1.1 GENERAL

This manual provides operational and maintenance instructions for HF Modem MDM-2001 (the modem), as shown in figure 1-1. The modem provides on-the-air (OTA) compatibility with 14 different modems. Each modem is capable of operating simultaneously as two independent full-duplex modems in 11 of the 14 major modes. Table 1-1 lists the major modes of operation emulated by the modem. Modes that support simultaneous dual-modem operation are indicated in the table. The table references military nomenclatures and manufacturer's type numbers as well as the military specifications and standards defining each of the emulated modems.

1.2 SCOPE AND CONTENT

This technical manual describes operation and maintenance of the modem. It contains a total of six sections covering the following subjects: General description, installation, operation, theory of operation, maintenance, and parts lists.

The technical content and the built-in test (BIT) information provided in this manual supports a full range of maintenance concepts, including: repair-by-replacement of the entire modem and repair-by-replacement of modules. Hereafter, these maintenance levels are referred to as organizational and intermediate maintenance respectively. Extensive firmware-based BIT has eliminated the requirement for special-purpose tools and test equipment and has minimized the requirement for standard tools and test equipment at all levels. As an example, repair-by-replacement of the entire unit is achievable with no test equipment. Repair-by replacement of circuit cards and modules within the unit is achievable using only a standard volt/ohm-meter (VOM).

1.3 CAPABILITIES

The modem is a single-card programmable hf modem. It provides OTA compatibility with emerging high-performance waveform standards as well as a wide variety of hf modems in current inventories.

The modem is firmware implemented using embedded stored-program erasable programmable read-only memories (EPROM). Dual processors coupled with a flexible interface architecture provides sufficient capability to implement computationally intensive high performance modes. This includes modes such as the adaptively equalized single-tone modem defined in MIL-STD-188-110 or the simultaneous operation of two conventional multitone modems.

As indicated in table 1-2, the modem covers a wide range of capabilities. These capabilities include synchronous and asynchronous data sources, a complete range of user data rates, phase-shift keying (PSK) and frequency-shift keying (FSK) modulation techniques coupled with a variety of error detection and correction (EDAC)
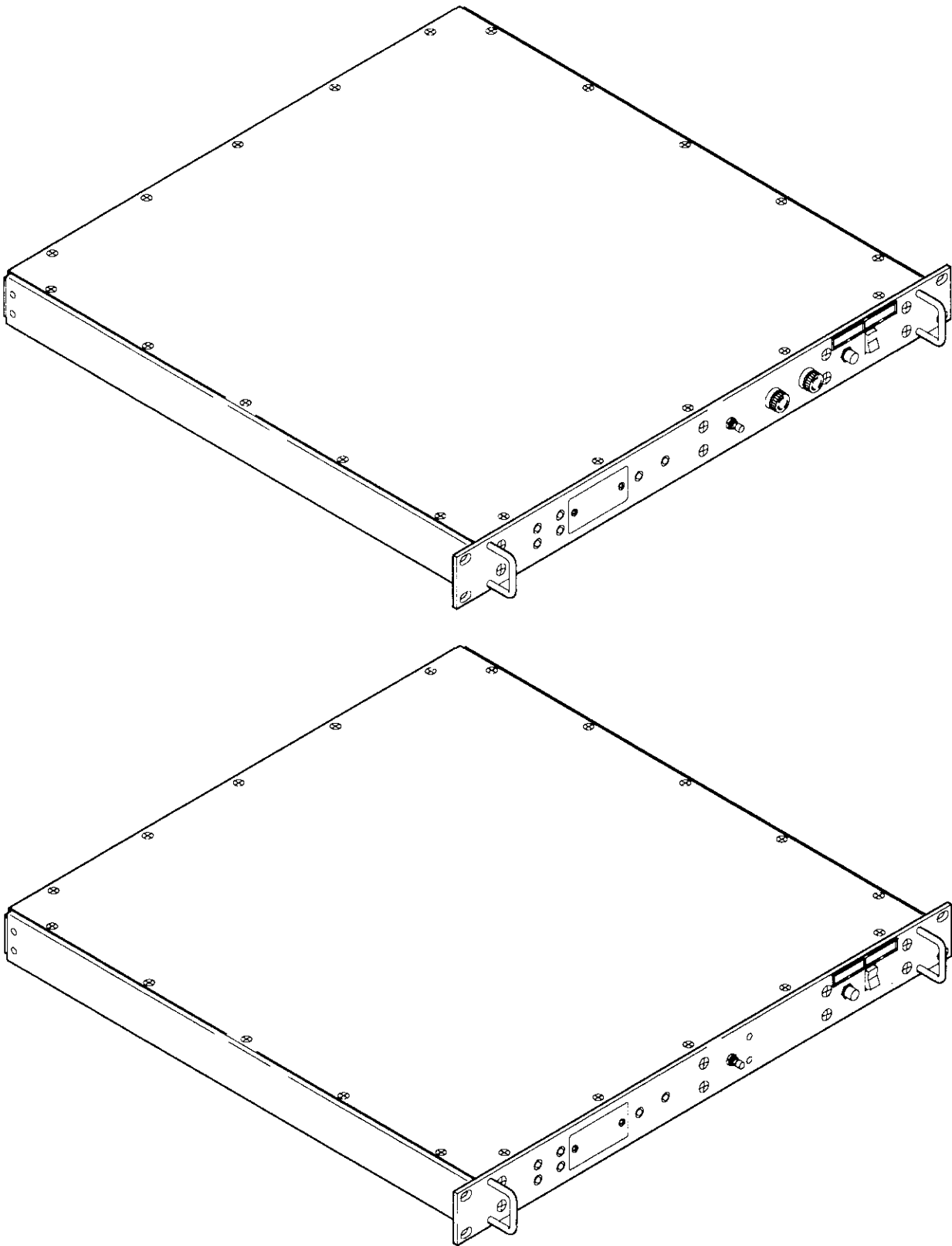
TPC-2968-011A

