MDR-8000/i/s/u

Microwave Digital Radios
Users Manual

Alcatel Part Number 3EM15726AA
Issue 2, June, 2004

Part 1 of 2

3400 West Plano Parkway
Plano, Texas 75075-5813 U.S.A.

Table of Contents

1 GENERAL

1.1 INTRODUCTION

This MDR-8000 Users Manual contains information on the MDR-8000 Hot-Standby Shelf, MDR-8000 CommPak Indoor Shelf, and MDR-8000 CommPak Outdoor Unit as follows:

MDR-8000 Hot-Standby Shelf – Section 1 through Section 5

MDR-8000 CommPak Indoor Shelf – Appendix A

MDR-8000 CommPak Outdoor Unit – Appendix B (to be supplied)

The information in the Users Manual is a summary of the overall instruction book that is located on the attached CD. The summary information is provided to support initial turnup, day-to-day operation, and maintenance of the MDR-8000 equipment.

1.2 CONTENT

Refer to Table 1-1. The *MDR-8000 Instruction Book* Section/Appendix column lists the parts of the *MDR-8000 Instruction Book*, PN 3DH03220. A check mark under the Users Manual column or the Instruction Book CD column indicates that this information is located in either the Users Manual, the Instruction Book, or both.

Table 1-1 Information Location

	Location	
Section/Appendix	***Users Manual***	**MDR-8000 Instruction Book**
Glossary		√
General		√
Application		√
Functional Description		√
Physical Installation		√
Interconnect	√	√
Initial Turnup	√	√
Operation	√	√
Users Guide		√
Maintenance	√	√
Diagrams		√
Rack Installation		√
Alarm/Status/Control		√
MCS-11 Reference Guide		√
Modem Provisioning		√
Maintenance Support Procedures		√
CommPak Indoor Shelf	√	√

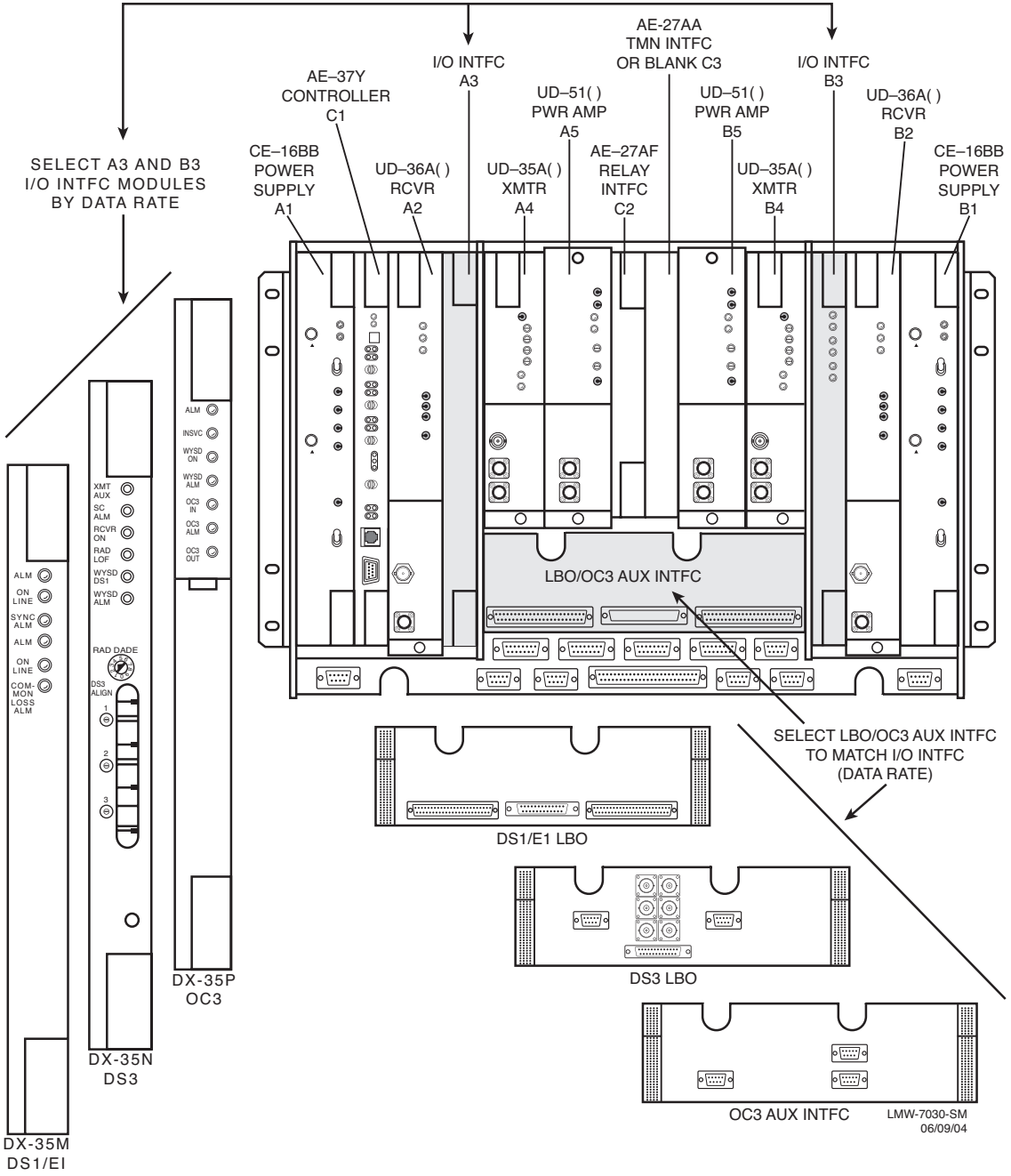


Figure 1-1 Typical MDR-8000 Hot-Standby Shelf Component Locations and Options (Sheet 1 of 3)

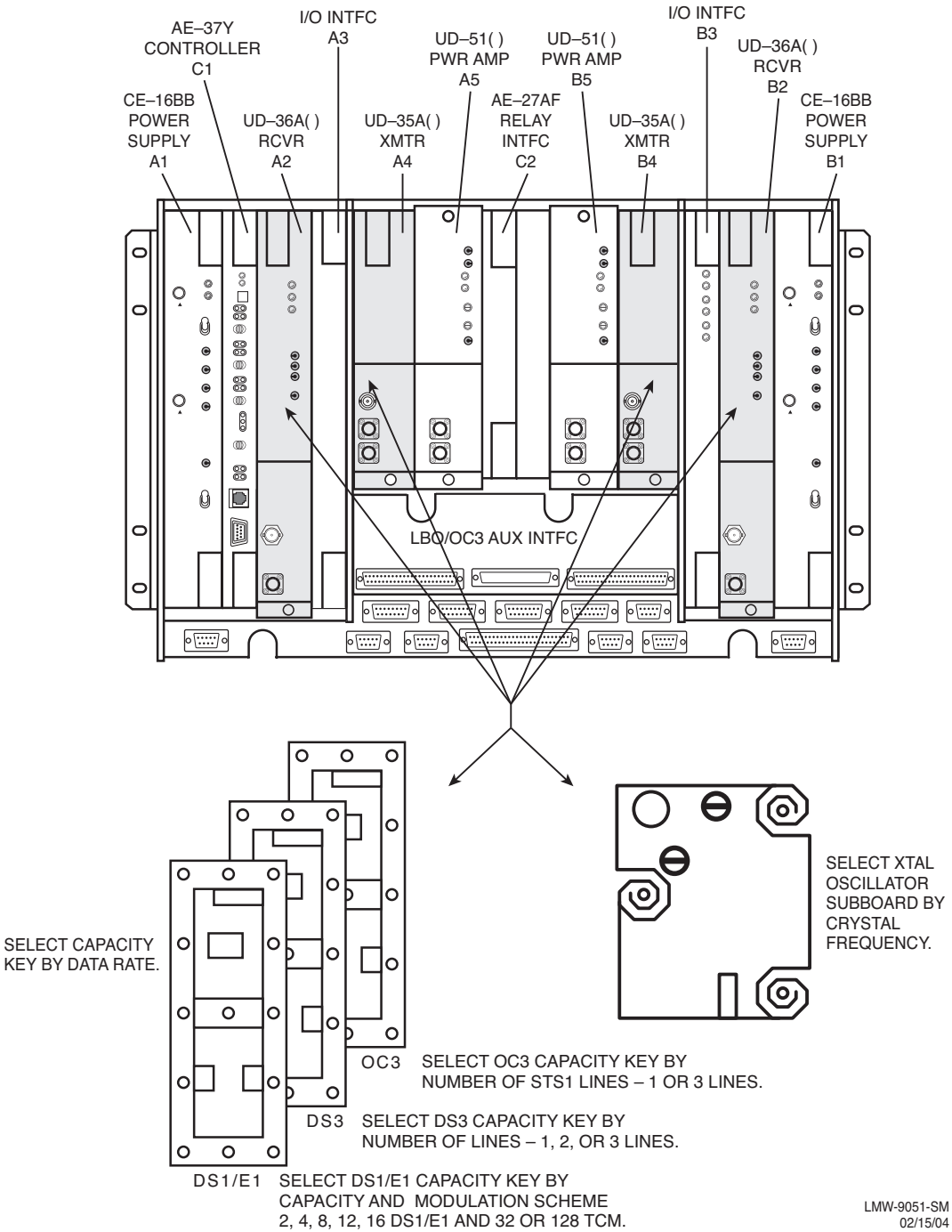
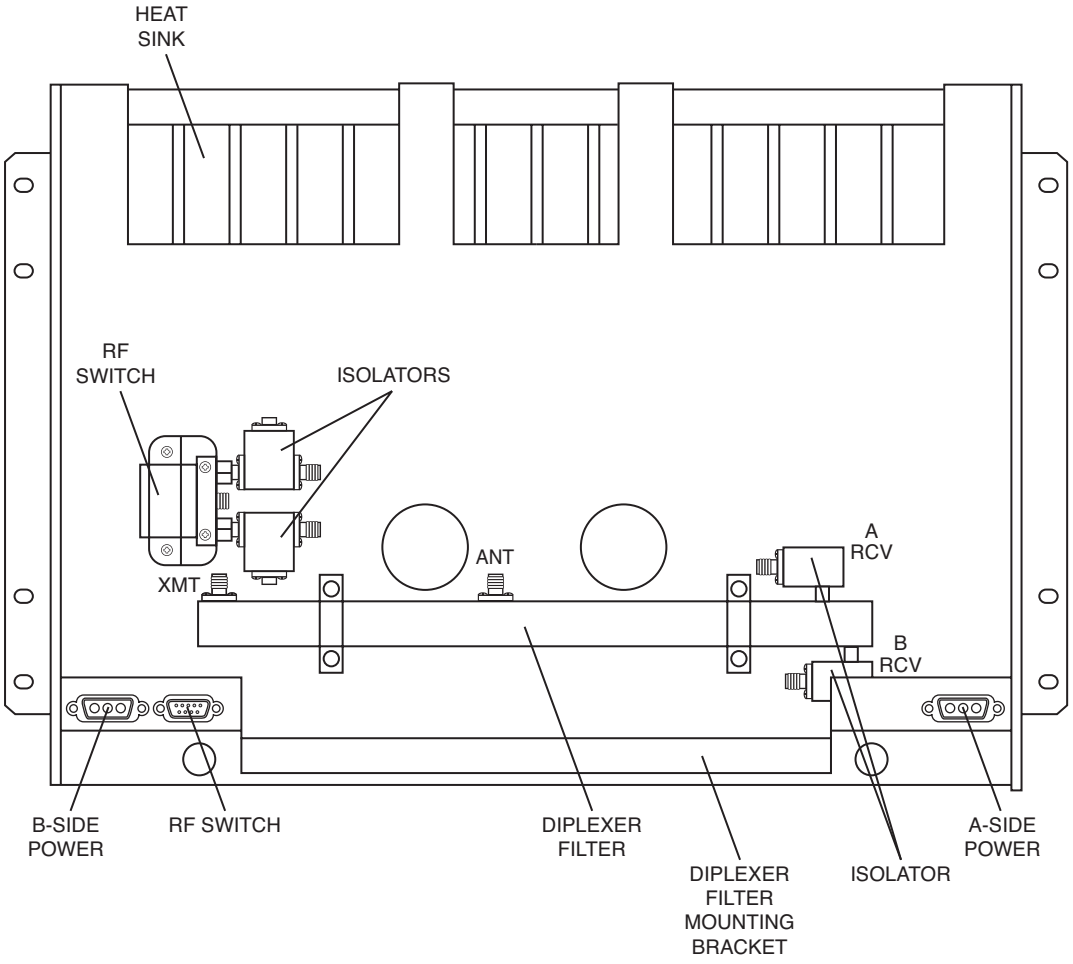


Figure 1-1 Typical MDR-8000 Hot-Standby Shelf Component Locations and Options (Sheet 2 of 3)



REAR VIEW
(TYPICAL HOT-STANDBY 1:10 COUPLER SINGLE ANTENNA CONFIGURATION)

Note

Location of A and B RCV ports on diplexer filter varies, depending on RF frequency. For some frequencies, A and B ports reverse location.

LMW-7211-SM
06/08/04

Figure 1-1 Typical MDR-8000 Hot-Standby Shelf Component Locations, and Options (Sheet 3 of 3)

2 OPERATION

2.1 GENERAL

This section contains turn-on, normal operation, turn-off, and emergency operating procedures plus a description of controls. indicators, test points, and connectors for the MDR-8000 Series Microwave Digital Radios.

Note

Before performing any procedures, operating personnel should become familiar with the locations of power distribution units and circuit breakers. If an equipment performance problem occurs during the following procedures, refer to the Maintenance section.

2.2 TURN-ON

The radio is designed to operate continuously without operator intervention. After initial installation and power turn-on, operating procedures are limited to periodic visual lamp checks, alarm checks, and answering or initiating orderwire service calls. Turn-on procedures are needed only if the system has been turned off due to a malfunction or during maintenance.

WARNING

Possibility of Damage to Equipment

Exposure to energy radiated at microwave frequencies can cause eye damage and eventual blindness. Do not operate the system with either the transmit or the receive waveguide port unterminated. Do not look into the waveguide run or the antenna of an operating radio.

Note

Until all radios in the transmission link are interconnected, turned on, and operating properly, alarm conditions may exist.

Perform the following procedure to turn on the MDR-8000 series radios:

1. On all power supply modules, set power ON/OFF switches to ON.
2. Verify that power distribution unit rack alarm indicator (if any) is not lighted. If indicator is lighted, troubleshoot as described in the Maintenance section.
3. Verify that no red indicators are lighted. If a red indicator is lit, troubleshoot as described in the Maintenance section.
4. Perform lamp test by momentarily holding OVRD-ACO/LT switch on controller to ACO/LT. All indicator lamps/LEDs should light.

2.3 USER SYSTEM INTERFACE (USI) PROVISIONING FUNCTION/OPERATION

The User System Interface (USI) software is used for maintenance and support of the radio including fault and status reporting. Refer to the Initial Turn-Up section for instructions on loading and running the software. Refer to the User's Guide section for descriptions and functions of the menus.

Note

Refer to the Software Release Notes before performing any operating, provisioning, or maintenance function on this equipment. The Software Release Notes may contain information affecting these functions that is not contained in this instruction manual.

2.4 OPERATING PROCEDURES

Note

The USI computer is the main control for the radio. If instructions for setting up the USI computer are needed, refer to Initial Turn-Up section.

After installation and turn-on, operating procedures are limited to periodic alarm checks and, when necessary, answering or initiating orderwire calls. Automatic and manual switching are provided for equipment protection. Manual switching may be accomplished using the Control screen on the USI computer or the switches on the front panel of the controller module. The following paragraphs provide operating procedures for manual switchover of protected radio systems.

2.4.1 Radio Receiver Manual Switching

Note

When used in conjunction with a RCVR manual switch, press the OVRD switch to lock the receiver on line regardless of alarms. Press again to unlock.

Controller Switch

Perform RCVR manual switch (Figure 2-1) using controls on front panel of controller module:

USI Switch

Perform RCVR manual switch (Figure 2-2) using the USI control screen.

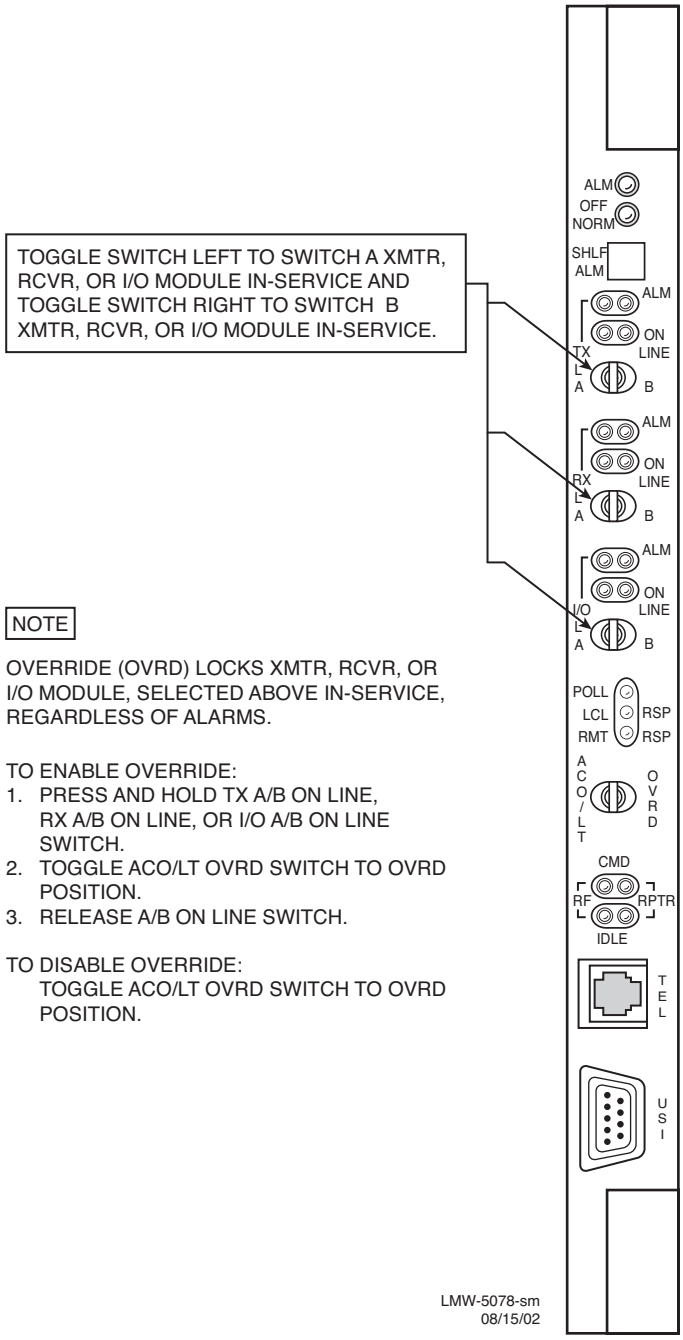


Figure 2-1 Manual Switch From Controller Front Panel

1. OPEN USI CONTROLS SCREEN.

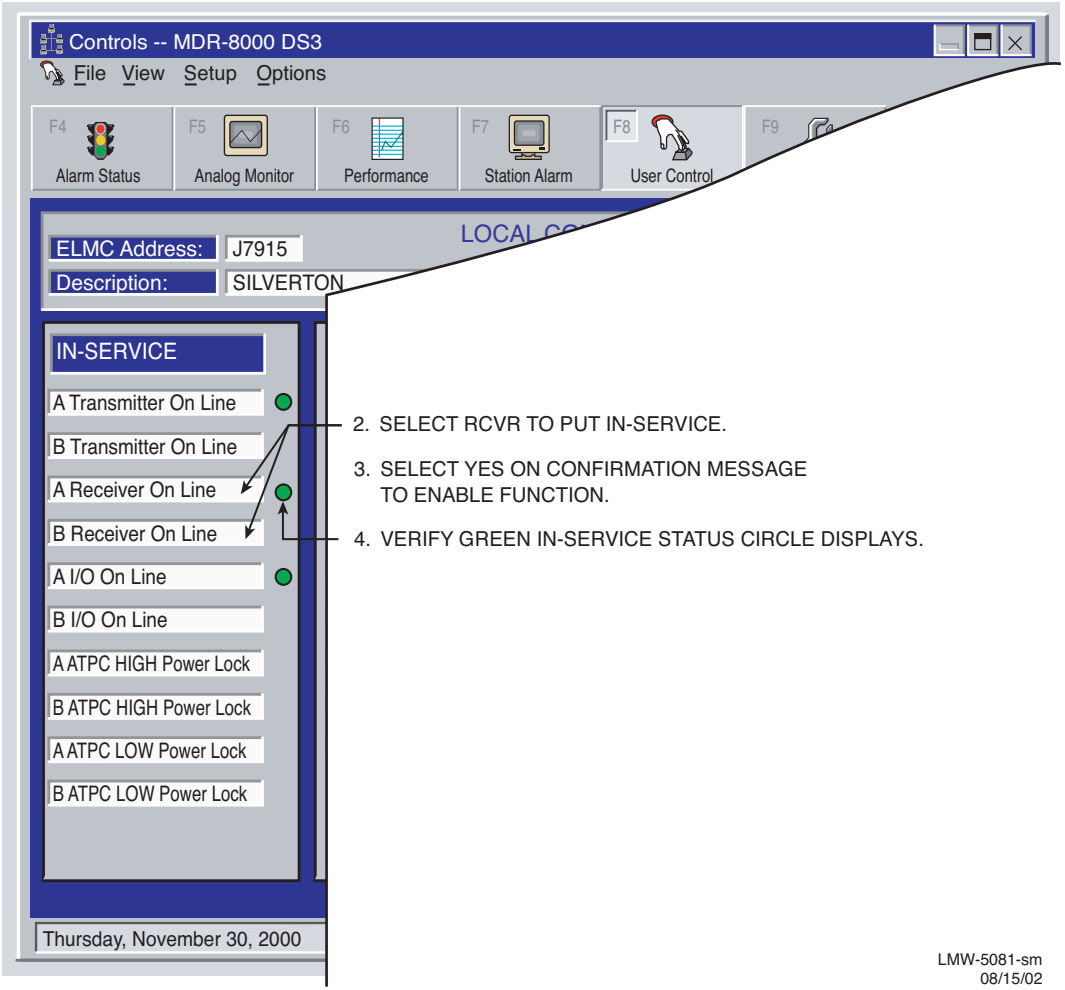


Figure 2-2 RCVR Manual Switch Using USI Control Screen

2.4.2 Radio Transmitter Manual Switching

CAUTION

Possibility of Service Interruption

Switching the radio transmitter may momentarily interrupt traffic. Before switching the transmitter, obtain permission from the proper authority.

Note

When used in conjunction with a XMTR manual switch, press the OVRD switch to lock the XMTR on line regardless of alarms. Press again to unlock.

Controller Switch

Perform XMTR manual switch (Figure 2-1) using controls on front panel of controller module.

USI Switch

Perform XMTR manual switch (Figure 2-3) using the USI control screen.

2.4.3 Radio I/O Interface Manual Switching

CAUTION

Possibility of Service Interruption

Traffic and auxiliary channel service will be momentarily interrupted. Obtain proper authorization before making this switch.

Note

When used in conjunction with an I/O interface manual switch, press the OVRD switch to lock the I/O interface on line regardless of alarms. Press again to unlock.

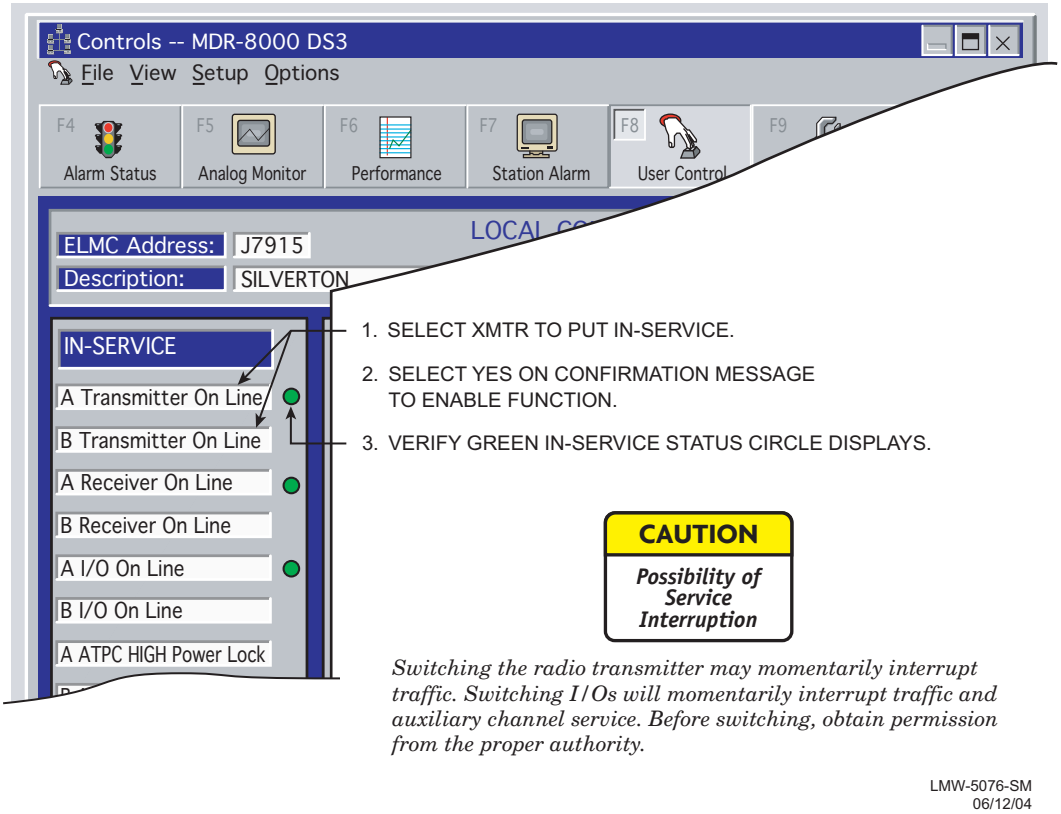


Figure 2-3 XMTR Manual Switch Using USI Control Screen

Controller Switch

Perform I/O manual switch (Figure 2-1) using controls on front panel of controller module.

USI Switch

Perform I/O manual switch (Figure 2-4) using the USI control screen.

1. OPEN USI CONTROLS SCREEN.

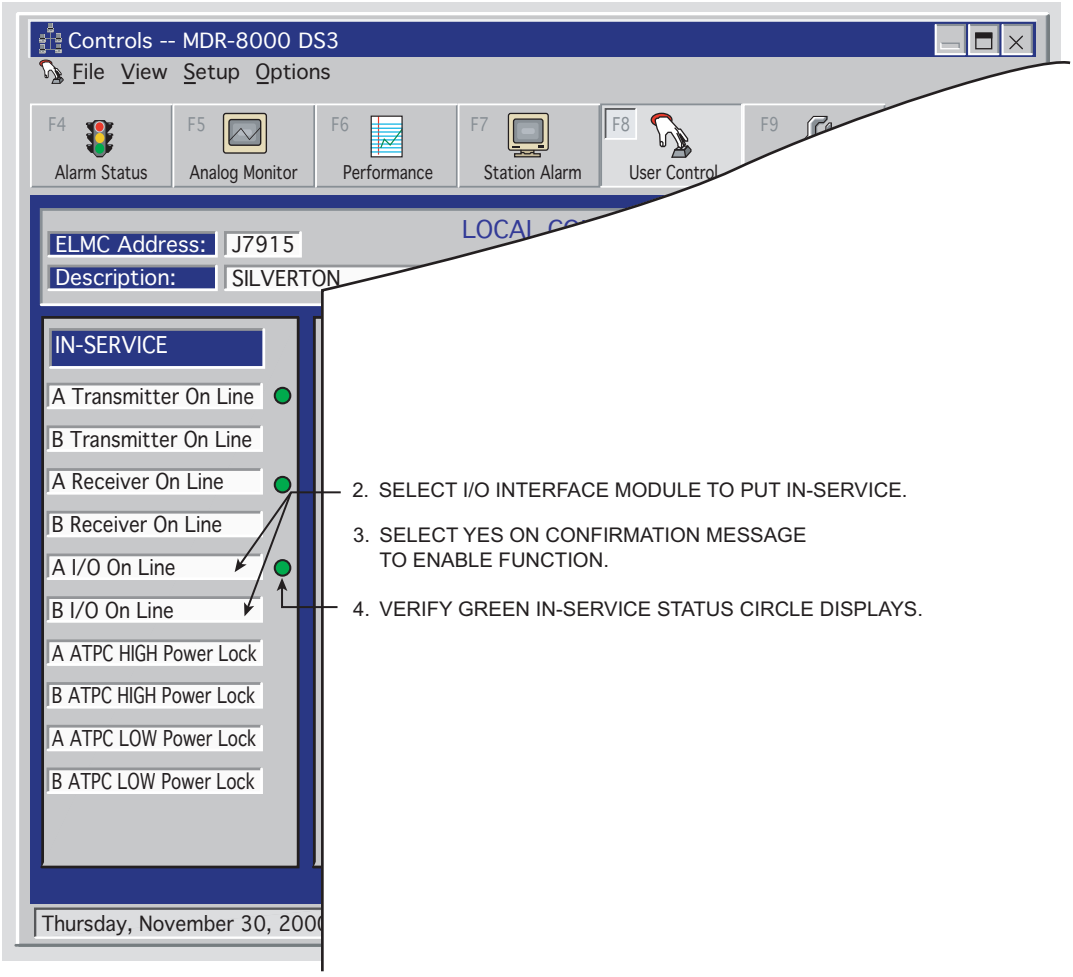


Figure 2-4 I/O Manual Switch Using USI Control Screen

2.4.4 MCS-11 Operation

An Operational Support System (OSS) provides a means to remotely monitor and control an MDR-8000 radio via an MCS-11 Monitor and Control System polling master. A Remote Station Summary (RSS), a Remote Detail Scanner (RDS), a Remote Analog Scanner (RAS), and a Remote Control Decoder (RCD) are available at the polling master for each radio network element. The remote station OSS addresses are programmed during radio provisioning using the USI laptop computer. (Refer to radio provisioning in the Initial Turn-Up section.) Refer to Appendix A at the end of this instruction book for MCS-11 details, including alarm/status mapping and connector information.

