



MDR-8000/i/s/u

Microwave Digital Radios Users Manual

Alcatel Part Number 3EM15726AA
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Part 2 of 2

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

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. Refer to the Users Guide section and applicable DS1/E1, DS3, or OC3 Initial Turnup section on the attached CD for more information.

4.2 RECOMMENDED SEQUENCE

Perform the following initial turnup procedures in sequence:

- 1 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.

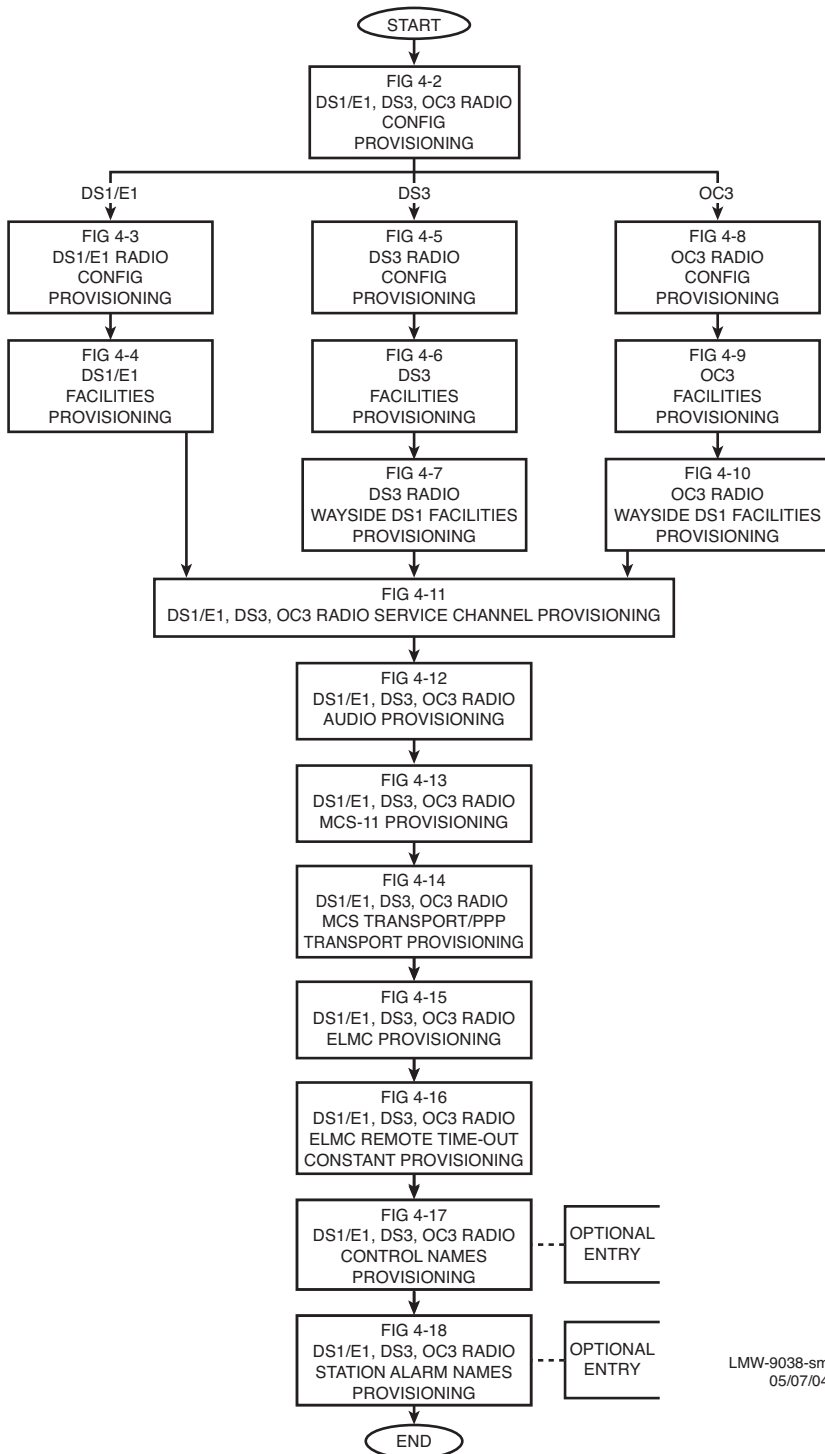
- 2 Establish communication between radio and USI computer.

Note

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

- 3 Provision radio. See Figure 4-1.

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).



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Figure 4-1 Provisioning Sequence

4.3 PROVISIONING RADIO

Note

Screen shown is for DS1 Radio. DS3 and OC3 radio configuration provisioning is similar. 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.

The screenshot shows a provisioning interface with the following fields and callouts:

- SYSTEM ID:** ELMC; TEST1
- RADIO LINK ID:** Disable
- RADIO TYPE:** MDR-8000 DS1, 16 LINES, 128 TCM, 6-8 GHz
- RADIO CONFIG:** HS Tx/HS Rx, TERMINAL, ATPC Enabled, A&B PA Present
- SYSTEM ALARM:** Visual/Audible, Relays ON/NO, Station Alarm 13-16, RSL Alarm Enable
- RCV SWITCHING:** RSL-Sw Enable, Eye BER Disable
- OPTIONS:** Option Key: Stat/Prov/WaySide

Callout boxes provide detailed instructions for each field:

- DISPLAYS NUMBER OF LINES AVAILABLE AS DETERMINED BY CAPACITY KEY. CHANGING NUMBER OF LINES REQUIRES CHANGING CAPACITY KEY.** (Points to 16 LINES)
- BACKSPACE TO DELETE CURRENT ADDRESS AND ENTER 5-DIGIT REMOTE RACK ADDRESS. SEE FIGURE 6-11 FOR DETAILS.** (Points to ELMC; TEST1)
- ENABLE OR DISABLE AUTOMATIC POWER CONTROL (ATPC) FUNCTION. SELECT **ATPC Disable**, **ATPC Enabled**, OR **ATPC with Timeout** FROM DROP DOWN LIST. SEE SHEET 2 OF 3 FOR DETAILS.** (Points to ATPC Enabled)
- DISPLAYS RADIO TYPE. NOT PROVISIONABLE.** (Points to MDR-8000 DS1)
- SELECT **TERMINAL**, **REPEATER**, **RING TERMINAL** OR **RING REPEATER** FROM DROP DOWN LIST. SELECT **REPEATER** IF TRAFFIC AND SERVICE CHANNEL (FOUR RAILS OF X/Y DATA) ARE BEING TRANSPORTED BETWEEN J314 OF BOTH SHELVES.** (Points to TERMINAL)
- DISPLAYS MODULATION SCHEME. NOT PROVISIONABLE.** (Points to 128 TCM)
- SELECT **DISABLE** OR DOUBLE CLICK TO ENABLE (00 DISPLAYS). ENTER 2-DIGIT NUMBER BETWEEN 00 AND 99 AS IDENTIFICATION FOR RADIO RCV/XMT PAIR. USE FOR FREQUENCY COORDINATION IN CONGESTED AREAS THAT HAVE NEARBY TRANSMITTERS AT SAME FREQUENCY WITH SAME MODULATION. ID MUST BE SAME AT BOTH ENDS OF HOP. IF RCV ID DOES NOT MATCH ID RECEIVED FROM FAR-END XMTR, A USI ALARM AND RACK ALARM ARE GENERATED.** (Points to 6-8 GHz)
- SELECT **RSL-Sw Enable** TO ENABLE AUTOMATIC RECEIVER SWITCHING BASED ON RSL. WHEN ENABLED, RECEIVER SWITCHES IF: 1. ON-LINE RCV RSL IS BELOW RCV AGC THRESHOLD, AND 2. OFF-LINE RCV RSL IS ABOVE RCV AGC THRESHOLD. SELECT **RSL-Sw Disable** TO DISABLE AUTOMATIC RECEIVER SWITCHING.** (Points to RSL-Sw Enable)
- SELECT **Major/Minor** TO TRIGGER MAJOR ALARM ON ANY ALARM ON ON-LINE SIDE AND MINOR ALARM ON ANY ALARM ON OFF-LINE SIDE. SELECT **Visual/Audible** TO TRIGGER RACK ALARM ON ANY ALARM ON ON-LINE SIDE.** (Points to Visual/Audible)
- DISPLAYS ELMC OPTION KEY TYPE INSTALLED ON CONTROLLER. STAT (STATUS)/PROV (REMOTE PROVISIONING)/WAYSIDE (WITH WAYSIDE DS1 MONITORING). NOT PROVISIONABLE. CHANGING DISPLAY REQUIRES CHANGING OPTION KEY.** (Points to Option Key: Stat/Prov/WaySide)
- SELECT **Station Alarm 13-16** TO ENABLE STATION ALARM 13-16 INPUTS TO RELAY INTFC. WHEN EXTERNAL TBOS IS WIRED TO RADIO, SELECT **TBOS Display 1-8** TO ENABLE TBOS DRIVERS ON CONTROLLER AND SELECT A TBOS DISPLAY (1-8) TO VIEW.** (Points to Station Alarm 13-16)
- SELECT **A&B PA Present** IF SHELF IS EQUIPPED WITH A&B PAs, A OR B PA ONLY IF SHELF IS EQUIPPED WITH ONLY ONE PA, OR **NO PA** IF SHELF IS NOT EQUIPPED WITH PA. UNEQUIPPED PA ALARMS ARE DISABLED.** (Points to A&B PA Present)
- SELECT APPROXIMATE ERROR RATE AT WHICH EYE CLOSURE ALARM ACTIVATES AND SWITCHING OCCURS: **EYE BER=1X10⁻⁵**, **1X10⁻⁶**, **1X10⁻⁷**, **1X10⁻⁸** OR SELECT **Eye BER Disable** TO ACTIVATE ALARMS AT APPROXIMATELY 1X10⁻⁶ WITHOUT RECEIVERS SWITCHING.** (Points to Eye BER Disable)
- SELECT **Relays ON/NO** (NORMALLY OPEN-HIGH IMPEDANCE) OR **Relays ON/NC** (NORMALLY CLOSED-GROUND) ON ALARM FOR ALARM/STATUS OUTPUTS OR **Relays OFF**. REFER TO RELAY INTERFACE IN THEORY SECTION FOR DETAILS.** (Points to Relays ON/NO)

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

Note

Screen shown is for DS1 Radio. DS3 and OC3 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/O**, 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.

SYSTEM ID:	ELMC: TEST1	RADIO LINK ID: Disable		
RADIO TYPE:	MDR-8000 DS1	16 LINES	128 TCM	6-8 GHz
RADIO CONFIG:	HS Tx/HS Rx	TERMINAL	ATPC Enabled	A&B PA Present
SYSTEM ALARM	Visual/Audible	RELAYS ON/NO	Station Alarm 13-1	RSL Alarm Enable
RCV SWITCHING:	Disable AGC	BER Disable		
OPTIONS:	Option Key: Stat./Prov/WaySide			

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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.

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

Note

MASTER RING CONFIGURATIONS – Master rings are networks that consist entirely of a loop of synchronous repeaters. All nodes in the same ring direction use the same clock timing. Timing may be different for each direction. All service channel data is passed synchronously around the ring. The status of the ring is monitored using messages in the ELMC channel.

SUBTENDING RING CONFIGURATIONS – Subtending rings are networks that connect asynchronously to another ring at two locations (called primary and secondary connection points). The networks consist of a string of synchronous repeaters. All nodes in the same direction use the same clock timing. Timing may be different for each direction. All service channel data is passed synchronously within the subtending ring section and asynchronously to the main ring. Asynchronous connection must use LMC1 for the ELMC connection. Messages are sent on LMC1 by the subtending ring primary and secondary nodes to monitor for continuity of the synchronous connection.

SELECT **RING REPEATER MASTER** AT ANY ONE RADIO IN THE RING, TO ENABLE THE CONFIGURATION THAT IS USED TO BREAK THE LOOP OF A SYNCHRONOUS RING. IN THIS CONFIGURATION, THE RF SERVICE CHANNEL AND REPEATER SYNC ARE DISABLED (NORMALLY ENABLED), PREVENTING THE RING FROM CLOSING ON ITSELF. WHEN A RING FAILURE OCCURS, THE MASTER RECEIVES A RING FAIL MESSAGE FROM THE FAILED RADIO AND RESPONDS BY ENABLING THE RF SERVICE CHANNEL AND REPEATER SYNC TO CONNECT THE SERVICE CHANNELS. THE FAILURE IS WHAT NOW BREAKS THE SERVICE CHANNEL LOOP, PREVENTING THE RING FROM CLOSING ON ITSELF.

SYSTEM ID: ELMC: TEST1 RADIO LINK ID: Disable

RADIO TYPE: MDR-8000 DS1 16 LINES 128 TCM 6-8 GHz

RADIO CONFIG: HS Tx/HS Rx Ring Repeater Normal

ATPC Enabled

SYSTEM ALARM Visual/Audible

RCV SWITCHING: RSL-SW Enable

OPTIONS: Option Key: Stat/Prov/WaySide

Ring Repeater options: Normal, Primary, Secondary, Master

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SELECT **RING REPEATER NORMAL** AT ALL RADIOS IN THE RING, EXCEPT THE ONE PROVISIONED **MASTER**. THIS ENABLES THE CONFIGURATION THAT ENABLES RF SERVICE CHANNEL AND REPEATER SYNC, ALLOWING SERVICE CHANNEL DATA TO PASS THROUGH THE RF AND REPEATER PORTS. WHEN A FAILURE IS DETECTED ON THE RF OR REPEATER PORT, THE ASSOCIATED RADIO SENDS A RING FAIL MESSAGE TO THE MASTER.

SELECT **RING REPEATER PRIMARY** WHEN THE RADIO IS IN THE MIDDLE OF A SUBTENDING RING AND IS THE PRIMARY SERVICE CHANNEL CONNECTION POINT TO ANOTHER RING. IN THIS CONFIGURATION, THE RF SERVICE CHANNEL AND REPEATER SYNC ARE ENABLED, ALLOWING SERVICE CHANNEL DATA TO PASS THROUGH THE RF AND REPEATER PORTS. WHEN A FAILURE OCCURS, THE RF SERVICE CHANNEL AND REPEATER SYNC ARE DISABLED.

SELECT **RING REPEATER SECONDARY** WHEN THE RADIO IS IN THE MIDDLE OF A SUBTENDING RING AND IS THE SECONDARY SERVICE CHANNEL CONNECTION POINT TO ANOTHER RING. IN THIS CONFIGURATION, THE RF SERVICE CHANNEL AND REPEATER SYNC ARE DISABLED. WHEN A FAILURE OCCURS, THE RF SERVICE CHANNEL IS ENABLED.

Figure 4-2 DS1/E1, DS3, OC3 Radio Configuration Provisioning (Sheet 3 of 4)

→ RING TERMINAL MASTER – NOT USED

The screenshot shows a configuration window with the following fields and values:

- SYSTEM ID: [Empty]
- ELMC: TEST1
- RADIO LINK ID: Disable
- RADIO TYPE: MDR-8000 OC3, OC-3, 128 QAM
- RADIO CONFIG: HS Tx, HS Rx, Ring Repeater (dropdown menu open), Normal (dropdown menu open)
- ATPC Enabled, A&B PA Present
- SYSTEM ALARM: Visual/Audible, RELAYS ON/NO
- RCV SWITCHING: Disable AGC, BER Disable
- OPTIONS: Option Key: Stat/Prov/WaySide

The 'Ring Repeater' dropdown menu is open, showing the following options: Normal, Terminal Repeater, Ring Terminal, Ring Repeater, and Upgrade Enable. The 'Normal' option is selected. Lines connect the 'Normal' option in the dropdown to the first text block, and the 'Ring Terminal', 'Ring Repeater', and 'Upgrade Enable' options to the second and third text blocks.

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→ SELECT **RING TERMINAL NORMAL** AT FIRST RADIO IN AN INCOMPLETE RING, WHEN BUILDING OUT A NEW RING. THIS PREVENTS HAVING TO GO BACK AND REPROVISION EACH RADIO WHEN THE RING IS COMPLETE. AS EACH NEW HOP IS ADDED, PROVISION THE RADIOS ON EACH END AS **RING TERMINAL NORMAL** AND PROVISION ALL RADIOS IN BETWEEN AS **RING REPEATER NORMAL**. IN THE **RING TERMINAL NORMAL** CONFIGURATION, THE REPEATER CABLE IS NOT INSTALLED. SYNC ALARMS ARE INHIBITED. THE RF SERVICE CHANNEL IS ENABLED, ALLOWING SERVICE CHANNEL DATA TO PASS THROUGH THE RF PORT. WHEN THE RING IS COMPLETE, PROVISION ONE RADIO **RING REPEATER MASTER** AND ALL OTHER RADIOS AS **RING REPEATER NORMAL**.

SELECT **RING TERMINAL NORMAL** AT RADIOS AT ENDS OF STUBS OFF SUBTENDING RINGS.

→ SELECT **RING TERMINAL PRIMARY** WHEN THE RADIO IS THE PRIMARY CONNECTION POINT TO THE MAIN RING. IN THIS CONFIGURATION, THE REPEATER CABLE IS NOT INSTALLED. SYNC ALARMS ARE INHIBITED. THE RF SERVICE CHANNEL IS ENABLED, ALLOWING SERVICE CHANNEL DATA TO PASS THROUGH THE RF PORT. THE RF SERVICE CHANNEL IS DISABLED WHEN A FAILURE OCCURS.

→ SELECT **RING TERMINAL SECONDARY** WHEN THE RADIO IS THE SECOND CONNECTION POINT TO THE MAIN RING. IN THIS CONFIGURATION, THE REPEATER CABLE IS NOT INSTALLED. SYNC ALARMS ARE INHIBITED. THE RF SERVICE CHANNEL IS DISABLED. THE RF SERVICE CHANNEL IS ENABLED WHEN A FAILURE OCCURS ALLOWING SERVICE CHANNEL DATA TO PASS THROUGH THE RF PORT.

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

SYSTEM ID:	ELMC: TEST1	RADIO LINK ID:	Disable
RADIO TYPE:	MDR-8000 DS1	16 LINES	128 TCM
RADIO CONFIG:	HS Tx/HS Rx	TERMINAL	
	ATPC Enabled	A&B PA Present	
SYSTEM ALARM	Visual/Audible	RELAYS ON/NO	Station Alarm 13-16
RCV SWITCHING:	Disable AGC	BER Disable	
OPTIONS:	Option Key:	Stat/Prov/WaySide	

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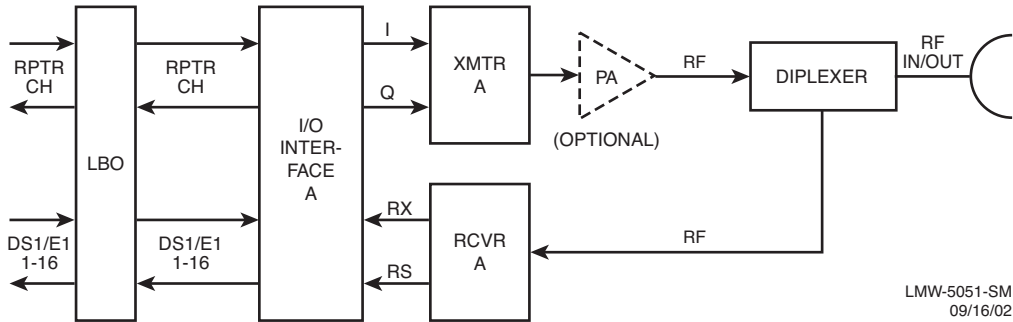
SELECT ONE:

- * NS Tx/NS Rx
- NS Tx/HS Rx
- * NS Tx/SD Rx
- * HS Tx/HS Rx
- * HS Tx/SD Rx
- FD TxA/Rx A
- FD TxA/Rx B

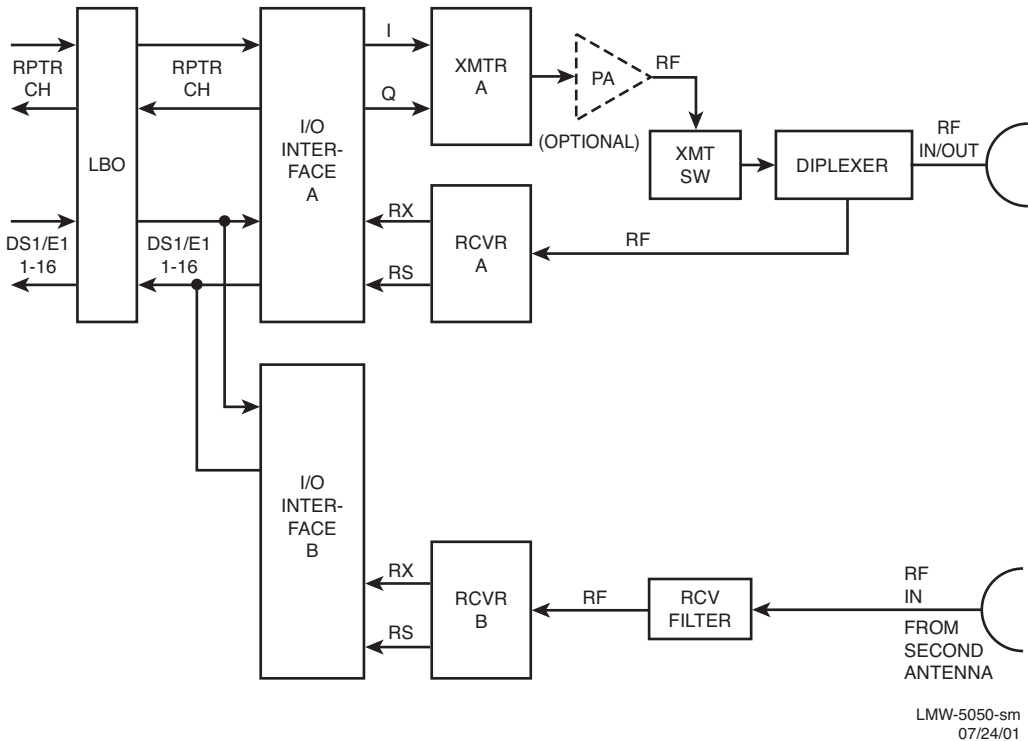
NS = NON-STANDBY
HS = HOT-STANDBY
SD = SPACE DIVERSITY
FQ = FREQUENCY DIVERSITY

* ALTHOUGH THERE ARE A TOTAL OF 7 CONFIGURATIONS, ONLY 4 EXAMPLES ARE ILLUSTRATED.

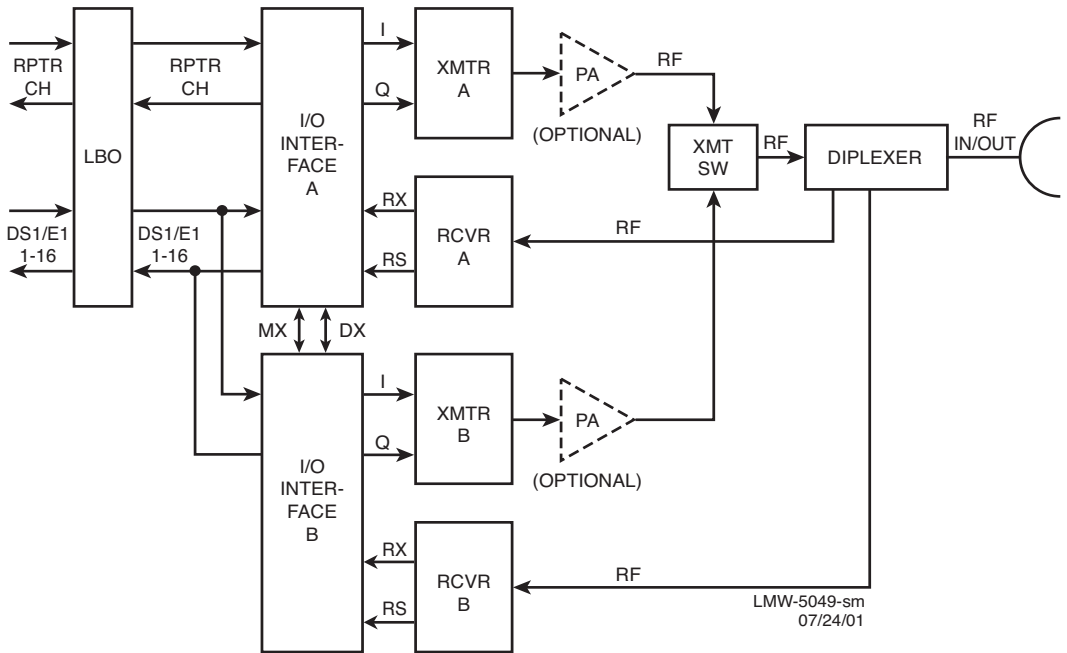
Figure 4-3 DS1/E1 Radio Configuration Provisioning



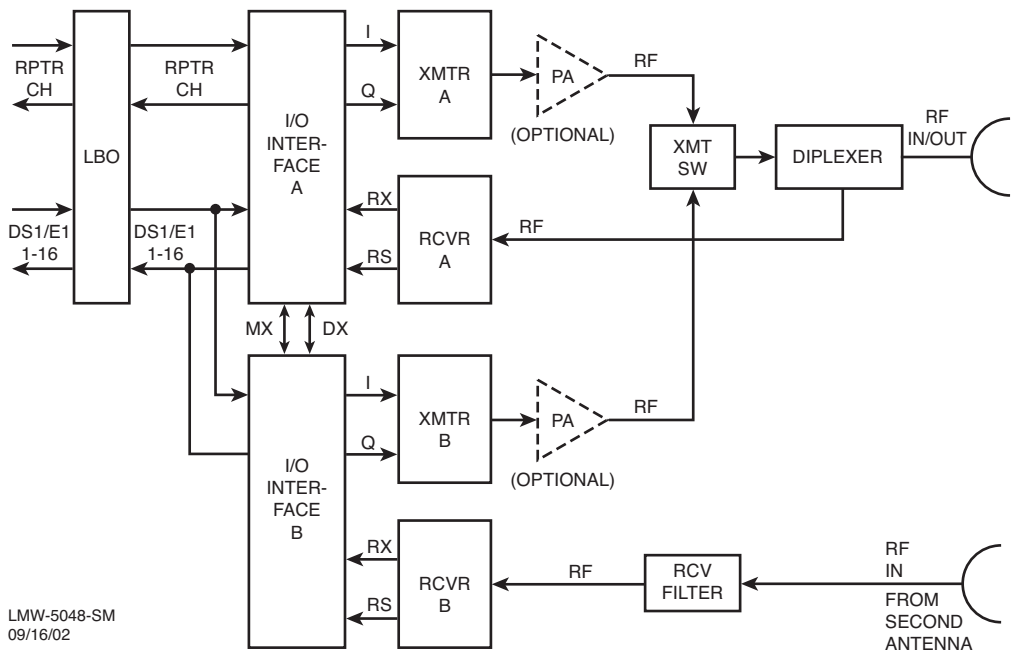
DS1/E1 PROVISIONING EXAMPLE 1: NS Tx/NS Rx



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



DS1/E1 PROVISIONING EXAMPLE 3: HS Tx/HS Rx



DS1/E1 PROVISIONING EXAMPLE 4: 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 **US1 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**.

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**.

SELECTING **ON** INSERTS LOCAL DATA AND TURNS ON ALARM REPORTING. SELECTING **NM** (NOT MONITORED), DEFAULT SETTING, INSERTS LOCAL AIS DATA BUT TURNS OFF ALARM REPORTING. SELECTING **OFF** TURNS OFF LOCAL DATA INSERT AND TURNS OFF ALARM REPORTING.

SELECT **ON** FOR ALL LINES IN USE AT A TERMINAL OR DROP-AND-INSERT REPEATER. SELECT **NM** FOR ALL LINES NOT USED AT A TERMINAL AND DROP-AND-INSERT REPEATER. SELECT **OFF** FOR ALL LINES AT A NON-STANDBY THROUGH REPEATER, OR SELECT **OFF** FOR LINES 1 THROUGH 4 AND **NM** FOR LINES 5 THROUGH 16 AT A PROTECTED REPEATER.

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

LINES	1	2	3	4	5	6	7	8	Select: All
INSERT CHANNEL	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	
DROP CHANNEL	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	
LINE CODING	AMI	AMI	AMI	AMI	AMI	AMI	AMI	AMI	
AIS INHIBIT	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	

LINE	9	10	11	12	13	14	15	16	Select: All
INSERT CHANNEL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
DROP CHANNEL	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
LINE CODING	AMI	AMI	AMI	AMI	AMI	AMI	AMI	AMI	
AIS INHIBIT	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
AIS SIGNAL	ALL ONES								

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

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

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.

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

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

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Figure 4-4 DS1/E1 Facilities Provisioning

SELECT **Degrade Enable** TO ACTIVATE APPROXIMATE ERROR RATE AT WHICH **BER Deg Alm** ALARM ACTIVATES AND SWITCHING OCCURS: 1X10-5, 1X10-6, 1X10-8, ON DS3 FACILITIES PROVISIONING SCREEN. SELECT **Degrade Disable** TO ACTIVATE **BER Deg Alm** AT SELECTED ERROR RATE WITHOUT RCVRS SWITCHING.

SYSTEM ID: [] ELMC: TEST1 RADIO LINK ID: Disable

RADIO TYPE: MDR-8000 DS3 3 LINES 64 QAM

RADIO CONFIG: HS Tx/HS Rx [v] TERMINAL [v]
 ATPC Enabled [v] A&B PA Present [v]

SYSTEM ALARM: Visual/Audible [v] RELAYS ON/NO [v] Station Alarm 13-16 [v] RSL Alarm Enable [v]

RCV SWITCHING: Disable AGC [v] BER Disable [v] Degrade Enable [v]

OPTIONS: Option Key: Stat/Prov/WaySide

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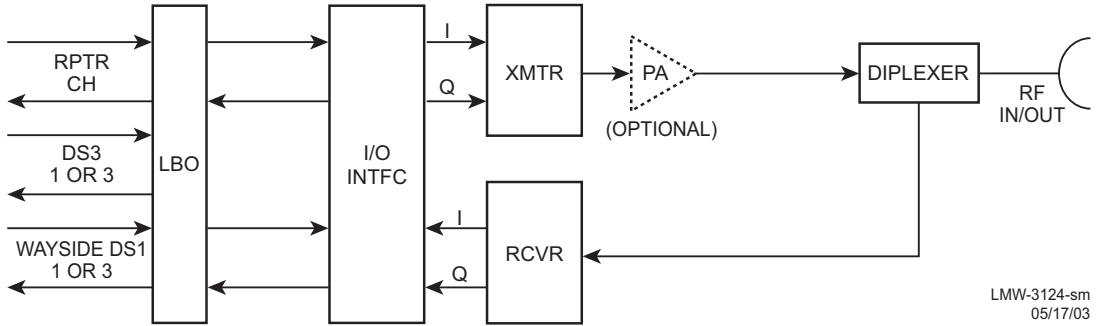
SELECT ONE:

- * NS Tx/NS Rx
- NS Tx/HS Rx
- * NS Tx/SD Rx
- * HS Tx/HS Rx
- * HS Tx/SD Rx
- * FREQ DIV
- * HS Tx/NS Rx
- * SIMPLEX NS Tx
- SIMPLEX HS Tx
- * SIMPLEX NS Rx
- * SIMPLEX HS/SD Rx

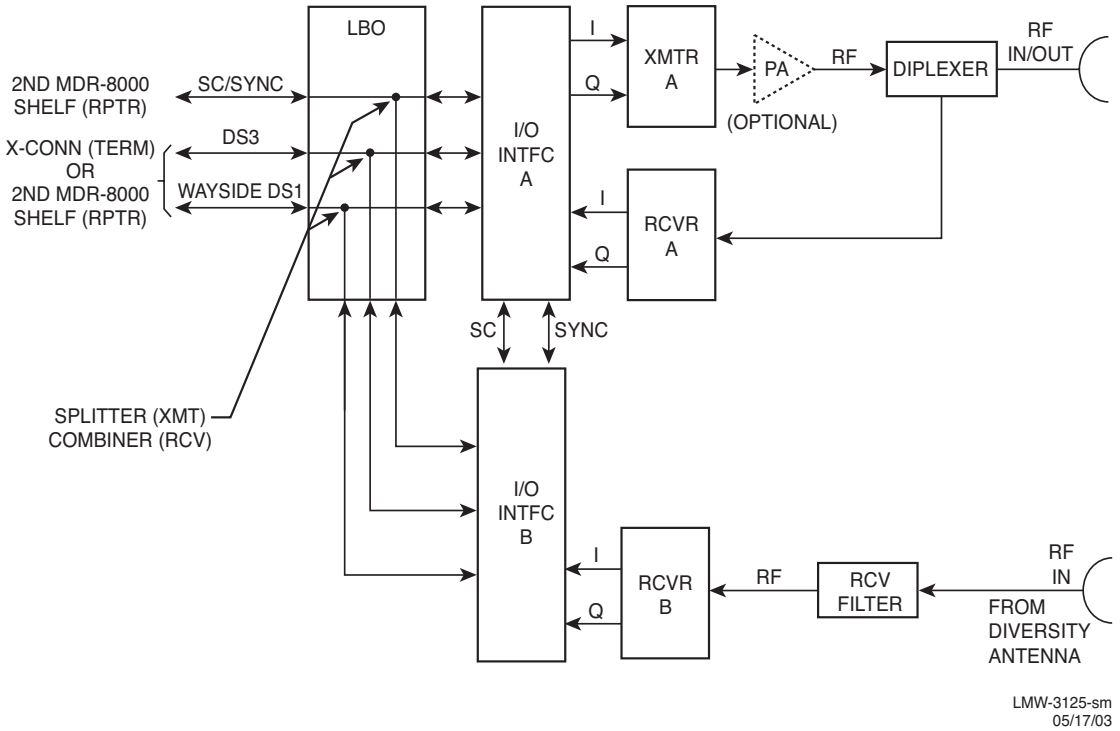
NS = NON-STANDBY
 HS = HOT-STANDBY
 SD = SPACE DIVERSITY
 FQ = FREQUENCY DIVERSITY

* Although there are a total of 11 configurations available, only 9 examples are illustrated.

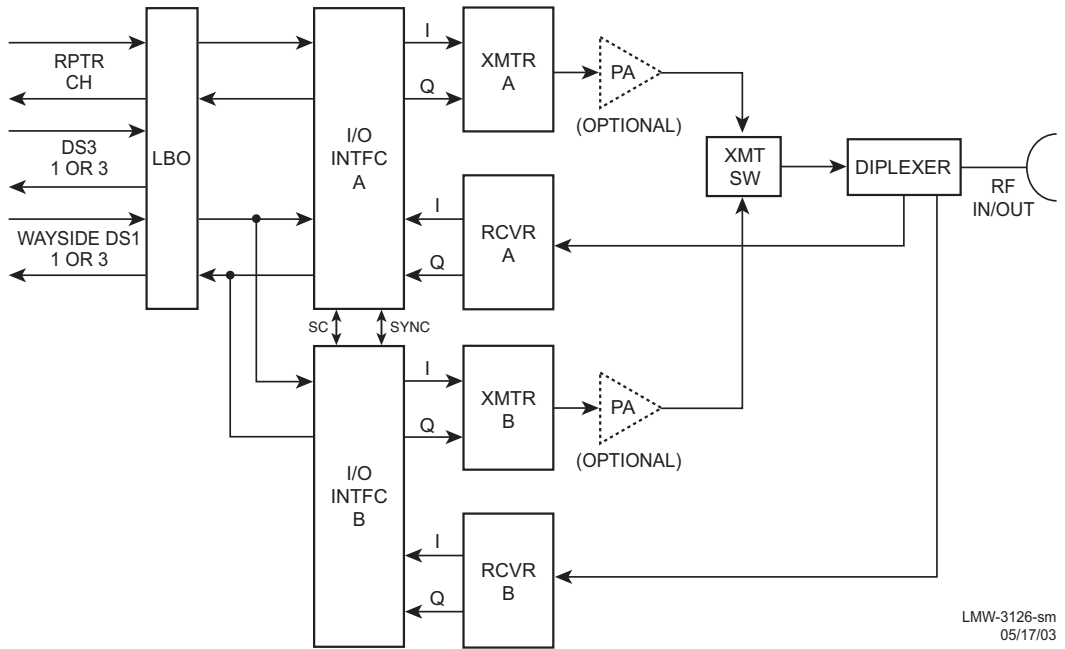
Figure 4-5 DS3 Radio Configuration Provisioning



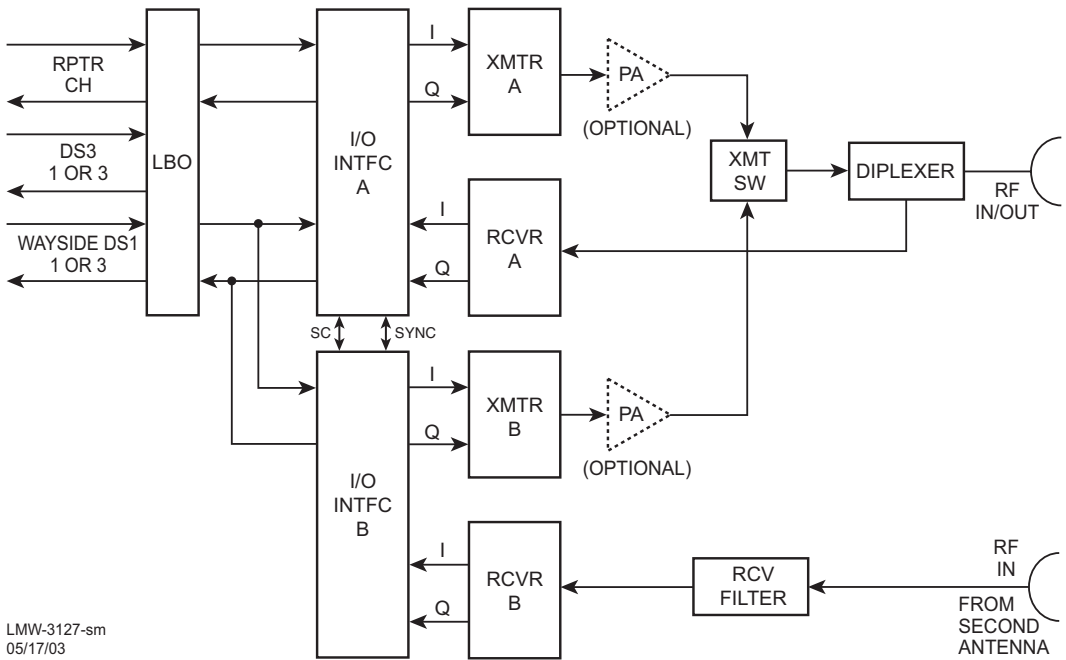
DS3 PROVISIONING EXAMPLE 1: NS Tx/NS Rx



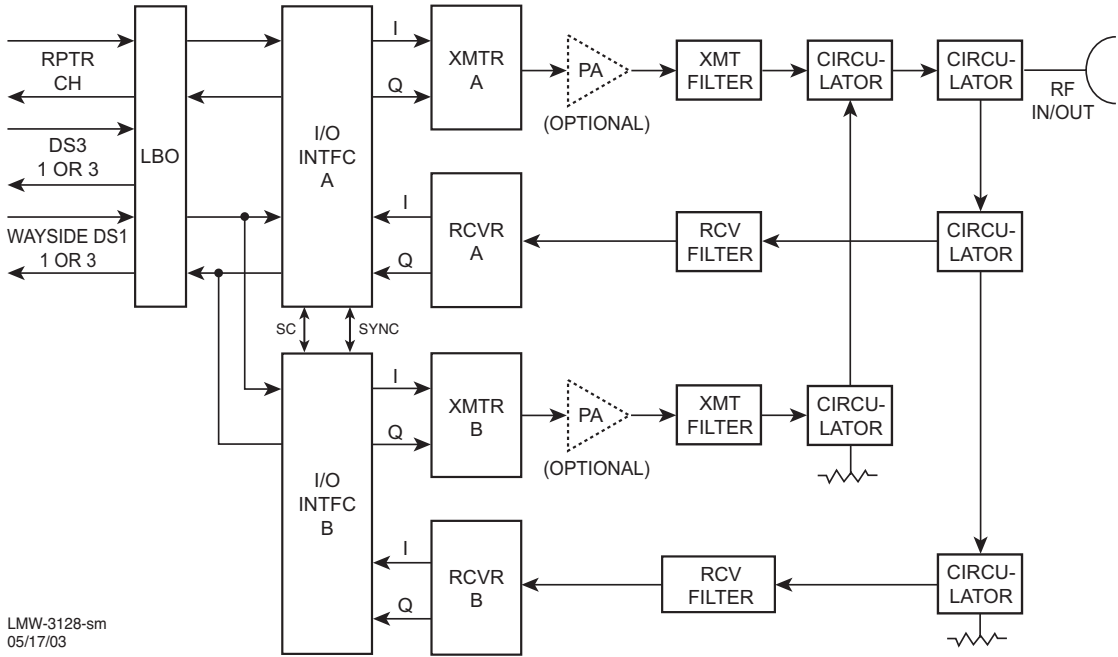
DS3 PROVISIONING EXAMPLE 2: NS Tx/SD Rx



DS3 PROVISIONING EXAMPLE 3: HS Tx/HS Rx

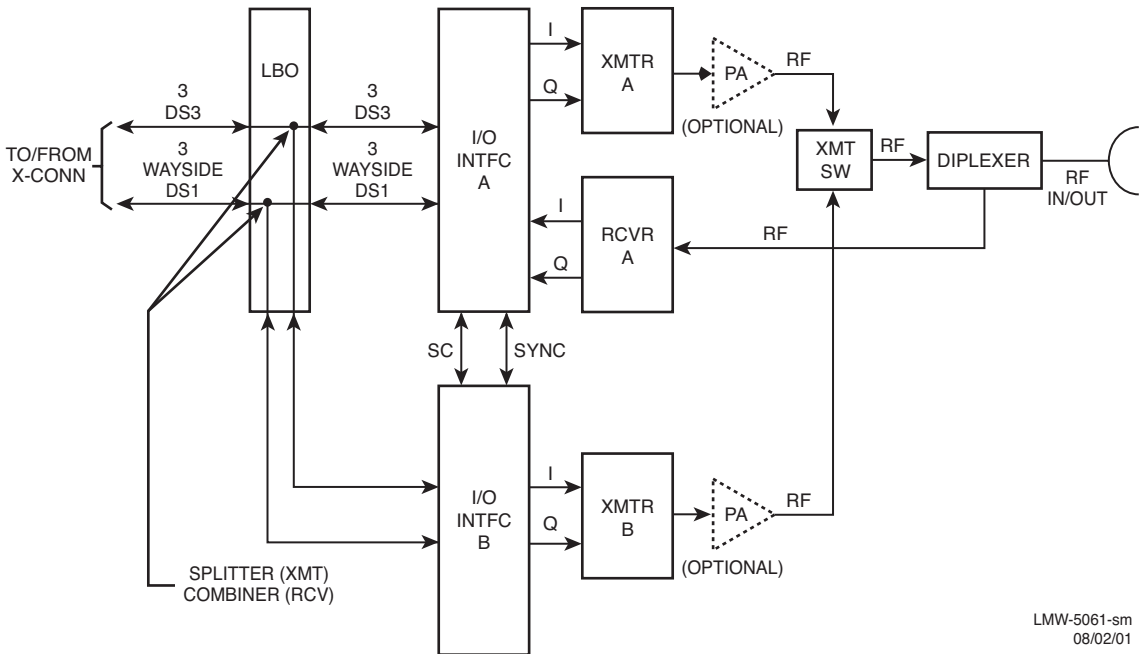


DS3 PROVISIONING EXAMPLE 4: HS Tx/SD Rx



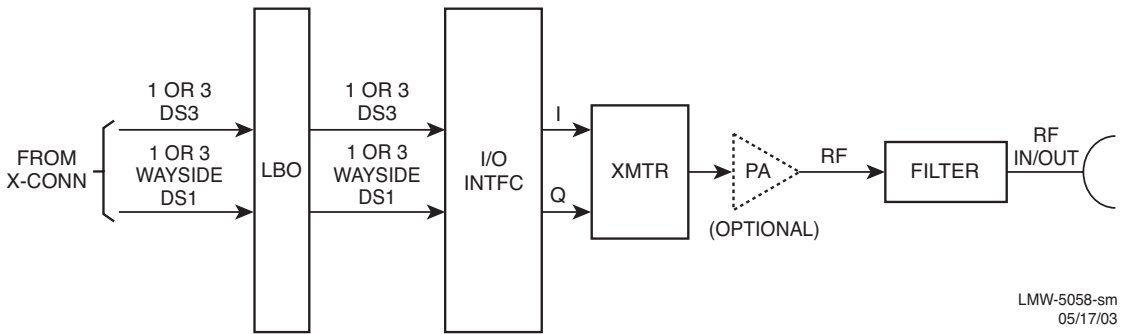
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DS3 PROVISIONING EXAMPLE 5: FREQ DIV

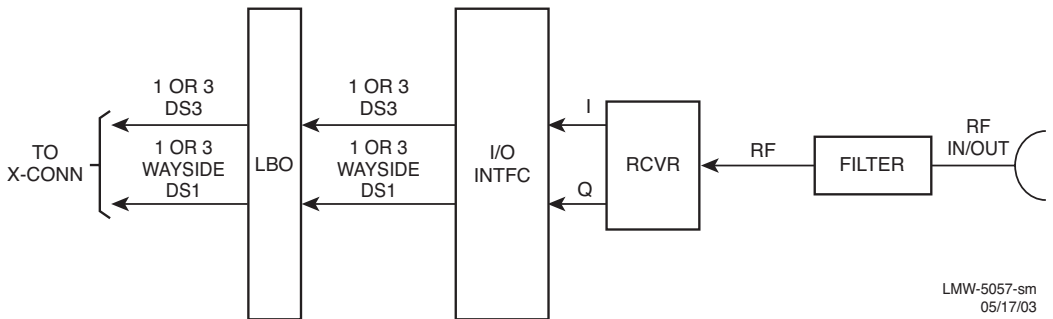


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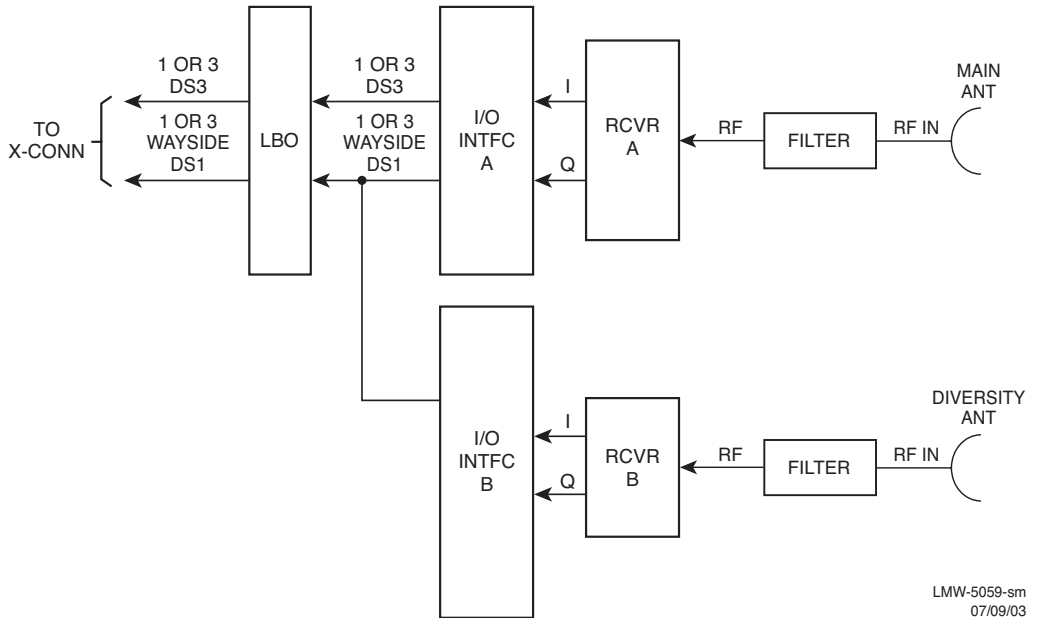
DS3 PROVISIONING EXAMPLE 6: HS Tx/NS Rx



DS3 PROVISIONING EXAMPLE 7: SIMPLEX NS Tx



DS3 PROVISIONING EXAMPLE 8: SIMPLEX NS Rx



DS3 PROVISIONING EXAMPLE 9: SIMPLEX HS/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.

