

section 1

general

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1 GENERAL

1.1 INTRODUCTION

The MDR-8000/i/s/u series Microwave Digital Radios (see Figure 1-1) consists of:

- Solid-state, licensed, digital radios that provide transport for DS1, E1, and DS3 in 2, 6, 7, 8, 10, and 11 GHz RF frequency bands and OC3 in 6, 7, 8, 10, and 11 GHz RF frequency bands
- Solid-state, unlicensed digital radios that provide transport for DS1 and DS3 in the 5 GHz RF frequency band.

The following capacities and modulation schemes are available:

- MDR-8000 – 2, 4, 8, 12, or 16 North American Standard DS1 channels at either 32 or 128 TCM or 1 or 3 North American Standard DS3 channels with 1 or 3 wayside DS1 channels at 64 QAM
- MDR-8000i – 2, 4, 8, 12, or 16 CCITT E1 channels at either 32 or 128 TCM
- MDR-8000s – 3 North American Standard STS1 channels with 3 wayside DS1 channels at 128 TCM
- MDR-8000u – 2, 4, 8, or 16 North American Standard DS1 channels at 32 TCM or 1 North American Standard DS3 channel with 1 wayside DS1 channel at 16 or 64 QAM.

The radio fits into a standard 19 in. (483 mm) rack and occupies seven vertical rack increments. Up to four fully-equipped hot-standby radios can be mounted in a standard 7 ft. rack. The radio is front accessible and can be mounted against a wall or back-to-back against other equipment.

1.2 STANDARD FEATURES

Standard features include:

- Frequency bands from 2 to 11 GHz
- Committee of European Post and Telegraph (CEPT)/Federal Communications Commission (FCC) applications
- DS1, E1, DS3, and OC3 Traffic capacities.
- International Telecommunications Union (ITU)/ETSI/FCC compliant
- Five configuration options
- Upstream management compatibility

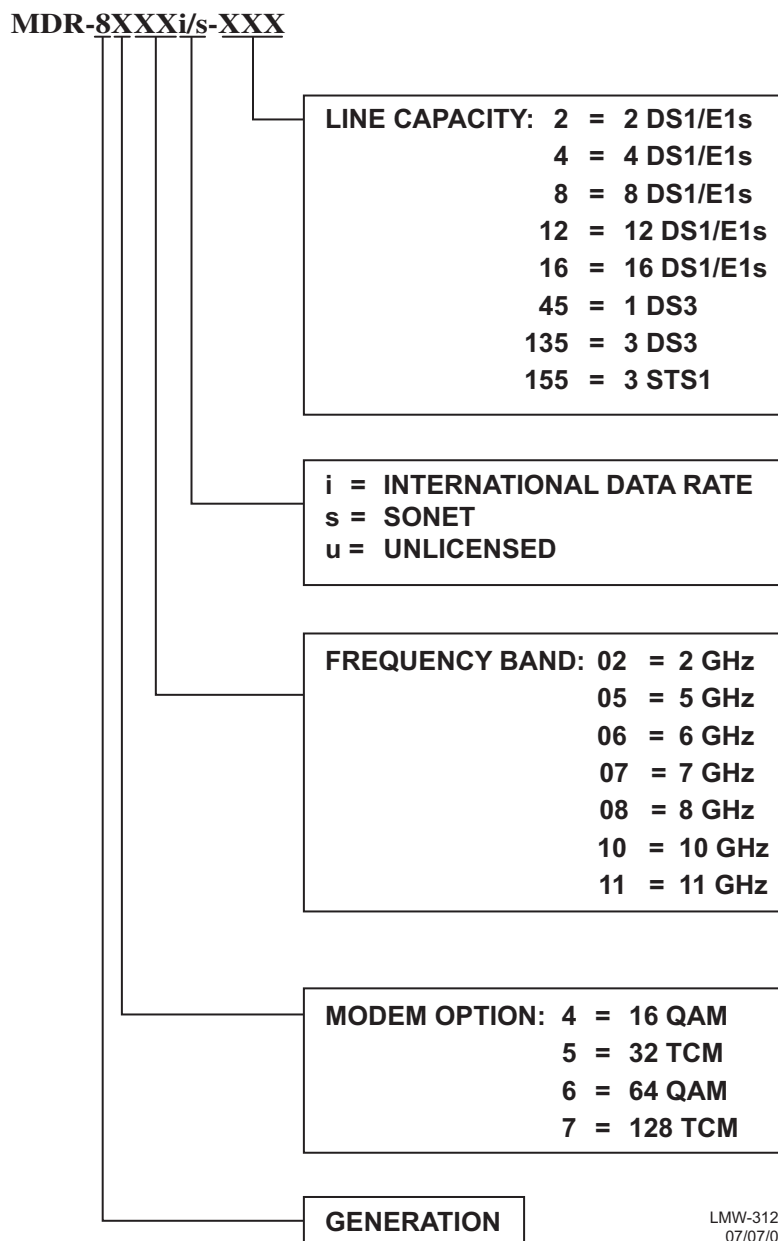
- User-friendly Personal Computer (PC) monitor and control
- Automatic Transmitter Power Control (ATPC)
- Adaptive Time Domain Equalization (TDE)
- Extended Link Monitor Channel (ELMC)
- MCS-11/Telemetry Byte Oriented Serial (TBOS) Alarm/Control Interface
- Two independent PCM audio channels



Figure 1-1 Typical MDR-8000/i/s/u Series Microwave Digital Radio

1.3 NAMING CONVENTION

The MDR-8000/i/s/u series radio naming conventions are as follows:



1.4 ORDERING INFORMATION

The radio is shipped as a complete unit; therefore, ordering information must specify the following:

- System capacity:
 - 2, 4, 8, 12, or 16 DS1
 - 2, 4, 8, 12, or 16 E1
 - 1 or 3 DS3 with/without wayside DS1
 - OC3 with/without wayside DS1
- System configuration: non-standby, non-standby/space diversity, hot-standby, hot-standby/space diversity, frequency diversity
- Transmit and receive frequency
- Transmit power level
- Fault alarm requirements
- Service channel requirements
- DS1/E1 interface connector requirements
- Alarm interface connector requirements

1.5 SYSTEM CONFIGURATIONS

The MDR-8000/i/s radio can be provisioned as a terminal, synchronous repeater, ring terminal, or ring repeater.

1.6 RADIO CONFIGURATIONS

1.6.1 Basic Configurations

The MDR-8000/i/s/u supports the three basic configurations:

- Non-standby – available in all frequency bands – stand alone transmitter/receiver combination
- Hot-standby – available in all frequency bands except 5 GHz (unlicensed) – pair of transmitters and receivers, both pairs operating on the same set of go and return frequencies.
- Frequency diversity – available in all frequency bands except 2 GHz and 5 GHz (unlicensed) – pair of transmitters and receivers, each pair operating on a different set of go and return frequencies.

1.6.2 Ring

Non-standby radios are typically used in ring systems where the radios are protected by the ring architecture.

1.6.3 Space Diversity Add-On

Space diversity can be added to any of the three basic configurations and ring systems.

1.6.4 Optical 2 X 4 Configuration

Hot-standby and frequency diversity configuration are available with 2-fiber or 4-fiber optical interfaces.

1.7 FEATURES AND OPTIONS

Features and options for the MDR-8000/i/s/u series of microwave digital radios are described in the following paragraphs.

1.7.1 Primary Power

The MDR-8000/i/s/u series radios operate from 20.5 to 60 V dc primary power with positive or negative ground.

1.7.2 Transmit Power Level Options

The standard radio is provided without a power amplifier (PA) module for low-power applications. The optional PA module is available for high-power requirements. There are different levels for the different frequency bands. Refer to the electrical characteristics table in this section for specific levels.

1.7.3 Differential Absolute Delay Equalization (DADE)

DADEing adjusts the differential absolute delay between the main and diversity signals in a space diversity configuration. DADEing is an automatic function within the DS1/E1 and OC3 MDR-8000/i/s/u receivers, reducing the time required for initial turn-up and test.

1.7.4 Trellis Encoding and Time Domain Equalization (TDE)

Trellis encoding (DS1/E1/OC3) ensures that even with the most severe multipath, only the correct digital data is demodulated. TDE further reduces the disruptive effects of multipath distortion.

1.7.5 MCS-11 Alarm/Control Interface

MCS-11 is standard in the MDR-8000. The MDR-8000 can interface with any alarm system that is based on the MCS-11 protocol. Use with the TSM-2500 network management system to develop a central access point to monitor and control the transmission system

1.7.6 Foreign Alarm Interface

This provisioning option provides serial alarm/status reporting for the Telemetry Byte Oriented Serial (TBOS) protocol. A wire-wrap adapter is provided to mate to connector J305 on the backplane.

1.7.7 Relay Interface Option

The optional AE-27AF Relay Interface unit provides relay closure indications of radio alarms and status. The relay interface also provides up to 16 station alarm inputs and six relay closure control outputs.

1.7.8 Extended Link Monitor Channel

ELMC is standard and performance monitoring, alarm and status information, and remote controls are accessible through the ELMC channel, independent of network management interfaces.

Optional remote provisioning and downloading capability is provided via an ELMC option key that is mounted on the controller module.

1.7.9 Automatic Transmitter Power Control Provisioning Option

Automatic Transmitter Power Control (ATPC) is a standard feature that can be enabled or disabled using the USI provisioning screens. When ATPC is disabled, transmitter power is fixed at the recommended maximum level. When ATPC is enabled, transmitter power may be reduced up to 10 dB from the maximum power level when the far end RSL is above a minimum level. When ATPC is enabled with timeout, transmitter ATPC activity is limited to a maximum time without returning to minimum transmit power. After five minutes of activity, the transmit power is forced to minimum until the far end RSL returns to normal levels.

