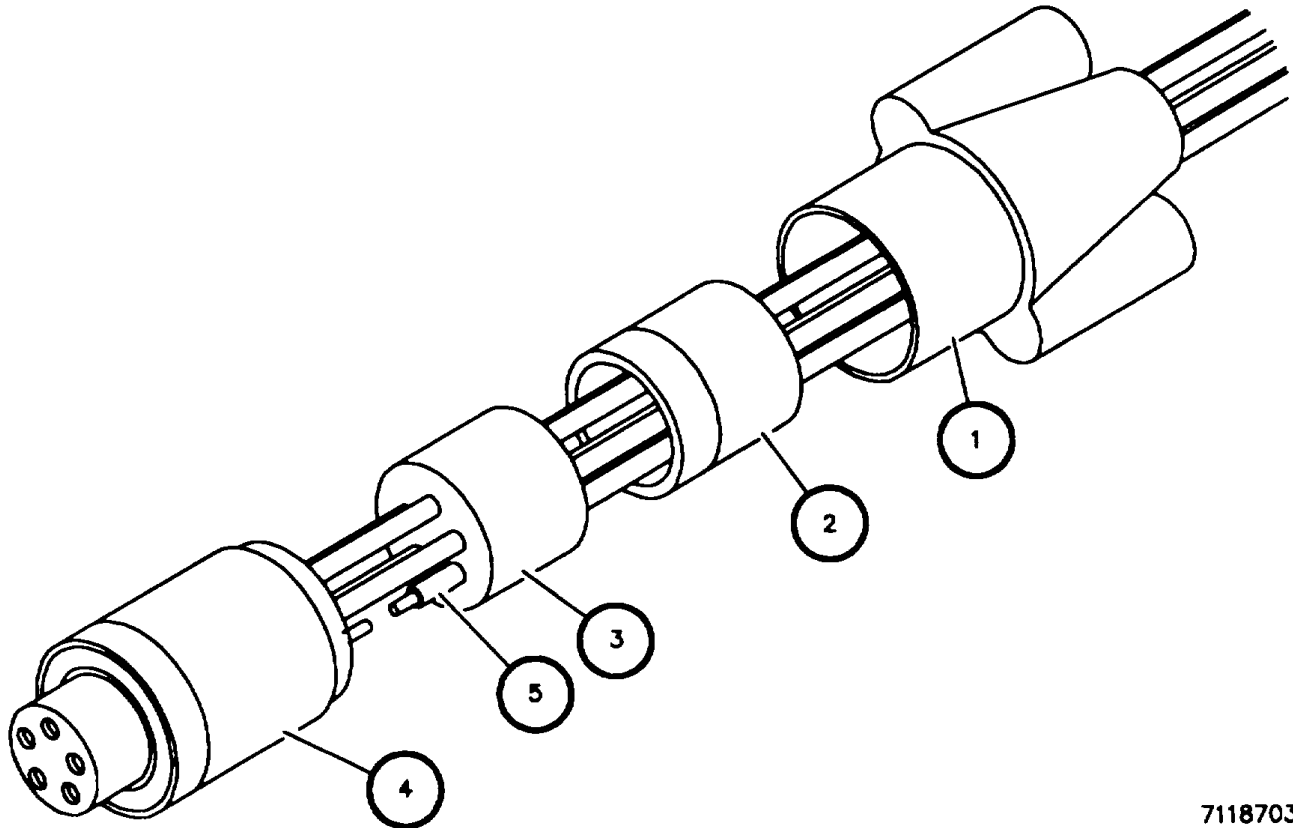
1. Working at AIR CONDITIONER FEEDTHRU box (1), loosen 10 fasteners (2).
2. Open access door (3).
3. Disconnect cable connector (4) from ECU (5).



7118702

8-45. REPLACE ECU POWER CABLE CONNECTOR - Continued

4. Loosen backshell (1).
5. Slide backshell (1), ferrule (2), and grommet (3) away from cable connector (4) to expose solder connections.
6. Tag, unsolder, and remove four wires (5).
7. Remove cable connector (4), backshell (1), ferrule (2), and grommet (3).



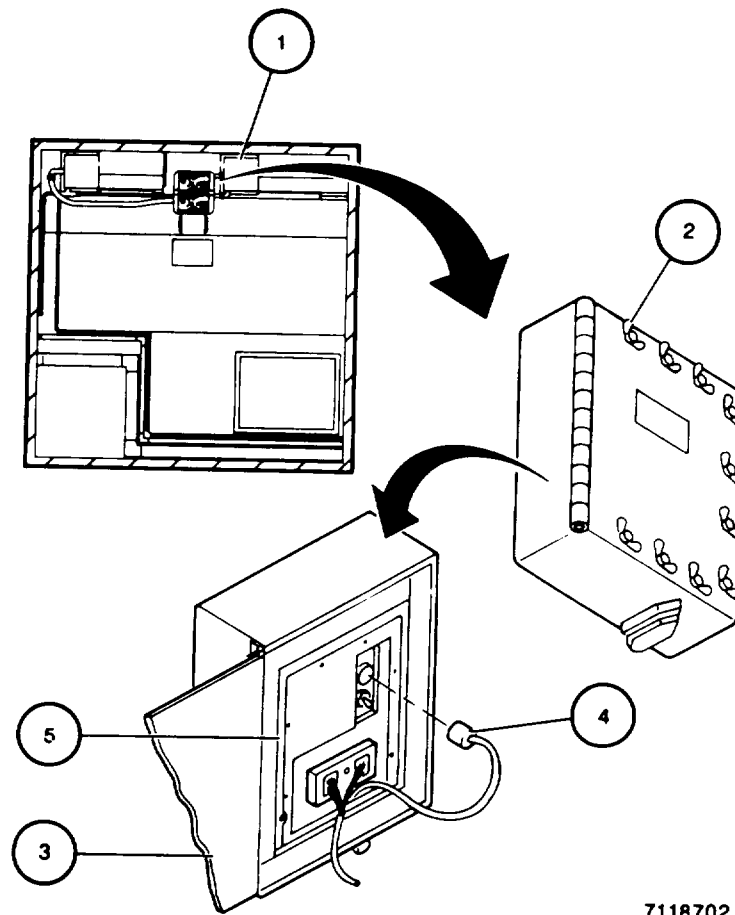
7118703

INSTALLATION

1. Form and dress four wires (5).
2. Install backshell (1), ferrule (2), and grommet (3) on four wires (5) so that wire ends can be soldered.
3. Solder four wires (5) to cable connector (4) as tagged. Remove tags.
4. Install grommet (3), ferrule (2), and backshell (1) on cable connector (4).

8-45. REPLACE ECU POWER CABLE CONNECTOR - Continued

5. Working inside AIR CONDITIONER FEEDTHRU box (1), install cable connector (4) in ECU (5).
6. Close access door (3).
7. Tighten 10 fasteners (2).



7118702

8-46. REPLACE DOOR LIMIT SWITCH S1**This task covers:****a. Removal****b. Installation****INITIAL SETUP**

General Safety Precautions:

WARNING

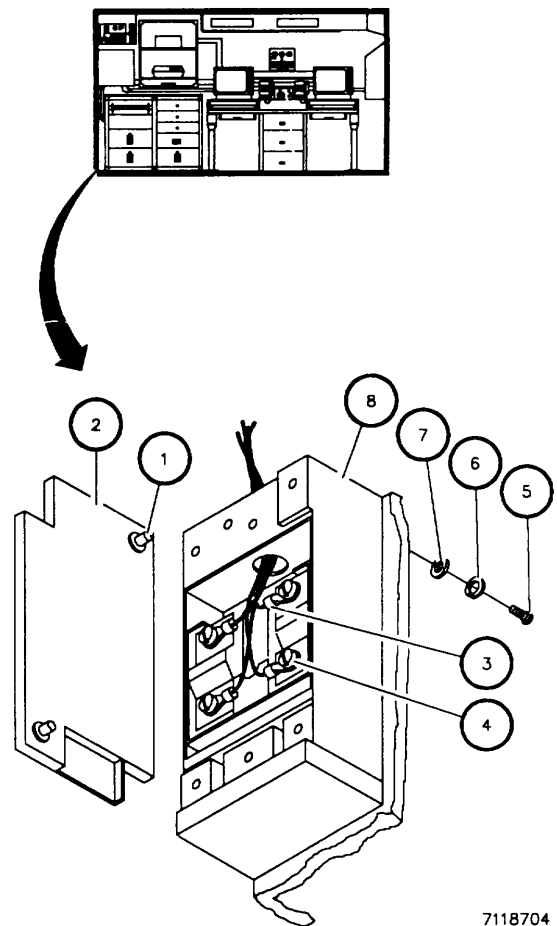
HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

Equipment Conditions: PDU LIGHTS circuit breaker to OFF.**REMOVAL**

1. Loosen two captive screws (1) and remove switch cover (2).
2. Tag four wires (3).
3. Remove four screws (4) and four wires (3).
4. Remove two screws (5), lockwashers (6), and washers (7).
5. Remove switch (8).

INSTALLATION

1. Place switch (8) in installed position.
2. Install two screws (5), lockwashers (6), and washers (7).
3. Install four wires (3) to switch (8) as tagged, using four screws (4). Remove tags.
4. Place switch cover (2) in installed position.
5. Tighten two captive screws (1).



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8-47. REPLACE ADP SHELTER EQUIPMENT RACK RECEPTACLES

This task covers:

a. Removal

b. Installation

INITIAL SETUP

General Safety Precautions:

WARNING

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

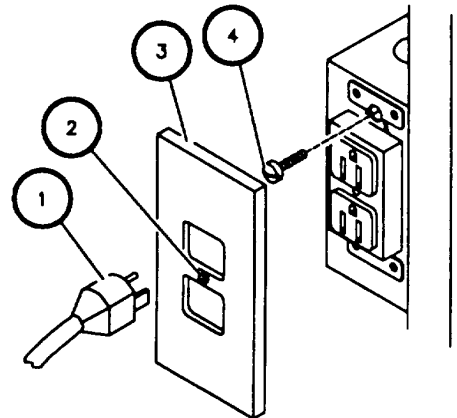
NOTE

Replace all equipment rack-mounted ac power receptacles the same way. Power receptacle shown is typical.

Equipment Conditions: PDU RACKS 1, RACKS 2, or RACKS 3 circuit breaker set to OFF, as applicable.

REMOVAL

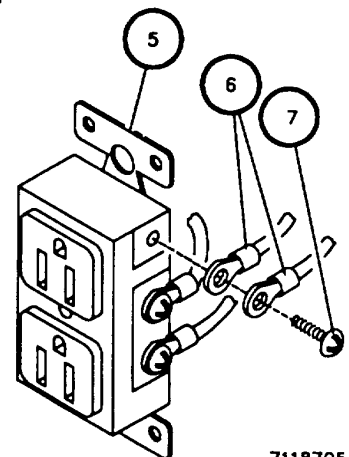
1. Unplug cables (1).
2. Loosen captive screw (2) and remove faceplate (3).
3. Remove two screws (4).
4. Position receptacle (5) to access wires (6).



NOTE

Some receptacles have three wires secured with three screws.

5. Tag six wires (6).
6. Remove five screws (7) and six wires (6).
7. Remove receptacle (5).



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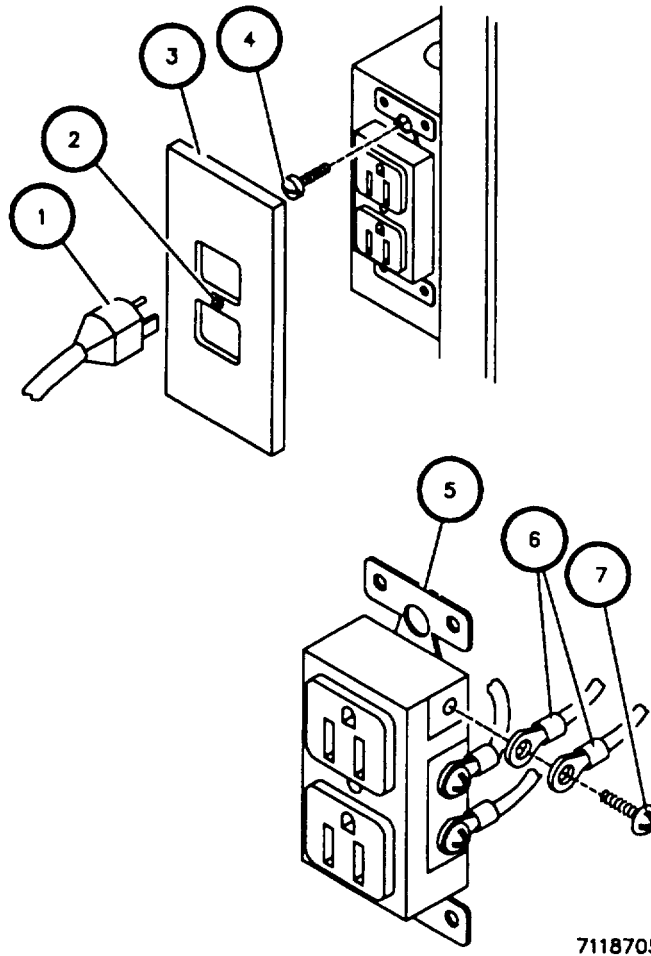
8-47. REPLACE ADP SHELTER EQUIPMENT RACK RECEPTACLES - Continued

INSTALLATION

NOTE

Some receptacles have three wires secured with three screws.

1. Install six wires (6) to receptacle (5) as tagged, using five screws (7). Remove tags.
2. Place receptacle (5) in installed position.
3. Install two screws (4).
4. Place faceplate (3) in installed position and tighten captive screw (2).
5. Install cables (1).



8-48. REPAIR POWER CABLES

This task covers:**a. Disassembly****b. Reassembly**

INITIAL SETUP**General Safety Precautions:****WARNING**

HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT. Disconnect power before removing any covers or replacing parts. DEATH ON CONTACT may result if the operator fails to observe safety precautions.

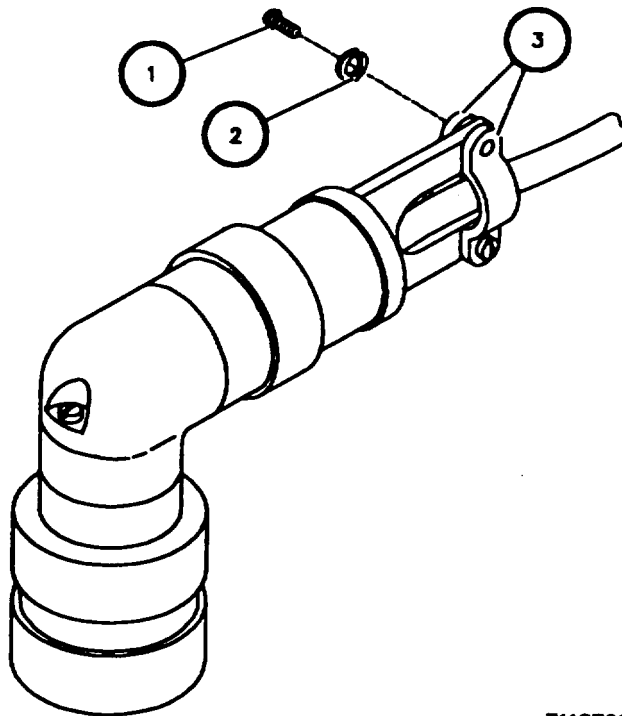
NOTE

- Repair DSDI, workstation, GM, LGM, and radio power cables the same way. Power cable shown is typical.
- Refer to cable assembly diagrams (volume 2) for cable parts and configurations.

Equipment Conditions: Power cable under repair removed from shelter.

DISASSEMBLY

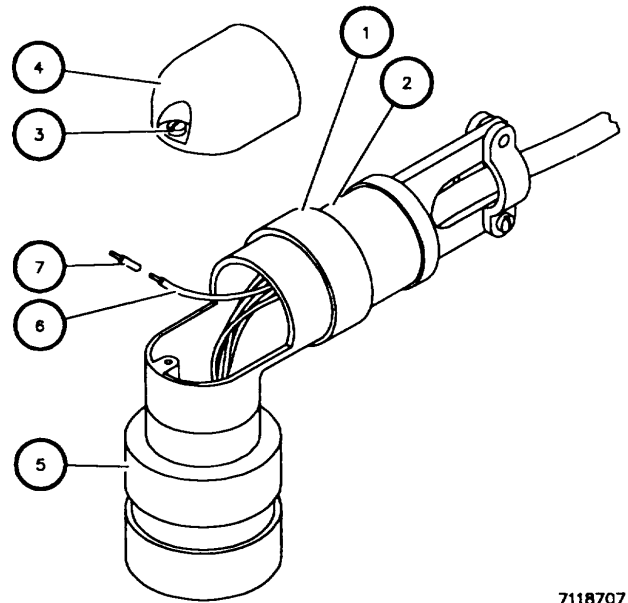
1. Remove two screws (1), lockwashers (2), and strain-relief clamps (3).



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8-48. REPAIR POWER CABLES - Continued

2. Loosen nut (1) on backshell (2).
3. If working on angled-type connector, loosen captive screw (3) on backshell cover (4) and remove backshell cover (4).
4. Separate backshell (2) from connector (5).
5. Note and record wire (6) locations to aid reassembly.
6. Remove wires (6) from connector (5).
7. Remove connector (5).
8. Inspect contacts (7). If bent, corroded, or otherwise damaged, cut and remove damaged contact(s) (7).

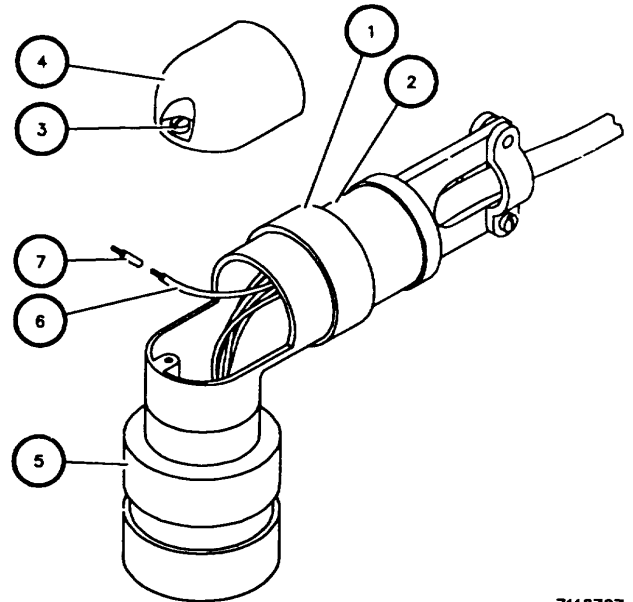


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8-48. REPAIR POWER CABLES - Continued

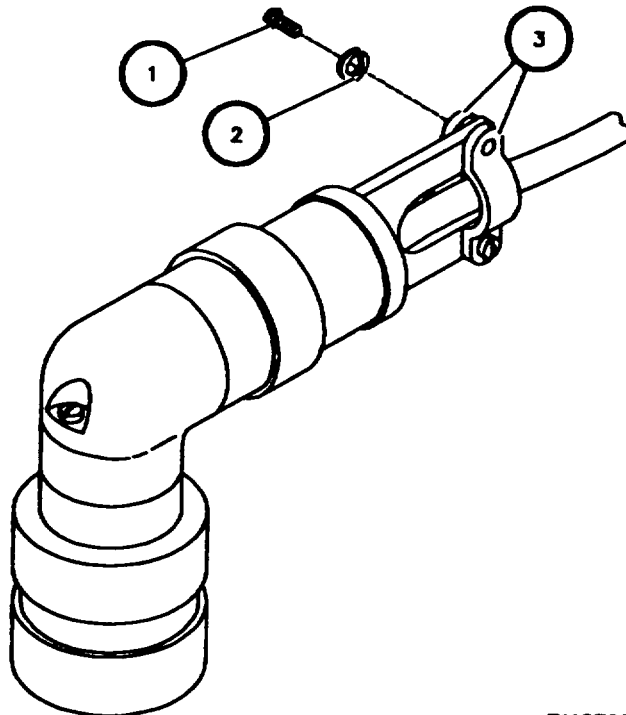
REASSEMBLY

1. If contacts (7) were removed, form and dress wires (6) in accordance with instructions in cable assembly diagrams (volume 2).
2. Install new contact(s) (7) on wires (6).
3. Install wires (6) in connector (5) as recorded in disassembly.
4. Mate connector (5) and backshell (2).
5. Tighten nut (1) on backshell (2).
6. If working on angled-type connector, place backshell cover (4) in installed position and tighten captive screw (3).



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7. Install two screws (1), lockwashers (2), and strain-relief clamps (3).



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8-49. REMOVE/REPAIR/INSTALL POINT-TO-POINT WIRING

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP**NOTE**

Using cable diagrams and wire lists (volume 2) as a guide, determine required replacement parts and termination points of power distribution system wire(s) under repair before proceeding.

Equipment Configuration: Shelter power off; power source off; power cable to PEP PRIMARY INPUT connector J1 disconnected.

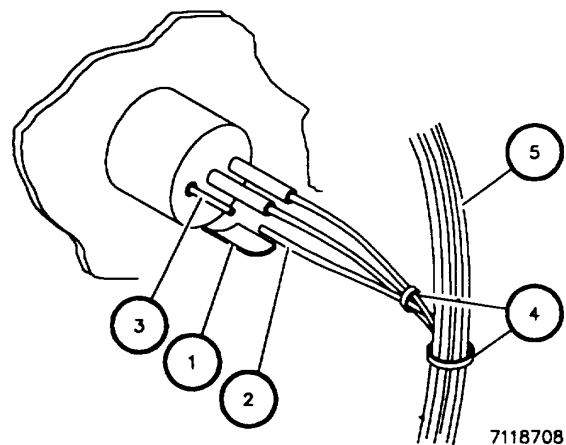
Preliminary Procedures:

1. If working on PEP, remove PEP access panel (para 8-8).
2. If working on PDU, open PDU front panel (para 8-23).

REMOVAL**NOTE**

- Perform removal steps required to isolate damaged wire(s) from assemblies and harness before proceeding to repair.
- If wire terminated at indicator lamp, go to step 1.
- If wire terminated at terminal board, go to step 4.
- If wire terminated at circuit breaker, go to step 8.
- If wire terminated at switch, go to step 10.
- If wire terminated at ground lug, go to step 12.

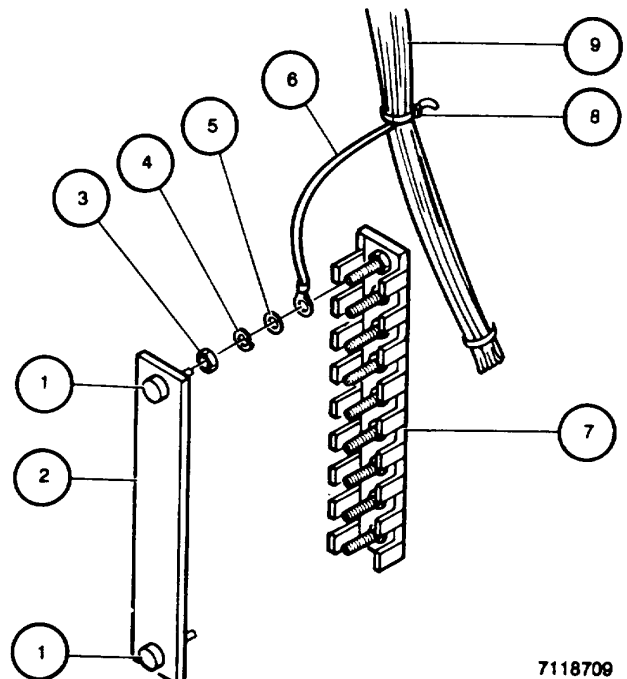
1. Working at appropriate indicator lamp, remove insulation sleeving (1) from wire (2).
2. Tag, unsolder, and remove wire (2) from indicator lamp terminal (3).
3. Cut and remove cable ties (4), as required, to isolate wire (2) from harness (5).



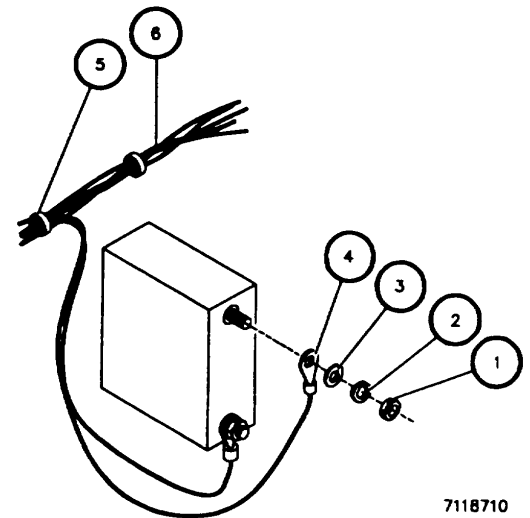
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8-49. REMOVE/REPAIR/INSTALL POINT-TO-POINT WIRING - Continued

4. Working at appropriate terminal board, loosen two captive screws (1) on terminal board cover (2).
5. Remove terminal board cover (2).
6. Remove nut (3), lockwasher (4), washer (5), and wire (6) from terminal board (7). Tag wire (6).
7. Cut and remove cable ties (8), as required, to isolate wire (6) from harness (9).

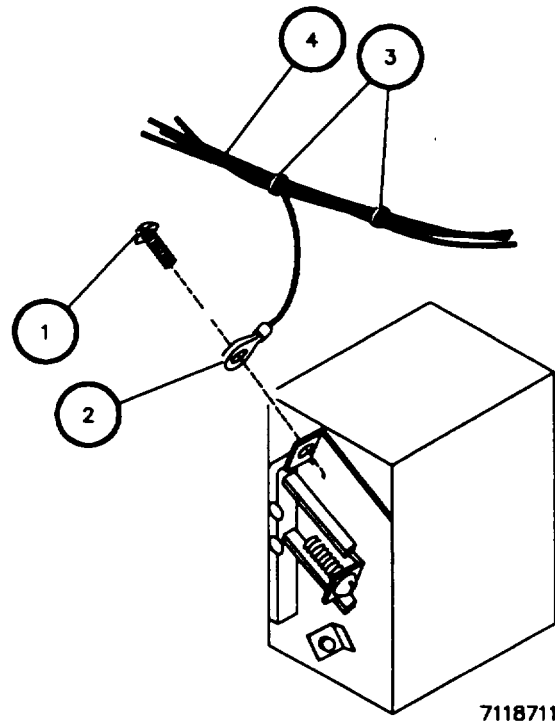


8. Working at appropriate circuit breaker, remove nut (1), lockwasher (2), washer (3), and wire (4). Tag wire (4).
9. Cut and remove cable ties (5), as required, to isolate wire (4) from harness (6).

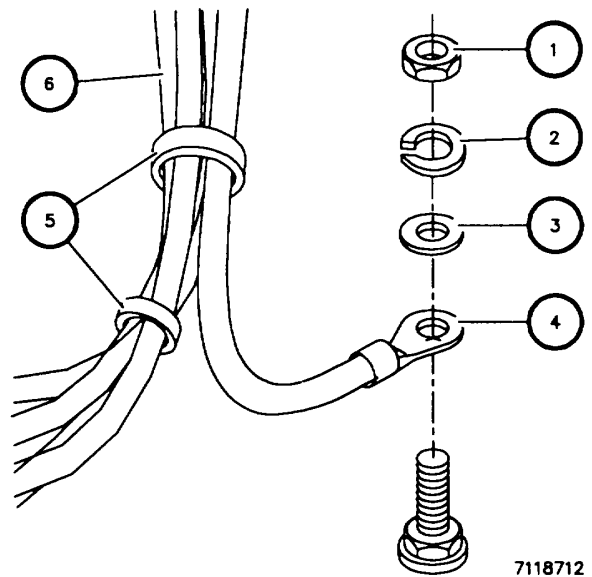


8-49. REMOVE/REPAIR/INSTALL POINT-TO-POINT WIRING - Continued

10. Working at appropriate switch, remove screw (1) and wire (2). Tag wire (2).
11. Cut and remove cable ties (3), as required, to isolate wire (2) from harness (4).



12. Working at appropriate ground lug, remove nut (1), lockwasher (2), washer (3), and wire (4). Tag wire (4).
13. Cut and remove cable ties (5), as required, to isolate wire (4) from harness (6).



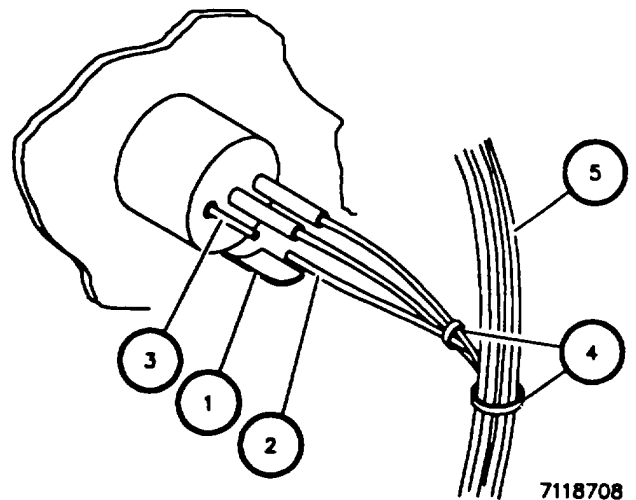
8-49. REMOVE/REPAIR/INSTALL POINT-TO-POINT WIRING - Continued**REPAIR**

Replace wire(s) and attached hardware in accordance with instructions in cable diagrams and wire lists (volume 2).

INSTALLATION**NOTE**

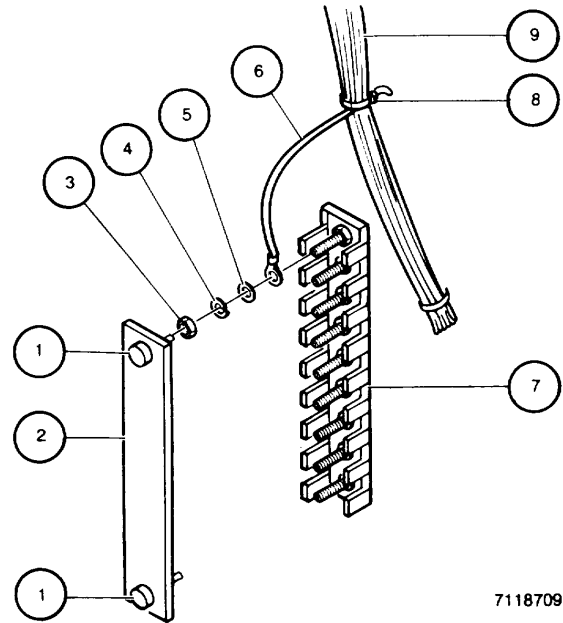
- Perform installation steps required to secure replaced wire(s) to assemblies and harness before proceeding to follow-on maintenance.
- If wire terminated at indicator lamp, go to step 1.
- If wire terminated at terminal board, go to step 6.
- If wire terminated at circuit breaker, go to step 10.
- If wire terminated at switch, go to step 12.
- If wire terminated at ground lug, go to step 14.

1. Working at appropriate indicator lamp, form and dress wire (2).
2. Place insulation sleeving (1) on wire (2) so that wire can be soldered.
3. Solder wire (2) to indicator lamp terminal (3) as tagged. Remove tag.
4. Position and shrink insulation sleeving (1).
5. Install cable ties (4), as required, to secure wire (2) to harness (5).

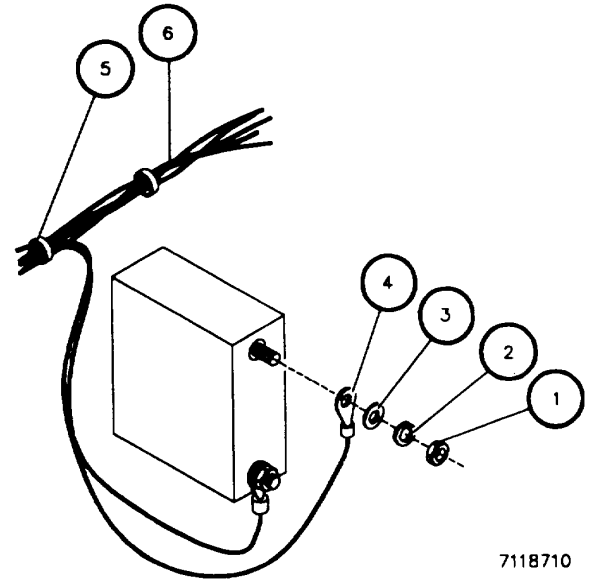


8-49. REMOVE/REPAIR/INSTALL POINT-TO-POINT WIRING - Continued

6. Working at appropriate terminal board, install wire (6) on terminal board (7) as tagged, using nut (3), lockwasher (4), and washer (5). Remove tag.
7. Place terminal board cover (2) in installed position.
8. Tighten two captive screws (1).
9. Install cable ties (8), as required, to secure wire (6) to harness (9).

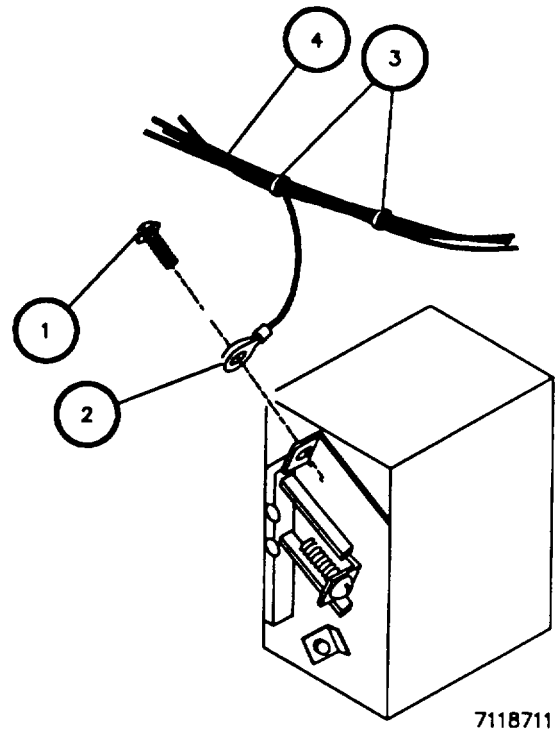


10. Working at appropriate circuit breaker, install wire (4) as tagged, using nut (1), lockwasher (2), and washer (3).
11. Install cable ties (5), as required, to secure wire (4) to harness (6).

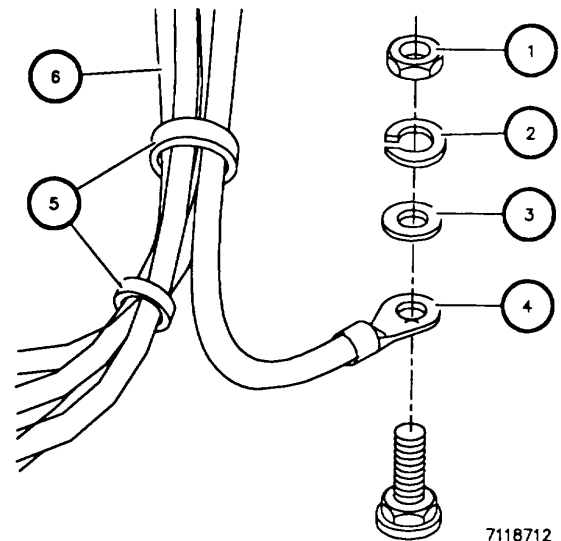


8-49. REMOVE/REPAIR/INSTALL POINT-TO-POINT WIRING - Continued

12. Working at appropriate switch, install wire (2) as tagged, using screw (1).
13. Install cable ties (3), as required, to secure wire (2) to harness (4).



14. Working at appropriate ground lug, install wire (4) as tagged, using nut (1), lockwasher (2), and washer (3).
15. Install cable ties (5), as required, to secure wire (4) to harness (6).



FOLLOW-ON MAINTENANCE:

1. If working on PEP, install PEP access panel (para 8-8).
2. If working on PDU, close PDU front panel (para 8-23).

**CHAPTER 9
SIGNAL DISTRIBUTION SYSTEMS**

Para		Page
Section I	Principles of Operation	9-2
9-1	Introduction	9-2
9-2	Theory of Operation	9-2
9-2.1	ADP Shelter Red Patch Panel Assembly.....	9-2
9-2.2	ADP Shelter Black Patch Panel Assembly	9-4
9-2.3	Operations (OPN) Shelter Red Patch Panel Assembly (30(V)1 Only)	9-6
9-2.4	OPN Shelter Black Patch Panel Assembly (30(V)1 Only)	9-7
9-2.5	ADP Shelter Signal/Video Entry Panel.....	9-8
9-2.6	OPN Shelter Signal Entry Panel	9-9
9-2.7	Audio Assembly	9-10
9-2.8	Cabling.....	9-10
Section II	Troubleshooting	9-11
9-3	Introduction	9-11
9-4	General Instructions.....	9-11
9-4.1	Introduction	9-11
9-4.2	Inspection Procedures	9-11
9-4.3	Troubleshooting Procedures.....	9-11
9-4.4	Maintenance Procedures	9-12
9-5	Equipment Setup	9-12
9-6	Symptom Index.....	9-13
9-7	Troubleshooting Table	9-14
Section III	Maintenance Procedures.....	9-25
9-8	Remove/Install ADP Shelter Block-Off Bracket Assembly	9-25
9-9	Replace SVEP Surge Arrestor Assembly	9-26
9-10	Replace SVEP Group Data Assembly	9-28
9-11	Replace SVEP Group Data Assembly Connectors	9-30
9-12	Replace SVEP EMI Filter Adapter	9-31
9-13	Replace SVEP Audio Assembly	9-32
9-14	Replace SVEP Audio Assembly Connector.....	9-34
9-15	Replace SVEP Audio Assembly Surge Arrestors	9-35
9-16	Replace SVEP INTERCOM Binding Posts.....	9-43
9-20	Replace ADP Shelter Red Patch Panel LDF SELECT Switch Assembly.....	9-44
9-21	Replace ADP Shelter Red Patch Panel Single Patch-to-Connector Assembly	9-46
9-22	Replace ADP Shelter Red Patch Panel Dual Patch-to-Connector Assembly.....	9-50
9-23	Replace ADP Shelter Red Patch Panel Alarm Cable Assembly	9-53
9-24	Replace ADP Shelter Black Patch Panel Bantam-Style Jacks A1-A72.....	9-55
9-25	Replace ADP Shelter Black Patch Panel Coaxial/Twinaxial Jack Assemblies A73-A84	9-57

9-26	Replace ADP Shelter Black Patch Panel Circular Connectors J1-J18, J23-J29	9-58
9-27	Replace ADP Shelter Black Patch Panel RF Connectors J19J22.....	9-59
9-28	Remove/Repair/Install ADP Shelter Black Patch Panel Cable W4, W6, W7, or W9 .	9-60
9-29	Remove/Repair/Install Black Patch Panel Point-to-Point Wiring	9-61
9-30	Repair Signal Distribution Cables-Emergency Procedure	9-66
9-31	Replace ADP Shelter Fiber-Optic Cable W3 or W5	9-67
9-32	Replace OPN Shelter Fiber-Optic Cable	9-70
9-33	Remove/Repair/Install Signal Distribution System Coaxial/Twinaxial Cables	9-73
9-34	Replace Signal Distribution System Antenna RF Connector.....	9-74
9-35	Replace Signal Distribution System Antenna Control Connector.....	9-77
9-36	Open/Close OPN Shelter Red/Black Patch Panel Front Panel	9-80
9-37	Remove/Install OPN Shelter Red/Black Patch Panel Top Cover	9-83
9-38	Replace OPN Shelter Red Patch Panel LDF Select Switch Assembly.....	9-84
9-39	Replace OPN Shelter Red Patch Panel Single Patch-to-Connector Assembly.....	9-87
9-40	Replace OPN Shelter Red Patch Panel Dual Patch-to-Connector Assembly	9-90
9-41	Replace OPN Shelter Black Patch Panel Bantam-Style Jacks A1-A24	9-93
9-42	Replace OPN Shelter Black Patch Panel Rear Panel Connectors J1-J7	9-95

SECTION I. PRINCIPLES OF OPERATION

9-1. INTRODUCTION

This section provides the theory of operation for the signal distribution circuits of the Communication System, Control Element, Central Processors AN/TYQ-30(V)1/2.

NOTE

The AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ-30(V)2 system are essentially the same. When the manual refers to the ADP shelter, that reference applies equally to the AN/TYQ-30(V)1 system's ADP shelter and AN/TYQ(V)2 system, except where noted.

9-2. THEORY OF OPERATION

The signal distribution system consists of patch panels, Signal Entry Panels (SEPs), and the cables that interconnect the system component units.

9-2.1. ADP Shelter Red Patch Panel Assembly. A block diagram of the ADP red patch panel assembly is shown on the facing page.

- (1) **DUAL PATCH JACK-TO-CONNECTOR ASSEMBLY** One of 10. Each consists of a dual-type EIA patch assembly and two D-type Input/Output (I/O) cable connectors. Patch assembly has two EIA 16-circuit jacks, one wired to each of two /O0 connectors. Inserting patch cable or loopback plug in either patch jack substitutes patch cable for other connector. Patching between two jacks of one patch assembly equals no patch cable.

9-2.1. ADP Shelter Red Patch Panel Assembly - Continued

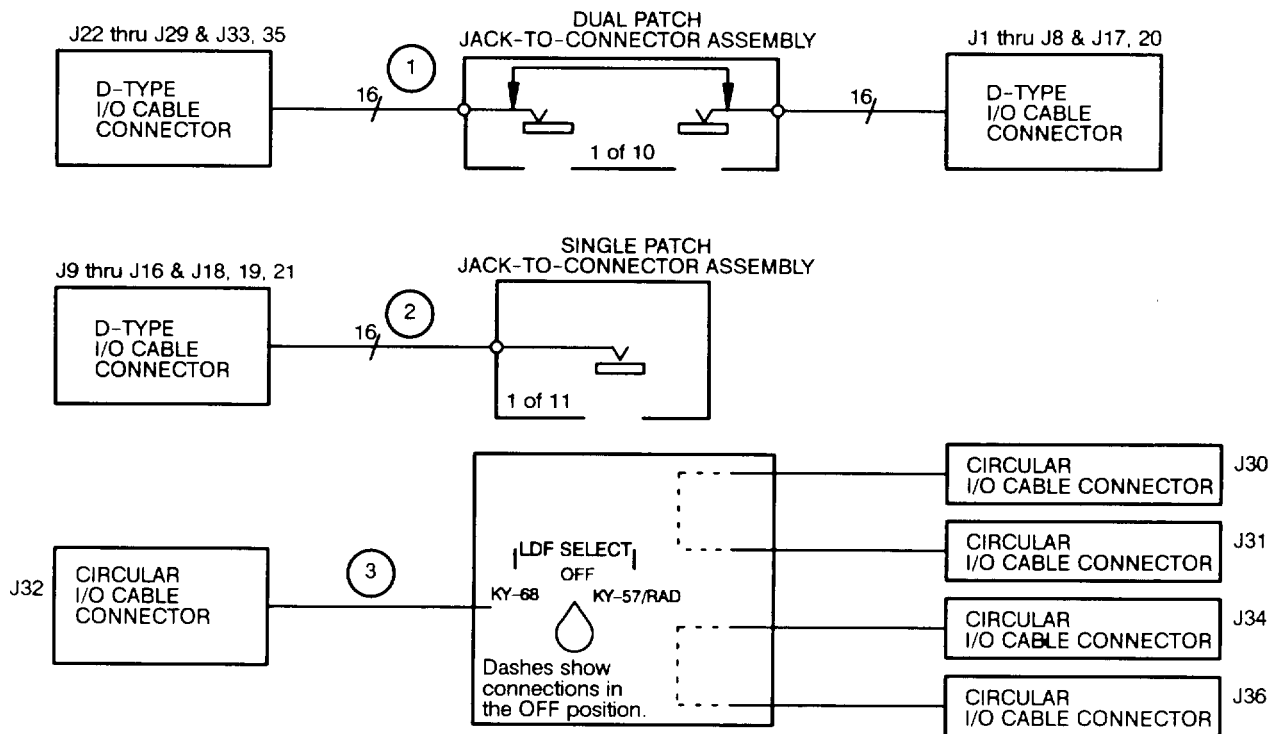
- (2) SINGLE PATCH JACK-TO-CONNECTOR ASSEMBLY One of 11. Each consists of a single-type EIA patch assembly and one D-type I/O connector Patch assembly has one 16-circuit jack wired to I/O connector. Inserting patch cable or loopback plug in patch jack connects patch cable to I/O connector.

- (3) SWITCH ASSEMBLY Consists of rotary Lightweight Digital Facsimile (LDF) SELECT switch and five I/O cable connectors. Connections depend upon switch position.

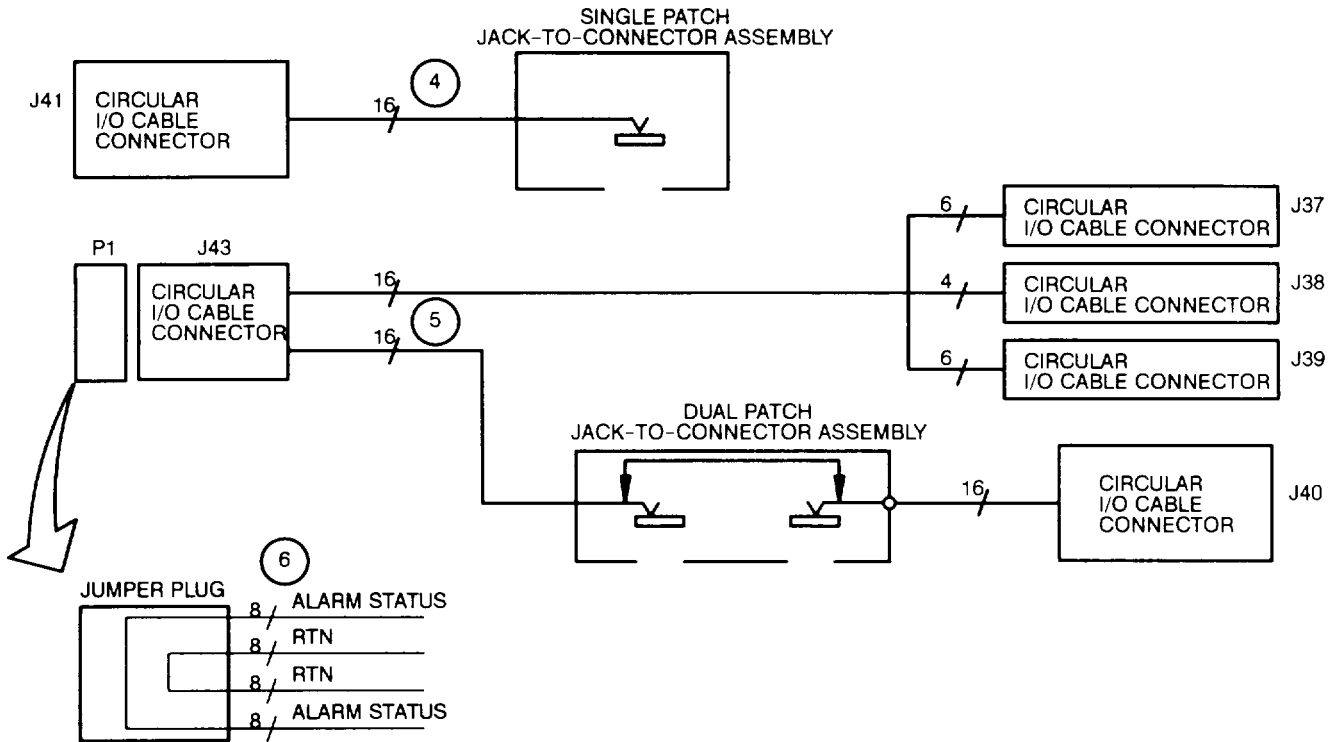
- (4) ALARM CABLE ASSEMBLY 1 Consists of single-type EIA patch jack and a circular I/O connector. Patch assembly has one 16-circuit jack wired to I/O connector. Inserting patch cable or loopback plug in patch jack connects patch cable to I/O connector.

