DM240-DVB

High-Speed
Digital Modulator
Installation and Operation Manual

TM083
Revision 4.0

Radyne Inc. • 3138 E. Elwood St. • Phoenix, AZ 85034 • (602) 437-9620 • Fax: (602) 437-4811 • www.radn.com


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Warranty Policy

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Warranty Repair Return Procedure

Before a warranty repair can be accomplished, a Repair Authorization must be received. It is at this time that Radyne Inc. will authorize the product or part to be returned to the Radyne Inc. facility or if field repair will be accomplished. The Repair Authorization may be requested in writing or by calling:

Radyne Inc.
3138 E. Elwood St.
Phoenix, Arizona 85034 (USA)
ATTN: Customer Support
Phone: (602) 437-9620
Fax: (602) 437-4811

Any product returned to Radyne Inc. for examination must be sent prepaid via the means of transportation indicated as acceptable to Radyne Inc. Return Authorization Number must be clearly marked on the shipping label. Returned products or parts should be carefully packaged in the original container, if possible, and unless otherwise indicated, shipped to the above address.

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When a product is returned for any reason, Customer and its shipping agency shall be responsible for all damage resulting from improper packing and handling, and for loss in transit, not withstanding any defect or nonconformity in the product. By returning a product, the owner grants Radyne Inc. permission to open and disassemble the product as required for evaluation. In all cases, Radyne Inc. has sole responsibility for determining the cause and nature of failure, and Radyne Inc.'s determination with regard thereto shall be final.

Preface

This manual provides installation and operation information for the Radyne ComStream DM240-DVB High-Speed Digital Modulator. This is a technical document intended for use by engineers, technicians, and operators responsible for the operation and maintenance of the DM240-DVB.

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>.

Cautions and Warnings

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	6-16-00	New Release.
1.1	9-20-00	Changed menus in Section 3.
2.0	3-1-01	Revised Manual.
2.1	10-9-01	Revised Sections 5.9.4,5.11, 5.12 and 7.5, Figures 5-1a and 5-1b, and Section 4 table numbers.
2.2	11-26-01	Revised Sections 4.2, 4.3, 4.5, and 4.6.
2.3	1-18-02	Added SNMP Section 4.5.
2.4	6-3-02	Revised Sections 4.2.6, 4.3, and 4.6.
3.0	12-6-04	Revised manual to include DVB-S2
4.0	7-21-06	Revised document to add Ethernet interface

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 Inc. Customer Service Department.


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Table of Contents

ToC


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Introduction

1

This chapter provides an overview of the DM240-DVB High-Speed Digital Modulator. The DM240 will be referred to in this manual as "the DM240", "the modulator", or "the unit".

1.0 Description

The New Standard in Digital Modulator Performance

Radyne's DM240 family of High-Speed Modulators is the ideal choice to meet the exacting standards of High Data-Rate Video, Internet and Fiber Restoral Satellite Applications. The DM240 meets the various international standards and supports BPSK, QPSK, 8PSK and 16QAM applications with symbol rates up to 68 Msps. With a variety of data interfaces available, the DM240 is configurable to meet high-speed satellite applications.

The powerful new onboard Monitor and Control (M&C) processor has the unique capability to download firmware and enhance features from a field-changeable PCMCIA Card. Offering unprecedented flexibility, this feature represents a new level of Radyne ComStream's outstanding Customer Support. Additionally, features are added to the installed equipment base with extreme ease, allowing the equipment to expand with changes in service while lowering initial installation budgets.

The Modulator offers a frequency-agile IF Output from 50 to 90, 100 to 180 MHz (70/140), or 950 to 1750 MHz (L-Band) in 100 Hz steps or 950 – 2050 MHz in 100 Hz steps. Variable data rates from 1 Mbps to 238 Mbps can be set in 1 bps steps.

Additional features include the choice of remotely interfacing through one of three onboard connections: 10 Base-T Ethernet, RS-485, or RS-232. The familiar Radyne Front Panel (Figure 1-1) offers push-button control of all features and a backlit LCD display. Menus are specifically designed for ease of use and quick online operation as well as changes in all modulator configurations.

The DM240-PIIC option offers three Plug-In Interface Card (PIIC) Slots on the rear of the unit allows the customer to plug in a variety of interfaces. These PIICs provide greater flexibility for changing and upgrading the terrestrial interface.

An optional 1:1 Redundancy Control Switch (RCS11) is available to provide the DM240 with superior system reliability.

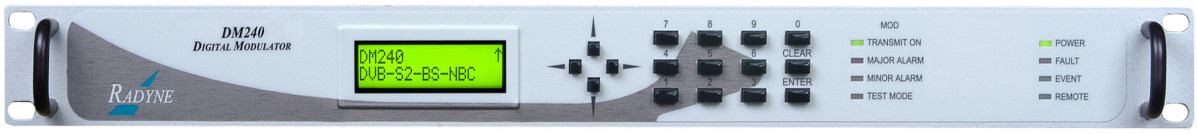

Figure 1-1. DM240-DVB


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Installation

2

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

2.0 Installation Requirements

The DM240 can be installed within any standard 19-inch equipment cabinet or rack, and requires 1 RU mounting space (1.75 inches) vertically and 17 inches of depth. Including cabling, a minimum of 20-inches of rack depth is required. The rear panel of the DM240 is designed to have power enter from the left and IF cabling enter from the right when viewed from the rear of the unit. Data and control cabling can enter from either side although they are closer to the center. The unit can be placed on a table or suitable surface if required.

! WARNING!!

There are no user-serviceable parts or configuration settings located inside the DM240 Chassis. There is a potential shock hazard internally at the power supply module. DO NOT open the DM240 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 DM240 configuration settings are unknown, where incorrect settings could disrupt existing communications traffic.

2.1 Unpacking

The DM240 Modulator was carefully packaged to avoid damage and should arrive complete with the following items for proper installation:

1. DM240 Unit.
2. PCMCIA Card. May be installed, depending upon configuration. If no card is installed, the unit has been factory configured.
3. Power Cord, 6-foot with applicable AC connector.
4. Installation and Operation Manual.

2.2 Removal and Assembly

Carefully unpack the unit and ensure that all of the above items are in the carton. If the Prime AC power available at the installation site requires a different power cord/AC connector, then arrangements to receive the proper device will be necessary before proceeding with the installation.

The DM240 modulator is shipped fully assembled. It does not require removal of the covers for any purpose in installation. The only replaceable assembly in the unit is the data interface and is not intended to be accomplished in the field. 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 application using from 100 to 240 VAC, 50 to 60 Hz, < 40 W.

2.3 Mounting Considerations

When mounted in an equipment rack, adequate ventilation must be provided. The ambient temperature in the rack should 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 DM240 units may be stacked one on top of the other up to a maximum of 10 consecutive units before providing a 1 RU space for airflow.

Do not mount the DM240 in an unprotected outdoor location where there is direct contact with rain, snow, wind or sun. The DM240 is designed for indoor applications only.

The only tools required for rack mounting the DM240 is a set of four rack mounting screws and an appropriate screwdriver. Rack mount brackets are an integral part of the cast front bezel of the unit and are not removable.

Shielded cables with the shield terminated to the conductive backshells are required in order to meet EMC directives. Cables with insulation flammability ratings of 94 VO or better are required in order to meet low voltage directives.

2.4 Modulator Checkout

The following descriptions assume that the DM240 is installed in a suitable location with prime AC power and supporting equipment available.

2.4.1 Initial Power-Up

Before initial power up of the DM240, it is a good idea to disconnect the transmit output from the operating ground station equipment. This is especially true if the current modulator configuration settings are unknown, where incorrect setting could disrupt existing communications traffic. New units from the factory are normally shipped in a default configuration which includes setting the transmit carrier off.

Turn the unit 'ON' by placing the rear panel switch (above the power entry connector) to the 'ON' position. Upon initial and subsequent power-ups, the DM240 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 is illuminated.

The initial field checkout of the DM240 can be accomplished from the front panel, Terminal Port, Remote Port, or Ethernet Port.


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Theory of Operation

3

3.0 Theory of Operation

The advanced hardware/software architecture of the DM240 allows a single piece of hardware to be configured for a variety of different applications. Several of these hardware/software platforms are listed in the next sections. Custom applications are available.

The basic operation of each platform is similar. A digital terrestrial interface supplies the modulator with a data stream. The data stream is synchronized if the incoming stream is framed. The data is scrambled, and FEC is added. The data is then convolutionally encoded, punctured, then constellation mapped. The resulting I&Q Symbols are digitally filtered. The data is then converted into an analog waveform and is vector modulated onto an RF Carrier produced from the Transmit IF Synthesizer Circuitry.

Since the baseband processing is completely digital, many different variations of signal processing can be performed. Therefore, the DM240 is one of the most flexible digital modulators available today.

3.1 DVB-S Operation

The DVB-S version of the DM240 complies with both EN300-421 and EN301-210 ETSI Specifications.

A block diagram of the signal flow is shown in Figure 3-1 below.

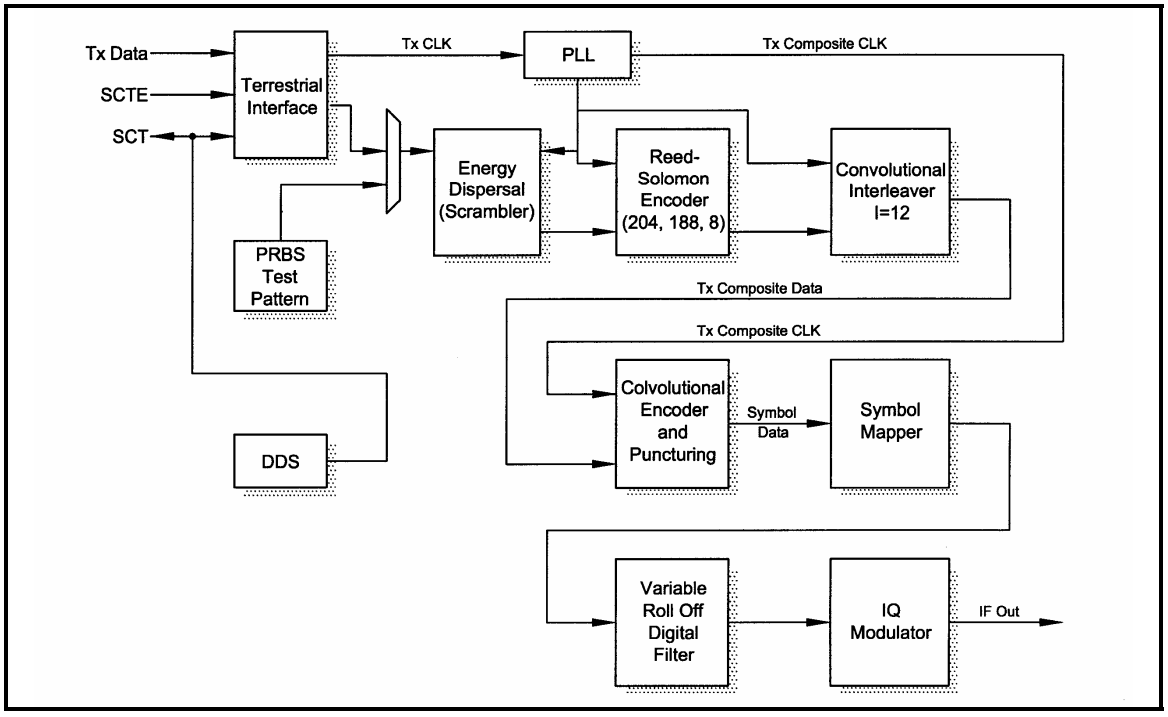

Figure 3-1. Functional Block Diagram

3.2 DVB-S2-BS-NBC Operation

The DVB-S2-BS-NBC version of the DM240 complies with the ETSI EN 302 307 V1.1.1 (2004-01) specification for non-backward compatible broadcast services.

A block diagram of the signal flow is shown in Figure 3-2 below.

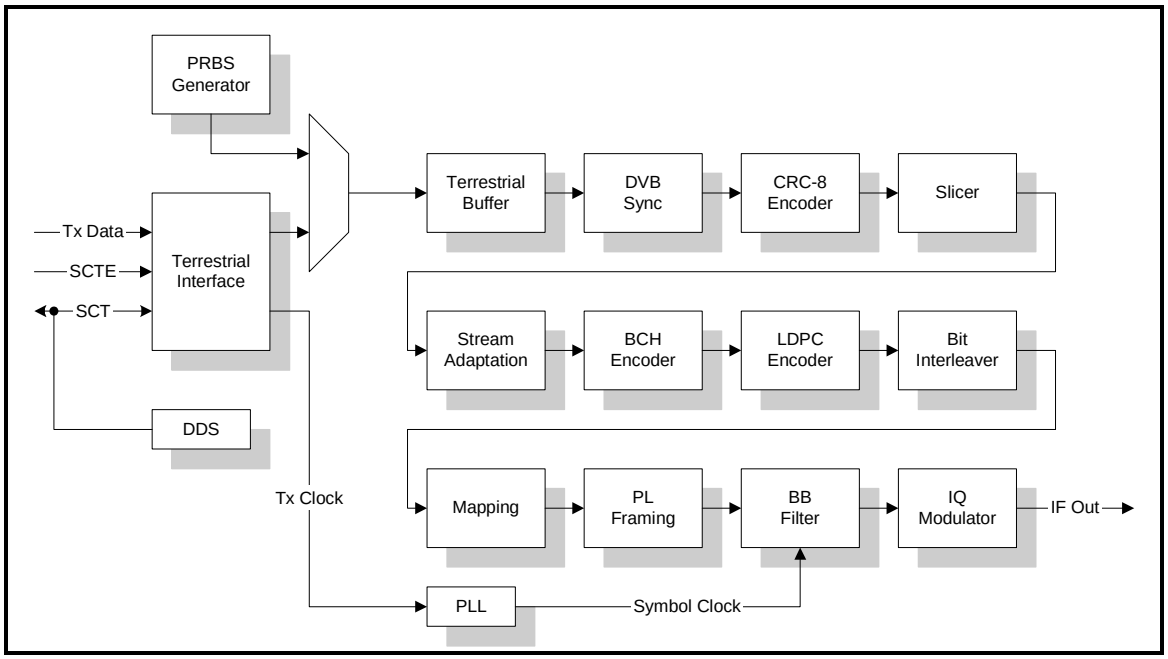

Figure 3-2. Functional Block Diagram


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User Interfaces

4

4.0 User Interfaces

There are four user interfaces available for the DM240 family of products. These are:

a. Front Panel
b. Remote Port
c. Ethernet Port
d. Terminal

4.1 Front Panel User Interface

The front panel of the DM240 allows for complete control and monitor of all DM240 parameters and functions via a keypad, LCD display and status LEDs.

The front panel layout is shown in Figure 4–1, showing the location and labeling of the front panel. The front panel is divided into three functional areas: the LCD display, the Keypad and the LED Indicators, each described below in Table 4-1.

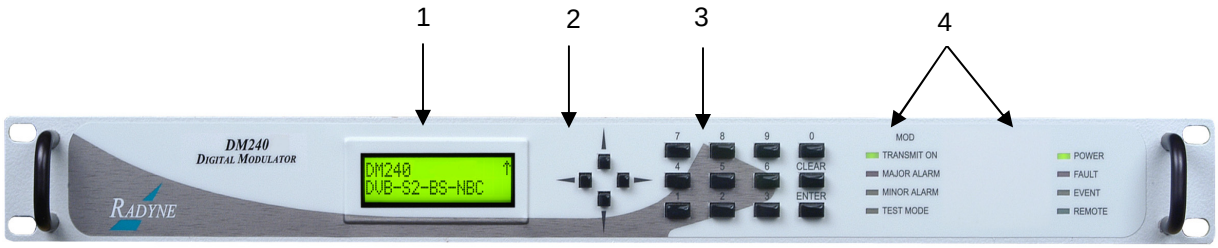


Figure 4-1. DM240 Front Panel

Table 4-1.		
Item Number	**Description**	**Function**
1	LCD Front Panel Display	Displays DM240 Operating parameters and Configuration data.
2	Cursor Control Arrows	Controls the up, down, right and left motion of the cursor in the LCD Display window (see Figure x-x).
3	Numeric Keypad	Allows entry of numeric data and Clear and Enter function keys.
4	Operational Function LEDs	See Table 4-2 for a description of these LED Indicators.

4.1.1 Front Panel LCD 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 Front Panel LED Indicators

Eight LEDs on the DM240 front panel (Refer to Table 4-2) indicate the status of the DM240's 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 4-2.

LED	Color	Function
Transmit On	Green	Indicates the DM240 Transmitter is turned on.
Major Alarm	Red	Indicates that the transmit direction has failed, losing traffic.
Minor Alarm	Yellow	Indicates a transmit warning condition exists.
Test Mode	Yellow	Indicates the modulator is involved in a current test mode activity.
Power	Green	Indicates the DM240 unit is currently powered up.
Fault	Red	Indicates a common fault exists such as power out of spec.
Event	Yellow	Indicates that events have been logged into the event buffer.
Remote	Green	Indicates that the unit is set to respond to the remote control or terminal input.

4.1.3 Front Panel Keypad

The front panel keypad consists of two areas: a 10-key numeric entry with 2 additional keys for the 'Enter' and 'Clear' function. The second area is a set of 'Arrow' or 'Cursor' keys (↑), (↓), (→), (←), used to navigate the parameter currently being monitored or controlled. Table 4-3 describes the key functions available at the front panel.

4.1.4 Parameter Setup

The four arrow keys (↑), (↓), (→), (←), to the right of the LCD display 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 4-3), 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>.

Following a valid input, the DM240 will place the new setting into the nonvolatile SRAM making it available immediately and available the next time the unit is powered-up.

Table 4-3.

Edit Mode Key Functions (Front Panel Only)

Parameter Type	0 – 9	↑	↓	←	→	'Clear' & ←	'Clear' & →
Fixed Point Decimal	Changes Digit	Toggles ± (If Signed)	Toggles ± (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 Cursor 1 Position Left	Moves Cursor 1 Position Right	N/A	N/A
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

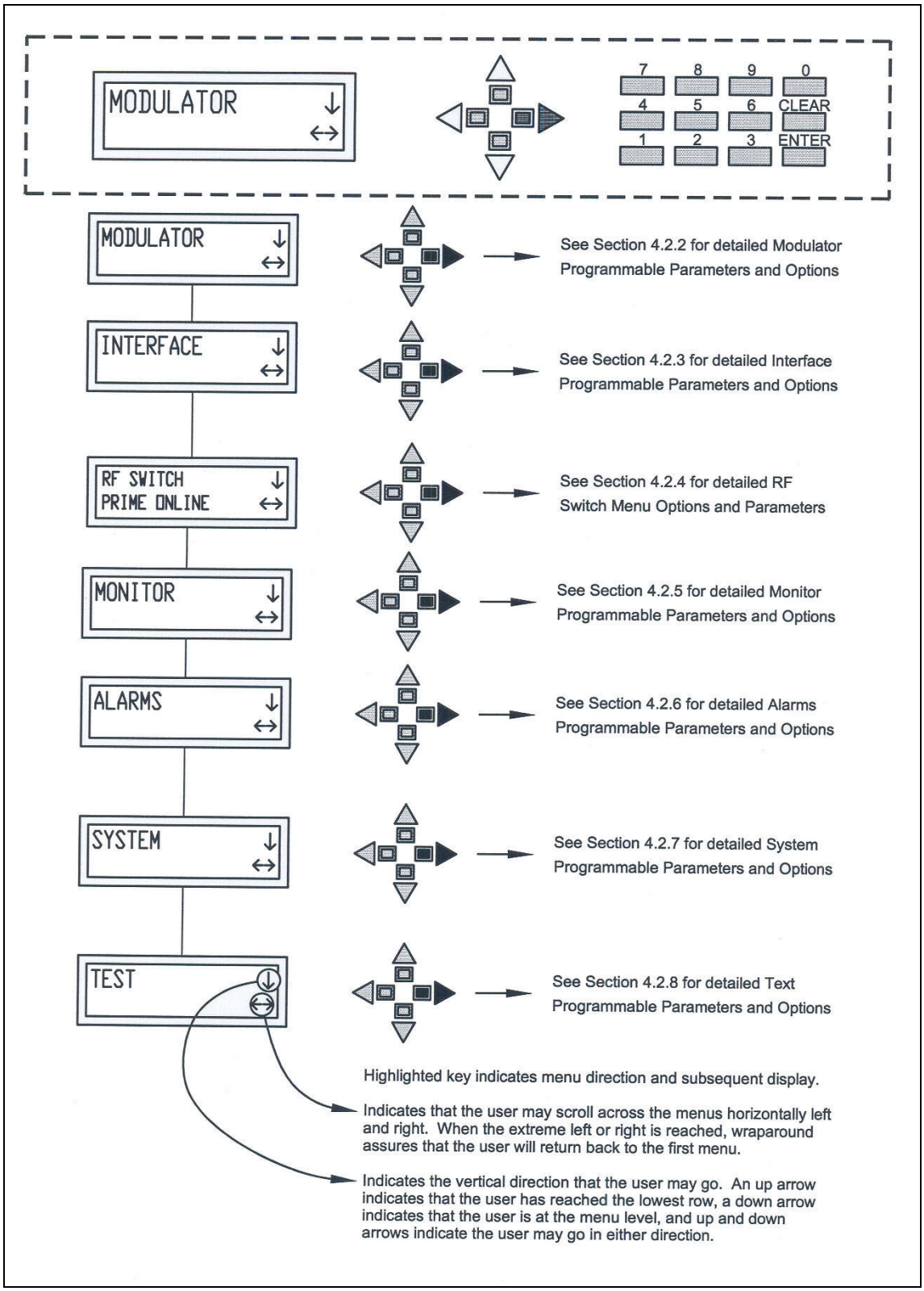


Figure 4-2. DM240 Main Programming Menu

NOTE

If at any time the user wishes to abort the changes being made, depress <CLEAR> to begin again.

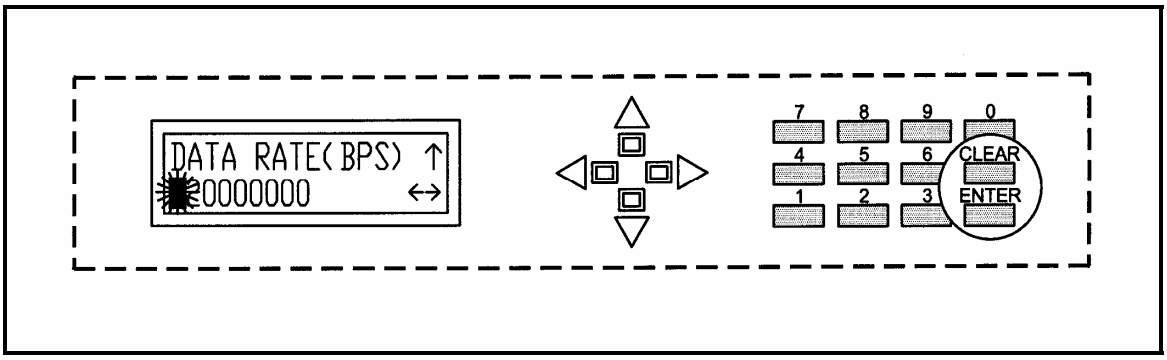


Figure 4-3. Entering New Parameters

4.2 Front Panel Control Screen Menus

NOTE

The complete set of DM240-DVB Front Panel Control Screens is made up of Main Menus. Each Main Menus has several Option and Parameter Screens.

4.2.1 Main Menus

The Main Menus available from the Front Panel of the DM240 are:

MODULATOR

INTERFACE: **{Manual, Redundancy}**
Allows the user to enter the PIIC Input Select Mode.
Manual Mode – the user selects an active input.
Redundancy Mode – the user selects a prime and backup input.

RFSWITCH **{PRIME, BACKUP}**
{OFFLINE, ONLINE}
This menu is available only when RF Switch support hardware is installed. The first status line indicates the side of the RF switch that the DM240 is attached (prime or backup). The second status line indicates if the output of the DM240 is the active output of the RF switch (online) or inactive (offline).

MONITOR

ALARMS

SYSTEM

TEST

4.2.2 Modulator Menu Options and Parameters

NETWORK SPEC: **{DVB-S, DPC, DVB-S2-BS-NBC, DTV-AMC-NBC }**
Indicates the network specification to which the unit configuration adheres.

RF(MHz): Displays satellite uplink frequency when LO frequency is entered or displays IF frequency when no LO frequency is entered.

IF (MHz): **IF Carrier Frequency:**
Enter in 100 Hz increments within the following ranges:
50 MHz to 90 MHz
100 MHz to 180 MHz
950 MHz to 2050 MHz - (DM240-PIIC Only)

LO FREQ (MHz): Enter LO Frequency of the BUC

LO Mix: High side or low side – Identify whether the LO of the BUC is above or below the actual uplink frequency.

POWER (dBm): **Transmitter output power:**
Enter in 0.1 dBm increments from:
-25.0 to 0.0 dBm

CARRIER: **{ON, OFF}**
Transmitter Power On/Off Control.

MODULATION: **{BPSK, QPSK, 8PSK, 16QAM}**
Modulation Type.

INNER FEC RATE: **1/4, 1/3, 2/5/, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 6/7, 7/8, 8/9, 9/10**

DATA RATE (BPS): **Terrestrial Data Rate:**
Enter in 1 Bps increments from 1,000,000 to 238,000,000 BPS.

SYMB RATE (SPS): **Output Symbol Rate:**

Enter in 1 SPS increments from 1,000,000 to 68,000,000 Sps.