1.7.10 Service Channels Provisioning Options

The MDR-8000 provides a 256 kb/s auxiliary channel for servicing the radio. This is an overhead channel and is independent of the traffic channels. The 256 kb/s service channel contains four 64 kb/s service channels. Three of the four 64 kb/s channels (Service Channel 1, 2, and 3) can be provisioned on the USI for a specific use. Service channel 4 is dedicated to radio commands and ELMC. Service channel 4 is not provisionable. Only 16 kb/s out of the 64 kb/s in this channel are used.

Note

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

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

- Service Channel 1 (64 kb/s channel) – can be used to carry 4-wire audio, RS232 data, or MCS-11 fault alarm information.
 - AUDIO 1 and 2 – Two audio provisioning options (AUDIO 1 and AUDIO 2) are provided for Service Channel 1. Each audio channel is a 4-wire audio channel that provides off-hook detection, level control, and E and M-lead signaling. AUDIO 1 also has DTMF decoding that allows a specific station to be dialed. External connection to AUDIO 1 is J316. External connection to AUDIO 2 is J317.
 - RS232 1 – RS232 Channel 1 is an RS232 formatted data channel that can provide interface to an external computer/modem. External connection to RS232-1 is J312.
 - MCS-11 – The MCS-11 channel is an RS422 formatted data that provides an interface to an external MCS-11 Monitor Control System or TSM system, used to control multiple MCS-11 systems. External connections to the MCS-11 include J307, J308, J309 and J310.
- Service channel 2 (64 kb/s channel) - can be used to carry 4-wire audio, RS232 data, or MCS-11 fault alarm information.
 - AUDIO-1 and -2 – Same as Service Channel 1
 - RS232-2 – RS232 Channel 2 is an RS232 formatted data channel that can provide interface to an external computer/modem. External connection to RS232-1 is J313.
 - MCS-11 – Same as Service Channel 1.
- Service Channel 3 (64 kb/s channel) - can be used to carry 4-wire audio, or MCS-11 fault alarm information.
 - AUDIO 1 and 2 – Same as Service Channel 1
 - MCS-11 – Same as Service Channel 1.

1.7.11 Mechanical Options

Mechanical options include:

- Racks. Refer to Table 1-1 for characteristics.
- Shelf covers - One front cover is provided.
- Rack extension kit PN 690-1125-001 through 005 - Extends 7-ft racks PN 690-1124-XXX and 694-9000-XXX to any height from 7 ft 3-1/2 in. to 11 ft 6 in. The purpose of the extensions is to provide top support mounting above the 7-ft level.
- Adjacent rack attachment (without/with rack extension) kit PN 694-9004-001/002 – Provides hardware for bolting two rack assemblies (PN 694-9000-XXX) together. The -001 kit is used to tie two racks together that do not have the optional rack extension kit (PN 690-1125-003) installed. Kit -002 is used when the two racks have the optional rack extension kit.

Note

Guardrails and AC outlets are field installed and are sent in shipper kits.

- Guardrail kit PN 690-4367-005 through -008 - Protects front only (PN 690-4367-007), front and rear (PN 690-4367-008), or sides (690-4367-005 and -006) of all configurations of rack PN 690-1124-XXX.
- AC outlet kit PN 690-4373-001 - Provides hardware for mounting ac outlet to the guardrail (PN 690-4367-XXX).
- Optical Fiber Management Panel (OC3 only). Optical fiber management panels are available for 2 or 4 fiber and for 2- or 4-fiber switched configurations. Each optical fiber management panel supports two MDR-8000s radio shelves. The 2- or 4-fiber switched optical fiber management panel (PN 3EM09257AA) is used with splitter/combiners to support 2 or 4 fiber switched applications using multimode or single mode fibers. For non-switched applications, the 2 or 4 fiber optical fiber management panel (PN 3EM09257AB) is used to support 2 or 4 fiber configurations.

Table 1-1 Rack Options

PART NO.	DESCRIPTION	RACK TYPE
694-9000-001	19-in. wide by 7-ft. high aluminum rack, no top support bar, no side covers	Standard
694-9000-002	19-in. wide by 7-ft. high aluminum rack with top support bar (694-9001-002), no side covers	Standard
694-9000-003	19 in. wide by 6-ft high aluminum rack with top support bar (694-9001-001), no side covers	Standard
019-0429-010	19-in. wide by 7-ft. high steel rack	Seismic *
019-0429-020	19-in. wide by 9-ft. high steel rack	Seismic *
019-0429-030	19-in. wide by 11-ft. 6-in high steel rack	Seismic *
019-0429-040	19-in wide by 11-ft. 8-in high steel rack	Seismic *
019-0429-080	19 in. wide by 7-ft. 6-in high steel rack	Seismic *
019-0429-090	19 in wide by 8-ft. high steel rack	Seismic *
695-0905-002	23-in. wide by 7-ft. high aluminum rack, no top support bar, no side covers	Standard
694-8873-001	MDR-8000 shelf mounting bracket extender (for mounting 19-in. shelf in 23-in. rack)	
694-8873-005	PDU mounting bracket extender (for mounting 19-in. PDU in 23-in. rack)	
690-1125-003	Aluminum rack extension (extends height of 7-ft aluminum rack)	
694-9004-001	Adjacent rack attachment (without rack extension 690-1125-003)	
694-9004-002	Adjacent rack attachment (with rack extension 690-1125-003)	
690-4367-005	Short side guard rail	
690-4367-006	Long side guard rail	
690-4367-007	Guard rail (front only)	
690-4367-008	Guard rail (front and rear)	
690-4373-001	AC outlet	

* Seismic racks require Seismic Accessory Kit PN 695-1001-001

1.7.12 Capacity upgrade

The number of maximum DS1/E1 lines can be changed to any number between 1 and 16 to meet expanding system needs. DS3 lines can be expanded from 1 to 3. The number of available DS1/E1/DS3 lines is determined by printed circuit boards (capacity keys). Identical capacity keys plug onto the transmitter and receiver modules. Changing the number of DS1/E1/DS3 lines requires changing capacity keys. DS1 to DS1 and/or DS3 to DS3 capacity upgrades can be performed in-service on protected systems without traffic interruption. In non-protected radios, traffic will be interrupted for the duration of the procedure.

1.7.13 Bandwidth upgrade

Assuming no frequency or band change, DS1 to DS3 conversion can be accomplished by changing out the I/O interface modules, LBO board, and capacity keys and installing DS3 software. Electrical DS3 to optical OC3 conversion can be accomplished by changing out the I/O interface modules, exchanging the LBO board with the auxiliary board, and changing capacity keys and installing OC3 software. Changing out the LBO or AUX board requires interrupting traffic for the duration of the procedure.

1.8 USER SYSTEM INTERFACE (USI)

A personal computer (PC) is required to access provisioning, status and alarm information, and maintenance control functions (on-line maintenance and troubleshooting) within the radio. The PC is not supplied with the radio and must be provided by the user. These functions are performed via the Alcatel USI maintenance program software (Table 1-2). The PC must be IBM compatible. PC guidelines are addressed in Table 1-3.

Note

The USI runs on Windows 95[®], 98[®], NT[®], or 2000[®],

1.8.1 System Security

Password options ensure that only authorized users have access to USI provisioning screens. The level of security provided by the system depends on how thoroughly the security system scheme is implemented and maintained by the system administrator.

Table 1-2 Software

CD ROM	PART NUMBER
DS1/E1	695-9406-021
DS3	695-9406-022
OC3	695-9406-023

Table 1-3 PC Guidelines

ITEM	MINIMUM REQUIREMENTS
CPU	Pentium
Speed	100 MHz or greater
RAM	32 Mbytes, minimum
Graphics	VGA
Display	Color
Hard Disk	Required
Free Disk Space	100 Mbytes
CD ROM Drive	Required
Mouse	Optional
Operating System	Windows 95, 98, NT, or 2000
Serial Port	2400 b/s

1.9 RADIO CHARACTERISTICS

Refer to Table 1-4 for the physical, environmental, and electrical characteristics of the MDR-8000/i/s/u series radio.

Table 1-4 Physical, Environmental, and Electrical Characteristics

ITEM		CHARACTERISTICS	
PHYSICAL CHARACTERISTICS			
Dimensions	WIDTH	DEPTH	HEIGHT
	483 mm (19 in.)	406.4 mm (16.25 in.)	311.15 mm (12.25 in.)
Weight	(Hot-Standby Terminal)38.6 kg (85 lbs)		
ENVIRONMENTAL CHARACTERISTICS			
Ambient Temperature Spec Compliant Operational Nonoperating		32° to 122°F (- 0° to 50°C) - 30° to 70°F (- 34° to 50°C) - 40° to 176°F (- 40° to 80°C)	
Altitude Operating Nonoperating Relative Humidity Vibration and Shock Duty Cycle		-350 to 16500 ft (-100 to 5000 m) -350 to 40000 ft (-100 to 12000 m) 5 to 95 percent (without condensation) Normal Storage and Handling Continuous, unattended	
COMMON ELECTRICAL CHARACTERISTICS			
Primary Input Voltage		24 V dc Battery	48 V dc Battery
Positive or Negative Ground		±20.5 to ±28.0 V dc	±41.5 to ±56.0 V dc
RF CHANNEL FREQUENCY (MHZ)			
MDR-8X02/i-X MDR-8X05u-X MDR-8X06/i/s-X MDR-8X07/i/s-X MDR-8X08/i/s-X MDR-8X10/i/s-X MDR-8X11/i/s-X		2025-2285 5725-5850 5850-7125 7125-7750 7700-8500 10440-10680 10700-11700	
XMT OUTPUT POWER (DBM, NOMINAL)		XMTR (NO PA)	OPTIONAL PA INSTALLED
MDR-8X02/i-X MDR-8X05u-X MDR-8X06/i/s-X MDR-8X07/i/s-X MDR-8X08/i/s-X MDR-8X10/i/s-X MDR-8X11/i/s-X		+14 +15 +14 +14 +14 +15 +15	+33 +25 or +30 +23 or +29 or +31 +28 or +30 +28 or +30 +23 or +27 or +29 +23 or +27 or +29
Note: XMT Power – Referenced at the SMA output of the diplexer filter or the top of the stack for waveguide stacking configurations.			