2.4.5 Lamp Tests

Perform lamp tests by pressing and holding **ACO/LT OVRD** switch on controller front panel in **ACO/LT** position. All indicators on controller and indicators on all equipped modules should light. Release **ACO/LT OVRD** switch.

2.4.6 Alarm Checks

The USI Alarm and Status screens provide alarms and status for the radio. Refer to description of alarms and status in the maintenance section.

2.4.7 Orderwire Operation

These operating procedures describe use of the orderwire system to answer incoming calls and initiate outgoing calls. The DTMF function allows the user to ring the dialed station.

2.4.8 Initiating Outgoing Orderwire Calls

1. Connect telephone to J302 TEL jack on front panel of AE-37( ) Controller.
2. Dial the 3-digit DTMF extension on the telephone keypad to call specific party or press the * key on keypad to initiate CALL signaling to all stations.

2.4.9 Answering Incoming Orderwire Calls

Note

Call can be heard by all stations.

1. When the buzzer sounds, alerting the operator there is an incoming call, connect telephone to J302 TEL jack on front panel of AE-37( ) Controller and turn ON-HOOK/OFF-HOOK switch to OFF-Hook position.
2. To terminate call, turn ON-HOOK/OFF-HOOK switch to ON-Hook position.

Note

During the DTMF dialing process, if an incorrect number sequence has been dialed, press # to reset DTMF digit accumulator to zero. A redial can then be initiated.

Note

If 1.5 seconds elapse between dialed digits, the DTMF digit accumulator resets to zero, and a redial must be initiated.

Note

Caller can press # to clear all flashing CALL indicators at all DTMF sites equipped with the DTMF signaling option (a tone is transmitted).

2.5 TURN-OFF PROCEDURE

The radio is designed for continuous operation. If power must be removed while performing maintenance on a particular cabinet or shelf, power can be removed by turning off associated power supplies.

Note

Normally, the turn-off procedures are not used. System design allows maintenance of the rack without interrupting service. It is recommended that turn-off be performed only in an emergency.

2.6 EMERGENCY OPERATION

If an emergency occurs, such as a short circuit or a fire, turn off all MDR-8000 Microwave Digital Radio power supplies as quickly as possible.

2.7 MODEM OPERATION

Refer to the Modem Provisioning section for modem connection and setup procedures.

2.8 CONTROLS, INDICATORS, TEST POINTS, AND CONNECTORS

CAUTION

Possibility of Service Interruption

Do not adjust controls unless instructed to do so in an installation or maintenance procedure. Unauthorized adjustment of controls illustrated and described in this section may interrupt traffic and/or degrade system performance.

Controls, indicators, test points, and connectors used in normal operation or referenced in procedures are shown in Figure 2-5 through Figure 2-16. The figures are arranged in alphabetical order according to the type number.

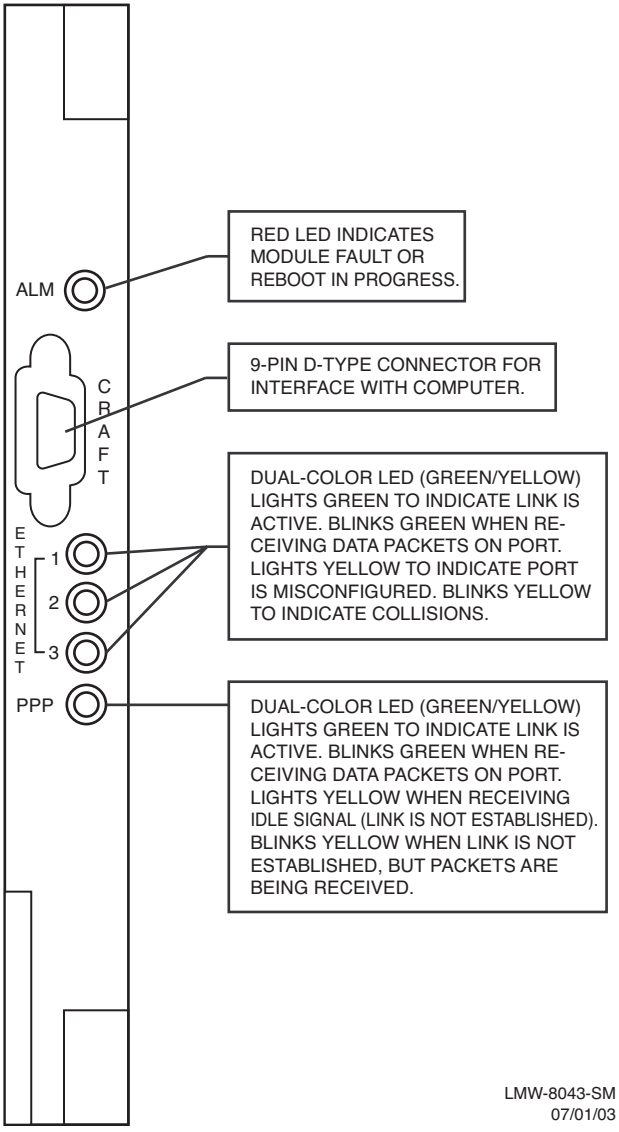
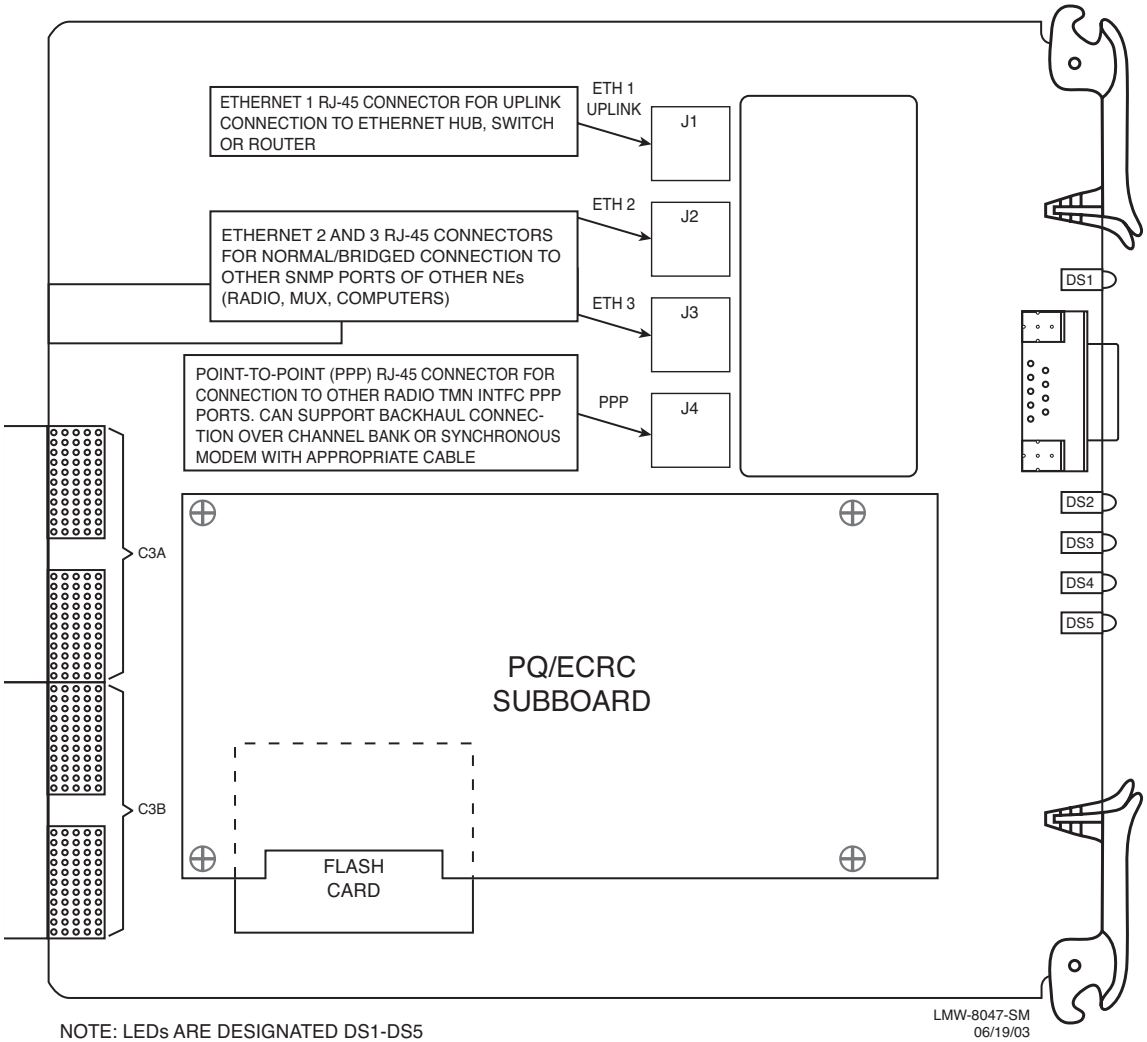


Figure 2-5 AE-37AA TMN Interface Module Controls, Indicators, and Connectors (Sheet 1 of 2)



NOTE: LEDs ARE DESIGNATED DS1-DS5

Figure 2-5 AE-37AA TMN Interface Module Controls, Indicators, and Connectors (Sheet 2 of 2)

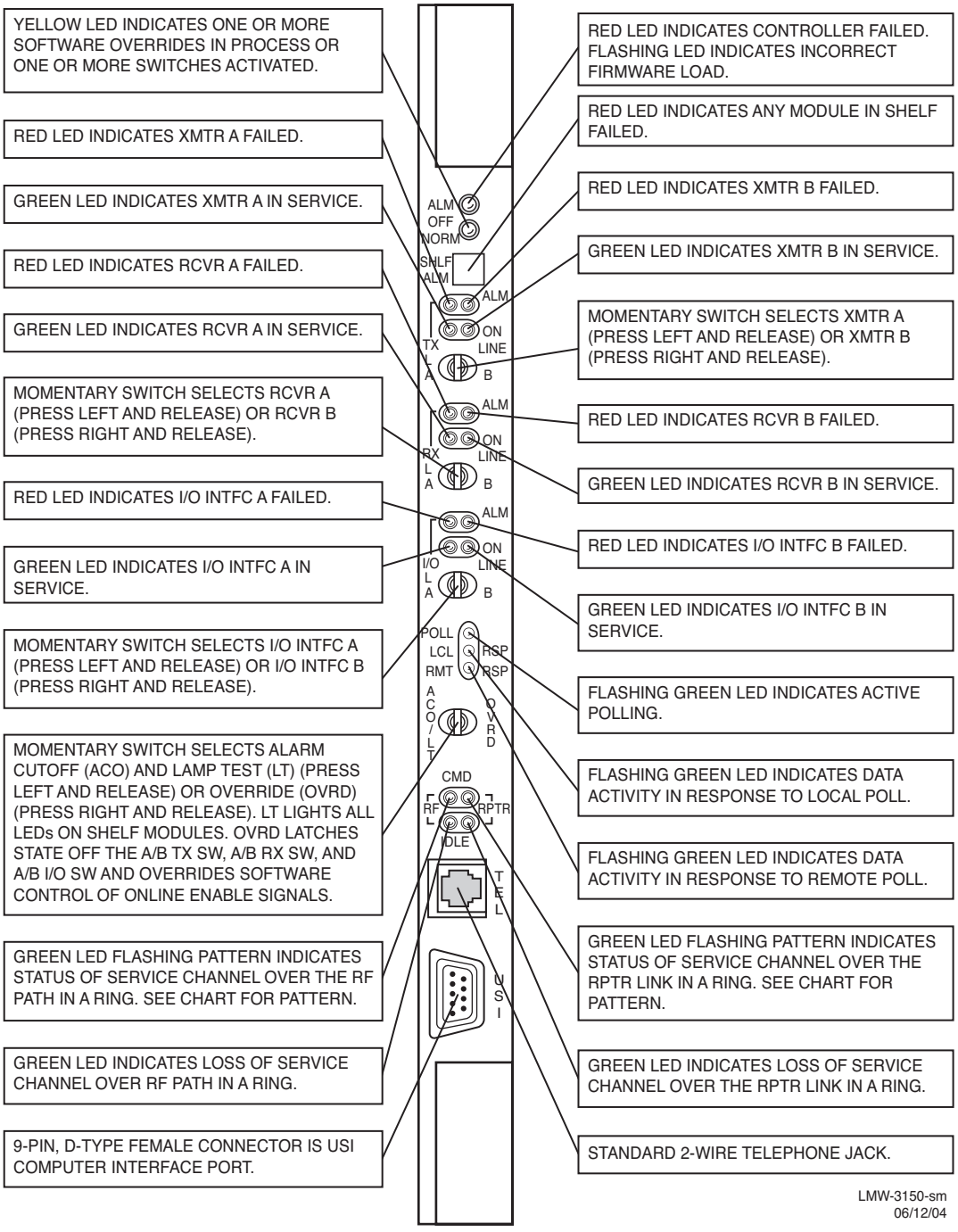


Figure 2-6 AE-37( ) Controller Controls, Indicators, and Connectors (Sheet 1 of 2)

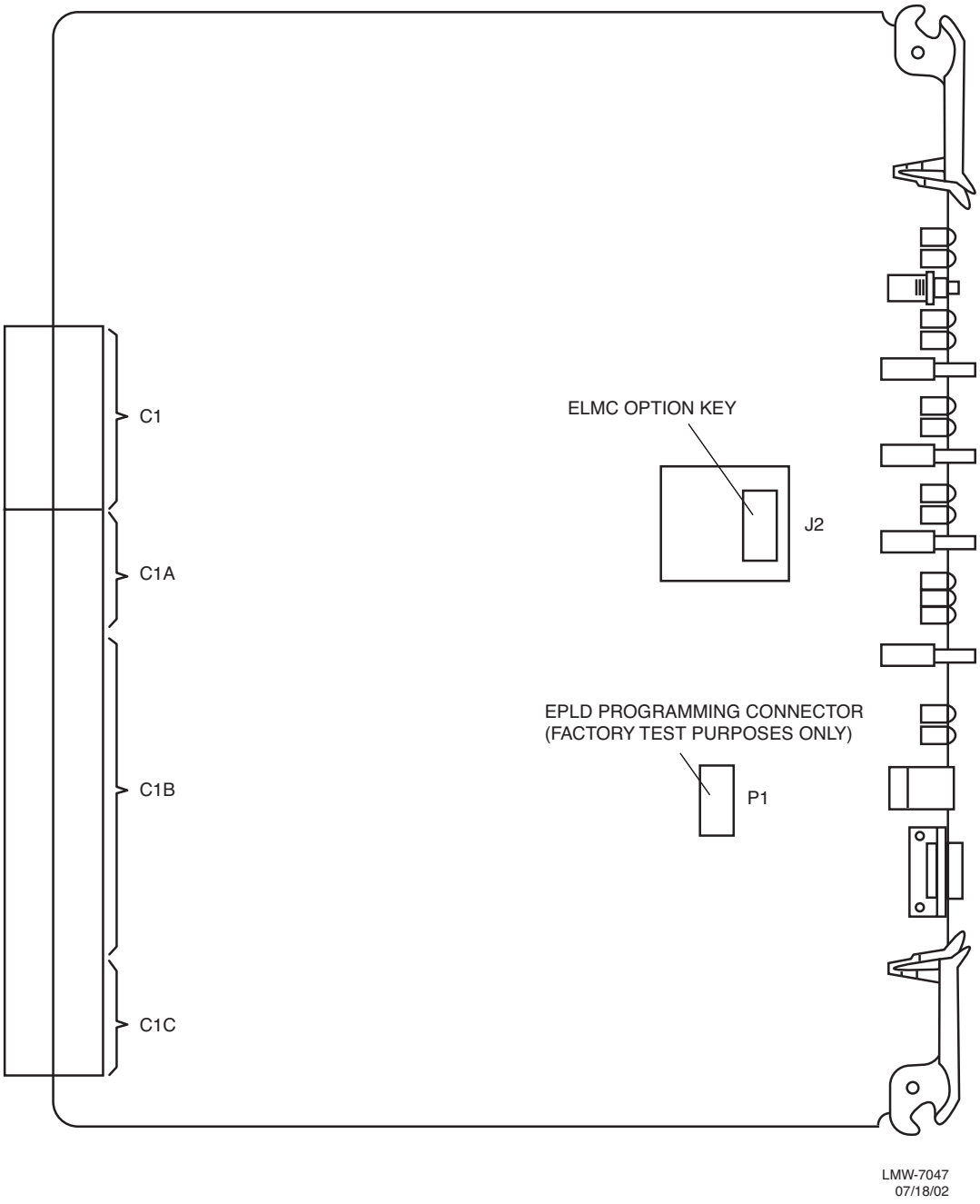


Figure 2-6 AE-37( ) Controller Controls, Indicators, and Connectors (Sheet 2 of 2)

Table 2-1 DS1/E1 Ring Flashing Patterns

CONTROLLER LOCATION	CONTROLLER LED			
	RF CMD	RPTR CMD	RF IDLE	RPTR IDLE
Scenario 1. Ring Operating Correctly				
Both Ring Terminals	On-long Off-short	On-long Off-short	On	Off
All Ring Repeaters	On-long Off-short	On-long Off-short	Off	Off
Scenario 2. Failed Repeater- RF Path Failure				
Both Ring Terminals	On and Off Same	On-short Off-long	Off	Off
Alarmed Ring Repeater	Off	On and Off Same	On	Off
All Other Ring Repeaters		Off	Off	
Scenario 3. Failed Repeater- RPTR Link Failure				
Both Ring Terminals	On and Off Same	On-short Off-long	Off	Off
Alarmed Ring Repeater	On and Off Same	Off	Off	On
All Other Ring Repeaters		Off	Off	
Scenario 4. Failed Terminal- RPTR Link Failure				
Alarmed Ring Terminal	On and Off Same	No Indication	Off	On
Associated Ring Repeater	On and Off Same	No Indication	Off	On
Other Ring Terminal	On-short Off-long	On-short Off-long	Off	Off
All Other Ring Repeaters	Depends on Location in Ring		Off	Off

Notes:

On-long Off-short duration indicates all ring normal pattern received.
On and Off Same duration indicates ring restore pattern received.
On-short Off-long duration indicates ring fail pattern received.

Table 2-2 DS3/OC3 Ring Flashing Patterns

CONTROLLER LOCATION	CONTROLLER LED			
	RF CMD	RPTR CMD	RF IDLE	RPTR IDLE
Scenario 1. Ring Operating Correctly				
Ring Repeater – Master Radio	On-long Off-short	On-long Off-short	On	Off
All Ring Repeaters – Normal Radios	On-long Off-short	On-long Off-short	Off	Off
Scenario 2. Failed Repeater- RF Path Failure				
Ring Repeater – Master Radio	On-short Off-long	On-short Off-long	Off	Off
Alarmed Ring Repeater – Normal Radio	Off	On and Off Same	On	Off
All Other Ring Repeaters – Normal Radio	Ring Fail or Ring Restore	Ring Fail or Ring Restore	Off	Off
Scenario 3. Failed Repeater- RPTR Link Failure				
Ring Repeater – Master	On-short Off-long	On-short Off-long	Off	Off
Alarmed Ring Repeater – Normal Radio	On and Off Same	Off	Off	On
All Other Ring Repeaters – Normal Radios	Ring Fail or Ring Restore	Ring Fail or Ring Restore	Off	Off
Scenario 4. Failed Master- RPTR Link Failure				
Alarmed Ring – Master Radio	On-long Off-short	Off	Off	On
Associated Ring Repeater – Normal Radio	On and Off Same	Off	Off	On
All Other Ring Repeaters – Normal Radios	Ring Fail or Ring Restore	Ring Fail or Ring Restore	Off	Off

Notes:

On-long Off-short duration indicates all ring normal pattern received.
On and Off Same duration indicates ring restore pattern received.
On-short Off-long duration indicates ring fail pattern received.

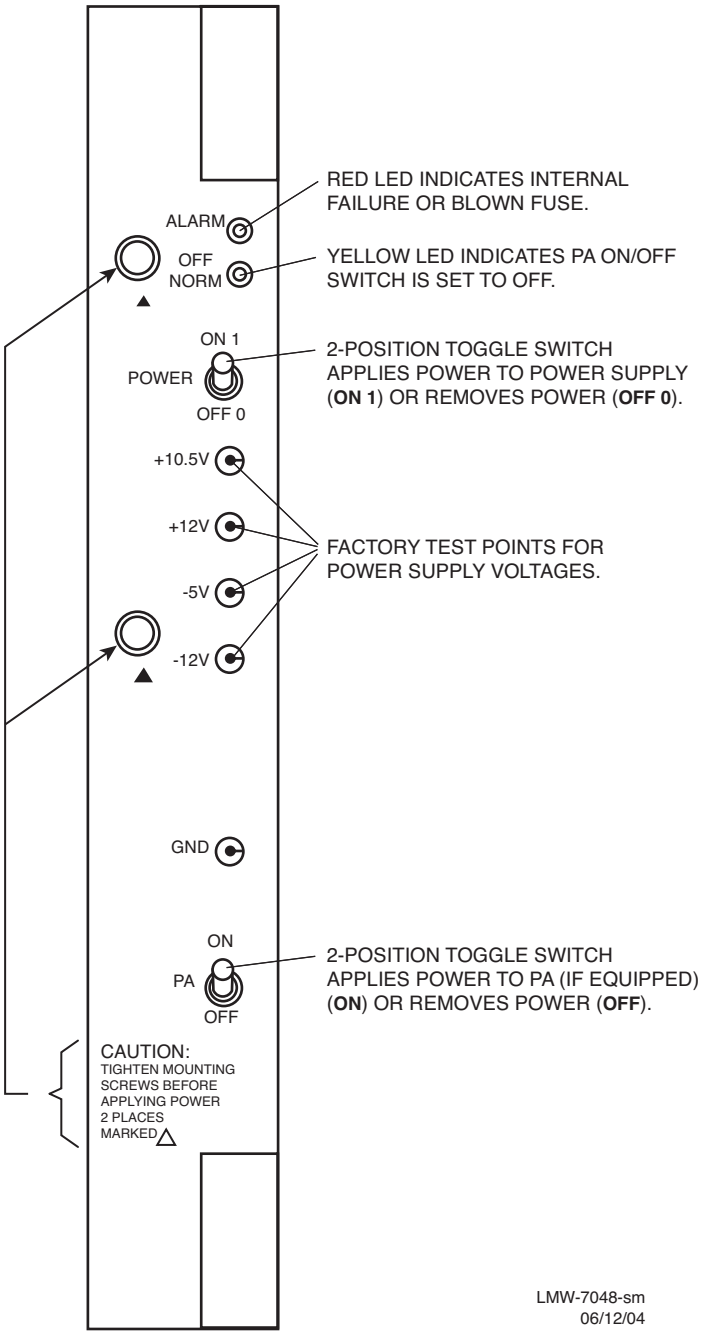
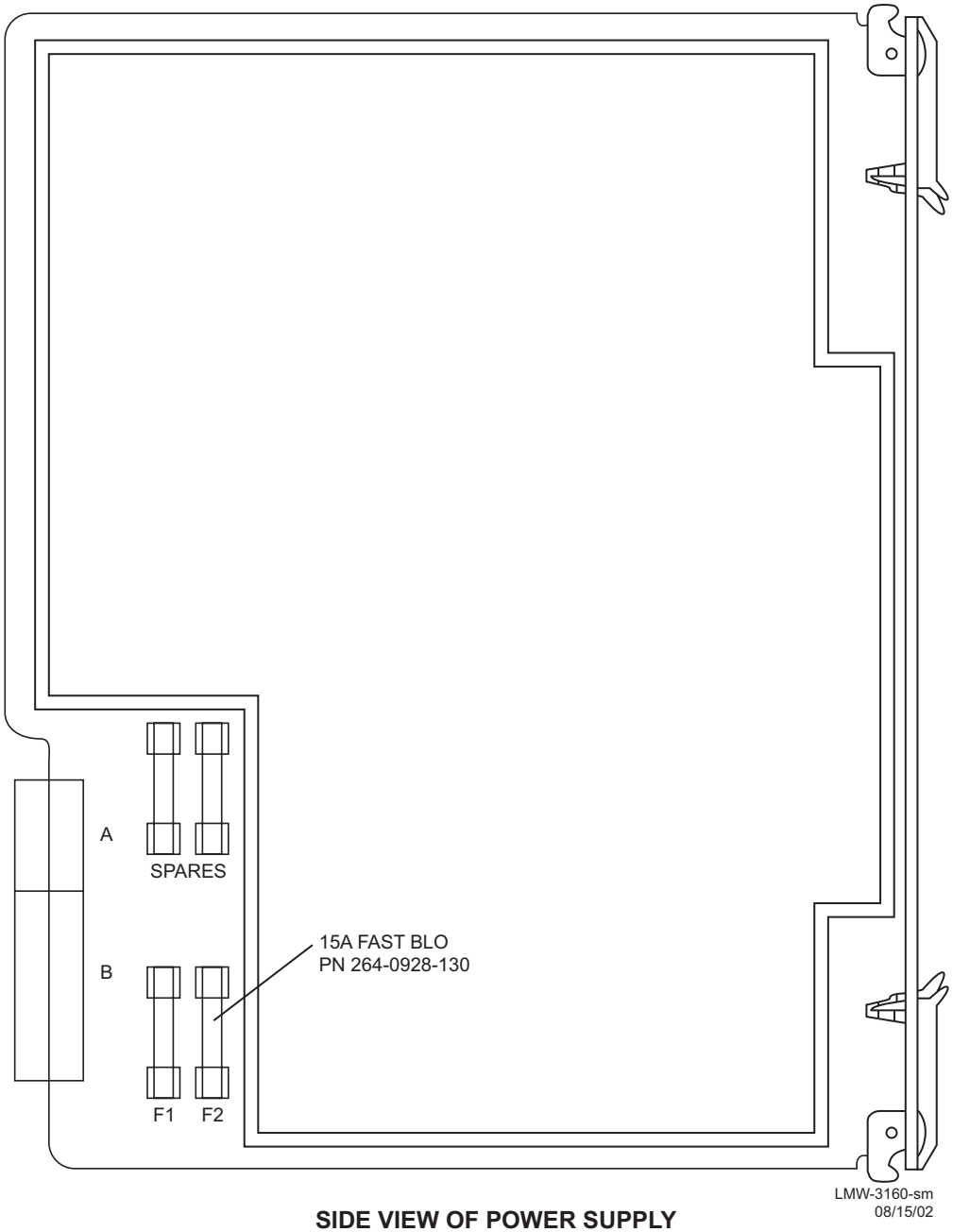


Figure 2-7 CE-16BB Power Supply Controls, Indicators, Test Points, and Connectors (Sheet 1 of 2)



SIDE VIEW OF POWER SUPPLY

Figure 2-7 CE-16BB Power Supply Controls, Indicators, Test Points, and Connectors (Sheet 2 of 2)

