MDR-8000

Microwave Digital Radios
Users Manual

Alcatel Part Number 3EM11931AA
Issue 9, December, 2007

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

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- Defined as loss of traffic, standby equipment, or network visibility on traffic-bearing systems.
- Available through our Customer Service Agents (CSA).

Contact Information Ask the Customer Service Agent (CSA) for a Microwave (MW) or a Network Management Service engineer (NMS).

Creating a TAC Action Request (AR)

Please provide the following information to the Customer Service Agent (CSA):

- Last and First name
- Company name
- Telephone number
- City and state (Street address if applicable) or Site Name and Location
- Equipment type
- A brief description of the problem affecting their equipment
- **Customer Priority:** *High, Medium,* or *Low.*
- TL-9000 Severity as described below.

TL-9000 Severities Defined

Critical	Problems severely affecting service, traffic, capacity, or network management. They require **immediate corrective action**. (Ex. Loss of network management capability, loss of traffic imminent or existing).
Major	Conditions **seriously affecting** system operation. They require **immediate attention**. (Ex. processor outage, loss of standby equipment, loss of remote access, or network managers).
Minor	Problems not classified as critical or major.

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Section 5 Maintenance

SAFETY PRECAUTIONS

While the manufacturer has attempted to detail in this manual all areas of possible danger to personnel in connection with the use of this equipment, personnel should use caution when installing, checking out, operating, and servicing this equipment. As with all electronic equipment, care should be taken to avoid electrical shock in all circuits where substantial currents or voltages may be present, either through design or short circuit.

Definitions of Danger, Warnings, Cautions, and Notes used throughout this manual are described below:

An operating procedure, practice, etc., which, if not correctly followed could result in personal injury or loss of life.

An operating procedure, practice, etc., which, if not strictly observed, could result in damage to or destruction of equipment.

An operating procedure, practice, etc., which, if not correctly followed, could result in an interruption of service.

Note

An operating procedure, condition, etc., which is essential to highlight.

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1 GENERAL

1.1 INTRODUCTION

This MDR-8000 Users Manual contains information on the MDR-8000 Hot-Standby Shelf. For information on the MDR-8000 Compact Indoor Shelf, and MDR-8000 Compact Outdoor Unit Refer to CD.

The information in the Users Manual is a summary of the overall Operation and Maintenance Manual 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 Attached CD column lists the parts of the *MDR-8000 Radio Family Operation and Maintenance Manual*, PN 3EM20188AAAA. A check mark under the Users Manual column or the Attached CD column indicates where the information is located.

Table 1-1 Information Location

	Location	
Section / Appendix	***Users Manual***	***Attached CD***
Glossary		√
General		
Ordering Information		√
Features and Options		√
Supplied and Optional equipment		√
Part Numbers		√
Physical, Environmental, and Electrical Characteristics		√
Application		√
Functional Description		√
Physical Installation		√
Interconnect	√	√
DS1/E1, DS3, OC3/STM-1, and ETH	√	√
Service Channel	√	√
Initial Turnup	√	√
Radio Provisioning	√	√
TMN Specifics		√
Operation	√	√
Controls and Indicators	√	√
Users Guide	√	√
USI Screen Descriptions	√	√

Table 1-1 (Cont.) Information Location

	Location	
Section / Appendix	***Users Manual***	***Attached CD***
Maintenance	√	√
Troubleshooting USI Alarms	√	√
Troubleshooting Using Performance Screens	√	√
Troubleshooting TMN Alarms	√	√
Module Replacement Procedures	√	√
Post-Replacement Test procedures	√	√
Diagrams		√
Rack Installation		√
Alarm / Status / Control		√
MCS-11 Reference Guide		√
Modem Provisioning		√
Maintenance Support Procedures		√
Optional Over-The-Hop Performance Tests		√
Compact Indoor Shelf		√
Compact Outdoor Unit		√
Ethernet + 4 DS1 Upgrade Procedure		√
Ethernet + 32 DS1 Upgrade Procedure		√

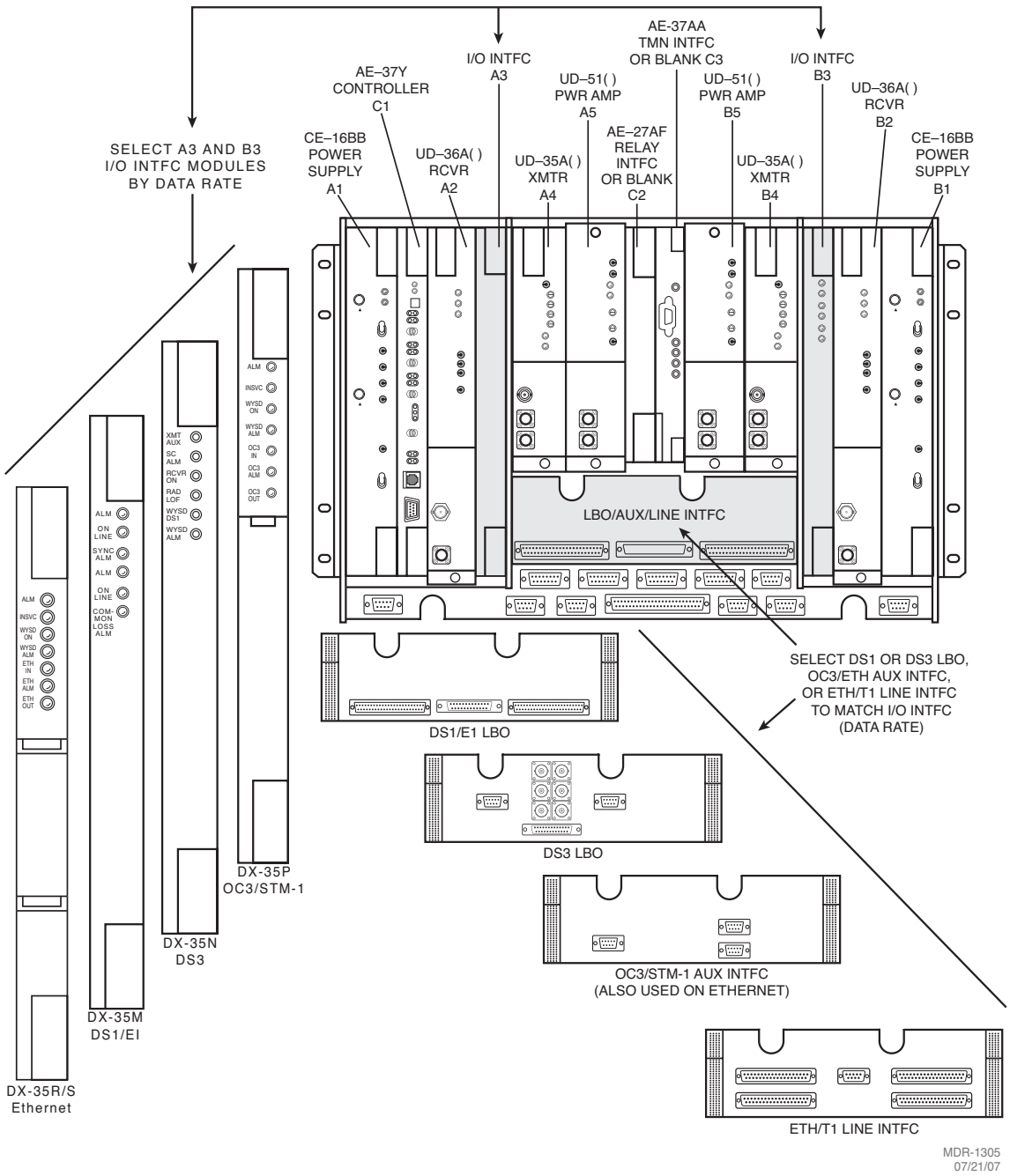


Figure 1-1 Typical MDR-8000 Hot-Standby Shelf Component Locations and Options (Sheet 1 of 3)

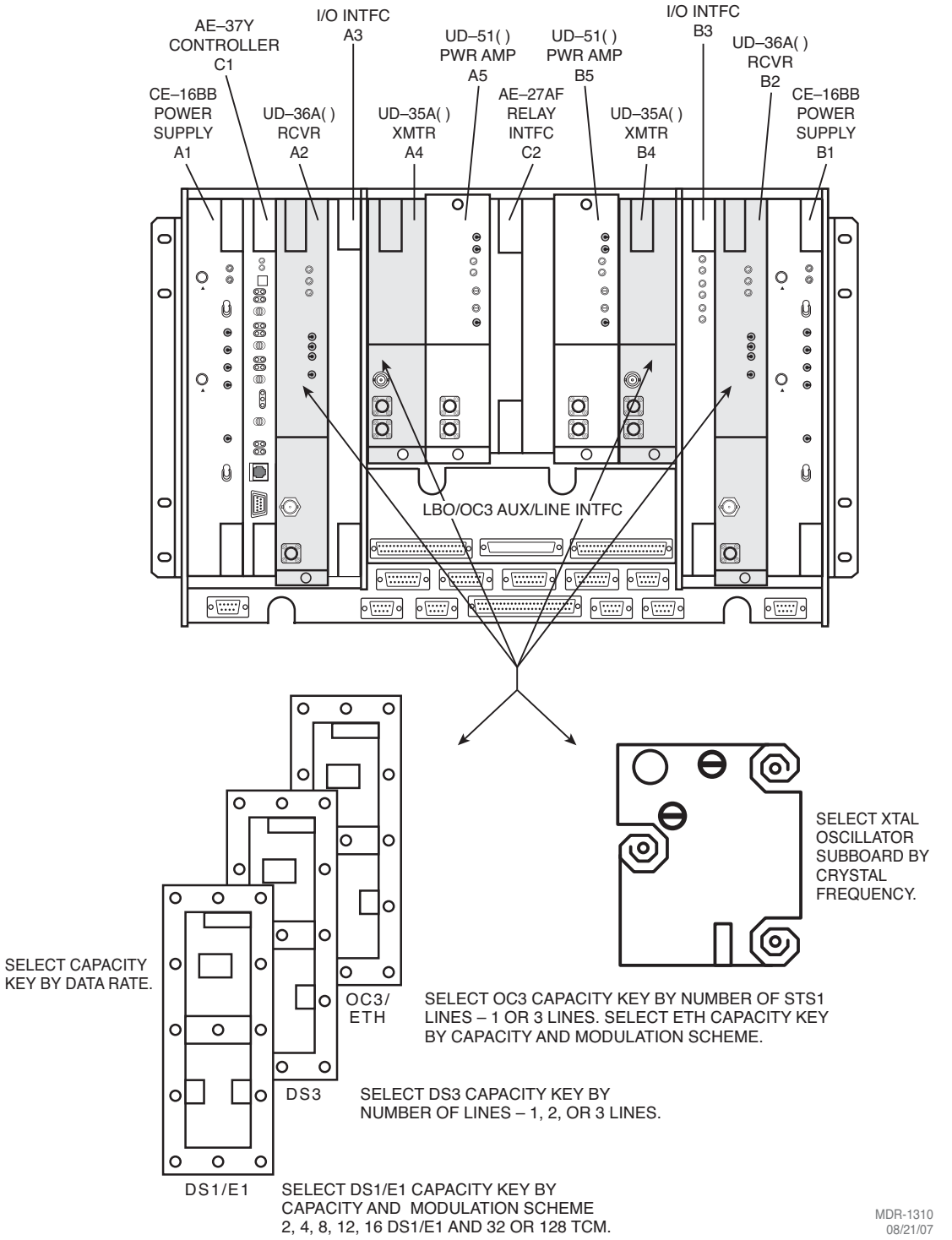
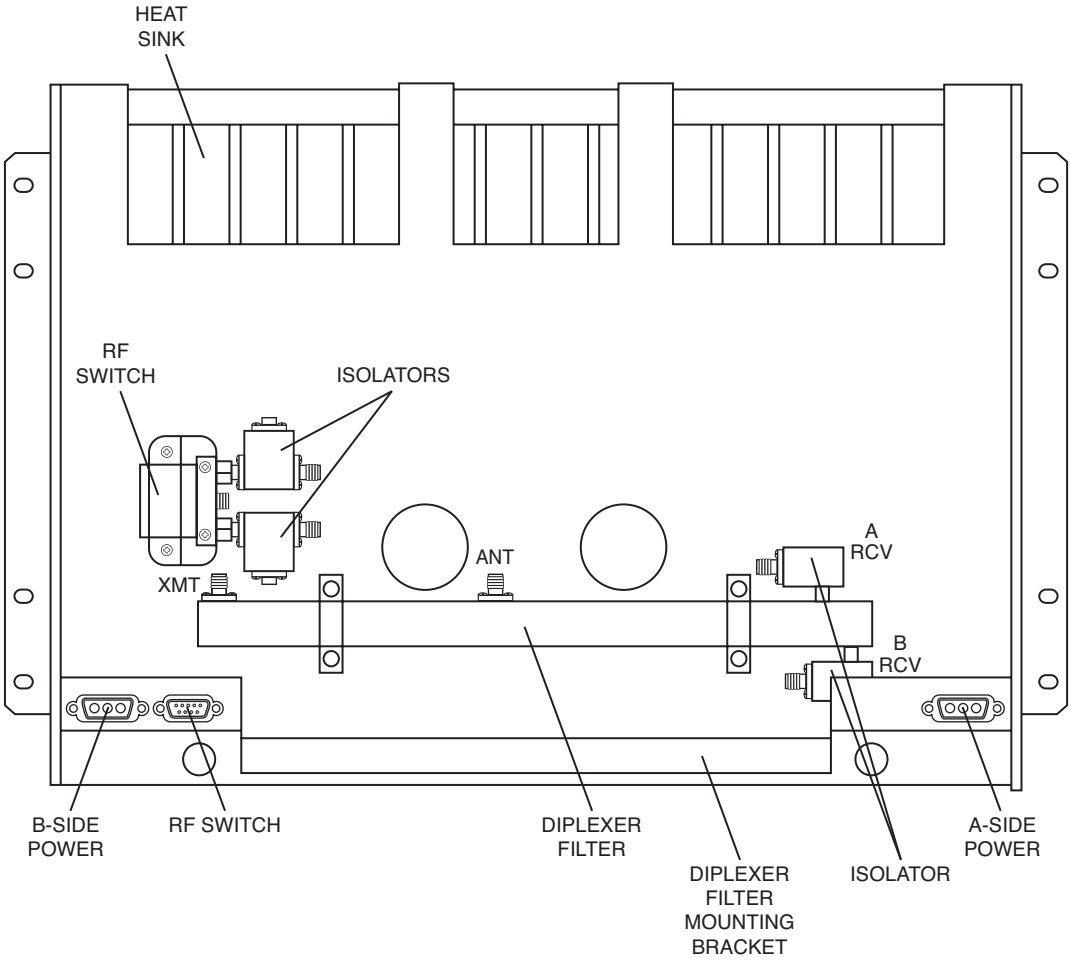


Figure 1-1 Typical MDR-8000 Hot-Standby Shelf Component Locations and Options (Sheet 2 of 3)



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.

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

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Note

The information contained in this section is a summary of the section with the same title, but not the same section number, on the enclosed CD. "Refer to CD" *is used throughout this section to refer the reader to the detail information on the CD. Go to this section on the CD for interactive links to the detail information referred to in this section.*

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.

TOGGLE SWITCH LEFT TO SWITCH A XMTR, RCVR, OR I/O MODULE IN-SERVICE AND TOGGLE SWITCH RIGHT TO SWITCH B XMTR, RCVR, OR I/O MODULE IN-SERVICE.

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NOTE

OVERRIDE (OVRD) LOCKS XMTR, RCVR, OR I/O MODULE, SELECTED ABOVE IN-SERVICE, REGARDLESS OF ALARMS.

TO ENABLE OVERRIDE:

1. PRESS AND HOLD TX A/B ON LINE, RX A/B ON LINE, OR I/O A/B ON LINE SWITCH.
2. TOGGLE ACO/LT OVRD SWITCH TO OVRD POSITION.
3. RELEASE A/B ON LINE SWITCH.

TO DISABLE OVERRIDE:

TOGGLE ACO/LT OVRD SWITCH TO OVRD POSITION.

Figure 2-1 Manual Switch From Controller Front Panel

1. OPEN USI CONTROLS SCREEN.

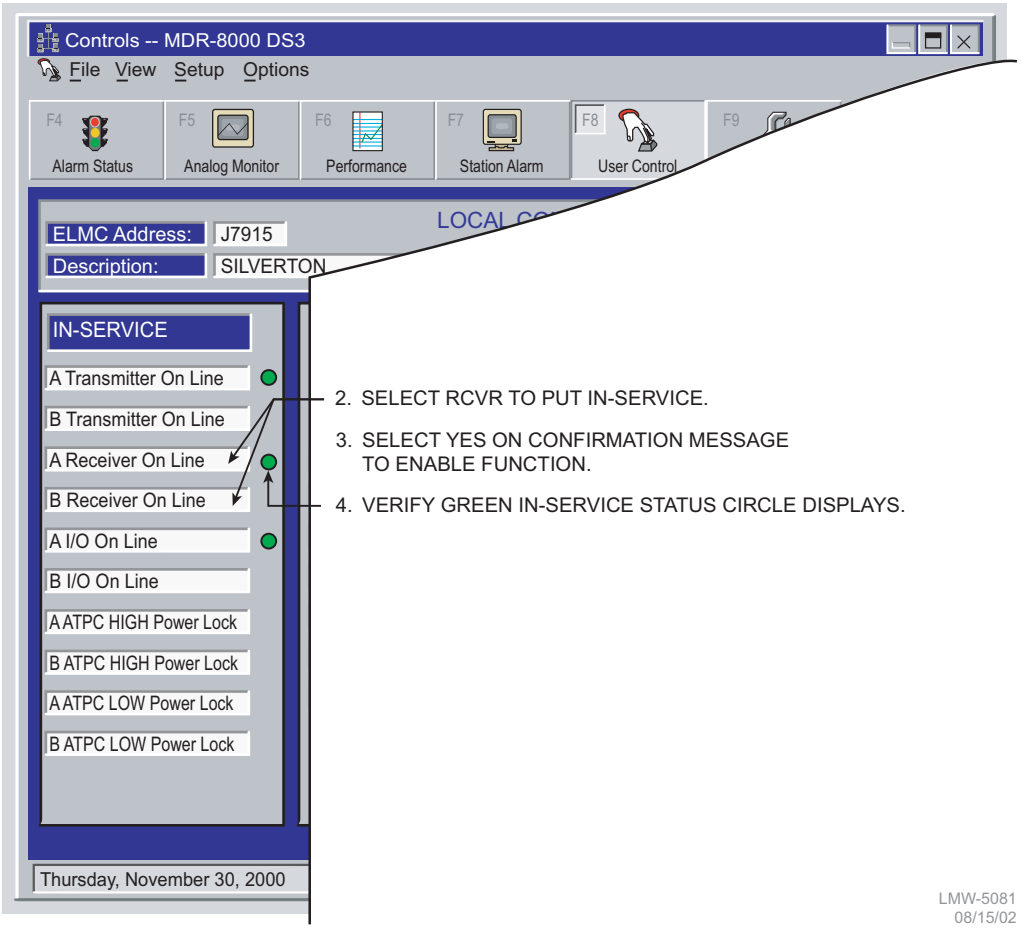


Figure 2-2 RCVR Manual Switch Using USI Control Screen

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.

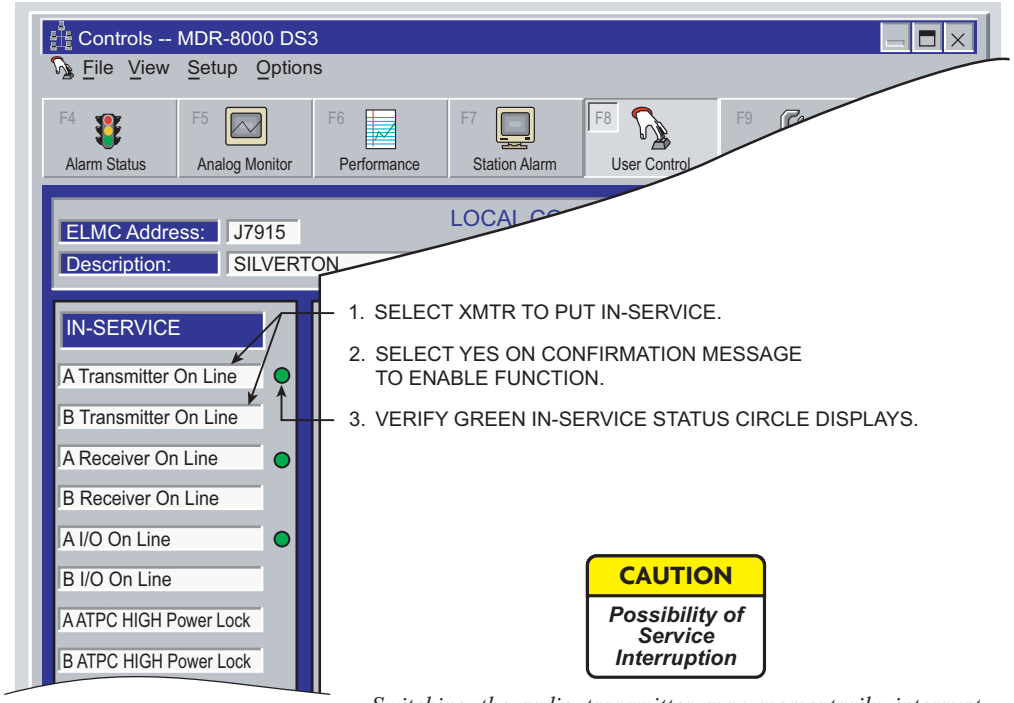


Figure 2-3 XMTR Manual Switch Using USI Control Screen

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.

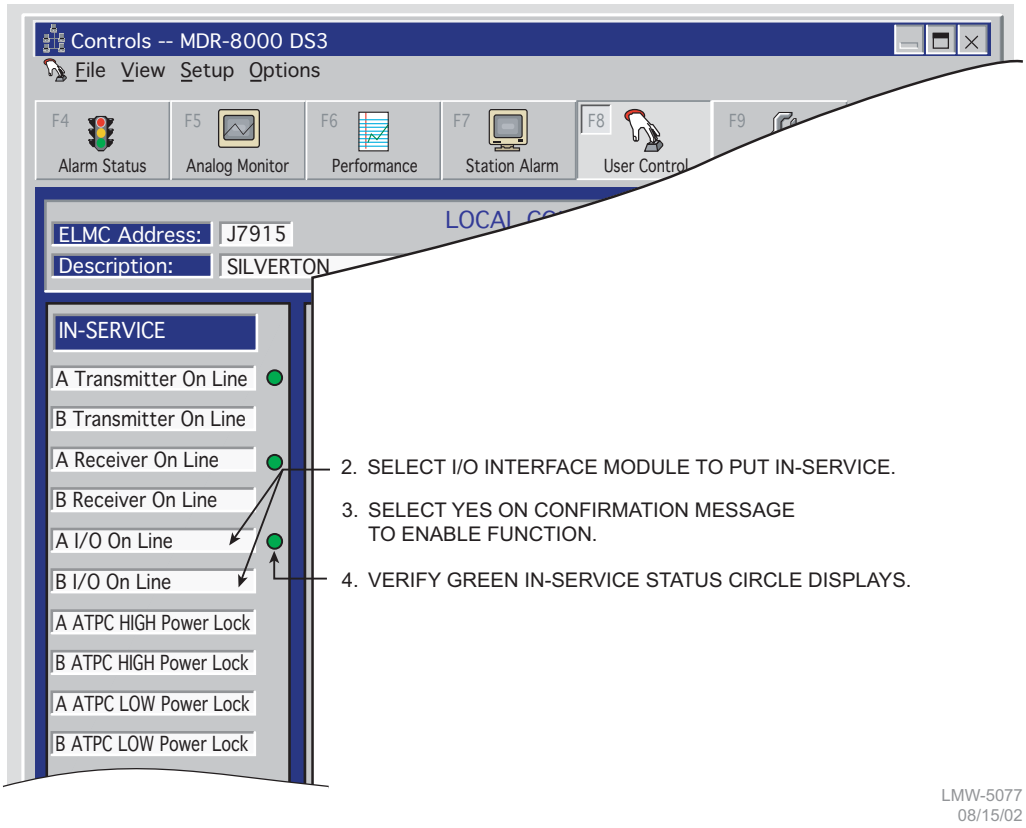


Figure 2-4 I/O Manual Switch Using USI Control Screen

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 the attached CD 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 attached CD 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 2-17. The figures are arranged in alphabetical order according to the type number. Current modules versions are illustrated. Refer to CD for older versions.

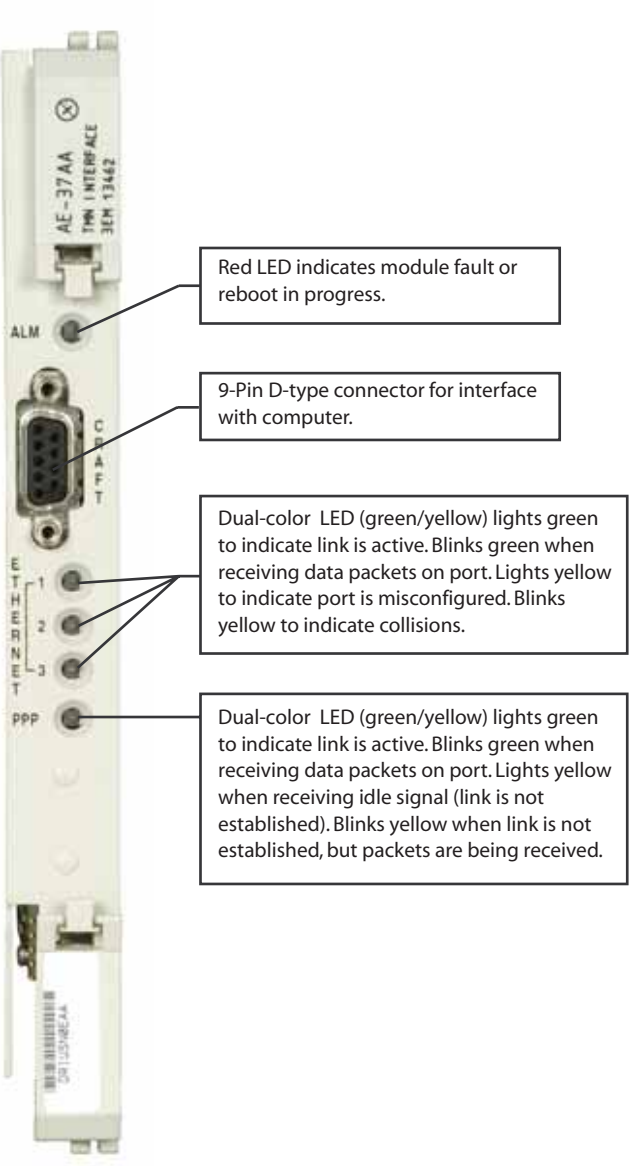


Figure 2-5 AE-37AA TMN Interface Module Controls, Indicators, and Connectors (Sheet 1 of 2)

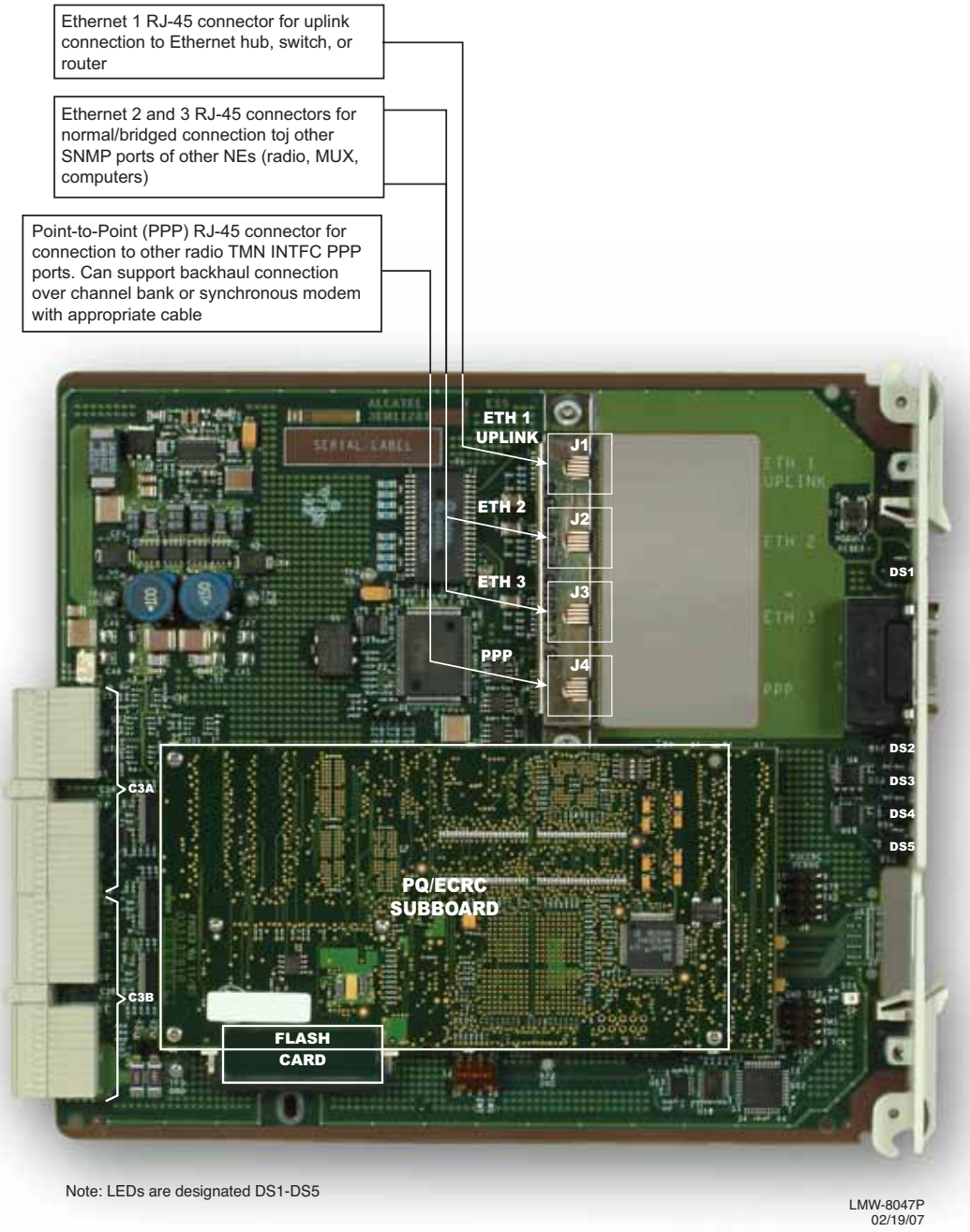


Figure 2-5 AE-37AA TMN Interface Module Controls, Indicators, and Connectors (Sheet 2 of 2)

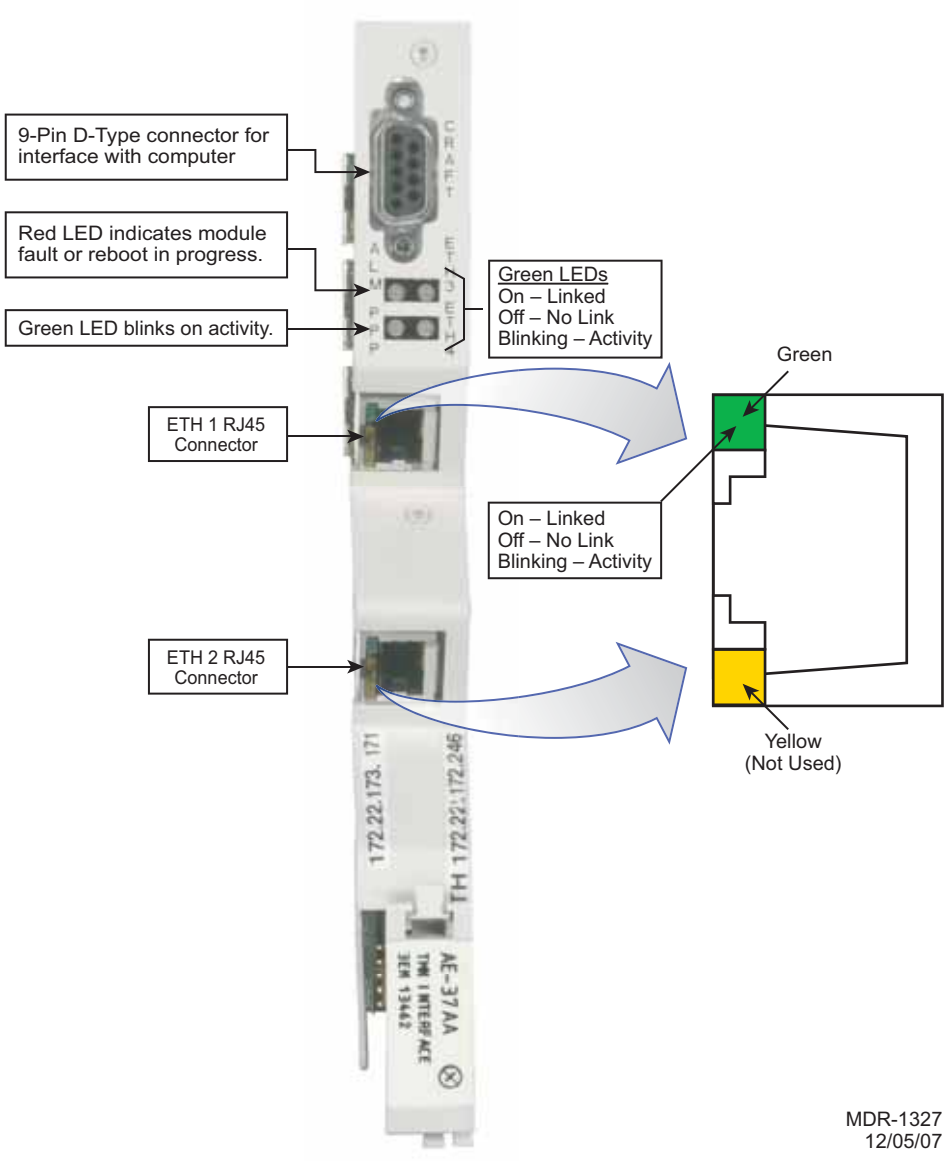
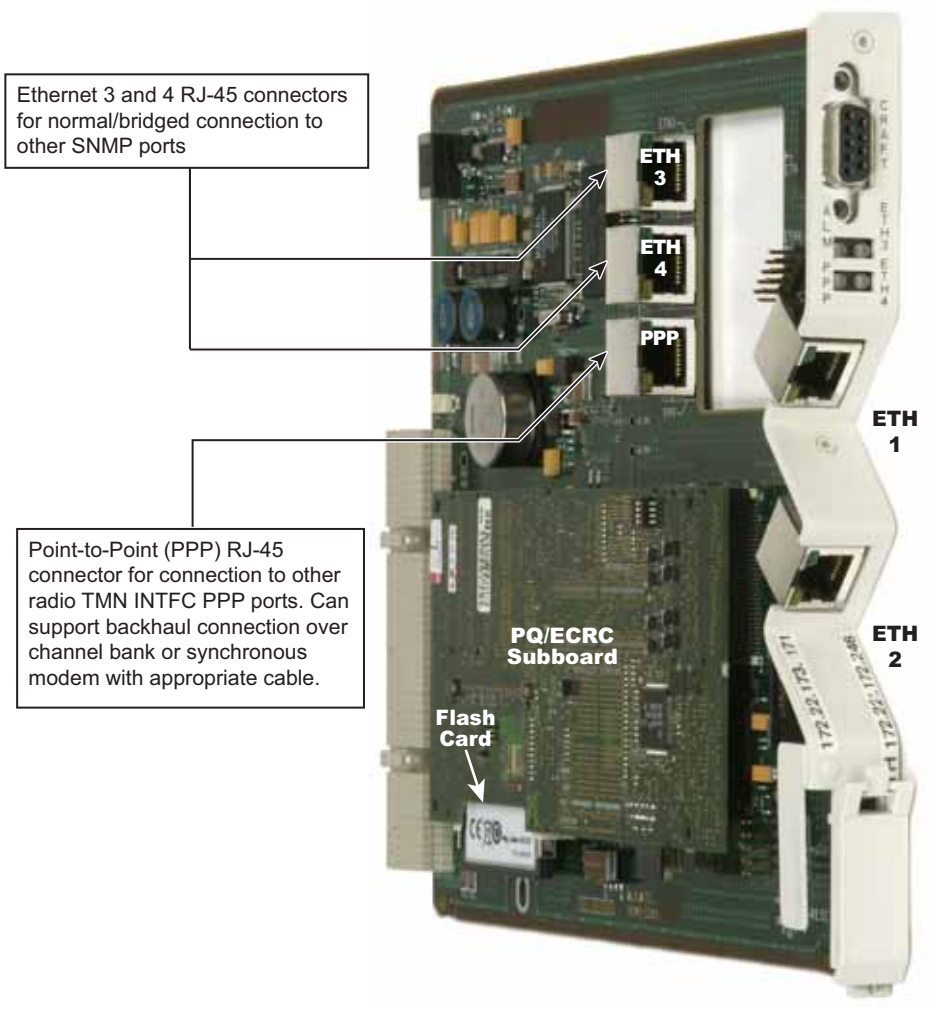


Figure 2-6 AE-37AA TMN Interface Module (PN 3EM13462AB) Controls, Indicators, and Connectors (Sheet 1 of 2)



Note: LEDs are designated DS1-DS5.

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Figure 2-6 AE-37AA TMN Interface Module (PN 3EM13462AB) Controls, Indicators, and Connectors (Sheet 2 of 2)

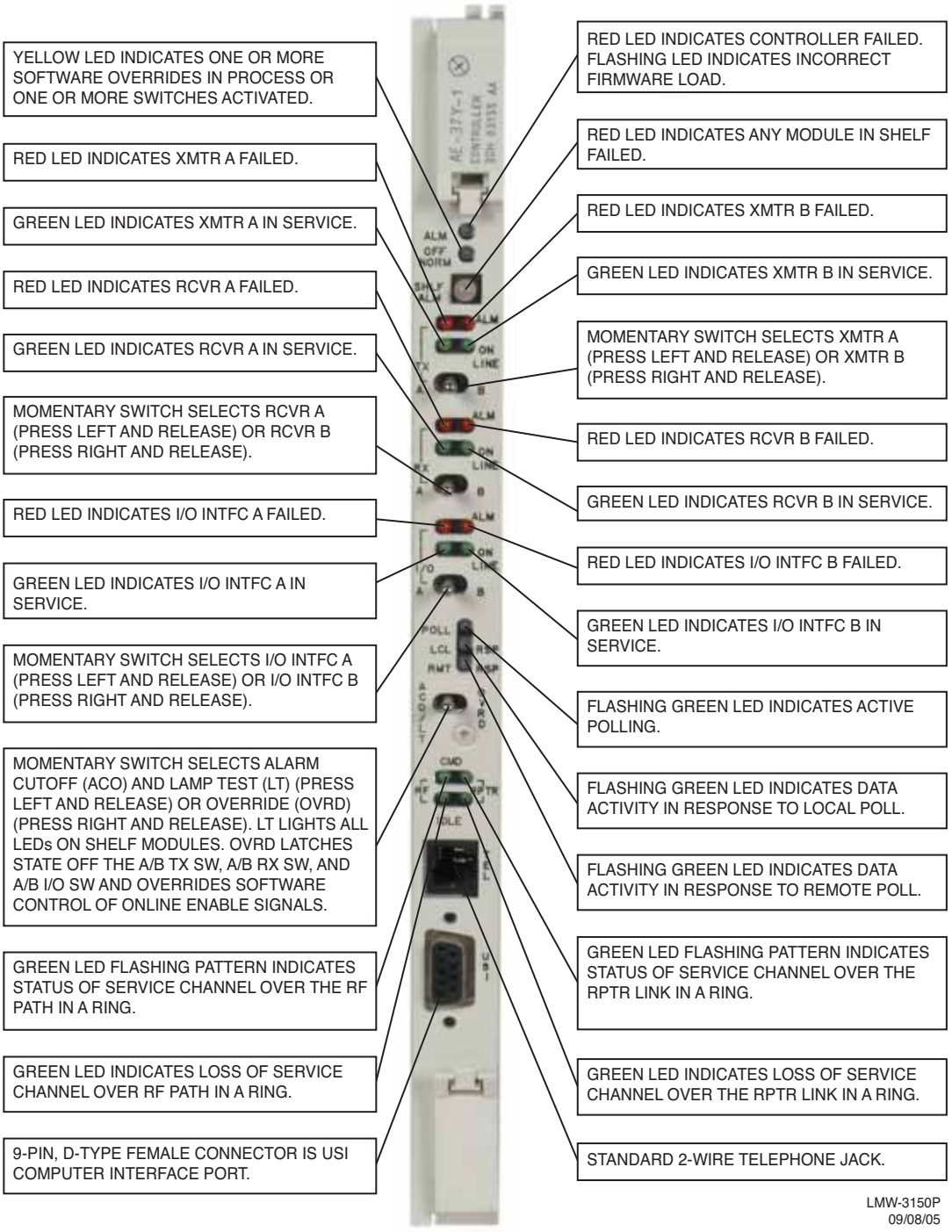


Figure 2-7 AE-37( ) Controller Controls, Indicators, and Connectors (Sheet 1 of 2)

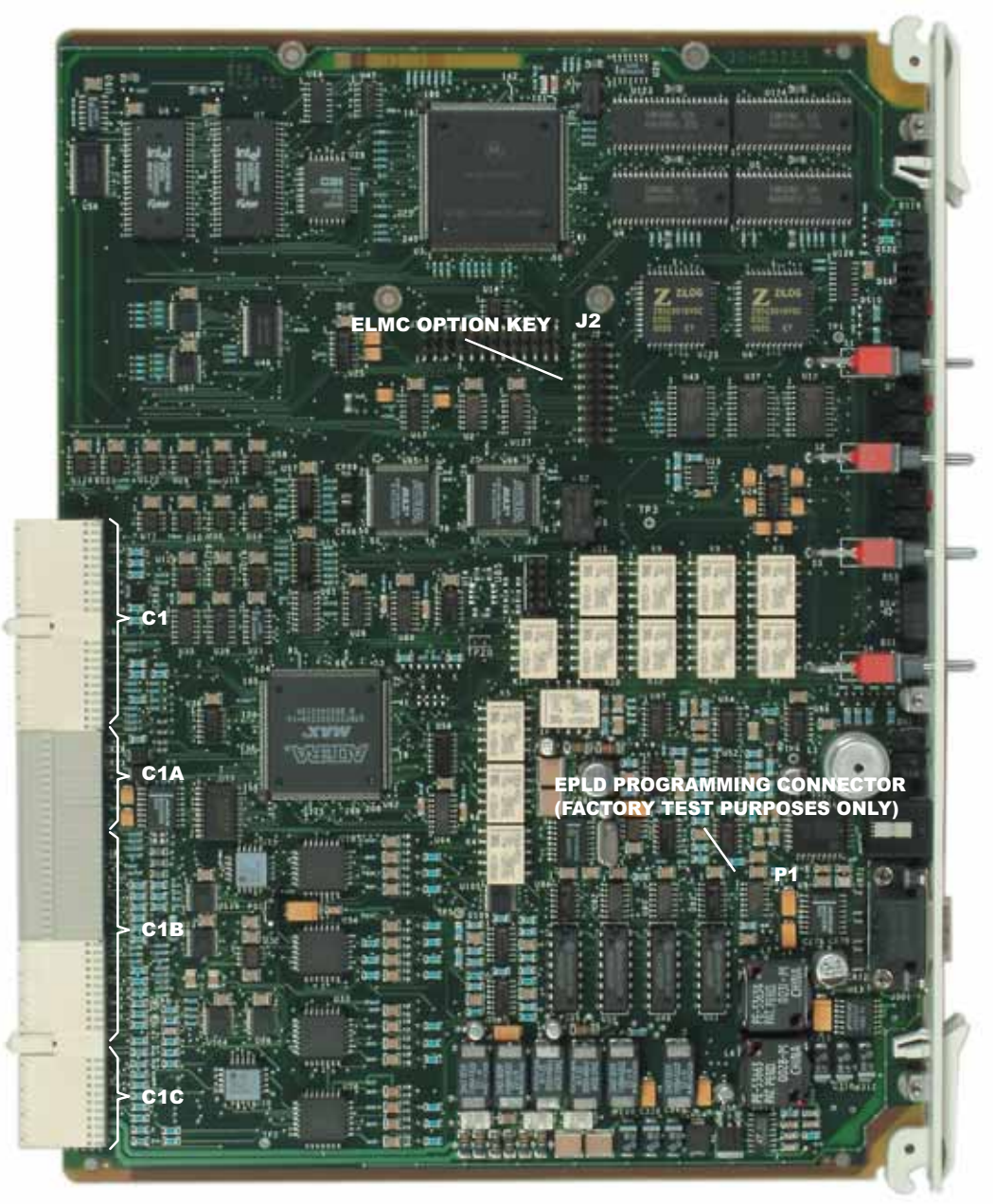
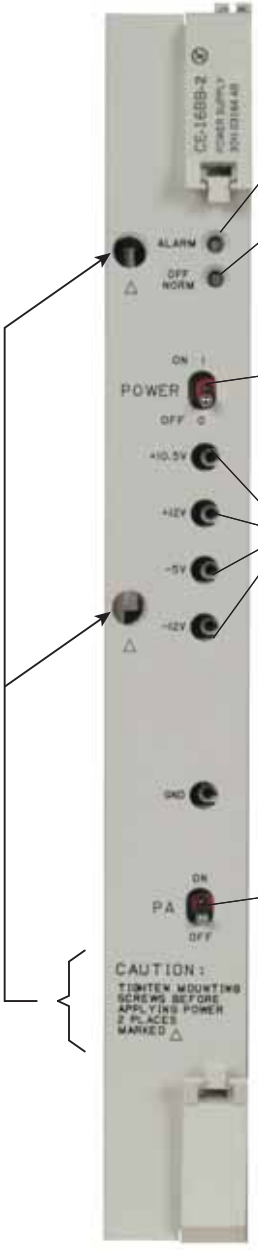


Figure 2-7 AE-37( ) Controller Controls, Indicators, and Connectors (Sheet 2 of 2)



RED LED INDICATES INTERNAL FAILURE OR BLOWN FUSE.

YELLOW LED INDICATES PA ON/OFF SWITCH IS SET TO OFF (LED IS LABELED **OFF NORM** ON OLDER VERSIONS OF POWER SUPPLIES).

2-POSITION TOGGLE SWITCH APPLIES POWER TO POWER SUPPLY (**ON 1**) OR REMOVES POWER (**OFF 0**).

FACTORY TEST POINTS FOR POWER SUPPLY VOLTAGES.

Note

Power Supply versions 3DH03164ABAB and 3DH03164ABAD do not require mounting to the shelf heat sink and therefore have no screw holes on the front panel. All other versions have mounting screw holes on the front panel.

2-POSITION TOGGLE SWITCH APPLIES POWER TO PA (IF EQUIPPED) (**ON**) OR REMOVES POWER (**OFF**).

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Figure 2-8 CE-16BB Power Supply Controls, Indicators, Test Points, and Connectors (Sheet 1 of 2)

SIDE VIEW OF POWER SUPPLY

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Figure 2-8 CE-16BB Power Supply Controls, Indicators, Test Points, and Connectors (Sheet 2 of 2)

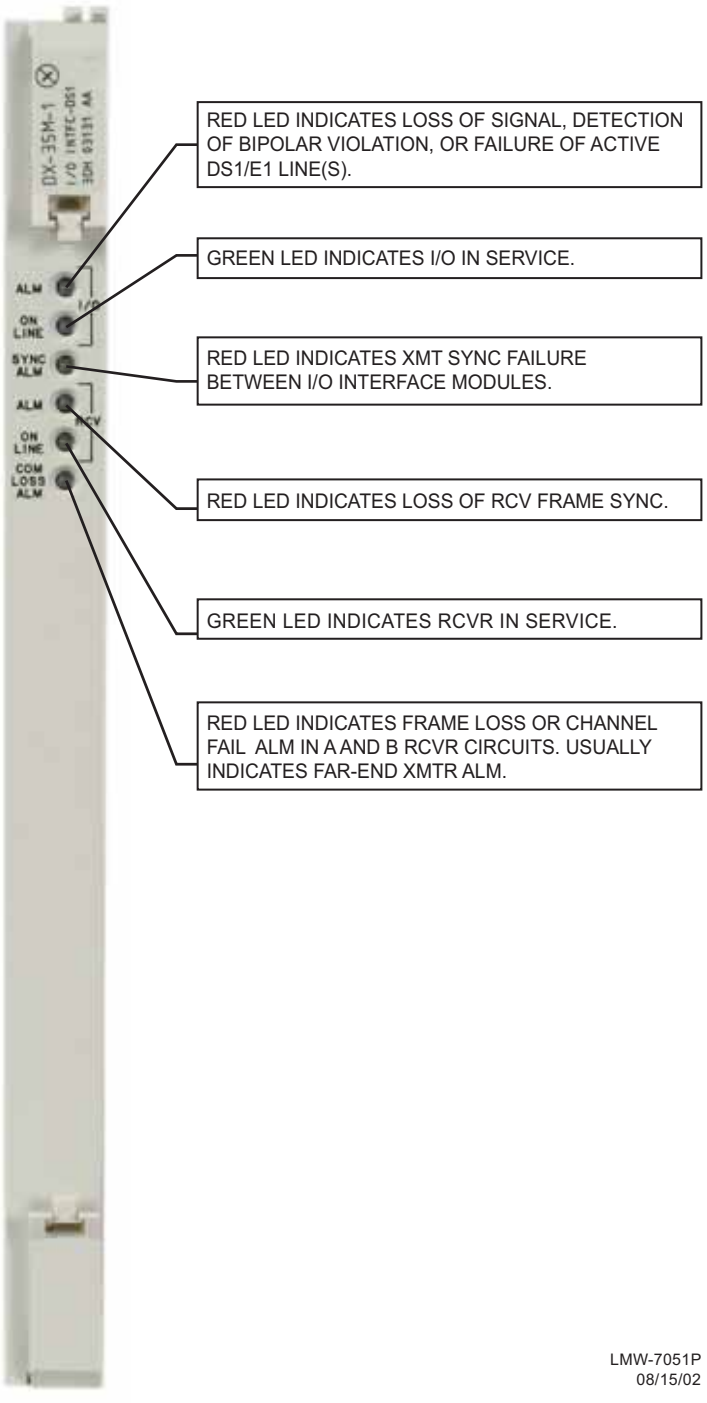


Figure 2-9 DX-35M DS1 I/O Interface Controls and Indicators

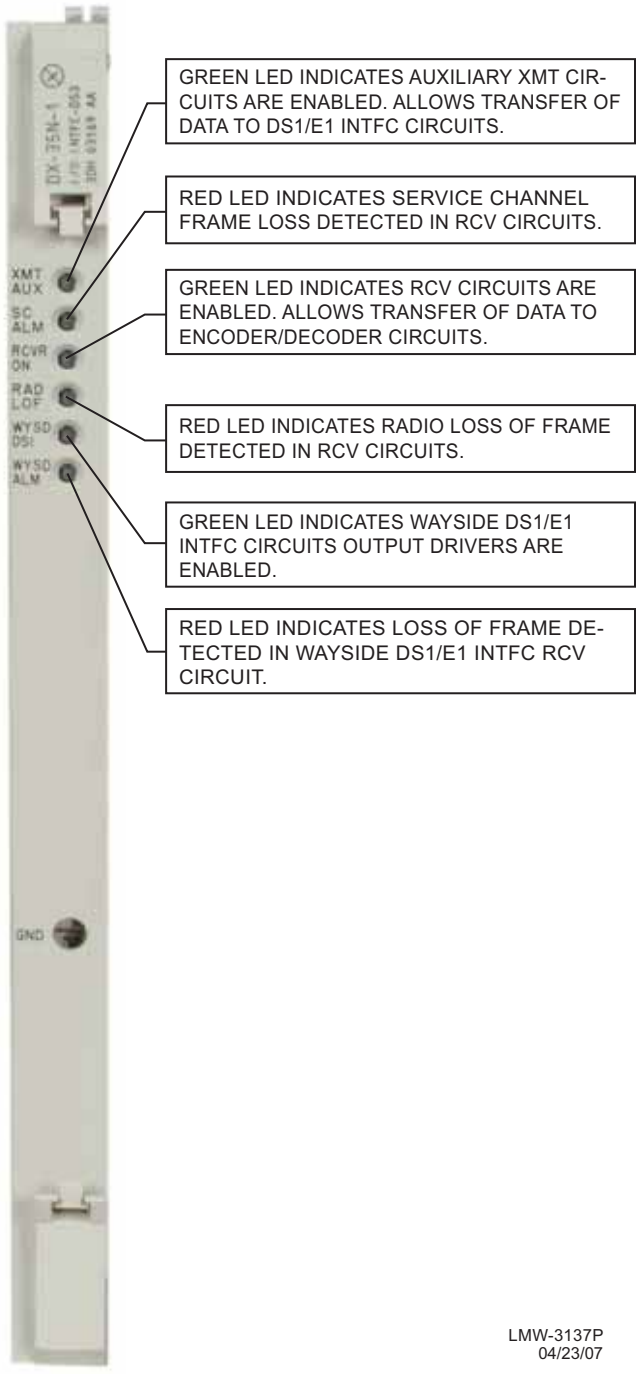


Figure 2-10 DX-35N DS3 I/O Interface Controls and Indicators

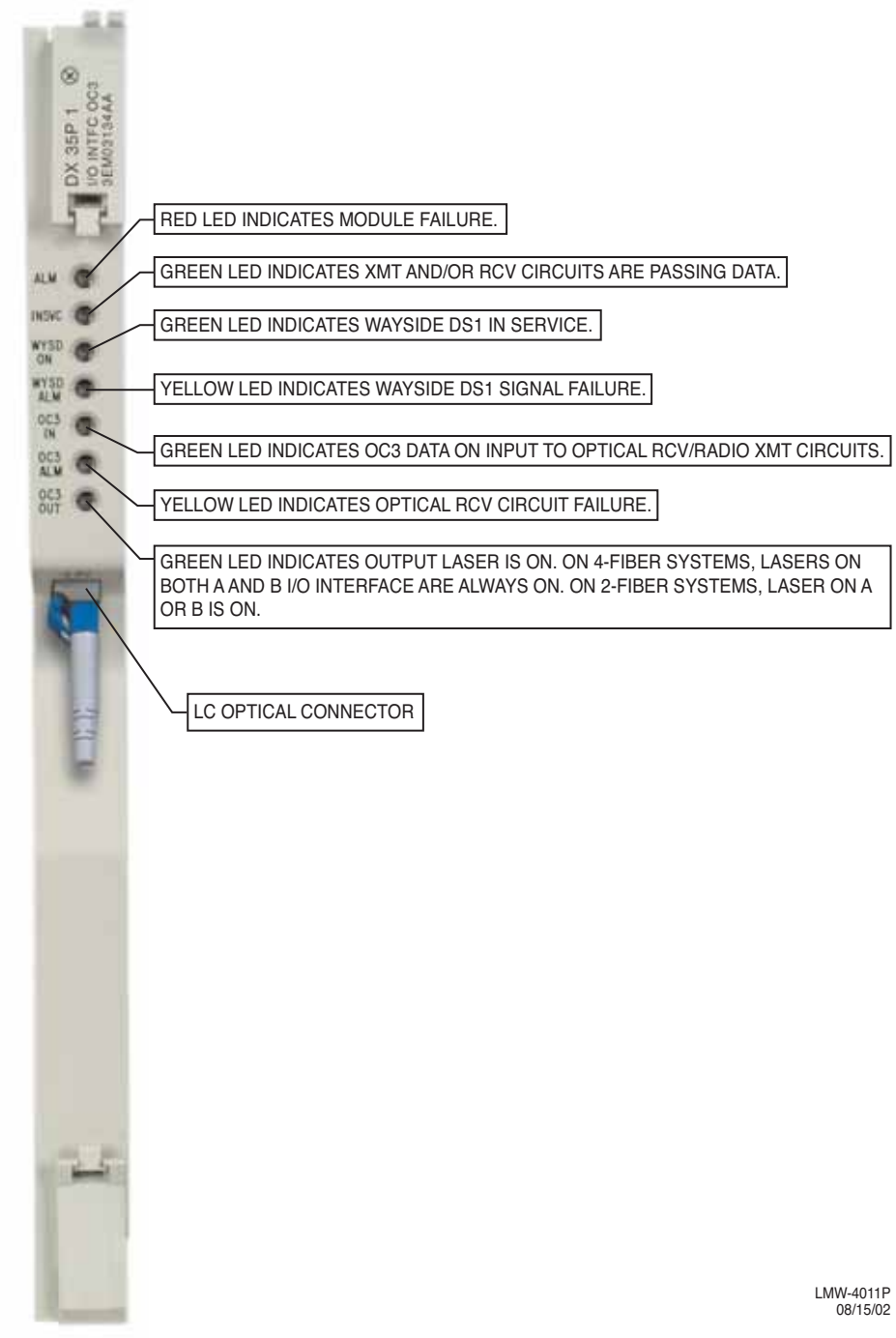


Figure 2-11 DX-35P OC3 I/O Interface Controls and Indicators

DX-35R-2 (DX-35R-1 is not shown).

Note

Both the Ethernet and optical ports can be connected for backup protection. Only one port is active. When both are connected, the optical port has priority over the Ethernet port and will remain the active port unless a failure occurs.

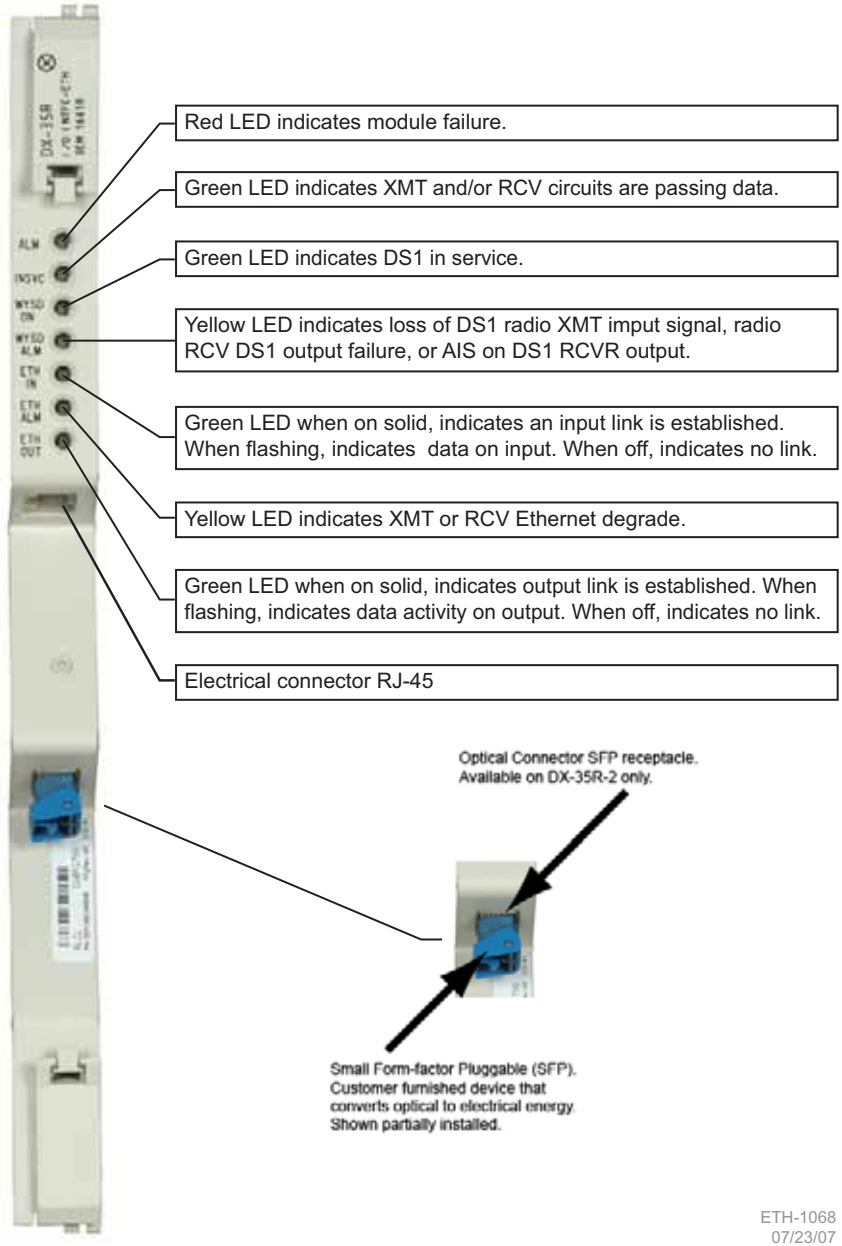


Figure 2-12 DX-35R/S ETH I/O Interface Controls and Indicators

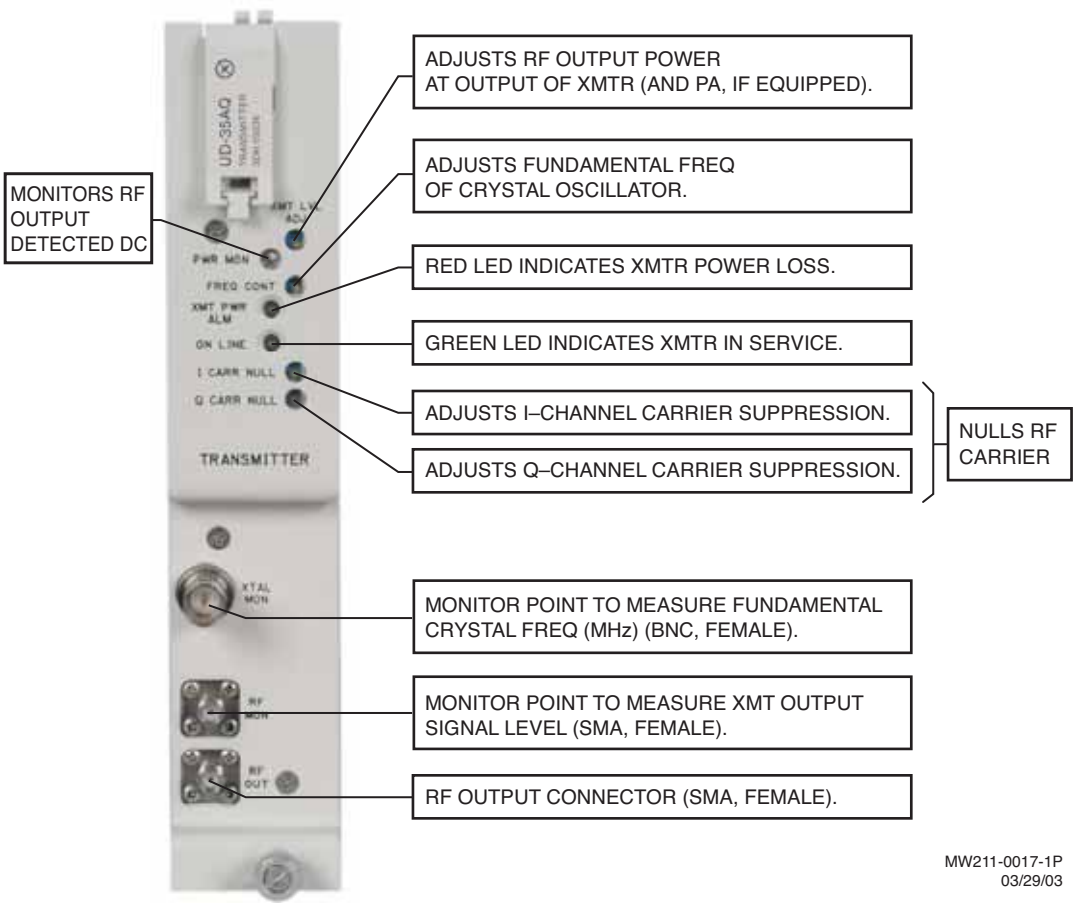


Figure 2-13 UD-35( ) Transmitter Controls, Indicators, Test Points, and Connectors

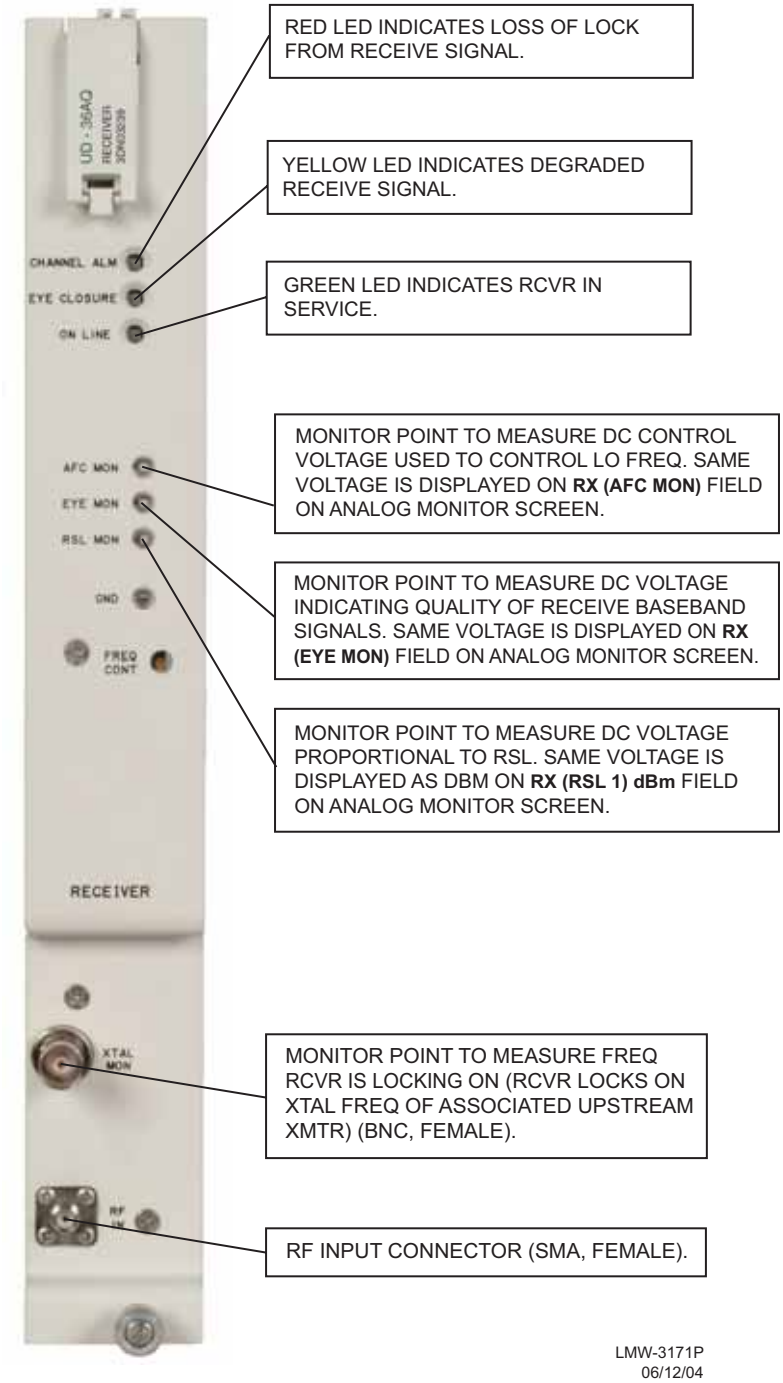


Figure 2-14 UD-36( ) DS1/E1/DS3/OC3 Single Receiver Controls, Indicators, Test Points, and Connectors

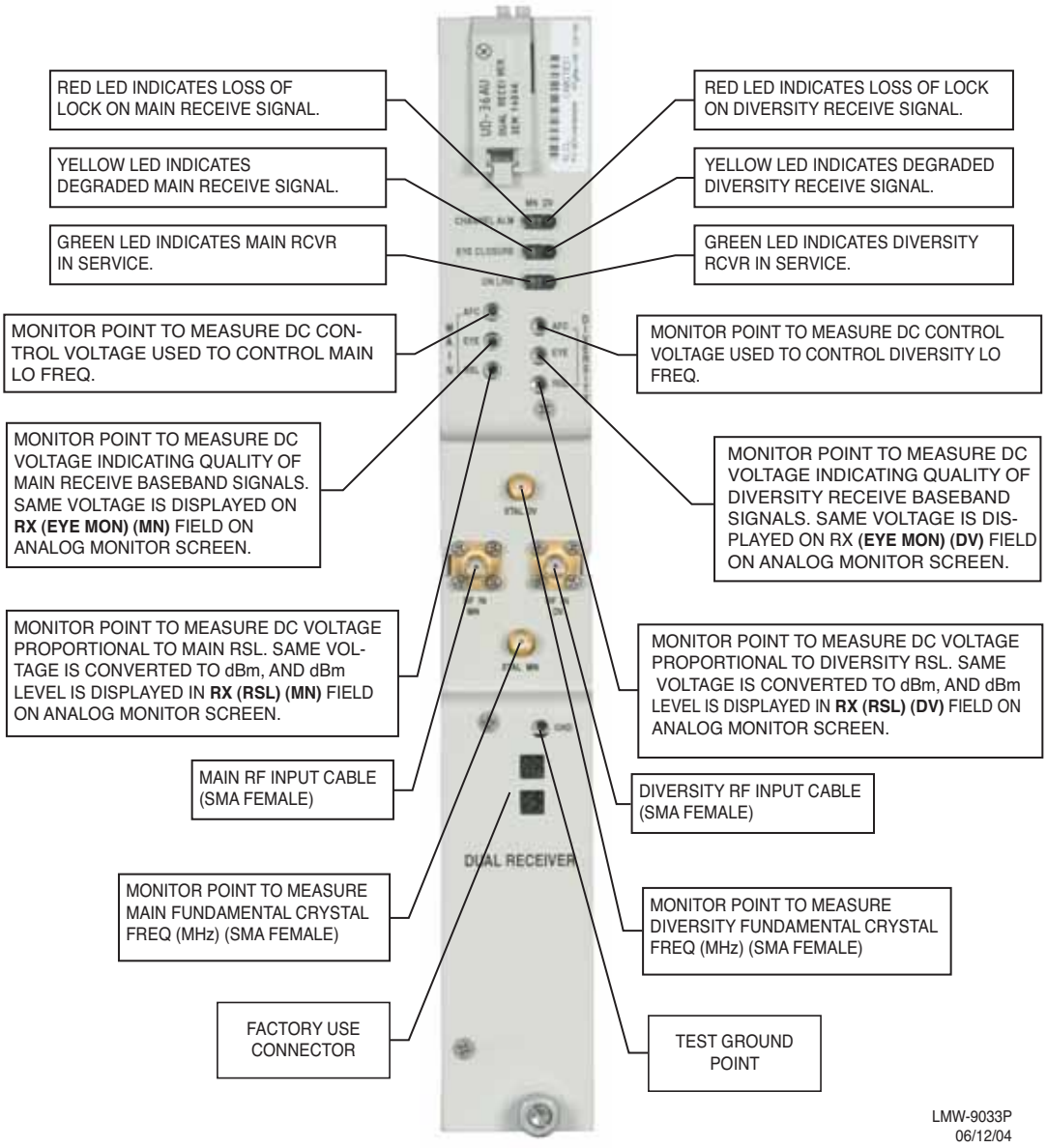


Figure 2-15 UD 36( ) Dual Receiver Controls & Indicators, Test Points and Connectors

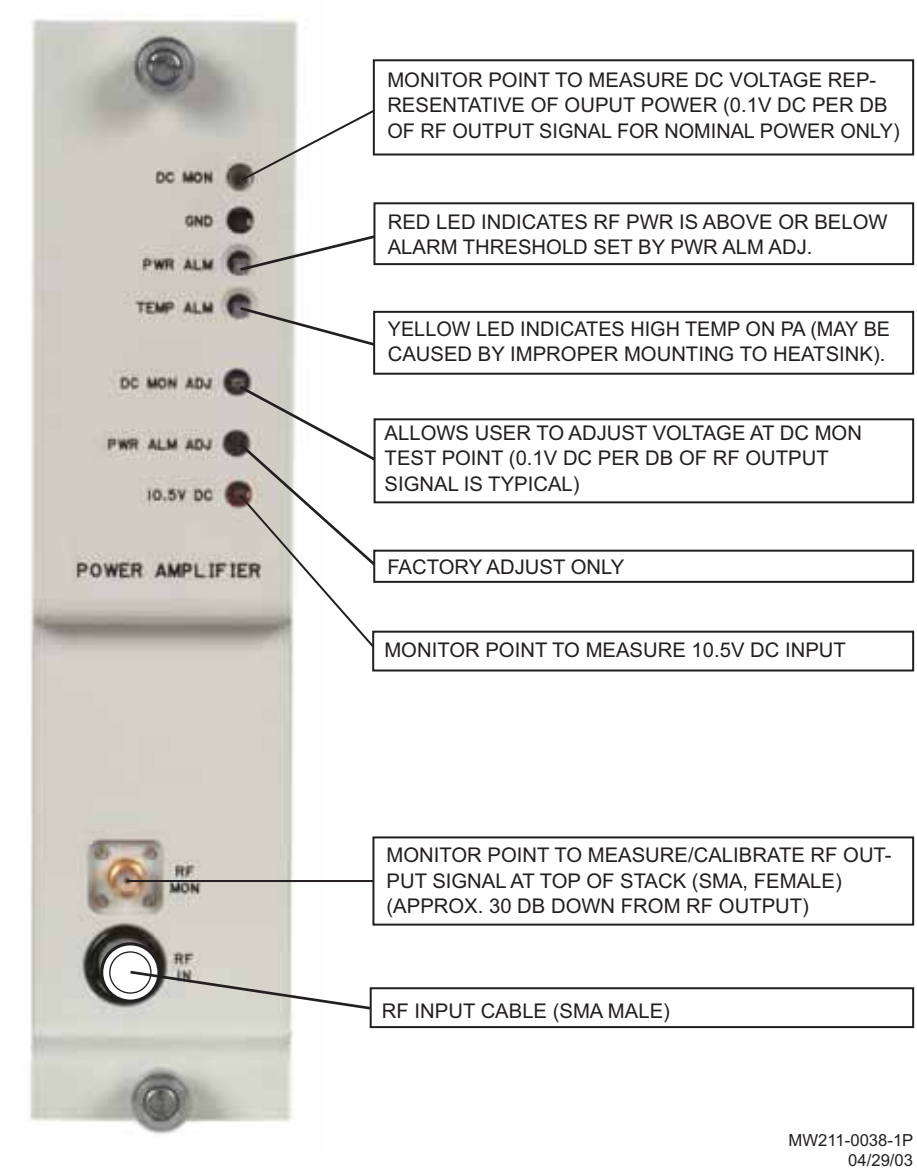


Figure 2-16 UD-51() Power Amplifier Controls, Indicators, Test Points, and Connectors

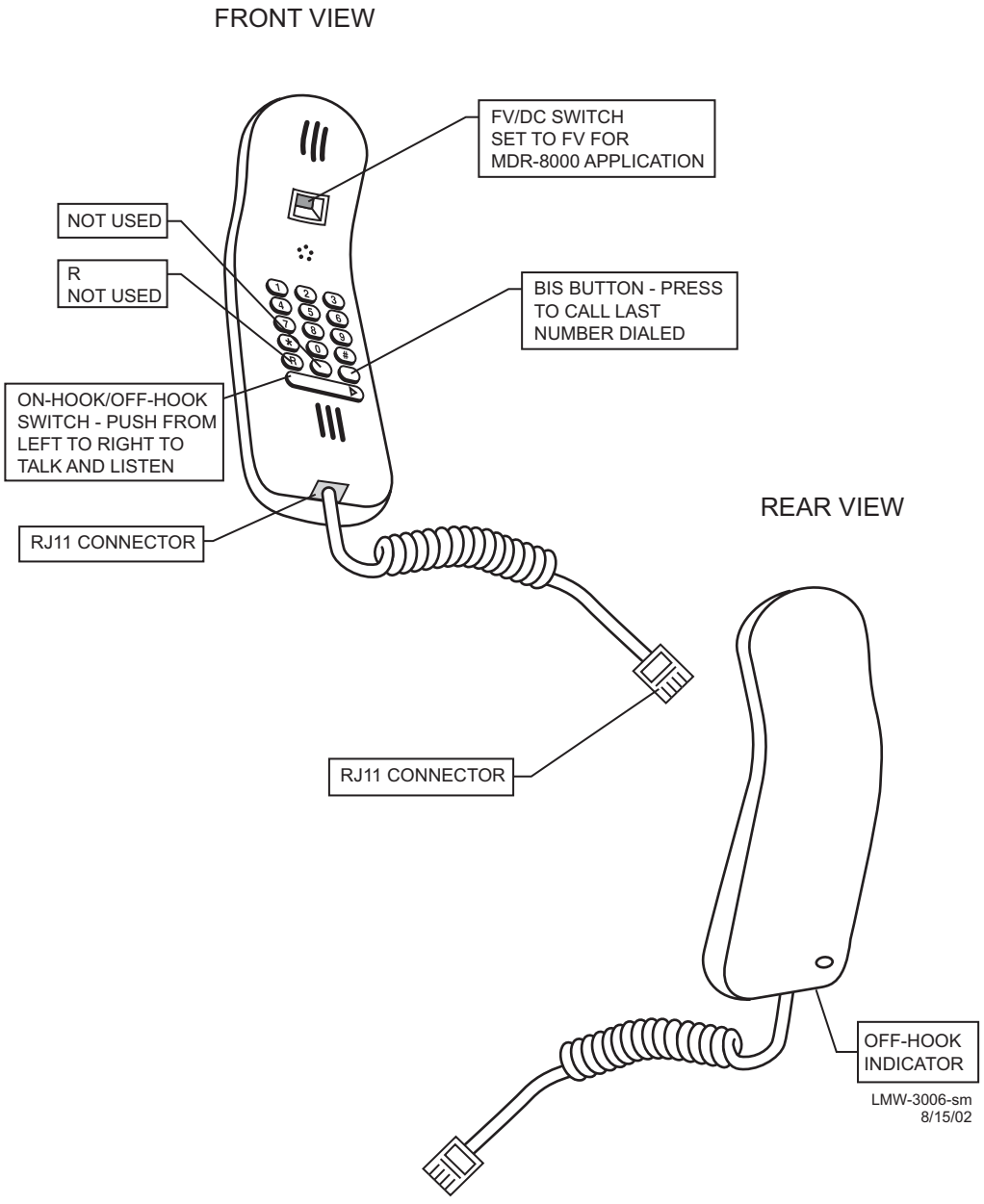


Figure 2-17 Handset Controls, Indicators, Test Points, and Connectors

Note

The information contained in this section is a summary of the section with the same title, but not the same section number, on the enclosed CD. "Refer to CD" is used throughout this section to refer the reader to the detail information on the CD. Go to this section on the CD for interactive links to the detail information referred to in this section.

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 the MDR-8000 hot-standby shelf. Refer to CD for similar installation information for the Compact radios.

3.2 POWER CABLE CONNECTION

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.

WARNING

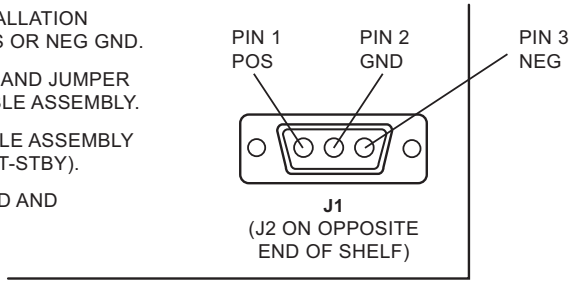
Possibility of Damage to Equipment

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.



REAR VIEW OF SHELF

WARNING

Possibility of Damage To Equipment

To prevent connector damage and improper wiring, ensure power cable mating connector is properly oriented and aligned with shelf connector before attempting to seat connectors.

