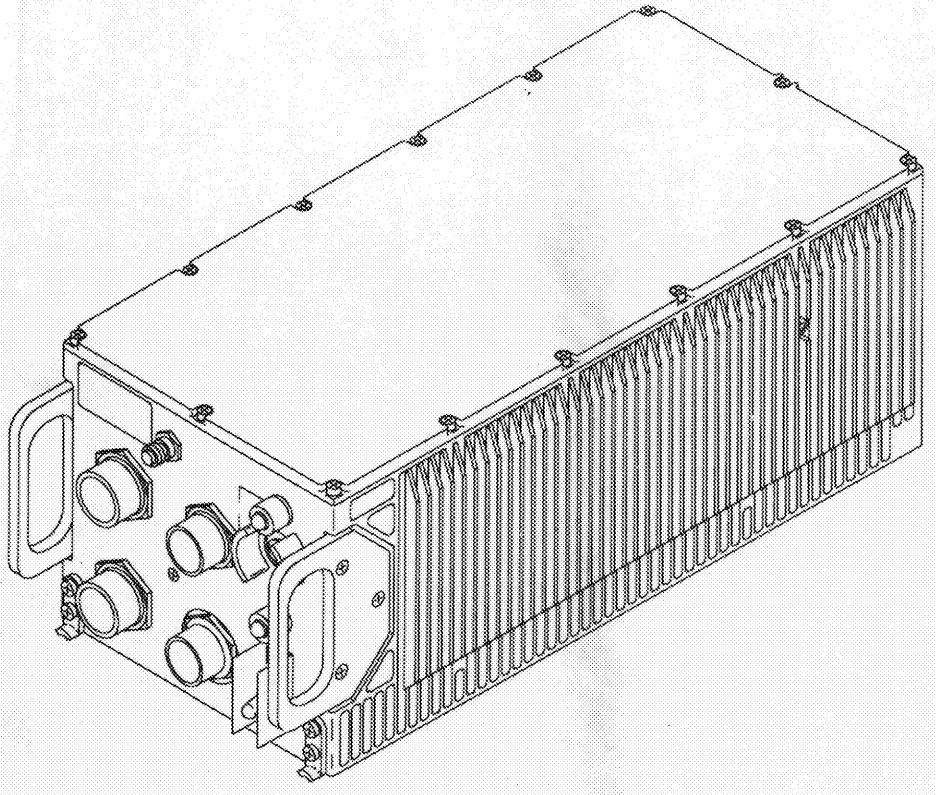
ARMY TM 11-5895-1307-24
NAVY EE163-HK-MMI-010/W110-MD1204G
AIR FORCE TO 31R2-4-585-2

UNIT, INTERMEDIATE DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL



MODEM, DIGITAL DATA MD-1204/G (NSN 5895-01-210-5235)

DEPARTMENTS OF THE ARMY, THE NAVY, AND THE AIR FORCE

15 MAY 1989

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

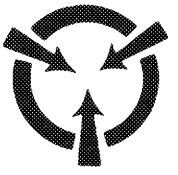
WARNING

Turn off all equipment power before using TRICHLOROTRIFLUOROETHANE. Provide adequate ventilation while using TRICHLOROTRIFLUOROETHANE. Avoid prolonged breathing of the fumes and vapor. Do not use solvent near heat or open flames; the products decomposed are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, avoid prolonged contact with the skin. When needed, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

CAUTION

Prior to removing or installing a component or cable, ensure that power to the component has been turned off. Removing and connecting cables while power is applied may result inan arc or short. This can damage the connector pins.

CAUTION



This equipment contains certain static-sensitive solid state devices which are subject to damage from electrostatic discharge. Effective control of electrostatic discharge is maintained only through continuous strict observance of the following maintenance procedures:

- Any maintenance requiring disassembly of the equipment must be performed at an approved work station. The work station must include a grounded surface and grounded wrist strap in accordance with DOD-HDBK-263.
- All maintenance personnel must have completed training in the handling of static-sensitive devices before working on this equipment. Maintenance personnel must wear the grounded wrist strap and be at an approved work station when performing maintenance.
- The static-sensitive subassemblies or circuit cards must be stored in approved electrostatic free material when not installed in the equipment.

Technical Manual
No. 11-5895-1307-24
Technical Manual
No. EE163-HK-MMI-010/W110-MD1204G
Technical Order
TO 31R2-4-585-2

DEPARTMENTS OF THE ARMY,
THE NAVY, AND THE AIR FORCE

Washington, DC, 15 May 1989

UNIT, INTERMEDIATE DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

MODEM, DIGITAL DATA
MD-1204/G
(NSN 5895-01-210-5235)

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-ME-PS, Fort Monmouth, New Jersey 07703-5000.

For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, TO 00-5-1. Forward direct to prime SM-ALC/MMEDT McClellan AFB, CA 95652-5609.

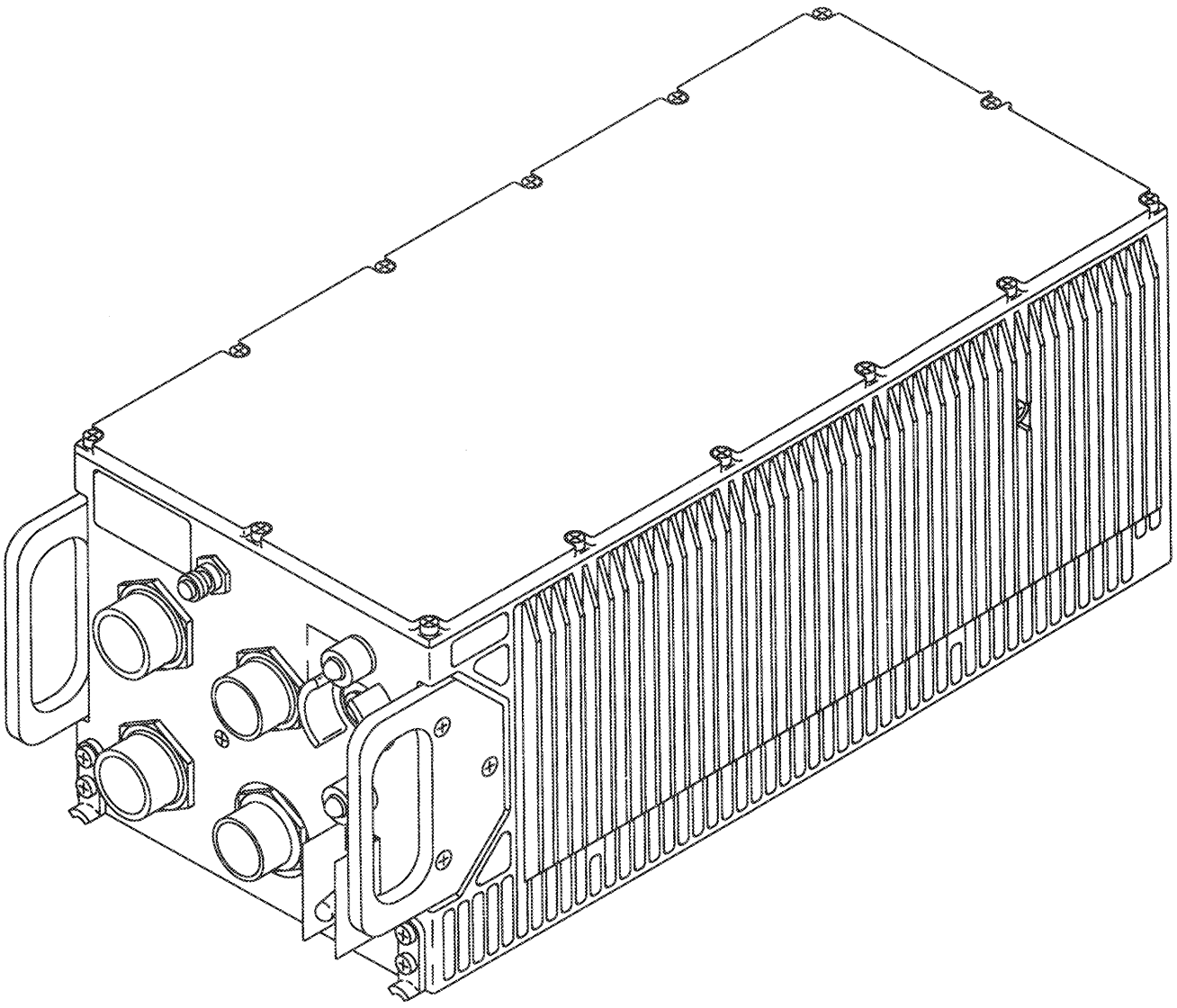
For Navy, mail comments to the Commander, Space and Naval Warfare Systems Command, ATTN: SPAWAR 003-242 Washington, DC 20363-5100.

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

FOLDOUTS (Cont.)

HOW TO USE THIS MANUAL

- The front cover index identifies frequently used information. Each item is boxed and identified by topic and page number.
- The first page containing the information you are looking for has a black box on the edge of the page.
- Bend the manual in half and following the index to the page with the black edge marker.
- Topics in the table of contents which are the same as topics on the front cover are also boxed.
- A complete alphabetical subject index is located in the back of the manual. Use the index to locate specific information.
- The glossary contains an explanation of technical terms and acronyms.



MODEM, DIGITAL DATA
MD-1204/G

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

a. Type of Manual. Unit, Intermediate Direct Support and General Support Maintenance.

b. Equipment Name and Model Number. Modem, Digital Data MD-1204/G.

c. Purpose of Equipment. Microprocessor-controlled frequency shift keying (FSK) modulator/demodulator which operates half duplex on both the transmit and receive portions of the Regency Network (RN) radio link. The transmit portion of the RN modem converts data from the KG-84A or teletype into FSK tones which it sends to the radio for broadcast onto the network. The receive portion of the RN modem converts tones from the radio into message data which it sends to the KG-84A or teletype. In addition, the modem provides signals required for link synchronization and timing for the electronic counter-countermeasure (ECCM) function.

d. Maintenance Category Cross-reference. Army maintenance categories are referenced in this manual. Navy and Air Force personnel will contact their same-level maintenance group. Refer to the following cross-reference list.

Army	Navy	Air Force
Unit	Organizational	Organizational

1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS

a. 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. Air Force personnel will use AFR 66-1 for maintenance reporting and TO 00-35D-54 for unsatisfactory equipment reporting. Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) IAW OPNAVINST 4790.4A, and unsatisfactory material/conditions utilizing the PMS Feedback Report.

b. 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.

c. 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.

1-3. CONSOLIDATED INDEX OF PUBLICATIONS AND BLANK FORMS

a. Army. 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.

b. Navy. Navy personnel refer to NAVSUP 2002.

c. Air Force. For technical publications, Air Force personnel refer to Numerical Index and Requirements Table (NI & RT). For non-technical publications, refer to AFR 0-2. For forms, refer to AFR 0-9.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

a. Army. If your equipment 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-PA-MA-D, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

b. Navy. Navy personnel are encouraged to submit EIR's through their local Beneficial Suggestion Program.

c. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFR 900-4.

1-5. DESTRUCTION OF MATERIEL TO PREVENT ENEMY USE

a. Army. Destroy the RN modem in accordance with the procedures in TM 750-244-2 to prevent enemy use.

b. Navy. Navy personnel comply with the local Command Material Destruction Plan.

c. Air Force. Air Force personnel comply with TM 750-244-2 or the local emergency destruction plan.

1-6. PREPARATION FOR STORAGE OR SHIPMENT

a. Army. Before placing equipment into administrative storage, insure that equipment is operational. If operational, put into storage using appropriate corrosion control techniques. When removing from storage, again perform operational tests and Unit PMCS (if available) to determine mission capability.

b. Navy. Refer to NAVSUP PUB 503.

c. Air Force. Refer to AFM 66-267 (storage) and AFR 67-31 (shipment).

1-7. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS

COMMON NAME	OFFICIAL NOMENCLATURE
RN modem	Modem, Digital Data, MD-1204/G
Chassis	Chassis Assembly, A1, P/N A3023953
Motherboard	Motherboard Assembly, A1A1A1, P/N A3023980
Power supply	Power Supply Assembly, PS1, P/N A3024066
Signal processor	Signal Processor CCA, A3, P/N A3078299
Analog I/O	Analog I/O and Modulator CCA, A5, P/N A3023976
Timing control/viterbi decoder	Timing Control/Viterbi Decoder CCA, A6, P/N A3023988
Data interface	Data Interface CCA, A7, P/N A3023903
Data controller	Data Controller CCA, A8, P/N A3028727

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

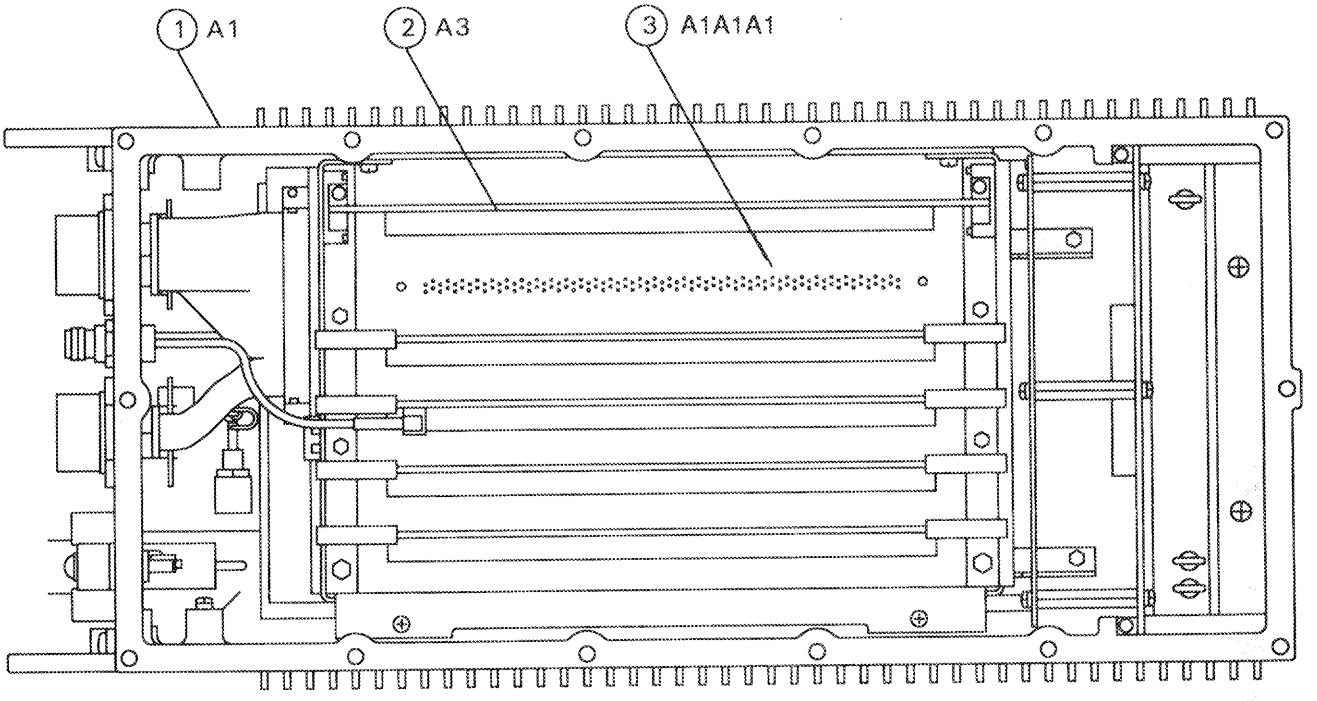
a. Characteristics

- Microprocessor-controlled FSK
- Half duplex in both receive and transmit
- Has built-in-test equipment (BITE)
- MIL-STD-188 compatible
- Uses convection cooling methods to dissipate approximately 40 watts

b. Capabilities and Features

- Performs built-in-test (BIT) function automatically upon power-up
- Has on-line and off-line BIT
- Performs FSK modulation of transmit data messages
- Performs demodulation of received FSK data messages
- Inputs from Communications Security (COMSEC) device (encrypted) or teletype (unencrypted)
- Outputs to COMSEC device (encrypted) or teletype (unencrypted)
- Guarded switches for power and BIT
- Internal BIT to assembly level
- Individual circuit card assemblies (CCA) contain fault indicators which are lit upon detection of a fault during on-line or off-line BIT.
- Modular design
- Self-contained power supply
- Replacement of CCA does not require adjustment or alignment
- On-board non-volatile memory
- Rack mountable

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS



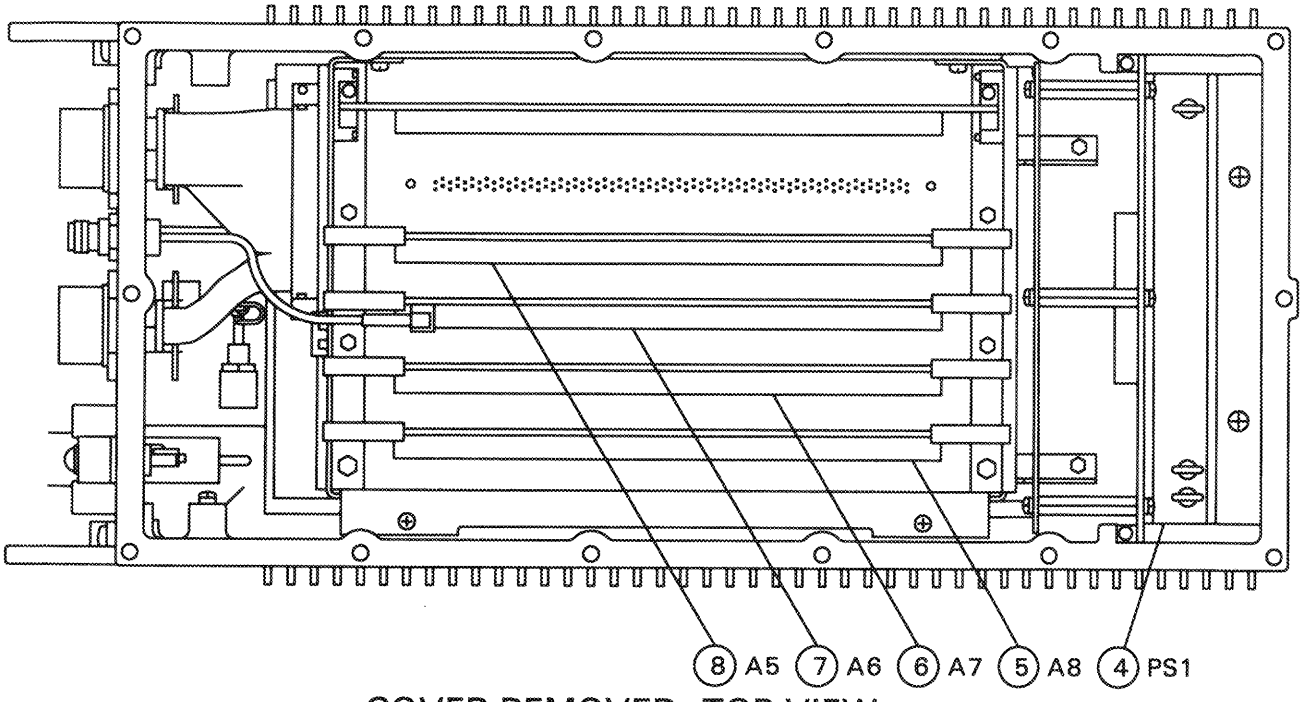
COVER REMOVED, TOP VIEW

① Chassis Assembly (A1). Provides front panel connections for input power, frequency standard, control data, KG-84A device, and receive/transmit data to/from the receiver/transmitter. Handles on the front of the chassis are used when carrying, installing, or removing the RN modem from a rack. An indicator lamp is lit when power is connected and the power switch is closed. A front panel switch initiates BIT. BIT fault is indicated by a panel-mounted indicator lamp. The chassis assembly houses the CCAs and provides mechanical mounting for the power supply. Access to the CCAs is provided by a cover that is secured with captive screws.

② Signal Processor Assembly (A3). Provides data synchronization and FSK demodulation of received signals.

③ Motherboard Assembly (A1A1A1). Contains connectors for mounting other assemblies and provides internal interconnection of CCAs, power supply, and front panel input/output connectors.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Cont.)



COVER REMOVED, TOP VIEW

(4) Power Supply Assembly (PS1). Switching mode regulator converts +28 Vdc input to +5 Vdc, +12 Vdc, and -12 Vdc. Contains EMP protection and automatic shutdown for over/under voltage conditions and transient EMP effects.

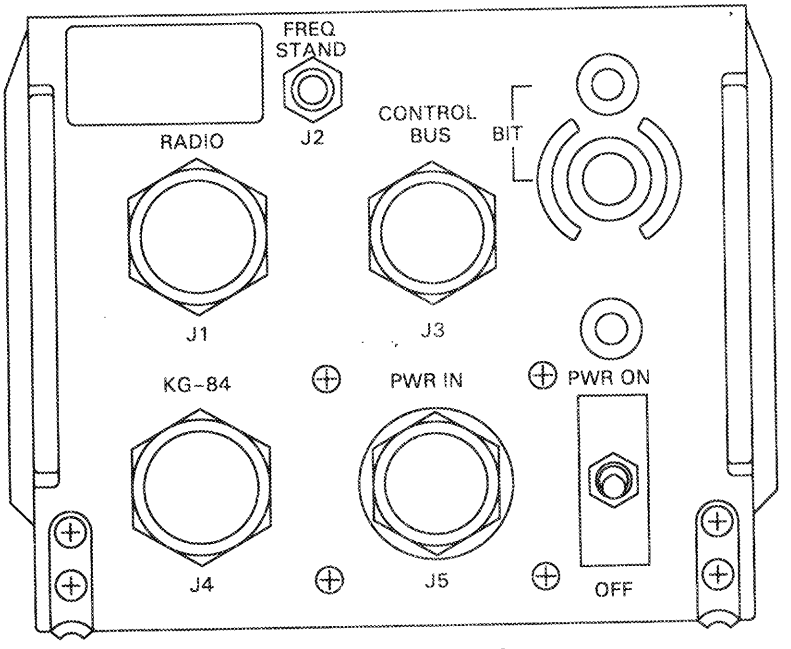
(5) Data Controller Assembly (A8). Microprocessor board containing 8088 microprocessor and 64K bytes of RAM and 32K bytes of ROM for control of the modem.

(6) Data Interface Assembly (A7). Provides signal interface (both synchronous and asynchronous) between the modem and other Regency Net units with handshake signals to control the data flow.

(7) Timing Control And Viterbi Decoder Assembly (A6). Provides all the critical timing signals for the modem based on the frequency standard and reference pulses from the reference frequency oscillator (RFO). Provides variable selection control, error correction, and status monitoring functions for the KG-84A.

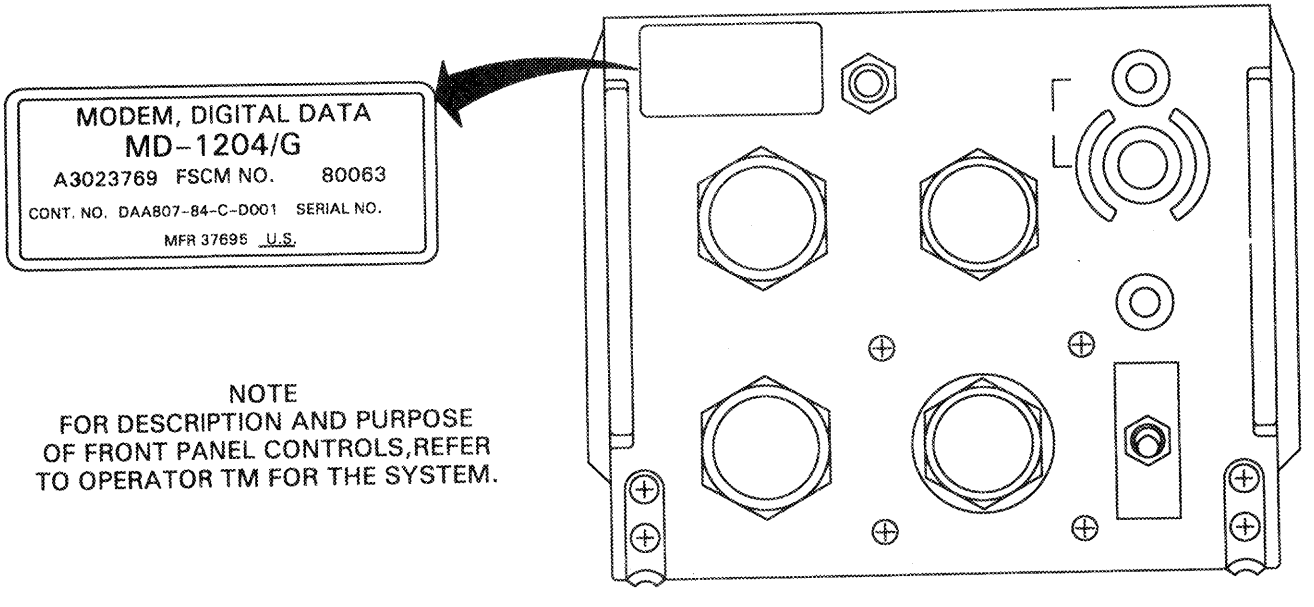
(8) Analog I/O and Modulator Assembly (A5). Provides analog I/O interface to/from the radio at baseband. On the receiver side, provides digitizing of the FSK tones for signal processor. In transmit, converts encoded digital message into FSK tones for application to the radio.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (Cont.)



FRONT VIEW

1-10. IDENTIFICATION AND INSTRUCTION PLATES



NOTE
FOR DESCRIPTION AND PURPOSE
OF FRONT PANEL CONTROLS,REFER
TO OPERATOR TM FOR THE SYSTEM.

FRONT VIEW

1-11. EQUIPMENT DATA

a. Electrical Characteristics:

Reference Frequency	10 MHz, O dBm
Built-In-Test	To Module Level
Power Requirements	+24 to +32 Vdc, 1.86 A, 52 W (nominal at 28 Vdc)
Internal Operating Voltages	+4.75 to 5.6 Vdc, 8.0 A +11.6 to +12.59 Vdc, 0.5 A -11.6 to -12.59 Vdc, 0.5 A

b. Physical Characteristics:

Weight	25 lb.
Height	6.75 in.
Width	8.00 in.
Length	18.0 in.

1-12. SAFETY, CARE, AND HANDLING

CAUTION

Prior to removing or installing a component or cable, ensure that power to the component has been turned off. Removing and connecting cables while power is applied may result in an arc or short. This can damage the connector pins.

CAUTION

The RN modem contains certain static-sensitive solid state devices which are subject to damage from electrostatic discharge. Effective control of electrostatic discharge is maintained only through continuous strict observance of the following maintenance procedures:

- Any maintenance action requiring disassembly of the equipment must be performed at an approved workstation. The workstation must include a grounded surface and grounded wrist strap in accordance with DOD-HDBK-263.

1-12. SAFETY, CARE, AND HANDLING (Cont.)

- All maintenance personnel must have completed training in the handling of static-sensitive devices before working on this equipment. Maintenance personnel must wear the grounded wrist strap and be at an approved workstation when performing maintenance.
- The static sensitive subassemblies or circuit cards must be stored in approved electrostatic-free materials when not installed in the equipment.

Make all cable connections by hand. Do not use tools.

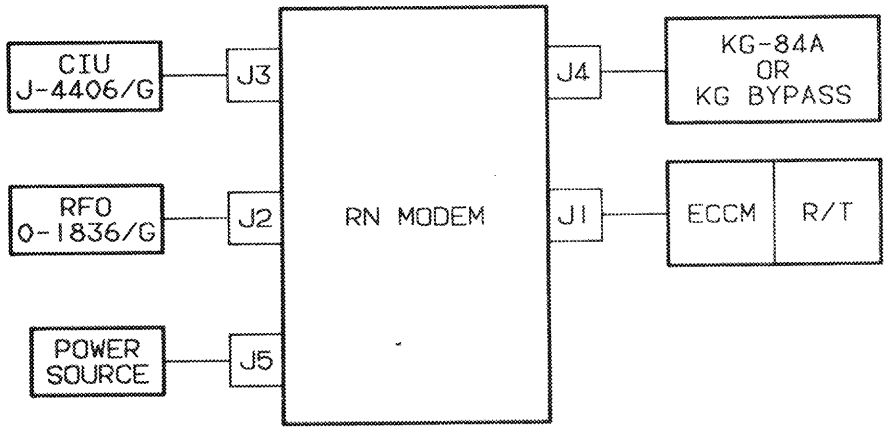
Section III. PRINCIPLES OF OPERATION

1-13. GENERAL

The RN modem consists of six functional assemblies:

- Data controller assembly
- Data interface assembly
- Analog I/O and modulator assembly
- Signal processor assembly
- Timing/control/viterbi decoder assembly
- Power supply assembly

These assemblies are housed in the chassis assembly (A1) and interconnect to Regency Net system configurations through front panel cable connectors J1 through J5.



1-13. GENERAL (Cont.)

a. J4, KG-84. Connects the RN modem to the KG-84A COMSEC equipment. Modem inputs are transmit data, transmit clock, request to send, remote parity flag, remote alarm, full operate, and KG-84A present. Modem outputs are receive data, clear to send, variable control to KG-84A, and 9600 bps clock (for TTY mode only).

b. J1, RADIO. Connects the RN modem to the receiver/transmitter equipment via the ECCM module. Modem inputs are receive audio and a serial control data pair from the ECCM module. Modem outputs are transmit audio, push to talk (keyline), automatic gain control (AGC), external clock enable, hop clock and a serial control data pair to the ECCM module.

c. J5, PWR IN. Connects the RN modem to the terminal power source. Inputs are +28 Vdc, +28 Vdc return, and safety ground.

d. J2, REF FREQ. Connects the RN modem to the reference frequency oscillator (RFO), which provides 10 MHz reference frequency.

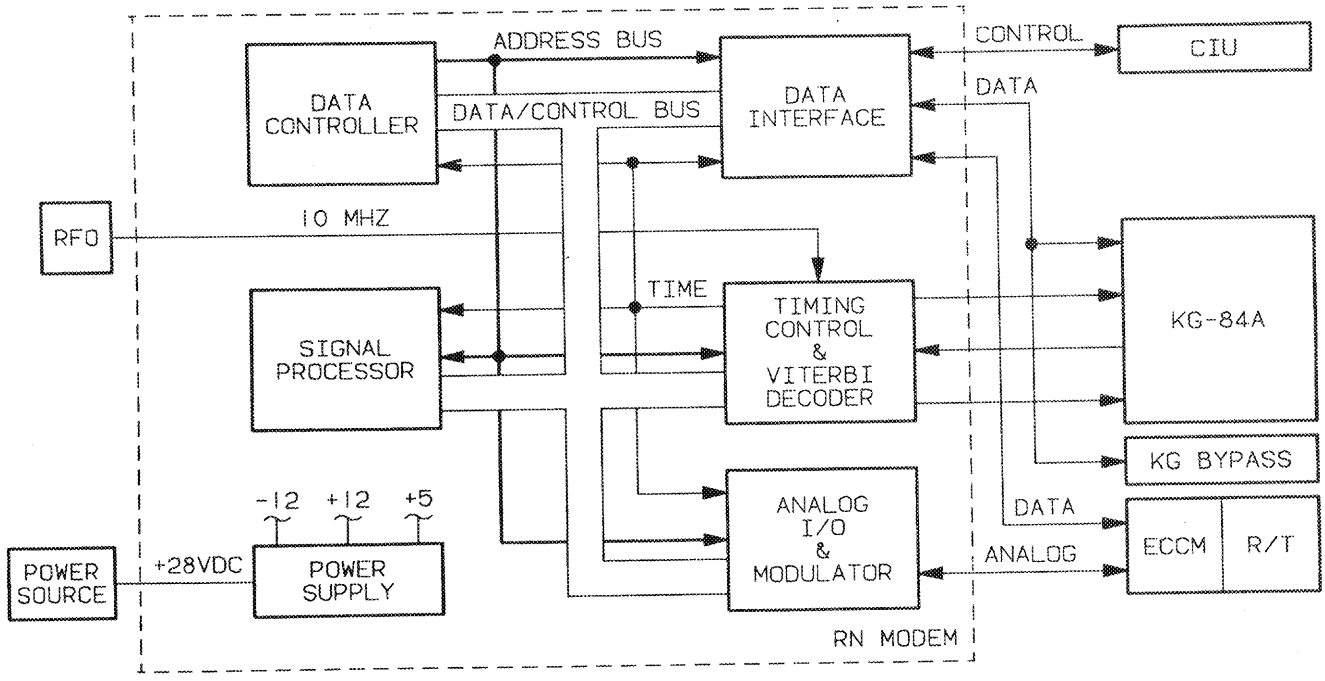
e. J3, CONTROL BUS. Connects the RN modem to the bi-directional control bus/status interface between the control interface unit (CIU) and other elements of the Regency Network terminal. Modem inputs are modem identification (established by grounded wires in the cable), control bus from the CIU (serial data pair), and 1 pulse per second timing (differential pair). Modem output is status bus to the CIU (serial data pair).

Refer to FO-1 for a schematic of the RN modem and FO-2 for a schematic of the motherboard (A1A1). Together, these schematics make up the internal chassis wiring of the RN modem.

1-14. FUNCTIONAL DESCRIPTION OF RN MODEM

The RN modem operates under control of the CIU and on-board ROM and RAM. Operation is half duplex on both the transmit and receive portions of the radio link. The transmit portion of the modem converts data from a KG-84A or teletype into FSK tones which are sent to the receiver/transmitter for broadcast on the Regency Network. The receive portion of the modem converts tones from the radio into data which it sends to the KG-84A or teletype. In addition, the modem provides the signals required for link synchronization and timing for the ECCM functions.

1-14. FUNCTIONAL DESCRIPTION OF RN MODEM (Cont.)

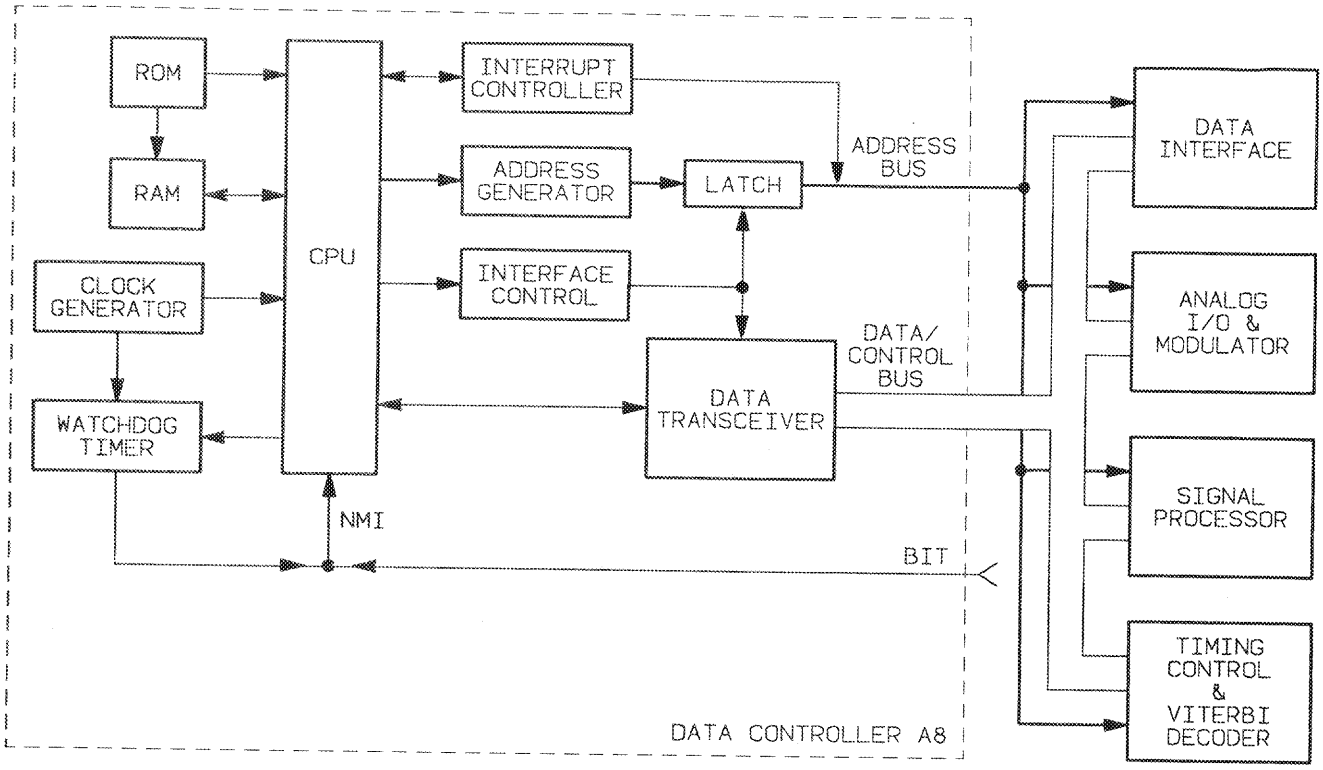


These functions are accomplished by the major assemblies housed in the chassis. The data controller establishes a data/control bus based on control words from the CIU and on-board memory. Internal operation of the modem is controlled by the microprocessor on this board. Digital interface with other terminal units is through the data interface CCA and analog interface is through the analog interface and modulator CCA. The signal processor CCA demodulates received signals and establishes link synchronization. The timing control and viterbi decoder CCA establishes internal time references and synchronization links to the KG-84A and ECCM modules.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS

a. Data Controller (A8). Provides microprocessor control and memory for RN modem operations. Data traffic to/from the CIU, KG-84A, and receiver/transmitter are on the control/data bus. Data is interchanged among the modem CCAs via the data controller control/data buses. Operating modes, submodes, and parameters of the modem are based on the pre-programmed data stored in the memory of this CCA.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)



The data controller is an 8088 microprocessor based system that controls up to three data interfaces. A memory mapped configuration is employed for all functions with the exception of BIT, which is I/O mapped at one unique address.

A non-maskable interrupt (NMI) is dedicated to BIT. It is activated by faults detected by the watchdog timer and fault detection circuitry, power-on reset, software selection, or external BIT initiation by the operator. A NMI signal causes a central processor unit (CPU) interrupt at the end of execution of the current instruction. At the end of successful BIT, the interrupt controller begins to poll peripherals for interrupt requests, beginning with the data interface port A (CIU Interface).

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(1) Interrupt requests. Seven maskable (transparent) interrupt request signals are input to the data controller for movement of control and data within the RN modem and on the interface lines. The microprocessor outputs an interrupt acknowledge and initiates modem activity when an initial interrupt request is received on the CIU interface via the data interface CCA. Data from the CIU is transferred from the interface to the data bus. This initial data is combined with program information stored in ROM to select modem mode and submode and initialize operations within the modem. After initialization, the interrupt controller polls interrupt requests from all peripherals, determines the priority of the interrupt from information stored in ROM, and initiates control of modem operations by combining CIU data with preprogrammed data.

(2) Data bus. The microprocessor bidirectional data lines are connected at P1 pins 29 (D7) through 36 (D0) through a data transceiver. The data transceiver is automatically selected for all off board read and write operations. Data is valid on this bus when a write (WR#) or read (RD#) pulse and the address latch enable (ALE) signal is low.

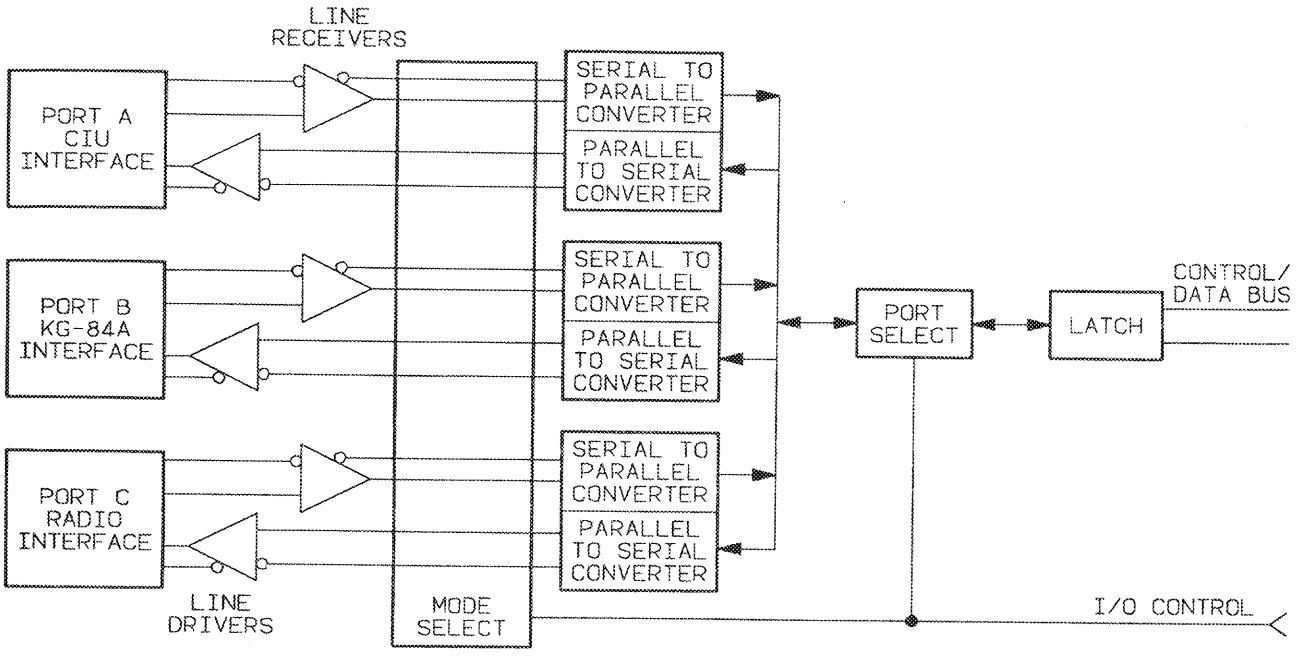
(3) Address lines. The microprocessor has 20 address lines. Address lines are latched through transparent latches. These address lines are used to control interface operations, store program data in RAM, and read data from ROM RAM through the control bus to the other modem CCAs.

(4) Watch dog circuitry. A watch-dog timer counter circuit provides a check of the microprocessor operation. Upon fault detection, the watch-dog timer generates a NMI, which sets the microprocessor to a known state. The counter must be reset through software every 40 milliseconds to avoid a hardware timeout. The counter is also reset through external BIT initiation. If the counter is not reset, the watch-dog timer initiates BIT by raising the NMI and lighting the board fault LED DS-1. The microprocessor will poll the BIT status register to determine if the NMI is user generated or a microprocessor fault.

(5) Timing. A clock generator supplies the microprocessor clock timing. The oscillator circuitry is crystal controlled. The output of the clock driver for peripherals is the basic time reference for data and control movement along the data/control bus.

b. Data Interface (A7). Provides serial data interface between The modem and all other Regency Net units. The data interface is a serial-to-parallel assembly that operates under supervision of the data controller CCA (A8).

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)



The data interface CCA contains four independent serial ports that are MIL-STD-188C compatible. The ports are multi-protocol serial controllers which are a type of universal synchronous/asynchronous receiver/transmitter (USART) ports. Ports A thru C are used to establish the required interfaces, Port D is not used. Port selection and control is provided by signal lines from the data controller CCA (A8).

In the receive function, port selection is accomplished by an address decoder that polls the conditions of line receivers on each port. When a properly addressed data transmission is sensed on a receive line, the data controller will select an analog switch in the mode select portion of the data interface. This disables the line driver for that port and enables the line receiver, routing serial data through the line receiver to the serial-to-parallel converter. The output of the serial-to-parallel converter is synchronous, 8-bit data which is routed through the port select portion (also controlled by the data controller) and latched into the data transceiver, a parallel, 8-bit data latch. The data controller will then clock data through the Data Latch to the modem internal data bus.

In the transmit function, properly addressed data on the internal data bus is applied to the data latch. The data controller selects the proper output port, opening a path between the data latch and the serial-to-parallel converter. The data controller then clocks data through the data latch into the serial-to-parallel converter, which produces a serial data output. Analog switches in the mode select portion enable the line driver of the selected port and control lines to clock the data out of the modem through the line drivers.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

The data bus is controlled by the DT/R# line and is low when the board is to be serviced by the microprocessor. The other control lines from the microprocessor are: I/O control# and I/O enable# which enable the data latch and address decoder; A0 thru A4 and ALE which establish port selection; CLK and PCLK which establish internal timing; WR# (transmit) and RD# (receive) which establish mode; and RESET which reinitializes the data interface after each interface operation.

The data lines of the data interface are interconnected to the motherboard at P1 pins 29 through 36. The data interface is connected via the motherboard CCA to the differential serial data signals to/from the modem at J2, J3, and J4 and to the RN modem internal data bus. The assembly establishes three interfaces between the modem data bus and other terminal LRUs. These interfaces are:

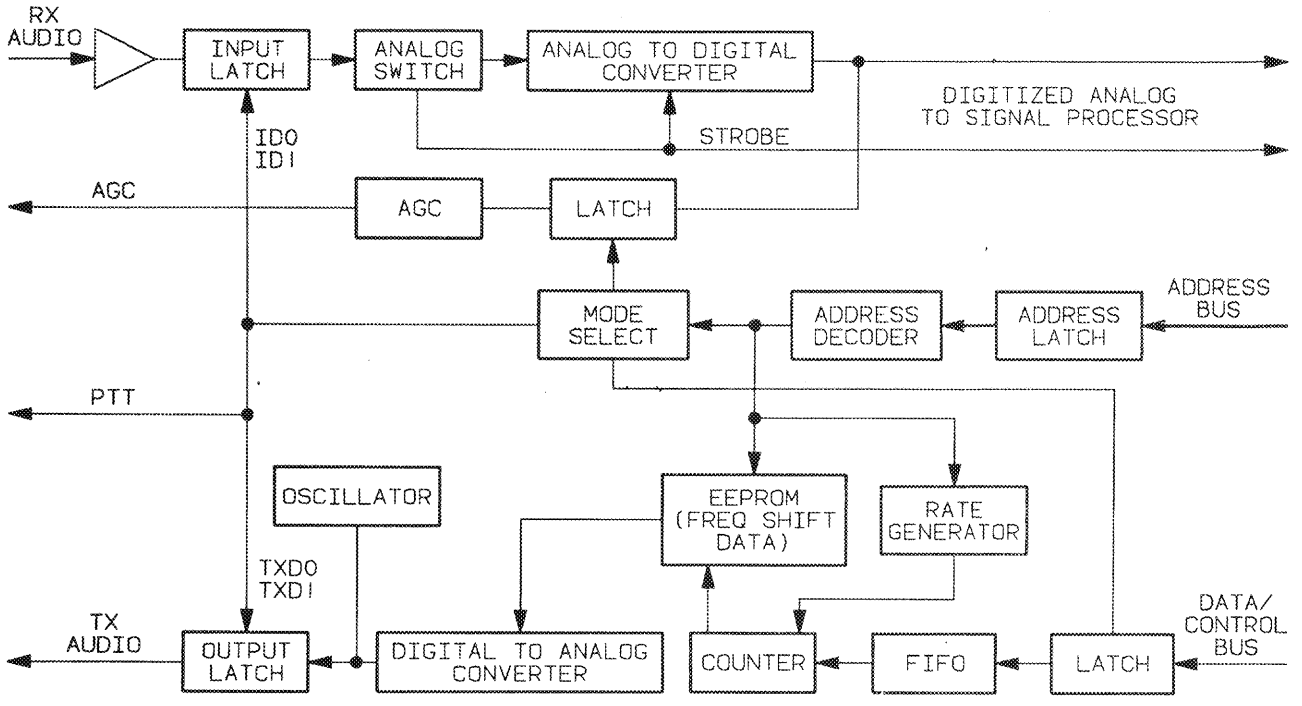
(1) CIU interface- Asynchronous interface controls modem mode selection and internal operation. Data includes operating mode selection, transmit/receive frequency data, and timing rates. Hard-wired connections in the external cable establishes a unique modem address within the RN configuration.

(2) Radio interface- Asynchronous interface used by the modem to command the ECCM timing of the radio ECCM and to control transmit/receive functions of the receiver/transmitter.

