SNM-1000

Node Control Modem
Installation and Operation Manual

Part Number MN/SNM1000.OM **Revision 3**

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Node Control Modem
Installation and Operation Manual

Comtech EF Data is an ISO 9001
Registered Company.

Part Number MN/SNM1000.OM
Revision 3
March 31, 2002

Comtech EF Data, 2114 West 7th Street, Tempe, Arizona 85281 USA, 480.333.2200, FAX: 480.333.2161

Network Customer Support

The Network Customer Support Plan identifies the steps to be followed in resolving the Customer's concern.

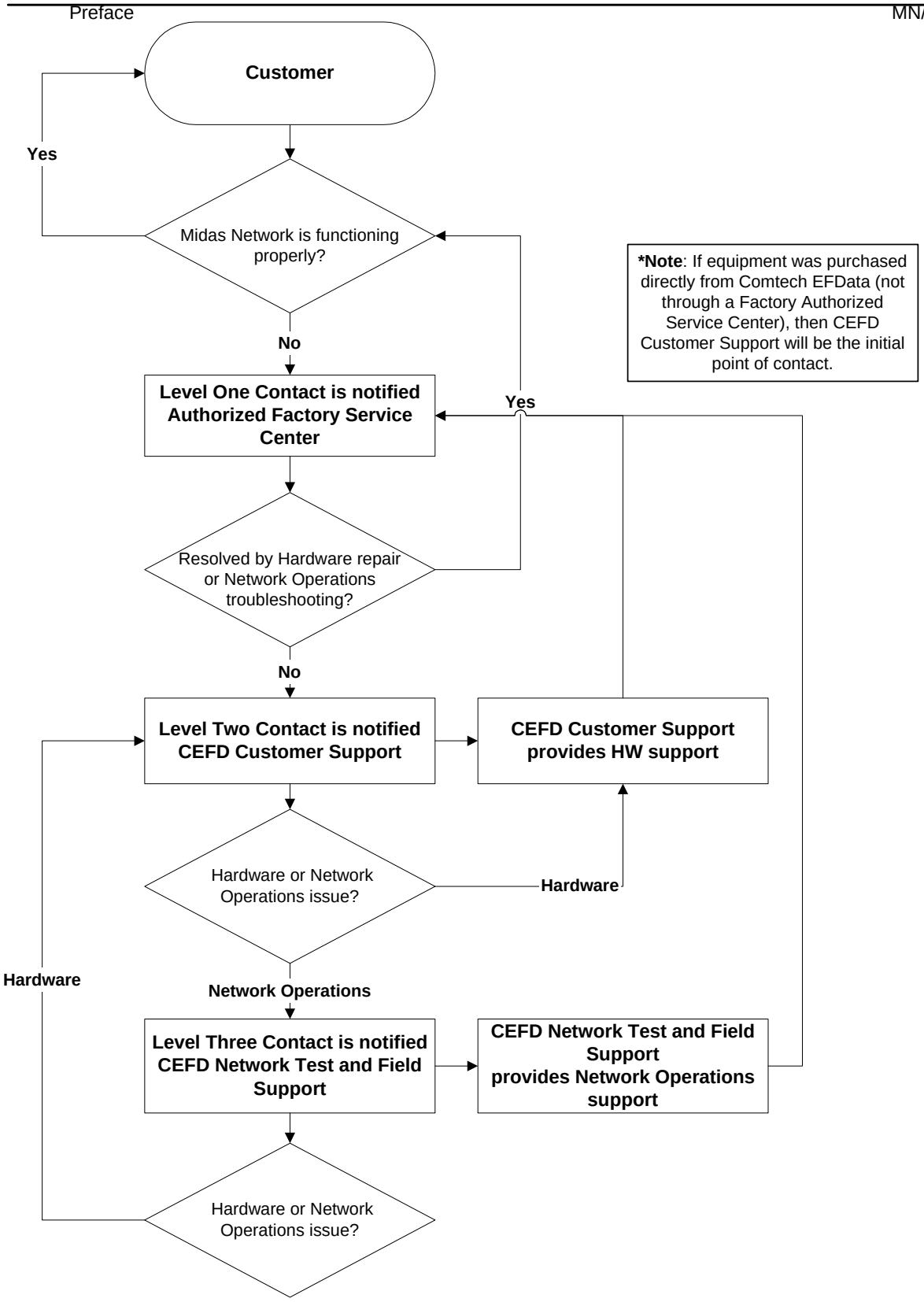
The resolution efforts will follow these levels of contact:

- **Level One Contact** – Factory Authorized Service Center.
- **Level Two Contact** – Comtech EF Data Customer Support.
- **Level Three Contact** – Network Test and Field Support

Procedural Steps

Step	Procedure
1	The **Customer** raises a concern with the **Level One Contact**.
2	The **Level One Contact** will perform ***Hardware*** repairs and ***Network Operations*** troubleshooting in accordance with the Comtech EF Data Service Center agreement.
3	If the **Level One Contact** is unable to resolve the concern, then the **Level One Contact** will inform the **Level Two Contact** of the concern in accordance with the instructions found within the attached Comtech EF Data Customer Support Department's document.
4	The **Level Two Contact** will enter the concern into the Comtech EF Data database and determine whether the concern is a ***Hardware*** concern or a ***Network Operations*** concern
5	The **Level Two Contact** will interface with the **Level One Contact** and provide the appropriate hardware support and enter all correspondence into the Comtech EF Data database.
6	If the **Level Two Contact** determines that the concern is a ***Network Operations*** concern, then the **Level Two Contact** will inform the **Level Three Contact**.
7	The **Level Three Contact** will interface with the **Level One Contact** and provide the appropriate support and enter all correspondence into the Comtech EF Data database.
8	If the **Level Three Contact** determines that there is a ***Hardware*** failure then the **Level Three Contact** will inform the **Level Two Contact**. Go to Step 5.

Network Support Customer Plan



See the Comtech EF Data website at http://www.comtechefdata.com for contact information for a Factory Authorized Service Center. Contact the Factory Authorized Service Center for:

- Product support
- Information on upgrading or returning a product

Contact the Comtech EF Data Customer Support Department for:

- Product support or training
- Information on upgrading or returning a product

A Customer Support representative may be reached at:

Comtech EF Data
Attention: Customer Support Department
2114 West 7th Street
Tempe, Arizona 85281 USA

480.333.2200 (Main Comtech EF Data Number)
480.333.4357 (Customer Support Desk)
480.333.2500 FAX

or, E-Mail can be sent to the Customer Support Department at:

service@comtechefdata.com

1. To return a Comtech EF Data product (in-warranty and out-of-warranty) for repair or replacement:

2. Request a Return Material Authorization (RMA) number from the Comtech EF Data Customer Support Department.

3. Be prepared to supply the Customer Support representative with the model number, serial number, and a description of the problem.

4. To ensure that the product is not damaged during shipping, pack the product in its original shipping carton/packaging.

5. Ship the product back to Comtech EF Data. (Shipping charges should be prepaid.)

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CHAPTER 3. OPERATION 3–1

Figures

Tables

About this Manual

This manual describes the operation and maintenance of the Comtech EF Data SNM-1000 Node Control Modem. This is a technical document intended for earth station engineers, technicians, and operators responsible for the operation and maintenance of the Comtech EF Data SNM-1000 Node Control Modem.

Related Documents

The following document is referenced in this manual:

- Comtech EF Data Specification, *SP/5747 DAMA Control Channel Messaging*

Conventions and References

Cautions and Warnings

CAUTION indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. CAUTION may also be used to indicate other unsafe practices or risks of property damage.

WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

IMPORTANT indicates a statement that is associated with the task being performed. .

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing English to Metric conversions.

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations (EIA-232, EIA-485, etc.) only.

Trademarks

Intel is a registered trademark of the Intel Corporation.

Sportster is a registered trademark of US Robotics Incorporated.

Product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are hereby acknowledged.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual will be appreciated. To submit comments, please contact the:

Comtech EF Data Technical Publications Department: techpub@comtechefdata.com

Overview of Changes to Previous Revisions

Electrical Safety

The SNM-1000 Modem has been shown to comply with the following safety standard:

- EN 60950: Safety of Information Technology Equipment, including electrical business machines

The equipment is rated for operation over the range 100 - 240 volts AC. It has a maximum power consumption of 40 watts, and draws a maximum of 400 mA.

The user should observe the following instructions:

Fuses

The SNM-1000 is fitted with two fuses - one each for line and neutral connections. These are contained within the body of the IEC power inlet connector, behind a small plastic flap.

- For 230 volt AC operation, use T0.75A, 20mm fuses.
- For 115 volt AC operation, use T1.25A fuses, 20mm fuses.

FOR CONTINUED OPERATOR SAFETY, ALWAYS REPLACE THE FUSES WITH THE CORRECT TYPE AND RATING.

Environmental

The SNM-1000 must not be operated in an environment where the unit is exposed to extremes of temperature outside the ambient range 0 to 50°C (32 to 122°F), precipitation, condensation, or humid atmospheres above 95% RH, altitudes (un-pressurised) greater than 2000 metres, excessive dust or vibration, flammable gases, corrosive or explosive atmospheres.

Operation in vehicles or other transportable installations that are equipped to provide a stable environment is permitted. If such vehicles do not provide a stable environment, safety of the equipment to EN60950 may not be guaranteed.

Installation

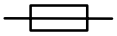
The installation and connection to the line supply must be made in compliance to local or national wiring codes and regulations.

The SNM-1000 is designed for connection to a power system that has separate ground, line and neutral conductors. The equipment is not designed for connection to power system that has no direct connection to ground.

The SNM-1000 is shipped with a line inlet cable suitable for use in the country of operation. If it is necessary to replace this cable, ensure the replacement has an equivalent specification.

Examples of acceptable ratings for the cable include HAR, BASEC and HOXXX-X. Examples of acceptable connector ratings include VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, BS1636A, BSI, SETI, IMQ, KEMA-KEUR and SEV.

International Symbols:

Symbol	Definition		Symbol	Definition
~	Alternating Current			Protective Earth
	Fuse			Chassis Ground

Telecommunications Terminal Equipment Directive

In accordance with the Telecommunications Terminal Equipment Directive 91/263/EEC, this equipment should not be directly connected to the Public Telecommunications Network.

EMC (Electromagnetic Compatibility)

In accordance with European Directive 89/336/EEC, the SNM-1000 Modem has been shown, by independent testing, to comply with the following standards:

Emissions: EN 55022 Class B - Limits and methods of measurement of radio interference characteristics of Information Technology Equipment.

(Also tested to FCC Part 15 Class B)

Immunity: EN 50082 Part 1 - Generic immunity standard, Part 1: Domestic, commercial and light industrial environment.

Additionally, the SNM-1000 has been shown to comply with the following standards:

EN 61000-3-2	Harmonic Currents Emission
EN 61000-3-3	Voltage Fluctuations and Flicker
EN 61000-4-2	ESD Immunity
EN 61000-4-4	EFT Burst Immunity
EN 61000-4-5	Surge Immunity
EN 61000-4-6	RF Conducted Immunity
EN 61000-4-8	Power frequency Magnetic Field Immunity
EN 61000-4-9	Pulse Magnetic Field Immunity
EN 61000-4-11	Voltage Dips, Interruptions, and Variations Immunity
EN 61000-4-13	Immunity to Harmonics

In order that the Modem continues to comply with these standards, observe the following instructions:

- Connections to the transmit and receive IF ports (BNC female connectors) should be made using a good quality coaxial cable - for example RG58/U (50 Ω or RG59/U (75 Ω).

- All 'D' type connectors attached to the rear panel must have back-shells that provide continuous metallic shielding. Cable with a continuous outer shield (either foil or braid, or both) must be used, and the shield must be bonded to the back-shell.

- The equipment must be operated with its cover on at all times. If it becomes necessary to remove the cover, the user should ensure that the cover is correctly re-fitted before normal operation commences

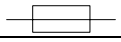
European EMC Directive

In order to meet the European Electro-Magnetic Compatibility (EMC) Directive (EN55022, EN50082-1), properly shielded cables for DATA I/O are required. More specifically, these cables must be shielded from end-to-end, ensuring a continuous ground shield.

The following information is applicable for the European Low Voltage Directive (EN60950):

<HAR>	Type of power cord required for use in the European Community.
	CAUTION: Double-pole/Neutral Fusing ACHTUNG: Zweipolige bzw. Neutralleiter-Sicherung

International Symbols:

	Alternating Current.
	Fuse.
	Safety Ground.
	Chassis Ground.

Note: For additional symbols, refer to “Cautions and Warnings” listed earlier in this preface.

Warranty Policy

This Comtech EF Data product is warranted against defects in material and workmanship for a period of two year from the date of shipment. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective.

For equipment under warranty, the customer is responsible for freight to Comtech EF Data and all related custom, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges **only** for return of the equipment from the factory to the customer. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

Limitations of Warranty

The foregoing warranty shall not apply to defects resulting from improper installation or maintenance, abuse, unauthorized modification, or operation outside of environmental specifications for the product, or, for damages that occur due to improper repackaging of equipment for return to Comtech EF Data.

No other warranty is expressed or implied. Comtech EF Data specifically disclaims the implied warranties of merchantability and fitness for particular purpose.

Exclusive Remedies

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Disclaimer

Comtech EF Data has reviewed this manual thoroughly in order that it will be an easy-to-use guide to your equipment. All statements, technical information, and recommendations in this manual and in any guides or related documents are believed reliable, but the accuracy and completeness thereof are not guaranteed or warranted, and they are not intended to be, nor should they be understood to be, representations or warranties concerning the products described. Further, Comtech EF Data reserves the right to make changes in the specifications of the products described in this manual at any time without notice and without obligation to notify any person of such changes.

If you have any questions regarding your equipment or the information in this manual, please contact the Comtech EF Data Customer Support Department.

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Chapter 1. INTRODUCTION

This chapter provides an overview of the SNM-1000 Node Control modem, referred to in this manual as “the node control modem” and “node controller.”

SNM-1000 Node Control Modem

The node controller contains the following components:

Modem	The modem is a fully digital. Integrated satellite modem and Demand Assigned Multiple Access (DAMA) controller. The modem is designed to function as the traffic node controller within Comtech EF Data’s Bandwidth On-Demand (BOD) Multimedia Integrated Digital Access System (MIDAS).
DAMA	DAMA control is provided by a DAMA Assignment Controller (DAC) daughter board.

1.1 Overview

The SNM-1000 Node Control Modem is a fully integrated digital satellite modem and DAMA controller. Utilizing the latest digital signal processing techniques, it is designed to function as a self-contained indoor unit that operates within Comtech EF Data's Bandwidth-on-Demand (BOD) Multimedia Integrated Digital Access System (MIDAS).

1.1.1 Additional Features

The modem contains the following additional features:

- Integrated DAMA controller in a 1RU package
- Burst mode modulator
- Continuous mode demodulator
- Fast acquisition
- Operational parameters stored in EEPROM
- 50/180 MHz operation
- Software stored in flash for easy update

1.1.2 Mode of Operation

The SNM-1000 operates as a dedicated node controller at the HUB and REMOTE sites, receiving the continuous outbound control channel from the hub station and transmitting to the hub station on the inbound control channel in burst mode. The node control modem manages traffic modems utilizing EFBUS1 connecting to the M&C port of the traffic modems (Figure 1-1).

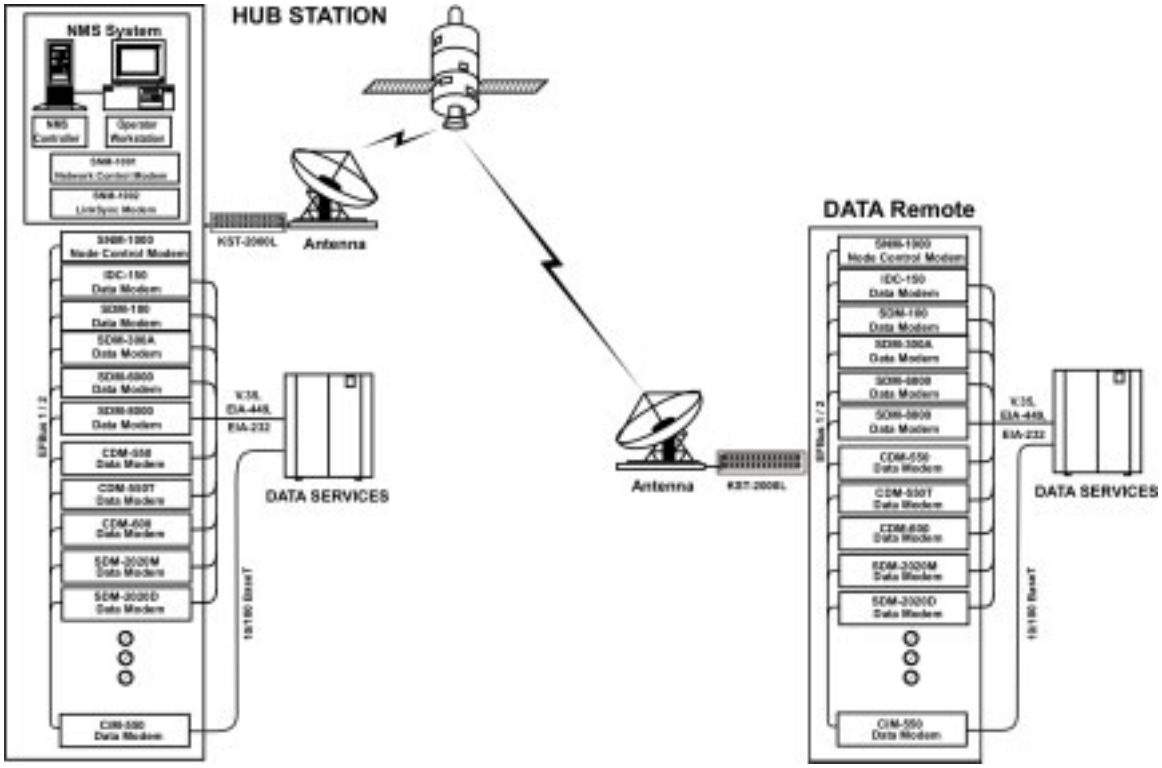

Figure 1-1. Typical Installation

1.2 Description

The SNM-1000 is housed in a 1-Rack Unit (1RU) rack-mountable chassis. Cooling is provided by a fan mounted on the rear panel. The SNM-1000 operates in burst transmit with continuous receive mode.

- *Burst mode* is used by the SNM-1000 to transmit to the NMS over the inbound control channel. The burst mode data rate is shown below.

Burst Mode Data Rates
19.2 kbit/s at FEC rate 1/2 QPSK

- *Continuous mode* is used to receive the outbound control channel at the remote. The continuous mode data rate is shown below.

Continuous Mode Data Rates
19.2 kbit/s Viterbi rate 1/2 QPSK

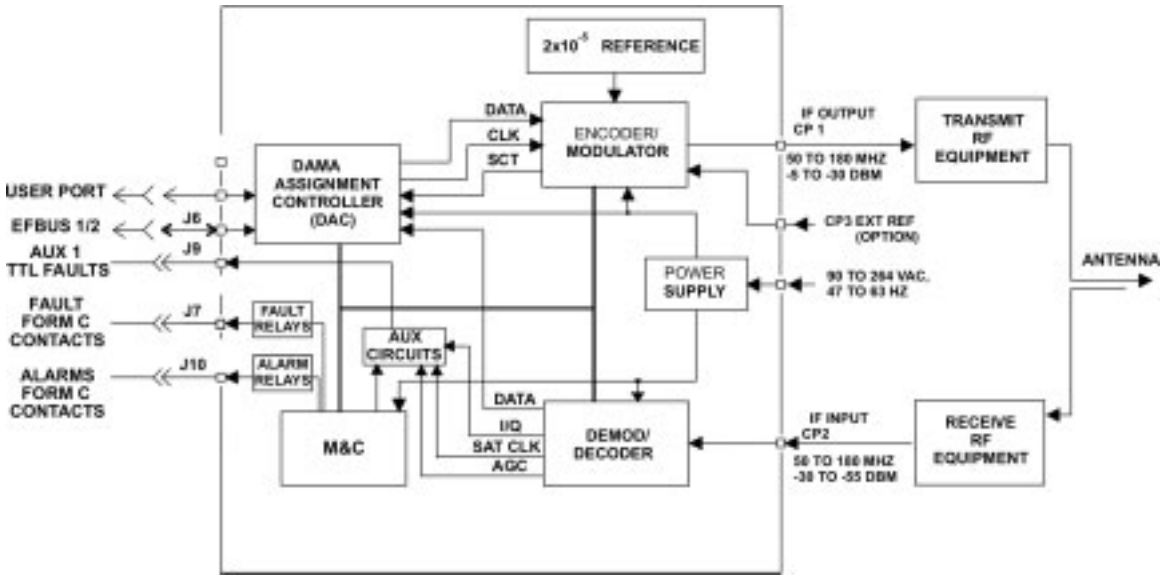

Figure 1-2. SNM-1000 Block Diagram

1.3 Options

The following options are available for the SNM-1000:

Option	Part No.
90-264 VAC	KT/8000-3
-48 VDC	KT/8000-4
50Ω	PL/6093-3
75Ω	PL/6093-1

1.4 Specifications

This section includes the following specifications:

- General Specifications
- Environmental and Physical Specifications
- DAC
- Burst mode operating specifications
- Continuous mode operating specifications
- Bit Error Rate (BER) specifications

1.4.1 General Specifications

Table 1-1. General Specifications

Parameter	Specification
Operating IF Range	50 to 180 MHz, in 1 Hz steps
Digital Data: Burst Mode Transmit (Slotted Aloha) TX Data Rate Continuous Mode Receive RX Data Rate	 TDMA 19.2 kbps TDM 19.2 kbps
Symbol Rate	19.2 kHz
Modulation	QPSK
Forward Error Correction	Viterbi, K=7, 1/2 rate
Data Scrambling	IESS-308 (V.35), IESS-309, or None
External Reference	1, 5, 10, 20 MHz
Plesiochronous Buffer	16 bits to 256 kbps, in 16 bit steps 2 to 98 ms, in 2 ms steps
Modulator	
Output Power	-5 to –30 dBm, adjustable in 0.1 dB steps
Output Spurious	< -55 dBc, 0 to 500 MHz (4 kHz in-band)
Output Harmonics	< -55 dBc, 0 to 500 MHz (4 kHz out-of-band)
Output Spectrum	Meets IESS-308/309 power spectral mask
Output Return Loss	> 20 dB
Output Impedance	75 Ω (Optional: 50 Ω)
Output Frequency Stability	± 10 PPM
Data Clock Source	Internal or External External Clock: ± 100 PPM and < 5% jitter Internal Clock: ± 10 PPM
Internal Stability	$\pm 1 \times 10^{-5}$

Table 1-1. General Specifications (Continued)

Demodulator	
Input Power: Desired Carrier Maximum Composite	 -30 to –55 dBm -5 dBm or +40 dBc
Input Impedance	75Ω (Optional: 50Ω)
Input Return Loss	> 20 dB
Carrier Acquisition Range	± 35 kHz from 100 Hz to 35 kHz, in 1 Hz steps
Acquisition Time: 19.2 bps, R=1/2	< 2 seconds
Sweep Reacquisition	0 to 999 seconds, in 1 second steps
Data Clock	Internal, External, Transmit, Recovered RX
Outbound (from NMS)	Continuous transmission, Time Division Multiplex (TDM), 19.2 kbps, QPSK, R=1/2
Inbound (to NMS)	Burst transmission, (TDMA) Slotted Aloha, 19.2 kbps, QPSK, R=1/2
Processor	
M&C Processor	Single processor for node control EEPROM variable storage Memory life without power for 10 years.
User Port Interface	
Interface Type	EIA-232
Data Rate	19.2 kbps
Data Bits	8
Parity	None
Stop Bits	1
Application	Remote circuit initiation and termination via command interface; Transmits and receives service terminal messages.
Control Interface	
EFBUS1:	
Interface Type	EIA-485
Data Rate	9.6 or 19.2 kbps
Application	Multi-drop bus used to control external data traffic modems
Compatibility	Standard Comtech EF Data remote commands
Modems Supported (Not limited to-)	SDM-100, SDM-300/300A, SDM-2020M/D, SDM-6000, SDM-8000, SDM-9000, CDM-550/550T, CDM-600, CiM-550

1.4.2 Environmental and Physical

Table 1-2. Environmental and Physical

Parameter	Specification
Prime Power	90 to 264 VAC, 47 to 63 Hz Optional: 38 to 64 VDC
Power Dissipation	30 Watt
Size	1.75H x 19.0W x 14.0D inch (1 RU) (4.4H x 48W x 36D cm)
Weight	< 11 lbs (< 5 kg)
Temperature: Operating Storage	 0 to 50°C (32 to 122°F) -55 to 70°C (-67 to 158°F)
Humidity	Up to 95%, non-condensing
Shipping Container Dimensions	22W x 20D x 12H inches (56W x 51D x 31H cm)
Shipping Weight	15 lbs (7 kg)

1.4.3 DAC Specification

The DAC performs all of the DAMA control functions. The DAC provides a set of interface for communicating with an operator, controlling external traffic modems, etc. The DAC communicates with the NMS for call control and M&C.

1.4.4 Burst Mode Specification

Table 1-3. Burst Mode Operating Specifications

Modulator Specifications	
Operating Frequency Range	50 to 180 MHz
Type of Modulation	QPSK
Operating Channel Spacing	Less than 0.5 dB degradation operating with 2 adjacent-like channels, each 10 dB higher at 1.3 times the symbol rate, or a minimum of 1.2 times the specified acquisition range
Phase Noise	In accordance with IESS-308
Digital Data Rate: QPSK, 1/2 Rate	 19.2 kbit/s
Forward Error Correction	Convolution encoding, soft-decision K=7 Viterbi decoding
Data Scrambling	Selectable or none, 215-1, synchronous

1.4.5 Continuous Mode Specifications

Table 1-4. Continuous Mode Operating Specifications

Demodulator Specifications	
Input Power (Desired Carrier)	-30 to -55 dBm (composite) +30 dB power within 2 MHz from desired carrier +40 dB power outside of 2 MHz from desired carrier -5 dBm maximum composite
Carrier Acquisition Range	± 35 kHz
Clock Acquisition Range	± 100 PPM
Acquisition Time	< 1 second at all data rates
Directed Sweep: Sweep Range Sweep Center	 0 to 70000 Hz -35000 to +35000 Hz

1.4.6 Viterbi Performance with Noise, Closed Network

Table 1-5 lists the Viterbi decoder specifications with noise, closed network, for the E_b/N_0 required to achieve 10^{-5} to 10^{-8} BER.

Table 1-5. Viterbi Performance

Eb/N0 (dB) Specification	
BER	**1/2 Rate**
10^{-5}	4.6
10^{-6}	5.3
10^{-7}	5.9
10^{-8}	6.4

1.5 Typical Spectral Occupancy

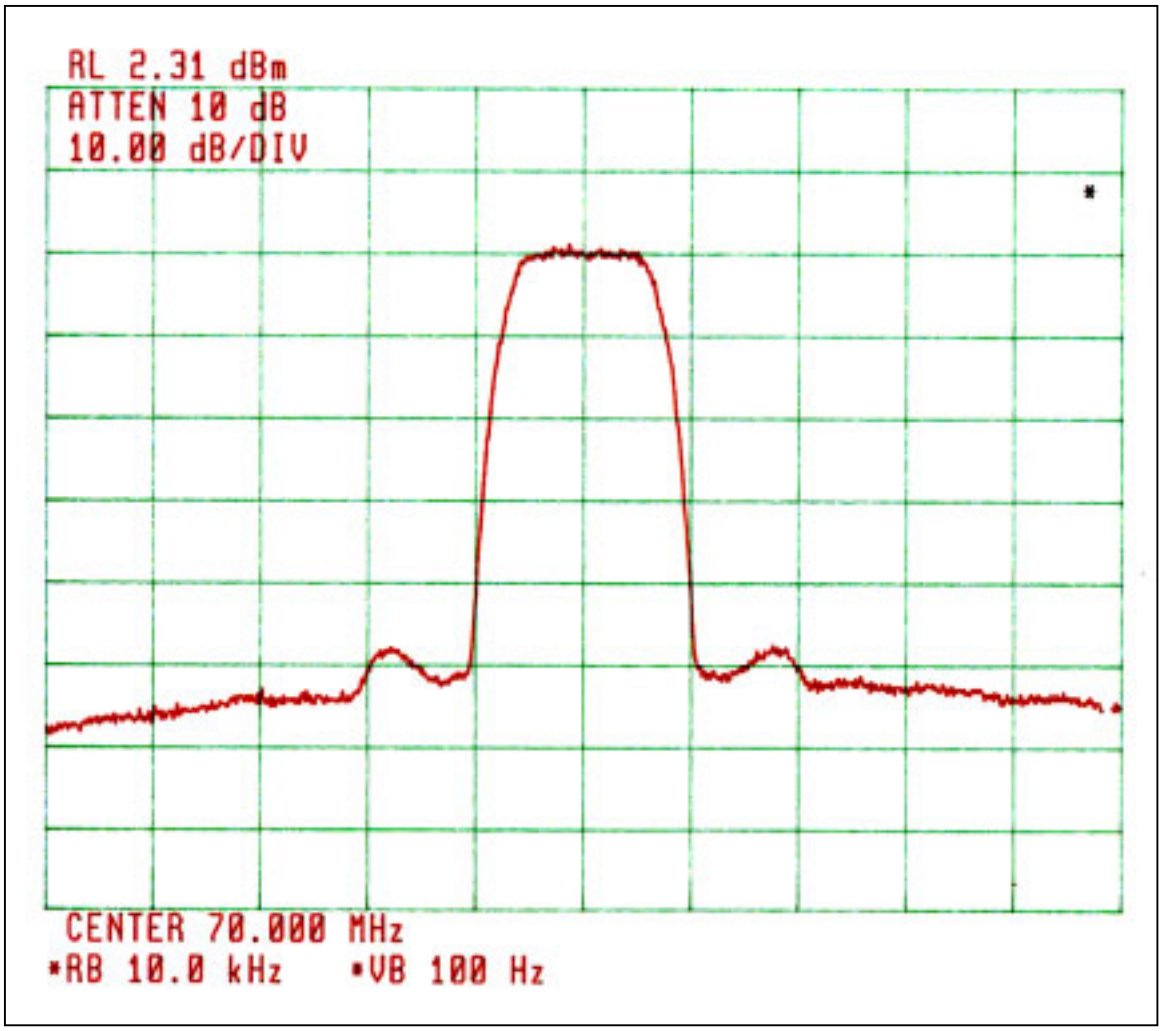

Figure 1-3. Typical Spectral Occupancy

1.6 Dimensional Envelope

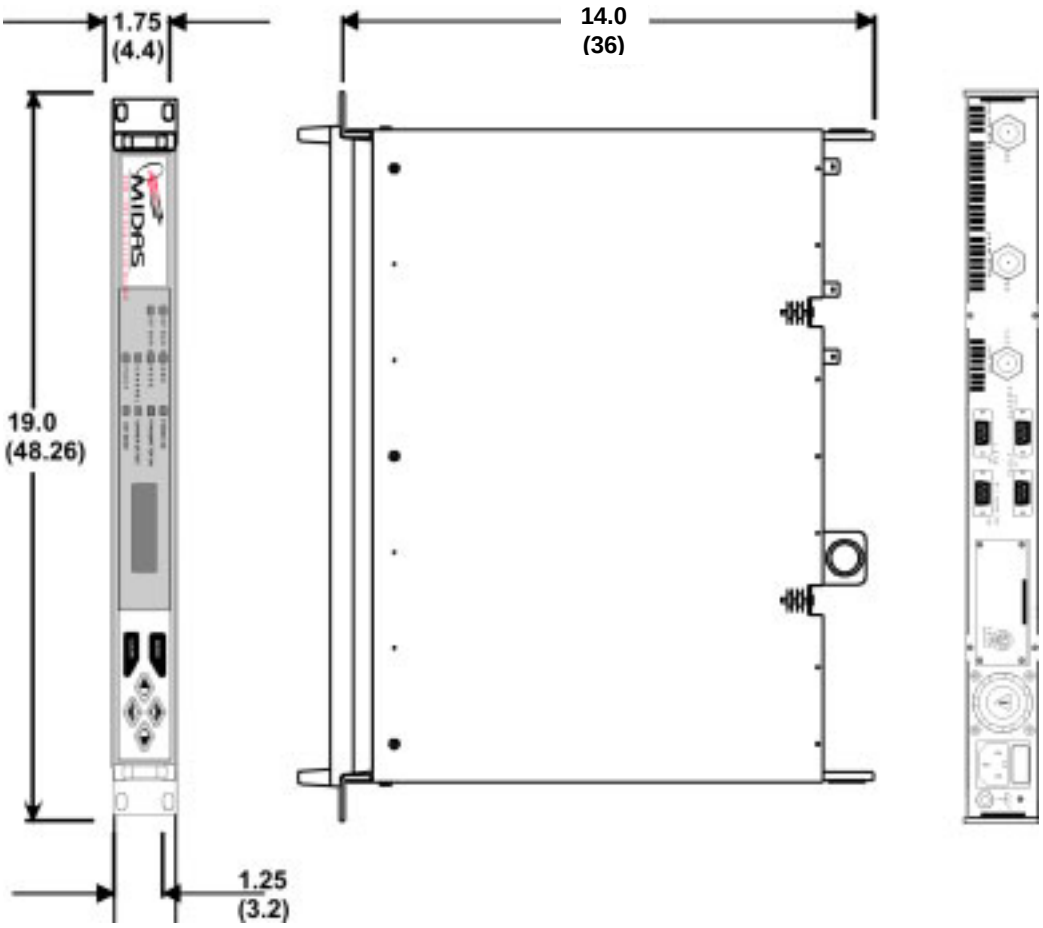

Figure 1-4. SNM-1000 Dimensional Envelope

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Chapter 2. INSTALLATION

This chapter provides unpacking and installation instructions, and a description of external connections information.

The equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting PCBs.

2.1 Unpacking

The modem and manual are packaged in pre-formed, reusable, cardboard cartons containing foam spacing for maximum shipping protection.

Do not use any cutting tool that will extend more than 1 inch (2.54 cm) into the container. This can cause damage to the modem.

Unpack the modem as follows:

1. Cut the tape at the top of the carton indicated by OPEN THIS END.
2. Remove the cardboard/foam space covering the modem.
3. Remove the modem, manual, and power cord from the carton.
4. Save the packing material for storage or reshipment purposes.
5. Inspect the equipment for any possible damage incurred during shipment.
6. Check the equipment against the packing list to ensure the shipment is correct.
7. Refer to Section 2.2 for installation instructions.

2.2 Installation

The modem arrives fully assembled from the factory. After unpacking the modem, install the modem as follows:

1. If required, install the mounting bracket in equipment rack (Figure 2-1). Install and tighten the bracket bolts.

2. Loosen the screw with flat washer located on the left side of modem chassis. Mount the modem chassis into the equipment rack and slide the screw with flat washer through the slot of the mounting bracket. Tighten the screw sufficiently to allow the modem chassis to slide in the bracket.

3. Connect the cables to the proper locations on the rear panel. Refer to Section 2.4 for connector pinouts, placement, and function.

4. Connect the primary power cable to the power source. Before turning on the power switch, become familiar with the front panel operation in Chapter 3.

5. If problems exist with the installation, refer to Chapter 5 for troubleshooting information.

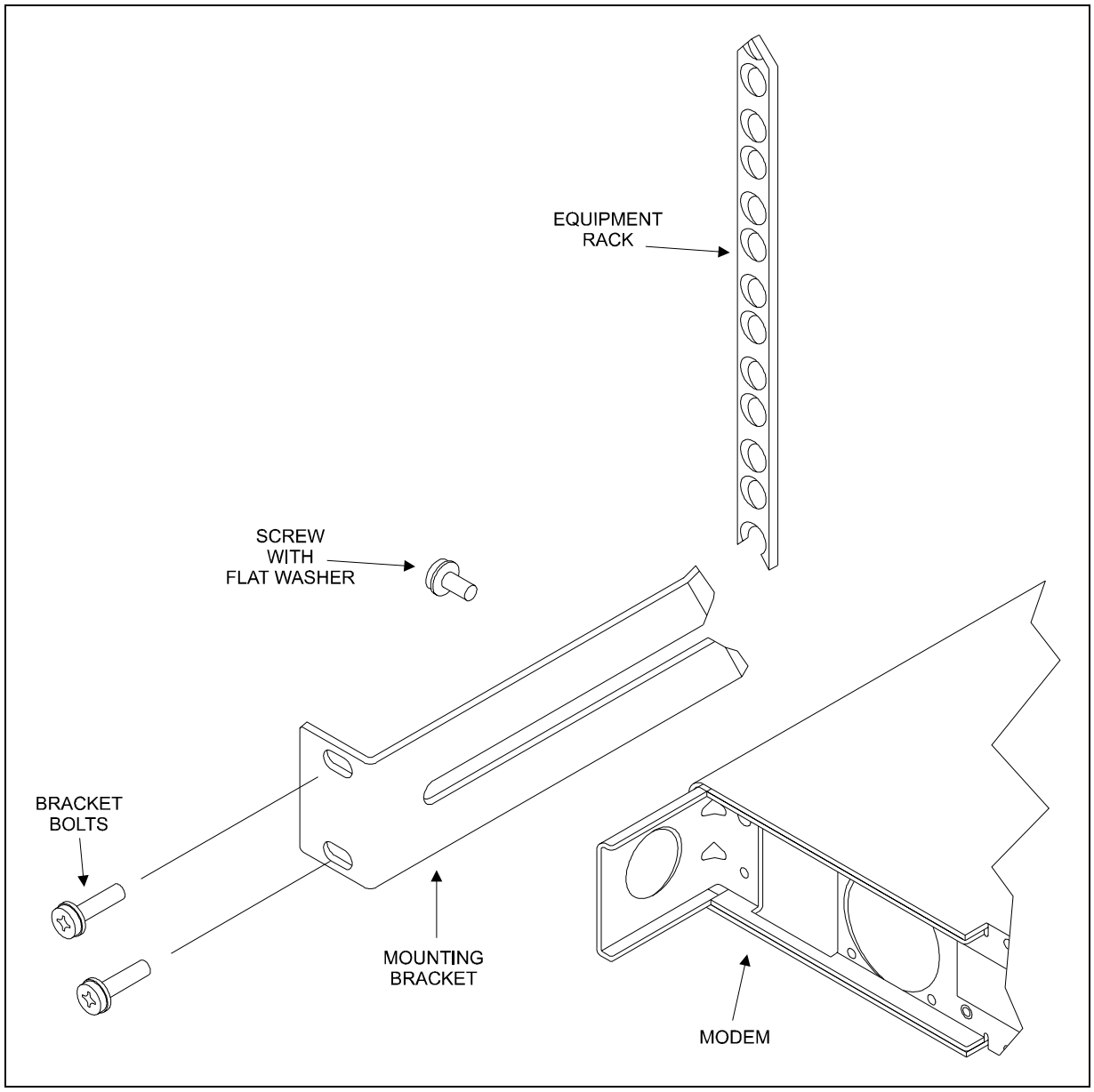


Figure 2-1. Installation of the Mounting Bracket

2.3 Rear Panel Connections

The rear panel connectors provide all necessary external connections between the node control modem and other equipment. Figure 2-1 provides a layout of the SNM-1000 rear panel, and Table 2-1 lists these connectors.

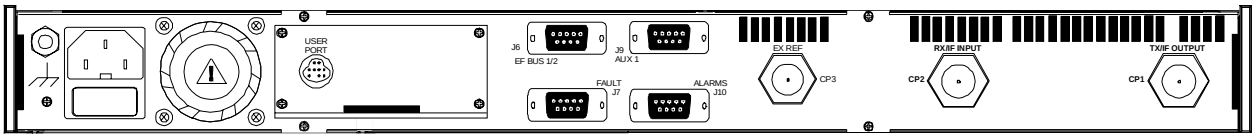


Figure 2-2. SNM-1000 Rear Panel

Table 2-1. Rear Panel Connectors

Connection	Description
GROUND CONNECTOR	The GROUND CONNECTOR (GRN), provides a common chassis ground connection among all of the equipment, via a #10-32 stud.
AC POWER	The AC POWER accepts input power for the SNM-1000. (+48 VDC optional)
USER PORT	The USER PORT allows the user to configure setup parameters, and to initiate/terminate remotely initiated calls.
EFBUS1/2	The EFBUS1/2 in used by the Node Control Modem to control up to 30 Comtech EF Data/MIDAS modems.
AUXILIARY 1	The AUXILIARY 1 connector (J9), provides MOD and DEMOD (TTL) faults, satellite clock, satellite I&Q, and Automatic Gain Control (AGC) output voltage.
FAULT	The FAULT connector (J7), provides Form C contact closures for fault reporting.
ALARM OUTPUT	Not currently used. The ALARM OUTPUT (J10), provides FORM C contact closures for the purpose of fault reporting.
EXTERNAL REFERENCE	The EXTERNAL REFERENCE (CP3), is a BNC connector for an external reference. The input impedance is 75Ω
RX IF INPUT CONNECTOR	The RX IF INPUT CONNECTOR (CP2), is a BNC jack that provides a connection for the receive IF signal.
TX IF OUTPUT CONNECTOR	The TX IF OUTPUT CONNECTOR (CP1), is a BNC jack that provides a connection for the transmit IF signal.

Note: The European EMC Directive (EN55022, EN50082-1) requires using properly shielded cables for DATA I/O. These cables must be double-shielded from end-to-end, ensuring a continuous ground shield.

2.3.1 EFBUS1/2 Port (J6)

The EFBUS port provides two separate 2-wire EIA-485 interfaces wired to a common 9-pin D female connector located on the rear of the MIDAS Node Control Modem. The IF Modulator and IF Demodulator status is also presented for external use.

The Modem Control serial port, EFBUS1, is used for control of other Comtech EF Data traffic modems. The signals are described in the following table, with signal names having the MC prefix. The interface is ASYNC, EIA-485/2 wire, and 19.2 kbps.

The EFBUS2 port is reserved for communication with future MIDAS traffic modems.

Signal Function	Name	I/O	MIDAS Conn Pin #	Signal Level
Ground	MCGND	-	1	-
Demodulator fault	BP_DF	I/O	2	TTL
Modulator fault	BP_MF	I/O	3	TTL
Receive/Transmit +	MS_RD/SD+(EFBUS2)	I/O	4	EIA-485
Receive/Transmit -	MS_RD/SD-(EFBUS2)	I/O	5	EIA-485
Receive/Transmit+	MC_RD/SD+(EFBUS1)	I/O	6	EIA-485
Receive/Transmit-	MC_RD/SD-(EFBUS1)	I/O	7	EIA-485
Ground	MSGND	-	8	-
Not used	-	-	9	-
Not used	-	-	-	-

2.3.2 Fault Connector and Pinouts (J7)

The fault connector provides Form C contact closures for fault reporting. The three Form C summary fault contacts, ratings 1A maximum at 24 VDC, 0.5A at 120 VAC, are Modulator, Demodulator, and Common Equipment.

The fault interface connection is a 9-pin subminiature female D connector (J7) located on the rear panel of the modem. Screw locks are provided for mechanical security on the mating connector. Refer to Table 2-2 for pinout information.

Table 2-2. Fault Connector and Pinouts (J7)

Pin #	Signal Function	Name
1	Common equipment is not faulted	NO
2		COM
3	Common equipment is faulted	NC
4	Modulator is not faulted	NO
5		COM
6	Modulator is faulted	NC
7	Demodulator is not faulted	NO
8		COM
9	Demodulator is faulted	NC

Note: A connection between the common (COM) and normally open (NO) contacts indicates no fault.

Refer to Chapter 5 for a discussion of monitored faults. To obtain a system summary fault, connect all the Form C contacts in parallel.

2.3.3 User Port

The User Port provides for serial communications with the modem to allow configuration of setup parameters and user requests for traffic channel assignments. The interface is provided on a 9-pin MINI-DIN female connector (DCE) located on the rear panel of the SNM-1000. Refer to the following listing for User Port specifications.

Connector Type	9-pin MINI-DIN
Signal Type	EIA-232
Rate	19.2 kbit/s, 8 bits-no parity-1stop

Note: Refer to Appendix A for a description of the software communications parameters and for detailed message format information.

Pinout and signal levels are described in Table 2-3.

Table 2-3. SNM-1000 User Port Pinout and Signals

Signal Function	Name	Pin #	I/O	Signal Level
Receiver Ready	RR	1	O	EIA-232
Receive Data	RD	2	O	EIA-232
Send Data	SD	3	I	EIA-232
Terminal Ready	TR	4	I	EIA-232
Signal Ground	SG	5		
Data Mode	DM	6	O	EIA-232
Request to Send	RS	7	I	EIA-232
Clear to Send	CS	8	O	EIA-232
Incoming Call	IC	9	O	EIA-232

2.3.4 Auxiliary 1 Connector and Pinouts (J9)

The auxiliary 1 (AUX 1) connector provides:

- MOD and DEMOD (TTL) faults
- Satellite clock
- Satellite I&Q
- Automatic Gain Control (AGC) output voltage

The faults are open collector levels that indicate a modulator or demodulator failure. A logic "1" indicates the faulted condition.

AGC_OUT is a programmable voltage, 0 to 10V, for a receive signal level between -25 and -60 dBm.

AUX 1 connection is a 9-pin female D connector (J9) located on the rear panel of the modem. Screw locks are provided for mechanical security on the mating connector. Refer to Table 2-4 for pinout information

Table 2-4. AUX 1 Connector and Pinouts (J9)

Pin #	Signal Function	Name
1	Satellite Clock -	SAT_CLK-
2	No Connection	NC
3	Satellite Clock +	SAT_CLK+
4	MODULATOR TTL Fault	MDFLTTTL
5	Ground	GRN
6	RX Q Channel Eye	RX_Q
7	DEMODULATOR TTL Fault	DFFLTTTL
8	RX 1 Channel Eye	Rx_1
9	Agc Output	AGC

2.3.5 Alarms Connector and Pinouts (J10)

The alarms connector provides Form C contact closures for alarm reporting. The two Form C summary fault contacts are Modulator and Demodulator.

The alarms connection is a 9-pin female D connector (J10) located on the rear panel of the modem. Screw locks are provided for mechanical security on the mating connector. Refer to Table 2-5 for pinout information.

Table 2-5. Alarms Connector and Pinouts (J10)

Pin #	Signal Function	Name
1	Alarm 1 is faulted	NO
2		COM
3	Alarm 1 is not faulted	NC
4	Alarm 2 is faulted	NO
5		COM
6	Alarm 2 is not faulted	NC
7	Alarm 3 is faulted	NO
8		COM
9	Alarm 3 is not faulted	NC

- Alarm 1 = Not used
- Alarm 2 = TX
- Alarm 3 = RX

2.3.6 AC Power

The AC power is supplied to the SNM-1000 by a standard, detachable, non-locking, 3-prong power cord. Refer to the following listing for AC power specifications.

Input power	50W max.
Input voltage	90 to 264 VAC, 47 to 63Hz. Note: Unit switches ranges automatically.
Connector type	IEC
Fuse protection	1A slo-blo line and neutral fusing 5 mm type fuses.

2.3.7 DC Power

For DC supplied units, the DC Power is supplied by terminal lugs installed on the back panel. Refer to the following table for specifications

Input power	50W max.
Input voltage	38 to 64 VDC.
Connector type	Terminal Lug
Fuse protection	1A slo-blo 5 mm type fuses.

2.3.8 TX IF Output Connector (CP1)

CP1 is a BNC connector for the transmit IF signal. The standard output impedance is 75Ω (50 Ω optional), and the output power level is -5 to -30 dBm. In normal operation, the output will be a 8PSK, QPSK/OQPSK, or BPSK-modulated result of the data connector between 50 and 180 MHz, in 1 Hz steps.

2.3.9 RX IF Input Connector (CP2)

CP2 is a BNC connector for the RX-IF signal. The standard input impedance is 75Ω (50Ω optional). For normal operation, the desired carrier signal level should be between -30 and -55 dBm. Signals between 50 and 180 MHz are selected and demodulated to produce clock and data.

2.3.10 External Reference (CP3)

CP3 is a BNC connector for an EX REF. The input impedance is 75Ω.For normal operation, the reference signal is ≥ 0 dBm.

2.3.11 Ground Connector (GND)

A #10-32 stud on the rear panel of the modem is used for connecting a common chassis ground among all equipment. The AC power connector provides the safety ground.

Chapter 3. OPERATION

This chapter describes the operation of the SNM-1000.

3.1 Front Panel

The front panel of the SNM-1000 (Figure 3-1) provides for monitoring modem configuration and status.

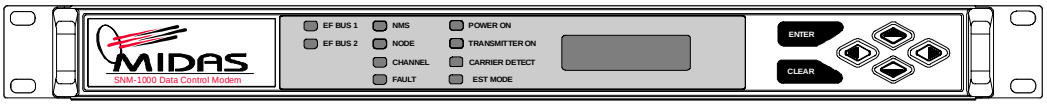


Figure 3-1. SNM-1000 Front Panel View

The front panel features include:

- 32- character, two-line LCD display
- Six-button keypad for local control
- Eight LED's to provide overall status at a glance

These functions are accessible at the front panel by entering on of five pre-defined function select categories or levels:

- Configuration
- Monitor
- Faults/Alarms
- Stored Faults/Alarms
- Utility

3.1.1 LED Indicators

In addition to the LCD, the LED's provides the modem status. The DAC board controls LEDs 6 through 10. The LED's support three states:

- ON
- OFF
- Flashing

Table 3-1. SNM-1000 Front Panel Indicators

LED	Color	Description
POWER ON	Green	Power is applied to the modem.
FAULT	Red	A fault condition exists.
TEST MODE	Yellow	Flashes when the unit is in a test configuration.
TRANSMITTER ON	Green	Transmitter is currently ON. Indicates the actual condition of the transmitter, as opposed to the programmed condition. In control mode, the indicator blinks since the transmitter is operating in the burst mode. In traffic mode, the indicator is solid green.
CARRIER DETECT	Green	Decoder is locked.
NODE	Green	Indicates the node has been enabled or disabled by the NMS. It is ON if the node is enabled, OFF if the node is disabled.
NMS	Green	(OFF) Node did not receive timing or ACKNOWLEDGE messages from the NMS. (FLASHING) Node received timing message from the NMS, but no ACKNOWLEDGE message was received. (ON) Node received timing and ACKNOWLEDGE from the NMS.
CHANNEL	Green	(OFF) Not used on SNM-1000.
EFBUS1	Green	(OFF) Indicates operational status of externally connected traffic modems. (ON) OK (FLASHING) Fault indication.
EFBUS2	Green	(OFF) Indicates operational status of externally connected traffic modems. (ON) OK (FLASHING) Fault indication.

3.1.2 Front Panel Keypad

The front panel keypad operates in monitor mode only, and permits local operation of the modem. The keypad consists of six keys (Figure 3-2).

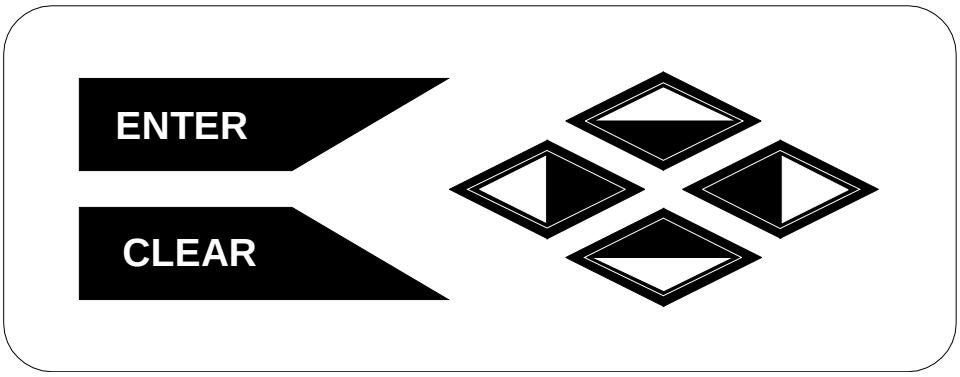


Figure 3-2. Keypad

Each key provides one or more logical functions. These functions are defined in the following table.

ENTER	This key is used to select a displayed function or to execute a modem configuration change.
CLEAR	This key is used to back out of a selection or to cancel a configuration change which has not been executed using [ENTER]. Pressing [CLEAR] generally returns the display to the previous selection.
Left and Right Diamond Keys	These keys are used to move to the next selection or to move the cursor for certain functions. **Note:** Throughout this chapter, [←] and [→] are used to indicate left and right diamond keys.
Top and Bottom Diamond Keys	These keys are used primarily to change configuration data (numbers). At times, they are also used to move from one section to another. **Note:** Throughout this chapter, [↑] and [↓] are used to indicate top and bottom diamond keys.

The modem responds by beeping whenever a key is pressed:

- A single beep indicates a valid entry and the appropriate action was taken.
- A double beep indicates an invalid entry or a parameter is not available for operation.

3.2 Menu System

Use the Main menu in Figure 3-3 as a quick reference for accessing the modem functions.

When the modem power is applied, the base level of the menu system displays the sign-on message:

- Line 1 of the sign-on message is the modem type.
- Line 2 is the node address.

The main level of the menu system is Function Select. To access this level from the sign-on message, press the [←] or [→] keys. From the Function Select menu, select one of the functional categories:

- Configuration
- Monitor
- Faults/Alarms
- Stored Faults/Alarms
- Utility

Press [←] or [→] to move from one selection to another. When line 2 displays the desired function, select that level by pressing [ENTER]. After entering the appropriate functional level, press [←] or [→] to move to the desired function.

To view the modem's configuration, enter the Configuration level from the Function Select menu. Once in the Configuration menu, press [←] or [→] to scroll through the Configuration menu selection:

- Modulator
- Demodulator
- Interface
- Save
- Recall

Press [ENTER] to select the desired Configuration menu option. To view the options for the selected configuration parameters, press [←] or [→].

Notes:

1. Menus or commands that are specific to certain modem configurations are only accessible after selecting the appropriate modem configuration. This prevents incompatible parameters from accidentally being selected.
3. All of the windows are accessible in the Custom mode. Take caution not to select incompatible parameters, as the modem does not shut out incompatible command choices in the Custom mode.

3.3 Front Panel Menu

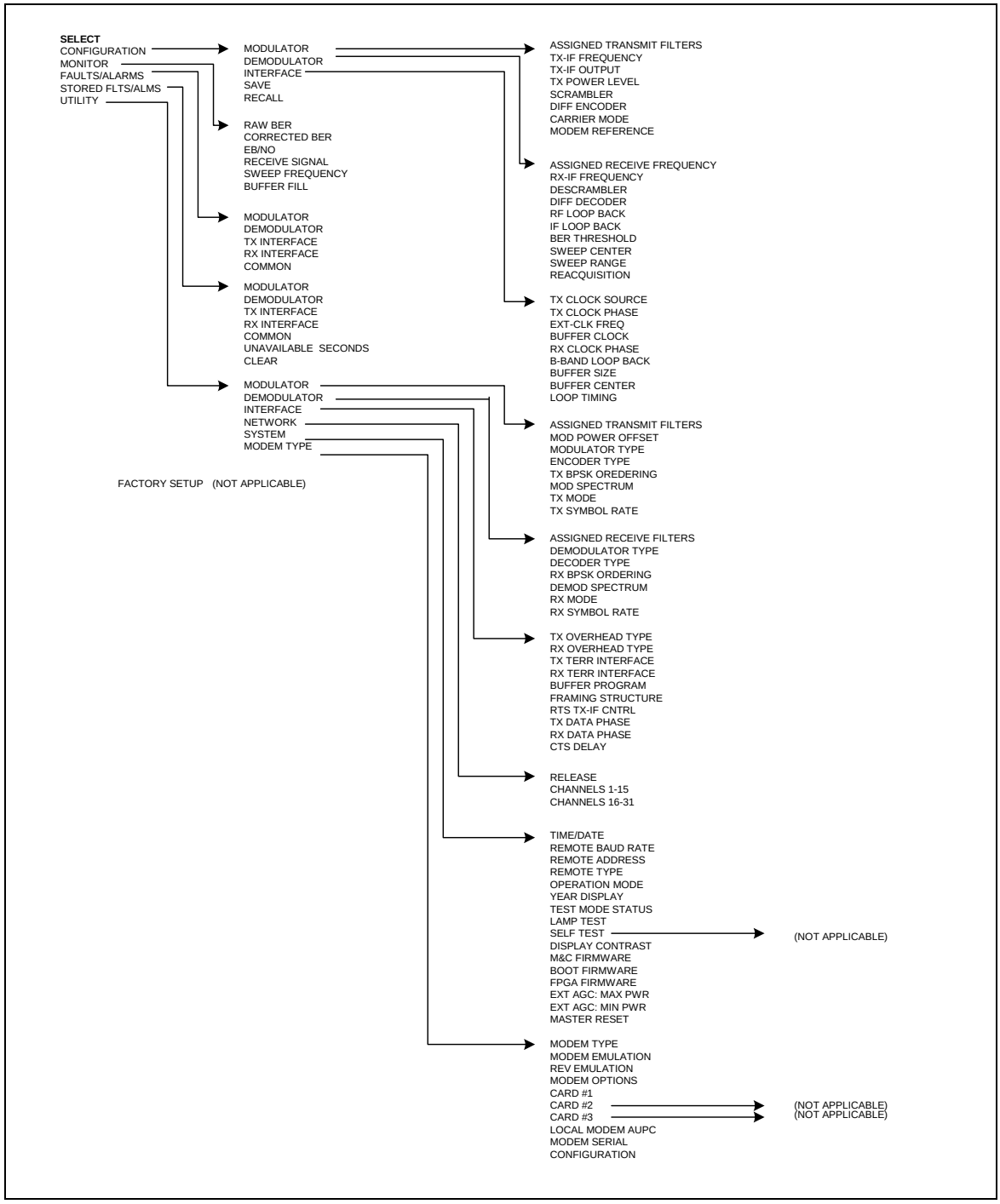


Figure 3-3. Main Menu

Note: The following menus show the modem functions that are available operating as a DAMA Controller (DAC). The default settings for the DAMA Controller are shown underlined.

3.4 OPENING SCREEN

```
SNM 1000
NA  2000
```

3.4.1 FUNCTION SELECT:CONFIGURATION

```
FUNCTION SELECT
CONFIGURATION
```

3.4.1.1 CONFIGURATION:MODULATOR

```
CONFIGURATION
MODULATOR
```

3.4.1.1.1 MODULATOR: CODE RATE/TYPE

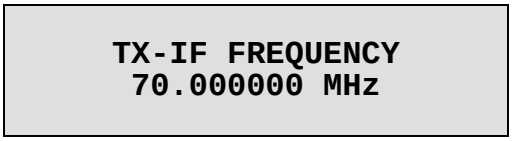
```
TX-X QPSK 1/2
19.200   kbps
```

Transmit code rate/type as follows:

TX-A QPSK 1/2 19.200 kbps
TX-B QPSK 1/2 19.200 kbps
TX-C QPSK 1/2 19.200 kbps
TX-D QPSK 1/2 19.200 kbps
TX-V QPSK 1/2 19.200 kbps

Upon entry, the current transmitter rate is displayed.

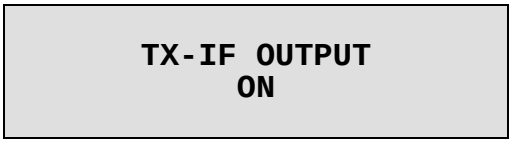
3.4.1.1.2 MODULATOR:TX-IF FREQENCY



Displays the modulator TX IF frequency between 50 and 180 MHz, in 1 Hz steps.

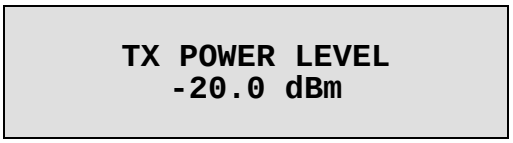
Upon entry, the current transmitter frequency is displayed with the flashing cursor on the first character. Press [←] or [→] to move the flashing cursor, and [↑] or [↓] to increase or decrease the digit at the flashing cursor. Press <ENTER> to execute the change.

3.4.1.1.3 MODULATOR:TX-IF OUTPUT



Displays the modulator output status, either On or Off.

3.4.1.1.4 MODULATOR:TX POWER LEVEL

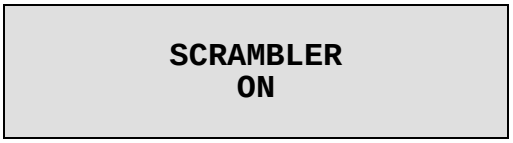


Displays the modulator output level from:

- -5.0 to –30.0 dBm (Normal Range)

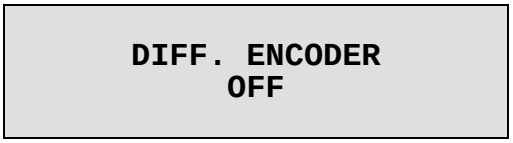
Upon entry, the current output power level is displayed with the flashing cursor on the first character. Press [←] or [→] to move the flashing cursor, and [↑] or [↓] to increase or decrease the digit at the flashing cursor. Press <ENTER> to execute the change.

3.4.1.1.5 MODULATOR:SCRAMBLER



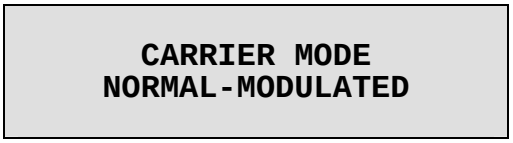
Displays the scrambler status, either On or Off.

3.4.1.1.6 MODULATOR:DIFF. ENCODER



Displays the differential encoder status, either On or Off.

3.4.1.1.7 MODULATOR:CARRIER MODE



Displays the carrier mode of operation as follows:

Normal-Modulated	The carrier mode in normally in this Off position.
Center-CW	Generates a carrier at the current modulator frequency. This can be used to measure the output frequency.
Offset-CW	Generates a single, upper, side-band-suppressed carrier signal. The upper side-band is at one-quarter of the symbol rate from the carrier. When inverted spectrum is selected, this generates a single, lower, side-band-suppressed carrier.
Dual-CW	Generates a dual side-band suppressed carrier signal. Side-bands are at one-half of the symbol rate from the carrier. This is used to check the channel balance and carrier null.

Upon entry, the current carrier mode is displayed with the flashing cursor on the first character. Press [↑] or [↓] to change the carrier mode. Press <ENTER> to execute the change.

3.4.1.1.8 MODULATOR:MODEM REFERENCE

```
MODEM REFERENCE
   INTERNAL
```

Displays the following references to the modulator:

- INTERNAL
- EXT1, EXT5, EXT10 and EXT20 MHz EXT REF (CP3)

Note: If any EXT REF is selected for the modem reference and there is no input to CP3, the modem will detect an alarm and switch to the INTERNAL clock.

Upon entry, the current modem reference is displayed with the flashing cursor on the first character. Press [↑] or [↓] change the modem reference. Press <ENTER> to execute the change.

3.4.1.2 CONFIGURATION:DEMODULATOR

```
CONFIGURATION
 DEMODULATOR
```

3.4.1.2.1 DEMODULATOR:CODE RATE/TYPE

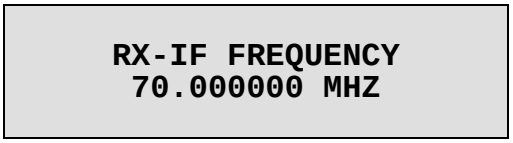
```
RX-X QPSK 1/2
19.200   kbps
```

Receive code rate/type as follows:

RX-A QPSK 1/2 19.200 kbps
RX-B QPSK 1/2 19.200 kbps
RX-C QPSK 1/2 19.200 kbps
RX-D QPSK 1/2 19.200 kbps
RX-V QPSK 1/2 19.200 kbps

Upon entry, the current transmitter rate is displayed. Press [↑] or [↓] change the assigned filter. Press <ENTER> to execute the change.

3.4.1.2.2 DEMODULATOR:RX-IF FREQUENCY



Displays the demodulator receive frequency, between 50 and 180 MHz, in 1 Hz steps.

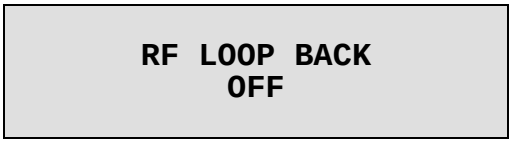
3.4.1.2.3 DEMODULATOR:DESCRAMBLER

Displays the descrambler status, either On or Off.

3.4.1.2.4 DEMODULATOR:DIFF.DECODER

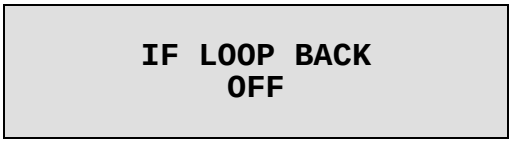
Displays the differential decoder status, either On or Off.

3.4.1.2.5 DEMODULATOR:RF LOOP BACK



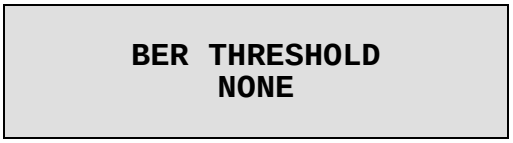
Displays the RF loop back status, either On or Off.