HF Modem MDM-2001
Figure 1-1

codes and interleaving selections. Also, specific modes permit in-band diversity (IBD) and out-of-band diversity (OBD) selections. All modes provide for half and full duplex operating configurations. Full-duplex operation allows both transmit and receive functions to occur at the same time while half-duplex operation allows only one or the other - with transmit functions taking priority. When transmitting in half-duplex modes, the modem's receiving functions are internally disabled.

At the higher data rates, the single-tone waveform defined by MIL-STD-188-110 provides good performance over hf channels troubled by multipath and fading conditions. Occasionally, at medium to high data rates, the classical multitone modems employing 16 and 39 tone waveforms provide more reliable communications under conditions of interference. At the lower data rates, some of the time-and-frequency diversity FSK waveforms provide more reliable data communications. These factors coupled with the continuing need for OTA compatibility with a wide variety of hf modems already operating in the field form the basis for this modem.

Summary information on each major mode of operation embedded in the modem is tabularized under paragraph 1.8. Also, additional technical details describing the implementation of each major mode are in Section 4, Theory of Operation.

Table 1-1. Major Modes of Operation.

MAJOR MODE	MODE DESCRIPTION	MEDIA	OVER-THE-AIR (OTA) COMPATIBILITY AND REFERENCE DOCUMENTS	DUAL MODEM
MS110 FFST	Fixed frequency single tone (FFST)	HF	Harris RF-5254B (MIL-STD-188-110, para 5.3)	
MS110 16T	Basic 16 tone (16T)	HF	Rockwell TE-233A, TE-233B, and TE-233C (MIL-STD-188-C, para 7.2.1 and 7.3.5) (MIL-STD-188-110, Appendix A)	(*)
16T ENHD	16 tone enhanced (ENHD)	HF	Rockwell TE-233P-6, TE-233P-7 (MD-1239), and TE-233P-8 (MD-1268)	(*)
MD-1061	16 tone (MD-1061)	HF	Magnavox MX-513B (MD-1061)	(*)
39 TONE	39 tone ENHD	HF	Harris RF-3466A (MIL-STD-188-110, Appendix B)	(*)
WIRELINE	Wireline FSK	Wireline	TH-22 (MIL-T-55255A) and Stelma MD-674 (MIL-STD-188-110, para 5.2)	(*)
TE-204	Time/frequency diversity (div) FSK	HF	Rockwell TE-204 (AN/USC-11)	(*)
CV-786	Single-channel FSK	HF (wb)	Rockwell 700B series (CV-786)	(*)
MD-522	Radioteletypewriter (RTTY) FSK	HF	MIL-M-55529A (MD-522/GRC)	(*)

description

Table 1-1. Major Modes of Operation (Cont).