(3) KG-84A interface- Synchronous interface which provides for transfer of encrypted data between the RN modem and the KG-84A.

c. Analog I/O and Modulator (A5). Provides the analog interface to/from the receiver/transmitter at baseband. On the receiver side, this CCA provides digitization of the FSK tones for the signal processor. On the transmit side, it converts encoded data into tones for application to the radio.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

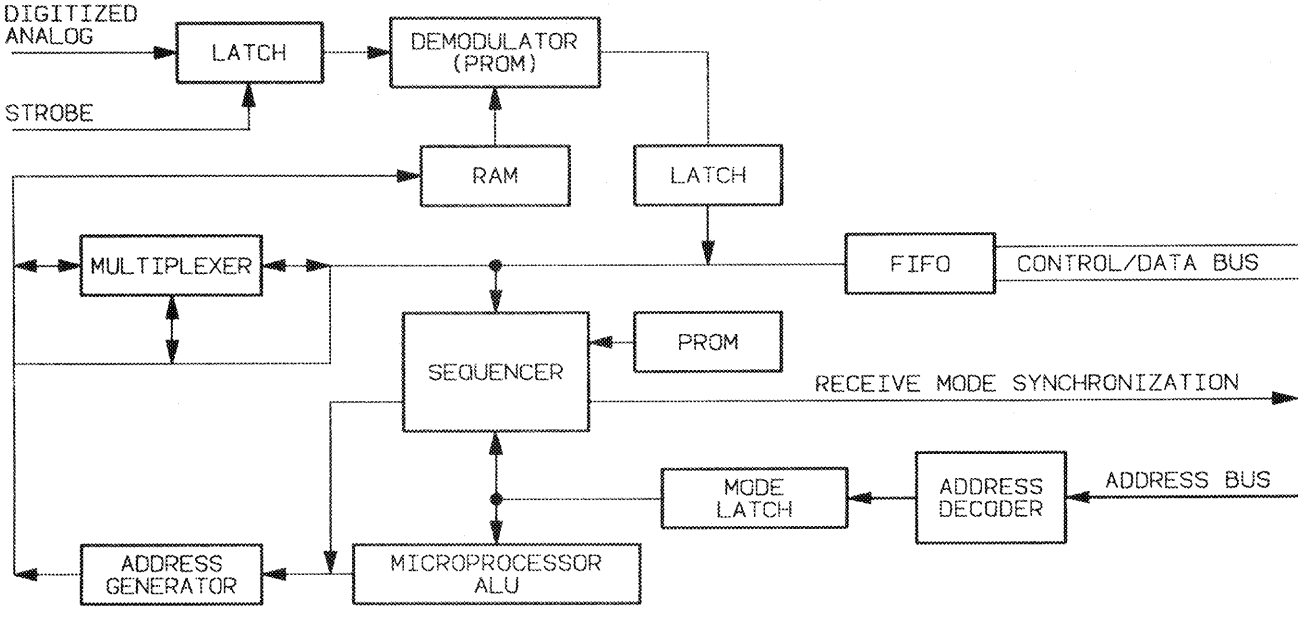


(1) Receive signals. Received audio signals from the receiver/transmitter are applied to the input circuit where they are amplified and routed to the input latch. Mode selection, under direction of control bus signals, enables the latch, applying the receiver signal to an analog switch. The analog-to-digital (A/D) converter outputs a strobe signal which gates the input signal through this analog switch to route 11-bit words through to the converter. Serial analog signals are converted by the analog to digital converter to parallel digitized signals. These digitized words are routed out of the analog I/O and modulator to the signal processor CCA at P1-53 thru 60 and 117 thru 120. Message data is also applied to a latch and, under program control, applied to the AGC circuit which senses signal strength and develops automatic gain control (AGC) which is returned to the receiver/transmitter.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(2) Transmit signals. Message data is applied to the input latch and clocked into the input first-in-first-out (FIFO) under program control on the control bus. Transmit mode select uses preprogrammed data and CIU commands to set up the rate generator. Data in the FIFO is then clocked through the counter at a rate determined by the rate generator. Outputs from the counter address preprogrammed frequency data locations in electrically erasable programmable read-only memory (EEPROM), which outputs a data stream that is an image of message data from the counter. Each bit represents a command to shift the carrier by a value dependent by the counter rate. This parallel data stream is applied to the D/A converter which provides the FSK modulation data. Mode control applies the PTT (keyline) signal to the receiver/transmitter and enables the output latch to apply modulation to the transmitter.

d. Signal Processor (A3). Demodulates received FSK signals and determines synchronization timing for the receive process.



(1) Receive. Digitized analog signals from the analog I/O and modulator CCA are applied to the signal processor input latch and clocked through, under mode control, by the strobe signal from the analog I/O and modulator CCA. Under program control, the digitized analog data is decoded and synchronized using the modem time standard. Data is then latched as an input to the controller data bus.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

f. Power Supply (PS-1). The power supply CCA is power from a Vdc power source and supplies three outputs; +12, -12, and +5 Vdc. All outputs are required to power the RN modem during normal operation. Input power to PS-1 is routed from the input connector on the front of the chassis to the power supply (located at the rear of the RN modem chassis) through the motherboard (A1A1A1). Refer to FO-3 for a schematic of the power supply.

(1) Principal features and characteristics of PS-1 are:

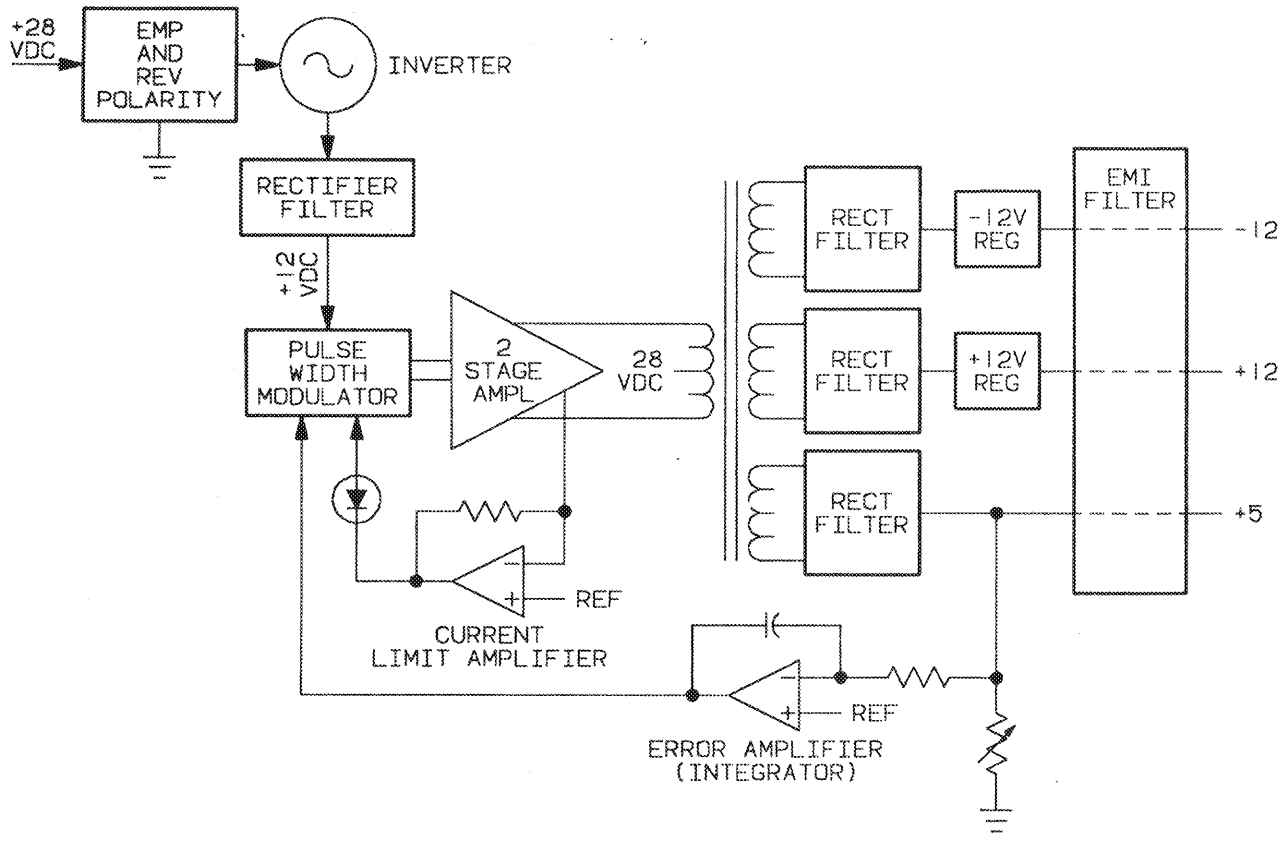
- Input power: +28 Vdc at 1.86 Amps
- Outputs: +12 Vdc at 0.5 Amps
  -12 Vdc at 0.5 Amps
  +5 Vdc at 8.00 Amps
  BIT Output
- The power input is controlled by the circuit breaker CB1 located on the RN modem front panel.
- Power and BIT indicators are located on the RN modem front panel. A BIT indicator is also located on the power supply assembly to distinguish a power supply fault from a modem fault.
- The power supply is equipped with reverse polarity protection.
- Input is EMP protected.
- The power supply is basically a dc-to-dc switching inverter employing a "pulse width modulated" type regulator. Two outputs, the +12 and -12 Vdc outputs, are further regulated with analog type IC regulators.
- BIT indications are provided for over/under voltage conditions as well as for overcurrent conditions. When the supply outputs (voltage or current) exceed specified limits, the supply automatically shuts down. If the shutdown occurs because of an overvoltage condition, the supply must be turned off and then re-energized to resume normal operation. If the shutdown occurred as a result of an overcurrent condition, the supply will resume normal operation when the fault or the condition causing the overload is corrected.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(2) Refer to the RN modem power supply block diagram.

The normal input to the power supply is +28 Vdc at approximately 1.5 amps. The input is protected from damage due to high voltage spikes by the EMP protection device VR1 (54 volt zener diode). A diode is also connected across the input to protect the supply in the event the input voltage is connected backwards. The +28 Vdc is applied to an oscillator (inverter) which is a two transistor device connected in half-bridge configuration. The output is transformer coupled, isolated, and applied to a full wave bridge rectifier and capacitive filter. The resulting dc is about +12 Vdc in amplitude. This supplies power to energize the control and supervisory circuits. The control circuit is the pulse-width-modulator (PWM). The PWM is the control device which regulates the +5 Vdc output. It consists of an oscillator and a pulse width modulator. It has two outputs displaced in phase by 180 degrees which drives a two stage amplifier. The output of the final push-pull amplifier is isolated and coupled to final rectifiers by a transformer with three secondaries. One is the +5 Vdc supply. This voltage is rectified, filtered, and fed to the output thru an EMI filter. Notice that a sample of the output is fed to an integrating error operational amplifier (OP AMP), the output of which is fed to the PWM. If the +5 Vdc output goes high, the integrator applies a voltage to the PWM which causes the pulse width to narrow. Thus the energy to the output is reduced and the voltage is reduced to the correct level. The error amplifier input includes a potentiometer adjustment (R14) which is used to adjust the output voltage of the +5 Vdc supply. Two other secondary windings on the transformer are used for the +12 Vdc and -12 Vdc supplies. These outputs are rectified, filtered and routed to the input of their respective analog IC regulators. The regulator outputs are then routed through the EMI filter to the output connector. Samples of the three outputs are fed to OP AMP window detectors and the supervisory circuit which cause the supply to shut down if any one of the output voltages get too high. If the voltages go low, out of limits, a BIT indication is provided, but the system does not shut down. A current limit OP AMP is also diagrammed. If the output current exceeds about 14 amps, (+5 Vdc supply) the supply shuts off. The supply resumes normal operation when the overcurrent condition is corrected. However, if the supply shuts off for overvoltage reasons, the supply remains off until reset by switching off and then back on.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

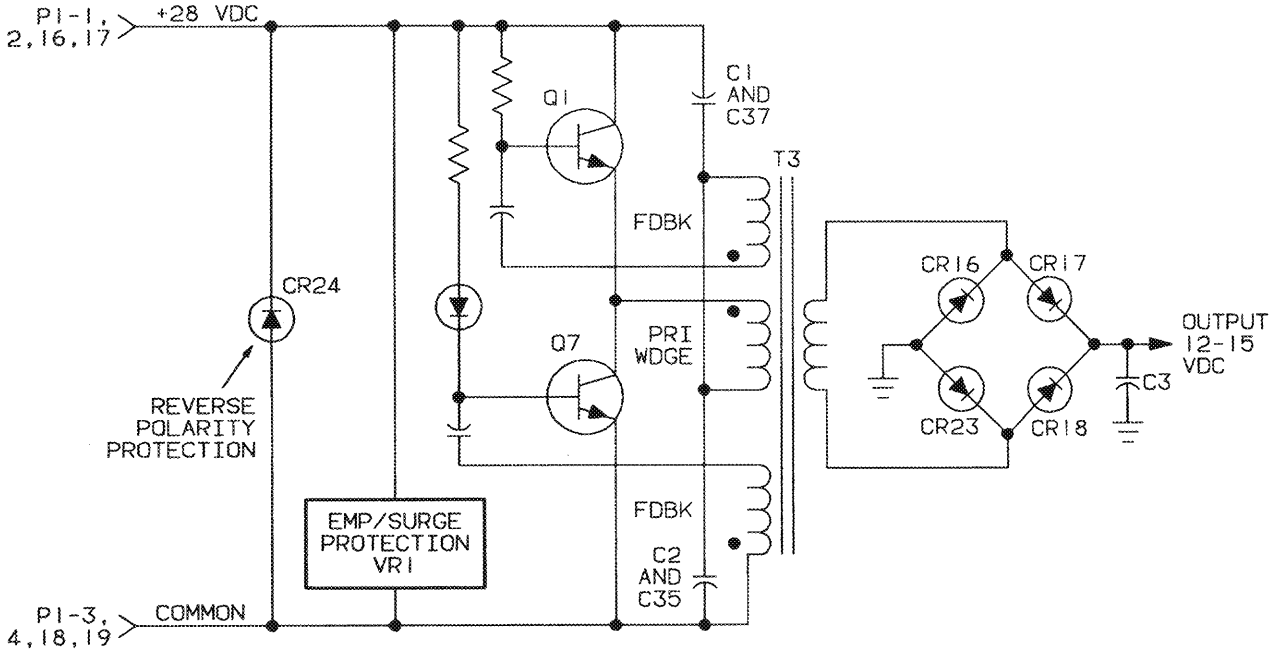


1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(The following detailed discussion is made in reference to the schematic in FO-3 and to the simplified schematics on these pages.)

(3) (Refer to FO-3, sheet 4.) The +28 Vdc input is protected from damage by reverse polarity of diode CR24. The input is also provided with overvoltage surge protection by zener diode VR1. This diode is rated at 54 volts; thus, any spike exceeding that value is shorted out. The first functional section is the dc-to-dc Inverter. Transistors Q1 and Q7 are connected in a half bridge configuration and have feedback windings on the output coupling transformer (T3) which provide positive feedback necessary for the circuit to oscillate. When power is applied to the circuit, Q1 conducts first. The base is biased to a higher level than Q7. As Q1 conducts, current flows through the primary winding. Voltage is induced into the feedback windings which are connected in a positive feedback manner. At this time, the field around the core begins to collapse. The polarity of the feedback voltage is reversed and transistor Q7 is biased ON while Q1 is biased OFF. The junction between the Q1 emitter and Q7 collector is alternately pulled to +28 Vdc and to ground. The transistor conduction path is completed through the parallel combination of C1 and C37 or through the C2 and C35 combination, depending upon which transistor is conducting. The output is a square wave with a frequency of about 40 kHz; thus Q1 and Q7 alternately conduct. As each transistor goes into and out of conduction, the current through T3 primary windings reverse direction. The ac voltage produced is coupled to the secondary windings where it is fed to the full-wave bridge rectifier (CR16, CR17, CR18 and CR23). The rectifier and bulk capacitor reduce AC ripple and provide a dc output of +12 to +15 Vdc. This is the voltage that is used to power circuit components which are used for control and supervisory purposes.

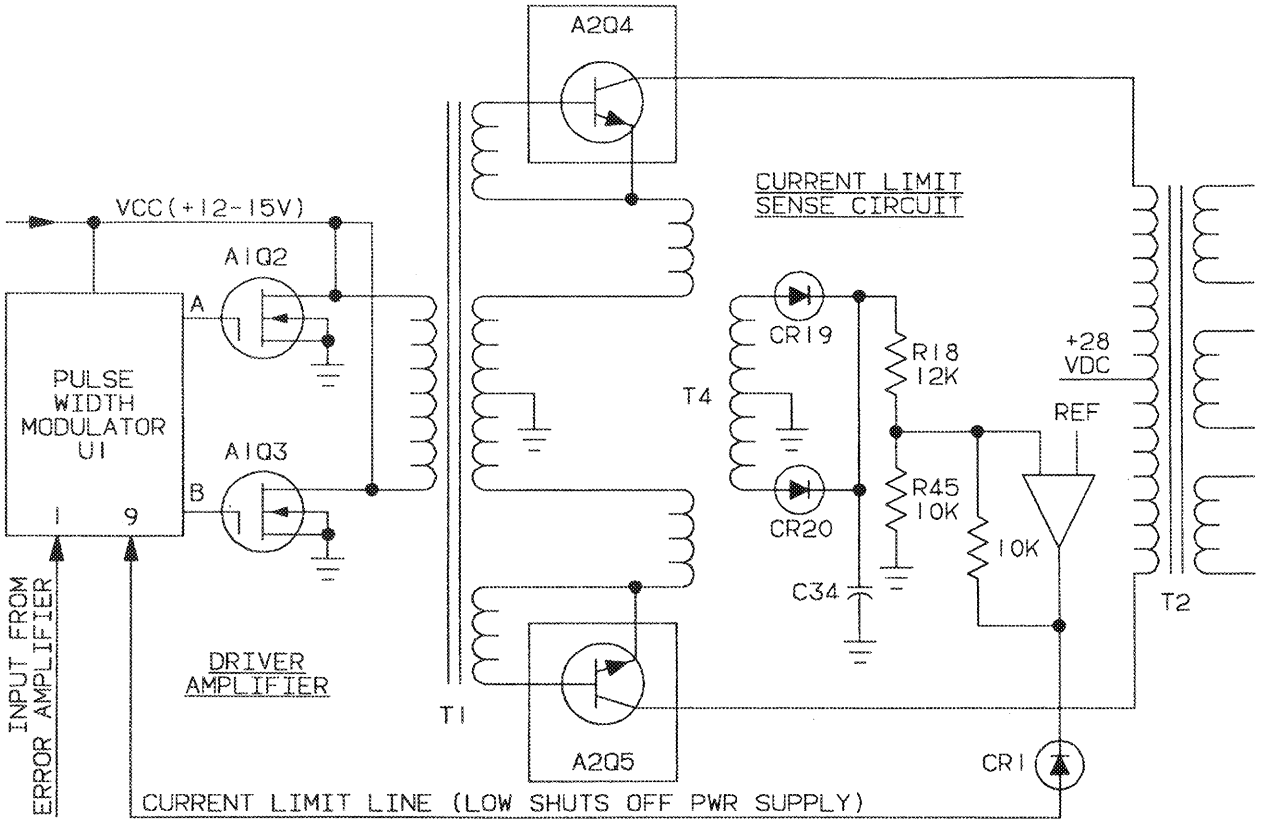
1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

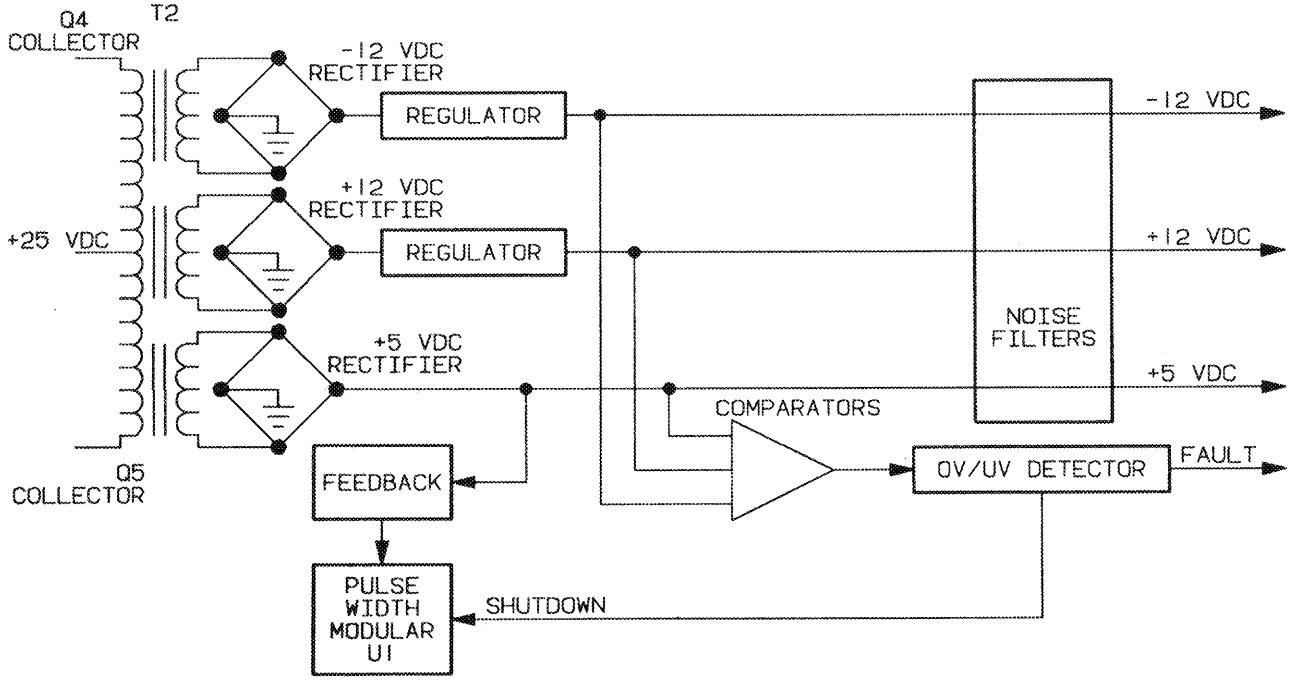
(4) (Refer to FO-3, sheet 2.) The +12 to +15 Vdc output from the inverter is routed to the remainder of the power supply used to power the control and supervisory circuits. Output voltage control of the +5 Vdc supply is the function of the PWM, U1. The PWM contains an oscillator which operates at about 40 kHz. R4 and C6 determine this frequency. The input to the PWM is the error OP AMP output. The +5 Vdc output is sampled and fed to an error OP AMP U3B. Its output is then fed to the PWM (U1-2). The square wave output of the PWM is fed to amplifiers Q2 and Q3 which drive T1. The final amplifer (Q4 and Q5) is connected in push-pull configuration and increases the output level enough to meet the needs of the three outputs. The push-pull amplifier is powered directly by the input +28 Vdc, not by the inverter output. It is important when making measurements on this amplifier to reference the measuring instrument to the +28 Vdc common or the +28 high side current overcurrent shutdown. T4 has two secondaries, one in the emitter circuit of Q4 and the other in the Q5 emitter circuit. Voltage induced in the secondary is proportional to the total Q4 and Q5 collector current. CR19 and CR20 rectify the AC and C34 is the bulk capacitor. The dc output is fed to the voltage divider R18 and R23. The voltage picked off the junction is fed to the inverting input of the OP AMP U3A. The output of the OP AMP is blocked by diode CR1. Thus the voltage on U1-9 is not influenced by the current limit unless it goes low. Normally this voltage is equal to the voltage at the error OP AMP output. An examination of the U1 control inputs reveal that they are connected as a unity gain voltage follower OP AMP (U3). Therefore the voltage at pins 1, 2, and 9 are equal and follow the input at pin 1. When the output current exceeds 12 amps or 5 V output, the PWM output begins to decrease and continues until the output is reduced. If the output voltage goes below about 4.3 Vdc, the power supply is latched off. If the overcurrent condition is less severe and the condition causing the excessive current is corrected, the power supply resumes normal operation.

1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(5) Output Stage. Refer to FO-3. The outputs from the three T2 secondaries are rectified by bridge rectifiers and filtered with inductive input LC filters. The output of the +5 Vdc supply is routed directly through the EMI filter FL1 to the output connector. The outputs for the +12 Vdc and the -12 Vdc supplies are fed to analog IC regulators. These regulated outputs are then fed through the EMI filter to the output. The schematic also reveals an output crowbar and lockout circuit on each of the power supply outputs.



1-15. FUNCTIONAL DESCRIPTION OF MAJOR COMPONENTS (Cont.)

(6) Control and Error Detection (Refer to FO-3, sheet 2). The control of the switching regulator is accomplished by sampling the +5 Vdc output. This line is fed to the inverting input of the error OP AMP (U3B). The error OP AMP is connected as an integrator. Therefore the output is rising or falling depending upon the polarity of the error voltage from the +5 Vdc output when compared with the reference value at U3 pin 3. The output voltage is under continual regulation to maintain a constant +5 Vdc. The error OP AMP (internal to the PWM) is connected as a voltage follower. The error signal from the integrator is therefore fed thru to the internal PWM which controls the pulse width of the square wave output at pins 11 and 14.

To review, this output is amplified by the two stage amplifier, is rectified, filtered, and the corrected output is again sensed and the control process continues to keep the output at the desired +5 Vdc. The rectified outputs of the +12 and -12 Vdc rectifiers follow the variations of the +5 Vdc output. However, they are independently regulated with analog type IC regulators and their outputs are essentially unaffected by the input variations. All three outputs are monitored by window detectors. U7A and U7B form the window detector for the +5 Vdc supply. U2A and U2B form a window detector (FO-3, sheet 3) sensing the +12 Vdc output. U2C is a level detector whose output goes low when the +12 Vdc output exceeds about 10 percent overvoltage. U7C and U7D are level detectors for the -12 Vdc supply. U7A and U7B outputs are fed to transistor Q11. When this line goes low, BIT lamp CR29 illuminates. Shutdown occurs when the +5 Vdc output deviates more than about 15 percent thru the action of the supervisory circuit U6. The inputs to U6 pins 6 and 7 are developed in the R29, R30, and R31 voltage divider. Similarly, the other window detectors and level detectors provide output levels to Q11 to turn on the BIT lamp and to the supervisory IC U6 to shut the power supply down. Any over-voltage condition in the output of any of the supplies cause the supply to shut down and remain off until action is taken to turn the supply off and then back on.

CHAPTER 2
UNIT MAINTENANCE

Section I. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

2-1. COMMON TOOLS AND EQUIPMENT

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

b. Navy. Navy personnel refer to applicable Tables of Allowance (TA).

c. Air Force. Air Force personnel refer to applicable Tables of Allowance (TA).

2-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools, TMDE, and support equipment and their purposes are listed in the Maintenance Allocation Chart, Appendix B.

2-3. REPAIR PARTS

Repair parts used during unit maintenance are listed and illustrated in the repair parts and special tools list located in TM 11-5895-1307-24P, (Navy) EE163-HK-PLD-010/W110-MD1204G, (Air Force) TO 31R2-4-585-4.

Section II. SERVICE UPON RECEIPT

2-4. CHECKING UNPACKED EQUIPMENT

CAUTION

The RN Modem contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364, Report of Discrepancy (ROD).

b. Check the equipment against the packing slip to see if the equipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

2-5. PRELIMINARY SERVICING OF EQUIPMENT

The RN Modem does not require alignment prior to installation. Perform the following checks upon receiving a new unit or prior to installing a repaired unit. The RN Modem is installed in accordance with the instructions contained in the following communications terminal manuals.

Terminal	Manual
AN/TRC-179(V)1,(V)3	(Army) TM 11-5895-1218-12 (Navy) EE150-LQ-OMI-010/W110-TRC179V (Air Force) TO 31R2-2TRC179-21
AN/TRC-179(V)2	(Army) TM 11-5895-1219-12 (Navy) EE150-LR-OMI-010/W110-TRC179V2 (Air Force) TO 31R2-2TRC179-1
AN/GRC-215	(Army) TM 11-5895-1220-12 (Navy) EE160-RG-OMI-101/W110-GRC215 (Air Force) TO 21R2-2GRC215-1
AN/FRC-180(V)2	(Army) TM-11-5895-1302-12 (Navy) EE160-RH-OMI-010/W110-FRC180 (Air Force) TO 31R2-2FRC180-1

2-5. PRELIMINARY SERVICING OF EQUIPMENT (Cont.)

a. Check all front panel connectors.

- Connectors will be securely mounted to the chassis.
- Connector pins will not be bent or broken.

b. Check all panel-mounted switches and lamps.

- ON indicator lamp will be installed in the lamp holder.
- Indicator lamp holder can be turned for blackout operation.
- Switch will be firmly attached and the switch guard will be in place and secure.
- The switch will operate to the ON and OFF positions.
- BIT fault indicator lamp will be installed in the lamp holder.
- BIT initiate pushbutton switch will be securely mounted to the front panel.
- BIT initiate pushbutton switch will operate evenly and does not bind or remain in when pressed.

c. Check the general mechanical condition of the RN Modem chassis.

- The front panel handles are securely mounted to the panel.
- The mounting channels will be securely fastened to the front panel.

d. Remove top cover (para 2-12), check the front panel, power supply, and plug in CCAs.

- Gasket may be loose or damaged, replace if necessary.
- The power supply assembly and cardcage assembly will be firmly mounted to the RN modem chassis.
- The interior will not have loose hardware or metal filings, and will be free of dirt, grease, lint, and other contaminating materials.
- Cables will be free of cuts and punctures and will be properly connected.
- The front panel ribbon cable W1 will be connected.

2-5. PRELIMINARY SERVICING OF EQUIPMENT (Cont.)

- The CCAs A3, A5, A6, A7 and A8 will be securely mounted in the cardcage.
- CCAs A5, A6, A7, and A8 will have extractors attached at the corners.
- Socket head screws holding A3 into place will be secured.
- Coaxial connector W3P2 will be connected to A6J21 on the Timing Control and Viterbi Decoder CCA (A6).

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-6. INTRODUCTION

Unit preventive maintenance procedures help maintain the equipment in a serviceable condition. They include items to be checked and procedures for checking them. The checks and services described in the PMCS table outline inspections that are to be made at specific monthly (M) and quarterly (Q) intervals.

a. Routine Checks. The following items are not listed in the PMCS table. Defects that can be found by these checks are obvious and should be reported and corrected when found.

- Cleaning and dusting.
- Checking for frayed cables.
- Covering unused receptacles.
- Checking for loose nuts, bolts, and screws.

b. Explanation of Columns.

(1) Item number column. This column is used as a source of item numbers for the TM Number Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

(2) Interval column. This column specifies the frequency of the check, M for Monthly checks and Q for Quarterly checks.

(3) Item to be inspected column. This column specifies the item that is to be checked.

(4) Procedures column. This column describes the procedure by which the check is to be performed.

2-6. INTRODUCTION (Cont.)

c. Instructions for Reporting and Correcting Deficiencies. If your equipment does not perform as required, refer to the trouble-shooting procedures within this chapter. Report any malfunction or failures on the proper DA Form 2404, or refer to DA Pam 738-750.

NOTE

If your equipment must be in operation all the time, only do items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

2-7. UNIT PMCS TABLE

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

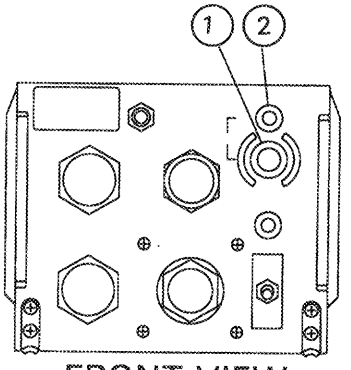
Item No.	Interval		Item To Be Inspected	Procedures
	M	Q		
1	●		End item equipment.	Inspect for completeness.
2	●		Communications equipment performance.	Initiate terminal off-line BIT. If BIT fails, refer to troubleshooting procedures in Section IV, Chapter 2.

Section IV. UNIT TROUBLESHOOTING

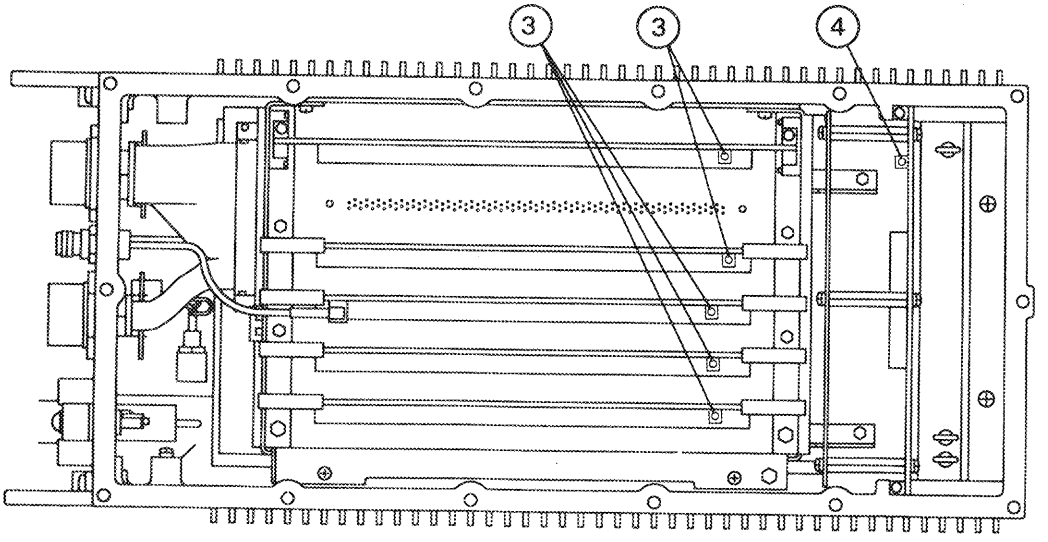
2-8. GENERAL

a. Unit level troubleshooting procedures for the RN Modem are performed in the system and are simplified by both on-line and off-line built-in-test (BIT) and fault detection capabilities.

- RN Modem off-line BIT is automatically run upon power up or it can be initiated by pressing the BIT pushbutton switch (1).
- The front panel BIT fault indicator lamp (2) lights to show faults sensed within the RN Modem.
- The CCAs BIT fault LEDs (3) are located near the top edge of the CCAs and indicate failure of the individual CCA or failure of an associated assembly.
- The Power Supply BIT fault LED (4) is located near the top edge of the assembly and indicates failure of PS1.



FRONT VIEW



COVER REMOVED, TOP VIEW

2-8. GENERAL (Cont.)

b. The BIT can fault isolate to the following assemblies that are removed and replaced at the unit maintenance level.

- Power Supply Assembly PS1
- Data Controller CCA A8
- Data Interface CCA A7
- Timing Control and Viterbi Decoder CCA A6
- Analog I/O and Modulator CCA A5
- Signal Processor CCA A3

c. Some defects and corrective measures are routine and will be corrected at the unit maintenance level.

- Checking and replacing failed PWR ON/OFF indicator lamp.
- Checking and replacing failed BIT fault indicator lamp.

CAUTION

When a circuit breaker can not be reset or trips immediately upon reset, this may be an indication of a short circuit or severe component failure. Do not force circuit breakers to remain on by holding them in place. More extensive damage can occur.

- Checking and resetting the PWR ON/OFF circuit breaker.
- Tighten, repair, and replace handles and channel mount assemblies.

2-9. TROUBLESHOOTING PROCEDURE

Troubleshooting procedures are provided as an aid to the unit maintenance technician. Due to the complexity of the equipment, it is not possible to prepare procedures for every possible failure. They are intended as a guide for using logical step-by-step troubleshooting procedures. Upon completion of corrective action and before returning the RN Modem to service, initiate BIT to verify system operational status. Refer to the following symptom index to determine the troubleshooting procedure to follow.

SYMPTOM INDEX

2-9. TROUBLESHOOTING PROCEDURE (Cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. MODEM IS COMPLETELY INOPERATIVE

STEP 1. Disconnect power input cable from J5. Measure for +28 Vdc input power, on pins A & B of power cable plug.

If input power is not present, refer to the appropriate system operator's TM to restore input power to the RN Modem. Connect power input cable to J5.

STEP 2. Move PWR ON/OFF switch to the ON (up) position. Check that PWR ON indicator lamp lights.

If PWR ON indicator lamp does not light, check/replace lamp. If the PWR ON indicator lamp still does not light, the RN Modem is not repairable at the Unit level.

STEP 3. Depress and release BIT initiate pushbutton switch. Check that BIT fault indicator lamp flashes on and off for approximately 20 seconds and then remains off.

If BIT fault indicator lamp fails to stop flashing, check that 10 MHz reference frequency input cable from the RFO is connected to J2. Restore 10 MHz reference frequency and repeat step 3.

If 10 MHz reference frequency is present and BIT fault indicator lamp fails to flash on and off, replace Timing Control and Viterbi Decoder CCA (A6) (para 2-16). Initiate BIT.

If A6 has been replaced and BIT fault indicator lamp fails to flash on and off, replace the Data Controller CCA (A8) (para 2-14). If this does not correct the problem, replace Data Interface CCA (A7). If this does not correct the problem, the unit is not repairable at the Unit level.

If BIT fault indicator lamp flashes on and off for approximately one minute then remains on, refer to Troubleshooting Procedure 2.

2-9. TROUBLESHOOTING PROCEDURE (Cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. MODEM FAILS BIT

STEP 1. Remove top cover (para 2-12), reconnect all input cables and turn on the modem. Depress and release BIT pushbutton switch. Check that BIT fault indicator lamps on front panel, and CCA fault indicators flash for approximately 1 minute.

If BIT fault indicators do not flash, refer to Troubleshooting Procedure 1 above.

NOTE

More than one CCA BIT fault indicator may be lighted during a BIT fault. Each time the BIT initiate push-button switch is depressed, follow these procedures in order. Ignore multiple fault indicators.

STEP 2. Check Power Supply (PS1) BIT fault indicator.

If BIT fault indicator is lighted, replace PS1 (para 2-13). Initiate BIT.

STEP 3. Check Data Controller CCA (A8) BIT fault indicator.

If BIT fault indicator is lighted, replace Data Controller CCA (A8) (para 2-14). Initiate BIT.

STEP 4. Check Data Interface CCA (A7) BIT fault indicator.

If BIT fault indicator is lighted, replace Data Interface CCA (A7) (para 2-15). Initiate BIT.

STEP 5. Check Timing Control and Viterbi Decoder CCA (A6) BIT fault indicator.

If BIT fault indicator is lighted, replace Timing Control and Viterbi Decoder CCA (A6) (para 2-16). Initiate BIT.

2-9. TROUBLESHOOTING PROCEDURE (Cont.)

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

2. MODEM FAILS BIT (Cont.)

STEP 6. Check Analog I/O and Modulator CCA (A5) BIT fault indicator.

If BIT fault indicator is lighted, replace Analog I/O and Modulator CCA (A5) (para 2-17). Initiate BIT.

STEP 7. Check Signal Processor CCA (A3) BIT fault indicator.

If BIT fault indicator is lighted, replace Signal Processor CCA (A3) (para 2-18). Initiate BIT.

STEP 8. Verify that no BIT fault indicators light.

If any BIT fault indicator is lighted, and all assemblies have been replaced, RN Modem is not repairable at Unit level. Replace top cover and notify next higher level of maintenance.

Section V. UNIT MAINTENANCE

2-10. GENERAL

a. This section contains maintenance procedures which are the responsibility of unit maintenance as authorized by the Maintenance Allocation Chart (MAC); refer to Appendix B.

CAUTION

The RN Modem contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures. When shipping, place item in anti-static bag. The following assemblies are ESD Sensitive:

2-10. GENERAL (Cont.)

- Data Controller Assembly A3028727
- Data Interface Assembly A3023903
- Analog I/O and Modulator Assembly A3023976
- Signal Processor Assembly A3078299
- Timing/Control/Viterbi Decoder Assembly A3023988
- Power Supply Assembly A3024066

b. Operational check. Initiate off-line BIT by pressing the BIT pushbutton on the front panel of the Modem. BIT fault indicator lamp should flash for approximately 20 seconds, then remain off.

c. Inspection of installed items. Inspect all assemblies and parts mounted on the RN Modem to determine if the item is damaged or incomplete to the extent that it should be replaced/repaired.

2-11. REPLACEMENT OF MD-1204/G

Refer to system TMs (para 2-5) to remove the modem from its rack installation.

2-12. REMOVAL AND REPLACEMENT OF MD-1204/G TOP COVER

INITIAL SET-UP

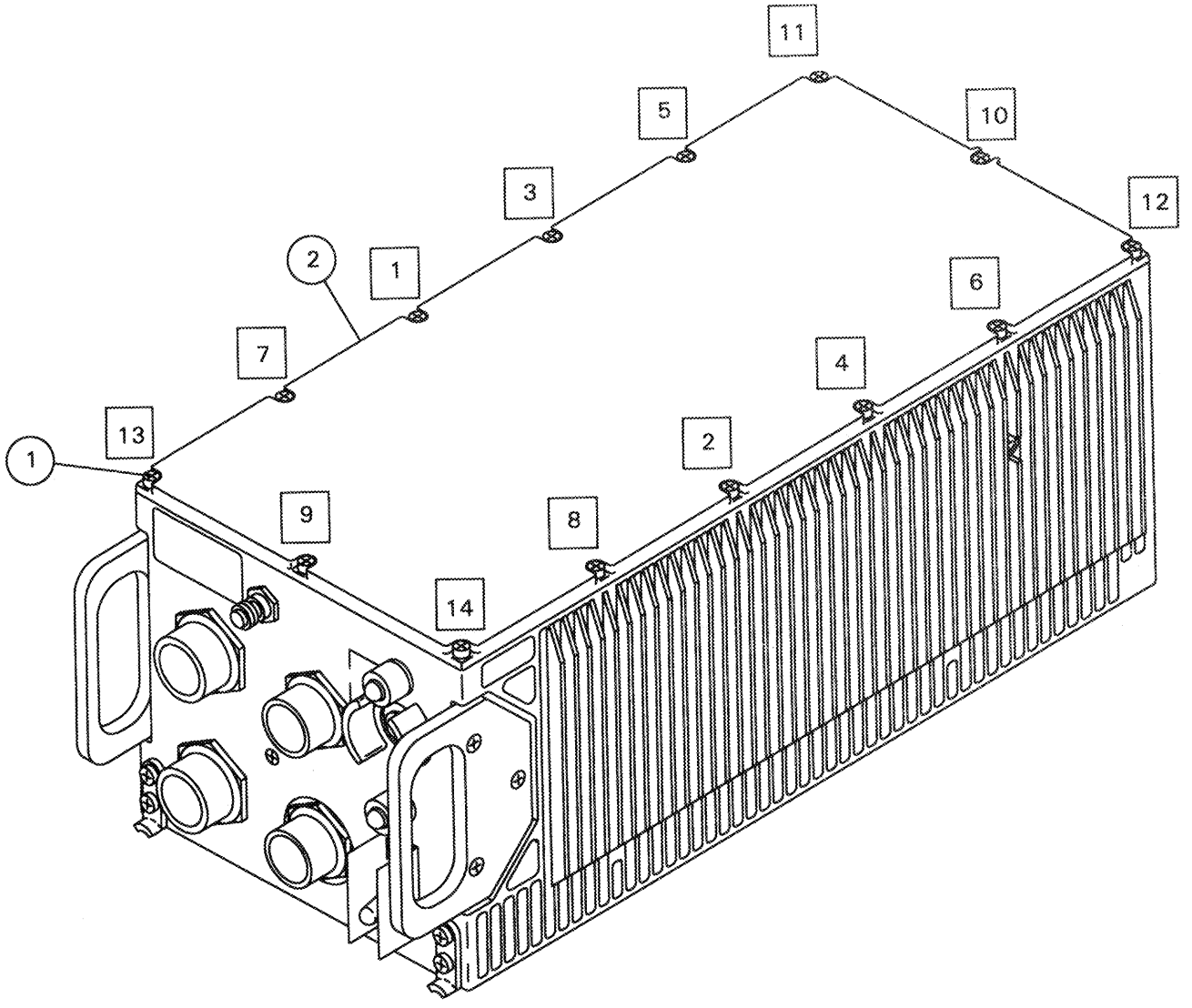
Tools	Equipment Condition
Tool Kit, TK-101/G Torque Screwdriver, 0-30 in. lbs.	Power OFF. RN modem removed from rack, (para 2-11).

Disassembly and assembly consists of removing and replacing the top cover. This requires a crosstip screw-driver to loosen the 14 captive screws (1) securing the top cover (2). Removal of the top cover is necessary to observe BIT fault indicators on the power supply and CCAs and for removal and replacement of the power supply and CCAs. When the cover is replaced, torque cover screws to 15-18 inch-pounds starting with screw (1) and continue in sequence to screw (14).

NOTE

If gasket is damaged, it must be replaced prior to reinstalling cover.

2-12. REMOVAL AND REPLACEMENT OF MD-1204/G TOP COVER (Cont.)



2-14. REPLACEMENT OF DATA CONTROLLER CCA (A8)

INITIAL SETUP

Tools

Tool Kit TK-101/G
Static Control Service Kit

Equipment Condition

Power off
Top cover removed (para 2-12)

Materials/Parts

Data Controller CCA, A8, P/N A3028727
Anti-Static Bag

REMOVE DATA CONTROLLER ASSEMBLY (A8)

CAUTION

The Data Controller CCA contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

STEP 1. Circuit card ejectors (1) are mounted on top corners of CCA. Lift card ejectors up and out to release CCA from edge connector.

NOTE

Circuit card ejectors will not move more than 90 degrees.

STEP 2. Lift CCA (2) from assembly by pulling straight up.

STEP 3. Place CCA into anti-static bag.

REPLACE DATA CONTROLLER CCA (A8)

STEP 1. Remove Data Controller CCA (2) from anti-static bag.

STEP 2. Place CCA into card guides (3) on cardcage assembly. Check keys on CCA (4) and connector to ensure that they match.

STEP 3. Push straight down on CCA to engage securely into edge connector.

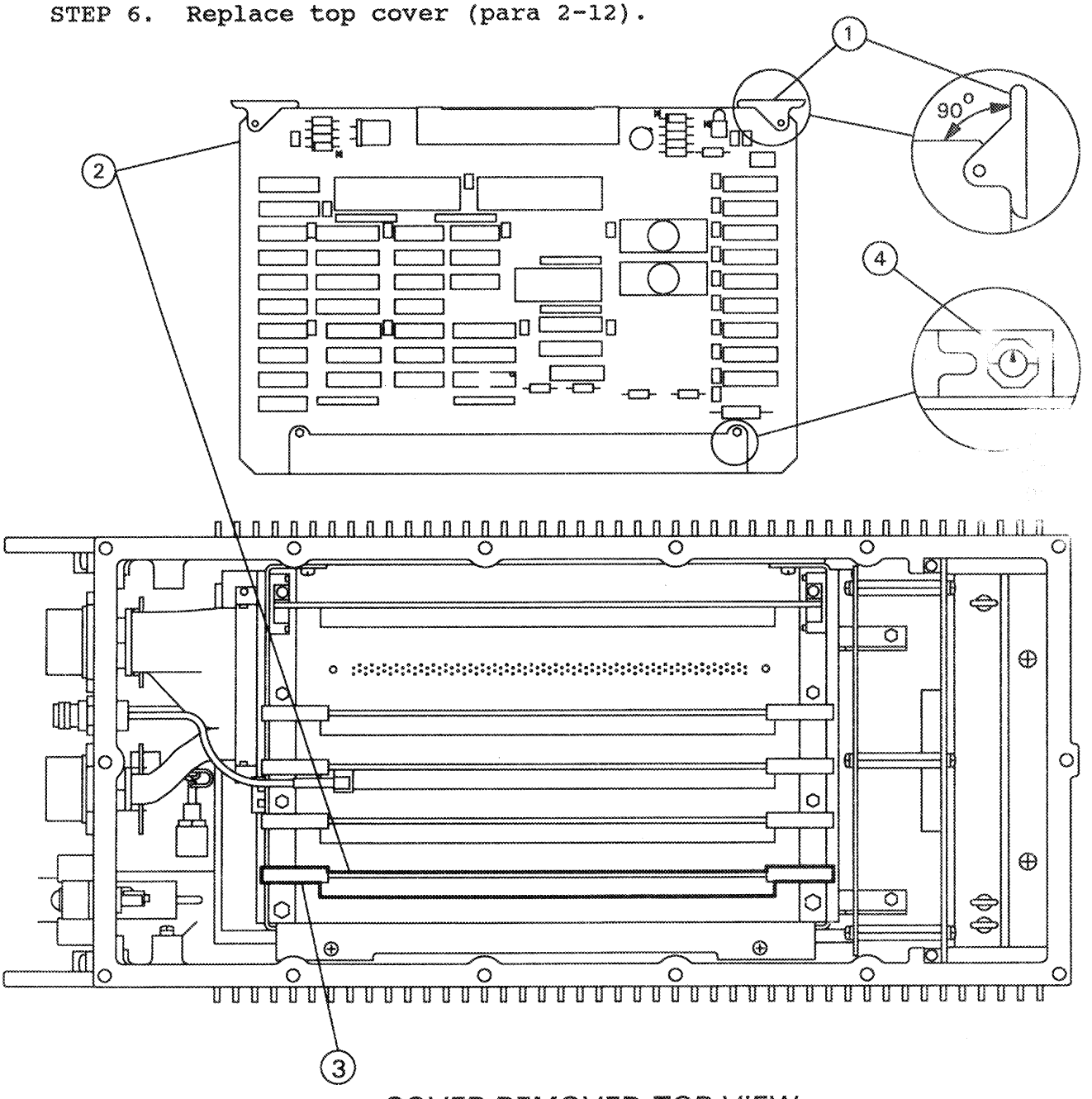
2-14. REPLACEMENT OF DATA CONTROLLER CCA (A8) (Cont.)