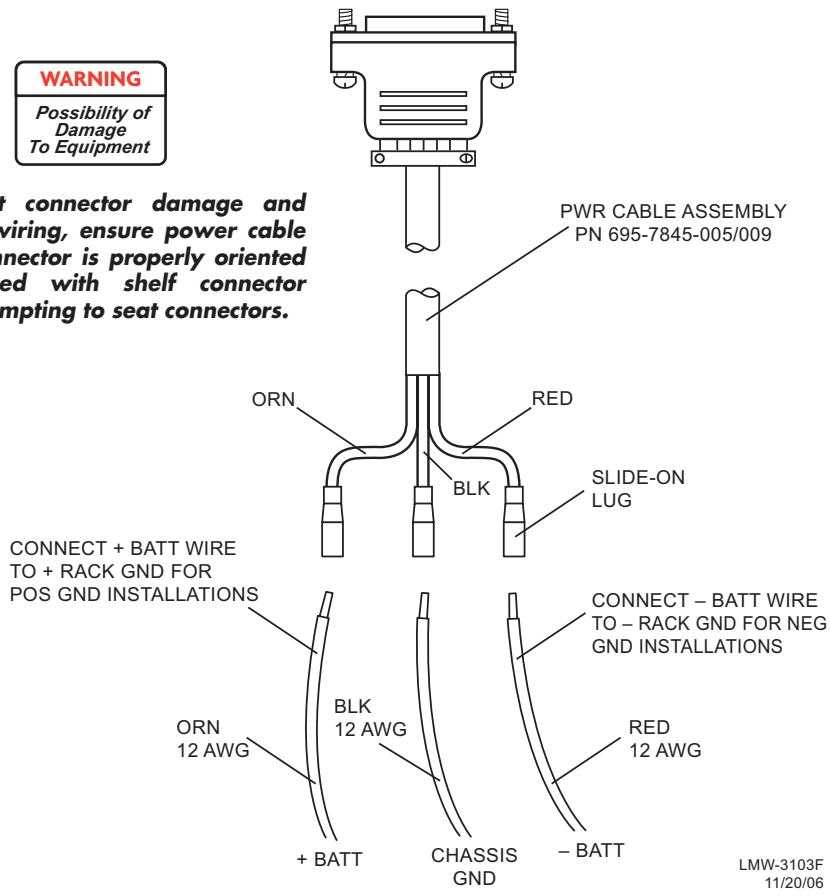


Figure 3-1 Power Cable Connection

3.3 PDU STRAPPING AND CONNECTIONS

See Figure 3-2 for strapping and connections for PDU PN 3EM13317AA. For strapping and connections for PDU PN 695-6200, Refer to CD.

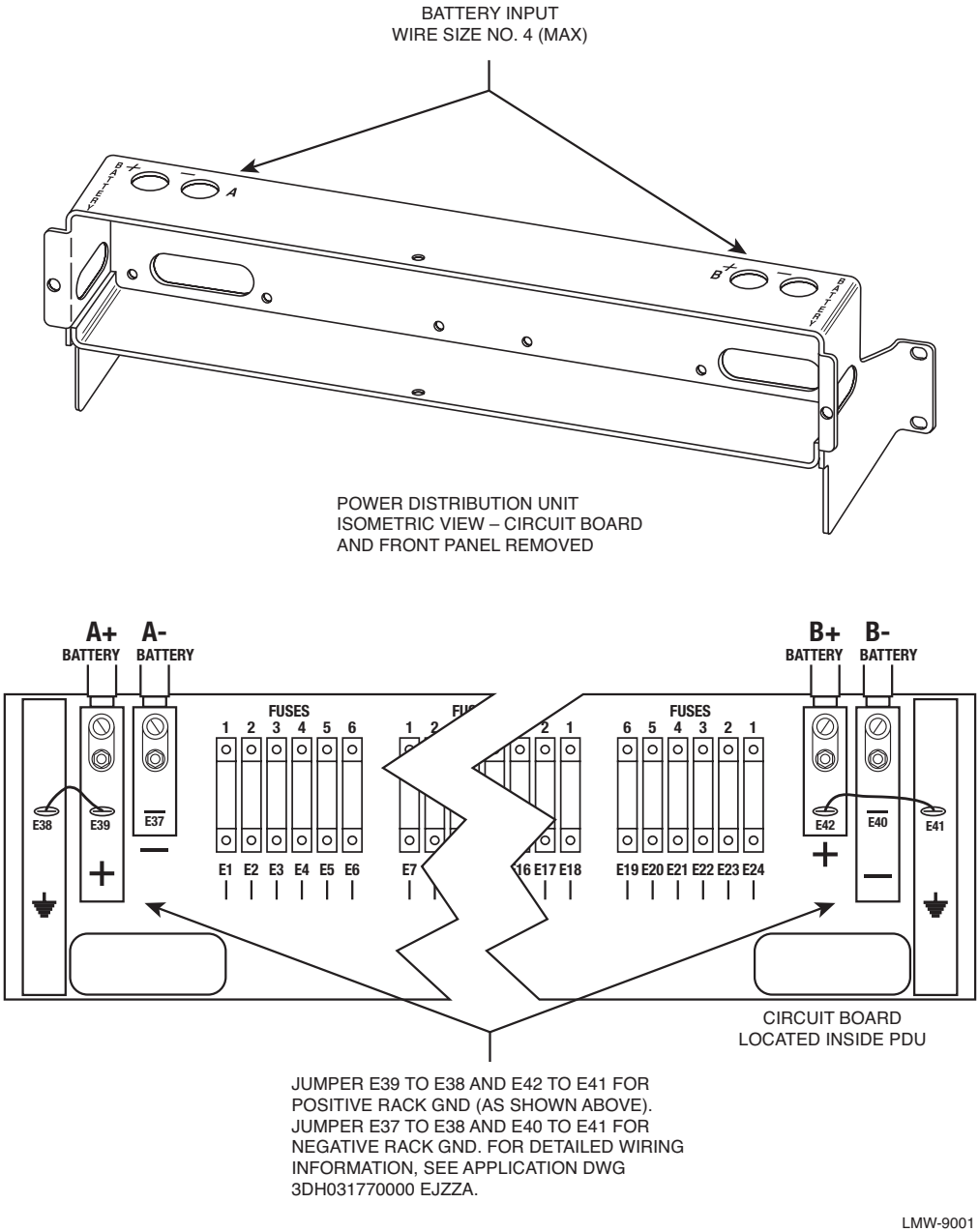


Figure 3-2 PDU Strapping and Connections

3.4 SHELF/RACK ALARM CONNECTION

The PDU, PN 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 for shelf to PDU alarm wiring for PDU PN 3EM13317AA. For shelf to PDU alarm wiring for PDU PN 695-6200, Refer to CD.

3.5 MDR-8000 SYNCHRONOUS REPEATER CONNECTIONS

The following paragraphs describe the cabling and limitations involved with carrying MDR-8000 service channel information across two (2) back-to-back radio terminals at a repeater site. In this document, the term synchronous indicates that the clocks of the two radios are locked together. **Synchronous, in this document, has absolutely nothing to do with whether or not the radios are transporting synchronous (SONET or SDH) data.**

Where allowed, only two radios can be tied together synchronously. In scenarios where there are three (3) radios (or some other odd number of radios), the third radio must be clocked independently or asynchronously from the first two.

Note

Multiple service channel functions [i.e., orderwire, fault alarm, RS-232 and extended link monitor channel (ELMC) data] can be carried across a common synchronous repeater cable. When asynchronous connections are required between radios, each service channel function (i.e., orderwire, fault alarm, ELMC, etc.) must be carried across its own independent cable.

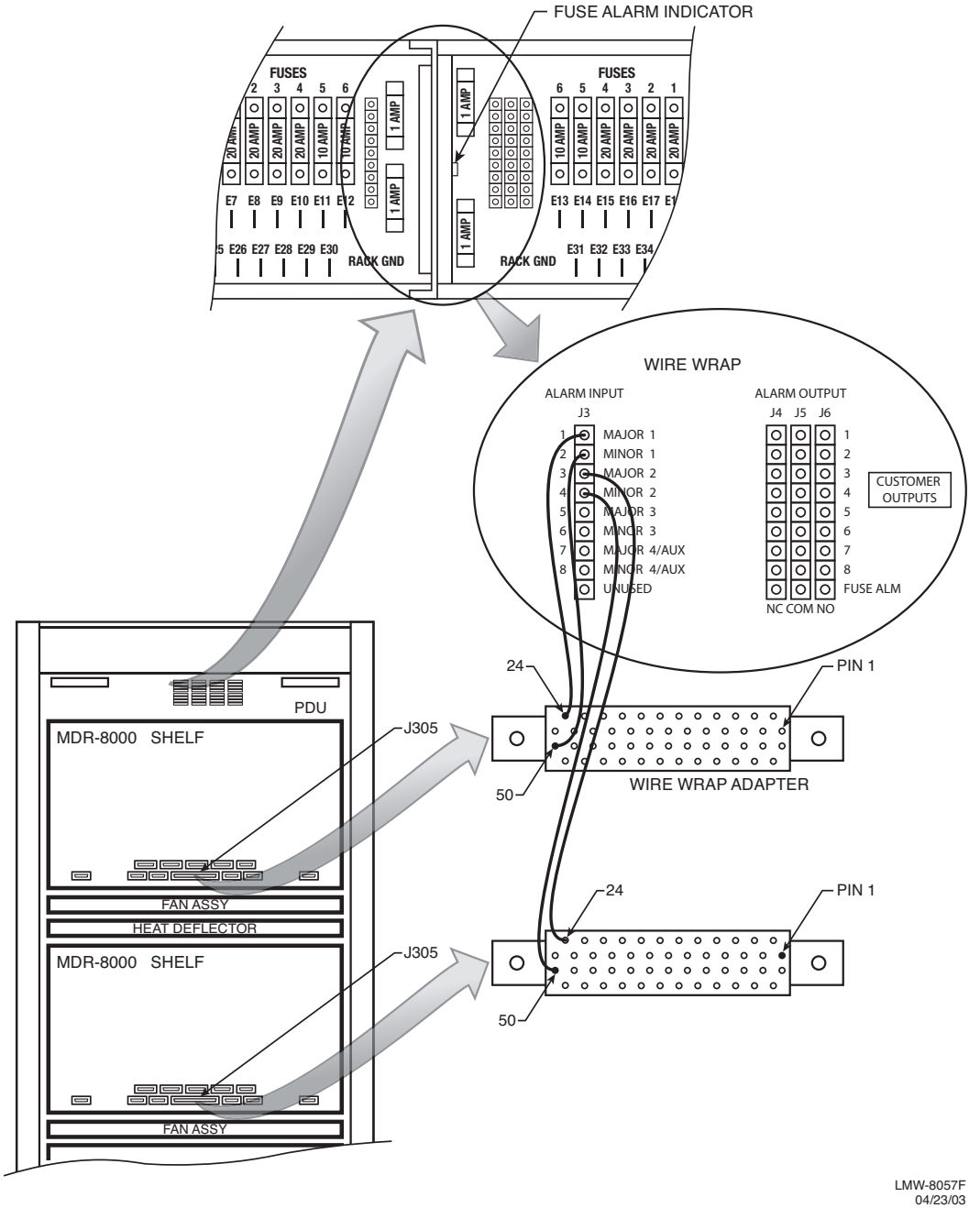


Figure 3-3 Shelf Alarm Wiring PDU (3EM13317AA

3.5.1 Low Capacity DS1 Radios

The MDR-8000 synchronous repeater connection J314 in a low capacity DS1 radio is used to pass orderwire, fault alarm, ELMC, **and DS1** traffic between two (2) back-to-back low capacity terminals over a common cable. The framing structure of the X/Y rail pairs being passed over the synchronous repeater cable are the same for radios equipped to transport 4, 8, 12, or 16 DS1s but unique for 2 DS1. Because of the difference in frame structure, **a radio configured to transport 2 DS1 radio can only be connected via the J314 synchronous repeater cable to another 2 DS1 radio.** There are no restrictions with any combinations of capacity above 2 DS1. Connections for the service channels from a radio configured for 2 DS1 to a radio configured for 4, 8, 12, or 16 DS1s must be interconnected asynchronously.

Note

The DS1 version of the radio is the only one that can pass its "through" traffic across the synchronous repeater cable.

Note

The E1 version of the radio uses all of the same components as the DS1, with the exception of the capacity keys and LBOs. Therefore, its operation is virtually identical to the DS1. However, an E1 radio cannot be configured as a synchronous repeater with a DS1 radio.

3.5.2 High Capacity DS3 Radios

The MDR-8000 synchronous repeater connection J401 in a high capacity DS3 radio is used to pass orderwire, fault alarm and ELMC data between two (2) back-to-back high capacity terminals over a common cable. The frame structure of the data transported over the synchronous repeater cable on radios configured to transport 1 or 3 DS3 is the same for both capacities. Repeater connections using J401 between a radio configured for 1 DS3 and a radio configured for 3 DS3s is allowed. **Repeater connections between a radio configured for DS1 or OC3 capacities to a radio configured for DS3 capacities using J314 to J401 or J203 to J401 are not allowed.** Connections between a radio configured for DS1, E1, or OC3 capacities and a radio configured for DS3 capacities must be interconnected asynchronously.

3.5.3 High Capacity OC3 Radios

The MDR-8000s synchronous repeater connection J203 in a high capacity OC3 radio is used to pass orderwire, fault alarm and ELMC data between two (2) back-to-back high capacity terminals over a common cable. The orderwire, fault alarm and ELMC data is multiplexed together into a standard T1. The multiplexed T1 data is the same for either version of the OC3 radio, 10 MHz/1STS-1 or 30 MHz/3STS-1 payload. Therefore, repeater connections using J203 between a radio configured for 1 STS-1 and a radio configured for 3 STS-1s is allowed. Repeater connections between an OC3 version of the radio and a non-OC3 version of the radio using J203 to J314 or J203 to J401 are not allowed. Connections between a radio configured for OC3 capacities and a radio configured for DS1 or DS3 capacities must be interconnected asynchronously.

Note

Having the radio overhead multiplexed together into a standard T1 also allows the overhead to be transported over non-Alcatel radio facilities (i.e., channel banks, fiber optic terminals, or no-Alcatel radio equipment). This feature is extremely useful in SONET rings where part of the ring will be MDR-8000s OC3 radio and part will be SONET fiber equipment.

3.5.4 MDR-8000 Synchronous Repeater Compatibility Matrix

Table 3-1 lists the combinations of MDR-8000 capacities that support the use of the synchronous repeater cable.

Table 3-1 Synchronous Repeater Compatibility

Radio #1 Capacity	Radio #2 Capacity								
	DS1					DS3		OC3	
	2	4	8	12	16	1	3	10 MHz	30 MHz
2 DS1	X								
4 DS1		X	X	X	X				
8 DS1		X	X	X	X				
12 DS1		X	X	X	X				
16 DS1		X	X	X	X				
1 DS3						X	X		
3 DS3						X	X		
OC3 (10 MHz)								X	X
OC3 (30 MHz)								X	X

X denotes allowable combinations of use

3.5.5 MDR-8000 Synchronous Repeater Cables

Refer to Table 3-2.

Notes:

1 For both High and Low capacity applications, refer to drawing number 3DH031770000EJZZA for the specific cable connections.

2 The MDR-8000 Synchronous Repeater Cable part number is the same for both the DS1 and D3 versions of the radio. Refer to drawing number 3DH031770000BJZZA for cable dash numbers and lengths.

3 The MDR-8000 Synchronous repeater Cable for the OC3 version of the radio uses the same part number as the ELMC cable.

Table 3-2 Synchronous Repeater Cables

Capacity	Part Number	Designation	No. of Pins
DS1	695-7836-001/005	J314	50
DS3	695-7836-001/005	J401	50
OC3	695-4125-007/013	J203	9

3.6 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 3-3 for mating cable wiring and color code.

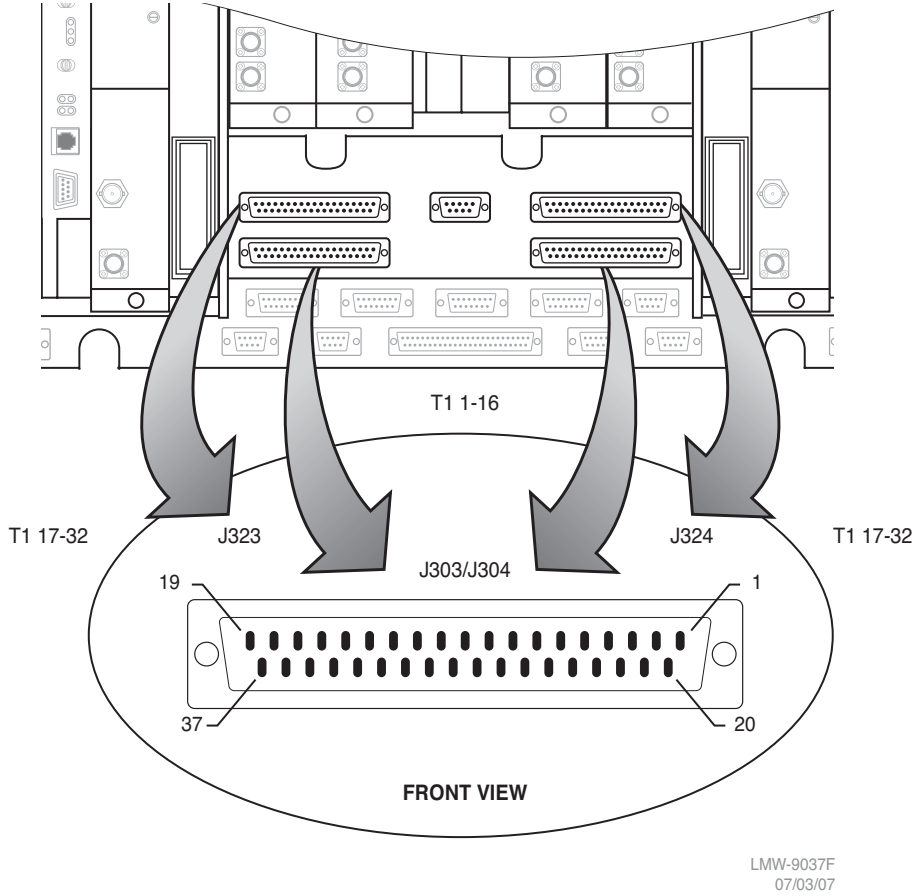


Figure 3-4 DS1 Connectors Location and Pinout

Table 3-3 DS1 IN J303 and DS1 OUT J304 Mating Cable

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	

3.7 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 Refer to 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)

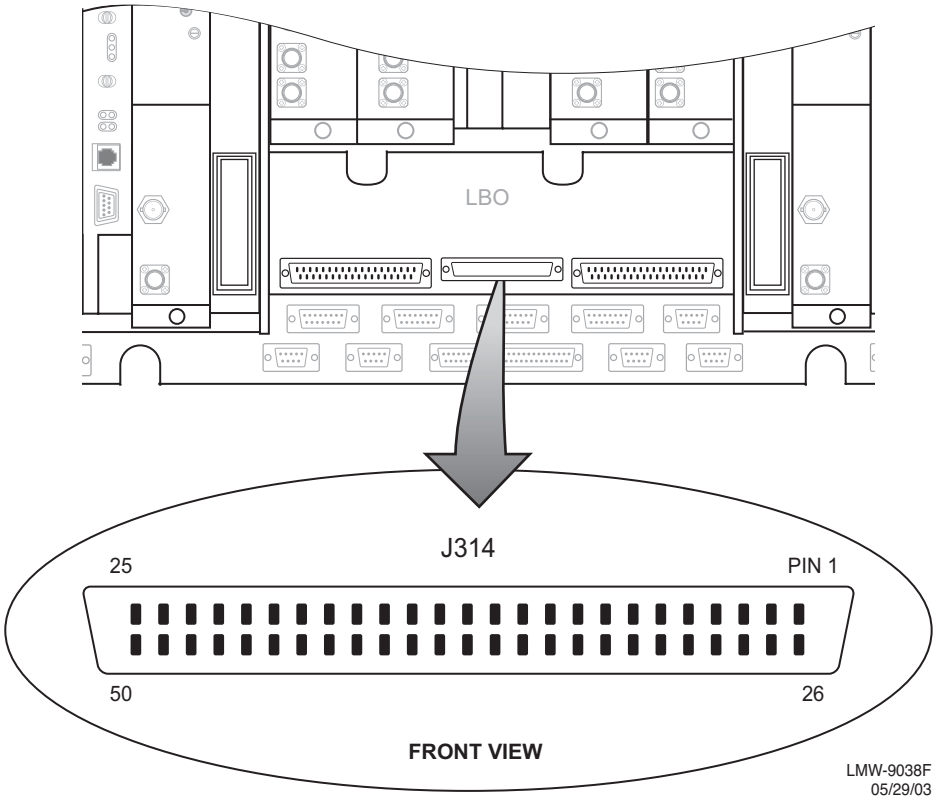


Figure 3-5 Connector J314 Location – DS1 LBO

3.8 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 3-4 for strapping requirements.

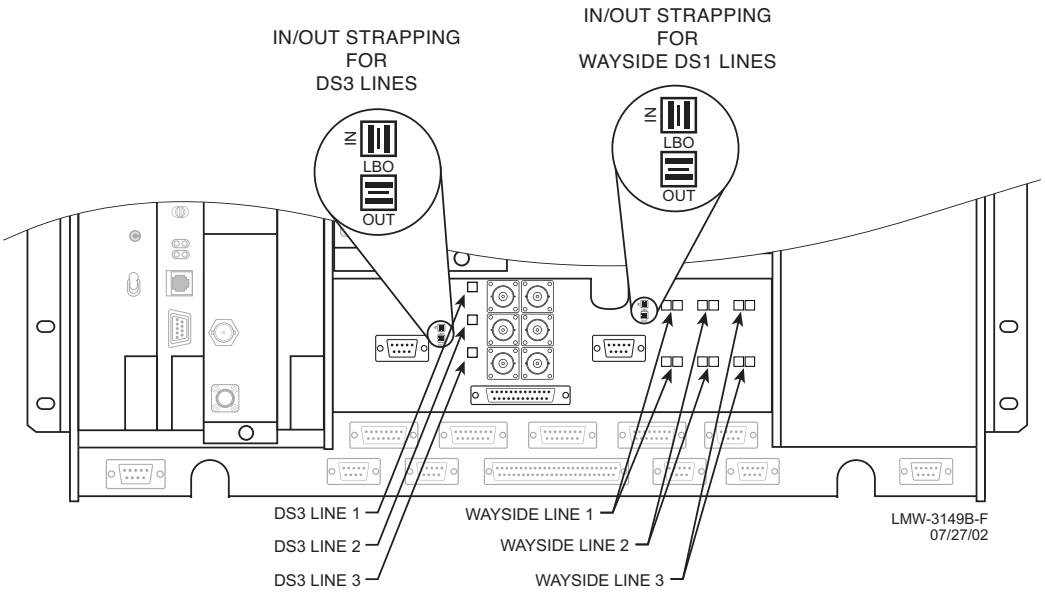


Figure 3-6 DS3 LBO Strapping

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 3-4 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

3.9 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 3-5 for locations. Refer to Table 3-5 for connections.

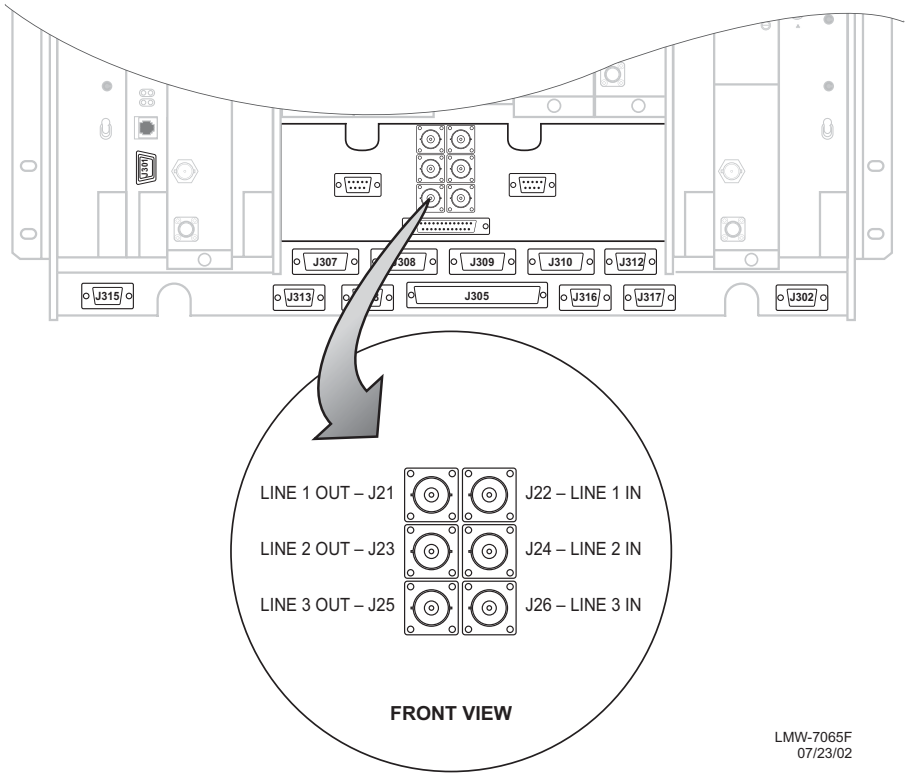


Figure 3-7 DS3 LBO DS3 Connectors Location

Table 3-5 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

3.10 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 3-6 for ELMC option key requirements for remote monitoring/controlling wayside DS1s.

Table 3-6 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

3.10.1 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 3-9 for shelf connector location and pinout. Refer to Table 3-7 for mating cable wiring and color code.

3.10.2 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 3-8 for Wayside DS1 repeater interconnect.

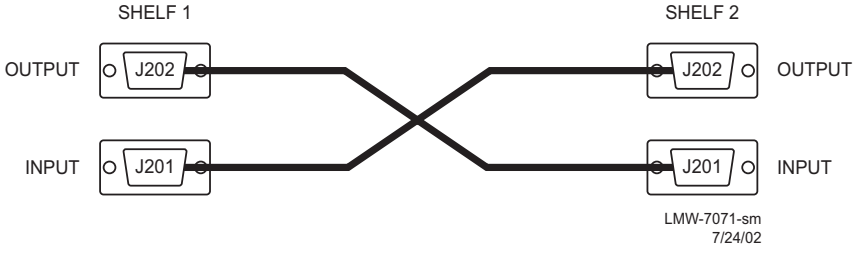


Figure 3-8 Wayside DS1 Repeater Interconnect

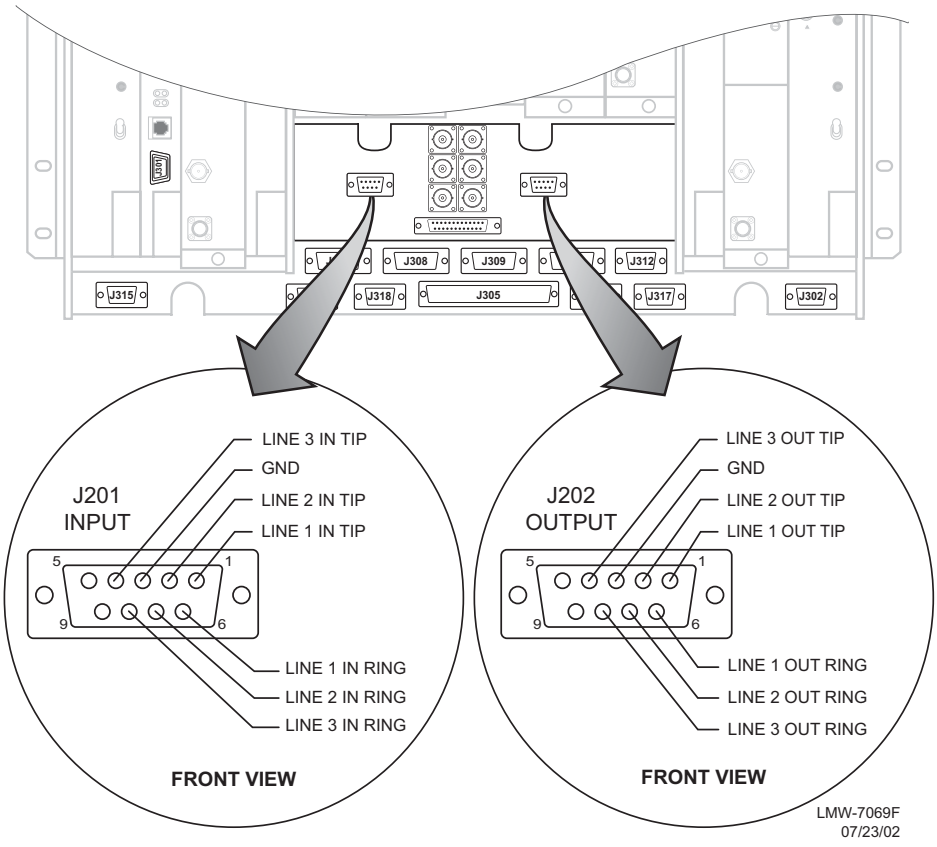


Figure 3-9 DS3 LBO Wayside DS1 Connectors Location and Pinout

Table 3-7 Wayside DS1 Mating Cable – DS3 LBO

J201 (INPUTS)			202 (OUTPUTS)		
FUNCTION	**END 1**	**WIRE COLOR**	**WIRE COLOR**	**END 2**	**FUNCTION**
LINE 1 TIP IN	01	BLACK	BLACK	01	LINE 1 TIP OUT
LINE 1 RING IN	06	RED	RED	06	LINE 1 RING OUT
LINE 2 TIP IN	02	BLACK	BLACK	02	LINE 2 TIP OUT
LINE 2 RING IN	07	WHITE	WHITE	07	LINE 2 RING OUT
LINE 3 TIP IN	04	BLACK	BLACK	04	LINE 3 TIP OUT
LINE 3 RING IN	08	GREEN	GREEN	08	LINE 3 RING OUT
NOT USED	05	BLACK	BLACK	05	NOT USED
NOT USED	09	BLUE	BLUE	09	NOT USED
GND	03	BLACK	GND	03	NOT USED
NOT USED	10	YELLOW	YELLOW	10	NOT USED

3.11 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 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).

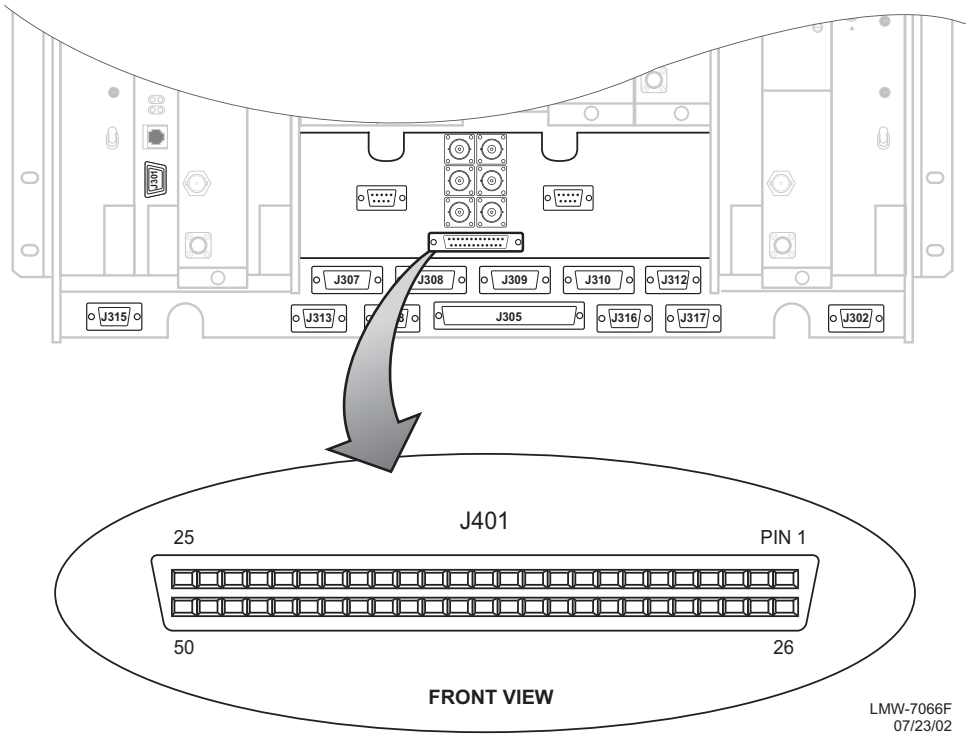


Figure 3-10 Connector J401 Location – DS3 LBO

3.12 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.

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 3-10 for recommended fiber optic jumpers.

Table 3-8 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

3.12.1 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

3.12.2 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.

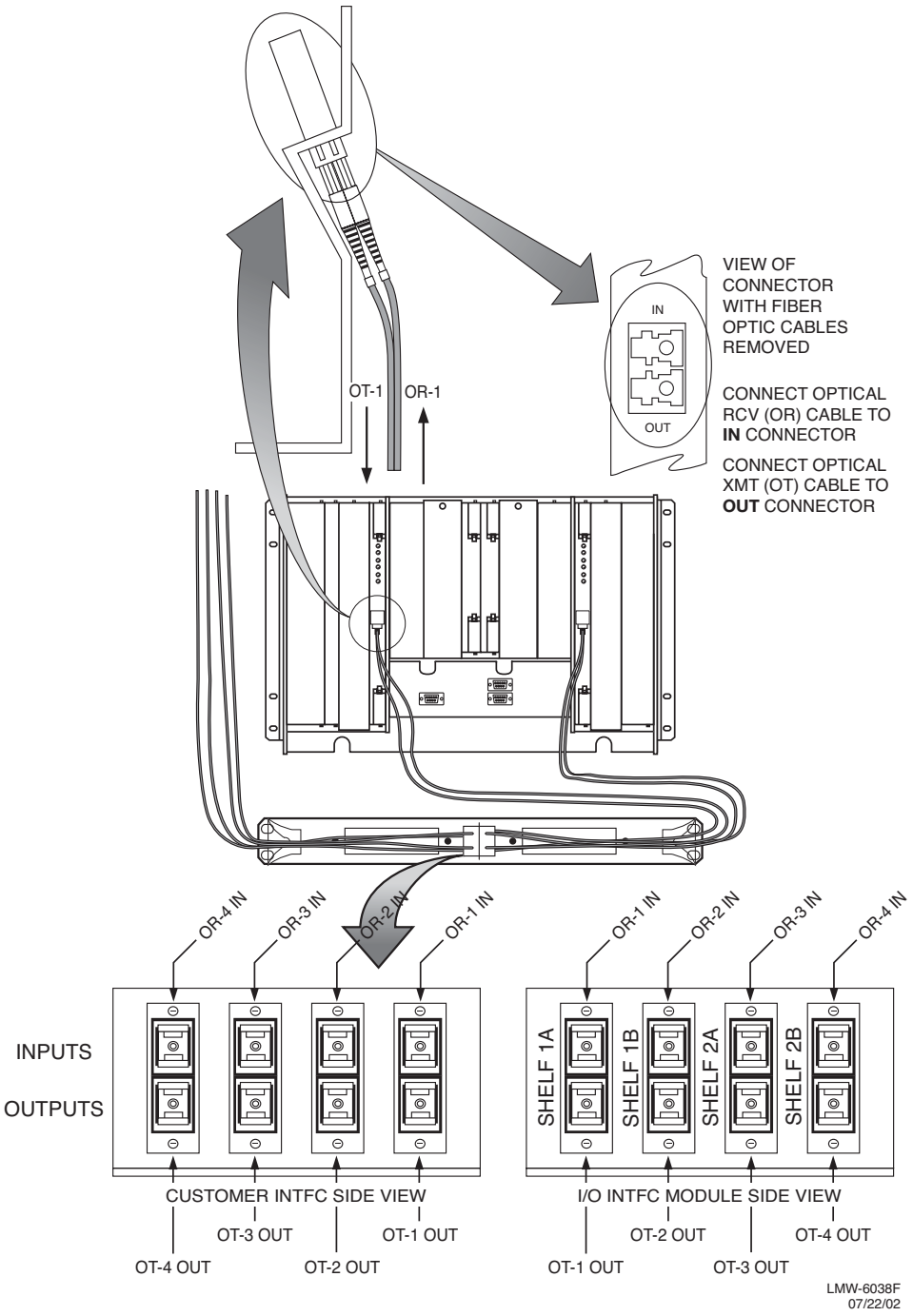


Figure 3-11 2 or 4 Fiber Management Panel

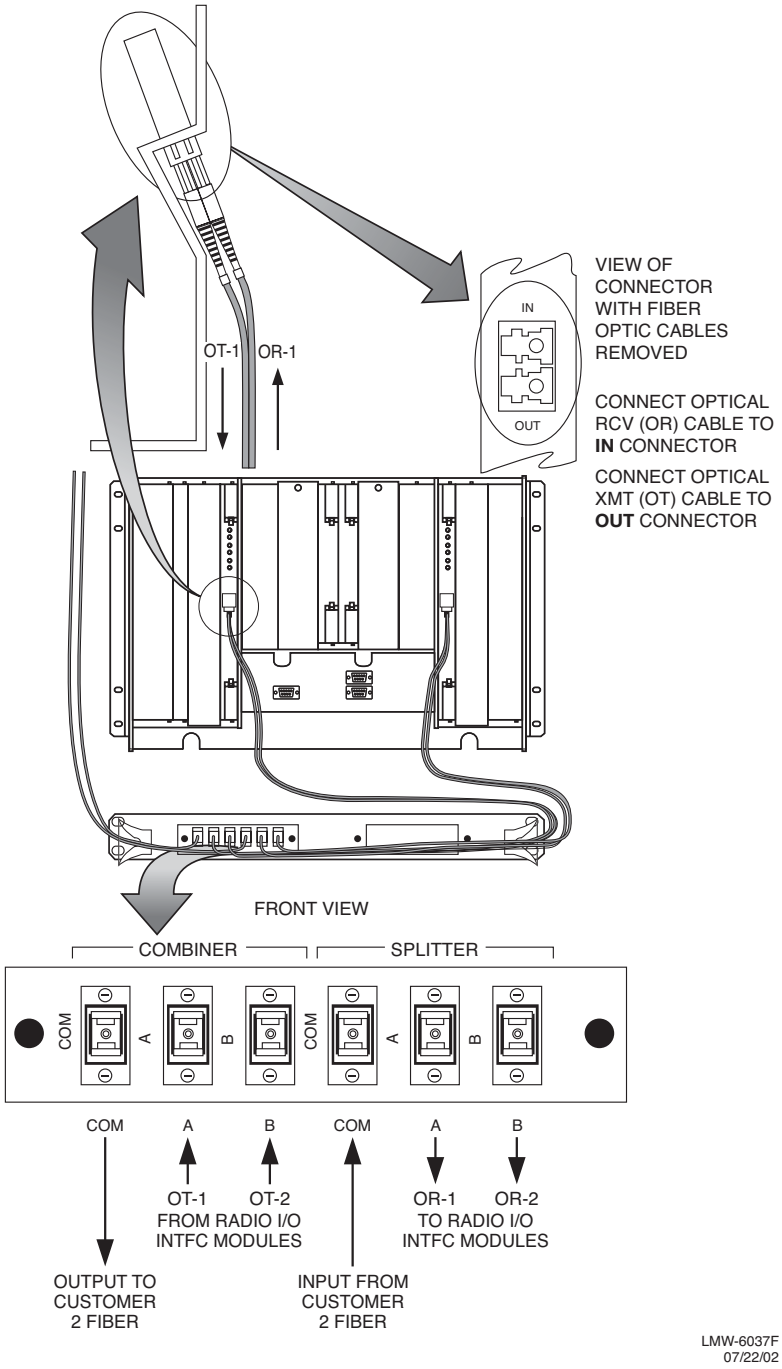


Figure 3-12 2 X 4 Fiber Management Panel

3.13 OC3/STM-1 AUX INTERFACE BOARD WAYSIDE DS1 CONNECTIONS (J201 IN AND J202 OUT)

Wayside DS1 is an option in the MDR-8000 OC3/STM-1 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/STM-1. Refer to Table 3-7 for ELMC option key requirements for remote monitoring/controlling wayside DS1.

3.13.1 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 Figure 3-6 for pinout and color code.

3.13.2 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 3-13 for Wayside DS1 repeater interconnect. See Figure 3-8 for wayside DS1 repeater interconnect.

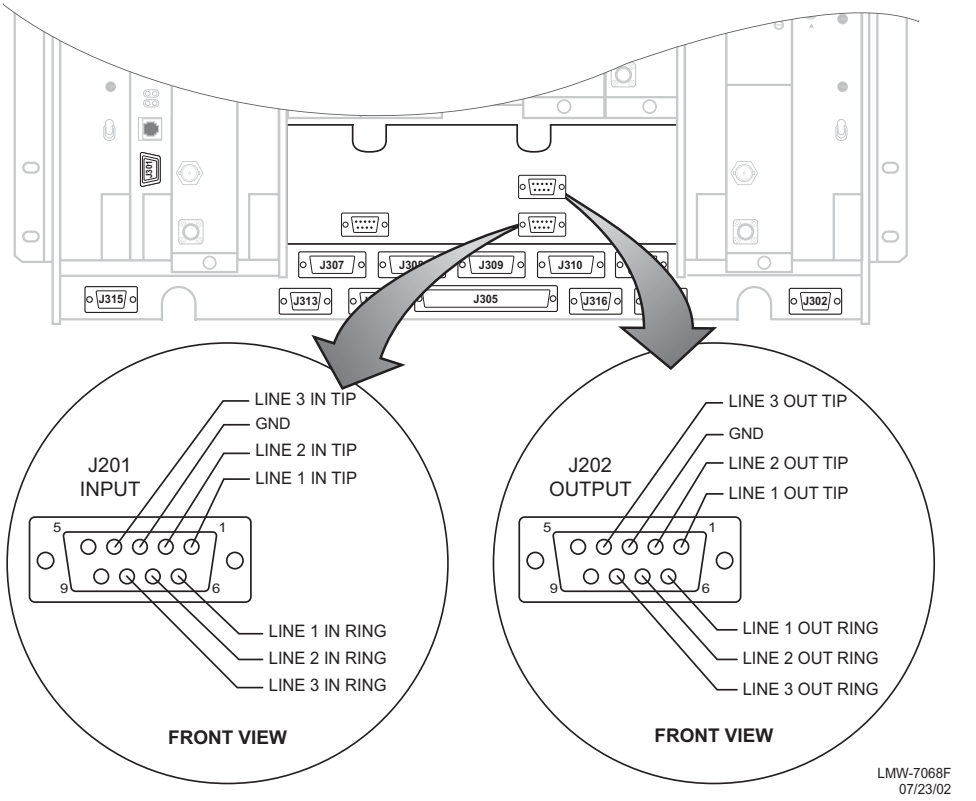


Figure 3-13 Wayside DS1 Connectors – OC3/STM-1 AUX Interface

3.14 OC3/STM-1 REPEATER (J203 ON ONE SHELF TO J203 ON SECOND SHELF)

Note

The OC3/STM-1 radio repeater cable carries clocks, data, and overhead for two directions. It does not carry OC3/STM-1 or Wayside DS1 traffic. OC3/STM-1 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 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)

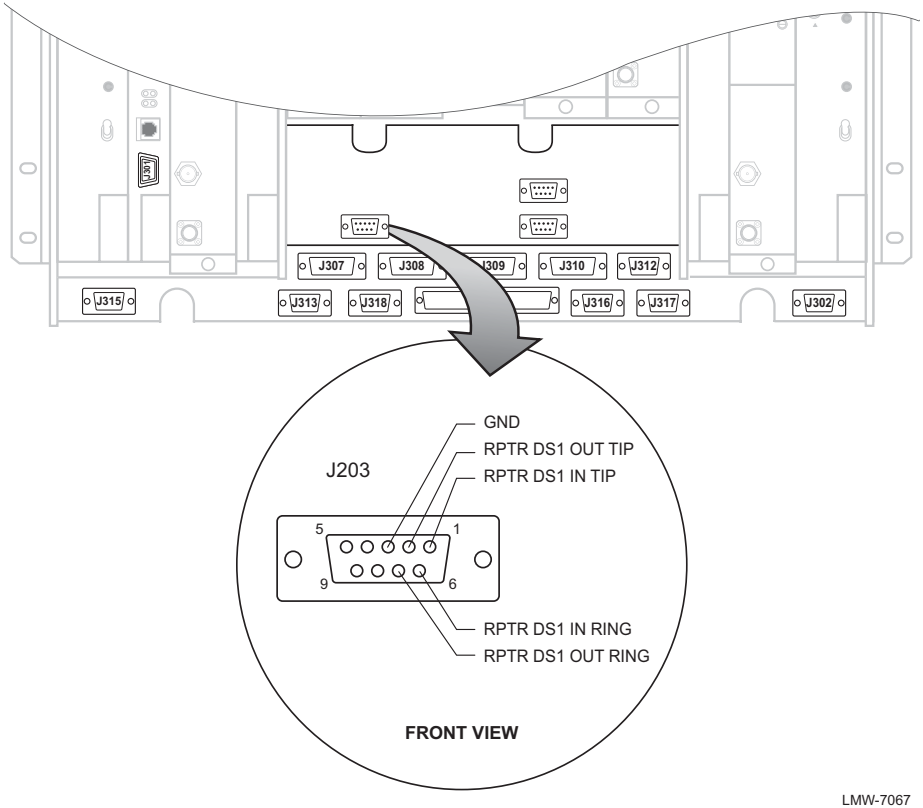


Figure 3-14 Repeater Connector – OC3/STM-1 AUX Interface

Table 3-9 Repeater Mating Cable – OC3/STM-1 AUX Interface

J203/J203 MDR-8000 OC3/STM-1			J203/J203	J203/J203 MDR-8000 OC3/STM-1		
FUNCTION	END 1	WIRE COLOR	PAIR	WIRE COLOR	END 2	FUNCTION
DS1 IN TIP	01	BLACK	1	BLACK	02	DS1 OUT TIP
DS1 IN RING	06	RED		RED	07	DS1 OUT RING
DS1 OUT TIP	02	BLACK	2	BLACK	01	DS1 IN TIP
DS1 OUT RING	07	WHITE		WHITE	06	DS1 IN RING
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

3.15 ETHERNET CABLE CONNECTIONS

Part numbers are assigned for unshielded, straight-through CAT5 UTP (PN 3AL48960AA-AL) and CAT5E UTP (PN 3AL15052AA-AL) cables. The CAT5 or CAT5E cables can be used for 10/100/1000BASE-T applications, however the CT5E cable is the recommended cable for 1000BASE-T applications. The CAT5E cable has a tighter, higher quality twisting on the wire pairs and is less susceptible to crosstalk. Refer to Table 3-10 and Table 3-11 for pinout. See Figure 3-15 for pair wire colors. See Figure 3-16 and Figure 3-17 for interconnect information.

3.15.1 Automatic MDI/MDI-X Configuration

The Ethernet PHY provides automatic Medium Dependent Interface (MDD/Medium Independent Interface-crossover (MDI-X). Automatic MDI/MDI-X configuration eliminates the need for crossover cables.

3.15.2 Crossover Cable Option

Crossover type cables with pin 1 wired to pin 3 and pin 2 wired to pin 6 can be used, but are not necessary. Crossover is automatically performed by the Ethernet PHY, resulting in a straight-through interface to the link partner.

Table 3-10 10/100BASE-T Ethernet Connector Pinout

PIN	FUNCTION	PORT	
		MDI	MDI-X
1	TD+	Output	Input
2	TD+	Output	Input
3	RD+	Input	Output
4/5	GRD	N/A	N/A
6	RD-	Input	Output
7/8	GRD	N/A	N/A

Table 3-11 1000BASE-T Ethernet Connector Pinout

PIN	FUNCTION	DIRECTION
1	TRDA+	Input/Output
2	TRDA-	Input/Output
3	TRDB+	Input/Output
4	TRDB-	Input/Output
5	TRDC+	Input/Output
6	TRDC-	Input/Output
7	TRDD+	Input/Output
8	TRDD-	Input/Output

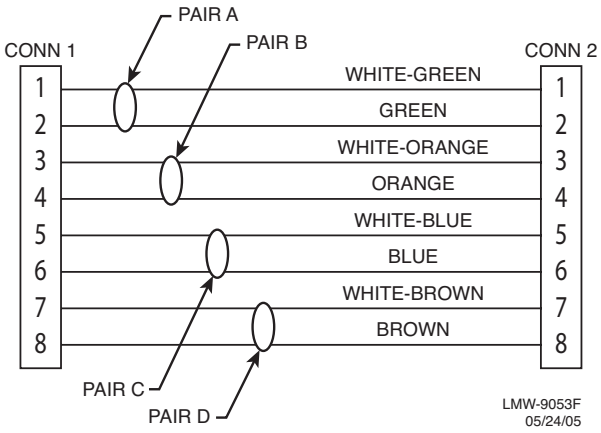


Figure 3-15 Straight-Through Mating Cable

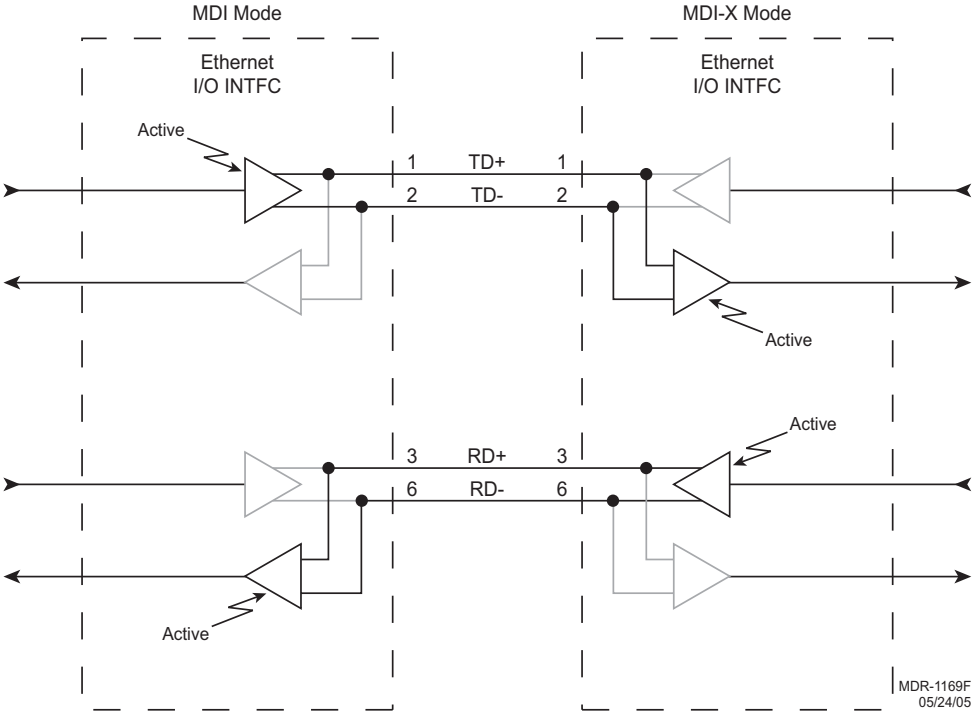


Figure 3-16 10/100BASE-T Interconnect

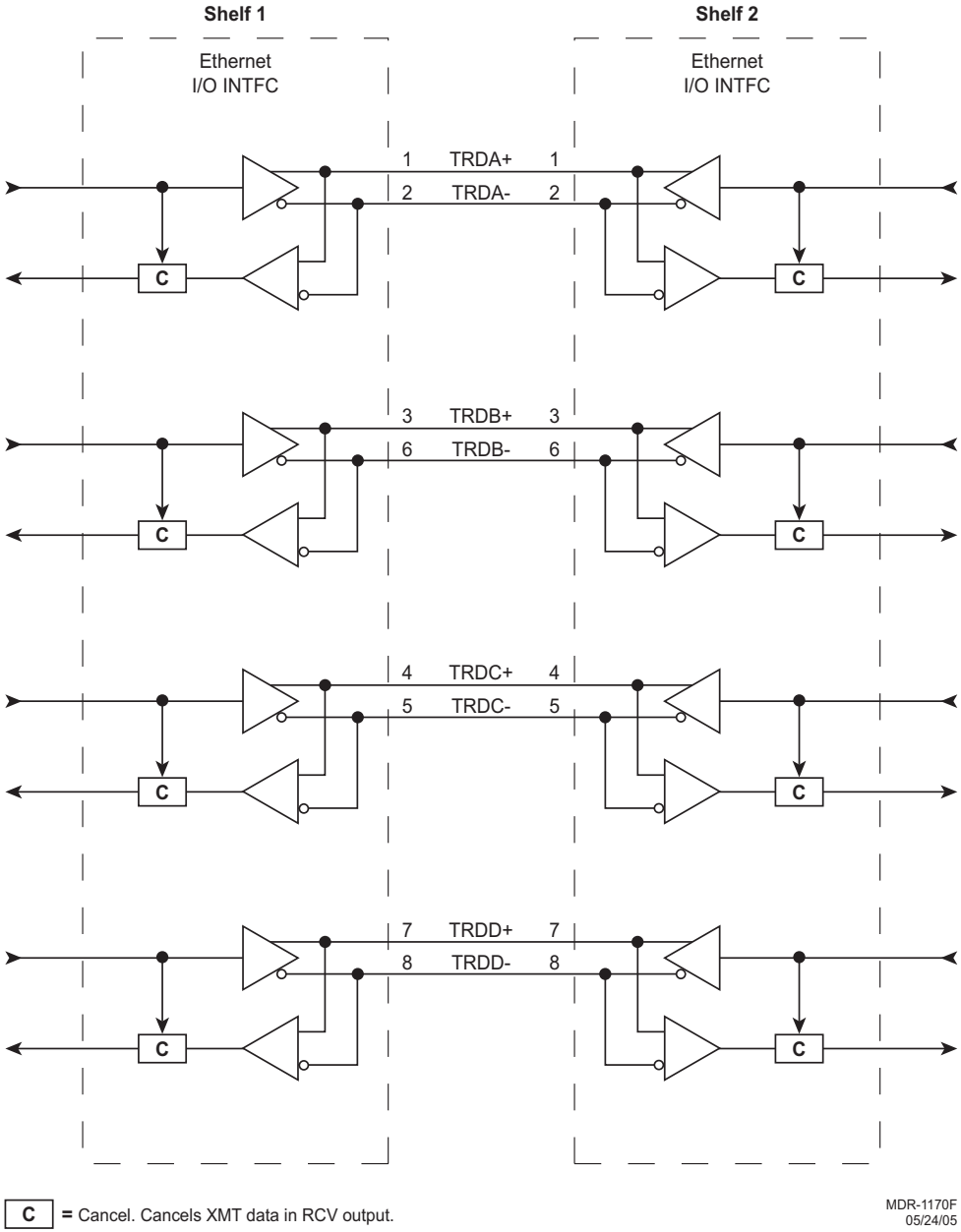


Figure 3-17 1000BASE-T Interconnect

Note

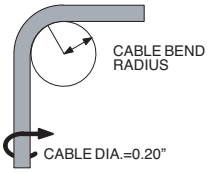
Transmit data (TRD) is both directions, simultaneously. Unwanted data is cancelled.

WARNING

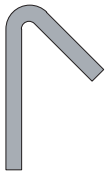
Possibility of Damage to Equipment

Follow carefully the following do's and don'ts to prevent future loss of traffic.

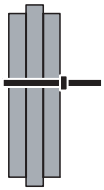
DO MAINTAIN A MAXIMUM BEND RADIUS OF 4 TIMES CABLE DIAMETER (4–PAIR CABLES).



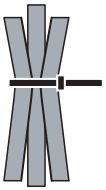
DON'T EXCEED A 90 DEGREE BEND.



DO APPLY CABLE TIES LOOSELY AND AT RANDOM INTERVALS.

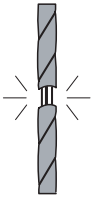


DON'T OVERTIGHTEN CABLE TIES.

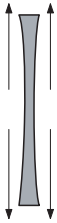


DO TRY TO MINIMIZE THE AMOUNT OF JACKET TWISTING.

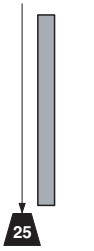
DON'T OVERTWIST CABLE; IT CAN LEAD TO TORN JACKETS.



DO AVOID STRETCHING CABLE.



DON'T EXCEED 25 LB OF PULLING TENSION.



MW215–0028–1
071897

3.15.3 Terminal Connections

See Figure 3-18. Radio terminal connections consist of Ethernet connections (refer to Para 3.6), DS1 connections, and service channel connections. The radio provisioned as a terminal can transport up to 32 DS1 lines in one direction.

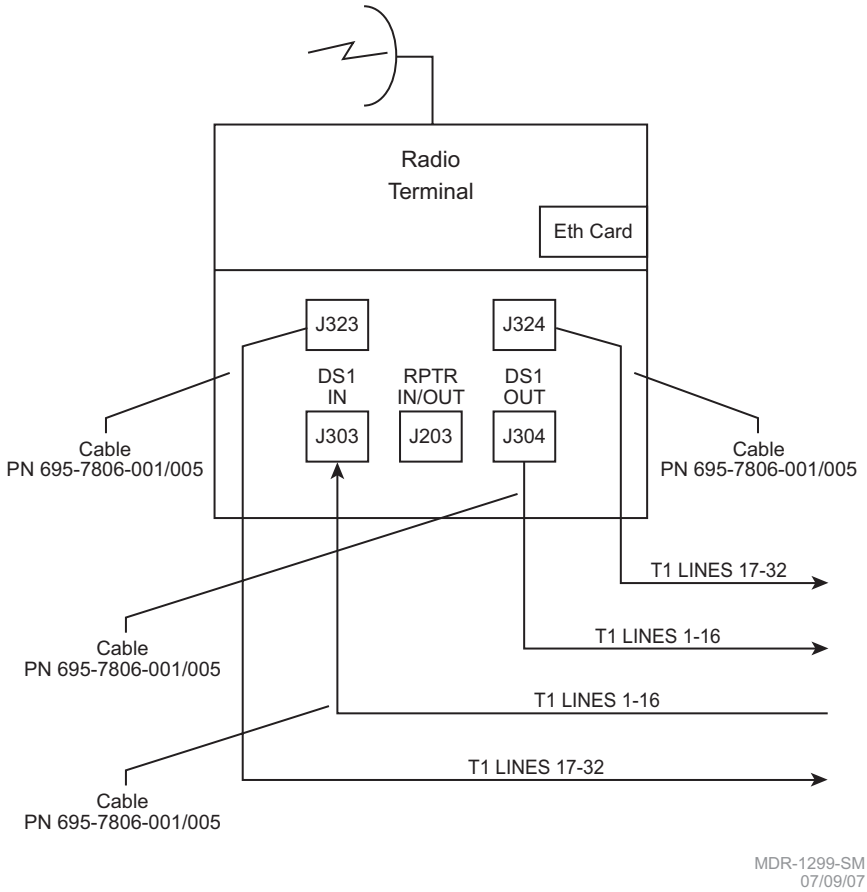


Figure 3-18 Terminal Interconnect Diagram

3.15.3.1 Terminal DS1 Lines 1-32 Connections (J303/J323 In and J304/J324 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 3-19 for location and pinout. Refer to Table 3-12 and Table 3-13 for mating cable pinout.

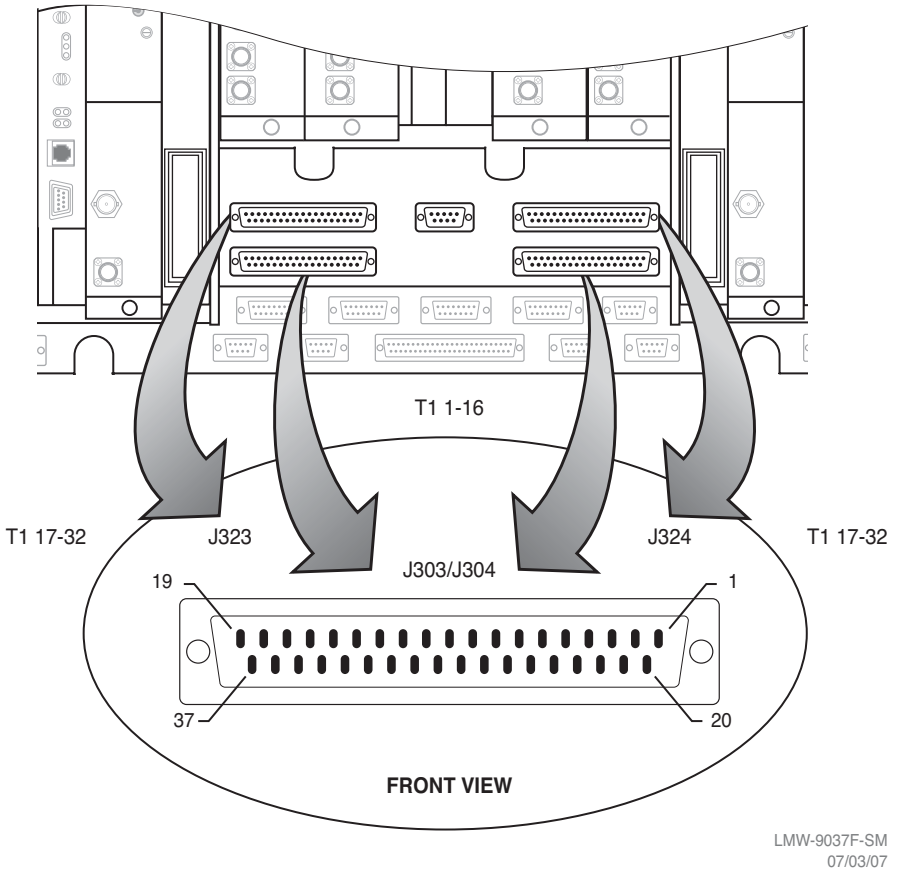


Figure 3-19 DS1 Lines 1-32 Connectors – Location and Pinout

Table 3-12 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	

Table 3-13 DS1 IN J323 and DS1 OUT J324 Pinout Assignments

CONNECTOR PIN NUMBER	WIRE COLOR	SIGNAL NAME	CABLE PAIR NUMBER
1	WHITE–BLUE	CHAN 17 TIP	1
20	BLUE–WHITE	CHAN 17 RING	
2	WHITE–ORANGE	CHAN 18 TIP	2
21	ORANGE–WHITE	CHAN 18 RING	
3	WHITE–GREEN	CHAN 19 TIP	3
22	GREEN–WHITE	CHAN 19 RING	
4	WHITE–BROWN	CHAN 20 TIP	4
23	BROWN–WHITE	CHAN 20 RING	
5	WHITE–SLATE	CHAN 21 TIP	5
24	SLATE–WHITE	CHAN 21 RING	
6	RED–BLUE	CHAN 22 TIP	6
25	BLUE–RED	CHAN 22 RING	
7	RED–ORANGE	CHAN 23 TIP	7
26	ORANGE–RED	CHAN 23 RING	
8	RED–GREEN	CHAN 24 TIP	8
27	GREEN–RED	CHAN 24 RING	
9	RED–BROWN	CHAN 25 TIP	9
28	BROWN–RED	CHAN 25 RING	
10	RED–SLATE	CHAN 26 TIP	10
29	SLATE–RED	CHAN 26 RING	
11	BLACK–BLUE	CHAN 27 TIP	11
30	BLUE–BLACK	CHAN 27 RING	
12	BLACK–ORANGE	CHAN 28 TIP	12
31	ORANGE–BLACK	CHAN 28 RING	
13	BLACK–GREEN	CHAN 29 TIP	13
32	GREEN–BLACK	CHAN 29 RING	
14	BLACK–BROWN	CHAN 30 TIP	14
33	BROWN–BLACK	CHAN 30 RING	
15	BLACK–SLATE	CHAN 31 TIP	15
34	SLATE–BLACK	CHAN 31 RING	
16	YELLOW–BLUE	CHAN 32 TIP	16
35	BLUE–YELLOW	CHAN 32 RING	

3.15.4 Repeater Connections

See Figure 3-20. Radio repeater connections consist of Ethernet connections (refer to Para. 3.15), DS1 connections, and service channel connections. When the radio is provisioned as a repeater, service channel overhead is transported between shelves at the DS1 data rate using the RPTR IN/OUT connector J203 on the ETH/T1 line interface board.

3.15.4.1 Repeater DS1 Lines 1-32 Connections (J201/J323 In and J202/J324 Out)

Recommended connectorized cable assembly – PN 695-7806-XXX (22 AWG 16-pair shielded, jacketed cable with 37-pin D-type connector on each end). See Figure 3-19 for location and pinout. Refer to Table 3-12 and Table 3-13 for mating cable and pinout.

3.15.4.2 Repeater Service Channel Connections (J203 on one shelf to J203 on second shelf)

Recommended connectorized cable assembly – PN 695-4125-007/013 (26 AWG 5-pair shielded, jacketed cable with 9-pin D-type connector on each end). see Figure 3-20 for location and pinout. Refer to Table 3-14 for mating cable pinout.

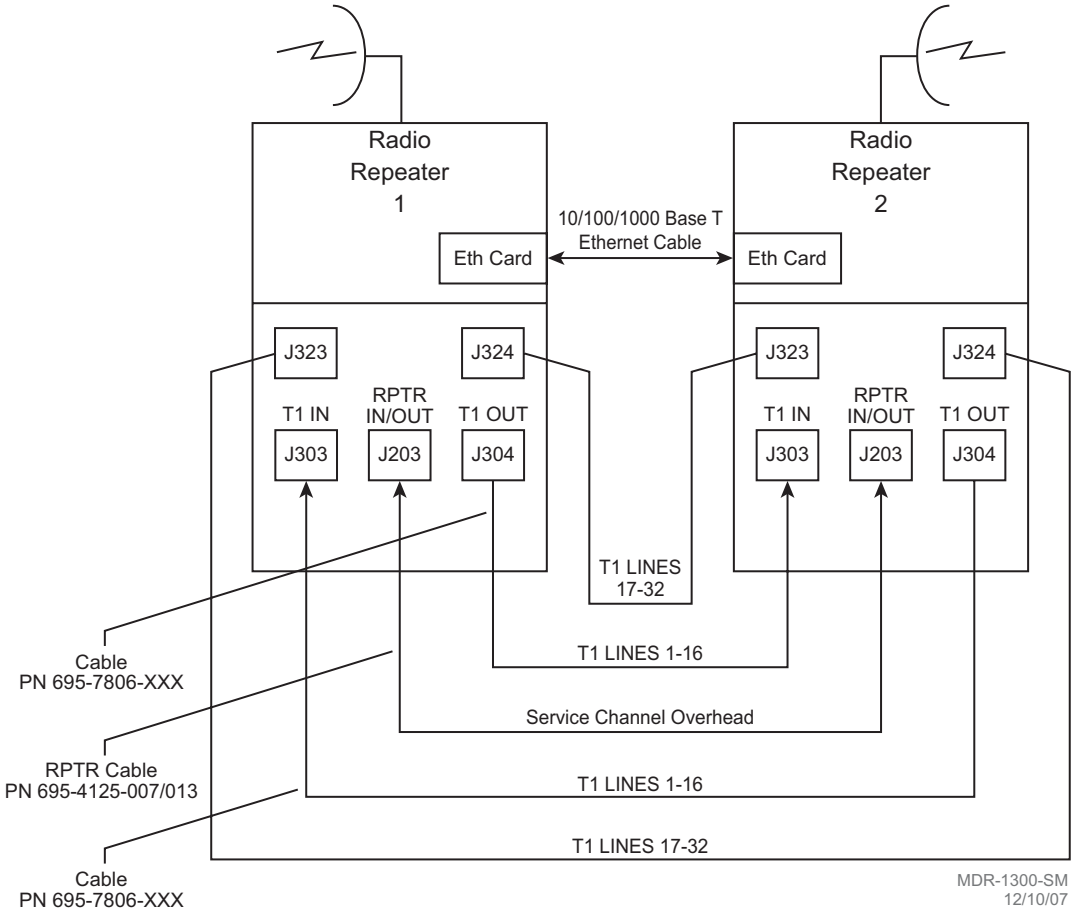


Figure 3-20 Repeater Interconnect Diagram

Table 3-14 Repeater Mating Cable – ETH/T1 Line

J203/J203 MDR-8000			J203/J203	J203/J203 MDR-8000		
FUNCTION	**END 1**	**WIRE COLOR**	**PAIR**	**WIRE COLOR**	**END 2**	**FUNCTION**
DS1 IN TIP	01	BLACK	1	BLACK	02	DS1 OUT TIP
DS1 IN RING	06	RED		RED	07	DS1 OUT RING
DS1 OUT TIP	02	BLACK	2	BLACK	01	DS1 IN TIP
DS1 OUT RING	07	WHITE		WHITE	06	DS1 IN RING
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

3.16 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 3-21 for Figure 3-22 for controller connector location and pinout. Refer to Table 3-17 for mating cable pinout and color code.

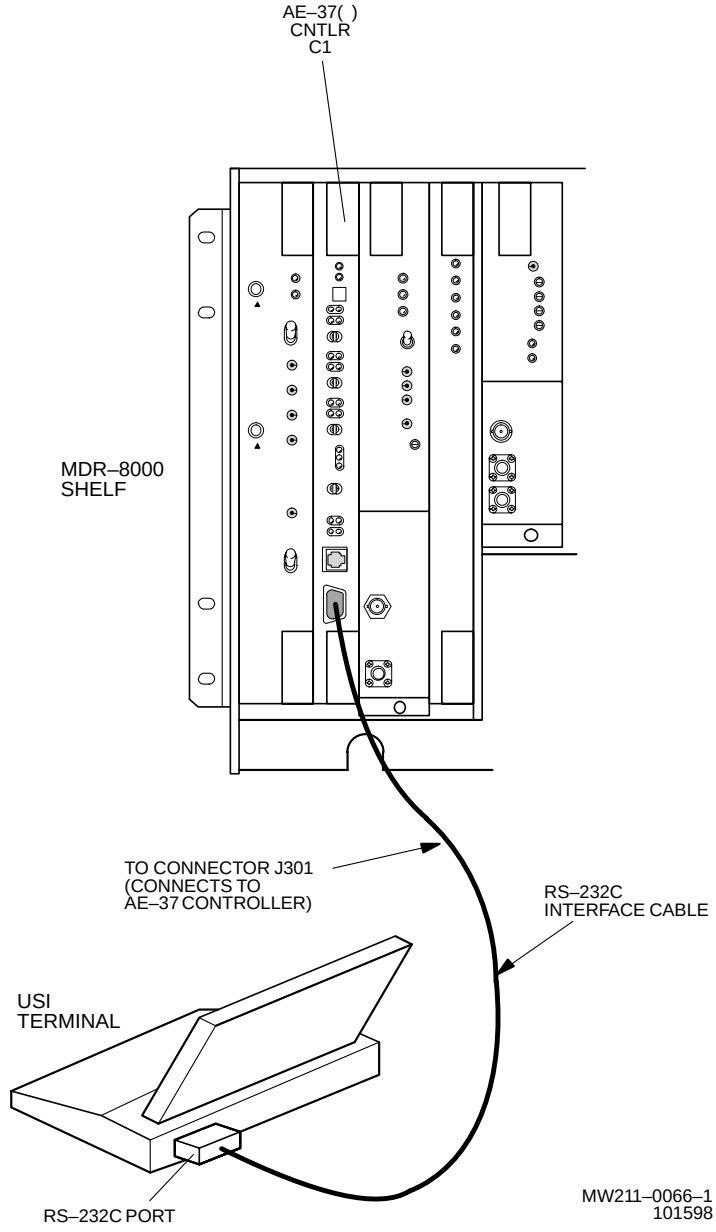


Figure 3-21 USI Computer to Controller Interconnection

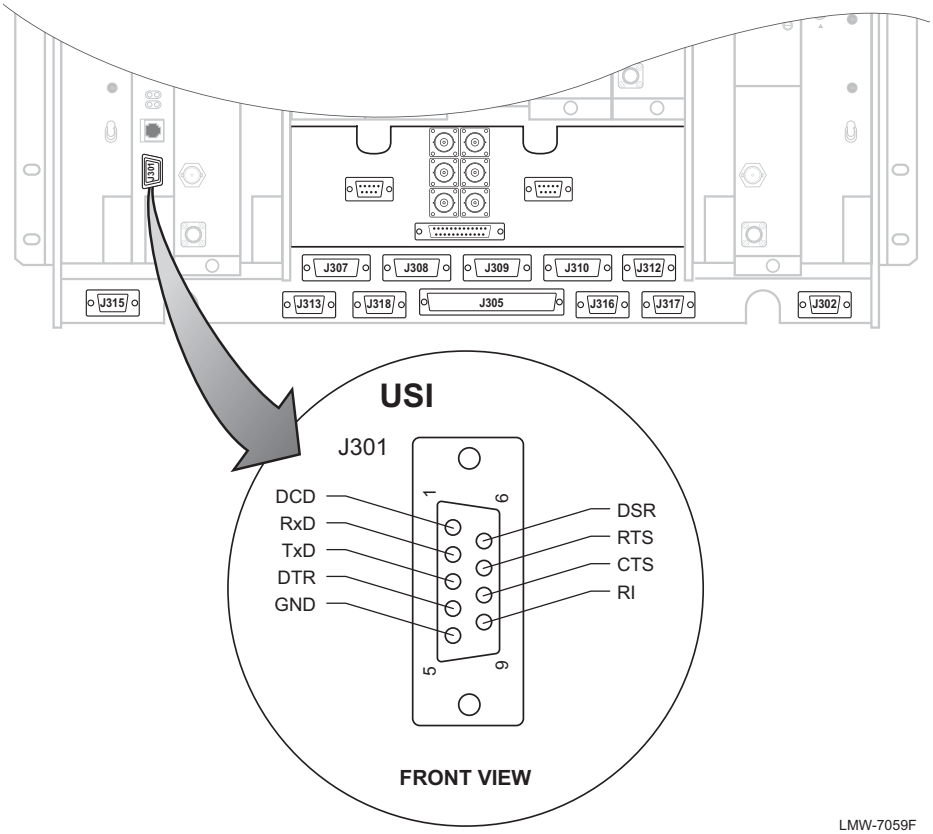


Figure 3-22 Controller USI Connector Location and Pinout

Table 3-15 Controller Mating Cable

J301 MDR-8000 CONTROLLER			J301/LAPTOP	LAPTOP		
FUNCTION	END 1	WIRE COLOR	PAIR	WIRE COLOR	END 2	FUNCTION
DCD	01	BLACK	1	BLACK	01	DCD
DSR	06	RED	1	RED	06	DSR
RXD	02	BLACK	2	BLACK	02	RXD
RTS	07	WHITE	2	WHITE	07	RTS
TXD	03	BLACK	3	BLACK	03	TXD
CTS	08	GREEN	3	GREEN	08	CTS
DTR	04	BLACK	4	BLACK	04	DTR
RI	09	BLUE	4	BLUE	09	RI
GND	05	BLACK	5	BLACK	05	GND
NOT USED	N/A	YELLOW	5	YELLOW	N/A	NOT USED
NOT USED	N/A	BLACK	6	BLACK	N/A	NOT USED
NOT USED	N/A	BROWN	6	BROWN	N/A	NOT USED

3.17 SERVICE CHANNEL CONNECTIONS

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 4 is dedicated to radio commands and ELMC. Service channel is not provisionable. The four channels are multiplexed and shifted in and out of registers on the controller.

See Figure 3-23. 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.

3.17.1 2-Wire Handset Connection

The 2-wire port at the TEL connector on AE-37Y Controller accepts either the optional handset, listed under equipment supplied in the General section, or a standard telephone. The 2-wire port is not provisionable and should not be confused with the 4-wire provisionable parts (Audio 1 and Audio 2). To use the handset, the radio must be provisioned for Audio 1.

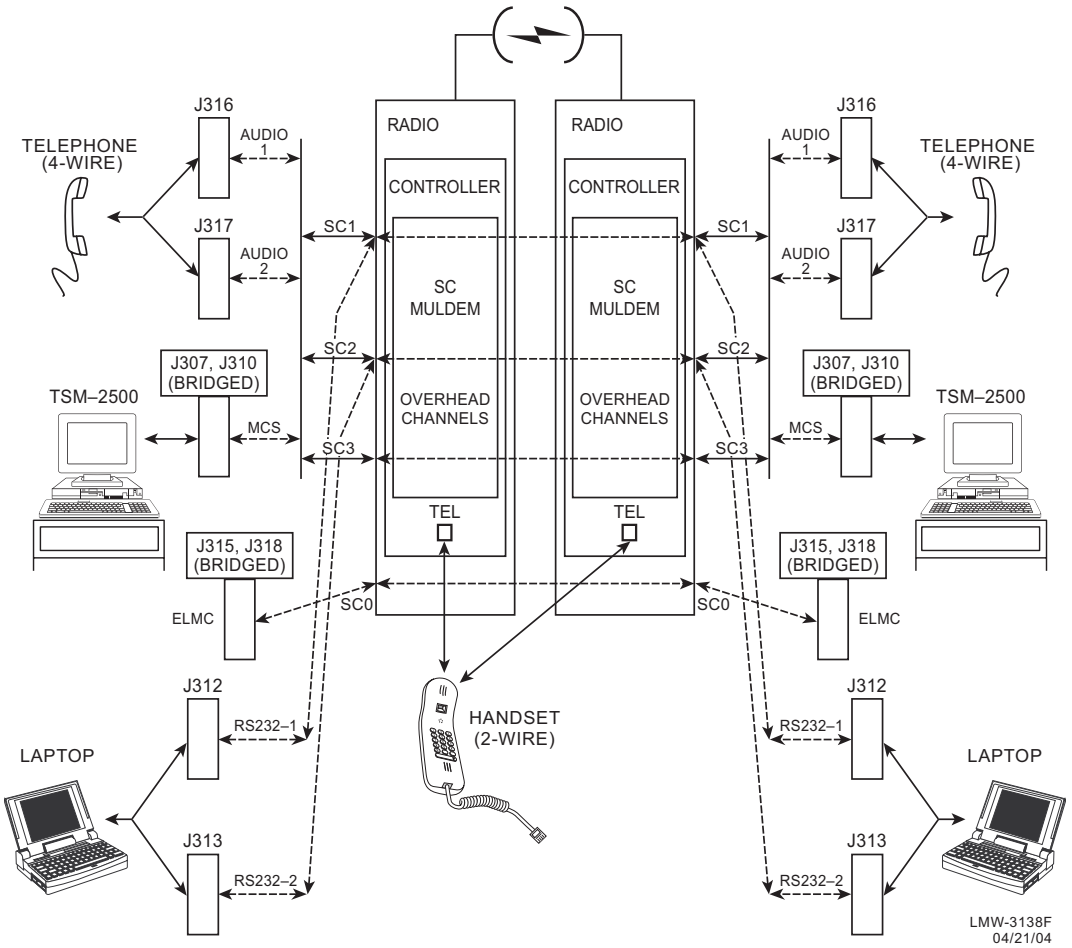


Figure 3-23 Service Channel Connections / Applications

3.17.2 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.

3.17.3 Audio 1, Audio 2 (J316, J317) Connections

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.

3.17.3.1 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, and DTMF and 2-wire handset capabilities.

3.17.3.2 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 3-24 for shelf connector locations and pinout. Refer to Table 3-16 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 3-25 for pinout.

