NWS EHB 6–545
AF TO 31P1–4–108–2
FAA TI 6345.1 V51

TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS
WBC (WIDEBAND COMMUNICATIONS) GROUP

DOPPLER METEOROLOGICAL RADAR
WSR–88D

OFFICE OF PRIMARY RESPONSIBILITY:
RADAR OPERATIONS CENTER

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FOREWORD

This technical manual provides maintenance personnel with an overview of the Doppler Meteorological Radar Weather Surveillance Radar – 1988 Doppler (WSR–88D) WBC Group. It describes the purpose, structure, and functioning of the radar and discusses the operating and maintenance concepts. This manual was prepared in accordance with the content requirements of MIL–M–38798B and the format requirements of MIL–M–38784B, as amended by TMCR AF TM–86–Ø1/NEXRAD (June 1987). It consists of seven chapters, a glossary, and an index.

Chapter 1 General Information. This chapter describes the purpose, structure, capabilities, and itemization of the WBC.

Chapter 2 Not Used.

Chapter 3 Not Used.

Chapter 4 Operations. This chapter describes the WBC Group operations, procedures, controls, and indicators.

Chapter 5 Theory of Operations. This chapter describes the functional operation of the WBC Group.

Chapter 6 Maintenance. This chapter provides WBC on–site maintenance activities as well as a description of the WBC site maintenance concept.

Chapter 7 Reference Data. This chapter provides system interface diagrams, interconnection cabling diagrams, cable wiring data, and power distribution diagrams for the WBC Group.

Index

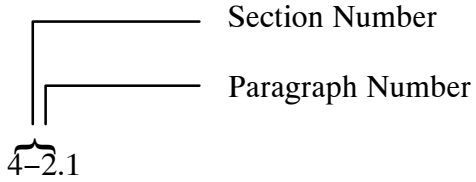
Glossary

This manual is one of a family of technical manuals which provide various levels of description, operation, maintenance, and logistics information on the WSR–88D. Refer to TO 31–1–141, Basic Electronic Technology and Testing Practices, for any basic electronic technology or testing practice that is not fully described in these documents. The WSR–88D technical manual family is defined and discussed in the System Manual, National Weather Service (NWS) EHB 6–5ØØ, Section 1–4.

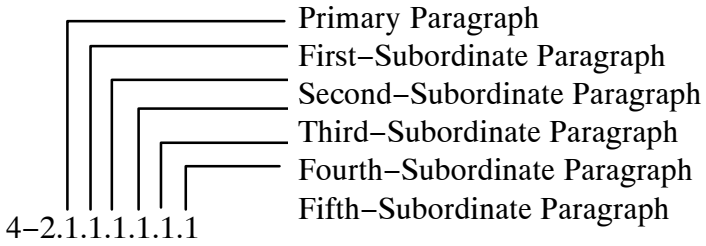
The format of this technical manual is as follows:

- Sections represent the major content divisions of the chapter or appendix and are formatted as physically–separate standalone elements.
- Sections are numbered as subdivisions of the chapter or appendix. The section numbering system consists of two digits separated by a hyphen. The first digit indicates the chapter or appendix, the second digit indicates the section. Thus, Section 4–2 represents the second section of Chapter 4.

- Paragraph numbering is by section rather than by chapter. The basic numbering system consists of three digits, where the first two digits identify the section.



- A decimal paragraph number system is used to identify paragraph subordination.



- Pages, tables, and figures are numbered by chapter. The number consists of two digits separated by a hyphen. The first digit identifies the chapter. The second digit identifies the page, table, or figure.

SAFETY SUMMARY

5. GENERAL SAFETY INSTRUCTIONS.

This manual describes physical and chemical processes which may cause injury or death to personnel, or damage to equipment if not properly followed. This safety summary includes general safety precautions and instructions that must be understood and applied during operation and maintenance to ensure personnel safety and protection of equipment. Prior to performing any task, the WARNINGs, CAUTIONs, and NOTEs included in that task shall be reviewed and understood.

6. WARNINGS, CAUTIONS, AND NOTES.

WARNINGs and CAUTIONs are used in this manual to highlight operating or maintenance procedures, practices, conditions, or statements which are considered essential to protection of personnel (WARNING) or equipment (CAUTION). WARNINGs and CAUTIONs immediately precede the step or procedure to which they apply. WARNINGs and CAUTIONs consist of four parts: heading (WARNING or CAUTION), a statement of the hazard, minimum precautions, and possible result if disregarded. NOTEs are used in this manual to highlight operating or maintenance procedures, practices, conditions, or statements which are not essential to protection of personnel or equipment. NOTEs may precede or follow the step or procedure, depending upon the information to be highlighted. The headings used and their definitions are as follows.

WARNING

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury to, or death of, personnel or long term health hazards.

CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Highlights an essential operating or maintenance procedure, condition, or statement.

7. GENERAL SAFETY PRECAUTIONS.

The following safety precautions shall be observed while performing procedures in this manual.

- ELECTRICAL

  Dangerous voltages are present at system connectors. Ensure power is OFF prior to connecting or disconnecting cables.

- ELECTRONIC

  Do not wear metal frame glasses, rings, watches, or other metal jewelry while working on electronic equipment.

- HIGH VOLTAGE (POWER ON)

  Avoid contact with high voltage in the equipment, and do not remove safety guards, panels, or covers in the high voltage area. Severe injury or **DEATH** may occur upon contact with or in the proximity of high voltages due to electrical shock.

- HIGH VOLTAGE (POWER OFF)

  Avoid contact with the high voltage circuit area. Properly discharge all high voltage capacitors with the grounding rod. Dangerous high voltages exist when power is turned off and will remain until discharged. Severe injury or **DEATH** may occur upon contact with or in the proximity of high voltages due to electrical shock.

- KEEP AWAY FROM LIVE CIRCUITS

  Maintenance personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with the high voltage supply turned on. Under certain conditions, dangerous potentials may exist when the power control is in the off position due to charges retained by capacitors. To avoid casualties, always remove power, discharge and ground circuit before touching it.

- MICROWAVE RADIATION PRECAUTIONS

  The WSR–88D generates and detects electromagnetic energy at a transmitted frequency between 2.7 Gigahertz (GHz) and 3.0 GHz. This non–ionizing radiation is concentrated in the antenna beam. The potential hazard of this radiation to personnel is biological heating. Intense microwave radiation (power densities greater than 300 mW/cm^2 can result in biological damage such as the formation of cataracts or other opacities in the eyes.

  Service personnel must comply with the guidelines given in American Standards Institute C.95.1–1982 which states that for unrestrictive exposure to microwave radiation the body energy deposition averaged over the entire body mass for any 0.1 hour period must be kept to less than 144 joules per kilogram (J/ko). This is equivalent to a specific absorption rate (SAR) of 0.4 watts per kilogram. For the WSR–88D frequency band, this corresponds to a power density of 5 mW/cm^2).

  Average power densities less than 5 mW/cm^2 are regarded as safe for indefinite exposure. Power densities greater than 5 mW/cm^2 should be regarded as potentially hazardous.

- DIRECT ANTENNA INTO OPEN AREA WHEN TRANSMITTING

  When it is necessary to perform maintenance with power radiating from the antenna, take the necessary steps to keep the antenna directed into open area whenever possible.

- DO NOT SERVICE OR ADJUST ALONE

  Under no circumstances should any person reach into or enter an enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid.

- RESUSCITATION

  Personnel working with or near high voltage should be familiar with modern methods of CPR. Such information may be obtained from the Red Cross or Heart Association. This knowledge may save a life.

- DO NOT WEAR JEWELRY

  Personnel performing maintenance on equipment are not to wear metal frame glasses, watches, rings, necklaces, bracelets, or other jewelry at any time. Electrical arcing can occur when metallic objects are in the proximity of voltage potentials. Jewelry can become entangled or otherwise restrict movement causing severe personal injury.

- ELEVATED WORK PLATFORM

  Use all handrails, safety chains, safety harness, safety rails, and ladders properly while servicing the antenna pedestal and tower. Install all safety equipment and ladders prior to maintenance tasks. Severe injury of **DEATH** may occur from impacting the surface below.

- FLAMMABLE AND/OR TOXIC MATERIALS

  Some cleaning materials specified herein are flammable and/or toxic. Keep away from open flame or other ignition sources. Provide adequate ventilation and avoid skin/eye exposure.

- COMPRESSED AIR

  Cleaning with compressed air can create airborne particles that may enter eyes or penetrate skin. Pressure shall not exceed 30 psig. Wear goggles. Do not direct compressed air against skin.

- 0365 ELECTRON AEROSOL, CLEANING COMPOUND

  Follow all safety precautions listed in the Material Safety Data Sheets for 0365 Electron Aerosol, Cleaning Compound. 0365 Electron Aerosol is flammable and releases flammable vapors. Do not use near an open flame or other sources of ignition. The use of 0365 Electron Aerosol in a closed area poses a health hazard. 0365 Electron Aerosol is toxic to skin and eyes. Use skin and eye protection. Failure to comply with all safety precautions listed in the Material Safety Data Sheets for 0365 Electron Aerosol Wipe Solvent may cause serious injury or **DEATH**. Dispose of contaminated 0365 Electron Aerosol in accordance with applicable federal, state, and local regulations.

- HOT SURFACES

  Avoid contact with the diesel engine and exhaust pipes during and after engine operation. Contact with hot surfaces can cause skin burns and other injuries reacting to hot surfaces.

- EXPLOSIVE GAS (FUEL)

  Clean and remove all fuel spills during engine service with absorbent materials or cloths. Ventilate the area of fuel spills and cleanup. Avoid sparks and open flames in the area. Fumes may accumulate and explode causing severe burns or **DEATH**.

- EXPLOSIVE GAS (BATTERIES)

  Service batteries only in a well–ventilated area. Hydrogen and Oxygen gases may accumulate during the charging process. Avoid sparks and open flames near batteries. Severe burns or **DEATH** may occur due to explosion.

- SULFURIC ACID

  Wear protective clothing, face shields, gloves, and aprons when servicing batteries. Severe skin and eye injury may occur upon contact with battery acid. Flush skin and eyes with water immediately and get medical attention.

- CLEANING SOLVENTS (GENERAL)

  Wear protective clothing, safety goggles, and gloves when using toxic cleaning solvents. Repeated and prolonged contact may cause skin and eye irritation. Flush skin and eyes with water. Remove clothing saturated with cleaning solvent.

- CLEANING SOLVENTS (INHALATION)

  Use cleaning solvents only in a well–ventilated area. Avoid inhalation of cleaning solvents. Asphyxiation or **DEATH** may occur from prolonged exposure to fumes.

- REFRIGERANT (GENERAL)

  Wear protective clothing and gloves when servicing air conditioning equipment. Contact with refrigerant–filled pipes and fittings may cause severe skin burn.

- REFRIGERANT (INHALATION)

  Avoid inhalation of refrigerant. Breathing refrigerant is hazardous to personnel.

- HEARING LOSS (GENERATOR)

  Wear ear protection near the diesel generator set while in operation. Hearing loss can occur from prolonged exposure to high noise.

- HEARING LOSS (TRANSMITTER)

  Wear ear protection when transmitter center cabinet door is opened for extended periods or while tuning the klystron. Hearing loss can occur from prolonged exposure to high noise.

- PERFORM WORK EFFICIENTLY

  When working in areas designated as hazardous, perform work using the proper safety procedures. Be thoroughly familiar with the procedures required for the task before entering the area.

- SECURE ALL MATERIAL WHEN NOT IN USE

  Secure all tools, chassis, and covers before operating equipment.

- RESTORE ALL INTERLOCKS

  Restore all interlock switches to normal operating condition immediately upon completion of work on the unit involved.

- DO NOT USE METAL TOOLS NEAR EXPOSED PARTS

  Do not use brushes, brooms, or other tools that have exposed metal parts within four feet of any electrical equipment having exposed current–carrying parts.

- DO NOT USE FERROUS TOOLS OR INSTRUMENTS NEAR KLYSTRONS

  Do not use steel or iron tools near klystrons. Such tools may be pulled from the technicians grasp and may cause damage to the tube.

8. SPECIFIC SAFETY PRECAUTIONS.

- TOWER SAFETY

  To prevent death or severe injury from falling from the tower, the following procedures must be followed:

  - Use hand rails and rest platforms when using the stairs for access to/from Antenna areas.
  - Ensure that the Antenna floor hatch is closed and secured at all times when not in use.

- ROTATING EQUIPMENT

  Stay clear of the antenna dish during rotation. Severe injury or **DEATH** may occur from being crushed by the antenna dish.

- GROUNDING

  Equipment grounds in the transmitter cabinets must remain connected at all times while operating the WSR–88D equipment. The equipment is grounded through multiple paths and with grounds connected, the standing current on the safety ground poses no safety hazard. However, operation of the equipment with a ground disconnected may pose a potential hazard. For example, if a voltage were to short to an ungrounded chassis, personnel touching the chassis could provide a ground path for the voltage and this could result in injury or **DEATH**. Ensure that the grounds have been reconnected and that all cabinet to cabinet voltages are less than 1 volt after performing any maintenance procedure that disconnects grounds. A ground and power survey conducted by the Air Force 1839th Engineering and Installation Group and Lincoln Labs concludes that for current at the equipment "the ground currents consist of frequencies greater than 60 Hz" and that "the currents found on the ground system pose no threat to the safety of personnel working on or about the site."

- ELECTRICAL SHOCK HAZARDS

  Prime power voltages and high voltages within cabinets can cause **DEATH** or severe injury. These voltages are contained in the generator area, the Radar Data Acquisition (RDA) area and Antenna area. Warning signs and labels are located on the guards and barriers to alert personnel of the potential hazard. DO NOT DISREGARD THESE WARNINGS. Ensure that safety interlocks, barriers and guards are not bypassed.

  In the RDA and the PUP, the CRT has extremely high voltages present that can cause **DEATH** or severe injury. The transmitter high voltage can also cause **DEATH** or severe injury. Warning labels and interlocks are present to prevent electrical shock. DO NOT BYPASS INTERLOCKS.

  The transmitter high voltage can cause **DEATH** or severe injury. Warning labels and interlocks are present to prevent electrical shock. DO NOT BYPASS INTERLOCK.

- RADIATION HAZARD

  Microwave (electromagnetic) radiation is emitted by the WSR−88D. During all operational modes while the antenna is scanning, the ANSI designated power density safety level of 5 mW/cm^2 is not exceeded anywhere. However, if the antenna is stationary with the transmitter on, power densities approaching one half of the safe level may occur within a cylindrical volume 40 ft. diameter and 600 ft. long in front of the antenna reflector. This zone is indicated by the illustration in Figure SS−1. Maintenance personnel should be aware of this condition and should point the antenna in a direction where there are no people within this zone. Refer to Figure SS−1.

- X−RAY SHIELDING

  The klystron tube produces dangerous x−radiation during operation. Exposure will occur without personnel being aware, and serious personal injury or **DEATH** may occur as a consequence at some later date. Never modify or alter the tube or other transmitter components since modifications might decrease radiation shielding.

- MAJOR EQUIPMENT DAMAGE

  Mismating electrical connectors on the RDA, RPG, or PUP can cause major equipment damage. Therefore, ensure that the connector keys/color coding is followed when reconnecting connectors during maintenance.

  Loss of (lubricant) oil, or (coolant) glycol from the generator engine could result in equipment damage. When performing maintenance, inspect for leaks and tighten fittings as needed. An automatic overtemperature shut−off switch is used to prevent damage.

  In order to satisfy an OSHA requirement relative to step height, a step has been added to the elevation housing cross member for those Limited Production sites that have aircraft warning lights. If it becomes necessary to move the antenna up passed the upper operational limit in elevation then it may become necessary to remove this step to avoid causing damage to the equipment.

- REMOVAL OF TOOLS

  Remove all tools and dropped hardware such as locknuts, washers, screws, etc., from equipment prior to restoring power to any WSR−88D equipment.

- HOIST SAFETY

  Before operating the hoist, the operator shall be familiar with all operating controls of the hoist, and shall be instructed as to warnings on the hoist and the safe hoisting practices listed in the operator's portion of the manual provided by the hoist manufacturer.

- ANTENNA/PEDESTAL SAFETY

  Do not attempt to climb or service the pedestal assembly while the antenna is rotating and/or while the antenna servos are operating. Severe injury from moving elements may result unless all maintenance instructions and safety procedures are followed.

  The antenna/pedestal is provided with safety features and procedures to protect maintenance personnel from hazards associated with moving masses, dangerous heights, and awkward equipment access/handling positions. The safety features provided on the antenna/pedestal assembly include the following:

- Safety interlock switch
- Grab bars
- Non–skid surface(s)
- Ladder hooks
- Stow pins.

NOTE

The Radome hatch is equipped with a safety interlocks. When the hatch (interlock) is opened, servo power is removed from the Antenna Pedestal and the Transmitter high–power RF output is switched into the dummy load.

To ensure personnel safety, the following precautions must always be observed:

1. Turn off pedestal power at the RDA Data Processor Maintenance Panel.
2. Place SAFETY WARNING tags on the pedestal electronic ON/OFF switch on maintenance panel.
3. Ensure the transmitter is in STANDBY.
4. Place the pedestal “PWR ON/SAFE” switch to “SAFE”.
5. Engage azimuth and elevation stow pins.
6. Use riser ladder properly secured with quick release pins when climbing the pedestal to work inside azimuth portion of the pedestal.
7. Always use grab bars when climbing the antenna pedestal.
8. Use the appropriate ladder hooks for the ladder for each work area on the antenna pedestal.

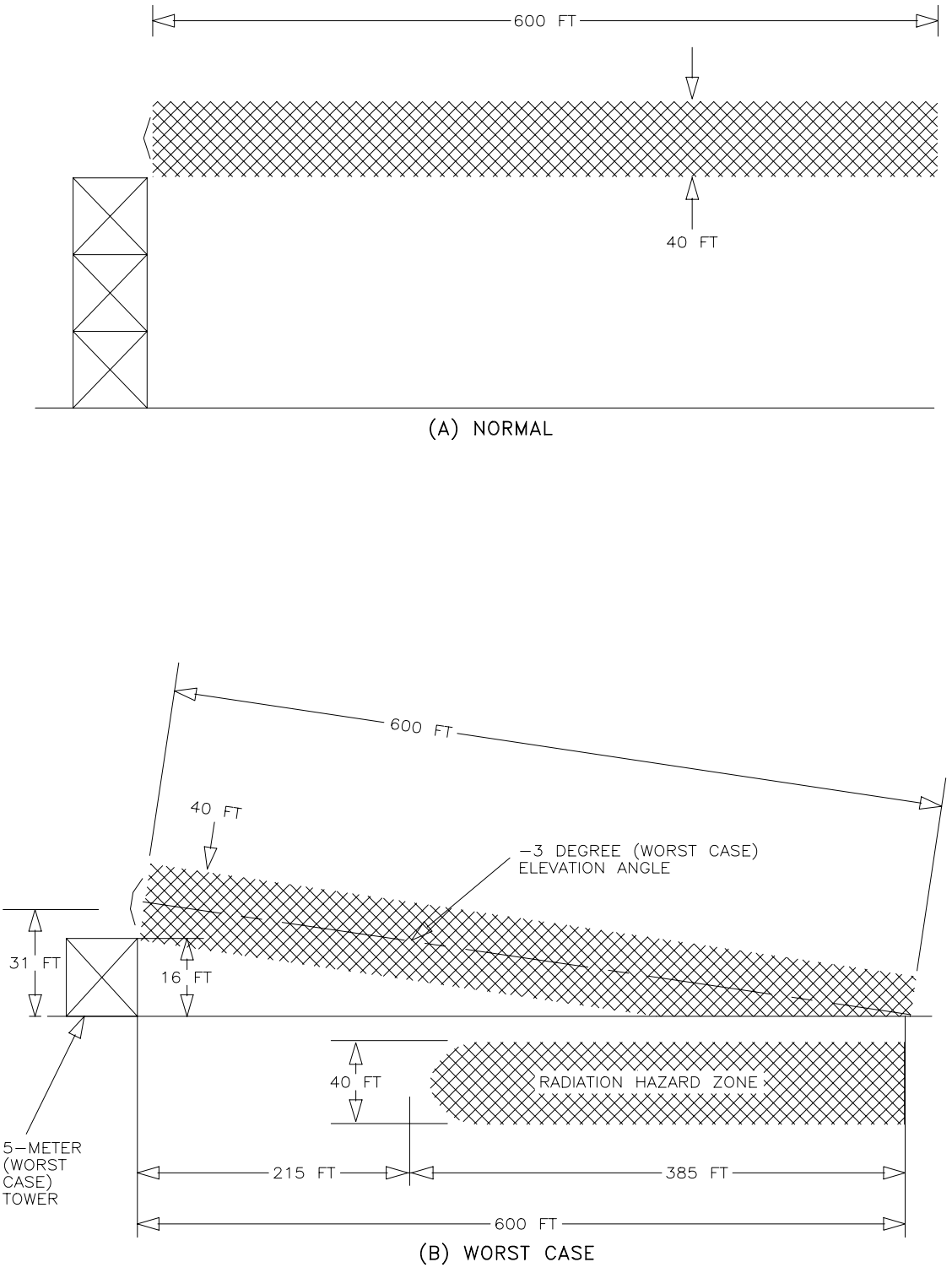


Figure SS–1. Radiation Hazard Zones

CHAPTER 1
GENERAL INFORMATION
Section 1–1. Introduction

NOTES

The acronym “RPG” is still applicable to the Open Systems Radar Product Generation function.

This chapter and its corresponding sections refer to the Radar Product Generation Processor/Communications Assembly (RPGPCA) as UD70 (previously referred to as the RPG Processor Cabinet {UD21} and RPG Communications Cabinet {UD22}). Unless otherwise specified, for Federal Aviation Administration (FAA) systems, this also applies to RPGPCA UD170.

1–1.1 GENERAL

This chapter is organized into the following sections:

- Section 1–1. Introduction – Identifies the equipment which makes up the WBC Group, describes its function, and includes leading particulars such as physical dimensions, power requirements, and capabilities/characteristics.
- Section 1–2. Equipment Description – A detailed description of the equipment which makes up the WBC Group.
- Section 1–3. Software Description – Describes the software programs associated with the WBC Group.
- Section 1–4. Reference Data – Identifies the WBC Group reference data.

1–1.2 WIDEBAND COMMUNICATIONS GROUP

A WBC link is used to exchange base data, radar status, and control data between a Radar Data Acquisition (RDA) group and its associated RPG. The WBC Group consist of the following basic configurations to support variations in the length of the wideband link, the local requirements, and the types of users:

- Data communications between a collocated RDA and RPG
- Data communications equipment needed to communicate between the RDA and the RPG when they are not collocated
- Data communications equipment needed to communicate from the RPG to other users

All configurations use different equipment (See Figure 1–1.), and the location of that equipment depends on the site’s configuration. In addition to the WSR–88D systems that contain one RPG and

one RDA, there are also two types of redundant systems. They are called NWS redundant and FAA redundant systems after the agencies that use them.

The NWS redundant system contains one RPG, two RDAs, and a switch to toggle a single wideband link from the RPG to either RDA. Selection between the two RDAs, called channels, and control of the system is performed at a Remote RDA Maintenance Terminal.

The FAA redundant system contains two RPGs and two RDAs that all reside in the same shelter and form two completely separate wideband communications links. An RPG and an RDA are grouped together as a channel and called channel 1 (UD170) and channel 2 (UD70). The channel 1 RPG can only connect to the channel 1 RDA and the channel 2 RPG can only connect to the channel 2 RDA. Selection between the two channels and control of the system is performed at the Distant Master System Control Function (MSCF) or at one of the RPG's Maintenance Position terminals.

All RPGs in every configuration contain an RDA/RPG Communications Gateway that ingests the T1 DSX−1 wideband data received from the RDA as High Density Link Control (HDLC) analog data and converts it into Transmission Control Protocol/Internet Protocol (TCP/IP) High Speed Serial (HSS) RS−530 digital data that is passed on to the RPG Processor via the Local Area Network (LAN) Switch. In all configurations, communications are controlled by the resident software in the RDA and RPG processors.

A Hardwire link is used when the RDA and RPG are within 400 feet of each other. This configuration uses only a copper cable between the RDA and RPG Input/Output (I/O) panels in a typical Department of Defense (DOD) or FAA configuration. An Extended Hardwire link configuration is used at some NWS sites that requires a set of surge suppressors to be added to the link when the RPG is located in the Weather Service Forecast Office (WSFO) building adjacent to the RDA shelter. For distances beyond 400 feet, data is transferred via Private T1, Telephone Company (Telco) T1, or Microwave Line−of−Sight (MLOS) equipment.

A Private T1 link is used when the RDA and RPG are between 400 and 3,000 feet apart. A Channel Service Unit (CSU) is used in the RDA connected by twisted wire pairs to the RDA/RPG Gateway in the RPG. Lower loss cables and surge suppressors can be used to extend the link to up to 6,000 feet.

A Telco T1 line is used when the distance between the RDA and RPG is too long for a Private T1 link to be used and when such service is available and more economical than an MLOS link. This configuration also uses a CSU in the RDA and an RDA/RPG Gateway in the RPG that are connected by the transmission medium leased from a Telephone Company.

An MLOS link is used when the distance between the RDA and RPG is too long for a Private T1 link and Telco T1 service is not available. This configuration uses MLOS transceivers and associated equipment mounted in an Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) shielded cabinet located at the RDA and RPG sites. Each MLOS transceiver requires an antenna that is mounted as necessary. A pair of MLOS transceivers is used for approximately each 25 miles. Additional pairs of MLOS transceivers can be used as repeater sites if necessary.

The RPG has an option of being configured with extra LAN ports that transmit wideband base data to additional other users by adding the Base Data Distribution Server (BDDS). The BDDS is a

separate processor from the RPG which acts as a server. It receives multicast (bcast) wideband base data from the RPG and makes it available to other users in a unique format via a reliable TCP/IP connection. Virtual LAN (VLAN) ports are available on the BDDS user distribution subnet for user connectivity so the data is segregated from the other LAN traffic for security purposes. These additional BDDS ports are only allowed to transmit BDDS data and are not configured to receive any RPG or RDA commands. BDDS users, which are limited to four by policy, establish their own links to the VLAN ports and must run unique client software to "ingest" the wideband data from the BDDS server. Table 1–1 lists the WBC Group equipment by unit designation.

Table 1–1. WBC Group Unit Designations

Unit Designation	Official Nomenclature	Common Name
UD5A18	TxPort Channel Service Unit	RDA CSU
UD70A12	Polycom RDA/RPG Gateway	Wideband Gateway
UD5A1A2	Motorola (Versa Module Eurocard) VME381–01	RDA Wideband Board
UD70A13	Cisco 2924 LAN Switch	RPG LAN
UD70A1	Sun Ultra 5 BDDS	BDDS Processor
UD19	RDA MLOS Equipment	RDA MLOS Cabinet
UD39	RPG MLOS Equipment	RPG MLOS Cabinet
UD70A19	Short Haul Modem	Short Haul Modem
UD8A29	TxPort Channel Service Unit	MLOS CSU
A26	MCG DLP–20–200 V10 Surge Suppr.	Private T1/Hardwire Surge Suppr.
A28	EDCO PC642C–150 LCW Surge Suppr.	Telco T1 Surge Suppressor
NONE	Wideband Cable Assembly	Wideband Cable

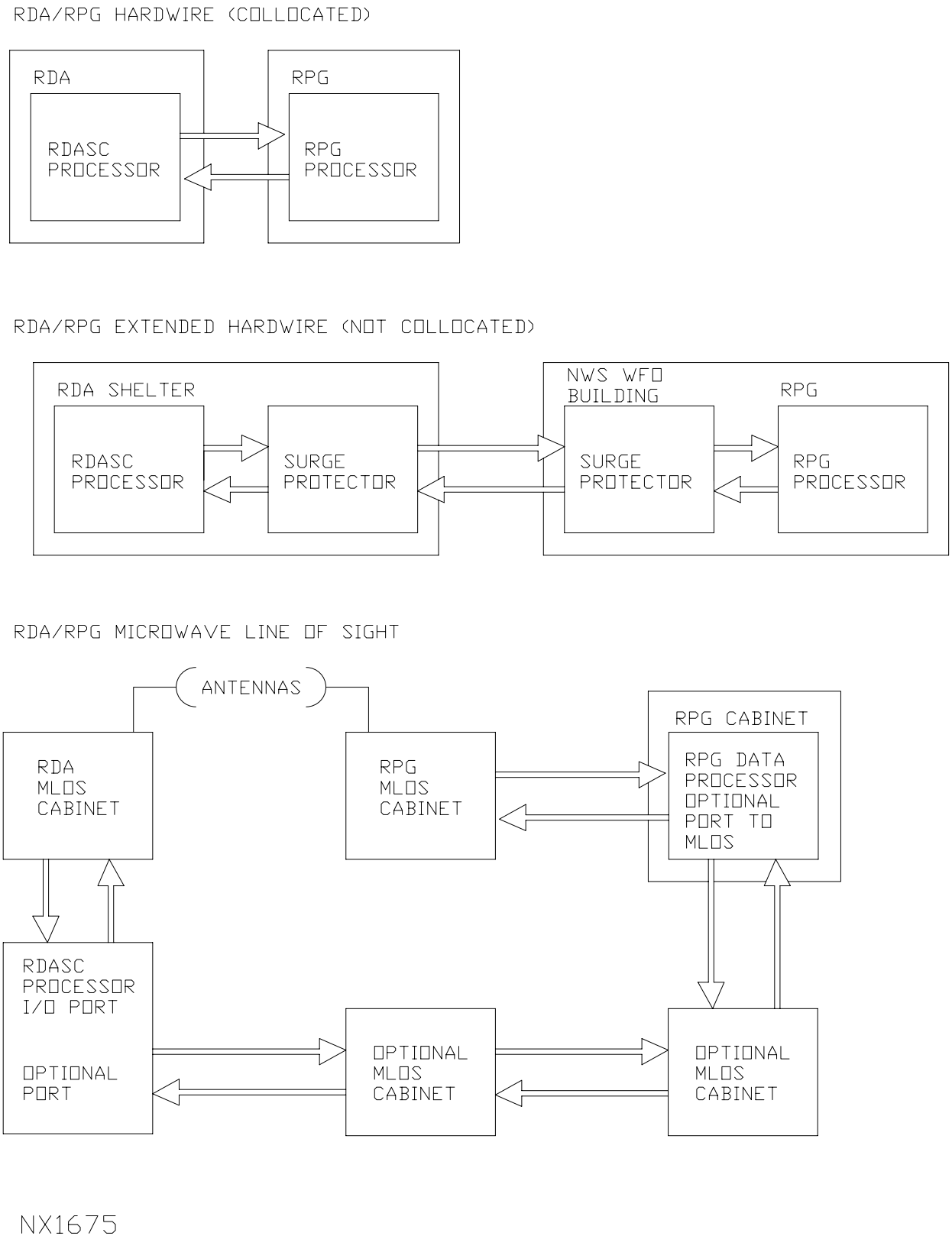


Figure 1-1. Wideband Communications Variants (Sheet 1 of 2)

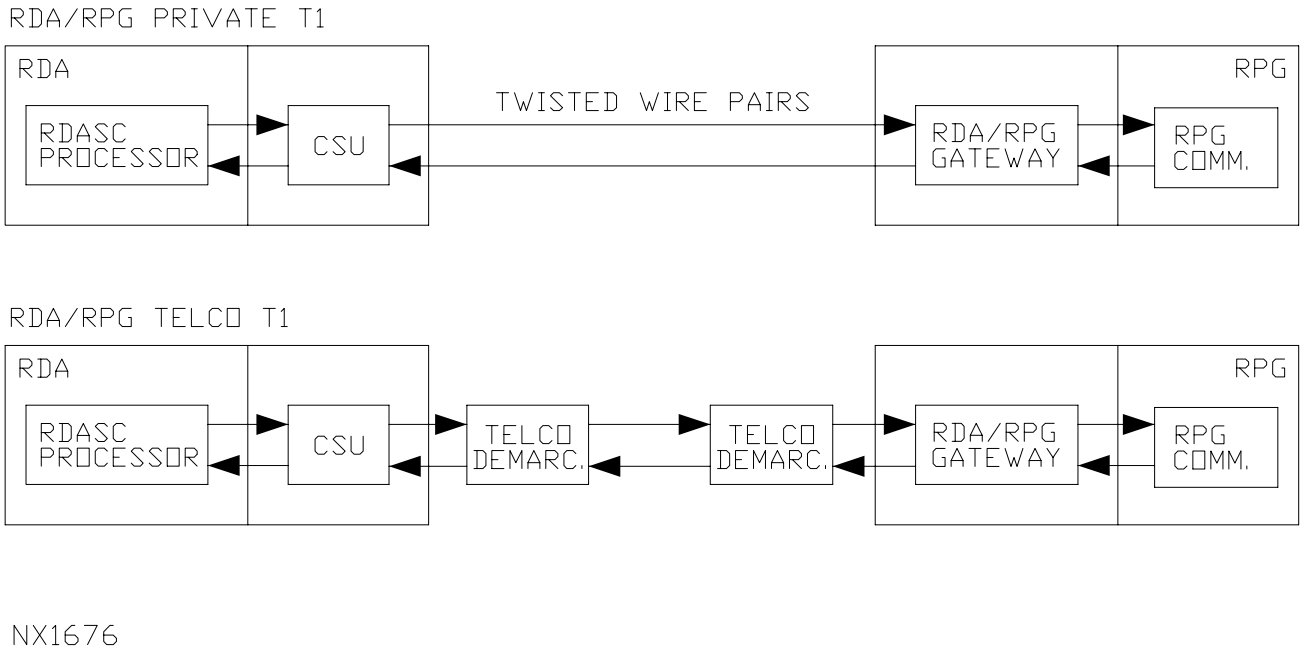


Figure 1–1. Wideband Communications Variants (Sheet 2 of 2)

1–1.3 LEADING PARTICULARS

The following lists the WBC leading particulars and the tables where they can be found:

- WBC Group Equipment Physical Dimensions – Table 1–2.
- WBC Group Power Requirements – Table 1–3.
- WBC Group Capabilities and Characteristics – Table 1–4.
- MLOS Capabilities and Characteristics – Table 1–5.
- MLOS Shelter Characteristics – Table 1–6.
- Private T1 Characteristics – Table 1–7.
- Telco T1 Characteristics – Table 1–7.

Table 1–2. WBC Group Equipment Physical Dimensions

Equipment	Height (Inches)	Width (Inches)	Depth (Inches)	Weight (Pounds)
RDA CSU	1.75	6	11.75	3
RDA Wideband Board	10.25	0.79	7.125	1.5
RDA/RPG Gateway	1.75	17.5	6.5	
RPG LAN	3.46	17.5	12	13.8
BDDS	4.31	17.17	16.69	22.4
MLOS Cabinet	72.0	24	24	160
MLOS Transceiver	11	19	20	84
MLOS Antenna Coupling Unit	4	19	20	10
MLOS Modem	0.8	2.2	2.9	0.4
MLOS Minimaster Alarm Unit	1.75	19	12	6
MLOS Remote Station Fault Alarm System (FAS)	1.75	19	12	4
MLOS Power Supply LRS–53–24	4.75	2.4	8.5	3.25
Short Haul Modem	0.8	2.1	2.7	0.4
MLOS CSU	1.75	6	11.75	3
MLOS Antenna	Site Selected			
MLOS Tower	Site Selected			
Private T1/Hardwire Surge Suppr.				
Telco T1 Surge Suppressor				
Wideband Cable	Site Specific			

Table 1–3. WBC Group Power Requirements

Equipment	Voltage	Frequency (Hz)	Phase	Power (Watts)
RDA CSU	120 Vac	60	1	10
RDA Wideband Board				
RDA/RPG Gateway	120 Vac	60	1	120
RPG LAN	120 Vac	60	1	100
BDDS	120 Vac	60	1	200
RDA/RPG MLOS Cabinet	120 Vac	60	1	85
MLOS CSU	120 Vac	60	1	10
Private T1/Hardwire Surge Suppressor				
Telco T1 Surge Suppressor				
Short Haul Modem		None		
Hardwire		None		

Table 1–4. WBC Group Capabilities and Characteristics

Parameter/Feature	Capability/Characteristic
1. WBC Group Components	
• RDA Interface Components	The VME to Concurrent Interface Board – Concurrent (VCI–C) and VME to Concurrent Interface Board – VME (VCI–V) provide direct memory access (DMA) for the Wideband Board and are mounted in the RDA Concurrent and VME chassis', respectively.
• RPG Interface Components	The RDA/RPG Gateway sends data to the RPG CPU via the LAN Switch for product generation. The LAN Switch is the ethernet TCP/IP network backbone of the system. Most RPG components communicate using TCP/IP, and the LAN Switch is the central connectivity point for these devices.

Table 1−4. WBC Group Capabilities and Characteristics − Cont

Parameter/Feature	Capability/Characteristic
• Terminal Links	MLOS Transceivers provide Line−of−Sight (LOS) transmission and receiving capabilities. MLOS CSU provides surge suppression. Wire is used for the DSX−1 interface with 100 ohm DSX−1 compatibility. The RDA CSU provides surge suppression, extended length capability to the hardwire link, and the appropriate interface to Telco T1 service. The RDA/RPG Gateway provides surge suppression, extended length capability to the hardwire link, the appropriate interface to Telco T1 service, converts wideband data from T1 DSX−1 analog to HSS RS−530 digital data, and performs protocol conversion from HDLC to TCP/IP. Category 5 (CAT5) cable is used for the RS−530 HSS interface.
• Wideband Interface Format	Provide a standard DSX−1 at 1.544 Mbps ±75 bps using B8ZS line coding or Extended Super Frame (ESF) format.
2. WBC Group Operations	
• Restart and Warm Startup	Automatic restart and equipment reinitialization to reestablish interface.
• Data Communication and Error Detection	Transmission rate of 1.544 Mbps ±75 bps, full duplex with DMA bus. Errors in frame format and signaling are detected by the wideband components prior to, and on receipt of, T1 transmissions. End−to−end network testing of line coding is available with CSU to RDA/RPG Gateway configured links.

Table 1–4. WBC Group Capabilities and Characteristics – Cont

Parameter/Feature	Capability/Characteristic
• Terminal Links	Twisted wire pairs are used from 0 – 400 feet with a loss not to exceed 6 dB per 1000 feet at 772 kHz. (Maximum cable length is 500 feet.) MLOS transceiver from 1.7 to 2.3 GHz with a power output of 30 dBm. Its range is about 25 miles per pair. Repeaters can provide greater range. The bit error rate (BER) is less than 10^{-6}. Twisted wire pairs are used up to 3,000 feet in conjunction with an RDA CSU and an RDA/RPG Gateway at the RPG. Inputs/outputs are DSX–1 compatible. Twisted wire pairs have the same characteristics as the hardwired configuration. CSUs and RDA/RPG Gateways provide the data and signal interface for the RDA and RPG processors to communicate via Telco T1 service. This option is used when such commercial service is available and less expensive than the MLOS.

Table 1–5. MLOS Capabilities and Characteristics

Parameter/Feature	Capability/Characteristic
1. LR4–2000 Transceiver Technical Summary:	
a. Line Rate	1.544 Mbps
b. Transmit/Receive Frequency	1700 – 2300 MHz
c. Minimum Frequency Separation:	
(1.) Transmitter/Receiver	40 MHz
(2.) Transmitter/Transmitter	28 MHz
(3.) Receiver/Receiver	28 MHz
d. Minimum adjacent parallel Radio Frequency (RF) channel spacing (cross–polarized operation on separate antennas with a minimum threshold C/I of 10 dB and a 1 dB degradation to the BER threshold of victimized receiver)	1.6 MHz
e. RF bandwidth efficiency	1 bps/Hz, nominal
f. Net System gain (antenna port to antenna port)	115.5 dB (typical, assumes 1 watt output power at 1.544 Mbps)
g. Digital Service Channel	

Table 1–5. MLOS Capabilities and Characteristics – Cont

Parameter/Feature	Capability/Characteristic
(1.) Transmit input level	–3.5 dBm or –16 dBm into 600 ohms, balanced
(2.) Receive input level	–3.5 dBm or +7 dBm into 600 ohms, balanced
(3.) Signal/Idle Noise	55 dB
h. Alarms	Dry relay contacts with contact closure between common and normally open contacts.
i. Ambient temperature range	
(1.) operational	+40°F to +131°F
(2.) storage/transmit	–31°F to +140°F
j. Humidity	95%, noncondensing at +140°F
k. Altitude range	16,200 feet above mean sea level
l. RFI immunity (antenna connected to the following RF sources is operated 25 cm from the equipment in any polarization)	450 MHz RF transmitter with 5 Watt output power or a 50 MHz transmitter with 15 Watt output power.
2. 481 Minimaster Alarm and Master Control Station	Master supervisory alarm system connected to the Remote Station FAS.
3. 481 Remote Station FAS	Monitors up to 16 remote site alarms and communicates with the Minimaster.
4. Power Supply	Provides –24 Vdc to the UD19/UD39 cabinets that house the MLOS units.
5. Antennas	Provide directed transmission\reception between 1.9 and 2.1 MHz. Either planar dome or grid designs are used depending on site location.
6. Towers	Site selective. Guy wire or self–supporting, optionally equipped with aircraft warning lights and up to four antennas.

Table 1–6. MLOS Shelter Characteristics

Parameter/Feature		Capability/Characteristic
Length		Inside 8.0 feet
Width		Inside 6.75 feet Outside 8.0 feet
Height		Inside 8.5 feet Outside 10.0 feet
Transportable		By surface, air, or sea
Moveable		Lift by crane or move by forklift
Insulation		Roof R19; Walls R11; Floor R11
Temperature:	Operating Minimum	–40°F
	Non–Operating Minimum	–80°F
	Operating Maximum	+122°F
	Non–Operating Maximum	+140°F
Humidity Range		15 – 100%
Fire Protection System		Smoke detector provides a remote alarm.
	Operational	Operate in an instantaneous rain rate of 11.9 inches/hour with a maximum wind speed of 41 mph.
	Non–Operational	Survive in a rainfall environment of: a. One hour average rain rate of 5.3 inches/hour and wind speed of 74 mph. b. A 24 hour average rain rate of 1.1 inches/hour with a maximum wind speed of 47 mph.

Table 1–7. Private T1 and Telco T1 Characteristics

Parameter/Feature	Capability/Characteristic
Line rate	1.544 Mbps (Tolerance depending on ±300 bps)
Line code	Alternate mark inversion (AMI)
Network output	DSX–1 compatible
Network input range	DSX–1 compatible to –30 dB below that level
Alarm/Status	Indicators on CSU front panel
Loopback testing	Near end and far end loopback testing capabilities
Ambient temperature range	0°F to +122°F
Relative humidity range	Up to 95%, non–condensing

Section 1–2. Equipment Description

1–2.1 WBC GROUP EQUIPMENT SUPPLIED

Refer to NWS EHB 6–501, Illustrated Parts Breakdown (IPB) for the complete component listing for the WBC Group.

1–2.2 RDA/RPG WBC HARDWARE DESCRIPTION

All WBC link configurations are shown in Figure 1–2. Each one provides a capability, using a different communications medium, to create a "link" between the RDA and RPG processors.

In the RDA, the VME Wideband Board, VCI–V, and VCI–C combination provide the complete interface between the processor and the communications medium for all Hardwire and MLOS configurations without an MLOS Shelter. For the MLOS configurations that do contain a separate MLOS Shelter on either the RDA or RPG side of the link, a CSU is added in the MLOS Shelter. For the Private T1 and Telco T1 configurations, a CSU is added in the RDA cabinet.

In the RPG, the RDA/RPG Gateway and LAN Switch provide the complete interface between the processor and all of the communication mediums. In all configurations, a cable runs directly from the Wide Area Network (WAN) B port of the RDA/RPG Gateway (RJ–48 phone–type jack) to the I/O panel. The WAN A port is not used. An RJ–48 jack is the same size as an 8–wire RJ–45 jack; however, pins 1 and 2 are receive and pins 4 and 5 are transmit to conform to the RJ–48 standard for T1 communications. This equipment does sync code detection, frame check sequence generation, and error checking. Additional information concerning data flow can be found in Chapter 5.

1–2.2.1 RDA VME to Concurrent Interface (VCI). The RDA VME to Concurrent interface consists of a VCI–C card (UD5A12A18), a VCI–V card (UD5A1A1), and an interconnecting cable. The VCI–C resides in the Concurrent chassis and is used to convert the Concurrent processor signals into Cable Bus signals. The VCI–V resides in the VME chassis and is used to convert the VME bus signals into Cable Bus signals. The cable between the two cards carries the Cable Bus signals to each one allowing them to communicate and pass data directly between the two busses.

1–2.2.2 RDA Wideband Communications Control Board (Motorola VME 381–01). The RDA wideband board (UD5A1A2) resides in the VME chassis and provides communication between the VCI and the WBC equipment including optimized T1 data with error correction, line equalization, and status indicators. Its front panel connector allows for monitoring of the interface.

1–2.2.3 RDA/RPG Gateway. A Polycom protocol translator (UD70A12) provides the gateway between the RDA and RPG processors. It ingests the analog data in T1 DSX–1 format from the RDA and converts it into digital data in HSS RS–530 format. It also converts the data from HDLC/X.25 protocol to TCP/IP, and then transmits the data to the RPG Processor (UD70A7) via the RPG LAN Switch (UD70A13) to be generated into products.

1–2.2.4 RPG LAN Switch. The Cisco 2924 LAN Switch (UD70A13) is the backbone of the RPG system. It is a self–contained unit with an integrated power supply and 4 MB of internal memory. It provides 24 switchable 10/100 BaseT RJ–45 jacks, autosensing for switching between 10 and 100 Mbps, and autonegotiation of half duplex and full duplex operation.

1–2.2.5 Hardwire Link. In a Hardwire link configuration, the cable from the RDA VME Wideband board goes directly to the RDA I/O panel. In the DOD and FAA Hardwire links a cable connects directly between the I/O panel of the RDA cabinet and the I/O panel of the collocated RPG cabinet using a twisted wire pair, standard DSX–1 interface. In the NWS Extended Hardwire link, a Surge Suppressor is used on both the RDA and RPG sides of the link. The Surge Suppressor is a stand–alone wall mounted type (MCG DLP–20–200V10) that is installed at the cable's entrance point at both the RDA shelter and the adjacent NWS WSFO building that houses the RPG.

1–2.2.6 Private T1 Link. In a Private T1 link configuration, the cable from the RDA VME Wideband board goes to the Data Terminal Equipment (DTE) port of the CSU in the RDA cabinet. From the network port of the CSU another cable goes to the RDA I/O panel. A similar twisted wire pair cable that is used in a Hardwire link is also used in the Private T1 link to run between the I/O panels of the RDA and RPG cabinets. All Private T1 links use a Surge Suppressor on both the RDA and RPG sides of the link. The Surge Suppressor is installed at the cable's entrance point at both the RDA shelter and the NWS WSFO building that houses the RPG and is the same stand–alone wall mounted type that is used in the Extended Hardwire link configuration (MCG DLP–20–200V10).

1–2.2.7 Telco T1 Link. In a Telco T1 link configuration, the cable from the RDA VME Wideband board goes to the DTE port of the CSU, and from the network port of the CSU another cable goes to the RDA I/O panel. Twisted wire pairs run from the RDA and RPG I/O panels to the Telco demarcation (demarc) blocks. A wall mounted (EDCO PC642C–150LC) Surge Suppressor is used between the demarc and the CSU at the RDA, and between the demarc and the RDA/RPG Gateway at the RPG. Transmission medium leased from a telephone company completes the link.

1–2.2.8 MLOS Link. In an MLOS link, the cable from the RDA VME Wideband board goes directly to the RDA I/O panel. Twisted wire pairs run from the RDA and RPG I/O panels to the RDA and RPG MLOS cabinets. Transmission medium provided by MLOS equipment completes the link. The MLOS equipment is installed in an EMI/RFI MLOS cabinet. The components are identified in Figure 1–3 and Table 1–8. The MLOS link is configured for non–space diversity and has the same basic equipment setup at both the RDA and RPG sites. It contains a Farinon LR4–2000 transceiver with antenna coupler, a transceiver power supply, a Remote Station FAS, a receiver (demodulator) bandpass filter, and a terminal block panel for internal wiring. To protect the equipment from electrical surges, CSUs or Surge Suppressors are used in configurations that contain a remote MLOS shelter located separately from the RDA or RPG.

The RPG MLOS cabinet configuration is identical to the RDA except for the addition of a minimaster alarm station which collects the alarms sent by the RDA site and forwards them to the RPG CPU via a non–powered, short haul modem.

Two highly directional dish antennas are used in each configuration and are located on a space/direction needed basis. At the RDA site, the antenna may be mounted on the radar tower, a shelter, or on a separate dedicated tower. At the RPG site, the antenna may be mounted on the user facilities roof, on an existing tower, or on a separate dedicated tower.

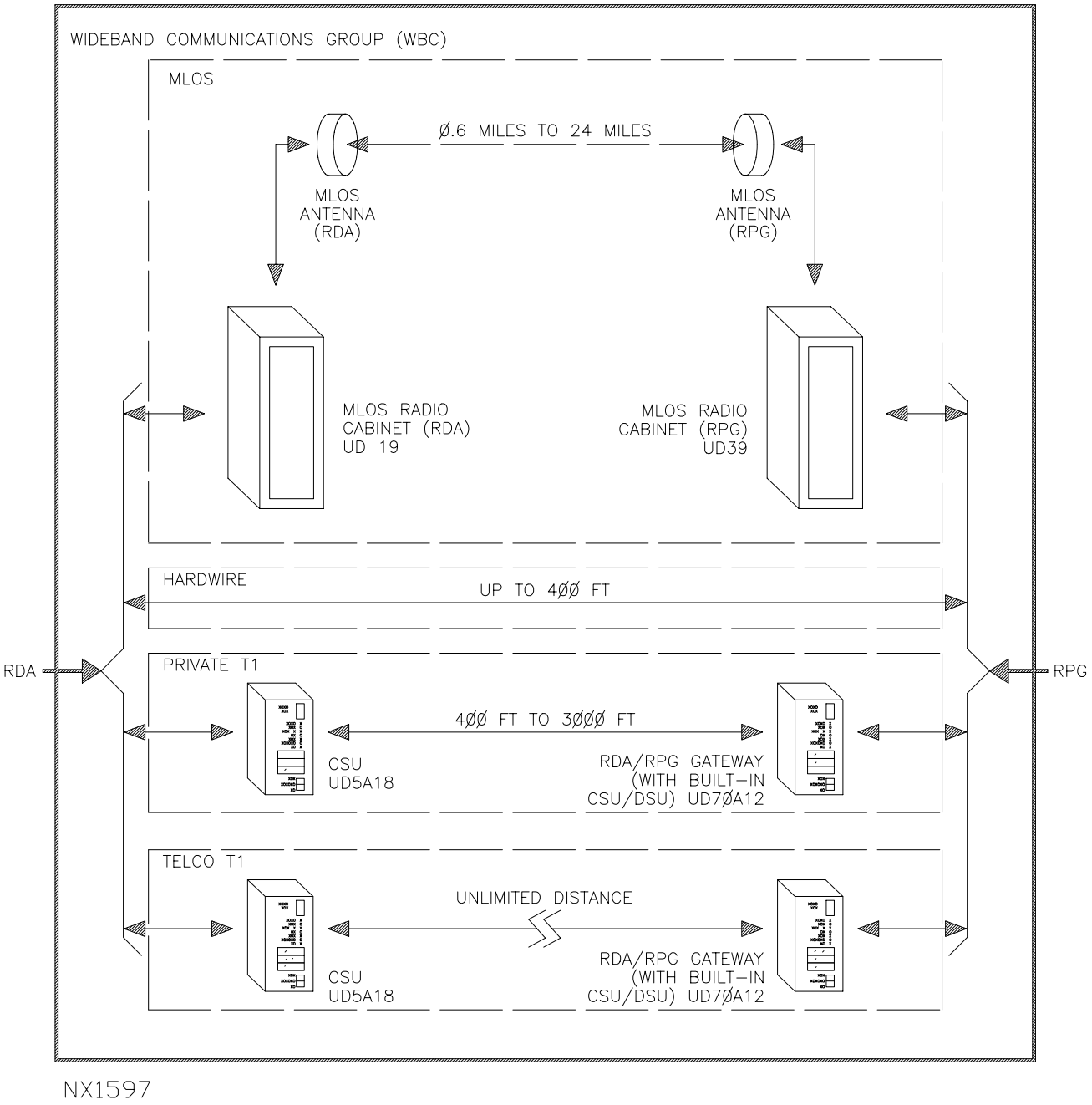


Figure 1–2. WBC Link Configurations

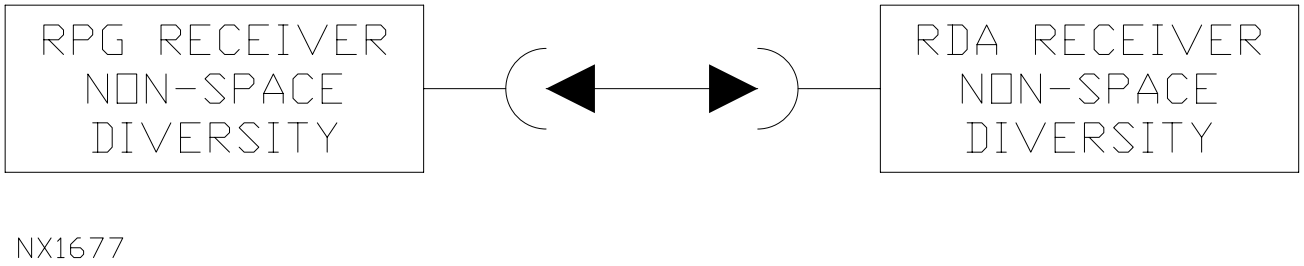


Figure 1–3. MLOS Link Configuration

Table 1–8. MLOS Link Configurations

Configured For	Base Components	Additional Components
RDA Receiver Non–Space Diversity	Terminal Block Panel Bandpass Filter Antenna Coupler LR4–2000 Transceiver Orderwire (Speech Plus) Remote Station FAS Power Supply	
RPG Receiver Non–Space Diversity	Same as above.	Minimaster Alarm Station Short Haul Modem

1–2.3 WSR–88D USERS

Figure 1–2 shows the different WBC configurations that are available. Figure 1–3 shows the different MLOS configurations.

1–2.4 PHYSICAL CONFIGURATION

Figure 1–4 through Figure 1–10 show the location of the equipment used in a Hardwire, Private T1, Telco T1, or MLOS wideband link.

- Figure 1–4 shows the RDA Equipment Shelter UD7.
- Figure 1–5 shows the MLOS Equipment Shelter UD13. This shelter will be located in close proximity to the RDA and RPG equipment that it supports.
- Figure 1–6 shows the MLOS transceiver front panel with a handset. The handset can be stored on a panel in the radio.
- Figure 1–7 shows the MLOS racks for the different configurations of equipment.
- Figure 1–8 shows the MLOS cabinet UD19/UD39. The total number of top and bottom connectors will vary with the site configuration.
- Figure 1–9 shows the MLOS antenna styles used with the system. These antennas will mount on either the existing radar tower, a shelter, or on a dedicated tower.
- Figure 1–10 shows the dedicated MLOS towers for use at sites where other mounting methods are not advised.