REPLACE DATA CONTROLLER CCA (A8) (Cont.)

STEP 4. Check that card ejectors (1) are flat and flush with top of chassis.

STEP 5. Perform operational check to verify unit is working properly (para 3-5).

STEP 6. Replace top cover (para 2-12).



COVER REMOVED,TOP VIEW

2-15. REPLACEMENT OF DATA INTERFACE CCA (A7)

INITIAL SETUP

Tools

Tool Kit TK-101/G
Static Control Service Kit

Equipment Condition

Power off
Top cover removed (para 2-12)

Materials/Parts

Data Interface CCA, A7, P/N 3023903
Anti-Static Bag

REMOVE DATA INTERFACE ASSEMBLY (A7)

CAUTION

The Data Interface CCA contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

STEP 1. Circuit card ejectors 1 are mounted on top corners of CCA. Lift card ejectors up and out to release CCA from edge connector.

NOTE

Circuit card ejectors will not move more than 90 degrees.

STEP 2. Lift CCA (2) from assembly by pulling straight up.

STEP 3. Place CCA into anti-static bag.

REPLACE DATA INTERFACE CCA (A7)

STEP 1. Remove Data Interface (2) CCA from anti-static bag.

STEP 2. Place CCA into card guides (3) on cardcage assembly. Check keys on CCA (4) and connector to ensure that they match.

STEP 3. Push straight down on CCA to engage securely into edge connector.

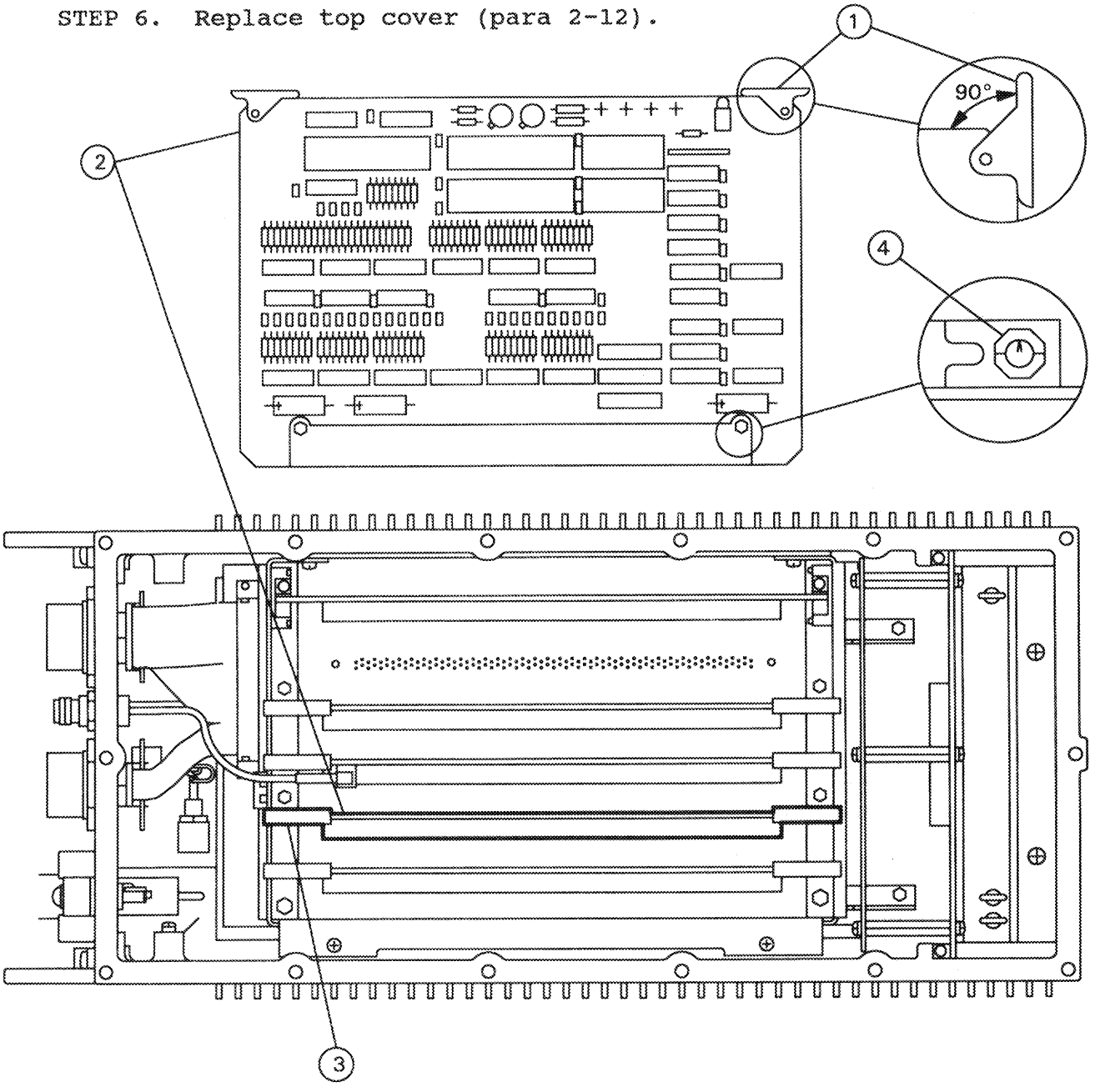
2-15. REPLACEMENT OF DATA INTERFACE CCA (A7) (Cont.)

REPLACE DATA INTERFACE CCA (A7) (Cont.)

STEP 4. Check that card ejectors (1) are flat and flush with top of chassis.

STEP 5. Perform operational check to verify unit is working properly (para 3-5).

STEP 6. Replace top cover (para 2-12).



COVER REMOVED, TOP VIEW

2-16. REPLACEMENT OF TIMING CONTROL AND VITERBI DECODER CCA (A6)

INITIAL SETUP

Tools	Equipment Condition
Tool Kit TK-101/G	Power off
Static Control Service Kit	Top cover removed (para 2-12)

Materials/Parts

Timing Control and Viterbi Decoder CCA, A6, P/N A3023988
Anti-Static Bag

CAUTION

The Timing Control and Viterbi Decoder CCA contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

REMOVE TIMING CONTROL AND VITERBI DECODER CCA (A6)

STEP 1. Using needle-nose pliers, disconnect A1W2P1 from XA6J3 (1) by pulling up on the connector. Do not pull on the cable.

STEP 2. Circuit card ejectors (2) are mounted on top corners of CCA. Lift card ejectors up and out to release CCA from edge connector.

NOTE

Circuit card ejectors will not move more than 90 degrees.

STEP 3. Lift Timing Control and Viterbi Decoder CCA (3) from assembly by pulling straight up.

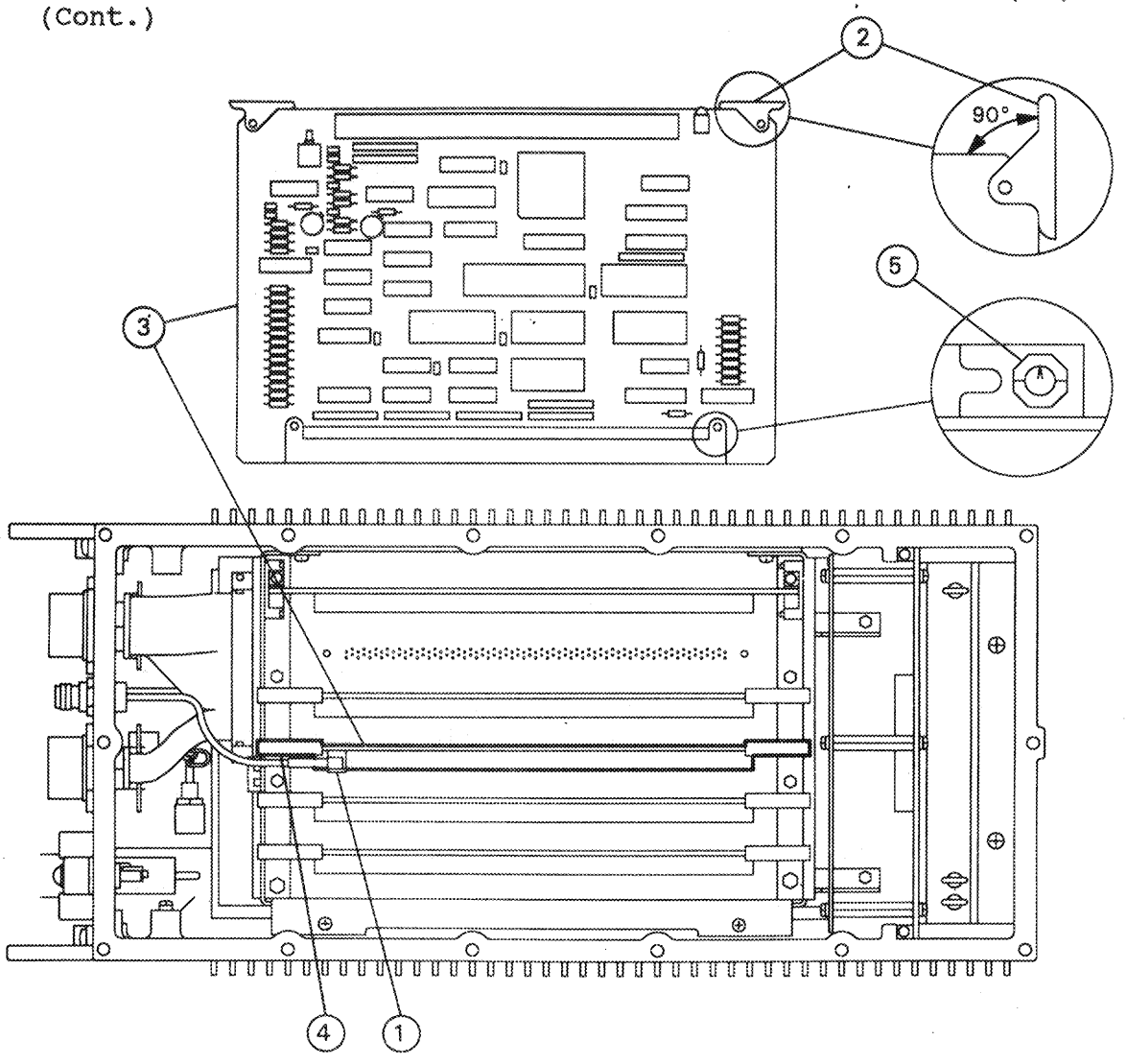
STEP 4. Place CCA into anti-static bag.

REPLACE TIMING CONTROL AND VITERBI DECODER CCA (A6)

STEP 1. Remove Timing Control and Viterbi Decoder CCA (3) from anti-static bag.

STEP 2. Place CCA into card guides (4) on cardcage assembly. Check keys on CCA (5) and connector to ensure that they match.

2-16. REPLACEMENT OF TIMING CONTROL AND VITERBI DECODER CCA (A6) (Cont.)



COVER REMOVED, TOP VIEW

STEP 3. Push straight down on CCA to engage securely into edge connector.

STEP 4. Reconnect A1W2P1 to XA6J3 (1) by pushing straight down on the connector.

STEP 5. Check that card ejectors (2) are flat and flush with top of chassis.

STEP 6. Perform operational check to verify unit is working properly (para 3-5).

STEP 7. Replace top cover (para 2-12).

2-17. REPLACEMENT OF ANALOG I/O AND MODULATOR CCA (A5)

INITIAL SETUP

Tools

Tool Kit TK-101/G
Static Control Service Kit

Equipment Condition

Power off
Top cover removed (para 2-12)

Materials/Parts

Analog I/O and Modulator CCA, A5, P/N A3023976
Anti-Static Bag

REMOVE ANALOG I/O AND MODULATOR ASSEMBLY (A5)

CAUTION

The Analog I/O and Modulator CCA contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

STEP 1. Circuit card ejectors (1) are mounted on top corners of CCA. Lift card ejectors up and out to release CCA from edge connector.

NOTE

Circuit card ejectors will not move more than 90 degrees.

STEP 2. Lift CCA (2) from assembly by pulling straight up.

STEP 3. Place CCA into anti-static bag.

REPLACE ANALOG I/O AND MODULATOR CCA (A5)

STEP 1. Remove CCA (2) from anti-static bag.

STEP 2. Place CCA into card guides (3) on cardcage assembly. Check keys on CCA (4) and connector to ensure that they match.

STEP 3. Push straight down on CCA to engage securely into edge connector.

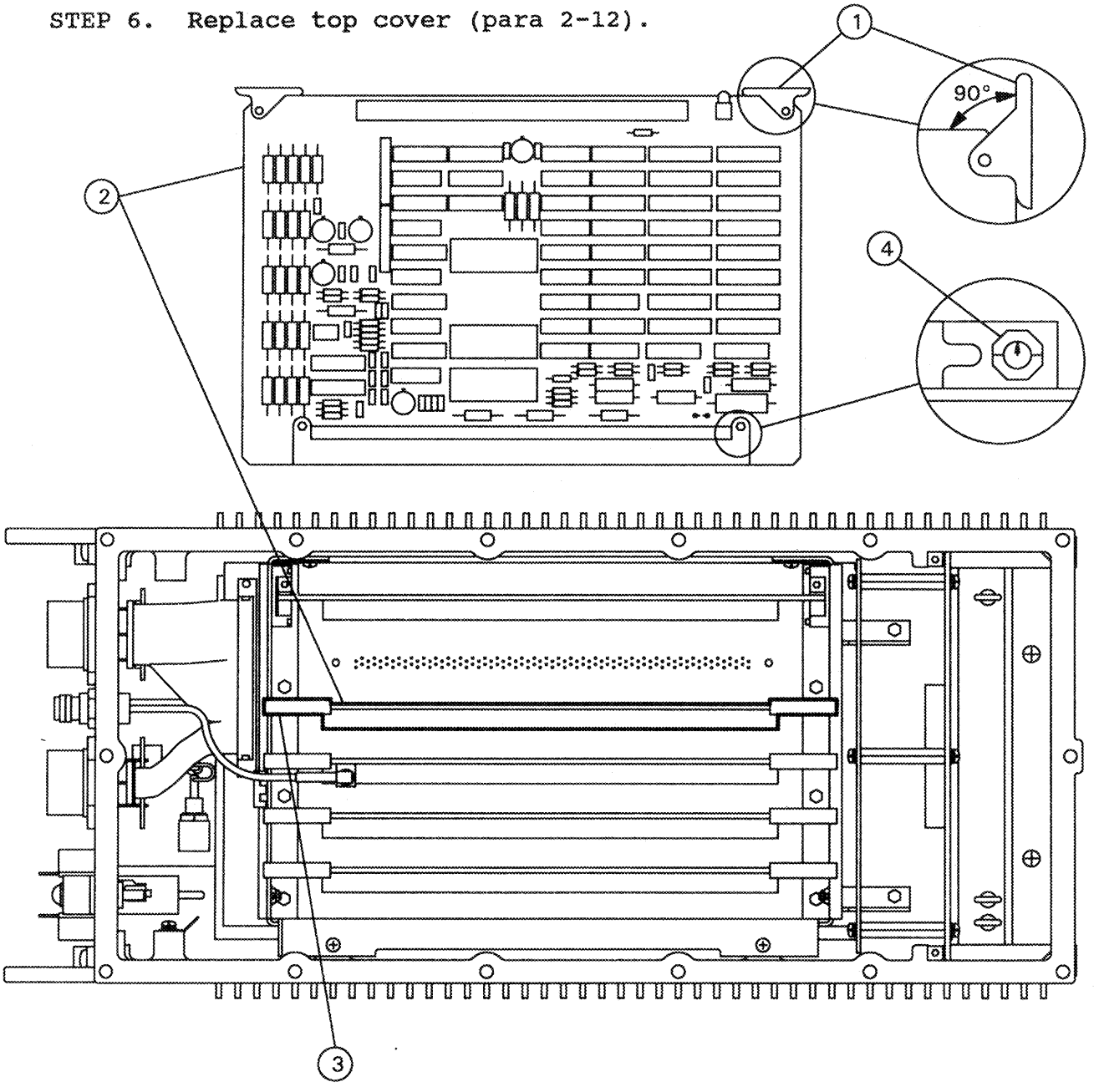
2-17. REPLACEMENT OF ANALOG I/O AND MODULATOR CCA (A5) (Cont.)

REPLACE ANALOG I/O AND MODULATOR CCA (A5) (Cont.)

STEP 4. Check that card ejectors (1) are flat and flush with top of chassis.

STEP 5. Perform operational check to verify unit is working properly (para 3-5).

STEP 6. Replace top cover (para 2-12).



COVER REMOVED, TOP VIEW

2-18. REPLACEMENT OF SIGNAL PROCESSOR CCA (A3)

INITIAL SETUP

Tools

Tool Kit TK-101/G
Static Control Service Kit

Equipment Condition

Power off
Top cover removed (para 2-12)

Materials/Parts

Signal Processor CCA, A3, P/N A3028299
Anti-Static Bag

REMOVE SIGNAL PROCESSOR CCA (A3)

CAUTION

The Signal Processor CCA contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

STEP 1. Loosen 2 captive sockethead screws (1) securing the Signal Processor CCA (2) to the cardcage.

STEP 2. Lift CCA from assembly by pulling straight up.

STEP 3. Place CCA into anti-static bag.

REPLACE SIGNAL PROCESSOR CCA (A3)

STEP 1. Remove Signal Processor CCA (2) from anti-static bag.

STEP 2. Place CCA into card guides (3) on cardcage assembly. Check keys on CCA (1) and connector to ensure that they match.

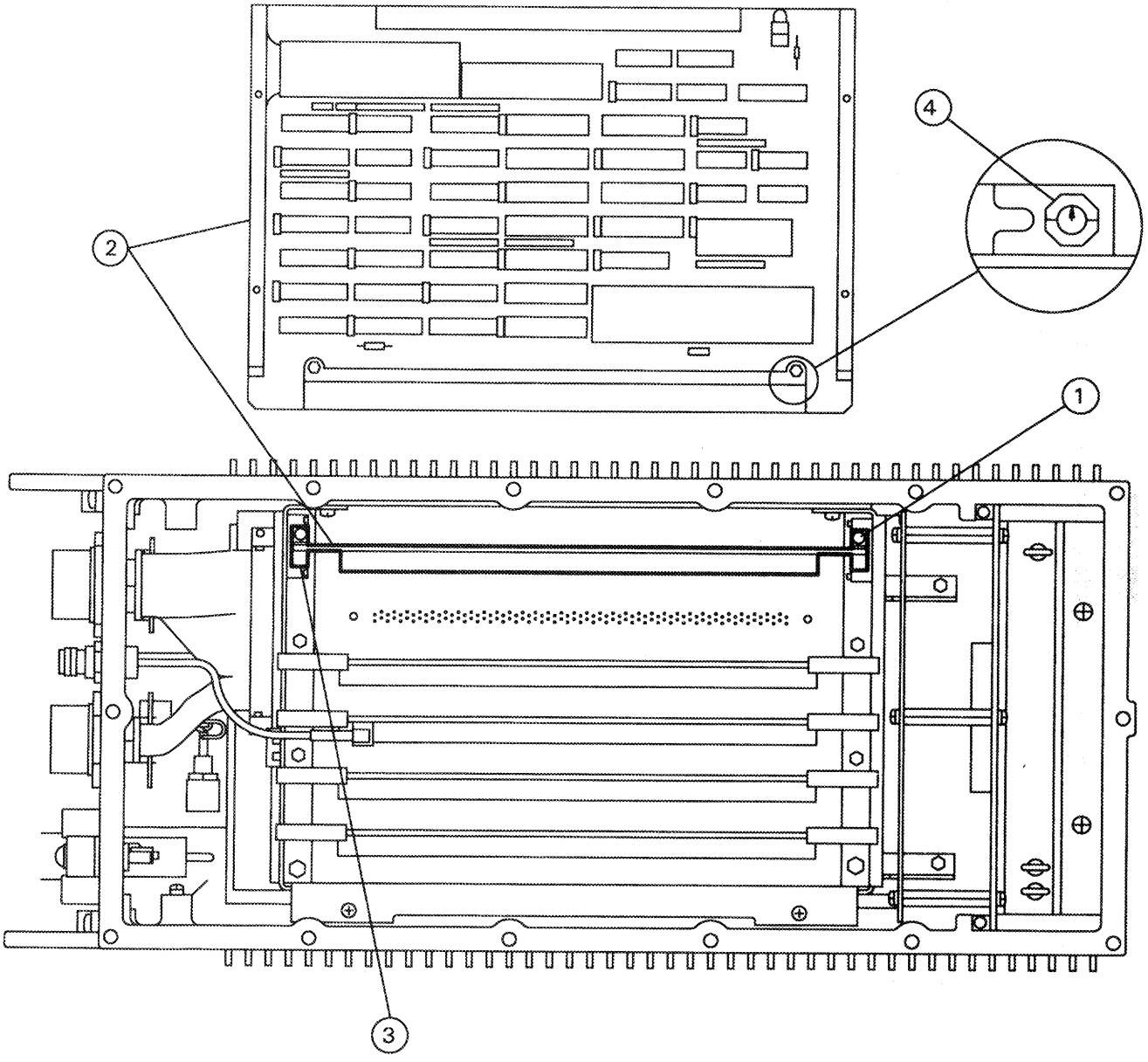
STEP 3. Push straight down on CCA to engage securely into edge connector.

STEP 4. Tighten sockethead screws (1) to secure CCA to cardcage.

STEP 5. Perform operational check to verify unit is working properly (para 3-5).

STEP 6. Replace top cover (para 2-12).

2-18. REPLACEMENT OF SIGNAL PROCESSOR CCA (A3) (Cont.)



COVER REMOVED, TOP VIEW

2-19. CLEANING

WARNING

Turn off all equipment power before using TRICHLOROTRIFLUOROETHANE. Provide adequate ventilation while using TRICHLOROTRIFLUOROETHANE. Avoid prolonged breathing of the fumes and vapor. Do not use solvent near heat or open flames; the products decomposed are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, avoid prolonged contact with the skin. When needed, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

Use a dry, clean, lint-free cloth or brush to remove dust or dirt. If needed, moisten the cloth or brush with TRICHLOROTRIFLUOROETHANE. After cleaning, wipe dry with a clean cloth.

Section VI. PREPARATION FOR STORAGE OR SHIPMENT

2-20. GENERAL

a. Army. Refer to paragraph 1-6a for administrative storage.

b. Navy. Refer to NAVSUP PUB 503.

c. Air Force. Refer to AFM 66-267 (storage) and AFR 67-31 (shipment).

2-21. MARKING

The marking on the exterior of the container shall be in accordance with MIL-STD-129H.

CHAPTER 3
INTERMEDIATE DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE

NOTE

Intermediate Direct Support is not allocated for the RN Modem.

Section I. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

3-1. COMMON TOOLS AND EQUIPMENT

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

b. Navy. Navy personnel refer to applicable Tables of Allowance (TA).

c. Air Force. Air Force personnel refer to applicable Tables of Allowance (TA).

3-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT

Special tools, TMDE, and support equipment and their purposes are listed in the Maintenance Allocation Chart, Appendix B.

3-3. REPAIR PARTS

Repair parts used during intermediate general support maintenance are listed and illustrated in the repair parts and special tools list located in TM 11-5895-1307-24P, (Navy) EE163-HK-PLD-010/W110-MD1204G, (Air Force) TO 31R2-4-585-4.

Section II. INTERMEDIATE GENERAL SUPPORT TROUBLESHOOTING

3-4. GENERAL

a. At Intermediate General Support Maintenance Level, either an entire RN modem or only the power supply assembly may be received for maintenance (refer to appendix B). General support maintenance accomplishes modem chassis repair, wiring repair, and repair of the power supply. Repair of the power supply includes component replacement.

b. An inspection and test of the received item must be accomplished prior to applying power. Failure to perform an inspection could result in incorrect indications during test, or damage to components due to incorrect mounting or seating. Refer to Chapter 2, Section II for service upon receipt requirements for the RN modem.

c. Upon completion of troubleshooting and repair of RN modem chassis and/or power supply an operational check is performed again to validate the repair action. (Operational check consisting of the procedures given in para 3-5.)

d. Intermediate general support maintenance level troubleshooting procedures for the RN modem is simplified by both on-line and off-line built-in test (BIT) and fault detection capabilities. RN modem off-line BIT is initiated automatically upon power up or by depressing the BIT initiate pushbutton switch.

e. RN modem BIT identifies failed or faulty assemblies in the modem by lighting a LED on failed CCA or power supply.

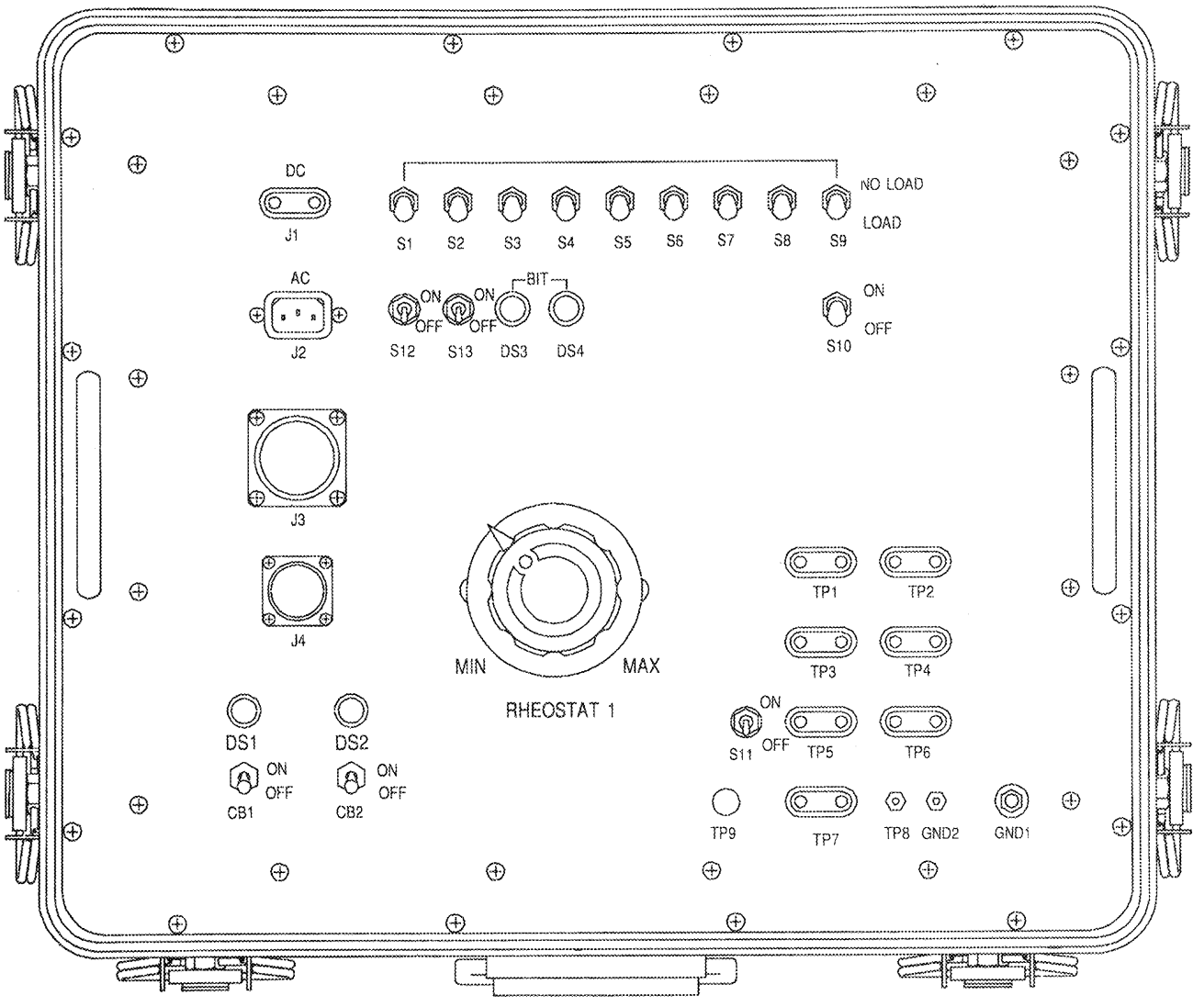
f. An operational test of the RN modem and/or power supply assembly must be accomplished prior to troubleshooting to validate the symptom of the reported failure and type of repair.

g. Defects and corrective measures for items listed below are not in the troubleshooting chart. These are routine and should be corrected when noted.

- Front panel indicators and holders.
- Replacing/repairing handles.
- Replacing damaged top cover.
- Replacing top cover cushions and screws.

h. Test Set, Power Supply TS-4243/G. The test set provides the necessary loads, interface, and test points required to test RN power supply assemblies including PS1. It includes an assortment of cables including W1, W3, and W5. For complete operating and maintenance instructions for the test set see TM 11-6625-3218-14&P.

3-4. GENERAL (Cont.)



TEST SET, POWER SUPPLY TS-4243/G
(Commonly referred to as Test Fixture)

3-5. OPERATIONAL TEST OF RN MODEM

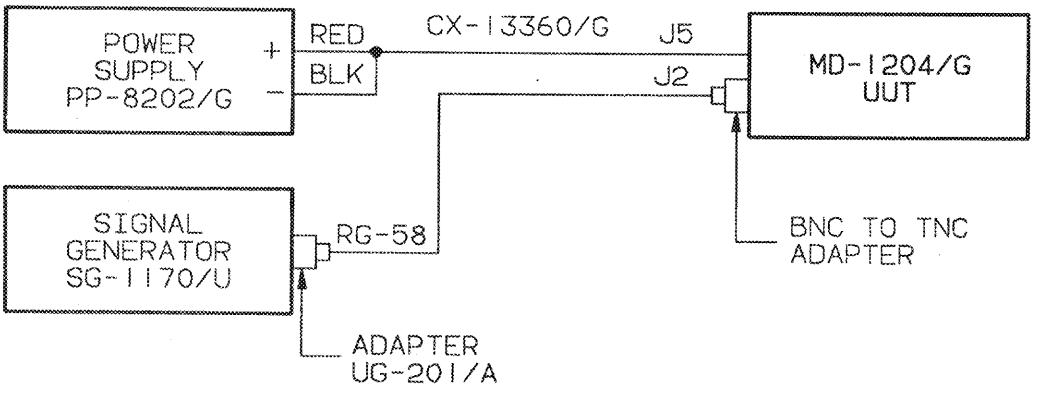
The following test is performed -

- Upon receiving a suspected defective RN modem.
- Following troubleshooting of a RN modem.
- After completing repair action on a RN modem.

Except for the source of the input power and 10 MHz signal, troubleshooting procedures for BIT failures of the RN modem are the same as those contained in paragraph 2-9. Refer to the Symptom Index in paragraph 3-7 for further assistance in troubleshooting the RN modem.

INITIAL SETUP

Test Equipment	Equipment Condition
DC Power Supply, PP-8202/G	Power off
Power Cable, CX-13360/G	Test setup
Signal Generator, SG-1170/U	
Adapter, BNC to TNC	Tools
Test Cable, RG-58, Male BNC to Male BNC (2 each)	Workstation, Static
Adapter, UG-201/A	



STEP 1. Remove unit under test (UUT) top cover (para 2-12).

STEP 2. Set power supply POWER switch to ON. Set the voltage to +28 Vdc. Observe that current is approximately 1.5 amps.

STEP 3. Set Signal Generator POWER switch to ON. Set output to 10 MHz, OdBm.

STEP 4. Set UUT PWR ON switch to ON.

STEP 5. Check that PWR ON indicator lights and that power on BIT is performed automatically. BIT fault indicators on UUT front panel and CCAs will flash for approximately seconds at a 1 Hz rate. BIT lamp on PS1 flashes once upon energizing, and then goes off and remains off.

3-6. OPERATIONAL TEST OF RN MODEM POWER SUPPLY (PS1)

The following tests are performed -

- Upon receiving a suspected defective RN Modem power supply removed at unit level.
- Following troubleshooting of a RN Modem and removal of a power supply as a possible defective unit.
- After completing repair action on a power supply.

If a failure occurs during operational test, refer to the symptom index in paragraph 3-7.

INITIAL SETUP

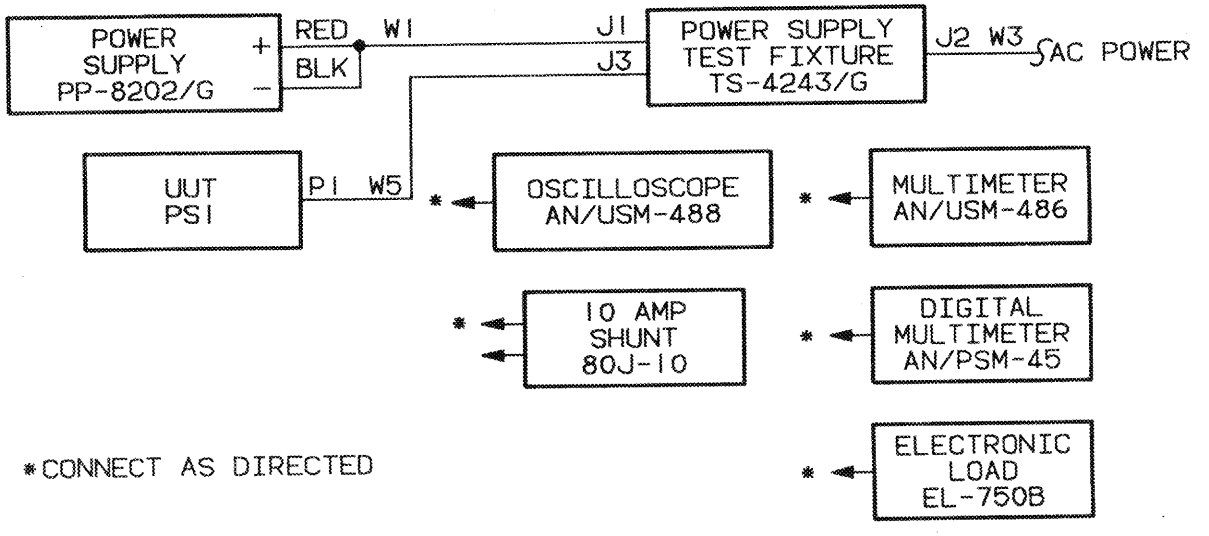
Test Equipment
DC Power Supply, PP-8202/G
Power Supply Test Set, TS-4243/G
Oscilloscope, AN/USM-488
Digital Multimeter, AN/USM-486
Digital Multimeter, AN/PSM-45
Electronic Load, EL-750B
10 AMP Shunt, Fluke 80J-10

Tools
Workstation, Static

Equipment Condition
Power off
PS1 removed from RN modem (para 2-13)
Test setup
Power Supply Test Fixture:
CB1 and CB2 OFF
S1 through S9 NO LOAD
Rheostat 1 fully CCW
S10, S11, S12, S13 OFF

CAUTION

The power supply contains components that are sensitive to damage by Electrostatic Discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. refer to DOD-HDBK-263 for proper handling procedures.



3-6. OPERATIONAL TEST OF RN MODEM POWER SUPPLY (Cont.)

STEP 1. On power supply test fixture measure resistance between TP1 and GND1. Move S1 to LOAD and back to NO LOAD position. Verify that resistance changes.

STEP 2. On power supply test fixture measure resistance between TP2 and GND1. Move S1 to LOAD and back to NO LOAD position. Verify that resistance changes.

STEP 3. On power supply test fixture measure resistance between TP3 and GND1. Move S1 to LOAD and back to NO LOAD position. Verify that resistance changes.

STEP 4. Turn the dc power supply ON and adjust the voltage to 28 Vdc.

STEP 5. On power supply test fixture move ac power circuit breaker (CB1) and dc power circuit breaker (CB2) to ON position. Power on indicators will light and fan will operate.

STEP 6. Observe that BIT indicator DS4 does not light. Using the voltmeter, measure:

VOLTAGE	TEST POINTS
+4.75 to +5.25 Vdc	TP1 to GND1
+11.75 to +12.25 Vdc	TP2 to GND1
-12.75 to -11.25 Vdc	TP3 to GND1

STEP 7. Move S1 to LOAD position.

STEP 8. Observe that BIT indicator DS4 does not light. Using the voltmeter, measure:

VOLTAGE	TEST POINTS
+4.75 to +5.25 Vdc	TP1 to GND1
+11.75 to +12.25 Vdc	TP2 to GND1
-12.75 to -11.25 Vdc	TP3 to GND1

NOTE

When measuring ripple voltage, ignore spikes of less than two microseconds duration.

STEP 9. Using the oscilloscope, measure ripple voltage:

RIPPLE VOLTAGE	TEST POINTS
< 100 mVp-p	TP1 to GND
< 120 mVp-p	TP2 to GND
< 120 mVp-p	TP3 to GND

3-6. OPERATIONAL TEST OF RN MODEM POWER SUPPLY (Cont.)

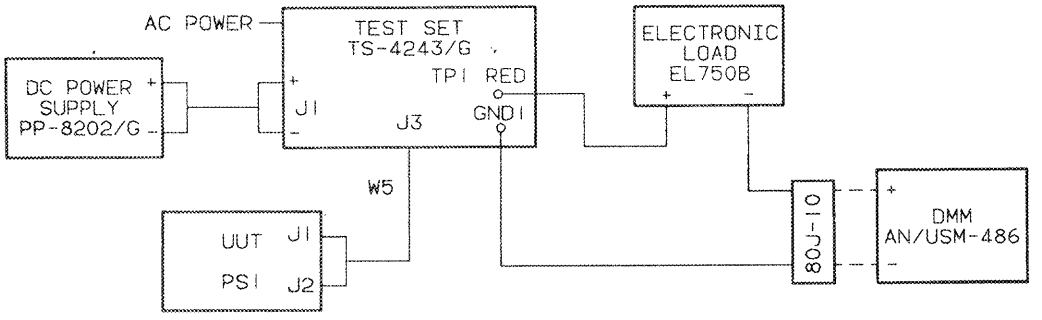
STEP 10. On the power supply test fixture set CB2 to OFF.

STEP 11. Remove leads from DMM and insert 80J-10 current shunt into the VDC and common jacks of DMM. Remove shorting bar from TP1 red and black jacks. Connect DMM leads to current shunt and TP1 jacks. Set DMM to measure 200 mVdc.

STEP 12. Set CB2 to ON. Observe that the DMM indicates between +68 and +82 mVdc. Set CB2 to OFF.

STEP 13. On the test fixture set S1 to NO LOAD.

STEP 14. Connect and set the electronic load as shown:



PWR	ON
MODE	R
DYNAMIC LOADING	OFF
LOAD Switch	OFF
DYNAMIC CURRENT knob	fully CCW
STATIC CURRENT knob	fully CCW
Volts knob	47
METER CURRENT RANGE	50A

STEP 15. Set electronic load to LOAD position.

STEP 16. Set CB2 to ON.

STEP 17. Slowly turn STATIC CURRENT adjustment knob toward 18 amps maximum or until the power supply shuts off as indicated by the DMM and DS1 lighting on the UUT.

STEP 18. Switch CB2 OFF.

STEP 19. Remove DMM and electronic load from TP1 and GND, and replace shorting bar into TP1 red and black jacks.

STEP 20. Remove shorting bar from TP2 red and black jacks. Remove current shunt and connect DMM leds to the TP2 jacks. Set DMM to measure 2000 millamperes.

STEP 21. Set S1 to LOAD position.

3-6. OPERATIONAL TEST OF RN MODEM POWER SUPPLY (Cont.)

STEP 22. Set CB2 to the ON position. Observe that DMM indicates 0.45 to 0.55 amps.

STEP 23. Set CB2 to OFF.

STEP 24. Remove DMM from TP2 and replace shorting bar.

STEP 25. Remove shorting bar from TP3 red and black jacks. Connect DMM leads to the TP3 jacks.

STEP 26. Set CB2 to ON. Observe that DMM indicates 0.45 to 0.55 amps.

STEP 27. Set CB2 to OFF and S1 to NO LOAD.

STEP 28. Remove DMM from TP3.

STEP 29. Replace the shorting bar into TP3 red and black jacks.

3-7. TROUBLESHOOTING PROCEDURE

a. Troubleshooting procedures contained in the troubleshooting flow charts are intended as an aid to technicians working at the intermediate general support maintenance level. In view of the complexity of the equipment, these flow charts can not cover all possible failures and faults which may occur. Flow charts serve as a guide to logical step-by-step troubleshooting. Wiring diagrams of the RN modem are contained in the rear of this manual. These should be referred to for location of connections and test points used during troubleshooting. Test point locations are illustrated in FO-2 and FO-3 through FO-10. A symptom index is provided to help you determine the flow chart applicable to the type of failure.

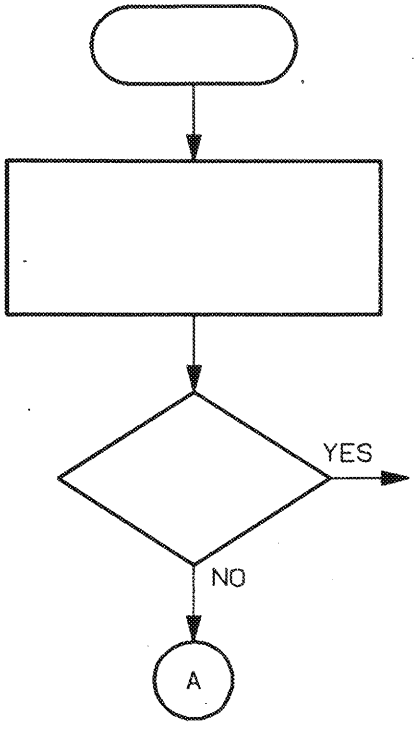
b. SYMPTOM INDEX

SYMPTOM INDEX

3-8. FLOW CHARTS AND HOW TO USE THEM

The Flow Charts make troubleshooting easier and give maintenance personnel a clear path to follow.

To use the Flow Chart begin at START and follow the path indicated by the arrow. Perform the task given in the symbol block and then follow the arrow to the next block. At the decision symbol be sure to follow the correct path indicated by YES or NO.

SYMBOL	MEANING
	START AND FINISH SYMBOL INDICATES STARTING AND FINISHING POINTS. TASK SYMBOL INDICATES WHAT TO DO AND WHERE TO DO IT. DECISION SYMBOL (YES OR NO) INDICATES THAT A DECISION MUST BE MADE. THE DIRECTION TO GO FROM THE DECISION SYMBOL DEPENDS ON THE DECISION MADE. CONTINUATION SYMBOL INDICATES THAT THE PATH CONTINUES TO OR COMES FROM ANOTHER FLOW CHART.

3-9. UNIT IS COMPLETELY INOPERATIVE

INITIAL SETUP

Test Equipment

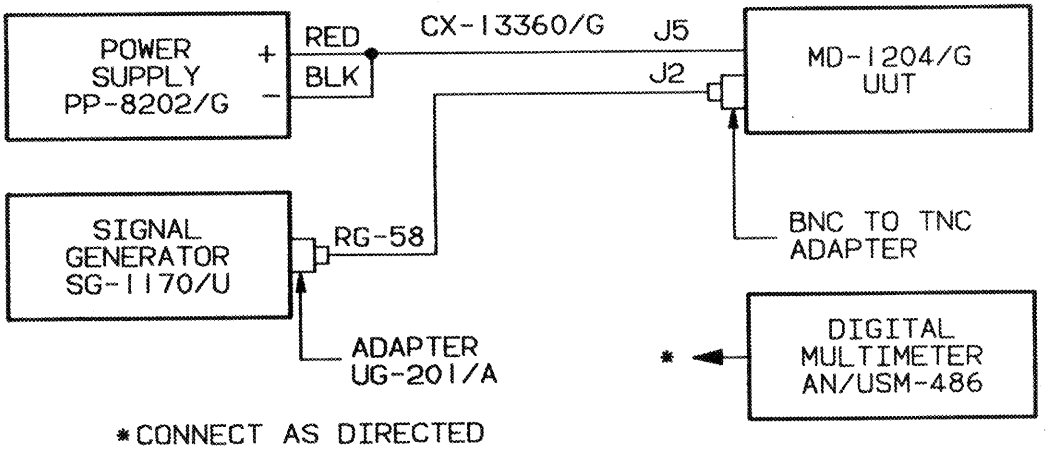
DC Power Supply, PP-8202/G
Power Cable, CX-13360/G
Signal Generator, SG-1170/U
Digital Multimeter, AN/USM-486
Oscilloscope, AN/USM-488
Adapter, BNC to TNC
Test Cable, RG-58, BNC to BNC
Adapter, UG-201/A

Tools

Tool Kit TK-17
Workstation, Static

Equipment Condition

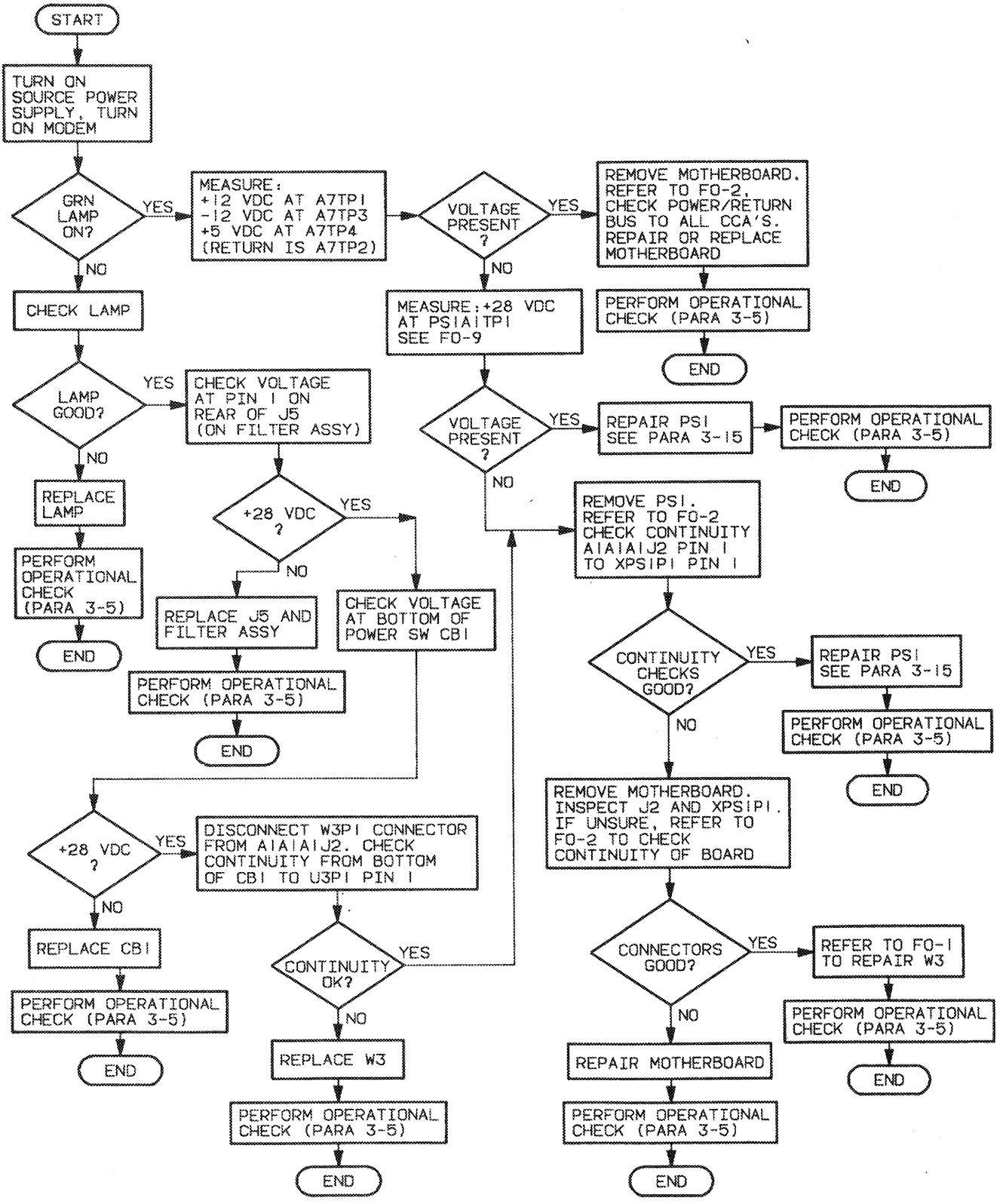
Power off
Test setup
Top cover removed (para 2-12)
PP-8202/G power ON and adjusted for +28 Vdc



NOTE

Test point locations are shown in foldouts FO-4 (A7), FO-5 (Motherboard), and FO-9 (PS1).

