

# **DMDVR20 LBST**

## **L-Band Satellite Modulator Industry Standard LDPC Receiver and ODU Driver**

**Installation and Operation Manual**

**TM136  
Revision 1.1**



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Phoenix, Arizona 85034 (USA)  
ATTN: Customer Support  
Phone: (602) 437-9620  
Fax: (602) 437-4811

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## Preface

# P

This manual provides installation and operation information for the Radyne DMDVR20 LBST. This is a technical document intended for use by engineers, technicians, and operators responsible for the operation and maintenance of the DMDVR20 LBST.

### Conventions

Whenever the information within this manual instructs the operator to press a pushbutton switch or keypad key on the Front Panel, the pushbutton or key label will be shown enclosed in "less than" (<) and "greater than" (>) brackets. For example, the Reset Alarms Pushbutton will be shown as <RESET ALARMS>, while a command that calls for the entry of a '7' followed by 'ENTER' Key will be represented as <7,ENTER>.

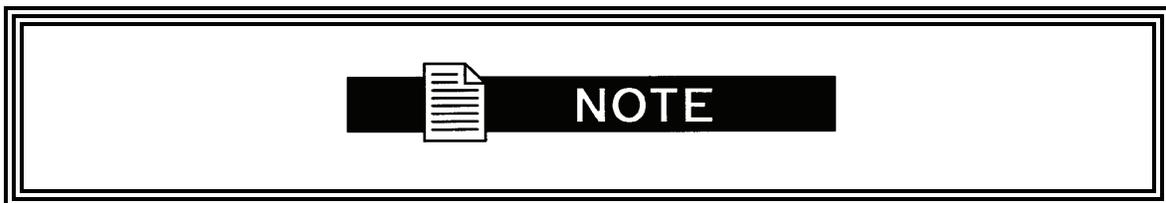
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A caution icon indicates a hazardous situation that if not avoided, may result in minor or moderate injury. Caution may also be used to indicate other unsafe practices or risks of property damage.



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



A note icon identifies information for the proper operation of your equipment, including helpful hints, shortcuts, or important reminders.

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**Record of Revisions**

Revision Level	Date	Reason for Change
1.0	2-19-08	Initial Release
1.1	5-5-08	Correct front panel menus, Various other changes.

**Comments or Suggestions Concerning this Manual**

Comments or suggestions regarding the content and design of this manual are appreciated. To submit comments, please contact the Radyne Corp. Customer Service Department.

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## Introduction

# 1

This chapter provides an overview of the DMDVR20 LBST Satellite Modem. The DMDVR20 LBST will be referred to in this manual as “the standard unit” and the DMDVR20 LBST will be referred to as the LBST. When describing the DMDVR20 LBST, it may be referred to as “the DMDVR20 LBST”, “the modem”, or “the unit”.

### 1.0 Overview

The Radyne DMDVR20 LBST Satellite Modem (Figure 1-1) offers the best features of a sophisticated programmable modem.



**Figure 1-1. DMDVR20 LBST Satellite Modem Front Panel**

This versatile equipment package combines unsurpassed performance with numerous user-friendly Front Panel Programmable Functions. The DMDVR20 LBST provides different services for the modulator and the demodulator. The modulator supported services are: Closed net, Intelsat IBS and LDPC Receiver. All of the configuration and Monitor and Control (M&C) Functions are available at the Front Panel. Operating parameters, such as variable data rates, FEC Code Rate, modulation type, IF Frequencies, Framing and interface type can be readily set and changed at the Front Panel by earth station operations personnel.

The modulator operates at all standard IBS Data Rates up to 8.448 Mbps. Selection of any data rate is provided over the range of 2.4 Kbps to 20 Mbps in 1 bps steps. The Demodulator supports LDPC Broadcast Services. The LDPC supports QPSK, 8PSK and 16APSK applications with symbol rates of 2 to 20 Msps. Standard Interface available on the unit is RS422/530.

The DMDVR20 LBST offers additional features that serves as an interface between the indoor unit (DMDVR20 LBST) and the outdoor units (consisting of the BUC and LNB). The output frequency of the LBST is 950 to 2050 MHz. The LBST TX port can supply voltage, 10 MHz Reference and FSK to the BUC via the IFL cable. The RX port can supply LNB via the IFL Cable. The BUC voltage supplied to the BUC can either be 24 or 48 Volts. The Rx Port LNB voltage consists of 18 volts.

The LBST has the capability to enable and disable the BUC/LNB voltages and 10 MHz reference via the front panel. In addition, monitoring features provide verification of system status. The LBST monitors both the current and the voltage at the output of the Tx Port, thus allowing the user to monitor the status of both the indoor units and outdoor units.

## 1.1 Features/Options Installed at Time of Order

The DMDVR20 LBST can be configured in the following different ways:

- features and options that are installed when the unit is ordered
- feature upgrades
- hardware options that are installed to a unit that is sent to a Radyne facility
- hardware options that the user can install at their own location

Features installed at the time of ordering are the options pre-installed/initialized in the factory prior to shipment. These can be reviewed from the front panel system menu. Refer to Section 4, User Interfaces for information on how to view these features.

Factory installed options are chassis and board configurations that are introduced during manufacturing.

### 1.1.1 Feature Upgrades

Feature Upgrades are soft upgrades that can be easily be enabled on the modem. Enabling new features are done remotely or through the front panel of the modem. Features may be purchased at any time by contacting a Radyne Corp. salesperson. Refer to Section 4 and Appendix D, for information on how upgrade features are enabled.

### 1.1.2 Radyne Installed Options

Units may also be sent to the Radyne Corp. facility for hardware option installation. Please contact the Radyne Corp. Customer Service Department for information pertaining to availability and to shipping costs.

### 1.1.3 Hardware Options

Hardware options (refer to Appendix A) are purchased parts that can be installed into the unit at the customer's site. A screwdriver is normally the only tool required. Please contact the Radyne Corp. Customer Service Department for information pertaining to availability and to shipping costs.



*Only authorized service personnel should handle and install optional hardware options.*

## 1.2 Function Accessibility

All functions can be accessed through the front panel, terminal or personal computer via a serial link or via the Ethernet port offering a complete remote monitoring and control capability.





## Installation

# 2

This section provides unpacking and installation instructions, and a description of external connections and backward alarm information.

### 2.0 Installation Requirements

The DMDVR20 LBST Modem is designed to be installed within any standard 19-inch (48.26 cm) wide equipment cabinet or rack. It requires one rack unit (RU) of mounting space (1.75 inches/4.45 cm) vertically and 19.25 inches (48.89 cm) of depth for the DMDVR20 LBST and 24 inches (60.96 cm) of depth for the DMDVR20 LBST. The rear panel of the modem is has power entering from the left and IF Cabling entering from the right (as viewed from the rear of the unit). Data and Control Cabling can enter from either side.



### **WARNING!!**

***PROPER GROUNDING PROTECTION: During installation and setup, the user must ensure that the unit is properly grounded. The equipment shall be connected to the protective earth connection through the end use protective earth protection.***

***In addition, the IF input and output coax cable shielding must be properly terminated to the Chassis/unit ground***



### **WARNING!!**

***There are no user-serviceable parts or configuration settings located inside the Chassis. There is a potential shock hazard internally at the power supply module. DO NOT open the Chassis under any circumstances.***

 **CAUTION!!**

***Before initially applying power to the unit, it is a good idea to disconnect the transmit output from the operating ground station equipment. This is especially true if the current configuration settings are unknown, where incorrect settings could disrupt existing communications traffic.***

 **CAUTION!!**

***The modem contains a Lithium Battery. DANGER OF EXPLOSION exists if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries in accordance with local and national regulations.***

## 2.1 Unpacking

The Universal Satellite Modem was carefully packaged to avoid damage and should arrive complete with the following items for proper installation:

- Modem Unit
- Power Cord, with applicable AC Connector
- Installation and Operation Manual

## 2.2 Removal and Assembly

The Modem is shipped fully assembled. It does not require removal of the covers for any purpose in installation.

 **CAUTION!!**

***Always ensure that power is removed from the before removing or installing any optional modules. Failure to do so may cause damage to the equipment.***

Carefully unpack the unit and ensure that all of the above items are in the carton. If the available AC mains power at the installation site requires a different cord set from the one included in the package, then a suitable and approved cord set (for the country where the equipment is to be installed) will be required before proceeding with the installation.

Should the Power Cable/AC Connector be of the wrong type for the installation, either the cable or the power connector end should be replaced. The power supply itself is designed for universal AC application. See specifications for appropriate voltages and currents.

### 2.3 Mounting Considerations

When mounted in an equipment rack, adequate ventilation must be provided. The ambient temperature in the rack should preferably be between 10° and 35°C, and held constant for best equipment operation. The air available to the rack should be clean and relatively dry. The modems may be stacked one on top of the other to a maximum of 10 consecutive units before providing one (1) RU of space for airflow. Modems should not be placed immediately above a high-heat or EMF Generator to ensure the output signal integrity and proper receive operation.

Do not mount the in an unprotected outdoor location where there is direct contact with rain, snow, wind or sun. The only tools required for rack mounting are four (4) customer supplied rack-mounting screws and the appropriate screwdriver. Rack mounting brackets are an integral part of the front bezel of the unit and are not removable.

### 2.4 Initial Configuration Check

The modem is shipped from the factory with preset factory defaults. Upon initial power-up, a user check should be performed to verify the shipped modem configuration. Refer to Section 4, User Interfaces to locate and verify that the following configuration settings are correct:



***The Interface Type (V.35, RS-422, RS-232, etc.) MUST be selected from the Front Panel BEFORE the mating connectors are installed. Failure to do so may cause damage to the Universal Interface Module. Power up the modem, select the appropriate interface type, and then install the mating connectors.***



***Transmit (Tx) and Receive (Rx) Interface types are dependent upon the customer's order.***

---

## Standard Factory Configuration Settings

### Modulator:

Data Rate:	2.048 Mbps
Mode:	Closed Network
Frequency:	1200 MHz
Modulation:	QPSK
Inner FEC:	1/2 Rate Viterbi
Satellite Framing:	None
Scrambler:	V.35 (IESS)
Reed Solomon:	Disabled
Modulator Output Power:	-20 dBm

### Demodulator:

Data Rate:	2.048 Mbps
Mode:	DSS
Frequency:	1200 MHz
Modulation:	QPSK
Inner FEC:	1/2 Rate LDPC
Satellite Framing:	S2 Short
Terrestrial Framing:	None
Pilot Symbols:	Disabled



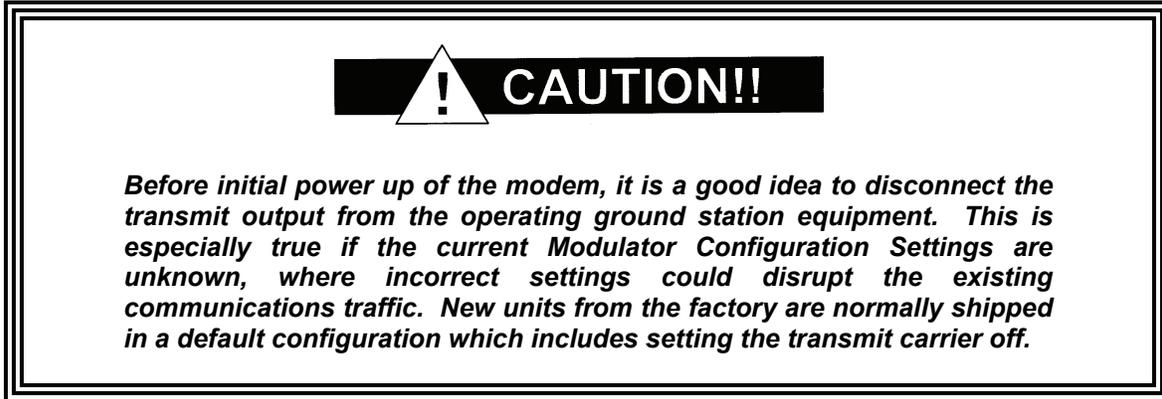
## NOTE

*Usage of the modems loopback capabilities in conjunction with the Ethernet data interface can produce undesirable network loops. In order to run any type of data test with an Ethernet interface you must utilize two modems connected back to back. Simply using one modem and a loopback will not produce the desired results.*

## 2.5 Modulator Checkout

The following descriptions assume that the modem is installed in a suitable location with prime AC power and supporting equipment available.

### 2.5.1 Initial Power-Up



Turn on the unit by placing the Rear Panel Switch (located above the power entry connector) to the On Position. Upon initial and subsequent power-ups, the Microprocessor will test itself and several of its components before beginning its Main Monitor/Control Program. These power-up diagnostics show no results if successful. If a failure is detected, the Fault LED will illuminate.

The initial field checkout of the modem can be accomplished from the Front Panel or in the Terminal Mode. The Terminal Mode has the advantage of providing full screen access to all of the modem's parameters, but requires a separate terminal or computer running a Terminal Program. The Terminal Mode is enabled from the front panel in the System M&C Submenu.

### 2.5.2 Factory Terminal Setup

The factory terminal setup is as follows:

Emulation Type:	VT-100 (can be changed)
Baud Rate:	19.2 K (Can be changed via Front Panel)
Data Bits:	8
Parity:	No Parity (Fixed)
Stop Bits:	1 Stop Bit

## 2.6 Storage

It is recommended that the unit be stored in its original sealed packing. The unit should be stored in a dry location where the temperature is stable, away from direct contact with rain, snow, wind, sun, or anything that may cause damage.

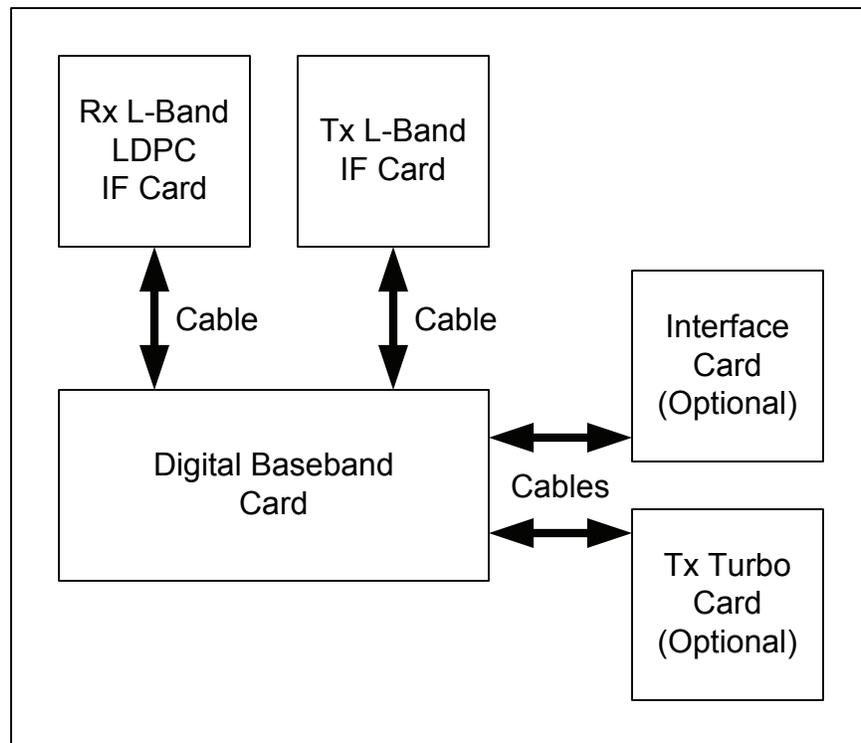


## Theory of Operation

# 3

### 3.0 Modem Hardware

The modem is based on a two printed circuit card (minimum configuration) design with additional optioned printed circuit cards available for additional features. The minimum configuration consists of a Digital Baseband assembly, Tx L-Band assembly and RX L-Band Receiver assembly. The optional printed circuit cards include a Turbo Codec printed circuit card an optional data interface printed circuit card (refer to Appendix A). A block diagram of the Modem is shown in Figure 3.1.



**Figure 3-1. Block Diagram**

#### 3.0.1 L-Band Printed Circuit Card

The L-Band circuit cards consists of an analog modulation function, an analog complex down conversion, and two wide-band digital synthesizers. The block diagram of the L-Band assembly is shown in Figure 3-2.

In the modulator, analog in-phase (I) and quadrature (Q) signals are generated on the Digital Baseband Printed Circuit Card, routed to the L-Band Printed Circuit Card, and modulated at the desired frequency. The L-Band modulated signal is then passed through a microprocessor controlled variable attenuator providing gain control of the output signal.

In the complex downconverter, the signal for demodulation is amplified and sent through a variable wideband attenuator for AGC. The gain-controlled signal is then passed through a complex downconverter to a low IF.

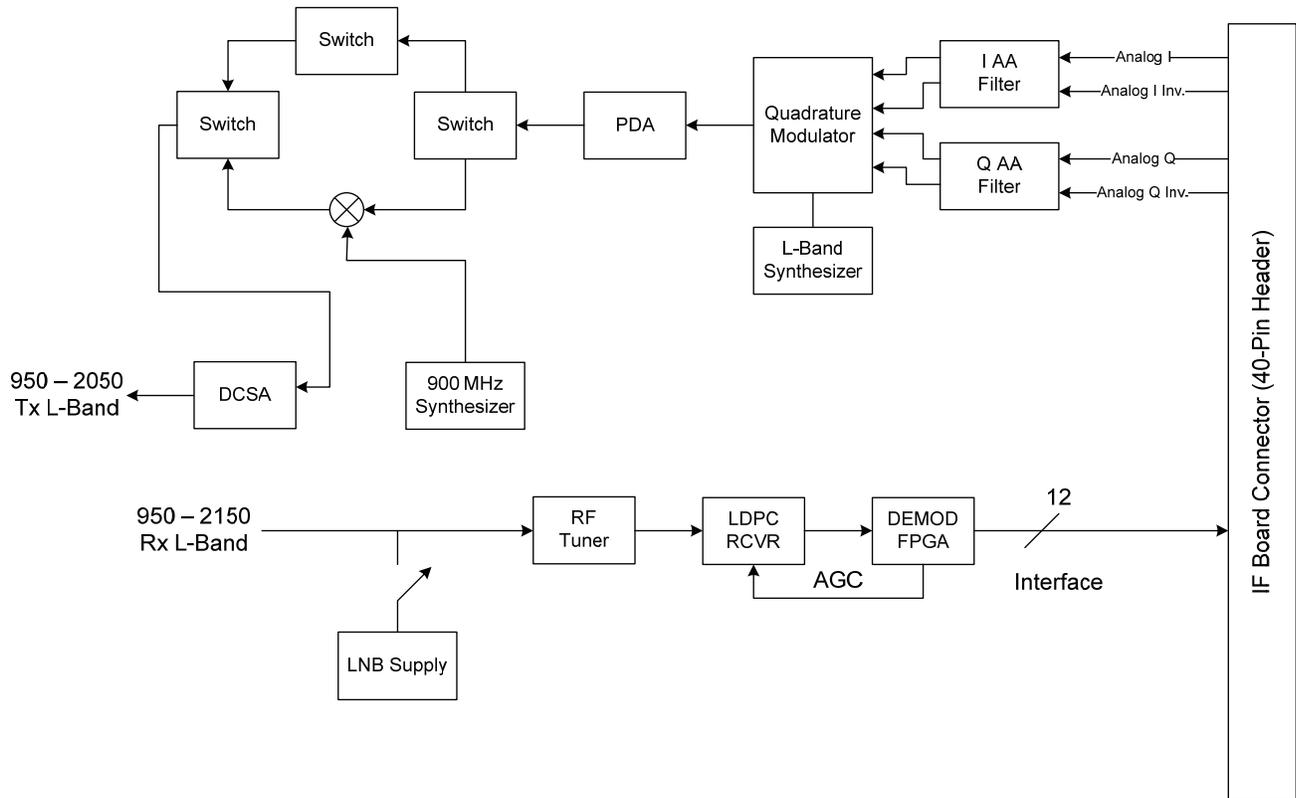


Figure 3-2. IF Card Block Diagram

### 3.0.2 Baseband Processing Printed Circuit Card

The advent of million-plus gate count FPGAs, advanced logic synthesis tools, and DSPs providing hundreds of MIPs enabled the design of a software configurable modem. Large, fast FPGAs now provide designers with what is essentially an on the fly programmable ASIC. High speed, complex digital logic functions that previously could only be implemented in dedicated integrated circuits are now downloaded from a micro-controller through a serial or peripheral interface. When a new digital logic function is needed, a new configuration file is loaded into the FPGA. There is no limit to the number of digital logic configurations available to the FPGA, aside from the amount of Flash memory available to the system microprocessor for storage of configuration files.