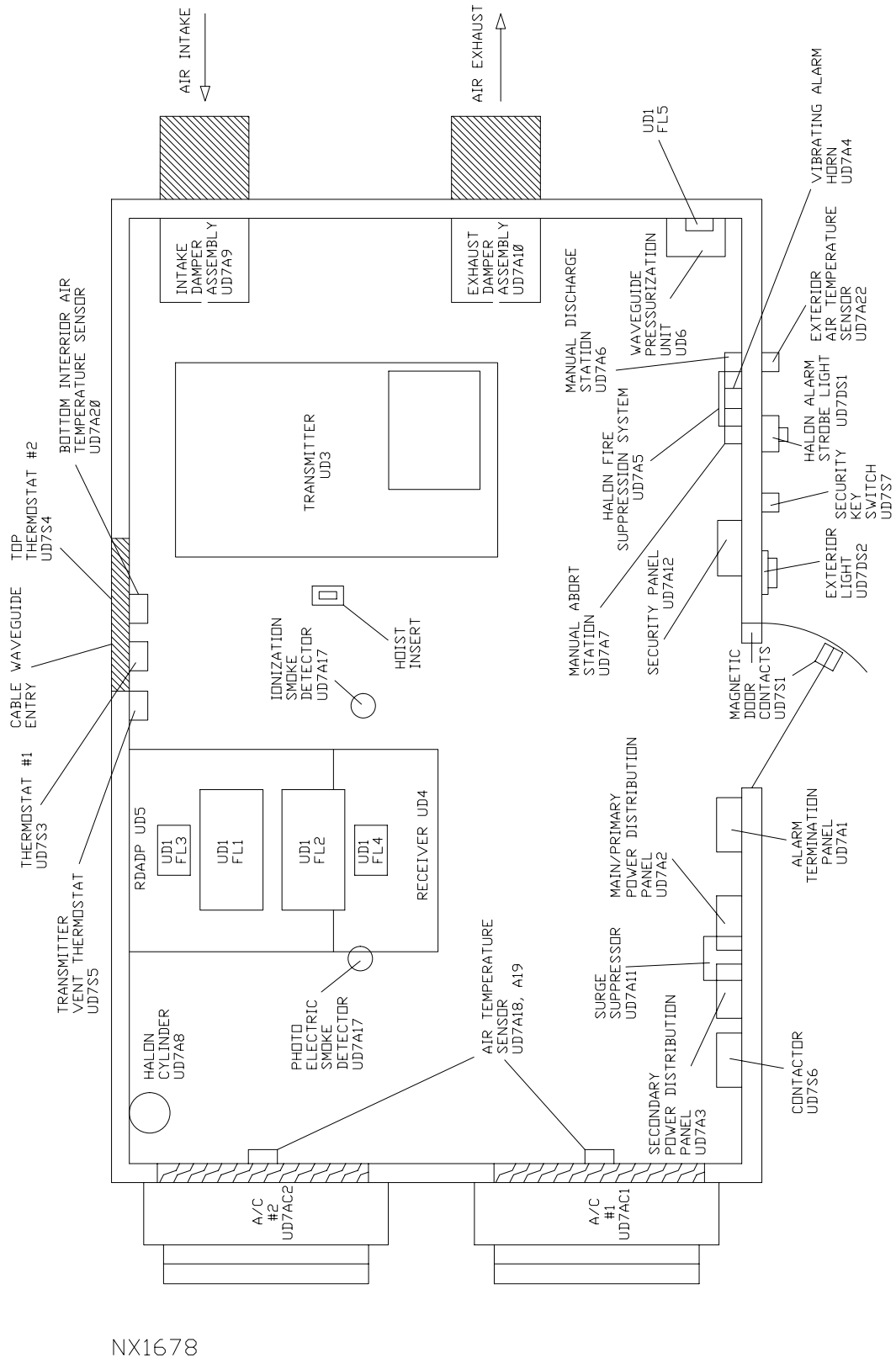


Figure 1–4. RDA Equipment Shelter UD7

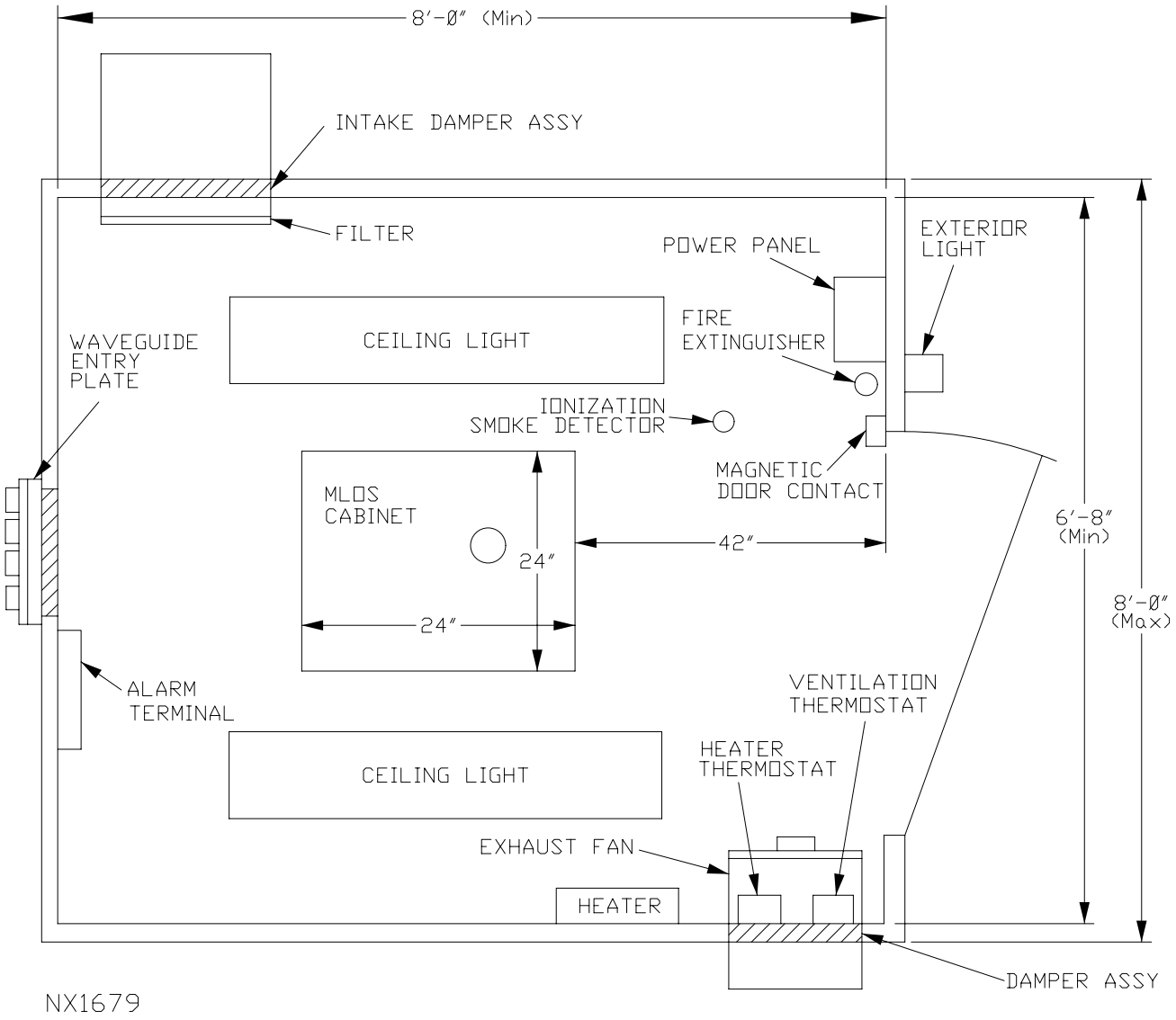


Figure 1–5. MLOS Equipment Shelter UD13

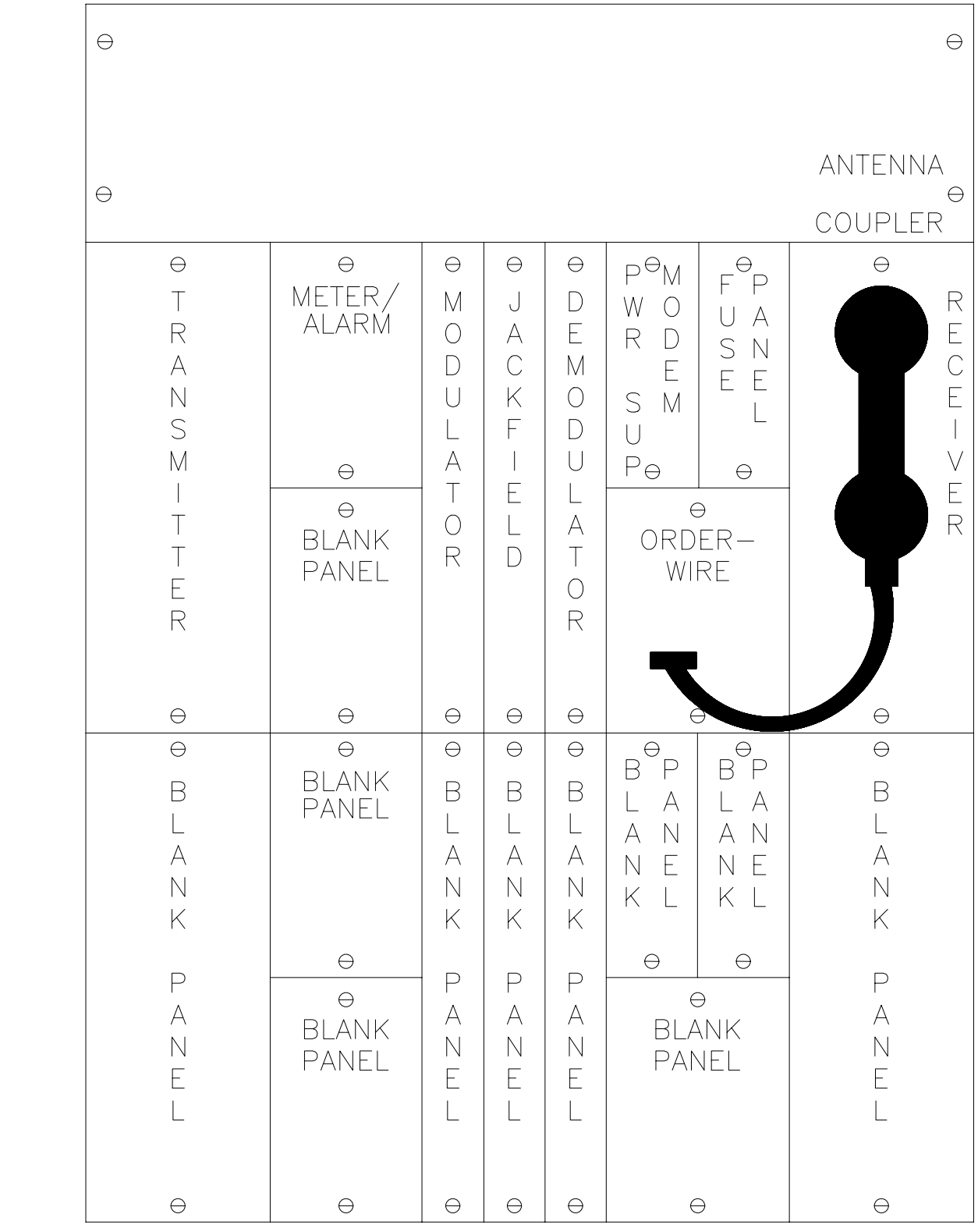


Figure 1–6. MLOS Transceiver Front Panel

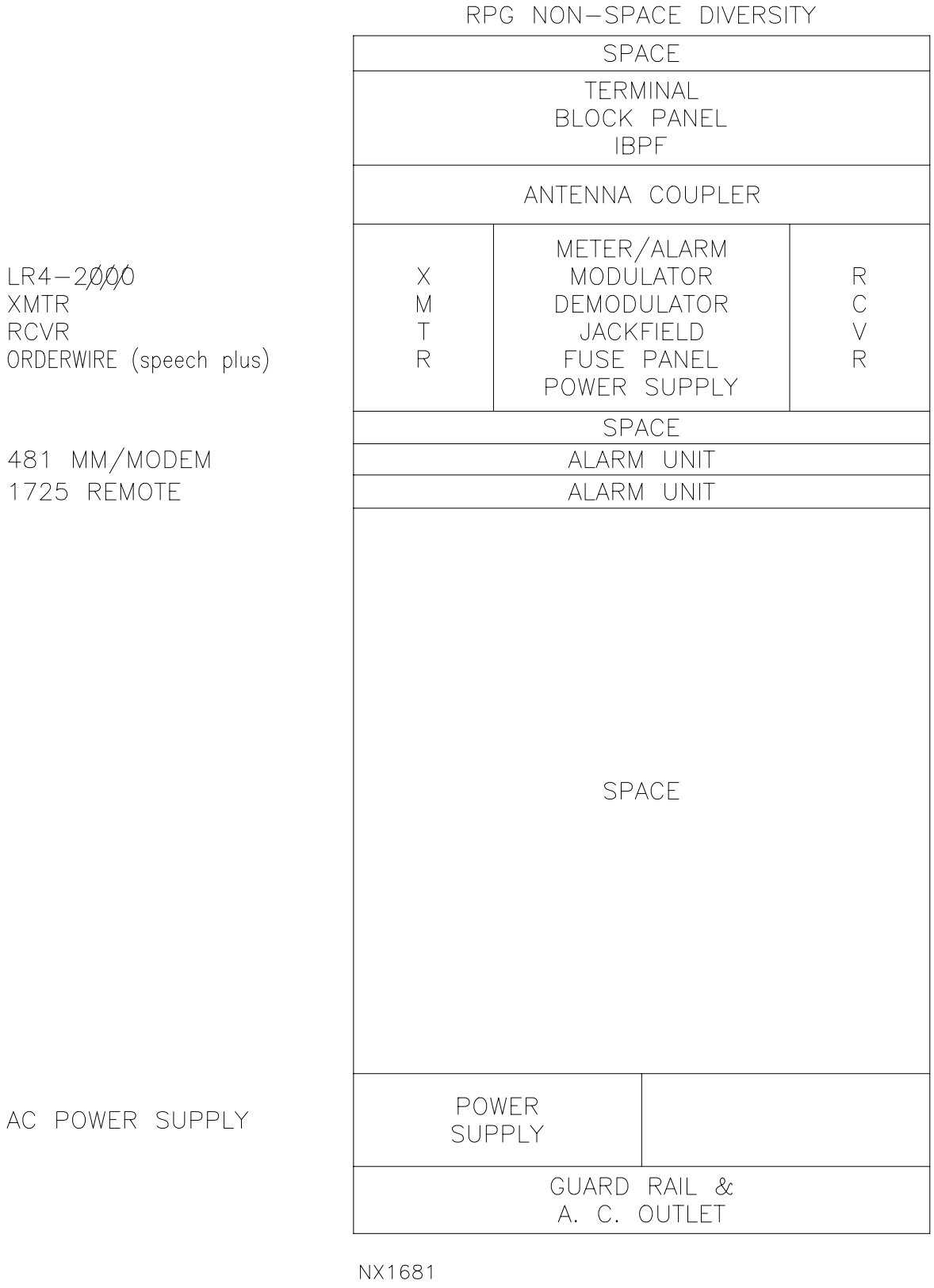


Figure 1–7. MLOS Rack Profile (RPG Non–Space Diversity)
(Sheet 1 of 2)

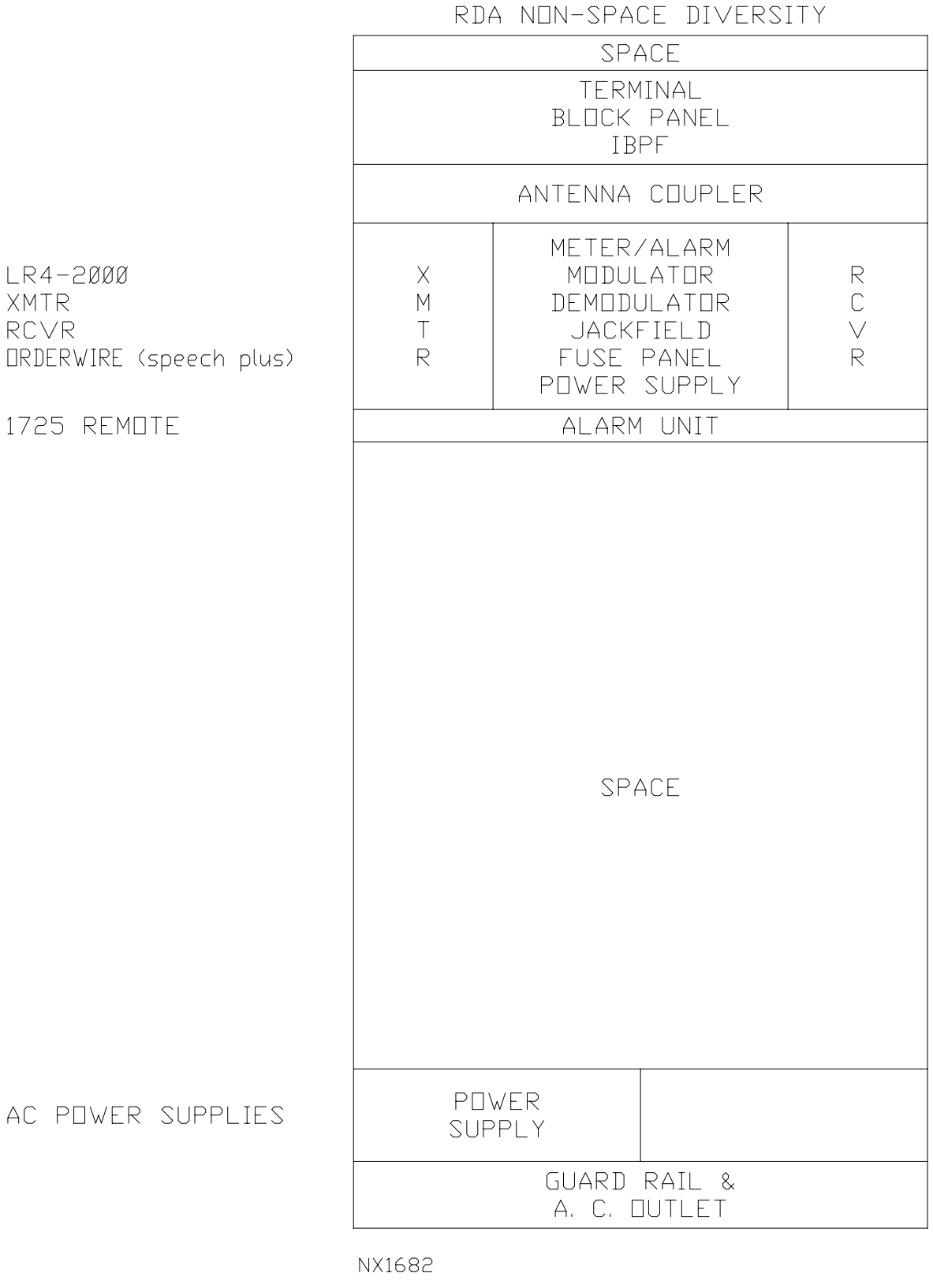
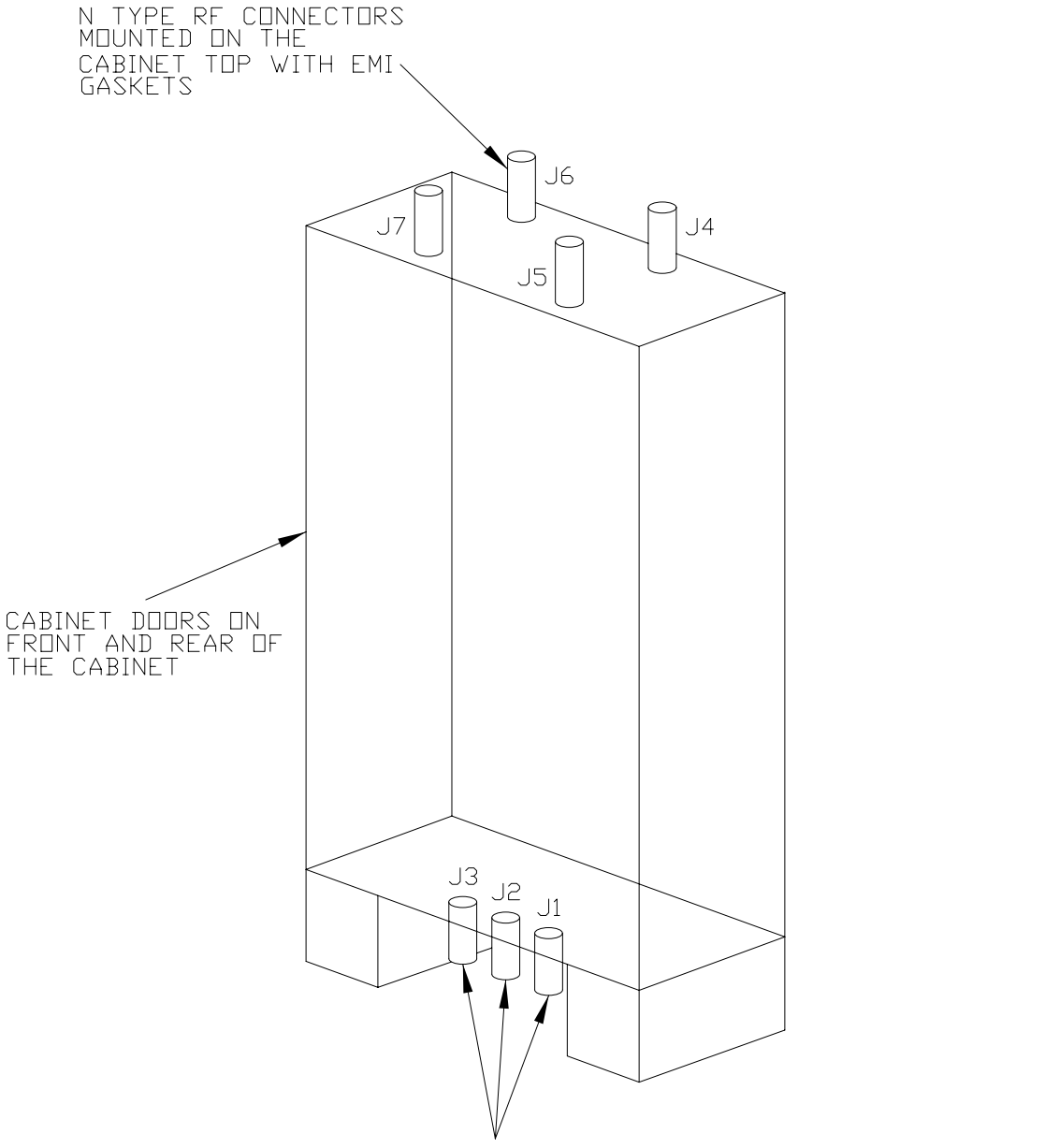


Figure 1–7. MLOS Rack Profile (RDA Non–Space Diversity)
(Sheet 2 of 2)

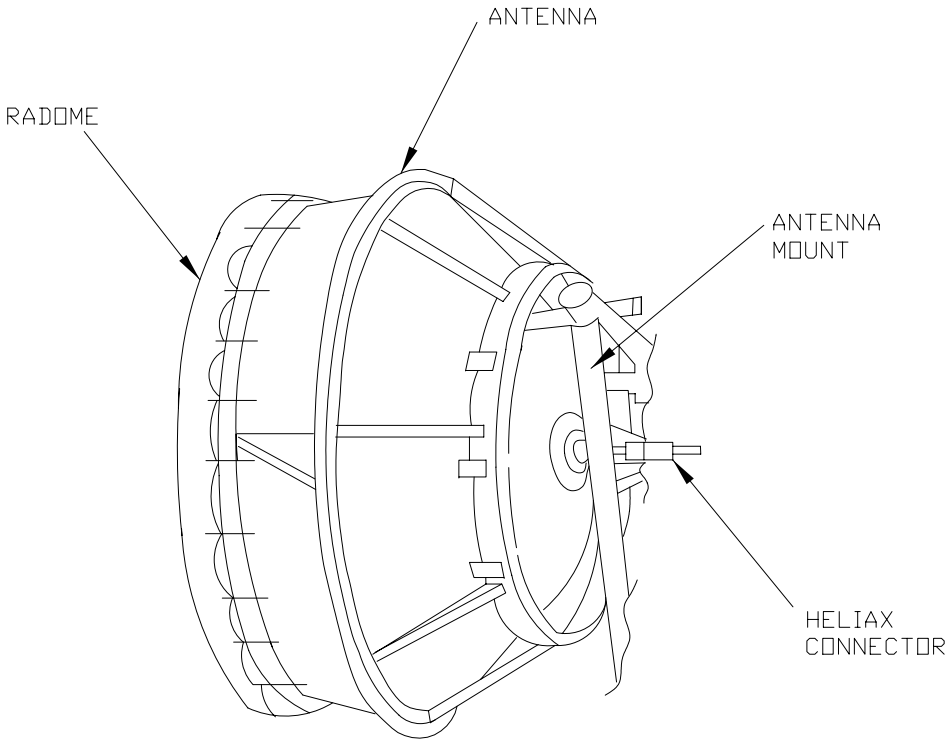


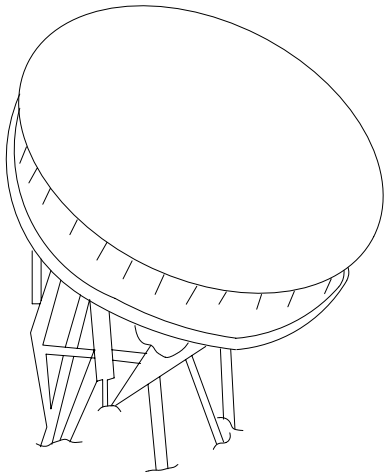
	FUNCTION
J1 = D38999/24W A35 SN	(T1 IN/OUT)
J2 = D38999/24W C35 SN	(FAS)
J3 = D38999/24W DØ5 PN	(AC/DC PWR)
J4 THRU J7 = N TYPE FEMALE CONNECTOR	(ANTENNA)

NOTE: NOT ALL SITES WILL CONTAIN ALL THE CONNECTORS

NX1683

Figure 1–8. MLOS Cabinet UD19, UD39





NX1684

Figure 1–9. MLOS Antennas

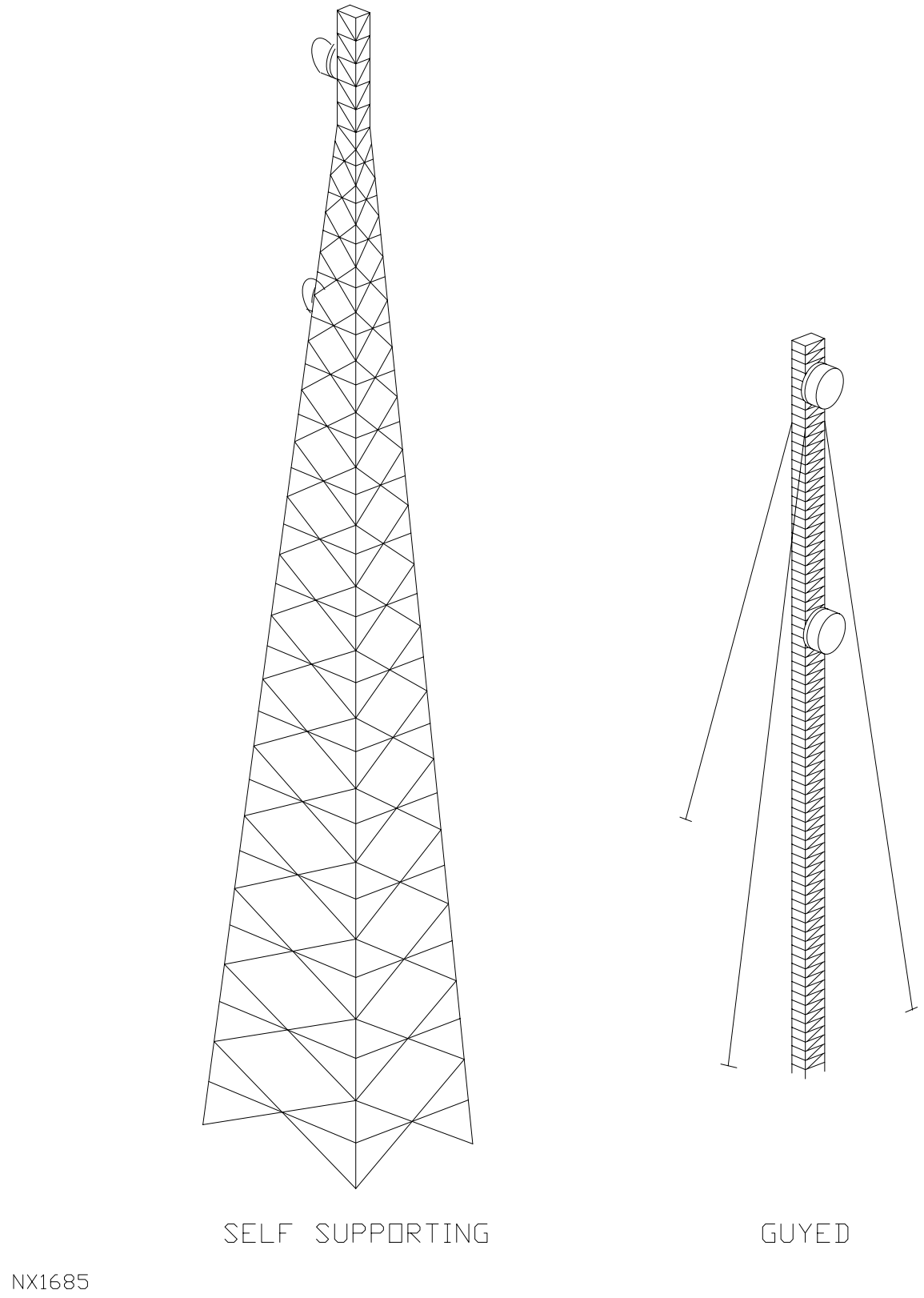


Figure 1–10. MLOS Towers

Section 1–3. Software Description

1–3.1 RDA APPLICATIONS SOFTWARE PROGRAM (CPCI 01)

Computer Program Configuration Items (CPCIs) identify unique software programs in the WSR–88D program. The RDA's Applications Software Program, CPCI 01, controls the WBC interface to the RPG and the optional WBC link. It monitors the status of the WBC links, passes this information to the Monitor RDA hardware function, and passes on requests for special interface tests to the wideband link hardware. It also transfers commands from the RPG to the RDA (allowing the RPG to control the operational modes of the RDA), plus base data and status from the RDA to the RPG, either upon request or as scheduled through adaptation data. This includes headers, summary RDA status, RDA alarms, and detailed RDA calibration, performance data, and status information (maintenance data). Another part of the CPCI enables and disables base data transmission over the WBC links, including startup, restart, and shutdown sequences, plus power fail/recovery procedures.

The WBC link has direct memory access (DMA) to the Radar Data Acquisition Status and Control (RDASC) processor by the wideband interface function. This DMA provides synchronous, bidirectional, full duplex communication between two or more separated functional areas.

1–3.2 RPG GROUP SOFTWARE

The RPG group software controls and monitors the operational equipment, maintains the operator/machine interface, and runs the hydrometeorological applications. It consists of the following three computer software programs:

- RPG Applications Software Program (CPCI 03)
- RPG Commercial Off–The–Shelf (COTS) Software (CPCI 12)
- RPG Support Software (CPCI 23)

1–3.3 RPG APPLICATIONS SOFTWARE PROGRAM (CPCI 03)

This CPCI gives the user an interactive computer program in a multiprocessing environment. However, it is possible to perform RPG functions in either a fully–automated or a manually aided mode. The RPG processes radar wideband data to generate weather products containing information on related meteorological phenomenon. These products can then be stored, archived, and distributed to users. Data transmitted by the RDA to the RPG includes base data with headers, summary RDA status, RDA alarms, detailed RDA calibration data, RDA performance data, and status information (maintenance data). Data transmitted by the RPG to the RDA includes mode selection, control commands, volume scan program rate, and requests for RDA status. This CPCI functionally interfaces with operational hardware, operational CPCIs, WSR–88D system interfaces, and support CPCIs. The RPG software program runs on a Sun Ultra 10 processor and peripherals. The hardware interfaces consist of RPG processor(s), mass storage, display terminal, and communications equipment. The RPG software program interfaces with the CPCI 01 RDASC program, the CPCI 04 product display program, and the OS software program. The RPG software program is divided into different tasks as described in the following paragraphs.

1−3.3.1 Acquire Radar Data. This software function interfaces with the RDA over the bi−directional wideband communications link to receive base data, status, alarms, and maintenance information from the RDA and to transmit status request and control commands to the RDA. The RPG can also be configured with a BDDS option that provides the capability of retransmitting the wideband base data to additional other users. With the optional BDDS configuration, once the RPG receives the wideband base data from the RDA, it simply passes that same data along to the BDDS. The BDDS then makes that data available, to be ingested by other users, in a unique format on four additional ports of the RPG LAN that are logically partitioned off into a VLAN that segregates the data from the other LAN traffic for security purposes. The BDDS software is configured so that it can only transmit data, and is not configured to receive or process any commands.

1−3.3.2 DELETED.

1−3.3.3 Generate Products. This software function converts base data into meteorological products consisting of base, derived, and alphanumeric products.

1−3.3.4 Distribute Products. This software function distributes products to associated, non−associated, and other users, and provides for on−line storage and archiving of these products.

1−3.3.5 Control System. This software function performs all of the system control tasks including RDA control, RPG processing control, system control, and the WSR−88D System status monitoring and error detection.

1−3.4 RPG COMMERCIAL OFF THE SHELF SOFTWARE (CPCI 12)

CPCI 12 includes the COTS Software that is available from the commercial vendors in support of the RPG. This software includes the UNIX OS, compiler, as well as the router, and communication server software. UNIX is responsible for managing the RPG system environment, scheduling tasks, and providing file management memory allocation services. The other COTS software programs are designed to work within their own components.

1−3.5 WBC GROUP DIAGNOSTIC PROGRAMS

The following lists the WBC diagnostic programs:

- RDA Macrolink on−board VME to Concurrent Interface Diagnostic
- CPCI 07 − RDA M3200 Computer Diagnostic
- CPCI 23 − RPG Support Software (Test Tools). This CPCI consists of RPG software developed and utilized by the WSR−88D Radar Operations Center (ROC) for testing of the RPG operational software, for example, the load/start scripts.

1−3.5.1 Off−Line Diagnostics Tests. Off−Line Diagnostics Tests are not required for this equipment.

Section 1–4. Reference Data

1–4.1 WBC GROUP REFERENCE PUBLICATIONS

The WSR–88D System commercial equipment reference documentation applicable to the WBC Group is listed in Table 1–9.

1–4.2 GLOSSARY OF TERMS

There is a glossary of terms in the System Manual, NWS EHB 6–500, as well as at the back of this manual.

1–4.3 EQUIPMENT SUPPLIED

The table that identifies the WBC Group equipment required for maintenance and supplied as WBC Group equipment is in the System Manual, NWS EHB 6–500.

1–4.4 STANDARD TOOLS

The list of standard tools required for the WBC Group maintenance is in the System Manual, NWS EHB 6–500.

1–4.5 STANDARD TEST EQUIPMENT

The list of standard test equipment required for the WBC Group maintenance is in the System Manual, NWS EHB 6–500.

1–4.6 SPECIAL PURPOSE TOOLS AND FIXTURES

The list of special purpose tools and fixtures required for WBC Group maintenance is in the System Manual, NWS EHB 6–500.

1–4.7 CONSUMABLES/EXPENDABLES

The list of consumables/expendables required for WBC Group maintenance is in the System Manual, NWS EHB 6–500.

Table 1–9. WBC Group Reference Publications

NWS EHB Number	Title	Manufacturer	Document Number	Revision
6–541–1	RDA General Manual S/O N90013	Harris	31P1–4–108–91	0
6–541–2	RDA Link Manual S/O N90013	Harris	31P1–4–108–91	0
6–541–3	RPG General Manual S/O N90013	Harris	31P1–4–108–91	0
6–541–4	RPG Link Manual S/O N90013	Harris	31P1–4–108–91	0

CHAPTER 2

NOT USED

CHAPTER 3

NOT USED

CHAPTER 4

OPERATIONS

Section 4–1. Introduction

4–1.1 GENERAL

This chapter contains brief descriptions of the WBC Group operations, procedures, and controls and indicators to give the maintenance technician an understanding of the overall operations and tasks performed in the WBC. Refer to Chapter 6 for fault isolation procedures if failures occur.

4–1.2 CHAPTER ORGANIZATION

Chapter 4 is organized into the following sections:

- Section 4–1 Introduction – Provides descriptions of the Chapter 4 sections.
- Section 4–2 Controls and Indicators – Provides figures and tables for identifying, locating, and describing the WBC Group equipment controls and indicators.
- Section 4–3 RDA WBC Startup and Shutdown Procedures – Provides a pre–operational setup procedure to be used as a maintenance tool if problems are encountered which cause a failure during startup after a maintenance action. This is followed by a comprehensive set of instructions for bringing the RDA WBC Group to a fully operational state and to a complete shutdown for maintenance purposes.
- Section 4–4 RPG WBC Startup and Shutdown Procedures – Provides a pre–operational setup procedure to be used as a maintenance tool if problems are encountered which cause a failure during startup after a maintenance action. This is followed by a comprehensive set of instructions for bringing the RPG WBC Group to a fully operational state and to a complete shutdown for maintenance purposes.
- Section 4–5 Off–Line Diagnostics Tests – Off–Line Diagnostics Tests are not required for this equipment.
- Section 4–6 Emergency/Recovery Procedures – provides guidance for restoring the WBC Group to normal operation.

Section 4–2. Controls and Indicators

4–2.1 GENERAL

The WBC equipment controls and indicators for fault isolation are found in Chapter 6 or a COTS manual. This section contains figures and tables for locating and identifying the WBC equipment controls and indicators. The tables contain the following columns of information:

- Fig. and Index No. – refers to a specific control or indicator in the designated figure
- Control/Indicator Nomenclature (Type) – lists panel nomenclature of the controls or indicators and their type
- Function – describes the purpose of each control or indicator
- Normal Position/State – lists the normal position/state of each control or indictor

4–2.2 HARDWIRE LINK

Those systems with hardwire wideband links do not have any controls or indicators.

4–2.3 RDA CABINET UD5

The controls and indicators of the WBC equipment contained in the RDA cabinet are located on the following equipment:

- CSU UD5A18
- VME Chassis UD5A1
- VCI–V UD5A1A1
- Wideband Board (Motorola VME381–01) UD5A1A2
- VCI–C UD5A12A18

4–2.3.1 CSU UD5A18. See Figure 4–1 and Table 4–1 for the location and description of the RDA CSU controls and indicators.

4–2.3.2 VME Chassis UD5A1. See Figure 4–2 and Table 4–2 for the location and description of the RDA VME chassis controls and indicators.

4–2.3.3 VCI–V UD5A1A1. See Figure 4–3 and Table 4–3 for the location and description of the RDA VCI–V controls and indicators.

4–2.3.4 Wideband Board (Motorola VME381–01) UD5A1A2. See Figure 4–4 and Table 4–4 for the location and description of the RDA Wideband board controls and indicators.

4–2.3.5 VCI–C UD5A12A18. See Figure 4–5 and Table 4–5 for the location and description of the RDA VCI–C controls and indicators.

4–2.4 RPG CABINET UD70

The controls and indicators of the WBC equipment contained in the RPG cabinet are located on the following equipment:

- RDA/RPG Gateway (Polycom) UD70A12
- LAN Switch (Cisco 2924) UD70A13
- Short Haul Modem UD70A19

4–2.4.1 RDA/RPG Gateway (Polycom) UD70A12. See Figure 4–6 and Table 4–6 for the location and description of the RPG Wideband Gateway controls and indicators.

4–2.4.2 LAN Switch (Cisco 2924) UD70A13. See Figure 4–7 and Table 4–7 for the location and description of the RPG LAN Switch controls and indicators.

4–2.4.3 Short Haul Modem UD70A19. See Figure 4–8 and Table 4–8 for the location and description of the RPG Short Haul Modem controls and indicators.

4–2.5 MLOS EQUIPMENT SHELTER UD13

The power controls for the shelter are located on the shelter circuit breaker panel. The environmental controls are located on separate control boxes. See Figure 1–5 for locations.

4–2.6 MLOS CABINET UD19/UD39

The controls and indicators for the MLOS cabinets are on the following equipment:

- MLOS Transceiver UD19 and UD39
- Minimaster UD39A18
- Remote Station Fault Alarm System UD19A19 and UD39A19.

4–2.6.1 MLOS Transceiver UD19 and UD39. See Figure 4–9 and Table 4–9 for a description of the MLOS transceiver controls and indicators.

4–2.6.2 MLOS Minimaster UD39A18. See Figure 4–10 and Table 4–10 for a description of the Minimaster controls and indicators.

With the Minimaster (UD39A18) in normal supervisory (default) mode, the SYSTEM (display mode) Light Emitting Diode (LED) is lit and the Alarm Status LEDs (1–32) represent MLOS stations, where Alarm Status LED set 1 (major–red and minor–yellow) represents the RPG MLOS station, and LED set 2 represents the RDA MLOS station.

To observe the individual alarms reported to the Minimaster by a station, press the DSPLY ACK button once. The Alarm Status LEDs now represent the individual alarms reported to the Minimaster by the station whose number is now on the four digit LED display. For example, if a 2 is displayed and the number seven Alarm Status LED is lit, the RDA MLOS Contra–line 481 (UD19A19) has reported an unauthorized entry.

Press DSPLY ACK a second time and the Alarm Status LEDs extinguish because they have been acknowledged. If the alarm conditions still exists, the station will report the alarms again and the LEDs will light again.

Press DSPLY ACK a third time and the digit display changes and the Alarm Status LEDs now represent alarm conditions from the station whose number is displayed.

Press DSPLY ACK continuously to cycle through all the MLOS stations in the configuration. The STATION LED will extinguish and the System LED will be lit again.

4–2.6.3 MLOS Remote Station FAS UD19A19/UD39A19. See Figure 4–11, Table 4–11, and Table 4–12 for a description of the FAS controls and indicators.

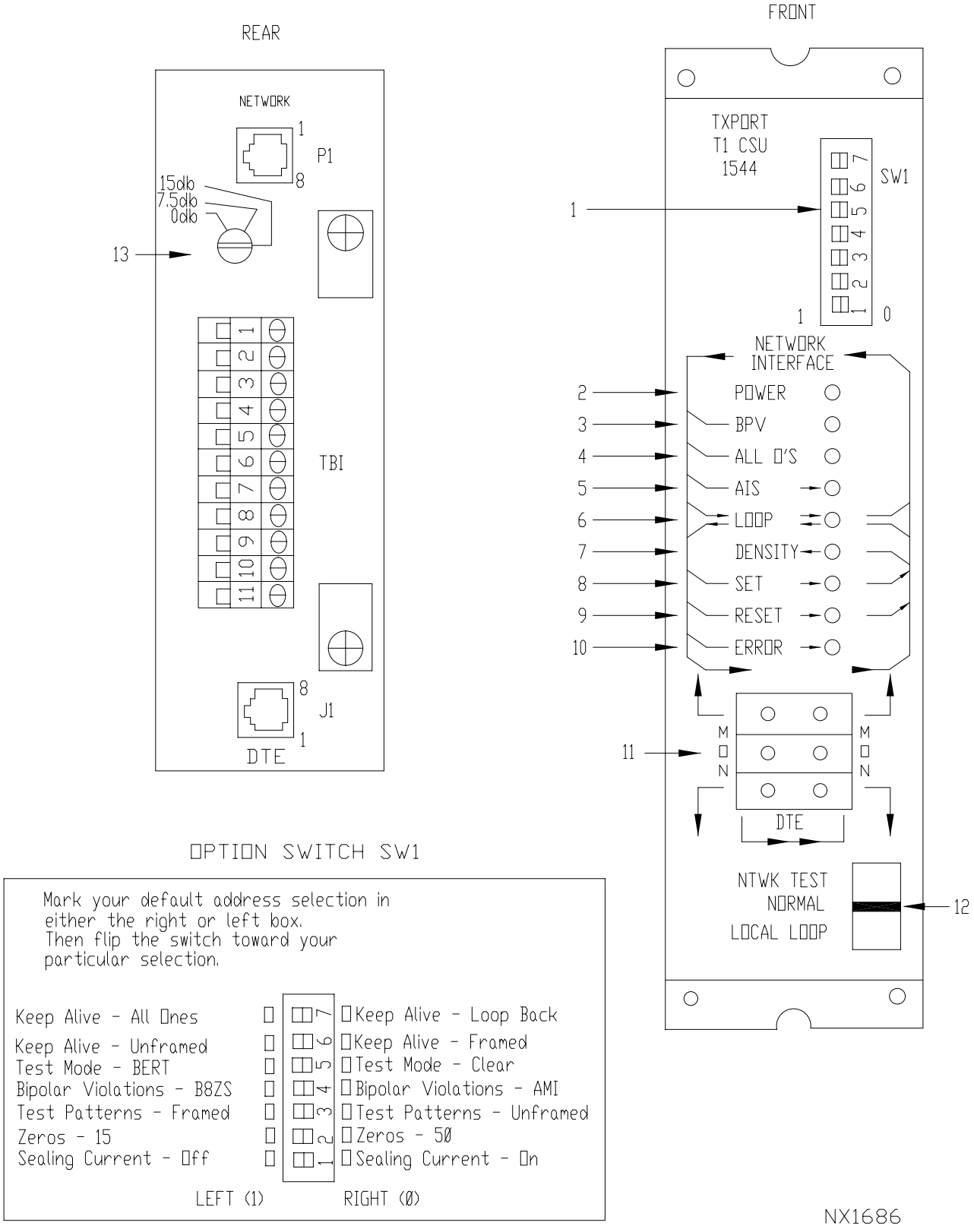


Figure 4–1. RDA CSU UD5A18 and SW1 Switch Setting Options (Sheet 1 of 2)

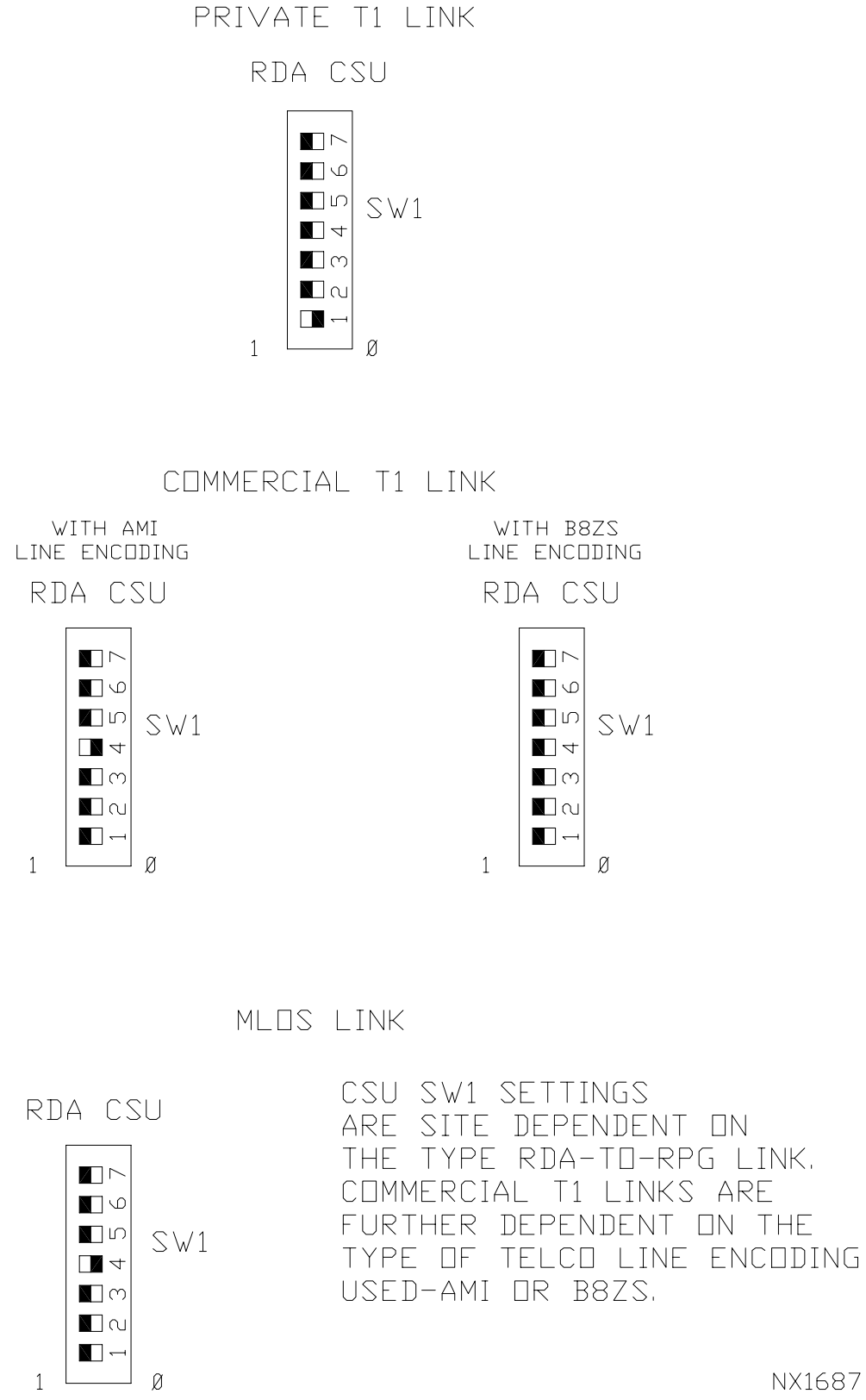


Figure 4–1. RDA CSU UD5A18 and SW1 Switch Setting Options (Sheet 2 of 2)

Table 4–1. RDA CSU UD5A18 Controls and Indicators

Figure 4–1 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position /State
1.*	SW1–1	Turns sealing current off (1) or on (0) in local mode.	*
	SW1–2	Selects 15 (1) or 50 (0) successive zeros before keep–alive is activated.	1
	SW1–3	Selects framed (1) or unframed (0) test patterns.	1
	SW1–4	Selects B8ZS (1) or AMI (0) codes from the network.	*
	SW1–5	Selects internal test pattern BERT (1) or clear (0) for externally injected signals for network tests.	1
	SW1–6	Selects unframed (1) or framed (0) keep–alive signals.	1
	SW1–7	Selects all 1's (1) or loopback (0) as keep–alive signal.	1
2.	POWER	Indicates that power is applied to the CSU.	On
3.	BPV	Lights for each occurrence of bipolar violation.	Off
4.	ALL 0's	Lights if no signals are detected from the network.	Off
5.	A1S	Lights if unframed all 1's signal detected from the DTE.	Off
6.	LOOP	Lights indicating that the unit is in a line loop condition.	Off
7.	DENSITY	Lights if the ones density of the received data from the DTE is less than 12.5%.	Off
8.	SET	Flashes when the BERT test code is transmitted. Lights constantly when the in–band set code is received.	Off
9.	RESET	Flashes when the reset code is transmitted. Lights constantly if the in–band reset code is received.	Off
10.	ERROR	Flashes if an error is received during network test.	Off
11.	Test Jacks	Provide access to the DTE side of the T1 line for traffic monitoring, or receive/transmit to the network or DTE.	
12.	TEST	3–position switch for network or local loopback tests.	Normal
13.	LBO	This switch has three settings, 0, 7.5, and 15 dB, which allow efficient signal transmission based on the distance to the Telco T1 link. For those links equipped with Telco smart jacks, the setting is 0.	Site Specific
*	Site Dependent	See Figure 4–1 Sheet 2 for details.	

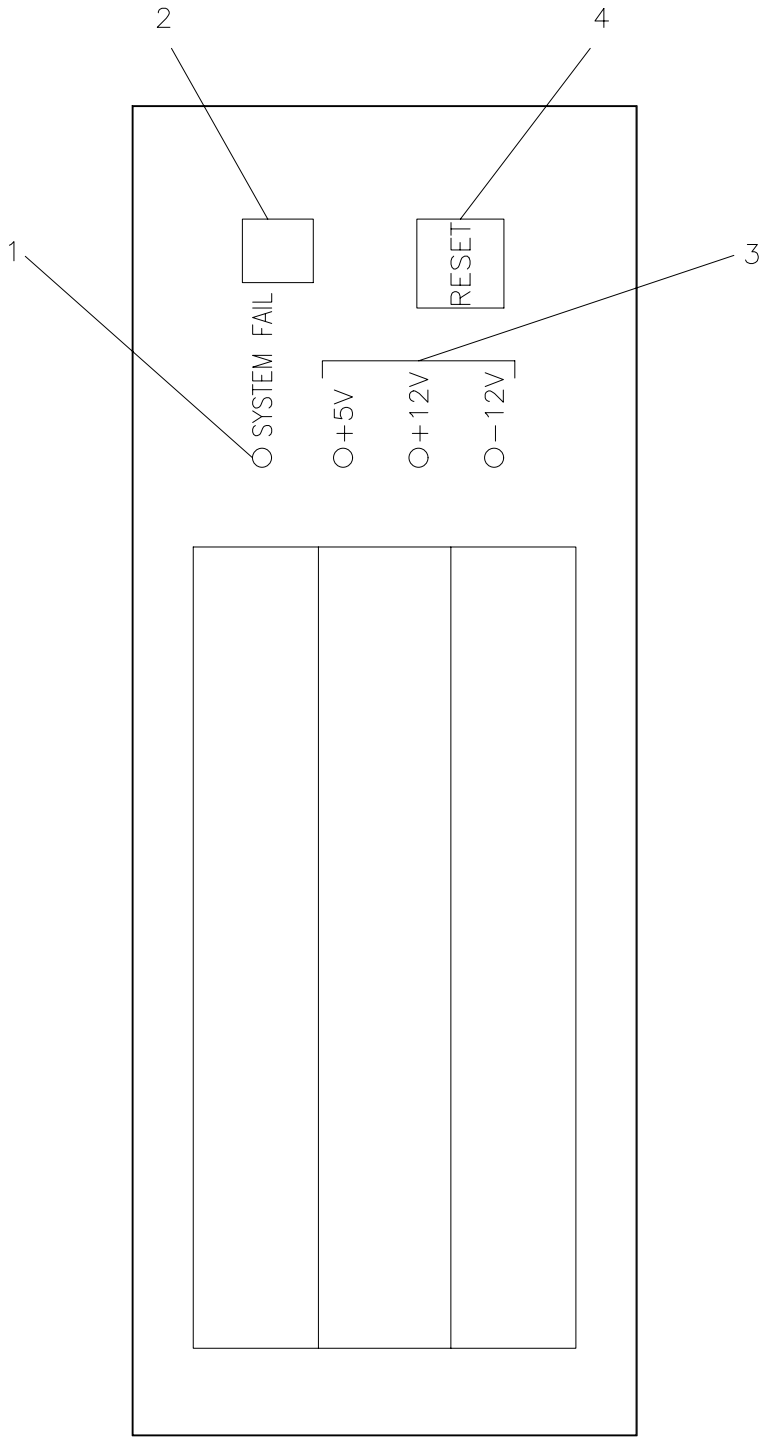


Figure 4–2. RDA VME Chassis UD5A1

Table 4–2. RDA VME Chassis UD5A1 Controls and Indicators

Figure 4–2 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position /State
1.	System Fail Light, red	Light indicates that the system fail signal is activated.	OFF
2.	ON/OFF Switch	Supplies power to the VME Chassis when in the 1 (ON) position. No power when in the 0 (OFF) position.	ON
3.	+5V +12V –12V Lights, green	Light indicates the presence of that voltage	ON ON ON
4.	RESET Button	Resets the VME Chassis causing the boards to reinitiate self–test (depress button and release to reset).	N/A

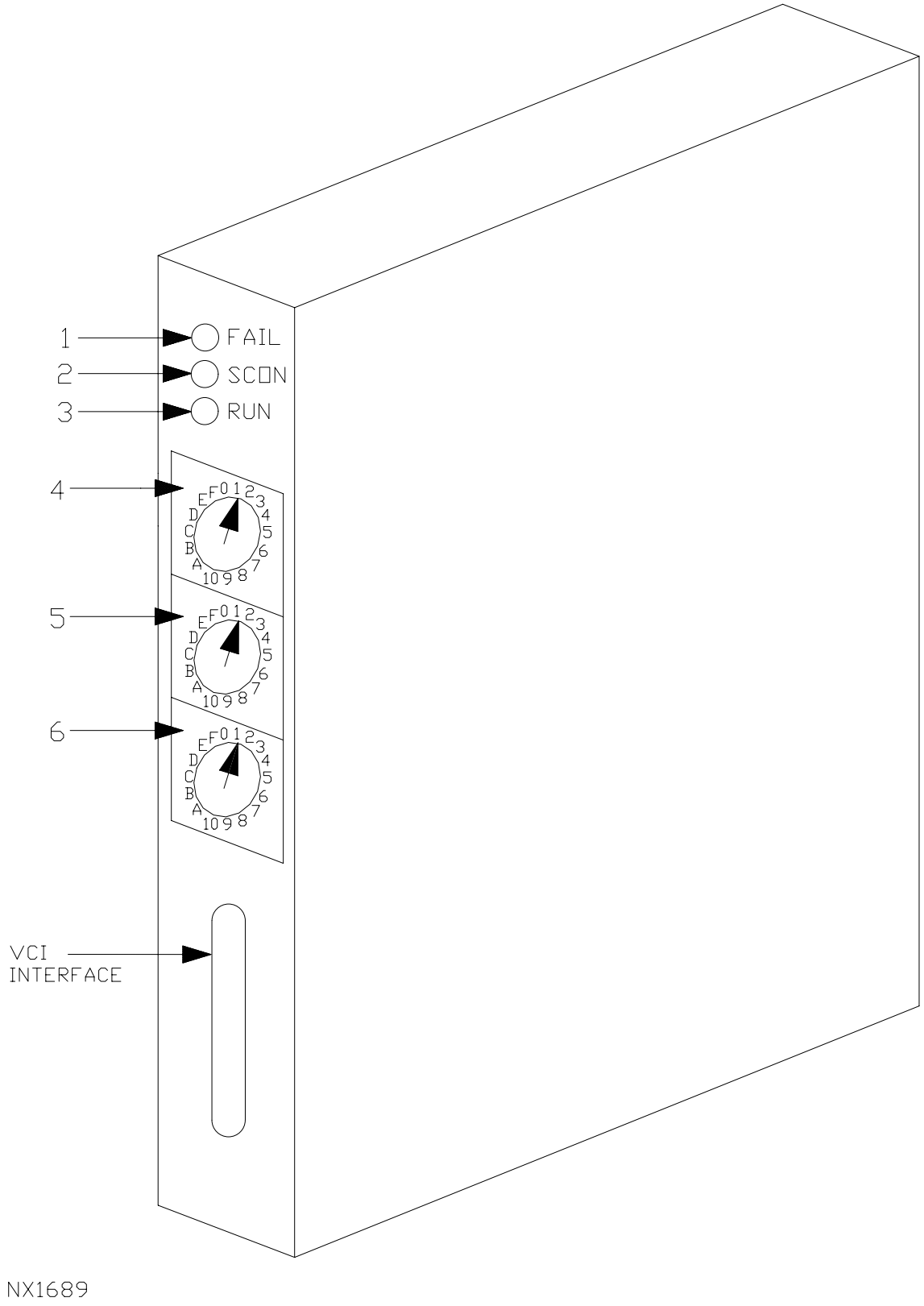


Figure 4–3. RDA VCI–V Board UD5A1A1

Table 4–3. RDA VCI–V Board UD5A1A1 Controls and Indicators

Figure 4–3 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position /State
1.	SYSFAIL Light, red	Light indicates System FAIL signal is activated.	OFF
2.	SCON Light, yellow	Lit when configured as the System Controller.	ON
3.	RUN Light, green	Lit when the RESET is not activated on the VMEbus.	ON
4.	Board ID2 Switch, (SW1)	Top nibble (4 bits) of the VME A32 address (28 – 31)	
5.	Board ID1 Switch, (SW2)	Next nibble (4 bits) of the VME A32 address (24 – 27)	
6.	MEM Size Switch, (SW3)	Memory size of the CARD, where 0 = 1 Mbyte of VME memory used 1 = 2 Mbytes of VME memory used . . . 15 = 16 Mbytes of VME memory used	

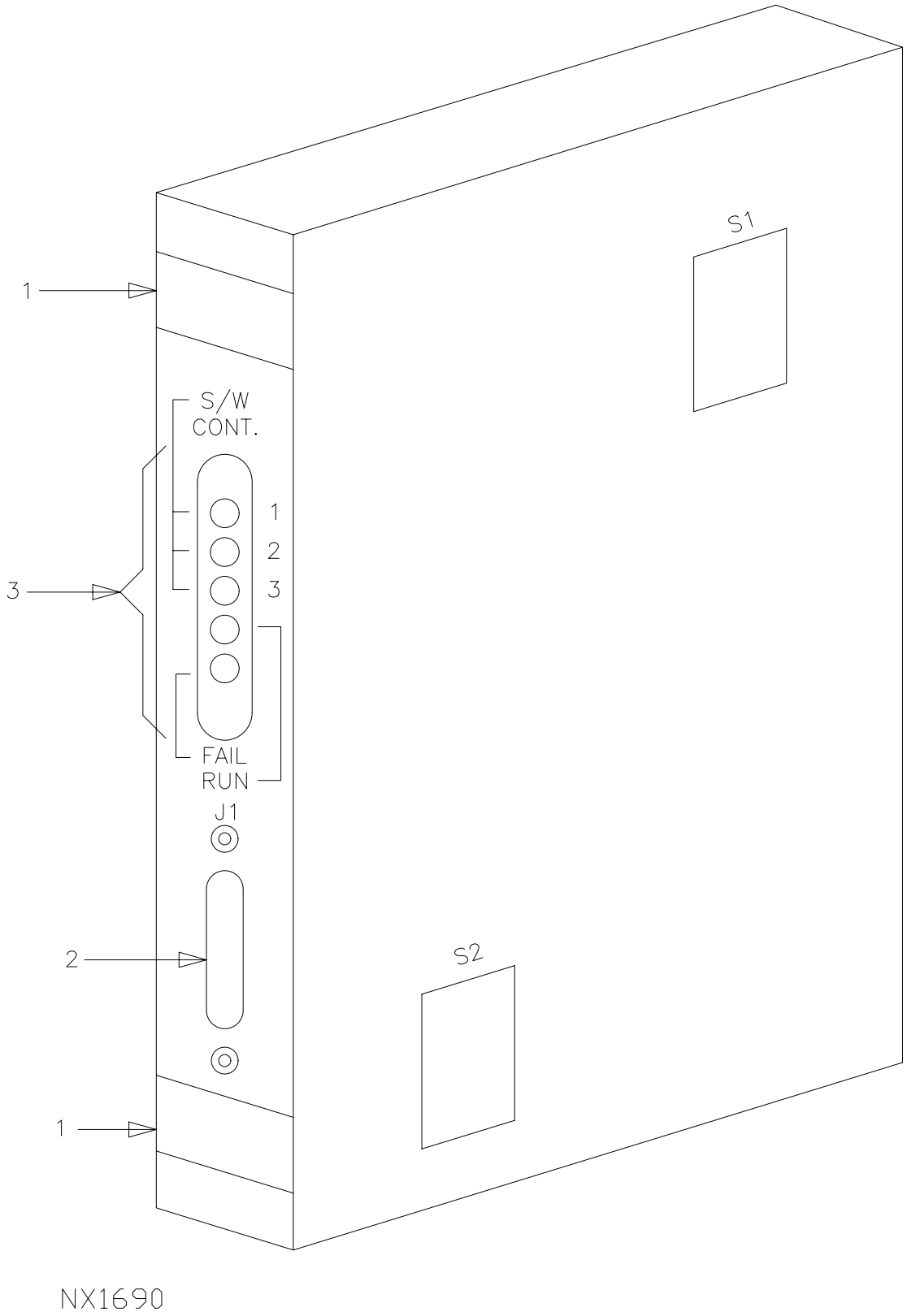


Figure 4–4. RDA VME Wideband Board (Motorola VME381–01) UD5A1A2

Table 4–4. RDA VME Wideband Board (Motorola VME381–01) UD5A1A2, Controls and Indicators

Figure 4–4 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/State
1.	Ejector Handles	Aids in inserting and removing board from slot. Lift upward to eject. Press down to insert.	Down
2.	J1 (I/O Connector)	Optional connector to connect cable to Data Communications Equipment (DCE).	N/A
3.	Status Lights		
	1, 2, 3 Lights, yellow	Software controlled.	OFF
	RUN Light, green	Indicates power supplied to board.	ON
	FAIL Light, red	Indicates board failure.	OFF (lights momentarily during reset)

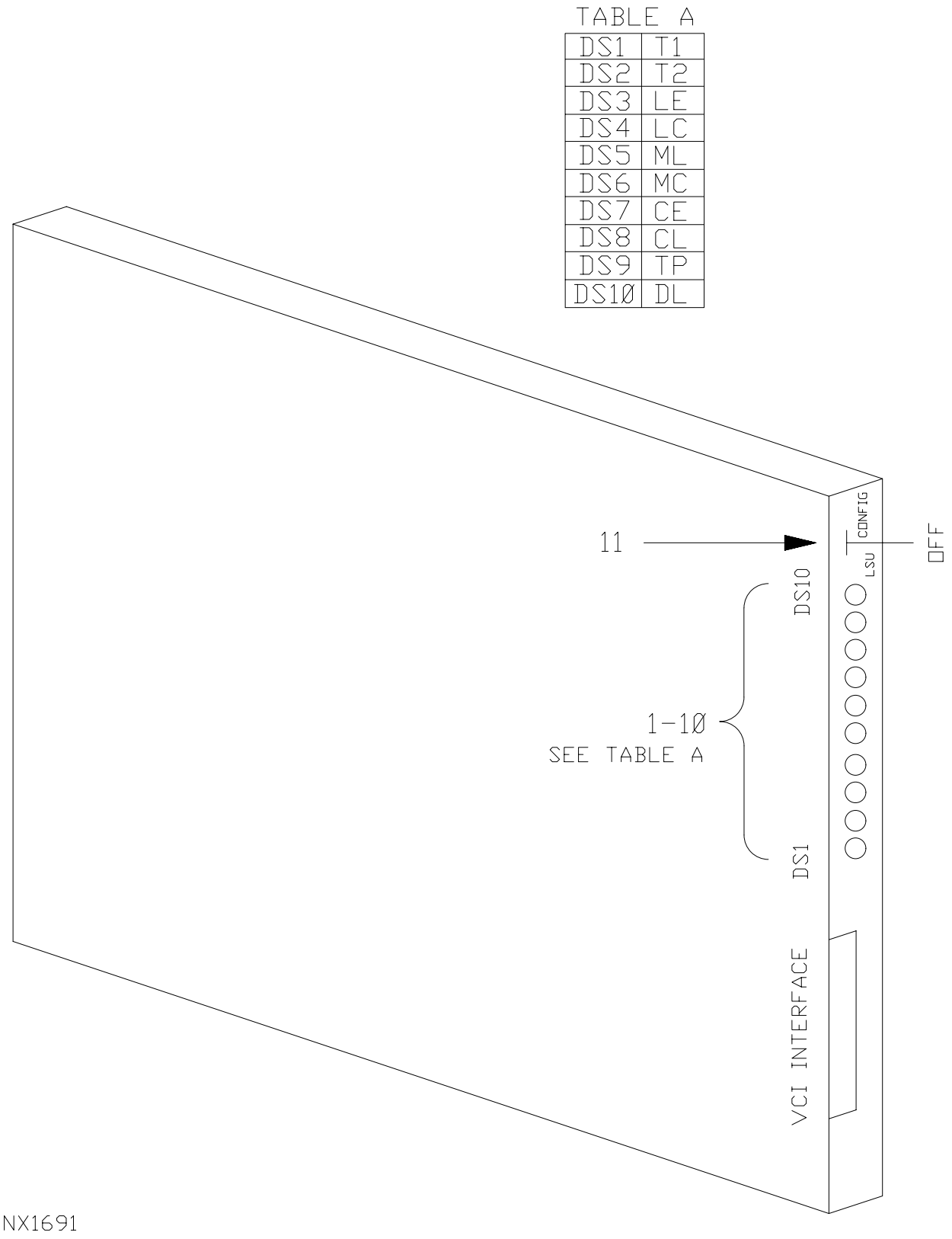


Figure 4–5. RDA VCI–C Board UD5A12A18

Table 4–5. RDA VCI–C Board UD5A12A18 Controls and Indicators

Figure 4–5 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position /State
1.	T1	Power On Test Status LED	ON*
2.	T2	Power On Test Status LED	ON*
3.	LE	Local CPU to EDMA Bus Access LED	
4.	LC	Local CPU to cable SWS Access LED	
5.	ML	Mux Bus to Local CPU Bus Access LED	
6.	MC	Mux Bus to Cable Bus Access LED	
7.	LE	Cable Bus to EDMA Bus Access LED	
8.	CL	Cable Bus to Local CPU Bus Access LED	
9.	TP	Test Point TP1	OFF**
10.	DL	Deadlock of Cable Bus/VIC	
11.	SW3	LSU/OFF/CONFIG Switch	OFF

* T1 OFF during the power up process.
T2 blinks at about 1.5 MHz until the VME is up.
Both LEDs will be on after power–up test is complete.
T2 will blink if VMEbus is in an ACFAIL condition.