3-9. UNIT IS COMPLETELY INOPERATIVE (Cont.)



3-10. CIRCUIT BREAKER OPENS

INITIAL SETUP

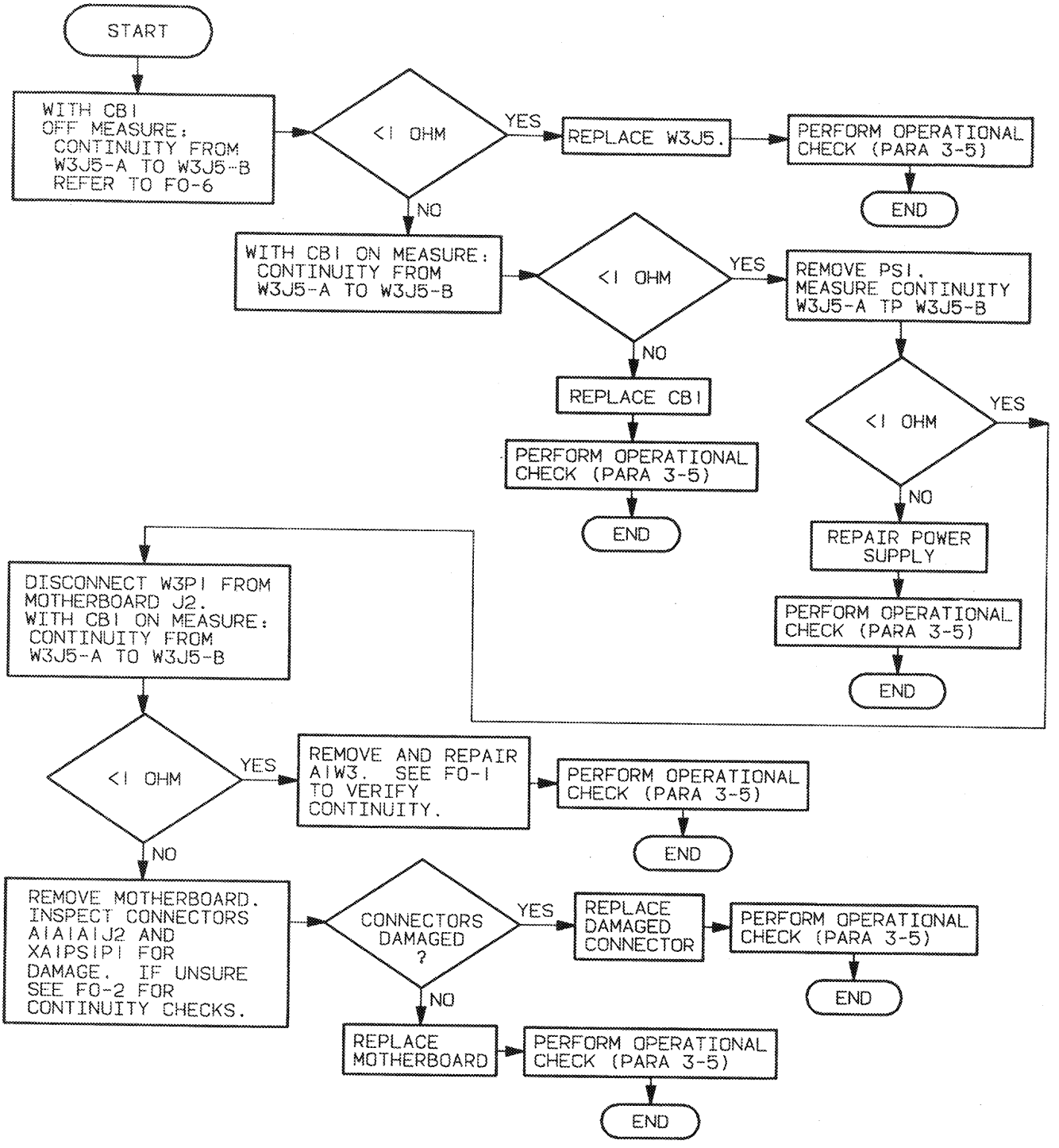
Test Equipment	Equipment Condition
Digital Multimeter, AN/USM-486	UUT disconnected from power source Top cover removed (para 2-12)
Tools	
Tool Kit TK-17 Workstation, Static	

NOTE

Test point locations are shown in FO-2, FO-5 (Motherboard) and FO-6 (A1W3).

* CONNECT AS DIRECTED

3-10. CIRCUIT BREAKER OPENS (Cont.)



3-11. MODEM FAILS BIT, ALL MODULES REPLACED

INITIAL SETUP

Test Equipment

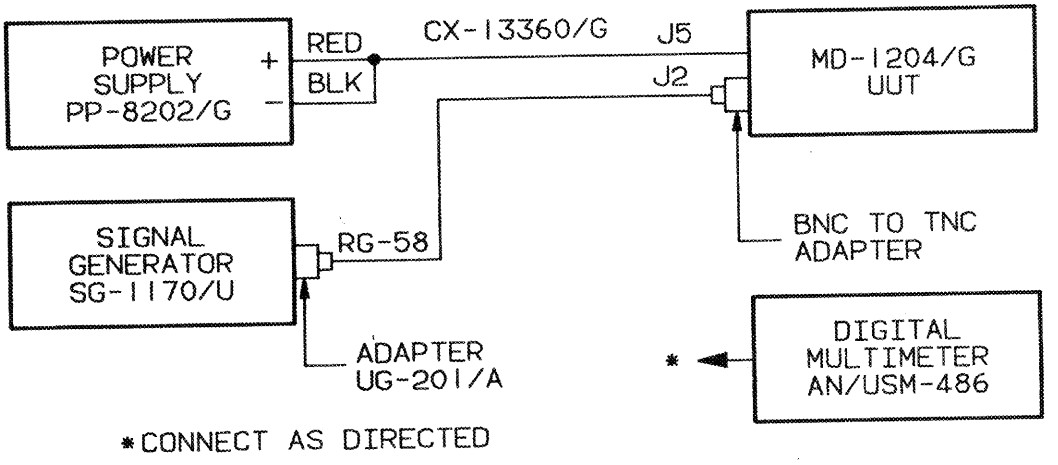
DC Power Supply, PP-8202/G
Power Cable, CX-13360/G
Signal Generator, SG-1170/U
Digital Multimeter, AN/USM-486
Adapter, UG-201/A
Adapter, BNC to TNC
Test Cable, RG-58, BNC to BNC

Tools

Tool Kit TK-17
Workstation, Static

Equipment Condition

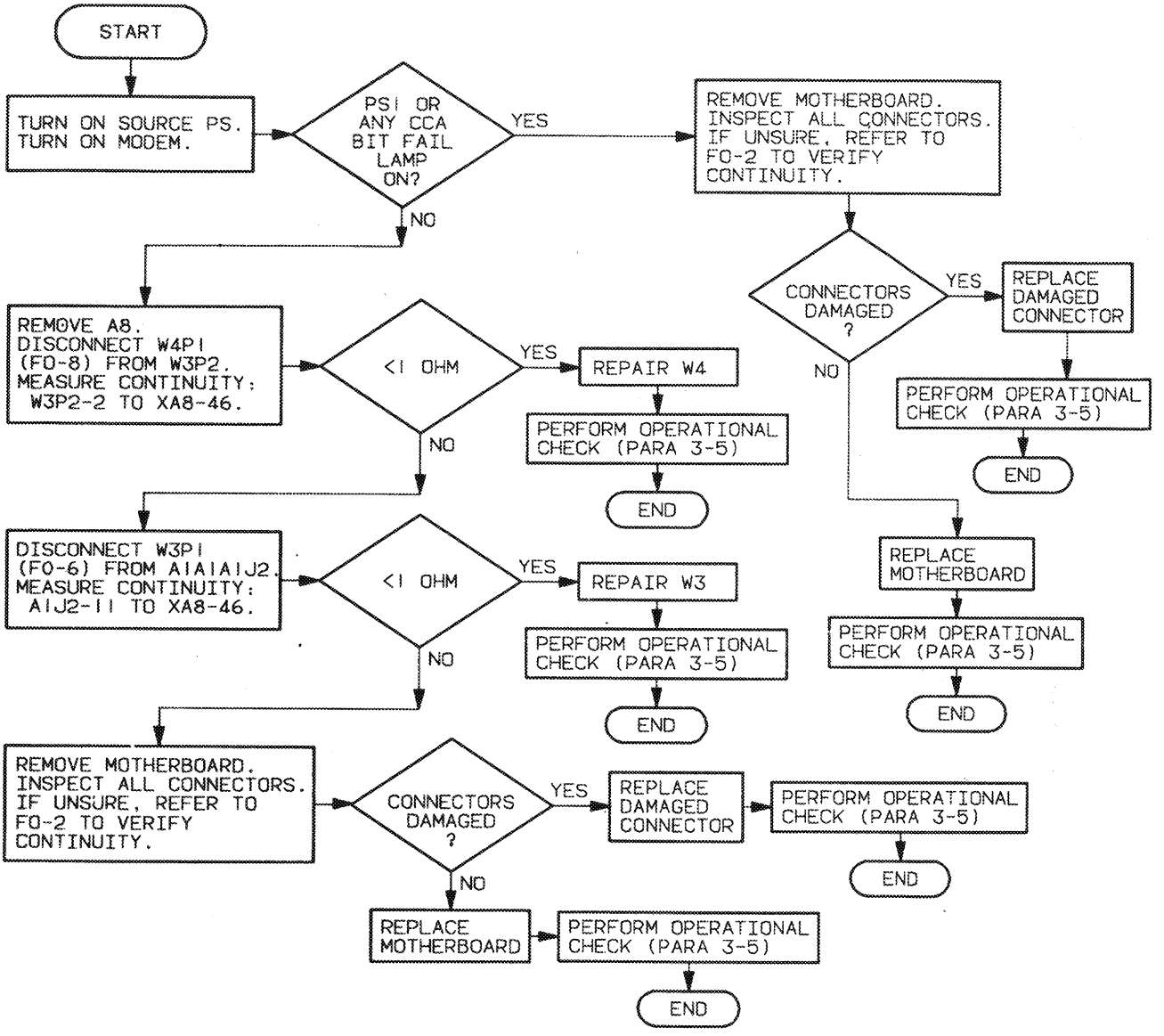
Power off
Test setup
Top cover removed (para 2-12)
PP-8202/G power ON and adjusted for +28 Vdc



NOTE

Test point locations are shown in FO-5 (Motherboard), FO-6 (A1W3), and FO-8 (A1W4).

3-11. MODEM FAILS BIT, ALL MODULES REPLACED (Cont.)



3-12. MODEM PASSES BIT, WILL NOT PERMIT VOICE COMMUNICATIONS IN SYSTEM

INITIAL SETUP

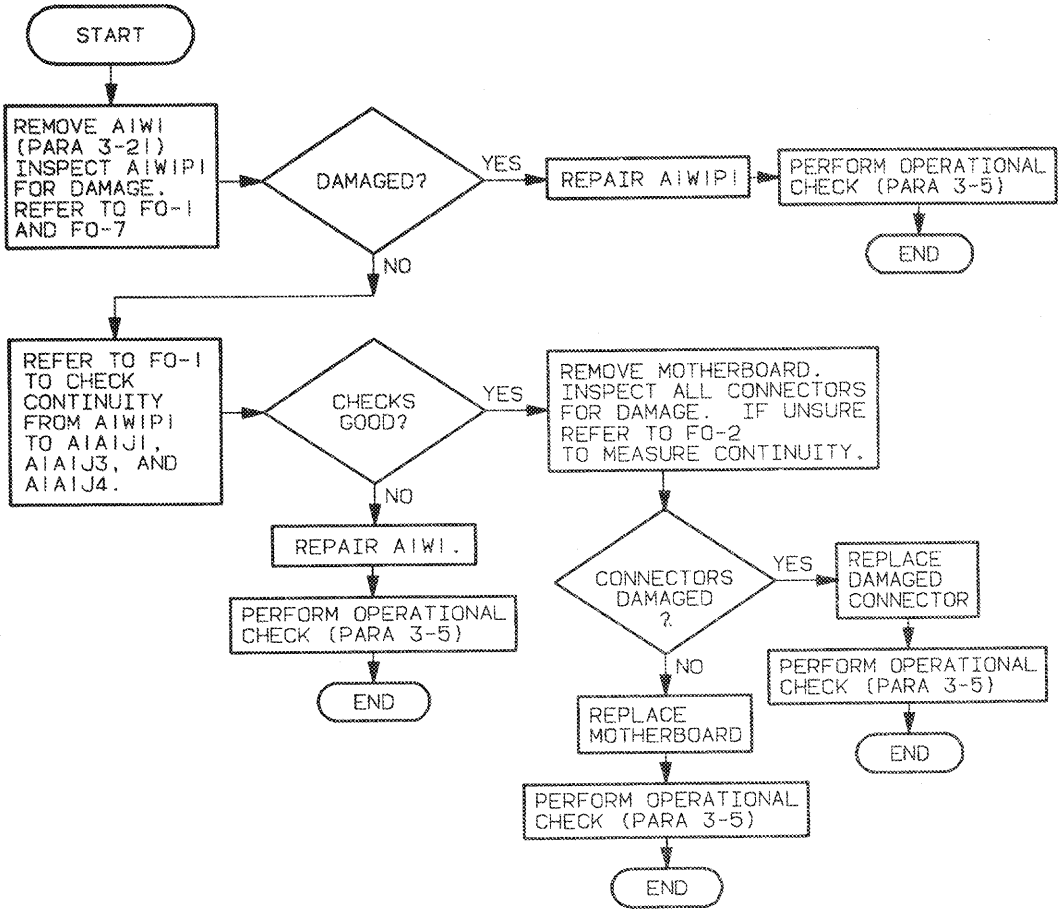
Test Equipment	Equipment Condition
Digital Multimeter, AN/USM-486	UUT disconnected from power source Top cover removed (para 2-12)

Tools

Tool Kit TK-17
Workstation, Static

* CONNECT AS DIRECTED

3-12. MODEM PASSES BIT, WILL NOT PERMIT VOICE COMMUNICATIONS IN SYSTEM (CONT.)



3-13. FAILS BIT AT CCA OR PS1, FRONT PANEL BIT FAIL LAMP DOES NOT LIGHT

INITIAL SETUP

Test Equipment	Equipment Condition
Digital Multimeter, AN/USM-486	UUT disconnected from power source Top cover removed (para 2-12)

Tools

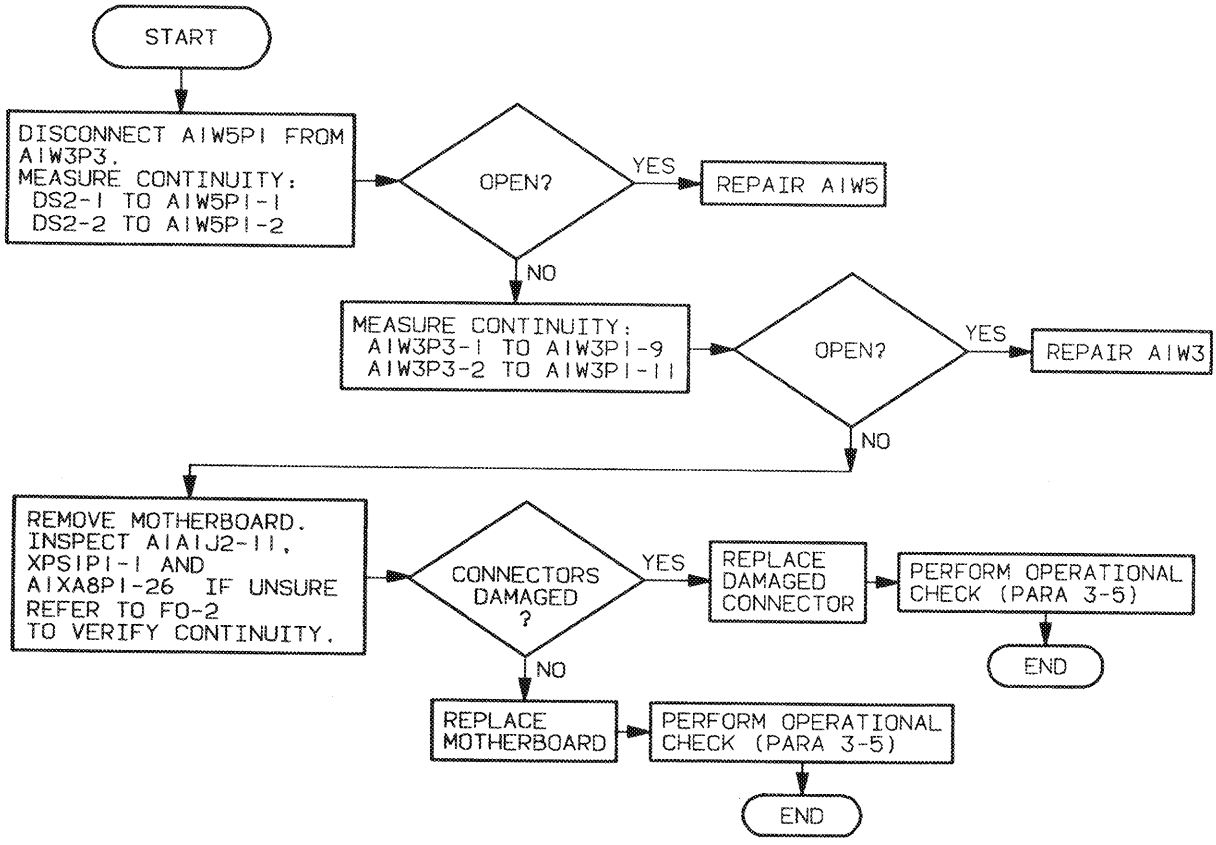
Tool Kit TK-17
Workstation, Static

* CONNECT AS DIRECTED

3-13. FAILS BIT AT CCA OR PS1, FRONT PANEL BIT FAIL LAMP DOES NOT LIGHT (CONT.)

NOTE

Test point locations are shown in FO-2, FO-5 (Motherboard), and FO-6 (A1W3).



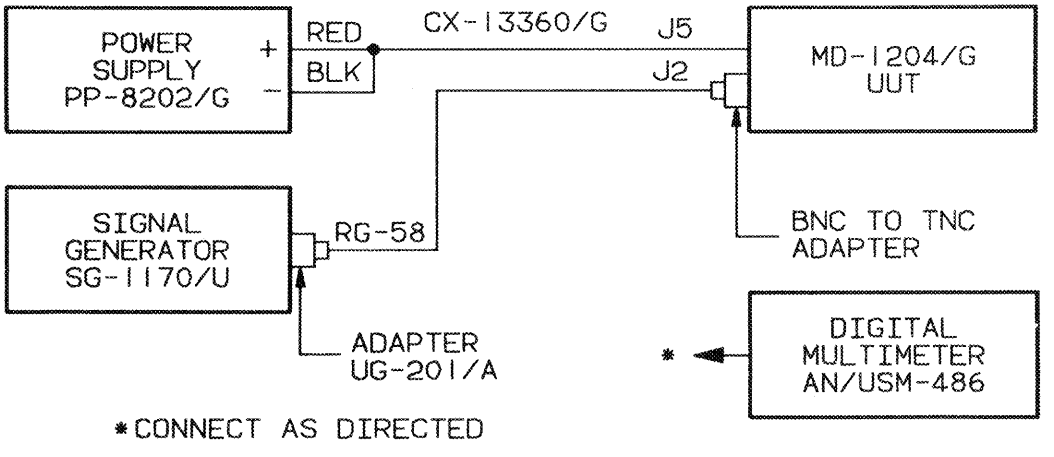
3-14. CANNOT RUN BIT

INITIAL SETUP

Test Equipment	Equipment Condition
DC Power Supply, PP-8202/G	Power off
Power Cable, CX-13360/G	Test setup
Signal Generator, SG-1170/U	Top cover removed (para 2-12)
Digital Multimeter, AN/USM-486	

Tools

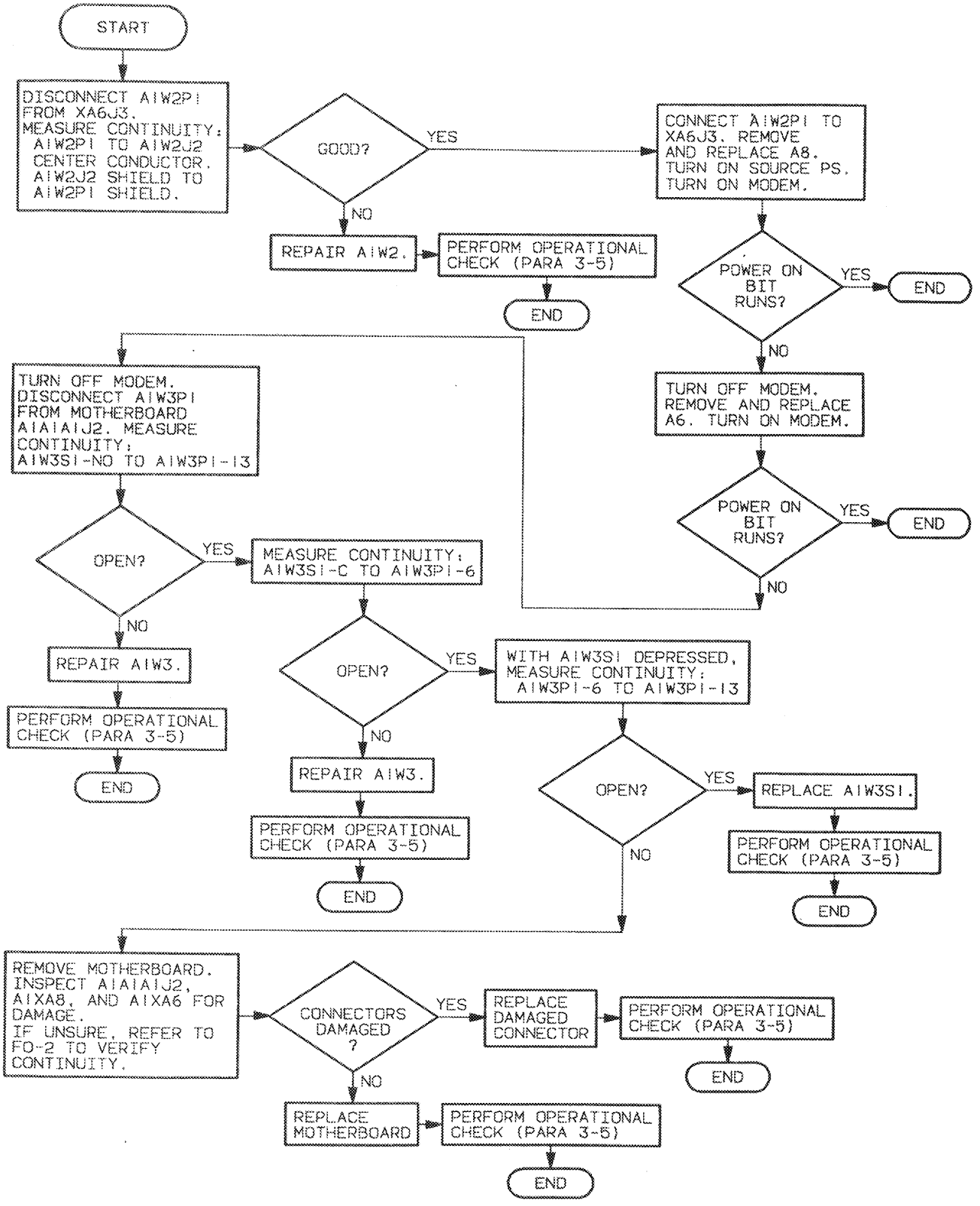
Tool Kit TK-17
Workstation, Static



NOTE

Test point locations are shown in FO-2, FO-5 (Motherboard), FO-6 (A1W3), and FO-8 (A1W2).

3-14. CANNOT RUN BIT (Cont.)



3-15. PS1 FAILS OPERATIONAL TEST

INITIAL SETUP

Test Equipment

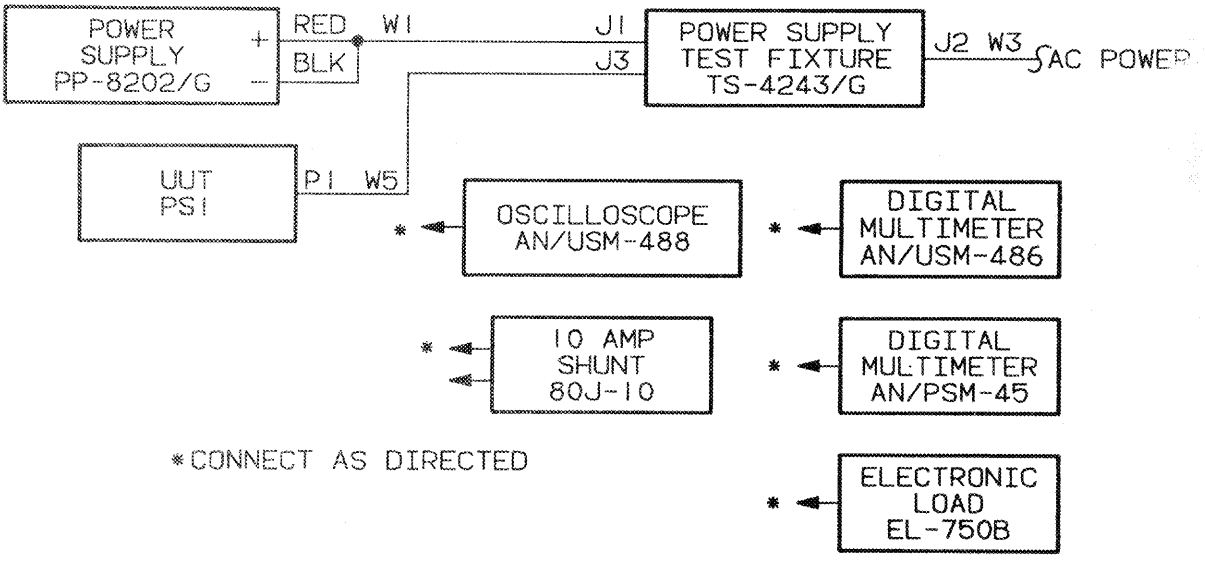
Test Set, Power Supply TS-4343/G
DC Power Supply, PP-8202/G
Oscilloscope, AN/USM-488
Digital Multimeter, AN/USM-486
Digital Multimeter, AN/PSM-45
Electronic Load, EL-750B
Current Shunt, Fluke 80J-10

Tools

Tool Kit, TK-17
Workstation, Static

Equipment Condition

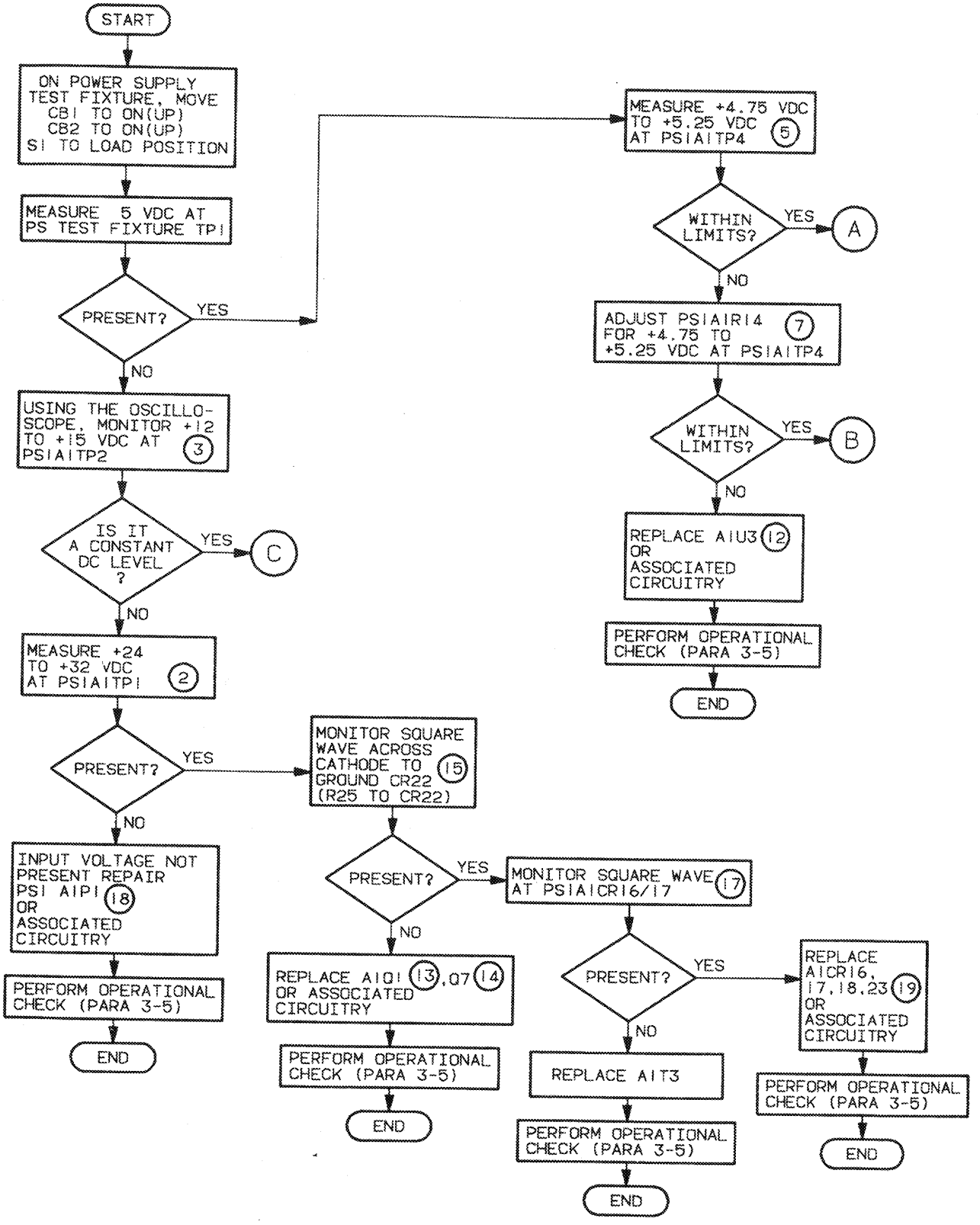
Power off
PS1 removed from RN Modem (para 2-13)
Test Setup
Power Supply Test Fixture:
CB1 and CB2 OFF
S1 thru S9 NO LOAD
Rheostat 1 maximum
S10, S11, S12, S13 OFF



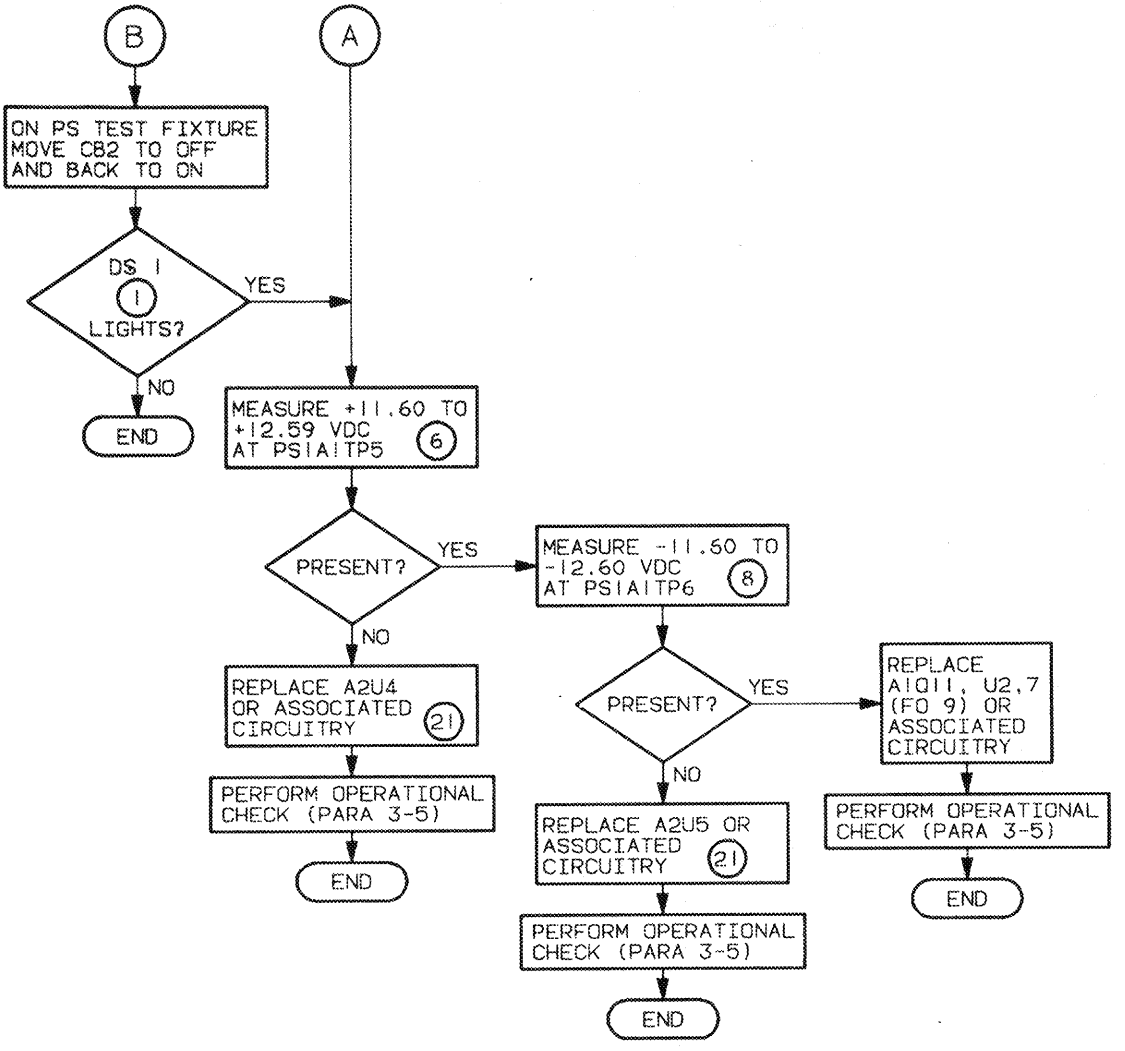
NOTE

Test point locations are shown in FO-9 (PS1A1) and FO-10 (PS1A2). Callout numbers within the flowchart refer to callout numbers on the foldouts.

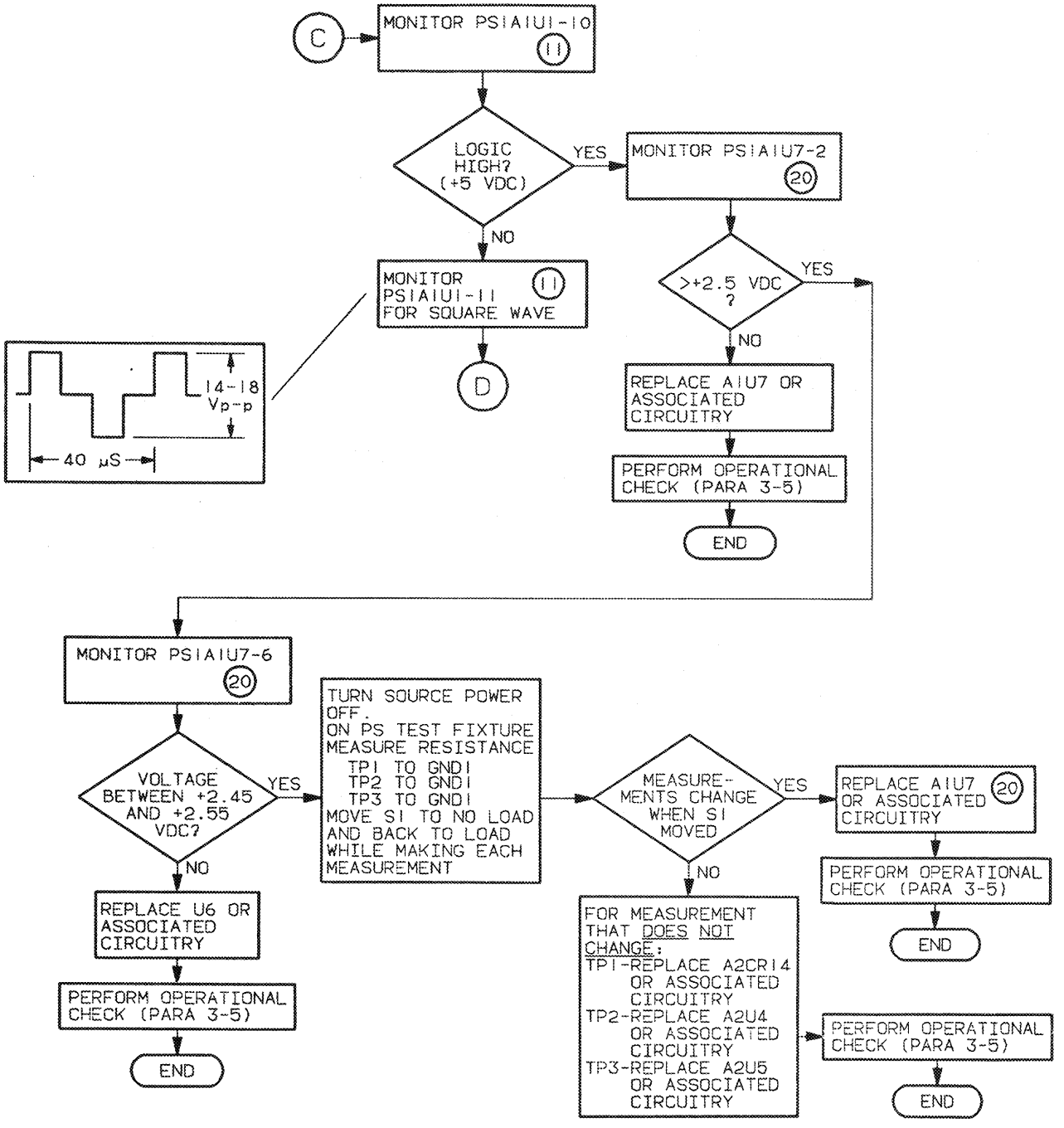
3-15. PS1 FAILS OPERATIONAL TEST (Cont.)



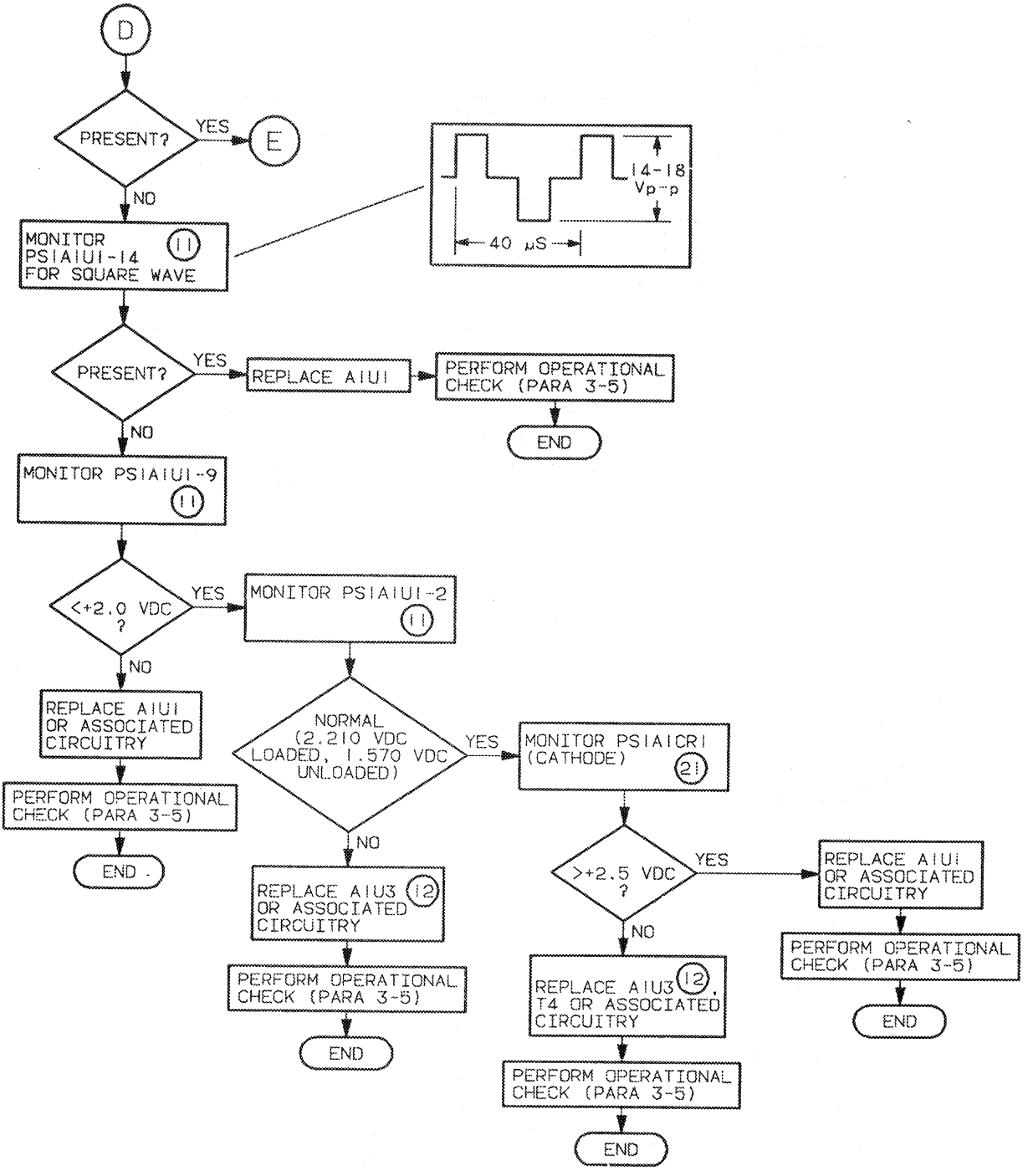
3-15. PS1 FAILS OPERATIONAL TEST (Cont.)



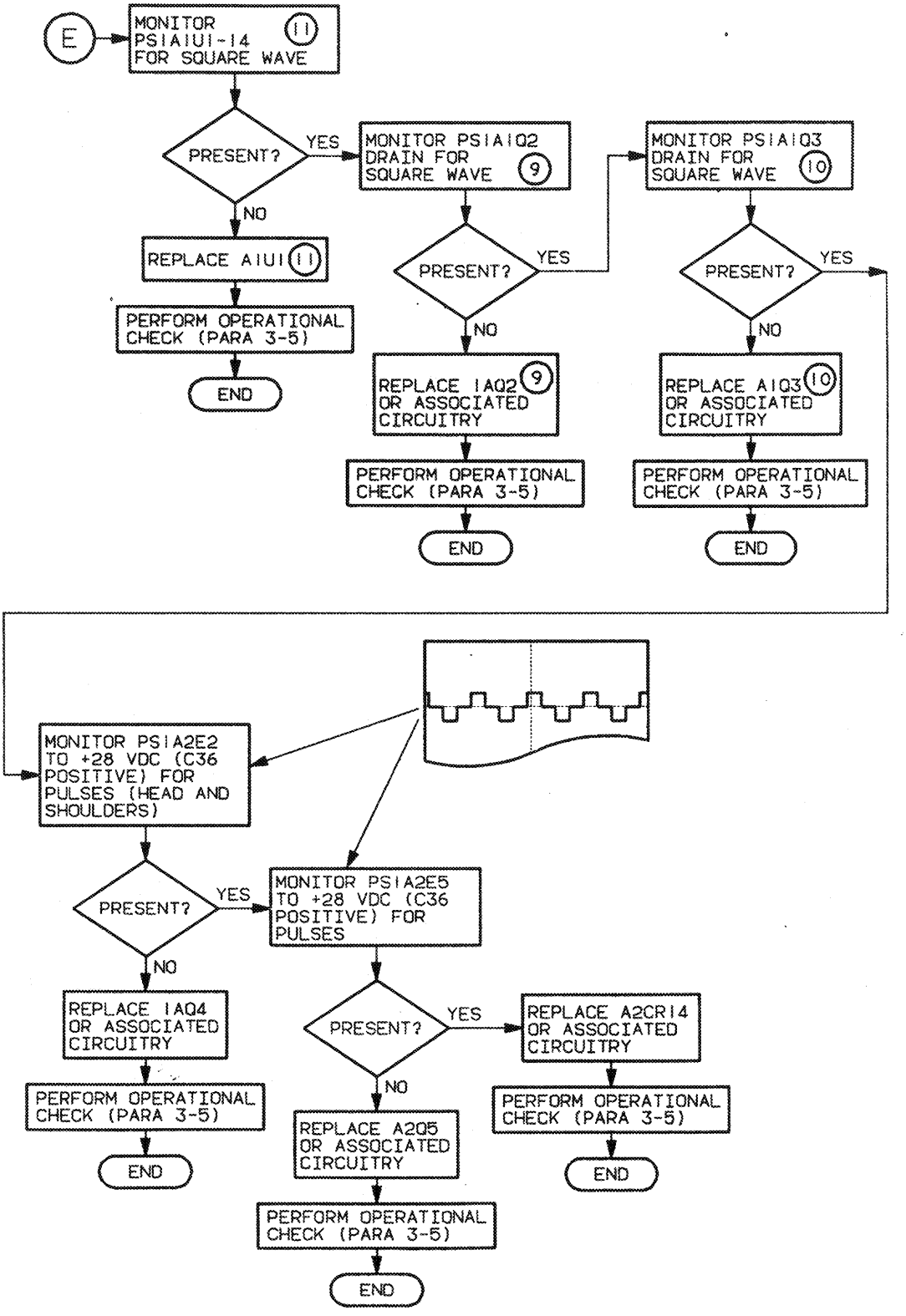
3-15. PS1 FAILS OPERATIONAL TEST (Cont.)



3-15. PS1 FAILS OPERATIONAL TEST (Cont.)



3-15. PS1 FAILS OPERATIONAL TEST (Cont.)



Section III. INTERMEDIATE GENERAL SUPPORT MAINTENANCE

3-16. GENERAL

Maintenance procedures which follow include all maintenance actions which are authorized at the intermediate general support level.

3-17. REPLACEMENT OF DC-DC CONVERTER CCA (PS1A1)

INITIAL SETUP

Tools

Tool Kit TK-17
Workstation, Static

Equipment Condition

Power off
PS1 removed from RN Modem (para 2-13)

Materials/Parts

Power Supply Assembly, PS1A1, P/N A3024793

CAUTION

The Power Supply contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

REMOVE DC-DC CONVERTER CCA PS1A1

STEP 1. Remove 5 crosstip screws (1) securing cover (2) to power supply (3). Remove cover.

STEP 2. Unsolder and tag 13 wires connecting FL1 (4) to the A1 CCA (5).

STEP 3. Unsolder and tag 17 wires connecting heat sink assembly A2 (6) to the A1 CCA.

STEP 4. Remove 4 crosstip screws (7) securing A1 CCA to power supply.

STEP 5. Lift A1 CCA free of power supply.

REPLACE DC-DC CONVERTER CCA PS1A1

STEP 1. Place A1 CCA (5) on power supply (3).

STEP 2. Secure with 4 crosstip screws (7).

STEP 3. Solder 17 leads from heatsink assembly (6) to A1 CCA.

STEP 4. Solder 13 leads from FL1 (4) to A1 CCA.