SELECT **ON** TO DISABLE VIOLATION MONITORING AND REMOVAL (VMR) ON LINE DUE TO LOSS OF UPSTREAM DS3 FRAME. DS3 PARITY ERRORS ARE NOT REMOVED AND ARE PASSED ON TO NEXT SECTION. SELECT **OFF** TO ENABLE VMR AND REMOVE DS3 PARITY ERRORS.

SELECT **OFF** TO REPORT ALL ALARMS. SELECT **ON** TO DISABLE ALARMS FOR LINE.

SELECT **ON** TO BRIDGE DS3 LINE 1 ONTO SELECTED LINE(S) 2 AND/OR 3 TO PREVENT ALARMS ON UNUSED LINE(S). SELECT **OFF** TO DISABLE FUNCTION.

DS3 LINES	TX/RX INTERFACE A			TX/RX INTERFACE B			Select All
	1	2	3	1	2	3	
INPUT LINE BRIDGE	NA	OFF	OFF	NA	OFF	OFF	
XMT ALARM DISABLE	OFF	OFF	OFF	OFF	OFF	OFF	
XMT VMR DISABLE	ON	ON	ON	ON	ON	ON	
RCV ALARM DISABLE	OFF	OFF	OFF	OFF	OFF	OFF	
RCV VMR DISABLE	OFF	OFF	OFF	OFF	OFF	OFF	
AIS SIGNAL DISABLE	OFF	OFF	OFF	OFF	OFF	OFF	
AIS SIGNAL TIMING	10/350	10/350	10/350	10/350	10/350	10/350	
BIT ERROR RATE	DS3 DEGRADE=10E-5						

WHEN **Degrade Enable** IS SELECTED ON RADO CONFIGURATION PROVISIONING SCREEN, SELECT APPROXIMATE ERROR RATE AT WHICH **BER Deg Alm** ALARM ACTIVATES AND RCVRS SWITCHING OCCURS: 10E-5 (1X10-5), 10E-6 (1X10-6), 10E-7 (1X10-7), OR 10E-8 (1X10-8). WHEN **Degrade Disable** IS SELECTED, SELECT ERROR RATE AT WHICH **BER Deg Alm** ACTIVATES WITHOUT RCVRS SWITCHING.

SELECT **10/350** TO INSERT AIS (BLUE SIGNAL) WHEN DS3 FRAME LOSS IS DETECTED FOR AT LEAST 10ms AND REMOVE AIS WHEN FRAME LOSS HAS CLEARED FOR 350ms. SELECT **3/3** TO INSERT AIS WITHIN 3ms OF DS3 FRAME LOSS DETECTION AND REMOVAL WITHIN 3ms AFTER FRAME LOSS CLEARS.

SELECT **ON** TO DISABLE AIS (BLUE SIGNAL) INSERTION ON LINE WHEN LOSS OF UPSTREAM DS3 FRAME IS DETECTED. SELECT **OFF** TO INSERT AIS (BLUE SIGNAL) WHEN RADIO OR DS3 FRAME LOSS IS DETECTED.

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06/03/03

Figure 4-6 DS3 Facilities Provisioning

SELECT **AMI** OR **B8ZS** CODING FOR WAYSIDE DS1 LINE.

SELECT **ON** TO DISABLE ALARM REPORTING FOR WAYSIDE DS1 LINE. SELECT **OFF** TO REPORT ALL ALARMS FOR THAT LINE.

DS1 LINES	DS1 CARD A			DS1 CARD B			Select All
	1	2	3	1	2	3	
ALARM LOCK OUT	OFF	OFF	OFF	OFF	OFF	OFF	
DS1 LINE CODING	AMI	AMI	AMI	AMI	AMI	AMI	
AIS INHIBIT	OFF	OFF	OFF	OFF	OFF	OFF	
AIS INSERT	1	1	1	1	1	1	

SELECT **1** (ALL ONES) OR **0** (ALL ZEROES) FOR ALARM INDICATION SIGNAL (AIS) LINE CODE.

SELECT **ON** TO DISABLE AIS INSERTION ON WAYSIDE DS1 LINE WHEN LOSS OF UPSTREAM DS1 FRAME IS DETECTED. SELECT **OFF** TO INSERT AIS WHEN DS1 FRAME LOSS IS DETECTED.

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Figure 4-7 DS3 Radio Wayside DS1 Facilities Provisioning

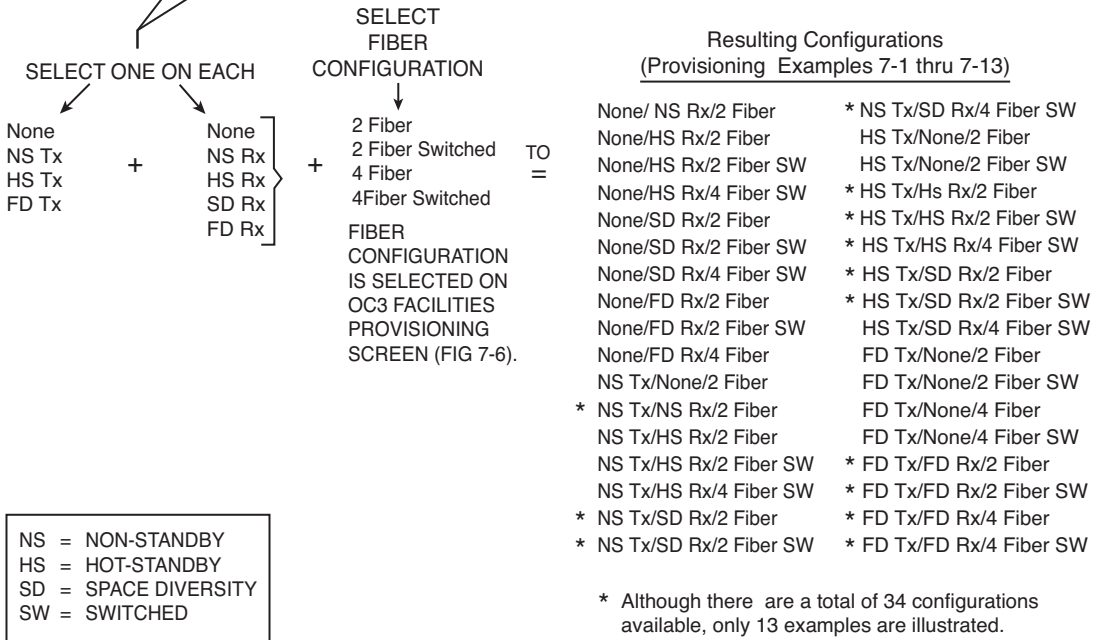
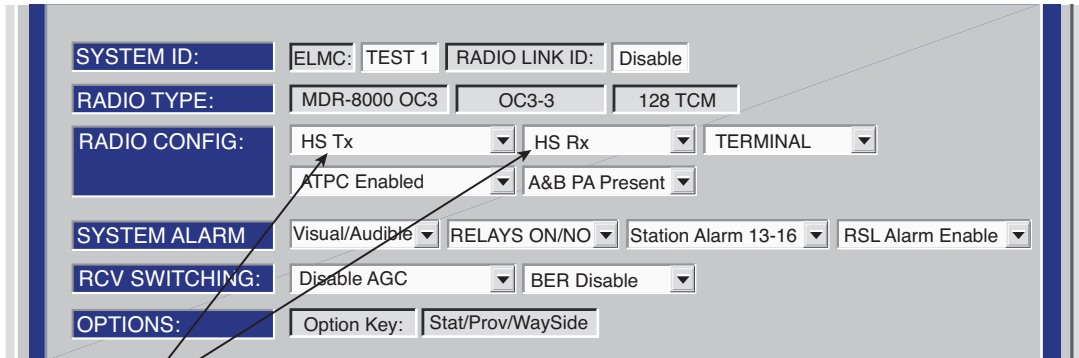


Figure 4-8 OC3 Radio Configuration Provisioning

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.

SELECT **None** TO DISABLE SECTION OVERHEAD (OH) DATA INSERT FUNCTION IN APPLICATIONS WHERE FRAME AND PARITY INSERT IS PERFORMED EXTERNALLY. SELECT **Frame** TO INSERT SECTION OVERHEAD DATA. SELECT **Frame & B1** TO INSERT SECTION OVERHEAD DATA AND PARITY BIT.

SELECT ERROR RATE (1x10-5, 1x10-6, 1x10-7, OR 1x10-8) WHICH CAUSES OC3 INPUT TO BE SWITCHED OR SELECT **DISABLE** TO DISABLE OC3 INPUT SWITCHING.

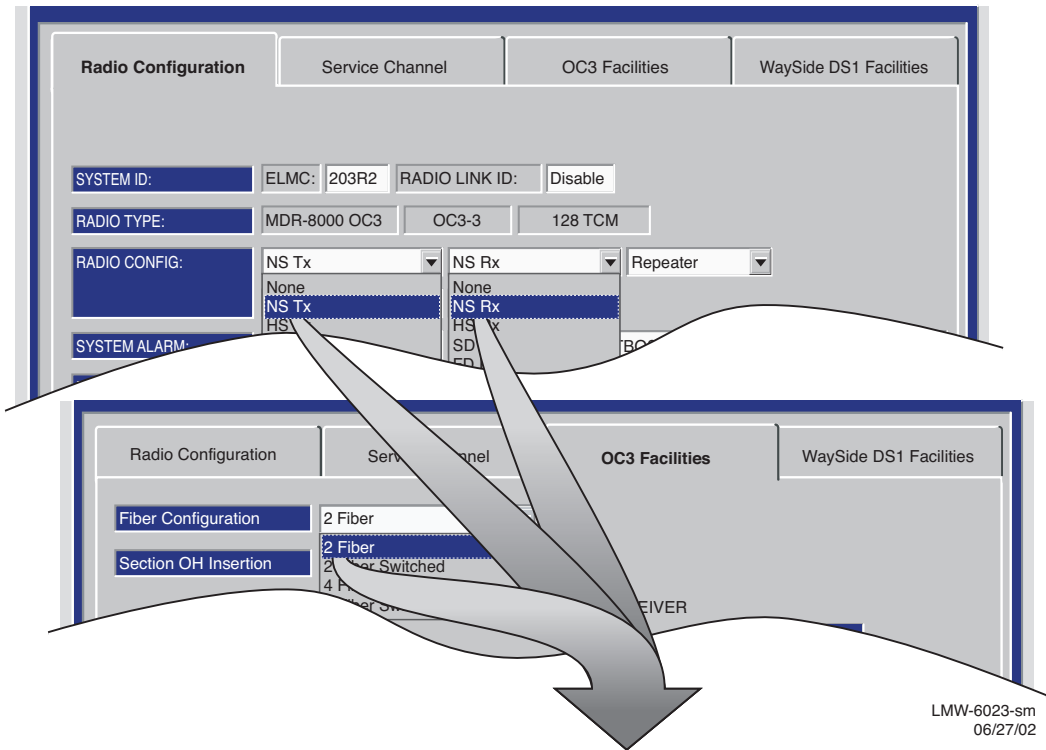
SELECT ERROR RATE (1x10-5, 1x10-6, 1x10-7, OR 1x10-8) AT WHICH XMTR BER ALARM ACTIVATES OR SELECT **DISABLE** TO DISABLE ALARM.

SELECT ERROR RATE (1x10-5, 1x10-6, 1x10-7, OR 1x10-8) WHICH CAUSES OC3 OUTPUT TO BE SWITCHED OR SELECT **DISABLE** TO DISABLE OC3 OUTPUT SWITCHING.

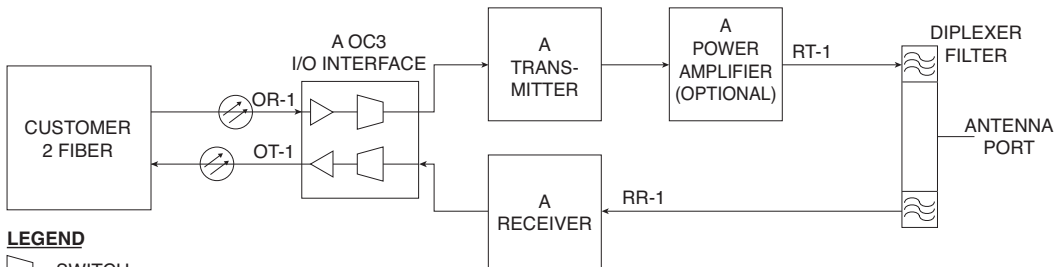
SELECT ERROR RATE (1x10-5, 1x10-6, 1x10-7, OR 1x10-8) AT WHICH RCVR BER ALARM ACTIVATES OR SELECT **DISABLE** TO DISABLE ALARM.

SELECT **OFF**, TO ENABLE OC3 ALARMS. SELECT **ON** TO DISABLE ALARMS.

Figure 4-9 OC3 Facilities Provisioning



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06/27/02



LEGEND

◻ = SWITCH

▷ = LASER

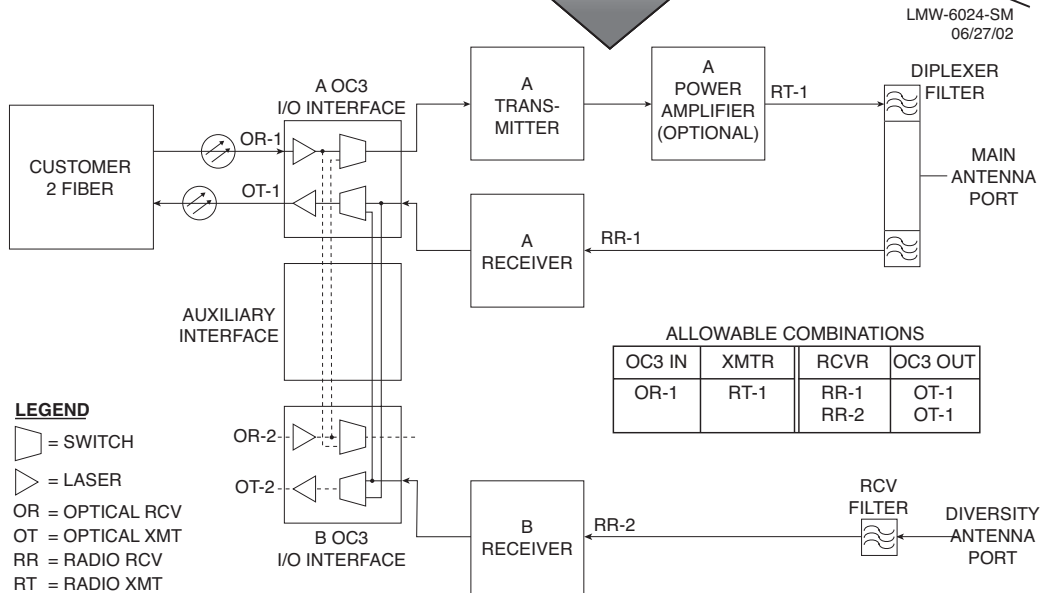
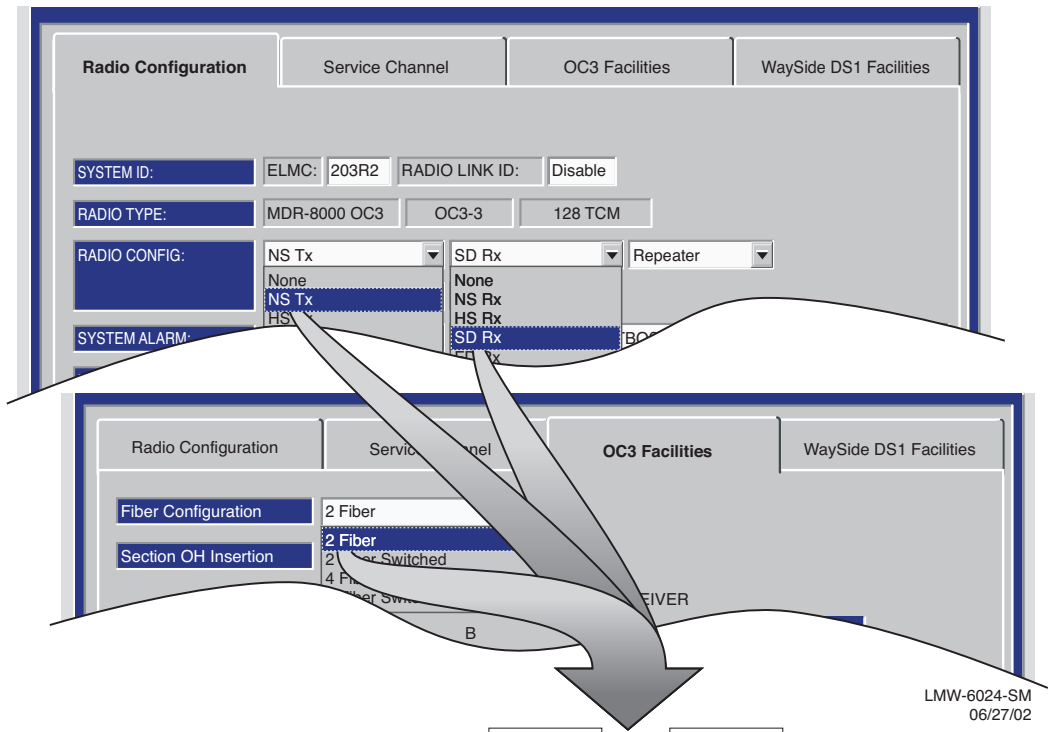
OR = OPTICAL RCV

OT = OPTICAL XMT

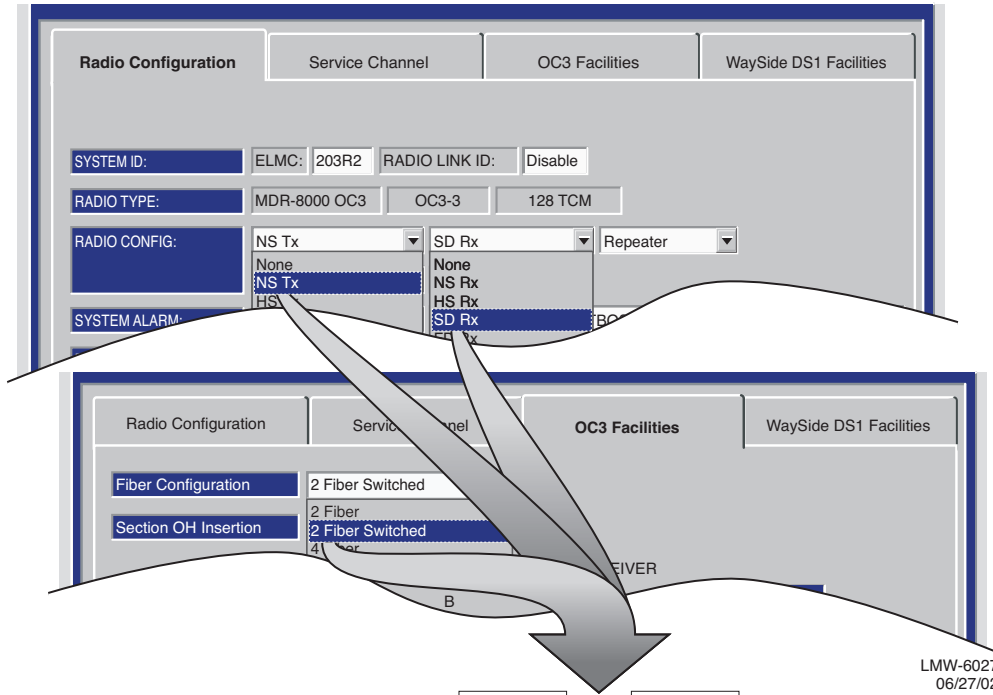
RR = RADIO RCV

RT = RADIO XMT

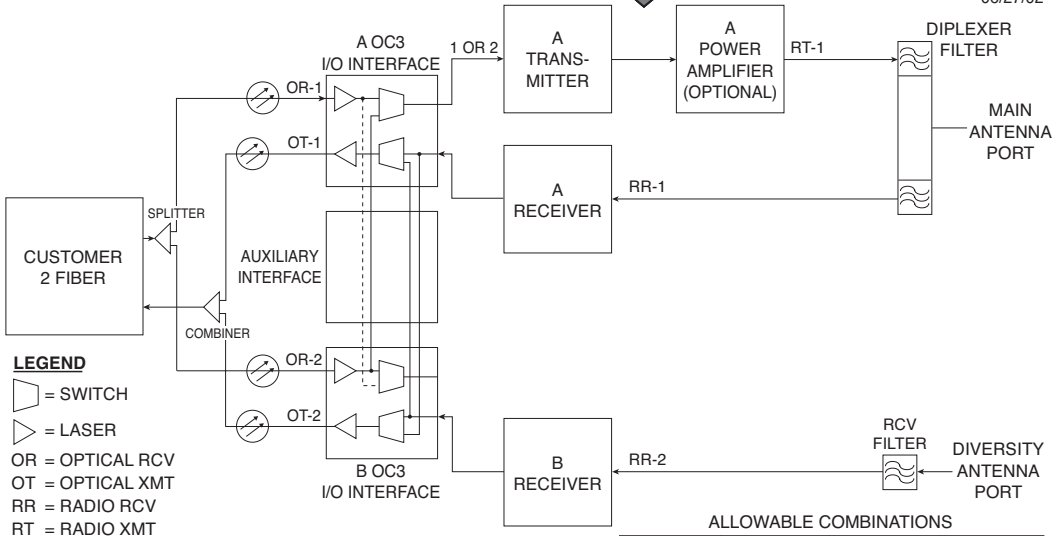
OC3 PROVISIONING EXAMPLE 1: NS Tx/NS Rx/2 Fiber



OC3 PROVISIONING EXAMPLE 2: NS Tx/SD Rx/2 Fiber



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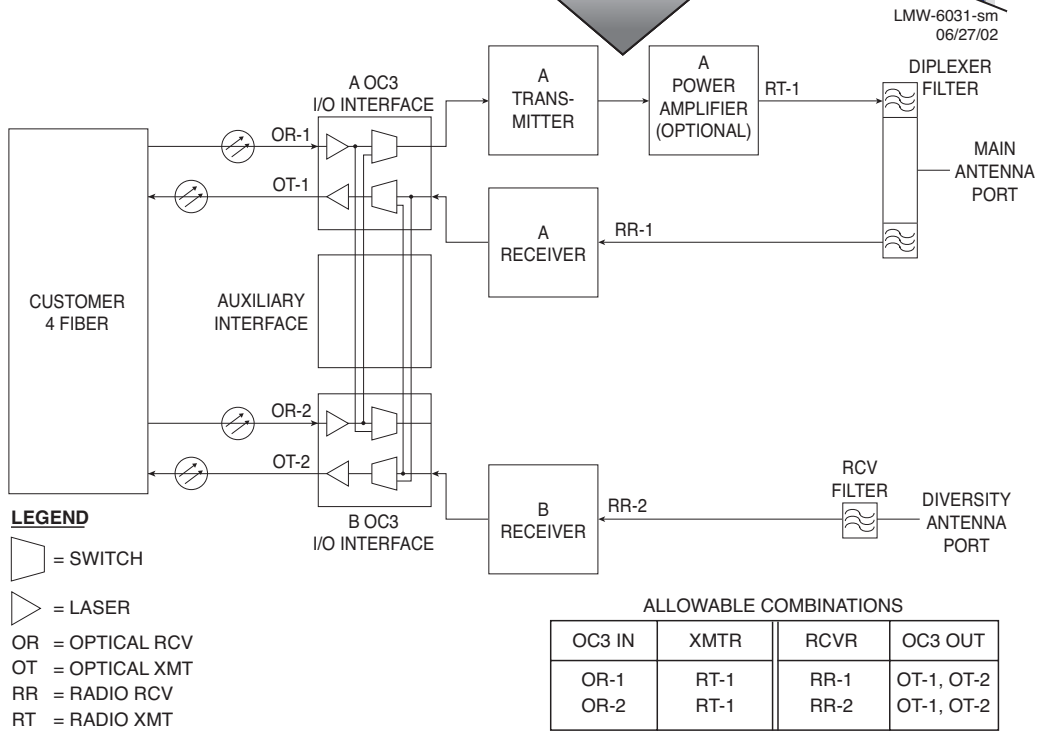
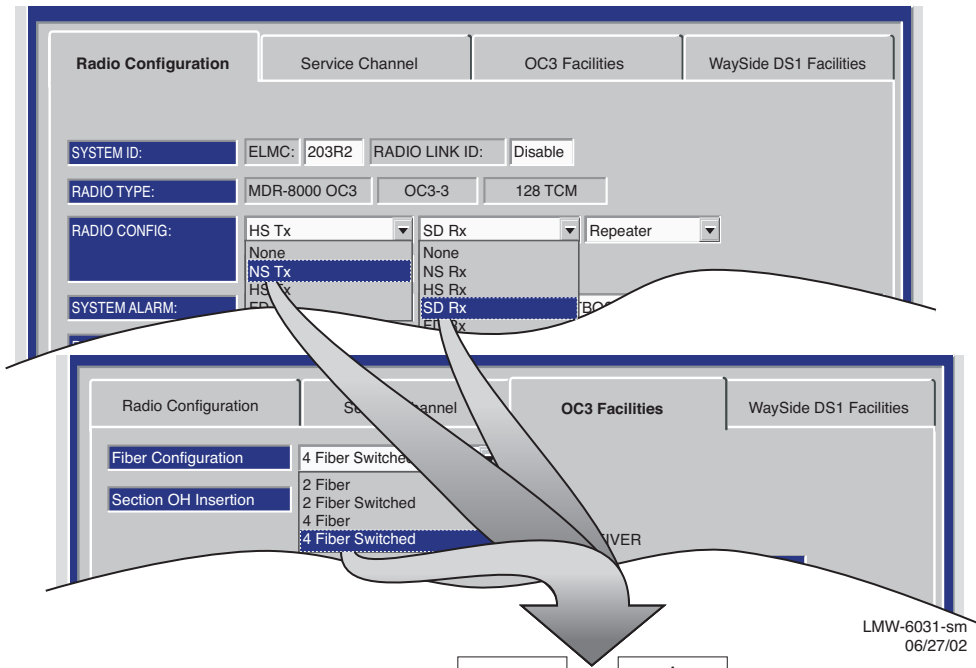


- LEGEND**
- = SWITCH
 - = LASER
 - OR = OPTICAL RCV
 - OT = OPTICAL XMT
 - RR = RADIO RCV
 - RT = RADIO XMT

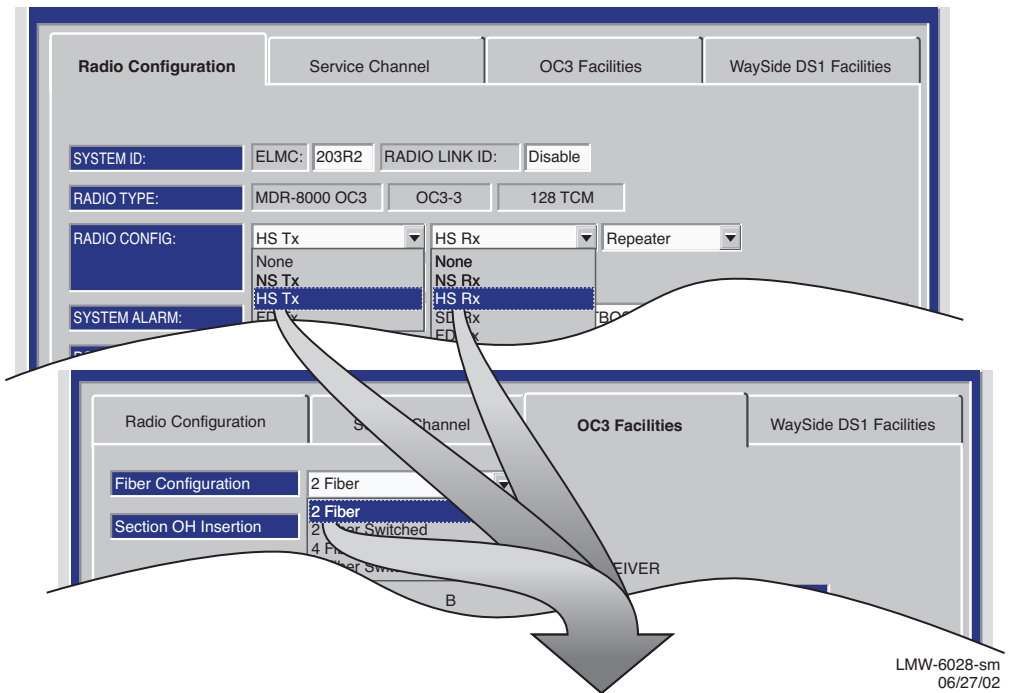
ALLOWABLE COMBINATIONS

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

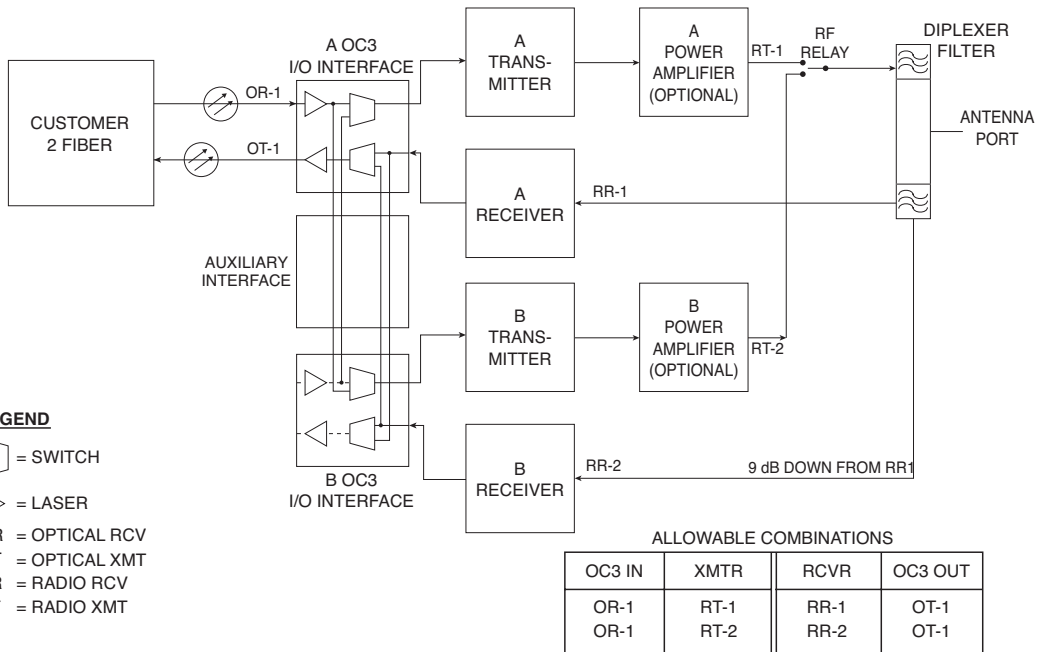
OC3 PROVISIONING EXAMPLE 3: NS Tx/SD Rx/2 Fiber Switched



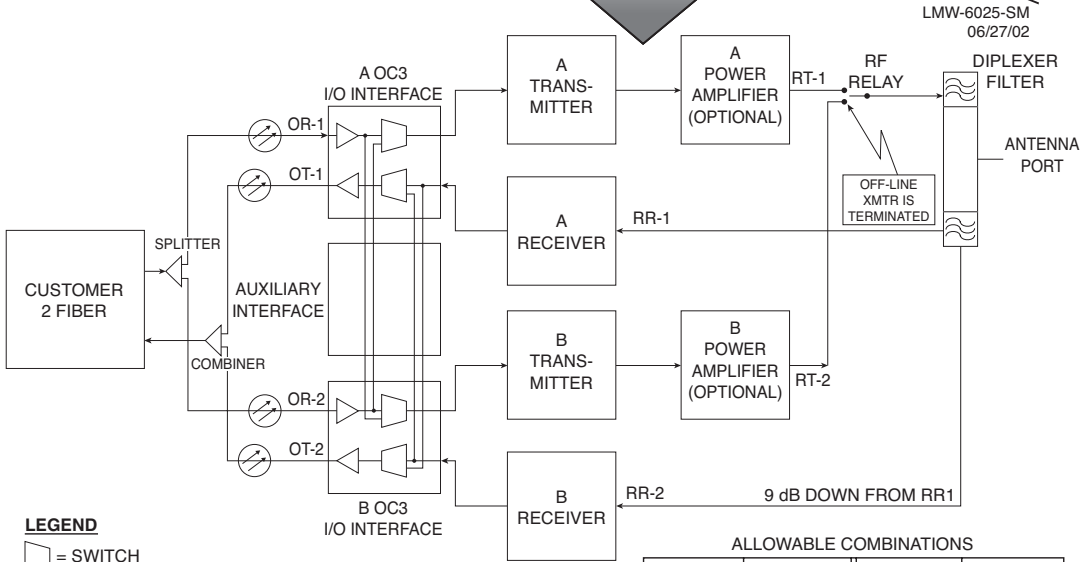
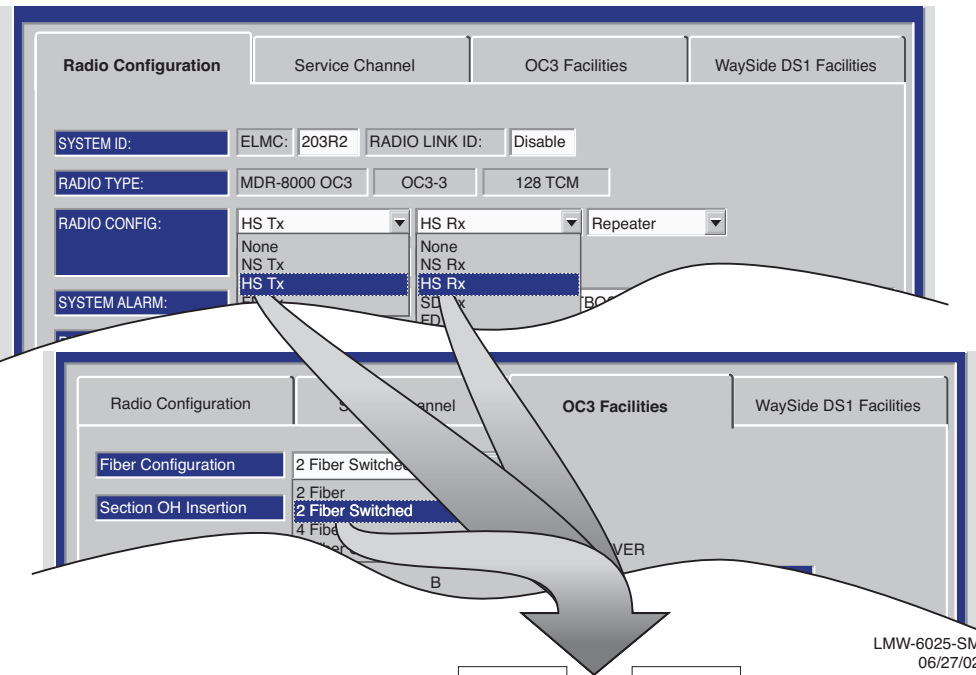
OC3 PROVISIONING EXAMPLE 4: NS Tx/SD Rx/4 Fiber Switched



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OC3 PROVISIONING EXAMPLE 5: HS Tx/HS Rx/2 Fiber



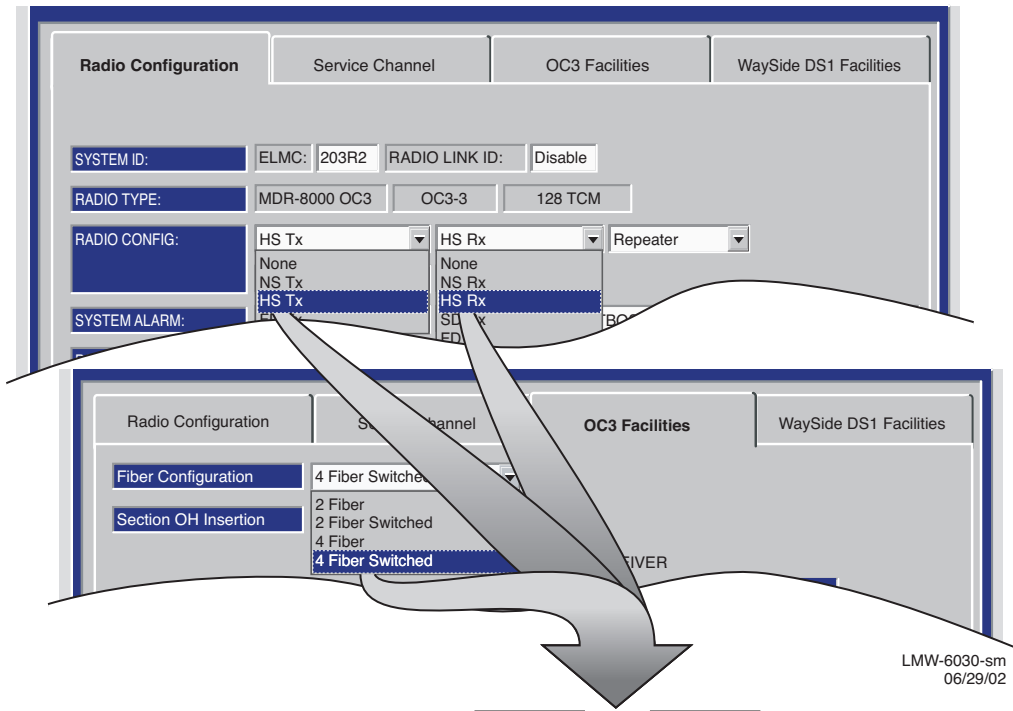
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- LEGEND**
- = SWITCH
 - ▷ = LASER
 - OR = OPTICAL RCV
 - OT = OPTICAL XMTR
 - RR = RADIO RCV
 - RT = RADIO XMTR

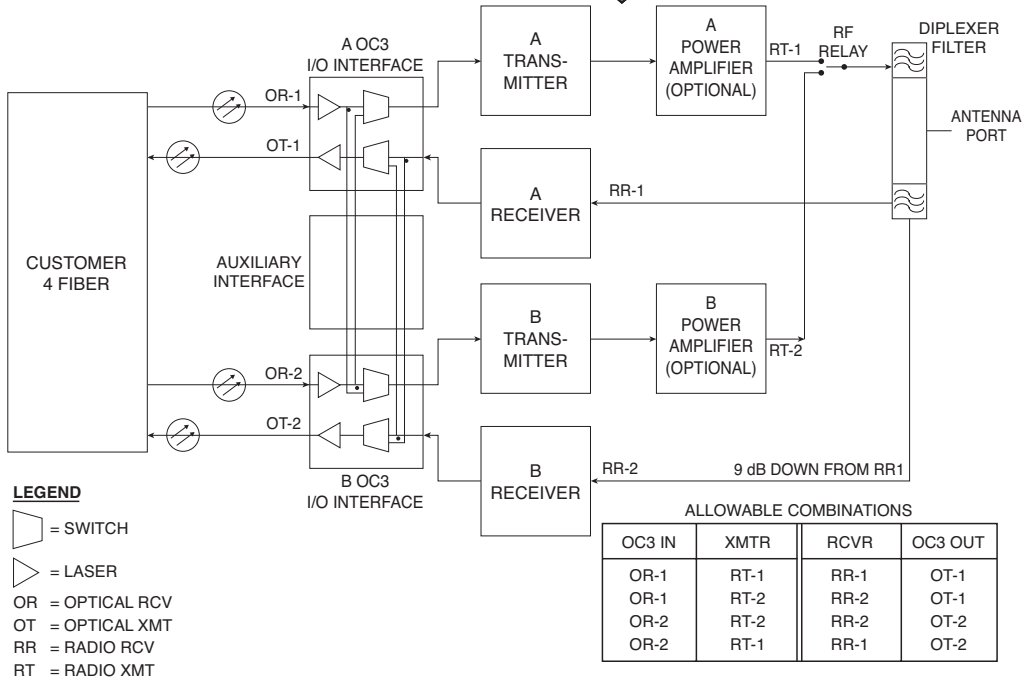
ALLOWABLE COMBINATIONS

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

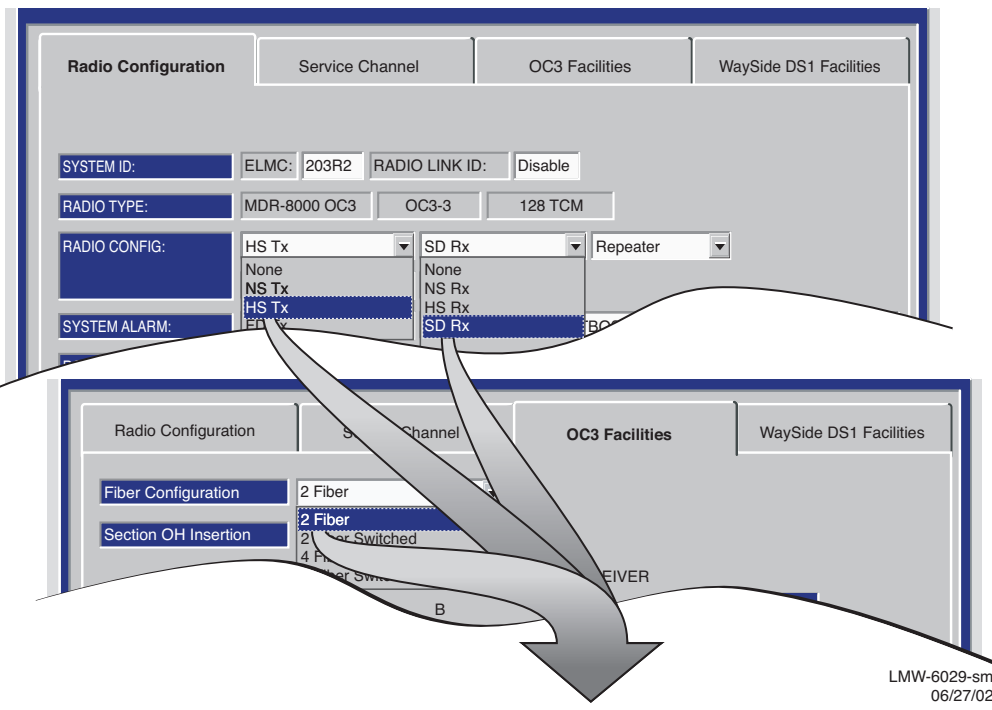
OC3 PROVISIONING EXAMPLE 6: HS Tx/HS Rx/2 Fiber Switched