3.4.1.2.6 DEMODULATOR:IF LOOP BACK



Displays the IF loop back status, either On or Off.

3.4.1.2.7 DEMODULATOR:BER THRESHOLD



Displays the BER threshold .

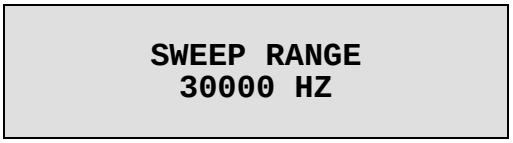
If the BER threshold set is exceeded, a receive fault will be indicated by the modem status indicators. BER threshold may be set from 1.0 E-3 to 1.0 E-8, or may be disabled by specifying NONE.

3.4.1.2.8 DEMODULATOR:SWEEP CENTER

Displays the sweep center frequency for the directed sweep function. When in directed sweep, the value from the sweep monitor screen (when the modem was last locked) should be entered for the sweep center frequency. The sweep center frequency can be set in the range from –35000 to +35000 Hz. Default: 0 Hz.

Upon entry, the current sweep center frequency is displayed with the flashing cursor on the first character. Press [←] or [→] to move the flashing cursor, and [↑] or [↓] to increase or decrease the digit at the flashing cursor. Press <ENTER> to execute the change.

3.4.1.2.9 DEMODULATOR:SWEEP RANGE



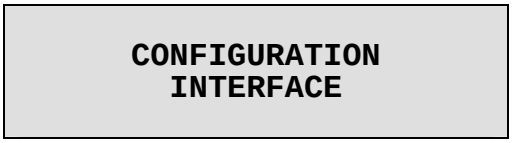
Displays the overall travel of the sweep width range during acquisition in the directed sweep mode. The sweep width may be set from 0 to 70000 Hz. Default: 30000 Hz.

When set at 70000 Hz, the modem is in Normal acquisition mode. The smaller the range, the faster the modem will lock, provided the receive carrier center frequency is within the RX-IF frequency sweep range.

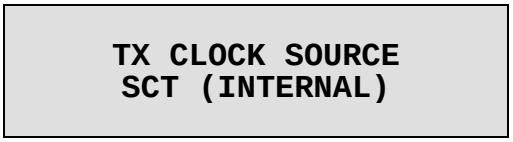
3.4.1.2.10 DEMODULATOR:REACQUISITION

Displays the sweep reacquisition mode time duration. This is the time that the modem will remain in a narrow sweep after loss of acquisition. After this timer runs out, the modem will return to the normal acquisition sweep. The reacquisition time is 0 to 999 seconds. Default: 0 seconds.

3.4.1.3 CONFIGURATION:INTERFACE



3.4.1.3.1 INTERFACE:TX CLOCK SOURCE



Programs the clock source for the modem transmitter clock to the following configurations:

TX Terrestrial	Sets the TX clock to recover timing from the incoming clock/data.
SCT (INTERNAL)	Sets the TX clock to operate from the modem internal clock (this also is the fallback clock). Note: When loop timing is enabled, SCT (LOOP) is displayed instead of SCT (INTERNAL).
EXT CLOCK	Sets the TX clock to operate from the EXT-CLK clock. Transmit clock source must be phase/frequency locked to the data that is being transmitted. The correct frequency must be programmed into EXT-CLK FREQ.

Upon entry, the current TX clock source is displayed. Press [↑] or [↓] to make the selection. Press <ENTER> to execute the change.

3.4.1.3.2 INTERFACE:TX CLOCK PHASE

```
TX CLOCK PHASE
   NORMAL
```

Programs the TX clock phase to AUTO, NORMAL, INVERT.

Upon entry, the current TX clock phase is displayed. Press [↑] or [↓] to make the selection. When AUTO is s elected, the modem will automatically select NORMAL or INVERT to properly phase the TX clock with the TX data. Press <ENTER> to execute the change.

3.4.1.3.3 INTERFACE:EXT-CLK FREQ

```
EXT-CLK FREQ
1544.000 KHZ
```

Programs the external reference clock input frequency between 8.0 kHz and 10.0 MHz. Default: 1544 kHz.

Note: The clock rate must be equal to the data rate unless the asymmetrical loop timing option is present.

This clock frequency can be any multiple of 600 Hz from 2.4 to 64 kHz, and can be any multiple of 8 kHz from 64 kHz to 4.376 MHz.

This can be used for the Doppler/plesiochronous buffer reference. It can be a reference to SCT. Use the master clock input on J8 for the external master reference. The EXT REF on CP3 only allows for 1, 5, 10, and 20 MHz external reference input.

Upon entry, the current setting for the external reference is displayed. Press [←] or [→] to increment or decrement the digit at the flashing cursor. Press [ENTER] to execute the change.

3.4.1.3.4 INTERFACE:BUFFER CLOCK

```
BUFFER CLOCK
RX  (SATELLITE)
```

Programs the interface buffer output clock to one of the following modes:

RX (SATELLITE)	Sets the output buffer clock to the satellite clock. (This is a Bypass.)
SCT (INTERNAL)	Sets the buffer clock to operate from the modem internal clock. This is also the fallback clock.
EXT. CLOCK	Sets this clock source to the external clock.
TX TERRESTRIAL	Sets the buffer output clock to recover timing from the incoming TX data clock.
INSERT CLOCK	Selects the recovered clock from the insert send data input received from the terrestrial equipment.

Upon entry, the current setting of the plesiochronous buffer clock is displayed. Press [↑] or [↓] to make the selection. Press [ENTER] to execute the change.

3.4.1.3.5 INTERFACE:RX CLOCK PHASE

```
RX CLOCK PHASE
NORMAL
```

Programs the RX clock phase to Normal or Inverted.

Upon entry, the status of the RX Clock is displayed. Press [↑] or [↓] to make the selection. Press [ENTER] to execute the change.

3.4.1.3.6 INTERFACE:B-BAND LOOP BACK

```
B-BAND LOOP BACK
OFF
```

Programs the modem for baseband loopback operation, On or Off.

When baseband loopback is turned on, the data and timing signals are switched from the demodulator to the modulator on the modem side of the interface. The DTE baseband signals are also looped back from the transmitter data and clock to receiver data and clock on the customer side of the interface. This is a bi-directional loopback of the baseband data. Refer to figure 3-4 for a block diagram of baseband loopback operation.

Upon entry, the status is displayed. Press [↑] or [↓] to make the selection. Press [ENTER] to execute the change.

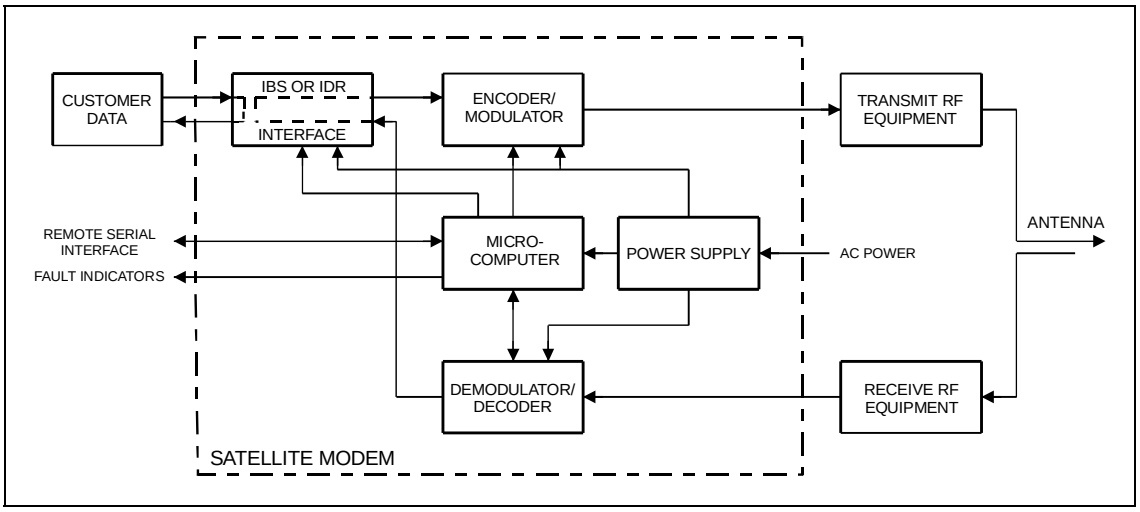


Figure 3-4. Baseband Loopback

Note: When baseband loopback is turned on, data is looped back on the customer side of the interface. This is a bi-directional loopback of the baseband data. This test mode will verify the customer equipment and cabling between the modem and the customer equipment. The baseband loopback is not bi-directional in D&I.

3.4.1.3.7 INTERFACE:BUFFER SIZE

Sets the size of the buffer, 32 to 262144 bits, 1 to 99 mS , or 0 (Bypass)

Upon entry, the current buffer length is displayed. Press [↑] or [↓] to select the desired buffer size. The buffer size is displayed in seconds or bits. Enter the Utility Interface menu to change the buffer units to seconds or bits.

- If selecting seconds, choose from 1 to 99 ms, in increments of 1 ms, or 0 (Bypass).
- If selecting bits, choose from 32 to 262144 bits, in increments of 16 bits.
- Press [ENTER] to execute the change.

Note: To have the modem calculate the plesiochronous shift, set the buffer units to ms. When a specific buffer depth is desired, set the buffer units to bits. Select bits or ms from the Utility Interface menu.

3.4.1.3.8 INTERFACE:BUFFER CENTER

This configuration function is used to center the buffer. Choosing YES centers the buffer.

Press <ENTER> twice to center the buffer.

3.4.1.3.9 INTERFACE:LOOP TIMING

```
LOOP TIMING
OFF
```

The SCT output will become phase-locked to the RX satellite clock.

TX and RX data rates must be equal unless the asymmetrical loop timing option is On or Off.

- Upon entry, the status is displayed.
- Press [↑] or [↓] to make the selection.
- Press [ENTER] to execute the change.

3.4.1.4 CONFIGURATION:SAVE

```
CONFIGURATION
SAVE
```

The Configuration Save menu allows programming of configuration parameters into memory on the M&C. There are five memory locations that may be used to store specific configuration setups that are used frequently. After changing the configuration parameters to the desired settings, enter the Configuration Save menu and select memory location 1 through 5.

Press [ENTER] to execute the save.

3.4.1.5 CONFIGURATION:RECALL

```
CONFIGURATION
RECALL
```

The Configuration Recall menu allows the user to recall a previously saved configuration setup. Upon entry, select memory location 1 through 5 by pressing [↑] or [↓].

Press [ENTER] to execute the recall.

3.4.2 FUNCTION SELECT:MONITOR

```
FUNCTION SELECT
   MONITOR
```

3.4.2.1 MONITOR:RAW BER

```
RAW BER
NO DATA
```

Displays the current BER or "No Data" (if carrier is not locked).

Range: < m.m E-e to > m.m E-e.

Note: Low limit is based on performance. High limit is based on data/code rate.

3.4.2.2 MONITOR:CORRECTED BER

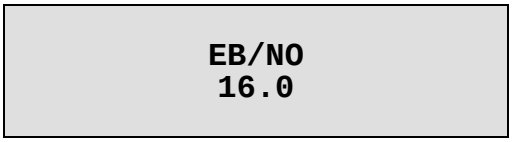
```
CORRECTED BER
   NO DATA
```

Displays the current corrected BER or "No Data" (if carrier is not locked).

Range: 1.0 E-3 to 1.0 E-12.

Note: Low limit is based on performance. High limit is 1.0 E-12.

3.4.2.3 MONITOR:EB/NO

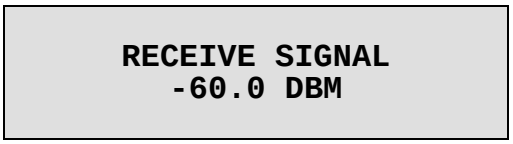


Displays the current E_b/N_0 or "No Data" (if carrier is not locked).

Range: 2.0 to 16.0 dB.

Note: Low limit is based on the data rate. High limit is 16.0 dB.

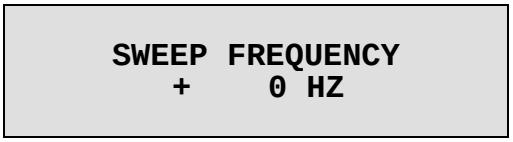
3.4.2.4 MONITOR:RECEIVE SIGNAL



Displays the current receive signal level.

Range: -25.0 to -60.0 dBm.

3.4.2.5 MONITOR:SWEEP FREQUENCY



Displays the current offset frequency or "No Data" (if carrier is not locked).

Range: -35,000 to +35,000 Hz.

3.4.2.6 MONITOR:BUFFER FILL

Displays the current plesiochronous buffer fill status percent.

Range: 1 to 99%.

3.4.3 FUNCTION SELECT:FAULTS/ALARMS

```
FUNCTION SELECT
FAULTS/ALARMS
```

The Faults/Alarms menu is accessible from the Function Select menu. The Faults/Alarms are similar to monitor functions, as they display the current fault status of the group being displayed.

Press [←] or [→] to move between the following Faults/Alarms groups:

- Modulator
- Demodulator
- Transmit Interface
- Receive Interface
- Common Equipment

Line 2 of the display shows the current Faults/Alarms status in real time. For each parameter monitored, fault status is displayed as one of the following:

- "–" indicates that no fault or alarm exists.
- "+" indicates that a fault exists, and will cause switching in a redundant system.
- Reversed contrast "+" indicates an active alarm.

Unlike faults, alarms do not cause switching to occur. To display labels for individual faults or alarms, press [ENTER].

Press [←] or [→] to move the flashing cursor to make the selection. The label for that Fault/Alarm is then displayed on line 1 of the display. Press [CLEAR] to exit this level of operation and return to the previous level.

The following sections outline the faults and alarms monitored and displayed in each group.

3.4.3.1 FAULTS AND ALARMS:MODULATOR

```
MODULATOR
+--------
```

IF SYNTHESIZER	Modulator IF synthesizer fault.
DATA CLOCK SYN	Transmit clock synthesizer fault. Indicates the internal Voltage Controlled Oscillator (VCO) has not locked to the incoming data clock.
I CHANNEL	I channel data activity fault.
Q CHANNEL	Q channel data activity fault.
AGC LEVEL	TX IF AGC level fault.
MODEM REF ACT	MODEM REF activity alarm.
MODEM REF PLL	MODEM REF PLL not locked.
MODULE	Modulator module fault.
CONFIGURATION	Modulator configuration fault.

3.4.3.2 FAULTS AND ALARMS:DEMODULATOR

```
DEMODULATOR
+-++-----
```

CARRIER DETECT	Carrier detect fault. Indicates the decoder is not locked.
IF SYNTHESIZER	Demodulator IF synthesizer fault. Indicates the IF synthesizer is not locked.
I CHANNEL	I channel activity fault. Indicates a loss of activity in the I channel of the quadrature demodulator.
Q CHANNEL	Q channel activity fault. Indicates a loss of activity in the Q channel of the quadrature demodulator.
BER THRESHOLD	Secondary alarm result of the BER threshold set in the DEMOD Configuration menu.
MODULE	Demodulator/decoder module fault.
CONFIGURATION	Demodulator/decoder configuration fault.

3.4.3.3 FAULTS AND ALARMS:TX INTERFACE

```
TX INTERFACE
---------
```

TX DROP	Not Applicable.
TX DATA/AIS	Data or AIS. When data fault is selected in the Interface Configuration menu, the fault indicates a data stable condition. This indicates the data is all 1s or 0s (i.e., data is not transitioning). When AIS is selected, the alarm indicates the data is all 1s from customer data input to the modem. When None is selected in the Interface Configuration menu, the TX Data/AIS Fault/Alarm is not activated. Note: AIS is an alarm, not a switching fault.
TX CLK PLL	Transmitter phase-locked loop fault. Indicates the transmitter Phase-Locked Loop (PLL) is not locked.
TX CLK ACTIVITY	Activity detector alarm of the selected interface transmit clock. The interface will fall back to the internal clock when this alarm is active.
TX AUDIO 1 CLIP	Not Applicable.
TX AUDIO 2 CLIP	Not Applicable.
CONFIGURATION	TX interface configuration fault. Indicates the TX interface cannot execute a programmed configuration parameter.

3.4.3.4 FAULTS AND ALARMS:RX INTERFACE

```
RX INTERFACE
---------
```

BUFFER UNDERFLOW	Buffer underflow alarm. Indicates that a buffer underflow has occurred.
BUFFER OVERFLOW	Buffer overflow alarm. Indicates that a buffer overflow has occurred.
RX DATA/AIS	Data or AIS. When data fault is selected in the Configuration Interface menu, the fault indicates a data stable condition. This indicates the data coming from the satellite is all 1s or 0s (i.e., data is not transitioning). When AIS is selected, the Alarm indicates the data is all 1s from the satellite. When None is selected in the Configuration Interface menu, the RX Data/AIS Fault/Alarm is not activated. Note: AIS is an alarm, not a switching fault.
FRAME BER	Frame BER fault. Indicates that the frame BER exceeds 1^{-3}.
BACKWARD ALARM	Not Applicable.
BUFFER CLK PLL	Buffer clock phase-locked loop fault. Indicates the buffer clock PLL is not locked.
BUFFER CLK ACT	Activity detector alarm of the selected interface receive clock. The interface will fall back to the satellite clock when this fault is active.
DEMUX LOCK	DEMUX lock fault. Indicates that the DEMUX is not locked.
RX 2047 LOCK	RX 2047 lock alarm. Indicates the RX 2047 data pattern is not locked. Note: This alarm is only active if RX 2047 is ON.
BUFFER FULL	Buffer full alarm. Indicates the buffer is less than 10% or greater than 90% full.
RX INSERT	Not Applicable.
RX AUDIO 1 CLIP	Not Applicable.
RX AUDIO 2 CLIP	Not Applicable.
CONFIGURATION	Configuration alarm.

3.4.3.5 FAULTS AND ALARMS:COMMON

```
COMMON
---------
```

BATTERY/CLOCK	Battery or clock fault.
-12V SUPPLY	-12V power supply fault.
+12V SUPPLY	+12V power supply fault.
+5V SUPPLY	+5V power supply fault.
SELF TEST	Not Applicable.
CONTROLLER	Controller fault. Typically indicates the controller has gone through a power on/off cycle.
INTERFACE MODULE	Interface module fault. Typically indicates that the interface module is missing or will not program.

3.4.4 FUNCTION SELECT:STORED FLTS/ALMS

```
FUNCTION SELECT
STORED FLTS/ALAMS
```

The modem stores the first 10 (Flt0 through Flt9) occurrences of fault status changes in each of the following major fault categories:

- Modulator
- Demodulator
- Transmit Interface
- Receive Interface
- Common Equipment

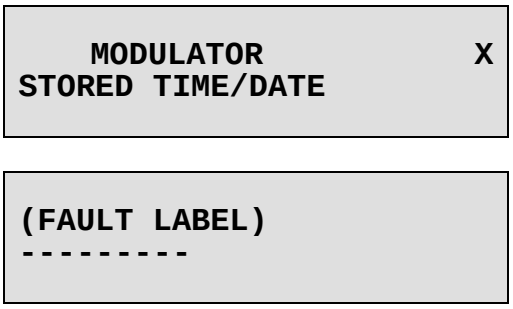
Each fault status change is stored with the time and date of the occurrence of the fault. Stored faults may be viewed by entering the stored faults level from the Select menu.

Stored faults are not maintained through controller power-on reset cycle. However, the last known time is maintained in nonvolatile Random Access Memory (RAM). On power-up, a common equipment fault is logged (Flt0) with that last known time and date. In addition, on power-up, an additional common equipment fault is logged (Flt1) to indicate the power-up time and date. The power-down and power-up times are logged as common equipment fault 0 and common equipment fault 1, respectively.

On entering the stored faults level, press [←] or [→] to move between the fault groups and the “Clear Stored Faults ?” selections. The time and date of the first stored fault status (Flt0) for the selected group will be displayed alternately on line 2 of the display. Press [↑] or [↓] to cycle through the selected group has stored fault status (Flt0 through Flt9). To display the fault status associated with the displayed time and date, press [ENTER]. To identify the fault, press [←] or [→] to move the flashing cursor. To clear the currently logged stored faults, press [ENTER] when the “Clear Stored Faults/Yes?” selection is displayed.

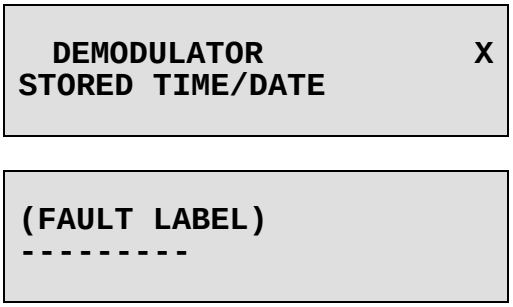
Note: Faults are stored in time sequence, with the oldest fault status change stored in Flt0, and the most recent in Flt9. Only the first 10 fault status changes are stored. All stored faults, which have not been used, indicate “No Fault” on the display.

3.4.4.1 STORED FLTS/ALMS:MODULATOR



IF Synthesizer
DATA CLOCK SYN
I CHANNEL
Q CHANNEL
AGC LEVEL
MODEM REF ACT
MODEM REF PLL
MODULE CONFIGURATION

3.4.4.2 STORED FLTS/ALMS:DEMODULATOR



CARRIER DETECT
IF SYNTHESIZER
I CHANNEL
Q CHANNEL
BER THRESHOLD
MODEL
CONFIGURATION

3.4.4.3 STORED FLTS/ALMS:TX INTERFACE

```
 TX INTERFACE          X
STORED TIME/DATE
```

```
(FAULT LABEL)
---------
```

TX DROP (Not Applicable)
TX DATA/AIS
TX CLK PLL
TX CLK ACTIVITY
TX AUDIO 1 CLIP (Not Applicable)
TX AUDIO 2 CLIP (Not Applicable)
CONFIGURATION

3.4.4.4 STORED FLTS/ALMS:RX INTERFACE

```
 RX INTERFACE          X
STORED TIME/DATE
```

```
(FAULT LABEL)
---------
```

BUFFER UNDERFLOW
BUFFER OVERFLOW
RX DATA/AIS
FRAME BER
BACKWARE ALARM (Not Applicable)
BUFFER CLK PLL
BUFER CLK ACT
DEMUX LOCK
RX 2047 LOCK
BUFFER FULL
RX INSERT (Not Applicable)
RX AUDIO 1 CLIP (Not Applicable)
RX AUDIO 2 CLIP (Not Applicable)
CONFIGURATION

3.4.4.5 STORED FLTS/ALMS:COMMON

```
 COMMON              X
STORED TIME/DATE
```

```
(FAULT LABEL)
---------
```

BATTERY/CLOCK
-12 VOLT SUPPLY
+12 VOLT SUPPLY
+5 VOLT SUPPLY
SELF TEST (Not Applicable)
CONTROLLER
INTERFACE MODULE

3.4.4.6 STORED FLTS/ALMS:UNAVL SECONDS

```
  UNAVAL SECONDS        X
STORED TIME/DATE
```

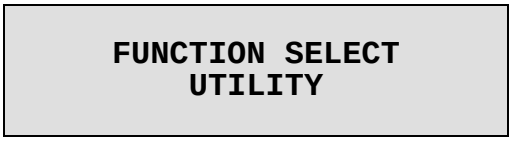
Note: Reed-Solomon option only.

A fault is indicated if the Reed-Solomon Codec could not correct bit errors in one block of serialized data in any given second.

3.4.4.7 STORED FLTS/ALMS:CLEAR

```
      CLEAR ??
   STORED FAULTS
```

3.4.5 FUNCTION SELECT:UTILITY



The Function Select Utility menu is divided into the following categories:

- Modulator
- Demodulator
- Interface
- Network
- System
- Modem Type
- Factory Setup

The menu information includes:

- Filter Types
- Terrestrial Interface Types
- Mod/Demod Types
- Time/Date
- Encoder/Decoder Types
- Modem Types
- Current Firmware
- Test Mode Status
- Overhead Type
- Revision Emulation
- Lamp Test

Provisions are also made for assigning data and code rates to the modulator and demodulator.

After entering the Utility menu, press [←] or [→] to select the desired sub-menu, and press [ENTER].

Notes:

1. The Utility Factory Setup menu is for Comtech EF Data service personnel only. Entering this menu without authorization may cause the modem to operate incorrectly.
2. Changes in the Utility menu may cause changes in other front panel menus.

3.4.5.1 UTILITY:MODULATOR

```
UTILITY
MODULATOR
```

3.4.5.1.1 MODULATOR: ASSIGN TRANSMIT FILTERS

```
ASSIGN
TRANSMIT FILTERS
```

Transmit code rate/type as follows:

TX-A QPSK 1/2 19.200 kbps
TX-B QPSK 1/2 19.200 kbps
TX-C QPSK 1/2 19.200 kbps
TX-D QPSK 1/2 19.200 kbps
TX-V QPSK 1/2 19.200 kbps

Upon entry, the current transmitter rate is displayed.

3.4.5.1.2 MODULATOR:MOD POWER OFFSET

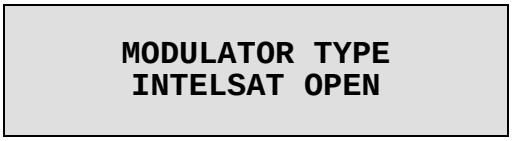
```
MODEM POWER OFFSET
     + 0.0 DB
```

Modulator power offset adjust. Offsets the modulator output power readout in the Configuration menu. This feature does not actually change the modulator power level, but displays an offset value in the monitor.

The modulator power offset range is -99.9 to +99.9 dB, in 0.1 dB steps.

Note: Anything except 0.0 dB will cause ADJ to be displayed for the TX power level.

3.4.5.1.3 MODULATOR:MODULATOR TYPE



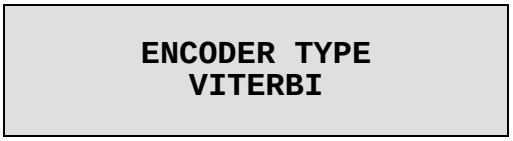
Transmit filter type select. Select one of the following for network filtering:

Note: Change in EFD, ASYNC, or Custom modem types only.

INTELSAT OPEN	FDC CLOSED
EFD CLOSED	SDM-51 COMPATIBLE
CSC CLOSED	

Notes:
1. TX filter type is selectable only when CUSTOM is selected for the modem type in the Utility Modem Type menu.
2. Code Rate 3/4 is not compatible with a combination of a CSC CLOSED Modulator Type and Sequential Encoder.

3.4.5.1.4 MODULATOR:ENCODER TYPE



Encoder type selection. Select VITERBI or SEQUENTIAL encoder type.

Notes:
1. Change in EFD, ASYNC, or Custom modem types only.
2. A Sequential Encoder Type and a 3/4 Code Rate combination is not compatible with a CSC CLOSED Modulator Type.

Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change.

3.4.5.1.5 MODULATOR:TX BPSK ORDERING

```
TX BPSK ORDERING
STANDARD
```

Transmit BPSK bit ordering selection. Select STANDARD or NON-STANDARD

Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change.

3.4.5.1.6 MODULATOR:MOD SPECTRUM

```
MOD SPECTRUM
NORMAL
```

Programmable vector rotation allows the operator to select NORMAL or INVERT for spectrum reversal of the I and Q baseband channels.

Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change

3.4.5.1.7 MODULATOR:TX MODE

```
TX MODE
BURST
```

Selection of BURST or CONTINUOUS. Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change.

3.4.5.1.8 MODULATOR:TX SYMBOL RATE

```
TX SYMBOL RATE
19.200 KSPS
```

Status only. Selects TX Symbol Data rate.

3.4.5.2 UTILITY:DEMODULATOR

```
UTILITY
DEMODULATOR
```

3.4.5.2.1 DEMODULATOR:ASSIGN TRANSMIT FILTERS

```
ASSIGN
TRANSMIT FILTERS
```

Receive code rate/type as follows:

RX-A QPSK 1/2 19.200 kbps
RX-B QPSK 1/2 19.200 kbps
RX-C QPSK 1/2 19.200 kbps
RX-D QPSK 1/2 19.200 kbps
RX-V QPSK 1/2 19.200 kbps

Upon entry, the current transmitter rate is displayed.

3.4.5.2.2 DEMODULATOR: DEMODULATOR TYPE

```
DEMODULATOR TYPE
 INTELSAT OPEN
```

Transmit filter type select. Select one of the following for network filtering:

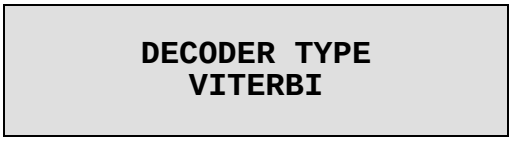
Note: Change in EFD, ASYNC, or Custom modem types only.

INTELSAT OPEN	FDC CLOSED
EFD CLOSED	SDM-51 COMPATIBLE
CSC CLOSED	

Notes:

1. TX filter type is selectable only when CUSTOM is selected for the modem type in the Utility Modem Type menu.
2. Code Rate 3/4 is not compatible with a combination of a CSC CLOSED Modulator Type and Sequential Encoder.

3.4.5.2.3 DEMODULATOR:DECODER TYPE



Decoder type selection. Select VITERBI or SEQUENTIAL decoder type.

Notes:

1. Change in EFD, ASYNC, or Custom modem types only.
2. A Sequential Decoder Type and a 3/4 Code Rate combination is not compatible with a CSC CLOSED Modulator Type.

Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change.

3.4.5.2.4 DEMODULATOR:RX BPSK ORDERING

Receive BPSK bit ordering selection. Select STANDARD or NON-STANDARD

Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change.

3.4.5.2.5 DEMODULATOR:DEMOD SPECTRUM

Programmable vector rotation allows the operator to select NORMAL or INVERT for spectrum reversal of the I and Q baseband channels.

Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change.

3.4.5.2.6 DEMODULATOR:RX MODE

```
RX MODE
CONTINUOUS
```

Selection of BURST or CONTINUOUS.

Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change..

3.4.5.2.7 DEMODULATOR:RX SYMBOL RATE

```
RX SYMBOL RATE
19.200 KSPS
```

Status only.

Selects RX Symbol Data rate, with 4.800 to 2500.000 ksps.

3.4.5.3 UTILITY:INTERFACE

```
UTILITY
INTERFACE
```

3.4.5.3.1 INTERFACE:TX OVERHEAD TYPE

```
TX OVERHEAD TYPE
NONE
```

Select None for TX overhead type.

Note: Overhead types are selectable only when Custom is selected for modem type in the Utility Modem Type menu.

3.4.5.3.2 INTERFACE:RX OVERHEAD TYPE

Select None RX overhead type.

Note: Overhead types are selectable only when Custom is selected for modem type in the Utility Modem Type menu.

3.4.5.3.3 INTERFACE:TX TERR INTERFACE

Displays the TX interface type RS-232, RS-422, or V.35.

Note: Not applicable since SNM-1000 is not used for User Data Traffic.

3.4.5.3.4 INTERFACE:RX TERR INTERFACE

Displays the RX interface type RS-232, RS-422, or V.35.

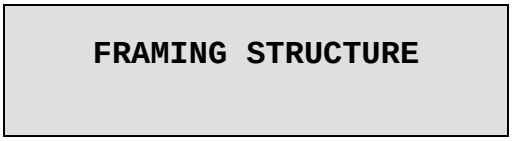
Note: Not applicable since SNM-1000 is not used for User Data Traffic.

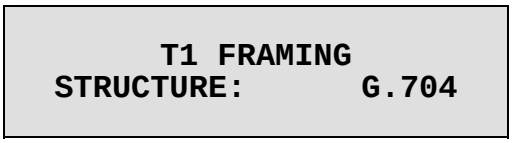
3.4.5.3.5 INTERFACE:BUFFER PROGRAM

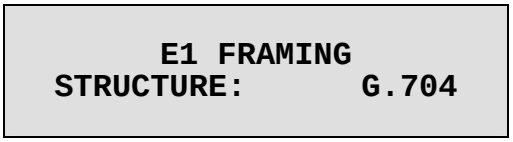
Buffer unit program function. Select MILLI-SECONDS or BITS.

Note: To have the modem calculate the plesiochronous shift, set the buffer units to MILLI-SECONDS. For a specific buffer depth, set the buffer units to BITS.

3.4.5.3.6 INTERFACE:FRAMING STRUCTURE



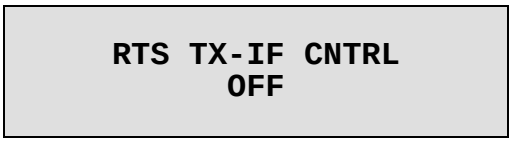




Displays the currently selected framing type and structure of the data. This function is used with the buffer program in ms for plesiochronous buffer slips.