The Baseband Processing Printed Circuit Card provides a flexible architecture that allows different modes of terrestrial and satellite framing, various FEC options, and several different modulation/demodulation formats. Also included on the Baseband Printed Circuit Card are three synchronous interfaces, an EIA-530 Interface supporting RS-422, V.35, and RS-232. All three interfaces are provided on the same DB-25 Connector, and are selectable from the front panel.

The Baseband Printed Circuit Card also contains the Monitor and Control (M&C) Circuitry responsible for:

- Programmable part setup and initialization
- Continuous control and adjustment of some functions
- Calibration
- Monitoring fault status
- Calculating and displaying measurements
- User monitor and control interface including front panel and remote
- Units configuration and feature set

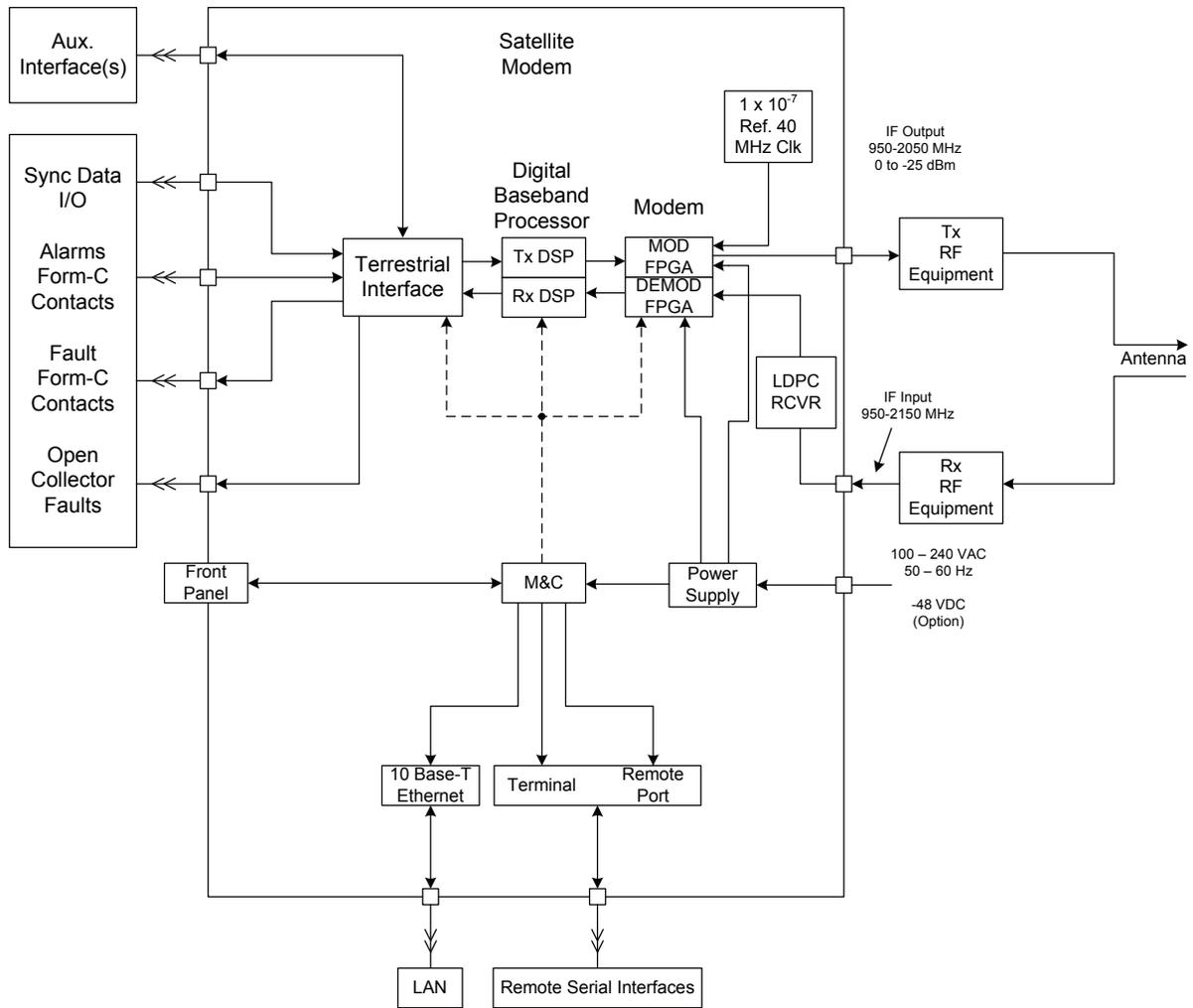
The M&C System is based on a powerful microprocessor with a large amount of Flash memory. Several bus architectures are used to interconnect the M&C to all components of the modem. Communication to the outside world is done via connections to the remote port, terminal port, Ethernet port, and alarm ports. The M&C runs off of software programmed into its Flash memory. The memory can be reprogrammed via the Ethernet port to facilitate changes in software.

### **3.0.3 Enhanced Interface Printed Circuit Card**

The normal terrestrial data for the Baseband Processing Card can be re-routed to the enhanced interface card. The enhanced interface card adds a variety of connections to the modem for additional applications

## **3.1 Functional Block Diagram**

Figure 3-3 represents the Functional Blocks. The modem is shown in a typical application with customer data, Tx/Rx RF equipment and an antenna.



**Figure 3-3. Satellite Modem Functional Block Diagram**

### 3.1.1 Front Panel

The Front Panel includes a 2 x 16 backlit LCD Display, Indicator LEDs, and a Numeric Keypad (refer to Section 4.1).

### 3.1.2 Baseband Processing

The Baseband Processor performs all Modulator functions required for an IBS Framing Unit, and Reed-Solomon Codec. In addition, the Baseband Processing Section provides for transmit clock selection and rate adaptation as well as a rate adapter and Plesiochronous/Doppler (PD) Buffer in the receive direction. A multiplexer is also provided for the SCT Clock Source for Loop Timing Applications. The transmit and receive paths are configured independently under processor control.

### 3.1.3 Tx Baseband Processing

The Tx Data and Clock enters the Baseband Processor, passes through a Rate Adapting FIFO and enters the Framer/Drop Processor. In IBS mode, the framer adds the appropriate framing as defined in 309. The data is then sent to the Reed-Solomon Encoder.

When enabled, the Reed-Solomon Encoder, encodes the data into Reed-Solomon Blocks. The blocks are then interleaved and synchronized to the frame pattern as defined by the selected specification (IESS-309, etc.). After Reed-Solomon Encoding, the composite data and clock are applied to the BB Loopback Circuit.

### 3.1.4 Rx Baseband Processing

The Receive Processor performs the inverse function of the Tx Processor. Data received from the satellite passes through the LDPC Receiver to the Decoder/Deframer. The Deframer acquires the LDPC frame, and extracts the received data, placing the data into the PD Buffer, sending the overhead data to the UIM. The data is extracted from the buffer and is sent to the UIM.

## 3.2 Monitor & Control (M&C) Subsystem

The modems M&C system is connected to most of the circuitry on any board contained in the modem. These connections provide status on the working condition of the circuitry as well as providing the data required for the various measurements the modem provides. The M&C processes this information and generates status indications as well as alarms when necessary. Detailed status information is available via the modems various user interfaces including the remote and terminal ports. An external summary fault is available on the RS422 Data interface

The M&C contains a high-performance microprocessor and is responsible for overall command and control of modem functions. The M&C is constantly monitoring all subsystems of the modem by performing a periodic poll routine and configures the modem by responding to commands input to the system. During each poll cycle, the status of each of the subsystems is collected and reported to each of the external ports. Performance statistics such as Eb/No, buffer fill %, etc. are compiled. If faults are detected, the M&C will take appropriate actions to minimize the effect of such faults on the system (refer to the Fault Matrices in Section 6).

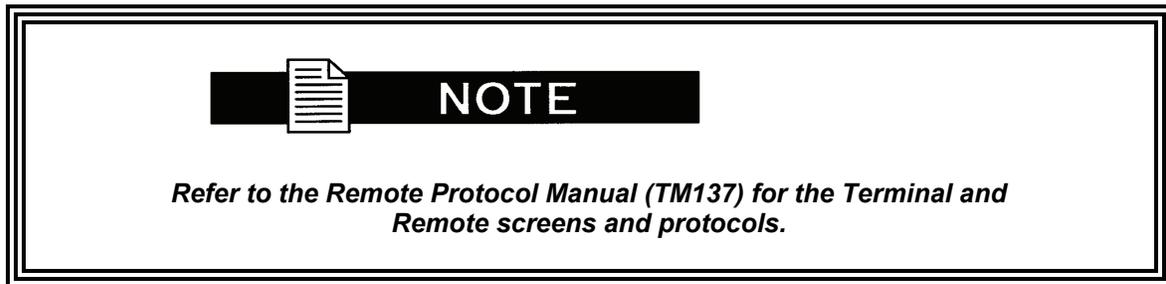
The modem supports the following M&C protocols:

- Terminal Interface (Section 3.2.1)
- Remote Port Interface (Section 3.2.2)
- Modem Status, Alarms & Contact Closures (Section 3.2.4)

### 3.2.1 Terminal Port (Supported in Rev B or greater)

This port supports an asynchronous control protocol as described in Section 4. It is configured to support RS-232 signal levels. This port is intended for use in computer-based remote M&C. All functions of the modem may be monitored and controlled from this port via a common terminal connected to the Terminal Port. This function is front panel selectable.

The Terminal Mode Control allows the use of an external terminal or computer to monitor and control the modem from a full screen interactive presentation operated by the modem itself. No external software is required other than VT-100 Terminal Emulation Software (e.g. "Procomm" for a computer when used as a terminal). The Control Port is normally used as an RS-232 Connection to the terminal device. The RS-232 operating parameters can be set using the modem Front Panel and stored in Non-volatile memory for future use.



### 3.2.2 Modem Remote Communications (RLLP)

The Remote Port located on J20 allows for control and monitoring of parameters and functions via an RS-232 Serial Interface, or RS-485 for RLLP Protocol. 'Equipment Remote Mode' setup can be entered from the front panel under the "System" menu. This requires the user to first set the Remote Port Control to "Remote" then set the Multidrop Address as needed followed by setting the Remote Interface to RS232 or RS485.

Control and status messages are conveyed between the modem and all subsidiary modems and the host computer using packetized message blocks in accordance with a proprietary communications specification. This communication is handled by the Radyne Link Level Protocol (RLLP), which serves as a protocol 'wrapper' for the RM&C data. Complete information on monitor and control software is contained in the following sections.

### 3.2.3 Ethernet M&C Port (Not Supported)

### 3.2.4 Modem Monitor Status

The modems M&C system is connected to most of the circuitry on any board contained in the chassis. These connections provide status on the working condition of the circuitry as well as providing the data required for the various measurements the modem provides. The M&C processes this information and generates status indications as well as alarms when necessary. Detailed status information is available via the modems various user interfaces (front panel, remote and terminal). A summary of this information can be connected to external equipment, switches or alarms via the open collector and/or form-C fault connections

**Form-C Contacts:**

The UIM provides three Form-C Relays under processor control that appear at J15.

**Mod Fault:** De-energized when any transmit side fault is detected.

**Demod Fault:** De-energized when any receive side fault is detected.

**Common Fault:** De-energized when any fault that is not explicitly a Tx or Rx Fault such as an M&C or Power Supply Fault.

**Open Collector Faults:**

The UIM provides two Open Collector Faults that appear at Pins 18 & 21 on J19.

**Mod Fault:** Will sink up to 20 ma (maximum) until a transmit or common fault is detected. Will not sink current if a fault is detected.

**Demod Fault:** Will sink up to 20 ma (maximum) until a receive or common fault is detected. Will not sink current if a fault is detected.

The open collector faults are intended for use in redundancy switch applications in order to provide quick status indications.

**3.3 Internal Clock**

The time and date is kept in order to 'time-tag' system events. User can change the Internal Clock via the front panel or Terminal ports.

### 3.4 Loopback Features (Terrestrial)

The modem provides for a number of different loopbacks. The Loopback supported are:

- TX Terrestrial Loopback - Tx Data port is looped back to the Rx Data port after the interface driver/receiver. (prior to the framing unit)
- TX Baseband Loopback - Tx Data port is looped back to the Rx Data port after the interface driver/receiver. (after the framing unit)
- RX Terrestrial Loopback - Receive Data from the satellite is looped back for retransmission to the satellite, providing a far end loopback. (prior to the framing unit)
- RX Baseband Loopback - Receive Data from the satellite is looped back for retransmission to the satellite, providing a far end loopback. (after to framing unit)



#### NOTE

***Usage of the modems loopback capabilities in conjunction with the Ethernet data interface can produce undesirable network loops. In order to run any type of data test with an Ethernet interface you must utilize two modems connected back to back. Simply using one modem and a loopback will not produce the desired results.***

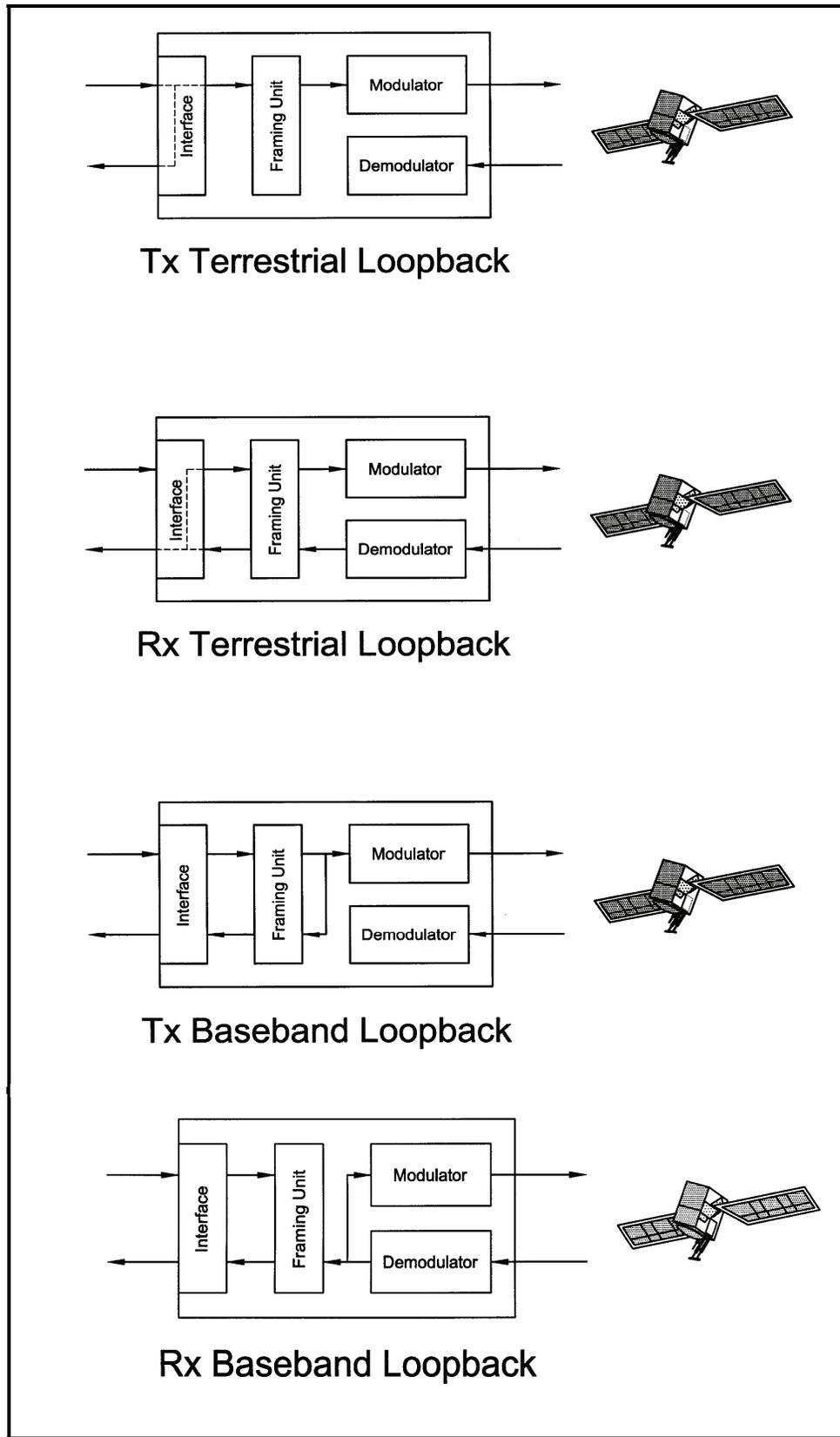


Figure 3-5. Loopback Functional Block Diagram

### 3.5 Clocking Options

The modem supports a number of different clocking options that can be recovered from the satellite or the terrestrial links. The various clocking options allow users to determine which clock will best fit their applications. Figure 3-6 gives an overview on how the modem processes the various clocks for the Tx Clock source and the Rx Buffer Clock source. Tx and Rx Clocks may be independently locked.