MAJOR MODE	MODE DESCRIPTION	MEDIA	OVER-THE-AIR (OTA) COMPATIBILITY AND REFERENCE DOCUMENTS	DUAL MODEM
TADIL B	Wireline FSK	Wireline	Rockwell TD-1089 and Frederick 1280R (MIL-STD-188-203, part 2)	(*)
STANAG	Single tone	HF	Rockwell MDM-2501, MDM-2201, (STANAG 4285 per annex E of 4285)	
VFCT	Eight-channel, voice frequency channelized teletype (VFCT)	HF	Frederick model 1209 (MIL-STD-188-342)	(*)
MD-1280	FSK	HF	Frederick MD-1280 (MIL-STD-188-342)	
MD-1142	Time/frequency div FSK	HF	Barry 6029C, Harris RF-3351 (MD-1142)	(*)

Table 1-2. Range of Capabilities.

MAJOR MODE	MODE DESCRIPTION	DATA SOURCE	USER DATA RATE	MODULATION	EDAC	INTER-LEAVE	DEGREES OF IDB	OBD
MS110 16T	Basic 16 tone	Syn	75-600	2φ PSK	None	None	2 to 16	Yes
		Syn	1200	4φ PSK	None	None	2	Yes
		Syn	2400	4φ PSK	None	None	None	Yes
16T ENHD	16-tone	Syn	75-600	2φ PSK	Golay (1/2)	N/S/L	2 to 16	Yes
	(enhanced)	Syn	75-1200	4φ PSK	BCH (1/2)	Many	2 to 16	Yes
	(MD-1239)	Syn	1200	4φ PSK	Golay (1/2)	N/S/L	2	Yes
	(MD-1268)	Syn	2400	4φ PSK	None	None	None	Yes
		Syn	2400	8φ PSK	RS (2/3)	N/S/L	None	Yes
		Syn	3600	8φ PSK	None	None	None	Yes
MD-1061	16 tone	Syn	75-1200	4φ PSK	BCH (1/2)	Many	2 to 16	Yes
		Syn	2400	4φ PSK	None	None	None	Yes
MS110 FFST	Single tone (RF-5254B)	Syn	4800	8φ PSK	None	None	None	No
		Syn	150-2400	8φ PSK	Conv (1/2)	N/S/L	None	No
		Syn	75	8φ PSK	Conv (1/2)	N/S/L	32	No
39 TONE	39 tone	Syn	75-1200	4φ PSK	RS (3/7)	4 sel	2 to 16	No
	(enhanced)	Syn	2400	4φ PSK	RS (5/7)	8 sel	Partial	No
	(RF-3466A)	Syn	75-600	4φ PSK	RS (3/7)	4 sel	Time-freq	No
		Asyn	75-1200	4φ PSK	RS (3/7)	4 sel	2 to 16	No
		Asyn	2400	4φ PSK	RS (5/7)	8 sel	Partial	No
		Asyn	75-600	4φ PSK	RS (3/7)	4 sel	Time-freq	No

Table 1-2. Range of Capabilities (Cont).

MAJOR MODE	MODE DESCRIPTION	DATA SOURCE	USER DATA RATE	MODULATION	EDAC	INTER-LEAVE	DEGREES OF IDB	OBD
WIRELINE	Wireline FSK (TM-22, MD-674)							
	(1275-Hz cf)	Asyn	150 max	85-Hz FSK	None	None	None	No
	(1500-Hz cf)	Syn	600	400-Hz FSK	None	None	None	No
	(1700-Hz cf)	Syn	1200	800-Hz FSK	None	None	None	No
TE-204	Time and frequency diversity FSK (TE-204) (2-tone mark, 2-tone space, plus time dispersion)							
	(880-Hz FSK)	Syn	75	4-tone FSK	None	None	Time-freq	No
	(880-Hz FSK)	Asyn	75 (±5%)	4-tone FSK	None	None	Time-freq	No
CV-786	Single-channel FSK							
	(2000-Hz cf)	Asyn	150 Max	850-Hz FSK	None	None	None	No
MD-522	RTTY FSK							
	(2804-Hz cf)	Asyn	110 max	85-Hz FSK	None	None	None	No
	(2804/425 cf)	Asyn	110 max	85-Hz FSK	None	None	2	No
	(2000-Hz cf)	Asyn	110 max	85-Hz FSK	None	None	None	No
STANAG	STANAG 4285	Syn/asyn	1200-3600	8φ PSK	Conv	None	None	No
	Single tone	Syn/asyn	75-2400	8φ PSK	Conv	S/L	None	No
MD-1280	1 chan VFCT	Asyn	50-300	FSK	None	None	None	No
TADIL B	Wireline FSK							
	(1500-Hz cf)	Syn	600	400-Hz FSK	None	None	None	No
	(1700-Hz cf)	Syn	1200	800-Hz FSK	None	None	None	No
VFCT	Eight-channel VFCT (Model 1290)							
	8 chan max	Asyn	50 max	60-Hz FSK	None	None	None	No
	8 chan max	Asyn	110 max	85-Hz FSK	None	None	None	No
	6 chan max	Asyn	150 max	170-Hz FSK	None	None	None	No
	4 chan max	Asyn	300 max	240-Hz FSK	None	None	None	No
	3 chan max	Asyn	600 max	850-Hz FSK	None	None	None	No