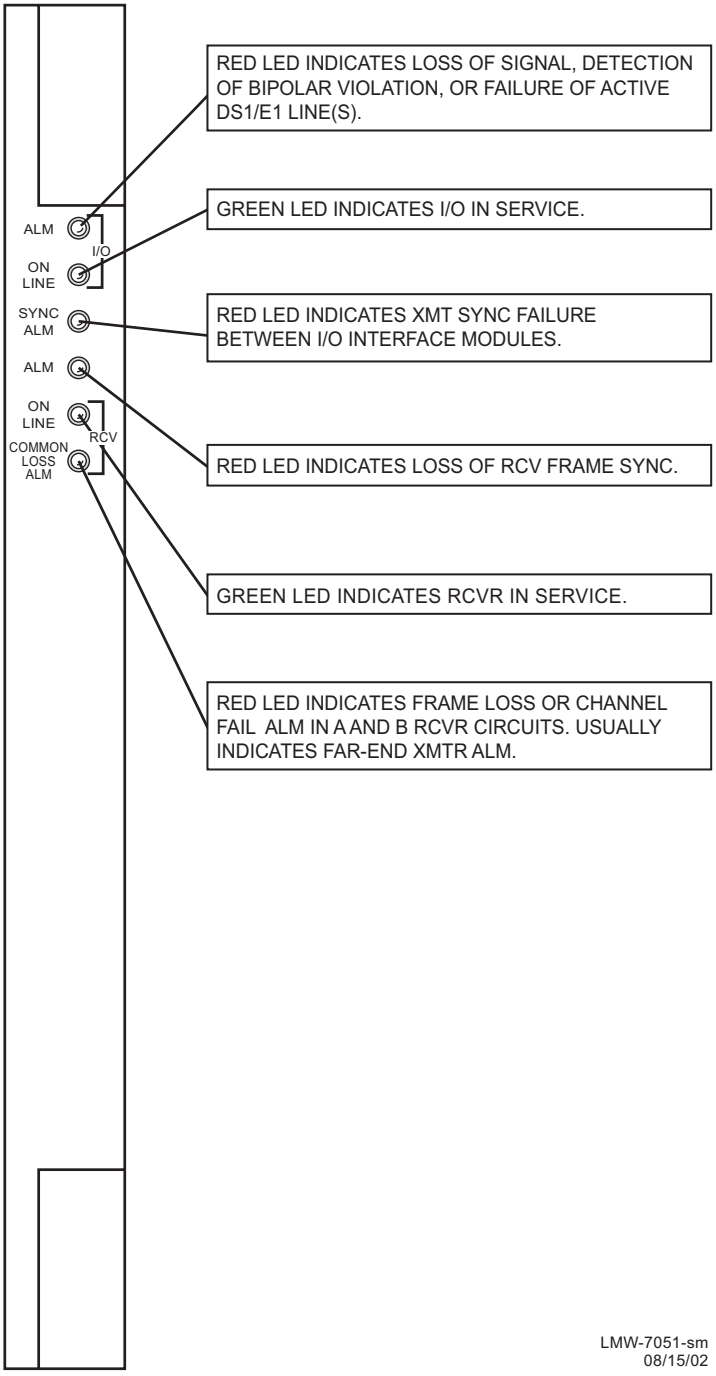


Figure 2-8 DX-35M DS1 I/O Interface Controls and Indicators

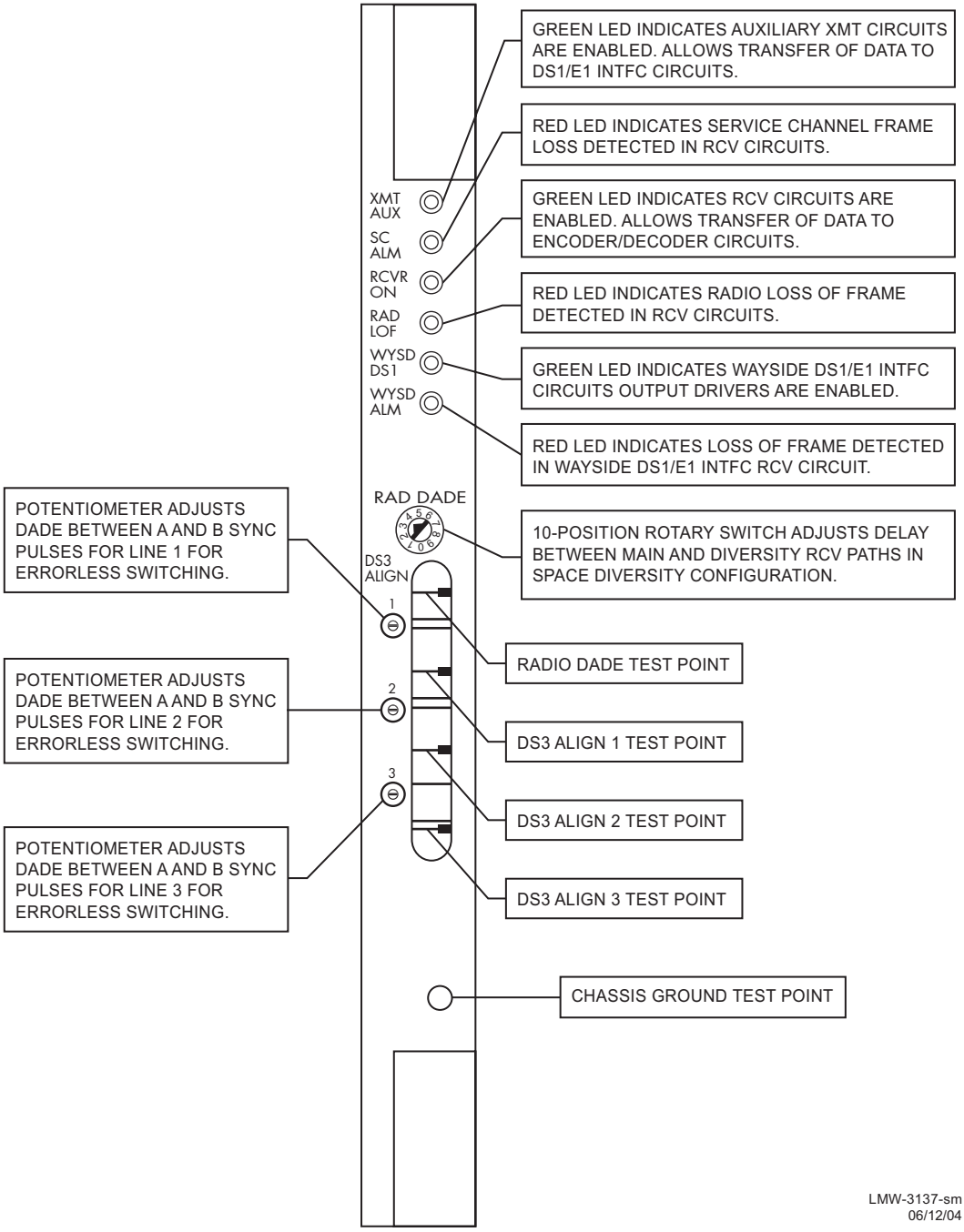


Figure 2-9 DX-35N DS3 I/O Interface Controls and Indicators

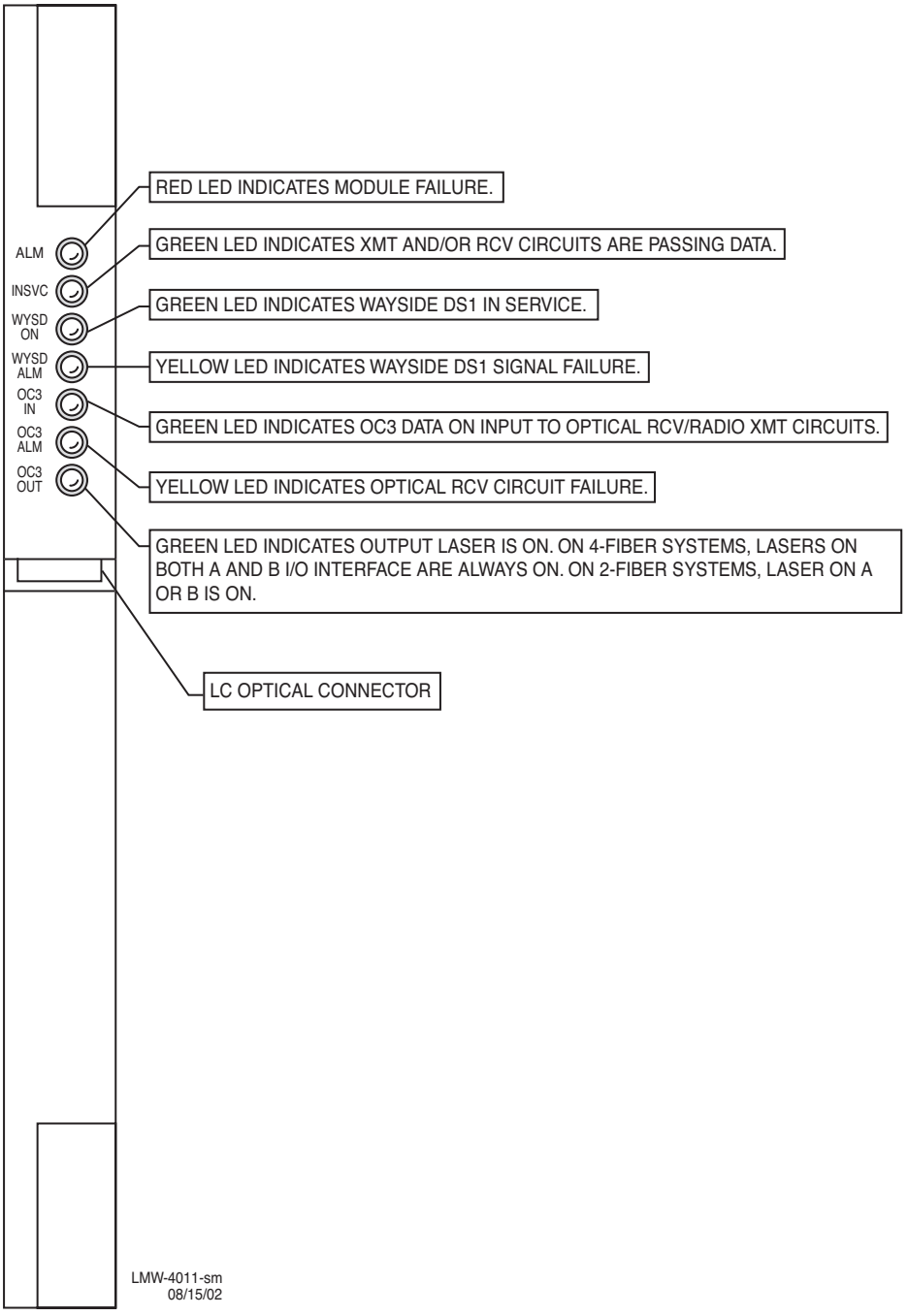


Figure 2-10 DX-35P OC3 I/O Interface Controls and Indicators

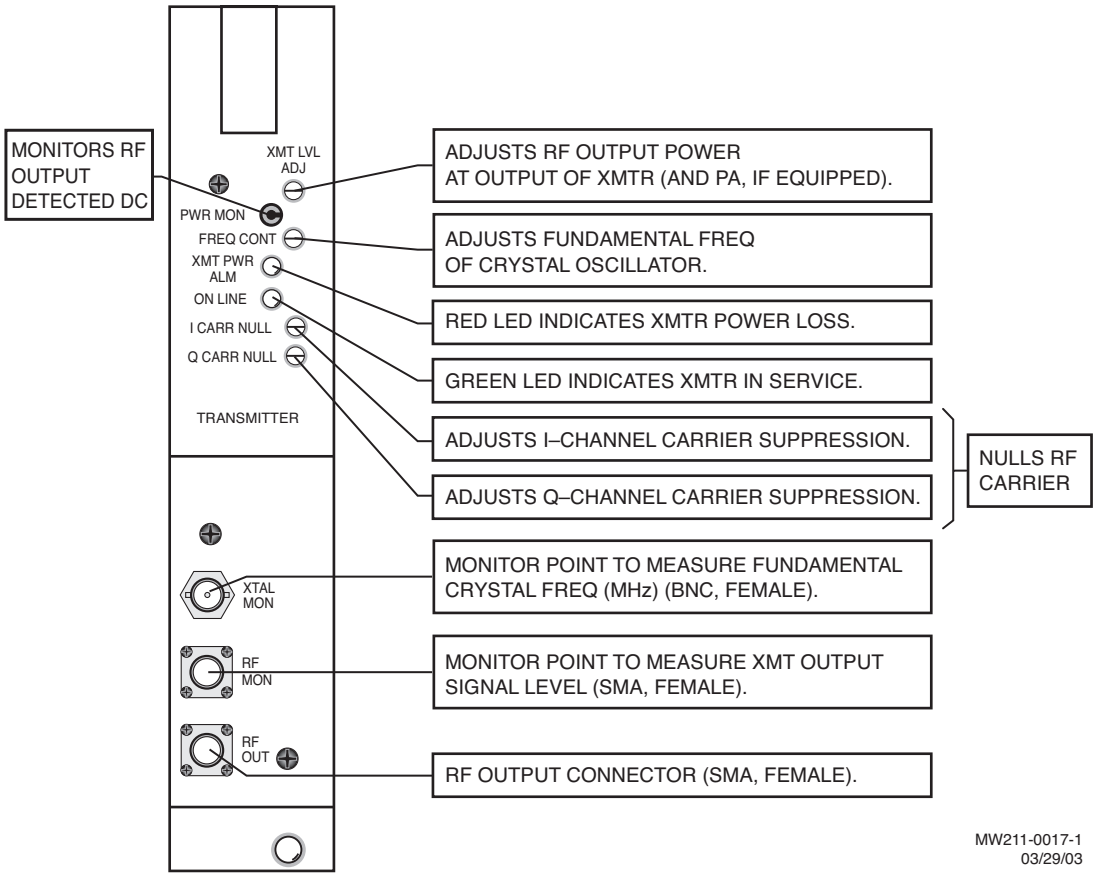


Figure 2-11 UD-35( ) Transmitter Controls, Indicators, Test Points, and Connectors

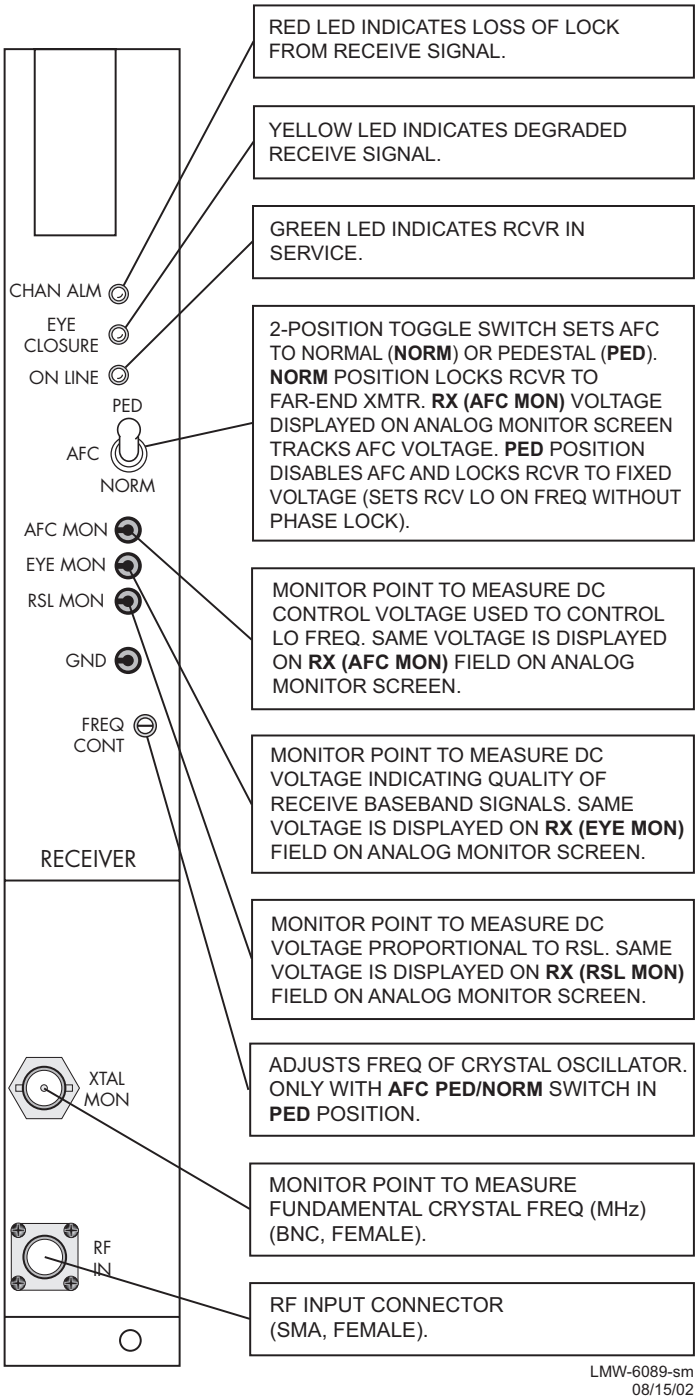


Figure 2-12 DS1/E1 UD-36( ) Receiver (Obsolete Version With Pedestal Switch) Controls, Indicators, Test Points, and Connectors

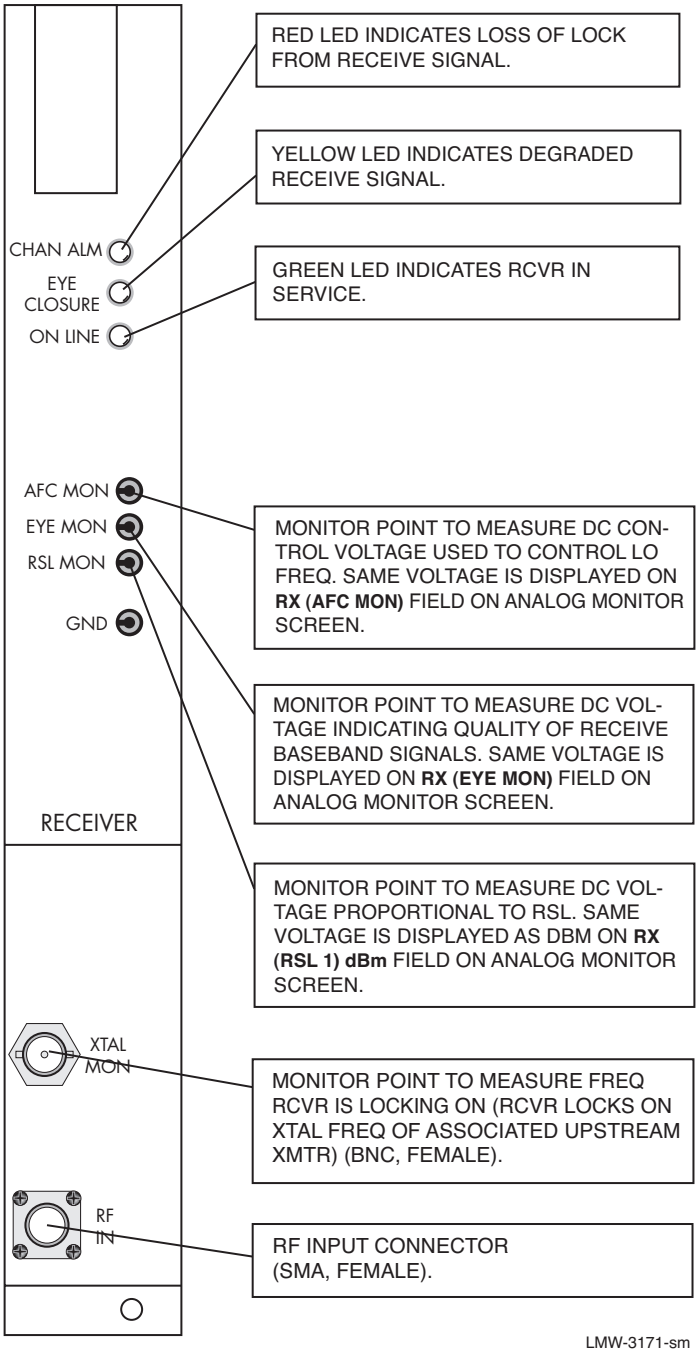


Figure 2-13 UD-36( ) DS1/E1/DS3/OC3 Single Receiver Controls, Indicators, Test Points, and Connectors

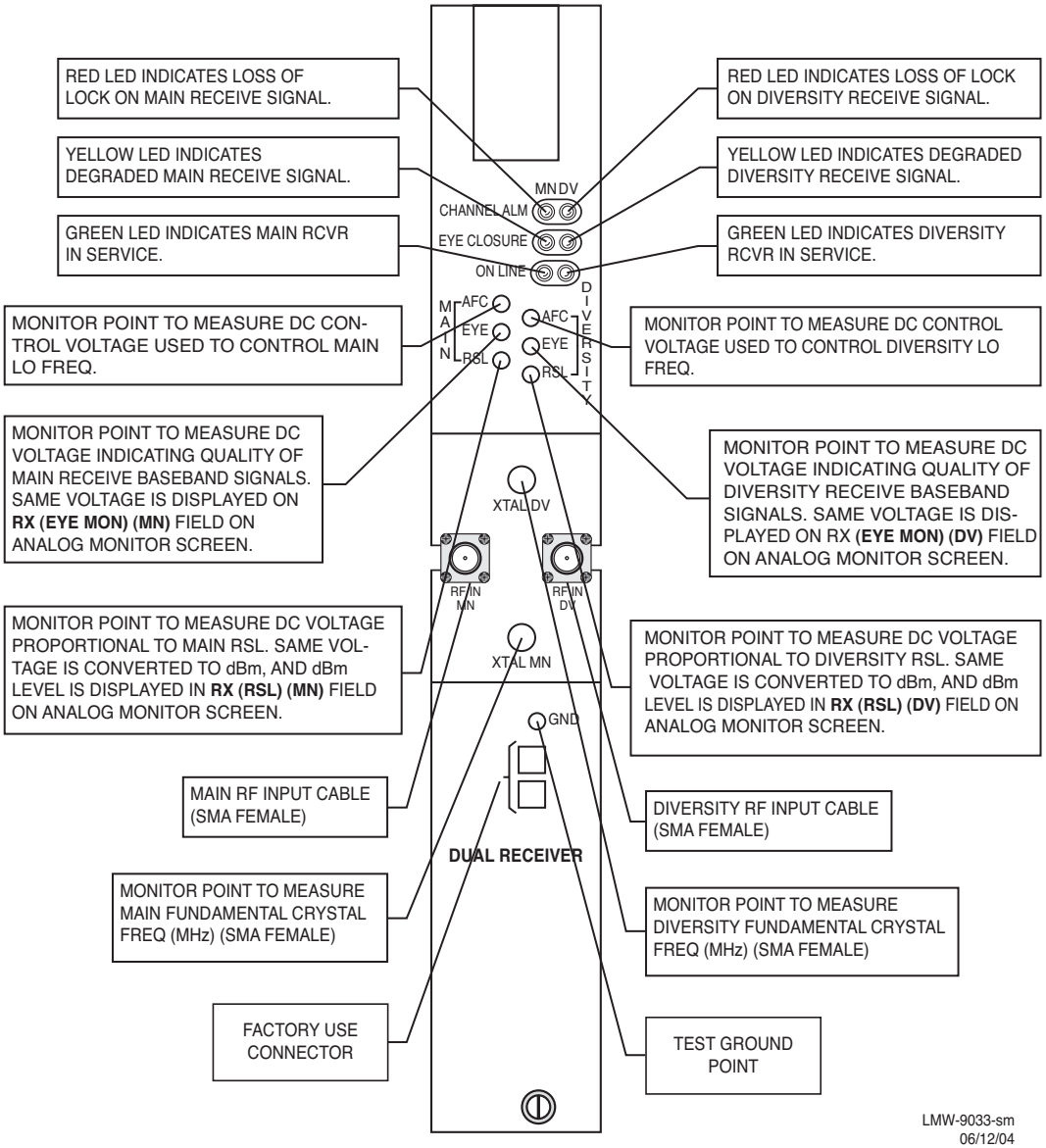


Figure 2-14 UD 36( ) Dual Receiver Controls & Indicators, Test Points and Connectors

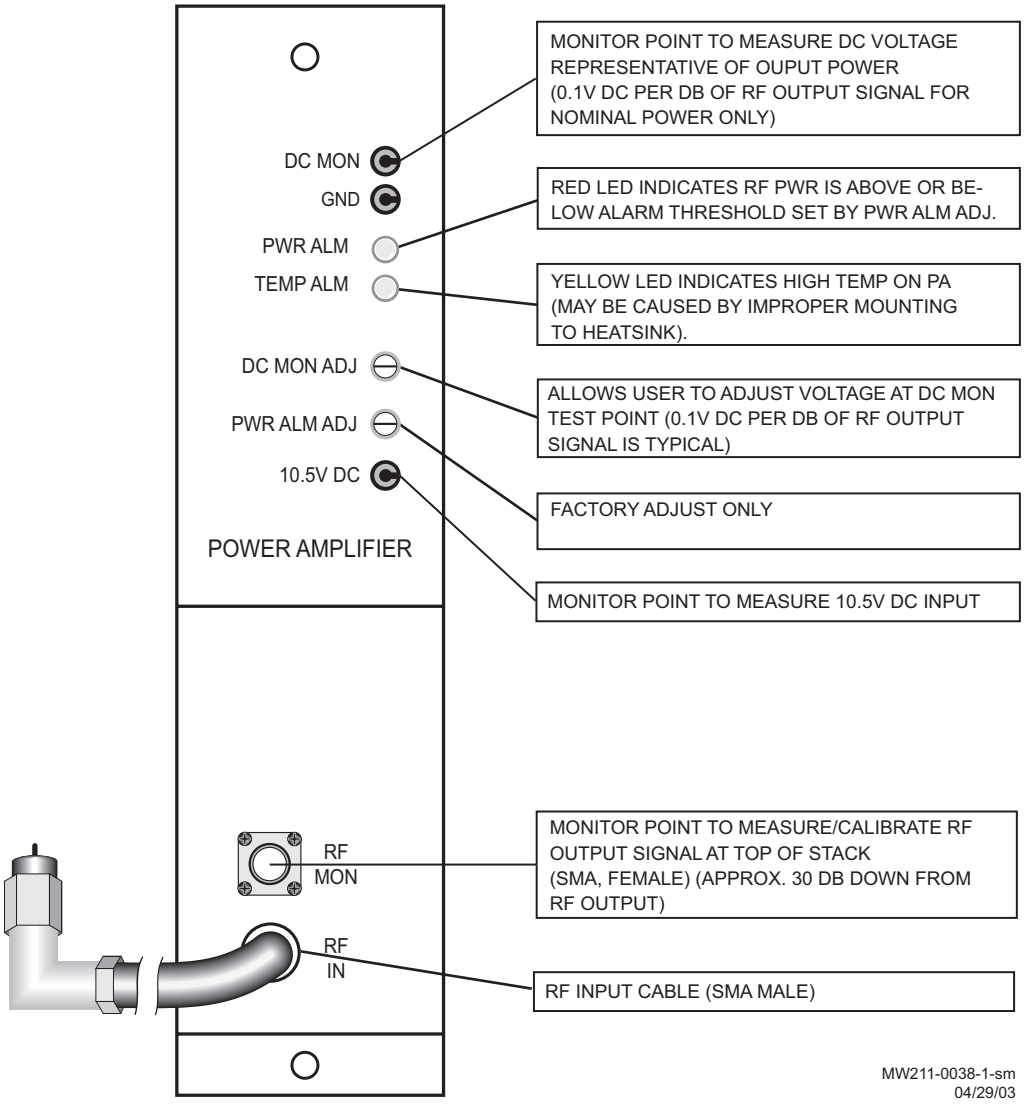


Figure 2-15 UD-51( ) Power Amplifier Controls, Indicators, Test Points, and Connectors

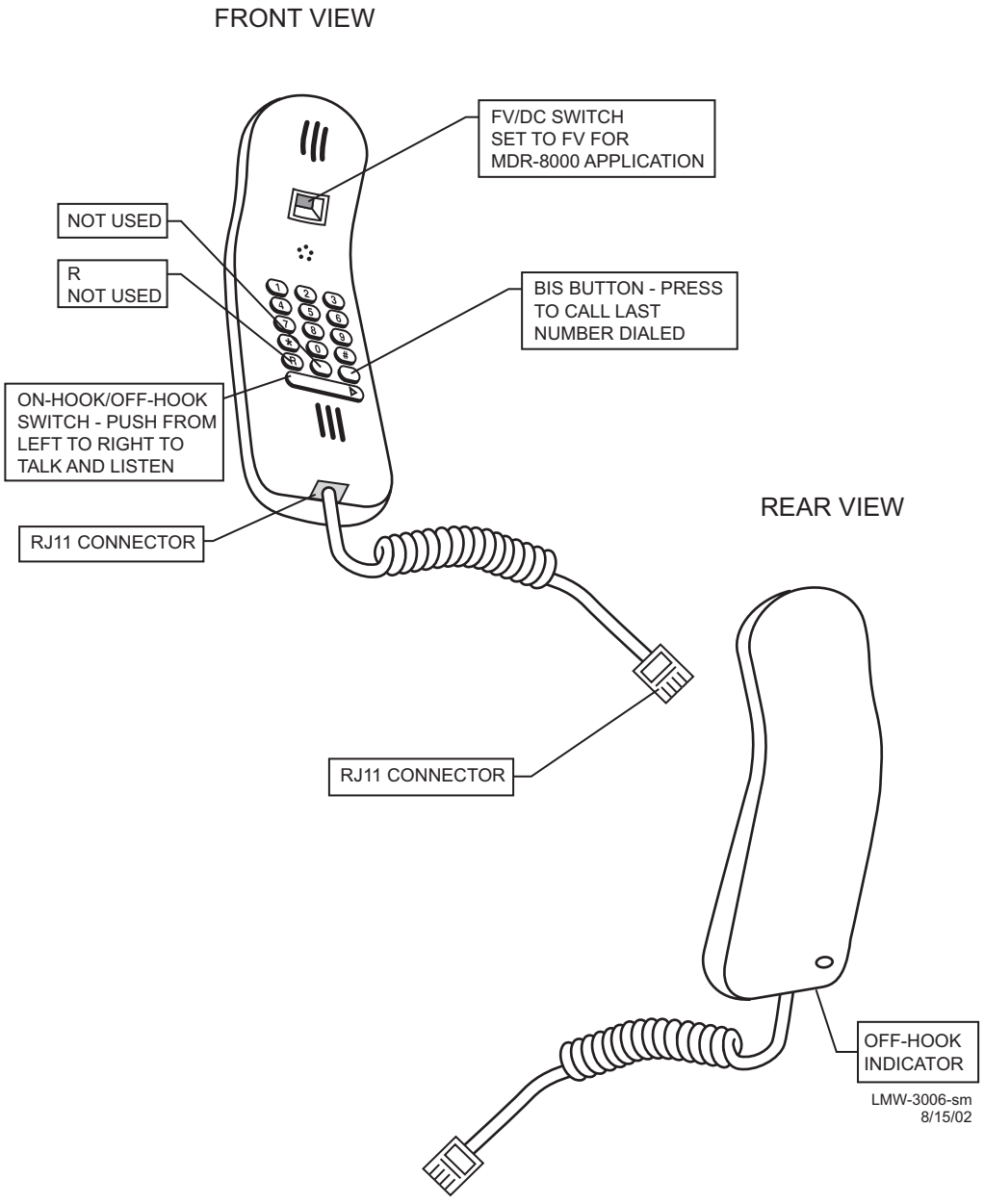


Figure 2-16 Handset Controls, Indicators, Test Points, and Connectors

3 INTERCONNECT

3.1 SECTION INTRODUCTION

This section gives the location and describes strapping, power connections, signal connections, status and alarm connections, and service channel connections. For further details, refer to the complete instruction book on the attached CD ROM.