- (5) ALARM CABLE ASSEMBLY 2 Consists of dual-type EIA patch jack assembly and five circular I/O cable connectors. Patch assembly has two EIA 16-circuit jacks. Inserting patch cable or loopback plug in either patch jack substitutes patch cable for other jack. Patching between two jacks of one patch assembly equals no patch cable.

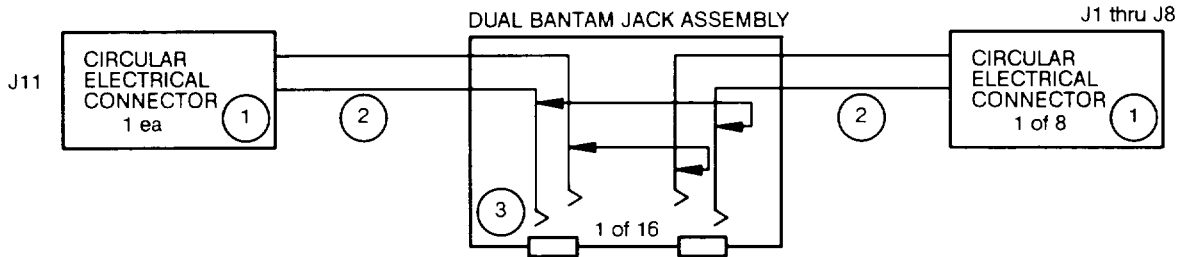
- (6) JUMPER PLUG Consists of circular jumper plug. When connected to circular I/O connector, interfaces 16 wires from 4 I/O connectors to 16 wires for Dual Patch Jack-to-Connector Assembly 2.



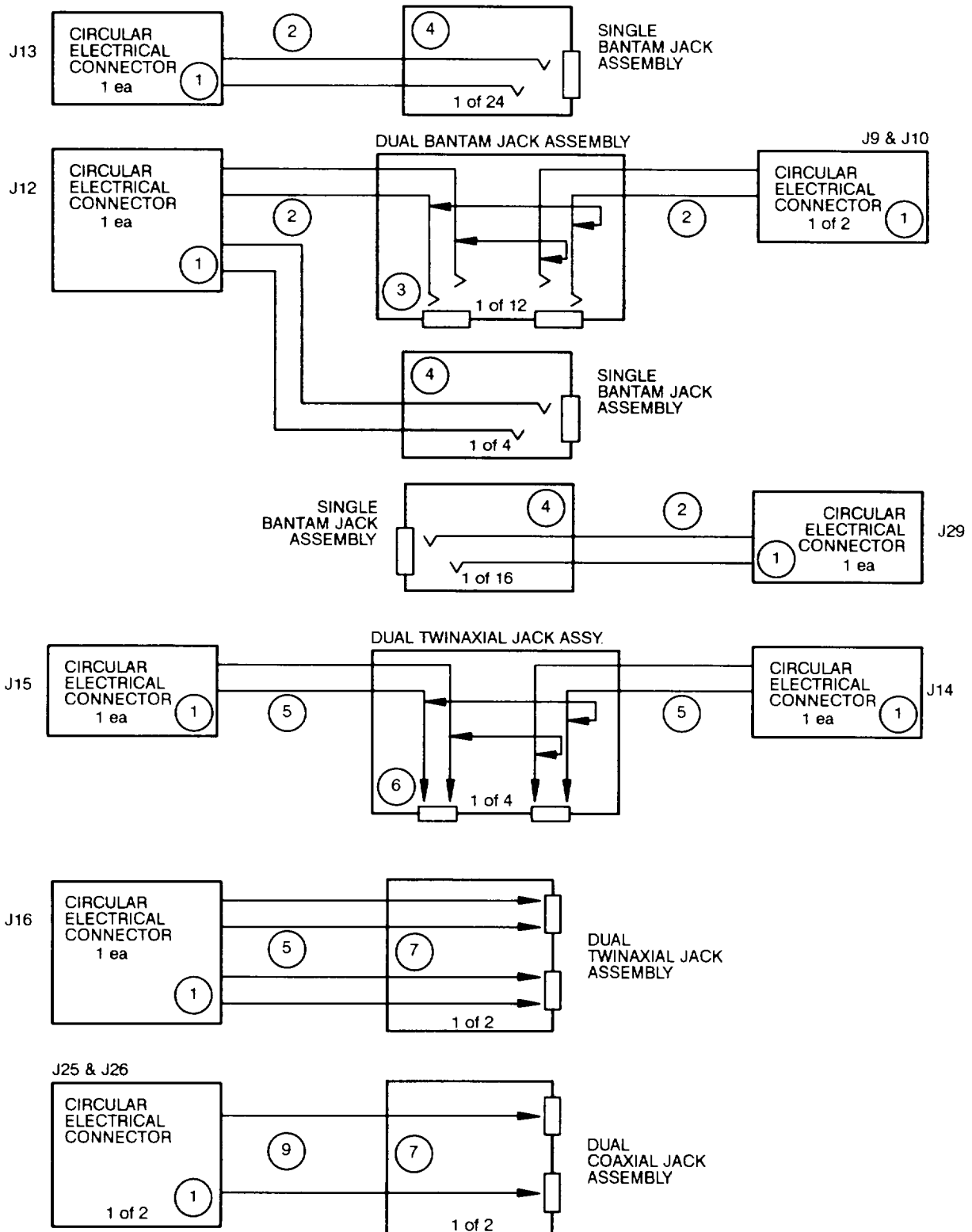
9-2.1. ADP Shelter Red Patch Panel Assembly - Continued



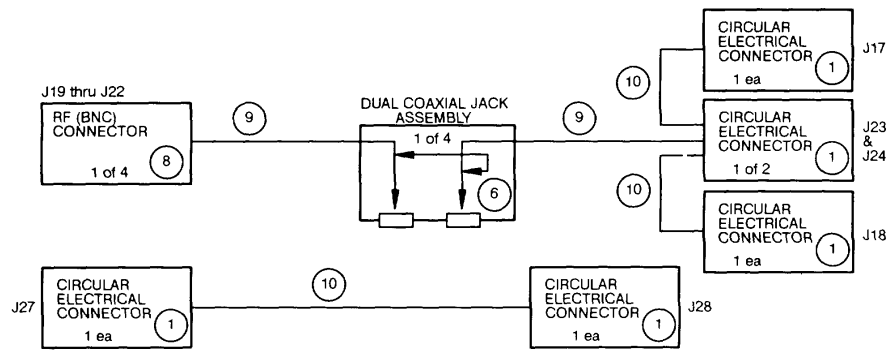
9-2.2. ADP Shelter Black Patch Panel Assembly. A block diagram of the ADP black patch panel assembly begins below.



9-2.2. ADP Shelter Black Patch Panel Assembly - Continued. The block diagram of the ADP black patch panel assembly is continued below.



9-2.2. ADP Shelter Black Patch Panel Assembly - Continued



- (1) CIRCULAR I/O CONNECTOR
- (2) POINT-TO-POINT TWISTED PAIR WIRING
- (3) DUAL BANTAM-TYPE PATCH JACK ASSEMBLY
- (4) BANTAM-TYPE PATCH JACK ASSEMBLY
- (5) RADIO FREQUENCY (RF) CABLES
- (6) COAXIAL/TWINAXIAL PATCH JACK ASSEMBLY
- (7) COAXIAL/TWINAXIAL PATCH JACK ASSEMBLY
- (8) CONNECTOR BNC-TYPE
- (9) COAXIAL RF CABLES
- (10) POINT-TO-POINT WIRING

Total 29. Provide cable interface to patch panel assembly.

Wiring between bantam-type patch jack assemblies and I/O connectors. Soldered at jack end.

One of 28. Used in Voice Frequency (F) patch section. Has two bantam-type jacks, each wired to one I/O connector. Inserting patch cable or loopback plug in patch jack substitutes patch cable for other I/O connector

One of 44. Used in VF section. Has one bantam-type jack, wired to I/O connector. Inserting patch cable or loopback plug in patch jack connects patch cable to I/O connector.

Connect twinaxial patch jack assemblies to I/O connectors. BNC-type connector at patch jack end. Crimped contacts at I/O end. One of eight: four coaxial, four twinaxial. Twinaxial used in equipment group patch section. Coaxial used in line group section. Has two jacks, each wired to one I/O connector. Inserting patch cable or loopback plug in patch jack substitutes patch cable for other I/O connector.

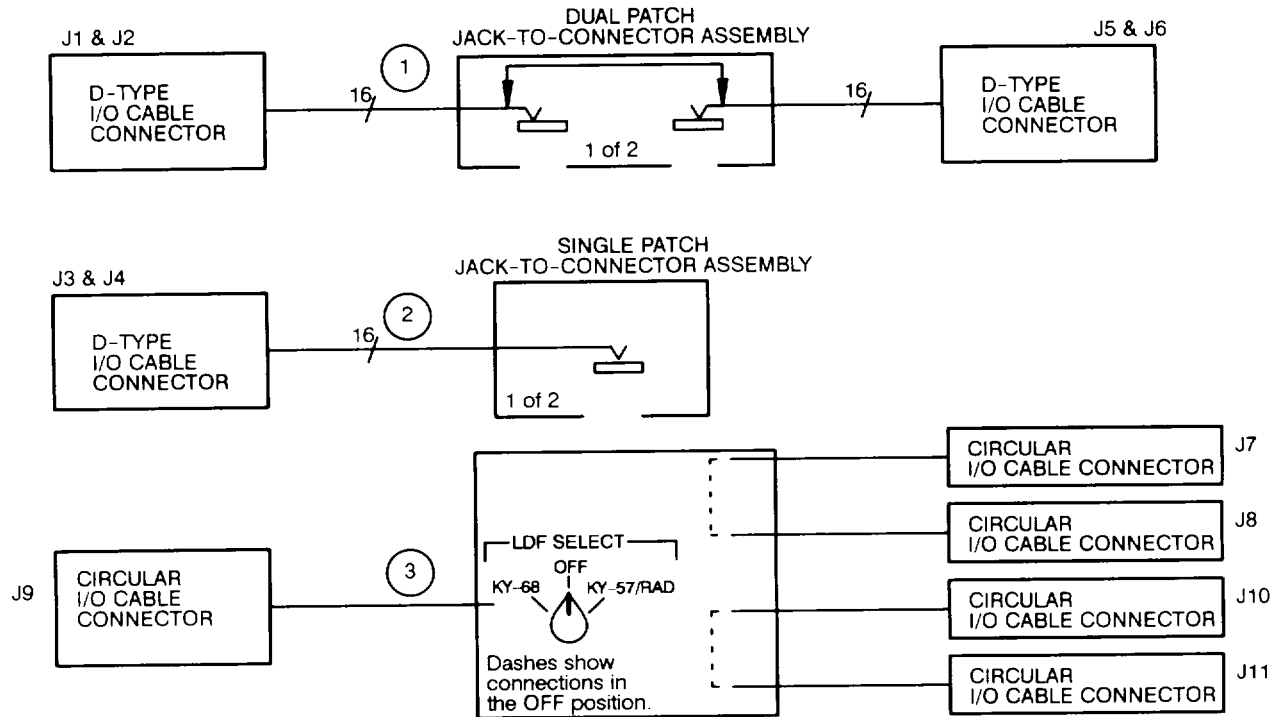
One of four: two coaxial, two twinaxial. Twinaxial used in equipment group patch section. Coaxial used in line group section. Has one jack, wired to I/O connector. Inserting patch cable or loopback plug in patch jack connects cable to I/O connector.

One of four. Provide Radio Frequency (RF) cable interface to patch panel.

Connect patch jack assemblies to I/O connectors using RG-58 coax. BNC-type connector at jack end. Crimped contacts at I/O end.

Wiring between I/O connectors using 22 and 26 AWG stranded wire.

9-2.3. Operations (OPN) Shelter Red Patch Panel Assembly (30(V)1 Only). A block diagram of the OPN red patch panel assembly is shown below.



(1) DUAL PATCH -TO-D-TYPE CONNECTOR ASSEMBLY

One of two. Each consists of a dual-type EIA patch assembly and two D-type I/O cable connectors. Patch assembly has two 16-circuit jacks, one wired to each of two I/O connectors. Inserting patch cable or loopback plug in either patch jack substitutes patch cable for other connector. Patching between two jacks of one patch assembly equals no patch cable.

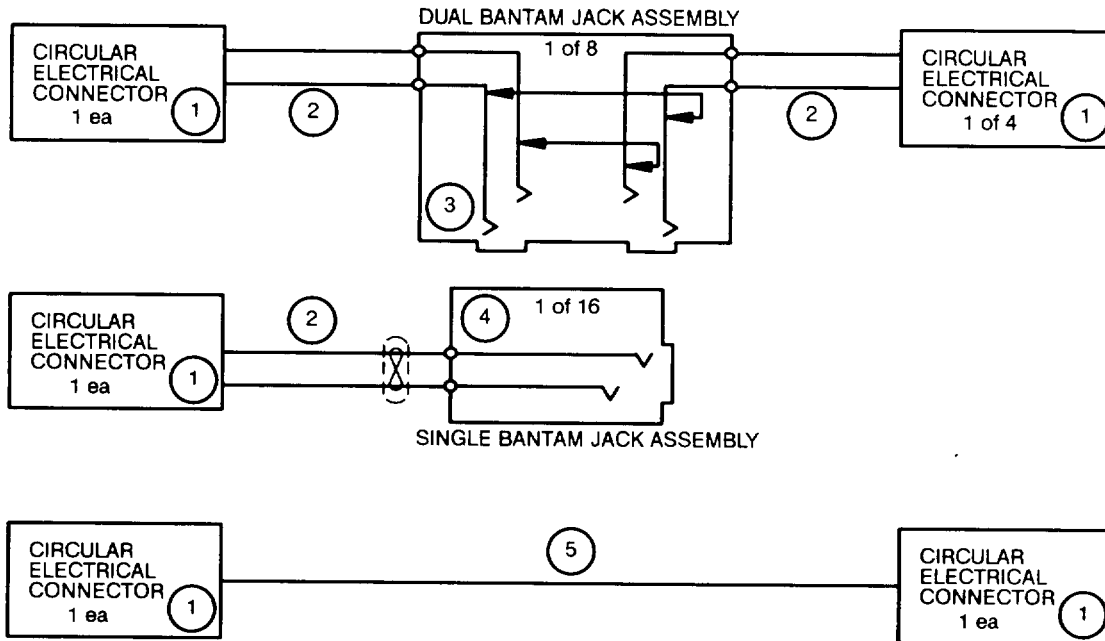
(2) SINGLE PATCH -TO-D-TYPE CONNECTOR ASSEMBLY

One of two. Each consists of a single-type EIA patch assembly and one D-type I/O connector. Patch assembly has one 16-circuit jack wired to I/O connector. Inserting patch cable or loopback plug in patch jack connects patch cable to I/O connector.

(3) ASSEMBLY

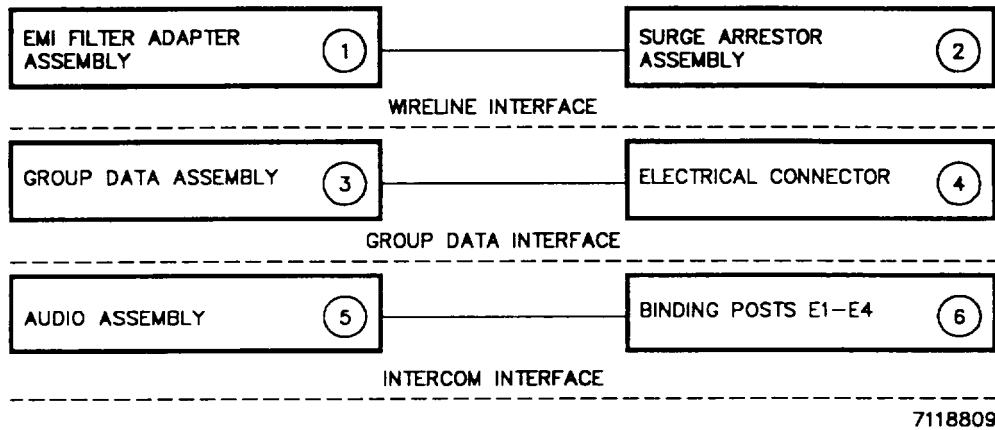
Consists of rotary Lightweight Digital Facsimile (LDF) SELECT switch and five I/O cable connectors. Connections depend upon switch position.

9-2.4. OPN Shelter Black Patch Panel Assembly (30(V)1 Only). A block diagram of the OPN black patch assembly is shown below.



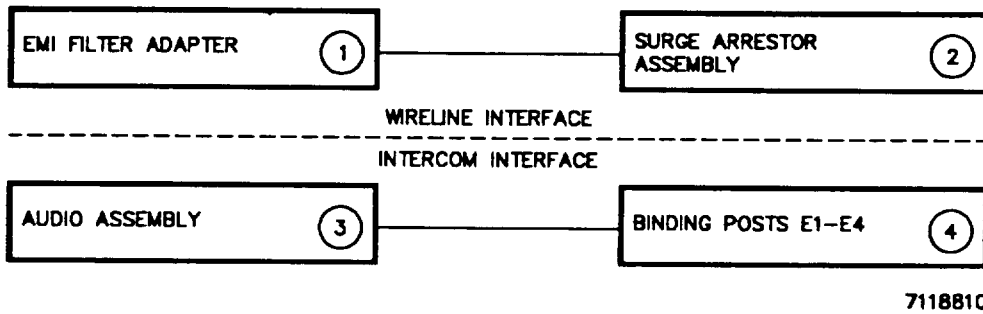
- | | |
|--|---|
| (1) CIRCULAR I/O CONNECTOR | Total seven. Provide cable interface to patch panel assembly. |
| (2) POINT-TO-POINT WIRING | Wiring between bantam-type patch jack assemblies and I/O connectors. Soldered at jack end. |
| (3) DUAL BANTAM-TYPE PATCH JACK ASSEMBLY | One of eight. Has two bantam-type jacks, each wired to one I/O connector. Inserting patch cable or loopback plug in patch jack substitutes patch cable for other I/O connector. |
| (4) SINGLE BANTAM-TYPE PATCH JACK ASSEMBLY | One of 16. Has one bantam-type jack, wired to I/O connector. Inserting patch cable or loopback plug in patch jack connects patch cable to I/O connector. |
| (5) POINT-TO-POINT WIRING | Wiring between I/O connectors using 22 AWG stranded wire.9-7 |

9-2.5. ADP Shelter Signal/Video Entry Panel. A block diagram of the ADP shelter Signal/Video Entry Panel (SVEP) is shown below.



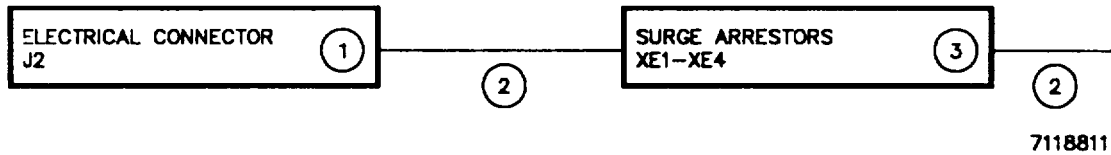
- | | |
|---|--|
| (1) ELECTROMAGNETIC INTERFERENCE (EMI) FILTER ADAPTER | Provides cable connection point for internal wireline cable. Also provides filtering for wireline signals. |
| (2) SURGE ARRESTOR ASSEMBLY | Provides cabling point for external wireline cable. Also protects internal circuits against external induced surges. |
| (3) GROUP DATA ASSEMBLY | Provides cable connection point for internal group data cable. Also contains surge suppressors. |
| (4) CONNECTOR | Provides cable connection point for external group data cable. |
| (5) ASSEMBLY | Interfaces intercom to two sets of binding posts. Also provides cabling point for internal intercom cable. Contains surge arrestors. |
| (6) BINDING POSTS E1-E4 | Provide two sets of connection points for external intercom units. |

9-2.6. **OPN Shelter Signal Entry Panel.** A block diagram of the OPN SEP is shown below.



- | | |
|-----------------------------|--|
| (1) EMI FILTER ADAPTER | Provides cable connection point for internal wireline cable. Also provides filtering for wireline signals. |
| (2) SURGE ARRESTOR ASSEMBLY | Provides cabling point for external wireline cable. Also protects internal circuits against external induced surges. |
| (3) AUDIO ASSEMBLY | Interfaces intercom to two sets of binding posts. Also provides cabling point for internal intercom cable. Contains surge arrestors. |
| (4) BINDING POSTS E1-E4 | Provide two sets of connection points for external intercom units. |

9-2.7. **Audio Assembly.** A block diagram of the audio assembly is shown below.



- | | |
|-----------------------------|--|
| (1) ELECTRICAL CONNECTOR J2 | Provides cable connection point for internal intercom cable. |
| (2) POINT-TO-POINT WIRING | |
| (3) SURGE ARRESTORS XE1-XE4 | Connects surge arrestors to electrical connector. Also provides for connection to external binding posts.

Provide protection against external voltage surges. |

9-2.8. **Cabling.** A complete cabling interconnect diagram of each shelter is provided in volume 2 of this manual.

SECTION II. TROUBLESHOOTING

9-3. INTRODUCTION

This section provides procedures required to set up, test, fault isolate, and repair the ADP shelter and OPN shelter signal distribution circuits at the direct support maintenance level.

9-4. GENERAL INSTRUCTIONS

9-4.1. Introduction

- a. Troubleshooting and repair should be performed only by experienced technicians who are familiar with the equipment and capable of ensuring that procedures are correctly accomplished.
- b. Maintenance personnel should read all inspection, troubleshooting, and maintenance instructions before attempting to troubleshoot or repair the equipment.

9-4.2. Inspection Procedures

- a. Visually inspect all wiring and all electronic assemblies and their components for obvious damage. Check for open connections, shorts, burning, discoloration, brittle or cracked insulation, or charring. If damage is noted, carefully inspect related components for similar damage to help identify the cause of the damage.
- b. When removed, visually inspect all Circuit Card Assemblies (CCAs) for signs of excess heat, such as charred, burned, discolored, cracked, or broken components. Inspect all printed wire etching on CCAs for apparent breaks, cuts, nicks, or signs of lifting from the card. Inspect CCA connectors for cracked or broken insulation and for missing, loose, bent, or broken pins. Inspect contacts of CCA edge connectors to ensure that they are not broken, scratched, nicked, cut or dirty. Clean dirty contacts.
- c. Inspect all chassis connectors for broken, scratched, dented, or damaged housings; missing hardware; and missing or damaged connector pins.
- d. Operate each switch to all positions to ensure that it operates freely and smoothly and that all contacts appear to mate when they should. Ensure that all switch detents operate positively and firmly. Inspect knobs for breaks or cracks.

9-4.3. Troubleshooting Procedures

- a. Observe reported symptom or repeat failed diagnostic test to verify reported fault.
- b. Using symptom index (table 9-1) and troubleshooting table (table 9-2), perform steps required to isolate fault to a part or assembly and perform first specified corrective action.
- c. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- d. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action.
- e. When corrective action is complete, repeat the action or diagnostic test that initially identified fault to confirm repair.
- f. Repeat steps d and e until fault is corrected or it becomes necessary to refer unit to next higher level of maintenance.

9-4.4. Maintenance Procedures

- a. The equipment documented in this manual is typical. The equipment you are repairing may contain minor variations (location and number of cable ties, cable markers, lockwashers, etc.) which do not affect the essential procedural steps given.
- b. While performing maintenance procedures, cut and remove cable ties whenever needed. Note and record the number and location of the cable ties removed to aid installation.
- c. Bag and tag hardware (screws, washers, etc.) during removal procedures to aid installation.
- d. Tag connectors and wires during removal procedures to ensure correct reconnection.
- e. If during removal of an assembly it is observed that wires, cables, or connectors attached to that assembly are loose, reinstall or reconnect the loose item and repeat troubleshooting procedure to verify repair.

9-5. EQUIPMENT SETUP

1. Connect all internal and external cables for normal operation.
2. Refer to TM 11-5895-1392-12 and perform turn-on procedure for appropriate shelter to point where first trouble symptom is noted.

9-6. SYMPTOM INDEX

The symptom index for ADP shelter and OPN shelter signal distribution is provided in table 9-1. Unless otherwise indicated, all symptoms are for either the ADP or OPN shelter. Simply check the table for the fault condition and go to the referenced troubleshooting procedure in Table 9-2, Signal Distribution Troubleshooting.

Table 9-1. Signal Distribution Symptom Index

NUMBER	SYMPTOM	PAGE
1	Faulty circuit in ADP shelter red patch panel	9-15
2	Faulty LDF SELECT switch assembly in ADP shelter red patch panel	9-15
3	Faulty circuit in ADP shelter black patch panel	9-15
4	Faulty circuit in OPN shelter red patch panel	9-16
5	Faulty LDF SELECT switch assembly in OPN shelter red patch panel	9-17
6	Faulty circuit in OPN shelter black patch panel	9-17
7	Faulty SVEP wireline interface	9-18
8	Faulty ADP shelter SVEP group data interface	9-18
9	Faulty SVEP intercom interface	9-18
10	Faulty antenna RF or control connectors	9-19
11	Faulty fiber-optic cable W3 or W5	9-19
12	Faulty signal distribution system coaxial/twinaxial cables	9-19

WARNING

• **HIGH VOLTAGE IS USED IN THE OPERATION OF THIS EQUIPMENT.** Disconnect power before removing any covers or replacing parts. **DEATH ON CONTACT** may result if the operator fails to observe safety precautions.

• **HIGH VOLTAGES ARE PRESENT IN THE EQUIPMENT WHEN POWER IS APPLIED.** Work carefully if covers are removed or panels are open to avoid electrical shock.

• **The shelter must be properly grounded.** In addition to being a personnel safety hazard, improper grounding may cause erroneous operation and damage to equipment.

9-7. TROUBLESHOOTING TABLE TABLE

CAUTION

- To avoid electrical shorts or similar problems, promptly remove any hardware or other foreign matter dropped into the equipment.
- Never place spillable containers on or near the equipment.

NOTE

- When performing troubleshooting procedures, especially during electrical checks, be alert for intermittent as well as good/bad conditions.
- When panels are opened or covers removed, inspect interior components for damage, loose wiring, etc. Replace any damaged components and tighten loose connections. Then proceed with troubleshooting.
- Be sure that plugs, jacks, cables, and integrated circuits are completely and positively engaged. When reconnecting these items, guard against bending pins and inverting or offsetting connection of unkeyed connectors.
- Instructions that refer to right, left, front, or rear are given as if viewing the unit from the front panel, looking toward the rear of the unit.

Troubleshooting procedures for the signal distribution circuits are provided in table 9-2. The table consists of three columns and is used as follows:

1. MALFUNCTION: Indicates equipment fault as described in symptom index. Look in TEST OR INSPECTION column for required fault isolation steps.
2. TEST OR INSPECTION: Indicates step(s) to be taken to isolate fault to a specific part or assembly. If equipment passes a test or inspection step, go to next step. If equipment fails a test or inspection, look in CORRECTIVE ACTION column for repair steps.
3. CORRECTIVE ACTION: Indicates authorized adjustment or repair for an isolated fault. When action is completed, repeat action or diagnostic test that initially identified fault to confirm repair. If fault persists, proceed to next corrective action, reinstalling, where applicable, parts and assemblies removed in prior corrective action. If all steps are completed and fault persists, refer equipment to next higher level of maintenance.

9-7. TROUBLESHOOTING TABLE TABLE - Continued

Table 9-2. Signal Distribution Troubleshooting

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION
<p>1. FAULTY CIRCUIT IN ADP SHELTER RED PATCH PANEL</p>
<p>Using task referenced in table 9-3, identify components and check continuity of suspected faulty assembly.</p>
<ul style="list-style-type: none"> a. Replace faulty assembly. b. Refer to next higher level of maintenance.
<p>2. FAULTY LDF SELECT SWITCH ASSEMBLY IN ADP SHELTER RED PATCH PANEL</p>
<p>Check LDF SELECT switch assembly by replacing with a known good LDF SELECT switch assembly (para 9-20).</p>
<ul style="list-style-type: none"> a. Replace faulty LDF SELECT switch assembly. b. Refer to next higher level of maintenance.
<p>3. FAULTY CIRCUIT IN ADP SHELTER BLACK PATCH PANEL</p>
<p>NOTE</p>
<p>Using table 9-4, find faulty circuit and identify associated parts. Perform troubleshooting steps required:</p>
<ul style="list-style-type: none"> • If a LINE GROUP PATCH - EQUIPMENT XMT/REC circuit is faulty, go to step 1. • If any other circuit is faulty, go to step 4.
<p>Step 1. Visually inspect RF connectors J19-J22 for bent pins, excessive dirt or corrosion, or any other sign of damage.</p>
<p>Replace faulty RF connector J19-J22 (para 9-27).</p>
<p>Step 2. Remove black patch panel bottom access cover (para 9-19). Disconnect cable from front panel patch jack. Check for short or open in patch jack. Refer to ADP shelter black patch panel schematic (volume 2).</p>
<p>Replace faulty coaxial/ twinaxial jack assembly (para 9-25).</p>
<p>9-15</p>

9-7. TROUBLESHOOTING TABLE TABLE - Continued

Table 9-2. Signal Distribution Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. FAULTY CIRCUIT IN ADP SHELTER BLACK PATCH PANEL - Continued		
Step 3.	Check cable W4, W6, W7, or W9, as required, for continuity.	<ul style="list-style-type: none"> a. Replace faulty cable W4, W6, W7, or W9, as required (para 9-28). b. Refer to next higher level of maintenance.
Step 4.	Visually inspect circuit circular connectors at top access cover for bent pins, excessive dirt or corrosion, or any other sign of damage.	Replace faulty circular connector (para 9-26).
Step 5.	Remove black patch panel bottom access cover (para 9-19). If circuit is terminated in bantam-style jack, go to step 6. Disconnect cable from front panel patch jack. Check for short or open in patch jack. Refer to ADP shelter black patch panel schematic (volume 2).	<ul style="list-style-type: none"> a. Replace faulty coaxial/twinaxial jack assembly (para 9-25). b. Refer to next higher level of maintenance.
Step 6.	Check for short or open in bantam-style jack. Refer to ADP shelter black patch panel schematic (volume 2).	<ul style="list-style-type: none"> a. Replace faulty bantam-style jack (para 9-24). b. Repair faulty point-to-point wiring (para 9-29). c. Refer to next higher level of maintenance.
4. FAULTY CIRCUIT IN OPN SHELTER RED PATCH PANEL		
Using task referenced in table 9-5, identify and remove faulty assembly. Check assembly by replacing with a known good assembly.		
<ul style="list-style-type: none"> a. Replace faulty assembly. b. Refer to next higher level of maintenance. 		

9-7. TROUBLESHOOTING TABLE TABLE - Continued

Table 9-2. Signal Distribution Troubleshooting - CONT

MALFUNCTION
TEST OR INSPECTION
CORRECTIVE ACTION
<p>5. FAULTY LDF SELECT SWITCH ASSEMBLY IN OPN SHELTER RED PATCH PANEL</p>
<p>Check switch assembly by replacing with a known good LDF SELECT switch assembly (para 9-20).</p>
<ul style="list-style-type: none"> a. Replace faulty LDF SELECT switch assembly. b. Refer to next higher level of maintenance.
<p>6. FAULTY CIRCUIT IN OPN SHELTER BLACK PATCH PANEL</p>
<p>NOTE</p>
<p>Using table 9-6, find faulty circuit and identify associated parts.</p>
<p>Step 1. Visually inspect circuit circular connectors at top access cover for bent pins, excessive dirt or corrosion, or any other sign of damage.</p>
<p>Replace faulty circular connector (para 9-26).</p>
<p>Step 2. Remove black patch panel bottom access cover (para 9-19). If circuit terminated in bantam-style jack, go to step 3. Disconnect cable from front panel patch jack. Check for short or open in patch jack. Refer to OPN shelter black patch panel schematic (volume 2).</p>
<ul style="list-style-type: none"> a. Replace faulty coaxial/twinaxial jack assembly (para 9-25). b. Refer to next higher level of maintenance.
<p>Step 3. Check for short or open in bantam-style jack. Refer to OPN shelter black patch panel schematic (volume 2).</p>
<ul style="list-style-type: none"> a. Replace faulty bantam-style jack (para 9-24). b. Repair faulty point-to-point wiring (para 9-29). c. Refer to next higher level of maintenance.
<p>9-17</p>

9-7. TROUBLESHOOTING TABLE TABLE - Continued

Table 9-2. Signal Distribution Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
7. FAULTY SVEP WIRELINE INTERFACE		
Step 1.	Remove SVEP EMI filter adapter (para 9-12). Check for short or open in filter adapter.	Replace faulty SVEP EMI filter adapter.
Step 2.	Remove SVEP EMI filter adapter (para 9-12). Check for short or open in surge arrester assembly.	<ul style="list-style-type: none"> a. Replace faulty SVEP surge arrester assembly (para 9-9). b. Refer to next higher level of maintenance.
8. FAULTY ADP SHELTER SVEP GROUP DATA INTERFACE		
	Remove SVEP group data assembly (para 9-10). Check for short or open in group data assembly.	<ul style="list-style-type: none"> a. Replace faulty SVEP group data assembly. b. Refer to next higher level of maintenance.
9. FAULTY SVEP INTERCOM INTERFACE		
Step 1.	Check SVEP audio assembly connector for bent pins, excessive dirt or corrosion, or any other sign of damage.	Replace faulty SVEP audio assembly connector (para 9-14).
Step 2.	Remove SVEP audio assembly (para 9-13). (Leave SVEP audio assembly on workbench until fault is corrected.) Check for short or open in intercom binding posts E1-E4.	Replace faulty intercom binding posts (para 9-16).
Step 3.	Check for short or open in SVEP audio assembly surge arrestors.	Replace faulty SVEP surge arrestors (para 9-15).

9-7. TROUBLESHOOTING TABLE TABLE - Continued

Table 9-2. Signal Distribution Troubleshooting - CONT

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
9. FAULTY SVEP INTERCOM INTERFACE - Continued		
Step 5.	Check SVEP audio assembly point-to-point wiring. Refer to SVEP audio assembly schematic (volume 2).	<ul style="list-style-type: none"> a. Repair faulty wiring. Refer to SVEP audio assembly wire list (volume 2). b. Refer to next higher level of maintenance.
10. FAULTY ANTENNA RF OR CONTROL CONNECTORS		
Visually inspect connector for bent pins, excessive dirt or corrosion, or any other sign of damage.		
Replace faulty antenna RF connector (para 9-34) or antenna control connector (para 9-35), as required.		
11. FAULTY FIBER-OPTIC CABLE W3 OR W5		
Check fiber-optic cable W3 or W5 by replacing with a known good fiber-optic cable W3 or W5 (para 9-31).		
Replace faulty fiber-optic cable W3 or W5.		
12. FAULTY SIGNAL DISTRIBUTION SYSTEM COAXIAL/TWINAXIAL CABLES		
Check that coaxial/twinaxial cable under repair has continuity.		
Replace or repair faulty coaxial/twinaxial cable (para 9-33).		

9-7. TROUBLESHOOTING TABLE - Continued

Table 9-3. ADP Shelter Red Patch Panel Cross-Reference

NOTE

Reference designators in parentheses are labels on replacement assembly connectors.

PATCH PANEL LABEL	PATCH JACK REF DES	CONNECTOR REF DES	REPLACE PARAGRAPH
COMM PROCESSOR NO 1 CH 1	A1 (P1)	J1 (P2), J22 (P3)	9-22
COMM PROCESSOR NO 1 CH 2	A2 (P1)	J2 (P2), J23 (P3)	9-22
COMM PROCESSOR NO 1 CH 3	A3 (P1)	J3 (P2), J24 (P3)	9-22
COMM PROCESSOR NO 1 CH 4	A4 (P1)	J4 (P2), J25 (P3)	9-22
COMM PROCESSOR NO 1 CH 5	A5 (P1)	J5 (P2), J26 (P3)	9-22
COMM PROCESSOR NO 1 CH 6	A6 (P1)	J6 (P2), J27 (P3)	9-22
COMM PROCESSOR NO 1 CH 7	A7 (P1)	J7 (P2), J28 (P3)	9-22
COMM PROCESSOR NO 1 CH 8	A8 (P1)	J8 (P2), J29 (P3)	9-22
COMM PROCESSOR NO 2 CH 1	A14 (P1)	J9 (P2)	9-21
COMM PROCESSOR NO 2 CH 2	A15 (P1)	J10 (P2)	9-21
COMM PROCESSOR NO 2 CH 3	A16 (P1)	J11 (P2)	9-21
COMM PROCESSOR NO 2 CH 4	A17 (P1)	J12 (P2)	9-21
COMM PROCESSOR NO 2 CH 5	A18 (P1)	J13 (P2)	9-21
COMM PROCESSOR NO 2 CH 6	A19 (P1)	J14 (P2)	9-21
COMM PROCESSOR NO 2 CH 7	A20 (P1)	J15 (P2)	9-21
COMM PROCESSOR NO 2 CH 8	A21 (P1)	J16 (P2)	9-21
CONSOLE PORTS CP 1	A9 (P1)	J20 (P2), J35 (P3)	9-22
CONSOLE PORTS CP 2	A10 (P1)	J19 (P2)	9-21
CONSOLE PORTS DBMP	A11 (P1)	J21 (P2)	9-21
PRINTER PORTS WS 1	A12 (P1)	J17 (P2), J33 (P3)	9-22
PRINTER PORTS WS 2	A13 (P1)	J18 (P2)	9-21
EQPT ALARMS CP 1	A22 (P1)	J37 (P4), J38 (P5), J39 (P6), J40 (P2), J43 (P3)	9-23
EQPT ALARMS CP 2	A23 (P1)	J41 (P2)	9-21
LDF SELECT	A24 (S1)	J30 (P1), J31 (P2), J32 (P3), J34 (P4), J36 (P5)	9-20

9-7. TROUBLESHOOTING TABLE - Continued

Table 9-4. ADP Shelter Black Patch Panel Cross-Reference

PATCH PANEL LABEL	PATCH JACK		CONNECTOR		CONNECTOR	
	REF DES	REPLACE PARA	REF DES	REPLACE PARA	REF DES	REPLACE PARA
VF PATCH DSVT CH-1	A1, A2	9-24	J1	9-26	J11	9-26
VF PATCH DSVT CH-2	A3, A4	9-24	J2	9-26	J11	9-26
VF PATCH DSVT CH-3	A5, A6	9-24	J3	9-26	J11	9-26
VF PATCH DSVT CH-4	A7, A8	9-24	J4	9-26	J11	9-26
VF PATCH DSVT CH-5	A5, A10	9-24	J5	9-26	J11	9-26
VF PATCH DSVT CH-6	A11, A12	9-24	J6	9-26	J11	9-26
VF PATCH DSVT CH-7	A37, A38	9-24	J7	9-26	J11	9-26
VF PATCH DSVT CH-8	A39, A40	9-24	J8	9-26	J11	9-26
VF PATCH DSVT CH-9	A41, A42	9-24	J9	9-26	J12	9-26
VF PATCH DSVT CH-10	A43, A44	9-24	J10	9-26	J12	9-26
VF PATCH DSVT CH-15	A45, A46	9-24	--	--	J12	9-26
VF PATCH DSVT CH-16	A47, A48	9-24	--	--	J12	9-26
VF PATCH SEP CH-1	A13, A14	9-24	--	--	J13	9-26
VF PATCH SEP CH-2	A15, A16	9-24	--	--	J13	9-26
VF PATCH SEP CH-3	A17, A18	9-24	--	--	J13	9-26
VF PATCH SEP CH-4	A19, A20	9-24	--	--	J13	9-26
VF PATCH SEP CH-5	A21, A22	9-24	--	--	J13	9-26
VF PATCH SEP CH-6	A23, A24	9-24	-	--	J13	9-26
VF PATCH SEP CH-7	A25, A26	9-24	-	--	J13	9-26
VF PATCH SEP CH-8	A27, A28	9-24	--	--	J13	9-26
VF PATCH SEP CH-9	A29, A30	9-24	--	--	J13	9-26
VF PATCH SEP CH-10	A31, A32	9-24	--	--	J13	9-26
VF PATCH SEP CH-11	A33, A34	9-24	--	--	J13	9-26
VF PATCH SEP CH-12	A35, A36	9-24	--	--	J13	9-26
OPS SHELTER CH-1	A49, A50	9-24	J29	9-26	J12	9-26
OPS SHELTER CH-2	A51, A52	9-24	J29	9-26	J12	9-26
OPS SHELTER CH-3	A53, A54	9-24	J29	9-26	J12	9-26

9-7. TROUBLESHOOTING TABLE - Continued

Table 9-4. ADP Shelter Black Patch Panel Cross-Reference - CONT

PATCH PANEL LABEL	PATCH JACK		CONNECTOR		CONNECTOR	
	REF DES	REPLACE PARA	REF DES	REPLACE PARA	REF DES	REPLACE PARA
OPS SHELTER CH-4	A55, A56	9-24	J29	9-26	J12	9-26
OPS SHELTER CH-5	A57, A58	9-24	J29	9-26	--	--
OPS SHELTER CH-6	A59, A60	9-24	J29	9-26	--	--
OPS SHELTER CH-7	A61, A62	9-24	J29	9-26	--	--
OPS SHELTER CH-8	A63, A64	9-24	J29	9-26	--	--
OPS SHELTER CH-9	A65, A66	9-24	J29	9-26	--	--
OPS SHELTER CH-10	A67, A68	9-24	J29	9-26	--	--
OPS SHELTER CH-11	A69, A70	9-24	J29	9-26	--	--
OPS SHELTER CH-12	A71, A72	9-24	J29	9-26	--	--
EQUIPMENT GROUP PATCH GROUP 1 DATA IN	A73	9-25	J14	9-26	J15	9-26
EQUIPMENT GROUP PATCH GROUP 1 TIM IN	A74	9-25	J14	9-26	J15	9-26
EQUIPMENT GROUP PATCH GROUP 1 DATA OUT	A75	9-25	J14	9-26	J15	9-26
EQUIPMENT GROUP PATCH GROUP 1 TIM OUT	A76	9-25	J14	9-26	J15	9-26
EQUIPMENT GROUP PATCH GROUP 2 DATA IN/TIM IN	A77	9-25	J16	9-26	--	--
EQUIPMENT GROUP PATCH GROUP 2 DATA OUT/TIM OUT	A78	9-25	J16	9-26	--	--
LINE GROUP PATCH EQUIPMENT XMT	A79	9-25	J19	9-24	W4P1	9-28
LINE GROUP PATCH EQUIPMENT REC	A80	9-25	J20	9-24	W6P1	9-28
LINE GROUP PATCH EQUIPMENT XMT	A81	9-25	J21	9-24	W7P1	9-28
LINE GROUP PATCH EQUIPMENT REC	A82	9-25	J22	9-24	W9P1	9-28
LINE GROUP PATCH CABLE XMT/REC	A83	9-25	--	--	J25	9-26

9-7. TROUBLESHOOTING TABLE - Continued

Table 9-4. ADP Shelter Black Patch Panel Cross-Reference - CONT

PATCH PANEL LABEL	PATCH JACK		CONNECTOR		CONNECTOR	
	REF DES	REPLACE PARA	REF DES	REPLACE PARA	REF DES	REPLACE PARA
LINE GROUP PATCH CABLE XMT/REC	A84	9-25	--	--	J26	9-26
(ROA 1 Faults)	--	--	J17	9-26	J23	9-26
(ROA 2 Faults)	--	--	J18	9-26	J24	9-26
(Intercom)	--	--	J27	9-26	J28	9-26

Table 9-5. OPN Shelter Red Patch Panel Cross-Reference

NOTE

Reference designators in parentheses are labels on replacement assembly connectors.