NOTE

Each of the channel inputs in the VFCT mode may also be user mapped to provide a single channel with an in-band diversity enhancement.

MAJOR MODE	MODE DESCRIPTION	DATA SOURCE	USER DATA RATE	MODULATION	EDAC	INTER-LEAVE	DEGREES OF IDB	OBD
MD-1142	Time and frequency diversity FSK							
	(850-2890 Hz)	Asyn	110 max	2-tone FSK (85 Hz)	None	None	7 times	No

Conv = Convolution	BCH = Bose-chaudhuri-hocquenguem
ASYN = Asynchronous	RS = Reed Solomon
FFST = Fixed frequency single tone	N/S/L = None/short/long
VFCT = Voice frequency channelized teletype	(1/2) or (2/3) = EDAC rate
	c/f = Center frequency
SYN = Synchronous	φ = Phase
PSK = Phase-shift keying	TADIL = Tactical digital information link
FSK = Frequency-shift keying	OBD = Out-of-band diversity
IBD = In-band diversity	

1.4 CONTROLLING AND MONITORING THE MODEM

The modem can be controlled and monitored from any IBM-compatible PC/XT (or equivalent) which runs DOS version 3.2 (or higher). Controller software is provided with each modem. This feature allows the size of the modem to be reduced by minimizing front-panel controls and indicators. The resulting multimode modem consumes only 1-3/4 inches of vertical rack-space, permitting five of the modems to be installed in the same space previously used by just one hf modem.

A serial RS-232 tri-stated bus architecture is used for the control and monitor interface. This permits multiple modems to be controlled from a single personal computer (PC). This also allows other communications equipments that use the same protocol (such as Rockwell's Spectrum-2000™ radios) to be controlled and monitored over a common bus from the same PC. In addition, by using inexpensive wireline modems operating at standard rates from 300 to 9600 baud, the serial RS-232 bus simplifies remote control of the modem while also enabling unmanned remote operation.

The operation section of this manual describes the use of the controller software provided with each modem. The section also includes details on each selectable submode that is available under each major mode of operation.

The modem can also be controlled by using Modem Control Unit MCU-2201F (the MCU). The MCU is a panel mounted, remote control unit than can be used to control a single modem. It can store up to 16 preset modes, any one which can be selected to control the modem. Built-in test (BIT) can be initiated of the MCU. Although the modem has dual-channel capability, it is limited to single-mode operation when using the MCU.

1.5 PHYSICAL AND ENVIRONMENTAL INFORMATION

The modem can be rack-mounted in fixed ground, shelterized transportable or shipboard applications. The low profile enclosure requires only 4.45 cm (1.75 in) of vertical rack space and 49.53 cm (19.5 in) of depth in standard 48.3 cm (19 in) racks.

Table 1-3 is a summary of the modem's physical and environmental characteristics.

Table 1-3. Modem Summary of Characteristics.

| CHARACTERISTIC	PARAMETER
Physical Characteristics	Height: 4.45 cm (1.75 in) Width: 48.3 cm (19.0 in) Depth: 49.53 cm (19.5 in) Weight: 5.4 kg (12 lb) maximum
Primary power	100-220 V ac, 47 to 66 Hz (See paragraph 2.3)
Power consumption	25 W maximum

Table 1-3. Modem Summary of Characteristics (Cont).