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
DS1 RADIO ELECTRICAL CHARACTERISTICS		
Power Consumption	NO PA	WITH PA
MDR-8502-16 Non-Standby +14 dBm XMT Power +33 dBm XMT Power Hot-Standby +14 dBm XMT Power +33 dBm XMT Power	69 W 138 W	68 W (With Fan Assy) 288 W (With Fan Assy)
MDR-8X05u-16 Non-Standby +14 dBm XMT Power +29 dBm XMT Power	69 W	126 W (With Fan Assy)
MDR-8706-16 Non-Standby +14 dBm XMT Power +23 dBm XMT Power +29 dBm XMT Power +31 dBm XMT Power Hot-Standby +14 dBm XMT Power +23 dBm XMT Power +29 dBm XMT Power +31 dBm XMT Power Frequency Diversity +14 dBm XMT Power +23 dBm XMT Power +29 dBm XMT Power +31 dBm XMT Power	69 W 126 W 126 W	94 W 126 W 165 W (With Fan Assy) 169 W 226 W 286 W (With Fan Assy) 175 W 240 W 307 W (With Fan Assy)

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
MDR-8708-16 Non-Standby +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power Hot-Standby +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power Frequency Diversity +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power	69 W 126 W 126 W	 126 W 165 W (With Fan Assy) 226 W 286 W (With Fan Assy) 240 W 307 W (With Fan Assy)
MDR-8710/11-16 Non-Standby +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power Hot-Standby +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power Frequency Diversity +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power	71 W 130 W 130 W	 126 W 162 W (With Fan Assy) 180 W (With Fan Assy) 226 W 280 W (With Fan Assy) 311 W (With Fan Assy) 240 W 300 W (With Fan Assy) 336 W (With Fan Assy)
CAPACITY (MB/S, NOMINAL)		
MDR-8XXXX-2	2 X 1.544	
MDR-8XXXX-4	4 X 1.544	
MDR-8XXXX-8	8 X 1.544	
MDR-8XXXX-12	12 X 1.544	
MDR-8XXXX-16	16 X 1.544	

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM		CHARACTERISTICS	
MODULATION			
MDR-85XX-X	32 TCM		
MDR-87XX-X	128 TCM		
BAUD RATE (MB/S, ±0.003%)		MDR-85XX	MDR-87XX
-2		0.7726	0.5349
-4		1.4594	1.0104
-8		2.9189	0.5349
-12		4.3783	3.0311
-16		5.8378	4.3783
MINIMUM RF CHANNEL BANDWIDTH (99% POWER) (MHZ)		MDR-85XX	MDR-87XX
-2		1.25	0.80
-4		2.50	1.25
-8		3.75	2.50
-12		5.25	3.75
-16		7.00	5.00
Frequency Stability		±0.001%	
Receiver Noise Figure (measured at the filter input of a space-diversity radio)		Not More Than 5 dB	
Max RSL (1 X 10 ⁻⁶ BER) (measured at the filter input of a space-diversity radio)		-10 dBm	
Background BER		Less Than 1 X 10 ⁻¹¹ for RSL at least 5 dB above 1 X 10 ⁻⁶ threshold	
RADIO TYPE		TYPICAL RCVR THRESHOLD (DBM) BER=10 ⁻⁶	TYPICAL DISPERSIVE FADE MARGIN (DB) BER=10 ⁻³
MDR-8502-2		-88.0	78
MDR-8502-4		-86.0	74
MDR-8502-8		-83.0	65
MDR-8502-12		-81.0	62
MDR-8502-16		-80.0	60
MDR-8505u-2		-89	TBD
MDR-8505u-4		-86	TBD
MDR-8505u-8		-83	TBD
MDR-8505u-16		-80	TBD

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
MDR-8506-2	-89.0	78
MDR-8506-4	-86.0	74
MDR-8506-8	-83.0	65
MDR-8506-12	-81.0	62
MDR-8506-16	-80.0	60
MDR-8508-2	-87.0	78
MDR-8508-4	-84.0	74
MDR-8508-8	-81.0	65
MDR-8508-12	-79.0	62
MDR-8508-16	-78.0	60
MDR-8510-2	-86.0	78
MDR-8510-4	-83.0	74
MDR-8510-8	-80.0	65
MDR-8510-12	-78.0	62
MDR-8510-16	-77.0	60
MDR-8511-2	-86.0	78
MDR-8511-4	83.0	74
MDR-8511-8	-80.0	65
MDR-8511-12	-78.0	62
MDR-8511-16	-77.0	60
MDR-8706-2	-85.0	81
MDR-8706-4	-82.0	76
MDR-8706-8	-79.0	68
MDR-8706-12	-77.0	65
MDR-8706-16	-76.0	63
MDR-8710-2	-82.0	81
MDR-8710-4	-79.0	77
MDR-8710-8	-76.0	68
MDR-8710-12	-74.0	65
MDR-8710-16	73.0	63

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
MDR-8711-2	-82.0	81
MDR-8711-4	-79.0	77
MDR-8711-8	-76.0	68
MDR-8711-12	-74.0	65
MDR-8711-16	-73.0	63
Notes: 1. The typical RCVR thresholds listed above are for non-standby or hot-standby with space diversity configurations. For hot-standby configurations, deduct 1 dB for the A side and 10 dB for the B side. 2. RCVR thresholds and dispersive fade margins are typical values. Guaranteed values are 2 dB worse. 3. For RCVR thresholds in the FCC Part 74 Broadcast Auxiliary Band from 6.875 to 7.125 GHz, deduct an additional 0.5 dB.		
Receiver DADE	Automatic, range Not Less Than ±300 ns	
DS1 Interface Requirements		
Line Rate	1.544 Mb/s ±50 ppm	
Line Code	Bipolar AML, with at least 12.5% average 1s density, and no more than 15 consecutive 0s. B8ZS coding option available.	
Line Impedance	100 ohms ±5% balanced	
Power Levels	Refer to CCITT G.703, Section 2.	
Pulse Shape	Refer to CCITT G.703, Section 2.	
Jitter Tolerance	Meets both North American and CCITT performance standards.	
Jitter Attenuation	Meets both North American and CCITT performance standards.	
Cross-connect Distance	660 ft maximum (LBO cards are selected in 330 ft increments).	
E1 RADIO ELECTRICAL CHARACTERISTICS		
Power Consumption	NO PA	WITH PA
MDR-8706i-16		
Non-Standby		
+14 dBm XMT Power	74W	
+23 dBm XMT Power		98 W
+29 dBm XMT Power		131 W
+31 dBm XMT Power		170 W (With Fan Assy)
Hot-Standby		
+14 dBm XMT Power	135 W	
+23 dBm XMT Power		178 W
+29 dBm XMT Power		235 W
+31 dBm XMT Power		295 W (With Fan Assy)

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
Frequency Diversity +14 dBm XMT Power +23 dBm XMT Power +29 dBm XMT Power +31 dBm XMT Power	135 W	184 W 249 W 316 W (With Fan Assy)
MDR-8708-16i Non-Standby +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power Hot-Standby +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power Frequency Diversity +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power	69 W 126 W 126 W	126 W 165 W (With Fan Assy) 226 W 286 W (With Fan Assy) 240 W 307 W (With Fan Assy)
MDR-8710/11-16i Non-Standby +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power Hot-Standby +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power Frequency Diversity +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power	71 W 130 W 130 W	126 W 162 W (With Fan Assy) 180 W (With Fan Assy) 232 W 280 W (With Fan Assy) 321 W (With Fan Assy) 240 W 300 W (With Fan Assy) 336 W (With Fan Assy)

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
CAPACITY (MB/S, NOMINAL)		
MDR-8XXXi-2	2 X 2.048	
MDR-8XXXi-4	4 X 2.048	
MDR-8XXXi-8	8 X 2.048	
MDR-8XXXi-12	12 X 2.048	
MDR-8XXXi-16	16 X 2.048	
MODULATION		
MDR-85XX-X	32 TCM	
MDR-87XX-X	128 TCM	
BAUD RATE (MB/S, $\pm 0.003\%$)	MDR-85XXi	MDR-87XXi
-2	0.9962	0.6897
-4	1.9070	1.3202
-8	3.8140	2.6404
-12	5.7209	3.9606
-16	7.6279	5.2808
MINIMUM RF CHANNEL BANDWIDTH (99% POWER) (MHZ)	MDR-85XXi	MDR-87XXi
-2	1.25	0.80
-4	2.50	1.50
-8	5.00	3.00
-12	7.00	5.00
-16	9.00	7.00
Frequency Stability	$\pm 0.001\%$	
Receiver Noise Figure (measured at the filter input of a space-diversity radio)	Not More Than 5 dB	
Max RSL (1×10^{-6} BER) (measured at the filter input of a space-diversity radio)	-10 dBm	
Background BER	Less Than 1×10^{-11} for RSL at least 5 dB above 1×10^{-6} threshold	