** TP LED normally OFF.
ON = TP1 is at 0 Vdc.
OFF = TP1 is at 5 Vdc.

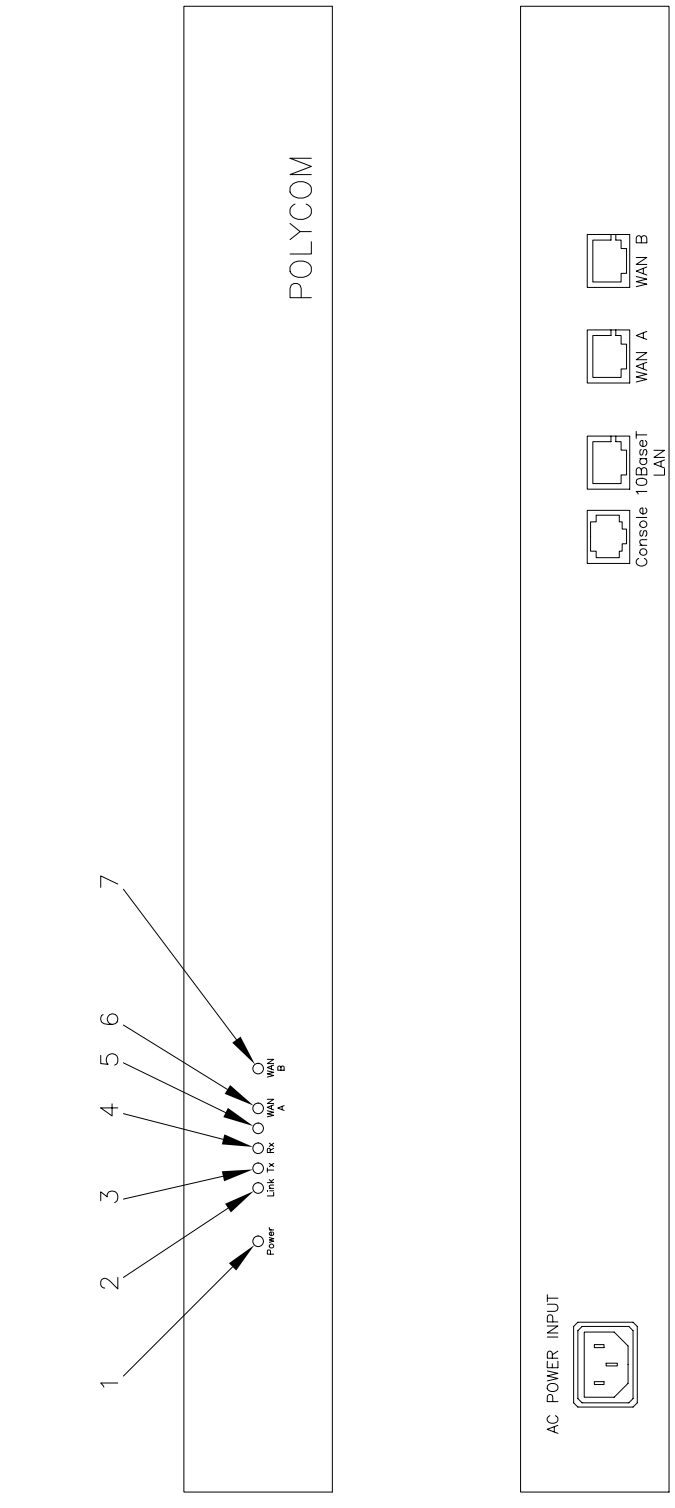


Figure 4–6. RDA/RPG Gateway UD70A12

Table 4–6. RDA/RPG Gateway UD70A12 Controls and Indicators

Figure 4–6 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
1.	Power LED	On when power to the RDA/RPG Gateway is on.	On Green
2.	Link LED	On when the link is enabled.	On Green
3.	Tx LED	On when transmitting data.	Flashing Amber
4.	Rx LED	On when receiving data.	Flashing Amber
5.	LED	Not Used	N/A
6.	WAN A LED	On when the link is valid.	Off
7.	WAN B LED	On when the link is valid.	On Green

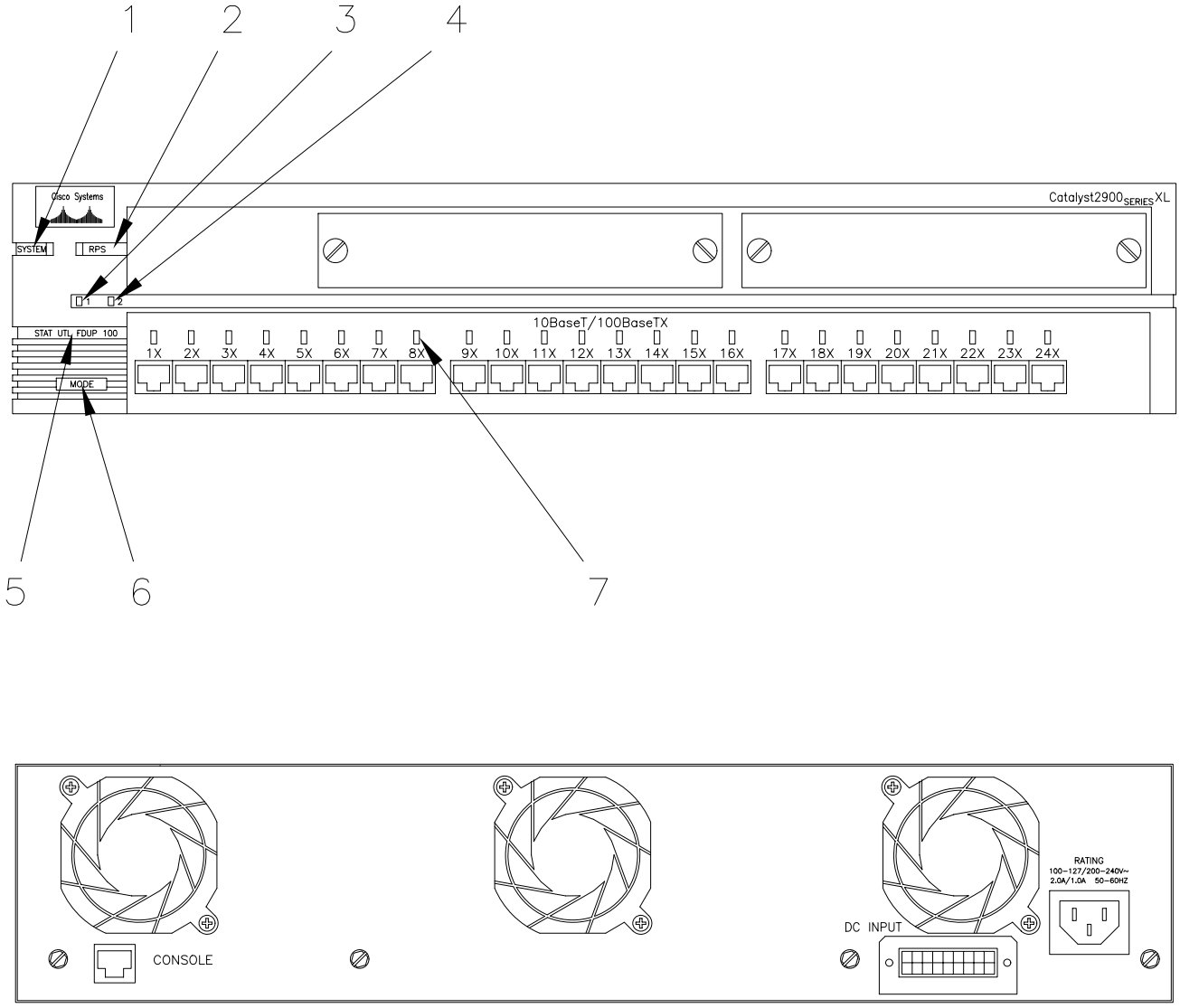


Figure 4–7. RPG LAN Switch UD70A13

Table 4–7. RPG LAN Switch UD70A13
Controls and Indicators

Figure 4–7 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
1.	System LED	Indicates whether the system is receiving power and operating properly. If LED is OFF, then system is not powered up. If LED is ON and green then system is operating normally. If LED is ON and amber then system is receiving power but is not operating properly.	Green
2.	Redundant Power System LED	Not used.	
3.	Expansion Slot Status LED	Not used. No expansion cards are installed.	Off
4.	Expansion Slot Status LED	Not used. No expansion cards are installed.	Off
5.	Port mode LED	Indicates which mode the user has placed the system by using the Mode Button. Four modes are possible: STAT, UTL, FDUP, and 100.	STAT
6.	Mode Button	Changes the port mode. The mode selected is indicated by the Port Mode LED. Each time the mode button is press, the Port Mode LED changes and is lit. Releasing the button enables the lit function. Four modes are possible: STAT, UTL, FDUP, and 100.	N/A
7.	Port Status LEDs (24 in all)	Each individual LED gives the status of the specific port. The following are the possibilities. Off – No Link. Solid green – Link Present. Flashing Green – Activity, port is receiving or transmitting data. Alternating green / amber – Link Fault. Solid Amber – Port is not forwarding. After a port is configured, the port status LED may stay amber up to 30 seconds, before changing to green.	Solid Green Flashing Green or Off

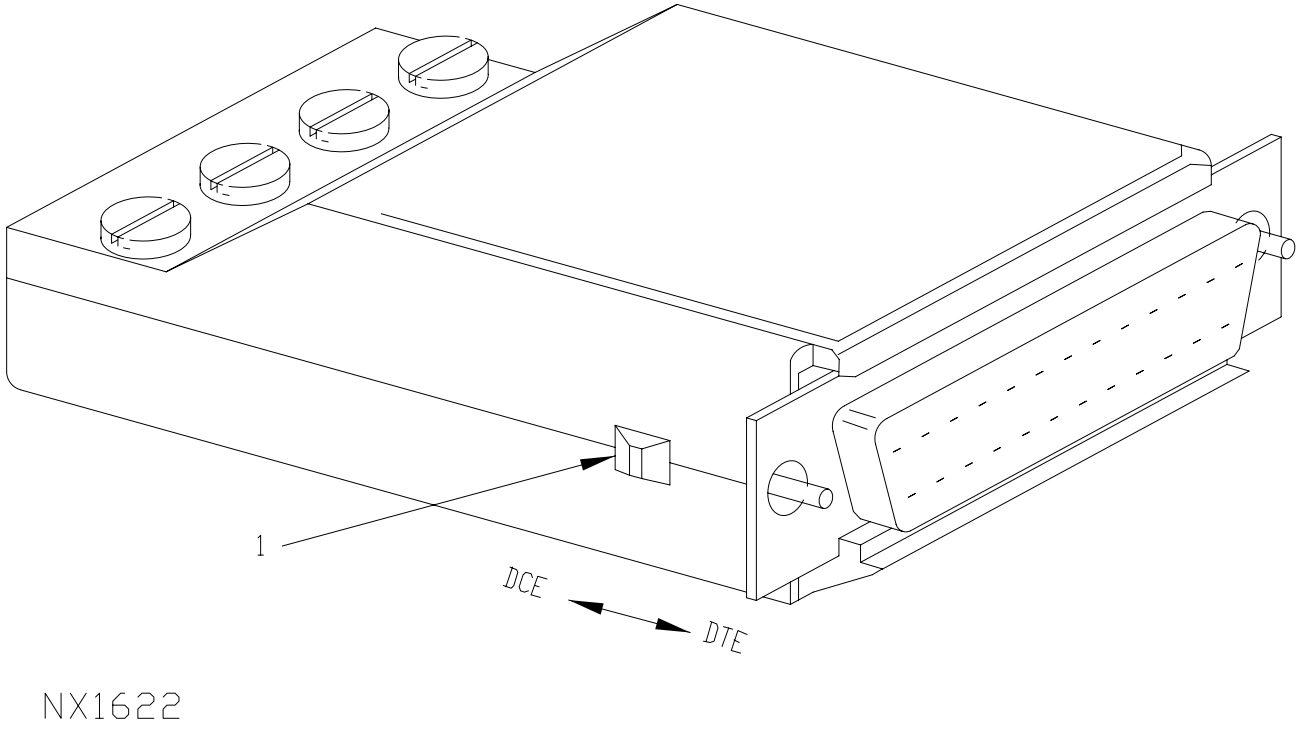


Figure 4–8. RPG Short Haul Modem UD70A19

Table 4–8. RPG Short Haul Modem UD70A19, Controls and Indicators

Figure 4–8 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position /State
1.	DCE/DTE Switch	To be used as DCE or DTE device.	

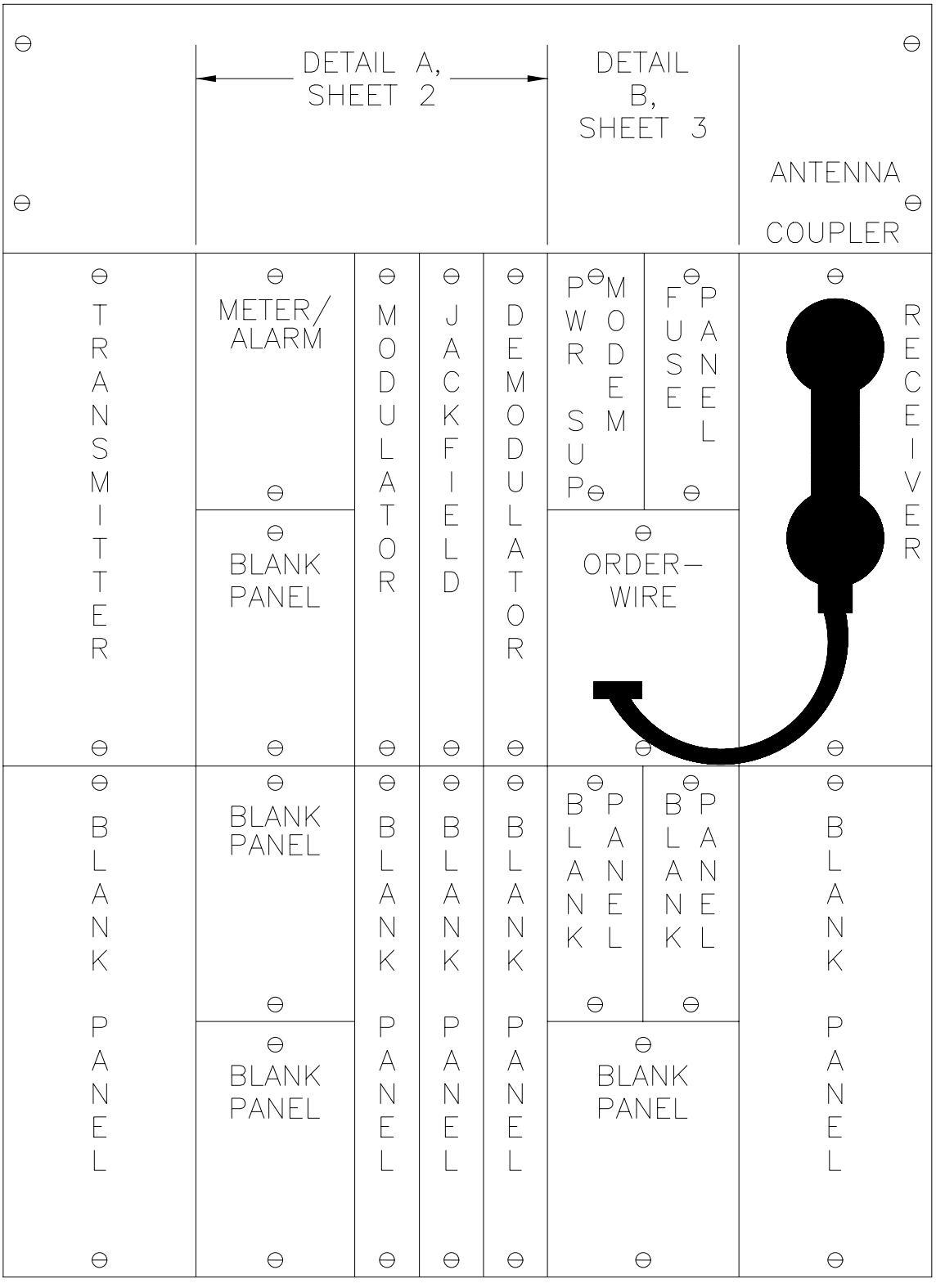


Figure 4–9. MLOS Transceiver (UD19 and UD39) (Sheet 1 of 3)

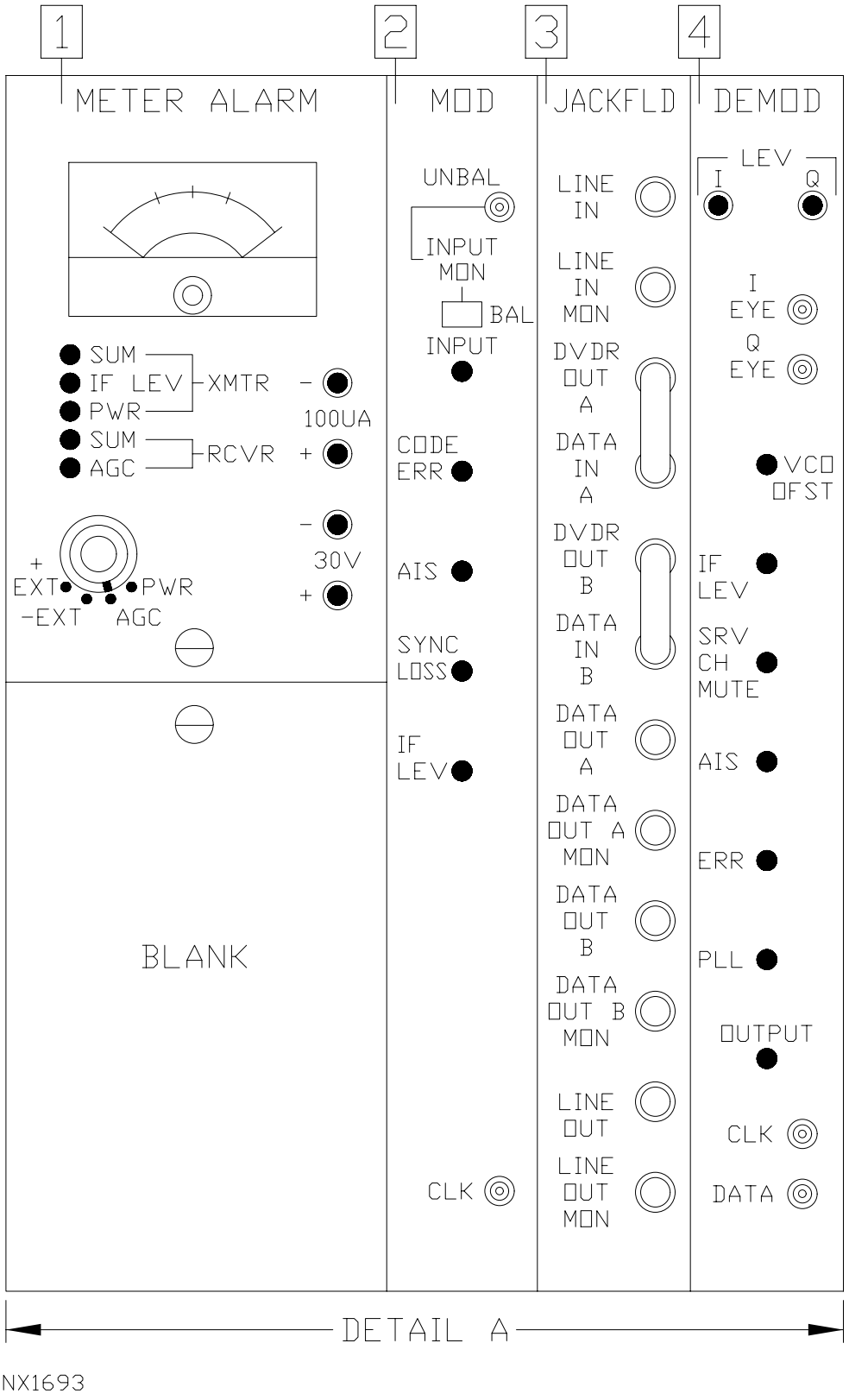


Figure 4–9. MLOS Transceiver (UD19 and UD39) (Sheet 2 of 3)

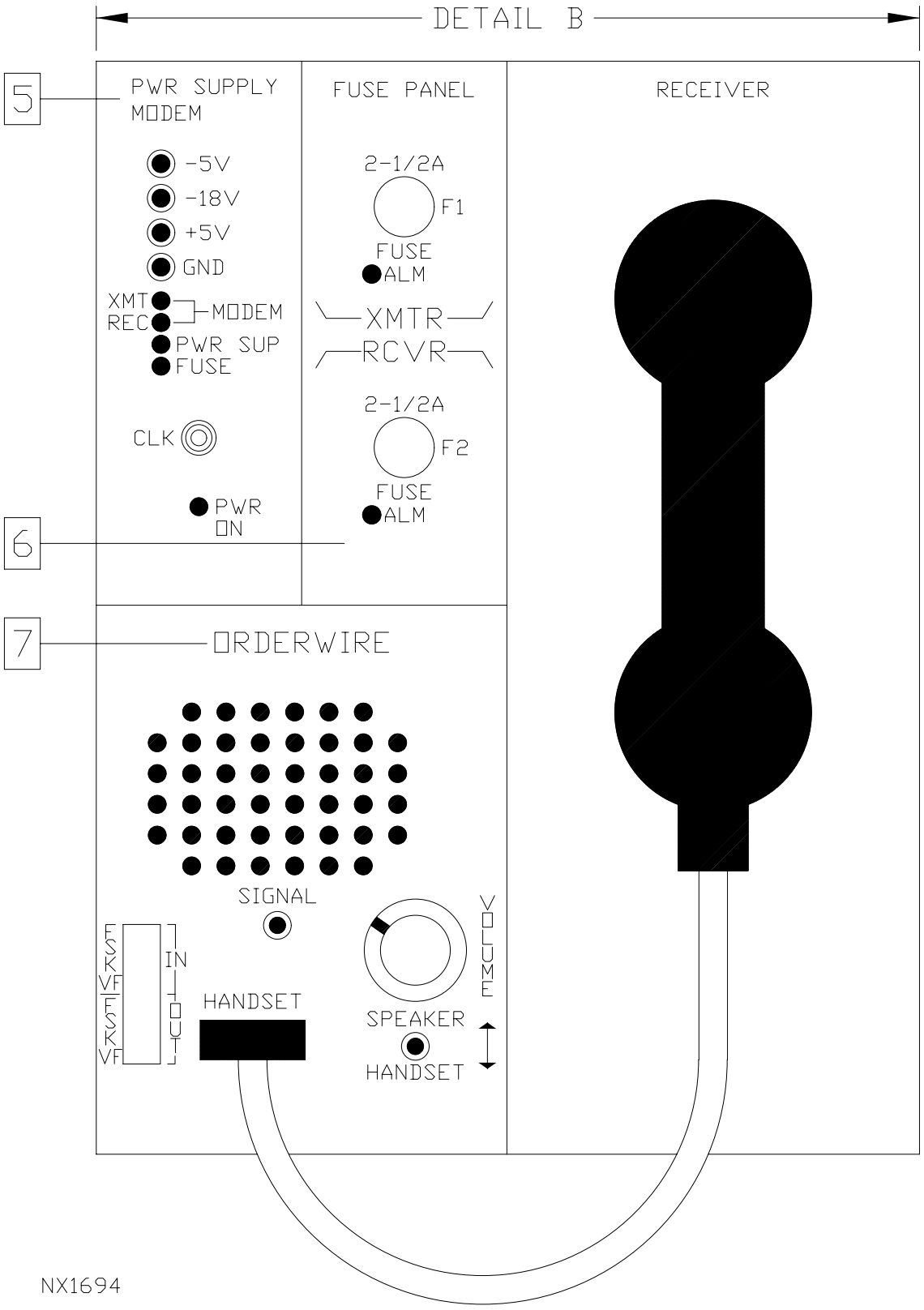


Figure 4–9. MLOS Transceiver (UD19 and UD39) (Sheet 3 of 3)

Table 4–9. MLOS Transceiver (UD19 and UD39) Controls and Indicators

Figure 4–9 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
1.	METER/ALARM (A4)		
	XMTR SUM (indicator, red)	When lit, a summed alarm is present in the modem's transmitter section.	Off
	XMTR IF LEV (indicator, red)	When lit, the level of IF input signal to upconverter has dropped by at least 3 dB.	Off
	XMTR PWR (indicator, red)	When lit, the transmitted RF output power has dropped by at least 3 dB below its nominal value.	Off
	RCVR SUM (indicator, red)	When lit, a summed alarm is present in the modem's receive section.	Off
	RCVR AGC (indicator, red)	When lit, the receive signal level has dropped below the preset threshold determined by the sensitivity of the receiver. This is the level that the BER alarm occurs on the DEMOD.	Off
	Test Meter Selector Switch		
	PWR	Measures transmitter output power.	ON
	AGC	Monitors the linearized AGC voltage that is proportional to the received signal level. Full–scale = 10V.	N/A
	+EXT	Enables the panel meter to measure positive voltages and currents from external sources or identically colored pin jacks at the unit test points.	N/A
	–EXT	Enables the panel meter to measure negative voltages and currents from external sources or identically colored pin jacks at the unit test points.	N/A
	–100 µA (pin jack, green)	Used when measuring current up to 100 µA.	N/A

Table 4–9. MLOS Transceiver (UD19 and UD39) Controls and Indicators – Continued

Figure 4–9 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
	+100 μA (pin jack, brown)	Used when measuring current up to 100 μA.	N/A
1. Cont.	–30 V (pin jack, orange)	Used when measuring voltage up to 30 volts.	N/A
	+30 V (pin jack, red)	Used when measuring voltage up to 30 volts.	N/A
2.	MODULATOR (A5)		
	A1S (indicator, yellow)	When lit, an “All 1’s” signal was received from the preceding source. If it was at the end of the link, it points to the wideband board, CSU, or surge suppressor, if configured.	Off
	INPUT (indicator, red)	When lit, the input data stream is lost or is below low level threshold.	Off
	SYNC LOSS (indicator, red)	When lit, the circuit phase–locked loop is out of lock or the phase difference between the read and write clocks is excessive.	Off
	IF LEV (indicator, red)	When lit, the IF output level has dropped by at least 3 dBm from nominal.	Off
	CODE ERR (indicator, red)	When lit, coding errors are detected.	Off
3.	JACKFIELD (A6)		
	LINE IN (jack)	Line input signal from external equipment. Inserting a plug here interrupts the corresponding signal.	N/A
	LINE IN MON (jack)	Sample of line input signal from external equipment.	N/A
	DVDR OUT (jack)	An attenuated line input signal.	N/A
	DATA IN A (jack)	Goes to DVDR OUT A by U–Link for line input signal to modulator A.	N/A
	DVDR OUT B (jack)	Attenuated line input signal.	N/A

Table 4–9. MLOS Transceiver (UD19 and UD39) Controls and Indicators – Continued

Figure 4–9 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
	DATA IN B (jack)	Goes to DVDR OUT B by U–link for line input signal to modulator B.	N/A
3. Cont.	DATA OUT A (jack)	Line output signal from demodulator A.	N/A
	DATA OUT A MON (jack)	Sample of line output signal from demodulator A.	N/A
	DATA OUT B (jack)	Line output signal from demodulator B.	N/A
	DATA OUT B MON (jack)	Sample of line output signal from demodulator B.	N/A
	LINE OUT (jack)	Line output signal to external equipment. Inserting a plug here interrupts the corresponding signal.	N/A
	LINE OUT MON (jack)	Sample of line output signal to external equipment.	N/A
4.	DEMODULATOR (A7)		
	IF LEV (indicator, yellow)	When lit, the IF input level is too low, and there is no more AGC range for the IF signal.	Off
	SRV CH MUTE (indicator, yellow)	When lit, the service channel is muted due to: a. Modem has a carrier–recovery or clock recovery PLL alarm. b. Receiver has an AGC alarm. c. Both a. and b.	Off
	A1S (indicator, yellow)	When lit, a previous site is sending an “All 1’s or 0’s” signal. May be lit in conjunction with other alarms.	Off
	ERR (indicator, red)	When lit, the error rate exceeds a preset threshold of 1×10^{-6}.	Off/ flickering

Table 4–9. MLOS Transceiver (UD19 and UD39) Controls and Indicators – Continued

Figure 4–9 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
	PLL (indicator, red)	When lit, indicates lock loss in the carrier–recovery or clock–recovery phase–locked loop.	Off
	OUTPUT (indicator, red)	When lit, the output data stream is lost or below the low level threshold.	Off
4. Cont.	LEV I (jack, green)	Voltage level that is proportional to I “eye” pattern.	N/A
	LEV Q (jack, green)	Voltage level that is proportional to Q “eye” pattern.	N/A
	I EYE (BNC jack)	Sample of “eye” pattern for I data stream.	N/A
	Q EYE (BNC jack)	Sample of “eye” pattern for Q data stream.	N/A
	VCO OFST (potentiometer)	Provides fine adjustment for phase differences between recovered and received carrier signals.	N/A
	CLK (BNC jack)	Sample of recovered clock system	N/A
	DATA (BNC jack)	Sample of the binary NRZ output data stream.	N/A
5.	MODEM POWER SUPPLY (A8)		
	PWR ON (indicator, green)	When lit, input voltage is present.	On
	MODEM XMT (indicator, red)	When lit, a summed alarm is present in the modem’s transmitter section.	Off
	MODEM RCV (indicator, red)	When lit, a summed alarm is present in the modem’s receive section	Off
	PWR SUP (indicator, red)	When lit, one of the output voltages is out of tolerance, or the clock oscillator has failed.	Off
	FUSE (indicator, red)	When lit, the input voltage fuse has opened.	Off
	–5 V (jack, orange)	Sample of –5 Vdc output voltage.	N/A
	–18 V (jack, orange)	Sample of –18 Vdc output voltage.	N/A

Table 4–9. MLOS Transceiver (UD19 and UD39) Controls and Indicators – Continued

Figure 4–9 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
	+5 V (jack, red)	Sample of +5 Vdc output voltage.	N/A
	GND (jack, black)	Equipment ground.	N/A
	CLK (BNC jack)	Sample of local, level 1 or level 2 clock frequency.	N/A
6.	FUSE PANEL (A9)		
	RCVR FUSE ALM (indicator, red)	When lit, the receiver input voltage fuse is opened and –24 Vdc is present at the unit input.	Off
	XMTR FUSE ALM (indicator, red)	When lit, the transmitter input voltage fuse is opened and –24 Vdc is present at the unit input.	Off
7.	ORDERWIRE SIGNAL (A11) (momentary pushbutton)	When pressed, alerts other sites that voice communication is required.	N/A
	SPEAKER/HANDSET (switch, toggle)	Selects speaker or handset as communication device.	HANDSET
	VOLUME (potentiometer)	Controls volume level.	N/A
	VF IN (TRS jack)	Line input signal from external equipment.	N/A
	FSK IN (TRS jack)	Sample of line input signal from external equipment.	N/A
	VF OUT (TRS jack)	Line output signal to external equipment.	N/A
	FSK OUT (TRS jack)	Sample of line output signal to external equipment.	N/A

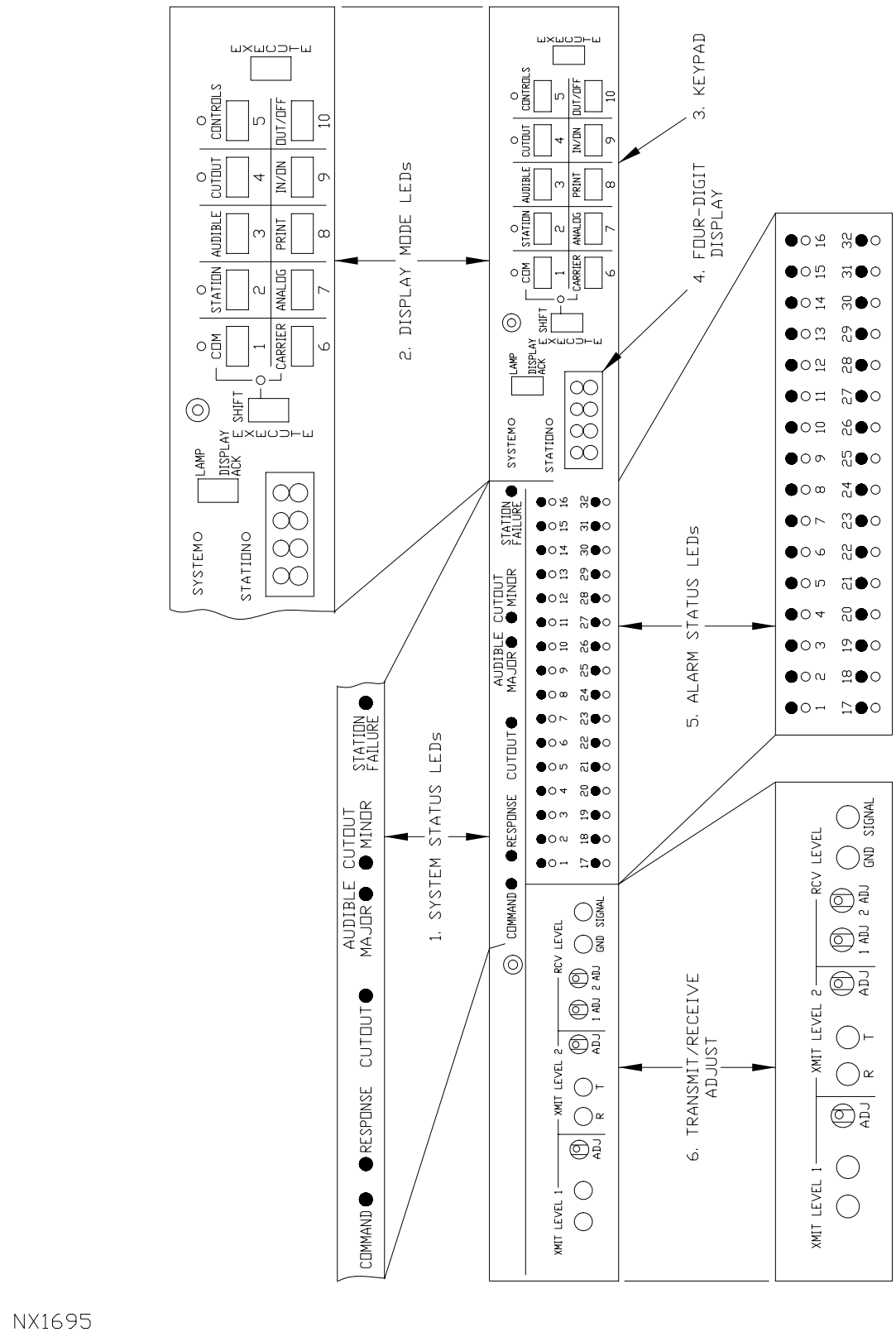


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Figure 4–10. MLOS Minimaster UD39A18 (RPG Only)

Table 4–10. MLOS Minimaster UD39A18 (RPG Only) Controls and Indicators in Normal Supervisory (Default) Mode

Figure 4–10 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
1.	SYSTEM STATUS ALARMS		
	COMMAND (indicator, green)	In Maintenance mode, lights when carrier signal is transmitted to all Remote Terminal Units (RTUs) for 20 seconds.	Off
	RESPONSE (indicator, green)	In Maintenance mode, lights when carrier signal is transmitted by an RTU for 20 seconds.	Off
	CUTOUT (indicator, red)	When lit, a remote site has been disabled from reporting alarms.	Off
	AUDIBLE CUTOUT MAJOR (indicator, red)	When lit, the alarm point audible alarm for major faults cuts off.	Off
	AUDIBLE CUTOUT MINOR (indicator, yellow)	When lit, the alarm point audible alarm for minor faults cuts off.	Off
	STATION FAILURE (indicator, red)	Lights when a RTU fails.	Off
2.	DISPLAY MODE LEDs		
	STATION (indicator, yellow)	Lights when displaying the status of alarm points at a remote station.	Off
	SYSTEM (indicator, green)	Lights to indicate the status of each remote station.	Lit
	COS (indicator, green)	When lit, a remote station has had a change of state.	Lit
	STATUS (indicator, yellow)	In Requested Reports mode, lights for selected reports.	Off
	CUTOUT (indicator, yellow)	Lights if one or all RTU(s) have been cutout from reporting by a Supervisory Modification mode operator operation.	Off
	CONTROLS (indicator, yellow)	Lights when the operator selects Remote Controls mode.	Off

Table 4–10. MLOS Minimaster UD39A18 (RPG Only) Controls and Indicators in Normal Supervisory (Default) Mode – Cont

Figure 4–10 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position/ State
	EXECUTE/SHIFT (indicator, yellow)	Lights in other modes when the EXECUTE/SHIFT pushbutton is pressed by the operator.	Off
3.	KEYPAD	Not used in default mode.	N/A
4.	FOUR DIGIT DISPLAY	Not used in default mode.	Off
5.	ALARM STATUS LEDs		
	1 thru 16 (indicators, red)	When lit, a remote major alarm or failure other than a remote station power loss has occurred. A flashing indicator represents an unacknowledged alarm accompanied by an audible alarm. A steadily lit indicator represents an acknowledged, standing alarm without an audible alarm. Refer to Table 4–12 for specific alarm indications.	Off
	1 thru 16 (indicator, yellow)	Same as for red indicators above except indications are for minor alarms or failures all others off.	Chan 16 flashing at 30 cps;
6.	TRANSMIT/RECEIVE ADJUST	Not used.	N/A

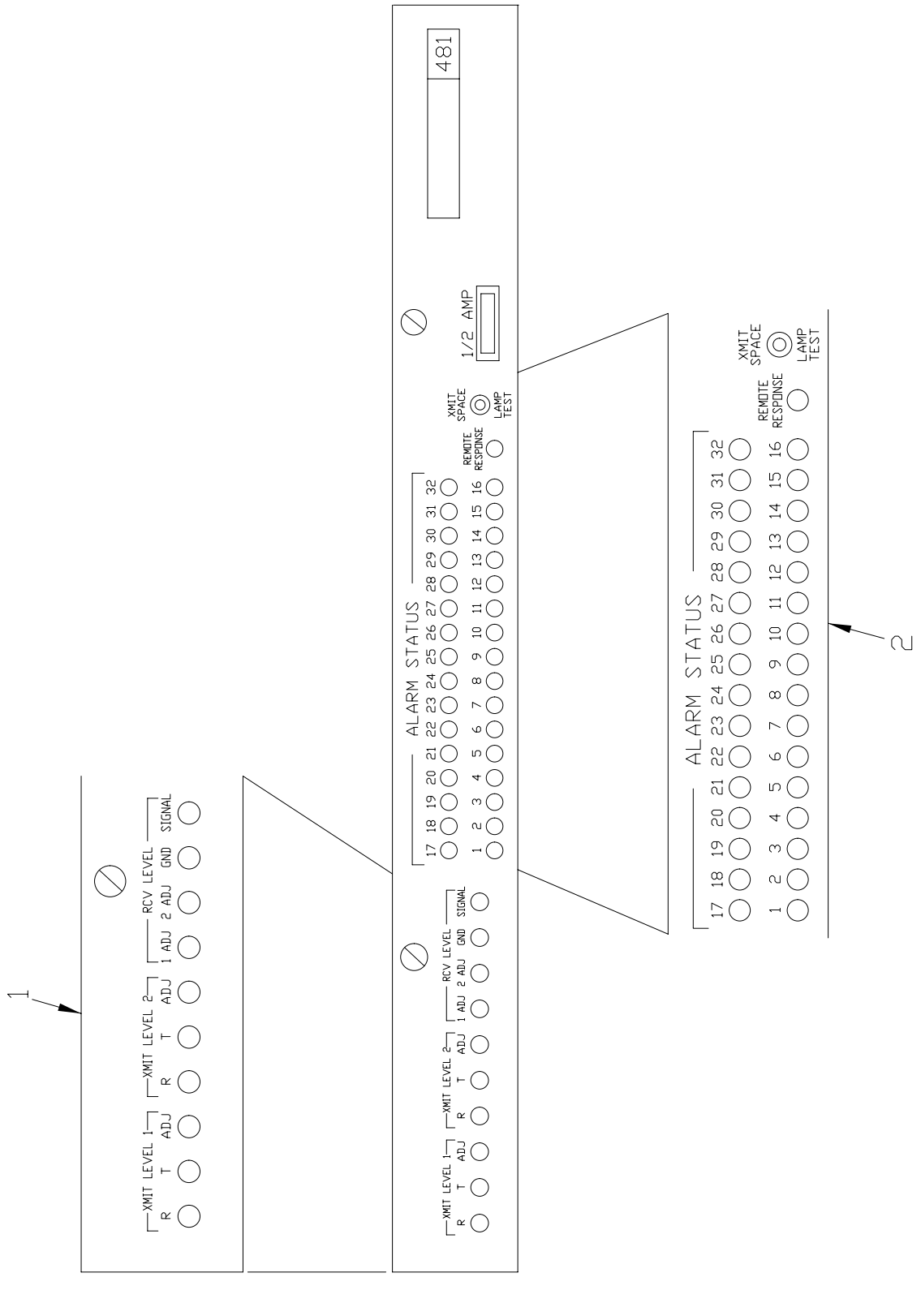


Figure 4–11. MLOS Remote Station FAS (UD19A19 and UD39A19)

Table 4–11. MLOS Remote Station FAS (UD19A19 and UD39A19) Controls and Indicators

Figure 4–11 Index Number	Control/Indicator Nomenclature (Type)	Function	Normal Position /State
1.	XMIT LEVEL 1		
	R (jack)	Connects to ac meter to adjust transmit levels.	N/A
	T (jack)	Connects to ac meter to adjust transmit levels.	N/A
	ADJ (potentiometer)	Adjusts transmit levels.	N/A
	XMIT LEVEL 2		
	R (jack)	Connects to ac meter to adjust transmit levels.	N/A
	T (jack)	Connects to ac meter to adjust transmit levels.	N/A
	ADJ (potentiometer)	Adjusts transmit levels.	N/A
	RCV LEVEL		
	1 ADJ (potentiometer)	Adjusts receiver levels	N/A
	2 ADJ (potentiometer)	Adjusts receiver levels	N/A
	GND (jack)	Connects to ac meter to adjust receiver levels.	N/A
	SIGNAL (jack)	Connects to ac meter to adjust receiver levels.	N/A
2.	ALARM STATUS		
	1 thru 15 (indicators)	When lit, one of the alarm relays has closed. See Table 4–12 for specific alarm indications.	Off
	16 (indicator)	Connects to 30 second alternating alarm to exercise system.	Flashing at 30 sec rate
	17 thru 32 (indicators)	Not used.	Off
	REMOTE RESPONSE (indicator)	Flashes each time remote station responds with message to master station.	Flashing
	XMT SPACE/LAMP TEST (switch)	XMT SPACE position, forces all spaces to transmit. LAMP TEST, lights all indicators.	N/A

Table 4–12. MLOS Remote Station FAS Alarms

MLOS Station Configuration	CHAN 1	CHAN 2	CHAN 3	CHAN 4	CHAN 5	CHAN 6	CHAN 7–16
RPG D1 NON DIVERSITY	XMTR Summed Alarm	RCVR Summed Alarm	MOD All 1's Alarm	DEMOD All 1's Alarm	Spare	Spare	See Notes 1 and 2
RDA D2 NON DIVERSITY	XMTR Summed Alarm	RCVR Summed Alarm	MOD All 1's Alarm	DEMOD All 1's Alarm	Spare	Spare	See Notes 1 and 2

Note 1: Channel 16 on the Remote FAS causes MINIMASTER Channel 1 YELLOW to flash at an interval of 30 seconds.

Note 2: Channels 7–15 major alarms are configured as follows:
Channel 7 Unauthorized Entry
Channel 8 Utility Power
Channel 9 Generator Power
Channel 10 Converter Output Voltage
Channel 11 Battery Voltage
Channel 12 Transfer Switch in Utility position
Channel 13 Fuel Level Low
Channel 14 Transfer Switch not in Automatic position
Channel 15 Aircraft Warning Light Failure

Section 4–3. RDA WBC Startup and Shutdown Procedures

4–3.1 INTRODUCTION

This section contains the RDA WBC Group preoperational setup/startup procedures and the RDA WBC Group shutdown procedure. These procedures are for use only when the RDA WBC Group is to be shutdown for an extended period of time (more than 24 hours) or to restore the RDA WBC Group to an operational state following an extended shutdown period. Refer to Section 6–1 for detailed power down and power up procedures associated with specific types of maintenance actions such as Line Replaceable Unit (LRU) replacement, alignment, or periodic maintenance.

4–3.2 STARTUP AND SHUTDOWN PROCEDURES

WARNING

Lethal voltages from commercial power and low–voltage high current power sources exist in the WBC Group cabinets. Observe appropriate safety precautions at all times to ensure personnel safety. The safety summary at the beginning of this document should be reviewed before attempting maintenance.

To restore the RDA WBC MLOS equipment to a fully operational state following an extended complete shutdown, perform the procedure in Table 4–13 for the preoperational setup/startup. To do a complete shutdown of the RDA WBC MLOS equipment, perform the steps in Table 4–13 in reverse order.

To restore the WBC Private T1 equipment to a fully operational state following an extended complete shutdown, perform the procedure in Table 4–14 for the preoperational setup/startup. To do a complete shutdown of the WBC Private T1 equipment, perform the steps in Table 4–14 in reverse order.

To restore the WBC Telco T1 equipment to a fully operational state following an extended complete shutdown, perform the procedure in Table 4–15 for the preoperational setup/startup. To do a complete shutdown of the WBC Telco T1 equipment, perform the steps in Table 4–15 in reverse order.

Table 4–13 may or may not reflect the exact configuration of every RDA WBC MLOS Group cabinet assembly, but contains all of the equipment setup procedures necessary to setup any cabinet.

4–3.3 SPECIAL WBC STARTUP NOTES

The wideband communication link will present data link fault indications during power–on until the communications equipment at both ends of the link are operational and under applications software control. If faults persist or communications cannot be established after power–on is complete, refer to RDA Maintenance Manual, NWS EHB 6–510, Chapter 6 for entry into the fault isolation procedures.

Table 4–13. RDA MLOS Shelter Equipment Startup and Shutdown Procedure

Step	Equipment/Location	Action/Procedure	Indication/Response
1.	RDA Equipment Shelter Power Distribution Panel	Set CB24 and CB26 to ON.	
2.	RDA MLOS Shelter Power Distribution Panel	a. Set Main Disconnect circuit breakers CB1 and CB3 to ON.	
		b. Set Receptacle circuit breaker CB5 to ON.	
		c. Set Vent System circuit breaker CB7 to ON.	
		d. Set Lighting and Smoke Alarm circuit breaker CB9 to ON.	
		e. Set MLOS Transceiver Cabinet circuit breaker CB2 to ON.	
		f. Set Aircraft Warning Light circuit breaker CB4 to ON (if equipped).	
		g. Set Heater circuit breakers CB6 and CB8 to ON. (At discretion of operator.)	
		h. Set vent thermostat to 95°F.	
		i. Set heat thermostat to 30°F.	
		j. Set heater controls to heat.	
		k. Turn on INT LTS (internal lights) as required.	
		l. Turn off EXT LTS (external lights) as required.	
3.	MLOS Transceiver(s)	a. Observe POWER ON indicator.	POWER ON indicator lit.
		b. Check for the following jumpers on the jackfield UD19A6: DVDR OUT A to DATA IN A DVDR OUT B to DATA IN B	

Table 4–13. RDA MLOS Shelter Equipment Startup and Shutdown Procedure – Cont.

Step	Equipment/Location	Action/Procedure	Indication/Response
4.	Remote Station (FAS)	a. Observe ALARM STATUS indicators.	CH 16 cycles on and off every 30 seconds; all others either off or lit.
		b. Observe REMOTE RESPONSE indicator.	REMOTE RESPONSE may flicker on and off.

Table 4–14. RDA Private T1 Equipment Startup and Shutdown Procedure

Step	Equipment/Location	Action/Procedure	Indication/Response
1.	RDA Equipment Shelter Power Distribution Panel	Set CB24 to ON.	
2.	Channel Service Unit	Set dip switch SW1 as follows: SW1–1 1 SW1–2 0 SW1–3 0 SW1–4 0 SW1–5 1 SW1–6 1 SW1–7 1 Set the NTWK TEST/NORMAL/LOCAL LOOP Switch to NORMAL.	
3.	Channel Service Unit	Set the LBO Switch to: dB Link Distance 15 Less than 500 feet 7.5 500 – 1750 feet 0 Greater than 1750 feet	
4.	Channel Service Unit	Plug the power supply adapter into the power distribution panel.	Power LED lit. Density LED lit if no data is being transmitted.

Table 4–15. RDA Telco T1 Equipment Startup and Shutdown Procedure

Step	Equipment/Location	Action/Procedure	Indication/Response
1.	RDA Equipment Shelter Power Distribution Panel	Set CB24 to ON.	
2.	Channel Service Unit	Set dip switch SW1 as follows: SW1–1 1 SW1–2 0 SW1–3 0 SW1–4 0 SW1–5 1 SW1–6 1 SW1–7 1 Set the NTWK TEST/NORMAL/LOCAL LOOP Switch to NORMAL.	
3.	Channel Service Unit	Set the LBO Switch in accordance with site instructions. Otherwise, set it to 7.5 dB.	
4.	Channel Service Unit	Plug the power supply adapter into the power distribution panel.	Power LED lit. Density LED lit if no data is being transmitted.

Section 4–4. RPG WBC Startup and Shutdown Procedures

4–4.1 INTRODUCTION

This section contains the RPG WBC Group preoperational setup and startup procedures as well as the RPG shutdown procedure. These procedures are to be used only when the entire WBC Group is to be shutdown for an extended period of time (over 24 hours) or to restore the RPG WBC Group to an operational state following an extended shutdown period. Refer to Section 6 for detailed power down and power up procedures associated with specific types of maintenance actions such as LRU replacement, alignment, or periodic maintenance.

4–4.2 STARTUP AND SHUTDOWN PROCEDURES

WARNING

Lethal voltages from commercial power and low–voltage high current power sources exist in the WBC Group cabinets. Observe appropriate safety precautions at all times to ensure personnel safety. The safety summary at the beginning of this document should be reviewed before attempting maintenance.

To restore the RPG WBC MLOS equipment to a fully operational state following an extended complete shutdown, perform the procedure in Table 4–16 for the preoperational setup/startup. To do a complete shutdown of the RPG WBC MLOS equipment, perform the steps in Table 4–16 in reverse order.

To restore the WBC Private T1 equipment to a fully operational state following an extended complete shutdown, perform the procedure in Table 4–14 for the preoperational setup/startup. To do a complete shutdown of the WBC Private T1 equipment, perform the steps in Table 4–14 in reverse order.

To restore the WBC Telco T1 equipment to a fully operational state following an extended complete shutdown, perform the procedure in Table 4–15 for the preoperational setup/startup. To do a complete shutdown of the WBC Telco T1 equipment, perform the steps in Table 4–15 in reverse order.

Table 4–16 may or may not reflect the exact configuration of every RPG WBC MLOS Group cabinet assembly, but contains all of the equipment setup procedures necessary to setup any cabinet.

4–4.3 SPECIAL WBC STARTUP NOTES

The WBC link will present fault indications during startup until the communications equipment at both ends of the link is operational and under applications software control. If faults continue or communications cannot be established after the startup procedure is complete, refer to the RPG Maintenance Manual, NWS EHB 6–525, Chapter 6 for fault isolation procedures.

Table 4–16. RPG MLOS Shelter Equipment Startup and Shutdown Procedure

Step	Equipment/Location	Action/Procedure	Indication/Response
1.	RPG Equipment Shelter Power Distribution Panel	Set circuit breakers 25/27/29 to ON.	
2.	RPG MLOS Shelter Power Distribution Panel	a. Set Main Disconnect circuit breakers CB1 and CB3 to ON.	
		b. Set Receptacle circuit breaker CB5 to ON.	
		c. Set Vent System circuit breaker CB7 to ON.	
		d. Set Lighting and Smoke Alarm circuit breaker CB9 to ON.	
		e. Set MLOS Transceiver circuit breaker CB2 to ON.	
		f. Set Aircraft Warning Light circuit breaker CB4 to ON (if equipped).	
		g. Set Heater circuit breakers CB6 and CB8 to ON.	
		h. Set vent thermostat to 95°F.	
		i. Set heat thermostat to 30°F.	
		j. Set heater controls to heat.	
		k. Turn on INT LTS (internal lights) as required.	
		l. Turn off EXT LTS (external lights) as required.	
3.	MLOS Transceiver, FAS ON/OFF Switch (rear center panel)	Loosen the lock nut, set the switch to the ON position, and then tighten the lock nut.	
	MLOS Transceiver	a. Observe POWER ON indicator (on power supply modem).	POWER ON indicator lit.
3.		b. Check for the following jumpers on the jackfield UD39A6: DVDR OUT A to DATA IN A DVDR OUT B to DATA IN B	

Table 4–16. RPG MLOS Shelter Equipment Startup and Shutdown Procedure – Cont.

Step	Equipment/Location	Action/Procedure	Indication/Response
4.	Remote Station FAS	a. Observe ALARM STATUS indicators.	CH 16 cycles on and off every 30 seconds; all others will be off for no major alarm conditions.
		b. Observe REMOTE RESPONSE indicator.	Flashes each 10 seconds. The P16 Status Alarms is on for 30 seconds, then off for 30 seconds. This is the FAS self–test.
5.	Minimaster Station	a. Press **DSPLY ACK** until the COS LED lights. This sets up any change of state to cause an alarm to be transmitted.	
		b. Press **STATUS 2**, **SHIFT** and **AUDIBLE 3** simultaneously. This silences minor alarms and enables audible alarm for others. To silence both the major and minor alarms, press **OUT/OFF O SHIFT** and **AUDIBLE 3**.	
		c. Observe the following command lights every 30 seconds to indicate that the remote units are being polled by the minimaster. If all units are responding, then each command will be followed by an immediate response.	
6.	Minimaster (RPG only)	Silence the Minimaster audible alarm by performing the following steps: a. Press **DISPLAY ACK** until the mode becomes SYSTEM COS. b. Press **2**, **SHIFT**, and **AUDIBLE**.	Beeps shortly after the CB is set to ON; COS and SYSTEM indicators are lit. MINOR ALARM one flashing (yellow) every 30 seconds.

Section 4–5. Off–Line Diagnostic Tests

NOT APPLICABLE

Section 4–6. Emergency/Recovery Procedures

NOTES

The acronym “RPG” is still applicable to the Open Systems Radar Product Generation function.

The section in this chapter refer to the RPGPCA as UD70, previously referred to as the RPG Processor Cabinet (UD21) and RPG Communications Cabinet (UD22). Unless otherwise specified, for FAA redundant systems, this information also applies to RPGPCA UD170.

4–6.1 INTRODUCTION

If an operating system or other error condition is reported or exists in the RPG, perform the following emergency/recovery procedures contained in this section:

- Component Software Reinitialization (Reboot) Procedures
- Component Power Off/On Reset Procedures
- Wideband Communications Recovery Procedures

4–6.2 COMPONENT SOFTWARE REINITIALIZATION (REBOOT) PROCEDURES

This section contains the software reinitialization (reboot) procedures for the Cisco 2916 LAN Switch. This procedure should always be performed prior to attempting any procedures in section 4–6.3. However, do not perform this procedure unless software corruption has occurred within the component and it has become unusable or its operation appears to be deteriorating.

The telnet command is used in conjunction with an address or name (as linked to an address in the /etc/hosts file) to establish a TCP/IP communication path to the component. At that point, the user can login to the component and perform whatever actions are necessary (in this case, a “reload”). The telnet session can be initiated from the boot console, the MSCF, or the BDDS if installed. If the telnet session can not establish a TCP/IP communication path to the component, then proceed to paragraph 4–6.3.

NOTE

An example is included in the following procedure. Command entries are displayed in **bold**, responses from the system are displayed in non–bold, and comments to the procedure are displayed in (parenthesis).

4–6.2.1 RPG LAN Switch Reinitialization. Perform the following example procedure at the MSCF workstation, starting with the telnet command to hostname “lan” which has an IP address of 192.168.100.20.

telnet *lan*<CR> (“lan” for single channel systems; “lan1” or “lan2” for FAA Redundant channels.)

Trying 192.168.100.20...
Connected to lan.
Escape character is ’^]’.
login

** WARNING ** WARNING ** WARNING **
This is a U.S. Government computer system. This computer system, including all related equipment, networks, network devices, and Internet access, is provided only for authorized U.S. Government use. U.S. Government computer systems may be monitored for all lawful purposes, ensuring that its use is authorized, for management of the system, to facilitate protection against unauthorized access, and to verify security procedures, survivability, and to test or verify the security of this system. During monitoring, information may be examined, recorded, copied, and used for authorized purposes. All information, including personal information, placed on or sent over this system may be monitored. Unauthorized use may subject you to criminal prosecution. Evidence of unauthorized use collected during monitoring may be used for administrative, criminal, or other adverse action. Use of this system constitutes consent to monitoring for these purposes.

User Access Verification

Password: ***password*<CR>** (Site–specific *password*, default is “cisco”.)
lan>enable
Password: ***enable_password*<CR>** (Site–specific *enable_password*, default is “cisco”.)
lan# **reload<CR>** (LAN switch reloads and telnet session is terminated.)

NOTE

User–generated passwords are required to have the following characteristics:

- Be at least eight characters in length.
- Passwords must contain at least one of each of the following: uppercase, lowercase, number, and special character.
- Six characters of a password may only occur once.
- No null or blank characters may be used
- No consecutive numbers or letters
- Users should not use a password that is the same as the USERID or user’s name
- Must not be related to any easily identifiable personal information (such as birthdays, names, etc.) or words that appear in the dictionary, project names, or other acronyms.

- May not be a password that was used within the previous nine password changes.
- Differ from the old password by at least three characters.

4–6.3 COMPONENT POWER OFF/ON RESET PROCEDURES

This section contains the power off/on reset procedures for RPG components. The reboot procedures in section 4–6.2 should always be performed prior to attempting any procedures in this section. As with section 4–6.2, these procedures should only be performed when software corruption has occurred and it has become unusable or its operations appears to be deteriorating.

Control of the MasterSwitch can be accomplished in two ways. Paragraph 4–6.3.1 discusses an example procedure by using a text–based telnet session. Paragraph 4–6.3.2 discusses an example procedure using a graphics–based web browser. In either case, the power outlets controlled by the MasterSwitch will always be specified in the same order and will have the same short name as follows (long name shown in parenthesis):

1. RPG (Sun Ultra 10 RPG Processor)
2. LAN (Cisco 2916 LAN Switch)
3. Router (Cisco 3640 Router)
4. Comm Server A (PTI MPS 800 Communications Server)
5. RDA/RPG Gateway (Polycom Protocol Translator)
6. BDDS (Sun Ultra 5 Base Data Distribution Server) NWS and DoD only
7. Comm Server B (PTI MPS 800 Communications Server)
8. Comm Server C (PTI MPS 800 Communications Server)

4–6.3.1 MasterSwitch Power Control Using telnet. The MasterSwitch can be controlled using a telnet text–based session. The telnet command is used in conjunction with an address or a name (linked to an address in the /etc/hosts file) to establish a TCP/IP path to the component. At that point, the user can login to the MasterSwitch and perform whatever actions are necessary (in this case, a power off/on reset). The telnet session can be initiated from the boot console, the MSCF, or the BDDS if installed. Since the procedure would be identical for all six outlets listed above (except for selection of the outlet number), this procedure is only for outlet 3, the router. The MasterSwitch shown in this example has a name of “pwradm1” and an address of 192.168.1Ø8.131.

NOTE

An example is included in this procedure. Command entries are in **bold**, responses in non–bold, and comments in (parenthesis).

Example:

telnet pwradm1<CR> (“pwradm” for single channel systems; “pwradm1” or “pwradm2” for

FAA Redundant channels.)
Trying 192.168.1Ø8.131...
Connected to pwradm1.
Escape character is '^]'.

User Name: **pwradm1<CR>**
Password: ***password*<CR>** (Site–specific *password*, default is "apc".)

American Power Conversion Ethernet MasterSwitch v1.1.1
www.apcc.com (c) Copyright 1997 All Rights Reserved
––

Name : Unknown Contact: Unknown
Location : Unknown

MasterSwitch Up Time : 9 Days 19 Hours 27 Minutes 47 Seconds

––––––––––––––––––––––– Current MasterSwitch Status ––––––––––––––––––––––––––––––

RPG: ON	LAN: ON	Router: ON	Comm Server A: ON
RDA/RPG Gateway: ON	BDDS: ON	Comm Server B: ON	Comm Server C: ON

––––––– Control Console ––

1 – Outlet Manager
2 – Network
3 – MasterSwitch
4 – Logout

? – Help
<ENTER> Redisplay Menu
<ESC> Refresh Main Menu
> **1<CR>** (To select the outlet manager.)
––––––– Outlet Manager ––

1 – Outlet 1: RPG
2 – Outlet 2: LAN
3 – Outlet 3: Router
4 – Outlet 4: Comm Server A
5 – Outlet 5: RDA/RPG Gateway
6 – Outlet 6: BDDS
7 – Outlet 7: Comm Server B
8 – Outlet 8: Comm Server C
9 – Master : PDU
<ENTER> Redisplay Menu
<ESC> Return To Previous Menu

> **3<CR>** (To select outlet 3.)
––––––– Outlet 3: Router ––

1 – Control of Outlet 3
2 – Configuration of Outlet 3

? – Help
<ENTER> Redisplay Menu
<ESC> Return To Previous Menu

> **1<CR>** (To select control of outlet 3.)
––––––– Control of Outlet 3 ––

Outlet	Device Name	Auto Power On	Reboot Duration
1: ON	RPG	With Master	Same as Master
2: ON	LAN	With Master	Same as Master
3: ON	Router	With Master	Same as Master
4: ON	Comm Sever A	With Master	Same as Master
5: ON	RDA/RPG Gateway	With Master	Same as Master
6: ON	BDDS	With Master	Same as Master
7: ON	Comm Server B	With Master	Same as Master
8: ON	Comm Server C	With Master	Same as Master
Master PDU		Immediate	5 Seconds

1 – Turn Outlet On
2 – Turn Outlet Off
3 – Reboot Outlet

? – Help
<ENTER> Redisplay Menu
<ESC> Return To Previous Menu

> **3<CR>** (To reboot outlet 3.)

––
Reboot Outlet

This command will immediately turn the load named Router
on Outlet 3 OFF for 5 Seconds and then turn it back ON.

Enter 'YES' to continue or <ENTER> to cancel: YES

This command has been issued successfully!

Press <ENTER> to continue...

<CR> (To continue.)

------- Control of Outlet 3 ----------

Outlet	Device Name	Auto Power On	Reboot Duration
1: ON	RPG	With Master	Same as Master
2: ON	LAN	With Master	Same as Master
3: OFF*	Router	With Master	Same as Master (Shows outlet 3 OFF.)
4: ON	Comm Server A	With Master	Same as Master
5: ON	RDA/RPG Gateway	With Master	Same as Master
6: ON	BDDS	With Master	Same as Master
7: ON	Comm Server B	With Master	Same as Master
8: ON	Comm Server C	With Master	Same as Master
Master PDU		Immediate	5 Seconds

1 – Turn Outlet On
2– Turn Outlet Off
3 – Reboot Outlet

? – Help

<ENTER> Redisplay Menu
<ESC> Return To Previous Menu

> **<CR>** (To redisplay menu.)

------- Control of Outlet 3 ----------

Outlet	Device Name	Auto Power On	Reboot Duration
1: ON	RPG	With Master	Same as Master
2: ON	LAN	With Master	Same as Master
3: ON	Router	With Master	Same as Master (Shows outlet 3 back on.)
4: ON	Comm Server A	With Master	Same as Master
5: ON	RDA/RPG Gateway	With Master	Same as Master
6: ON	BDDS	With Master	Same as Master
7: ON	Comm Server B	With Master	Same as Master
8: ON	Comm Server C	With Master	Same as Master
Master PDU		Immediate	5 Seconds

1 – Turn Outlet On

2 – Turn Outlet Off
3 – Reboot Outlet

? – Help
<ENTER> Redisplay Menu
<ESC> Return To Previous Menu
> (<ESC> pressed.)

------- Outlet 3: Router ----------

1 – Control of Outlet 3
2 – Configuration of Outlet 3

? – Help
<ENTER> Redisplay Menu
<ESC> Return To Previous Menu

> **<ESC>** (To return to previous menu.)
------- Outlet Manager ----------

1 – Outlet 1: RPG
2 – Outlet 2: LAN
3 – Outlet 3: Router
4 – Outlet 4: Comm Server A
5 – Outlet 5: RDA/RPG Gateway
6 – Outlet 6: BDDS
7 – Outlet 7: Comm Server B
8 – Outlet 8: Comm Server C
9 – Master : PDU

<ENTER> Redisplay Menu
<ESC> Return To Previous Menu
> **<ESC>** (To return to previous menu.)
------- Control Console ----------

1 – Outlet Manager
2 – Network
3 – MasterSwitch
4 – Logout

? – Help
<ENTER> Redisplay Menu
<ESC> Refresh Main Menu

> **4<CR>** (To logout of the MasterSwitch.)
Connection closed by foreign host.

4−6.3.2 MasterSwitch Power Control Using the MSCF Power Control Window. The MSCF Power Control window can be used to control the powering off and on of all RPG devices that are plugged into the MasterSwitch. At the MSCF workstation, the MSCF main window starts automatically when a user logs in. That window can also be displayed at the RPG workstation. The following procedure applies to all MasterSwitch power outlets:

1. Enter **mscf &<CR>** at the command line, (RPG or MSCF workstation) if an MSCF main window is not already present. In a moment an MSCF main window will appear. (See Figure 4−12.)

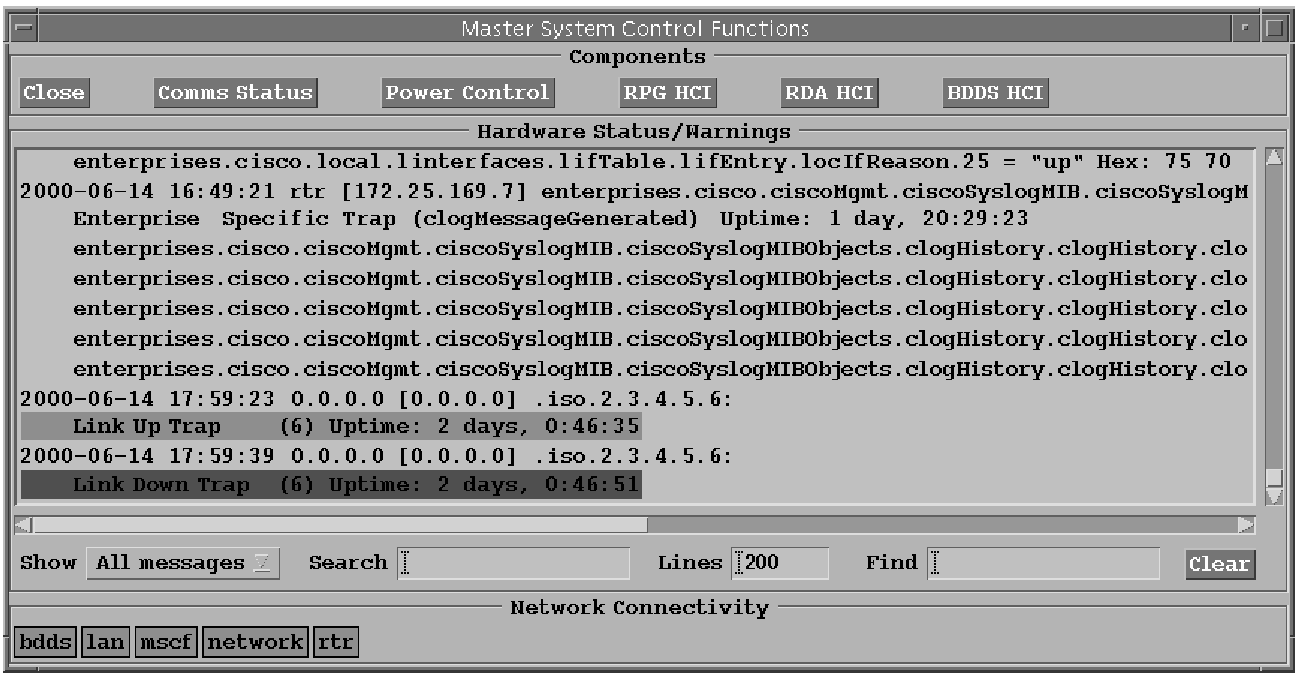


Figure 4−12. MSCF Main Window

2. Click on the **Power Control** button. The MSCF Power Control in Figure 4−13 window appears as follows:

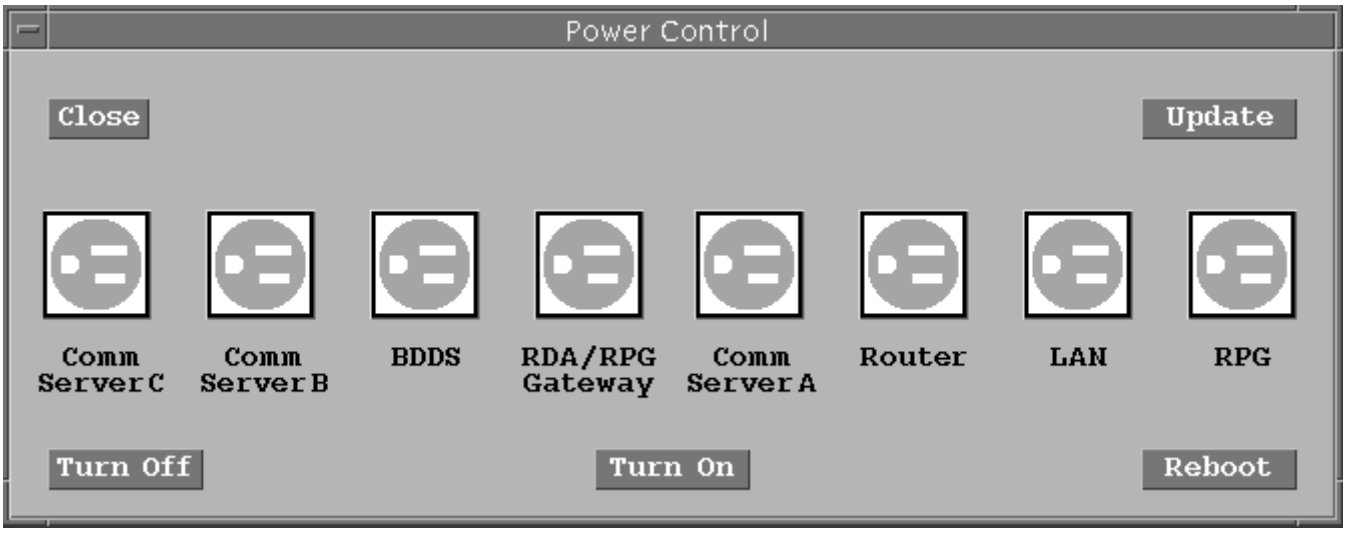


Figure 4–13. MSCF Power Control Window

3. Click on the desired outlet to highlight it.

4. Click on **Turn Off**, **Turn On**, or **Reboot** as desired. **Reboot** powers off the device for five seconds and then automatically powers it back on.