3.2 INSTALL POWER CABLE ASSEMBLIES

See Figure 3-1 for power cable assembly installation procedures. The MDR-8000 is internally wired to accept 20.5 to 60 V dc input power with positive or negative ground. To protect maintenance personnel from lightning strikes, the ground system must be integrated by bonding station ground and dc battery return together. The dc power connectors J1 and J2 are located on the rear of the back panel. Install power cables as shown.

Short circuiting low-voltage, low-impedance dc circuits can cause arcing that may result in burns or eye injury. Remove rings, watches, and other metal jewelry while working with primary circuits. Exercise caution to avoid shorting input power terminals.

To protect maintenance personnel from antenna tower lightning strikes, the ground system must be integrated by bonding frame ground and dc battery return together.

Do not apply battery power until it is determined that A and B battery cables with isolated returns and power cables are wired correctly. With power applied, reverse polarity on wiring (+batt wired to -batt pin on connector) can cause power supply fuse to blow.

Note

Grounding of pole, antenna, customer interfaces, and all entrances to the building interior shall meet local electrical code and standard business practices.

1. DETERMINE IF INSTALLATION REQUIRES POS OR NEG GND.
2. INSTALL BATT, GND, AND JUMPER WIRES ON PWR CABLE ASSEMBLY.
3. CONNECT PWR CABLE ASSEMBLY TO J1 (AND J2 IF HOT-STBY).
4. CONNECT RACK GND AND CHASSIS GND.
5. CONNECT BATT.

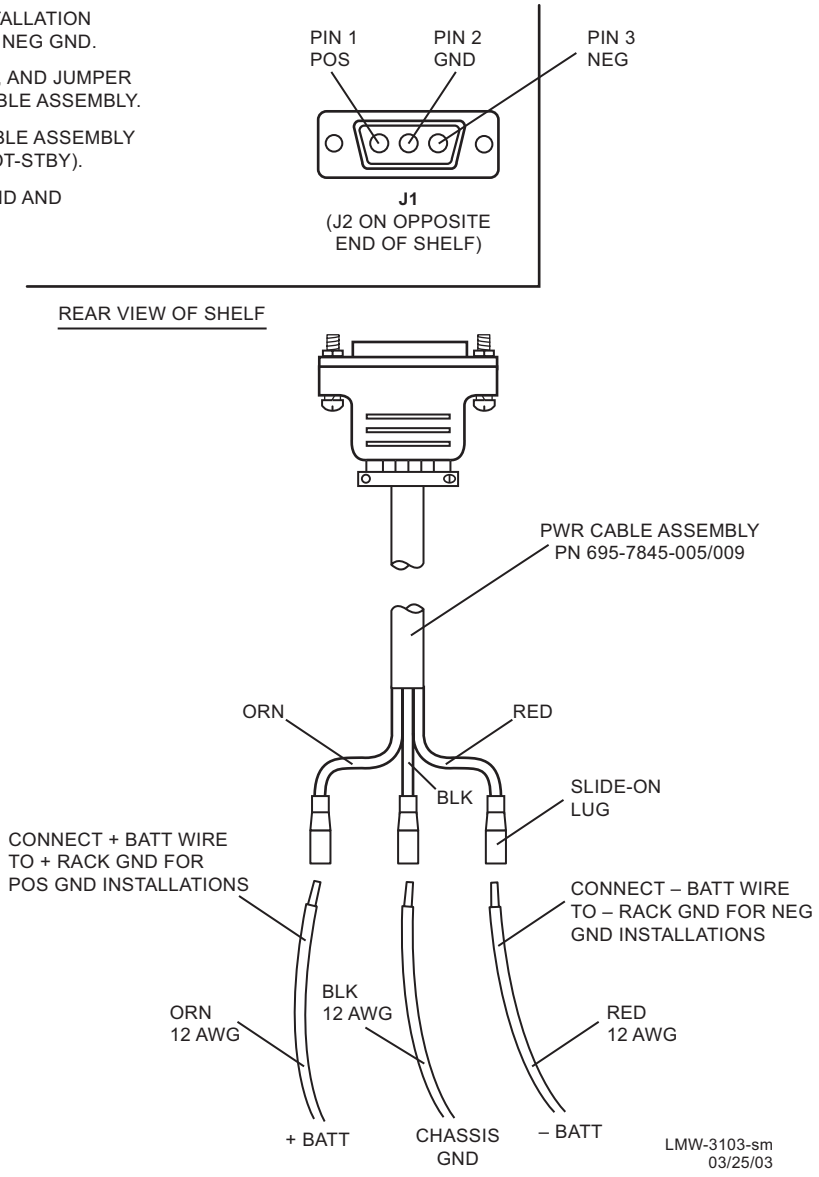


Figure 3-1 Power Cable Assembly Installation

3.3 PDU STRAPPING AND CONNECTIONS

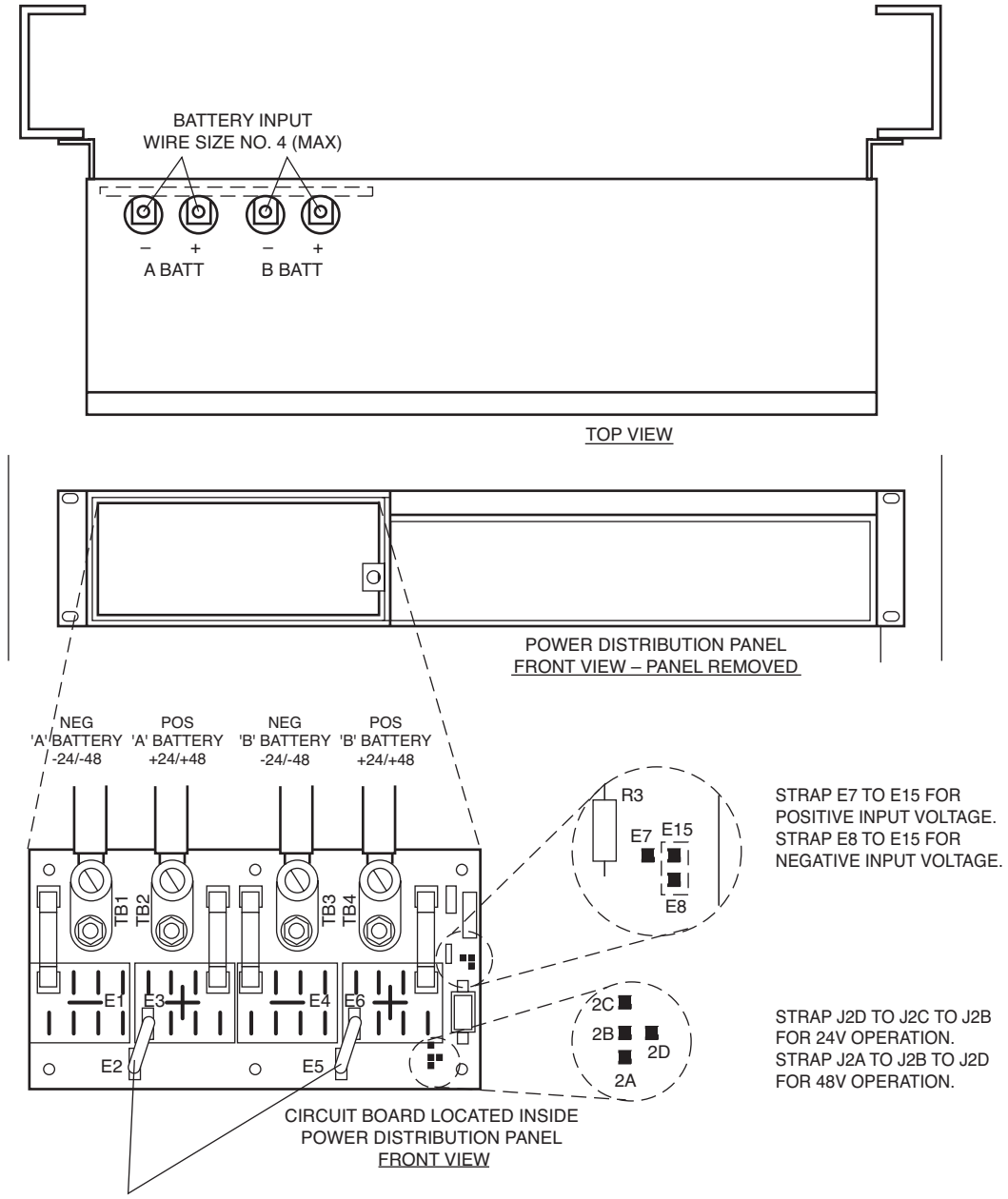


Figure 3-2 PDU (695-6200-001/002) Strapping and Connections (Sheet 1 of 2)

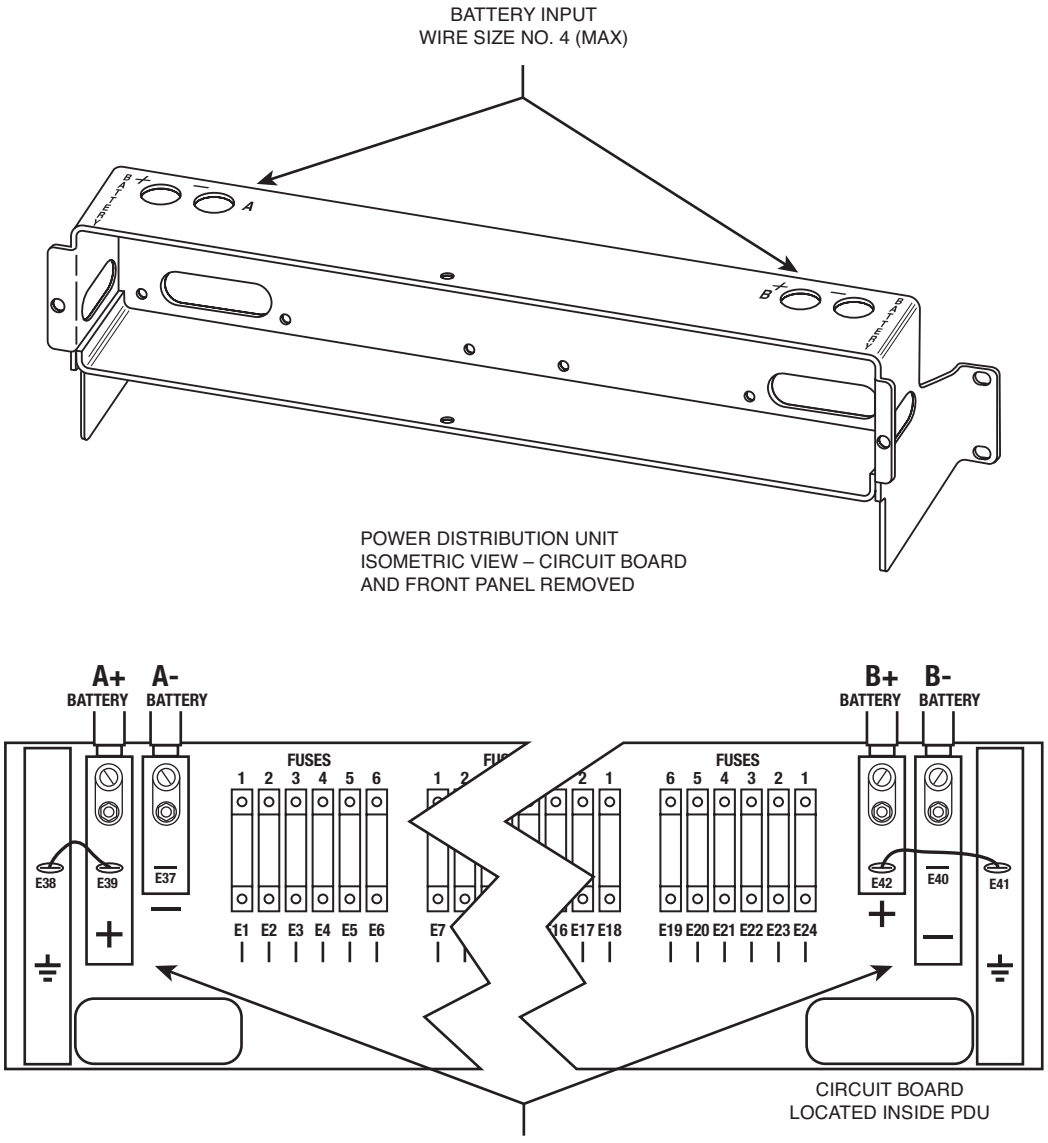


Figure 3-2 PDU (3EM13317AA) Strapping and Connections (Sheet 2 of 2)

3.4 SHELF/RACK ALARM CONNECTION

Each MDR-8000 rack equipped with the Power Distribution Unit (PDU) 695-6200-001/002 has a visual rack alarm indicator to report a shelf failure. In order to activate a rack alarm visual indicator on the PDU, the shelf alarm output from each MDR-8000 shelf must be hardwired to connector J1 on the PDU. The shelf alarm is provided on alarm connector J305 pin 24 (major/visual alarm). A wire-wrap adapter (PN 695-4171-002) for connector J305 is available. Insulated 22-gauge solid copper wire is recommended for connecting to the wire-wrap adapter. To attach to J1 (2-pin connector) on the PDU, use 2-position socket housing PN 372-0114-140 and socket contact PN 372-0114-390. See Figure 3-3, sheet 1, for shelf-to-rack alarm wiring.

Each MDR-8000 rack equipped with PDU 3EM13317AA has a blown fuse alarm visual indicator and a Form C relay alarm output (J4, J5, and J6) for connection to customer alarm equipment.

An optional Fuse and Shelf alarm plug-in assembly is available to provide shelf alarm connections requiring Form C relays. The alarm inputs (major and minor) must be hard wired to J3 on the PDU. The alarms are provided on alarm connector J305 pin 24 (major/visual alarm) and pin 50 (minor/audible alarm) of each shelf. A wire-wrap adapter (PN 695-4171-002) for connector J305 is available. Insulated 22-gauge solid copper wire is recommended for connecting to the wire-wrap adapter and also to J3 on the PDU. Alarm outputs are transmitted to customer equipment via Form C relay outputs (J4, J5, J6, relays 1 through 8). This option also includes the blown fuse alarm indicator and Form C relay alarm output (J4, J5, and J6 – relay 9). See Figure 3-3, sheet 2, for shelf to PDU alarm wiring.

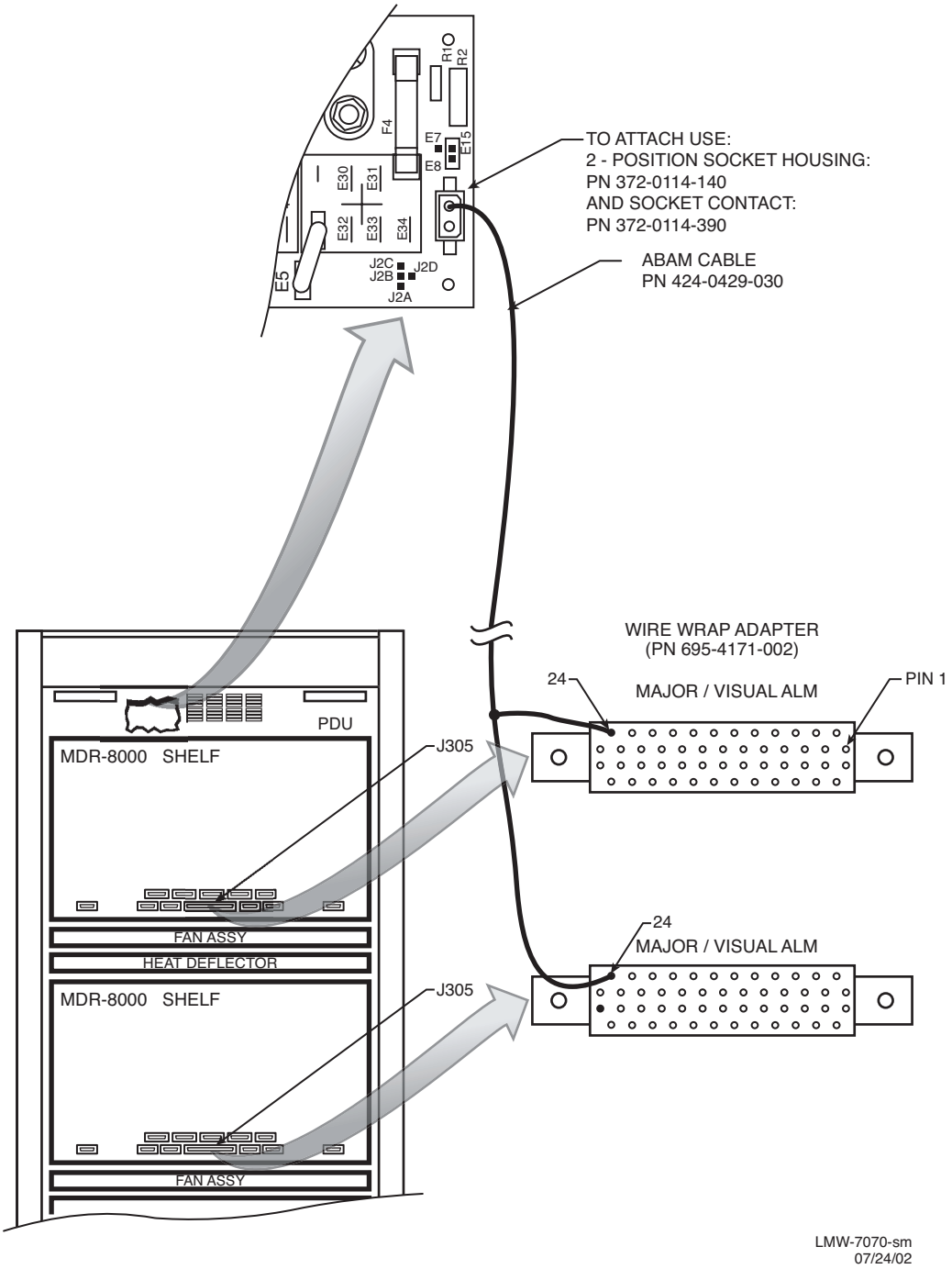


Figure 3-3 Shelf Alarm Wiring PDU (695-6200-001/002) (Sheet 1 of 2)

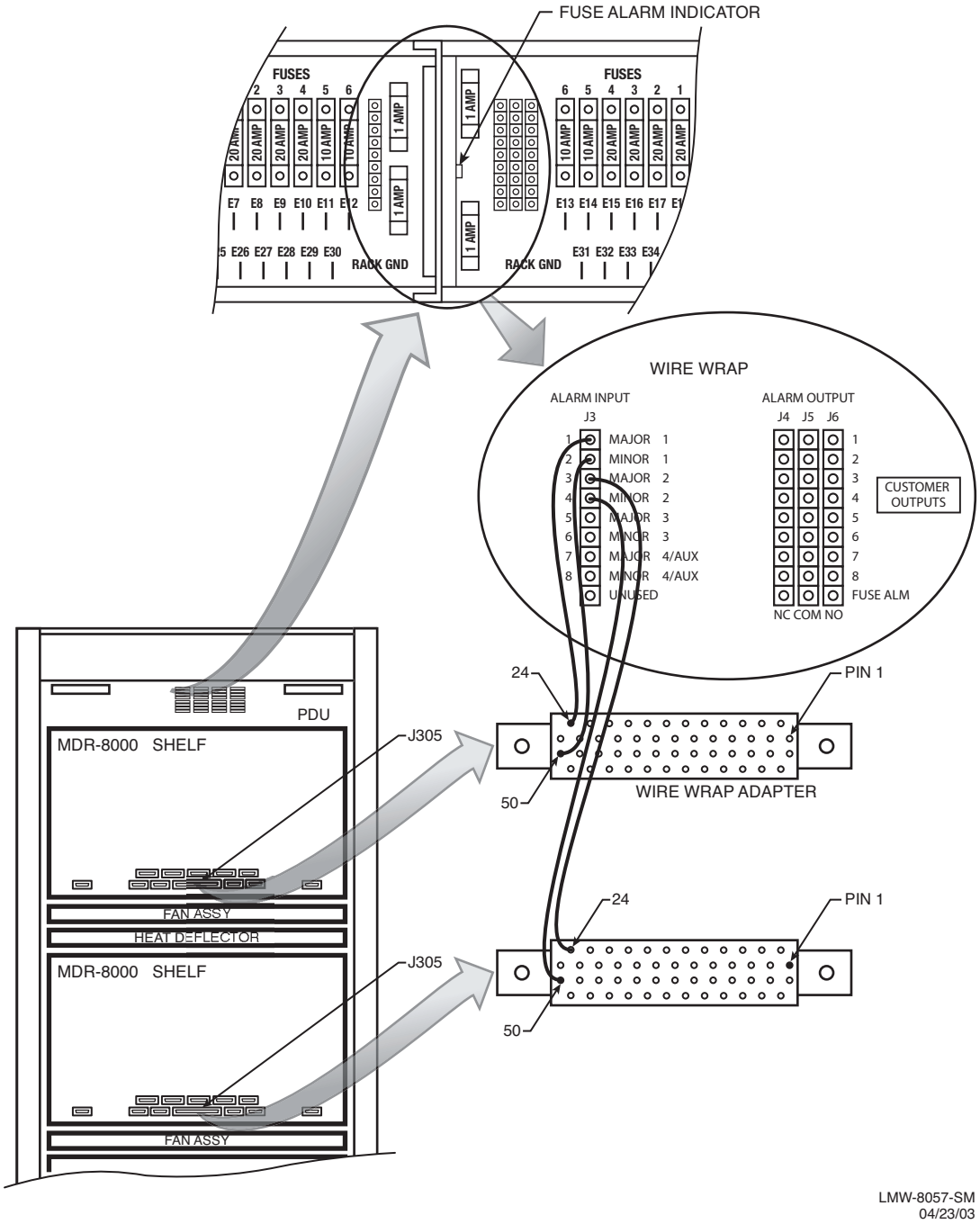


Figure 3-3 Shelf Alarm Wiring PDU (3EM13317AA) (Sheet 2 of 2)

3.5 DS1 CONNECTIONS (J303 IN AND J304 OUT)

Recommended connectorized cable assembly – PN 695-7806-001 through -005 (22 AWG 16 pair shielded, jacketed cable with 37-pin D-type connector on one end). See Figure 3-4 for shelf connector location and pinout. Refer to Table 3-1 for mating cable wiring and color code.

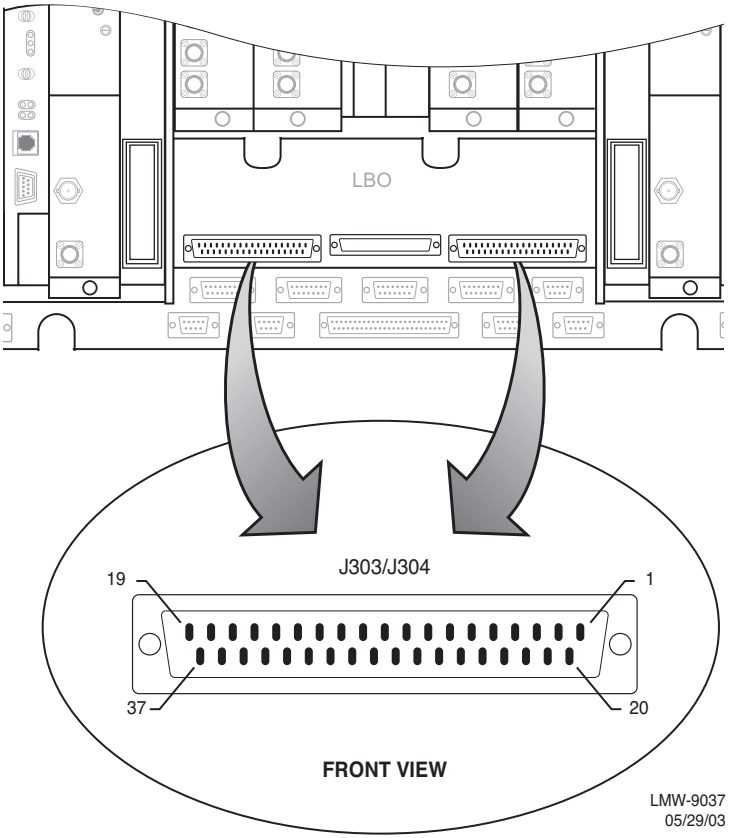


Figure 3-4 DS1 Connectors Location and Pinout

Table 3-1 DS1 IN J303 and DS1 OUT J304 Pinout Assignments

CONNECTOR PIN NUMBER	WIRE COLOR	SIGNAL NAME	CABLE PAIR NUMBER
1	WHITE–BLUE	CHAN 1 TIP	1
20	BLUE–WHITE	CHAN 1 RING	
2	WHITE–ORANGE	CHAN 2 TIP	2
21	ORANGE–WHITE	CHAN 2 RING	
3	WHITE–GREEN	CHAN 3 TIP	3
22	GREEN–WHITE	CHAN 3 RING	
4	WHITE–BROWN	CHAN 4 TIP	4
23	BROWN–WHITE	CHAN 4 RING	
5	WHITE–SLATE	CHAN 5 TIP	5
24	SLATE–WHITE	CHAN 5 RING	
6	RED–BLUE	CHAN 6 TIP	6
25	BLUE–RED	CHAN 6 RING	
7	RED–ORANGE	CHAN 7 TIP	7
26	ORANGE–RED	CHAN 7 RING	
8	RED–GREEN	CHAN 8 TIP	8
27	GREEN–RED	CHAN 8 RING	
9	RED–BROWN	CHAN 9 TIP	9
28	BROWN–RED	CHAN 9 RING	
10	RED–SLATE	CHAN 10 TIP	10
29	SLATE–RED	CHAN 10 RING	
11	BLACK–BLUE	CHAN 11 TIP	11
30	BLUE–BLACK	CHAN 11 RING	
12	BLACK–ORANGE	CHAN 12 TIP	12
31	ORANGE–BLACK	CHAN 12 RING	
13	BLACK–GREEN	CHAN 13 TIP	13
32	GREEN–BLACK	CHAN 13 RING	
14	BLACK–BROWN	CHAN 14 TIP	14
33	BROWN–BLACK	CHAN 14 RING	
15	BLACK–SLATE	CHAN 15 TIP	15
34	SLATE–BLACK	CHAN 15 RING	
16	YELLOW–BLUE	CHAN 16 TIP	16
35	BLUE–YELLOW	CHAN 16 RING	

3.6 DS1 REPEATER (J314 ON ONE SHELF TO J314 ON SECOND SHELF)

Note

The DS1 repeater cable carries clocks, DS1 data, and overhead for two directions. If the 314 cable is not used, the embedded data in the overhead must be cabled individually. In this case, individual cables must be run for MCS–11, audio, RS-232, and ELMC.

Recommended connectorized cable assembly – PN 695-7836-001/005 (25 pair shielded cable with 50 pin Amp connectors) (SCSI). See Figure 3-5 for shelf connector location and pinout. Refer to the Interconnect Section on attached CD for mating cable wiring and color code.

Note

Use repeater cables for cabling repeater shelf 1 to repeater shelf 2 (eastbound/westbound data/clock)

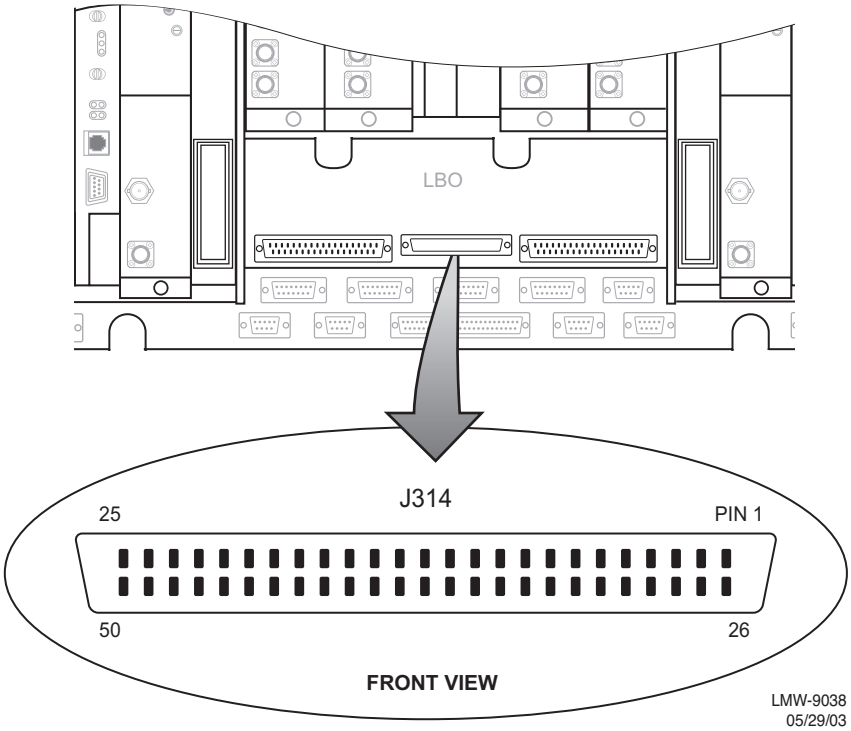


Figure 3-5 Connector J314 Location – DS1 LBO

3.7 DS3 LBO STRAPPING AND CONNECTIONS

The DS3 LBO compensates for the distance to the cross-connect for DS3 and wayside DS1 outputs. See Figure 3-6 for strap locations. Refer to Table 3-2 for strapping requirements.