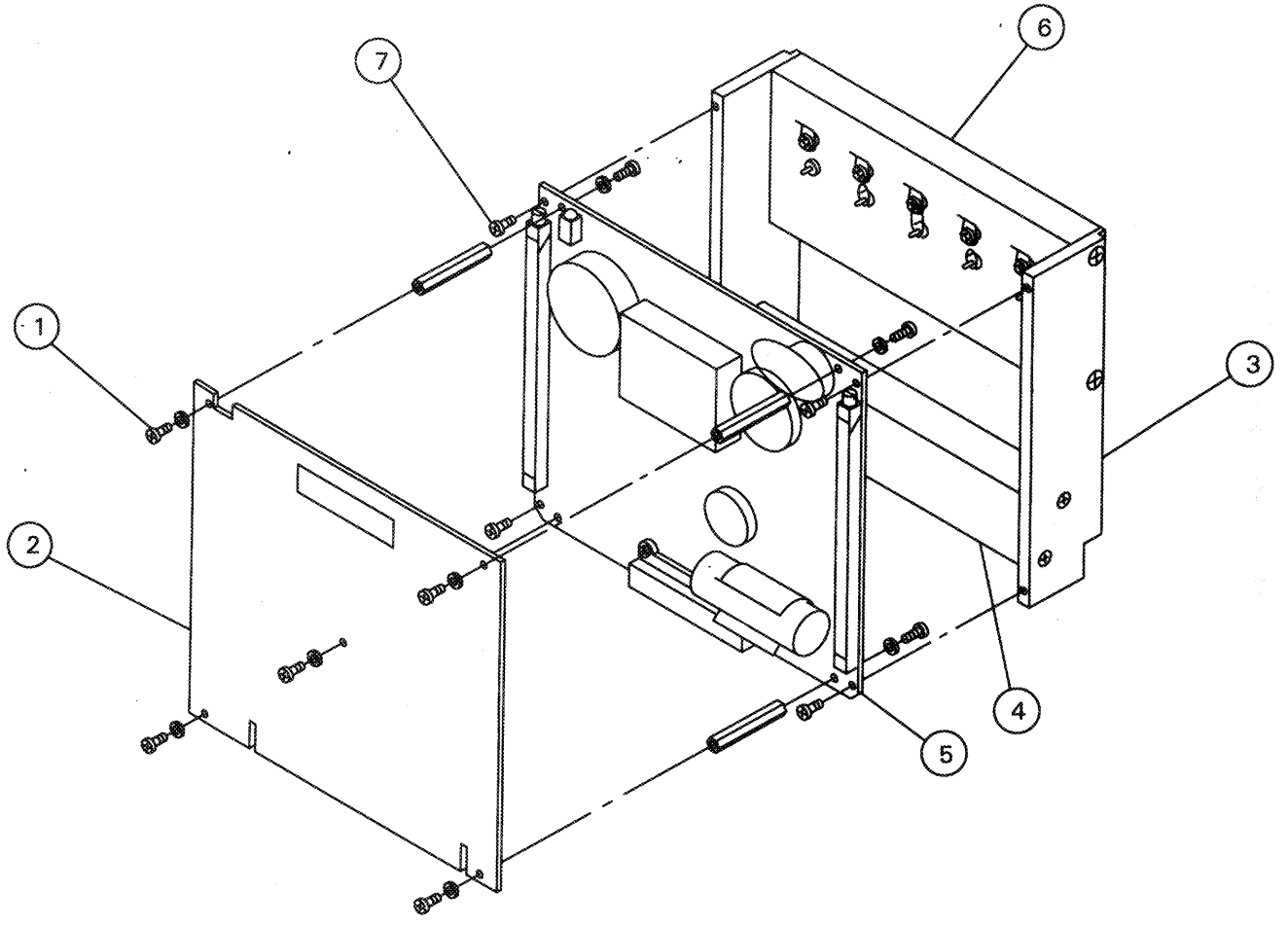
STEP 5. Place cover (2) on power supply so that notch (8) is positioned over BIT indicator (9).

3-17. REPLACEMENT OF DC-DC CONVERTER CCA (PS1A1) (Cont.)

REPLACE DC-DC CONVERTER CCA PS1A1 (Cont.)

STEP 6. Secure with 5 crosstip screws (1).

STEP 7. Perform operational check (para 3-5).



3-18. REPLACEMENT OF HEATSINK (PS1A2)

INITIAL SETUP

Tools

Tool Kit, TK-17
Workstation, Static

Materials Parts

Power Supply Assembly, PS1A2, P/N A3024796

Equipment Condition

Power off
Top cover removed (para 2-12)
PS1 removed from RN Modem (para 2-13)

CAUTION

The Power Supply contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

REMOVE HEATSINK PS1A2

STEP 1. Remove 4 crosstip screws (1) securing heatsink (2) to power supply (3).

STEP 2. Unsolder and tag 17 wires connecting heatsink to CCA A1 (4).

STEP 3. Lift heatsink free of power supply.

REPLACE HEATSINK PS1A2

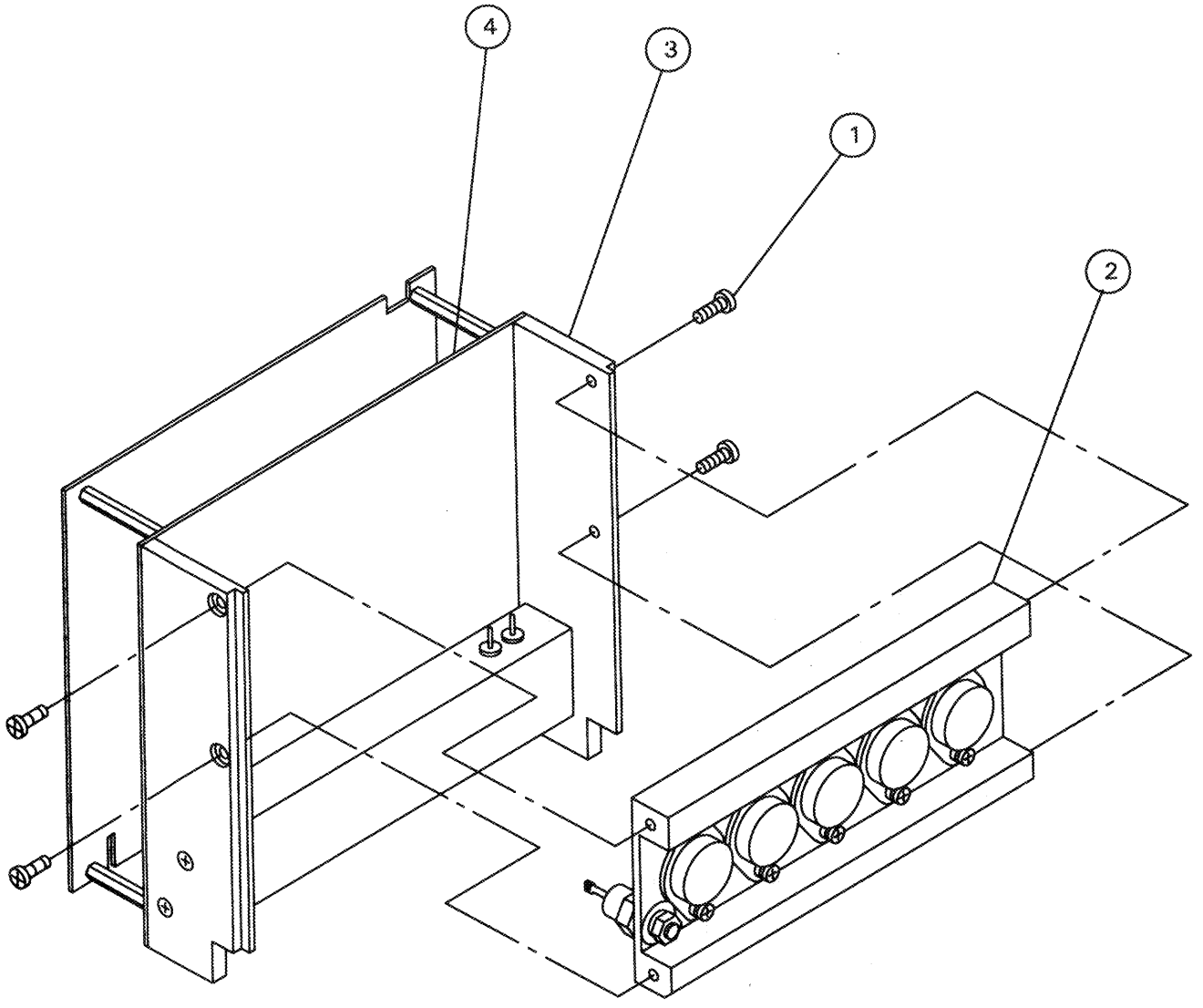
STEP 1. Solder 17 wires from CCA A1 (6) to heatsink (5).

STEP 2. Place heatsink on power supply (3) and secure with 4 crosstip screws (4).

STEP 3. Place cover (2) on power supply and secure with 5 crosstip screws (1).

STEP 4. Perform operational test (para 3-5).

3-18. REPLACEMENT OF HEATSINK (PS1A2) (Cont.)



3-19. REPLACEMENT OF CARDCAGE

INITIAL SETUP

Tools	Equipment Condition
Tool Kit TK-17 Workstation, Static	Top cover removed (para 2-12) Power off

NOTE

As each CCA is removed, it must be tagged for identification and ease of reinstallation.

Materials/Parts	Power supply removed (para 2-13) A8 removed (para 2-14) A7 removed (para 2-15) A6 removed (para 2-16) A5 removed (para 2-17) A3 removed (para 2-18)
Cardcage Assembly, P/N A3023964	

CAUTION

The RN Modem contains components that are sensitive to damage by electrostatic discharge (ESD). Improper handling will result in component and assembly failure. Use extreme care when handling. Refer to DOD-HDBK-263 for proper handling procedures.

REMOVE CARDCAGE

STEP 1. Disconnect A1W1 (1) from Motherboard J1 (2) by pushing out on cable locks and pulling straight up on connector.

STEP 2. Remove nut (3) and lockwashers holding A1W3 cable clamp to cardcage.

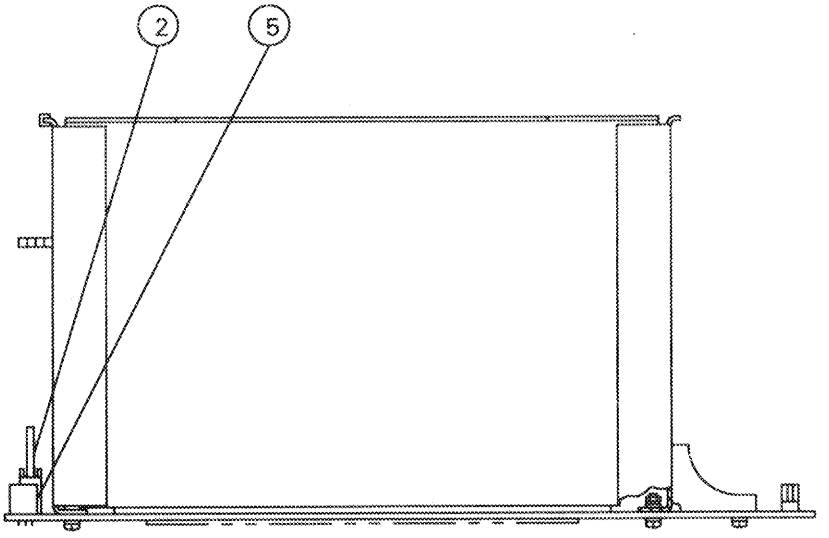
STEP 3. Disconnect A1W3 (4) from Motherboard J2 (5) by pulling straight up on connector.

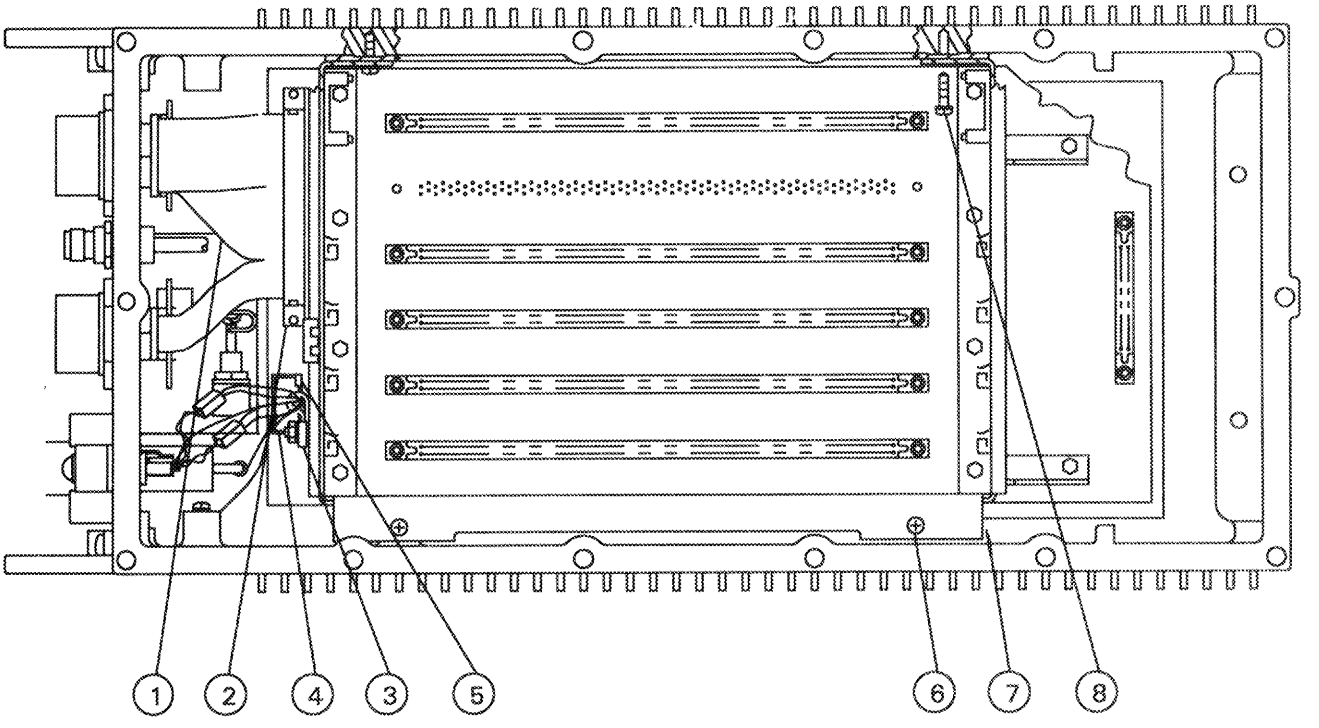
STEP 4. Remove and retain 2 crosstip screws and flat washers (6) securing right side of cardcage (7) to chassis.

STEP 5. Remove and retain 6 crosstip screws (8) securing left side of cardcage to chassis. These screws are accessed from inside the chassis.

STEP 6. Lift cardcage assembly from the chassis.

3-19. REPLACEMENT OF CARDCAGE (Cont.)





COVER REMOVED, TOP VIEW
ALL CCA'S AND PS1 REMOVED

3-19. REPLACEMENT OF CARDCAGE (Cont.)

REPLACE CARDCAGE

STEP 1. Place cardcage (7) into chassis with J1 (2) and J2 (5) toward front.

STEP 2. Connect A1W3 (4) to Motherboard J2 by pushing straight down on connector.

STEP 3. Connect A1W1 (1) to Motherboard J1 by pushing down on connector. Close locks on to connector.

STEP 4. Replace A1W3 cable clamp and secure with nut and lockwasher (3).

STEP 5. Replace 4 crosstip screws (8) securing left side of cardcage to chassis. These screws are accessed from inside the cardcage. Do not tighten screws completely.

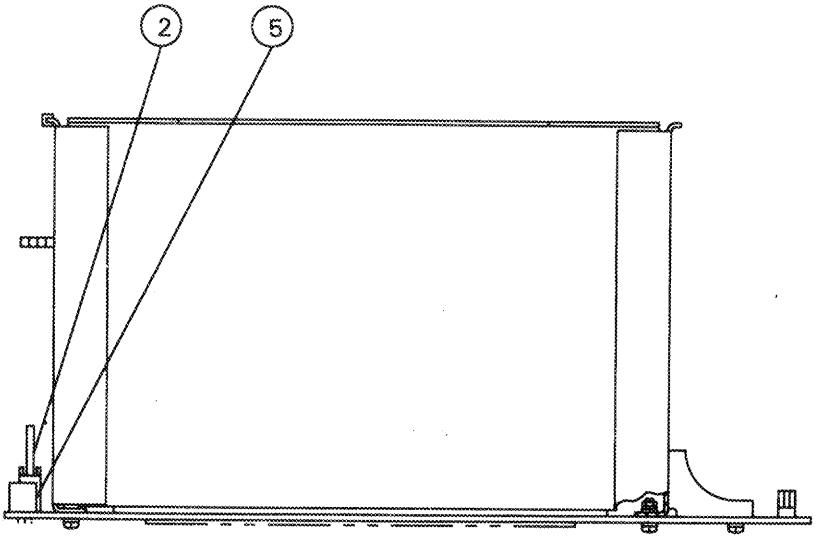
STEP 6. Replace 2 crosstip screws and flat washers (6) securing right side of cardcage to chassis. Do not tighten screws completely.

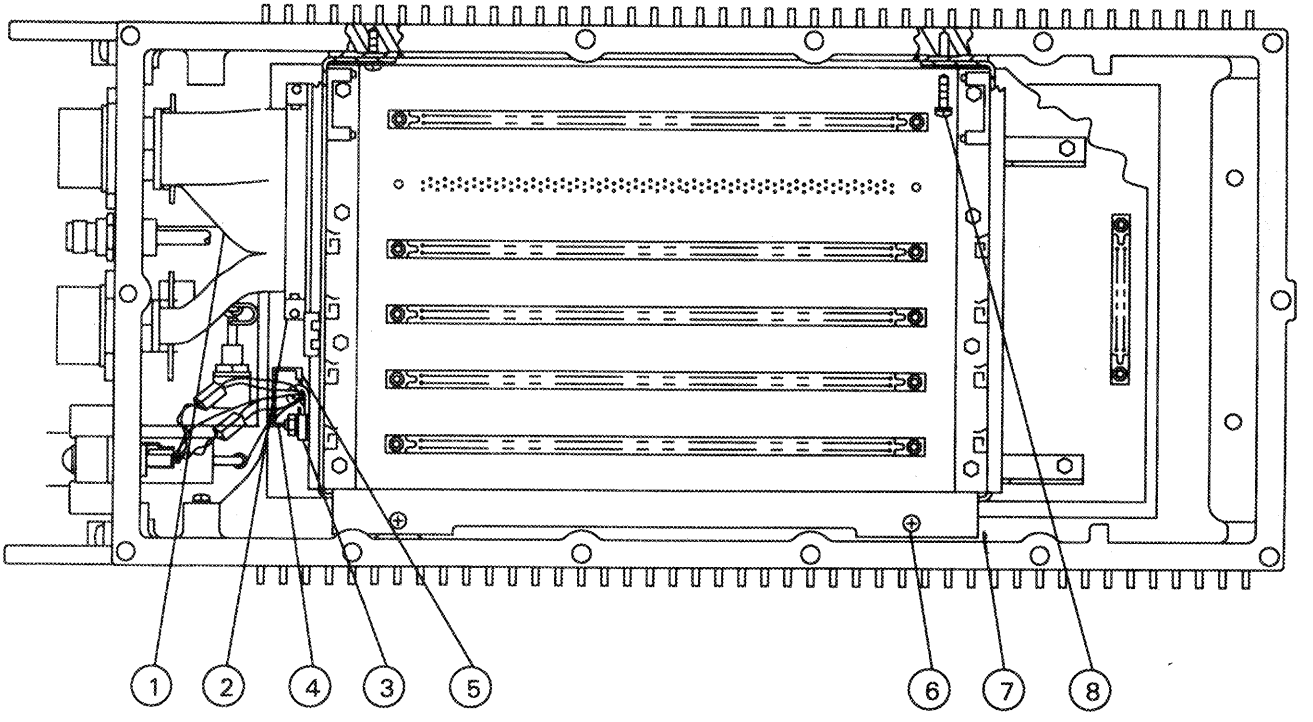
STEP 7. Tighten 4 crosstip screws (6) at left side of cardcage and 2 crosstip (8) screws at right side of cardcage.

STEP 8. Perform operational check to verify unit is working properly (para 3-5).

STEP 9. Replace top cover (para 2-12).

3-19. REPLACEMENT OF CARDCAGE (Cont.)





COVER REMOVED, TOP VIEW
ALL CCA'S AND PS1 REMOVED

3-20. REPLACEMENT OF MOTHERBOARD CCA (A1A1A1)

INITIAL SETUP

Tools

Tool Kit TK-17
Workstation, Static

Materials/Parts

Motherboard CCA, A1A1A1,
P/N A3023980

Equipment Condition

Power off
Top cover removed (para 2-12)
PS1 removed (para 2-13)
A8 removed (para 2-14)
A7 removed (para 2-15)
A6 removed (para 2-16)
A5 removed (para 2-17)
A3 removed (para 2-18)
Cardcage removed (para 3-19)

REMOVE MOTHERBOARD

STEP 1. Remove and retain 10 crosstip screws, flatwashers, lockwashers, and nuts (1) securing Motherboard CCA (2) to cardcage (3).

STEP 2. Lift Motherboard CCA from cardcage assembly.

REPLACE MOTHERBOARD

STEP 1. Place Motherboard CCA (2) on cardcage (3). Check that J1 and J2 are toward front.

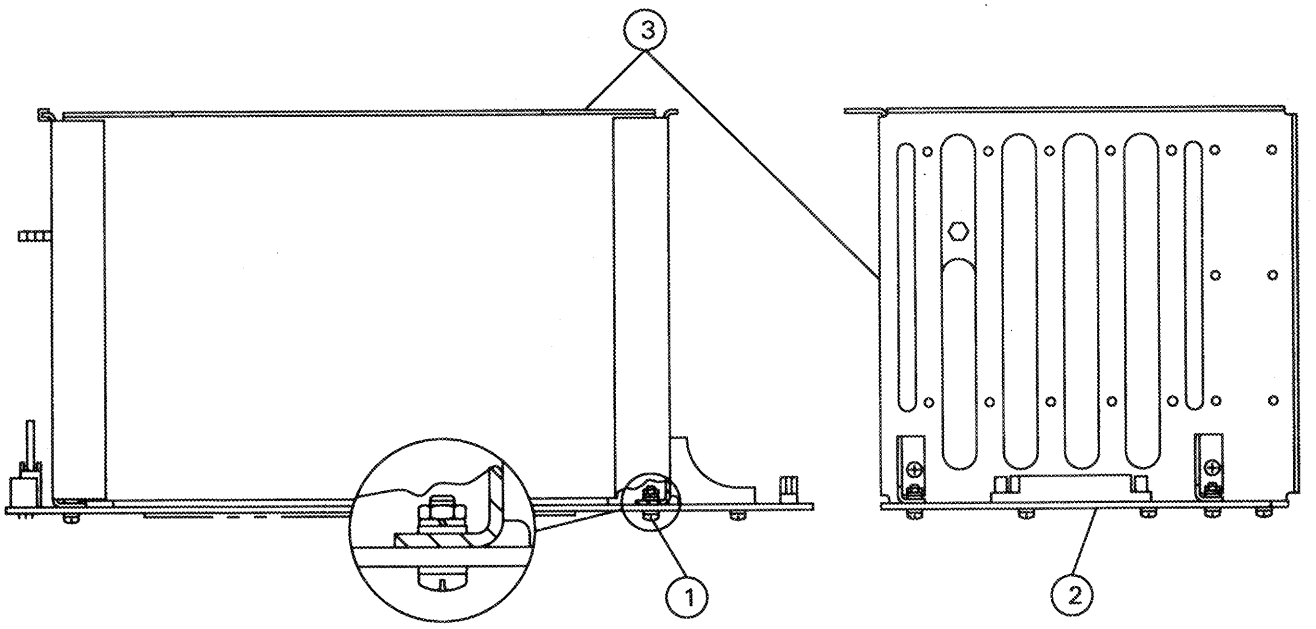
STEP 2. Replace 10 crosstip screws, flatwashers, lockwashers, and nuts (1) securing Motherboard CCA to cardcage assembly.

STEP 3. Replace all assemblies.

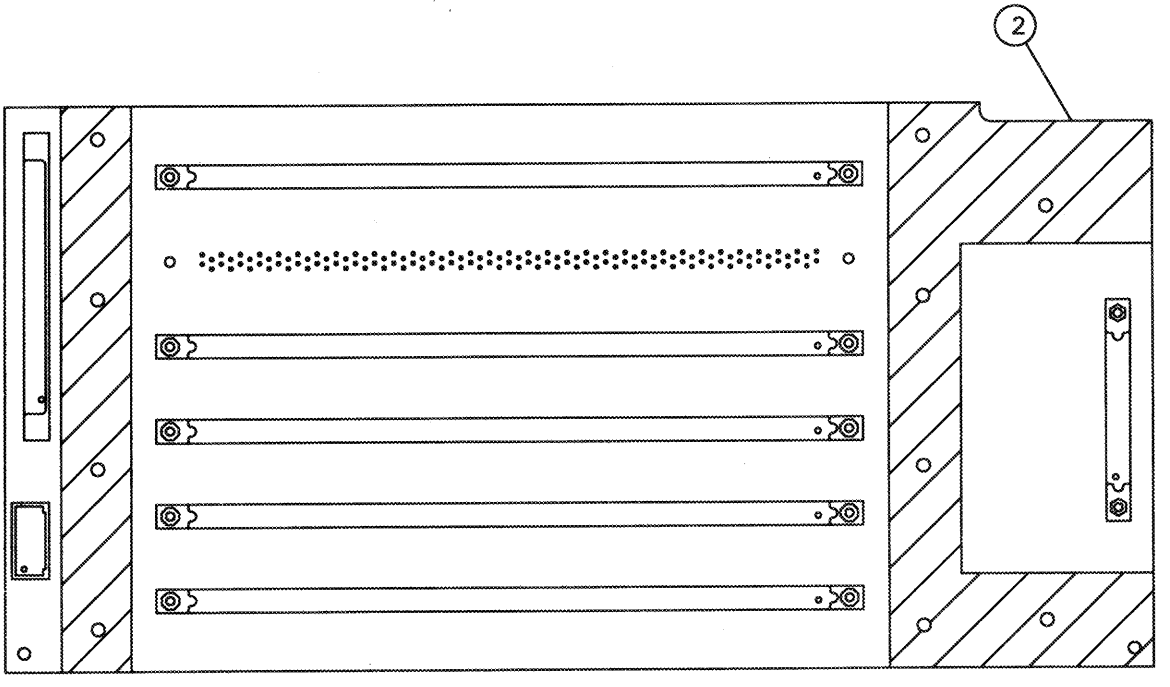
STEP 4. Perform operational check to verify corrective action (para 3-5).

STEP 5. Replace top cover (para 2-12).

3-20. REPLACEMENT OF MOTHERBOARD CCA (Cont.)



LEFT SIDE VIEW BACK VIEW



TOP VIEW

3-21. REPLACEMENT OF CONNECTOR ASSEMBLY (A1W1)

INITIAL SETUP

Tools

Tool Kit TK-17
Workstation, Static
Torque Wrench, 0-100 inch pounds
Sockets, 1 5/16 in, 1 7/16 in deep well, with 3/8 to 1/2 in drive adapter

Materials/Parts

Connector Assembly, A1W1, P/N A3023957

Equipment Condition

Power off
Top cover removed (para 2-12)
PS1 removed (para 2-13)
A8 removed (para 2-14)
A7 removed (para 2-15)
A6 removed (para 2-16)
A5 removed (para 2-17)
A3 removed (para 2-18)
Cardcage removed (para 3-19)

NOTE

Inspect connector O-rings before replacing A1W1. Replace worn or damaged O-rings with serviceable parts.

REMOVE A1W1

STEP 1. Using a 1 7/16 inch socket, remove nut securing J1 (1) to front panel (2).

STEP 2. Slide J1 straight back from front panel.

STEP 3. Using a 1 5/16 inch socket, remove nut securing J3 (3) to front panel.

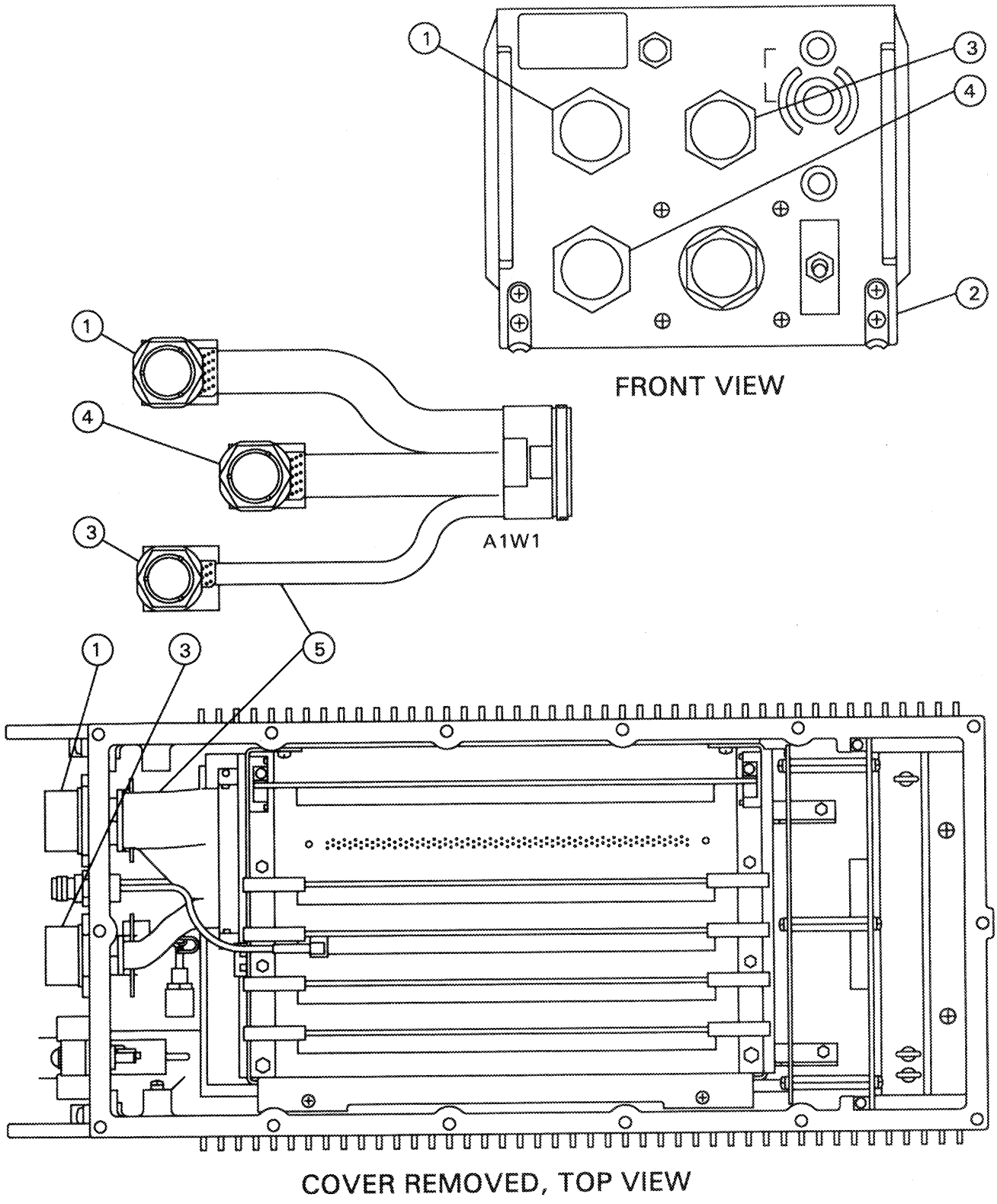
STEP 4. Slide J3 straight back from front panel.

STEP 5. Using a 1 7/16 inch socket, remove nut securing J4 (4) to front panel.

STEP 6. Slide J4 straight back from front panel.

STEP 7. Lift A1W1 (5) out of chassis.

3-21. REPLACEMENT OF CONNECTOR ASSEMBLY (A1W1) (Cont.)



3-21. REPLACEMENT OF CONNECTOR ASSEMBLY (A1W1) (Cont.)

REPLACE A1W1

STEP 1. Lower cable A1W1 (5) into chassis with P1 toward back of chassis.

STEP 2. From rear of front panel, slide J3 (3) into front panel opening marked J3 KG-84.

STEP 3. Place retaining nut on J3 and tighten to 70 to 75 inch-pounds.

STEP 4. From rear of front panel, slide J4 (4) into front panel opening marked J4 CONTROL BUS.

STEP 5. Place retaining nut on J4 and tighten to 80 to 85 inch-pounds.

STEP 6. From rear of front panel, slide J1 (1) into front panel opening marked J1 RADIO.

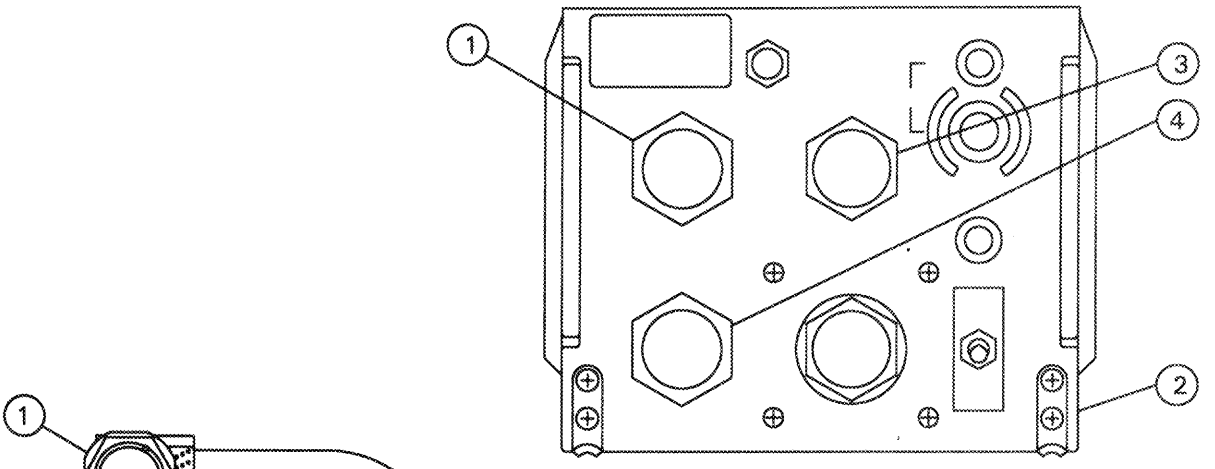
STEP 7. Place retaining nut on J1 and tighten to 80 to 85 inch-pounds.

STEP 8. Replace all assemblies.

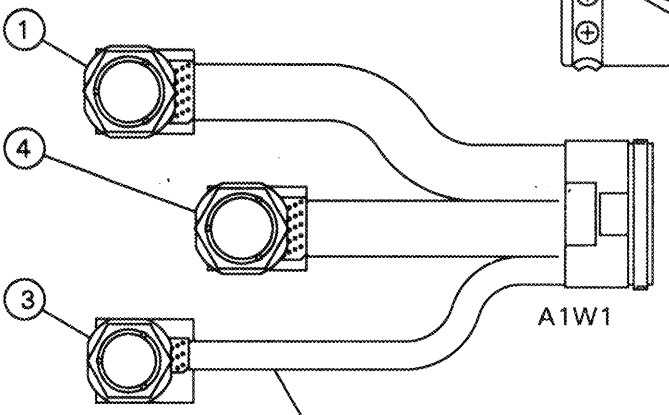
STEP 9. Perform operational check to verify unit is operating properly (para 3-5).

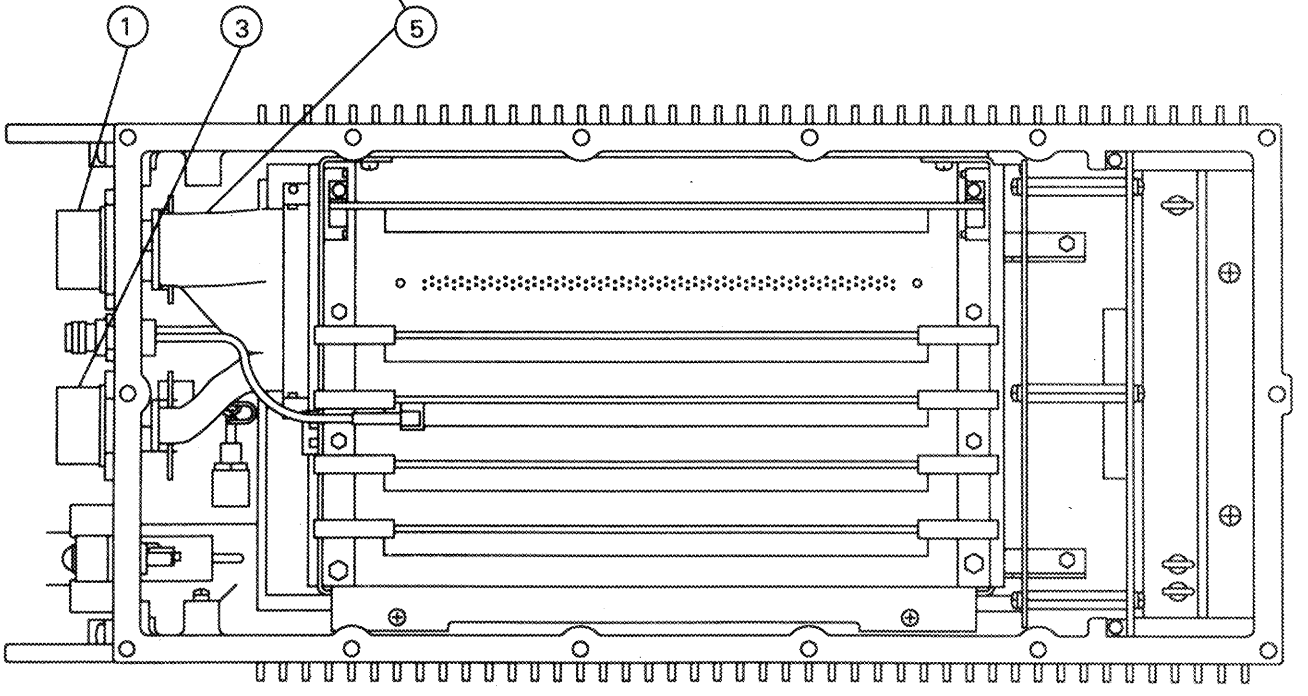
STEP 10. Replace top cover (para 2-12).

3-21. REPLACEMENT OF CONNECTOR ASSEMBLY (A1W1) (Cont.)



FRONT VIEW





COVER REMOVED, TOP VIEW

3-22. REPLACEMENT OF WIRING HARNESS ASSEMBLY (A1W3)

INITIAL SETUP

Tools

Tool Kit TK-17
Workstation, Static
1/2 in. Deep Well Socket,
3/8 in. Drive
Torque Wrench, 0-100 in. lbs.
Torque Screwdriver, 0-30 in. lbs

Materials/Parts

Wiring Harness Assembly, A1W3,
P/N A3023958

Equipment Condition

Power off
Top cover removed (para 2-12)
PS1 removed (para 2-13)
A8 removed (para 2-14)
A7 removed (para 2-15)
A6 removed (para 2-16)
A5 removed (para 2-17)
A3 removed (para 2-18)
Cardcage removed (para 3-19)

REMOVE A1W3

STEP 1. Remove and retain crosstip screw and flatwasher securing ground terminal lug E1 (1) to chassis.

STEP 2. Remove and retain 4 crosstip screws (2) securing J5 (3) to front panel (4).

STEP 3. Slide J5 back from front panel.

STEP 4. Disconnect A1W4P1 from A1W3P2 (5) by pulling connector ends apart.

STEP 5. Disconnect A1W5P1 from A1W3P3 (6) by pulling connector ends apart.

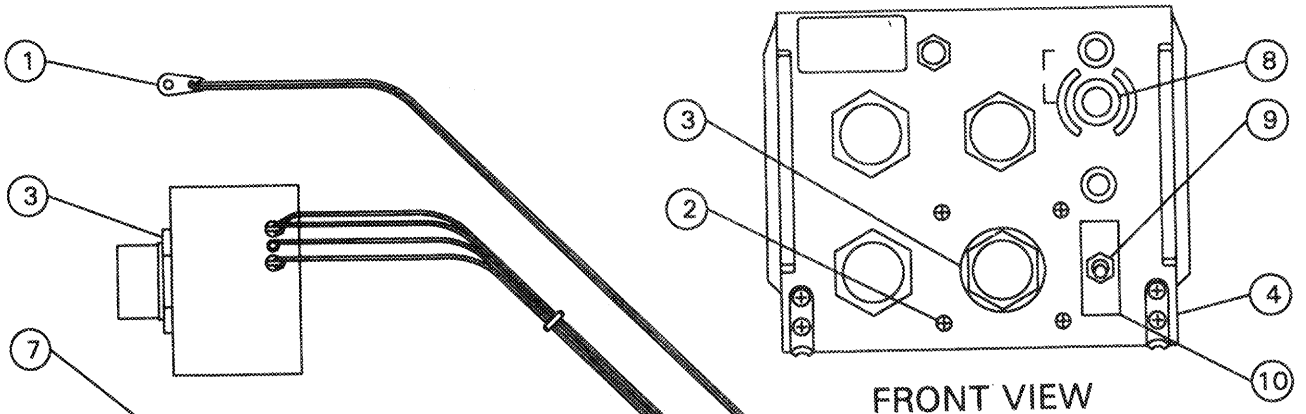
STEP 6. With flat blade screwdriver, push back retaining ring (7) on S1 pushbutton (8). Push S1 straight back to remove from front panel (4).

STEP 7. Using a 1/2 inch socket, remove and retain nut and flatwasher securing CB1 (9) to front panel. Remove and retain switch guard (10).

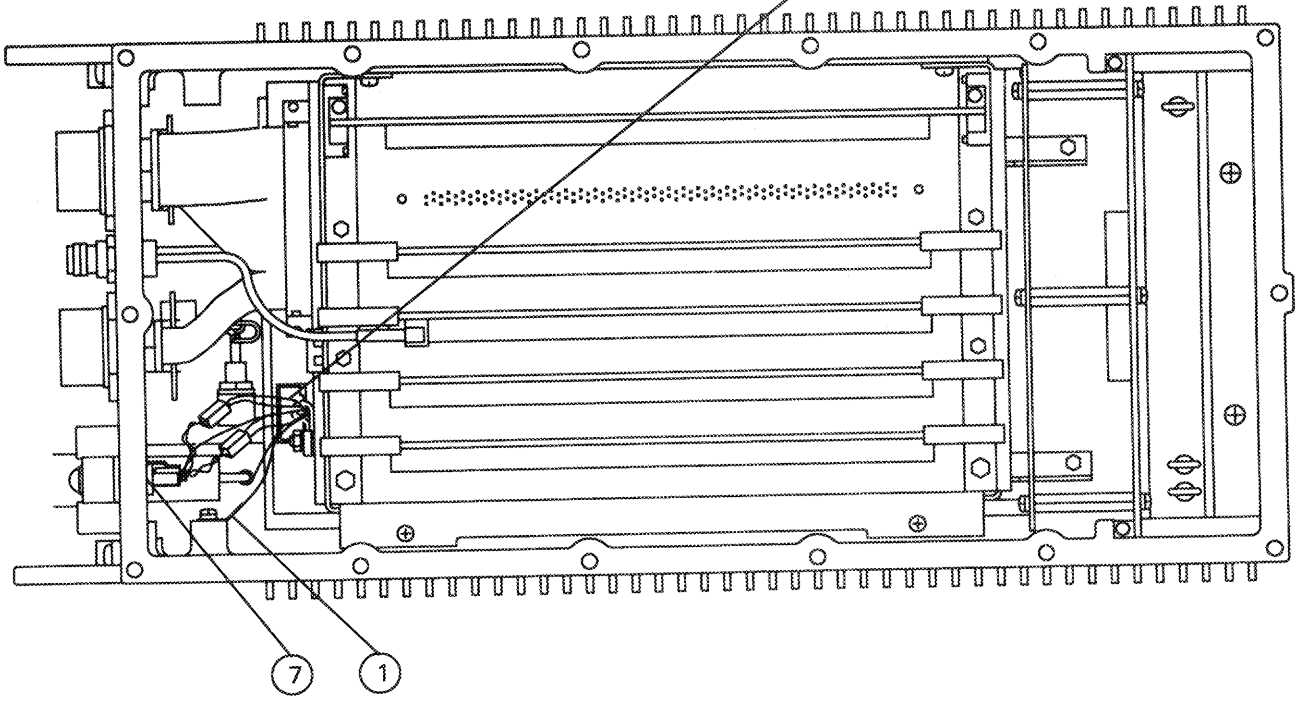
STEP 8. Slide CB1 straight back from front panel.

STEP 9. Lift A1W3 cable assembly (11) up, out of chassis.

3-22. REPLACEMENT OF WIRING HARNESS ASSEMBLY (A1W3) (Cont.)



FRONT VIEW



COVER REMOVED, TOP VIEW

3-22. REPLACEMENT OF WIRING HARNESS ASSEMBLY (A1W3) (Cont.)

REPLACE A1W3

STEP 1. Lower A1W3 cable assembly (11) into chassis with P1 toward rear.

STEP 2. From rear of front panel (4), slide CB1 (9) into front panel opening labeled PWR ON.

STEP 3. Place switch guard (10) over CB1 and replace washer and retaining nut on CB1. Tighten nut to 20 inch pounds.

STEP 4. From rear of front panel, aline S1 pushbutton (8) on rear of BIT pushbutton. Push S1 onto BIT pushbutton threaded portion until retaining ring (7) snaps into place.

STEP 5. Connect A1W5P1 (BIT) indicator cable assembly to A1W3P3 (6).

STEP 6. Connect A1W4P1 (PWR ON) indicator cable assembly to A1W3P2 (5).

STEP 7. From rear of front panel (4), slide A1W3J5 (3) into front panel opening labeled J5 PWR IN.

STEP 8. Replace and tighten 4 crosstip screws (2) to secure J5 to front panel (4), torque to 18 inch pounds.

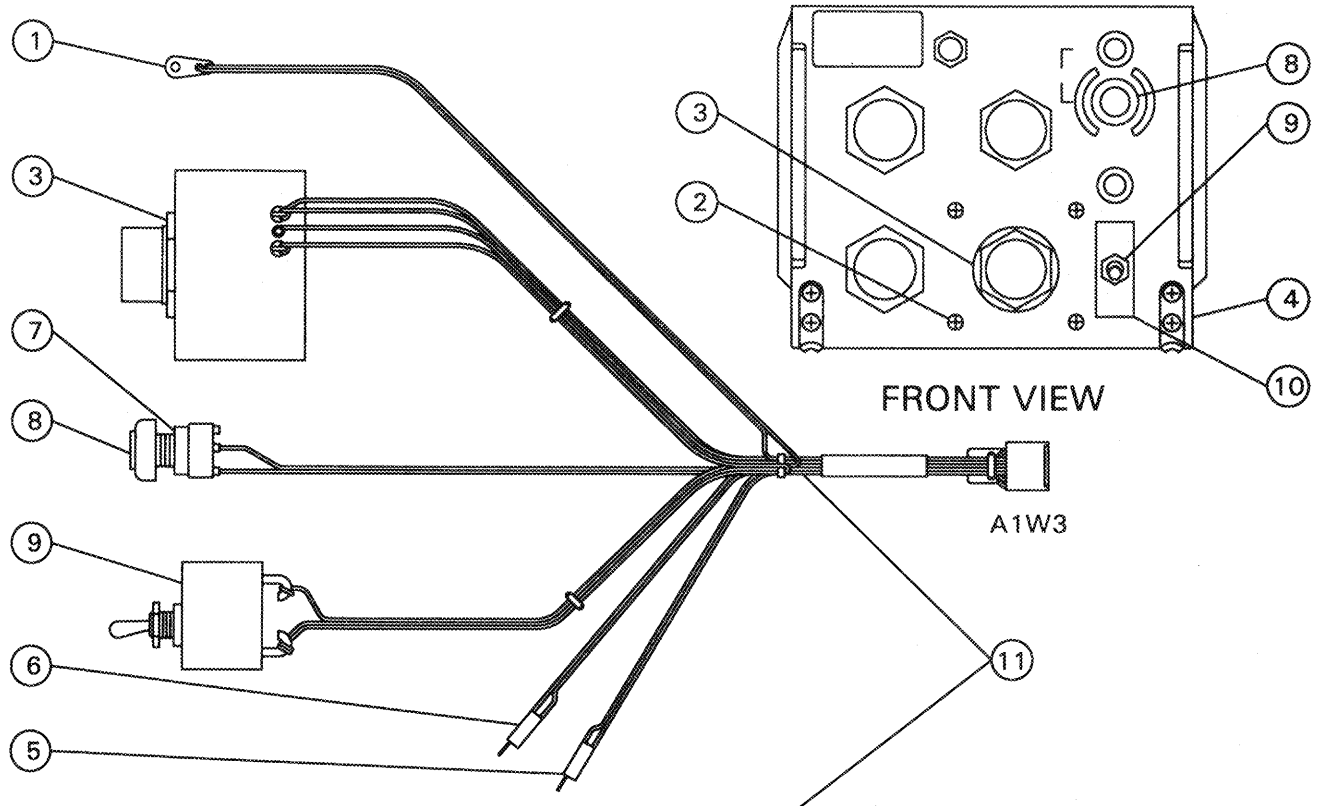
STEP 9. Replace ground lug E1 (1) on chassis mounting point and replace washer and crosstip screw.