Table 3-16 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

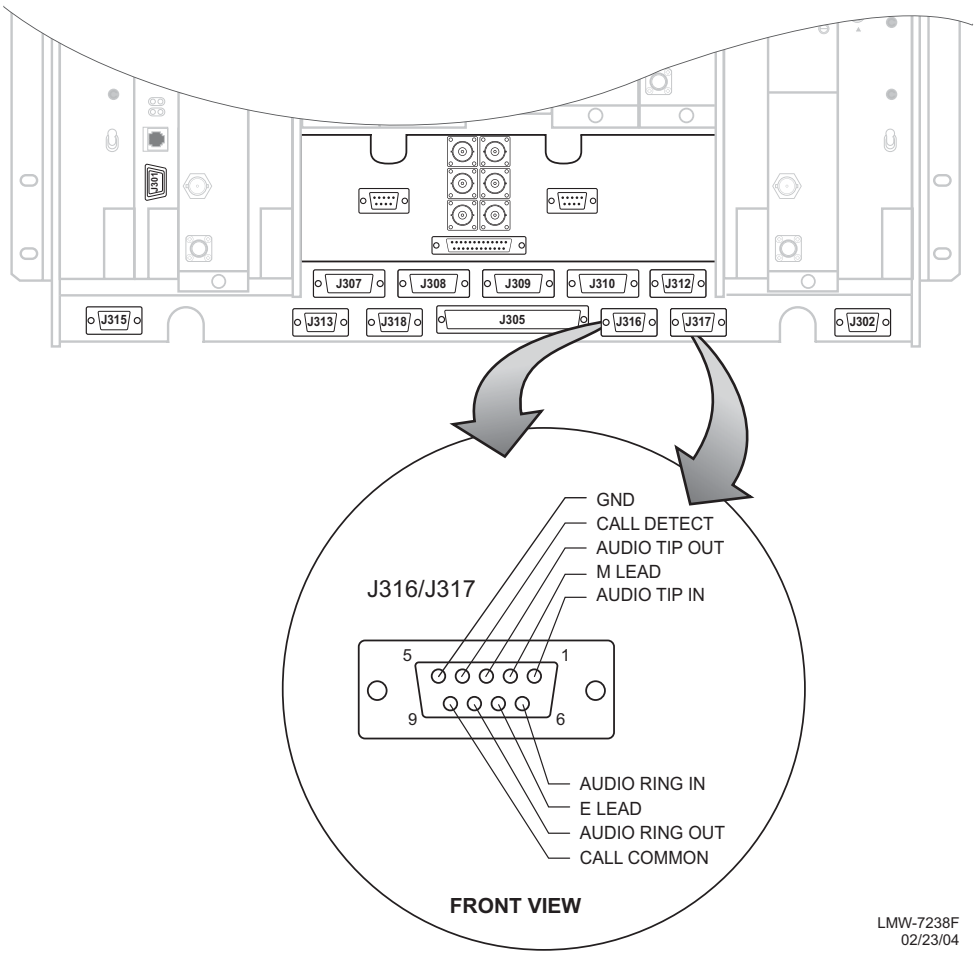
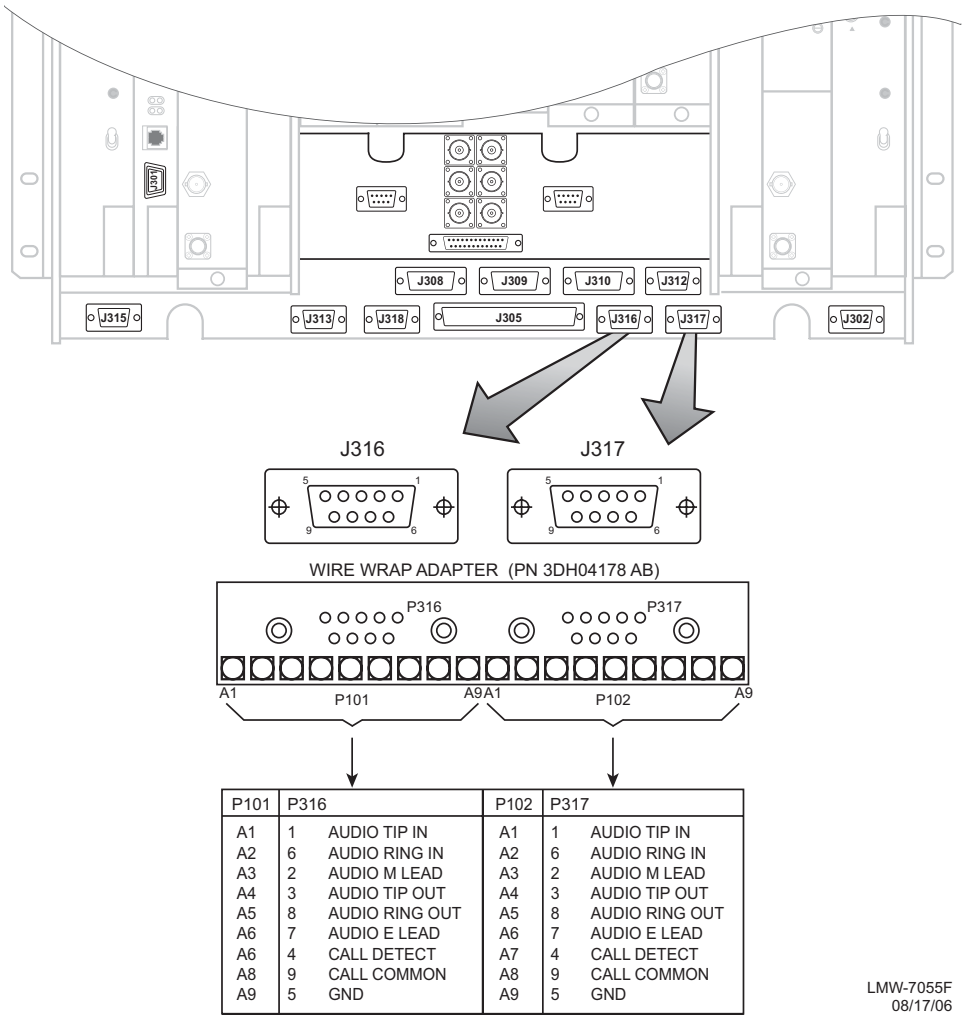


Figure 3-24 Audio Connectors Location and Pinout



P101	P316		P102	P317	
A1	1	AUDIO TIP IN	A1	1	AUDIO TIP IN
A2	6	AUDIO RING IN	A2	6	AUDIO RING IN
A3	2	AUDIO M LEAD	A3	2	AUDIO M LEAD
A4	3	AUDIO TIP OUT	A4	3	AUDIO TIP OUT
A5	8	AUDIO RING OUT	A5	8	AUDIO RING OUT
A6	7	AUDIO E LEAD	A6	7	AUDIO E LEAD
A6	4	CALL DETECT	A7	4	CALL DETECT
A8	9	CALL COMMON	A8	9	CALL COMMON
A9	5	GND	A9	5	GND

LMW-7055F
08/17/06

Figure 3-25 Audio Wirewrap Adapter Pinout

3.17.4 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 3-26 for shelf connector locations and pinout. Refer to Table 3-17 for mating cable wiring and color code.

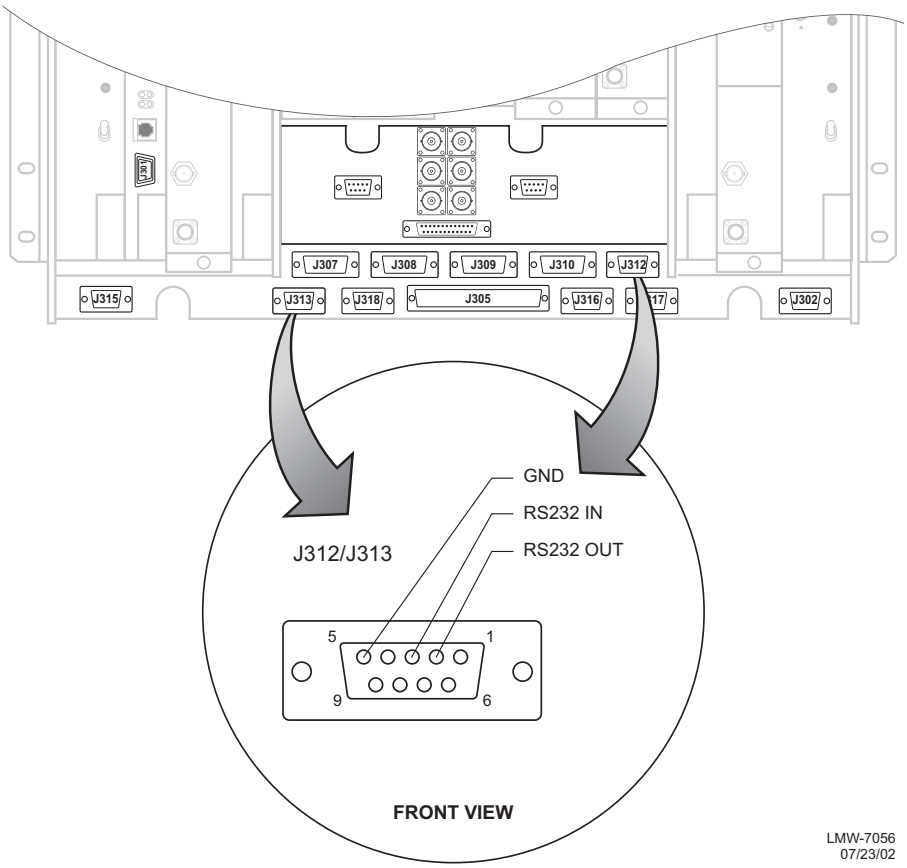


Figure 3-26 RS-232 Connectors Location and Pinout

Table 3-17 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 Compact Radio

3.18 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**.

3.18.1 MCS-11 Master (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 3-27 for shelf connector location and pinout. Refer to Table 3-18 for mating cable pinout and color code. See Figure 3-28 for typical connection scheme.

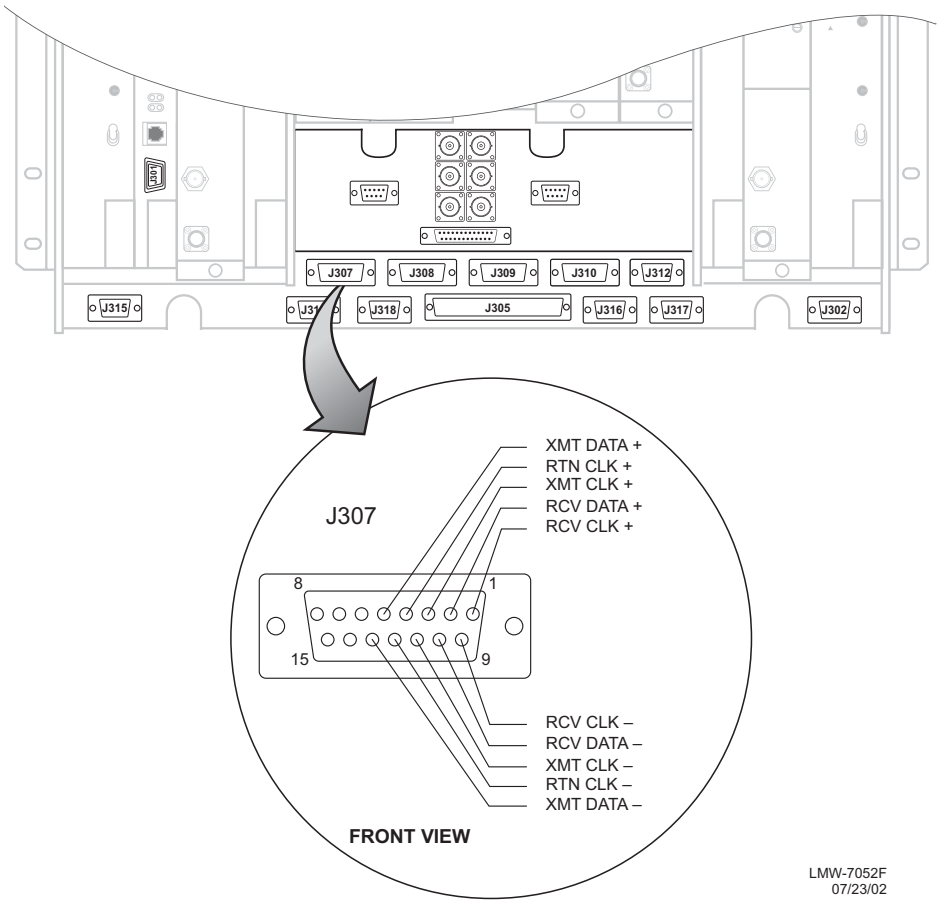


Figure 3-27 MCS-11 Master Connector (J307) Location and Pinout

Table 3-18 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

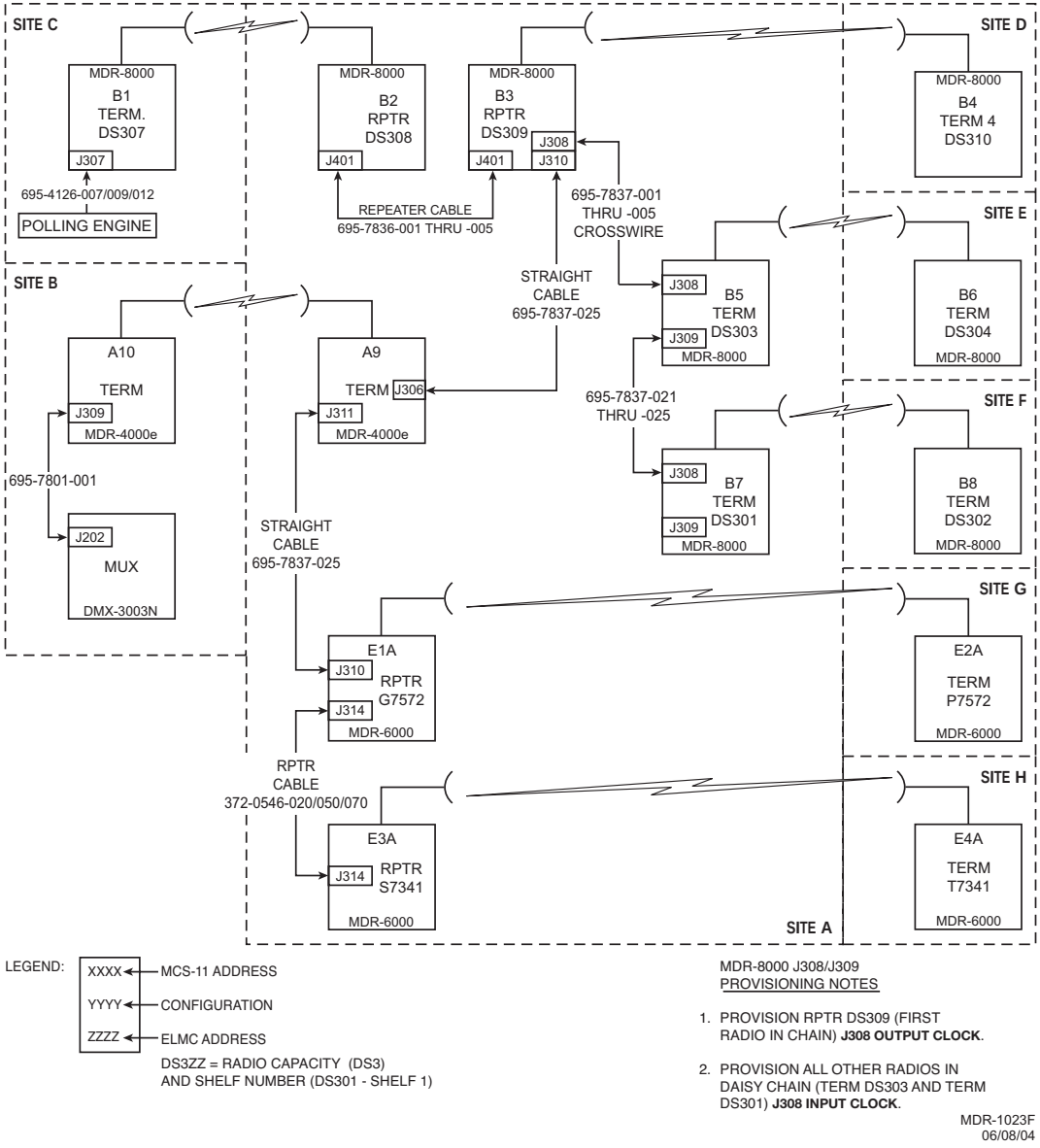


Figure 3-28 Typical MCS-11 System

3.18.2 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 connectors J308 and J309 are typically used to sync radios at a site with multiple radios configured as junctions, spurs, and/or daisy-chained spurs. The multiple radios are connected to common XMT and RCV clocks. In this scenario, one radio is provisioned to supply the clocks. This radio is designated "master" or DCE. All other radios at the site are designed as "slave" or DTE and receive their sync from the master.

See Figure 3-29 for a typical connection scheme for three radios. Shelf 1 is the master (DCE) radio. Shelf 1 is provisioned J308 Output Clock. Shelves 2 and 3 (slaves) sync to Shelf 1 and are provisioned J308 Input clock. 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.

3.18.2.1 Clock Master and Slave Modes

Clock direction is controlled by the MASTER/SLAVE control from the microprocessor. Switching is controlled by the CLK E DET control and the Master/Slave control from the microprocessor. The master and slave modes are provisioned functions. The master mode is set by provisioning the radio J308 Output Clock. The slave mode is set by provisioning the radio J308 Input Clock.

3.18.2.2 Master Mode (CLKS OUT)

See Figure 3-30 for a simplified block diagram of the master mode. The master mode sends RCV and XMT clocks out to other equipment. Typically one radio at a repeater/junction is provisioned J308 Output clock and this master radio provides the clocks on which other radios at the site can sync. The east and west service channel modems on the controller provide the XMT and RCV clocks. The east service channel modem provides the 64k CLK E (64 kHz clock east) that is switched through the EPLD, amplified by the clock driver and output through the bi-directional XCVR to connector J308. The west service channel modem provides the 64k CLK W (64 kHz clock west) that is switched through the EPLD, amplified by the clock driver and output through the bi-directional XCVR to connector J308.

3.18.2.3 Slave Mode (CLKS IN)

See Figure 3-31 for a simplified block diagram of the slave mode. The slave mode receives RCV and XMT clocks from other equipment. Typically all but one radio at a repeater/junction are provisioned J308 Input clock. The master radio provides the clocks on which the slave radios at the site can sync. The RCV clock on J308 is passed through the bi-directional XCVR, is switch through the EPLD, and output to the microprocessor as CLK 7. The XMT clock on J308 is passed through the bi-directional XCVR, is switched through the EPLD, and output to the microprocessor as CLK 8.

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 3-32 for shelf connectors J308 and J309 location and pinout. Refer to Table 3-19 for J308 to J308 mating cable pinout and color code. See Figure 3-29 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 3-20 for J309 to J308 mating cable pinout and color code. See Figure 3-29 for typical connection scheme.

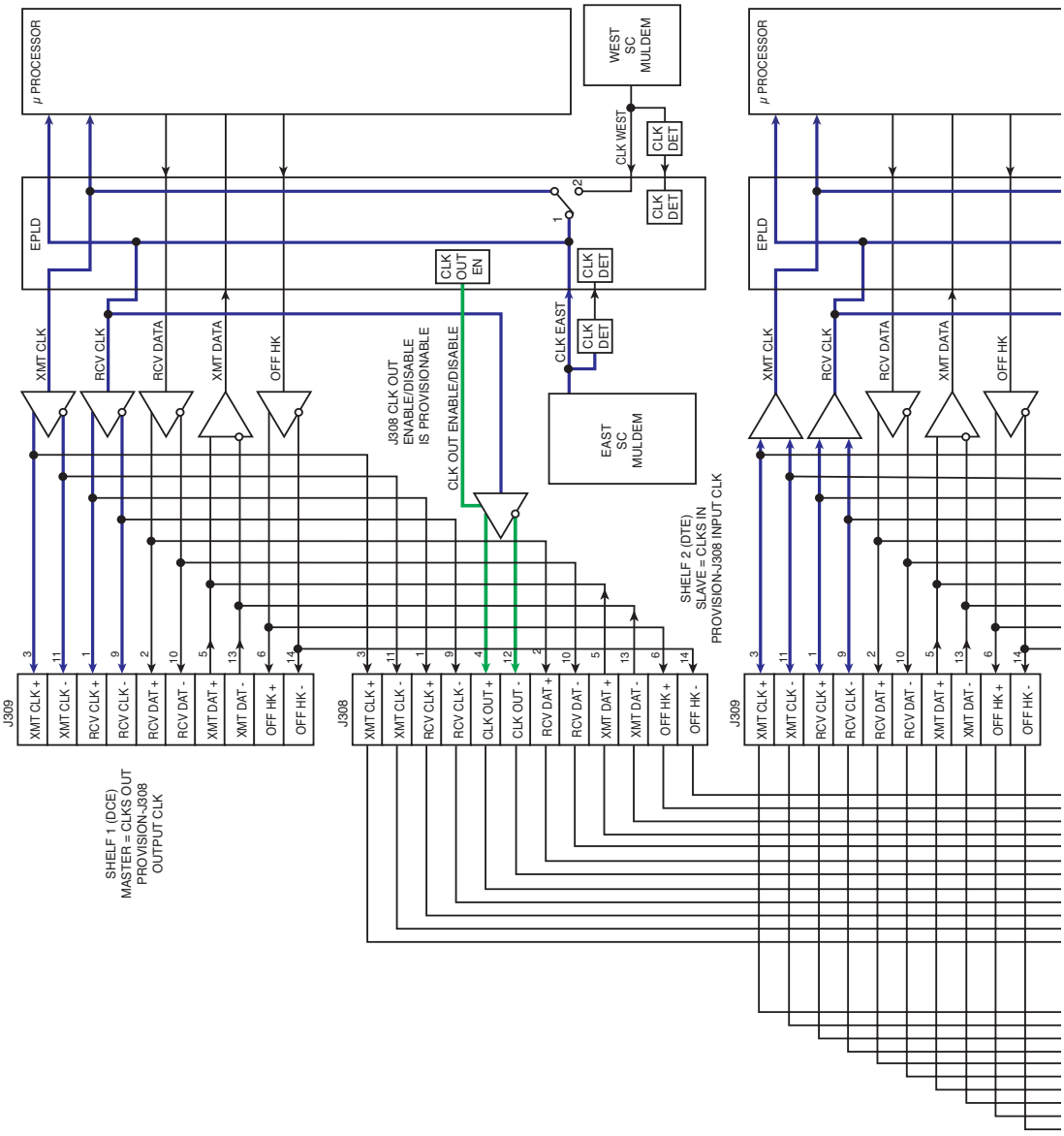
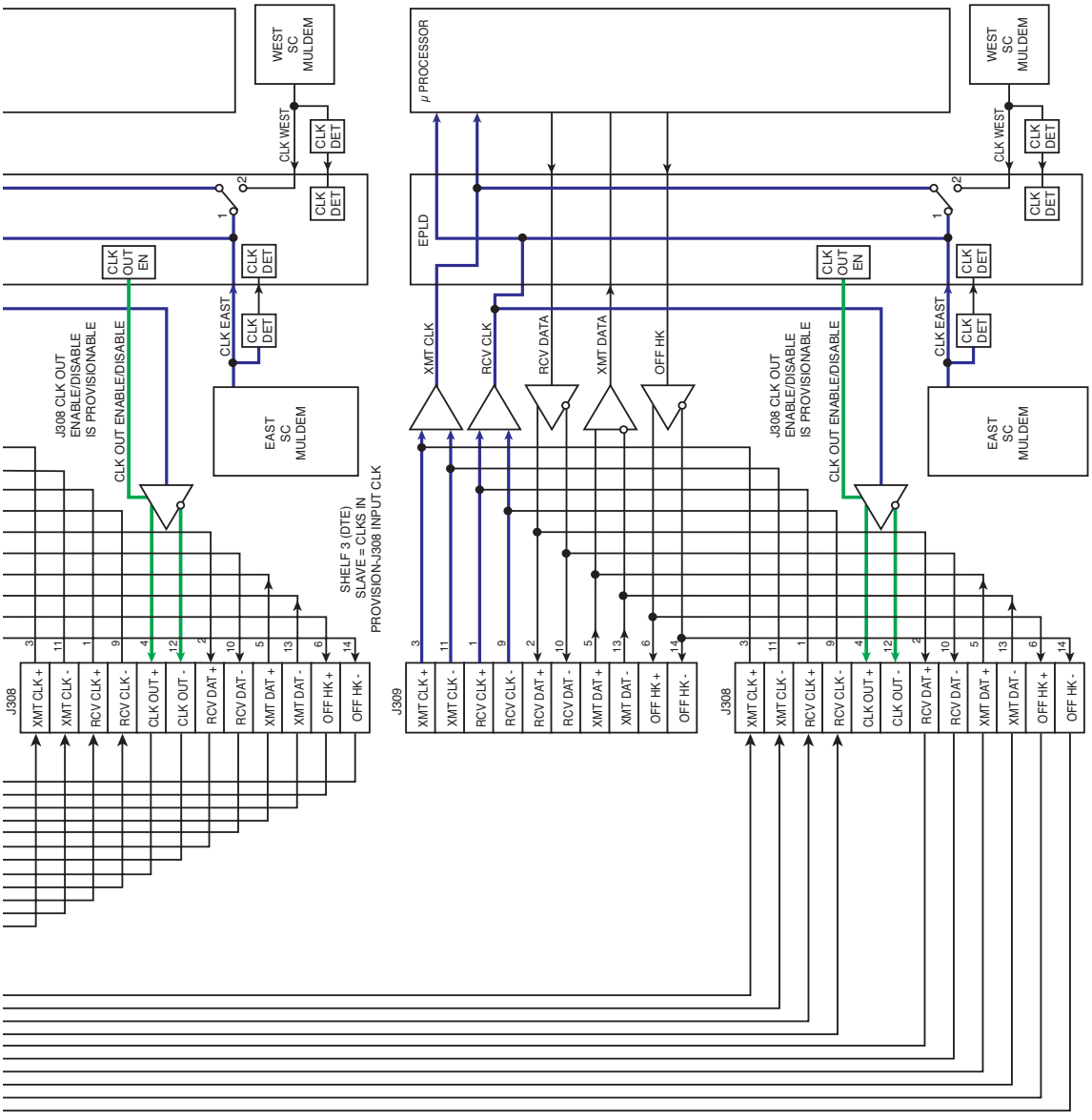


Figure 3-29 Typical MCS-11 Interconnect



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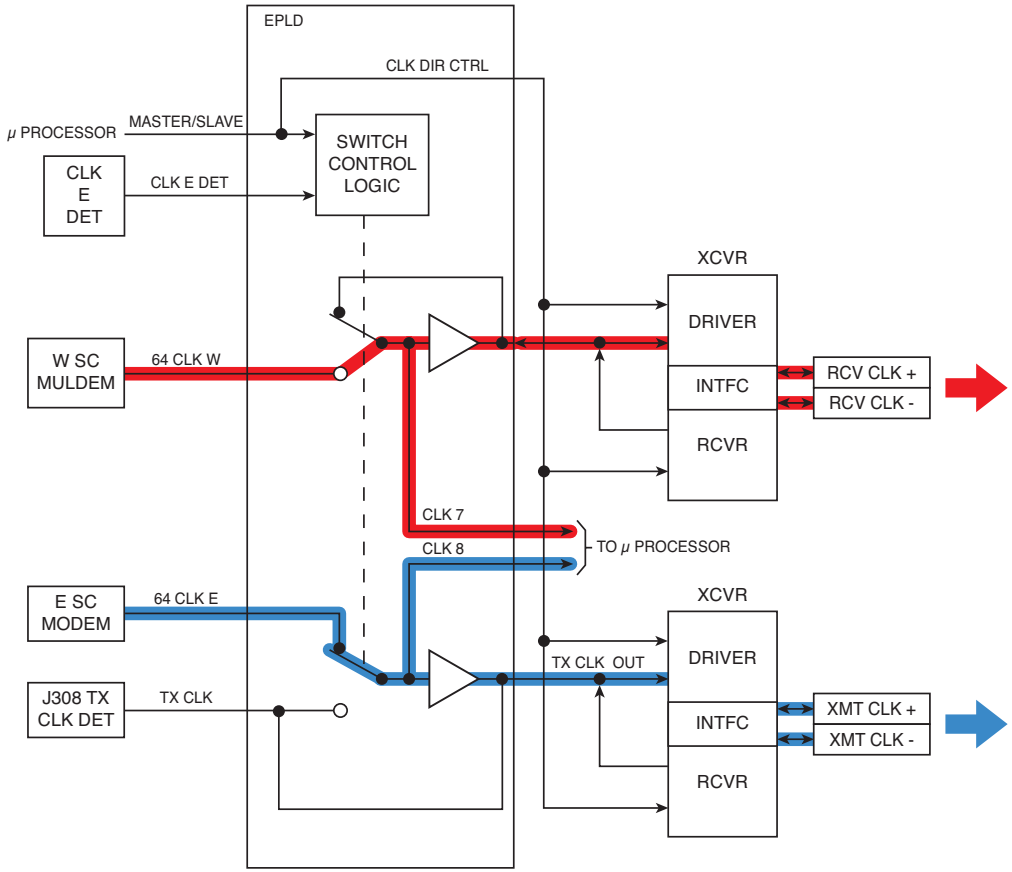
Typical Interconnect



MASTER (DCE) = CLKS OUT (PROVISIONED J308 OUTPUT CLK)

NOTE:
SOFTWARE CONTROLS ARE SHOWN AS PHYSICAL FOR SIMPLIFICATION.

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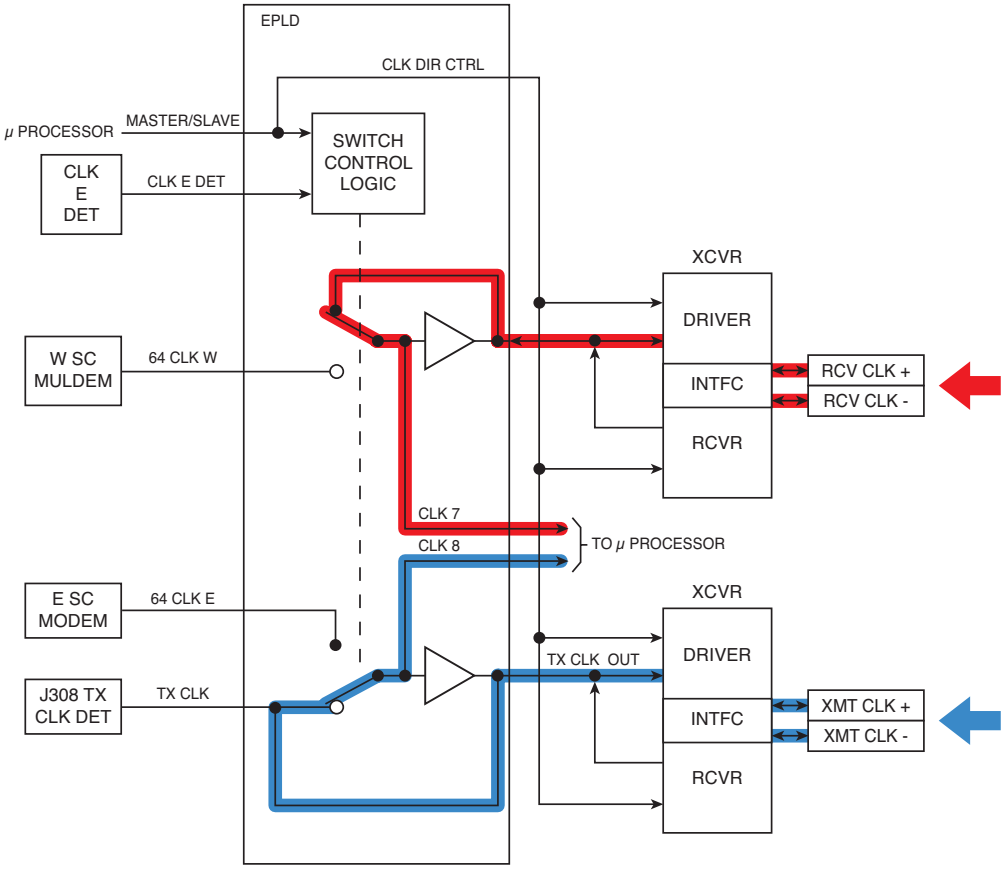
Figure 3-30 Master Mode Functional Block Diagram



SLAVE (DTE) = CLKS IN (PROVISIONED J308 INPUT CLK)

NOTE:
SOFTWARE CONTROLS ARE SHOWN AS PHYSICAL FOR SIMPLIFICATION.

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Figure 3-31 Slave Mode Functional Block Diagram

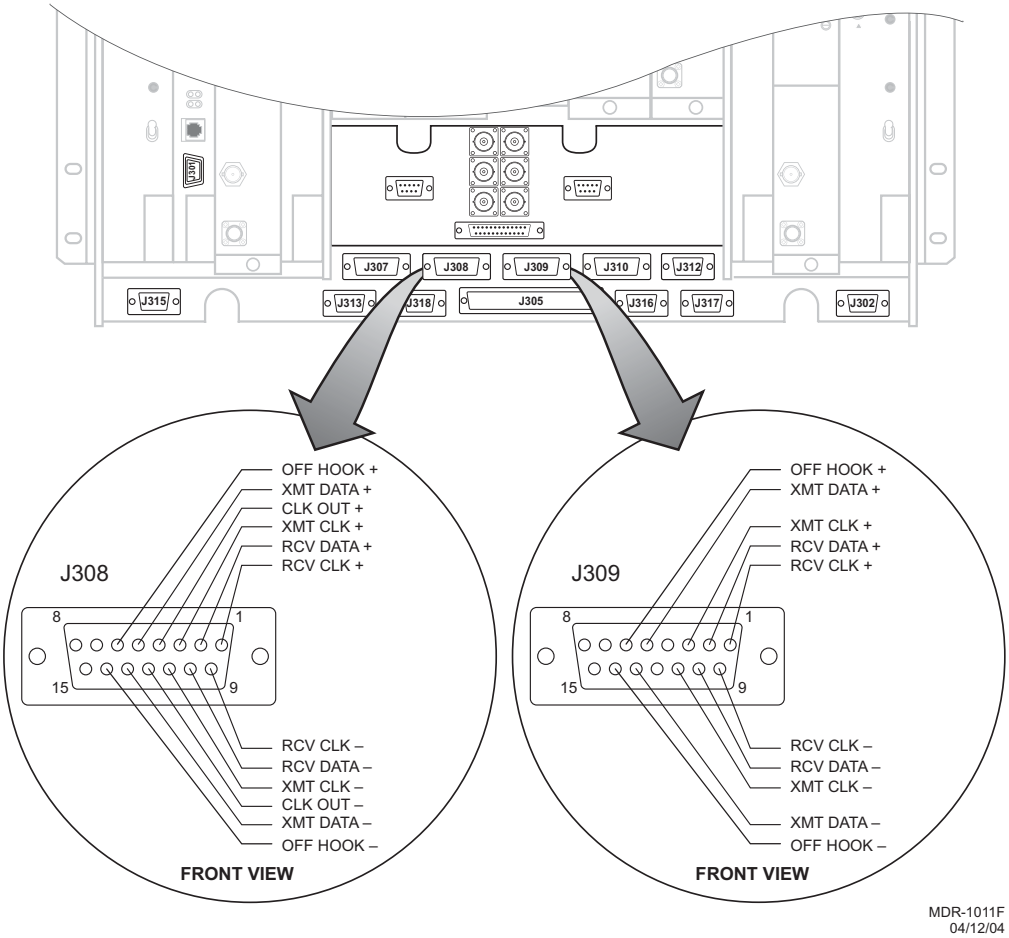


Figure 3-32 MCS-11 Connectors J308 and J309 Location and Pinout

Table 3-19 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 3-20 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

3.18.3 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 3-33 for shelf connector J310 location and pinout. Refer to Table 3-21 for mating cable wiring and color code. See Figure 3-28 for typical connection scheme.

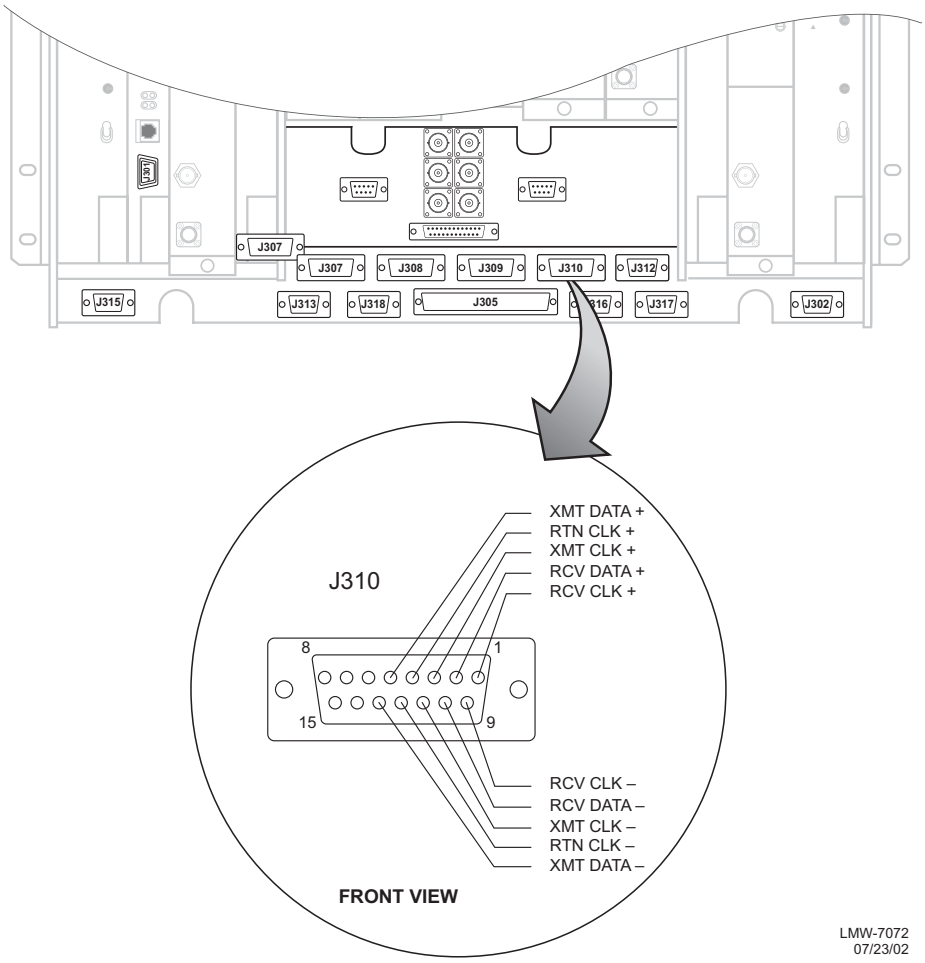


Figure 3-33 MCS-11 Spur Connector J310 Location and Pinout

Table 3-21 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

3.19 TMN CONNECTIONS

This section gives the location and description of customer connections on the TMN interface module.

3.19.1 Installing Module

1 Connect mating cables to applicable connectors J1-J4.

2 Install TMN Interface module loosely in slot C3 in MDR-8000 shelf.

3 Route cables through slot in module front panel, leaving a service loop in the space below.

4 Limit the number of cable ties to prevent having to use large service loops. Leave a service loop of ten in. minimum for future access to cable connectors and module extraction.

5 Press top and bottom handles to seat module in backplane connector.

6 Go to Initial Turnup section for initial turnup procedures.

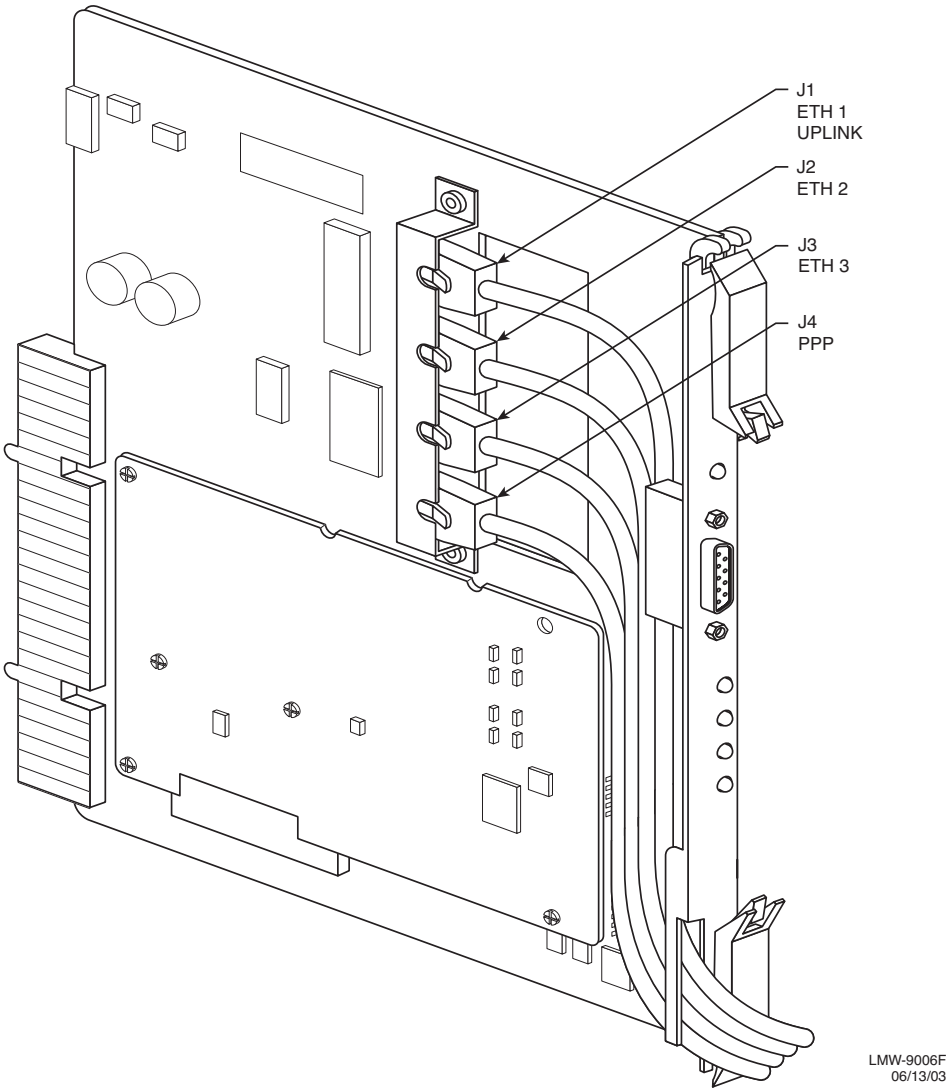


Figure 3-34 TMN Interface Module Signal Connections

3.19.2 Typical Interconnect Scenarios

Note

Refer to CD, Connecting MDR-8000 Radio TMN Interface in an Ethernet LAN, for limitations on interconnecting radios and equipment at a site.

3.19.2.1 Scenario 1 – Daisy Chain, Bridged Connection

See Figure 3-35. In this scenario, four TMN interface modules are connected to the LAN. Daisy chaining prevents having to use external equipment to connect to the LAN. Daisy chaining is typically used instead of a costly battery powered switch/hub at smaller junction stations and/or battery powered remote sites where ac power is not available.

This is accomplished using the Uplink (U) ports on the TMN interface modules on shelves 2 and 3 to connect to the TMN interface module in shelf 1. The uplink port on the TMN interface module in shelf 3 connects to the Ethernet 2 port TMN interface module in shelf 2.

3.19.2.2 Scenario 2 – Switched Connection

See Figure 3-36. In this scenario, four TMN interface modules are connected to the LAN via a switch/hub using the Ethernet uplink port on each module. Ethernet 2 or 3 could be used with a crossover cable.

Note

Since many switch/hubs are powered by ac, this scheme is typically used at terminals where ac power is accessible.

3.19.2.3 Scenario 3 – Front PPP Port Connections

For TMN to TMN PPP connections from Normal (DCE) to Crossover (DTE) or vice-versa, use standard Cat. 5 cable. For other PPP connection options see Figure 3-37 and Figure 3-38.

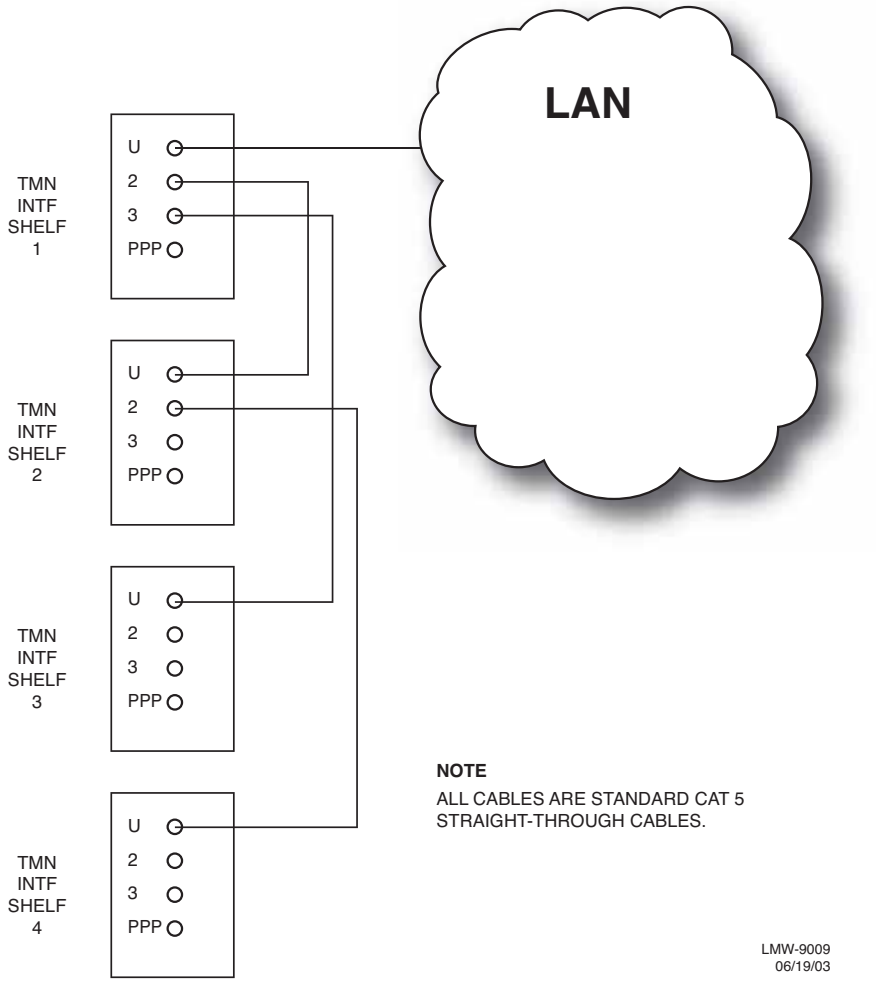


Figure 3-35 Daisy Chain, Using Internal Repeating Hub

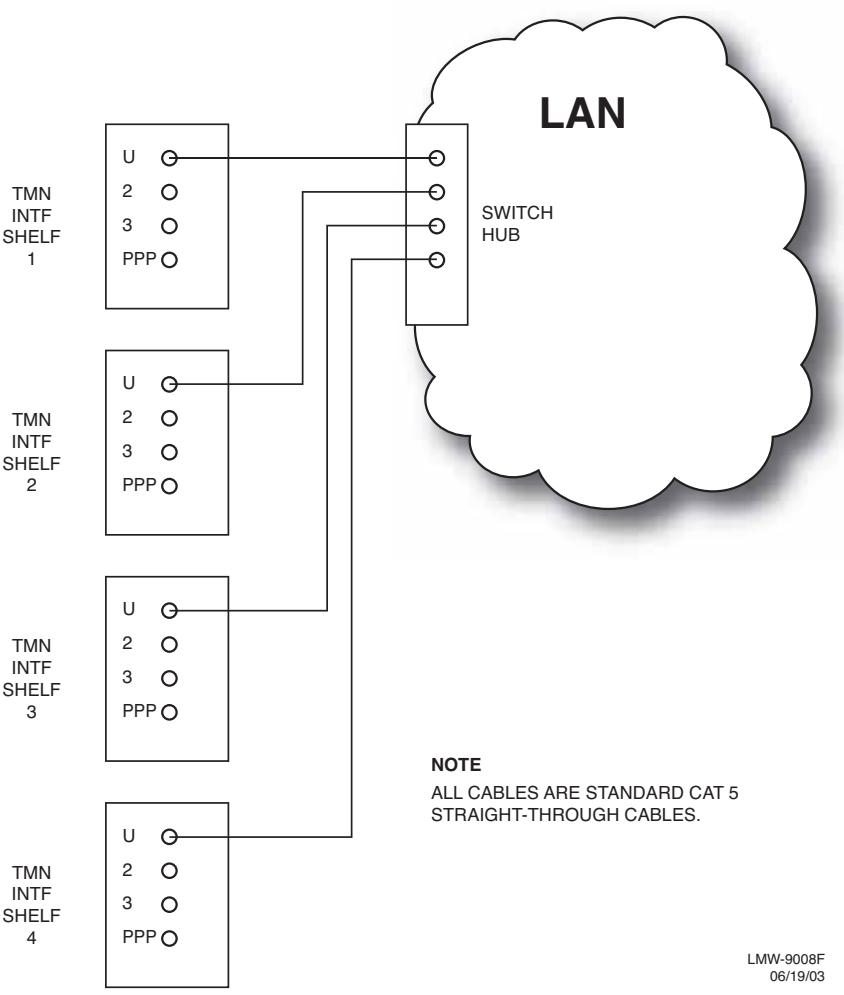


Figure 3-36 Switched Connection Using External Switch/Hub

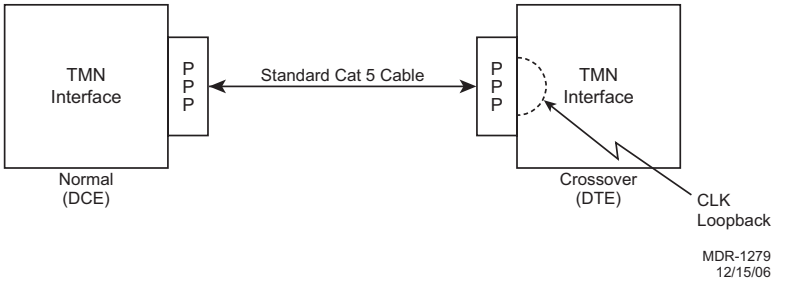
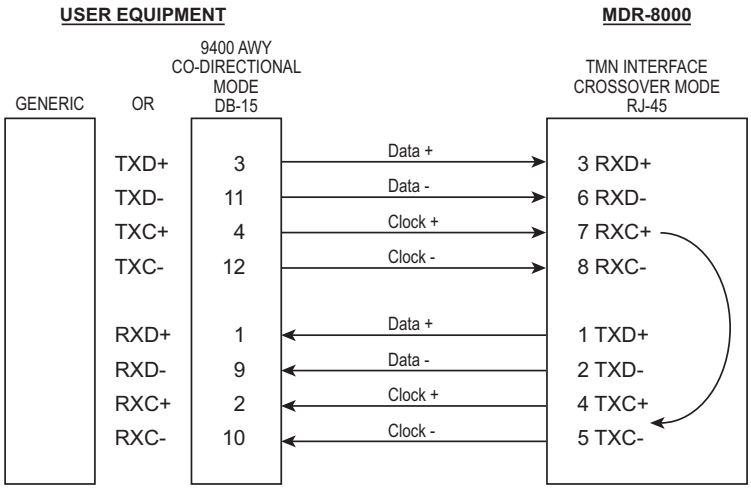
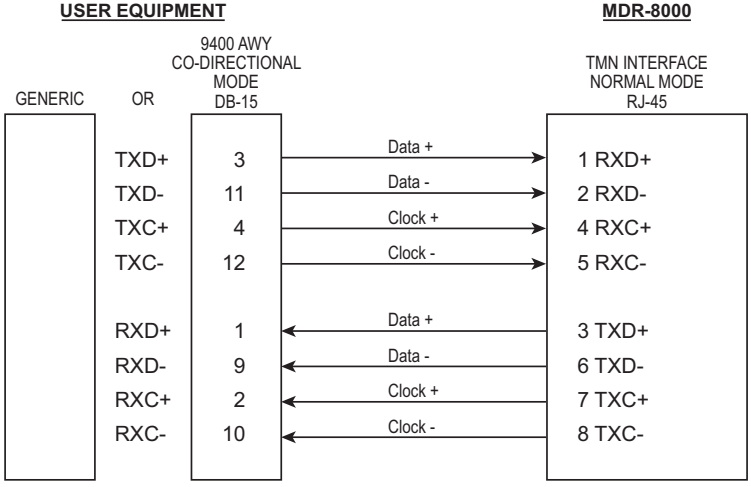


Figure 3-37 Front PPP Port TMN to TMN Connection



In Crossover mode, the Received Clock is used to time the Transmitted data, and the interface is synchronous with the external equipment.



In Normal mode, the functions of the pins reverse, the clock from the user equipment is used to time the incoming data, and an internal clock is used to time the outgoing data making the interface fully asynchronous.

GENERIC OR 9400 AWY TO TMN

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Figure 3-38 Other Front PPP Port Connections (Sheet 1 of 2)

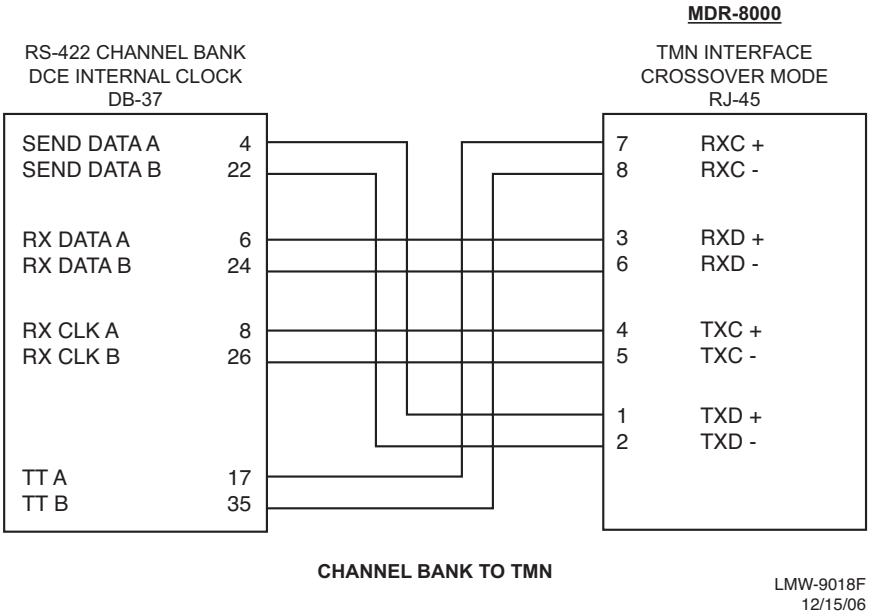


Figure 3-38 Other Front PPP Port Connections (Sheet 2 of 2)

3.19.3 Front Access Connectors

Front access connectors include ETH1 Uplink connector J1, ETH2 connector J2, ETH3 connector J3, and PPP connector J4. Refer to the following paragraphs for details.

Note

See Figure 3-39. *To determine which wire is number 1 on the RJ-45 connector on the mating cable, hold the cable so that the end of the plastic tip is facing away from you (the copper pins are facing up and the plastic spring lock s=clip is underneath). When looking down on the copper pins, pin number 1 is on the far left.*

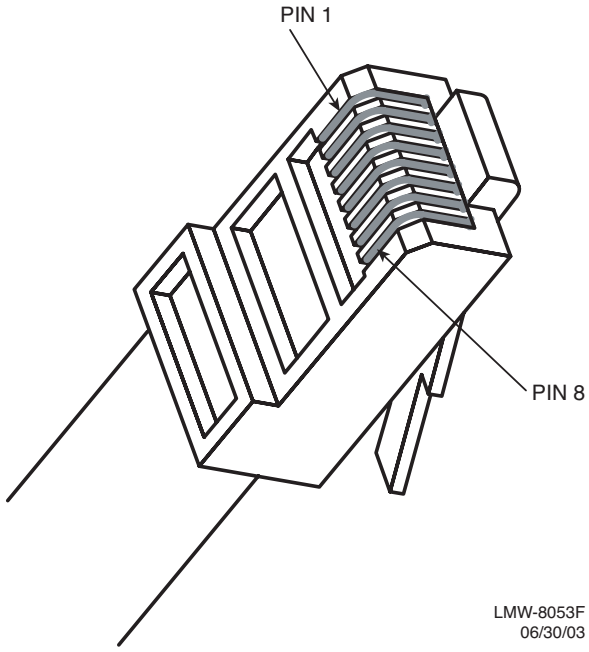


Figure 3-39 Typical RJ-45 Connector Pinout

3.19.3.1 Ethernet (ETH) 1 Uplink Connector J1

Uplink connector J1 is crosswired internally. Use a straight-through cable for connecting to hub or other equipment. Refer to Table 3-22 for module connector pinout.

Table 3-22 ETH1 Uplink Connector J1 Pinout

PIN	FUNCTION
1	TX+
2	TX-
3	RX+
4/5	GND (via 75 ohm resistor)
6	RX-
7/8	GND (via 75 ohm resistor)

3.19.3.2 Ethernet Connectors J2 and J3

ETH2 and ETH3 connectors require straight-through cables to connect to external equipment. Refer to Table 3-23 for pinout/function.

Table 3-23 ETH2 and ETH3 Connectors J2 and J3 Pinout

PIN	FUNCTION
1	RX+
2	RX+
3	TX+
4/5	GND (via 75 ohm resistor)
6	TX-
7/8	GND (via 75 ohm resistor)

3.19.3.3 PPP Connector J4

Proposed wiring compatible with TIA-568B on an RJ45 connector. Using this pinout, MDR-8000 radios could be interconnected using a standard four twisted pair (8 wire) straight-through wired CAT5 Ethernet Crossover patch cord, provided that the clocks port on one end is provisioned to *receive clock* instead of *transmit clock*. Refer to Table 3-24 for pinout/function.

Table 3-24 PPP Connector J4 Pinout

PIN	FUNCTION	DTE	DCE
1	TXDAP	OUT	IN
2	TXDAN	OUT	IN
3	RXDAP	IN	OUT
5	TXCAP	OUT	IN
6	RXDAN	IN	OUT
7	RXCAP	IN	OUT
8	RXCAN	IN	OUT

3.19.4 MATING CABLES

See Figure 3-40 and Figure 3-41. Part numbers are assigned for CAT5 UTP straight and crossover unshielded and shielded cables as follows:

PN 3AL48960AAAAAADSZZA straight-through, unshielded

PN 3AL48956AAAAAADSZZA straight-through, shielded

PN 3AL48961AAAAAADSZZA crossover, unshielded

PN 3AL48962AAAAAADSZZA crossover, shielded

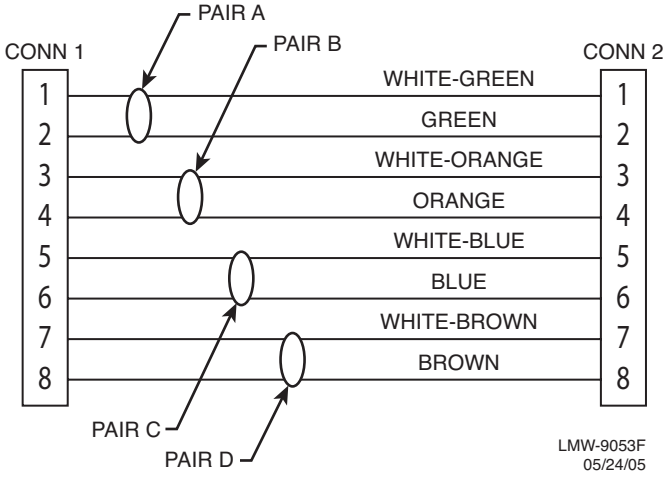


Figure 3-40 Straight-Through Mating Cable

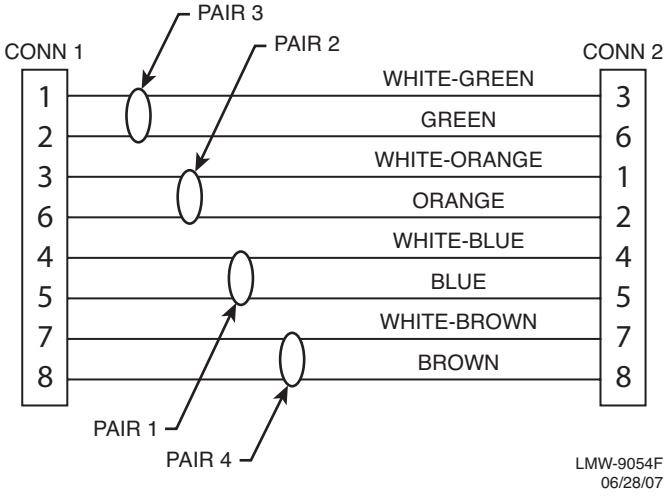


Figure 3-41 Crossover Mating Cable

3.19.5 Front Panel Craft Interface Connector J5

The CRAFT J5 connector on the front panel is used to interface the TMN interface module with a PC. The CRAFT interface is an RS-232-compatible DCE interface, DB9 male to DB9 female cable, PN 695-7848. Refer to Table 3-25 for connector pinout/function. Refer to Table 3-26 for mating cable pinout/function. See Figure 3-42 for location/pinout details.

Table 3-25 CRAFT Terminal Connector J5 Pinout

PIN	FUNCTION
1	DCD
2	TXD
3	RXDD
4	DTR
5	GND
6	DSR
7	NC
8	NC
9	NC

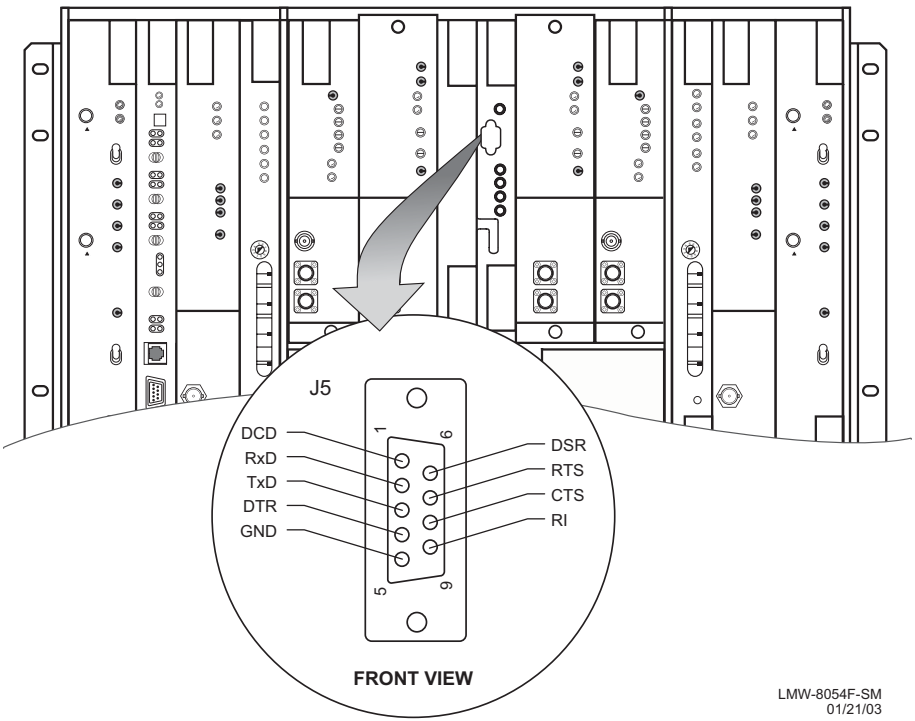


Figure 3-42 CRAFT Terminal Connector J5 Location and Pinout

Table 3-26 J5 Straight-Through Mating Cable

FUNCTION	END 1	WIRE COLOR	END 2	FUNCTION
DCD	01	BLACK	01	DCD
TXD	02	RED	02	TXD
RXD	03	BLACK	03	RXD
DTR	04	WHITE	04	DTR
GND	05	BLACK	05	GND
DTR	06	GREEN	06	DTR
NC	07	BLACK	07	NC
NC	08	BLUE	08	NC
NC	09	BLACK	09	NC

3.20 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 3-27 for details.

Recommended connectorized cable assembly – PN 695-4125-006/013 (26 AWG 5 pair shielded, jacketed cable). See Figure 3-43 for shelf connectors locations and pinout. Refer to Table 3-28 for mating cable wiring and color code. See Figure 3-44 for typical connection scheme.

Table 3-27 ELMC Option Keys

ELMC Option Key	695-5647-018	Required for remote provisioning and downloading on DS1/E1 radios, and DS3 and OC3/STM-1 radios without wayside DS1
ELMC Option Key	695-5647-019	Required for status of DS3 and OC3/STM-1 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/STM-1 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 3-28 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

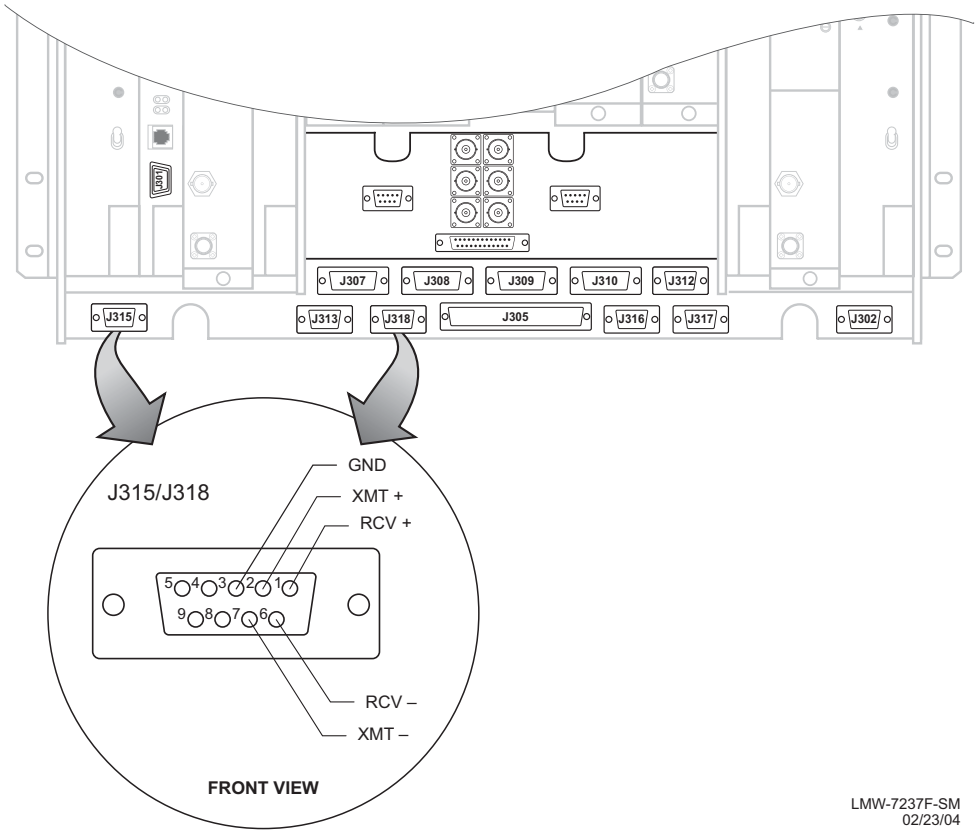
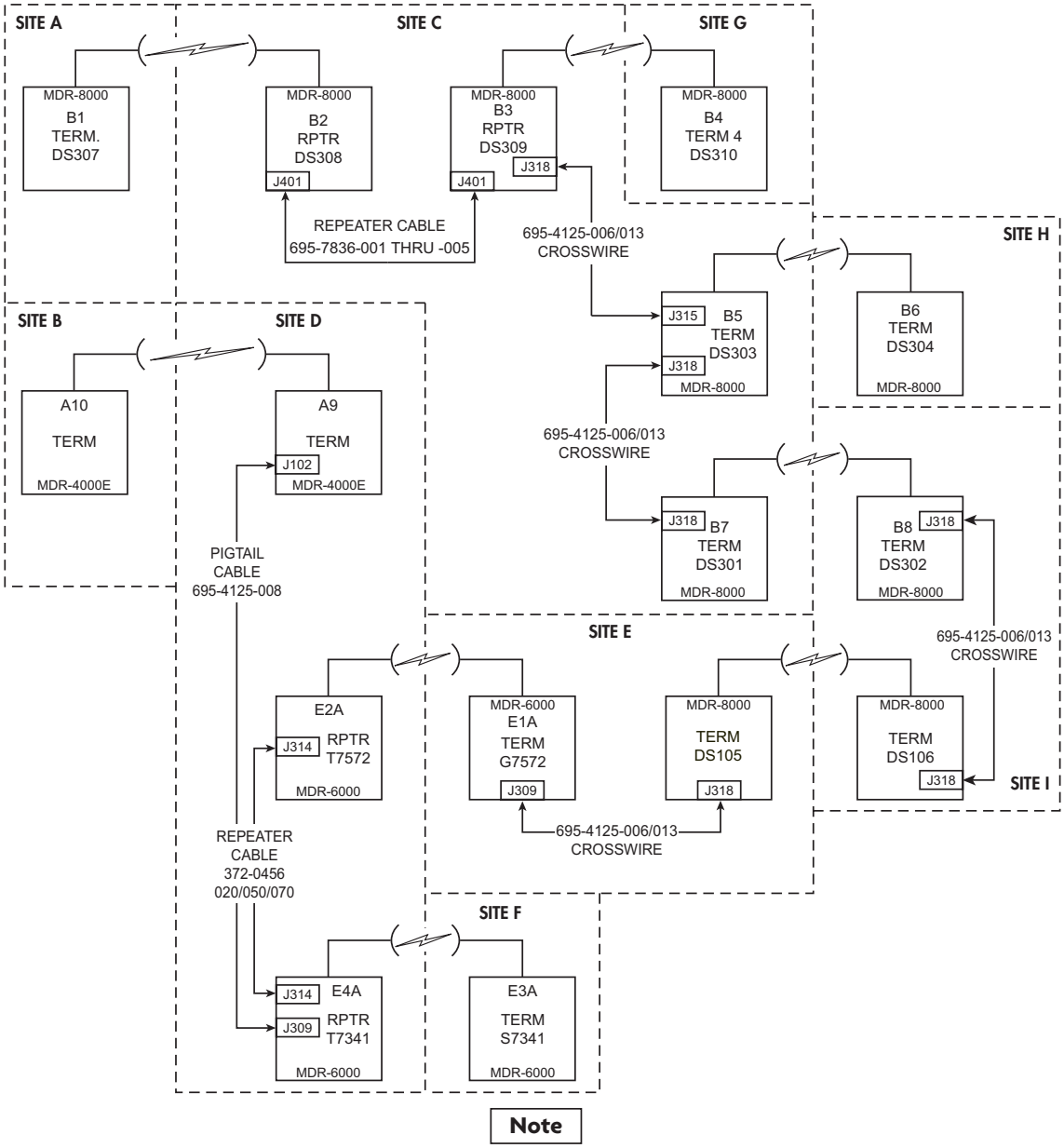


Figure 3-43 ELMC Connectors Location and Pinout



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.

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Figure 3-44 Typical ELMC Connections

3.21 FOREIGN ALARM INTERFACE (J305)

Recommended connectorized cable assembly – PN 695-4121-001/003 (24 AWG 25 pair cable). See Figure 3-45 for shelf connector location and pinout. Refer to Table 3-29 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 3-29 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.

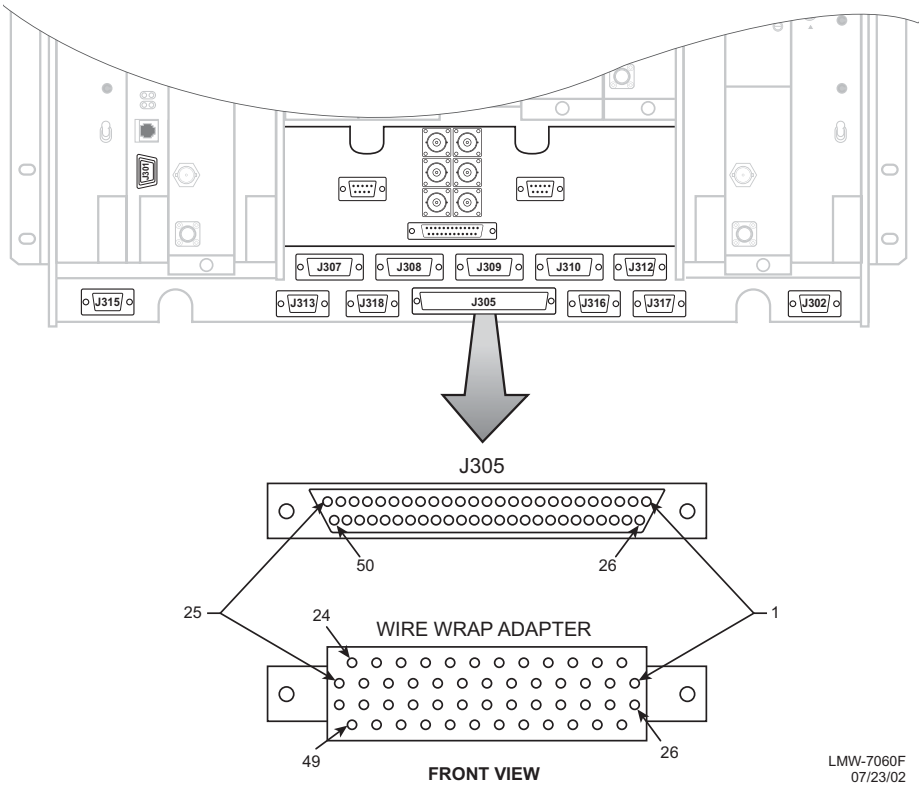


Figure 3-45 Alarm/Status/TBOS Connector J305 Location and Pinout

Table 3-29 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
B XMT ALM OUT	26		BLU/WHT	ALARM OUTPUT FROM RELAY INTFC
A RCV ALM OUT	02	2	WHT/ORN	ALARM OUTPUT FROM RELAY INTFC
B RCV ALM OUT	27		ORN/WHT	ALARM OUTPUT FROM RELAY INTFC
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
B XMT IN SVCE OUT	30		SLT/WHT	STATUS OUTPUT FROM RELAY INTFC
A RCV IN SVCE OUT	06	6	RED/BLU	STATUS OUTPUT FROM RELAY INTFC
B XMT IN SVCE OUT	31		BLU/RED	STATUS OUTPUT FROM RELAY INTFC
A I/O IN SVCE OUT	07	7	RED/ORN	STATUS OUTPUT FROM RELAY INTFC
B I/O IN SVCE OUT	32		ORN/RED	STATUS OUTPUT FROM RELAY INTFC
PWR SUPPLY ALM OUT	08	8	RED/GRN	ALARM OUTPUT FROM RELAY INTFC
NOT USED/OPEN DOOR FAULT	33		GRN/RED	ALARM OUTPUT ON COMM PAK ONLY
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	RELAYINPUT 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

Table 3-29 Alarm/Status Connector J305 Mating Cable Wiring and Pinout (Cont.)

ALM/STATUS/CONTROL	PIN	PR	WIRE COLOR	REMARKS
TBOS XMT- DATA IN OR STATION ALM 13 IN	13	13	BLK/GRN	SERIAL DATA INPUT TO RADIO CONTROLLER OR RELAY 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 RELAY INPUT FROM CUSTOMER EQUIPMENT TO RELAY INTFC CARD (PROVISIONABLE)
STATION ALM 6 IN	39		BRN/BLK	INPUT FROM CUSTOMER EQUIPMENT
TBOS RCV- DATA OUT OR STATION ALM 15 IN	15	15	BLK/SLT	SERIAL DATA OUTPUT FROM RADIO CONTROLLER OR RELAY 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 OUTPUT FROM RADIO CONTROLLER OR RELAY INPUT FROM CUSTOMER EQUIPMENT TO RELAY INTFC CARD (PROVISIONABLE)
STATION ALM 8 IN	41		BLU/YEL	RELAY 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

Table 3-29 Alarm/Status Connector J305 Mating Cable Wiring and Pinout (Cont.)

ALM/STATUS/CONTROL	PIN	PR	WIRE COLOR	REMARKS
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 RELAY INTFC
LOSS OF INPUT OUT	48		GRN/VIO	ALARM OUTPUT FROM RELAY INTFC
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		BRN/VIO	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)

3.22 ALARM, STATUS, AND CONTROLS INTERCONNECT

See Figure 3-46 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.

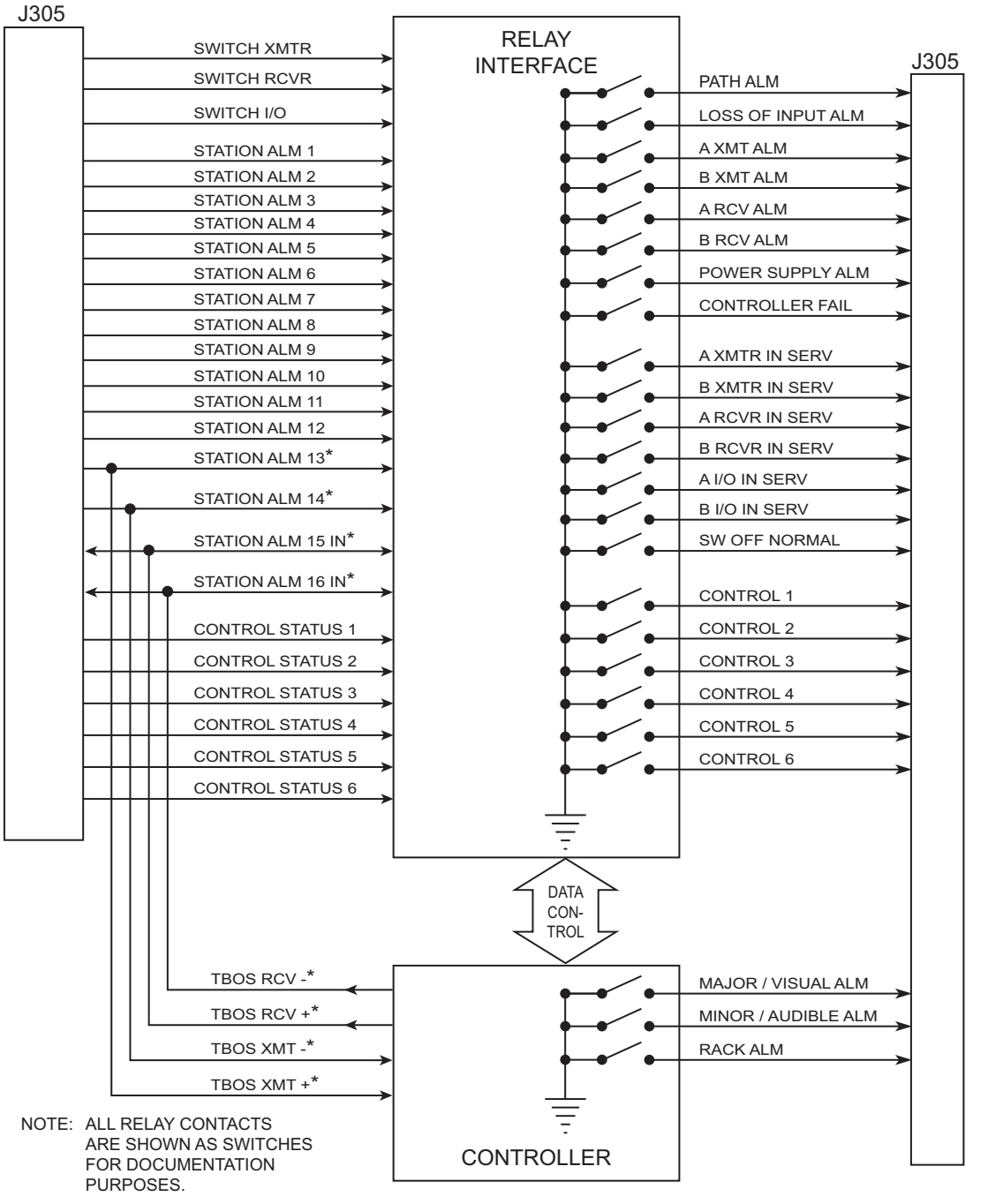


Figure 3-46 Alarm and Status Relays/TBOS Interconnect

3.22.1 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.

3.22.2 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.

3.22.3 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, with10 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.

3.22.4 Station Alarm Wiring

See Figure 3-47. 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.

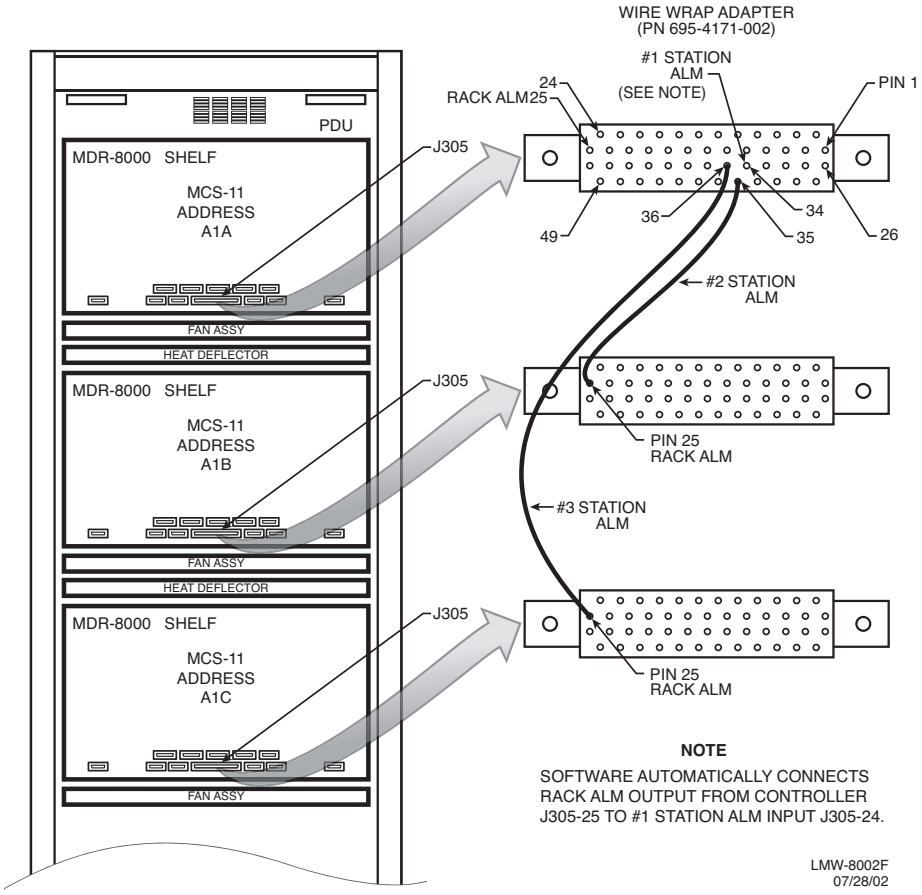


Figure 3-47 Station Alarm Wiring

3.22.5 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/STM-1)

    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 any of 22 conditions exists. Refer to the Maintenance Section for details.