SPECTRUM: **{NORMAL, INVERTED}**

ROLL OFF: **{0.35, 0.25, 0.20}**
Changes the Spectrum Roll Off

PILOT SYMBOLS: **{DISABLED, ENABLED}**
Physical layer pilot symbols. Displayed only in DVB-S2 related network spec.

GOLD SEQ N: **{0 - 262142}**
Gold code sequence index.

LAST RATE CTRL: **{SYMBOL RATE DATA RATE AUTO}**
Indicates the rate (symbol or data) which is maintained when associated parameters (i.e. Modulation, Inner FEC Code Rate, Terr Framing) are changed. For example, if the Last Rate Control is set to “Symbol Rate” and the modulation is subsequently changed, the system will attempt to maintain the same symbol rate by adjusting the data rate. If the Last Rate Control is set to “Data Rate” and the modulation is subsequently changed, the system will attempt to maintain the same data rate by adjusting the symbol rate.

The “Auto” Setting of Last Rate Control causes the last explicitly changed rate (symbol or data) to be maintained when associated parameters are changed. For example, if the last rate control is set to “Auto” and the Data Rate is subsequently explicitly changed, any subsequent changes to Modulation or Inner FEC Rate would cause the symbol rate to be adjusted in order to maintain the Data Rate.

4.2.3 Interface Menu Options and Parameters

4.2.3.1 Plug-In Interface Card (PIIC)

ACTIVE INPUT: **{SLOT 1, SLOT 2, SLOT 3}**
Active Input Select - Allows the user to select the slot that is active in Manual Mode.

PRIME INPUT: **{SLOT 1, SLOT 2, SLOT 3}**
Prime Input Select - Allows the user to designate the Prime Input in Redundancy Mode. An “(A)” indicates the active input.

BACKUP INPUT: **{SLOT 1, SLOT 2, SLOT 3}**
Backup Input Select - Allows the user to designate the Backup Input in Redundancy Mode. An “(A)” indicates the active input.

INTERFACE TYPE: (PIIC) **{ASI, Advanced ASI, HSSI, M2P Parallel, DVB Parallel (RS422 or LVDS), Ethernet 100/1000, DirecTV PECL}**
Enter the Terrestrial Interface type.

Only the Interface types that are installed may be selected.

TERR FRAMING: **{DVB 188, DVB 204, DIRECTPC, NONE}**
Terrestrial Framing – Allows the user to choose framing packet.

DATA POLARITY **{NORMAL, INVERTED}**
Allows the data to be used as is or to be inverted.

INCLK SRC **{SCTE, SCT}**
Input Clock Source – Allows the user to choose between an internal (SCT) and external (SCTE) clock sources.

INCLK POL **{NORMAL, INVERTED}**
Input Clock Polarity – Allows the user to use the input clock signal as is or to invert it.

OUTCLK SRC **{"Status Only"}**
When used with G.703, the user may choose between an internal (SCT), external (SCTE), or no output clock sources. All else provides status only.

OUTCLK POL **{NORMAL, INVERTED}**
Output Clock Polarity – Allows the user to use the output clock signal as is or to invert it.

REF FREQ SRC: **{Internal, External}**
Reference Frequency Source – Allows the user to select either an internal or external reference source.

EXT REF (MHz): **External Reference Frequency:**
Enter the External Reference Frequency in 8 kHz steps from 1 MHz to 10 MHz.

PCR RESTAMPING: **{ON, OFF}**
This selection is available only when the Advanced ASI Interface Type is selected. When set to "On," the DM240 will overwrite the PCR Value in appropriate packets to compensate for any Null Packets, which have been inserted into the data stream.

The Transmit Clock (SCT) supplied by the DM240 is always Output. Normally, this clock is used to clock the data out of the data source and then return it to the SCTE input. The DM240 is then set to SCTE mode eliminating any possible clock skew. Alternately, the data source can generate the SCTE clock internally and the SCT signal can be ignored. If SCT mode is selected, the Modulator data clock will not be locked to the incoming data stream. This mode is NOT recommended except for testing or fault backup.

4.2.3.2 Ethernet Interface (J1)

The PIIC Ethernet Data Interface (EDI) is a full duplex 100/1000 BaseT supported by an RJ45 connector. The EDI supports the input of generic UDP packets or Pro-MPEG COP3 formatted packets. With Pro-MPEG input, a powerful video-specific packet-based forward error correction (FEC) algorithm is also available providing a cost-effective solution for error recovery in video streams transported over public or private IP networks.

4.2.3.3 Ethernet Data Interface, Additional Menus

When the Ethernet Data Interface is installed, it will add new menus for control and status monitoring. It is recommended that all Ethernet parameters be selected prior to placing the unit into the network.

INTERFACE MENU - The following new items are available under the Interface menu

INTERFACE TYPE: **{ETHERNET}**
When the slot with GigEth card is active, the interface type will be Ethernet.

TERR FRAMING: **{DVB 188}**
When the Ethernet Data Interface is installed, the terrestrial framing is fixed DVB 188 and cannot be changed.

TERR ETHERNET: Menu comes up when GigEth card is installed.

TERR MAC ADDR: **{0123456789AB}**
This menu displays the MAC address of the Ethernet Data Interface card. Entering any non-zero value in this field will cause the EDI to use the entered value as its MAC address. Entering a value of all zeros will cause the Ethernet Data Interface to revert back to its original MAC address.

MODE SELECTIONS: **{UDP PACKETS, COP 3 RTP, or COP 3 RTP FEC**

UDP PACKETS - the modulator accepts generic UDP packets with seven MPEG packets encapsulated in each UDP datagram.

COP 3 RTP - the modulator accepts seven MPEG packets encapsulated in a COP 3 compliant RTP datagram.

COP 3 RTP FEC- the modulator accepts COP 3 compliant Column FEC packets in addition to the RTP datagram.

ONLINE SELECT: **{Prime or Backup}**
Allows selection and an indication of which UDP port is currently online.

JITTER BUFFER: **{10 TO 200ms}**
Allows the operator to select the jitter buffer depth from 10 ms to 200 ms in 10 ms steps. The Jitter Buffer is used by the modulator to smooth out the network jitter that is inherent in Ethernet networks. Entry of zero (no jitter buffer) is not allowed.

JITTER TRACKING: **{Widest, Wide, Mid Level, Narrow, Narrowest}**
Allows the operator to select how the modulator reacts to and compensates for jitter. Because the modulators transmit clock is locked to the incoming data stream, care must be taken when selecting this parameter. While wider tracking allows larger changes due to network jitter to be compensated for, it also means that the receiver will have to track larger, faster, clock rate changes as the transmit clock is adjusted. On the other hand, narrower tracking means smaller, slower, changes in the clock rate but requires more precise network timing to keep the jitter buffer from over or under flowing.

BACKUP MODE: **{Manual or Automatic)**
When manual mode is selected, the modulator will stay with the selected online port (Prime or Backup) even when it is not able to lock to the incoming data stream. When Automatic mode is selected, the modulator will switch between the Prime or Backup port when it is not able to lock to one or the other.

BACKUP DELAY: **{100ms TO 5 seconds}**
Allows selection of the time to delay in the event of an online source fault (prime or backup) before switching over to the other source (backup or prime). Entry is in 100 ms steps from 100 ms to 5 seconds. Displayed when backup mode is set to AUTO.

PRIME ETHERNET: Scroll down to configure the IP selection for the prime UDP port

PRIME IP ADDR: **{XXX.XXX.XXX.XXX}**
Allows entry of the prime IP address to be used by the Ethernet Data Interface. This will be the source IP address for all Ethernet traffic generated by this interface. Entries in the range of 224.000.000.000 to 239.255.255.255 place the unit in Multicast mode. All other entries place the unit in Unicast mode.

PRIME UDP PORT: **{XXXXX}**
This is the destination UDP port on which packets addressed to the prime IP address will arrive.

When operating in COP3 RTP FEC mode

Prime Column FEC packets must arrive on Prime UDP port + 2

Prime Row FEC packets must arrive on Prime UDP port + 4

SOURCE IP ADDR: **{XXX.XXX.XXX.XXX}**

In Multicast mode: The user can specify a source IP address for the prime to listen to. When a non-zero IP address is entered, the prime will only accept multicast packets addressed to it on its prime port from the specified source. When an IP address of zero is entered, the prime will accept multicast packets addressed to it on its prime port from any source.

In Unicast mode: This field is hidden and has no affect. The prime accepts Unicast packets addressed to it from any source.

UNICAST IP PORT: **{XXXXX}**

BACKUP ETHERNET: Scroll down to configure the IP selection for the prime UDP port

BACKUP IP ADDR: **{XXX.XXX.XXX.XXX}**

In Multicast mode: Allows the operator to enter the backup multicast IP address. The unit will only accept valid multicast IP address entries in the range of 224.000.000.000 to 239.255.255.255

In Unicast mode: This field is hidden and has no affect. The backup IP address is the same as the prime IP address

BACKUP UDP PORT: **{XXXXX}**
This is the destination UDP port on which packets addressed to the prime IP address will arrive.

When operating in COP3 RTP FEC mode:

Backup Column FEC packets must arrive on Prime UDP port + 2

Backup Row FEC packets must arrive on Prime UDP port + 4

PROG ETH FLASH: **{Press Clear}**

Used for field upgrades. To upgrade the EDI firmware, install the appropriate PCMCIA card, scroll to this menu, and press clear. The front panel will sequence through a series of displays indicating that the flash is being Erased, Programmed, and Verified. At the end of sequence the final status will be displayed as either Successful or Unsuccessful. The current revision of firmware resident on the EDI card can be accessed via the System menu and is described in detail in that section.

MONITOR MENU - The following status monitoring menus are available under the Monitor menu when the Ethernet Data interface is installed.

TERR ETHERNET - Scroll down for the Ethernet specific status

LINK STATUS **{No Link, 100Mbps Full, 1Gbps}**
This menu displays the current terrestrial link status and rate at which the Ethernet Data Interface has established a physical connection.

No Link: The unit is unable to establish a valid link. An unplugged cable would be one cause of this condition.

100 Mbps Full: The unit has established a valid 100 Mbps Full Duplex link

1 GIG Full: The unit has established a valid Gigabit Full Duplex link

PRIME DATA **{No Activity, Online Activity, Offline Activity}**

No Activity: The prime port is not receiving any data packets

Online Activity: The prime port is currently the online port and it is receiving data packets

Offline Activity: The prime not currently the online port, but it is receiving data packets.

PRIME COL FEC **{Disabled, No Activity, Online Activity, Offline Activity}**

Disabled: FEC is not enabled (COP3 RTP FEC mode is not selected)

No Activity: The prime port is not receiving any column FEC packets

Online Activity: The prime port is currently the online port and is receiving column FEC packets

Offline Activity: The prime is not currently the online port, but it is receiving column FEC packets

PRIME ROW FEC **{Disabled, No Activity, Online Activity, Offline Activity}**

Disabled: FEC is not enabled (COP3 RTP FEC mode is not selected)

No Activity: The prime port is not receiving any row FEC packets

Online Activity: The prime port is currently the online port and is receiving row FEC packets

Offline Activity: The prime is not currently the online port, but it is receiving row FEC packets

BACKUP DATA **{No Activity, Online Activity, Offline Activity}**

No Activity: The backup port is not receiving any data packets

Online Activity: The backup port is currently the online port and it is receiving data packets

Offline Activity: The backup not currently the online port, but it is receiving data packets.

BACKUP COL FEC **{No Activity, Online Activity, Offline Activity}**

Disabled: FEC is not enabled (COP3 RTP FEC mode is not selected)

No Activity: The backup port is not receiving any row FEC packets

Online Activity: The backup port is currently the online port and is receiving row FEC packets

Offline Activity: The backup is not currently the online port, but it is receiving row FEC packets

BACKUP ROW FEC **{No Activity, Online Activity, Offline Activity}**

Disabled: FEC is not enabled (COP3 RTP FEC mode is not selected)

No Activity: The backup port is not receiving any row FEC packets

Online Activity: The backup port is currently the online port and is receiving row FEC packets

Offline Activity: The backup is not currently the online port, but it is receiving row FEC packets

JITTER FILL: **{0 to 99%}**

Displays the current jitter buffer fill status

NULL PACKETS: **{count value}**

Displays the number of times the modulator has had to insert null packets into the modulated data stream due to a missing or erred (and not correctable) data packet.

COLLECTED PACKETS: **{count value}**

Indicates the number of times the modulator has had to use the FEC data stream to generate a missing or erred data packet.

REORDERED PACKETS: **{count value}**

Indicates the number of packets that have been received out of order. The modulator automatically places these packets into their correct positions in the transmit data stream.

CLEAR STATS: **{enter}**

Pressing Enter will reset the packet counters.

ALARMS - The following items are available under the Alarms menu

CURRENT ALARMS - The following new items are available under the Current Alarms menu

TX MINOR - The following new items are available under the Rx Minor menu

TERR DATA ACT **{Pass/Fail, Unmasked/Masked}**
Fail indicates that the EDI has not been able to establish a valid terrestrial data link. Most likely, the Ethernet cable is not plugged in.

ONLINE DATA ACT **{Pass/Fail, Unmasked/Masked}**
Fail indicates that the EDI has not been able to lock to a data stream on the online port.

JITTER OVERFLOW **{Pass/Fail, Unmasked/Masked}**
Fail indicates that the Jitter Buffer is overflowing

JITTER UNDERFLOW **{Pass/Fail, Unmasked/Masked}**
Fail indicates that the Jitter Buffer is under flowing

GIGE FPGA REV **{Pass/Fail, Unmasked/Masked}**
Fail indicates EDI firmware currently programmed in the GigEth card. Flash is older than the firmware expected by the M&C.

SYSTEM - The following new items are available under the System menu

HW / FW CONFIG - The following new items are available under the HW / FW Configuration menu

PIIC TYPE **{ETHERNET}**
Indicates the Ethernet Data Interface board assembly is installed in the unit. When an EDI is installed, the following is available under this menu

PIIC REV **{ }**
This indicates the Ethernet Data Interface firmware revision.

4.2.3.4 DM240 With Standard Interfaces (Non-PIIC Version)

INTERFACE TYPE: **{ASI, Advanced ASI, HSSI, RS-442 Serial, M2P Parallel, DVB Parallel (RS422 or LVDS), G.703 T1 B8ZS, G.703 T1 AMI, G.703 E1 UNBAL, G.703 E1 BAL, G.703 T2 UNBAL, G.703 T2 BAL, G.703 E2, G.703 T3, G.703 E3, G.703 STS1, DirecTV PECL}**
Enter the Terrestrial Interface type.

Only the Interface types that are installed may be selected.

TERR FRAMING: **{DVB 188, DVB 204, NONE}**
Terrestrial Framing – Allows the user to choose framing packet.

DATA POLARITY **{NORMAL, INVERTED}**
Allows the data to be used as is or to be inverted.

INCLK SRC **{SCTE, SCT}**
Input Clock Source – Allows the user to choose between an internal (SCT) and external (SCTE) clock sources.

INCLK POL **{NORMAL, INVERTED}**
Input Clock Polarity – Allows the user to use the input clock signal as is or to invert it.

OUTCLK SRC {**SCTE, SCT}**
When used with G.703, the user may choose between an internal (SCT), external (SCTE), or no output clock sources. All else provides status only.

OUTCLK POL **{NORMAL, INVERTED}**
Output Clock Polarity – Allows the user to use the output clock signal as is or to invert it.

REF FREQ SRC: **{Internal, External}**
Reference Frequency Source – Allows the user to select either an internal or external reference source.

EXT REF (MHz): **External Reference Frequency:**
Enter the External Reference Frequency in 8 kHz steps from 1 MHz to 10 MHz.

The Transmit Clock (SCT) supplied by the DM240 is always Output. Normally, this clock is used to clock the data out of the data source and then return it to the SCTE input. The DM240 is then set to SCTE mode eliminating any possible clock skew. Alternately, the data source can generate the SCTE clock internally and the SCT signal can be ignored. If SCT mode is selected, the Modulator data clock will not be locked to the incoming data stream. This mode is NOT recommended except for testing or fault backup.

4.2.4 RF Switch Menu Options and Parameters

REDUNDANCY MODE: **{MANUAL, AUTO REVERT, BACKUP}**
Indicates the mode of operation for the RF redundancy switch.

ACTIVATE PRIME Pressing ENTER causes the prime side of the RF switch to be selected as online.

ACTIVATE BACKUP Pressing ENTER causes the backup side of the RF switch to be selected as online.

(BACKUP|PRIME) STATUS: **{NORMAL, FAULT}**

This is the status of the other DM240 connected to the RF switch.

FAULT TEST: **{NORMAL, FAULT}**
Asserts the fault signal to the RF switch for testing purposes.

4.2.5 Monitor Menu Options and Parameters

EVENTS: **Event Buff:**
Display/Clear logged events and faults.

ERASE EVENTS: **Clear Events:**
Clear all logged events and faults from the event buffer.

+5V SUPPLY: Display the currently measured +5 VDC power supply.

+12V SUPPLY: Display the currently measured +12 VDC power supply.

-12V SUPPLY: Display the currently measured -12 VDC power supply.

4.2.6 Alarms Menu Options and Parameters

CURRENT ALARM (Menu): Displays Current Alarm Status.

TX MAJOR (Menu)

	Status	***Edit Table***
SCT PLL:	**{PASS/FAIL, UNMASKED/MASKED}**	
OVERSAMPLE PLL:	**{PASS/FAIL, UNMASKED/MASKED}**	
SYNTH PLL:	**{PASS/FAIL, UNMASKED/MASKED}**	
SYS REF PLL:	**{PASS/FAIL, UNMASKED/MASKED}**	

TX MINOR (Menu)

FRAME SYNC:	**{PASS/FAIL, UNMASKED/MASKED}**
FIFO:	**{PASS/FAIL, UNMASKED/MASKED}**
TERR CLK ACT:	**{PASS/FAIL, UNMASKED/MASKED}**
TERR DATA ACT:	**{PASS/FAIL, UNMASKED/MASKED}**

COMMON (Menu)

+12 VOLTS:	**{PASS/FAIL, UNMASKED/MASKED}**
-12 VOLTS:	**{PASS/FAIL, UNMASKED/MASKED}**
+ 5 VOLTS:	**{PASS/FAIL, UNMASKED/MASKED}**

LATCHED ALARMS (Menu): This menu duplicates the Current Alarm Menu, but displays Latched Alarms instead of Current Alarms.

TX MAJOR (Menu)

SCT PLL: **{PASS/FAIL}**

OVERSAMPLE PLL: **{PASS/FAIL}**

SYNTH PLL: **{PASS/FAIL}**

SSYS REF PLL: **{PASS/FAIL}**

TX MINOR (Menu)

FRAME SYNC: **{PASS/FAIL}**

FIFO: **{PASS/FAIL}**

TERR CLK ACT: **{PASS/FAIL}**

TERR DATA ACT: **{PASS/FAIL}**

COMMON (Menu)

+12 VOLTS: **{PASS/FAIL}**

-12 VOLTS: **{PASS/FAIL}**

+ 5 VOLTS: **{PASS/FAIL}**

CLEAR LATCHED ALARMS: **{FALSE/TRUE}**
Set to True, to clear the latched alarms. It will immediately revert to False

4.2.7 System Menu Options and Parameters

Remote Port (Menu)

Address: Multi-Drop Address: Enter the address for computer control from 32 to 255.

Baud Rate: **{150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400}**
Remote port baud rate for Terminal and Computer Mode.

TCP/IP (Menu):

BOOT MODE: **{Default, NonVol, Bootp}**
Default: If no Ethernet Interface is to be used. No IP Address or mask changes will be allowed.

NonVol: Stores and uses IP Mask and addresses as provided by the user.

Bootp: At boot time, use Bootp Protocol to get names, masks, and IP Addresses of the modem, router, and server.

BOOTp SERVER TAG: **{128 – 257, default is 206}**
Only used if Bootp is selected in Boot Mode. Should be consistent with the tag expected by the users Bootp Server.

IP ADDR MASK: **{FF.XX.XX.XX}**
The IP Address Mask of the local network. The mask is expressed in a hexadecimal format, and must be a valid TCP/IP Mask.

XX.XX.XX can start with F, E, C, 8, or 0. Once a character other than F is encountered, all remaining fields must be zero. For example:

FF.FF.FF.80
FF.FF.FC.00
FF.00.00.00

This field should be set before changes are made to the Modem or Router Address.

MODEM IP ADDR: **{XX.XX.XX.XX}**
The IP Address of the modem. This address should be consistent for the mask defined. This address is expressed in hexadecimal format. For example:

For the decimal Modem IP Octets:
172.18.100.212

Mask: FF.FF.0.0
Modem IP Address: AC.12.64.D4

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

SERVER IP ADDR: **{XX.XX.XX.XX}**
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. For example:

For the modem 172.18.100.212
No router, and server: 172.18.28.253

Mask: FF.FF.00.00
Modem: AC.12.64.D4
Router: AB.00.00.01
Server: AC.12.1C.FD

For the modem 172.18.100.212
Router on the same network: 172.18.1.5 and server on a different network: 196.24.14.250

Mask: FF.FF.00.00
Modem: AC.12.64.D4
Router: AC.12.1.5
Server: C4.18.E.FA

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: **{XX.XX.XX.XX}**
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. For example:

For the modem 172.18.100.212
No router, and server: 172.18.1.5

Mask: FF.FF.00.00
Modem: AC.12.64.D4
Router: AC.12.1.5

For the modem 172.18.100.212
With no local router

Mask: FF.FF.00.00
Modem: AC.12.64.D4
Router: A0.00.00.01

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

MODEM EADDR: **{001065FFFFFF}**
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/FD}**
The data rate for the local Ethernet Interface.
10 Mbps/HD/FD – for 10 Base-T in either half-duplex or full duplex.

SNMP (Menu):

Trap Version: **{V1, V2}**
This controls the message format used when a message trap is generated by the equipment and bound for a SNMP host. Messages will only be sent if the unit has been authorized to do so.

Authorization: **{TRAPS OFF, TRAPS ON}**
This controls the message format used when a message trap is generated by the equipment and bound for a SNMP host. Messages will only be sent if the unit has been authorized to do so.

RD COMMUNITY: **{16 characters of name}**
This menu is only displayed when SNMP VERSION is set to V1 & V2.

This is the community that a host must be acting within when an OID variable is requested by a V1/V2 SNMP message.

RDWR COMMUNITY: **{16 characters of name}**
This menu is only displayed when SNMP version is set to V1&V2.

This is the community that a host must be acting within when an OID variable is being changed by a V1/V2 SNMP message.

TERMINAL (menu)

TYPE: **{VT100, VIEWPOINT, WYSE50}**

BAUD RATE: **{300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600}**
Allows the user to enter the Terminal Baud Rate.

HW/FW CONFIG (menu)

DM240: **{"Status Only"}**
Displays the DM240 feature level (e.g. Series 400)

FIRMWARE REV: **{"Status Only"}**
Displays the Firmware revision level.

M&C REV: **{"Status Only"}**
Displays the Monitor and Control revision level.

MAIN BOARD: **{sub-menu}**

MAIN BOARD (menu)

PC NUMBER: **{"Status Only"}**

ASSEMBLY #: **{"Status Only"}**

SERIAL NUMBER: **{"Status Only"}**

4.2.8 Test Menu Options and Parameters

CARRIER TYPE: **{NORMAL, CW, DUAL, OFFSET, POS.FIR, NEG.FIR}**
Sets carrier test modes.

OUTER FEC: **{NORMAL, BYPASS}**

INNER FEC: **{NORMAL, BYPASS}**

INTERLEAVER: **{NORMAL, BYPASS}**

Enables Interleaver.

BB SCRAMBLER: **{NORMAL, BYPASS}**
Enables Baseband Scrambler for Energy Dispersal.

PL SCRAMBLER: **{NORMAL, BYPASS}**
Enables Physical Layer Scrambler for Energy Dispersal.

TEST PATTERN: **{NONE, 2^{15}-1, 2^{23}-1}**
Enables Test Pattern Generator. Inserts a test pattern in the data stream before the scrambler.

4.3 Remote Port User Interface

The Remote Port of the DM240 allows for complete control and monitor functions via an RS-485 Serial Interface.

Control and status messages are conveyed between the DM240 and the 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 M&C data.

Complete information on monitor and control software is contained in the following sections.

4.3.1 Protocol Structure

The Communications Specification (COMMSPEC) defines the interaction of computer resident Monitor and Control software used in satellite earth station equipment such as modems, redundancy switches, multiplexers, and other ancillary support gear. Communication is bi-directional, and is normally established on one or more full-duplex multi-drop control buses that conform to EIA Standard RS-485.

Each piece of earth station equipment on a control bus has a unique physical address, which is assigned during station setup/configuration or prior to shipment. Valid decimal addresses on one control bus range from 032 through 255 for a total of up to 224 devices per bus. Address 255 of each control bus is usually reserved for the M&C computer.

4.3.2 Protocol Wrapper

The Radyne COMMSPEC is byte-oriented, with the Least Significant Bit (LSB) issued first. Each data byte is conveyed as mark/space information with two marks comprising the stop data. When the last byte of data is transmitted, a hold comprises one steady mark (the last stop bit). To begin or resume data transfer, a space substitutes this mark. This handling scheme is controlled by the hardware and is transparent to the user. A pictorial representation of the data and its surrounding overhead may be shown as follows:

S1	S2	B_0	B_1	B_2	B_3	B_4	B_5	B_6	B_7	S1	S2, etc.