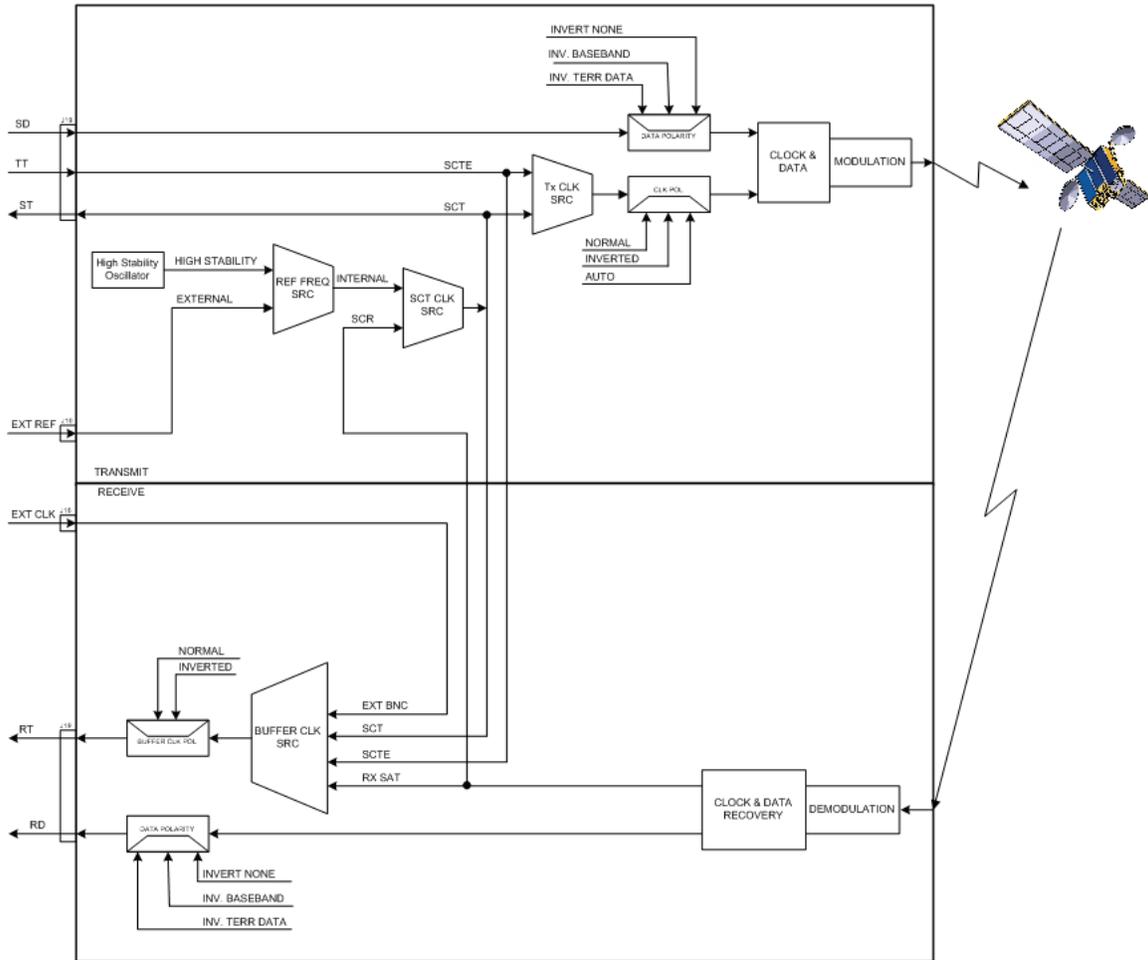


Figure 3-6. Clocking and Polarity Diagram

#### 3.5.1 TX Clock Options

TX clock options can be recovered from the terrestrial interface, satellite interface or internally generated. The allows users to select SCTE Clock (Terrestrial) or the SCT internal clock. The modem also allows user to recover the SCT Clock from the satellite (SCR) or from the modem internally. The modem allows users to select clock polarity. The Tx clock selections available are:

The following paragraphs define the types of clocking options available to the user at the Front Panel.

- SCT (Internal Oscillator)
- SCTE (External Tx Terrestrial Clock)
- Rx Satellite Clock

### 3.5.1.1 SCTE: Serial Clock Transmit External

The SCTE clock is the Transmit Terrestrial Clock associated with the data interface. SCTE is an external clock received from the terrestrial equipment and the modem utilizes the terrestrial clock to lock the internal clock.

In Figure 3-7, the Transmit Terrestrial Data enters the modem and is clocked into a dejitter FIFO. Data is clocked out of the FIFO by the Modulator Clock. The Modulator Clock and Phase-Locked Loop (PLL), in conjunction with the Dejitter FIFO, which reduces the input jitter. Jitter reduction exceeds the jitter transfer specified in CCITT G.821.

SCTE is sometimes referred to as Tx Terrestrial Timing or Terminal Timing. Terminal Timing is reference to the RS422 synchronous interfaces.

### 3.5.1.2 SCT: Serial Clock Transmit

The SCT clock can be generated internally or recovered from the satellite. The SCT clock source can be used as the TX clock source, RX Buffer Clock source and the Terrestrial Terminal equipment for clocking the transmit data. If the SCT clock is recovered from the satellite, then it is referred to as SCR. SCR is also referred to as Receive Clock, Satellite Clock, or Receive Timing (RT).

When SCT clock is configured as Internal, the frequency of the clock is set the same as the Transmit Terrestrial Clock rate. If SCT clock is configured as SCR, the internal clock is set to the same rate as the incoming receive satellite clock. SCT is sometimes referred to as Internal Timing or Send Timing (ST). In the event that the satellite clock is lost, the modem will automatically switch over to the Internal Clock and revert back to SCR when activity is detected.

If SCT is selected, then Terrestrial data that is synchronous to the SCT Clock is required to be supplied by the modem. It is intended for the terminal equipment to use the SCT as its clock source. The Autophase Circuit will automatically ensure that the data is clocked correctly into the modem. Therefore, a return clock is not necessary. The Clock Polarity should be set to Auto.

## 3.5.2 RX Buffer Clock Options

The modem supports a number of RX Buffer clock options that can be recovered from the satellite, terrestrial links, internally or externally. The various clocking options allow users to determine which clock will best fit their applications. Figure 3-7 gives an overview on how the modem processes the various clocks for the Tx Clock and the Rx Buffer Clock. The modem allows users to select clock polarity Tx and Rx Clocks may be independently locked. The following RX Buffer clock selections are available:

- Rx Satellite Clock (Recovered from Satellite)

The modem handles RX Buffer clock selections based on source priority levels. The user assigns priorities to the clock sources based on source selections. Source 1 has the highest priority and Source 4 being the last resort or lowest priority. If a fallback clock is selected and activity is lost at the highest priority source, the modem will fall back to the next highest priority clock with activity. When activity resumes on a higher priority source, the modem resumes using the higher priority source

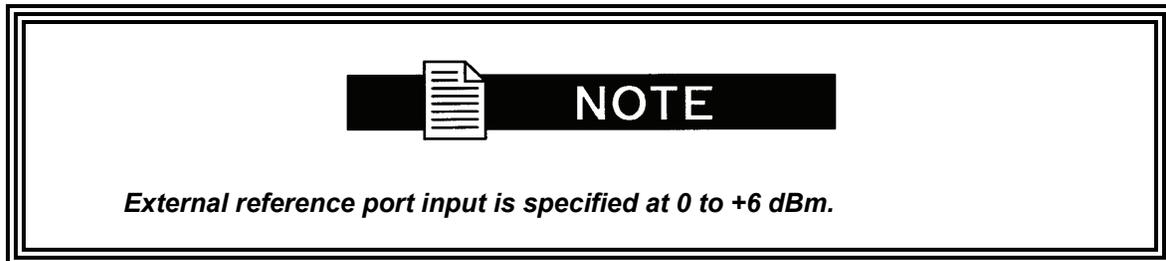
<u>Clock Source</u>		<u>Priority</u>	
RX SAT	1	of	4
SCTE	2	of	4
SCT	3	of	4
EXC BNC	4	of	4

### 3.5.2.1 RX SAT Clock

The RX Sat clock is recovered from the satellite that is received from the distant end. If selected the Buffer Clock is lock to the RX sat clock.

### 3.5.3 EXT REF: External Reference, Top BNC Port, J10

This is not actually a clock, but does have some clocking implications. When the external reference is used, the master oscillator within the modem is locked to the external reference, and the internal accuracy and stability of the unit assumes that of the External Reference. Therefore, not only are the transmit frequencies locked to the external reference, but the modem's internal SCT Oscillator is locked to the external reference as well.



### 3.6 RS530/422/V.35 Interface (Standard)

Data must be clocked into the modem by either the SCTE or SCT Source. If SCTE is selected as the Tx Clock Source, then SCTE must be supplied to the modem on the EIA-530 port. The output of the dejitter buffer will be clocked with this source. SCT should be used if SCTE has excessive jitter.

### 3.7 Reed-Solomon Codec (TX Only)



*Reed Solomon only pertains to TX options.  
Refer to Figures 3-8, 3-9, and Table 3-1.*

Utilizing a Reed-Solomon (R-S) Outer Codec concatenated with a Convolutional Inner Codec is an effective way to produce very low error rates even for poor signal-to-noise ratios while requiring only a small increase in transmission bandwidth. Typically, concatenating an R-S Codec requires an increase in transmission bandwidth of only 9 – 12% while producing a greater than 2 dB improvement in  $E_b/N_o$ . R-S is a block Codec where K data bytes are fed into the encoder which adds  $2t = (N - K)$  check bytes to produce an N byte R-S block. The R-S decoder can then correct up to “t” erred bytes in the block.

#### 3.7.1 Reed-Solomon Operation

When the Reed-Solomon Codec is enabled, data is fed to the R-S Encoding Section where it is scrambled, formed into blocks, R-S encoded, and interleaved. Unique words are added so that the blocks can be reformed in the Receiving Modem (Refer to Figures 3-7 and 3-8). Data is then sent to the modulator where it is convolutionally encoded, modulated and transmitted to the satellite.

When the signal is received and demodulated by the Receiving Modem, it is fed to a Viterbi Decoder for the first layer of error correction. After error correction is performed by the Viterbi Decoder, the unique words are located and the data is deinterleaved and reformed into blocks. The R-S Decoder then corrects the leftover errors in each block. The data is then descrambled and output from the R-S Section.

#### 3.7.2 Reed-Solomon Code Rate

The R-S Code Rate is defined by (N, K) where N is the total R-S block size in bytes - data + check bytes - and K is the number of data bytes input into the R-S Encoder. The transmission rate expansion required by the R-S Codec is then defined by N/K. The modem automatically sets the correct R-S code rate for IBS open network operation in accordance with the data shown in Table 3-1. The modem allows the following N and K setting: (126, 112), (219, 201), (194, 178), (225, 205).

Variable Reed-Solomon rates are available on the optional AS/5167 Super Card. Refer to Appendix A for further information.

#### 3.7.3 Interleaving

Interleaving depths of 4, 8, or 12 R-S blocks are allowed. This allows burst errors to be spread over multiple blocks in order to enhance the error correcting performance of the R-S Codec. For Intelsat Network Modes, the interleaving depth is automatically set to 4 for QPSK or BPSK, or 8 for 8PSK. In Closed Network Mode, the interleaver depth can be manually set to 4 or 8

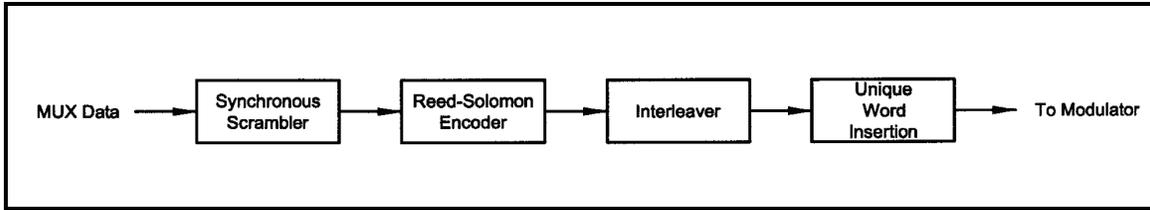


Figure 3-7. Reed-Solomon Encoder Functional Block Diagram

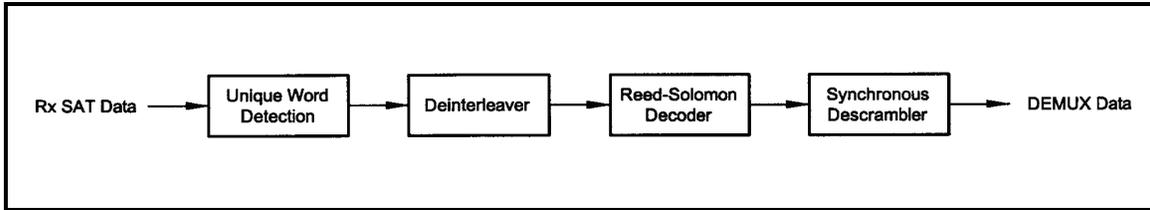


Figure 3-8. Reed-Solomon Decoder Functional Block Diagram

Table 3-1. Reed-Solomon Codes					
Type of Service	Data Rate (Kbps)	R-S Code (n, k, t) <sup>1</sup>	Bandwidth Expansion [ (n/k) - 1 ]	Interleaving Depth	Maximum <sup>2</sup> R-S Codec Delay (ms)
<b>Small IDR (With 16/15 O/H)</b>	64	(126, 112, 7)	0.125	4	115
	128	(126, 112, 7)	0.125	4	58
	256	(126, 112, 7)	0.125	4	29
	384	(126, 112, 7)	0.125	4	19
	512	(126, 112, 7)	0.125	4	15
	768	(126, 112, 7)	0.125	4	10
	1024	(126, 112, 7)	0.125	4	8
<b>IDR (With 96 Kbps O/H)</b>	1544	(225, 205, 10)	0.0976	4	9
	2048	(219, 201, 9)	0.0896	4	7
	6312	(194, 178, 8)	0.0899	4	2
	8448	(194, 178, 8)	0.0899	4	<2
<b>8PSK</b>	1544	(219, 201, 9)	0.0896	8	18
	2048	(219, 201, 9)	0.0896	8	13
	6312	(219, 201, 9)	0.0896	8	4
	8448	(219, 201, 9)	0.0896	8	3

1. n = code length, k = information symbols and t = symbol error correcting capability.  
 2. Design objective.

### 3.8 Locating the ID Code Operational Procedure

The modem has unique ID codes that allow the user to add feature upgrades to the modem without the unit having to be returned to the factory. Users are required to identify these ID codes

when they want additional features added to their unit. Radyne will supply a new ID code that is required to be entered in the ID code field. Once the new ID code is entered, the modem will activate the new features.

Refer to Appendix B for upgrade procedures.

### **3.9 Strap Codes (TX Only Option)**

The Strap Code is a quick set key that sets many of the modem parameters. For quick setup of the modem, Strap Codes are very helpful. When a Strap Code is entered, the modem is automatically configured for the code's corresponding data rate, overhead, code rate, framing, scrambler type and modulation. An example of how to set a strap code follows:

Refer to Appendix D or the various strap code options.



## User Interfaces

# 4

### 4.0 User Interfaces

This section contains information pertaining to the user interfaces for the modem. There are four user interfaces available for the modem. These are:

- Front Panel Interface – Refer to section 4.1.
- Terminal Interface - :Refer to section 4.4.
- RS485 Remote Port Interface (RLLP) – Refer to the Section 4.6.

#### 4.1 Front Panel User Interface

The Front Panel of the DMDVR20 LBST allows for complete control and monitor of all DMDVR20 LBST parameters and functions via a keypad, LCD display and status LEDs.

The front panel layout is shown in Figure 4-1 and 4-2 showing the location and labeling of the front panel. The front panel is divided into four functional areas: the LCD Front Panel Display, the Cursor Control Arrow Keys, the Numeric Keypad, and the Front Panel LED Indicators, each described below in Table 4-1.

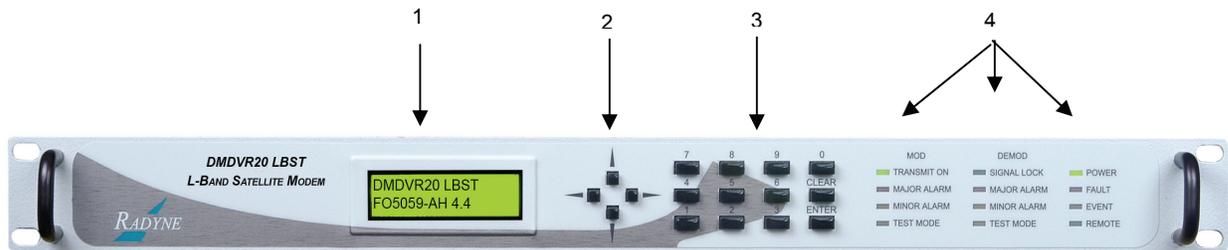


Figure 4-2. DMDVR20 LBST Front Panel

<b>Item Number</b>	<b>Description</b>	<b>Function</b>
1	LCD Front Panel Display	Displays operating parameters and Configuration data
2	Cursor Control Arrow Keys	Controls the up, down, right and left motion of the cursor in the LCD Display window
3	Numeric Keypad	Allows entry of numeric data and Clear and Enter function keys
4	Front Panel LED Indicators	See Paragraph 4.1.4 below for an itemized description of these LEDs

### 4.1.1 LCD Front Panel Display

The front panel display is a 2 line by 16-character LCD display. The display is lighted and the brightness can be set to increase when the front panel is currently in use. The LCD display automatically dims after a period of inactivity. The display has two distinct areas showing current information. The upper area shows the current parameter being monitored, such as 'Frequency' or 'Data Rate'. The lower line shows the current value of that parameter. The LCD display is a single entry window into the large matrix of parameters that can be monitored and set from the Front Panel.

### 4.1.2 Cursor Control Arrow Keys

A set of 'Arrow' or 'Cursor' keys ( $\uparrow$ ), ( $\downarrow$ ), ( $\rightarrow$ ), ( $\leftarrow$ ), is used to navigate the parameter currently being monitored or controlled. Table 4-2 describes the functions available at the Front Panel.

### 4.1.3 Numeric Keypad

A 10-Key Numeric Keypad with two additional keys for the 'Enter' and 'Clear' function allows the entry of data into the system. Table 4-2 describes the functions available at the Front Panel.

Parameter Type	0 – 9	$\uparrow$	$\downarrow$	$\leftarrow$	$\rightarrow$	'Clear' & $\leftarrow$	'Clear' & $\rightarrow$
Fixed Point Decimal	Changes Digit	Toggles $\pm$ (If Signed)	Toggles $\pm$ (If Signed)	Moves Cursor 1 Position Left	Moves Cursor 1 Position Right	N/A	N/A
Unsigned Hexadecimal	Changes Digit	Increments Digit Value	Decrements Digit Value	Moves Cursor 1 Position Left	Moves Cursor 1 Position Right	N/A	N/A
Enumerated	N/A	Previous Value in List	Next Value in List	N/A	N/A	N/A	N/A
Date/ Time	Changes Digit	N/A	N/A	Moves	Moves	N/A	N/A

				Cursor 1 Position Left	Cursor 1 Position Right		
IP Address	Changes Digit	Increments Digit Value	Decrements Digit Value	Moves Cursor 1 Position Left	Moves Cursor 1 Position Right	N/A	N/A
Text Strings	Changes Character	Increments Character Value	Decrements Character Value	Moves Cursor 1 Position Left	Moves Cursor 1 Position Right	Clears to Left of Cursor Inclusive	Clears to Right of Cursor Inclusive

#### 4.1.4 Front Panel LED Indicators

Twelve LEDs on the Front Panel (Refer to Table 4-3) indicate the status of operation. The LED colors maintain a consistent meaning. Green signifies that the indication is appropriate for normal operation, Yellow means that there is a condition not proper for normal operation, and Red indicates a fault condition that will result in lost communications.