3.22.6 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.

Note

The information contained in this section is a summary of the section with the same title, but not the same section number, on the enclosed CD. "Refer to Cd" is used throughout this section to refer the reader to the detail information on the CD. Go to this section on the CD for interactive links to the detail information referred to in this section.

4 INITIAL TURNUP

4.1 SECTION INTRODUCTION

This section describes the procedures required to turn up the MDR-8000 Microwave Digital Radios after installation.

This provisioning part of the section describes provisioning options available with the MDR-8000 software application. Provisioning allows for the definition, editing, and storing of specific functions. The MDR-8000 provides the ability to provision equipment and facilities through a series of Windows™-based screens and messages. The Provisioning menu lists equipment and functions which may be provisioned. You should use only those provisioning screens that are applicable to your radio.

4.2 RECOMMENDED SEQUENCE

Perform the following initial turnup procedures in sequence:

A. Install software on PC.

Note

Software installed at the factory before delivery should not be overwritten by downloading to the radio controller at initial turnup. Refer to Maintenance section on the attached CD for procedure to upgrade existing software.

B. Turn on the radio.

C. Establish communication between radio and USI computer.

Note

Saving provisioning on disk provides a reference for any future provisioning changes.

D. Provision radio.

4.3 SECURITY MANAGEMENT

Note

A password is not required to operate the MDR-8000. The radio is shipped without a password and if a password is desired, it must be entered using the Change Password screen. Once entered initially, the password must be entered each time the user wants to access the provisioning screens (level 1 password required) or download software (level 2 password required).

The MDR-8000 application software offers user password security management using two different levels of passwords. User security deals with access level assigned to specific users. The level of user security affects the type and number of commands an individual user may execute. This prevents an unqualified user's access to high-level commands.

Level 1 password allows the user to perform all tasks except downloading software. Level 2 password allows access to all functions and is the highest level.

4.4 LOAD MDR-8000 SOFTWARE ON PC

Before operating the user system interface (USI) for the first time, the programs contained on the CD ROM must be installed on the PC. The installation process configures the PC for its unique requirements and prepares it to run the program.

A. Insert CD ROM disk into PC.

B. On Windows desktop, double click on **My Computer** icon. **My Computer** window displays.

C. In **My Computer** window, click on **CD ROM** icon. Files window displays

D. See Figure 4-1. Follow directions and load USI software on PC.

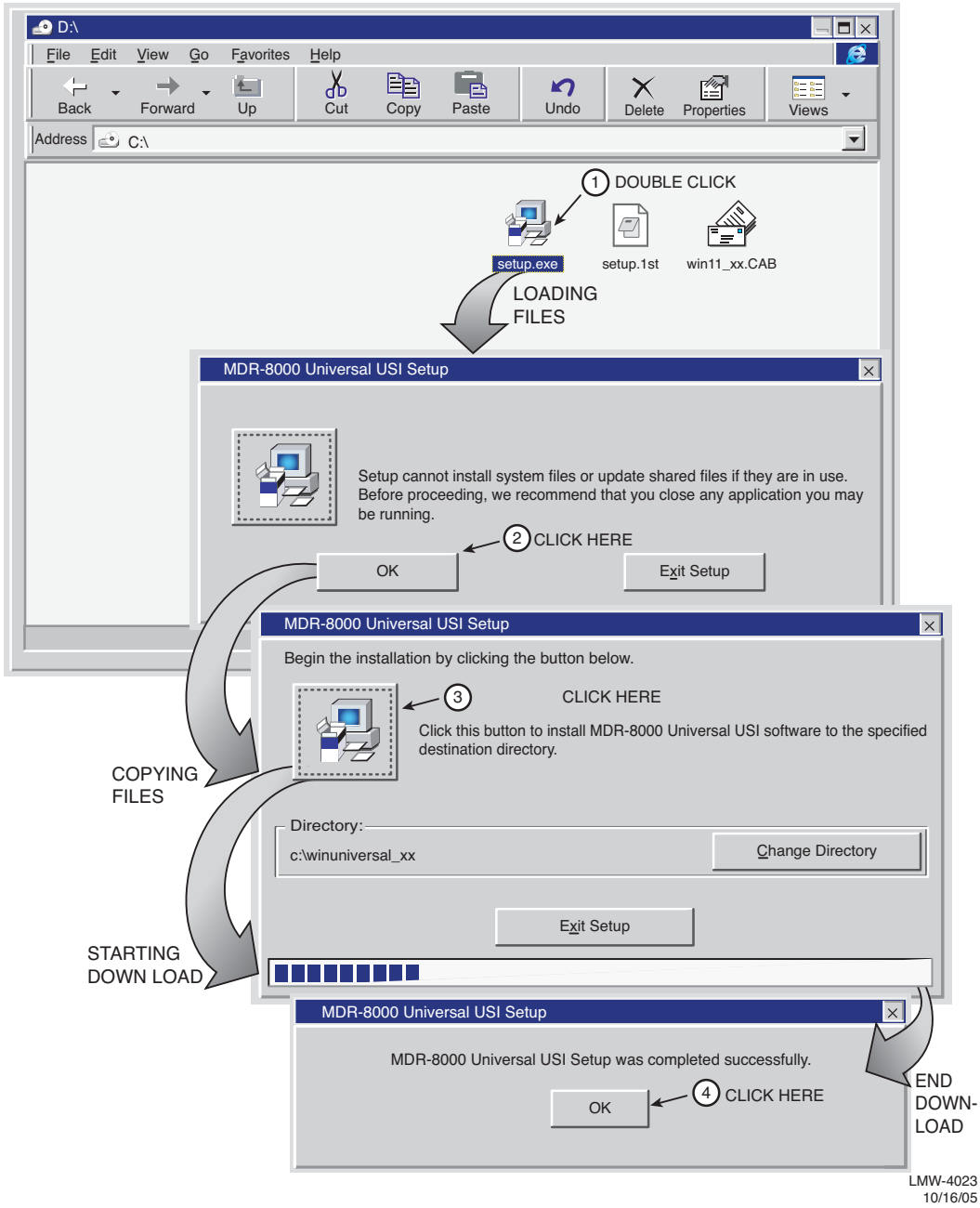


Figure 4-1 Load USI Software on PC

4.5 TURN-ON PROCEDURE

Note

For user safety, user should become familiar with locations of power distribution units and circuit breakers associated with the MDR-8000 radio.

Perform the following procedure to turn on the radio.

A. On power supply module, set **PA ON/OFF** switch to **OFF**. Yellow **PA OFF** indicator will light.

B. On power supply module, set **POWER ON 1/OFF 0** switch to **ON 1**.

C. On power supply module, set **PA ON/OFF** switch to **ON**. Yellow **PA OFF** indicator will turn off.

Note

Until both the local and farend radios in the hop are turned on and operating properly and the RF path has been established, alarm conditions will exist.

D. Observe CHAN ALM indicator on RCVR module is lit.

E. Wait for RCVR to lock on frequency. When RCVR is locked on frequency (approximately 5 to 30 seconds), CHAN ALM indicator on RCVR module will turn off.

F. Verify all front panel alarm indicators on radio shelf are off. If not, refer to Maintenance section for troubleshooting.

4.6 ESTABLISH COM PORT

Establish communication between the USI computer and the controller in the radio.

Note

Disable infrared option on laptop (if equipped) to prevent disrupting communication on com port.

A. Connect RS-232 interface cable between USI connector on controller and PC. See Figure 4-2.

B. On Windows desktop, click on **Start** icon. Program menu displays.

Note

Only one COM port can be used at a time.

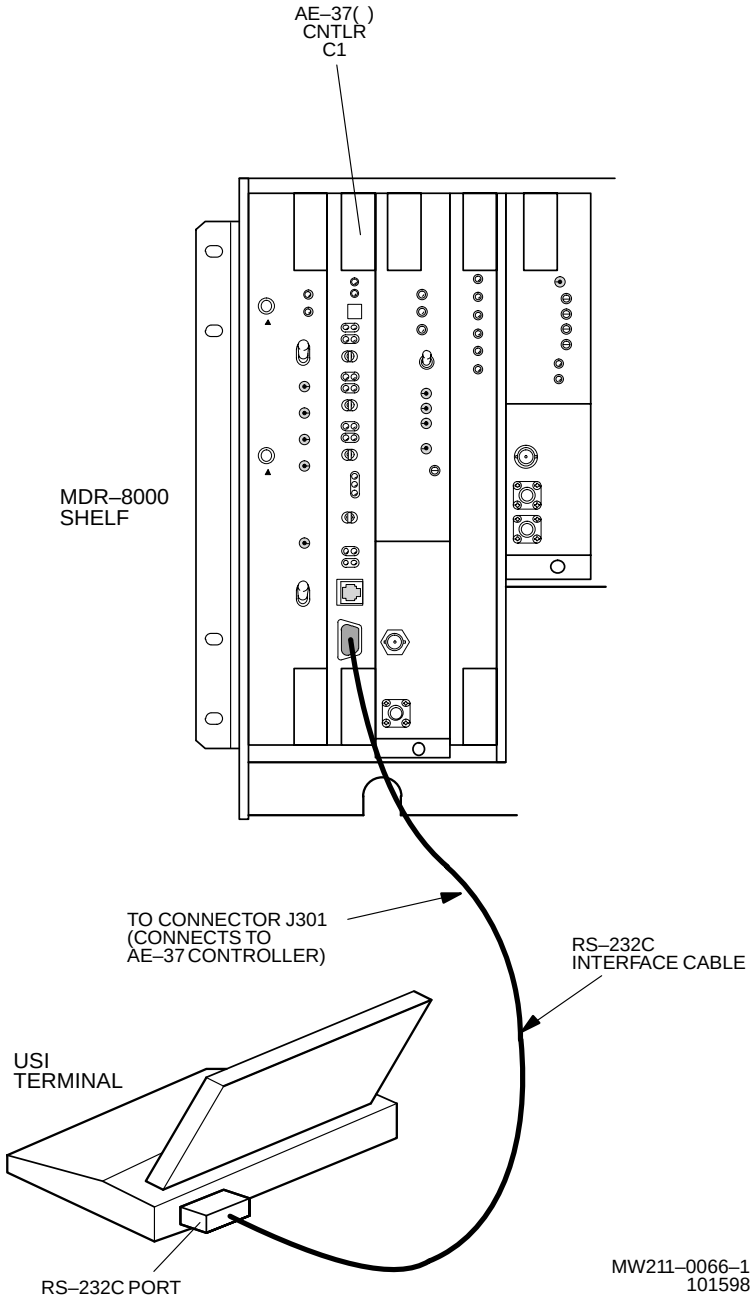


Figure 4-2 USI Computer Hookup

C. On Program menu, click on Win USI program. Win USI screen displays with message COMMUNICATING to indicate PC is communicating with the radio controller. If COMMUNICATION DOWN message is displayed, perform procedure shown on Figure 4-3 to change COM port.

D. STOP. This procedure is complete.

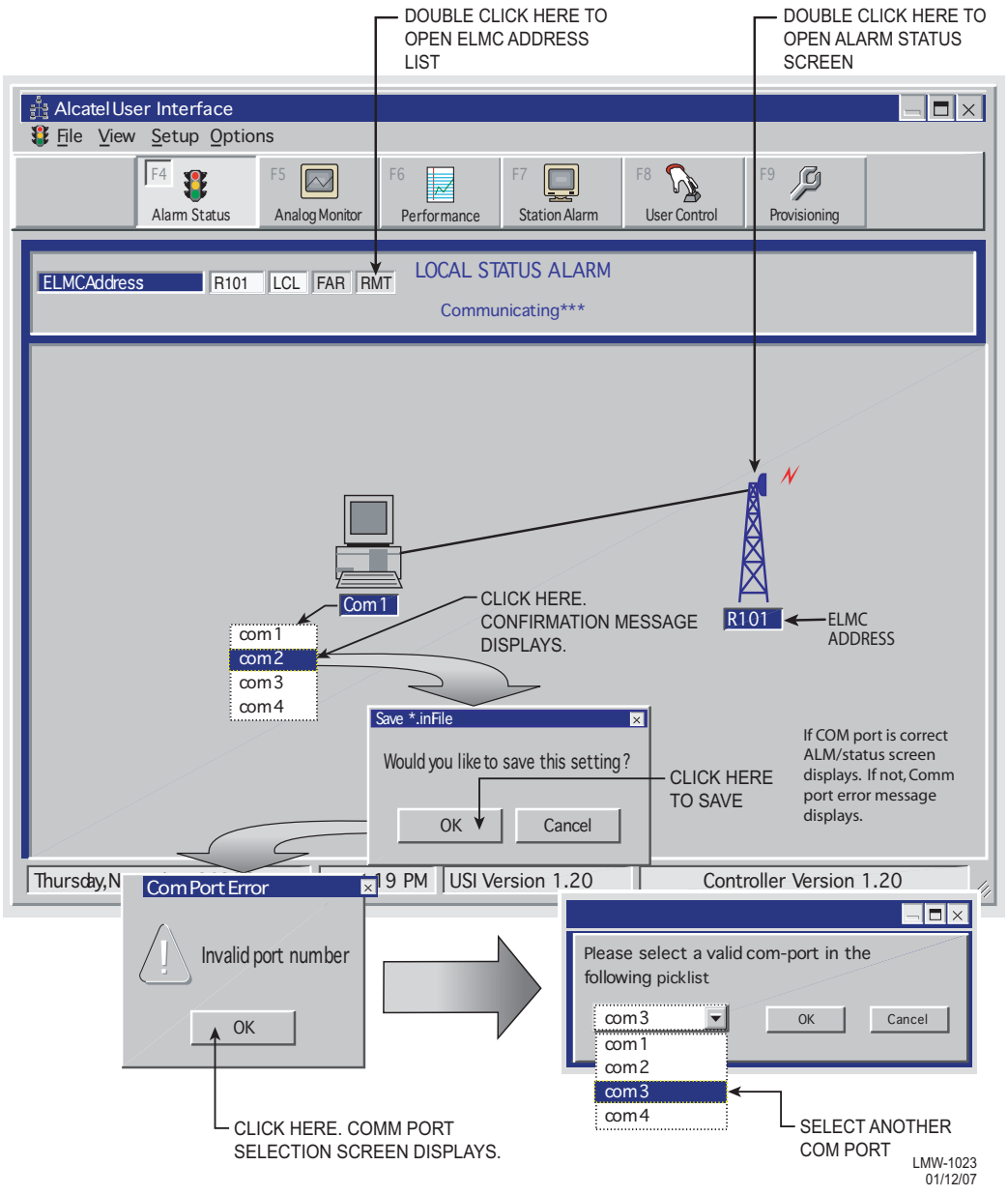


Figure 4-3 Communications Port Setup

4.7 TEST PROCEDURES

The radio has been properly aligned and tested at the factory before shipment eliminating the need for testing after initial turn-up. The only time testing and/or adjustment is required is after a maintenance action such as removal and replacement procedure and/or constant alarms requiring corrective maintenance action. The completed maintenance action procedure(s) will reference any required test procedure(s).

4.8 PROVISIONING RADIO

Note

Changes to provisioning do not have to be made in any particular order.

Open radio provisioning screens. On main screen, double click on tower icon. Status and alarm screen displays. Click on Provisioning. Check current provisioning and change as required. See Figure 4-4 for recommended sequence.

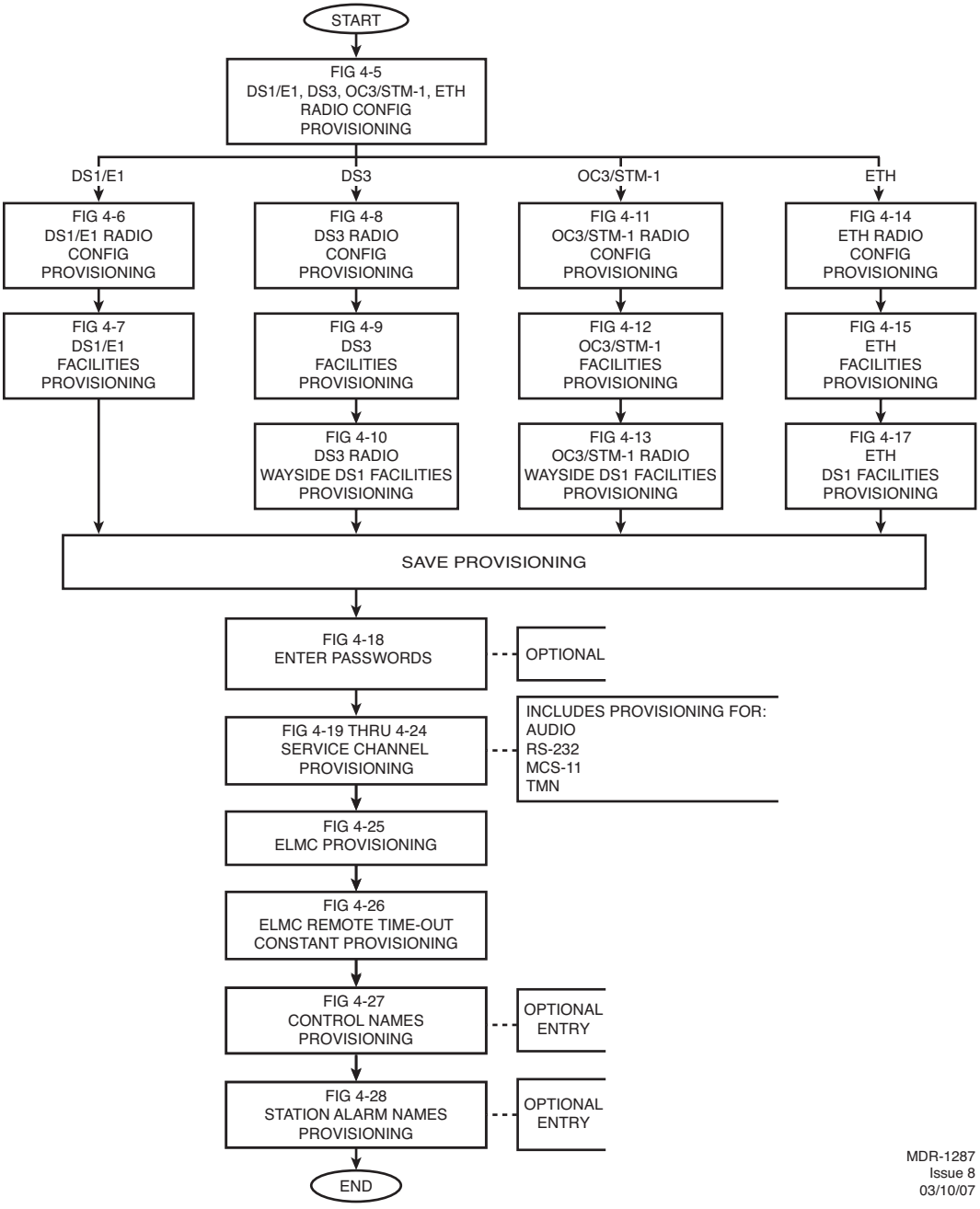


Figure 4-4 Provisioning Sequence

Note

Screen for OC3 radio is shown. DS1/E1, DS3, SNMP, and ETH radio configuration is similar.

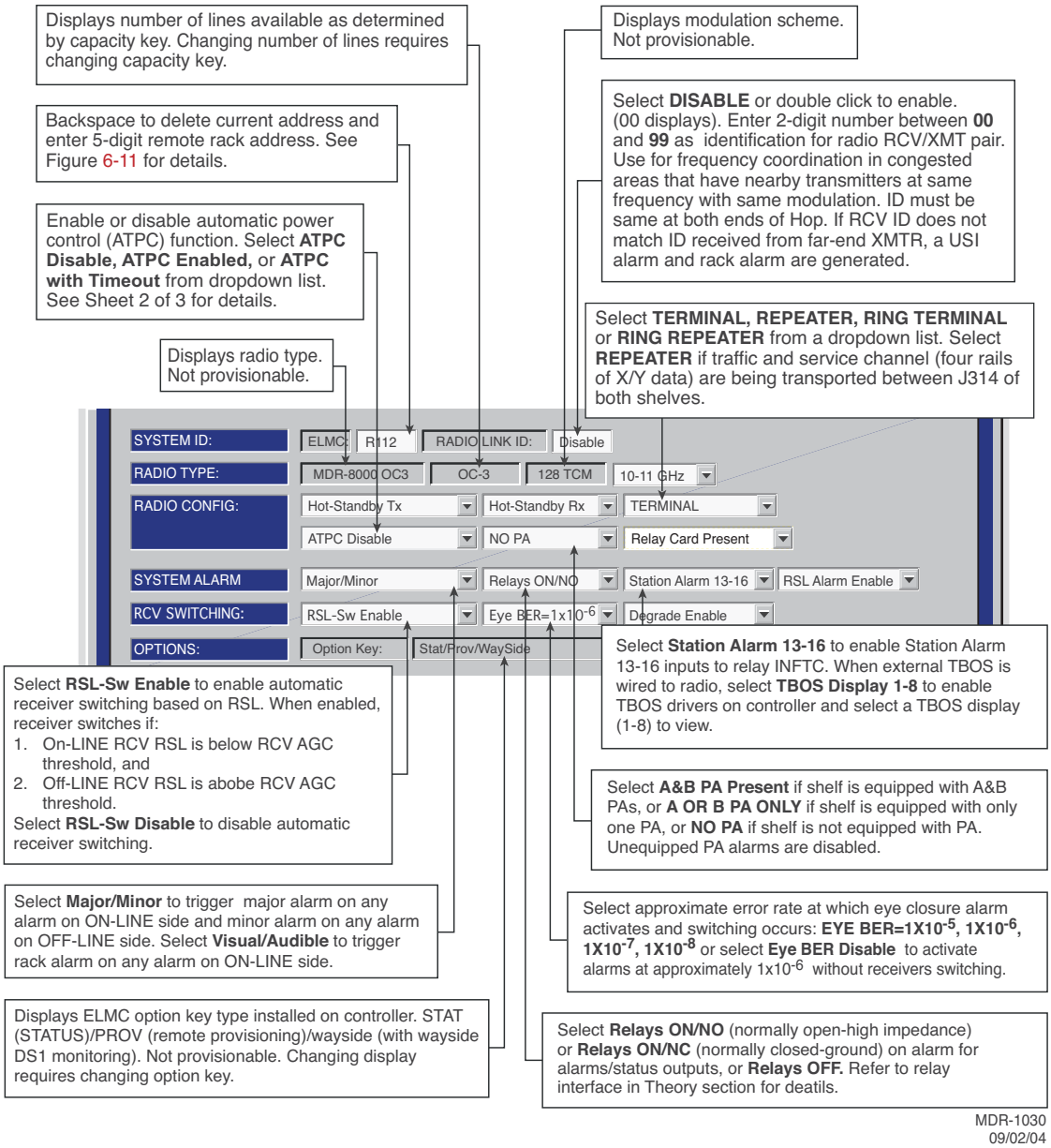


Figure 4-5 DS1/E1, DS3, OC3/STM-1, ETH Radio Configuration Provisioning (Sheet 1 of 2)

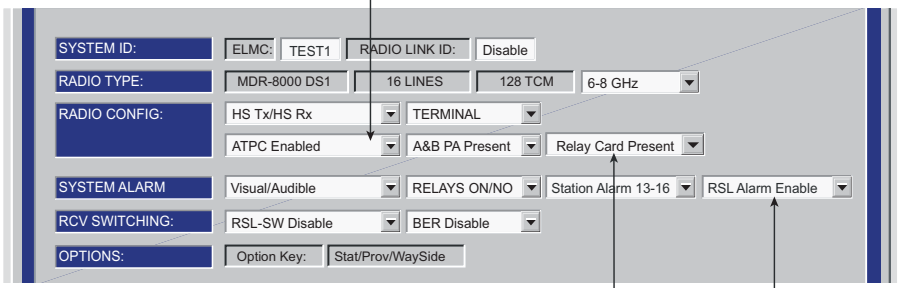
Note

Screen shown is for DS1 Radio. E1, DS3, OC3/STM-1, and ETH radio configuration provisioning is similar. Changes to provisioning do not have to be made in any particular order.

NOTES

1. ATPC T/O IS A CMD PATH FUNCTION PERFORMED AT XMTR.
2. ATPC TRACKS RCVR WITH HIGHEST LEVEL.
3. LOW POWER ATPC IS 10dB DOWN FROM HIGH POWER.

SELECT **ATPC** OR **ATPC T/O** ENABLE AUTOMATIC XMT POWER CONTROL (ATPC) FUNCTION. WHEN PROVISIONED **ATPC** OR **ATPC T/0**, ONE RCVR OUT-OF-LOCK CAUSES HIGH POWER ATPC FOR 10 SECONDS EVERY ONE MINUTE. IF BOTH RCVRS ARE OUT-OF-LOCK, ATPC GOES TO HIGH POWER AND STAYS AT HIGH POWER UNTIL ONE RCVR (REVERTS TO ONE RCVR OUT-OF-LOCK MODE) OR BOTH RCVRS LOCK. WHEN PROVISIONED **ATPC T/O** (TIMEOUT), IF CMD PATH IS LOST, ATPC GOES TO HIGH POWER FOR FIVE MINUTES THEN GOES TO LOW POWER. THEN, EVERY HOUR, ATPC GOES HIGH FOR 10 SECONDS AND THEN GOES TO LOW POWER. THIS CONTINUES UNTIL THE CMD PATH IS RESTORED. SELECT **DISABLE** TO DISABLE ATPC FUNCTION.



SELECT **Relay Card Present** IF SHELF IS EQUIPPED WITH A RELAY INTFC MODULE. SELECT **Relay Card Not Present** IF SHELF IS NOT EQUIPPED WITH A RELAY INTFC CARD.

SELECT **RSL Alarm Enable** TO ENABLE ALARM ON USI ALARM AND STATUS SCREEN WHEN RSL DROPS BELOW THRESHOLD. SELECT **RSL Alarm Disable** TO INHIBIT ALARM.

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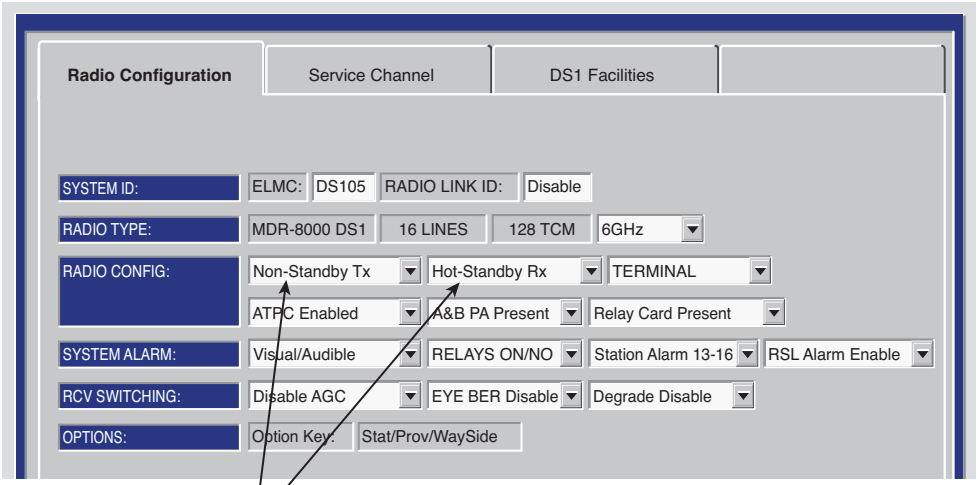
Figure 4-5 DS1/E1, DS3, OC3/STM-1, ETH Radio Configuration Provisioning (Sheet 2 of 2)



SELECT ONE ON EACH

None Non-Standby Tx Hot-Standby Tx Freq-Diversity Tx	+	None Non-Standby Rx Hot-Standby Rx Space-Diversity Rx Freq-Diversity Rx	=	Resulting Configurations NS Tx/NS Rx NS Tx/HS Rx } (Refer to CD) NS Tx/SD Rx HS Tx/HS Rx (See Example 1) HS Tx/SD Rx (See Example 2) FREQ DIV (Refer to CD).

NS = Non-Standby
HS = Hot-Standby
SD = Space Diversity

Note

Any combination can be selected. Select **Prov Save** *and an Invalid Configuration box/message displays if combination selected results in an invalid configuration.*

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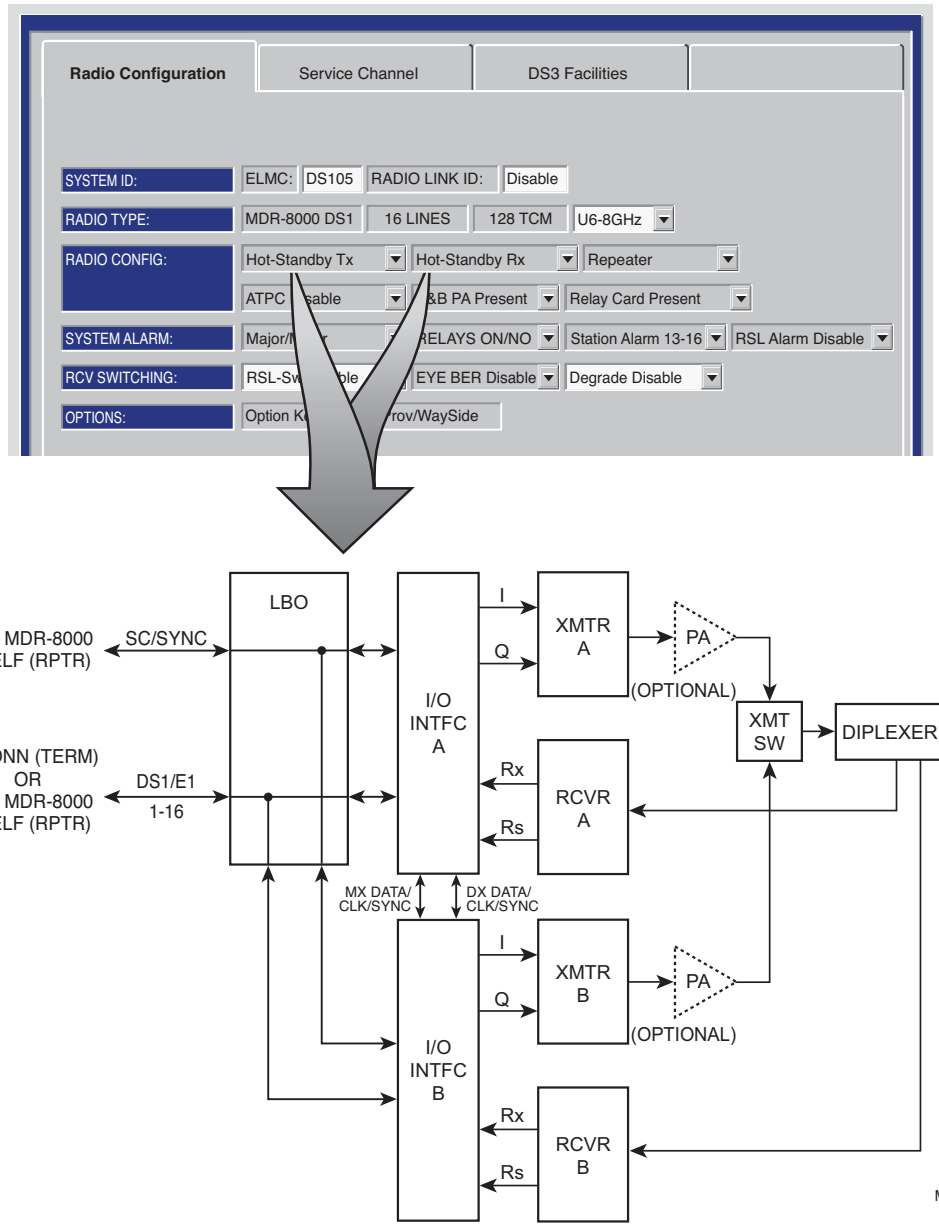
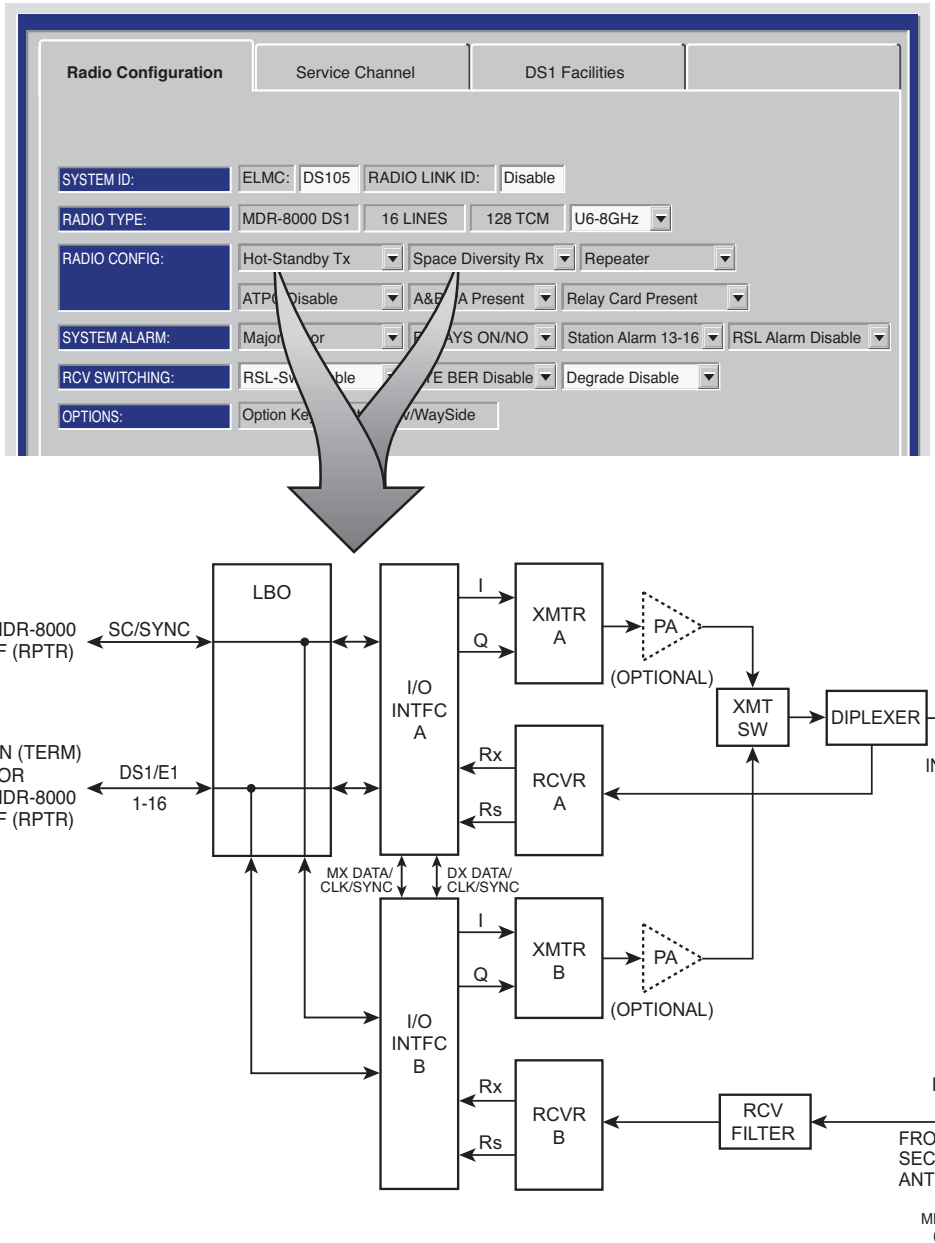
Figure 4-6 DS1/E1 Radio Configuration Provisioning



DS1/E1 PROVISIONING EXAMPLE 1: HS Tx/HS Rx



DS1/E1 PROVISIONING EXAMPLE 2: HS Tx/SD Rx

Note

If installation at both ends of a hop are complete except for connecting to customer inputs/outputs and it is desirable to have an alarm-free system, alarm reporting on the incomplete connections can be disabled temporarily through provisioning. You can communicate over the hop even if you do not have the radio connected to customer DS1 inputs; however, you will alarm unless you select **OFF** *to disable* **INSERT CHANNEL** *(located on the USI DS1 Facilities screen) for all equipped lines. Disabling the DS1 insert function disables both the lines and alarm reporting for the lines. After all customer connections are complete, alarm reporting can be restored to normal. To restore alarm reporting to normal, set* **INSERT CHANNEL** *on DS1 Facilities screen to* **ON**.

SELECTING *ON* INSERTS LOCAL DATA AND TURNS ON THE SELECTED CHANNEL.
SELECTING **OFF** TURNS OFF LOCAL DATA INSERT AND TURNS OFF LINE INPUT ALARM REPORTING ON THE SELECTED CHANNEL.
SELECTING **NM** INSERTS AN AIS SIGNAL AND TURNS OFF LINE INPUT ALARMS ON THE SELECTED CHANNEL.

- ALWAYS SELECT ON WHEN LOCAL DATA IS INSERTED.
- ALWAYS SELECT OFF AT EITHER A TERMINAL OR A NON-PROTECTED REPEATER WHEN LOCAL DATA IS NOT INSERTED.
- ONLY SELECT **NM** ON UNUSED CHANNELS AT PROTECTED REPEATERS.

UNUSED CHANNELS ARE DEFINED AS CHANNELS THAT HAVE NEITHER LOCALLY INSERTED DATA NOR PASS-THRU DATA ACROSS THE REPEATER CABLE. SELECT OFF IF LOCAL DATA IS NOT INSERTED AND THE CHANNEL HAS PASS-THRU DATA ACROSS THE REPEATER CABLE (NOTE: SELECTING NM IN THIS CASE WILL CAUSE THE DATA FROM THE REPEATER TO BE OVERWRITTEN WITH AN AIS SIGNAL PRIOR TO TRANSMISSION).

USING THE REPEATER CABLE TO PASS DS1 DATA ON CHANNELS 5-16 IS NOT RECOMMENDED ON MDR-8000 RADIOS. PASSING THE DATA THROUGH ON THESE CHANNELS WILL PREVENT INDEPENDENT SWITCHING BETWEEN THE DS1 I/O AND THE RADIO TRANSMITTERS. THE DATA SHOULD BE DROPPED AND REINSERTED AT EACH REPEATER NODE.

Note

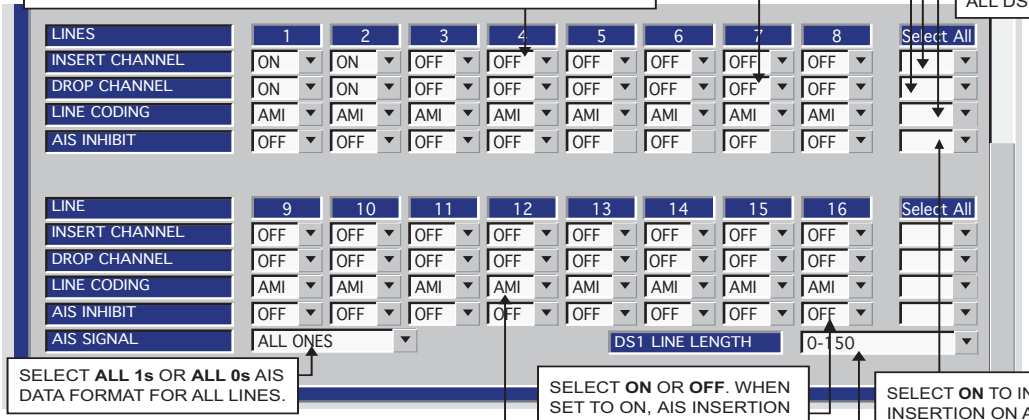
The term "LINE" is used to describe an input/output signal at DS1/E1 rate (1.544 MB/S 2.043 MB/S). The term "CHANNEL" is used to describe a multiplexed signal, at a higher rate than DS1/E1. The inserted channel is output of multiplexer circuit. The dropped channel is input to demultiplexer circuit. The multiplexer and demultiplexer circuits are located on I/O interface module.

SELECT **ON** TO DROP ALL LINES OR **OFF** TO DISABLE ALL LINES AND ALARMS.

SELECT **ON** TO INSERT ALL LINES OR **OFF** TO DISABLE ALL LINES AND ALARMS.

FOR EACH LINE, SELECT **ON** TO DROP LINE OR **OFF** TO DISABLE LINE AND ALARMS.

SELECT **AMI** OR **B8ZS** CODING FOR ALL DSI LINES



SELECT **ALL 1s** OR **ALL 0s** AIS DATA FORMAT FOR ALL LINES.

SELECT **ON** OR **OFF**. WHEN SET TO ON, AIS INSERTION IS INHIBITED ON SELECTED DS1/E1.

SELECT **ON** TO INHIBIT AIS INSERTION ON ALL LINES. SELECT **OFF** TO ENABLE AIS INSERTION ON ALL LINES.

SELECT **AMI** OR **B8ZS** CODING FOR EACH DS1 LINE. E1 LINE CODING IS ALWAYS HDB3.

FOR ALL DS1 LINES, SELECT RANGE THAT MATCHES ACTUAL DISTANCE TO CROSS-CONNECT **0-150 (TEO OFF), 150-330 (TEO ON), 330-480 (TEO OFF)** OR **480-660 (TEO ON)** FT. FOR E1, NO DISTANCE IS DISPLAYED.

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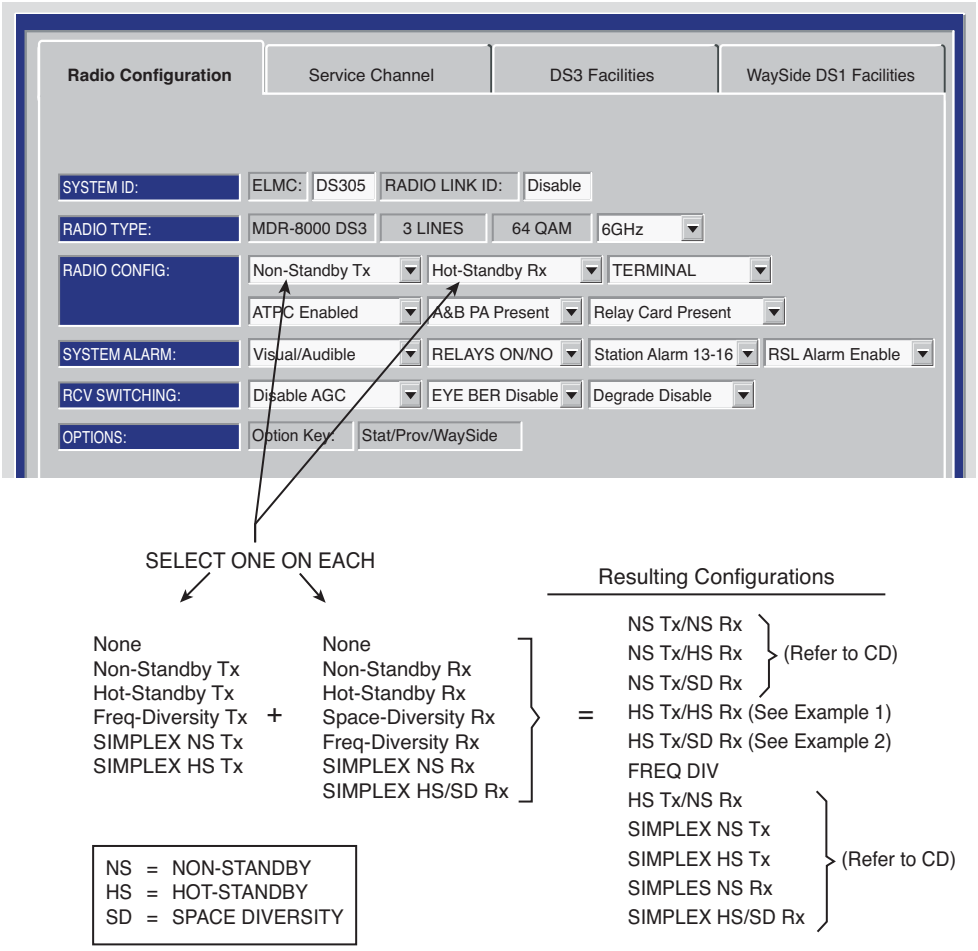
Figure 4-7 DS1/E1 Facilities Provisioning



Note

Any combination can be selected. Select **Prov Save** *and an Invalid Configuration box/message displays if combination selected results in an invalid configuration.*

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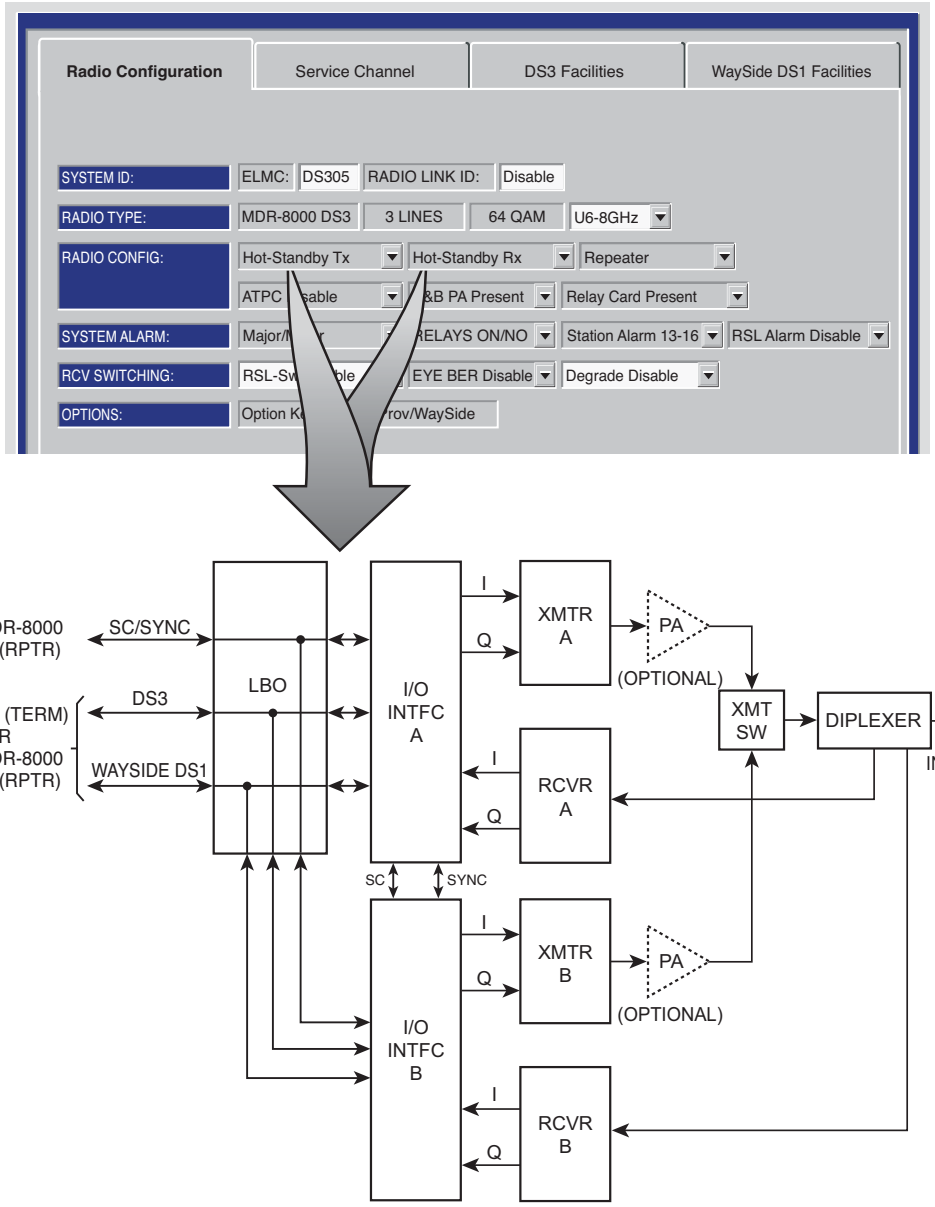
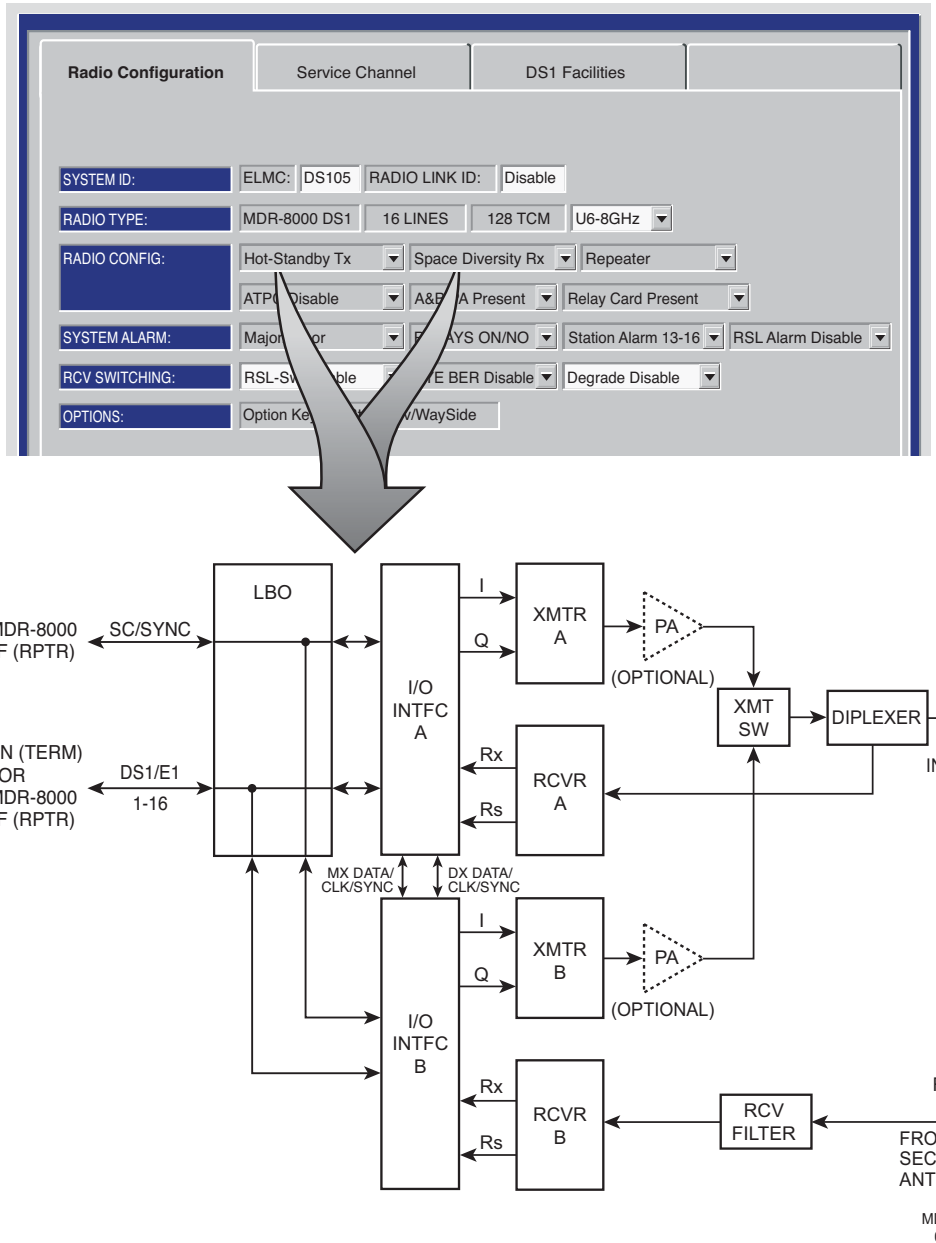
Figure 4-8 DS3 Radio Configuration Provisioning



DS3 PROVISIONING EXAMPLE 1: HS Tx/HS Rx



DS3 PROVISIONING EXAMPLE 2: HS Tx/SD Rx

Note

If installation at both ends of a hop are complete except for connecting to customer inputs/outputs and it is desirable to have an alarm-free system, alarm reporting on the incomplete connections can be disabled temporarily through provisioning. You can communicate over the hop even if you do not have the radio connected to customer DS3 and wayside DS1 inputs; however, you will alarm. On the DS3 Facilities screen, set **XMT ALARM DISABLE** *and* **RCV ALARM DISABLE** *to* **ON** *to disable DS3 alarm reporting on the wayside DS1 Facilities screen, set ALARM Lockout to ON to disable alarm reporting for all equipped wayside DS1 lines. After all customer connections are complete, alarm reporting can be restored to normal.*

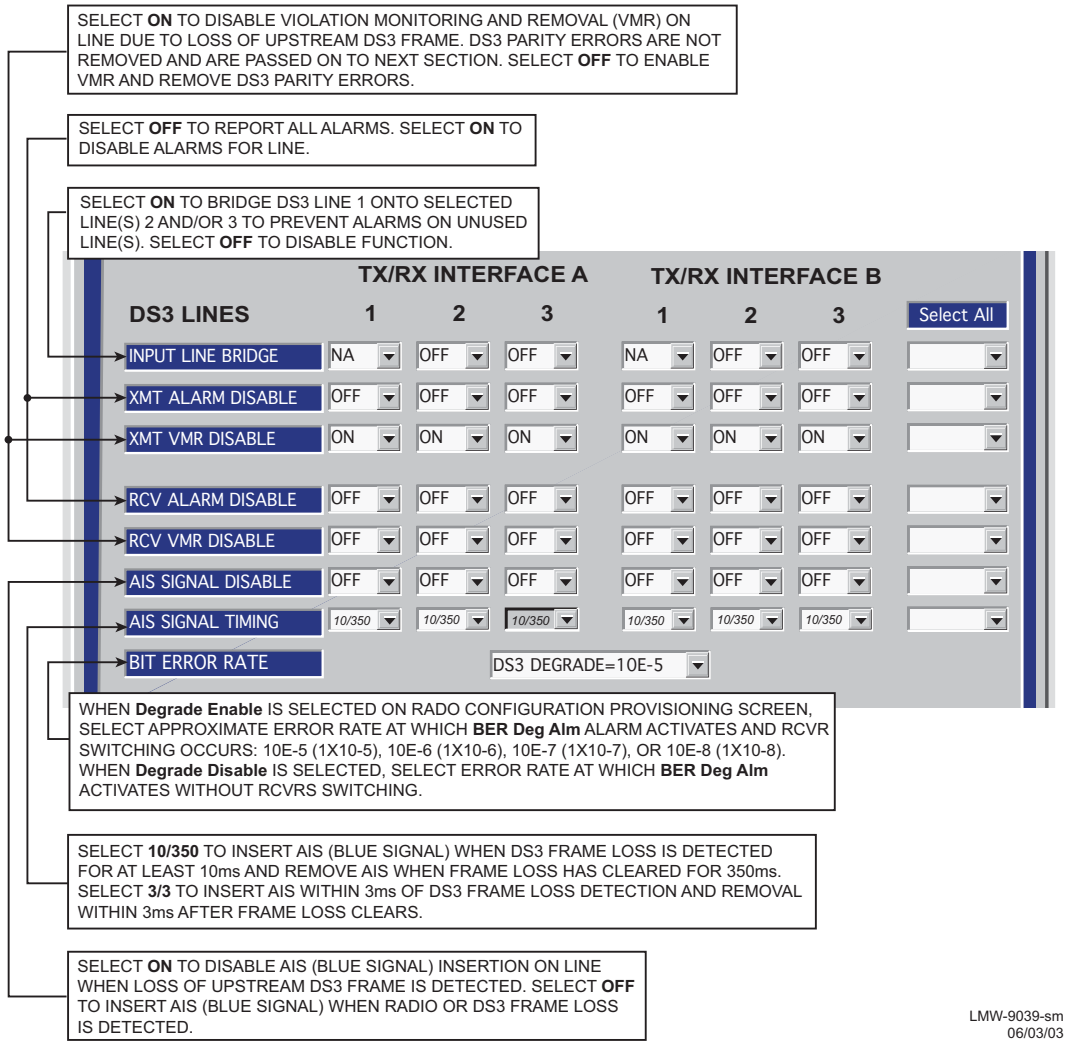


Figure 4-9 DS3 Facilities Provisioning

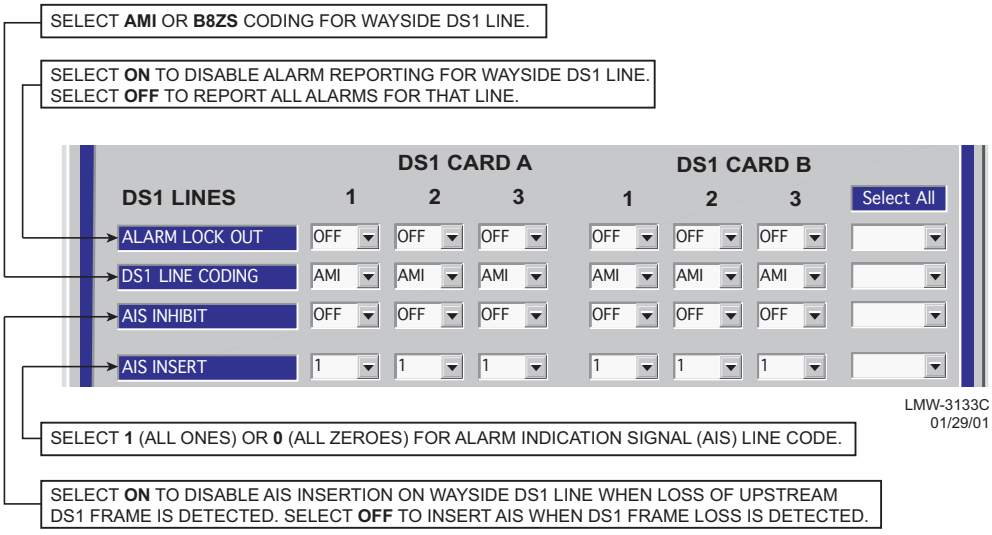
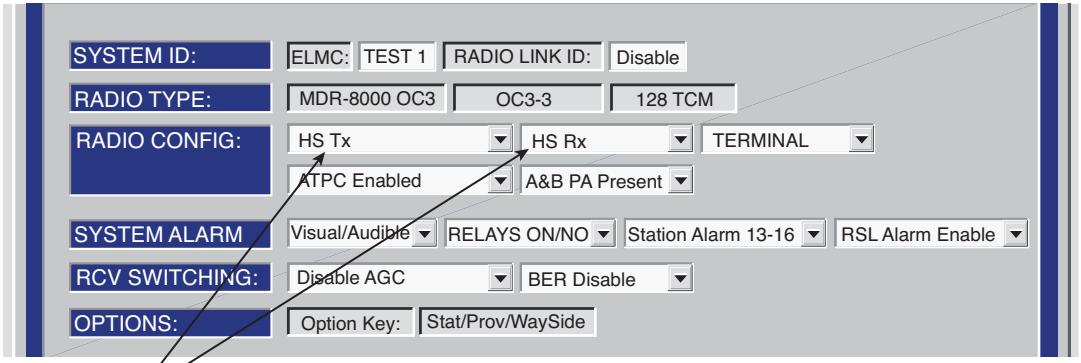


Figure 4-10 DS3 Radio Wayside DS1 Facilities Provisioning



SELECT ONE ON EACH

None
NS Tx
HS Tx
FD Tx

+

None
NS Rx
HS Rx
SD Rx
FD Rx

+

SELECT FIBER CONFIGURATION

2 Fiber
2 Fiber Switched
4 Fiber
4Fiber Switched

FIBER CONFIGURATION IS SELECTED ON OC3 FACILITIES PROVISIONING SCREEN (FIG 7-6).

TO =

NS = NON-STANDBY
HS = HOT-STANDBY
SD = SPACE DIVERSITY
SW = SWITCHED

Resulting Configurations

None/ NS Rx/2 Fiber
None/HS Rx/2 Fiber
None/HS Rx/2 Fiber SW
None/HS Rx/4 Fiber SW
None/SD Rx/2 Fiber
None/SD Rx/2 Fiber SW
None/SD Rx/4 Fiber SW
None/FD Rx/2 Fiber
None/FD Rx/2 Fiber SW
None/FD Rx/4 Fiber
NS Tx/None/2 Fiber
NS Tx/NS Rx/2 Fiber
NS Tx/HS Rx/2 Fiber
NS Tx/HS Rx/2 Fiber SW
NS Tx/HS Rx/4 Fiber SW
NS Tx/SD Rx/2 Fiber
NS Tx/SD Rx/2 Fiber SW
NS Tx/SD Rx/4 Fiber SW
HS Tx/None/2 Fiber
HS Tx/None/2 Fiber SW
HS Tx/Hs Rx/2 Fiber
HS Tx/HS Rx/2 Fiber SW
* HS Tx/HS Rx/4 Fiber SW
HS Tx/SD Rx/2 Fiber
* HS Tx/SD Rx/2 Fiber SW
HS Tx/SD Rx/4 Fiber SW
FD Tx/None/2 Fiber
FD Tx/None/2 Fiber SW
FD Tx/None/4 Fiber
FD Tx/None/4 Fiber SW
FD Tx/FD Rx/2 Fiber
FD Tx/FD Rx/2 Fiber SW
FD Tx/FD Rx/4 Fiber
FD Tx/FD Rx/4 Fiber SW

* There are a total of 34 configurations available. Only 2 examples are illustrated. Refer to CD for examples of all configurations.

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Figure 4-11 OC3/STM-1 Radio Configuration Provisioning

Note

If installation at both ends of a hop are complete except for connecting to customer inputs/outputs and it is desirable to have an alarm-free system, alarm reporting on the incomplete connections can be disabled temporarily through provisioning. You can communicate over the hop even if you do not have the radio connected to customer OC3 and wayside DS1 inputs; however, you will alarm. On the OC3 Facilities screen, set **Alarm Disable TRANSMITTER (IN) A** *and/or* **B** *and* **RECEIVER (OUT) A** *and/or* **B** *to* **ON** *to disable OC3 alarm reporting for all equipped wayside DS1 lines. After all customer connections are complete, alarm reporting can be restored to normal.*

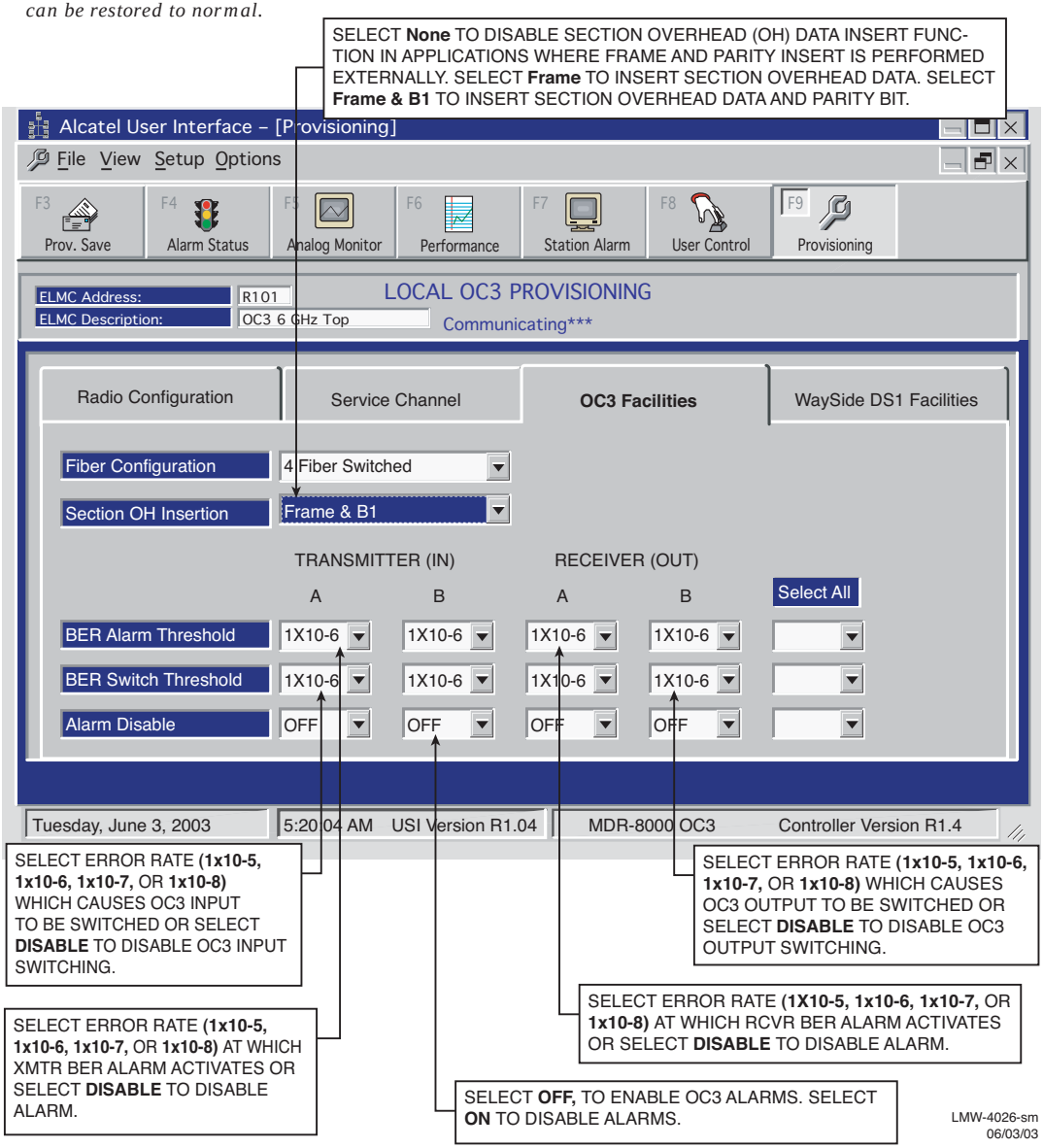
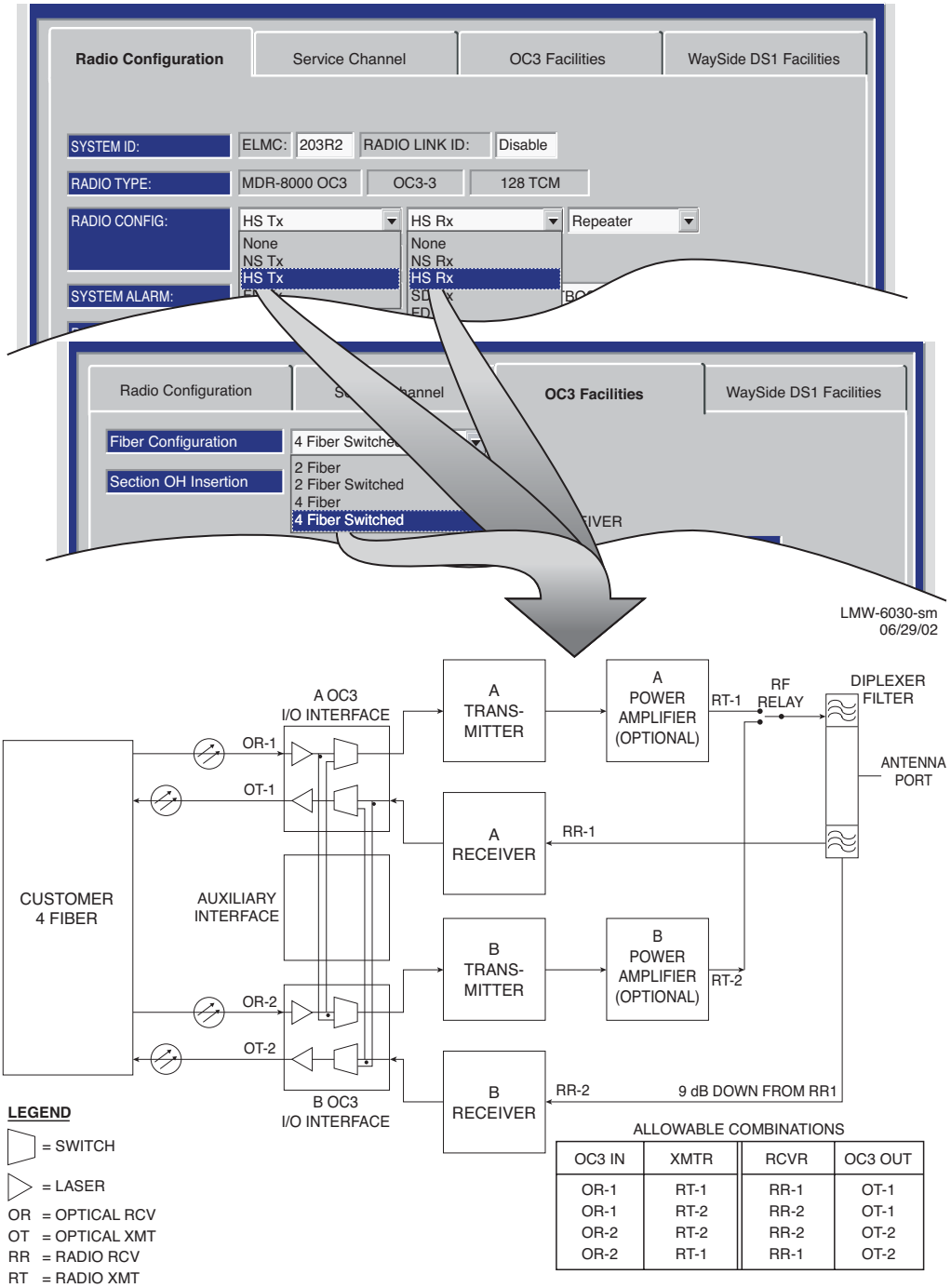
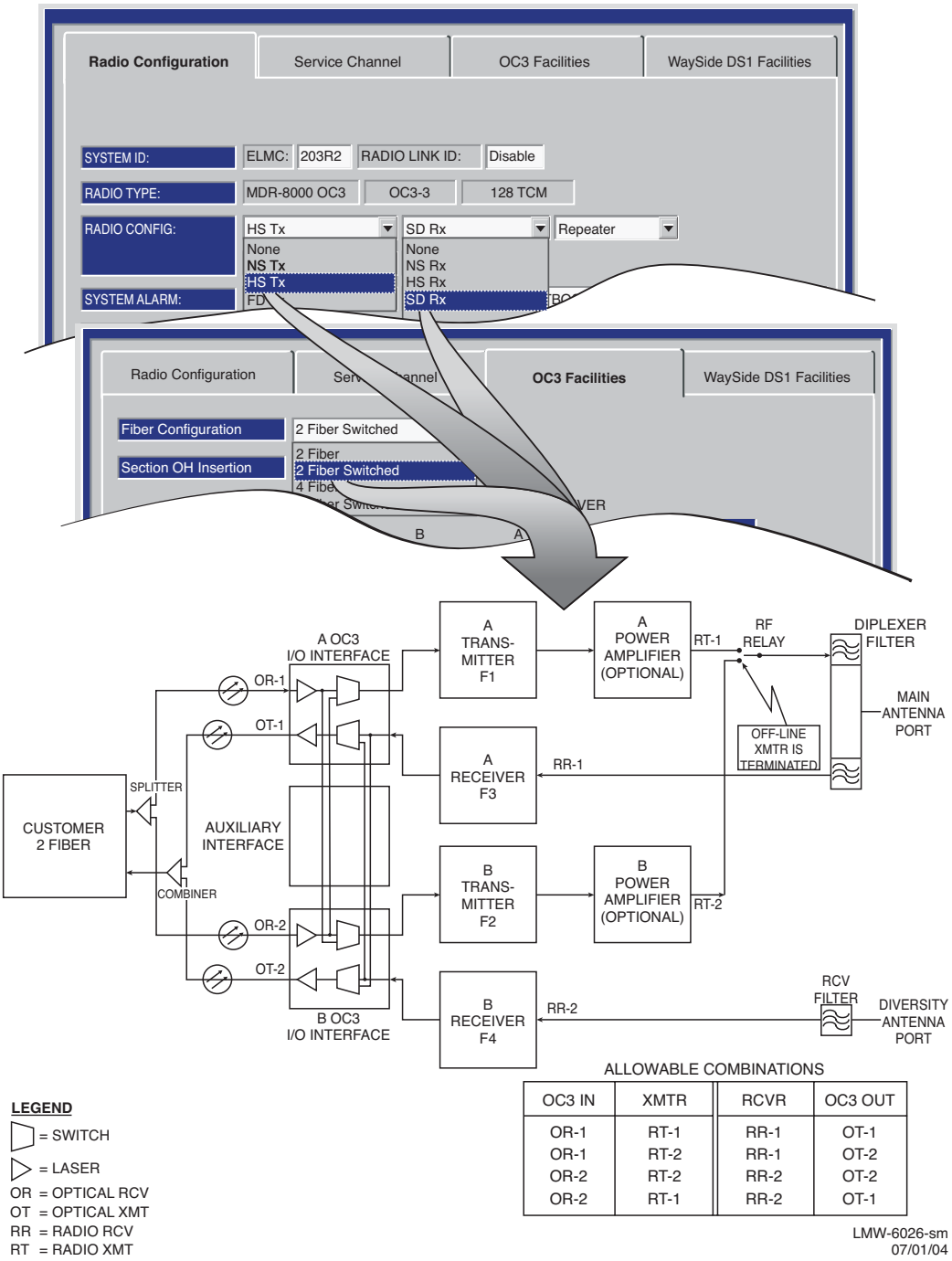


Figure 4-12 OC3/STM-1 Facilities Provisioning



OC3 PROVISIONING EXAMPLE 1: HS Tx/HS Rx/4 Fiber Switched



ALLOWABLE COMBINATIONS

OC3 IN	XMTR	RCVR	OC3 OUT
OR-1	RT-1	RR-1	OT-1
OR-1	RT-2	RR-1	OT-2
OR-2	RT-2	RR-2	OT-2
OR-2	RT-1	RR-2	OT-1

LEGEND

= SWITCH

= LASER

OR = OPTICAL RCV
OT = OPTICAL XMT
RR = RADIO RCV
RT = RADIO XMT

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OC3 PROVISIONING EXAMPLE 2: HS Tx/SD Rx/2 Fiber Switched

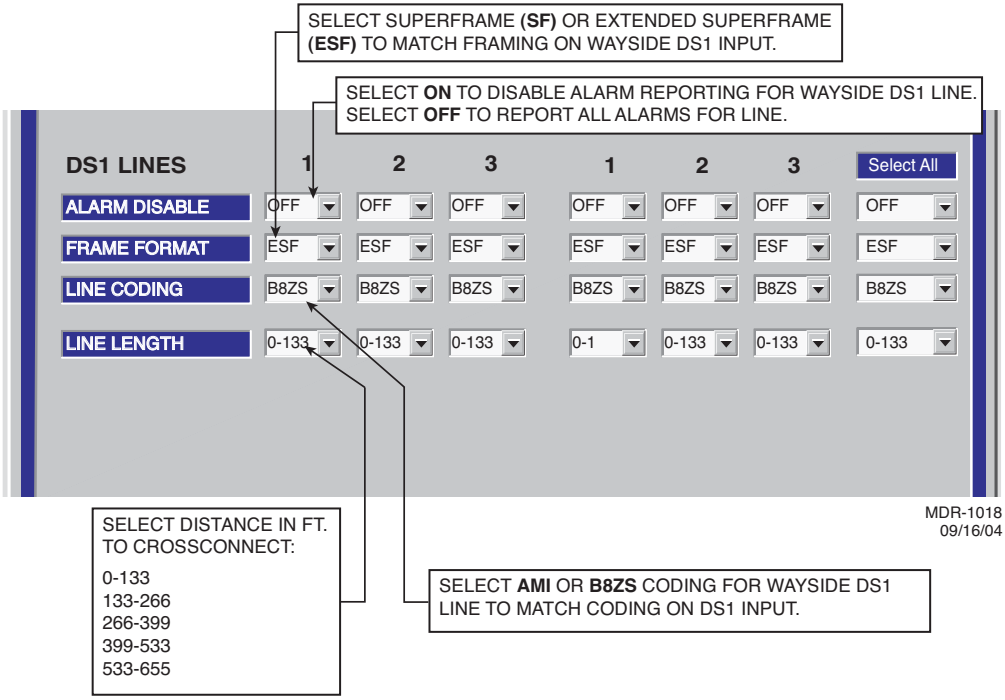
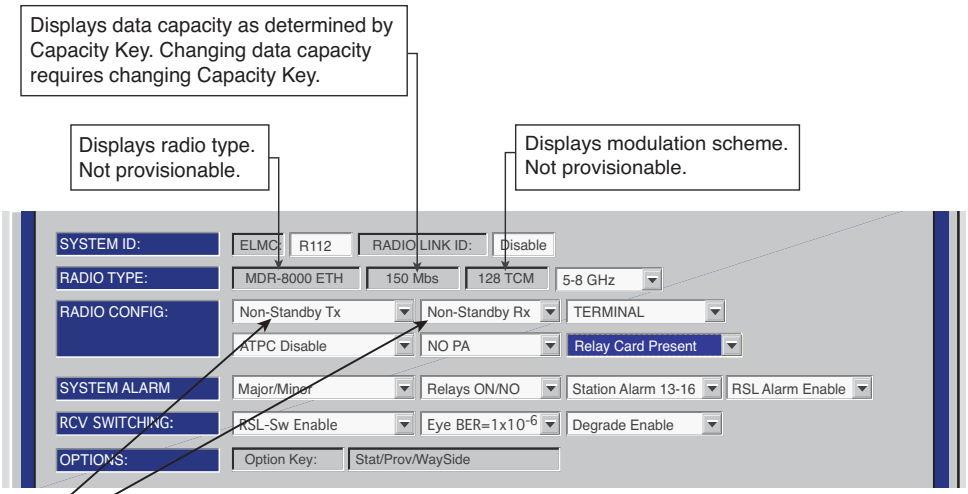


Figure 4-13 OC3/STM-1 Radio Wayside DS1 Facilities Provisioning

Note

A password is not required to operate the MDR-8000. The radio is shipped without a password and if a password is desired, it must be entered using the Change Password screen. Once entered initially, the password must be entered each time the user wants to access the provisioning screens (level 1 password required), or download software (level 2 password required).



SELECT ONE ON EACH
(SHELF W/SINGLE RCVRs)

No Tx		No Rx
Non-Standby Tx		Non-Standby Rx
Hot-Standby Tx	+	Hot-Standby Rx
Freq Diversity Tx		Frequency Diversity Rx
Dual Channel Tx		Space Diversity Rx
		Dual Channel Rx

OR

SELECT ONE ON EACH
(SHELF W/DUAL RCVRs)

No Tx		No Rx
Non-Standby Tx		Non-Standby Dual Rx
Hot-Standby Tx	+	Hot-Standby Dual Rx
Freq Diversity Tx		Frequency Diversity Dual Rx
Dual Channel Tx		Space Diversity Dual Rx
		Dual Channel Dual Rx

SELECT PORT CONFIGURATION

A Only
A & B Switched
A & B Separate
A & B Summed

To =

\+ Port configuration is selected on Ethernet Facilities Provisioning Screen (FIG 5-2).