PATCH PANEL LABEL	PATCH JACK REF DES	CONNECTOR REF DES	REPLACE PARAGRAPH
WS1/PRINTER 1	A1 (P1)	J1 (P2), J5 (P3)	9-40
WS2/PRINTER 2	A2 (P1)	J2 (P2), J6 (P3)	9-40
WS3	A3 (P1)	J3 (P2)	9-39
WS4	A4 (P1)	J4 (P2)	9-39
LDF SELECT	A5 (S1)	J7 (P1), J8 (P2), J9 (P3), J10 (P4), J11 (P5)	9-38

9-7. TROUBLESHOOTING TABLE - Continued

Table 9-6. OPN Shelter Black Patch Panel Cross -Reference

PATCH PANEL LABEL	PATCH JACK		CONNECTOR		CONNECTOR	
	REF DES	REPLACE PARA	REF DES	REPLACE PARA	REF DES	REPLACE PARA
VF PATCH CH-1 XMT	A1, A2	9-41	J1	9-42	J5	9-42
VF PATCH CH-2 XMT	A3, A4	9-41	J2	9-42	J5	9-42
VF PATCH CH-3 XMT	A5, A6	9-41	J3	9-42	J5	9-42
VF PATCH CH-4 XMT	A7, A8	9-41	J4	9-42	J5	9-42
VF PATCH CH-5	A9, A10	9-41	--	--	J5	9-42
VF PATCH CH-6	A11, A12	9-41	--	--	J5	9-42
VF PATCH CH-7	A13, A14	9-41	--	--	J5	9-42
VF PATCH CH-8	A15, A16	9-41	--	--	J5	9-42
VF PATCH CH-9	A17, A18	9-41	--	--	J5	9-42
VF PATCH CH-10	A19, A20	9-41	--	--	J5	9-42
VF PATCH CH-11	A21, A22	9-41	--	--	J5	9-42
VF PATCH CH-12	A23, A24	9-41	--	--	J5	9-42
(Intercom)	--	--	J6	9-42	J7	9-42

SECTION III. MAINTENANCE PROCEDURES

9-8. REMOVE/INSTALL ADP SHELTER BLOCK-OFF BRACKET ASSEMBLY

This task covers: a. Removal

b. Installation

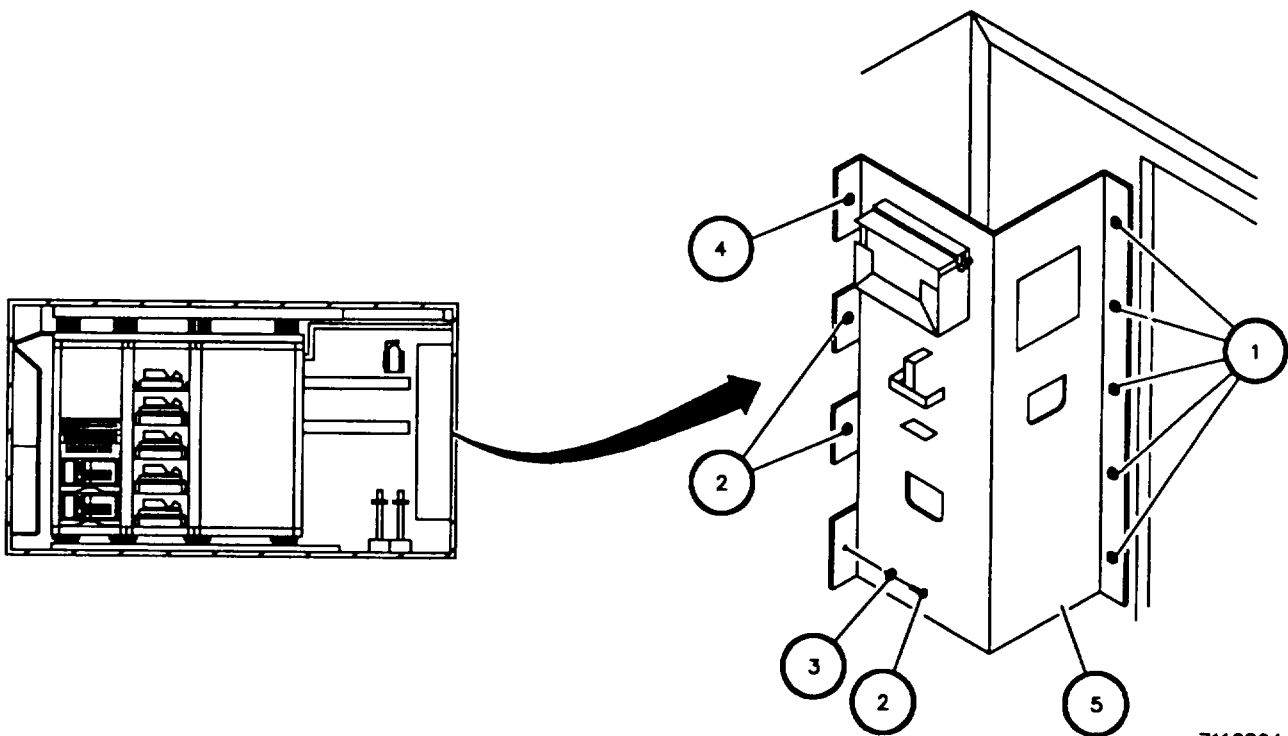
INITIAL SETUP

General Safety Precaution:WARNING

Multiple person lift required. Do not attempt to lift, carry, or move the equipment by yourself. Get help.

REMOVAL

1. Working inside shelter at curbside rear corner, remove five short screws (1), three medium length screws (2) and washers (3), and one long screw (4).
2. Remove block-off bracket assembly (5).



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INSTALLATION

1. Place and hold block-off bracket assembly (5) in installed position.
2. Install five short screws (1), three medium screws (2) and washers (3), and one long screw (4).

9-9. REPLACE SVEP SURGE ARRESTOR ASSEMBLY

This task covers: a. Removal

b. Installation

INITIAL SETUP

NOTE

- Replace ADP and OPN shelter surge arrestor assemblies the same way. An ADP shelter surge arrestor assembly is shown.
- EMI gasket may be replaced when surge arrestor removed and installed.

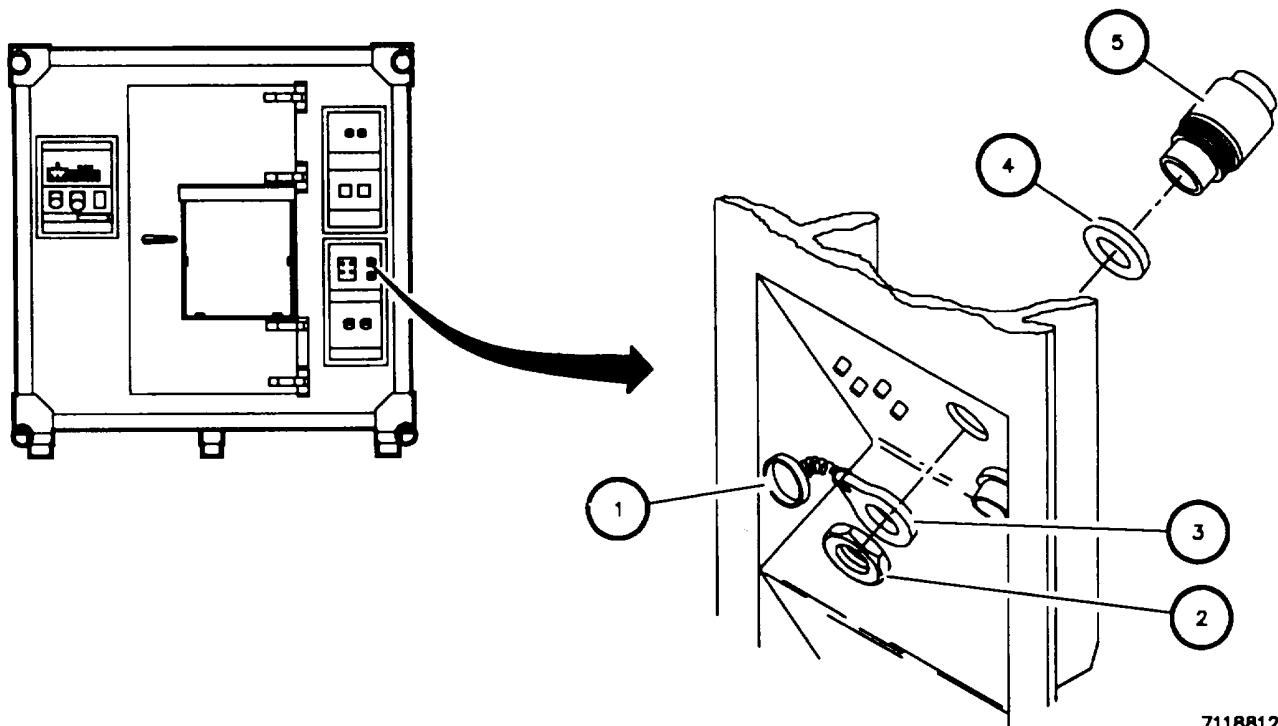
Materials/Parts: Gasket, shielding, EMI (M83528/002D-132)

Equipment Conditions: Interior and exterior cables tagged and disconnected from assembly under repair.

Preliminary Procedure: Remove SVEP EMI filter adapter (para 9-12).

REMOVAL

1. If installed, unscrew and remove connector cap (1).
2. Remove nut (2), connector cap retainer ring (3), EMI gasket (4), and surge arrestor (5).
3. Inspect EMI gasket (4) for cuts, cracks, tears, or other damage. Discard if damaged.



7118812

9-9. REPLACE SVEP SURGE ARRESTOR ASSEMBLY- Continued

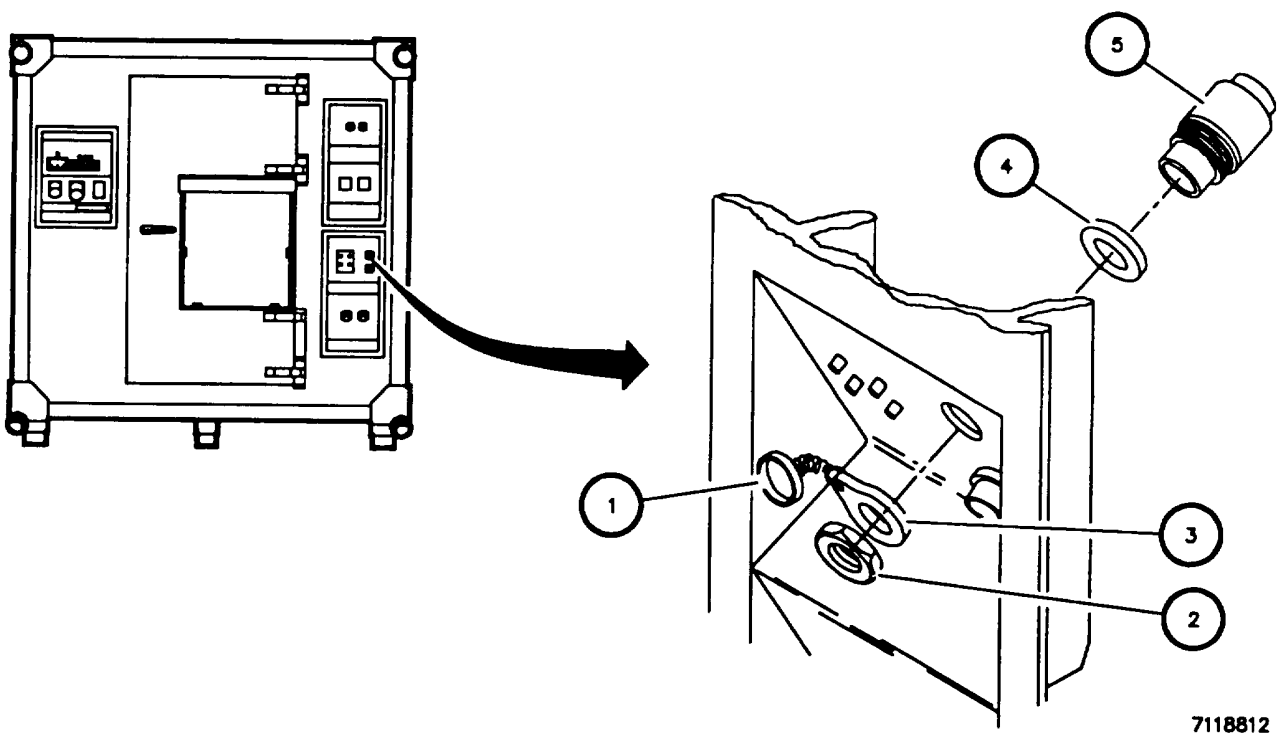
INSTALLATION

1. Place EMI gasket (4), surge arrestor (5), and connector cap retainer ring (3) in installed position.

CAUTION

Failure to torque within limits given will degrade system hardness critical item (HCI) integrity.

2. Install nut (2) and torque to 180-200 inch-pounds (203-226 Nom).
3. Install and tighten connector cap (1).



7118812

FOLLOW-ON MAINTENANCE: Install SVEP EMI filter adapter (para 9-12).

9-10. REPLACE SVEP GROUP DATA ASSEMBLY**This task covers:** a. Removal

b. Installation

INITIAL SETUP**NOTE**

EMI gasket may be replaced when group data assembly is removed and installed.

Personnel Required: Two

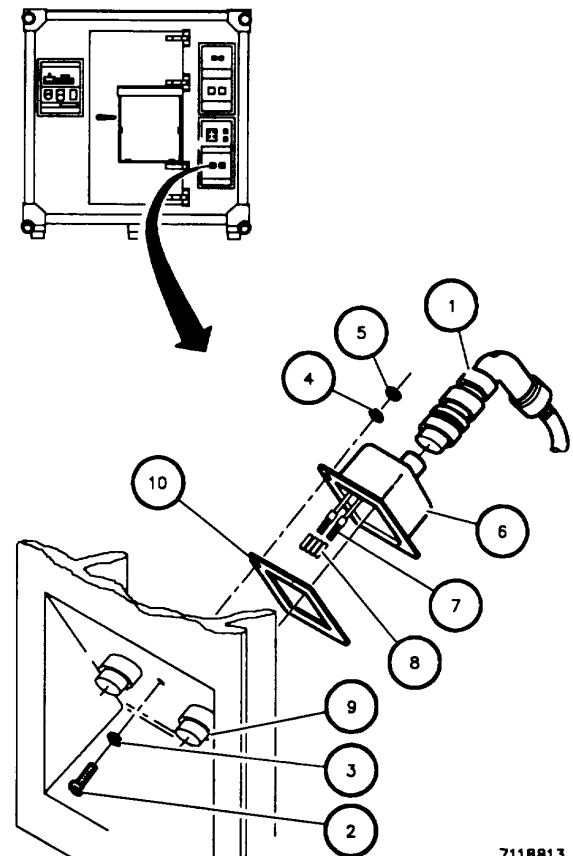
Materials/Parts: Gasket, shielding, EMI (SM-A-838320-1)

Equipment Conditions: Exterior cables tagged and disconnected from assembly under repair.

Preliminary Procedure: Remove ADP shelter block-off bracket assembly (para 9-8).

REMOVAL

1. Technician B: Working inside shelter, tag and disconnect cable (1).
2. With technician B holding locknuts, technician A: Remove six screws (2), black washers (3), washers (4), and locknuts (5).
3. Position group data assembly (6) to access wires (7).
4. Cut and remove insulation sleeving (8) from four wires (7) soldered to receptacle (9).
5. Tag, unsolder, and remove four wires (7).
6. Remove EMI gasket (10) and group data assembly (6).
7. Inspect EMI gasket (10) for cuts, cracks, tears, or other damage. Replace if damaged.



7118813

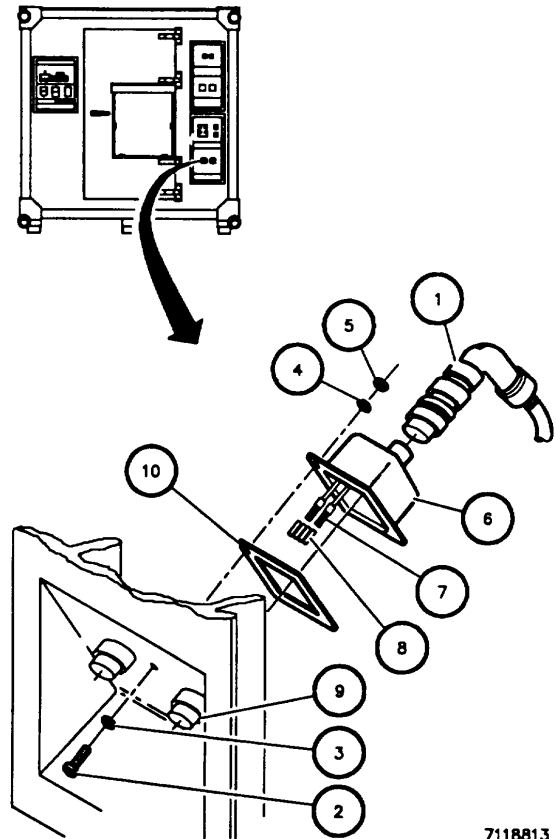
9-10. REPLACE SVEP GROUP DATA ASSEMBLY - Continued**INSTALLATION**

1. Technician B: Form and dress four wires (7).
2. Position four lengths of insulation sleeving (8) on wires (7) so that wires can be soldered.
3. Place and hold EMI gasket (10) against group data assembly (6).
4. Solder four wires (7) from group data assembly (6) to receptacle (9), as tagged. Remove tags.
5. Position and shrink insulation sleeving (8).
6. Place and hold EMI gasket (10) and group data assembly (6) in installed position.
7. With technician B holding locknuts, technician A: Install six screws (2), black washers (3), washers (4), and locknuts (5).

CAUTION

Failure to torque within limits given will Failure to torque within limits given will degrade system hardness critical item (HCI) integrity.

8. Torque six screws (2) to 10-16 inch-pounds (11-18 Nom).
9. Technician B: Install cable (1), as tagged. Remove tag.



7118813

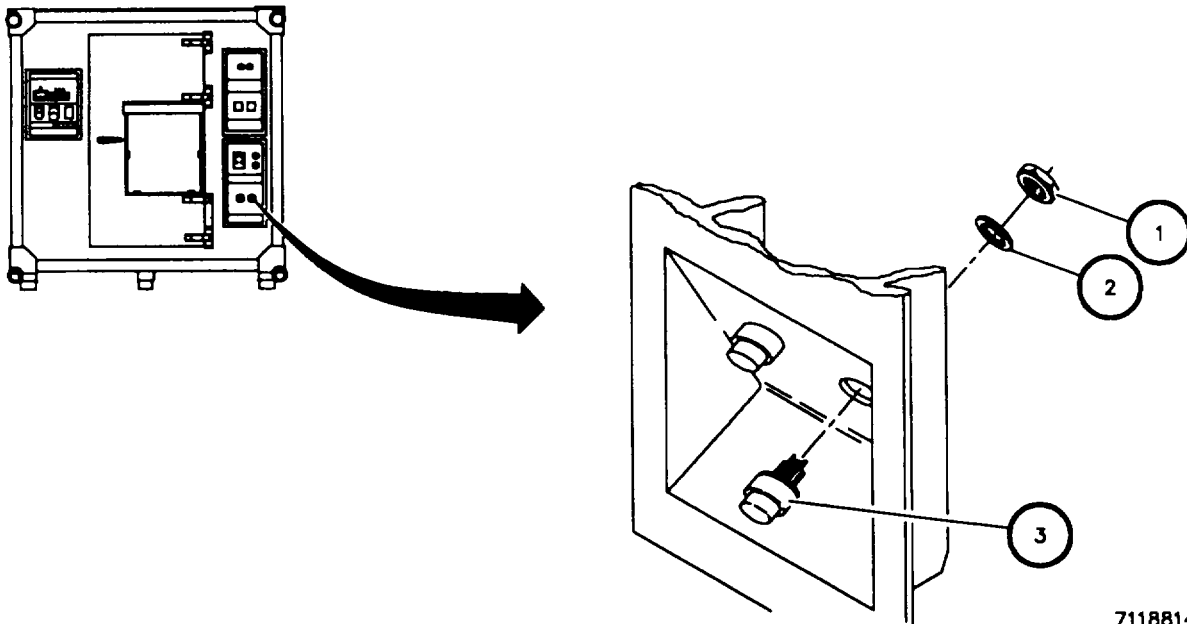
FOLLOW-ON MAINTENANCE: Install ADP shelter block-off bracket assembly (para 9-8).

9-11. REPLACE SVEP GROUP DATA ASSEMBLY CONNECTORS**This task covers:** a. Removal

b. Installation

INITIAL SETUP**Personnel Required:** Two**Equipment Conditions:** Interior and exterior cables tagged and disconnected from assembly under repair.**Preliminary Procedure:** Remove associated group data assembly (para 9-10).**REMOVAL**

1. Technician A: Working inside shelter, remove nut (1) and internal-tooth lockwasher (2).
2. Technician B: Working outside shelter, remove connector (3).



7118814

INSTALLATION

1. Technician B: Working outside shelter, place and hold connector (3) in installed position.
2. Technician A: Working inside shelter, install nut (1) and internal-tooth lockwasher (2).

FOLLOW-ON MAINTENANCE: Install associated group data assembly (para 9-10).

9-12. REPLACE SVEP EMI FILTER ADAPTER

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

Replace ADP and OPN shelter surge arrestor assembly EMI filter adapters the same way. EMI filter adapter shown is typical.

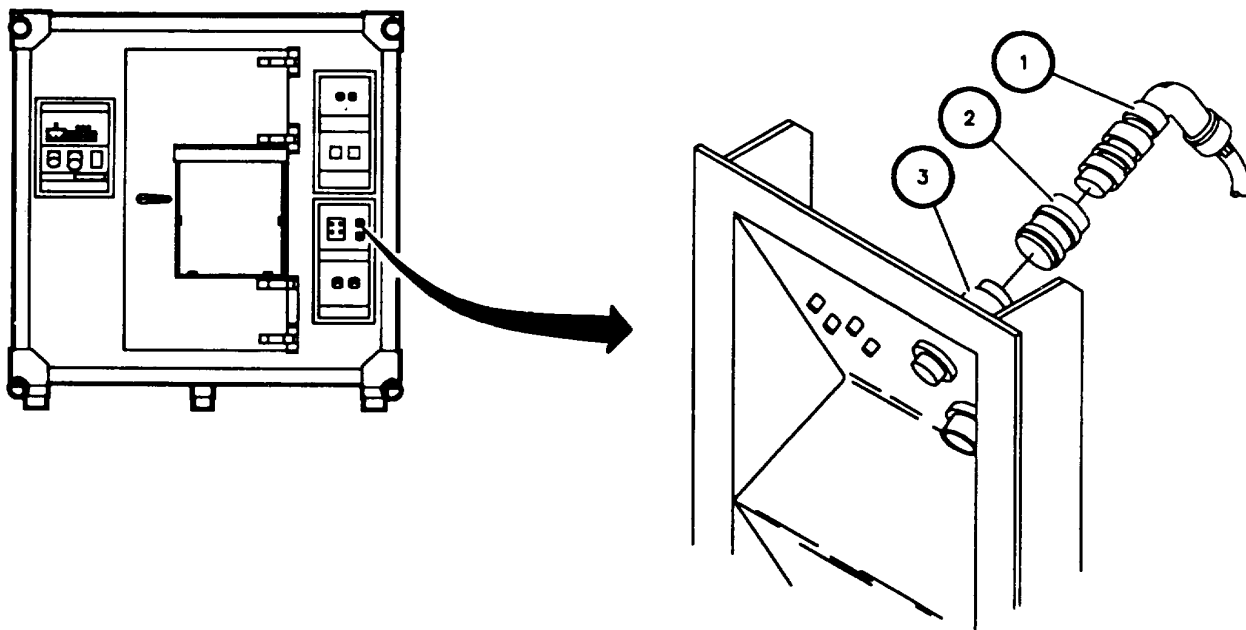
Materials/Parts: Gasket, shielding, EMI (SM-A-838320-1)

Equipment Conditions: Exterior cables tagged and disconnected from assembly under repair.

Preliminary Procedure: If working on ADP shelter, remove block-off bracket assembly (para 9-8).

REMOVAL

1. Disconnect cable (1) from filter adapter (2).
2. Remove filter adapter (2) from surge arrestor (3).



7118815

INSTALLATION

1. Install filter adapter (2) on surge arrestor (3).
2. Reconnect cable (1) to filter adapter (2).

FOLLOW-ON MAINTENANCE: If working on ADP shelter, install block-off bracket assembly (para 9-8).

9-13. REPLACE SVEP AUDIO ASSEMBLY

This task covers:

a. Removal

b. Installation

INITIAL SETUP

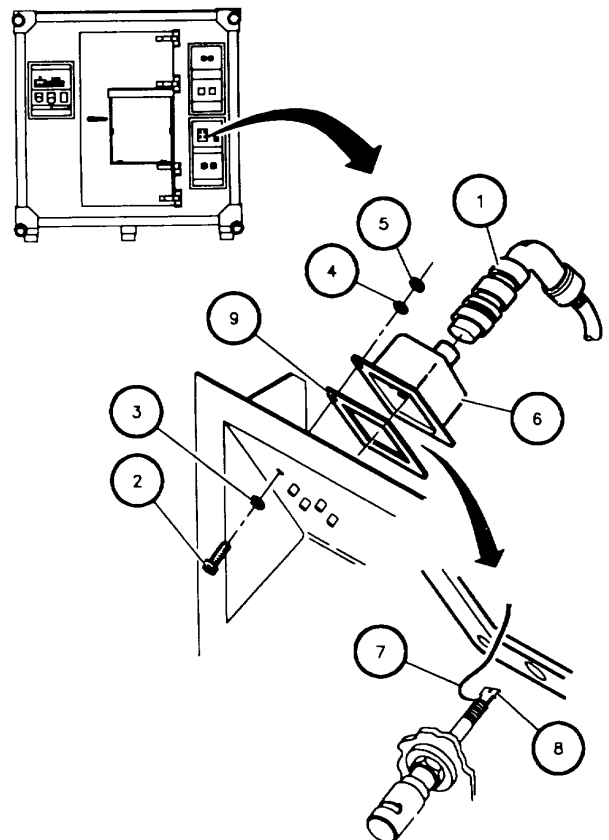
NOTE

- Replace ADP and OPN shelter SVEP audio assemblies the same way, except where noted. Audio assembly shown is typical.
- EMI gasket may be replaced when audio assembly is removed and installed.

Personnel Required: Two**Materials/Parts:** Gasket, shielding, EMI (SM-A-838320-1)**Equipment Conditions:** Exterior wires tagged and disconnected from assembly under repair.**Preliminary Procedure:** If working on ADP shelter, remove block-off bracket assembly (para 9-8).

REMOVAL

1. Technician B: Tag and disconnect cable (1).
2. With technician B holding locknuts, technician A: Remove six screws (2), black washers (3), washers (4), and locknuts (5).
3. Position audio assembly (6) to access wires (7).
4. Tag, unsolder, and remove all wires (7) from binding posts (8).
5. Remove audio assembly (6) and EMI gasket (9).
6. Inspect EMI gasket (9) for cuts, cracks, tears, or other damage. Replace if damaged.



7118816

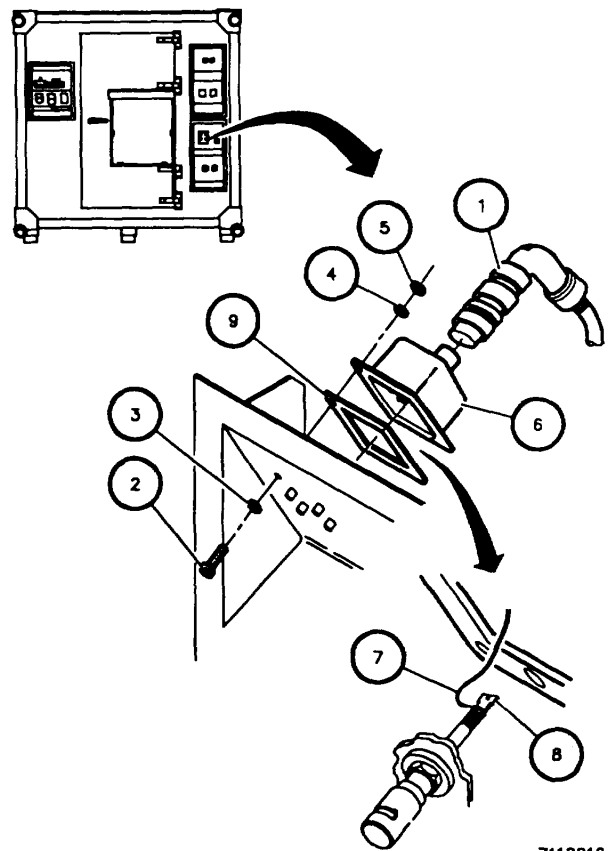
9-13. REPLACE SVEP AUDIO ASSEMBLY- Continued**INSTALLATION**

1. Technician B: Form and dress all wires (7).
2. Place and hold gasket (9) against audio assembly (6).
3. Solder all wires (7) to binding posts (8), as tagged. Remove tags.
4. Place gasket (9) and audio assembly (6) in installed position.
5. With technician B holding locknuts, technician A: Install six screws (2), black washers (3), washers (4), and locknuts (5).

CAUTION

Failure to torque within limits given will degrade system Hardness Critical Item (HCI) integrity.

6. Torque six screws (2) to 10-16 inch-pounds (11-18 Norm).
7. Technician B: Connect cable (1), as tagged. Remove tag.



7118816

FOLLOW-ON MAINTENANCE: If working on ADP shelter, install block-off bracket assembly (para 9-8).

9-14. REPLACE SVEP AUDIO ASSEMBLY CONNECTOR

This task covers:

a. Removal

b. Installation

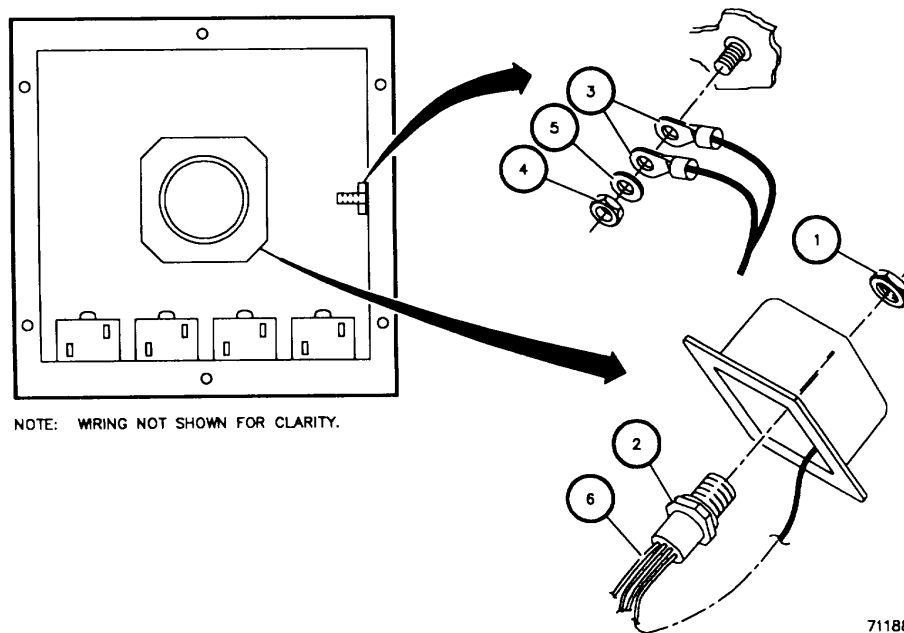
INITIAL SETUP

Equipment Conditions: Audio assembly placed on firm, clean surface.

Preliminary Procedure: Remove all SVEP audio assembly surge arrestors (para 9-15).

REMOVAL

1. Remove jamnut (1).
2. Position connector (2) to access two ground wires (3).
3. Remove locknut (4), washer (5), and two ground wires (3).
4. Tag and remove all wires (6) from connector (2).



INSTALLATION

1. Install all wires (6) in connector (2), as tagged. Remove tags.
2. Install two ground wires (3) using locknut (4) and washer (5).
3. Place connector (2) in installed position.
4. Install jamnut (1).

FOLLOW-ON MAINTENANCE: Install all SVEP audio assembly surge arrestors (para 9-15).

9-15. REPLACE SVEP AUDIO ASSEMBLY SURGE ARRESTORS

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

Replace audio assembly surge arrestors A1-A4 the same way. Surge arrestor shown is typical.

Equipment Conditions: Audio assembly placed on firm, clean surface.

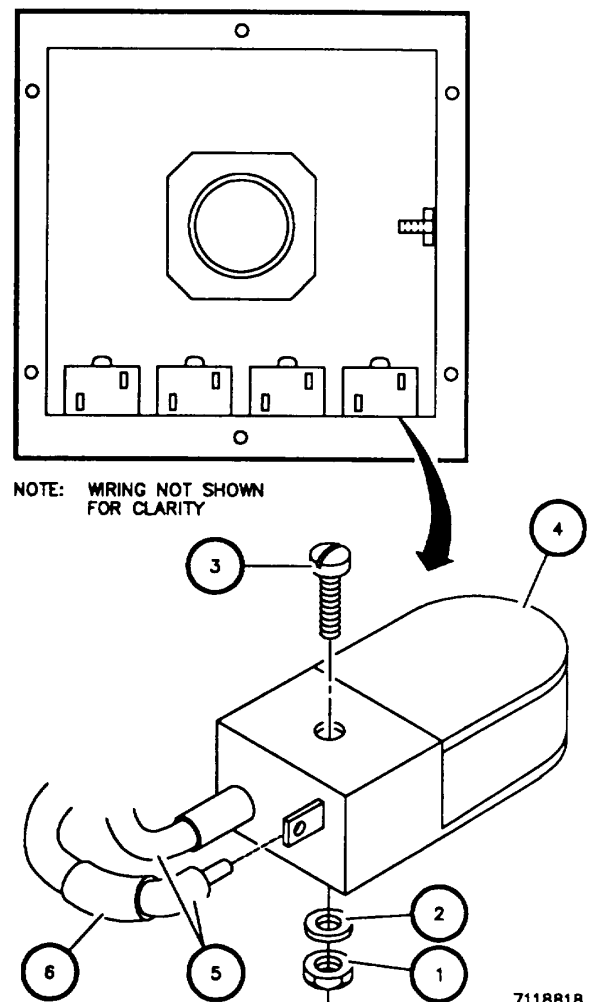
Preliminary Procedure: Remove SVEP audio assembly (para 9-13).

REMOVAL

1. Remove locknut (1), washer (2), and screw (3).
2. Position surge arrestor (4) to access wires (5).
3. Cut and remove insulation sleeving (6).
4. Tag, unsolder, and remove two wires (5) from surge arrestor (4).
5. Remove surge arrestor (4).

INSTALLATION

1. Form and dress two wires (5). Install new lengths of insulation sleeving (6) on wires, leaving ends exposed for soldering.
2. Solder two wires (5) to surge arrestor (4), as tagged. Remove tags.
3. Position and shrink insulation sleeving (6).
4. Place surge arrestor (4) in installed position.
5. Install locknut (1), washer (2), and screw (3).



7118818

FOLLOW-ON MAINTENANCE: Install SVEP audio assembly (para 9-13).

9-16. REPLACE SVEP INTERCOM BINDING POSTS

This task covers: a. Removal b. Installation

INITIAL SETUP

NOTE

Replace ADP and OPN shelter INTERCOM binding posts EI-E4 the same way, except where noted. ADP shelter binding post EI is shown.

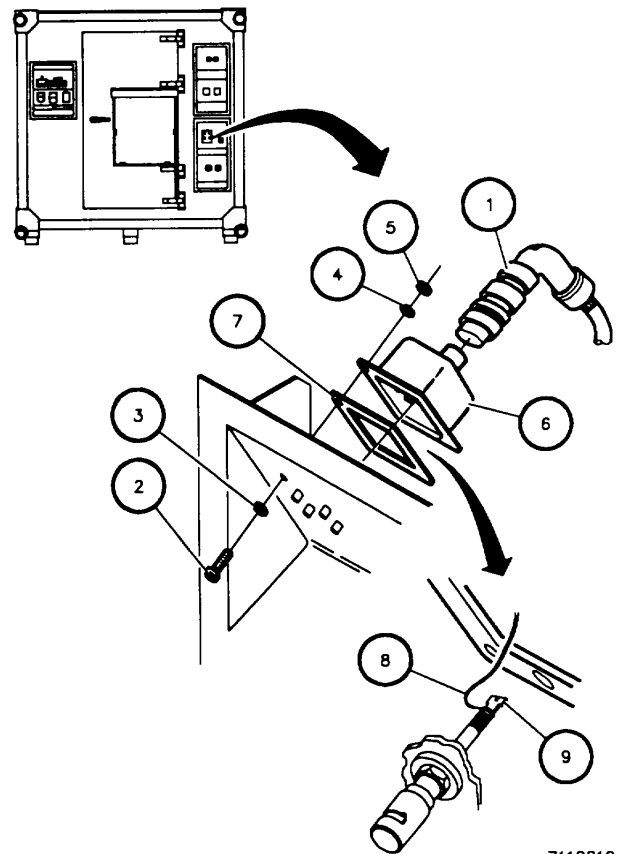
Personnel Required: Two

Equipment Conditions: Exterior wires tagged and disconnected from assembly under repair.

Preliminary Procedure: If working on ADP shelter, remove block-off bracket assembly (para 9-8).

REMOVAL

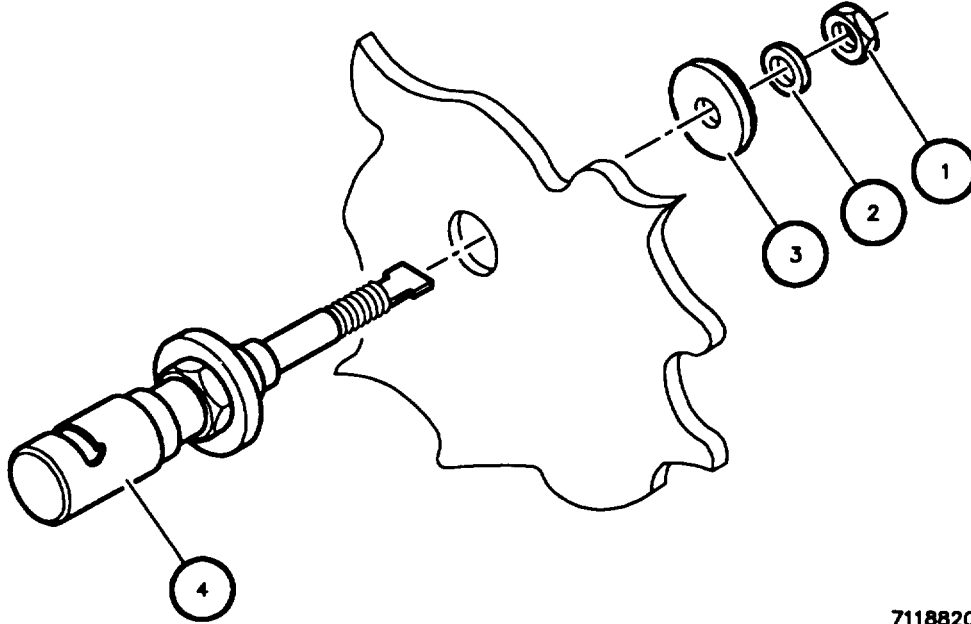
1. Technician B: Working inside shelter, tag and disconnect cable (1).
2. With technician B holding locknuts, technician A: Remove six screws (2), black washers (3), washers (4), and locknuts (5).
3. Separate audio assembly (6) and EMI gasket (7) from panel.
4. Inspect EMI gasket (7) for cuts, cracks, tears, or other damage. If damaged, replace EMI gasket by removing/installing SVEP audio assembly (para 9-13).
5. Tag, unsolder, and remove wire (8) from faulty binding post (9).



7118819

9-16. REPLACE SVEP INTERCOM BINDING POSTS - Continued

6. Technician B: Working inside shelter, remove locknut (1), washer (2), and plastic washer (3).
7. Technician A: Working outside shelter, remove binding post (4).



7118820

INSTALLATION

1. Technician A: Place and hold binding post (4) in installed position.
2. Technician B: Install locknut (1), washer (2), and plastic washer (3).

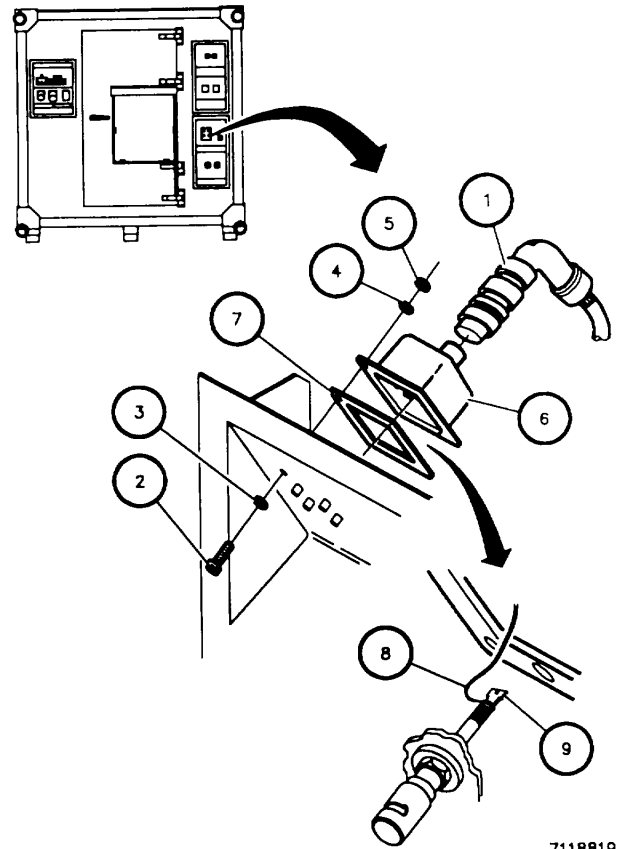
9-16. REPLACE SVEP INTERCOM BINDING POSTS - Continued

3. Technician B: Form and dress all wires (8).
4. Solder all wires (8) to binding post (9), as tagged. Remove tags.
5. Place EMI gasket (7) and audio assembly (6) in installed position.
6. With technician B holding locknuts, technician A: Install six screws (2), black washers (3), washers (4), and locknuts (5).

CAUTION

Failure to torque within limits given will degrade system Hardness Critical Item (HCI) integrity.

7. Torque six screws (2) to 10-16 inch-pounds (11-18 Nom).
8. Technician B: Connect cable (1), as tagged. Remove tag.



7118819

FOLLOW-ON MAINTENANCE: If working on ADP shelter, install block-off bracket assembly (para 9-8).

9-17. OPEN/CLOSE ADP SHELTER RED/BLACK PATCH PANEL FRONT PANEL

This task covers:

a. Open

b. Close

INITIAL SETUP

NOTE

Open/close ADP shelter red or black patch panel front panel the same way, except where noted. Red patch panel is shown.

Equipment Condition: Red/black patch panel placed on firm, clean surface.

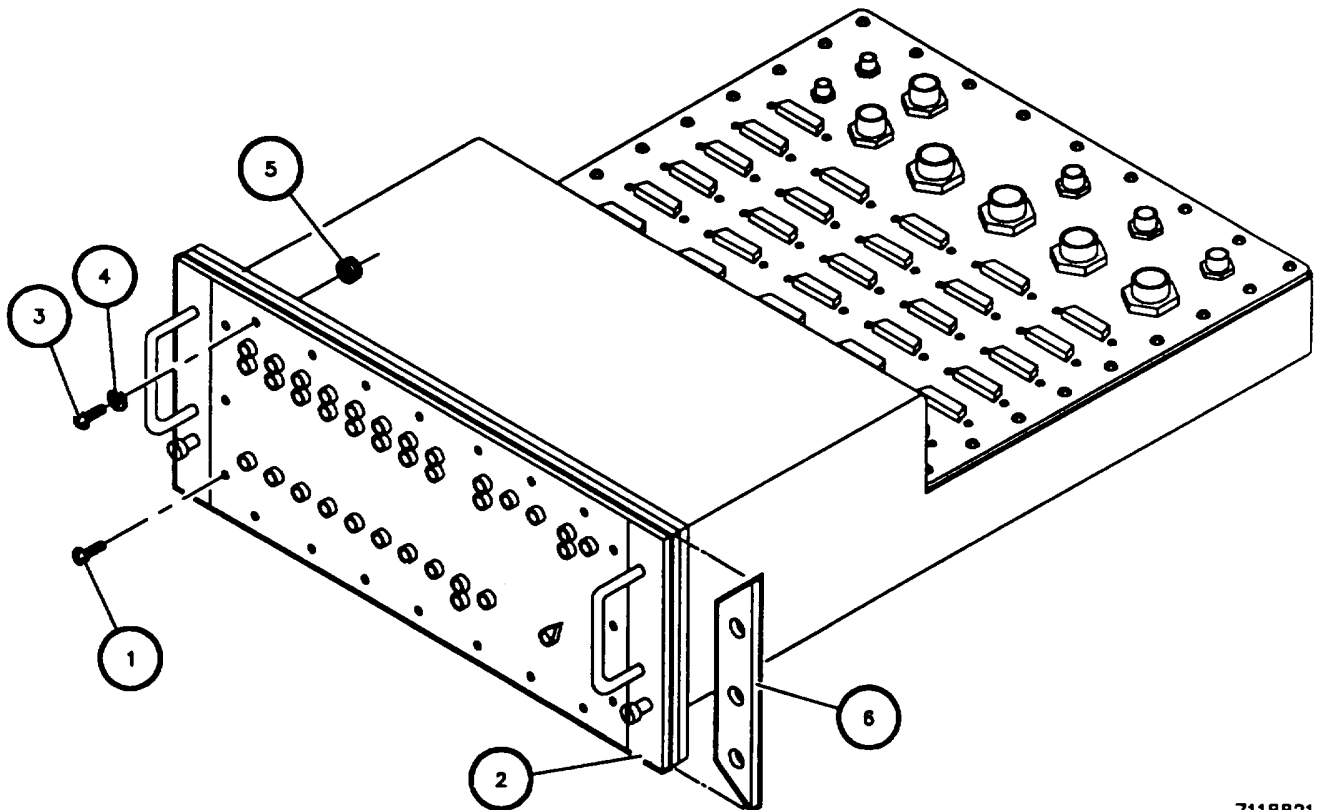
OPEN

1. Remove three screws (1) from both right and left edges of front panel (2).
2. Remove 14 screws (3), washers (4), and locknuts (5).

CAUTION

Handle front panel carefully to avoid damaging wiring and front panel components.

3. Carefully separate front panel (2) from chassis to access interior. Collect gaskets (6) that fall from chassis, as required.



7118821

9-17. OPEN/CLOSE ADP SHELTER RED/BLACK PATCH PANEL FRONT PANEL - Continued

NOTE

If working on black patch panel, go to step 6.

4. Loosen two setscrews (1) and remove knob (2).
5. While supporting switch (3), remove nut (4) and internal tooth lockwasher (5).

CAUTION

Separate identification plate from front panel by carefully prying edges of plate toward the middle, changing positions frequently, to avoid bending or breaking plate.

6. Remove identification plate (6) from front panel (7).

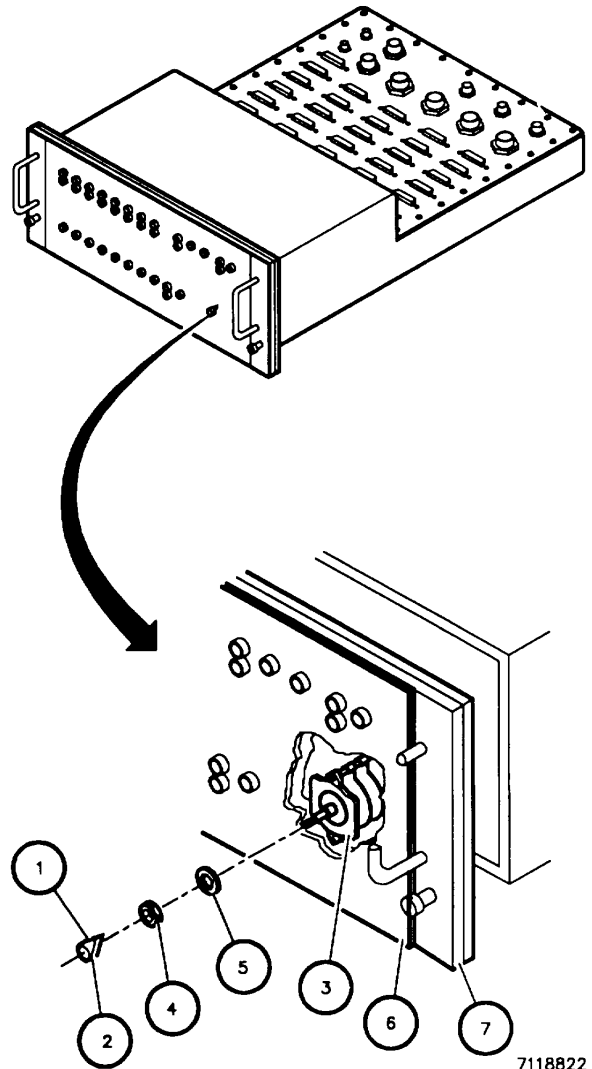
CLOSE

1. Install identification plate (6) on front panel (7).

NOTE

If working on black patch panel, go to step 5.