Upon entry, the framing type (T1 or E1) is displayed on Line 1. The framing structure of each type (None or G.704) is displayed on Line 2. Press [←] or [→] and [↑] or [↓] to select framing structure and type. Press [ENTER] to execute the change.

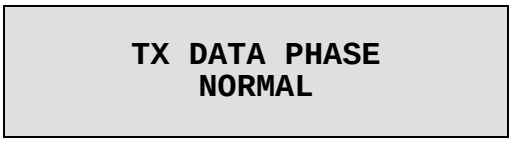
3.4.5.3.7 INTERFACE:RTS TX-IF CNTRL



Programs the modem to allow a Request To Send (RTS) signal to On or Off the output when data is ready for transmission.

Press[←], [→], [↑], or [↓] to move the flashing cursor. Press [ENTER] to execute the change.

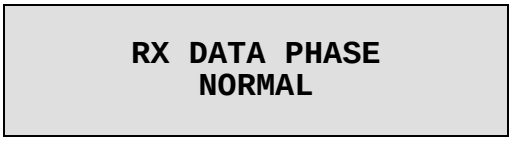
3.4.5.3.8 INTERFACE:TX DATA PHASE



TX data phase relationship. Use this option to select NORMAL or INVERT for the TX data relationship to the selected TX clock.

Upon entry, press [↑] or [↓] to make the selection. Press [ENTER] to execute the change.

3.4.5.3.9 INTERFACE:RX DATA PHASE



RX data phase relationship. Use this option to select NORMAL or INVERT for the RX data relationship to the selected RX clock.

Upon entry, press [↑] or [↓] to make the selection. Press [ENTER] to execute the change.

3.4.5.3.10 INTERFACE:CTS DELAY

Sets the delay in seconds (0 to 60) for the Clear To Send (CTS) signal.
Default: 0 Seconds.

3.4.5.4 UTILITY:NETWORK

3.4.5.4.1 NETWORK:RELEASE

Status only.

Shows installed version of DAC code and code's CRC in hexadecimal.

e.g. rel 4.3.0 p cc14

3.4.5.4.2 NETWORK:CHANNELS 1 -15

```
CHANNELS 1 – 15
---------------
```

Status only.

- = Traffic Modem Not Installed
I = Traffic Modem Idle
O = Traffic Modem Offline
C = Call in Progress
S = Connecting Call
D = Disconnecting Call

3.4.5.4.3 NETWORK:CHANNELS 16 - 31

```
CHANNELS 16 – 31
---------------
```

3.4.5.5 UTILITY:SYSTEM

```
        UTILITY
        SYSTEM
```

3.4.5.5.1 SYSTEM:TIME/DATE

```
TIME: 12:00:00AM
DATE: 7/04/1976
```

Time of day and date display/set function.

The current time and date in the modem's memory are displayed when selected.

To change the modem time and/or date, press [ENTER].

- Press [←] or [→] to position the cursor over the parameter to be changed.
- Press [↑] or [↓] to change the parameter.
- Once the parameters are displayed as desired, press [ENTER] to set the time and date.

3.4.5.5.2 SYSTEM:REMOTE BAUD RATE

```
REMOTE BAUD RATE
19.200 BPS NONE
```

The parity and baud rate settings of the modem are displayed.

To change the modem parity, press [ENTER].

- Press [←] or [→] to position the cursor over the parameter to be changed.
- Press [↑] or [↓] to change the parameter.
- Once the parameters are displayed as desired, press [ENTER] to set the baud rate and parity.
- The parity can be set to EVEN, ODD, or NONE.

The baud rate is 19200 bit/s.

3.4.5.5.3 SYSTEM:REMOTE ADDRESS

```
REMOTE ADDRESS
      1
```

The current modem address is displayed (1 to 255).

Note: 0 is reserved as a global address.

To change the remote address, press [ENTER]. Press [↑] or [↓] to make the selection. Press [ENTER] to execute the change.

3.4.5.5.4 SYSTEM:REMOTE TYPE

```
REMOTE TYPE
RS485 (2-WIRE)
```

Select RS-485 (2-Wire), RS-485 (4-Wire), or RS-232.

3.4.5.5.5 SYSTEM:OPERATION MODE

```
OPERATION MODE
   DUPLEX
```

Programs the modem for DUPLEX, TRANSMIT ONLY, or RECEIVE ONLY operation.

Upon entry, the operational status may be changed. Press [↑] or [↓] to make the selection. Press [ENTER] to execute the change.

Note: When TRANSMIT ONLY or RECEIVE ONLY are selected, the appropriate faults are masked from the Faults and Stored Faults menus.

3.4.5.5.6 SYSTEM:YEAR DISPLAY

```
YEAR DISPLAY
  2 - DIGIT
```

Selects the display for the year in either 2-digit or 4-digit format.

Upon entry, the year display may be changed. Press [↑] or [↓] to make the selection. Press [ENTER] to execute the change

3.4.5.5.7 SYSTEM:TEST MODE STATUS

```
TEST MODE STATUS
---------
```

Test mode status indicator. The following modem test points are listed and display a "+" when a test mode is active:

- RS CORR OFF
- INTRFC LOOP BACK
- B-BAND LOOP BACK
- RF LOOP BACK
- IF LOOP BACK
- CARRIER MODE
- RX 2047 Pattern
- TX 2047 Pattern

To view the test modes, press [ENTER]. Press [↑] or [↓] to make the selection.

3.4.5.5.8 SYSTEM:LAMP TEST ??

```
LAMP TEST ??
PRESS ENTER
```

Lamp test function. Press [ENTER] to turn the front panel indicators on for 3 seconds.

3.4.5.5.9 SYSTEM:SELF TEST (NOT APPLICABLE)

3.4.5.5.10 SYSTEM:DISPLAY CONTRAST

```
DISPLAY CONTRAST
  LEVEL:    64
```

Sets the contrast setting of the Front Panel menu.

Press [ENTER] to begin. Press [↑] or [↓] to increment or decrement the number at the flashing cursor, from 0 to 100. Press [ENTER] to execute the change.

3.4.5.5.11 SYSTEM:M&C FIRMWARE

```
M&C FIRWARE
FW/NNNNNN-DDR
```

Displays the M&C module firmware version.

The display includes the month, day, and year.

3.4.5.5.12 SYSTEM:BOOT FIRMWARE

```
BOOT FIRWARE
FW/NNNNNN-DDR
```

Displays the boot module firmware version.

The display includes the month, day, and year

3.4.5.5.13 SYSTEM:FPGA FIRMWARE

```
FPGA FIRWARE
FW/NNNNNN-DDR
```

Displays the FPGA module firmware version.

The display includes the month, day, and year

3.4.5.5.14 SYSTEM:EXT AGC: MAX PWR

```
EXT AGC: MAX PWR
   0.0 VOLTS
```

Sets the AGC voltage for a receive signal level of -60.0 dBm. The voltage range is 0.0 to 10.0V, in 0.5V steps.

Upon entry, the current external AGC voltage level is displayed. Press [↑] or [↓] to increment or decrement the AGC voltage level in 0.5V steps. Press [ENTER] to execute the change.

Note: For any receive signal level between -25.0 and -60.0 dBm, the software will interpolate the required AGC voltage.

3.4.5.5.15 SYSTEM:EXT AGC: MIN PWR

```
EXT AGC: MIN PWR
  10.0 VOLTS
```

Sets the AGC voltage for a receive signal level of -25.0 dBm. The voltage range is 0.0 to 10.0V, in 0.5V steps.

Upon entry, the current external AGC voltage level is displayed. Press [↑] or [↓] to increment or decrement the AGC voltage level in 0.5V steps. Press [ENTER] to execute the change.

Note: For any receive signal level between -25.0 and -60.0 dBm, the software will interpolate the required AGC voltage.

3.4.5.5.16 SYSTEM:MASTER RESET

```
MASTER RESET
HARD/SOFT
```

Initiating a hard reset will reset the modem and place the default configuration settings in ROM. Initiating a soft reset will reset the modem hardware, but saves the current configuration settings.

Select [ENTER] once to access HARD or SOFT.
Press [←] or [→] to make the selection. Press [ENTER].
Press [→] five times to move the cursor to YES. Select YES and press [ENTER] again.

Note: The following parameters do not revert to default settings after a hard reset:

- Address
- Parity
- Baud Rate
- Remote Type
- Ext AGC: Min Pwr
- Ext AGC: Max Pwr
- Display Contrast

3.4.5.6 UTILITY:MODEM TYPE

```
UTILITY
MODEM TYPE
```

3.4.5.6.1 MODEM TYPE:MODEM TYPE

```
MODEM TYPE
CUSTOM
```

Selects the following types of modem operation:

- CUSTOM Selections are made from the Front Panel menu
- EFD Closed Network Operation

When the modem is changed from one type of operation to another, the modem will be reset to the default configurations of the new modem type. The RF-IF Output must be turned on to get the modem to lock.

- If the existing modem type is the same as the type entered, the modem will not change any parameters.
- If the modem type is changed to Custom, no parameters will be changed.
- If the modem will not allow the modem type selection, that type of operation may not be an available option.
- Select MODEM OPTIONS and OVERHEAD OPTIONS to see which modem operations are allowed.

Note: D&I is designed to work with the G.703 interface only.

3.4.5.6.2 MODEM TYPE:MODEM EMULATION

```
MODEM EMULATION
DISABLED
```

Selects the following types of modem emulation:

SDM-100	VER:	15.7.1
SDM-300		6.2.2
SDM-308-4		4.03
SDM-308-4		6.05
SDM-308-4		6.08
SDM-308-4		7.03
SDM-309		6.04
SDM-650		4.12A
SDM-650		4.16
SDM-6000		5.1.1

or Disabled

Upon entry, the current modem emulation is displayed. Press [↑] or [↓] to change the display. Press [ENTER] to execute the change.

3.4.5.6.3 MODEM TYPE:REVISION EMULATION

```
REV EMULATION
CURRENT VERSION
```

Programs an emulation mode of a previous functional revision. This allows the user to select the CURRENT VERSION or FUNCTIONAL X.

Note: The number displayed in the CURRENT VERSION position increases with each software version change.

Upon entry, the CURRENT VERSION is displayed. Press [↑] or [↓] to select the FUNCTIONAL version. Press [ENTER] to execute the change.

Notes:

1. Programming a current version (default) allows all features and options (if installed) to operate normally.
2. Programming a FUNCTIONAL version (X) eliminates any changes that affect the later version. Only functional changes are affected by the revision emulation feature.
3. A correction change (e.g., VER 3.1.2) remains fixed in accordance with the latest version. Since the revision emulation default is the current version, program the functional version at the start of each operation.
4. The revision emulation feature does not affect some interface changes for the direct operation of the modem (Configuration save/recall, test mode screen in the Utility/System, all factory setup modes, etc.).

3.4.5.6.4 MODEM TYPE:MODEM OPTIONS

```
MODEM OPTIONS
-------------
```

Displays the installed modem options.

If the option is installed, a "+" symbol is displayed. To view the available options press [ENTER]. Observe for the flashing cursor. Press the [←] [→] arrows to move from one symbol to the next. The first line will display the option. The second line will display the status:

HIGH POWER	(0)	0 = Not Installed, Not Upgradeable
HIGH STABILITY	(0)	- = Not Installed
ASLT	(-)	+ = Installed
VITERBI	(+)	X = Not Installed, Field Upgradeable
SEQUENTIAL	(-)	
SINGLE RATE	(-)	
LOW RATE VAR	(-)	
FULL RATE VAR	(+)	
CARD #1 PCB	(+)	
CARD #2 PCB	(x)	
CARD #3 PCB	(x)	
8PSK 2/3	(-)	
TX ONLY	(-)	
RX ONLY	(-)	

3.4.5.6.5 MODEM TYPE:CARD #1 TYPE

```
CARD #1 TYPE
   DAC 01
```

Status Only.

Displays either of the following:

- DAC 01
- NOT INSTALLED

3.4.5.6.6 MODEM TYPE:CARD #2 TYPE (NOT INSTALLED)

3.4.5.6.7 MODEM TYPE:CARD #3 TYPE (NOT INSTALLED)

3.4.5.6.8 MODEM TYPE:LOCAL MODEM AUPC

```
LOCAL MODEM AUPC
      OFF
```

Configures the modem for the self-monitoring Local Modem AUPC mode and for local TX power control (self-monitoring) due to severe rain fade.

Notes:

1. The self-monitoring Local Modem AUPC mode is not used when the ASYNC/AUPC is selected as the Modem Type.
2. Used for local control (self-monitoring) due to severe rain fade.

3.4.5.6.9 MODEM TYPE:MODEM SERIAL

```
MODEM SERIAL
  123456789
```

Status Only

3.4.5.6.10 MODEM TYPE:CONFIGURATION CODE - MODEM

```
CONFIGURATION
CODE - MODEM
```

```
1)   AAAAAAAAAA
2)   AAAAAAAAAA
```

If installed, Status Only
Comtech EF Data supplied code.

.

3.4.5.7 UTILITY:FACTORY SETUP (NOT APPLICABLE)

3.5 User Port Operation

The User Port allows the user at the remote site to communicate with the remote control SNM-1000 to request the setup and termination of circuits, send and receive service messages, and configure the SNM-1000. The commands configure and control the SNM-1000 and the traffic modems that have addresses within the range of 1 through 30. The remote control SNM-1000 modem always utilizes address zero.

The User Port uses a 9-pin mini-DIN female connector on the rear of the SNM-1000. The port is configured as a DCE with the pin definitions as shown in the following listing.

Signal Function	Name	Pin #	I/O	Signal Level
Receiver Ready	RR	1	O	EIA-232
Receive Data	RD	2	O	EIA-232
Send Data	SD	3	I	EIA-232
Terminal Ready	TR	4	I	EIA-232
Signal Ground	SG	5		
Data Mode	DM	6	O	EIA-232
Request to Send	RS	7	I	EIA-232
Clear to Send	CS	8	O	EIA-232
Incoming Call	IC	9	O	EIA-232

The interface operates at 19.2 kbps, 8 data bits, No Parity, and 1 Stop Bit. Levels are in accordance with EIA-232. The User Port can also be accessed using an optional Public Switched Telephone Network (PSTN) dial-up modem.

3.6 Remote Dial-Up Capability

The SNM-1000 User Port can be accessed via an external PC modem. A user dials into an SNM-1000 from a remote location using the following items:

- Personal computer
- Auto-interface speed-detect modem
- Modem terminal software capable of emulating an ANSI terminal

3.6.1 User Port Modem

The remote dial-up was tested using a US Robotics, Inc. external Sportster™ 28.8 modem with V.34 and V.32bis at the User Port. Recommended dip switch settings for this modem are described in the following listing.

Pin 1	Down	Data Terminal Override
Pin 2	Up	Verbal Result Codes
Pin 3	Up	Suppress Result Codes
Pin 4	Down	No Echo, Off-line Commands
Pin 5	Up	Auto Answer On
Pin 6	Up	Carrier Detect Normal
Pin 7	Up	Load NOVRAM Defaults
Pin 8	Up	Dumb Mode

The US Robotics, Inc. external Sportster™ 28.8 modem or a similar modem should be used at the User Port.

3.6.2 Remote Site Modem

The remote dial-up was tested using a US Robotics, Inc. external or internal Sportster™ 28.8 modem with V.34 and V.32bis at the remote site. Recommended dipswitch settings for this modem are the factory default settings.

The US Robotics, Inc. external or internal Sportster™ 28.8 modem or a similar modem should be used at the remote site.

On the PC, modem setting requirements include the following:

ANSI emulation
19.2, 8, N, 1
Software flow control XON/XOFF
1 ms character pacing for ASCII uploads

3.7 SNM-1000 Commands

The commands described in this section are used to set SNM-1000 functional parameters within a DAMA environment. Refer to Appendix A for commands used to communicate with external modems attached to an SNM-1000.

3.7.1 Character Set

The interface responds to ASCII characters in the range of 0x00 to 0x7F. The 8th bit (most significant) is not generated on the transmit side and is ignored on the receive side.

3.7.2 Status Lines and Flow Control

The interface ignores all status inputs.

3.7.3 Message Structure

A message is either a command or a response. Each message is made up of three elements:

- Prefix
- Message body
- End character

3.7.3.1 Prefix

The prefix consists of the channel number in ASCII decimal, with a valid range of 0 through 30. Leading zeros are ignored. Prefix 0 is valid for an SNM-1000 Node Control modem and prefixes 1 through 30 are valid for external traffic modems attached to the SNM-1000 such as SDM-300s, SDM-6000s, etc.

3.7.3.2 Message Body

The message body is made up of individual commands and fields.

Certain conventions are used to improve the readability of the commands presented in this document. These conventions do not appear in the commands themselves. Conventions used in the command names and descriptions include the following characters.

[...] Square brackets are used to indicate that the enclosed items are optional. (The square brackets themselves do not appear in the message.)

<...> Angle brackets are used to enclose the names of other syntactical elements. (When those elements appear in an actual message, the actual element is used and the angle brackets are omitted.)

‘...’ Single quotes are used to enclose an ASCII character for illustration of syntax elements. (The single quotes themselves do not appear in the message.)

3.7.3.3 End Character

The end character for both command and response messages is a carriage return (represented by “cr”).

3.7.3.4 Case Sensitivity

Messages are not case sensitive. However, the DCE generates responses and results in uppercase text.

3.7.3.5 Delimiters

Commas and semicolons are valid delimiters that may be used interchangeably with no difference in behavior.

3.7.3.6 End Character

Each message is ended with a single character which signals the end of the message:

“]” End bracket for responses.

3.7.3.7 Queries

The interface can be queried by issuing a valid command without a value at the end. This will result in the return of the currently set value.

Example (assume a previously sent command as shown):

ICF 70.4567'cr' — sets inbound control IF frequency to 70.4567 MHz.

Now a query:

ICF'cr'

Response from interface:

ICF 70.4567 — inbound control IF frequency is 70.4567 MHz.

3.7.4 Node Address (NA)

This command sets the node number for the remote control channel mode SNM-1000 controller.

3.7.4.1 Command Format

NA <node_number>'cr'

<node_number>	Range of 1 to 9999 and must be unique in the network. Unpredictable results will occur if two nodes are online and both have been assigned the same node number. The node number will generally be defined by the provisioning documents that establish remote sites and circuits.

3.7.4.2 Local Command Responses

node address = <node_number>	

3.7.5 Receive Control Channel Frequency (ICF)

This command sets the receive (NMS to remote) control channel IF frequency at the remote node.

3.7.5.1 Command Format

ICF <frequency>'cr'

<frequency>	Entered in MHz. Range of 50 to 90 MHz, or 100 to 180 MHz Resolution of 100 Hz. Formatting is pseudo-floating point. Example: ICF 70.4567 sets receive control IF frequency to 70.4567 MHz.

3.7.5.2 Local Command Responses

ICF= <frequency>, <control channel offset>, <traffic channel offset>	

3.7.6 Transmit Control Channel Frequency (OCF)

This command sets the transmit (remote to NMS) control channel IF frequency at the remote node.

3.7.6.1 Command Format

OCF <frequency>'cr'

<frequency>	Entered in MHz. Range of 50 to 90 MHz, or 100 to 180 MHz. Resolution of 100 Hz. Formatting is pseudo-floating point. Example: OCF 70.1234 sets transmit control IF frequency to 70.1234 MHz.

3.7.6.2 Local Command Responses

OCF= <frequency>, <control channel offset>, <traffic channel offset>	

3.7.7 Transmitter On (RF_ON)

This command enables the SNM-1000 transmitter.

3.7.7.1 Command Format

RF_ON'cr'

3.7.7.2 Local Command Responses

None.

3.7.8 Transmitter Off (RF_OFF)

This command disables the SNM-1000 transmitter.

3.7.8.1 Command Format

RF_OFF'cr'

3.7.8.2 Local Command Responses

None.

3.7.9 Transmit Power (TX)

This command sets the SNM-1000 transmit power.

3.7.9.1 Command Format

TX <tx_power>'cr'

<tx_power>	In the range of +5 to -30 dBm, in 0.1 dBm steps. The format for TX_power is [+] XX.X with an implied minus sign.

3.7.9.2 Local Command Responses

transmit power = <tx_power>	

3.7.10 Current SNM-1000 DAC Software Revision (VER)

This command queries the SNM-1000 DAC board for its current software revision number.

3.7.10.1 Command Format

VERSION'cr' or VER'cr'

3.7.10.2 Local Command Responses

DAC VERSION: X.Y.ZZZ.CCCC	Where: X.Y = SNM-1000 DAC software release number. ZZZ = Revision level for the release. CCCC = Checksum

3.7.11 Node to NMS Service Messages (NMS_MSG)

This command permits the transmission of up to 28 ASCII text characters to the NMS.

3.7.11.1 Command Format

NMS_MSG 'text string to be transmitted to the NMS''cr'

3.7.11.2 Local Command Responses

None.

3.7.12 SNM-1000 Mode (MD)

This command sets the SNM-1000 mode.

3.7.12.1 Command Format

MD <mode>'cr'

<mode>	EXT Remote Control Channel-External Traffic Remote Control Channel-External Traffic mode — the modem performs control functions to control external traffic modems..

3.7.12.2 Local Command Responses

mode = <mode>	

3.7.13 Built-In Diagnostic Tests (EFD_DIAG)

Note: Qualified personnel shall perform these tests only.

This command starts the SNM-1000 DAC Diagnostic software:

```
EFD_DIAG'cr'
```

Wait several seconds. The User Port will display:

```
Diagnostic Test, Press F1 for Help.
>
```

Enter an ANSI F1 function key character sequence to display the diagnostic main menu:

```
F1: Help Screen
F2: Transfer Control to Flash Loader
F3: Transfer Control to PDREM Ram
F4: Restore Area 1 Defaults
F5: Restore Area 2 Defaults

1:  Run Ram test
2:  Run NOVRAM cycle power test
3:  Run Chip Select test
4:  Run EFBUS1 to EFBUS2 loopback test
5:  Run EFBUS2 to EFBUS1 loopback test
6:  Run Service Terminal loopback test
7:  Alarm Input Test
```

To leave the diagnostic tests and return to SNM-1000 operational code, enter an ANSI F4 function key character sequence.

Selecting any menu selection other than "F4" may cause unpredictable operation of the SNM-1000.

3.7.13.1 Help Screen

To display the menu selection for the Comtech EF Data diagnostics, select menu option "F1" by entering an ANSI F1.

3.7.13.2 Flash Updates

Select menu option "F2" by entering an ANSI F2. This will begin the flash update procedure, causing the User Port to display:

```
> > Xfer Control to Flash Loader

READY FOR FLASH CODE. START ASCII UPLOAD WITH S/W FLOW CONTROL
USE ctrl z KEY TO COMPLETE THE DOWNLOAD OR ctrl c TO ABORT
```

The SNM-1000 then waits for an Intel hex format software download properly terminated with an end of record marker.

Using the ASCII file upload utility on the PC terminal emulation program, upload the appropriate Intel hex file. The User Port will display the following progress messages as the update proceeds:

```
    Sending Flash Setup Commands ...
    Erasing sector
    Sending Flash Setup Commands ...
.....................................................................................
```

When the file transfer to the SNM-1000 has completed, enter 'CTRL Z' from the PC terminal program.

Note: Making any entry other than 'CTRL Z' will cause a failure of the file transfer.

If the SNM-1000 FLASH update is successful, the User Port will display:

```
Flash programming complete
```

The SNM-1000 will reset and begin to execute SNM-1000 operational code.

The User port will display an error message for any errors that occur during the programming sequence. Possible error message are listed in the following listing.

DAC FLASH WRITE FAILURE	Failure in flash programming.
DAC FLASH ERASE FAILURE	Failure in erasing a Flash sector.
DAC FLASH TIME OUT	Flash part not responding with the correct programming status.
DAC FLASH PROGRAMMING FAILURE	An error was found in the upload data.

The download process can be terminated with a 'CTRL C'.

3.7.13.3 PDREM Ram

To load a RAM-based version of a remote debugger, select menu option "F3" by entering an ANSI F3.

3.7.13.4 Area1 Defaults

To cause the SNM-1000 to execute SNM-1000 code stored in FLASH AREA 1, select menu option "F4" by entering an ANSI F4.

3.7.13.5 Area2 Defaults

To cause the SNM-1000 to execute SNM-1000 code stored in FLASH AREA 2, select menu option "F5" by entering an ANSI F5.

3.7.13.6 Ram Test

To perform a write/read/compare operation on locations 70000H to 7FFFFH of SNM-1000 DRAM with a 55AA pattern, select menu option "1".

3.7.13.7 NOVRAM Cycle Power Test "2"

To test the SNM-1000 NOVRAM, perform the following steps.

1. Power up the SNM-1000.

2. Select menu option "2" (NOVRAM test). This test will fail due to the unknown content of NOVRAM, and will store a pre-set pattern into NOVRAM.

3. Cycle the power and select menu option "2" again. If the test does not pass, the SNM-1000 NOVRAM has failed.

3.7.13.8 Chip Select Test

To test the SNM-1000 Quad Pack A-D and the 1550 UART, select menu option “3”. Verify that the User Port displays “Chip Select Test Pass”.

3.7.13.9 Service Terminal Loopback Test

To perform a loopback test of the Service Terminal port using a PC terminal emulation program, select menu option “6”.

3.7.13.10 EFBUS Loopback Test

Same as above, except select option "4 or "5".

3.7.14 Echo (ECHO)

This command enables/disables echo of characters sent to the SNM-1000 user port.

3.7.14.1 Command Format

ECHO <state>	‘ON’ enables character echo ‘OFF’ disables character echo

3.7.14.2 Local Command Responses

ECHO <state>	

3.7.15 Setup Override (SETUP)

This command enables/disables the modem default setup capability on a specified <channel_no>. When SETUP is enabled, the SNM-1000 remote control channel sends default modem settings before a data call is configured. If SETUP is disabled, no default settings are sent to the modem before a data call is configured.

3.7.15.1 Command Format

<channel_no> SETUP <feature_status>'cr'

<channel_no>	<channel_no> is the channel number for the command. Range: 1 to 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
<feature_status>	'ENABLE' enables the SETUP capability for the selected <channel_no>. 'DISABLE disables the SETUP capability for the selected <channel _no>.

3.7.15.2 Local Command Responses

<channel_no> SETUP<feature_status>	

3.7.16 Channel Type (CT)

This command determines the type of channel connected to a given control SNM-1000. It does not have the capability of determining the modem type of a channel at another node.

3.7.16.1 Command Format

<channel_no> CT'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
CT	Channel type.

3.7.16.2 Local Command Responses

<channel_no> NOT PRESENT	The local channel number does not exist or is disconnected.			
<channel_no> DATA <modem_model>	<modem_model> can have the following values:			
	Modem Model	Code	Modem Model	Code
	CiM-550	CiM-550	*SDM-100	SDM-100
	CiM-300L	CiM-300L	*SDM-150	SDM-150
	CDM-550	CDM-550	*SDM-6000	SDM-6000
	CDM-600	CDM-600	*SDM-8000	SDM-8000
	SDM-300	SDM-300	*SDM-9000	SDM-9000
	SDM-300L2	SDM-300L2	*SDM-140	SDM-140
	SDM-300L3	SDM-300L3	*SDM-155	SDM-155
	SDM-2020D	SDM-2020D		
	SDM-2020M	SDM-2020M		

*Legacy Modem

3.7.17 Modem Command Sequence (MC)

This command permits the use of the User Port to directly communicate with the specified external traffic modem being controlled by the SNM-1000. Communication with the control channel modem is through channel 0 and with traffic modems using the defined channel number.

Refer to Appendix A for some of the M&C remote commands that can be used with this command.

3.7.17.1 Command Format

<channel_no> MC 'modem command string''cr'

<channel_no>	Prefix channel number. Valid range: 0 through 30. 0 for SNM1000 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
MC	The command string following the 'MC' command is issued directly to the specified modem. It has the format as shown in the appropriate modem manuals, except that the leading string through the slash mark (<add/) is eliminated.

3.7.17.2 Local Command Responses

>add/’response’’cr’	Where: ‘add’ = <channel_no>

If the local channel number does not exist or is disconnected, the SNM-1000 returns the following message:

CHANNEL <channel_no> INVALID

3.7.18 Data Call

The user can initiate a data call by either specifying the destination data channel address and grade of service information or by specifying a pre-defined circuit id.

3.7.18.1 “Dialed” Data Call (DD)

The user initiates the data call by specifying the destination data channel address and the desired grade of service.

3.7.18.1.1 Command Format

<channel_no> DD <phone_number> <tx_data> <tx_code> <tx_mod> <origin_clock> <rx_data> <rx_code><rx_mod> <dest_clock> [<grade_of_service>]'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
DD	Dialed data call.
<phone_number>	Destination data channel address (phone number). Max. length: 32 characters. Valid characters: '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', '*', '#', 'A', 'B', 'C', 'D', '-', '(' or ')' Note: The '-' and '('or')' characters are not part of the number and are used to increase readability. They are stripped out and not passed to the NMS.
<tx_data> and <rx_data>	Data rates, defined in kbps. Step size: 1 bit/s. Maximum value: 8192.000 kbps. Examples: 64 is 64 kbps, 64.001 is 64.001 kbps, 1024.1 is 1.0241 Mbit/s, etc. Note: The decimal point is not required and the entered number is rounded to the nearest 1 bit/s value.

<tx_code> and <rx_code>	Codes. Values: Code Rates — Code 1/2 — 1 2/3 — 2 3/4 — 3 5/6 — 5 7/8 — 7 8/9 — 8 5/16 — A 21/44 — B
<tx_mod> and <rx_mod>	Modulation. Values: Modulation Type — Code BPSK — B QPSK — Q OQPSK — O 8PSK — 8 16QAM — 16
<origin_clock> and <dest_clock>	Clock Source. Values: Clock Source — Code Terrestrial (TT) — T Internal (ST) — I Satellite (RT) — S
<grade_of_service>	Optional coding method indicator. Values: Coding Method — Code Viterbi — V (default) Sequential — S Turbo — T

3.7.18.1.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.	
Error <code> : <description>	Code	Description
	9	Channel <Channel No.> Invalid
	20	Not enough parameters.

3.7.18.2 Pre-defined Data Circuit Call (DC)

The user initiates a data call by specifying a pre-defined circuit. The circuit must be pre-defined at the NMS.

3.7.18.2.1 Command Format

<channel_no> DC <circuit_id>'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
DC	Pre-defined data circuit call.
<circuit_id>	Pre-defined circuit id at the NMS. Valid range: 1 through 9999.

3.7.18.2.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.	
Error <code> : <description>	Code	Description
	9	Channel <channel No.> Invalid
	20	Not enough parameters

3.7.19 Terminate (TE)

The terminate command terminates an active call.

3.7.19.1 Command Format

<channel_no> TE'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
TE	Terminate active call.

3.7.19.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.	
Error <code> : <description>	Code	Description
	9	Channel Invalid
	24	Channel not active

3.7.20 Initiate Multipoint Data Call (MI)

This command initiates a multipoint data call on the specified channel. The NMS reports call status using the CS unsolicited response.

3.7.20.1 Command Format

<channel_no> MI <phone_number> <tx_data> <tx_code> <tx_mod> <origin_clock> <rx_data> <rx_code><rx_mod> <dest_clock> <encoder_type>'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
MI	Initiate MultiPoint Data Call
<phone_number>	Destination data channel address (phone number). Max. length: 32 characters. Valid characters: '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', '*', '#', 'A', 'B', 'C', 'D', '-', '(' or ')' Note: The '-' and '('or')' characters are not part of the number and are used to increase readability. They are stripped out and not passed to the NMS.
<tx_data> and <rx_data>	Data rates, defined in kbps. Step size: 1 bit/s. Maximum value: 8192.000 kbps. Examples: 64 is 64 kbps, 64.001 is 64.001 kbps, 1024.1 is 1.0241 Mbit/s, etc. Note: The decimal point is not required and the entered number is rounded to the nearest 1 bit/s value.

<tx_code> and <rx_code>	Codes. Values: Code Rate — Code 1/2 — 1 2/3 — 2 3/4 — 3 5/6 — 5 7/8 — 7 8/9 — 8 5/16 — A 21/44 — B
<tx_mod> and <rx_mod>	Modulation. Values: Modulation Type — Code BPSK — B QPSK — Q OQPSK — O 8PSK — 8 16QAM — 16
<origin_clock> and <dest_clock>	Clock Source. Values: Clock Source — Code Terrestrial (TT) — T Internal (ST) — I Satellite (RT) — S
<encoder_type>	Optional coding method indicator. Values: Coding Method — Code Viterbi — V (default) Sequential — S Turbo — T

3.7.20.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.
Error <code>: <description> <cr><lf>	Code — Description 2 — Bad code rate. 9 — Channel <channel_no> Invalid. 20 — Not enought parameters.