Resulting Configurations

No Tx/NS Rx/A Only
No Tx/HS Rx/A Only
No Tx/HS Rx/A & B Switched
No Tx/HS Rx/A & B Summed
No Tx/SD Rx/A Only
No Tx/SD Rx/A & B Switched
No Tx/SD Rx/A & B Summed
No Tx/FD Rx/A Only
No Tx/FD Rx/A & B Switched
No Tx/Dual Chan Rx/ A & B Separate
NS Tx/ No Rx/A Only
Ns Tx/ NS Rx/A Only
NS Tx/HS Rx/A Only
NS Tx/HS Rx/A & B Switched
NS Tx/HS Rx/A & B Summed
NS Tx/SD Rx/A Only
NS Tx/SD Rx/A & B Switched
NS Tx/SD Rx/A & B Summed
HS Tx/No Rx/A Only
HS Tx/No Rx/A & B Switched
HS Tx/HS Rx/A Only
* HS Tx/HS Rx/A & B Switched
* HS Tx/HS Rx/A & B Summed
HS Tx/SD Rx/A Only
* HS Tx/SD Rx/A & B Switched
HS Tx/SD Rx/A & B Summed
FD Tx/No Rx/A Only
FD Tx/No Rx/A & B Switched
FD Tx/No Rx/A & B Separate
FD Tx/No Rx/A & B Summed
FD Tx/FD Rx/A Only
FD Tx/FD Rx/A & B Switched
Dual Chan Tx/Dual Chan Rx/ A & B Separate
Dual Chan Tx/Dual Chan Rx/ A & B Summed
HS Tx/No Rx/A & B Summed

* There are a total of 35 configurations available. Only 3 examples are illustrated. Refer to CD for examples of all configurations.

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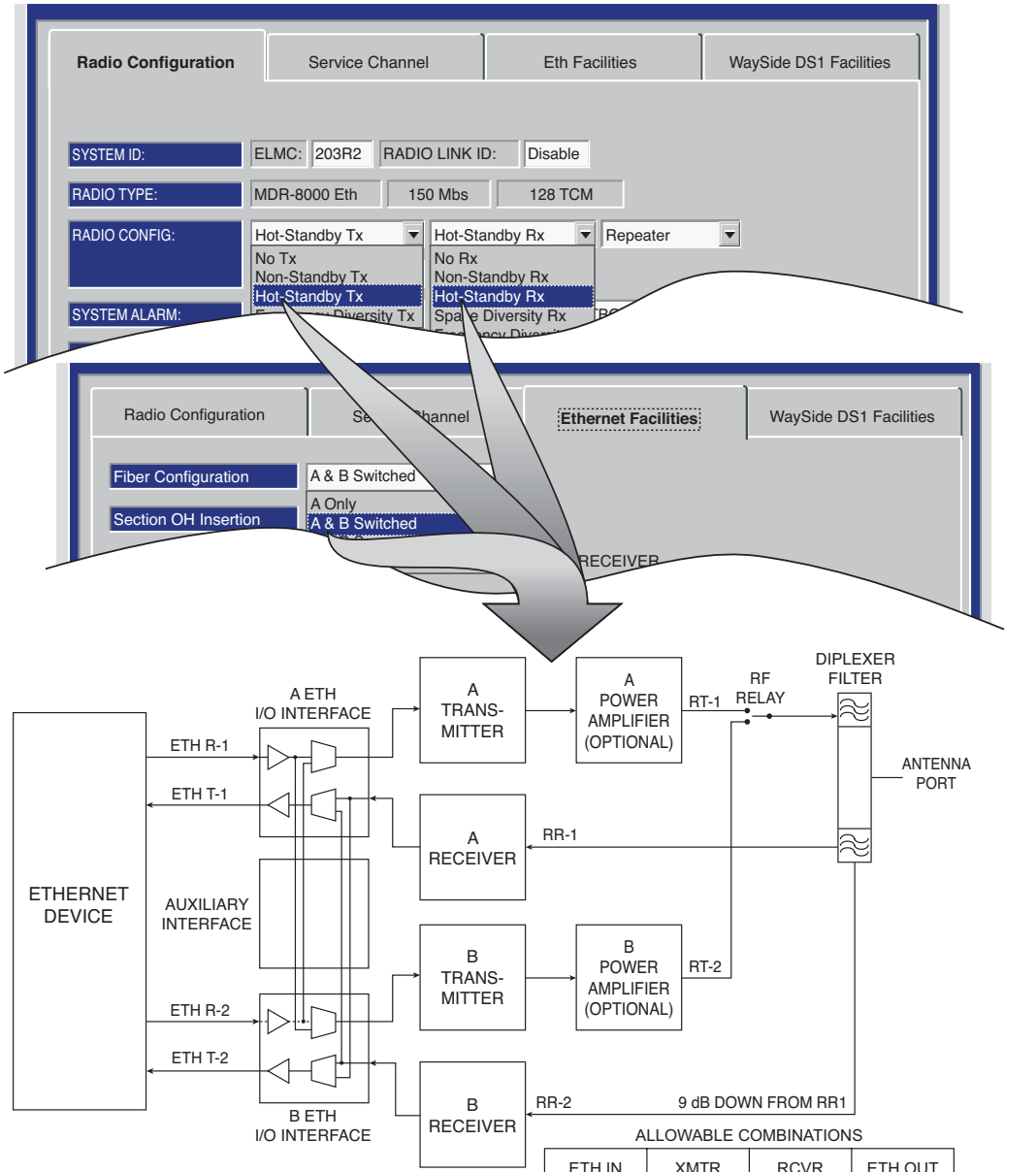
Figure 4-14 Ethernet Radio Configuration Provisioning



ALLOWABLE COMBINATIONS

ETH IN	XMTR	RCVR	ETH OUT
ETH R-1	RT-1	RR-1	ETH T-1
ETH R-1	RT-1	RR-2	ETH T-1
ETH R-1	RT-2	RR-1	ETH T-1
ETH R-1	RT-2	RR-2	ETH T-1
ETH R-2	RT-1	RR-1	ETH T-2
ETH R-2	RT-1	RR-2	ETH T-2
ETH R-2	RT-2	RR-1	ETH T-2
ETH R-2	RT-2	RR-2	ETH T-2

LEGEND

= SWITCH
ETH R = Ethernet RCV
ETH T = Ethernet XMT
RR = Radio RCV
RT = Radio XMT

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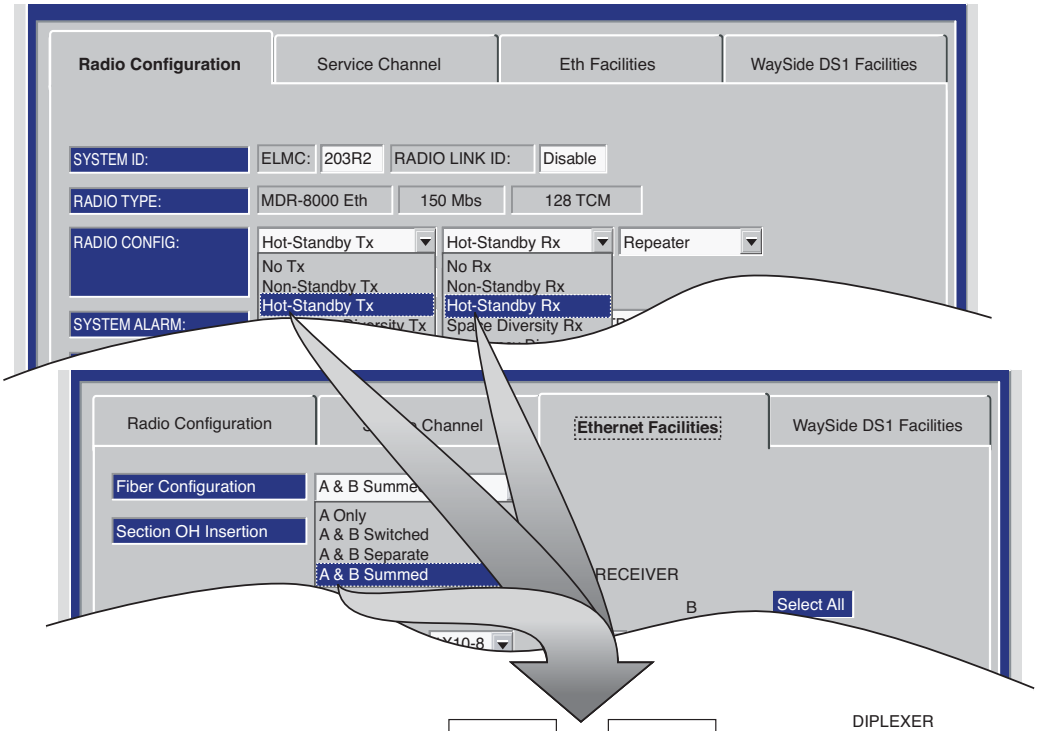
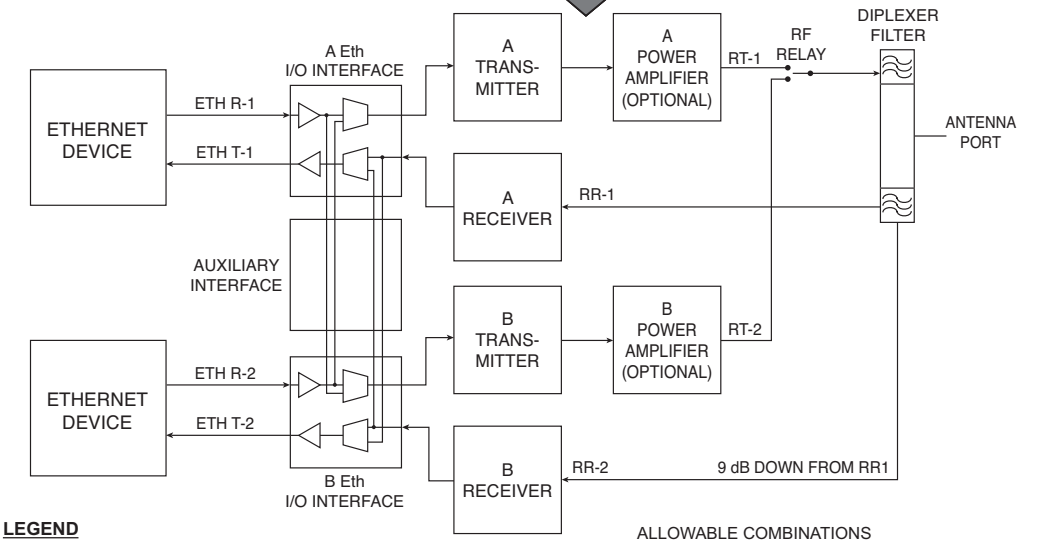
ETH PROVISIONING EXAMPLE 1: HS Tx/HS Rx/A and B Switched





LEGEND

= SWITCH

ETH R = Ethernet RCV

ETH T = Ethernet XMT

RR = Radio RCV

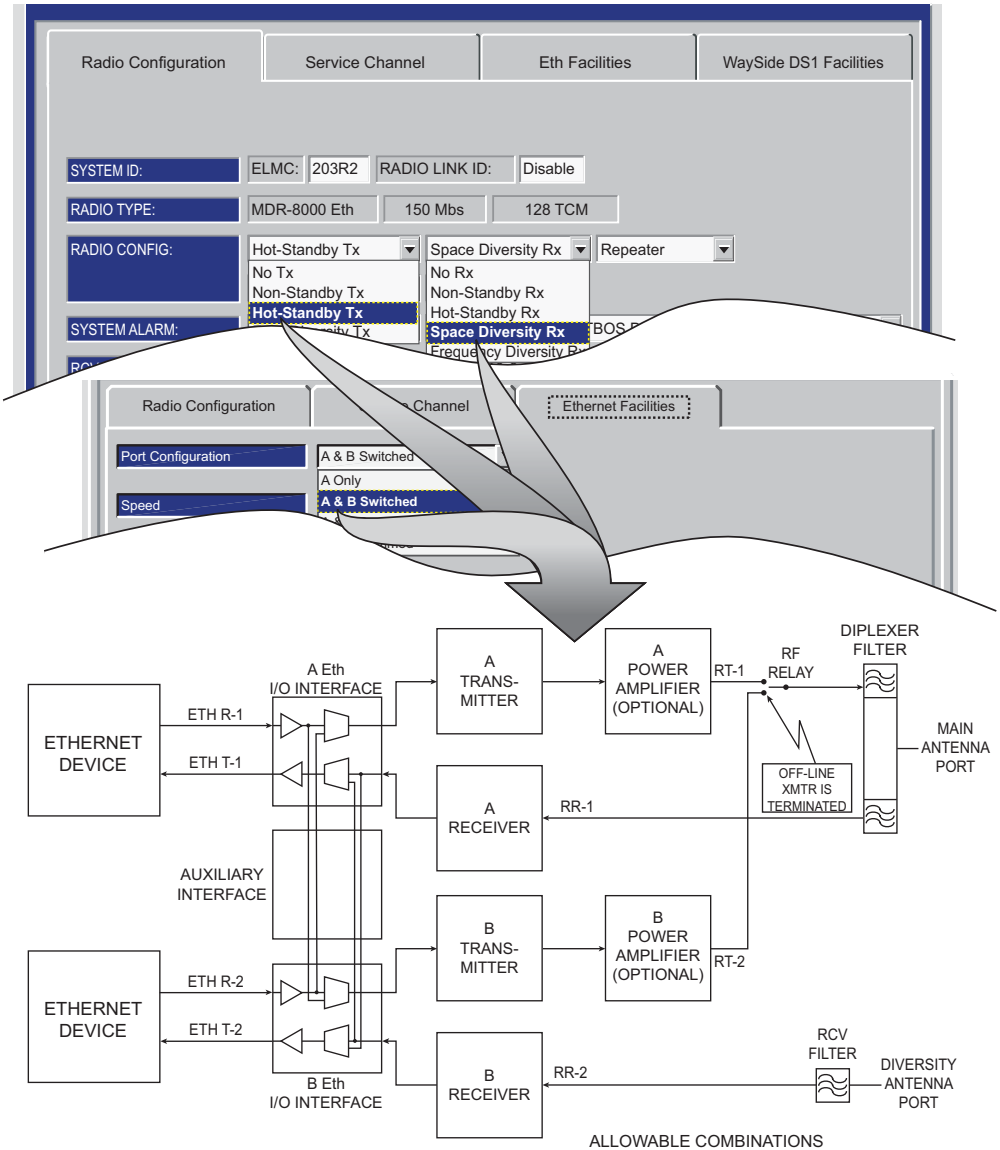
RT = Radio XMT

ALLOWABLE COMBINATIONS

ETH IN	XMTR	RCVR	ETH OUT
ETH R-1,2	RT-1	RR-1	ETH T-1,2
ETH R-1,2	RT-1	RR-2	ETH T-1,2
ETH R-1,2	RT-2	RR-1	ETH T-1,2
ETH R-1,2	RT-2	RR-2	ETH T-1,2

ETH-1023
Issue 8
03/02/07

ETH PROVISIONING EXAMPLE 2: HS Tx/HS Rx/A and B Summed



ALLOWABLE COMBINATIONS

ETH IN	XMTR	RCVR	ETH OUT
ETH R-1	RT-1	RR-1	ETH T-1
ETH R-1	RT-2	RR-1	ETH T-1
ETH R-2	RT-2	RR-2	ETH T-2
ETH R-2	RT-1	RR-2	ETH T-2
ETH R-1	RT-1	RR-2	ETH T-1
ETH R-1	RT-2	RR-2	ETH T-1
ETH R-2	RT-2	RR-1	ETH T-2
ETH R-2	RT-1	RR-1	ETH T-2

LEGEND

= SWITCH
ETH R = Ethernet RCV
ETH T = Ethernet XMT
RR = Radio RCV
RT = Radio XMT

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03/02/07

ETH PROVISIONING EXAMPLE 3: HS Tx/SD Rx/A and B Switched

4.9 PROVISION ETHERNET FACILITY

See Figure 4-15 to provision the Ethernet radio.

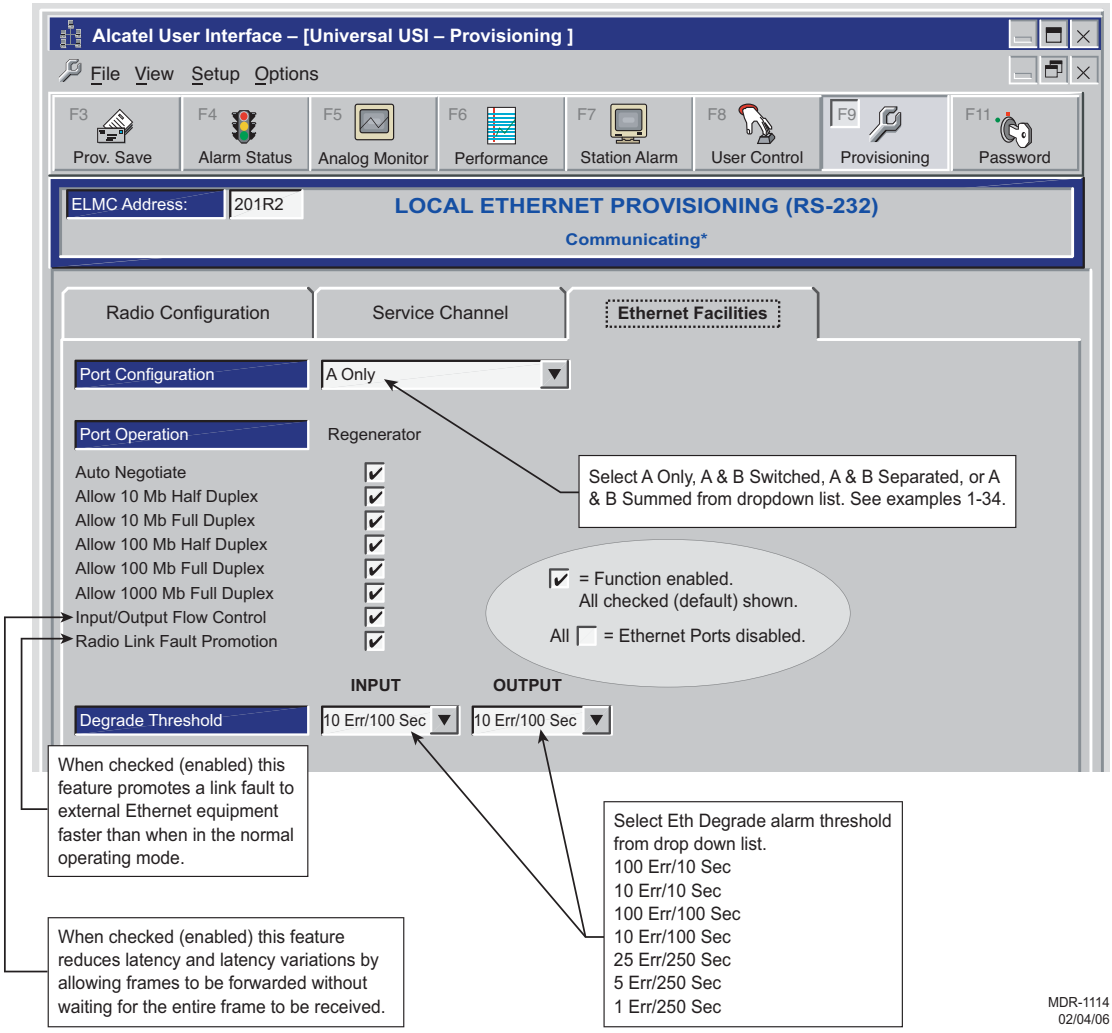


Figure 4-15 Ethernet Facilities Provisioning

4.9.1 Auto-Negotiation

MDR-8000E auto-negotiation is not a stand-alone function, and proper operation and use of all available functions depends on the capabilities of the external customer equipment that is connected to the radio. Just because an autonegotiation function is checked for provisioning does not automatically mean that function is fully operable. The device on the other end of the cable must also have the capability and be provisioned with a matching function.

4.9.1.1 Auto-Negotiate

Auto-Negotiate details are beyond the scope of this supplement. The rule of thumb to follow when unsure of what functions to check or change from factory default provisioning is leave at default (all autonegotiation functions are checked). Full autonegotiation capability is becoming standard for manufacturers of Ethernet devices.

4.9.1.2 Allow 10, 100, and/or 1000 Mb Half and Full Duplex

If in doubt as to the link speed and mode of the external device connecting Ethernet to the radio, check all boxes for speeds and modes. If you know the external Ethernet device has speed and/or mode limitations, check only the boxes that apply.

Auto-Negotiate is automatically enabled when Allow 1000 Mb Full Duplex is enabled. Auto-Negotiate must be enabled (checked) when more than one link speed is selected.

4.9.1.3 Input/Output Flow Control Features

Checking the box next to Input/Output Flow Control enables input and output pause functions and the forward errored or large frame function. These flow control functions are described in the following paragraphs.

4.9.1.3.1 Input Pause Feature

See Figure 4-16. This feature makes the auto-negotiation function willing to stop receiving traffic. When the radio input buffers approach overflow, the function sends a pause message to the link partner that is transmitting data to the radio, telling the device to temporarily stop sending data. The link partner will stop sending data if the device has and is provisioned with the Allow Option Pause function.

If the link partner is either not equipped with or is not provisioned for input pause, data overflowing the registers in the radio will be lost, regardless of the provisioning for input pause in the radio. Any time there is an overflow, the radio will alarm and indicate Dropped Frames on the Performance Monitor screens.

4.9.1.3.2 Pause Feature

This feature auto-negotiation function willing to stop sending traffic. When the input buffers on the link partner approach overflow, the link partner sends a pause message to the radio telling the radio to temporarily stop sending data. If the Input/Output Flow Control function is checked, the radio will stop sending out data.

4.9.1.4 Input Pause Feature

See Figure 4-16. Checking the box next to ***Allow Input Pause*** makes the auto-negotiation function willing to stop receiving traffic. When the radio input buffers approach overflow, the function sends a pause message to the ink partner that is transmitting data to the radio, telling the device to temporarily stop sending data. The link partner will stop sending data if the device has and is provisioned with the Allow Option Pause function.

If the link partner is either not equipped with or is not provisioned for input pause, data overflowing the registers in the radio will be lost, regardless of the provisioning for input pause in the radio. Any time there is an overflow, the radio will alarm and indicate Dropped Frames on the Performance Monitor screens.

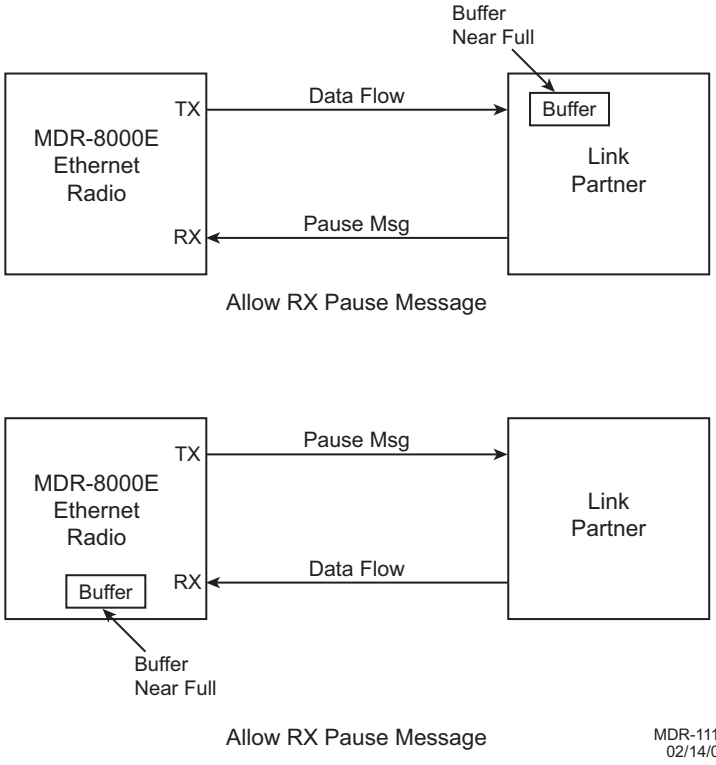


Figure 4-16 Input/Output Pause Messaging

4.9.1.5 Allow Output Pause

Checking the box next to ***Allow Output Pause*** makes the radio auto-negotiation function willing to stop sending traffic. When the input buffers on the link partner approach overflow, the link partner sends a pause message to the radio, telling the radio to temporarily stop sending data. If the ***Allow Output Pause*** function is checked, the radio will stop sending out data.

4.10 PROVISION DS1 FACILITY

See Figure 4-17 to provision the DS1 lines (if equipped).

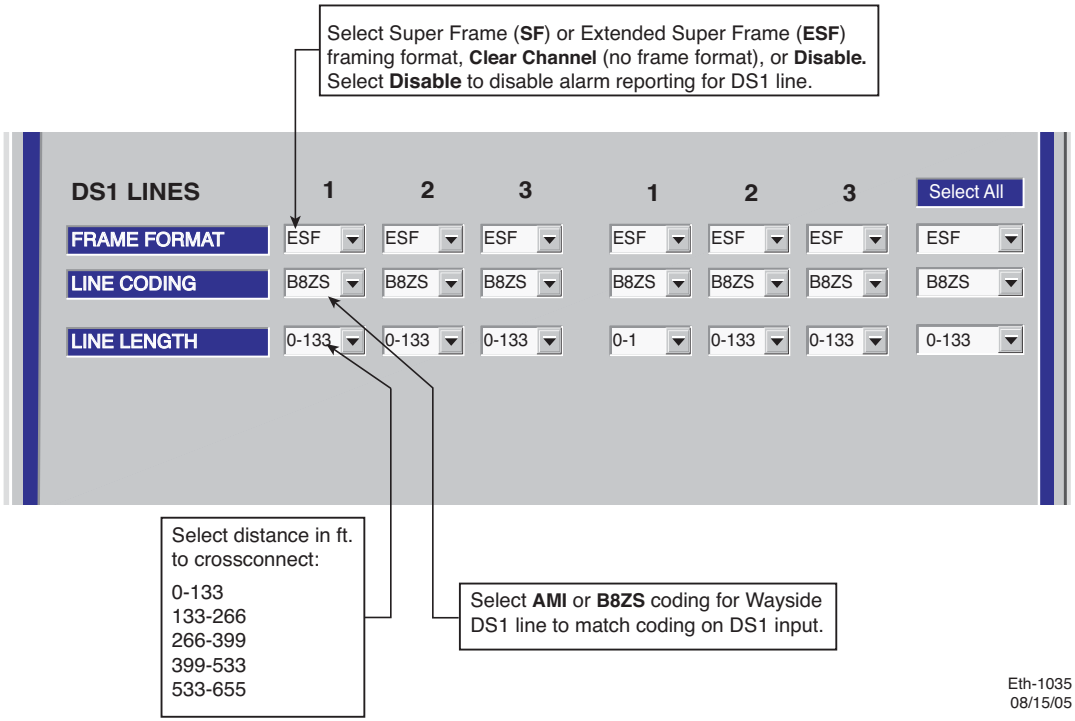
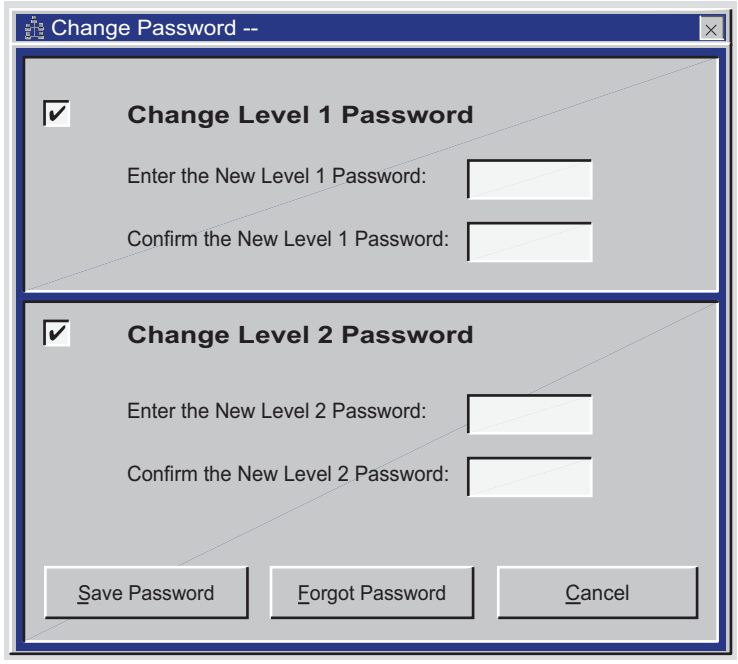


Figure 4-17 Ethernet Radio DS1 Facilities Provisioning



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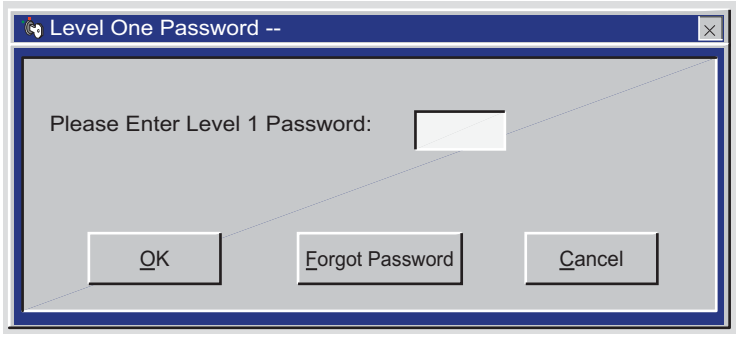

MDR-1032
09/02/04

Figure 4-18 Password Screens

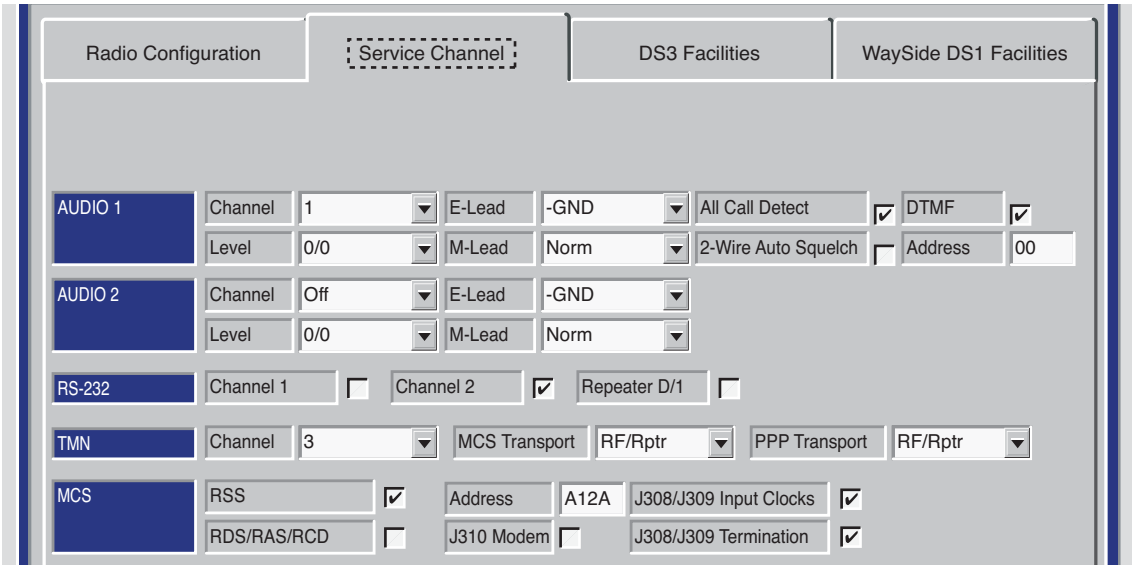

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Figure 4-19 Service Channel Provisioning

Note

The 2-wire handset is transported over Audio 1 only.

Note

Audio provisioning is required only if 4-wire audio equipment (external equipment not part of the radio) is supplied and the external audio equipment is connected to audio port 1 J316 or audio port 2 J317 on the radio backplane. These provisionable 4-wire audio functions should not be confused with the 2-wire audio handset. The handset is fully operational after it is connected to the TEL jack on the radio controller module, provided the radio is provisioned Audio 1.

The most common audio provisioning is: 1:, 2:, or 3: AUDIO 1 0/0 Norm.

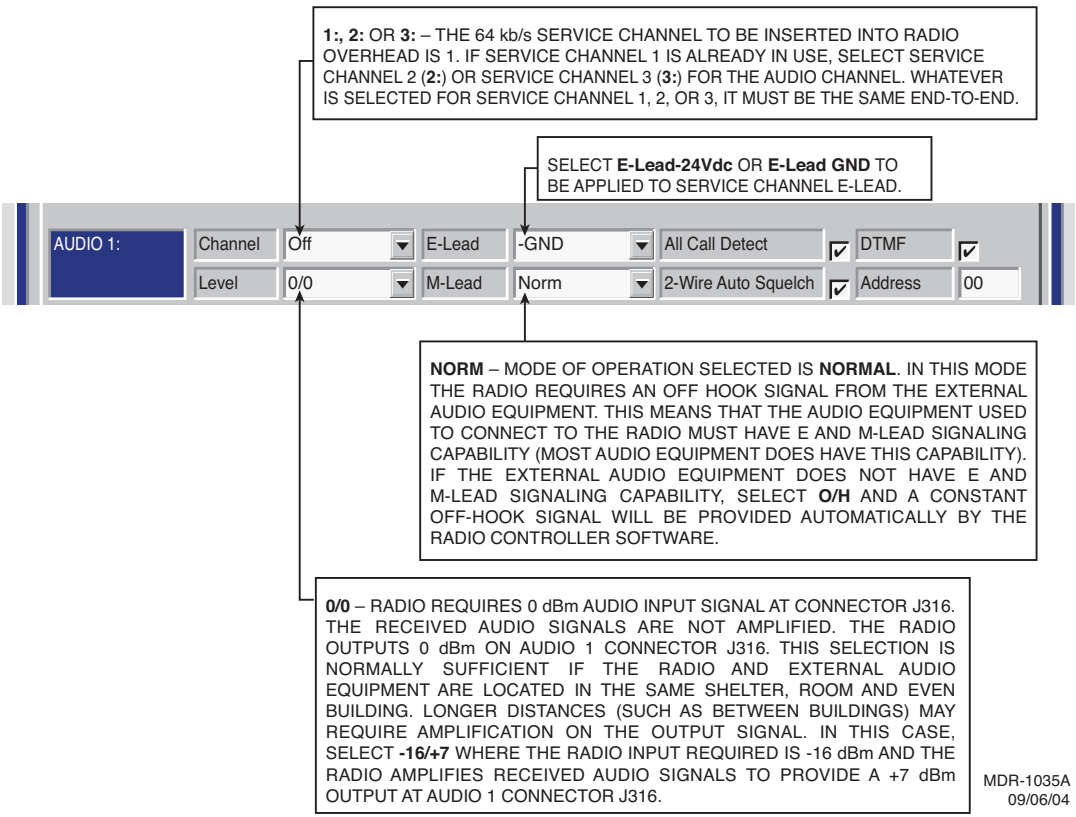


Figure 4-20 Audio 1 Provisioning (Sheet 1 of 2)

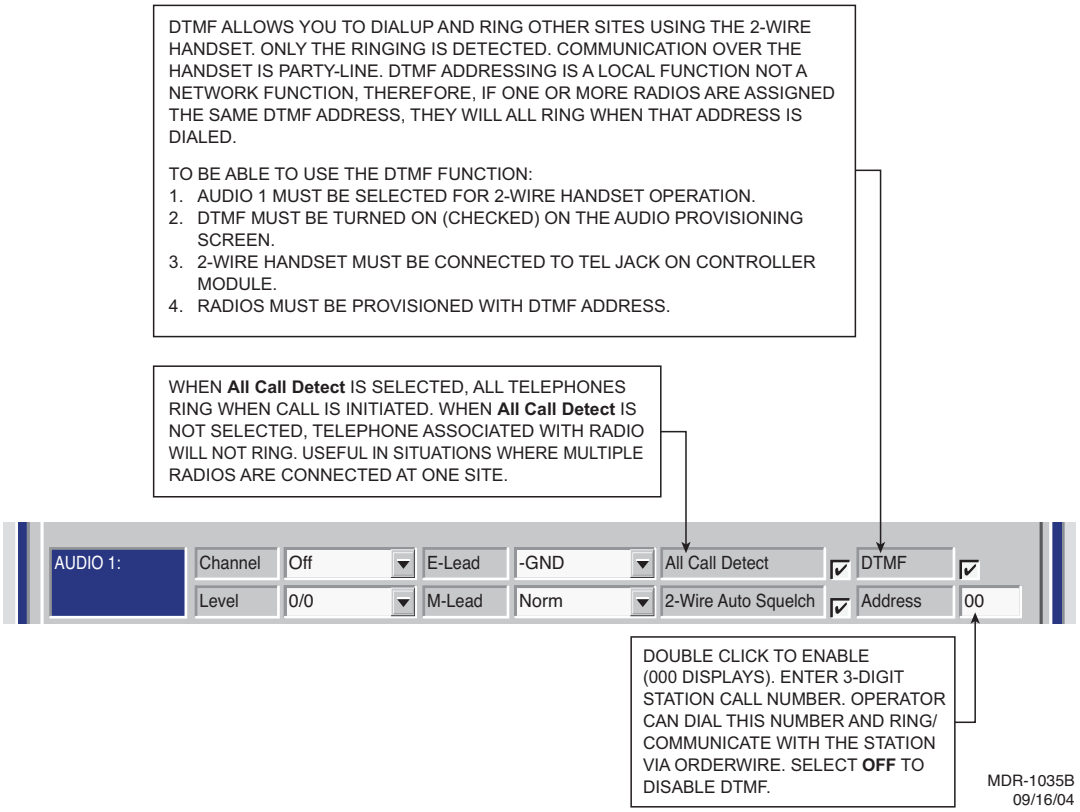


Figure 4-20 Audio 1 Provisioning (Sheet 2 of 2)

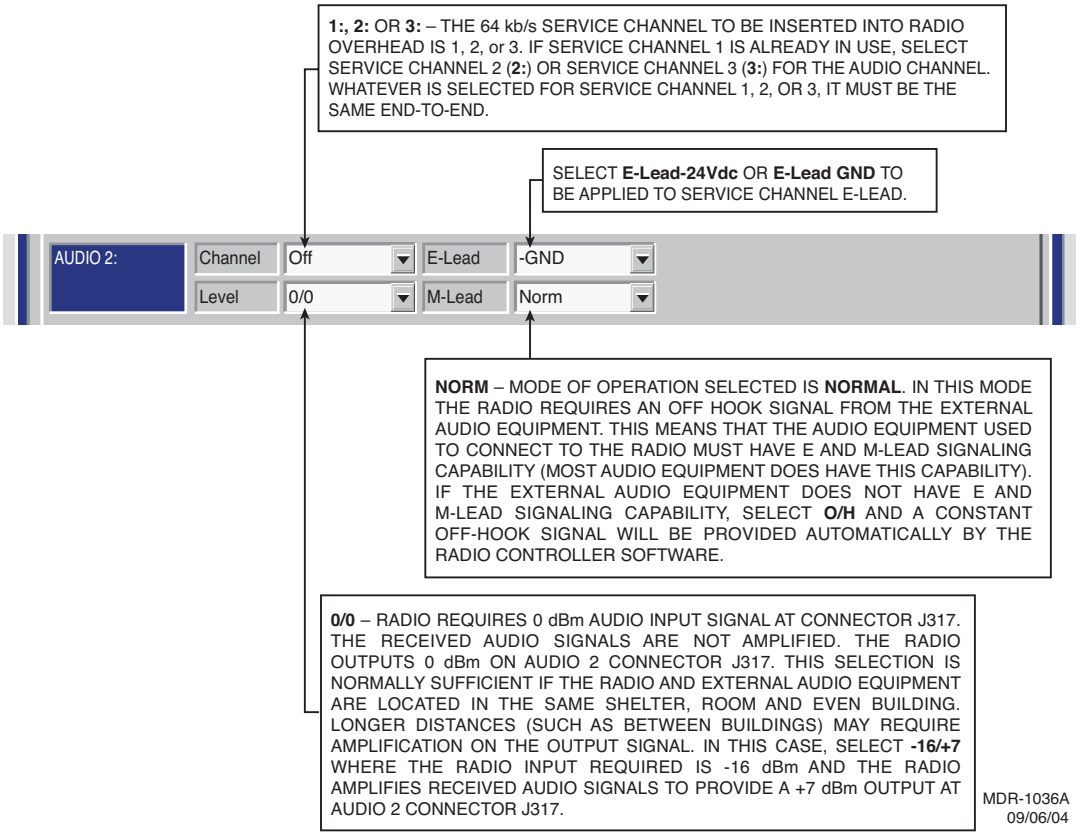


Figure 4-21 Audio 2 Provisioning

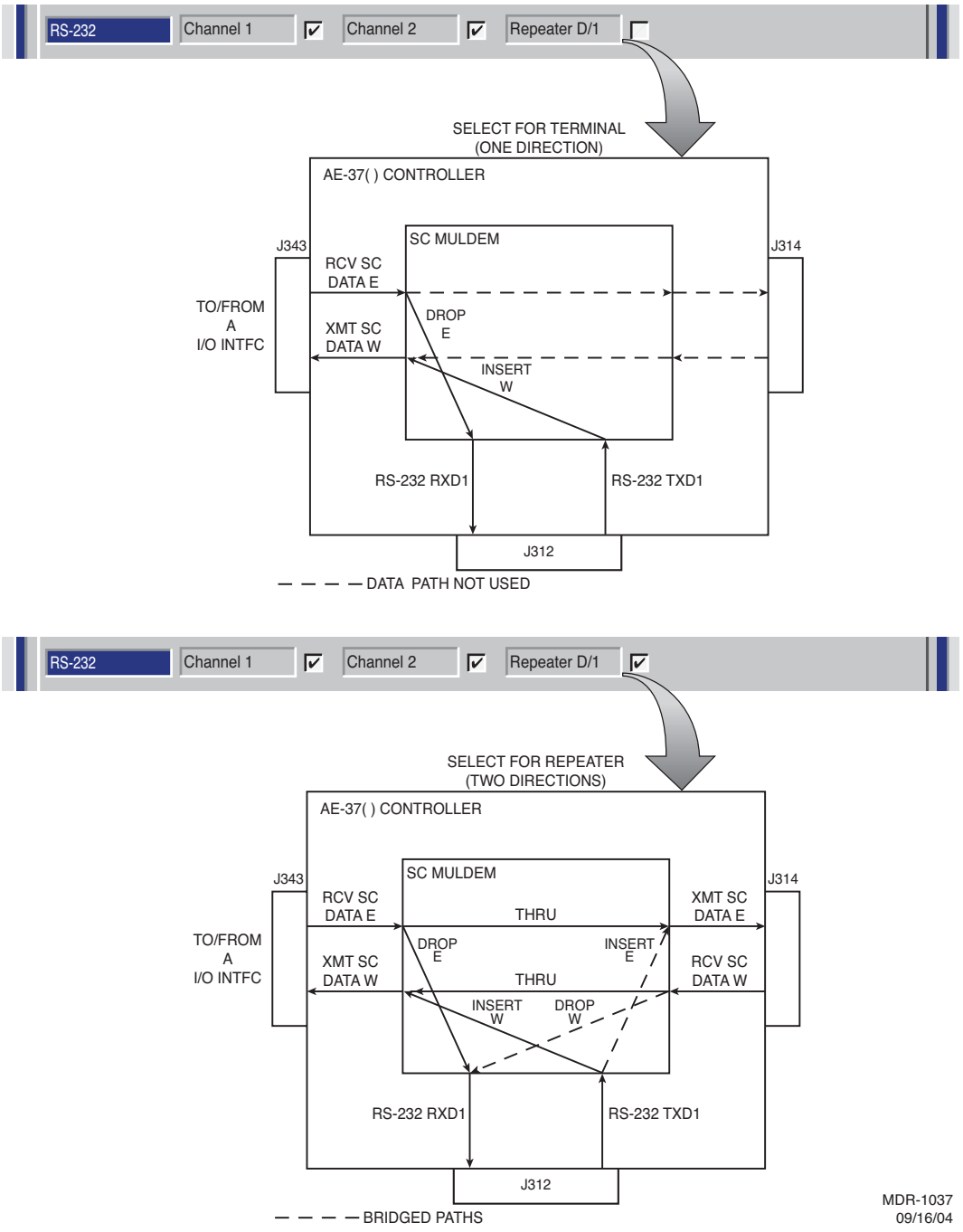
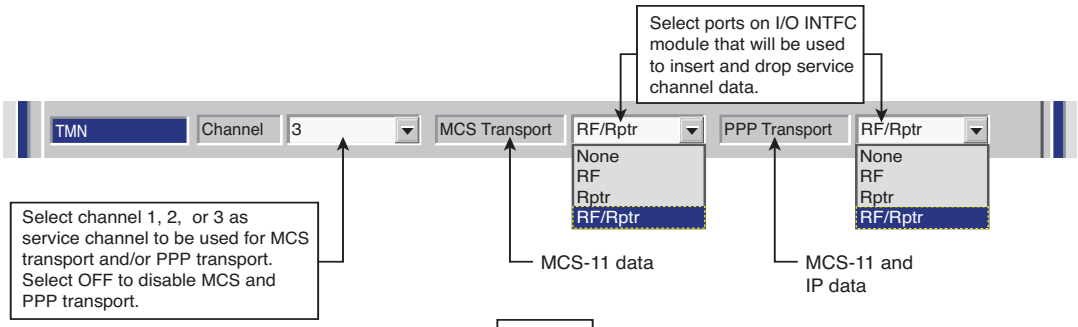


Figure 4-22 RS-232 Provisioning



Note

For MCS-11 to operate properly, all radio controllers in a system inter- connected by RF or RPTR must have the same PPP transport provisioning on facing (interconnecting) interfaces. The valid transport combinations (for terminal or repeater) are shown. The combination chosen from MCS TRANSPORT and PPP TRANSPORT determines the RPTR PORT and RF PORT PROTOCOLS supported.

Note

MCS-11 must be enabled even if it is unused and TMN (only) is used for alarm monitoring and controls. For specific TMN Initial Turnup requirements, refer to CD.

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Figure 4-23 MCS/TMN Transport Provisioning (Sheet 1 of 5)

PPP TRANSPORT SETTING = NONE

DRAWING REFERENCE	RADIO TRANSPORT SETTING		RADIO PORT	
	MCS	PPP	RF	RPTR
A	NONE	NONE	PASS-THROUGH MODE. NO LOCAL INSERT CAPABILITY.	
B	RF	NONE	MCS-11	DISABLED
C	RPTR	NONE	DISABLED	MCS-11
D	RF/RPTR	NONE	MCS-11	MCS-11

Notes:

1) Set PPP Transport to NONE if the repeater and RF ports interface with radios not TMN compatible.
2) RF at both ends of the hop must be provisioned for the same PPP Transport selection.
3) RPTR at both ends must be provisioned for the same PPP Transport selection.
4) MCS-11 = Non TMN compatible
   MCS-11 + PPP = TMN compatible
5) TMN compatibility is determined by the radio controller software and radio provisioning.

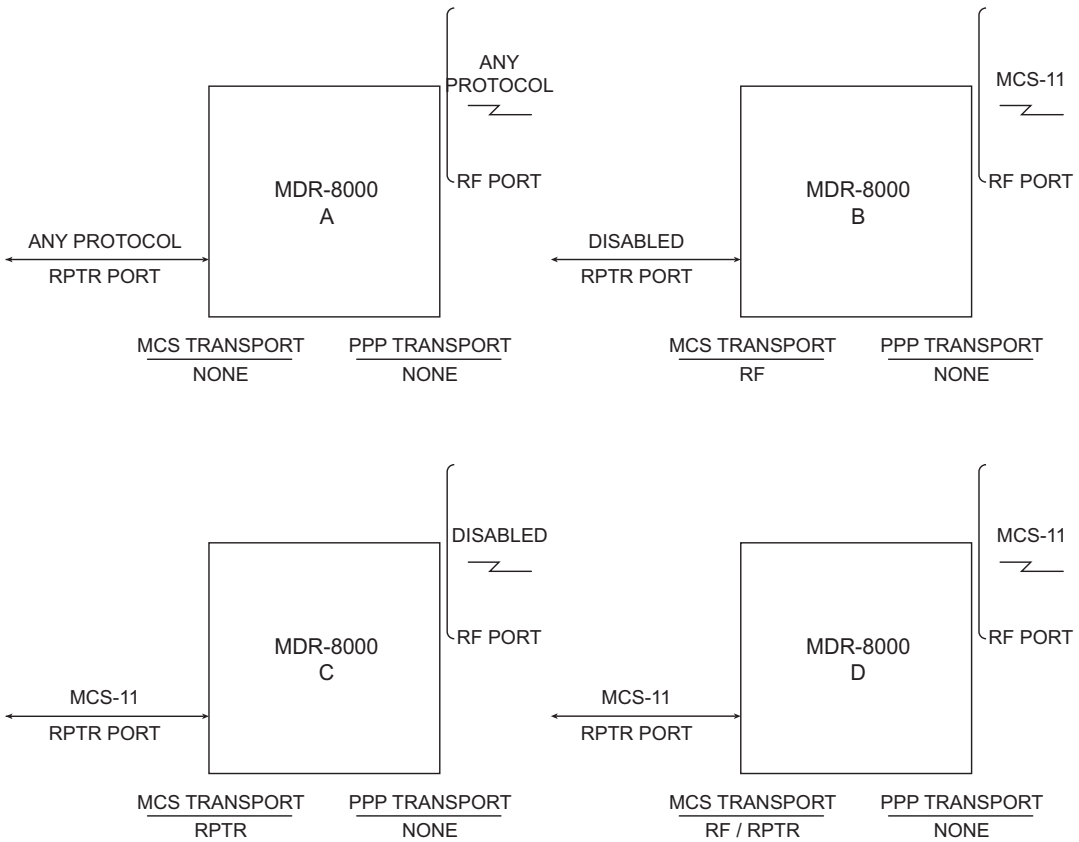

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Figure 4-23 MCS/TMN Transport Provisioning (Sheet 2 of 5)

PPP TRANSPORT SETTING = RF

DRAWING REFERENCE	RADIO TRANSPORT SETTING		RADIO PORT	
	MCS	**PPP**	**RF**	**RPTR**
A	NONE	RF	MCS-11 + PPP	DISABLED
B	RF	RF	MCS-11 + PPP	DISABLED
C	RPTR	RF	MCS-11 + PPP	MCS-11
D	RF/RPTR	RF	MCS-11 + PPP	MCS-11

Notes:

1) Set PPP Transport to RF when the farend radio is TMN compatible, but the radio connected via the repeater cable is not.
2) RF at both ends of the hop must be provisioned for the same PPP Transport selection.
3) RPTR at both ends must be provisioned for the same PPP Transport selection.
4) MCS-11 = Non TMN compatible
   MCS-11 + PPP = TMN compatible
5) TMN compatibility is determined by the radio controller software and radio provisioning.

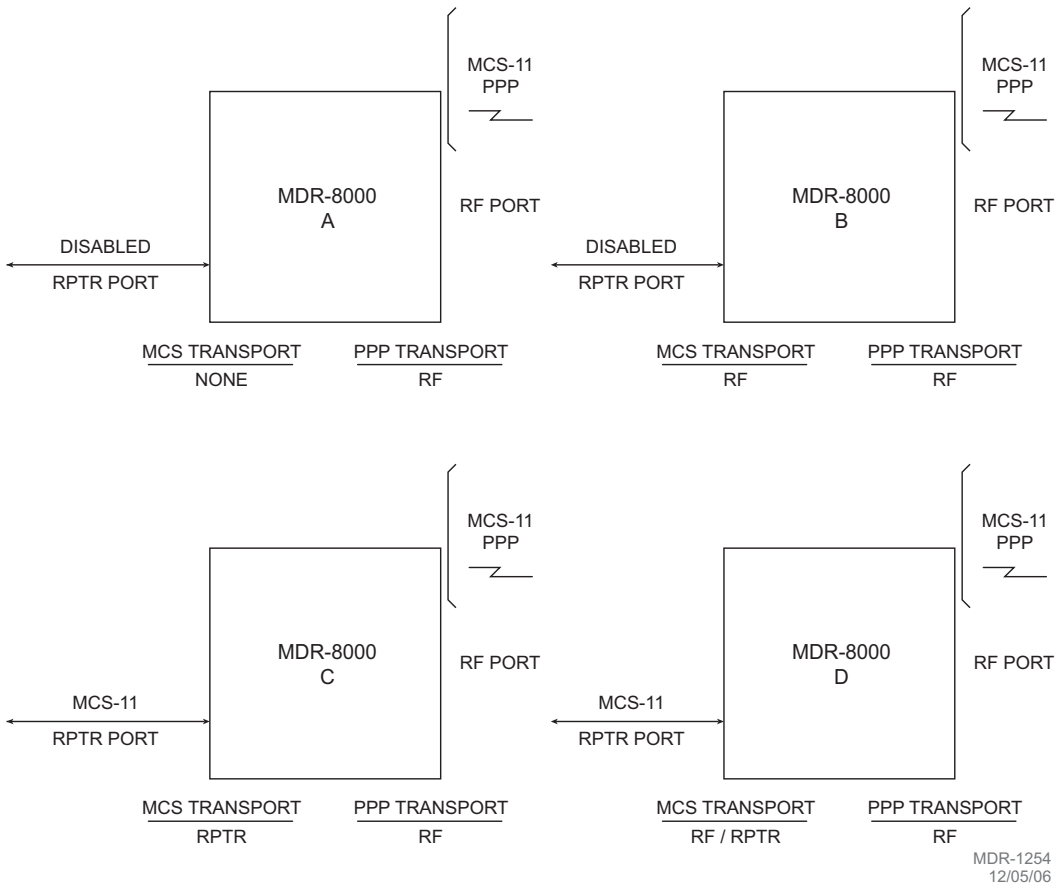

Figure 4-23 MCS/TMN Transport Provisioning (Sheet 3 of 5)

PPP TRANSPORT SETTING = RPTR

DRAWING REFERENCE	RADIO TRANSPORT SETTING		RADIO PORT	
	MCS	**PPP**	**RF**	**RPTR**
A	NONE	RPTR	DISABLED	MCS-11 + PPP
B	RF	RPTR	MCS-11	MCS-11 + PPP
C	RPTR	RPTR	DISABLED	MCS-11 + PPP
D	RF/RPTR	RPTR	MCS-11	MCS-11 + PPP

Notes:
1) RF at both ends of the hop must be provisioned for the same PPP Transport selection.
2) RPTR at both ends must be provisioned for the same PPP Transport selection.
3) MCS-11 = Non TMN compatible
   MCS-11 + PPP = TMN compatible
4) TMN compatibility is determined by the radio controller software and radio provisioning.

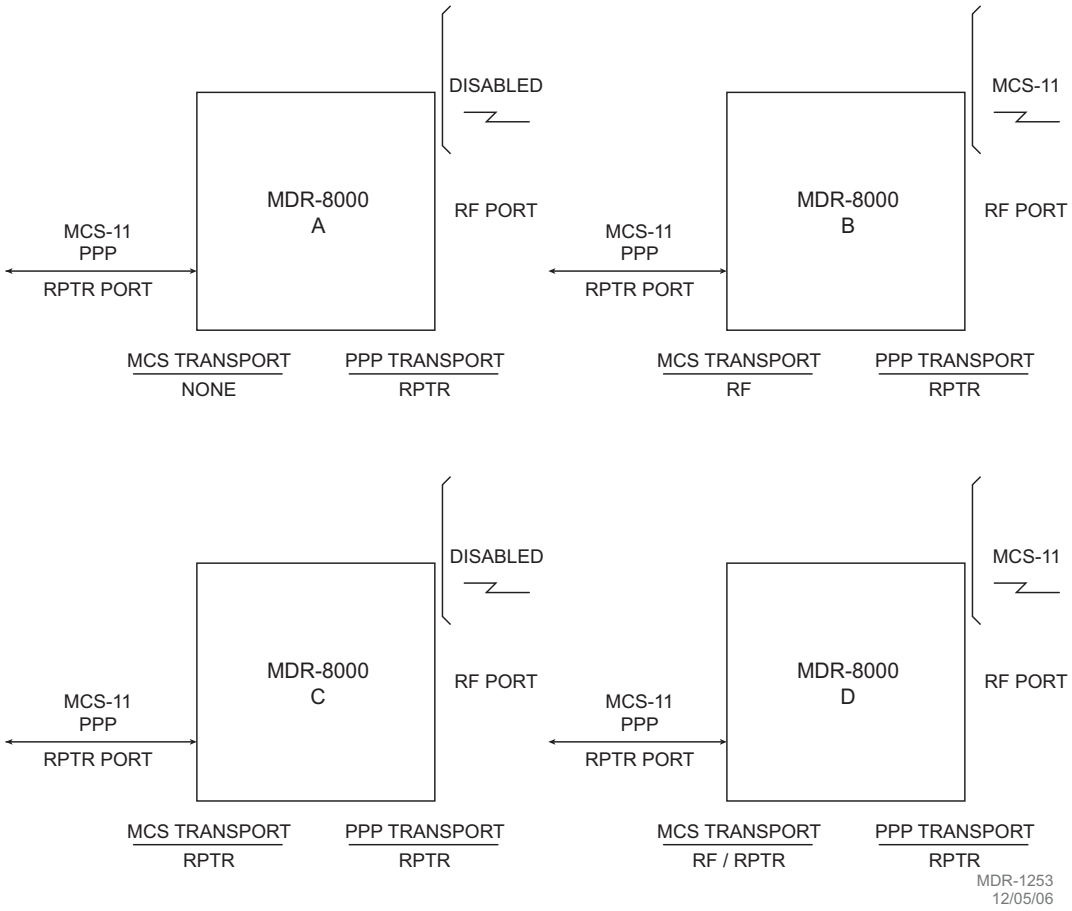

Figure 4-23 MCS/TMN Transport Provisioning (Sheet 4 of 5)

PPP TRANSPORT SETTING = RF/RPTR

DRAWING REFERENCE	RADIO TRANSPORT SETTING		RADIO PORT	
	MCS	**PPP**	**RF**	**RPTR**
A	NONE	RF/RPTR	MCS-11 + PPP	MCS-11 + PPP
B	RF	RF/RPTR	MCS-11 + PPP	MCS-11 + PPP
C	RPTR	RF/RPTR	MCS-11 + PPP	MCS-11 + PPP
D	RF/RPTR	RF/RPTR	MCS-11 + PPP	MCS-11 + PPP

Notes:

1) RF at both ends of the hop must be provisioned for the same PPP Transport selection.
2) RPTR at both ends must be provisioned for the same PPP Transport selection.
3) MCS-11 = Non TMN compatible
   MCS-11 + PPP = TMN compatible
4) TMN compatibility is determined by the radio controller software and radio provisioning.

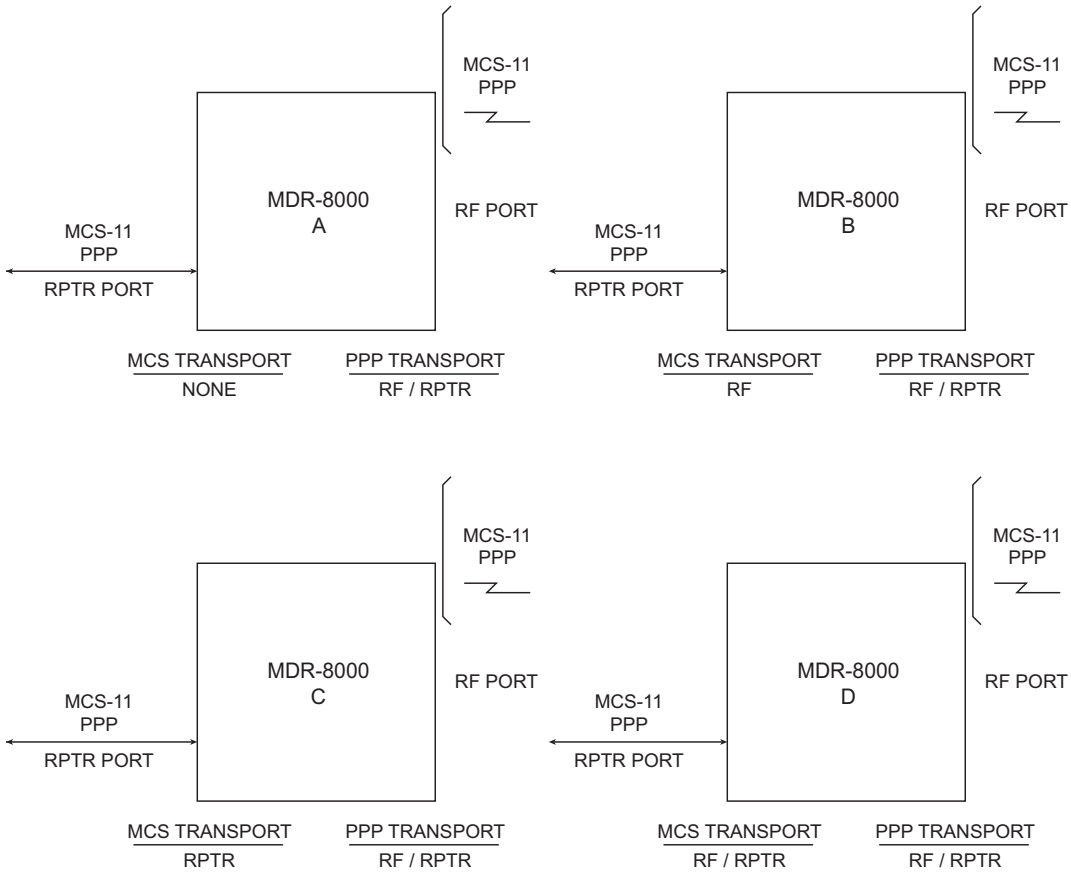

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Figure 4-23 MCS/TMN Transport Provisioning (Sheet 5 of 5)

Note

*A default MCS-11 address **(A1A)** is assigned automatically. A different unique address must be entered for each radio to prevent concurrent responses to poll from more than one radio with the same address. If multiple responses are received, the response data is invalid.*

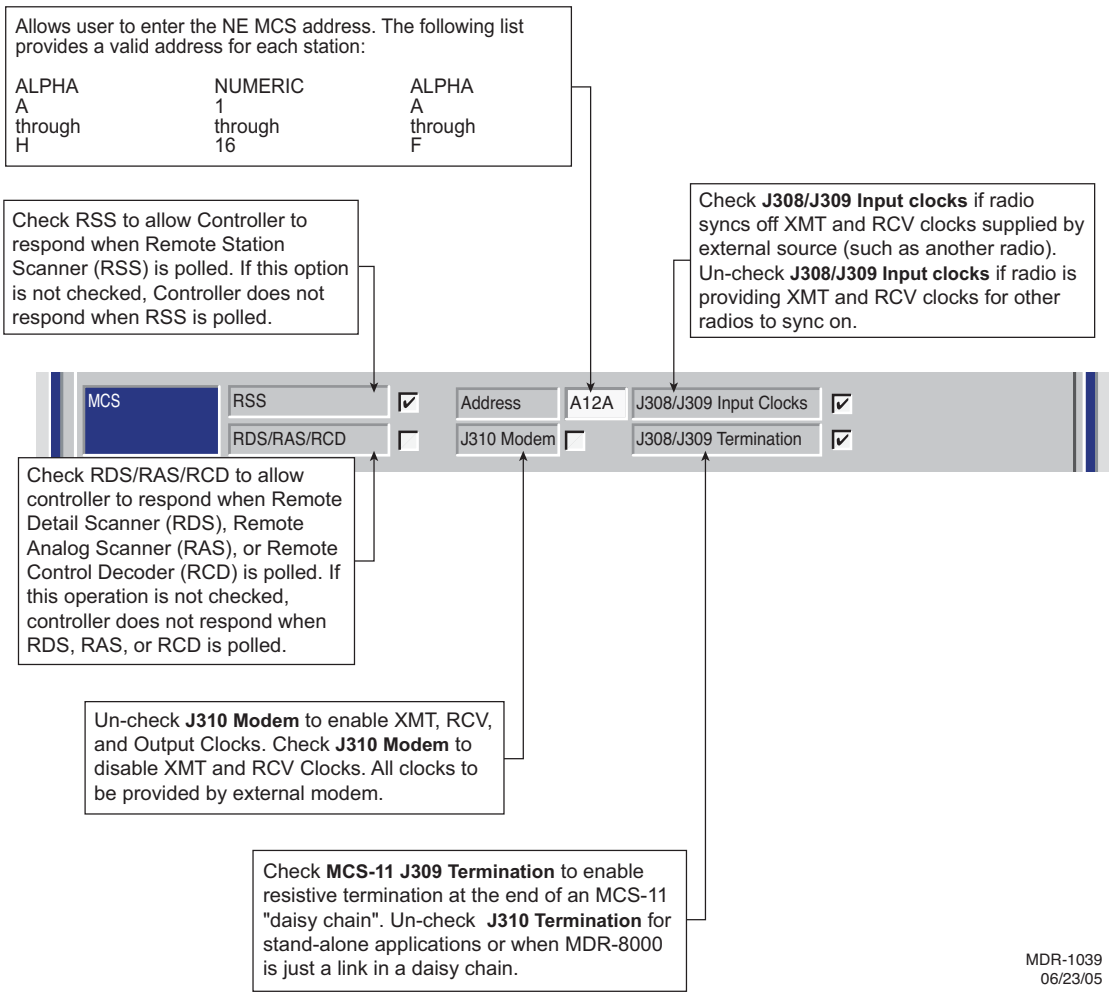
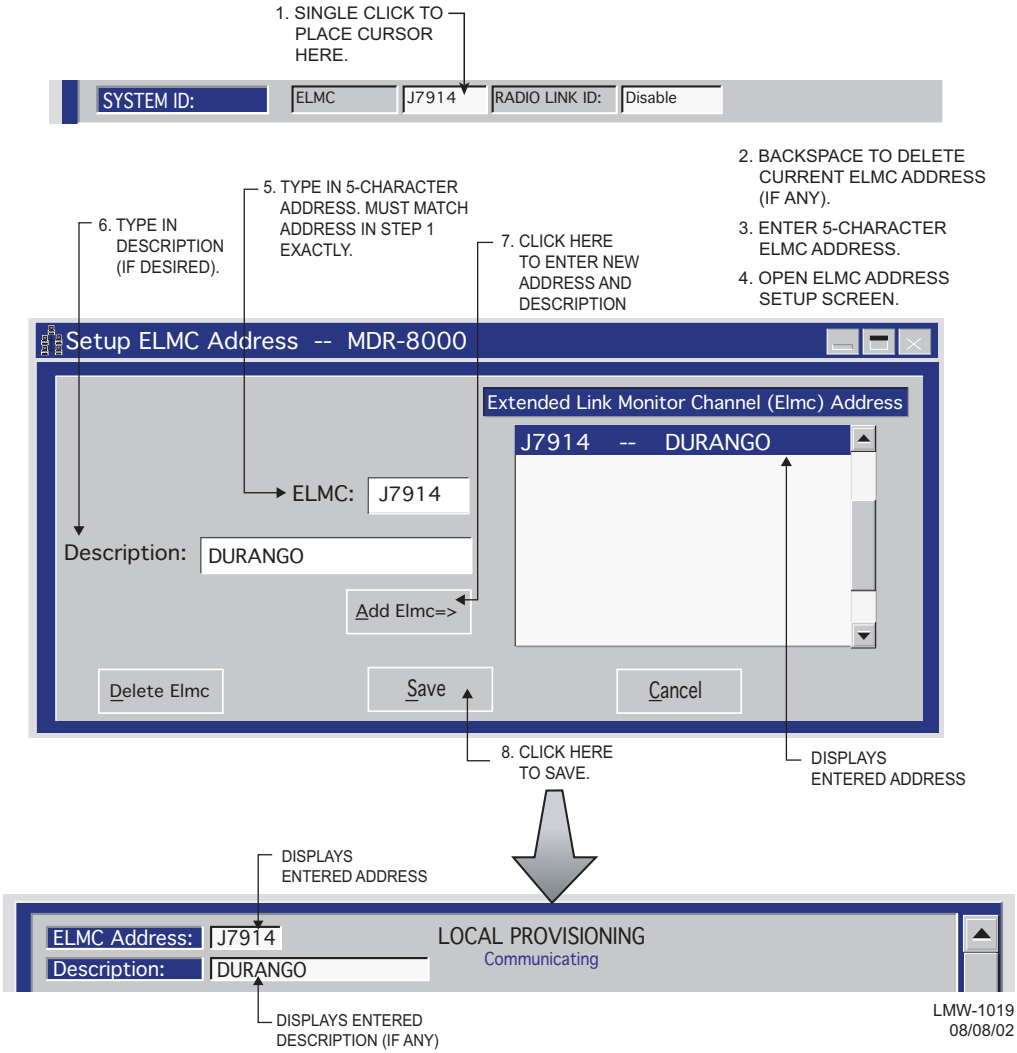


Figure 4-24 MCS-11 Provisioning

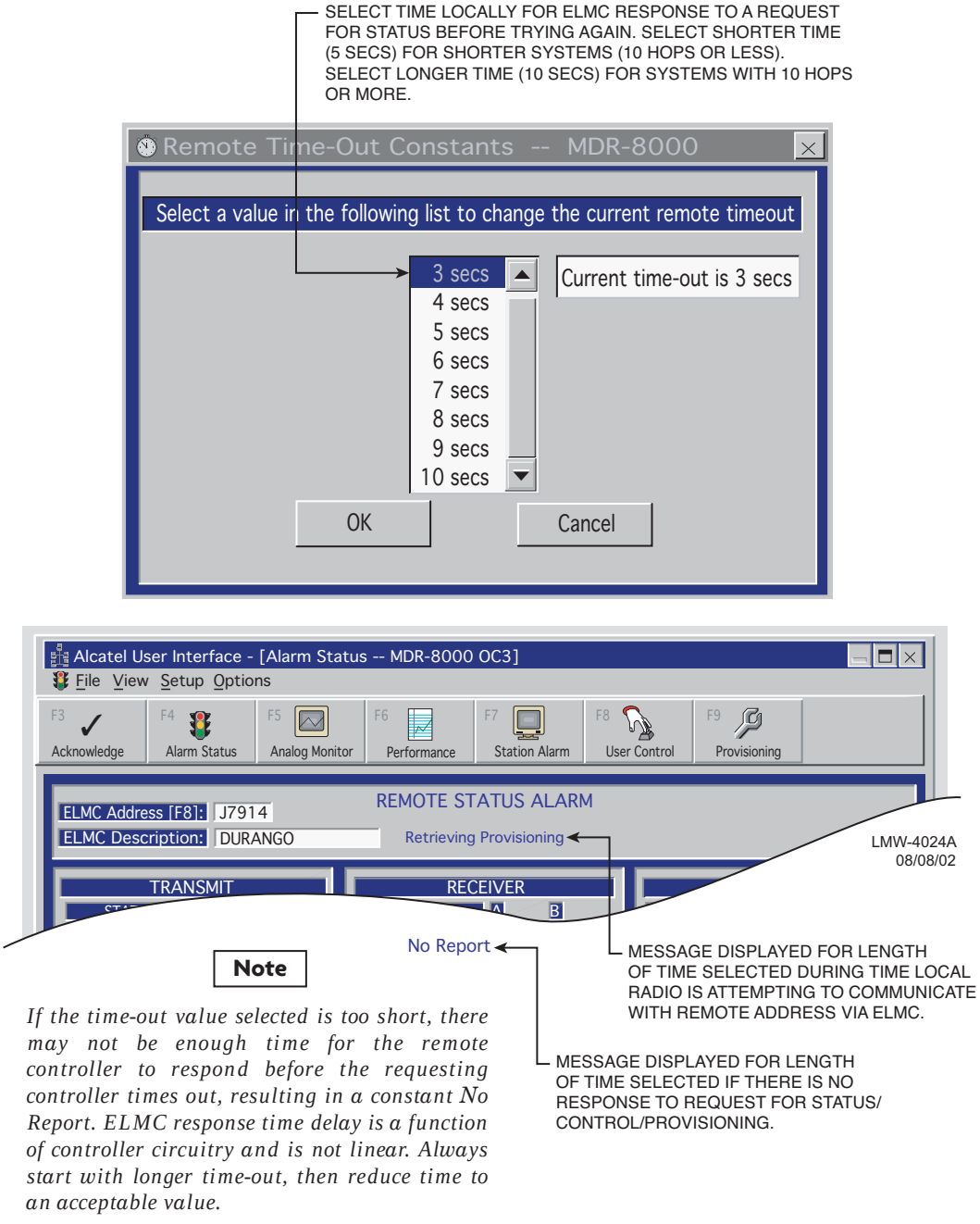
PROVISION ANY ONE OR ALL RADIOS AT A SITE, LOCALLY, USING FOLLOWING PROCEDURE:



Note

Each network element controller with ELMC must first be locally provisioned with a unique ELMC or remote address. The ELMC address is not related to MCS-11. Any name can be entered as long as the name is a 5-character, alphanumeric word. The address is case sensitive. Space, dash, slash, asterisk, and underscored characters are not allowed. If small numbers are used as addresses, then it is necessary to fill higher order digits with zeros. For example, if the address is the value 1, then the address must be entered as 00001. No address, or the same address used on multiple network elements, prevents ELMC access to that/those network elements. The remote address can only be pro-visioned and changed locally. Service-affecting functions, including operation mode, radio configuration, and remote address, cannot be provisioned or changed remotely.

Figure 4-25 ELMC Provisioning



Note

If the time-out value selected is too short, there may not be enough time for the remote controller to respond before the requesting controller times out, resulting in a constant No Report. ELMC response time delay is a function of controller circuitry and is not linear. Always start with longer time-out, then reduce time to an acceptable value.

Figure 4-26 ELMC Remote Time-Out Constant Provisioning

NOTE: DEFAULT CONTROL NAMES ARE USER CONTROL 1-6

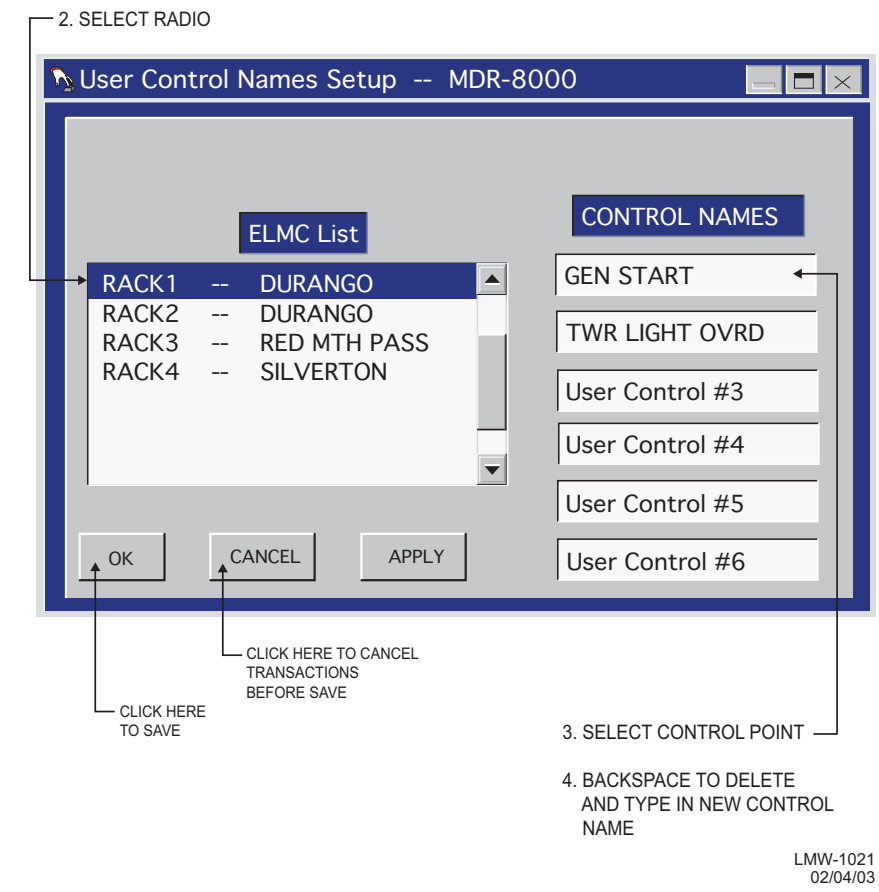


Figure 4-27 Control Names Provisioning

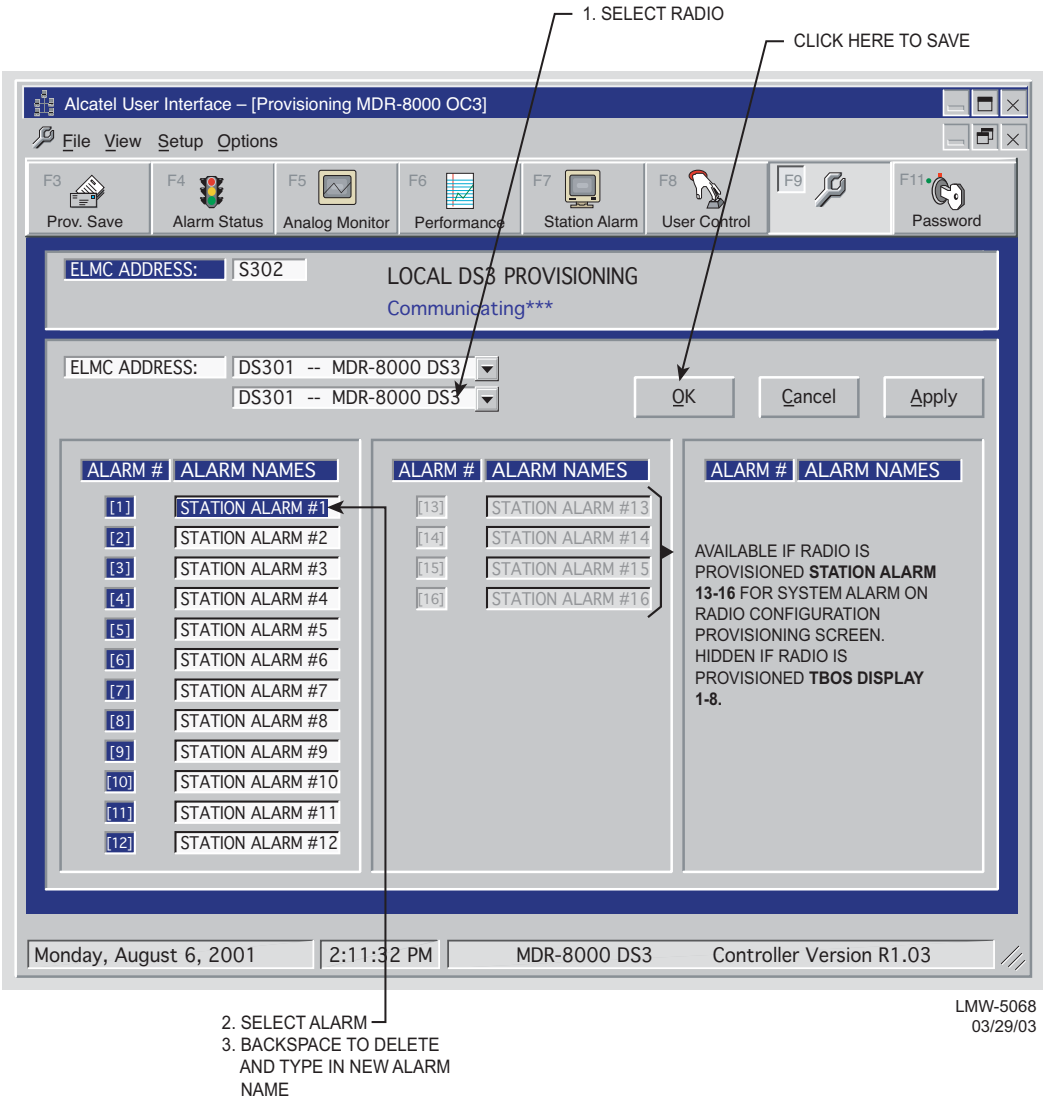


Figure 4-28 Alarm Names Provisioning

Note

DS3 screen is shown. DS1/E1 and OC3/STM-1 alarm names provisioning is similar.

Note

The information contained in this section is a summary of the section with the same title, but not the same section number, on the enclosed CD. "Refer to CD" is used throughout this section to refer the reader to the detail information on the CD. Go to this section on the CD for interactive links to the detail information referred to in this section.

5 MAINTENANCE

5.1 INTRODUCTION

This section contains information and procedures to aid in restoring the equipment to its proper operating condition after it has been determined that a problem exists.

The following warnings and cautions apply while operating, performance testing, troubleshooting, or repairing the MDR-8000 series radios.

Short circuits in low-voltage, low-impedance dc circuits can cause severe 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 power input terminals.

XMTR Crystals should never be shipped as replacements without being soldered and tuned up in an oscillator assembly board at the factory.

Units with the electrostatic-sensitive (ESS) symbol contain ESS devices. Store these units in an antistatic container when not in use, and anyone handling a unit should observe antistatic precautions. Refer to the Special Precautions pages in the front of the instruction book for detailed handling information.