5. When prompted in the warning_popup window, click on **Yes** to continue or click on **No** to abort the action.

4–6.4 COMMUNICATION RECOVERY PROCEDURES

Communication errors, task pausing, or other conditions may result in wideband link failures. To restore the system to normal operation, perform the procedure in paragraph 4–6.4.1.

4–6.4.1 Wideband Recovery Procedure. This procedure disconnects/reconnects the wideband line, resets the RDA/RPG Gateway, and does RDA recovery actions if remote access is available.

1. At the Human Computer Interface (HCI) Main Menu, (See Figure 4–15.) click on the wideband graphic between the RDA and RPG icons to open the RDA/RPG Interface Control/Status window. (See Figure 4–14.)

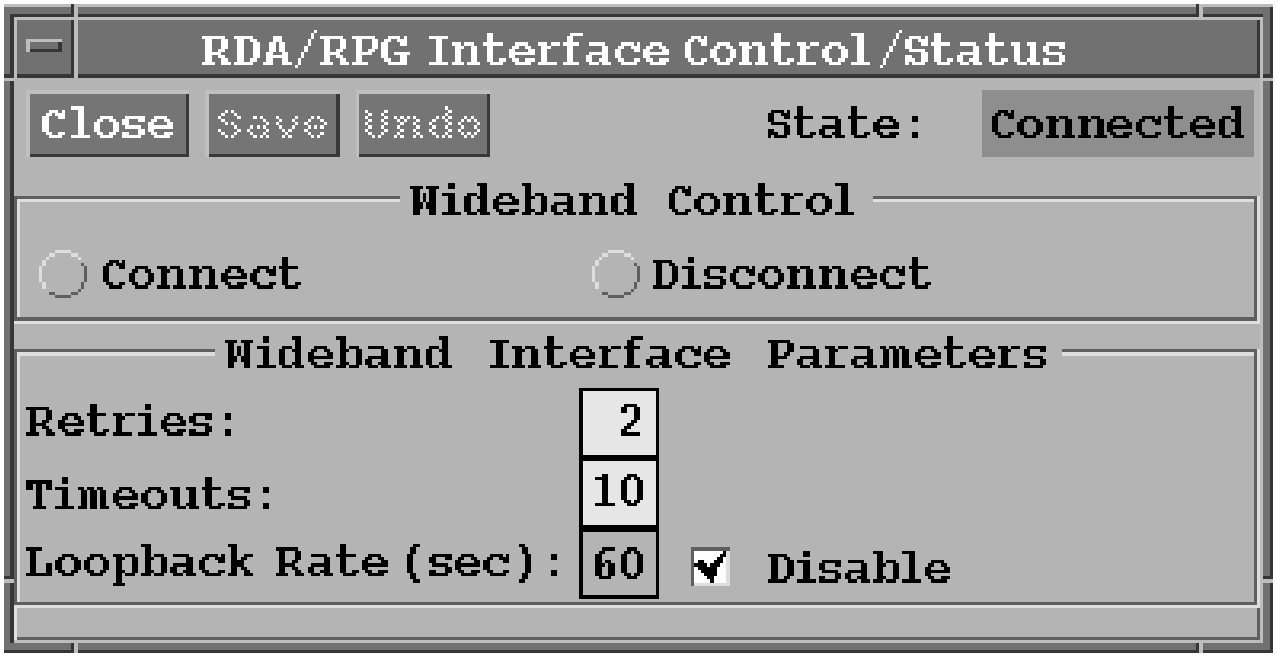


Figure 4–14. RDA/RPG Interface Control/Status Window

2. In the RDA/RPG Interface Control/Status window, click on **Disconnect** and then click on **Yes** in the warning_popup window to continue.

3. In the RDA/RPG Interface Control/Status window, click on **Connect** and then click on **Yes** in the warning_popup window to continue. If the wideband link does not connect, perform the next step.

4. At the MSCF Main window, click on the **Power Control** button, then in the Power Control window that opens up, click on the RDA/RPG Gateway outlet to select it, then click on the **Reboot** button, and then click on **Yes** in the warning_popup window to continue. Wait approximately one minute. If the wideband link does not connect, perform the next step.

5. At the HCI Main Menu, click on the **Control** button in the RPG icon. In the RPG Control window that opens up, click on the **All Tasks** button in Restart column. Wait approximately two minutes. If the wideband link does not connect, perform the next step if remote access is available to the RDA's RDA / RPG Remote Access Terminal (RRRAT).

6. Establish a remote session to the RDA RRRAT and terminate the RDA application software (**TERP<tab>*passwd*<CR>**) and then bring it back up (**RDAUP<CR>**). If the wideband link does not connect, terminate the RDA application software, mark off its disk, go to the RDADP's CDS (Control Diagnostic System), and enter **init<CR>** to reinitialize the RDA processor.

No emergency/recovery procedure exist for an MLOS failure because power must be removed to replace an LRU. However, the FAS can be replaced without a loss of communications through the

MLOS transceiver. Although the radio and FAS have the same power source, they are wired by a split bus and the FAS can be powered off separately. The RDA and RPG software will continuously try to restore the link. During this time, the RDA continues to operate in its previously designated mode. Upon repair of the transceivers, the system should reestablish communications if neither of the applications programs were terminated during the fault isolation process.

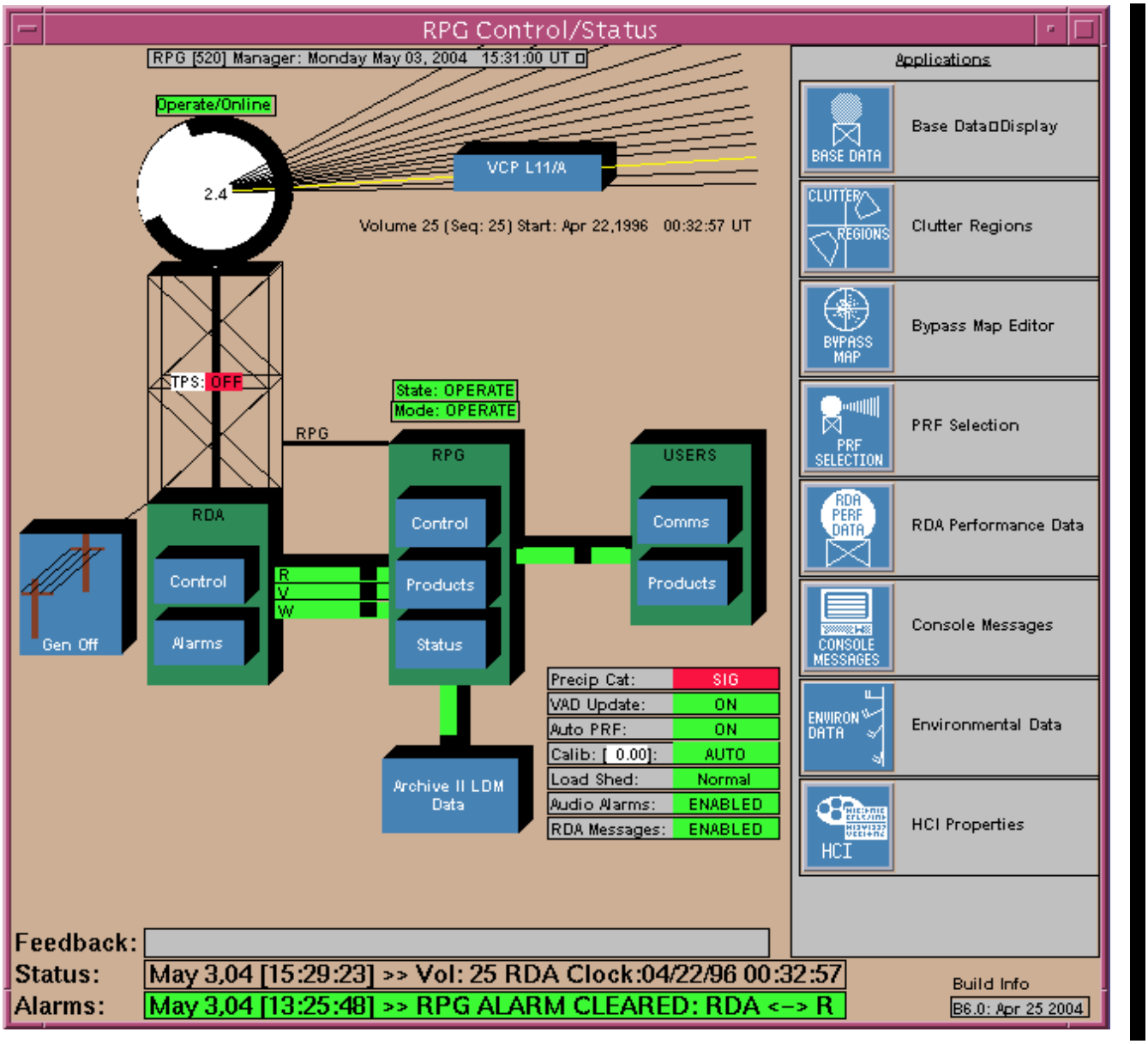


Figure 4–15. RPG Control/Status Window (Main Menu)

CHAPTER 5

THEORY OF OPERATION

Section 5–1. Introduction

5–1.1 GENERAL

This chapter contains descriptions of functional system and electronic circuit operation for the WBC Group components. References are made to COTS manuals to eliminate repetition.

NOTE

COTS manuals that are not referenced are not valid and are not to be used for replacement, alignment, or initialization of LRUs.

5–1.2 CHAPTER ORGANIZATION

Chapter 5 is organized into the following sections:

- Section 5–1. Introduction – Provides descriptions of the Chapter 5 sections.
- Section 5–2. Functional System Operation – Describes the functional system operation of the MLOS, Telco, and Private T1 equipment. In addition, illustrations show the interconnection between the subsystem components and the major systems of the WSR–88D.
- Section 5–3. Functional Software Operation – Describes the RPG/RDA functional relationship of the WBC software interfaces and major systems of the WSR–88D.
- Section 5–4. Functional Operation of Electronic Circuits – Describes the functional operation of the LRUs within the WBC Group and the related RPG/RDA software and hardware. Extensive reference to the COTS manual is used.
- Section 5–5. Functional Operation of Software Interfaces – Details the software functions controlling the transmission of the wideband data
- Section 5–6. Functional Description of Contractor Furnished Equipment (CFE) Real Property Installed Equipment (RPIE) – Describes the RPG/RDA shelter and its equipment.

Section 5–2. Functional System Operation

5–2.1 GENERAL

This section presents an overall functional description of the WBC and its relation with the other WSR–88D Groups.

5–2.2 MLOS CABINET UD19, UD39

Each MLOS cabinet contains the following pieces of equipment:

- LR4–2000 microwave transceiver
- Minimaster Alarm Station (RPG only)
- Remote Station FAS
- Modem (RPG only)
- 24 Vdc power supply

5–2.2.1 Microwave Transceiver Equipment. See Figure 5–1 RPG MLOS Transceiver Block Diagram. The transceiver is mounted in a standard Electronic Industries Association (EIA) cabinet. It has a transmitter and receiver in separate drawers that slide out and lock with a spring–loaded catch. Each unit slides in, engages pin connectors at the rear, and secures to the frame by two thumbscrews on the front. Each RDA/RPG transceiver unit has a maximum of ten rack–mounted assemblies plus two additional assemblies above the transceiver. The assemblies are as follows:

- Fuse Panel
- Power Supply
- Meter Alarm
- Orderwire
- Modulator
- Transmitter
- Antenna Coupler (mounted separately)
- Bandpass Filters
- Receiver
- Demodulator
- Receiver Switch
- Terminal Panel (mounted separately)

−24 Vdc is supplied to the fuse panel by an external power supply mounted in the bottom of the cabinet. Fuses isolate the external power supply from the internal power supply. If a fuse fails, either the FUSE ALM XMTR or FUSE ALM RCVR indicators will light.

The internal power supply receives the −24 Vdc input voltage from the fuse panel and provides regulated +5V, −5V, and −18V to the transceiver rack−mounted units. An LED will light if the input voltages are present. The internal power supply unit also generates a local clock signal used to keep the transceiver active during the loss of input signals. Front panel alarm LEDs indicate a transmit (XMIT) alarm, receiver (RCV) alarm, Power Supply alarm and Fuse alarm. A Power Supply alarm will result in the lighting of an LED on the internal power supply card. Test points are provided for measuring output voltages or the local clock frequency.

The Meter/Alarm unit can measure various voltages and currents in the transceiver. Color coordinated jacks aid in determining what is being measured. The unit also measures the relative transmitter output power and the receive signal level. Visual indicators, logic outputs, and relay contacts signal the different alarm conditions.

The modulator receives the DSX−1 serial bipolar signal and decodes it to a Non−Return−to−Zero (NRZ) format for input to the serial−to−parallel converter. The clock signal is also extracted and supplied to the converter. The data stream is split into two separate and offset Input (I) and Quadrature (Q) streams which are applied to a 35 MHz quadrature (out of phase) modulator. A voltage−controlled oscillator generates carriers that are phase modulated by the I and Q streams in the two separate balanced mixers. Because of the offset between the two streams, the IF output is designated as an Offset Quaternary Phase Shift Keyed (OQPSK) signal. The signal is combined and passed through an external Surface Acoustical Wave (SAW) filter which provides spectral control via its bandpass characteristics. The modulator also accepts service channel input signals from the orderwire and modulates the output.

The 35 MHz signal, with data and service channel information, is amplified, filtered, and held to a constant output level by an internal Automatic Gain Control (AGC). The signal is applied to an upconverter which also receives a locally−generated RF signal from a crystal−controlled oscillator. The output of the upconverter is two sidebands, one of which is selected by a bandpass filter. This is applied to the power amplifier to increase the signal strength to a minimum of 1 watt. The amplified signal goes to the antenna coupler which filters it and sends it via the circulator to the antenna.

The receive RF signal from the antenna is routed by the circulator to the band−pass filter in the coupler. The antenna coupler sends the signal to external band−pass filter(s) (not shown) which provides high attenuation to adjacent transmitter frequencies. The signal is then routed to the receiver. A downconverter in the receiver heterodynes the input RF signal with a local oscillator. The 35 MHz output of the downconverter is sent to a filter and amplifier that provides up to 50 dB of automatic variable gain. This offset (OQPSK) IF signal, containing digital and service channel information, is applied to the demodulator. The demodulator splits the incoming IF signal and applies it to two mixers. Each mixer also has an input from a VCO which is controlled by a Phase Lock Loop (PLL) that compares the phase of the demodulated I and Q signals. The mixer output is sent to sample circuits which output NRZ format signals. The streams are combined in a parallel−to−serial converter and outputted.

The service channel information is present in the VCO control voltage. A sample of this voltage is amplified, filtered, and sent to the orderwire unit.

Because high noise levels are approximately equal to expected error rates, error detection is simplified. When high noise is detected during a sampling period, error pulses are generated (1's). When the error rate exceeds a set level, an error alarm is generated and sent to the receive alarm section of the meter/alarm unit. The demodulator will provide all 1's output if an alarm occurs. The local clock signal then is used instead of the received clock in the demodulator. This local clock signal provides for accurate timing of all the 1's so that the alarm condition can be accurately understood at the same or following sites by inhibiting downstream alarms.

The orderwire unit is divided into three parts: the transmit path, the receive path, and the signalling circuits. The transmit path has one unit for the Frequency–Shift–Keyed (FSK) supervisory signal and two units for the Voice Frequency (VF). The VF enters at the handset jack or a VF IN input. It is amplified and compressed. The FSK tones enter the board at FSK IN terminals and are amplified and combined with the VF signal and signalling signal. The combined signals go to the modulator.

The combined received VF and FSK (and signalling) signals are split and amplified. VF is fed to the handset and an internal speaker on the orderwire unit. The signalling signal is fed to the speaker.

The signalling signal is activated by pressing a SIGNAL pushbutton. This causes the generation of a 1000 Hz tone which is sent via the service channel to the other transceivers. Once the other receivers detect the tone, a local audible generator is activated and sounds the speaker.

A terminal panel is mounted above the antenna coupler and contains a 30–second timer and wire–wrap blocks. Wiring to/from the transceiver and other rack components traverse cableways on either side of the cabinet and the terminal panel.

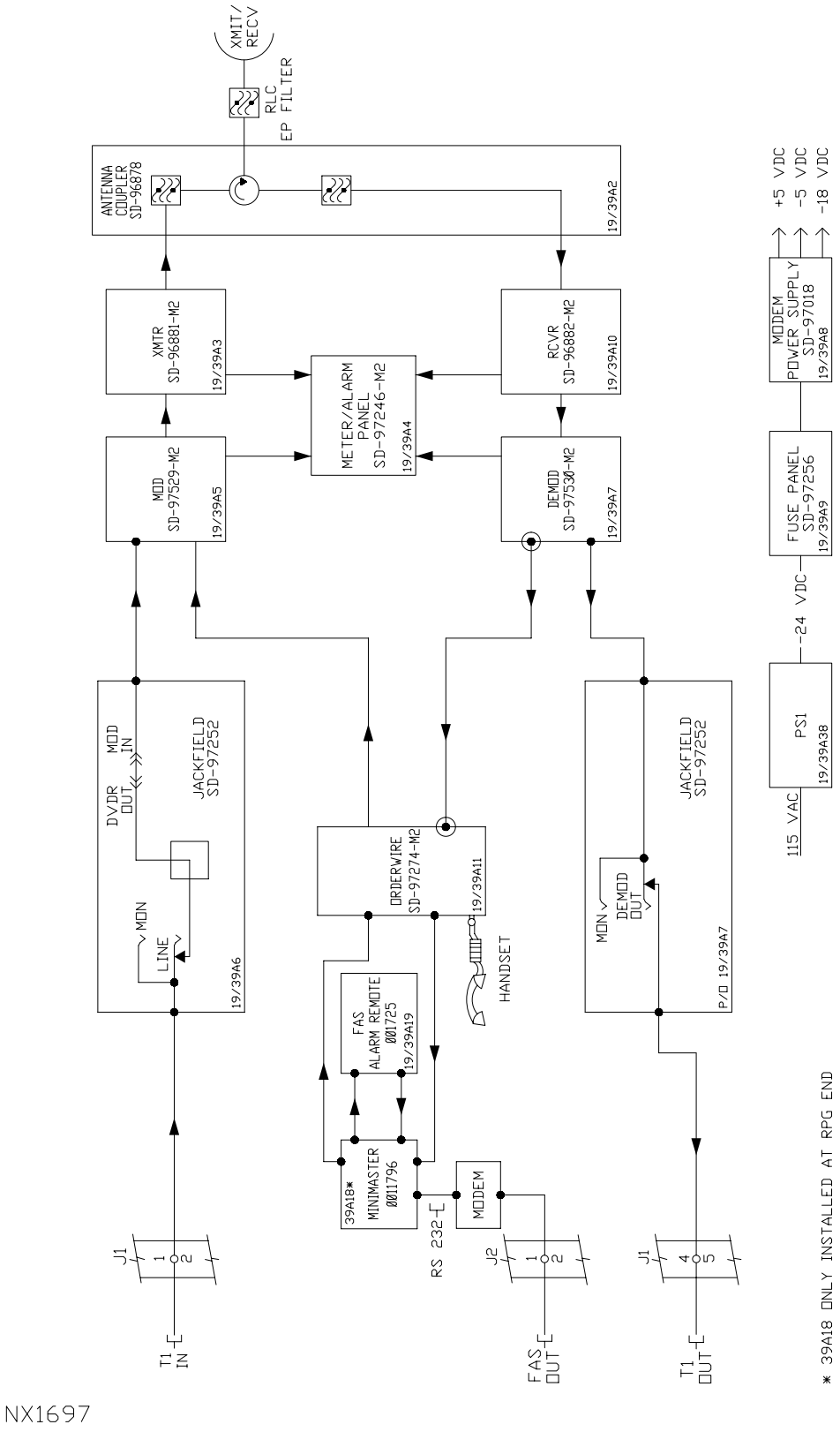


Figure 5–1. RPG MLOS Transceiver Block Diagram

5−2.2.2 Minimaster UD39A18 (RPG Only). See Figure 5−2 MLOS Minimaster Alarm Reporting Simplified. This is a self−contained, microprocessor−based, alarm and control master station. It automatically and continuously polls for a change of state detected by a system of up to 32 remote stations.

In the default System mode, front panel alarm status LEDs indicate the major/minor status conditions at each of the remote stations. An operator can change to the Station mode where the alarm status LEDs will represent the specific alarm at a designated site. In addition, other LEDs indicate master station status and system diagnostics.

A front panel keypad provides the means of initializing the Minimaster, responding to alarm conditions, requesting detailed alarm data, acknowledging alarms, completely cutting out remote stations, or executing local controls. An audible alarm can be programmed to sound on major and/or minor alarms. A bank of four LED displays is provided to present information such as selected remote station address, and prompts for assisting operator interaction with the system. The following terms are used to describe the Minimaster supervisory systems:

- COS Change Of State. A remote station or remote station alarm point that has changed condition. The change could be from a normal−to−alarm or from an alarm−to−normal condition.
- Alarm A failure triggered by a COS in any network element caused by an alarm point input at a remote station changing conditions. The following are alarm types:
    - ••Audible: Sounds at the receipt of an alarm.
    - ••Block Mode: Allows communications from the status line.
    - ••Acknowledged Alarm: Suspends audible and visually notifies the user of an alarm.
    - ••Station Fail: An operational error that would cause a no RTU response.
    - ••Major/Minor: Priorities assigned to alarm monitoring inputs at RTUs.
    - ••Standing Alarm: An unresolved, acknowledged station or alarm point.
    - ••Normal/Off Normal: One of the two states of an RTU alarm input. User selects which of the two states triggers an alarm. Normal master setting tracks the RTU front panel LED.
- Polling Master station sequentially addressing remote stations to acquire alarm data.
- Command Instruction transmitted from master to remote, (examples: poll, COS detect flag).
- Response Data transmitted from remote to master station.
- System level COS monitoring for inputs of remote stations that is displayed at the front panel.
- Station level Status of up to 32 alarm point inputs displayed at a remote station front panel.
- RTU/FAS Remote terminal unit (remote station) Fault Alarm System.
- Input An alarm point of an RTU.

A 481 Minimaster alarm and master control unit, mounted in the RPG MLOS cabinets, is used as the master alarm and control station. It receives alarm status from the remote alarm units mounted in each MLOS cabinet, including its own. The master alarm unit automatically and continuously compares the data received from the remote stations against the configuration parameters in its resident database. Any differences results in the alarm being set on the Minimaster front panel along with an alarm status message being sent to the RPG processor.

The Minimaster has two resident databases, one of which resides in a non–volatile memory located on the Processor/Power Supply card and the other on a battery–backed Random Access Memory (RAM). Stored data is retained whenever power is removed. Parameter entry into the database is done using front panel keystrokes. Prompts are displayed on the LEDs advising the operator of the parameter requested. Access to the database is password protected by a user–defined word in the database. The configuration database holds the master station setup, the remote unit addresses, and the alarm point definitions. These values are used as a system configuration template for the unit supervisory functions. The supervisory system configuration is defined at the time of system installation and should not require modification unless the number of RTUs or RTU configuration changes. Some of the database parameters refer to specific configurations of the RTU alarm inputs. Thus, user database entries must match the values set at the corresponding RTUs.

The system database is self–tested by a checksum routine during power–on. If verified, a short beep sounds and the contents are used. If a printer is connected, “Database verified” is printed. If not verified, “Database corrupted: loading default values” is printed and the system loads factory–set default parameters, allowing the unit to come on–line. The different configuration database entries represent the various areas requiring definition to set up the Minimaster to the RTU network. Each database entry is assigned a default value which must be modified for the site specific values. The configuration Database Entry program is divided into the following parts:

- ENTRY – Specifies on–line or off–line input followed by password entry/verification. On–line entries are used during the normal alarm monitoring mode (SYSTEM COS). This mode is automatically entered at power–on or if the station is left in any other mode without operator entry for 5 minutes. In this mode, the operator uses pre–programmed steps to determine system information. In the off–line mode, the operator defines and inserts the configuration data.

- SYSTEM – Relates to the configuration items in a COTS manual table where the operator inputs single entries for each step in response to a series of prompt(s).

- STATION – Identifies the station address and alarm point definition. This section of the program consists of station address and alarm point major steps with associated substeps for the definition of the assigned address to master display position and alarm point location and type. The operator will need to use a COTS manual procedure to load the station database parameters defining the custom configuration of the installed network of RTUs.

Either the SYSTEM or STATION LED is lit to identify that the database input sets a master station parameter or a RTU parameter.

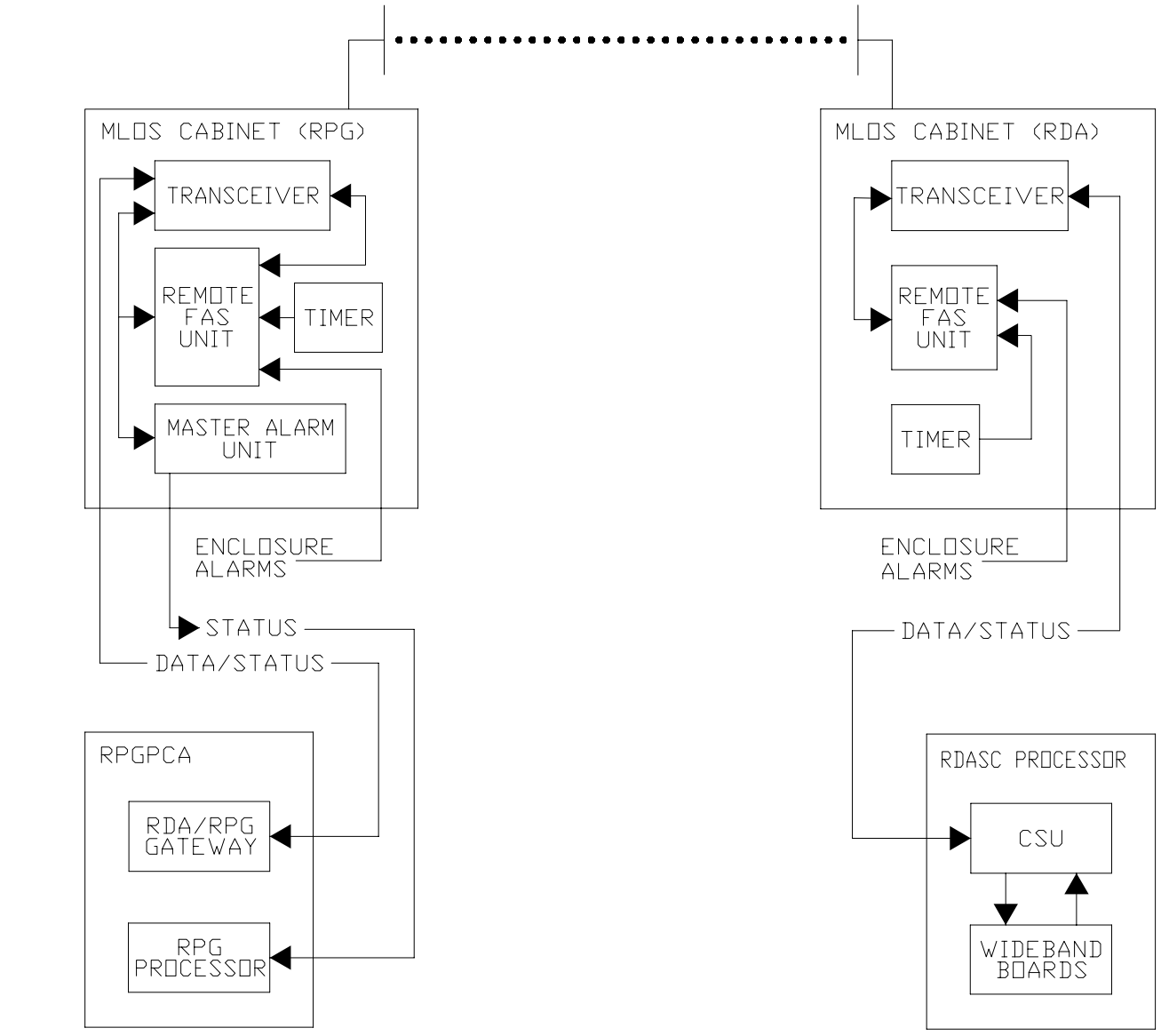


Figure 5–2. MLOS Minimaster Alarm Reporting Simplified

The run–time database stores current alarm/control status, temporary alarm point data, and operational parameter data in a battery–backed RAM preventing data loss in the event of a power failure. In some cases, once a supervisory (configuration) database parameter has been defined, it may be enabled or disabled by various keystroke entries encountered during normal operation. For example, a defined alarm point may be cutout from reporting. This does not affect the configuration database in that the alarm point is still defined, but not polled.

Minimaster messages are sent to the RPG or to a printer through its printer port. In any MLOS configuration, the Remote Station FAS is identified on the Minimaster printout as follows:

- RPG Remote FAS — D01, S001
- RDA Remote FAS — D02, S002

Figure 5–3 shows the message types that can be transmitted. Example A occurs upon power–on at an RPG station in an MLOS link. Example B occurs from each station (D01 and D02) in an MLOS link, and the status is changed every 30 ± 6 seconds and is used for a continuous on–line FAS system check. It will be accompanied by a flashing minor alarm light (yellow) on the Minimaster for each station in the link. Example C occurs for a station failure and a return to operation. Example D occurs for an alarm at a station in an MLOS link. P01–P15 are major alarms that also cause flashing major alarm lights (red) on the Minimaster of the station with the alarm.

Example	Date	Time	Station Number		Alarm Number	Type	Message/Status Change
A	19–Jun–91	11:49:16					Database Verified
	19–Jun–91	11:49:23	D01	S001			Power Fail Reset
B	19–Jun–91	11:49:43	D01	S001	16	Minor Bistate	COS ON ALARM
	19–Jun–91	11:51:15	D01	S001	16	Minor Bistate	COS OFF NORMAL
	19–Jun–91	11:51:45	D01	S001	16	Minor Bistate	COS ON ALARM
	19–Jun–91	11:51:17	D01	S001	16	Minor Bistate	COS OFF NORMAL
	19–Jun–91	11:52:45	D01	S001	16	Minor Bistate	COS ON ALARM
	19–Jun–91	11:52:47	D02	S001	16	Minor Bistate	COS ON ALARM
	19–Jun–91	11:51:17	D01	S001	16	Minor Bistate	COS OFF NORMAL
C	19–Jun–91	21:49:43	D01	S001			Station Failure COS
	19–Jun–91	21:52:15	D01	S001			Communications Restored
D	19–Jun–91	22:13:13	D01	S001	07	Major Bistate	COS ON ALARM
	19–Jun–91	22:52:55	D01	S001	07	Major Bistate	COS OFF NORMAL

Figure 5–3. MLOS Minimaster FAS Message Formats (Typical)

5–2.2.3 Remote Station FAS. See Figure 5–4. The Remote Station is a self–contained, microprocessor–based system designed for automatic status monitoring and remote control operation in a communications network. The network consists of a master station (Minimaster unit) with a number of remote stations (FASs).

The master station communicates with the remote stations by transmitting command signals and receiving status information responses. Communications between the remote stations and the master

uses digitally coded messages sent via the service channel of the LR4−2000. These messages are sent by FSK using the upper half of LR4−2000 voice channel.

The messages sent by the master station are called “master commands” and those sent by the remote station are “remote responses”. The commands serve to interrogate the remote station to detect any COS conditions and request status information. Remote station responses depend on the status of the equipment at the time the commands are received. The responses either acknowledge the command or provide the information requested. Each remote station FAS Channel 16 is connected to a timer which changes state every 30 seconds to exercise and prove that each station is working properly. The Minimaster looks for this COS and in the event it does not receive it, the operator will receive a wideband failure message.

Figure 5−5 is a block diagram of the FSK Transceiver card. It is polled by the master and transmits responses to the master station via the transceiver or, in the RPG cabinet, directly via wiring. Each remote unit can be configured for 16 alarm status inputs. The status of the inputs is displayed on front panel LEDs. With the exception of the LED display, all of the major circuits are mounted on separate removable cards. These cards are the 152025 PHYS Transceiver card and the 151962 Alarm Processor and Power Supply card.

The remote alarm station FSK Transceiver card (See Figure 5−5) under control of the alarm processor, receives command messages from the master station and transmits the RTU response messages. When a command message arrives from the master station, the receive signals are amplified, level adjusted, and applied to the transmit/ receive switch. The transmit/receive switch is controlled by the TXSW signal and, in the receive mode, the signal passes through a bandpass filter which rejects unwanted frequencies and passes the signal to the carrier presence detector (CRX). The CRX automatically produces an output signal if the input exceeds a threshold level. After a clock−determined delay, the output signal enables the demodulator and signals the alarm processor that a message is being received. The demodulator uses a digital sampling technique to sample each cycle of the input and produce a detected mark−space element (RCV DATA) for the alarm processor.

When a transmit message is to be transmitted to the master station, the alarm processor sends OE and TXSW to the transmit control to enable the modulator and switch the signal path. The master clock is divided down to the mark/space frequencies and applied to the modulator. The modulator processes this input and produces a FSK digital pulse train from the XMIT DATA input signal. From the modulator, the signal is passed through the Bandpass Filter (BPF), part of the TX/RX switch, transmit amplifiers and level adjusts and transmitted out of the FAS to the LR4−2000.

The alarm processor card (See Figure 5−6) is the master of the remote station. It contains the circuits for directly handling 16 possible alarm status inputs connected to the remote station. A microprocessor unit and its peripheral devices also reside in the alarm processor. Other circuits include those for monitor and test functions and those for interfacing with other circuits in the remote station. The remote station power supply is also mounted on this card.

The Microprocessor Unit (MPU), Erasable Programmable Read Only Memory (EPROM), and RAM Input/Output and Timer (RIOT) devices control the basic operation of the entire remote station. The EPROM contains the program for remote station operation. Its instructions are provided to the MPU via the data bus. The EPROM is programmed at the factory. The RIOT device is used as a temporary input and output data storage device by the MPU and also provides timing and control

functions. Data transfers use the data bus. A crystal oscillator on the transceiver card is frequency divided to provide a clock to the MPU and a timing clock to the RIOT. The MPU basic instruction set is contained on the EPROM. During operation, the MPU uses the address and data buses to get its instructions from the EPROM and to read or write data into the RIOT. All digital data is sent between the MPU/RIOT and the applicable circuits over the data bus.

All 16 alarm status inputs are stored in parallel form in parallel–to–serial shift registers. The alarm status data stored in the shift registers is gated out in serial form by the RIOT–generated PARALLEL STROBE signal. The RIOT–generated SHIFT CLOCK steps the serial data out. Alarm Status LEDs light when its corresponding alarm status input switches to the off–normal state.

The alarm processor monitors several other inputs. These include:

- The baud rate strapping SEL1–4 from the transceiver that determines which value the MPU uses for the transmission rate.
- The 8–bit STATION ADDRESS switch S2 (not shown). The MPU compares the STATION ADDRESS with the code sent by the master station. If they agree, the MPU initiates action.
- The TRANSMIT KEYING DELAY switch S1 segment (not shown).
- The COS OUTPUT SEL switch S1 segment (not shown).
- The TRANSMIT KEYING DELAY segment. If open, no transmission delay occurs; if closed, a 200 ms delay occurs.

The XMIT SPACE/LAMP TEST switch S5 on the front panel provides two test inputs. When pushed to the XMIT SPACE position, the processor causes continuous transmission of a space signal. When the switch is pushed to the LAMP TEST position, all LEDs light. A third test is for transmission of all mark signal. This is done by shorting a pin on the processor to a ground pin.

The Logic Voltage Monitor monitors the –5 Vdc level. When it drops below –4.25 Vdc, the monitor resets the MPU and RIOT.

The power supply on this card uses series regulation with a regulating pulse width modulator to convert the input to a –16 and –5 Vdc outputs.

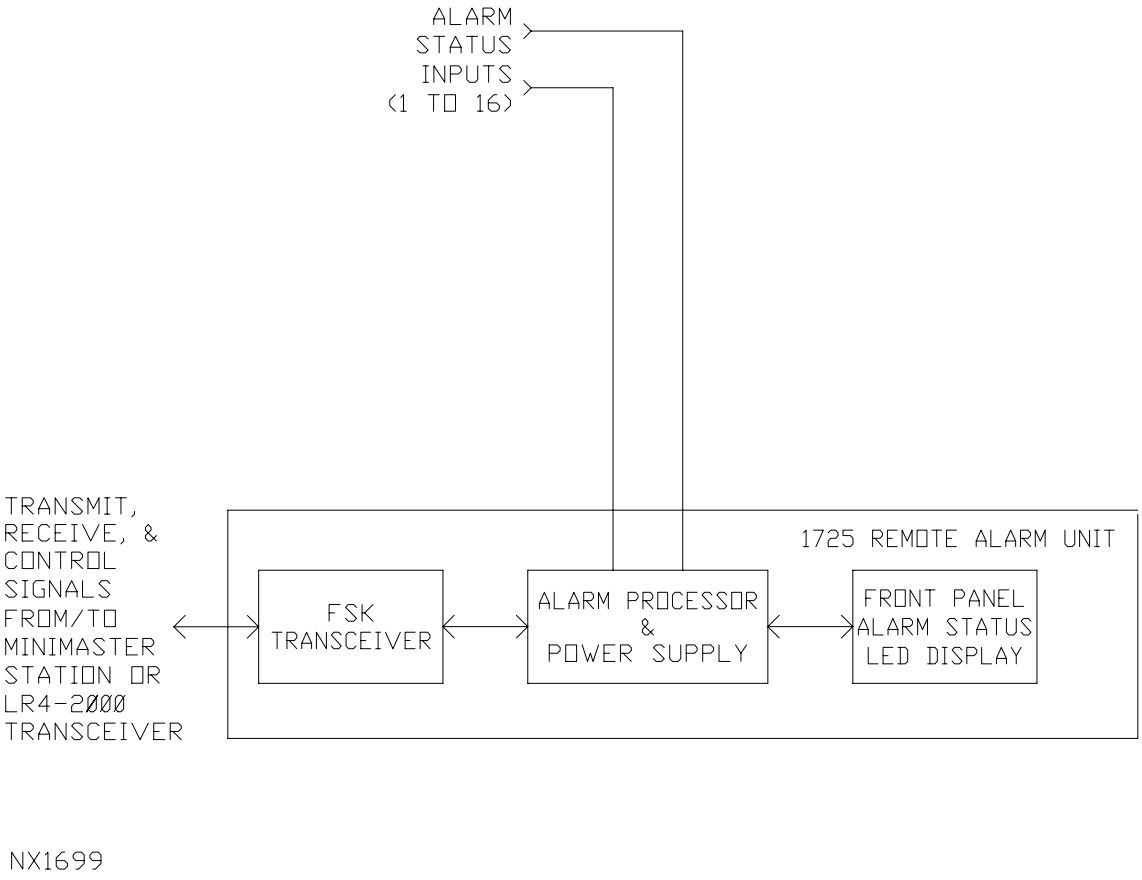


Figure 5–4. MLOS Remote Station FAS Block Diagram

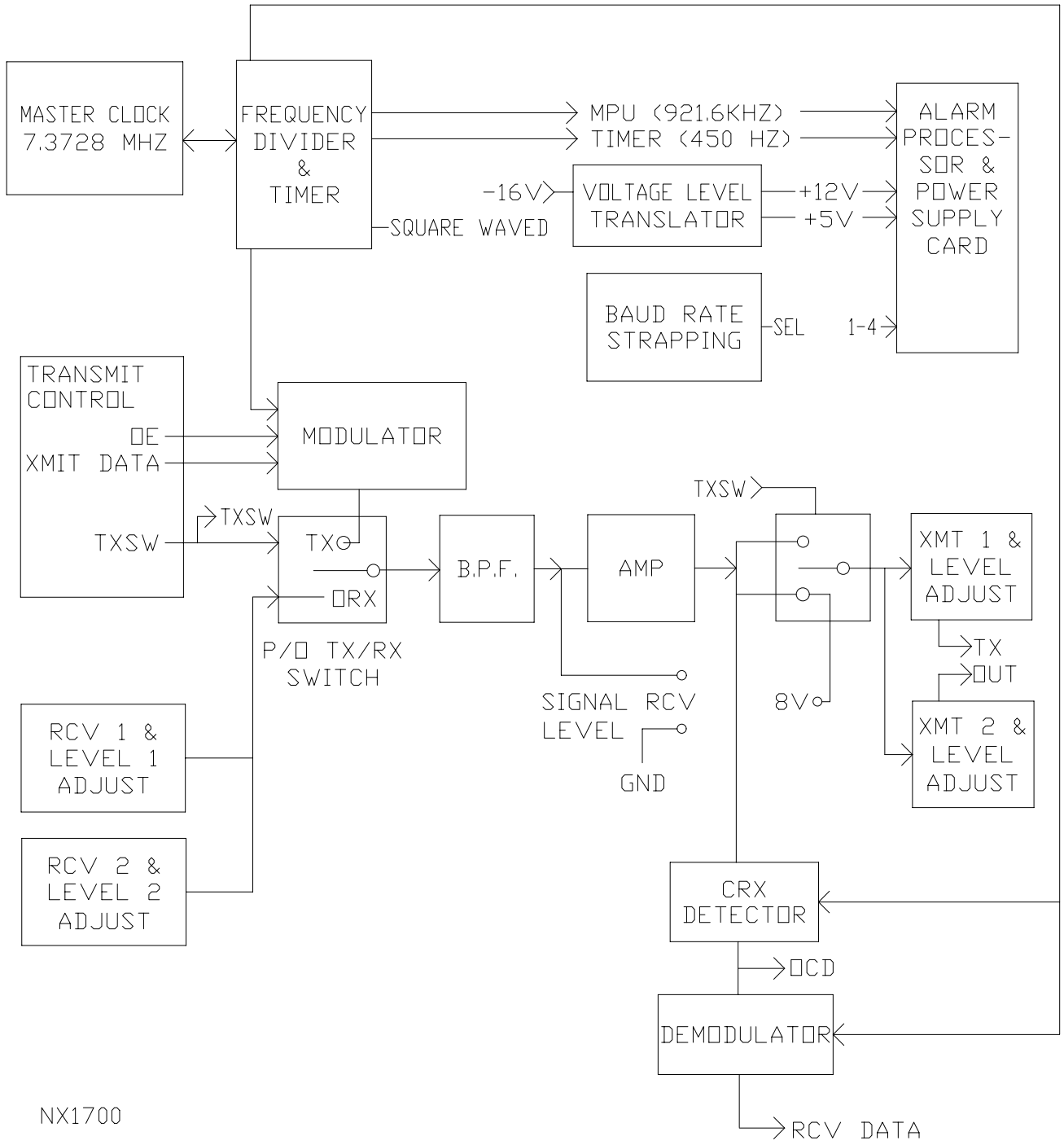


Figure 5–5. MLOS Remote Station FAS FSK Transceiver Card Block Diagram

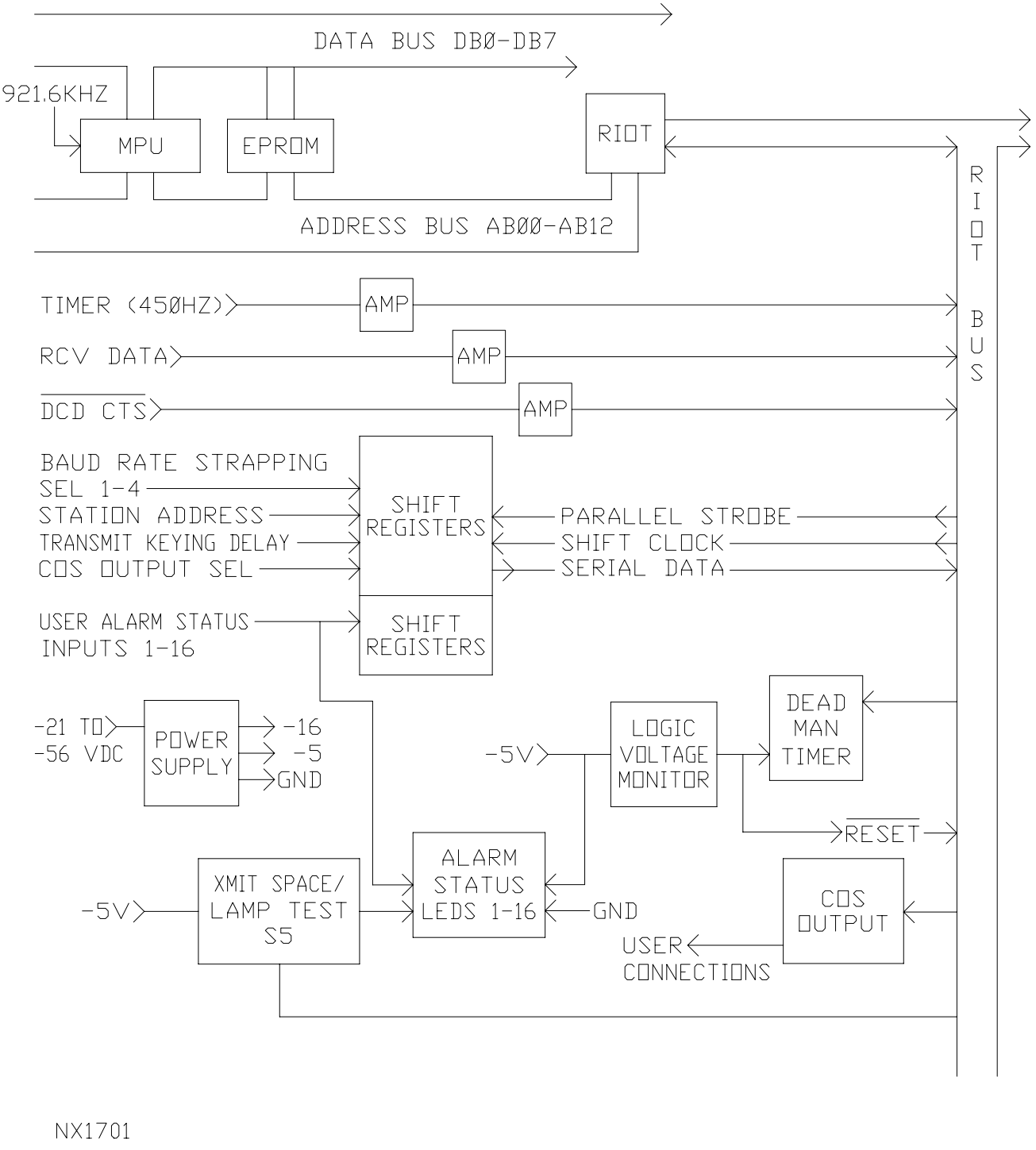


Figure 5-6. MLOS Remote Station FAS Alarm Processor Card and Power Supply Block Diagram

5–2.2.4 Modem. A non–powered short haul modem pair is required for the master alarm unit to communicate with the RPG. One modem connects to the Minimaster and the other is in the RPG cabinet. The modems operate asynchronously over full–duplex, 4–wire circuits using +12V from the host RS–232 interface. The modems have no indicators and are totally self–contained.

5–2.2.5 Power Supply. An LRS 52–24 power supply develops –24V for the units in the RDA or RPG MLOS cabinets.

5–2.2.6 CSU. Primarily to protect the equipment from electrical surges, CSUs are used in configurations that contain a remote MLOS shelter located separately from the RDA or RPG. This is the same unit used in the Private T1 configuration as described below in paragraph 5–2.3.1. It is an interface between the MLOS service and either the wideband board in the RDA or the RDA/RPG Gateway in the RPG. The same LBO settings, 0, 7.5, or 15 dB, support the various lengths from the CSU in the MLOS cabinet to either the RDA or the RPG.

5–2.2.7 Non–Space Diversity Simplified Functional Description. See Figure 5–7. The power supply converts 115 Vac input power to –24 Vdc output for the MLOS cabinet.

The RDA/RPG Gateway's digital output enters the radio assembly at connector J1, gets converted to NRZ format, modulated, upconverted to the selected transmit frequency in the 2 GHz band, and amplified to 1 watt. The RF is output via an antenna coupler, circulator, and bandpass filter to connector J4, and routed via helix cable to the antenna dish, which is used for transmitting and receiving. The received signal travels from the antenna, through an antenna coupler, circulator, and a bandpass filter to block unwanted frequencies. Then it's routed to the receiver section of the LR4–2000, downconverted to bipolar format, and returned to the wideband board.

The transceiver is monitored for failures and will produce alarm outputs which are routed to the Remote Alarm Unit. Up to 16 alarm inputs can be sent to the Remote Alarm Unit, which formats the alarms for transmission to the Master Alarm Unit.

The Master Alarm Unit reports alarms received from its local FAS along with the alarms received from the remote site(s). Alarm signals from the remote site FAS are encoded in the received signal. These alarm signals are decoded by the transceiver and transferred to the Master Alarm Unit. The Master Alarm Unit output is sent via the modem to the RPG processor.

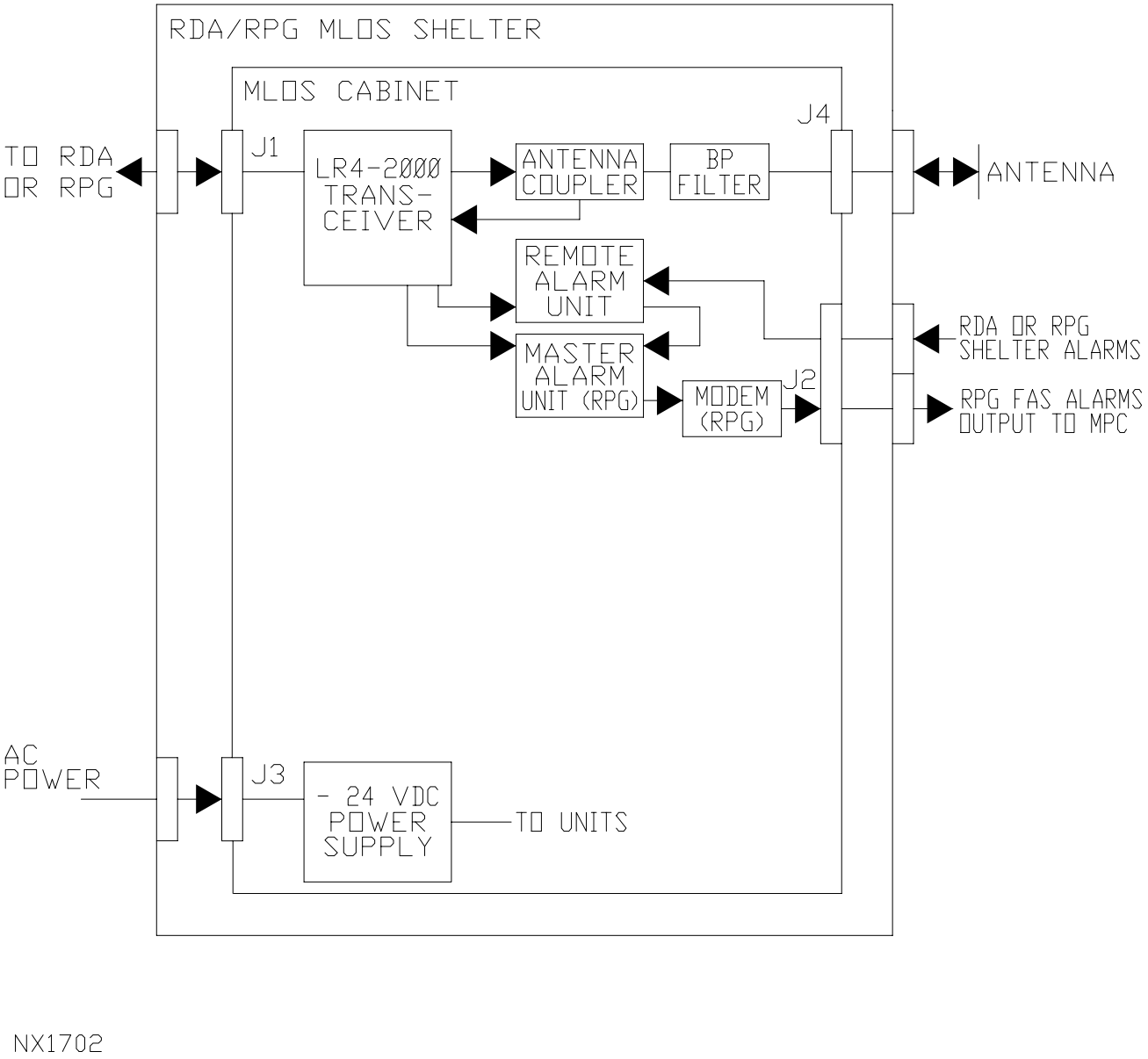


Figure 5-7. MLOS Non-Space Diversity Simplified Functional Diagram

5–2.3 PRIVATE T1

The Private T1 configuration contains a CSU in the RDA with an AC/DC adapter power supply, twisted wire pairs, surge suppressors, and built–in CSU/DSU functionality provided by the RDA/RPG Gateway as shown in Figure 5–8.

5–2.3.1 CSU. The CSU acts as a signal repeater for the 1.544 Mbps digital signal from the RDA's VME wideband card. The CSU only regenerates the bipolar bit stream from the VME wideband card and is transparent with respect to the specific T1 framing and coding.

The link budget of the Private T1 is 30 dB, which translates to over 6,000 feet of AWG #22 twisted wire pairs. To allow for the series resistor loss of the MCG DLP–20–200 V10 surge suppressors, the length of the link is conservatively set to 3,000 feet maximum. A three step LBO (Line–Build–Out) switch provides either 0, 7.5, or 15 dB for peek performance at various link lengths. The CSU also provides sealing current to prevent corrosion and keep contacts active, has a built–in surge suppressor that meets the FCC Rules and Regulations, Part 68, can generate local and remote loopback test patterns, and detects and indicates the following alarms on the front panel:

- Bipolar violation – When consecutive pulses are of the same polarity. This feature can be disabled by setting the dip switch SW1–4 to "1".
- All "0"s – When no network signal is received. This can be a result of the receive wire pair shorted or open.
- All "1"s – When the network signal is all "1"s. This can be the "keep alive" signal from the opposite CSU when it receives no signal.
- Loop – When the unit is in the test mode.
- Density – When the 1's density is low (15 consecutive zeros detected).
- Set – When in–band loopback set code is received from network. The indicator flashes when BERT test code is being sent.
- Reset – When in–band loopback reset code is received from network. The indicator flashes when Reset Code is being sent.
- Error – When an error is detected during test.

5–2.3.2 AC/DC Adapter. A –48 Vdc power supply is required to operate the CSU. The power supply converts 115 Vac 60 Hz to –48 Vdc. The CSU draws 100 mA from the power supply, which is capable of supporting up to five CSUs.

5–2.3.3 RDA/RPG Gateway CSU/DSU Functionality. The RDA/RPG Gateway has a built–in CSU/DSU which ingests the T1 DSX–1 wideband data from the RDA and converts it from analog to digital. Since this particular CSU functionality is not provided with external switches, CSU–specific parameters are actually built–in to the firmware and specific versions of the firmware will be provided to a site based on it's needed CSU settings. This will be identified by specific revision levels annotated on the exterior of the RDA/RPG Gateway. In addition, FAA Channel 1 has a firmware version with a unique embedded MAC address so that the FAA RPGs will assign a unique IP address to each RDA/RPG Gateway. The seven possible combinations are as follows:

Revision Level	Possible Usage	Line Breakout (LBO)	Line Encoding
–301	NWS	0 dB	B8ZS
–302	NWS	7.5 dB	B8ZS
–303	NWS	15 dB	B8ZS
–304	NWS, DOD, or FAA Channel 2	0 dB	AMI
–305	NWS	7.5 dB	AMI
–306	NWS	15 dB	AMI
–307	FAA Channel 1	0 dB	B8ZS

5–2.4 TELCO T1

This configuration also has a CSU in the RDA, short lengths of twisted wire pairs, surge suppressors at both ends of the Telco demarc, and built–in CSU/DSU functionality provided by the RDA/RPG Gateway . See Figure 5–8. The Telco unit at the demarc is generally a “loopback” or “smart jack” that has keep–alive functions and network loopback testing.

5–2.4.1 CSU. This is the same unit used in Private T1 as described above in paragraph 5–2.3.1. It is an interface between Telco T1 service and either the wideband board in the RDA or the RDA/RPG Gateway in the RPG. The same LBO settings, 0, 7.5, or 15 dB, support the various lengths from the CSU to the Telco’s last amplifier which is provided by the Telco when installation of the line is complete. In addition to the built–in surge suppressor, an additional surge suppressor (EDCO PC642C–150 LC) is installed between the CSU and the Telco demarc that provides two stage production, clamping surges to 150V, and meets the NWS transient susceptibility standards.

5–2.4.2 AC/DC Adapter. This is the same unit as described above in paragraph 5–2.3.2.

5–2.4.3 RDA/RPG Gateway CSU/DSU Functionality. This is the same unit as described above in paragraph 5–2.3.3.

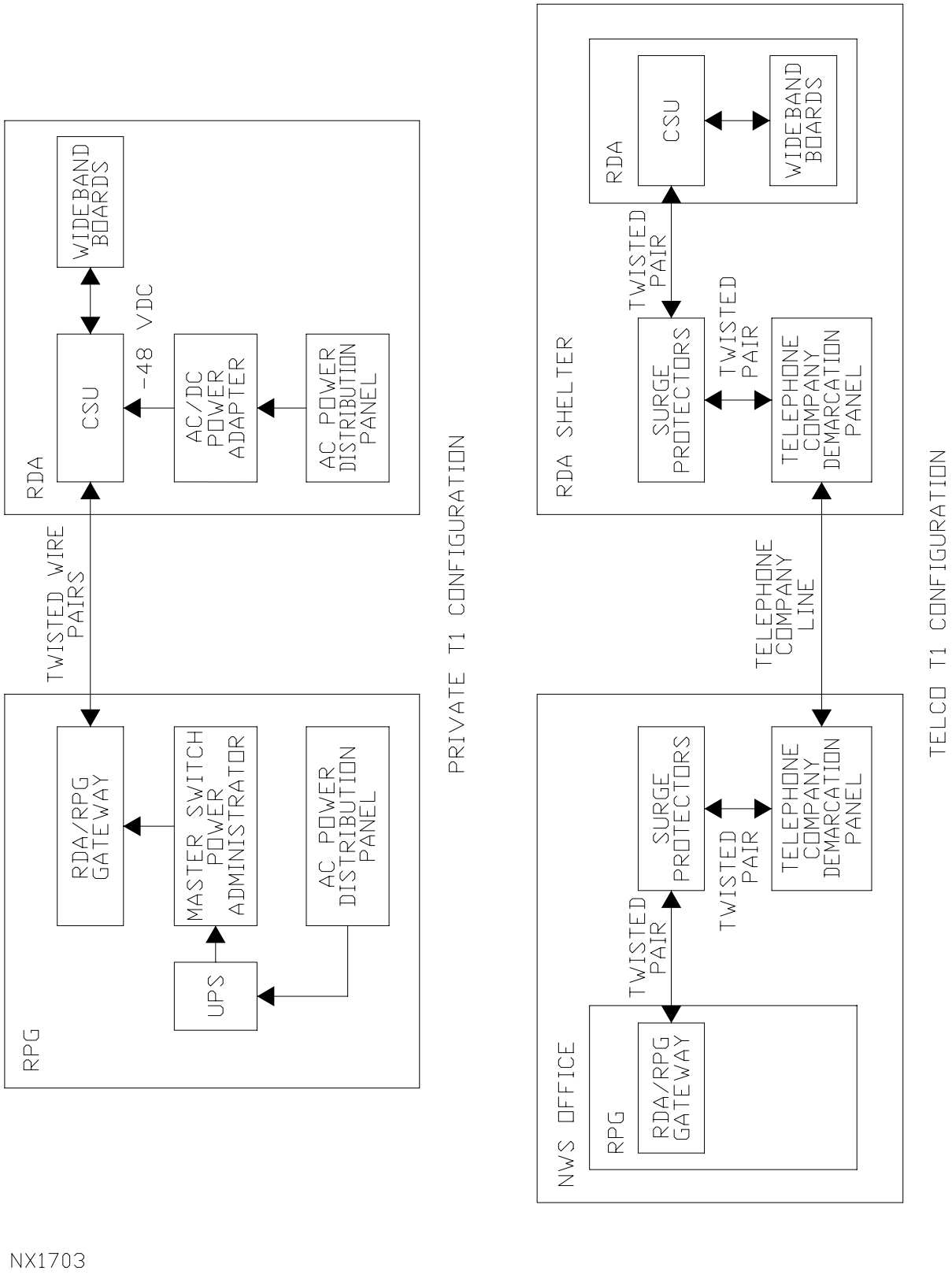


Figure 5–8. Private T1 and Telco T1 Configurations

Section 5–3. Functional Software Operation

5–3.1 GENERAL

This section describes the functional relationship of the software controlling the subsystem components and the major groups of the WSR–88D System.

5–3.2 RDA/RPG WBC FUNCTIONAL SOFTWARE

The RDA operating system (OS/32), CPCI 10, produces system initialization and operation. It performs all real–time OS functions, schedules tasks, coordinates requests for remote devices or telecommunications facilities, manages system environment, provides file management services, allocates memory, and handles interrupt/fault conditions. It interfaces with the RDA Handle Wideband Function, CPCI 01, in the RDASC processor and the RPG Acquire Radar Data Function in the RPG processor which is part of CPCI 03. (See Figure 5–9.)

CPCI 01 and CPCI 03 interfaces with the WBC data link are physically different because of the differences in processors and operating systems, but they are functionally identical. Interface signal definitions, control commands, status, and alarm information are specified and the types of data that are transferred between them include meteorological base data, summary RDA status, scan profile, state commands, and console messages.

5–3.3 RDA OPERATIONAL SOFTWARE PROGRAM

CPCI 01 controls the real–time operation of the configuration items comprising the RDA Group. The Handle Wideband function of CPCI 01 controls the Wideband Interface and is divided into the functions described in the following paragraphs.

5–3.3.1 Handle Wideband Data. The Handle Wideband Link automatically initiates a software loopback test on RDA startup and restart, communications link re–initialization, and periodically as required by the periodicity defined by RDA adaptation data. The link is defined as operational if the transmitted bit pattern matches the received bit pattern. It also initializes the Channel Terminal Manager (CTM) for startup, which formats the data, initializes communications link parameters, and establishes/verifies communications with the RPG (and User Site, if implemented). For an RDA restart, the Handle Wideband function notifies the RPG (and User Site, if implemented) of the impending RDA restart, terminates the wideband link with the RPG (and User Site, if implemented) and initiates the RDA startup. It also receives the message header and data pointer list from the RDA Data function then starts the data transmission over the link. When the RDA is shut down, the Handle Wideband function notifies the RPG (and User Site, if implemented) of the impending RDA shutdown and terminates the wideband link with the RPG (and User Site, if implemented).