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
RADIO TYPE	TYPICAL RCVR THRESHOLD (DBM) BER=10 ⁻⁶	TYPICAL DISPERSIVE FADE MARGIN (DB) BER=10 ⁻³
MDR-8506i-2	-88.0	78
MDR-8506i-4	-85.0	74
MDR-8506i-8	-82.0	65
MDR-8506i-12	-80.0	62
MDR-8506i-16	-79.0	60
MDR-8508i-2	-86.0	78
MDR-8508i-4	-83.0	74
MDR-8508i-8	-80.0	65
MDR-8508i-12	-78.0	62
MDR-8508i-16	-77.0	60
MDR-8510i-2	-85.0	78
MDR-8510i-4	-82.0	74
MDR-8510i-8	-79.0	65
MDR-8510i-12	-77.0	62
MDR-8510i-16	-76.0	60
MDR-8511i-2	-85.0	78
MDR-8511i-4	-82.0	74
MDR-8511i-8	-79.0	65
MDR-8511i-12	-77.0	62
MDR-8511i-16	-76.0	60
MDR-8706i-2	-84.0	81
MDR-8706i-4	-81.0	76
MDR-8706i-8	-78.0	68
MDR-8706i-12	-76.0	65
MDR-8706i-16	-75.0	63

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
MDR-8710i-2	-81.0	81
MDR-8710i-4	-78.0	76
MDR-8710i-8	-75.0	68
MDR-8710i-12	-73.0	65
MDR-8710i-16	-72.0	63
MDR-8711i-2	-81.0	81
MDR-8711i-4	-78.0	76
MDR-8711i-8	-75.0	68
MDR-8711i-12	-73.0	65
MDR-8711i-16	-72.0	63
Notes: 1. The typical RCVR thresholds listed above are for non-standby or hot-standby with space diversity configurations. For hot-standby configurations, deduct 1 dB for the A side and 10 dB for the B side. 2. RCVR thresholds and dispersive fade margins are typical values. Guaranteed values are 2 dB worse.		
Receiver DADE	Automatic, range Not Less Than ±300 ns	
CEPT INTERFACE (E1) REQUIREMENTS		
Line rate	2.048 Mb/s ±50 ppm	
Line code	High density bipolar with 3 zeroes maximum (HDB3)	
Line impedance	120 ohms nominal, line-to-line	
Pulse Shape	Refer to CCITT G.703, Section 6.	
Pulse width	244 ns, nominal	
Interference	18 dB without affecting error-free performance	
Jitter tolerance	1.5 unit intervals peak-to-peak (UI p-p) from 20 to 2400 Hz, falling at 20 dB/decade to 0.2 UI p-p at 18 kHz, and continuing at 0.2 UI p-p from 8 to 100 kHz	
Intrinsic jitter	0.2 UI p-p, 10 Hz to 100 kHz; 0.05 UI p-p, 18 to 100 kHz	
Jitter transfer	Jitter gain will not exceed 0.5 dB from 1 Hz, and will not exceed a gain line from 0.5 dB at 40 Hz falling (at 20 dB/decade) to -19.5 dB at 400 Hz.	

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
DS3 RADIO ELECTRICAL CHARACTERISTICS		
Power Consumption	NO PA	WITH PA
MDR-8602-45 Non-Standby +14 dBm XMT Power +33 dBm XMT Power Hot-Standby +14 dBm XMT Power +33 dBm XMT Power	99 W 169 W	178 W (With Fan Assy) 305 W (With Fan Assy)
MDR-8605u-45 Non-Standby +15 dBm XMT Power +25 dBm XMT Power +30 dBm XMT Power	XXW	XXX W XXX W (With Fan Assy)
MDR-8606-135 Non-Standby +14 dBm XMT Power +23 dBm XMT Power +29 dBm XMT Power +31 dBm XMT Power Hot-Standby +14 dBm XMT Power +23 dBm XMT Power +29 dBm XMT Power +31 dBm XMT Power Frequency Diversity +14 dBm XMT Power +23 dBm XMT Power +29 dBm XMT Power +31 dBm XMT Power	74W 135 W 135 W	98 W 131 W 170 W (With Fan Assy) 178 W 235 W 295 W (With Fan Assy) 184 W 249 W 316 W (With Fan Assy)

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
MDR-8608-135		
Non-Standby		
+14 dBm XMT Power	74 W	
+28 dBm XMT Power		131 W
+30 dBm XMT Power		170 W (With Fan Assy)
Hot-Standby		
+14 dBm XMT Power	135 W	
+28 dBm XMT Power		235 W
+30 dBm XMT Power		295 W (With Fan Assy)
Frequency Diversity		
+14 dBm XMT Power	135 W	
+28 dBm XMT Power		249 W
+30 dBm XMT Power		316 W (With Fan Assy)
MDR-8610/11-135		
Non-Standby		
+15 dBm XMT Power	76 W	
+23 dBm XMT Power		131 W
+27 dBm XMT Power		166 W (With Fan Assy)
+29 dBm XMT Power		184 W (With Fan Assy)
Hot-Standby		
+15 dBm XMT Power	140 W	
+23 dBm XMT Power		236 W
+27 dBm XMT Power		289 W (With Fan Assy)
+29 dBm XMT Power		321 W (With Fan Assy)
Frequency Diversity		
+15 dBm XMT Power	140 W	
+23 dBm XMT Power		250 W
+27 dBm XMT Power		309 W (With Fan Assy)
+29 dBm XMT Power		345 W (With Fan Assy)

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
CAPACITY (MB/S, NOMINAL)	DS3	DS1 WAYSIDE
MDR-8XXX/u-45	1 X 44.736	1 X 1.544
MDR-8XXX-135	3 X 44.736	3 X 1.544
MODULATION	QAM 64	
MDR-8405u-45	16 QAM	
MDR-8605u-45	64 QAM	
MDR-86XX-XXX	64 QAM	
RADIO TYPE	TYPICAL RCVR THRESHOLD (DBM) BER= 10^{-6}	TYPICAL DISPERSIVE FADE MARGIN (DB) BER= 10^{-3}
MDR-8605U-45	-73.0	70
MDR-8602-45	-74.0	70
MDR-8606-45	-75.5	70
MDR-8606-135	-70.0	51
MDR-8608-45	-74.5	70
MDR-8608-135	-69.0	51
MDR-8611-45	-74.5	70
MDR-8611-135	-69.0	51
Notes: 1. With exception of the unlicensed radios (non-standby only), the typical RCVR thresholds listed above are for non-standby or hot-standby with space diversity configurations. For hot-standby configurations, deduct 1 dB for the A side and 10 dB for the B side. 2. For RCVR thresholds in the FCC Part 74 Broadcast Auxiliary Band from 6.875 to 7.125 GHz, deduct an additional 0.5 dB.		
MAXIMUM RSL (BER= 1×10^{-6} BER (DBM)	-10 DBM	
THRESHOLD INTERFERENCE		
COCHANNEL (DB)	34	
ADJACENT CHANNEL (DB)	-8	

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS
RF CHANNEL BANDWIDTH (MHZ)	
MDR-8605u-45	10
MDR-8602-45	10
MDR-8606-45	10
MDR-8606-135	30
MDR-8608-45	10
MDR-8608-135	30
MDR-8611-45	10
MDR-8611-135	30
EMISSION DESIGNATOR	
MDR-8X05-45	N/A
MDR-8602-45	10MOD7W
MDR-8606-45	10MOD7W
MDR-8606-135	30MOD7W
MDR-8608-45	10MOD7W
MDR-8608-135	30MOD7W
MDR-8611-45	10MOD7W
MDR-8611-135	30MOD7W
DS3 INTERFACE REQUIREMENTS	
Data Inputs/Outputs	Compatible with DSX-3 cross-connect; interface specification, DS3 interface equipment per AT&T Compatibility bulletin 119.
Line rate	44.736 Mb/s ± 20 ppm
Line code	Bipolar with 3-Zero Substitution (B3ZS)
Pulse Shape	Refer to CCITT G.703, Section 5

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
Wayside DS1 Interface Requirements		
Line Rate	1.544 Mb/s ±32 ppm	
Line Code	Optionally provisionable as Bipolar/AMI or B8ZS	
Data Rate Sync tolerance	±130 ppm	
Line Impedance	100 ohms ±5% balanced	
Jitter Accommodation	5.0 UI p-p low frequency, 0.1 UI p-p high frequency per TR-TSY-000499 para. 3.7.1	
Jitter Transfer	0.1 dB low frequency per TR-TSY-000499 para. 3.7.2	
Jitter Generation	Less than 0.28 UI p-p	
OC3 RADIO ELECTRICAL CHARACTERISTICS		
Power Consumption	NO PA	WITH PA
MDR-8706s-155		
Non-Standby		
+14 dBm XMT Power	71W	96 W
+23 dBm XMT Power		128 W
+29 dBm XMT Power		167 W (With Fan Assy)
+31 dBm XMT Power		
Hot-Standby		
+14 dBm XMT Power	130 W	173 W
+23 dBm XMT Power		230 W
+29 dBm XMT Power		290 W (With Fan Assy)
+31 dBm XMT Power		
Frequency Diversity		
+14 dBm XMT Power	130 W	179 W
+23 dBm XMT Power		244 W
+29 dBm XMT Power		311 W (With Fan Assy)
+31 dBm XMT Power		