CHARACTERISTIC	PARAMETER
Service Conditions	
Operation	Continuous duty
Operating Temperature	0 to +50 °C (32 to 122 °F)
Relative Humidity	Up to 95% (without condensation)
Altitude	0 to 3048 m (10 000 ft)
Cooling required	None (convection cooled)
Storage Conditions	
Temperature	-20 to +75 °C (+4 to +167 °F)
Relative Humidity	Up to 100%
Digital input/output	Per MIL-STD-188-114 w/RS-232 protocol
Radio input/output	Per MIL-STD-188-141 (Paragraph 5.2.7.1)
Transmit audio output	0 dBm, 600 ohms, balanced (+3 to -20 dBm adjustable)
Receive audio input	+3 to -18 dBm (0 dBm nominal), 600 ohms, balanced
Control/monitor input/output	RS-232 w/Rockwell-defined protocol

NOTE

When mounted in a 483 cm (19 in) rack using rear-stabilizers, the modem will survive the ship-board hammer blow shock test per MIL-S-901 (Grade A, Class I, Lightweight, Type A).

1.6 ELECTRICAL INTERFACES

All electrical interfaces are on the rear of the modem. Connectors J1 through J4 are arranged in the following order as viewed from the rear of the modem.

J4	J3	J2	J1
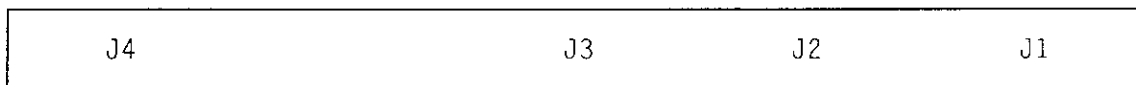
The functions, number of pins, and interface signals for each connector are as follows.

CONNECTOR J-NUMBER	FUNCTION (I/O PORT)	NUMBER OF PINS	INTERFACE SIGNAL DESCRIPTION
J1	Digital data	(50 pins)	MIL-STD-188-114 data w/RS-232 protocol
J2	Control and monitor	(25 pins)	RS-232 serial two-wire bus (IBM-PC port)
J3	Audio (radio)	(25 pins)	Dual balanced audio/keyline (radio port)
J4	AC power	(3 pins)	AC high, neutral and safety ground

<u>description</u>

The rear connector types and mating connector types are as follows.

CONNECTOR J-NUMBER	REAR CONNECTOR TYPE	MATING CONNECTOR TYPE
J1	50 pin D, female contacts	50 pin D, male contacts
J2	25 pin D, female contacts	25 pin D, male contacts
J3	25 pin D, male contacts	25 pin D, female contacts
J4	Std IEC power connector	HP-type ac line connector

Refer to tables in section 2 for detailed signal pin-out information and typical interface illustrations. The controls and indicators on the front of the modem are defined and described in section 3.

1.7 EQUIPMENT SUPPLIED

Items supplied with each modem are listed in table 1-4.

Table 1-4. Equipment Supplied.

NOMENCLATURE	†PART NUMBER	QTY	*MODEM PART NUMBER ENDING (XXX)							
			001	002	003	004	005	006	007	008
HF Modem MDM-2001	622-9653-XXX	1	X	X	X	X	X	X	X	X
Instruction book	523-0776395	1	X	X	X	X	X	X	X	X
**MDM-2000 controller software	752-4611-004	1	X	X	X	X	X	X	X	X

*This instruction book provides coverage of eight configurations of the modem. Differences between software configurations are listed below. The -003 configuration has audio output level controls that are accessible from the front panel. The -004 configuration has audio interfaces designed for British Telecommunications Standards. The -008 configuration is same as 004 configuration except it has same audio interface as -005 through -007 configurations. The -001 and -002 configurations are no longer available from the company.

<u>MODE</u>								
MS110 16 tone	X	X	X	X	X	X	X	X
16-tone enhanced	X	X	X	X	X	X	X	X
MD-1061	X	X	X	X	X	X	X	X
MS110 FFST	X	X	X	X	X	X	X	X
39 tone	X	X	X	X	X	X	X	X
Wireline FSK	X	X	X	X	X	X	X	X
TE-204	X	X	X	X	X	X	X	X
CV-786	X	X	X	X	X	X	X	X
MD-522	X	X	X	X	X	X	X	X
VFCT	X	X	X	X	X	X	X	X

Table 1-4. Equipment Supplied (Cont).