3.7.20.3 Example

2 MI 12345 19.2 3 q I 19.2 3 q I v

3.7.21 Add Multipoint Data Circuit (MA)

Adds another circuit to multipoint data call, NMS reports results of call using CS unsolicited response.

3.7.21.1 Command Format

<channel_no> MA<phone_number>'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
MA	Add MultiPoint Data Call
<phone_number>	Destination data channel address (phone number). Max. length: 32 characters. Valid characters: '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', '*', '#', 'A', 'B', 'C', 'D', '-', '(' or ')' Note: The '-' and '('or')' characters are not part of the number and are used to increase readability. They are stripped out and not passed to the NMS.

3.7.21.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.	
Error <code>: <description> <cr><lf>	Code	Description
	9	Channel <channel_no> Invalid.
	20	Not enought parameters.
	21	Bad circuit number.

3.7.22 Drop Multipoint Data Circuit (MT)

Drops circuit from multipoint data call, NMS will respond with a CS response to both the called and the calling nodes.

3.7.22.1 Command Format

<channel_no> MT<phone_number>'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
MT	Drop MultiPoint Data Call
<phone_number>	Destination data channel address (phone number). Max. length: 32 characters. Valid characters: '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', '*', '#', 'A', 'B', 'C', 'D', '-', '(' or ')' Note: The '-' and '('or')' characters are not part of the number and are used to increase readability. They are stripped out and not passed to the NMS.

3.7.22.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.	
Error <code>: <description> <cr><lf>	Code	Description
	9	Channel <channel_no> Invalid.
	20	Not enought parameters.
	21	Bad circuit number.

3.7.23 Change Forward Channel for Multipoint Data Circuit (MF)

Changes the forward channel for a data call in progress.

3.7.23.1 Command Format

<channel_no> MF<phone_number>'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
MF	Change forward channel
<phone_number>	Destination data channel address (phone number). Max. length: 32 characters. Valid characters: '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', '*', '#', 'A', 'B', 'C', 'D', '-', '(' or ')' Note: The '-' and '('or')' characters are not part of the number and are used to increase readability. They are stripped out and not passed to the NMS.

3.7.23.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.	
Error <code>: <description> <cr><lf>	Code	Description
	9	Channel <channel_no> Invalid.
	20	Not enought parameters.
	21	Bad circuit number.

3.7.24 Change Return Channel for Multipoint Data Circuit (MR)

Changes return channel for a multipoint data call.

3.7.24.1 Command Format

<channel_no> MR <option><phone_number>'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
MR	Change Return Channel
<option>	Option — Description 0 — Turn return channel off. 1 — Return channel request, phone number follows.
<phone_number>	Destination data channel address (phone number). Max. length: 32 characters. Valid characters: '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', '*', '#', 'A', 'B', 'C', 'D', '-', '(' or ')' Note: The '-' and '('or')' characters are not part of the number and are used to increase readability. They are stripped out and not passed to the NMS.

3.7.24.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.
Error <code>: <description> <cr><lf>	Code — Description 9 — Channel <channel_no> Invalid. 20 — Not enough parameters. 21 — Bad circuit number. 44 — Bad fields or number of parameters, invalid option.

3.7.25 Send Message to Multipoint Data Circuit Originator (MO)

Sends a message to the originator of a multipoint data circuit.

3.7.25.1 Command Format

<channel_no> MO <message>'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
MO	Send message to originator
<message>	Message Max. length: 28 characters..

3.7.25.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.
Error <code>: <description> <cr><lf>	Code — Description 9 — Channel <channel_no> Invalid. 20 — Not enough parameters.

3.7.26 Send message to Multipoint Data Circuit Listener (ML)

Changes the return channel for a multipoint data call.

3.7.26.1 Command Format

<channel_no> ML<phone_number> <message>'cr'

<channel_no>	Prefix channel number. Valid range: 1 through 30. 1 through 30 are for traffic modems attached to an SNM-1000, operating in external traffic mode.
ML	Send message to specified listener
<phone_number>	Destination data channel address (phone number). Max. length: 32 characters. Valid characters: '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', '*', '#', 'A', 'B', 'C', 'D', '-', '(' or ')' Note: The '-' and '('or')' characters are not part of the number and are used to increase readability. They are stripped out and not passed to the NMS.
<message>	Message Max. length: 13 characters..

3.7.26.2 Local Command Responses

<none>	Command received OK, will be sent to the NMS.
Error <code>: <description> <cr><lf>	Code — Description 9 — Channel <channel_no> Invalid. 20 — Not enought parameters.

3.7.27 Port Redirection

The operation of the User Port may be switched to the Service Port mode. The Service Port operation contains information to be used for debugging purposes. To redirect the User Port to the Service Port type:

'!<cr>'

3.7.28 Debugging with the User Port

Debug messages at the user/service port can be enabled and disabled.

3.7.28.1 Command Format

DEB
Example:

```
User Port > DEB

DAC debug commands:
  1: SYS debug    2: MSG debug      3: ROUTER debug
  4: HDLC debug   5: C/SDAC debug   6: MODEM debug
  7: DICA debug   8: VFDU debug     9: DTCP debug
User Port >
```

3.7.28.2 Initiate Modem Command Debug

Enter “DEB 6” to display the Modem debug submenus:

```
User Port > DEB 6
MODEM debug:
  1:sdmMsg=0, 2:mcpMsg=0,
User Port >
```

To enable l:sdmMsg, enter “DEB 6 1 1.”

```
User Port > DEB 6 1 1
MODEM debug:
  1:sdmMsg=1, 2:mcpMsg=0,
User Port >
```

IMPORTANT

Notice that sdmMsg=1 (enabled). The redirection command described in Section 3.2.27 can be used to toggle the display of messages On or Off.

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Chapter 4. THEORY OF OPERATION

This chapter describes the theory of operation for the following printed circuit boards (PCBs) contained in the SNM-1000.

- DAC
- Monitor & Control (M&C) Board
- Modulator
- Demodulator

4.1 Demand Assignment Controller (DAC)

The DAC performs DAMA control inbound/outbound functions within the SNM-1000. The DAC is capable of remotely controlling in-circuit reconfiguration of the DAMA microcontroller code. The DAC performs the following functions:

- Decodes a network control HDLC encoded data stream from the demodulator
- Encodes a burst signal using HDLC encoding
- Synchronizes transmit burst to control slot time
- Controls the data interface
- Controls the modem M&C board via a serial link
- Supports two EIA-232 user interface ports
- Supports two EIA-485 interface ports

The SNM-1000 interfaces with the DAC through an interface bus connector. Eleven external and internal interfaces are provided as permanent installations on the DAC board.

A block diagram of the DAC is shown in Figure 4-1.

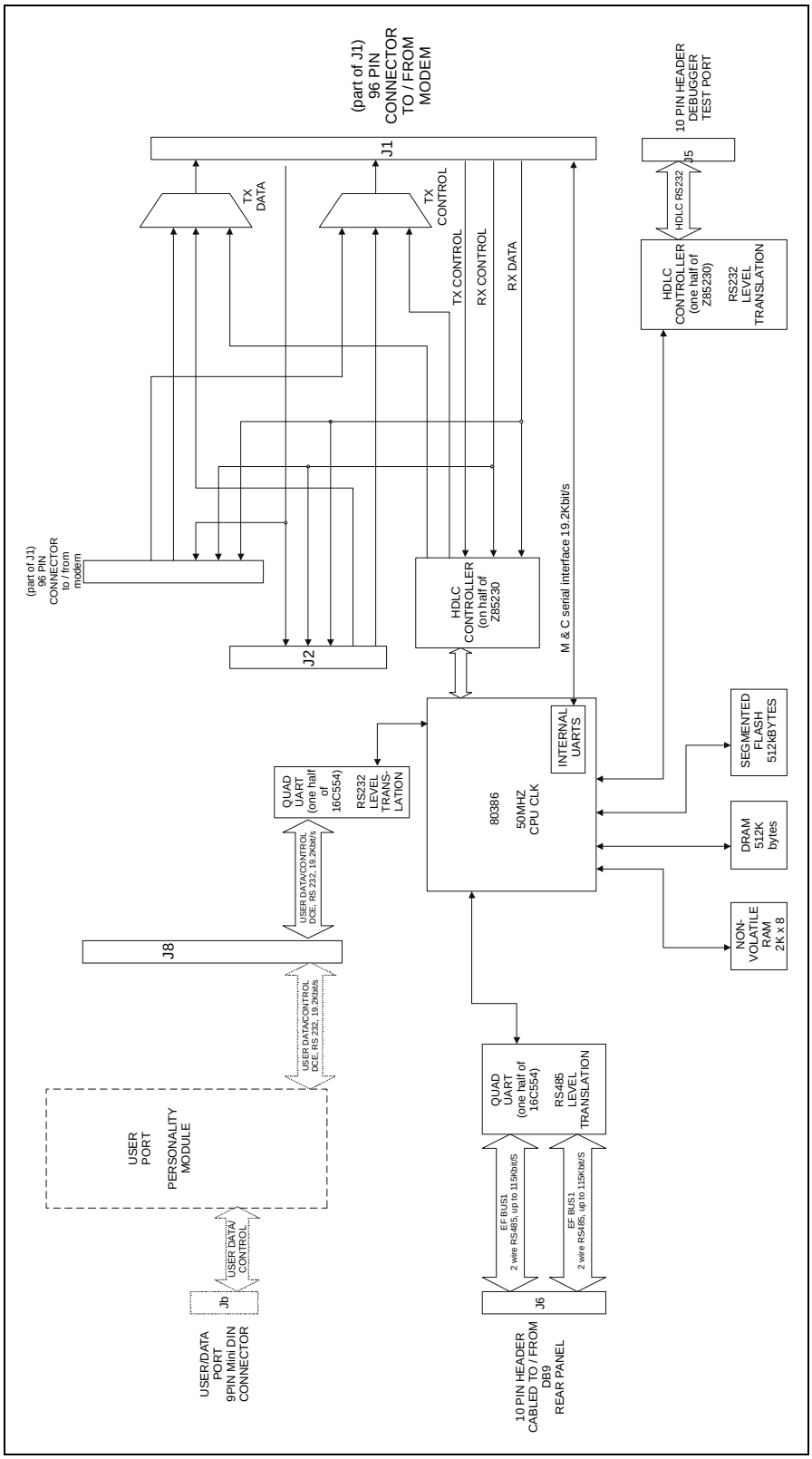


Figure 4-1. DAC Block Diagram

4.1.1 Specifications

Refer to the following listing for specifications.

Physical Size	5.3 x 7 inches (13.46 x 17.78 cm) The DAC board fits into the SNM-1000 1RU chassis.
Power Requirements	+5 VDC
Operating Temperature	0 to +50° C (32 to 122° F)

4.1.2 Theory of Operation

To ensure a high level of integration, the DAC uses the Intel 80386EX embedded microcontroller. This 16/32 bit microcontroller performs DAMA controller functions (and other functions) under control of a real time, multi-tasking operating system.

The DAC uses non-volatile configuration memory with unlimited read/write access to satisfy memory reconfiguration requirements. Flash ROM is used for program storage. NVRAM storage maintains the configuration parameters during power-down conditions.

HDLC synchronous serial ports are implemented with a Z85230 serial communications controller device. This device supports the SNM-1000 control channel satellite channel interface and the HDLC external serial port.

The 80386EX DMA channels are used for the satellite channel interface receive functions. Additional asynchronous ports are implemented with 16C450/16C550 compatible UART devices, to provide monitor and control of modems under SNM-1000 control, via either the SNM-1000 microcontroller or a PC.

4.1.2.1 User Port

The User port serial interface is a 9-pin mini-DIN female connector (DCE) on the rear panel of the SNM-1000. The interface operates at 19.2 kbit/s, 8 data bits, no parity, 1 stop bit. The interface levels are EIA-232. The interface allows the user to configure the SNM-1000 and to request the establishment and termination of data circuits.

Note: Refer to the following sections for a description of the software communications parameters and detailed message format information.

Paragraph No.	Nomenclature	Description
3.5	User Port Operation	Functional parameters for DAMA enviroment.
Appendix A	Remote Control Operation	External traffic modem communications.

4.1.3 EFBUS1/2 Port (External)

The EFBUS 1/2 port combines EFBUS1 and EFBUS2 onto a common connector at J6, a 10-pin header. The EFBUS port provides two separate 2-wire EIA-485 interfaces wired to a common 9-pin D female connector located on the rear of the MIDAS modem. The IF Modulator and IF Demodulator status is also presented for external use.

The Modem Control serial port, EFBUS1, is used for control of other Comtech EF Data traffic modems. The signals are described in the following table with signal names having the MC prefix. The interface is ASYNC, EIA-485/2-wire, and 19.2 kbps.

The EFBUS2 port is reserved for communication with future MIDAS traffic modems.

Signal Function	Name	I/O	J6 EFBUS 10-Pin Header	J2 VFDU Interface 96-Pin	MIDAS Conn Pin #	Signal Level
Ground	MCGND	-	1	NC	1	-
Demodulator fault	BP_DF	I/O	3	NC	2	TTL
Modulator fault	BP_MF	I/O	5	NC	3	TTL
Receive/Transmit +	MS_RD/SD+(EFBUS2)	I/O	7	B14	4	EIA-485
Receive/Transmit -	MS_RD/SD-(EFBUS2)	I/O	9	C14	5	EIA-485
Receive/Transmit+	MC_RD/SD+(EFBUS1)	I/O	2	NC	6	EIA-485
Receive/Transmit-	MC_RD/SD-(EFBUS1)	I/O	4	NC	7	EIA-485
Ground	MSGND	-	6		8	-
Not used	-	-	8		9	-
Not used	-	-	10		-	-

4.1.4 Monitor and Control

The modem uses a sophisticated microcontroller module to perform M&C functions. This module is located on the demodulator board. The M&C monitors the modem and provides configuration updates to other modules within the modem as required.

The modem configuration parameters are maintained in battery-backed RAM. The RAM provides for total recovery after a power-down situation.

Notes:

1. Extensive fault monitoring and status gathering are provided.
2. Modem functions are accessible through a user port interface.

4.1.5 Non-Volatile Memory

Non-volatile memory on the M&C module allows it to retain configuration information without prime power for at least one year. Should the modem be powered down, the following sequence is carried out when power is reapplied to the M&C:

1. The microcontroller checks the non-volatile memory RAM to see if data has been retained. If data has been retained, the modem is reconfigured to that information.

2. If non-volatile memory fails the data test, a default configuration from ROM is loaded into the system.

4.1.6 User Port

Modem functions can be remotely controlled and monitored via the User port on the back panel. Refer to Section 3.5 and Appendix A.

4.1.7 M&C Theory of Operation

The M&C module is built around the Intel 80C32 microcontroller, operating at 11.0592 MHz. The microsystem is designed to support up to 512 kilobytes (Kb) of read-only code memory, and up to 32 Kb of non-volatile, random-access data memory.

4.2 Modulator

The SNM-1000 modulator performs filtered Quadrature Phase Shift Keying (QPSK) modulation onto a variable frequency/amplitude carrier. The modulator also provides the following functions:

- Encodes data for the appropriate decoder
- Scrambles data
- Monitors and displays the modulator status without interrupting service
- Provides source control timing
- Appends a burst preamble for detection by the demodulator (burst mode)

The SNM-1000 creates a QPSK modulated carrier within the 50 through 180 MHz range from the digital data stream provided by the interface section.

The following subsections make up the modulator:

- Scrambler
- Convolutional encoder
- Preamble and postamble generator (burst mode only)
- Modulator
- Output amplifier
- RF synthesizer
- SCT synthesizer

A block diagram of the modulator is shown in Figure 4-2.

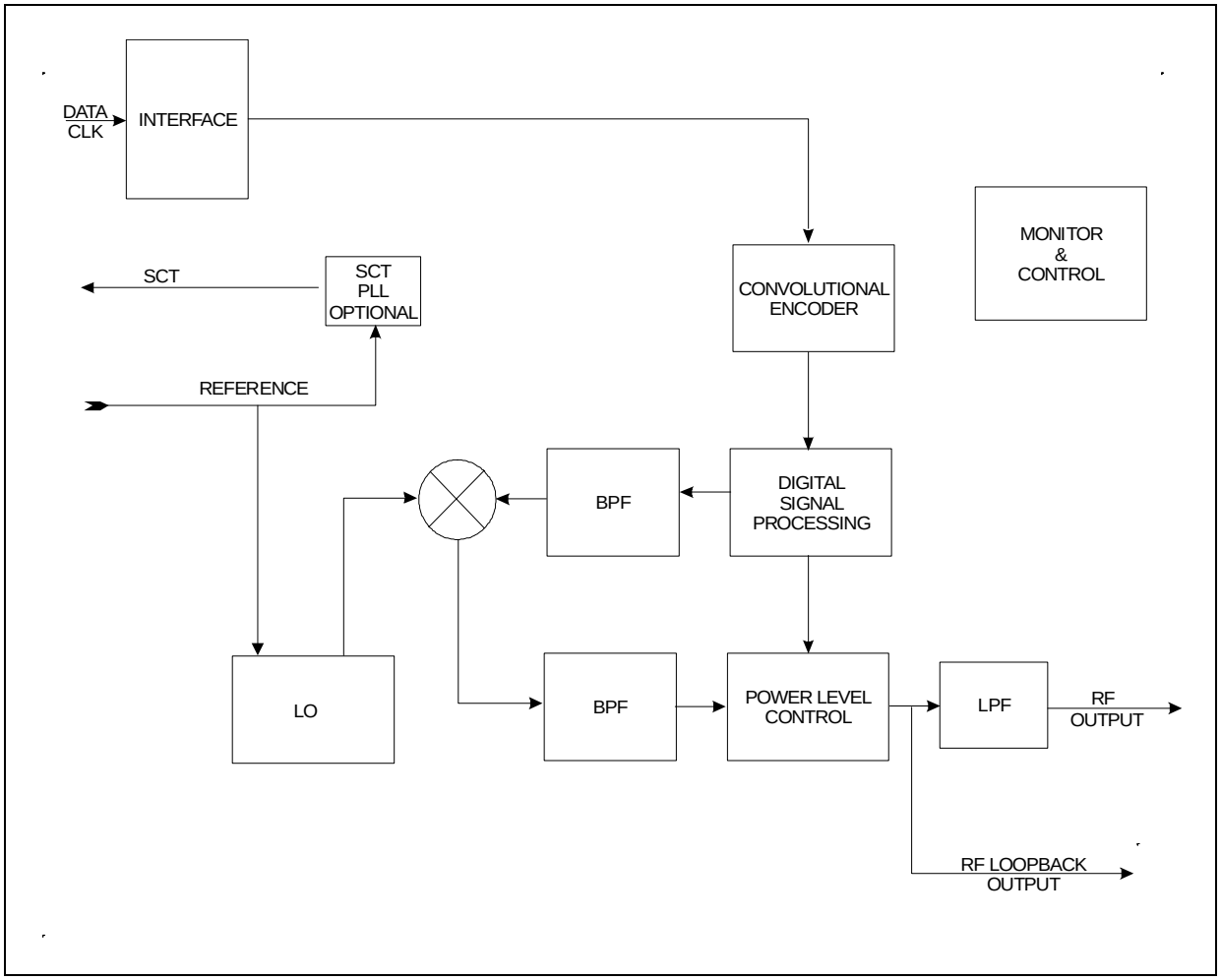


Figure 4-2. Modulator Block Diagram

4.2.1 Theory of Operation

The modulator is composed of two basic sections: the baseband processing section, and the RF section. The modem M&C controls all programmable functions in both sections.

4.2.1.1 Burst Mode

When a transmission is initiated, the modulator issues a pure carrier for 96 clock cycles, followed by a clock training sequence for 352 clock cycles. A 31-bit unique word is then transmitted. The user data is transmitted into the modem. When the modulator detects the end of the user data stream, the modulator flushes the convolutional encoder (6 bits), then transmits the unique word prime twice (62 bits). The packet is complete and the modulator is ready for the next packet.

Data to be transmitted comes from the DAC. At this point, the data signal is clean and free of jitter. The data signal goes to the scrambler, which provides energy dispersal. There is no need for a differential encoder in burst mode, as the ambiguities are resolved using the unique word. The data signal passes to the 1/2 rate Viterbi K=7 convolutional encoder.

The output of the encoder generates two separate data streams to drive the in-phase and quadrature channels of the modulator. The data signal passes through a set of variable-rate digital Nyquist filters. There are activity detectors on both the In-phase and Quadrature (I&Q) channel Nyquist filters.

The digital Nyquist filters are followed by Digital-to-Analog converters and reconstruction filters. These filters provide proper spectral shaping and equalization. The filters are under control of the M&C.

The I&Q filtered data signals are applied to the RF modulator, which converts them to a modulated carrier. The spectral shape is identical to that of the input data streams, but is double-sided about the carrier frequency.

The RF synthesizer provides the proper frequencies to convert the modulator IF to the desired output frequency in the 50 through 180 MHz range. The synthesizer has multiple loops, and incorporates a Direct Digital Synthesis (DDS) chip to accommodate 100 Hz steps over a range of 130 MHz. The RF section has a frequency stability of $\pm 1 \times 10^{-5}$.

The signal from the power combiner is sent to the output amplifier, which amplifies the low-level signal from the modulator section to the proper level for output from the module. The amplifier contains circuitry which provides programmable control of the output level over a range of -5.0 to -30.0 dBm, in 0.1 dB graduated steps. Power leveling is provided at ± 1.0 dB to maintain the stability of the output level over time and temperature.

4.2.2 Theory of Modulation Types

The modulation type for the modem is QPSK.

The PSK data transmission encoding method uses the phase modulation technique. This method varies the phase angle of the carrier wave to represent a different bit value for the receiver.

- QPSK represents: 4 discrete phase angles represent the 4 possible states of a symbol.

4.2.2.1 QPSK Encoding

The modulator converts transmitted baseband data into a modulated QPSK carrier at the following parameters:

- 19.2 kbit/s (1/2 rate)

Using vector analysis of the constellation pattern, QPSK represents a symbol with the carrier phase angle at 45°, 135°, 225°, or 315°. The 1/2 rate encoded at the convolutional encoder provide the desired input/output bit rates.

Code Rate	Symbols/Bit	Bits/Hz
1/2	2	1

4.2.3 Modulator Specifications

Refer to Chapter 1 for specifications.

4.3 Demodulator

The demodulator converts PSK modulated carriers within the 50 to 180 MHz range to a demodulated baseband data stream. The converted modulation type is QPSK, (refer to Section 4.2.3 for a description of modulation type). The demodulator then performs FEC on the data stream using the Viterbi decoding algorithm.

A block diagram of the demodulator is shown in Figure 4-3.

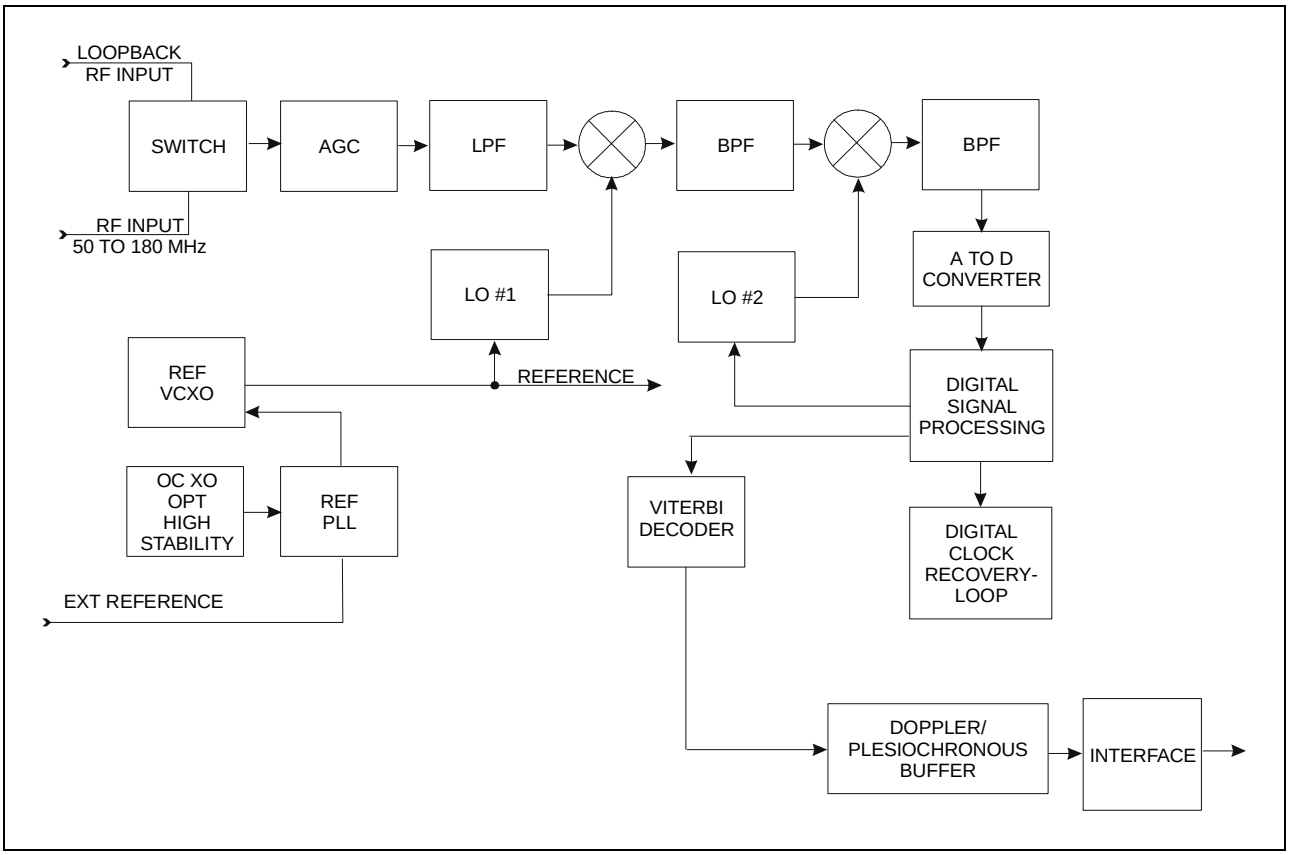


Figure 4-3. Demodulator Block Diagram

4.3.1 Theory of Operation

The demodulator card functions as an advanced, fully digital, coherent phase-lock receiver, and a Viterbi decoder.

4.3.1.1 Continuous Mode

The demodulator consists of the following subsections:

- RF synthesizer
- IF amplifier
- Quadrature demodulator
- Identical anti-aliasing filters
- Analog-to-Digital converters
- Digital Nyquist filters
- Costas loop
- Clock loop
- AGC
- AOC
- Ambiguity resolver
- Soft-decision decoder
- V.35 descrambler
- BER monitor

The modulated signal enters the RF module, where it is converted from an IF signal at 50 through 180 MHz to I&Q baseband channels. The synthesizer has multiple loops, and incorporates a DDS chip to accommodate 100 Hz steps over a range of 130 MHz. The RF section has a frequency stability of $\pm$ 1 x 10^{-5}.

The two channels are then passed through identical anti-aliasing filters Analog-to-Digital converters, and digital Nyquist filters. The result is a filtered, digital representation of the received signal. A Costas loop maintains the phase lock during the message. A phase-lock loop maintains the data clock. The soft-decision mapper converts the I&Q samples to soft-decision values. The soft-decision values are then fed to the Viterbi decoder where error detection and correction are performed.

The I&Q channels also are used to calculate the AGC and AOC voltages. The AGC and AOC are fed back to the RF module.

The data from the output of the Viterbi decoder is descrambled with a V.35 descrambler, and routed to the interface card. Additionally, a summary fault relay provides a FORM C output located on the demodulator board.

During acquisition, the demodulator sweeps the range around the nominal IF frequency. These parameters (sweep width and offset) can be set by the user. As the demodulator sweeps through a carrier, the data is fed to the selected decoder, which resolves the

ambiguities of the incoming data. When the decoder generates a lock signal, the demodulator stops sweeping. If the signal level is within the operating range of the demodulator, the modem declares lock.

Notes:

1. After the demodulator is locked, BER and frequency offset monitoring are available via the remote interface.
2. For QPSK applications, the demodulator has the ability to lock to a carrier that has gone through a spectral inversion.

4.3.2 Demodulator Specifications

Refer to Chapter 1 for specifications.

Chapter 5. MAINTENANCE

This chapter provides the following information:

- Fault isolation

5.1 Fault Isolation

This equipment contains parts and assemblies sensitive to damage by ESD. Use ESD precautionary procedures when touching, removing, or inserting PCBs.

The fault isolation procedure lists the following categories of faults or alarms.

- Modulator
- Demodulator
- Transmit Interface
- Receive Interface
- Common Equipment

Note: Each fault or alarm category includes possible problems and the appropriate action required to repair the modem.

If any of the troubleshooting procedures mentioned earlier in this chapter do not isolate the problem, and Comtech EF Data Customer Support assistance is necessary, have the following information available for the representative:

- Modem configuration. Modem configuration includes the modulator, demodulator, and interface.
- Faults (active or stored).

5.1.1 System Faults/Alarms

System faults are reported in the “Faults/Alarms” menu, and stored faults are reported in the “Stored Flts/Alms” menu. Refer to Chapter 3 for more information.

Table 5-1. SNM-1000 Fault Tree

	TX IF OUTPUT OFF	TX FAULT RELAY (1)	RX FAULT RELAY (2)	FAULT LED	COM EQ FAULT RELAY (3)	TX ALARM RELAY #2 (4)	RX ALARM RELAY #3 (5)	SPARE RELAY ALARM #1	PRIMARY ALARM RELAY (6)	SECONDARY ALARM RELAY (7)	IBS BACKWARD ALARM	DEFERRED MAIN ALARM (8)
MODULATOR FAULTS												
IF SYNTHESIZER	X	X		X					X			
DATA CLOCK SYN	X	X		X					X			
I CHANNEL	X	X		X					X			
Q CHANNEL	X	X		X					X			
AGC	X	X		X					X			
MODEM REF ACT				X		X				X		
MODEM REF PLL	X	X		X					X			
MODULE	X	X		X					X			
CONFIGURATION	X	X		X								
DEMODULATOR FAULTS												
CARRIER DETECT			X	X					X		X	
IF SYNTHESIZER			X	X					X		X	
I CHANNEL			X	X					X		X	
Q CHANNEL			X	X					X		X	
BER THRESHOLD				X			X			X		X
MODULE			X	X					X		X	
CONFIGURATION			X	X								

Legend		
Note	**Fault/Alarm Relay**	**Test Points Connector/Pins**
1	TX FAULT	Pin 4 (NO), 5 (COM), 6 (NC) *
2	RX FAULT	Pin 7 (NO), 8 (COM), 9 (NC) *
3	COM EQ FAULT	Pin 1 (NO), 2 (COM), 3 (NC) *
4	TX ALARM #2	Pin 4 (NO), 5 (COM), 6 (NC) *
5	RX ALARM #3	Pin 7 (NO), 8 (COM), 9 (NC) *
6	PRIMARY ALARM	Pin 43 (NO), 10 (COM), 27 (NC) *
7	SECONDARY ALARM	Pin 44 (NO), 11 (COM), 28 (NC) *
8	DEF MAINT ALARM	Pin 17 **
*	A connection between the common and N.O. contacts indicate no fault/alarm.	
**	Signal is open collector high impedance if faulted.	