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
MDR-8708s-155 Non-Standby +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power Hot-Standby +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power Frequency Diversity +14 dBm XMT Power +28 dBm XMT Power +30 dBm XMT Power	71 W 130 W 130 W	128 W 167 W (With Fan Assy) 230 W 290 W (With Fan Assy) 244 W 311 W (With Fan Assy)
MDR-8710/11s-155 Non-Standby +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power Hot-Standby +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power Frequency Diversity +15 dBm XMT Power +23 dBm XMT Power +27 dBm XMT Power +29 dBm XMT Power	73 W 135 W 135 W	128 W 164 W (With Fan Assy) 182 W (With Fan Assy) 231 W 284 W (With Fan Assy) 316 W (With Fan Assy) 245 W 304 W (With Fan Assy) 340 W (With Fan Assy)
CAPACITY (MB/S, NOMINAL)	OC3	DS1 WAYSIDE
MDR-87XXs-155	3 X 51.840	3 X 1.544

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS	
Frequency Stability	±0.001%	
Receiver Noise Figure (measured at the filter input of a space-diversity radio)	Not More Than 5 dB	
MODULATION	128 TCM	
RF BAUD (MB/S =0.003 %) MDR-87XXs-155	25.285	
RADIO TYPE	TYPICAL RCVR THRESHOLD (DBM) BER=10⁻⁶	TYPICAL DISPERSIVE FADE MARGIN (DB) BER=10⁻³
MDR-8706s-155	-70.0	51
MDR-8708s-155	-69.0	51
MDR-8711s-155	-69.0	51
Note: The typical RCVR thresholds listed above are for non-standby or hot-standby with space diversity configurations. For hot-standby configurations, deduct 1 dB for the A side and 10 dB for the B side.		
MAXIMUM RSL (BER=1 X 10⁻⁶ BER (DBM))	-10	
THRESHOLD INTERFERENCE		
COCHANNEL (DB)	34	
ADJACENT CHANNEL (DB)	-8	
RF CHANNEL BANDWIDTH (MHZ)		
MDR-87XXs-155	30	
EMISSION DESIGNATOR		
MDR-87XXs-155	30MOD7W	

Table 1-4 (Cont.) Physical, Environmental, and Electrical Characteristics

ITEM	CHARACTERISTICS
OC3 INTERFACE REQUIREMENTS	
Data Inputs/Outputs	Compatible with optical interfaces per ANSI T1.105/106/117.
Line rate	155.52 Mb/s $\pm$ 20 ppm
Line code	Binary NRZ
Payload	STS-1, STS-3c
Wavelength	1260-1360 nm
Physical Interface	LC Cable Assembly
Type of Optical XCVR	Laser
Optical Input Power	-8 to -28 dBm
Optical Output Power	-8 to -15 dBm
Wayside DS1 Interface Requirements	
Line Rate	1.544 Mb/s $\pm$ 32 ppm
Line Code	Optionally provisionable as Bipolar/AMI or B8ZS
Data Rate Sync tolerance	$\pm$ 130 ppm
Line Impedance	100 ohms $\pm$ 5% balanced
Jitter Accommodation	5.0 UI p-p low frequency, 0.1 UI p-p high frequency per TR-TSY-000499 para. 3.7.1
Jitter Transfer	0.1 dB low frequency per TR-TSY-000499 para. 3.7.2
Jitter Generation	Less than 0.28 UI p-p

1.10 EXTERNAL INTERFACE REQUIREMENTS

Refer to Table 1-5 for Operational Support System (OSS) external interface requirements.

Table 1-5 OSS External Interface Requirements

ITEM	CHARACTERISTICS
<i>MCS-11</i>	
Type	RS-422-compatible on backplane. Interfaces to 15-pin D-style connectors (J307, J308, J309, and J310).
Receiver	0.2 to 6.0 V dc, 2.3 mA maximum
Logic 1	-6.0 to -0.2 V dc, 2.8 mA maximum
Logic 0	-7.0 to 7.0 V dc
Common Mode Range	Selectable; not less than 4 kilohms, balanced (bridged)
Input Impedance	Nominal 120 ohms terminated
Input Clock Rate	62 to 68 kHz
Driver Differential Output Voltage	+6 V dc maximum, +150 mA maximum +2 V dc minimum, +150 mA maximum
Output Impedance	108 to 130 ohms
Output Clock Rate	64 kHz $\pm$ 500 Hz, internal clock 300 Hz to 68 kHz, external clock
<i>TBOS</i>	
Type	RS-485-compatible on backplane. Interfaces to four pins (13-16) on 50-pin connector (J305).
Receiver	0 to 5.0 V dc, 2.8 mA maximum
Input Sensitivity	$\pm$ 200 mV
Logic 1	-6.0 to -0.2 V dc, 2.8 mA maximum
Logic 0	-7.0 to 7.0 V dc
Input Impedance	Nominal 120 ohms terminated
Input Clock Rate	62 to 68 kHz
Driver Differential Output Voltage	+5 V dc maximum
Output Clock Rate	64 kHz $\pm$ 500 Hz, internal clock 300 Hz to 68 kHz, external clock

Table 1-5 (Cont.) OSS External Interface Requirements

ITEM	CHARACTERISTICS
AUDIO HANDSET JACK	
Type	RJ-11, 4-wire modular jack on AE-37Y Controller
Frequency	300-3400 Hz
Level	0 dBm maximum
Impedance	220 ohms
Off-hook	Microphone current greater than 15 mA indicates handset is off hook. Maximum microphone current is 40 mA.
RS-232 CONNECTOR	
Type	9-pin D-style ribbon (J312 and J313)
Data Rate	9600 kb/s
Input Levels	
Logic 0	3.0 to 30 V dc, input resistance 3 to 7 kilohms
Logic 1	-30 to 0.5 V dc, input resistance 3 to 7 kilohms
Output Levels	
Logic 0	8.0 to 12.0 V dc, not less than 300 ohms output resistance
Logic 1	-12.0 to -8.0 V dc, not less than 300 ohms output resistance
4-WIRE AUDIO	
Type Connector	9-pin D-style (J316 and J317)
LEVELS	
Input	0 or -16 dBm, 600 ohms balanced
Output	0 or +7 dBm, 600 ohms balanced
E-lead	Single form-A contact to ground or -12 V dc when off hook.
M-lead	Normally open; voltage more negative than -9 V indicates input is off hook.
Relay Interface	All interface via AE-27AF Relay Interface module
Type Connector	50-pin (J305)

Table 1-5 (Cont.) OSS External Interface Requirements

ITEM	CHARACTERISTICS
CONTROL INPUTS	
Number of Inputs	9
Input Voltage	0 to 5 V dc, diode protected
Current Limiting Resistor	10 kohm
Pull-Up Resistor	100 kohm
ALARM/STATUS INPUTS	
Number of Inputs	16 (13 through 16 are not available if TBOS is used)
Input Voltage	0 to 5 V dc, diode protected
Current Limiting Resistor	10 kohm
Pull-Up Resistor	100 kohm
Alarm State	Logic 0
Non-Alarm State	Logic 1
RELAY ALARM/STATUS OUTPUTS	ALL RELAYS DEFAULT TO OPEN IF CARD POWER IS LOST, EXCEPT POWER SUPPLY ALARMS, WHICH DEFAULT TO GROUND.
Number of Alarm Outputs	8
Number of Status Outputs	7
Activated State	Closure to ground
Maximum Contact Rating	0.5 A, 100 V
Relay Control Outputs	All relays default to open if card power is lost.
Number of Outputs	6
Activated State	Closure to ground
Maximum Contact Rating	0.5 A, 100 V
CONTROL STATUS INPUTS	
Number of Inputs	6
Input Voltage	0 to 5 V dc, diode protected
Current Limiting Resistor	10 kohm
Pull-Up Resistor	100 kohm

1.11 EQUIPMENT LISTING

See Figure 1-2 through Figure 1-6. The following paragraphs describe required and optional equipment for the MDR-8000 radio, in top-down breakdown order.

The MDR-8000 common shelf assembly (Table 1-6) consists of the shelf assembly wired (SAW), shelf internal RF cables, front cover, and modules. Refer to Table 1-7 for supplied and optional equipment. The MDR-8000 SAW (PN 3EM 00116 ABAA UDZZA), consists of backplane assembly, cardcage assembly, front cover, heatsinks, brackets, mounting hardware, and decal.