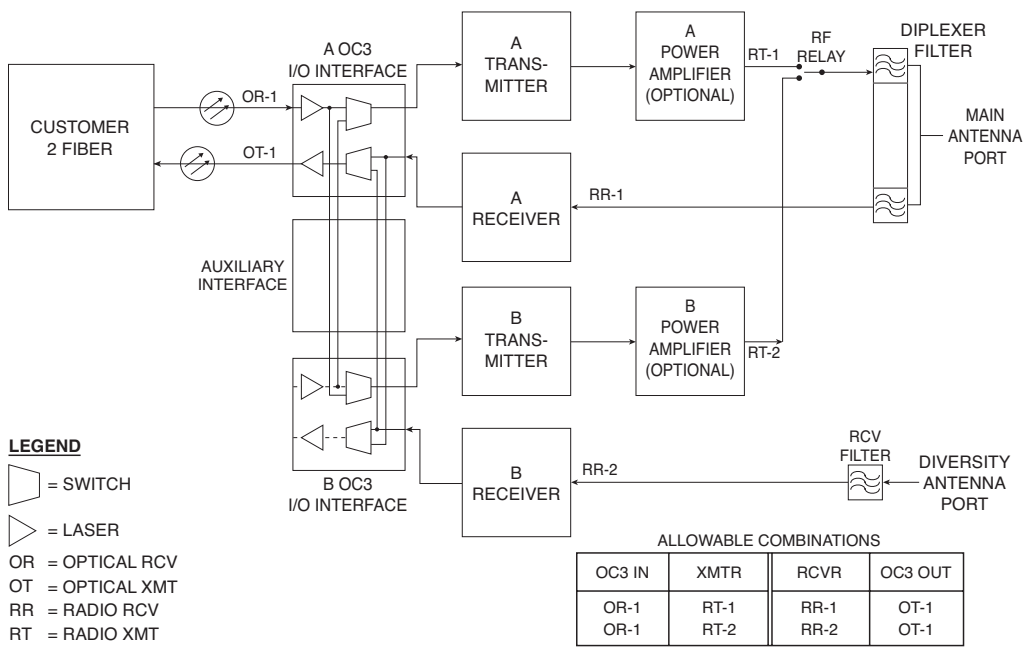
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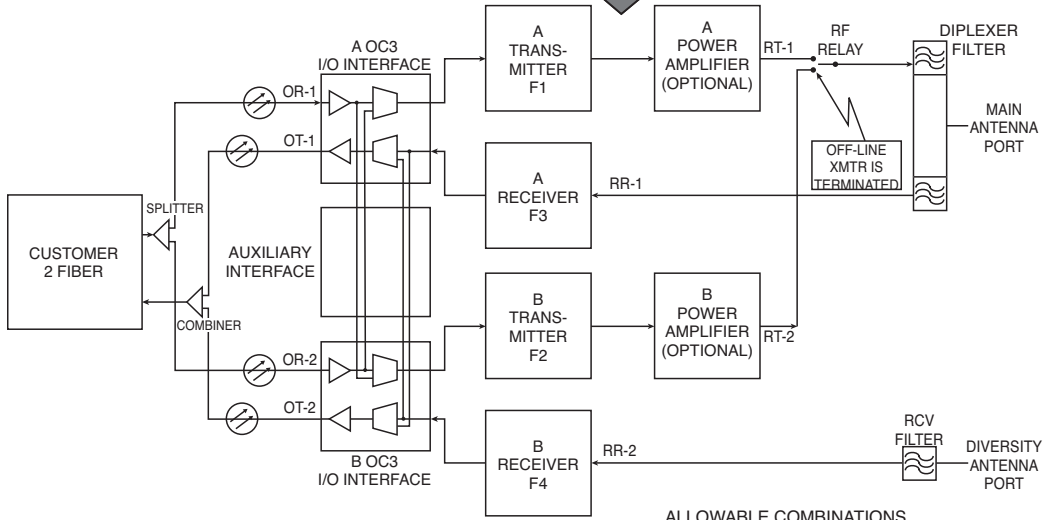
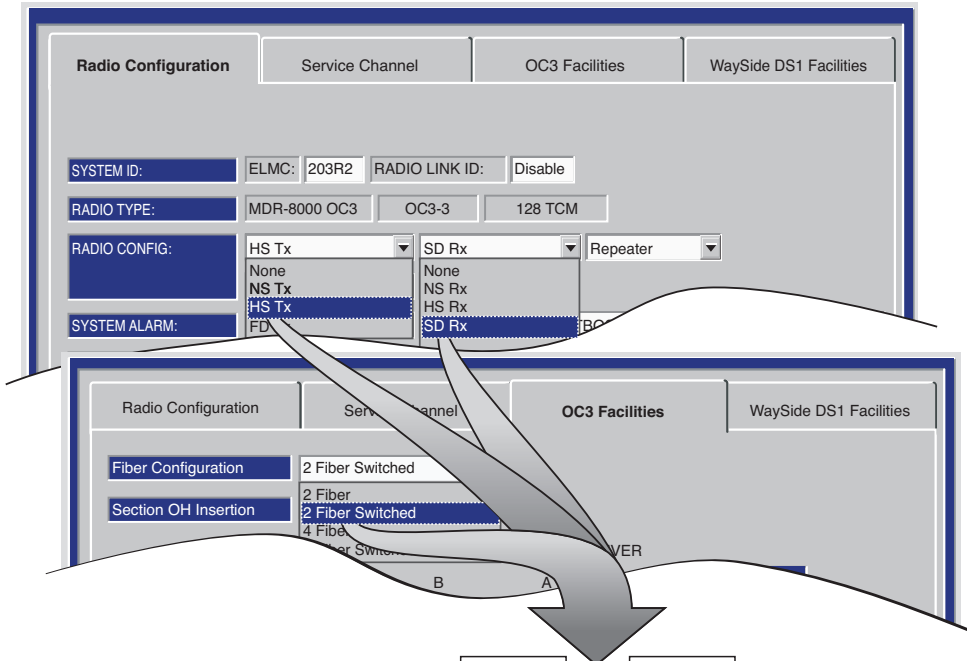
OC3 PROVISIONING EXAMPLE 7: HS Tx/HS Rx/4 Fiber Switched



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OC3 PROVISIONING EXAMPLE 8: HS Tx/SD Rx/2 Fiber



LEGEND

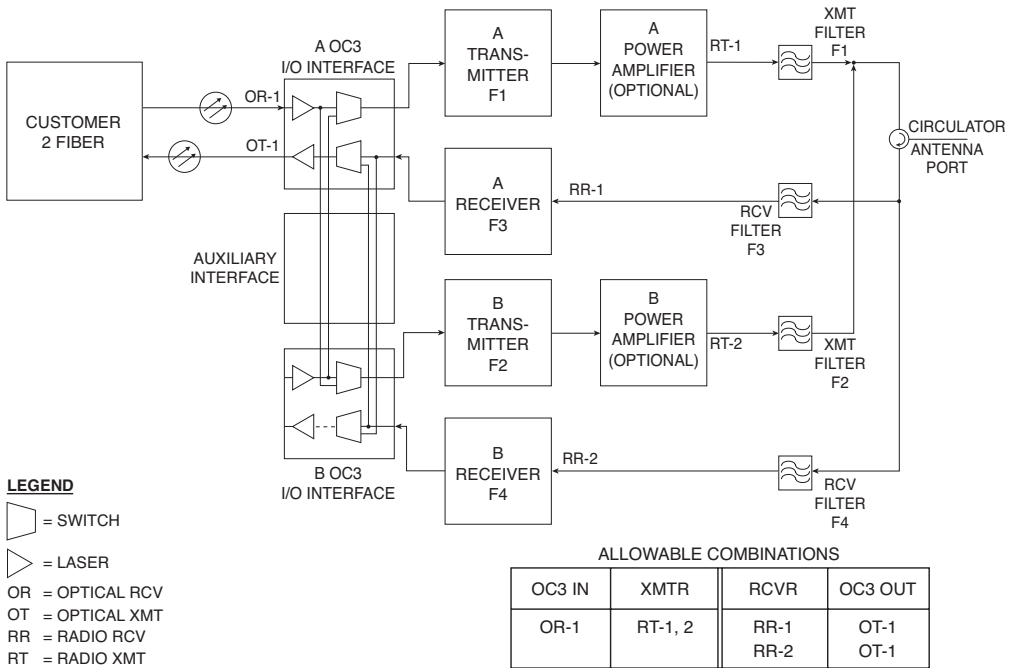
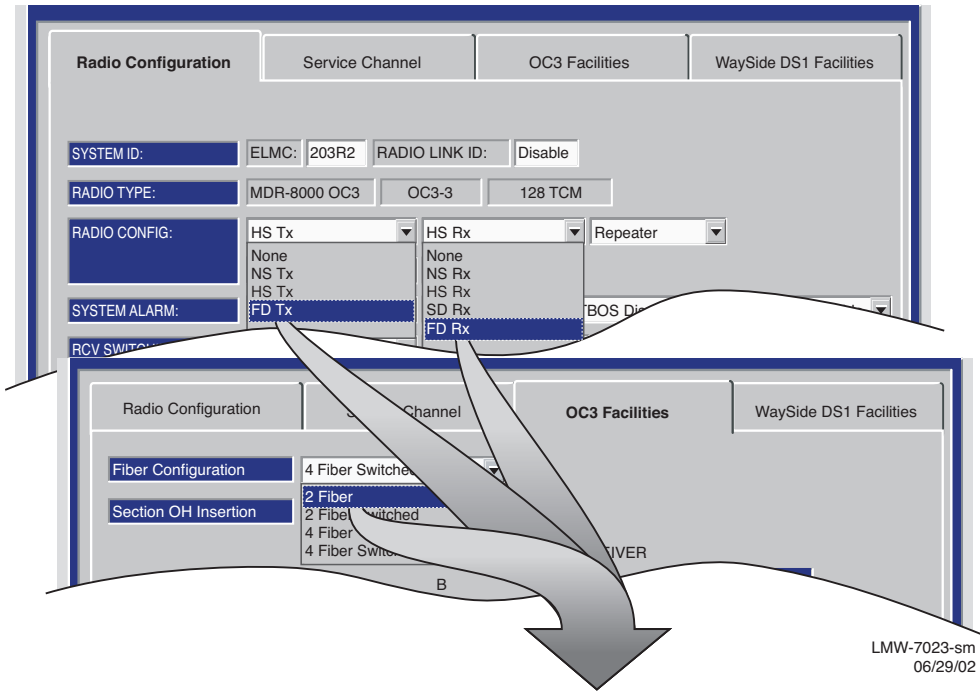
□ = SWITCH
 ▷ = LASER
 OR = OPTICAL RCV
 OT = OPTICAL XMT
 RR = RADIO RCV
 RT = RADIO XMT

ALLOWABLE COMBINATIONS

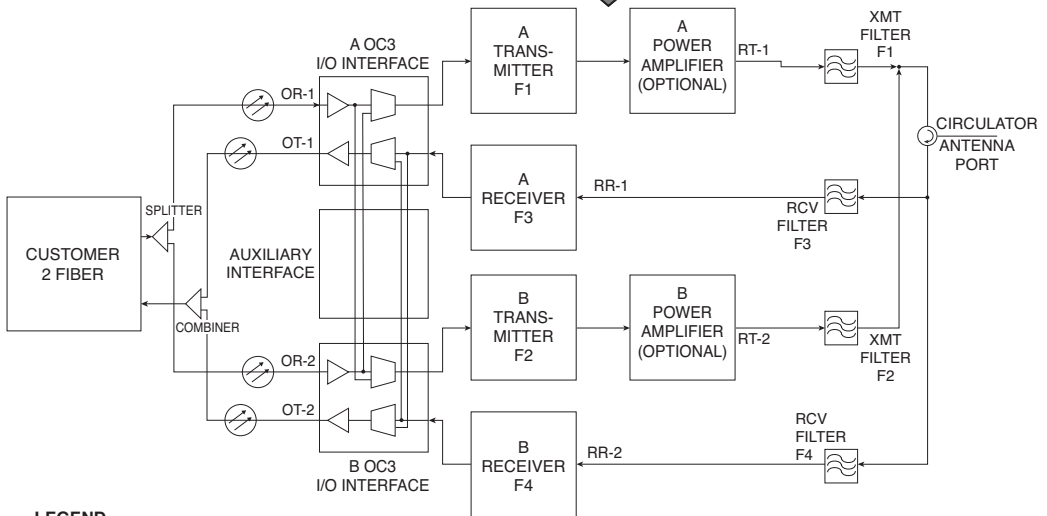
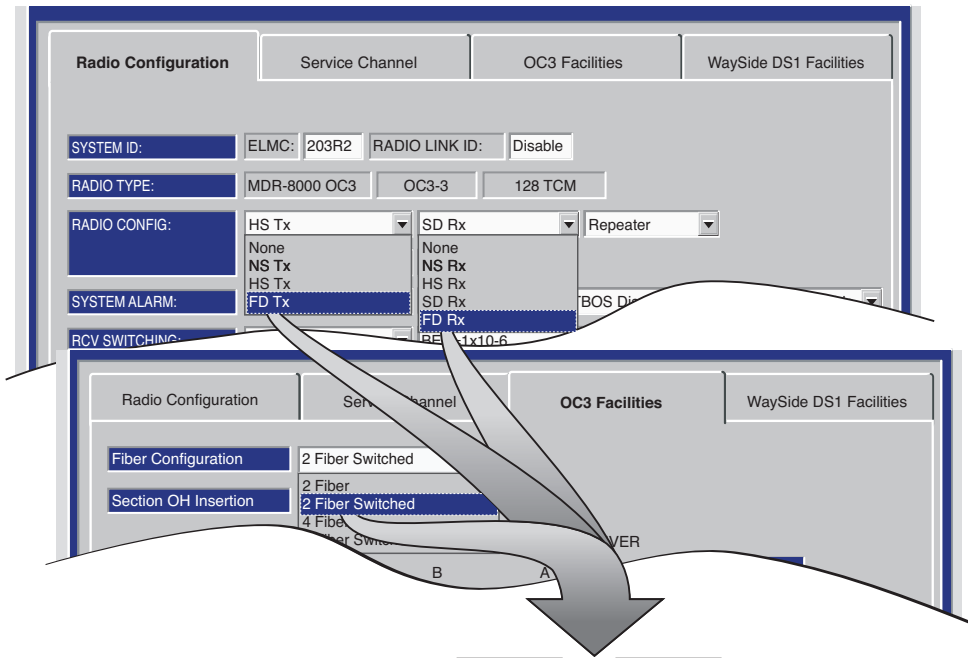
OC3 IN	XMTR	RCVR	OC3 OUT
OR-1	RT-1	RR-1	OT-1
OR-1	RT-2	RR-1	OT-2
OR-2	RT-2	RR-2	OT-2
OR-2	RT-1	RR-2	OT-1

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07/01/04



OC3 PROVISIONING EXAMPLE 9: HS Tx/SD Rx/2 Fiber Switched



OC3 PROVISIONING EXAMPLE 10: FD Tx/FD Rx/2 Fiber



LEGEND

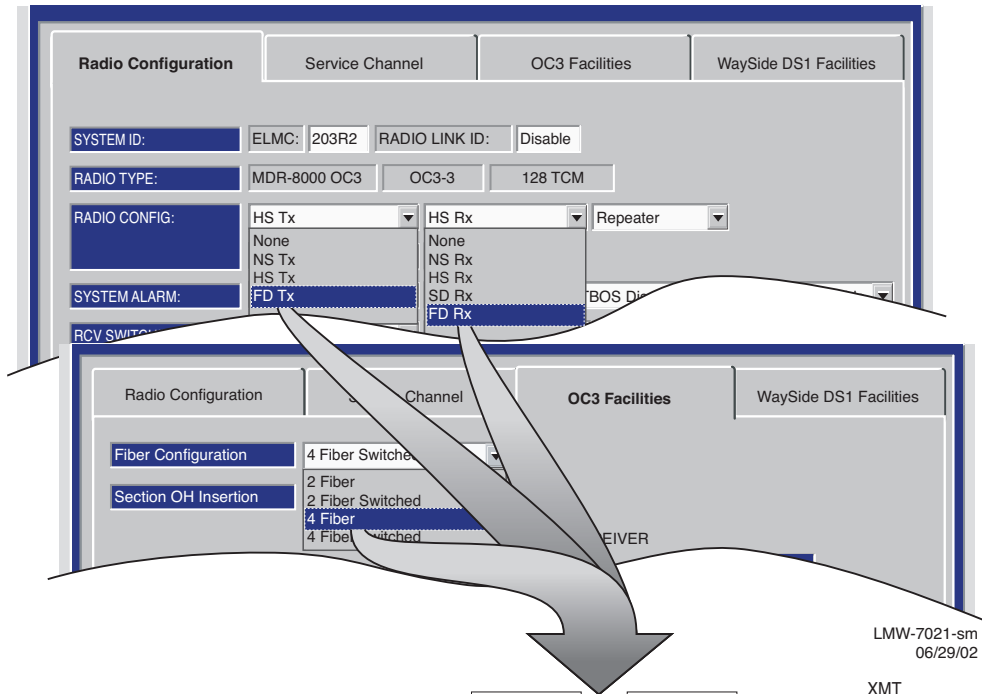
-  = SWITCH
-  = LASER
- OR = OPTICAL RCV
- OT = OPTICAL XMT
- RR = RADIO RCV
- RT = RADIO XMT

ALLOWABLE COMBINATIONS

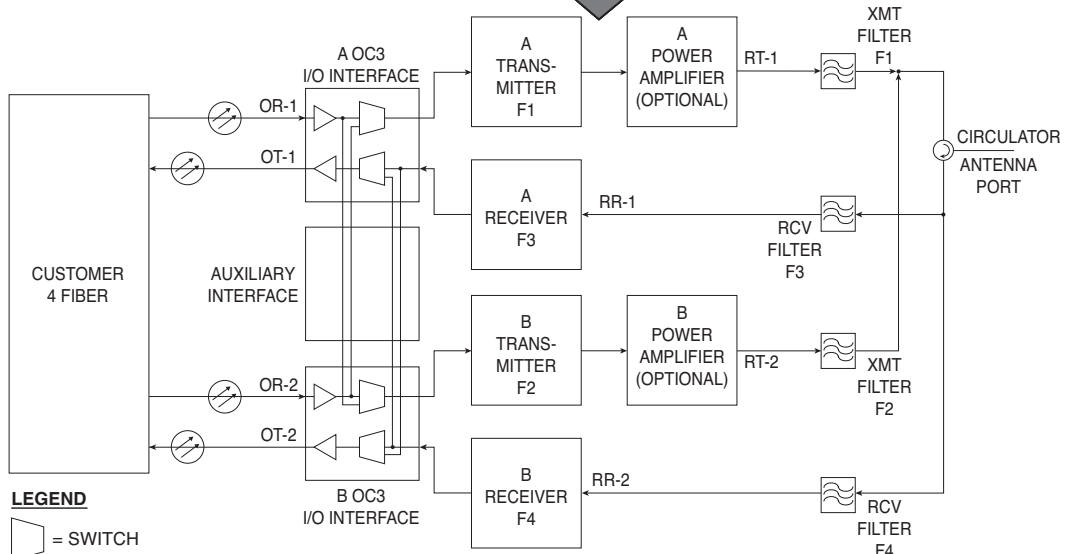
OC3 IN	XMTR	RCVR	OC3 OUT
OR-1	RT-1, 2	RR-1	OT-1, 2
OR-2	RT-1, 2	RR-2	OT-1, 2

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OC3 PROVISIONING EXAMPLE 11: FD Tx/FD Rx/2 Fiber Switched



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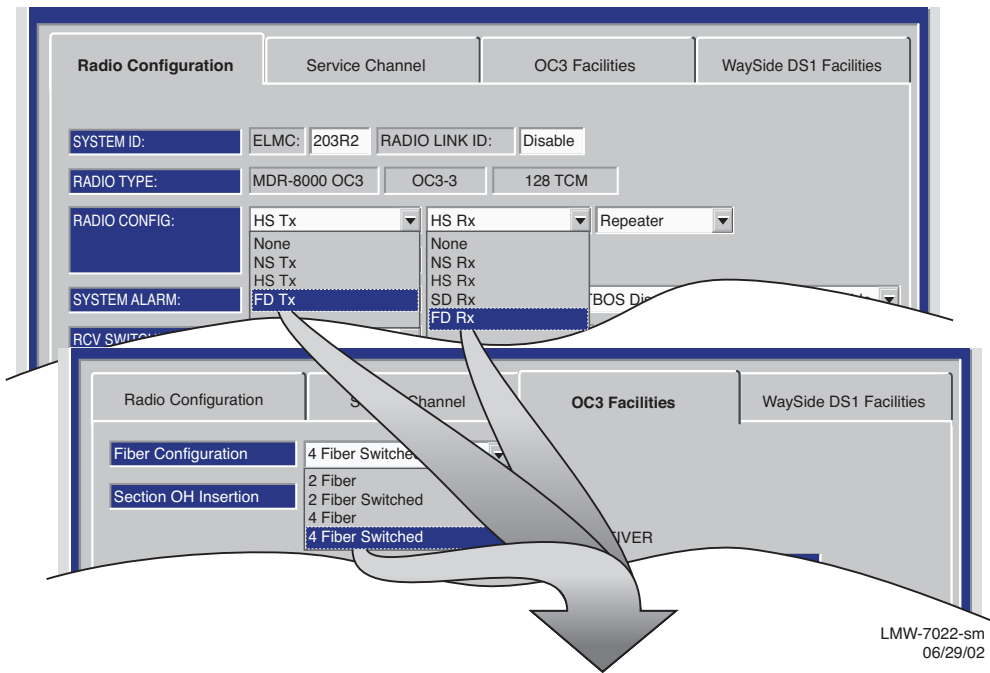
LEGEND

-  = SWITCH
-  = LASER
- OR = OPTICAL RCV
- OT = OPTICAL XMT
- RR = RADIO RCV
- RT = RADIO XMT

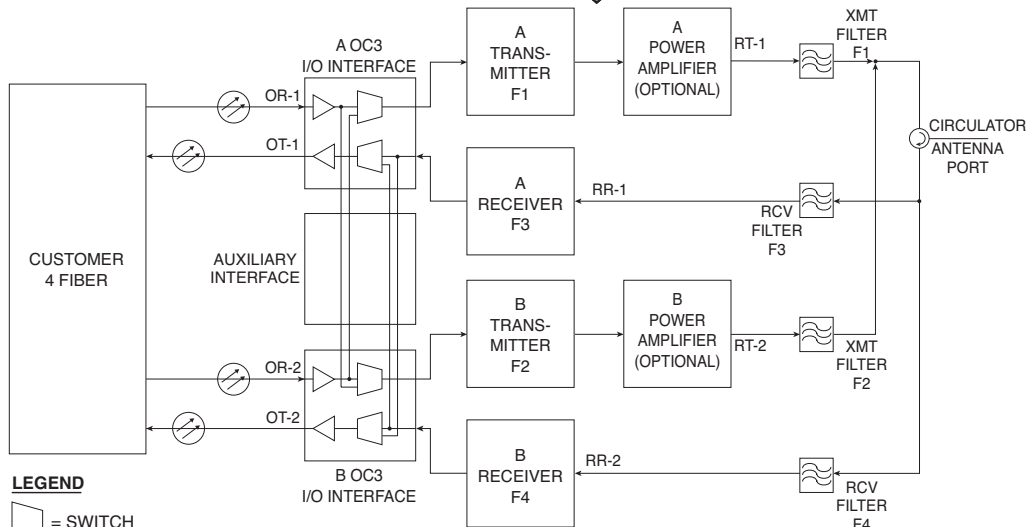
ALLOWABLE COMBINATIONS

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

OC3 PROVISIONING EXAMPLE 12: FD Tx/FD Rx/4 Fiber



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LEGEND

□ = SWITCH

▷ = LASER

OR = OPTICAL RCV

OT = OPTICAL XMT

RR = RADIO RCV

RT = RADIO XMT

ALLOWABLE COMBINATIONS

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

OC3 PROVISIONING EXAMPLE 13: FD Tx/FD Rx/4 Fiber Switched

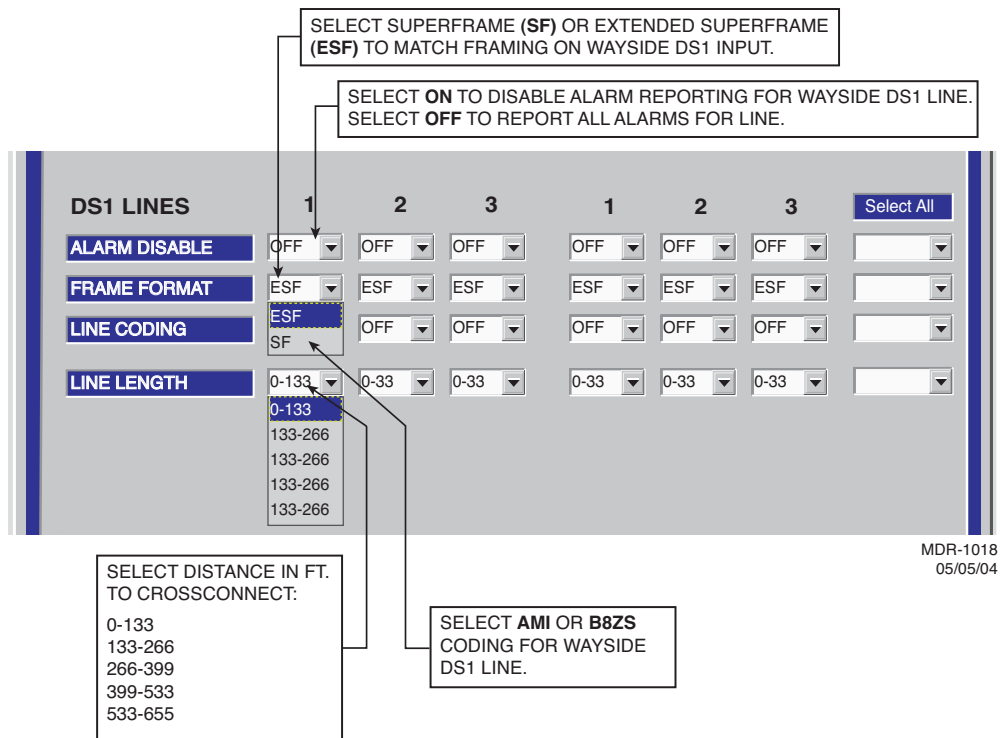


Figure 4-10 OC3 Radio Wayside DS1 Facilities Provisioning

Note

There are five connectors on the backplane to interface the three service channels. Connectors on backplane interface three functions: Audio, RS-232, and MCS. Each service channel is provisioned for a specific function. Audio and MCS can be put on any open service channel. RS-232-1 data can be put on Service Channel 1 and RS-232-2 data can be put on Service Channel 2. RS-232 data cannot be put on Service Channel 3.

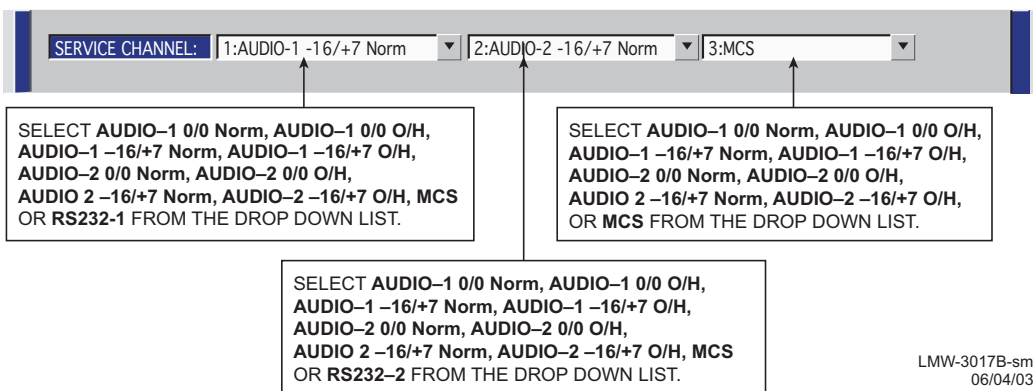


Figure 4-11 DS1/E1, DS3, OC3 Radio Service Channel Provisioning (Sheet 1 of 2)

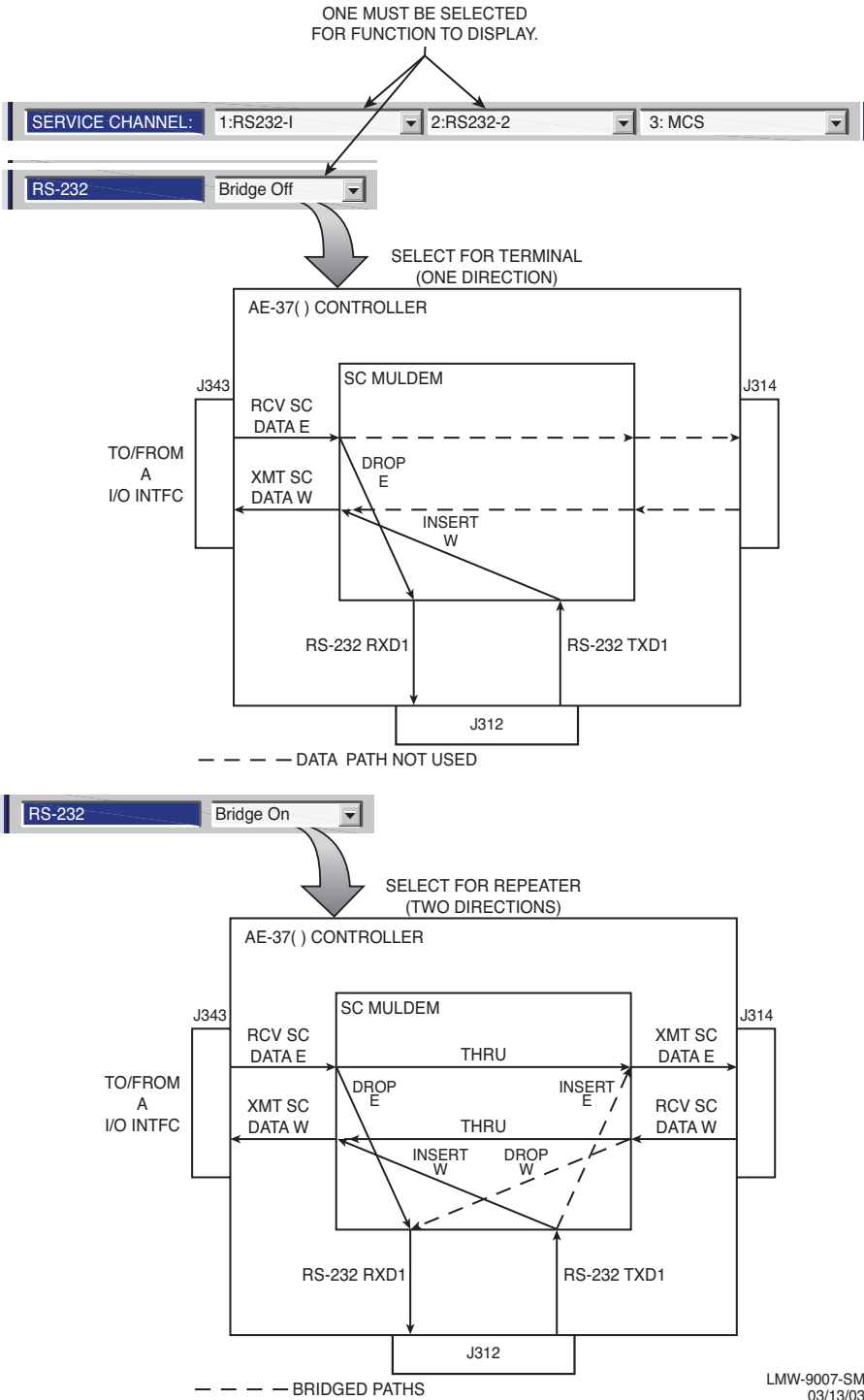


Figure 4-11 DS1/E1, DS3, OC3 Radio Service Channel Provisioning (Sheet 2 of 2)

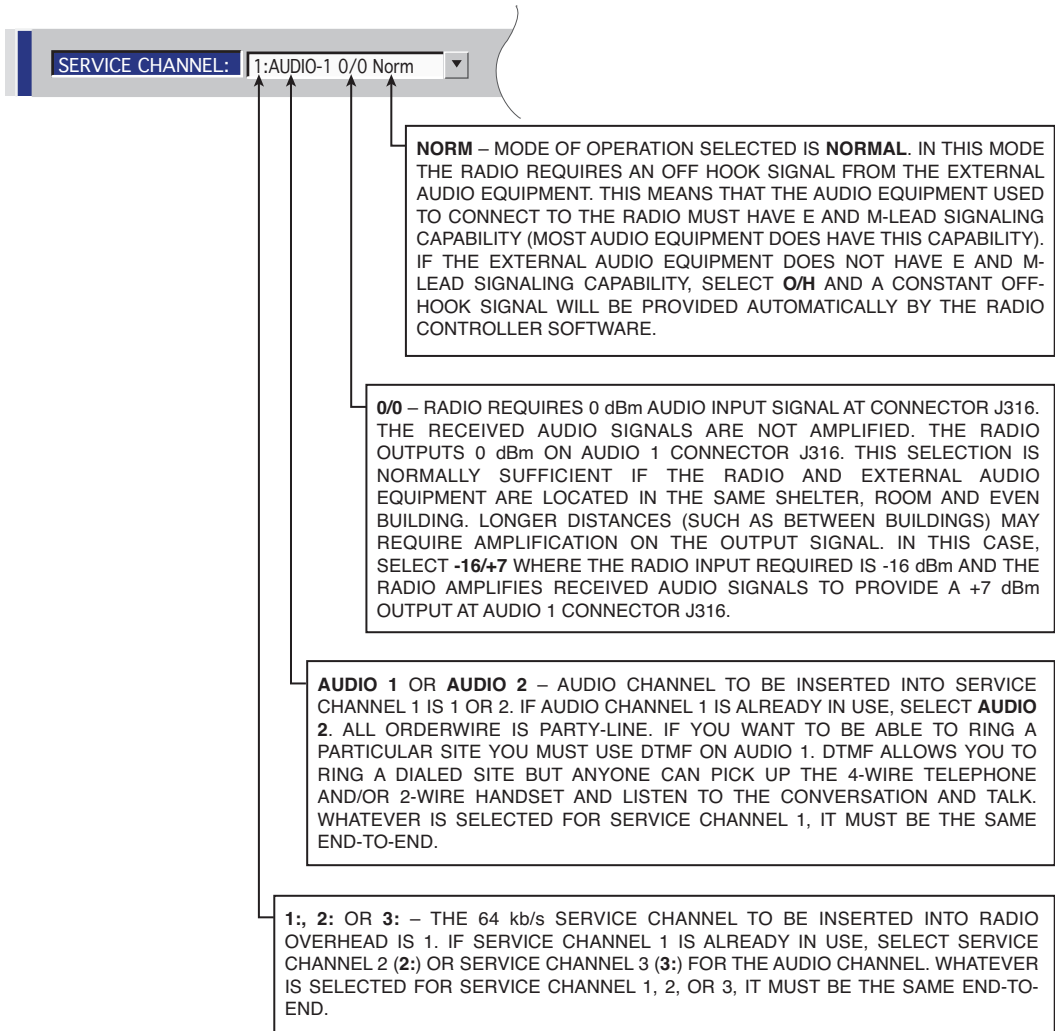
Note

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.**



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Figure 4-12 DS1/E1, DS3, OC3 Radio Audio Provisioning (Sheet 1 of 2)

Note

DTMF allows you to dialup and ring other sites using the 2-wire handset. Only the ringing is detected. Communication over the handset is party-line. DTMF addressing is a local function not a network function, therefore if one or more radios are assigned the same DTMF address, they will all ring when that address is dialed.

To be able to use the DTMF function:

- 1. Audio 1 must be selected for 2-wire handset operation.*
- 2. DTMF must be turned ON on the Audio provisioning screen.*
- 3. 2-wire handset must be connected to TEL jack on controller module.*
- 4. Radios must be provisioned with DTMF address.*

DOUBLE CLICK TO ENABLE (000 DISPLAYS). ENTER 3-DIGIT STATION CALL NUMBER. OPERATOR CAN DIAL THIS NUMBER AND RING/ COMMUNICATE WITH THE STATION VIA ORDERWIRE. SELECT **OFF** TO DISABLE DTMF.

SELECT **E-Lead-24Vdc** OR **E-Lead GND** TO BE APPLIED TO SERVICE CHANNEL E-LEAD.

NOT USED

AUDIO: DTMF: OFF E-Lead-24Vdc All Call Ringer Off Auto Squelch On

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WHEN **All Call Ringer On** IS SELECTED, ALL TELEPHONES RING WHEN CALL IS INITIATED. WHEN **All Call Ringer Off** IS SELECTED, TELEPHONE ASSOCIATED WITH RADIO WILL NOT RING. USEFUL IN SITUATIONS WHERE MULTIPLE RADIOS ARE CONNECTED AT ONE SITE.

Figure 4-12 DS1/E1, DS3, OC3 Radio Audio Provisioning (Sheet 2 of 2)

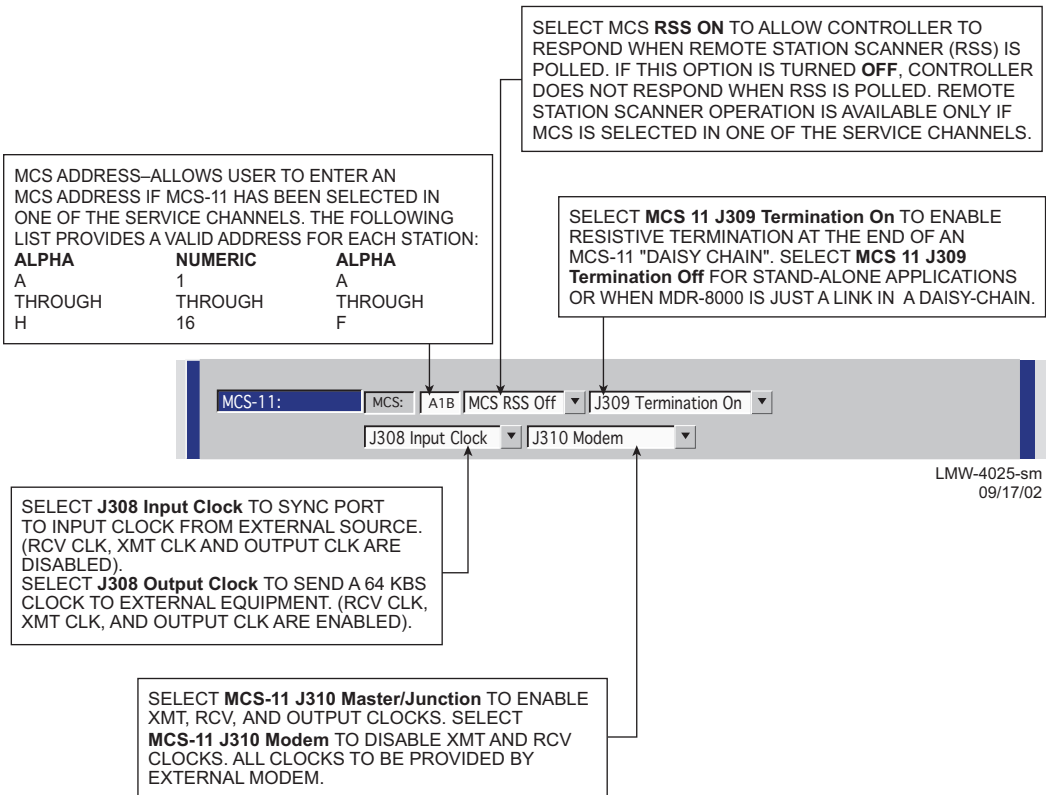
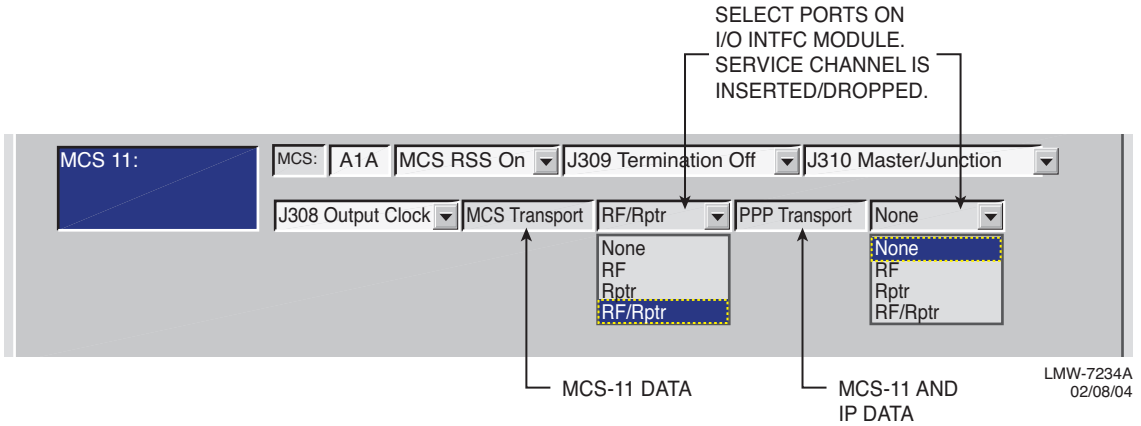


Figure 4-13 DS1/E1, DS3, OC3 Radio MCS-11 Provisioning

Note

*MCS-11 is enabled/disabled using the service channel 1-3 selections.
MCS-11 must be enabled for MCS-11/PPP transport operation.*



Note

Currently the only valid transport combinations (for terminal or repeater) are:

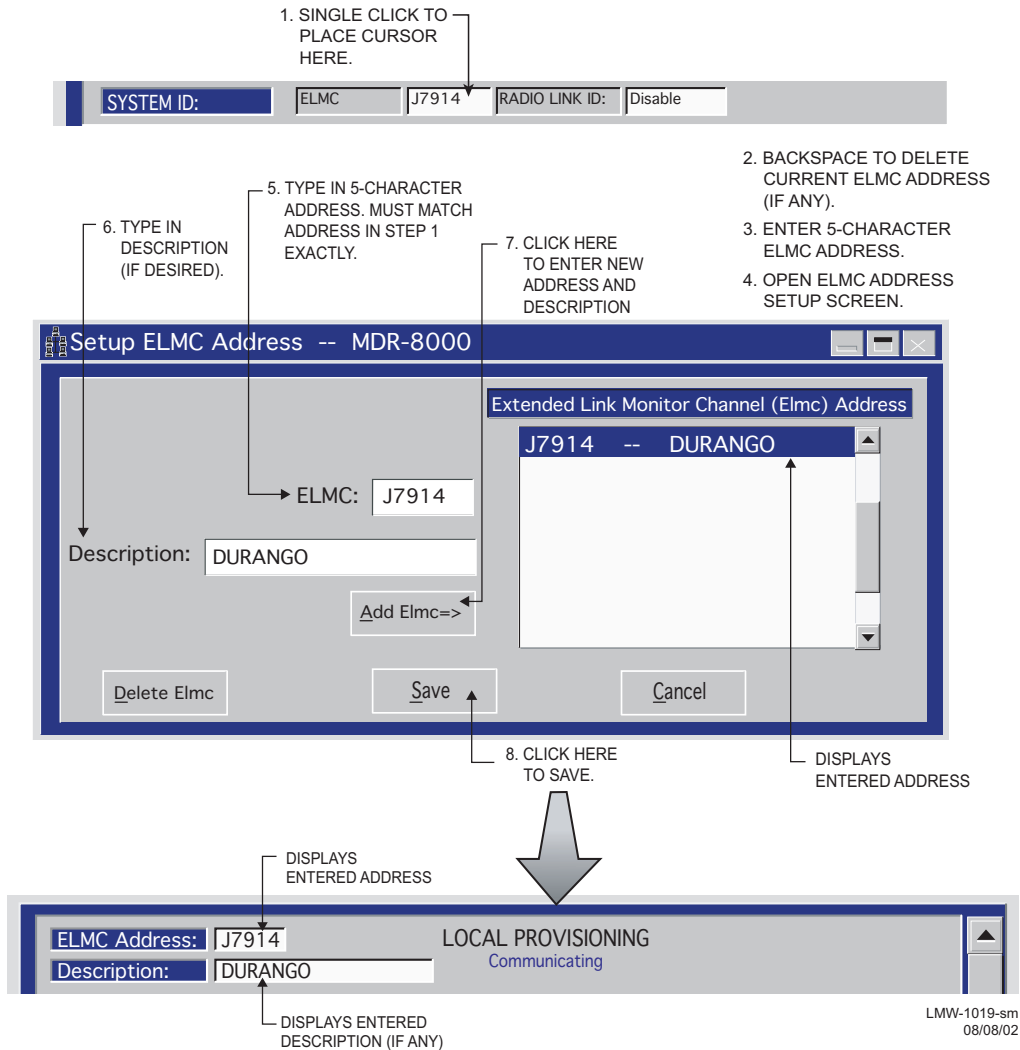
Note

For MCS-11 to operate properly, all radio controllers in a system interconnected by RF or RPTR must have the same MCS transport and PPP transport provisioning. Currently the only valid transport combinations (for terminal or repeater) are:

<u>MCS TRANSPORT</u>	<u>PPP TRANSPORT</u>	<u>REMARKS</u>
RF/RPTR	NONE	TMN INTFC MODULE IS NOT INSTALLED. COMPATIBLE WITH OLDER (PRE-TMN) SOFTWARE. RECOMMENDED FOR SYSTEM UPGRADES ONLY.
RF/RPTR	RF/RPTR	MUST BE CHOSEN IF TMN INTERFACE MODULE IS INSTALLED. RECOMMENDED FOR ALL NEW SYSTEMS.