NOMENCLATURE	†PART NUMBER	QTY	*MODEM PART NUMBER ENDING (XXX)							
			001	002	003	004	005	006	007	008
MODE (Cont)										
MD-1280			X	X	X	X	X	X	X	X
TADIL B					X	X	X	X	X	X
STANAG 4285								X	X	
MD-1142			X		X	X			X	X

**Controller software is supplied on 3.5-inch double-sided, double-density disk. This instruction book covers version 1.01 of the MDM-2000 controller software.

†Part numbers are Rockwell, Collins division.

1.8 EQUIPMENT REQUIRED BUT NOT SUPPLIED

Items required to install and operate the modem but not supplied are listed in table 1-5.

1.9 SPECIFIC MAINTENANCE REQUIREMENTS

Tools required for each level of maintenance are listed in table 1-6. No test equipment is required for organizational level maintenance. Only a digital voltmeter capable of reading volts dc and true rms volts ac, Fluke 8010A or equivalent, is required for intermediate level maintenance and adjustment.

Table 1-5. Equipment Required To Install and Operate The Modem.

QTY	*PART NUMBER	ITEM DESCRIPTION	VENDOR/MIL NUMBER
1	371-1085-050	Mating J1 connector (50-pin D type with male contacts)	M24308/4-263
1	371-0999-030	Mating J2 connector (25-pin D type with male contacts)	M24308/2-283
1	371-1085-030	Mating J3 connector (25-pin D type with female contacts)	M24308/4-261
1	426-1034-010	Mating J4 connector and cable (ac power cord)	Beldon 17250
1		IBM-compatible desk-top or laptop computer. Used to control one or more modems.	IBM-compatible or GRID™-1520 computer

Table 1-5. Equipment Required To Install and Operate The Modem (Cont).

QTY	*PART NUMBER	ITEM DESCRIPTION	VENDOR/MIL NUMBER
1 Optional	597-2087-001	Remote control unit that stores up to 16 user-preselected modes plus BIT. Used to control a single modem operating in single mode only.	Modem Control Unit MCU-2201F (MCU)
1 Optional	752-4497-001	MCU data load cable from 9-pin com port of IBM-compatible computer to MCU connector J1.	
1 Optional	752-4497-002	MCU data load cable from 25-pin com port of IBM-compatible computer to MCU connector J1.	

*Part numbers are Rockwell, Collins division.

Crimp-type contacts (75 of M39029/64-369 and 25 of M39029/63-368) for 24 gauge wire are recommended for the D-type mating connectors. A variety of backshells are also available for each connector. Modem installation kit, part number 751-8729-001, is provided with all modems except configurations -001 and -003. The kit contains mating connectors, contacts, strain reliefs, and the power cord.

Table 1-6. Tools Required For Modem Maintenance.

QTY	TOOL DESCRIPTION	ORGANIZATIONAL MAINTENANCE	INTERMEDIATE MAINTENANCE
1	Phillips head screwdriver (large)	X	X
1	Phillips head screwdriver (small)		X
1	Flathead (slotted) screwdriver (small)		X

1.10 TECHNICAL SUMMARY

Each major mode of operation is summarized in table 1-7.

Table 1-7. Major Mode Technical Summary.

CHARACTERISTIC	SPECIFICATION
(1) Basic 16-tone modes (MS110 16T mode)	
Compatibility	Rockwell TE-233A/TE-233B/TE-233C/CV-2214
Defined by	MIL-STD-188C and MIL-STD-188-110. Appendix A
Data rates	Accepts synchronous user data from 75 through 2400 b/s
Modulation	Differentially coherent 4ϕ or 2ϕ PSK (DCPSK), depending on data rate
Tone library	16 data tones (935 Hz - 2585 Hz at 110-Hz spacing) + Doppler tone (605 Hz)
EDAC	None
Interleaving	None
IBD	Increasing degrees (2 to 16) provided at data rates below 2400 b/s
OBD	Selectable in any submodes.
(2) 16-tone mode enhanced (16T ENHD mode)	
Compatibility	Rockwell TE-233P-6/TE-233P-7 (MD-1239)/TE-233P-8 (MD-1268)
Defined by	Technical manuals for the TE-233P-6, TE-233P-7, and TE-233P-8
Data rates	Accepts synchronous user data from 75 through 3600 b/s
Modulation	Differentially coherent 2ϕ, 4ϕ, or 8ϕ PSK (DCPSK), depending on data rate
Tone library	16 data tones (935 Hz - 2585 Hz at 110-Hz spacing) + Doppler tone (605 Hz)
EDAC	Rate 2/3 octal Reed Solomon code at 2400 b/s user data rate - soft decision Rate 1/2 binary Golay code at 1200 b/s and lower data rates - soft decision Rate 1/2 BCH code at 1200 b/s and lower data rates - soft decision
Interleaving	Selectable degrees (none, short = 3 seconds (s), long = 10 s)
IBD	Varying degrees are selectable at 1200 b/s and lower data rates
OBD	Selectable in any submodes.
(3) 16 tone (MD-1061 mode)	
Compatibility	Magnavox MD-1061
Defined by	Technical manual for the MD-1061
Data rates	Accepts synchronous user data from 75 through 2400 b/s
Modulation	Differentially coherent 4ϕ PSK (DCPSK) at all data rates