Table 5-1. SNM-1000 Fault Tree (Continued)

	TX IF OUTPUT OFF	TX FAULT RELAY (1)	RX FAULT RELAY (2)	FAULT LED	COM EQ FAULT RELAY (3)	TX ALARM RELAY #2 (4)	RX ALARM RELAY #3 (5)	SPARE RELAY ALARM #1	PRIMARY ALARM RELAY (6)	SECONDARY ALARM RELAY (7)	IBS BACKWARD ALARM	DEFERRED MAINT ALARM (8)
TX INTERFACE FAULTS												
TX DROP	Not Applicable											
TX DATA/AIS				X		X				X		X
TX CLK PLL	X	X		X					X			
TX CLK ACTIVITY				X		X			X			
TX AUDIO 1 CLIP	Not Applicable											
TX AUDIO 2 CLIP	Not Applicable											
CONFIGURATION	X	X		X								
RX INTERFACE FAULTS												
BUFFER UNDERFLOW							X					
BUFFER OVERFLOW							X					
RX DATA/AIS							X			X		X
FRAME BER			X	X					X		X	
BACKWARD ALARM	Not Applicable											
BUFFER CLK PLL			X	X					X			
BUFFER CLK ACT				X			X		X			
DEMUX LOCK			X	X					X		X	
RX 2047 LOCK				X			X					
BUFFER FULL				X			X					
RX INSERT	Not Applicable											
RX AUDIO 1 CLIP	Not Applicable											
RX AUDIO 2 CLIP	Not Applicable											
CONFIGURATION			X	X								

Legend		
Test Note	**Fault/Alarm Relay**	**Test Points Connector/Pins**
1	TX FAULT	Pin 4 (NO), 5 (COM), 6 (NC) *
2	RX FAULT	Pin 7 (NO), 8 (COM), 9 (NC) *
3	COM EQ FAULT	Pin 1 (NO), 2 (COM), 3 (NC) *
4	TX ALARM #2	Pin 4 (NO), 5 (COM), 6 (NC) *
5	RX ALARM #3	Pin 7 (NO), 8 (COM), 9 (NC) *
6	PRIMARY ALARM	Pin 43 (NO), 10 (COM), 27 (NC) *
7	SECONDARY ALARM	Pin 44 (NO), 11 (COM), 28 (NC) *
8	DEF MAINT ALARM	Pin 17 **
*	A connection between the common and N.O. contacts indicate no fault/alarm.	
**	Signal is open collector high impedance if faulted.	

Table 5-1. SNM-1000 Fault Tree (Continued)

COMMON EQUIP FAULTS	TX IF OUTPUT OFF	TX FAULT RELAY (1)	RX FAULT RELAY (2)	FAULT LED	COM EQ FAULT RELAY (3)	TX ALARM RELAY #2 (4)	RX ALARM RELAY #3 (5)	SPARE RELAY ALARM #1	PRIMARY ALARM RELAY (6)	SECONDARY ALARM RELAY (7)	IBS BACKWARD ALARM	DEFERRED MAIN ALARM (8)
BATTERY/CLOCK				X						X		X
-12V POWER SUPPLY				X	X				X			
+12V POWER SUPPLY				X	X				X			
+5V SUPPLY				X	X				X			
SELF TEST	Not Applicable											
CONTROLLER				X	X				X			
INTERFACE MODULE				X	X				X			

Legend		
Test Note	**Fault/Alarm Relay**	**Test Points Connector/Pins**
1	TX FAULT	Pin 4 (NO), 5 (COM), 6 (NC) *
2	RX FAULT	Pin 7 (NO), 8 (COM), 9 (NC) *
3	COM EQ FAULT	Pin 1 (NO), 2 (COM), 3 (NC) *
4	TX ALARM #2	Pin 4 (NO), 5 (COM), 6 (NC) *
5	RX ALARM #3	Pin 7 (NO), 8 (COM), 9 (NC) *
6	PRIMARY ALARM	Pin 43 (NO), 10 (COM), 27 (NC) *
7	SECONDARY ALARM	Pin 44 (NO), 11 (COM), 28 (NC) *
8	DEF MAINT ALARM	Pin 17 **
*	A connection between the common and N.O. contacts indicate no fault/alarm.	
**	Signal is open collector high impedance if faulted.	

5.1.2 Faults/Alarms Display

General fault, status, and alarm information are indicated by 8 LEDs located on the modem's front panel.

- A fault (red LED) indicates a fault that currently exists in the modem.
- When a fault occurs, it is stored in the stored fault memory, and indicated by the single red LED.
- The LED is turned off when the fault clears. If the fault clears, the occurrence is also stored.

A total of 10 occurrences of any fault can be stored. Each fault or stored fault indicated by a front panel LED could be one of many faults. To determine which fault has occurred, use the Fault or Stored Fault front panel menu. Refer to Chapter 3 for information on the Fault or Stored Fault front panel menu.

Alarms are considered minor faults which will not switch the modem offline in a redundant system. Alarms are shown in the Fault or Stored Fault front panel menu by a reversed contrast (white on black) character that appears at the display panel.

5.1.3 Faults/Alarms Analysis

This section describes the possible problems and actions to take for the following faults:

- Modulator
- Demodulator
- Transmit interface
- Receive interface
- Common equipment

5.1.3.1 Modulator Faults

Fault/Alarm	Possible Problem and Action
IF SYNTHESIZER	Modulator IF synthesizer fault. This is considered a major alarm, and will turn off the modulator output. Return the modem for repair.
DATA CLOCK SYN	Transmit data clock synthesizer fault. This fault indicates that the internal clock VCO has not locked to the incoming data clock, or the internal clock synthesizer has not locked to the internal reference. This is considered a major alarm, and will turn off the modulator output. Ensure the proper data rate has been set up and selected, and the incoming data rate matches the modem selections.
I CHANNEL	Activity alarm for the I channel digital filter. This alarm is considered a major alarm, and will turn off the modulator IF output. An alarm in this position indicates either a fault in the scrambler, or if the scrambler is disabled, the alarm indicates a loss of incoming data. If the fault is active with the scrambler turned off, check for input data at the DATA I/O connector.
Q CHANNEL	Activity alarm for the Q channel digital filter. Use the I channel procedure.
AGC LEVEL	Output power AGC level fault. Indicates the level at the modulator output is not the programmed level.
INTERNAL SCT SYN	Internal TX data clock synthesizer fault. The SCT has failed to lock to the internal reference.
EXT REF ACT	External reference activity fault. Indicates clock reference not detected.
MODULE	Modulator module fault. Typically indicates that the modulator module is missing or will not program.

5.1.3.1.1 Modulator Checkout

Use the following procedure to check out the modulator:

1. Set up the equipment. Refer to Chapter 4 for modulator specifications.

2. Set up the modem for operation by using the Configuration Modulator and Demodulator front panel menus.

3. Clear all TX faults by correct use of data and clock selection (Chapter 4).

4. Measure the E_b/N_0 with a receiver that is known to be properly operating. Refer to Table 5-2.

5. Check for proper E_b/N_0 level. The (S+N)/N is measured by taking the average level of the noise and the average level of the modem spectrum top. Use this measurement for the first column.

6. Read across the page to find the S/N and E_b/N_0 for the specific code rate. Once the demodulator has locked to the incoming signal, the Monitor menu will display signal level, raw BER, corrected BER, and E_b/N_0. Refer to Chapter 1 for examples of BER performance curves.

7. Connect a spectrum analyzer to the modem. Ensure the IF output meets the appropriate mask and spurious specifications. Measure the power output at different levels and frequencies.

   A typical output spectrum is shown in Figure 5-1 and Figure 5-2.

8. To check the frequency and phase modulation accuracy:

   a. Set the modem to the continuous wave Normal mode by using the Carrier Mode front panel menu (Chapter 3). This sets the Carrier mode in the off condition. A pure carrier should now be present at the IF output. This should only be used for frequency measurements. In this mode, spurious and power measurements will be inaccurate.

   b. Set the modem to the continuous wave Offset mode by using the Carrier Mode front panel menu (Chapter 3). This generates a single, upper side-band-suppressed carrier signal. Ensure the carrier and side-band suppression is < -35 dBc.

Table 5-2. Conversion to S/N and E_b/N_0 Chart

(dB)	Code	Rate 1/2
(S+N)/N	S/N	E_b/N_0
4.0	1.8	1.8
4.5	2.6	2.6
5.0	3.3	3.3
5.5	4.1	4.1
6.0	4.7	4.7
6.5	5.4	5.4
7.0	6.0	6.0
7.5	6.6	6.6
8.0	7.3	7.3
8.5	7.8	7.8
9.0	8.4	8.4
9.5	9.0	9.0
10.0	9.5	9.5
10.5	10.1	10.1
11.0	10.6	10.6
11.5	11.2	11.2
12.0	11.7	11.7
12.5	12.2	12.2
13.0	12.8	12.8
13.5	13.3	13.3
14.0	13.8	13.8
14.5	14.3	14.3
15.0	14.9	14.9
15.5	15.4	15.4
16.0	15.9	15.9
16.5	16.4	16.4
17.0	16.9	16.9
17.5	17.4	17.4
18.0	17.9	17.9
18.5	18.4	18.4
19.0	18.9	18.9
19.5	19.5	19.5
20.0	20.0	20.0

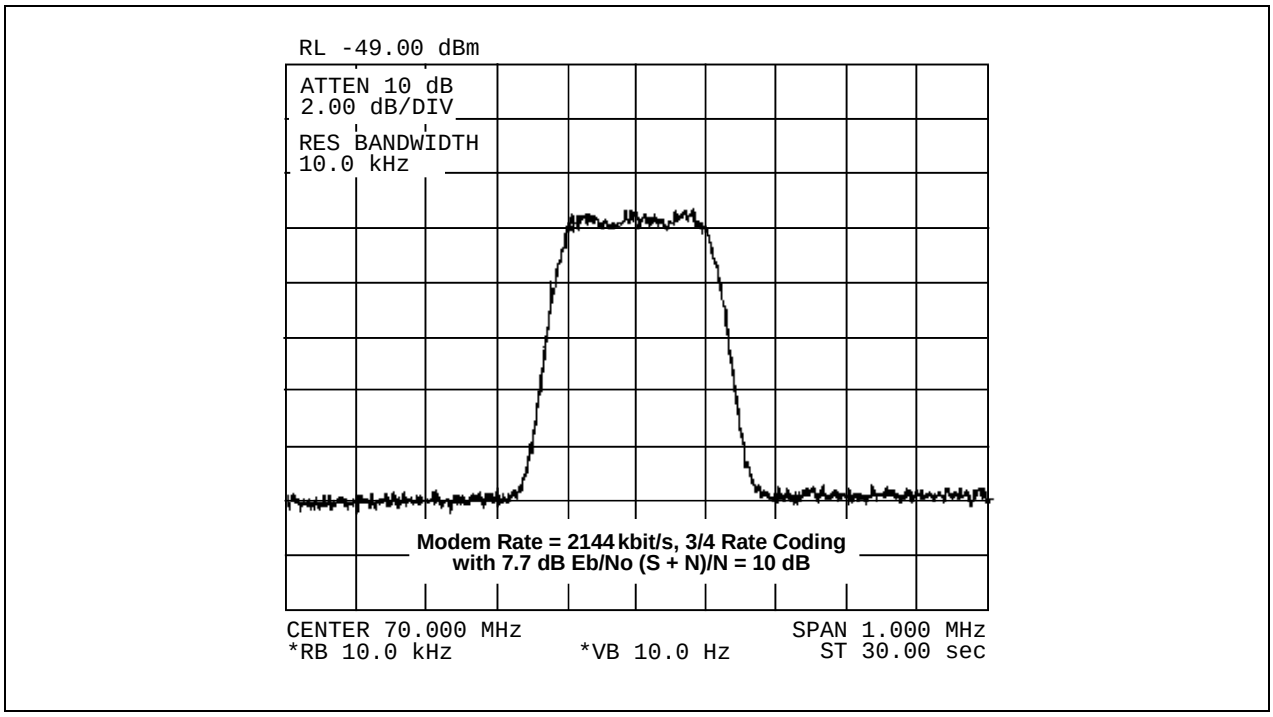


Figure 5-1. Typical Output Spectrum (with Noise)

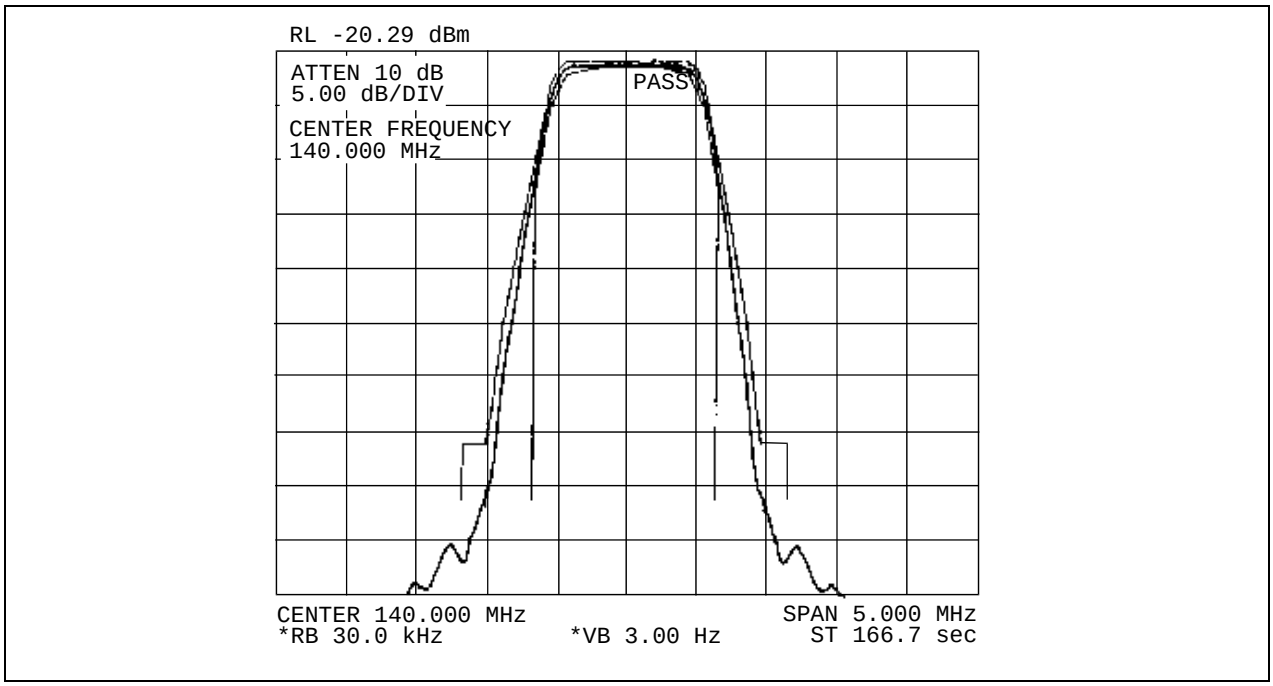


Figure 5-2. Typical Output Spectrum (without Noise)

5.1.3.2 Demodulator Faults

Fault/Alarm	Possible Problem and Action
CARRIER DETECT	Carrier detect fault. Indicates the decoder is not locked. This is the most common fault displayed in the modem. Any problem from the input data on the modulator end of the circuit to the output of the decoder can cause this alarm. First, ensure the demodulator has an RF input at the proper frequency and power level. Ensure the demodulator data rate is properly programmed. Refer to the fault isolation procedure for Data Clock Syn in the modulator section. Verify the frequency of the data transmitted from the modulator is within 100 PPM.
IF SYNTHESIZER	Demodulator IF synthesizer fault. Indicates the demodulator IF synthesizer is faulted. This fault is a hardware failure. Contact the Comtech EF Data Customer Support Department.
I CHANNEL	Indicates a loss of activity in the I channel of the quadrature demodulator. Typically indicates a problem in the modulator side of the circuit. Check for proper RF input to the demodulator. If the input to the demodulator is correct, then the problem is in the baseband processing.
Q CHANNEL	Indicates a loss of activity in the Q channel of the quadrature demodulator. Follow the same procedure for the I channel fault.
BER THRESHOLD	Indicates the preset BER threshold has been exceeded. Setting of this alarm is done in the Utility menu. This is an alarm based on the corrected BER reading on the front panel.
MODULE	Demodulator module fault. Typically indicates that the demodulator module is missing or will not program. Contact the Comtech EF Data Customer Support Department.

5.1.3.2.1 Demodulator Checkout

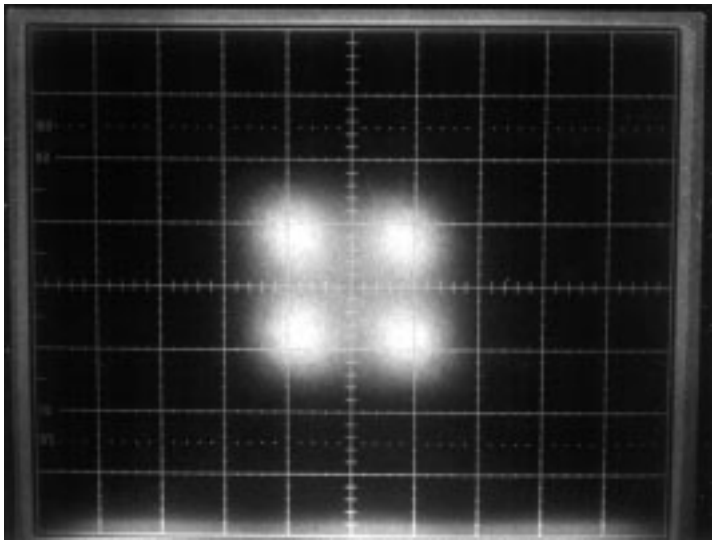
Use the following procedure to test the demodulator.

1. Set up the equipment. Refer to Chapter 4 for the demodulator specifications.

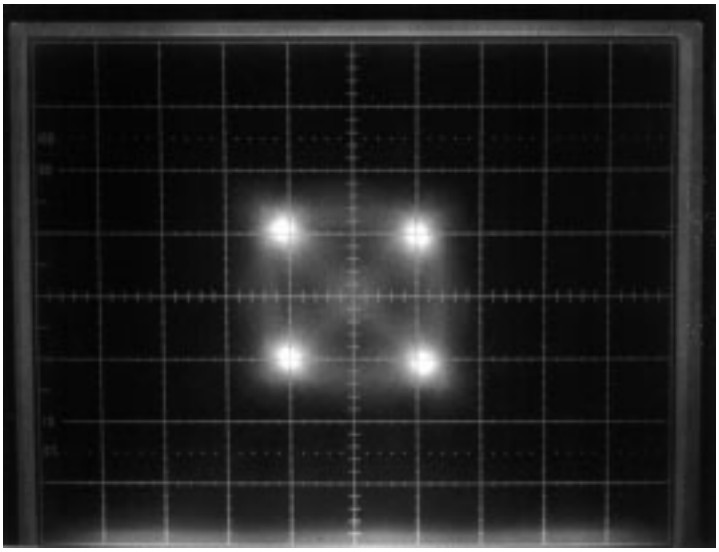
2. Set up the modem with an external IF loop and level. Use a properly operating modulator, and ensure that power levels, data rates, code rates, etc., are compatible.

3. Allow the modem to lock up. Depending on the data rate and overhead type, lock up may take several seconds. When the green carrier detect LED is on and the DEMUX lock fault has been cleared (where applicable), the modem will run at the specified error rate. Run the TX power level (input amplitude) over the full range, and offset the TX frequency from the RX frequency by 35 kHz. Ensure the modem still runs within the specified error rate.

4. Set up the modem to check the constellation patterns with an oscilloscope that is set in the X-Y mode. Typical constellation patterns with noise and without noise. These test points are available on the auxiliary connector (J9, pins 6 and 8). It is not necessary to open the modem to look at these test points.



WITH NOISE



WITHOUT NOISE

Figure 5-3. Typical Eye Constellations

5.1.3.3 Transmit Interface Faults

Fault/Alarm	Possible Problem and Action
TX DROP	Not Applicable
TX DATA/AIS	Data or incoming AIS. When the AIS is selected in the Interface Utility menu for TX data fault, the transmit interface fault TX data/AIS is monitoring a fault condition of all 1s from customer data input to the modem. When data is selected in the Interface Utility menu for TX data fault, the TX interface fault TX data/AIS is monitoring a fault condition of all 1s or 0s. This is referred to as a data-stable condition (data is not transitioning). This fault indicates there is trouble in the chain sending data to the modem. The modem passes this signal transparently, and takes no other action. This indication is a monitor function only, and aids in isolating the trouble source in a system.
TX CLOCK PLL	Transmitter phase-locked loop fault. Indicates the transmitter PLL is not locked to the reference of the interface transmit clock recovery oscillator. Contact the Comtech EF Data Customer Support Department.
TX CLOCK ACT	Activity detector alarm of the selected interface transmit clock. Indicates the selected TX clock is not being detected. Check the signal of the selected TX clock source to verify the signal is present. The interface will fall back to the internal clock when this alarm is active.
TX AUDIO 1 CLIP	Not Applicable
TX AUDIO 2 CLIP	Not Applicable
CONFIGURATION	Configuration fault. Indicates the selected TX Output , Fault Relay, or Fault LED is not functioning. Check the signal of the selected TX source to verify the signal is present. The configuration will fall back to the default when this alarm is active.

5.1.3.4 Receive Interface Faults

Fault/Alarm	Possible Problem and Action
BUFFER UNDERFLOW	Buffer underflow alarm. Indicates the plesiochronous buffer has underflowed. Buffer underflow is normally a momentary fault (there are clock problems if this alarm is continuously present). This alarm is included in this section to be consistent with the fault reporting system and to be correctly registered in the stored fault memory. The time and date of the first 10 receive buffer underflow faults are stored in battery-backed memory as an aid to troubleshooting. The interval between stored overflow/underflow events can be used to determine relative clock accuracies.
BUFFER OVERFLOW	Buffer overflow alarm. Indicates the plesiochronous buffer has overflowed. The problems and actions in the buffer underflow section apply to this alarm.
RX DATA/AIS	Data or incoming AIS. The data monitored for RX data is coming from the satellite. When the AIS is selected for RX data fault in the Interface Utility menu, the RX data/AIS is monitoring an alarm condition of all 1s from the satellite. When data is selected for RX data fault in the Interface Utility menu, the RX data/AIS is monitoring a fault condition of all 1s or 0s. This is referred to as a data-stable condition (data is not transitioning). The fault indicates trouble in receiving data from the satellite. The modem passes this signal transparently, and can close a FORM C contact. The indication is a monitor function only to help isolate the source of trouble in a system.
FRAME BER	The receive decoded error rate has exceeded 10^{-3} over a 60-second period measured on the framing bits. This is defined as a major (prompt) receive alarm by INTELSAT specifications IESS-308. In a redundant system, a switch-over will be attempted. Since some data must be correctly received to indicate this fault, receive AIS will not be substituted. This fault is to be sent as a backward alarm to the distant end. This must be wired externally, as faults other than from the modem may need to enter the fault tree.
BACKWARD ALARM	Not Applicable

Fault/Alarm	Possible Problem and Action
BUFFER CLK PLL	Buffer clock phase-locked loop fault. The buffer synthesizer is the wrong frequency or will not lock. Ensure the selected buffer clock source is at the proper frequency and level. If the fault continues, contact the Comtech EF Data Customer Support Department.
BUFFER CLK ACT	Activity detector alarm of the selected interface receive clock. The interface will fall back to the satellite clock when this fault is active.
DEMUX_LOCK	Demultiplexer synchronization lock fault. This fault means that the demultiplexer is unable to maintain valid frame and multiframe alignment. The usual cause is invalid or absent receive data. This is a major (prompt) alarm. The alarm will cause insertion of receive AIS (all 1s) and the switch-over will be attempted. This fault is to be sent as a backward alarm to the distant end. This fault will occur when no carrier is present, but will probably never occur with a correct signal.
RX 2047 LOCK	RX 2047 lock alarm. Indicates the RX 2047 data test pattern is not being received by the decoder. The alarm probably indicates the transmitter is not set correctly.
BUFFER FULL	Buffer full alarm. Indicates the buffer is < 10% or > 90% full.
RX INSERT	Not Applicable
RX AUDIO 1 CLIP	Not Applicable
RX AUDIO 2 CLIP	Not Applicable
CONFIGURATION	Configuration fault. Indicates the selected, Fault Relay or Fault LED is not functioning. Check the signal of the selected RX source to verify the signal is present. The configuration will fall back to the default when this alarm is active.

5.1.3.5 Common Equipment Faults

Fault/Alarm	Possible Problem and Action
BATTERY/CLOCK	M&C battery voltage or clock fault. Indicates a low voltage in the memory battery. Typically, this fault will be active when a modem has been hard reset or the firmware has been changed. When a hard reset has been executed or the firmware has been changed, this fault will typically be active when the modem is first turned on.
-12 VOLT SUPPLY	-12V power supply fault. Indicates a high or low voltage condition. Level is ± 5%. Check for a short on the –12V line from the power supply or on any of the plug-in boards.
+12 VOLT SUPPLY	+12 VDC power supply fault. Use the same procedure as with –12V fault.
+5 VOLT SUPPLY	+5V power supply fault. Use the same procedure as with a –12V fault. The +5V supply requires a minimum load of 1A.
SELF TEST	Not Applicable
CONTROLLER	Controller fault. Indicates a loss of power in the M&C card. Typically indicates the controller has gone through a power on/off cycle.
INTERFACE MODULE	Interface module fault. Indicates a problem in programming the interface card.

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Appendix A. REMOTE CONTROL OPERATION

The commands listed in this appendix are M&C remote commands used with other modems in the network.

Status queries are always safe. However, exercise caution when issuing an SDM-300A M&C command. Some commands can produce an undesirable result if executed on an active/installed SNM-1000 MIDAS node. For example; the IF Loopback command "MC IFL_ON" will cause the SNM-1000 to disengage from the MIDAS control channel. Reconnecting the control channel would only be possible by taking the modem out of IF Loopback via the front panel or a local M&C command.

- Firmware number: FW/6535-3G
- Software version: 4.1.5

Note: The firmware referenced in this manual may be an earlier version of the actual firmware supplied with the unit.

A.1 Channel Number

Channel number <channel_no> has a valid range of 0 through 30. Leading zeros are ignored. Channel 0 is valid for an SNM-1000 Node Control modem and channels 1 through 30 are valid for external traffic modems attached to the SNM-1000 such as SDM-300s, SDM-6000s, etc.

A.2 Abnormal Condition Responses

If a satellite modem receives a message which does not match the established protocol or cannot be implemented, a negative acknowledgment message is sent in response. The possible message formats are:

- <channel_no> ?ER1_PARITY ERROR'cr''lf']
  (Error message for received parity errors.)
- <channel_no> ?ER2_INVALID PARAMETER'cr''lf']
  (Error message for a recognized command which cannot be implemented or has parameters which are out-of-range.)
- <channel_no> ?ER3_UNRECOGNIZABLE COMMAND'cr''lf']
  (Error message for unrecognizable command or bad command syntax.)
- <channel_no> ?ER4_MODEM IN LOCAL MODE'cr''lf']
  (Modem in local error, use the REM command to go to remote mode.)
- <channel_no> ?ER5_HARD CODED PARAMETER'cr''lf']
  (Error message indicating that the parameter is hardware dependent and may not be changed remotely.)

A.2.1 Character Set

The interface responds to ASCII characters in the range of 0x00 to 0x7F. The 8th bit (most significant) is not generated on the transmit side and is ignored on the receive side.

A.2.2 Status Lines and Flow Control

The interface ignores all status inputs.

A.2.3 Message Structure

A message is either a command or a response. Each message is made up of three elements:

- Prefix
- Message body
  End character

A.3 Configuration Commands/Responses

A.3.1 Modulator Configuration Commands

Modulator Frequency	Command: Response: Status: Response:	<channel_no> MC MF_nnn.nnnn'cr' <channel_no> MF_nnn.nnnn'cr' RF_OFF'cr''lf'] <channel_no> MC MF_'cr' <channel_no> MF_nnn.nnnn'cr''lf']	Where: nnn.nnnn = Frequency in MHz, 50.0000 to 180.0000, in 1 Hz steps. Note: When the modulator frequency is programmed, the RF output is switched OFF.
RF Output (IF Output)	Command: Response: Status: Response:	<channel_no> MC RF_xxx'cr' <channel_no> RF_xxx'cr''lf'] <channel_no> MC RF_'cr' <channel_no> RF_xxx'cr''lf']	Where: xxx = ON or OFF.
Modulator Rate Preset Assignment	Command: Response: Status: Response:	<channel_no> MC AMRx_nnnn_mmm.mmm'cr' <channel_no> AMRx_nnnn_mmm.mmm'cr''lf'] <channel_no> MC AMRx_'cr' <channel_no> AMRx_nnnn_mmm.mmm'cr''lf']	Where: x = A, B, C, D or V (Preset designator). In TX Burst mode, nnnn = 1/2, or 3/4 (Coder rate). In TX continuous mode, nnnn = 1/2 (QPSK 1/2), [coder rate], 3/4 (QPSK 3/4), 7/8 (QPSK 7/8), BP12 (BPSK 1/2), 8P23 (8PSK 2/3), OQ12 (OQPSK 1/2), OQ34 (OQPSK 3/4), OQ78 (OQPSK 7/8), OQSK (OQPSK 1/1), BPSK (BPSK 1/1) (QPSK (QPSK 1/1), 2144 (BPSK 21/44), B516 (BPSK 5/16), 8P34 (8PSK 3/4). mmm.mmm = Data rate in kHz.
Modulator Rate Preset Selection	Command: Response: Status:	<channel_no> MC SMRx_'cr' <channel_no> SMRx_'cr' RF_OFF'cr''lf'] (See MR command.)	Where: x = A, B, C, D, or V (Preset designator). Note: Setting the modulator rate turns the RF transmitter OFF.
Modulator Rate Variable Assignment and Selection	Command: Response: Status:	<channel_no> MC SMRV_nnnn_mmm.mmm'cr' <channel_no> SMRV_nnnn_mmm.mmm'cr' <channel_no> RF_OFF'cr''lf'] (See MR command.)	Where: In TX Burst mode, nnnn = 1/2 or 3/4 (Coder rate). In TX Continuous mode, nnnn = 1/2 (QPSK 1/2), [coder rate], 3/4 (QPSK 3/4), 7/8 (QPSK 7/8), BP12 (BPSK 1/2), 8P23 (8PSK 2/3), OQ12 (OQPSK 1/2), OQ34 (OQPSK 3/4), OQ78 (OQPSK 7/8), OQSK (OQPSK 1/1), BPSK (BPSK 1/1) (QPSK (QPSK 1/1), 2144 (BPSK 21/44), B516 (BPSK 5/16), 8P34 (8PSK 3/4). mmm.mmm = Data rate in kHz. Note: Setting the modulator turns the RF transmitter OFF.

Set Modulator Power Offset	Command: Response: Status: Response:	<channel_no> MC MPO_snn.n'cr' <channel_no> MPO_snn.n'cr"lf'] <channel_no> MC MPO_'cr' <channel_no> MPO_snn.n'cr"lf']	Where: snn.n = +99.0 to -99.0, in 0.1 dB increments. Note: The modulator power offset is added to the nominal power level to adjust the transmit power range.
Set Modulator Output Power Level	Command: Response: Status: Response:	<channel_no> MC MOP_snnn.n'cr' <channel_no> MOP_snnn.n'cr"lf'] <channel_no> MC MOP_'cr' <channel_no> MOP_snnn.n'cr"lf']	Where: snnn.n = -30.0 to +5.0, in 0.1 steps (nominal range in dBm). Note: The nominal power range is modified relative to the value specified by the modulator power offset (MPO_).
Scrambler Enable	Command: Response: Status: Response:	<channel_no> MC SE_xxx'cr' <channel_no> SE_xxx'cr"lf'] <channel_no> MC SE_'cr' <channel_no> SE_xxx'cr"lf']	Where: xxx = ON or OFF.
Differential Encoder Enable	Command: Response: Status: Response:	<channel_no> MC DENC_xxx'cr' <channel_no> DENC_xxx'cr"lf'] <channel_no> MC DENC_'cr' <channel_no> DENC_xxx'cr"lf']	Where: In TX Burst mode, xxx = OFF. In TX Continuous mode, xxx = ON or OFF.
Modulator Type	Command: Response: Status: Response:	<channel_no> MC MT_xxxx'cr' <channel_no> MT_xxxx'cr"lf'] <channel_no> MC MT_'cr' <channel_no> MT_xxxx'cr"lf']	Where: In TX Burst mode, xxxx = INTL (INTELSAT Open Network). In TX Continuous mode, xxxx = INTL (INTELSAT Open Network), EFD (Comtech EF Data Closed Network), CSC (Comstream Closed Network), FDC (Fairchild Closed Network), or SDM51 (SDM51 Compatible).
Modulator Encoder Type	Command: Response: Status: Response:	<channel_no> MC MET_xxx'cr' <channel_no> MET_xxx'cr"lf'] <channel_no> MC MET_'cr' <channel_no> MET_xxx'cr"lf']	Where: In TX Burst mode, xxx = VIT (K-7 Viterbi Encoder). In TX Continuous mode, xxx = VIT (K-7 Viterbi Encoder) SEQ (Sequential Encoder) TUR (Turbo)
Modem Reference Clock	Command: Response: Status: Response:	<channel_no> MC MRC_xxxxx'cr' <channel_no> MRC_xxxxx'cr"lf'] <channel_no> MC MRC_'cr' <channel_no> MRC_xxxxx'cr"lf']	Where: xxxxx = INT (INTERNAL), EXT1 (EXTERNAL 1 MHz), EXT5 (EXTERNAL 5 MHz), EXT10 (EXTERNAL 10 MHz), EXT20 (EXTERNAL 20 MHz), OUT10 (OUTPUT 10 MHz).
Modulator Spectrum Rotation	Command: Response: Status: Response:	<channel_no> MC MSR_xxx'cr' <channel_no> MSR_xxx'cr"lf'] <channel_no> MC MSR_'cr' <channel_no> MSR_xxx'cr"lf']	Where: xxx = NRM (normal spectrum), INV (inverted spectrum).
Reed-Solomon Encoder Enable	Command: Response: Status: Response:	<channel_no> MC RSEN_xxx'cr' <channel_no> RSEN_xxx'cr'lf'] <channel_no> MC RSEN_'cr' <channel_no> RSEN_xxx'cr'lf']	Where: xxx = ON or OFF.