2. Place and hold switch (3) in installed position.
3. Install nut (4) and internal tooth lockwasher (5).
4. Install knob (2) on switch (3) and tighten two setscrews (1).



7118822

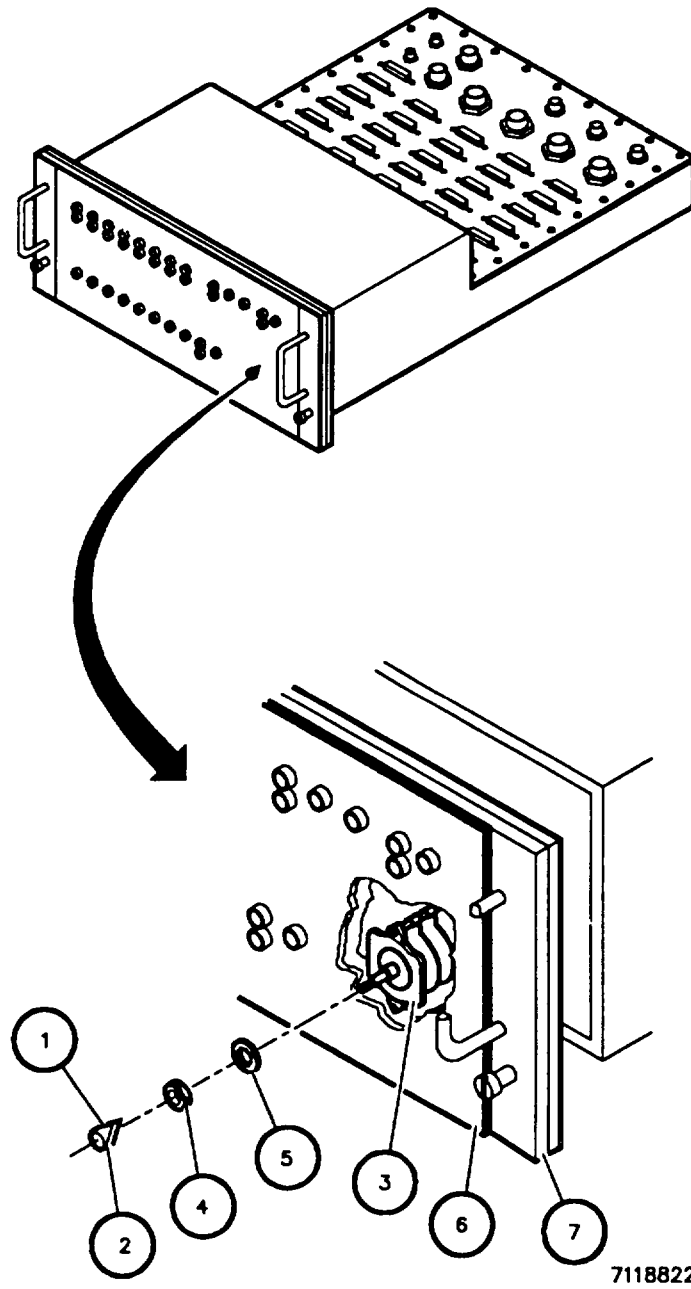
9-17. OPEN/CLOSE ADP SHELTER RED/BLACK PATCH PANEL FRONT PANEL - Continued

5. Carefully place front panel (2) in installed position.

NOTE

If gaskets (6) need to be reinstalled, position and hold gaskets using hardware in steps 6 and 7, as required.

6. Install 14 screws (3), washers (4), and locknuts (5).
7. Install three screws (1) at both right and left edges of front panel (2).



9-18. OPEN/CLOSE ADP SHELTER RED/BLACK PATCH PANEL TOP ACCESS COVER

This task covers:

a. Open

b. Close

INITIAL SETUP

NOTE

Open/close ADP shelter red or black patch panel top access cover the same way. Red patch top cover is shown.

Equipment Condition: Red/black patch panel placed on firm, clean surface.

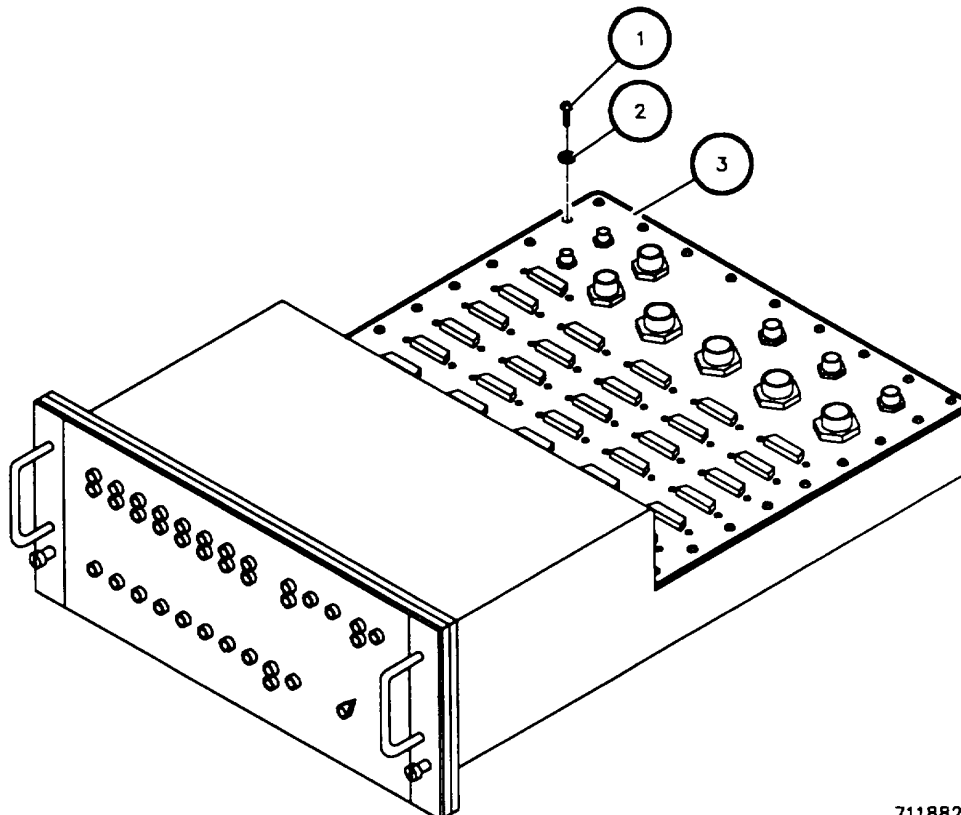
OPEN

1. Remove 32 screws (1) and washers (2).

CAUTION

Handle top cover carefully to avoid damaging wiring and components.

2. Carefully separate top cover (3) from chassis to access interior.



7118823

CLOSE

1. Carefully place top cover (3) in installed position.
2. Install 32 screws (1) and washers (2).

9-19. REMOVE/INSTALL ADP SHELTER RED/BLACK PATCH PANEL BOTTOM ACCESS COVER

This task covers:

a. Removal

b. Installation

INITIAL SETUP

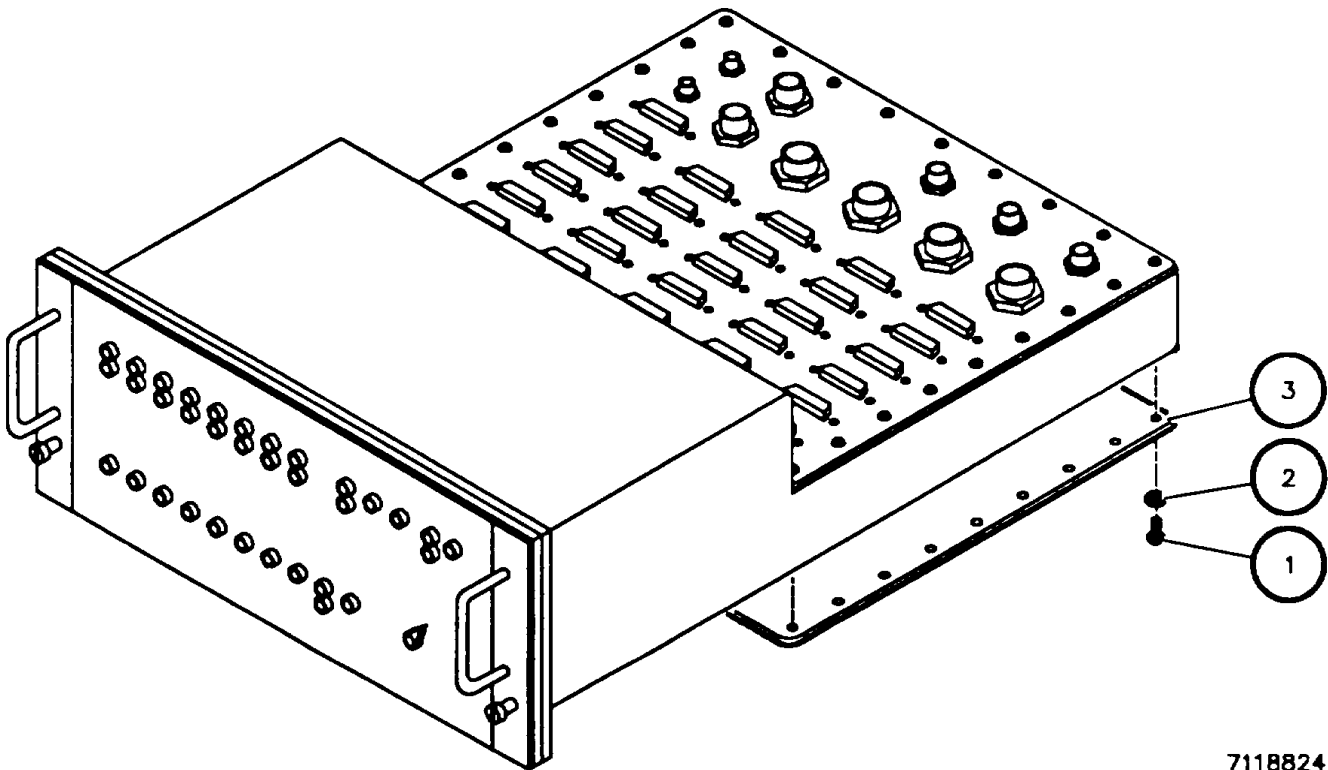
NOTE

Remove/install ADP shelter red or black patch panel bottom access cover the same way. Red patch panel bottom cover is shown.

Equipment Condition: Red/black patch panel placed on firm, clean surface.

REMOVAL

1. Set patch panel upside down.
2. Remove 32 screws (1) and washers (2).
3. Remove bottom cover (3).



7118824

INSTALLATION

1. Place bottom cover (3) in installed position.
2. Install 32 screws (1) and washers (2).
3. Set patch panel in normal, upright position.

9-20. REPLACE ADP SHELTER RED PATCH PANEL LDF SELECT SWITCH ASSEMBLY

This task covers:

a. Removal

b. Installation

INITIAL SETUP

Equipment Condition: ADP shelter red patch panel placed on firm, clean surface.**Preliminary Procedures:**

1. Remove red patch panel bottom access cover (para 9-19).
2. Open red patch panel front panel (para 9-17).

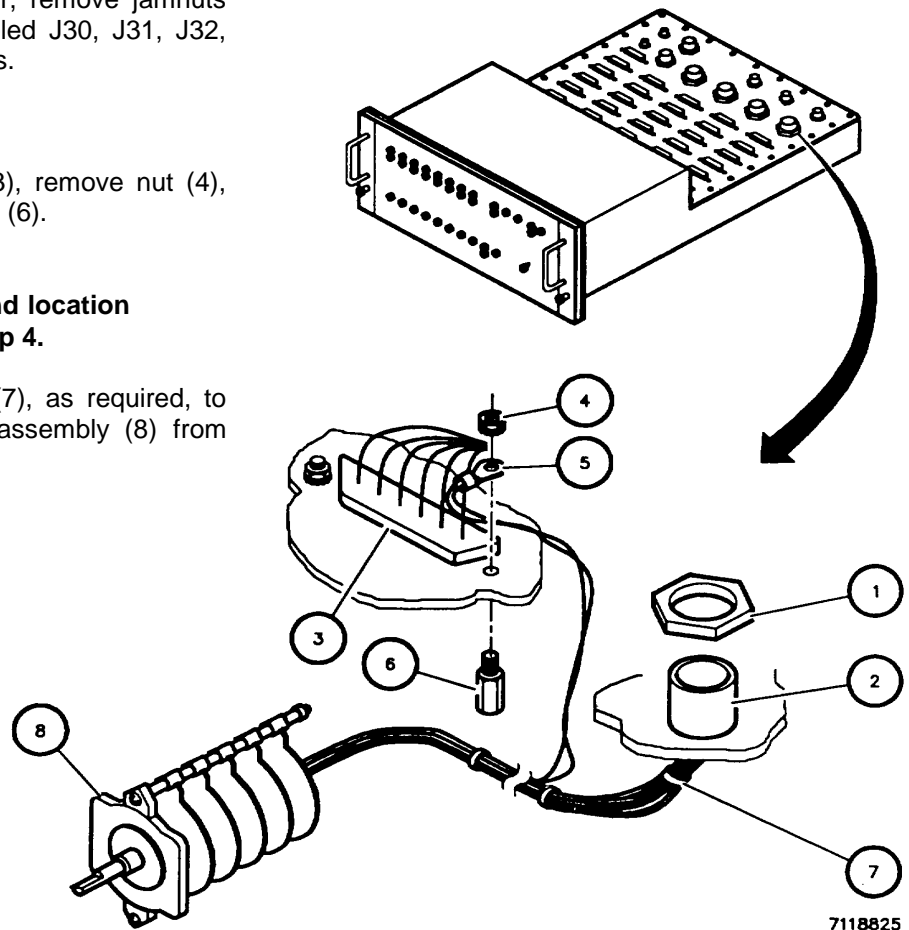
REMOVAL

1. Working at top access cover, remove jamnuts (1) from connectors (2) labeled J30, J31, J32, J34, and J36. Tag connectors.
2. Set patch panel upside down.
3. Working at connector J28 (3), remove nut (4), ground strap (5), and standoff (6).

NOTE

Note and record number and location of cable ties removed in step 4.

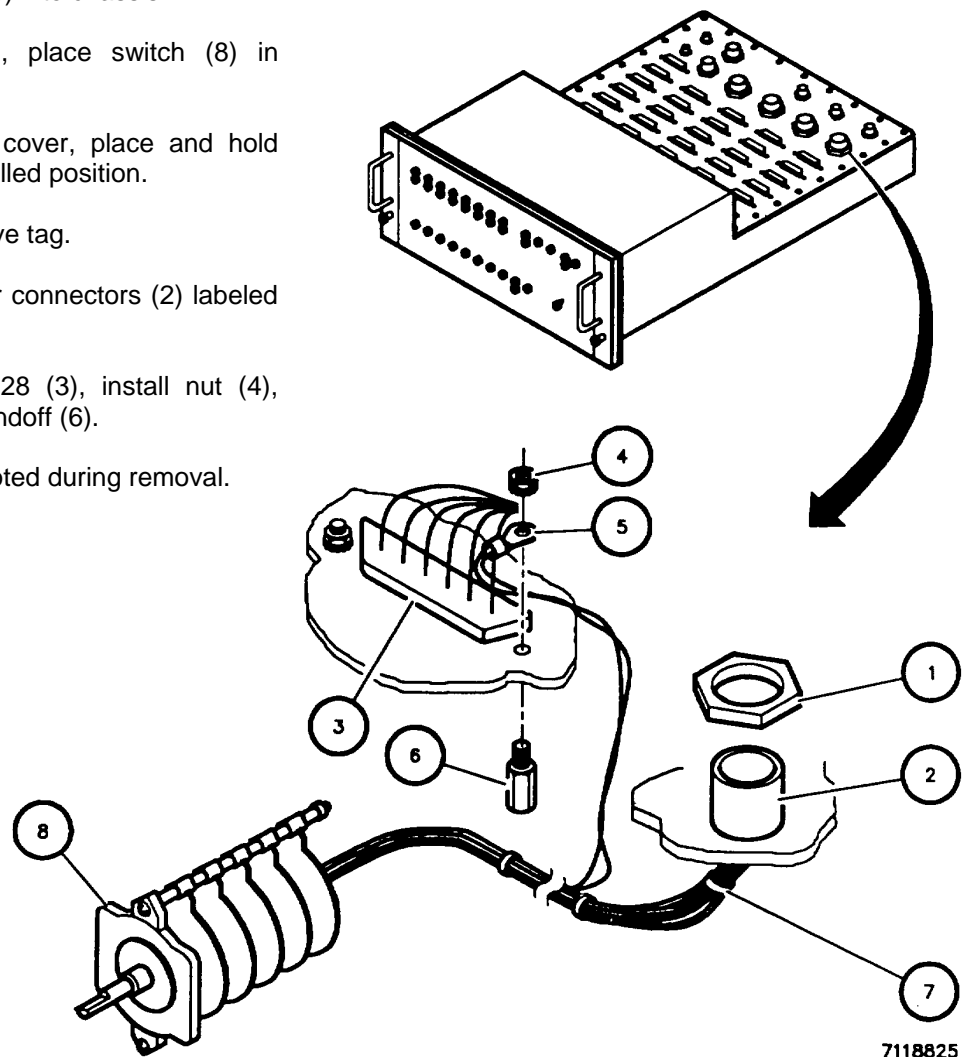
4. Cut and remove cable ties (7), as required, to isolate and remove switch assembly (8) from chassis.



7118825

9-20. REPLACE ADP SHELTER RED PATCH PANEL LDF SELECT SWITCH ASSEMBLY - Continued**INSTALLATION**

1. Route switch assembly (8) into chassis.
2. Working at front panel, place switch (8) in installed position.
3. Working at top access cover, place and hold connector J30 (2) in installed position.
4. Install jamnut (1). Remove tag.
5. Repeat steps 3 and 4 for connectors (2) labeled J31, J32, J34, and J36.
6. Working at connector J28 (3), install nut (4), ground strap (5), and standoff (6).
7. Install cable ties (7) as noted during removal.



7118825

FOLLOW-ON MAINTENANCE:

1. Install red patch panel bottom access cover (para 9-19).
2. Close red patch panel front panel (para 9-17).

9-21. REPLACE ADP SHELTER RED PATCH PANEL SINGLE PATCH-TO-CONNECTOR ASSEMBLY

This task covers:**a. Removal****b. Installation**

INITIAL SETUP**NOTE**

- Originally, single patch jacks, associated wiring, and connectors were individually replaced. These parts now form a single patch-to-connector assembly.
- Refer to table 9-3 for a listing of ADP shelter single patch-to-connector assemblies and their associated parts. Replace all single patch assemblies the same way, except where noted. Single patch assembly A15-J10 is shown.

Equipment Condition: ADP shelter red patch panel placed on firm, clean surface.

Preliminary Procedures:

1. Remove ADP shelter red patch panel bottom access cover (para 9-19).
 2. Open ADP shelter red patch panel front panel (para 9-17).
-

9-21. REPLACE ADP SHELTER RED PATCH PANEL SINGLE PATCH-TO-CONNECTOR ASSEMBLY -Continued

REMOVAL

NOTE

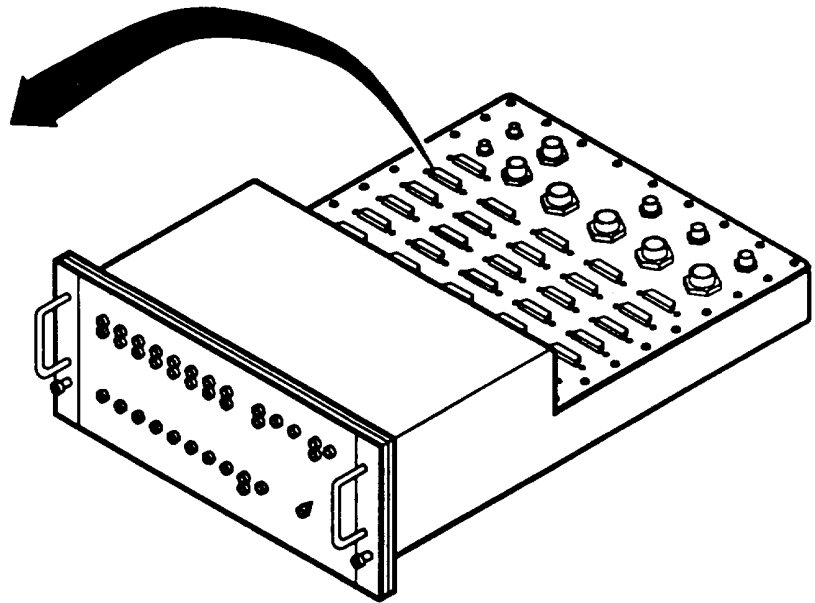
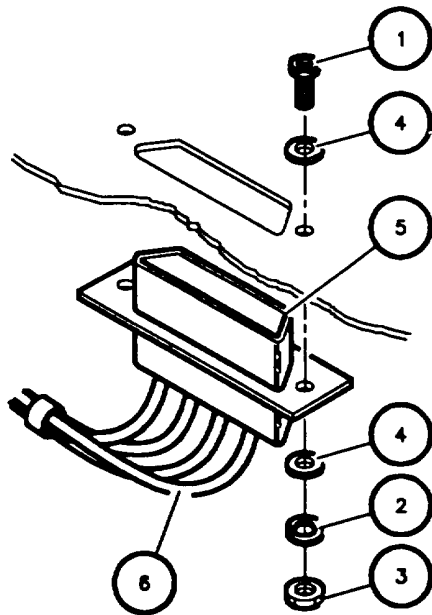
If working on A23-J41 single patch assembly, go to step 4.

1. Working at top access cover, remove two standoffs (1), lockwashers (2), nuts (3), and four washers (4).

NOTE

If connector body is mounted on top of top access cover, configuration is obsolete. Cut wiring to connector to remove completely from red patch panel.

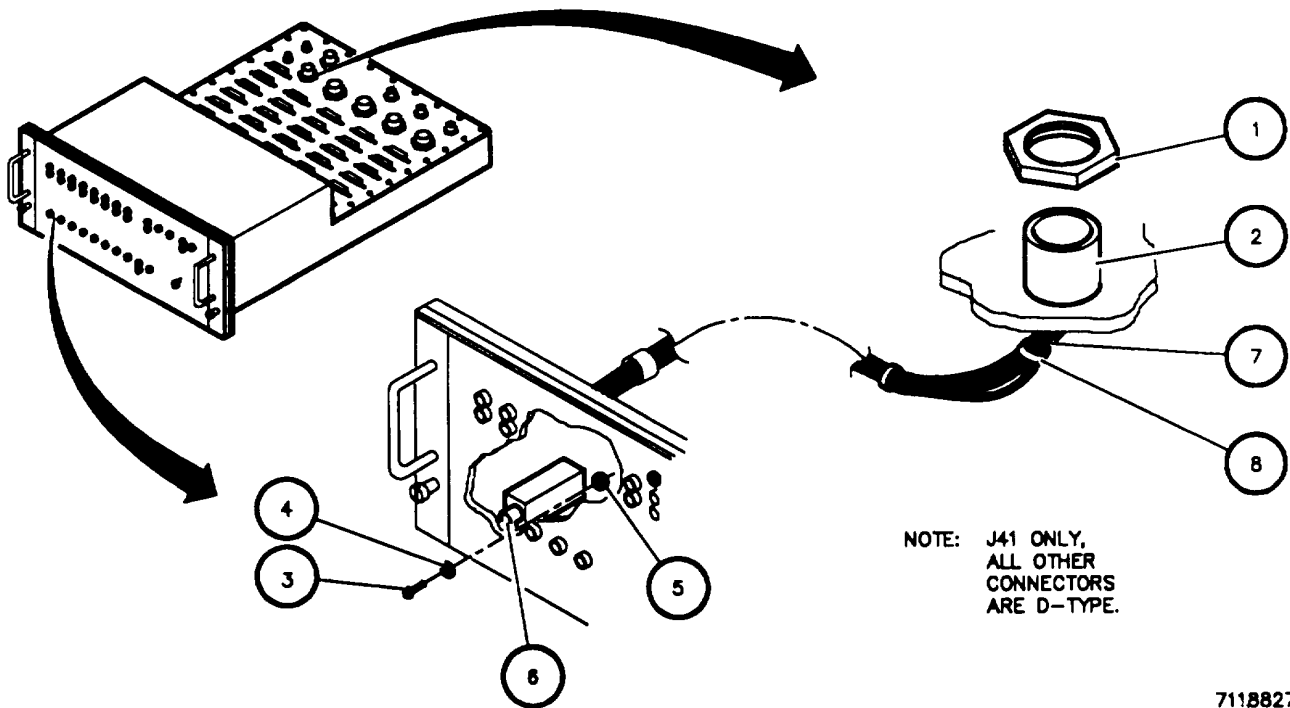
2. Remove connector (5) from cover (J10 shown), cutting wiring (6) if obsolete configuration (newest configuration shown).
3. Go to step 5.



7118826

9-21. REPLACE ADP SHELTER RED PATCH PANEL SINGLE PATCH-TO-CONNECTOR ASSEMBLY - Continued

4. Working at top access cover, remove jamnut (1) and connector J41 (2).
5. Working at front panel, remove two screws (3), washers (4), and locknuts (5) and patch jack (6) (A15 shown).
6. Remove single patch assembly (7) from chassis, cutting and removing cable ties (8), as required.



7118827

INSTALLATION

1. Route single patch assembly (7) into chassis.
2. Working at front panel, place and hold patch jack (6) in installed position.
3. Install two screws (3), washers (4), and locknuts (5).
4. Install cable ties (8), as required.

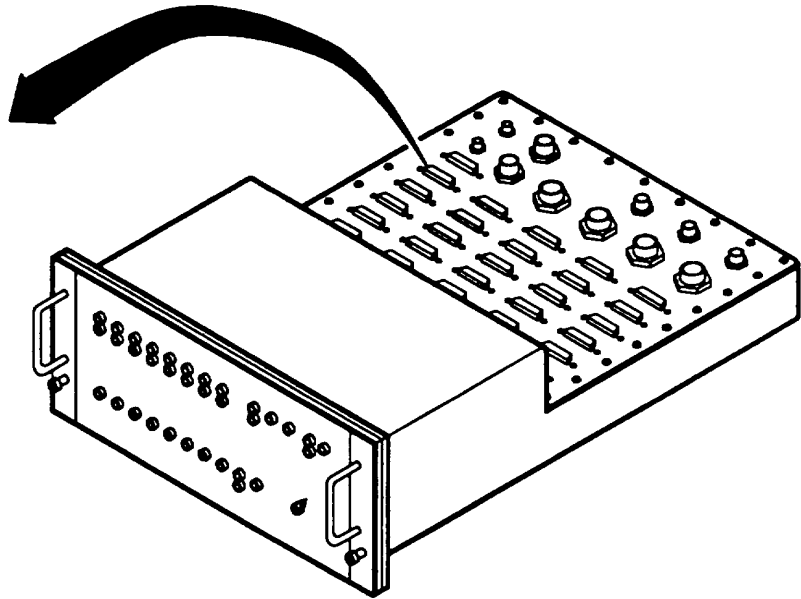
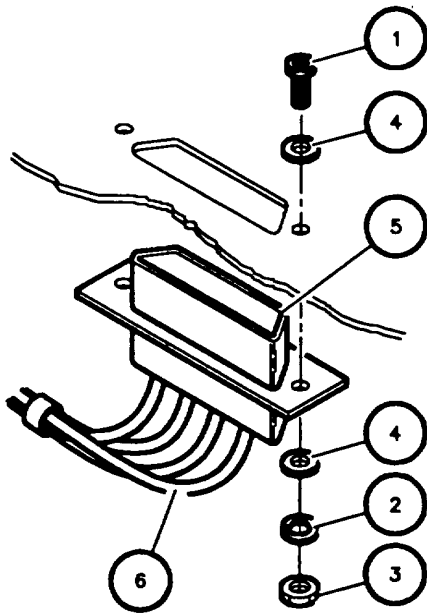
NOTE

If working on A23-J41 single patch assembly, go to step 7.

5. Working at top access cover, place and hold connector (2) in installed position (J41 shown).
6. Install jamnut (1). Go to follow-on maintenance.

9-21. REPLACE ADP SHELTER RED PATCH PANEL SINGLE PATCH-TO-CONNECTOR ASSEMBLY - Continued

7. Working at top access cover, place and hold connector (5) (J10 shown) and attached wiring (6) in installed position (install through top access cover, as shown).
8. Install two standoffs (1), lockwashers (2), nuts (3), and four washers (4).



7118826

FOLLOW-ON MAINTENANCE:

1. Install ADP shelter red patch panel bottom access cover (para 9-19).
2. Close ADP shelter red patch panel front panel (para 9-17).

9-22. REPLACE ADP SHELTER RED PATCH PANEL DUAL PATCH-TO-CONNECTOR ASSEMBLY

This task covers: a. Removal b. Installation

INITIAL SETUP

NOTE

- Originally, dual patch jacks, associated wiring, and connectors were individually replaced. These parts now form a single dual patch-to-connector assembly.
- Refer to table 9-3 for a listing of ADP shelter dual patch-to-connector assemblies and their associated parts. Replace all dual patch assemblies the same way. Dual patch assembly AL-J1, J22 is shown.

Preliminary Procedures:

- Remove ADP shelter red patch panel bottom access cover (para 9-19).
- Open ADP shelter red patch panel front panel (para 9-17).

REMOVAL

NOTE

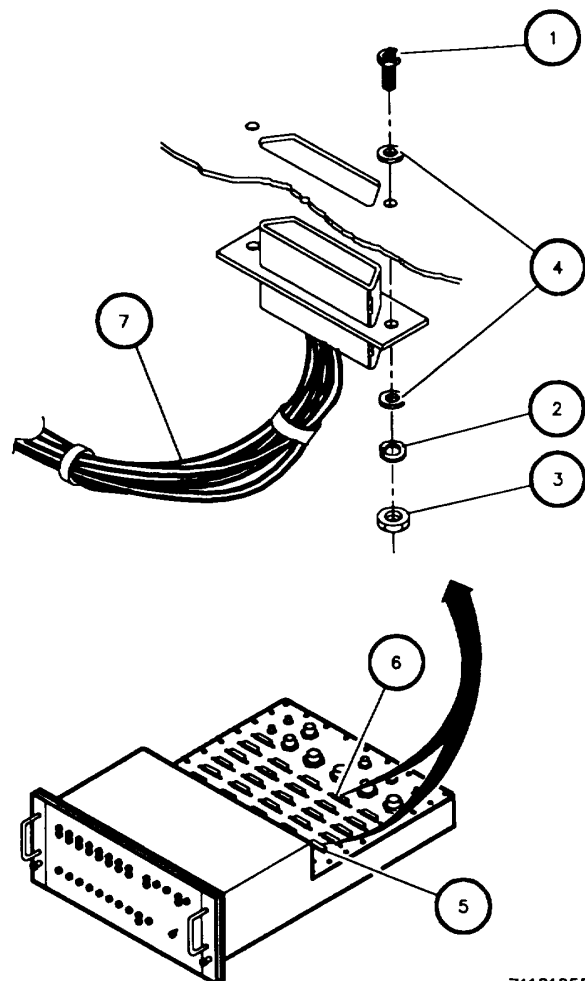
All dual patch assemblies have two connectors installed in the top access cover.

- Working at top access cover, remove two standoffs (1), lockwashers (2), nuts (3), and four washers (4) from first connector (5) (J1 shown).
- Repeat step 1 for second connector (6) (J22 shown).

NOTE

If connector body is mounted on top of top access cover, configuration is obsolete. Cut wiring to connector to remove completely from red patch panel.

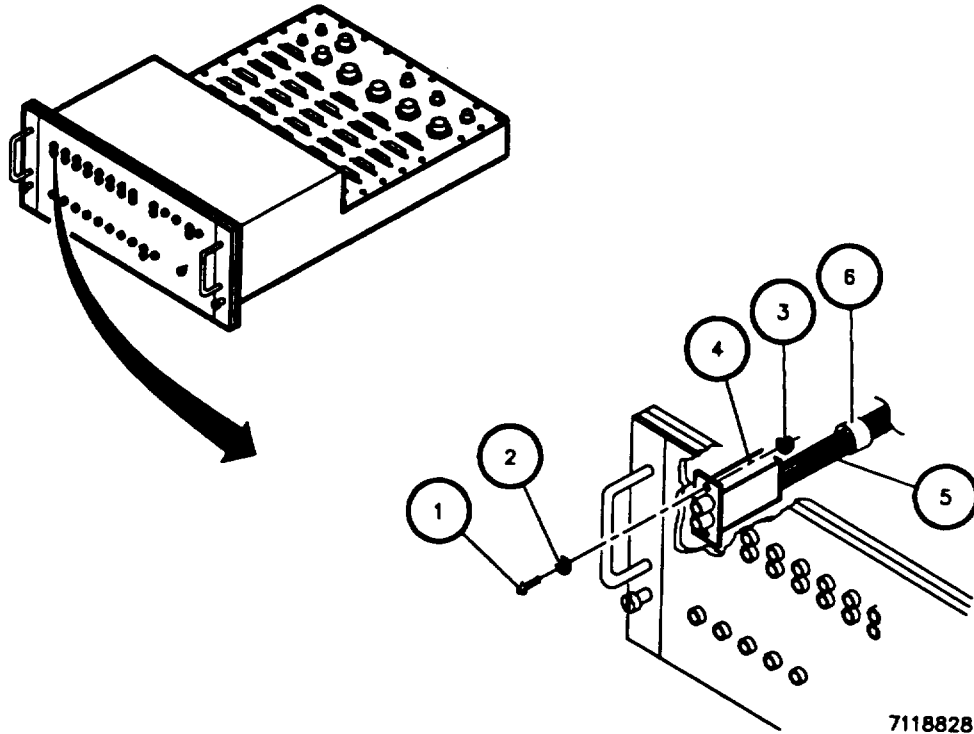
- Remove connectors (5, 6) from cover (J1 and J22 shown), cutting wiring (7) if obsolete configuration (newest configuration shown).



71181255

9-22. REPLACE ADP SHELTER RED PATCH PANEL DUAL PATCH-TO-CONNECTOR ASSEMBLY - Continued

4. Working at front panel, remove two screws (1), washers (2), and locknuts (3).
5. Remove patch jack (4) from rear of front panel.
6. Remove dual patch assembly (5) from chassis, cutting and removing cable ties (6), as required.



7118828

INSTALLATION

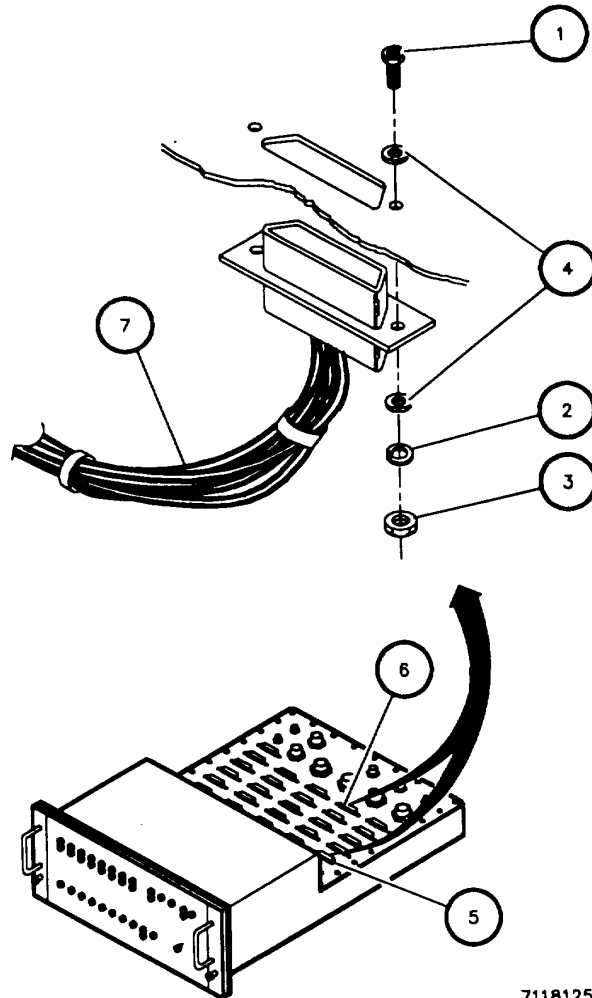
1. Route dual patch assembly (5) into chassis.
2. Working at front panel, place and hold patch jack (4) in installed position.
3. Install two screws (1), washers (2), and locknuts (3).
4. Install cable ties (6), as required.

9-22. REPLACE ADP SHELTER RED PATCH PANEL DUAL PATCH-TO-CONNECTOR ASSEMBLY - Continued

NOTE

All dual patch assemblies have two connectors installed in the top access cover.

5. Place and hold first connector (5) and attached wiring (7) in installed position (J1 shown).
6. Install two standoffs (1), lockwashers (2), nuts (3), and four washers (4).
7. Repeat steps 5 and 6 for second connector (6) (J22 shown).



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FOLLOW-ON MAINTENANCE:

1. Install ADP shelter red patch panel bottom access cover (para 9-19).
2. Close ADP shelter red patch panel front panel (para 9-17).

9-23. REPLACE ADP SHELTER RED PATCH PANEL ALARM CABLE ASSEMBLY

This task covers:

a. Removal

b. Installation

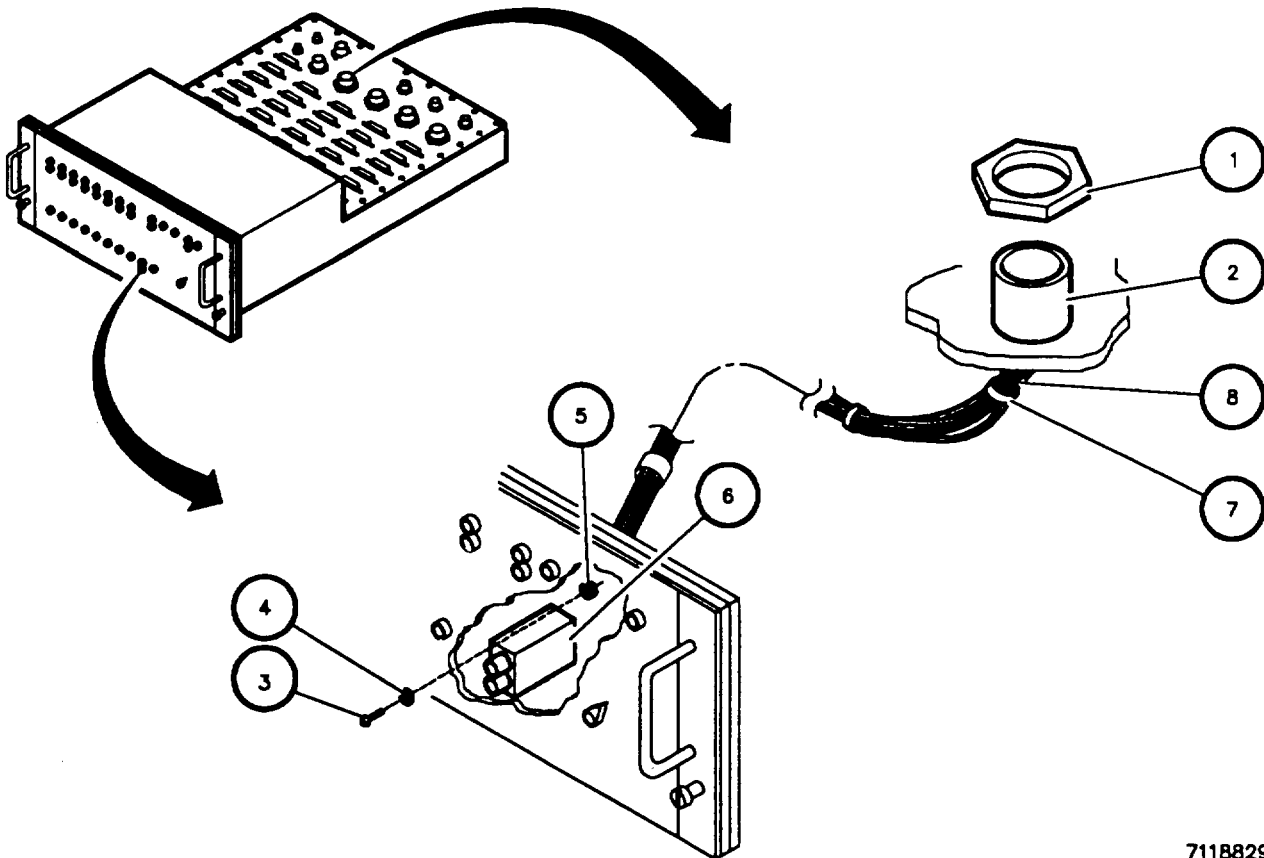
INITIAL SETUP

Equipment Condition: ADP shelter red patch panel placed on firm, clean surface.**Preliminary Procedures:**

1. Remove ADP shelter red patch panel bottom access cover (para 9-19).
2. Open ADP shelter red patch panel front panel (para 9-17).

REMOVAL

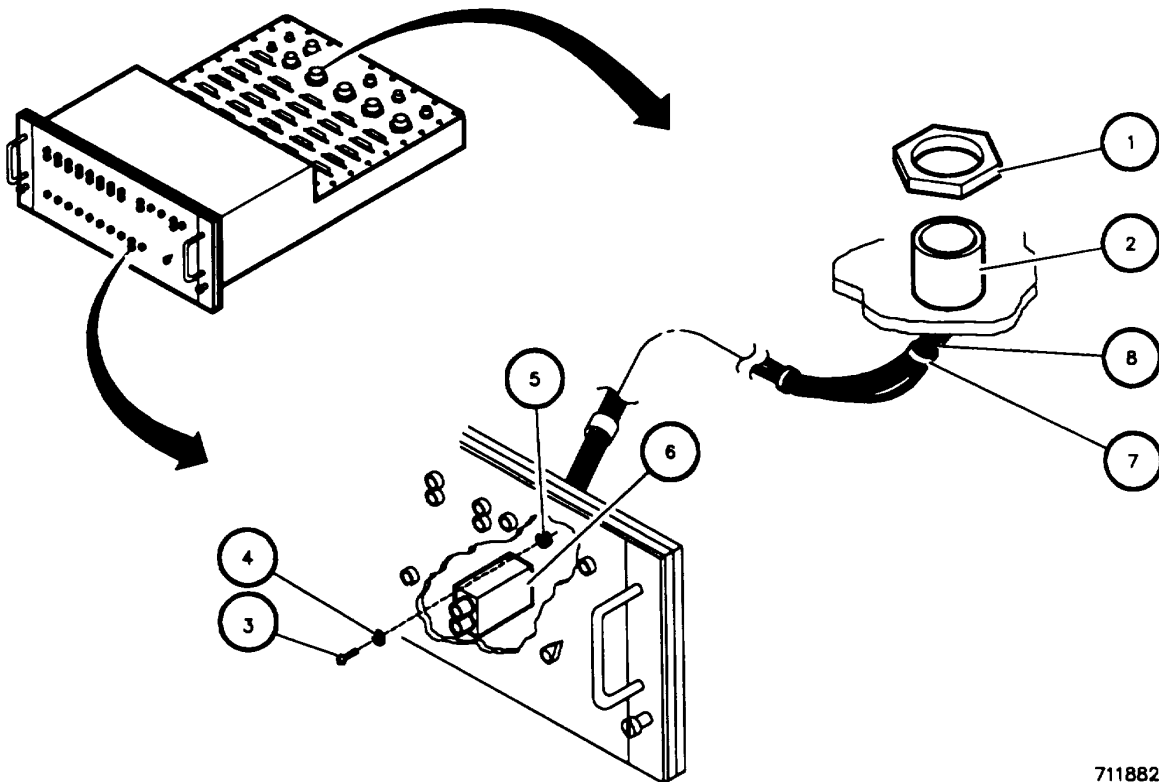
1. Working at top access cover, remove jamnuts (1) and connectors (2) labeled J37, J38, J39, J40, and J42 from cover. Tag connectors.
2. Working at front panel, remove two screws (3), washers (4), and locknuts (5) and dual patch jack (6) from panel.
3. Cut and remove cable ties (7) as required to isolate and remove alarm cable assembly (8) from chassis.



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9-23. REPLACE ADP SHELTER RED PATCH PANEL ALARM CABLE ASSEMBLY - Continued**INSTALLATION**

1. Route alarm cable assembly (8) into chassis.
2. Working at front panel, place and hold dual patch jack (6) in installed position.
3. Install two screws (3), washers (4), and locknuts (5).
4. Working at top access cover, place and hold connector J37 (2) in installed position.
5. Install jamnut (1). Remove tag.
6. Repeat steps 4 and 5 for connectors labeled J38, J39, J40, and J42.
7. Install cable ties (7) as required.



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FOLLOW-ON MAINTENANCE:

1. Install ADP shelter red patch panel bottom access cover (para 9-19).
2. Close ADP shelter red patch panel front panel (para 9-17).

9-24. REPLACE ADP SHELTER BLACK PATCH PANEL BANTAM-STYLE JACKS A1-A72

 This task covers: a. Removal b. Installation

INITIAL SETUP

NOTE

- Refer to table 9-4 for a listing of ADP shelter bantam-style jacks and their associated parts.
- Replace bantam-style jacks A1-A72 the same way, except where noted. Jack shown is typical.

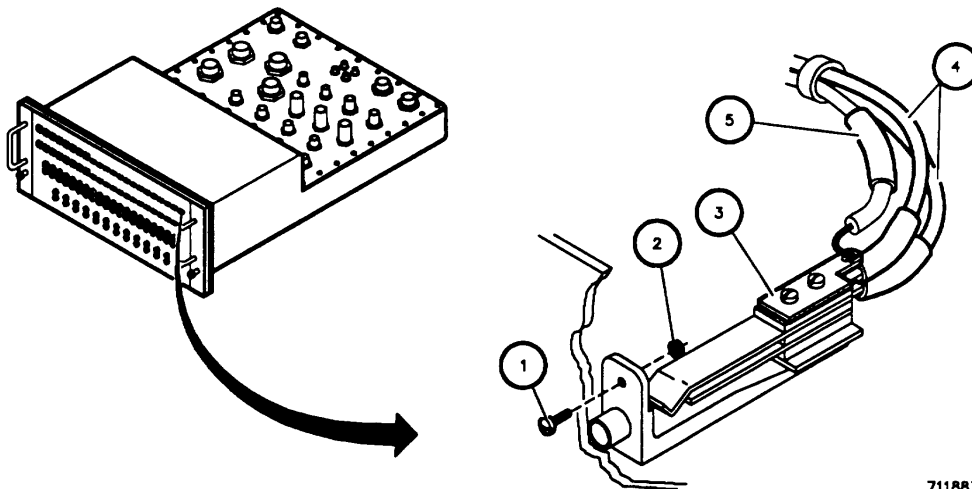
Materials/Parts: Trichlorotrifluoroethane; locking compound

Preliminary Procedure: Open ADP shelter black patch panel front panel (para 9-17).