Table 1-6 MDR-8000/i/s Common Shelf Assembly

UNIT/MODULE	PART NUMBER	APPLICATIONS
Single T/R, Domestic Kit	3DH 04122 AA	Low Capacity DS1 Non-Standby Applications.
Single T/R, International Kit	3DH 04122 AB	Low Capacity E1 Non-Standby Applications.
Dual T/R, Domestic Kit	3DH 04122 AC	Low Capacity DS1 Hot-Standby Applications
Dual T/R, International Kit	3DH 04122 AD	Low Capacity E1 Hot-Standby Applications
Single T/R, Domestic Kit	3DH 04122 AG	High Capacity DS3 Non-Standby Applications.
Dual T/R, Domestic Kit	3DH 04122 AJ	High Capacity DS3 Hot-Standby Applications
Single T/R, Domestic Kit	3DH 04122 AL	High Capacity OC3 Non-Standby Applications With Wayside DS1
Dual T/R, Domestic Kit	3DH 04122 AN	High Capacity OC3 Hot-Standby Applications With Wayside DS1

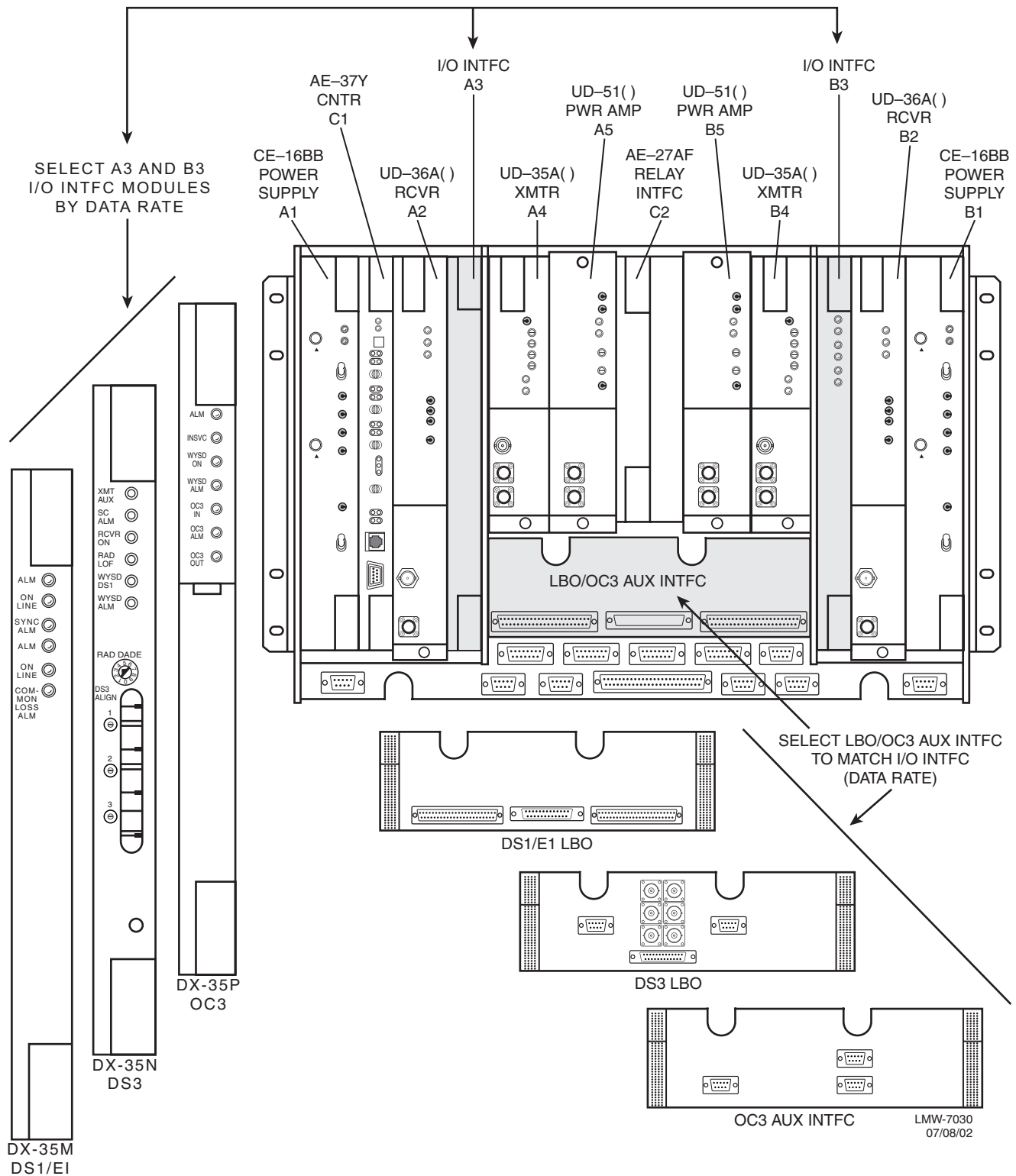
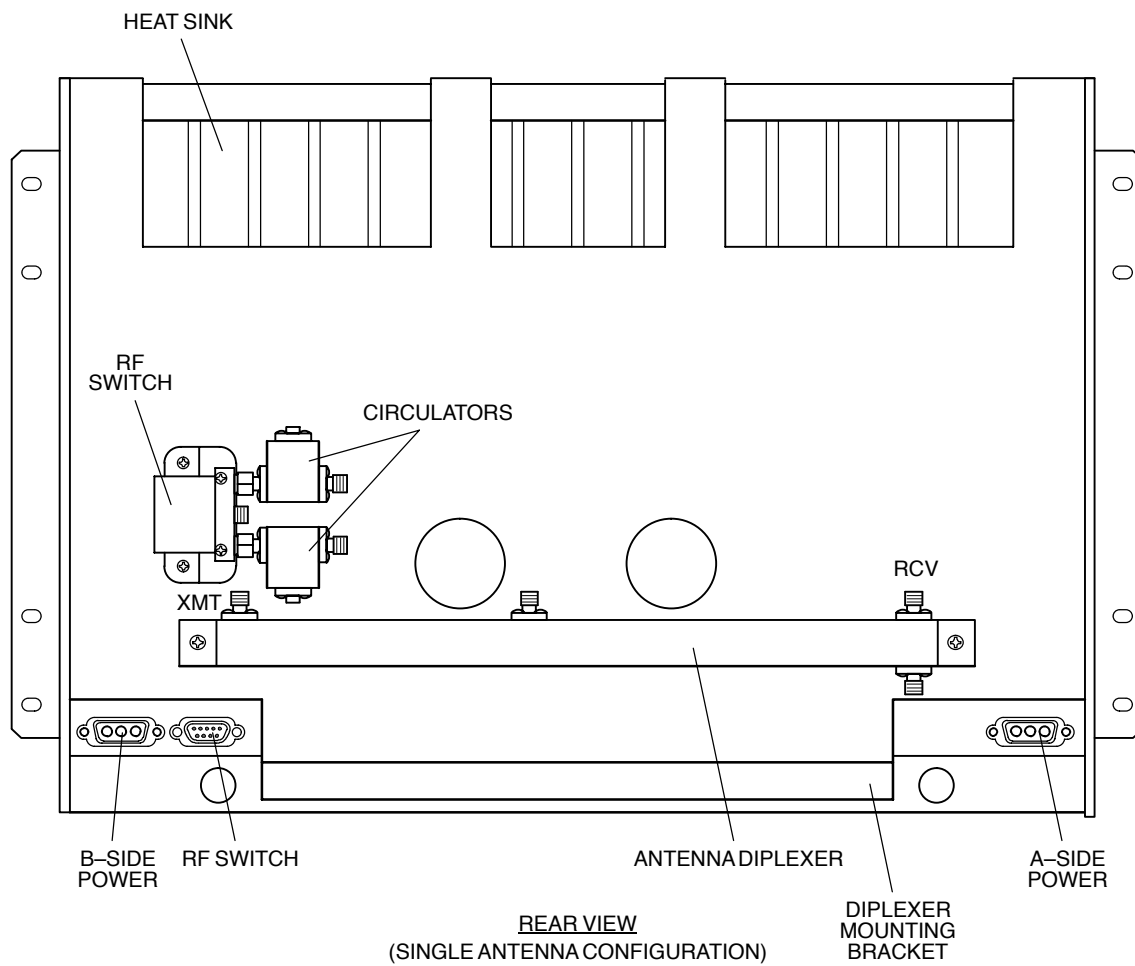


Figure 1-2 Typical MDR-8000/i/s/u Component Locations and Options



MW211-0061-1B
101898

Figure 1-3 MDR-8000/i/s Component Locations, Rear View

Table 1-7 Supplied and Optional Equipment

UNIT/MODULE	PART NUMBER	REMARKS
AE-37Y-1 Controller:	3DH 03155 AA	One Per Shelf
ELMC Option Key	695-5647-018	Required for remote provisioning and downloading on DS1/E1 radios, and DS3 and OC3 radios without wayside DS1
ELMC Option Key	695-5647-019	Required for status of DS3 and OC3 radios with wayside DS1 (no remote provisioning or download capability provided)
ELMC Option Key	695-5647-020	Required for remote provisioning and downloading of DS3 and OC3 radios with wayside DS1
CE-16BB-1 Power Supply:	3DH 03164 AA	Two included in Dual T/R assembly kit.
Fuse	264-0928-130	4 ea. 15A fast-blow fuses. (Two operational and two spares)
DX-35() I/O Interface:	Capacity and Application Dependent Refer to Table 1-8	Two included in Dual T/R assembly kit.
UD-35() Transmitter:	Application and Frequency Dependent Refer to Table 1-9	Two required for hot-standby
UM-62AX Crystal Oscillator Subboard	3DH 04123 AX Frequency Dependent	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. See drawing 3DH 03177 0000 BJZZA in the Diagrams Section.
Capacity Key	Modulation and Capacity Dependent	Refer to Table 1-12.
UD-51() Power Amplifier	Frequency and Output Power Dependent. Refer to Table 1-10.	Optional. Two required for hot-standby (if equipped)
Cooling Fan Assembly	Configuration Dependent	Assembly with fans always required for PAs with +27 or +29 (10/11 GHz), +28 dBm (8 GHz) and +31 dBm (6 GHz) output power. Assembly with fans and heat deflector are always required between radios in a rack with multiple shelf stacking (regardless of PA output power).
Fan Assembly Without Lap Top Tray	967-0500-001	
Fan Assembly With Lap Top Tray	967-0500-002	