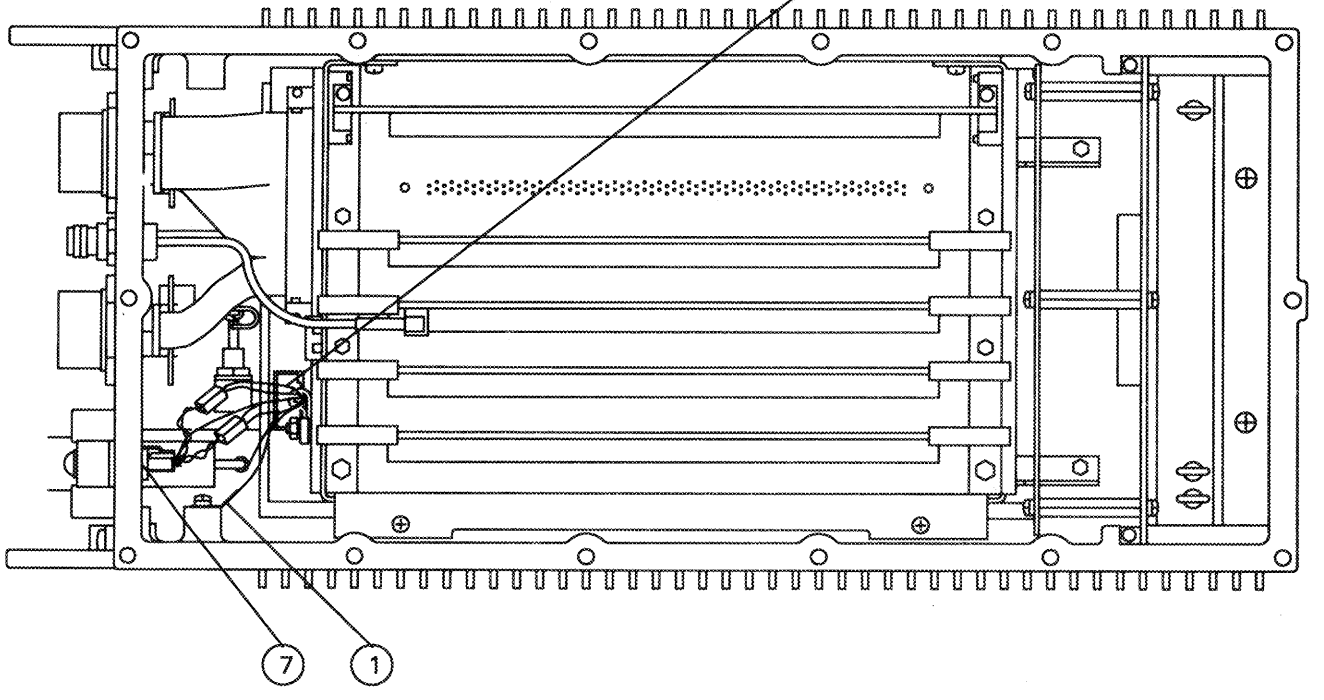
STEP 10. Replace all assemblies.

STEP 11. Perform operational check to verify unit is working properly (para 3-5).

STEP 12. Replace top cover (para 2-12).

3-22. REPLACEMENT OF WIRING HARNESS ASSEMBLY (A1W3) (Cont.)





COVER REMOVED, TOP VIEW

3-23. REPLACEMENT OF POWER ON CIRCUIT BREAKER (A1W3CB1)

INITIAL SETUP

Tools

Tool Kit TK-17
Workstation, Static
1/2 in. Deep Well Socket,
3/8 in. Drive
Torque Wrench, 0-100 in. lbs.

Materials/Parts

Circuit Breaker, A1W3CB1,
P/N M39019/01-230

Equipment Condition

Power off
Top cover removed (para 2-12)
PS1 removed (para 2-13)
A8 removed (para 2-14)
A7 removed (para 2-15)
A6 removed (para 2-16)
A5 removed (para 2-17)
A3 removed (para 2-18)
Cardcage removed (para 3-19)

REMOVE CIRCUIT BREAKER A1W3CB1

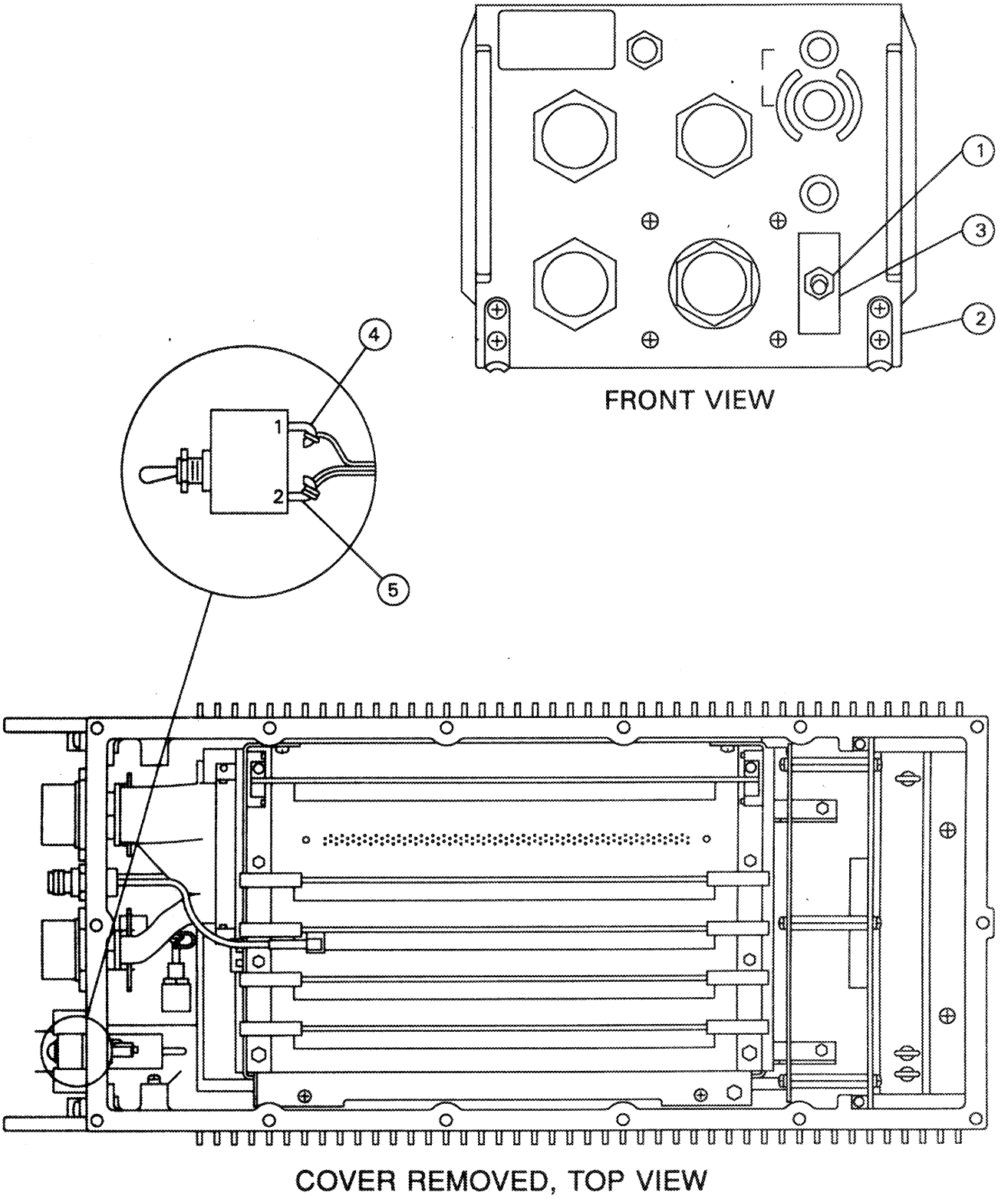
STEP 1. Using a 1/2 inch socket, remove and retain nut, keyed flatwasher, and lockwasher securing CB1 (1) to front panel (2). Remove and retain switch guard (3).

STEP 2. Slide CB1 straight back from front panel.

STEP 3. Unsolder and tag wire from CB1-1 (4).

STEP 4. Unsolder and tag 2 wires from CB1-2 (5).

3-23. REPLACEMENT OF POWER ON CIRCUIT BREAKER (A1W3CB1) (Cont.)



3-23. REPLACEMENT OF POWER ON CIRCUIT BREAKER (A1W3CB1) (Cont.)

REPLACE CIRCUIT BREAKER A1W3CB1

STEP 1. Solder wire to CB1-1 (4).

STEP 2. Solder two wires to CB1-2 (5).

STEP 3. With CB1 in OFF position, check continuity:

FROM	TO	READING
CB1-1	J5-A	<1 ohm (short)
	A1W3P1-1	infinite ohms (open)
	A1W3P1-2	infinite ohms (open)
CB1-2	J5-A	infinite ohms (open)
	A1W3P1-1	<1 ohm (short)
	A1W3P1-2	<1 ohm (short)

STEP 4. With CB1 in ON position, check continuity:

FROM	TO	READING
CB1-1	J5-A	<1 ohm (short)
	A1W3P1-1	<1 ohm (short)
	A1W3P1-2	<1 ohm (short)
CB1-2	J5-A	<1 ohm (short)
	A1W3P1-1	<1 ohm (short)
	A1W3P1-2	<1 ohm (short)

STEP 5. From rear of front panel, slide CB1 (1) into front panel (2) opening labeled PWR ON.

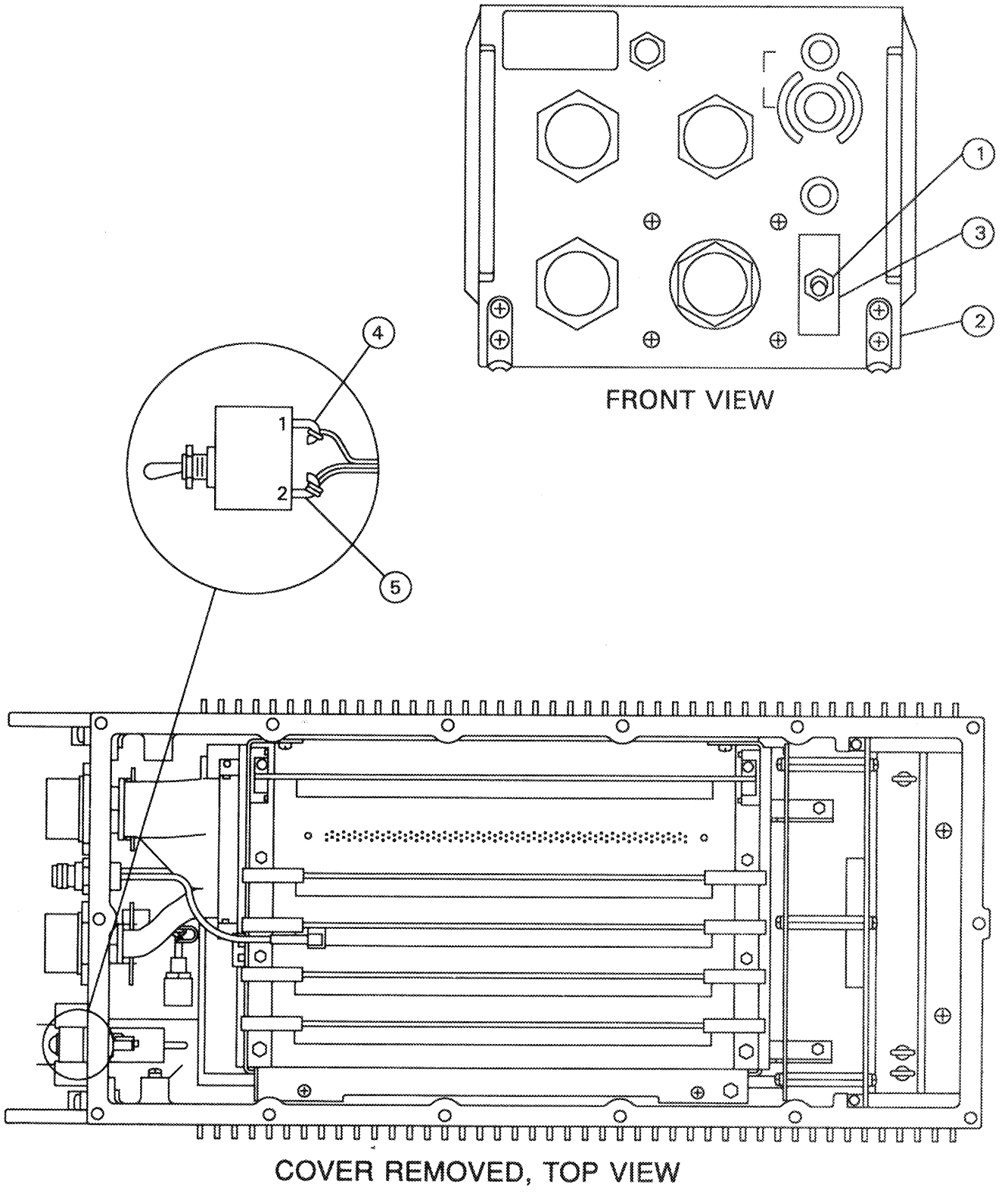
STEP 6. Place keyed flatwasher over CB1. Replace switch guard (3), lockwasher, and retaining nut on CB1. Tighten to 20 in. lbs. torque.

STEP 7. Replace all assemblies.

STEP 8. Perform operational check to verify unit is working properly (para 3-5).

STEP 9. Replace top cover (para 2-12).

3-23. REPLACEMENT OF POWER ON CIRCUIT BREAKER (A1W3CB1) (Cont.)



3-24. REPLACEMENT OF BIT PUSHBUTTON SWITCH (A1W3S1)

INITIAL SETUP

Tools	Equipment Condition
Tool Kit TK-17	Power off
Workstation, Static	Remove top cover (para 2-12)
	PS1 removed (para 2-13)
Materials/Parts	A8 removed (para 2-14)
	A7 removed (para 2-15)
Switch, Pushbutton, A1W3S1, P/N A3024454	A6 removed (para 2-16)
	A5 removed (para 2-17)
	A3 removed (para 2-18)
	Cardcage removed (para 3-19)

REMOVE A1W3S1

STEP 1. With flat blade screwdriver, push back retaining ring (1) on S1 pushbutton (2). Turn S1 to match retaining key of switch to pushbutton retaining key. Pull S1 straight back.

STEP 2. Unsolder and tag wire (white/green color) from S1-C (3).

STEP 3. Unsolder and tag wire (black color) from S1-NO (4).

STEP 4. Remove S1.

REPLACE A1W3S1

STEP 1. Solder wire (white/green color) to S1-C (3).

STEP 2. Solder wire (black color) to S1-NO (4).

STEP 3. Check continuity:

FROM	TO	READING
S1-C	P1-12	<1 ohm (short)
S1-NO	P1-11	<1 ohm (short)

STEP 4. With S1 depressed, check continuity:

FROM	TO	READING
P1-12	P1-11	<1 ohm (short)

STEP 5. From rear of front panel, align S1 (2) with front panel retaining shaft, push S1 on shaft until retaining ring (1) snaps into place.

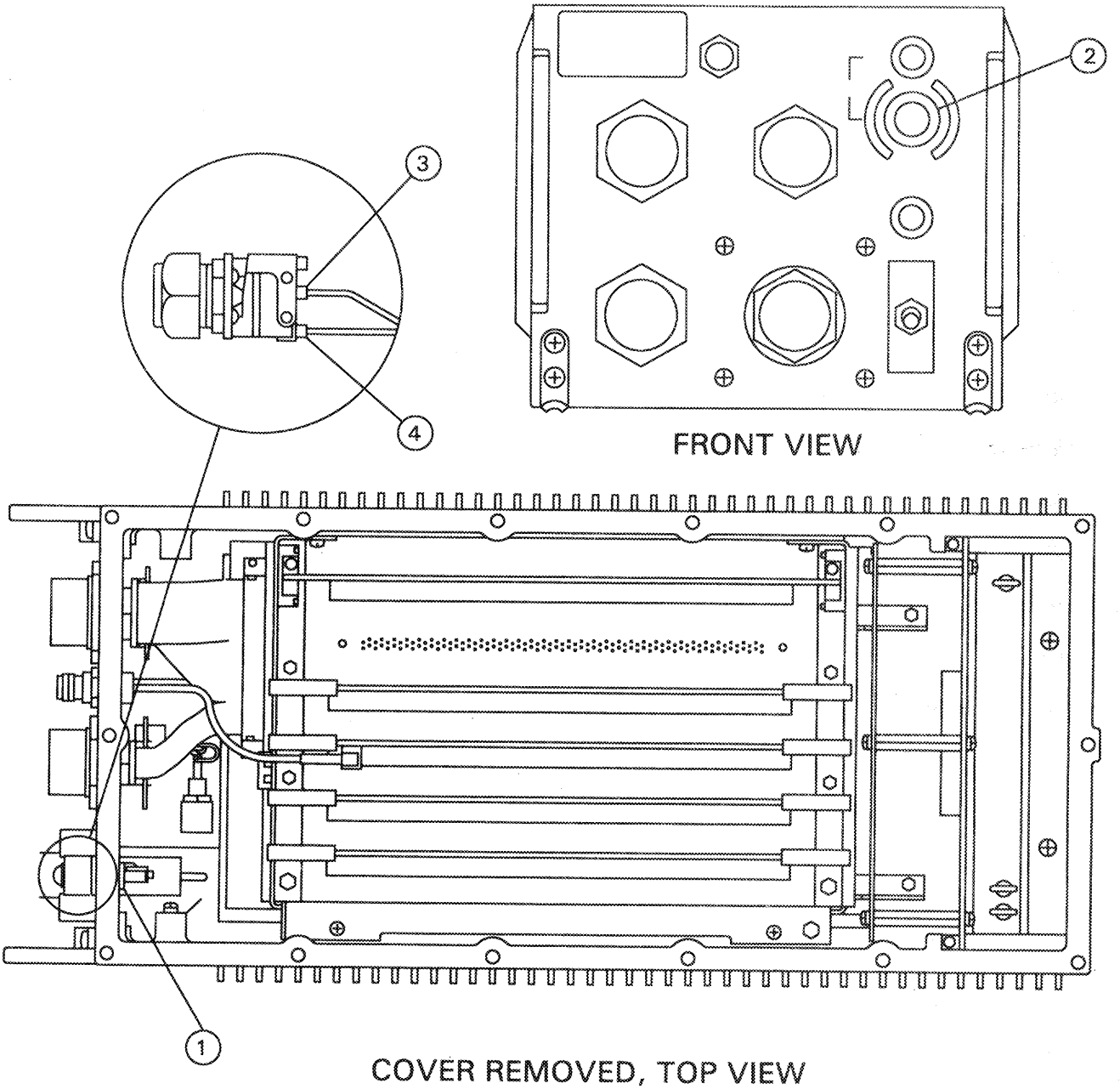
3-24. REPLACEMENT OF BIT PUSHBUTTON SWITCH (A1W3S1) (Cont.)

REPLACE A1W3S1 (Cont.)

STEP 6. Replace all assemblies.

STEP 7. Perform operational check to verify unit is working properly (para 3-5).

STEP 8. Replace top cover (para 2-12).



3-25. REPLACEMENT OF EMI FILTER (A1W3J5)

INITIAL SETUP

Tools	Equipment Condition
Tool Kit TK-17	Power off
Workstation, Static	Top cover removed (para 2-12)
Torque Screwdriver, 0-30 in. lbs.	PS1 removed (para 2-13)
	A8 removed (para 2-14)
Materials/Parts	A7 removed (para 2-15)
	A6 removed (para 2-16)
Filter, EMI A1W3J5, P/N A3024064	A5 removed (para 2-17)
Gasket, Sealing P/N A3024147	A3 removed (para 2-18)
	Cardcage removed (para 3-19)

REMOVE EMI FILTER

STEP 1. Remove and retain 4 crosstip screws (1) securing J5 (2) to front panel (3).

STEP 2. Slide J5 and gasket (4) back from front panel.

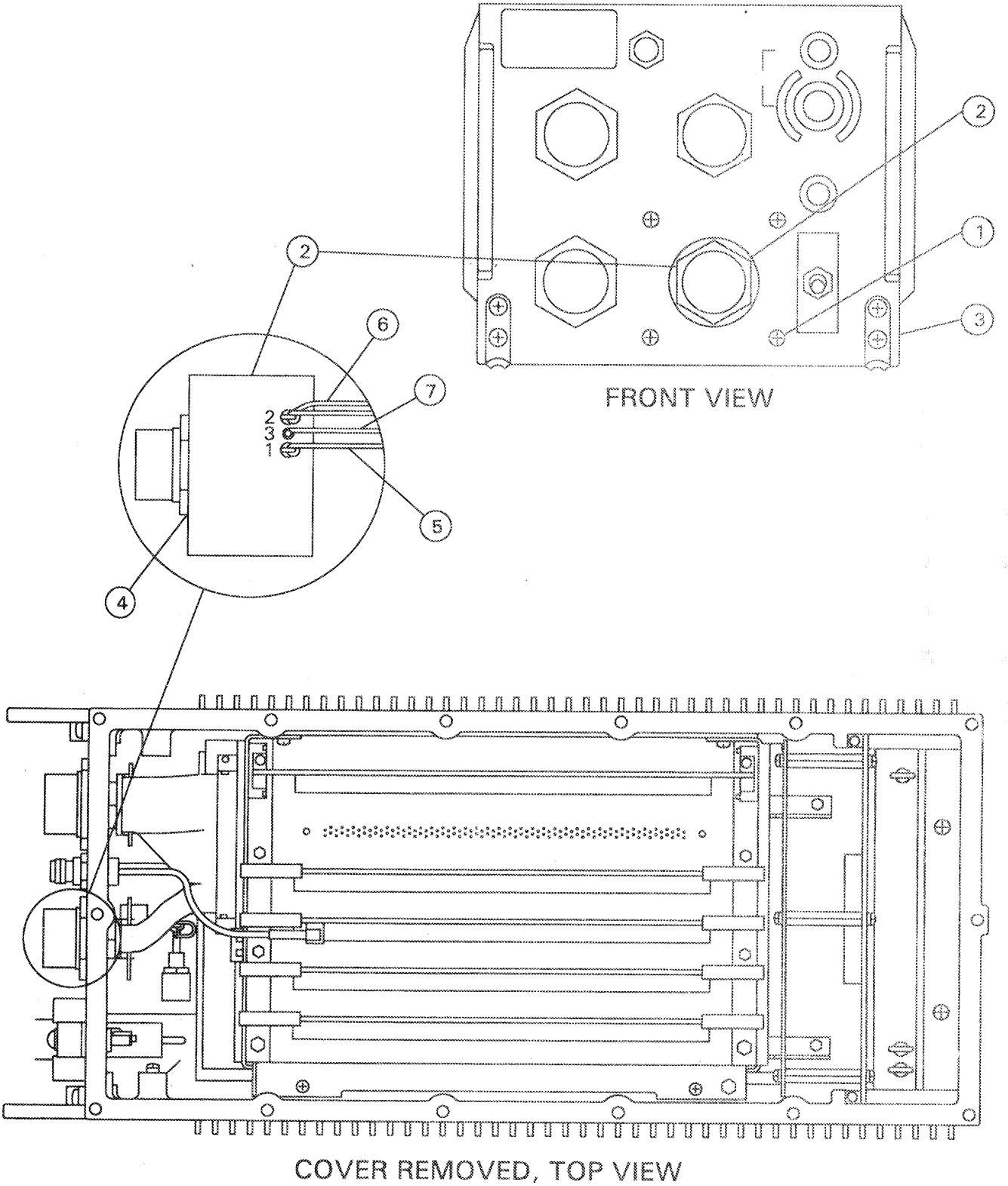
STEP 3. Unsolder and tag wire (blue color) from J5-1 (5).

STEP 4. Unsolder and tag wires (black color) from J5-2 (6).

STEP 5. Unsolder and tag wire (green color) from J5-3 (7).

STEP 6. Remove J5.

3-25. REPLACEMENT OF EMI FILTER (A1W3J5) (Cont.)



3-25. REPLACEMENT OF EMI FILTER (A1W3J5) (Cont.)

REPLACE EMI FILTER

STEP 1. Solder wire (green color) to J5-3 (7).

STEP 2. Solder wires (black color) to J5-2 (6).

STEP 3. Solder wire (blue color) to J5-1 (5).

STEP 4. Check Continuity:

FROM	TO	READING
J5-1	CB1-1	<1 ohm (short)
	E1	infinite ohms (open)
J5-2	P1-9	<1 ohm (short)
	P1-10	<1 ohm (short)
	CB1-1	infinite ohms (open)
	E1	infinite ohms (open)
J5-3	E1	<1 ohm (short)
	CB1-1	infinite ohms (open)

STEP 7. From rear of front panel, place gasket (4) into position and then slide A1W3J5 (2) into front panel opening labeled J5 PWR IN.

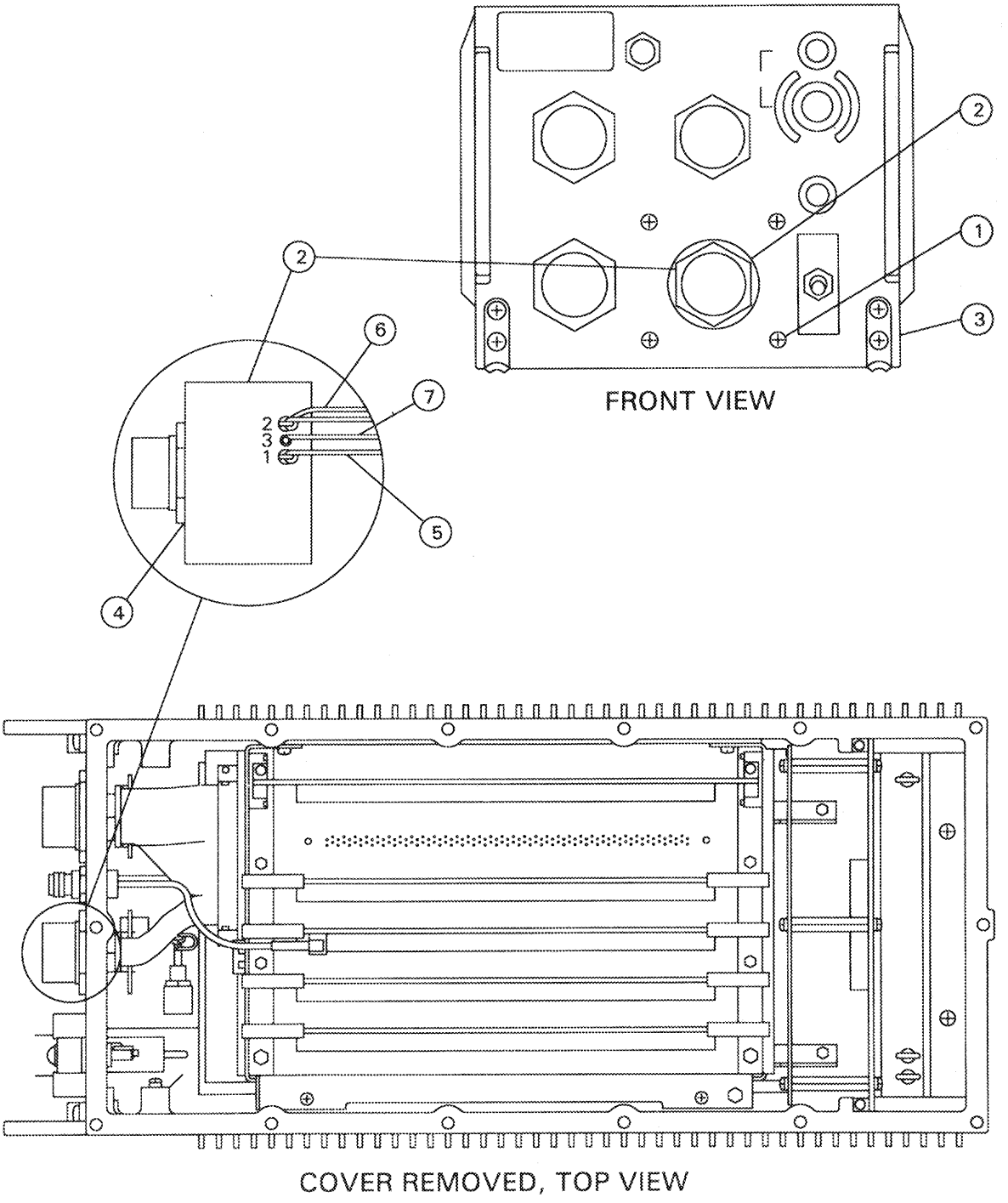
STEP 8. Replace and tighten 4 crosstip screws (1) to secure J5 to front panel (3). Torque to 18 inch pounds.

STEP 9. Replace all assemblies.

STEP 10. Perform operational check to verify unit is operating properly (para 3-5).

STEP 11. Replace top cover (para 2-12).

3-25. REPLACEMENT OF EMI FILTER (A1W3J5) (Cont.)



FRONT VIEW

COVER REMOVED, TOP VIEW

3-26. REPLACEMENT OF A1W1J1 (RADIO) CONNECTOR

INITIAL SETUP

Tools

Tool Kit TK-17
Workstation, Static
Torque Wrench, 0-100 in. lbs.
Socket, 1 7/16"

Materials/Parts

Connector, Receptacle, A1W1J1, P/N A3024551-21

Equipment Condition

Power off
Top cover removed (para 2-12)
PS1 removed (para 2-13)
A8 removed (para 2-14)
A7 removed (para 2-15)
A6 removed (para 2-16)
A5 removed (para 2-17)
A3 removed (para 2-18)
Cardcage removed (para 3-19)

REMOVE J1 (RADIO) CONNECTOR

STEP 1. Using a 1 7/16 inch socket, remove and retain nut securing J1 (1) to front panel (2).

STEP 2. Slide J1 straight back from front panel.

STEP 3. Unsolder the terminal board (3) from the connector leads (4).

STEP 4. Separate J1 from terminal board.

REPLACE J1 (RADIO) CONNECTOR

STEP 1. Orient new connector leads (4) terminal board .

STEP 2. Solder connector leads (4) to connector (3).

STEP 3. Measure continuity from J1 RADIO to P1 per FO-1.

STEP 4. From rear of front panel, slide J1 (1) into front panel (2) opening marked J1 RADIO.

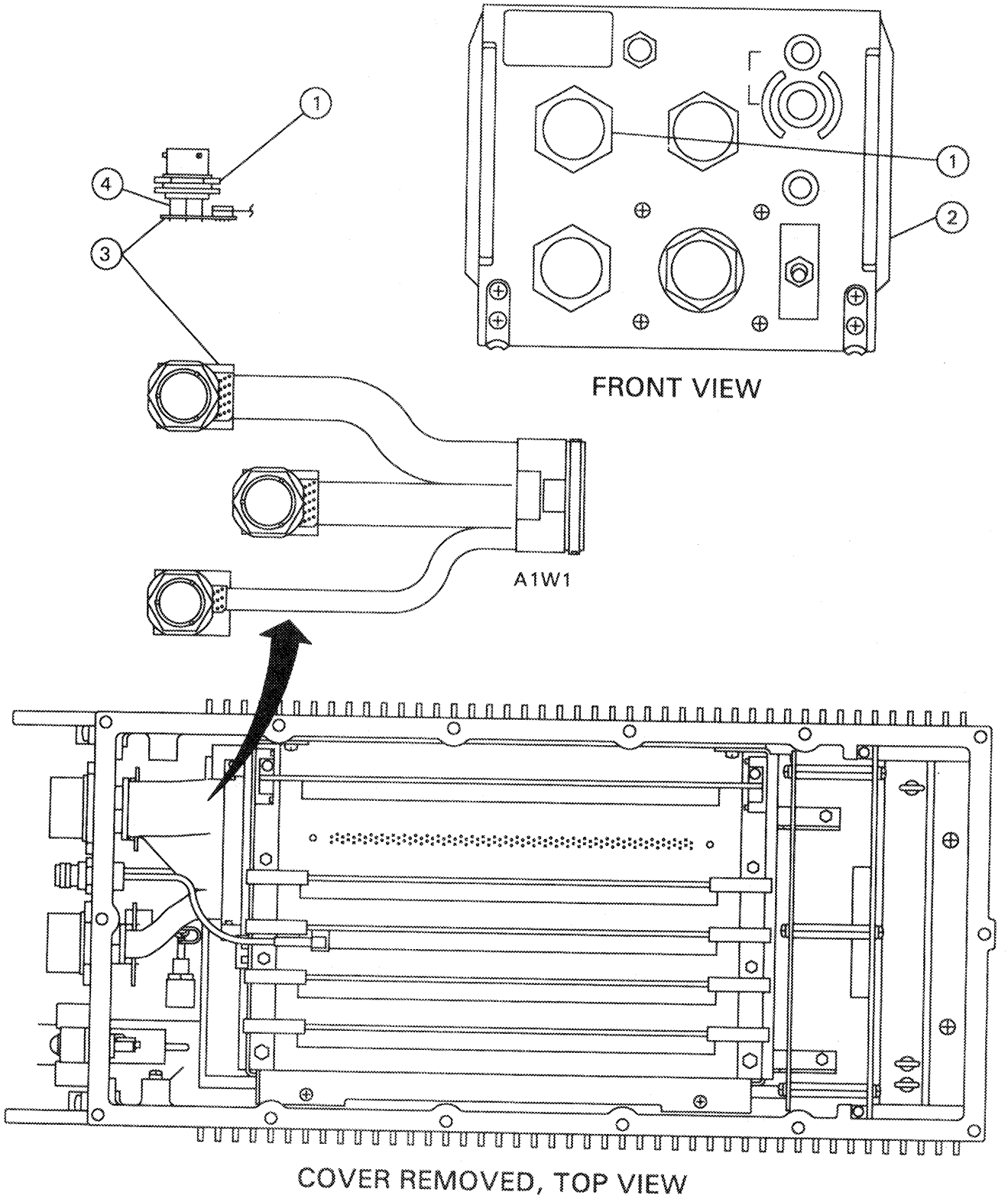
STEP 5. Place retaining nut on J1 (1) and tighten. Torque to 80-85 inch pounds.

STEP 6. Replace all assemblies.

STEP 7. Perform operational check to verify unit is operating properly (para 3-5).

STEP 8. Replace top cover (para 2-12).

3-26. REPLACEMENT OF A1W1J1 (RADIO) CONNECTOR (Cont.)



FRONT VIEW

COVER REMOVED, TOP VIEW

3-27. REPLACEMENT OF A1W1J3 (CONTROL BUS) CONNECTOR

INITIAL SETUP

Tools

Tool Kit TK-17
Workstation, Static
Torque Wrench, 0-100 in. lb.
Socket, 1 5/16"

Materials/Parts

Connector, Receptacle, A1W1J3, P/N A3024451-17

Equipment Condition

Power off
Top cover removed (2-12)
PS1 removed (para 2-13)
A8 removed (para 2-14)
A7 removed (para 2-15)
A6 removed (para 2-16)
A5 removed (para 2-17)
A3 removed (para 2-18)
Cardcage removed (para 3-19)

REMOVE J3 (CONTROL BUS) CONNECTOR

STEP 1. Using a 1 5/16 inch socket, remove and retain nut and washer securing J3 (1) to front panel (2).

STEP 2. Slide J3 straight back from front panel.

STEP 3. Unsolder the terminal board (3) from the connector leads (4).

STEP 4. Separate J3 (1) from terminal board (3).

REPLACE J3 (CONTROL BUS) CONNECTOR

STEP 1. Orient new connector leads (4) from terminal board (3).

STEP 2. Solder connector leads (4) to terminal board (3).

STEP 3. Measure continuity from J3 (CONTROL BUS connector) to P1 per FO-1.

STEP 4. From rear of front panel, slide J3 (1) into front panel (2) opening marked J3 CONTROL BUS.

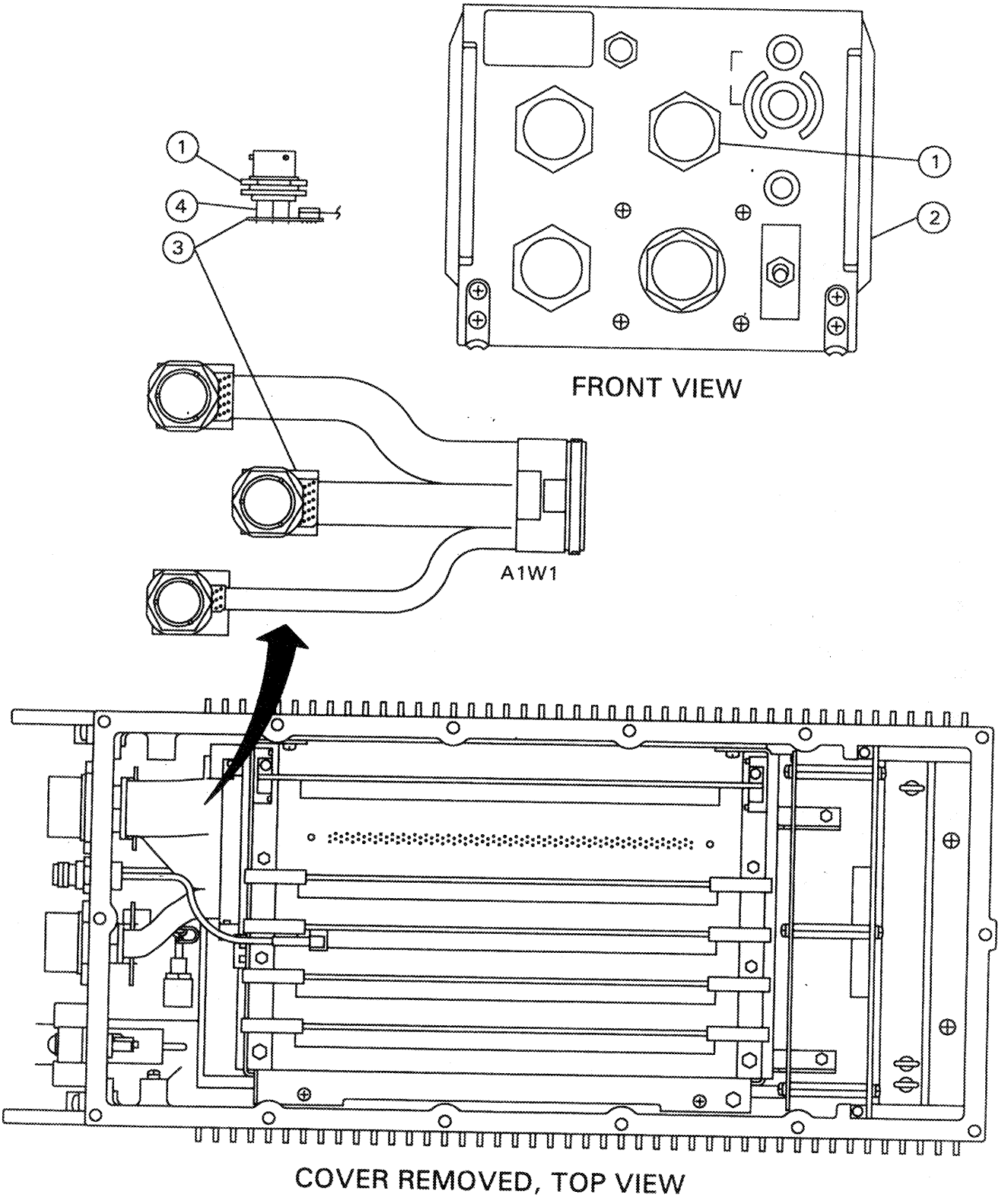
STEP 5. Place retaining nut on J3 (1) and tighten. Torque to 70-75 inch pounds.

STEP 6. Replace all assemblies.

STEP 7. Perform operational check to verify unit is operating properly (para 3-5).

STEP 8. Replace top cover (para 2-12).

3-27. REPLACEMENT OF A1W1J3 (CONTROL BUS) CONNECTOR (Cont.)



FRONT VIEW

COVER REMOVED, TOP VIEW

3-28. REPLACEMENT OF A1W1J4 (KG-84) CONNECTOR

INITIAL SETUP

Tools

Tool Kit TK-17
Workstation, Static
Torque Wrench, 0-100 in. lb.
Socket, 1 7/16"

Materials/Parts

Connector, Receptacle, A1W1J4,
P/N A3024451-20

Equipment Condition

Power off
Top cover removed (para 2-12)
PS1 removed (para 2-13)
A8 removed (para 2-14)
A7 removed (para 2-15)
A6 removed (para 2-16)
A5 removed (para 2-17)
A3 removed (para 2-18)
Cardcage removed (para 3-19)

REMOVE J4 (KG-84) CONNECTOR

STEP 1. Using a 1 7/16 inch socket, remove and retain nut securing J4 (1) to front panel (2).

STEP 2. Slide J4 straight back from front panel.

STEP 3. Unsolder the terminal board (3) from the connector leads (4).

STEP 4. Separate J4 from terminal board.

REPLACE J4 (KG-84) CONNECTOR

STEP 1. Orient new connector leads (4) to terminal board (3).

STEP 2. Solder leads to terminal board (3).

STEP 3. Measure continuity from J4 (KG-84 connector) to P1 per FO-1.

STEP 4. From rear of front panel, slide J4 (1) into front panel 2 opening marked J4 KG-84.

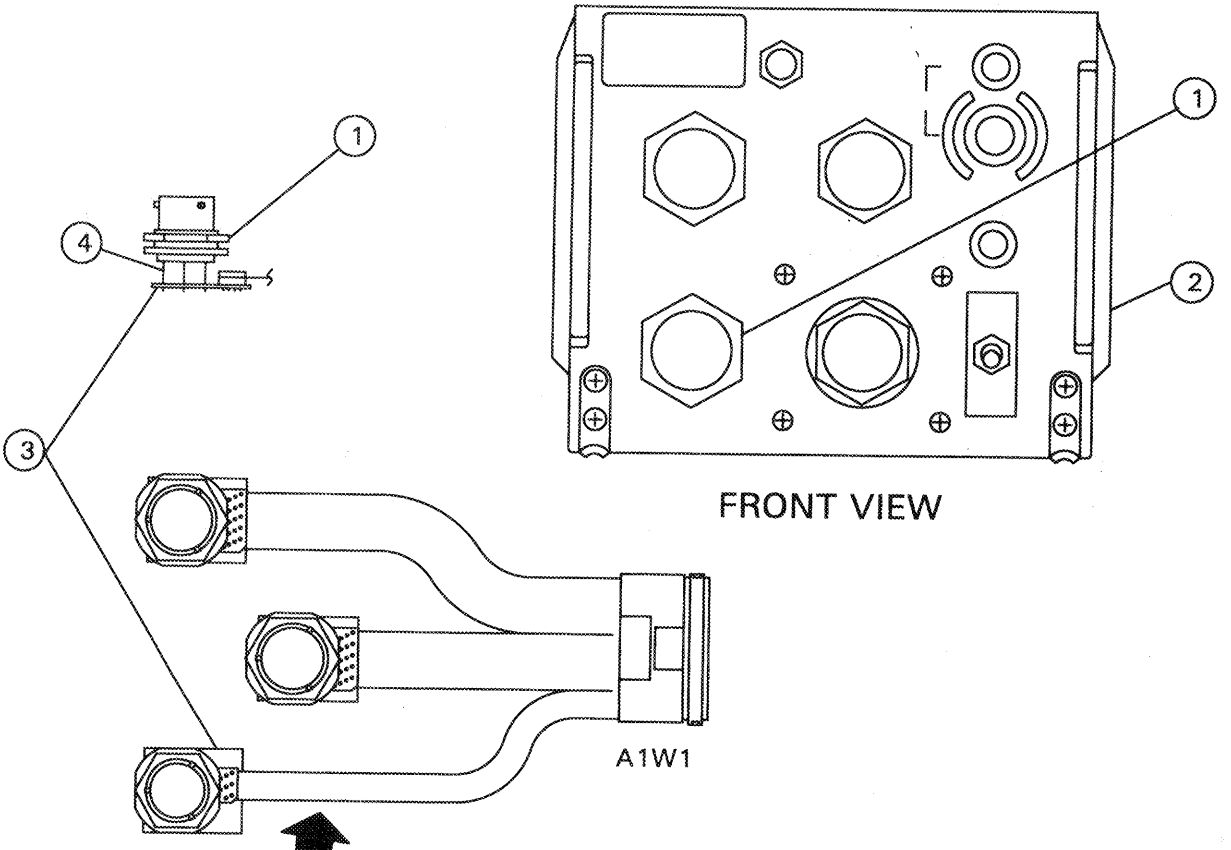
STEP 5. Place retaining nut on J4 and tighten. Torque to 80-85 inch pounds.

STEP 6. Replace all assemblies.

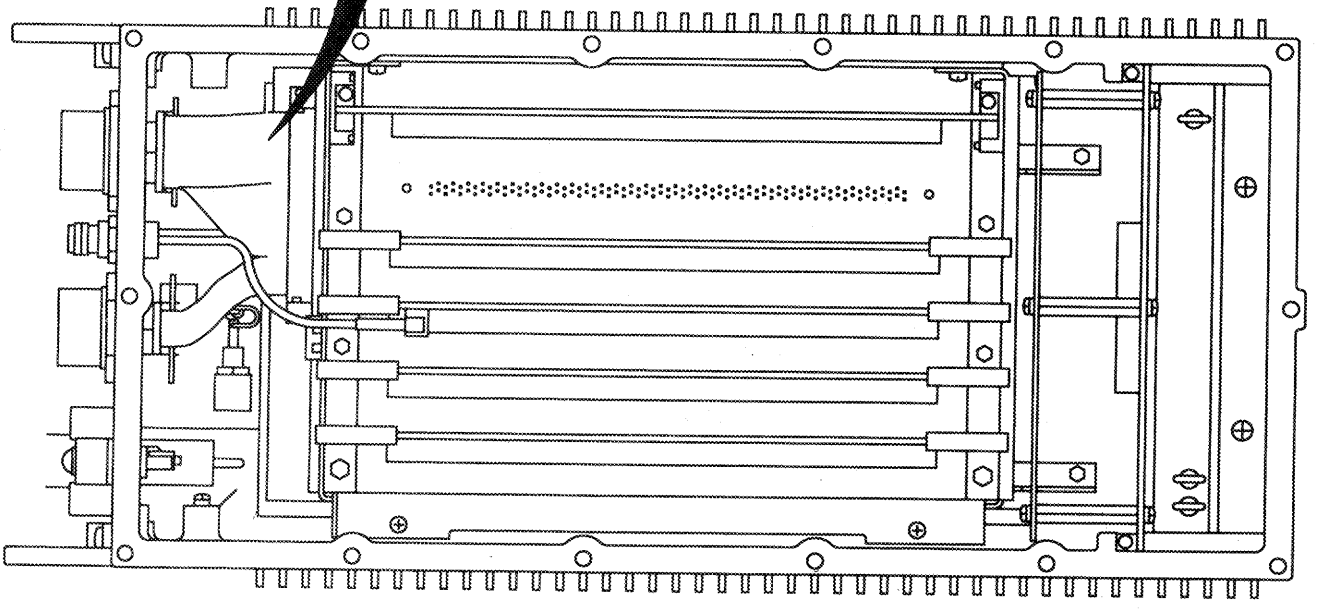
STEP 7. Perform operational check to verify unit is operating properly (para 3-5).

STEP 8. Replace top cover (para 2-12).

3-28. REPLACEMENT OF A1W1J4 (KG-84) CONNECTOR (Cont.)



FRONT VIEW



COVER REMOVED, TOP VIEW

3-29. REPLACEMENT OF A1W4 OR A1W5 (BIT FAULT OR POWER ON) CABLE ASSEMBLY

INITIAL SETUP

Tools

Tool Kit, TK-17
Workstation, Static
Torque Wrench, 0-100 in. lb.
Crowfoot Wrench, open-end 9/16 in., 3/8 in. drive

Materials/Parts

Wiring Harness, A1W4 or A1W5, P/N A3023918

Equipment Condition

Power off
Top cover removed (para 2-12)
PS1 removed (para 2-13)
A8 removed (para 2-14)
A7 removed (para 2-15)
A6 removed (para 2-16)
A5 removed (para 2-17)
A3 removed (para 2-18)
Cardcage removed (para 3-19)

REMOVE A1W4

STEP 1. Disconnect A1W4P1 from A1W3P2 or A1W5P1 from A1W3P3 (as appropriate) by pulling connector ends (1) and (2) apart.

STEP 2. Using a 9/16 in. open-end wrench w/socket adapter, remove the retaining nut (3) securing lamp holder (4) to front panel (5).

STEP 3. Slide lamp holder forward through the front panel opening to remove assembly (6) from chassis.

REPLACE A1W4

STEP 1. Slide cable assembly (6) through appropriate front panel opening into chassis. From back of assembly, place retaining nut (3) on assembly and secure to front panel (5). Torque to 20-26 inch pounds.