REMOVAL

NOTE

- It may be necessary to identify and remove nearby components to access jack being replaced before proceeding.
 - Some jacks are secured using two screws and nuts.
1. Remove screw (1) and nut (2).
 2. Position jack (3) to access wires (4).
 3. Move insulation sleeving (5) to expose soldered connection.
 4. Tag, unsolder, and remove all wires (4).
 5. Remove jack (3).



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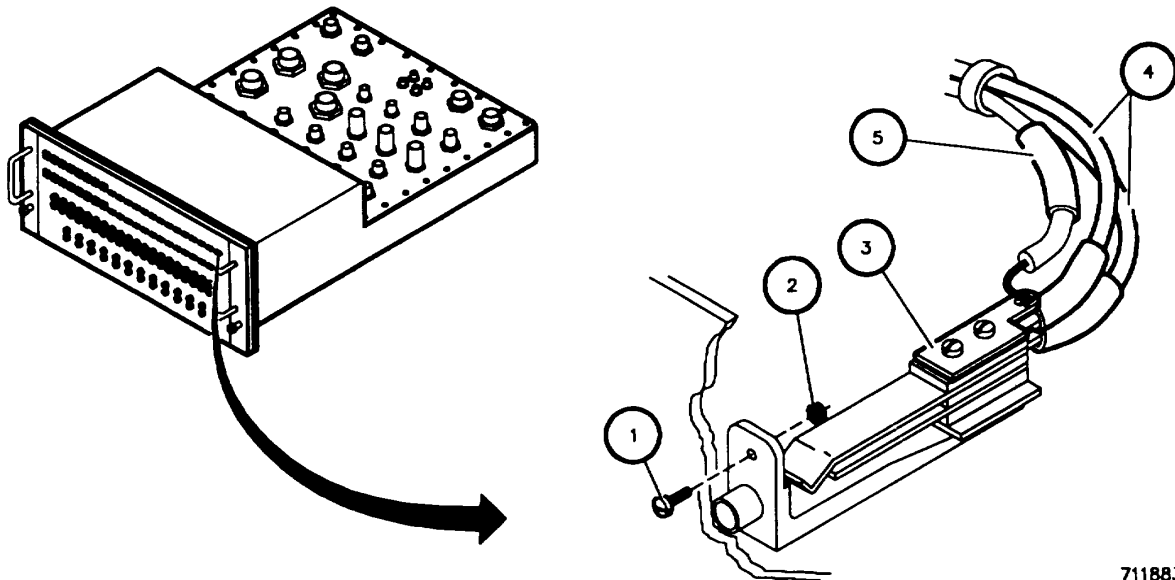
9-24. REPLACE ADP SHELTER BLACK PATCH PANEL BANTAM-STYLE JACKS A1-A72 - Continued

INSTALLATION

WARNING

The fumes of trichlorotrifluoroethane used for cleaning this equipment can cause severe irritation or injury.

1. Using trichlorotrifluoroethane, thoroughly clean jack mounting area of locking compound residue.
2. Form and dress all wires (4) to be soldered to jack (3).
3. Solder all wires (4) to jack (3), as tagged. Remove tags.
4. Place insulation sleeving (5) in installed position.
5. Apply light coat of locking compound on screw(s) (1).
6. Place jack (3) in installed position.
7. Install screw (1) and nut (2).



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FOLLOW-ON MAINTENANCE:

1. Install any components removed to access replaced jack.
2. Close ADP shelter black patch panel front panel (para 9-17).

9-25. REPLACE ADP SHELTER BLACK PATCH PANEL COAXIAL/TWINAXIAL JACK ASSEMBLIES A73-A84

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

- Refer to table 9-4 for a listing of ADP shelter coaxial and twinaxial jack assemblies and their associated parts.
- Replace all coaxial and twinaxial jack assemblies A73-A84 the same way. Jack shown is typical.

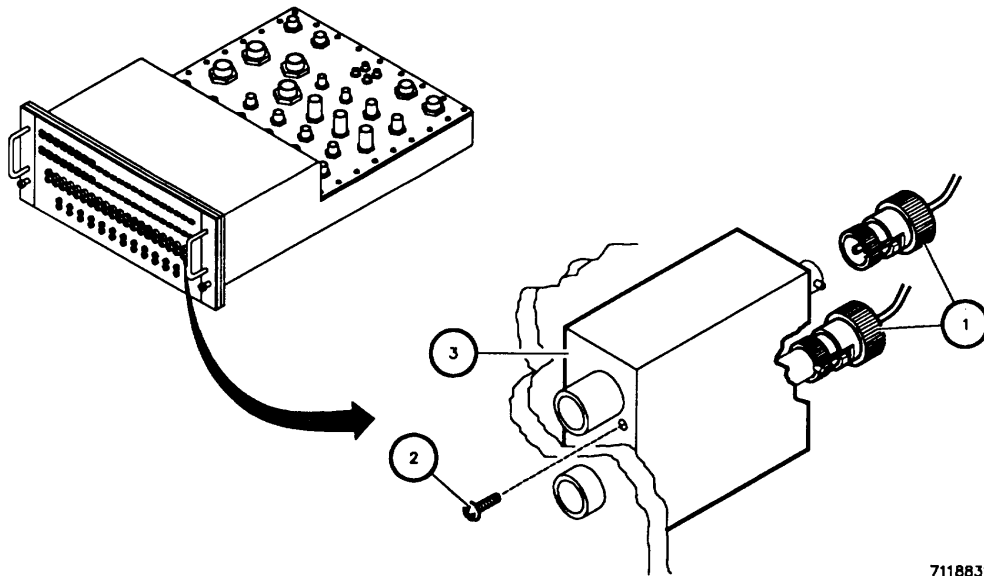
Preliminary Procedure: Open ADP shelter black patch panel front panel (para 9-17).

REMOVAL

NOTE

It may be necessary to identify and remove nearby components to access jack being replaced before proceeding.

1. Working inside front panel, tag and disconnect two cables (1).
2. Remove two screws (2) and jack (3).



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INSTALLATION

1. Place jack (3) in installed position.
2. Install two screws (2).
3. Connect two cables (1), as tagged. Remove tags.

FOLLOW-ON MAINTENANCE: Install black patch panel front panel (para 9-17).

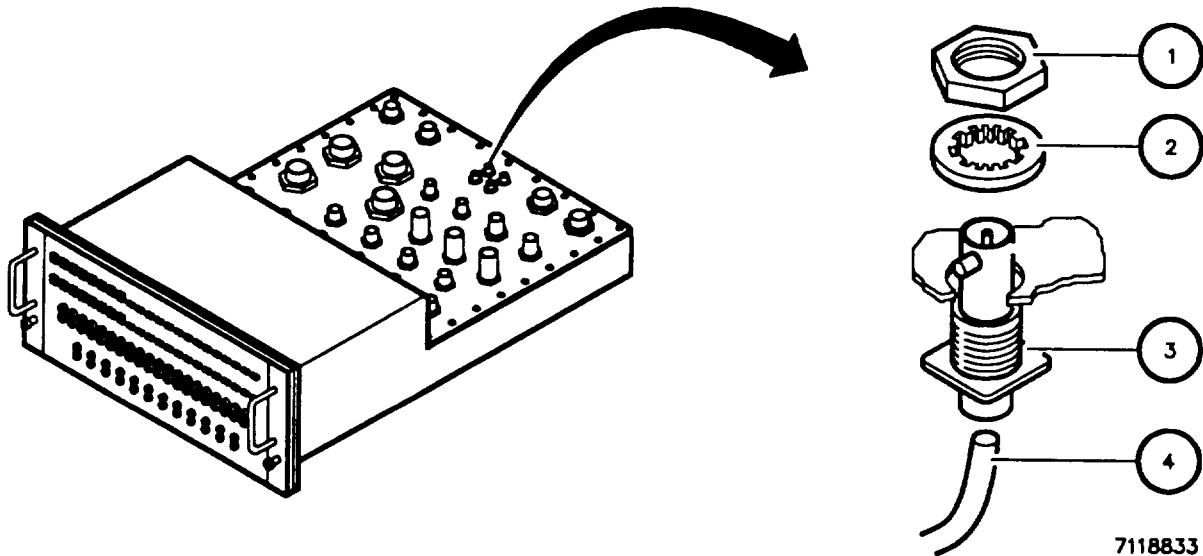
9-27. REPLACE ADP SHELTER BLACK PATCH PANEL RF CONNECTORS J19-J22**This task covers:****a. Removal****b. Installation****INITIAL SETUP****NOTE**

- Refer to table 9-4 for a listing of ADP shelter RF connectors and their associated parts.
- Replace all RF connectors J19-J22 the same way. Connector shown is typical.

Preliminary Procedure: Remove ADP shelter black patch panel bottom access cover (para 9-19).

REMOVAL

1. Working at top panel access cover, remove nut (1) and internal tooth lockwasher (2).
2. Cut and remove RF connector (3) from cable (4), cutting as close to RF connector as possible.

**INSTALLATION**

1. Form and dress cable (4) in accordance with guidelines provided in cabling and wiring instructions (volume 2).
2. Using crimping tool and die, crimp cable (4) to RF connector (3).
3. Place RF connector (3) in installed position.
4. Install nut (1) and internal tooth lockwasher (2).

FOLLOW-ON MAINTENANCE: Install ADP shelter black patch panel bottom access cover (para 9-19).

9-29. REMOVE/REPAIR/INSTALL BLACK PATCH PANEL POINT-TO-POINT WIRING

This task covers:	a. Removal	b. Repair	c. Installation
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INITIAL SETUP**NOTE**

Using table 9-4 or 9-6 as a guide, determine termination points of ADP or OPN shelter black patch panel wire(s) under repair before proceeding.

Materials/Parts: Trichlorotrifluoroethane; locking compound

Preliminary Procedures:

1. Open ADP shelter black patch panel front panel (para 9-17).
 2. Remove ADP shelter black patch panel bottom access cover (para 9-19).
 3. Remove OPN shelter black patch panel top cover (para 9-37).
-

REMOVAL**NOTE**

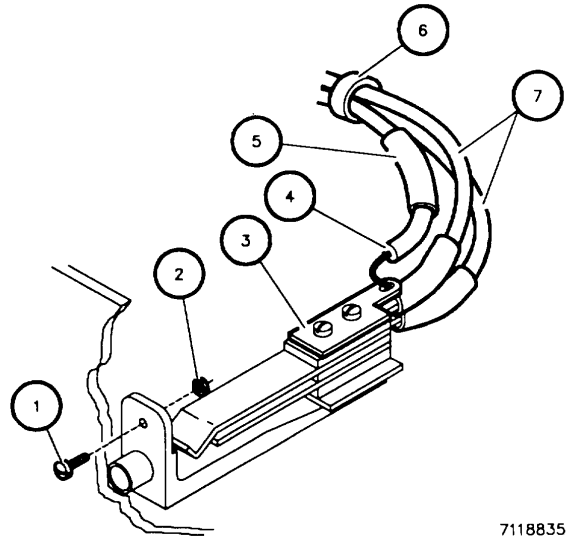
- It may be necessary to identify and remove nearby components to access wiring being replaced before proceeding.
- Perform all removal steps required to isolate damaged cable(s)/wire(s) from assemblies and harness before proceeding to repair.
- If wire terminated at bantam-style jack, go to step 1.
- If wire terminated at coaxial/twinaxial jack assembly, go to step 6.
- If wire terminated at circular connector, go to step 8.

9-29. REMOVE/REPAIR/INSTALL BLACK PATCH PANEL POINT-TO-POINT WIRING - Continued

NOTE

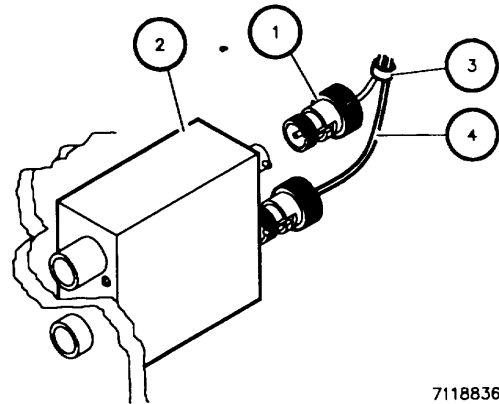
Some bantam-style jacks are secured using two screws and nuts.

1. Working at appropriate jack, remove screw(s) (1) and nut(s) (2).
2. Position jack (3) to access wire (4).
3. Move insulation sleeving (5) to expose soldered connection.
4. Tag, unsolder, and remove faulty wire (4) from jack (3).
5. Cut and remove cable ties (6), as required, to isolate wire (4) from nearby cables or wires (7).



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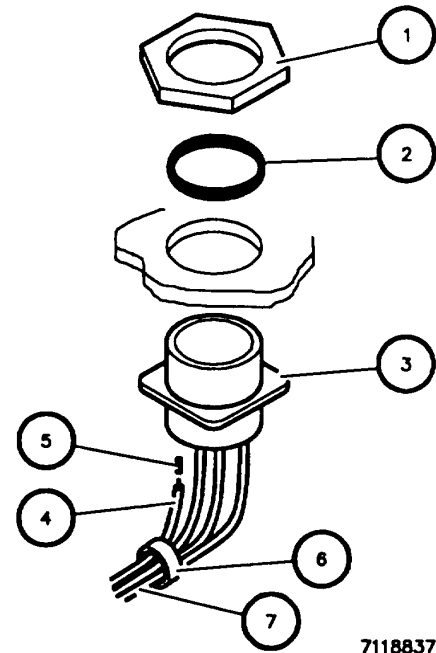
6. Working at appropriate jack, disconnect cable (1) from coaxial/twinaxial jack (2).
7. Cut and remove cable ties (3), as required, to isolate cable (1) from cables or wires (4).



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9-29. REMOVE/REPAIR/INSTALL BLACK PATCH PANEL POINT-TO-POINT WIRING - Continued

8. Working at appropriate connector, remove nut (1), O-ring (2), and connector (3) from panel, as required, to access wire (4).
9. Tag and remove wire (4) and contact (5) from connector (3).
10. Cut and remove cable ties (6), as required, to isolate wire (4) from cables or wires (7).



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REPAIR

Replace cable(s) /wire(s) and attached hardware in accordance with instructions in cable diagrams and wire lists (volume 2).

INSTALLATION**NOTE**

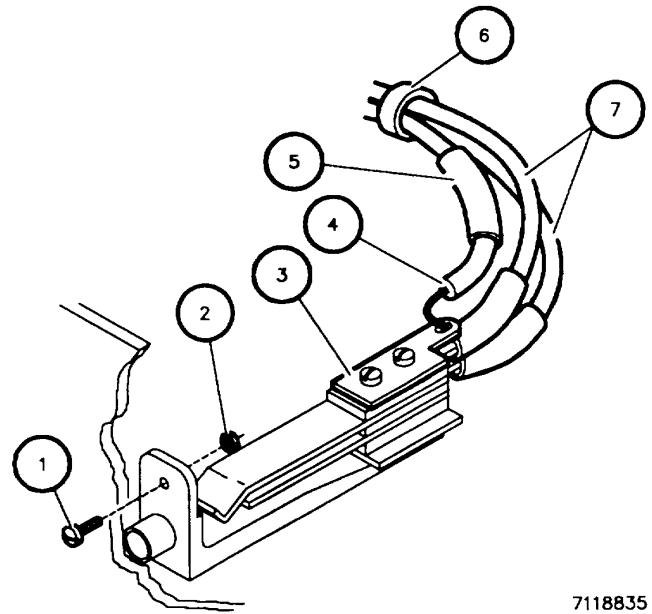
- **Perform all installation steps required to secure repaired cable(s)/wire(s) to assemblies and harness before proceeding to follow-on maintenance.**
- **If wire terminated at bantam-style jack, go to step 1.**
- **If wire terminated at coaxial/twinaxial jack assembly, go to step 10.**
- **If wire terminated at circular connector, go to step 12.**

9-29. REMOVE/REPAIR/INSTALL BLACK PATCH PANEL POINT-TO-POINT WIRING - Continued

WARNING

The fumes of trichlorotrifluoroethane used for cleaning this equipment can cause severe irritation or injury.

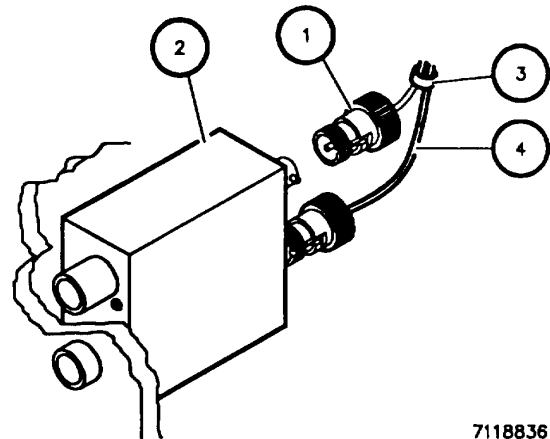
1. Using trichlorotrifluoroethane, thoroughly clean jack mounting area of locking compound residue.
2. Form and dress wire (4).
3. Position length of insulation sleeving (5) on wire (4) so that wire can be soldered.
4. Solder wire (4) to jack (3), as tagged. Remove tag.
5. Position insulation sleeving (5) over solder joint.
6. Apply light coat of locking compound on screw(s) (1).
7. Place jack (3) in installed position.
8. Install screw(s) (1) and nut(s) (2).
9. Install cable ties (6), as required, to secure wire (4) to cables or wires (7).



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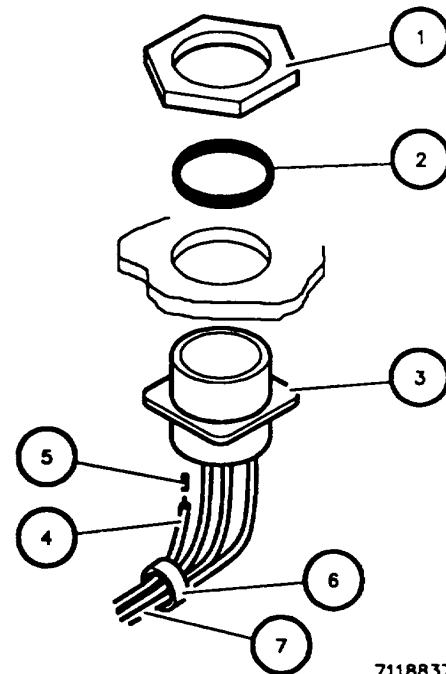
9-29. REMOVE/REPAIR/INSTALL BLACK PATCH PANEL POINT-TO-POINT WIRING - Continued

10. Working at appropriate jack, connect cable (1) to coaxial/twinaxial jack (2).
11. Install cable ties (3), as required, to secure cable (1) to cables or wires (4).



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12. Working at appropriate connector, install wire (4) and contact (5) in connector (3), as tagged. Remove tag.
13. If removed for access, install O-ring (2) and connector (3) into panel and install nut (1).
14. Install cable ties (6), as required, to secure wire (4) to cables or wires (7).



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FOLLOW-ON MAINTENANCE:

1. Install any components removed to access replaced wire.
2. Close ADP shelter black patch panel front panel (para 9-17).
3. Install ADP shelter black patch panel bottom access cover (para 9-19).
4. Install OPN shelter black patch panel top cover (para 9-37).

9-30. REPAIR SIGNAL DISTRIBUTION CABLES - EMERGENCY PROCEDURE

This task covers: **Repair**

INITIAL SETUP**NOTE**

- This procedure is provided for emergency/temporary replacement of damaged signal distribution cables. This task is necessary because these cables are not physically accessible. The cable(s) fabricated as a result of this procedure will degrade the system's overall Tempest integrity.
- Using cable diagrams and wire lists (volume 2) as a guide, determine required replacement parts and termination points of cable(s) under repair before proceeding.

Equipment Conditions: Equipment connected to faulty cable turned off.

REPAIR

1. Disconnect faulty cable from associated equipment.

NOTE

Emergency cable will be routed between cable termination points, subject to the following rules and limitations:

- **Maintain 2-inch separation for double-shielded cables.**
 - **Avoid parallel runs of red and black cables.**
 - **Cross cables at 90-degree angles.**
 - **Resulting cable configuration should be tested to ensure Tempest integrity of system.**
2. Measure distance between cable termination points, using best route available, ensuring that all above requirements are met.
 3. Fabricate cable in accordance with cable diagrams, wire lists, and instructions given for cable under repair (volume 2).
 4. Route cable between cable termination points and connect cable to associated equipment.
 5. Deliver system-appropriate level of maintenance for proper cable replacement at earliest opportunity.

9-31. REPLACE ADP SHELTER FIBER-OPTIC CABLE W3 OR W5

This task covers: a. Removal b. Installation

INITIAL SETUP**General Safety Precautions:****CAUTION**

Damage to fiber-optic cables can be avoided by using the following guidelines:

- Ensure that cable is not kinked or bent sharply.
- Avoid subjecting cable to sharp blows.
- Do not twist or otherwise stress cable.
- When removing cable, hold cable firmly and only turn spin nut on connector.
- When installing cable, ensure that no cross-threading occurs.

NOTE

- Replace ADP shelter fiber-optic cable W3 or W5 the same way, except where noted. Cable W3 is shown.
- Using ADP shelter system interconnect diagram (volume 2) as a guide, determine termination points of cable under repair before proceeding.

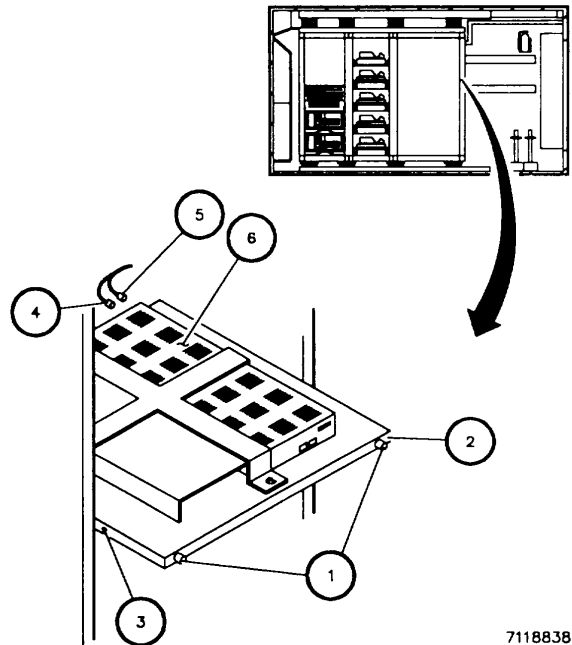
Equipment Conditions: Power to affected Fiber-Optic Ethernet Repeater (FOER) and associated equipment set to off, as required. Exterior cable disconnected from Fiber-Optic Entry Panel (FOEP).

Preliminary Procedure: Remove block-off bracket assembly (para 9-8).

9-31. REPLACE ADP SHELTER FIBER-OPTIC CABLE W3 OR W5 - Continued

REMOVAL

1. Working at rack A3A3, loosen two captive screws (1).
2. Slide tray (2) outward until right and left slide locks (3) engage.
3. Tag and disconnect W3P1 (4) and W3P2 (5) from FOER (6).



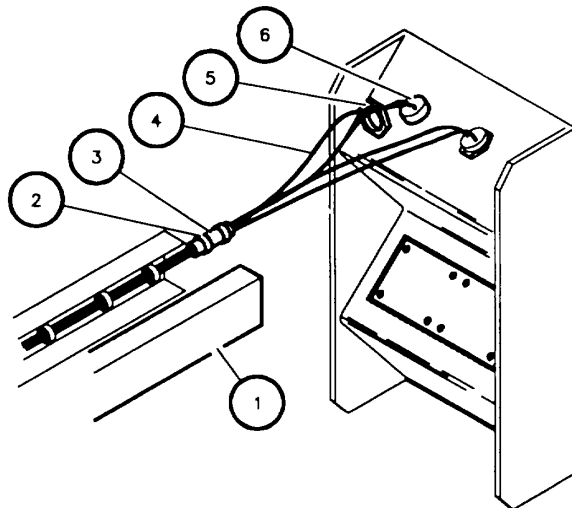
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4. Working at fiber-optic cable raceway, remove raceway cover (1).

NOTE

Note and record number and placement of cable ties and protective sleeving to aid installation.

5. Cut and remove cable ties (2) and protective sleeving (3) to isolate cable (4).
6. Working at FOEP, loosen nut (5) securing P3 (6) to panel.
7. Route cable (4) through nut (5) and FOEP and out of shelter.

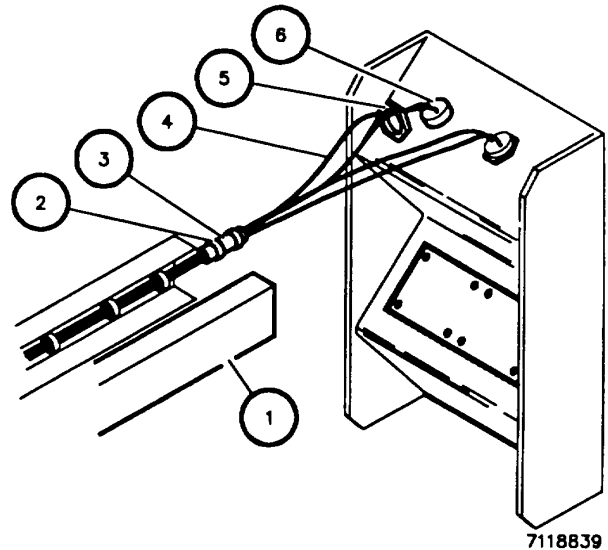


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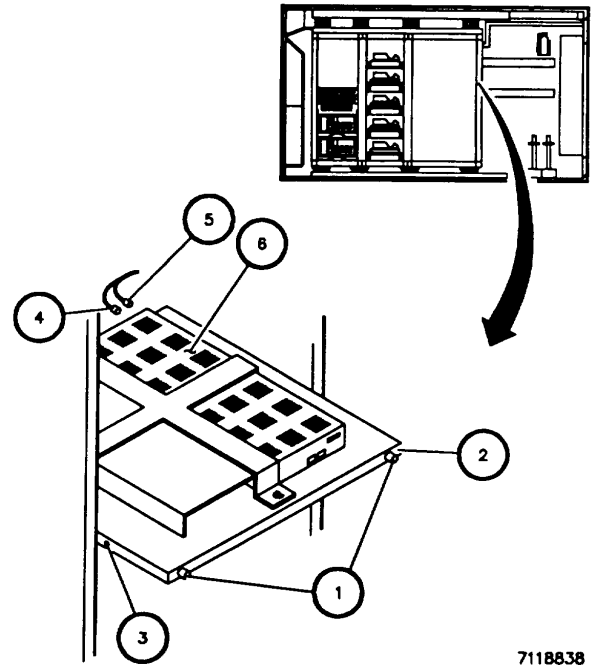
9-31. REPLACE ADP SHELTER FIBER-OPTIC CABLE W3 OR W5 - Continued

INSTALLATION

1. Working outside FOEP, route cable (4) through FOEP into shelter.
2. Install nut (5) on cable (4), sliding it up cable to P3 (6).
3. Install nut (5) to secure P3 (6) to FOEP.
4. Install cable ties (2) and protective sleeving (3) as recorded during removal.
5. Install raceway cover (1).



6. Working at rack A3A3, connect W3P1 (4) and W3P2 (5) to FOER (6).
7. Press right and left slide locks (3) and slide tray (2) in fully.
8. Tighten two captive screws (1).



FOLLOW-ON MAINTENANCE: Install block-off bracket assembly (para 9-8).

9-32. REPLACE OPN SHELTER FIBER-OPTIC CABLE

This task covers:**a. Removal****b. Installation**

INITIAL SETUP**General Safety Precautions****CAUTION**

Damage to fiber-optic cables can be avoided by using the following guidelines:

- Ensure that cable is not kinked or bent sharply.
- Avoid subjecting cable to sharp blows.
- Do not twist or otherwise stress cable.
- When removing cable, hold cable firmly and only turn spin nut on connector.
- When installing cable, ensure that no cross-threading occurs.

NOTE

Using OPN shelter system interconnect diagram (volume 2) as a guide, determine termination points of cable under repair before proceeding.

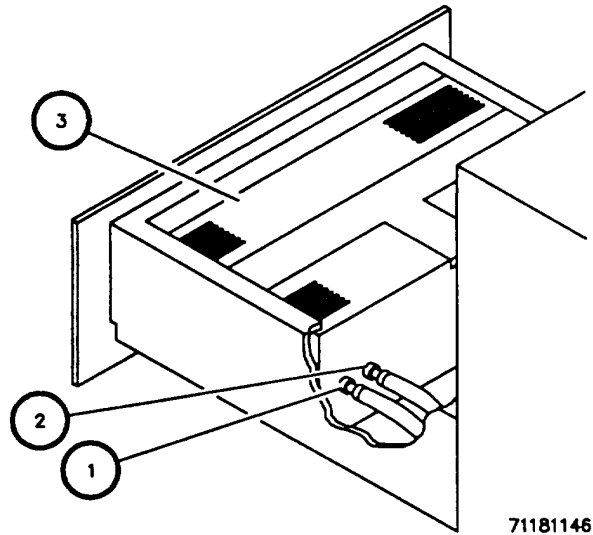
Equipment Conditions: EQPT RACK circuit breaker on OPN shelter Power Distribution Unit (PDU) set to OFF.
Exterior cable disconnected from OPN shelter A4 SIGNAL ENTRY PANEL RTC J2.

Preliminary Procedure: Remove OPN shelter Repeater/Station Adapter (RSA) top cover. Refer to TM 11-5895-1392-12.

9-32. REPLACE OPN SHELTER FIBER-OPTIC CABLE - Continued

REMOVAL

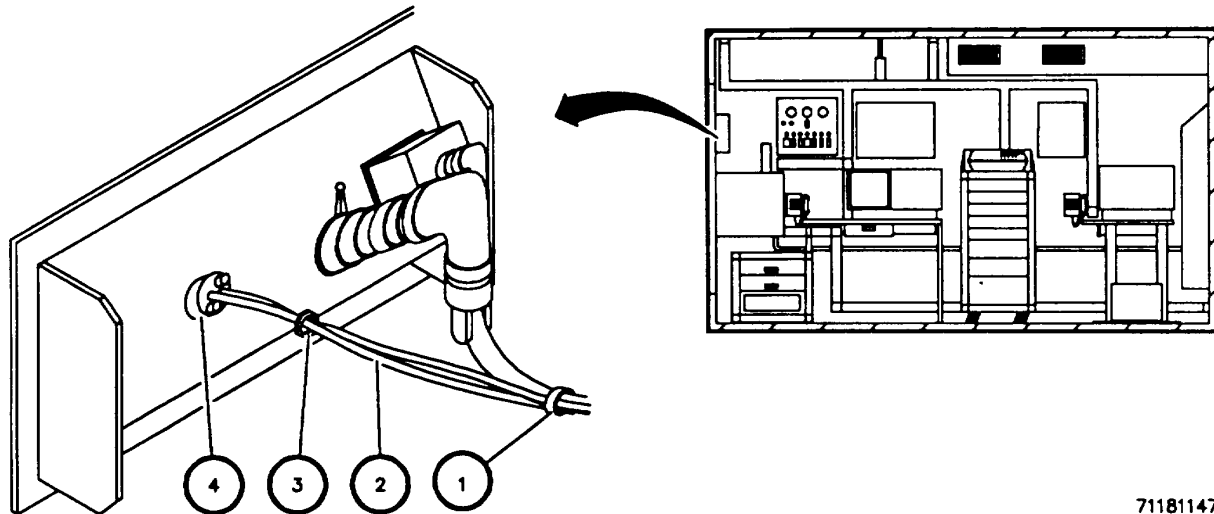
1. Working inside OPN shelter RSA top cover, disconnect W2P1 (1) and W2P2 (2) from FOER (3).



NOTE

Note and record number and placement of cable ties to aid installation.

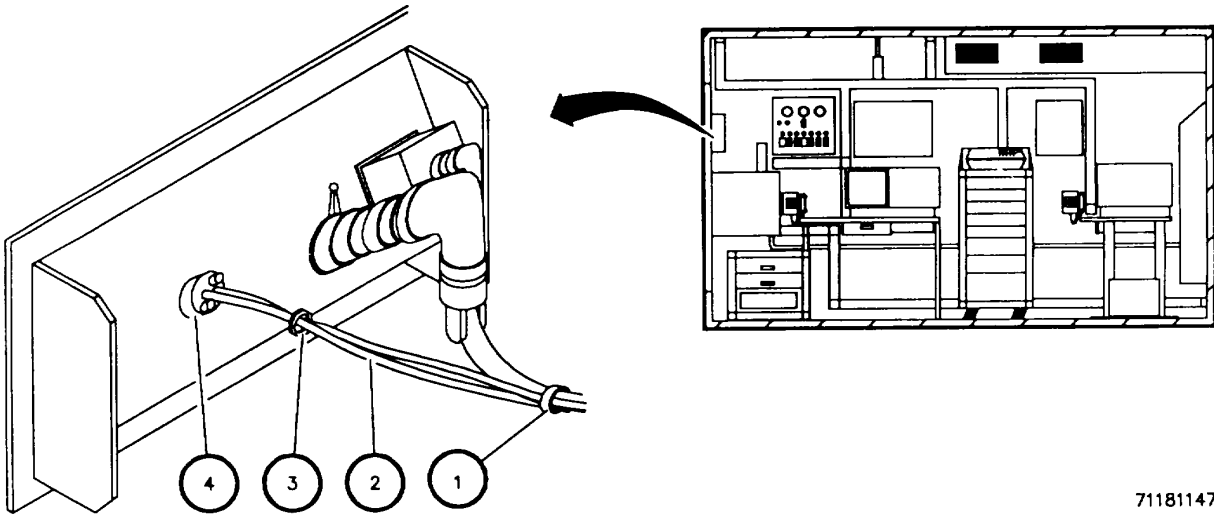
2. Cut and remove cable ties (1), as required, to isolate cable (2).
3. Working inside shelter at A4 SIGNAL ENTRY PANEL RTC J2, loosen nut (3) securing W2P3 (4) to panel.
4. Route cable (2) through nut (3) and panel and out of shelter.



9-32. REPLACE OPN SHELTER FIBER-OPTIC CABLE - Continued

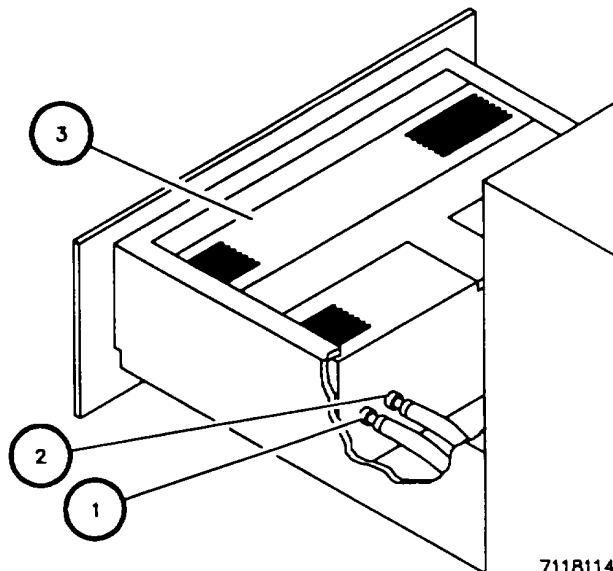
INSTALLATION

5. Working outside A4 SIGNAL ENTRY PANEL, route cable (2) through panel into shelter.
6. Install nut (3) on cable (2), sliding nut up cable to W2P3 (4).
7. Install nut (3) to secure W2P3 to panel.
8. Install cable ties (1), as recorded during removal.



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9. Working inside RSA to cover, connect W2P1 (1) and W2P2 (2) to FOER (3).



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FOLLOW-ON MAINTENANCE: Install OPN shelter RSA top cover. Refer to TM 11-5895-1392-12.

9-33. REMOVE/REPAIR/INSTALL SIGNAL DISTRIBUTION SYSTEM COAXIAL/TWINAXIAL CABLES

This task covers: a. Removal b. Repair c. Installation

INITIAL SETUP**NOTE**

- **Replace all signal distribution system coaxial/twinaxial cables the same way, except where noted.**
- **Using system interconnect diagram (volume 2) as a guide, determine termination points of cable under repair before proceeding.**

Equipment Conditions: Equipment connected to faulty cable turned off.

REMOVAL

Disconnect cable from associated assemblies, as determined using system interconnect diagram.

REPAIR

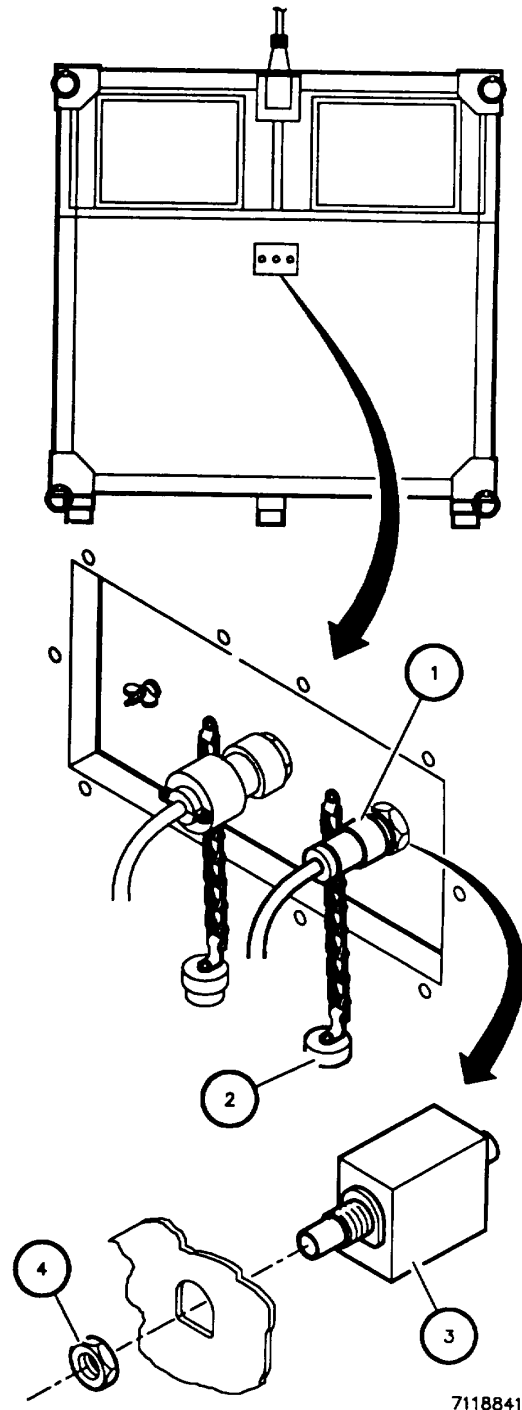
Replace cables(s) and attached hardware in accordance with instructions in cable diagrams and wire lists (volume 2).

INSTALLATION

Connect cable to associated assemblies, as determined using system interconnect diagram.

9-34. REPLACE SIGNAL DISTRIBUTION SYSTEM ANTENNA RF CONNECTOR - Continued

5. Technician B: Working outside shelter at forward wall, remove cable (1) or protective cap (2), as applicable.
6. With technician A holding antenna RF connector (3) inside shelter, technician B: Remove nut (4) from connector.
7. Technician B: Remove antenna RF connector (3).



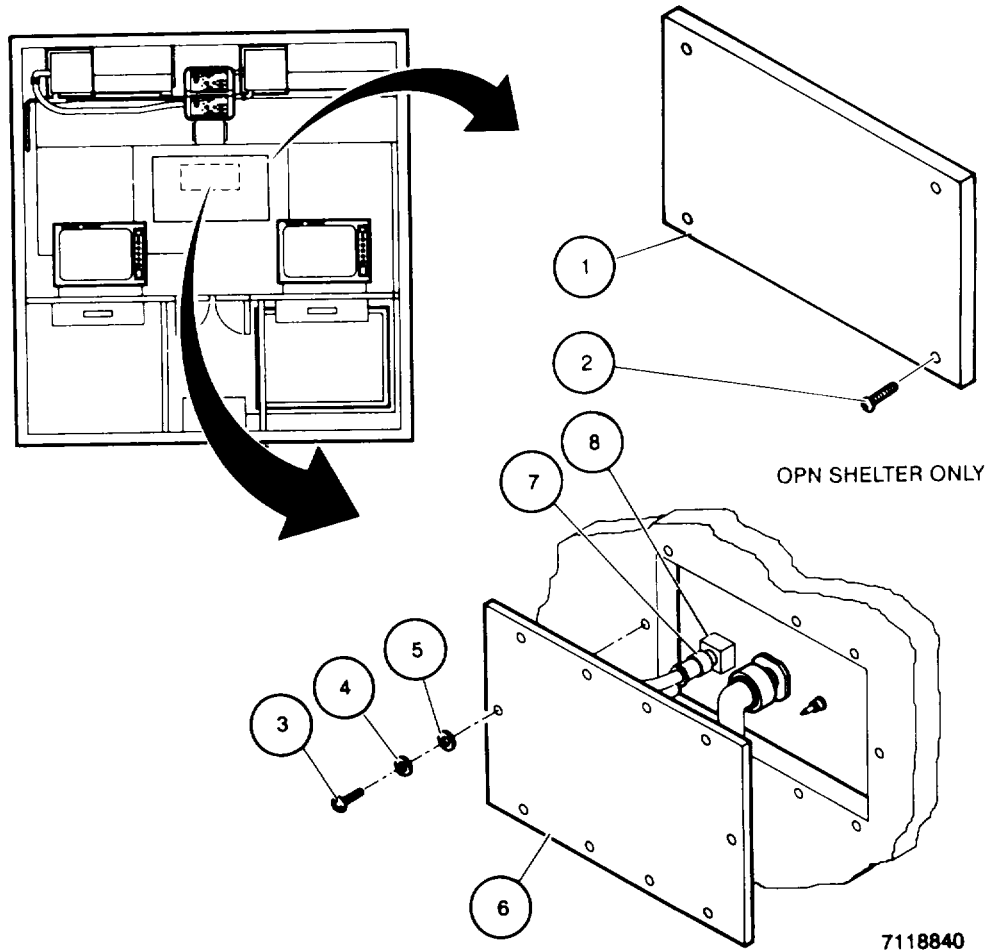
INSTALLATION

1. Technician A: Working inside shelter inside front wall, place and hold antenna RF connector (3) in installed position.
2. Technician B: Working outside shelter at forward wall, install nut (4) on antenna RF connector (3).
3. Install cable (1) or protective cap (2) on antenna RF connector (3), as applicable.

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9-34. REPLACE SIGNAL DISTRIBUTION SYSTEM ANTENNA RF CONNECTOR - Continued

4. Technician A: Install cable (7) on antenna RF connector (8).
5. Place and hold antenna access panel (6) in installed position.
6. Install 10 screws (3), lockwashers (4), and washers (5). If working on ADP shelter, task complete.
7. If working on OPN shelter, place and hold bulletin board (1) in installed position.
8. Install four screws (2).



9-35. REPLACE SIGNAL DISTRIBUTION SYSTEM ANTENNA CONTROL CONNECTOR

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

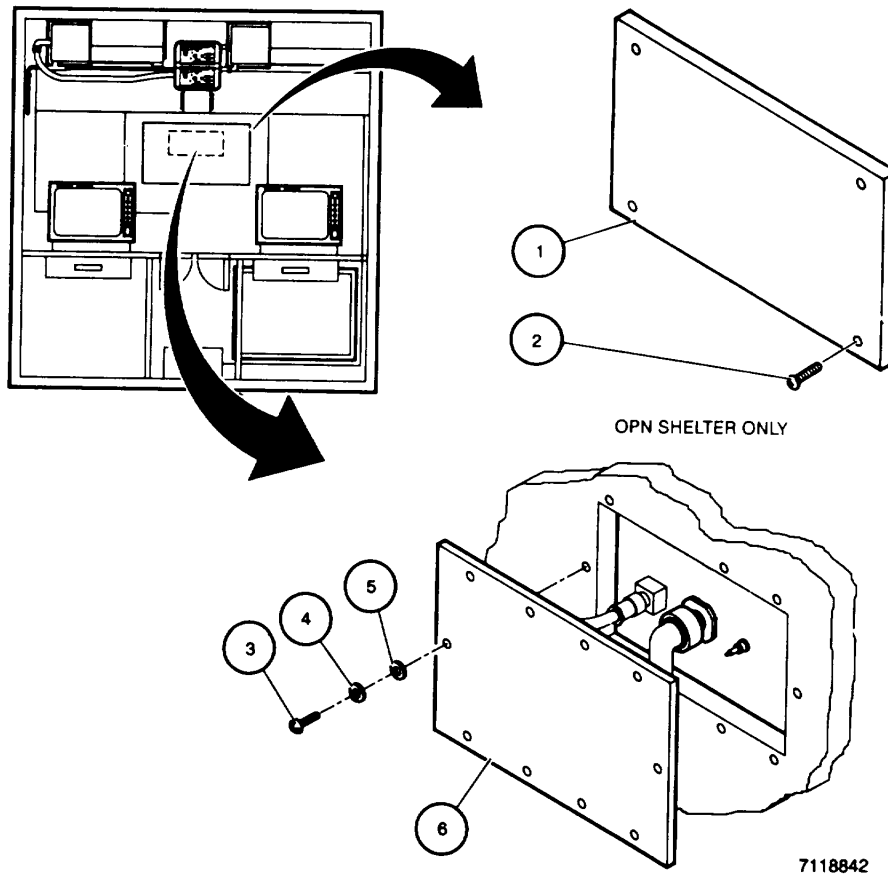
Replace ADP and OPN shelter antenna control connector the same way, except where noted. OPN shelter antenna control connector is shown.

Personnel Required: Two

Equipment Conditions: Equipment connected to faulty cable turned off.

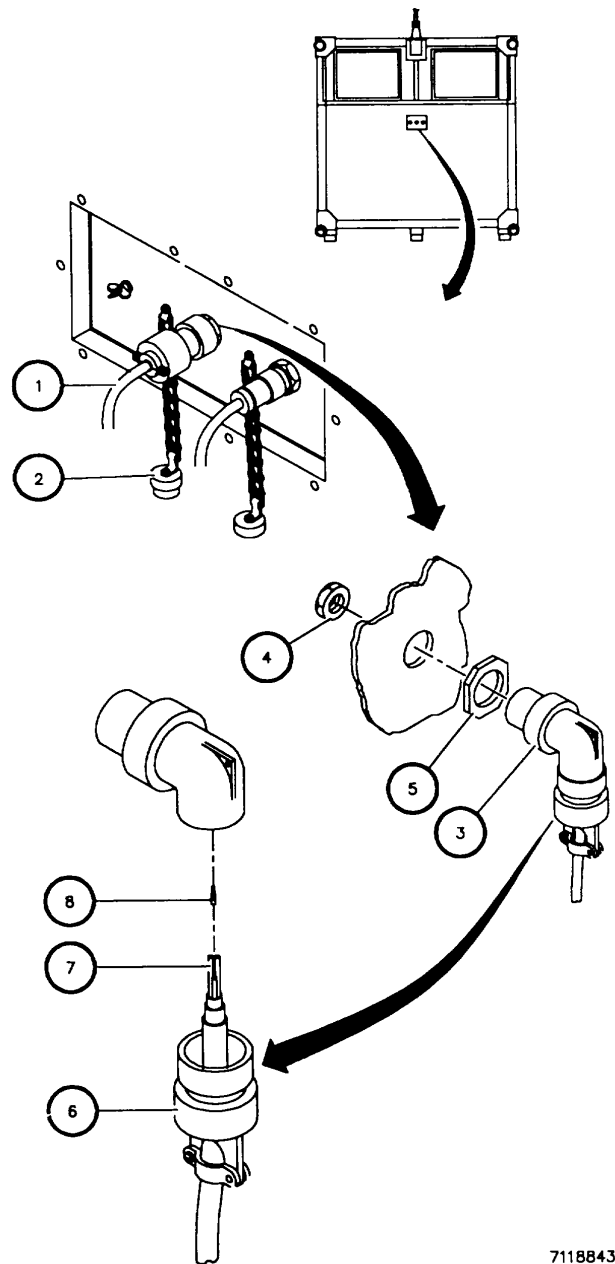
REMOVAL

1. Technician A: If working on OPN shelter, working inside shelter at forward wall, remove four screws (1) and bulletin board (2).
2. Remove 10 screws (3), lockwashers (4), and washers (5).
3. Remove antenna access panel (6).