5–3.3.2 Transmit Wideband Data. The Transmit Wideband Data function receives the message header and data pointer list from the RDA Data function and starts the data transfer over the link. The Control RDA function enables or disables the transmission of base data over the wideband link.

5–3.3.3 Receive Wideband Data. When notified by the Handle Wideband Link that a message has been received, the Receive Wideband Data function reads the incoming data header information for the type and destination, then notifies the Control RDA function that incoming data is available.

5–3.4 RPG OPERATIONAL SOFTWARE PROGRAM

CPCI 03 controls the real–time operation of the configuration items comprising the RPG Group. The Acquire Radar Data function of CPCI 03 interfaces with the RDA via the WBC link. It interfaces with the CPCI 01 RDASC program and the CPCI 12 OS software program. It also provides for the distribution of base data to optional users and is divided into the functions described in the following paragraphs.

5–3.4.1 Acquire Radar Data. This software function interfaces with the RDA over the bi–directional wideband communications link to receive base data, status, alarms, and maintenance information from the RDA and to transmit status request and control commands to the RDA. The RPG can also be configured with a BDDS option that provides the capability of retransmitting the wideband base data to additional other users. With the optional BDDS configuration, once the RPG receives the wideband base data from the RDA, it simply passes that same data along to the BDDS. The BDDS then makes that data available, to be ingested by other users, in a unique format on four additional ports of the RPG LAN that are logically partitioned off into a VLAN that segregates the data from the other LAN traffic for security purposes. The BDDS software is configured so that it can only transmit data, and is not configured to receive or process any commands.

5–3.4.2 DELETED.

5–3.4.3 Generate Products. This software function converts base data into meteorological products consisting of base, derived, and alphanumeric products.

5–3.4.4 Distribute Products. This software function distributes products to associated, non–associated, and other users, and provides for on–line storage and archiving of these products.

5–3.4.5 Control System. This software function performs all of the system control tasks including RDA control, RPG processing control, system control, and the WSR–88D System status monitoring and error detection.

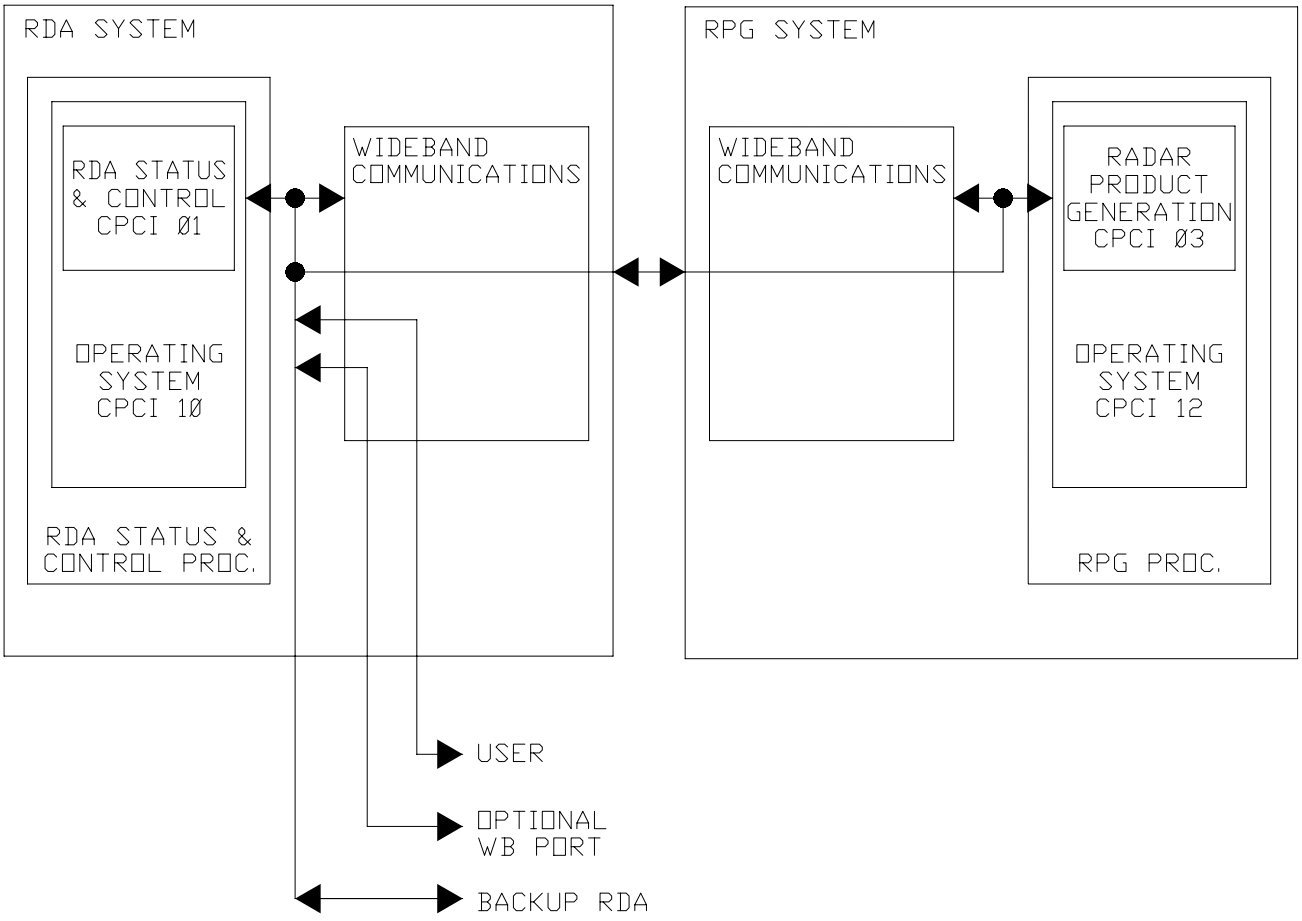


Figure 5–9. RDA and RPG Operating Systems Operational Interfacing

5–3.5 WIDEBAND INTERFACE

Figures FO5–1, FO5–2, and FO5–3 of NWS EHB 6–525 depict the RPG processor simplified block diagrams for the NWS, DOD, and FAA configurations respectively. Functional block diagrams are also in the NWS EHB 6–525 in Figures FO5–4, FO5–5, FO5–9, and FO5–11 for the LAN and Power Administration, RPG Processor, and BDDS configurations respectively. All data flows to/from the RDA via the RDA/RPG Gateway. The T1 DSX–1 formatted wideband data from the RDA enters the RPG via the I/O Panel then goes to the WAN B port of the Gateway. The Gateway ingests this data, converts it from analog to digital, and then does protocol conversion from HDLC LAPB (Link Access Procedure Balanced) to TCP/IP. From the 10BaseT LAN port of the Gateway, this data is forwarded to the RPG Processor via the LAN Switch. The PCI–B (Peripheral Component Interconnect) bus in the RPG Processor transfers data and addresses via the Advanced PCI Bridge which then transfers the data to the main CPU (Central Processor Unit). While data and protocol conversion processes are running in the Gateway, the control and monitoring of these, and the entire wideband physical link, is actually handled by the RPG's applications software. A communication manager, more commonly called a comm manager, provides this API (Applications Program Interface) between the Gateway and the Processor. This comm manager is called cm_atlas, which is designated as cm_atlas.Ø for logging purposes.

If the wideband link is provided by MLOS equipment, the fault alarms are received by the Short Haul Modem (UD70A19) which is a separate component within the cabinet.

The RDA status and control FBD is depicted in NWS EHB 6–510. The RDASC Processor is a minicomputer which operates under the executive control of the operating system. It runs the RDA Status and Control Applications Program CPCI 01 during normal operation and contains a CPU, a memory, a timing function, and a mass storage and archiving section. It communicates with the Programmable Signal Processor (PSP), the maintenance console, and RPG via the WBC Interface.

The WBC link transfers elevation slices of base data and RDA status to the RPG. It transfers commands and controls to the RDA from the RPG. It supports the synchronous, bidirectional, full duplex communications between the two physically separate functional areas of the WSR–88D.

The RDA side of the wideband link includes Digital Communications Units (DCUs) that are under the control of function 4, Handle Wideband Data, of CPCI 01. Direct memory access makes the high rate of data transfers possible.

Section 5−4. Functional Operation of Electronic Circuits

5−4.1 GENERAL

This section contains text, figures, and tables describing the functional operation of the WBC Group LRUs. References to COTS manuals are used in support of the MLOS equipment.

5−4.2 MLOS CABINET UD19, UD39 FUNCTIONAL DESCRIPTION

NOTE

COTS manuals that are not referenced are not valid and are not to be used for replacement, alignment, or initialization of LRUs.

5−4.2.1 Transceiver. For a functional description of the MLOS Transceiver circuits, refer to Table 5−1 for the applicable paragraphs of COTS manual NWS EHB 6–541–1.

5−4.2.2 Minimaster UD39A18 (RPG Only). For a functional description of the MLOS Minimaster Alarm Station circuits, refer to Table 5−1 for the applicable paragraphs of COTS manual NWS EHB 6–541–1.

5−4.2.3 Remote Station FAS. For a functional description of the MLOS Remote Station FAS circuits, refer to Table 5−1 for the applicable paragraphs of COTS manual NWS EHB 6–541–1.

5−4.2.4 Modem. For a functional description of the modem, refer to NWS EHB 6–541–1, Index H.

5−4.2.5 24 Vdc Power Supply. For a functional description of the MLOS 53−24 Power Supply circuits, refer to COTS manual NWS EHB 6−541–1 or NWS EHB–541–3, Index G.

Table 5−1. RDA/RPG MLOS Cabinet Assemblies COTS Manual Reference Index

Unit Designation	Nomenclature	NWS EHB 6–541–1 or 6–541–3 Index Letter/Document Number
UD19/UD39	MLOS Transceiver (nonmultiplexed)	B/LR4−2000 Radio DI, Issue 2A, Sections IA, IIA, IIB, IVA, B2, B3, C1, C2, D3, and D4.
	LR4−2000	D/SD−97526, Option 001 D/SD−97527−M2, Option 001−Nonstandard configuration, if in the future, transmitter B is installed, refer to ECN−C5425 (Index E) to undo the modification that disables the transmitter B alarms.
A1	Bandpass Filter Assembly	TBD
A1FL1 and FL2	Bandpass Filter, Receiver	C/TI−94517, D/SD−94517, Option 4
A2	Antenna Coupler	C/DI−96878, D/SD−96878, Option 1
A3	Transmitter	D/SD−96881−M2, Option 1

Table 5–1. RDA/RPG MLOS Cabinet Assemblies COTS Manual Reference Index – Cont

Unit Designation	Nomenclature	NWS EHB 6–541–1 or 6–541–3 Index Letter/Document Number
	Transmitter	C/TI–95185–M2, D/SD–95185–M2, Options 1 and 4
	Transmitter	C/TI–97262, D/SD–97262, Option A
	Transmitter	C/TI–97654, D/SD–97654, Option 1
	Transmitter	C/TI–94517, Option 4
	Transmitter	C/TI–97796, D/SD–97796, Option 1
	Transmitter	C/TI–97528, D/SD–97528, Option 1
A3CR1	Transmitter, crystal	C/TI–97369–M2, D/SD–97369–M2
A4	Meter/Alarm Panel	C/TI–97246–M2, D/SD–97246–M2, Option 1
A5	Modulator	C/TI–97529–M2, D/SD–97529–M2, Option 3
A6	Jackfield Panel	D/SD–97252, Option 2
A7	Demodulator	C/TI–97530–M2, D/SD–97530–M2, Option 4
A8	Power Supply Panel	C/TI–97018, D/SD–97018, Option 3
A9	Fuse Panel	C/TI–97256, D/SD–97256, Option A
A10	Receiver	D/SD–96882–M2, Option 1
	Receiver	C/TI–95185–M2, D/SD–95185–M2, Options 1 and 4
	Receiver	C/TI–97361, D/SD–97361, Option 1
	Receiver	C/TI–97324, D/SD–97324, Option Y
	Receiver	C/TI–97271, D/SD–97271, Option A
A10CR1	Receiver, crystal	C/TI–97369–M2, D/SD–97369–M2
A11	Orderwire	C/TI–97274–M2, D/SD–97274–M2, Option 1
A11A1	Handset	D/SD–97652
A18	Minimaster, RPG only	F/Section 1, Section 2, pages 2–8 thru 2–10, Section 3, and Section 4
A18F1	Fuse, 1/2A GMT	Recommend addition to LRU list, PN 160104–000, Type C
A18A1	Short Haul Modem	6–541–1, Index H

Table 5–1. RDA/RPG MLOS Cabinet Assemblies COTS Manual Reference Index – Cont

Unit Designation	Nomenclature	NWS EHB 6–541–1 or 6–541–3 Index Letter/Document Number
A19	Remote Station FAS	F/Section 1, Section 2–8, 2–10 thru 2–15, Section 4–1, 4–2.a, 4–2.d, Appendices A and C
A19F1	Fuse, 1/2A GMT	Recommend addition to LRU list, PN 160104–000, Type C
A38PS1	Power Supply	G
A39	AC outlet	TBD

Section 5–5. Functional Operation of Software Interfaces

5–5.1 GENERAL

This section details the software functions controlling wideband data transmission.

5–5.2 SOFTWARE CONTROL FUNCTIONAL DESCRIPTION

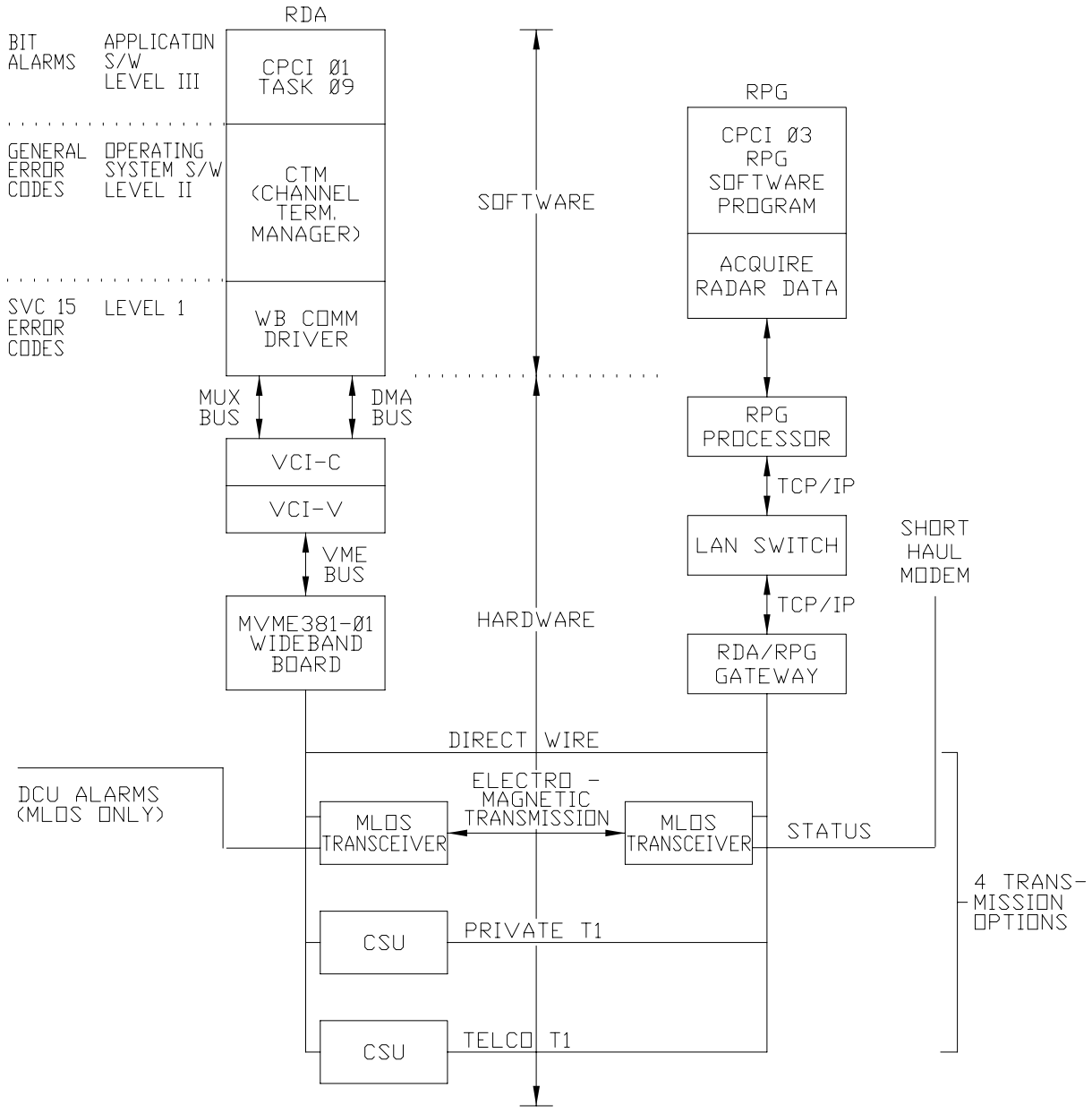
The wideband link, which is a X.25 LAPB transmission, can send data in a full duplex mode (i.e., simultaneous transmission in both directions) at the rate of 1.1 Mbps. with 25% channel capacity for protocol overhead and bad block re–transmission. Figure 5–10 shows data transmission in terms of software and hardware elements. Level III wideband alarms result from tests initiated by the application software on either end of the link. Up to 4 Kbytes of information is prepared and stored into buffers by the RDA Application Software CPCI 01 Handle Wideband Function. The OS CTM then formats the data adding necessary protocol overhead to the basic information. A WBC software driver then passes the formatted message via the MUX and DMA busses to the VCI boards, and then to the Wideband Board MVME 381–01. The wideband board converts the parallel data transfer via the Private MUX bus to a serial bipolar data format known as DSX–1.

On the RPG side of the wideband link, a similar process as described above is reversed until the transmitted data is resident in the Acquire Radar Data function of RPG Applications Software Program CPCI 03. The task of CPCI 03 is to convert the base data into weather products. The processing of transmitted data is monitored and will result in the following types of alarms:

- General status codes (Level II) output by the CTM, mostly describe software status
- SVC 15 errors (Level I) output by the WBC driver, mostly describe hardware errors
- DCU alarms (Level I) output only by the MLOS alarm units to the associated system and then passed directly to the application software

Figure 5–11 is a WBC transmission X.25 LAPB protocol frame. The first byte is a SYNC flag, the Address (A) and Control (C) fields follow, and the Information (I) field has the contents of up to 4K buffers. The Frame Check Sequence (FCS) field determines if a frame is accepted or will require retransmission. The frame ends with another SYNC flag. The idle sequence (7E) is transmitted between frames to synchronize the receive sides PLL to reconstitute the transmitter clock on the receiver end. If any field has more than five consecutive 1's, the transmission end inserts an extra 0 into the data which is removed on the receiving end of the link. This ensures that the transmitted data always has at least one 0 for every five 1's which meets the 1's density requirement of a T1.

Figure Figure 5–12 shows the possible wideband users. Line 1 is a normal dedicated RPG LINK which exists in all configurations. An option is available in the RDA to send wideband base data to a USER LINK with a separate VCI–Wideband board on Line 2.



NX1705

Figure 5–10. Wideband Communications Data Transmission

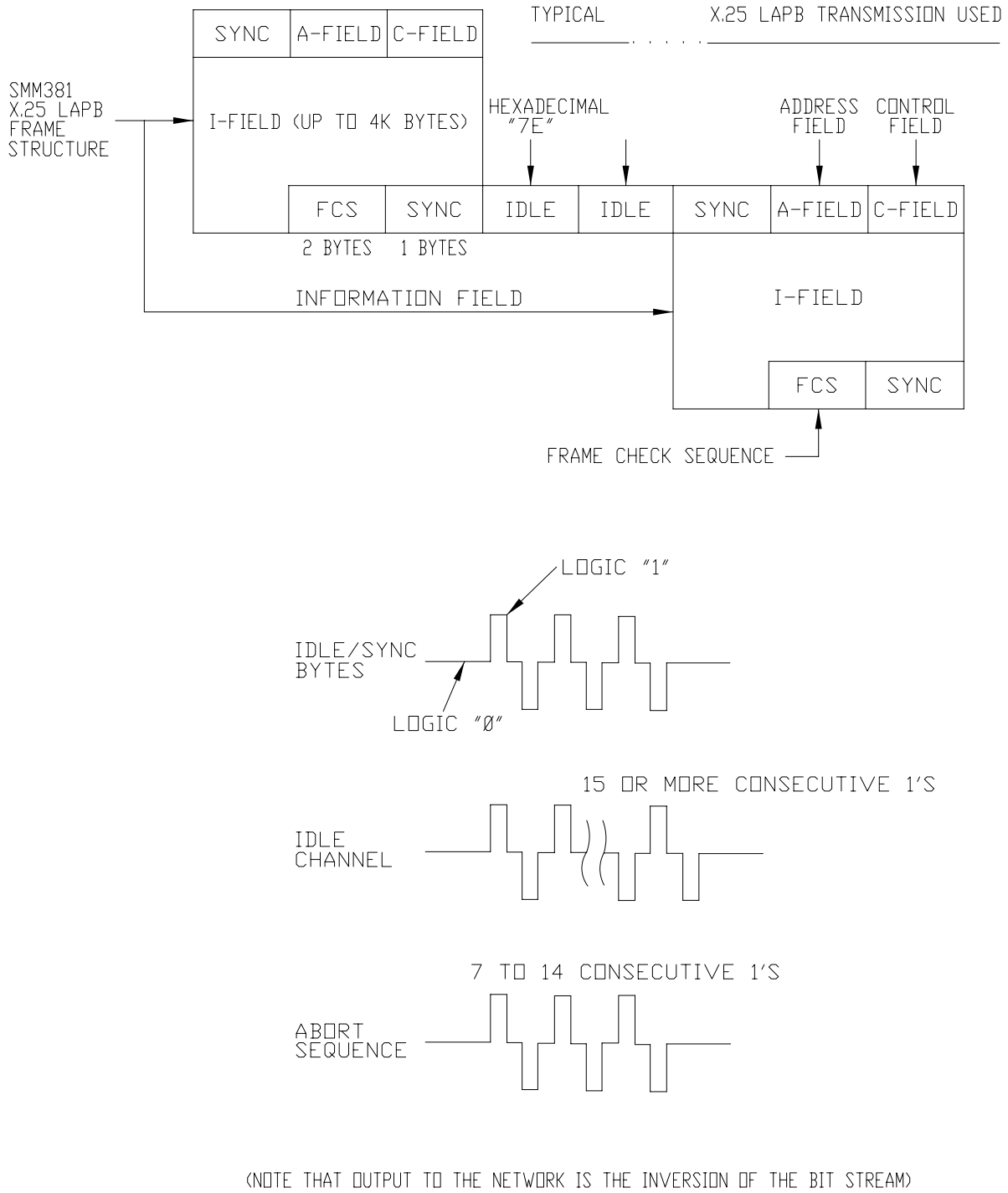


Figure 5–11. RDA VME Wideband Board (Motorola VME 381–01) Frames

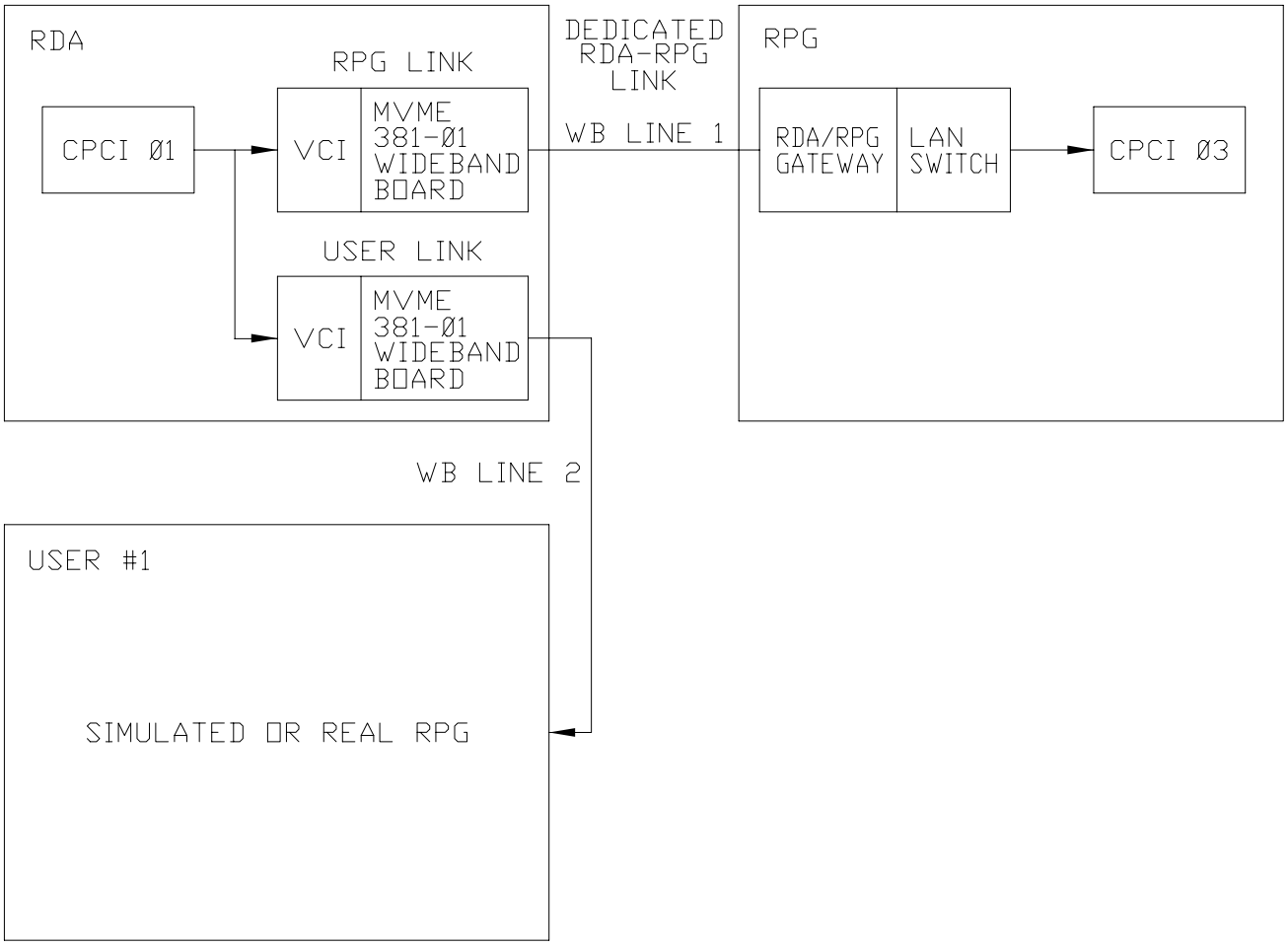


Figure 5–12. Possible Wideband Communications Users

5–5.2.1 Link Initialization and Alarms. As the RDA or RPG software is initialized, connect messages appear. The RPG or USER LINK INITIALIZATION ERROR alarms appear if an RPG or USER link initialization error occurs. If a link initialization sequence times out, the INIT SEQ TIMEOUT – RESTART INITIATED alarm appears and the RDA restarts in an attempt to reinitialize the link. Once the link is successfully initialized, unexpected disconnects cause a CONNECT PENDING message to appear until the link re–connects. The RDA also monitors the DCU status word and communication line statistics and includes this information in the RDA Performance Data. If a CTM or SVC 15 ERROR occurs, or the DCU status word indicates an alarm condition, the appropriate alarm is displayed from the following list:

- RPG/USER LINK – GENERAL ERROR
- RPG/USER LINK – SVC 15 ERROR
- RPG/USER LINK – MAJOR XMTR ALARM
- RPG/USER LINK – MAJOR RCVR ALARM
- RPG/USER LINK – MINOR ALARM
- RPG/USER LINK – FUSE ALARM
- RPG/USER LINK – MAJOR ALARM
- RPG/USER LINK – REMOTE ALARM

Sufficient buffering provides full recovery from a link break of up to two seconds. To avoid a write queue overflow during a link fade out, the subfunction sizes each write queue to avoid any data loss.

Within the RPG Applications Software is the functionality to support and control the Wideband communications link. Adaptation data for each site includes the type of link, the timeout duration, and number of retries for establishing a link. A user can start/stop communications with a WBC link Enable/Disable command at the MSCF. The Applications Software also monitors the status of the WBC interface and reports both hardware and software status to the MSCF. This check includes a software loopback test that is done either in response to a command from the MSCF under Local Control, automatically upon initialization, or on a periodic basis as determined within the adaptation data. A test pattern is sent from the RPG to the RDA and back. If it doesn't come back within the time limit, an RPG/USER LOOP TEST TIMED OUT alarm is seen. If the transmitted and received patterns don't match, then an RPG/USER LOOP TEST VERIFICATION ERROR alarm is seen. If an RDA status message isn't received within the time limit, a SEND WIDEBAND STATUS TIMED OUT alarm is seen. The type of alarm determines if it's displayed at the MSCF. The link is operational if the bit patterns match and are received within the defined time frame.

On MLOS links, the FAS sends status to the RPG when a COS alarm occurs. If the status of a remote station indicates a STATION FAILURE, this inhibits reporting of any alarms for that station until a Communications Restored status is received. If a P16 alarm is reported for the RPG remote alarm unit, the System Monitor Subfunction receives the name of MINIMASTER.

5–5.2.2 Wideband Communications Interface Functional Description. WBC data interfaces are functional elements in both the RDASC and RPGPCA. The RDASC has a VME bus to Concurrent

Interface (VCI) and VME wideband board MVME381−01. The RPGPCA has an RDA/RPG Gateway, LAN Switch, and Sun Processor. Both the RDA and RPG sides of the wideband interface function are shown in illustrations in the NWS EHB 6–510 and 6–525, respectively.

5−5.2.3 VME Bus to Concurrent Interface. The RDA VCI consists of two cards, the VCI−C and VCI−V, and a cable connecting the two cards together. The VCI−C converts Concurrent Processor signals to cable bus signals. The VCI−V converts VME bus signals to cable bus signals. The common point of connection between the VCI−C and VCI−V is the cable bus, which is a 50−wire pair cable. The VCI−C has an on−board processor to perform the following functions:

- MUX bus command processing
- Interrupt queue handling
- VME Interface Chip (VIC) initialization
- Power−up testing
- DMA loop testing

An 64K x 8 EPROM is used to store the power−up test code, the VCI operational code, and the LSU load code. A 2K x 8 Electrically Erasable PROM (EEPROM) stores the configuration information at power down. For program and data storage, 128 Kbytes of Static RAM (SRAM) are used. The CPU directly accesses the VME and DMA busses. The VME bus accesses are done with an external page map memory table. The DMA bus fits into the allocated memory space (256 Mbytes). DMA bus access allows the CPU to aid in diagnostics. Conflicts of bus connection requests are arbitrated and queued. The VCI−C also has cross−bar switches connecting the following busses together:

- DMA bus to local CPU bus
- DMA bus to cable bus
- MUX bus to local CPU bus
- MUX bus to cable bus

The VCI−V card has an LSI VIC (VME Interface Chip) which is an industry standard device and handles all the VME bus functions. The following are among the many functions it provides:

- VME bus master interface
- VME bus slave interface
- VME bus interrupt handler
- VME bus system controller
- Local CPU interface
- Direct driving for A1−A7 and D0−D7

Each of these functions is controlled by the local CPU on the VCI−C card. All VME signals are generated by the VIC. All support circuitry and components for the VIC's addressing and buffering

are provided by the VCI–V card. The cable bus interface allows the two VCI cards to communicate with each other and pass data directly between the VME bus and the Concurrent busses.

5–5.2.4 VME Wideband Board (Motorola VME 381–01). See Figure 5–13 and Figure 5–14. The RDA Motorola VME 381–01 is a VME board in the VME chassis. It provides the following functions and full–duplex communications between the VCI and wideband transmission medium.

- Formatting data to conform to CCITT X.25 LAPB protocol
- Providing T1 framing and error checking
- Generating T1 clock for transmitting data to the T1 links
- Recovering T1 clock from received data
- Supplying testing and diagnostics and operational status for front panel displays
- Converting data to DSX–1 bipolar bit stream for output to the T1 links

The DSX–1 signal is specified in the AT&T Technical Advisory #34, which defines the pulse shape, amplitude, and pulse rate into a 100 ohm load. (See Figure 5–15.) The bipolar output code from the Motorola VME 381–01 board is a serial code in which a zero (0) bit is defined as 0.0 volts for a bit period. A one (1) bit is defined as either a negative or positive pulse for a 50% duty cycle in the same period. Each time a one (1) bit is transmitted, it is the opposite polarity of the pulse previously transmitted. This is called the AMI, and the violation is known as bipolar violation.

DSX–1 requires a minimum of 12.5% average ones (1) with a maximum of 15 consecutive 0's. In CCITT X.25 protocol, hexadecimal 7E is used as the start and end flags and as the idle code. To differentiate real data from this code, a bit stuffing technique is used. A 0 bit is inserted after five consecutive 1's are encountered anywhere between the start and end flags of the frame. With this scheme, the stream is guaranteed not to have more than 6 continuous ones (but may have more than 15 zeros). Inverting the serial bit stream guarantees no more than 6 continuous zeros and meets the 12.5% average ones requirement. Once received, DSX–1 data are inverted for proper interpretation.

Transmission over the DSX–1 interface uses a shielded twisted pair cable to the RDA/RPG Gateway in the RPG (hardwired). A longer cable (up to 3,000 feet) can be used with an RDA CSU to the Gateway in a different building (Private T1), or a leased T1 line (Telco T1), or an MLOS transceiver.

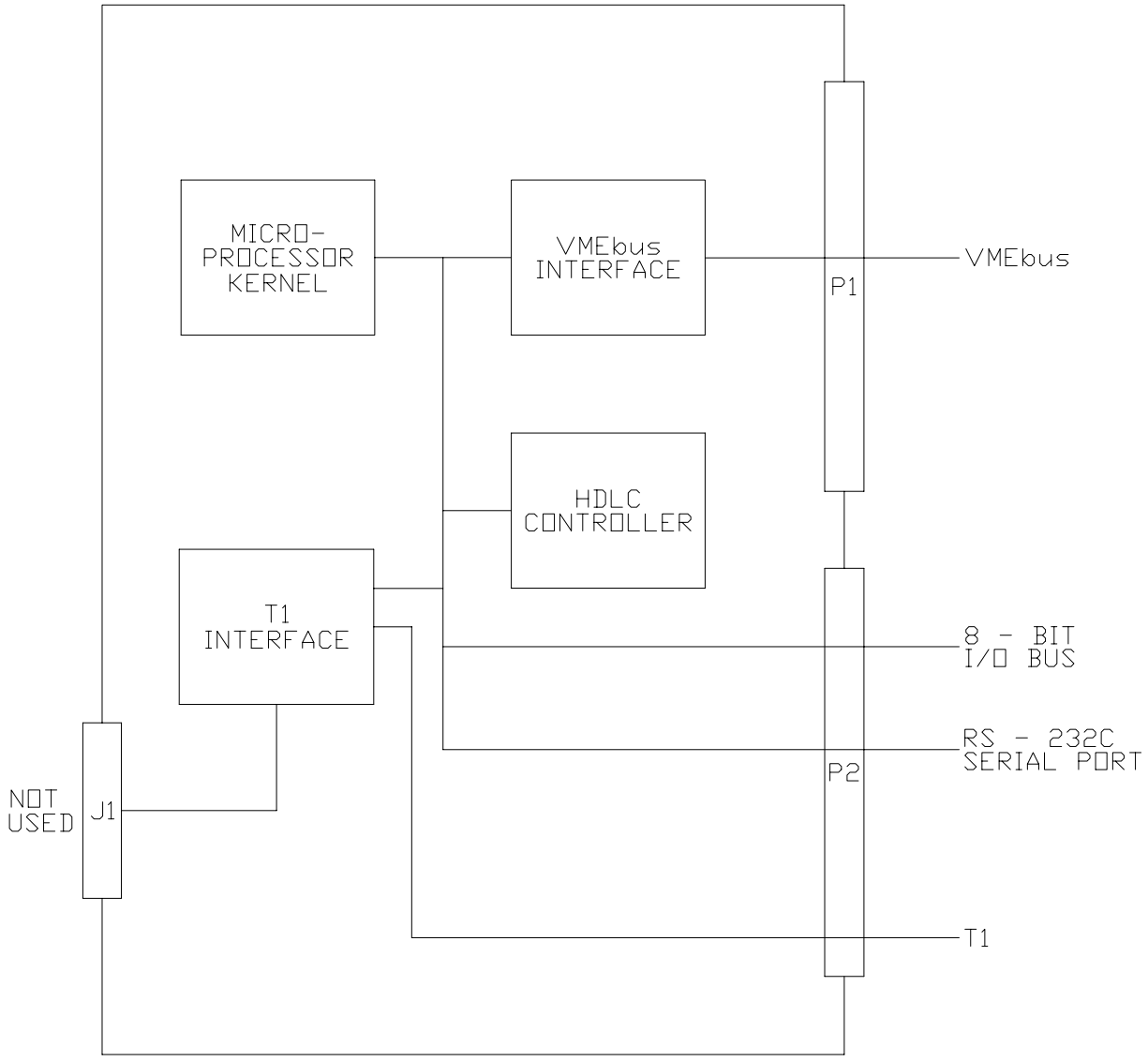


Figure 5–13. VME Wideband Board (Motorola VME 381–01) Functional Block Diagram

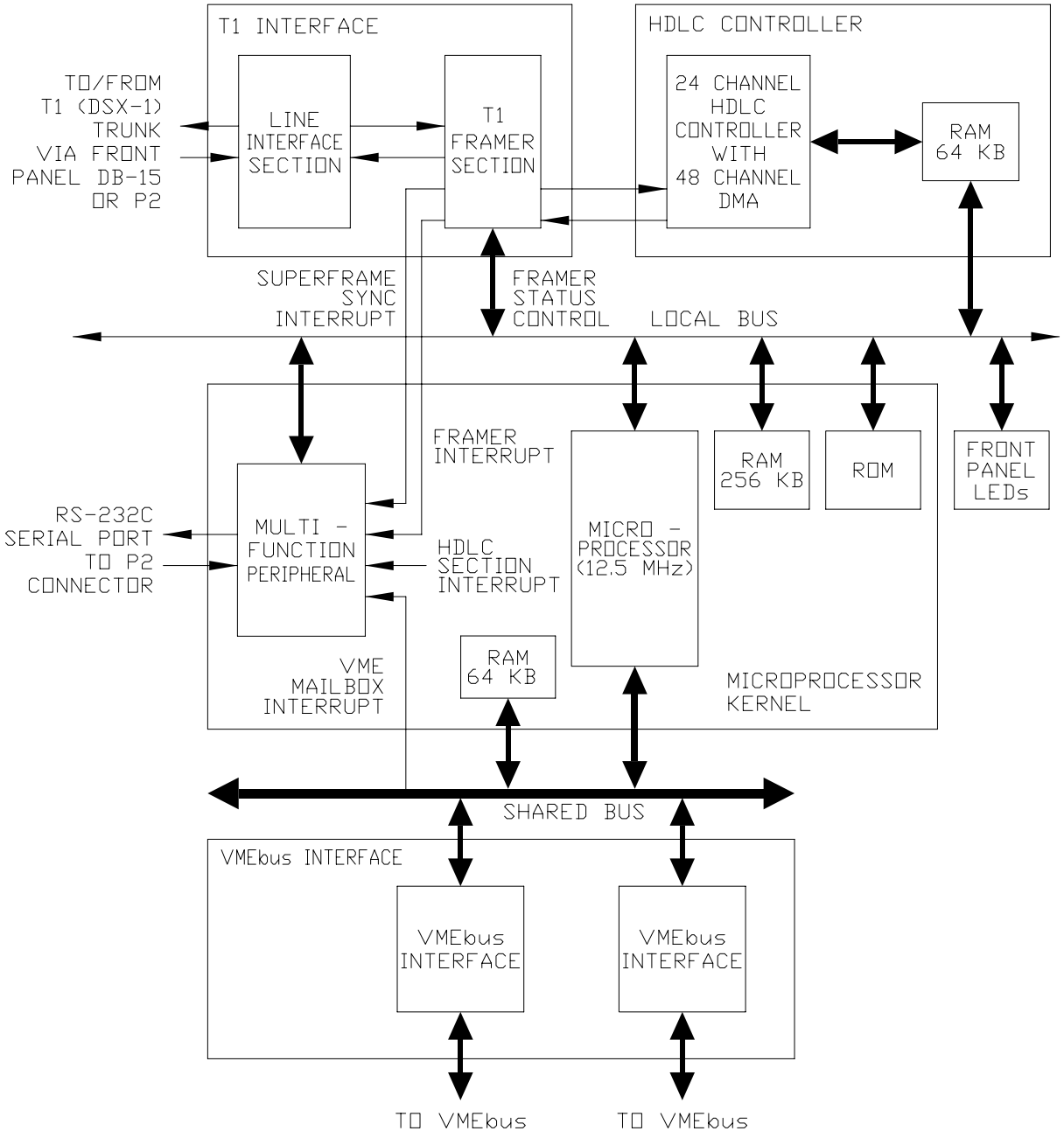


Figure 5–14. VME Wideband Board (Motorola VME 381–01) Detail Block Diagram

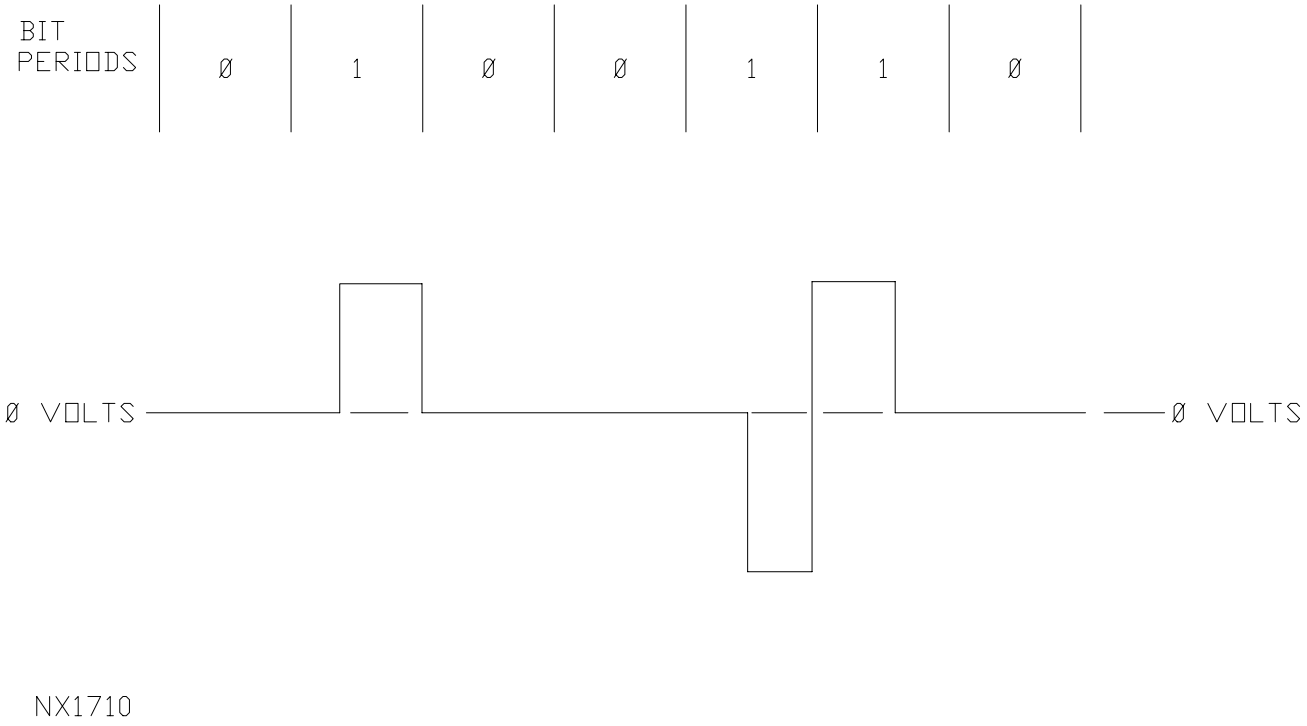


Figure 5−15. VME DSX−1 Bipolar Code

5–5.2.5 Product Generation Processor. The interaction between the hardware and software within the RPG processor is depicted in NWS EHB 6–525. (Refer to that manual for the alarm, data communications, and the expansion for base data interfaces.) The PCI–B bus transfers data and addresses via the Advanced PCI Bridge which then transfers the data to the main CPU.

Alarms are processed by the RPG. MLOS alarms travel through the Short Haul Modem to the serial card and then to the main CPU via the PCI–B bus and the Advanced PCI Bridge.

5–5.2.6 RDA Status and Control Processor. The link between the hardware and software in the RDASC is shown in NWS EHB 6–510. The PSP/RDASC interface directs data/control transfer between the I/O controller in the PSP (not shown), and the MUX and DMA busses in the RDASC processor. The PSP Interface (PSPI UD5A12A15), is part of the PSP/RDASC interface and links the PSP–IOC to the Selector Channel (SELCH) which is also part of the PSP/Interface. The SELCH links the PSPI to the DMA and MUX busses in the RDASC processor and has direct memory access providing a quick means of communication between an I/O device controller and memory via the DMA bus. An I/O device controller can only respond through its SELCH via a private MUX bus.

The WBC interfaces contain the VCI and the two MVME381–01 boards. It is how base data and status information is sent from the RDA to the RPG. The link sends data in full duplex mode. A typical radial transmission from the RDA to the RPG is described in the following paragraphs.

Up to 4 Kbytes of information is prepared and stored into buffers by the RDA Application Software CTM which formats the data adding the necessary protocol overhead to the basic information. A software driver then passes the formatted message via the MUX and DMA busses to the VCI boards. Halfword transfers are then done over the private VME bus to the wideband board which converts the parallel data transfer from the private VME bus to serial DSX–1 bipolar data format.

5–5.2.7 MLOS Status Lines.

5–5.2.7.1 Functional Description. An FAS is built into each MLOS link to transmit data between the RPG and RDA. This paragraph describes the characteristics of the FAS and the Fault Alarm data that is sent from the MLOS station nearest to an RPG site to the RPG computer.

An MLOS link is composed of station at the RPG and the RDA. See Figure 5–16.

A Badger 1725 remote fault sensing alarm unit is located in each of the stations in the MLOS link. The remote units sense 16 alarm signals in each station.

A single Badger 481 Minimaster control unit is located in the MLOS RPG station.

The minimaster successively polls each of the remote units in the MLOS link, via the MLOS orderwire channel, and reports, via a serial RS232 RAS line to the RPG computer, any alarm changes that are detected in the link.

Serial ASCII data is transmitted at any time via the Minimaster at a 600 baud rate over this data line when an alarm COS is detected by the remote station FAS. No flow control is used, and the FAS link is a one way reporting link.

Since the FAS system only reports a change in alarm status, a 30 sec +20% alternating alarm is induced into channel 16 of each station to continuously exercise the system. These alternating alarm

signals will be recognized at the RPG computer as normal operation, and not reported as an alarm condition. If these signals do not appear from each station in the link, an appropriate alarm condition will be reported.

The output of the Minimaster is an RS232 serial link which has a transmission distance limit of 50 feet. To increase this distance, a short haul modem (ME721B–M), Figure 5–17, is plugged into the Minimaster output connection which converts the RS232 signals to RS422 which can be transmitted over a mile to the RPG. The same modem at the RPG changes the RS422 signals back to RS232 before sending them to the interface card in the RPG computer.

5–5.2.7.2 FAS Station and Alarm Designators. See Figure 5–16. In an MLOS link configuration, the RPG remote station is designated D01 and the RDA remote station is designated D02. Actual message formats printed out for each station are D01 S001 and D02 S002. The S designators are redundant for NEXRAD applications.

Each remote station senses 16 alarm signals, designated P01 – P16 that are defined in Table 5–2 and indicate the functions of the radio configuration at an RPG or RDA station of an MLOS link. P16 is an on–line alternating 30 second test signal.

5–5.2.7.3 FAS Message Format. Table 5–3 shows the types of messages that may be transmitted from the Minimaster to the RPG computer.

The messages are sent in serial RS232 ASCII code. There can be 80 ASCII characters per line of transmission. The maximum number of alarm message lines that can be transmitted is 64. The transmission rate is 600 baud.

Message Format A appears upon power turn on or loss of power and reapplication of power at an RPG MLOS station.

Message Format B1 appears if there is a station failure in the MLOS link. The station numbers may be D01 or D02 depending on the failed station. When the station failure is corrected, message B2 is transmitted.

Message Format C1 is transmitted when an alarm (P01 through P15) is detected at one of the stations in the link. C2 is transmitted when the alarm is cleared.

Message Format D1 appears as an alarm for 30 seconds + 20% for alarm P16 from each station (D01 and D02) in the MLOS link, followed by message D2 as an alarm for 30 seconds + 20% for alarm P16 from each station. This is normal operation and is detected as such by the RPG CPU. The sequence may be random.

Failure to receive the alternate 30 second signal from the sixteenth channel (P16) of each station (D01 and D02) in a link will constitute a link FAS system failure.

To eliminate transient alarms produced during power restoration at any station, do not acknowledge any alarm that has been produced and reset to normal for a period of 1 minute after the receipt of any power fail reset message. Do not perform the checks on channel 16 during this period.

5–5.2.7.4 FAS – RPG Interface Connections. Figure 5–18 shows the signal flow (and connections) between the FAS Badger Minimaster and the Serial card in the RPG processor. The Serial card must provide the power for the short haul modem located in the RPG cabinet.

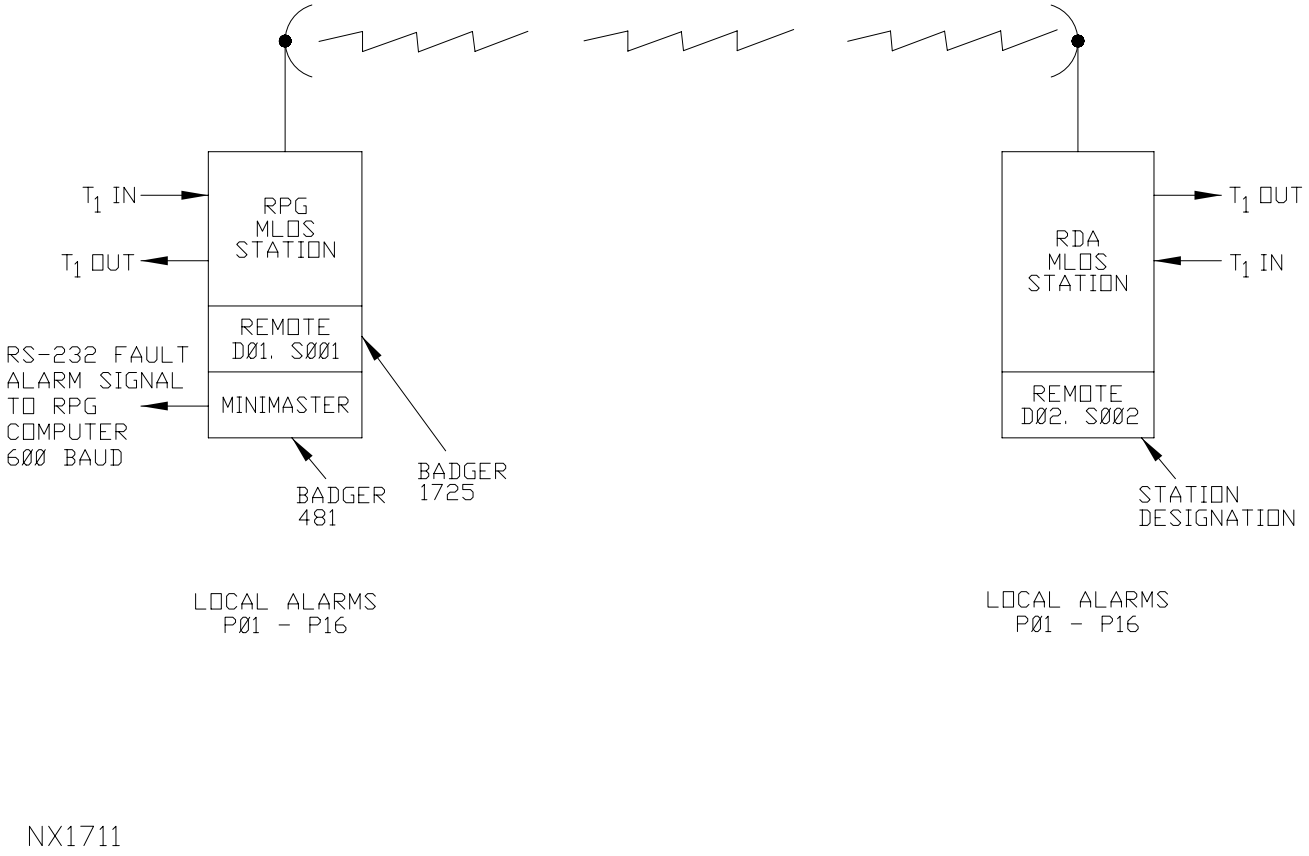
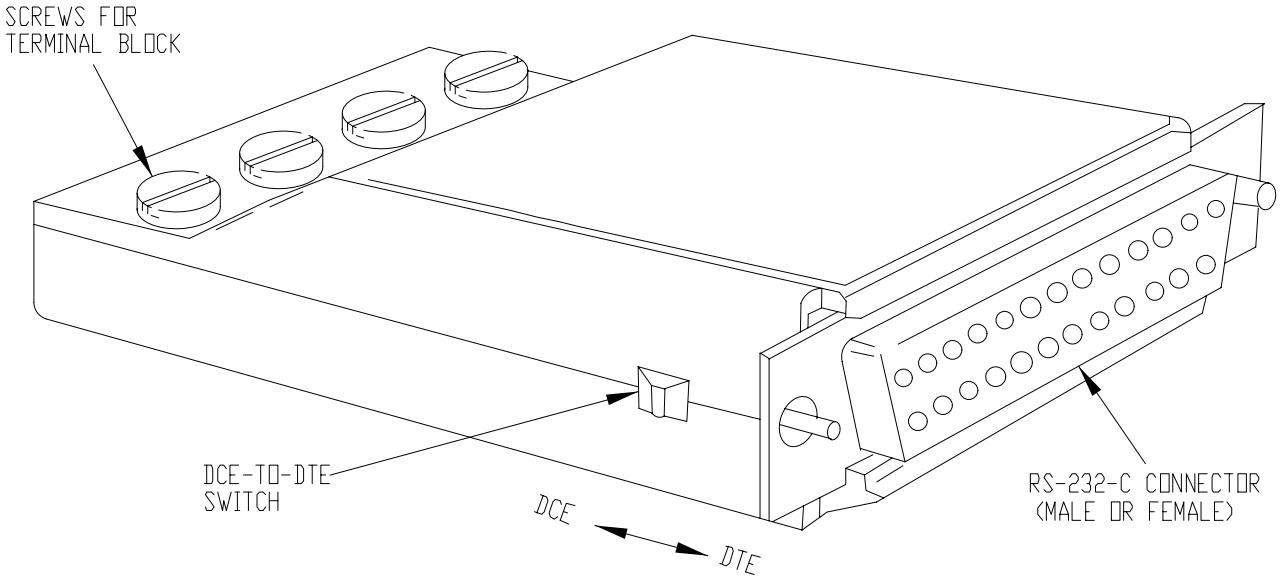


Figure 5–16. MLOS Link Configuration



TRANSMISSION DISTANCES (IN MILES)				
DATA RATE (BPS)	26 GAUGE (Ø.15 MM)	24 GAUGE (Ø.2 MM)	22 GAUGE (Ø.4 MM)	19 GAUGE (1.Ø MM)
11Ø	15.Ø	18.Ø	22.Ø	3Ø.Ø
3ØØ	1Ø.Ø	12.Ø	15.Ø	25.Ø
12ØØ	6.Ø	7.5	9.Ø	15.Ø
24ØØ	4.5	5.5	7.5	11.Ø
48ØØ	3.5	4.5	5.5	7.Ø
96ØØ	2.2	3.2	4.Ø	5.Ø
192ØØ	1.Ø	1.2	1.5	2.Ø

NX1712

Figure 5–17. Short Haul Modem

Table 5–2. MLOS Remote Station FAS Alarms

MLOS Station Configuration	CHAN 1	CHAN 2	CHAN 3	CHAN 4	CHAN 5	CHAN 6
RPG and RDA NON SPACE DIVERSITY	XMTR Summed Alarm	RCVR Summed Alarm	MOD All 1's Alarm	DEMOD All 1's Alarm	Spare	Spare

Channel	Alarm Description
7	Unauthorized Entry
8	Utility Power
9	Generator Power
10	Converter Output Voltage
11	Battery Voltage
12	Transfer Switch in Utility Position
13	Low Fuel Level
14	Transfer Switch Not in Automatic
15	Aircraft Warning Light Failure

Table 5–3. MLOS Remote Station FAS Message Formats

This message is output at power on/off and return of power at an RPG station in an MLOS link.

	Date	Time	Station Number	Message
A 1	24–July–89	11:49:16	Database Verified	
2	24–July–89	11:49:13	D01 S001	Power Fail Reset

This message is output for a station (D01 or D02) failure and a return to operation.

	Date	Time	Station Number	Message
B 1	19–Jun–89	6:18:37	D01 S001	Station Failure COS
2	19–Jun–89	6:18:54	D01 S001	Communications Restored

This message is output for an alarm (01 – 15) that occurs at either station (D1 or D2) in an MLOS link. 01 – 15 are major alarms.

	Date	Time	Station Number	Alarm Number	Alarm Type	Status Change
C 1	24–July–89	9:11:37	D01 S001	7	Major Bistate	COS ON ALARM
2	24–July–89	9:11:54	D01 S001	7	Major Bistate	COS OFF NORMAL

This message is output from each station (D1 and D2) in the MLOS link. The status is changed every 30 seconds ±20% and is used for a continuous on line FAS system check.

	Date	Time	Station Number	Alarm Number	Alarm Type	Status Change
D 1	24–July–89	9:11:37	D01 S001	16	Minor Bistate	COS ON ALARM
2	24–July–89	9:11:54	D01 S001	16	Minor Bistate	COS OFF NORMAL

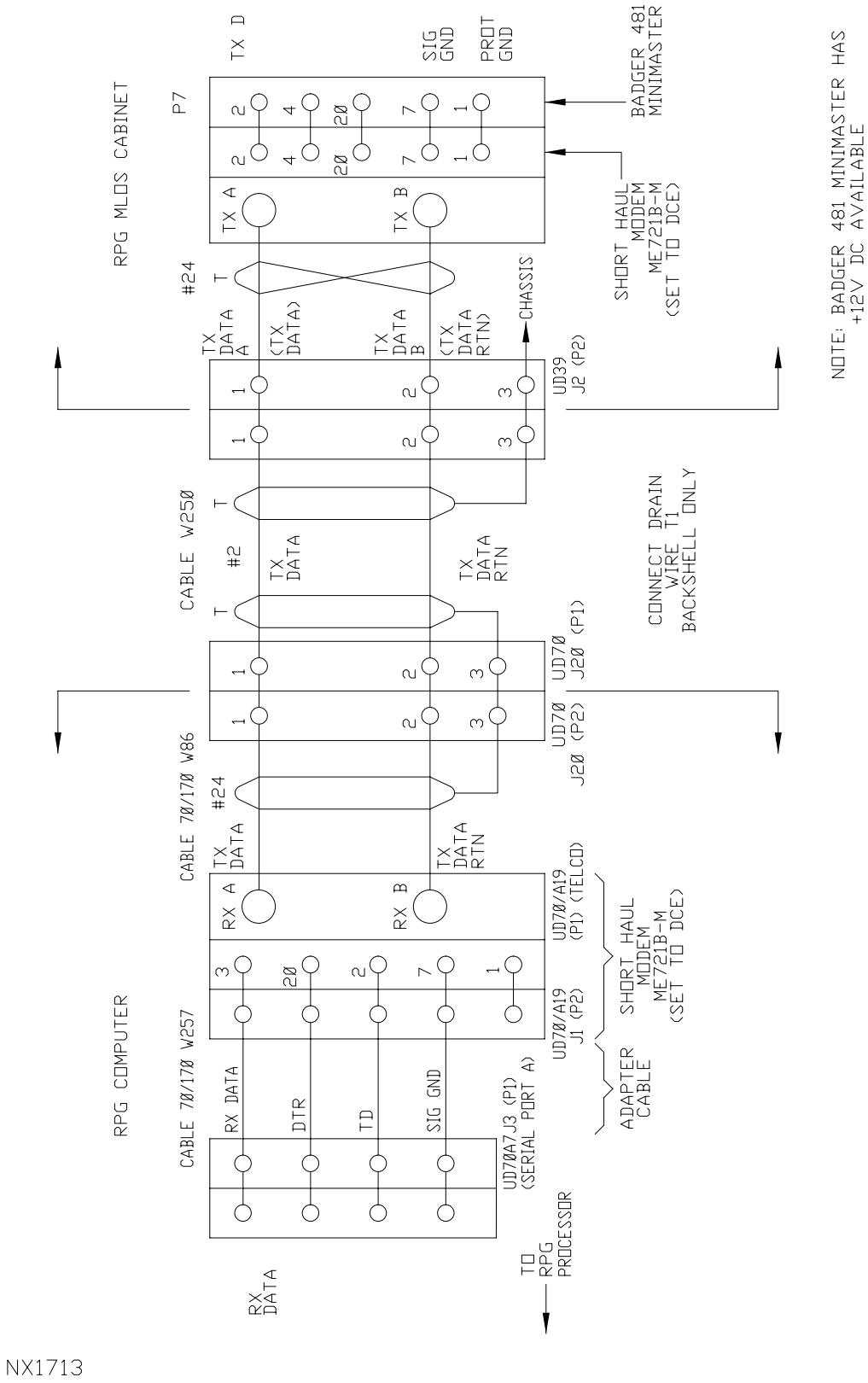


Figure 5–18. FAS – RPG Interface Connections

Section 5–6. Functional Description of CFE RPIE

5–6.1 GENERAL

This section describes the RPG/RDA and their RPIE. The RPIE system consists of four major subsystems which provide the independent functions of the following:

- Power generation and distribution
- Heating, Ventilation and Air Conditioning (HVAC)
- Fire detection and suppression
- Security and temperature sensing

5–6.2 POWER GENERATION AND DISTRIBUTION

The power generation and distribution subsystem which supplies power to the RDA generator shelter and RDA equipment shelter power distribution panels for distribution to the RDA site equipment including the RDA MLOS shelter is detailed in NWS EHB 6–550. This subsystem operates in the automatic mode for power generation and portions of power distribution. Power distribution to individual equipment must be initially applied manually utilizing the procedures in equipment manuals.

5–6.2.1 RDA MLOS Shelter Power Distribution. The RDA MLOS shelter receives 120/208 Vac at circuit breaker CB1 (Phase A) and CB3 (Phase C) from the RDA equipment shelter Power Distribution Panel (PDP) #2 CB24 and CB26. Neutral and ground are jumpered together in the PDP. Figure 5–19 depicts the RDA/RPG PDP.

5–6.2.2 RPG MLOS Shelter Power Distribution. Power generation for the RPG shelter is site selective; however, the internal distribution is identical to the RDA PDP.