Table 1-7. Major Mode Technical Summary (Cont).

CHARACTERISTIC	SPECIFICATION
Tone library	16 data tones (935 Hz - 2585 Hz at 110-Hz spacing) + Doppler tone (605 Hz)
EDAC	Rate 1/2 BCH code at 1200 b/s and lower data rates - soft decision
Interleaving	A wide range of selectable degrees
IBD	Varying degrees are selectable at 1200 b/s and lower data rates
OBD	Selectable in any submodes.

(4) Single-tone (MS110 FFST mode)

Compatibility	Harris RF-5254B
Defined by	MIL-STD-188-110, paragraph 5.3.2
Data rates	Accepts synchronous user data from 75 through 4800 b/s (nonhopped)
Modulation	8ϕ PSK (DCPSK) - 2400 chip/s rate
Tone library	Single tone with carrier at 1800 Hz
EDAC	Rate 1/2 convolutional (conv) decreasing 1/2 to 1/8 provided at 600 b/s and lower data rate, constraint length 7, using soft decision Viterbi
Interleaving	Block interleaving with selections of 0, 0.6, or 4.8 second interleaving (0, 1.2, and 9.6 s end-to-end delay)
IBD	Increasing degrees (2 to 16) provided at 600 b/s and lower data rates
OBD	None

(5) 39-tone (enhanced) (39 TONE mode)

Compatibility	Harris RF-3466A
Defined by	MIL-STD-188-110, Appendix B
Data rates	Accepts synchronous or asynchronous user data from 75 through 2400 b/s
Modulation	4ϕ PSK (DCPSK)
Preamble	Enhanced multisegment and multitone preamble with two selectable durations
Tone library	39 data tones (675 Hz - 2812.5 Hz at 56.25-Hz spacing) + Doppler tone (393.75 Hz)
EDAC	Reed Solomon cyclic block code using soft decision
Interleaving	Block interleaving with various selections up to 12 s end-to-end delay

Table 1-7. Major Mode Technical Summary (Cont).

CHARACTERISTIC	SPECIFICATION
IBD	Increasing degrees (2 to 16) provided at 600 b/s and lower data rates. Special modes of time-freq diversity available at 600 b/s and lower data rates
OBD	None

(6) Wireline FSK (WIRELINE mode)

Compatibility	Stelma MD-674 and many others
Defined by	MIL-STD-188-110, paragraph 5.2
Data rates	Accepts asynchronous data up to 150 baud and synchronous data at 600 or 1200 b/s
Modulation	85-Hz shift FSK - 1275 Hz center frequency (cf) - Asyc data up to 150 baud400-Hz shift FSK - 1500 Hz cf - Sync data up to 600 b/s800-Hz shift FSK - 1700 Hz cf - Sync data up to 1200 b/s
Tone library	2-tone FSK
EDAC	None
Interleaving	None
IBD	None
OBD	None

(7) Time and frequency diversity FSK (TE-204 mode)

Compatibility	Rockwell TE-204/AN/USC-11
Defined by	Technical order for the AN/USC-11
Data rates	Two modes of operation, accepts asynchronous or synchronous data at 75 baud
Modulation	Uses a 4-tone time and in-band frequency diversity FSK
Tone library	Mark tones at 935 and 1815 Hz, space tones at 1375 Hz and 2255 Hz
EDAC	None
Interleaving	None
IBD	2-degrees frequency diversity and 2-degrees time diversity (6.67 milliseconds (ms) separation)
OBD	None

(8) Single-Channel FSK (CV-786 mode)

Compatibility	Rockwell CV-786 (from the 700-B family)
Defined by	Technical order for the CV-786/TRC-75

description

Table 1-7. Major Mode Technical Summary (Cont).