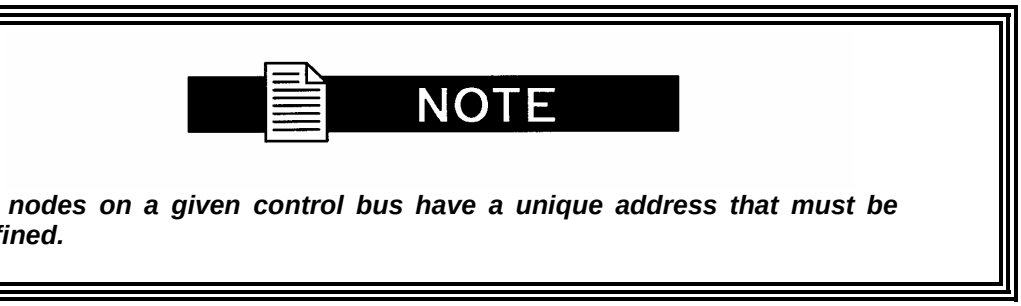
The stop bits, S1 and S2, are each a mark. Data flow remains in a hold mode until S2 is replaced by a space. If S2 is followed by a space, it is considered a start bit for the data byte and not part of the actual data (B_0 - B_7).

The COMMSPEC developed for use with the Radyne Link Level Protocol (RLLP) organizes the actual monitor and control data within a shell, or "protocol wrapper", that surrounds the data. The format and structure of the COMMSPEC message exchanges are described herein. Decimal numbers have no suffix; hexadecimal numbers end with a lower case h suffix and binary values have a lower case b suffix. Thus, 22 = 16h = 000010110b. The principal elements of a data frame, in order of occurrence, are summarized as follows:

<SYN> - the message format header character, or ASCII sync character, that defines the beginning of a message. The <SYN> character value is always 16h.

<BYTE COUNT> - the Byte Count is the number of bytes in the <DATA> field, ranging from 0 through TBD. This field is 2 bytes long for the DM240 protocol.

<SOURCE ID> - the Source Identifier defines the message originator's multidrop address.



<DESTINATION ID> - The Destination Identifier specifies the multidrop address of the device(s) to which the message is sent.

<FRAME SEQUENCE NUMBER> - The FSN is a tag with a value from 0 through 255 that is sent with each message. It assures sequential information framing and correct equipment acknowledgment and data transfers.

<OPCODE> - The Operation Code field contains a number that identifies the message type associated with the data that follows it. Acknowledgment and error codes are returned in this field. This field is 2 Bytes for the DM240 protocol.

<...DATA...> - The Data field contains the binary, data bytes associated with the <OPCODE>. The number of data bytes in this field is indicated by the <BYTE COUNT> value.

<CHECKSUM> - The checksum is the modulo 256 sum of all preceding message bytes, excluding the <SYN> character. The checksum determines the presence or absence of errors within the message. In a message block with the following parameters, the checksum is computed as shown below in Table 4-4.

Table 4-4. Checksum Calculation Example

BYTE FIELD	DATA CONTENT	RUNNING CHECKSUM
<BYTE COUNT> (Byte 1)	00h = 00000000b	00000000b
<BYTE COUNT> (Byte 2)	02h = 00000010b	00000010b
<SOURCEID>	F0h = 11110000b	11110010b
<DESTINATION ID>	2Ah = 00101010b	00011100b
<FSN>	09h = 00001001b	00100101b
<OPCODE> (Byte 1)	00h = 00000000b	00101000b
<OPCODE> (Byte 2)	03h = 00000011b	00101000b
<DATA> (Byte 1)	DFh = 11011111b	00000111b
<DATA> (Byte 2)	FEh = 11111110b	00000101b

Thus, the checksum is 00000101b; which is 05h or 5 decimal. Alternative methods of calculating the checksum for the same message frame are:

00h + 02h + F0h + 2Ah + 09h + 00h + 03h + DFh + FEh = 305h.

Since the only concern is the modulo 256 (modulo 100h) equivalent (values that can be represented by a single 8-bit byte), the checksum is 05h.

For a decimal checksum calculation, the equivalent values for each information field are:

0 + 2 + 240 + 42 + 9 + 0 + 3 + 223 + 254 = 773;

773/256 = 3 with a remainder of 5. This remainder is the checksum for the frame.

5 (decimal) = 05h = 0101b = <CHECKSUM>

4.3.3 Frame Description and Bus Handshaking

In a Monitor and Control environment, every message frame on a control bus port executes as a packet in a loop beginning with a wait-for-SYN-character mode. The remaining message format header information is then loaded, either by the M&C computer or by a subordinate piece of equipment requesting access to the bus. Data is processed in accordance with the OPCODE, and the checksum for the frame is calculated. If the anticipated checksum does not match then the wait-for-SYN mode goes back into effect. If the OPCODE resides within a command message, it defines the class of action that denotes an instruction that is specific to the device type, and is a prefix to the DATA field if data is required. If the OPCODE resides within a query message packet, then it defines the query code, and can serve as a prefix to query code DATA.

The Frame Sequence Number (FSN) is included in every message packet, and increments sequentially. When the M & C computer or bus-linked equipment initiates a message, it assigns the FSN as a tag for error control and handshaking. A different FSN is produced for each new message from the FSN originator to a specific device on the control bus. If a command packet is sent and not received at its intended destination, then an appropriate response message is not received by the packet originator. The original command packet is then re-transmitted with the same FSN. If the repeated message is received correctly at this point, it is considered a new message and is executed and acknowledged as such.

If the command packet is received at its intended destination but the response message (acknowledgment) is lost, then the message originator (usually the M&C computer) re-transmits the original command packet with the same FSN. The destination device detects the same FSN and recognizes that the message is a duplicate, so the associated commands within the packet are not executed a second time. However, the response packet is again sent back to the source as an acknowledgment in order to preclude undesired multiple executions of the same command.

To reiterate, valid equipment responses to a message require the FSN tag in the command packet. This serves as part of the handshake/acknowledge routine. If a valid response message is absent, then the command is re-transmitted with the same FSN. For a repeat of the same command involving iterative processes (such as increasing or decreasing transmit power level), the FSN is incremented after each message packet. When the FSN value reaches 255, it overflows and begins again at zero.

The full handshake/acknowledgment involves a reversal of source and destination ID codes in the next message frame, followed by a response code in the <OPCODE> field of the message packet from the equipment under control.

4.3.4 Global Response Operational Codes

In acknowledgment (response) packets, the operational code <OPCODE> field of the message packet is set to 0 by the receiving devices when the message intended for the device is evaluated as valid. The device that receives the valid message then exchanges the <SOURCE ID> with the <DESTINATION ID>, sets the <OPCODE> to zero in order to indicate that a good message was received, and returns the packet to the originator. This "GOOD MESSAGE" Opcode is one of nine global responses. Global response Opcodes are common responses, issued to the M&C computer or to another device, that can originate from and are interpreted by all Radyne equipment in the same manner. These are summarized as follows (all Opcode values are expressed in decimal form):

RESPONSE OPCODE DESCRIPTION	OPCODE
Good Message	0000h
Bad Parameter	00FFh
Bad Opcode	00FEh
IF Frequency Error	0401h
Data Rate Error	0404h
External Reference Error	0406h
Frequency Reference Source Error	0407h
Modulation Type Error	0408h
Inner FEC Rate Error	0409h
Outer FEC Bypass Error	040Ah
Scrambler Bypass Error	040Bh
Transmit Power Level Error	0410h
Carrier Control Error	0411h
Carrier Type Error	0412h
Spectrum Error	0413h
Input/Output Clock Source Error	0417h
Input Clock Polarity Error	0418h
Network Spec Error	0422h
Tx Interface Type Error	0429h
Symbol Rate Error	042Ch
Data Polarity Error	042Eh
Terrestrial Framing Error	0450h
Roll Off Error	0451h
Time Error	0A01h
Date Error	0A02h

4.3.5 Collision Avoidance

When properly implemented, the physical and logical devices and ID addressing scheme of the COMMSPEC normally precludes message packet contention on the control bus. The importance of designating unique IDs for each device during station configuration cannot be overemphasized. One pitfall, which is often overlooked, concerns multi-drop override IDs. All too often, multiple devices of the same type are assigned in a direct-linked ("single-thread") configuration accessible to the M&C computer directly. For example, if two DM240 Modulators with different addresses (DESTINATION IDs) are linked to the same control bus at the same hierarchical level, both will attempt to respond to the M&C computer when the computer generates a multi-drop override ID of 23. If their actual setup parameters, status, or internal timing differs, they will both attempt to respond to the override simultaneously with different information, or asynchronously in their respective message packets and response packets, causing a collision on the serial control bus.

To preclude control bus data contention, different IDs must always be assigned to the equipment. If two or more devices are configured for direct-linked operation, then the M&C computer and all other devices configured in the same manner must be programmed to inhibit broadcast of the corresponding multi-drop override ID.

The multi-drop override ID is always accepted by devices of the same type on a common control bus, independent of the actual DESTINATION ID. These override IDs with the exception of “BROADCAST” are responded to by all directly linked devices of the same type causing contention on the bus. The “BROADCAST” ID, on the other hand, is accepted by all equipment but none of them returns a response packet to the remote M&C.

The following multi-drop override IDs are device-type specific, with the exception of "BROADCAST". These are summarized below with ID values expressed in decimal notation:

Directly-Addressed Equipment	Multi-Drop Override ID
Broadcast (all directly-linked devices)	00
DMD-3000/4000, 4500 or 5000 Mod Section, DMD15	01
DMD-3000/4000, 4500 or 5000 Demod Section, DMD15	02
RCU-340 1:1 Switch	03
RCS-780 1:N Switch	04
RMUX-340 Cross-Connect Multiplexer	05
CDS-780 Clock Distribution System	06
SOM-340 Second Order Multiplexer	07
DMD-4500/5000 Modulator Section	08
DMD-4500/5000 Demodulator Section	09
RCU-5000 M:N Switch	10
DMD15 Modulator	20
DMD15 Demodulator	21
DMD15 Modem	22
DVB3030 Video Modulator, DM240	23
Reserved for future equipment types	24-31

Multi-drop override ID 01 can be used interchangeably to broadcast a message to a DMD-3000/4000 modem, a DMD-4500/5000, a DMD15 modem, or a DVB3030. Radyne Corp. recommends that the multi-drop override IDs be issued only during system configuration as a bus test tool by experienced programmers, and that they not be included in run-time software. It is also advantageous to consider the use of multiple bus systems where warranted by a moderate to large equipment complement.

Therefore, if a DMD15 Modulator is queried for its equipment type identifier, it will return a "20" and DMD15 Demodulator will return a "21". A DMD15 Modem will also return an "22". A DVB3030 Video Modulator will return a “23.”

4.3.6 Software Compatibility

The COMMSPEC, operating in conjunction within the RLLP shell, provides for full forward and backward software compatibility independent of the software version in use. New features are appended to the end of the DATA field without OPCODE changes. Older software simply discards the data as extraneous information without functional impairment for backward compatibility.

If new device-resident or M&C software receives a message related to an old software version, new information and processes are not damaged or affected by the omission of data.

The implementation of forward and backward software compatibility often, but not always, requires the addition of new Opcodes. Each new function requires a new Opcode assignment if forward and backward compatibility cannot be attained by other means.

When Radyne equipment is queried for bulk information (Query Mod, Query Demod, etc.) it responds by sending back two blocks of data; a Non-Volatile Section (parameters that can be modified by the user) and a Volatile Section (status information). It also returns a count value that indicates how large the Non-Volatile Section is. This count is used by M&C developers to index into the start of the Volatile Section.

When new features are added to Radyne equipment, the control parameters are appended to the end of the Non-Volatile Section, and status of the features, if any, are added at the end of the Volatile Section. If a remote M&C queries two pieces of Radyne equipment with different revision software, they may respond with two different sized packets. The remote M&C **must** make use of the non-volatile count value to index to the start of the Volatile Section. If the remote M&C is not aware of the newly added features to the Radyne product, it should disregard the parameters at the end of the Non-Volatile Section and index to the start of the Volatile Section.

If packets are handled in this fashion, there will also be backward-compatibility between Radyne equipment and M&C systems. Remote M&C systems need not be modified every time a feature is added unless the user needs access to that feature.

4.3.7 RLLP Summary

The RLLP is a simple send-and-wait protocol that automatically re-transmits a packet when an error is detected, or when an acknowledgment (response) packet is absent.

During transmission, the protocol wrapper surrounds the actual data to form information packets. Each transmitted packet is subject to time out and frame sequence control parameters, after which the packet sender waits for the receiver to convey its response. Once a receiver verifies that a packet sent to it is in the correct sequence relative to the previously received packet, it computes a local checksum on all information within the packet excluding the <SYN> character and the <CHECKSUM> fields. If this checksum matches the packet <CHECKSUM>, the receiver processes the packet and responds to the packet sender with a valid response (acknowledgment) packet.

The response packet is therefore either an acknowledgment that the message was received correctly. If the sender receives a valid acknowledgment (response) packet from the receiver, the <FSN> increments and the next packet is transmitted as required by the sender.

If an acknowledgment (response) packet is lost, corrupted, or not issued due to an error and is thereby not returned to the sender, the sender re-transmits the original information packet; but with the same <FSN>. When the intended receiver detects a duplicate packet, the packet is acknowledged with a response packet and internally discarded to preclude undesired repetitive executions. If the M&C computer sends a command packet and the corresponding response packet is lost due to a system or internal error, the computer times out and re-transmits the same command packet with the same <FSN> to the same receiver and waits once again for an acknowledgment.

4.3.8 DM240 Opcode Command Set

Refer to Appendix A for Modem Remote Communications.

4.3 Ethernet Port User Interface

The Ethernet Port of the DM240 allows for complete control and monitoring of all DM240 parameters and functions via a 10 Base-T Ethernet Connection.

4.5 Simple Network Management Protocol (SNMP)

Simple Network Management Protocol (SNMP), as its name suggests, is a relatively simple protocol by which management information for a network device may be inspected and/or altered by remote administrators.

4.6 The Management Information Base (MIB)

Refer to Appendix B for MIB Protocol.

Management objects are defined in the Management Information Base (MIB), which uses a hierarchical naming scheme. Within this scheme, each object is identified by an Object Identifier (OID), a sequence of non-negative integers that uniquely describes the path taken through the hierarchical structure.

MIB objects may then be specified either from the Root (which has no designator), or alternatively from anywhere within the hierarchical structure.

For example: 1.3.6.1.4.1.2591.4 is equivalent to {iso(1). org(3). dod(6). internet(1). private(4). enterprises(1). Radyne(2591). RCS10L(4)} (See Figure 4-4a and 4-4b).

In general, we are mainly concerned with just two groups that reside in the *internet* subtree, namely the *mgmt*, and *private* groups. For completeness however, the four major groups are discussed below:

4.6.1 Directory {internet 1} 1.3.6.1.1

This area was reserved to describe how the OSI directory structure may be used in the Internet. To date this has not been implemented and therefore is of little interest to us.

4.6.2 Mgmt {internet 2} 1.3.6.1.2

This area was reserved to describe objects in the standard MIB. As RFCs defining new groups are ratified, the Internet Assigned Numbers Authority (IANA) assigns new group IDs.

4.6.3 Experimental {internet 3} 1.3.6.1.3

This subtree provides an area where experimentation is carried out. Only those organizations directly involved in the experiment have any interest in this subtree.

4.6.4 Private {internet 4} 1.3.6.1.4

This is possible the most important area of the MIB, since it is within this subtree that vendors place objects specific to their particular devices. Beneath the private branch, there is a subtree called enterprises, beneath which each vendor may define its own structure. Vendors are assigned Private Enterprise Numbers (PENs) that uniquely identify them. They may then place all objects specific to their devices in this tree, provided of course that the object conforms to the format defined by SMI. Radyne ComStream Corporation's Private Enterprise Number is 2591. Other products are added to Radyne ComStream Corporation's subtree as they become remotely manageable through SNMP.

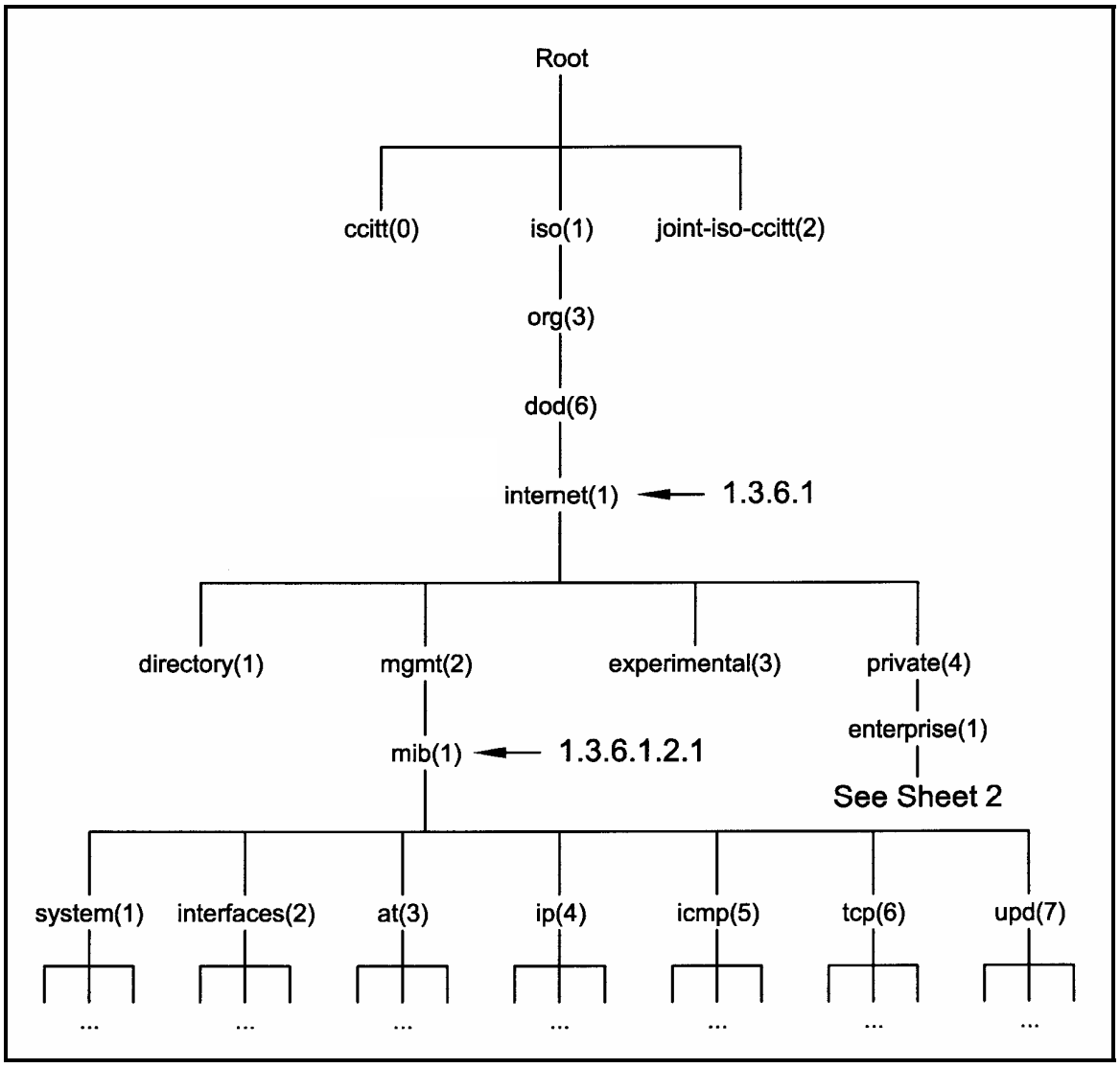


Figure 4-4a. Object Identifiers in the Management Information Base (Figure 1 of 2)

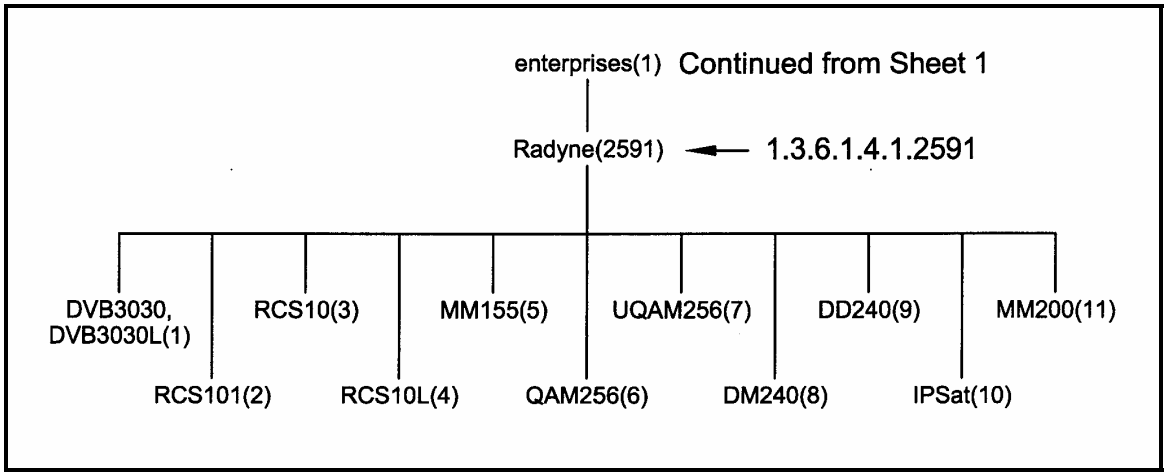


Figure 4-4b. Object Identifiers in the Management Information Base (Figure 2 of 2)

Refer to Appendix B for the MIB

4.7 Terminal Port User Interface

The Terminal Port of the DM240 allows for complete control and monitoring of all DM240 parameters and functions via an RS-232 Serial Interface.

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 J5 on the Back Panel. All operating software for the terminal mode is contained within the DM240 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.

Representations of the terminal screens are shown in Figures 4-5 through 4-13. These screens may differ from the exact screens displayed due to changes in software and the presence (or absence) of options in the modem hardware. For instance, the presence of RF Switch control hardware will result in added options available on the screens, or additional screens to be available.

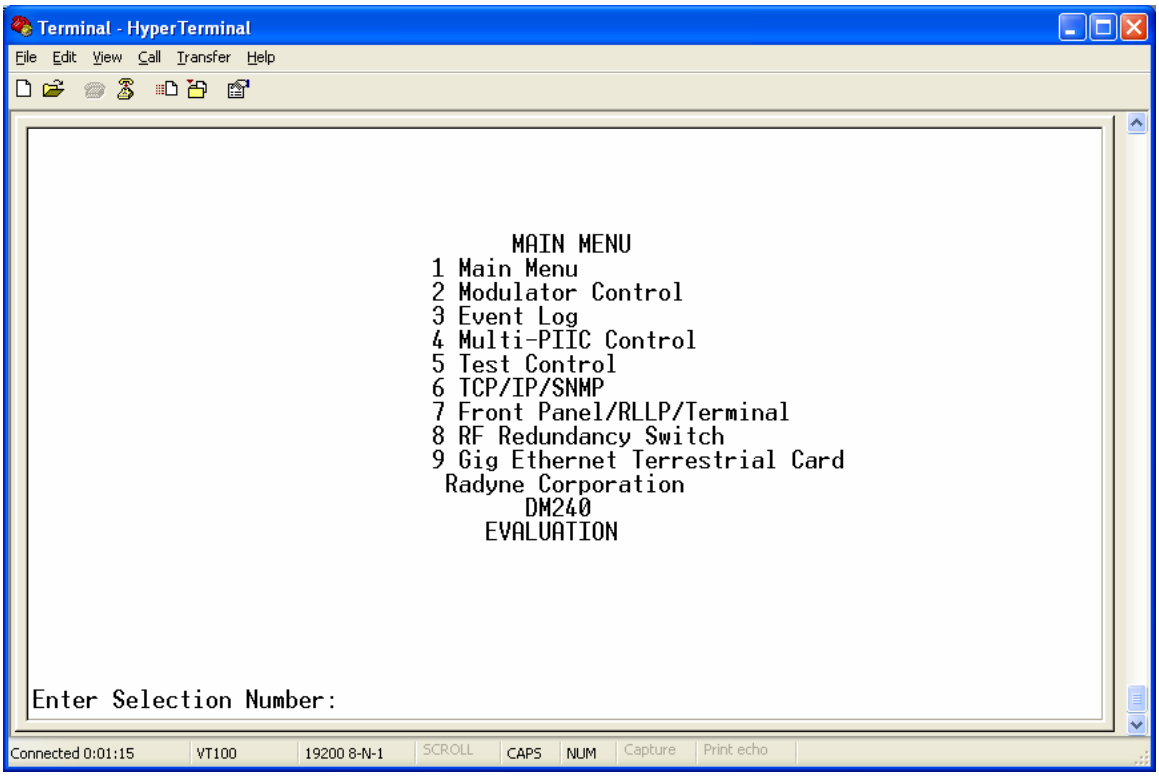


Figure 4-5. Main Menu

Note: The GIG Ethernet Terrestrial Card is only displayed when the Ethernet Data Interface is installed.