Figure 4-14 MCS Transport/PPP Transport Provisioning

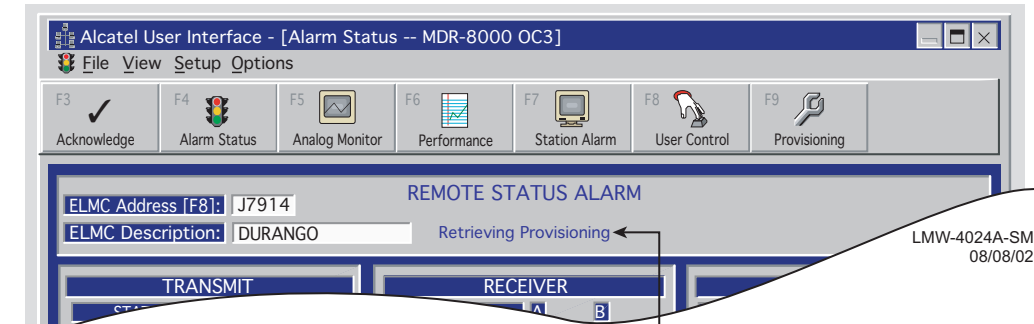
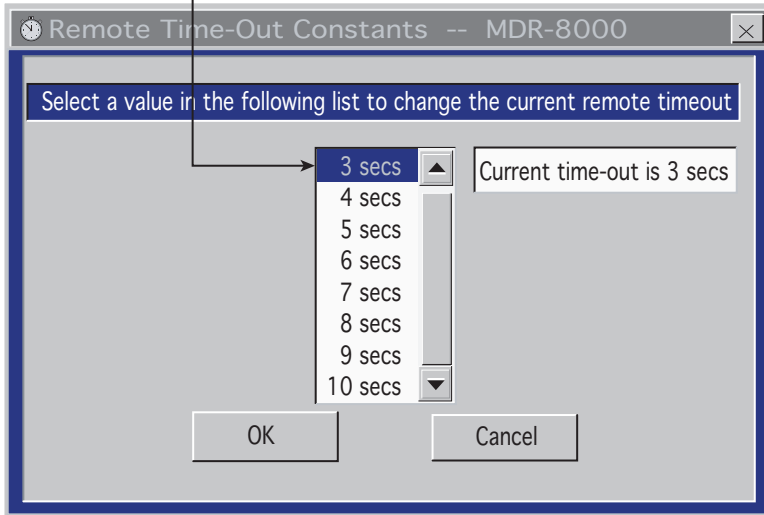
PROVISION ANY ONE OR ALL RADIOS AT A SITE, LOCALLY, USING FOLLOWING PROCEDURE:



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 provisioned and changed locally. Service-affecting functions, including operation mode, radio configuration, and remote address, cannot be provisioned or changed remotely.

Figure 4-15 DS1/E1, DS3, OC3 Radio ELMC Provisioning

SELECT TIME LOCALLY FOR ELMC RESPONSE TO A REQUEST FOR STATUS BEFORE TRYING AGAIN. SELECT SHORTER TIME (5 SECS) FOR SHORTER SYSTEMS (10 HOPS OR LESS). SELECT LONGER TIME (10 SECS) FOR SYSTEMS WITH 10 HOPS OR MORE.



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.

MESSAGE DISPLAYED FOR LENGTH OF TIME SELECTED DURING TIME LOCAL RADIO IS ATTEMPTING TO COMMUNICATE WITH REMOTE ADDRESS VIA ELMC.

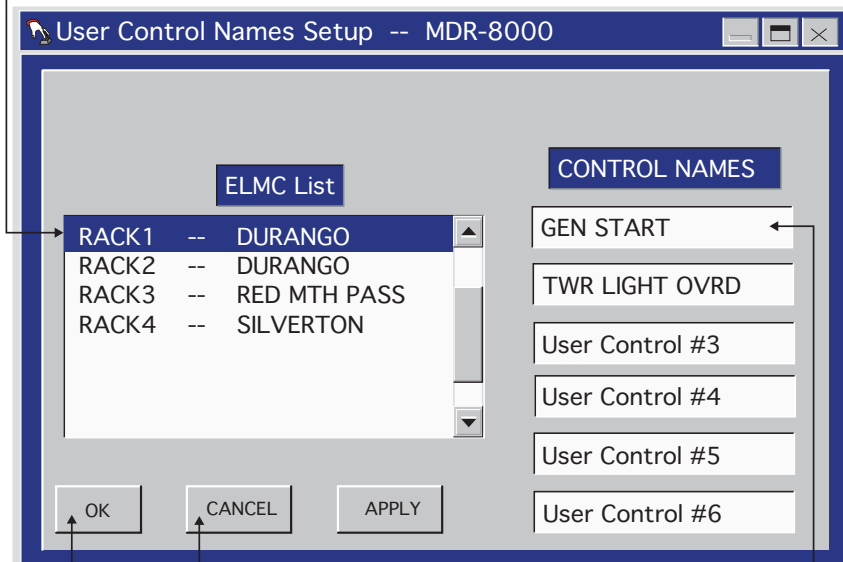
MESSAGE DISPLAYED FOR LENGTH OF TIME SELECTED IF THERE IS NO RESPONSE TO REQUEST FOR STATUS/CONTROL/PROVISIONING.

Figure 4- 16 DS1/E1, DS3, OC3 Radio ELMC Remote Time-Out Constant Provisioning

NOTE: DEFAULT CONTROL NAMES ARE USER CONTROL 1-6

1. OPEN USER CONTROL NAMES SETUP SCREEN

2. SELECT RADIO



CLICK HERE TO SAVE

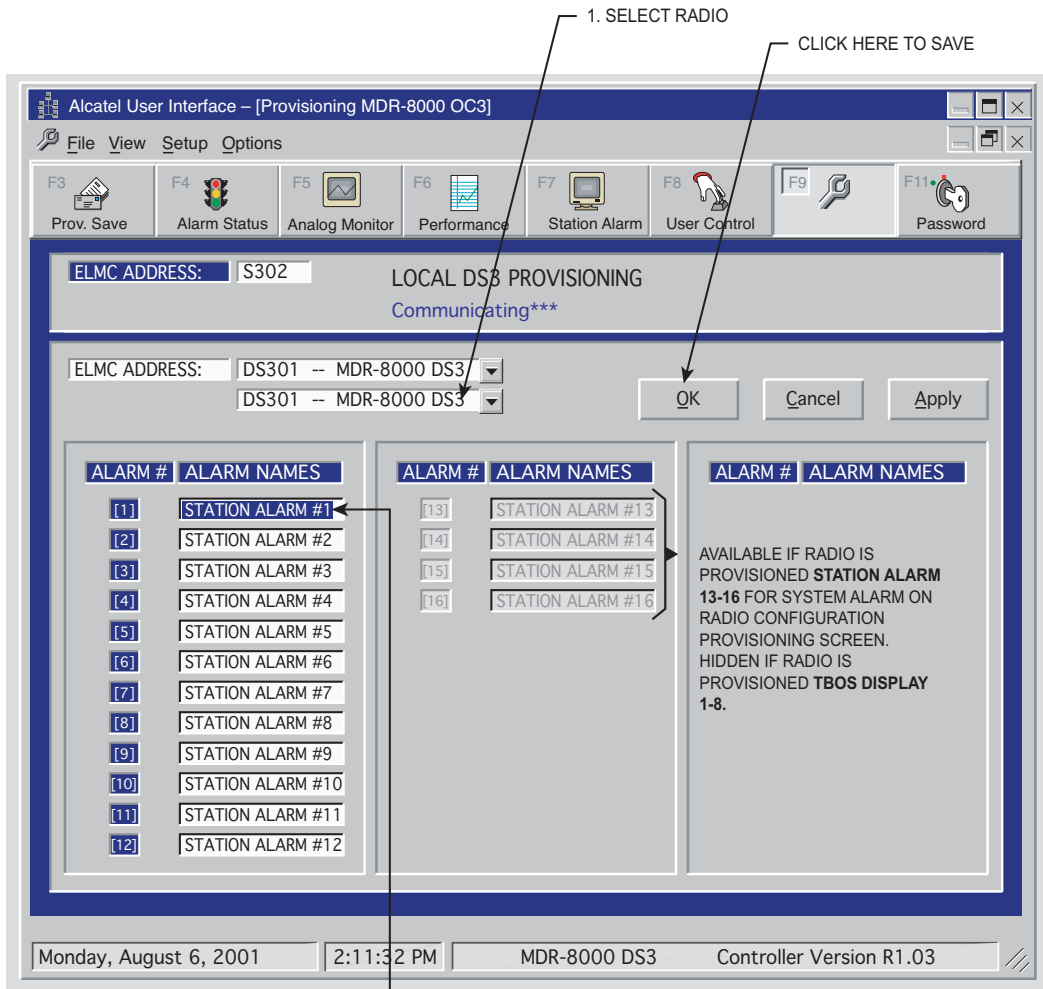
CLICK HERE TO CANCEL TRANSACTIONS BEFORE SAVE

3. SELECT CONTROL POINT

4. BACKSPACE TO DELETE AND TYPE IN NEW CONTROL NAME

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Figure 4-17 DS1/E1, DS3, OC3 Radio Control Names Provisioning



- 2. SELECT ALARM
- 3. BACKSPACE TO DELETE AND TYPE IN NEW ALARM NAME

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03/29/03

Figure 4-18 DS1/E1, DS3, OC3 Radio Alarm Names Provisioning

Note

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

5 MAINTENANCE

5.1 GENERAL

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 and RCVR crystals are soldered and tuned in an oscillator assembly board at the factory. Crystals are not replaceable components.



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.

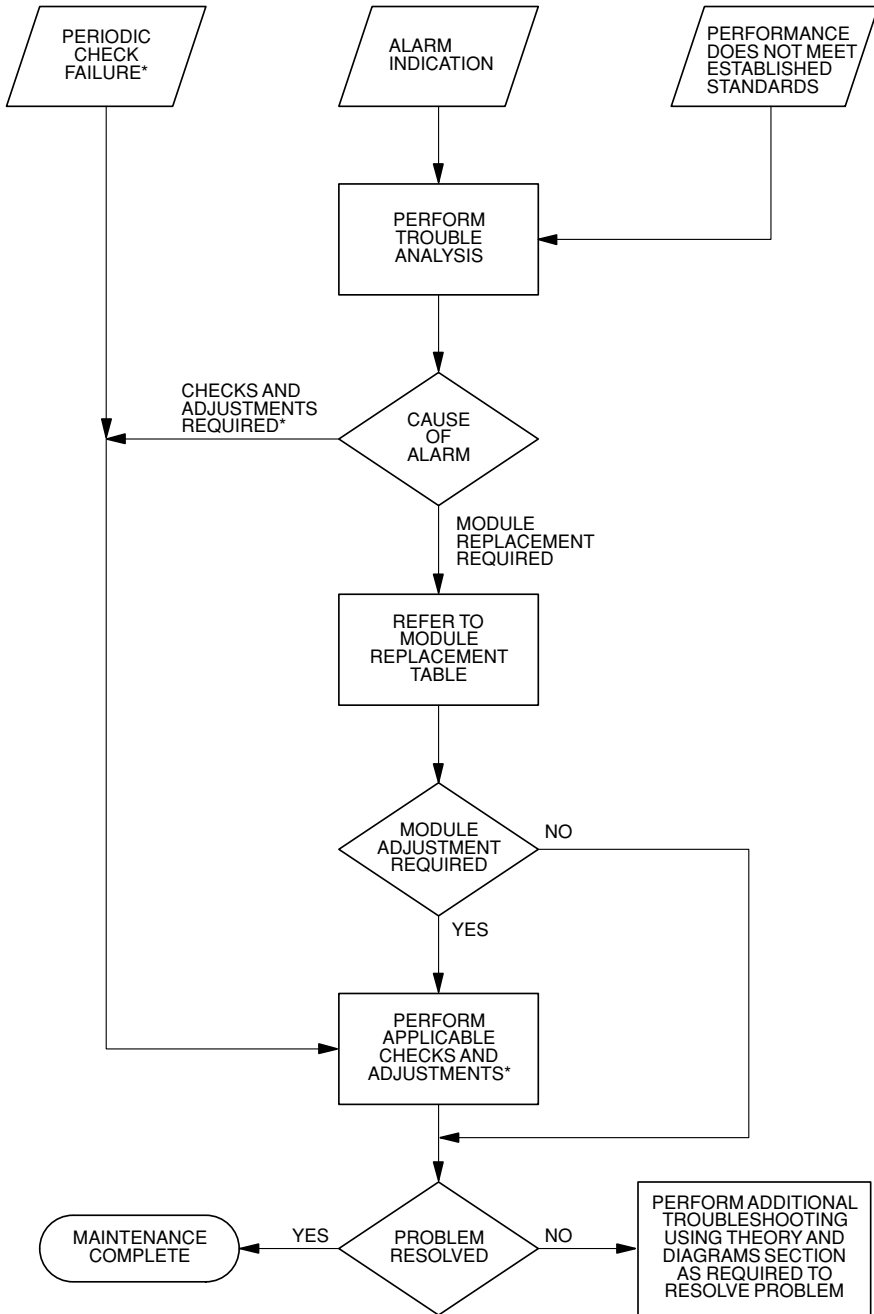
Note

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).



*IF APPLICABLE

MW300-0843-2

Figure 5-1 Maintenance Philosophy Flow Chart

5.3 SPECIAL TOOLS

Refer to Table 5-1 for special tools required for maintenance. Similar tools can be substituted for those recommended; however, before substitution, check the minimum parameters.

Table 5-1 Special Tools Required

TOOL	ESSENTIAL CHARACTERISTICS	USED ON
Torque Limiting Screwdriver Briggs-Weaver PN 8370-01880	#2 Phillips, 19 in-lb	DS1/E1, DS3, OC3
#2 Phillips Bit Extension Briggs-Weaver PN 8528-27370	(for use with torque limiting screwdriver)	DS1/E1, DS3, OC3
Torque Wrench, Utica Model CHA5 w/OP-102	5/16 in., 7-to-9 in-lb, sensing type	DS1/E1, DS3, OC3

5.4 PERSONAL COMPUTER (PC)

The PC is an on-line maintenance and troubleshooting tool. See Figure 5-2. Connect the RS-232 interface cable between USI connector on controller and the PC.

5.5 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.

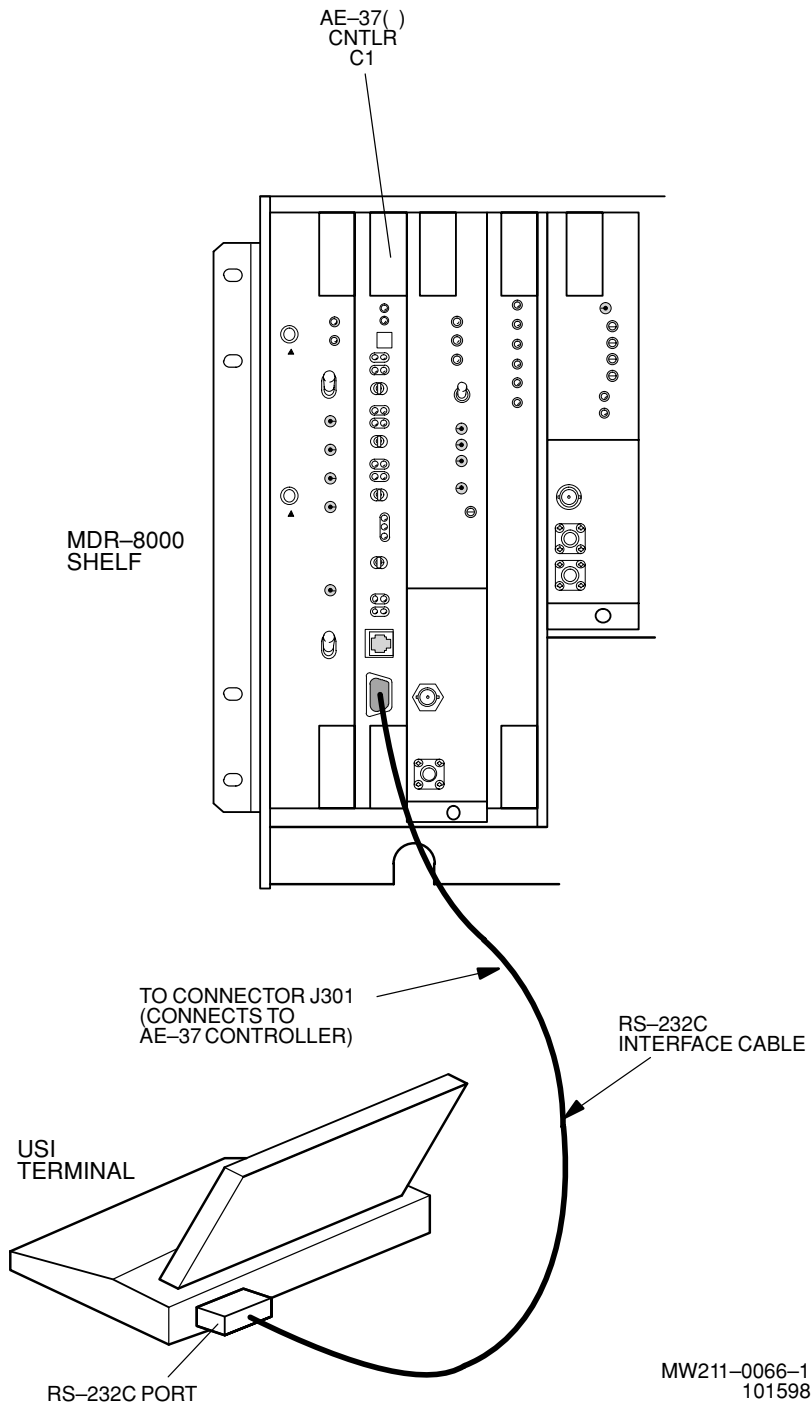


Figure 5-2 USI Computer to Controller Interconnection

5.6 RECOMMENDED PERIODIC CHECKS

Perform local oscillator frequency verification, receive local oscillator frequency verification, and transmitter output check 1 year after initial setting and at 5-year intervals thereafter to correct possible drift caused by aging.

5.7 TROUBLESHOOTING

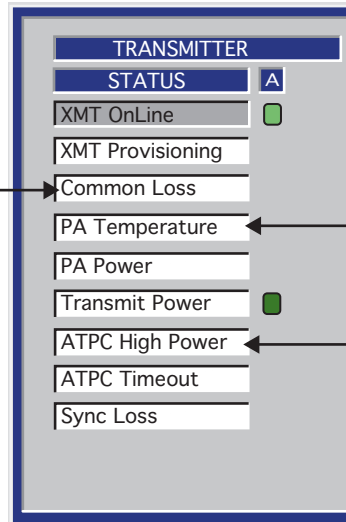
The digital radio system is equipped with alarm circuitry and automatic switching (in hot-standby, frequency diversity, and space diversity configurations) to provide protection against loss of traffic. This automatic switching, coupled with adaptive equalization of multipath distortion, provides protection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

5.7.1 Test Procedures

All referenced test and check procedures are in Appendix E on attached CD.

5.7.2 Linear/Ring Radio Troubleshooting

Troubleshoot linear and ring radio systems using alarm troubleshooting Figure 5-3 through Figure 5-14. Ring troubleshooting is further explained in the Maintenance section on the attached CD. After isolating the fault to the most probable cause, replace modules or repair as directed. The Module Replacement Matrix identifies the alignment procedures to be performed after a module has been replaced.



PA TEMPERATURE LIMITS EXCEEDED. CHECK MOUNTING SCREWS.

ATPC HAS BEEN ACTIVE FOR 5 MINUTES WITHOUT RETURNING TO NORMAL (DROPS BACK TO LOW POWER ONLY IF ATPC HAS BEEN ENABLED WITH TIMEOUT).

SILENT FAILURE (NO ALARM ACTIVATED) AT TRANSMITTER. THE COMMON LOSS ALARM, GENERATED BY THE AE-37Y CONTROLLER, TRIGGERS WHEN BOTH A SIDE AND B SIDE DOWNSTREAM RECEIVERS HAVE A RADIO FRAME LOSS OR CHANNEL FAILURE. IN A HOT-STANDBY HOP, LOSS OF BOTH RECEIVERS INITIATES A REQUEST TO SWITCH TO STANDBY TRANSMITTER, EVEN THOUGH NO TRANSMIT ALARMS ARE PRESENT. IF THE PATH IS NOMINAL, THE TRANSMITTER SWITCHES IN 5 SECONDS. IF THE PATH IS IN A FADE (APC IS IN ACTIVE RANGE), THE TRANSMITTER SWITCHES IN 30 SECONDS. IF THE DOWNSTREAM ALARMS CLEAR WITHIN 5 SECONDS, A CLA IS INITIATED ON THE OFF-LINE SIDE TO INDICATE A SILENT TRANSMIT FAILURE. IF ALARMS STILL EXIST, THE TRANSMITTER CONTINUES TO SWITCH EVERY 30 SECONDS. THIS PROCESS CONTINUES UNTIL THE RECEIVE ALARMS CLEAR, BUT NO CLA IS ACTIVATED.

Note

In order to clear a CLA, it must be acknowledged locally (at radio indicating alarm) using front panel control on controller module.

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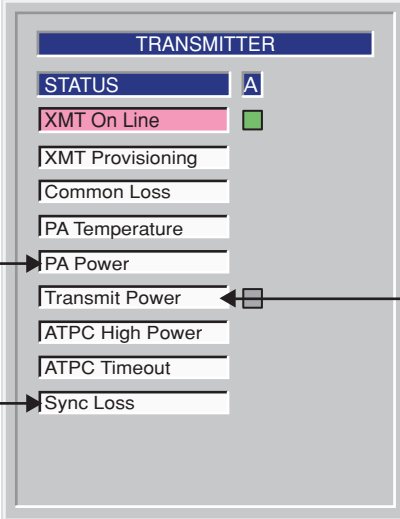
Figure 5-3 Troubleshooting DS1/E1 Radio XMT Alarms (Sheet 1 of 2)

LOSS OF XMT SIGNAL DETECTED AT OUTPUT OF PA. IF ANY OTHER ALARMS ARE RED, GO TO 1. IF NOT GO TO 2.

1. IF OFF NORMAL ALARM IS LIT, CHECK 10.5 V SWITCH ON POWER SUPPLY IS ON. IF NOT REMOVE/REPLACE PA MODULE.
2. MEASURE RF LEVEL AT RF MON CONNECTOR ON XMTR MODULE. IF LEVEL IS LOW, GO TO 3. IF NOT, GO TO 4.
3. MEASURE FREQUENCY AT XTAL MON CONNECTOR ON XMTR MODULE. IF FREQUENCY IS CORRECT, REMOVE/REPLACE XMTR MODULE. IF NOT REMOVE/REPLACE XTAL OSCILLATOR SUBBOARD.
4. REMOVE/REPLACE I/O INTERFACE MODULE.

LOSS OF XMT SIGNAL DETECTED AT OUTPUT OF XMTR. IF I/O COMMON ALARM AND XMT SYNC LOSS ALARM ARE RED, GO TO 1. IF NOT GO TO 2.

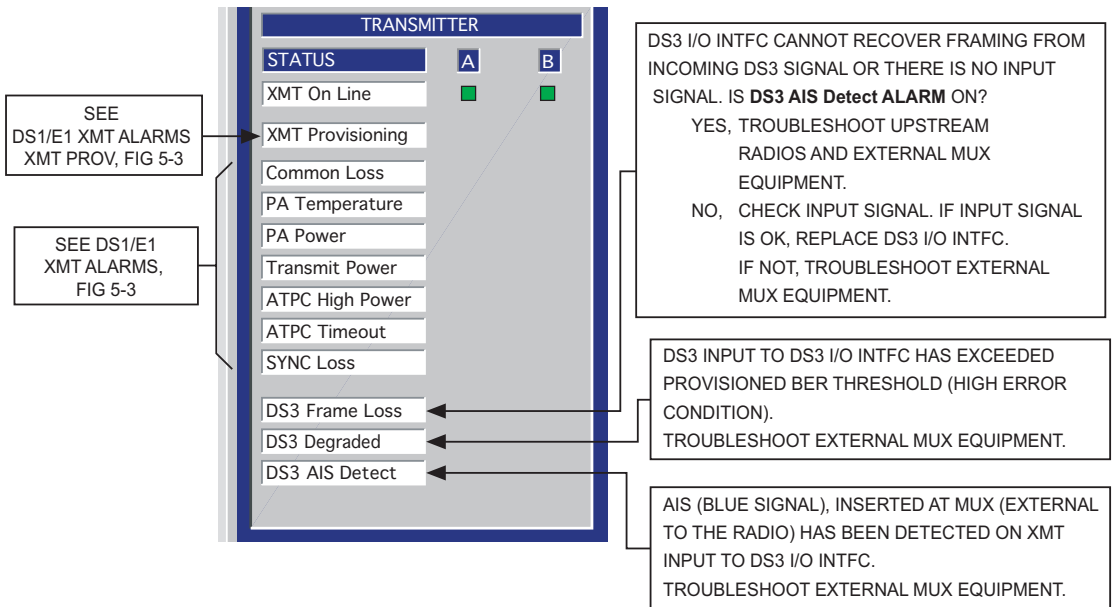
1. REMOVE/REPLACE I/O INTERFACE MODULE.
2. MEASURE RF LEVEL AT RF MON CONNECTOR ON XMTR MODULE. IF LEVEL IS LOW, GO TO 3. IF NOT, GO TO 4.
3. MEASURE FREQUENCY AT XTAL MON CONNECTOR ON XMTR MODULE. IF FREQUENCY IS CORRECT, REMOVE/REPLACE XMTR MODULE. IF NOT, REMOVE/REPLACE XTAL OSCILLATOR SUBBOARD.
4. REMOVE/REPLACE I/O INTERFACE MODULE.



IN PROTECTED SYSTEMS, INDICATES FAILURE IN SYNCHRONIZATION BETWEEN I/O INTERFACE MODULES. IF I/O INTERFACE MODULE IN-SERVICE IS NOT ACTIVE ON ALARMED SIDE, FAILURE IS BETWEEN A AND B I/O INTERFACE MODULES. IF I/O INTERFACE MODULE IN-SERVICE IS ACTIVE, FAILURE IS BETWEEN REPEATER RACKS OF SYNCHRONOUS REPEATER.

1. REPLACE A-SIDE I/O INTERFACE MODULE.
2. REPLACE B-SIDE I/O INTERFACE MODULE.

Figure 5-3 Troubleshooting DS1/E1 Radio XMT Alarms (Sheet 2 of 2)



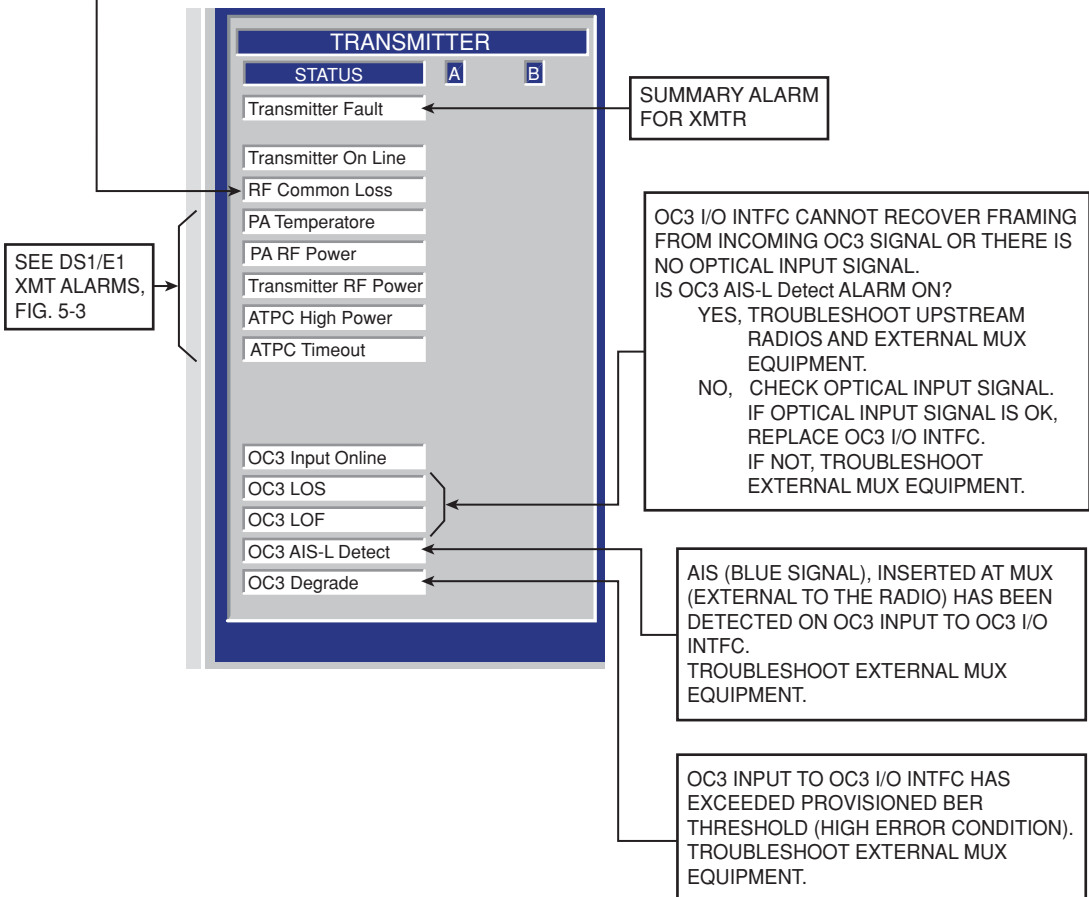
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Figure 5-4 Troubleshooting DS3 Radio XMT Alarms

TRIGGERS WHEN BOTH A AND B RCVRS HAVE LOF. THIS INITIATES A REQUEST TO SWITCH XMTRS AT FAREND. WHEN RSL IS MORE POSITIVE THAN - 50 DBM, FAREND XMTR SWITCHES IN 5 SECONDS AND THEN SWITCHES EVERY 30 SECONDS UNTIL ALARM CLEARS. AFTER XMTR SWITCHES 10 TIMES, THE I/O INTERFACE MODULE SWITCHES. THIS SEQUENCE OF EVENTS CONTINUES UNTIL ALARM CLEARS. TROUBLESHOOT FAREND XMTRS.

Note

In order to clear a CLA, it must be acknowledged locally (at radio indicating alarm) using front panel control on controller module.



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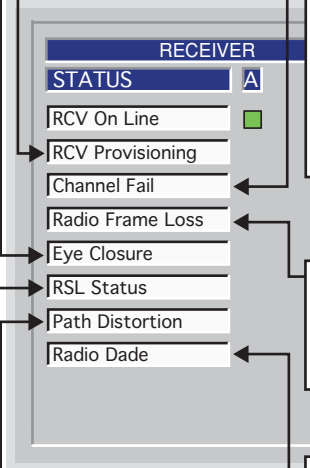
Figure 5-5 Troubleshooting OC3 Radio XMT Alarm

COMMUNICATION FAILURE BETWEEN CONTROLLER AND RCVR. MAY BE CAUSED BY MISMATCH BETWEEN CAPACITY KEYS. IF BOTH A AND B SIDES ARE ALARMED, REMOVE/REPLACE CONTROLLER. IF ONLY ONE SIDE IS ALARMED, CHECK RCVR CAPACITY KEY ON FAILED SIDE.

DEGRADED SIGNAL. NORMALLY THRESHOLD IS PROVISIONED TO PRECEDE CHANNEL FAIL ALARM. NORMALLY ON IF CHANNEL FAIL AND RADIO FRAME ARE ALARMED. VERIFY RSL ON ANALOG MONITOR SCREEN. IF RSL IS OK, REMOVE/REPLACE RCVR. IF NOT:
 1. CHECK FOR PATH FADING.
 2. CHECK UPSTREAM XMTR.

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.



LOSS OF SIGNAL LOCK IN RCVR. MAY BE DUE TO LOSS OF RCVR SIGNAL OR LO OFF FREQUENCY
 1. VERIFY RSL ON ANALOG MONITOR SCREEN. IF RSL IS OK, GO TO 2. IF NOT GO TO 3.
 2. VERIFY RCVR XTAL FREQUENCY. IF FREQUENCY IS CORRECT, REMOVE/REPAIR RCVR. IF NOT, REMOVE/REPLACE XTAL OSC SUBBOARD
 3. ON ANALOG MONITOR SCREEN VERIFY RECEIVE LO VOLTAGE IS $-3.0 \pm 0.5V$ dc. IF VOLTAGE IS CORRECT CHECK UPSTREAM XMTR. IF NOT, REMOVE/REPLACE XTAL OSC SUBBOARD.

LOSS OF RADIO FRAME IN I/O INTERFACE. IF A AND B ARE ALARMED, REPLACE I/O INTERFACE. IF NOT, REPLACE ON LINE XMTR.

OUT OF DADE RANGE. APPLICABLE TO HOT-STANDBY RADIO. CHECK CABLE LENGTHS.

Figure 5-6 Troubleshooting DS1/E1 Radio RCVR Alarms

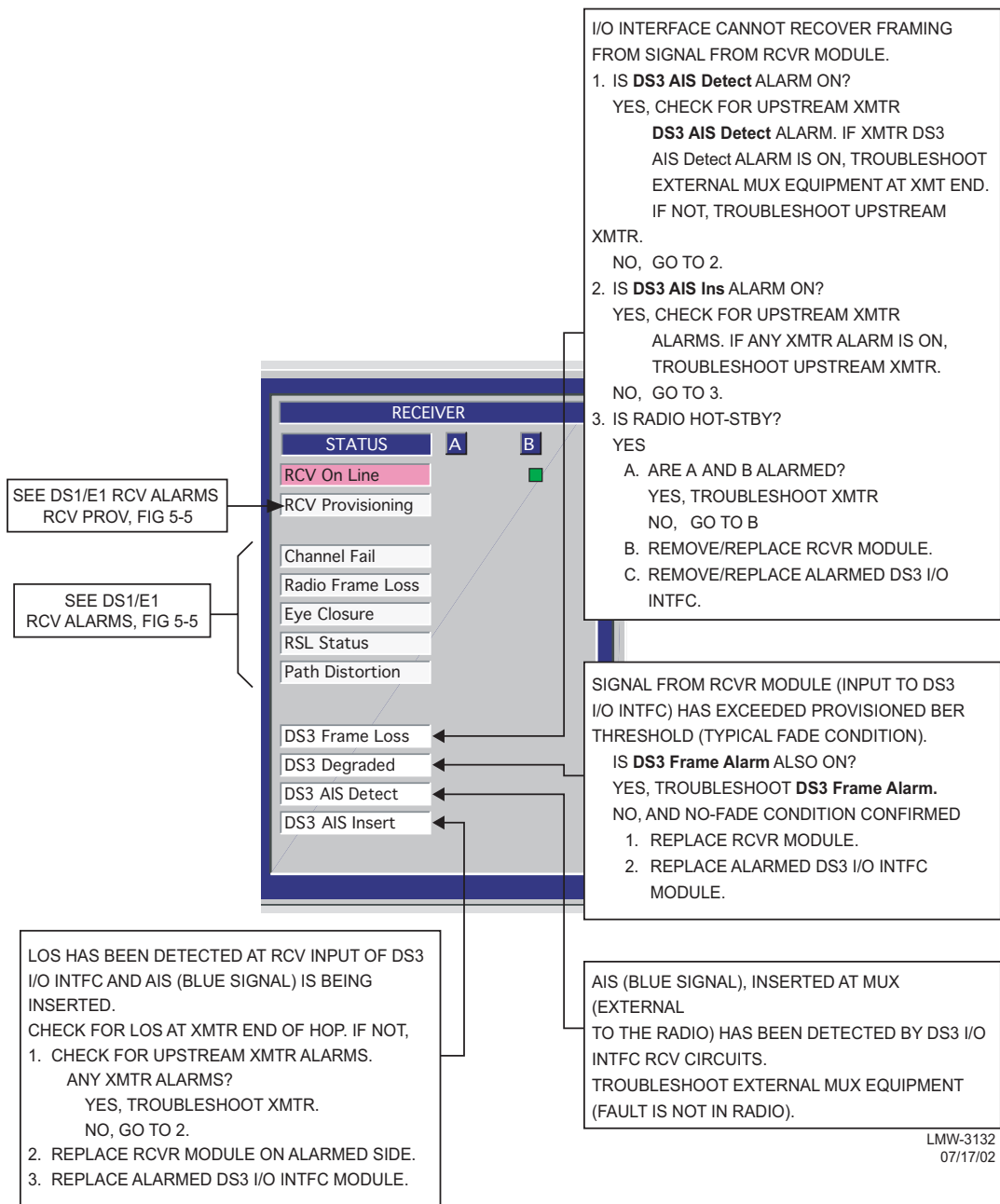
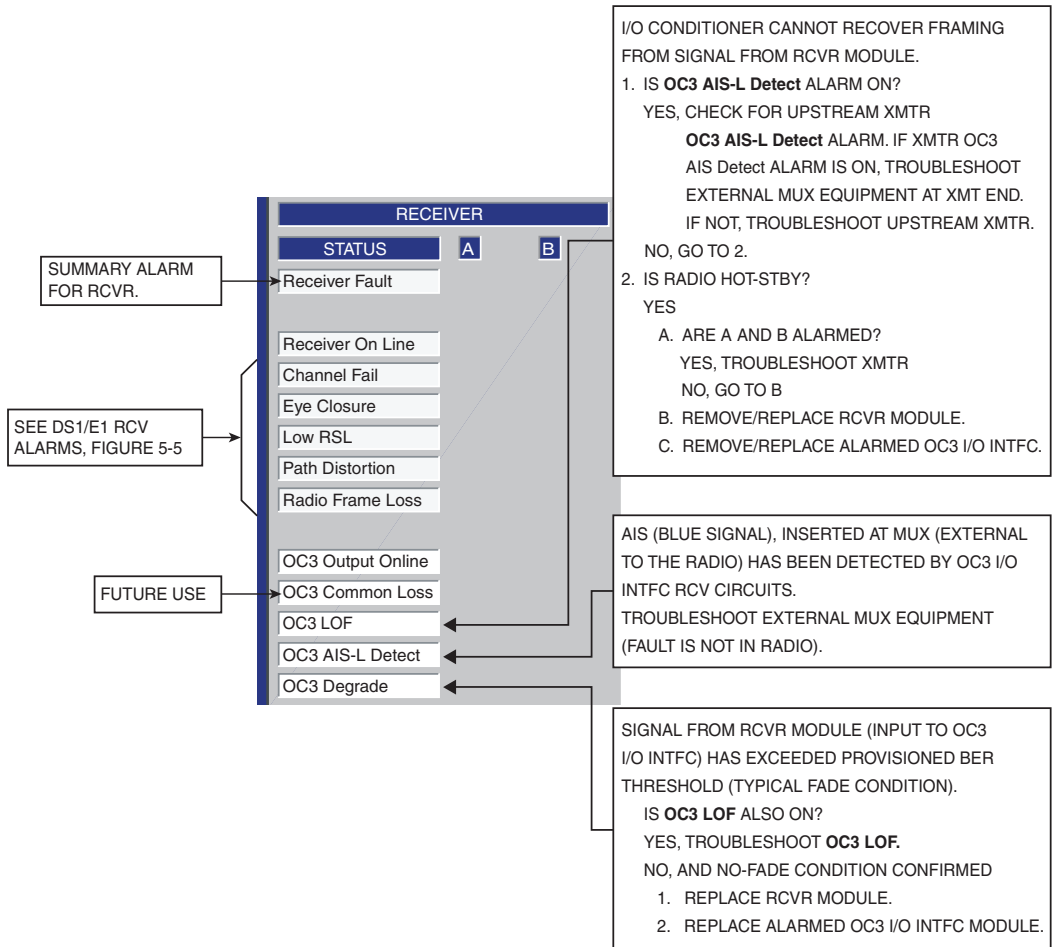
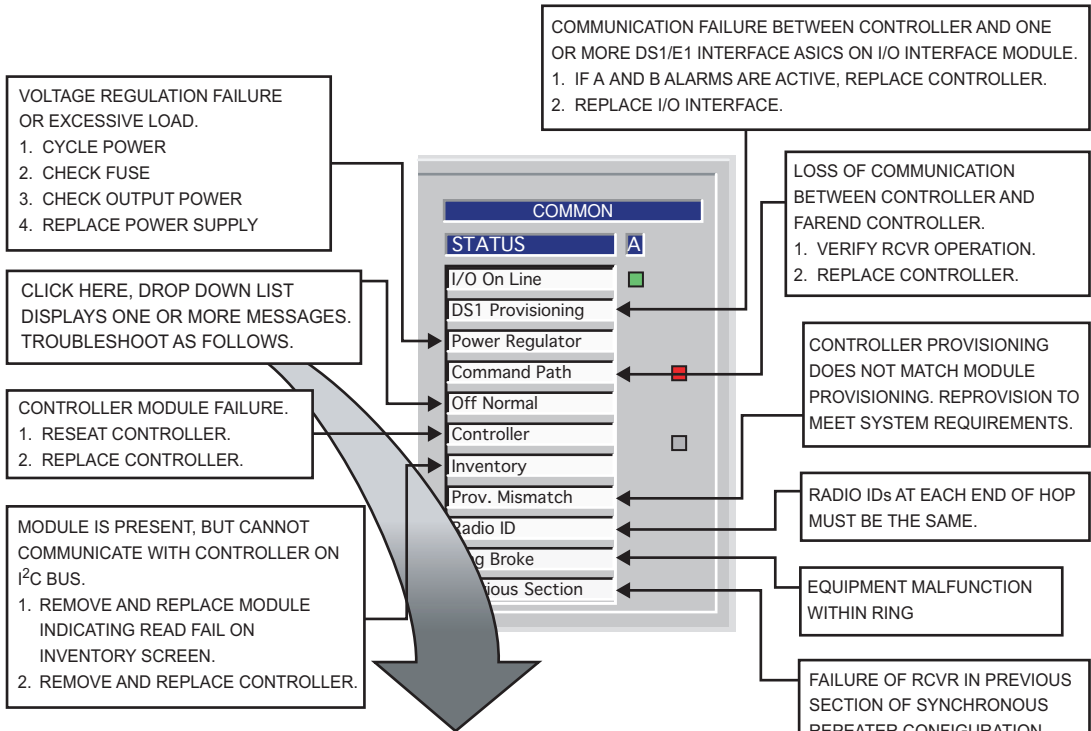