CAUTION

Possibility of Service Interruption

RF flex coaxial cable requires special consideration. The electrical characteristics of the coax can be affected if it is accidentally twisted or bent. Provide mechanical support to prevent any weight or strain to the coax and connector when connecting or disconnecting equipment. Loosen the connectors at both ends of a coax section if one end must be moved even slightly. SMA connectors should be secured in place fingertight, and then gently tightened using a torque wrench with a 5/16 in. head set for 7 to 9 inch-pounds. The connectors should not be left fingertight.

Note

Ensure that all antennas are properly aligned and waveguide is in good physical condition.

Note

Before performing procedures that might in any way affect transmission, it is recommended that the person performing the procedure understand the FCC Rules and Regulations pertaining to the equipment and be properly authorized to operate the equipment.

5.2 MAINTENANCE PHILOSOPHY

This section provides information and procedures for equipment maintenance down to the module level. Module repair is not covered in this manual. A replacement procedure for the crystal oscillator subboard on the transmitter and receiver modules is provided to enable future use of the local oscillator at a different frequency in another application or at another location. Use the drawings in the appendix and those in the station drawing package to support the procedures in this section

The use of maintenance procedures in this section may result from failure of a periodic check, an alarm indication, or unacceptable performance. These problems should normally be resolved as shown in the maintenance philosophy flow chart (Figure 5-1).

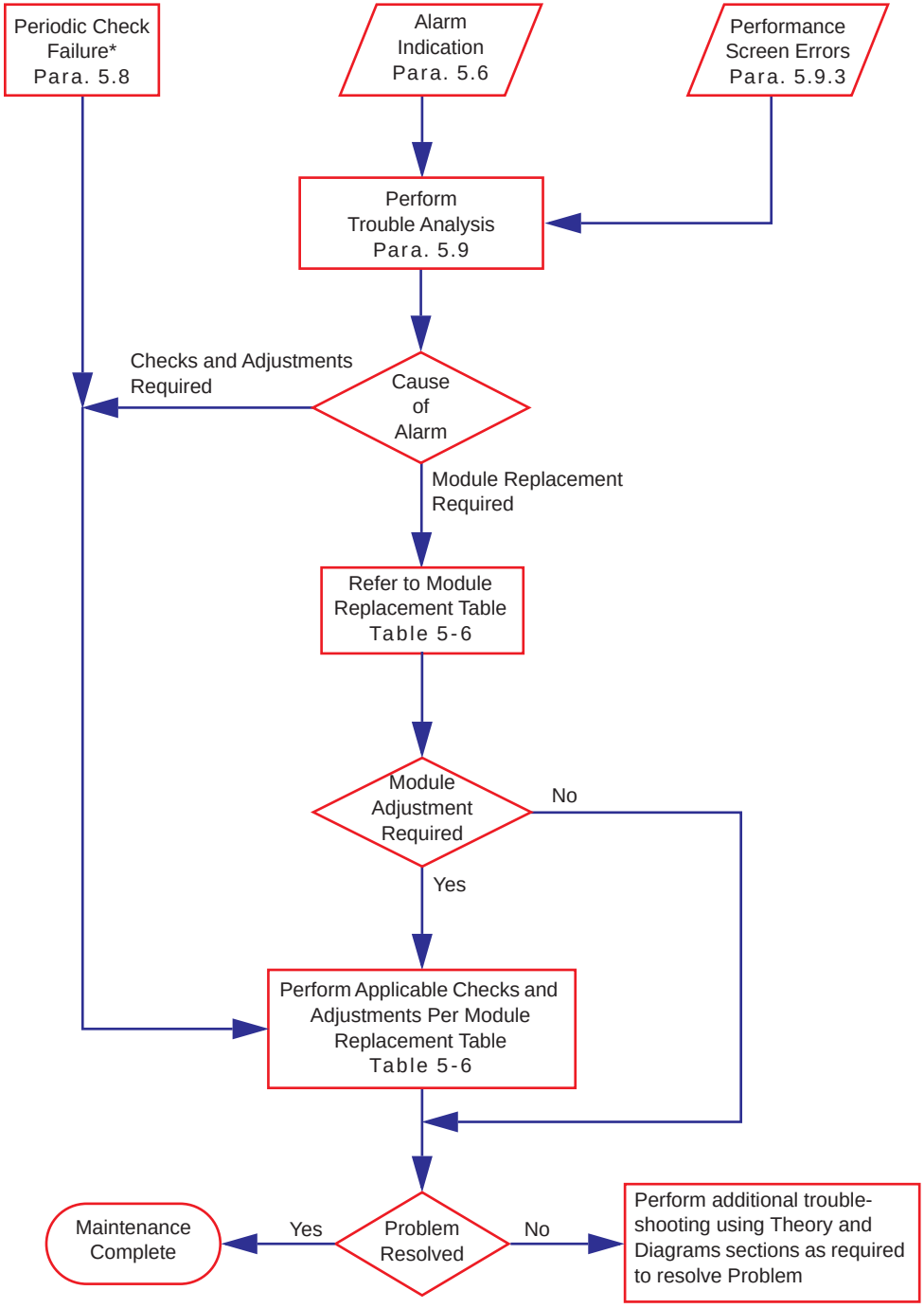


Figure 5-1 Maintenance Philosophy Flow Chart

5.3 RECOMMENDED TEST EQUIPMENT

Refer to Table 5-1 for the list of recommended test equipment. Alcatel recommends this test equipment to properly maintain the radio.

Table 5-1 Recommended Test Equipment

Test Equipment / Function	Essential Characteristics	Used On
Digital Volt Meter (DVM) Fluke 75		Out-of-Service Carrier Null Adjustment Using DVM (Refer to CD).
Frequency Counter, Agilent 5315A	106 to 150 MHz	Para. 5.18, XMT Crystal Oscillator Frequency Correction Para. 5.23, RCV Crystal Oscillator Frequency Correction
Power Meter, Agilent E4418A with E4418B Power Sensor E9300A	-60 to +20 dBm, 10 MHz to 18 GHz, 50 ohms	Para. 5.21, XMTR Output Level Calibration (No PA) Para. 5.25, PA Output Level Calibration
Test Lead and Tool Kit	PN 695-0675-003	As Required

5.4 OPTIONAL TEST EQUIPMENT

Refer to Table 5-2 for a list of optional test equipment to support alternate test procedures in this section and the over-the-hop test procedure (Refer to CD).

Table 5-2 Optional Test Equipment

Test Equipment / Function	Essential Characteristics	Used On
Adapter Type N Male Interface Adapter (Qty. 2 Required) Tyco Electronics 1048789-1		Flexible RF Test Cable
Attenuator Narda 768-30	30 dB, 50 Ohms, 20 Watts	Para. 5.25, PA Output Level Calibration (Alternate Procedure)
Bit Error Rate Test Set Acterna ANT-5 Data Rate Modulation Scheme	 2.048 Mb/s, HDB3	Over-The-Hop E1 BER Threshold Test

Table 5-2 Optional Test Equipment (Cont.)

Test Equipment/Function	Essential Characteristics	Used On
Communications Analyzer w/DS1 Package Acterna TB 2310-P4 D1 Data Rate DS1 Modulation Scheme	1.544 Mb/s, B8ZS or AMI	Over-The-Hop DS1 BER Threshold Test
Communications Analyzer w/DS3 Package Acterna TB 2310-P5 DS3 Data Rate DS3 Modulation Scheme	44.736 Mb/s, 64 QAM	Over-The-Hop DS3 BER Threshold Test
Communications Analyzer w/OC3 Package Acterna TB 2310-P2	155.52 Mb/s	Over-The-Hop OC3/STM-1 BER Threshold Test
Flexible RF Test Cable, 6 Ft. Tyco Electronics 1049982-5		Spectrum Analyzer
Optical Power Meter RIFOCS 555B with SC and FC SOC Power Wavelength	-8 to -28 dBM, 1310/1550 nm	Over-The-Hop Optical Power Test
Oscilloscope, Tektronix TDS3052B		DS3 Radio DADE DS3 Line DADE
Spectrum Analyzer, Agilent E4408B	1.7 to 11.7 GHz	Para. 5.20, In-Service XMTR Carrier Null Adjustment Using Spectrum Analyzer
Variable Attenuator, Narda 791	1.7 to 11.7 GHz, 0 to 37.5 dB	Over-The-Hop DS1 BER Threshold Test, Over-The-Hop E1 BER Threshold Test, Over-The-Hop DS3 BER Threshold Test, Over-The-Hop OC3/STM-1 BER Threshold Test, OC3/STM-1/ETH I/O Interface Removal and Replacement, Over-The-Hop OC3/STM-1 Fade Margin Test (to the 10-6/10-3 BER Level)

5.5 PERSONAL COMPUTER (PC)/LAPTOP

The PC is an on-line maintenance and troubleshooting tool. Refer to the General Section for PC guidelines. See Figure 5-2. Connect the RS-232 Interface cable between USI connector on controller and the PC.

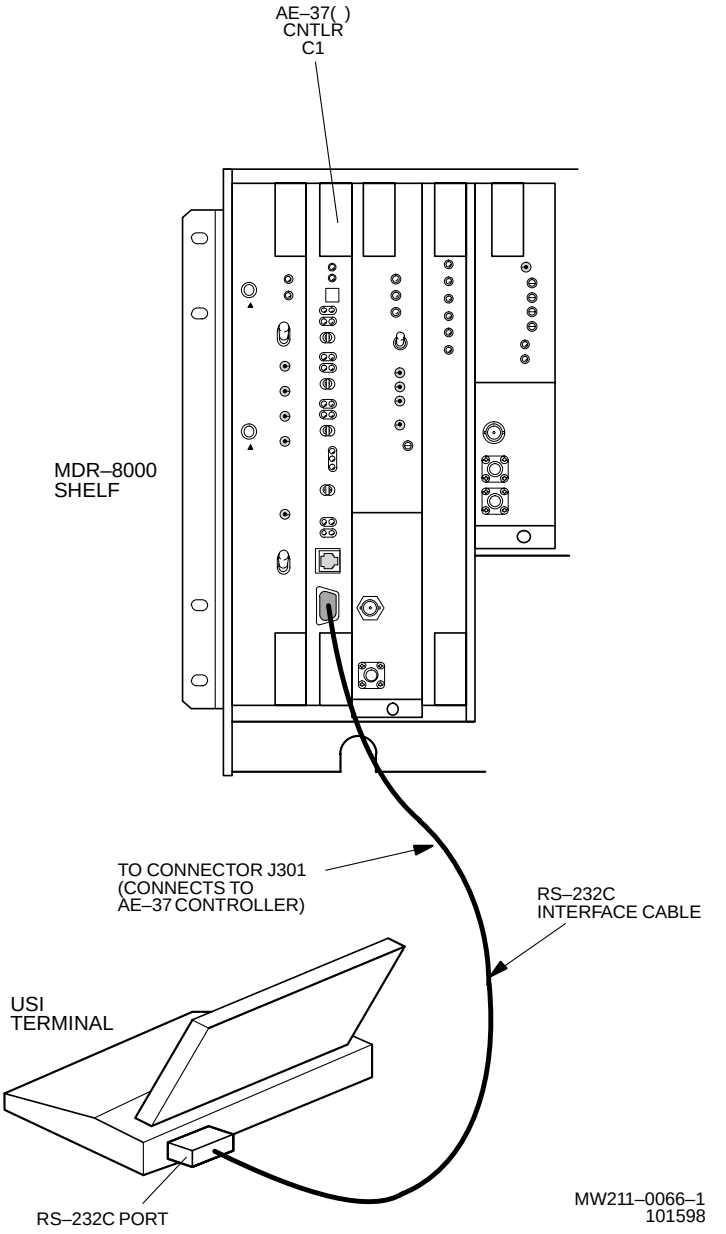


Figure 5-2 USI Computer to Controller Interconnection

5.6 MDR-8000 ALARMS

MDR-8000 Alarms are displayed on:

1. USI Alarm and Status screen
2. Alcatel MCS-11 Monitor and Control System
3. SNMP MIB browser
4. TBOS foreign alarm system
5. External relay interface
6. Module front panel indicators

Alarm names are radio/alarm equipment dependent. The Alarm List found under NOC Alarm Troubleshooting on the enclosed CD, identifies every alarm name indicated by the above alarm display equipment, in alphabetic order. By clicking on the alarm name, the user can go straight to the description, cause, effect, and action for that alarm, regardless of where the alarm is displayed. The alarm list is a summary of alarms designed for use by NOC personnel. Refer to the detail troubleshooting later in this section for more information.

5.7 ALARM MONITORING AND INSPECTION

Perform the following checks whenever a station is entered:

1. Verify that no alarms are lighted; only the green status indicators should be lighted.
2. Momentarily press LAMP TEST switch. Verify all indicators light.

Note

Keeping records of errors and alarm history can be an aid to system troubleshooting.

Note

The local status alarms screen displays the alarms of the radio to which the USI is connected, either physically or addressed via the ELMC.

3. Using the USI computer, check local alarms on the Local Status Alarms screen.

5.8 RECOMMENDED PERIODIC CHECKS

Perform XMTR local oscillator frequency verification (Para. 5.18) and XMTR output check (Para. 5.19) 1 year after initial setting and at 5-year intervals thereafter to correct possible drift caused by aging.

5.9 RADIO TROUBLESHOOTING

The digital radio system is equipped with alarm circuitry and automatic switching (in hot-standby, frequency diversity, and space diversity configurations) to provide protection against loss of traffic. This automatic switching, coupled with adaptive equalization of multipath distortion, provides protection against equipment outage and propagation variations. Because of the finite life of electronic equipment, failures occur.

5.9.1 Troubleshooting USI Alarms

First alert for an alarm is normally the USI Status Alarm Screen. See Figure 5-3 through Figure 5-12 for detailed alarm information and troubleshooting guidelines. After isolating the fault to the most probable cause, replace module or repair as directed.

5.9.2 Troubleshooting RCVR Lockup Problems

The radio is operational when the RCVR is locked onto the associated farend XMTR frequency. Normally lockup occurs within minutes after power is applied. Successful lockup is indicated by not having the channel alarm (Chan Alm) lit on the RCVR front panel.

5.9.2.1 Slow Lockup At Initial Turnup

Slow lockup at initial turnup is defined as lockup occurring five minutes or more after powerup. If the radio is non-standby/no space diversity (one RCVR in A side), replace the RCVR. If radio is non-standby space diversity or hot-standby (two RCVRs, A and B sides) problem is probably the XMTR at the farend of the hop. The most common cause of slow lockup is incorrect carrier null. First try switching XMTRs. If this clears the problem, perform carrier null (Para. 5.20) and XMTR/PA output level calibration procedure (Para. 5.21) on the off-line XMTR. If the problem is not cleared, replace the XMTR.

5.9.2.2 Slow Lockup During Normal Operation

Slow lockup after a bad fade or other temporary interruption is defined as lockup occurring less than a second after RSL is restored. Troubleshooting this type of slow lockup requires knowing what the RSL is. Check RSL using the procedure in Appendix G on attached CD.

If the RSL is at least 4 to 5 dB above RCV threshold, the two most probable causes are carrier leakage and the RCVR local oscillator. Perform carrier null test (Para. 5.20) on the farend XMTR. If slow lockup continues, remove and replace the RCVR crystal oscillator subboard.

If the RSL is below or 1 to 3 dB above RCVR threshold, wait until RSL improves to at least 4 to 5 dB above RCVR threshold before starting troubleshooting.

5.9.3 Troubleshooting Performance Screen Errors

Path and intermod problems can occur that cause errors to be indicated on the Performance monitor screens that are not severe enough to generate an alarm on the USI Alarm and Status screen. Errors of this type fall into two categories: burst and dribbling errors.

The performance screens can be a useful tool in troubleshooting a radio with and without alarms being indicated on the Status Alarm screen.

5.9.3.1 Troubleshooting Burst Errors

Burst errors are defined as multiple errors in a very short time. Burst errors can be caused by many things, including loose connections on cable or waveguide at either end of the hop. An aging oscillator can cause burst type errors. Burst errors can be identified by a high number of **Errors** and low number of **Error Seconds** on the Performance screens. The most probable cause of burst errors is a loose connection. Check/repair all shelf and external cables and check all waveguide connections The next most probable cause is the crystal on the crystal oscillator subboard at either end of the hop.If the radio has both A and B XMTRS and RCVRS and both A and B are indicating burst errors, the fault is at the XMT end of the hop. If only A is equipped and indicates burst errors, remove and replace the crystal oscillator subboard on the on-line RCVR.

5.9.3.2 Troubleshooting Dribbling Errors

Dribbling errors are defined as small number of errors over long period of time (no frame errors). Dribbling errors can be caused by a path problem, such as interference or fading, or by a hardware problem such as a XMTR or PA that is being over driven, or high phase noise in the XMTR or RCVR oscillator. Dribbling errors can be identified by observing the **Radio CRC Errors** (DS1), **Radio Errors** (DS3), **Receiver Errors** (OC3), or **RF Receiver Errors** (ETH) fields on the radio Performance screen. Typically, less than five Errors to one Error Second identifies the fault as dribbling errors. Try isolating the transmitter by switching transmitters in a protected system. You can further isolate a transmitter by changing output levels using ATPC and or dropping the output power out of the XMTR to the PA by one or two dB.

The DS1 radio performance screen has a Repeater CRC Error Sec field that indicates errors over the repeater cable.

Two troubleshooting tips: 1) errors are displayed on the USI at the receive end in which they are detected, and 2) these specific type of radio errors are not propagated down the path.

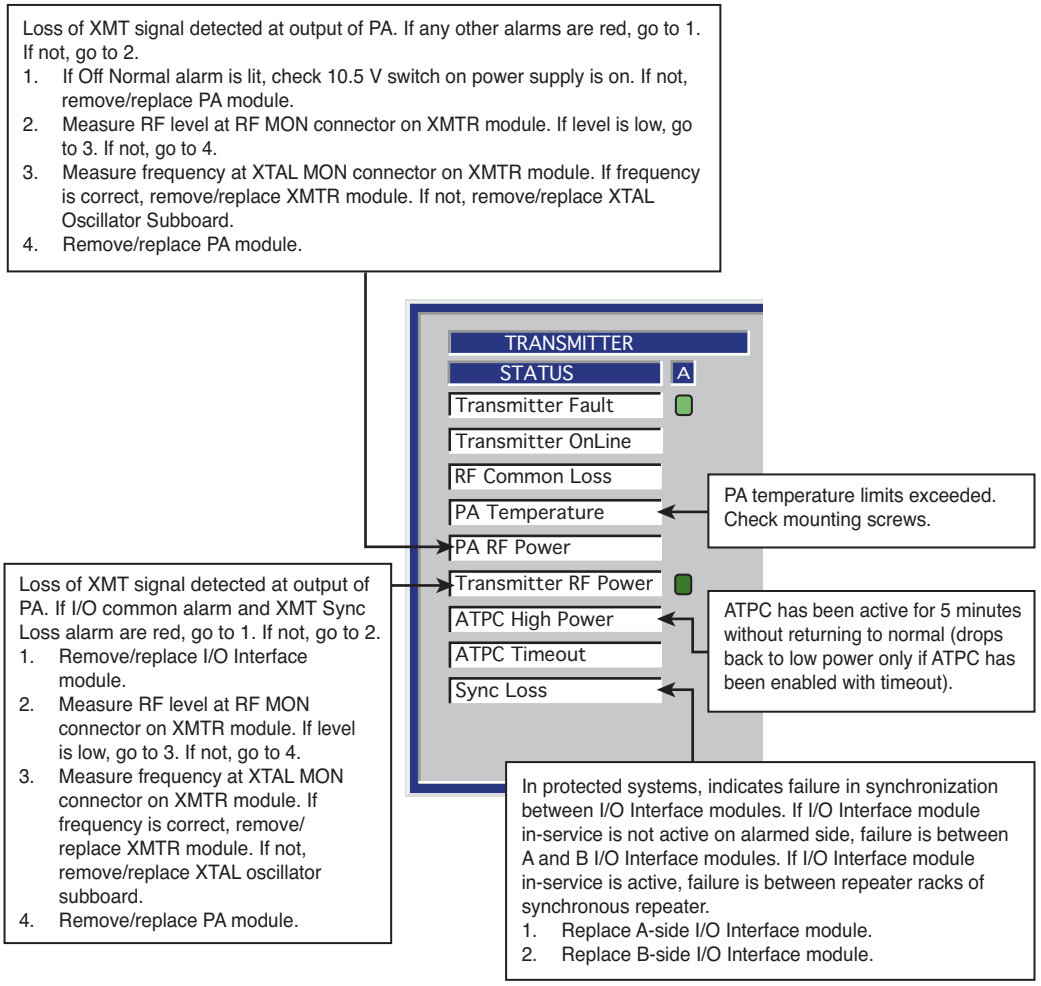


Figure 5-3 Troubleshooting Radio XMT Alarms (Sheet 1 of 2)

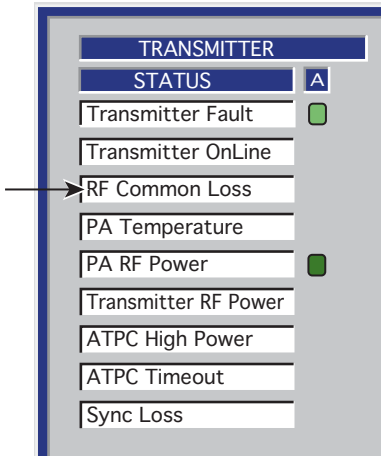
Both RCVRs at the other end have a problem and have switched the XMTRs to try and clear it. If the RCVRs clear within a defined time frame (which we will hereafter call the CLA window) after switching, the CLA appears. if the RCVRs clear by switching or any other way outside of the CLA window, the CLA does not activate, but switching continues.

Switching times vary, depending on RSL.

If RSL is above alarm threshold, the first XMT switch occurs 5 seconds after the problem at the RCVRs is detected. The 5 seconds following the first XMT switch is the "CLA window". If the RCVR alarms clear during the 5-second CLA window, the CLA will activate at the XMT end.

Since the RSL at the RCVRs is ok, equipment failure at the farend XMTR is the most probable cause of the RCVRs failing.

If RSL is below alarm threshold, the first XMTR switch occurs 30 seconds after the problem at the RCVRs is detected. The CLA window is the first 5 seconds of the second 30 seconds. If the RCVR alarms clear during the 5-second CLA window, the CLA will activate at the XMT end.



In DS1 and OC3/STM-1 2-fiber switched and 4-fiber switched radios, if the RCVR alarms do not clear within the CLA window, after ten 30-second periods (10 switches) the controller switches the I/O Interface modules and another 5-second CLA window is opened. If the RCVR alarms clear during the 5-second CLA window following the I/O switch, the CLA will activate at the XMT end.

Since this is a silent alarm at the XMT end, no other alarm should show up at the XMTR.

Clearing the RCVR problem does not automatically clear the CLA at the XMT end. The CLA can be cleared using the ACO switch on the controller module or by rolling the mouse over RF Common Loss on the screen and double clicking.

CLA can be caused by many things. Troubleshooting is RSL dependent. Problems that can cause a CLA follow.

1. Path problems, such as fading, refraction, interference
2. Frequency problems due to aging or bad crystal oscillator
3. Bad capacity key on XMTR
4. Bad RF cable
5. Bad RF switch
6. Bad I/O Interface

If RSL is normal, look for a digital signal problem at the XMT end. The RCV end will probably have Eye Closure and Frame Loss alarms, **but not an RSL alarm**. Since the RCVRs are receiving a strong signal (but not a good signal) from the farend XMTR, the RCVRs will probably be locked on frequency.

Is RSL above or below alarm threshold?

Above, go to 1.
Below, go to 2.

1. If RSL is ok, look for a digital signal problem at the farend XMTR:
   a. Check XMTR capacity key.
   b. Remove/replace XMTR.
   c. Remove/replace I/O Interface.
2. If RSL is low, there will be a RCVR RSL alarm along with any others:
   a. Check for prolonged fade. Use USI RSL screen and check history. Worst fading times are early in the morning and late in the evening.
   b. Look for equipment failure at XMT end:
      Check for bad XMTR/PA. Verify correct output power out of XMTR/PA. Is output power correct?
      Yes, check for bad cable or RF switch at the XMT end.
      No, remove and replace XMTR, PA, I/O Interface, in that order.

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Figure 5-3 Troubleshooting Radio XMT Alarms (Sheet 2 of 2)

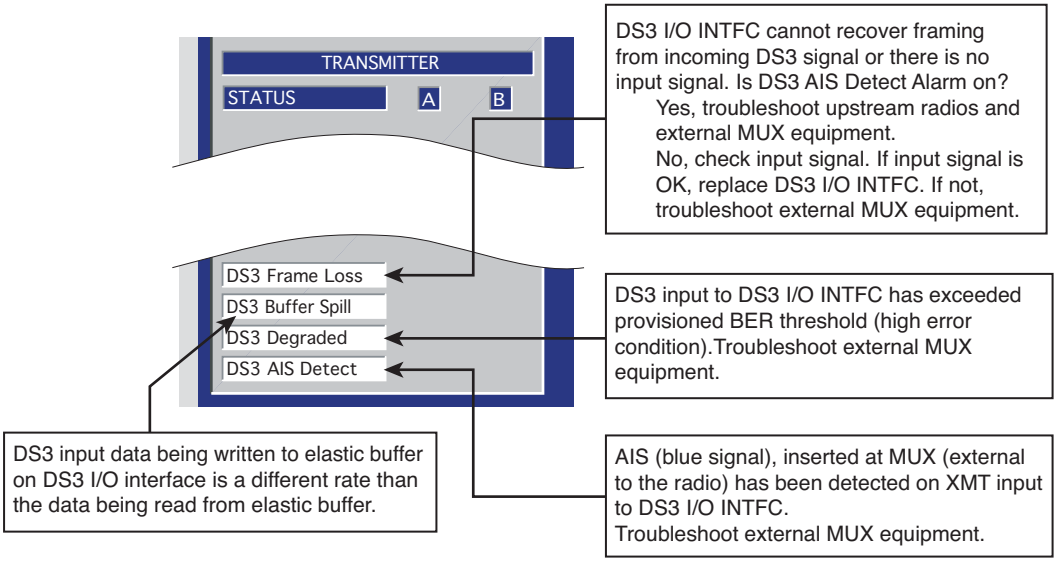


Figure 5-4 Troubleshooting DS3 Radio XMT Alarms

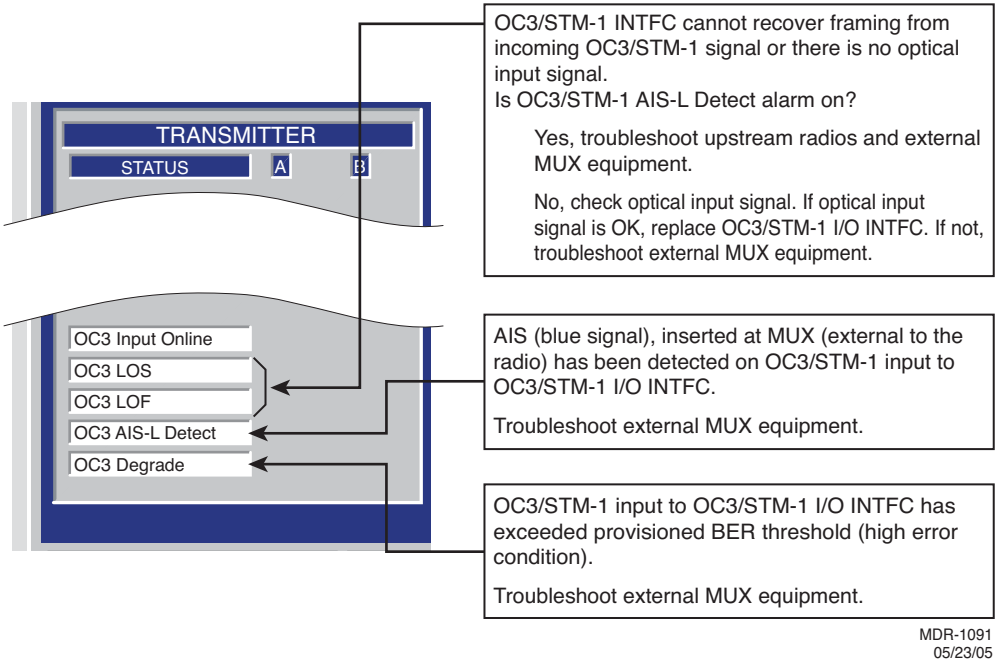
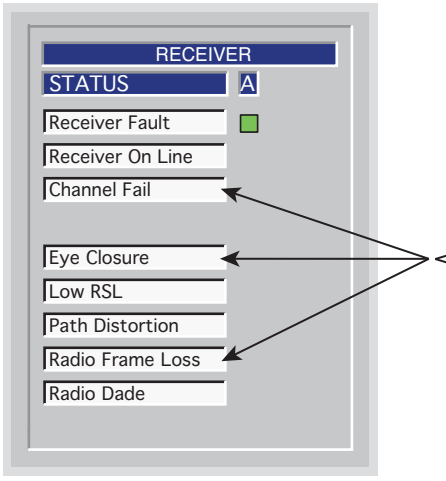


Figure 5-5 Troubleshooting OC3/STM-1 Radio XMT Alarm

Note

Always troubleshoot and clear the most severe alarm first. Channel Fail is the most severe, followed by Radio Frame Loss and Eye Closure.



The Eye Closure alarm, Radio Frame Loss alarm, and Channel Fail alarm all work together to form effective 3-level troubleshooting tools. If the radio is provsioned correctly, Eye Closure (the first level) should be the first indication that there is a steady stream of errors (more than dribbling errors) being detected by the RCV circuit in the I/O Interface module. The second level is the Radio Frame Loss alarm. This alarm indicates that the errors have increased to the point that complete frames are being lost. The third level, the Channel Fail alarm, is the most severe level. This alarm indicates that the RCVR can no longer lock on the farend XMTR. Even worse, the overhead with command path and Service Channel is lost, inhibiting communication with the farend, making troubleshooting more difficult.

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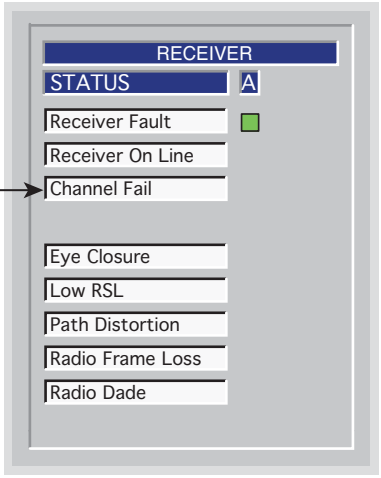
Figure 5-6 Troubleshooting Radio RCV Alarms (Sheet 1 of 5)

A **Channel Fail** alarm occurs when RCVR(s) have lost lock and are not locked on the signal from the farend XMTR(s). Loss of signal also means loss of CMD path. The most effective method of troubleshooting this type alarm is to have a technician at both ends of the hop. Farend status viewing and controls must be performed at the farend site. This alarm can be caused by a failure at the farend XMTR, RF path/antenna/waveguide problems, or a failure in the local RCVR or I/O Interface.



Start by isolating the fault to one end of the hop or the RF path/antenna/waveguide. If the farend XMTR is protected, switch XMTRs and see if alarms at the RCVR end clear. If so, the problem is at the XMT end and the path and RCV end are ok. If the RCVR alarms do not clear (and/or the XMTR is not protected) proceed as follows:

1. Observe **RX (RSL 1) dbm** on the analog monitor screen and compare the RSL level with the **TYPICAL RCVR THRESHOLD (DBM) BER = 10^{-6}**, for the type and capacity of radio, listed on Tabe 1-3, Physical, Environmental, and Electrical Characteristics, in the General section of this instruction book. If the RSL is too low (below the RCVR threshold), the RCVR will not lock to the farend XMTR. The problem is in the farend XMTR, is an RF path problem, or is a farend or local antenna/waveguide problem.

2. Troubleshoot farend XMTR.
   If the RSL is above the listed threshold, troubleshoot the local RCVR. Start by isolating the fault to the RCVR module or I/O Interface module.
   a. Observe **RX (AFC MON)** voltage on the analog monitor screen. This is the correction voltage for the crystal oscillator. The voltage should be -3.0 ±0.5 Vdc, indicating that the crystal oscillator is on center frequency. If not, remove and replace crystal oscillator subboard on RCVR. If the **RX (AFC MON)** voltage is correct, the failure could still be the RCVR or the RCVR circuits in the I/O Interface module. The most probable cause is the RCVR.
   b. Remove and replace RCVR. The crystal oscillator subboard and capacity key must be removed from the suspected RCVR and installed on the spare RCVR. If the alarm is stil not cleared, remove and replace the I/O Interface module.

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Figure 5-6 Troubleshooting Radio RCV Alarms (Sheet 2 of 5)

Note

Always troubleshoot and clear the most severe alarm first. **Channel Fail** *is the most severe, followed by Radio Frame Loss and Eye Closure.*

Loss of radio frame from RCVR in I/O Interface RCVR circuits. Before starting, check USI for receiver **Channel Fail** alarms and **Common Command Path** alarm. If there is a **Channel Fail** alarm, troubleshoot and clear that alarm first. If there is a **Command Path** alarm, troubleshoot and clear that alarm second.

1. Verify farend radio configuration. Is farend radio hot-standby?
   Yes, go to 2.
   No, go to 4.

2. Check for Radio Frame Loss alarms on both A and B.
Are there Radio Frame Loss radio frame loss alarms on both A and B?
   Yes, go to 3.
   No, only A or B has a frame loss alarm, go to 4.

3. Switch farend XMTRs. Do alarms clear?
   Yes, replace farend off-line XMTR.
   No, replace local I/O Interface on alarmed side. Do alarms clear?
      Yes, stop. Procedure is complete.
      No, replace local RCVR on alarmed side.

4. Replace local I/O Interface on alarmed side. Do alarms clear?
      Yes, stop. Procedure is complete.
      No, replace local RCVR on alarmed side.

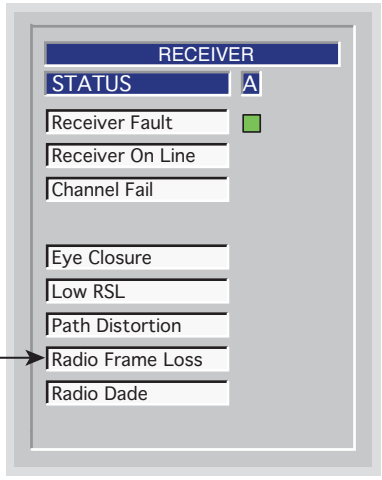

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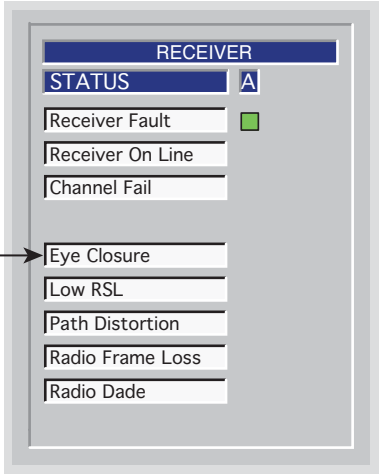
Figure 5-6 Troubleshooting Radio RCV Alarms (Sheet 3 of 5)

Errors are being received by the RCVR at a rate exceeding the Eye BER threshold error rate provisioned on the radio configuration screen. This alarm could be caused by a faulty XMTR (farend), radio interference on the RF path (RFI), antenna/waveguide problem, or a faulty antenna/waveguide problem, or a faulty RCVR/RCVR local oscillator failure. Troubleshooting is configuration dependent.



1. Check for **Eye Closure** alarms on both A and B RCVRs.
Are there **Eye Closure** alarms on both A and B RCVRs?
Yes, go to 2.
No, only A or B has an Eye Closure alarm. The failure is on the RCVR end. Go to 3.

2. The problem is in the farend XMTR, is an RF path problem, or is a farend or local antenna/waveguide problem. Start by isolating the fault to one end of the hop or the RF path/antenna/waveguide.
a. Check farend for XMTR alarms. Troubleshoot and clear alarms (if any) at far end as required. Go to b.
b. Check farend radio XMTR configuration as follows:
Hot-standby XMTRs? Go to c.
Frequency diversity? Go to 4.
Space diversity? Troubleshoot farend XMTR.
c. If the farend XMTR is hot-standby, switch XMTRs and see if alarms at the RCVR end clear.
Do RCVR alarms clear?
Yes, the problem is at the XMT end and the path and RCV end are ok. Replace farend off-line XMTR.
No, the problem is a path problem or a problem at the RCVR. Go to d to isolate the path.
d. The problem may be RF interference (RFI) on the path. While observing the RSL on the RCV end Analog screen, disable the farend XMTRs.
Does RSL drop at least 25 dB?
No, there is high RFI on the path. Eliminate the RFI source.
Yes, RSL drops 25 dB or more. The problem is a path problem, such as an obstruction in the path, or a problem with the antenna or waveguide, or is a RCVR problem. Go to 3.

3. Isolate failure to RCVR crystal oscillator subboard or the RCVR module as follows:
a. At RCV end, observe **RX (AFC MON)** voltage on the analog monitor screen. This is the correction voltage for the crystal oscillator. The voltage should be -3.0 ±0.5 Vdc, indicating that the crystal oscillator is on center frequency.
If not, remove and replace crystal oscil lator subboard on RCVR.
If the **RX (AFC MON)** voltage is correct, replace RCVR module.
Do RCVR alarms clear?
Yes, stop. Procedure is complete.
No, go to 4.

4. Problem is in path (not RFI) or antenna/waveguide. Sweep waveguide at both ends of hop. Repair or replace as required.

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Figure 5-6 Troubleshooting Radio RCV Alarms (Sheet 4 of 5)

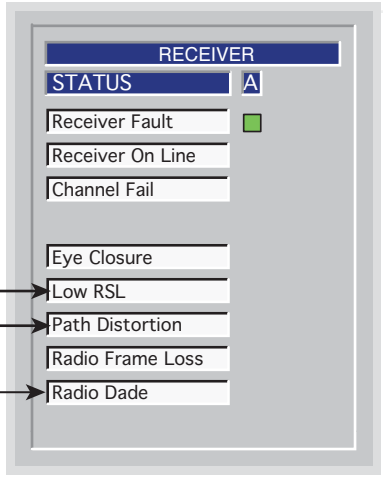
Note

Radio Dade *is displayed on DS1 USI Status and Alarm screen only.*

Low RSL on alarmed RCVR. Alarm only functions if AGC switching threshold is provisioned active.

1. Check for path fading.
2. Check upstream XMTR.

High level of distortion in TDE due to excessive multipath activity. Check path for interference.



More delay in system than elastic buffers on DS1 I/O Interface can correct.

1. Isolate the delay to local or farend. Delay in the farend XMTR is a possible cause in frequency diversity configurations. Is the farend radio frequency diversity?
   Yes, go to 2.
   No, delay is probably a local problem. Go to 3.
2. Verify there are no farend XMTR alarms. Troubleshoot and clear farend XMTR alarms first.
3. Check/repair waveguide/path.
4. Isolate delay to A-side or B-side I/O Interface. On local controller front panel, observe **I/O ALM** indicators. The **A** or **B I/O ALM** will be lit for the side with the excessive delay.
5. Remove/replace RCVR on alarmed side.
6. Remove/replace I/O Interface module on alarmed side.

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Figure 5-6 Troubleshooting Radio RCV Alarms (Sheet 5 of 5)

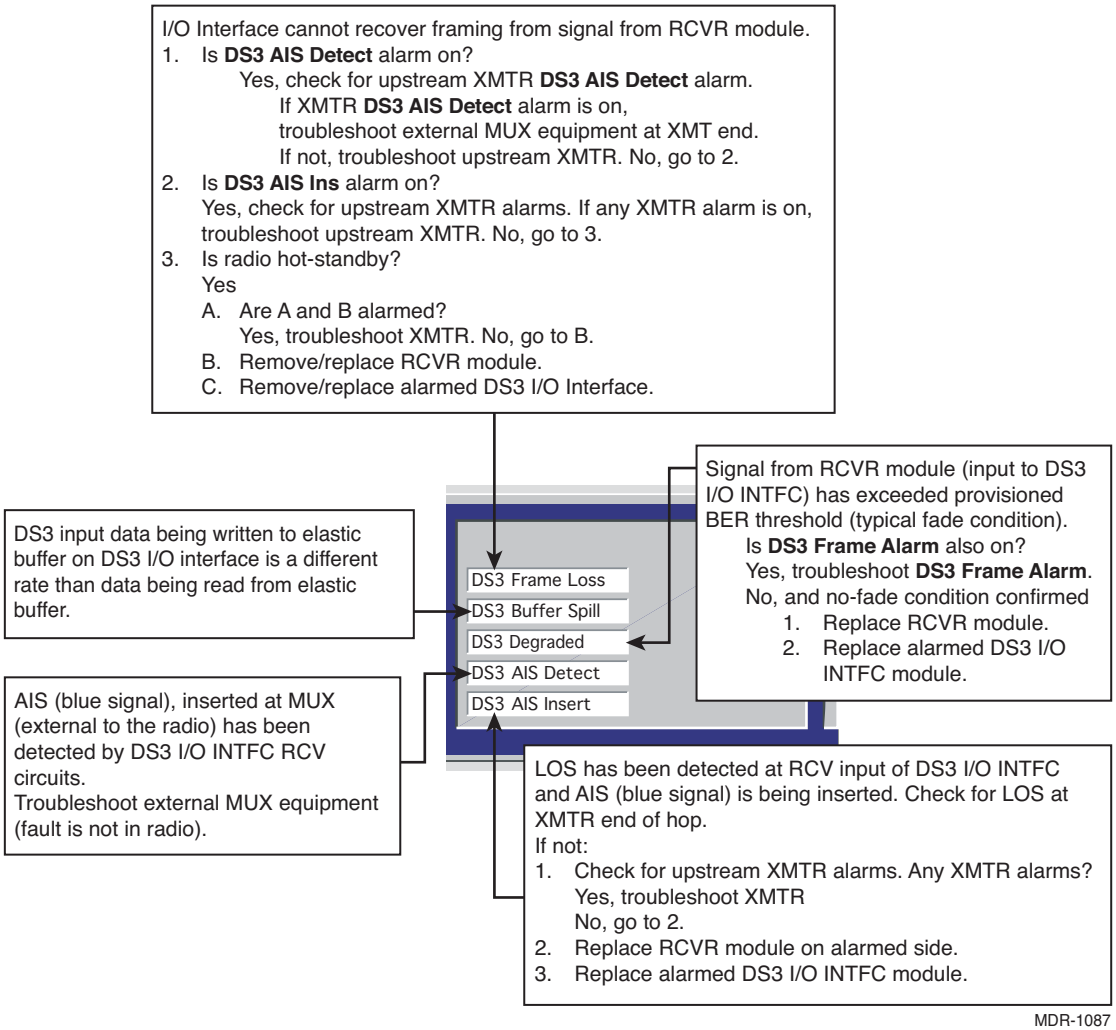


Figure 5-7 Troubleshooting DS3 Radio RCV Alarms

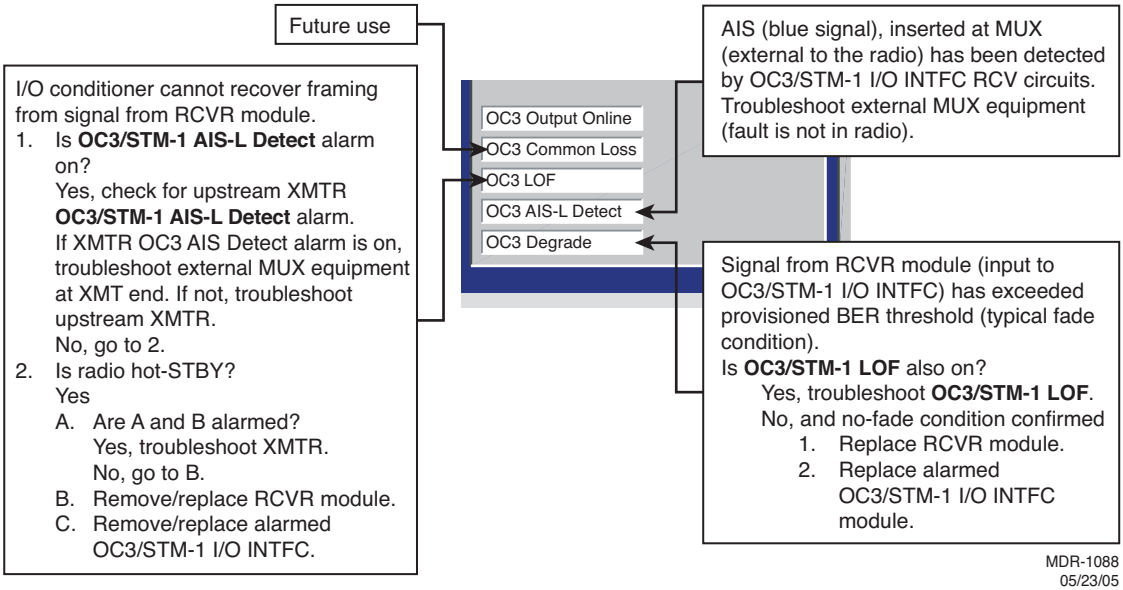


Figure 5-8 Troubleshooting OC3/STM-1 Radio RCV Alarms

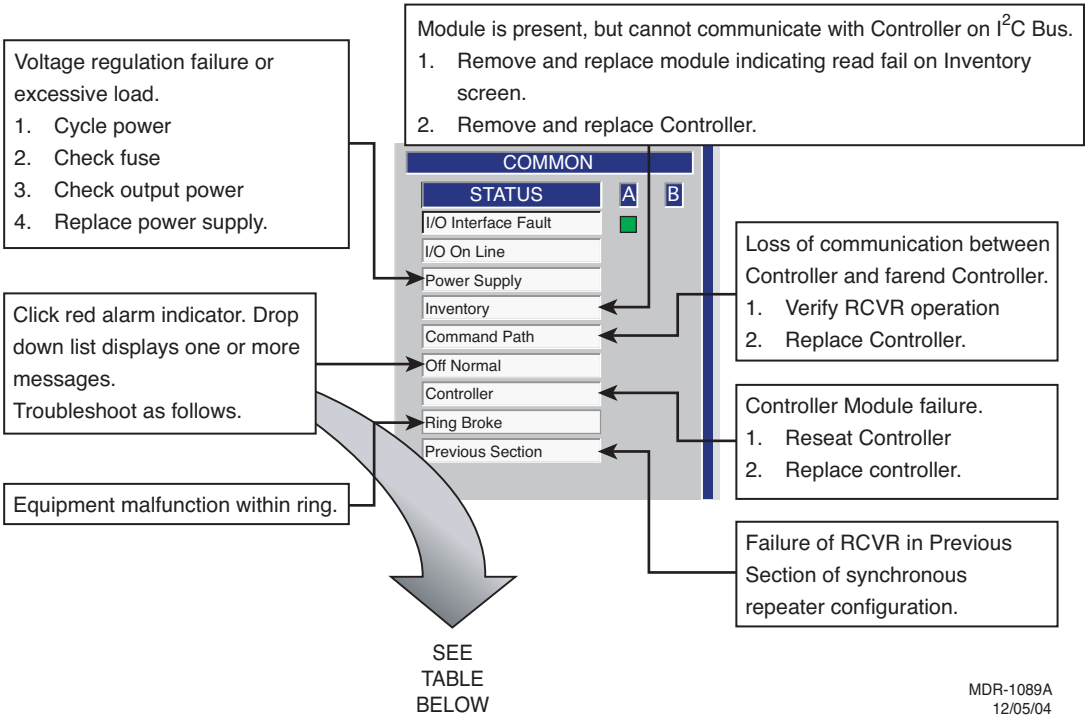
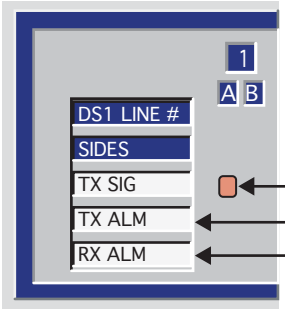


Figure 5-9 Troubleshooting Radio Common Alarms

MESSAGE	MEANING	ACTIONS
Fan Alarm	Fan or fan control module failed.	Remove/replace fan/fan assembly.
A ATPC High Power Lock	***A ATPC High Power Lock*** function is enabled on USI control screen locking A-side XMTR/PA at highest power.	Disable ***A ATPC High Power Lock*** function on USI control screen.
B ATPC High Power Lock	***B ATPC High Power Lock*** function is enabled on USI control screen locking B-side XMTR/PA at highest power.	Disable ***B ATPC High Power Lock*** function on USI control screen.
A ATPC Low Power Lock	Locks A-side XMTR/PA output power 10 dB down from highest power.	Disable ***A ATPC Low Power Lock*** function on USI control screen.
B ATPC Low Power Lock	Locks B-side XMTR/PA output power 10 dB down from highest power.	Disable ***B ATPC Low Power Lock*** function on USI control screen.

MESSAGE	MEANING	ACTIONS
A Tx Override	Override function is enabled on controller module locking A-side XMTR/PA in-service. Switching is disabled regardless of alarms.	Disable override function on controller module front panel.
B Tx Override	Override function is enabled on controller module locking B-side XMTR/PA in-service. Switching is disabled regardless of alarms.	Disable override function on controller module front panel.
A Rx Override	Override function is enabled on controller module locking A-side RCVR in-service. Switching is disabled regardless of alarms.	Disable override function on controller module front panel.
B Rx Override	Override function is enabled on controller module locking B-side RCVR in-service. Switching is disabled regardless of alarms.	Disable override function on controller module front panel.
A I/O Override	Override function is enabled on controller module locking A-side I/O interface in-service. Switching is disabled regardless of alarms.	Disable override function on controller module front panel.
B I/O Override	Override function is enabled on controller module locking B-side I/O interface in-service. Switching is disabled regardless of alarms.	Disable override function on controller module front panel.
Calibrating A Side	A-side XMTR/PA output level calibration procedure has been initiated.	Complete or cancel A-side XMTR/PA output level calibration procedure.
Calibrating B Side	B-side XMTR/PA output level calibration procedure has been initiated.	Complete or cancel B-side XMTR/PA output level calibration procedure.
Pedestal Switch Activated	***PED/AC/NORM*** switch on front panel of original/older style RCVR is set to ***PED***.	Set ***PED/AC/NORM*** switch to ***NORM***.
DS1 Loopback On	DS1/wayside DS1 line and/or facility loopback function is enabled on USI control screen.	Disable loopback functions on USI control screen.
A Side PA OFF	***PA ON/OFF*** switch on A-side power supply is set to ***OFF***.	Set ***PA ON/OFF*** switch on A-side power supply to ***OFF***.

MESSAGE	MEANING	ACTIONS
B Side PA OFF	***PA ON/OFF*** switch on B-side power supply is set to ***OFF***.	Set ***PA ON/OFF*** switch on B-side power supply to ***OFF***.
Prov. Mismatch	Provisioning on the controller does not match the provisioning screen.	Provision to match system requirements.
Controller/Power Supply Prov. Mismatch	Provisioning data stored in memory on the controller does not match provisioning data stored in memory on the A-side power supply.	Check for correct provisioning. Reprovision as required. Save provisioning.
Could Not Write/Read Power Supply Prov.	Cannot download provisioning data from controller to A-side power supply.	Remove/replace: 1. A-side power supply 2. Controller.
Capkey Mismatch	Capacity key on A-side XMTR has different part number than capacity key n B-side XMTR.	Instal correct capacity keys on XMTRs.
Radio ID Mismatch	Radio IDs provisioned on the radio configuration screen are not the same at both ends of the hop.	Provision both ends of hop with same radio ID number.



Loss of input signal to I/O Interface, inability to recover clock on alarmed line, or bipolar violation detection

1. Check presence and quality of DS1/E1 input to radio
2. Enable **DS1 I/O Loopback** on USI control screen for continuity check for DS1 signal through LBO and I/O interface module.

   Continuity?

   Yes – replace I/O interface

   No – check LBO connectors for open or bent pins. Repair as required.

Transmit hardware failure or buffer spills on alarmed line.

1. Verify quality of TX input data.
2. Replace I/O Interface module.

Loss of receive clock, buffer spills, or alarm insertion signal on the alarmed line. May also be caused by DS1 driver failure.
Replace I/O Interface module.

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Figure 5-10 Troubleshooting DS1/E1 Radio Alarms

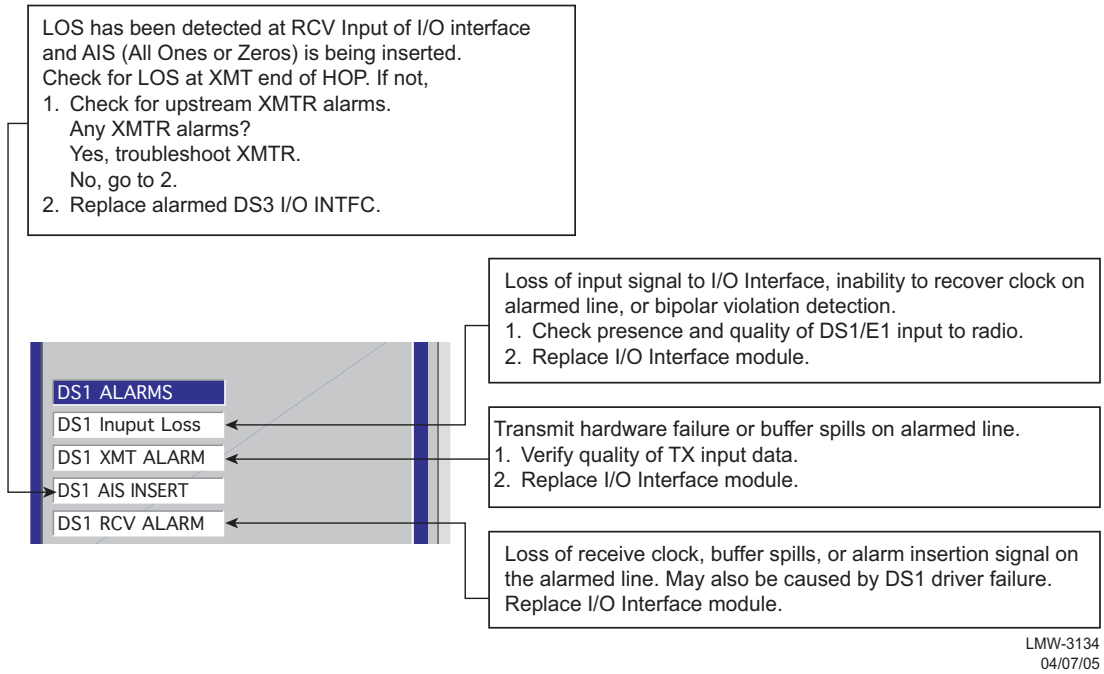


Figure 5-11 Troubleshooting DS3 Radio Wayside DS1 Alarms

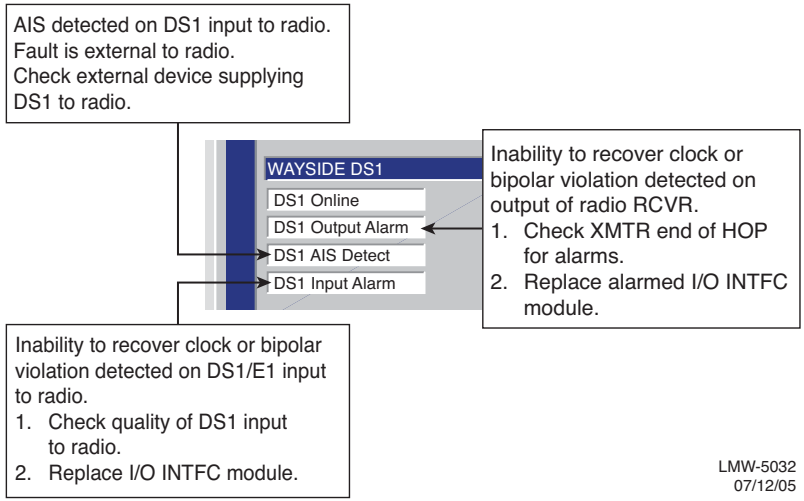


Figure 5-12 Troubleshooting OC3/STM-1 Radio Wayside DS1 Alarms

5.10 ETHERNET-SPECIFIC TROUBLESHOOTING

The LEDs on the front panel of the Ethernet I/O Interface module and the alarms on the radio USI status and alarm screen are the first indication of a fault. Troubleshoot radio XMT and RCV alarms using the procedures in the MDR-8000 Instruction Book/Users Manual. Troubleshoot Ethernet alarms as follows:

5.10.1 Troubleshooting Using Ethernet I/O Interface Module Front Panel Indicators

Refer to Table 5-3. In this analysis, troubleshoot using Table 5-3 to isolate the most probable cause. Replace modules or repair as directed.

Table 5-3 Troubleshoot Using Ethernet I/O Interface Module Indicators

LED	Indication	Probable Cause	Corrective Action
ALM	Steady Red LED	1. Module failure	1. Replace Ethernet I/O Interface module
WYSD ALM	Yellow LED Lit	1. Loss of DS1 radio XMT input to I/O Interface	Check presence of DS1 input to radio. Is DS1 Present? Yes - Replace Ethernet I/O module. No - Check/repair cables to customer interface.
		2. I/O Interface cannot recover clock, or there are errors on DS1 output of radio RCVR (RCV input to I/O Interface).	Check XMTR end of hop for alarms. Farend XMTR alarmed? Yes - Troubleshoot farend XMTR No - 1. Replace local alarmed I/O Interface module. 2. Replace local radio RCVR module.
		3. AIS has been detected on DS1 output of radio RCVR (RCV input to I/O Interface). RCVR fault is not in this radio.	Check upstream XMTR/hops for alarms.

Table 5-3 Troubleshoot Using Ethernet I/O Interface Module Indicators (Cont.)

LED	Indication	Probable Cause	Corrective Action
ETH IN	Green LED Not Lit	Loss of Ethernet RCV/radio XMT signal in. Most probable causes:	
		1. Cable between link partner and radio is disconnected/broken.	Connect/repair cable.
		2. Speed/Mode provisioning mismatch between link partner and radio	1. Check local Ethernet facility provisioning screen. 2. Check link partner provisioning.
ETH ALM	Yellow LED Lit	Summary alarm, could be caused by XMT or RCV Ethernet degrade	Use USI to determine if degradation is in the input or output side.
ETH OUT	Green LED Not Lit	Loss of Ethernet XMT/radio RCV signal out. Most probable causes:	
		1. Loss of RF input to radio RCVR	Check local RSL screen on USI. Is RSL ok? Yes - Check farend for Ethernet alarm. No - Check farend XMTR output. Is farend XMTR Out ok? Yes - Check path, antenna, waveguide/cabling No - Check/replace farend XMTR.
		2. Loss of Ethernet input to radio RCVR	Check farend for Ethernet alarms. Are any alarms indicated? Yes - Troubleshoot farend alarms No - Check farend Ethernet status. Is only abnormal status indicated? Yes - Troubleshoot farend Ethernet status. No - 1. Replace local alarmed Ethernet I/O Interface module. 2. Replace local RCVR module.

5.11 TMN-SPECIFIC TROUBLESHOOTING

Refer to Table 5-4. The red ALM LED on the front panel of the TMN Interface module and the alarm on the radio USI status and alarm screen are the first indication of a fault. The ALM LED on the front panel of the TMN Interface module lights for any module fault. The LED remains lit during module reboot and also after reboot if reboot is not completed satisfactorily.

Table 5-4 Troubleshooting Using TMN Interface Module Indicators

LED	Indication	Probable Cause	Corrective Action
ALM	Steady Red	1. Module failure 2. Module reboot in progress (several seconds to reboot) 3. Module reboot failed.	1. Replace module 2. Wait several seconds for reboot to complete. 3. Attempt reboot.
Ethernet 1, 2, and/or 3	Blinking Yellow	Network with too much traffic (collisions occurring). Some collisions are normal in any network.	Wait for situation to clear. If collisions continue (severe occurrence), troubleshoot network.
Ethernet 1, 2, and/or 3	Not Steady Green When First Connected	1. Cable is disconnected/broken 2. Cable/port mismatch 3. Rate mismatch. Far end equipment does not support 10Base/T.	1. Connect/repair cable. 2. Check application matches cable. Straight cable instead of crossover cable, etc. 3. Check far end equipment supports 10Base/T.
PPP	Not Steady Green When First Connected	1. Cable is disconnected/broken. 2. Cable/port mismatch	1. Connect/repair cable. 2. Check application matches cable. Straight cable instead of crossover cable, etc.
PPP	Yellow	Local end is receiving data but PPP disabled locally	Check local provisioning for PPP port enabled.

Table 5-5 TMN Network Troubleshooting

Problem	Possible Cause	Possible Solution
Unusually slow communication in radio network	1. Normal network management traffic is saturating the communications channel.	1. There may be too many radios being managed within a single region. Split the radio network management into different regions and backhaul the traffic for each region through separate channels.
	2. Polling radios for PM data or missed alarms too rapidly	2. Poll the radios more slowly.
	3. Multiple remote software downloads in process	3. Download to fewer radios at a time.
	4. IP traffic other than network management traffic being routed through radio network	4 Configure external routers to allow only network management related traffic through the Management network of the radios. Dynamic route updates (OSPF, RIP) may attempt to reroute high speed traffic through the TMN network if a high speed ink fails.
Unable to operate controls using SNMP	To perform control operations, the Manager must be registered as a craft device.	Register the Manager as a craft device. Manager registration type can be changed as needed to type 'ct' to allow control operation and then be changed back to 'nml' for normal operation.
Can Read SNMP objects but cannot Write to SNMP objects	1. Incorrect community string	1. Use the correct community string.
	2. Insufficient SNMPv3 privileges	2. Use the correct privileges: a) The TMN Interface supports 4 view levels. Use a SNMPv3 user account that supports write access to the selected SNMP object. b) Use the correct Authentication mode. c) Use the correct Privacy passphrase.
	3. If the TMN Interface is configured for SNMPv2, the write community string is probably wrong.	3 Use the correct write community string.

Table 5-5 TMN Network Troubleshooting (Cont.)

Problem	Possible Cause	Possible Solution
No traps being received from NE	1. Manager not registered in NE to receive traps	1. Register Manager with NE.
	2. Communication failure in network	2. Check network connectivity. Check redundant network paths and routing. Traceroute (tracert) is useful for locating path or routing faults.
Unable to communicate with the NE through the radio network (unable to 'ping' the NE)	Possible communication path failure or routing failure within the radio network	Use traceroute (tracert) to help locate for communication path or routing problems.
Can 'ping' the TMN Interface but cannot communicate with the NE using SNMP, or can only see a few SNMP objects (mib-2) in the NE.	1. Using incorrect SNMP version at manager	1. Note the TMN card ships in SNMPv3 mode. If SNMPv2 operation is desired, it must be provisioned for SNMPv2 using the TUI.
	2. If using SNMPv2, using the wrong community string. If using SNMPv3 using wrong username/passphrase pair	2. Verify community string or username/passphrase.
	3. A corrupt SNMPv3 security configuration file may have caused the module to revert to the previous copy of the security configuration or to factory defaults.	3. Check to see if another username/passphrase combination works. Check to see if the previous passphrase works. Check the Default username/passphrase combination. It may be necessary to re-initialize the security configuration using the TUI. Reprovision accounts as required, and after the changes have been committed, force a reboot to copy the new security configuration into the backup configuration.

WARNING

Possibility of Damage to Equipment

Modules screwed to heat sink must be screwed securely before power is turned on.

WARNING

Possibility of Damage to Equipment

Units with the electrostatic-sensitive (ESS) symbol contain ESS devices. Store these units in an antistatic container when not in use, and anyone handling a unit should observe antistatic precautions. Damage to the unit may result if antistatic protection is not maintained. Refer to the Special Precautions pages in the front of the instruction book for detailed handling information.

WARNING

Possibility of Damage to Equipment

RF flex coaxial cable requires special consideration. The electrical characteristics of the coax can be affected if it is accidentally twisted or bent. Provide mechanical support to prevent any weight or strain to the coax and connector when connecting or disconnecting equipment. Loosen the connectors at both ends of a coax section if one end must be moved even slightly. SMA connectors should be secured fingertight, and then gently tightened using a torque wrench with a 5/16 in. head set for 7 to 9 inch-pounds. The connectors should not be left fingertight.

CAUTION

Possibility of Service Interruption

XMTR Crystals are soldered and tuned up in an oscillator assembly board at the factory.

CAUTION

Possibility of Service Interruption

Modules may be removed or installed with shelf power applied. However, exercise reasonable care to prevent contacting adjacent modules. If clearances are narrow, consider setting the power supply to OFF while the module is being removed or replaced. (Before setting any switch to OFF, verify that traffic has been protected.)

Before replacing any module, refer to Table 5-6 to determine the actions, other than physical replacement, required. If the module has any options (switches, subboards, etc.), refer to the removed module so that the replacement module can be set up the same way.

Any module installed in the card cage, except those having front-panel cable connections, can be removed by grasping the module handle(s) and pulling firmly outward. Modules with front-panel interconnects can be removed in the same manner after disconnecting the cable from the module being removed and moving the cable out of the way.

To install a module in the card cage, insert the module card connector edge into the appropriate card slot. Engage module handles in card cage and press on module handles until they are latched and the card is fully seated. After installing a module with front-panel interconnections, reconnect the cable(s) to the front-panel connector(s).

Table 5-6 Module Replacement Matrix

MODULE/UNIT	REMOVAL/REPLACEMENT PROCEDURE	CHECKS/ADJUSTMENTS PROCEDURE
AE-27AF Relay Interface	No Special Procedure Required	None Required
AE-37Y Controller	Para. 5.14	None Required
CE-16BB Power Supply	Para. 5.13	None Required
Fuse	No Special Procedure Required. Refer to Operations Section for Location.	
DX-35M DS1/E1 I/O Interface	No special procedure required.	None Required
DX-35N DS3 I/O Interface (Early Versions)	Para. 5.15	Para. 5.15 and Table 5-9
DX-35P OC3/STM-1 I/O Interface	Para. 5.16	None Required
DX-35R/S ETH I/O Interface	Para. 5.16	None Required
UD-35( ) Transmitter	Para. 5.17	Para. 5.18, Para. 5.19, Para. 5.20, and Para. 5.21
Crystal Oscillator Subboard	Figure 5-15	The Crystal Oscillator Subboard and crystal part numbers define this unit. The crystal is soldered to the oscillator subboard and factory tuned to the customers requirements.
Capacity Key	Figure 5-16	
UD-36( ) Receiver	Para. 5.22	Para. 5.23[2]
Crystal Oscillator Subboard	Figure 5-22	The Crystal Oscillator Subboard and crystal part numbers define this unit. The crystal is soldered to the oscillator subboard and factory tuned to the customers requirements.
Capacity Key	Figure 5-23	
UD-51( ) Power Amplifier Hot-Standby Shelf CommPak Indoor Shelf	 Para. 5.24 Appendix A on enclosed CD	 Para. 5.25
LBO/AUX/Line Interface Hot-Standby Shelf CommPak Indoor Shelf	 Maintenance Section on enclosed CD Appendix H on enclosed CD	 No Special Procedure Required No Special Procedure Required
RF Switch	Maintenance Section on enclosed CD	No Special Procedure Required

(1) If ATPC is in use, it must be provisioned disabled or locked high before removing controller.

(2) Applicable to older versions of RCVR with Freq Cont on front panel.

5.13 POWER SUPPLY REMOVAL AND REPLACEMENT

See Figure 5-13 and follow the procedure to remove and replace CE-16BB Power Supply.

CAUTION

Possibility of Service Interruption

This is an out-of-service procedure when on a nonstandby (unprotected) system. On a hot-standby or frequency diversity system, switch traffic on the channel under test to protect. Use front panel OVRD controls on AE-37( ) Controller to switch and lock on-line opposite side XMTR, RCVR, and I/O to opposite side from failed power supply.

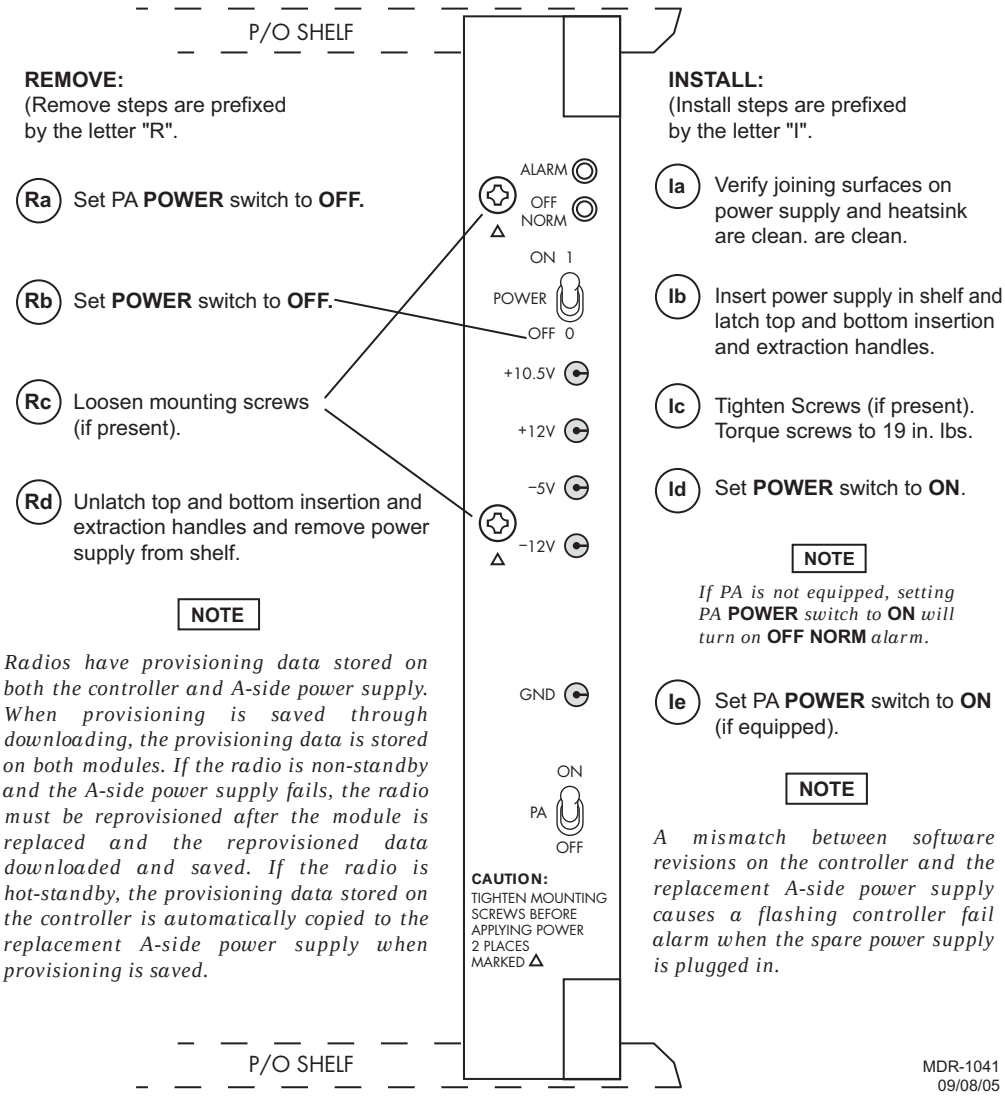


Figure 5-13 Power Supply Removal/Installation

5.14 CONTROLLER REMOVAL AND REPLACEMENT

See Figure 5-14 and follow the procedure to remove and replace AE-37Y Controller.

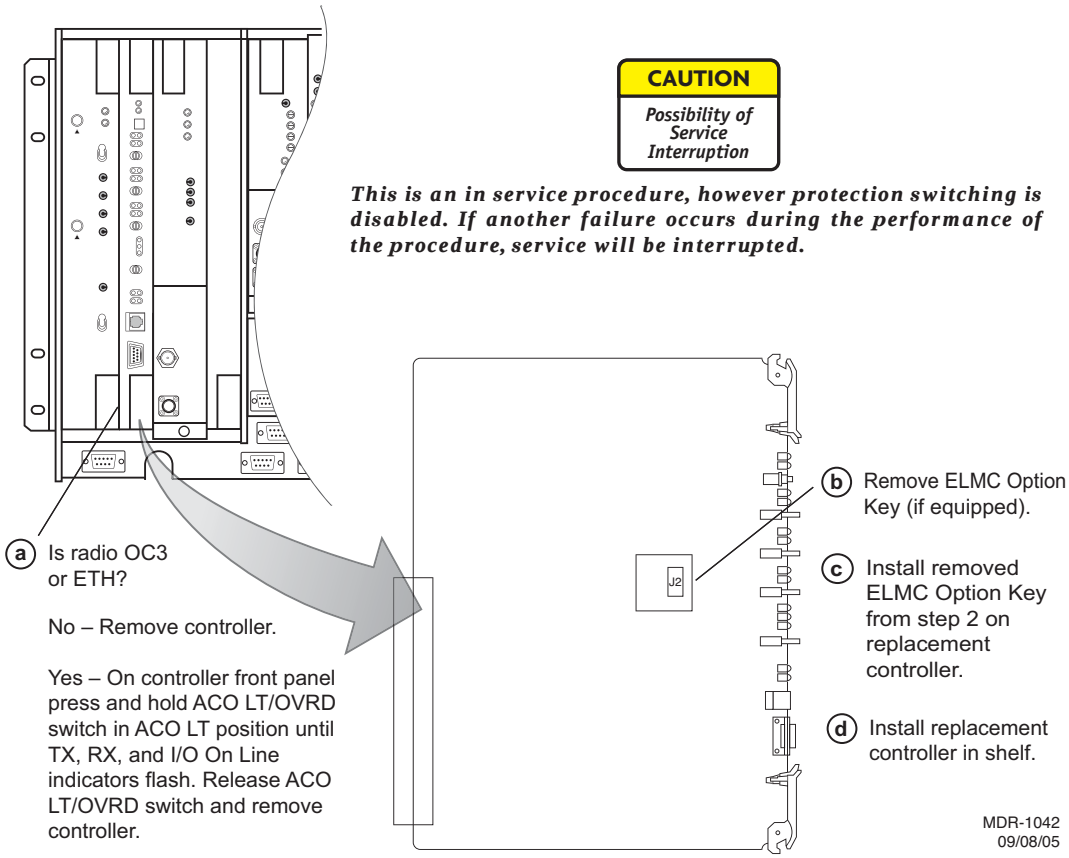
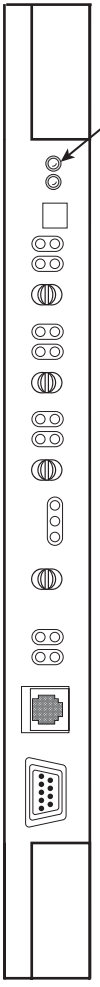


Figure 5-14 Controller Module Installation (Sheet 1 of 4)

Note

A replacement controller that is loaded with the same firmware load as the controller that is being replaced (i.e.: controller for DS3 radio is replacing a DS3 radio controller) is automatically rebooted and provisioned to match the module it is replacing. If the replacement controller is for a different type of radio (i.e.; controller for a DS3 radio is being used to replace a controller in a DS1 or OC3 radio), the controller alarm will flash when the replacement module is installed in the shelf. The flashing alarm prompts the user that the wrong firmware is installed.



(e) Verify alarm LED is not flashing and reboot is in progress. (reboot is indicated by all LEDs flashing in progression.

Is controller alarm flashing?
- Yes – Go to Step (f).
- No – Is reboot in progress?
  - Yes – Verify **Controller Version** on bottom of USI screen is latest.

Is latest version of firmware displayed?
- Yes – STOP. This procedure is complete.
- No – Do you want to upgrade to the latest version?
  - Yes – Go to step (h).
  - No – Stop. This procedure is complete.

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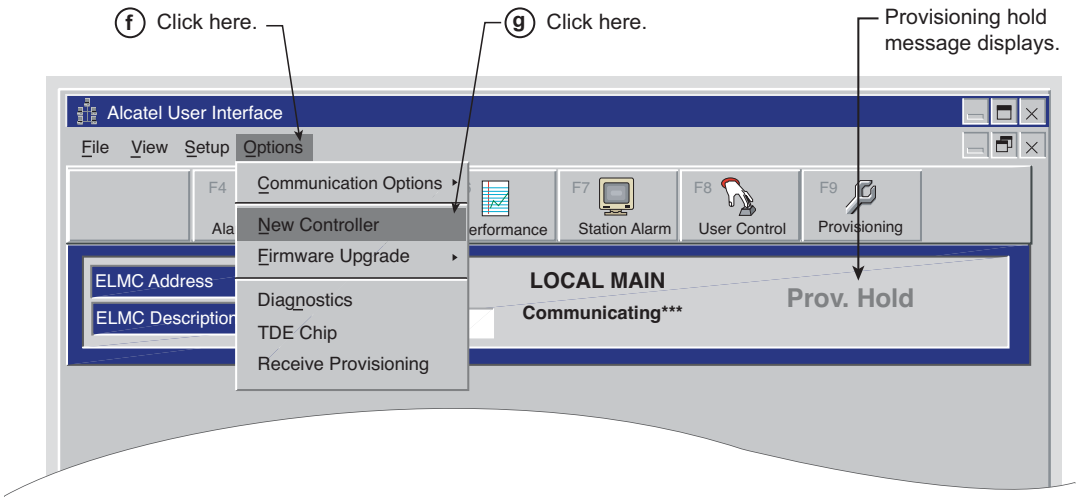
Figure 5-14 Controller Module Installation (Sheet 2 of 4)



Note

Provisioning hold message is displayed on all screens. The message is removed when provisioning is saved.

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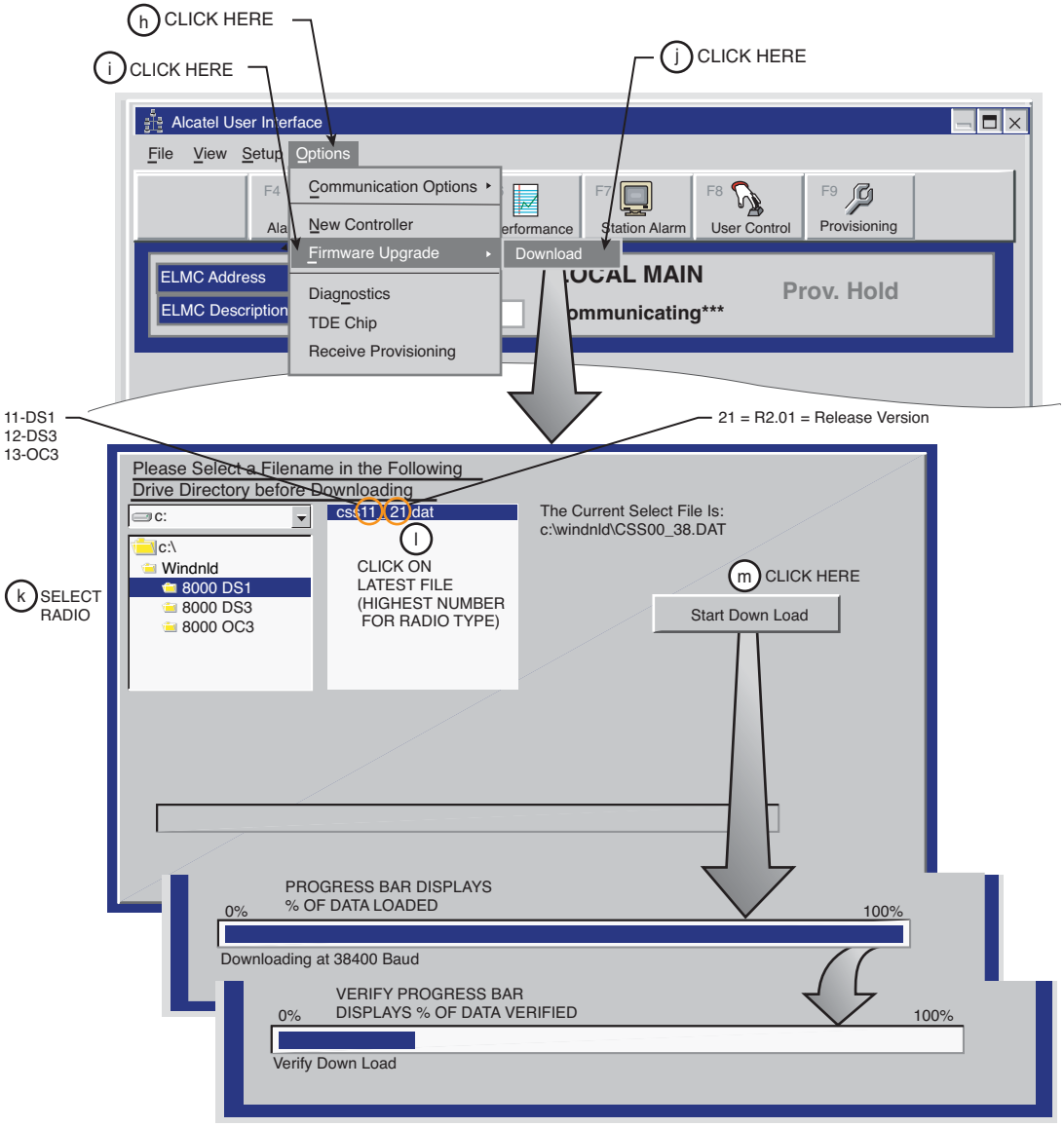
Figure 5-14 Controller Module Installation (Sheet 3 of 4)



NOTE
AFTER AUTOMATICALLY REBOOTING, THE CONTROLLER WILL START RUNNING, PROVISIONING PREVIOUSLY STORED IN THE CONTROLLER WILL BE LEFT UNCHANGED BY THE DOWNLOAD PROGRAM.

n GO TO THE INITIAL TURNUP SECTION AND CHECK PROVISIONING/REPROVISIONING AS REQUIRED.