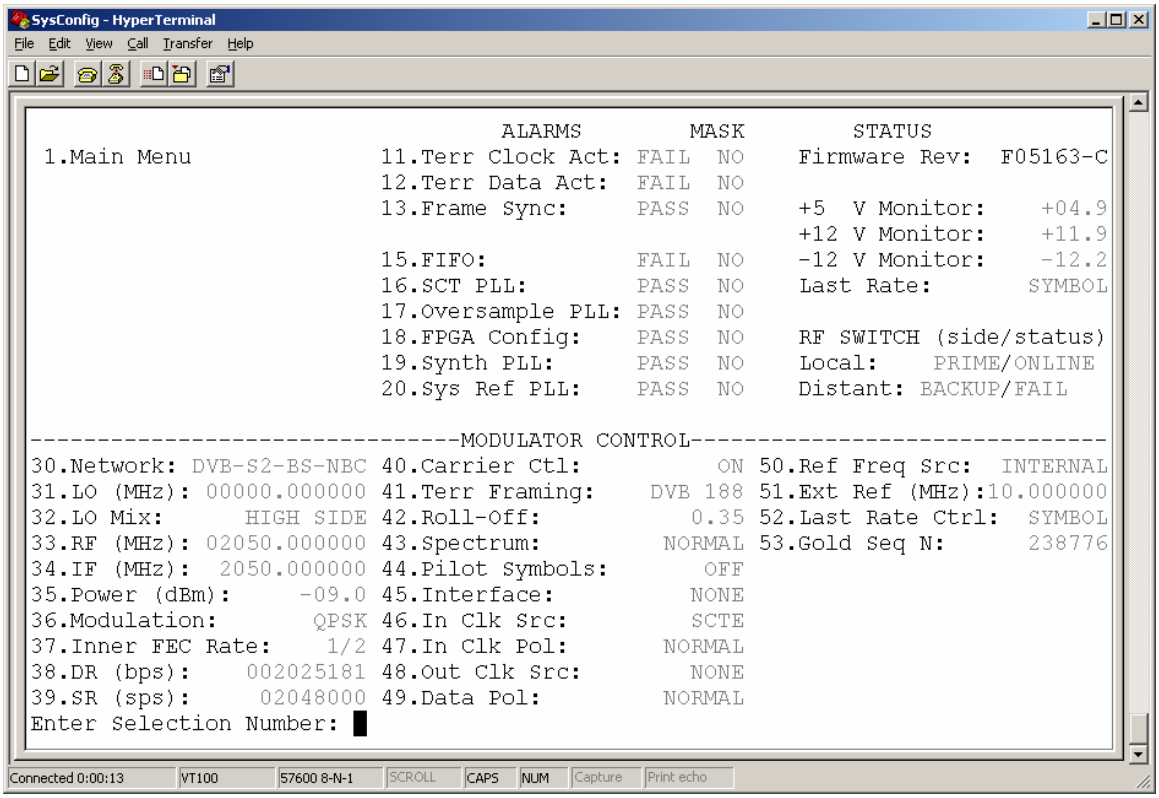


Figure 4-6. Modulator Menu

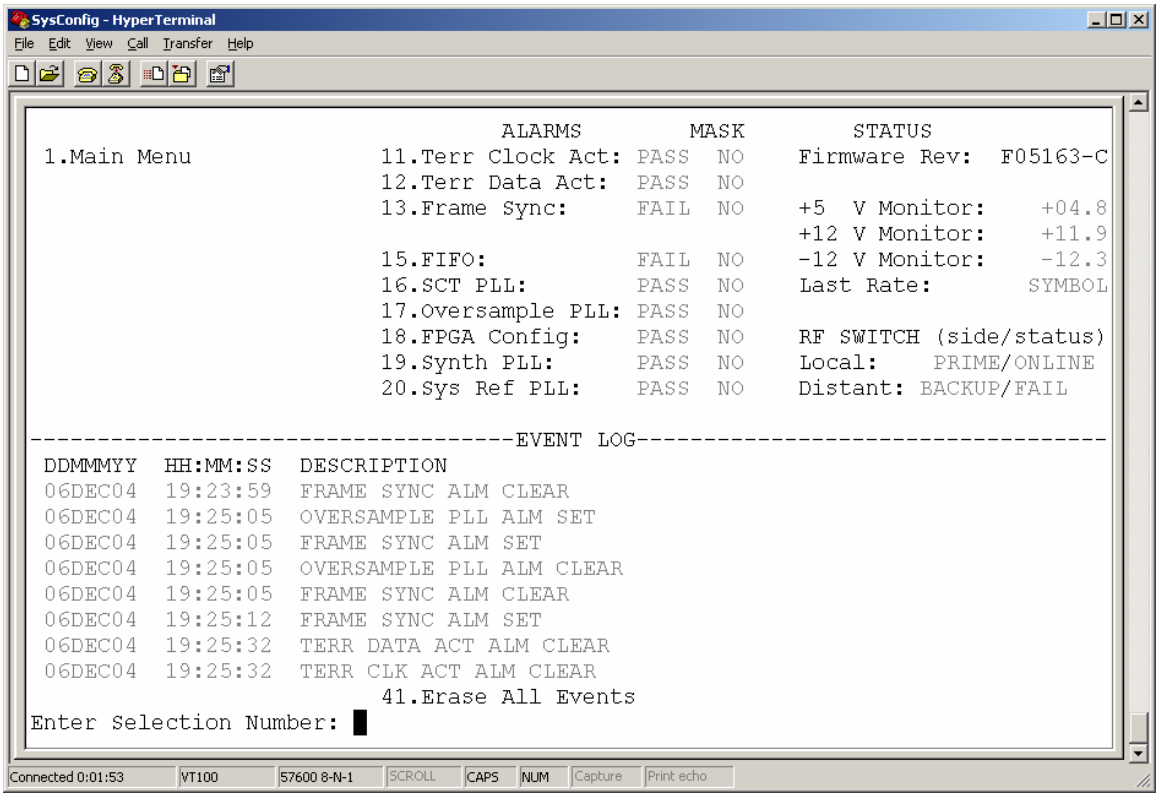


Figure 4-7. Event Log Menu

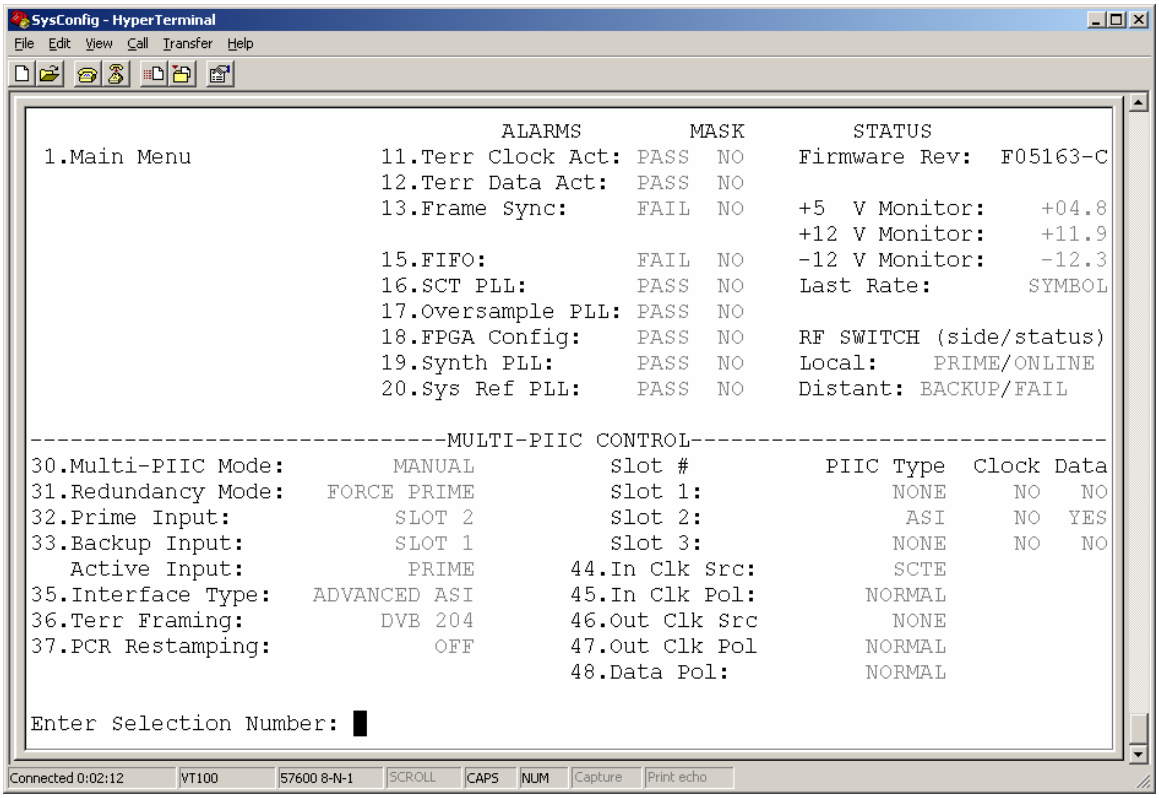


Figure 4-8. Multi-PIIC Control Menu

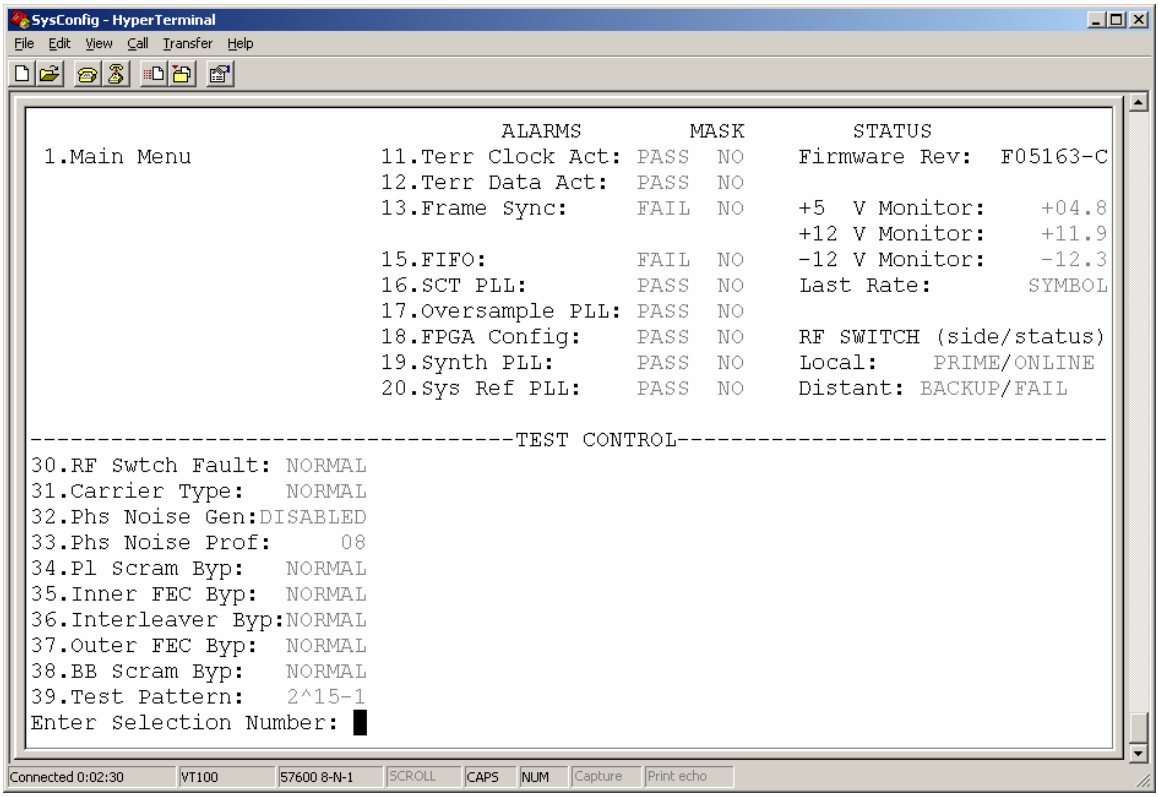


Figure 4-9. Test Control Menu

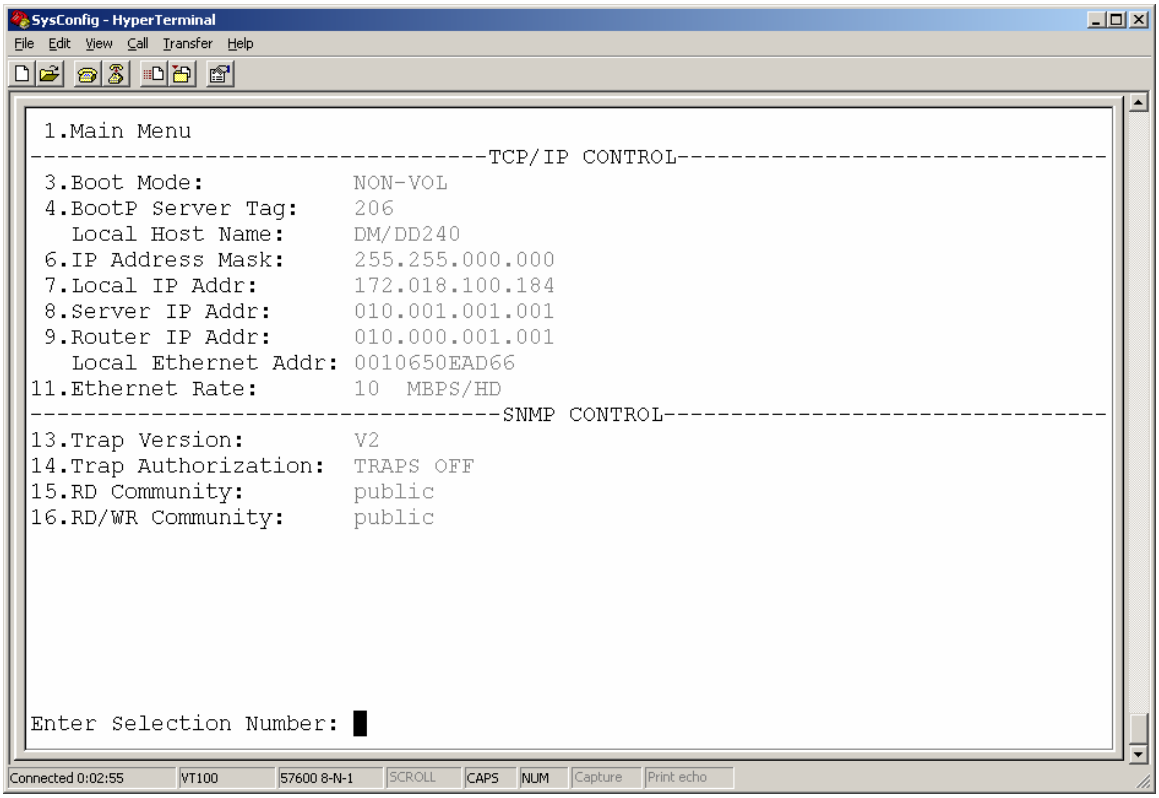


Figure 4-10. TCP/IP/SNMP Control Menu

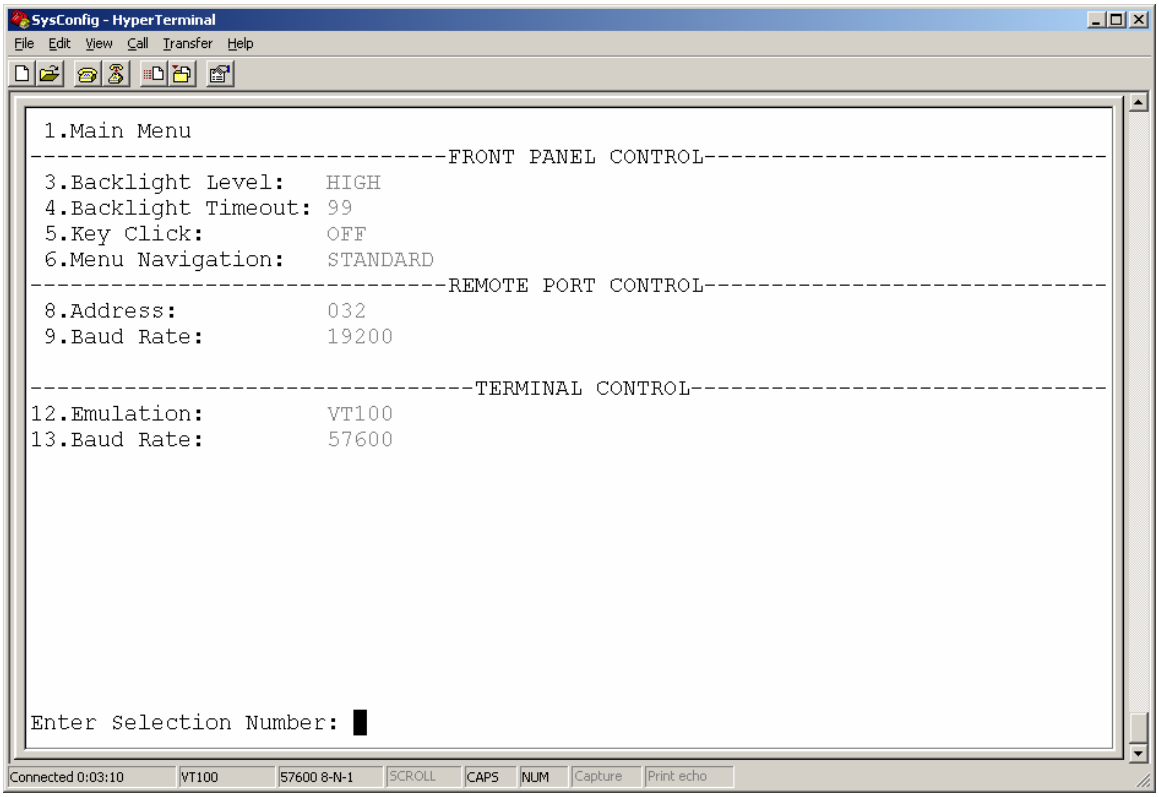


Figure 4-11. Front Panel/RLLP/Terminal Control Menu

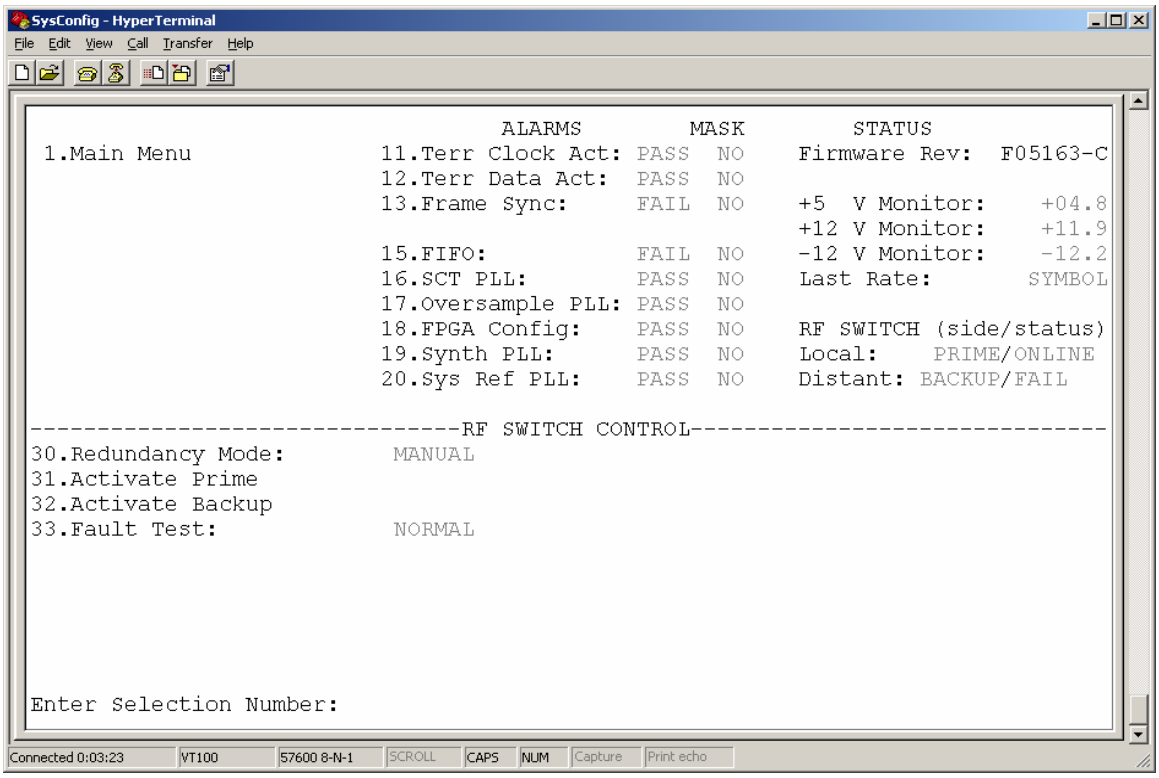


Figure 4-12. RF Switch Control Menu

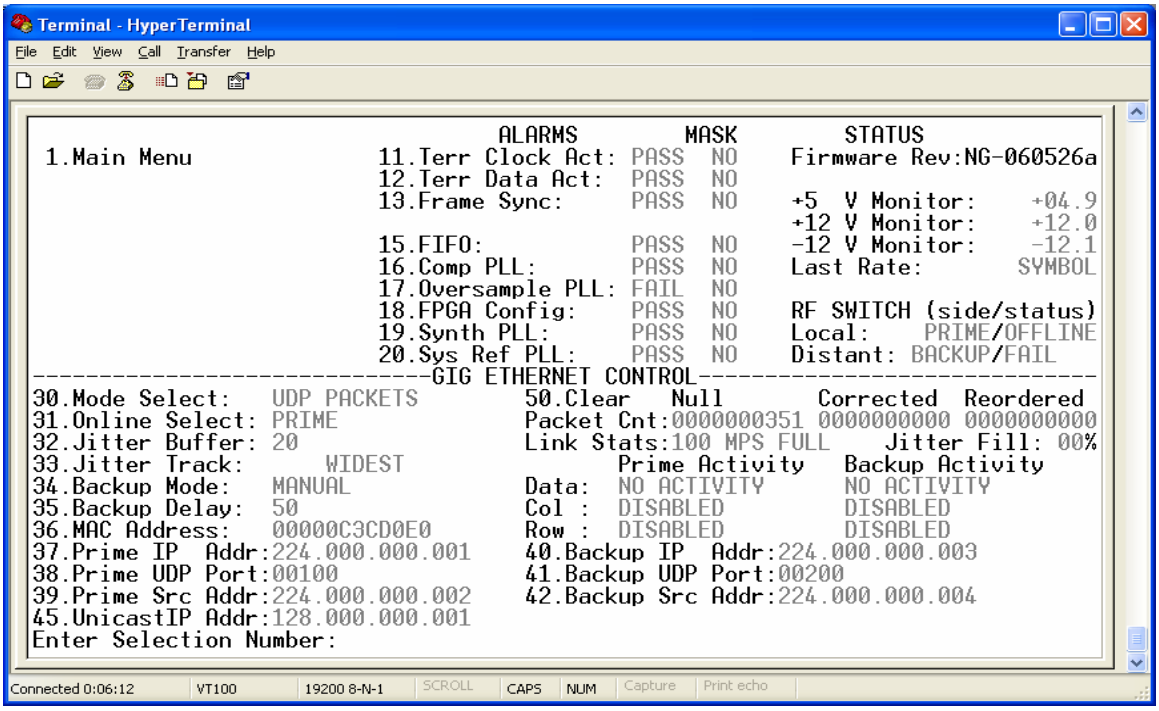


Figure 4-13. RF Switch Control Menu

Note: Only displayed when the Ethernet Data Interface is installed.


RADYNE

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 DM240 Connections

All DM240 connections are made to labeled connectors located on the rear of the unit. Any connection interfacing to the DM240 must be the appropriate mating connector. Refer to Figures 5-1a and 5-1b (non-PIIC), Figures 5-2a and 5-2b (PIIC), or Figure 5-3 DM240 PIIC (S2) for connector locations.

NOTE

PIICs may be different from those shown in Figures 5-2a and 5-2b. Refer to Section 5.14 for all PIIC pinouts.

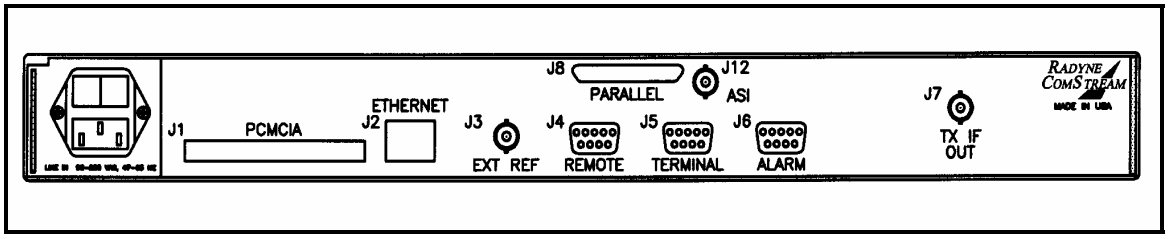


Figure 5-1a. DM240 Rear Panel Connectors (70/140 MHz)

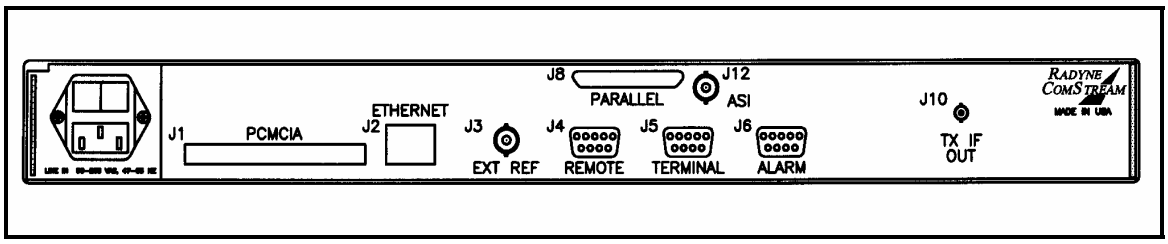


Figure 5-1b. DM240 Rear Panel Connectors (L-Band)

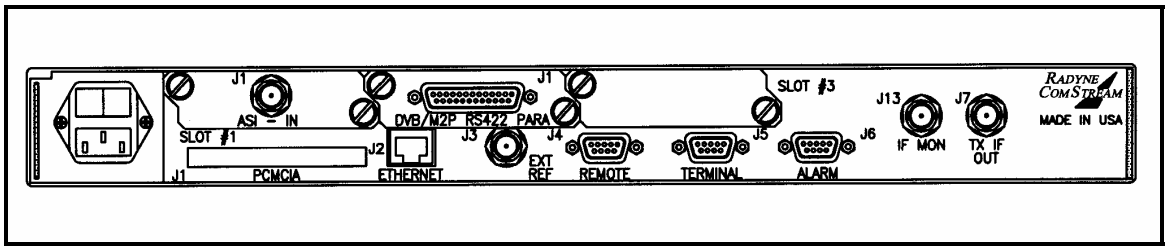


Figure 5-2a. DM240 Rear Panel Connectors (70/140 MHz) with PIIC

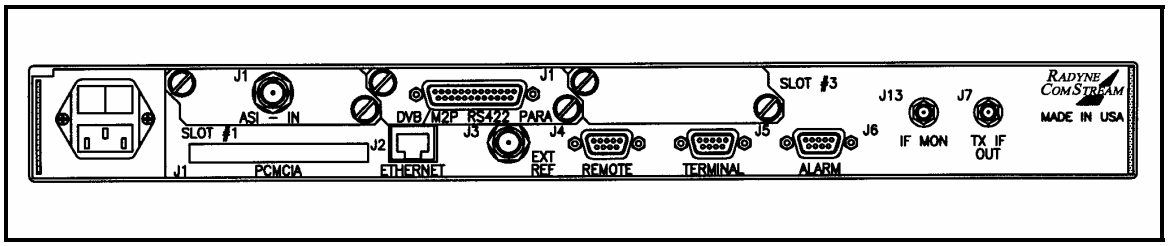


Figure 5-2b. DM240 Rear Panel Connectors (L-Band) with PIIC.