Figure 5-7 Troubleshooting DS3 Radio RCV Alarms



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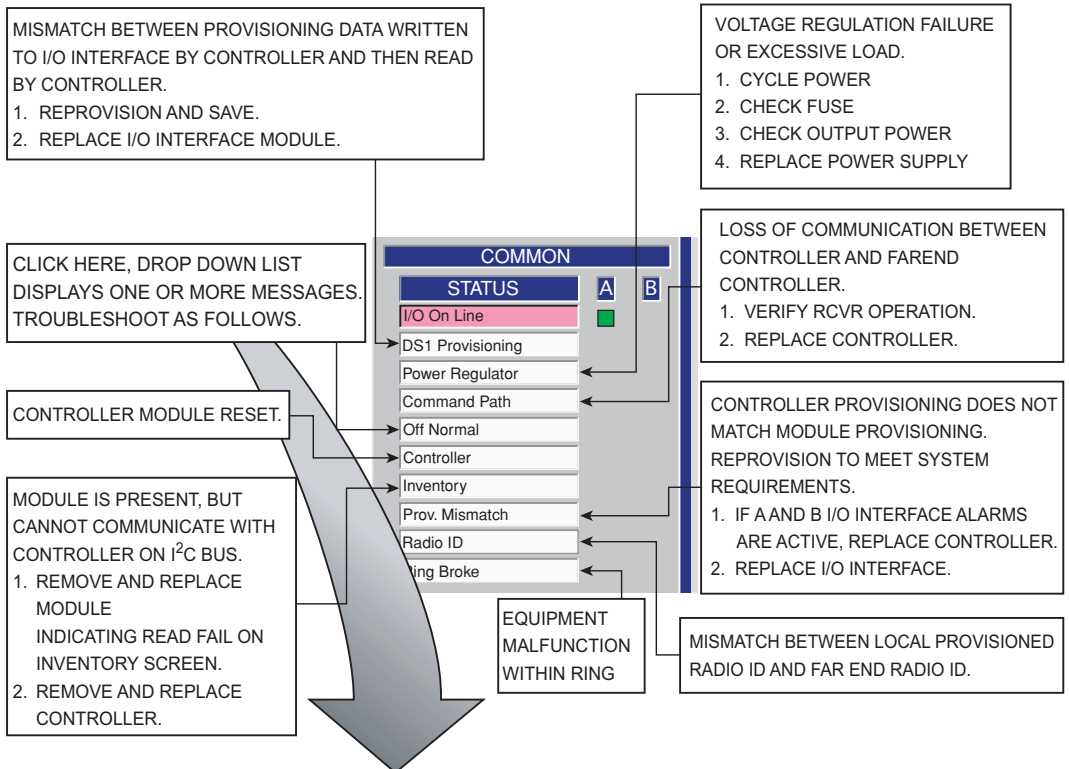
Figure 5-8 Troubleshooting OC3 Radio RCV Alarms



MESSAGE	MEANING	ACTION
A/B SIDE LIO SPI FAIL	LOST COMMUNICATION BETWEEN CONTROLLER AND I/O INTERFACE	REMOVE/REPLACE 1) I/O INTERFACE 2) CONTROLLER
A/B SIDE RCV SPI FAIL	LOST COMMUNICATION BETWEEN CONTROLLER AND I/O INTERFACE/RCVR	REMOVE/REPLACE 1) RCVR 2) I/O INTERFACE 3) CONTROLLER
A/B SIDE DS1 SPI FAIL	LOST COMMUNICATION BETWEEN CONTROLLER AND I/O INTERFACE	REMOVE/REPLACE 1) I/O INTERFACE 2) CONTROLLER
FAN ALARM	FAN OR FAN CONTROL MODULE FAILED	REMOVE/REPLACE FAN/FAN ASSEMBLY
LIO/DS1 LOOPBACK ON A/B HIGH/LOW POWER LOCK	FUNCTION ENABLED ON CONTROL SCREEN	DISABLE FUNCTION ON CONTROL SCREEN
A/B TX/RX/OR I/O OVERRIDE	FUNCTION ENABLED ON CONTROL SCREEN OR FRONT PANEL ON CONTROLLER	DISABLE FUNCTION ON CONTROL SCREEN OR CONTROLLER FRONT PANEL
EEPROM PROV DOES NOT MATCH MODULE PROV	PROVISIONING ON CONTROLLER DOES NOT MATCH PROVISIONING SCREEN	PROVISION TO MATCH PROPER SYSTEM REQUIREMENTS

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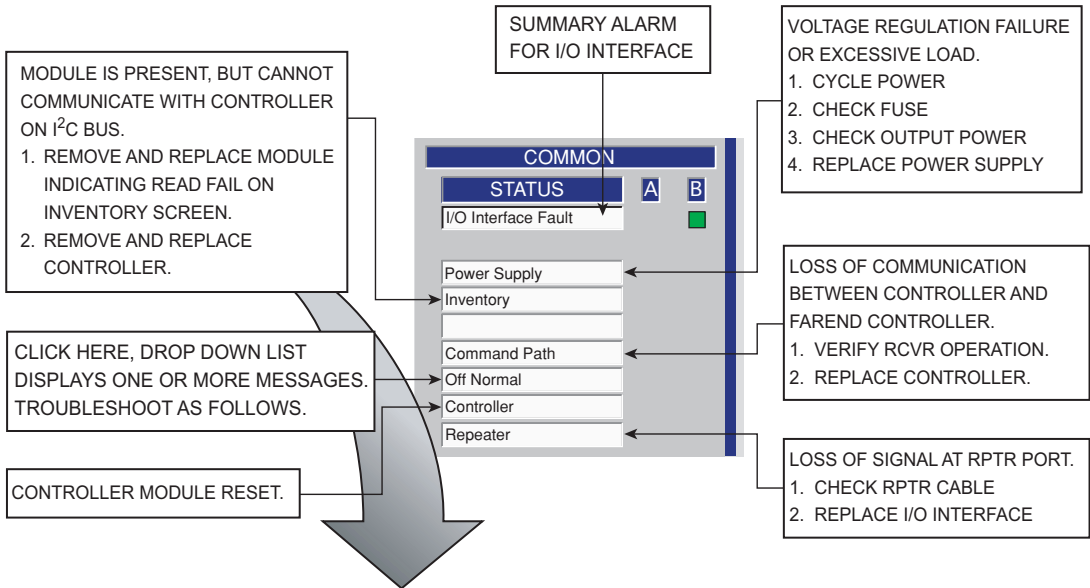
Figure 5-9 Troubleshooting DS1/E1 Radio Common Alarms



MESSAGE	MEANING	ACTION
A/B SIDE LIO SPI FAIL	LOST COMMUNICATION BETWEEN CONTROLLER AND I/O INTERFACE	REMOVE/REPLACE 1) I/O INTERFACE 2) CONTROLLER
A/B SIDE RCV SPI FAIL	LOST COMMUNICATION BETWEEN CONTROLLER AND I/O INTERFACE/RCVR	REMOVE/REPLACE 1) RCVR 2) I/O INTERFACE 3) CONTROLLER
A/B SIDE DS1 SPI FAIL	LOST COMMUNICATION BETWEEN CONTROLLER AND I/O INTERFACE	REMOVE/REPLACE 1) I/O INTERFACE 2) CONTROLLER
FAN ALARM	FAN OR FAN CONTROL MODULE FAILED	REMOVE/REPLACE FAN/FAN ASSEMBLY
DS3 LOOPBACK ON A/B HIGH/LOW POWER LOCK	FUNCTION ENABLED ON CONTROL SCREEN	DISABLE FUNCTION ON CONTROL SCREEN
A/B TX/RX/OR I/O OVERRIDE	FUNCTION ENABLED ON CONTROL SCREEN OR FRONT PANEL ON CONTROLLER	DISABLE FUNCTION ON CONTROL SCREEN OR CONTROLLER FRONT PANEL
EEPROM PROV DOES NOT MATCH MODULE PROV	PROVISIONING ON CONTROLLER DOES NOT MATCH PROVISIONING SCREEN	PROVISION TO MATCH PROPER SYSTEM REQUIREMENTS

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Figure 5-10 Troubleshooting DS3 Radio Common Alarms



MESSAGE	MEANING	ACTION
OVERRIDE SWITCH ACTIVE	OVRD CONTROL ON CONTROLLER MODULE IS ACTIVATED.	DISABLE OVERRIDE
PA POWER SUPPLY ALARM	PA ON/OFF SWITCH ON POWER SUPPLY IS SET TO ON.	SET PA ON/OFF SWITCH TO OFF
CONTROLLER/POWER SUPPLY PROVISION MISMATCH	PROVISIONING DATA STORED IN MEMORY ON CONTROLLER DOES NOT MATCH PROVISIONING DATA STORED IN MEMORY ON THE A-SIDE POWER SUPPLY.	
CAN'T PROVISION A POWER SUPPLY	CAN NOT DOWNLOAD PROVISIONING DATA FROM CONTROLLER TO A-SIDE POWER SUPPLY.	REMOVE/REPLACE 1) A-SIDE POWER SUPPLY 2) CONTROLLER
A&B TX CAP-KEY MISMATCH	CAPACITY KEY ON A-SIDE XMTR HAS DIFFERENT PAST NUMBER THAN CAPACITY KEY ON B-SIDE XMTR.	VERIFY CAPACITY KEY REQUIREMENTS. REPLACE A/B SIDE CAPACITY KEY AS REQUIRED.
ATPC LOCKED HIGH OR LOW	ATPC LOCK FUNCTION ON USI CONTROL SCREEN IS ENABLED.	DISABLE ATPC OR UNLOCK ATPC LOCK FUNCTION ON CONTROL SCREEN.
FAN ALARM	FAN OR FAN CONTROL MODULE FAILED.	REMOVE/REPLACE FAN/FAN ASSEMBLY

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Figure 5-11 Troubleshooting OC3 Radio Common Alarms

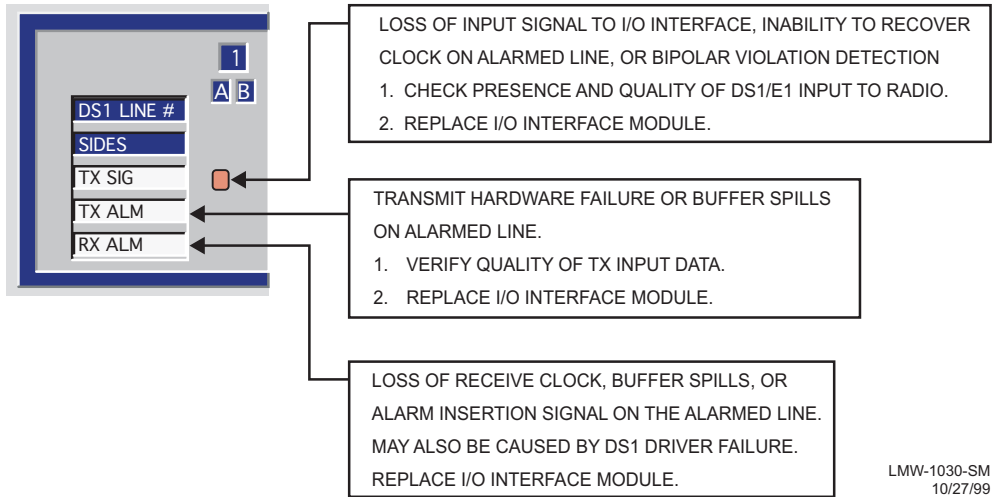


Figure 5-12 Troubleshooting DS1/E1 Radio Alarms

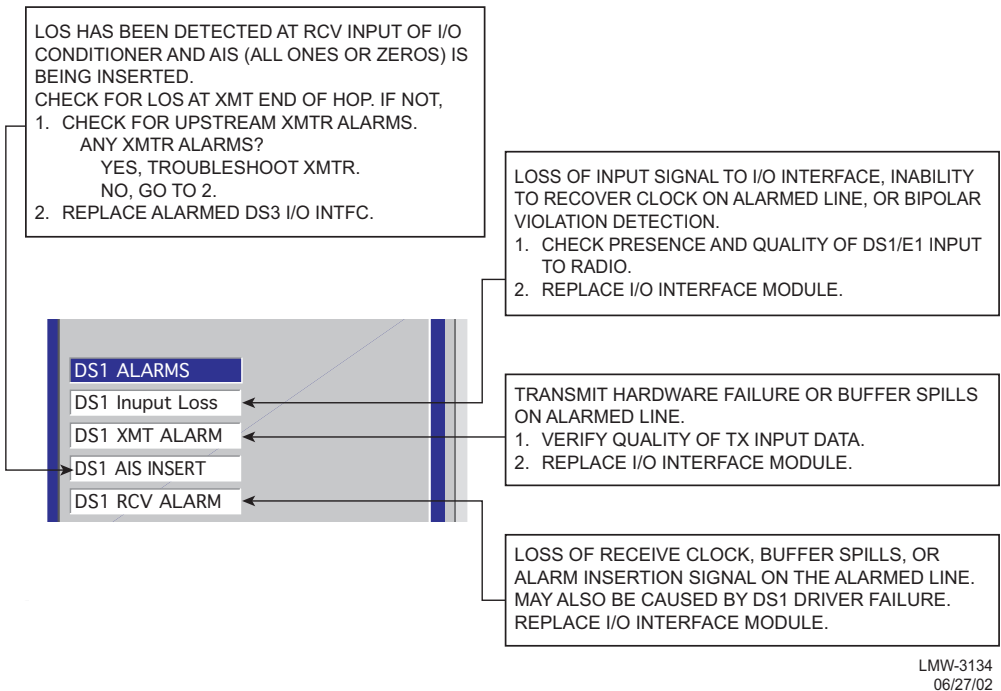
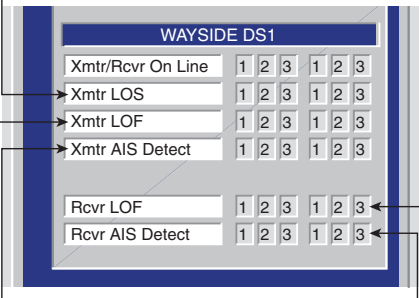


Figure 5-13 Troubleshooting DS3 Radio Wayside DS1 Alarms

LOSS OF INPUT SIGNAL TO I/O INTFC.
 1. CHECK PRESENCE OF DS1 INPUT TO RADIO.
 2. REPLACE I/O INTFC MODULE.

INABILITY TO RECOVER CLOCK OR BIPOLAR VIOLATION DETECTED ON DS1/E1 INPUT TO RADIO.
 1. CHECK QUALITY OF DS1 INPUT TO RADIO.
 2. REPLACE I/O INTFC MODULE.



INABILITY TO RECOVER CLOCK OR BIPOLAR VIOLATION DETECTED ON OUTPUT OF RADIO RCVR.
 1. CHECK XMTR END OF HOP FOR ALARMS.
 2. REPLACE ALARMED I/O INTFC MODULE.

AIS DETECTED ON DS1 INPUT TO RADIO.
 FAULT IS EXTERNAL TO RADIO.
 CHECK EXTERNAL MUX SUPPLYING DS1/E1 TO RADIO.

AIS HAS BEEN DETECTED ON OUTPUT OF RADIO RCVR. FAULT IS NOT IN THIS RADIO.
 CHECK UPSTREAM XMTR/HOPS FOR ALARMS.

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Figure 5-14 Troubleshooting OC3 Radio Wayside DS1 Alarms

5.7.3 Ring Radio Troubleshooting

The four ring status LEDs on the front panel of the controller module are useful in determining the status of the ring radios. The four LEDs are divided into two groups: Command LEDs and Idle LEDs. Each group has an LED for the RF path and a LED for the repeater link. The command LEDs use a flashing pattern to determine the status of the ring. The Idle leds are used to determine if ring commands are being received on the corresponding port. Refer to ring trouble shooting on the attached CD for details.

5.8 MODULE REPLACEMENT

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 should never be shipped as replacements without being 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 5-2 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 5-2 Module Replacement Matrix

MODULE/UNIT	REMOVAL/REPLACEMENT PROCEDURE	CHECKS/ADJUSTMENTS PROCEDURE
AE-27AF Relay Interface	No Special Procedure Required	None Required
AE-37Y Controller	Chart 2	None Required
CE-16BB Power Supply	Chart 1	None Required
Fuse	No Special Procedure Required. Refer to Operations Section for Location.	
DX-35M DS1/E1 I/O Interface	Chart 3	None Required
DX-35N DS3 I/O Interface	Chart 3	Appendix E
DX-35P OC3 I/O Interface	Chart 3	None Required
UD-35() Transmitter	Chart 4	Appendix E
Crystal Oscillator Subboard	Figure 5-17	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 5-18	
UD-36() Receiver	Chart 5	Appendix E
Crystal Oscillator Subboard	Figure 5-19	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 5-20	
UD-51() Power Amplifier	Chart 6	Appendix E
LBO/AUX Interface	Chart 7 in the Maintenance section on the attached CD	No Special Procedure Required
RF Switch	Chart 8 in the Maintenance section on the attached CD	No Special Procedure Required

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

(2) Appendix E is on attached CD.

5.9 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 of ± 2 MHz requires re-tuning the diplexer. Re-tuning the diplexer is a factory procedure.

5.10 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.

Chart 1 Power Supply Removal and Replacement

PURPOSE

Use this procedure to remove and replace CE-16BB Power Supply.

SPECIAL TOOLS REQUIRED

Torque Screwdriver

STEP	PROCEDURE
------	-----------

WARNING

*Possibility of
Damage
to Equipment*

Wear ground straps according to local office procedures.

WARNING

*Possibility of
Damage
to Equipment*

Ensure the two mounting screws, accessible through the front panel, are loosened before attempting to remove power supply from shelf to prevent breaking handle.

WARNING

*Possibility of
Damage
to Equipment*

Mounting surfaces on both power supply and heatsink must be clean to ensure proper heat transfer. Mounting screws must be torqued to 19 in. lbs.

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.

STEP**PROCEDURE, CONTINUED**

- 1 Is radio protected (hot-standby or frequency diversity)?
If yes, go to step 2.
If no, go to step 3.
- 2 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.
- 3 Do you want to remove or install power supply module?
If remove, go to step 4.
If install, go to step 7.
- REMOVE:**
- 4 On failed power supply, set **PA ON/OFF** switch to **OFF**.
- 5 On failed power supply, set **POWER ON/OFF** switch to **OFF**.
- 6 Perform removal steps shown on Figure 5-15.
- INSTALL:**
- 7 Perform installation steps shown on Figure 5-15.
- 8 Was XMTR, RCVR, and I/O switched (step 2)?
If yes, go to step 9.
If no, go to step 10.
- 9 On AE-37() Controller, toggle **OVRD** switch to disable override (unlocks on-line XMTR, RCVR, and I/O and restores automatic switching functions).

Note

If radio is not equipped with power amplifiers and the PA ON/OFF switch on the power supply is accidentally turned on, the OFF NORM alarm on the power supply and the Off Normal alarm on the USI Status Alarm screen will light. The off normal message on the USI Status Alarm screen will be blank.

- 10** Is radio equipped with optional PA?
 - If yes, go to step 11.
 - If no, go to step 16.

- 11** On power supply, set **PA ON/OFF** switch to **ON**.

Note

DS3 and OC3 radios have provisioning data stored on both the controller and A-side power supply. When provisioning is saved through downloading, the provisioning data is stored on both modules. If the radio is non-standby and the A-side power supply fails, the radio must be reprovisioned after the module is replaced and the reprovisioned data downloaded and saved. If the radio is hot-standby, the provisioning data stored on the controller is automatically copied to the replacement A-side power supply when provisioning is saved.

- 12** is radio DS3/OC3 non-standby?
 - If yes, go to step 13.
 - If no, go to step 16.

- 13** Go to applicable DS3/OC3 initial turnup section and reprovision radio.

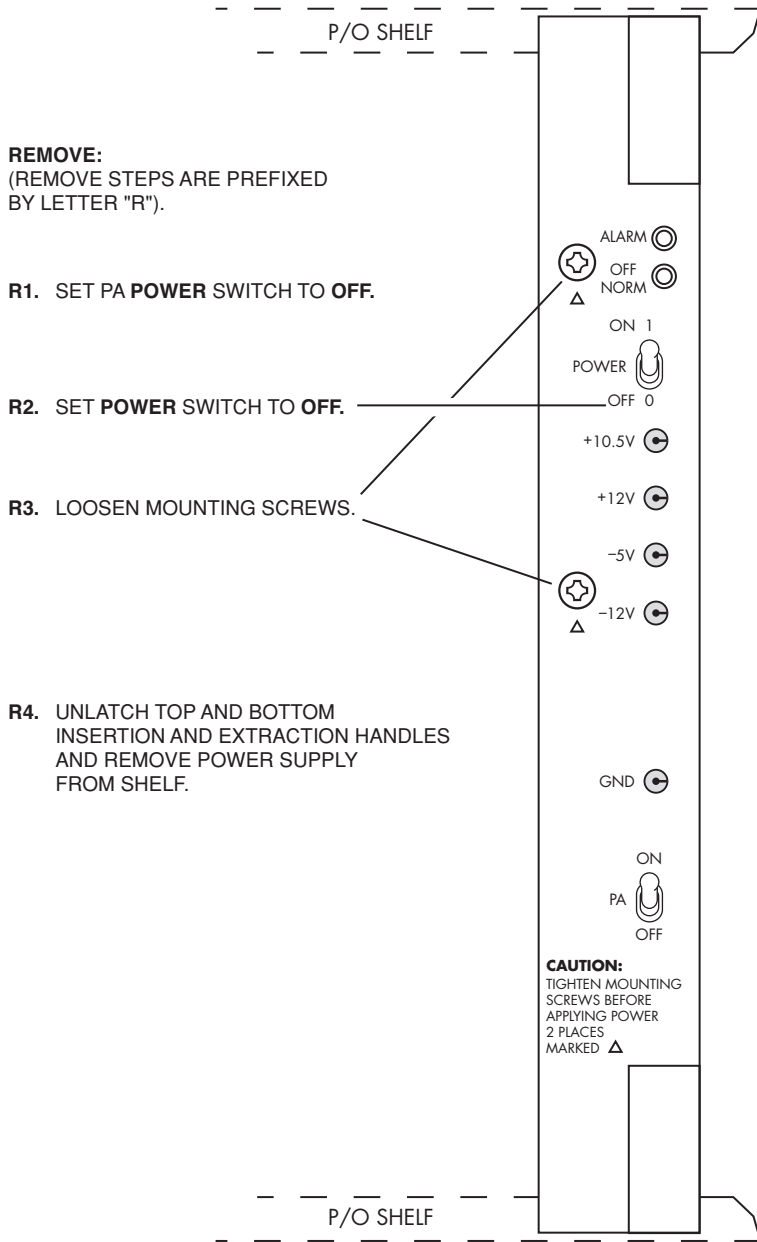
Note

A mismatch between software revisions on the controller and the replacement A-side power supply causes a flashing controller fail alarm when the spare power supply is plugged in.

- 14** Observe Alarm LED on controller. Is controller alarm flashing (software/firmware mismatch indicated)?
 - If yes, go to step 15.
 - If no, go to step 16.

- 15** Go to applicable DS3/OC3 initial turnup section and download and save current provisioning.

- 16** STOP. This procedure is complete.



INSTALL:
(INSTALL STEPS ARE PREFIXED BY LETTER "I").

- I1.** VERIFY JOINING SURFACES ON POWER SUPPLY AND HEATSINK ARE CLEAN.
 - I2.** INSERT POWER SUPPLY IN SHELF AND LATCH TOP AND BOTTOM INSERTION AND EXTRACTION HANDLES.
 - I3.** TIGHTEN SCREWS. TORQUE SCREWS TO 19 IN. LBS.
 - I4.** SET **POWER** SWITCH TO **ON**.
- NOTE**
- IF PA IS NOT EQUIPPED, SETTING PA **POWER** SWITCH TO **ON** WILL TURN ON **OFF NORM** ALARM.
- I5.** SET PA **POWER** SWITCH TO **ON** (IF EQUIPPED).

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Figure 5-15 Power Supply Removal/Installation

Chart 2 Controller Removal and Replacement

PURPOSE

Use this procedure to remove and replace AE-37Y Controller.

SPECIAL TOOLS REQUIRED

None

STEP	PROCEDURE
------	-----------

WARNING

*Possibility of
Damage
to Equipment*

Wear ground straps according to local office procedures.

CAUTION

*Possibility of
Service
Interruption*

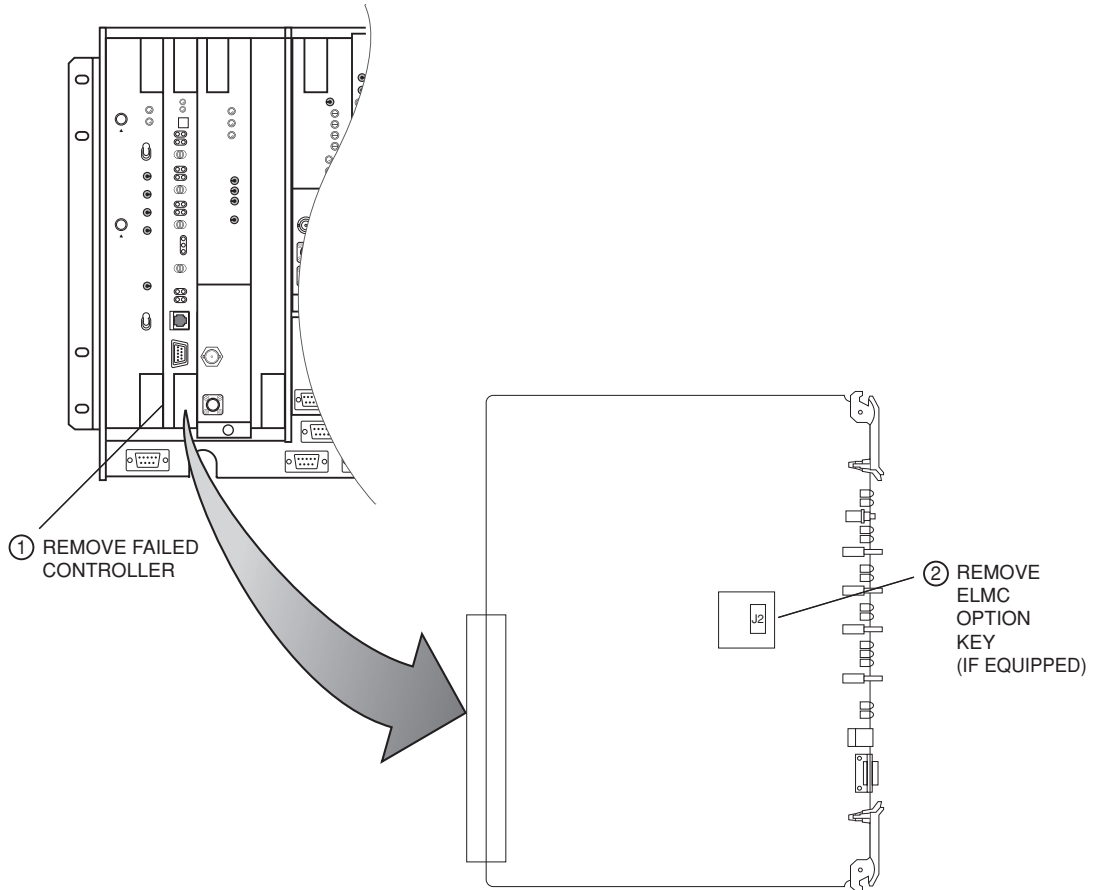
This is an in service procedure, however protection switching is disabled. If another failure occurs during the performance of the procedure, service will be interrupted.

- 1 Do you want to remove or install controller module?
 - If remove, go to step 2.
 - If install, go to step 6.
- REMOVE:**
- 2 Is controller installed in an OC3 radio?
 - If yes, go to step 3.
 - If no, go to step 5.
- 3 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).
- 4 Release **ACO LT/OVRD** switch.
- 5 Remove controller module from shelf.

INSTALL:

□ 6

See Figure 5-16 and follow step-by step procedure to install controller module.



① REMOVE FAILED CONTROLLER

② REMOVE ELMC OPTION KEY (IF EQUIPPED)

③ INSTALL REMOVED ELMC OPTION KEY FROM STEP 2 ON REPLACEMENT CONTROLLER.

④ INSTALL REPLACEMENT CONTROLLER IN SHELF.

LMW-5062-SM
06/04/02

Figure 5-16 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.

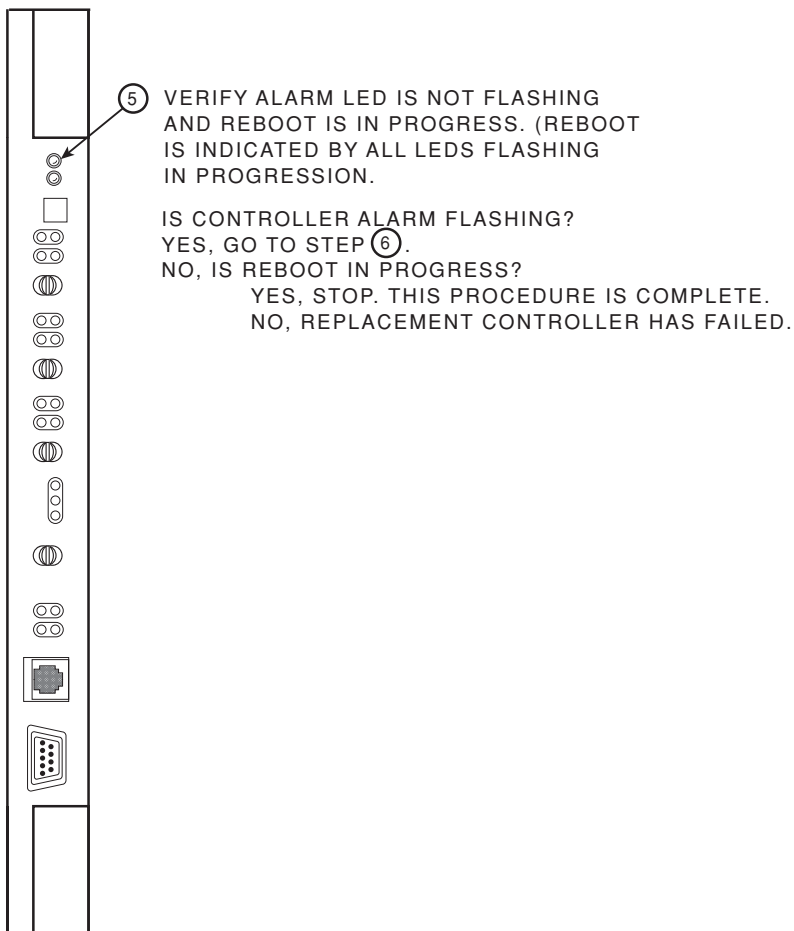
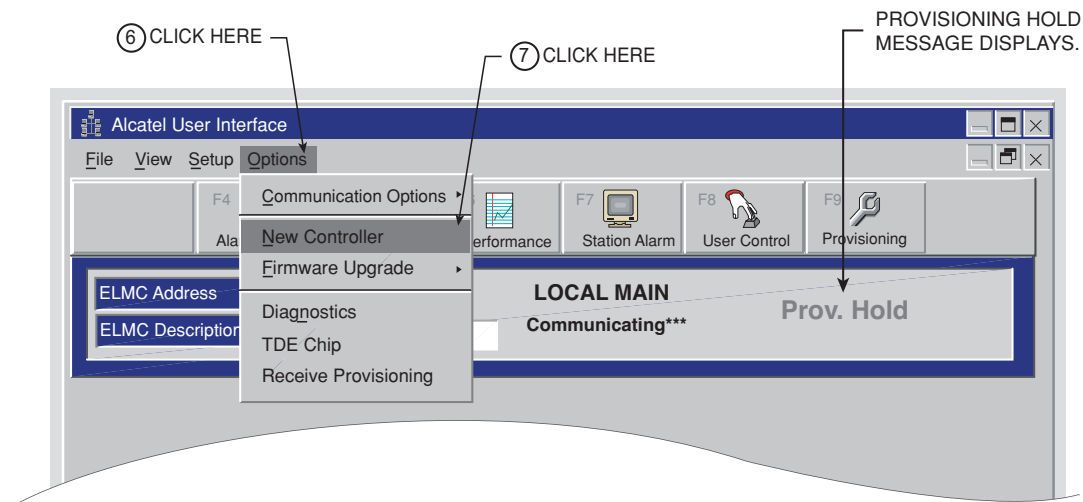


Figure 5-16 Controller Module Installation (Sheet 2 of 4)



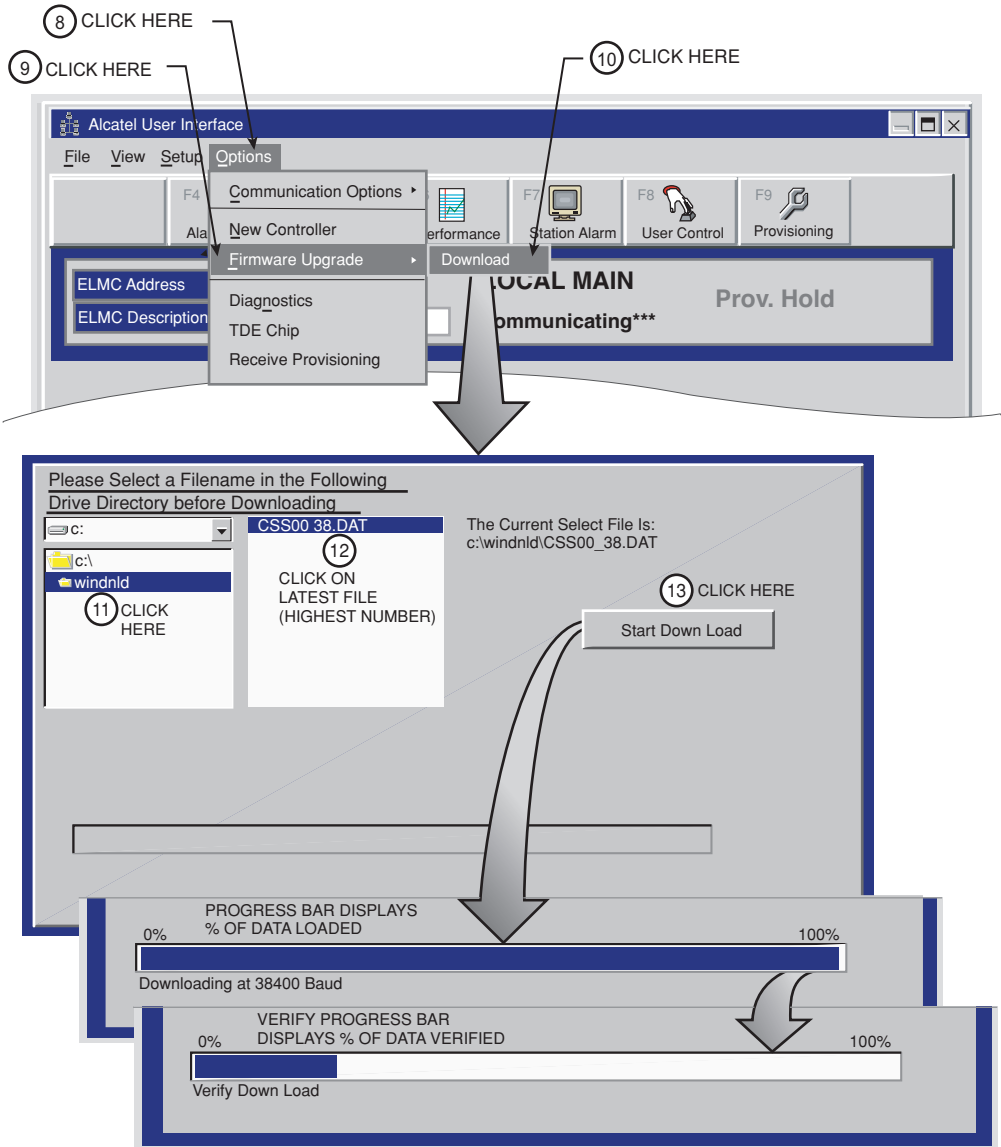
PROVISIONING HOLD MESSAGE DISPLAYS.

NOTE

PROVISIONING HOLD MESSAGE IS DISPLAYED ON ALL SCREENS. THE MESSAGE IS REMOVED WHEN PROVISIONING IS SAVED.

LMW-5065-SM
08/10/01

Figure 5-16 Controller Module Installation (Sheet 3 of 4)



LMW-5064-SM
08/10/01

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

- 14 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.

- 15 STOP. THIS PROCEDURE IS COMPLETE.

Figure 5-16 Controller Module Installation (Sheet 4 of 4)

Chart 3 I/O Interface Removal and Replacement

PURPOSE

Use this procedure to remove and replace DX-35() I/O Interface module.

SPECIAL TOOLS REQUIRED

None

STEP	PROCEDURE
------	-----------

WARNING

*Possibility of
Damage
to Equipment*

Wear ground straps according to local office procedures.

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.

- 1** Is radio protected (hot-standby or frequency diversity)?
 - If yes, go to step 2.
 - If no, go to step 3.
 - 2** 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.
 - 3** Do you want to remove or install I/O interface module?
 - If remove, go to step 4.
 - If install, go to step 9.
- REMOVE:**
- 4** Is I/O interface module DX-35P OC3 I/O Interface?
 - If yes, go to step 7.
 - If no, go to step 8.

- 5** 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).
- 6** Release **ACO LT/OVRD** switch.
- 7** Disconnect fiber optic cables.
- 8** Remove I/O interface module from shelf.
- INSTALL:**
- 9** Install I/O interface module in shelf.
- 10** Is I/O interface module DX-35P OC3 I/O Interface?
 - If yes, go to step 11.
 - If no, go to step 15.
- 11** Connect fiber optic cables.
- 12** Is I/O interface module DX-35N DS3 I/O Interface?
 - If yes, go to step 13.
 - If no, go to step 15.
- 13** Perform Radio DADE. Refer to Appendix E.
- 14** Perform DS3 Line DADE. Refer to Appendix E.
- 15** Was I/O locked on line (step 2).
 - If yes, go to step 16.
 - If no, go to step 17.
- 16** On AE-37() Controller, toggle OVRD switch to disable override (unlocks on-line XMTR and restores automatic switching functions).
- 17** STOP. This procedure is complete.

Chart 4 XMTR Removal and Replacement

CAUTION

*Possibility of
Service
Interruption*

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

PURPOSE

Use this procedure to remove and replace UD-35() XMTR and/or:

- 1 to replace a faulty crystal oscillator subboard
- 2 to change out the crystal oscillator subboard to change frequency
- 3 to move oscillator to a replacement XMTR
- 4 to replace a faulty capacity key
- 5 to change DS1/E1 or DS3 capacity
- 6 to move capacity key to a replacement XMTR

SPECIAL TOOLS REQUIRED

None

STEP	PROCEDURE
------	-----------

WARNING

*Possibility of
Damage
to Equipment*

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.

WARNING

*Possibility of
Damage
to Equipment*

Wear ground straps according to local office procedures.

- 1 Do you want to remove or install XMTR module?
 - If remove, go to step 2.
 - If install, go to step 8.

- REMOVE:**
- 2 Is radio protected (hot-standby or frequency diversity)?
 - If yes, go to step 3.
 - If no, go to step 4.
- 3 Use front panel **OVRD** controls on AE-37() Controller to lock on-line XMTR (opposite side from failed XMTR) on line.
- 4 On XMTR module, disconnect cable from RF OUT connector.

CAUTION

*Possibility of
Service
Interruption*

Removing XMTR module from card cage causes SYNC LOSS and I/O PROV alarms.

- 5 Remove XMTR module from card cage.
- 6 On XMTR module being replaced, remove XMTR crystal oscillator subboard. Retain for installation on replacement module.
- 7 On XMTR module being replaced, remove XMTR capacity key. Retain for installation on replacement module.

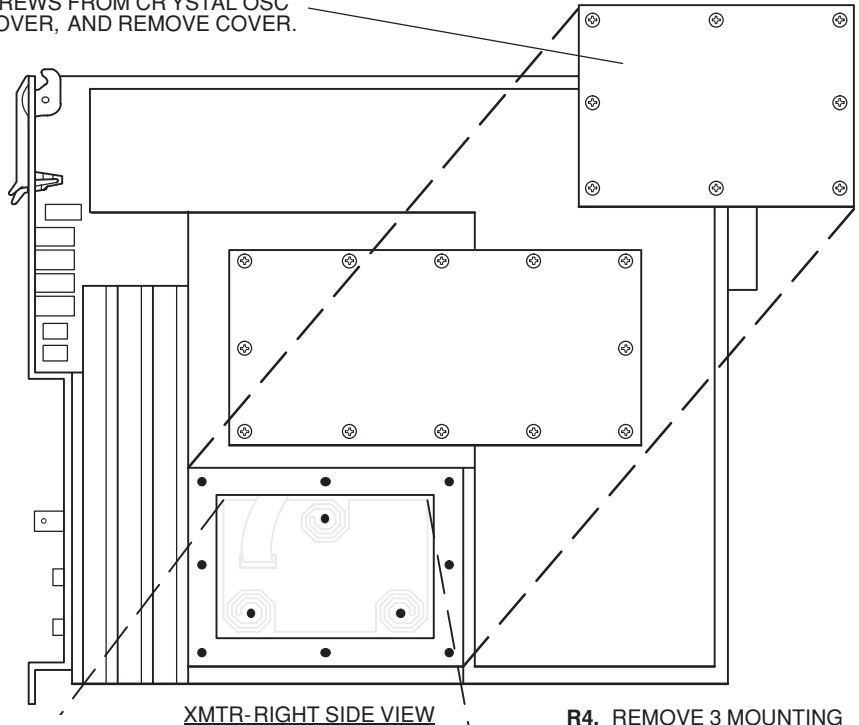
INSTALL:

- 8** On replacement XMTR module, install XMTR crystal oscillator subboard. See Figure 5-17.
- 9** On replacement XMTR module, install XMTR capacity key. See Figure 5-18.
- 10** Install replacement XMTR module in card cage.
- 11** Perform XMT Crystal Oscillator Frequency Checks and Adjustment procedure. Refer to Appendix E.
- 12** Is radio equipped with optional PA?
 - If no, Perform XMTR Output Level Checks and Adjustment (No PA) procedure. Refer to Appendix E.
 - If yes, Perform PA Output Level Checks and Adjustment procedure. Refer to Appendix E.
- 13** Perform XMTR Carrier Null Adjustment procedure. Refer to Appendix E.
- 14** Was XMTR locked on-line on step 3.
 - If yes, go to step 15.
 - If no, go to step 16.
- 15** On AE-37() Controller, toggle OVRD switch to disable override (unlocks on-line XMTR and restores automatic switching functions).
- 16** STOP. This procedure is complete.

REMOVE:
(REMOVE STEPS ARE PREFIXED
BY LETTER "R").

R1. REMOVE TRANSMITTER FROM CARD CAGE.

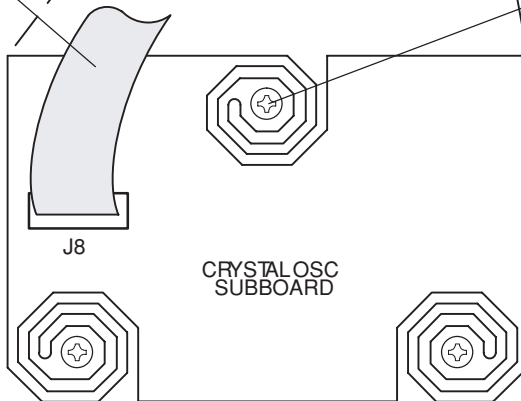
R2. REMOVE 8 SCREWS FROM CRYSTAL OSC
SUBBOARD COVER, AND REMOVE COVER.