Table 4-3.		
LED	Color	Function
<b>Modem LED Indicators</b>		
Power	Green	Indicates that the unit is turned on.
Fault	Red	Indicates a hardware fault for the unit.
Event	Yellow	Indicates that a condition or event has occurred that the modem has stored in memory. The events may be viewed from the Front Panel or in the Terminal Mode.
Remote	Green	Indicates that the unit is in the process of updating firmware with FTP or flashing indicates some features are demo enabled.
<b>Modulator LED Indicators</b>		
Transmit On	Green	Indicates that the transmitter is on.
Major Alarm	Red	Indicates that the Transmit Direction has failed, losing traffic.
Minor Alarm	Yellow	Indicates that a Transmit Warning Condition exists.
Test Mode	Yellow	Indicates that the transmitter is involved in a current Test Mode activity.
<b>Demodulator LED Indicators</b>		
Signal Lock	Green	Indicates that the receiver locked to an incoming carrier and data, including FEC Sync.
Major Alarm	Red	Indicates that the Receive Direction has failed, losing traffic.
Minor Alarm	Yellow	Indicates that a Receive Warning Condition exists.
Test Mode	Yellow	Indicates that the receiver is involved in a current Test Mode activity.

## 4.2 Parameter Setup

The four Cursor Control Arrow Keys are used to navigate the menu tree and select the parameter to be set. After arriving at a parameter that needs to be modified, depress <ENTER>. The first space of the modifiable parameter highlights (blinks) and is ready for a new parameter to be entered. After entering the new parameter using the keypad (Refer to Figure 4-2), depress <ENTER> to lock in the new parameter. If a change needs to be made prior to pressing <ENTER>, depress <CLEAR> and the display defaults back to the original parameter. Depress <ENTER> again and re-enter the new parameters followed by <ENTER>.

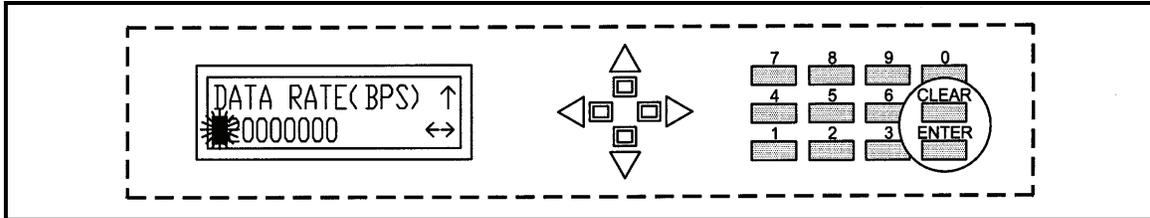
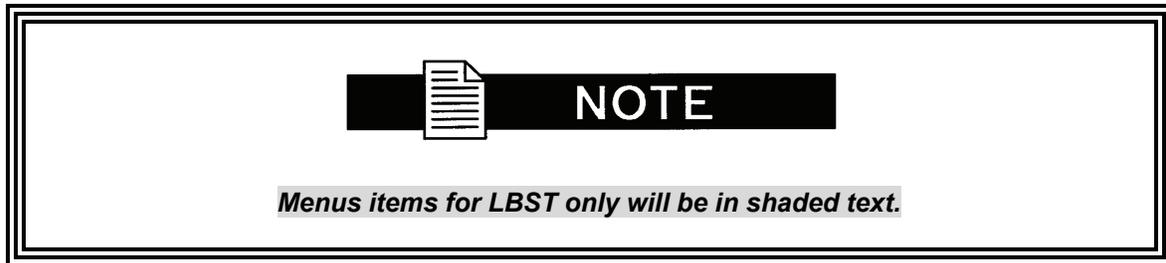


Figure 4-2. Entering New Parameters

Following a valid input, the unit will place the new setting into the nonvolatile EEPROM making it available immediately and available the next time the unit is powered-up.

## 4.3 Front Panel Control Screen Menus

The Front Panel Control Screens are broken down into sections under several Main Menus.



### 4.3.1 Main Menus

MODULATOR

DEMULATOR

INTERFACE

MONITOR

ALARMS

SYSTEM

TEST

### 4.3.2 Modulator Menu Options and Parameters

#### NETWORK SPEC

**{CLOSED NET}**

The Network Spec Command sets a number of parameters within the modem to meet a specification. The purpose is to eliminate keystrokes and potential compatibility problems.

Data rates not covered by a given network specification will not be allowed. If the mode of operation is selected after the data rate has been entered, then the data rate must be compatible with the desired mode of operation or the network spec will not be allowed. The following parameters cannot be changed while the unit is in the given mode of operation:

#### STRAP CODE

**{Refer to Strap Code Guide, Appendix H}**

The Strap Code is a quick set key that sets many modem parameters. Consult the strap code guide for available strap codes. Parameters set by strap code:

- Data Rate
- Inner Code Rate
- Satellite Framing
- Scrambler
- Outer Code Rate (Reed-Solomon)
- Modulation
- Network Spec

#### IF (menu)

##### FREQUENCY (MHz)

**{950 - 2050 MHz}**

Allows the user to enter the Modulator IF Output Frequency of the modem in 1 Hz increments.

##### UPLINK FREQ

Displays the output frequency of the BUC also referred to as Satellite uplink frequency. The user must enter the BUC LO and OSC SIDE BAND before using this menu. The UPLINK FREQUENCY is a calculated measurement of both the BUC LO and OSC SIDE BAND. Once the menus are entered correctly, the user can control the uplink Frequency from this menu.

##### POWER (dBm)

**{0 to -25 dBm}**

Allows the user to enter the Transmitter Power Level.

##### CARRIER

**{ON, OFF, AUTO, VSAT, RTS}**

Allows the user to select the carrier type. Refer to Appendix C for further information.

<b>CARR DLY(SEC)</b>	<b>{0-255}</b> Allows the user to select the time delay after power-up before the Tx Carrier may be enabled. This allows time for the BUC to stabilize.
<b>SPECTRUM</b>	<b>{NORMAL, INVERTED}</b> Allows the user to invert the direction of rotation for QPSK Modulation. Normal meets the IESS Specification.  Spectral inversion may be required if the BUC LO is higher in frequency than the BUC output frequency. When BUC LO is higher than the BUC output frequency, this creates a spectral inversion and the IF Spectrum must be again inverted to compensate.
<b>MODULATION</b>	<b>{QPSK, BPSK, OQPSK, 8PSK, 16QAM}</b> Allows the user to select the modulation type.
<b>SPECTRAL MASK</b>	<b>{Intelsat 0.35, DSS SAT 0.35, DSS SAT 0.25, DSS SAT 0.20}</b> Allows the user to set the spectral shape of Tx Data Filter.
<b>COMPENSATION</b>	<b>{0.0 – 1.0}</b> Allows you to offset output power by up to 1 dBm. This is intended as a correction for user cabinet connectors.
<b>DATA (menu)</b>	
<b>DATA RATE (bps)</b>	<b>{Refer to Technical Specs for Data Rates}</b> Allows the user to set the Data Rate in bps steps via the Front Panel Arrows or Keypad.
<b>SYMB RATE (sps)</b>	Allows the user to view the Symbol Rate.
<b>INNER FEC</b>	<b>Viterbi</b> {1/2, 3/4, 7/8, None} <b>Optional FEC Rates:</b> <b>Sequential</b> {1/2, 3/4, 7/8} <b>Trellis 8PSK</b> {2/3} <b>Turbo</b> {1/2, 3/4, 7/8} <b>Comstream Seq</b> {3/4}  Allows the user to select the Tx Code Rate and Type
<b>DIFF CODING</b>	<b>{ENABLED, DISABLE}</b> Allows the user to enable or disable the Differential Encoder. Having the encoder enabled ensures proper phase lock. May not be adjustable in some modes.
<b>SCRAMBLER SEL</b>	<b>{NONE, V.35-IESS, V.35 CITT, V.35 EF, IBS w/Optional Framing and optional Reed-Solomon, Reed-Solomon Scrambler w/Optional Framing, CCITT, V.35FC, V.35EF_RS, TPC SCRAMBLER (Turbo Codec)}</b> Allows the user to select the descrambler type.

<b>SCRAMBLER CTRL</b>	<b>{ENABLED, DISABLE}</b> Allows the user to enable or disable scrambler operation.
<b>SAT FRAMING</b>	<b>{1/15 (IBS), None}</b> Allows the user to select the framing type.
<b>TERR FRAMING</b>	<b>{NONE}</b>
<b>DATA POLARITY</b>	<b>{INV. TERR &amp; BASE, INV. BASEBAND, INV.TERR DATA, INVERT NONE}</b> Allows the user to invert the Tx Data polarity.
<b>REED-SOLOMON (menu)</b>	These selections are visible only when the Reed-Solomon Option is installed.
<b>ENABLE/DISABLE</b>	<b>{ENABLED, DISABLE}</b> Allows the user to Enable/Disable the Reed-Solomon Encoder.
<b>RS RATE</b>	<b>{Refer to Table 3-1 for standard n/k values}</b> Displays the currently used n, k Reed-Solomon Codes. In Closed Net Mode and using the appropriate hardware, the user may select custom R-S Codes.
<b>INTERLVR DEPTH</b>	<b>{4, 8, 12}</b> Allows the user to select the Reed-Solomon interleaver depth. In Closed Net Mode, a depth of 4 or 8 may be selected.
<b>ODU-BUC (menu)</b>	
<b>FSK COMMS</b>	<b>{NONE/CODAN/TERRASAT/AMPLUS}</b> <b>(Only available when the FSK Comm is Enabled)</b>  <b>OFF/NONE:</b> Will disable the FSK Communication link. User must select this option if the BUC does not support FSK or if the customer does not want to utilize the FSK option.  <b>CODAN:</b> Enables the FSK Communication link for CODAN BUCs only. This feature enables the DMD20LBST to retrieve and display certain BUC parameters on the front panel of the modem.  <b>TERRASAT:</b> Enables the FSK communication link for Terrasat BUCs only. This feature enables the DMD20LBST to retrieve and display certain BUC parameters on the front panel of the modem.  <b>AMPLUS:</b> Enables the FSK communication link for AMPLUS BUCs only. This feature enables the DMD20LBST to retrieve and display certain BUC parameters on the front panel of the modem.



## NOTE

*If user enables the FSK and the BUC does not support FSK, the modem will display a fault or if the user selects the incorrect manufacturers BUC, the unit will display a fault.*

<b>BUC OUTPUT</b>	<b>{Enable/Disable}</b> <b>(Only available when the FSK Comm is Enabled)</b> Enables or Disables the BUC RF Output.
<b>LO FREQ (MHz)</b>	Allows the user to enter the Local Oscillator frequency of the BUC LO in order for the uplink frequency to be displayed correctly (refer to the BUC manufacturer's specifications).
<b>OSC SIDE BAND</b>	<b>{LOW SIDEBAND, HIGH SIDEBAND}</b> Allows the user to select the location of the BUC LO. The user must enter the location of the BUC LO in order for the UPLINK FREQUENCY to be displayed correctly. The BUC LO can be either higher or lower in frequency than the BUC output frequency. If the BUC LO is higher in frequency then the user must enter HIGH SIDEBAND.
<b>10 MHz BUC REF</b>	<b>{ENABLED, DISABLED}</b> Allows the user to enable or disable the 10 MHz BUC reference clock.
<b>BUC VOLTAGE</b>	<b>{ENABLED, DISABLED}</b> Allows the user to enable or disable the BUC supply voltage.
<b>LOW ALARM THRSH</b>	<b>{0.00 Volts}</b> Allows user to select lower alarm limit/threshold for BUC voltage.
<b>HI ALARM THRSH</b>	<b>{0.00 Volts}</b> Allows user to select high alarm limit/threshold for BUC voltage.
<b>LOW ALARM THRSH</b>	<b>{0.00 Amps}</b> Allows user to select lower alarm limit/threshold for BUC current.
<b>HI ALARM THRSH</b>	<b>{0.00 Amps}</b> Allows user to select high alarm limit/threshold for BUC current.
<b>ADDRESS</b>	<b>Allows user to enter the BUC address to establish FSK communications between the modem and BUC. (Only available when the FSK Comm is Enabled)</b>



## NOTE

*When utilizing BUC that supports FSK, the modem will enable the following highlighted menus. and display LO frequency as stated by the BUC.*

### FSK TEST

**{NONE, PASSTHRU, QUERY FOR ADDRESS, LOOPBACK, CYCLE TX ENABLE, }**  
**(Only available when the FSK Comm is Enabled)**

#### **NONE:**

This is the none FSK operational mode.

#### **LOOPBACK:**

The FSK will initiate an internal loopback test of the FSK transmitter and receiver verifying that the modem communication link is functioning properly.

#### **CYCLE TX ENABLE:**

The modem will initiate a test of the FSK between the modem and BUC. The LBST will enable and disable the BUC RF output and verify that the commands are properly received and accepted by the BUC and the modem. If communications are lost, LBST will initiate a fault.

#### **QUERY FOR ADDRESS:**

The modem will initiate a FSK query requesting BUC address.

### 4.3.3 Demodulator Menu Options and Parameters

#### NETWORK SPEC

The Network Spec Command sets a number of parameters within the modem to meet a specification. The purpose is to eliminate keystrokes and potential compatibility problems.

Data rates not covered by a given mode will not be allowed. If the mode of operation is selected after the data rate has been entered, then the data rate must be compatible with the desired mode of operation or the Network Spec will not be allowed. The following parameters cannot be changed while the unit is in the given mode of operation:

#### **DSS-S2**

Data Rates:	All Rates
Framing Type:	S2 Short
Spectrum Mask:	DSS 0.20, 0.25, 0.35

**IF (menu)**

<b>FREQUENCY (MHz)</b>	<b>{950 – 2150 MHz}</b> Allows the user to enter the Modulator IF Frequency in 1 Hz increments.
<b>DWNLNK FREQ (MHz)</b>	Displays the input frequency into the LNB from the satellite, also referred known as Satellite downlink frequency. The user must enter the LNB LO and OSC SIDEBAND of the LNB before using this menu. The DOWNLINK FREQUENCY is a calculated measurement of both the LNB LO and OSC SIDE BAND. Once the menus are entered correctly, the user can control the downlink Frequency from this menu.
<b>SPECTRUM</b>	<b>{NORMAL, INVERTED}</b> Allows the user to invert the direction of rotation for PSK Modulation. Normal meets the IESS Specification.  Spectral inversion may be required if the LNB LO is higher in frequency than the LNB input frequency from the satellite. When LNB LO is higher in frequency than the LNB input frequency, this creates a spectral inversion and the IF Spectrum must be inverted to compensate for the inversion.
<b>MODULATION</b>	<b>{QPSK, 8PSK, 16APSK}</b> Allows the user to select the demodulation type.
<b>SPECTRAL MASK</b>	<b>{DSS 0.35, DSS 0.25, DSS 0.20}</b> Allows the user to set the spectral shape of Rx Data Filter.
<b>SWEEP RANGE (kHz)</b>	<b>{+/- 0.10 * Symbol Rate up to 7.5 MHz}</b> Allows the user to set the acquisition range for the demodulator
<b>INPUT LVL THRESH</b>	<b>{-30 to 90 dbm}</b> Allows the user to adjust the low level threshold limit for input power. Input power level below the threshold limit will trigger a major alarm on the demodulator.
<b>EB/NO ALARM</b>	<b>{0.0 to 9.90 db}</b> Allows the user to set the desired $E_b/N_o$ for the local receiver. This setting is compared against the receive $E_b/N_o$ and commands to the remote modem to increase or decrease Transmit Power accordingly are sent.

**DATA (menu)**

<b>DATA RATE (bps)</b>	<b>{Refer to Technical Specs for Data Rates}</b>  Allows the user to set the Data Rate in bps steps via the Front Panel Arrows or Keypad.
<b>SYMB RATE (sps)</b>	Allows the user to view the Symbol Rate.  Maximum SR is 10 MSps
<b>INNER FEC</b>	<b>LDPC:</b>
<b>SHORT BLOCK SIZE:</b>	<b>LDPC {1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9}</b>  Allows the user to select the Rx Code Rate and Type
<b>SAT FRAMING</b>	<b>{S2 NORMAL, S2 SHORT}</b> Allows the user to select the LDPC frame size.
<b>TERR FRAMING</b>	<b>{NONE, 188}</b>
<b>DATA POLARITY</b>	<b>{NONE, INV. BASEBAND, INV.TERR DATA, INV. TERR &amp; BASE,}</b> Allows the user to invert the Rx Data polarity.
<b>PILOT SYMBOLS</b>	<b>{DISABLED, ENABLED}</b> Allows the user to turn on or off pilot symbol insertion. Default is off.
<b>GOLD SEQ N</b>	<b>{000000}</b> Allows the user to enter specific tap value to choose different gold sequences for the S2 scrambler. The unit are decimal and the maximum value allow is $2^{18} - 1$ .
<b>ODU-LNB (menu)</b>	
<b>LO FREQ (MHz)</b>	Allows the user to enter the LNB Local Oscillator frequency in MHz in order for the downlink frequency to be displayed correctly (refer to the LNB manufacturer's specifications).
<b>OSC SIDE BAND</b>	<b>{LOW SIDEBAND, HIGH SIDEBAND}</b> Allows the user to select the location of the LNB LO. The user must enter the location of the LNB LO in order for the DOWNLINK FREQUENCY to be displayed correctly. The LNB LO can be either higher or lower in frequency than the LNB output frequency. If the LNB LO is higher in frequency then the user must enter HIGH SIDEBAND.
<b>10 MHz LNB REF</b>	<b>{ENABLED, DISABLED}</b> Allows the user to enable or disable the 10 MHz BUC reference clock.

<b>VOLTAGE SELECT</b>	<b>{13, 15, 18, 20}</b> Allows the user to select the voltage required by the LNB (refer to the LNB manufacturer's specifications)
<b>LNB VOLTAGE</b>	<b>{ENABLED, DISABLED}</b> Allows the user to enable or disable the LNB supply voltage.