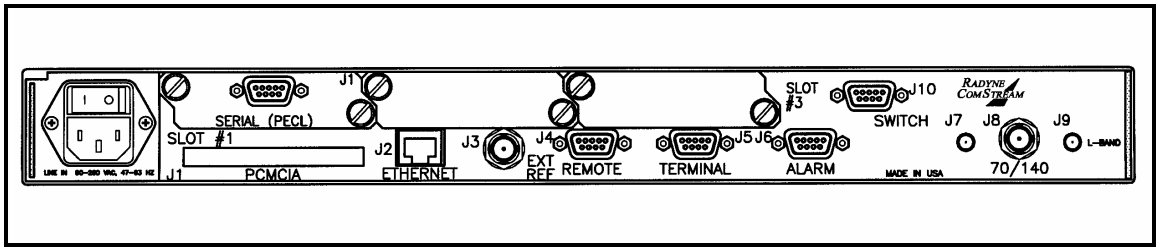


Figure 5-3. DM240 – PIIC (S2) Rear Panel Connectors (70/140 MHz and L-Band)

DM240 Optional Data Interfaces are shown in Figures 5-4 – 5-11.

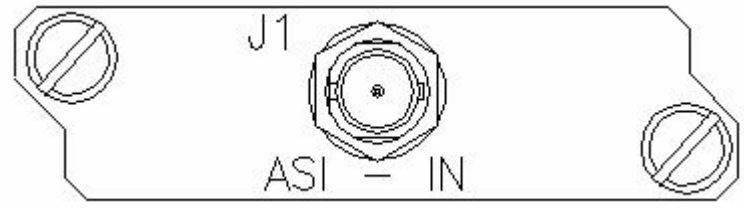


Figure 5-4. DM240 Rear Panel Connectors (ASI IN)

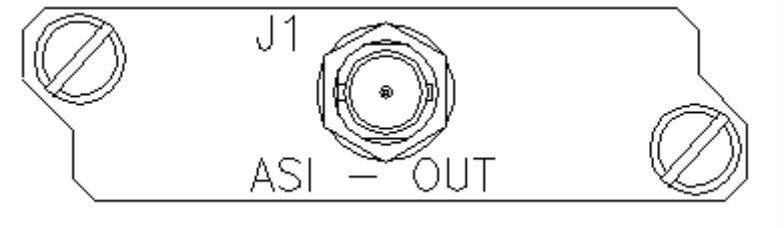


Figure 5-5. DM240 Rear Panel Connectors (ASI IN)

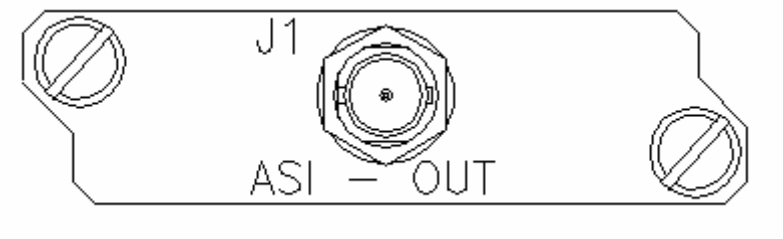


Figure 5-6. DM240 Rear Panel Connectors (ASI OUT)

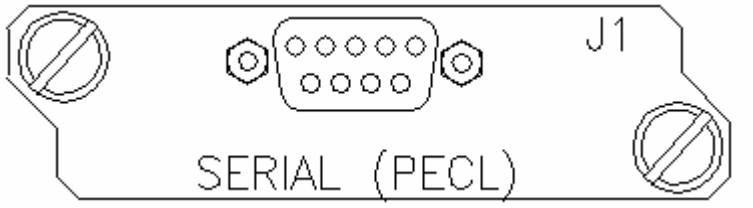


Figure 5-7. DM240 Rear Panel Connectors (Serial PECL)

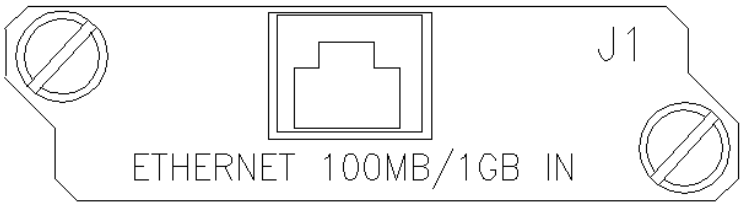


Figure 5-8. DM240 Rear Panel Connectors (Ethernet)

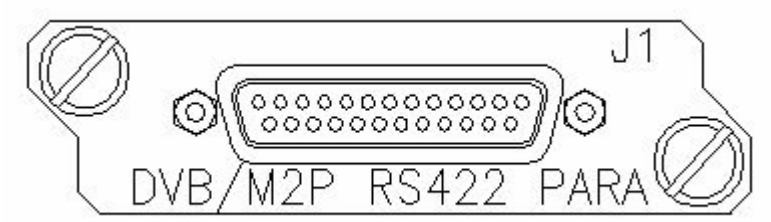


Figure 5-9. DM240 Rear Panel Connectors (DVB/M2P RS422 PARA)

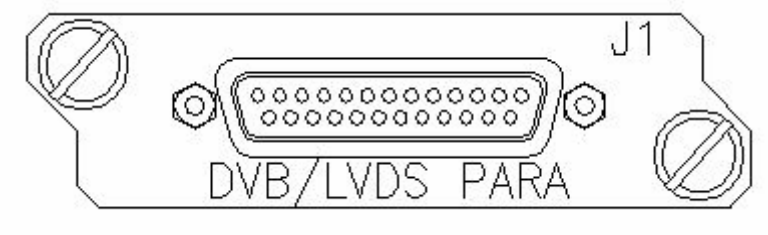


Figure 5-10. DM240 Rear Panel Connectors (DVB/LVDS PARA)

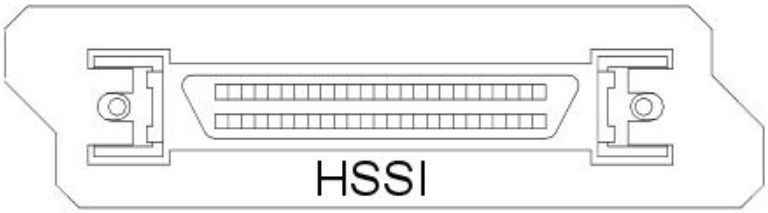


Figure 5-11. DM240 Rear Panel Connectors (HSSI)

5.1 AC Power

The unit is powered from a 100 – 240 VAC, 50 – 60 Hz source. Maximum unit power consumption is 25 W. The switch turns power on and off to the unit. A chassis ground connection can be made at the stud located to the lower right of the AC Power Connector.

5.2 PCMCIA Interface

The PCMCIA Interface (J1) allows a PCMCIA Card to be inserted for the following three main functions:

1. Feature Upgrade
2. Firmware Update
3. Custom Configuration

5.2.1 Feature Upgrade

If the customer requires feature upgrades such as 8PSK or 16QAM operation, contact the Radyne Sales Department for ordering information.

Once the customer has the Feature Upgrade Card, the following steps are performed:

1. Power off the unit.
2. Install the Feature Upgrade PCMCIA Card.
3. Power on the unit.
4. The Event LED (yellow) will blink while the feature upgrade is being added.
5. The Remote LED (green) will illuminate when the feature upgrade is complete.
6. Power off the unit.
7. Remove the PCMCIA Card.

If the red Fault LED illuminates, contact the Radyne ComStream Customer Service Department.

The loaded features will be available the next time the unit is powered on.

5.2.2 Firmware Update

To upgrade the firmware, a Firmware Upgrade PCMCIA Card is required. Follow the instructions from Section 5.2.1 for upgrade.

5.2.3 Custom Configuration

For a custom configuration, the customer orders a Custom Configuration PCMCIA Card.

Perform the following steps:

1. Power off the unit.
2. Install the Custom Configuration PCMCIA Card.
3. Power the unit on.

The unit will operate in the custom configuration as long as the PCMCIA Card is installed. If the card is removed and power is cycled, the original operation is restored.

5.3 Ethernet Interface (I/O)

The Ethernet Interface (J2) can be used for the monitor & control functions of the unit. The physical interface is a standard female RJ-45 Connector. Refer to Section 7.6 for programming details.

5.4 External Reference (Input)

The External Reference Input (J3) is supplied to allow the customer to phase-lock the modulator's internal oscillator to an external reference.

This female BNC Connector accepts a 1.5 – 5 Vp-p @ 50 Ohms. The frequency range of the external reference is 1 – 10 MHz in 8 kHz steps.

5.5 Remote Port (I/O)

The Remote Port Interface (J4) can be used for the monitor & control functions of the unit. The physical interface is a female 9-Pin D-Sub Connector. This bi-directional port complies with RS-485 Electrical Specifications. Refer to Section 7.6 for protocol and programming details. Pinouts are listed in Table 5-1.

Table 5-1. J4 - RS-485 Remote Control- 9-Pin 'D' Female

Pin No.	Signal	Description	Direction
1	Tx (B)	Transmit Data (+)	Output
5	GND	Ground	---
6	Tx (A)	Transmit Data (-)	Output
8	Rx (B)	Receive Data (+)	Input
9	Rx (A)	Receive Data (-)	Input

5.6 Terminal Port (I/O)

The Terminal Port Interface (J5) can be used for the monitor & control functions of the unit. The physical interface is a female 9-Pin D-Sub Connector. This bi-directional port complies with RS-232 Electrical Specifications. Refer to Section 4.6 for terminal interface details. The pinouts are listed in Table 5-2.

Table 5-2. J5 - RS-232 Terminal Port - 9-Pin 'D' Female

Pin No.	Signal Name	Description	Direction
3	TxD	Transmit Data	Output
2	RxD	Receive Data	Input
5	GND	Ground	---
7	RTS	Request to Send	Output
8	CTS	Clear to Send	Input

5.7 Alarm Port

The Alarm Connector (J6) is used to indicate the fault condition of the modulator to external equipment. This male 9-Pin D-Sub Connector provides connection to two Form-C relays and an open collector output. The user can distinguish between major and minor alarms with the relays. Refer to Table 5-3 for connector pinouts. Table 5-4 below describes the alarm indications.

Table 5-3. Alarm Connector J6 Pin Assignment	
Pin No.	**Connection**
1	Relay 1 NO
2	Relay 1 C
3	Relay 1 NC (Major Alarm)
4	Ground
5	No Connect
6	Mod Fault (Open Collector)
7	Relay 2 NO
8	Relay 2 C
9	Relay 2 NC (Minor Alarm)

Table 5-4. Alarm Indications	
Alarm	**Pin Description**
None	1 – 2 shorted, 7 – 8 shorted, open collector output driven low
Minor	1 – 2 shorted, 8 – 9 shorted, open collector output driven low
Major	2 – 3 shorted, 7 – 8 shorted, open collector output open

5.8 IF Port (Output)

There are 4 available options. If the 70/140 MHz IF is ordered, the IF Port will be a 75-Ohm female BNC Connector. The power level is programmable from -20 to +5 dBm in 0.1 dBm steps. The IF Frequency can be programmed to 50 – 90 MHz or 100 – 180 MHz, in 1 Hz steps. Refer to Figure 5-1a for the non-PIIC version and Figure 5-2a for the PIIC version.

If L-Band IF is ordered, the IF Port will be a 50 Ohm SMA female connector. The power level is programmable from -30 to -5 dBm, in 0.1 dBm steps. The IF Frequency can be programmed to 950 – 1750 MHz, in 1 Hz steps. Refer to Figure 5-1b for the L-Band 950 – 1750 non-PIIC version or Figure 5-2b for PIIC version.

Refer to Figure 5-3 for the DM240 PIIC with DVB-S2 Option. This configuration supports both IF and L-Band frequencies. The IF frequency is programmable from 50 to 90 MHz and 100 to 180 MHz in 1 Hz steps. The IF port will be a 75 Ohm female BNC connector. The L-Band is programmable from 950-2050 MHz in 1 Hz steps. The L-Band port is a 50 Ohm SMA female connector. The output level for IF and L-Band is -25 to 0 dBm programmable in 0.1 dBm steps. The unit includes a monitor port that reflects the output power level of the selected frequency output. The monitor port is an SMA female connector that is -20 dBc +/-5dB.

5.9 RF Switch Control (PIIC Interface Only)

Each modulator has a 9-pin D-sub connector for the switch. A 1:1 cable is connected from each modulator to the switch. The pinout for the control connector is listed in Table 5-5.

Table 5-5. RF Switch Control 9-pin 'D' Female

Pin No.	Signal	Description	Direction
5	Signal Ground	Modulator GND	Output
9	Backup Select	One modulator is designated as Backup. This line is tied low on the Backup Mod Control connector.	Input
1	+DC	+12V DC power	Output
2	nPrime_Sel	Forces On-Line output to Prime	Output
7	nBackup_Sel	Forces On-Line output to Backup	Output
8	Local Fault	Fault output of modulator	Output
4	Distant Fault	State of distant modulator	Input
3	Switch-State	Switch state monitor. Logic '1' = Prime Online	Input
6	NC	---	---

5.10 ASI/Parallel RS-422 Interface

This interface supports four terrestrial interface types.

5.10.1 M2P (Parallel, RS-422)

M2P is supported on the DB-25 female connector. It complies with RS-422 Electrical Specifications. Refer to Table 5-6 for pinouts for this connector. The maximum data rate is 238 Mbps.

Table 5-6. J8 – M2P RS-422 Parallel - 25-Pin Female

Pin No.	Signal Name	Direction
1	OUTCLK+	Output
14	OUTCLK-	Output
2	CLK+	Input
15	CLK-	Input
3	SYNC+	Input
16	SYNC-	Input
4	VALID+	Input
17	VALID-	Input
5	D0+	Input

18	D0-	Input
6	D1+	Input
19	D1-	Input
7	D2+	Input
20	D2-	Input
8	D3+	Input
21	D3-	Input
9	D4+	Input
22	D4-	Input
10	D5+	Input
23	D5-	Input
11	D6+	Input
24	D6-	Input
12	D7+	Input
25	D7-	Input
13	Not Connected	-

5.10.2 DVB (Parallel, RS-422)

The DVB Interface is also supported on the DB-25 Female Connector. It complies with RS-422 Electrical Specifications. The pinouts for this connector are given in Table 5-7.

Table 5-7. J8 - DVB RS-422 Parallel, 25-Pin Female

Pin No.	Signal Name	Direction
1	Clock +	Input
2	System GND	Ground
3	D7 +	Input
4	D6 +	Input
5	D5 +	Input
6	D4 +	Input
7	D3 +	Input
8	D2 +	Input
9	D1 +	Input
10	D0 +	Input
11	DVALID +	Input
12	PSYNC +	Input

13	Cable Shield	Input
14	Clock -	Input
15	System GND	Ground
16	D7 -	Input
17	D6 -	Input
18	D5 -	Input
19	D4 -	Input
20	D3 -	Input
21	D2 -	Input
22	D1 -	Input
23	D0 -	Input
24	DVALID -	Input
25	SYNC -	Input

5.10.3 ASI (Asynchronous Serial Interface)

The ASI interface is supported on the BNC Connector. The interface complies with DVB ASI Electrical Specifications. The maximum data rate is 216 Mbps.

5.10.4 AASI (Advanced Asynchronous Serial Interface)

The AASI Interface is a specialized mode of the normal ASI Interface. The interface allows the user to input a variable rate data stream into the modulator (as long as the input data rate does not exceed the programmed data rate). The AASI Interface inserts MPEG-2 Null Packets to provide a constant data rate to the modulator.

5.11 ASI/Parallel LVDS Interface

This interface is identical to the ASI/Parallel RS-422 Interface except that the electrical specifications of the Parallel Interface (M2P, DVB) comply with LVDS instead of RS-422.

5.12 Serial RS-422 Interface

This serial interface is supported on a DB-37 Female Connector. It complies with RS-422/ RS-449 Electrical Specifications. Refer to Figure 5-8 for the pinouts for this interface. The maximum data rate is 16 Mbps.

Table 5-8. J9 - Serial RS-422 Interface

Pin No.	Signal Name	Direction
1	Shield	GND
4	Send Data (SD) A	Input
5	Send Timing (SCT) A	Output
7	Request To Send (RTS) A	Output
9	Clear to Send (A)	Output
11	Data Mode (DM) A	Output
14	NA	---
15	NA	---
17	Terminal Timing (SCTE) A	Input
19	Signal GND	GND
20	Common	GND
22	Send Data (SD) B	Input
23	Send Timing (SCT) B	Output
25	Request to Send (RTS) B	Input
27	Clear To Send (CTS) B	Output
29	Data Mode (DM) B	Output
33	NA	---
35	Transmit Timing (SCTE) B	Input
37	Common	GND

5.13 G.703 Interface

The G.703 Interface supports the following G.703 Rates: E1, T1, E2, T2, E3, T3, and STS-1. The interface complies with G.703 Electrical Specifications. Table 5-9 lists the data rate and physical interface for each rate.

NOTE

All balanced rates use Pins 1 (-) and 9 (+) of DB-15 connector J14.

Table 5-9. Available G.703 Interfaces

G.703 Rate	Data Rate (Mbps)	Wire Type	Connector	Impedance (Ohms)	Coding
E1	2.048	Coax	J11 Female BNC	75	HDB3
E1	2.048	Pair	J14 DB-15	120	HDB3
T1	1.544	Pair	J14 DB-15	100	AMI/B8ZS
E2	8.448	Coax	J10 Female BNC	75	HDB3
T2	6.312	Coax	J9 Female BNC	75	B8ZS
T2	6.312	Pair	J14 DB-15	110	B6ZS
E3	34.368	Coax	J8 Female BNC	75	HDB3
T3	44.736	Coax	J8 Female BNC	75	B3ZS
STS-1	51.84	Coax	J8 Female BNC	75	B3ZS

5.14 HSSI Interface

The HSSI (High-Speed Serial Interface) complies with the HSSI Functional and Electrical Specifications. The physical interface is a 50 Pin SCSI-2 Type Connector. Electrical levels are ECL. The pinouts for this interface are listed in Table 5-10.

Table 5-10. J9 – HSSI (High-Speed Serial Interface) 50-Pin Connector

Pin No. (+)	Pin No. (–)	Signal Name	Description	Direction
1	26	SG	Signal Ground	---
2	27	RT	Receive Timing	Output
3	28	CA	DCE Available	Output
4	29	RD	Receive Data	Output
5	30	LC	Loopback Circuit C	Output
6	31	ST	Send Timing (SCT)	Output
7	32	SG	Signal Ground	---
8	33	TA	DTE Available	Input
9	34	TT	Terminal Timing (SCTE)	Input

10	35	LA	Loopback Circuit A	Input
11	36	SD	Send Data	Input
12	37	LB	Loopback Circuit B	Input
13	38	SG	Signal Ground	---
14 - 18	39 – 43	5 Ancillary to DCE	Reserved	Input
19	44	SG	Signal Ground	---
20 - 23	45 - 48	4 Ancillary from DCE	Reserved	Output
24	49	TM	Test Mode	Output-

5.15 Plug-In Interface Cards (PIICs)

If the customer orders a unit configured for use with PIICs (Figure 5-4), greater flexibility for changing and upgrading the terrestrial interface will be available. Each of the interfaces described below consists of a single card with a metal back plate. Each interface can be plugged into one of three slots on the rear of the unit.

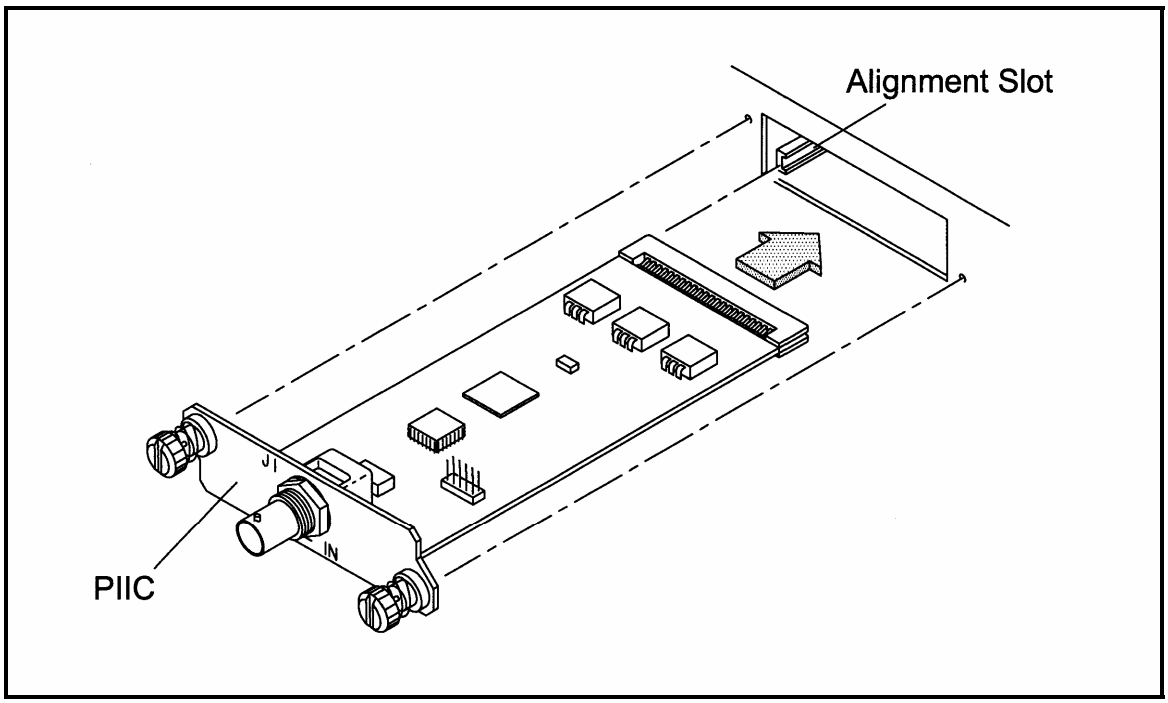


Figure 5-4. Typical PIIC

To insert the PIIC, slide the card completely into the appropriate slot (1, 2, or 3) ensuring that it lines up with the alignment slots. When the PIIC is fully seated, tighten the two screws hand tight.

5.15.1 ASI PIIC

This interface supports two terrestrial interface types.

5.15.1.1 ASI (Asynchronous Serial Interface)

The interface complies with DVB ASI Electrical Specifications. The maximum data rate is 216 Mbps.

5.15.1.2 AASI (Advanced Asynchronous Serial Interface)

The AASI Interface is a specialized mode of the normal ASI Interface. The interface allows the user to input a variable rate data stream into the modulator (as long as the input data rate does not exceed the programmed data rate). The AASI Interface inserts MPEG-2 Null Packets to provide a constant data rate to the modulator.

5.15.2 ASI Monitor

Incoming data from the active PIIC slot is output on this interface, allowing the customer to monitor the incoming data stream. The interface complies with DVB ASI Electrical Specifications.

5.15.3 Parallel RS-422 Interface

This interface supports two terrestrial interface types and complies with RS-422 Electrical Specifications.

5.15.3.1 M2P

Refer to Table 5-6 for pinouts.

5.15.3.1 DVB

Refer to Table 5-7 for pinouts.

5.15.4 Parallel LVDS Interface

This interface is identical to the Parallel RS-422 Interface except that it complies with the LVDS Electrical Specification.

5.15.5 DirecTV Positive Emitter Coupled Logic (PECL) Interface

The DirecTV Serial Interface is supported on a DB-9 Female Connector. The electrical levels are +5 V PECL. The impedance on all inputs is 110 Ohms.

The DM240 supplies the SCT Output, which is the programmed terrestrial data rate. The user supplies the Clk, Data, and Snc Inputs.