XMTR-RIGHT SIDE VIEW

R3. DISCONNECT RIBBON CABLE
FROM J8.

R4. REMOVE 3 MOUNTING
SCREWS, AND REMOVE
CRYSTAL OSC SUBBOARD.



INSTALL
(INSTALL STEPS ARE
PREFIXED BY LETTER "I").

I1. PLACE CRYSTAL OSC SUBBOARD
IN MOUNTING CAVITY

Note

*Ensure board edge does not make
contact with chassis wall.*

I2. INSTALL 3 MOUNTING SCREWS.

I3. CONNECT RIBBON CABLE TO
CONNECTOR J8.

I4. INSTALL COVER WITH 8 SCREWS.

I5. INSTALL XMTR IN CARD CAGE.

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06/08/04

Figure 5-17 XMTR Crystal Oscillator Subboard Removal/Installation

CAUTION

*Possibility of
Service
Interruption*

REMOVE:

(REMOVE STEPS ARE PREFIXED BY THE LETTER "R").

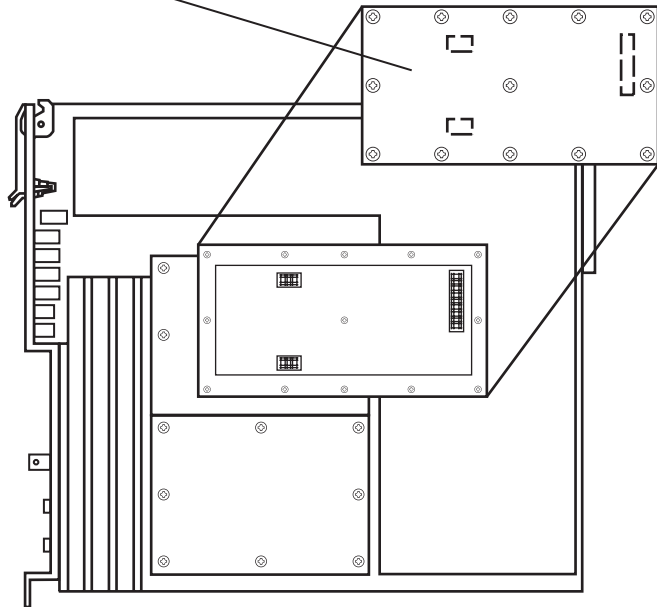
- R1. REMOVE TRANSMITTER FROM CARD CAGE.
- R2. REMOVE 13 SCREWS FROM CAPACITY KEY AND REMOVE CAPACITY KEY.

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.

INSTALL:

(INSTALL STEPS ARE PREFIXED BY THE LETTER "I").

- I1. INSTALL CAPACITY KEY ON THREE CONNECTORS.
- I2. INSTALL 13 SCREWS.



XMTR-RIGHT SIDE VIEW

LMW-6016-SM
09/12/02

Figure 5-18 XMTR Capacity Key Removal/Installation

Chart 5 RCVR Removal and Replacement



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

PURPOSE

Use this procedure to remove and replace UD-36() RCVR and/or:

- 1 to replace a faulty crystal oscillator subboard
- 2 to change out the crystal oscillator subboard to change frequency
- 3 to move oscillator to a replacement RCVR
- 4 to replace a faulty capacity key
- 5 to change DS1/E1 or DS3 capacity
- 6 to move capacity key to a replacement RCVR

SPECIAL TOOLS REQUIRED

None

STEP	PROCEDURE
------	-----------



Exposure to energy radiated at microwave frequencies can cause eye injury and eventual blindness. Do not operate the system with a waveguide port unterminated.

WARNING

*Possibility of
Damage
to Equipment*

Wear ground straps according to local office procedures.

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.

- 1 Is radio protected (hot-standby or frequency diversity)?
- If yes, go to step 2.
If no, go to step 3.
- 2 Use front panel **OVRD** controls on AE-37() Controller to switch and lock opposite side RCVR (opposite side from failed RCVR) on line.
- 3 Do you want to remove or install RCVR module?
- If remove, go to step 4.
If install, go to step 8.
- REMOVE:**
- 4 On RCVR module, disconnect cable from RF In connector.

CAUTION

*Possibility of
Service
Interruption*

Removing RCVR module from card cage causes CHANNEL FAIL, EYE CLOSURE, RADIO FRM LOSS, and RCV PROV alarms.

- 5 Remove RCVR module from card cage.

STEP

PROCEDURE, CONTINUED

- 6 On RCVR module being replaced, remove RCVR crystal oscillator subboard. See Figure 5-19. Retain for installation on replacement module.
 - 7 On RCVR module being replaced, remove RCVR capacity key. See figure 2. Retain for installation on replacement module.
- INSTALL:**
- 8 On replacement RCVR module, install RCVR crystal oscillator subboard. See Figure 5-19.
 - 9 On replacement RCVR module, install RCVR capacity key. See Figure 5-20.
 - 10 Install replacement RCVR module in card cage.
 - 11 Is RCVR equipped with front panel **FREQ CONT**?
 - If yes, go to step 12.
 - If no, go to step 13.
 - 12 Perform RCV Crystal Oscillator Frequency Checks and Adjustment procedure. Refer to Appendix E.

Note

Optional performance checks, including RSL, BER and RCVR Threshold are provided in Appendix E.

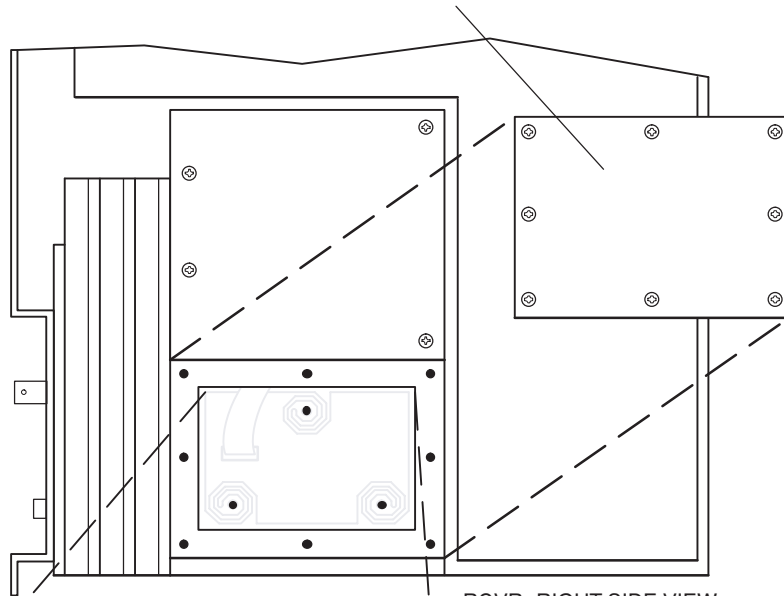
- 13 Was RCVR switched on step 2?
 - If yes, go to step 14.
 - If no, go to step 17.
- 14 On AE-37() Controller, toggle **OVRD** switch to disable override (unlocks on-line RCVR and restores automatic switching functions).
- 15 Open Control screen.
- 16 On Control screen, under heading **IN-SERVICE**, highlight **A RCVR On Line** or **B RCVR On Line** and select Yes on confirmation message to force opposite side RCVR off line.
- 17 STOP. This procedure is complete.

REMOVE:

(REMOVE STEPS ARE PREFIXED BY LETTER "R").

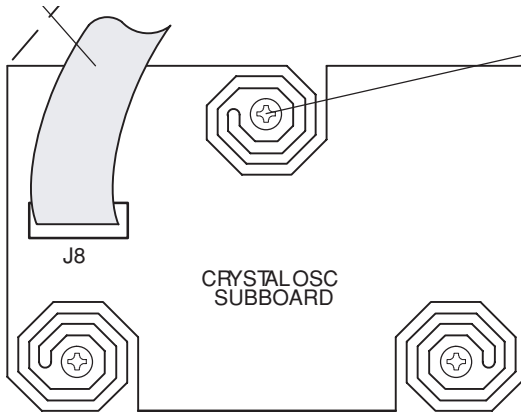
R1. REMOVE RECEIVER FROM CARD CAGE.

R2. REMOVE 8 SCREWS FROM CRYSTAL OSC SUBBOARD COVER, AND REMOVE COVER.



RCVR—RIGHT SIDE VIEW

R3. DISCONNECT RIBBON CABLE FROM J8.



R4. REMOVE 3 MOUNTING SCREWS, AND REMOVE CRYSTAL OSC SUBBOARD.

INSTALL:

(INSTALL STEPS ARE PREFIXED BY LETTER "I").

I1. PLACE CRYSTAL OSC SUBBOARD IN MOUNTING CAVITY.

Note

Ensure board edge does not make contact with chassis wall.

I2. INSTALL 3 MOUNTING SCREWS.

I3. CONNECT RIBBON CABLE TO CONNECTOR J8.

I4. INSTALL COVER WITH 8 SCREWS.

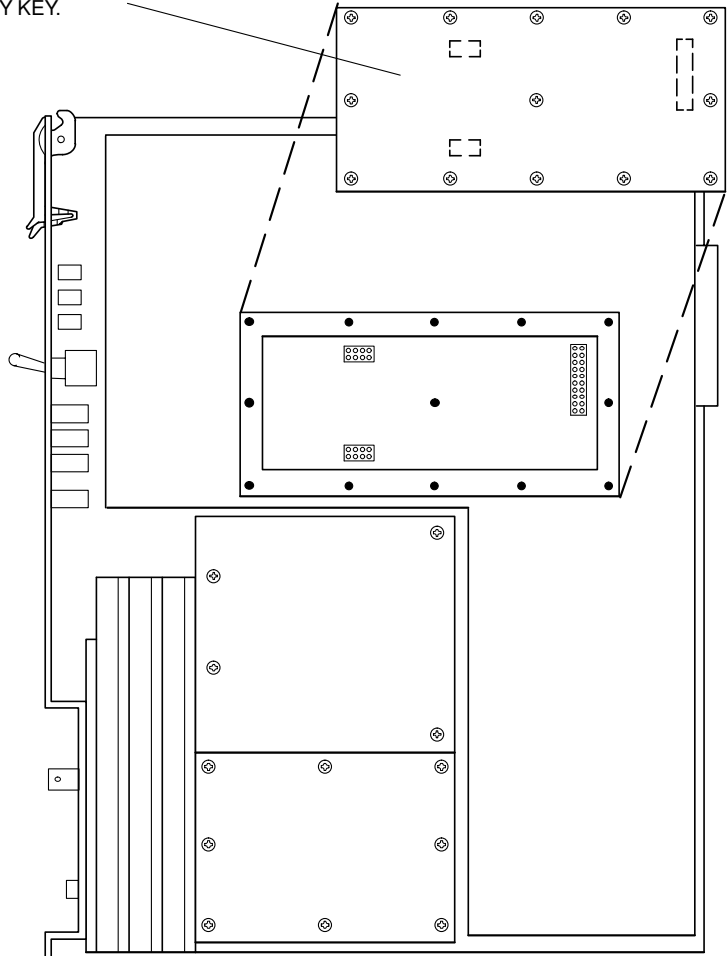
I5. INSTALL RECEIVER IN CARD CAGE.

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06/08/04

Figure 5-19 RCVR Crystal Oscillator Subboard Removal/Installation

REMOVE:
(REMOVE STEPS ARE PREFIXED
BY LETTER 'R').

- R1. REMOVE RCVR FROM CARD CAGE.
- R2. REMOVE 13 SCREWS FROM CAPACITY KEY
AND REMOVE CAPACITY KEY.



RCVR-RIGHT SIDE VIEW

INSTALL:
(INSTALL STEPS ARE
PREFIXED BY LETTER 'I').

- I1. INSTALL CAPACITY KEY ON THREE CONNECTORS.
- I2. INSTALL 13 SCREWS.

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101598

Figure 5-20 RCVR Capacity Key Removal/Installation

Chart 6 PA Removal and Replacement

PURPOSE

Use this procedure to remove and replace UD-51() PA.

SPECIAL TOOLS REQUIRED

None

STEP	PROCEDURE
------	-----------



Exposure to energy radiated at microwave frequencies can cause eye injury and eventual blindness. Do not operate the system with a waveguide port unterminated.



Wear ground straps according to local office procedures.



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.

1 Is radio protected (hot-standby or frequency diversity)?

If yes, go to step 2.

If no, go to step 3.

STEP**PROCEDURE, CONTINUED**

2 Use front panel **OVRD** controls on AE-37() Controller to lock on-line XMTR (opposite side from failed XMTR) on line.

3 Do you want to remove or install PA module?

If remove, go to step 4.

If install, go to step 6.

REMOVE:**WARNING**

*Possibility of
Damage
to Equipment*

Check to ensure that the three mounting screws securing the PA to the heatsink are loose before attempting to remove the PA to prevent damage to the module.

4 Remove PA from shelf. See Figure 5-21.

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.

INSTALL

WARNING

*Possibility of
Damage
to Equipment*

The PA to heatsink mounting is critical. The three screws securing the PA to the heat sink must be tightened to 19 in-lbs using a torque wrench and not over/under-tightened. Improper mounting will cause over-heating and alarm and shut off power to the PA. This will result in loss of traffic on unprotected systems. On protected systems, a switch to the off-line PA will occur.

- 5 Install PA in shelf. See Figure 5-21.
- 6 Perform PA Checks and Adjustment procedure. Refer to Appendix E.
- 7 Was XMTR locked on line (step 2).
 - If yes, go to step 8.
 - If no, go to step 9.
- 8 On AE-37() Controller, toggle OVRD switch to disable override (unlocks on-line XMTR and restores automatic switching functions).
- 9 STOP. This procedure is complete.

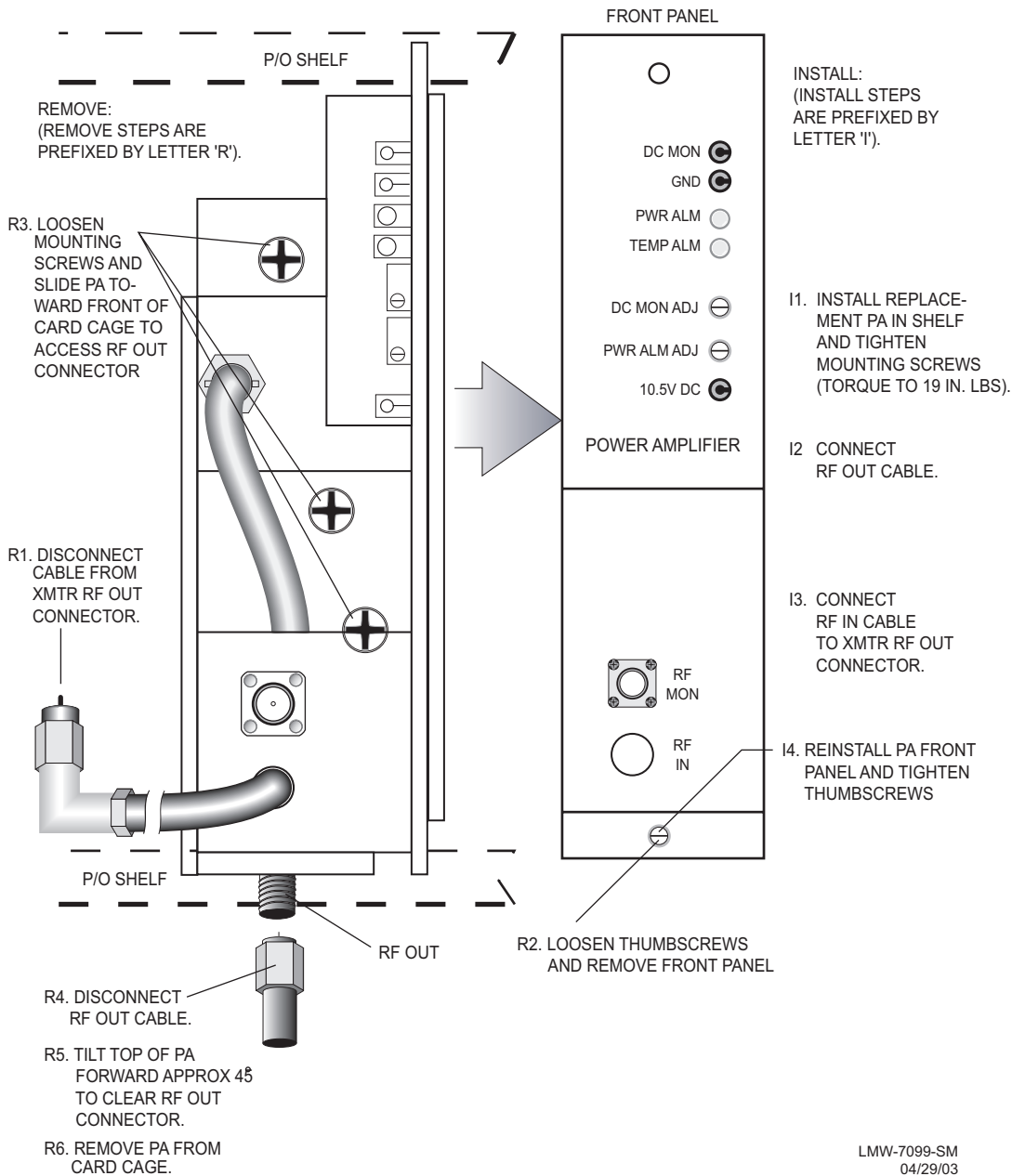


Figure 5-21 UD-51() Power Amplifier Removal and Replacement

Chart 7 Changing System Software

PURPOSE

This procedure provides instructions to change previously loaded software to a newer version. The procedure is written for DS3 but applies to DS1, DS3, and OC3 software and radios.

TOOLS REQUIRED

PC

RS-232 interface cable PN 695-7848

GENERAL

The system operating software for the AE-37() Controller can be changed through the USI port using the laptop computer. The system software in remotely located AE-37() Controllers can also be changed remotely using the ELMC function.

Note

For DS1 controller loads R1.04 or earlier, refer to Issue 5 of the MDR-8000 instruction book.

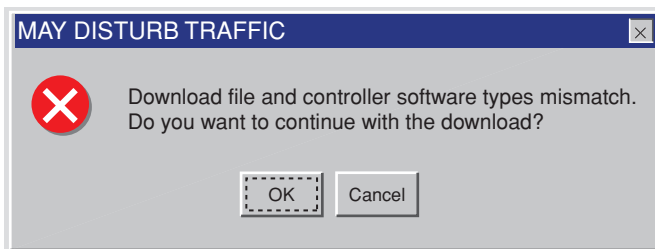
STEP

PROCEDURE

CAUTION

*Possibility of
Service
Interruption*

When upgrading system software, the load must be for the specific radio type, e.g., DS1 for a DS1 radio, DS3 for a DS3 radio, and OC3 for an OC3 radio. Use of incorrect software will result in a controller alarm and a software types mismatch message on the computer screen (see Figure 5-22). The mismatch message asks “Do you want to continue with the download?” Click Cancel and load the correct software.



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07/20/02

Figure 5-22 Mismatch Message

STEP	PROCEDURE, CONTINUED
------	----------------------

- | | |
|----------------------------|---|
| <input type="checkbox"/> 1 | Insert CD ROM disk into PC. |
| <input type="checkbox"/> 2 | On Windows desktop, double click on My Computer icon. My Computer window displays. |
| <input type="checkbox"/> 3 | In My Computer window, click on CD ROM icon. Files window displays. |

DOWNLOAD SOFTWARE TO PC

- | | |
|----------------------------|--|
| <input type="checkbox"/> 4 | See Figure 5-23. Follow directions to download software to PC. |
|----------------------------|--|

STEP

- 1 DOUBLE CLICK (WILL LOAD FILES)
- 2 CLICK OK (COPYING FILES)
- 3 CLICK ON SETUP ICON (STARTS DOWNLOAD)
- 4 CLICK OK WHEN COMPLETED

Figure 5-23 Download Software to PC

DOWNLOAD SOFTWARE TO RADIO CONTROLLER

CAUTION

*Possibility of
Service
Interruption*

While the system software is being changed, all alarm monitoring and protection switching functions are suspended. If the system software change is interrupted before completion, the change is aborted and operation under the previous software resumes.

- 5 Connect RS-232 interface cable between USI port on controller and laptop computer.
- 6 Open Download screen (**Start>Programs>WinUSI**).
- 7 Will download be to a local or remote radio?

If local, go to step 8.

If remote, go to step 9.

LOCAL DOWNLOAD CONTROLLER

- 8 See Figure 5-24. Follow directions to install program on local controller.

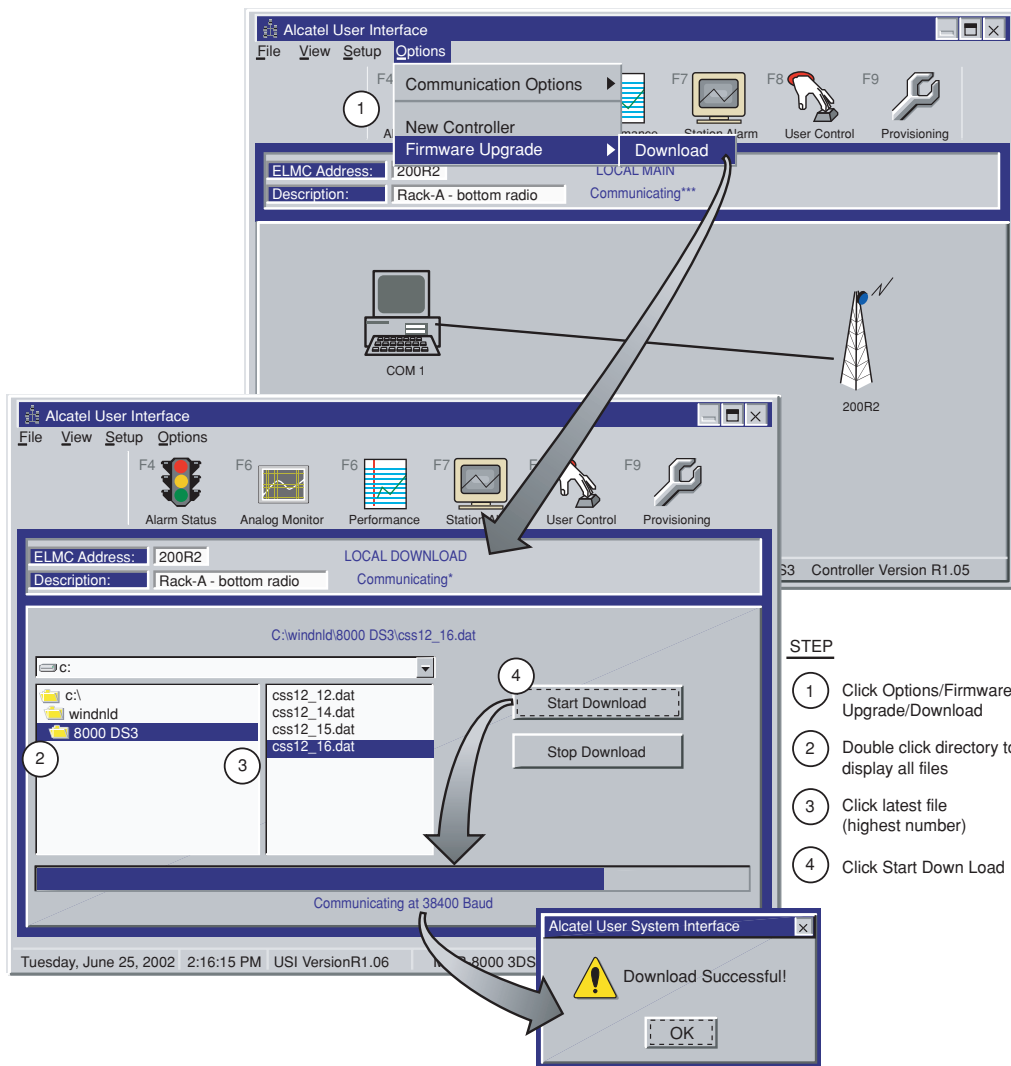
REMOTE DOWNLOAD TO CONTROLLER

- 9 Is the remote controller equipped with ELMC option key with provisioning?

If yes, go to step 10.

If no, stop. Remote downloading requires that the ELMC option key with provisioning be installed on controller module.

- 10 See Figure 5-25. Follow directions to install program on remote controller.



Note

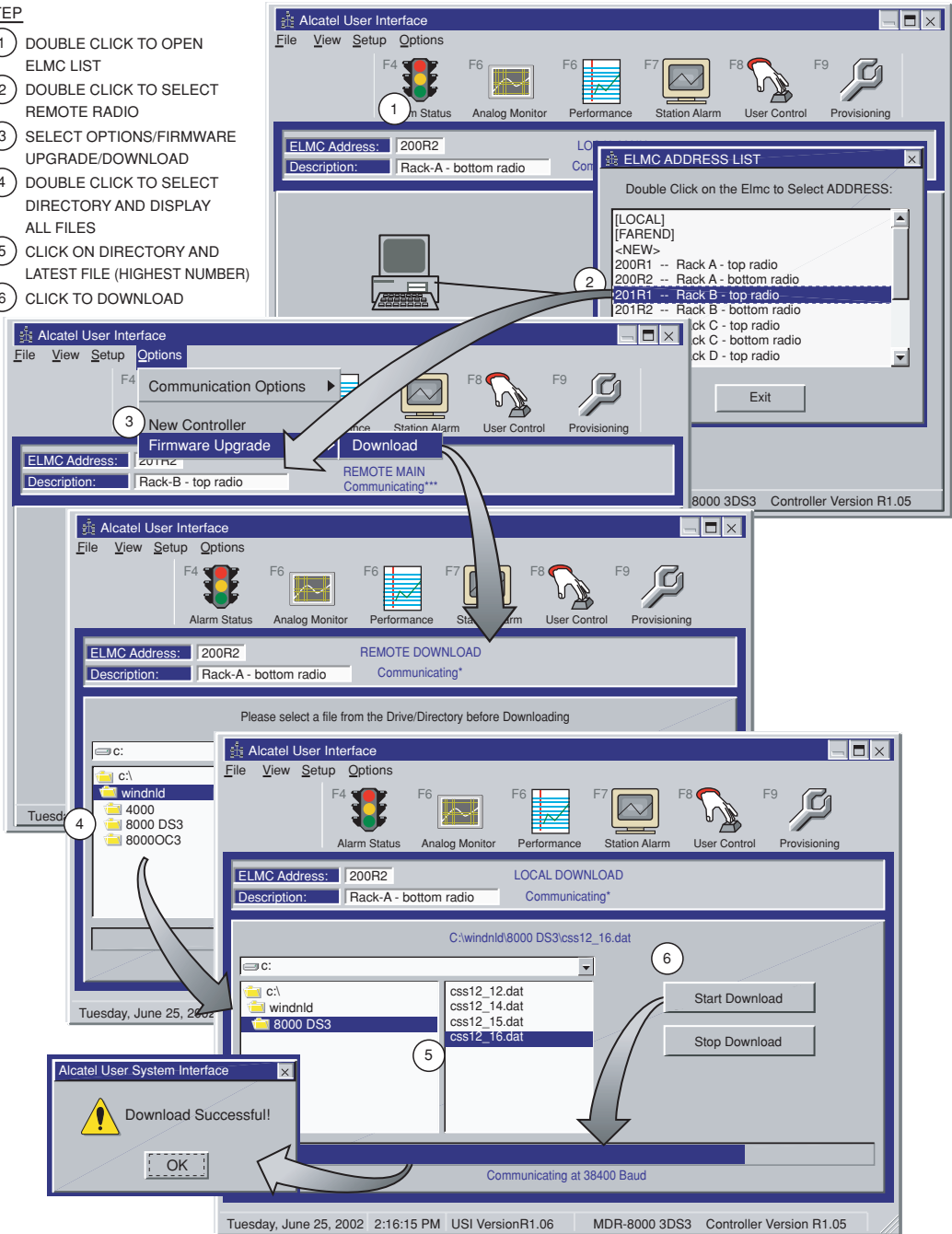
After automatically re-booting, the controller will start running, provisioning previously stored in the controller will be left unchanged by the download program.

LMW-7045-SM
07/16/02

Figure 5-24 Download Software From PC to Local Radio Controller

STEP

- 1 DOUBLE CLICK TO OPEN ELMC LIST
- 2 DOUBLE CLICK TO SELECT REMOTE RADIO
- 3 SELECT OPTIONS/FIRMWARE UPGRADE/DOWNLOAD
- 4 DOUBLE CLICK TO SELECT DIRECTORY AND DISPLAY ALL FILES
- 5 CLICK ON DIRECTORY AND LATEST FILE (HIGHEST NUMBER)
- 6 CLICK TO DOWNLOAD



Note

LMW-7046
07/16/02

After automatically re-booting, the controller will start running, provisioning previously stored in the controller will be left unchanged by the download program.

Figure 5-25 Download Software From PC to Remote Radio Controller

A CommPak INDOOR SHELF

The MDR-8000 CommPak indoor shelf (Figure A-1) is a reduced-size package for non-standby radio configurations. The CommPak indoor shelf operates the same as the MDR-8000 hot-standby shelf configured as a non-standby radio using the same software and equipped with the same modules with two exceptions: LBO and fan assembly.



Figure A-1 Typical MDR-8000 CommPak Indoor Shelf

This appendix describes the differences between the MDR-8000 hot-standby shelf and the CommPak indoor shelf. Refer to the applicable sections in the Users Manual for descriptions of functions common to both types of shelves. Refer to the instruction book for details of functions not covered in the Users Manual.

A.1 COMPONENT LOCATIONS AND OPTIONS

See Figure A-2 for component locations and options.

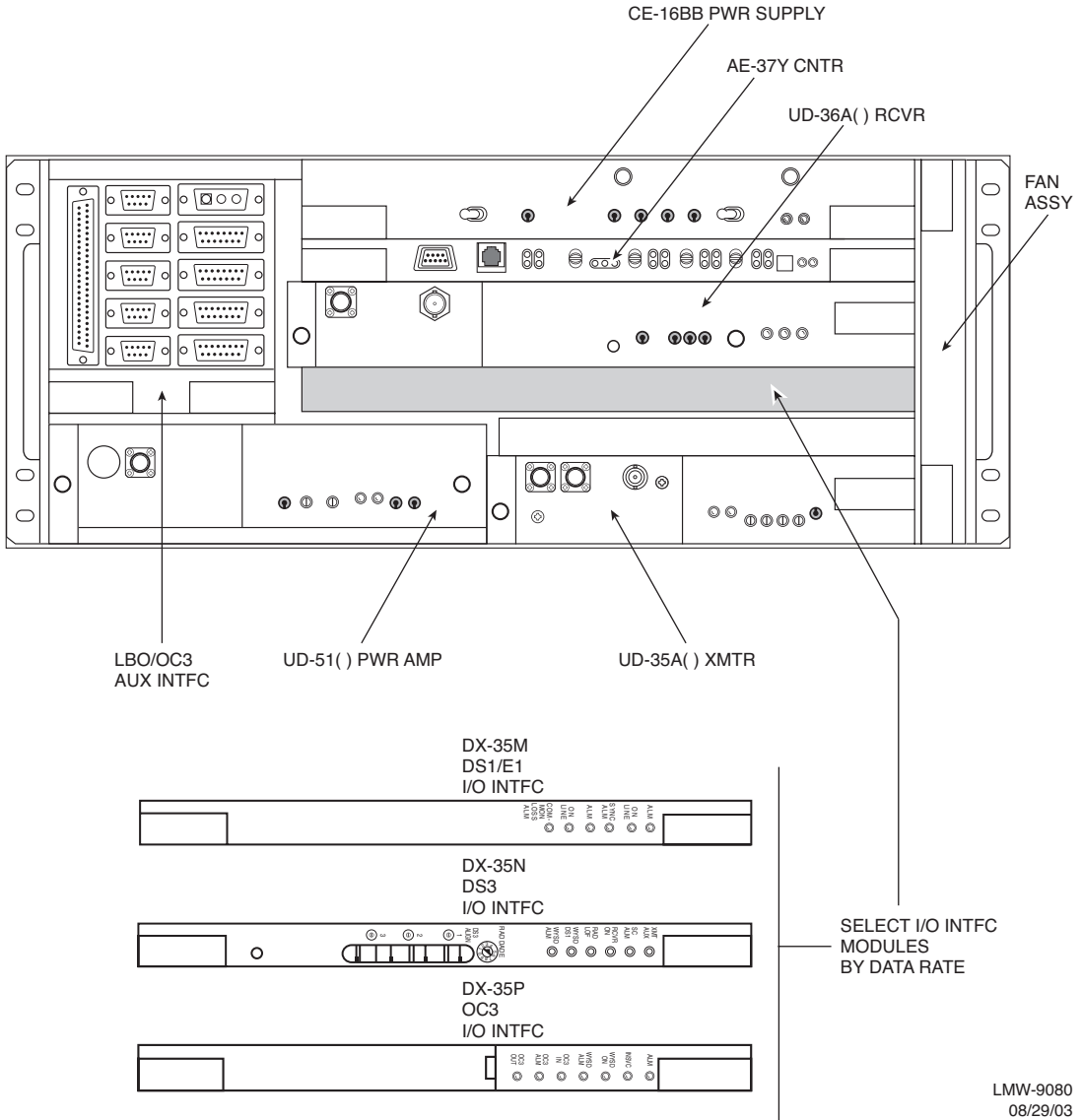


Figure A-2 Typical MDR-8000 CommPak Indoor Shelf Component Locations and Options (Sheet 1 of 3)

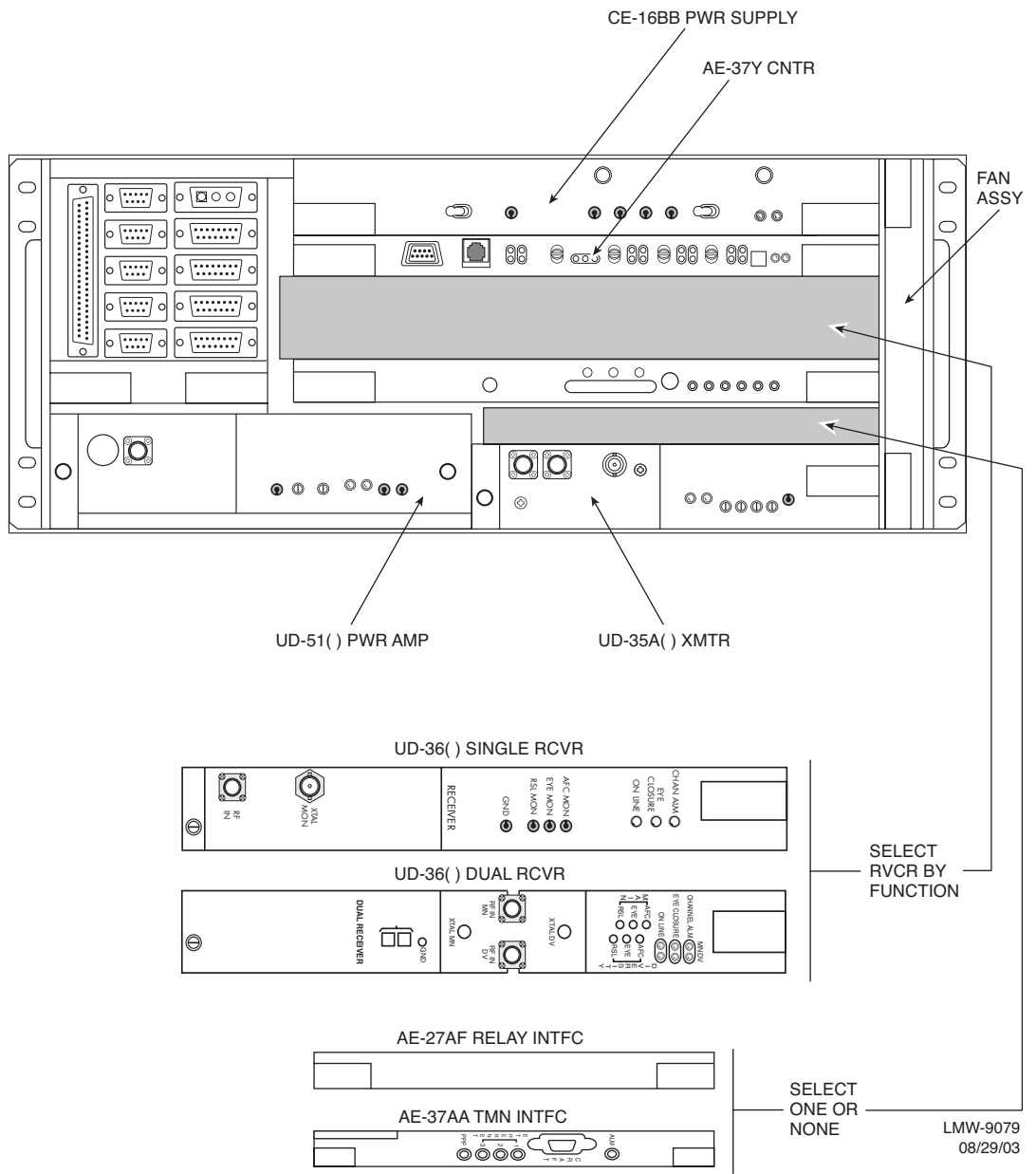
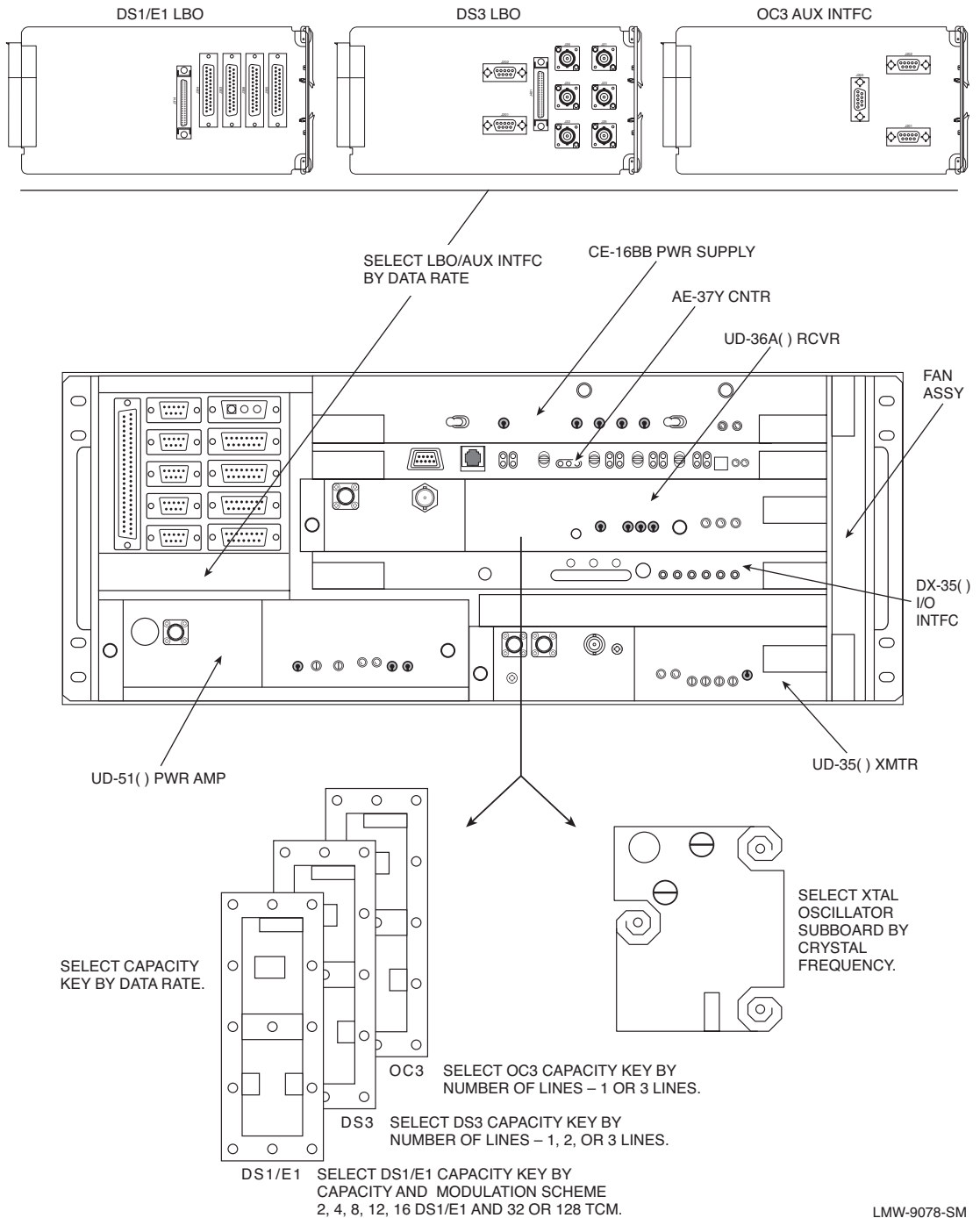


Figure A-2 Typical MDR-8000 CommPak Indoor Shelf Component Locations and Options (Sheet 2 of 3)



LMW-9078-SM
02/15/04

Figure A-2 Typical MDR-8000 CommPak Indoor Shelf Component Locations and Options (Sheet 3 of 3)

A.1.1 External Fan Assembly

See Figure A-3. The external fan assembly PN 3EM11901ABAA is required for cooling the CommPak indoor unit equipped with high-power amplifiers, for specific frequency bands, as follows:

Radio	Output Power
MDR-8505u	+30 dBm
MDR-8506	+31 and +33 dBm
MDR-8510/8511	+29 dBm

The external fan assembly is wired to the CommPak indoor shelf internal fan assembly PN 3EM14510AAAA via cable. The internal fan assembly passes +12 Vdc operating power to the external fan assembly, and the internal fan assembly passes 12C and alarms from the external fan assembly.

The external fan assembly mounts to the rack rails directly below the heatsink on the CommPak indoor shelf with four screws. The external fan assembly cools by blowing air between the vanes on the heatsink. Fan revolutions are monitored and an alarm occurs if any one or more fans loses rpm.

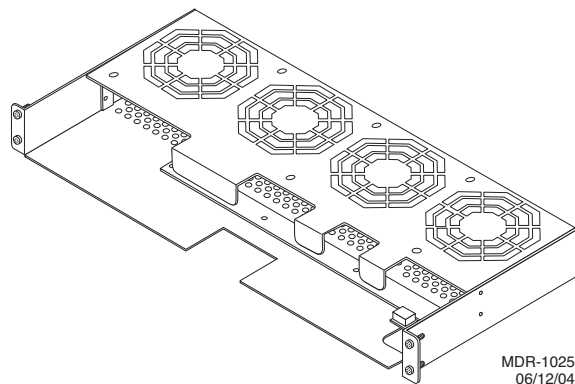


Figure A-3 External Fan Assembly

A.2 INTERCONNECT

This part of the section gives the location and describes strapping, power connections, signal connections, status and alarm connections and service channel connections for the CommPak indoor shelf.

A.2.1 Power Cable Assembly

See Figure A-4 for power cable assembly installation procedures. The MDR-8000 is internally wired to accept 20.5 to 60 V dc input power with positive or negative ground. To protect maintenance personnel from lightning strikes, the ground system must be integrated by bonding station ground and dc battery return together. The dc power connectors J1 and J2 are located on the rear of the back panel. Install power cables as shown.