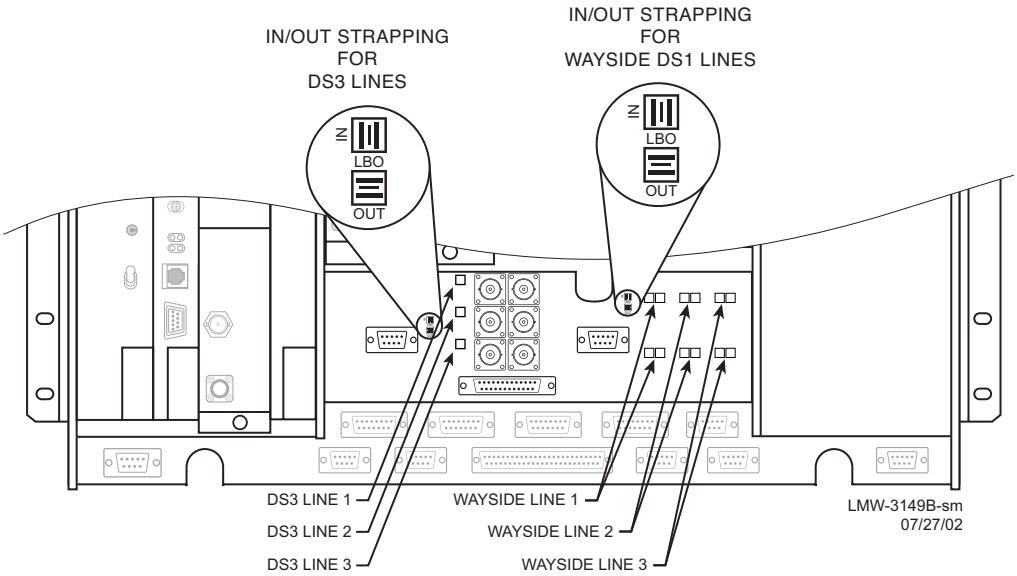


Figure 3-6 DS3 LBO Strapping

Note

When using 734 or equivalent type DS3 cable, 450 feet is the maximum length to the cross-connect. The maximum length with the LBO strapped IN is 225 feet.

Table 3-2 DS3 LBO Strapping

OUTPUTS	DISTANCE TO CROSS-CONNECT	STRAPPING
DS3	0 to 225 ft	In
DS3	226 to 450 ft	Out
Wayside DS1	0 to 330 ft	In
Wayside DS1	331 to 660 ft	Out

3.8 DS3 LBO DS3 BNC CONNECTIONS (J21 THROUGH J26)

BNC removal tool (PN 359-0092-010) is required for installing and removing BNC cables.

Recommended connectorized cable assembly for all applications except repeaters, PN 632-4429-096/180 (8/15 ft RG-59B/U coax cable with straight male BNC connector on one end and right angle male BNC connector on other end). For repeater applications, recommend PN 632-4288-096/180 (8/15 ft RG-59B/U coax cable with straight male BNC connector on each end). See Figure 3-7 for locations. Refer to Table 3-3 for connections.

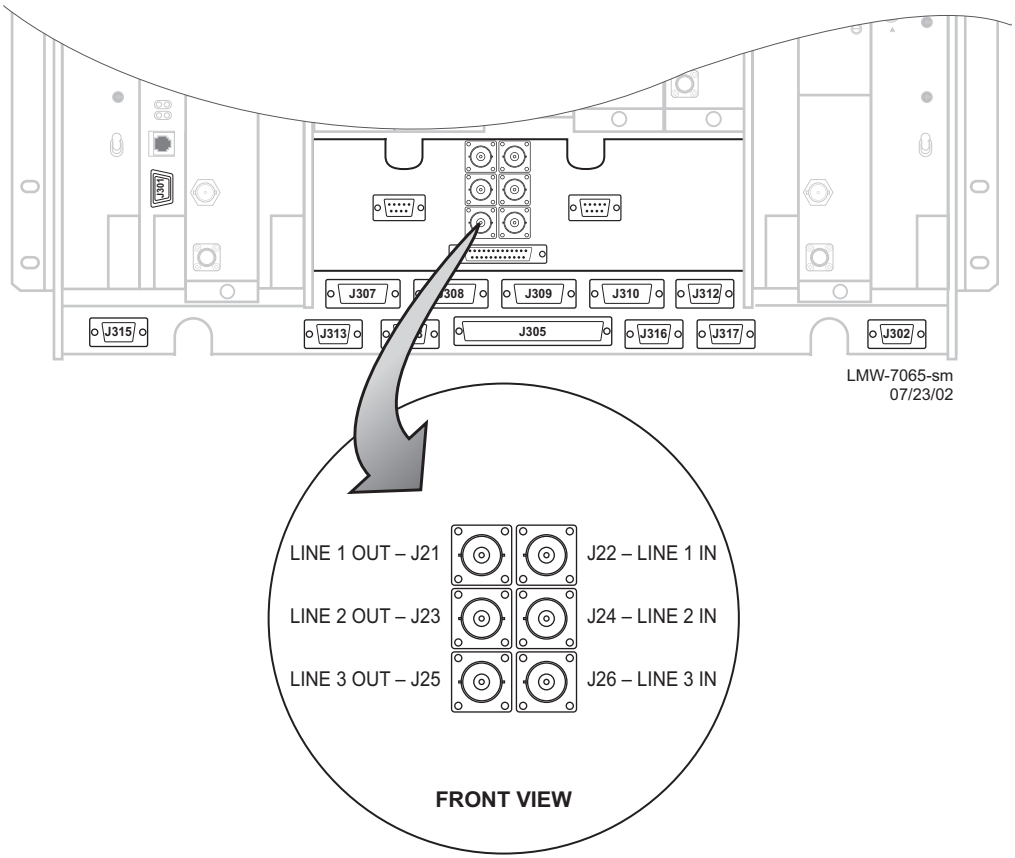


Figure 3-7 DS3 LBO DS3 Connectors Location

Table 3-3 DS3 LBO Connectors

DS3 INPUTS		DS3 OUTPUTS	
FUNCTION	**BNC CONNECTOR**	**FUNCTION**	**BNC CONNECTOR**
DS3 LINE 1	J22	DS3 LINE 1	J21
DS3 LINE 2	J24	DS3 LINE 2	J23
DS3 LINE 3	J26	DS3 LINE 3	J25

3.9 DS3 LBO WAYSIDE DS1 CONNECTIONS (J201 IN AND J202 OUT)

Wayside DS1 is an option in the MDR-8000 DS3 radios. This option provides 1 DS1 for each equipped DS3. To activate the wayside channels requires a small circuit board, called ELMC option key, that plugs onto the controller module. The protection of the wayside channels follows the protection scheme of the radio configuration. In other words, if the radio is hot-standby the wayside channels are hot-standby. The channels are point to point just as is the payload traffic. They are independent of the traffic and reside in the overhead channels. The advantage of the wayside DS1 is the ability to drop 1 to 3 DS1's without having to add a 1:3 muldem to access the traffic. Refer to Table 3-4 for ELMC option key requirements for remote monitoring/controlling wayside DS1s.

Table 3-4 Wayside DS1 Performance and Control

	PART NO.	**FUNCTION**
ELMC Option Key	695-5647-019	Required to enable WS DS1 lines for remote wayside DS1status
ELMC Option Key	695-5647-020	Required to enable WS DS1 lines for remote wayside DS1status + remote provisioning and downloading

3.9.1 Wayside DS1 Terminal

Recommended connectorized cable assembly – PN 695-4125-041 (26 AWG 5 pair shielded, jacketed cable with 9-pin D-type connector on one end). See Figure 3-8 for shelf connector location and pinout. Refer to Interconnect section on attached CD for mating cable wiring and color code.

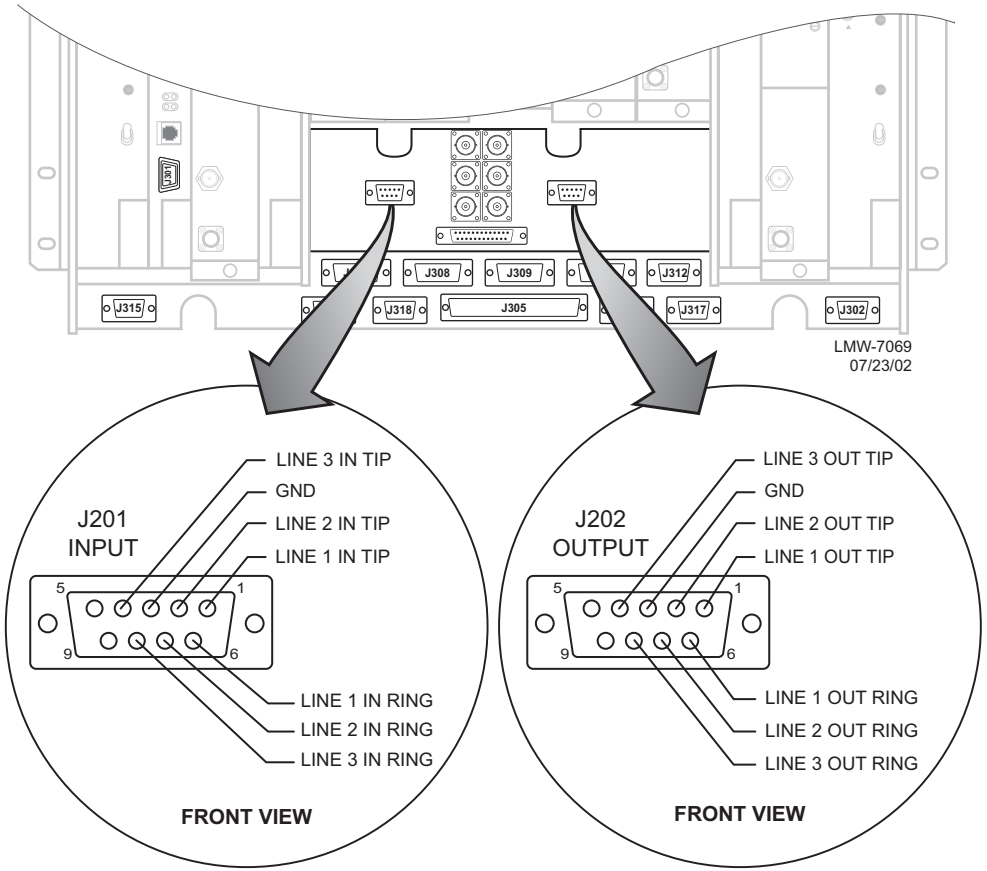


Figure 3-8 DS3 LBO Wayside DS1 Connectors Location and Pinout

3.9.2 Wayside DS1 Repeater

Recommended connectorized cable assembly – PN 695-4125-051 (26 AWG 5 pair shielded, jacketed cable with 9-pin D-type connector on each end). See Figure 3-9 for Wayside DS1 repeater interconnect.

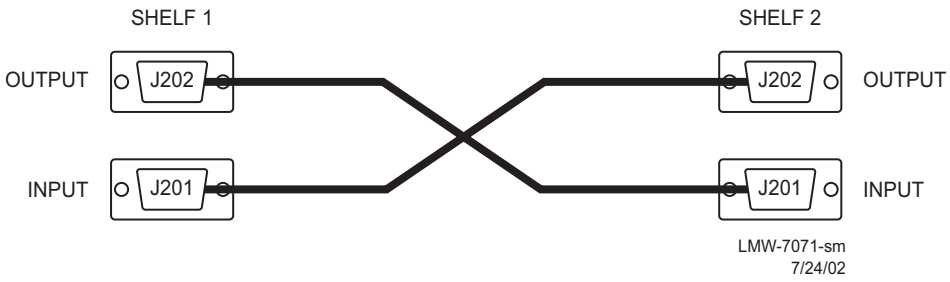


Figure 3-9 Wayside DS1 Repeater Interconnect

3.10 DS3 REPEATER (J401 ON ONE SHELF TO J401 ON SECOND SHELF)

Note

The DS3 repeater cable carries clocks, data, and overhead for two directions. It does not carry DS3 or wayside DS1 traffic. DS3 and wayside DS1 cables must be run separately. If the 401 cable is not used, the embedded data in the overhead must be cabled individually. In this case, individual cables must be run for MCS-11, audio, RS-232, and ELMC.

Recommended connectorized cable assembly – PN 695-7836-001/005 (25 pair shielded cable with 50 pin Amp connectors) (SCSI). See Figure 3-10 for shelf connector location and pinout. Refer to Interconnect section on attached CD for mating cable wiring and color code.

Note

Use repeater cables for cabling repeater shelf 1 to repeater shelf 2 (eastbound/westbound data/clock)

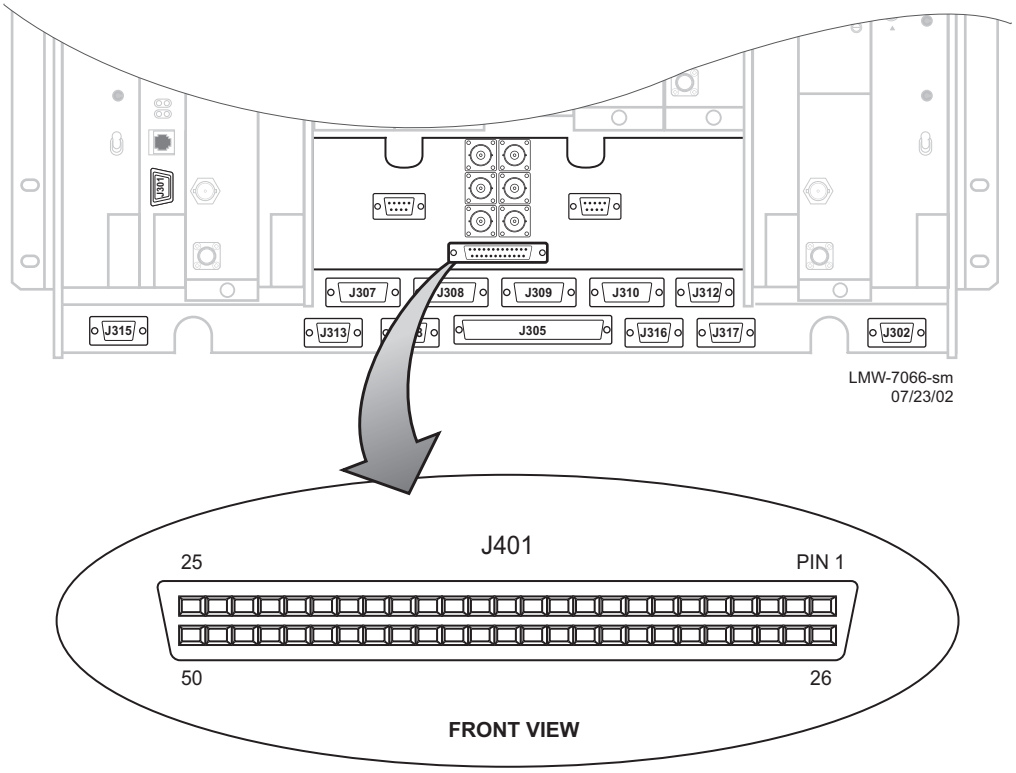


Figure 3-10 Connector J401 Location – DS3 LBO

3.11 FIBER OPTIC CABLE CONNECTIONS

This system normally operates as a Class I Laser Product (no hazard), however during servicing operations, when optical connectors are being connected, disconnected, or handled without dust covers, it is possible to be exposed to Class IIIB laser radiation which can cause eye damage.

WARNING

Possibility of Damage to Equipment

Fiber optic connectors are delicate and can be damaged easily by dirt or debris on the end of the connector. Keep fiber optic connectors free of dust and debris by cleaning the connector before and after use. Carefully clean the fiber optic connector and cable ends with a cotton swab dipped in alcohol or an alcohol wipe. Keep safety cap on connectors when not in use.

The Alcatel 2 or 4 fiber management panel (PN 3EM09257AB) and 2x4 fiber management panel (PN 3EM09257AA) connections are described. For other fiber management equipment, refer to the manufacturers instructions. See Figure 3-11 and Figure 3-12 for typical connections. Refer to Table 3-5 for recommended fiber optic jumpers.

Table 3-5 Fiber Optic Jumpers

JUMPER TYPE	PART NO.	APPLICATION
FC to LC	3EM07651AA-AK	TERMINAL
SC TO LC	3EM07646AA-AK	TERMINAL
LC TO LC	3EM07641AA-AK	REPEATER

3.11.1 2 or 4 Fiber Management Panel

The 2 or 4 fiber management panel provides a direct interface with customers 2 or 4 fiber equipment. The two fibers on a non-standby radio or four fibers on a hot-standby radio connect to the two or four fibers from the customers equipment. The 2 or 4 fiber configuration requires the duplex adapter panel to route the fiber to/from the I/O interface modules. One duplex adapter panel can accommodate two radio shelves. Customer fiber must have SC type connectors

3.11.2 2x4 Fiber Switched Management Panel

The 2x4 fiber management panel interfaces the four fibers on a hot-standby shelf with customer's 2-fiber equipment. The 2x4 fiber configuration requires combiner/splitter units to route the fiber to/from the I/O interface modules. One combiner/splitter unit per radio shelf is required. The 2x4-fiber management panel has cutouts for two combiner/splitter units and can accommodate two radio shelves.

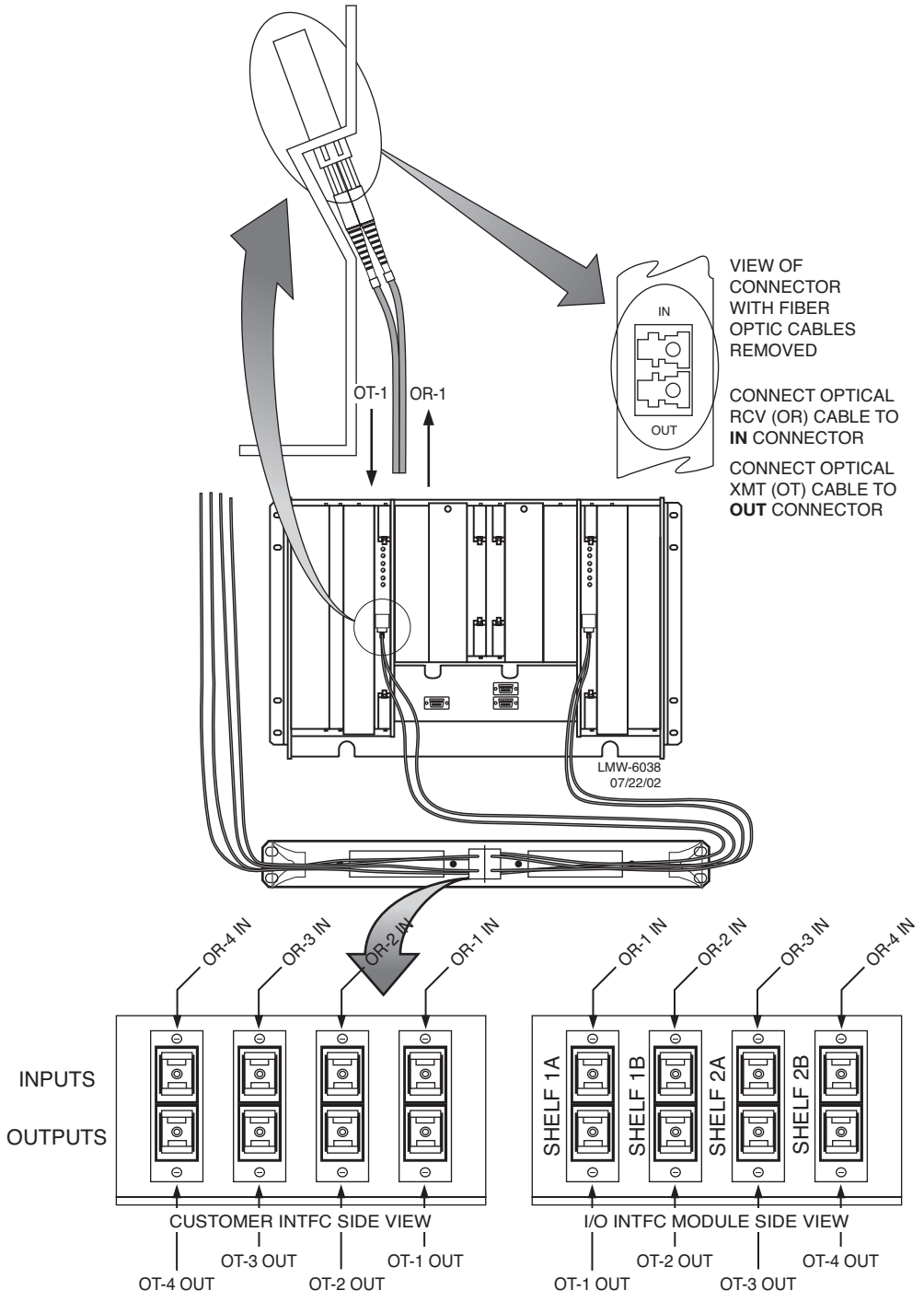


Figure 3-11 2 or 4 Fiber Management Panel

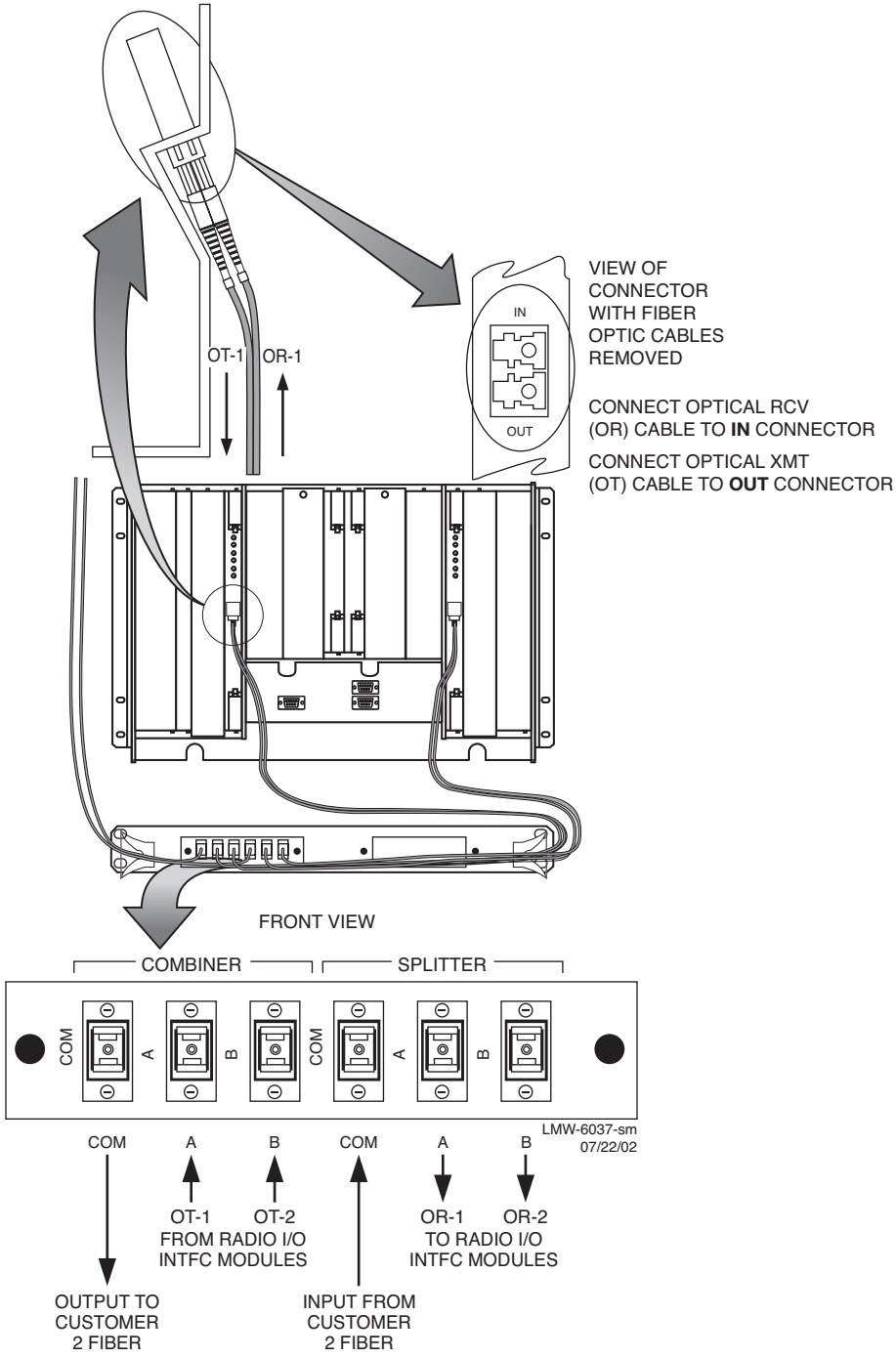


Figure 3-12 2x4 Fiber Management Panel

3.12 OC3 AUX INTERFACE BOARD WAYSIDE DS1 CONNECTIONS (J201 IN AND J202 OUT)

Wayside DS1 is an option in the MDR-8000 OC3 radios that prevents having to add a SONET add/drop MUX to access payload traffic. This option provides 1 DS1 for each STS-1 within the OC3. Refer to Table 3-4 for ELMC option key requirements for remote monitoring/controlling wayside DS1.

3.12.1 Wayside DS1 Terminal

Recommended connectorized cable assembly – PN 695-4125-041 (26 AWG 5 pair shielded, jacketed cable with 9-pin D-type connector on one end). See Figure 3-13 for location. Refer to Interconnect section on attached CD for pinout and color code.

3.12.2 Wayside DS1 Repeater

Recommended connectorized cable assembly – PN 695-4125-051 (26 AWG 5 pair shielded, jacketed cable with 9-pin D-type connector on each end). See Figure 3-9 for Wayside DS1 repeater interconnect.

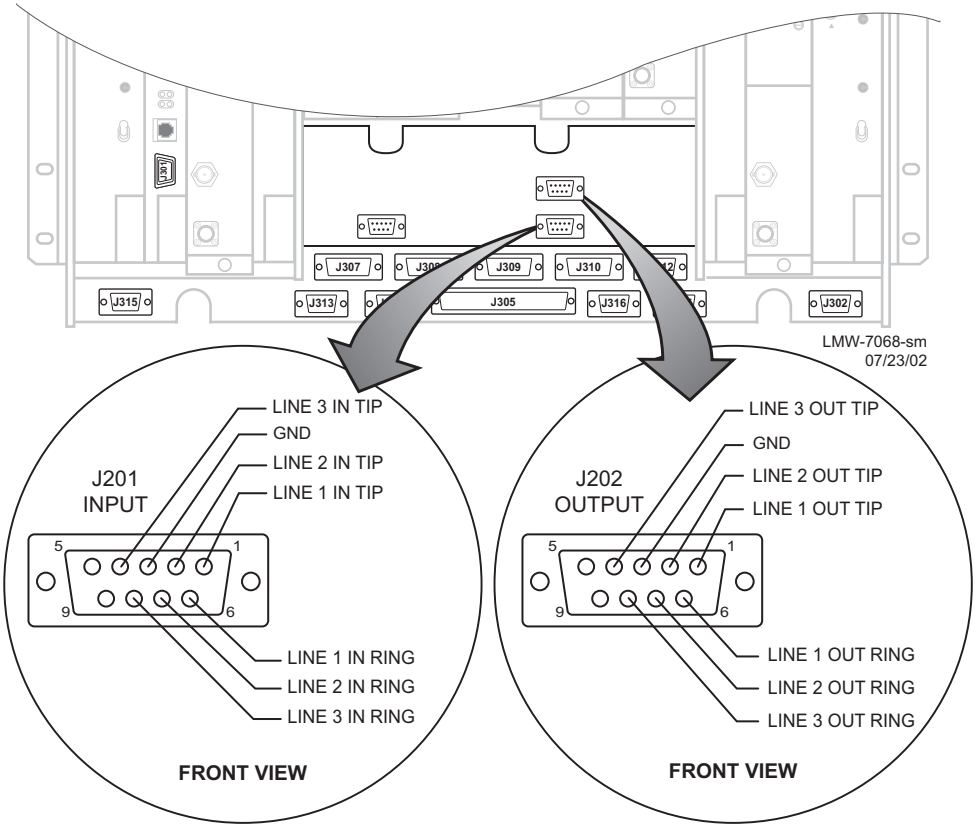


Figure 3-13 Wayside DS1 Connectors – OC3 AUX Interface

3.13 OC3 REPEATER (J203 ON ONE SHELF TO J203 ON SECOND SHELF)

Note

The OC3 radio repeater cable carries clocks, data, and overhead for two directions. It does not carry OC3 or Wayside DS1 traffic. OC3 fiber optic cables and Wayside DS1 cables must be run separately. If the repeater cable is not used, the embedded data in the overhead must be cabled individually. In this case, separate cables must be run for MCS-11, audio, RS-232, and ELMC.