The DM240 expects the Sync Signal to be asserted during the first bit of every packet. The packet size is 1176 bits (147 x 8). The first 1040 bits (130 x 8) are payload data, and the remaining bits in the packet are ignored (17 x 8). 16 Reed-Solomon check bytes and a sync byte are added to the payload data, and the DM240 expects signals to transition on the rising edge of the Clk.

The DM240 will assert the major alarm outputs when there is a loss of terrestrial clock.

Refer to Table 5-11 for pinouts for this connector.

Table 5-11. PECL DB-9 Female Connector		
Pin No.	**Signal Name**	**Direction**
1	Signal Ground	–
3	CLK+	Input
7	CLK-	Input
2	DATA+	Input
6	DATA-	Input
4	SYNC+	Input
8	SYNC-	Input
5	ECLK+	Output
9	ECLK-	Output

5.15.6 HSSI Interface

The HSSI (High-Speed Serial Interface) complies with the HSSI Functional and Electrical Specifications. The physical interface is a 50 Pin SCSI-2 Type Connector. Electrical levels are ECL. The pinouts for this interface are listed in Refer to Table 5-10 for pinouts for this interface.

5.16.7 Ethernet Interface (J1)

The PIIC Ethernet Data Interface (EDI) is a full duplex 100/1000 BaseT supported by an RJ45 connector. The EDI supports the input of generic UDP packets or Pro-MPEG COP3 formatted packets. With Pro-MPEG input, a powerful video-specific packet-based forward error correction (FEC) algorithm is also available providing a cost-effective solution for error recovery in video streams transported over public or private IP networks.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Maintenance and Troubleshooting

6

This section discusses unit maintenance and troubleshooting for the DM240-DVB High-Speed Digital Modulator.

6.0 Periodic Maintenance

The DM240 modulator requires no periodic field maintenance procedures. 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 DM240. If this does not cure the problem, wiring or power should be suspect.

There is no external fuse on the DM240. The fuse is located on the power supply assembly inside the case, and replacement is not intended in the field.


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Technical Specifications

7

7.0 Introduction

This section defines the technical performance parameters and specifications for the DM240-PIIC DVB Digital Modulator.

7.1 IF Specification

Tx IF:	50 to 90 MHz, 100 to 180 MHz (70/140 MHz), 950 to 1750 MHz (L-Band)
IF Step Size:	100 Hz
Frequency Stability:	3 ppm
Power Output:	0 to -25 dBm
Power Output Accuracy:	± 1.0 dB
Power Output Stability:	± 0.5 dB
Carrier Mute:	-55 dB
Spurious Emissions:	-55 dBc, 50 to 90 and 100 to 180 MHz (70/140 MHz), 950 to 2050 MHz (L-Band) -45 dBc, all other frequencies
Output Impedance:	50 Ohm (L-Band), 75 Ohm (70/140 MHz)
Return Loss:	20 dB (70/140 MHz), 14 dB (L-Band)
Phase Noise:	1 kHz -73 dBc 10 kHz -86 dBc 100 kHz -100 dBc 1 MHz -120 dBc
Output Connector:	BNC Female (70/140 MHz), SMA Female (L-Band)
External Reference:	1 10 10 MHz in 8 kHz steps, better than 10 ppm 1.5 to 5 Vp-p, 50 Ohms

7.2 Baseband Specification

7.2.1 DVB-S

Compliance	EN 300-421 and EN 301-210
Modulation Types:	BPSK, QPSK, 8PSK, 16QAM
Data Rate:	1 to 59.5 Mbps in 1 bps steps (BPSK) 1 to 119 Mbps in 1 bps steps (QPSK) 2 to 181 Mbps in 1 bps steps (8PSK) 3 to 238 Mbps in 1 bps steps (16QAM)
Symbol Rate:	1 to 68 Msps in 1 sps steps
Frame Size:	187 payload bytes, 1 sync byte, 16 parity bytes
Terrestrial Framing:	204, 188, 187 (Unframed data)
Randomization for Energy Dispersal:	Per EN 300-421
Outer Code:	Reed-Solomon (204,188,T = 8)
Interleaver:	Convolutional, I = 12
Inner Code:	1/2, 2/3, 3/4, 5/6, 7/8 (BPSK, QPSK) 2/3, 5/6, 7/8 (8PSK) 3/4, 7/8 (16QAM) Viterbi K = 7, G1 = 171oct G2 = 133oct

Baseband Roll-Off:	Square Root Raised Cosine 0.35 (BPSK, QPSK, 8PSK, 16QAM) 0.25 (8PSK, 16QAM) 0.20 (BPSK, QPSK)
Terrestrial Input Clock Accuracy:	400 ppm (Maximum)
Test Pattern:	Internal 2^{15}-1 and 2^{23}-1 Pseudo-Random Number Generators

7.2.2 DVB-S2-BS-NBC (PIIC Interface Only)

Compliance	ETSI EN 302 307 v1.1.1 (normative)
Modulation Types:	QPSK, 8PSK
Data Rate:	1 to 54 Mbps in 1 bps steps (QPSK) 2 to 81 Mbps in 1 bps steps (8PSK)
Symbol Rate:	1 to 32.5 Msps in 1 sps steps
Terrestrial Framing:	188 (1 sync byte, 187 payload bytes)
Baseband Processing:	Per ETSI EN 302 307 v1.1.1
Block Size:	64 Kbits
FEC Code:	BCH + LDPC
Interleaver:	Block Interleaver, per ETSI EN 302 307 v1.1.1
Inner Code Rate:	1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (QPSK) 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (8PSK)
Baseband Roll-Off	Square Root Raised Cosine 0.20, 0.25, 0.35
Terrestrial Input Clock Accuracy:	400 ppm (max)
Test Pattern:	Internal 2^{15}-1 and 2^{23}-1 Pseudo-Random Number Generators

7.3 Interface Types Available

7.3.1 Data Interfaces (Non PIIC)

ASI/RS-422 Parallel:	ASI, Serial, BNC (female) DVB/M2P, Parallel, RS-422, DB-25 (female)
ASI / LVDS Parallel:	ASI, Serial, BNC (female) DVB/M2P, Parallel, LVDS, DB-25 (female)
HSSI:	HSSI, Serial, 50 pin SCSI-2 type connector (female)
G.703:	T1, E1, T2 (balanced), serial, 15 Pin D Connector (female) E1,T2, T2, E2, E3, T3, STS-1 (unbalanced), serial, BNC (female)
RS-422 Serial:	RS-422/RS-449, Serial (<16 Mbps), DB-37 (Female)

7.3.2 Plug In Interface Card (PIIC)

ASI	ASI, Serial, BNC (female)
RS-422 Parallel	DVB/M2P, Parallel, RS-422, DB-25 (female)
LVDS Parallel	DVB/M2P, Parallel, LVDS, DB-25 (female)
HSSI	HSSI, Serial, 50 pin SCSI-2 type connector (female)
Serial PECL Interface:	DTV, Serial, PECL, DB-9 (Female), 1 to 100 Mbps
Ethernet	100/1000 BaseT, RJ45, Full Duplex

7.4 Monitor and Control

Interface:	Serial RS-485 and RS-232, Ethernet 10 Base-T
Parameters Controlled:	
	IF Frequency IF Output Level IF Output On/Off Modulation Type FEC Rate Spectral Inversion Data Rate Symbol Rate Roll-Off Interface Type Terrestrial Framing Clock/Data Sources Clock/Data Polarity Reference Freq Source External Reference Freq Test Modes
Parameters Monitored:	
	Alarms (Major/Minor) Stored Alarms (Major/Minor) Faults Stored Faults

7.5 Environmental

Prime Power	100 to 240 VAC, 50 – 60 Hz, 40 Watts Maximum
Operating Temperature:	0 to 50°C Humidity: Up to 95%, Non-condensing
Storage Temperature:	-20 to 70°C Humidity: Up to 99%, Non-condensing

7.6 Physical

Weight:	7 lb. (3.2 Kg)
Size:	19” W x 17” D x 1.75" H (48.3 x 43.2 x 4.45 cm)

7.7 Options

50 Ohm IF Output (on 70/140 MHz IF)
48 VDC Operation


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Remote Operations

A

CAUTION!!

When new features are added to Radyne Inc. equipment, the control parameters are appended to the end of the Non-Volatile Section of the Remote Communications Specification, and status of the features, if any, are added at the end of the Volatile Section. If a remote M&C queries two pieces of Radyne Inc. equipment with different revision software, they could respond with two different sized packets. The remote M&C MUST make use of the non-volatile count value to index to the start of the Volatile Section. If the remote M&C is not aware of the newly added features to the product, it should disregard the parameters at the end of the Non-Volatile Section and index to the start of the Volatile Section.

Before creating any software based on the information contained in this document, contact the Radyne Inc. Customer Service Department (602-437-9620) to find out if the software revision for that piece of equipment is current and that no new features have been added since the release of this document.

A.0 DM240 Opcode Command Set

The DM240 Opcode Command Set is listed below.

A.1 Modulator Command Set

Command	Opcode
Query Mod All	**2400h**
Query Mod Latched Alarms	2405h
Query Mod Current Alarms	2408h
Query Mod Status	240Bh
Query Time	240Eh
Query Date	240Fh
Query Time and Date	2410h
Query Firmware Part/Rev	2414h
Query AASI NULL PID (w/IPSat interface card only)	2456h
Query IPSat Burst Demod Count (w/IPSat interface card only)	2457h

Query IPSat Control PID (w/IPSat interface card only)	2458h
Query IPSat Enable (w/IPSat interface card only)	2459h
Query IPSat User Data Rate (w/IPSat interface card only)	245Ah
Query PCR Restamping	245Bh
Query Multi-PIIC Configuration (w/Multi-PIIC interface card only)	245Ch
Query Multi-PIIC Status (w/Multi-PIIC interface card only)	245Dh
Query RF Switch Status (w/RF Switch hardware only)	2560h
Command Mod Configuration	2601h
Command Mod Single Parameter:	
Frequency	2602h
Data Rate	2604h
Modulation Type	2606h
Inner FEC Rate	2607h
Tx On/Off	2609h
Carrier Type	260Ah
Input Clock Source	260Bh
Input Clock Polarity	260Ch
Transmit Power Level	260Fh
Spectrum	2611h
Reference Source	2616h
Network Specification	2619h
External Reference Frequency	261Bh
Data Polarity	2620h
Terrestrial Interface Type	2621h
Terrestrial Framing	2640h
Carrier Set Roll Off	2641h
Output Clock Source	2642h
Symbol Rate	2643h
AASI NULL PID (w/IPSat interface card only)	2656h
IPSat Burst Demod Count (w/IPSat interface card only)	2657h
IPSat Control PID (w/IPSat interface card only)	2658h
IPSat Enable (w/IPSat interface card only)	2659h
Command PCR Restamping	265Bh
Command Multi-PIIC Configuration (w/Multi-PIIC Interface Card only)	265Ch
Command Clear Latched Alarms	2C03h
Command Set Time	2C04h
Command Set Date	2C05h
Command Set Time and Date	2C06h
Command RF Switch Redundancy Mode (w/RF Switch hardware only)	2F40h

Command RF Switch Fault Test (w/RF Switch hardware only)	2F41h
Command RF Switch Activate Side (w/RF Switch hardware only)	2F42h

A.2 Detailed Command Descriptions

Opcode: <2400h> (Query Mod All) Query a Modulator's Configuration and Status

Query Response		
<1>	Number of Nonvol bytes	
Configuration Bytes		
<4>	IF Frequency	Binary Value, units Hz in 100Hz steps. 50000000Hz to 180000000Hz 70/140 950000000Hz to 2050000000Hz L-Band
<2>	Reserved	TBD
<4>	Data Rate	Binary Value, 1bps steps
<4>	External Reference	Binary Value, units Hz in 8000Hz steps, e.g. 1000000Hz, 1008000Hz, etc. 256000Hz to 10000000Hz
<1>	Frequency Reference Source	0 = Internal, 1 = External
<1>	Modulation Type	0 = QPSK, 1 = BPSK, 2 = 8PSK, 3 = 16QAM
<1>	Inner FEC Rate	1 = 1/2 Rate, 2 = 2/3 Rate, 3 = 3/4 Rate, 4 = 5/6 Rate, 5 = 7/8 Rate, 6 = 6/7 Rate, 7=4/5, 8 = 8/9 Rate, 9 = 9/10 Rate, 128 = 1/4 Rate, 129 = 1/3 Rate, 130 = 2/5 Rate, 131 = 3/5 Rate
<1>	Reserved	TBD, Default = 1
<1>	Reserved	TBD, Default = 1
<1>	Reserved	TBD, Default = 0
<1>	Reserved	TBD, Default = 0
<2>	Transmit Power Level	Signed Value. 0 to –250 (0.0 to –25.0 dBm)
<1>	Carrier Control	0 = Off, 1 = On
<1>	Carrier Test	0 = Normal, 1 = CW, 2 = Dual, 3 = Offset, 4 = Pos FIR, 5 = Neg FIR
<1>	Spectrum	0 = Inverted, 1 = Normal
<1>	Reserved	TBD, 0 = Default

<1>	Tx Interface Type	0 = Serial, 1 = Parallel, 2 = ASI_Norm, 3 = ASI_Null, 4 = G.703E3, 5 = G.703T3, 6 = G.703STS-1, 7 = HSSI, 8 = Parallel DVB, 9 = Parallel M2P, 10 = None, 13 = OC3, 14 = STM-1, 15 = G.703E2, 16 = G.703T2Bal, 17 = G.703T2Unbal, 18 = G.703E1Bal, 19 = G.703E1Unbal, 20 = G.703T1AMI 21 = G.703T1B8ZS
<1>	Input Clock Polarity	0 = Normal, 1 = Inverted
<1>	Data Polarity	0 = Normal, 1 = Inverted
<1>	Input Clock Source	0 = SCTE, 1 = SCT
<1>	Reserved	TBD, Default = 0
<11>	Reserved	TBD
<1>	Reserved	TBD
<1>	Major Alarm Mask	Bit 0 = Spare Bit 1 = Transmit Oversample PLL Lock Bit 2 = FPGA Config Error Bit 3 = IF Synthesizer PLL Lock Bit 4 = External Reference PLL Lock Bit 5 = SCT PLL Lock Bit 6 = Spare Bit 7 = Spare 0 = Mask, 1 = Allow
<1>	Minor Alarm Mask	Bit 0 = Spare Bit 1 = Loss Terrestrial Clock Bit 2 = Loss Terrestrial Data Bit 3 = FIFO Error Bit 4 = Spare Bit 5 = Terrestrial Framing Error Bit 6 = Spare Bit 7 = Spare 0 = Mask, 1 = Allow

<1>	Common Fault Mask	Bit 0 = -12 V Alarm Bit 1 = +12 V Alarm Bit 2 = +5 V Alarm Bit 3 = Spare Bit 4 = Spare Bit 5 = Spare Bit 6 = Spare Bit 7 = Spare 0 = Mask, 1 = Allow
<1>	Reserved	TBD, Default = 0
<4>	Symbol Rate	Symbol Rate in Symbols Per Second
<1>	Terrestrial Framing	0 = 188 Byte, 1 = 204 Byte, 2 = No Framing
<1>	Roll Off	0 = 0.35, 25 = 0.25, 1 = 0.20
<1>	Reserved	TBD
<1>	Output Clock Source	0 = SCTE, 1 = SCT, 2 = None
<1>	Network Spec	0 = DVB-S, 1 = DirectPC 9 = DirectTV 11 = DVB-S2 BS NBC, 13 = DirectTV AMC NBC
<1>	BB Scrambler Bypass	0 = Normal, 1 = Bypass
<1>	Outer FEC Bypass	0 = Normal, 1 = Bypass
<1>	Test Pattern	0 = None, 1 = $2^{15} - 1$, 23 = 2^{23}-1
<1>	Last Rate Control	0 = Symbol Rate, 1 = Data Rate, 2 = Auto
<1>	Interleaver Bypass	0 = Bypass, 1 = Normal
<1>	PCR Restamping	0 = Off, 1= On
<1>	Multi-PIIC Mode	Without Multi-PIIC Card: 1 = Manual With Multi-PIIC Card: 1 = Manual, 2 = Redundancy

<1>	Redundancy Mode	Without Multi-PIIC Card or Manual Multi-PIIC Mode: 0 With Multi-PIIC Card: 0 = Force Prime, 1 = Force Backup, 2 = Manual Revert, 3 = Auto-Revert
<1>	Prime PIIC Slot	Without Multi-PIIC Card: 1 With Multi-PIIC Card: 1 – 3
<1>	Backup PIIC Slot	Without Multi-PIIC Card: 1 With Multi-PIIC Card: 1 – 3
<1>	Pilot Symbols	0 = Off, 1= On
<1>	Inner FEC Bypass	0 = Normal, 1 = Bypass
<1>	PL Scrambler Bypass	0 = Normal, 1 = Bypass
<2>	Reserved	Set to 0
<2>	Reserved	Set to 1
<4>	Gold Code Seq Index	0 to 262142
Status Bytes		
<1>	Reserved	TBD
<1>	Reserved	TBD
<1>	Reserved	TBD
<1>	Major Alarm	Bit 0 = Spare Bit 1 = Transmit Oversample PLL Lock Bit 2 = FPGA Config Error Bit 3 = IF Synthesizer PLL Lock Bit 4 = External Reference PLL Lock Bit 5 = SCT PLL Lock Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail

<1>	Minor Alarm	Bit 0 = Spare Bit 1 = Loss Terrestrial Clock Bit 2 = Loss Terrestrial Data Bit 3 = FIFO Error Bit 4 = Spare Bit 5 = Terrestrial Framing Error Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Common Fault	Bit 0 = -12 V Alarm Bit 1 = +12 V Alarm Bit 2 = +5 V Alarm Bit 3 = Spare Bit 4 = Spare Bit 5 = Spare Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Latched Major Alarm	Bit 0 = Spare Bit 1 = Transmit Oversample PLL Lock Bit 2 = FPGA Config Error Bit 3 = IF Synthesizer PLL Lock Bit 4 = External Reference PLL Lock Bit 5 = SCT PLL Lock Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Latched Minor Alarm	Bit 0 = Spare Bit 1 = Loss Terrestrial Clock Bit 2 = Loss Terrestrial Data Bit 3 = FIFO Error Bit 4 = Spare Bit 5 = Terrestrial Framing Error Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Latched Common Fault	Bit 0 = -12 V Alarm Bit 1 = +12 V Alarm Bit 2 = +5 V Alarm Bit 3 = Spare Bit 4 = Spare Bit 5 = Spare Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Reserved	
<1>	+5 Voltage	Implied Decimal Point. 49 = +4.9 V
<1>	+12 Voltage	Implied Decimal Point. 121 = +12.1 V
<1>	-12 Voltage	-12 V. Implied Decimal Point and Minus Sign. 118 = -11.8 V

<2>	Reserved	TBD
<2>	Reserved	TBD
<1>	Last Rate Status	0 = Symbol Rate, 1 = Data Rate
<1>	Active PIIC Slot	Without Multi-PIIC Card: 1 With Multi-PIIC Card: 1 – 3
<1>	Slot 1 PIIC Type	Without Multi-PIIC Card: 0x01 = RS-422 Serial 0x07 = ASI and RS422 Parallel 0x08 = ASI and LVDS Parallel 0x83 = G.703 (E1,T1,E2,T2 E3, T3, STS-1) 0x84 = HSSI 0x89 = IPSAT 0xFF = None With Multi-PIIC Card: 0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel 0x96=HSSI 0x9C=DirecTV (PECL) 0x9D=Ethernet 0xD3=ASI Out (monitor) 0xFF = None
<1>	Slot 2 PIIC Type	Without Multi-PIIC Card: Unused With Multi-PIIC Card: 0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel 0x96=HSSI 0x9C=DirecTV (PECL) 0x9D=Ethernet 0xD3=ASI Out (monitor) 0xFF = None
<1>	Slot 3 PIIC Type	Without Multi-PIIC Card: Unused With Multi-PIIC Card: 0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel 0x96=HSSI 0x9C=DirecTV (PECL) 0x9D=Ethernet 0xD3=ASI Out (monitor) 0xFF = None
<1>	PIIC Clock Activity	Without Multi-PIIC Card: Unused With Multi-PIIC Card: Bit 1 = Slot 1 Activity Bit 2 = Slot 2 Activity

		Bit 3 = Slot 3 Activity
<1>	PIIC Data Activity	Without Multi-PIIC Card: Unused With Multi-PIIC Card: Bit 1 = Slot 1 Activity Bit 2 = Slot 2 Activity Bit 3 = Slot 3 Activity

Opcode: <2405h> Query a Modulator's Latched Alarms

Query response		
<1>	Latched Major Alarm	Bit 0 = Spare Bit 1 = Transmit Oversample PLL Lock Bit 2 = FPGA Config Error Bit 3 = IF Synthesizer PLL Lock Bit 4 = External Reference PLL Lock Bit 5 = SCT PLL Lock Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Latched Minor Alarm	Bit 0 = Spare Bit 1 = Loss Terrestrial Clock Bit 2 = Loss Terrestrial Data Bit 3 = FIFO Error Bit 4 = Spare Bit 5 = Terrestrial Framing Error Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Latched Common Fault	Bit 0 = -12 V Alarm Bit 1 = +12 V Alarm Bit 2 = +5 V Alarm Bit 3 = Spare Bit 4 = Spare Bit 5 = Spare Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail

Opcode: <2408h> Query a Modulator's Current Alarms

Query response		
<1>	Major Alarm	Bit 0 = Spare Bit 1 = Transmit Oversample PLL Lock Bit 2 = FPGA Config Error Bit 3 = IF Synthesizer PLL Lock Bit 4 = External Reference PLL Lock Bit 5 = SCT PLL Lock Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Minor Alarm	Bit 0 = Spare

		Bit 1 = Loss Terrestrial Clock Bit 2 = Loss Terrestrial Data Bit 3 = FIFO Error Bit 4 = Spare Bit 5 = Terrestrial Framing Error Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Common Fault	Bit 0 = -12 V Alarm Bit 1 = +12 V Alarm Bit 2 = +5 V Alarm Bit 3 = Spare Bit 4 = Spare Bit 5 = Spare Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail

Opcode: <240Bh> Query a Modulator's Status

Query Response		
<1>	Reserved	TBD
<1>	Reserved	TBD
<1>	Reserved	TBD
<1>	Major Alarm	Bit 0 = Spare Bit 1 = Transmit Oversample PLL Lock Bit 2 = FPGA Config Error Bit 3 = IF Synthesizer PLL Lock Bit 4 = External Reference PLL Lock Bit 5 = SCT PLL Lock Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Minor Alarm	Bit 0 = Spare Bit 1 = Loss Terrestrial Clock Bit 2 = Loss Terrestrial Data Bit 3 = FIFO Error Bit 4 = Spare Bit 5 = Terrestrial Framing Error Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Common Fault	Bit 0 = -12 V Alarm Bit 1 = +12 V Alarm Bit 2 = +5 V Alarm Bit 3 = Spare Bit 4 = Spare Bit 5 = Spare Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail

<1>	Latched Major Alarm	Bit 0 = Spare Bit 1 = Transmit Oversample PLL Lock Bit 2 = FPGA Config Error Bit 3 = IF Synthesizer PLL Lock Bit 4 = External Reference PLL Lock Bit 5 = SCT PLL Lock Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Latched Minor Alarm	Bit 0 = Spare Bit 1 = Loss Terrestrial Clock Bit 2 = Loss Terrestrial Data Bit 3 = FIFO Error Bit 4 = Spare Bit 5 = Terrestrial Framing Error Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Latched Common Fault	Bit 0 = -12 V Alarm Bit 1 = +12 V Alarm Bit 2 = +5 V Alarm Bit 3 = Spare Bit 4 = Spare Bit 5 = Spare Bit 6 = Spare Bit 7 = Spare 0 = Pass, 1 = Fail
<1>	Reserved	TBD
<1>	+5 Voltage	+5 V. Implied Decimal Point. Ex: 49 = +4.9 V
<1>	+12 Voltage	+12 V. Implied Decimal Point. Ex: 121 = +12.1 V
<1>	-12 Voltage	-12 V. Implied Decimal Point and Minus Sign. Ex: 118 = -11.8 V
<2>	Reserved	TBD
<2>	Reserved	TBD
<1>	Last Rate Status	0 = Symbol Rate, 1 = Data Rate
<1>	Active PIIC Slot	Without Multi-PIIC Card: 1 With Multi-PIIC Card: 1 – 3

<1>	Slot 1 PIIC Type	Without Multi-PIIC Card: 0x01 = RS-422 Serial 0x07 = ASI and RS422 Parallel 0x08 = ASI and LVDS Parallel 0x83 = G.703 (E1,T1,E2,T2 E3, T3, STS-1) 0x84 = HSSI 0x89 = IPSAT 0xFF = None With Multi-PIIC Card: 0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel 0x96 = ASI Out (Monitor) 0xFF = None
<1>	Slot 2 PIIC Type	Without Multi-PIIC Card: Unused With Multi-PIIC Card: 0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel 0x96 = ASI Out (Monitor) 0xFF = None
<1>	Slot 3 PIIC Type	Without Multi-PIIC Card: Unused With Multi-PIIC Card: 0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel 0x96 = ASI Out (Monitor) 0xFF = None
<1>	PIIC Clock Activity	Without Multi-PIIC Card: Unused With Multi-PIIC Card: Bit 1 = Slot 1 Activity Bit 2 = Slot 2 Activity Bit 3 = Slot 3 Activity
<1>	PIIC Data Activity	Without Multi-PIIC Card: Unused With Multi-PIIC Card: Bit 1 = Slot 1 Activity Bit 2 = Slot 2 Activity Bit 3 = Slot 3 Activity

Opcode: <240Eh> Query Time

<1>	Hour	0 – 23
<1>	Minute	0 – 59
<1>	Second	0 – 59

Opcode: <240Fh> Query Date

<1>	Year	0 – 99
<1>	Month	1 – 12
<1>	Day	1 – 31

Opcode: <2410h> Query Time and Date

<1>	Year	0 – 99
<1>	Month	1 – 12
<1>	Day	1 – 31
<1>	Hour	0 – 23
<1>	Minute	0 – 59
<1>	Second	0 – 59

Opcode: <2414h> Query Firmware Part/Rev

<16>	Firmware Part/Rev	ASCII null terminated string

Opcode: <2456h> Query AASI NULL PID

<2>	PID	0x0010 - 0x1FFF

Opcode: <2457h> Query IPSat Burst Demod Count

<2>	Num Burst Demods	1 – 50

Opcode: <2458h> Query IPSat Control PID

<2>	PID	0x0010 - 0x1FFF

Opcode: <2459h> Query IPSat Enable

<1>	IPSat Enable	0 = OFF, 1 = ON

Opcode: <245Ah> Query IPSat User Data Rate

<4>	Data Rate	Bps. This represents the terrestrial data rate less the IPSat overhead.