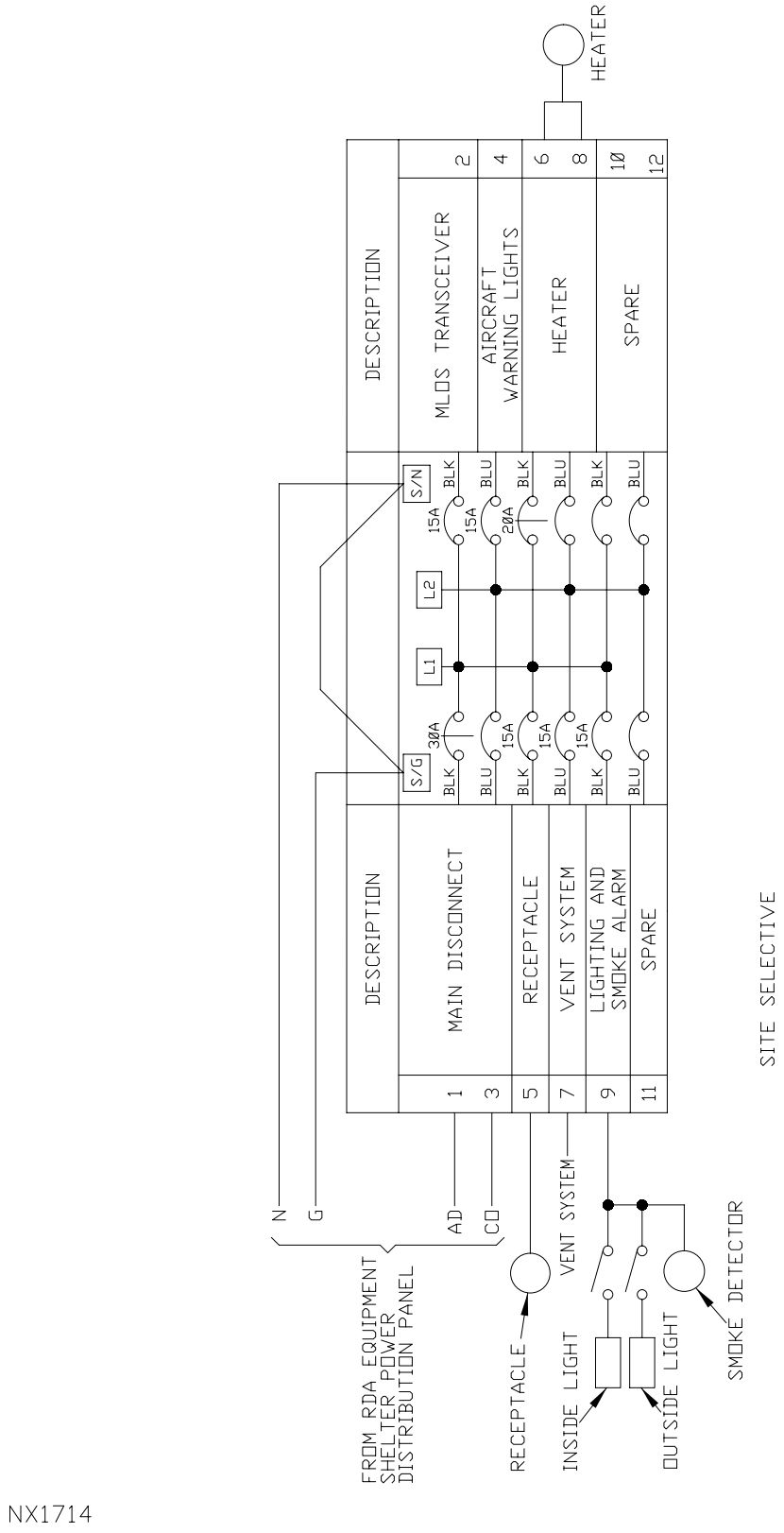


Figure 5–19. RDA/RPG MLOS Shelter PDP

5–6.3 HEATING, VENTILATION, AND AIR CONDITIONING

The HVAC subsystem provides heating and ventilation for the MLOS shelters. (See Figure 5–20.) Major HVAC components consist of the following:

- RDA/RPG Shelter
- Exhaust fan with motorized damper assembly
- Intake motorized damper assembly
- 1.5 kW heater
- Ventilation thermostat
- Heater thermostat

5–6.4 FIRE DETECTION AND SUPPRESSION SUBSYSTEM

This subsystem provides fire detection for the RPG/RDA shelter. The MLOS shelter contains a portable fire extinguisher and ionization smoke detector which is connected to the remote station FAS. A smoke alarm is sent via the MLOS link to the RPG.

5–6.5 SECURITY AND TEMPERATURE SENSING SUBSYSTEM

This subsystem provides security and environmental data for the RPG/RDA shelter. The shelter door contains a magnetic contact which is connected to the remote station FAS.

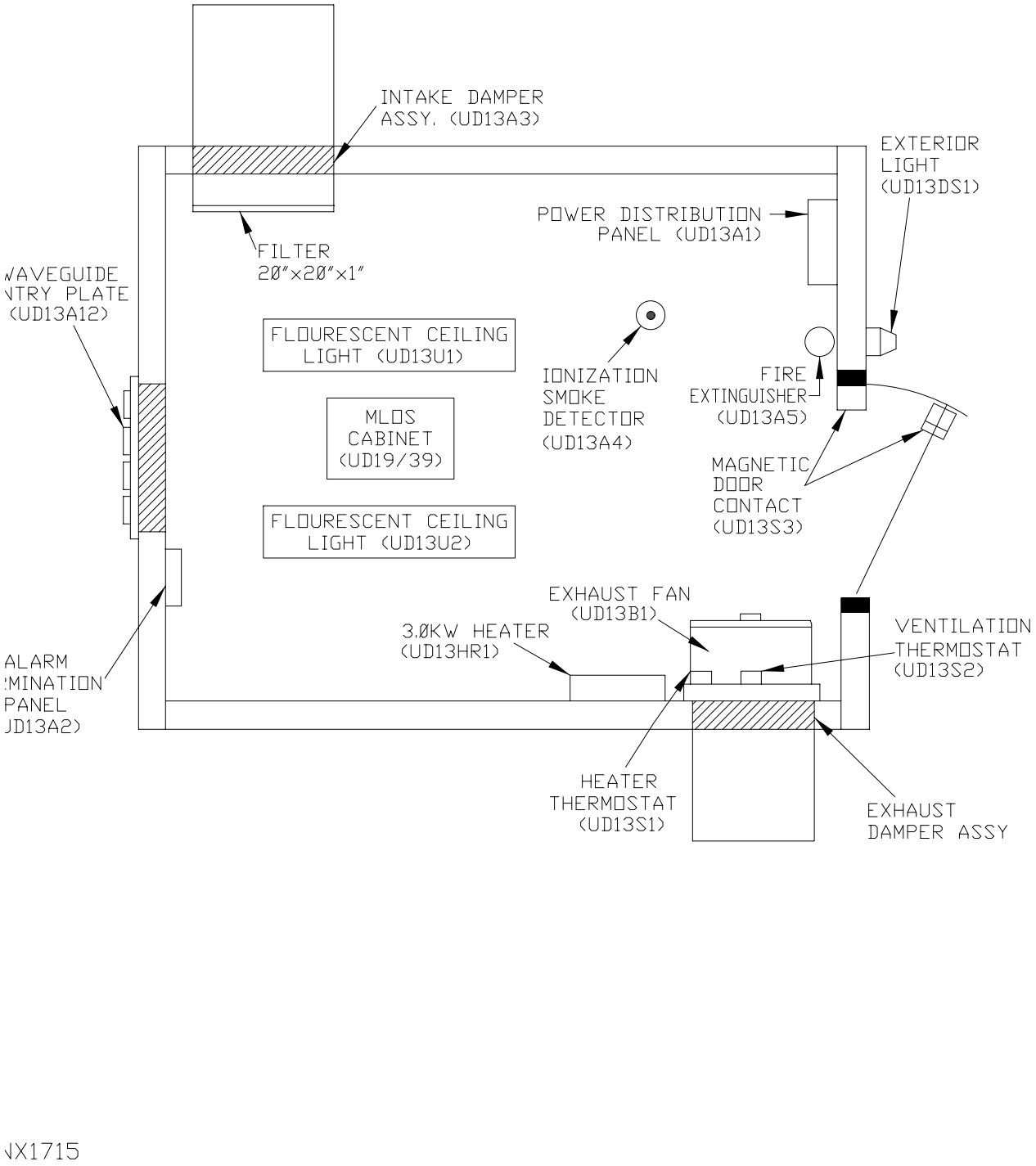


Figure 5–20. RDA/RPG MLOS Shelter UD13 RPIE Configuration

CHAPTER 6

MAINTENANCE

Section 6–1. Introduction

6–1.1 GENERAL

This chapter gives an introduction to the WSR–88D on–site maintenance activities, and a general description of the WSR–88D site maintenance concept. It is organized to provide rapid identification and location of the maintenance data required to implement the field maintenance activities, and contains the following sections:

- Section 6–1. Introduction
- Section 6–2. Preventive Maintenance
- Section 6–3. Primary Fault Isolation
- Section 6–4. Secondary Fault Isolation
- Section 6–5. Replacement and Setup Procedure
- Section 6–6. Alignments and Adjustments

The purpose and use of the data and procedures is described in each of these sections. The following paragraphs explain the purpose of Sections 6–2 through 6–6.

6–1.1.1 Maintenance Concept. To reduce system down time, built–in test (BIT), on–line status and performance monitoring, and off–line diagnostic programs are used to the maximum extent possible. Detailed flow diagrams and instructions are used for operational checks, fault isolation, unit replacements and adjustments.

The general maintenance approach is to centrally monitor system performance at the RDA, RPG, and PUP level to localize the failures through the use of software and hardware maintenance features, and to replace the failed site replaceable unit from on–site spares whenever available. The actual repair of a replaced item will be performed either in a designated on–site repair area with equipment not part of the operational system or at a depot.

On–site maintenance will consist primarily of removal and replacement of failed LRUs or site replaceable assemblies (SRAs). An LRU is defined as a self–contained unit/module assembly to which a fault can be isolated so that system fault isolation, removal and replacement can all take place within the LRU maintainability requirements. SRAs contain components such as panel meters, indicators and switches, which may also be isolated and replaced using standard shop practices. On–site maintenance will be on–equipment.

On–equipment maintenance at the operational sites will normally be accomplished by maintenance personnel assigned to the location. Organizational maintenance action will consist primarily of removal and replacement of LRUs.

However, where simple tests or repairs can be made to LRUs, such as repair or replacement of blowers, circuit breakers, fuses, cables, lamps, switches, etc., maintenance personnel will perform these repairs using standard shop troubleshooting and repair procedures. If a failed LRU is coded (Site Maintenance Requirement (SMR) code in the IPB manual NWS EHB 6–501) for off–site repair, it will be sent to the repair facility.

NOTE

When performing maintenance, tag each Concurrent cable disconnected with jack connection location.

6–1.1.2 On–Line Status and Performance Monitoring. An extensive capability for on–line status and performance monitoring has been incorporated into the system design, using BITE (Built–In–Test–Equipment) to monitor critical system parameters and hardware status. Also, the operational programs continuously monitor operation using self–tests and continuous evaluation of communication links and data processor operation. The results of this on–line performance and status monitoring activity are displayed at the PUP color monitors, and at the alphanumeric terminals in the form of status, error, or alarm messages. Listings of these messages and instructions for responding to them are contained in Section 6–3. For general information describing system commands and messages, including format and syntax rules, refer to Chapter 4.

6–1.1.3 Recovery Procedures. Error messages/alarms are displayed when a fault occurs. If the fault is a temporary condition such as a keyboard lockup or communication link disconnect, the quick–checks, and recovery procedures in the UCP Operator's Manual, NWS EHB 6–521, and Chapter 4 of this manual should restore the system to full operation. When the fault is more serious, the message/alarm serves as the starting point in the fault isolation flowchart in this chapter.

6–1.2 PREVENTIVE MAINTENANCE

WSR–88D preventive maintenance procedures are provided to help ensure continuing operational availability of the system. They are intended to minimize the effects of environmental conditions and both detect and correct the effects of wear and tear. Preventive maintenance tasks are scheduled on a periodic basis. They consist of inspections, cleaning, lubrication, servicing, and operational checks. Performance monitoring functions reduce the need for periodic system and parameter checks. Section 6–2 contains the schedule and procedures for preventive maintenance.

6–1.3 PRIMARY FAULT ISOLATION AND OPERATIONAL CHECKS

Upon detection of an abnormal condition, verify the existence of a problem by observing system performance and/or performing an operational check IAW the operational check flowchart in Section 6–3. Once a problem is confirmed, isolate the faulty LRU IAW the fault isolation flowchart in Section 6–3. On–line diagnostics use the system status changes and specific system alarms. Off–line diagnostics are specified from the fault isolation flowcharts as required.

6–1.4 SECONDARY FAULT ISOLATION

Secondary fault isolation is not required for this equipment.

6–1.5 CORRECTIVE MAINTENANCE

Corrective maintenance procedures consist of LRU or piece part replacement, and any associated adjustments and alignments. Section 6–5 contains replacement procedures for items which require instruction beyond standard shop practices. Procedures are provided for setup and strapping as well as follow–up operational checks. Section 6–5 also contains instructions for equipment shutdowns and startup to safely perform replacements. These include program termination and restart procedures. If replacement to an asset fails to correct the problem, interconnection or wiring problems may be indicated. Chapter 7 contains interconnection, cabling, and power distribution diagrams for point–to–point troubleshooting. When a fault occurs in a piece part, standard shop practices for troubleshooting are employed. Detailed functional diagrams in Chapter 5 and associated commercial manuals may be used to isolate the faulty components.

6–1.6 ALIGNMENTS AND ADJUSTMENTS

Some site replaceable units require adjustment or alignment following their replacement. Section 6–6 contains an index which identifies these assets. Reference to any related adjustment/alignment procedures is also provided in the specific component replacement instructions in Section 6–5. Section 6–6 contain the alignment/adjustment procedures.

6–1.7 COMPONENT LOCATION AND IDENTIFICATION

The IPB manual, NWS EHB 6–501, provides indexed illustrations which may be used for identification and location of all site–replaceable units. The IPB also contains complete parts ordering data, and a reference designation index. Supplemental pictorial data is provided in this chapter or related commercial manuals as required to support specific maintenance procedures.

6–1.8 COMMERCIAL MANUALS

Commercial manuals are provided for selected equipment. These manuals contain useful information, but should not be used in place of information contained in this chapter. Only those commercial manuals referenced from within this document should be used for WSR–88D field maintenance. Specific references are provided as required in the appropriate sections of this chapter.

6–1.9 TOOLS, TEST EQUIPMENT, AND CONSUMABLES

The required tools, test equipment, and consumables are specified at the beginning of each maintenance procedure. A complete list of all tools, test equipment, and consumables required for all site maintenance activities is contained in the WSR–88D System Manual, NWS EHB 6–500.

6–1.10 STARTUP/SHUTDOWN PROCEDURES

Chapter 4 contains the startup/shutdown procedures to be used for initial power on, complete shutdown, system startup following a complete shutdown, and a pre–operational setup procedure to be used following extensive maintenance or an extended shutdown to ensure that all switches are in the correct position for startup. Individual sections of this chapter provide specific instructions for the partial shutdown required for each preventive or corrective maintenance action.

WARNING

Ensure that primary cabinet power at the specified power distribution panel is removed prior to replacing internal components or performing internal or external cleaning activities. Failure to comply with this warning can result in damage to equipment and/or serious injury or death to personnel.

6−1.11 DIAGNOSTIC TEST PROGRAM PROCEDURES

Chapter 4 contains a description of the diagnostic test programs used in connection with WSR−88D WBC LRU fault isolation. Chapter 4 also contains procedures for loading, initializing, and running the tests. These tests are not intended to be run on a stand−alone or impromptu basis. Correct results from the use of these tests can only be obtained when they are executed IAW the instructions contained in Section 6−3 because the flowcharts and associated notesheets establish the correct conditions for invoking the tests in an orderly sequence and interpreting the results.

Section 6–2. Preventive Maintenance

6–2.1 GENERAL

This section contains the WBC periodic preventive maintenance (PM) procedures necessary to prolong the life of the WBC equipment, to ensure optimum operational time, and to provide a method for detection of deterioration caused by environmental conditions.

Table 6–1 lists PM procedures applicable to the RDA/RPG MLOS cabinet and identifies the applicable COTS manual (NWS EHB 6–541–1, 6–541–3 or 6–541–5) sections where the procedure is located. Table 6–1 lists the areas to be inspected and conditions to look for. Two technicians are normally required to do a PM on the WBC equipment at remote sites.

6–2.2 HARDWIRE LINK

Systems with hardwire wideband link configurations don't have any WBC PM's.

6–2.3 CABINET MAINTENANCE POWER–DOWN/POWER–UP PROCEDURES

The maintenance power–down/power–up procedure is to turn off the MLOS cabinet circuit breakers prior to doing any maintenance and restoring power prior to leaving the shelter. Power–up/power–down procedures for the RPIE units are contained in the appropriate procedures.

Table 6–1. RDA/RPG MLOS WBC Preventive Maintenance Index

Equipment	Procedure Description	Periodicity	Time Required (Hours)	Reference Paragraph
	NOTE COTS manual sections not specifically referenced in this manual are not valid and are not to be used for preventive maintenance.			
UD19/UD39	MLOS Cabinet Assembly Inspection and Cleaning	12 months	0.3	6–2.4
A4	Test Meter Readings	6 months	1.0	NWS EHB 6–541–1, 6–541–3 Maintenance Procedure (MP) R5
A3	Transmitter Carrier Frequency	12 months	1.0	NWS EHB 6–541–1, 6–541–3
A3	Transmitter RF Output Power and Test Meter Calibration	12 months	1.0	NWS EHB 6–541–1, 6–541–3
A18	Minimaster (RPG only)	None		

Table 6–1. RDA/RPG MLOS WBC Preventive Maintenance Index – Continued

Equipment	Procedure Description	Periodicity	Time Required (Hours)	Reference Paragraph
A19	Remote Station FAS	12 months	0.7	NWS EHB 6–541–1, 6–541–3 Index F
A38PS1	Power Supply	None		

Table 6–2. Equipment Inspection

Inspection Areas	Abnormal Conditions
Panels, covers, and chassis	Loose or missing hardware Physical damage Illegible markings or nameplates
Fuses and fuseholders	Insecure mounting Missing fuses Improper fuse rating Damaged fuseholder
Indicator lamps and sockets	Insecure mounting Missing lamps Damaged or missing lenses Damaged socket
Toggle switches and circuit breakers	Insecure mounting Improper switching action Damaged connections
Terminal boards	Insecure mounting Breaks, cracks, or loose terminals
Wiring	Frayed or burned insulation Pinched, broken, or disconnected leads
Connectors and receptacles	Insecure mounting Damaged shells Bent or missing pins

Table 6–2. Equipment Inspection – Continued

Inspection Areas	Abnormal Conditions
Cables	Kinking or twisting Damaged insulation Loose or damaged cable clamps Missing identification tags
Panel Controls	Loose or missing controls Improper switching action

6–2.4 MLOS WBC CABINET INSPECTION AND CLEANING

This procedure is to inspect and clean MLOS cabinets UD19, and UD39.

6–2.4.1 Equipment and Tools Required.

1. Liquid detergent, water
2. Plastic bucket
3. Sponges, lent free cloths
4. Vacuum
5. Flashlight

6–2.4.2 Initial Conditions/Preliminary Setup.

CAUTION

Latch shelter door under windy conditions.

1. Place all cabinet circuit breakers to OFF.

6–2.4.3 Procedure.

WARNING

Use extreme caution to avoid contact with exposed terminals and wires in the WBC cabinets. Heated parts may cause serious burns.

1. Wipe all exterior surfaces of the cabinet using a sponge dampened with the detergent solution. Remove residue detergent from cabinet surfaces with a sponge dampened with clean water. Wipe surface dry with a lint–free cloth.

CAUTION

Avoid displacement of wires/parts during cleaning and inspection.

2. Inspect interior of the cabinet for dust, dirt, and foreign material. Vacuum if needed.
3. Inspect the cabinet interior and exterior using the guidelines listed in Table 6–2.

NOTE

For a period of one minute after restoring power, do not acknowledge any alarms.

4. Restore equipment to normal operation by placing cabinet circuit breakers to ON.
5. Clear any alarms.

Section 6–3. Primary Fault Isolation

6–3.1 INTRODUCTION

This section contains the procedures necessary to perform primary fault isolation in the WBC functional area. It includes fault isolation flowcharts and notes to aid in the process.

6–3.2 FAULT ISOLATION FLOWCHARTS

Flowcharts are the main resource in fault isolation. They use alarm and status messages, as well as on–line and off–line techniques to isolate faults to a single LRU.

6–3.2.1 System Fault Isolation Flowchart. The system fault isolation flowchart (See Figure 6–1.) is designed to ensure that the maintenance technician performs fault isolation in the proper functional area. References to the WBC flowchart are made on the system flowchart.

6–3.2.2 WBC Fault Isolation Flowchart. The WBC fault isolation flowchart (See Figure 6–2.) covers all versions of interconnection between the RDA and the RPG and is designed to ensure that the maintenance technician performs fault isolation down to the faulty component.

6–3.2.3 Flowchart Comments. Comments appear throughout the flowchart to aid the technician. Due to the complexity and cross–referencing of pages, a technician may not realize or may forget what has been already established in previous steps. These comments keep technicians informed of what has been learned and/or what will be tried next to fault isolate.

6–3.2.4 Secondary Fault Isolation. Secondary fault isolation is not applicable to this equipment.

6–3.2.5 Flowchart Symbol Convention. All circled letters on the flowcharts indicate a reference to another part of the flowchart. All circled numbers are references to the notes which must be run before proceeding to the next step. Examples are illustrated below:

(A) Reference to another part of flowcharts

(3) Reference to notes

In both the System Fault Isolation Flowchart and the WBC Fault Isolation Flowchart, all actions to be performed by the technician are contained in boxes. In addition, all questions to be answered by the technician are contained in diamonds and can be answered with a YES or a NO.

6–3.2.6 Cabling and Connector Problems. Cabling and connector problems could also cause the noted symptoms. If replacing an LRU doesn't fix the problem, this should be examined. To include this in the flowcharts would make them too bulky. Necessary wiring data is in Chapter 7.

6–3.2.7 Flowchart Notes. Cross–referenced notes give instructions on performing diagnostic procedures or they provide definitions. Some of the procedures encountered are included elsewhere in the manual; if this is the case, the notes will simply reference the technician to another part of the manual. An index of the notes are provided in Table 6–3.

Table 6–3. Flowchart Note Index

Flowchart Figure Number	Note Number	Description
Figure 6–1	1	Definition
	2	Archive IV Check
	3	Exercise the Streaming Tape (PUP)
	4	Exercise the One Time Dial–Up
	5	Issue a Wideband Disconnect/Connect
	6	Verify RPG HCI Functionality at MSCF Workstation, System Check
	7	Check JAZ Disk Functionality
	8	Check Floppy Drive Functionality
	9	Check CD–ROM Drive Functionality
	10	Check Date/Time of MSCF, RPG, or BDDS at MSCF Workstation
	11	Exercise the Streaming Tape (RDA)
	12	OS/32 Error Messages
	13	Arithmetic Unit (AU) 1–3 Board Manipulation
	14	Suncheck
	15	Check for NB Lines Connected at MSCF

Notes for Figure 6–1. (System Fault Isolation Flowchart)

SU

(1) DEFINITION

Normal operations is defined as the state of the WSR–88D system when full chain operation has been established (i.e., wideband link between RPG and RDA established, RDA under RPG control) and one volume scan has been completed, thus making products available at dedicated users.

(2) ARCHIVE IV CHECK

Step	Operator Action	System Response/Comments
	NOTE Ensure that the disk is NOT write protected.	
1.	At the optical disk drive:	
	a. Insert the test optical disk into the optical disk drive.	
	b. Turn the handle 90 degrees.	Locks in the disk.
	c. Press the disk load button on the lower right hand side of the drive.	The green indicator starts blinking. Wait until the indicator lights steadily.
	NOTE All of the following entries are made at the PUP Applications Terminal.	
2.	Press **<F1>** key and then enter **S,P,19 <CR>**	Displays the status of base reflectivity.
3.	Make a note of the product parameters for line 1: • Slice • RPG • Time • Date	
4.	Enter **S,P,D,1,L <CR>**	Displays the product on the left color monitor.
5.	a. Press **<F1>**, then enter **A,A,O,R <CR>**.	Archives the product.

Step	Operator Action	System Response/Comments
	b. Fill in the parameters with Data Level=**16**, Resolution=**.54**, and the parameters from Step 3. then press**<CR>**.	`Archive Unit 1 Write Done` is displayed after a while.
6.	a. Press **<F1>** and then enter **S,P,19 <CR>**	Displays the status of base reflectivity.
	b. Press **<F1>** and then enter **S,P,DEL**,X **<CR>** (X = Line # of *product from step 3*.)	Deletes the product from the database.
	c. Press **<F1>** and then enter **A,R,O,R<CR>**.	Reads the product from the optical disk.
	d. Fill in the parameters from Step 5.b. then press **<CR>**.	`Archive Unit 1 Read Done` is displayed after a while.
7.	a. Press **<F1>** and then enter **S,P,19 <CR>**	Displays the status of base reflectivity.
	b. Enter **S,P,D,X,R <CR>** (X = Line # of *product read*.)	Displays the product on the right color monitor.

NOTE

The product on both screens should be the same.

(3) EXERCISE THE STREAMING TAPE (PUP)

Step	Operator Action	System Response/Comments
1.	At the PUP, insert a blank tape into the SCSI drive. Ensure that it is ready to write on by ensuring that the black pointer at the top of the tape is not pointing to the SAFE position.	
2.	At the PUP System Console, enter:	
	a. **PUPDOWN <CR>**	
	b. **D TA <CR>**	`TASK(S) NOT FOUND` displayed if all tasks are canceled. If there are tasks in memory, note the task ID and perform step c. If all tasks are canceled proceed to step d.

Step	Operator Action	System Response/Comments
	c. **CA** *Taskid* **<CR>**	Cancels task.
	d. **LO BACKUP,5ØØ <CR>**	
	e. **ST <CR>**	
	f. **IN=DSCØ:,OUT=STØ:,SEL=CON:,SIZ=3ØØ, LI=CON:,DEL,VER,END <CR>**	
3.	At the BACKUP> prompt, enter: **PUPDOWN.CSS <CR>** **./ <CR>**	The screen should give a series of messages ending with `End of Task = ø`.
4.	If `End of Task = ø` appears, the tape works. Remove the tape from the SCSI drive.	An End of Task value other than Ø indicates an abnormal termination of task occurred.
5.	At the PUP System Console, enter: **PUPUP <CR>**	

(4) EXERCISE THE ONE TIME DIAL UP

Step	Operator Action	System Response/Comments
1.	At the PUP graphics tablet:	
	a. Use the mouse to select: **Base Reflectivity** **Default Parameters** **Lowest Elevation** **Dial–up Assoc RPG** **Send RPG Request** **Clear Screen/Quad**	
	b. Wait about one minute while the program runs.	At the PUP monitor, the following messages are displayed: `SEND RPG REQUEST` `REQUEST ACCEPTED.` A line number appears followed by a request for DSCNCT shortly after a timeout error occurs. Verify that the requested product was received.

(5) ISSUE A WIDEBAND DISCONNECT/CONNECT

Step	Operator Action	System Response/Comments
1.	At the MSCF RPG HCI, click on the wideband link lines between the RDA and RPG.	Opens up the `RDA/RPG Interface Control/Status` window. If the link shows a `State:` of `Disconnected HCI` or `Disconnect Pending`, proceed to step 3.
2.	In the `RDA/RPG Interface Control/Status` window, click on **Disconnect** and then click on **Yes** when prompted to continue.	Issues a Disconnect command to the wideband link. `State:` should change to `Disconnected HCI` or `Disconnect Pending`. If previous `State:` was `Failure`, the state may change to `Disconnect Pending` and then eventually revert back to a `Failure` state. If this appears to be the case, wait approximately one minute after the original disconnect command is entered before proceeding.
3.	In the `RDA/RPG Interface Control/Status` window, click on **Connect** and then click on **Yes** when prompted to continue.	Issues a Connect command to the wideband link. `State:` should change to `Connected`. If State: remains `Connect Pending` or `Failed`, wideband did not connect and either way this procedure is complete. Close the `RDA/RPG Interface Control/Status` window.

NOTE

For steps 2. and 3., if no state change was noticed at all, then the HCI is not responding. For step 3. if some state change is noted, or the `Feedback:` message `Connect Wideband Link` is noted on the HCI Main Menu, then the HCI does appear to be functioning OK even if the wideband does not actually connect (i.e., a wideband problem).

Step	Operator Action	System Response/Comments
4.	If the wideband link connected, click on the RDA **Control** block.	Opens the RDA/RPG Interface Control/Status window.
5.	Click on RDA State: **Operate** and then click on **Yes** when prompted to continue.	Issues an Operate command to the RDA. The State: display should change to Operate.

(6) VERIFY RPG HCI FUNCTIONALITY AT MSCF WORKSTATION, SYSTEM CHECK

NOTE

If the system is in full operation, the following check will temporarily place the RDA in STANDBY and then back into OPERATE. If this check is just being done as part of an operability check only (Figure 6–1, sheet 2 or Figure 6–2, sheet 1) and not to isolate a system fault, then obtain approval from operations personnel prior to performing this check (from Active channel only for FAA Redundant system). This can be performed at any time on the HCI from the FAA Redundant Inactive channel.

Step	Operator Action	System Response/Comments
1.	On the RPG HCI on the MSCF Workstation, click on the wideband link (three lines) between the RDA and RPG. For an FAA Redundant system, this check can be done on the HCI for either channel; however, for the purposes of a system check, it should be primarily done on the Active channel.	Opens up the RDA/RPG Interface Control/Status window. If the current wideband State:is Disconnected HCI, proceed to step 3.
2.	In the RDA/RPG Interface Control/Status window, click on **Disconnect** and then click on **Yes** when prompted to continue.	Issues a Disconnect command to the wideband link. State: should change to Disconnected HCI. If the present State: is Failure, the State: should show a Disconnect Pending, but probably will not actually change to a disconnect state and then revert back to a Failure state (wait approximately one minute before proceeding). If the state does not change, the HCI is not responding. Proceed to step 4.

Step	Operator Action	System Response/Comments
3.	In the RDA/RPG Interface Control/ Status window, click on **Connect** and then click on **Yes** when prompted to continue.	Issues a Connect command to the wideband link. State: should change to its previous state (Connected, Connect Pending, or Failure). If previous or present State: was Failure, no specific state change may be noted if an actual wideband problem exists; however, the Feedback: message Connect Wideband Link should be noted on the HCI Main Menu. Close the RDA/RPG Interface Control/Status window. If the State does not change or the feedback message is not noted, the HCI is not responding. Proceed to step 4. If the HCI appears to be responding OK, this procedure is complete.
4.	Double−click the [−] in the upper left corner of the HCI window to kill the HCI. For FAA Redundant systems, kill the HCI for the channel being checked at this time.	The HCI closes. Since this HCI is displayed on this platform through the RSSD, this is all that is required to stop the HCI functionality.
5.	If an MSCF display is not available, go to a terminal window and enter **mscf &<CR>**.	If an MSCF Display is already open, continue with the next step. The MSCF window is used to start a new HCI.
6.	On the MSCF window, click on **RPG HCI**. For FAA Redundant systems, the appropriate channel must be selected first.	A new HCI appears. For DOD systems and either FAA channel, the display will not be complete for approximately one minute. If no HCI appears, the HCI is non−functional and this procedure is complete. If an HCI appears, continue on to the next step to determine if it useable.
7.	On the RPG HCI, click on the WB link between the RDA and RPG.	Opens up the RDA/RPG Interface Control/Status window. If the current wideband State: is Disconnected HCI, proceed to step 9.

Step	Operator Action	System Response/Comments
8.	In the RDA/RPG Interface Control/ Status window, click on **Disconnect** and then click on **Yes** when prompted to continue.	Issues a Disconnect command to the wideband link. State: should change to Disconnected HCI. If the present State: is Failure, the State: should show a Disconnect Pending, but probably will not actually change to a disconnect state and then revert back to a Failure state (wait approximately one minute before proceeding). If the state does not change, the HCI is not responding.
9.	In the RDA/RPG Interface Control/ Status window, click on **Connect** and then click on **Yes** when prompted to continue.	Issues a Connect command to the wideband link. State: should change to its previous state (Connected, Connect Pending, or Failure). If previous or present State: was Failure, no specific state change may be noted if an actual wideband problem exists; however, the Feedback: message Connect Wideband Link should be noted on the HCI Main Menu. Close the RDA/RPG Interface Control/Status window. If the state does not change or the feedback message is not noted, the HCI is not responding.

(7) CHECK JAZ DISK FUNCTIONALITY

SU

Step	Operator Action	System Response/Comments
1.	For the RPG processor only, stop the applications software per NWS EHB 6–525, Table 4–41.	
	NOTE Completion of this procedure requires Superuser (root) privileges.	
2.	At the MSCF workstation (for MSCF) or the RPG maintenance position workstation (for RPG), enter the following at a normal terminal window system prompt to become a root user: **su<CR>** and the *root_password*<**CR**>	
3.	If a disk is inserted in the Jaz drive, then at the # prompt, enter: **umount /jaz<CR>** then press the button on the Jaz drive and remove the Jaz disk from the drive.	This unmounts the Jaz disk before doing the backup. If a disk is not inserted, continue with the next step. If an `umount: /jaz not mounted` message occurs, it just indicates that the Jaz disk is already unmounted.
4.	Insert a Jaz disk cartridge designated for backup purposes into the Jaz disk drive.	
5.	If at an RPG workstation, then in the terminal window at the # prompt, enter: **ls –l /jaz<CR>** If at an MSCF workstation, then in the terminal window at the # prompt, enter: **mount /dev/dsk/c1t3dØs2 /jaz<CR>**	Mounts the Jaz disk in the Jaz disk drive to the /jaz mount point and displays a current directory listing of the disk. For the RPG, this is done by an auto–mounting program as soon as any attempt is made to access the /jaz directory. If an error occurs (either a “permission denied” or a mount error), the Jaz Disk drive is not working correctly and this procedure is complete.
6.	In the terminal window at the # prompt, enter: **mount<CR>**	Verify that the last line shows `/jaz is mounted`. If it is not mounted, the Jaz Disk drive is not working right and the procedure is complete.

Step	Operator Action	System Response/Comments
7.	In the terminal window at the # prompt, enter: **cp /etc/hosts /jaz<CR>**	Makes a backup copy of the hosts file on the Jaz disk. A # prompt returns if the copy was successful and no write errors should occur. If the system does not return to a # prompt or write errors do occur, the Jaz disk drive is defective.
8.	In the terminal window at the # prompt, enter: **ls –lrt /jaz<CR>**	Displays a directory listing of the /jaz directory with the most recent files listed at the bottom. The "hosts" file should be the last entry.
9.	In the terminal window at the # prompt, enter: **umount /jaz<CR>**	Unmounts the Jaz disk cartridge. This procedure is complete.
10.	Press the button on the Jaz drive to eject the backup disk cartridge.	
11.	At the # prompt, enter: **exit<CR>**	Exits Superuser mode.
12.	If at an RPG processor restart the applications software per NWS EHB 6–525, Table 4–42.	If at an RPG, applications software was stopped prior to performing this procedure.

(8) CHECK FLOPPY DRIVE FUNCTIONALITY

Step	Operator Action	System Response/Comments
1.	Insert a known good DOS or UNIX formatted floppy into the floppy drive.	Either type formatted floppy will work in the drive.
2.	At the normal user prompt, enter: **volcheck<CR>**	"volcheck" mounts the floppy disk in the drive.
3.	At the normal user prompt, enter: **mount<CR>**	Displays all mounted devices and disk partitions. The last mount entry should indicate "/floppy/unnamed_floppy" (or possible floppy volume name) is the mount point for "/vol/dev/diskette0/..." (the actual floppy. If a "floppy" entry is not observed, the floppy disk did not mount and the drive is defective.

Step	Operator Action	System Response/Comments
4.	At the normal user prompt, enter **cp /etc/hosts /floppy/floppyØ<CR>**	"/floppy/floppyØ" is just a consistent linked mount point, whether the floppy is "unnamed" or actually has a volume name.
5.	At the normal user prompt, enter: **ls –lrt /floppy/floppyØ/*<CR>**	Displays a directory listing of the /floppy/floppyØ disk. The "*" is necessary in this case to get past the link. The "hosts" file should be the last entry in the main floppy disk directory list (sub–directory lists may be present also).
6.	At the normal user prompt, enter: **eject<CR>**and click **OK** when prompted that the floppy disk can be manually ejected.	Unmounts the floppy disk. This procedure is complete.

(9) CHECK CD–ROM DRIVE FUNCTIONALITY

Step	Operator Action	System Response/Comments
1.	Insert the Full System Load CD into the CD–ROM drive and close the cradle.	Any known good CD should work (e.g., the Technical Manual Distribution CD). The CD should auto–mount and a File Manager window should appear.
2.	Click on any file within the File Manager window to select it (not a folder).	This file will be used to test a copy of the file from the CD.
3.	At the top of the File Manager window, click on **Selected ▶ Copy to ...**.	Allows the selected file to be copied off of the CD.
4.	Use the mouse to drag across and highlight the entire path in the `Destination Folder:` box. Then enter **~<CR>**	The home directory (~) is selected as the destination point, and the file is copied when **<CR>** is entered.
5.	Go to a normal terminal window with a normal user prompt (not a root # prompt) and enter: **cd /export/home/***user_login_name***<CR>**	Changes directories to the user's home directory.

Step	Operator Action	System Response/Comments
6.	At user's home directory prompt, enter: **ls –lrt<CR>**	Displays a list of files with the newest file at the end of the list. The file that was just copied should be at the bottom of the list. Use the rm command to remove that specific file if desired.
7.	On the File Manager window, click on **File ▶ Eject** and retrieve the test CD from the CD–ROM drive.	This ejects the CD and closes the File Manager window.

(10) CHECK DATE/TIME OF MSCF, RPG, OR BDDS AT MSCF WORKSTATION

Step	Operator Action	System Response/Comments
1.	At any MSCF Workstation terminal window prompt, enter: **date<CR>**	This displays the system date and time (GMT time, 24 hour clock). To remotely check the date/time of the RPG and/or BDDS processors from the MSCF, continue with step 2. Otherwise, this procedure is complete.
2.	To remotely check the date/time of the RPG, at an MSCF terminal window prompt, enter: **ssh rpg1<CR>** (or rpg2 for FAA Redundant only)	"ssh" will establish a secure remote connection to that processor. To only check the BDDS processor time, skip to step 5. Otherwise, continue with the next step.
3.	At the "Login:" prompt, enter normal user account name and enter password when prompted.	All maintenance personnel should have user accounts on all processors.

NOTE

This password must meet the requirements specified in the NOTE in paragraph 4–6.2.1.

Step	Operator Action	System Response/Comments
4.	Enter: **date<CR>**	This displays the system date and time (GMT time, 24 hour clock). To remotely check the date/time of the BDDS processor from the RPG, then continue with step 5. Otherwise, this procedure is complete. (Note: NWS and DoD sites have BDDS units.)
5.	To remotely check the date/time of the BDDS, at an MSCF terminal window prompt or an RPG terminal window prompt, enter: **ssh bdds<CR>**	"ssh" will establish a secure remote connection to that processor.
6.	At the "Login:" prompt, enter a normal user account name and enter password when prompted.	All maintenance personnel should have user accounts on all processors.

NOTE

This password must meet the requirements specified in the NOTE in paragraph 4–6.2.1.

7.	Enter: **date<CR>**	This displays the system date and time (GMT time, 24 hour clock). This procedure is complete.
8.	Enter: **exit<CR>**as many times as necessary to exit remote ssh session(s) and return to an MSCF prompt.	This displays the system date and time (GMT time, 24 hour clock). This procedure is complete.

(11) EXERCISE THE STREAMING TAPE (RDA)

Step	Operator Action	System Response/Comments
1.	At the RDA, insert a blank tape into the SCSI drive. Ensure that it is ready to write on by ensuring that the black pointer at the top of the tape is not pointing to the SAFE position.	
2.	At the RDA System Console, enter: **LO BACKUP,5ØØ <CR>** **ST,IN=DSCØ:,OUT=STØ:,LI=CON:,** **SIZ=3ØØ,SEL=CON:,DEL,VER,END <CR>**	
3.	At the `BACKUP>` prompt, enter: **RDAUP.CSS <CR>** **./ <CR>**	The screen should give a series of messages ending with `End of Task = ø`
4.	If `End of Task = ø` appears, the tape works. Remove the tape from SCSI drive.	If an `End of Task = ø` messages is not received, the tape "exercise" did not complete successfully.

(12) OS/32 ERROR MESSAGES

The following is a list of operating system alarms which may appear on the RDA or PUP System Console. For explanations of individual alarms, refer to Tables 4–8.1 and 4–8.2 of EHB 6–530.

1. I/O error on voln; Mark off and check bit map error on voln; mark off and check
2. PIC (Precision Interval Clock) not active at address XX
3. Access level address error at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
4. Address fault is SVC at XXXXXX (YYYYYY)
5. Alignment fault instruction at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
6. Floating point functional range error at XXXXXX
7. Decimal overflow error at XXXXXX (YYYYYY), next instruction at XXXXXX (YYYYYY)
8. Executive privilege error at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
9. Fixed point–zero divide error at XXXXXX (YYYYYY), next instruction at XXXXXX (YYYYYY)
10. Fixed point–zero overflow error at XXXXXX (YYYYYY), next instruction at XXXXXX (YYYYYY)
11. Illegal instruction at XXXXXX (YYYYYY)
12. Illegal SVC–instruction at XXXXXX (YYYYYY), SVC parameter block at XXXXXX (YYYYYY)
13. Floating point underflow error at XXXXXX (YYYYYY)
14. Invalid segment address error at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
15. I/O–ERR Type = XXXX; Segname = YYYY; Segtype = 2222
16. Floating point overflow error at XXXXXX (YYYYYY)
17. Memory error on data fetch at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
18. Memory error on instruction fetch at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
19. Floating point zero divide error at XXXXXX (YYYYYY)
20. Non–existent segment error (Process Segment Table {PST}) at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)

21. Non–existent segment error (SST) at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
22. Packed format–sign error at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
23. Packed format–data error at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
24. Read privilege address error at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
25. Segment limit address error at RRXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
26. SVC address error–instruction at XXXXX (YYYYYY)
27. SVC parameter block at XXXXXX (YYYYYY)
28. Task paused
29. Undefined data format fault at XXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)
30. Write privilege address error at XXXXXX (YYYYYY), memory fault address = XXXXXX (YYYYYY)

(13) ARITHMETIC UNIT (AU) 1–3 BOARD MANIPULATION

The problem is with one of the three PSP AUs. AU1 controls displays nearest the center of the PUP display; AU2 controls the mid range; and AU3 controls the outer range.

The AUs are made up of the following cards:

Arithmetic Unit	Memory	Input Multiplexor (MUX)	Multiplexor Accumulator	Output Select
AU1	5A9A8	5A9A9	5A9A10	5A9A11
AU2	5A9A12	5A9A13	5A9A14	5A9A15
AU3	5A9A16	5A9A17	5A9A18	5A9A19

Exchange the four cards in the AU with the annular ring problem with one of the other AUs not having the problem. Bring the system up and wait for new products to be received. If the problem has migrated to another band, the AU in the band with the rings has a bad card. Switch the AUs back to original position and replace the bad AU.

Step	Operator Action
1.	At the RDA Applications Terminal Main Menu command line, type **TERP** and then **<Tab>** to parameters line and type in *password* **<CR>**.
2.	At the RDA Secondary PDP set the HSP/PSP circuit breakers CB16/18 to OFF.
3.	Using proper ESD precautions remove the AU1, AU2, and AU3 boards from the PSP. Be sure to note the slot #’s and S/N’s before and after the next step.

Step	Operator Action
4.	Put AU1 in AU3 slot. Put AU2 in AU1 slot. Put AU3 in AU2 slot.
5.	At the RDA Secondary PDP set the HSP/PSP circuit breakers CB16/18 to ON.
6.	At the RDA Applications Terminal keyboard, simultaneously press the **<Shift>** and **<Port>** keys to get to the RDA System Console screen. At the RDA System Console prompt, enter **RDAUP<CR>** to start the RDA Applications Software.

(14) SUNCHECK

Step	Operator Action	System Response/Comments
1.	Ensure that the RDA is down by typing **TERP <TAB> FLOYD <CR>** at the RDA Applications Terminal Main Menu command line.	Terminates the RDA Applications Software program.
2.	Type **RDASOT <CR>**.	The Radar Data Acquisition System Operational Test (RDASOT) software program loads and starts.
3.	Type **3 <CR>**	The Calibration menu is displayed.
4.	Type **2 <CR>**	The SUNCHECK Test Control Menu is displayed.
5.	Type **1 <CR>**	Begins the pedestal alignment.
6.	Enter the current GMT in the format displayed.	
7.	Enter **Y <CR>**	Saves the azimuth correction factor.
8.	Enter **Y <CR>**	Saves the elevation correction factor.
9.	Enter **TERM <CR>**	The SUNCHECK Test Control Menu is displayed.
10.	Type **Ø <CR>**	
11.	Type **Ø <CR>**	
12.	Type **Ø <CR>**	RDASOT program terminates.

(15) CHECK FOR NB LINES CONNECTED AT MSCF

Step	Operator Action	System Response/Comments
1.	At the MSCF HCI, click on the light green link between the `RPG` and `USERS` blocks.	This will bring up the `Product Distribution Comms Status` window.
2.	Click on **Status** in the `Sorted By:` area below the `Product Distribution Lines` window.	Connected lines will move to the top of the display.

6−3.3 WBC PERFORMANCE MONITORING

The WBC link is described in Figure 6−4. Once connected, the RDA and RPG send messages over the link continuously. If no message is seen in 2−1/2 minutes, the RPG reports a link failure. Failure to connect is reported by the RDA to the MSCF, and that message usually starts fault isolation. RDA messages may not be seen at the MSCF if the WBC link failed before they were sent. MLOS links use an FAS to check link integrity and to send MLOS status/alarms to the RPG.

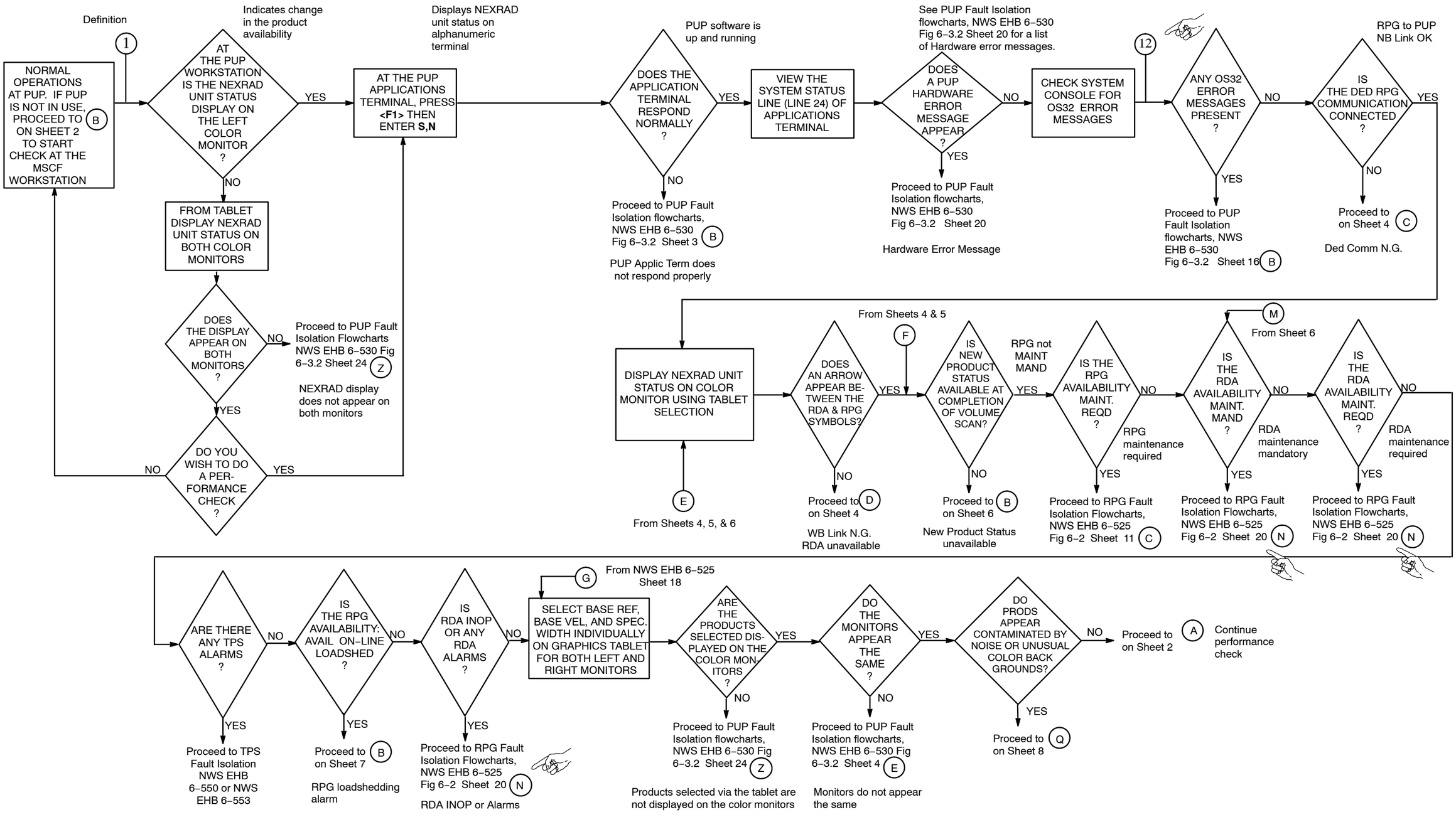


Figure 6–1. System Fault Isolation Flowchart (Operability Check) (Sheet 1 of 8)

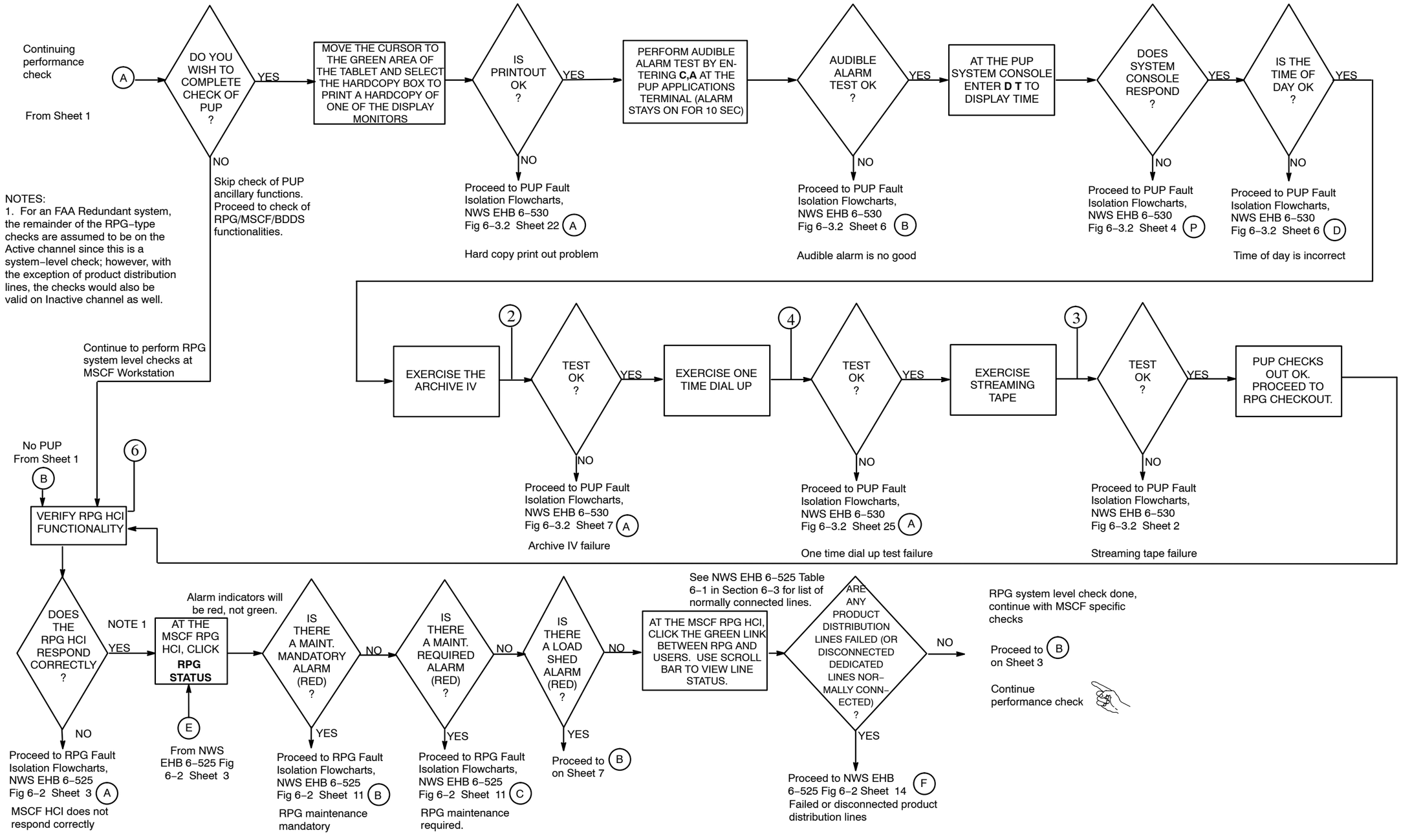


Figure 6–1. System Fault Isolation Flowchart (Operability Check) (Sheet 2 of 8)

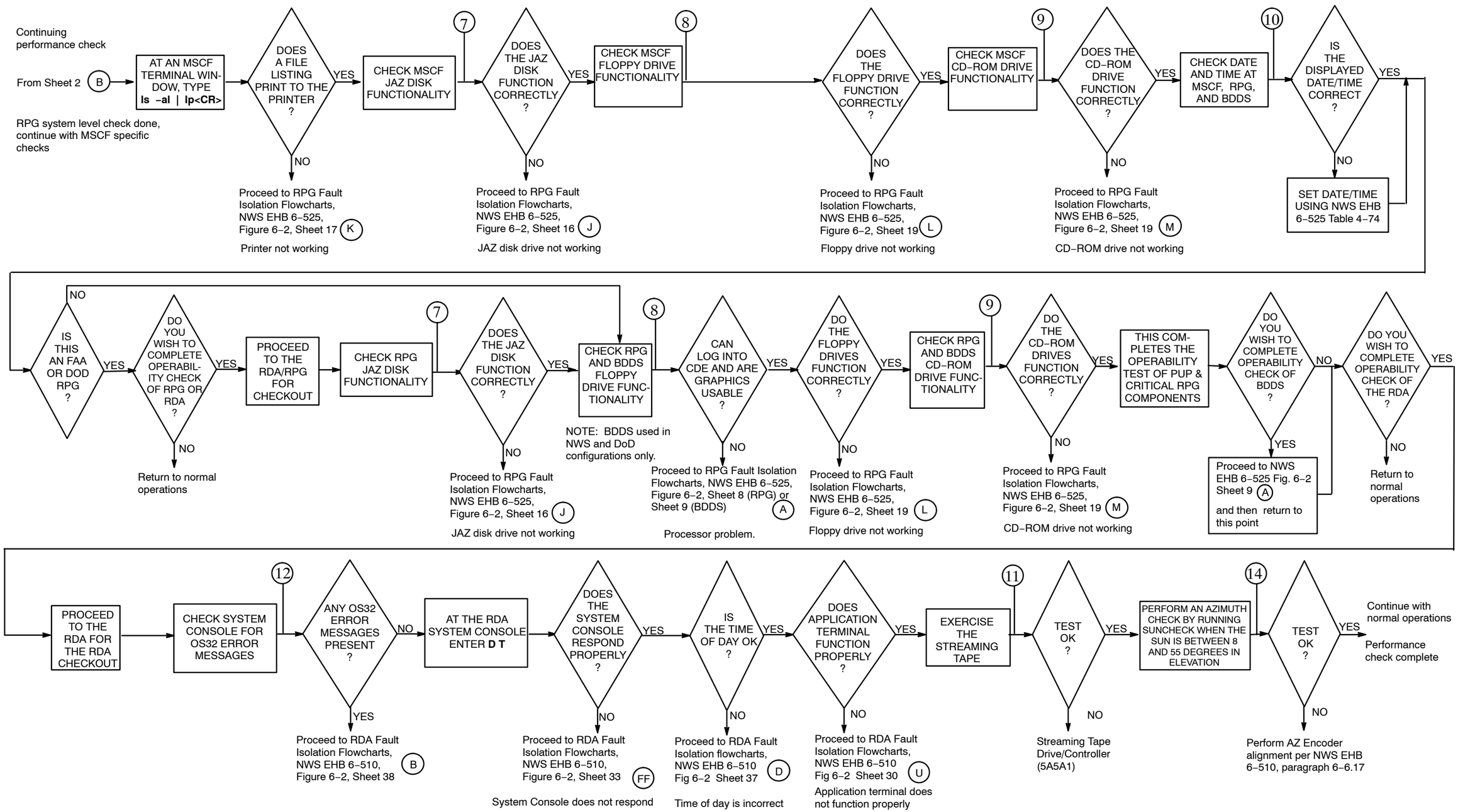


Figure 6–1. System Fault Isolation Flowchart (Operability Check) (Sheet 3 of 8)

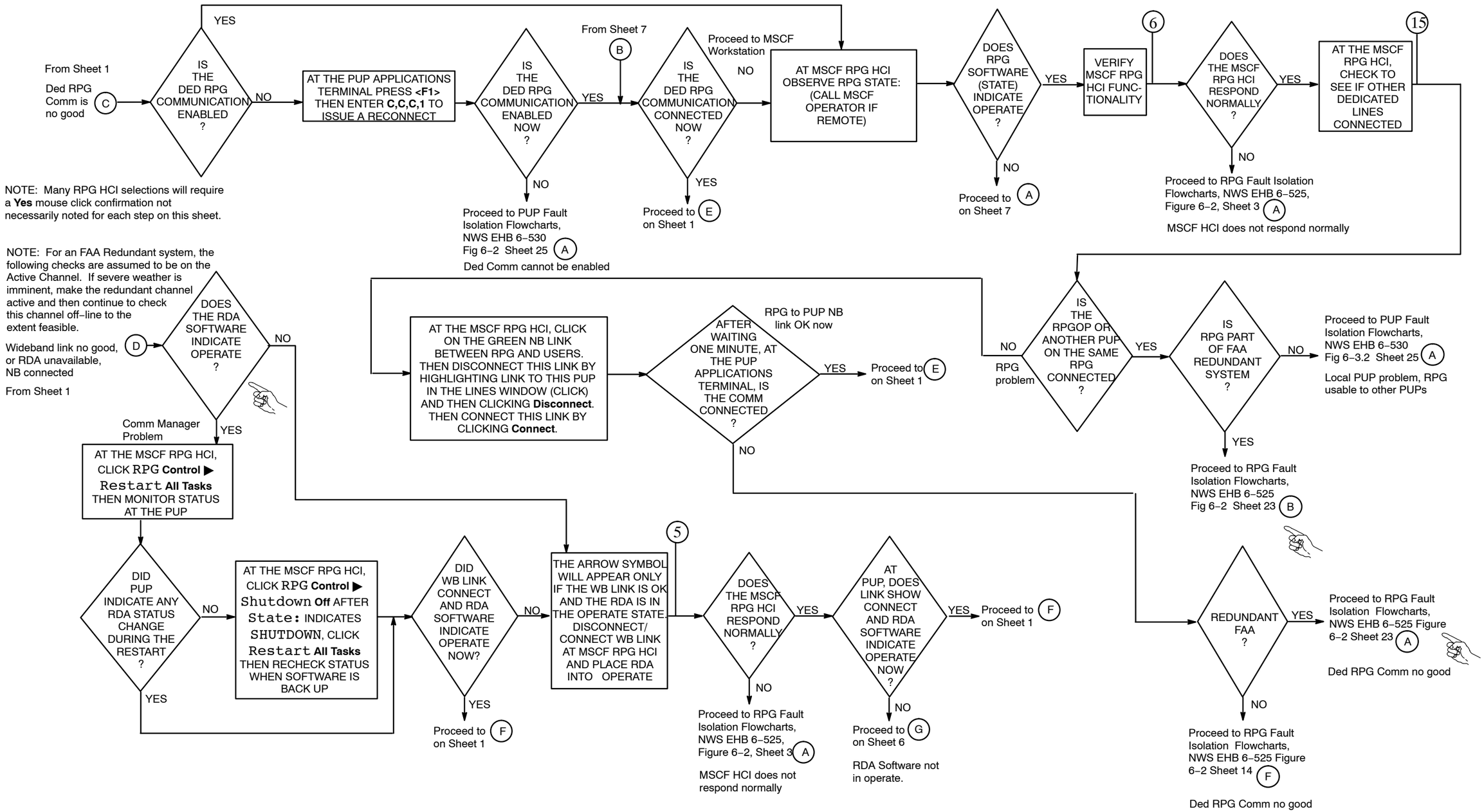


Figure 6–1. System Fault Isolation flowchart (Communications) (Sheet 4 of 8)

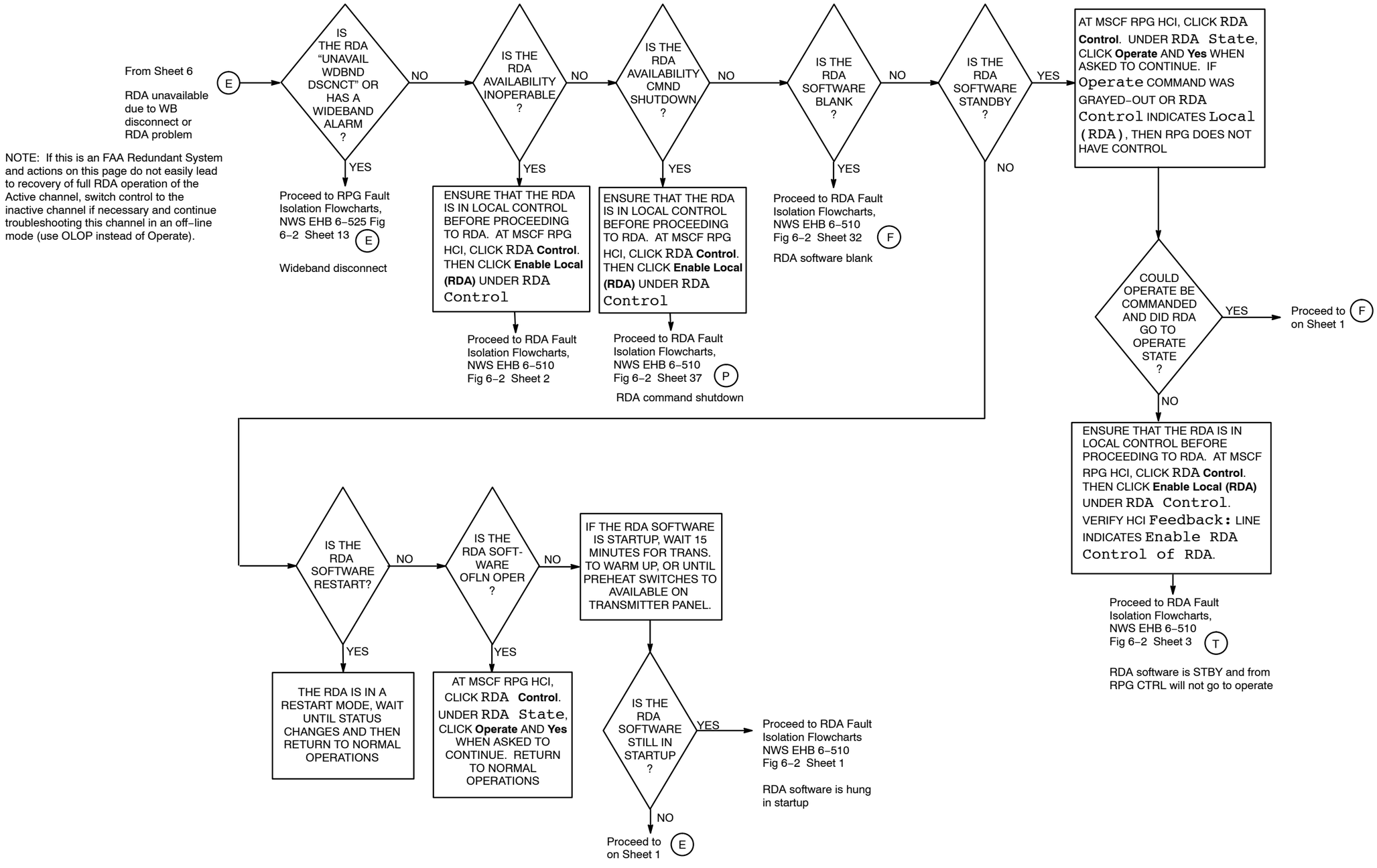


Figure 6–1. System Fault Isolation flowchart (Status RDA) (Sheet 5 of 8)