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



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



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

Note

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

Note

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

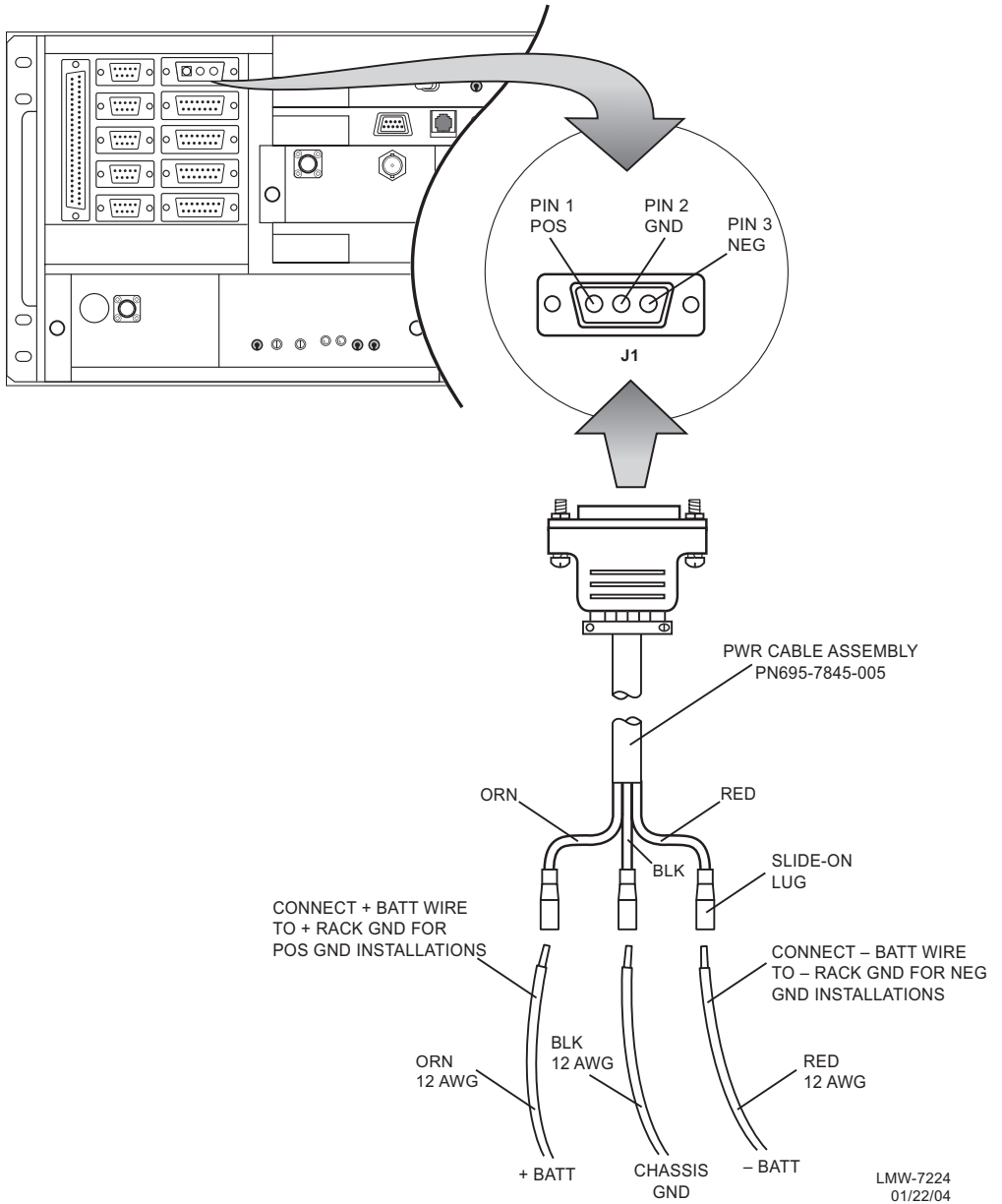


Figure A-4 Power Cable Assembly Installation

A.2.2 External Fan Assembly

See Figure A-5 for interconnect details.

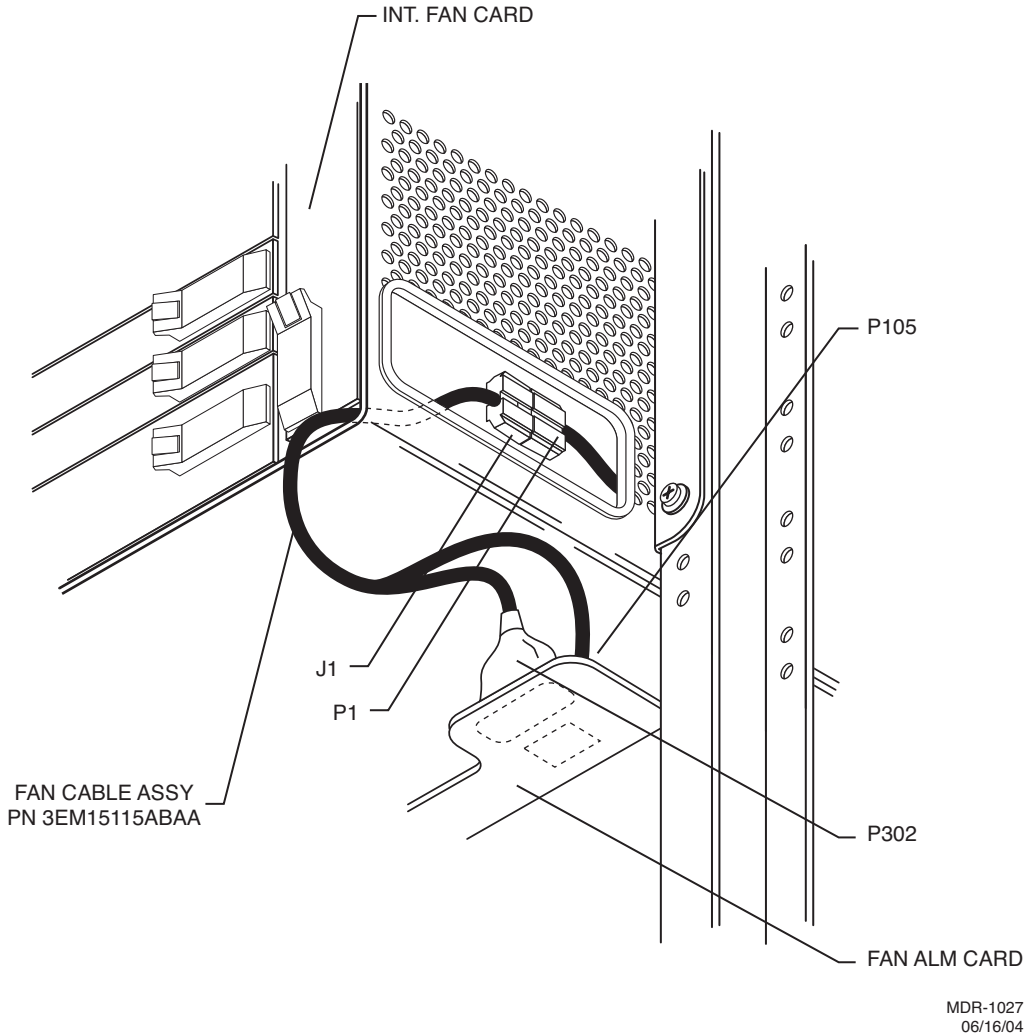
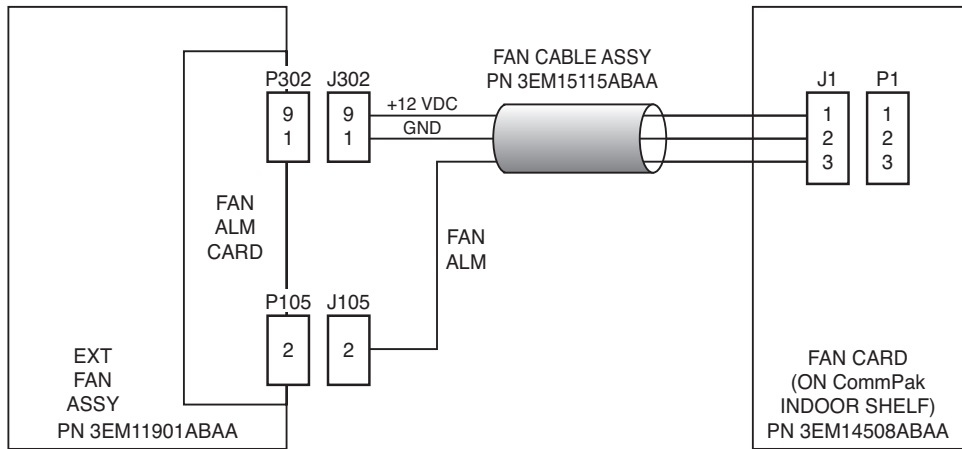


Figure A-5 External Fan Assembly Interconnect Diagram (Sheet 1 of 2)



FAN CABLE ASSY PIN-OUT AND COLOR CODE

FAN ALM	J302	J305	WIRE COLOR
1	9		RED
2	1		BLK
3		2	BLU

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Figure A-5 External Fan Assembly Interconnect Diagram (Sheet 2 of 2)

A.2.3 SHELF/RACK ALARM CONNECTION

Each MDR-8000 rack equipped with the Power Distribution Unit (PDU) 695-6200-001/002 has a visual rack alarm indicator to report a shelf failure. In order to activate a rack alarm visual indicator on the PDU, the shelf alarm output from each MDR-8000 shelf must be hardwired to connector J1 on the PDU. The shelf alarm is provided on alarm connector J305 pin 24 (major/visual alarm). A wire-wrap adapter (PN 695-4171-002) for connector J305 is available. Insulated 22-gauge solid copper wire is recommended for connecting to the wire-wrap adapter. To attach to J1 (2-pin connector) on the PDU, use 2-position socket housing PN 372-0114-140 and socket contact PN 372-0114-390. See Figure A-6 for shelf-to-rack alarm wiring.

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

An optional Fuse and Shelf alarm plug-in assembly is available to provide shelf alarm connections requiring Form C relays. The alarm inputs (major and minor) must be hard wired to J3 on the PDU. The alarms are provided on alarm connector J305 pin 24 (major/visual alarm) and pin 50 (minor/audible alarm) of each shelf. A wire-wrap adapter (PN 695-4171-002) for connector J305 is available. Insulated 22-gauge solid copper wire is recommended for connecting to the wire-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 A-6 for typical shelf to PDU alarm wiring.

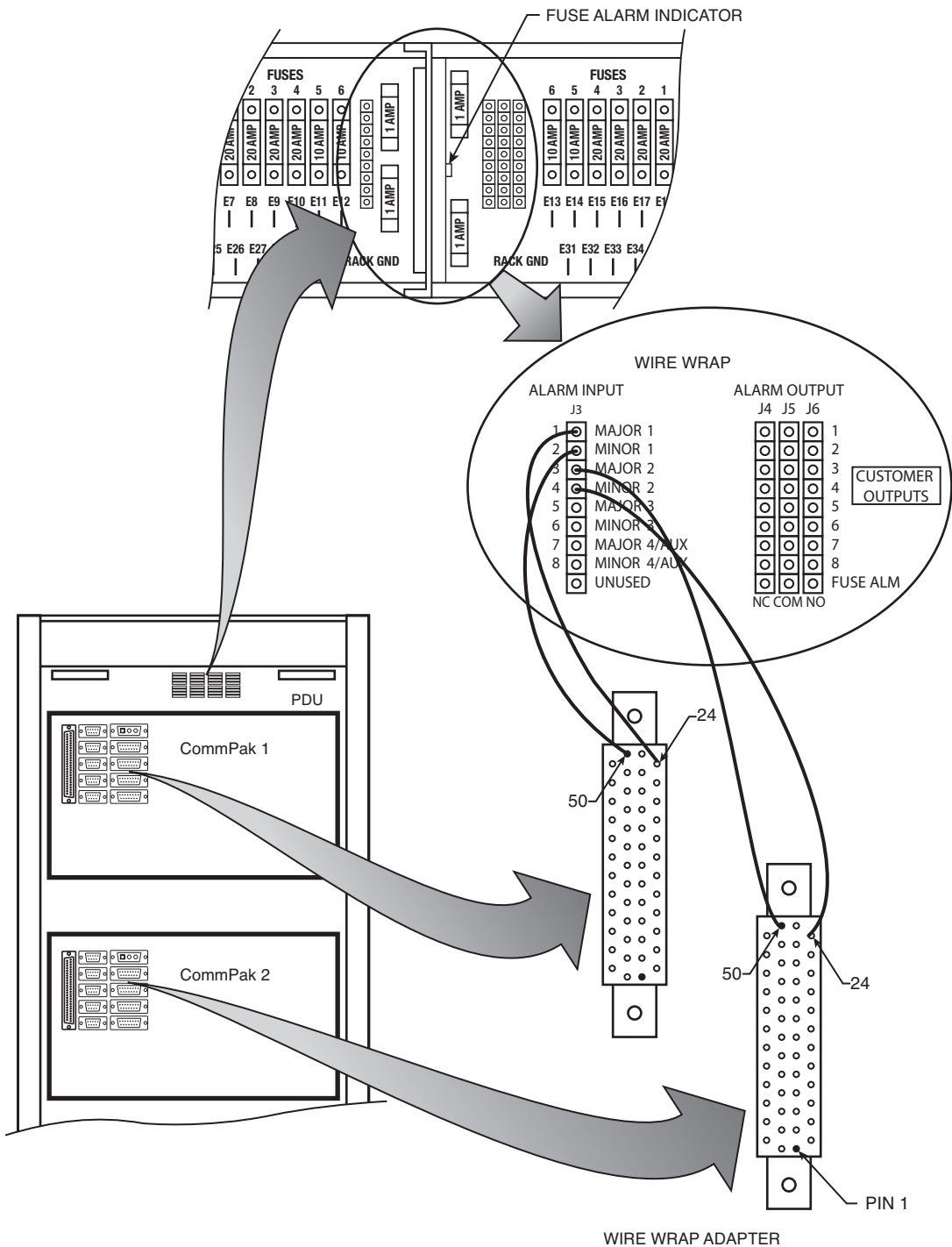


Figure A-6 Typical Shelf Alarm Wiring PDU (695-6200-001/002)

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A.2.4 DS1 LBO Connections

A.2.4.1 DS1 Cable Connections

Recommended connectorized cable assembly – PN 695-7806-021 through -025 (22 AWG 12 pair shielded, jacketed cable with 25-pin D-type connector on one end). See Figure A-7 for shelf connector location and pinout. Refer to Table A-1 for mating cable wiring and color code.

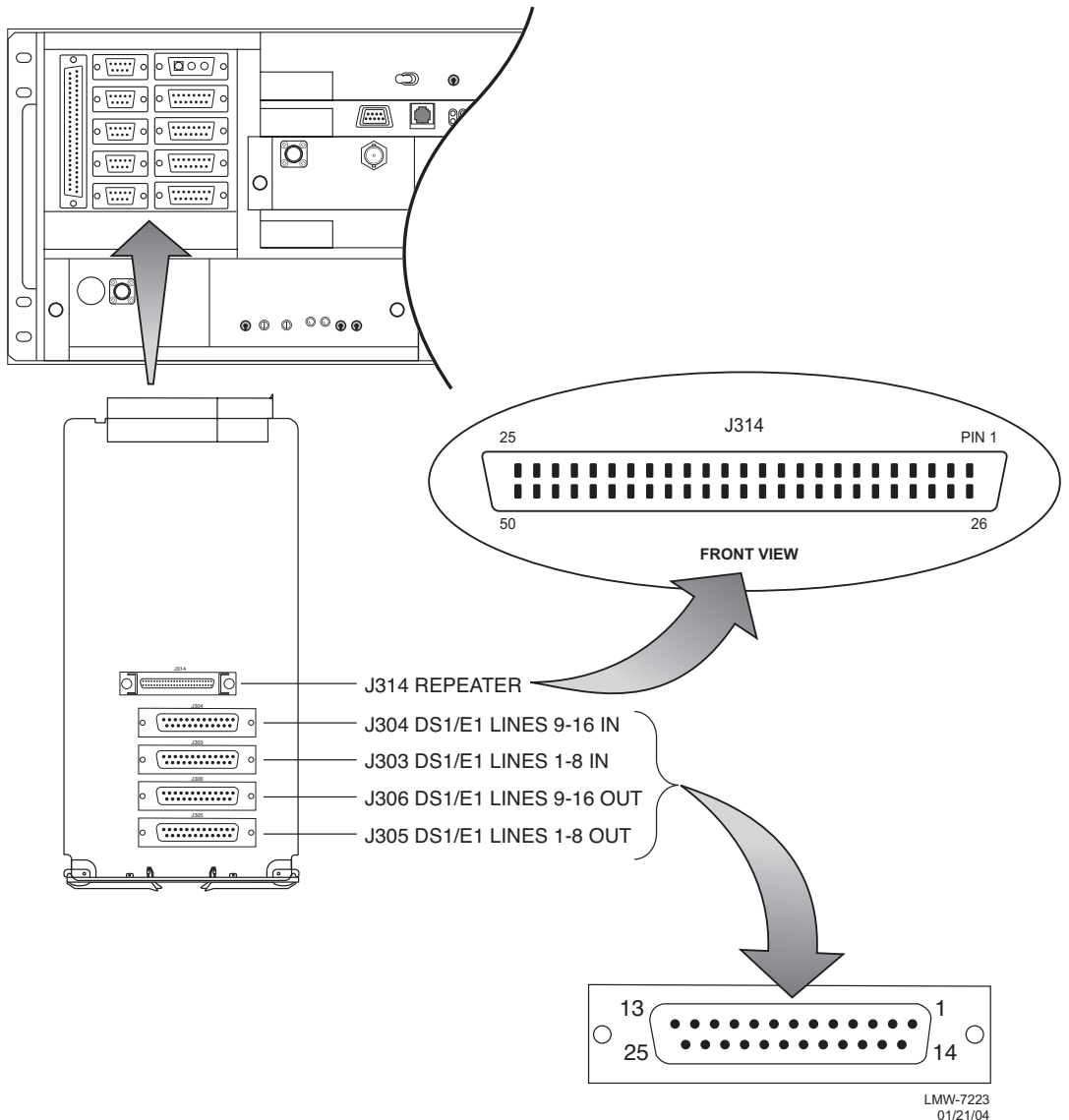


Figure A-7 DS1 LBO Connector Location and Pinouts

Table A-1 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
14	BLUE-WHITE	CHAN 1 RING	
2	WHITE-ORANGE	CHAN 2 TIP	2
15	ORANGE-WHITE	CHAN 2 RING	
3	WHITE-GREEN	CHAN 3 TIP	3
16	GREEN-WHITE	CHAN 3 RING	
4	WHITE-BROWN	CHAN 4 TIP	4
17	BROWN-WHITE	CHAN 4 RING	
5	WHITE-SLATE	CHAN 5 TIP	5
18	SLATE-WHITE	CHAN 5 RING	
6	RED-BLUE	CHAN 6 TIP	6
19	BLUE-RED	CHAN 6 RING	
7	RED-ORANGE	CHAN 7 TIP	7
20	ORANGE-RED	CHAN 7 RING	
8	RED-GREEN	CHAN 8 TIP	8
21	GREEN-RED	CHAN 8 RING	
N/A	RED-BROWN	CUTBACK	9
N/A	BROWN-RED	CUTBACK	
N/A	RED-SLATE	CUTBACK	10
N/A	SLATE-RED	CUTBACK	
N/A	BLACK-BLUE	CUTBACK	11
N/A	BLUE-BLACK	CUTBACK	
N/A	BLACK-ORANGE	CUTBACK	12
N/A	ORANGE-BLACK	CUTBACK	

A.2.4.2 DS1 Repeater Cable Connections

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 also be cabled individually. In this case, individual cables must be run for MCS-11, audio, RS-232, and ELMC.

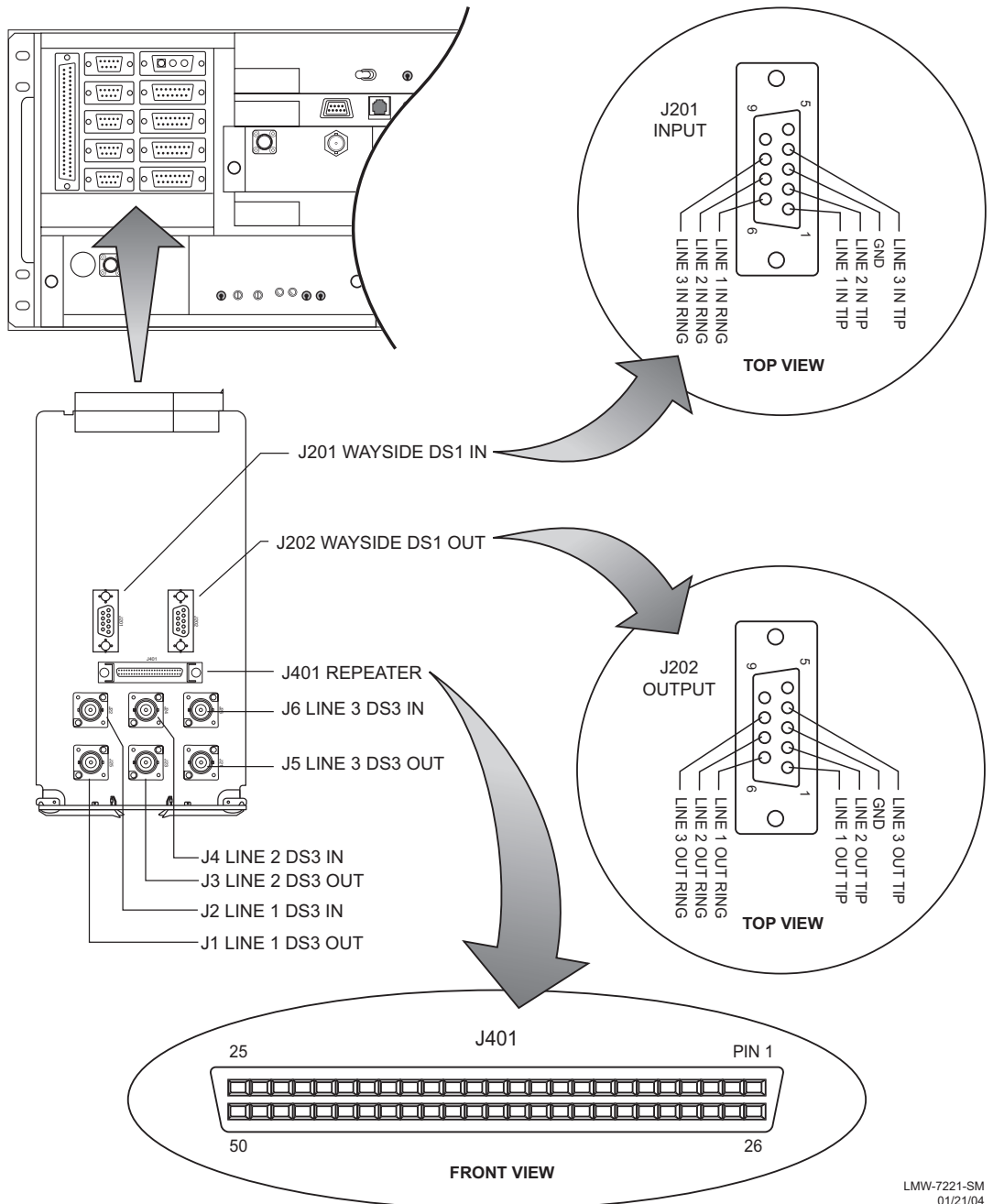
Recommended connectorized cable assembly – PN 695-7836-001/005 (25 pair shielded cable with 50 pin Amp connectors) (SCSI). See Figure A-7 for shelf connector location and pinout.

Note

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

A.2.5 DS3 LBO CONNECTIONS

The DS3 LBO compensates for the distance to the cross-connect for DS3 and wayside DS1 outputs. See Figure A-8 for connector locations.



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Figure A-8 DS3 LBO Connector Location and Pinouts

A.2.5.1 DS3 Cable Connections

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 A-8 for locations.

A.2.5.2 Wayside DS1 Cable Connections

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 A-8 for shelf connector location and pinout. Refer to Table A-2 for mating cable wiring and color code.

Table A-2 DS1 LBO Wayside DS1 Connector Mating Cable – Wiring and Pinout

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

A.2.5.3 DS3 Repeater Cable Connections

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 also 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 A-8 for shelf connector location and pinout.

Note

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

A.2.6 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.

Note

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

Refer to Table A-3 for recommended fiber optic jumpers.

Table A-3 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

A.2.7 OC3 AUX Interface Board Connections

A.2.7.1 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 A-9 for location.

A.2.7.2 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 A-9 for location.

A.2.7.3 OC3 Repeater Cable Connections

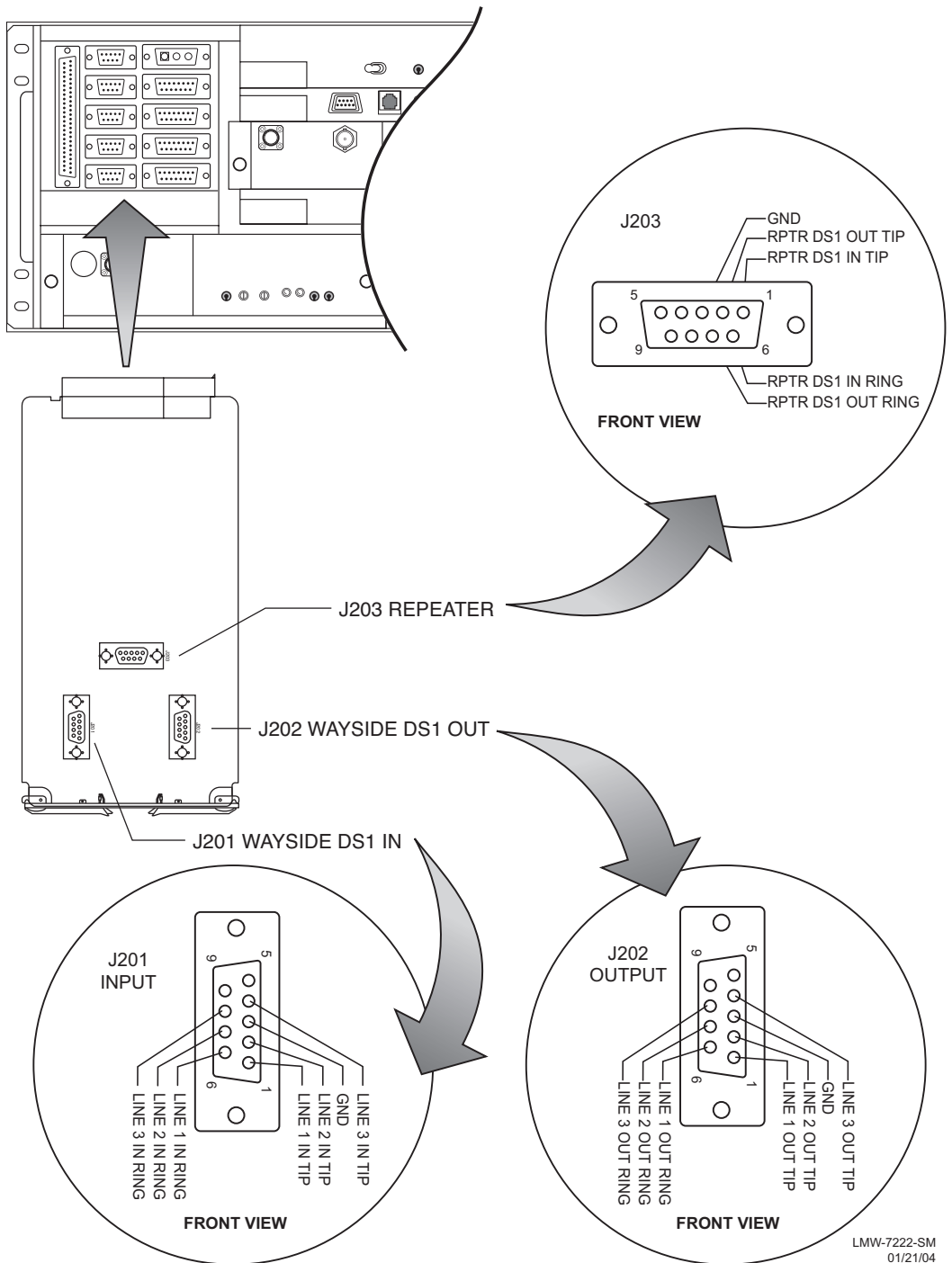
Note

The OC3 radio repeater cable carries wayside clocks, data, and overhead for two directions. It does not carry OC3 traffic. OC3 fiber optic cables must be run separately. If the repeater cable is not used, the embedded data in the overhead must also 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 A-9 for shelf connector location and pinout.

Note

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



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Figure A-9 OC3 AUX Interface Connector Location and Pinouts

A.2.8 Controller Cable Connection (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 A-10 for controller connector location and pinout.

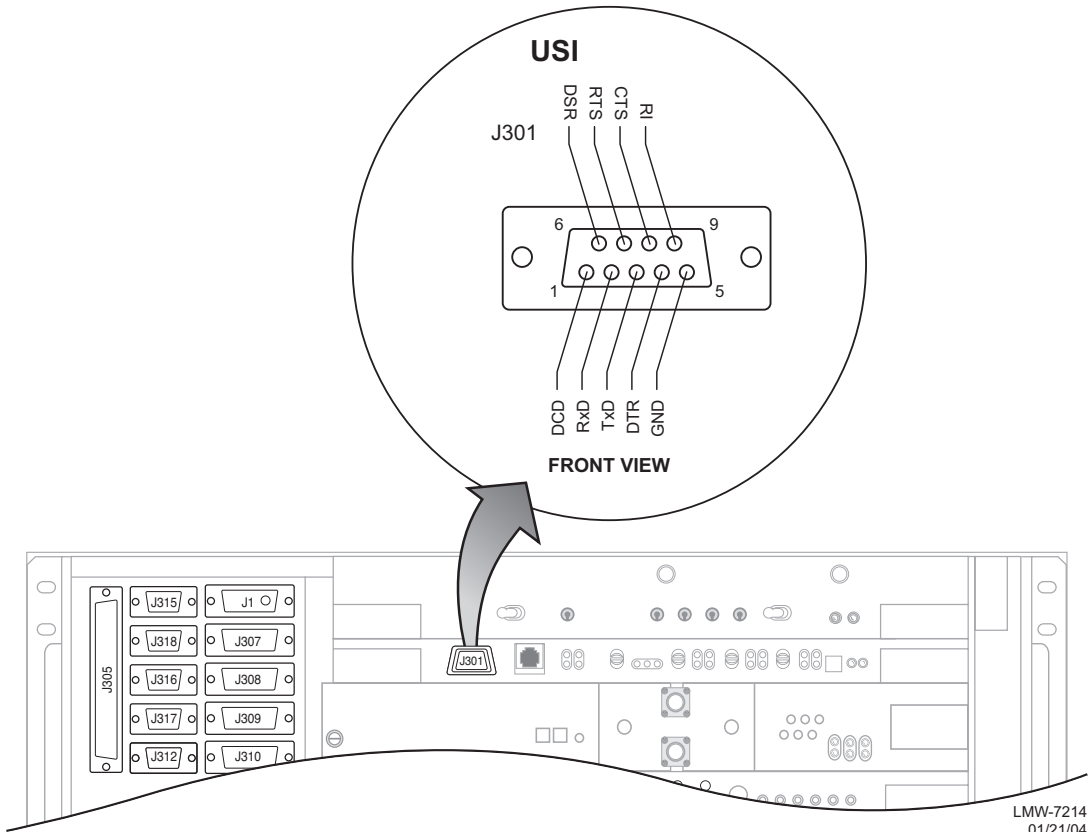


Figure A-10 Controller USI Connector J301 Location and Pinout

A.2.9 Audio Cable Connections

Recommended cable – PN 424-0305-030 (26 AWG 5 pair shielded, jacketed cable with 9-pin D-type connector on each end). See Figure A-11 for pinout.

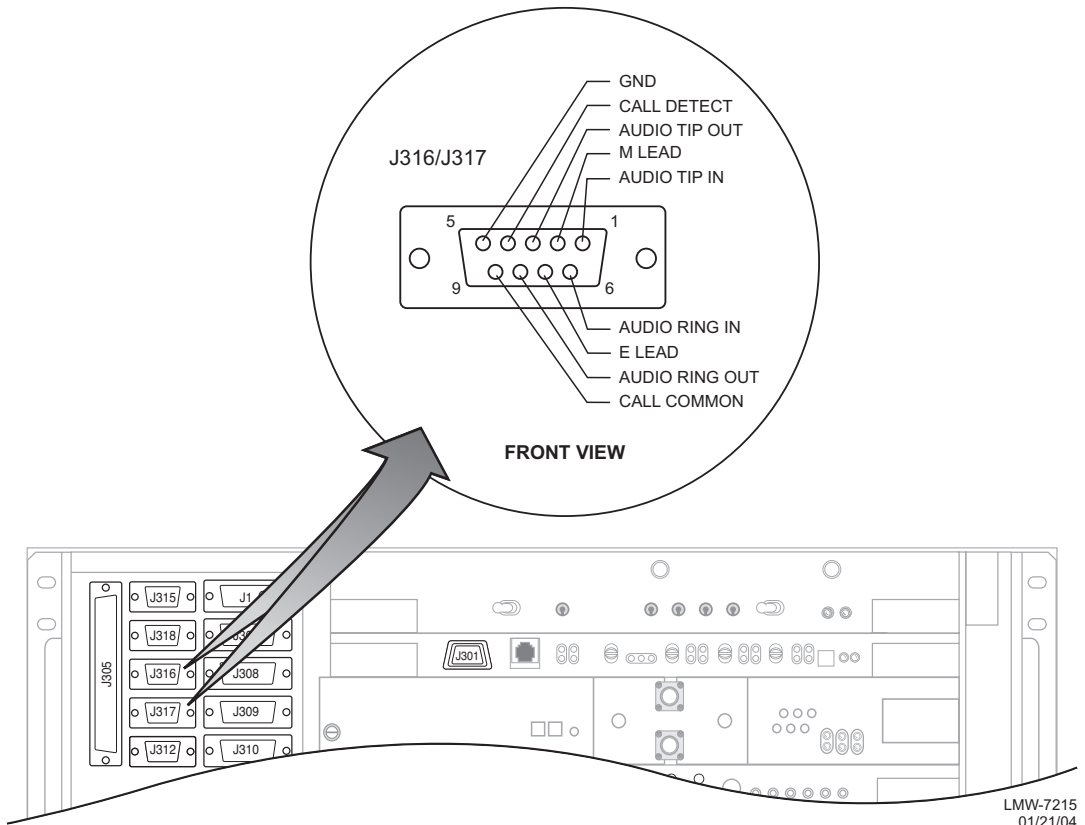


Figure A-11 Audio Connectors J316 and J317 Location and Pinout

A.2.10 RS-232 Cable Connections

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 A-12 for shelf connector locations and pinout.

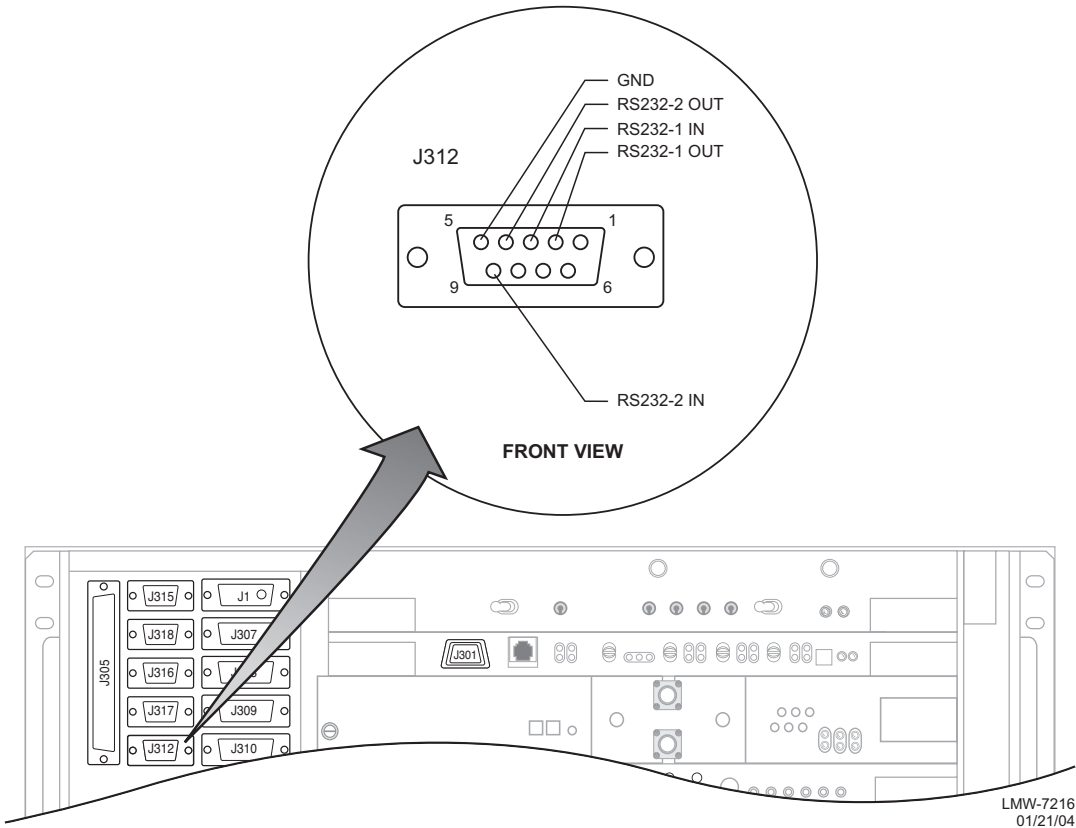


Figure A-12 RS-232 Connect J312 Location and Pinout

A.2.11 MCS-11 Cable 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.

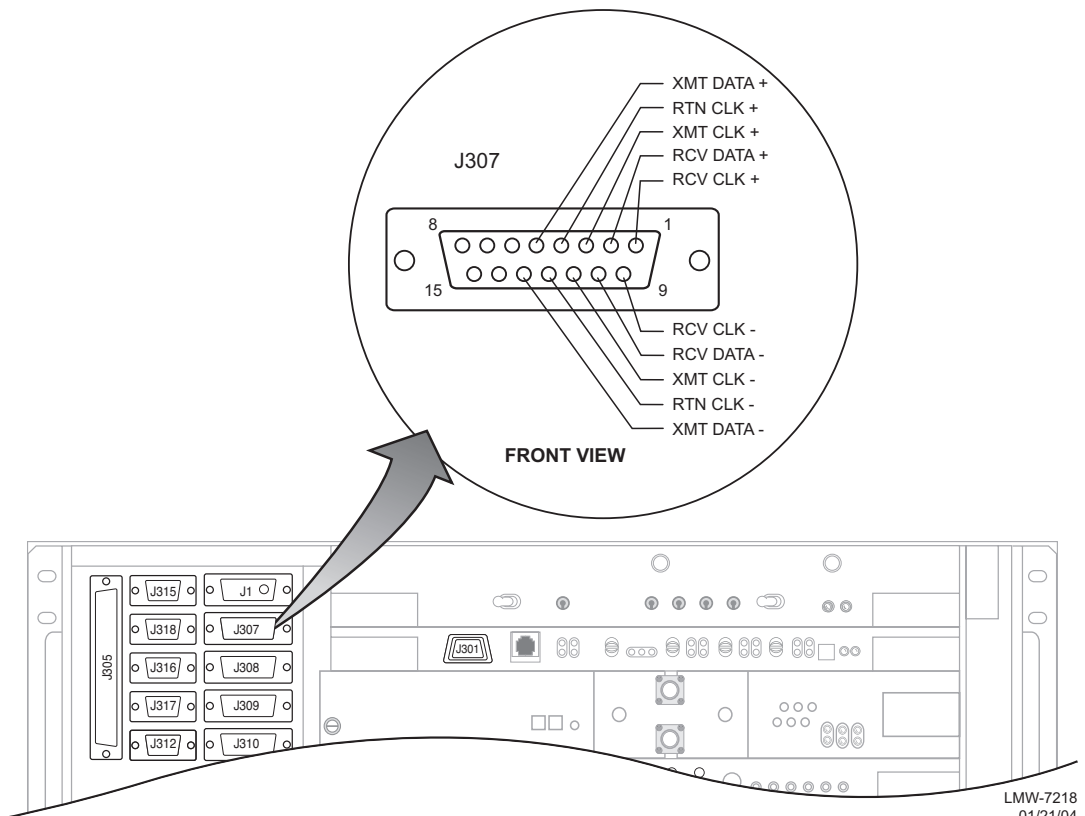
A.2.11.1 MCS-11 Master (J307) Cable Connection

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 A-13 for shelf connector location and pinout.



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Figure A-13 MCS-11 Connector J307 Location and Pinout

A.2.11.2 MCS-11 Repeater-to-Spur Daisy Chain Connection (J308/J309)

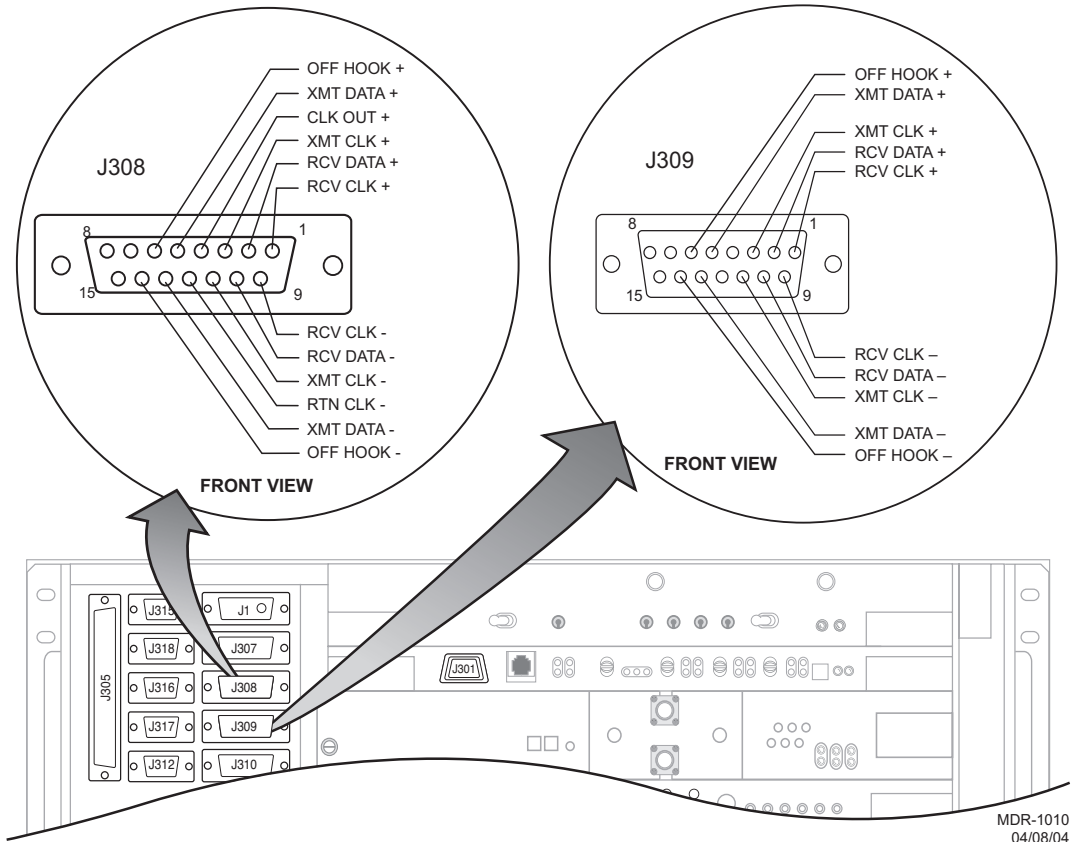
Note

*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.*

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

CROSSWIRED CABLE ASSEMBLY – Recommended connectorized cable assembly – PN 695-7837-001 through -005 (26 AWG 8 pair shielded, jacketed cable with 15-pin D-type connector on each end). See Figure A-14 for shelf connector J308 location and pinout. See Figure A-14 for shelf connector J309 location and pinout.

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).



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Figure A-14 MCS-11 Connector J308 and J309 Location and Pinout

A.2.11.3 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 DMX-3003N MUX.

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 A-15 for shelf connector J310 location and pinout.