9-35. REPLACE SIGNAL DISTRIBUTION SYSTEM ANTENNA CONTROL CONNECTOR - Continued

4. Technician B: Working outside shelter at forward wall, remove cable (1) or protective cap (2), as applicable.
5. With technician A holding connector (3) inside shelter, technician B: Remove nut (4) from connector.
6. Technician B: Remove connector (3) and plastic O-ring (5) from panel.
7. Unscrew connector backshell (6) and position it to expose wires (7).
8. Tag and remove wires (7) from connector (3).
9. Remove connector (3).
10. Inspect contacts (8) on wires (7). If bent, corroded, or otherwise damaged, cut and replace contact (8)

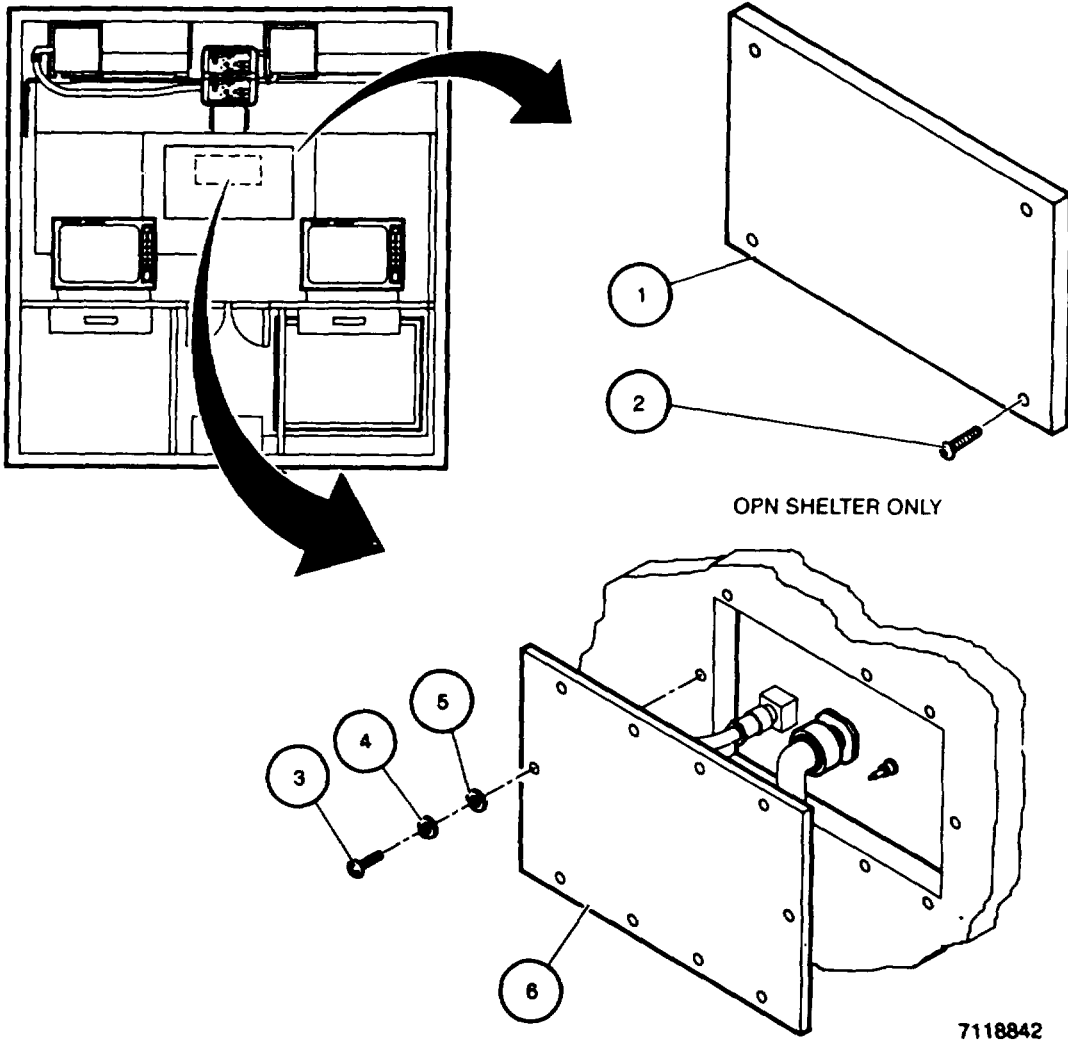


INSTALLATION

1. If contact removed, technician A: Working inside shelter inside front wall, form and dress wire (7) and install new contact (8).
2. Install wires (7) into connector (3), as tagged. Remove tags.
3. Place and hold connector (3) and plastic O-ring (5) in installed position.
4. Technician B: Working outside shelter at forward wall, install nut (4) on connector (3).
5. Install cable (1) or protective cap (2) on connector (3), as applicable.

9-35. REPLACE SIGNAL DISTRIBUTION SYSTEM ANTENNA CONTROL CONNECTOR - Continued

6. Technician A: Place and hold antenna access panel (6) in installed position.
7. Install 10 screws (3) lockwashers (4), and washers (5). If working on ADP shelter, task complete.
8. If working on OPN shelter, place and hold bulletin board (1) in installed position.
9. Install four screws (2).



9-36. OPEN/CLOSE OPN SHELTER RED/BLACK PATCH PANEL FRONT PANEL

This task covers:

a. Open

b. Close

INITIAL SETUP

NOTE

Open/close OPN shelter red or black patch panel front panel the same way, except where noted. Red patch panel is shown.

Equipment Condition: Red/black patch panel placed on firm, clean surface.

Preliminary Procedure: Remove OPN shelter red/black patch panel top cover (para 9-37).

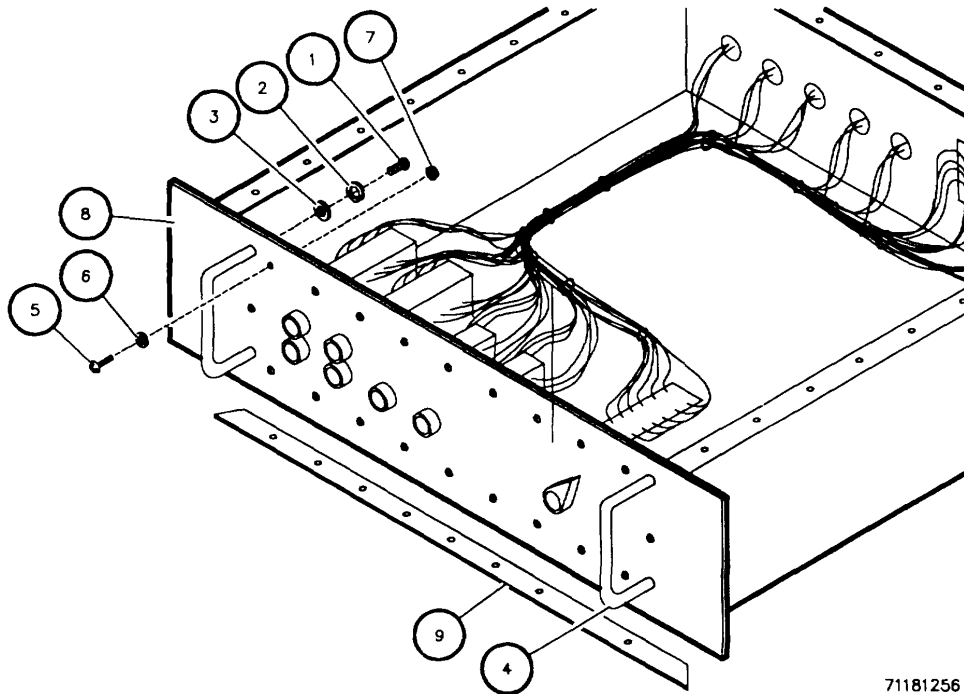
OPEN

1. Remove four screws (1), lockwashers (2), washers (3), and two handles (4).
2. Remove 20 screws (5), washers (6), and locknuts (7).

CAUTION

Handle front panel carefully to avoid damaging wiring and front panel components.

3. Carefully separate front panel (8) from chassis to access interior. Collect gaskets (9) that fall from chassis, as required.



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9-36. OPEN/CLOSE OPN SHELTER RED/BLACK PATCH PANEL FRONT PANEL - Continued

NOTE

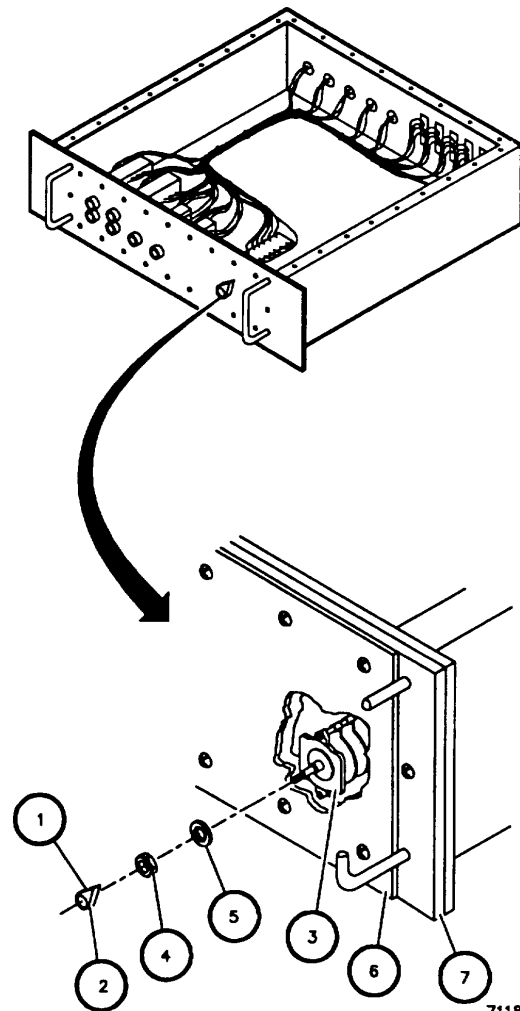
If working on black patch panel, go to step 6.

4. Loosen two setscrews (1) and remove knob (2).
5. While supporting switch (3), remove nut (4) and internal tooth lockwasher (5).

CAUTION

Separate identification plate from front panel by carefully prying edges of plate toward the middle, changing positions frequently to avoid bending or breaking plate.

6. Remove identification plate (6) from front panel (7).



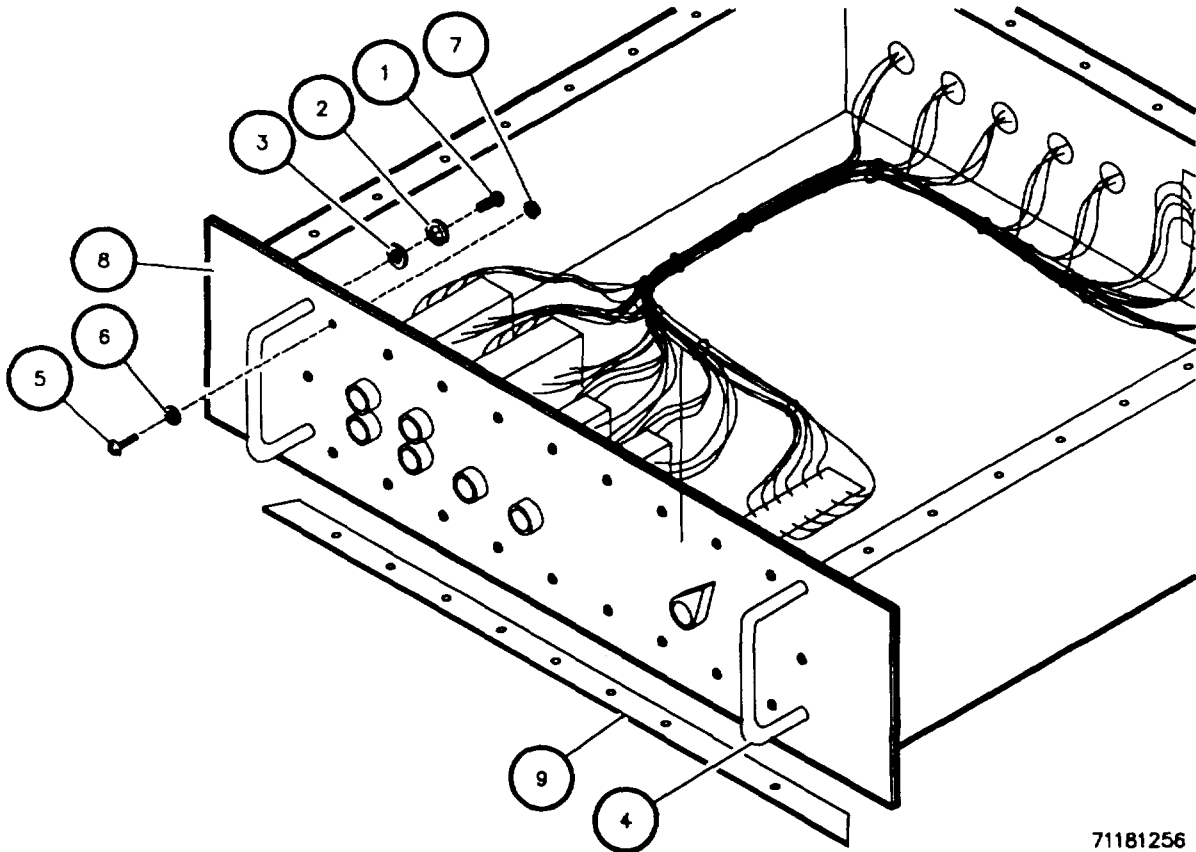
71181257

CLOSE

1. Install identification plate (6) on front panel (7).
2. Place and hold switch (3) in installed position.
3. Install nut (4) and lockwasher (5).
4. Install knob (2) on switch (3) and tighten two setscrews (1).

9-36. OPEN/CLOSE OPN SHELTER RED/BLACK PATCH PANEL FRONT PANEL - Continued

5. Carefully place front panel (8) in installed position.
6. If gaskets (9) need to be reinstalled, position and hold gaskets using hardware in step 7, as required.
7. Install 20 screws (5), washers (6), and locknuts (7).
8. Using four screws (1), lockwashers (2), and washers (3), install two handles (4).



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FOLLOW-ON MAINTENANCE: Install OPN shelter red/black patch panel top cover (para 9-37).

9-37. REMOVE/INSTALL OPN SHELTER RED/BLACK PATCH PANEL TOP COVER

This task covers:**a. Removal****b. Installation**

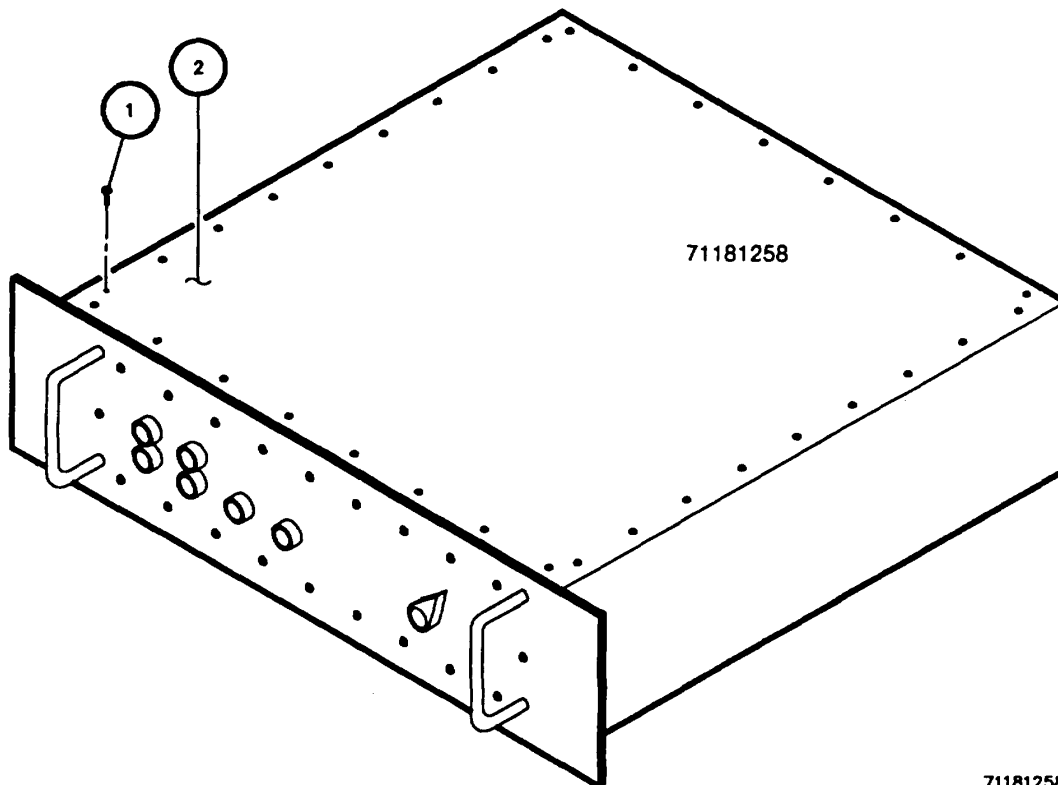
INITIAL SETUP**NOTE**

Remove/install OPN shelter red or black patch panel top cover the same way. Red patch panel top cover is shown.

Equipment Condition: Red/black patch panel placed on firm, clean surface.

REMOVAL

1. Remove 34 screws (1)
2. Remove cover (2).



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INSTALLATION

1. Place cover (2) in installed position.
2. Install 34 screws (1).

9-38. REPLACE OPN SHELTER RED PATCH PANEL LDF SELECT SWITCH ASSEMBLY

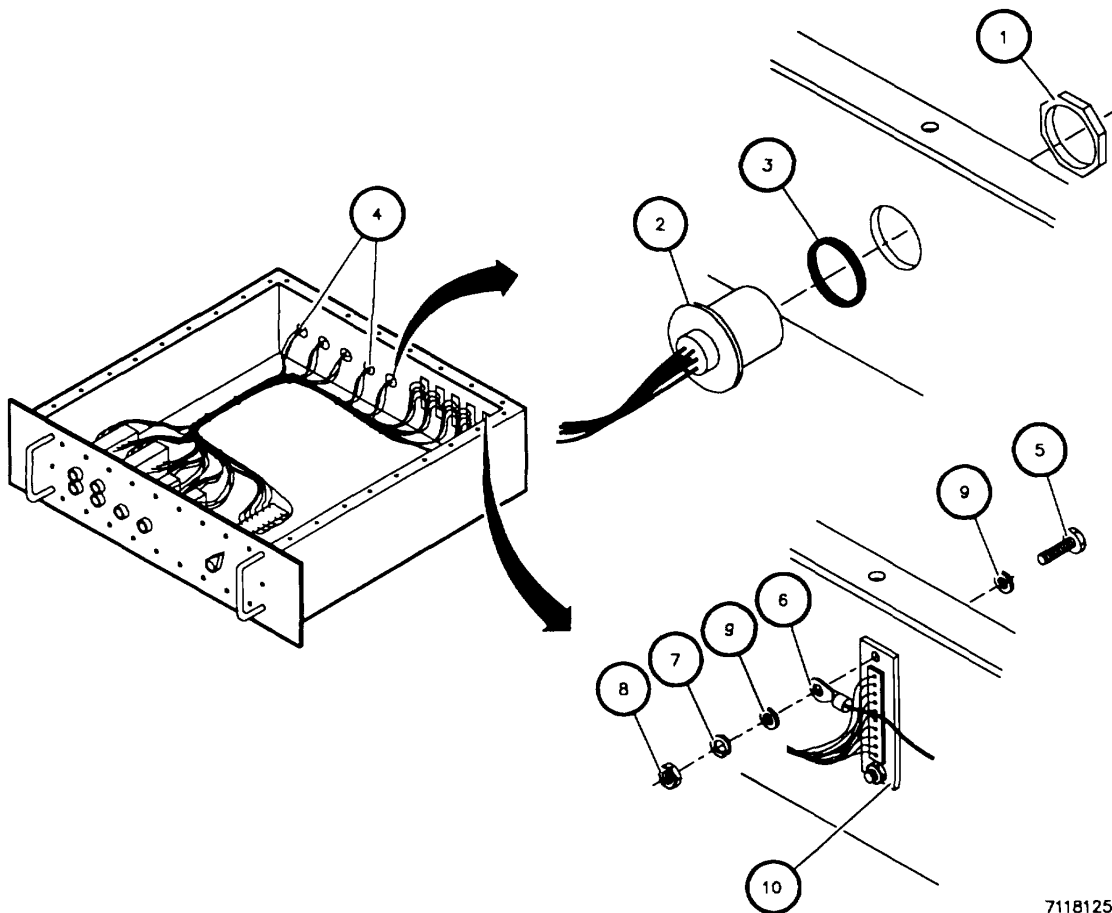
This task covers:

a. Removal

b. Installation

INITIAL SETUP**Equipment Condition:** Red patch panel placed on firm, clean surface.**Preliminary Procedure:** Open OPN shelter red patch panel front panel (para 9-36).**REMOVAL**

1. Working at rear cover, remove jamnut (1) from connector J7 (2). Tag connector.
2. Remove connector J7 (2), with O-ring (3), which may remain seated in J7.
3. Repeat steps 1 and 2 for connectors (4) J8 through J 1.
4. Working at rear panel, remove top standoff (5), ground lug (6), lockwasher (7), nut (8), and two washers (9) from connectors J1 through J3 (10) (J3 shown).



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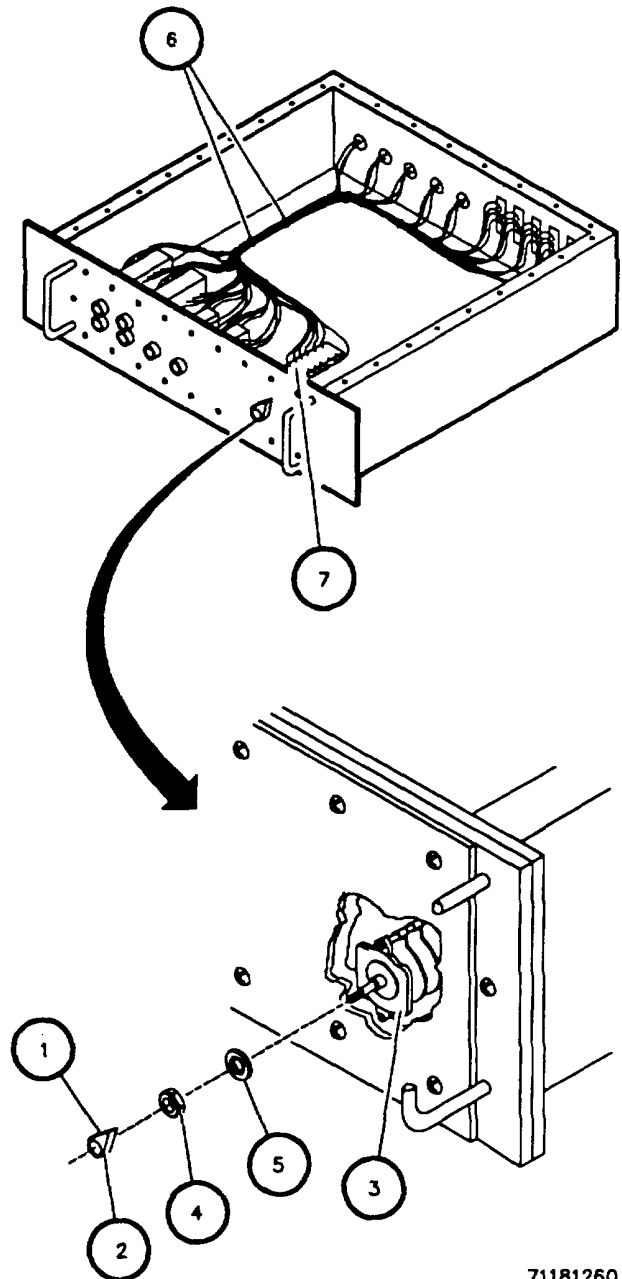
9-38. REPLACE OPN SHELTER RED PATCH PANEL LDF SELECT SWITCH ASSEMBLY - Continued

5. Loosen two setscrews (1) and remove knob (2).
6. While supporting switch (3), remove nut (4) and internal tooth lockwasher (5).

NOTE

Note and record number and location of cable ties removed in step 7 to aid installation.

7. Cut and remove cable ties (6), as required, to isolate and remove switch assembly (7) from chassis.



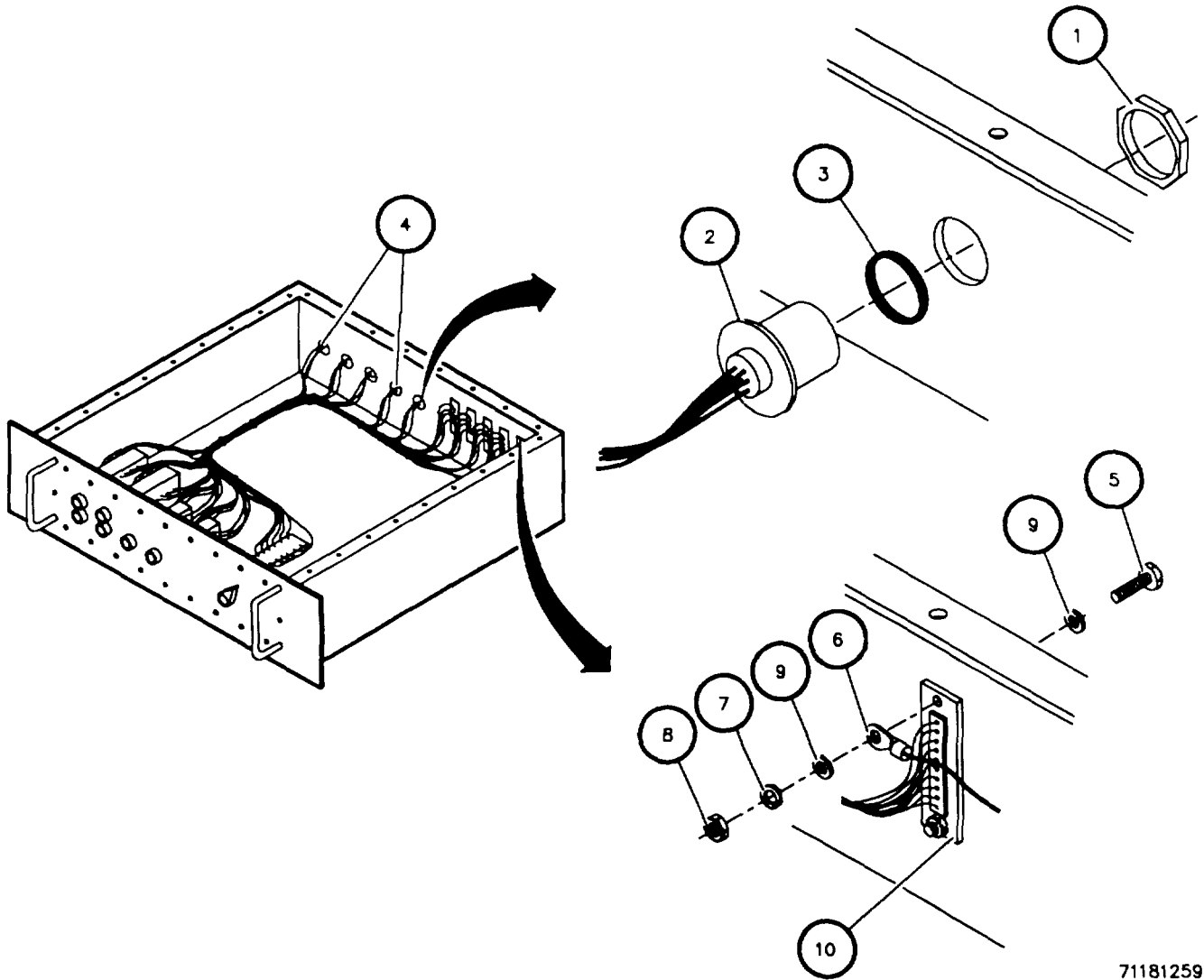
INSTALLATION

1. Route switch assembly (7) into chassis.
2. Place and hold switch (3) in installed position.
3. Install nut (4) and internal tooth lockwasher (5).
4. Install knob (2) on switch (3) and tighten two setscrews (1).
5. Install cable ties (6) as noted during removal.

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9-38. REPLACE OPN SHELTER RED PATCH PANEL LDF SELECT SWITCH ASSEMBLY - Continued

6. Working at rear panel. place connector J7 (2), with O-ring (3) seated in connector, in installed position.
7. Install jamnut (1). Remove tag.
8. Repeat steps 6 and 7 for connectors (4) J8 through J 1.
9. Working at rear panel, install top standoff (5), ground lug (6), lockwasher (7), nut (8), and two washers (9) in connectors J1 through J3 (10) (J3 shown).



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FOLLOW-ON MAINTENANCE: Close OPN shelter red patch panel front panel (para 9-36).

9-39. REPLACE OPN SHELTER RED PATCH PANEL SINGLE PATCH-TO-CONNECTOR ASSEMBLY

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

- Originally, single patch jacks, associated wiring, and connectors were individually replaced. These parts now form a single patch-to-connector assembly.
- Refer to table 9-5 for a listing of OPN shelter single patch-to-connector assemblies and their associated parts. Replace all single patch assemblies the same way. Single patch assembly consisting of patch jack A4 and connector J4 is shown.

Equipment Condition: Red patch panel placed on firm, clean surface.

Preliminary Procedure: Open OPN shelter red patch panel front panel (para 9-36).

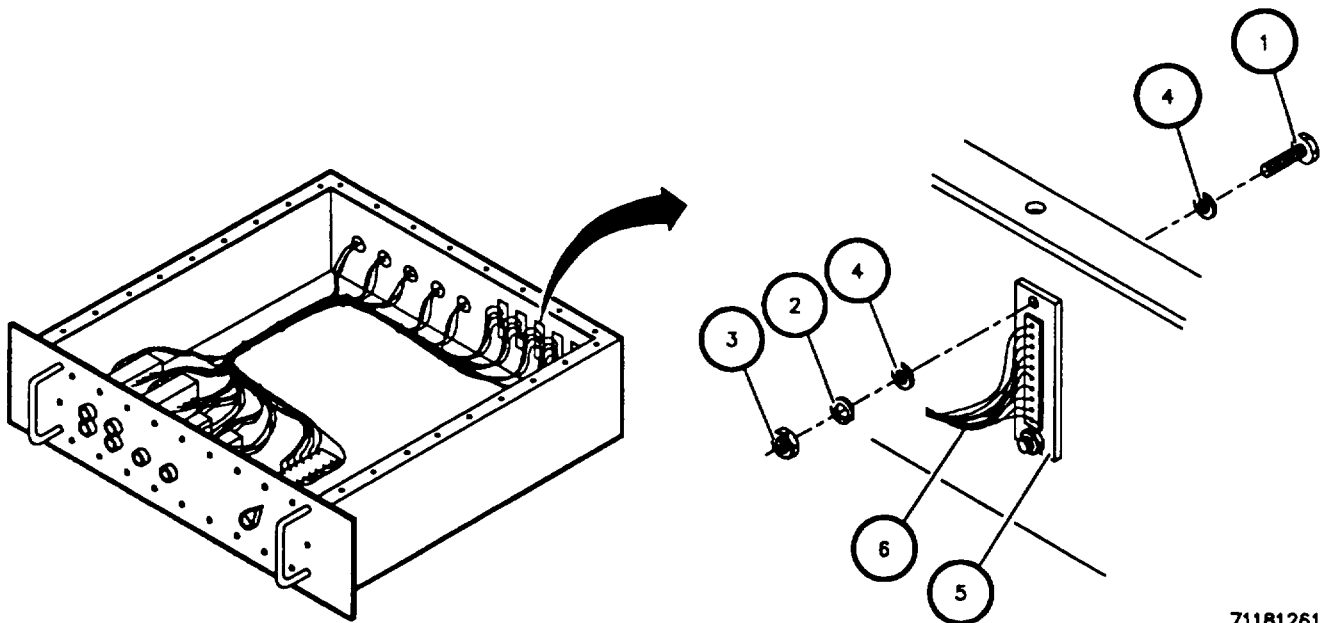
REMOVAL

1. Working at rear panel, remove two standoffs (1), lockwashers (2), nuts (3), and four washers (4) from connector (5) (J4 shown).

NOTE

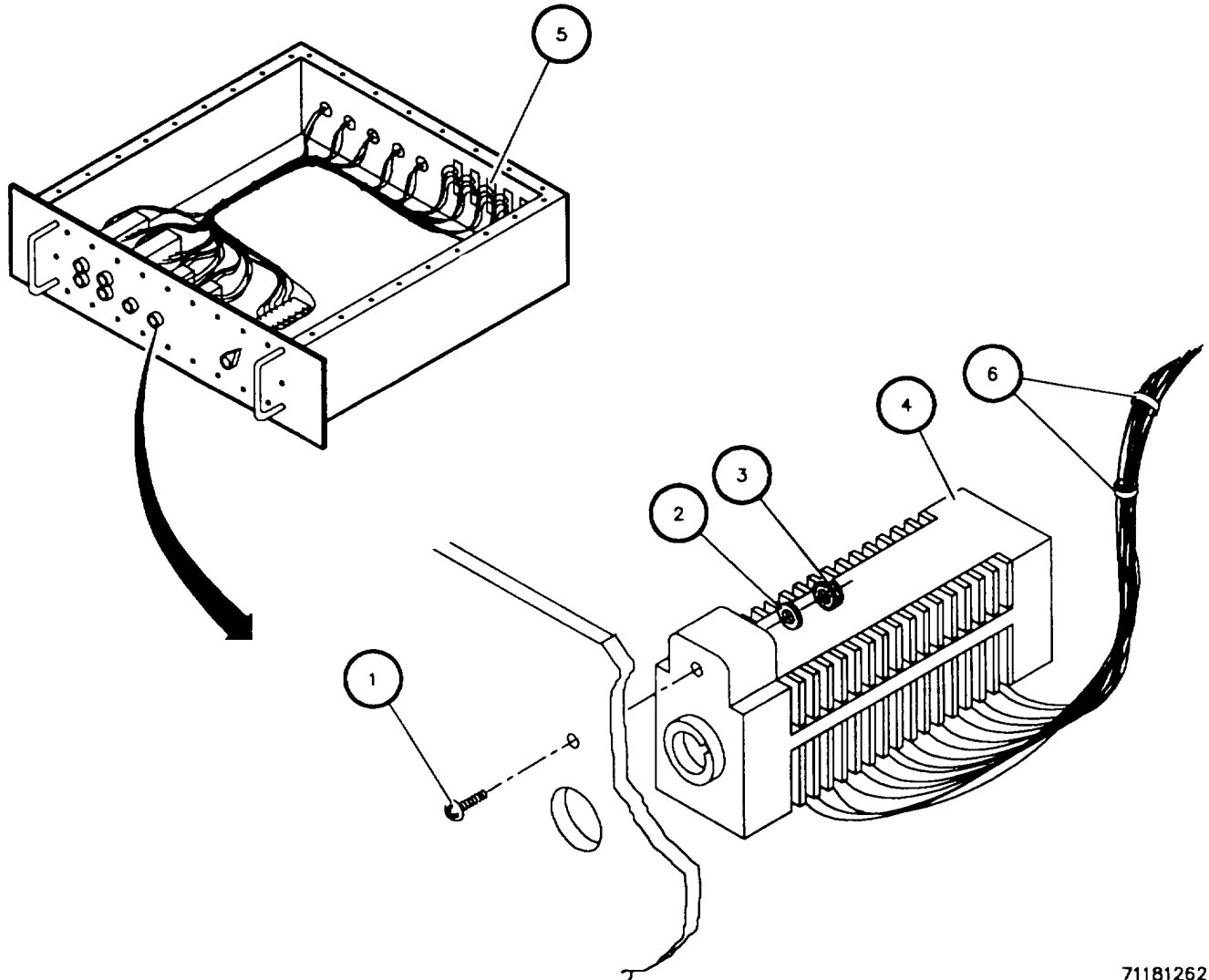
If connector body is mounted on outside of rear panel, configuration is obsolete. Cut wiring to connector to remove completely from red patch panel.

2. Remove connectors (5) from rear panel, cutting wiring (6) if obsolete configuration (newest configuration shown).



9-39. REPLACE OPN SHELTER RED PATCH PANEL SINGLE PATCH-TO-CONNECTOR ASSEMBLY-Continued

3. Working at front panel, remove screw (1), washer (2), and locknut (3) and patch jack (4) (A4 shown).
4. Remove assembly formed by patch jack (4) and connector (5) from chassis, cutting and removing cable ties (6), as required.



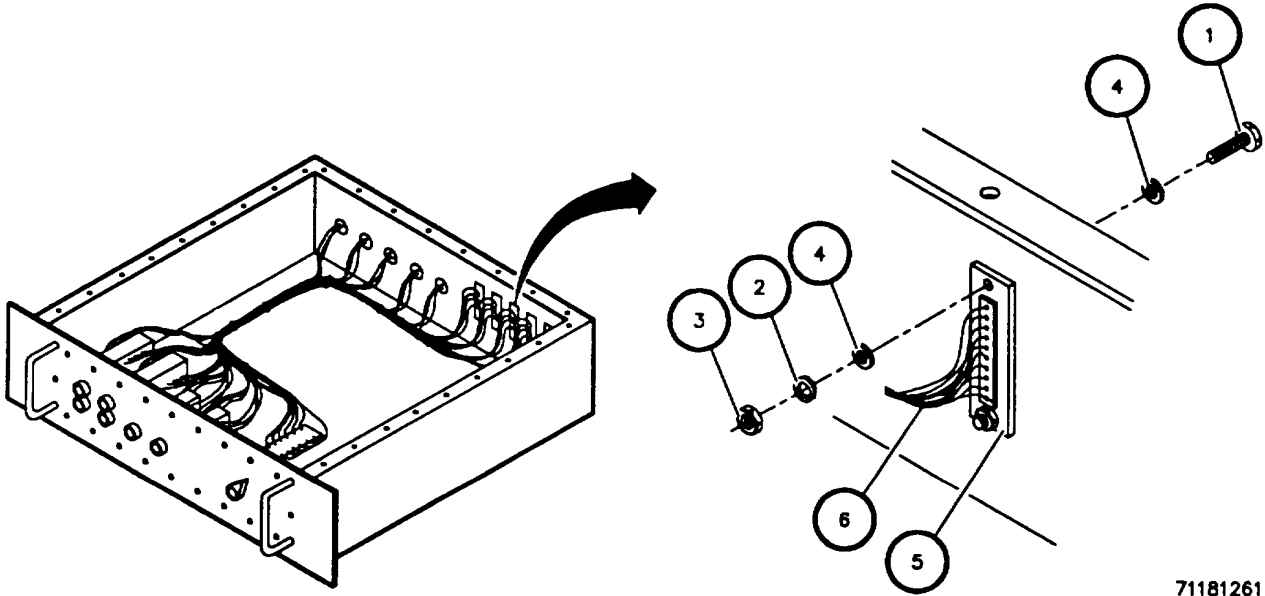
71181262

INSTALLATION

1. Route assembly formed by patch jack (4) (A4 shown) and connector (5) (J4 shown) into chassis.
2. Working at front panel, place and hold patch jack (4) in installed position.
3. Install screw (1), washer (2), and locknut (3).

9-39. REPLACE OPN SHELTER RED PATCH PANEL SINGLE PATCH-TO-CONNECTOR ASSEMBLY-Continued

4. Working inside rear panel, place and hold connector (5) and attached wiring (6) in installed position.
5. Install two standoffs (1), lockwashers (2), nuts (3), and four washers (4).



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FOLLOW-ON MAINTENANCE: Close OPN shelter red patch panel front panel (para 9-36).

9-40. REPLACE OPN SHELTER RED PATCH PANEL DUAL PATCH-TO-CONNECTOR ASSEMBLY

This task covers:

a. Removal

b. Installation

INITIAL SETUP

NOTE

- Originally, dual patch jacks, associated wiring, and connectors were individually replaced. These parts now form a single dual patch-to-connector assembly.
- Refer to table 9-5 or 9-6 for a listing of OPN shelter dual patch-to-connector assemblies and their associated parts. Replace all dual patch assemblies the same way. Dual patch assembly consisting of patch jack A1 and connectors J1 and J5 is shown.

Equipment Condition: Red patch panel placed on firm, clean surface.

Preliminary Procedure: Open red patch panel front panel (para 9-36).

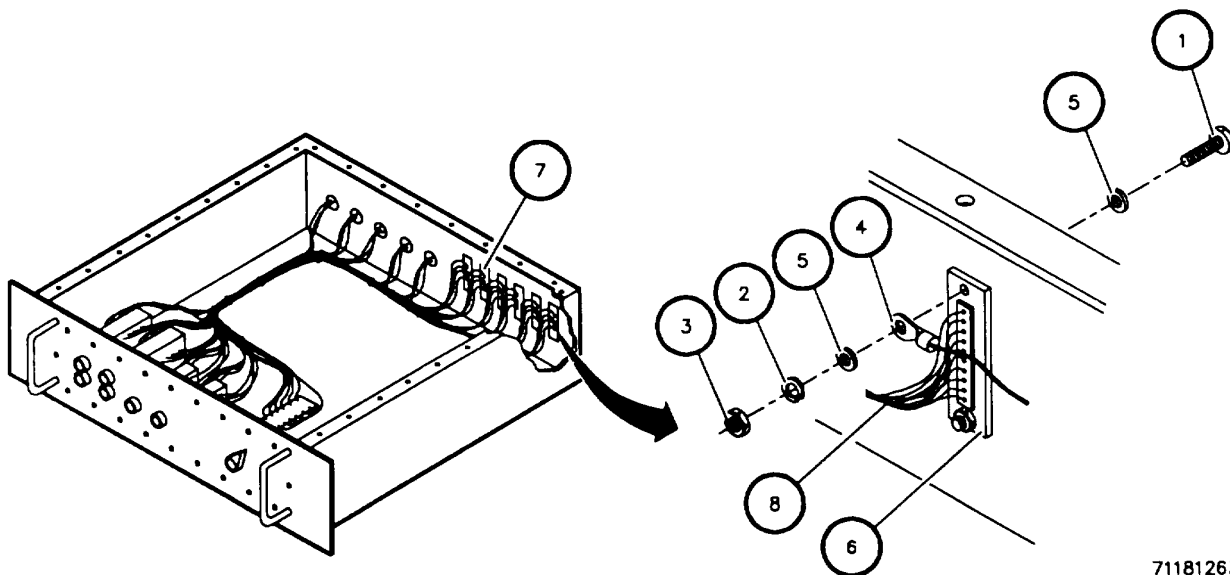
REMOVAL

- Working at rear panel, remove two standoffs (1), lockwashers (2), nuts (3), ground lug (4) (J1 through J3 only), and four washers (5) from connector (6) (J1 shown).
- Repeat step 1 for remaining connector (7) in assembly (J5 shown).

NOTE

If connector body is mounted on outside of rear panel, configuration is obsolete. Cut wiring to connector to remove completely from red patch panel.

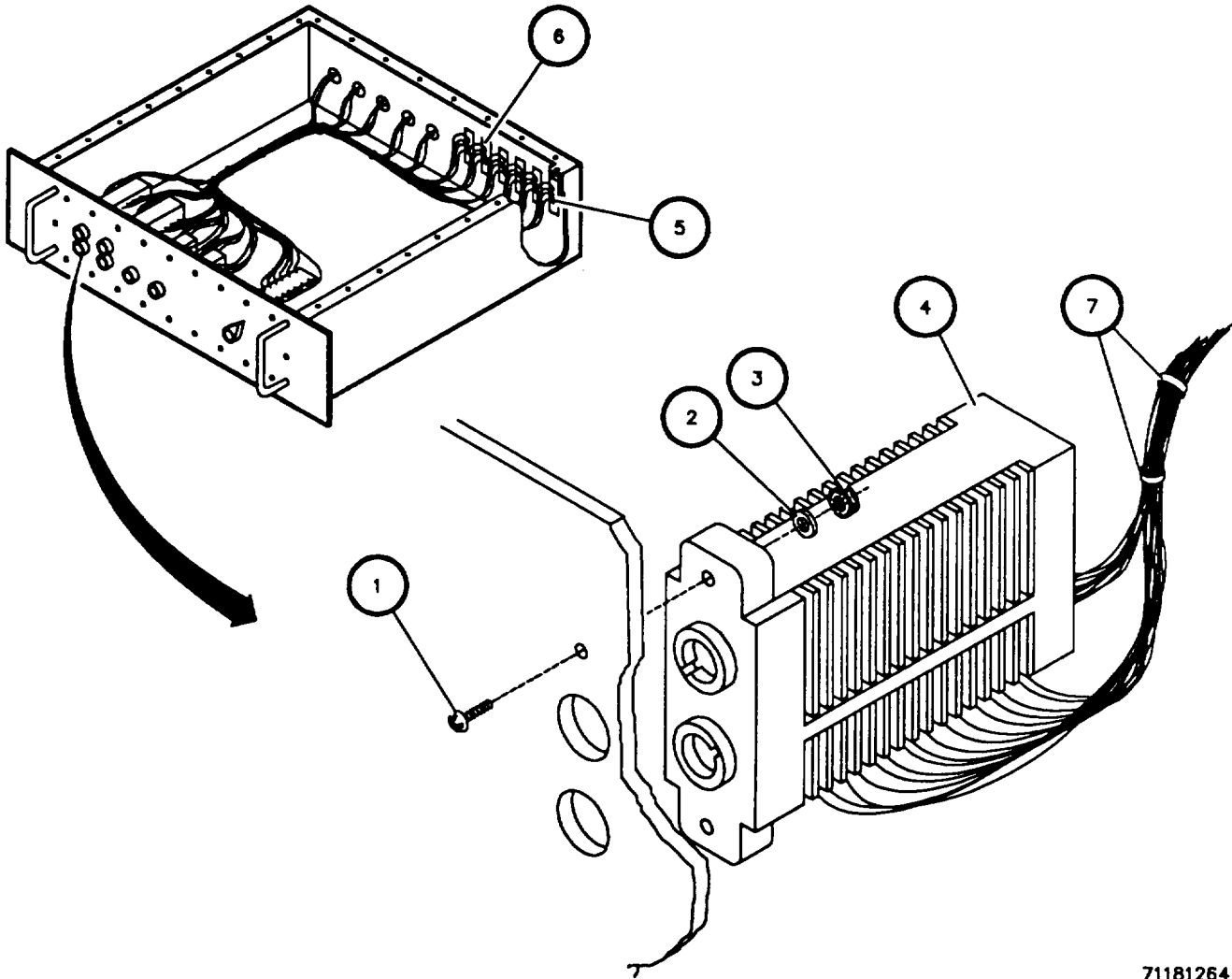
- Remove connectors (6, 7) from rear panel, cutting wiring (8) if obsolete configuration (newest configuration shown).