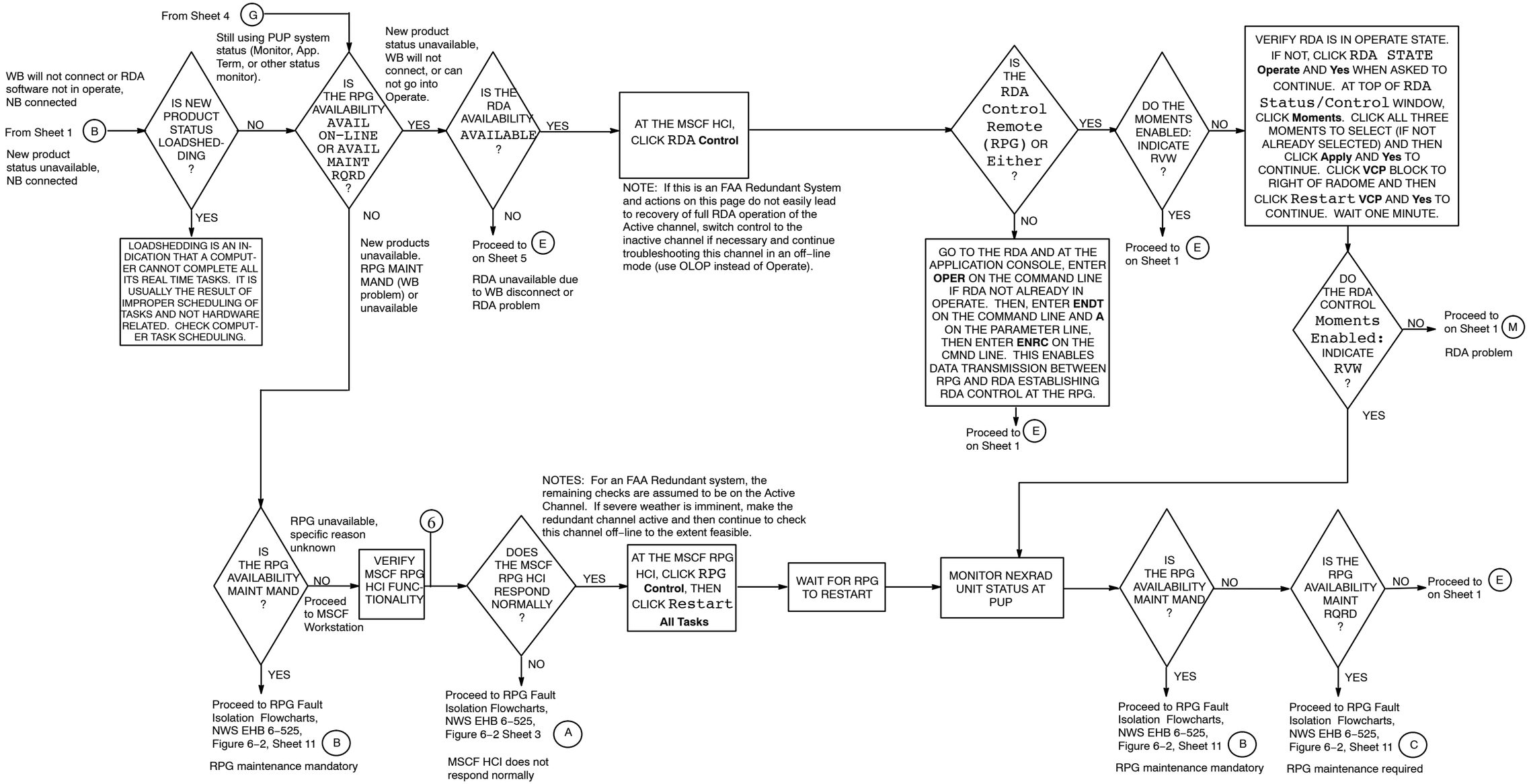


Figure 6–1. System Fault Isolation Flowchart (RPG Check) (Sheet 6 of 8)

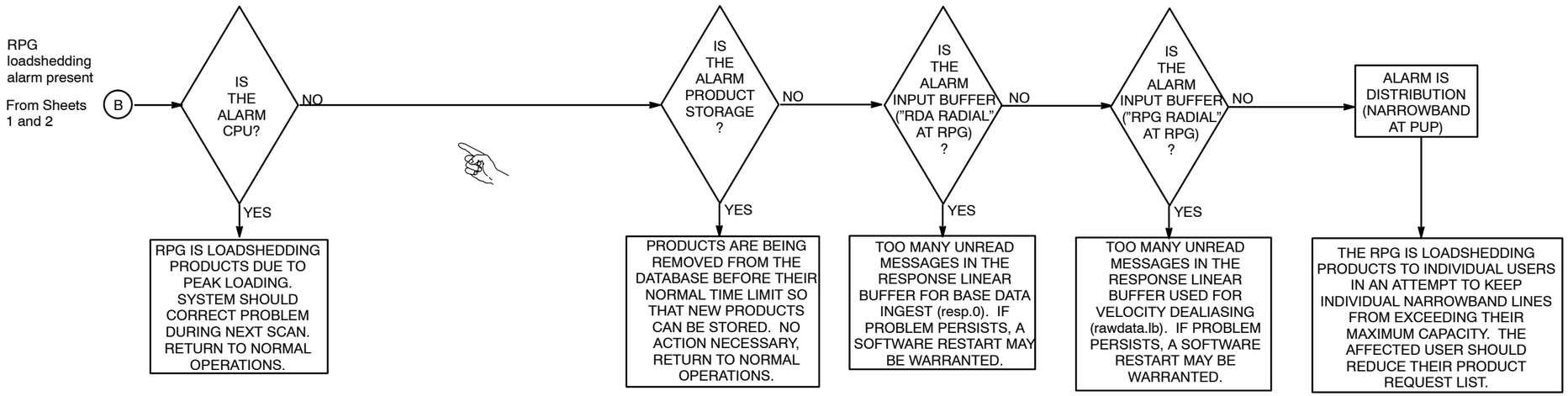


Figure 6–1. System Fault Isolation Flowchart (RPG Software, Alarms) (Sheet 7 of 8)

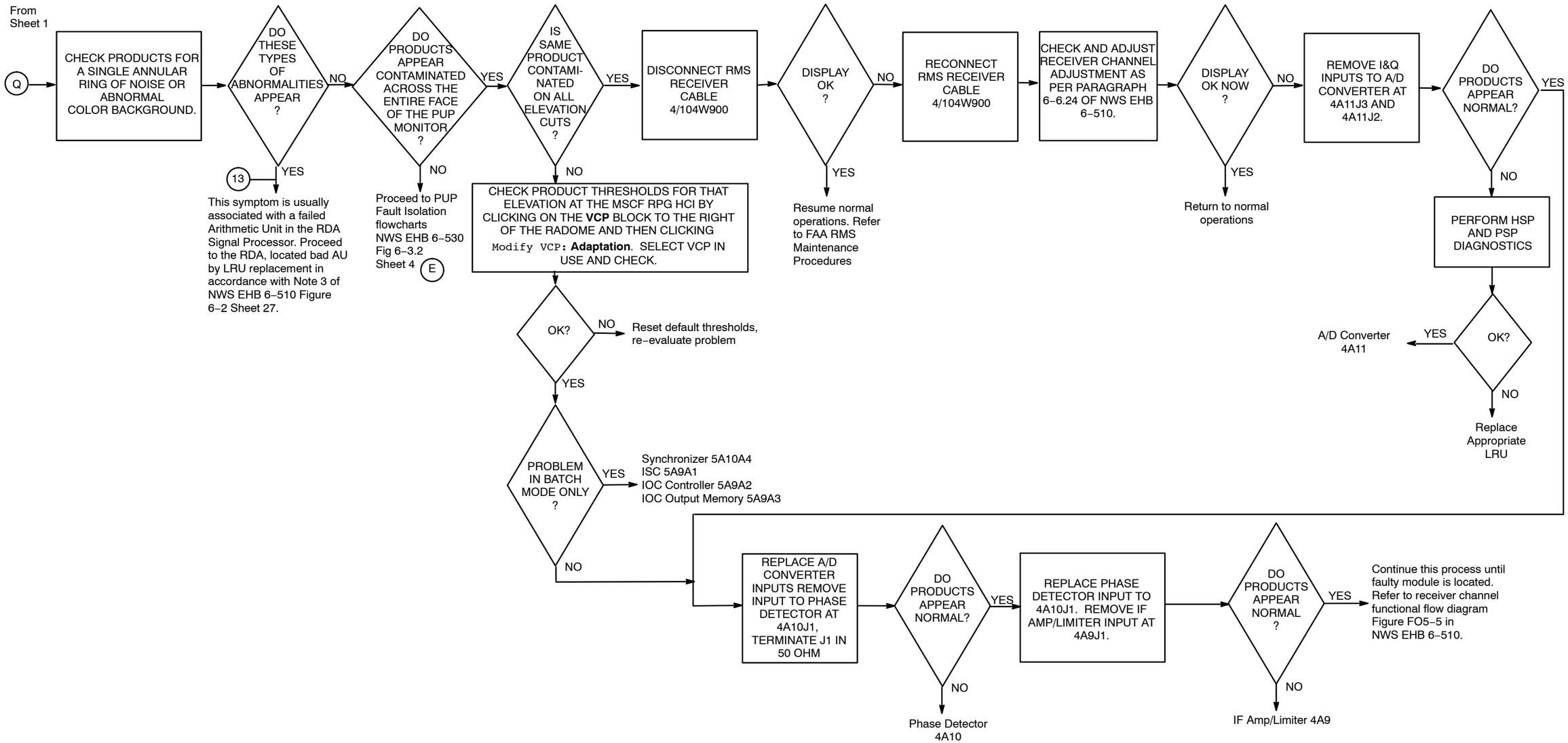


Figure 6–1. System Fault Isolation Flowchart (Sheet 8 of 8)

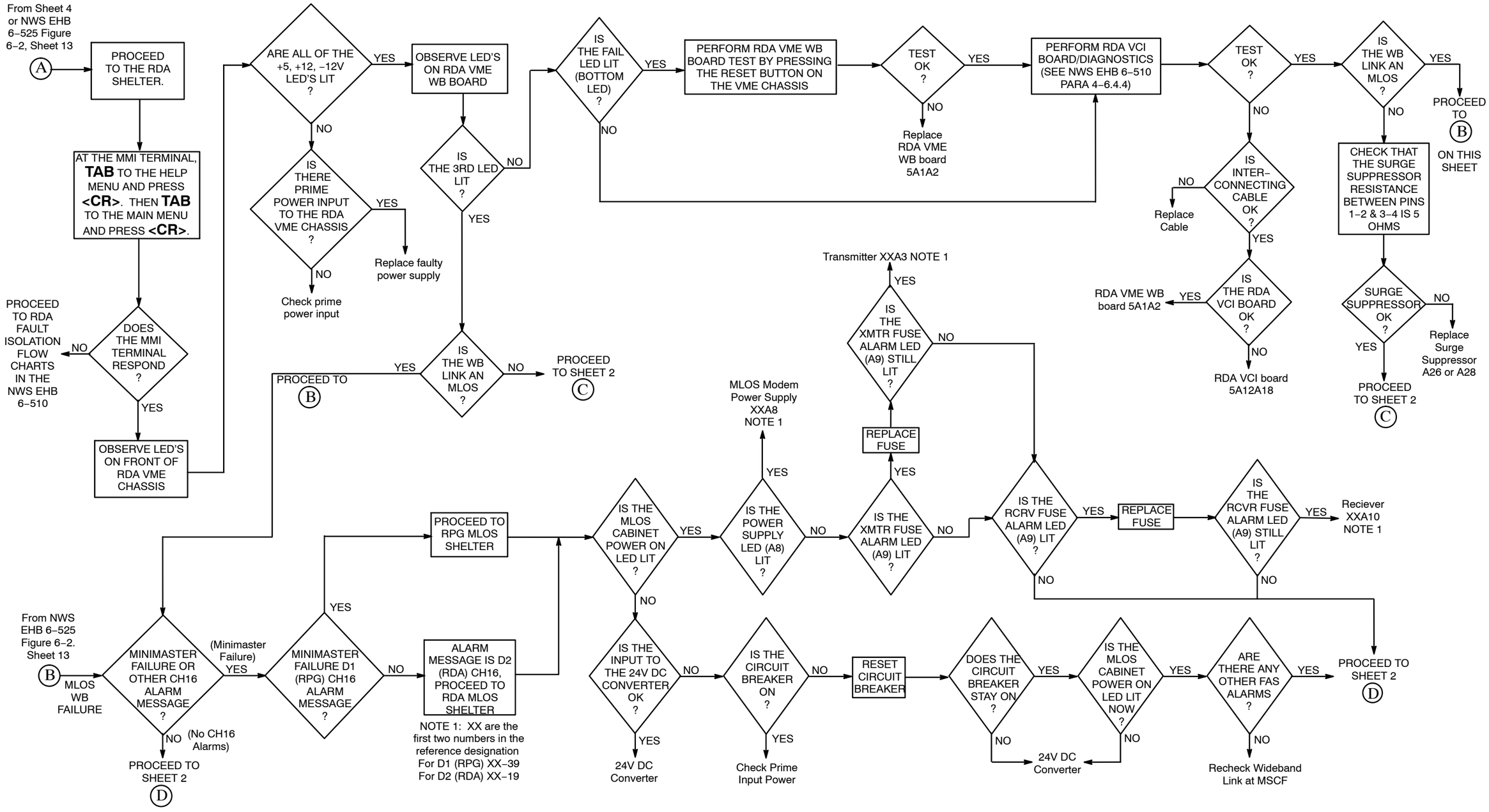


Figure 6–2. Wideband Communications Fault Isolation Flowchart (Sheet 1 of 6)

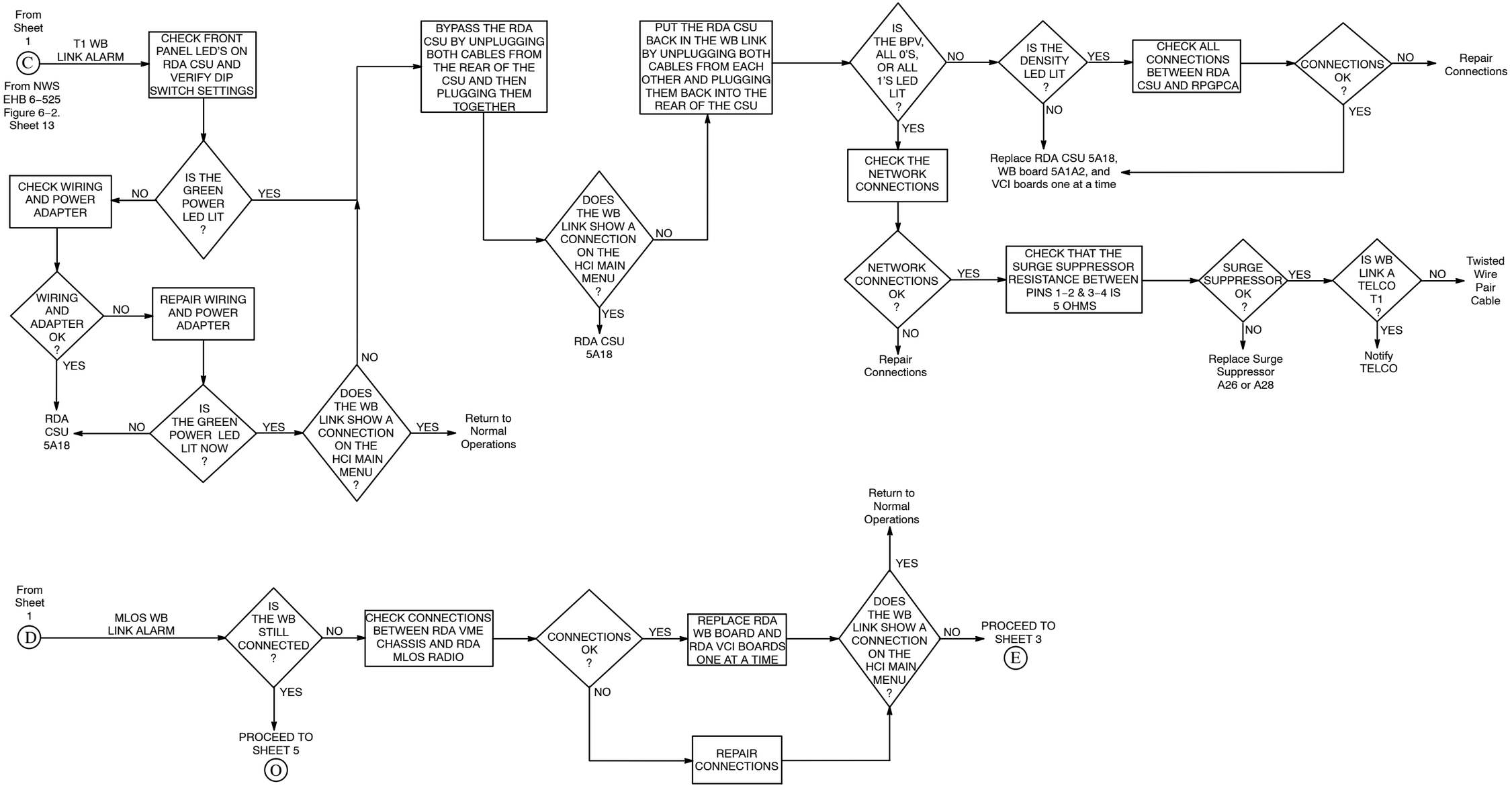


Figure 6–2. Wideband Communications Fault Isolation Flowchart (Sheet 2 of 6)

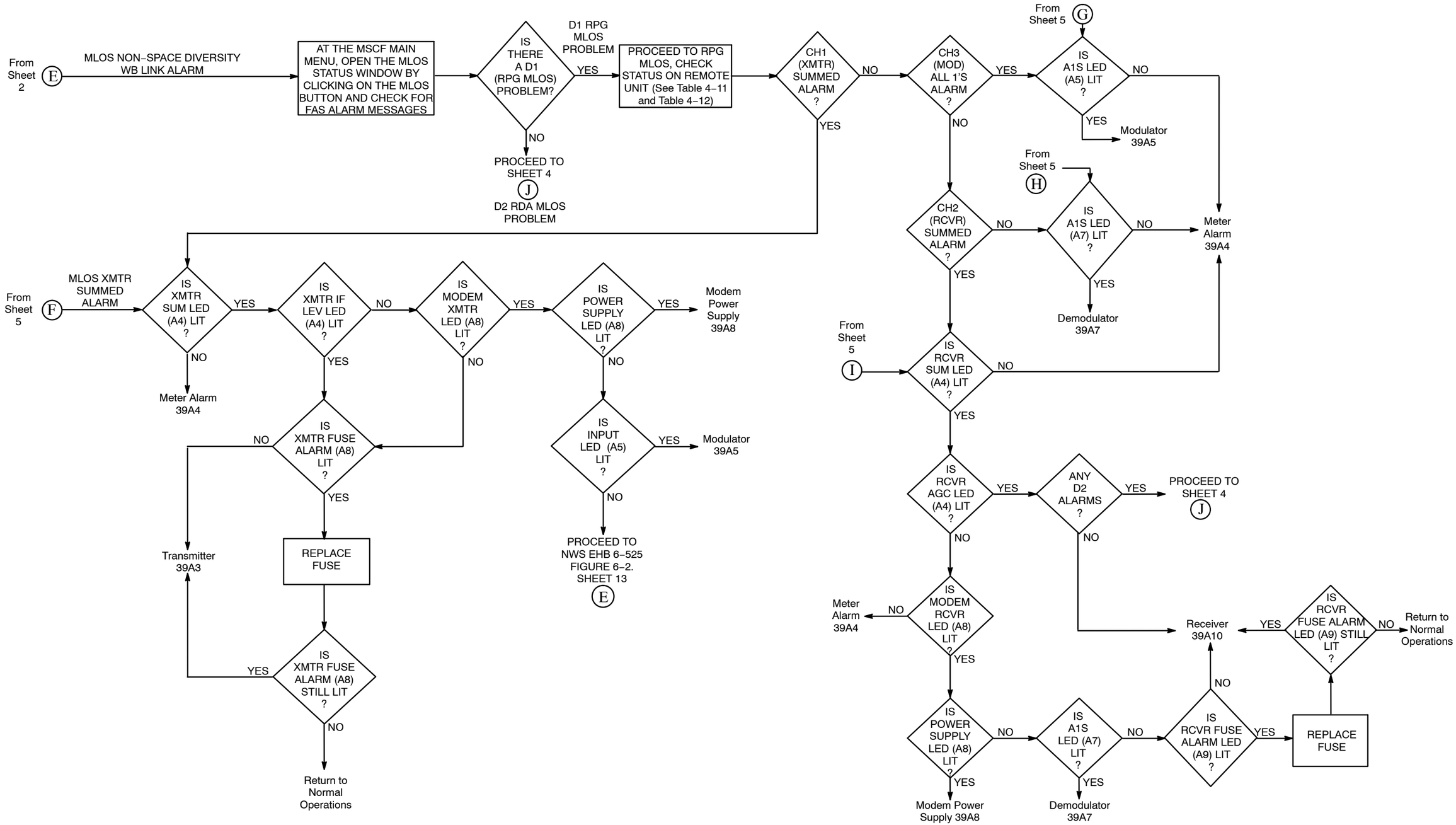


Figure 6–2. Wideband Communications Fault Isolation Flowchart (Sheet 3 of 6)

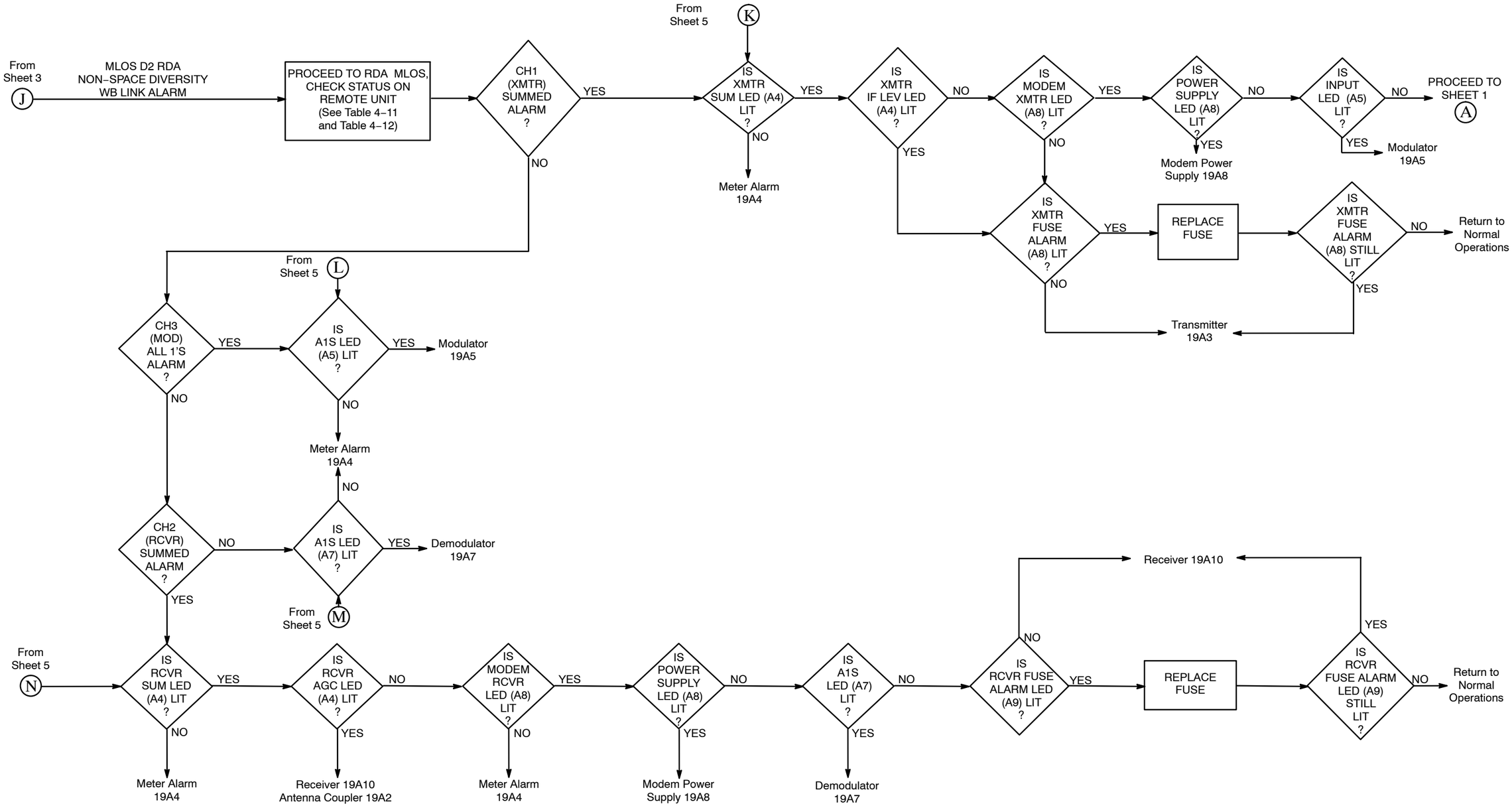


Figure 6–2. Wideband Communications Fault Isolation Flowchart (Sheet 4 of 6)

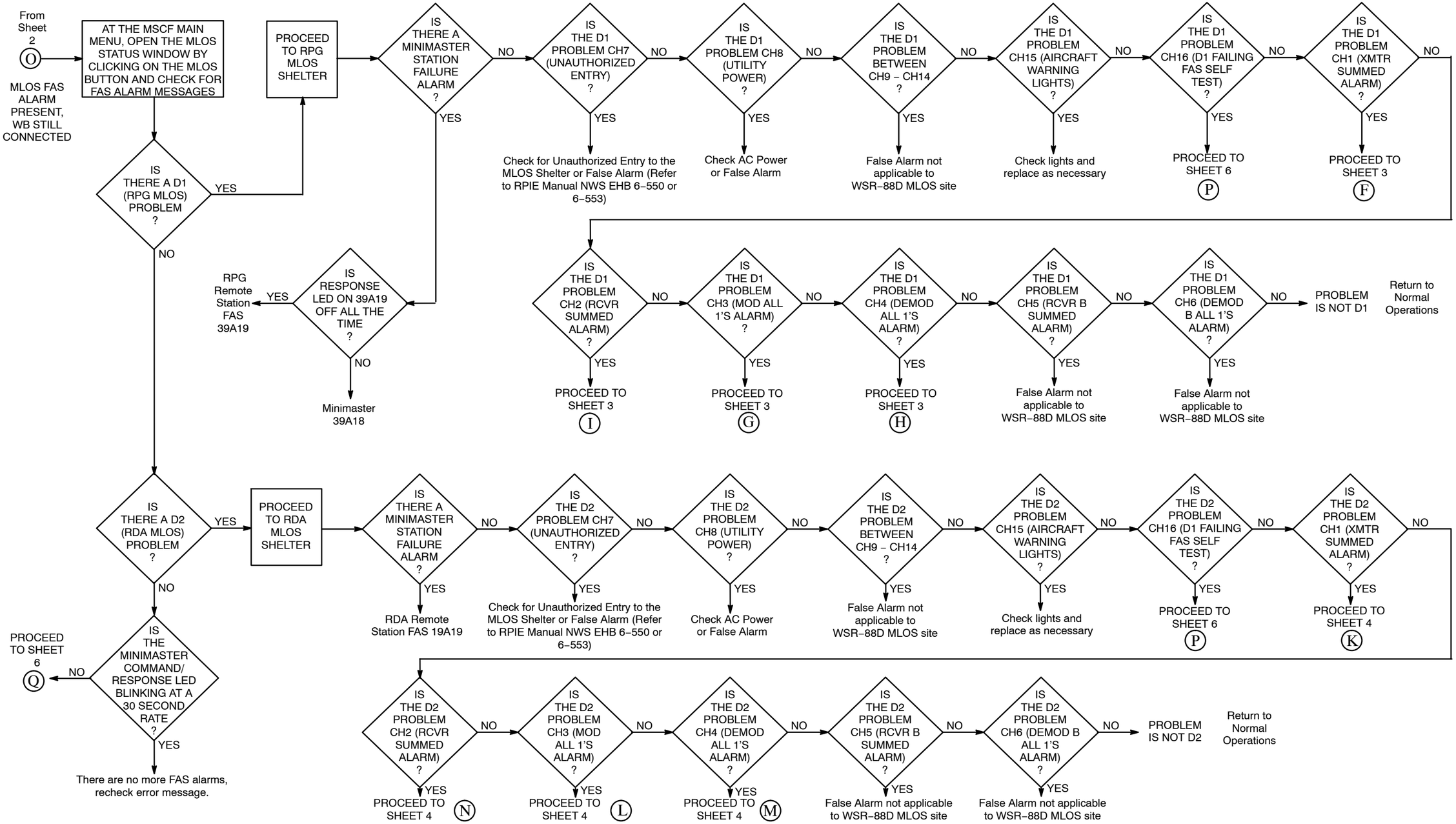


Figure 6–2. Wideband Communications Fault Isolation Flowchart (Sheet 5 of 6)

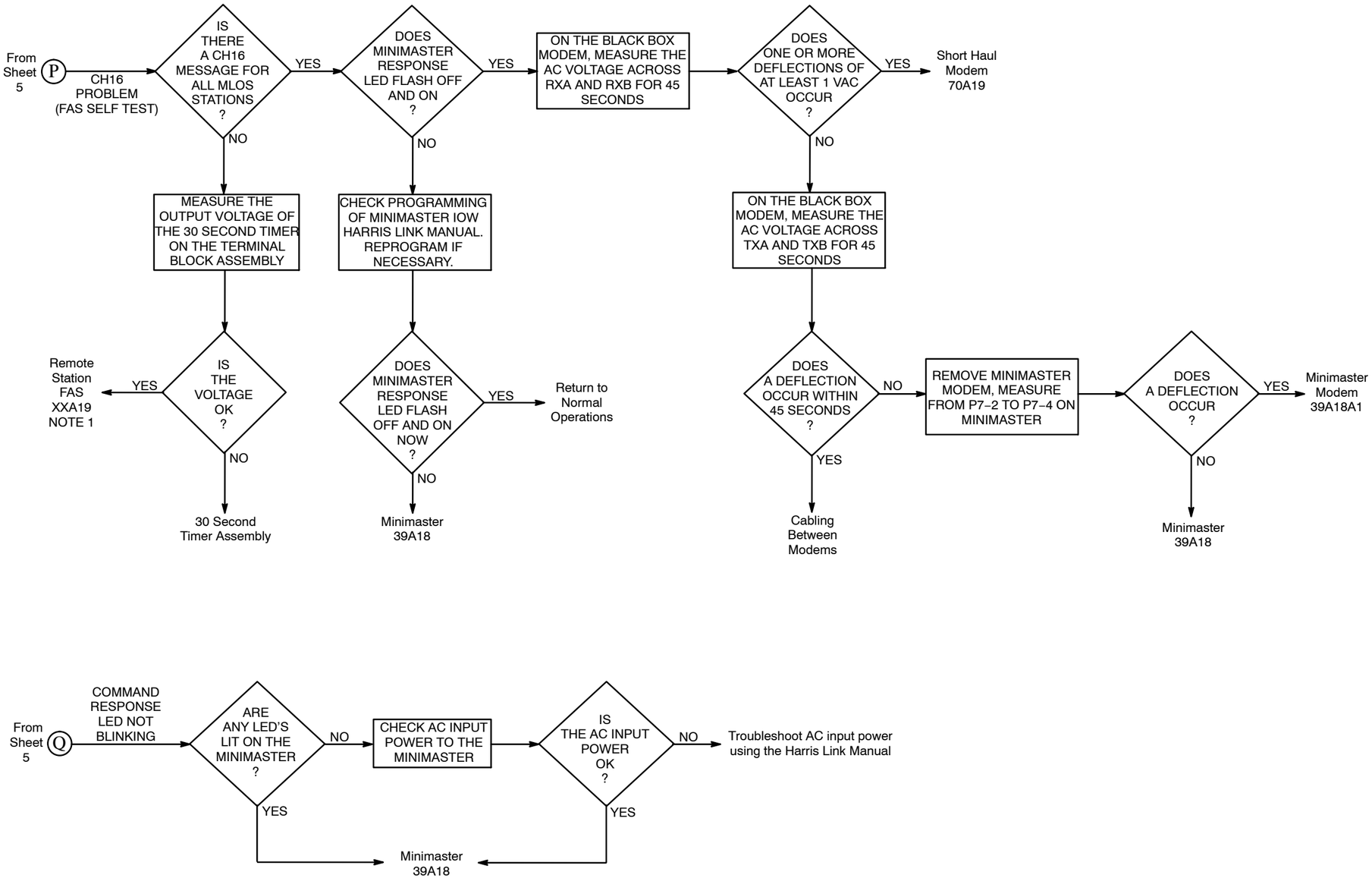


Figure 6–2. Wideband Communications Fault Isolation Flowchart (Sheet 6 of 6)

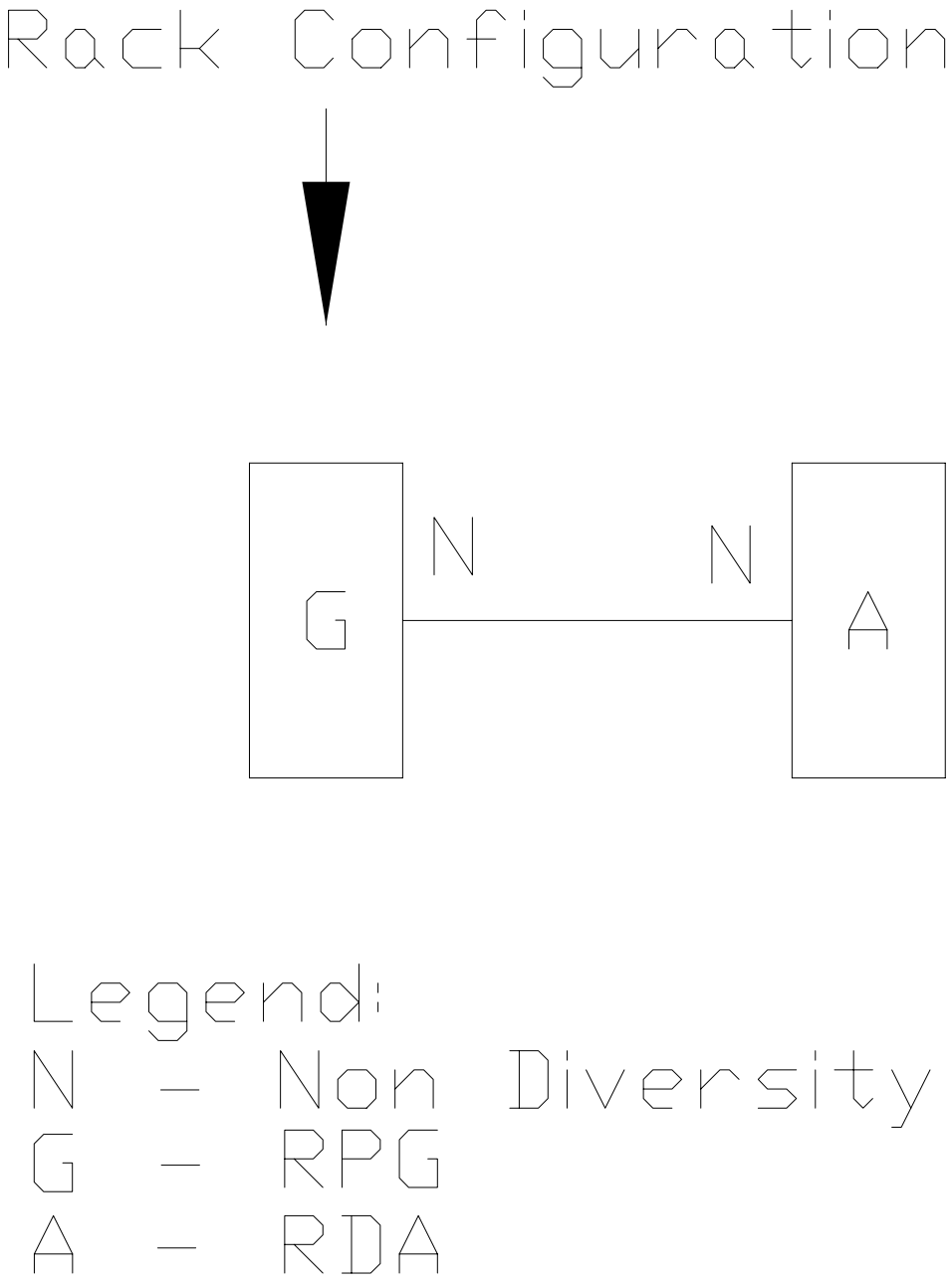


Figure 6–3. MLOS Link Configuration

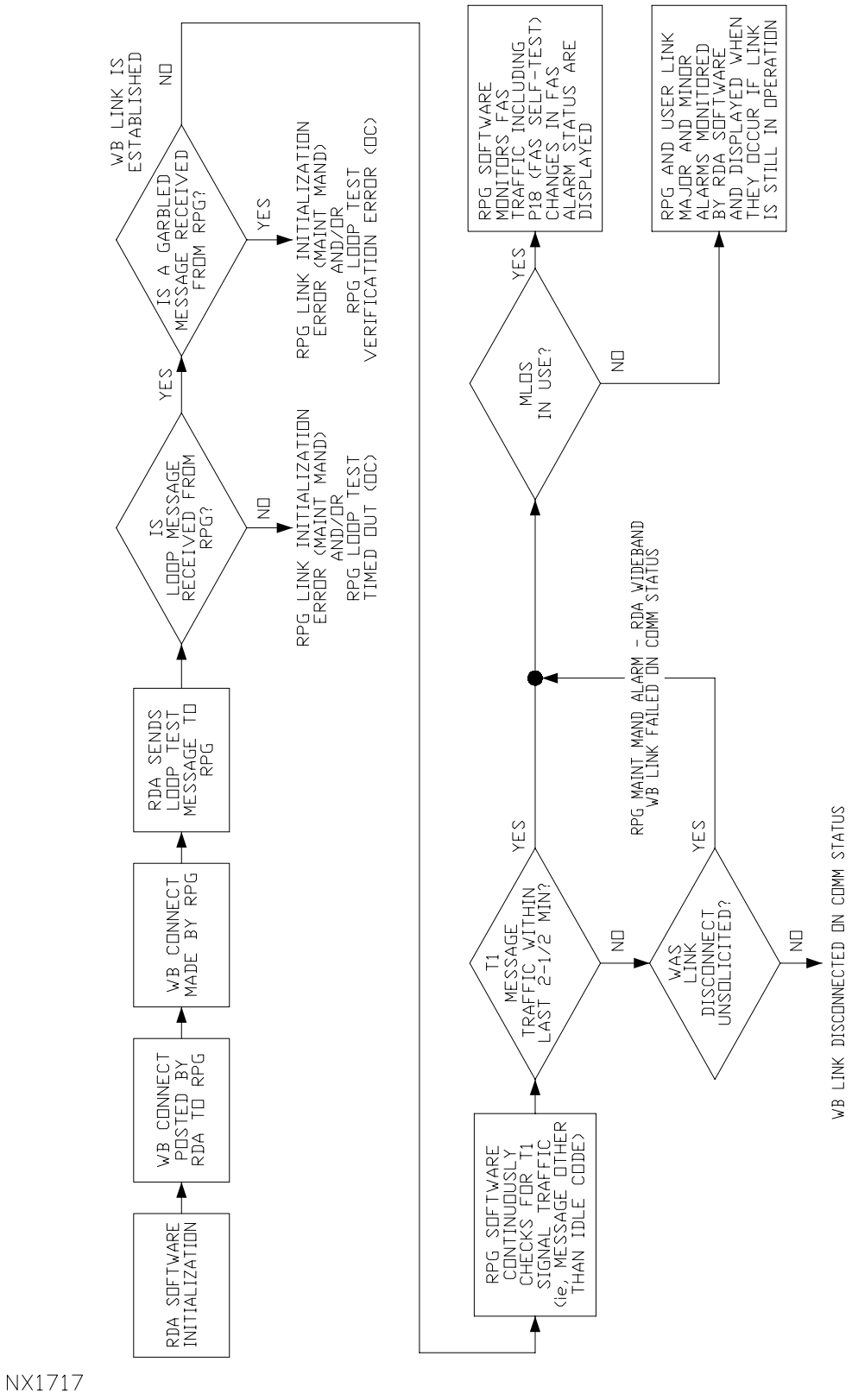


Figure 6–4. Wideband Communications Performance Monitoring

Section 6–4. Secondary Fault Isolation

NOT APPLICABLE

Section 6–5. Replacement and Setup Procedures

6–5.1 INTRODUCTION

This section provides instructions and data for the replacement of those WBC assemblies which require special handling or setup procedures. The procedures are organized by unit designation. Table 6–4 provides an index to identify the replacement procedures that must be performed when a given assembly is to be replaced. Refer to the IPB Manual, NWS EHB 6–501, for exact parts location, identification, and part number ordering data.

The great majority of WBC assemblies are either stand–alone, plug–in, or rack–mounted modules which do not require special replacement instructions. Visual inspection and reference to cabinet layout/interconnection drawings to determine access requirements, cable connections and fastening hardware suffice for most assemblies. There are two types of assemblies for which special procedures are required. These include certain printed circuit cards and universal communications devices. Each of these types is defined in the following paragraphs.

6–5.1.1 Printed Circuit Cards. Many of the printed circuit cards in the WBC require removal or installation of jumpers (straps) before they are installed into the equipment. Many cards require the proper setting of miniature built–in switches before they are installed. These switches are either rotary, rocker, or Dual–in–Line Package (DIP) switches. The reason for this requirement is that many of the cards are standard off–the–shelf card assemblies which can function in several different modes or configurations. They must be configured for their specific application at the time of installation. This section includes tables for determining the proper strap/switch setting for each unique card location and card layout figures for positive identification of straps/switches.

NOTE

All straps not defined in this section must be left in the original configuration as received from the factory/spares depot.

6–5.1.2 Universal Communication Devices. The communications devices used in the WBC equipment (Minimaster, Remote Alarm Station) are universal devices capable of operating in a wide variety of applications. Special jumper/switch settings are required to define the operating modes and data transfer protocols. In some cases, such as with the Minimaster, mode selection is accomplished via interactive pushbutton LED displays. Instructions to accomplish the correct setup for the LRU applications are referenced in the applicable replacement procedure.

Table 6–4. Wideband Communications Replacement Procedure Index

NOTE

COTS manuals not referenced here are not valid and should not be used for replacement, alignment or initialization of LRUs.

Unit Designation	Nomenclature	Replacement Paragraph
UD5A18	RDA CSU	6–5.12
UD13A1	MLOS Shelter PDP Circuit Breaker Replacement	6–5.5
UD19/UD39	MLOS Transceiver	
A	Terminal Block Mount 30 Second Timer	6–5.6
A3	Transmitter	6–5.7
A10	Receiver	6–5.8
A18	Minimaster (RPG only)	6–5.9
A19	Remote Station FAS	6–5.10
A38PS1	Power Supply	6–5.11
UD70A12	Polycom RDA/RPG Gateway	6–5.13

6–5.2 SPECIAL CONSIDERATIONS FOR REPLACEMENT PROCEDURES

Whenever a part or assembly is replaced, the following general considerations apply:

1. Safety. Always read the text and procedures, noting the safety cautions provided. Do not attempt to bypass or circumvent instructions and features provided for the safety of personnel or the protection of the equipment.

2. Software Shutdown. A software shutdown is performed when it is necessary to stop the application software prior to a removal and replacement procedure. When this is necessary, it is written in the removal and replacement procedure.

3. Power Off. Always power off equipment before connecting/disconnecting or removing/installing components. Follow the appropriate equipment shutdown procedure as provided within each removal and replacement procedure.

4. Inspection. When a new or replacement component is to be installed in the equipment, first verify it is the correct part by checking part numbers against the parts list. Then inspect for physical damage. Attempted installation of an incorrect part or a correct part installed into the wrong location, can cause equipment damage.

5. Related Procedures. The replacement of certain components will require an alignment or initialization process to be done. It will be referenced in one of the last steps of a replacement procedure.

6−5.2.1 Handling of Electrostatic Sensitive Devices. All WSR−88D circuit cards are ESDs and must be handled using a grounded conductive mat, a wrist strap, a suitable conductive bag for proper component protection, and the following special ESD handling procedures as applicable.

CAUTION

The ESD symbol establishes the requirement that all paragraphs, steps, figures with illustrations, and diagrams identified by ****ESD**** must be followed as written and according to ESD handling procedures.

1. Card Removal/Installation
   a. Remove all power to equipment.
   b. Put wrist strap on bare wrist and connect clip lead to chassis frame.
   c. Have a conductive bag ready.
   d. Remove the component and place into the conductive bag.
   e. Remove new card from its conductive package and install.
   f. Disconnect wrist strap and return system to normal operation.
2. ESD DIP Switch Setting
   a. Put ESD wrist strap on bare wrist and connect clip lead to chassis frame.
   b. Place ESD on grounded conductive mat.
   c. Set DIP switches for correct setting.
   d. Install circuit card in proper slot.
   e. Remove wrist strap.
   f. Disconnect wrist strap clip lead from chassis frame.

6−5.3 DATA PROCESSORS SHUTDOWN AND STARTUP PROCEDURES

It is not necessary to shut down either processor to do maintenance on the WBC Group. Normally, the processors continuously make attempts to reconnect the wideband link once they are commanded to do so within the troubleshooting procedures. However, there have been instances where the processors stopped attempting to reestablish communications and instead continuously output an idle code. Either way, the idle code or the reconnect command will be sufficient to clear any alarm lights on the MLOS when power is turned on after maintenance or alignment has been completed. It is advised that a wideband reconnect be done at the terminal upon completion of WBC maintenance.

If it is necessary to shut down the processors for a repair, refer to the RDA and RPG Maintenance Manuals, NWS EHB 6−510 and 6−525, for the applicable processor shutdown procedures.

6–5.4 STRAPPING AND SWITCHES

Many of the WBC cards have a unique component complement and layout. For this reason, separate figures are provided for each card which requires strapping or switch settings. In most cases, the strapping information is provided directly in the figure. In a few cases, because of the complexity of the strapping layout, a separate table may be provided. The card strapping and switch setting must always be done prior to installation in the equipment.

6–5.5 RDA/RPG MLOS SHELTER PDP CIRCUIT BREAKER UD13A1 REPLACEMENT

Two technicians are required for this procedure.

6–5.5.1 Equipment and Tools Required.

1. Screwdriver set, flat–tip

6–5.5.2 Initial Conditions/Preliminary Setup.

WARNING

Failure to do the shutdown procedure in the following steps could cause serious injury or death.

CAUTION

Latch the shelter door under windy conditions.

NOTE

Refer to paragraph 6–5.2 for special considerations for replacement procedures.

1. At the RDA/RPG PDP, place the MLOS shelter circuit breaker(s) to the OFF position.
2. At the MLOS Shelter PDP UD13A1, place the MLOS main disconnect circuit breakers 1 and 3 to the OFF position.

6–5.5.3 Procedure.

1. Open the MLOS PDP UD13A1 door to gain access to the outer panel holding screws.
2. Remove the PDP outer panel by loosening the holding screws using the proper screwdriver.
3. Remove the PDP inner panel holding screws using the proper screwdriver and set it aside.
4. Remove and tag the lead from the defective circuit breaker using the proper screwdriver.

5. Disengage the defective circuit breaker by pulling it outward and to the side, note the amperage rating of the defective circuit breaker.
6. Ensure that the replacement circuit breaker has the same amperage rating that the defective circuit breaker has; install the replacement.
7. Using the tag or guide, connect the lead to the replacement circuit breaker using the proper screwdriver.
8. Install the inner panel by inserting it and tightening its holding screws using the proper screwdriver.
9. Install the outer panel by tightening its holding screws using the proper screwdriver.
10. On the MLOS PDP UD13A1, place the MLOS main circuit breakers 1 and 3 to the ON position.
11. At the RDA/RPG PDP, place the MLOS shelter circuit breaker(s) to the ON position.
12. If necessary, do a WB connect at the terminal to return the system to normal operation.
13. At the MLOS cabinet assembly, note that Remote Alarm Station REMOTE RESPONSE indicator flashes each time the station is polled by the RPG Minimaster and that no major alarms exist. If a major alarm exists, go to Section 6−3.
14. If at the RPG site, note if any major alarms exist on the Minimaster. If a major alarm exists, refer to Section 6−3.
15. Close and latch the MLOS cabinet doors.
16. Close and latch the shelter door.

6−5.6 MLOS TERMINAL BLOCK MOUNT 30 SECOND TIMER UD19A/UD39A REPLACEMENT

Two technicians are required for this procedure.

6−5.6.1 Equipment and Tools Required.

1. Screwdriver set, flat−tip
2. Solder gun, 25 watt
3. Rosin core 60/40 solder
4. Flux
5. Needlenose pliers

6–5.6.2 Initial Conditions/Preliminary Setup.

WARNING

Failure to do the shutdown procedure in the following steps could cause serious injury or death.

CAUTION

Latch the shelter door under windy conditions.

NOTE

Refer to paragraph 6–5.2 for special considerations for replacement procedures.

1. Open the UD19/UD39 front and rear cabinet doors and locate the assembly.
2. At the circuit breaker panel, place the MLOS Cabinet Assembly circuit breaker to the OFF position.

6–5.6.3 Procedure.

1. Unsolder and tag the blue wire and resister lead from Pin 1.
2. Unsolder and tag the two black wires and resister lead from Pin 3.
3. Tag and pull off the lead on Pin 2.
4. Remove the screws retaining the defective module using the proper screwdriver.
5. Remove the defective module and set it aside.
6. Inspect the replacement module for disfigured connector contacts and foreign material.
7. Reverse Steps 1. through 4. to install the replacement timer. Use the tags as a guide.
8. At the circuit breaker panel, place the MLOS Cabinet Assembly circuit breaker to the ON position.
9. Ensure that the remote alarm station lamp 16 cycles on and off within 30 ± 6 seconds.
10. If necessary, do a WB connect at the terminal to return the system to normal operation.
11. At the MLOS cabinet assembly, note that the Remote Alarm Station REMOTE RESPONSE indicator flashes each time the station is polled by the RPG Minimaster and that no major alarms exist. If a major alarm exists, go to Section 6–3.

12. If at the RPG site, note any major alarms on the Minimaster. If a major alarm exists, refer to Section 6–3.

13. Close and latch the MLOS cabinet doors.

14. Close and latch the shelter door.

6–5.7 MLOS TRANSMITTER UD19A3, UD39A3 REPLACEMENT

Two technicians are required for this procedure.

6–5.7.1 Equipment and Tools Required.

1. Screwdriver set, flat–tip
2. ESD wrist strap with clip lead
3. Wrench, torque (SMA connector)

6–5.7.2 Initial Conditions/Preliminary Setup.

WARNING

Failure to do the shutdown procedure in the following steps could cause serious injury or death.

CAUTION

Latch the shelter door under windy conditions.

NOTE

Refer to paragraph 6–5.2 for special considerations for replacement procedures.

1. Open the UD19/UD39 front and rear cabinet doors and locate the assembly. (Refer to the plate mounted on the front door.)
2. At the circuit breaker panel, place the MLOS Cabinet Assembly circuit breaker to the OFF position.

6–5.7.3 Procedure.

****ESD** CAUTION **ESD****

All WSR–88D printed circuit cares are electrostatic devices which require special handling.

1. Put the ESD wrist strap on and attach the clip lead to the cabinet.

2. At the cabinet rear, remove the three connections from the defective component.
3. At the cabinet front, loosen the captive screws retaining the defective module.
4. Remove the defective module and set it aside.
5. Inspect the replacement module for disfigured connector contacts and foreign material.
6. Reverse Steps 1. through 3. to install the replacement module.
7. At the circuit breaker panel, place the MLOS Cabinet Assembly circuit breaker to the ON position.
8. Refer to Table 6–5 for the applicable alignments and record data in the appropriate Link Manual, NWS EHB6–541–2 or 6–541–4.
9. If necessary, do a WB connect at the terminal to return the system to normal operation.
10. At the MLOS cabinet assembly, note that the Remote Alarm Station REMOTE RESPONSE indicator flashes each time the station is polled by the RPG Minimaster and that no major alarms exist. If a major alarm exists, go to Section 6–3.
11. If at the RPG site, note any major alarms on the Minimaster. If a major alarm exists, refer to Section 6–3.
12. Close and latch the MLOS cabinet doors.
13. Close and latch the shelter door.

6–5.8 MLOS RECEIVER UD19A10, UD39A10 REPLACEMENT

Two technicians are required for this procedure.

6–5.8.1 Equipment and Tools Required.

1. Screwdriver set, flat–tip
2. ESD wrist strap with clip lead

6–5.8.2 Initial Conditions/Preliminary Setup.

WARNING

Failure to do the shutdown procedure in the following steps could cause serious injury or death.

CAUTION

Latch the shelter door under windy conditions.

NOTE

Refer to paragraph 6−5.2 for special considerations for replacement procedures.

1. Open the UD19/UD39 front and rear cabinet doors and locate the assembly. (Refer to the plate mounted on the front door.)
2. At the circuit breaker panel, place the MLOS Cabinet Assembly circuit breaker to the OFF position.

6−5.8.3 Procedure.

****ESD** CAUTION **ESD****

All WSR−88D printed circuit cards are electrostatic devices which require special handling.

1. Put the ESD wrist strap on and attach the clip lead to the cabinet chassis.
2. At the cabinet rear, remove the three connections from the defective component.
3. At the cabinet front, loosen the captive screws retaining the defective module.
4. Remove the defective module and set it aside.
5. Inspect the new module for disfigured connector contacts and foreign material. Ensure that the new part is the same frequency as the part that was removed.
6. Reverse Steps 1. through 3. to install the replacement module.
7. Refer to Table 6−5 for applicable alignments and record data in the appropriate Link Manual, NWS EHB6−541−2 or 6−541−4.
8. At the circuit breaker panel, place the MLOS Cabinet Assembly circuit breakers to the ON position.
9. If necessary, do a WB connect at the terminal to return the system to normal operation.
10. At the MLOS cabinet assembly, note that the Remote Alarm Station REMOTE RESPONSE indicator flashes off and on each time the station is polled by the RPG Minimaster and that no major alarms exist. If a major alarm does exists, go to Section 6−3.
11. If at the RPG site, note any major alarms on the Minimaster. If a major alarm exists, refer to Section 6−3.
12. Close and latch the MLOS cabinet doors.
13. Close and latch the shelter door.

6–5.9 MLOS MINIMASTER UD39A18 REPLACEMENT (RPG ONLY)

Two technicians are required for this procedure, one at the Minimaster and one at the remote site.

6–5.9.1 Equipment and Tools Required.

1. Screwdriver sets, phillips–tip and flat–tip
2. Multimeter, digital calibrated in dBm and AC volts
3. Test probes with 0.08” probes
4. Small alignment (plastic pot) screwdriver

6–5.9.2 Initial Conditions/Preliminary Setup.

WARNING

Failure to do the shutdown procedure in the following steps could cause serious injury or death.

CAUTION

Latch the shelter door under windy conditions.

NOTE

Refer to paragraph 6–5.2 for special considerations for replacement procedures.

1. Open the UD19/UD39 front and rear cabinet doors and locate the assembly. (Refer to the plate mounted on the front door.)
2. Locate the Remote Station FAS power ON/OFF switch behind the rear cabinet door. Turn the locking nut counterclockwise and place the toggle switch to the OFF position.
3. Ensure that the fuse is installed in the front and rear panels of the replacement unit.
4. Remove the two front panel screws from the replacement unit using the proper screwdriver.
5. Put the ESD wrist strap on and attach the clip lead to the cabinet chassis.
6. Remove the front panel and slide the circuit card tray forward a few inches until Switch S3 is exposed. If the switch is not in the ON position, place it in the ON position.
7. Reverse steps 4., 5., and 6.

6−5.9.3 Procedure.

****ESD** CAUTION **ESD****

All WSR−88D printed circuit cards are electrostatic devices which require special handling.

NOTE

The Remote Station Fault Alarm Station must be removed to provide clearance for replacement of the Minimaster.

1. Put the ESD wrist strap on and attach the clip lead to the cabinet chassis.
2. At the rear of the cabinet, loosen the screws that secure the FAS wiring to the TB1 terminals until the spade lugs can be removed, and then remove the spade lugs and label the pins as follows:

   Pin 1 − Blue

   Pin 2 − Yellow

   Pin 3 − Black half of jumper

   Pin 4 − Black half of jumper and black input lead
3. Remove the cable clamp from the left side of the unit using the proper screwdriver.
4. Grasp the J6 connector bar and pull it to remove. Repeat for the J5 connector.
5. From the front, remove the four screws from the left and right retaining mounts.
6. Pull the unit forward until it clears the side rails, then turn it to clear the front cabinet assembly.
7. Set the FAS unit aside.
8. Remove the following connectors from the Minimaster in this order: J8, P6, and J5.
9. Remove the cable clamp from the left side of the unit using the proper screwdriver.
10. From the front, remove the four screws from the left and right retaining mounts.
11. Pull the unit forward until it clears the side rails, then turn it to clear the front cabinet assembly.
12. Set the defective Minimaster unit aside.

NOTE

At power restoration, the Minimaster will do a short self−test. At the end of the self−test, a short beep will sound. If a printer is

connected, it will print “Database verified” or “Database corrupt:loading default values.”

13. Reverse Steps 1. through 11. for installation.

14. Set the Remote Station FAS Power ON/OFF switch to the ON position and tighten the locking nut clockwise.

15. Initialize the Minimaster database per paragraph 6−6.2.

16. Perform the following steps to align the RTU:

NOTES

All paragraph references in the substeps below are contained in the 481 MINIMASTER Installation and Maintenance Manual NWS EHB 6−541−1 or 6−541−3 which is included in the COTS manual.

Desired system termination for the 152025 board is set at the factory and W26 strapped for low range.

a. Adjust the transmit level with J5 disconnected per paragraph 2−12 (Transmit Level(s) Adjustment) at a 600 ohm transmit impedance.

b. Connect J5 and adjust the receive level per paragraph 2−13 (Receive Level(s) Adjustment).

17. If necessary, do a WB connect at the terminal to return the system to normal operation.

18. At the MLOS cabinet assembly, note that the Remote Alarm Station REMOTE RESPONSE indicator flashes each time the station is polled by the RPG Minimaster and that no major alarms other than the entry alarm exist. If a major alarm exists, refer to Section 6−3.

19. If at the RPG site, note any major alarms on the Minimaster. If a major alarm exists, refer to Section 6−3.

20. Close and latch the MLOS cabinet doors.

21. Close and latch the shelter door.

6−5.10 MLOS REMOTE STATION FAS UD19A19, UD39A19 REPLACEMENT

Two technicians are required for this procedure, one at the Minimaster and one at the remote site.

6−5.10.1 Equipment and Tools Required.

1. Screwdriver set, phillips−tip2 and flat−tip

2. Multimeter digital, calibrated in dBm and AC volts
3. Test probes with 0.08 inch probes
4. Small alignment (plastic pot) screwdriver

6−5.10.2 Initial Conditions/Preliminary Setup.

WARNING

Failure to do the shutdown procedure in the following steps could cause serious injury or death.

CAUTION

Latch the shelter door under windy conditions.

NOTE

Refer to paragraph 6−5.2 for special considerations for replacement procedures.

1. Open the UD19/UD39 front and rear cabinet doors and locate the assembly.
2. Locate the Remote Station FAS power ON/OFF switch behind the rear cabinet door. Turn the locking nut counterclockwise and place the toggle switch to the OFF position.

6−5.10.3 Procedure.

****ESD** CAUTION **ESD****

All WSR−88D printed circuit cards are electrostatic devices which require special handling.

1. Put the ESD wrist strap on and attach the clip lead to the cabinet chassis.
2. At the cabinet rear, loosen the TB1 screws until the spade lugs can be removed. Remove and tag the spade lugs from:

   Pin 1 − Blue

   Pin 2 − Yellow

   Pin 3 − Black half of jumper

   Pin 4 − Black half of jumper and black input lead.
3. Remove the cable clamp from the left side of the unit using the proper screwdriver.
4. Grasp the J6 connector bar and pull it to remove. Repeat for the J5 connector.

5. From the front, remove the four screws from the left and right retaining mounts.
6. Pull the unit forward until it clears the side rails, then turn it to clear the front cabinet assembly.
7. Set the defective unit aside.
8. Strap the replacement unit as follows:

NOTE

All references to tables, figures and text in the substeps below are contained in the 481 Remote Station Model 001725 Installation and Maintenance Manual NWS EHB 6–541–1 or 6–541–3 which is included in the COTS manual.

a. Remove the RTU from its enclosure using the strapping procedure (paragraph 2–7)

b. Set the RTU address per the RTU Switch Setting Procedures (paragraph 2–8.a). Decimal Number addresses are:

RPG RTU = 1
RDA RTU = 2

c. Set the ALARM STATUS INPUTS per paragraph 2–8.b on card 151962 for a normally open/nonconducting alarm status input (OFF direction). If card 151963 is installed, repeat for S6 and S7.

d. See Figure 2–4, Termination Resistor Location. Termination resistance is 600 ohms per Table 2–3.1 and the receive level range is LO (W26 strapped).

e. Factory settings are for channel 22, which uses 2.7 KHz with a nominal center frequency of 550 Hz and a baud rate of 300 bps. Ensure that the correct baud rate is set.

f. Set all of the S1 switches to the OFF position.

g. No further strapping is necessary. Reverse the procedure in step 8a to re–install the RTU in the enclosure.

9. Reverse steps 1. though 6. for installation.
10. Set the Remote Station FAS Power ON/OFF switch to the ON position and tighten the locking nut clockwise.
11. Perform the following steps to align the RTU:

NOTE

All references in the substeps below are listed in the 481 Remote Station Model 001725 Installation and Maintenance Manual NWS EHB 6–541–1 or 6 541–3 included in the COTS manual.

a. Adjust the transmit level with J5 disconnected per paragraph 2−12 (Transmit Level(s) at a 600 ohm transmit impedance.

b. Connect J5 and adjust the receive level per paragraph 2−13 (Receive Level(s)).

12. If necessary, do a WB connect at the terminal to return the system to normal operation.

13. At the MLOS cabinet assembly, note that the Remote Alarm Station REMOTE RESPONSE indicator flashes off and on each time the station is polled by the RPG Minimaster and that no major alarms exist. If a major alarm does exists, refer to Section 6−3.

14. If at the RPG site, note any major alarms on the Minimaster and refer to Section 6−3.

15. Close and latch the MLOS cabinet doors.

16. Close and latch the shelter door.

6−5.11 MLOS POWER SUPPLY UD19A38, UD39A38 REPLACEMENT

Two technicians are required for this procedure.

6−5.11.1 Equipment and Tools Required.

1. Screwdriver set, phillips−tip

6−5.11.2 Initial Conditions/Preliminary Setup.

WARNING

Failure to do the shutdown procedure in the following steps could cause serious injury or death.

CAUTION

Latch the shelter door under windy conditions.

NOTE

Refer to paragraph 6−5.2 for special considerations for replacement procedures.

1. Open the UD19/UD39 front and rear cabinet doors and locate the assembly. (Refer to the plate mounted on the front door.)

2. At the circuit breaker panel, place the MLOS Cabinet Assembly circuit breaker to the OFF position.

6–5.11.3 Procedure.

1. At the rear of the cabinet, remove the four cover screws from the power supply and then follow the wires from the defective unit to the terminal block.

NOTE

Label the same color wires to ensure that they are connected to the proper terminal.

- Pin 1 – Black (short)
- Pin 2 – White
- Pin 3 – Green
- Pin 7 – Yellow
- Pin 8 – Yellow (2) and Black
- Pin 9 – Black (longer)

2. Remove the four restraining screws from the bottom of the unit and set the defective unit aside.
3. Reverse Steps 1. and 2. for replacement.
4. At the circuit breaker panel, place the MLOS Cabinet Assembly circuit breakers to the ON position.
5. If necessary, do a WB connect at the terminal to return the system to normal operation.
6. At the MLOS cabinet assembly, note that the Remote Alarm Station REMOTE RESPONSE indicator flashes each time the station is polled by the RPG Minimaster and that no major alarms exist. If a major alarm does exists, refer to Section 6–3.
7. If at the RPG site, note any major alarms on the Minimaster and see Section 6–3.
8. Close and latch the MLOS cabinet doors.
9. Close and latch the shelter door.

6–5.12 RDA CSU UD5A18 REPLACEMENT

One technician is required for this procedure.

6–5.12.1 Equipment and Tools Required.

1. Screwdriver set, phillips–tip
2. Screwdriver set, flat–tip

6−5.12.2 Initial Conditions/Preliminary Setup.