CHARACTERISTIC	SPECIFICATION
Data rates	Accepts asynchronous data up to 100 words per minute (wpm)
Modulation	2-tone FSK
Tone library	850-Hz shift FSK with mark tone at 2425 Hz and space tone at 1575 Hz
EDAC	None
Interleaving	None
IBD	None
OBD	None

(9) RTTY FSK (MD-522 mode)

Compatibility	MD-522/GRC
Defined by	MIL-M-55529A
Data rates	Three modes of operation, each accepting asynchronous data up to 110 baud
Modulation	2-tone FSK with 85 Hz 4-tone FSK (IBD) with 85 Hz 2-tone FSK with 850-Hz shift
Tone library	2804.5 Hz cf with 85-Hz shift 424.5 and 2804.5 Hz with 85-Hz shift 2000 Hz cf with 850-Hz shift
EDAC	None
Interleaving	None
IBD	2 degrees of frequency diversity (in the IBD mode)
OBD	None

(10) 8-Channel voice frequency channelized teletype (VFCT) FSK (VFCT mode)

Compatibility	Frederick Model 1290
Defined by	MIL-STD-188-342
Data rate and modulation	Asyn data up to 50 baud 60-Hz FSK mod Up to 8 chan max Asyn data up to 110 baud 85-Hz FSK mod Up to 6 chan max Asyn data up to 150 baud 170-Hz FSK mod Up to 4 chan max Asyn data up to 300 baud 240-Hz FSK mod Up to 3 chan max Asyn data up to 600 baud 850-Hz FSK mod
Tone library	Eight independent channels of 2-tone FSK that can be programmed by the user or individual channels may be programmed to provide various IBD combinations.
EDAC	None

Table 1-7. Major Mode Technical Summary (Cont).

CHARACTERISTIC	SPECIFICATION
Interleaving	None
IBD	Up to a maximum of 8 degrees of IBD (See tone library above.)
OBD	None

(11) 4285 single-tone (STANAG mode) (per NXE of 4285)

Compatibility	Harris RF-5710 and others
Defined by	STANAG 4285
Data rates	1200, 2400, and 3600 b/s (uncoded); 75, 150, 300, 600, 1200, and 2400 b/s (coded)
Modulation	8-ary PSK on 1800 Hz carrier
Tone library	Single tone with carrier at 1800 Hz
EDAC	1/16-1/2, 2/3 rate convolutional depending on data rate
Interleaving	Annex E of 4285
IBD	Selectable (none, 0.8, or 10 seconds)
OBD	None

(12) MD-1280 (MD-1280 mode - variation of voice frequency channelized teletype (VFCT) mode)

Compatibility	Frederick MD-1280
Defined by	MIL-STD-188-342
Data rates	Asynchronous from 50 to 300 b/s
Modulation	Single channel FSK
Tone library	FSK-programmed by user
EDAC	None
Interleaving	None
IBD	None
OBD	None

(13) TADIL B (TADIL B mode)

Compatibility	Rockwell TD-1089, Frederick 1280R, and other TADIL B equipment
Defined by	MIL-STD-188-203 part 2
Data rates	Synchronous from 75 to 1200 b/s
Modulation	400 Hz shift FSK - 1500 Hz cf - synchronous data up to 600 b/s 800 Hz shift FSK - 1700 Hz cf - synchronous data at 1200 b/s
Tone library	2-tone FSK

description

Table 1-7. Major Mode Technical Summary (Cont).

CHARACTERISTIC	SPECIFICATION
EDAC	None
Interleaving	None
IBD	None
OBD	None

(14) MD-1142 (MD-1142 mode)

Compatibility	Barry Model 6029C and Harris Model RF-3351 (MD-1142) FSK modem
Defined by	Technical Manual for the Barry Model 6029C and Harris Model RF-3351
Data rates	Accepts asynchronous user data up to 110 baud
Modulation	2-tone FSK with 7-times in-band-frequency and 7-seconds time diversity
Tone library	7 center frequencies from 850 to 2890 Hz, each using ±85-Hz shifts
EDAC	None
Interleaving	None
IBD	7-times in-band-frequency diversity (with a total of 7-second time diversity)
OBD	None