#### 4.3.4 Interface Menu Options and Parameters

##### TX SETUP (menu)

<b>CIRCUIT ID</b>	Allows the user entry of a Tx Circuit Identifier. Circuits can be given up to an 11 Character alphanumeric identity such as LINK1.
<b>TERR INTERFACE</b>	<b>STANDARD INTERFACE</b> <b>{RS422 SERIAL, RS232 SERIAL, V.35}</b> Allows the user to select the Transmit Interface Type.
<b>TX CLK SRC</b>	<b>{SCTE, SCT,}</b> Allows the user to select the Transmit Clock Source.
<b>TX CLK POL</b>	<b>{AUTO, NORMAL, INVERTED}</b> Allows the user to select the Clock Polarity for the Tx Terrestrial Clock relative to the Tx Data. "Auto" detects wrong polarity and automatically corrects. If G.703 Interface is selected, this selection cannot be changed.
<b>SCT CLK SRC</b>	<b>{INTERNAL, SCR}</b> Allows the user to select internal Source. SCT is the internally generated SCT clock. SCR is the Rx Satellite clock. SCR is used for loop timing.
<b>DROP &amp; INSERT (menu)</b>	(Reference Section 3.13, "Drop and Insert Mapping" in this manual)
<b>DROP MODE</b>	<b>{NONE, T1-D4, T1-ESF, PCM-30, PCM-31, PCM-31C, T1-D4-S, T1-ESF-S.}</b> Drop mode may only be changed from none when the drop and insert specification is in use.
<b>MAP COPY</b>	<b>{SRC Map → Dest Map}</b>  Allows the user to copy drop and insert maps. Tx Act map is the drop map currently being used by the modem. Source and destination may be any of the following:  TX ACT, RX ACT, TX EDIT, RX EDIT, USER 1 - USER 8, ROM 1 -ROM 8

<b>SAT CH TERRCH</b>	<b>{1-31 1-31}</b>
	<p>The up/down arrow keys allow you to traverse the sat terr pairings. The slot numbers may be edited using the keypad.</p> <p>Allows the user to edit the Tx Edit map and specify the terrestrial slots that will be dropped into the assigned satellite channels. The satellite channels are fixed and the number of channels is determined by the data rate. The terrestrial time slots available are determined by the drop mode. When the user has finished editing the Tx Edit map, it must be copied to the Tx Act map before it will be used by the modem.</p>
<b>ESC CHAN#1 (dB)</b>	<b>{-20 to +10 dB}</b> <b>Allows user to select ESC Voice Channel Gain. Only displayed when IDR NETWORK and VOICE Channel are selected.</b>
<b>ESC CHAN#2 (dB)</b>	<b>{-20 to +10 dB}</b> <b>Allows user to select ESC Voice Channel Gain. Only displayed when IDR NETWORK and VOICE Channel are selected.</b>
<b>TX ASYNC MODE (menu)</b>	
<b>TX ASYNC MODE</b>	<b>{ES-ES, ESC ENHANCED}</b> ES-ES is the normal IBS Async Channel. ESC Enhanced can be selected in Closed Net and uses the Overhead Signaling bytes in the IBS Overhead to pass asynchronous data. This menu is not available when SCC is selected.
<b>ES INTERFACE</b>	<b>{RS-232, RS-485}</b> Allows the user to select the interface type.
<b>ES BAUDRATE</b>	<b>{150 – 1024} For IBS ES to ES</b> <b>{150 – 19200} For ES to ES Enhanced</b> <b>{150 – 115200} For SCC Communications</b>  <b>ES to ES : Fixed Baud Rate based on IBS Network Specification.</b> Available rates are listed in Table 3-3.  ES to ES Enhanced: Allows user to select the Interface Baud Rate. This selection will allow the user to set rate as listed in Table 3-3.  SCC: Allows user to select the interface Baud rate. Interface Rate must be equal to or greater than the In-Band Rate.
<b>ES BITS/CHAR</b>	<b>{7, 8}</b> Allows the user to choose between 7 or 8 bit data.

**RX SETUP (menu)**

**CIRCUIT ID** Allows the user entry of a Tx Circuit Identifier. Circuits can be given up to an 11 Character alphanumeric identity such as LINK1.

**TERR INTERFACE** **STANDARD INTERFACE**  
**{RS422 SERIAL,RS232 SERIAL, V.35}**  
 Allows the user to select the Transmit Interface Type.

**BUFF SIZE (msec)** **{0 - 64 msec}**  
 Allows the user to set the Doppler Buffer Size in msec.

**BUFFER CLK SRC** **Note: RX Sat only supported in Version A**  
 The user must assign priorities to the clock sources. 1 being the highest priority and 4 being the last resort. The menu has three fields; the first field is the name of the clock source, the second field is the priority entry area, and the last field is the depth of the list. In the priority field, the up/down arrow keys will scroll through the list displaying the names and the current priority. When the desired clock name is displayed, the number keys may be used to assign a priority value. Pressing <Enter> will re-sort the list. Do this until the clock sources are prioritized in the order desired. Use the left/right arrow keys to move the cursor to the depth field. This field assigns the number of entries to use. The number keypad or the up/down arrows can be used to change the value.

<u>Clock Source</u>	<u>Priority</u>		<u>SRC DEPTH</u>		
RX SAT	1	of	3	}	Only these will be used
SCTE	2	of	3		
SCT	3	of	3		
EXT BNC	4	of	3	}	Will not be used since 4>3

**BUFFER CLK POL** **{NORMAL, INVERTED}**  
 Allows the user to select the Clock Polarity for the Rx Terrestrial Clock relative to the Rx Data.

**TERR STREAMING** **{BYTE OUTPUT}**

**GENERAL (menu)**

**EXT FREQ (MHz)** **{Variable Through Data Rate}**  
 Allows the user to select the external clock frequency in MHz.

<b>REF FREQ SRC</b>	<b>{EXTERNAL, HIGH STABILITY}</b> Allows the user to select the Frequency Reference Source. High Stability is only displayed if the appropriate hardware is detected.
<b>REF FREQ (MHz)</b>	Allows the user to select the reference clock frequency in MHz.
<b>BB RELAYS</b>	<b>{IBS ALMS, IBS/MNR/ALMS, IBS/MNR/MJR ALM}</b>  <b>IBS ALARMS:</b> Allows the user to select rear panel contact closures to support IBS alarms only.  <b>IBS/MINOR ALARMS:</b> Allows the user to select rear panel contact closures to support IBS and Minor alarms.  <b>IBS/MINOR/MAJOR ALARMS:</b> Allows the user to select rear panel contact closures to support IBS, Minor and Major alarms.

### 4.3.5 Monitor Menu Options and Parameters

<b>EVENTS</b>	Displays a history of events recorded in the event buffer. A maximum of 100 events may be stored in the buffer. Upon receipt of the 101 <sup>st</sup> event, the first received event is automatically deleted, and so on, maintaining the maximum 100 events.
<b>ERASE EVENTS.. PRESS CLEAR</b>	Allows the user to clear the contents of the Event Buffer by pressing <CLEAR> on the keypad.
<b>INPUT LVL (dBm)</b>	Displays the estimated receive signal level as seen by the Demodulator.
<b>FREQ OFFSET</b>	Displays the received carrier frequency offset as measured by the modem.
<b>EBNO (dB)</b>	Displays the estimated $E_b/N_o$ as seen by the demodulator.
<b>PKT ERROR RATE</b>	<b>{0.00E-00} NEEDS INFO</b> This screen displays the ratio of mpeg packets with CRC errors to mpeg packets with no errors. No CRC errors = 0, every packet with a CRC error = 1.
<b>VOLTAGES (menu)</b>	
<b>+1.5V RX SUPPLY</b>	Displays the measured voltage of the 1.5 Volt Rx power bus located inside the modem.
<b>+1.5V TX SUPPLY</b>	Displays the measured voltage of the 1.5 Volt Tx power bus located inside the modem.
<b>+3.3V SUPPLY</b>	Displays the measured voltage of the +3.3 Volt power bus located inside the modem.

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<b>+5V SUPPLY</b>	Displays the measured voltage of the +5 Volt power bus located inside the modem.
<b>+12V SUPPLY</b>	Displays the measured voltage of the +12 Volt power bus located inside the modem.
<b>-12V SUPPLY</b>	Displays the measured voltage of the -12 Volt power bus located inside the modem.
<b>+20V SUPPLY</b>	Displays the measured voltage of the +20 Volt power bus located inside the modem.
<b>BUC CURRENT</b>	Displays the measured current of the BUC.
<b>BUC VOLTAGE</b>	Displays the measured voltage of the BUC.
<b>ODU-BUC (menu)</b>	
<b>POWER OUT (dBm)</b>	Displays the measured output power of the BUC in dBm. Only displayed with Smart BUCs that support this feature in FSK mode.
<b>TEMPERATURE</b>	Displays the measured temperature of the BUC in degrees Celsius. Only displayed with Smart BUCs that support this feature in FSK mode.
<b>BUC SUMMARY</b>	Displays a summary status of the BUC. Only displayed with Smart BUCs that support this feature in FSK mode.
<b>RX BUFFER LEVEL</b>	<b>{0 – 100%}</b> Displays the status of the Doppler Buffer.
<b>RX BUFFER RESET ((ENTER))</b>	Allows the user to re-center the Doppler Buffer when <ENTER> is pressed on the keypad.

### 4.3.6 Alarms Menu Options and Parameters



#### CURRENT ALARMS (menu)

<b>TX MAJOR (menu)</b>	<b><u>Status</u>    <u>Edit Table</u></b>
<b>FPGA CFG</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates a transmit FPGA configuration failure.
<b>DSP CFG</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates a transmit DSP configuration failure.
<b>SCT CLOCK PLL</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Tx SCT Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration failure within the modem.
<b>SYM CLOCK PLL</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Tx Symbol Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a problem with the incoming clock to the modem (SCTE).
<b>LB SYNTH PLL</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Tx L-Band Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.
<b>BUC CURRENT</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the BUC current has fallen outside of the threshold limits.
<b>BUC VOLTAGE</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the BUC voltage has fallen outside of the threshold limits.
<b>FORCED ALARM</b>	<b>{DISABLED, ENABLED}</b> Allows user to disable or enable forcing of a Tx Summary Alarm.

**TX MINOR (menu)**

<b>TERR CLK ACT</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates no Terrestrial Clock activity.
<b>TERR DATA ACT</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates no Tx Data activity.
<b>TX TERR AIS</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that AIS has been detected in the Tx Data Stream.
<b>DnI FRAME LOCK</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates the framing unit is unable to find the expected terrestrial framing pattern.
<b>DnI M-FRAME LOCK</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates the framing unit is unable to find the expected inter-frame pattern.
<b>TX DSS FRM LOCK</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that Tx input data stream framing does not match the user selected TX TERR FRAMING.
<b>TX CLKSRC FALLBK</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the clock resource has fallen.
<b>BUC PLL</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the BUC has a PLL fault. Only available when used with Smart BUC that support this FSK option.
<b>BUC OVER TEMP</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the BUC has an over temperature fault. Only available when used with Smart BUC that support this FSK option.
<b>BUC SUMMARY</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the BUC has a Summary fault. Only available when used with Smart BUC that support this FSK option.
<b>BUC OUTPUT</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates BUC PLL has failed. (Only available when FSK is enabled)
<b>FSK COMMS</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the modem has lost communications with the BUC

**RX MAJOR (menu)**

<b>FPGA CFG</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates a receive FPGA hardware failure.
<b>DSP CFG</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates a receive DSP failure.

<b>DMD CFG</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates a demodulator DSS-S2 FPGA hardware failure.
<b>SIGNAL LOCK</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the demod is unable to lock to a signal.
<b>INPUT LVL THRESH</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates Rx signal level has fallen below input threshold.
<b>FRAME LOCK</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Framing Unit is unable to find the expected framing pattern.
<b>LB SYNTH PLL</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Rx L-Band Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.
<b>FORCED ALARM</b>	<b>{DISABLED, ENABLED}</b> Allows user to enable a forced Rx summary alarm.
<b>RX MINOR (menu)</b>	
<b>BUFF UNDERFLOW</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that a Doppler Buffer underflow has occurred.
<b>BUFF NEAR EMPTY</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Doppler Buffer is about to underflow.
<b>BUFF NEAR FULL</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Doppler Buffer is about to overflow.
<b>BUFF OVERFLOW</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that a Doppler Buffer overflow has occurred.
<b>RX DATA ACTIVITY</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that there is no Rx Data activity.
<b>IFEC LOCK</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Framing Unit is unable to find the expected framing pattern.
<b>EBNO (dB)</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates that the Eb/No are outside of limits.
<b>COMMON (menu)</b>	
<b>TERR FPGA CFG</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates an Interface Card FPGA configuration failure.
<b>CODEC FPGA CFG</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates Turbo Codec Card FPGA configuration failure.

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<b>CODEC DEV CFG</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates Turbo Codec Card ASIC configuration failure.
<b>EXT CLOCK ACT</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates the External Clock activity.
<b>EXT REF ACT</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates the External Reference activity.
<b>EXT REF LOCK</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Indicates the External Reference PLL is locked detection.
<b>VOLTAGES (menu)</b>	
<b>+1.5V RX SUPPLY</b>	<b>{Pass/Fail, Unmasked/Masked}</b>  Displays the measured voltage of the 1.5 Volt Rx power bus located inside the modem.
<b>+1.5V TX SUPPLY</b>	<b>{Pass/Fail, Unmasked/Masked}</b>  Displays the measured voltage of the 1.5 Volt Tx power bus located inside the modem.
<b>+3.3V SUPPLY</b>	<b>{Pass/Fail, Unmasked/Masked}</b>  Displays the measured voltage of the +3.3 Volt power bus located inside the modem.
<b>+5V SUPPLY</b>	<b>{Pass/Fail, Unmasked/Masked}</b>  Displays the measured voltage of the +5 Volt power bus located inside the modem.
<b>+12V SUPPLY</b>	<b>{Pass/Fail, Unmasked/Masked}</b>  Displays the measured voltage of the +12 Volt power bus located inside the modem.
<b>-12V SUPPLY</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Displays the measured voltage of the -12 Volt power bus located inside the modem.
<b>+20V SUPPLY</b>	<b>{Pass/Fail, Unmasked/Masked}</b> Displays the measured voltage of the +20 Volt power bus located inside the modem.

**LATCHED ALARMS****{Pass/Fail}**

The following alarms are latched in order to catch intermittent failures:

**TX MAJOR (menu)****FPGA CFG****DSP CFG****SCT CLOCK PLL****SYM CLOCK PLL****LB SYNTH PLL****BUC CURRENT****BUC VOLTAGE****TX MINOR (menu)****TERR CLK ACT****TERR DATA ACT****TX TERR AIS****DnI FRAME LOCK****DnI M-FRAME LOCK****TX DSS FRM LOCK****TX CLKSRC FALLBK****BUC PLL****BUC OVER TEMP****BUC SUMMARY****BUC OUTPUT****FSK COMMS****RX MAJOR (menu)****FPGA CFG****DSP CFG****DMD CFG****SIGNAL LOCK****INPUT LVL THRESH**

**FRAME LOCK**

**LB SYNTH PLL**

**RX MINOR (menu)**

**BUFF UNDERFLOW**

**BUFF NEAR EMPTY**

**BUFF NEAR FULL**

**BUFF OVERFLOW**

**RX DATA ACTIVITY**

**IFEC LOCK**

**EBNO**

**COMMON (menu)**

**TERR FPGA CFG**

**CODEC FPGA CFG**

**CODEC DEV CFG**

**EXT CLOCK ACT**

**EXT REF ACT**

**EXT REF LOCK**

**VOLTAGE (menu)**

**+1.5V RX SUPPLY**

**+1.5V TX SUPPLY**

**+3.3V SUPPLY**

**+5V SUPPLY**

**+12V SUPPLY**

**-12V SUPPLY**

**+20V SUPPLY**

**CLEAR LATCHED ((ENTER))** Allows the user to reset the latched alarms by pressing <ENTER> on the keypad.

<b>BACKWARD ALARM</b>	<b>{Pass/Fail}</b> Backward alarms are only available on the Modulator.
<b>IDR1 SAT CNTRL</b>	<b>{STNDRD, ERC ON, ERC OFF} (TX=PASS)</b>
<b>IDR2 SAT CNTRL</b>	<b>{STNDRD, ERC ON, ERC OFF} (TX=PASS)</b>
<b>IDR3 SAT CNTRL</b>	<b>{STNDRD, ERC ON, ERC OFF} (TX=PASS)</b>
<b>IDR4 SAT CNTRL</b>	<b>{STNDRD, ERC ON, ERC OFF} (TX=PASS)</b>
<b>IBS SAT CNTRL</b>	<b>{STNDRD, ERC ON, ERC OFF} (TX=PASS)</b>
<b>T1E1 TERR CNTRL</b>	<b>{STNDRD, ERC ON} (TX=PASS)</b>
<b>IBS TX PROMPT</b>	<b>{STNDRD, ERC ON} (TX=PASS)</b>
<b>IBS TX SERVICE</b>	<b>{STNDRD, ERC ON} (TX=PASS)</b>

### 4.3.7 System Menu Options and Parameters

<b>DATE (MM/DD/YY)</b>	Allows the user to enter the current date.
<b>TIME {HH:MM:SS}</b>	Allows the user to enter the current time.
<b>CONFIG COPY</b>	<b>{Current, CFG1.....CFG10}</b> Allows user to copy, save and recall modem configurations.
<b>FRONT PANEL (menu)</b>	
<b>BKLT LEVEL</b>	<b>{OFF, LOW, MED, HIGH}</b> Allows the user to enter the backlight intensity level.
<b>BKLT TIMEOUT</b>	<b>{00 - 99}</b> Allows the user to enter the length of time (in seconds) of keyboard inactivity before the backlight shuts off. 00 = no timeout.
<b>KEY CLICK</b>	<b>{ON, OFF}</b> Allows the user to enable or disable the audible beep each time a key is pressed. Illegal entries will still cause a beep to be heard.
<b>LED TEST</b>	<b>{ENTER}</b> Allows user to test all front panel LEDs.
<b>REMOTE CONTROL</b>	<b>{TERMINAL, COMPUTER}</b> Allows the user to select between terminal RS-232 control and remote port M&C RS-232/-485 control.

**TERMINAL (menu)**

<b>TYPE</b>	<b>{VT-100, WYSE50, VIEWPOINT}</b> Allows the user to select the emulation type.
<b>BAUD RATE</b>	<b>{300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600}</b> Allows the user to enter the terminal baud rate.

**REMOTE PORT (menu)**

<b>ADDRESS</b>	<b>{32 - 255}</b> Allows the user to enter the Remote Port Multidrop Address.
<b>BAUD RATE</b>	<b>{300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600}</b> Allows the user to enter the Remote Port Baud Rate.
<b>INTERFACE</b>	<b>{RS-232, RS-485}</b> Allows the user to enter the Remote Port interface type.

**TCP/IP Menu (THIS FEATURE IS NOT SUPPORTED)**

<b>BOOT MODE</b>	<b>{DEFAULT, NON-VOL, BOOTP, IP TEST}</b>
------------------	---

**DEFAULT:** During initialization (boot up), the modem will restore the web setting to the standard IP Mask and addresses supplied by the modem. The modem will be taken off the network and will not be accessible. The Default settings are:

IP Address Mask:	255.000.000.000	(FF.00.00.00 hex)
Modem IP Address:	010.000.000.001	(C0.A8.00.EE hex)
Server IP Address:	010.001.001.001	(0A.01.01.01 hex)
Router IP Address:	010.000.001.001	(0A.00.01.01 hex)

**BOOTP:** During initialization (boot up), the modem will get the names, masks, and IP Addresses of the modem, router, and server.