Recommended connectorized cable assembly – PN 695-4125-007/013 (26 AWG 5 pair shielded, jacketed cable). See Figure 3-14 for shelf connector location and pinout. Refer to Interconnect section on attached CD for mating cable wiring and color code.

Note

Use repeater cables for cabling repeater shelf 1 to repeater shelf 2 (east-bound/westbound data/clock)

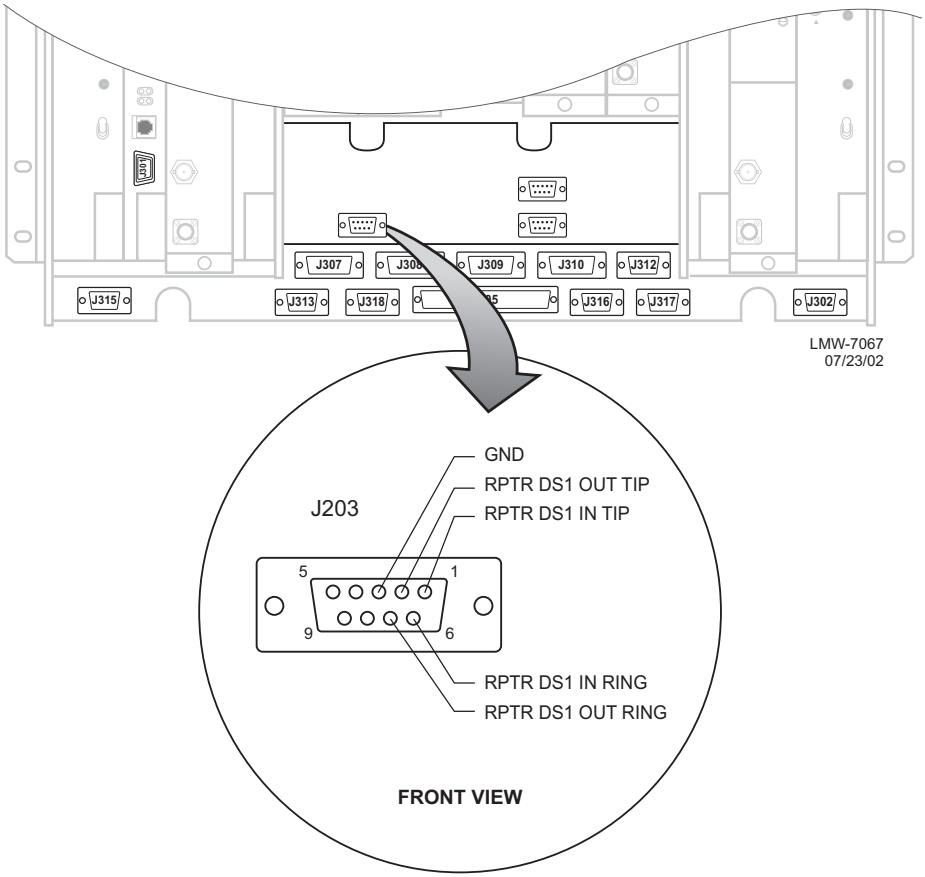


Figure 3-14 Repeater Connector – OC3 AUX Interface

3.14 USI/CONTROLLER CABLE CONNECTION TO LAPTOP (J301)

Recommended connectorized cable assembly – PN 695-7848-001 through 004 (24 AWG 6 pair shielded, jacketed cable with DEMM-9P connector on each end). See Figure 3-15 for controller connector location and pinout. Refer to attached CD for mating cable pinout and color code.

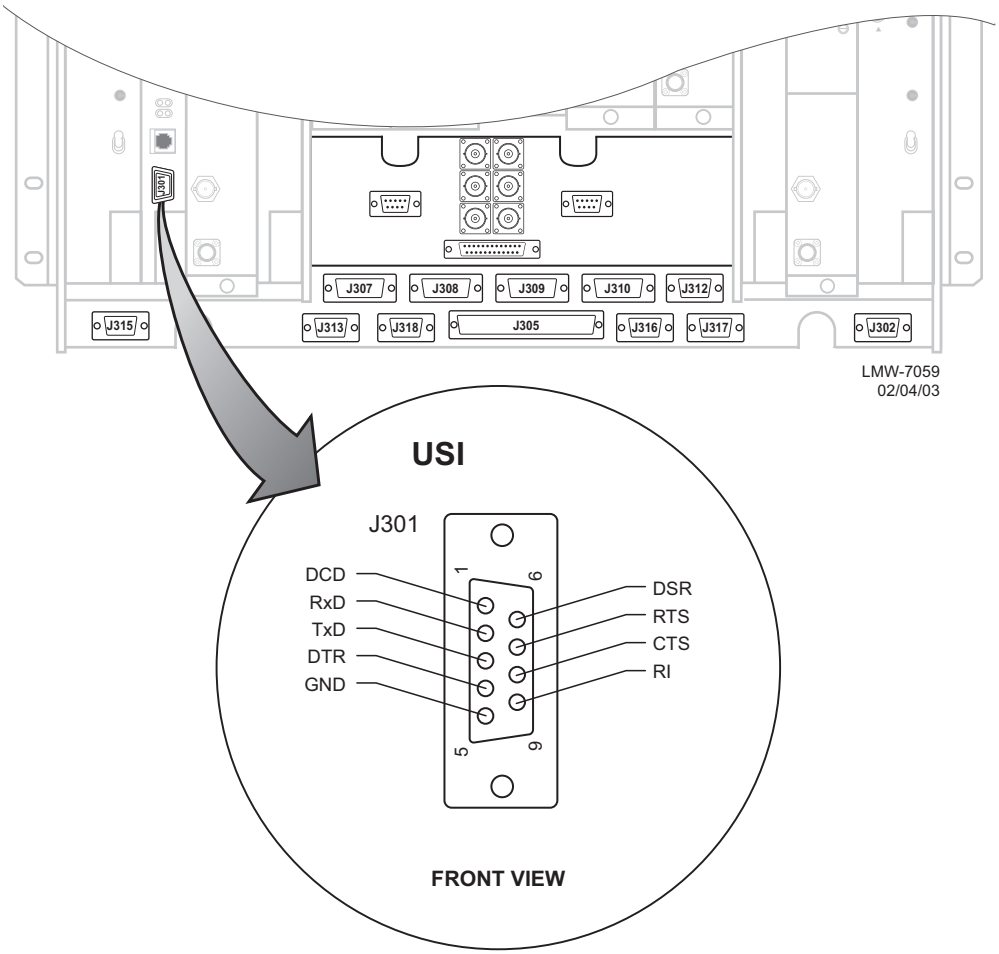


Figure 3-15 Controller USI Connector Location and Pinout

3.15 SERVICE CHANNEL

A service channel is defined as a non-revenue bearing channel provided as part of a transmission system for operation, maintenance, monitoring, and control of the system. The MDR-8000 provides a 256 kb/s auxiliary channel for servicing the radio. This is an overhead channel and is independent of the traffic channels. The 256 kb/s service channel contains four 64 kb/s service channels. Three of the four 64 kb/s channels (Service Channel 1, 2, and 3) can be provisioned on the USI for a specific use. Service channel 0 is dedicated to radio commands and ELMC. Service channel 0 is not provisionable. The four channels are multiplexed and shifted in and out of registers on the controller.

See Figure 3-16. There are eight connectors on the backplane to interface with three of the service channels. The connectors on the backplane interface three functions: audio, RS-232, and MCS-11. Each service channel is provisioned for a specific function. As shown by the vertical line connecting to the three functions on one side and the three service channels (SC1, SC2, and SC3) on the opposite side, audio and MCS can be put on any open service channel. RS-232 data can be put on service channel 1 or 2 but cannot be put on service channel 3. This is shown by the dashed lines to the specific service channel.

3.15.1 Handset Jack

The 2-wire port at the TEL connector on AE-37Y Controller accepts either the optional handset or a standard telephone. The 2-wire port is not provisionable. To use the handset, the radio must be provisioned for Audio 1.

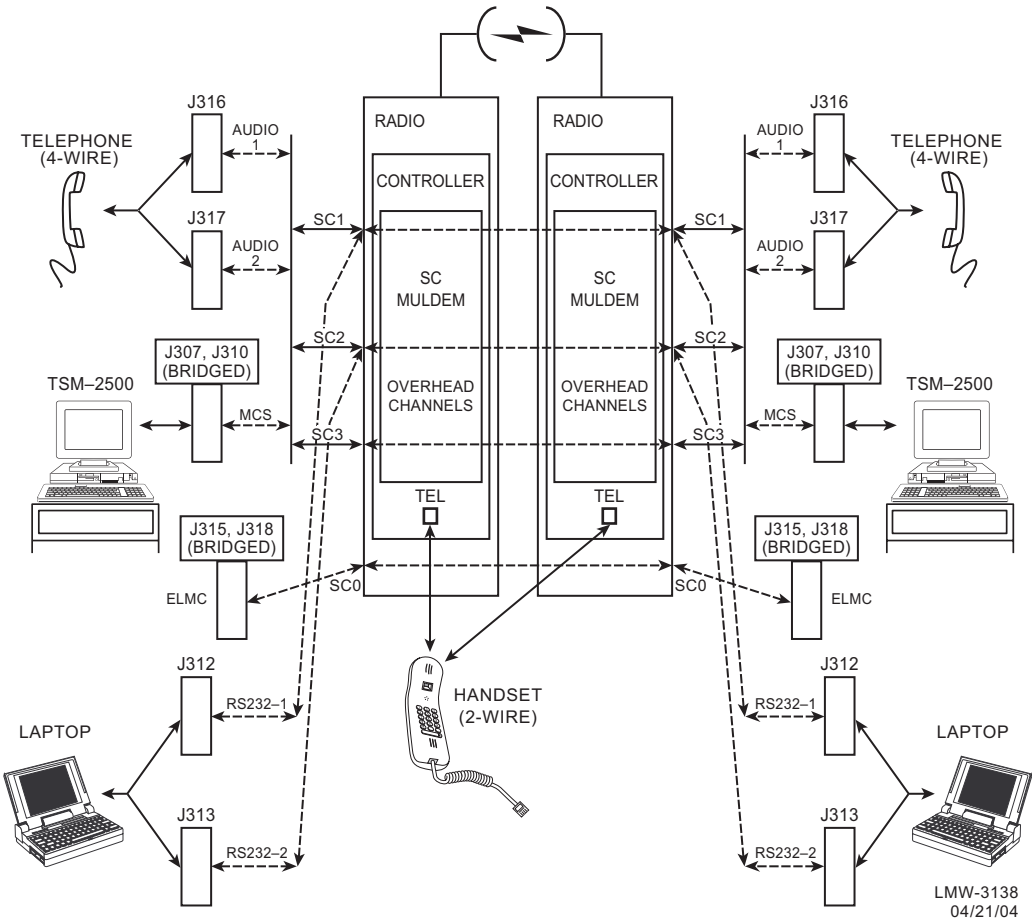


Figure 3-16 Service Channel Connections/Applications

3.15.2 Service Channels Provisioning Options

Note

Service channels at both ends of a hop (and end-to-end in a link) must be provisioned the same.

Service channel provisioning is interactive. When an option is selected for any service channel, that option is excluded from selections on the other applicable service channels. Provisioning options for Service Channels 1, 2, and 3 are listed:

- Service Channel 1 (64 kb/s channel) – can be used to carry 4-wire audio, RS-232 data, or MCS-11 fault alarm information.
  - AUDIO 1 and 2 – Two audio provisioning options (AUDIO 1 and AUDIO 2) are provided for Service Channel 1. Each audio channel is a 4-wire audio channel that provides off-hook detection, level control, and E and M-lead signaling. AUDIO 1 also has DTMF decoding that allows a specific station to be dialed. External connection to AUDIO 1 is J316. External connection to AUDIO 2 is J317.
  - RS-232-1 – RS-232 Channel 1 is an RS-232 formatted data channel that can provide interface to an external computer/modem. External connection to RS-232-1 is J312.
  - MCS-11 – The MCS-11 channel is an RS-422 formatted data that provides an interface to an external MCS-11 Monitor and Control System or TSM system (used to control multiple MCS-11 systems). External connections to the MCS-11 include J307, J308, J309 and J310.
- Service channel 2 (64 kb/s channel) – can be used to carry 4-wire audio, RS-232 data, or MCS-11 fault alarm information.
  - AUDIO-1 and -2 – Same as Service Channel 1
  - RS-232-2 – RS-232 Channel 2 is an RS-232 formatted data channel that can provide interface to an external computer/modem. External connection to RS-232-2 is J313.
  - MCS-11 – Same as Service Channel 1
- Service Channel 3 (64 kb/s channel) – can be used to carry 4-wire audio, or MCS-11 fault alarm information
  - AUDIO 1 and 2 – Same as Service Channel 1
  - MCS-11 – Same as Service Channel 1.

3.15.3 Audio 1, Audio 2 (J316, J317)

The Audio 1 and 2 4-wire functions are provisionable. Refer to the Initial Turnup section for details. These audio functions should not be confused with the non-provisionable 2-wire handset.

Audio 1

Audio 1 (J316) is a 4-wire function port on the backplane that provides off-hook detection, level control, E and M-lead signaling, DTMF, and 2-wire handset capabilities.

Audio 2

Audio 2 (J317) is a 4-wire function port on the backplane that provides off-hook detection, level control, and E and M-lead signaling. Audio 2 has no DTMF decoding capabilities.

Recommended connectorized cable assembly – PN 695-4125-026 through 030 (26 AWG 5 pair shielded, jacketed cable with 9-pin D-type connector on each end). See Figure 3-17 for shelf connector locations and pinout. Refer to Table 3-6 for mating cable wiring and color code.

or

Recommended cable – PN 424-0305-030 (26 AWG 5 pair shielded, jacketed cable) for wire-wrapping to wirewrap adapter PN 3DH04178AB. See Figure 3-18 for pinout. Refer to Table 3-6 for mating cable wiring and color code.

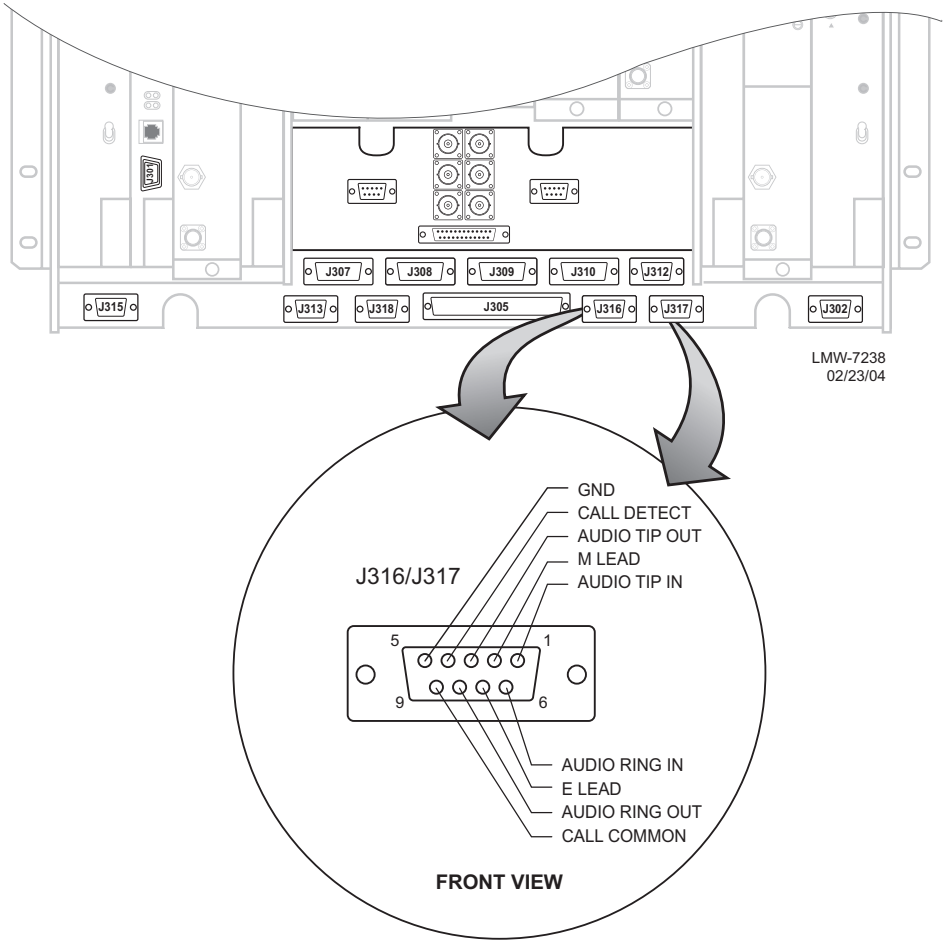


Figure 3-17 Audio Connectors Location and Pinout

Table 3-6 Audio Mating Cable Wiring and Color Codes

FUNCTION	END 1	WIRE COLOR	PAIR	WIRE COLOR	END 2	FUNCTION
AUDIO TIP IN	01	BLACK	1	BLACK	03	AUDIO TIP OUT
AUDIO RING IN	06	RED	1	RED	08	AUDIO RING OUT
AUDIO M LEAD	02	BLACK	2	BLACK	07	AUDIO E LEAD
AUDIO E LEAD	07	WHITE	2	WHITE	02	AUDIO M LEAD
AUDIO TIP OUT	03	BLACK	3	BLACK	01	AUDIO TIP IN
AUDIO RING OUT	08	GREEN	3	GREEN	06	AUDIO RING IN
CALL DETECT	04	BLACK	4	BLACK	04	NOT USED
CALL COMMON	09	BLUE	4	BLUE	09	NOT USED
GND	05	BLACK	5	BLACK	05	GND
NOT USED	10	YELLOW	5	YELLOW	10	NOT USED

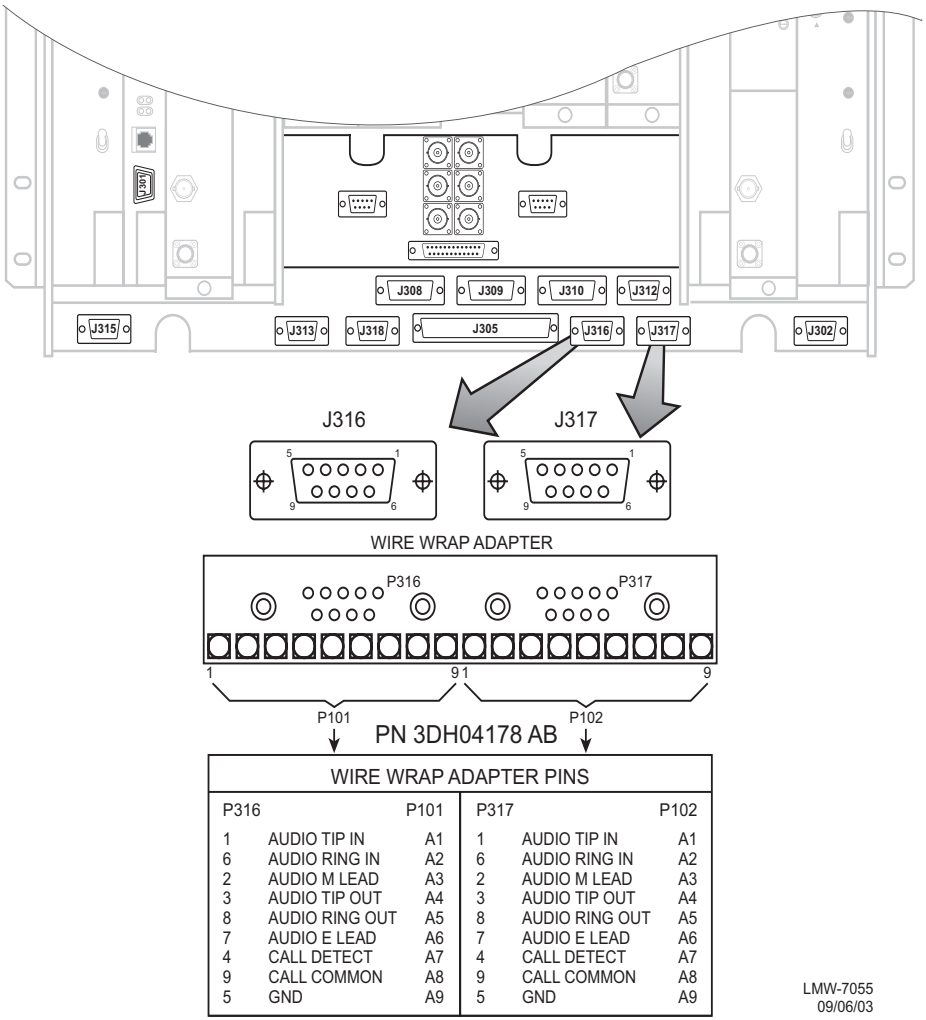


Figure 3-18 Audio Wirewrap Adapter Pinout

3.15.4 RS-232-1, RS-232-2 (J312, J313)

Recommended connectorized cable assembly – PN 695-4125-021 through 025 (26 AWG 5 pair shielded, jacketed cable with 9-pin D-type connector on each end). See Figure 3-19 for shelf connector locations and pinout. Refer to Table 3-7 for mating cable wiring and color code.

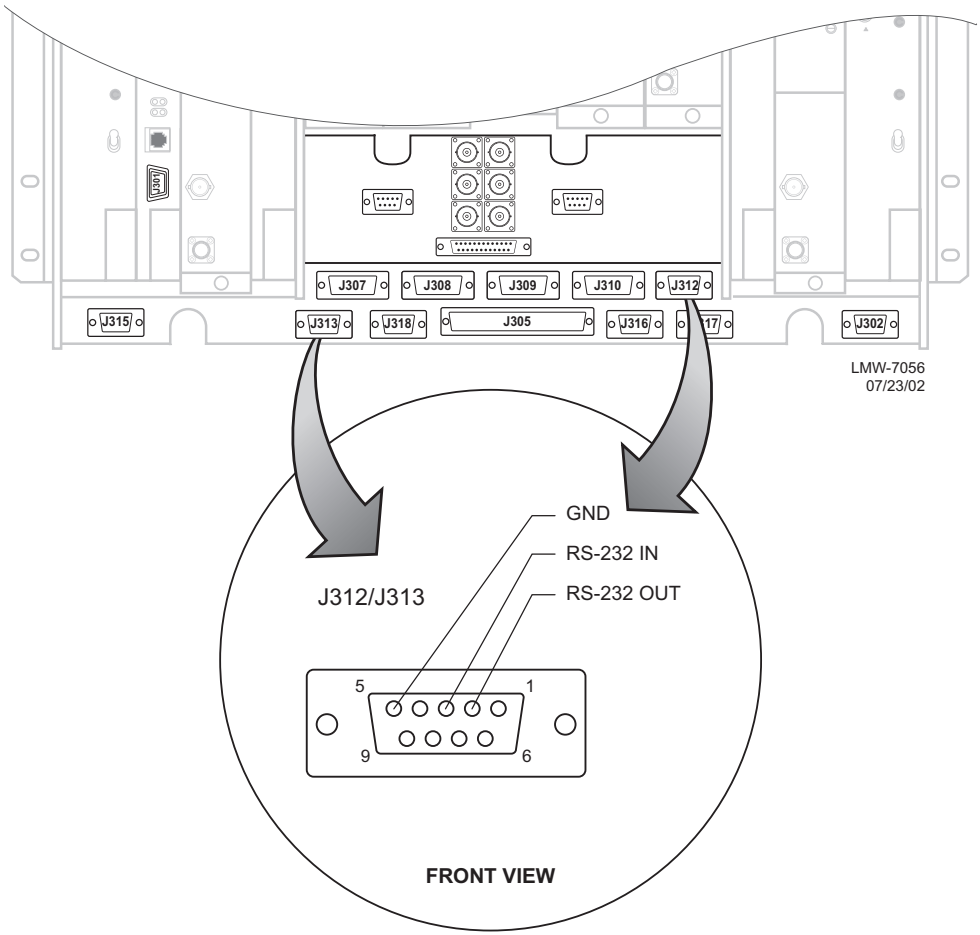


Figure 3-19 RS-232 Connectors Location and Pinout

Table 3-7 RS-232 Mating Cable Wiring and Color Codes

J312/J313 MDR-8000			J312/J313	J312/J313 MDR-8000		
FUNCTION	**END 1**	**WIRE COLOR**	**PAIR**	**WIRE COLOR**	**END 2**	**FUNCTION**
NOT USED	01	BLACK	1	BLACK	01	NOT USED
NOT USED	06	RED	1	RED	06	NOT USED
RS-232 OUT/ RS-232-1 OUT*	02	BLACK	2	BLACK	03	RS-232 IN/ RS-232-1 IN*
NOT USED	07	WHITE	2	WHITE	08	NOT USED
RS-232 IN/ RS-232-1 IN*	03	BLACK	3	BLACK	02	RS-232 OUT/ RS-232-1 OUT*
NOT USED	08	GREEN	3	GREEN	07	NOT USED
NOT USED/ RS-232-2 OUT*	04	BLACK	4	BLACK	04	NOT USED/ RS-232-2 OUT*
NOT USED/ RS-232-2 IN*	09	BLUE	4	BLUE	09	NOT USED/ RS-232-2 IN*
GND	05	BLACK	5	BLACK	05	GND
NOT USED	10	YELLOW	5	YELLOW	10	NOT USED

*J312 on CommPak Radio

3.15.5 MCS-11 Connections

When MCS is selected to be placed on one of the three service channels and then RSS is enabled and properly addressed, applicable ports on the controller module are enabled. This allows the user to interface external MCS-11 Monitor and Control System equipment at any or all four connectors on the backplane (J307, J308, J309, and J310). Two connectors (J308 and J309) are synchronous, parallel, data ports and provide CLK outputs. Connectors J307 and J310 are asynchronous ports.

For proper operation, MCS-11 must be provisioned using the following guidelines:

a. **MCS-11** must be selected as one of the service channels.

b. MCS must be assigned a valid address

c. The **MCS RSS** must be set to **ON** for each radio with a unique RSS address. Refer to Appendix B on the attached CD for address details. At a site, typically only one RSS is turned on. Station scanners at all other radios at that site are normally jumpered to the RSS enabled radio to allow access to their detail scanners. If station scanners are properly wired, detail scanners always respond, regardless of whether RSS is provisioned **ON** or **OFF**.

Note

*MCS-11 must be provisioned **MCS-11 J310 Master/Junction** to enable XMT, RCV, and OUTPUT clocks. If an external modem is being used, provision MCS-11 for **MCS-11 J310 Modem**. This selection disables XMT, RCV, and OUTPUT clocks and all MCS-11 clocks must now be provided by the external modem.*

d. **MCS-11 J310 Master/Junction** must be selected unless an external modem is connected to the radio. If an external modem is used it must provide all MCS-11 clocks and the radio must be provisioned **MCS-11 J310 Modem**.

Note

*When provisioned **J308 Input Clock**, J308 and J309 RCV CLK and XMT CLK and J308 OUTPUT CLK are disabled. Select **J308 Output Clock** to send a 64 kb/s clock to external equipment (OUTPUT CLK J308-4/12) and also enable RCV CLK and XMT CLK.*

e. **MCS-11 J308 Output Clock** must be selected unless an external clock source is provided that will supply all MCS-11 clocks. If an external clock source is used, the radio must be provisioned **MCS-11 J308 Input Clock**.

3.15.5.1 MCS-11 (J307)

Note

*If the radio is provisioned **Repeater**, port 2 on the controller, that connects to J307, is disabled. At a repeater, you can use J310 in lieu of J307 for connecting the TSM polling engine to the radio.*

MCS-11 connector J307 is used to connect to a TSM (-2500, -3500, or -8000) polling engine at a master terminal.

Recommended connectorized cable assembly – PN 695-4126-007/009/012 (26 AWG 8 pair shielded, jacketed cable). See Figure 3-20 for shelf connector location and pinout. Refer to Table 3-8 for mating cable pinout and color code. See Figure 3-21 for typical connection scheme.