Table 1-7 (Cont.) Supplied and Optional Equipment

UNIT/MODULE	PART NUMBER	REMARKS
Fan Assembly With Fans	967-0500-003	
Fan Alarm Board	3DH 04169 AA	
Heat Deflector	3EM 03390 AA	For use with fan assembly
UD-36() Receiver:	Application and Frequency Dependent Refer to Table 1-11	Two required for hot-standby
UM-62AX Crystal Oscillator Sub board	3DH 04123 AX Frequency Dependent	The crystal oscillator subboard and crystal part numbers define this unit. The crystal is soldered to the oscillator subboard and fac- tory tuned to the customers requirements. See drawing 3DH 03177 0000 BJZZA in the Diagrams section.
Capacity Key	Modulation and Capacity Dependent	Refer toTable 1-12.
Line Buildout (LBO)	Application and Distance Dependent Refer to Table 1-13.	
AE-27AF Relay Interface	3DH 03219 AA	Optional
2 X 4 Fiber Management Panel	3EM 0957 AA	Optional. For use with OC3 2- or 4-fiber switched configurations. Provides interface for one or two radio shelves.
Single-mode Splitter/Combiner	1AB 12332 0023	Single-mode fiber interface. One per radio shelf required.
Multi-mode Splitter/Combiner	1AB 12332 0022	Multi-mode fiber interface. One per radio shelf required.
2 or 4 Fiber Management Panel	3EM 0957 AB	Optional. For use with OC3 2- or 4-fiber configurations. Provides interface for one or two radio shelves. SC mating connectors required.
Handset Kit	3CC07946AAAA	Optional
Coiled Cord, RJ11 to RJ11	155-3362-010	Replaces RJ9 to RJ11 cord supplied with handset kit.
Diplexer Filter Kit	Frequency Dependent	Refer to drawing 3DH 03177 0000 UDZZA in the Diagrams section.
Waveguide Iso-Adapters	Frequency, Waveguide, and Configuration Dependent	Optional. Refer to drawing 3DH 03177 0000 BJZZA in the Diagrams section.
Waveguide Flanges	Frequency, Waveguide, and Configuration Dependent	Optional. Refer to drawing 3DH 03177 0000 BJZZA in the Diagrams section.
Customer Interface Cables	Applications Dependent	Optional. Refer to drawing 3DH 03177 0000 BJZZA in the Diagrams section.

Table 1-8 I/O Interface Options

TYPE NO.	PART NUMBER	CAPACITY/APPLICATIONS
DX-35M-1	3DH 03131 AA	DS1/Domestic
DX-35M-2	3DH 03131 AB	E1/International
DX-35N-1	3DH 03169 AG	DS3 (1 or 3 DS3 Lines + DS1 Wayside per DS3)
DX-35P-1	3EM 03134 AA	OC3 (3 STS1 Lines + DS1 Wayside per STS1)

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.

Table 1-9 XMTR Options

TYPE NO.	PART NUMBER	APPLICATIONS/FREQUENCY
UD-35AN-1 *	3DH 03137 AA	DS1/E1 6400-6525 MHz
UD-35AN-2 *	3DH 03137 AB	DS1/E1 6425-6875 MHz
UD-35AN-3 *	3DH 03137 AC	DS1/E1 6875-7125 MHz
UD-35AN-4	3DH 03137 AD	DS1/E1/DS3/OC3 6400-6525 MHz
UD-35AN-5	3DH 03137 AE	DS1/E1/DS3/OC3 6525-6875 MHz
UD-35AN-6	3DH 03137 AF	DS1/E1/DS3/OC3 6875-7125 MHz
UD-35AQ-1 *	3DH 03236 AA	DS1/E1 5850-5925 MHz
UD-35AQ-2 *	3DH 03236 AB	DS1/E1 5925-6425 MHz
UD-35AQ-3	3DH 03236 AC	DS1/E1/DS3/OC3 5850-5925 MHz
UD-35AQ-4	3DH 03236 AD	DS1/E1/DS3/OC3 5925-6425 MHz
UD-35AP-1 *	3DH 03228 AA	DS1/E1 10400-10700 MHz
UD-35AP-2 *	3DH 03228 AB	DS1/E1 10700-11200 MHz
UD-35AP-3 *	3DH 03228 AC	DS1/E1 11200-11700 MHz
UD-35AP-4	3DH 03228 AD	DS1/E1/DS3/OC3 10400-10700 MHz
UD-35AP-5	3DH 03228 AE	DS1/E1/DS3/OC3 10700-11200 MHz
UD-35AP-6	3DH 03228 AF	DS1/E1/DS3/OC3 11200-11700 MHz
UD-35AR-1	3DH 04170 AA	DS1/E1/DS3/OC3 7125-7750 MHz
UD-35AR-2	3DH 04170 AB	DS1/E1/DS3/OC3 7700-8500 MHz
UD-35AS-1	3EM 09626 AA	DS1/DS3 2025-2285 MHz

*Obsolete. Have been replaced with DS1/E1/DS3/OC3 XMTR.

Table 1-10 PA Options

TYPE NO.	PART NUMBER	FREQUENCY/TOP OF STACK POWER
UD-51Z-1	3DH 03218 AA	5850-6425 MHz, +23 dBm
UD-51Z-2	3DH 03218 AB	6425-7125 MHz, +23 dBm
UD-51Z-3	3DH 03218 AC	5850-6425 MHz, +29 dBm
UD-51Z-4	3DH 03218 AD	6425-7125 MHz, +29 dBm
UD-51Z-5	3DH 03218 AE	5850-6425 MHz, +31 dBm
UD-51Z-6	3DH 03218 AF	6425-7125 MHz, +31 dBm
UD-51AA-1	3DH 04136 AA	10550-10700 MHz, +27 dBm
UD-51AA-2	3DH 04136 AB	10700-11200 MHz, +27 dBm
UD-51AA-3	3DH 04136 AC	11200-11700 MHz, +27 dBm
UD-51AA-4	3DH 04136 AD	10440-10700 MHz, +23 dBm
UD-51AA-5	3DH 04136 AE	10700-11200 MHz, +23 dBm
UD-51AA-6	3DH 04136 AF	11200-11700 MHz, +23 dBm
UD-51AA-7	3DH 04136 AG	10440-10700 MHz, +29 dBm
UD-51AA-8	3DH 04136 AH	10700-11200 MHz, +29 dBm
UD-51AA-9	3DH 04136 AJ	11200-11700 MHz, +29 dBm
UD-51AB-1	3EM 04070 AA	7125-7750 MHz, +28 dBm
UD-51AB-2	3EM 04070 AB	7700-8500 MHz, +28 dBm
UD-51AB-3	3EM 04070 AC	7125-7750 MHz, +30 dBm
UD-51AB-4	3EM 04070 AD	7700-8500 MHz, +30 dBm
UD-51AC-1	3EM 09037 AA	2025-2285 MHz, +32 dBm

CAUTION

*Possibility of
Service
Interruption*

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

Table 1-11 RCVR Options

TYPE NO.	PART NUMBER	APPLICATIONS/FREQUENCY
UD-36AN-1	3DH 03132 AA	DS1/E1 6400-6525 MHz
UD-36AN-2	3DH 03132 AB	DS1/E1 6525-6875 MHz
UD-36AN-3	3DH 03132 AC	DS1/E1 6875-7125 MHz
UD-36AN-4*	3DH 03132 AD	DS3 6400-6525 MHz
UD-36AN-5*	3DH 03132 AE	DS3 6525-6875 MHz
UD-36AN-6*	3DH 03132 AF	DS3 6875-7125 MHz
UD-36AN-7	3DH 03132 AG	DS3/OC3 6400-6525 MHz
UD-36AN-8	3DH 03132 AH	DS3/OC3 6525-6875 MHz
UD-36AN-9	3DH 03132 AJ	DS3/OC3 6875-7125 MHz
UD-36AP-1	3DH 03231 AA	DS1/E1 10400-10700 MHz
UD-36AP-2	3DH 03231 AB	DS1/E1 10700-11200 MHz
UD-36AP-3	3DH 03231 AC	DS1/E1 11200-11700 MHz
UD-36AP-4*	3DH 03231 AD	DS3 10400-10700 MHz
UD-36AP-5*	3DH 03231 AE	DS3 10700-11200 MHz
UD-36AP-6*	3DH 03231 AF	DS3 11200-11700 MHz
UD-36AP-7	3DH 03231 AG	DS3/OC3 10400-10700 MHz
UD-36AP-8	3DH 03231 AH	DS3/OC3 10700-11200 MHz
UD-36AP-9	3DH 03231 AJ	DS3/OC3 11200-11700 MHz
UD-36AQ-1	3DH 03239 AA	DS1/E1 5850-5925 MHz
UD-36AQ-2	3DH 03239 AB	DS1/E1 5925-6425 MHz
UD-36AQ-3*	3DH 03239 AC	DS3 5850-5925 MHz
UD-36AQ-4*	3DH 03239 AD	DS3 5925-6425 MHz
UD-36AQ-5	3DH 03239 AE	DS3/OC3 5850-5925 MHz
UD-36AQ-6	3DH 03239 AF	DS3/OC3 5925-6425 MHz
UD-36AR-1	3DH 04175 AA	DS1/E1 7125-7750 MHz
UD-36AR-2	3DH 04175 AB	DS1/E1 7700-8500 MHz
UD-36AR-3*	3DH 04175 AC	DS3 7125-7750 MHz
UD-36AR-5	3DH 04175 AE	DS3/OC3 7125-7750 MHz
UD-36AR-6	3DH 04175 AF	DS3/OC3 7700-8500 MHz
UD-36AS-1	3EM 09628 AA	DS1/DS3 2025-2285 MHz

*Obsolete. Have been replaced with DS3/OC3 RCVR.