Transmit BPSK Data Ordering for Continuous Mode	Command: Response: Status: Response:	<channel_no> MC TDA_xxx'cr' <channel_no> TDA_xxx'cr''lf'] <channel_no> MC TDA_'cr' <channel_no> TDA_xxx'cr''lf']	Where: xxx = NRM (Standard) or INV (Non-Standard).
Carrier Only Mode	Command: Response: Status: Response:	<channel_no> MC COM_xxxxxx'cr' <channel_no> COM_xxxxxx'cr''lf'] <channel_no> MC COM_xxxxxx'cr' <channel_no> COM_xxxxxx'cr''lf']	Where: xxxxxx = OFF (NORMAL-MODULATED), DUAL (DUAL-CW), OFFSET (OFFSET-CW), CENTER (CENTER-CW).
Modulator Preamble for Burst Mode	Command: Response: Status: Response:	<channel_no> MC MPRE_n'cr' <channel_no> MPRE_n'cr''lf'] <channel_no> MC MPRE_'cr' <channel_no> MPRE_n'cr''lf']	Where: n = 1 (Preamble 1) or 2 (Preamble 2).
Reed-Solomon Interleave Value	Command: Response: Status: Response:	<channel_no> MC TRSI_xx'cr' <channel_no> TRSI_xx'cr''lf'] <channel_no> MC TRSI_'cr' <channel_no> TRSI_xx'cr''lf']	Where: xx = 4, 8, or 16.
TX 8PSK 2/3 IESS-310 Operation	Command: Response: Status: Response:	<channel_no> MC T310_xxx'cr' <channel_no> T310_xxx'cr''lf'] <channel_no> MC T310_'cr' <channel_no> T310_xxx'cr''lf']	Where: xxx = ON or OFF.
Bulk Modulator Configuration	Command: Response:	<channel_no> BMC_BMNOP,xxx.x,yyy.yyyy,DDDD,zzzz.zzz'cr' <channel_no> BMC_BMNOP,xxx.x,yyy.yyyy,DDDD,zzzz.zzz'cr''lf']	Where: B = Modulator set to Burst (B) or Continuous (C). M = Scrambler status set to OFF (1) or ON (0). N = Differential Encoder status set to 0 or 1. O = Reed-Solomon Encoder status set to 0 or 1 (always 0). P = IF Output 0 (off) or 1 (on). xxx.x = Output power setting: -5.0 to -30.0 dBm, in 0.1 steps. yyy.yyyy = Output IF frequency: 50.0 to 180.0 MHz. DDDD = Code Rate: '1/2', '3/4' ,'7/8', or 'BP12'. zzzz.zzz = Data Rate: 4.800 to 2000.0 kbps (limited by Code Rate).

A.4 Demodulator Configuration Commands

Set Demodulator Frequency	Command: Response: Status: Response:	<channel_no> MC DF_nnn.nnnn'cr' <channel_no> DF_nnn.nnnn'cr''lf'] <channel_no> MC DF_'cr' <channel_no> DF_nn.nnnn'cr''lf']	Where: nnn.nnnn = Frequency in MHz, 50.0000 to 180.0000, in 1 Hz steps.
Demodulator Rate Preset Assignment	Command: Response: Status: Response:	<channel_no> MC ADRx_nnnn_mmm.mmm'cr' <channel_no> ADRx_nnnn_mmm.mmm'cr''lf'] <channel_no> MC ADRx_'cr' <channel_no> ADRx_nnnn_mmm.mmm'cr''lf']	Where: x = A, B, C, D, or V (Preset designator). In RX Continuous mode, nnnn = 1/2 (QPSK 1/2), [coder rate], 3/4 (QPSK 3/4), 7/8 (QPSK 7/8), BP12 (BPSK 1/2), 8P23 (8PSK 2/3), OQ12 (OQPSK 1/2), OQ34 (OQPSK 3/4), OQ78 (OQPSK 7/8), OQSK (OQPSK 1/1), BPSK (BPSK 1/1) (QPSK (QPSK 1/1), 2144 (BPSK 21/44), B516 (BPSK 5/16), 8P34 (8PSK 3/4). mmm.mmm = Data rate in kHz.
Demodulator Rate Preset Selection	Command: Response: Status:	<channel_no> MC SDRx_'cr' <channel_no> SDRx_'cr''lf'] (See DR command.)	Where: x = A, B, C, D, or V (Preset designator).
Demodulator Rate Variable Assignment and Selection	Command: Response: Status:	<channel_no> MC SDRV_nnnn_mmm.mmm'cr' <channel_no> SDRV_nnnn_mmm.mmm'cr''lf'] (See DR command.)	Where: In RX Continuous mode, nnnn = 1/2 (QPSK 1/2), [coder rate], 3/4 (QPSK 3/4), 7/8 (QPSK 7/8), BP12 (BPSK 1/2), 8P23 (8PSK 2/3), OQ12 (OQPSK 1/2), OQ34 (OQPSK 3/4), OQ78 (OQPSK 7/8), OQSK (OQPSK 1/1), BPSK (BPSK 1/1) (QPSK (QPSK 1/1), 2144 (BPSK 21/44), B516 (BPSK 5/16), 8P34 (8PSK 3/4). mmm.mmm = Data rate in kHz.
Descrambler Enable	Command: Response: Status: Response:	<channel_no> MC DE_xxx'cr' <channel_no> DE_xxx'cr''lf'] <channel_no> MC DE_'cr' <channel_no> DE_xxx'cr''lf']	Where: xxx = ON or OFF.
Differential Decoder Enable	Command: Response: Status: Response:	<channel_no> MC DDEC_xxx'cr' <channel_no> DDEC_xxx'cr''lf'] <channel_no> MC DDEC_'cr' <channel_no> DDEC_xxx'cr''lf']	Where: In RX Continuous mode, xxx = ON or OFF.
RF Loopback	Command: Response: Status: Response:	<channel_no> MC RFL_xxx'cr' <channel_no> RFL_xxx'cr''lf'] <channel_no> MC RFL_'cr' <channel_no> RFL_xxx'cr''lf']	Where: xxx = ON or OFF.

IF Loopback	Command: Response: Status: Response:	<channel_no> MC IFL_xxx'cr' <channel_no> IFL_xxx'cr''lf'] <channel_no> MC IFL_'cr' <channel_no> IFL_xxx'cr''lf']	Where: xxx = ON or OFF.
Sweep Center Frequency	Command: Response: Status: Response:	<channel_no> MC SCF_snnnnn'cr' <channel_no> SCF_snnnnn'cr''lf'] <channel_no> MC SCF_'cr' <channel_no> SCF_snnnnn'cr''lf']	Where: snnnnn = -35000 to +35000, in 1 Hz steps. Note: In RX Continuous mode only.
Sweep Width Range	Command: Response: Status: Response:	<channel_no> MC SWR_nnnnn'cr' <channel_no> SWR_nnnnn'cr''lf'] <channel_no> MC SWR_'cr' <channel_no> SWR_nnnnn'cr''lf']	Where: nnnnn = 0 to 70000, in 1 Hz steps. Note: In RX Continuous mode only.
Sweep Reacquisition	Command: Response: Status: Response:	<channel_no> MC SR_xxx'cr' <channel_no> SR_xxx'cr''lf'] <channel_no> MC SR_'cr' <channel_no> SR_xxx'cr''lf']	Where: xxx = 0 to 999 (number of seconds).
Demodulator Spectrum Rotation	Command: Response: Status: Response:	<channel_no> MC DSR_xxx'cr' <channel_no> DSR_xxx'cr''lf'] <channel_no> MC DSR_'cr' <channel_no> DSR_xxx'cr''lf']	Where: xxx = NRM (normal spectrum), INV (inverted spectrum).
Reed-Solomon Decoder Enable	Command: Response: Status: Response:	<channel_no> MC RSDE_xxx'cr' <channel_no> RSDE_xxx'cr'lf'] <channel_no> MC RSDE_'cr' <channel_no> RSDE_xxx'cr'lf']	Where: xxx = ON, OFF, or CORR_OFF.
Bit Error Rate Threshold	Command: Response: Status: Response:	<channel_no> MC BERT_xxxx'cr' <channel_no> BERT_xxxx'cr''lf'] <channel_no> MC BERT_'cr' <channel_no> BERT_xxxx'cr''lf']	Where: xxxx = None or 1E-n (where n = 3, 4, 5, 6, 7, or 8 [exponent of threshold]).
Demodulator Type	Command: Response: Status: Response:	<channel_no> MC DT_xxxx'cr' <channel_no> DT_xxxx'cr''lf'] <channel_no> MC DT_'cr' <channel_no> DT_xxxx'cr''lf']	Where: In RX Continuous mode, xxxx = INTL (INTELSAT Open Network), EFD (Comtech EF Data Closed Network), CSC (Comstream Closed Network), or FDC (Fairchild Closed Network).
Demodulator Decoder Type	Command: Response: Status: Response:	<channel_no> MC DDT_xxx'cr' <channel_no> DDT_xxx'cr''lf'] <channel_no> MC DDT_'cr' <channel_no> DDT_xxx'cr''lf']	Where: In RX Continuous mode, xxx = VIT (K-7 Viterbi Encoder) SEQ (Sequential Encoder) TUR (Turbo)
Reed-Solomon Interleave Value	Command: Response: Status: Response:	<channel_no> MC RRSI_xx'cr' <channel_no> RRSI_xx'cr''lf'] <channel_no> MC RRSI_'cr' <channel_no> RRSI_xx'cr''lf']	Where: xx = 4, 8, or 16.
RX 8PSK 2/3 IESS-310 Operation	Command: Response: Status: Response:	<channel_no> MC R310_xxx'cr' <channel_no> R310_xxx'cr''lf'] <channel_no> MC R310_'cr' <channel_no> R310_xxx'cr''lf']	Where: xxx = ON or OFF.

Receive BPSK Data Ordering	Command: Response: Status: Response:	<channel_no> MC RDA_xxx'cr' <channel_no> RDA_xxx'cr''lf'] <channel_no> MC RDA_'cr' <channel_no> RDA_xxx'cr''lf']	Where: xxx = NRM (Standard) or INV (Non-Standard). Note: In RX Continuous mode only.
Bulk Demodulator Configuration	Command: Response:	<channel_no> BDC_BMNO,yyy.yyyy,ttttt,uuuuu,DDDD, zzzz.zzz'cr' <channel_no> BDC_BMNO,yyy.yyyy,ttttt,uuuuu,DDDD, zzzz.zzz 'cr''lf']	Where: B = Modulator set to Burst (B) or Continuous (C). M = Descrambler status OFF (0) or ON (1). N = Differential Decoder status 0 or 1. O = Reed Solomon Decoder status 0 or 1 (always 0). yyy.yyyy = Input IF frequency 50.0 to 180.0 MHz. ttttt = Sweep Center Frequency -35000 to +35000. uuuuu = Sweep Frequency Range 0 to 70000. DDDD = Code Rate '1/2','3/4','7/8' '8/9', '5/16' (B516), '21/44' (2144), or 'BP12'. zzzz.zzz = Data Rate 4.800 to 2000.0 kbps (limited by Code Rate).
Maximum Packet Size	Command: Response:	<channel_no> BPS,xxxxxxxx'cr' <channel_no> BPS,xxxxxxxx'cr''lf']	Where: xxxxxxxx = user length in bits, range of 2 to 16777216 bits (QPSK 1/2, Burst mode). This command specifies the maximum user data packet length that the SNM-1000 will accept in Burst mode. If the received packet is longer that the specified length, the modem assumes that the packet has been corrupted and enters the acquisition mode.

A.5 Interface Configuration Commands

Transmit Clock	Command: Response: Status: Response:	<channel_no> MC TC_xxx'cr' <channel_no> TC_xxx'cr''lf'] <channel_no> MC TC_'cr' <channel_no> TC_xxx'cr''lf']	Where: xxx = INT (Internal SCT Clock), EXT (External TX Terrestrial Clock), or SAT (Receive Satellite Clock).
Transmit Clock Phase	Command: Response: Status: Response:	<channel_no> MC TCP_xxxx'cr' <channel_no> TCP_xxxx'cr''lf'] <channel_no> MC TCP_'cr' <channel_no> TCP_xxxx'cr''lf']	Where: In TX Burst mode, xxxx = NRM (Normal Clock Phasing) or INV (Inverted Clock Phasing). In TX Continuous mode, xxxx = NRM (Normal Clock Phasing), INV (Inverted Clock Phasing), or AUTO (Automatic Clock Phasing).
Buffer Clock	Command: Response: Status: Response:	<channel_no> MC BC_xxx'cr' <channel_no> BC_xxx'cr''lf'] <channel_no> MC BC_'cr' <channel_no> BC_xxx'cr''lf']	Where: xxx = INT (Internal SCT Clock), EXT (External TX Terrestrial Clock), SAT (Receive Satellite Clock), or REF (External Reference Clock). Note: In RX Continuous mode only.
Receive Clock Phase	Command: Response: Status: Response:	<channel_no> MC RCP_xxxx'cr' <channel_no> RCP_xxxx'cr''lf'] <channel_no> MC RCP_'cr' <channel_no> RCP_xxxx'cr''lf']	Where: xxxx = NRM (normal clock phasing) or INV (inverted clock phasing).
Baseband Loopback	Command: Response: Status: Response:	<channel_no> MC BBL_xxx'cr' <channel_no> BBL_xxx'cr''lf'] <channel_no> MC BBL_'cr' <channel_no> BBL_xxx'cr''lf']	Where: xxx = ON or OFF.

A.5.1 Interface Buffer Size

Buffer size programming is supported in two formats: bits or ms. The selected format shall be chosen using the buffer programming command (IBP_), shown in the following listing.

Interface Buffer Size (bit format)	Command: Response: Status: Response:	<channel_no> MC IBS_nnnnn'cr' <channel_no> IBS_nnnnn'cr''lf'] <channel_no> MC IBS_'cr' <channel_no> IBS_nnnnn'cr''lf']	Where: nnnnn = 64 to 65536, in 16-bit increments. Note: In RX Continuous mode only.
Interface Buffer Size (ms format)	Command: Response: Status: Response:	<channel_no> MC IBS_nn'cr' <channel_no> IBS_nn'cr''lf'] <channel_no> MC IBS_'cr' <channel_no> IBS_nn'cr''lf']	Where: nn = 0 to 50 (buffer size in ms). Note: In RX Continuous mode only.
Interface Buffer Center	Command: Response:	<channel_no> MC IBC_'cr' <channel_no> IBC_'cr''lf']	Note: In RX Continuous mode only.
Interface Buffer Programming	Command: Response: Status: Response:	<channel_no> MC IBP_xxx'cr' <channel_no> IBP_xxx'cr''lf'] <channel_no> MC IBP_'cr' <channel_no> IBP_xxx'cr''lf']	Where: xxx = bits or ms. Note: In RX Continuous mode only.

A.6 System Configuration Commands

Refer to the following listing for system commands.

Time of Day	Command: Response: Status: Response:	<channel_no> MC TIME_hh:mmxx'cr' <channel_no> TIME_hh:mmxx'cr''lf'] <channel_no> MC TIME_'cr' <channel_no> TIME_hh:mmxx'cr''lf']	Where: hh = 1 to 12 (hours). mm = 00 to 59 (minutes). xx = AM or PM.
Date	Command: Response: Status: Response:	<channel_no> MC DATE_mm/dd/yy'cr' <channel_no> DATE_mm/dd/yy'cr''lf'] <channel_no> MC DATE_'cr' <channel_no> DATE_mm/dd/yy'cr''lf']	Where: mm = 1 to 12 (month). dd = 1 to 31 (day). yy = 00 to 99 (year).
Remote Operation	Command: Response:	<channel_no> MC REM_'cr' <channel_no> REM_'cr''lf']	The modem will respond to any status request at any time. However, the modem must be in Remote mode to change configuration parameters.
Clear Stored Faults	Command: Response:	<channel_no> MC CLSF_'cr' <channel_no> CLSF_'cr''lf']	This command is used to clear all stored faults logged by the modem.
Modem Operation Mode	Command: Response: Status: Response:	<channel_no> MC MOM_xxxxxxx'cr' <channel_no> MOM_xxxxxxx'cr''lf'] <channel_no> MC MOM_'cr' <channel_no> MOM_xxxxxxx'cr''lf']	Where: xxxxxxx = TX_only, RX_only, or duplex. This command configures the modem for simplex or duplex operation modes. When transmit only mode is selected, receive faults are inhibited. When receive only mode is selected, transmit faults are inhibited.
RTS TX-IF Control Mode	Command: Response: Status: Response:	<channel_no> MC RTSM_xxx'cr' <channel_no> RTSM_xxx'cr''lf'] <channel_no> MC RTSM_'cr' <channel_no> RTSM_xxx'cr''lf']	Where: xxx = ON or OFF. Note: In TX Continuous mode only. This command configures the modem for the RTS TX-IF control mode. If ON is selected, the TX-IF output will only be turned ON if the incoming RTS signal is asserted. The TX-IF output has to be programmed ON. There should be no major modulator faults present. If OFF is selected, the TX-IF output will operate normally, ignoring the RTS signal.
Online LED Display	Command: Response:	<channel_no> LED,AAAAA'cr' <channel_no> LED,AAAAA'cr''lf']	Where: AAAAA = OFF, ON, or FLASH

A.6.1 Modem Type Commands

Refer to the following listing for modem type commands.

Transmit Mode Selection	Command: Response: Status: Response:	<channel_no> MC TXM_xxxxx'cr' <channel_no> MC TXM_xxxxx'cr"lf'] <channel_no> MC TXM_'cr' <channel_no> MC TXM_xxxxx'cr"lf']	Where: xxxxx = BURST or CONT (Continuous). This command configures the modem transmit side to operate in Burst or Continuous mode. The <channel_no> is 0 for the remote control mode SNM-1000.
Receive Mode Selection	Command: Response: Status: Response:	<channel_no> MC RXM_xxxxx'cr' <channel_no> MC RXM_xxxxx'cr"lf'] <channel_no> MC RXM_'cr' <channel_no> MC RXM_xxxxx'cr"lf']	Where: xxxxx = CONT (Continuous). This command configures the modem receive side to operate in Burst or Continuous mode. The <channel_no> is 0 for the remote control mode SNM-1000.

A.7 Configuration Status

Refer to the following listing for configuration status data.

Modulator Configuration Status	Status: Response:	<channel_no> MC MCS_'cr' <channel_no> MCS_'cr' RF_xxx'cr' MF_nnn.nnnn'cr' MR_nnnn_mmm.mmm'cr' AMRA_nnnn_mmm.mmm'cr' AMRB_nnnn_mmm.mmm'cr' AMRC_nnnn_mmm.mmm'cr' AMRD_nnnn_mmm.mmm'cr' AMRV_nnnn.mmm.mmm'cr' MPO_snn.n'cr'Modulator MOP_snnn.n'cr' SE_xxx'cr' DENC_xxx'cr' MT_xxxx'cr' MET_xxx'cr' TDA_xxx'cr' (Note 1) COM_xxx'cr' TXM_xxxxx'cr' MPRE_n'cr' (Note 2) RSEN_xxx'cr"lf'] (Note 1)	RF Output (ON/OFF) Modulator Frequency Modulator Rate Preset A Assignment Preset B Assignment Preset C Assignment Preset D Assignment Preset V Assignment Power Offset Modulator Output Power Scrambler Enable (ON/OFF) Differential Encoder (ON/OFF) Modulator Type Modulator Encoder Type Transmit BPSK Data Ordering Carrier Only Mode (ON/OFF) Transmit Mode Modulator Preamble Reed-Solomon Encoder The modulator configuration status command causes a block of data to be returned by the addressed modem. The block of data reflects the current configuration status of the modulator module. Notes: 1. Status only returned in Transmit Burst mode. 2. Status only returned in Transmit Continuous mode.

Modulator/ Coder Configuration Program Status	Status: Response:	<channel_no> MC MCP_'cr' <channel_no> MCP_'cr' MOM_xxxxxxx'cr' MT_xxxx'cr' MET_xxx'cr' MF_nnn.nnnn'cr' MR_nnnn_mmm.mmm'cr' MPO_snn.n'cr' MOP_snnn.n'cr' SE_xxx'cr' DENC_xxx'cr' TDA_xxx'cr' (Note 1) TC_xxx'cr' TCP_xxxx'cr' BBL_xxx'cr' RTSM_xxx'cr' (Note 2) TXM_xxxxx'cr' (Note 2) MPRE_n'cr' (Note 2) RSEN_xxx'cr' (Note 1) RF_xxx'cr''lf']	Modem Operation Mode Modulator Type Modulator Encoder Type Modulator Frequency Modulator Rate Modulator Power Offset Modulator Output Power Scrambler Enable (ON/OFF) Differential Encoder (ON/OFF) Transmit BPSK Data Ordering Transmit Clock (Source) Transmit Clock Phase Baseband Loopback RTS TX-IF Control Mode Transmit Mode Modulator Preamble Reed-Solomon Encoder RF Output (ON/OFF) This command is used by the Comtech EF Data M:N protection switch to collect information necessary for configuring backup modems. Notes: 1. Status only returned in Transmit Continuous mode. 2. Status only returned in Transmit Burst mode.
Demodulator Configuration Status	Status: Response:	<channel_no> MC DCS_'cr' <channel_no> DCS_'cr' DF_nnn.nnnn'cr' DR_nnnn_mmm.mmm'cr' ADRA_nnnn_mmm.mmm'cr' ADRB_nnnn_mmm.mmm'cr' ADRC_nnnn_mmm.mmm'cr' ADRD_nnnn_mmm.mmm'cr' ADRV_nnnn.mmm.mmm'cr' DE_xxx'cr' DDEC_xxx'cr' RFL_xxx'cr' IFL_xxx'cr' SCF_snnnnn'cr' (Note 1) SWR_nnnnn'cr' (Note 1) BERT_xxxx'cr' DT_xxxx'cr' DDT_xxx'cr' RDA_xxx'cr' (Note 1) RXM_xxxxx'cr' RSDE_xxx'cr''lf'] (Note 1)	Demodulator Frequency Demodulator Rate Preset A Assignment Preset B Assignment Preset C Assignment Preset D Assignment Preset V Assignment Descrambler Enable (ON/OFF) Differential Decoder (ON/OFF) RF Loopback (ON/OFF) IF Loopback (ON/OFF) Sweep Center Frequency Sweep Width Range BER Threshold Demodulator Type Demodulator Decoder Type Receive BPSK Data Ordering Receive Mode Reed-Solomon Decoder The demodulator configuration status command causes a block of data to be returned by the addressed modem. The block of data reflects the current configuration of the demodulator. Notes: 1. Status only returned in Receive Continuous mode.

Demodulator/Decoder Configuration Program Status	Status: Response:	<channel_no> MC DCP_'cr' <channel_no> DCP_'cr' MOM_xxxxxxx'cr' BERT_xxxx'cr' DT_xxxx'cr' DDT_xxx'cr' DF_nnn.nnnn'cr' DR_nnnn_mmm.mmm'cr' DE_xxx'cr' DDEC_xxx'cr' RFL_xxx'cr' IFL_xxx'cr' SCF_snnnnn'cr' (Note 1) SWR_nnnnn'cr' (Note 1) RDA_xxx'cr' (Note 1) BC_xxx'cr' (Note 1) RCP_xxxx'cr' BBL_xxx'cr' IBP_xxx'cr' (Note 1) IBS_nnnnn'cr' (Note 1) RXM_xxxxx'cr' RSDE_xxx'cr''lf']	Modem Operation Mode BER Threshold Demodulator Type Demodulator Decoder Type Demodulator Frequency Demodulator Rate Descrambler Enable (ON/OFF) Differential Decoder (ON/OFF) RF Loopback (ON/OFF) IF Loopback (ON/OFF) Sweep Center Frequency Sweep Width Range Receive BPSK Data Ordering Buffer Clock (Source) Receive Clock Phase Baseband Loopback Interface Buffer Programming Interface Buffer Size Receive Mode Reed-Solomon Decoder This command is used by the M:N protection switch to collect information necessary for configuring backup modems. Notes: 1. Status only returned in Receive Continuous mode.
Interface Configuration Status	Status: Response:	<channel_no> MC ICS_'cr' <channel_no> ICS_'cr' TC_xxx'cr' TCP_xxxx'cr' RCP_xxxx'cr' BBL_xxx'cr' BC_xxx'cr' (Note 1) IBP_xxx'cr' (Note 1) IBS_nnnnn'cr' (Note 1) RTSM_xxx'cr''lf'] (Note 2)	Transmit Clock (Source) Transmit Clock Phase Receive Clock Phase Baseband Loopback Buffer Clock (Source) Interface Buffer Programming Interface Buffer Size RTS TX-IF Control Mode The interface configuration status command causes a block of data to be returned by the addressed modem. The block reflects the current configuration of the interface. Notes: 1. Status only returned in Receive Continuous mode. 2. Status only returned in Transmit Continuous mode.

A.7.1 Modem Faults Status

Modem Faults Status (Summary)	Status: Response:	<channel_no> MC MFS_'cr' <channel_no> MFS_'cr' DMD_xxx'cr' MOD_xxx'cr' ITX_xxx'cr' IRX_xxx'cr' CEQ_xxx'cr''lf']	RX Continuous Mode: Demodulator (FLT/OK) Modulator (FLT/OK) Interface Transmit Side (FLT/OK) Interface Receive Side (FLT/OK) Common Equipment (FLT/OK)
Modulator Status	Status: Response: Response:	<channel_no> MC MS_'cr' <channel_no> MS_'cr' RF_xxx'cr' MOD_xxx'cr' SYN_xxx'cr' DCS_xxx'cr' AGC_xxx'cr' SFLT_xx'cr''lf'] <channel_no> MS_'cr' RF_xxx'cr' MOD_xxx'cr' SYN_xxx'cr' DCS_xxx'cr' ICH_xxx'cr' QCH_xxx'cr' AGC_xxx'cr' SFLT_xx'cr''lf']	TX Burst Mode: RF Output (ON/OFF) Actual Status, Not Configured Module (OK/FLT) IF Synthesizer (OK/FLT) Data Clock Synthesizer (OK/FLT) AGC Level (OK/FLT) Number of Stored Faults Logged (0 through 10) TX Continuous Mode: RF Output (ON/OFF) Actual Status, Not Configured Module (OK/FLT) IF Synthesizer (OK/FLT) Data Clock Synthesizer (OK/FLT) I Channel (OK/FLT) Q Channel (OK/FLT) AGC Level (OK/FLT) Number of Stored Faults Logged (0 through 10)
Demodulator Status	Status: Response:	<channel_no> MC DS_'cr' <channel_no> DS_'cr' MOD_xxx'cr' CD_xxx'cr' SYN_xxx'cr' ICH_xxx'cr' QCH_xxx'cr' DSCR_xxx'cr' BERT_xxx'cr' SFLT_xx'cr''lf']	RX Continuous Mode: Demod Module (OK/FLT) Carrier Detect (OK/FLT) IF Synthesizer Lock (OK/FLT) I Channel (OK/FLT) Q Channel (OK/FLT) Descrambler (OK/FLT) BER Threshold (OK/FLT) Number of Stored Faults Logged (0 through 10)

Interface Transmit Side Status	Status: Response: Response:	<channel_no> MC ITXS_'cr' <channel_no> ITXS_'cr' CLK_xxx'cr' SFLT_xx'cr"lf'] <channel_no> ITXS_'cr' CLK_xxx'cr' SFLT_xx'cr"lf']	TX Burst Mode: Selected Transmit Clock Activity (OK/FLT) Number of Stored Faults Logged (0 through 10) TX Continuous Mode: Selected Transmit Clock Activity (OK/FLT) Number of Stored Faults Logged (0 through 10)
Interface Receive Side Status	Status: Response:	<channel_no> MC IRXS_'cr' <channel_no> IRXS_'cr' CLK_xxx'cr' UNFL_xxx'cr' OVFL_xxx'cr' SFLT_xx'cr"lf']	Selected Buffer Clock Activity (OK/FLT) Buffer Underflow (OK/FLT) Buffer Overflow (OK/FLT) Number of Stored Faults Logged (0 through 10)
Common Equipment Status	Status: Response:	<channel_no> MC CES_'cr' <channel_no> CES_'cr' M&C_xxx'cr' INT_xxx'cr' BAT_xxx'cr' +5_xxx'cr' +12_xxx'cr' -12_xxx'cr' MODE_xxxxxx'cr' SFLT_xx'cr"lf']	M&C Module (OK/FLT) Data Interface Module (OK/FLT) Battery/Clock (OK/FLT) +5V Power Supply (OK/FLT) +12V Power Supply (OK/FLT) -12V Power Supply (OK/FLT) Mode (LOCAL or REMOTE) Number of Stored Faults Logged (0 through 10) The common equipment status command causes the return of a block of data indicating the common equipment status.

A.7.2 Error Performance Status

Raw BER	Status: Response:	<channel_no> MC RBER_'cr' <channel_no> RBER_xm.mE-ee'cr''lf']	Where: x = < or > (data modifier to indicate that the error rate is less than or greater than the returned value). m.m = 1.0 to 9.9 (error rate mantissa). ee = 1 to 99 (error rate exponent). Notes: 1. The 'x' (< or >) parameter is only returned if the error rate has exceeded the computational resolution of the system. 2. 'No Data' is returned if the error rate cannot be calculated. 3. 'Sampling' is returned if not enough data is currently available to calculate the error rate.
Corrected BER	Status: Response:	<channel_no> MC CBER_'cr' <channel_no> CBER_xm.mE-ee'cr''lf']	Where: x = < or > (data modifier to indicate that the error rate is less than or greater than the returned value). m.m = 1.0 to 9.9 (error rate mantissa). ee = 1 to 99 (error rate exponent). Notes: 1. The 'x' (< or >) parameter is only returned if the error rate has exceeded the computational resolution of the system. 2. 'No Data' is returned if the error rate cannot be calculated. 3. 'Sampling' is returned if not enough data is currently available to calculate the error rate.

E_b/N_0 Status	Status: Response:	<channel_no> MC EBN0_'cr' <channel_no> EBN0_xnn.ndB'cr''lf']	Where: x = < or > (data modifier to indicate that the E_b/N_0 is less than or greater than the returned value). nn.n = 1.0 to 99.9 (E_b/N_0 value). Notes: 1. The 'x' (< or >) parameter is only returned if the E_b/N_0 has exceeded the computational resolution of the system. 2. 'No Data' returned if the E_b/N_0 cannot be calculated. 3. 'Sampling' returned if not enough data available to calculate the E_b/N_0.
Modulator Rate Status	Status: Response:	<channel_no> MC MR_'cr' <channel_no> MR_nnnn_mmm.mmm'cr''lf']	Where: In TX Burst mode, nnnn = 1/2 or 3/4 (Coder rate). In TX Continuous mode, nnnn = 1/2 (QPSK 1/2), [coder rate], 3/4 (QPSK 3/4), 7/8 (QPSK 7/8), BP12 (BPSK 1/2), 8P23 (8PSK 2/3), OQ12 (OQPSK 1/2), OQ34 (OQPSK 3/4), OQ78 (OQPSK 7/8), OQSK (OQPSK 1/1), BPSK (BPSK 1/1) (QPSK (QPSK 1/1), 2144 (BPSK 21/44), B516 (BPSK 5/16), 8P34 (8PSK 3/4). mmm.mmm = Data rate in kHz.
Demodulator Rate Status	Status: Response:	<channel_no> MC DR_'cr' <channel_no> DR_nnnn_mmm.mmm'cr''lf']	Where: In RX Continuous mode, nnnn = 1/2 (QPSK 1/2), [coder rate], 3/4 (QPSK 3/4), 7/8 (QPSK 7/8), BP12 (BPSK 1/2), 8P23 (8PSK 2/3), OQ12 (OQPSK 1/2), OQ34 (OQPSK 3/4), OQ78 (OQPSK 7/8), OQSK (OQPSK 1/1), BPSK (BPSK 1/1) (QPSK (QPSK 1/1), 2144 (BPSK 21/44), B516 (BPSK 5/16), 8P34 (8PSK 3/4). mmm.mmm = Data rate in kHz.