WARNING

Hazardous voltages are present within the CSU UD5A18. Failure to perform the applicable shutdown steps in NWS EHB 6−510, Table 6−5.2, could cause serious injury or death.

NOTE

Refer to NWS EHB 6−510, paragraph 6−5.2, for special consideration for replacement procedures.

1. Open the UD5 left front and right rear cabinet doors and locate the UD5A18 CSU.
2. Refer to NWS EHB 6−510, Table 6−5.2, and perform steps 1, 2, 5, and 6 to shut down the RDASC processor.

6−5.12.3 Procedure.

1. Remove both cables from the P1 and J1 connectors on the rear of the unit.
2. Label all of the wires connected to terminal block TB1 at the rear of the unit to ensure proper re−connection when the replacement unit is installed.
3. Using the proper screwdriver, loosen all of the terminal lugs on terminal block TB1 until they are loose enough to remove and then remove all of the wires.
4. Remove the faulty unit from the cabinet and set it aside for reference.
5. Take note of the LBO switch setting and the DIP switch settings on the faulty CSU.
6. Set the switch settings on the new unit to the same positions as the faulty unit.
7. Reverse steps 1. through 4. to install the unit.
8. Refer to NWS EHB 6−510, Table 6−5.3, and perform steps 3a, 3b, 5 and 6 to restore power to the RDASC processor.

6−5.13 RDA/RPG GATEWAY UD70A12 REPLACEMENT

Two technicians are required for this procedure.

6−5.13.1 Equipment and Tools Required.

1. Screwdriver set, phillips−tip

6–5.13.2 Initial Conditions/Preliminary Setup.

WARNING

Lethal voltages (from commercial power, CRTs, high–voltage power supplies, and low–voltage, high–current power supplies) are present in the RPG cabinets. Failure to observe the safety summary precautions in the front of this manual prior to doing any maintenance procedure could cause serious injury or death.

(Refer to NWS EHB 6–525 Figure 1–3. for the RDA/RPG Gateway location.)

1. Open the RPGPCA doors and locate the defective RDA/RPG Gateway UD70A12.

6–5.13.3 Procedure.

1. Locate and disconnect the AC power cord from the back of the RDA/RPG Gateway.
   a. NWS and DOD: Cable UD70/170W54
   b. FAA: Cable UD70/170W69
2. Disconnect the LAN cable UD70/170W206 from the 10BaseT LAN Port at the back of the RDA/RPG Gateway.
3. Disconnect the T1 cable UD70/170W256 from the WAN B Port at the back of the RDA/RPG Gateway.
4. With a second technician supporting the RDA/RPG Gateway, remove the screws and washers securing the RDA/RPG Gateway to the cabinet mounting rails.
5. Remove the defective RDA/RPG Gateway from the UD70 cabinet and set it aside.
6. If mounting brackets aren't provided, reuse those from the old RDA/RPG Gateway.
7. Secure the mounting brackets to the new RDA/RPG Gateway in the same manner that the defective RDA/RPG Gateway had the brackets installed.
8. Reverse steps 1. through 5. to install the new RDA/RPG Gateway.
9. There are no follow–on setup procedures for this piece of equipment.
10. This completes the replacement procedure.

Section 6–6. Alignment Procedures

6–6.1 INTRODUCTION

This section contains the procedures to be used for the proper setup/alignment of a WBC Group LRU following the replacement of a faulty unit.

Table 6–5 lists the LRUs for which an alignment procedure is required and identifies the NWS EHB 6–541–1 or 6–541–3 index/procedure number for the required procedure.

Each procedure identifies the personnel, time, and materials necessary to perform the procedure. Additionally, some procedures provide reference information such as the complete menus for software initialized devices.

If an LRU is not listed, then the LRU either has been preset prior to being issued or has no site alignment or adjustment requirements.

Before performing the alignment procedure for the MLOS Transceiver, read the maintenance considerations in the LR4–2000 Maintenance Procedure R1 of the NWS EHB 6–541–1 or 6–541–3. The original factory test or the previous test readings are included in the NWS EHB 6–541–2 or 6–541–4. If additional blank general equipment test record sheets are needed, make copies from LR4–2000 Maintenance Procedure R3 of NWS EHB 6–541–1 or 6–541–3.

Upon completing the procedure, repeat the initiating performance check and return to normal operation.

Table 6–5. WBC LRU Alignment Index

Unit Designation	Name	Paragraph Number
	NOTES	
	COTS manual sections not specifically referenced in this manual are not valid and are not to be used for alignment procedures.	
	Read the procedure prior to departing for the remote site to ensure that the proper tools and test equipment are available.	
UD19/UD39	MLOS Cabinet Assembly	
A3	Transmitter RF Power/Test Meter Calibration	LR4–2000, MP R12
A4	Meter/Alarm Panel Test Meter Readings	LR4–2000, MP R5
A5	Modulator Transmit Carrier Frequency	LR4–2000, MP R11
	Transmit Data Levels and IF Output Alarm Threshold	LR4–2000, MP R41, Chart 2 Capacity=1544 Kbits/sec

Table 6–5. WBC LRU Alignment Index – Cont.

Unit Designation	Name	Paragraph Number
A7	Demodulator Bit Error Rate	N/A
	Receive Data and Service Channel Levels	LR4–2000, MP R41, Chart 3 Capacity=1544 Kbits/sec
	Quadrature Verification	LR4–2000, MP R41, Chart 4
	Demodulator Adjustments	Capacity=1544 Kbits/sec LR4–2000, MP R41, Chart 5 Capacity=1544 Kbits/sec
A8	Power Supply Panel +5V Adjustment	LR4–2000, MP R5, Step B, Note 1
A10	Receiver tests, AGC Calibration and Alarm Threshold	LR4–2000, MP R21, Step 27, Table A=1544
	Receiver Bit Error Rate	N/A
A11	Orderwire Frequency Deviation	LR4–2000, MP R13, Step 1a=500 Hz
	System Tests, Orderwire Parameters	LR4–2000, MP R42, Table A, max=1.9; option 4 Table B, max=3.4; option 4 Chart 2=1004 Hz
A18	Minimaster, RPG only	Database configuration 6–6.2
A19	Remote FAS, all	FSK levels, 6–5.16.3.11

6–6.2 MLOS MINIMASTER UD39A18 DATABASE CONFIGURATION (RPG ONLY)

This procedure requires one technician and takes 0.7 hours.

6–6.2.1 Equipment and Tools Required.

Screwdriver set, phillips–tip

6–6.2.2 Initial Conditions/Preliminary Setup.

1. Refer to NWS EHB 6–541–1, Section F, 481 Minimaster Installation, Operation and Maintenance Manual, Section 3.
2. Read pages 3–1 through 3–13.
3. Remove the two screws that hold the front panel to the chassis.

4. Pull the front panel out about one inch and look behind the keypad area for the 4−section (quad) dip switch on the processor power supply card.

NOTE

Paragraph 3−7 and Figure 3−1 of the manual are in error concerning the position of S4.

5. Set S1 − segment 4 to the rear (ON) position.

6. Apply power to the Minimaster.

6−6.2.3 Procedure.

NOTES

The following database entries parallel the Figure Step numbers on pages 3−7 through 3−17 of the Minimaster manual. Paragraph 3−7 and Figure 3−1 should read switch 4 to ON position.

If a printer is connected to the Minimaster, the configuration setting can be printed out per paragraph 3−12.

1. (Figure 3−1) Press 9999 to enter the password (0_ _ _ displayed).

NOTE

The following will enter the basic database entries.

2. (Figure 3−2) Press ACK to advance to Step 1 (1_ _ _ displayed).

3. Press 1ØØ, then press SHIFT (S) (wait for SHIFT LAMP to light) and then press EXECUTE (E) for Step 1 entry.

4. Press ACK, until 2_ _ _ is displayed.

5. Press 2, then SE (Step 2).

6. Press ACK, until 3_ _ _ is displayed.

7. Press 5, then SE (Step 3).

8. Press ACK, until 4_ _ _ is displayed.

9. Press 1, then SE (Step 4).

10. Press ACK, until 5_ _ _ is displayed.

11. Press XX (year), then SE (Step 5).

12. Press ACK, until 6_ _ _ is displayed.

13. Press XX (month), then SE (Step 6).

14. Press ACK, until 7_ _ _ is displayed.

15. Press XX (day), then SE (Step 6).

16. Press ACK.

17. Press XX (hour), then SE (Step 7).

18. Press ACK.

19. Press XX (minute), then SE (Step 8).

NOTES

When defining the station address, the STATION LED should be lit. If the SYSTEM LED is lit, the password can be changed at this step. Press SHIFT LAMP to toggle from the SYSTEM to the STATION LED. The following will enter the database station addresses.

20. Press SHIFT LAMP for station address entries, Figure 3–3, Step 10 (0 displayed).

21. Press SE, then ACK (0 displayed).

22. Press 1, then SE (1 displayed).

23. Press 2, then SE (2 displayed).

24. Press SHIFT–SHIFT to quit followed by pressing DISPLAY–ACK to advance to Figure 3–4, Step 11 and do step 25.

NOTE

The following enters the alarm type (major or minor) definition.

25. Figure 3–4 (1 displayed). Press SE, then ACK.

26. Press 1, then SE (1 displayed).

27. Press Ø, then SE (0 displayed).

28. Press 2, then SE (L 1 displayed).

29. Press 1, then SE (E 1 displayed).

30. Press 32, then SE (H 32 displayed).

31. Press SHIFT–SHIFT.

32. Press 1, then SE (1 displayed).

33. Press Ø, then SE (L 0 displayed).

34. Press SHIFT–SHIFT, SHIFT LED on, press SHIFT–SHIFT again to go to step 11.

NOTE

The following enters the alarm type (Normally ON) definition.

35. Press DISPLAY−ACK to advance to Figure 3−5, Step 12 (2 displayed).
36. Press 1, then SE (1 displayed).
37. Press Ø, then SE (0 displayed).
38. Press 1, then SE (L 1 displayed).
39. Press Ø, then SE (E 0 displayed).
40. Press 32, then SE (H 32 displayed).
41. Press SHIFT−SHIFT, wait for SHIFT LED to light, and press SHIFT−SHIFT again.

NOTE

The following enters the database alarm type (bi−state) definition.

42. Press DISPLAY−ACK to advance to Figure 3−6, step 13 (3 displayed).
43. Press 1, then SE (1 displayed).
44. Press Ø, then SE (0 displayed).
45. Press 1, then SE (L 1 displayed).
46. Press Ø, then SE (E 0 displayed).
47. Press 32, then SE (H 32 displayed).
48. Exit database configuration by setting dip switch 4 to the OFF (forward) position.
49. Push the tray back into the chassis.
50. Insert and tighten the two screws using the proper tool.

CHAPTER 7

REFERENCE DIAGRAMS AND CABLING DATA

Section 7–1. Introduction

7–1.1 GENERAL

Chapter 7 contains Interconnection Cabling Diagrams (ICDs), cable wiring data, and Power Distribution Diagrams (PDDs). The data in this chapter is provided to support wiring and cable troubleshooting by means of point–to–point continuity testing. This chapter contains information on several configurations, therefore, not all information is applicable every site.

7–1.2 CHAPTER ORGANIZATION

Chapter 7 is organized into the following sections:

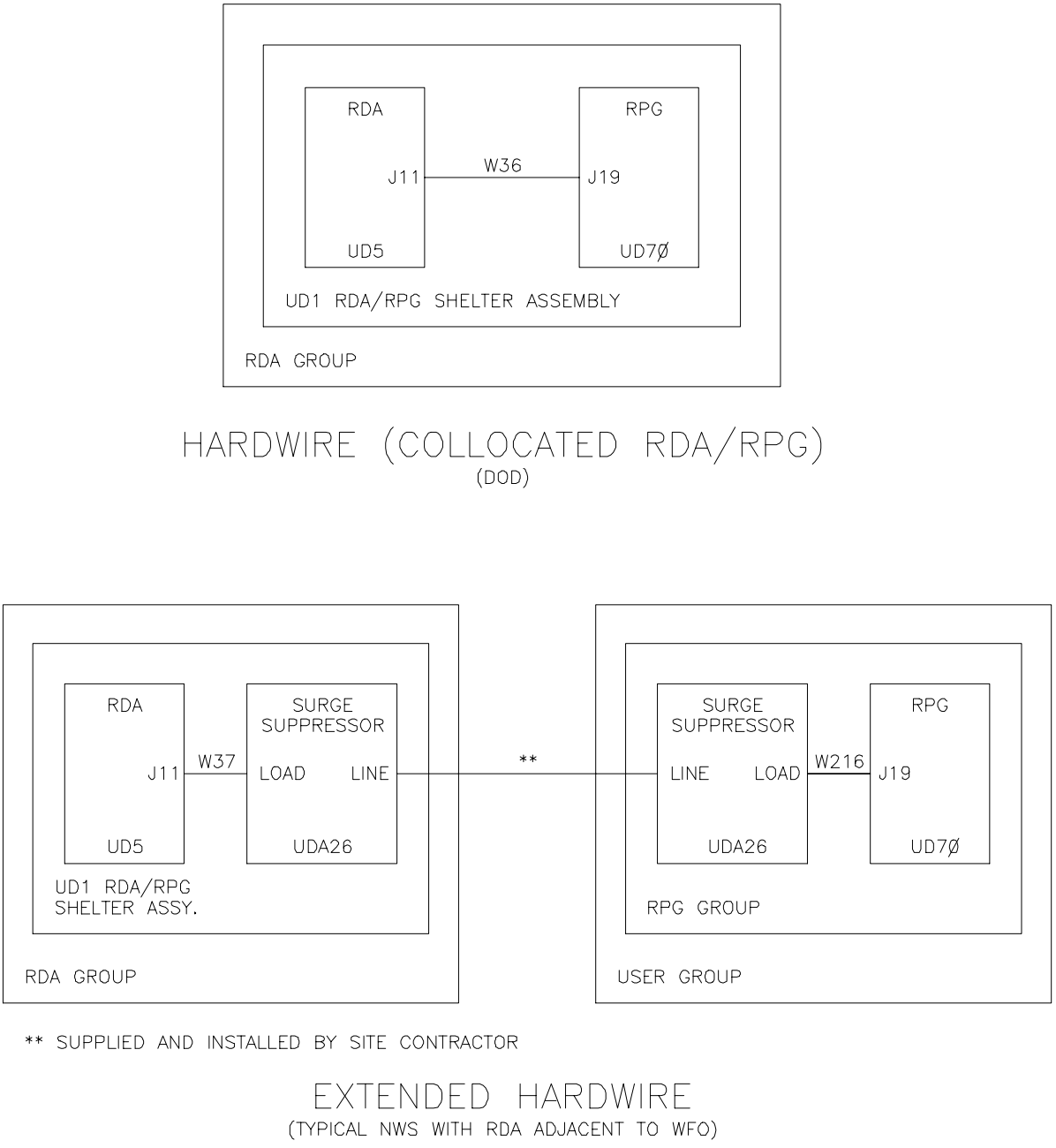
- Section 7–1. Introduction
- Section 7–2. Interconnection Cabling Diagrams
- Section 7–3. Cable Wiring Data
- Section 7–4. Power Distribution Diagrams

Section 7–2. Interconnection Cabling Diagrams (ICDs)

7–2.1 GENERAL

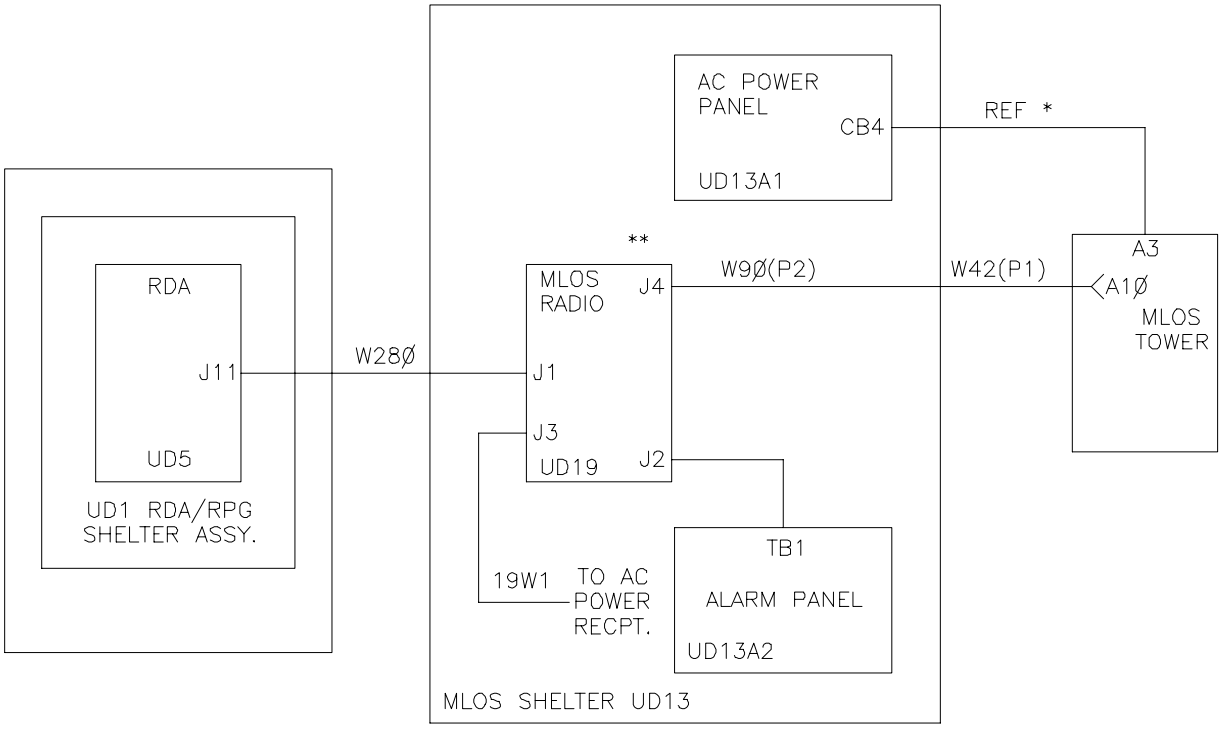
This section contains a set of ICDs. For detailed cabling information, refer to section 7–3, Table 7–1. The following Figures are provided:

- Figure 7–1. RDA/RPG Group Hardwire Wideband Link ICD (Collocated and Extended)
- Figure 7–2. RDA Group MLOS Wideband Link ICD (2 sheets)
- Figure 7–3. RPG Group MLOS Wideband Link ICD (2 sheets)
- Figure 7–4. RDA/RPG Group Private T1 Wideband Link ICD
- Figure 7–5. RDA/RPG Group Telco T1 Wideband Link ICD



NX1718

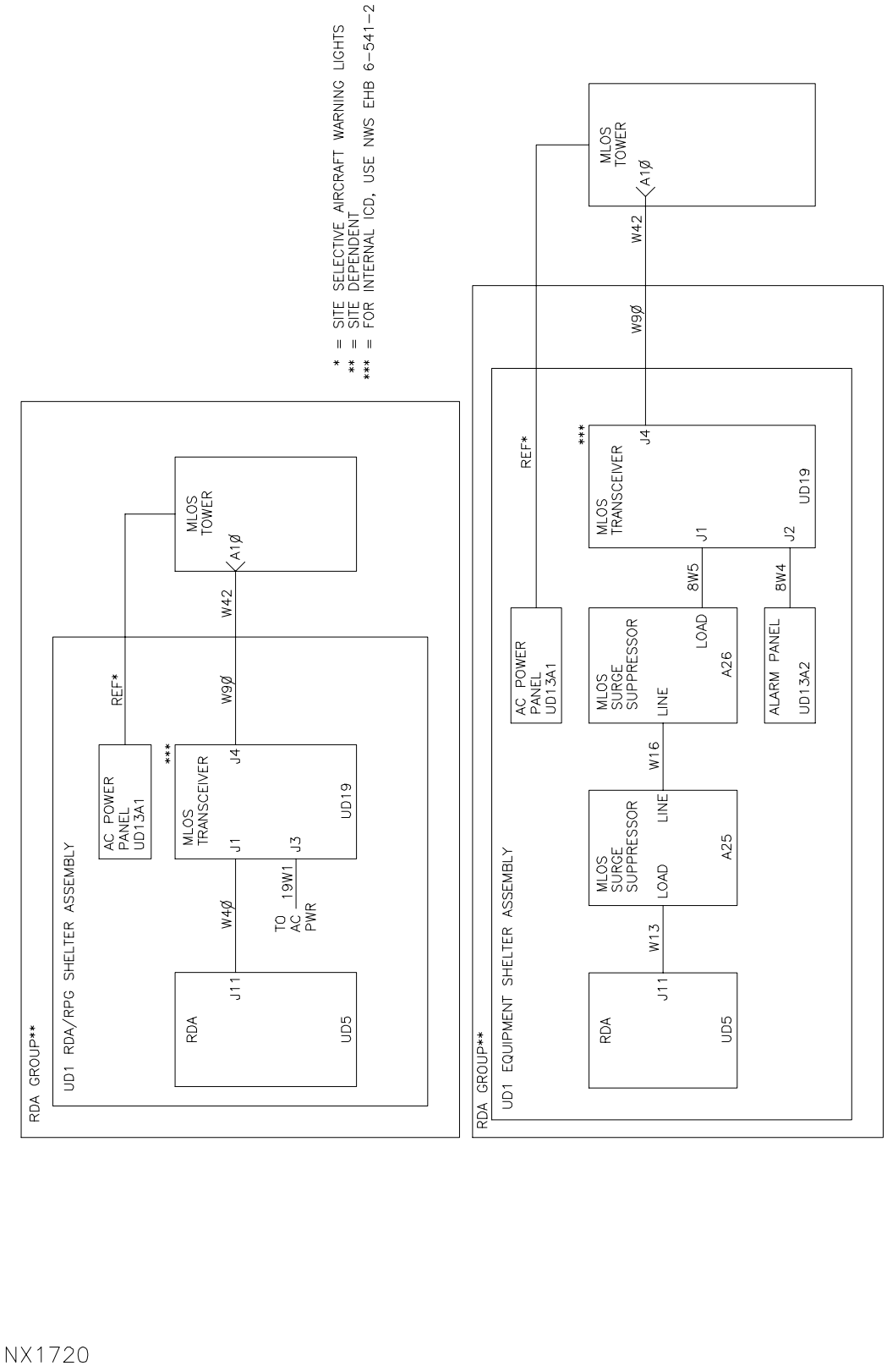
Figure 7–1. RDA/RPG Group Hardwire Wideband Link ICD (Collocated and Extended)



* = SITE SELECTIVE AIRCRAFT WARNING LIGHTS
** = FOR INTERNAL ICD, USE NWS EHB 6–541–2

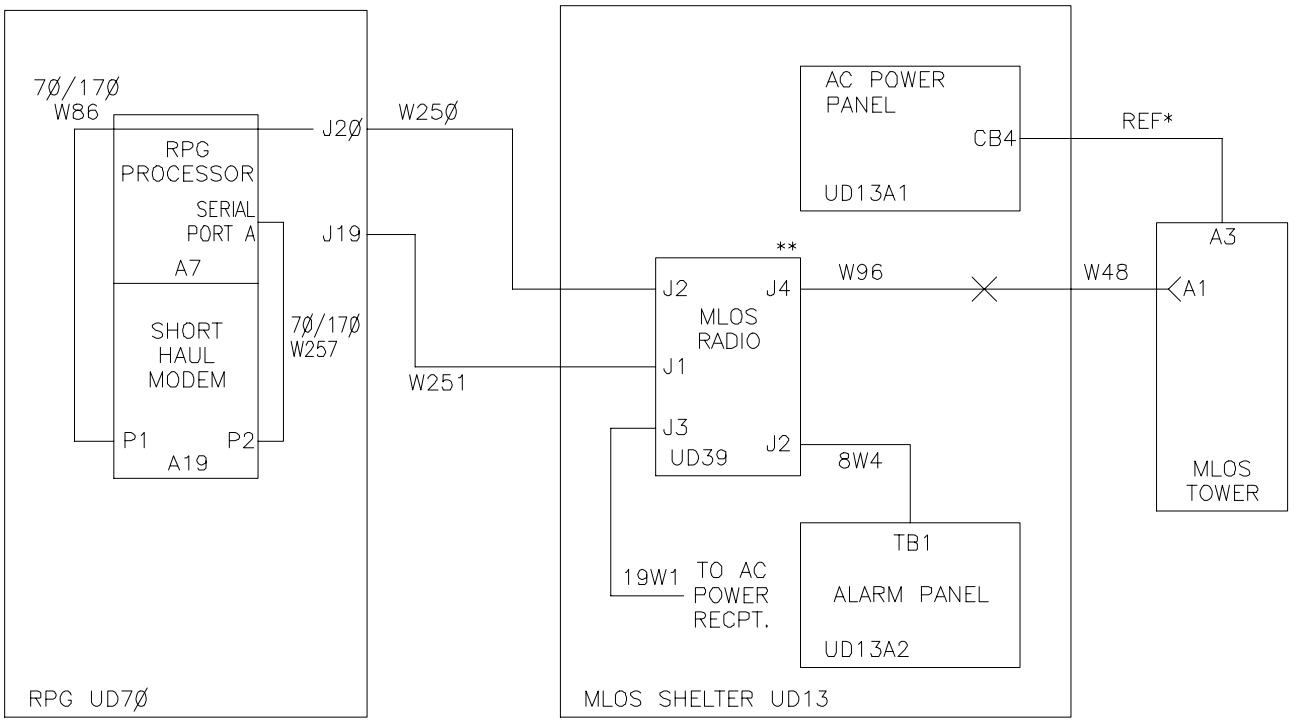
NX1719

Figure 7–2. RDA Group MLOS Wideband Link ICD (Sheet 1 of 2)



NX1720

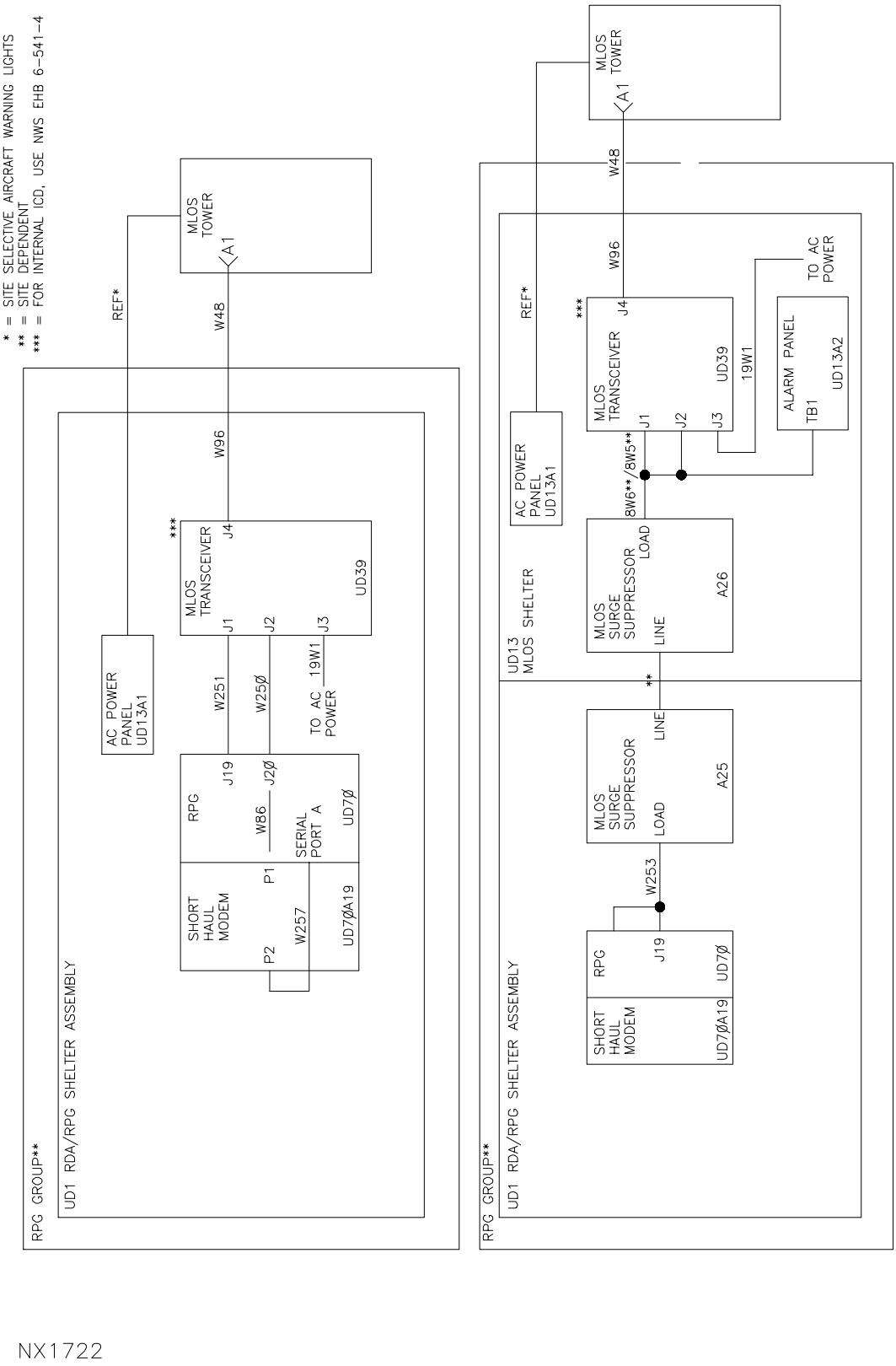
Figure 7–2. RDA Group MLOS Wideband Link ICD (Sheet 2 of 2)



* = SITE SELECTIVE AIRCRAFT WARNING LIGHTS
** = FOR INTERNAL ICD, USE NWS EHB 6–541–2

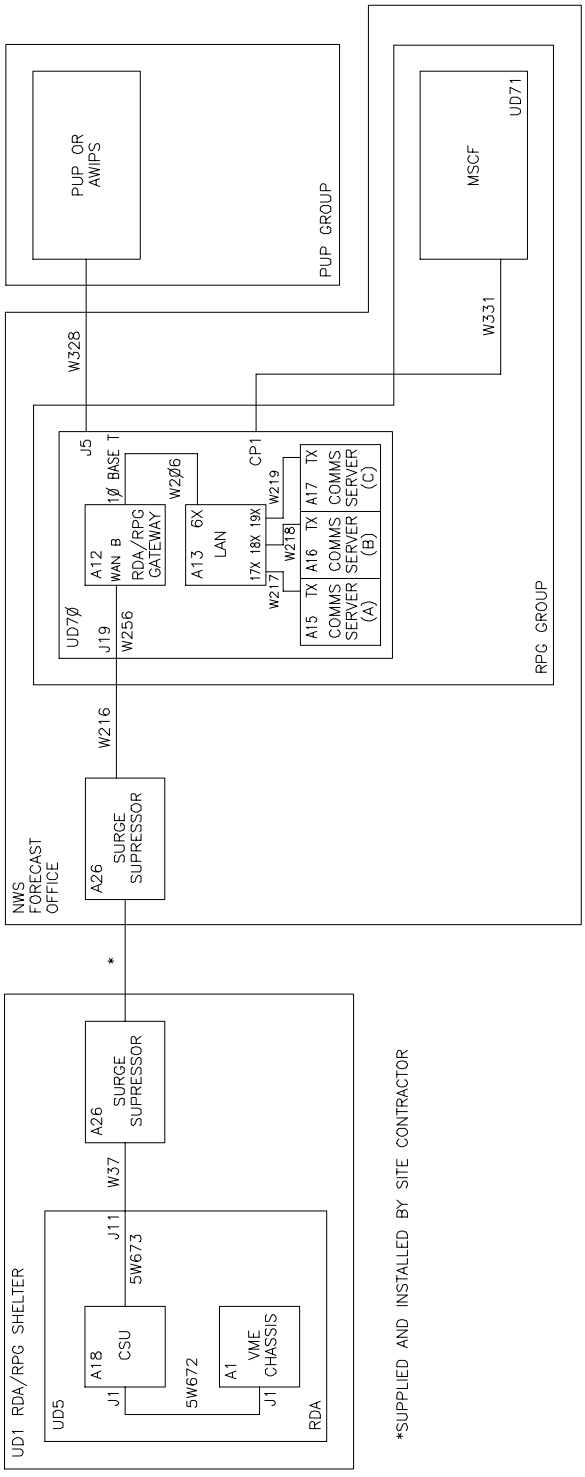
NX1721

Figure 7–3. RPG Group MLOS Wideband Link ICD (Sheet 1 of 2)



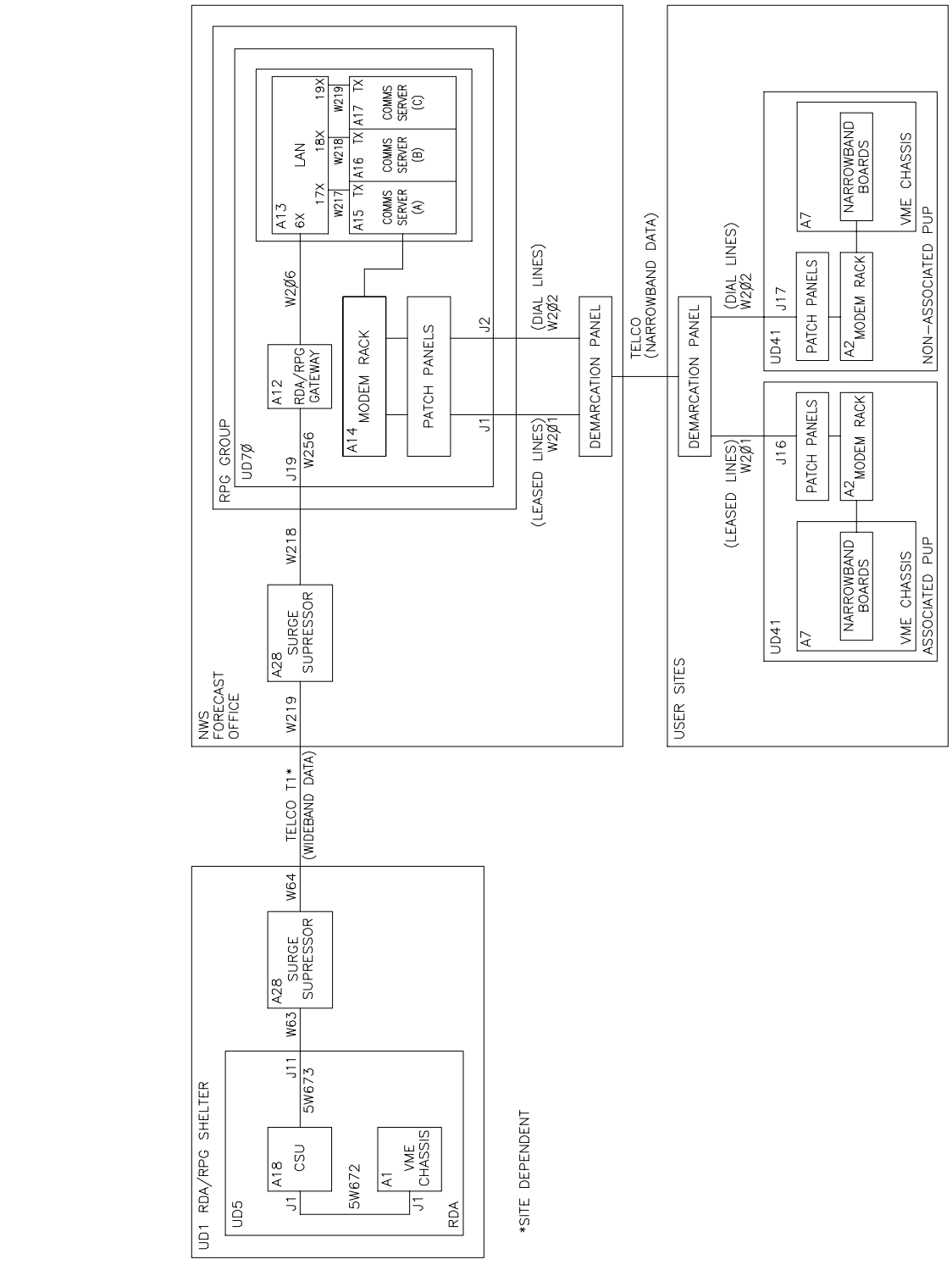
NX1722

Figure 7–3. RPG Group MLOS Wideband Link ICD (Sheet 2 of 2)



NX1723

Figure 7–4. RDA/RPG Group Private T1 Wideband Link ICD



NX1724

Figure 7–5. RDA/RPG Group Telco T1 Wideband Link ICD

Section 7–3. Cable Wiring Data

7–3.1 GENERAL

This section provides point–to–point from/to wiring data for all multiconductor cables in Table 7–1, and the data is organized by the cable reference designation number (e.g., “4W3”).

Table 7–1. Running Wire List

Conductor No.	Aux.	From	To
		W9/109 UD70/170 FL1J1 (P1)	208 VAC/3PH
1		P1–A	PHASE A
2		P1–B	PHASE B
3		P1–C	PHASE C
4		P1–D	GROUND
5		P1–E	NEUTRAL
		W13* UD5 J11	UD1 A26 LOAD
		W13* UD5 J11	UD1 A25 LOAD
		W16* UD1 A25 LINE	UD1 A26 LINE
		W36/136 UD70/170 J19(P1)	UD5/105 J11(P2)
1	1	P1–1	P2–10
2	2	P1–9	P2–2
	A	SHIELD	E101
	B	SHIELD	E102
2	1	P1–2	P2–9
2	2	P1–10	P2–1
	A	SHIELD	E103
	B	SHIELD	E104
3	1		
3	2		
	SHIELD		
4		E101	E103
5		E102	E104
6		E103	P1–5
7		E104	P2–5

*Site Dependent

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		W37	
		UD5 J11(P1)	UD1A26 LOAD
1	1	P1–1	A1 LOAD–1
1	2	P1–9	A1 LOAD–2
	A	SHIELD	N/C
	B	SHIELD	E101
3	1	N/C	N/C
3	2	N/C	N/C
SHIELD		SHIELD	P1–GROUND
		E101	A1 LOAD–GROUND
		W40	
		UD5 J11(P1)	UD19 J1(P2)
1	1	P1–1	P2–1
1	2	P1–9	P2–2
	SHIELD	SHIELD B	E101
2	1	P1–2	P2–4
2	2	P1–10	P2–5
	SHIELD	SHIELD B	E102
		E102	P2–6
3	1**		
3	2**		
	SHIELD		
		W42	
		W90 P2(P1)	UD20 A10J1(P2)
		W48	
		UD1W96P2 (P1)	UD40A1 J1(P2)

*Site Dependent. **Wires tied back and insulated.

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		W63	
		UD5J11 (P1)	UD1 A28
1	1	P1–1	A28–2
1	2	P1–9	A28–4
	SHIELD	P1–GROUND	N/C
2	1	P1–10	A28–6
2	2	P1–2	A28–8
	SHIELD	P1–GROUND	N/C
SHIELD		P1–GROUND	N/C
		W64	
		UD1 TELCO (P1)	UD1 A28
1		P1–1	A28–9
2		P1–2	A28–7
3		P1–3	N/C
4		P1–4	A28–5
5		P1–5	A28–3
6		P1–6	N/C
7		P1–7	N/C
8		P1–8	N/C
		W90	
		UD19 J4(P1)	W42 P1(P2)

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		W95/195*	
		UD70/170 J17 (P1)	UD5/105 J25 (P2)
1	1	P1–15	P2–7
1	2	P1–11	P2–2
2	1	P1–14	P2–3
2	2		
3	1	P1–1	P2–16
3	2	P1–2	P2–6
4	1	P1–12	P2–20
4	2		
5	1	P1–6	P2–14
5	2	P1–8	P2–19
SHIELD		P1–GROUND	P2–GROUND
6		P1–4	P1–12
7		P1–3	P1–13
8		P2–1	P2–7
9		P2–4	P2–5
10		P2–6	P2–8
		W96	
		UD39 J4(P1)	UD1W48P1 (P2)
		W200	
		UD70/170 FL1J1 (P1)	208 VAC/3PH (P2)
1		P1–A	P2–X
2		P1–B	P2–Y
3		P1–C	P2–Z
4		P1–D	P2–G
5		P1–E	P2–W

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		W216* UD70/170 J19 (P2)	UD70/170 A26 LOAD
1	1	P2–1	A1LOAD–1
1	2	P2–9	A1LOAD–2
	A	SHIELD	N/C
	B	SHIELD	E101
2	1	P2–2	A1LOAD–3
2	1	P2–10	A1LOAD–4
	A	SHIELD	N/C
	B	SHIELD	E101
3	1	N/C	N/C
3	2	N/C	N/C
		E101	A1LOAD–GROUND
		W216* UD70/170 J19 (P2)	UD1 A26
SHIELD		SHIELD	P2–GROUND
1	1	P2–1	A1–2
1	2	P2–9	A1–4
	SHIELD	P2–GROUND	N/C
2	1	P2–10	A1–6
2	2	P2–2	A1–8
	SHIELD	P2–GROUND	N/C
SHIELD		P2–GROUND	N/C
		W218* UD70/170 J19 (P1)	A28 (P2)
1	1	P1–1	A28–2
1	2	P1–9	A28–4
	SHIELD	P1–GROUND	N/C
2	1	P1–10	A28–4
2	2	P1–2	A28–8
	SHIELD	P1–GROUND	N/C
SHIELD		P1–GROUND	N/C

*Site Dependent

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		W219*	
		TELCO (P2)	A28
1		P2–1	A28–9
2		P2–2	A28–7
3		P2–3	N/C
4		P2–4	A28–5
5		P2–5	A28–3
6		P2–6	N/C
7		P2–7	N/C
8		P2–8	N/C
		W250*	
		UD70 J20(P1)	UD39 J2(P2)
1	1	P1–1	P2–1
1	2	P1–2	P2–2
	SHIELD	SHIELD B	E101
		E101	P2–3
2	1		
2	2		
	SHIELD		
3	1		
3	2		
	SHIELD		
		W251*	
		UD70 J19(P1)	UD39 J1(P2)
1	1	P1–1	P2–1
1	2	P1–9	P2–2
2	1	P1–2	P2–4
2	2	P1–10	P2–5
SHIELD		SHIELD B	E101
		E101	P2–3
		W253*	
		UD25 LOAD	UD70 J19, J20

*Site Dependent

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		W280	
		UD5 J11(P1)	UD19 J1(P2)
1	1	P1–1	P2–10
1	2	P1–9	P2–2
	SHIELD	SHIELD A	E101
2	1	P1–2	P2–9
2	2	P1–10	P2–1
	SHIELD	SHIELD B	E102
3	1*		
3	2*		
	SHIELD		
		E101	P1–5
		E102	P2–5
		W282	
		UD1 A24	UDA24
		UD5/105W672	
		UD5/105 A18 J1 DTE (P1)	UD5/105 A1 J1 (P2)
1	1	P1–1	P2–1
1	2	P1–9	P2–9
2	1	P1–3	P2–3
2	2	P1–11	P2–11
SHIELD		P1–2	P2–2
SHIELD		P1–GROUND	P2–GROUND
3		P2–4	P2–2
4		P1–4	P1–2
		UD5/105W673	
		UD5/105 A18 P1 NETWORK (P1)	UD5/105 J11
1	1	P1–1	P11–1
1	2	P1–9	P11–9
2	1	P1–3	P11–10
2	2	P1–11	P11–2
SHIELD		P1–2	P11–5
SHIELD		P1–GROUND	P11–GROUND
3		P1–2	P1–4

*Site Dependent

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		8W2	
		UD39 52(P1)	UD13 A2TB1
1	1	P1–1	A1LOAD 5
1	2	P1–2	A1LOAD 6
SHIELD		SHIELD A	P1–3
1	1	P1–4	TB1–4
1	2	P1–5	TB1–5
2	1	P1–20	TB1–20
2	2	P1–21	TB1–21
SHIELD		SHIELD A	E101
		E101	P1–GROUND
		8W2*	
		UD19 J1(P1)	UD13 A26 LOAD
1	1	P1–4	A1LOAD–1
1	2	P1–5	A1LOAD–2
	SHIELD	E101	SHIELD
		P1–6	SHIELD
2	1	P1–1	A1LOAD–3
2	2	P1–2	A1LOAD–4
	SHIELD	E101	SHIELD
		P1–3	SHIELD
3	1		
3	2		
	SHIELD		
		A1LOAD–GROUND	E101
		8W4	
		UD19 J2(P1)	UD13 A2TB1
1	1	P1–4	TB1–4
1	2	P1–5	TB1–5
2	1	P1–20	TB1–20
2	2	P1–21	TB1–21
3	1**		
3	2**		
4	1**		
4	2**		
	SHIELD	SHIELD A	E101
		E101	P1–GROUND
		P1–22	P1–GROUND

*Site Dependent. **Wires tied back and insulated

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		8W6*	
		UD39 J1(P1)	A26 LOAD
1	1	P1–4	A1LOAD–1
1	2	P1–5	A1LOAD–2
	SHIELD	E101	SHIELD
		P1–6	SHIELD
2	1	P1–1	A1LOAD–3
2	2	P1–2	A1LOAD–4
	SHIELD	E101	SHIELD
		P1–3	SHIELD
3	1		
3	2		
	SHIELD		
		A1LOAD–GROUND	E01
		9W4	
		UD19 J4(P1)	W4P1(P2)
		9W5	
		UD19 J5(P1)	W5P1(P2)
		9W6	
		UD19 J6(P1)	W6P1(P2)
		9W7	
		UD19 J7(P1)	W7P1(P2)
		19W1	
		UD19 J3(P1)	AC Power (P2)
1		P1–A	P2–1
2		P1–B	P2–2
3		P1–C	P2–3
		39W1	
		UD39 J3(P1)	AC Power (P2)
1		P1–A	P2–1
2		P1–B	P2–2
3		P1–C	P2–3
		UD70/170W86	
		UD70/170 A19 TELCO (P1)	UD70/170 J20 (P2)
1		RXA	J20–1
2		RXB	J20–2
SHIELD			J20–GROUND

*Site Dependent

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From	To
		UD70/170W206, W217, W218, W219 (P1)	LAN Cables (P2)
1	1	P1–1	P2–1
1	2	P1–2	P2–2
2	1	P1–3	P2–3
2	2	P1–6	P2–6
3	1	P1–4	P2–4
3	2	P1–5	P2–5
4	1	P1–7	P2–7
4	2	P1–8	P2–8
		UD70/170W256, UD70/170 A12 WAN B (P1)	UD70/170 J19 (P2) with RJ–45 to DB15(F) adapter. Pinouts shown after passing through adapter to DB15(F) on P2 side.
1	1	P1–1	P2–2
1	2	P1–2	P2–10
2	1	P1–4	P2–9
2	2	P1–5	P2–1
3	1	SPARE	
3	2	SPARE	
4	1	SPARE	
4	2	SPARE	

Table 7–1. Running Wire List – Cont.

Conductor No.	Aux.	From UD70/170W257, UD70/170 A7J3 (P1) SUN SERIAL PORT A	To UD70/170 A19J1 (P2) SHORT HAUL MODEM, DTE
1	1	P1–2	P2–2
1	2	P1–14	P2–14
2	1	P1–3 c	P2–3
2	2	P1–16	P2–16
3	1	P1–4	P2–4
3	2	P1–19	P2–19
4	1	P1–5	P2–5
4	2	P1–13	P2–13
5	1	P1–6	P2–6
5	2	P1–22	P2–22
6	1	P1–20	P2–20
6	2	P1–23	P2–23
7	1	P1–8	P2–8
7	2	P1–10	P2–10
8	1	P1–15	P2–15
8	2	P1–12	P2–12
9	1	P1–9	P2–9
9	2	P1–17	P2–17
10		P1–7	P2–7
11		P1–18	P2–18
12		P1–21	P2–21
13		P1–24	P2–24
14		P1–11	P2–11
15		P1–25	P2–25
16		P1–1	P2–1
SHIELD		P1–GROUND	P2–GROUND

Section 7–4. Power Distribution Diagrams (PDDs)

7–4.1 GENERAL

This section provides a set of PDDs in schematic format for use in troubleshooting power distribution problems. The following figures are provided:

- Figure 7–6. RDA/RPG Equipment Shelter MLOS PDD
- Figure 7–7. RDA MLOS Shelter UD8 PDD
- Figure 7–8. RPG MLOS Shelter UD8 PDD

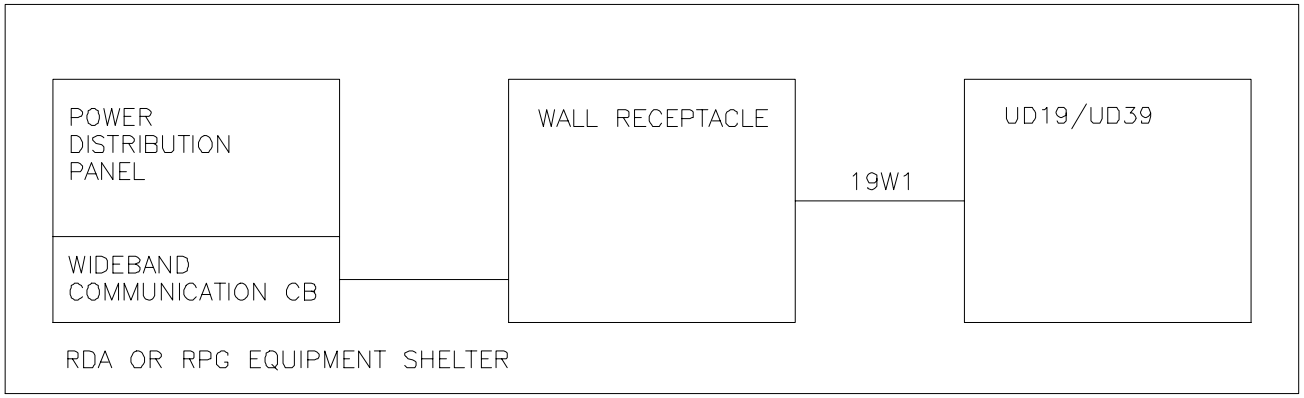


Figure 7–6. RDA/RPG Equipment Shelter MLOS PDD

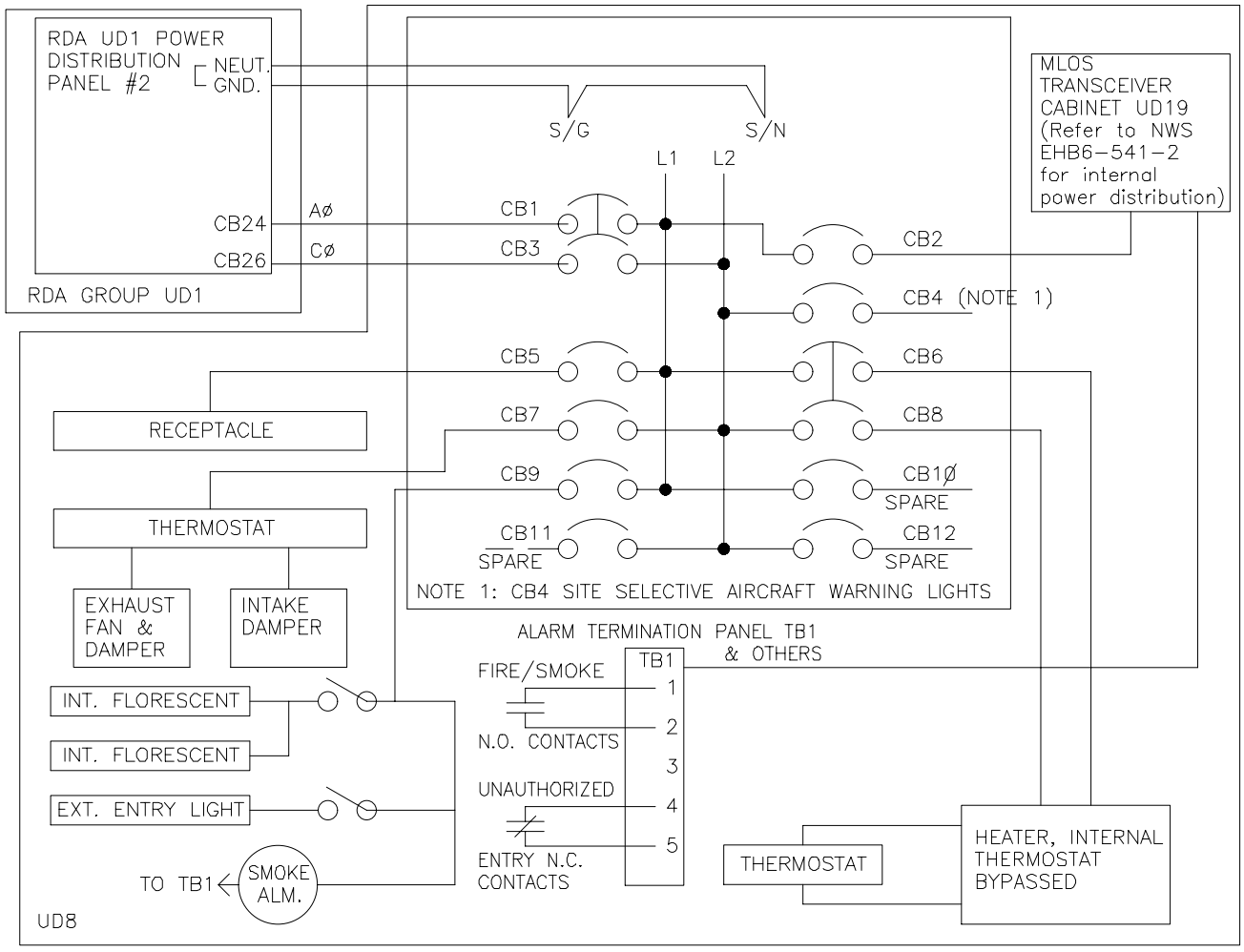


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Figure 7–7. RDA MLOS Shelter UD8 PDD

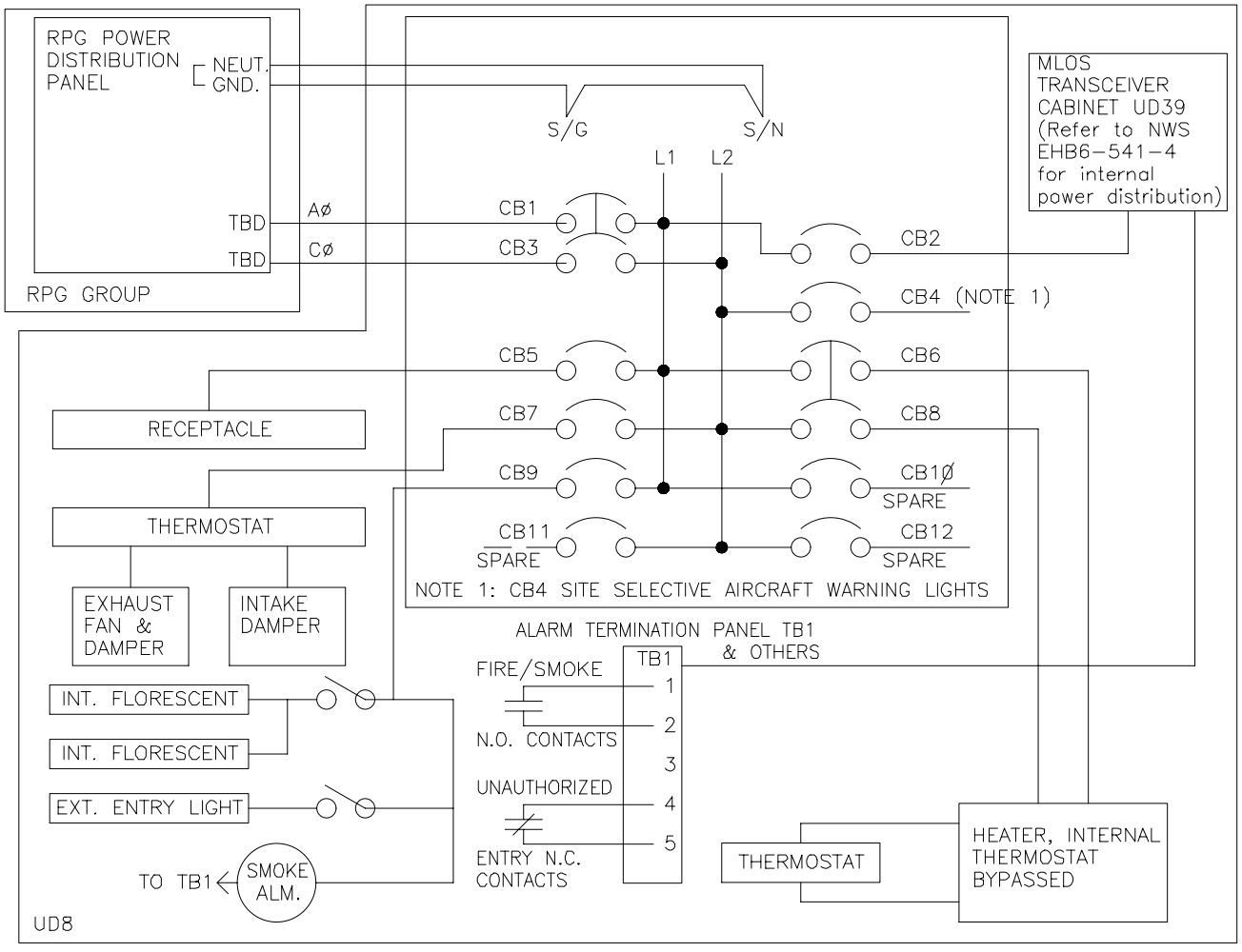

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Figure 7–8. RPG MLOS Shelter UD8 PDD

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Numbers

GLOSSARY

Acronym or Non–Standard Term	Definition
	A
AC	Alternating Current
ACO	Audible Cut–Off
ADCCP	Advanced Data Communications and Control Procedures
AGC	Automatic Gain Control
ALM	Alarm
AMI	Alternate Mark Inversion
APC	American Power Conversion
AWIPS	Advanced Weather Interactive Processing System
	B
bcast	Broadcast (a TCP/IP broadcast tool)
BDDS	Base Data Distribution Server
BER	Bit Error Rate
BERT	Bit Error Rate Test
BIT	Built In Test
BO	Build Out
BPF	Bandpass Filter
bps	Bits Per Second
BPV	Bi–Polar Violation
brecv	Broadcast Receive (receipt of BCAST data)

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
	C
CAT5	Category 5
CB	Circuit Breaker
CCITT	Consultative Committee for International Telegraph and Telephone
CDS	Control Diagnostic System
CFE	Contractor Furnished Equipment
CH	Channel
CHAN	Channel
CMI	Coded Mark Inversion
COS	Change of State
COTS	Commercial Off the Shelf
CPCI	Computer Program Configuration Items
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CRX	Carrier Presence Detector
CSU	Channel Service Unit
CTM	Channel Terminal Manager
	D
dB	Decibels
DC	Direct Current
DCE	Data Communications Equipment

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
DCU	Digital Communications Unit
DEL	Delete
Demarc	Demarcation
DEV	Device
DIP	Dual–in–Line Package
Distant MSCF	Distant Master System Control Function. A DOD or FAA MSCF. The RPG is in the RDA shelter while the Distant MSCF is with the primary PUP.
DMA	Direct Memory Access
DMI	Direct Memory Interface
DOD	Department of Defense
DSPLY	Display
DTA	Data
DTE	Data Terminal Equipment
	E
EDMA	Extended Direct Memory Access
EHB	Engineering Handbook
EIA	Electronic Industries Association
EMI	Electromagnetic Interference
EMUX	Extended Mux (or Multiplexer) Bus
EPROM	Erasable Programmable Read Only Memory
EEPROM	Electrically Erasable Programmable Read Only Memory

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
ESD	Electrostatic Sensitive Device
ESF	Extended Super Frame
EXT	Exterior
	F
F	Fahrenheit
FAA	Federal Aviation Administration
FAS	Fault Alarm Station
FBD	Functional Block Diagram
FSK	Frequency–Shift–Keyed
	G
GHz	Gigahertz
	H
Halfword	A continuous sequence of BITs or characters that make up half of a computer word and that can be addressed as a unit.
HCI	Human Computer Interface
HDLC	High–Level Data Link Control
HSS	High Speed Serial
HVAC	Heat, Ventilation, and Air Conditioning
Hz	Hertz
	I
I/O	Input/Output
ICD	Interconnection Cabling Diagram Interface Control Document

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
IF	Input Frequency
INT	Internal
IOC	Input/Output Controller
IP	Internet Protocol
IPB	Illustrated Parts Breakdown
IPC	Intelligent Peripheral Controller
	J
Jackfield	Inserting a plug at this jack interrupts the corresponding signal.
	K
kHz	Kilohertz
	L
LAN	Local Area Network
LAPB	Link Access Procedure Balanced
LBO	Line Build Out
LED	Light Emitting Diode
LCLOOP	Local Loopback
LL1	Local Loopback 1
Local MSCF	Local Master System Control Function. An NWS MSCF located in the same building as the RPG.
LOS	Line of Sight
LRU	Line Replaceable Unit
LSU	Loader Storage Unit
LTS	Lights

GLOSSARY − Cont.

Acronym or Non−Standard Term	Definition
	M
mA	Milliamp
MB	Megabytes
Mbps	Megabits per second
MHz	Megahertz
MLOS	Microwave Line of Sight
MODEM	MOdulate/DEModulate
MP	Maintenance Procedure
mph	Miles per hour
MPC	Multiple Peripheral Controller
MPE	Micro−Interrupt Priority Encoder
MPU	Microprocessor Unit
MSCF	Master System Control Function
MUX	Multiplexer
	N
NAK	Not Acknowledge
NEXRAD	Next Generation Weather Radar
NTWK	Network
NWS	National Weather Service
NRZ	Non−Return−to−Zero

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
	O
OE	Output Enable
OED	Overhead Encoder/Decoder
OFST	Offset
OPTØ	Optical Disk Drive's Mnemonic Logic Unit
OQPSK	Offset Quaternary Phase Shift Keyed
Orderwire	Proper Name for a Module in the MLOS Equipment
OS	Operating System
	P
PCI	Peripheral Component Interconnect
PDD	Power Distribution Diagram
PDP	Power Distribution Panel
PIC/LFC	Precision Interval Clock/Line Frequency Check
PIQ	Processor Interrupt Queue
PLL	Phase Lock Loop
PROM	Programmable Read Only Memory
PSP	Programmable Signal Processor
PSPI	Programmable Signal Processor Interface
PUES	Principal User External System
PWR	Power

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
	Q
	R
RAM	Random Access Memory
RAS	Remote Alarm Station
RCV	Receive
RCVR	Receiver
RD	Receiver Data
RDA	Radar Data Acquisition
RDASC	Radar Data Acquisition Status and Control
RDADP	Radar Data Acquisition Data Processor
RF	Radio Frequency
RFI	Radio Frequency Interference
RIOT	RAM Input/Output and Timer
RL	Remote Loop
RLB	Remote Loopback
RMS	Remote Monitoring Subsystem (FAA)
ROC	Radar Operations Center (formerly the OSF)
ROM	Read–Only Memory
RPG	Radar Product Generator
RPGPCA	Radar Product Generator Processor/Communications Assembly

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
RPIE	Real Property Installed Equipment
RRRAT	RDA / RPG Remote Access Terminal
RST	Remote Self–Test
RTU	Remote Terminal Unit
RX	Receiver
S	
SAW	Surface Acoustical Wire
SELCH	Selector Channel
SMR	Site Maintenance Requirement
SRA	Site Replaceable Assembly
SRAM	Static Random Access Memory
STBY	Standby
SVC	Supervision Call
SW	Spectrum Width
SYNC	Synchronous
T	
TBD	To Be Determined
TCP	Transmission Control Protocol
Telco	Telephone Company
TVS	Tornado Vortex Signature
TX	Transmitter

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
TXSW	Transmitter Switch
	U
UD	Unit Designation
USART	Universal Asynchronous Receiver Transmitter
	V
VCO	Voltage Controlled Oscillator
VCP	Volume Coverage Pattern
VCI	VME to Concurrent I/O Interface
VCI–C	VME to Concurrent Interface Board – Concurrent
VCI–V	VME to Concurrent Interface Board – VME
Vdc	Volts of direct current
VF	Voice Frequency
VIC	VME Interface Chip
VIOL	Violations
VLAN	Virtual Local Area Network
VME	Versa Module Eurocard
	W
WAN	Wide Area Network
WB	Wideband
WBC	Wideband Communications
WSFO	Weather Service Forecast Office
WL	Wavelength

GLOSSARY – Cont.

Acronym or Non–Standard Term	Definition
WSR	Weather Surveillance Radar
	X
XMIT	Transmit
XMTR	Transmitter
	Y
	Z