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9-40. REPLACE OPN SHELTER RED PATCH PANEL DUAL PATCH-TO-CONNECTOR ASSEMBLY-Continued

4. Working at front panel, remove two screws (1), washers (2), and locknuts (3) and patch jack (4) (A1 shown).
5. Remove assembly formed by patch jack (4) and connectors (5, 6) from chassis, cutting and removing cable ties (7), as required.



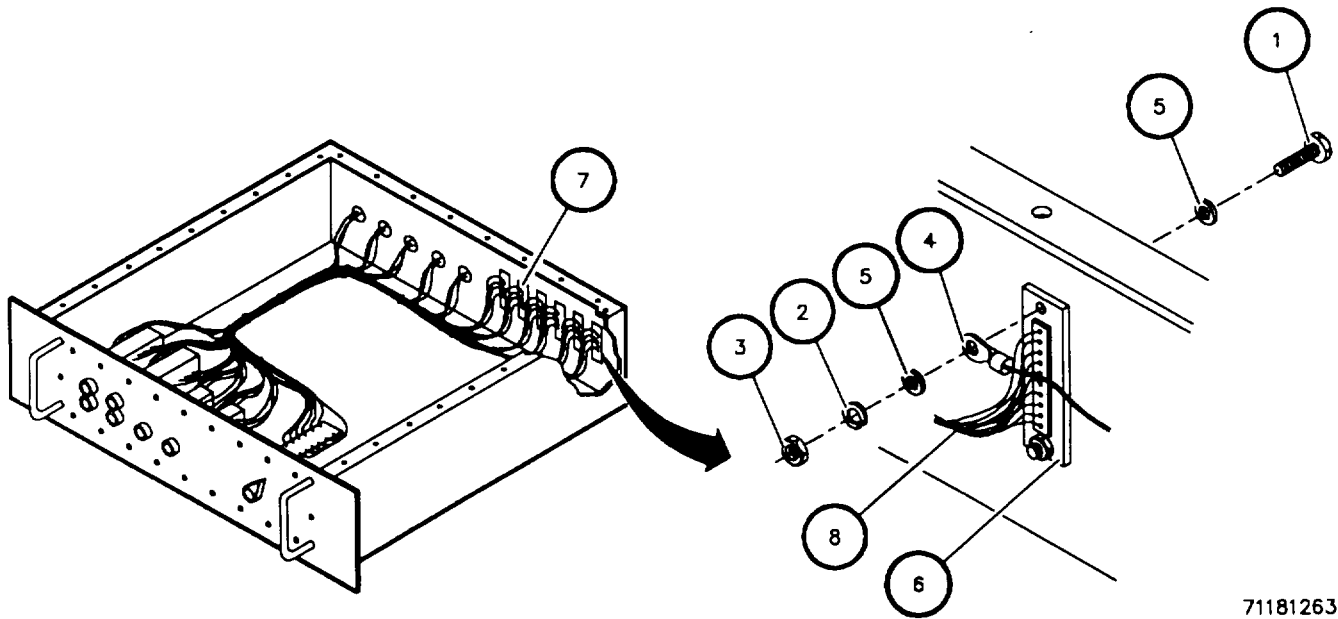
71181264

INSTALLATION

1. Route assembly formed by patch jack (4) (A1 shown) and connectors (5) (J1 shown) and (6) (J5 shown) into chassis.
2. Working at front panel, place and hold patch jack (4) in installed position.
3. Install two screws (1), washers (2), and locknuts (3).
4. Install cable ties (7), as required.

9-40. REPLACE OPN SHELTER RED PATCH PANEL DUAL PATCH-TO-CONNECTOR ASSEMBLY-Continued

5. Working at rear panel, place and hold connector (6) and attached wiring (8) in installed position.
6. Install two standoffs (1), lockwashers (2), nuts (3), ground lug (4) (J1 through J3 only), and four washers (5) on connector (6) (J1 shown).
7. Repeat step 6 for remaining connector (7) in assembly (J5 shown).



FOLLOW-ON MAINTENANCE: Close OPN shelter red patch panel front panel (para 9-36).

9-41. REPLACE OPN SHELTER BLACK PATCH PANEL BANTAM-STYLE JACKS A1-A24

This task covers:

a. Removal

b. Installation

INITIAL SETUP**NOTE**

Replace bantam-style jacks A1-A24 the same way, except where noted. Jack shown is typical.

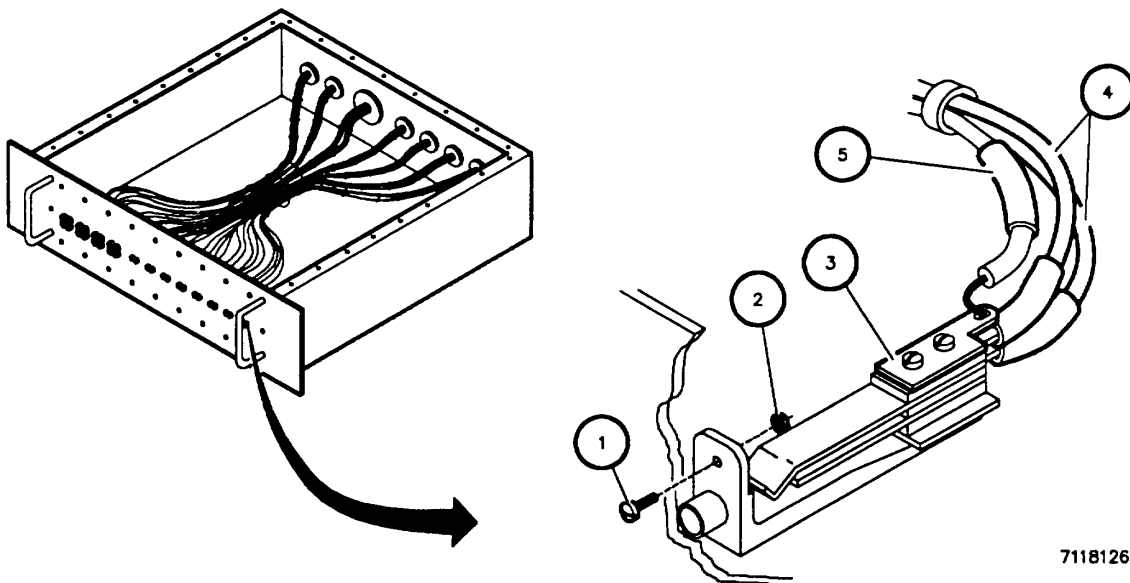
Materials/Parts: Trichlorotrifluoroethane; locking compound.

Preliminary Procedure: Open OPN black patch panel front panel (para 9-36).

REMOVAL**NOTE**

- Dual bantam-style jacks are secured using two screws and nuts.
- Perform step 1 on nearby jacks as required, to access desired jack.

1. Remove screw (1) and nut (2).
2. Position jack (3) to access wires (4).
3. Move insulation sleeving (5) to expose soldered connection.
4. Tag, unsolder, and remove all wires (4).
5. Remove jack (3).



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9-41. REPLACE OPN SHELTER BLACK PATCH PANEL BANTAM-STYLE JACKS A1-A24 - Continued

INSTALLATION

WARNING

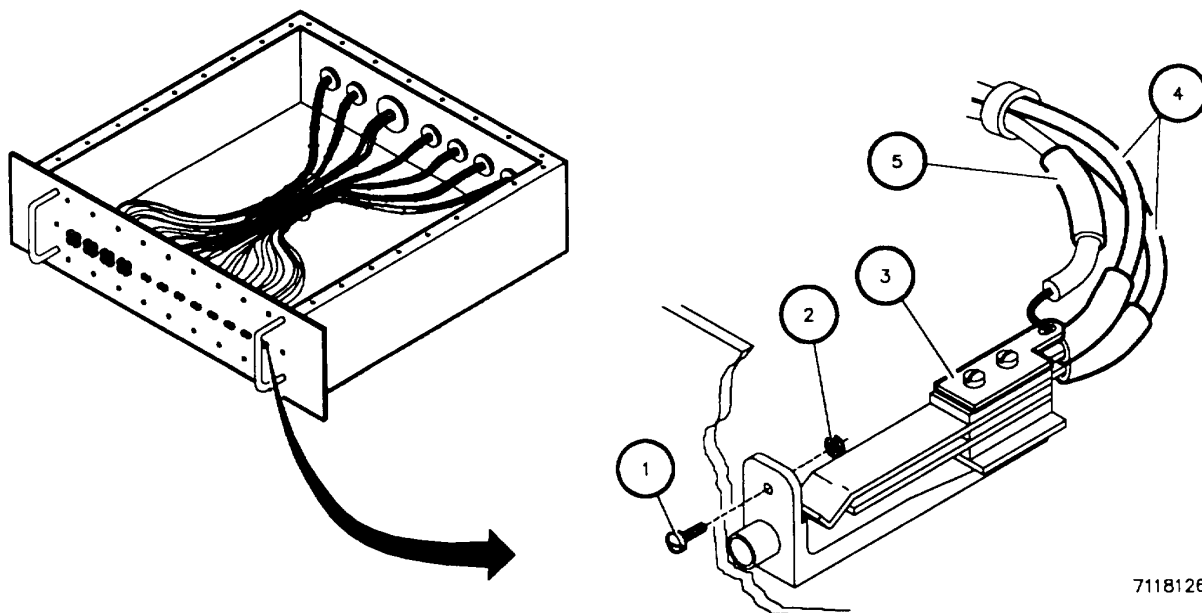
The fumes of trichlorotrifluoroethane used for cleaning this equipment can cause severe irritation or injury.

1. Using trichlorotrifluoroethane, thoroughly clean jack mounting area of locking compound residue.
2. Form and dress all wires (4) to be soldered to jack (3).
3. Solder all wires (4) to jack (3), as tagged. Remove tags.
4. Place insulation sleeving (5) in installed position.
5. Apply light coat of locking compound on screw(s) (1).
6. Place jack (3) in installed position.

NOTE

Dual bantam-style jacks are secured using two screws and nuts.

7. Install screw (1) and nut (2).
8. Repeat step 7 for nearby jacks removed for access, as required.



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FOLLOW-ON MAINTENANCE: Close OPN shelter black patch panel front panel (para 9-36).

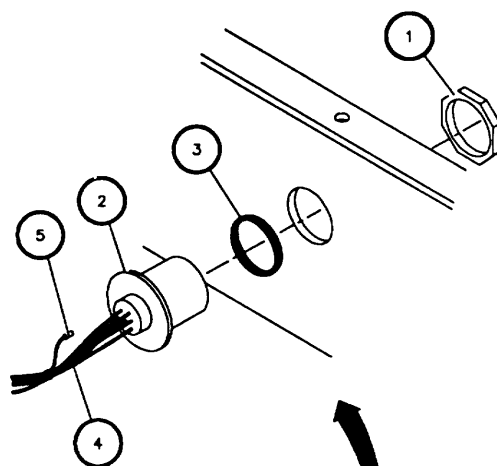
9-42. REPLACE OPN SHELTER BLACK PATCH PANEL REAR PANEL CONNECTORS J1-J7**This task covers:****a. Removal****b. Installation****INITIAL SETUP****NOTE**

Replace OPN shelter rear panel connectors J1-J7 the same way. Connector J7 is shown.

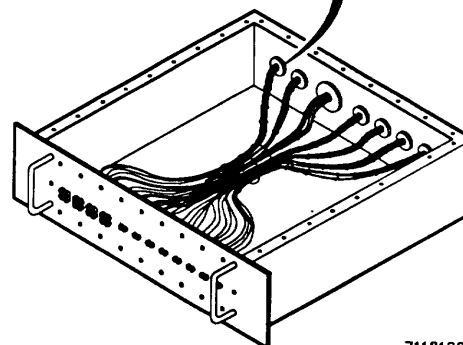
Preliminary Procedure: Remove OPN shelter black patch panel top cover (para 9-37).

REMOVAL

1. Working at rear cover, remove jamnut (1) (J7 shown).
2. Remove connector (2), with O-ring (3) seated in connector, from rear panel.
3. Position connector (2) to access wires (4).
4. Tag and remove all wires (4) from connector (2).
5. Inspect contacts (5). If bent, corroded, or otherwise damaged, cut and remove damaged contacts (5).

**INSTALLATION**

1. If contacts (5) were replaced, form and dress wires (4).
2. Install contacts (5) in all wires (4), as required.
3. Install all wires (4) in connector (2) as tagged. Remove tags.
4. Place connector (2), with O-ring (3) seated in connector, in installed position.
5. Install jamnut (1).



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FOLLOW-ON MAINTENANCE: Close OPN shelter black patch panel top cover (para 9-37).

9-95/(9-96 blank)

APPENDIX A REFERENCES

A-1. SCOPE

This appendix lists all forms, technical publications, and miscellaneous publications that are referenced in this manual.

A-2. ARMY REGULATIONS

- AR 55-38..... Report of Transportation Discrepancies in Shipment
- AR 380-1..... Military Security of Crypto Material
- (C)AR 380-40..... The Department of the Army Policy for Safeguarding COMSEC Information (U)
- AR 735-11-2..... Report of Item and Packaging Discrepancies

A-3. PAMPHLETS

- DA PAM 25-30..... Consolidated Index of Army Publications and Blank Forms
- DA PAM 310-10..... U. S. Army Index of Modification Work Orders
- DA PAM 310-9..... Index of Communication Security (COMSEC) Publications (U)
- DA PAM 738-750..... The Army Maintenance Management System (TAMMS)

A-4. FORMS

- AFTO Form 22..... Technical Order System Publication Improvement Report and Reply
- DA Form 173..... Material Deficiency Report (Category 1)
- DA Form 2028..... Recommended Changes to Publications and Blank Forms
- DA Form 2028-2..... Recommended Changes to Equipment Technical Manuals
- DA Form 2404..... Equipment Inspection and Maintenance Worksheet
- DA Form 2407..... Maintenance Request
- DA Form 24081..... Equipment Daily or Monthly Log
- DA Form 2408-14..... Uncorrected Fault Report
- SF 361..... Product Quality Deficiency Report (Category 2)
- SF 364..... Report of Discrepancy (ROD)
- SF 368..... Product Quality Deficiency Report (Category 2)

A-5. SERVICE BULLETINS

- SB 11-573..... Painting and Preservation Supplies Available for Field Use for Electronics Equipment
- SB 11-624..... Warning Notice for Vehicles in Which Radios Are Mounted
- SB 708-41/42 Federal Supply Code for Manufacturers; United States and Canada - Name to Code and Code to Name (GSA-FSS H4-1/H4-2)

A-6. TECHNICAL BULLETINS

- TB 11-5895-1392 Warranty for Communication System, Control Element, Central Processor AN/TYQ-30(V)1 and Central Processor AN/TYQ-30(V)2
- TB 43-0118 Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electronic Shelters
- TB 43-0124 Maintenance and Repair Procedures for Shelters, Electrical Equipment S-141/G and S-141B/G (NSN 5410-00-752-9698), S-144/G, S-144A/G, S-144B/G, S-144C/G, and S-144D/G (5410-11-542-2532), S-250/G (5410-00-999-4935), S-250/G (Shielded) (5410-00-489-6076), S-280/G (5410-00-999-5269), S-280A/G (5410-00-999-6092), S-280B/G (5410-00-117-2868), S-280B/G (Shielded) (5410-00-001-4093), S-280C/G (5411-01-092-0892), S-381/G (5410-00-763-2339) and S-319A/G (5410-00-116-7086)
- TB 43-0125 Installation of Communications-Electronic Equipment: Hookup of Electrical Cables to Mobile Generator Sets on Fielded Equipment to Meet Electrical Safety Standards
- TB 43-0127 Maintenance and Repair of Printed Circuit Boards and Printed Wiring Assemblies
- TB 385-4 Safety Precautions for Maintenance of Electrical/Electronic Equipment
- TB 700-4 Decontamination of Facilities and Equipment
- TB 740-97-2 Installation and Cabling of Generator Set MJQ-10 (NSN 6115-00-394-9582)

A-7. TECHNICAL MANUALS

- TM 5-4120-384-14..... Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Air Conditioner Model F18H-3S (NSN 4120-01-165-1125)

A-7. TECHNICAL MANUALS - Continued

- TM 5-6115-594-14&P Operator's, Organizational, Direct Support, and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Generator Sets, Diesel Engine Driven Trailer Mounted Set, PU-405A/M (NSN 6115-00-394-9577), PU-406B/M (6115-00-394-9577), PU-732/M (6115-00-260-3082), PU-760/M (6115-00-394-9581), PU-707A/M (6115-00-394-9573), PU-495A/G (6115-00-394-9575), AN/MJQ-10A (6115-00-394-9582), AN/MJQ-15 (6115-00-400-7591), PU-650B/G (6115-00-258-1622), AN/M'SQ-12A (6115-00-757-1602), PU-751/M (6115-00-033-1373), AN/MJQ-16 (6115-00-033-1395), PU-753/M (6115-00-033-1389), AN/MJQ-18 (6115-00-033-1398), and AM/MJQ-25 (6115-00-153-7742)

- TM 9-2330-205-14&P Operator's, Organizational, Direct Support, and General Support Maintenance (Including Repair Parts and Special Tools List) for Chassis, Trailer: Generator, 2-1/2 Ton, 2-Wheel, M200A1 (NSN 2330-00-331-2307)

- TM 9-4940-435-14..... Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Leak Detector, Refrigerant Gas (NSN 4940-00-531-0362)

- TM 11-487M..... Maintenance Manual for Handset H-250/U

- TM 11-5410-213-14..... Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Shelter S-280-C/G (NSN 5411-01-092-0892)

- TM 11-5805-750-14&P Operator's, Organizational, Direct Support, and General Support Manual Including Repair Parts and Special Tools List for Digital-to-Digital Converter, CV-4068A/TTC-39 (NSN 7050-01-239-4859)

- TM 11-5815-615-23..... Unit and Intermediate Direct Support Maintenance Manual for Lightweight Digital Facsimile AN/UXC-7 (NSN 5815-01-187-7844)

- TM 11-5820-890-30..... Direct Support Maintenance Manual for Radio Sets AN/PRC-19 (NSN 5820-01-151-9915), AN/VRC-87 (5820-01-151-9916), AN/VRC-88 (5820-01-151-9917), AN/VRC-89 (5820-01-151-9918), AN/VRC-90 (5820-01-151-9919), AN/VRC-91 (5820-01-151-9920), and AN/VRC-92 (5820-01-151-9921)

- TM 11-5820-1040-13&P Operator's, Organizational, and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for Optical Converter Assembly CV-3895()/G (NSN 5810-01-044-0533)

- TM 11-5830-256-13..... Operator's, Unit, and Intermediate Direct Support Maintenance Manual for Intercommunication Station LS-147F/FI (NSN 5830-01-008-3126)

- TM 11-5895-1392-12..... Operator's and Unit Maintenance Manual for Communication System, Control Element, Central Processor AN/TYQ-30(V)1 (NSN 5895-01-280-3568) and Central Processor AN/TYQ-30(V)2 (NSN 5895-01-280-3567)

- TM 11-5895-1392-34P Direct Support and General Support Maintenance Spare Parts and Tool Lists for Communication System, Control Element, Central Processor AN/TYQ-30(V)1 (NSN 5895-01-280-3568) and Central Processor AN/TIQ-30(V)2

- TM 11-6625-3052-14..... Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Multimeter, Digital AN/PSM-45 (NSN 6625-01-139-2512)

A-7. TECHNICAL MANUALS - Continued

- TM 11-7010-248-10..... Operation (User) Manual for Communication System, Control Element, Central Processor AN/TYQ-30(V)1 and Central Processor AN/TYQ-30(V)2
- DA PAM 738-750 The Army's Maintenance Management System (TAMMS)
- TM 740-90-1 Administrative Storage of Equipment
- TM 750-244-2 Procedures for Destruction of Electronic Materiel to Prevent Enemy Use

A-8. SPECIFICATIONS

- Fed Spec P-D-680 Dry Cleaning Solvent

A-9. REGULATIONS

- AR 55-38..... Report of Transportation Discrepancies in Shipment
- AR 735-11-2..... Report of Item and Packaging Discrepancies

A-10. MISCELLANEOUS PUBLICATIONS

- CTA 8-100 Army Medical Department Expendable/Durable Items
- CTA 50-970..... Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items)
- KAM-330C Limited Maintenance Manual KYK-13/TSEC, KYK-15/TSEC, and KYK-18/TSEC
- MIL-STD-12D..... Abbreviations for Use on Drawings, and in Specifications, Standards, and Technical Documents
- SC-5180-91-CL-R13..... Tool Kit, Electronic Equipment TK-101/G (NSN 5180-00-064-5178)
- SC-5180-91-CL-R07..... Tool Kit, Electronic Equipment TK-105/G (NSN 5180-00-610-8177)

APPENDIX B
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

SECTION I. INTRODUCTION

B-1. SCOPE

This appendix lists expendable supplies and materials you will need to operate and maintain the AN/TYQ-30(V)1/2. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items) or CTA 8-100, Army Medical Department Expendable/Durable Items.

B-2. EXPLANATION OF COLUMNS

- a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, App D").
- b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Organizational Maintenance
F - Direct Support Maintenance
H - General Support Maintenance
- c. Column (3) - National Stock Number. This is the National stock number assigned to the item. Use it to request or requisition the item.
- d. Column (4) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.
- e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

SECTION II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION PART NUMBER AND CAGE	(5) U/M
1	C	7920-00-178-8315	BRUSH, DUSTING, BENCH (80063) SC-C-539469	EA
2	O	8020-00-721-9657	BRUSH, PAINT (54677) RB21N	EA
3	O	6850-00-984-5853	CLEANING COMPOUND, FREON PCA, 5 GALLON CAN	EA
4	C	8305-00-222-2423	CLOTH, CHEESE, LINT-FREE (81348) CCC-C-440	EA
5	C	6850-00-105-3084	FREON, TYPE TF, 16 OUNCE CAN	EA
6	C	7510-00-240-1526	PENCIL, MARKING, BLACK (81349) SS-P-196	DZ
7	O		PAINT, FOREST GREEN, ALPHATIC POLYURETHANE CAMOUFLAGE BASE MIL-C- 46168 COLOR 383 (81349)	QT
8	O		PAINT, LUSTERLESS GREEN EPOXY POLYAMIDE (81349) MIL-C-22750	QT
9	O		PAINT, LUSTERLESS GREEN FED-STD-595 COLOR 24533 (81349)	QT
10	O		PAINT, LUSTERLESS GRAY FED-STD-595 COLOR 36118 (81349)	QT
11	O		PAINT, LUSTERLESS WHITE FED-STD-595 COLOR 27875 (81349)	QT
12	O		ANTI-STATIC STORAGE BAGS AND POUCHES (PKG OF 100):	
		8105-01-096-9527	SIZE 5 X 8 INCHES	PKG
		8105-01-096-9528	SIZE 12 X 18 INCHES	PKG
		8105-01-097-4507	SIZE 8 X 12 INCHES	PKG
		8105-01-120-3375	SIZE 10 X 12 INCHES	PKG
		8105-01-120-3376	SIZE 8 X 10 INCHES	PKG
		8105-01-120-3378	SIZE 6 X 10 INCHES	PKG
		8105-01-120-3380	SIZE 4 X 6 INCHES	PKG
13	O		ESD-SENSITIVE CAUTION LABELS:	
		7540-01-109-8815	2 X 2 INCHES, PKG OF 500	PKG
		7540-01-110-4906	4 X 4 INCHES, PKG OF 100	PKG

LIST OF ABBREVIATIONS AND ACRONYMS

TERM	MEANING
AAL	Additional Authorization List
AC	Alternating Current
ACH CCA	Switching Regulator Circuit Card Assembly
ACL CCA	Power Supply Circuit Card Assembly
ACPL CCA	Control Panel Circuit Card Assembly
ADP	Automatic Data Processing
ADPE	Automatic Data Processing Equipment
AEP	Antenna Entry Panel
AIR COND	Air Conditioner
AMP	Ampere
ANT	Antenna
APHO CCA	Interrupter Circuit Card Assembly
APTR/MPTR CCA	Printer Control Circuit Card Assembly
AR	Army Regulation or As Required
AUD	Audio
AVAIL	Available
AWDR CCA	Wire Driver Circuit Card Assembly
B	Before
B/W	Black and White Only
BATT	Battery
BII	Basic Issue Item
BIT	Built-in Test
BITE	Built-In Test Equipment
BKR	Breaker
C-E	Communication-Electronics
CB	Circuit Breaker
CBR	Chemical-Biological-Radiological
CCA	Circuit Card Assembly
CH	Channel
CHAN	Channel
CLK	System Clock
CLR	Clear
cm	Centimeter
CNVC OUTLET	Convenience Outlet
COEI	Components of End Item
Col	Collision
COMM	Communication
COMPR	Compressor
COMSEC	Communications Security
CONT	Continuous, Continued
CONUS	Continental United States
CP	Communications Processor
CP1	Communications Processor 1
CP2	Communications Processor 2
CPU	Central Processor Unit
CRT	Cathode Ray Tube
CSCE	Communication System, Control Element

Acronyms-1

LIST OF ABBREVIATIONS AND ACRONYMS - CONT

TERM	MEANING
D	Daily
DA	Department of the Army
DA CCA	Differential Amplifier Circuit Card Assembly
DA PAM	Department of the Army Pamphlet
DBM	Data Base Management
DBMP	Data Base Management Processor
DC	Direct Current
DEQNA	Digital Ethernet Q-Bus Network Adapter, Ethernet Controller CCA
DGM	Digital Group Multiplexer
DHV11	Multiplexer CCA
DIP	Dual In-Line Package
DISREP	Discrepancy in Shipment Report
DOW	Digital Orderwire
DSBL	Disable
DSDI	Digital-to-Digital Converter
DSVT	Digital Subscriber Voice Terminal
DVOW	Digital Voice Orderwire
DZ	Serial Line Controller
Ea.	Each
EAC	Echelons Above Corps
ECC	Error Correction Circuit
ECCM	Electronic Counter Countermeasure
ECM	Electronic Countermeasure
ECPU CCA	Processor Circuit Card Assembly
ECU	Environmental Control Unit
EIR	Equipment Improvement Recommendation
EMI	Electromagnetic Interference
ENT	Enter
EQPT	Equipment
ESD	Electrostatic Discharge
ESTA	Ethernet Station Adapter
EXP CCA	Expander Circuit Card Assembly
EXT	External or Extension
FCTN	Function
FH	Frequency Hopping
FH/M	Frequency Hopping Master
FM	Frequency Modulation
FO	Foldout (illustration)
FOCA	Fiber-Optic Cable Assembly
FOEP	Fiber-Optic Entry Panel
FOER	Fiber-Optic Ethernet Repeater
FP	Foldout Page, Floating Point
FREQ	Frequency
GM	Group Modem
GND	Ground
H	Holding
HCP	Hard Copy Printer

Acronyms-2

LIST OF ABBREVIATIONS AND ACRONYMS - CONT

TERM	MEANING
HCP TU	Hard Copy Printer Transportable Unit
HDC	Disk Controller
HI RES	High Resolution
HI SP	High Speed
HR	Hand Receipt
HS	Handset or Headset
Hz	Hertz, cycles per second
110	Input/Output
in.	Inch
IT	Interval Timer
kc	Kilocycle
kg	Kilogram, 1000 grams
kHz	Kilohertz
km	Kilometer, 1000 meters
lb	Pound
LD	Load
LAN	Local Area Network
LDF	Lightweight Digital Facsimile
LED	Light-Emitting Diode
LGM	Loop Group Multiplexer
LO	Lubrication Order
LO RES	Low Resolution
LO SP	Low Speed
LOI	Loss of Input
LOS	Line of Sight
M	Monthly
MAC	Maintenance Allocation Chart
MAN	Manual
Mc	Megacycle, 1 million cycles
MDCS	Maintenance Data Collection System
MEM	Memory
MHz	Megahertz, millions of cycles per second
MIKE	Microphone
MM	Memory Management
Modem	Modulator/Demodulator
MONO	Base Video
MOW	Maintenance Orderwire
MSE	Mobile Subscriber Equipment
MT	Mount
MTOE	Modified Table of Organization and Equipment
MUX	Multiplexer
MWO	Modification Work Order
NATO	North Atlantic Treaty Organization
NATO ALT	NATO Alternate
NATO STD	NATO Standard
NI	Ethernet Interface
N•m	Newton-meter

LIST OF ABBREVIATIONS AND ACRONYMS - CONT

TERM	MEANING
No.	Number
NRZ	Nonreturn-to-Zero
NSW	Nonsecure Warning
NVR	Nonvolatile RAM
OPN	Operations
OPS	Operations Shelter
OSC CCA	Oscillator Circuit Card Assembly
PA	Public Address or Power Amplifier
PC CCA	Power Control Circuit Card Assembly
PDU	Power Distribution Unit
PEP	Power Entry Panel
PMCS	Preventive Maintenance Checks and Services
PRG	Program or Programmed
PS	Power Supply
psi	Pounds per Square Inch
PWR	Power
PWR AVAIL	Power Available
PWR SPLY	Power Supply
R/T	Receive/Transmit or Receiver/Transmitter
R-T	Receive/Transmit or Receiver/Transmitter
R/W	Read or Write
RAD	Radio
RAM	Random Access Memory
RCM	Reliability Centered Maintenance
RCV	Receive
REM	Remote
RF	Radio Frequency
RFI	Radio Frequency Interference
RGB	Red Green Blue
RMC	Reliability Centered Maintenance Concept
rms	Root Mean Square
ROA	Remote Optical Assembly
ROD	Report of Discrepancy
ROM	Read-Only Memory
RPSTL	Repair Parts and Special Tools List
RSA	Repeater/Station Adapter
RSA TU	RSA Transportable Unit
RT	Receiver/Transmitter
RTC	Remote Terminal Cluster
RXMT	Retransmit
S	Summary fault from GM or LGM
SA	Summary fault, except loss of sync, from GM or LGM
SC	Single Channel
SC CCA	Signal Control Circuit Card Assembly
SEL	Selected
SEP	Signal Entry Par 3'
Sh	Sheet

Acronyms-4

LIST OF ABBREVIATIONS AND ACRONYMS - CONT

TERM	MEANING
SIG	Signal
SLU	Serial Line Unit
SPKR	Speaker
SQ	Squelch
SQE	Sequence or Signal Quality Error
STA	Station Adapter
Sto	Store
STOR	Store or Storage
SVEP	Signal/Video Entry Panel
SYS	System
TB	Technical Bulletin
TD	Time Delay or Time Delayed
TDM	Time Division Multiplex
TDR	Time Delayed Response or Transportation Discrepancy Report
TECH LOAD	Technical Equipment Load (All equipment except ECUs)
TED	Trunk Encryption Device
TIM	Timing
TM	Technical Manual
TMDE	Test, Measurement, and Diagnostic Equipment
TO	Technical Order
TOF	Top of Form
TPC	Tape Controller
TRI-TAC	Joint Tactical Communication System
TSEC	Transmission Security
TST	Test
TU	Transportable Unit
UPS	Uninterruptible Power Source
Vac	Volts alternating current
VAR	Variable
Vdc	Volts direct current
VF	Voice Frequency
VOL	Volume
VPA	Vehicular Power Adapter
W	Weekly
WHSP	Whisper
WK STA	Workstation
WORK STA	Workstation
WS	Workstation
WS TU	Workstation Transportable Unit
X-MODE	Transmit Mode
XMT	Transmit
4PLN	Graphics Coprocessor

Acronyms-5/(6 blank)

GLOSSARY

TERM

MEANING

Antijamming	Measures taken to minimize the effects of jamming.
Asynchronous	Data and control are randomly related.
Channel	Individual signals that are multiplexed to form a group.
Clock	A source of timing signals.
Conditioned Diphas	Data transmission waveform designed for simple timing extraction.
Converter	Device used to change a signal from one form to another.
Data	Any or all information that can be processed by a computer.
Duplex	Simultaneous two-way data flow.
Energize	To activate or turn on, apply power to.
Fault	Error or indication of equipment trouble.
Group	More than one channel combined into a single signal.
Host Processor	The processor unit controlling specific functions. When in offline mode, the host processor is the one connected to the system console workstation. In Offline mode, the normal host processor is CP1 and the normal system console workstation is ADP shelter WS1.
Hertz	Measurement of frequency. 1 Hz = 1 cycle per second.
Icon	The miniature figure in the upper corner of displays.
Intercom	Intercommunication Station (LS-147F/FI).
Jamming	Transmission of a strong signal to disrupt radio communications.
Kilogram	Metric unit of weight; 1000 grams, approximately 2.2 pounds.
Kilohertz	1000 Hertz; 1000 cycles per second.
Kilometer	A measurement of distance; 1000 meters, approximately 5/8 mile.
Loopback	Routing the transmitted signal from a unit back to that unit as the received signal to that unit.
Malfunction	Equipment failed to operate correctly.
Menu	A list of choices that can be selected.
Meter	Metric unit of distance; approximately 39 inches.
Microphone	A device for converting sound to electrical signals.
Modulation	The process of superimposing data on a carrier.
Multiplexer	Device used to combine two or more signals into one signal.
Offline	Conditioned to perform maintenance procedures.
Orderwire	Circuit used for maintenance communication.
Prompt	System display indicating that operator action is required.
Scratch Disk	A disk assembly containing disk media that is either blank or that presently contains data that can be written over. Writing over destroys the previous data.
Scratch Tape	A tape cartridge containing tape media that is either blank or that presently contains data that can be written over. Writing over destroys the previous data.
Squelch	A circuit that automatically turns sound off when received signal is below a preset level.
Station Clock	A clock (timing) signal originating in the system, locally.

Glossary-1

GLOSSARY - CONT

TERM

MEANING

Synchronous
System Console

Having a regular timed pattern.
The workstation connected to the console port of one of the ADP shelter processor units. Normally, the system console is ADP shelter workstation WS1, and it is normally connected to CP1 console port. Another processor may be selected by patching at the ADP shelter red patch panel. Selecting another workstation as the system console requires cabling changes.

Timing
Transit case
VINSON
Window
Write Disable

A signal (clock) used to identify data bits in a digital stream.
A carrying case used for equipment shipment and/or storage.
The latest model of COMSEC equipment.
An area on the monitor screen used to display information.

Write Enable

To condition a disk or tape unit so that data cannot be written to the disk or tape media. This protects the data presently on the media.
To condition a disk or tape unit so that data may be written to the disk or tape media. This allows the data presently on the media to be destroyed by overwriting.

Glossary-2

ALPHABETICAL INDEX

	Page
A	
Abbreviations	1-3
Acronyms.....	1-3
Administrative storage or shipment	1-3
Appendices	
Expendable/durable supplies and materials list.....	B-1
References	A-1
Army equipment, destruction to prevent enemy use of.....	1-3
B	
Black patch panel, ADP shelter (See: Signal distribution systems)	
Black patch panel, OPN shelter (See: Signal distribution systems)	
C	
Capabilities of equipment.....	1-9
Characteristics of equipment.....	1-9
Color graphics monitor (See: Workstation)	
Common tools and equipment.....	1-92
Communications processor (See: Processor assembly)	
Components, major (See: Location and description of major components)	
Configuration, equipment.....	1-92
D	
Data, equipment.....	1-92
Data base management processor (See: Processor assembly)	
Description, component (See: Location and description of major components)	
Destruction of Army materiel to prevent enemy use	1-3
Differences between models	1-92
Dot matrix printers.....	3-1
Adjust procedures	
Carriage cable.....	3-70
Interrupter (APHO) CCA.....	3-68
Paper drive belt.....	3-71
Component location and description	1-39
Equipment setup, for troubleshooting.....	3-8
Maintenance procedures.....	3-20
Principles of operation	3-2
Remove/install procedures	
Belly pan cover assembly (Tempest printer).....	3-28
Bottom cover assembly (non-Tempest printer)	3-29
End caps (Tempest printer)	3-30
Front cover assembly (Tempest printer)	3-20
Rear cover assembly (Tempest printer).....	3-32
Support assembly front bracket	3-35
Support assembly top bracket (non-Tempest printer).....	3-37

ALPHABETICAL INDEX - CONT

	Page
D	
Dot matrix printers (Continued)	3-1
Remove/install procedures (Continued)	
Top cover assembly (non-Tempest printer).....	3-24
Replace procedures	
Carriage cable assembly	3-58
Carriage motor	3-62
Control panel (ACPL) CCA	3-49
Fan assembly (non-Tempest printer)	3-57
Fan assembly (Tempest printer)	3-56
Interrupter (APHO) CCA	3-51
Line filter (Tempest printer)	3-67
LOAD switch assembly.....	3-64
Paper motor assembly.....	3-63
Paper out switch.....	3-65
Power supply (ACL) CCA	3-40
Printer control (APTR/MPTR) CCA.....	3-38
Processor (ECPU) CCA.....	3-38
PROGRAM switch assembly	3-64
RFI filter box assembly.....	3-53
Ribbon motor.....	3-55
Switching regulator (ACH) CCA.....	3-41
Wire driver (AWDR) CCA (non-Tempest printer)	3-43
Wire driver (AWDR) CCA (Tempest printer).....	3-46
Self-test - offline	3-72
Symptom index.....	3-9
Theory of operation.....	3-2
Troubleshooting.....	3-6
Equipment setup	3-8
General instructions.....	3-6
Introduction	3-6
Symptom index	3-9
Table.....	3-9

E

Environmental control unit	
Component location and description	1-12
Equipment setup, for troubleshooting.....	2-4
Maintenance procedures.....	2-11
Principles of operation	2-1
Introduction	2-1
Theory of operation	2-2
Remove/repair/install ECU control cable wiring.....	2-46
Replace procedures	
ECU blanking plate.....	2-48
ECU control cable plug.....	2-40

ALPHABETICAL INDEX - CONT

	Page
E - Continued	
Environmental control unit (Continued)	
Replace procedures (Continued)	
ECU control cable receptacle	2-43
ECU control cable wiring	2-46
Environmental control unit.....	2-11
Symptom index.....	2-6
Theory of operation.....	2-1
Troubleshooting.....	2-3
Equipment setup	2-4
General instructions.....	2-3
Symptom index	2-6
Table.....	2-6
Equipment	
Capabilities.....	1-9
Characteristics.....	1-9
Configuration	1-92
Features	1-9
Improvement recommendations (EIR), reporting.....	1-3
Equipment setup	
Dot matrix printer.....	3-8
Environmental control unit.....	2-4
Power distribution systems.....	8-13
Processor assembly.....	4-7
Signal distribution systems.....	9-12
Telephone set.....	6-5
Uninterruptible power source	7-10
Workstation	5-5
Errors in manuals, reporting	i
Expendable/durable supplies and materials list	B-1
F	
Features of equipment	1-9
Fiber-optic entry panel (See: Signal distribution systems)	
First aid	A
Foldout diagrams	
ADP shelter power distribution	FP-11
ADP shelter power distribution unit block diagram.....	FP-17
OPN shelter power distribution.....	FP-13
OPN shelter power distribution unit block diagram	FP-19
Power entry panel block diagram	FP-15
Processor interconnect diagram.....	FP-1
Telephone interconnect diagram.....	FP-9
Workstation interconnect diagram.....	FP-7
Forms, Army, index of.....	1-3
Forms, records and reports, maintenance	1-3

ALPHABETICAL INDEX - CONT

	Page
F - Continued	
Forms, technical publications, and miscellaneous publications referenced	A-1
Functional description (See: Principles of operation)	
G	
Glossary	Glossary-1
H	
Hard copy printer (See: Dot matrix printer)	
HCP (See: Dot matrix printer)	
I	
Improvement recommendations	
Equipment	1-3
Manual	i
Index, Army publications and blank forms	1-3
Introduction	1-1
J	
K	
L	
Lists	
Abbreviations and acronyms	Acronyms-1
Expendable/durable supplies and materials	B-1
Nomenclature cross-reference	1-4
Referenced forms, technical publications, and miscellaneous publications.....	A-1
Location and description of major components.....	1-10
ADP shelter	1-13
Curbside.....	1-20
Equipment rack	1-22
Front exterior.....	1-26
Front interior.....	1-24
Power distribution unit	1-76
Power rack	1-19
Rear exterior	1-13
Roadside	1-14
Central Processors AN/TYQ-30(V)1/2.....	1-10
Communications processor.....	1-42
Black patch panel, ADP shelter.....	1-88
Black patch panel, OPN shelter	1-91
Data base management processor.....	1-49
Dot matrix printer.....	1-39

ALPHABETICAL INDEX - CONT

Page

L - Continued

Location and description of major components (Continued)

Monitor, color graphics.....	1-56
OPN shelter	
Curbside.....	1-32
Equipment rack	1-30
Front exterior.....	1-38
Front interior.....	1-36
Power distribution unit	1-80
Power rack	1-34
Rear exterior	1-27
Roadside	1-28
Power distribution unit	
ADP shelter	1-76
OPN shelter.....	1-80
Power entry panel.....	1-72
Printer.....	1-39
Red patch panel, ADP shelter.....	1-86
Red patch panel, OPN shelter.....	1-90
Remote terminal cluster.....	1-12
Workstation	1-56

M

Maintenance procedures

Dot matrix printers	3-20
Environmental control unit	2-11
Power distribution systems.....	8-72
Printers.....	3-20
Processor assembly.....	4-17
Signal distribution systems.....	9-25
Telephone set.....	6-10
Uninterruptible power source	7-24
Workstation	5-23

Major components (See: Location and description of major components)

Manual, scope of.....	1-2
Model number and equipment name	1-2
Monitor (See: Workstation)	

N

Nomenclature cross-reference list	1-4
---	-----

O

Operation, principles of (See: Principles of operation)	
Operation, theory of (See: Theory of operation)	

P

Patch panel, black (See: Signal distribution systems)	
---	--

ALPHABETICAL INDEX - CONT

	Page
P - Continued	
Patch panel, red (See: Signal distribution systems)	
Power distribution systems	
Component location and description	1-72
Equipment setup, for troubleshooting.....	8-13
Maintenance procedures.....	8-72
Open/close PDU front panel	8-109
Principles of operation	8-2
Remove/install procedures	
PDU front-panel protective guard	8-110
PEP access panel	8-72
Repair point-to-point wiring	8-166
Repair power cables	8-163
Replace procedures	
ADP shelter main filter assembly.....	8-98
DC power filter	8-150
Door limit switch S1.....	8-160
ECU power cable connector	8-157
Equipment rack ac power filter	8-145
Equipment rack ac receptacles.....	8-161
Main light assembly	
Ballast.....	8-135
Complete assembly.....	8-132
Fluorescent lampholder.....	8-138
Incandescent lampholder	8-140
Main power filter assembly filter modules	8-104
OPN shelter main power filter assembly	8-101
Power distribution unit (PDU)	
AC current transformers CT1-CT3.....	8-114
AC-DC converter PS1	8-111
Circuit breakers.....	8-125
DC-DC converter PS2.....	8-112
Indicator housings	8-127
Meters M1-M3.....	8-118
Meter M4.....	8-121
Rotary switch S1	8-122
Terminal board TB1 or TB2.....	8-129
Toggle switches S2-S4.....	8-123
Power entry panel (PEP)	
Circuit breaker CB1	8-73
Circuit breakers CB2-CB4	8-74
Indicator housing DS1	8-83
Indicator housings DS2-DS4.....	8-85
Power contactor K2	8-80
Power monitor K1.....	8-79
Receptacle J1 or J2.....	8-88
Receptacle J3	8-90

ALPHABETICAL INDEX - CONT

	Page
P - Continued	
Power distribution systems (Continued)	
Replace procedures (Continued)	
Power entry panel (PEP) (Continued)	
Surge arrestors E2-E5	8-87
Terminal board TB1 or TB2	8-95
Toggle switch S1	8-93
Wall-mounted components	
AC receptacle	8-153
DC receptacle	8-154
Dimmer controls	8-155
Workstation spotlight assembly	8-142
Symptom index	8-13
Theory of operation	8-2
Troubleshooting	8-12
Equipment setup	8-13
General instructions	8-12
Introduction	8-12
Symptom index	8-13
Table	8-16
Preparation for shipment or storage	1-3
Principles of operation	8-1
Dot matrix printers	3-2
Environmental control unit	2-1
Power distribution systems	8-2
Printers 3-2	
Processor assembly	4-2
Signal distribution systems	9-2
Telephone set	6-2
Uninterruptible power source	7-2
Workstation	5-2
Printers (see: Dot matrix printers)	
Processor assembly	4-1
Component location and description	1-42
Communications	1-42
Data base management	1-49
Equipment setup, for troubleshooting	4-7
Maintenance procedures	4-17
Principles of operation	4-2
Remove/install procedures	
Power supply mounting bracket and cover	4-24
Processor card cage	4-17
Top cover	4-66
Replace procedures	
AC distribution CCA	4-48
Anchor board	4-37
Circuit breaker	4-38

ALPHABETICAL INDEX - CONT

	Page
P - Continued	
Processor assembly (Continued)	
Replace procedures (Continued)	
Circuit card assembly	4-37
Digital I/O cable.....	4-31
Disk drive	4-29
Disk drive case.....	4-29
Ethernet cabinet kit.....	4-33
Fan assembly.....	4-21
Front panel assembly.....	4-62
Grant anchor board	4-37
Grant board.....	4-37
Multiplexer cabinet kit.....	4-34
Power distribution CCA.....	4-49
Power supply assembly	4-39
Power supply assembly fan	4-52
Power supply module	4-44
Rear air filter	4-36
Switched ac input wiring	4-60
Switched ac out wiring	4-60
Tape drive case.....	4-27
Tape transport assembly	4-27
Wiring harness 701273-0100.....	4-53
Wiring harness 701274-0100.....	4-55
Wiring harness 701327-0100.....	4-58
Symptom index.....	4-8
Test power supply assembly	4-63
Theory of operation.....	4-2
Troubleshooting.....	4-6
Equipment setup	4-7
Introduction	4-6
General instructions.....	4-6
Symptom index	4-8
Table.....	4-8
Publications, Army, index of.....	1-3
Publications referenced in manual, list	A-1
Purpose of equipment	1-2

Q

R

Recommended improvements	
Equipment	1-3
Manual	i
Red patch panel (See: Signal distribution systems)	
References, list of	A-1