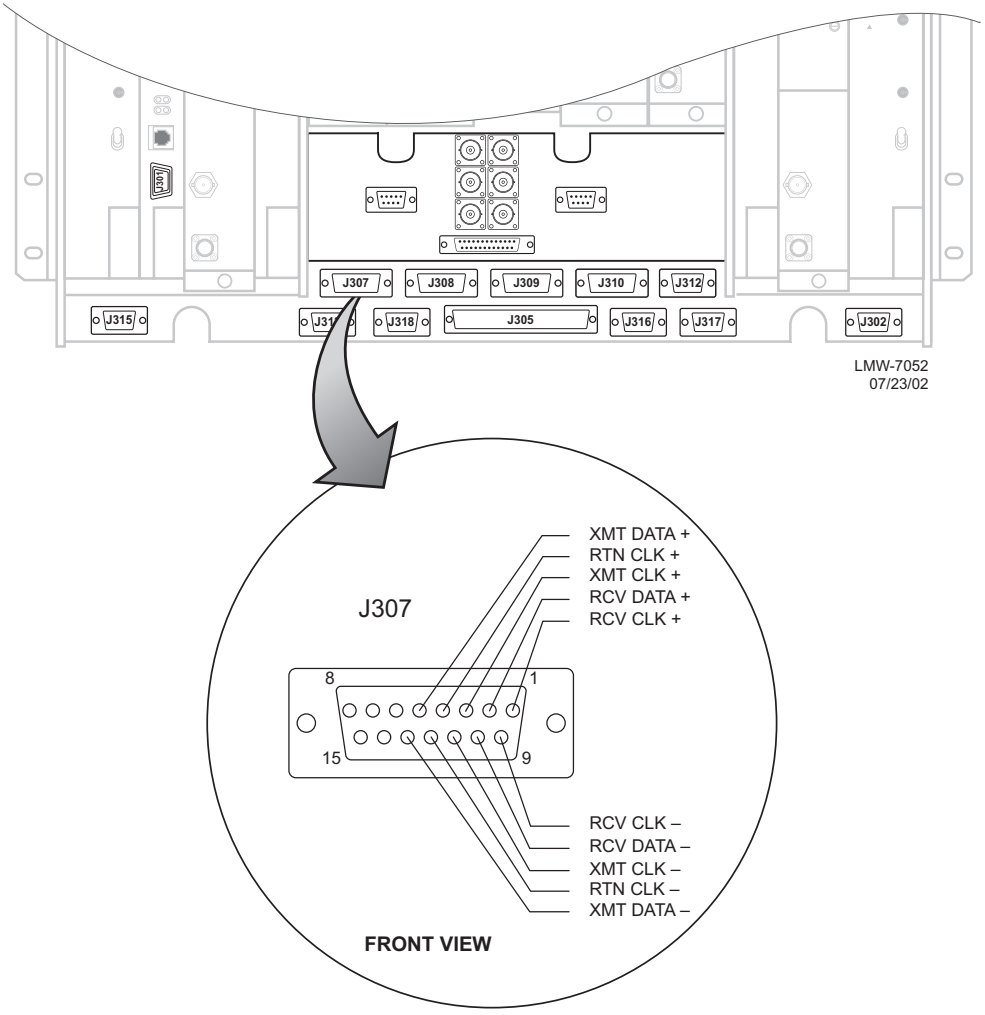


Figure 3-20 MCS-11 Master Connector Location and Pinout

Table 3-8 MCS-11 Master Connector J307 Mating Cable Wiring and Color Codes

J307 MDR-8000				POLLING ENGINE		
FUNCTION	**END 1**	**WIRE COLOR**	**PAIR**	**WIRE COLOR**	**END 2**	**FUNCTION**
RCV CLK +	01	BLACK	1	BLACK	01	RCV CLK +
RCV CLK-	09	RED	1	RED	09	RCV CLK-
RCV DATA +	02	BLACK	2	BLACK	02	RCV DATA +
RCV DATA -	10	WHITE	2	WHITE	10	RCV DATA -
XMT CLK +	03	BLACK	3	BLACK	03	XMT CLK +
XMT CLK -	11	GREEN	3	GREEN	11	XMT CLK -
RETURN CLK +	04	BLACK	4	BLACK	04	RETURN CLK +
RETURN CLK -	12	BLUE	4	BLUE	12	RETURN CLK -
XMT DATA +	05	BLACK	5	BLACK	05	XMT DATA +
XMT DATA -	13	YELLOW	5	YELLOW	13	XMT DATA -
NOT USED	06	BLACK	6	BLACK	06	OFF HOOK +
NOT USED	14	BROWN	6	BROWN	14	OFF HOOK -
NOT USED	07	BLACK	7	BLACK	07	RCV DATA
NOT USED	15	ORANGE	7	ORANGE	15	SIG GND
NOT USED	08	RED	8	RED	08	DTR
NOT USED	16	WHITE	8	WHITE	16	NOT USED

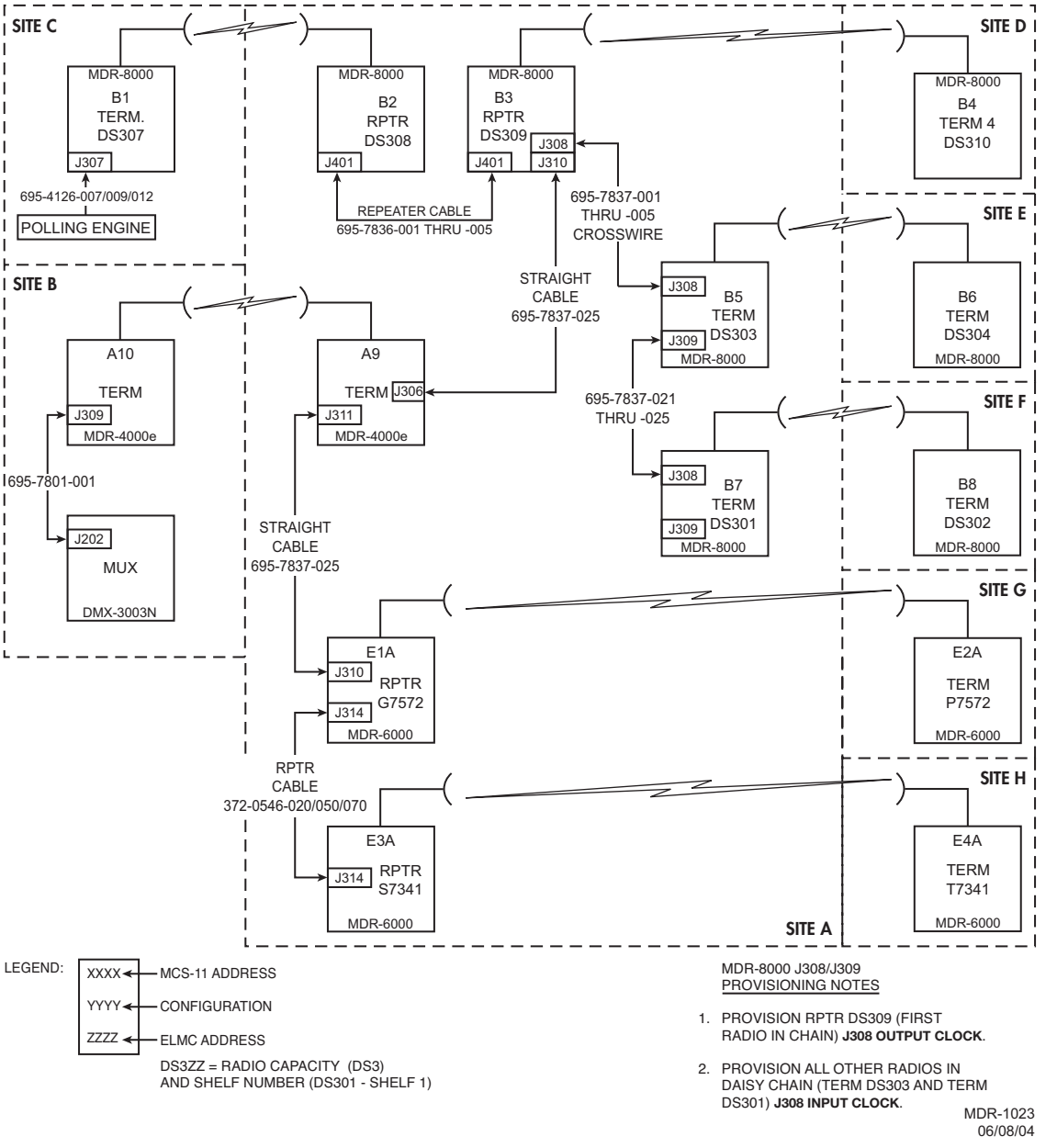


Figure 3-21 Typical MCS-11 System

3.15.5.2 MCS-11 Repeater-to-Spur Daisy Chain Connection (J308/J309)

Note

*MCS-11 must be provisioned **MCS-11 J310 Master/Junction** to enable XMT, RCV, and OUTPUT clocks. If an external modem is being used, provision MCS-11 for **MCS-11 J310 Modem**. This selection disables XMT, RCV,OUTPUT clocks and all MCS-11 clocks must now be provided by the external modem.*

Note

*Multiple radios at a site can be provisioned and connected to operate using a common XMT and RCV clock. In this scenario, one radio is provisioned to supply the clocks. All other radios are provisioned to sync off the supplied clocks. Provision the radio supplying the clocks **J308 Output Clock**. Provision all other radios at the site **J308 Input Clock**.*

MCS-11 connector J308/J309 is typically used to connect a repeater to a spur or multiple spurs in a daisy chain system configuration. Either repeater shelf 1 or repeater shelf 2 may feed the spur shelf. The first connection out of the repeater must be crosswired from J308 to J308. Then, every shelf from the spur must be wired 1:1, J309 to J308, in a daisy-chain fashion.

CROSSWIRED CABLE ASSEMBLY – Recommended connectorized cable assembly – PN 695-7837-001 through -005 (26 AWG 8 pair shielded, jacketed cable with 15-pin D-type connector on each end). See Figure 3-22 for shelf connector J308 location and pinout. See Figure 3-22 for shelf connector J309 location and pinout. Refer to Table 3-9 for J308 to J308 mating cable pinout and color code. See Figure 3-21 for typical connection scheme.

DAISY CHAIN CABLE ASSEMBLY – Recommended connectorized cable assembly – PN 695-7837-021 through -025 (26 AWG 8 pair shielded, jacketed cable with 15-pin D-type connector on each end, wired 1:1.) Refer to Table 3-10 for J309 to J308 mating cable pinout and color code. See Figure 3-21 for typical connection scheme.

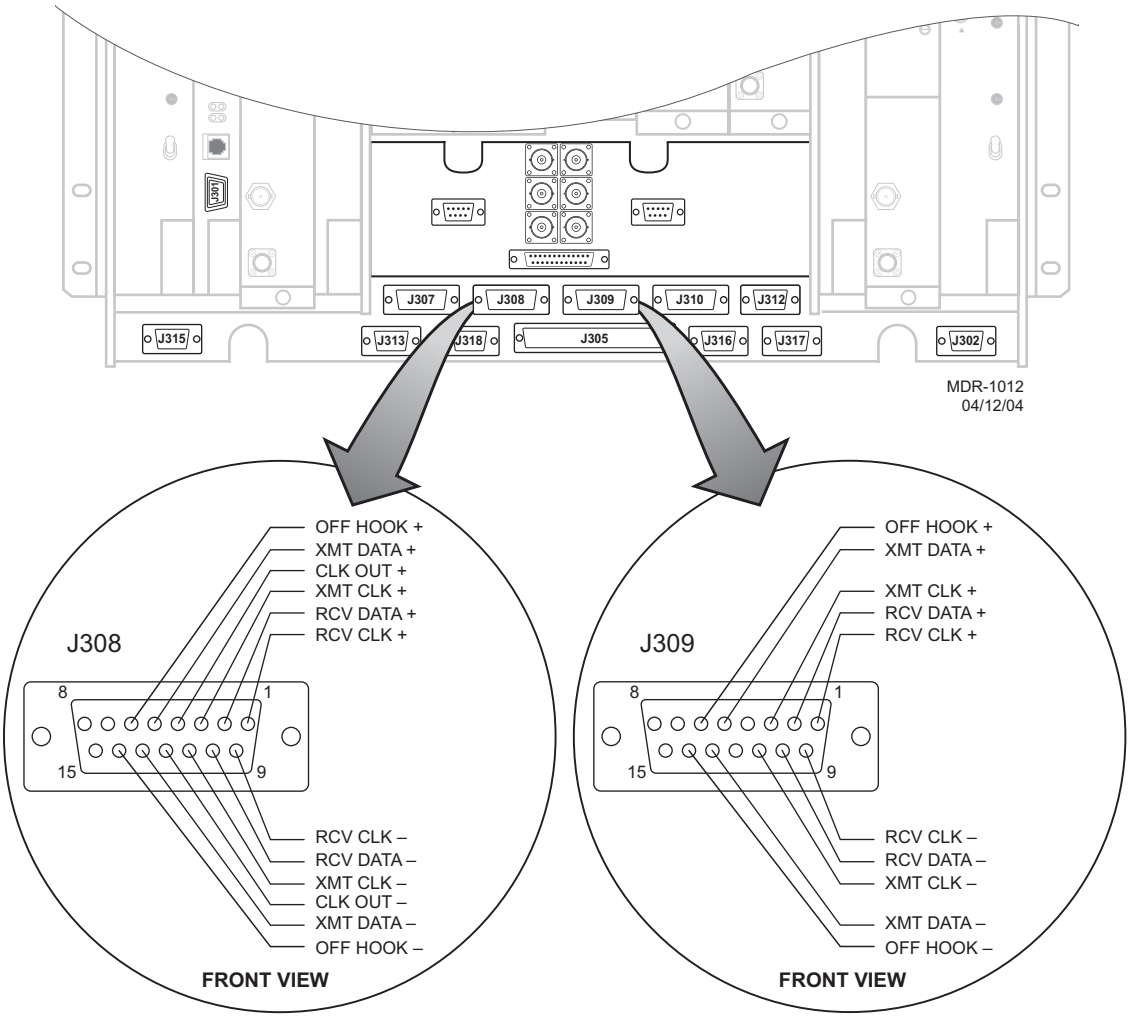


Figure 3-22 MCS-11 Connector J308 and J309 Location and Pinout

Table 3-9 J308-to-J308 Mating Cable Wiring and Pinout

J308 MDR-8000			J308/J308	J308 MDR-8000		
FUNCTION	**END 1**	**WIRE COLOR**	**PAIR**	**WIRE COLOR**	**END 2**	**FUNCTION**
RCV CLK +	01	BLACK	1	BLACK	03	XMT CLK +
RCV CLK-	09	RED		RED	11	XMT CLK-
RCV DATA +	02	BLACK	2	BLACK	05	XMT DATA +
RCV DATA -	10	WHITE		WHITE	13	XMT DATA -
XMT CLK +	03	BLACK	3	BLACK	01	RCV CLK +
XMT CLK -	11	GREEN		GREEN	09	RCV CLK -
CLK OUT+	04	BLACK	4	BLACK	04	NOT USED
CLK OUT -	12	BLUE		BLUE	12	NOT USED
XMT DATA +	05	BLACK	5	BLACK	02	RCV DATA +
XMT DATA -	13	YELLOW		YELLOW	10	RCV DATA -
OFF HOOK +	06	BLACK	6	BLACK	06	OFF HOOK +
OFF HOOK -	14	BROWN		BROWN	14	OFF HOOK -
NOT USED	07	BLACK	7	BLACK	07	NOT USED
NOT USED	15	ORANGE		ORANGE	15	NOT USED
NOT USED	08	RED	8	RED	08	NOT USED
NOT USED		WHITE		WHITE		NOT USED

Table 3-10 J309-to-J308 Mating Cable Wiring and Pinout

309 MDR-8000			J309/J308	J308 MDR-8000		
FUNCTION	**END 1**	**WIRE COLOR**	**PAIR**	**WIRE COLOR**	**END 2**	**FUNCTION**
RCV CLK +	01	BLACK	1	BLACK	01	RCV CLK +
RCV CLK-	09	RED		RED	09	RCV CLK-
RCV DATA +	02	BLACK	2	BLACK	02	RCV DATA +
RCV DATA -	10	WHITE		WHITE	10	RCV DATA -
XMT CLK +	03	BLACK	3	BLACK	03	XMT CLK +
XMT CLK -	11	GREEN		GREEN	11	XMT CLK -
CLK OUT+	04	BLACK	4	BLACK	04	NOT USED
CLK OUT -	12	BLUE		BLUE	12	NOT USED
XMT DATA +	05	BLACK	5	BLACK	05	XMT DATA +
XMT DATA -	13	YELLOW		YELLOW	13	XMT DATA -
OFF HOOK +	06	BLACK	6	BLACK	06	OFF HOOK +
OFF HOOK -	14	BROWN		BROWN	14	OFF HOOK -
NOT USED	07	BLACK	7	BLACK	07	NOT USED
NOT USED	08	ORANGE		ORANGE	15	NOT USED
NOT USED	15	RED	8	RED	08	NOT USED
NOT USED	16	WHITE		WHITE	16	NOT USED

3.15.5.3 MCS-11 Spur Connection (J310)

MCS-11 connector J310 can be used to connect to a spur shelf and is the preferred connection to the external DMX-3003N MUX. When connecting to a MDR-4000e or MDR-6000 radio use J310 on all of the radios for best results.

Recommended connectorized cable assembly – PN 695-4126-031 through -035 (26 AWG 8 pair shielded, jacketed cable with 15-pin D-type connector on each end). See Figure 3-23 for shelf connector J310 location and pinout. Refer to Table 3-11 for mating cable wiring and color code. See Figure 3-21 for typical connection scheme.

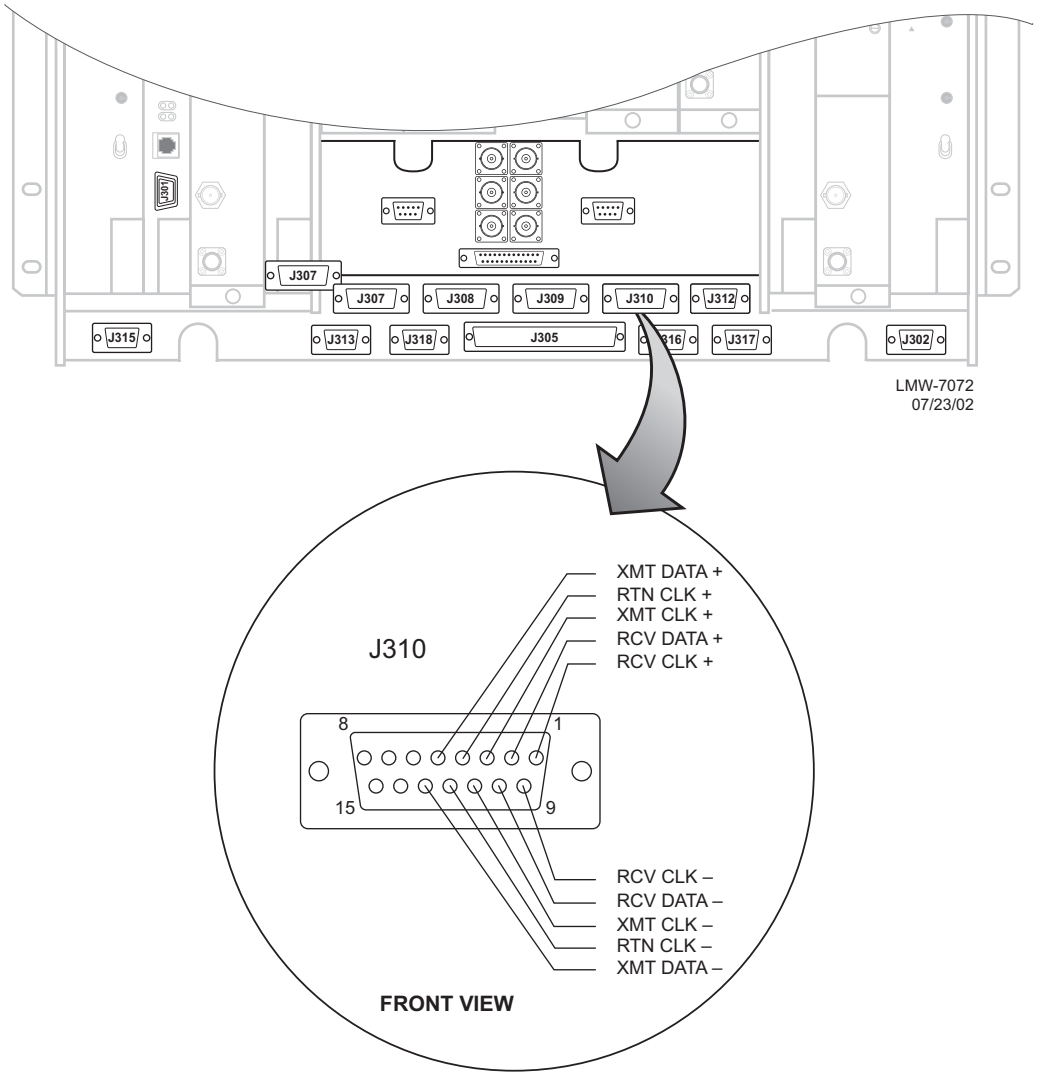


Figure 3-23 MCS-11 Spur Connector J310 Location and Pinout

Table 3-11 MCS-11 Spur Connector J310 Mating Cable Wiring and Pinout

J310 MDR-8000			J310/J310	J310 MDR-8000		
FUNCTION	**END 1**	**WIRE COLOR**	**PAIR**	**WIRE COLOR**	**END 2**	**FUNCTION**
RCV CLK +	01	BLACK	1	BLACK	04	RETURN CLK +
RCV CLK-	09	RED	1	RED	12	RETURN CLK-
RCV DATA +	02	BLACK	2	BLACK	05	XMT DATA +
RCV DATA -	10	WHITE	2	WHITE	13	XMT DATA -
XMT CLK +	03	BLACK	3	BLACK	03	XMT CLK +
XMT CLK -	11	GREEN	3	GREEN	11	XMT CLK -
RETURN CLK +	04	BLACK	4	BLACK	01	RCV CLK +
RETURN CLK -	12	BLUE	4	BLUE	09	RCV CLK -
XMT DATA +	05	BLACK	5	BLACK	02	RCV DATA +
XMT DATA -	13	YELLOW	5	YELLOW	10	RCV DATA -
NOT USED	06	BLACK	6	BLACK	06	NOT USED
NOT USED	14	BROWN	6	BROWN	14	NOT USED
NOT USED	07	BLACK	7	BLACK	07	NOT USED
NOT USED	15	ORANGE	7	ORANGE	15	NOT USED
NOT USED	08	RED	8	RED	08	NOT USED
NOT USED	16	WHITE	8	WHITE	16	NOT USED

3.15.6 ELMC (J315, J318)

As a standard feature, the Extended Link Monitor Channel (ELMC) function allows local provisioning, alarms, status information, and control commands for the local radio and, (with the exception of wayside DS1), alarms, status information, control for addressable remote radios. For wayside DS1 status, the ELMC option key (695-5647-019 or -020) must be installed on the AE-37Y Controller. For remote provisioning and downloading capability, the ELMC option key (695-5647-018 or 695-5647-020) must be installed on the AE-37Y Controller. Refer Table 3-12 for details.

Recommended connectorized cable assembly – PN 695-4125-006/013 (26 AWG 5 pair shielded, jacketed cable). See Figure 3-24 for shelf connectors locations and pinout. Refer to Table 3-13 for mating cable wiring and color code. See Figure 3-25 for typical connection scheme.

Table 3-12 ELMC Option Keys

ELMC Option Key	695-5647-018	Required for remote provisioning and downloading on DS1/E1 radios, and DS3 and OC3 radios without wayside DS1
ELMC Option Key	695-5647-019	Required for status of DS3 and OC3 radios with wayside DS1 (no remote provisioning or download capability provided)
ELMC Option Key	695-5647-020	Required for remote provisioning and downloading of DS3 and OC3 radios with wayside DS1

Note

ELMC 1 connector J318 and ELMC 2 connector J315 are wired in parallel. You can connect J315 to J315, J315 to J318, or J318 to J318. A typical connection scheme is shown.

Table 3-13 ELMC Connector J315/J318 Mating Cable Wiring and Pinout

J315/J318 MDR-8000				J315/J318 MDR-8000		
FUNCTION	**END 1**	**WIRE COLOR**	**PAIR**	**WIRE COLOR**	**END 2**	**FUNCTION**
RCV+	01	BLACK	1	BLACK	02	XMT+
RCV-	06	RED		RED	07	XMT-
XMT+	02	BLACK	2	BLACK	01	RCV+
XMT-	07	WHITE		WHITE	06	RCV-
NOT USED		BLACK	3	BLACK		NOT USED
GND	03	GREEN		GREEN	03	GND
NOT USED	04	BLACK	4	BLACK	05	NOT USED
NOT USED	08	BLUE		BLUE	09	NOT USED
NOT USED	05	BLACK	5	BLACK	04	NOT USED
NOT USED	09	YELLOW		YELLOW	08	NOT USED

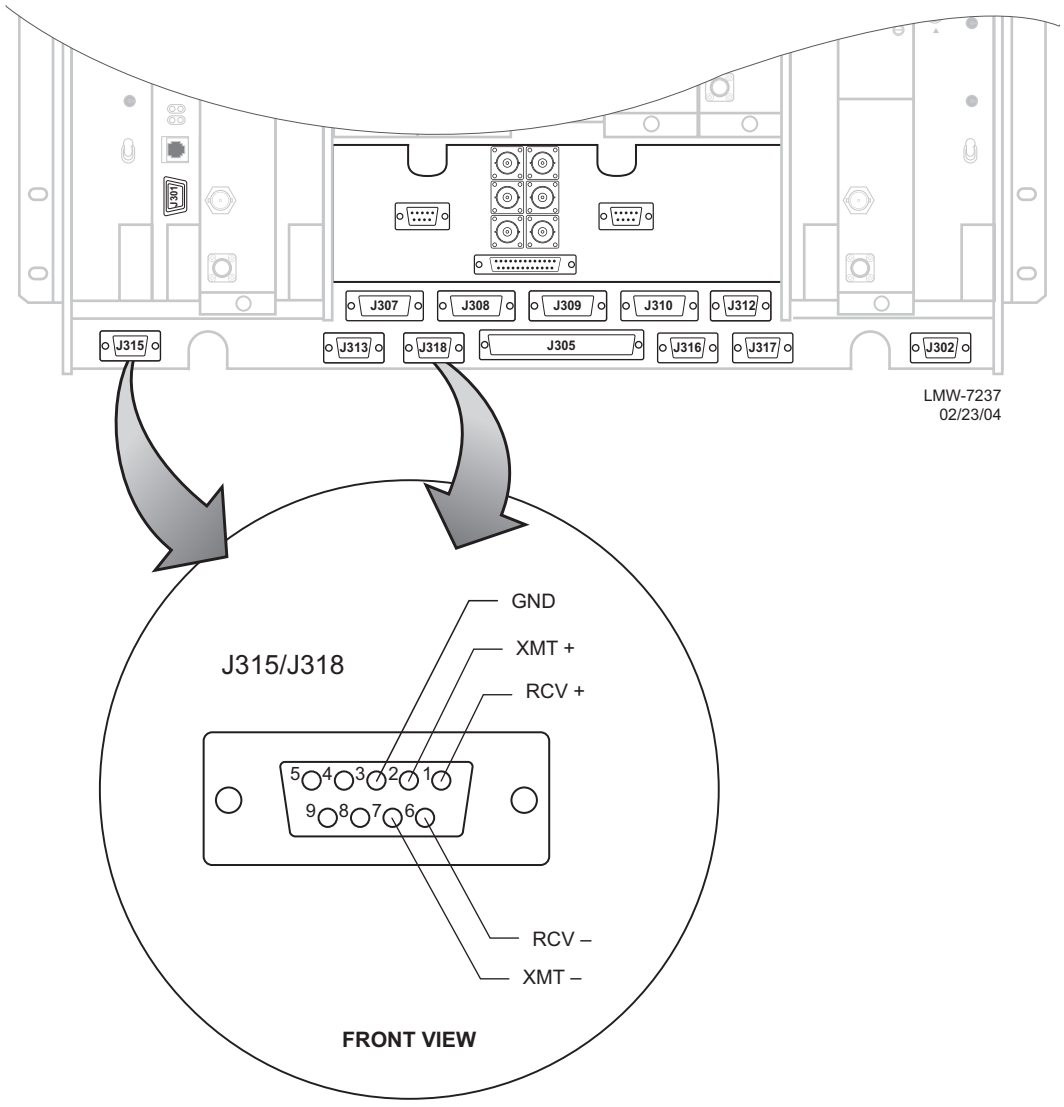
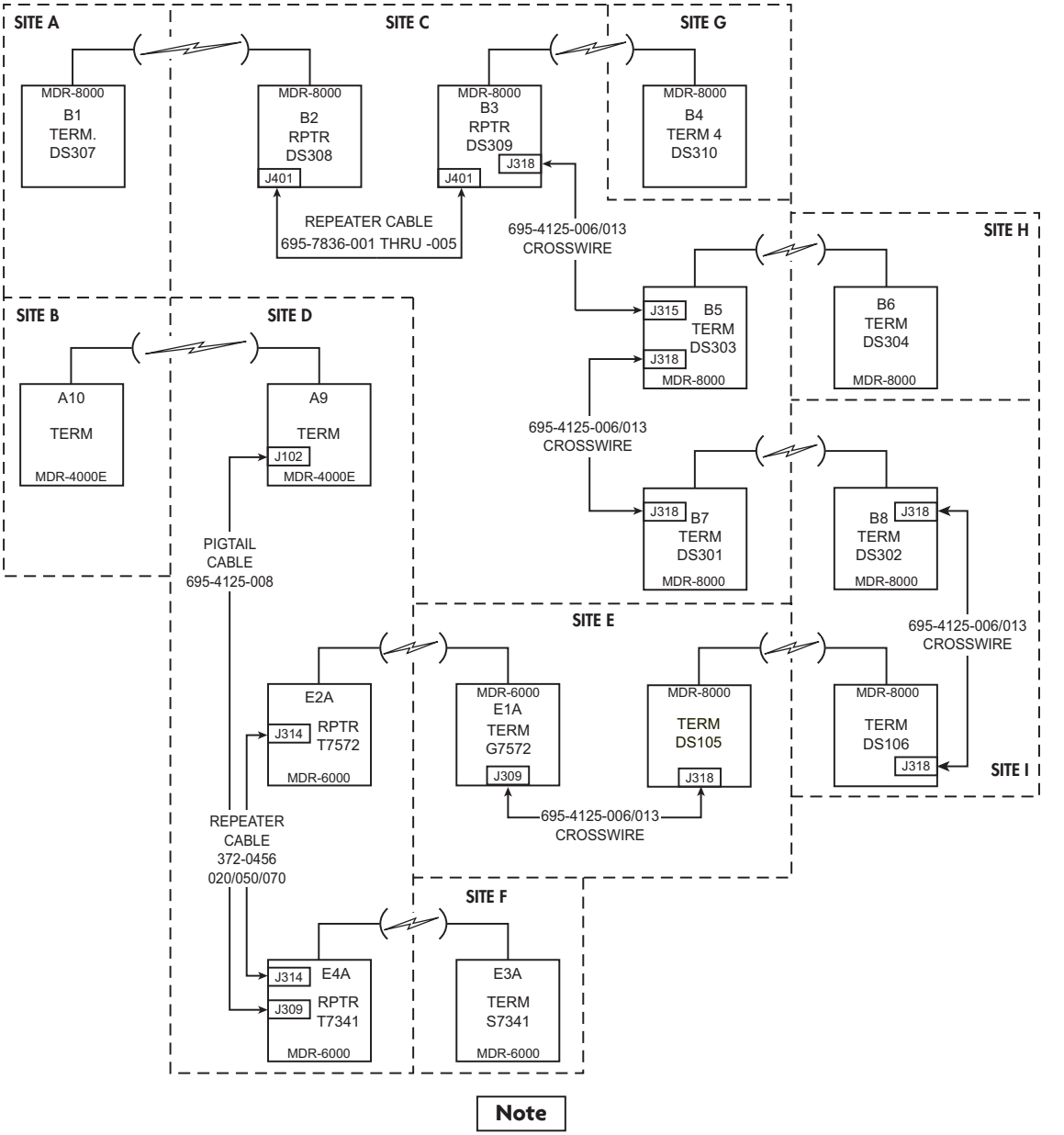


Figure 3-24 ELMC Connectors Location and Pinout



Note

When connecting MDR-8000 radios with Windows USI to radios with DOS USI, check the DOS USI ELMC address for space, dash, slash, asterisk, or underscore. The Windows USI cannot recognize a space, dash, slash, asterisk, or underscore. Change the DOS ELMC address to a 5-character alphanumeric address without the prohibited characters.