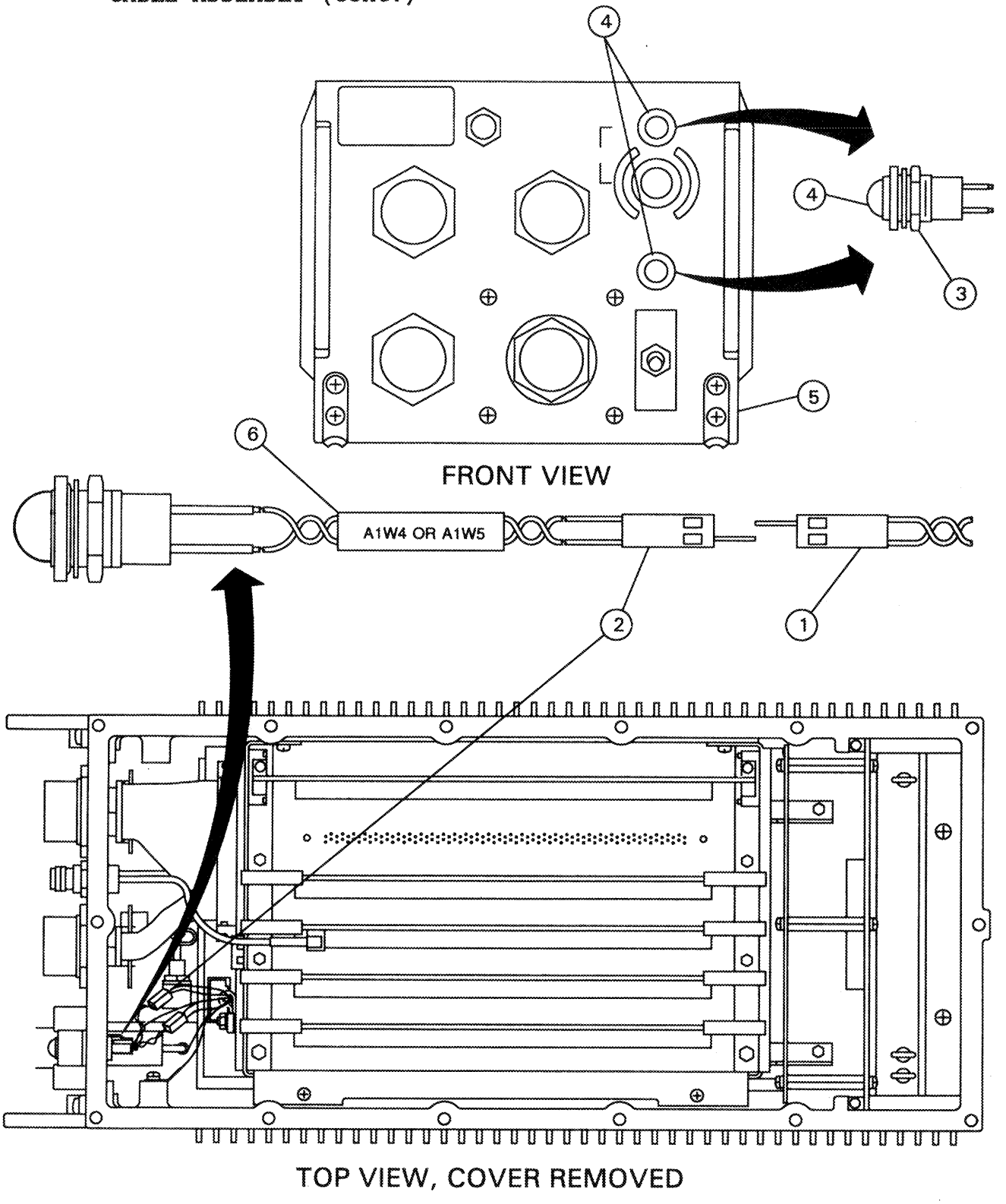
STEP 2. Connect A1W4P1 indicator cable assembly to A1W3P2 or A1W5P1 to A1W3P3 (as appropriate) by sliding connector ends (1) and (2) together.

STEP 3. Replace all assemblies.

STEP 4. Perform operational check to verify unit is operating properly (para 3-5).

STEP 5. Replace top cover (para 2-12).

3-29. REPLACEMENT OF A1W4 OR A1W5 (BIT FAULT OR POWER ON) CABLE ASSEMBLY (Cont.)



FRONT VIEW

TOP VIEW, COVER REMOVED

3-30. REPLACEMENT OF A1W2 (REF FREQ) CABLE ASSEMBLY

INITIAL SETUP

Tools

Tool Kit, TK-17
Workstation, Static
Torque Wrench, 0-100 in. lb.
Socket, deep-well, 5/8"

Equipment Condition

Power off
Top cover removed (para 2-12)

Materials/Parts

Wiring Harness, A1W2, P/N A3023956

REMOVE A1W2

STEP 1. Disconnect A1W2 (1) from XA6J3 (2) by pulling straight up on the connector P1. Do not pull on cable.

STEP 2. Using a 5/8" deep-well socket, remove and retain nut and washer securing A1W2J2 (3) to front panel (4).

STEP 3. Slide A1W2 back from front panel and lift out.

REPLACE A1W2

STEP 1. From back of front panel (4), slide A1W2J2 (3) into front panel opening labeled FREQ STD.

STEP 2. Replace washer and nut on J2 and tighten. Torque to 25 in. lbs.

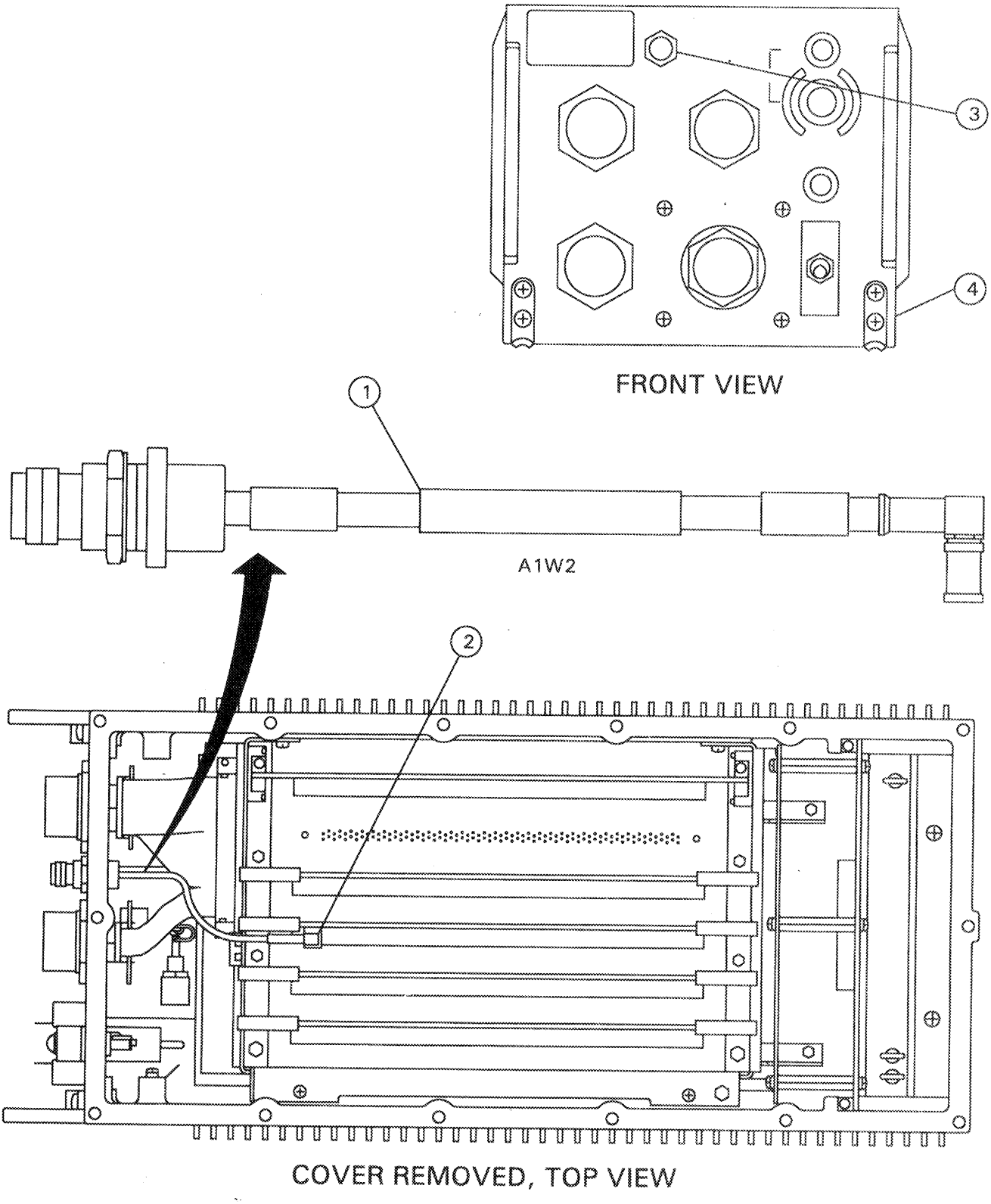
STEP 3. Connect A1W2P1 to XA6J3 (2) by sliding P1 onto XA6J3.

STEP 4. Replace all assemblies.

STEP 5. Perform operational check to verify unit is operating properly (para 3-5).

STEP 6. Replace top cover (para 2-12).

3-30. REPLACEMENT OF A1W2 (REF FREQ) CABLE ASSEMBLY (Cont.)



3-31. REPAIR OF ASSEMBLIES WITH HEATSINK-MOUNTED COMPONENTS

a. Heatsink assembly PS1A2 contains discrete components mounted on the heatsink. Removal and replacement of the components may be required for intermediate repair of the power supply.

b. Components mounted on the heatsink plates are insulated so that the component caps (flanges) are electrically isolated. Leads placed through the heatsink chassis are insulated with screw insulators. Retaining screws are also individually insulated. The component body is insulated from the chassis by an insulator, usually a mica wafer. All of these insulators must be in the proper position before power is applied or the assembly is tested.

c. The following steps are typical for each of the heatsink-mounted components. Use these instructions as a guide when replacing heatsink-mounted components.

INITIAL SETUP

Tools

Tool Kit, TK-17
Workstation, Static

Equipment Condition

Power off
PS1 removed (para 2-13)

Materials/Parts

Heatsink Compound,
insulators, as required.

NOTE

If the insulators are serviceable, keep and reuse them when replacing the component. Check to insure that there are no cracks, burns, or other evidence that the insulating properties have deteriorated. Replace if necessary.

REMOVE HEATSINK MOUNTED COMPONENTS

STEP 1. Remove the A2 heatsink assembly (1) but do not disconnect wires (para 3-18).

STEP 2. On the component to be replaced, tag and disconnect the wires from the component leads (2).

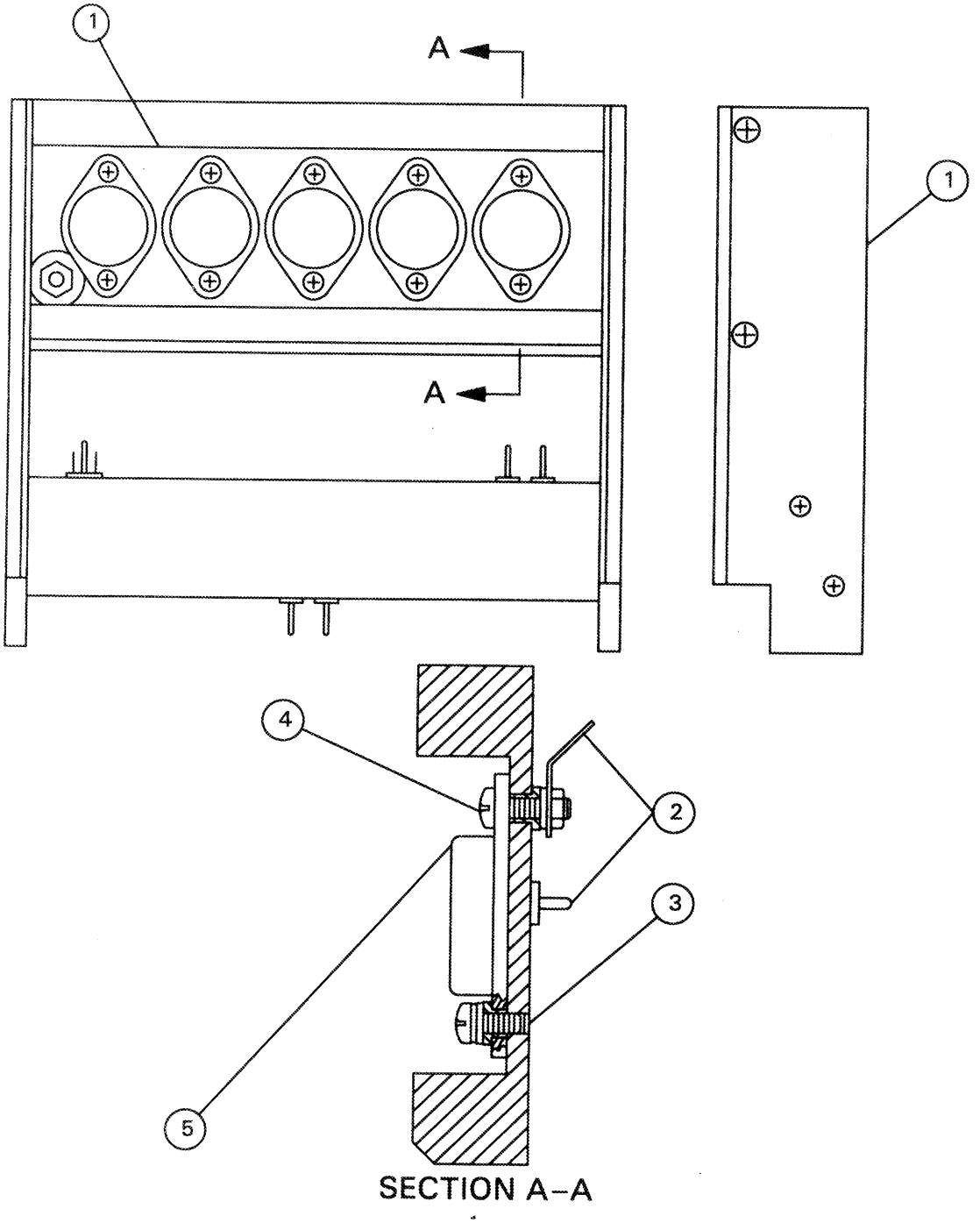
STEP 3. Remove the screw (3) (through the heatsink plate), wire terminal, flatwasher, and screw insulator.

3-31. REPAIR OF ASSEMBLIES WITH HEATSINK-MOUNTED COMPONENTS (Cont.)

REMOVE HEATSINK MOUNTED COMPONENTS (Cont.)

STEP 4. Remove the helicoil screw (4), lockwasher, flatwasher, and screw insulator.

STEP 5. Lift the component (5) and mica insulator from the heatsink plate.



SECTION A-A

3-31. REPAIR OF ASSEMBLIES WITH HEATSINK-MOUNTED COMPONENTS (Cont.)

REPLACE HEATSINK COMPONENT

STEP 1. Place an insulator (mica or similar type) on the component (5) and position it on the heatsink plate.

NOTE

Make sure that component is positioned for the correct lead orientation, as shown on the heat sink plate, and that the leads are properly positioned.

STEP 2. Insert insulators over the leads (2) and solder the leads in place.

STEP 3. Place the longer screw through the heatsink plate and install screw (3) insulator, flatwasher, terminal, and nut.

STEP 4. Secure the remaining side with helicoil screw, lockwasher, flatwasher and screw insulator.

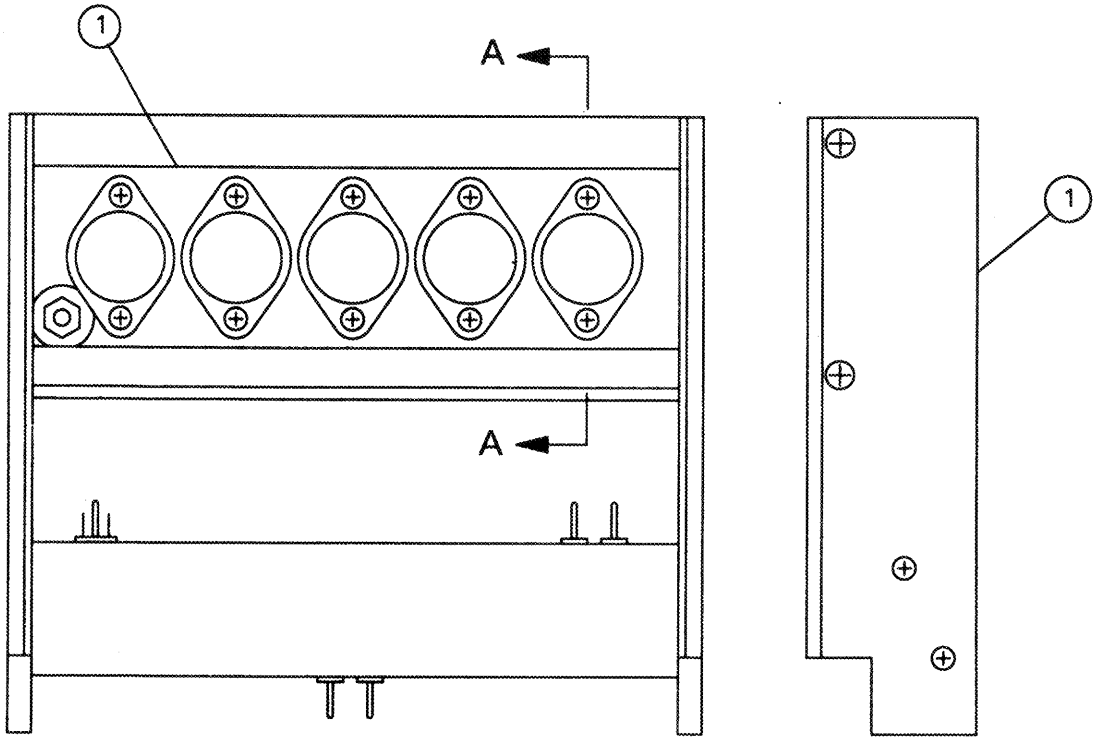
STEP 5. Assemble the power supply (para 3-18).

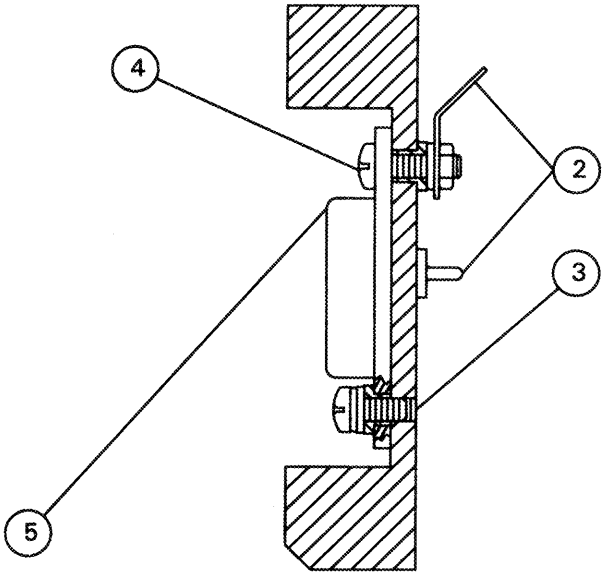
STEP 6. Replace all assemblies.

STEP 7. Perform operational check to verify unit is operating properly (para 3-5).

STEP 8. Replace top cover (para 2-12).

3-31. REPAIR OF ASSEMBLIES WITH HEATSINK-MOUNTED COMPONENTS (Cont.)





SECTION A-A

3-31. REPAIR OF ASSEMBLIES WITH HEATSINK-MOUNTED COMPONENTS (Cont.)

REMOVE HEATSINK MOUNTED DIODE CR24

STEP 1. Remove the A2 heatsink assembly (1), but do not disconnect wires (refer to para 3-18).

STEP 2. On the component to be replaced (2) tag and disconnect the wire from the diode terminal (3).

STEP 3. Remove the mounting nut (4), washers, insulating spacer and solder lug.

STEP 4. Lift the component from the heatsink plate.

REPLACE HEATSINK MOUNTED DIODE CR24

STEP 1. Place components on the diode mounting stud in the following order: terminal lug, insulating disk, and insulating spacer.

STEP 2. Insert the diode mounting stud into heatsink plate.

STEP 3. Place insulating disk and flatwasher over the mounting stud, and secure the diode with the nut (4).

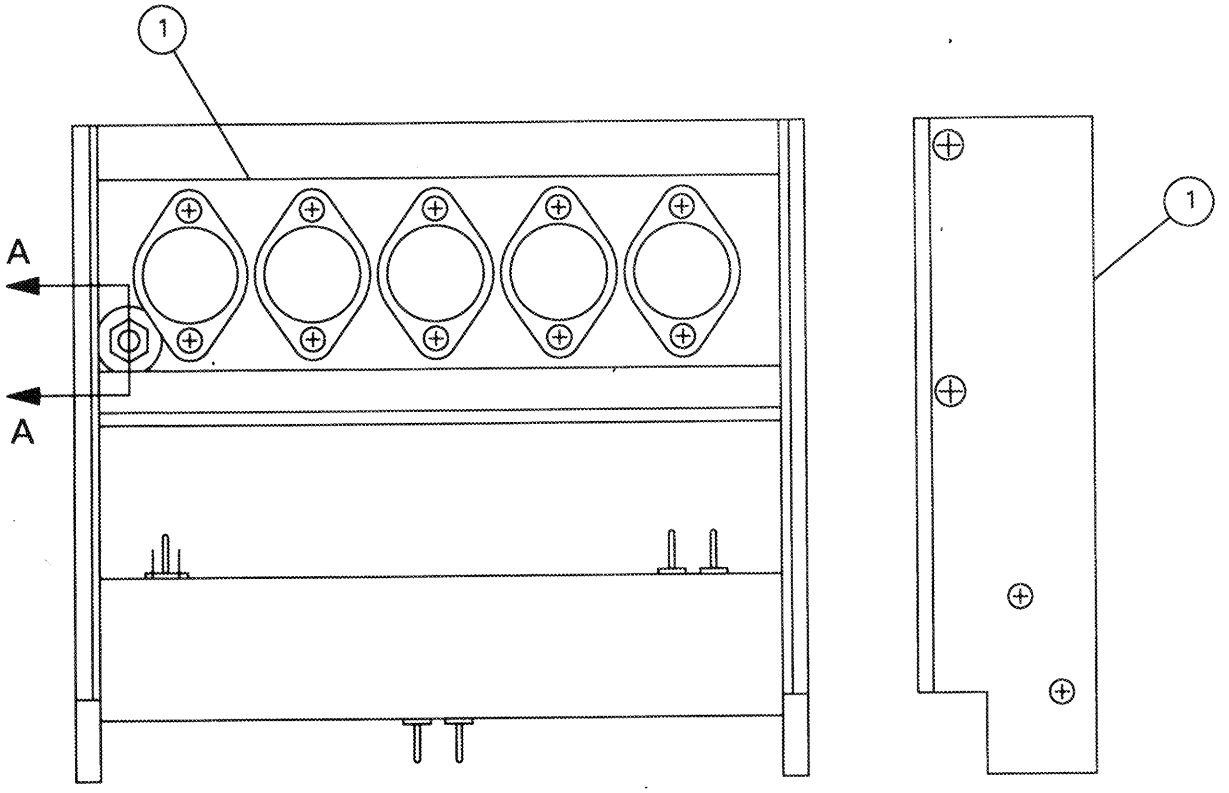
STEP 4. Connect the wire to the diode terminal (3).

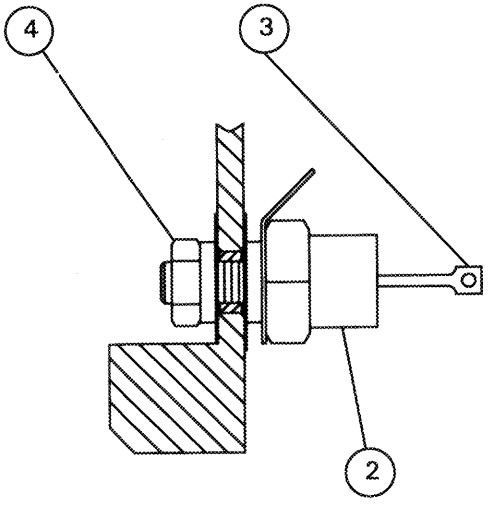
STEP 5. Replace all assemblies.

STEP 6. Perform operational check to verify unit is operating properly (para 3-5).

STEP 7. Replace top cover (para 2-12).

3-31. REPAIR OF ASSEMBLIES WITH HEATSINK-MOUNTED COMPONENTS (Cont.)





SECTION A-A

APPENDIX A
REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual.

A-2. FORMS

Consolidated Index of Army Publications and Blank Forms ..... DA Pam 25-30

Issue of Ships Maintenance and Material Managements (3-M) Manual ..... OPNAVINST 4790.4A

Maintenance Data Collection System ..... AFM 66-267

Military Communication Systems Technical Standards MIL-STD-188

Naval Supply Publication 2002 Navy Stock List of Publications and Forms ..... NAVSUP 2002

Operator's and Unit Maintenance Manual for Communications terminal AN/TRC-179(V)1 (NSN 5895-01-156-0411) ..... TM 11-5895-1218-12 EE150-LQ-OMI-010/W110-TRC179V1/ TO 31R2-2TRC179-21

Operator's and Unit Maintenance Manual for Communications Terminal, AN/TRC-179(V)2, (NSN 5895-01-156-0412) ..... TM 11-5895-1219-12/ EE150-LR-OMI-010/W110-TRC179V1/ TO 31R2-2TRC179-1

Operator's and Unit Maintenance Manual for Radio Set AN/GRC-215 (NSN 5895-01-202-8672) ..... TM 11-5895-1220-12 EE160-RG-OMI-010/W110-GRC215/ TO 31R2-2GRC215-1

Unit, Intermediate Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools Lists) for Test Set, Power Supply TS-4243/G (NSN 6625-01-267-4418) ..... TM 11-6625-3218-14&P/ ET940-AC-OMP-010/TS4243G/ TO 33AA17-191-1

Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command) ..... TM 750-224-2

Release For Shipment of Ground Communication Electronics Cryptographic Equipment ..... AFR 67-31

Reporting of Item and Packaging Discrepancies .... SECNAVINST 4355.18

Reporting of Transportation Discrepancies and Shipment ..... NAVSUPINST 4610.33C

APPENDIX B
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. GENERAL

This appendix provides a summary of the maintenance operations for Digital Data Modem, MD-1204/G. It authorizes levels of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. MAINTENANCE FUNCTION

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, aline, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/action necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components.

B-3. COLUMN ENTRIES

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work time figures will be shown for each category. The number of task-hours specified by the work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart.

Subcolumns of column 4 are as follows:

UNIT

C - Operator/Crew
O - Organizational/Unit

INTERMEDIATE

F - Direct Support
H - General Support
L - Special Repair Activity (SRA)

DEPOT

D - Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. TOOL AND TEST EQUIPMENT REQUIREMENTS (SECT. III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Level. The codes in this column indicate the maintenance level allocated to tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-5. REMARKS (SECT. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

SECTION II. MAINTENANCE ALLOCATION CHART FOR MD-1204/G

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINT. FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQPT.	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
00	MODEM, DIGITAL DATA MD-1204/G (A3023769)	REPLACE		0.1				5	A,C
		TEST		0.1		1.5		1,4,6-10, 14,15,19, 22	
		REPAIR		0.2				2,21,23	B,C,F
		REPAIR				1.5		3,10,16-18, 21,24	D
		OVERHAUL					100.0	TBD	
01	CHASSIS ASSEMBLY A1 (A3023953)	REPAIR				1.5			C,G
0101	CAGE ASSEMBLY A1A1 (A3023962)	REPAIR				0.5			C
010101	MOTHERBOARD ASSEMBLY A1A1A1 (A3023980)	REPAIR				0.5			C
02	SIGNAL PROCESSOR CCA A3 (A3078299)	REPLACE		0.1				2,21,23	F
		TEST				L(2.0)		TBD	E,F
		REPAIR				L(1.0)		TBD	E,F,I
03	DATA CONTROLLER CCA A8 (A3028727)	REPLACE		0.1				2,21,23	F
		TEST				L(2.0)		TBD	E,F
		REPAIR				L(1.0)		TBD	E,F,I
04	DATA INTERFACE CCA A7 (A3023903)	REPLACE		0.1				2,21,23	F
		TEST				L(2.0)		TBD	E,F
		REPAIR				L(1.0)		TBD	E,F,I
05	TIMING/CONTROL/VITERBI/ DECODER CCA A6 (A3023988)	REPLACE		0.1				2,21,23	F
		TEST				L(2.0)		TBD	E,F
		REPAIR				L(1.0)		TBD	E,F,I
06	ANALOG I/O & MODULATOR CCA A5 (A3023976)	REPLACE		0.1				2,21,23	F
		TEST				L(2.0)		TBD	E,F
		REPAIR				L(1.0)		TBD	E,F,I
07	POWER SUPPLY PS1 (A3024066)	REPLACE		0.1				2,10,21	F
		TEST				2.0		1,4-7,10, 13,19,20	F
		REPAIR				1.0		3,10,11,12	F,I
0701	DC-DC COVERTER CCA PS1A1 (A3024793)	REPAIR				1.0			C,H
0702	HEAT SINK ASSEMBLY PS1A2 (A3024796)	REPAIR				1.0			C,H

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR MD-1204/G

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	POWER SUPPLY PP-8202/G *	6130-00-160-0827	HP6274B
2	O	TOOL KIT TK-101/G	5180-00-064-5178	
3	H	TOOL KIT, ELECT. TK-17 (INCL. METRIC)	5180-01-195-0855	JTK-17RM
4	H	OSCILLOSCOPE AN/USM-488	6625-01-187-7847	TEK 2235L
5	O,H	MULTIMETER AN/PSM-45	6625-01-139-2512	SIMPSON 467
6	H	MULTIMETER, DIGITAL AN/USM-486	6625-01-145-2430	FLUKE 8050A-01
7	H	TEST SET, POWER TS-4243/G	6625-01-267-4418	MX 900151-801
8	H	GENERATOR, SIGNAL SG-1170/U	6625-01-120-3501	WAVETEK3001-608
9	H	CABLE ASSY., POWER, ELECT. CX-13360/G	5995-01-264-9748	MX 420892-801
10	H	WORKSTATION STATIC	4940-01-087-3458	3M 8021
11	H	PCB REPAIR KIT MK-772/U	5999-00-757-7042	
12	H	MAINTENANCE KIT, PCB MX-10897/G	5895-01-267-4473	PACE MODEL RNR P/N 8007-0117
13	H	ACTIVE LOAD	6625-01-111-3363	EL 750B
14	H	ADAPTER, BNC TO TNC	5935-00-701-2215	PAMONA 3844A
15	H	CABLE, RF MALE BNC TO MALE BNC		
16	H	WRENCH, TORQUE 3/8 IN. DRIVE (0-100 IN-LBS.)	5120-00-720-1975	
17	H	SOCKET SET, LONG LENGTH, 1/2" DR.	5120-00-596-8622	
18	H	ADAPTER, DRIVE 3/8 IN. TO 1/2 IN.	5120-00-240-8702	
19	H	KIT, TEST LEAD (FOR FLUKE)	6625-00-444-4041	
20	H	SHUNT, CURRENT (0.01 OHM)	6625-01-093-4609	FLUKE 80J-10
21	O,H	SCREWDRIVER SET, TORQUE (1-30 IN-LB.)	5120-00-127-2525	EDP 85002-00
22	H	ADAPTER, UG-201/A BNC TO N	5935-00-259-0205	
23	O	STATIC CONTROL SERVICE KIT	6625-01-168-2044	3M 8501
24	H	CROWFOOT WRENCH OPEN END 9/16", 3/8" DRIVE	5120-01-131-4465	SNAP-ON FC018

* PP-8214/G (NSN 6130-00-150-0028) PROVIDES IDENTICAL CAPABILITY WHEN SOURCE POWER IS 230V, 50 CYCLE. AIR FORCE USE ONLY.

SECTION IV. REMARKS FOR MD-1204/G

REFERENCE CODE	REMARKS
A	Verifies defective Modem and fault isolates to defective CCA/subassembly using Built-In-Test (BIT).
B	Repair by replacement of defective CCA/subassembly: Data Interface CCA A7, Power Supply PS1, Signal Processor CCA A3, Timing/Control/Viterbi/Decoder CCA A6, Analog and I/O Modulator CCA A5, Data Controller A8. Unit level also replaces Front Panel indicator lamps.
C	Repaired/tested as part of next higher assembly.
D	Chassis and Power Supply repair to piece part level.
E	Specialized Repair Activity (SRA). Note: Initial SRA repair will be performed by contractor. Return defective unit(s) to depot.
F	Electrostatic sensitive components.
G	Complete piece part repair including cables A1W1 (P/N A3023957), A1W2 (P/N A3023956), A1W3 (P/N A3023958), A1W4 and A1W5 (P/N A3023918). Repair of motherboard CCA A1A1A1 (P/N A3023980) limited to connector replacement.
H	Repair by replacement of defective components.
I	Repair to piece part level.

APPENDIX C
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

C-1. SCOPE

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the RN Modem. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

C-1.1. 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. E").

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew
O - Unit Maintenance
F - Intermediate Direct Support Maintenance
H - Intermediate 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.

F

FIFO ..... First in, first out
FM ..... Frequency modulation
FREQ ..... Frequency
FSK ..... Frequency shift keying

G

GND ..... Ground

H

HF ..... High frequency
Hz ..... Hertz

I

IAW ..... In Accordance With
ID ..... Identification
IF ..... Intermediate frequency, or injection frequency
I/O ..... Input/output
INT ..... Interrupt
INTA ..... Interrupt acknowledge

K

kHz ..... KiloHertz

L

LED ..... Light emitting diode
LRU ..... Line Replaceable Unit

M

MAC ..... Maintenance Allocation Chart
MHz ..... MegaHertz
MOSFET ..... Metal oxide field effect transistor
MPSC ..... Multi-protocol serial controller

N

NMI ..... Non-maskable interrupt

P

PCLK ..... Peripheral clock
PPC ..... Programmable peripheral controller
PPI ..... Programmable peripheral interface
PPS ..... Pulses per second
PS ..... Power supply
PTT ..... Push to talk (Key)
PWM ..... Pulse width modulator

R

RAM ..... Random access memory
RF ..... Radio frequency
RFO ..... Reference frequency oscillator
RN ..... Regency Net
ROM ..... Read only memory
RT ..... Receiver/transmitter
RTS ..... Ready (or request) to send
RTTY ..... Radio teletype
RXD ..... Receive data

S

SRA ..... Specialized Repair Activity

T

TDMA ..... Time division multiple access
TOD ..... Time of day
TRANSEC
or
TSEC ..... Transmission Security
TTL ..... Transistor transistor logic
TXD ..... Transmit data

U

UART ..... Universal asynchronous receiver/transmitter
USART ..... Universal synchronous/asynchronous receiver/transmitter
UUT ..... Unit under test

V

Vcc ..... Voltage, collector circuit
VCO ..... Voltage controlled oscillator
VDC ..... Volts, direct current

Section II. DEFINITION OF UNUSUAL TERMS

ASYNCHRONOUS - Transmissions in which time intervals between transmitted characters may be of unequal length. In communications, normally characterized by start-stop data bits to indicate the beginning and end of a character.

AUDIO - Frequencies which can be heard by the human ear, usually between 15 Hz and 20 kHz.

BANDWIDTH - The range of frequencies assigned to a channel or system.

BASEBAND - Transmission of a signal at its original frequencies (i.e., unmodulated).

BAUD - A unit of signaling speed equal to the number of discrete conditions or signal events per second. In asynchronous transmission, the unit of signaling speed corresponding to one unit interval per second.

BIT - The smallest binary element of information.

BLOCK - A group of digits transmitted as a unit over which a coding procedure is applied for synchronization or error control.

BUFFER - A storage device used to compensate for a difference in the rate of data flow when transmitting data from one device to another.

BYTE - A binary element string operated upon as a unit and usually shorter than a computer word.

CARRIER - A continuous frequency capable of being modulated or impressed with a signal.

CHANNEL - That part of a communications system that connects a message source to a message sink. A path for electrical transmissions between two or more points.

DATA COMMUNICATION - The interchange of data messages from one point to another over communications channels.

DATA COMMUNICATION EQUIPMENT (DCE) - The equipment that provides the functions required to establish, maintain, and terminate a connection, the signal conversion, and coding required form communication between data terminal equipment and data circuit. (A MODEM is normally considered as the DCE.)

DATA SET - In communications equipment, the DCE; in information, a collection of data records with logical relation of one to another.

DATA TERMINAL EQUIPMENT (DTE) - Equipment usually comprising the following functional units: control logic, buffer store, and one or more input/output devices.
DATA TRANSMISSION - The sending of data from one place for reception elsewhere.

DEINTERLEAVE - Demultiplexing of time division multiplexed signals. In time division multiplexing, a single bus may be used to connect multiple circuits for many functions by dividing the time during which signals are active on the bus into specific time slots during which the addressed circuits are enabled.

DEMODULATION - The process of retrieving an original signal from a modulated carrier wave. Used in data sets to make communications signals compatible with computer signals.

FEEDBACK - A portion of output signal returned to the input of a circuit for error detection and correction.

FREQUENCY MODULATION - A method of transmission whereby the frequency of the carrier wave is changed to correspond to changes in the information signal wave.

FREQUENCY SHIFT KEYING - A method of frequency modulation in which frequency is made to vary at significant instants by smooth as well as abrupt transitions. Typically a data "1" is represented by one frequency and a data "0" as another frequency.

FULL DUPLEX - The ability to transmit and receive simultaneously, normally used in reference to four-wire systems.

GATE - A circuit having two or more inputs and a single output, the output signal depending on the combination of signals at the inputs.

HANDSHAKE SIGNAL - Exchange of signals among elements of a digital data system to verify presence of all required elements.

HALF DUPLEX - The characteristic of transmitting or receiving in one direction at a time. Normally used in reference to a two-wire system.

HERTZ - A unit of frequency equal to one cycle per second.

INTERFACE - A device or equipment making possible interoperation between tow circuits or systems.

INTERLEAVE - Time division multiplexing. In time division multiplexing, a single bus is used to connect multiple circuits performing multiple operations. The time during which signals on the bus are active is limited to the time during which the intended receiving circuit is enabled.

LATCH - A logic storage element; two cross-coupled logic gates store a pulse applied to one logic input until a pulse is applied to the other input.

LINK - Any specified relationship between two nodes in a network. A communications path between two nodes.

MARK - The presence of a signal. In telegraphy, MARK represents the closed condition or current flowing. Equivalent to a binary one condition.

MASKABLE (TRANSPARENT) INTERRUPT - A CPU interrupt which does not reset CPU operation.

MEMORY MAP - Fixed memory locations.

MODE - A particular functional arrangement or condition, i.e., Receive Mode which sets up circuits into particular conditions to receive as opposed to Transmit Mode which arranges functional circuits into different conditions.

MODEM - Modulator/demodulator. A device that modulates and demodulates signals transmitted over communications circuits.

NMI - Non-maskable interrupt, a microprocessor interrupt which causes the microprocessor to reset to a known state.

PACKET - A group of bits including data and control elements which is transmitted as a composite whole.

PARALLEL TRANSMISSION - A method of transmission in which each group of information bits is sent simultaneously over a set of parallel lines rather than serially over a single line.

PARITY CHECK - Addition of non-information bits to data, making the number of ones in each grouping of bits either always odd, for odd parity, or always even, for even parity. This permits single error detection of each group.

POLLING - The process of inviting another station, node, or circuit to transmit data.

PORT - A place of access to a system or circuit.

PROTOCOL - A formal set of conventions governing the format and relative timing of message exchange between two communication processes.

RS-232C - The binary serial interchange that is the EIA recommended standard (RS-) for data processing equipment to be be interfaced to a carrier. The data processing equipment is referred to as Data Terminal Equipment (DTE) and the carrier (or MODEMS) are referred to as Data Communications Equipment (DCE). The C denotes that it is the third update of the standard. The standard defines the voltage minimum (3 volt), the voltage maximum (25 volt), and terminal impedance (3000 - 7000 ohm). Negative polarity indicates the binary state 1, marking or OFF control state. The positive polarity indicates the binary state 0, spacing or an ON control state. Normally the distance between DCE and DTE is defined as 50 feet, maximum.

RS-442 - A revision of the interface standard that permits TTL voltage levels and increases the distance permitted between the DTE/DCE.

SERIAL TRANSMISSION - A method of transmission in which each bit of information is sent sequentially on a single channel rather than simultaneously as a parallel transmission.

SLAVE - A system, terminal, or circuit whose functions are controlled by a central "master" system, terminal, or circuit.

SPACE - The absence of a signal. In telegraphy, SPACE represents the open condition or lack of current flow; equivalent to a binary zero. Opposite of a teletype MARKING state.

SYNCHRONOUS TRANSMISSION - Transmission in which the data characters and bits are transmitted at a fixed rate with the transmitter and receiver synchronized. This eliminates the need for start-stop elements, providing a greater efficiency.

TALK - In digital communications, the action of receiving and transmitting data between data terminal equipments.

TIME-DIVISION MULTIPLEXING - A system of multiplexing in which channels are established by connecting terminals one at a time at regular intervals by means of an automatic distribution.

TRICHLOROTRIFLUOROETHANE - A cleaning solution.

UNIVERSAL ASYNCHRONOUS RECEIVER TRANSMITTER - A circuit that converts parallel data bits into serial form for transmission over 2-wire lines, and the receive section reverses the process.

UNIVERSAL SYNCHRONOUS/ASYNCHRONOUS RECEIVER TRANSMITTER - A device that is used as a peripheral (programmed by the CPU) to operate using virtually any serial data transmission technique in use. The USART accepts data characters from the CPU in parallel format and then converts them into continuous serial form for transmission. Simultaneously the receive section reverses the process to send data to the CPU.

VITERBI CODE - A set of rules (algorithm) according to which data signals are decoded.

WIDEBAND - Communications channel having a bandwidth greater than a voice-grade channel characterized by data transmission speed of 10,000 to 500,000 bits per second.

WATCHDOG CIRCUIT - A circuit which causes a microprocessor to be reset to a known state upon power up or upon detection of a fault. This circuit normally relies upon receiving a pulse at a set interval to prevent it from initiating a reset pulse. Failure to receive this pulse (sometimes referred to as a "pet"), results in the circuit resetting all microprocessor registers.

WORD - An ordered set of characters that is the normal unit in which information may be stored, transmitted, or operated upon within a computer.

SUBJECT INDEX

F (Cont.)

G

H

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M (Cont.)

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T

U

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10 July 1975

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/PRC-76

BE EXACT. . . PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2^{o} IFF antenna lag rather than 1^{o}. REASON: Experience has shown that with only a 1^{o} lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2^{o} without degradation of operation.
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		FO3		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. +24 VDC is the input voltage.

SAMPLE

PERFORATED LINE — TEAR AL

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
SSG I. M. DeSpiritof 999-1776

SIGN HERE
I. M. DeSpiritof

DA FORM 1 JUL 79 2028-2

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TEAR ALONG PERFORATED LINE

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PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5895-1307-24	15 May 1989	Manual Modem, Digital Data MD-1204/G

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PAGE NO.	PARA-GRAPH	FIGURE NO	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

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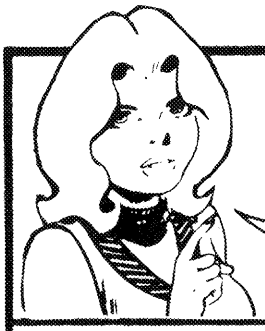

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PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 11-5895-1307-24	15 May 1989	Manual Modem, Digital Data MD-1204/G

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PAGE NO.	PARA-GRAPH	FIGURE NO	TABLE NO

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ATTN: AMSEL-LC-ME-PS
Fort Monmouth, New Jersey 07703-5000

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NOTES:

1.0 GENERAL:

1.1 A NUMBER SIGN (#) FOLLOWING THE SIGNAL NAME MEANS THE INVERTED (NOT) FORM OF THE SIGNAL.

2.0 SPECIFIC:

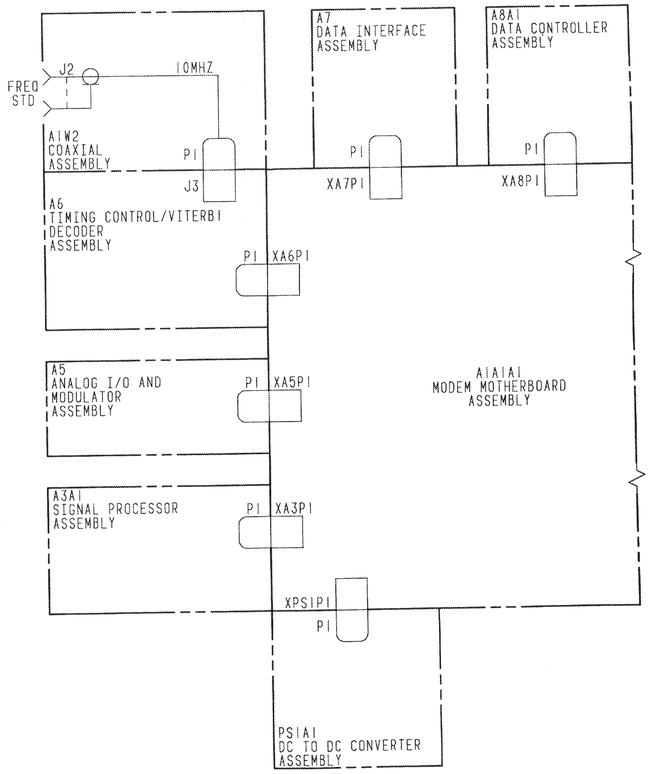
2.1 UNLESS OTHERWISE SPECIFIED:
VOLTAGES ARE DC.