**NON-VOL:** Stores and uses IP Mask and addresses as provided by the user.

**IP TEST:** Stores and uses IP Mask and addresses to fixed settings as listed below.

Bootp Server Tag:	206	
IP Address Mask:	255.255.255.000	(FF.FF.FF.00 hex)
Modem IP Address:	192.168.0.238	(C0.A8.00.EE)
Server IP Address:	192.168.000.101	(C0.A8.00.65)
Router IP Address:	192.168.000.102	(C0.A8.00.66)

<b>BOOTP SERVER</b>	<b>{128 – 257, default is 206}</b>
---------------------	------------------------------------

Only used if Bootp is selected in Boot Mode. Should be consistent with the tag expected by the users Bootp Server.

**MODEM HOST** The Host Modem for the network.

**IP ADDR MASK**

**{XXX.XXX.XXX.XXX} Hexadecimal Mask**

**{ddd.ddd.ddd.ddd} Decimal Mask**

The IP Address Mask of the local network. The mask is expressed in a hexadecimal format, and must be a valid TCP/IP Mask. This field should be set before changes are made to the Modem or Router Address.

**MODEM IP ADDR**

**{XXX.XXX.XXX.XXX} Hexadecimal Address**

**{ddd.ddd.ddd.ddd} Decimal Mask**

The IP Address of the modem. This address should be consistent for the mask defined. This address is expressed in hexadecimal format. Broadcast and loop back addresses will not be allowed. These are addresses with all subnet bits set to 0's or 1's.

**ROUTER IP ADDR**

**{XXX.XXX.XXX.XXX} Hexadecimal Address**

**{ddd.ddd.ddd.ddd} Decimal Address**

The IP Address of the Local Network Router. If a router is present on the local network, this address must be consistent with the IP Mask and the subnet of the modem. If no router is present, then the address should be set to a foreign address. This address is expressed in hexadecimal format.

**BOOTP SERVER**

**{XXX.XXX.XXX.XXX} Hexadecimal Address**

**{ddd.ddd.ddd.ddd} Decimal Address**

The IP Address of the Boot Server and the address of the SNMP Trap Server when SNMP is active. If a server is used and there is no local router, this address must be consistent with the modem address. If a router has been specified, the address is presumed to be reachable via the router. Broadcast and loop back addresses will not be allowed. These are addresses with all subnet bits set to 0's or 1's.

Broadcast and loop back addresses will not be allowed. These are addresses with all subnet bits set to 0's or 1's.



**NOTE**

*To change the display for the IP ADDRESS MASK, MODEM IP ADDRESS, SERVER IP ADDRESS, AND ROUTER IP ADDRESS, press all four arrow keys simultaneously.*

**MODEM EADDR** {001065010000}  
Displays the Ethernet address of the device. Set at the factory and is a unique identifier for the Ethernet physical interface.

**ETHER RATE** {10 MBPS/HD}  
The data rate for the local Ethernet Interface.  
10 Mbps/HD – for 10 Base-T in either half-duplex or full duplex.

#### HW/FW CONFIG (menu)

**FIRMWARE REV** Displays the installed firmware revision.

**M&C REV** Displays the installed Monitor and Control revision.

#### MAIN BOARD (menu)



*Only the appropriate of the VCO adjustment screens listed below will be displayed. These are protected fields, to prohibit accidental changes. To edit the field, the user must depress all four of the direction arrow keys simultaneously.*

**INT VCO ADJUST** {0% - 100%}  
Allows the user to adjust the internal frequency reference for calibration. **Only displayed if the system reference clock is INTERNAL.**

**HI STAB VCO ADJUST** {0% - 100%}  
Allows the user to adjust the internal frequency reference for calibration. **Only displayed if the system reference clock source is HI STABILITY.**

**LARGEST HB GAP** Used for factory test only.

**CLEAR USER NV** {Enter}

**SOFT RESET** {Enter}

**IF BOARD (menu)** Indicates the Radyne part number for the IF Board Assembly.

**AGC/CTRL/VALUE** {0% - 100%}  
Allows the user to adjust the internal frequency reference for calibration. **Only displayed if the system reference clock source is HI STABILITY.**

<b>I OFFSET</b>	Used for factory test only.
<b>Q OFFSET</b>	Used for factory test only.
<b>LB RX LVL OFFSET</b>	Used for factory test only.
<b>POWER SOURCE</b>	Used for factory test only.
<b>TERR INTFC BRD</b>	Indicates the Radyne assembly number for the Terrestrial Interface Assembly.
<b>CODEC BOARD (menu)</b>	Indicates the Radyne part number for the Codec Board.
<b>TPC FPGA IMAGE</b>	Used for factory test only.
<b>RS FPGA IMAGE</b>	Used for factory test only.
<b>TPC CODEC IMAGE</b>	Used for factory test only.
<b>FRONT PANEL BOARD</b>	Indicates the Radyne assembly number for the front panel board.
<b>FEATURES (menu)</b>	
<b>5012.2840.2417</b>	{ ..... } Allows the user to install purchased feature upgrades (see Appendix A). Contact the Radyne Customer Service Department or Sales for hardware and software upgrades.

**UPGRADE LIST (menu)** The following identifies the available upgrade features:

**10 MBPS, 20 MBPS** (The highest option installed will hide the lower rates.)

**RXLBAND**

**TXLBAND**

**IDR** (TX only)

**SEQ** (TX only)

**RS**

**RS CUSTOM** (TX only)

**IBS** (TX only)

**8PSK**

**16QAM**

**TURBO 20 MBPS** (TX only)

### 4.3.8 Test Menu Options and Parameters

<b>TX TEST PATTERN</b>	<b>{NONE, 2047, 2<sup>15</sup>-1, 2<sup>23</sup>-1}</b> Allows the user to enable the tests listed above.
<b>RX TEST PATTERN</b>	<b>{NONE, 2047, 2<sup>15</sup>-1, 2<sup>23</sup>-1}</b> Allows the user to enable the tests listed above.
<b>PATTERN SYNC</b>	<b>{YES, NO}</b> Yes indicates that the RX Test Pattern is in sync.
<b>TST PAT ERR CNT</b>	<b>{NO SYNC, nnnn x 10<sup>n</sup>}</b> Displays the number of errors detected by the test pattern checker.
<b>TST PATT BER</b>	<b>{NO SYNC, nnnn x 10<sup>-n</sup>}</b> Displays the measured BER for the test pattern.
<b>RESTART TST PAT ((ENTER))</b>	Allows the user to restart the test by pressing <ENTER> on the keypad.



## NOTE

### **LOOPBACK WITH ETHERNET DATA INTERFACE**

***Usage of the modems loopback capabilities in conjunction with the Ethernet data interface can produce undesirable network loops. In order to run any type of data test with an Ethernet interface you must utilize two modems connected back to back. Simply using one modem and a loopback will not produce the desired results.***

<b>LOOPBACK</b>	<b>{NONE, TERR TX, BASEBAND TX, IFEC TX}</b> Terrestrial Loopback is performed at the Terrestrial Interface  <b><i>NONE:</i></b> No loopback performed.  <b><i>TERR TX:</i></b> Sends Tx Terrestrial Data to Rx data out.  <b><i>BASEBAND TX:</i></b> Sends Tx data to the receive input to the BB Card.
<b>CARRIER TYPE</b>	<b>{NORMAL, CW, DUAL, OFFSET, POS FIR, NEG FIR}</b> Allows the user to set the type of carrier.  <b><i>NORMAL:</i></b> Causes the Modulator to output normal modulation.  <b><i>CW:</i></b> Causes the Modulator to output a pure carrier.  <b><i>DUAL:</i></b> Causes a double sideband output.

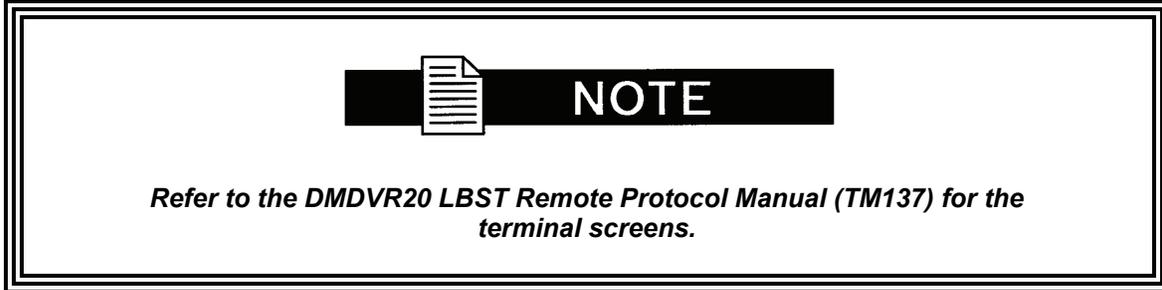
**OFFSET:** Causes a single sideband output.

**POS FIR:** For manufacturer's use only.

**NEG FIR:** For manufacturer's use only.

## 4.4 Terminal Mode Control

The Terminal Mode Control allows the use of an external terminal or computer to monitor and control the modem from a full screen interactive presentation operated by the modem itself. No external software is required other than VT-100 Terminal Emulation Software (e.g. "Procomm" for a computer when used as a terminal). The Control Port is normally used as an RS-232 Connection to the terminal device. The RS-232 operating parameters can be set using the modem Front Panel and stored in EEPROM for future use.



### 4.4.1 Modem Terminal Mode Control

The modem can be interactively monitored and controlled in the Terminal Mode, with a full screen presentation of current settings and status.

The Terminal Control Mode supports several baud rates, however the connection must be set for 8 data bits, 1 stop bit and no parity (8,N,1). Three terminal emulations are supported: VT-100, WYSE 50, and ADDS-VP.

"\$" is used for setting the screen when the terminal is used for the first time the non-volatile memory is reset.

### 4.4.2 Modem Setup for Terminal Mode

Terminal Mode Communications and Protocol is set from the Front Panel Control by setting the "Control Mode" Parameter to "Terminal", and then setting the "Modem Port", "Term Baud" and "Emulation" Parameters as desired. Then a terminal is connected to Connector J20 on the Back Panel. All operating software for the Terminal Mode is contained within the Modem Internal Control Software.

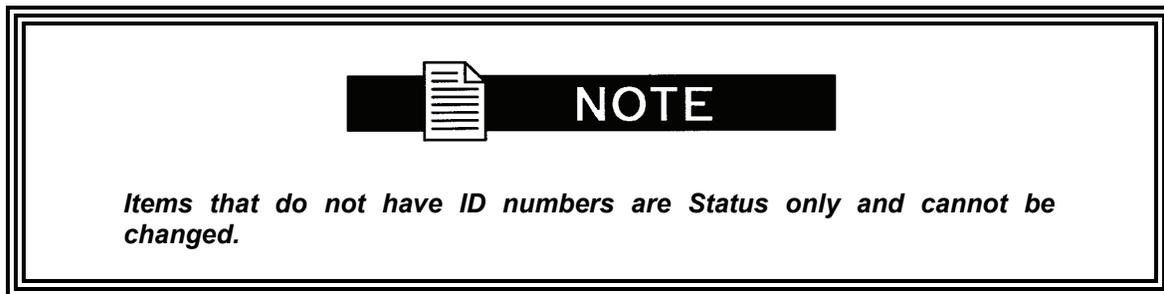
A "break" signal on the communications line, pressing "ESC" on the terminal or Power On of the modem will initiate full screen terminal mode printing and redraw the full screen. The Terminal Mode displays the present status of all user parameters controlled and read by the processor, and offers a menu allowing change to any controlled parameter.

The Terminal Mode uses eight "Screens," each of which have the basic contents of the three modem monitor and control areas as set in the Front Panel matrix columns. This screen is used for setting the parameters of the Modulator, Demodulator, Event, Alarm, Latched Alarm, Drop Controls, Insert Controls, and Interface Areas.

## 4.5 Terminal Port User Interface

The Remote Port (J20) of the modem allows for complete control and monitoring of all parameters and functions via an RS-232 Serial Interface, or RS-485 for RLLP Protocol. 'Terminal Mode' can be entered from the front panel by selecting "System" and then "Control Mode" followed by "Terminal". The baud rate and evaluation type can be changed at the front panel by using the *System>Baud Rate* Menu.

The Terminal Control Mode is menu-driven and the allowable values for each item number will be shown. To change an item, type in its number followed by <ENTER>. If the parameter to be changed requires a numeric value, enter the number followed by <ENTER>. If the parameter is non-numeric, press <SPACE> to cycle through the list of available entries.



## 4.6 Connecting the Terminal

1. Connect the computer to the Remote Connector (J20) on the rear of the unit using the RS-232 Cable.
2. Enable the terminal by selecting Terminal Mode (located under the System - Control Mode Menu) from the front panel.
3. Verify that your emulation software is set to the following:
  - 8 data bits
  - no parity
  - 1 stop bit

Modify the selection, if necessary, to match the settings (the Front Panel 'SYSTEM' Sub-Menu contains all the Terminal Emulation Controls).

## 4.7 Terminal Screens





## Rear Panel Interfaces

# 5

This section discusses the electrical interfaces available from the rear panel. All locations are as viewed from the rear of the unit unless otherwise specified.

### 5.0 DMDVR20 LBST Connections

All DMDVR20 LBST connections are made to labeled connectors located on the rear of the unit (refer to Figure 5-1 for the DMDVR20 LBST). The connector definitions below are those on the DMDVR20 LBST unit. Any connection interfacing to the DMDVR20 LBST must be the appropriate mating connector.



**Figure 5-1. DMDVR20 LBST Satellite Modem Rear Panel Configurations**

### 5.1 Compact Flash

The compact flash slot is located on the right side as viewed from the rear of the unit. A 128 or 256 Mbit flash memory card that stores all the modem M&C and operational data. It must be present when the modem is operating.

## 5.2 Power Input Modules

### 5.2.1 AC Power Input Module

AC Input Module (Figure 5-1) is located on the left side of the unit. Power applied to the port with the supplied power cable is 100 – 240 VAC, 50 – 60 Hz. Integrated into the Power Input Module is the Power On/Off Rocker Switch. Power consumption for the unit is 1A. A chassis ground connection (#10-32 threaded stud), is located to the lower right of the module .5.2.2 DC Power Input/Switch

The Optional DC Power Input and Switch (Figure 5-1) is available for all DMDVR20 LBST products. The unit may be powered from a 36 – 75 VDC source with a maximum unit power consumption of 3 A. Refer to Table 5-1 for pinouts.

A	–
B	Ground
C	+

## 5.3 DMDVR20 LBST Chassis Connections

### 5.3.1 EXT REF (J10)

The External Reference Port is a 50-Ohm Female BNC Connector and will accept the following frequencies: 1.0, 1.544, 2.0, 2.048, 5.0, and 10.0 MHz.

### 5.3.2 TX L-Band IF (J11)

The Transmit Output Port is a 50-Ohm Type-N Connector. The power level is programmable from 0 to -25 dBm, in 0.1 dBm steps. The IF Frequency can be programmed to 950 – 2050 MHz, in 1 Hz Steps.

### 5.3.3 RX (J1)

The Receive Input Port is a 75-Ohm F-Type Connector. The IF Frequency can be programmed from 950 to 2150 MHz in 1 Hz Steps.

### 5.3.4 ALARM (J15)

The Alarm Port is a 15-Pin Female “D” Connector. Refer to Table 5-2 for pinouts.

Pin No.	Signal Name	Signal	Direction
1	Mod Fault	MF-C	No Direction
2	Mod Fault	MF-NC	No Direction
3	Mod Fault	MF-NO	No Direction
4	Demod Fault	DF-C	No Direction
5	Demod Fault	DF-NC	No Direction

6	Demod Fault	DF-NO	No Direction
*7	Prompt	CEF-C	No Direction
*8	Prompt	CEF-NC	No Direction
*9	Prompt	CEF-NO	No Direction
*10	Service	SP1-C	No Direction
*11	Service	SP1-NC	No Direction
*12	Service	SP2-NO	No Direction
13	No Connection	SP2-NC	No Direction
14	AGC Out	AGC	No Direction
15	Ground	GND	---

Note: Normally open or Normally closed conditions identified above indicate a faulted state or off condition.

\*Note: Pins 1 through 6 offers form C contacts for Major Alarm Status on the Modulator and Demodulator. When the modem is configured for IBS Network Specification, pins 7-9 only support the IBS Prompt Alarms and pins 10-12 only support IBS Service Alarms. If the Network specification is configured for Closed Net, the contact closures for Prompt and Service can be utilized to include the summary of all minor alarms or minor/major alarms. The IBS Prompt menus can include TX Minor Alarms or TX Minor Alarm and TX Major Alarms. The IBS Service Alarms can include RX Minor Alarms or RX Minor Alarms and RX Major Alarms.

### 5.3.5 EXT CLK (J16)

The External Clock Port is a 75-Ohm Female BNC Connector. It allows interfacing to an external clock source.

### 5.3.6 ASYNC (J17) (NOT SUPPORTED)

### 5.3.7 (J18)

Radyne factory use only.

### 5.3.8 EIA-530 (J19)

The EIA-530 Port is an RS-422/V.35/RS-232 Connection. It is a 25-Pin Female “D” Connector. Refer to Table 5-3 for pinouts.

<b>Pin No.</b>	<b>Signal Name</b>	<b>Signal</b>	<b>Direction</b>
1	Shield	---	---
2	Send Data A (-)	SD-A	Input
3	Receive Data A (-)	RD-A	Output
4	Request To Send A (-)	RS-A	Input
5	Clear To Send A (-)	CS-A	Output
6	Data Mode A (-)	DM-A	Output
7	Signal Ground	SGND	---
8	Receiver Ready A (-)	RR-A	Output
9	Receive Timing B (+)	RT-B	Output
10	Receiver Ready B (+)	RR-B	Output
11	Terminal Timing B (+)	TT-B	Input
12	Send Timing B (+)	ST-B	Output
13	Clear T Send B (+)	CS-B	Output
14	Send Data B (+)	SD-B	Input
15	Send Timing A (-)	ST-A	Output
16	Receive Data B (+)	RD-B	Output
17	Receive Timing A (-)	RT-A	Output
18	Modulator Fault - Open Collector	MF	Output
19	Request To Send B (+)	RS-B	Input
20	Data Terminal Ready A (-)	TR-A	Input
21	Demodulator Fault	DF	Output
22	Data Mode B (+)	DM-B	Output
23	Data Terminal Ready B (+)	TR-B	Input
24	Terminal Timing A (-)	TT-A	Input
25	No Connection	---	---

### 5.3.9 REMOTE (J20)

The Remote Port is a RS-485 or RS-232 Connection for remote monitor and control of the modem. It is a 9-Pin Female “D” Connector. Refer to Table 5-4 for pinouts.