Table 1-12 Capacity Keys for Transmitter and Receiver Modules

CAPACITY KEY PN	TCM/QAM	RADIO TYPE	CONFIGURATION
967-1609-001	32 TCM	MDR-85XX-2	2 DS1
967-1609-002	32 TCM	MDR-85XX-4	4 DS1
967-1609-003	32 TCM	MDR-85XX-8	8 DS1
967-1609-004	32 TCM	MDR-85XX-12	12 DS1
967-1609-005	32 TCM	MDR-85XX-16	16 DS1
967-1609-006	128 TCM	MDR-87XX-2	2 DS1
967-1609-007	128 TCM	MDR-87XX-4	4 DS1
967-1609-008	128 TCM	MDR-87XX-8	8 DS1
967-1609-009	128 TCM	MDR-87XX-12	12 DS1
967-1609-010	128 TCM	MDR-87XX-16	16 DS1
967-1609-011	32 TCM	MDR-85XXi-2	2 E1
967-1609-012	32 TCM	MDR-85XXi-4	4 E1
967-1609-013	32 TCM	MDR-85XXi-8	8 E1
967-1609-014	32 TCM	MDR-85XXi-12	12 E1
967-1609-015	32 TCM	MDR-85XXi-16	16 E1
967-1609-016	128 TCM	MDR-87XXi-2	2 E1
967-1609-017	128 TCM	MDR-87XXi-4	4 E1
967-1609-018	128 TCM	MDR-87XXi-8	8 E1
967-1609-019	128 TCM	MDR-87XXi-12	12 E1
967-1609-020	128 TCM	MDR-87XXi-16	16 E1
3EM 01583 AA	64 QAM	MDR-86XX-45	1 DS3
3EM 01583 AB	64 QAM	MDR-86XX-135	3 DS3
3EM 04176 AB	128 TCM	MDR-87XX-155	3 STS1

*One capacity key is required for each UD-35() Transmitter and for each UD-36() Receiver.

Table 1-13 LBO Options

MODULE/DESCRIPTION	PART NUMBER	APPLICATIONS
DS1 LBO (Domestic) 0-330 ft. (Near)	3DH 03144 AA	Linear/Ring
DS1 LBO (Domestic) 330-650 ft. (Far)	3DH 03144 AB	Linear/Ring
E1 LBO (International)	3DH 03144 AC	Linear/Ring
DS3 LBO Hot Standby/ Frequency Diversity	3DH 04173 AK	Linear/Ring

1.11.1 Diplexer Filter Kits

Each kit contains diplexer, RF switch assembly, and cables for a specific configuration. The RF switch assembly (PN 978-0490-001, 002, 003 consist of isolators/circulators that are frequency dependent. For DS1 diplexer kit options, refer to Integral LM drawing (3DH 04122 0000 UDZZA) in the Diagrams section. For DS3 and OC3 diplexer kit options, refer to Integral LM drawing (3DH 04158 0000 UDZZA) in the Diagrams section.

1.11.2 Standard Filter Kits

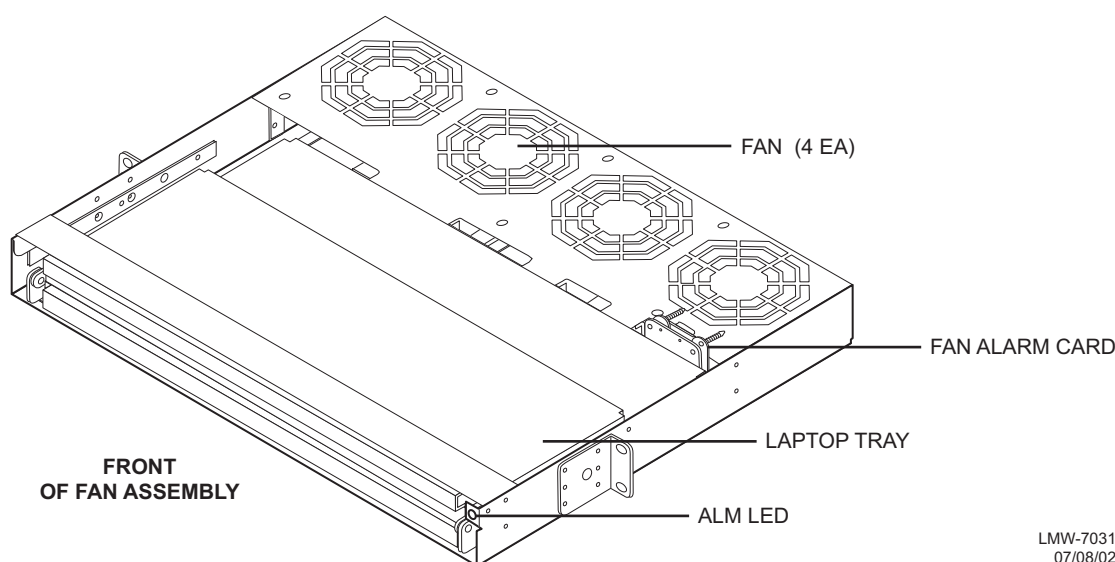
Each standard filter kit contains filter, isolators, circulators, and cables for a specific configuration. See Equipping Option Drawing (3DH 03177 0000 BJZZA) in the Diagrams section for information.

1.11.3 Cable Drop Kit Option

The cable drop kit option is available for all radio configurations. This option replaces waveguide with coaxial cable. Refer to engineering drawing 967-1665-XXX in the Diagrams section for list of kit parts.

1.12 FAN ASSEMBLY

See Figure 1-4 and Figure 1-5. The Fan Assembly fits into a standard 19 in. (483 mm) rack and occupies two vertical rack increments. Three options are available. Refer to Table 1-14 for details.



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Figure 1-4 Fan Assembly

Table 1-14 Fan Assembly/Lap Top Tray Options

DESCRIPTION	PART NUMBER	REMARKS
Without Lap Top Tray	967-0500-001	Contains four fans that can be replaced individually. A front-panel alarm LED illuminates if a fan fails.
With Lap Top Tray	967-0500-002	Contains a pullout tray to place a lap top computer and four fans that can be replaced individually. A front-panel alarm LED illuminates if a fan fails.
With Lap Top Tray, Without Fans	967-0500-003	Contains a pullout tray to place a lap top computer and no fans or front-panel alarm LED.

When equipped with fans, the fan assembly mounts directly below the radio and plugs into connector J302 on the MDR-8000 backplane. The four fans provide air flow to help dissipate heat. Power is provided by the backplane. When not equipped with fans, the assembly can be mounted in any rack location.

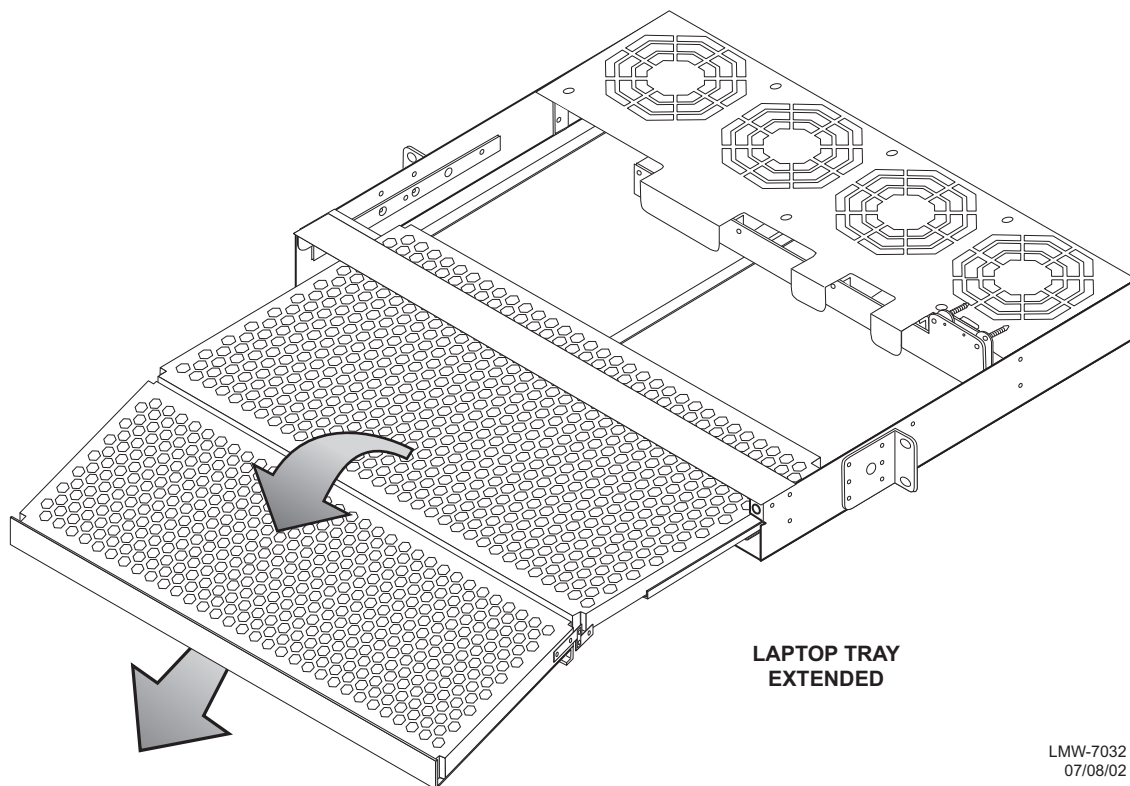


Figure 1-5 Fan Assembly With Laptop Tray Fully Extended

1.13 HANDSET KIT

See Figure 1-6. The handset kit consists of a handset, telephone cord, and handset holder. The handset is a push button multi-frequency type handset. The handset cord supplied with the handset contains an RJ11 connector on one end and RJ9 connector on the other end. A recommended cable is available with RJ11 connectors on both ends (PN 155-3362-010). The handset holder attaches to any flat surface with double-sided tape.



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