2.2 NOT USED

2.3 REFERENCE:
ASSEMBLY NUMBER A3023769.

REF DESIGNATION	
HIGHEST USED	NOT USED
A8 P1	A2,4
A1 ASSEMBLY	
A2 DS2 W5	W1
A1A2 ASSEMBLY	
J4 W1	J2
A1A2W1 ASSEMBLY	
P1 TB4	TB2
A1W2 ASSEMBLY	
J2 P1	J1
A1W3 ASSEMBLY	
CB1 E1 J5 P3 S1	J1-4
A1W4 & A1W5 ASSEMBLY	
P1	

REF DESIGNATION	
HIGHEST USED	NOT USED
A1A1A1 ASSEMBLY	
J2 XA8P1 XPS1P1	XA1P1,XA2P1
A3A1 ASSEMBLY	
P1	
A5 ASSEMBLY	
P1	
A6 ASSEMBLY	
J3 P1	J1-2
A7 ASSEMBLY	
P1	
A8A1 ASSEMBLY	
P1	
PS1A1 ASSEMBLY	
P1	



CEOKE-001

Figure FO-1. RN Modem Schematic (Sheet 1 of 2)

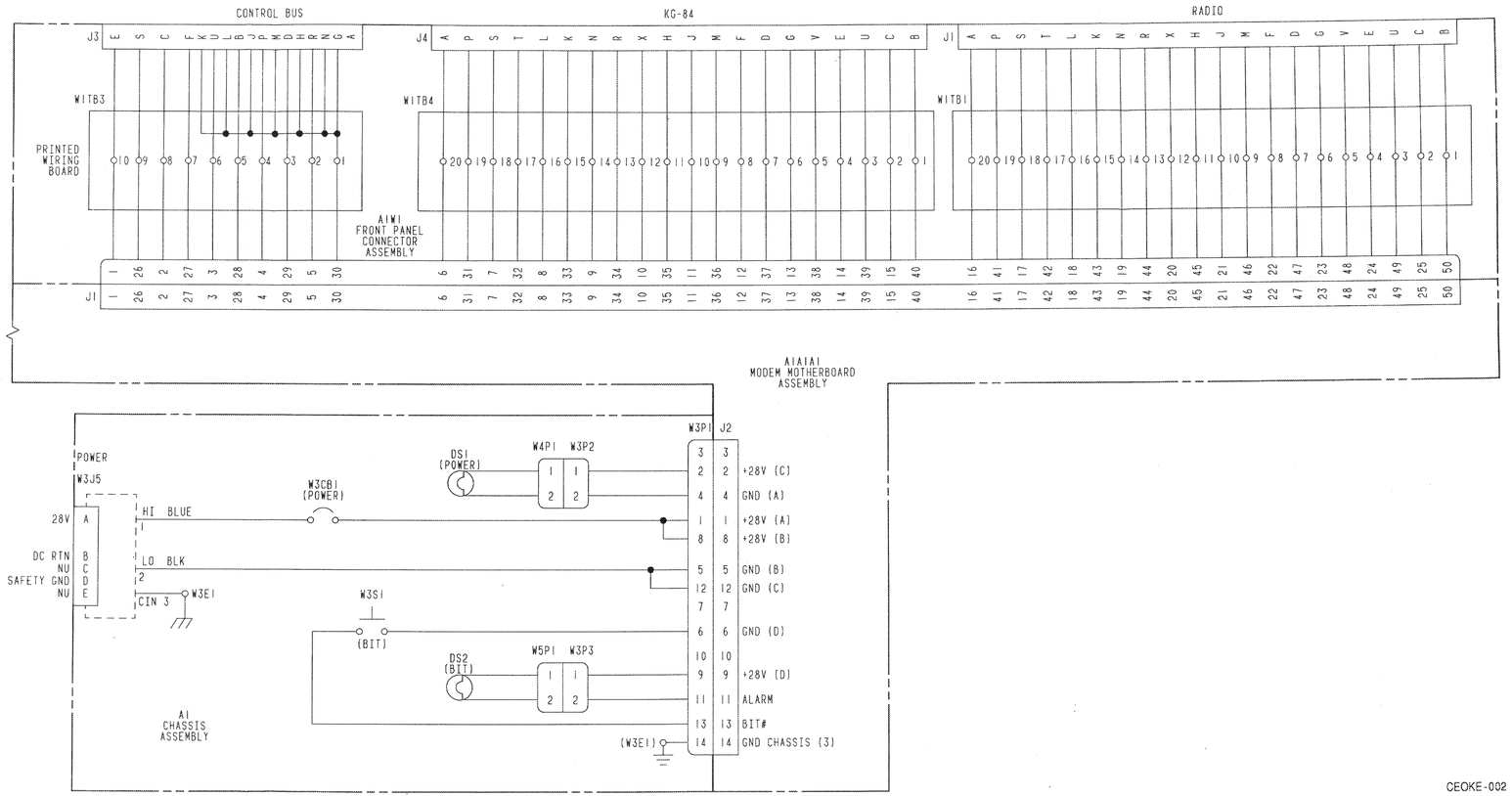
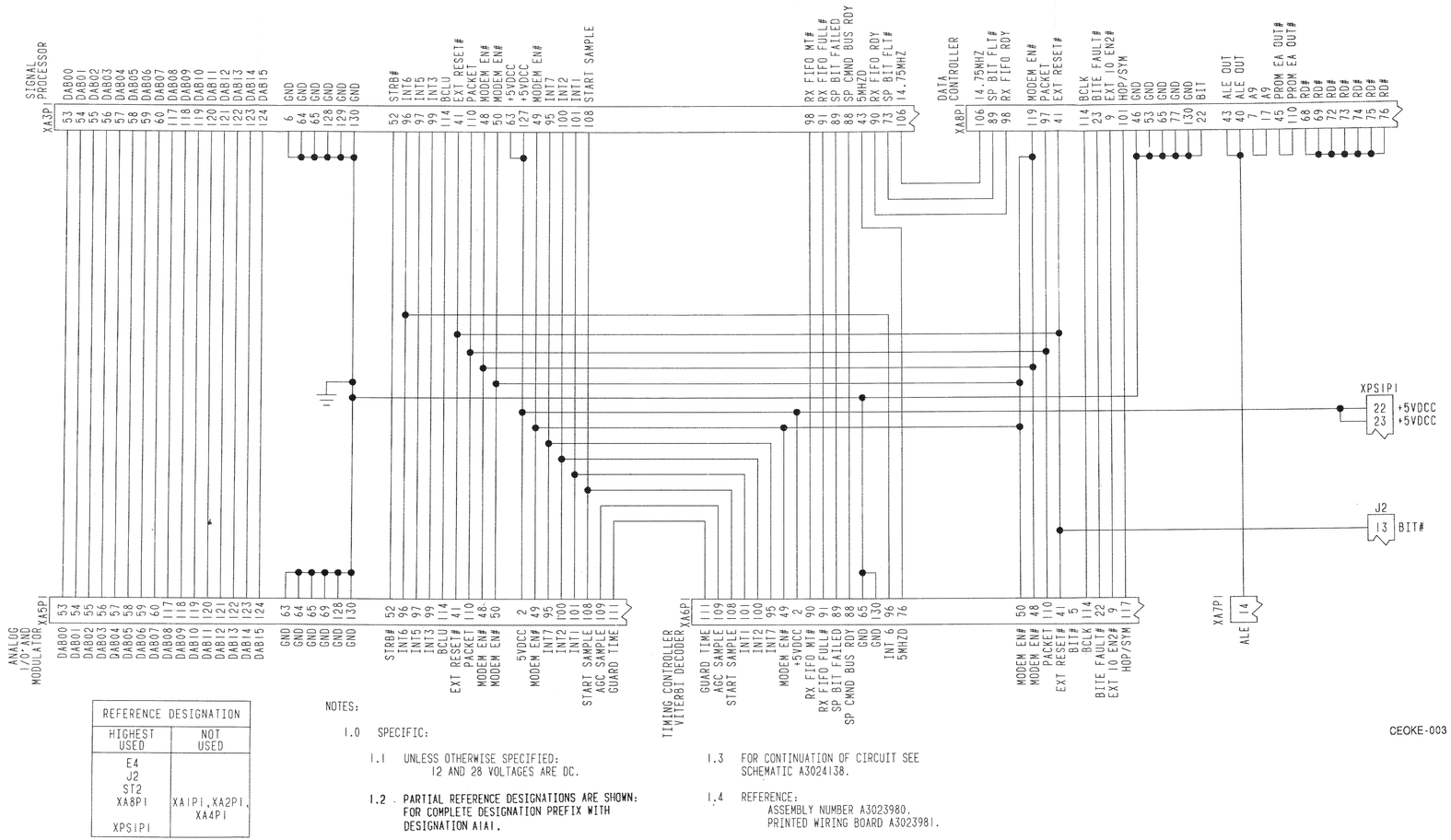


Figure FO-1. RN Modem Schematic (Sheet 2 of 2)



REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
E4 J2 ST2 XA8P1 XPS1P1	 XA1P1, XA2P1, XA4P1

NOTES:

1.0 SPECIFIC:

1.1 UNLESS OTHERWISE SPECIFIED: 12 AND 28 VOLTAGES ARE DC.

1.2 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATION PREFIX WITH DESIGNATION A1A1.

1.3 FOR CONTINUATION OF CIRCUIT SEE SCHEMATIC A3024138.

1.4 REFERENCE: ASSEMBLY NUMBER A3023980. PRINTED WIRING BOARD A3023981.

Figure FO-2. A1A1A1 Motherboard Schematic (Sheet 1 of 4)

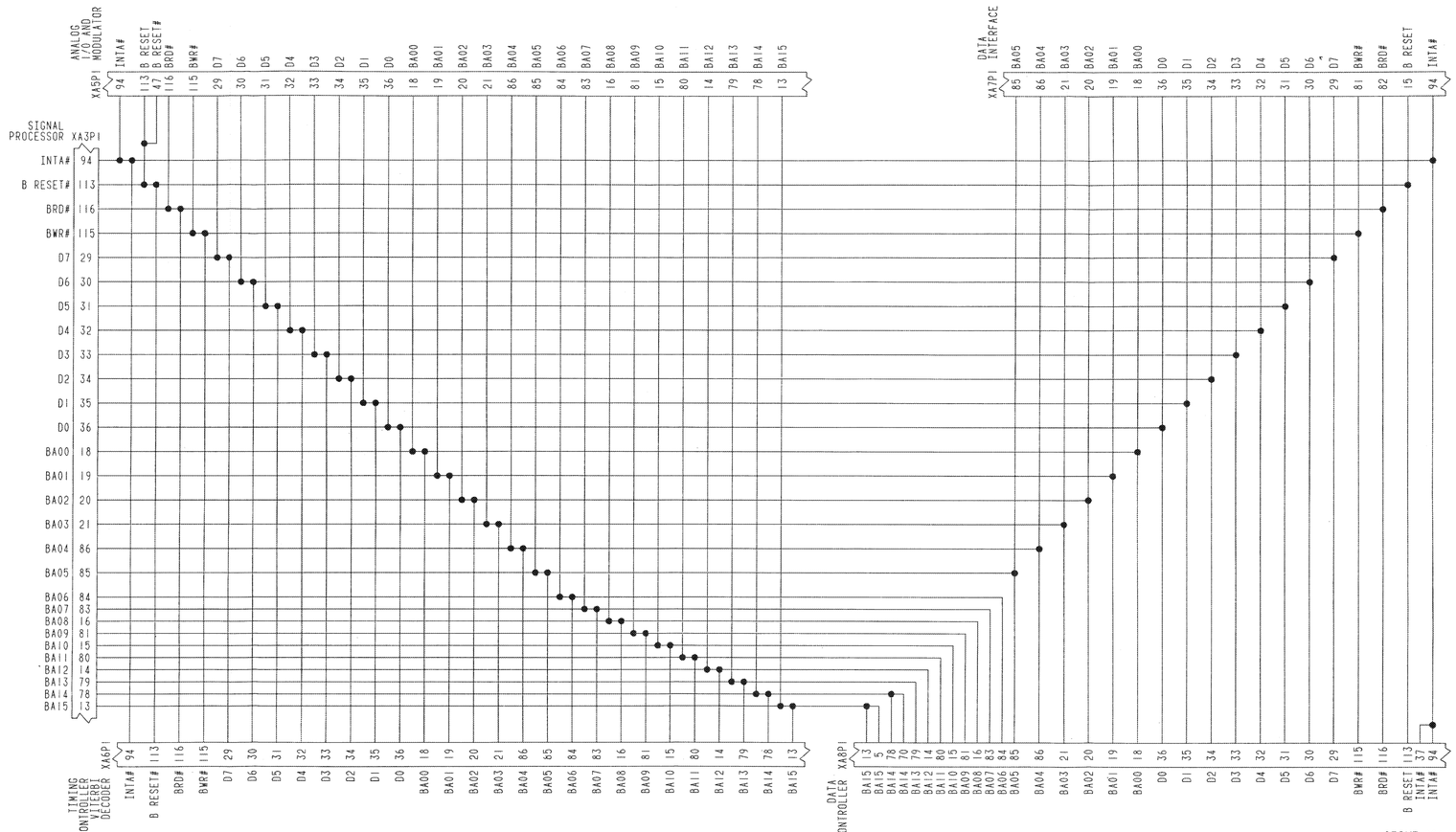


Figure FO-2. A1A1A1 Motherboard Schematic (Sheet 2 of 4)

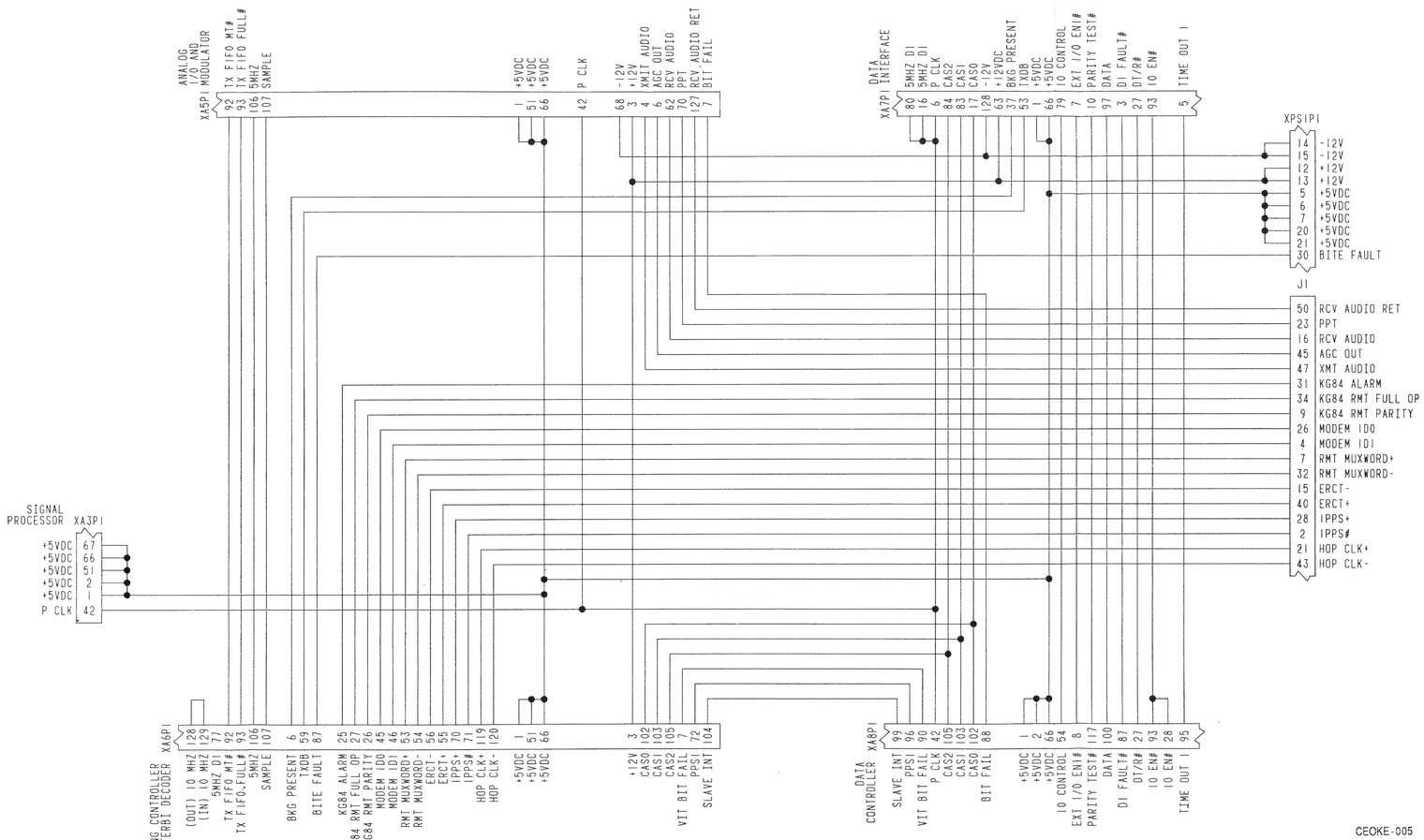


Figure FO-2. A1A1A1 Motherboard Schematic (Sheet 3 of 4)

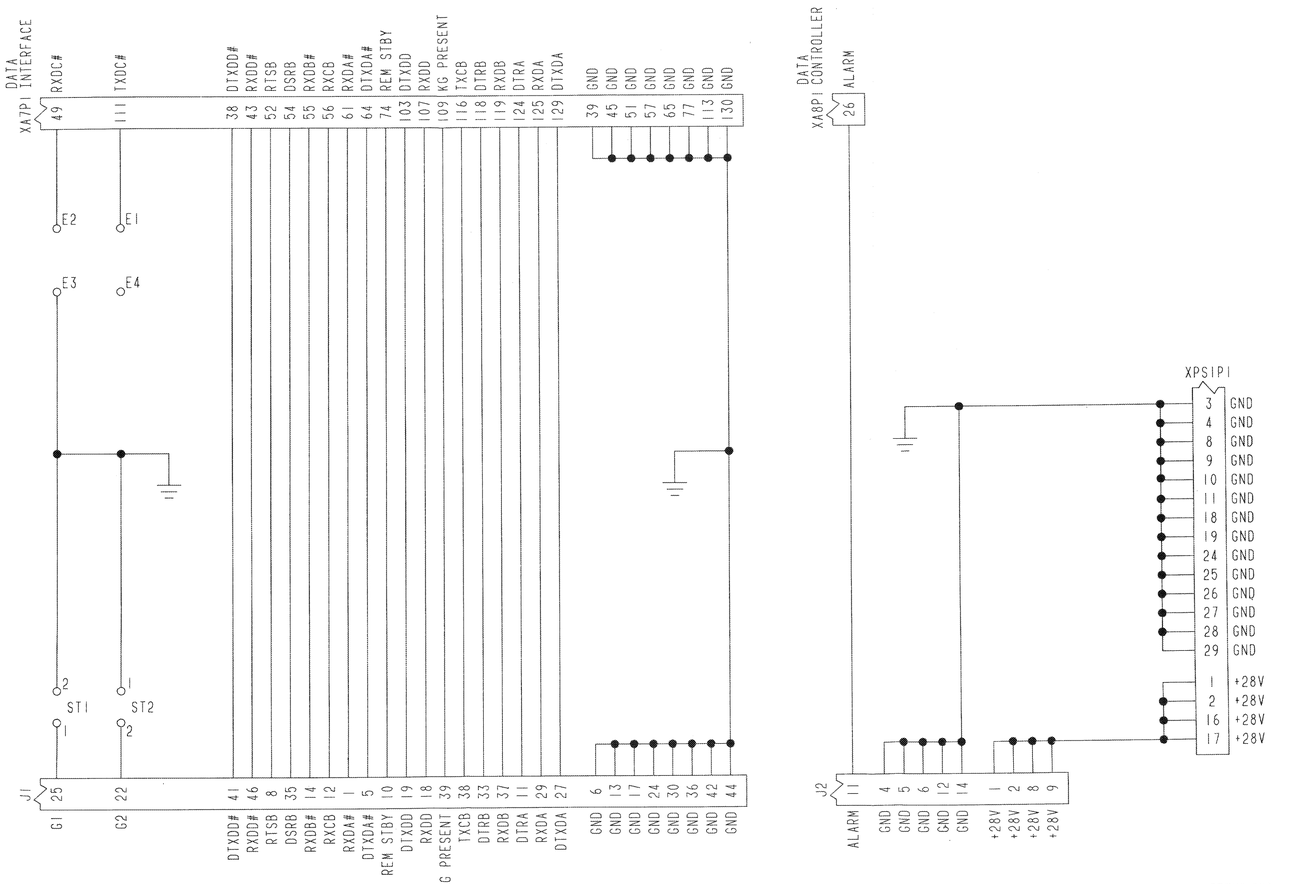


Figure FO-2. A1A1A1 Motherboard Schematic (Sheet 4 of 4)

NOTES:

1.0 GENERAL:

1.1 CHARACTERS UNDERLINED DENOTE LOWER CASE.

1.2 A NUMBER SIGN (#) FOLLOWING A SIGNAL NAME MEANS THE INVERTED (NOT) FORM OF THE SIGNAL.

2.0 SPECIFIC:

2.1 UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS.
RESISTORS ARE 5%, 1/4W.
1% RESISTORS ARE 1/8W.
CAPACITANCE VALUES ARE IN MICROFARADS.
VOLTAGES ARE DC.
DIODES AND/OR TRANSISTORS ARE JANTX TYPE.

2.2 PARTIAL REFERENCE DESIGNATIONS ARE SHOWN: FOR COMPLETE DESIGNATION PREFIX WITH DESIGNATION PS1.

2.3 FOR CONTINUATION OF CIRCUIT SEE SCHEMATIC A3024138.

2.4 PART NUMBER A3028690.

2.5 PART NUMBER A3028691.

2.6 PART NUMBER A3028012-1.

2.7 PART NUMBER A3028267.

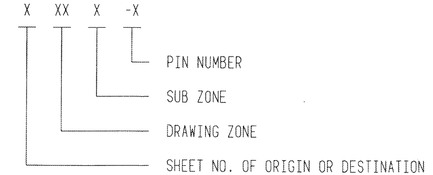
2.8 REFERENCE:
ASSEMBLY NUMBER A3024066.
A1 ASSEMBLY NUMBER A3024793.
PRINTED WIRING BOARD A3024794.
A2 ASSEMBLY NUMBER A3024796.

2.9 VALUE SELECTED AT TEST, NOMINAL VALUE SHOWN.

2.10 THIS DEVICE REQUIRES SPECIAL HANDLING AND PROCESSING TO PREVENT DAMAGE FROM ELECTROSTATIC DISCHARGE TRANSIENTS.

INTEGRATED CIRCUIT TABLE		
REFERENCE DESIGNATION	SECOND TAGGING LINE SYM	PART NUMBER
A1U3	M1	A3028083-2
A1U6	M2	A3028260
A1U1	M3	A3028263
A1U2,7	M4	JM38510/11201BCX
A2U5	M5	JM38510/11506BYX
A2U4	M6	7703401YX

REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
A2	
A1 ASSY	
C41 CR28 DS1 E31 J6 L1 P1 Q13 R78 T4 U7 VR5 W2	C38,39,40 CR14,24 E1,26 Q4,5 R34,42 U4,5
A2 ASSY	
CR24 E6 FL1 Q5 U5	CR1-13, 15-23 Q1,2,3 U1,2,3



TYPICAL CIRCUIT CONTINUATION CODE

CEOKE-007

Figure FO-3. Power Supply PS1 Schematic (Sheet 1 of 5)

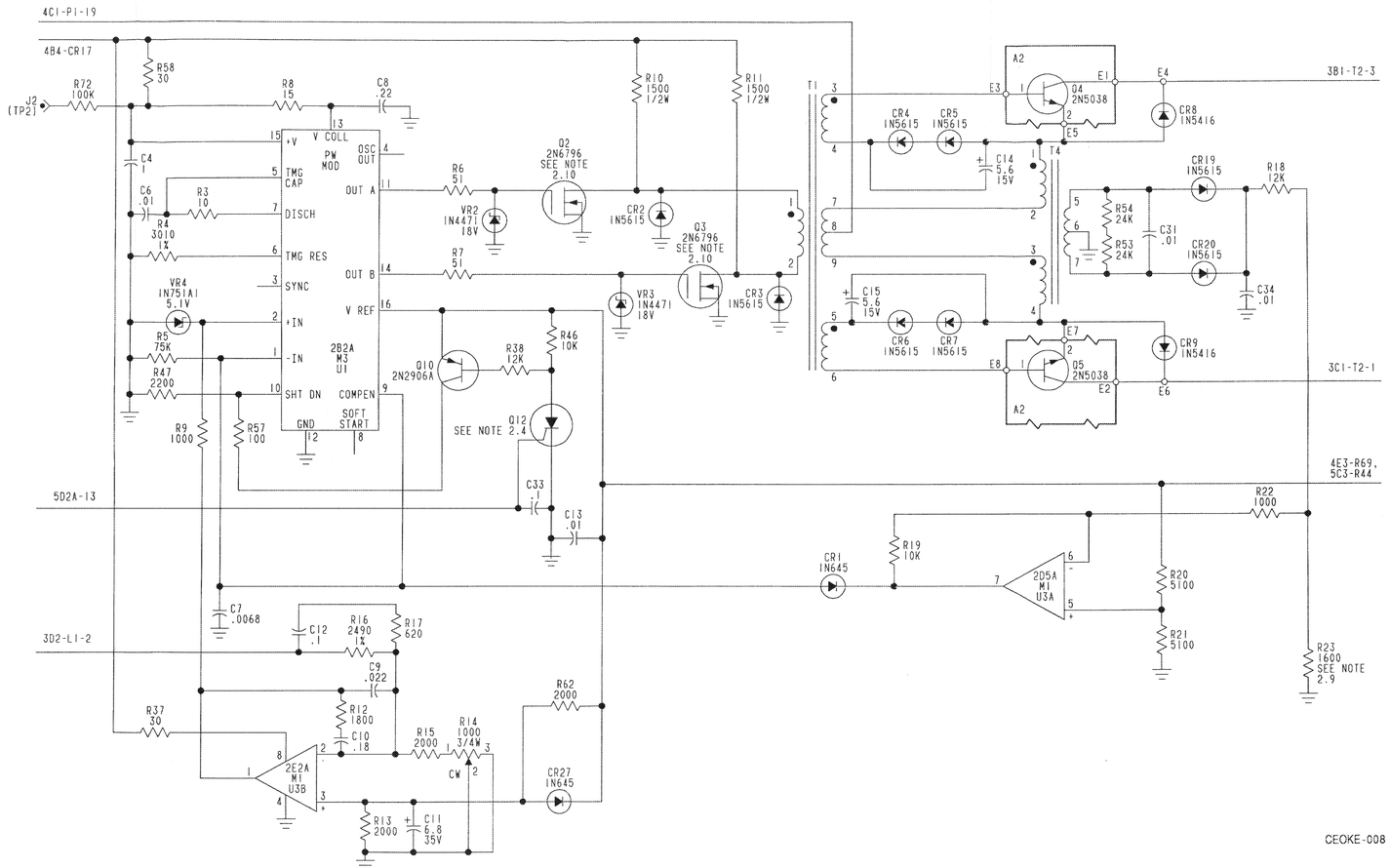


Figure FO-3. Power Supply PS1 Schematic (Sheet 2 of 5)

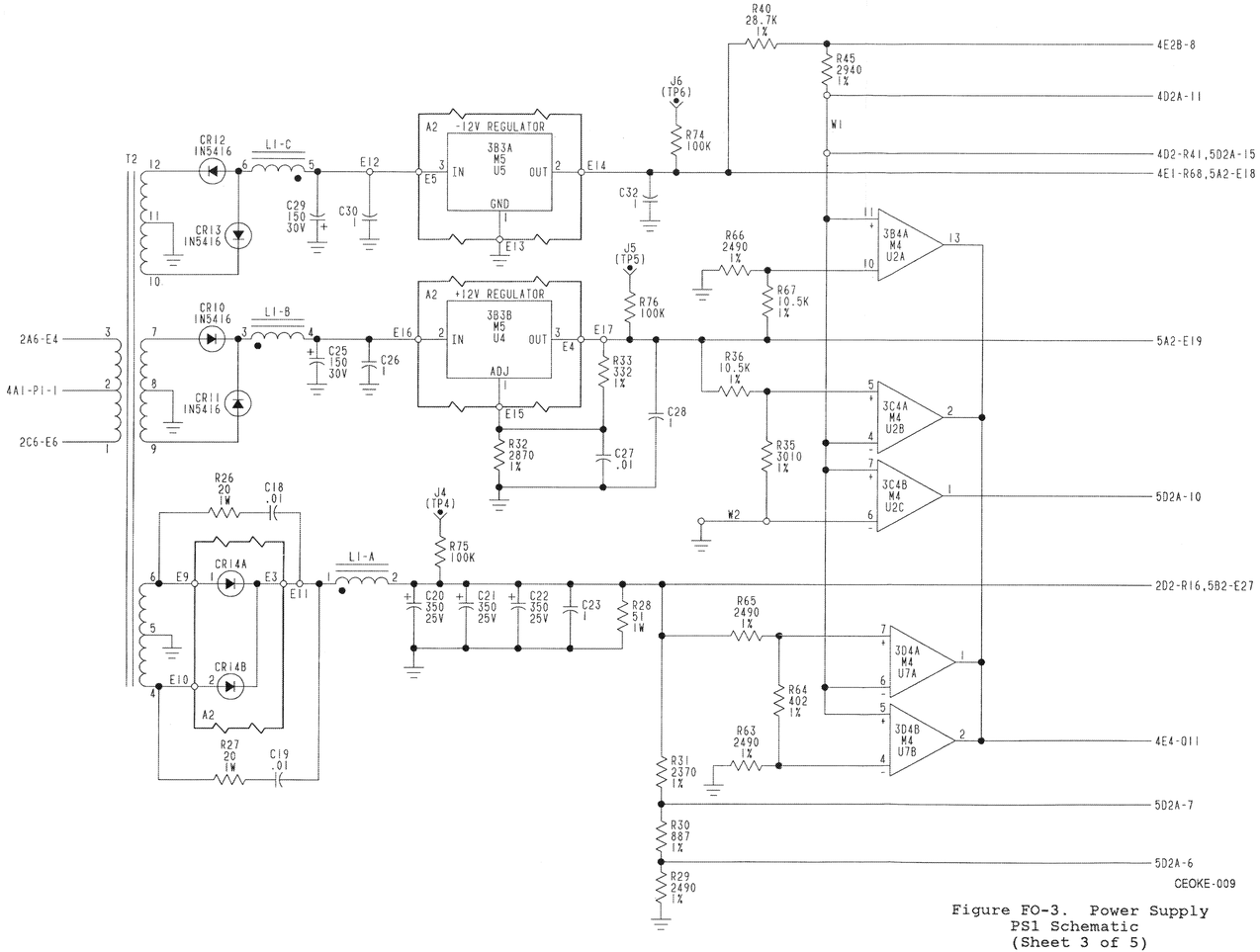


Figure FO-3. Power Supply PS1 Schematic (Sheet 3 of 5)

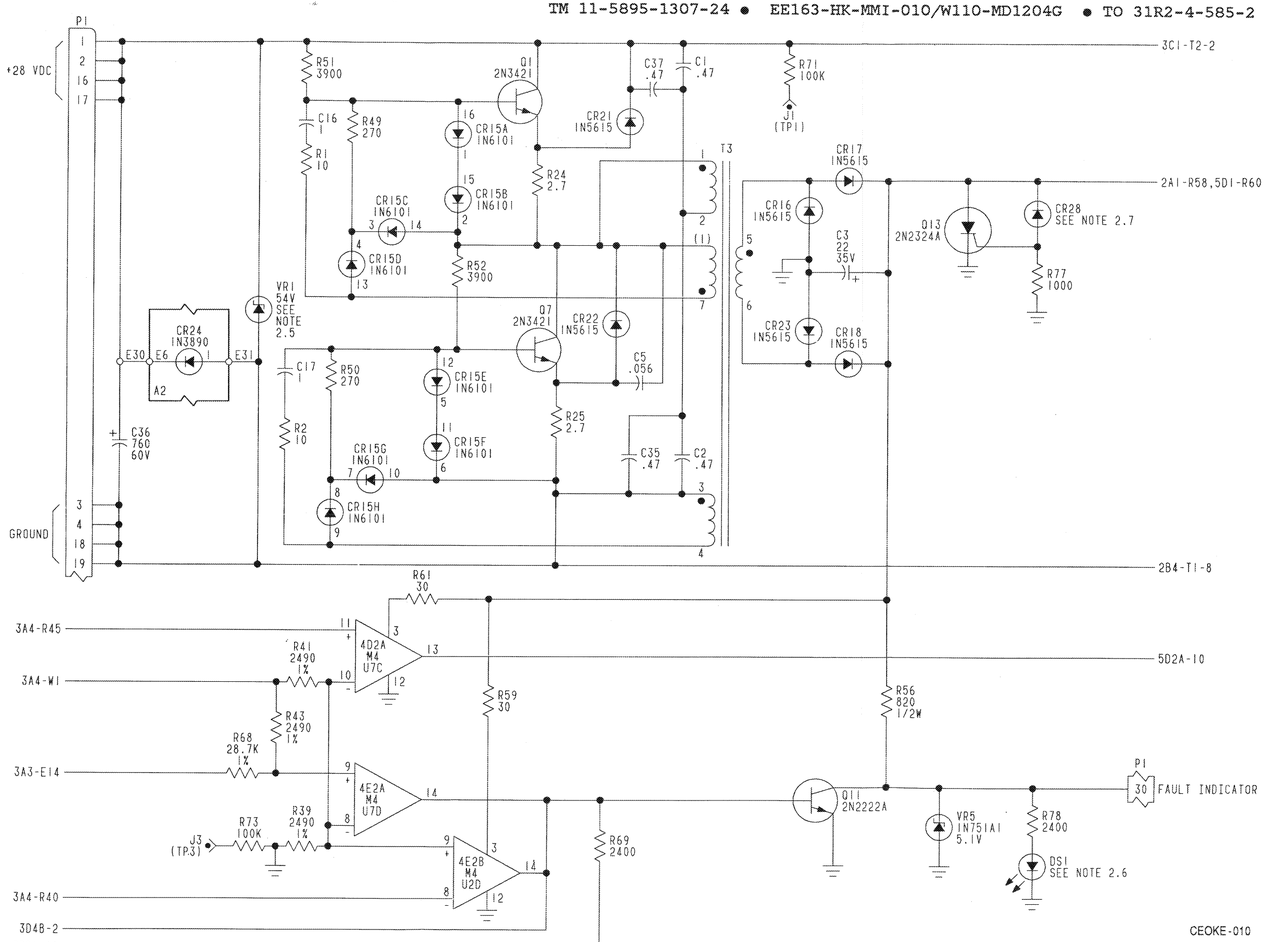


Figure FO-3. Power Supply PSI Schematic (Sheet 4 of 5)

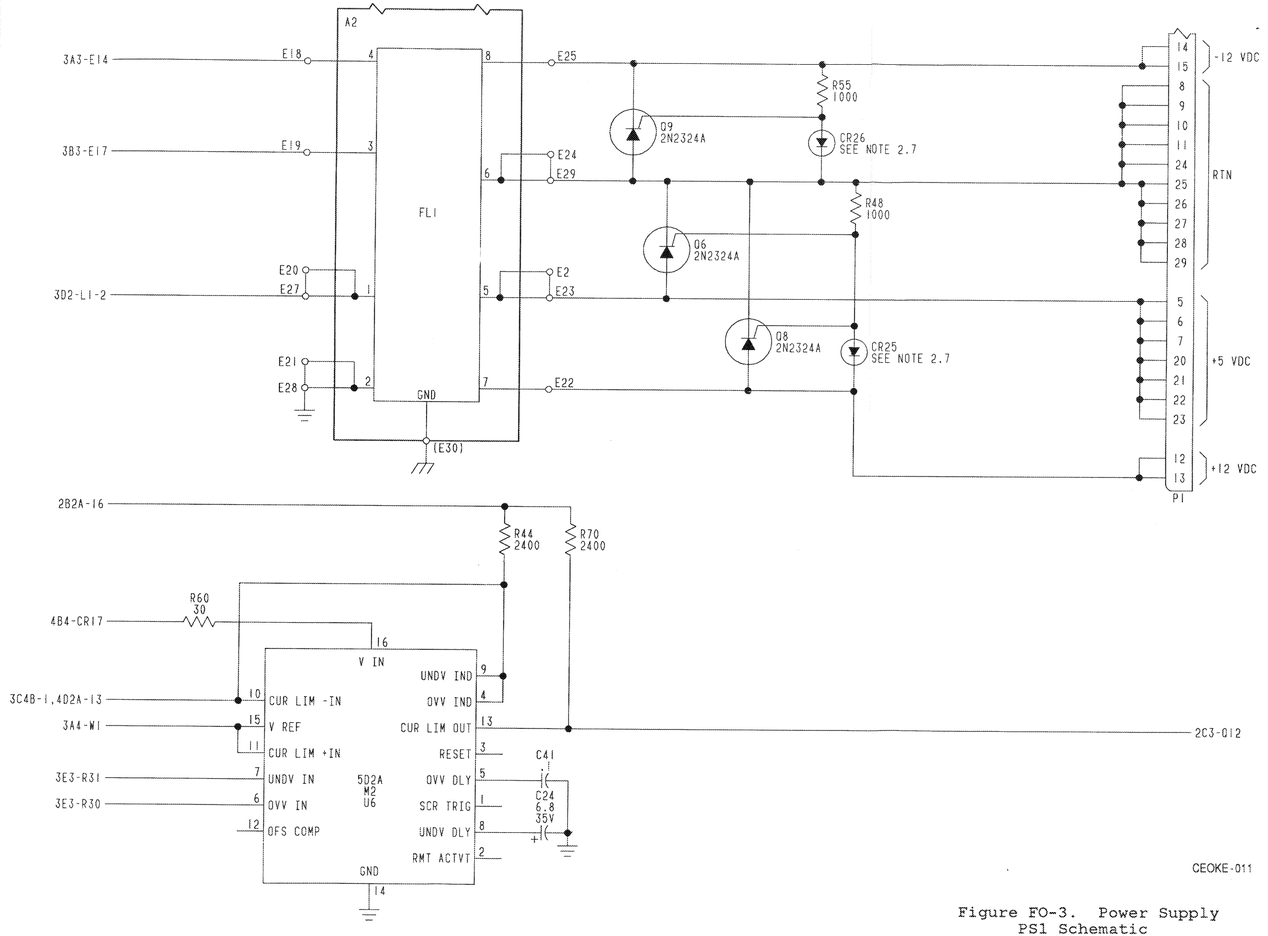


Figure FO-3. Power Supply PS1 Schematic (Sheet 5 of 5)

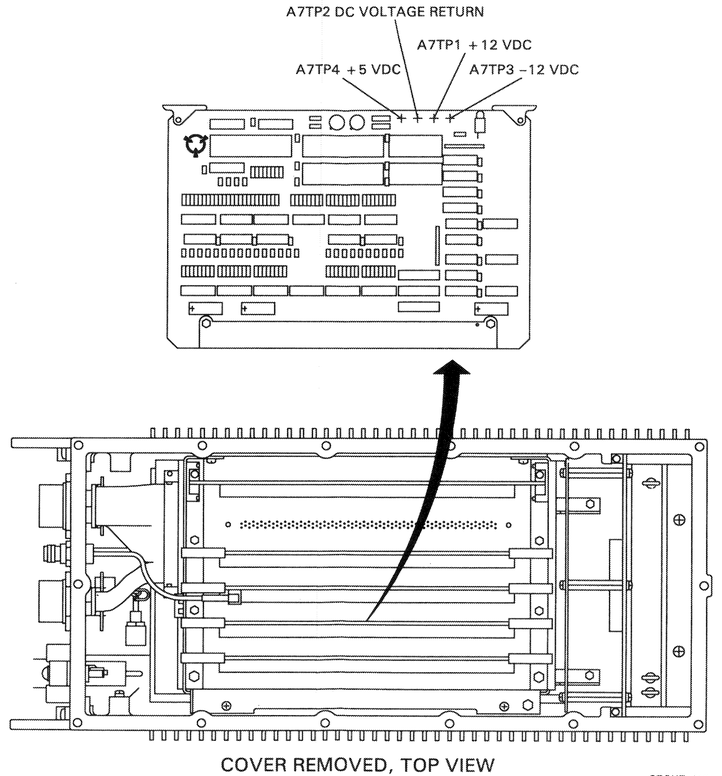


Figure FO-4. TP Locator A7

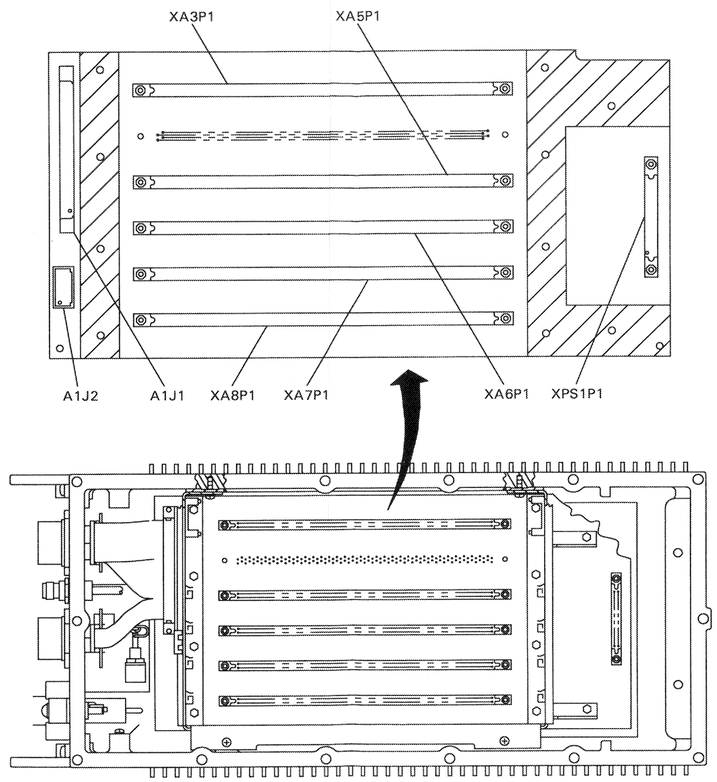


Figure FO-5. TO Locator Motherboard A1A1A1

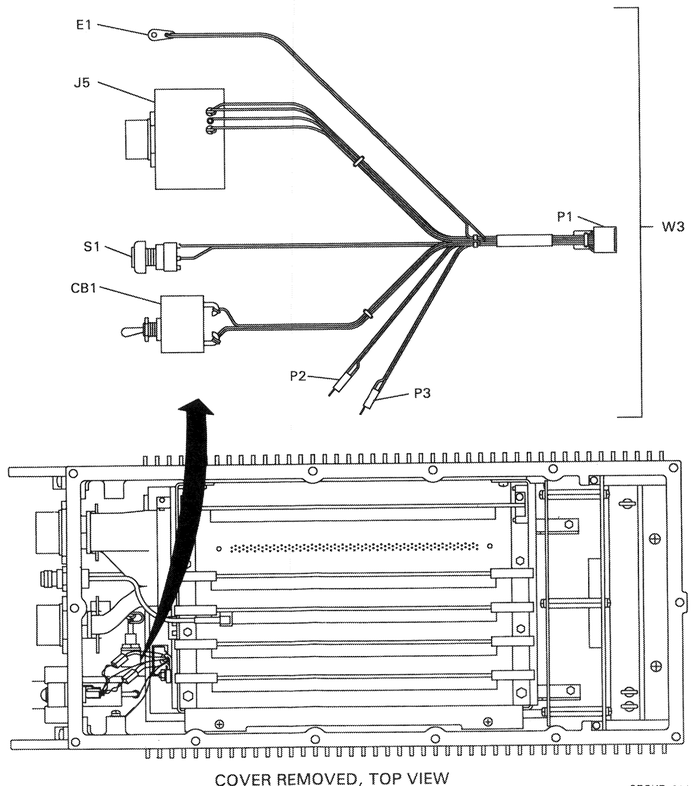


Figure FO-6. TP Locator W3

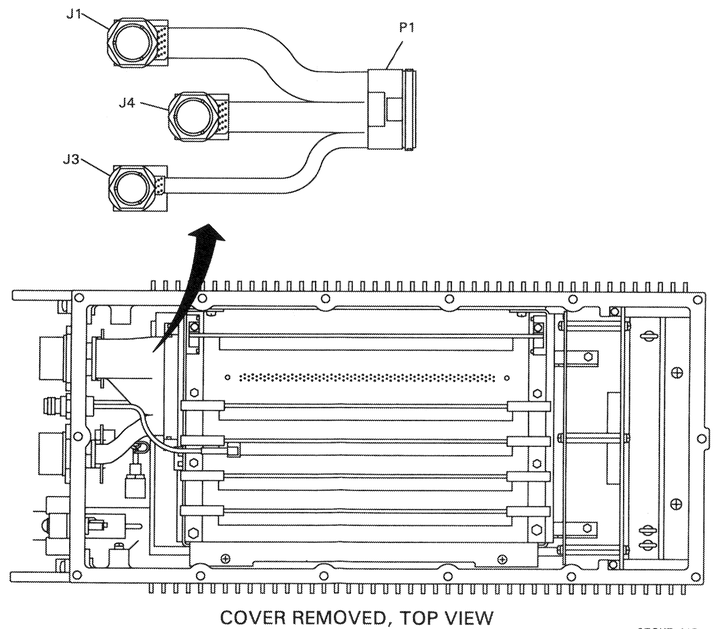


Figure FO-7. TP Locator W1

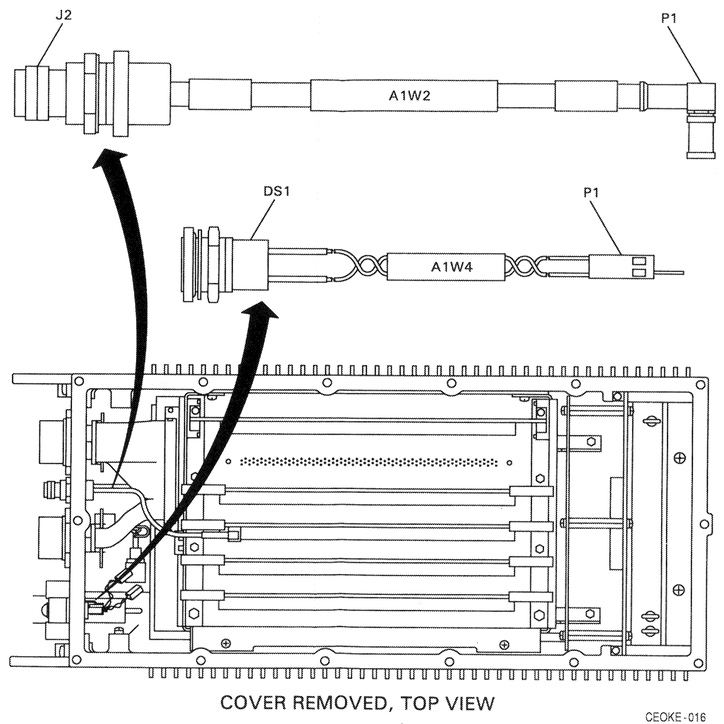


Figure FO-8. TP Locator A1W2, A1W4

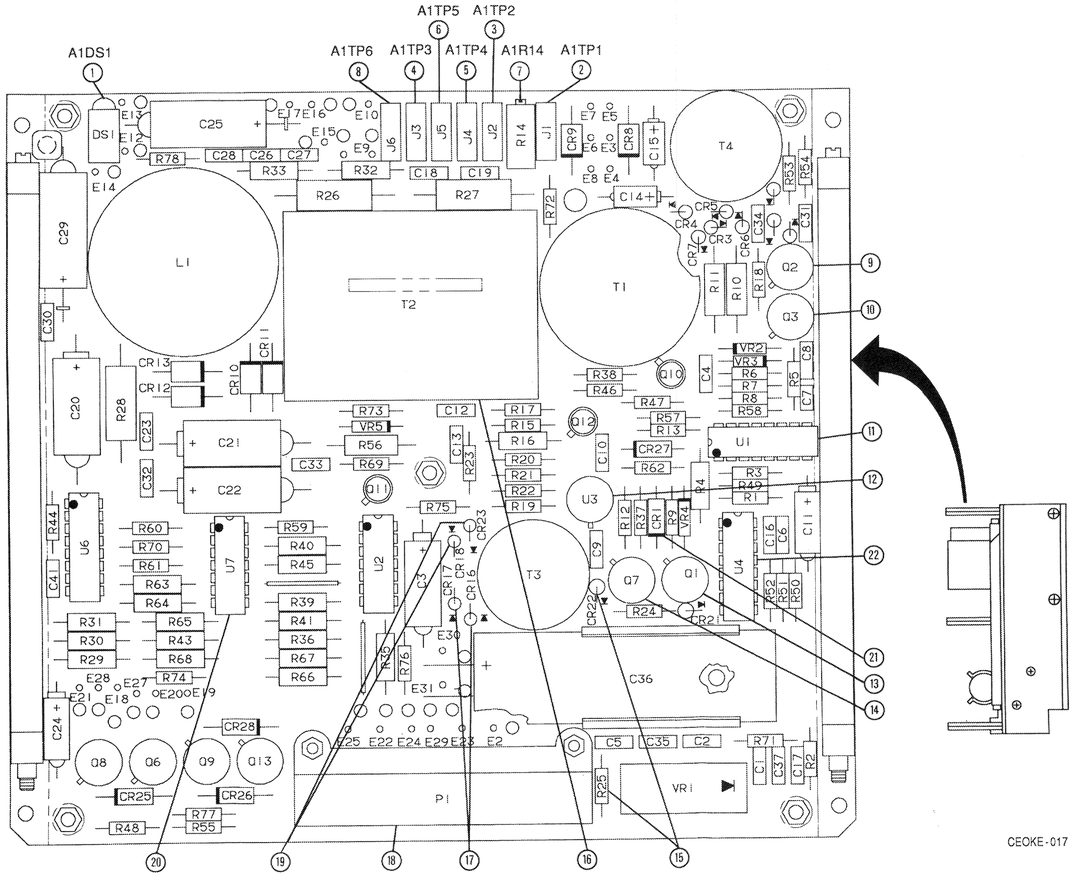
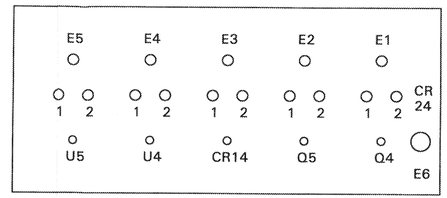
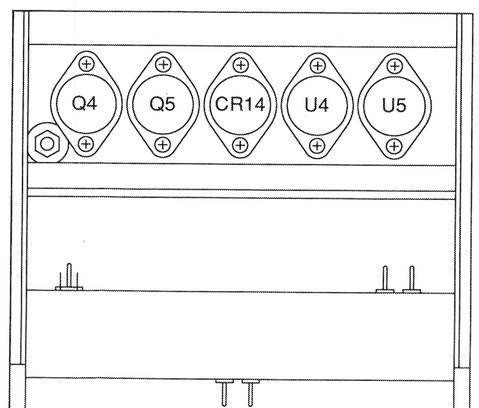


Figure FO-9. TP Locator PS1A1



BACK SIDE



CEOKE-018

Figure FO-10. TP Locator PS1A2