Pin No.	Signal Name	Signal	Direction
1	Transmit Data RS-485 (+)	TX-485-B	Output
2	Transmit Data RS-232	TXD-232	Output
3	Receive Data RS-232	RXD-232	Input
4	NC	NC	---
5	Ground	GND	---
6	Transmit Data RS-485 (-)	TX-485-A	Output
7	NC	No Connection	---
8	Receive Data RS-485 (+)	RX-485-B/CTS	Input
9	Receive Data RS-485 (-)	RX-485-A	Input



*When operating the remote port as RS232 using a cable pinned 1 for 1 may cause communication failures due to miss routing of standard RS232 com port signals.*

*When operating the remote port as RS232, the cable used should only have pins 2, 3 and 5 connected.*

### 5.3.10 ETHERNET (J21) (FUTURE OPTION)

The ETHERNET Port (J21) can be used for the Monitor & Control (M&C) Functions of the unit. The physical interface is a standard female RJ-45 Connector.



## Maintenance and Troubleshooting

# 6

This section discusses unit maintenance and troubleshooting for the Universal Satellite Modem.



### CAUTION!!

*The DMDVR20 LBST contains a Lithium Battery. **DANGER OF EXPLOSION** exists if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries in accordance with local and national regulations.*

## 6.0 Periodic Maintenance

There is no external fuse on the modem. The fuse is located on the power supply assembly inside the case, and replacement is not intended in the field.

### 6.0.1 Clock Adjustment

The modem allows for VCO speed adjustment from the front panel. Clock adjustment should be performed only when an internal clock source has insufficient accuracy for the custom modem application.

## 6.1 Troubleshooting

Should a unit be suspected of a defect in field operations after all interface signals are verified, the correct procedure is to replace the unit with another known working unit. If this does not cure the problem, wiring or power should be suspect.

The following is a brief list of possible problems that could be caused by failures of the modem or by improper setup and configuration for the type of service. The list is arranged by possible symptoms exhibited by the modem.

Symptom	Possible Cause
The Modem will not acquire the incoming carrier:	There is an improper receive input to modem.
	The Receive Carrier Level is too low.
	The Receive Carrier Frequency is outside of the acquisition range.
	The Transmit Carrier is incompatible.
	Modem is in Test Mode.

## 6.1.1 Alarm Faults

### 6.1.1.1 Major Tx Alarms

Alarm	Possible Cause
FPGA CFG	Indicates a transmit FPGA hardware failure.
DSP CFG	Indicates a transmit FPGA failure.
SCT Clock PLL	Indicates that the Tx SCT Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.
SYM Clock PLL	Indicates that the Tx Symbol Clock PLL is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a problem with the incoming clock to the modem (SCTE).
LB Synth PLL	Indicates that the Tx L-Band Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.

### 6.1.1.2 Major Rx Alarms

Alarm	Possible Cause
FPGA CFG	Indicates a receive FPGA hardware failure.
DSP CFG	Indicates a receive DSP failure.
SIGNAL LOCK	Indicates that the demod is unable to lock to a signal.
FRAME LOCK	Indicates that the Framing Unit is unable to find the expected framing pattern.
LB SYNTH PLL	Indicates that the Rx L-Band Synthesizer is not locked. This alarm will flash on during certain modem parameter changes. A solid indication points toward a configuration problem within the modem.

### 6.1.1.3 Minor Tx Alarms

Alarm	Possible Cause
TERR CLK ACT	Indicates no Terrestrial Clock activity.
TERR DATA ACT	Indicates no Tx Data activity.
TX TERR AIS	Indicates that AIS has been detected in the Tx Data Stream.
TX DSS FRAME LOCK	Indicates that the Tx Input Data Stream Framing does not match the user selected Tx Terr Framing. Incorrect Tx Terr Framing selected. Incorrectly framed Tx Input Data Stream.
BUC CURRENT	Indicates that current is either below or above the threshold limits of the LNB, as specified by the modem. Only active when voltage is enabled.
BUC VOLTAGE	Indicates that the voltage is not functioning correctly when voltage is enabled.

### 6.1.1.4 Minor Rx Alarms

Alarm	Possible Cause
BUFF UNDERFLOW	Indicates that a Doppler Buffer underflow has occurred.
BUFF NEAR EMPTY	Indicates that the Doppler Buffer is about to underflow.
BUFF NEAR FULL	Indicates that the Doppler Buffer is about to overflow.
BUFF OVERFLOW	Indicates that a Doppler Buffer overflow has occurred.
RX DATA ACTIVITY	Indicates that there is no Rx Data activity. For the Ethernet Interface, indicates that no Ethernet port is active (no cable is plugged in).
SAT AIS	Indicates that AIS has been detected in the receive satellite data stream.
IFEC LOCK	Indicates that the Inner Codec is not locked.
OFEC LOCK	Indicates that the Reed-Solomon Decoder is not locked.
EBNO (dB)	Indicates that the Eb/No is outside of limits.

### 6.1.1.5 Common Major Alarms

Alarm	Possible Cause
TERR FPGA CFG	Indicates an Interface Card FPGA configuration failure probably caused by a missing, or wrong file.
CODEC FPGA CFG	Indicates Turbo Codec Card FPGA configuration failure probably caused by a missing, or wrong file.
+1.5V RX SUPPLY	Displays the measured voltage of the 1.5 Volt Rx power bus located inside the modem.
+1.5V TX SUPPLY	Displays the measured voltage of the 1.5 Volt Tx power bus located inside the modem.
+3.3V SUPPLY	Displays the measured voltage of the +3.3 Volt power bus located inside the modem.
+5V SUPPLY	Displays the measured voltage of the +5 Volt power bus located inside the modem.
+12V SUPPLY	Displays the measured voltage of the +12 Volt power bus located inside the modem.
+20V SUPPLY	Displays the measured voltage of the +20 Volt power bus located inside the modem.
EXT CLOCK ACT	Indicates that the External Clock is not active.
EXT REF ACT	Indicates no activity on the External Reference.
EXT REF LOCK	Indicates that the External Reference PLL is not locked.

## 6.2 Alarm Masks

The modem performs a high degree of self-monitoring and fault isolation. The alarms for these faults are separated into the following three categories:

- Active Alarms
- Common Equipment Alarms
- Backward Alarms

A feature exists that allows the user to 'Mask' out certain alarms as explained below.



When an alarm is masked, the Front Panel LEDs and the Fault Relays do not get asserted, but the Alarm will still be displayed. This feature is very helpful during debugging or to lock out a failure of which the user is already aware.

### 6.2.1 Active Alarms

#### 6.2.1.1 Major Alarms

Major Alarms indicate a modem hardware failure. Major Alarms may flash briefly during modem configuration changes and during power-up but should not stay illuminated. Alarms are grouped into Transmit and Receive Alarms - Transmit and Receive are completely independent.

#### 6.2.1.2 Minor Alarms

Minor Alarms indicate that a problem may persist outside the modem such as loss of Terrestrial Clock, loss of terrestrial data activity, or a detected transmit or receive AIS condition. Alarms are grouped into Transmit and Receive Alarms - Transmit and Receive are completely independent.

#### 6.2.1.3 Common Equipment Faults

Common equipment faults indicate hardware or configuration problems in the modem that effect both transmit and receive operation. Most common faults indicate a hardware failure within the modem, such as a bad power supply. Common faults for the External Reference and External Clock indicate a bad modem configuration, not a hardware failure.

### 6.2.2 Latched Alarms

Latched Alarms are used to catch intermittent failures. If a fault occurs, the fault indication will be latched even if the alarm goes away. After the modem is configured and running, it is recommended that the Latched Alarms be cleared as a final step.



## Technical Specifications

# 7

### 7.0 Data Rates

Refer to Section 7.9.

### 7.1 Modulator

Modulation	BPSK, QPSK, and OQPSK (8PSK, 16QAM Optional)
L-Band Tuning Range	950 to 2050 MHz in 1 Hz Steps
Impedance	50-Ohm
Connector	N-type, 50-Ohm
Return Loss	L-Band, 14 dB Minimum
Output Power	0 to -25 dB
Output Stability	±0.5 dB Over Time and Temperature
Output Spectrum	Meets IESS 309/310 Power Spectral Mask
Spurious	-50 dBc In-Band -45 dBc Out-of-Band
On/Off Power Ratio	>60 dB
Scrambler	CCITT V.35 or IBS (Others Optional)
FEC	Viterbi 1/2, 3/4 and 7/8 (Optional FEC) Sequential 1/2, 3/4, 7/8 (optional) Trellis 2/3 Turbo Product Code (Optional) 21/44 Turbo 1/2 Turbo 3/4 Turbo 7/8 Turbo (Turbo Supported at all Modulation Types)
Outer Encoder Options	Reed-Solomon INTELSAT (Custom Rates Optional)
Data Clock Source	Internal, External, Rx Recovered
Internal Stability	$5 \times 10^{-8}$ Typical

## 7.2 Demodulator

Demodulation	QPSK and (8PSK, 16APSK Optional)
L-Band Tuning Range	950 to 2150 MHz in 1 Hz Steps
Impedance	75-Ohm
Connector	F-Type Female
Return Loss	7 dB Minimum
Spectrum	ETSI EN302 307 Compliant
Input Level	-60 TO -20DbM
Total Input Power	-20 dBm or +40 dBc (the Lesser)
FEC	DSS S2: LDPC (Short Block) 1/2, 2/3, 3/4, 3/5, 4/5, 5/6, 8/9
Decoder Options	Per ETSI EN 302 307
Descrambler	Per ETSI EN 302 307
Acquisition Range	+/- (0.10 * Symbol Rate) to 7.5Mhz Selectable
LNB DC Voltage	13, 15, 18, 20 VDC Selectable

## 7.3 Monitor and Control

Remote RS-485

## 7.4 Terrestrial Interfaces

A variety of standard interfaces are available for the DMDVR20 LBST modem in stand-alone applications.

## 7.5 IBS/Synchronous Interface (Standard)

RS-422/530	All Rates, Differential, Clock/Data, DCE
ITU V.35	All Rates, Differential, Clock/Data, DCE
RS-232	(DCE up to 200 Kbps)

## 7.6 Environmental

Prime Power	100 to 240 VAC, 50 to 60 Hz, 40 Watts Maximum 48 VDC (Optional)
Operating Temperature	0 to 50°C, 95% Humidity, Non-Condensing
Storage Temperature	-20 to 70°C, 99% humidity, Non-Condensing

## 7.7 Physical

Size	19" W x 19.25" D x 1.75" H (48.26 x 48.89 x 4.45 cm)
Weight	8.5 pounds (3.83 kg)

## 7.8 DMDVR20 LBST Modulator Data Rate Limits

### 7.8.1 Closed Net Data Rate Limits

Modulation	Code Rate	Min Data Rate	Max Data Rate
BPSK	NONE	4800	10000000
BPSK	VIT 1/2	2400	5000000
BPSK	VIT 3/4	3600	7500000
BPSK	VIT 7/8	4200	8750000
BPSK	SEQ 1/2	2400	2048000
BPSK	SEQ 3/4	3600	2048000
BPSK	CSEQ 3/4	3600	2048000
BPSK	SEQ 7/8	4200	2048000
BPSK	TPC 21/44	2400	4772727
BPSK	TPC 3/4	4100	6990000
BPSK	TPC 7/8	4200	8200000
QPSK	NONE	9600	20000000
QPSK	VIT 1/2	4800	10000000
QPSK	VIT 3/4	7200	15000000
QPSK	VIT 7/8	8400	17500000
QPSK	SEQ 1/2	4800	2048000
QPSK	SEQ 3/4	7200	2048000
QPSK	CSEQ 3/4	7200	2048000
QPSK	SEQ 7/8	8400	2048000
QPSK	TPC 1/2	4582	9545454
QPSK	TPC 3/4	7200	15000000
QPSK	TPC 7/8	8400	17500000
OQPSK	NONE	9600	20000000
OQPSK	VIT 1/2	4800	10000000
OQPSK	VIT 3/4	7200	15000000
OQPSK	VIT 7/8	8400	17500000
OQPSK	SEQ 1/2	4800	2048000
OQPSK	SEQ 3/4	7200	2048000
OQPSK	SEQ 7/8	8400	2048000
OQPSK	TPC 1/2	4582	9545454
OQPSK	TPC 3/4	7200	15000000
OQPSK	TPC 7/8	8400	17500000

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8PSK	TRE 2/3	9600	20000000
8PSK	TPC 3/4	10800	20000000
8PSK	TPC 7/8	12600	20000000
16QAM	VIT 3/4	14400	20000000
16QAM	VIT 7/8	16840	20000000
16QAM	TPC 3/4	1440	20000000
16QAM	TPC 7/8	16800	20000000

## 7.9 DMDVR20 LBST Demodulator Specifications

### 7.9.1 Data Rates (DSS-S2)

Data Rates (Mbps with Pilots Off)					
Modulation	FEC	MPEG Frame Size			
		Minimum Long = 64.8K	Maximum Long = 64.8K	Minimum Short = 16.2K	Maximum Short = 16.2K
QPSK	1/2	2.0	20.0	2.0	20.0
QPSK	2/3	2.644506	20.0	2.576801	20.0
QPSK	3/4	2.974946	20.0	2.840537	20.0
QPSK	3/5	2.376608	20.0	2.313065	20.0
QPSK	4/5	3.174394	20.0	3.016361	20.0
QPSK	5/6	3.309326	20.0	3.192186	20.0
QPSK	8/9	3.532902	20.0	3.455922	20.0
QPSK	9/10	3.577224	20.0	NA	NA
8PSK	3/5	3.559982	20.0	3.450638	20.0
8PSK	2/3	3.961272	20.0	3.844080	20.0
8PSK	3/4	4.456247	20.0	4.237523	20.0
8PSK	5/6	4.957123	20.0	4.762113	20.0
8PSK	8/9	5.292024	20.0	5.155556	20.0
8PSK	9/10	5.358414	20.0	NA	NA
16APSK	2/3	5.274401	20.0	5.097585	20.0
16APSK	3/4	5.933456	20.0	5.619324	20.0
16APSK	4/5	6.331246	20.0	5.967150	20.0
16APSK	5/6	6.600368	20.0	6.314976	20.0
16APSK	8/9	7.046286	20.0	6.836715	20.0
16APSK	9/10	7.134684	20.0	NA	NA

## 7.10 BER Performance (LDPC)

### Typical IF back-to back Eb/No Performance

	QPSK							
BER	1/2	3/5	2/3	3/4	4/5	5/6	8/9	9/10
$1.00 \times 10^{-06}$ (< 20 MSPS)	2.0	2.5	2.7	3.0	3.5	3.8	4.5	4.7
$1.00 \times 10^{-06}$ (> 20 MSPS)	2.0	2.5	2.7	3.0	3.5	3.8	4.5	4.7

	8PSK					
BER	3/5	2/3	3/4	5/6	8/9	9/10
$1.00 \times 10^{-06}$ (< 20 MSPS)	4.3	4.6	5.4	6.3	7.3	7.5
$1.00 \times 10^{-06}$ (> 20 MSPS)	4.4	4.7	5.5	6.4	7.4	7.6

	16APSK				
BER	2/3	3/4	5/6	8/9	9/10
$1.00 \times 10^{-06}$ (< 20 MSPS)	5.4	6.5	7.3	8.2	8.4
$1.00 \times 10^{-06}$ (> 20 MSPS)	5.5	6.6	7.4	8.3	8.5



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## Product Options



### A.0 Hardware Options

The following enhanced interface cards are available.

#### A.0.1 Internal High Stability

The modem can be equipped with a  $5 \times 10^{-8}$  or better Stability Frequency Reference as an add-on enhancement. This is a factory upgrade only.

#### A.0.2 DC Input Prime Power

Allows for an optional DC Input Power Source (**standard unit only**).

#### A.0.3 Turbo Product Code / Variable Reed-Solomon

The modulator can be equipped with an optional TPC Codec Card. This card allows variable Reed-Solomon rates as well as Turbo Codec and Sequential Codec Outer Code. This option must be installed at the factory and may require other options.

### A.1 Customized Options

The modem may be customized for specific customer requirements. Most modifications or customization can be accomplished by means of firmware/software modifications. The following are examples of the types of customization available to the user:

- Customized Data Rates.
- Customized Scrambler/Descramblers.
- Customized Overhead Framing Structures.
- Customized Modulation Formats.

Contact the Radyne Corp. Customer Service or Sales Department at (602) 437-9620 for all requests.



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## Front Panel Upgrade Procedure

# B

### B.0 Introduction

The Satellite Modem offers the ability to perform field upgrades of the modem's feature set quickly and easily from the front panel. Purchased upgrades will become part of the modems permanent configuration. Demonstration upgrades will enable the optional features for a 30-day evaluation period.

### B.1 Required Equipment

The Satellite Modem is the only equipment required for this procedure.

### B.2 Upgrade Procedure

The following paragraphs describe the procedure for permanently updating the feature set of the Satellite Modem

1. The following steps allow users to quickly determine from the front panel whether or not the desired feature(s) are supported by the hardware currently installed in the modem.
  - a. From the modem's Main Menu, scroll right to the SYSTEM Menu.
  - b. Scroll down.
  - c. Scroll right to the HW/FW CONFIG Menu.
  - d. Scroll down
  - e. Scroll right to the FEATURES Menu.
  - f. Scroll down.
  - g. Scroll right to the UPGRADE LIST Menu.
  - h. Scroll down.
  - i. Scroll right through the available list of options.

The top line identifies the options and the second line identifies the following options status:

**INSTALLED** indicates that the option is already available as part of the modems feature set.

**HW & KEY REQ** indicates that additional hardware is required to support the option. Contact your Radyne sales representative for more information regarding the required hardware upgrade.

**KEY CODE REQ** indicates that the desired option is available as a front panel upgrade.

2. Contact Radyne with the Unit ID and Desired Upgrades. The modem's Unit ID can be found on the front panel as follows:
  - a. From the modem's Main Menu, scroll right to the SYSTEM Menu.
  - b. Scroll down.
  - c. Scroll right to the HW/FW CONFIG Menu.
  - d. Scroll down.
  - e. Scroll right to the FEATURES Menu.
  - f. Scroll down

The value displayed on the top line of this menu is the 12-digit Unit ID. It is displayed as on the front panel of the modem as 3 sets of 4 digits in a dot-delineated format as follows:

1 2 3 4 . 1 2 3 4 . 1 2 3 4

Your Radyne sales representative will ask you for this number along with your desired feature set upgrades when placing your order.

3. Once your order has been processed, you will be issued a 12-digit feature set upgrade code. This code is only good on the modem for which it was ordered. To enter this code from the front panel, perform the following:
  - a. From the modem's Main Menu, scroll right to the SYSTEM Menu.
  - b. Scroll down.
  - c. Scroll right to the HW/FW CONFIG Menu.
  - d. Scroll down.
  - e. Scroll right to the FEATURES Menu.
  - f. Scroll down.

The value displayed on the top line of this menu is the 12-digit Unit ID. It is displayed on the front panel of the modem as 3 sets of 4 digits in a dot-delineated format indicated in Step 2. The second line is the data entry area and is displayed as 3 sets of 4 underscores in a dot-delineated format.