NOTE
AFTER PROVISIONING IS SAVED, THE CONTROLLER WILL BOOT UP WITHIN 20 SECONDS.

o STOP. THIS PROCEDURE IS COMPLETE.

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Figure 5-14 Controller Module Installation (Sheet 4 of 4)

5.15 DS3 I/O INTERFACE REMOVAL AND REPLACEMENT

Follow procedure to remove and replace DX-35N DS3 I/O Interface module. Refer to Table 5-7 and Table 5-8 for configuration functions.

Table 5-7 1- or 3-Line I/O Interface Module

PN 3DH03169XX Variant XX =	System Application	Auto Radio DADE	Auto Line DADE	Front Panel Controls
AA	Linear/Ring			X
AB	Ring			X
AG	Linear/Ring			X
AH	Linear/Ring		X	X
AK	Linear/Ring	X	X	X
AM	Linear/Ring	X	X	

Note:
X indicates function is applicable.

Table 5-8 2-Line I/O Interface Module

PN 3DH03169XX Variant XX =	System Application	Auto Radio DADE	Auto Line DADE	Front Panel Controls
AJ	Linear/Ring	X	X	X
AN	Linear/Ring	X	X	

Note:
X indicates function is applicable.

a Remove I/O interface module from shelf.

b Install I/O interface module in shelf.

c Refer to Table 5-9 or Table 5-10 and perform required procedures (if any).

d STOP. This procedure is complete.

Table 5-9 1- or 3-Line Matrix, Valid Combinations/Procedures

I/O Interface Module PN 3DH03169AAXX Configuration in Shelf Position A3, B3, Variant XX =		Radio Configuration	Radio DADE (Refer to CD)	Line DADE (Refer to CD)
AA	AA	HS, FD, SD	X	X
AA	AB	HS, FD, SD	X	X
AA	AG	HS, FD, SD	X	X
AA	AH	HS, FD, SD	X	X
AA	AK	HS, FD, SD	X	X
AB	AB	HS, FD, SD	X	X
AB	AG	HS, FD, SD	X	X
AB	AH	HS, FD, SD	X	X
AB	AK	HS, FD, SD	X	X
AG	AG	HS, FD, SD	X	X
AG	AH	HS, FD, SD	X	X
AG	AK	HS, FD, SD	X	X
AH	AH	HS, FD, SD	X	
AH	AK	HS, FD, SD	X	
AK	AK	HS, FD		
AK	AK	SD	X	
AK	AM	HS, FD, SD		
AM	AM	HS, FD, SD		

Notes:
1. Module locations are reversible.
2. Perform procedure indicated by X for specific module and radio configuration.

Table 5-10 Line Matrix, Valid Combinations/Procedures

I/O Interface Module PN3DH03169XX Configuration In Shelf Position A3, B3, VARIANT XX =		Radio Configuration	Radio DADE (Refer to CD)	Line DADE (Refer to CD)
AJ	AJ	HS, FD, SD	X	X
AJ	AL	HS, FD, SD	X	X
AL	AL	HS, FD		
AL	AL	SD	X	
AL	AN	HS, FD, SD		
AN	AN	HS, FD, SD		

NOTES:
1. Module locations are reversible.
2. Perform procedure indicated by X for specific module and radio configuration.

5.16 OC3/STM-1/ETH I/O INTERFACE REMOVAL AND REPLACEMENT

Use this procedure to remove and replace DX-35P OC3/STM-1 or DX-35R/S ETH I/O Interface module.

a If radio is protected (hot-standby, space diversity, or frequency diversity, use front panel **OVRD** controls on AE-37( ) Controller to lock on-line XMTR, RCVR, and I/O (opposite side from failed I/O) on line.

b On front panel of controller module, press and hold **ACO LT/OVRD** switch in **ACO LT** (lamp test) position until **TX, RX**, and **I/O On LINE** LEDs on front of controller flash (approximately 5 seconds wait).

c Release **ACO LT/OVRD** switch.

d Disconnect cables.

e Remove I/O Interface module from shelf.

f Install replacement I/O Interface module in shelf.

g Connect cables.

h On AE-37( ) Controller, toggle OVRD switch to disable override (unlocks on-line XMTR and restores automatic switching functions).

i STOP. This procedure is complete.

5.17 XMTR REMOVAL AND REPLACEMENT

Use this procedure to remove and replace the UD-35( ) XMTR and/or Capacity Key and Crystal Oscillator Subboards on the XMTR.

Note

Spare XMTRs and XMTRs repaired at the factory normally do not contain Crystal Oscillator Subboards or Capacity Keys. The user must retain the crystal Oscillator Subboard and the Capacity Key from the module being replaced before sending the module back to the factory for repair.

a On power supply, on same side as failed XMTR, set PA ON/OFF switch to OFF (if shelf is equipped with PA on that side).

b On XMTR module, disconnect cable from RF OUT connector.

c Remove XMTR module from card cage.

d On XMTR module being replaced, remove XMTR crystal oscillator subboard. See Figure 5-15. Retain for installation on replacement module.

e On XMTR module being replaced, remove XMTR capacity key. See Figure 5-16. Retain for installation on replacement module.

f On replacement XMTR module, install XMTR crystal oscillator subboard. See Figure 5-15.

g On replacement XMTR module, install XMTR capacity key. See Figure 5-16.

h Reconnect cable to RF OUT connector.

i Install replacement XMTR module in card cage.

j Perform XMT Crystal Oscillator Frequency Checks and Adjustment procedure. Refer to Para. 5.18.

k On power supply, set PA ON/OFF switch to ON (if turned off in Step a).

Note

Output level calibration is required for the last amplification stage in the chain of XMT amplifiers leading to the antenna, only. If the radio is equipped with a PA and a transmitter fails, the replacement transmitter must be adjusted to return the radio to the original PA output power. It is not necessary to calibrate the transmitter.

l Is radio equipped with optional PA?

If no, Perform XMTR Output Level Calibration (No PA) procedure. Refer to Para. 5.21.

If yes, restore PA output level. See applicable Figure 5-17 or Figure 5-18 for procedure.

m Perform one of the following XMTR Carrier Null Adjustment procedures:

In-Service XMTR Carrier Null Adjustment Using spectrum Analyzer, Para. 5.20

XMTR Carrier Null Adjustment Using Spectrum Analyzer, (Refer to CD).

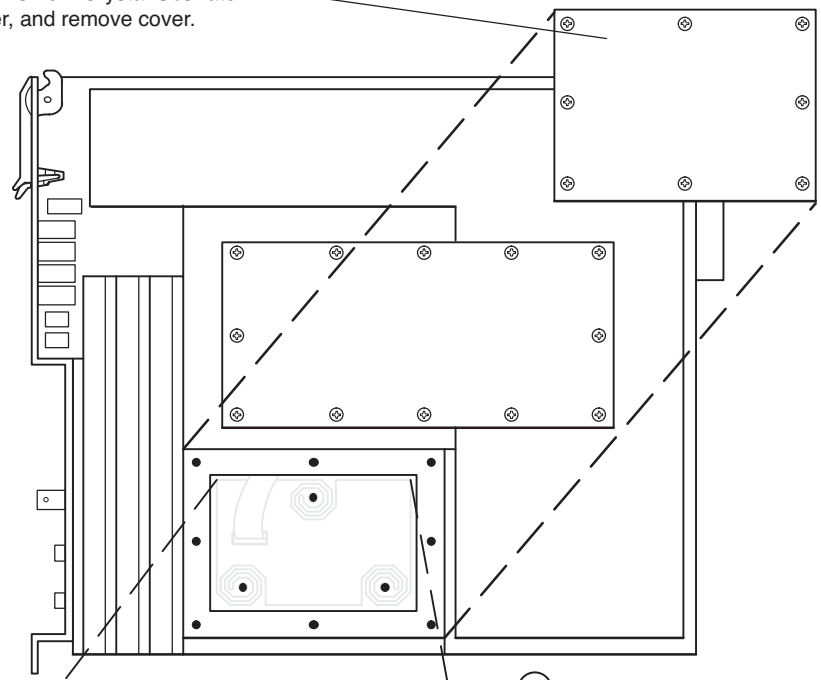
XMTR Carrier Null Adjustment Using DVM, (Refer to CD).

n STOP. This procedure is complete.

Remove:

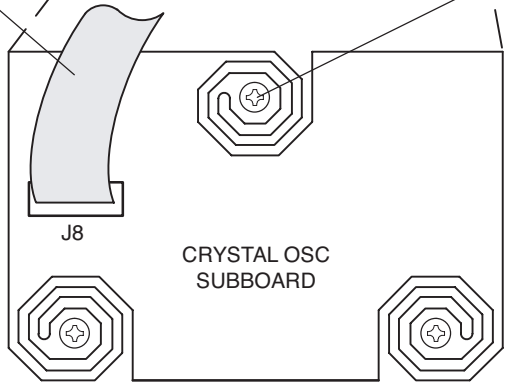
(a) Remove transmitter from card cage.

(b) Remove 8 screws from Crystal Ocsillator Subboard cover, and remove cover.



XMTR–RIGHTSIDE VIEW

(c) Disconnect ribbon cable from J8.



(d) Remove 3 mounting screws, and remove Crystal Oscillator Subboard.

Install:

(e) Place Crystal Oscillator Subboard in mounting cavity.

(f) Install 3 mounting screws.

(g) Connect ribbon cable to connector J8.

(h) Install cover with 8 screws.

(i) Install XMTR in card cage.

Note

Ensure board edge does not make contact with chassis wall.

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Figure 5-15 XMTR Crystal Oscillator Subboard Removal/Installation

CAUTION

Possibility of Service Interruption

This is an out-of-service procedure when on a nonstandby (unprotected) system. On a hot-standby or frequency diversity system, switch traffic on the channel under test to protect.

Remove:

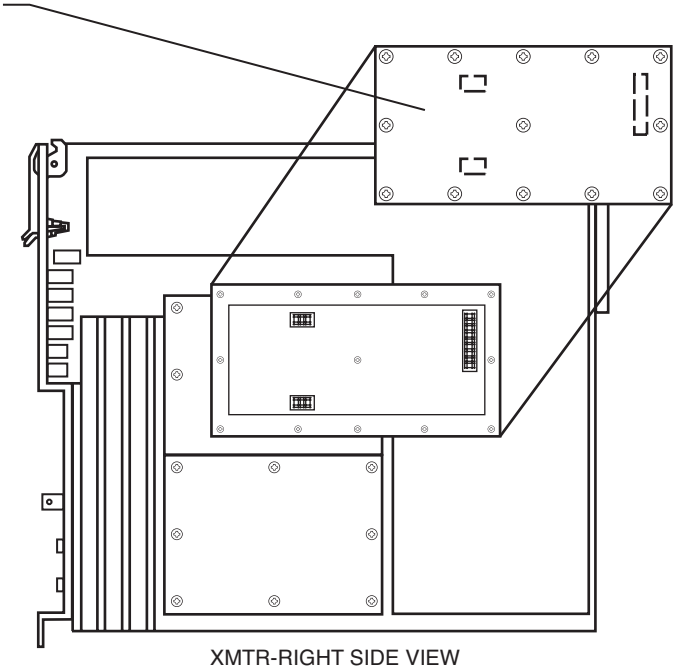
(a) Remove transmitter from card cage.

(b) Remove 13 screws from Capacity Key and remove Capacity Key.

Install:

(c) Install Capacity Key on three connectors.

(d) Install 13 screws.



XMTR-RIGHT SIDE VIEW

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Figure 5-16 XMTR Capacity Key Removal/Installation

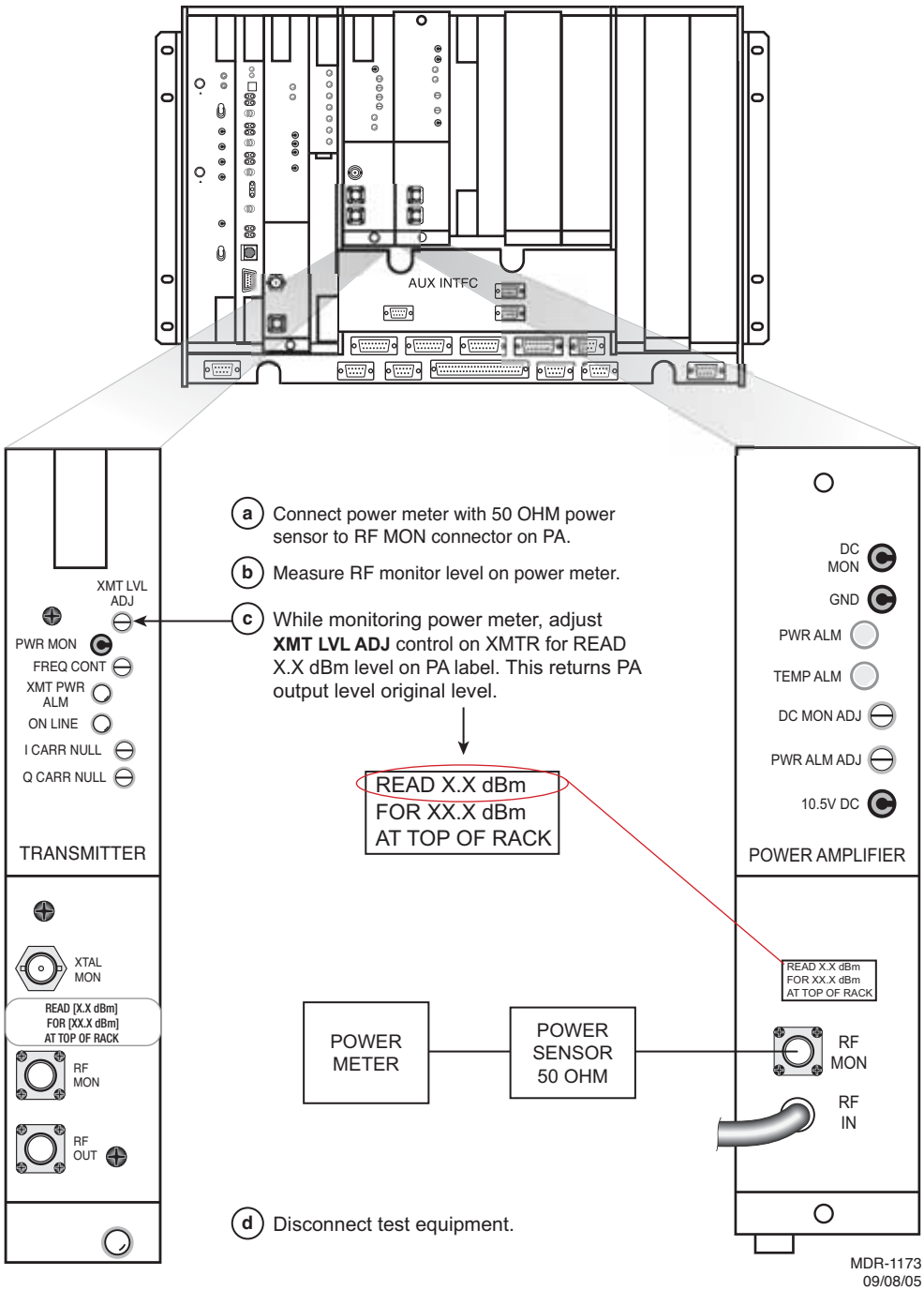


Figure 5-17 Restoring PA Output Power Using Power Meter

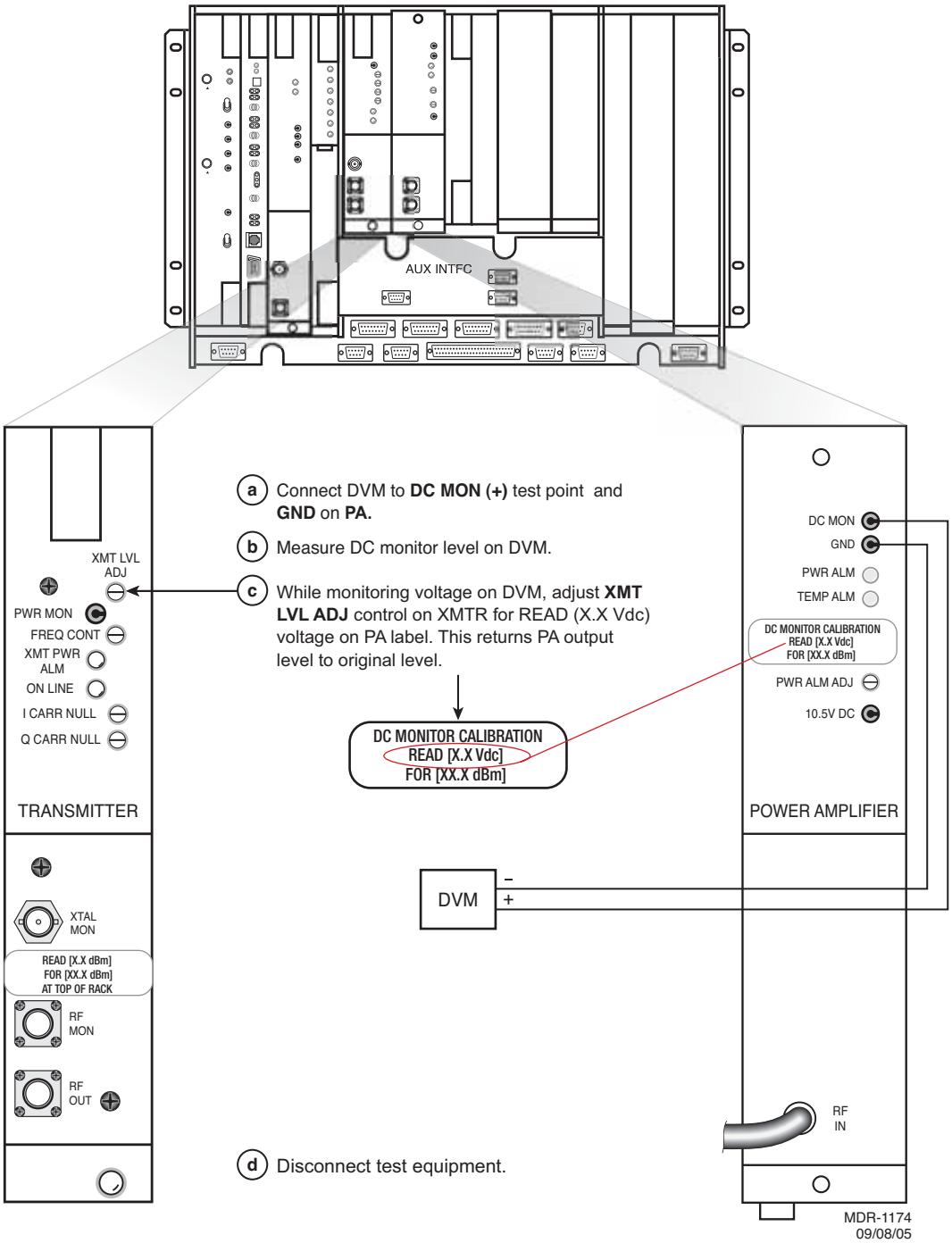


Figure 5-18 Restoring PA Output Power Using DVM

5.18 XMT CRYSTAL OSCILLATOR FREQUENCY CORRECTION

PURPOSE

See Figure 5-19 and follow the procedure to correct the transmit frequency of the crystal oscillator on the UD-35() Transmitter module.

Allow a 1-hour warm-up period for radio and test equipment before starting applicable tests or improper frequency adjustment can result. If waiting for initial alignment is impractical, it may be performed after a warm-up period of 5 minutes minimum; however, crystal frequency should be rechecked after full warmup.

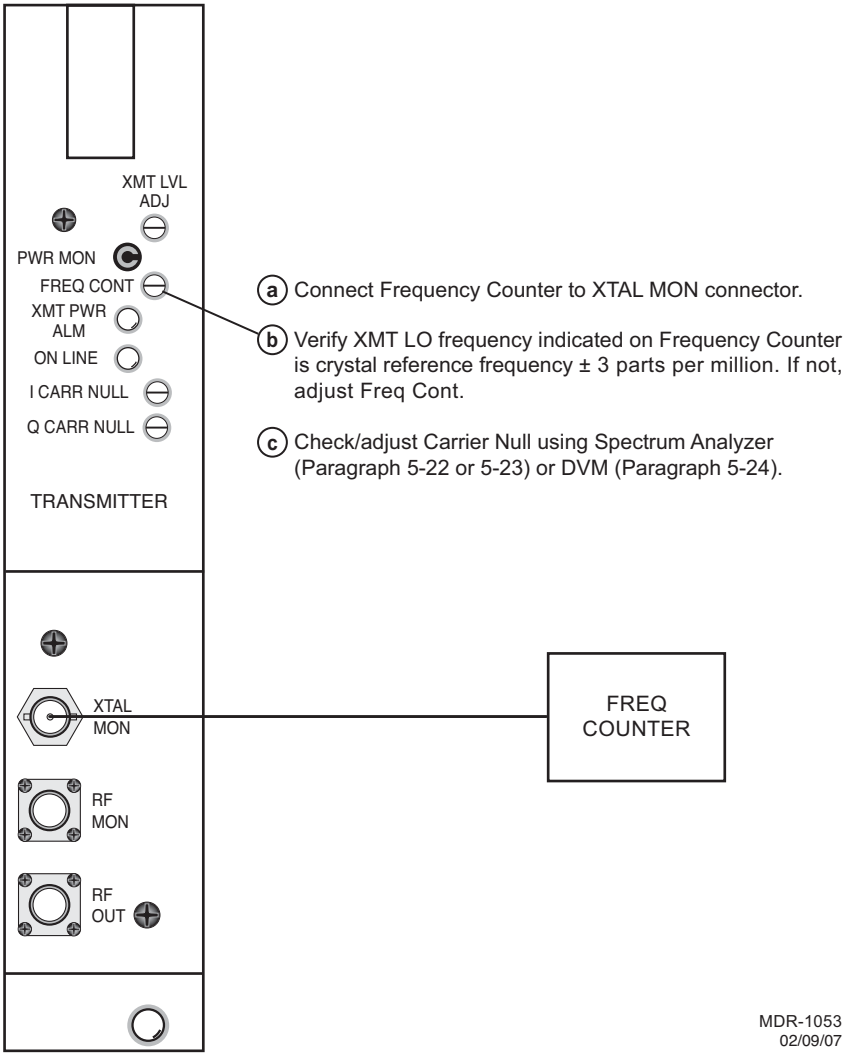


Figure 5-19 XMT Crystal Oscillator Frequency Check

5.19 XMTR OUTPUT LEVEL CHECK (NO PA)

See Figure 5-20 and follow the procedure to check the RF output of the UD-35( ) Transmitter in radio configuration that is not equipped with the optional PA.

CAUTION

Possibility of Service Interruption

This is an out-of-service procedure when on a nonstandby (unprotected) system. On a hot-standby or frequency diversity system, switch traffic on the channel under test off line.

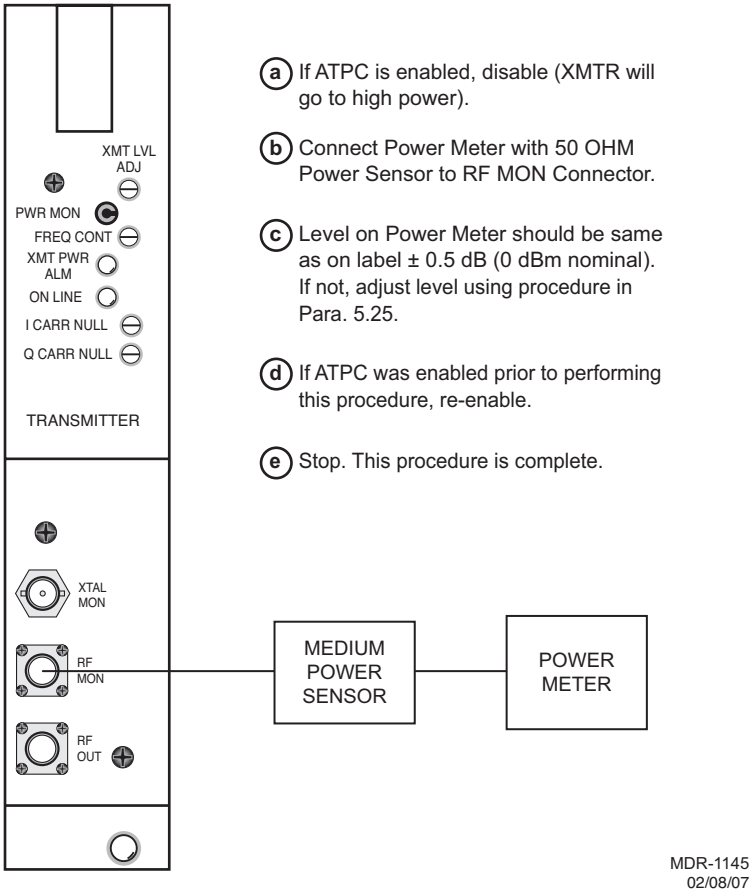


Figure 5-20 XMTR Output Level Check (No PA)

5.20 IN-SERVICE XMTR CARRIER NULL ADJUSTMENT USING SPECTRUM ANALYZER

See the following figures and follow the procedure to adjust carrier null on the UD-35A() Transmitter, in service. For out-of-service carrier null procedures, refer to CD.

Note

Carrier leakage can be nulled in the MDR-8000 using any one of three methods. Method 1 (the preferred method) uses a spectrum analyzer to determine if carrier leakage is present while a modulated signal is being transmitted (in service) and then nulling any carrier present. Methods 2 and 3 require that modulation be removed and the carrier is nulled while the transmitter is out of service. Method 2 uses a DVM to measure carrier leakage. Method 3 uses a spectrum analyzer.

Using the spectrum analyzer Span controls, reduce the frequency span until the Resolution Bandwidth (**Res BW**) reaches the value defined as the **Res BW for measuring carrier**. At this **Res BW**, observe the spectrum trace for a carrier signal. If a carrier signal, rising above the spectrum floor, 3 dB or more is visible, use the procedure to null the carrier. If no carrier is visible, the carrier is sufficiently nulled.

CAUTION

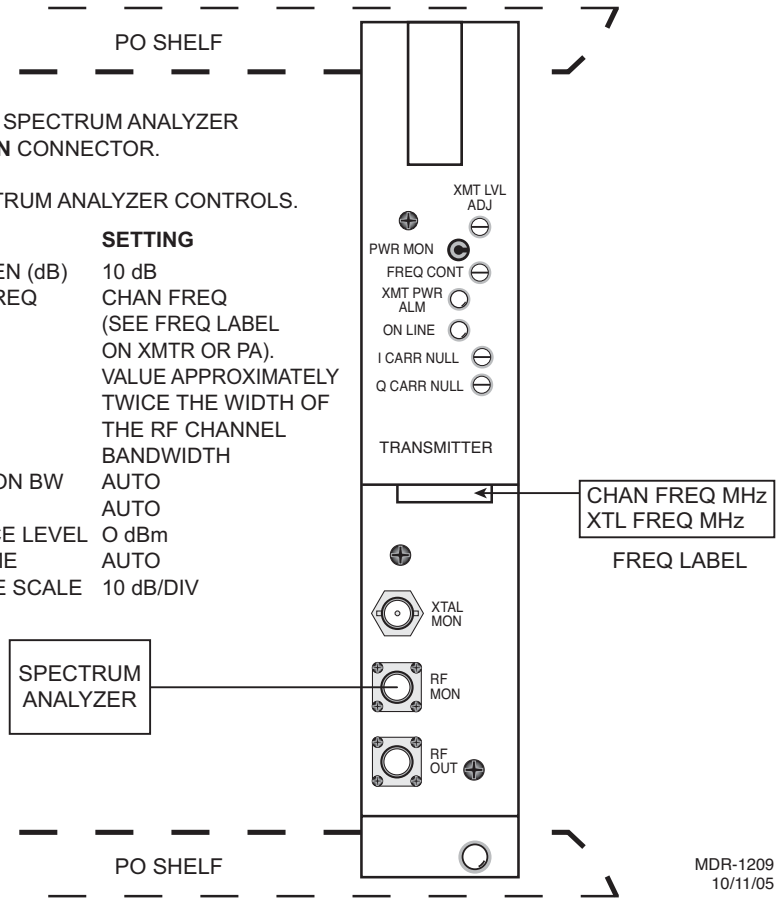
Possibility of Service Interruption

Ensure that the radio, and specifically the transmitter unit, is allowed to warm up for at least one hour operating in the radio before performing carrier null adjustments.

a. CONNECT SPECTRUM ANALYZER TO **RF MON** CONNECTOR.

b. SET SPECTRUM ANALYZER CONTROLS.

CONTROL	**SETTING**
INPUT ATTEN (dB)	10 dB
CENTER FREQ	CHAN FREQ (SEE FREQ LABEL ON XMTR OR PA).
FREQ SPAN	VALUE APPROXIMATELY TWICE THE WIDTH OF THE RF CHANNEL BANDWIDTH
RESOLUTION BW	AUTO
VIDEO BW	AUTO
REFERENCE LEVEL	O dBm
SWEEP TIME	AUTO
AMPLITUDE SCALE	10 dB/DIV



c Carefully adjust the spectrum analyzer to center the transmitter spectrum.

Note

As the spectrum analyzer's frequency span is reduced and the flat top of the spectrum fills the spectrum analyzer display, it is extremely important to keep the spectrum display (with carrier signal if any) centered so that the carrier signal (if any) will remain visible as the span is reduced.

d Reduce the frequency span on the spectrum analyzer display while keeping the spectrum centered on the spectrum analyzer display.

e Continue to reduce the spectrum analyzer span while observing the **Res BW** field in the bottom left corner of the spectrum analyzer display.

f Continue reducing the frequency span until the correct **Res BW** for measuring carrier for the Radio Capacity/Modulation is displayed. Refer to the following table for the **Res BW** for measuring carrier required for the radio under test.

Carrier Threshold Resolution Bandwidth

Radio Capacity / Modulation	Res BW For Measuring Carrier	Res BW For Nulling Carrier
OC3 / 128 TCM	30 kHz	1 kHz
1 STS-1 / 128 TCM	10 kHz	300 Hz
3 DS3 / 64 QAM	100 kHz	3 kHz
2 DS3 / 32 TCM	100 kHz	3 kHz
1 DS3 / 64 QAM	30 kHz	1 kHz
16 DS1 / 32 TCM	10 kHz	1 kHz
16 DS1 / 128 TCM	3 kHz	100 Hz
12 DS1 / 32 TCM	10 kHz	300 Hz
12 DS1 / 128 TCM	3 kHz	100 Hz
8 DS1 / 32 TCM	10 kHz	300 Hz
8 DS1 / 128 TCM	1 kHz	100 Hz
4 DS1 / 32 TCM	3 kHz	100 Hz
4 DS1 / 128 TCM	1 kHz	30 Hz
2 DS1 / 32 TCM	3 kHz	100 Hz
2 DS1 / 128 TCM	300 Hz	30 Hz

CAUTION

Possibility of Service Interruption

Adjustment of the carrier signal for minimum amplitude is critical. Do not attempt to null the carrier signal until the correct Res BW is reached. Incorrect adjustment can result in loss of traffic due to slow RCVR lock.

g Observe the display at the correct **Res BW** for measuring carrier for a carrier signal rising above the floor of the spectrum. Is a carrier signal rising 3 dB or more above the spectrum visible?

No. STOP. This procedure is complete. Carrier is nulled to an acceptable level.

Yes.

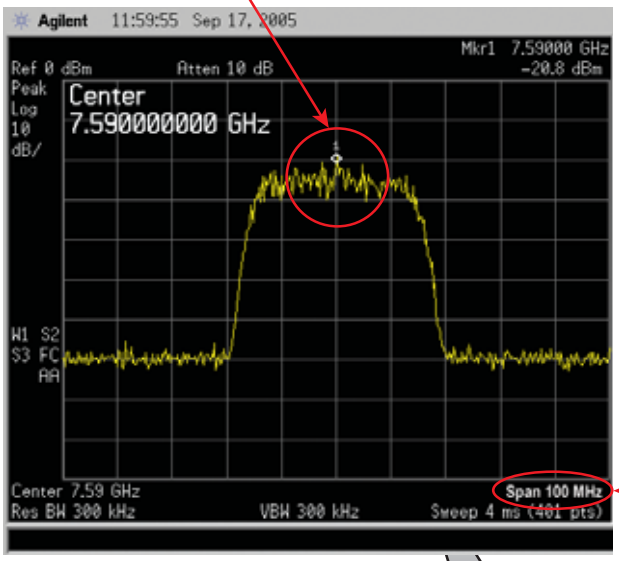
1) Continue to reduce the frequency span until the spectrum analyzer shows a Res BW equal to or lower than the **Res BW For Nulling Carrier** value shown in the table.

2) Alternately adjust the I Carr and Q Carr controls on the XMTR module for minimum carrier amplitude. Refer to the following typical scenario for adjustment tips/problems.

TYPICAL ADJUSTMENT SCENARIO

Refer to the following step-by-step adjustment of 3 DS3/64 QAM radio. In this scenario, carrier null adjustment is required due to slow RCVR lockup following a deep fade. The **Res BW** for nulling carrier for the 3 DS3/64 QAM radio is 3 kHz as listed in the table.

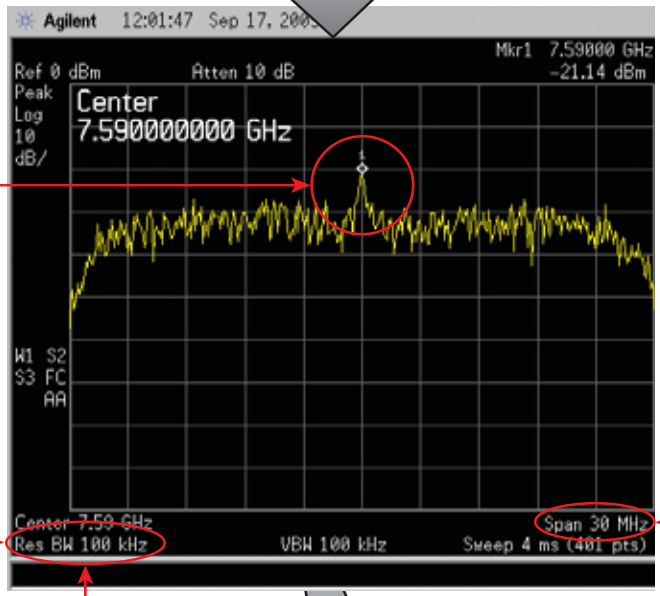
a. Center carrier on screen.



b. Reduce Span to 30 mHz.

Note

It is extremely important to keep the carrier signal centered in the display so that the carrier will become visible as the span is reduced.



c. Center carrier on screen.

10 dB above spectrum floor

Res BW for measuring carrier

d. Reduce Span to 5 mHz.

Note

Res BW automatically decreases as Span decreases.

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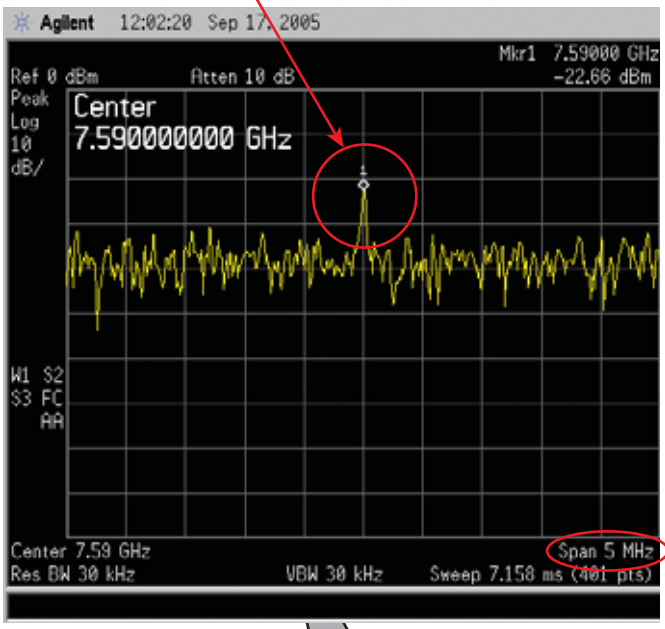
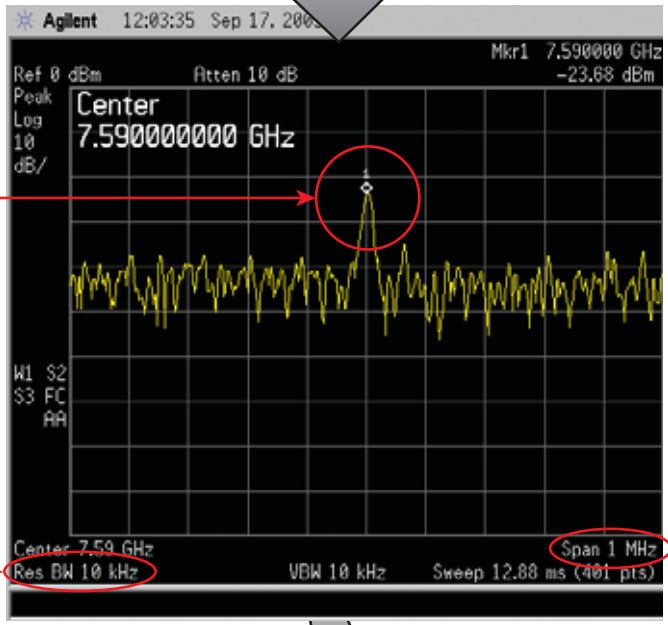
e. Center carrier on screen.



f. Reduce Span to 1 mHz.



g. Center carrier on screen.

h. Observe Res BW

i. Reduce Span to 500 kHz.

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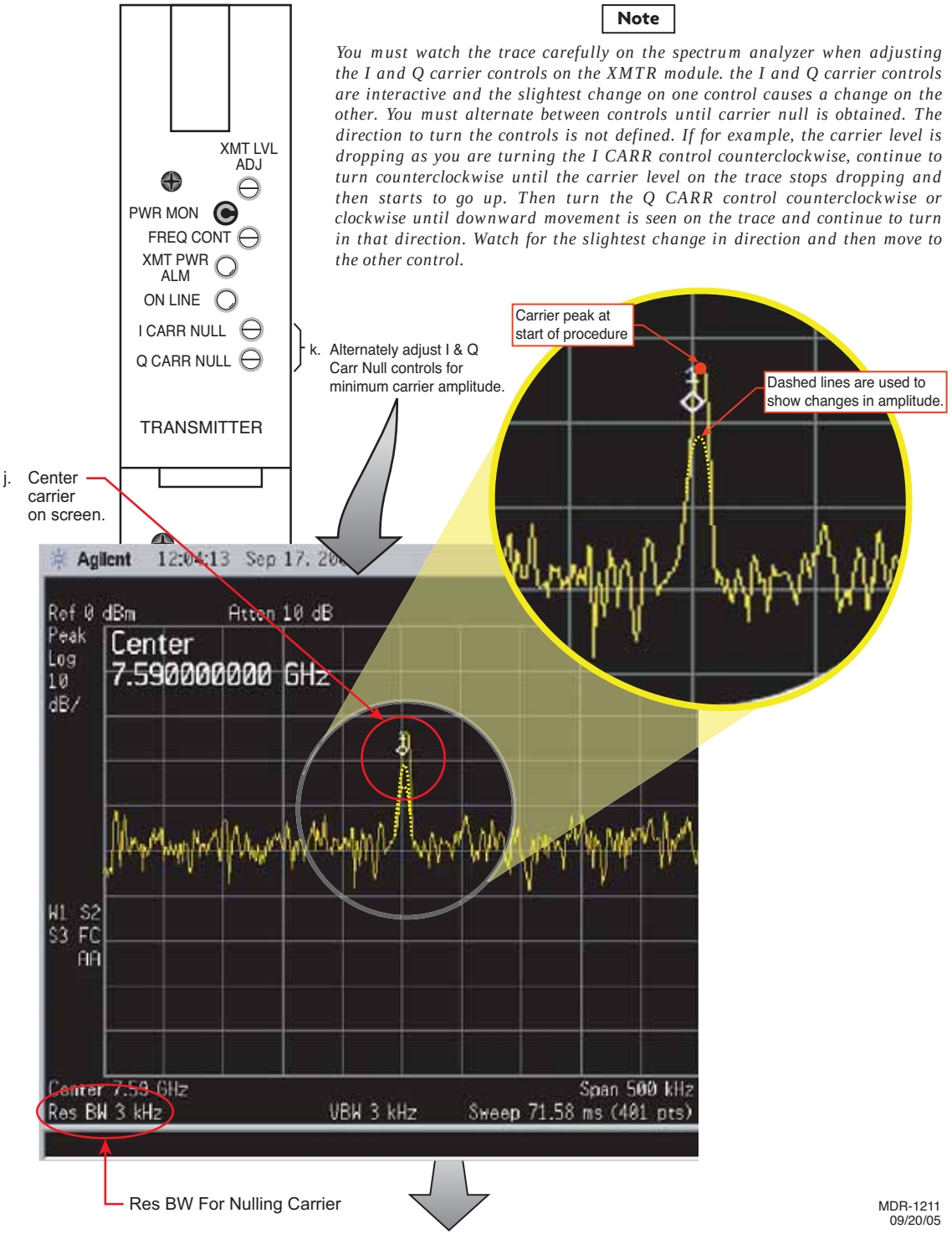
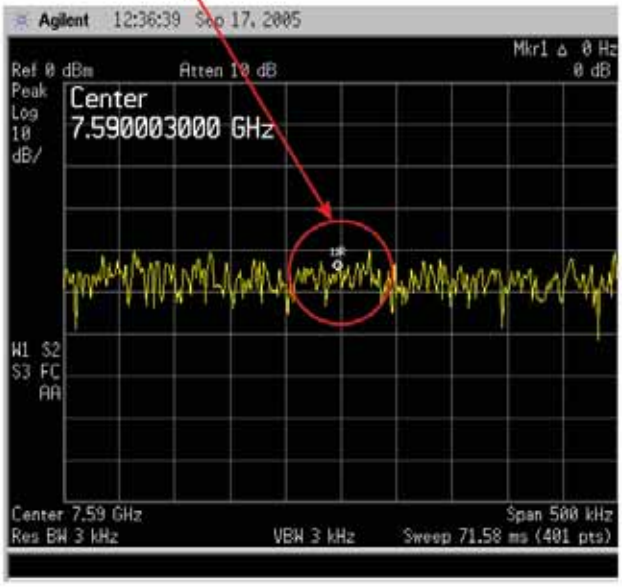
Note

You must watch the trace carefully on the spectrum analyzer when adjusting the I and Q carrier controls on the XMTR module. the I and Q carrier controls are interactive and the slightest change on one control causes a change on the other. You must alternate between controls until carrier null is obtained. The direction to turn the controls is not defined. If for example, the carrier level is dropping as you are turning the I CARR control counterclockwise, continue to turn counterclockwise until the carrier level on the trace stops dropping and then starts to go up. Then turn the Q CARR control counterclockwise or clockwise until downward movement is seen on the trace and continue to turn in that direction. Watch for the slightest change in direction and then move to the other control.



l. Stop. Carrier is at minimum (null) value.



5.21 XMTR OUTPUT LEVEL CALIBRATION

See Figure 5-21 and follow the procedure to check, and if necessary adjust, the RF output of the UD-35() Transmitter in radio configuration that is not equipped with the optional PA.

CAUTION

Possibility of Service Interruption

This is an out-of-service procedure when on a nonstandby (unprotected) system. On a hot-standby or frequency diversity system, switch traffic on the channel under test to protect.

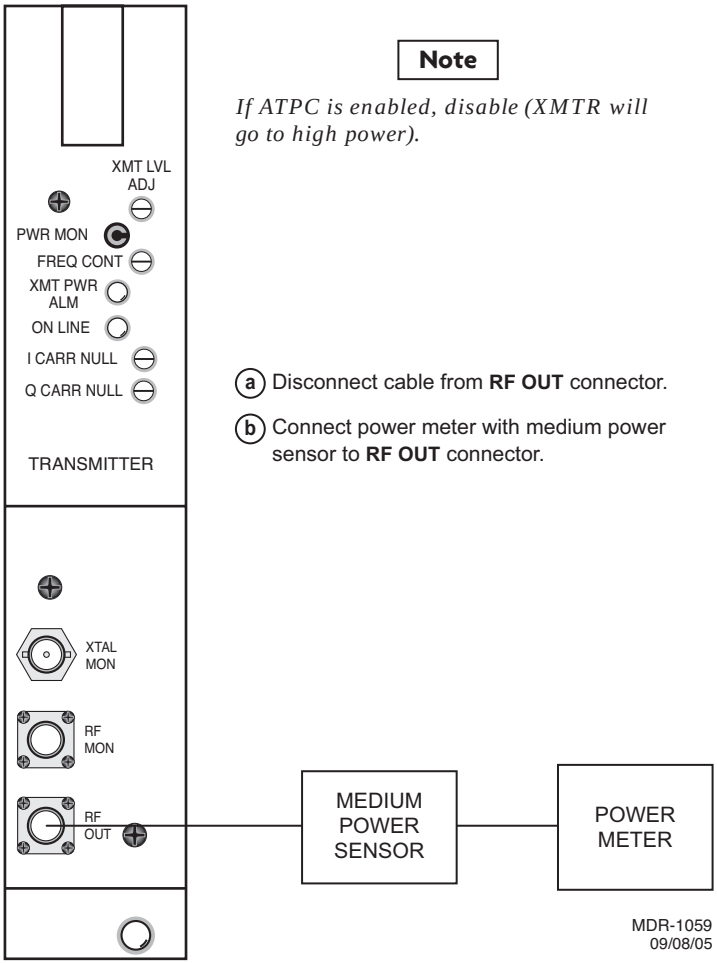


Figure 5-21 XMTR Output Level Calibration (Sheet 1 of 5)

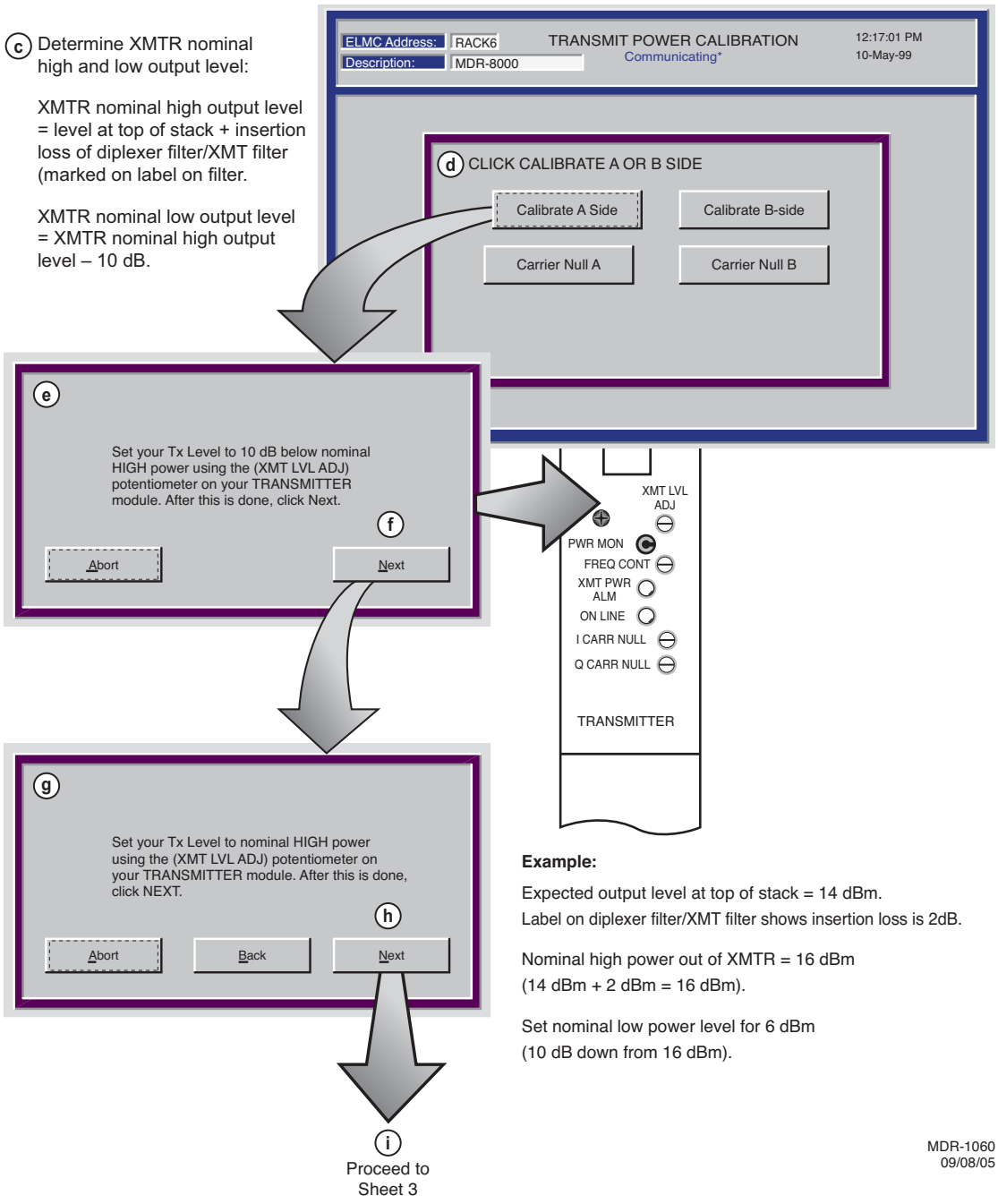
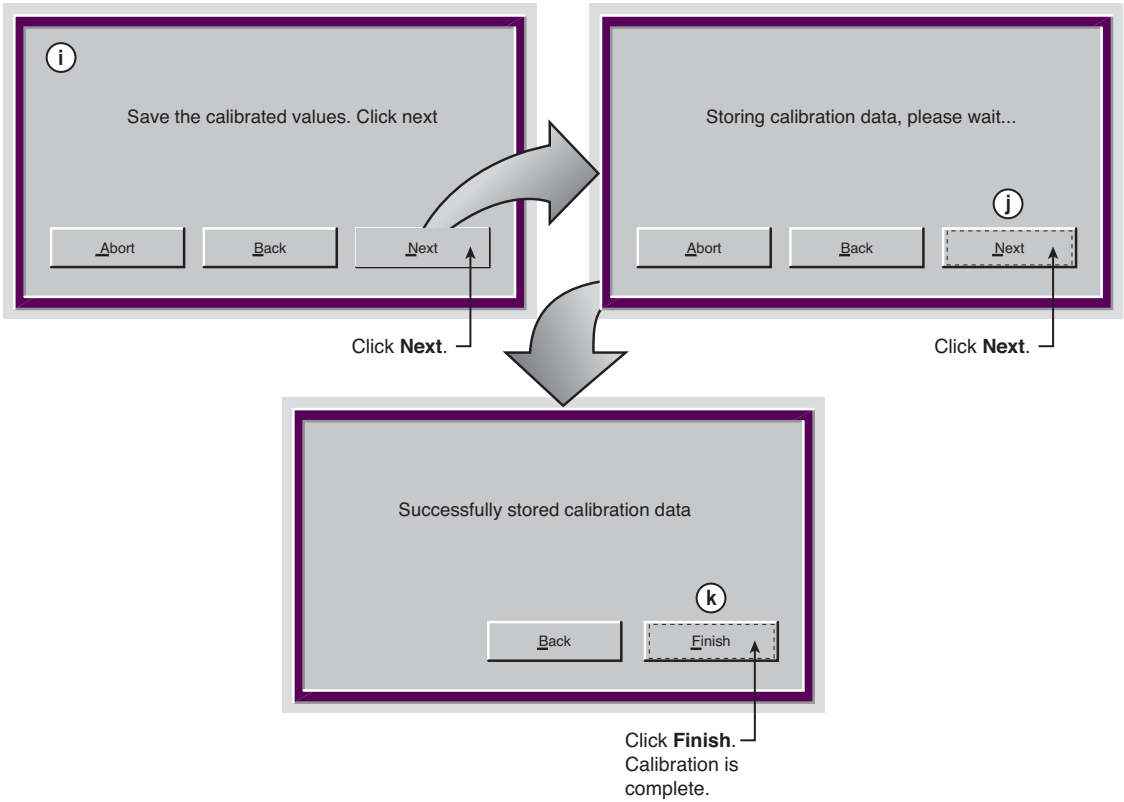


Figure 5-21 XMTR Output Level Calibration (Sheet 2 of 5)

Note

Ensure ATPC is disabled.



(l) Disconnect power meter and sensor from **RF OUT** connector.

(m) Reconnect cable to **RF OUT** connector.

(n) Observe RF MON label on XMTR front panel. On label, is the measured READ level in dBm or Vdc?

If labeled READ X.X dBm, go to step o.
If labeled READ X.X Vdc, go to step s.

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Figure 5-21 XMTR Output Level Calibration (Sheet 3 of 5)

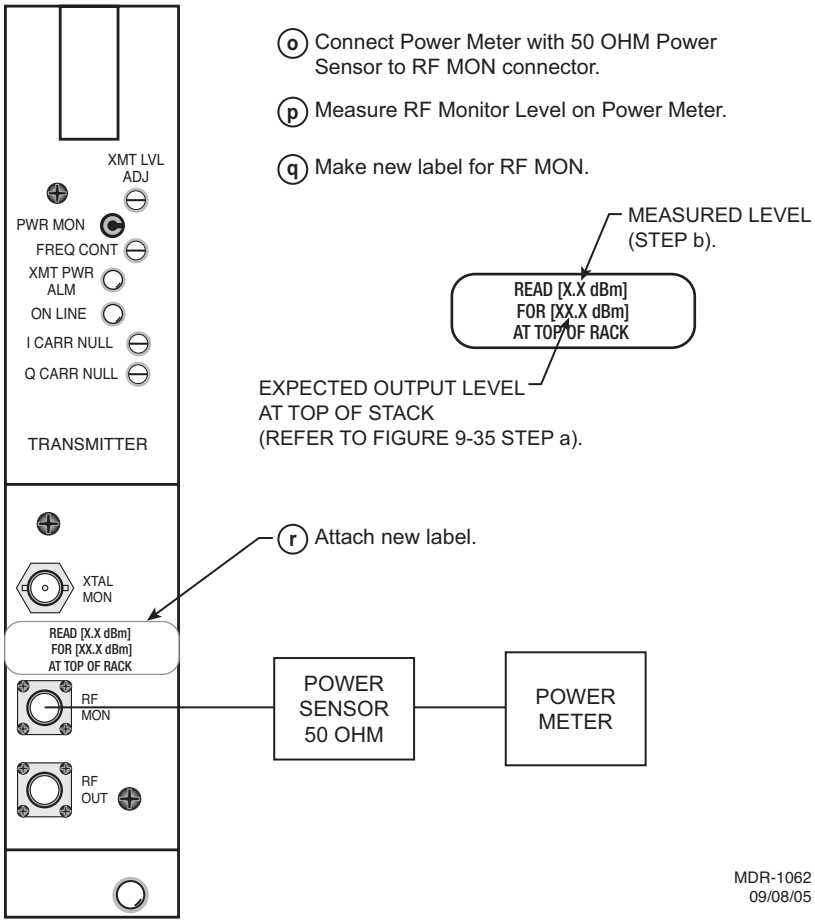


Figure 5-21 XMTR Output Level Calibration (Sheet 4 of 5)

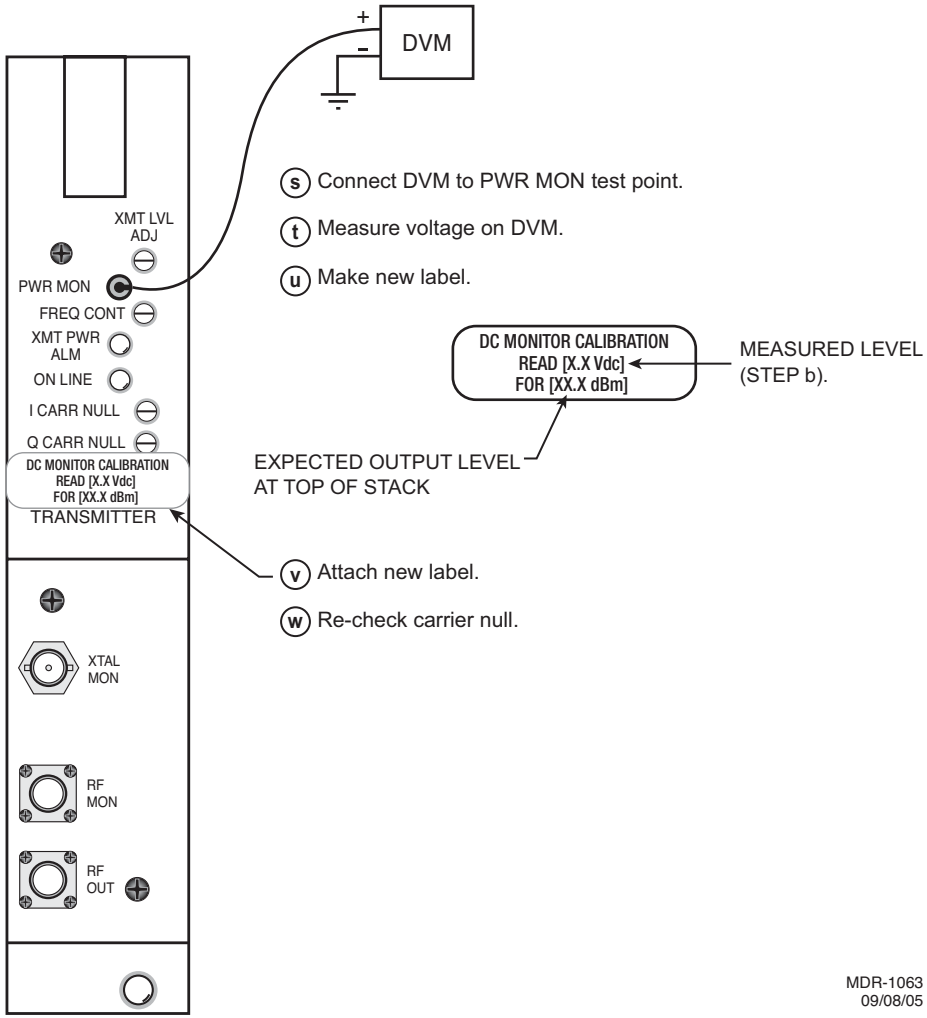


Figure 5-21 XMTR Output Level Calibration (Sheet 5 of 5)

5.22 RCVR REMOVAL AND REPLACEMENT

Use this procedure to remove and replace UD-36() RCVR.

CAUTION

Possibility of Service Interruption

This is an out-of-service procedure when on a nonstandby (unprotected) system. On a hot-standby, space diversity, or frequency diversity system, switch traffic on the channel under test to protect. Use front panel OVRD controls on AE-37() Controller to switch and lock opposite side RCVR (opposite side from failed RCVR) on line.

a On RCVR module, disconnect cable from RF In connector.

b Remove RCVR module from card cage.

c On RCVR module being replaced, remove RCVR Crystal Oscillator Subboard. See Figure 5-22. Retain for installation on replacement module.

d On RCVR module being replaced, remove RCVR Capacity Key. See Figure 5-23. Retain for installation on replacement module.

e On replacement RCVR module, install RCVR Crystal Oscillator Subboard. See Figure 5-22.

f On replacement RCVR module, install RCVR Capacity Key. See Figure 5-23.

g Install replacement RCVR module in card cage.

h Is RCVR equipped with front panel Freq Cont.?

If yes, go to step i

If no, go to step j.

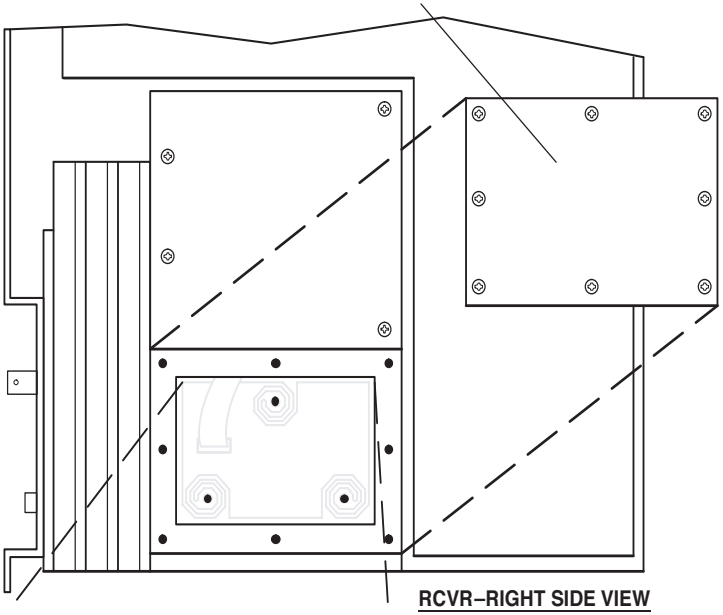
i Perform RCV Crystal Oscillator Frequency checks and adjustment procedure. Refer to Para. 5.23.

j Stop. This procedure is complete.

Remove:

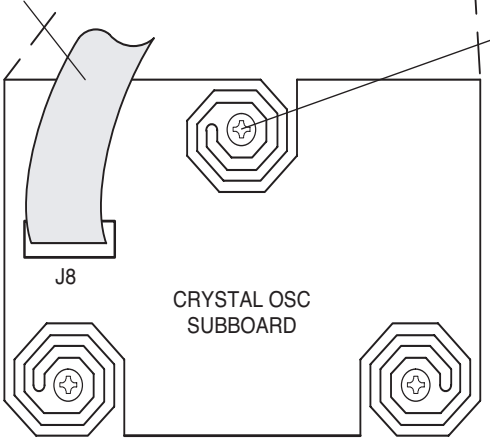
(a) Remove Receiver from card cage.

(b) Remove 8 screws from Crystal OSC Subboard cover, and remove cover.



RCVR–RIGHT SIDE VIEW

(c) Disconnect ribbon cable from J8.



(d) Remove 3 mounting screws, and remove Crystal OSC Subboard.

Install:

(e) Place Crystal OSC Subboard in mounting cavity.

Note

Ensure board edge does not make contact with chassis wall.

(f) Install 3 mounting screws.

(g) Connect ribbon cable to Connector J8.

(h) Install cover with 8 screws.

(i) Install Receiver in card cage.

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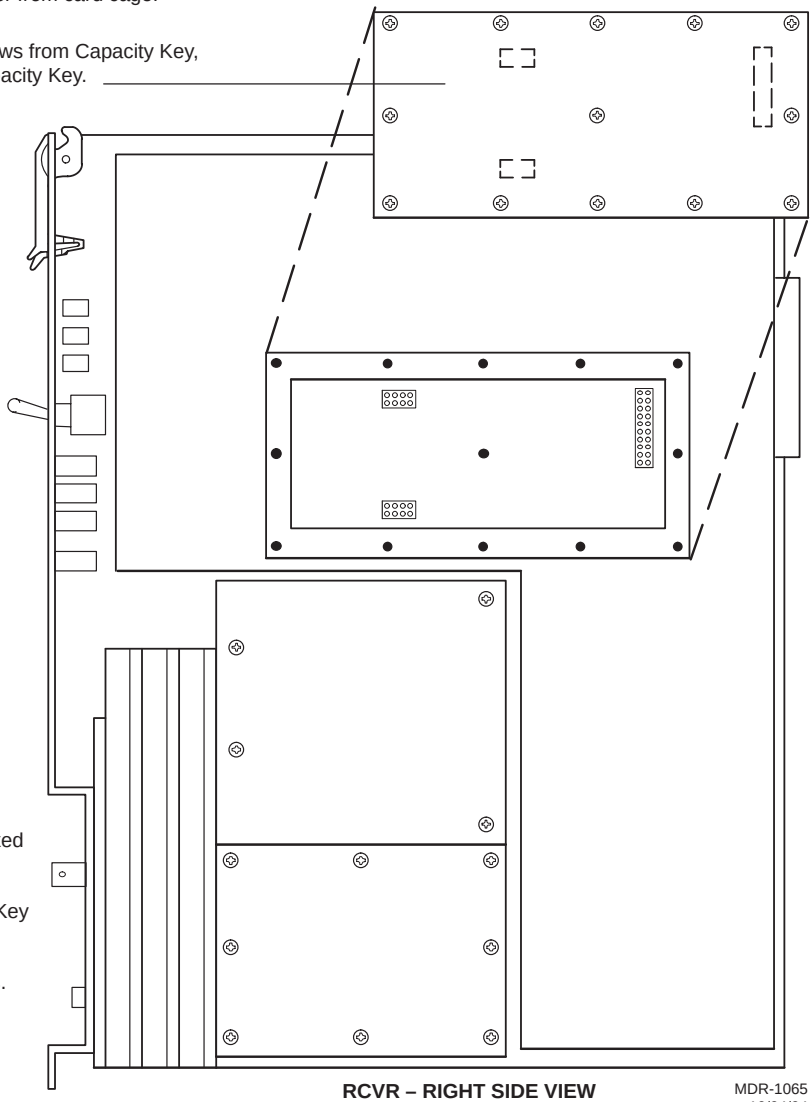
Figure 5-22 RCVR Crystal Oscillator Subboard Removal/Installation

REMOVE:
(Remove steps are prefixed by the letter "R".

(R1) Remove Receiver from card cage.

(R2) Remove 13 screws from Capacity Key, and remove Capacity Key.



INSTALL:
(Install steps are prefixed by the letter "I".

(I1) Install Capacity Key on 3 connectors.

(I2) Install 13 screws.

RCVR – RIGHT SIDE VIEW

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Figure 5-23 RCVR Capacity Key Removal/Installation

5.23 RCV CRYSTAL OSCILLATOR FREQUENCY CORRECTION

See Figure 5-24 and follow the procedure to correct the receive frequency of the crystal oscillator on older versions of the UD-36 ( ) receiver module.

Allow a 1-hour warm-up period for radio and test equipment before starting procedure or improper frequency adjustment can result.

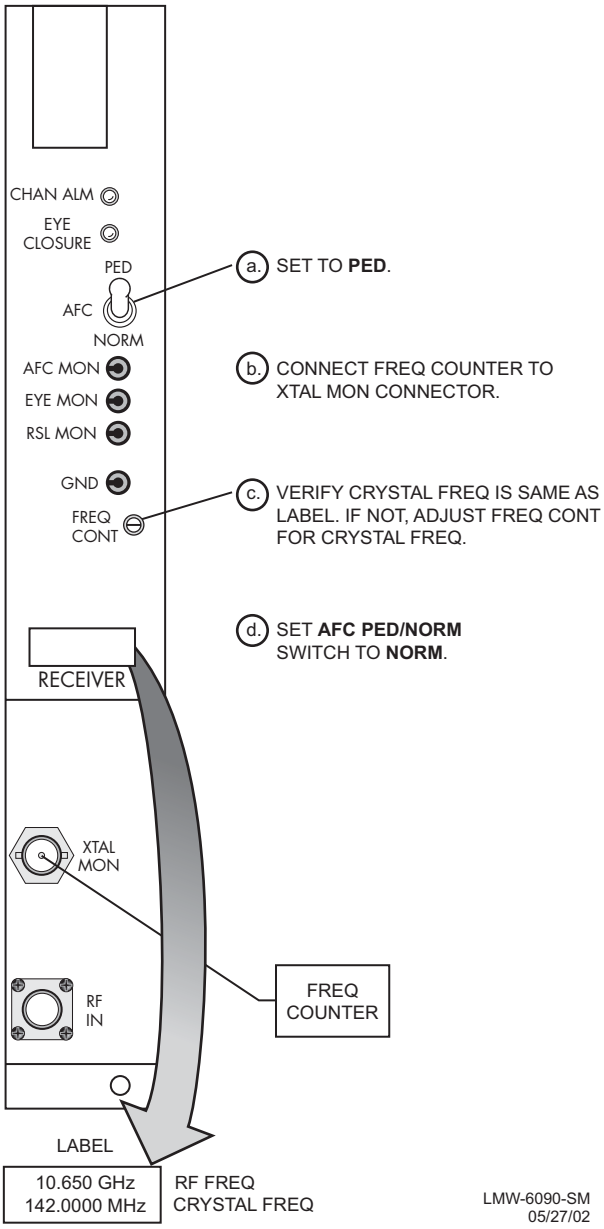


Figure 5-24 RCV LO Adjustment

5.24 PA REMOVAL AND REPLACEMENT

See Figure 5-25 and follow the procedure to remove and replace UD-51() PA.

CAUTION

Possibility of Service Interruption

This is an out-of-service procedure when on a nonstandby (unprotected) system. On a hot-standby or frequency diversity system, switch traffic on the channel under test to protect. Use front panel OVRD controls on AE-37() Controller to lock on-line XMTR (opposite side from failed XMTR) on line.

WARNING

Possibility of Damage to Equipment

To prevent monitor point errors, use caution to ensure that the front panel removed from the PA is replaced on that same PA. No two monitor point levels labeled on PAs are the same. Erroneous output levels can result from installing the wrong front panel and calibrating the PA to the level labeled on that front panel.

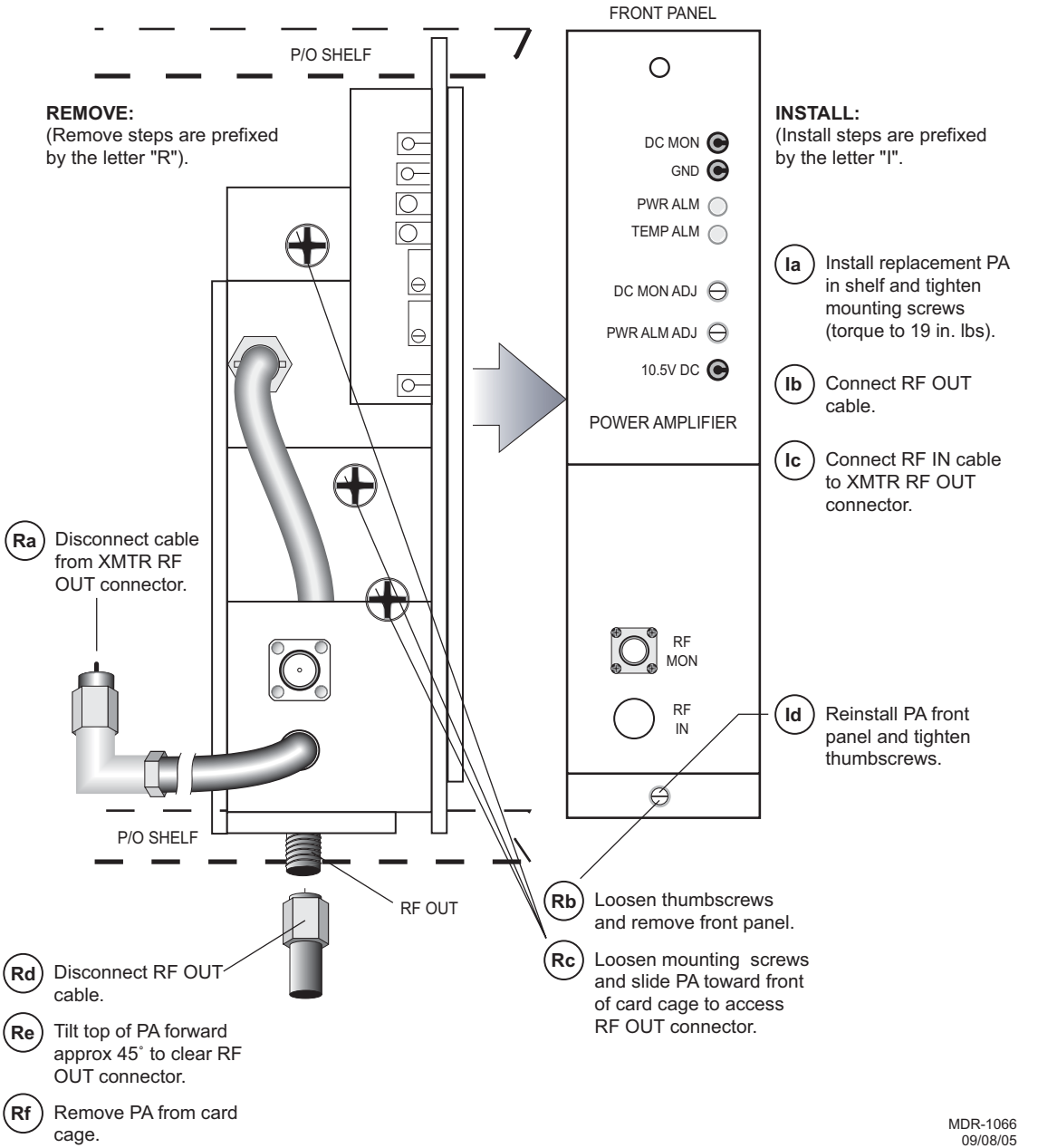


Figure 5-25 UD-51( ) Power Amplifier Removal and Replacement

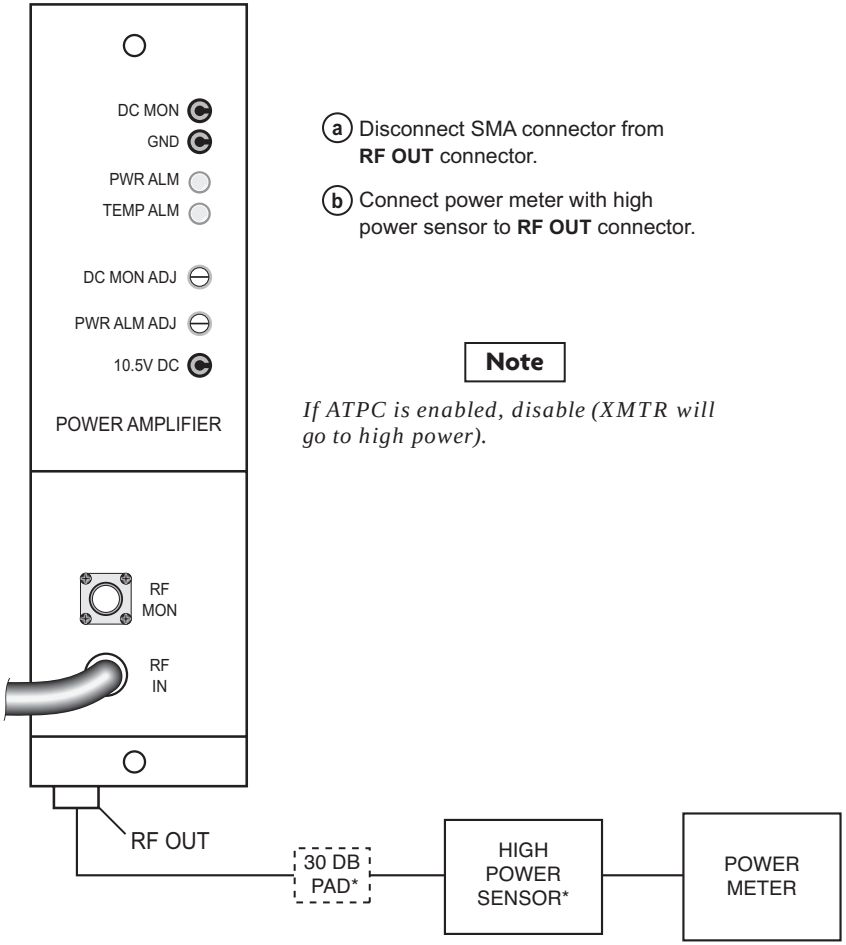
5.25 PA OUTPUT LEVEL CALIBRATION

See Figure 5-26 and follow procedure to check, and if necessary, adjust the UD-51( ) Power Amplifier (PA) output in radio configuration that is equipped with the optional PA.

CAUTION

Possibility of Service Interruption

This is an out-of-service procedure when on a nonstandby (unprotected) system. On a hot-standby or frequency diversity system, switch traffic on the channel under test to protect.



(a) Disconnect SMA connector from **RF OUT** connector.

(b) Connect power meter with high power sensor to **RF OUT** connector.

Note

If ATPC is enabled, disable (XMTR will go to high power).