MDR-1026
06/12/04

Figure 3-25 Typical ELMC Connections

3.16 FOREIGN ALARM INTERFACE (J305)

Recommended connectorized cable assembly – PN 695-4121-001/003 (24 AWG 25 pair cable). See Figure 3-26 for shelf connector location and pinout. Refer to Table 3-13 for mating cable pinout and color code.

or

Recommended wirewrap cable – PN 424-0429-020 (22 AWG 30-pair twisted cable) for use with wirewrap adapter PN 695-4171-002. Refer to Table 3-14 for pinout.

Note

TBOS connections on J305 share pins with station alarms 13 through 16 and either TBOS or station alarms 13 through 16 is selected (provisioned) on the USI Radio Configuration Provisioning screen.

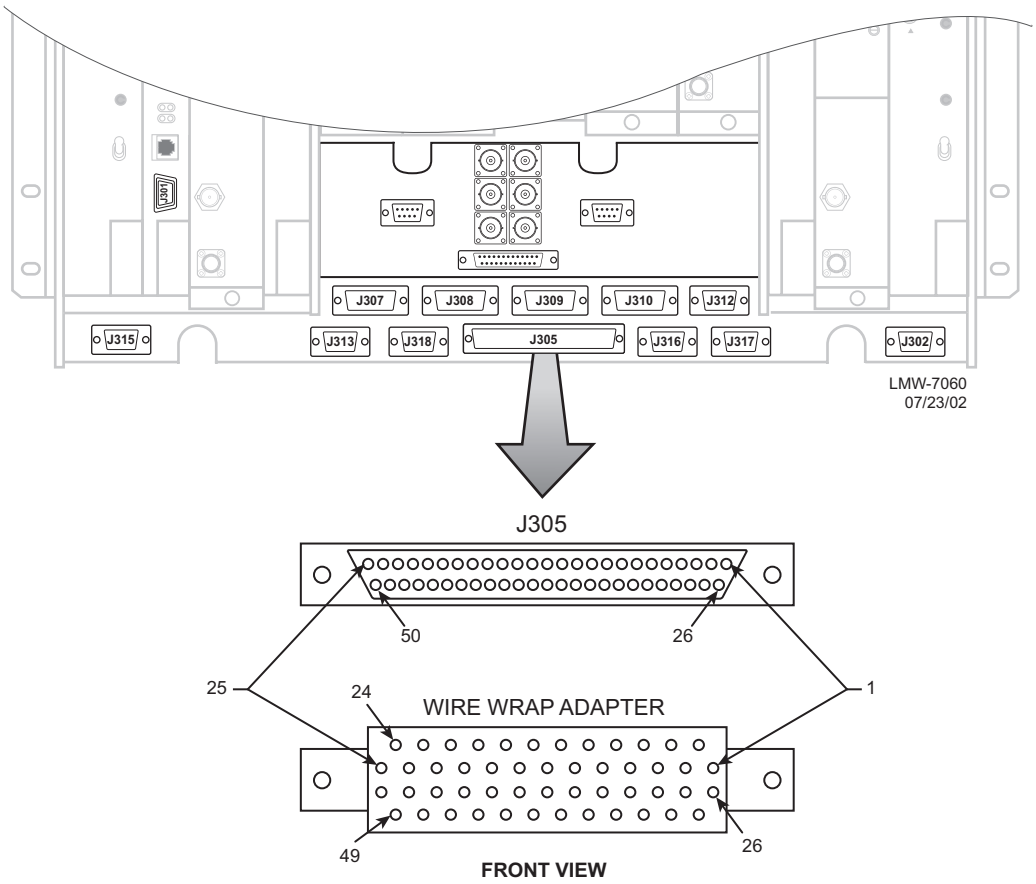


Figure 3-26 Alarm/Status/TBOS Connector J305 Location and Pinout

Table 3-14 Alarm/Status Connector J305 Mating Cable Wiring and Pinout

ALM/STATUS/CONTROL	PIN	PR	WIRE COLOR	REMARKS
A XMT ALM OUT	01	1	WHT/BLU	ALARM OUTPUT FROM RELAY INTFC
NOT USED*	26		BLU/WHT	N/A
A RCV ALM OUT	02	2	WHT/ORN	ALARM OUTPUT FROM RELAY INTFC
NOT USED*	27		ORN/WHT	N/A
CONTROLLER FAIL ALM OUT	03	3	WHT/GRN	ALARM OUTPUT FROM RELAY INTFC
SWITCH I/O OUT	28		GRN/WHT	CONTROL OUTPUT FROM RELAY INTFC
SWITCH XMTR OUT	04	4	WHT/BRN	CONTROL OUTPUT FROM RELAY INTFC
SWITCH RCVR OUT	29		BRN/WHT	CONTROL OUTPUT FROM RELAY INTFC
A XMT IN SVCE OUT	05	5	WHT/SLT	STATUS OUTPUT FROM RELAY INTFC
NOT USED*	30		SLT/WHT	N/A
A RCV IN SVCE OUT	06	6	RED/BLU	STATUS OUTPUT FROM RELAY INTFC
NOT USED*	31		BLU/RED	N/A
A I/O IN SVCE OUT	07	7	RED/ORN	STATUS OUTPUT FROM RELAY INTFC
NOT USED*	32		ORN/RED	N/A
PWR SUPPLY ALM OUT	08	8	RED/GRN	ALARM OUTPUT FROM RELAY INTFC
NOT USED*	33		GRN/RED	N/A
STATION ALM 9 IN	09	9	RED/BRN	RELAY INPUT FROM CUSTOMER EQUIPMENT
STATION ALM 1 IN	34		BRN/RED	RELAY INPUT FROM CUSTOMER EQUIPMENT
STATION ALM 10 IN	10	10	RED/SLT	RELAY INPUT FROM CUSTOMER EQUIPMENT
STATION ALM 2 IN	35		SLT/RED	RELAY INPUT FROM CUSTOMER EQUIPMENT
STATION ALM 11 IN	11	11	BLK/BLU	RELAY INPUT FROM CUSTOMER EQUIPMENT
STATION ALM 3 IN	36		BLU/BLK	RELAY INPUT FROM CUSTOMER EQUIPMENT
STATION ALM 12 IN	12	12	BLK/ORN	RELAY INPUT FROM CUSTOMER EQUIPMENT
STATION ALM 4 IN	37		ORN/BLK	RELAY INPUT FROM CUSTOMER EQUIPMENT
TBOS XMT- DATA IN OR STATION ALM 13 IN	13	13	BLK/GRN	SERIAL DATA INPUT TO RADIO CONTROLLER OR INPUT FROM CUSTOMER EQUIPMENT TO RELAY INTFC CARD (PROVISIONABLE)
STATION ALM 5 IN	38	13	GRN/BLK	INPUT FROM CUSTOMER EQUIPMENT
TBOS XMT+ DATA IN OR STATION ALM 14 IN	14	14	BLK/BRN	SERIAL DATA INPUT TO RADIO CONTROLLER OR INPUT FROM CUSTOMER EQUIPMENT TO RELAY INTFC CARD (PROVISIONABLE)
STATION ALM 6 IN	39		BRN/BLK	INPUT FROM CUSTOMER EQUIPMENT

Table 3-14 (Cont.) Alarm/Status Connector J305 Mating Cable Wiring and Pinout

ALM/STATUS/CONTROL	PIN	PR	WIRE COLOR	REMARKS
TBOS RCV- DATA OUT OR STATION ALM 15 IN	15	15	BLK/SLT	SERIAL DATA INPUT TO RADIO CONTROLLER OR INPUT FROM CUSTOMER EQUIPMENT TO RELAY INTFC CARD (PROVISIONABLE)
STATION ALM 7 IN	40		SLT/BLK	INPUT FROM CUSTOMER EQUIPMENT
TBOS RCV+ DATA OUT OR STATION ALM 16 IN	16	16	YEL/BLU	SERIAL DATA INPUT TO RADIO CONTROLLER OR INPUT FROM CUSTOMER EQUIPMENT TO RELAY INTFC CARD (PROVISIONABLE)
STATION ALM 8 IN	41		BLU/YEL	INPUT FROM CUSTOMER EQUIPMENT
CONTROL 1 OUT	17	17	YEL/ORN	OUTPUT TO CUSTOMER EQUIPMENT
CONTROL STATUS 1 IN	42		ORN/YEL	INPUT FROM CUSTOMER EQUIPMENT IN RESPONSE TO CONTROL 1 OUTPUT
CONTROL 2 OUT	18	18	YEL/GRN	OUTPUT TO CUSTOMER EQUIPMENT
CONTROL STATUS 2 IN	43		GRN/YEL	INPUT FROM CUSTOMER EQUIPMENT IN RESPONSE TO CONTROL 2 OUTPUT
CONTROL 3 OUT	19	19	YEL/BRN	OUTPUT TO CUSTOMER EQUIPMENT
CONTROL STATUS 3 IN	44		BRN/YEL	INPUT FROM CUSTOMER EQUIPMENT IN RESPONSE TO CONTROL 3 OUTPUT
CONTROL 4 OUT	20	20	YEL/SLT	OUTPUT TO CUSTOMER EQUIPMENT
CONTROL STATUS 4 IN	45		SLTYEL	INPUT FROM CUSTOMER EQUIPMENT IN RESPONSE TO CONTROL 4 OUTPUT
CONTROL 5 OUT	21	21	VIO/BLU	OUTPUT TO CUSTOMER EQUIPMENT
CONTROL STATUS 5 IN	46		BLU/VIO	INPUT FROM CUSTOMER EQUIPMENT IN RESPONSE TO CONTROL 5 OUTPUT
CONTROL 6 OUT	22	22	VIO/ORN	OUTPUT TO CUSTOMER EQUIPMENT
CONTROL STATUS 6 IN	47		ORN/VIO	INPUT FROM CUSTOMER EQUIPMENT IN RESPONSE TO CONTROL 6 OUTPUT
PATH ALM OUT	23	23	VIO/GRN	ALARM OUTPUT FROM CONTROLLER
LOSS OF INPUT OUT	48		GRN/VIO	ALARM OUTPUT FROM CONTROLLER
MAJOR ALM/VISUAL ALM OUT	24	24	VIO/BRN	ALARM OUTPUT FROM CONTROLLER (PROVISIONABLE MAJOR/MINOR OR VISUAL/AUDIBLE ON USI SCREEN)
RACK ALM RETURN	49		VIO/BRN	INPUT TO CONTROLLER
RACK ALM OUT	25	25	VIO/SLT	OUTPUT FROM CONTROLLER
MINOR ALM/AUDIBLE ALM OUT	50		SLT/VIO	ALARM OUTPUT FROM CONTROLLER (PROVISIONABLE MAJOR/MINOR OR VISUAL/AUDIBLE ON USI SCREEN)

*Wired but not used

3.17 ALARM, STATUS, CONTROLS INTERCONNECT

See Figure 3-27 for interconnect diagram. The AE-27( ) Relay Interface provides alarm, control and status inputs, and alarm, status and control relay outputs. All output relays can be disabled or provisioned normally open or normally closed as follows:

Normally open (NO) – relays are normally de-energized and relay contacts are open. When activated, relays are energized. Relay contacts close, connecting the output to ground.

Normally closed (NC) – relays are normally energized and relay contacts are closed and grounded. When activated, relays are de-energized. Relay contacts open, presenting an open (high impedance) to the output.

Rack ALM Return, Pin 49 is a ground point for use with Rack ALM Out. It is a signal ground (low current) not used for battery voltage or high current ground.

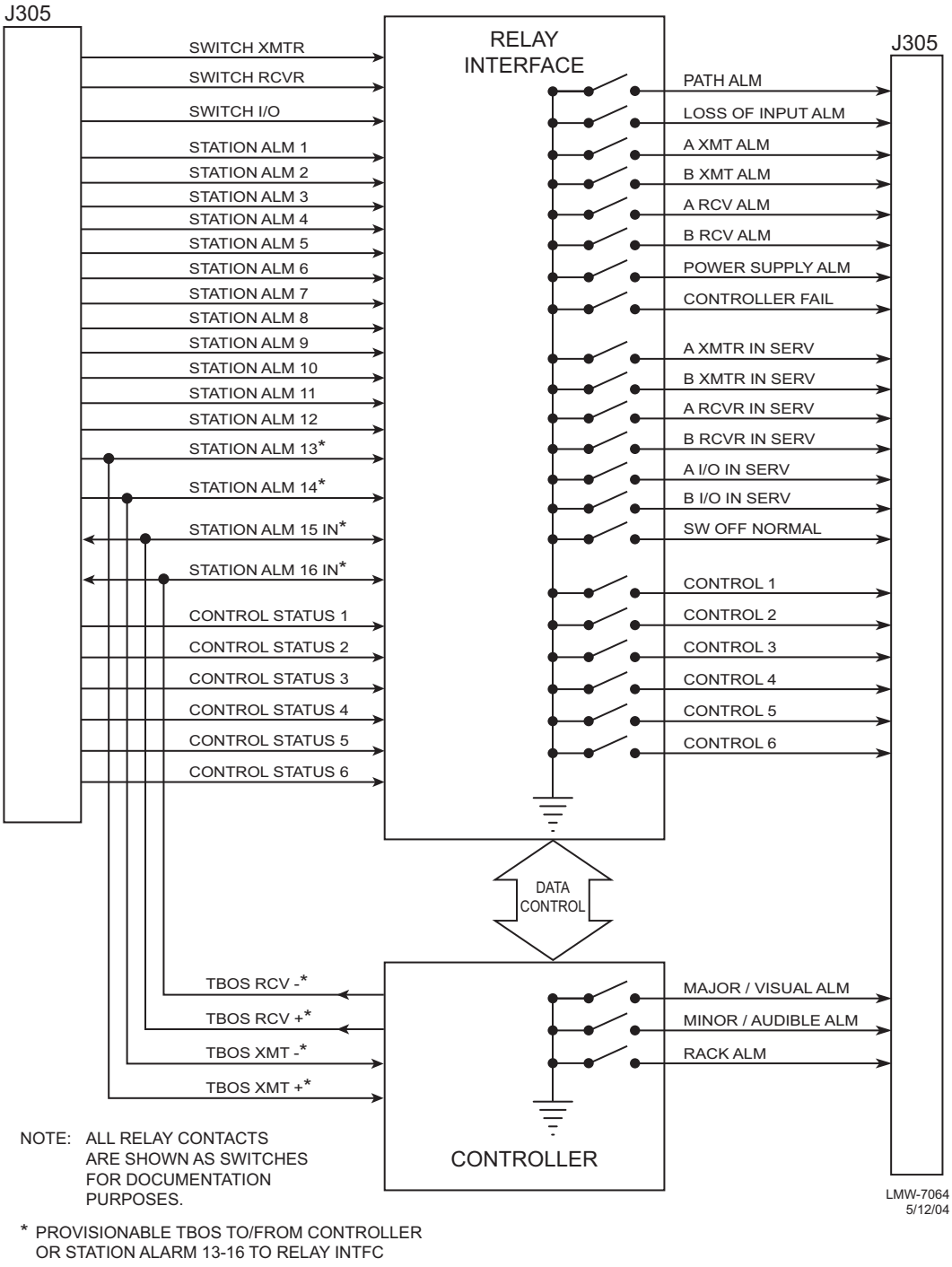


Figure 3-27 Alarm and Status Relays/TBOS Interconnect

3.17.1 Controller Bus

The Relay Interface communicates with the AE-37( ) Controller card via the processor bus and the data bus. The processor bus, consisting of three address lines, two control lines, and a clock, is applied to a XCVR. The data bus contains the eight data lines (D0-D7) and is applied to a separate transceiver. Interface with the relay transceivers is provided by the XCVR data bus. When commanded by the AE-37( ) Controller, the decoder/DEMUX decodes and demultiplexes the address and enables the appropriate relay XCVR via the EN2-9 controls. The controller can then write alarm/status/control information to the relay XCVRs, or read alarm/status/control inputs from the relay XCVRs. Further descriptions of the controller interface signals follow:

- Address lines A0 through A3 – HCMOS inputs. 100K Ohm pull-ups. Used by address decoders to enable output registers and input buffers.
- Buffered bidirectional data lines D0 through D7 – HCMOS input/outputs. 10K Ohm pull-ups. Used to write data to output registers and read present bits or data from input buffers.
- ECLK – 2 MHz bus clock. HCMOS input. 100K Ohm pull-up.
- R/WF Read/Write False. HCMOS input. 100K Ohm pull-up. A logic 1 indicates data is being read from an input buffer or the present bits. A logic 0 indicates data is being written to an output register.
- Relay Intfc CSF – Relay Interface Card Select False. HCMOS input. 100K Ohm pull-up. Chip select for relay interface card. Active low.

3.17.2 Control Inputs

Nine buffered control inputs are provided. The inputs are diode protected from voltages outside of the 0 to +5 V range, and have a 10K Ohm resistor for current limiting purposes. In addition, each input has a 100K Ohm pull-up resistor.

- Switch Transmitter (SWITCH TX) – buffered HCMOS input, sends signal to controller module to activate the transmitter that is currently not carrying traffic.
- Switch Receiver (Switch RX) – buffered HCMOS input, sends signal to controller module to activate the receiver that is currently not carrying traffic.
- Switch I/O Interface (SWITCH I/O) – buffered HCMOS input, sends signal to controller module to activate the stand-by I/O interface module.

3.17.3 Station Alarm Inputs/TBOS Interface

Each radio shelf can accept/report up to 12 different user-defined station-type alarms, and, if provisioned **Station Alarm 13-16**, the radio can accept an additional four station alarms, for a total of 16. Station alarms 13 through 16 share pins on connector J305 with the four TBOS inputs and outputs. TBOS inputs and outputs are enabled by software when the radio is provisioned **TBOS Display 1-8**. When TBOS is enabled station alarms 13 through 16 are disabled.

The alarm/status input signals are buffered HCMOS inputs, diode protected from voltages outside of the 0 to +5 V range, with 10 kilohm current limiting (series) resistor and 100 kilohm pull-up resistor. A logic 0 indicates an alarm state. A logic 1 (or open) indicates a non-alarm state.

3.17.4 Station Alarm Wiring

See Figure 3-28. Use wire wrap adapter PN 695-4171-002 to connect station alarm inputs to the AE-27A Relay Interface module, via connector J305, in each rack. A typical connection scenario is shown. The station/shelf alarm for MCS-11 address A1A (MCS-11 alarm point 1) is connected by software. The station alarms for MCS-11 address A1B and A1C are assigned to MCS-11 Alarm points 2 and 3, respectively.

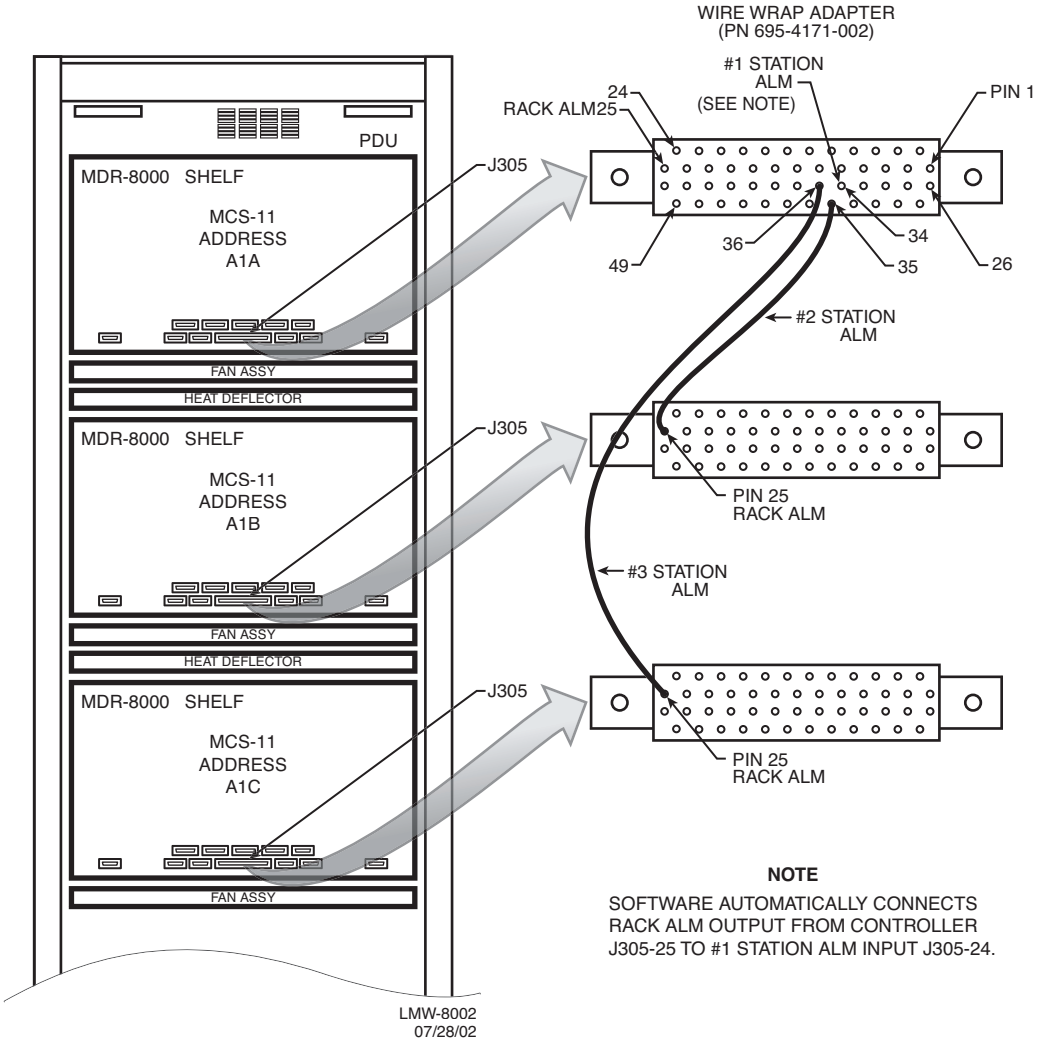


Figure 3-28 Alarm and Status Relays/TBOS Interconnect

3.17.5 Relay Alarm/Status Outputs

Eight alarm relay outputs and seven status relay outputs provide relay closure to ground (provisioned NO) or open (provisioned NC) when activated. All relays default to open if card power is lost, except the Power Supply alarms, which default to ground. The maximum contact rating for each relay is 0.5 A, 100 Vdc. The alarm/status relay outputs are:

- Alarms:
  - Path Alarm– This summary alarm is activated by the following alarms:

    A/B Path Distortion

    A/B AGC Threshold

  - Loss of Input Alarm– This summary alarm is activated by the following alarms:

    Loss of DS3 input

    Loss of optical input (OC3)

    Loss of wayside DS1 input

  - A XMT – A-side transmitter failure. This summary alarm is activated by any of the following alarms on the A side:

    XMT SYNC Alarm

    RF Power Alarm

    Common Loss Alarm

    ATPC Timeout

    MUX Input Loss Alarm

  - B XMT – B-side transmitter failure. This summary alarm is activated by any of the following alarms on the B side:

    XMT SYNC Alarm

    RF Power Alarm

    Common Loss Alarm

    ATPC Timeout

    MUX Input Loss Alarm

- A RCV – B-side receiver failure. This summary alarm is activated by any of the following alarms on the A side:

  Channel Alarm

  RCV Frame Loss

  Eye Closure

  RSL Alarm

- B RCV – B-side receiver failure. This summary alarm is activated by any of the following alarms on the B side:

  Channel Alarm

  RCV Frame Loss

  Eye Closure

  RSL Alarm

- PWR Supply Alarm – This summary alarm is activated by any A or B power supply failure.

- Controller Fail – relay is activated if a card select has not been detected in the previous approximately 200 msec.

- Status:
  - A XMTR In Service – A-side transmitter module is on-line.
  - B XMTR In Service – B-side transmitter module is on-line.
  - A RCVR In Service – A-side receiver module is on-line.
  - B RCVR In Service – B-side receiver module is on-line.
  - A I/O In Service – A-side I/O interface module is on-line.
  - B I/O In Service – B-side I/O interface module is on-line.
  - Switch Off Normal – Click on OFF NORM LED on USI Status Alarm screen to view message. Indicates manual control enabled or one of following conditions exists:

OFF NORMAL MESSAGE DISPLAYED ON USI STATUS ALARM SCREEN:

A/B Side PA Off – PA ON/OFF switch on A or B power supply is set to OFF.

A/B Side LIO SPI Fail – XMT or RCV circuit failure on Low Capacity I/O ASIC in A or B DS1 I/O interface module.

A/B Side RCV SPI Fail – Failure on the Serial Processor Interface bus causing loss of communication between the controller and RCV circuits on the I/O interface module.

A/B Side DS1 SPI Fail – Failure on the Serial Processor Interface bus causing loss of communication between the controller and DS1 interface circuits on the I/O interface module.

Fan Alarm – Failure of one or more cooling fans or failure of the fan control module on the fan assembly.

I/O Loopback On – I/O LOOPBACK function is enabled on USI control screen.

DS1 Line 1-3 Loopback On – DS1 LINE LOOPBACK RCV to XMT 1-3 function is enabled on USI control screen.

A/B RCV Prov. ERROR UNIRCV – Failure in communication between processor on controller and UNIRCV ASIC on DS3 I/O interface module.

A/B DS1 Prov. ERROR LEGHORN – Failure in communication between processor on controller and Leghorn ASIC on I/O interface module.

A/B ATPC LOW POWER LOCK – A or B Automatic Transmit Power Control low power lock function is enabled on USI control screen on DS1, DS3, or OC3 radio. Lock prevents ATPC from going high.

A/B ATPC HIGH POWER LOCK – A or B Automatic Transmit Power Control high power lock function is enabled on USI control screen on DS1, DS3, or OC3 radio. Lock prevents ATPC from going low.

EEPROM PROV DOES NOT MATCH MODULE PROV – Stored provisioning in controller memory does not match provisioning stored in module memory.

XMTR Capacity Key Mismatch – Part numbers of capacity keys on A and B XMTRs are different.

RCVR Capacity Key Mismatch – Part numbers of capacity keys on A and B RCVRs are different.

A/B Tx OVERRIDE – A or B XMTR has been switched and locked in-service using controls on the front panel of the controller module. Online XMTR will not switch out-of-service regardless of alarms.

A/B Rx OVERRIDE – A or B RCVR has been switched and locked in-service using controls on the front panel of the controller module. Online RCVR will not switch out-of-service regardless of alarms.

A/B I/O OVERRIDE – A or B I/O interface has been switched and locked in-service using controls on the front panel of the controller module. Online I/O interface will not switch out-of-service regardless of alarms.

3.17.6 Relay Control Outputs

Note

Control outputs and control status inputs operate together to perform control functions. The control status inputs to the relay interface must be properly wired to the external equipment that is being controlled by the associated control output in order to display the ON or OFF status on the USI control screen. Without the control status inputs, the control function on the USI screen will still turn on equipment/functions, but no status will be indicated and, once turned on, the equipment/function cannot be turned off.

Six relay control outputs (CTRL 1-6) provide relay closure to ground (provisioned NC) or open (provisioned NO) when activated. These relays default to open if card power is lost. The maximum contact rating for each relay is 0.5 A, 100 Vdc.

Nine buffered status inputs (CTRL STATUS 1-6) from the equipment controlled by the CTRL 1-6 outputs, verifying the controlled function. The inputs are diode protected from voltages outside of the 0 to +5 V range, and have a 10K Ohm resistor for current limiting purposes. In addition, each input has a 100K Ohm pull-up resistor.

This page intentionally left blank.