ALPHABETICAL INDEX - CONT

	Page
R - Continued	
Remove/install procedures (See specific assembly)	
Replace procedures (See specific assembly)	
Reporting	
Equipment improvement recommendation (EIR)	1-3
Errors and recommended improvements, manual.....	i
S	
Shipment and storage, preparation for	1-3
Signal distribution systems.....	9-1
Component location and description	1-84
Equipment setup, for troubleshooting.....	9-12
Maintenance procedures.....	9-25
Principles of operation	9-2
Remove/install procedures	
ADP shelter black patch panel bottom access cover.....	9-43
ADP shelter black patch panel cable W4, W6, W7, or W9.....	9-60
ADP shelter black patch panel point-to-point wiring	9-61
ADP shelter block-off bracket assembly.....	9-25
ADP shelter red patch panel bottom access cover	9-43
OPN shelter black patch panel point-to-point wiring	9-61
OPN shelter black patch panel top access cover	9-83
OPN shelter red patch panel top access cover	9-83
Signal distribution system coaxial/twinaxial cables	9-73
Open/close procedures	
ADP shelter black patch panel front panel	9-39
ADP shelter black patch panel top access cover.....	9-42
ADP shelter red patch panel front panel	9-39
ADP shelter red patch panel top access cover.....	9-42
OPN shelter black patch panel front panel.....	9-80
OPN shelter red patch panel front panel	9-80
Repair procedures	
ADP shelter black patch panel cable W4, W6, W7, or W9.....	9-60
ADP shelter black patch panel point-to-point wiring	9-61
OPN shelter black patch panel point-to-point wiring	9-61
Signal distribution system coaxial/twinaxial cables	9-73
Signal distribution cables, emergency procedure	9-66
Replace procedures	
ADP shelter black patch panel	
Bantam-style jacks A1-A72	9-55
Circular connectors J1-J18, J23-J29.....	9-58
Coaxial/twinaxial jack assemblies A73-A84	9-57
RF connectors J19-J22	9-59
ADP shelter fiber-optic cable W3 or W5	9-67
ADP shelter red patch panel	
Alarm cable assembly	9-53

ALPHABETICAL INDEX - CONT

	Page
S - Continued	
Signal distribution systems (Continued)	
Replace procedures (Continued)	
ADP shelter red patch panel (Continued)	
Dual patch-to-connector assembly.....	9-50
LDF SELECT switch assembly.....	9-44
Single patch-to-connector assembly.....	9-46
ADP shelter signal/video entry panel (SVEP)	
Audio assembly.....	9-32
Audio assembly connector.....	9-34
Audio assembly surge arrestors.....	9-35
EMI filter adapter.....	9-31
Group data assembly.....	9-29
Group data assembly connectors.....	9-30
INTERCOM binding posts.....	9-36
Surge arrestor assembly.....	9-26
Antenna entry panel (AEP)	
Antenna control connector.....	9-77
Antenna RF connector.....	9-74
OPN shelter black patch panel	
Bantam-style jacks A1-A24.....	9-93
Rear panel connectors J1-J7.....	9-95
OPN shelter fiber-optic cable.....	9-70
OPN shelter red patch panel	
Dual patch-to-connector assembly.....	9-90
LDF SELECT switch assembly.....	9-84
Single patch-to-connector assembly.....	9-87
Symptom index.....	9-15
Theory of operation.....	9-2
Troubleshooting.....	9-11
Equipment setup.....	9-12
General instructions.....	9-11
Introduction.....	9-11
Symptom index.....	9-13
Table.....	9-13
Special tools and equipment.....	1-92
Storage and shipment, preparation for.....	1-3
Symptom index	
Color graphics monitor.....	5-7
Communications processor (CP1, CP2).....	4-8
Data base management processor (DBMP).....	4-8
Dot matrix printers.....	3-9
Environmental control unit.....	2-6
Power distribution systems.....	8-13
Printers 3-9	
Processor assembly.....	4-8
Signal distribution systems.....	9-13

ALPHABETICAL INDEX - CONT

	Page
S - Continued	
Symptom index (Continued)	
Telephone set.....	6-5
Uninterruptible power source	7-13
Workstation	5-7
T	
Telephone set	6-1
Component location and description	1-62
Equipment setup, for troubleshooting.....	6-5
Maintenance procedures.....	6-10
Principles of operation	6-2
Remove/install rear cover	6-10
Replace procedures	
ADP shelter telephone set	6-28
Alarm unit.....	6-14
Keyboard.....	6-15
LED assemblies DS1-DS3.....	6-28
OPN shelter telephone set A12, A13, or A20	6-35
OPN shelter telephone set A21.....	6-38
Receptacle J1.....	6-20
Receptacle J2.....	6-18
Resistor R1 or R2.....	6-23
Switch S1 or S2.....	6-25
Telephone CCA.....	6-13
Terminal board TB1.....	6-27
Symptom index.....	6-5
Theory of operation.....	6-2
Troubleshooting.....	6-4
Equipment setup	6-5
General instructions.....	6-4
Introduction	6-4
Symptom index	6-5
Table.....	6-6
Theory of operation	
Color graphics monitor.....	5-2
Communications processor (CP1, CP2).....	4-2
Data base management processor (DBMP)	4-2
Dot matrix printers	3-2
Environmental control unit (ECU)	2-2
Power distribution systems.....	8-2
Printers	3-2
Processor assembly.....	4-2
Signal distribution systems.....	9-2
Telephone set.....	6-2
Uninterruptible power source	7-2

ALPHABETICAL INDEX - CONT

	Page
T - Continued	
Theory of Operation (Continued)	
Workstation	5-2
Tools and equipment	
Common.....	1-92
Special	1-92
Troubleshooting	
Color graphics monitor.....	5-4
Communications processor (CP1, CP2).....	4-6
Data base management processor (DBMP)	4-6
Dot matrix printers	3-6
Environmental control unit (ECU)	2-3
Power distribution systems.....	8-12
Printers 3-6	
Processor assembly.....	4-6
Signal distribution systems.....	9-11
Telephone set.....	6-4
Uninterruptible power source	7-9
Workstation	5-4
Troubleshooting table	
Color graphics monitor.....	5-7
Communications processor (CP1, CP2).....	4-10
Data base management processor (DBMP)	4-10
Dot matrix printers	3-11
Environmental control unit (ECU)	2-6
Power distribution systems.....	8-18
Printers 3-11	
Processor assembly.....	4-10
Signal distribution systems.....	9-15
Telephone set.....	6-7
Uninterruptible power source	7-15
Workstation	5-7
U	
Uninterruptible power source (UPS)	7-1
Component location and description	1-63
Equipment setup, for troubleshooting.....	7-10
Maintenance procedures.....	7-24
Principles of operation	7-2
Remove/install procedures	
Battery assembly top cover	7-54
Control assembly top cover	7-29
Input assembly top cover.....	7-54
Inverter assembly rear amplifier module.....	7-88
Inverter assembly top cover	7-54
Repair interconnect cables W506-W520	7-80

ALPHABETICAL INDEX - CONT

U - Continued

Page

Uninterruptible power source (UPS) (Continued)

Replace procedures

Battery assembly.....	7-51
Batteries BA1-BA8	7-67
BATTERY SWITCH	7-74
Cables.....	7-77
Fuse.....	7-63
Fuseholder	7-63
Rear panel cable connector J1	7-71

Control assembly.....	7-24
Adapter/interface CCA	7-38
BATTERY circuit breaker CB1	7-46
Bypass relay K1	7-43
Cable connectors J1-J15.....	7-44
Circuit breaker CB1	7-46
Display CCA.....	7-42
Fuse.....	7-49
Fuseholder	7-49
Meter module	7-36
Oscillator CCA	7-34
Power control CCA.....	7-41
Signal control CCA.....	7-35
50HZ/60HZ select switch assembly	7-50

Input assembly	7-51
Capacitors C1-C3.....	7-62
Circuit breaker CB1	7-58
EMI filters EMI-1 - EMI-3.....	7-60
Rear panel cable connectors J1-J4.....	7-57
Terminal board TB1	7-61

Inverter assembly.....	7-51
Bypass indicator CCA A1	7-96
Front fan assembly A3	7-98
Fuse/fuseholder	7-94
Output transformer T1	7-105
Rear fan assembly A2	7-97
Rear panel connectors J1-J4.....	7-95

Symptom index.....	7-13
--------------------	------

Test procedures

Battery assembly.....	7-86
Input assembly	7-82

Theory of operation.....	7-2
--------------------------	-----

Troubleshooting.....	7-9
----------------------	-----

Equipment setup	7-10
General instructions.....	7-9
Introduction	7-9
Symptom index	7-13
Table.....	7-15

ALPHABETICAL INDEX - CONT

	Page
V	
W	
Warning page	B
Workstation	5-1
AC power test	5-82
Component location and description	1-56
Diagnostic test	5-86
Equipment setup, for troubleshooting	5-5
Fixed disk verifier test	5-81
Maintenance procedures	5-23
Power supply test	5-80
Principles of operation	5-2
Remove/install procedures	
Bottom cover assembly	5-23
CCA assembly	5-25
CCA assembly bracket	5-29
Top cover assembly	5-23
Replace procedures	
AC IN voltage indicator	5-41
AC monitor cable assembly 504237-001	5-74
Auxiliary air inlet filter	5-79
Brightness/contrast control cable assembly 504213-001	5-72
BRIGHTNESS potentiometer	5-45
Cable assemblies	
AC monitor 504237-001	5-74
Brightness/contrast control 504213-001	5-72
CCA assembly fan 504173-001	5-71
Contrast/brightness control 504213-001	5-72
DC power 503769-002	5-64
Ethernet CCA 503760-001	5-61
Ethernet CCA 503761-001	5-60
Ethernet CCA 503761-002	5-60
Halt switch 504378-001	5-77
Internal disk drive 503752-001	5-70
I/O port 503716-001	5-69
Keyboard/video 503710-001	5-66
Video/keyboard 503710-001	5-66
CCA assembly fan	5-49
CCA assembly fan cable 504173-001	5-71
Circuit breaker CB1	5-48
Contrast/brightness control cable assembly 504213-001	5-72
CONTRAST potentiometer	5-45
CPU/motherboard CCA	5-35
DC power cable assembly 503769-002	5-64
DEGAUSS switch	5-43
Disk tray assembly	5-53

ALPHABETICAL INDEX - CONT

	Page
W - Continued	
Workstation (Continued)	
Replace procedures (Continued)	
EMI power line filter.....	5-38
Ethernet CCA cable assembly	
503760-001	5-61
503761-001	5-60
503761-002	5-60
Ethernet interface CCA.....	5-36
Fan, CCA assembly.....	5-49
Fan, system.....	5-50
Filter CCA, front panel.....	5-56
Filter CCA, rear panel.....	5-58
Front panel connectors	5-90
Front panel J/O filter CCA	5-56
Front panel wiring.....	5-90
Graphics controller CCA	5-34
Halt solenoid	5-47
HALT switch	5-43
Halt switch cable assembly 504378-001	5-77
Internal disk drive cable assembly 503752-001.....	5-70
I/O port cable assembly 503716-001	5-69
Keyboard/video cable assembly 503710-001	5-66
Memory CCA.....	5-33
Motherboard/CPU CCA	5-35
Power supply assembly	5-30
Rear panel I/O filter CCA.....	5-58
System fan	5-50
Video/keyboard cable assembly 503710-001	5-66
Symptom index.....	5-7
Test procedures	
AC power test.....	5-82
Diagnostic test.....	5-86
Fixed disk verifier test	5-81
Power supply test	5-80
Theory of operation.....	5-2
Troubleshooting.....	5-4
Equipment setup	5-5
General instructions.....	5-4
Introduction	5-4
Symptom index	5-7
Table.....	5-7

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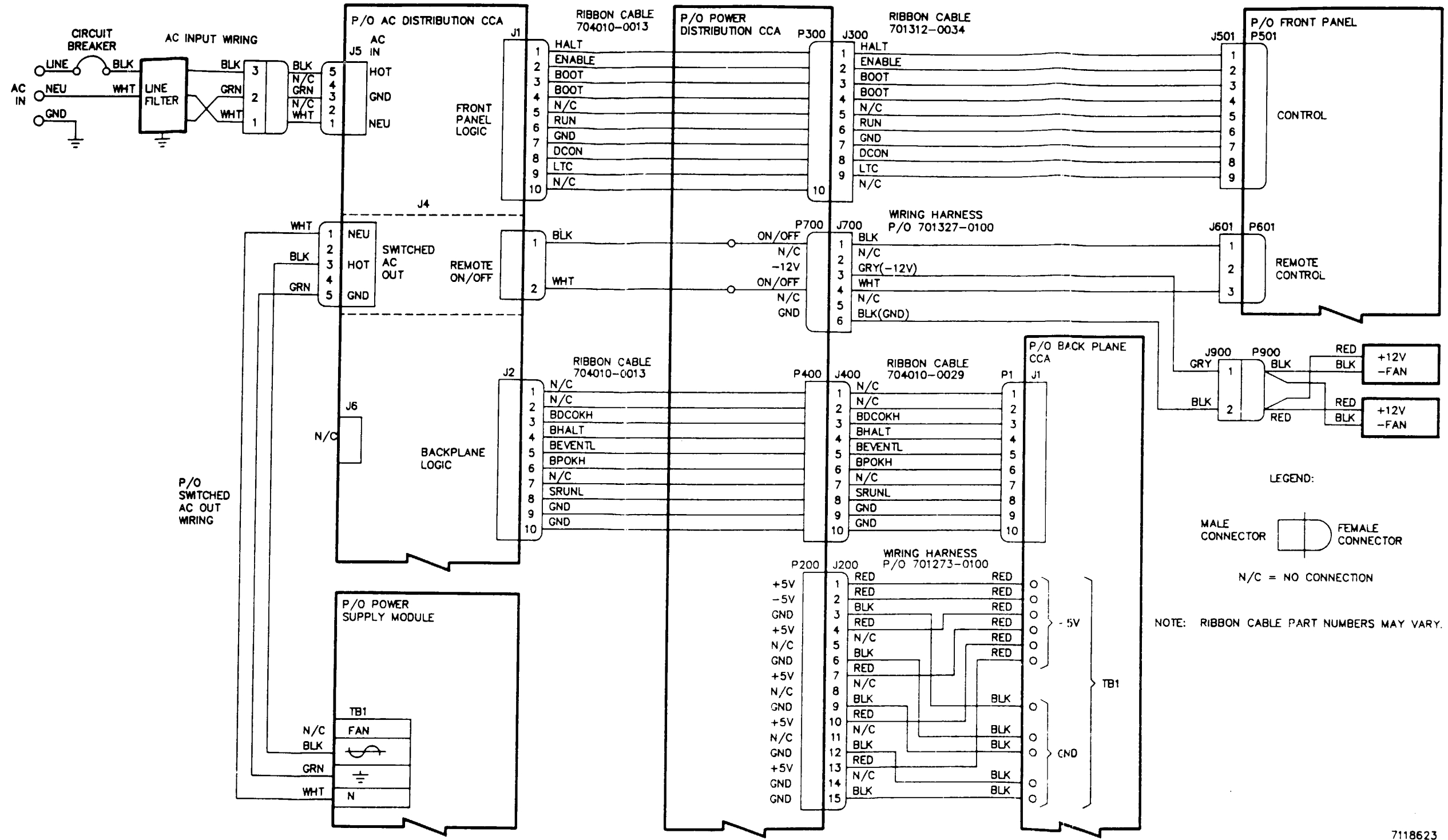
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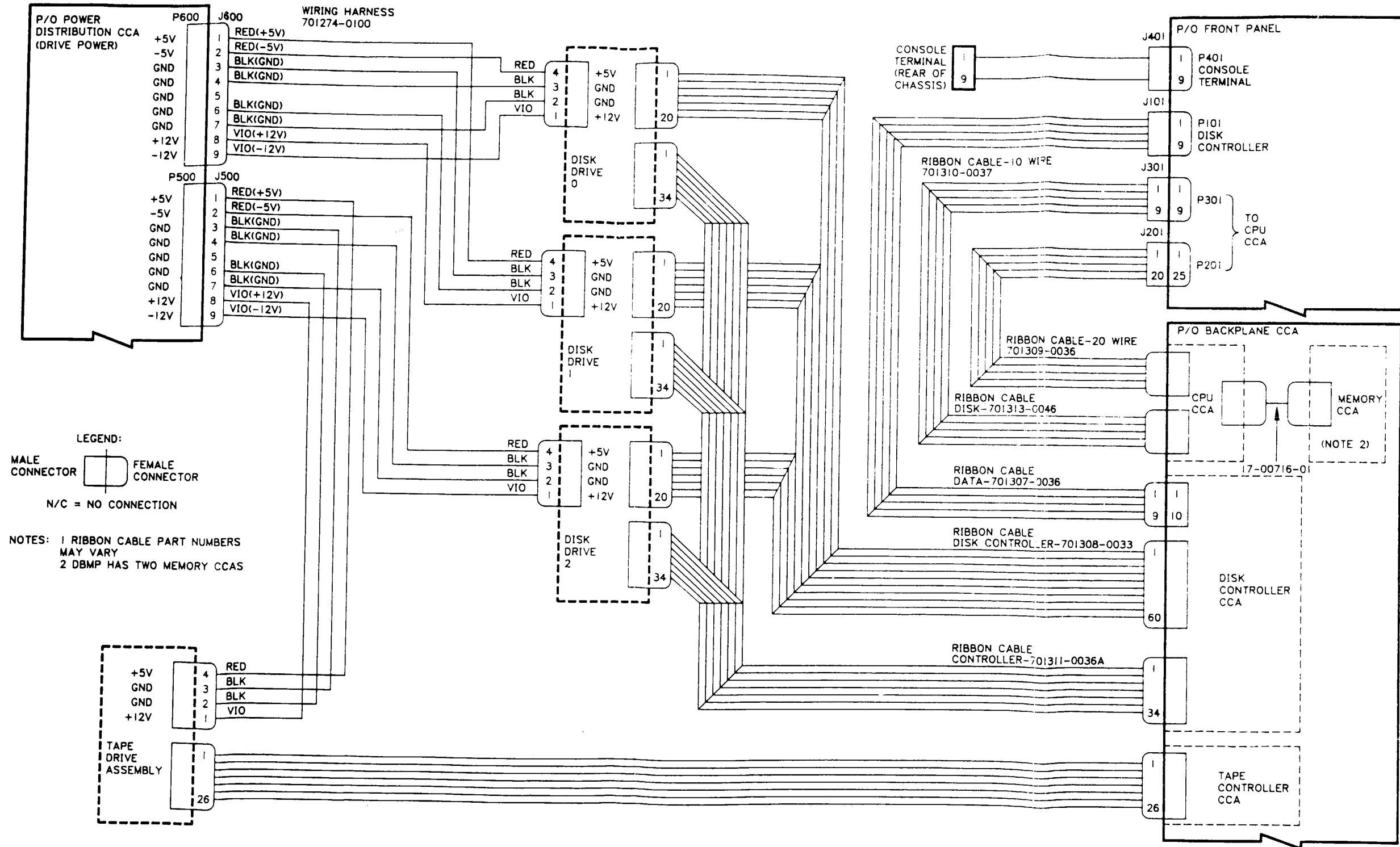
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FO-1. Processor Interconnect Diagram
(Sheet 1 of 3)

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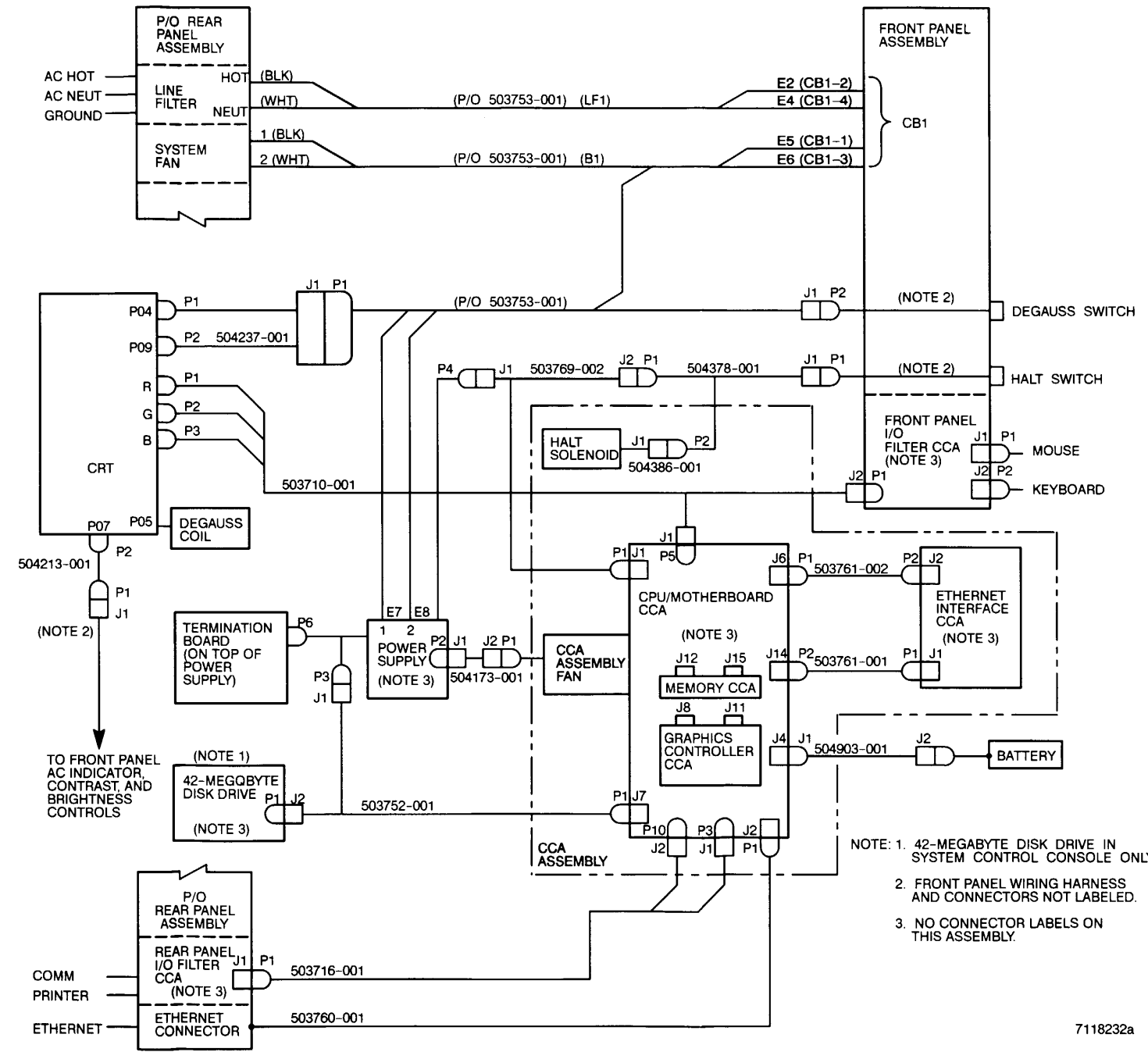


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FO-1. Processor Interconnect Diagram
(Sheet 2 of 3)

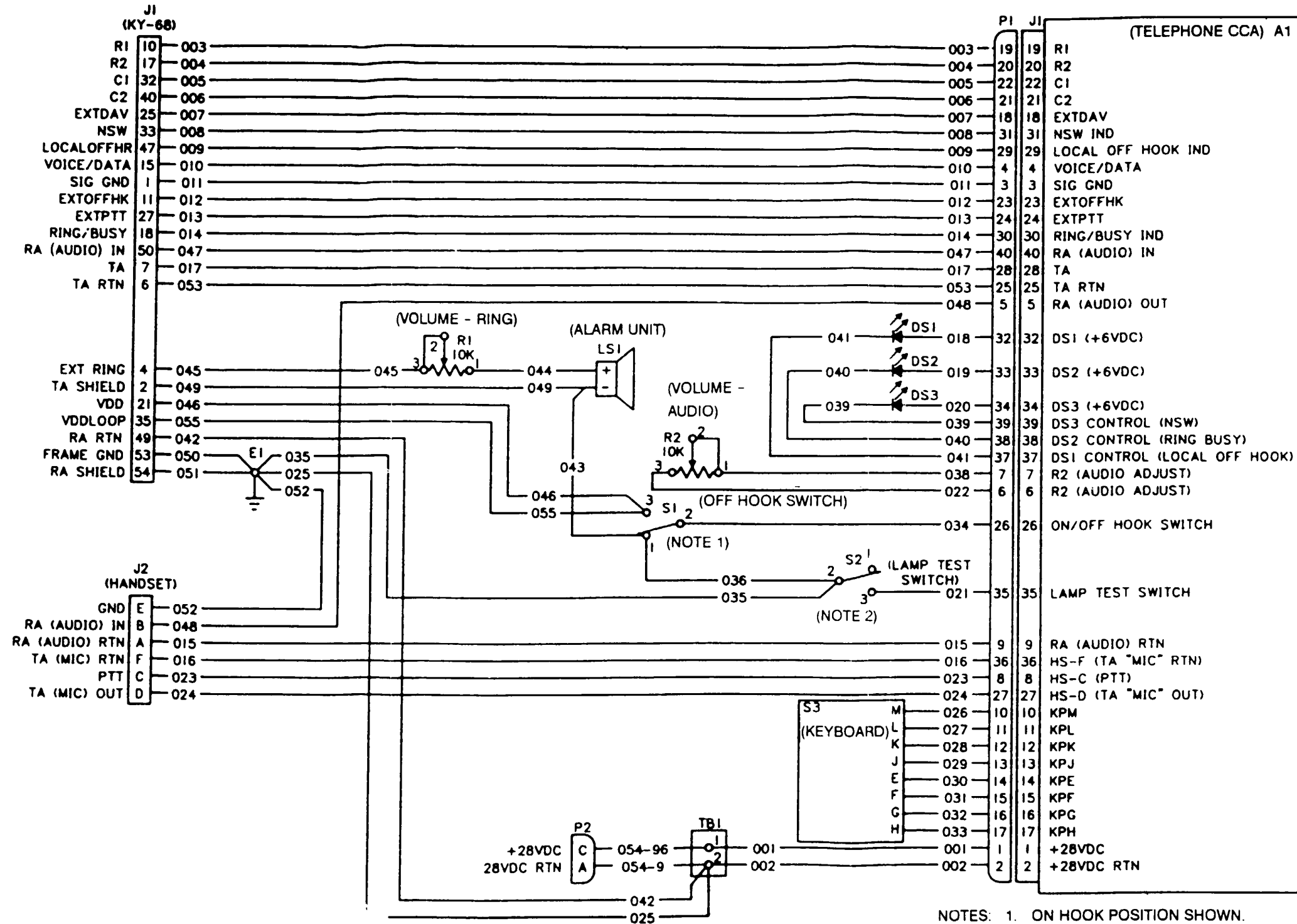
FP3/(FP-4 blank)

CABLE	FROM			TO		
	ASSEMBLY	JACK	CABLE PLUG	ASSEMBLY	JACK	CABLE PLUG
503710-001	CPU	PR	J1	FRNT FLTR CRT CRT CRT	P1 R G B	J2 P1 P2 P3
503716-001	CPU	P3	J1	REAR FLTR	J1	P1
503752-001	PWR SUPL	P3	J1	CPU DISK DRIVE	J7 P1	P1 J2
503760-001	CPU	J2	P1	ETHERNET CONN		
503761-001	CPU	J14	P2	ETHERNET CCA	J1	P1
503761-002	CPU	J6	P1	ETHERNET CCA	J2	P2
503769-002	PWR SUPL	P4	J1	CPU CABLE ASSY 504378-001	J1 P1	P1 J2
504173-001	PWR SUPL	P2	J1	CCA ASSY FAN	P1	J2
504213-001	CRT	P07	P2	BRIGHTNESS/CONTRAST HARNESS	J1	P1
504237-001	CRT	P04	P1	AC CABLE ASSY 503753-001	P1 J1	J1 P1 P2
504378-001	503769-002	J2	P1	HALT SWITCH SOLENOID	P1 J1	J1 P2



FO-2. Workstation Interconnect Diagram

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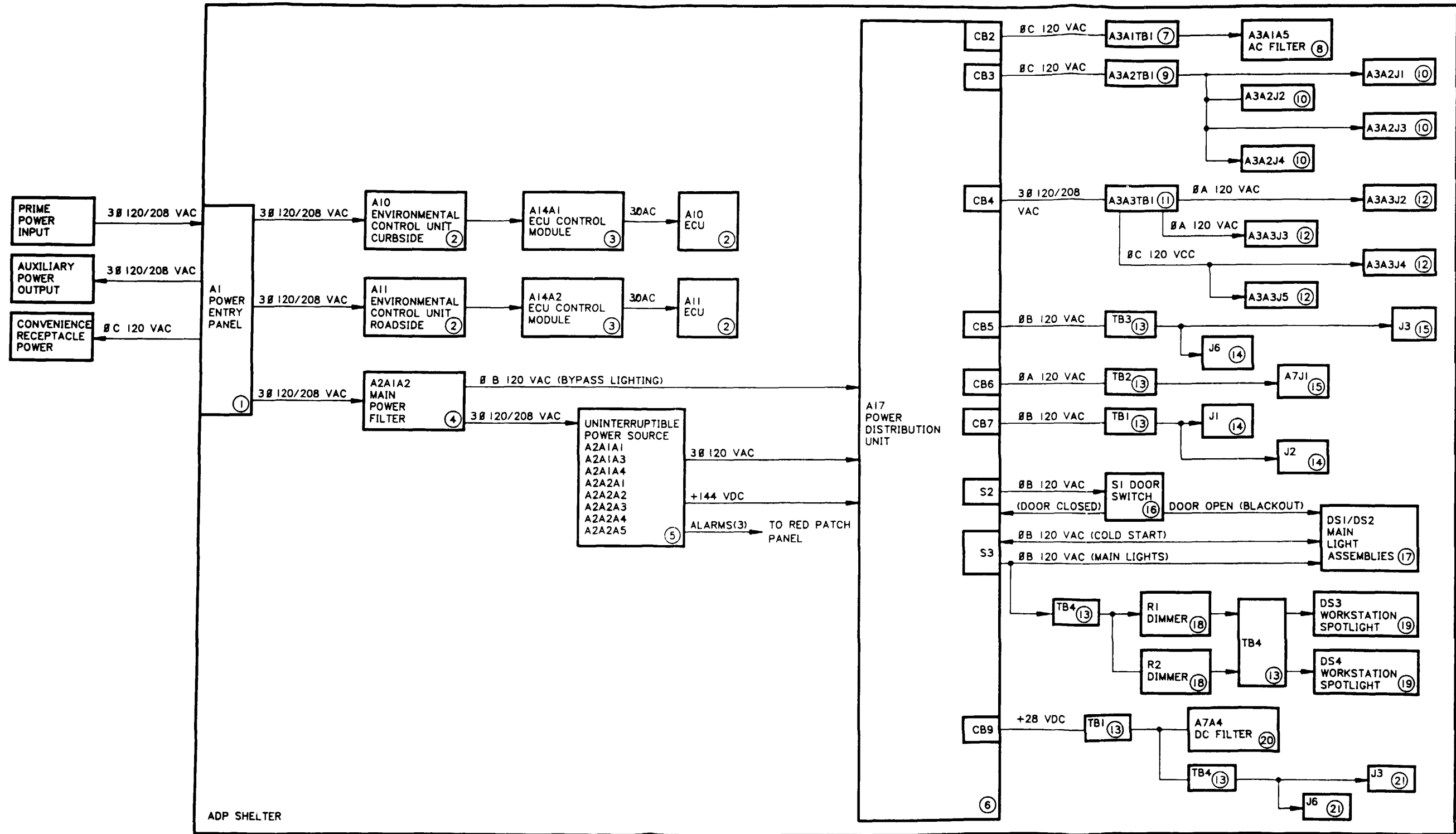


NOTES: 1. ON HOOK POSITION SHOWN.
2. NO TEST SWITCH POSITION SHOWN.

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FO-3. Telephone Interconnect Diagram

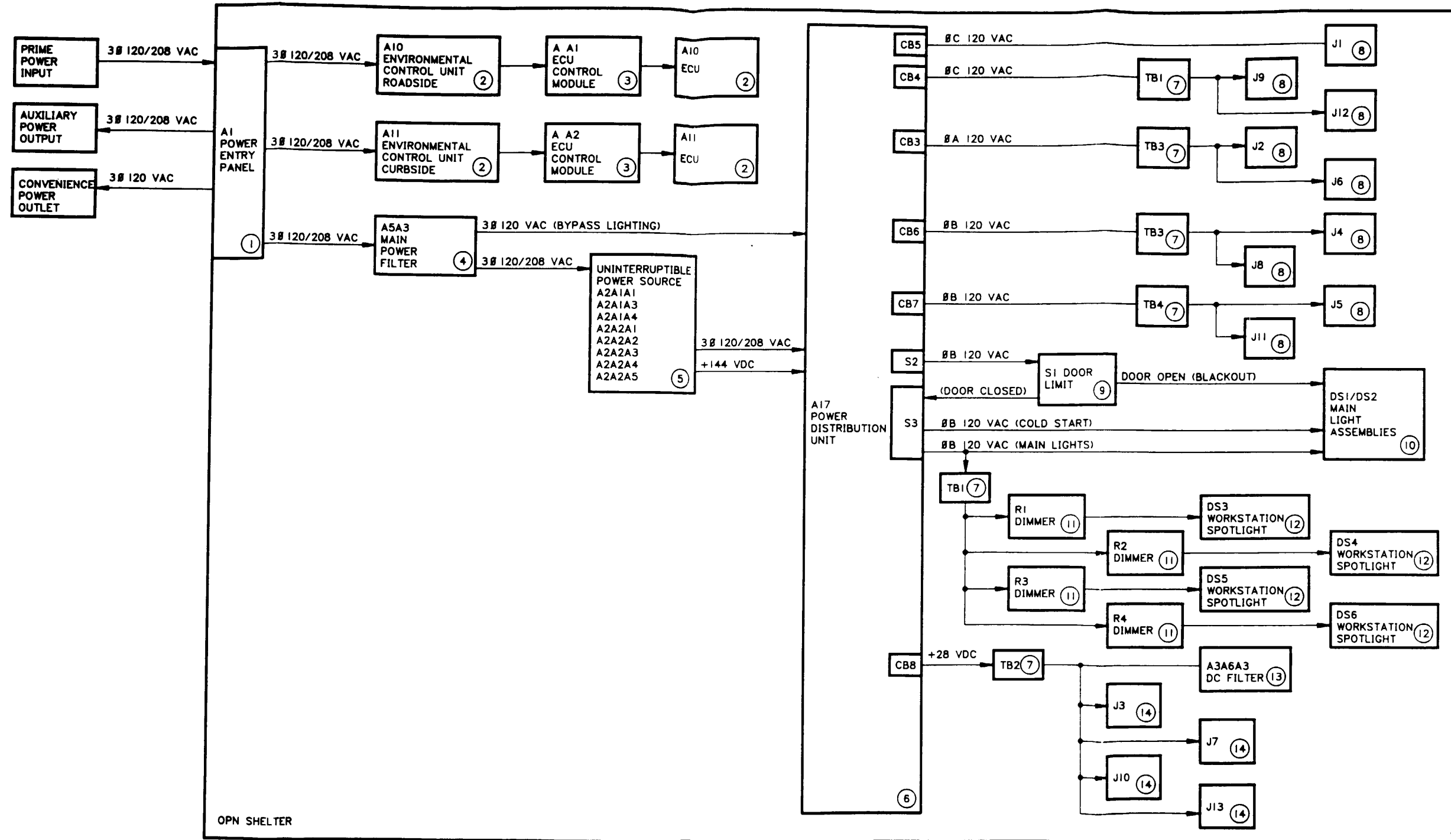
FP-9/(FP-10 blank)



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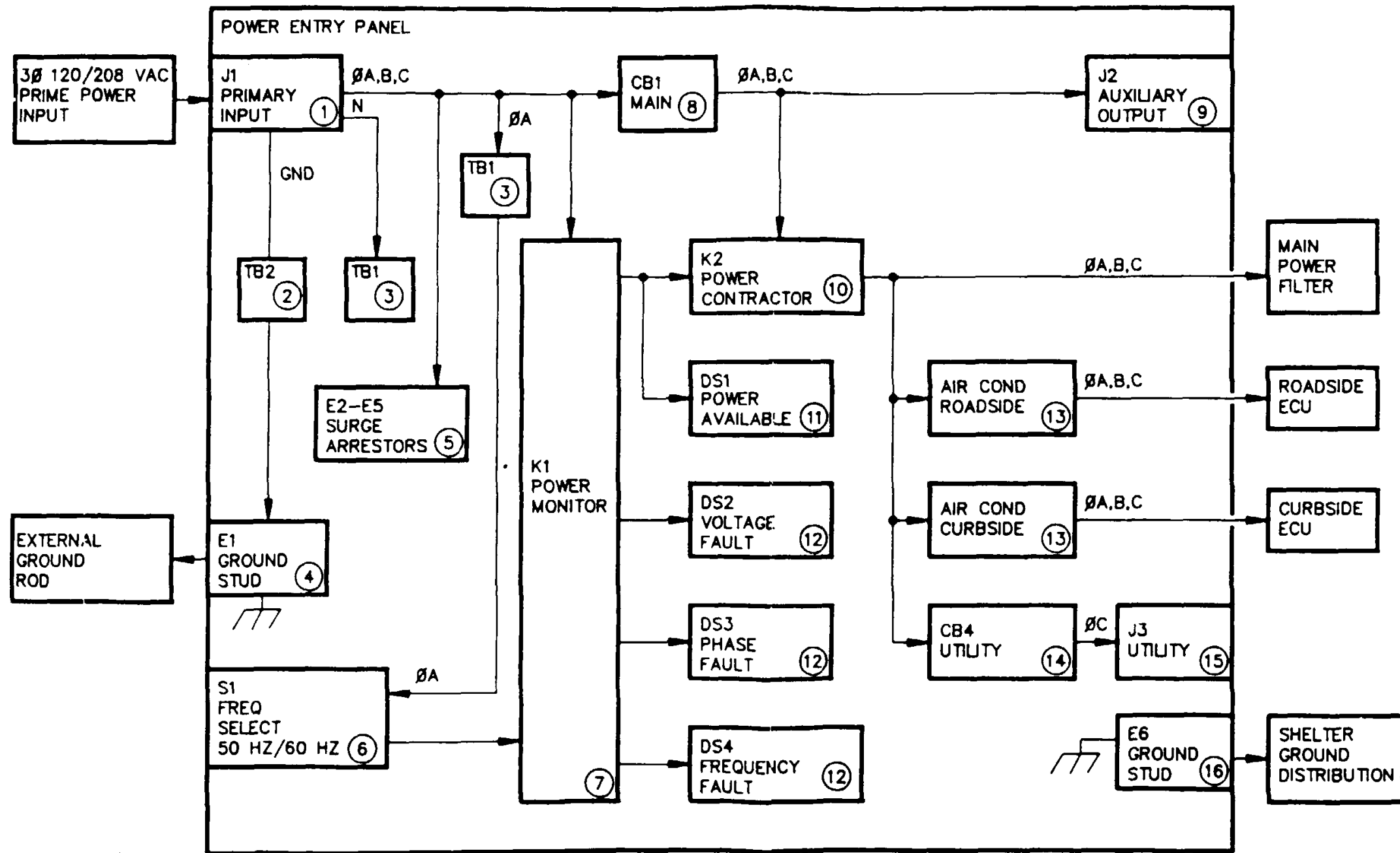
FO-4. ADP Shelter Power Distribution Block Diagram

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FO-5. OPN Shelter Power Distribution Block Diagram

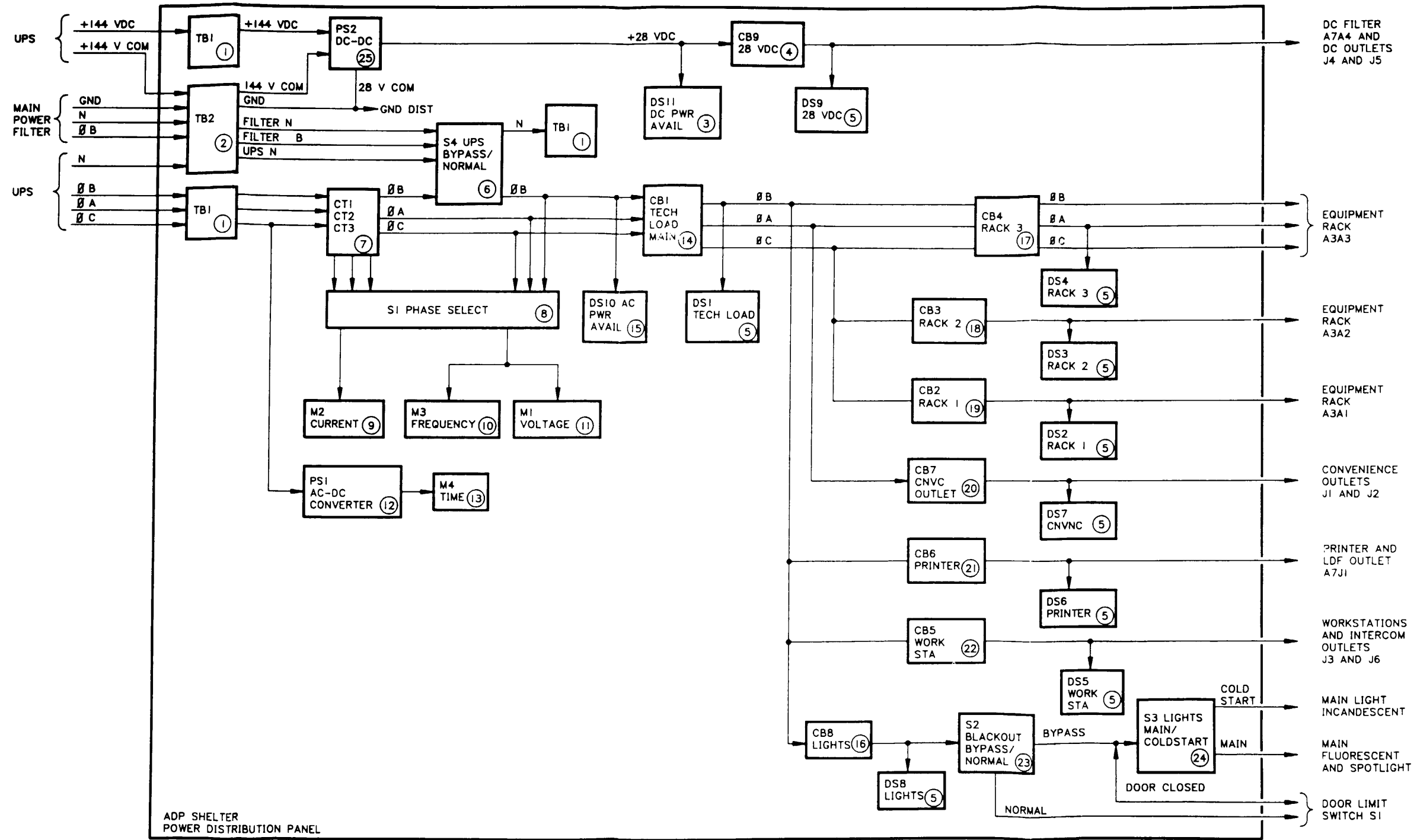
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FO-6. Power Entry Panel (PEP) Block Diagram

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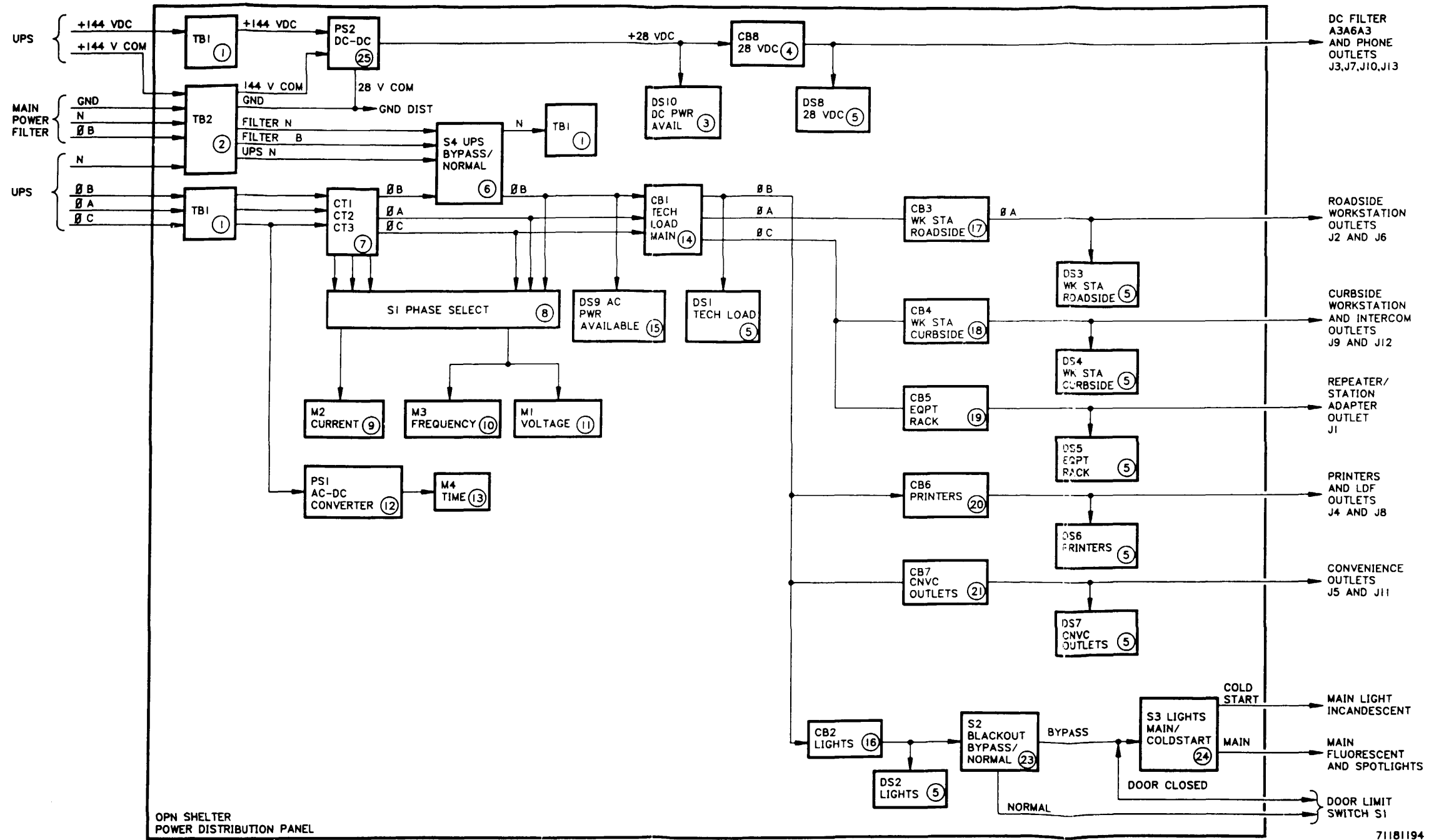


ADP SHELTER
POWER DISTRIBUTION PANEL

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FO-7. ADP Shelter Power Distribution Unit (PDU) Block Diagram

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FO-8. OPN Shelter Power Distribution Unit (PDU) Block Diagram

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