Receive Signal Level Status	Status: Response:	<channel_no> MC RSL_'cr' <channel_no> RSL_xsnn.ndBm'cr''lf']	Where: x = < or > (data modifier to indicate that the receive signal level is less than or greater than the returned value). s = + or - (receive signal level sign). nn.n = 0.0 to 99.9 (receive signal level magnitude). Notes: 1. The 'x' (< or >) parameter is only returned if the level has exceeded the computational resolution of the system. 2. 'No Data' is returned if the level cannot be calculated. 3. 'Sampling' is returned if not enough data is currently available to calculate the level.
Current Sweep Value	Status: Response:	<channel_no> MC CSV_'cr' <channel_no> CSV_snnnnn'cr''lf']	Where: x = < or > (data modifier to indicate that the sweep offset value is less than or greater than the returned value). s = + or - (sweep offset from center). nnnnn = 0 to 35000. This command returns the current sweep offset value. Notes: 1. The 'x' (< or >) parameter is only returned if the level has exceeded the computational resolution of the system. 2. 'No Data' is returned if the level cannot be calculated. 3. 'Sampling' is returned if not enough data is currently available to calculate the level. 4. In RX Continuous mode only.

A.8 Stored Faults

Information on stored faults is returned when requested. If no stored fault exists for a given fault number, the words ‘NO FAULT’ will be returned instead of the normal time/date and status information.

The following symbols are used to define the stored faults status commands.

- # Fault number (0 through 9), '0' is the first fault stored.
- hh Hours in 24-hour format.
- mm Minutes.
- ss Seconds.
- MM Month.
- DD Day.
- YY Year.

Modulator Stored Faults	Command: Response:	<channel_no> MC MSF_#'cr' <channel_no> MSF_# hh:mm:ss MM/DD/YY'cr' MOD_xxx'cr' SYN_xxx'cr' DCS_xxx'cr' AGC_xxx'cr''lf']	TX Burst Mode: Module (OK/FLT). IF Synthesizer (OK/FLT). Data Clock Synthesizer (OK/FLT). AGC Level (OK/FLT).
	Response:	<channel_no> MSF_# hh:mm:ss MM/DD/YY'cr' MOD_xxx'cr' SYN_xxx'cr' DCS_xxx'cr' ICH_xxx'cr' QCH_xxx'cr' AGC_xxx'cr''lf']	TX Continuous Mode: Module (OK/FLT). IF Synthesizer (OK/FLT). Data Clock Synthesizer (OK/FLT). I Channel (OK/FLT). Q Channel (OK/FLT). AGC Level (OK/FLT).
Demodulator Stored Faults	Command: Response:	<channel_no> MC DSF_#'cr' <channel_no> DSF_# hh:mm:ss MM/DD/YY'cr' MOD_xxx'cr' CD_xxx'cr' SYN_xxx'cr' ICH_xxx'cr' QCH_xxx'cr' DSCR_xxx'cr' BERT_xxx'cr''lf']	 RX Continuous Mode: Demod module (OK/FLT). Carrier Detect (OK/FLT). IF Synthesizer Lock (OK/FLT). I Channel (OK/FLT). Q Channel (OK/FLT). Descrambler (OK/FLT). BER Threshold (OK/FLT).

Common Equipment Stored Faults	Command: Response:	<channel_no> MC CSF_#'cr' <channel_no> CSF_# hh:mm:ss MM/DD/YY'cr' M&C_xxx'cr' INT_xxx'cr' BAT_xxx'cr' +5_xxx'cr' +12_xxx'cr' -12_xxx'cr''lf']	 Monitor and Control Module (OK/FLT). Data Interface Module (OK/FLT). Battery/Clock (OK/FLT). +5V Power Supply (OK/FLT). +12V Power Supply (OK/FLT). -12V Power Supply (OK/FLT).
Bulk Consolidated Analog Status	Command: Response:	<channel_no> MC BCAS_'cr' <channel_no> BCAS_p1,p2,p3, . . . pn'cr''lf']	This command is similar to the 'BCS_' command, but returns modem analog parameters.

Where: 'pn' is the last parameter returned.

	Parameter Number	Parameter Name (Command Reference)	Description
	1	**Receive Signal Level** (ref. 'RSL_' command).	p1 = xsnn.n, receive signal level in dBm.
	2	**Raw BER** (ref. 'RBER_' command).	p2 = xm.mE-ee.
	3	**Corrected BER** (ref. 'CBER_' command).	p3 = xm.mE-ee.
(Note 1)	4	**E_b/N_0** (ref. ' EBN0 _' command).	p4 = xnn.n, E_b/N_0 in dB.
	5	**Current Sweep Value** (ref. 'CSV_' command).	p5 = snnnnn, sweep offset value in Hz.

Notes:
1. Status only returned in Continuous mode.
2. Parameters 2 through 5 are dependent on carrier acquisition. If the decoder is not locked, empty data blocks are returned (,,,,).

Bulk Consolidated Status	Command: Response:	<channel_no> MC BCS_'cr' <channel_no> BCS_p1,p2,p3, . . . pn'cr''lf']	This command causes bulk modem status to be returned. To reduce the length of the response, message parameter data are returned without identifiers. However, parameter identification can be determined by order of return. Each status parameter (except for the last parameter) is terminated with a comma (','). The last parameter has the standard message termination sequence ('cr''lf']). Most of the data returned is formatted the same way as that returned by any single command status request (refer to Section A.3.2 for examples).

Where: 'pn' is the last parameter returned.

	Parameter Number	Parameter Name (Command Reference)	Description
	1	**Modulator RF Output** (ref. 'RF_' command).	p1 = n, where 'n' is '0' (OFF) or '1' (ON).
	2	**Modulator IF Frequency** (ref. 'MF_' command).	p2 = nnn.nnnn, IF frequency in MHz.
	3	**Modulator Rate** (ref. 'MR_' command).	p3 = nnnn_mmm.mmm, code rate/data rate in kbps.
	4	**Modulator Preset A assignment** (ref. 'ARMA_' command).	p4 = nnnn_mmm.mmm, code rate/data rate in kbps.
	5	**Modulator Preset B assignment** (ref. 'ARMB_' command).	p5 = nnnn_mmm.mmm, code rate/data rate in kbps.
	6	**Modulator Preset C assignment** (ref. 'ARMC_' command).	p6 = nnnn_mmm.mmm, code rate/data rate in kbps.
	7	**Modulator Preset D assignment** (ref. 'ARMD_' command).	p7 = nnnn_mmm.mmm, code rate/data rate in kbps.
	8	**Modulator Preset V assignment** (ref. 'ARMV_' command).	p8 = nnnn_mmm.mmm, code rate/data rate in kbps.
	9	**Modulator Power Offset** (ref. 'MPO_' command).	p9 = snn.n, modulator power offset in dB.
	10	**Modulator Output Power Level** (ref. 'MOP_' command).	p10 = snn.n, transmitter output power level in dBm.
	11	**Scrambler Enable** (ref. 'SE_' command).	p11 = n, where 'n' is '0' (OFF) or '1' (ON).
	12	**Differential Encoder Enable** (ref. 'DENC_' command).	p12 = n, where 'n' is '0' (OFF) or '1' (ON).
	13	**Modulator Type** (ref. 'MT_' command).	p13 = n, where 'n' is '0' (EFD), '1' (INTL), '2'(CSC), '3' (FDC), or '4' (SDM51).
	14	**Modulator Encoder Type** (ref. 'MET_' command).	p14 = n, where 'n' is '0' (SEQ) or '1' (VIT).
(Note 1)	15	**Transmit BPSK Data Ordering** (ref. 'TDA_' command).	p15 = n, where 'n' is '0' (NRM), '1' (INV).
	16	**Carrier Only Mode ON/OFF.**	p16 = n, where 'n' is '0' (OFF) or '1' (ON).

Bulk
Consolidated Status
(continued

Where: 'pn' is the last parameter returned.

	Parameter Number	Parameter Name (Command Reference)	Description
	17	**Demodulator IF Frequency** (ref. 'DF_' command).	p17 = nnn.nnnn, demodulator IF frequency in MHz.
	18	**Demodulator Rate** (ref. 'DR_' command).	p18 = nnnn_mmm.mmm, code rate/data rate in kbps.
	19	**Demodulator Preset A Assignment** (ref. 'ADRA_' command).	p19 = nnnn_mmm.mmm, code rate/data rate in kbps.
	20	**Demodulator Preset B Assignment** (ref. 'ADRB_' command).	p20 = nnnn_mmm.mmm, code rate/data rate in kbps.
	21	**Demodulator Preset C Assignment** (ref. 'ADRC_' command).	p21 = nnnn_mmm.mmm, code rate/data rate in kbps.
	22	**Demodulator Preset D Assignment** (ref. 'ADRD_' command).	p22 = nnnn_mmm.mmm, code rate/data rate in kbps.
	23	**Demodulator Preset V Assignment** (ref. 'ADRV_' command).	p23 = nnnn_mmm.mmm, code rate/data rate in kbps.
	24	**Descrambler Enable** (ref. 'DE_' command).	p24 = n, where 'n' is '0' (OFF) or '1' (ON).
	25	**Differential Decoder Enable** (ref. 'DDEC_' command).	p25 = n, where 'n' is '0' (OFF) or '1' (ON).
	26	**RF Loopback** (ref. 'RFL_' command).	p26 = n, where 'n' is '0' (OFF) or '1' (ON).
	27	**IF Loopback** (ref. 'IFL_' command).	p27 = n, where 'n' is '0' (OFF) or '1' (ON).
(Note 1)	28	**Sweep Center Frequency** (ref. 'SCF_' command).	p28 = snnnnn, sweep center frequency in Hz.
(Note 1)	29	**Sweep Width Range** (ref. 'SWR_' command).	p29 = nnnnn, sweep range in Hz.
	30	**BER Threshold** (ref. 'BERT_' command).	p30 = xxxx, BER threshold.
	31	**Demodulator Type** (ref. 'DT_' command).	p31 = n, where 'n' is '0' (EFD), '1' (INTL), '2' (CSC), or '3' (FDC).
	32	**Demodulator Decoder Type** (ref. 'DDT_' command).	p32 = n, where 'n' is '0' (SEQ) or '1' (VIT).
(Note 1)	33	**Receive BPSK Data** (ref. 'RDA_' command).	p33 = n, where 'n' is '0' (NRM),or '1' (INV).
	34	**Transmit Clock Source** (ref. 'TC_' command).	p34 = n, where 'n' is '0' (INT), '1' (REF), or '2' (EXT).

Bulk
Consolidated Status
(continued

Where: 'pn' is the last parameter returned.

	Parameter Number	Parameter Name (Command Reference)	Description
	35	**Transmit Clock Phase** (ref. 'TCP_' command).	p35 = n, where 'n' is '0' (NRM), '1' (INV), or '2' (AUTO).
(Note 1)	36	**Buffer Clock Source** (ref. 'BC_' command).	p36 = n, where 'n' is '0' (INT), '1' (REF), '2' (EXT), or '3' (SAT).
	37	**Receive Clock Phase** (ref. 'RCP_' command).	p37 = n, where 'n' is '0' (NRM) or '1' (INV).
	38	**Baseband Loopback** (ref. 'BBL_' command).	p38 = n, where 'n' is '0' (OFF) or '1' (ON).
(Note 1)	39	**Interface Buffer Programming** (ref. 'IBP_' command).	p39 = n, where 'n' is '0' (BITS) or '1' (MS).
(Note 1)	40	**Interface Buffer Size** (ref. 'IBS_' command).	p40 = nnnnnn, buffer size in bits or milliseconds.
	41	**Modem Operation Mode** (ref. 'MOM_' command).	p41 = n, where 'n' is '1' (TX_ONLY), '2' (RX_ONLY), or '3' (DUPLEX).
	42	**Modem Remote/Local Mode.**	p42 = n, where 'n' is '0' (LOCAL) or '1' (REMOTE).
	43	**Not valid.**	
	44	**Not valid.**	
	45	**Not valid.**	
	46	**Not valid.**	
	47	**Not valid.**	
	48	**Not valid.**	
	49	**Not valid.**	
	50	**Not valid.**	
	51	**Not valid.**	
	52	**Not valid.**	
	53	**Not valid.**	
	54	**Not valid.**	
(Note 3)	55	**Not valid.**	
	56	**Transmit Mode Selection (ref. 'TXM_' command).**	p56 = n, where 'n' is '1' (BURST) or '2' (CONTINUOUS).
(Note 2)	57	**Modulator Preamble Selection** (ref. 'MPRE_' command).	p57 = n, where 'n' is '1' (PREAMBLE) or '2' (PREAMBLE 2).

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Consolidated Status
(continued

Where: 'pn' is the last parameter returned.

	Parameter Number	Parameter Name (Command Reference)	Description
	58	**Receive Mode Selection** (ref. 'RXM_' command).	p58 = n, where 'n' is '2' (CONTINUOUS)
(Note 1)	60	**Reed-Solomon Encoder Enable** (ref. 'RSEN_' command).	p60 = n, where 'n' is '0' (OFF,) or '1' (ON).
(Note 1)	61	**Reed-Solomon Decoder Enable** (ref. 'RSDE_' command).	p61 = n, where 'n' is '0' (OFF), '1' (ON), or '2' (CORR_OFF).

Notes:
1. Parameters only valid in Transmit and Receive Continuous mode.
2. Parameters only valid in Transmit Continuous mode.
3. For any parameter other than the last parameter that is not returned, a comma (',') will be returned.

Bulk Consolidated Status Faults	Command: Response:	<channel_no> MC BCSF_'cr' <channel_no> BCSF_abcdefghijkl'cr''lf']	This command causes all modem fault status information to be returned. To reduce the length of the response, fault status is embedded into the bit structure of the characters that are returned. Faults are indicated by a binary 1 in the designated bit position. Where: Character a: Modulator fault status character 1. Bit 6 = 1 always. Bit 5 = Modulator module fault. Bit 4 = RF output status. Actual not programmed status (1 = ON, 0 = OFF). Bit 3 through Bit 0 = Binary representation (0 to 10) of the number of modulator stored faults. Character b: Modulator fault status character 2. Bit 6 = 1 always. Bit 5 = IF Synthesizer. Bit 4 = Data Clock Synthesizer. Bit 3 = reserved. Bit 2 = reserved. Bit 1 = AGC Level. Bit 0 = reserved. Note**:** In TX Burst mode only. Character b: Modulator fault status character 2. Bit 6 = 1 always. Bit 5 = IF Synthesizer. Bit 4 = Data Clock Synthesizer. Bit 3 = I Channel. Bit 2 = Q Channel. Bit 1 = AGC Level. Bit 0 = reserved. Note**:** In TX Continuous mode only. Character c: Modulator fault status character 3. Bit 6 = 1 always. Bit 5 = reserved. Bit 4 = reserved. Bit 3 = reserved. Bit 2 = reserved. Bit 1 = reserved. Bit 0 = reserved. Character d: Demodulator fault status character 1. Bit 6 = 1 always. Bit 5 = Demod module fault. Bit 4 = Carrier detect status (0 for decoder lock). Bit 3 through Bit 0 = Binary representation (0 to 10) of the number of demodulator stored faults. Note**:** In RX Continuous mode only. Character e: Demodulator fault status character 2. Bit 6 = 1 always. Bit 5 = IF Synthesizer Lock. Bit 4 = I Channel. Bit 3 = Q Channel. Bit 2 = Descrambler. Bit 1 = BER threshold. Bit 0 = reserved. Note**:** In RX Continuous mode only.

			Character f: Demodulator fault status character 3. Bit 6 = 1 always. Bit 5 = reserved. Bit 4 = reserved. Bit 3 = reserved. Bit 2 = reserved. Bit 1 = reserved. Bit 0 = reserved. Character g: Interface transmit side faults character 1. Bit 6 = 1 always. Bit 5 = reserved. Bit 4 = reserved. Bit 3 through Bit 0 = Binary representation (0 to 10) of the number of interface transmit side stored faults. Character h: Interface transmit side faults character 2. Bit 6 = 1 always. Bit 5 = Selected Transmit Clock Activity. Bit 4 = reserved. Bit 3 = reserved. Bit 2 = reserved. Bit 1 = reserved. Bit 0 = reserved. Note**:** In TX Burst mode only. Character i: Interface receive side faults character 1. Bit 6 = 1 always. Bit 5 = reserved. Bit 4 = reserved. Bit 3 through Bit 0 = Binary representation (0 to 10) of the number of interface receive side stored faults. Character j: Interface receive side faults character 2. Bit 6 = 1 always. Bit 5 = Selected Buffer Clock Activity. Bit 4 = Buffer Underflow. Bit 3 = Buffer Overflow. Bit 2 = reserved. Bit 1 = reserved. Bit 0 = reserved. Note**:** In RX Continuous mode only. Character k: Common equipment fault status character 1. Bit 6 = 1 always. Bit 5 = Monitor and Control Module. Bit 4 = Interface Module. Bit 3 through Bit 0 = Binary representation (0 to 10) of the number of common equipment stored faults. Character l: Common equipment fault status character 2. Bit 6 = 1 always. Bit 5 = Battery/Clock. Bit 4 = +5V power supply. Bit 3 = +12V power supply. Bit 2 = -12V power supply. Bit 1 = reserved. Bit 0 = reserved. Character m: Interface Reed-Solomon unavailable seconds. Bit 6 = 1 always. Bit 5 = not used. Bit 4 = not used. Bit 3 through Bit 0 = reserved.
Change Status	Command: Response:	<channel_no> MC CS_'cr' <channel_no> CS_x'cr''lf']	This command indicates that a change has or has not occurred on either the BCS or the BCSF response since the last BCS

			or BCSF_ poll. Where: the x character is defined as follows: @ = no change since last BCS_ and BCSF_ polls. A = BCS_ response has changed since last BCS_ poll. B = BCSF_ response has changed since last BCSF_ poll. C = Both responses have changed since last BCS_ and BCSF_ polls.
Equipment Type	Command: Response:	<channel_no> MC ET_'cr' <channel_no> ET_ttttttt_xxx.yyy.zzz'cr''lf']	This command returns the equipment type and the software version of the addressed device. Where: ttttttt = Equipment type. xxx.yyy.zzz = Software version.
Modem Monitor and Contro Firmware Information	Command: Response:	<channel_no> MC MCFI_'cr' <channel_no> MCFI_'cr' VER_xxx.yyy.zzz'cr' FW/nnnnnn-ddr'cr' mm/dd/yy'cr''lf']	Where: xxx.yyy.zzz = Software version number (0.0.0 to 999.999.999). nnnnnn = Firmware number (0 to 999999). dd = Firmware dash number (0 to 99). r = Firmware revision (-, or A to Z).
Modem Data ROM Firmware Information	Command: Response:	<channel_no> MC DFI_'cr' <channel_no> DFI_'cr' DSP_FW/nnnnnn-ddr'cr' DSP_mm/dd/yy'cr' FPGA_FW/nnnnnn-ddr'cr' FPGA_mm/dd/yy'cr''lf']	Where: nnnnnn = Firmware number (0 to 999999). dd = Firmware dash number (0 to 99). r = Firmware revision (-, or A to Z).

A.9 Unsolicited Responses

The following strings are generated by the DCE to reflect events which are not directly related to commands typed from the DTE. They generally reflect the results of an earlier command.

To ensure that a response is never inserted in the midst of another string, the following strings will not start until any transmission in progress has been completed. However, if a partial line has been entered from the DTE to the DCE, this strict sequence control causes indefinite waiting by the response string. The response string shall wait until the partial line is completed.

A.9.1 Messages from NMS

<channel_no> CONGESTION	Channel cannot be assigned because there is no satellite spectrum space available.
<channel_no> BUSY	Destination end is busy.
<channel_no> NO CONNECT <error code>	NMS was not able to complete the connection. Error Type Failure Terminate. Invalid Request.
<channel_no> CONNECT	Received when a connection is made.
<channel_no> DISCONNECT <result code>	Received when a connection is broken. Result Type — Code Path Ok. — 0 Calling Party Busy. — 1 Failure Terminate. — 2 Invalid Request. — 3 Normal Termination. — 4 Network Busy. — 5 Critical Fault. — 6

<channel no> CS <calling phone number> <called phone number> <status> <cause> <subcause>	Call Status <phone number> Calling phone number <dest node> Destination Node Id <dest channel> Destination Channel No. <status> Description 0 Path Ok 1 Channel busy 2 Failure 3 Invalid phone number 4 Normal Termination 5 Network Busy 6 Critical Fault <cause> and <subcause> Information only
<channel_no> MM <phone_no> <message>	Multipoint Message <phone_no> Source connection phone number or zero. <message> Message from source node.

A.9.2 List of Cause Codes

The complete list of *Cause* codes is given below. These are primarily used to determine what description of the call termination is included in the completed call log. The NMS and Node columns define whether the cause code is generated by the NMS or the Node, or whether both may generate it.

Value	Name	NMS	Node	Description
0x00	cause_Unknown	x	x	No more detail available
0x01	cause_NodeChanBusy	x	x	Calling or called Node/Ch is busy
0x02	cause_HuntGrpBusy	x		All numbers in hunt group are busy
0x03	cause_NoAnsTimer		x	No answer timer expired before going offhook
0x04	cause_NoCarrier	x		Carrier lock was never achieved
0x05	cause_CarrierLost	x		Carrier lock was achieved, but then lost
0x06	cause_ISDNFault	x		ISDN faults to be defined
0x07	cause_ModemProg	x		General Modem Programming failure
0x08	cause_IncompType	x		Incompatible modem types: voice/data, voice/ISDN
0x09	cause_NotInCircuit	x		The specified node is not online
0x0A	cause_InvalidNum	x		Number has invalid length, characters or is not defined
0x0B	cause_DoesNotExist	x		The specified node/channel/circuit is not in database
0x0C	cause_NotOnline	x		The specified node is not online
0x0D	cause_NotEnabled	x		The specified node or channel is not enabled
0x0E	cause_UserHangUp		x	User went on hook
0x0F	cause_NodeHangUp		x	Call terminated from user port on remote node
0x10	cause_RTSDrop	x		Call terminated when RTS went inactive
0x11	cause_NMSOperator	x		Call terminated by NMS
0x12	cause_CallTimer	x		Call term by the maximum call duration timer
0x13	cause_NoBandwidth	x		No bandwidth available
0x14	cause_NoPower	x		No power is available
0x15	cause_SequenceError	x		Commands sent out of sequence
0x16	cause_PreEmption	x		Pre-empted to free resources for high-priority call
0x17	cause_NoPowerNoBW	x		No power and no bandwidth available
0x18	cause_IncompVoiceCap	x		Attempt to mix G.728 + G.729 voice circuit
0x19	cause_IncompPhNum		x	Calling side PPTREQ # not equal PTTASSIGN #
0x1A	cause_InvalidVfduCmd		x	VFDU Card rejected DAC Command
0x1B	cause_NotInCall	x		MPDRequest, target node/chan not a member
0x1C	cause_InvalidMember		x	MPDRequest, action not allowed for this member
0x1D	cause_RequestInProg		x	MPDRequest, call member is busy with a request
0x1E	cause_AlreadyInCall		x	MPDRequest, cannot add node/chan already in call
0x1F	cause_NoReturn	x		MPDRequest, return off attempt with no return active

A.9.3 Cause and Subcause Codes Generated By NMS

The list of ***Cause*** and corresponding ***Subcause*** codes, which are generated by the NMS, is given below. These are used to give the maximum level of detail possible in describing why a call terminated. It is used primarily for diagnostic purposes. Note that each ***Cause*** code has its own list of ***Subcause*** definitions; a ***Subcause*** from one *Cause* cannot be used with another, unless it is also defined under that ***Cause***. Some Cause values have no Subcause list; these would always use ***subcause_Unknown***, which is defined with a value of 0. Even where sub causes are listed***, subcause_Unknown*** is still valid.

Example

Cause	Subcause	Name	Status	Description
0x01		cause_NodeChanBusy	term_Busy	Calling or called node/Ch is busy
	0x07	subcause_CannotCallSelf		Calling party attempted to call themselves
0x02		cause_HuntGrpBusy	term_Busy	All numbers in hunt group are busy
0x08		cause_IncompType	term_Invalid	Incompatible modem types; voice/data, voice/ISDN
	0x05	subcause_VoiceDataConf		Attempt to connect voice and data modems
0x09		cause_NotInCircuit	term_Invalid	The specified node/chan is not part of the circuit
0x0A		cause_InvalidNum	term_Invalid	Number has invalid length, characters or is not defined
	0x07	subcause_CannotCallSelf		A node/channel cannot call itself
	0x0F	subcause_NotDefined		The number is not in the database
0x0B		cause_DoesNotExist	term_Invalid	The specified node/channel/circuit is not in database
	0x01	subcause_ChanError		Channel is not in database
	0x02	subcause_NodeError		Node is not in database
	0x03	subcause_CircuitError		Circuit is not in database
0x0C		cause_NotOnLine	term_Invalid	Node is not responding to the NMS
	0x01	subcause_ChanError		Channel is not online
	0x02	subcause_NodeError		Node is not online
0x0D		cause_NotEnabled	term_Invalid	The specified node/channel/circuit is not enabled
	0x01	subcause_ChanError		Channel is not enabled
	0x02	subcause_NodeError		Node is not enabled
	0x04	subcause_AccessTime		Channel is not available, outside its access time
0x11		cause_NMSOperator	term_Normal	Call terminated by NMS
0x13		cause_NoBandwidth	term_NetworkBusy	No bandwidth available
0x14		cause_NoPower	term_NetworkBusy	No power is available
	0x03	subcause_NoPowerAtSite		No power at the site
	0x04	subcause_NoPowerAtSat		No power at the site
0x15		cause_SequenceError	term_Invalid	Messages sent out of sequence by node
	0x0D	subcause_NoPathStatus		Path status not received from one or both nodes
	0x0E	subcause_InvalidMsg		An invalid message received during call sequence
0x16		cause_PreEmption	term_FailureRetry	Pre-empted to free resources for high-priority call
0x17		cause_NoPowerNoBW	term_NetworkBusy	No power and no bandwidth available
	0x03	subcause_NoPowerAtSite		No power at the site
	0x04	subcause_NoPowerAtSat		No power at satellite
0x1B		cause_NotInCall	term_FailureRetry	The specified node/chan is not part of the call
0x1C		cause_InvalidMember	term_FailureRetry	Request not legal for this call member
	0x20	subcause_Chairman		Request not legal for the call Chairman
	0x21	subcause_Forward		Request not legal for the forward transmitter
	0x22	subcause_Return		Request not legal for the return transmitter
0x1D		cause_RequestInProg	term_FailureRetry	This member already has a request pending
0x1E		cause_AlreadyInCall	term_FailureRetry	Attempt to add a member already in the call
0x1F		cause_NoReturn	term_FailureRetry	Attempt to turn off return, with no return active

A.9.4 Cause and Subcause Codes Generated By Node

Example				
Cause	**Subcause**	**Name**	**Status**	**Description**
0x00		cause_Unknown	term_PathOk	
0x01		cause_NodeChanBusy	term_Busy	Called node/channel is busy
0x04		cause_NoCarrier	term_FailureRet	Carrier lock was never achieved
0x05		cause_CarrierLost	term_FailureRet	Carrier lock was achieved, but then lost
0x06		cause_ISDNFault	term_FailureRet	ISDN faults to be defined
	0x00-0x0D	reserved		
0x0E		subcause_InvalidRate		Invalid data rate for ISDN call
	0x0F-0xFF	reserved		
0x07		cause_ModemProg	term_FailureRet	General Modem Programming failure
	0x00	subcause_Unknown		Generic subcause code
	0x01	subcause_InvalidOpCode		Internal error code
	0x02	subcause_OpCodeFault		Internal error code
	0x03	subcause_InvalidResponseBuffer		Internal error code
	0x04	subcause_InvalidParm		Internal error code
	0x05	subcause_InvalidChan		Channel number out of range
	0x06	subcause_AccessDenied		Channel access denied
	0x07	subcause_ChannelOffline		Channel went offline
	0x08	subcause_InvalidRequestBuffer		Internal error code
	0x09	subcause_InvalidNodeStartupCode		Internal error code
	0x0A	subcause_InvalidNodeDisableOption		Internal error code
	0x0B	subcause_InvalidNodeStatusOption		Internal error code
	0x0C	subcause_InvalidTxFreq		Invalid transmit frequency
	0x0D	subcause_InvalidRxFreq		Invalid receive frequency
	0x0E	subcause_InvalidRate		Invalid Modulation ,code rate, data rate selection
	0x0F	subcause_InvalidPower		Invalid power level
	0x10	subcause_InvalidTxClock		Invalid transmit clock selection
	0x11	subcause_ChannelLocked		Channel already processing call
	0x12	subcause_ModemFault		Channel not responding to periodic status request
	0x13	subcause_NoCarrier		Carrier Not Detected
	0x14	subcause_InvalidParmBuffer		Internal error code
	0x15	subcause_CallNotActive		Call not in progress
	0x16	subcause_ModemNotPresent		Internal error code
	0x17	subcause_ModemFaultDetected		Modem offline
	0x18	subcause_InvalidEncoderType		Invalid Encoder Selection
	0x19	subcause_InvalidDecoderType		Invalid Decoder Selection
	0x1A	subcause_InvalidBus		Channel not defined on specific bus
	0x1B	subcause_InvalidSweep		Invalid demodulator sweep rate range
	0x1C	subcause_NoBufferAvail		Internal error code
	0x1D	subcause_InvalidDEncoder		Invalid differential encoder selection
	0x1E	subcause_InvalidDDecoder		Invalid differential decoder selection
	0x1F	subcause_ChannelNotInitialized		Internal error code
	0x20	subcause_ InvalidTransmitMode		Invalid Transmit Mode selection
	0x21	subcause_ InvalidBuffersize		Invalid Modem buffer size
	0x22	subcause_ InvalidAupcOption		Invalid Aupc Option
	0x23	subcause_ InvalidAupcNominalPower		Invalid Aupc Nominal Power
	0x24	subcause_ InvalidAupcMax		Invalid Aupc Max Power
	0x25	subcause_ InvalidAupcMin		Invalid Aupc Min Power
	0x26	subcause_ InvalidAupcSP		Invalid Aupc Set Point
	0x27	subcause_ InvalidAupcMaxRate		Invalid Aupc Max Rate
	0x28	subcause_ InvalidLocalAction		Invalid Aupc Local Action
	0x29	subcause_ InvalidRemoteAction		Invalid Aupc Remote Action
	0x30	subcause_ InvalidModemType		Internal error code
	0x31	subcause_ InvalidFramingType		Invalid Framing Selection
0x18		cause_IncompVoiceCap	term_FailureRet	Attempt to mix G.728 + G.729 voice circuit
0x19		cause_IncompPhNum	term_FailureRet	Calling side PPTREQ # not equal PTTASSIGN #
0x1A		cause_InvalidVfduCmd	term_FailureRet	VFDU Card rejected DAC Command
0x03		cause_NoAnsTimer	term_Normal	No answer timer expired without going offhook

Example				
Cause	**Subcause**	**Name**	**Status**	**Description**
0x0E		cause_UserHangUp	term_Normal	User went on hook
0x0F		cause_NodeHangUp	term_Normal	Call terminated from user port on remote node
0x10		cause_RTSDrop	term_Normal	Call terminated when RTS went inactive
0x12		cause_CallTimer	term_Normal	Call term by the maximum call duration timer

METRIC CONVERSIONS

Units of Length

Unit	Centimeter	Inch	Foot	Yard	Mile	Meter	Kilometer	Millimeter
1 centimeter	—	0.3937	0.03281	0.01094	6.214×10^{-6}	0.01	—	—
1 inch	2.540	—	0.08333	0.2778	1.578×10^{-5}	0.254	—	25.4
1 foot	30.480	12.0	—	0.3333	1.893×10^{-4}	0.3048	—	—
1 yard	91.44	36.0	3.0	—	5.679×10^{-4}	0.9144	—	—
1 meter	100.0	39.37	3.281	1.094	6.214×10^{-4}	—	—	—
1 mile	1.609×10^{5}	6.336×10^{4}	5.280×10^{3}	1.760×10^{3}	—	1.609×10^{3}	1.609	—
1 mm	—	0.03937	—	—	—	—	—	—
1 kilometer	—	—	—	—	0.621	—	—	—

Temperature Conversions

Unit	° Fahrenheit	° Centigrade
32° Fahrenheit	—	0 (water freezes)
212° Fahrenheit	—	100 (water boils)
-459.6° Fahrenheit	—	273.1 (absolute 0)

Formulas
C = (F - 32) * 0.555
F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoir.	Pound Troy	Kilogram
1 gram	—	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	—	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	—	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	—	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	—	0.3732
1 kilogram	1.0×10^{3}	35.27	32.15	2.205	2.679	—

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