- g. Press <ENTER>. A cursor will begin flashing in the data entry area.
- h. Using the numeric keypad, enter your 12-digit upgrade code.
- i. Press <ENTER>.

If the code entered is correct, the display will display **CODE ACCEPTED**, otherwise the **INVALID CODE** will be displayed.



## NOTE

*Care should be taken to insure that the upgrade code is entered properly. After three unsuccessful attempts to enter a code, the front panel upgrade and demonstration capability will be locked out and it will be necessary to cycle power on the modem in order to continue.*

### B.3 Demonstration Procedure

The procedure for enabling a 30-day demo of the options is similar to the procedure used for permanently updating the modems feature set. The one big difference being that at the end of 30 days, the demo features will automatically be disabled and the modem will revert back to its permanent configuration.



#### NOTE

*At the end of the demonstration period, when the modem reverts back to its permanent configuration an interrupt in traffic will occur, regardless of whether or not a demo enabled features was being run at the time. In addition, operator intervention may be required to restore the data paths. In order to avoid this interruption in service, the user can cancel the demonstration at any time by following the instructions outlined in the section on "Canceling Demonstration Mode."*

1. The following steps allow users to quickly determine from the front panel whether or not the desired feature(s) are supported by the hardware currently installed in the modem.
  - a. From the modem's Main Menu, scroll right to the SYSTEM Menu.
  - b. Scroll down.
  - c. Scroll right to the HW/FW CONFIG Menu.
  - d. Scroll down.
  - e. Scroll right to the FEATURES Menu.
  - f. Scroll down.
  - g. Scroll right to the UPGRADE LIST Menu.
  - h. Scroll down.
  - i. Scroll right through the available list of options.

The top line identifies the options and the second line identifies the options status.

**INSTALLED** indicates that the option is already available as part of the modems feature set.

**HW & KEY REQ** indicates that additional hardware is required to support the option. Contact your Radyne sales representative for more information regarding the required hardware upgrade.

**KEY CODE REQ** indicates that the desired option can be enabled as a demonstration from the front panel.

2. Contact Radyne with the Unit ID and Request a Demonstration.

The modem's Unit ID can be found on the front panel as follows:

- a. From the modem's Main Menu, scroll right to the SYSTEM Menu.
- b. Scroll down.
- c. Scroll right to the HW/FW CONFIG Menu.
- d. Scroll down.
- e. Scroll right to the FEATURES Menu.
- f. Scroll down.

The value displayed on the top line of this menu is the 12-digit Unit ID. It is displayed as on the front panel of the modem as 3 sets of 4 digits in a dot-delineated format as follows:

1 2 3 4 . 1 2 3 4 . 1 2 3 4

Your Radyne sales representative will ask you for this number along with the features you wish to demo.

3. Once your order has been processed, you will be issued a 12-digit demonstration code. This code can only be used one time and it is only good on the modem for which it was originally requested. To enter this code from the front panel, perform the following:

- a. From the modem's Main Menu, scroll right to the SYSTEM Menu.
- b. Scroll down.
- c. Scroll right to the HW/FW CONFIG Menu.
- d. Scroll down.
- e. Scroll right to the FEATURES Menu.
- f. Scroll down.

The value displayed on the top line of this menu is the 12-digit Unit ID. It is displayed on the front panel of the modem as 3 sets of 4 digits. The second line is the data entry area and is displayed as 3 sets of 4 underscores in a dot-delineated format.

Press <ENTER> and a cursor will begin flashing in the data entry area

Using the numeric keypad, enter your 12-digit demonstration code  
Press <ENTER>.

If the code entered is correct, the display will display CODE ACCEPTED, otherwise the display will read INVALID CODE.



## NOTE

***Care should be taken to insure that the demonstration code is entered properly. After three unsuccessful attempts to enter a code, the front panel upgrade and demonstration capability will be locked out and it will be necessary to cycle power on the modem in order to continue.***

### B.3.1 Running in Demonstration Mode

Because of the possible interruption in traffic when the demonstration mode expires, several indicators are used to inform an operator that the modem is indeed, operating in demonstration mode. The most obvious of these is that the remote LED is flashing.

A second indication can be found on the Features Menu as follows:

1. From the modem's Main Menu, scroll right to the SYSTEM Menu.
2. Scroll down.
3. Scroll right to the HW/FW CONFIG Menu.
4. Scroll down.
5. Scroll right to the FEATURES Menu. The second line will display DEMO.

A third indication can be found in the upgrade list as follows:

1. From the FEATURES Menu.
2. Scroll down.
3. Scroll right to the UPGRADE LIST Menu.
4. Scroll down.
5. Scroll right through the available list of options.

The top line identifies the options and the second line identifies the options status.

**DEMO MODE** indicates that the option is has been temporarily activated and is now available for evaluation as part of the modems feature set.

At the end of the demonstration period, the modem will revert back to its permanent configuration. When it does, an interrupt in traffic will occur, regardless of whether or not a demo enabled features was being run at the time. In addition, operator intervention may be required to restore the data paths. In order to avoid this interruption in service, the user can cancel the demonstration at any time by following the instructions outlined in the section on Canceling Demonstration Mode.

### B.3.2 Canceling Demonstration Mode

At any time, a demonstration may be canceled and have the modem return to its normal operation. Once the demonstration has been canceled, it cannot be restarted using the old demonstration code. In order to restart a demonstration, it will be necessary to obtain a new demonstration code.

To cancel a demonstration from the front panel, perform the following:

1. From the modem's Main Menu, scroll right to the SYSTEM Menu.
2. Scroll down.
3. Scroll right to the HW/FW CONFIG Menu.
4. Scroll down.
5. Scroll right to the FEATURES Menu.
6. Scroll down.

The value displayed on the top line of this menu is the 12-digit Unit ID. It is displayed on the front panel of the modem as 3 sets of 4 digits in a dot-delineated format indicated in section 4.2. The second line is the data entry area and is displayed as 3 sets of 4 underscores in a dot-delineated format.

Press <ENTER> and a cursor will begin flashing in the data entry area

Using the numeric keypad, enter 0000 0000 0000

Press <ENTER>.

The modem will immediately terminate the demonstration and the feature set will revert back to the permanent configuration.

The Mod and Demod Test LED's will stop flashing.





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## Carrier Control



### C.0 States

The transmitter will turn off the carrier output automatically when the modem determines there is a major alarm. This is done to prevent the carrier from outputting an unknown spectrum and possibly disturbing adjacent carriers. This automatic drop of the carrier can be overridden by masking the alarm that is causing the fault. This will keep the modulator output spectrum transmitting, even when the fault occurs. The following Carrier Control states are available:

- Carrier **OFF**
- Carrier **ON**
- Carrier **AUTO**
- Carrier **VSAT**
- Carrier **RTS**

### C.1 Carrier Off

Modulator output is disabled.

### C.2 Carrier On

Modulator output is turned off before reprogramming modulator functions that may alter the output spectrum through the front panel, and the user is required to enter “Yes” to re-enable output after the change. When using the terminal, the modulator is turned off while re-programming modulator functions that may alter the output spectrum, and the user is required to manually turn on the output after the reprogramming.

### C.3 Carrier Auto

Modulator output is turned off before reprogramming modulator functions that may alter the output spectrum through the front panel, but the output is automatically turned on after the change. When using the terminal, the modulator is turned off while re-programming modulator functions that may alter the output spectrum, and but the output is automatically turned on after the change.

### C.4 Carrier VSat

Modulator output is turned off before reprogramming modulator functions that may alter the output spectrum through the front panel, and the user is required to enter “Yes” to re-enable output after the change. When using the terminal, the modulator is turned off while re-programming modulator functions that may alter the output spectrum, and the user is required to manually turn on the output after the reprogramming (same as “Carrier On”). Additionally “VSat” mode disables the modulators output when the modems demodulator does not have signal lock. When signal lock returns to the demodulator, the modulator turns the carrier back on.

## C.5 Carrier RTS

Modulator output is turned off before reprogramming modulator functions that may alter the output spectrum through the front panel, and the user is required to enter “Yes” to re-enable output after the change. When using the terminal, the modulator is turned off while reprogramming modulator functions that may alter the output spectrum, and the user is required to manually turn on the output after the reprogramming (same as “Carrier On”). Additionally “RTS” (Request To Send) mode enables the modulator’s output based on the RTS lead of the data interface. When RTS is enabled on the data interface, the modulator turns on the carrier, when the RTS is disabled the modulator turns off the carrier.





## Strap Codes

# D

### D.0 Strap Codes for Modulator Only

The Strap Code is a quick set key that sets many of the modulator parameters. When a Strap Code is entered, the modulator automatically configured for the code's corresponding data rate, overhead, code rate, framing, scrambler type and modulation. An example of how to set a strap code follows:

**Example:** At the Front Panel <Modulator> Menu, depress '↓', then move '→' to the 'Strap Code' Submenu and enter #16. The unit will be automatically configured to the parameters shown below in the highlighted row 'Strap Code 16'.

Use the Strap Code Guide (Table D-1) for available strap codes.

Table D-1. Strap Codes Dis = Disable									
Strap Code (Decimal)	Data Rate (Kbps)	Overhead	Code Rate	Type	Framing Type	Scrambler Type	Reed-Solomon	Modulation	Mode
1	64	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
2	128	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
3	256	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
5	384	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
6	512	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
9	768	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
4	1536	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
10	1920	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
8	2048	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
12	2048	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
24	56	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
33	56	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
34	64	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
36	64	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
40	128	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT

48	128	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
65	256	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
66	256	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
68	320	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
72	320	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
80	384	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
96	384	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
129	512	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
130	512	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
132	768	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
136	768	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
144	896	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
44	896	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
7	1344	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
11	1344	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
13	1536	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
14	1536	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
19	1544	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
21	1544	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
22	1920	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
25	1920	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
26	2048	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
28	2048	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
37	2368	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
38	2368	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
41	48	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
160	1544	965/1024	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
52	1920	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
69	6312	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
70	8448	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
73	3152	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
74	3152	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
76	3264	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
81	3264	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
88	512	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
97	1024	1	1/2	VIT	CNT	V.35 (IESS)	Dis	QPSK	CNT
98	1024	1	3/4	VIT	CNT	V.35 (IESS)	Dis	QPSK	CNT

112	64	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
131	128	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
133	256	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
134	192	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
137	192	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
138	320	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
140	320	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
145	384	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
100	448	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
146	448	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
104	576	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
148	576	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
152	640	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
161	640	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
162	704	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
164	704	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
168	768	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
193	832	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
194	832	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
196	896	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
208	896	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
224	960	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
15	960	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
23	1024	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
27	1024	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
29	1536	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
30	1088	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	IBS
39	1088	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
43	1152	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
46	1152	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
51	1216	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
53	1216	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
54	1280	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
57	1280	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
58	1344	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
67	1408	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
71	1408	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT

75	1472	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
77	1472	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
78	1600	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
83	1600	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
85	1664	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
86	1664	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
89	1728	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
90	1728	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
92	1792	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
99	1792	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
101	2048	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
102	1856	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
105	1856	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
106	2048	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
120	1544	965/1024	3/4	VIT	IBS	IBS	Dis	QPSK	IBS
135	1984	16/15	1/2	VIT	IBS	IBS	Dis	QPSK	CNT
139	1984	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT
45	3088	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
141	3088	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
176	4000	1	1/2	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
116	4000	1	3/4	VIT	NONE	V.35 (IESS)	Dis	QPSK	CNT
60	1344	16/15	3/4	VIT	IBS	IBS	Dis	QPSK	CNT

## D.1 Sample Applications

The following section provides brief application notes for operating the modem and explains by example how to configure the modem for some of the most popular configurations.

The following information illustrates the allowable combinations for Mode and Data Rate.

Allowable Combinations: Mode/Rate/Framing.

### IBS:

2.048 Mbps or below                      1/2, 3/4, 7/8 Rate

### Closed Network:

8.448:                                      No Framing, 3/4, 7/8 Rate FEC  
6.312:                                      No Framing, 1/2, 3/4, 7/8 Rate FEC  
2.048:                                      1/15 Framing or No Framing, 1/2, 3/4, 7/8 Rate FEC  
1.544:                                      1/15 Framing or No Framing, 1/2, 3/4, 7/8 Rate FEC  
Any Rate 2.048 & lower:              1/15 Framing or No Framing, 1/2, 3/4, 7/8 Rate FEC

## D.1.1 Operational Case Examples



### NOTE

*For best results always begin setup by setting the data rate to 512 Kbps. This data rate is applicable for all modes and as such provides a convenient launch point for setting up the modulator parameters. Any mode of operation can be entered from this starting point.*

### Case 1: IBS 1.544 Mbps, 3/4 Rate Viterbi

Starting with the Data Rate – 512 Kbps

#### Modulator:

##### Method 1 -

Under Interface Menu:

Set Interface type  
Set Tx clock selection

Set Framing to 1/15

Set mode to IBS

Under Mod Data Menu:

Set code rate to 3/4 VIT  
Set data rate for 1544000

Under Mod IF Menu:

Set desired Tx frequency and power level  
Turn IF ON

##### Method 2 -

Under Interface Menu:

Set Interface type  
Set Tx clock selection

Set Mod strap code to: 120

Under Mod IF Menu:

Set desired Tx frequency and power level  
Turn IF on

**Method 2 -**

Under Interface Menu:  
Set Interface type  
Set Buff clock selection  
Set Buffer Size  
Set Demod strap code to: 120  
Under Demod IF Menu: Set desired Rx frequency

**Case 2: Closed Network, 3/4 Rate Viterbi, IBS Overhead**

Starting with the Data Rate = 512 Kbps

**Modulator:****Method 1 -**

Under Interface Menu:  
Set Interface type  
Set Tx clock selection  
  
Under Mod Data Menu:  
Set code rate to 3/4 VIT  
Set Framing for 1/15  
Under Mod IF Menu: Set desired Tx frequency and power level  
Turn IF ON

**Method 2 -**

Under Interface Menu:  
Set Interface type  
Set Tx clock selection  
Set Mod strap code to: 101  
Under Mod IF Menu: Set desired Tx frequency and power level  
Turn IF on





## Glossary

# G

<b>A</b>	
A	Ampere
AC	Alternating Current
ADC	Analog to Digital Converter
AGC	Automatic Gain Control
AIS	Alarm Indication System. A signal comprised of all binary 1s.
AMSL	Above Mean Sea Level
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
ASIC	Application Specific Integrated Circuit
ATE	Automatic Test Equipment
<b>B</b>	
BER	Bit Error Rate
BERT	Bit Error Rate Test
Bit/BIT	Binary Digit or Built-In Test
BITE	Built-In Test Equipment
bps	Bits Per Second
BPSK	Binary Phase Shift Keying
BUC	Block Upconverter
Byte	8 Binary Digits

<b>C</b>	
C	Celsius
CATS	Computer Aided Test Software
CA/xxxx	Cable Assembly
CD-ROM	Compact Disk – Read Only Memory
CLK	Clock
cm	Centimeter
COM	Common
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check. A system of error checking performed at the transmitting and receiving stations.
CW	Continuous Wave
C/N	Carrier to Noise Ratio
<b>D</b>	
DAC	Digital to Analog Converter
dB	Decibels
dBc	Decibels Referred to Carrier
dBm	Decibels Referred to 1.0 milliwatt
DC	Direct Current
Demod	Demodulator or Demodulated
DPLL	Digital Phase Locked Loop
DVB	Digital Video Broadcast
D&I	Drop and Insert
<b>E</b>	
$E_b/N_0$	Ratio of Energy per bit to Noise Power Density in a 1 Hz Bandwidth.
EEPROM	Electrically Erasable Programmable Read Only Memory
EIA	Electronic Industries Association
EMI	Electromagnetic Interference
ESC	Engineering Service Circuits
ES-ES	Earth Station to Earth Station Communication
ET	Earth Terminal

<b>F</b>	
F	Fahrenheit
FAS	Frame Acquisition Sync. A repeating series bits, which allow acquisition of a frame.
FCC	Federal Communications Commission
FEC	Forward Error Correction
FIFO	First In, First Out
FPGA	Field Programmable Gate Arrays
FW	Firmware
<b>G</b>	
g	Force of Gravity
GHz	Gigahertz
GND	Ground
<b>H</b>	
HSSI	High Speed Serial Interface
HW	Hardware
Hz	Hertz (Unit of Frequency)
<b>I</b>	
IBS	Intelsat Business Services
IDR	Intermediate Data Rate
I/O	Input/Output
IEEE	International Electrical and Electronic Engineers
IESS	INTELSAT Earth Station Standards
IF	Intermediate Frequency
INTELSAT	International Telecommunication Satellite Organization
ISO	International Standards Organization
I & Q	Analog In-Phase (I) and Quadrature Signals (Q)
<b>J</b>	
J	Joule

<b>K</b>	
Kbps	Kilobits per Second
Kbps	Kilobytes per Second
kg	Kilogram
kHz	Kilohertz
Ksps	Kilosymbols per Second
<b>L</b>	
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LO	Local Oscillator
<b>M</b>	
mA	Milliampere
Mbps	Megabits per Second
MFAS	Multi-Frame Acquisition Sync. See FAS.
MHz	Megahertz
MIB	Management Information Base
Mod	Modulator or Modulated
ms or msec	Millisecond
M&C	Monitor and Control
<b>N</b>	
NC	Normally Closed
NO	Normally Open
ns	Nanoseconds
NVRAM	Non-Volatile Random Access Memory
N/C	No Connection or Not Connected
<b>O</b>	
OQPSK	Offset Quadrature Phase Shift Keying
<b>P</b>	
PC	Personal Computer
PD Buffer	Plesiochronous/ Doppler Buffer
PLL	Phase Locked Loop
ppb	Parts per Billion
ppm	Parts per Million
P/N	Part Number

<b>Q</b>	
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
<b>R</b>	
RAM	Random Access Memory
RF	Radio Frequency
ROM	Read Only Memory
rms	Root Mean Square
RU	Rack Unit. 1 RU = 1.75"/4.45 cm
Rx	Receive (Receiver)
RxD	Receive Data
R-S	Reed-Solomon Coding. Reed-Solomon codes are block-based error correcting codes with a wide range of applications in digital communications and storage.
<b>S</b>	
SCC	Satellite Control Channel. A Radyne satellite format.
SEQ	Sequential
SYNC	Synchronize
<b>T</b>	
TBD	To Be Designed or To Be Determined
TM	Technical Manual
TPC	Turbo Product Codes
TRE	Trellis
TT	Terminal Timing
Tx	Transmit (Transmitter)
TxD	Transmit Data
<b>U</b>	
UART	Universal Asynchronous Receiver/Transmitter
UUT	Unit Under Test
<b>V</b>	
V	Volts
VAC	Volts, Alternating Current
VCO	Voltage Controlled Oscillator
VDC	Volts, Direct Current
VIT	Viterbi Decoding

<b>W X Y Z</b>	
W	Watt
<b>Misc.</b>	
$\mu$ s	Microsecond
16QAM	16 Quadrature Amplitude Modulation
8PSK	8 Phase Shift Keying