* As an alternative procedure, replace high power sensor with a medium power sensor and install in-line 30 dB attenuator. ***Attenuator must be properly calibrated for 30 dB.***

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Figure 5-26 PA Output Level Calibration (Sheet 1 of 5)

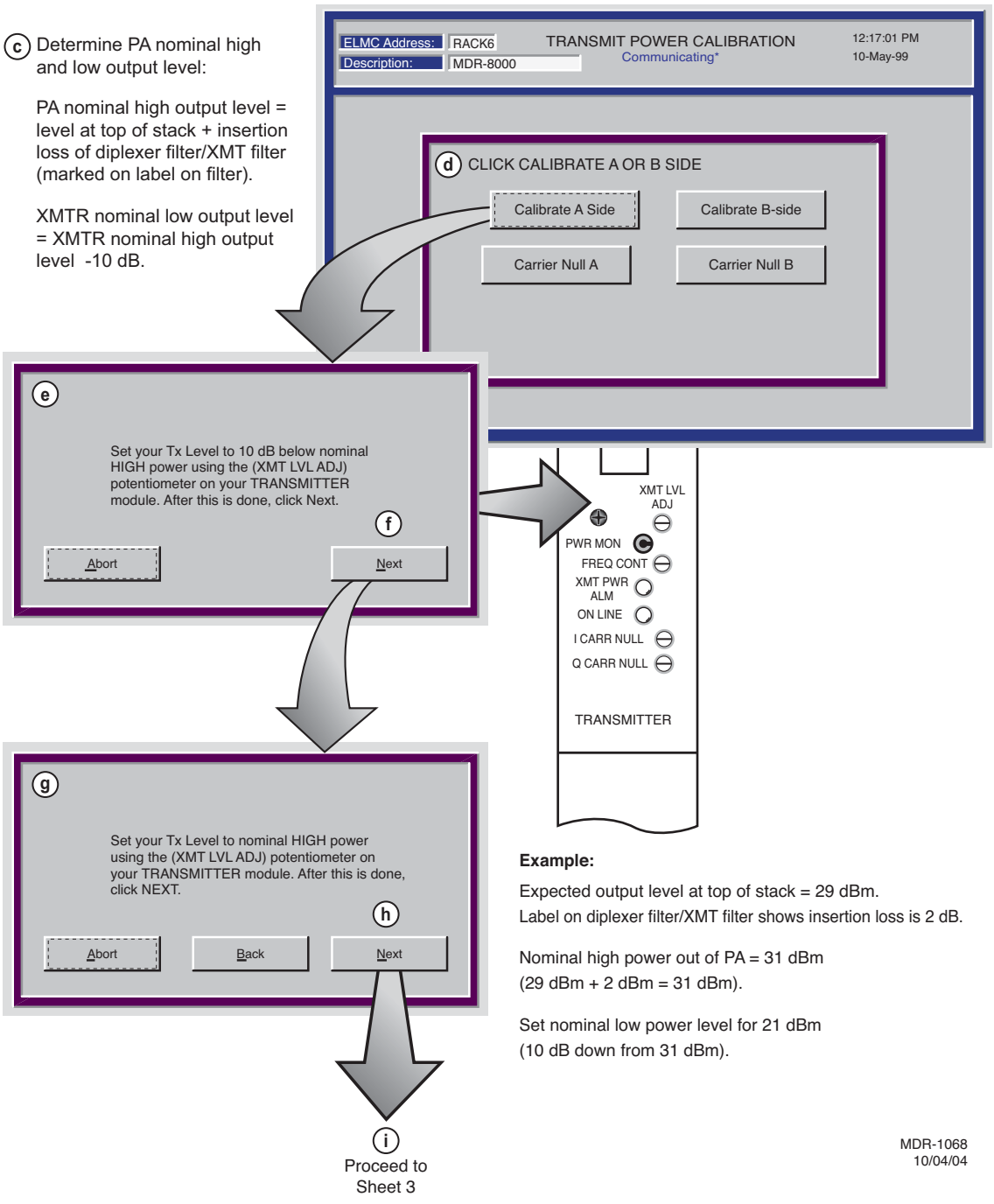
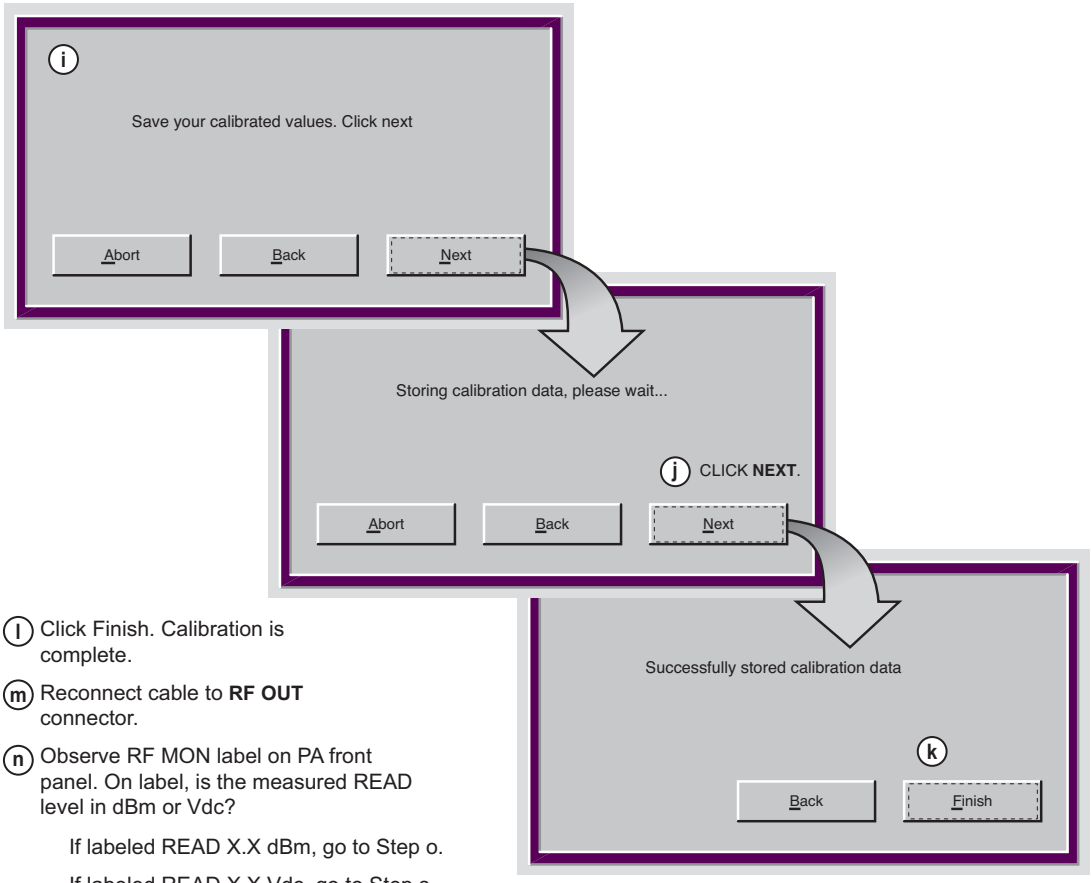


Figure 5-26 PA Output Level Calibration (Sheet 2 of 5)



(l) Click Finish. Calibration is complete.

(m) Reconnect cable to **RF OUT** connector.

(n) Observe RF MON label on PA front panel. On label, is the measured READ level in dBm or Vdc?

If labeled READ X.X dBm, go to Step o.

If labeled READ X.X Vdc, go to Step s.

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Figure 5-26 PA Output Level Calibration (Sheet 3 of 5)

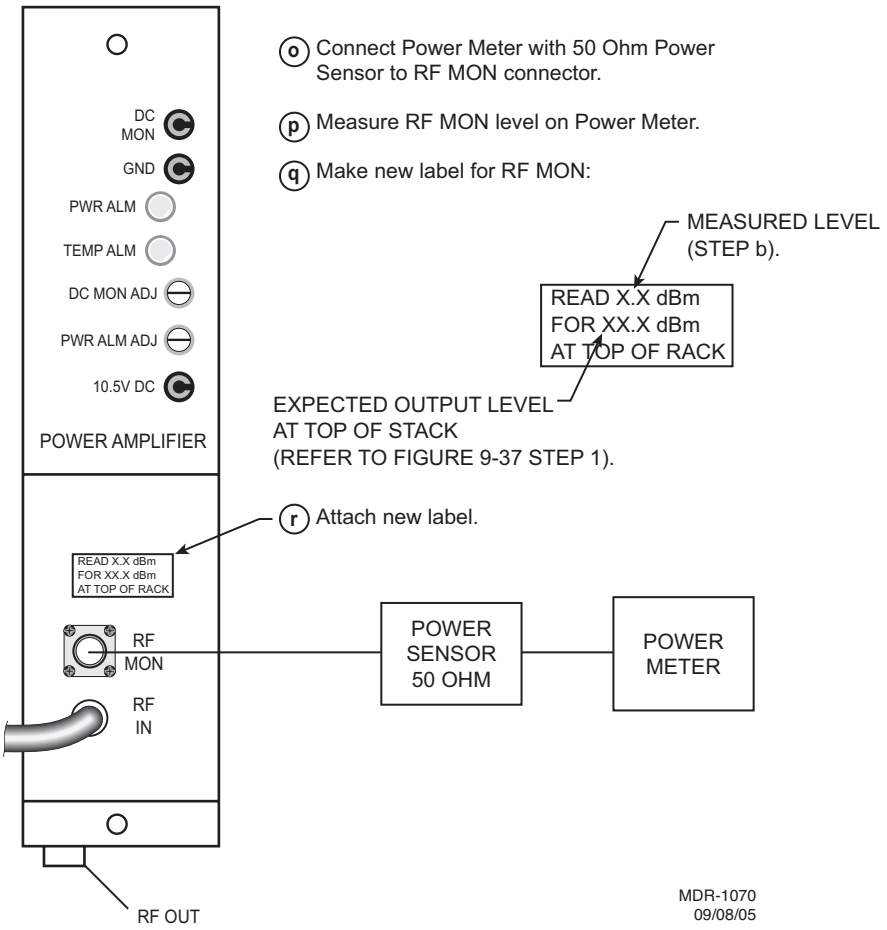

Figure 5-26 PA Output Level Calibration (Sheet 4 of 5)

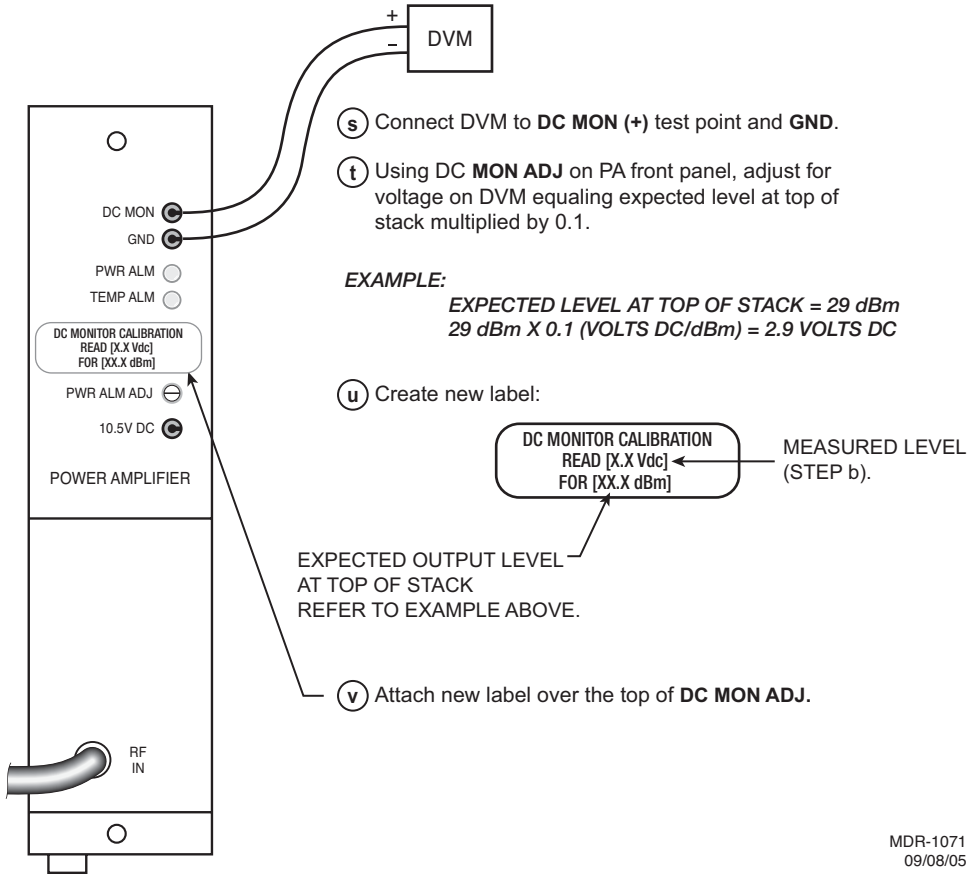

Figure 5-26 PA Output Level Calibration (Sheet 5 of 5)

5.26 CHANGING FREQUENCY

Crystals are soldered and tuned up in a crystal oscillator subboard at the factory.

Changing frequencies requires changing the crystal on the crystal oscillator subboard in the transmitter and receiver modules. Changing out the crystal requires tuning the crystal oscillator subboard. Tuning the crystal oscillator subboard is a factory procedure.

An RF frequency change may require re-tuning the diplexer. Re-tuning the diplexer is a factory procedure.

5.27 CLEANING

Do not use acid, alcohol, or brushes to clean modules because damage to the silkscreen labeling and antistatic coating can result. Cleaning should be confined to the removal of dust and dirt using a damp cloth.

Cleaning should normally be confined to the removal of dust and dirt using a soft bristled (natural fiber) brush and a low velocity blower (such as a vacuum cleaner with a plastic blower nozzle). Do not use acid or synthetic bristled brushes to clean modules that contain electrostatic-sensitive components.

Note

The information contained in this section is a summary of the section with the same title, but not the same section number, on the enclosed CD. "Refer to CD" is used throughout this section to refer the reader to the detail information on the CD. Go to this section on the CD for interactive links to the detail information referred to in this section.

6 USER GUIDE

6.1 INTRODUCTION

This section contains descriptions of screens not used or described in other sections. Where there are operational differences, DS1/E1, DS3, and OC3/STM-1 and/or ETH screens are shown separately.

6.2 ANALOG SCREEN

See Figure 6-1 and Figure 6-2. The Analog screen is used to display real-time analog voltages and radio performance monitors for the ELMC address. Analog voltages are updated automatically every second. Reset performance parameters to zero using the Error Reset button (or hotkey F3) on the toolbar. TIME SINCE LAST RESET displays the time in days, hours, minutes, and seconds since the last error reset.

6.2.1 PA (DC MON)

Indicates PA RF output level (Vdc).

6.2.2 TX (PWR MON)

Indicates XMTR module RF output level (Vdc).

6.2.3 ATPC Voltage

Indicates ATPC CONTROL signal output from controller to XMTR module(s) (Vdc).

6.2.4 RX (RSL 1) dBm

Indicates AGC MON output level from RCVR module (dBm).

6.2.5 RX (EYE MON)

Relative measure of noise level of receive signal (Vdc).

6.2.6 RX (AFC MON)

Indicates AFC MON output from single RCVR module (-3 Vdc = nominal frequency). (The AFC MON signal is developed from the correction voltage applied to the crystal oscillator on the single RCVR module.) Not provided by design and replaced with Path Distortion on dual RCVR module.

6.2.7 Battery Voltage

Indicates battery power input (Vdc).

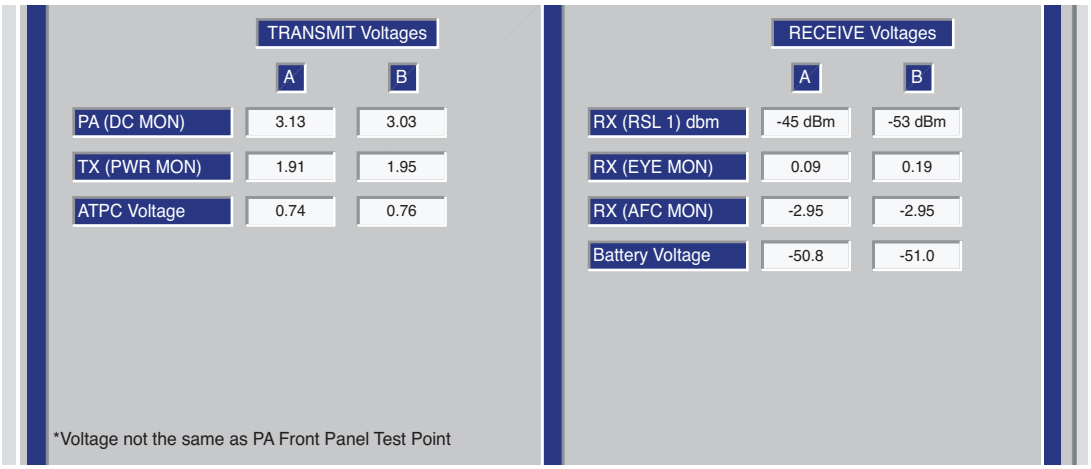

Figure 6-1 Analog Screen (Single RCVR)

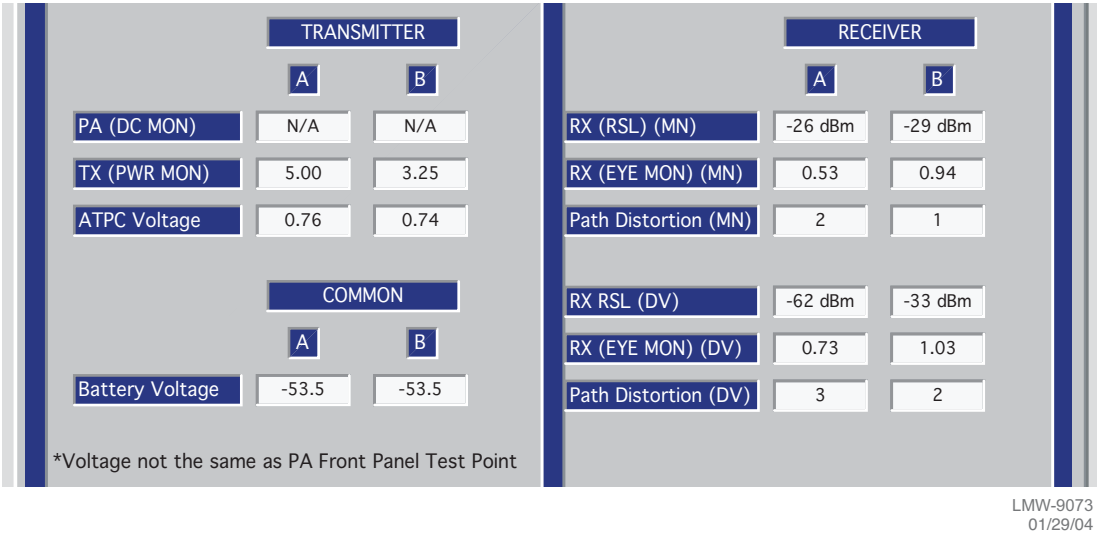

Figure 6-2 Analog Screen (Dual RCVR)

6.3 DS1/E1 RADIO PERFORMANCE SCREEN

See Figure 6-3. The Analog Monitor screen is used to display real-time analog voltages and radio performance monitors for the ELMC address. Analog voltages are updated automatically every second. Reset performance parameters to zero using the Error Reset button (or hotkey F3) on the toolbar. TIME SINCE LAST RESET displays the time in days, hours, minutes, and seconds since the last error reset.

6.3.1 Repeater CRC Err Sec

Repeater CRC Errored Seconds, indicates number of seconds that contain coding violations, slips, or frame losses in the data over the repeater cable.

6.3.2 Radio Severe Err Sec

Radio Severe Errored Seconds, indicates number of seconds that contain a predetermined number (N) of coding violations in the data over the RF path.

6.3.3 Radio Outage Sec

Radio Outage Seconds, indicates on-line RCVR errored seconds (number of seconds that contain coding violations, slips, or frame losses in the data over the RF path).

6.3.4 Radio A and B Outage Sec

Radio A and B Outage Seconds, indicates on-line and off-line RCVR errored in the same second.

6.3.5 Radio CRC Err Sec

Radio CRC Errored Seconds, indicates number of seconds that contain coding violations, slips, or frame losses in the data over the RF path.

6.3.6 Radio CRC Errors

Indicates number of errors in the data over the RF path.

6.3.7 Radio Internal BER

Indicates current BER of the data over the RF path.

6.3.8 Radio Average BER

Indicates average BER of the data over the RF path since last reset.

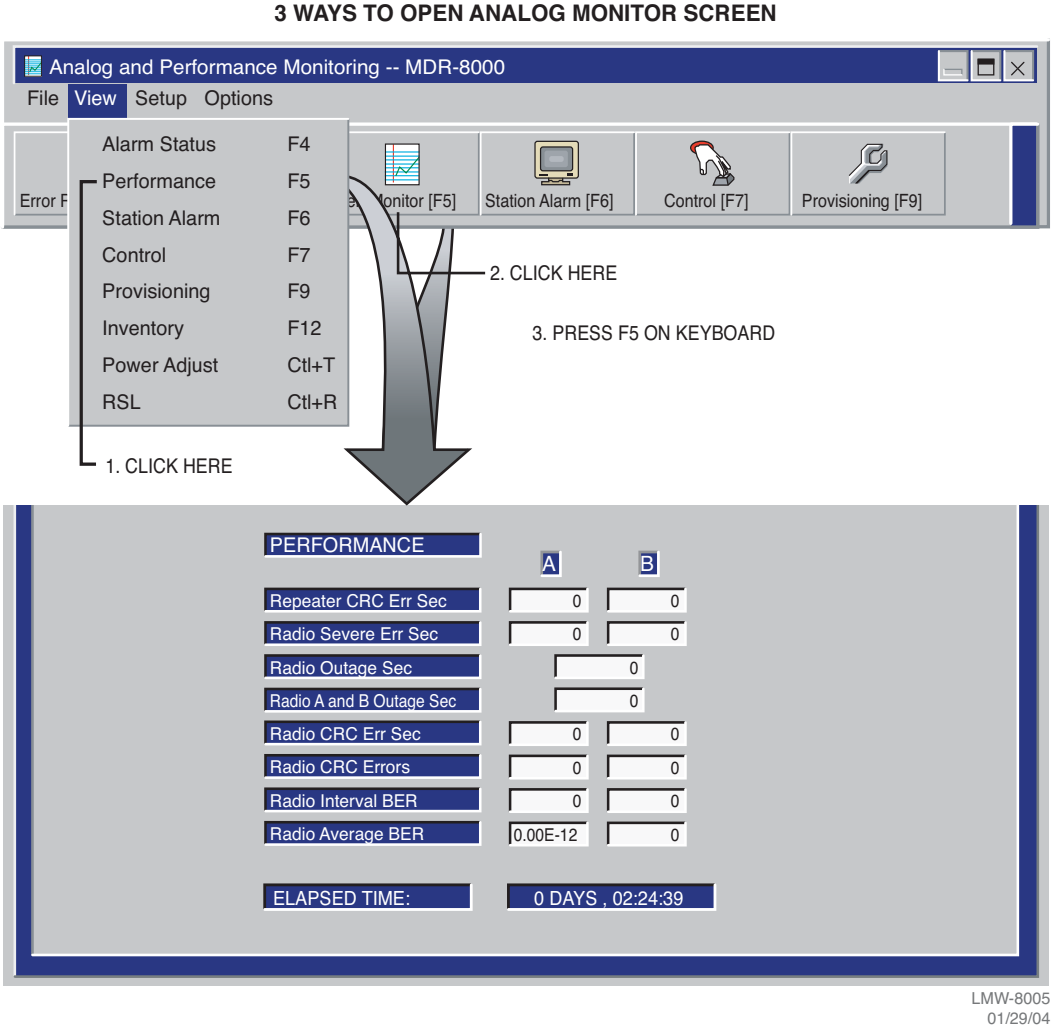

Figure 6-3 DS1/E1 Radio Performance Monitor Screen

6.4 DS3 RADIO PERFORMANCE MONITORING SCREEN

See Figure 6-4. Reset performance parameters to zero using the Error Reset button (or hotkey F3) on the toolbar. TIME SINCE LAST RESET displays the time in days, hours, minutes, and seconds since the last error reset.

6.4.1 Line 1-3 DS3 Errors

Indicates total number of coding violations, slips, or frame losses in the DS3 line data.

6.4.2 Line 1-3 DS3 BER

Calculated from code violation count and data rate.

6.4.3 Radio Errors

Indicates number of coding violations, slips, or frame losses in the data over the RF path.

6.4.4 Radio Error Seconds

Any second during which a code violation was detected.

6.4.5 Radio Severe Error

Any second during which the code violation count exceeds the number of errors that could occur in one second at 1 X 10^{-6} error rate.

6.4.6 Radio BER

Calculated from code violation count and data rate.

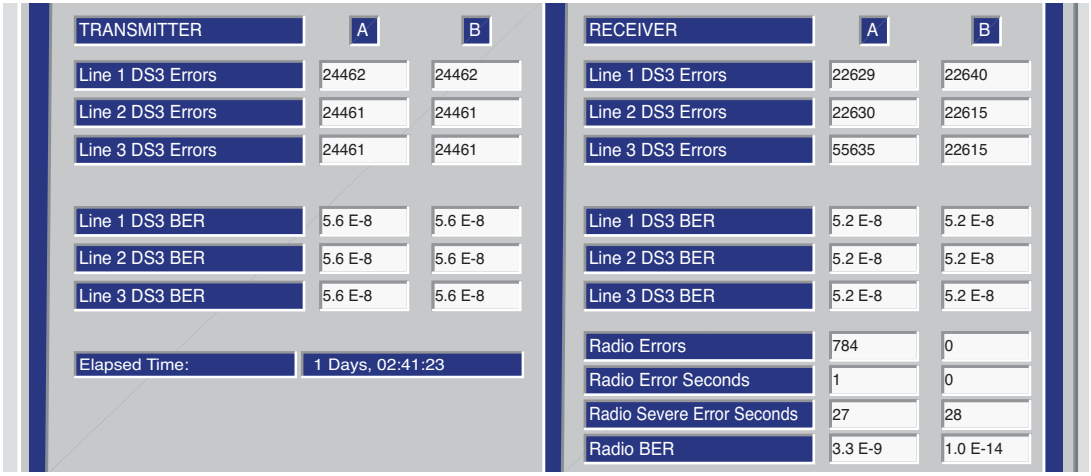

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Figure 6-4 DS3 Radio Performance Screen

6.5 OC3/STM-1 RADIO PERFORMANCE MONITORING SCREENS

See Figure 6-5, Figure 6-6, and Figure 6-7. Reset performance parameters to zero using the Error Reset button (or hotkey F3) on the toolbar. TIME SINCE LAST RESET displays the time in days, hours, minutes, and seconds since the last error reset.

6.5.1 OC3/STM-1 Errors

Indicates total number of coding violations, slips, or frame losses in the OC3/STM-1 data.

6.5.2 OC3/STM-1 Error Seconds

Any second during which a code violation was detected. Count is initiated during any second that qualifies as Unavailable Second.

6.5.3 OC3/STM-1 Severe Error Seconds

Any second during which the code violation count exceeds the number of errors that could occur in one second at 1 X 10^{-6} error rate. Count is inhibited during any second that qualifies as Unavailable Second.

6.5.4 OC3/STM-1 Severe Error Frame

Any second during which there is no start of frame for at least four consecutive frames.

6.5.5 OC3/STM-1 BER

Calculated from code violation count and data rate.

6.5.6 Line 1-3 DS1 Error Seconds

Any second during which a code violation was detected on the wayside DS1 line.

6.5.7 Radio Errors

Indicates number of coding violations, slips, or frame losses in the data over the RF path.

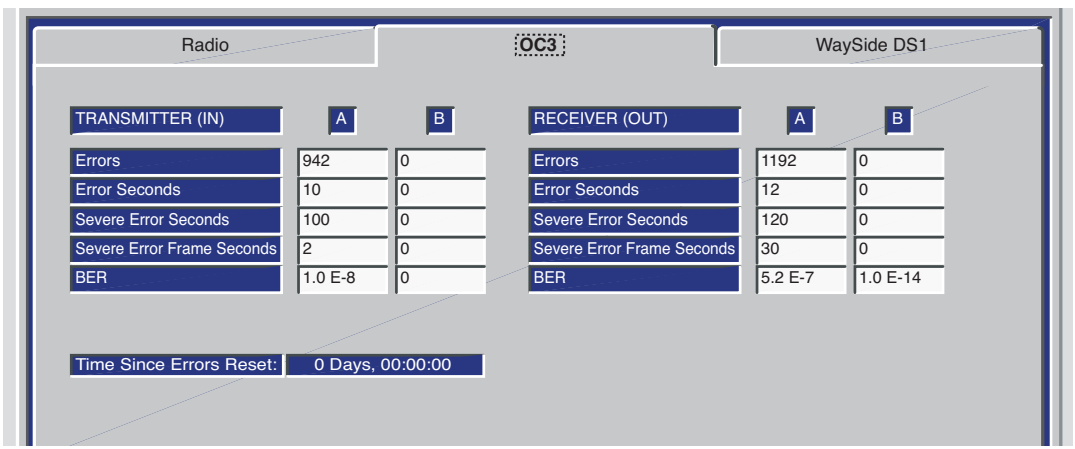

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Figure 6-5 OC3/STM-1 Radio, OC3/STM-1 Facilities Performance Screen

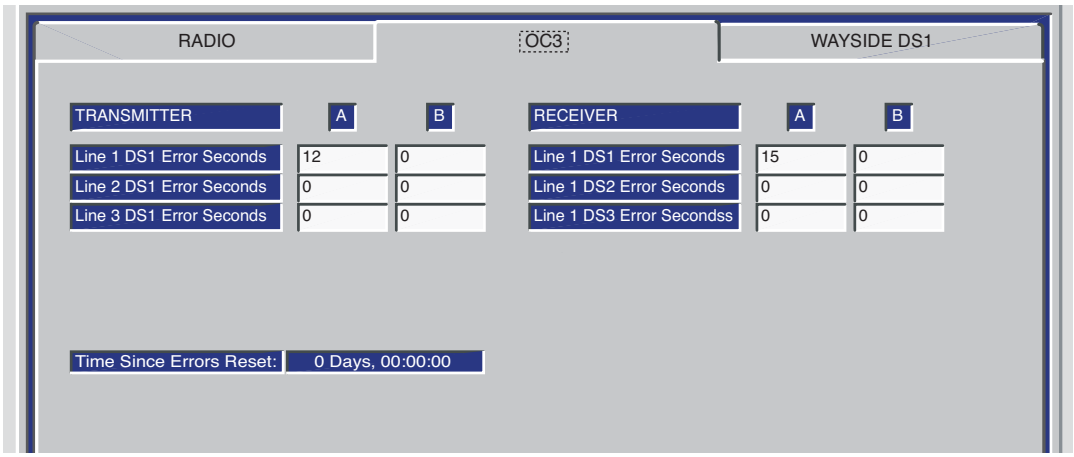

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Figure 6-6 OC3/STM-1 Radio, Wayside DS1 Facilities Performance Screen

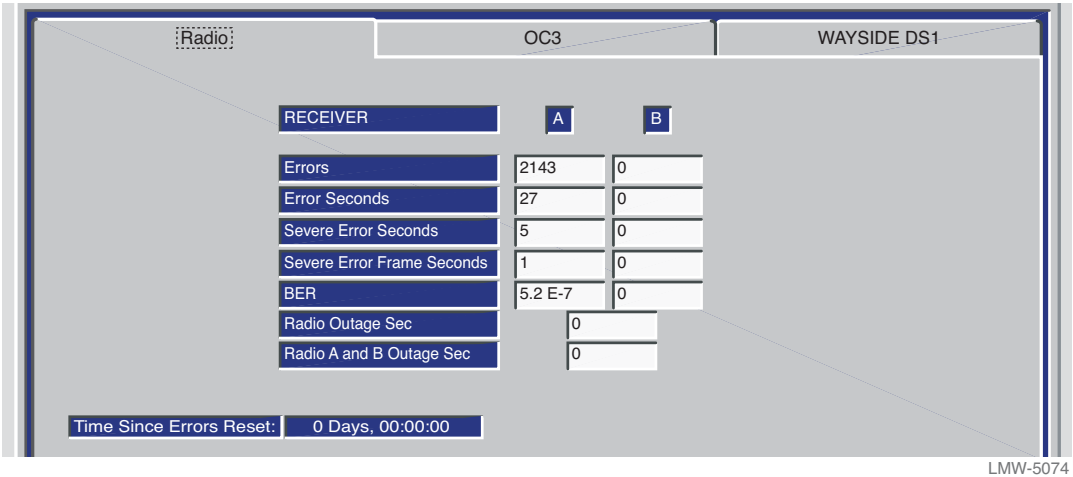

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Figure 6-7 OC3/STM-1 Radio, Radio Performance Screen

6.5.8 Radio Error Seconds

Any second during which a code violation was detected. Count is initiated during any second that qualifies as Unavailable Second.

6.5.9 Radio Severe Error

Any second during which the code violation count exceeds the number of errors that could occur in one second at 1 X 10^{-6} error rate. Count is inhibited during any second that qualifies as Unavailable Second.

6.5.10 Radio BER

Calculated from code violation count and data rate.

6.6 ETHERNET RADIO PERFORMANCE MONITORING SCREEN

See Figure 6-8. Reset performance parameters to zero using the Error reset button on the toolbar. TIME SINCE LAST RESET displays the time in days, hours, minutes and seconds, since the last error reset.

6.6.1 RF Receive

6.6.1.1 Errors

Indicates total number of coding violations, slips, or frame losses in the Ethernet data.

6.6.1.2 Error Seconds

Any second during which a code violation was detected. Count is initiated during any second that qualifies as Unavailable Second.

6.6.1.3 Severe Error Seconds

Any second during which the code violation count exceeds the number of errors that could occur in one second at 1x 10^{-6} error rate. Count is inhibited during any second that qualifies as Unavailable Second.

6.6.1.4 Severe Error Frame Seconds

Any second during which there is no start of frame for at least four consecutive frames.

6.6.1.5 BER

Calculated from code violation count and data rate.

6.6.1.6 Radio Outage Sec

Radio Outage Seconds, indicates on-line RCVR errored seconds (number of seconds that contain coding violations, slips, or frame losses in the data over the RF path).

6.6.1.7 Radio A and B Outage Sec

Radio A and B Outage Seconds, indicates on-line and off-line RCVR errored in the same second.

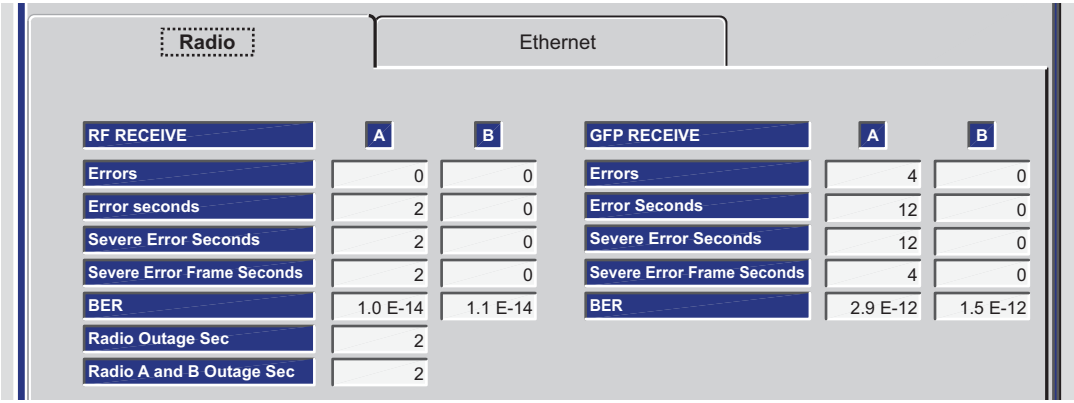

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Figure 6-8 Ethernet Radio, Radio Performance Screen

6.6.2 GPF Receive

6.6.2.1 Errors

Indicates total number of coding violations, slips, or frame losses in the Ethernet data.

6.6.2.2 Error Seconds

Any second during which a code violation was detected. Count is initiated during any second that qualifies as Unavailable Second.

6.6.2.3 Severe Error Seconds

Any second during which the code violation count exceeds the number of errors that could occur in one second at 1 x 10^{-6} error rate. Count is inhibited during any second that qualifies as Unavailable Second.

6.6.2.4 Severe Error Frame Seconds

Any second during which there is no start of frame for at least four consecutive frames.

6.7 ETHERNET PERFORMANCE MONITORING SCREEN

See Figure 6-9. Reset performance parameters to zero using the Error reset button on the toolbar. TIME SINCE LAST RESET displays the time in days, hours, minutes, and seconds since the last error reset.

6.7.1 IN (To RF Transmit)

6.7.1.1 Average Bytes/Sec

Indicates average number of frame bytes per second in the Ethernet RCV/radio XMT data.

6.7.1.2 Total Frames

Indicates number of valid Ethernet frames in the Ethernet RCV/radio XMT data.

6.7.1.3 Error Frames

Frame Check Sequence (FCS) error count indicates the number of Ethernet frames with errors in the Ethernet RCV/radio XMT data.

6.7.1.4 Dropped Frames

Indicates number of Ethernet frames dropped due to errors in the Ethernet RCV/radio XMT data or lack of buffer space.

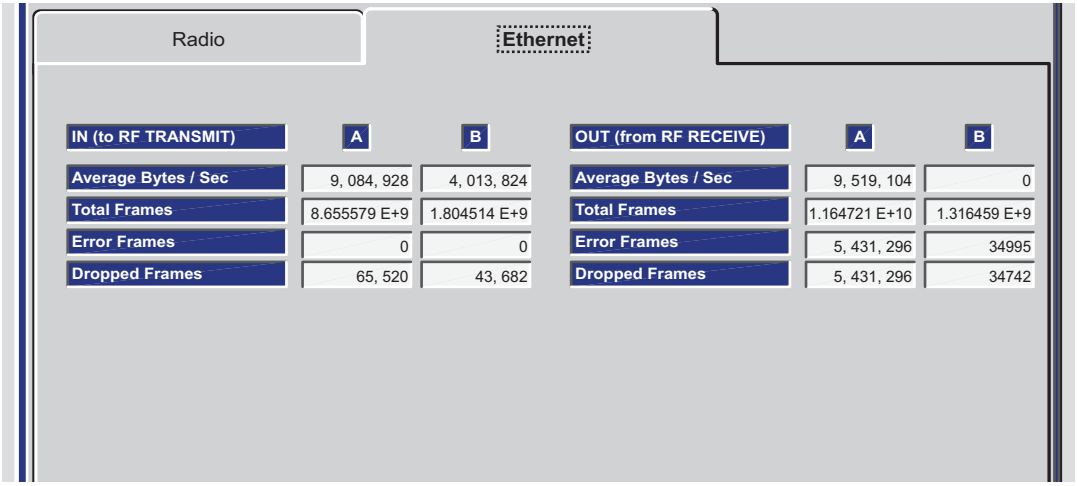

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Figure 6-9 Ethernet Radio, Ethernet Performance Screen

6.7.2 OUT (From RF Receive)

6.7.2.1 Average Bytes/Sec

Indicates average number of frame bytes per second in the Ethernet XMT/radio RCV data.

6.7.2.2 Total Frames

Indicates number of valid Ethernet frames in the Ethernet XMT/radio RCV data.

6.7.2.3 Error Frames

Frame Check Sequence (FCS) error count indicates the number of Ethernet frames with errors in the Ethernet XMT/radio RCV data.

6.7.2.4 Dropped Frames

Indicates number of Ethernet frames dropped due to errors in the Ethernet XMT/radio RCV data, or lack of buffer space.

6.8 DS1/E1 RADIO CONTROL SCREEN

See Figure 6-10. The Control screen is used to enable or disable and display the status of manual controls. Manual controls include equipment and function in-service controls, system loopback controls, user controls, and DS1/E1 loopback controls. The green square indicates control is enabled. Highlight and click on control name to change state.

6.8.1 In-Service Controls

IN-SERVICE controls are used to force A or B transmitter, receiver, and I/O interface modules on -or off-line. IN-SERVICE manual controls are also used to lock the A or B transmitter ATPC function high (ATPC High Pwr Lock) or low (ATPC Low Pwr Lock).

6.8.2 System Loopback Controls

When enabled, SYSTEM LOOPBACK manual controls loop I/O receiver to I/O transmitter (I/O LOOPBACK). I/O LOOPBACK is a local loopback function that can be used to test the performance of a standalone radio.

6.8.3 User Controls

USER CONTROLS, defined by the customer and named on the User Control Names Setup screen, are displayed and can be enabled or disabled if the optional AE-37( ) Relay Interface module is installed.

6.8.4 DS1 Line Loopback Controls

See Figure 6-11. When enabled, DS1 LINE LOOPBACK RCV to XMT manual controls loop DS1/E1 lines individually (Line 1-16 loopback). DS1 LINE LOOPBACK RCV to XMT is a far-end loopback function that can be used to test over-the-hop.

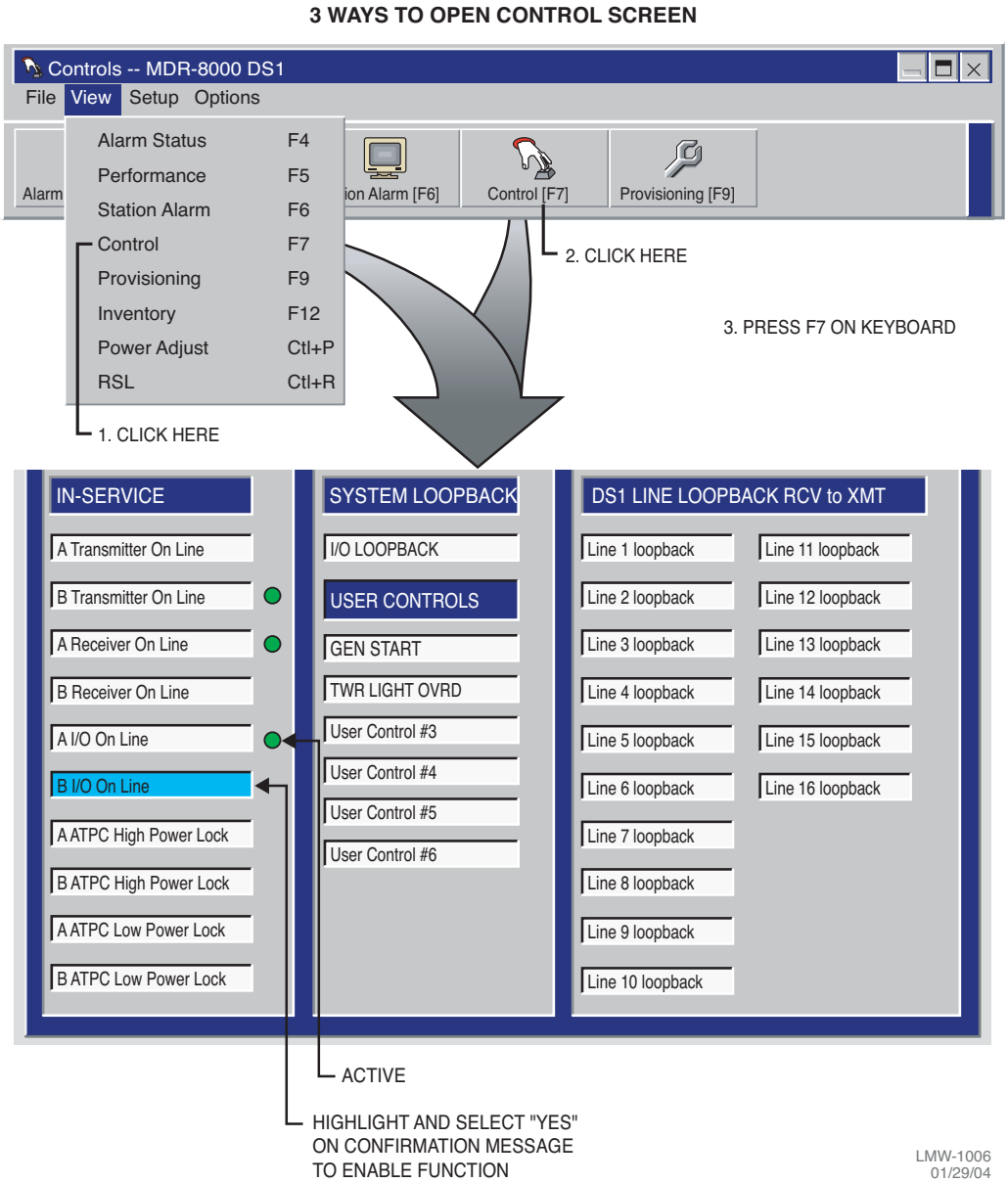

Figure 6-10 DS1/E1 Radio Control Screen

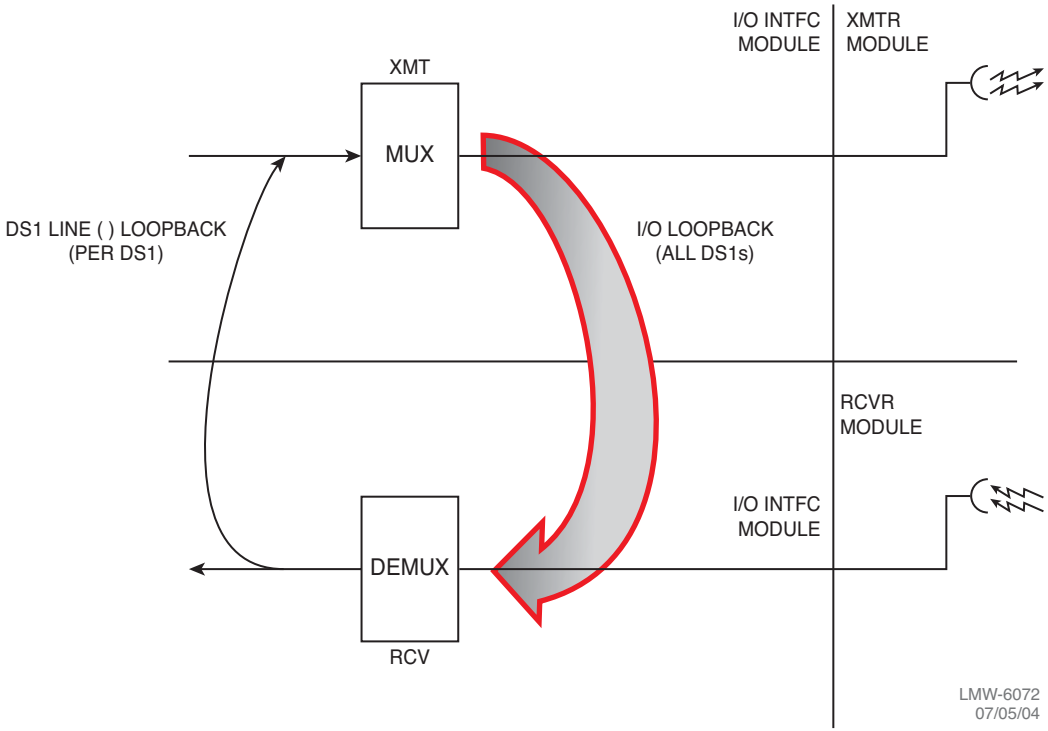

Figure 6-11 DS1/E1 Loopback

6.9 DS3 RADIO CONTROL SCREEN

See Figure 6-12. The Control screen is used to enable or disable and display the status of manual controls. Manual controls include equipment and function in-service controls, system loopback controls, user controls, and DS1/E1 loopback controls. The green square indicates control is enabled. Highlight and click on control name to change state.

6.9.1 In-Service Controls

IN-SERVICE controls are used to force A or B transmitter, receiver, and I/O interface modules on-or off-line. IN-SERVICE manual controls are also used to lock the A or B transmitter ATPC function high (APC High Pwr Lock) or low (APC Low Pwr Lock).

6.9.2 System Loopback Controls

See Figure 6-13.When enabled, SYSTEM LOOPBACK manual controls loop I/O receiver to I/O transmitter (I/O LOOPBACK). I/O LOOPBACK is a local loopback function that can be used to test the performance of a standalone radio.

6.9.3 User Controls

USER CONTROLS, defined by the customer and named on the User Control Names Setup screen, are displayed and can be enabled or disabled if the optional AE-27() Relay Interface module is installed.

6.9.4 Wayside DS1 Line Loopback Controls

See Figure 6-13. When enabled, DS1 LINE LOOPBACK RCV to XMT manual controls loop DS1/E1 lines, individually (Line 1-16 loopback). DS1 LINE LOOPBACK RCV to XMT is a far-end loopback function that can be used to test over-the-hop.

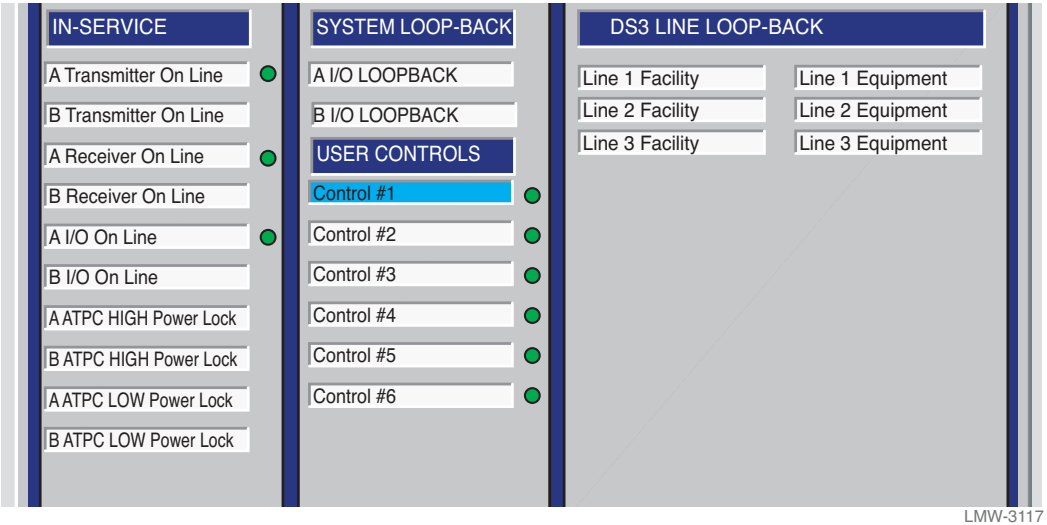

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Figure 6-12 DS3 Radio Control Screen

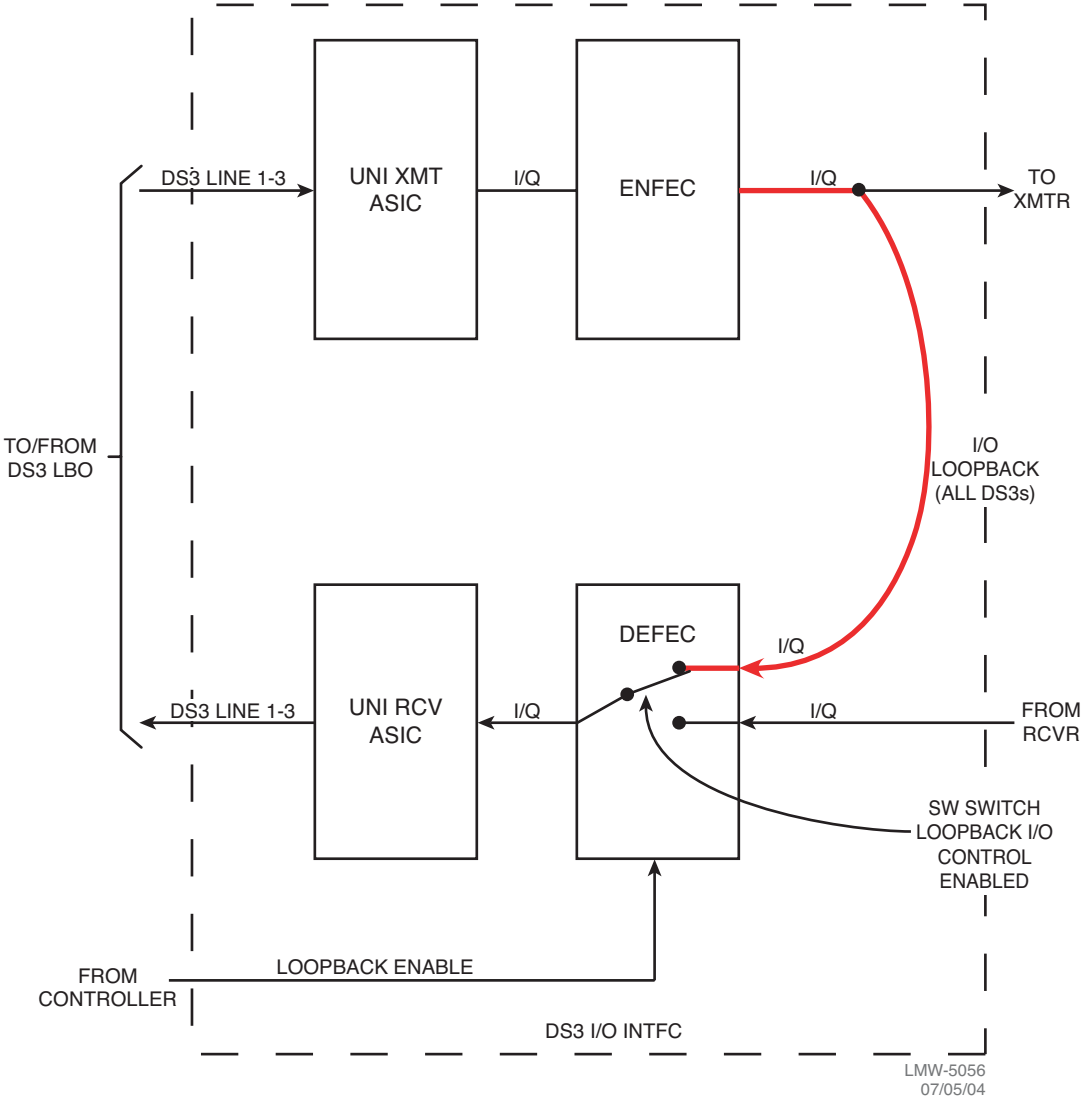

Figure 6-13 DS3 System Loopback

6.10 OC3/STM-1 RADIO CONTROL SCREEN

See Figure 6-14. and Figure 6-15 The Control screen is used to enable or disable and display the status of manual controls. Manual controls include equipment and function in-service controls, system loopback controls, user controls, and DS1/E1 loopback controls. The green square indicates control is enabled. Highlight and click on control name to change state.

6.10.1 In-Service Controls

IN-SERVICE controls are used to force A or B transmitter, receiver, and I/O interface (OC3/STM-1) modules on-or off-line. IN-SERVICE manual controls are also used to lock the A or B transmitter ATPC function high (ATPC High Power Lock) or low (ATPC Low Power Lock).

6.10.2 System Loopback Controls

See Figure 6-16 for SYSTEM LOOP-BACK. All loopbacks occur in the SMCRA on the I/O interface module. Loopback functions in both directions are bridged type functions. Data both loops back and continues. Loopbacks are named by facility in the direction of the loop. When enabled, **A/B OC3/STM-1 Facility** loops the optical RCV/radio XMT input to the radio RCV/optical XMT output. When enabled, **A/B OC3/STM-1 Equipment** loops the demultiplexed RCV output of the DEMUX circuit into the input to the MUX circuit.When enabled, **A/B RC3 Equipment** loops the output of the MUX circuit into the input of the DEMUX circuit.

6.10.3 User Controls

USER CONTROLS, defined by the customer and named on the User Control Names Setup screen, are displayed and can be enabled or disabled if the optional AE-27( ) Relay Interface module is installed.

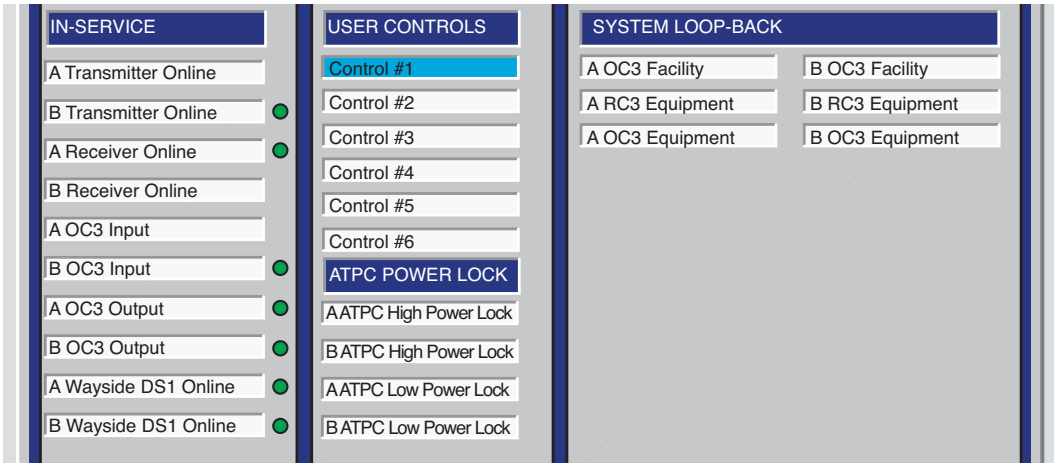

Figure 6-14 OC3/STM-1 Radio Control Screen (Single RCVR)

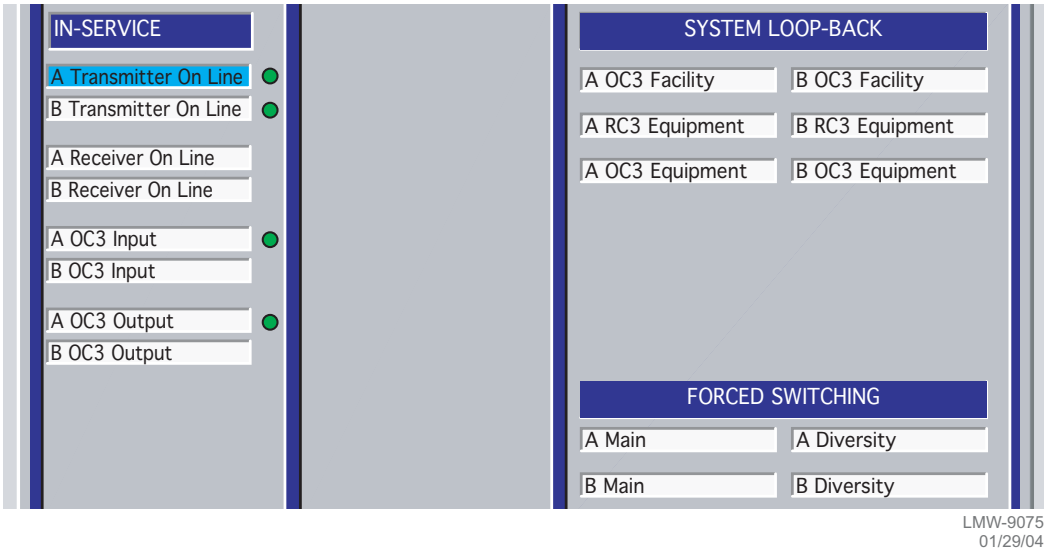

Figure 6-15 OC3/STM-1 Radio Control Screen (Dual RCVR)

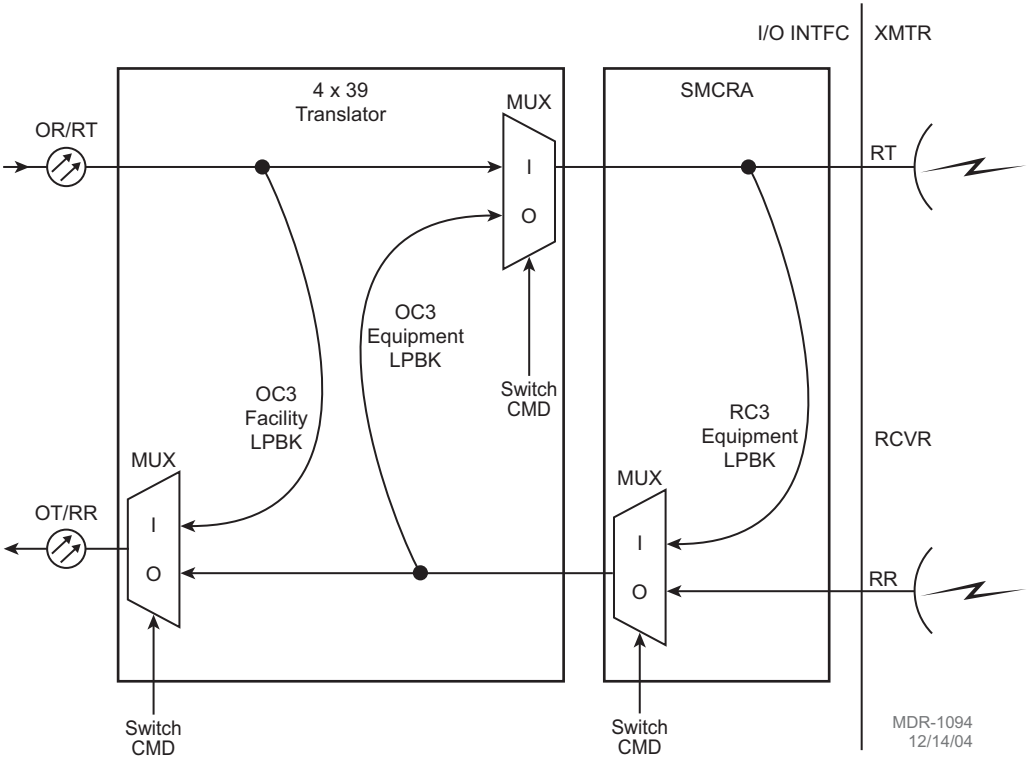

Figure 6-16 OC3/STM-1 Loopbacks

6.11 ETHERNET RADIO CONTROL SCREEN

See Figure 6-17. The Control screen is used to enable or disable and display the status of manual controls. Manual controls include equipment and function in-service controls, system loopback controls, user controls, and DS1 loopback controls. The green square indicates control is enabled. Highlight and click on control name to change state.

6.11.1 In-Service Controls

In service controls are used to force A or B transmitter, receiver, and I/O interface modules on-or off-line. IN-SERVICE manual controls are also used to lock the A or B transmitter ATPC function high (ATPC High Power Lock) or low (ATPC Low Power Lock).

6.11.2 User Controls

USER CONTROLS, defined by the customer and named on the User Control Names Setup screen, are displayed and can be enabled or disabled if the optional AE-27( ) Relay Interface module is installed.

6.11.3 System Loopback

See Figure 6-18 for the system loopback functions. There are three system loopback functions available on the Ethernet radio; Eth facility loopback, RC3 equipment loopback, and Eth equipment loopback. All loopbacks occur on the Ethernet I/O interface module. The loopback functions are controlled by software via the SYSTEM LOOPBACK controls on the USI Control screen.

6.11.3.1 Eth Facility Loopback

Eth facility loopback is a local loopback function that can be used to test the performance of a standalone radio. Eth Facility loopback is enabled by selecting A Eth Facility under SYSTEM LOOPBACK on the USI Control screen. This function loops the Ethernet RCV/radio XMT (EthR/RT) input back into the Ethernet XMT/radio RCV (EthT/RR) output. The actual loopback occurs in the PHY circuits on the I/O interface. When enabled, the EthR/RT input is switched through the MUX to the EthT/RR output. The Eth/R/RT input also continues through the MUX to the ETHRA FPGA.

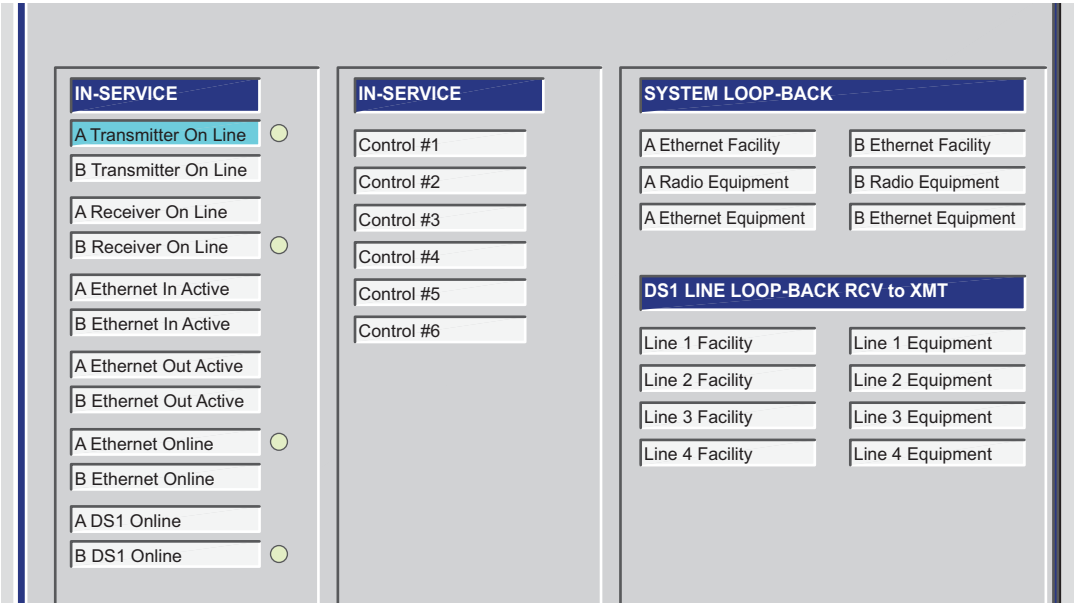

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Figure 6-17 Ethernet Radio, Ethernet Control Screen

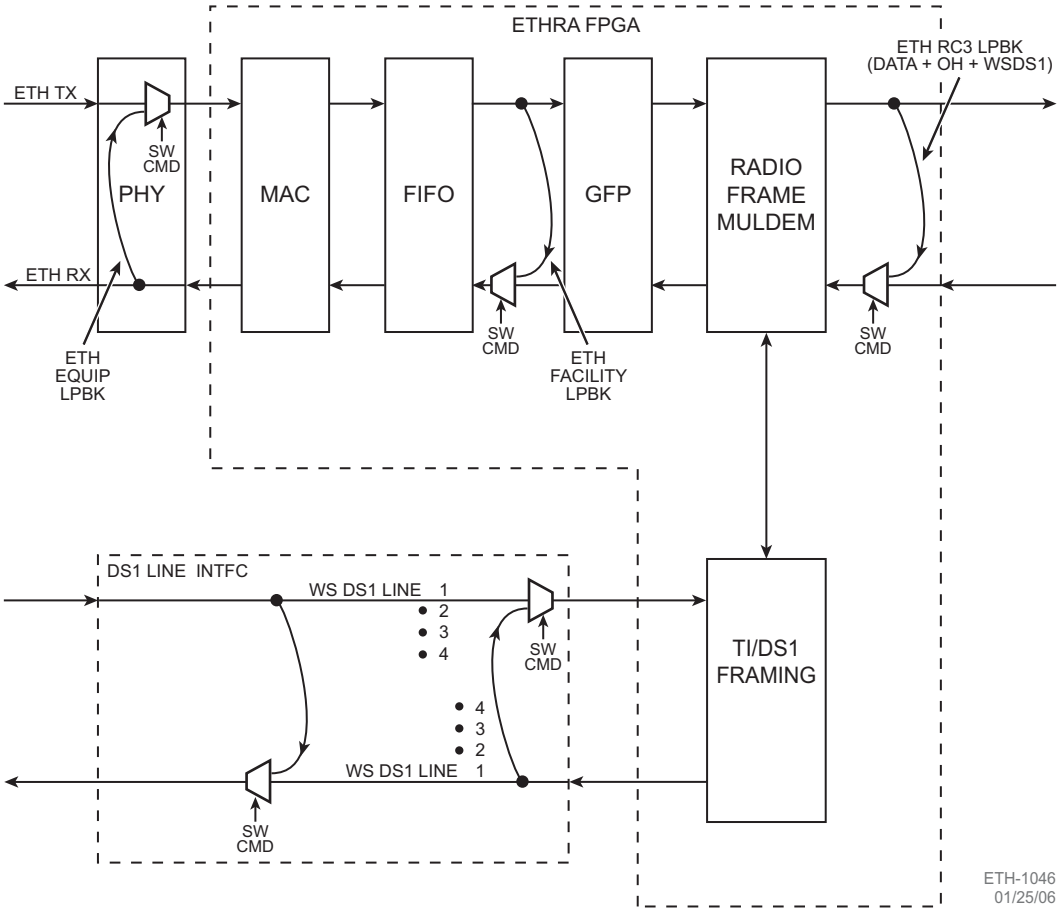


Figure 6-18 Ethernet Loopbacks

6.11.3.2 RC3 Equipment Loopback

RC3 equipment loopback is a local loopback function that can be used to test the performance of a standalone radio. RC3 Equipment loopback is enabled by selecting **A RC3 Equipment** under **SYSTEM LOOPBACK** on the USI Control screen. This function loops the Eth RCV/radio XMT (EthR/RT) input back into the EthXMT/radio RCV (EthT/RR) output. The actual loopback occurs in the ETHRA FPGA on the I/O interface. When enabled, the radio XMT (RT) output is switched through the MUX in the ETHRA, replacing the radio RC (RR) input. The radio XMT (RT) output also continues to the XMTR RT output.

6.11.3.3 Eth Equipment Loopback

Eth equipment Loopback is a farend loopback function that can be used to test the over-the-hop performance of radios. Eth Equipment loopback is enabled by selecting A Eth Equipment under SYSTEM LOOPBACK on the USI Control screen. This function loops the radio RCV (RR) input into the radio XMT output. The actual loopback occurs in the PHY circuits on the I/O interface. When enabled, the radio RCV (RR) input is switched through the MUX in the ETHRA and through the MUX in the PHY, replacing the Eth RCV/radio XMT (EthR/RT) output to the ETHRA. The radio RCV (RR) input also continues through the MUX in the PHY to the EthT/RR output.

6.11.4 DS1 Line Loopback

There are two individual DS1 line loopback functions available on the Ethernet radio Control screen; Line facility Loopback and Line Equipment Loopback. All loopbacks occur on the Ethernet I/O interface module. The DS1 line loopback functions are controlled by software via the DS1 LINE LOOPBACK controls on the USI Control screen.

6.11.4.1 DS1 Line Facility Loopback

See Figure 6-19 for functional block diagram. DS1 facility loopback is a local loopback function that can be used to test the performance of a standalone radio. Individual DS1 line facility loopback is enabled by selecting **Line 1, 2, 3, or 4 Facility** under **DS1 LINE LOOPBACK** on the USI Control screen. This function loops the DS1 RX1, 2, 3, or 4 Tip and Ring inputs to the DS1 TX1, 2, 3, or 4 Tip and Ring outputs. The actual loopback occurs in the QuadFalc FPGA on the I/O interface. When enabled, the DS1, RX1, 2, 3, or 4 Tip and Ring inputs are switched through the MUX in the QuadFalc, replacing the radio inputs from the ETHRA. The radio DS1 Rx1, 2, 3, or 4 Tip and Ring output of the QuadFalc also continues to the ETHRA FPGA.

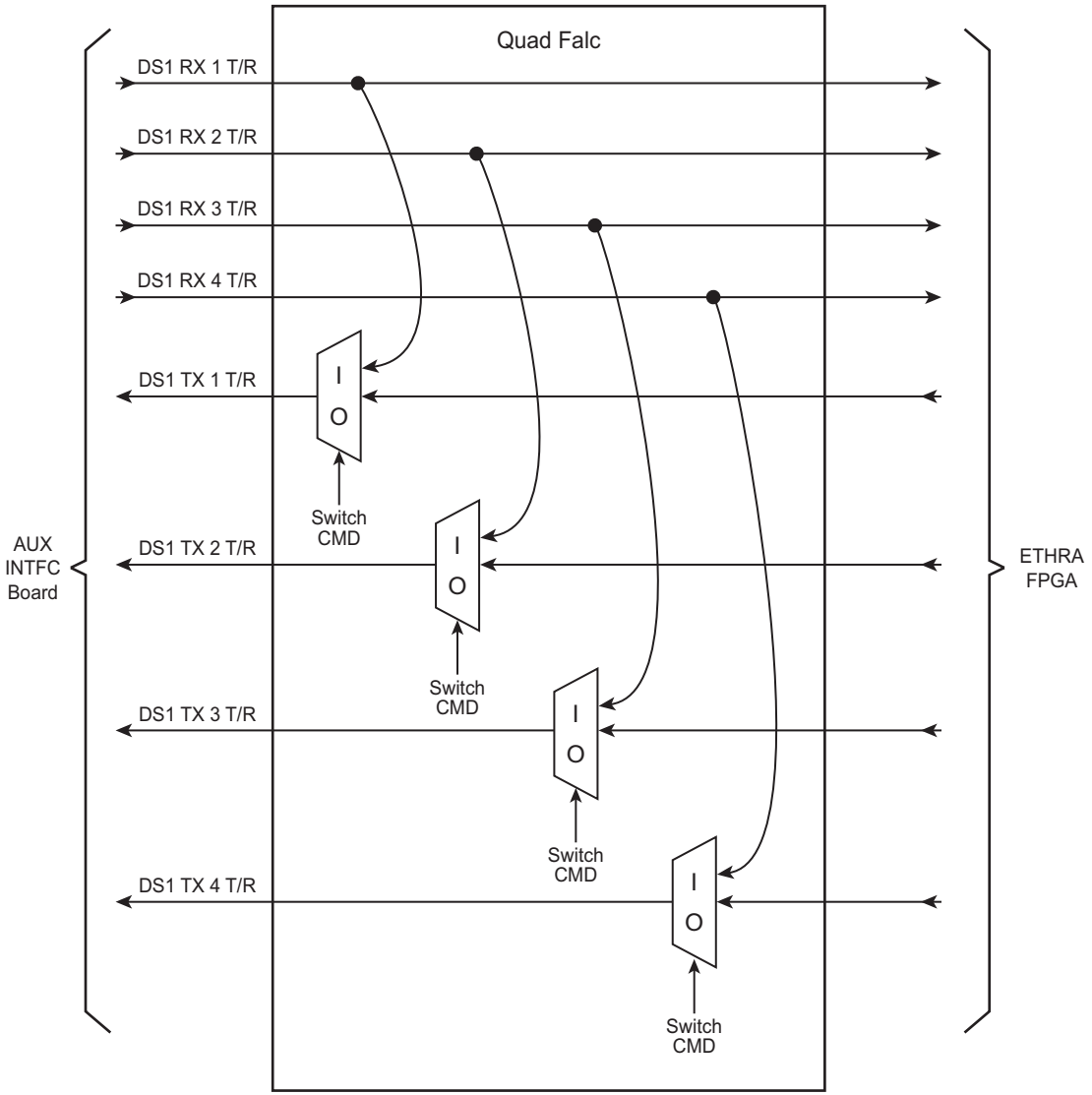
6.11.4.2 DS1 Line Equipment Loopback

See Figure 6-20 for a functional block diagram. DS1 Equipment Loopback is a farend loopback function that can be used to test the performance of radios over the hop. Individual Line Equipment facility loopback is enabled by selecting **Line 1, 2, 3, or 4 Equipment** under **DS1 LINE LOOPBACK** on the USI Control screen. This function loops the DS1 TX1, 2, 3, or 4 Tip and Ring inputs from the RCV circuits on the ETHRA to the DS1 RX1, 2, 3, or 4 Tip and Ring outputs of the QuadFalc to the XMT circuits in the ETHRA. The loopback occurs in the QuadFalc FPGA on the I/O interface. When enabled by the switch command, the DS1 TX1, 2, 3, or 4 Tip and Ring inputs are switched through the MUX in the QuadFalc, replacing the radio DS1 inputs from the AUX interface. The radio DS1 TX1, 2, 3, or 4 output of the QuadFalc continues to the AUX interface board.

CAUTION

Possibility of Service Interruption

Loopbacks cause loss of traffic on DS1 outputs to X-connect.



Note

Line 4 available in Terminal configuration.
Not available in Repeater configuration.

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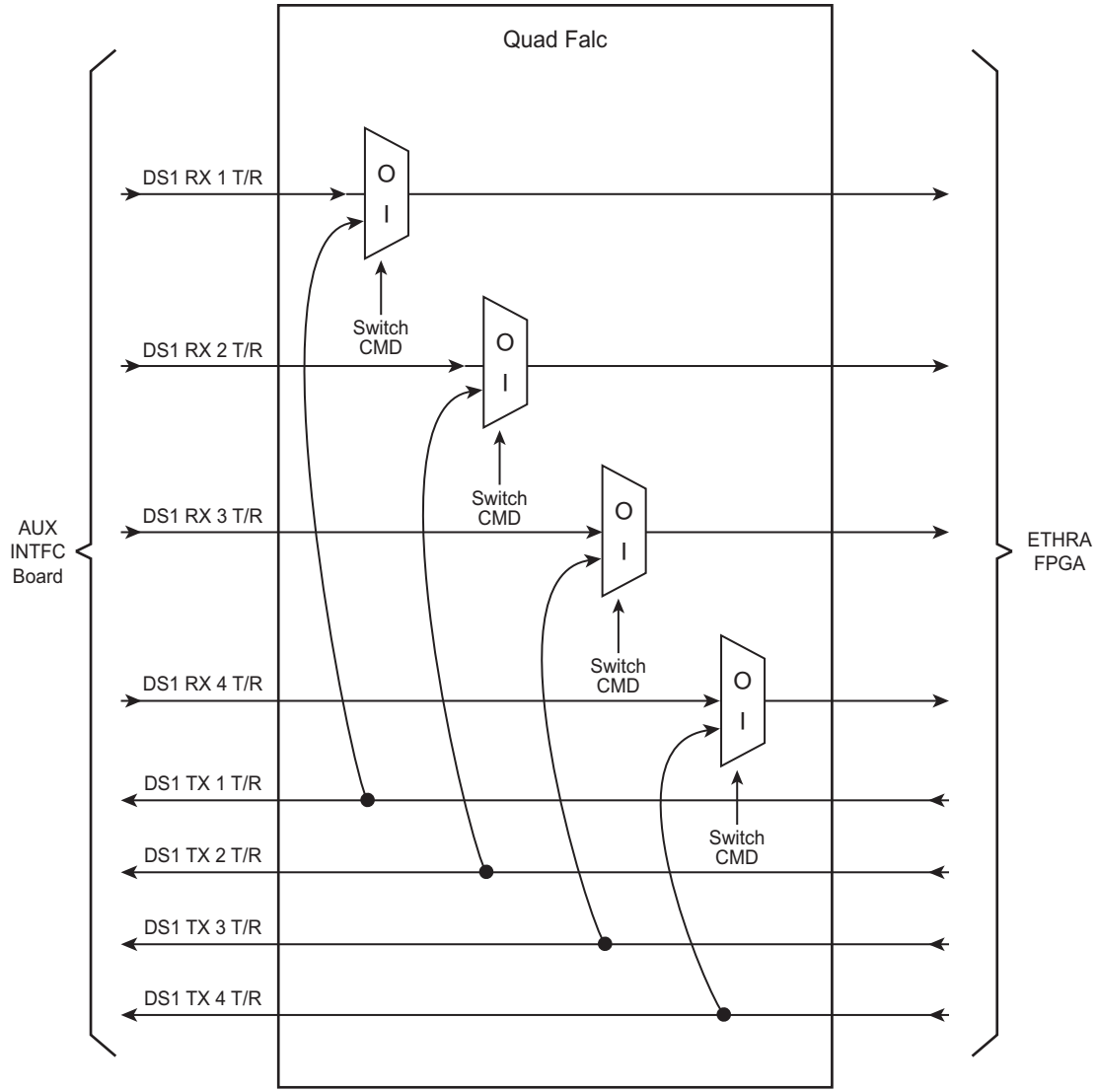
Figure 6-19 DS1 Facility Loopback – Ethernet

CAUTION

Possibility of Service Interruption

Loopbacks cause loss of traffic on DS1 inputs to ETHRA FPGA.



Note

Line 4 available in Terminal configuration.
Not available in Repeater configuration.

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Figure 6-20 DS1 Equipment Loopback – Ethernet

6.11.5 Inventory Screen

See Figure 6-21 for Inventory Screen. The inventory screen is used to display current shelf inventory, including module type number, module part number, hardware revision, software revision (if applicable), serial number, and remarks (if any).

Inventory is automatically updated if modules are replaced. Manual changes to the inventory list on the screen are performed only in the factory.

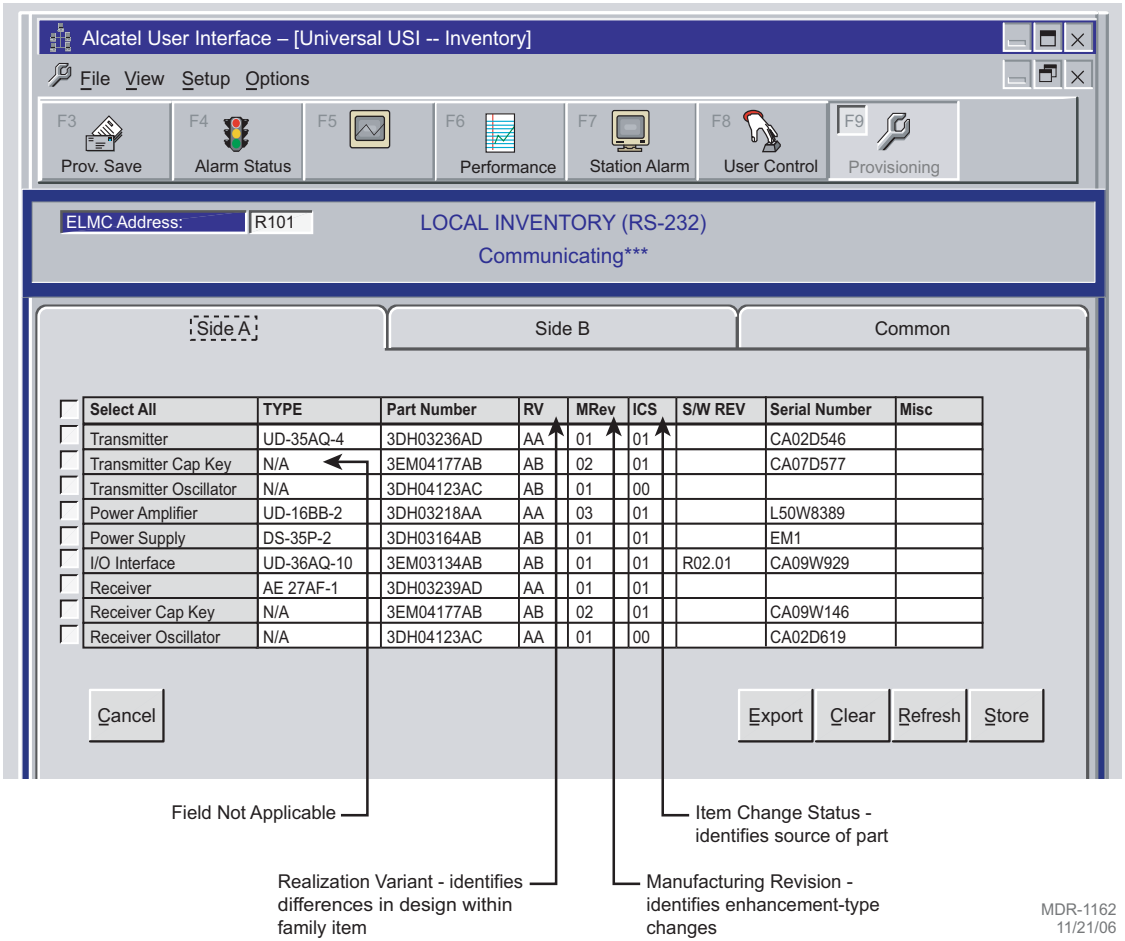

Figure 6-21 Inventory Screen