Opcode: <245Bh> Query PCR Restamping

<1>	PCR Restamping	0 = Off, 1= On

Opcode: <245Ch> Query Multi-PIIC Configuration

<1>	Multi-PIIC Mode	1 = Manual, 2 = Redundancy
<1>	Redundancy Mode	0 = Force Prime, 1 = Force Backup, 2 = Manual Revert, 3 = Auto-Revert
<1>	Prime PIIC Slot	1 – 3
<1>	Backup PIIC Slot	1 – 3

Opcode: <245Dh> Query Multi-PIIC Status

<1>	Active PIIC Slot	1 – 3
<1>	Slot 1 PIIC Type	0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel 0x96=HSSI 0x9C=DirecTV (PECL) 0x9D=Ethernet 0xD3=ASI Out (monitor) 0xFF = None
<1>	Slot 2 PIIC Type	0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel 0x96=HSSI 0x9C=DirecTV (PECL) 0x9D=Ethernet 0xD3=ASI Out (monitor) 0xFF = None
<1>	Slot 3 PIIC Type	0x93 = ASI 0x94 = RS422 0x95 = LVDS Parallel0x96=HSSI 0x9C=DirecTV (PECL) 0x9D=Ethernet 0xD3=ASI Out (monitor) 0xFF = None
<1>	PIIC Clock Activity	Bit 1 = Slot 1 Activity Bit 2 = Slot 2 Activity Bit 3 = Slot 3 Activity
<1>	PIIC Data Activity	Bit 1 = Slot 1 Activity Bit 2 = Slot 2 Activity Bit 3 = Slot 3 Activity

Opcode: <2560h> Query RF Switch Status

<1>	Redundancy Mode	3 = auto-revert, 4 = manual, 5 = backup
<1>	Fault Test	0 = normal, 1 = faulted
<1>	Switch Connector	0 = backup, 1 = prime
<1>	Online Side	0 = backup, 1 = prime
<1>	Distant Status	0 = normal, 1 = faulted

Opcode: <2601h> Command a Modulator's Configuration

<4>	IF Frequency	Binary Value, units Hz in 100Hz steps. 50000000Hz to 180000000Hz 70/140 950000000Hz to 2050000000Hz L-Band
<2>	Reserved	TBD
<4>	Data Rate	Binary Value, 1 bps Steps **(See note at the end of this command.)**
<4>	External Reference	Binary Value, units Hz in 8000Hz steps, e.g. 1000000Hz, 1008000Hz, etc. 256000Hz to 10000000Hz
<1>	Frequency Reference Source	0 = Internal, 1 = External
<1>	Modulation Type	0 = QPSK, 1 = BPSK, 2 = 8PSK , 3 = 16QAM **(See note at the end of this command.)**
<1>	Inner FEC Rate	1 = 1/2 Rate, 2 = 2/3 Rate, 3 = 3/4 Rate, 4 = 5/6 Rate, 5 = 7/8 Rate, 6 = 6/7 Rate, 7=4/5, 8 = 8/9 Rate, 9 = 9/10 Rate, 128 = 1/4 Rate, 129 = 1/3 Rate, 130 = 2/5 Rate, 131 = 3/5 Rate **(See note at the end of this command.)**
<1>	Reserved	TBD, Default = 1
<1>	Reserved	TBD, Default = 1
<1>	Reserved	TBD, Default = 0
<1>	Reserved	TBD, Default = 0
<2>	Transmit Power Level	Signed Value. 0 to –250 (0.0 to –25.0 dBm)
<1>	Carrier Control	0 = Off, 1 = On
<1>	Carrier Test	0 = Normal, 1 = CW, 2 = Dual, 3 = Offset, 4 = Pos FIR, 5 = Neg FIR
<1>	Spectrum	0 = Inverted, 1 = Normal
<1>	Reserved	TBD, 0 = Default

<1>	Tx Interface Type	0 = Serial, 1 = Parallel, 2 = ASI_Norm, 3 = ASI_Null, 4 = G.703E3, 5 = G.703T3, 6 = G.703STS-1, 7 = HSSI, 8 = Parallel DVB, 9 = Parallel M2P, 10 = None, 13 = OC3, 14 = STM-1, 15 = G.703E2, 16 = G.703T2Bal, 17 = G.703T2Unbal, 18 = G.703E1Bal, 19 = G.703E1Unbal, 20 = G.703T1AMI 21 = G.703T1B8ZS **(See table at the end of this command.)**
<1>	Input Clock Polarity	0 = Normal, 1 = Inverted
<1>	Data Polarity	0 = Normal, 1 = Inverted
<1>	Input Clock Source	0 = SCTE, 1 = SCT
<1>	Reserved	TBD, Default = 0
<11>	Reserved	TBD
<1>	Reserved	TBD
<1>	Major Alarm Mask	Bit 0 = Spare Bit 1 = Transmit Oversample PLL Lock Bit 2 = FPGA Config Error Bit 3 = IF Synthesizer PLL Lock Bit 4 = External Reference PLL Lock Bit 5 = SCT PLL Lock Bit 6 = Spare Bit 7 = Spare 0 = Mask, 1 = Allow
<1>	Minor Alarm Mask	Bit 0 = Spare Bit 1 = Loss Terrestrial Clock Bit 2 = Loss Terrestrial Data Bit 3 = FIFO Error Bit 4 = Spare Bit 5 = Terrestrial Framing Error Bit 6 = Spare Bit 7 = Spare 0 = Mask, 1 = Allow

<1>	Common Fault Mask	Bit 0 = -12 V Alarm Bit 1 = +12 V Alarm Bit 2 = +5 V Alarm Bit 3 = Spare Bit 4 = Spare Bit 5 = Spare Bit 6 = Spare Bit 7 = Spare 0 = Mask, 1 = Allow
<1>	Reserved	TBD, Default = 0
<4>	Symbol Rate	Symbol Rate in Symbols Per Second **(See note at the end of this command.)**
<1>	Terrestrial Framing	0 = 188 Byte, 1 = 204 Byte, 2 = No Framing **(See note at the end of this command.)**
<1>	Roll Off	0 = 0.35, 25 = 0.25, 1 = 0.20
<1>	Reserved	TBD
<1>	Output Clock Source	0 = SCTE, 1 = SCT, 2 = None **(See table at the end of this command.)**
<1>	Network Spec	0 = DVB-S, 1 = DirectPC 9 = DirectTV 11 = DVB-S2 BS NBC, 13 = DirectTV AMC NBC
<1>	BB Scrambler Bypass	0 = Normal, 1 = Bypass
<1>	Outer FEC Bypass	0 = Normal, 1 = Bypass
<1>	Test Pattern	0 = None, 1 = 2^{15} – 1, 23 = 2^{23}-1
<1>	Last Rate Control	0 = Symbol Rate, 1 = Data Rate, 2 = Auto
<1>	Interleaver Bypass	0 = Bypass, 1 = Normal
<1>	PCR Restamping	0 = Off, 1= On
<1>	Multi-PIIC Mode	Without Multi-PIIC Card: 1 = Manual With Multi-PIIC Card: 1 = Manual, 2 = Redundancy

<1>	Redundancy Mode	Without Multi-PIIC Card or Manual Multi-PIIC Mode: 0 With Multi-PIIC Card: 0 = Force Prime, 1 = Force Backup, 2 = Manual Revert, 3 = Auto-Revert
<1>	Prime PIIC Slot	Without Multi-PIIC Card: 1 With Multi-PIIC Card: 1 – 3
<1>	Backup PIIC Slot	Without Multi-PIIC Card: 1 With Multi-PIIC Card: 1 – 3
<1>	Pilot Symbols	0 = Off, 1= On
<1>	Inner FEC Bypass	0 = Normal, 1 = Bypass
<1>	PL Scrambler Bypass	0 = Normal, 1 = Bypass
<1>	PL Scrambler Bypass	0 = Normal, 1 = Bypass
<2>	Reserved	Set to 0
<2>	Reserved	Set to 1
<4>	Gold Code Seq Index	0 to 262142

DM240 Clock Source Selection Matrix		
Interface Type	**InClk Source**	**OutClk Source**
RS-422 Serial	SCT or SCTE	SCT Only
G.703 (E3, T3, STS-1)	SCTE Only	SCT, SCTE, or None
HSSI	SCT or SCTE	SCT Only
OC3	SCTE Only	None
STM-1	SCTE Only	None
ASI, AASI	SCTE Only	None
M2P Parallel	SCT or SCTE	SCT Only
DVB Parallel	SCTE Only	SCT Only

When changing Data Rate, Symbol Rate, Inner FEC Rate, Modulation Type, or Terrestrial Framing using the Mod All Command, the Data Rate and Symbol Rate parameter must be range checked using the following formulas to ensure they do not exceed the max limits:

Symbol Rate = (Data Rate * Overhead)/(Code Rate * Modulation)

Data Rate = (Symbol Rate * Code Rate * Modulation)/Overhead

Maximum Symbol Rate	68 Msps.
Maximum Data Rate	238 Mbps with high-speed interface card.
Overhead	204/188 for 188 byte 204/204 for 204 byte 204/187 for none
Modulation	QPSK = 2, 16QAM = 4, BPSK = 1, 8PSK = 3
Code Rate	1/4, 1/3, 2/5, 3/5, 1/2, 2/3, 3/4, 5/6, 6/7, 7/8, 8/9, 9/10

Opcode: <2602h> Command a Modulator's Frequency

<4>	Frequency	Binary Value, units Hz in 100Hz steps. 50000000Hz to 180000000Hz 70/140 950000000Hz to 2050000000Hz L-Band (This command will cause the carrier to turn off).

Opcode: <2604h> Command a Modulator's Data Rate

<4>	Data Rate	Binary Value, 1 BPS steps (This command will cause the carrier to turn off).

Opcode: <2606h> Command a Modulator's Modulation Type

<1>	Modulation Type	0 = QPSK, 1 = BPSK, 2 = 8PSK, 3 = 16QAM

Opcode: <2607h> Command a Modulator's Inner FEC Rate

<1>	Inner FEC Rate	1 = 1/2 Rate, 2 = 2/3 Rate, 3 = 3/4 Rate, 4 = 5/6 Rate, 5 = 7/8 Rate, 6 = 6/7 Rate, 7=4/5, 8 = 8/9 Rate, 9 = 9/10 Rate, 128 = 1/4 Rate, 129 = 1/3 Rate, 130 = 2/5 Rate, 131 = 3/5 Rate (This command will cause the carrier to turn off.)

Opcode: <2609h> Command a Modulator's Carrier Control

<1>	Carrier Control	0 = Off, 1 = On

Opcode: <260Ah> Command a Modulator's Carrier Test

<1>	Carrier Test	0 = Normal, 1 = CW, 2 = Dual, 3 = Offset, 4 = Pos FIR, 5 = Neg FIR

Opcode: <260Bh> Command a Modulator's Input Clock Source

<1>	Input Clock Source	0 = SCTE, 1 = SCT

Opcode: <260Ch> Command a Modulator's Input Clock Polarity

<1>	Input Clock Polarity	0 = Normal, 1 = Inverted

Opcode: <260Fh> Command a Modulator's Output Level

<2>	Transmit Power Level	Signed Value. 0 to –250 (0.0 to –25.0 dBm)

Opcode: <2611h> Command a Modulator's Spectrum

<1>	Spectrum	0 = Inverted, 1 = Normal

Opcode: <2616h> Command a Modulator's External Reference Source

<1>	External Reference Source	0 = Internal, 1 = External

Opcode: <2619h> Command DM240 Network Spec

<1>	Network Spec	0 = DVB-S, 1 = DirectPC 9 = DirectTV 11 = DVB-S2 BS NBC, 13 = DirectTV AMC NBC

Opcode: <261Bh> Command a Modulator's External Reference Frequency

<4>	External Reference Frequency	Binary Value, units Hz in 8000Hz steps, e.g. 1000000Hz, 1008000Hz, etc. 256000Hz to 10000000Hz

Opcode: <2620h> Command a Modulator's Data Polarity

<1>	Data Polarity	0 = Normal, 1 = Inverted

Opcode: <2621h> Command a Modulator's Interface Type

<1>	Tx Interface Type	0 = Serial, 1 = Parallel, 2 = ASI_Norm, 3 = ASI_Null, 4 = G.703E3, 5 = G.703T3, 6 = G.703STS-1, 7 = HSSI, 8 = Parallel DVB, 9 = Parallel M2P, 10 = None, 13 = OC3, 14 = STM-1, 15 = G.703E2, 16 = G.703T2Bal, 17 = G.703T2Unbal, 18 = G.703E1Bal, 19 = G.703E1Unbal, 20 = G.703T1AMI 21 = G.703T1B8ZS

Opcode: <2640h> Command a Modulator's Terrestrial Framing

<1>	Terrestrial Framing	0 = 188 Byte, 1 = 204 Byte, 2 = No Framing

Opcode: <2641h> Command a Modulator's Roll Off

<1>	Roll Off	0 = 0.35, 25 = 0.25, 1 = 0.20

Opcode: <2642h> Command a Modulator's Output Clock Source

<1>	Output Clock Source	0 = SCTE, 1 = SCT, 2 = None

Opcode: <2643h> Command a Modulator's Symbol Rate

<1>	Symbol Rate	Binary Value, 1bps Steps (This command will cause the carrier to turn off.

Opcode: <2656h> Command AASI NULL PID

<2>	PID	0x0010 - 0x1FFF

Opcode: <2657h> Command IPSat Burst Demod Count

<2>	Num Burst Demods	1 – 50

Opcode: <2658h> Command IPSat Control PID

<2>	PID	0x0010 - 0x1FFF

Opcode: <2659h> Command IPSat Enable

<1>	IPSat Enable	0 = OFF, 1 = ON

Opcode: <265Bh> Command PCR Restamping

<1>	PCR Restamping	0 = Off, 1= On

Opcode: <265Ch> Command Multi-PIIC Configuration

<1>	Multi-PIIC Mode	1 = Manual, 2 = Redundancy
<1>	Redundancy Mode	0 = Force Prime, 1 = Force Backup, 2 = Manual Revert, 3 = Auto-Revert
<1>	Prime PIIC Slot	1 – 3
<1>	Backup PIIC Slot	1 – 3

Opcode: <2C03h> Command Clear Latched Alarms

		No Parameters

Opcode: <2C04h> Command Set Time

<1>	Hour	0 – 23
<1>	Minute	0 – 59
<1>	Second	0 – 59

Opcode: <2C05h> Command Set Date

<1>	Year	00 – 99
<1>	Month	1 – 12
<1>	Day	1 – 31

Opcode: <2C06h> Command Set Time and Date

<1>	Year	00 – 99
<1>	Month	1 – 12
<1>	Day	1 – 31
<1>	Hour	0 – 23
<1>	Minute	0 – 59
<1>	Second	0 – 59