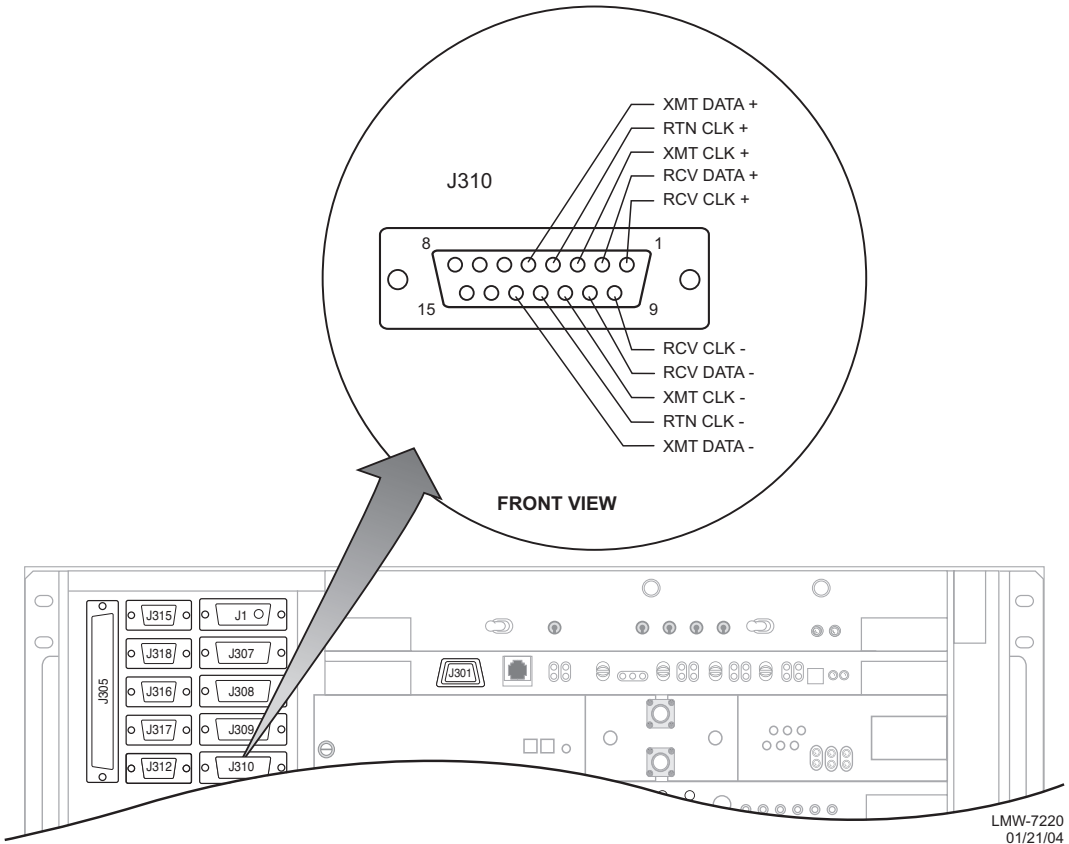


Figure A-15 MCS-11 Connector J310 Location and Pinout

A.2.12 ELMC Cable Connections

The Extended Link Monitor Channel (ELMC) function allows provisioning, alarms, status information, and control commands for the local radio and, with the exception of wayside DS1, alarms, status information, control commands for addressable remote radios as a standard feature. 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.

Recommended connectorized cable assembly – PN 695-4125-006/013 (26 AWG 5 pair shielded, jacketed cable). See Figure A-16 for shelf connectors locations and pinout.

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.

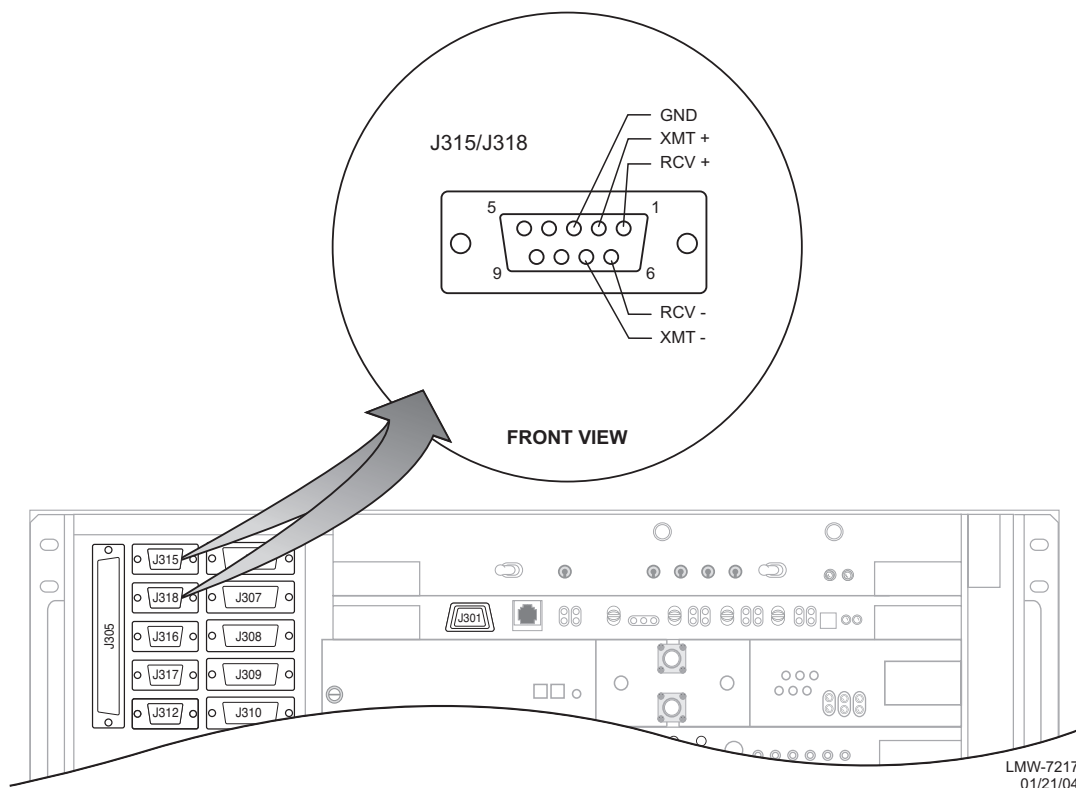


Figure A-16 ELMC Connectors J315 and J318 Location and Pinout

A.2.13 Foreign Alarm Interface (J305)

Recommended connectorized cable assembly – PN 695-4121-001/003 (24 AWG 25 pair cable). See Figure A-17 for shelf connector location and pinout.

or

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

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.

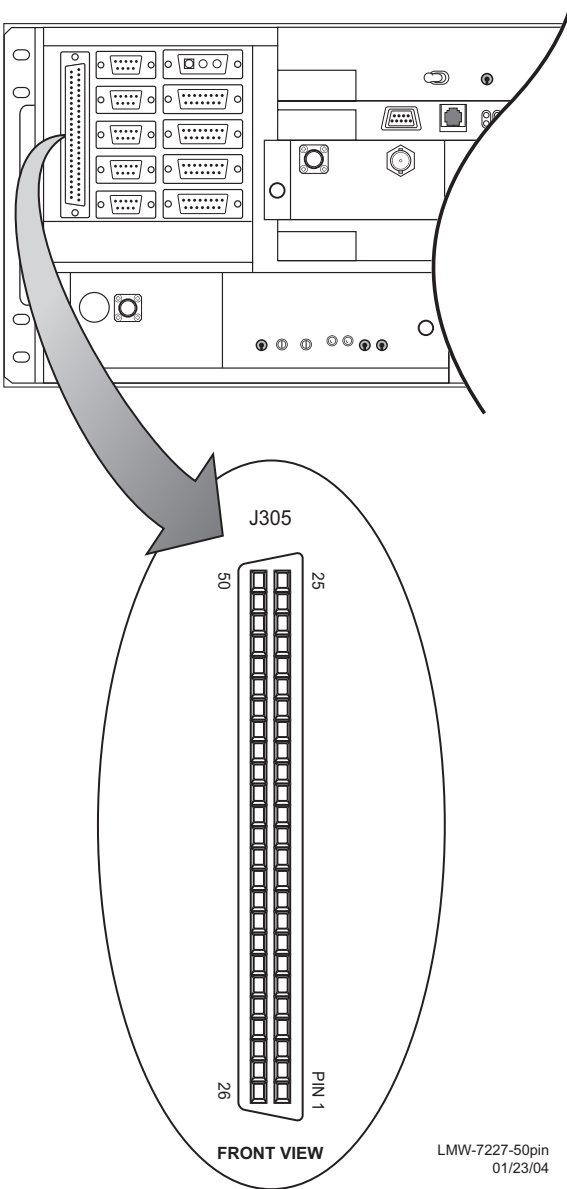


Figure A-17 Alarm/Status/TBOS Connector J305 Location and Pinout

A.2.14 Station Alarm Wiring

See Figure A-18. 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.

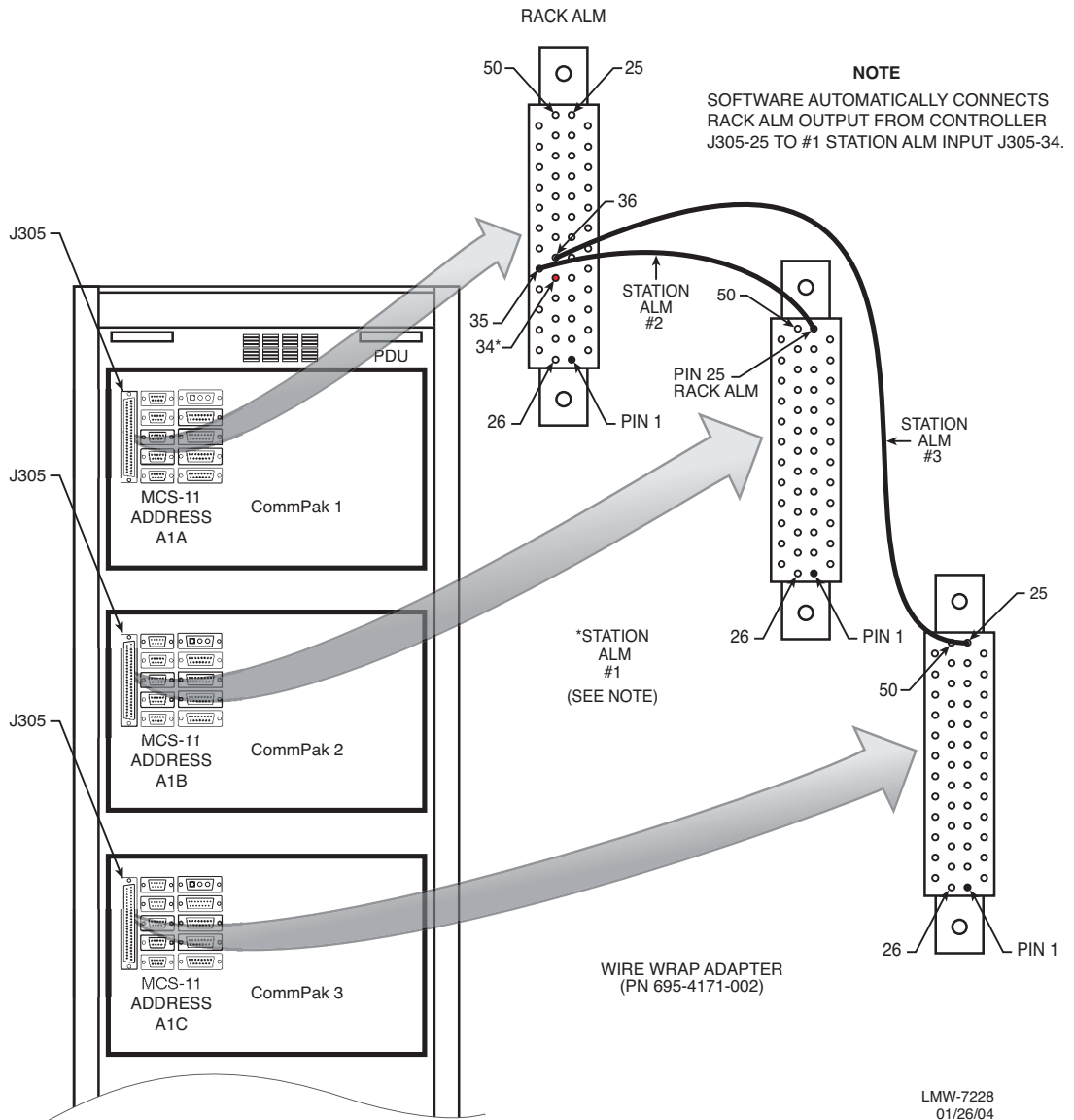


Figure A-18 Alarm and Status Relays/TBOS Interconnect

A.3 MAINTENANCE

This part of the appendix provides information and procedures that are different for the hot-standby shelf and the CommPak indoor shelf.

A.3.1 Warnings and Cautions

All Warnings and Cautions outlined in the Maintenance section of the main book apply while operating, performance testing, troubleshooting, or repairing the MDR-8000 series radio.

A.3.2 Troubleshooting

Refer to the Maintenance section in the main book.

A.3.3 Module Replacement

Before replacing any module refer to Table A-4 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.

Table A-4 Module Replacement Matrix

MODULE/UNIT	REMOVAL/REPLACEMENT PROCEDURE	CHECKS/ADJUSTMENTS PROCEDURE
AE-27AF Relay Interface	No Special Procedure Required	None Required
AE-37Y Controller	Chart 2 (Maintenance Section in main book)	None Required
CE-16BB Power Supply	Chart 1 (Maintenance Section in main book)	None Required
Fuse	No Special Procedure Required. Refer to Operations Section in main book for location.	
DX-35M DS1/E1 I/O Interface	Chart 3 (Maintenance Section in main book)	No Special Procedure Required
DX-35N DS3 I/O Interface	Chart 3 (Maintenance Section in main book)	Chart 10 and 11 in Appendix E on attached CD
UD-35() Transmitter	Chart 4 (Maintenance Section in main book)	Applicable Charts 1 through 5 in Appendix E on attached CD
Crystal Oscillator Subboard	Chart 4 (Maintenance Section in main book)	
Capacity Key	Chart 5 (Maintenance Section in main book)	
UD-51() Power Amplifier	Paragraph A.4.1 (This Section)	Applicable Charts 6 through 8 in Appendix E on attached CD
DS1/E1 LBO	Paragraph A.4.2 (This Section)	No Special Procedure Required
DS3 LBO	Paragraph A.4.3 (This Section)	No Special Procedure Required
OC3 AUX Infrc	Paragraph A.4.4 (This Section)	No Special Procedure Required

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

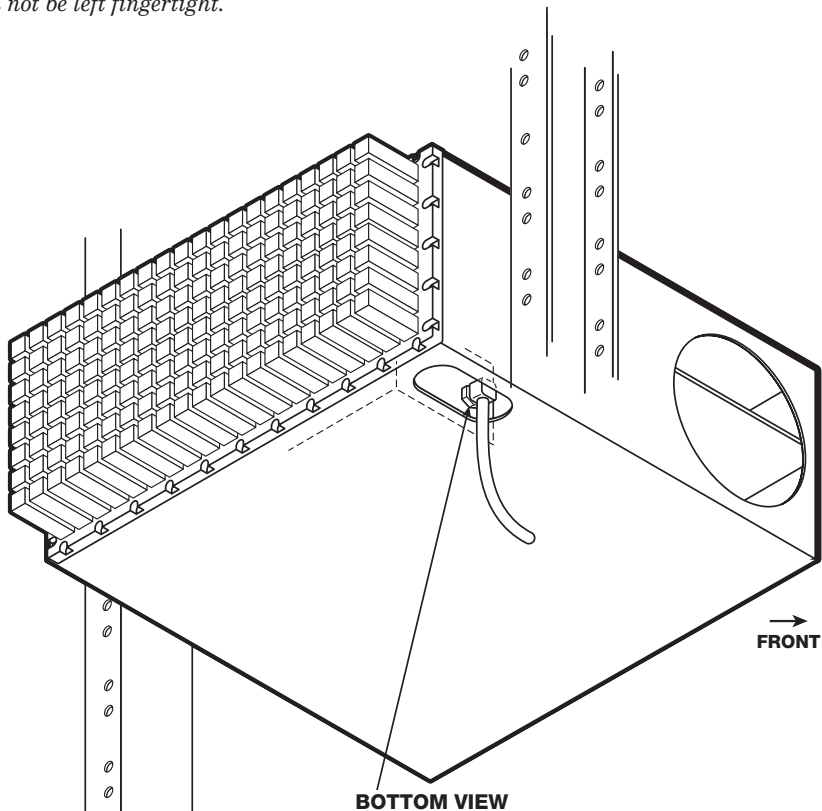
A.3.3.1 PA Module Removal and Replacement

Remove and replace the PA using the following procedure:



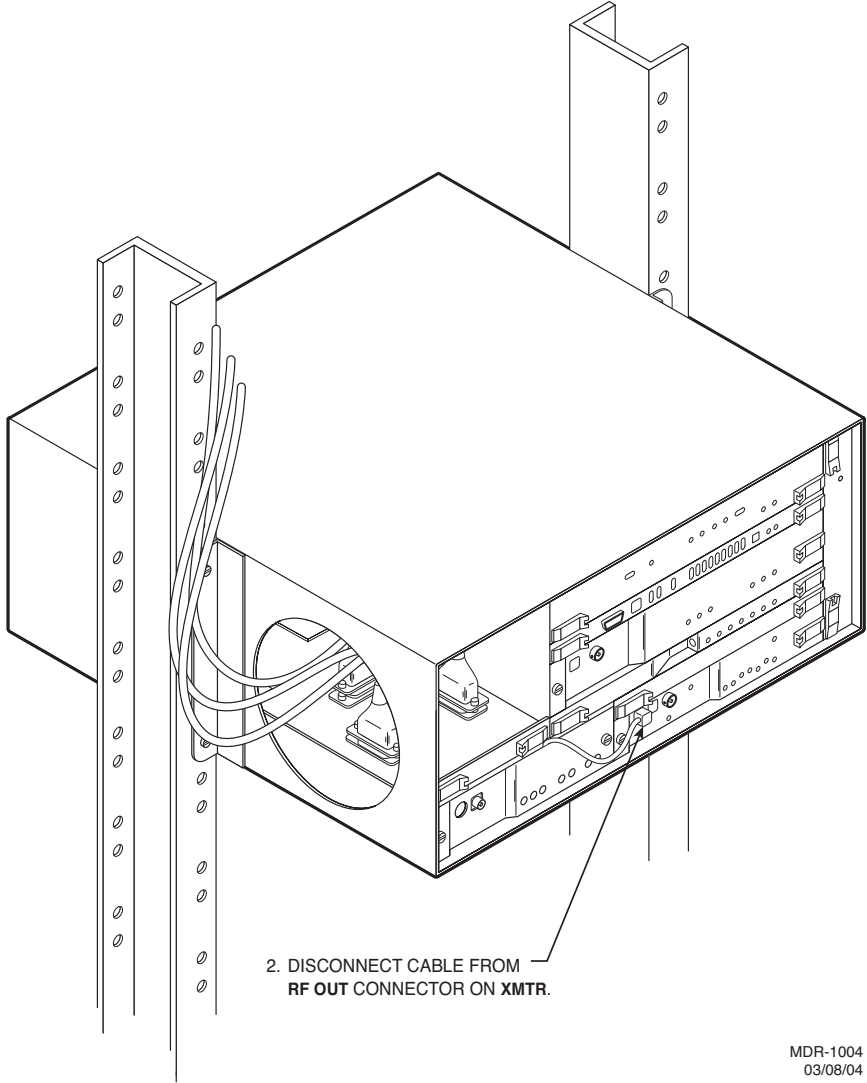
Before starting removal procedure, loosen cable connected to RF OUT connector on PA.

Semirigid coaxial cable requires special consideration. The electrical characteristics of the semirigid 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 semirigid 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.



1. USING OPEN-END 5/16 WRENCH
LOOSEN CABLE CONNECTOR ON
RF OUT CONNECTOR ON PA.

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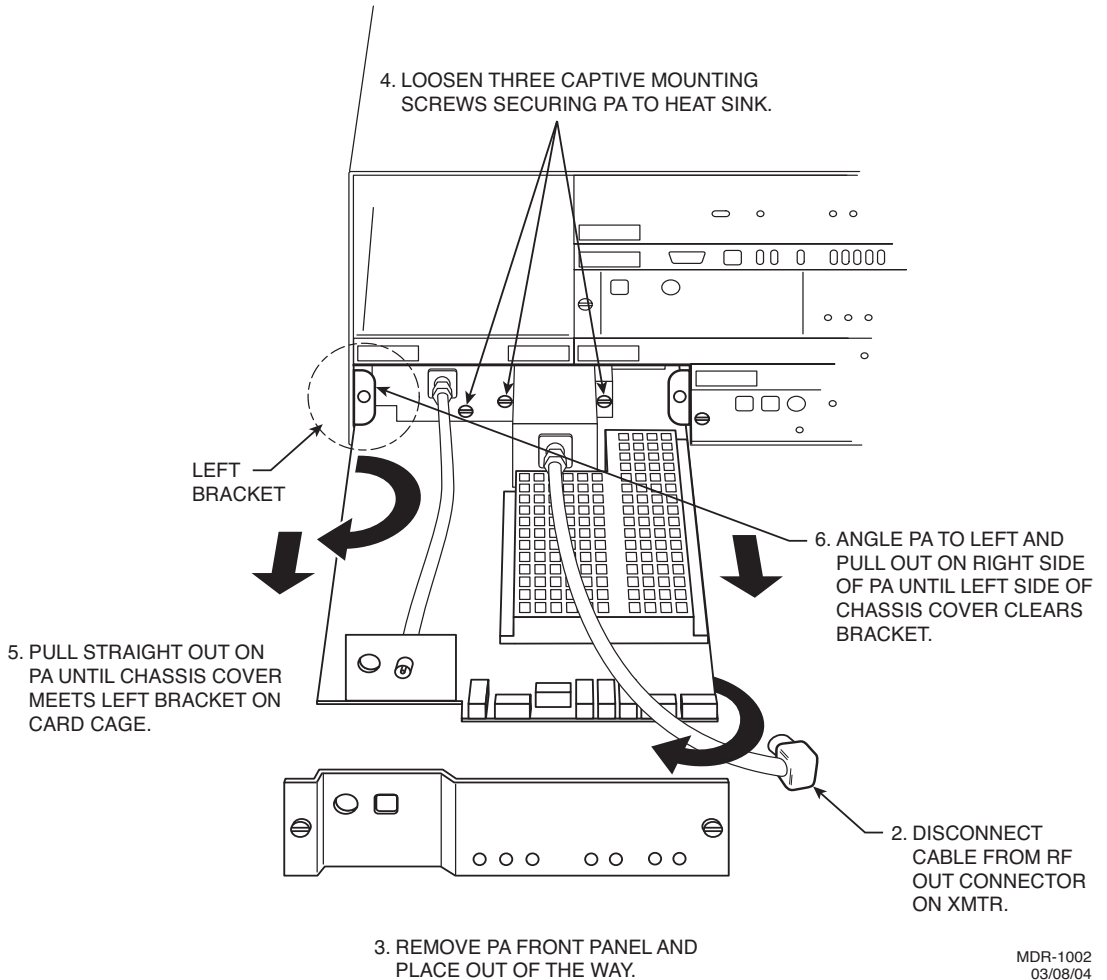
2. DISCONNECT CABLE FROM
RF OUT CONNECTOR ON XMTR.

MDR-1004
03/08/04

WARNING

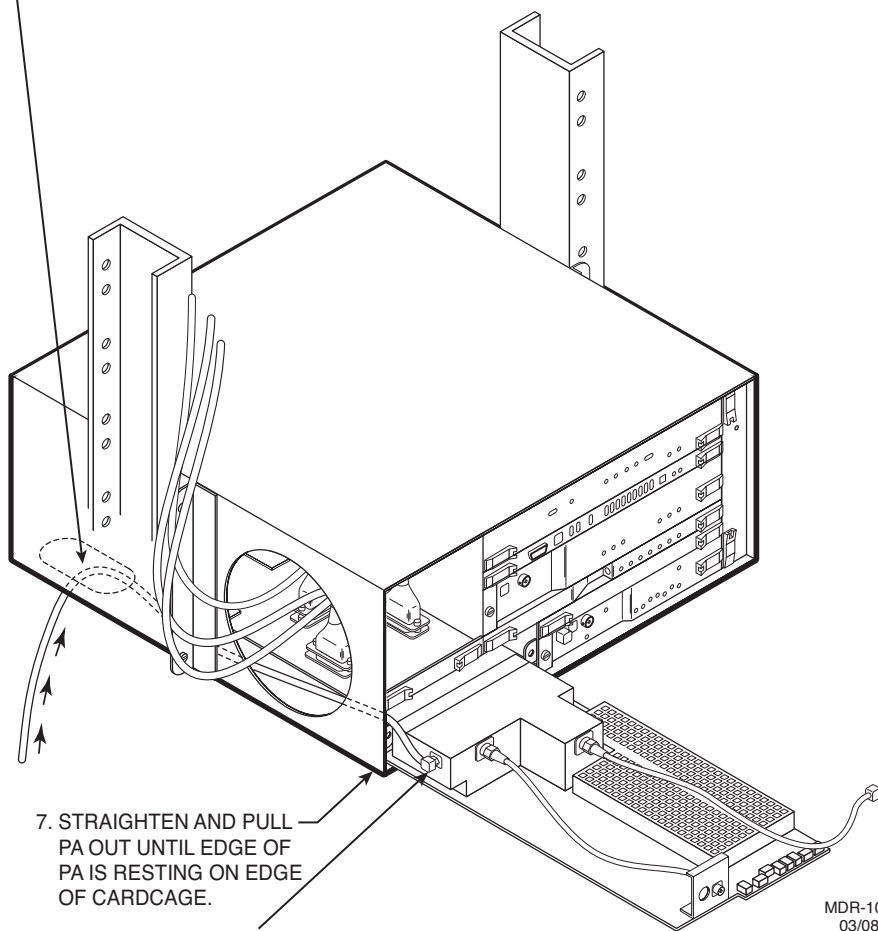
*Possibility of
Damage
to Equipment*

Check to ensure that the three mounting screws securing the PA to the heatsink are loose before attempting to remove the PA to prevent damage to the module.



Note

You must continually feed RF cable through bottom entrance hole in cardcage as you pull out PA, being cautious to not damage or overbend cable.



7. STRAIGHTEN AND PULL PA OUT UNTIL EDGE OF PA IS RESTING ON EDGE OF CARDCAGE.

8. WHILE HOLDING PA, DISCONNECT PA RF OUT CABLE.

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03/08/04

WARNING

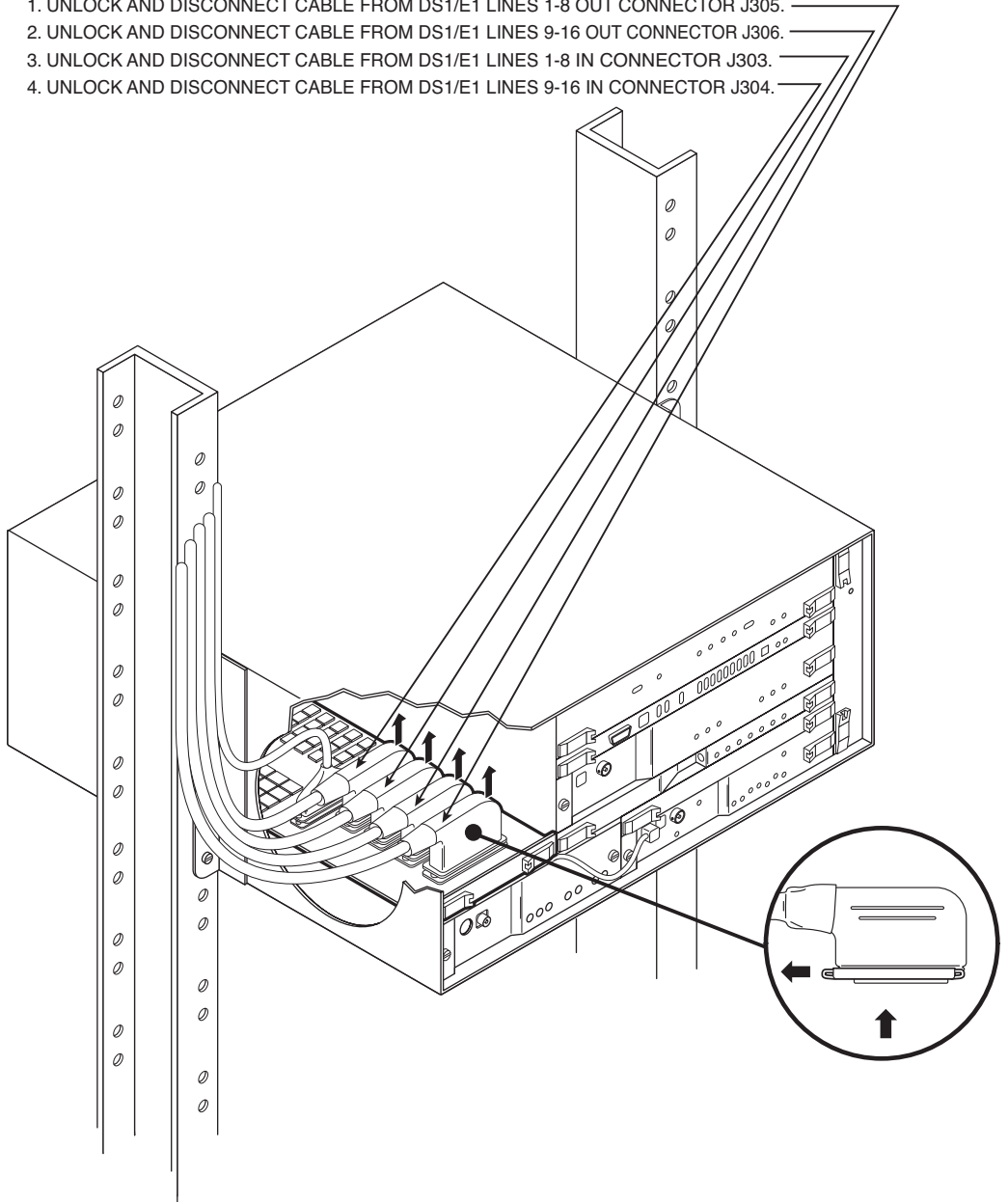
*Possibility of
Damage
to Equipment*

To prevent monitor point errors, use caution to ensure that the front panel removed from the PA is reinstalled on that same PA. No two monitor 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.

A.3.3.2 DS1/E1 LBO Module Removal and Replacement

Remove and replace the DS1/E1 LBO using the following procedure:

1. UNLOCK AND DISCONNECT CABLE FROM DS1/E1 LINES 1-8 OUT CONNECTOR J305.
2. UNLOCK AND DISCONNECT CABLE FROM DS1/E1 LINES 9-16 OUT CONNECTOR J306.
3. UNLOCK AND DISCONNECT CABLE FROM DS1/E1 LINES 1-8 IN CONNECTOR J303.
4. UNLOCK AND DISCONNECT CABLE FROM DS1/E1 LINES 9-16 IN CONNECTOR J304.

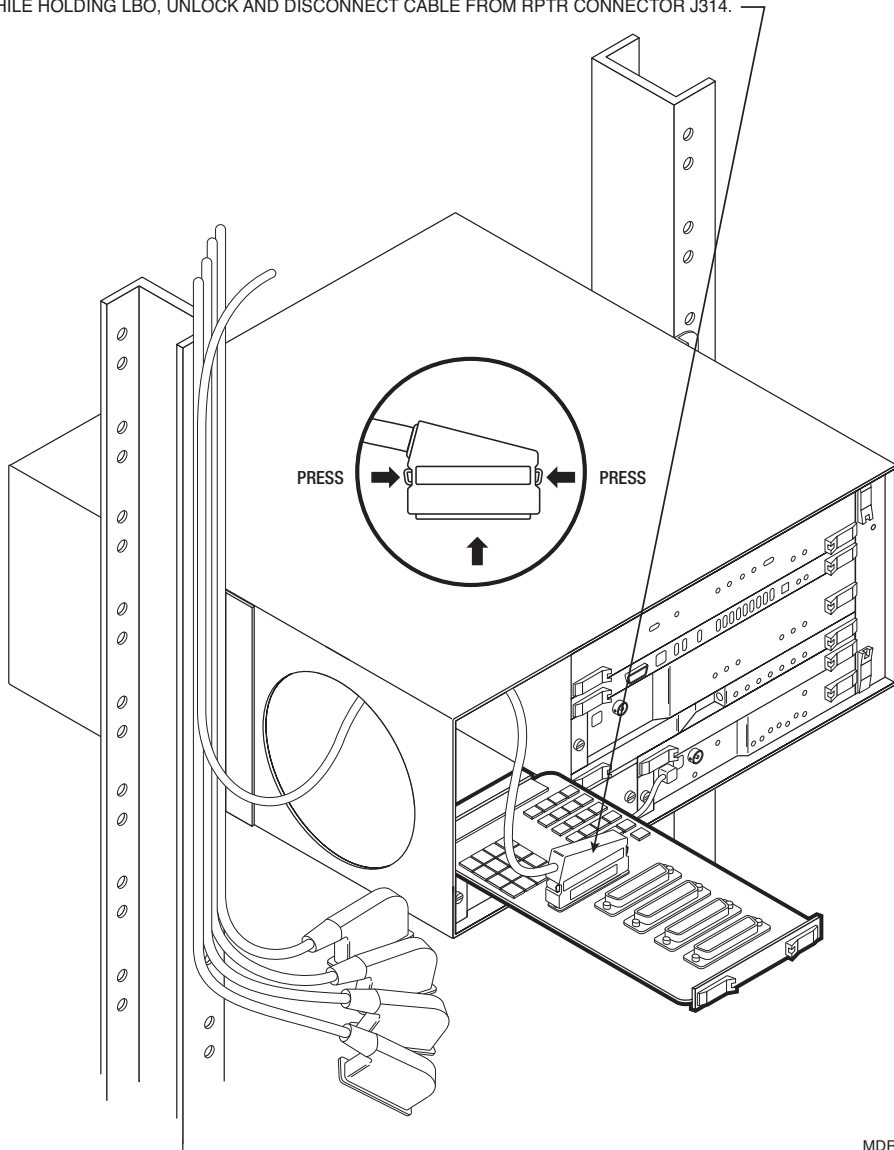


5. PULL CABLE THROUGH OPENING.

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6. USING HANDLES ON MODULE, UNLATCH DS1/E1 LBO AND PULL OUT OF CARD CAGE TO FULLY EXTENDED POSITION WITH EDGE OF LBO RESTING ON EDGE OF CARD CAGE.

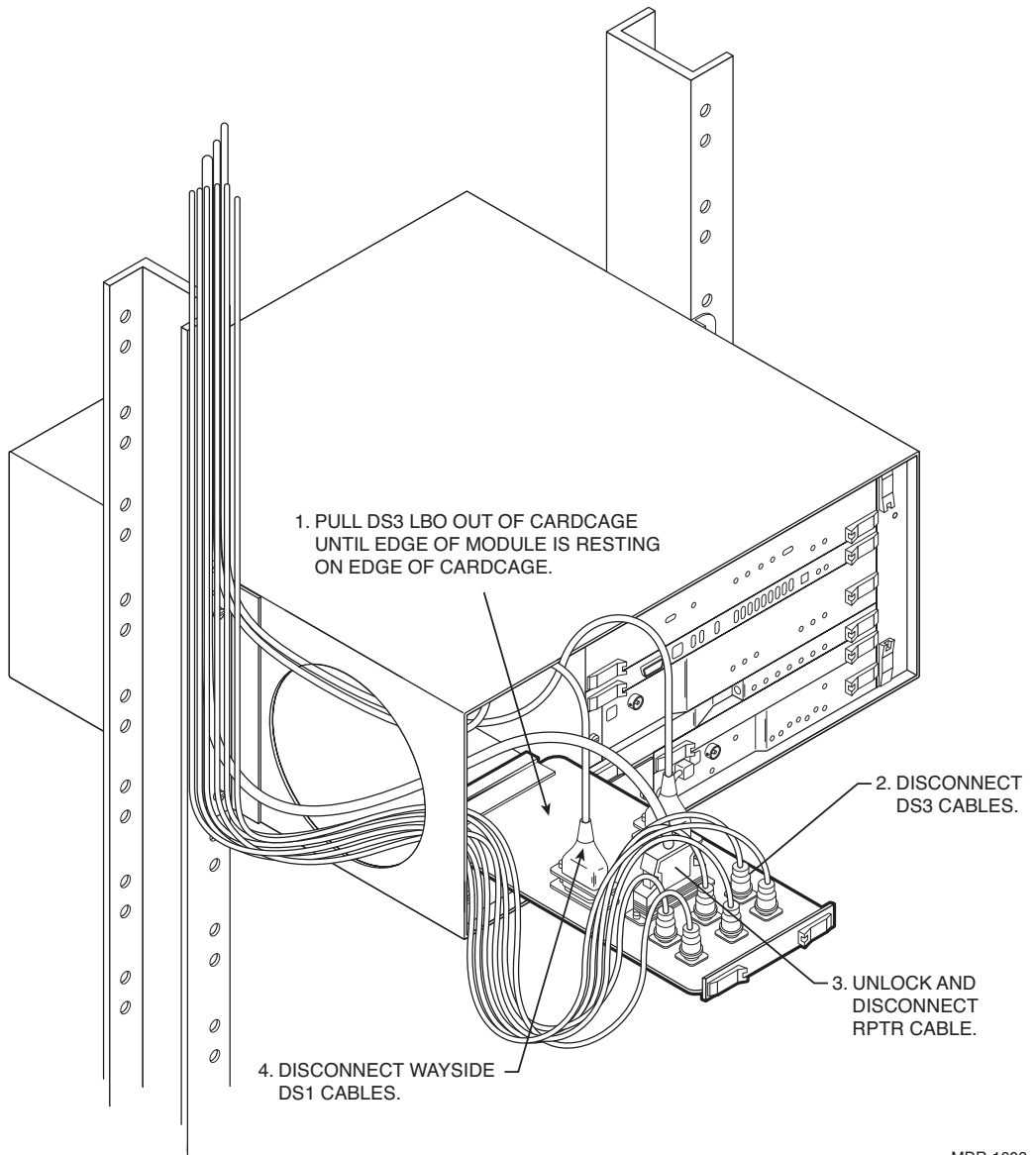
7. WHILE HOLDING LBO, UNLOCK AND DISCONNECT CABLE FROM RPTR CONNECTOR J314.



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A.3.3.3 DS3 LBO Module Removal and Replacement

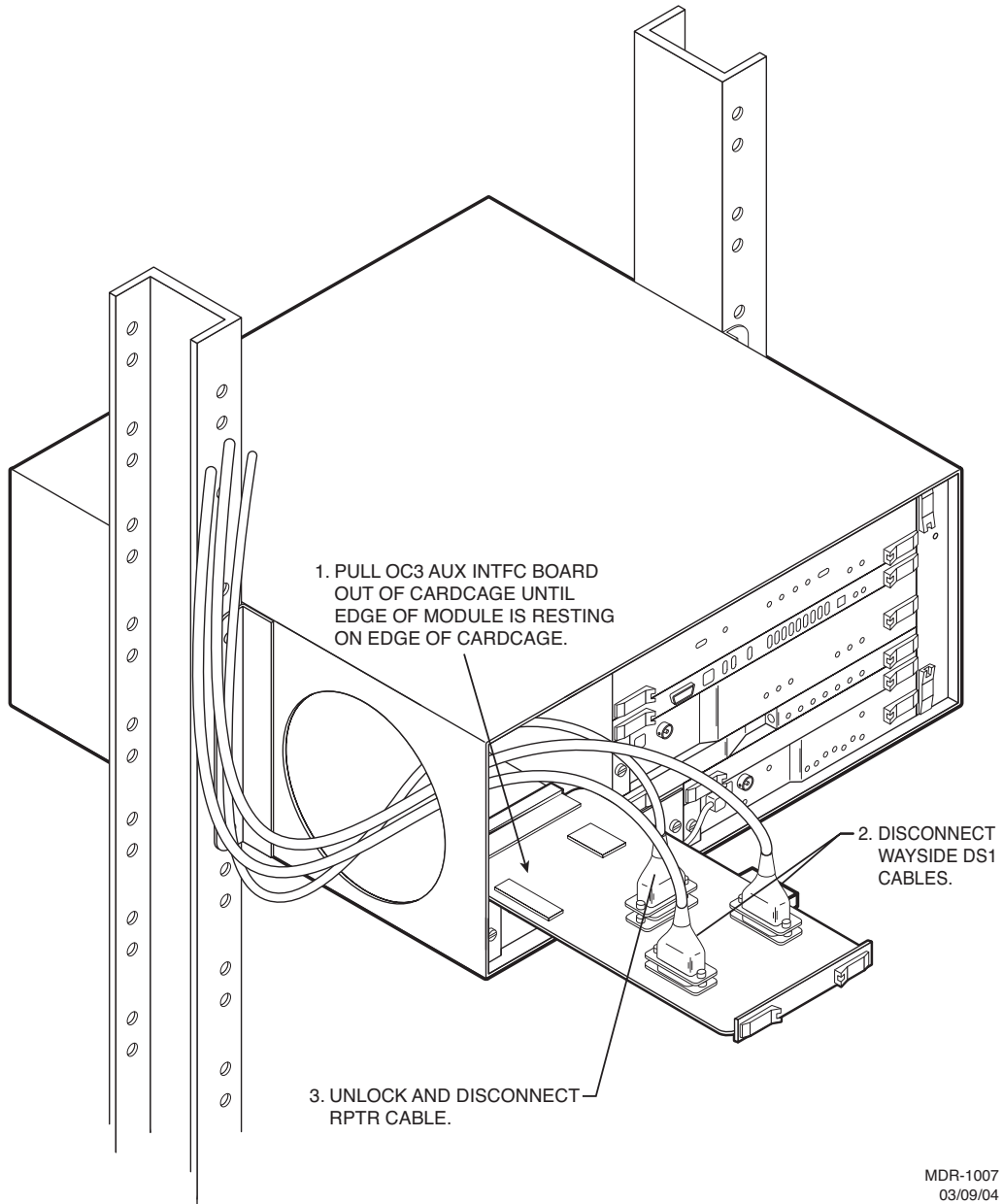
Remove and replace the DS3 LBO using the following procedure:



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A.3.3.4 OC3 AUX Interface Board Removal and Replacement

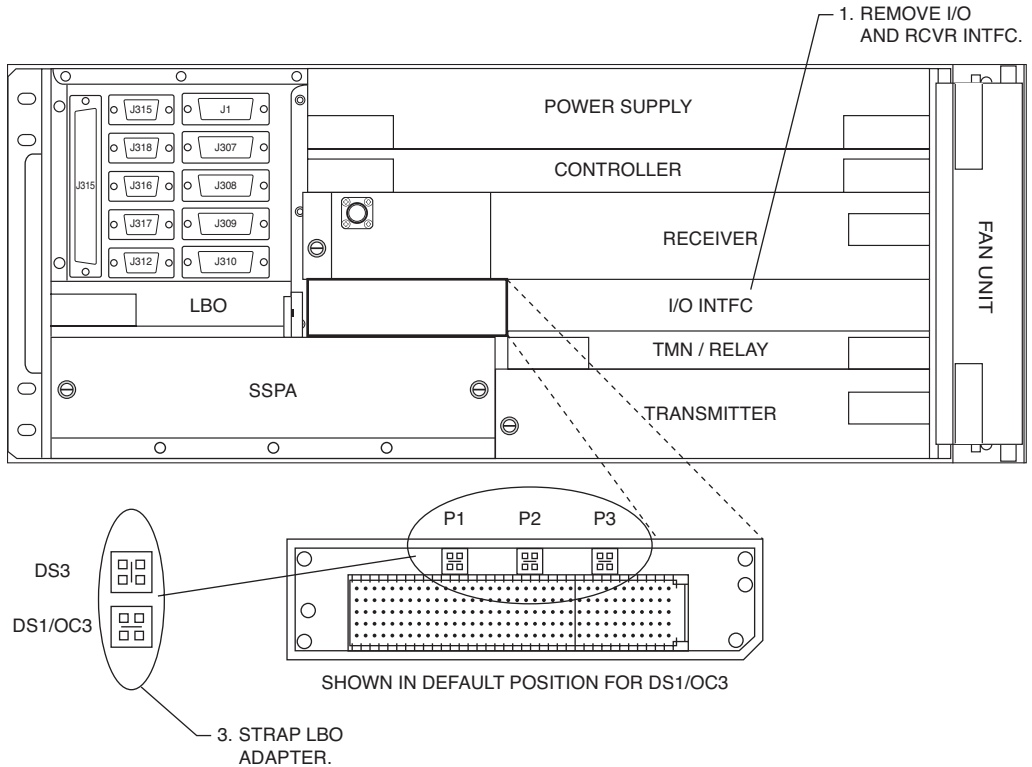
Remove and replace the OC3 AUX interface board using the following procedure:



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A.4 CAPACITY UPGRADE DS1 TO DS3 OR DS3 TO OC3

Upgrading a DS1 radio to DS3 or DS3 radio to OC3 requires changing straps on the LBO adaptor, located behind the I/O interface module. Use the following procedure before starting upgrade from DS3 to OC3.



2. REPLACE I/O INTFC AND RCVR.

MDR-1015
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A.5 CHANGING SYSTEM SOFTWARE

Refer to the Maintenance section in the main book.