Opcode: <2F40h> Command RF Redundancy Mode

<1>	Redundancy Mode	3 = auto-revert, 4 = manual, 5 = backup

Opcode: <2F41h > Command RF Fault Test

<1>	Fault Test	0 = normal, 1 = faulted

Opcode: <2F42h > Command RF Activate Side

<1>	Activate Side	0 = backup, 1 = prime


RADYNE

SNMP MIB

B

```
RADYNE-MIB DEFINITIONS ::= BEGIN

   IMPORTS
      enterprises
         FROM RFC1155-SMI
      TEXTUAL-CONVENTION
         FROM SNMPv2-TC
      OBJECT-TYPE
         FROM RFC-1212
      DisplayString
         FROM RFC1213-MIB;

   -- groups in Radyne specific MIB

   radyne  OBJECT IDENTIFIER ::= { enterprises 2591 }
   dvb3030 OBJECT IDENTIFIER ::= { radyne 1 }
   radSNMP_Mod_NV_Status OBJECT IDENTIFIER ::= { dvb3030 1 }
   radSNMP_Mod_Status    OBJECT IDENTIFIER ::= { dvb3030 2 }

   RadPowerLevel ::= TEXTUAL-CONVENTION
      DISPLAY-HINT    "d-1"
      STATUS          current
      DESCRIPTION
         "Power level in tenths of a dBm."
      SYNTAX          INTEGER

   RadVoltageLevel ::= TEXTUAL-CONVENTION
      DISPLAY-HINT    "d-1"
      STATUS          current
      DESCRIPTION
         "Voltage level in tenths of a volt."
      SYNTAX          INTEGER

   RadString ::= TEXTUAL-CONVENTION
      DISPLAY-HINT    "255a"
      STATUS          current
      DESCRIPTION
         "ASCII String."
      SYNTAX          OCTET STRING

   RadInterfaceCardType ::= TEXTUAL-CONVENTION
      STATUS          current
      DESCRIPTION
         "Terrestrial interface card type."
      SYNTAX          INTEGER{
         v1InSerialRs422(      '01'h),
         v1InDirecTV(          '02'h),
```

```
        v1InG703(            '83'h),
        v1InHssi(            '84'h),
        v1InAsiParallelRs422( '07'h),
        v1InAsiParallelLvds(  '08'h),
        v1InIpsat(           '89'h),
        piicInAsi(           '93'h),
        piicInParallelRs422(  '94'h),
        piicInParallelLvds(   '95'h),
        piicInHssi(          '96'h),
        piicInG703E1T1(       '98'h),
        piicInG703E2T2(       '99'h),
        piicInG703E3T3Sts1(   '9A'h),
        piicInSerialRs422(    '9B'h),
        piicInDirecTVAmc(     '9C'h),
        piicInGigEthernet(    '9D'h),
        piicOutAsi(          'D3'h),
        none(                'ff'h)
    }

RadRadioFreqHz ::= TEXTUAL-CONVENTION
    DISPLAY-HINT    "d"
    STATUS          current
    DESCRIPTION
        "Radio Frequency in Hz."
    SYNTAX          OCTET STRING

radCarrierControl OBJECT-TYPE
    SYNTAX  INTEGER {
        off(0),
        on(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Turns carrier on and off"
    ::= { radSNMP_Mod_NV_Status 1 }

radTransmitPower OBJECT-TYPE
    SYNTAX  RadPowerLevel (-300..50)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the Tx power level in tenths of dBm
        from +5.0 to -20.0 (70/140MHz),
        from -5.0 to -30.0 (L-Band),
        from +0.0 to -25.0 (Dual Band).
        There is an implied decimal point. For example, a value
        of 39 represents a transmit power level of +3.9 dBm."
    ::= { radSNMP_Mod_NV_Status 2 }

radIFFrequency OBJECT-TYPE
    SYNTAX  INTEGER (50000000..2050000000)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects IF frequency in Hz."
```

```
    ::= { radSNMP_Mod_NV_Status 3 }

radDataRate OBJECT-TYPE
    SYNTAX  INTEGER (1000000..238000000)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the data rate in bps.  Note: Changing data rate
        will affect symbol rate, see comment at the end of
        mibtext."
    ::= { radSNMP_Mod_NV_Status 4 }

radSymbolRate OBJECT-TYPE
    SYNTAX  INTEGER (1000000..68000000)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the symbol rate in sps."
    ::= { radSNMP_Mod_NV_Status 5 }

radSymbolRateMode OBJECT-TYPE
    SYNTAX  INTEGER {
        variable(0),
        fixed(1)
    }
    ACCESS  read-write
    STATUS  optional
    DESCRIPTION
        "Selects symbol rate mode. This can only be modified if
        the factory configuration is set to both variable and
        fixed.
        This is obsolete."
    ::= { radSNMP_Mod_NV_Status 6 }

radStrapCode OBJECT-TYPE
    SYNTAX  INTEGER (0..65535)
    ACCESS  read-write
    STATUS  optional
    DESCRIPTION
        "The strap code is a quick set key that sets many modem
        parameters.
        Not implemented."
    ::= { radSNMP_Mod_NV_Status 7 }

radConvolutionalEncoder OBJECT-TYPE
    SYNTAX  INTEGER {
        none(0),
        ifec_rate_1_2(1),
        ifec_rate_2_3(2),
        ifec_rate_3_4(3),
        ifec_rate_5_6(4),
        ifec_rate_7_8(5),
        ifec_rate_6_7(6),
        ifec_rate_4_5(7),
        ifec_rate_8_9(8),
        ifec_rate_9_10(9),
```

```
        ifec_rate_1_4(128),
        ifec_rate_1_3(129),
        ifec_rate_2_5(130),
        ifec_rate_3_5(131)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects Tx code rate and type.
        Note: Changing the convolutional encoder will affect
        symbol rate and data rate. See note at the end of this
        section. Unsupported choices include:
            none
            viterbi6_7
        "
    ::= { radSNMP_Mod_NV_Status 8 }

radClockControl OBJECT-TYPE
    SYNTAX  INTEGER {
        scte(0),
        sct(1),
        none(2)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects Tx clock source. 0 selects terrestrial clock
        (SCTE), 1 selects internal clock (SCT). Modulators using
        ASI or G.703 interface options must use SCTE at all
        times."
    ::= { radSNMP_Mod_NV_Status 9 }

radFramingMode  OBJECT-TYPE
    SYNTAX  INTEGER {
        framing_188_Byte (0),
        framing_204_Byte (1),
        framing_None     (2),
        framing_DirecPc  (3),
        framing_DirecTv  (4)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the frame transport stream input type.
        Note: Changing the framing mode will affect the symbol
        rate and/or data rate. See note at the end of this
        section."
    ::= { radSNMP_Mod_NV_Status 10 }

radRolloff OBJECT-TYPE
    SYNTAX  INTEGER {
        rolloff_0_35 (0),
        rolloff_0_2  (1),
        rolloff_0_25 (25)
    }
    ACCESS  read-write
```

```
    STATUS  current
    DESCRIPTION
       "0   selects alpha factor rolloff of 0.35,
       '1'  selects alpha factor rolloff of 0.2,
       '25' selects alpha factor rolloff of 0.25"
    ::= { radSNMP_Mod_NV_Status 11}

radFreqReferenceSource OBJECT-TYPE
    SYNTAX  INTEGER {
       internal(0),
       external(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects internal or external reference clock"
    ::= { radSNMP_Mod_NV_Status 12 }

radExternalReference OBJECT-TYPE
    SYNTAX  INTEGER (256000..10000000)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the external reference frequency in Hz with a
       8000Hz step size."
    ::= { radSNMP_Mod_NV_Status 13 }

radInterfaceType OBJECT-TYPE
    SYNTAX  INTEGER {
       serial(0),
       asi_norm(2),
       asi_null(3),
       g703_E3(4),
       g703_T3(5),
       sts_1(6),
       hssi(7),
       parallelDVB(8),
       parallelM2P(9),
       none(10),
       directv(11),
       oc3(13),
       stm1(14),
       g703_E2(15),
       g703_T2Bal(16),
       g703_T2Unbal(17),
       g703_E1Bal(18),
       g703_E1Unbal(19),
       g703_T1AMI(20),
       g703_T1B8ZS(21),
       gigEthernet(22)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the various interface types.
       The following choices are not supported:
```

```
            none(10),
            oc3(13),
            stm1(14)
        Note: Selecting interface types Parallel DVB,
        Parallel M2P, Serial, DirecTv or HSSI will force the
        outclock selection to SCT. Selecting interface type
        ASI Norm or ASI Null causes the outclock selection to
        be forced to None.
        "
    ::= { radSNMP_Mod_NV_Status 14 }

radClockPolarity OBJECT-TYPE
    SYNTAX  INTEGER {
        normal(0),
        inverted(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects clock polarity for Tx terrestrial clock
        relative to Tx data."
    ::= { radSNMP_Mod_NV_Status 15 }

radDataPolarity OBJECT-TYPE
    SYNTAX  INTEGER {
        normal(0),
        inverted(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects data polarity"
    ::= { radSNMP_Mod_NV_Status 16}

radSpectrum OBJECT-TYPE
    SYNTAX  INTEGER {
        inverted(0),
        normal(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Inverts the symbol mapping direction of rotation."
    ::= { radSNMP_Mod_NV_Status 17 }

radModulationType OBJECT-TYPE
    SYNTAX  INTEGER {
        qpsk(0),
        bpsk(1),
        psk8(2),
        qam16(3)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the modulation type.
```

```
        Note: Changing modulation type will affect the symbol
        rate and data rate. See note at the end of this section."
    ::= { radSNMP_Mod_NV_Status 18}

radFraming OBJECT-TYPE
    SYNTAX  INTEGER {
        dvb(0)
    }
    ACCESS  read-write
    STATUS  optional
    DESCRIPTION
        "Selects framing type.
        Reserved"
    ::= { radSNMP_Mod_NV_Status 19 }

radReedsolomon OBJECT-TYPE
    SYNTAX  INTEGER {
        disable(0),
        enable(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Enables the ReedSolomon encoder. Reserved"
    ::= { radSNMP_Mod_NV_Status 20 }

radScramblerControl OBJECT-TYPE
    SYNTAX  INTEGER {
        disable(0),
        enable(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Enables scrambler operation"
    ::= { radSNMP_Mod_NV_Status 21 }

radScramblerType OBJECT-TYPE
    SYNTAX  INTEGER {
        dvb(0)
    }
    ACCESS  read-write
    STATUS  optional
    DESCRIPTION
        "Selects scrambler type.
        Not implemented"
    ::= { radSNMP_Mod_NV_Status 22 }

radDifferentialEncoder OBJECT-TYPE
    SYNTAX  INTEGER {
        off(0)
    }
    ACCESS  read-write
    STATUS  optional
    DESCRIPTION
        "Disables differential encoder
```

```
        unsupported
        "
    ::= { radSNMP_Mod_NV_Status 23 }

radAlarmMaskEnable OBJECT-TYPE
    SYNTAX  INTEGER {
        disable(0),
        enable(1)
    }
    ACCESS  read-write
    STATUS  optional
    DESCRIPTION
        "unsupported"
    ::= { radSNMP_Mod_NV_Status 24 }

radMajorAlarmMask OBJECT-TYPE
    SYNTAX  INTEGER (0..255)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Major Alarm mask:
        A bit field. 0 = MASKED, 1 = UNMASKED
        Bit 1 = Oversample Clock PLL Lock
        Bit 2 = FPGA Configuration Error
        Bit 3 = Synthesis Clock PLL Lock
        Bit 4 = External Reference PLL Lock
        Bit 5 = SCT PLL Lock
        "
    ::= { radSNMP_Mod_NV_Status 25 }

radMinorAlarmMask OBJECT-TYPE
    SYNTAX  INTEGER (0..255)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Minor Alarm mask:
        A bit field. 0 = MASKED, 1 = UNMASKED
        Bit 1 = Terrestrial clock activity detect
        Bit 2 = Tx data activity detect
        Bit 3 = FIFO overflow/underflow error
        Bit 5 = Loss of frame synchronization
        "
    ::= { radSNMP_Mod_NV_Status 26 }

radCommonAlarmMask OBJECT-TYPE
    SYNTAX  INTEGER (0..255)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Common Alarm mask:
        A bit field. 0 = MASKED, 1 = UNMASKED
        Bit 0 = -12V alarm.
        Bit 1 = +12V alarm.
        Bit 2 = +5V  alarm.
        "
    ::= { radSNMP_Mod_NV_Status 27 }
```

```
radOperatingMode OBJECT-TYPE
   SYNTAX  INTEGER {
      normal(0),
      test_pattern_2_15(1),
      test_pattern_2_23(23)
   }
   ACCESS  read-write
   STATUS  current
   DESCRIPTION
      "Test Pattern Operating Mode:
      None,
      (2^15)-1,
      (2^23)-1
      "
   ::= { radSNMP_Mod_NV_Status 28 }

radCarrierTest OBJECT-TYPE
   SYNTAX  INTEGER {
      normal(0),
      cw(1),
      dual(2),
      offset(3),
      posfir(4),
      negfir(5)
   }
   ACCESS  read-write
   STATUS  current
   DESCRIPTION
      "normal, allows normal modulated data output
      cw, causes the modulator to output pure carrier
      dual, causes a double sideband output
      offset, causes a single side band output
      posfir, uses a positive FIR
      negfir, uses a negative FIR"
   ::= { radSNMP_Mod_NV_Status 29 }

radCircuitID OBJECT-TYPE
   SYNTAX  RadString (SIZE (11))
   ACCESS  read-write
   STATUS  optional
   DESCRIPTION
      "Provides entry of Tx circuit identifier. Circuits can
      be given up to 11 character alphanumeric identity such
      as LINK1. Not implemented."
   ::= { radSNMP_Mod_NV_Status 30 }

radControlMode OBJECT-TYPE
   SYNTAX  INTEGER {
      local(0),
      terminal(1),
      computer(2),
      ethernet(3)
   }
   ACCESS  read-write
   STATUS  optional
```

```
    DESCRIPTION
       "Selects the active control source.
       This is obsolete."
    ::= { radSNMP_Mod_NV_Status 31 }

radMode  OBJECT-TYPE
    SYNTAX  INTEGER {
       dvb(0),
       direcpc(1),
       directv(9),
       dvbs2_bs_nbc(11),
       dvbs2_bs_bc(12),
       directv_amc_nbc(13),
       directv_amc_bc(14)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the network specification."
    ::= { radSNMP_Mod_NV_Status 32 }

radInterleaver  OBJECT-TYPE
    SYNTAX  INTEGER {
       enable(0),
       disable(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Enables or disables the interleaver."
    ::= { radSNMP_Mod_NV_Status 33 }

radOutClockSelection  OBJECT-TYPE
    SYNTAX  INTEGER {
       scte(0),
       sct(1),
       none(2)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the source of clock output from the Terrestrial
       Interface. See the Clock Source Selection Matrix."
    ::= { radSNMP_Mod_NV_Status 34 }

radLastRateControl  OBJECT-TYPE
    SYNTAX  INTEGER {
       symbol(0),
       data(1),
       auto(2)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Allows the modulator to behave with symbol rate or data
       rate precedence based on the selection.
```

```
        See rate control notes."
    ::= { radSNMP_Mod_NV_Status 35 }

radClearLatchedAlarms  OBJECT-TYPE
    SYNTAX  INTEGER {
        clearAlarms(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Clears all latched alarms."
    ::= { radSNMP_Mod_NV_Status 36 }

radPcrRestamping OBJECT-TYPE
    SYNTAX  INTEGER {
        off(0),
        on(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Enables the PCR restamping in AASI."
    ::= { radSNMP_Mod_NV_Status 37 }

radMultiPiicMode OBJECT-TYPE
    SYNTAX  INTEGER {
        manual(1),
        redundancy(2)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the Multi-PIIC mode."
    ::= { radSNMP_Mod_NV_Status 38 }

radRedundancyMode OBJECT-TYPE
    SYNTAX  INTEGER {
        force_prime(0),
        force_backup(1),
        manual_revert(2),
        auto_revert(3)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the Redundancy submode if the Multi-PIIC mode
        is redundancy."
    ::= { radSNMP_Mod_NV_Status 39 }

radPrimePiicSlot OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "If the Multi-PIIC mode is manual, radPrimePiicSlot
        selects the input slot.
```

```
            If the Multi-PIIC mode is redundancy, radPrimePiicSlot
            selects the prime input slot."
        ::= { radSNMP_Mod_NV_Status 40 }

    radBackupPiicSlot OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
            "If the Multi-PIIC mode is redundancy, radBackupPiicSlot
            selects the backup input slot."
        ::= { radSNMP_Mod_NV_Status 41 }

--  radRadioFrequencyHz OBJECT-TYPE
--      SYNTAX  RadRadioFreqHz (SIZE (8))
--      ACCESS  read-write
--      STATUS  current
--      DESCRIPTION
--          "Selects RF frequency in Hz."
--      ::= { radSNMP_Mod_NV_Status 42 }
--
--  radLoFrequencyHz OBJECT-TYPE
--      SYNTAX  RadRadioFreqHz (SIZE (8))
--      ACCESS  read-write
--      STATUS  current
--      DESCRIPTION
--          "Selects LO frequency in Hz."
--      ::= { radSNMP_Mod_NV_Status 43 }

    radRadioFrequencyHz OBJECT-TYPE
        SYNTAX  Counter64
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
            "Selects RF frequency in Hz."
        ::= { radSNMP_Mod_NV_Status 42 }

    radLoFrequencyHz OBJECT-TYPE
        SYNTAX  Counter64
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
            "Selects LO frequency in Hz."
        ::= { radSNMP_Mod_NV_Status 43 }

    radLowSideMix OBJECT-TYPE
        SYNTAX  INTEGER {
            high_side(0),
            low_side(1)
        }
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
            "Selects the high-side/low-side LO mix."
        ::= { radSNMP_Mod_NV_Status 44 }
```

```
radLocalIpAddress OBJECT-TYPE
   SYNTAX  IpAddress
   ACCESS  read-write
   STATUS  current
   DESCRIPTION
      "Selects the local IP address."
   ::= { radSNMP_Mod_NV_Status 45 }

radPilotSymbolsEnabled OBJECT-TYPE
   SYNTAX  INTEGER {
      disable(0),
      enable(1)
   }
   ACCESS  read-write
   STATUS  current
   DESCRIPTION
      "Enables/disables pilot symbols at the physical layer."
   ::= { radSNMP_Mod_NV_Status 46 }

radPhysLayerScramblerBypass OBJECT-TYPE
   SYNTAX  INTEGER {
      normal(0),
      bypassed(1)
   }
   ACCESS  read-write
   STATUS  current
   DESCRIPTION
      "Enables/disables the physical layer scrambler. The
      modulator is considered in a test mode when the
      scrambler is bypassed."
   ::= { radSNMP_Mod_NV_Status 47 }

radInnerFecBypass OBJECT-TYPE
   SYNTAX  INTEGER {
      normal(0),
      bypassed(1)
   }
   ACCESS  read-write
   STATUS  current
   DESCRIPTION
      "Enables/disables the inner forward error correction.
      The modulator is considered in a test mode when the
      inner FEC is bypassed."
   ::= { radSNMP_Mod_NV_Status 48 }

radRfSwitchRedundancyMode OBJECT-TYPE
   SYNTAX  INTEGER {
      manual(1),
      auto_revert(2),
      backup(3)
   }
   ACCESS  read-write
   STATUS  current
   DESCRIPTION
      "If the modulator is connected to the prime
      side of the switch then manual and
```

```
        auto_revert modes are available. Otherwise,
        if modulator is connected to backup side
        then only manual and backup modes are
        available."
    ::= { radSNMP_Mod_NV_Status 49 }

radRfSwitchActivateSide OBJECT-TYPE
    SYNTAX  INTEGER {
        primary(1),
        backup(2)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Activates the primary or backup side of
        the RF switch."
    ::= { radSNMP_Mod_NV_Status 50 }

radRfSwitchFaultTestMode OBJECT-TYPE
    SYNTAX  INTEGER {
        normal(1),
        faulted(2)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Allows the assertion of the fault signal
        to the RF switch for test purposes"
    ::= { radSNMP_Mod_NV_Status 51 }

radPhaseNoiseGeneratorEnabled OBJECT-TYPE
    SYNTAX  INTEGER {
        disable(0),
        enable(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Enables/disables the phase noise generator."
    ::= { radSNMP_Mod_NV_Status 52 }

radPhaseNoiseProfileIndex OBJECT-TYPE
    SYNTAX  INTEGER (1..16)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the phase noise profile."
    ::= { radSNMP_Mod_NV_Status 53 }

radPlHeaderScramblerSeqIndex OBJECT-TYPE
    SYNTAX  INTEGER (0..2000)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the directv physical layer header scrambler
        sequence index."
```

```
    ::= { radSNMP_Mod_NV_Status 54 }

radGoldCodeSeqIndex OBJECT-TYPE
    SYNTAX  INTEGER (0..262142)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the gold code sequence index."
    ::= { radSNMP_Mod_NV_Status 55 }

radTerrEthMode OBJECT-TYPE
    SYNTAX  INTEGER {
        udp(0),
        cop3(1),
        cop3_fec(2)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects mode for the Gig Ethernet card."
    ::= { radSNMP_Mod_NV_Status 56}

radTerrEthSelect OBJECT-TYPE
    SYNTAX  INTEGER {
        prime(0),
        backup(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects prime or backup for the Gig Ethernet card."
    ::= { radSNMP_Mod_NV_Status 57 }

radTerrEthJitterSz OBJECT-TYPE
    SYNTAX  INTEGER (1..20)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the jitter buffer size in 10ms steps."
    ::= { radSNMP_Mod_NV_Status 58 }

radTerrEthJitterTrack OBJECT-TYPE
    SYNTAX  INTEGER {
        widest(0),
        wide(1),
        mid_level(2),
        narrow(3),
        narrowest(4)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
        "Selects the jitter tracking value from wide to narrow."
    ::= { radSNMP_Mod_NV_Status 59 }

radTerrEthRevert OBJECT-TYPE
```

```
    SYNTAX  INTEGER {
       manual(0),
       auto(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the backup mode for the Gig Ethernet card."
    ::= { radSNMP_Mod_NV_Status 60 }

radTerrEthBkupDly OBJECT-TYPE
    SYNTAX  INTEGER (1..20)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the backup delay in 100ms steps for the Gig Ethernet card."
    ::= { radSNMP_Mod_NV_Status 61 }

radTerrEthAddrPrime OBJECT-TYPE
    SYNTAX  IpAddress
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the prime IP address for the Gig Ethernet card."
    ::= { radSNMP_Mod_NV_Status 62 }

radTerrEthUdpPortPrime OBJECT-TYPE
    SYNTAX  INTEGER (0..65535)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the prime UDP port for the Gig Ethernet card."
    ::= { radSNMP_Mod_NV_Status 63 }

radTerrEthSourcePrime OBJECT-TYPE
    SYNTAX  IpAddress
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the prime source IP address for the Gig Ethernet card."
    ::= { radSNMP_Mod_NV_Status 64 }

radTerrEthAddrBackup OBJECT-TYPE
    SYNTAX  IpAddress
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the backup IP address for the Gig Ethernet card."
    ::= { radSNMP_Mod_NV_Status 65 }

radTerrEthUdpPortBackup OBJECT-TYPE
    SYNTAX  INTEGER (0..65535)
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
       "Selects the backup UDP port for the Gig Ethernet card."
```

```
        ::= { radSNMP_Mod_NV_Status 66 }

    radTerrEthSourceBackup OBJECT-TYPE
        SYNTAX  IpAddress
        ACCESS  read-write
        STATUS  current
        DESCRIPTION
            "Selects the backup source IP address for the Gig Ethernet card."
        ::= { radSNMP_Mod_NV_Status 67 }

--    radTerrEthMacAddr OBJECT-TYPE
--        SYNTAX  PhysAddress
--        ACCESS  read-write
--        STATUS  current
--        DESCRIPTION
--            "Selects the MAC address for the Gig Ethernet card."
--        ::= { radSNMP_Mod_NV_Status 68 }



-------------------------------------------------------------------------
-- Status information out of Radyne specific MIB

    radMajorAlarmStatus OBJECT-TYPE
        SYNTAX  INTEGER (0..255)
        ACCESS  read-only
        STATUS  current
        DESCRIPTION
            "Major Alarm status:
            A bit field. 0 = PASS, 1 = FAIL
            Bit 1 = Oversample Clock PLL Lock
            Bit 2 = FPGA Configuration Error
            Bit 3 = Synthesis Clock PLL Lock
            Bit 4 = External Reference PLL Lock
            Bit 5 = SCT PLL Lock
            "
        ::= { radSNMP_Mod_Status 1 }

    radMinorAlarmStatus OBJECT-TYPE
        SYNTAX  INTEGER (0..255)
        ACCESS  read-only
        STATUS  current
        DESCRIPTION
            "Minor Alarm status:
            A bit field. 0 = PASS, 1 = FAIL
            Bit 1 = Terrestrial clock activity detect
            Bit 2 = Tx data activity detect
            Bit 3 = FIFO overflow/underflow error
            Bit 5 = Loss of frame synchronization
            "
        ::= { radSNMP_Mod_Status 2 }

    radCommonAlarmStatus OBJECT-TYPE
        SYNTAX  INTEGER (0..255)
        ACCESS  read-only
        STATUS  current
```

```
    DESCRIPTION
       "Common Alarm status:
       A bit field. 0 = PASS, 1 = FAIL
       Bit 0 = -12V alarm.
       Bit 1 = +12V alarm.
       Bit 2 = +5V  alarm.
       "
    ::= { radSNMP_Mod_Status 3 }

radLatchedMajorAlarmStatus OBJECT-TYPE
    SYNTAX  INTEGER (0..255)
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
       "Major Alarm latched status:
       A bit field. 0 = PASS, 1 = FAIL
       Bit 1 = Oversample Clock PLL Lock
       Bit 2 = FPGA Configuration Error
       Bit 3 = Synthesis Clock PLL Lock
       Bit 4 = External Reference PLL Lock
       Bit 5 = SCT PLL Lock
       "
    ::= { radSNMP_Mod_Status 4 }

radLatchedMinorAlarmStatus OBJECT-TYPE
    SYNTAX  INTEGER (0..255)
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
       "Minor Alarm latched status:
       A bit field. 0 = PASS, 1 = FAIL
       Bit 1 = Terrestrial clock activity detect
       Bit 2 = Tx data activity detect
       Bit 3 = FIFO overflow/underflow error
       Bit 5 = Loss of frame synchronization
       "
    ::= { radSNMP_Mod_Status 5 }

radLatchedCommonAlarmStatus OBJECT-TYPE
    SYNTAX  INTEGER (0..255)
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
       "Common Alarm latched status:
       A bit field. 0 = PASS, 1 = FAIL
       Bit 0 = -12V alarm.
       Bit 1 = +12V alarm.
       Bit 2 = +5V  alarm.
       "
    ::= { radSNMP_Mod_Status 6 }

radRevisionNumber OBJECT-TYPE
    SYNTAX  INTEGER (0..255)
    ACCESS  read-only
    STATUS  optional
    DESCRIPTION
```

```
        "M&C Revision number."
    ::= { radSNMP_Mod_Status 7 }

radPlus5Volts OBJECT-TYPE
    SYNTAX  RadVoltageLevel (0..255)
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "+5V monitor with implied decimal point.
        For example, a value of 51 represents +5.1 Volts."
    ::= { radSNMP_Mod_Status 8 }

radPlus12Volts OBJECT-TYPE
    SYNTAX  RadVoltageLevel (0..255)
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "+12V monitor with implied decimal point.
        For example, a value of 119 represents +11.9 Volts."
    ::= { radSNMP_Mod_Status 9 }

radMinus12Volts OBJECT-TYPE
    SYNTAX  RadVoltageLevel (-255..0)
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "-12V monitor with implied decimal point.
        For example, a value of -122 represents -12.2 Volts."
    ::= { radSNMP_Mod_Status 10 }

radTemperature OBJECT-TYPE
    SYNTAX  INTEGER (0..1000)
    ACCESS  read-only
    STATUS  optional
    DESCRIPTION
        "Temperature monitor with implied decimal point.
        For example, a value of 490 represents 49.0 C"
    ::= { radSNMP_Mod_Status 11 }

radFactoryConfiguration OBJECT-TYPE
    SYNTAX  INTEGER (0..65535)
    ACCESS  read-only
    STATUS  optional
    DESCRIPTION
        "A bit field that shows the factory configuration
        options. 0=No, 1=Yes.
        Bit 0 = Serial Interface Present
        Bit 1 = Parallel Interface
        Bit 2 = ASI Norm Interface
        Bit 3 = ASI Null Interface
        Bit 4 = E3 Interface Present
        Bit 5 = T3 Interface Present
        Bit 6 = STS-1 Interface Present
        Bit 7 = HSSI Interface Present
        Bit 8 = DSS Option Enabled
        Bit 9 = SNMP Option Enabled
```

```
            Bit 10 = Parallel DVB Present
            Bit 11 = Parallel M2P Present
            Bit 12 = DVB LVDS Present
            Bit 13 = OC3 Interface Present
            Bit 14..15 = Spares
            unsupported"
         ::= { radSNMP_Mod_Status 12 }

      radLastRateStatus   OBJECT-TYPE
         SYNTAX  INTEGER {
            symbol(0),
            data(1)
         }
         ACCESS  read-only
         STATUS  current
         DESCRIPTION
            "Shows the current rate precedence. See Last Rate Control
            notes."
         ::= { radSNMP_Mod_Status 13 }

      radFirmwarePartRev OBJECT-TYPE
         SYNTAX  RadString (SIZE (16))
         ACCESS  read-only
         STATUS  current
         DESCRIPTION
            "Provides the system firmware part and revision number."
         ::= { radSNMP_Mod_Status 14 }

      radActivePiicSlot OBJECT-TYPE
         SYNTAX  INTEGER
         ACCESS  read-only
         STATUS  current
         DESCRIPTION
            "Indicates the active PIIC slot."
         ::= { radSNMP_Mod_Status 15 }

--  radPiicSlotStatusTable OBJECT-TYPE
--      SYNTAX   SEQUENCE OF RadPiicSlotStatusEntry
--      ACCESS   not-accessible
--      STATUS   mandatory
--      DESCRIPTION
--          "PIIC slot status table"
--      ::= { radSNMP_Mod_Status 16 }
--
--  radPiicSlotStatusEntry OBJECT-TYPE
--      SYNTAX   RadPiicSlotStatusEntry
--      ACCESS   not-accessible
--      STATUS   optional
--      DESCRIPTION
--          "PIIC slot status table entry"
--      INDEX    { radPiicSlotStatusIndex }
--      ::= { radPiicSlotStatusTable 1 }
--
--  RadPiicSlotStatusEntry ::=
--      SEQUENCE {
--          radPiicSlotStatusIndex   INTEGER,
```

```
--         radPiicSlotCardType      RadInterfaceCardType,
--         radPiicSlotClockActivity INTEGER,
--         radPiicSlotDataActivity  INTEGER
--     }
--
-- radPiicSlotStatusIndex OBJECT-TYPE
--     SYNTAX  INTEGER
--     ACCESS  not-accessible
--     STATUS  current
--     DESCRIPTION
--         "Index for radPiicSlotStatusTable."
--     ::= { radPiicSlotStatusEntry 1 }
--
-- radPiicSlotCardType OBJECT-TYPE
--     SYNTAX  RadInterfaceCardType
--     ACCESS  read-only
--     STATUS  current
--     DESCRIPTION
--         "Indicates the type of interface card in a slot."
--     ::= { radPiicSlotStatusEntry 2 }
--
-- radPiicSlotClockActivity OBJECT-TYPE
--     SYNTAX  INTEGER {
--         inactive( 0),
--         active( 1)
--     }
--     ACCESS  read-only
--     STATUS  current
--     DESCRIPTION
--         "Indicates clock activity of an interface card in a slot."
--     ::= { radPiicSlotStatusEntry 3 }
--
-- radPiicSlotDataActivity OBJECT-TYPE
--     SYNTAX  INTEGER {
--         inactive( 0),
--         active( 1)
--     }
--     ACCESS  read-only
--     STATUS  current
--     DESCRIPTION
--         "Indicates data activity of an interface card in a slot."
--     ::= { radPiicSlotStatusEntry 4 }

   radRfSwitchActiveSide OBJECT-TYPE
      SYNTAX  INTEGER {
         primary(1),
         backup(2)
      }
      ACCESS  read-only
      STATUS  current
      DESCRIPTION
         "Indicates the active input of the RF switch."
      ::= { radSNMP_Mod_Status 17 }

   radRfSwitchDistantSideFault OBJECT-TYPE
      SYNTAX  INTEGER {
```

```
        normal(1),
        faulted(2)
    }
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "Indicates the fault status of the modulator
        at the distant side of the RF switch."
    ::= { radSNMP_Mod_Status 18 }

radRfSwitchConnectorSide OBJECT-TYPE
    SYNTAX  INTEGER {
        primary(1),
        backup(2)
    }
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "Indicates the side of the RF switch to which the
        modulator is connected."
    ::= { radSNMP_Mod_Status 19 }

radTerrEthPortStatus   OBJECT-TYPE
    SYNTAX  INTEGER {
        down(0),
        unresolved(1),
        half_10m(2),
        half_100m(3),
        full_10m(4),
        full_100m(5),
        half_1gig(6),
        full_1gig(7)
    }
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "Shows the link status of the active Gig Ethernet card."
    ::= { radSNMP_Mod_Status 20 }

radTerrEthActPrime   OBJECT-TYPE
    SYNTAX  INTEGER {
        disabled(0),
        no_activity(1),
        online_activity(2),
        offline_activity(3)
    }
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "Shows the data activity of the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 21 }

radTerrEthActPrimeCol   OBJECT-TYPE
    SYNTAX  INTEGER {
        disabled(0),
        no_activity(1),
```

```
        online_activity(2),
        offline_activity(3)
    }
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "Shows the data activity of the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 22 }

radTerrEthActPrimeRow   OBJECT-TYPE
    SYNTAX  INTEGER {
        disabled(0),
        no_activity(1),
        online_activity(2),
        offline_activity(3)
    }
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "Shows the data activity of the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 23 }

radTerrEthActBackup   OBJECT-TYPE
    SYNTAX  INTEGER {
        disabled(0),
        no_activity(1),
        online_activity(2),
        offline_activity(3)
    }
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "Shows the backup data activity of the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 24 }

radTerrEthActBackupCol   OBJECT-TYPE
    SYNTAX  INTEGER {
        disabled(0),
        no_activity(1),
        online_activity(2),
        offline_activity(3)
    }
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "Shows the backup data activity of the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 25 }

radTerrEthActBackupRow   OBJECT-TYPE
    SYNTAX  INTEGER {
        disabled(0),
        no_activity(1),
        online_activity(2),
        offline_activity(3)
    }
    ACCESS  read-only
```

```
    STATUS  current
    DESCRIPTION
      "Shows the backup data activity of the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 26 }

  radTerrEthJitterFill OBJECT-TYPE
    SYNTAX  INTEGER (0..99)
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
      "Percent fill of jitter buffer for the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 27 }

      radTerrEthNullPkts OBJECT-TYPE
    SYNTAX  Counter32
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
      "Null packet count for the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 28 }

      radTerrEthCorrPkts OBJECT-TYPE
    SYNTAX  Counter32
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
      "Corrected packet count for the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 29 }

      radTerrEthReorPkts OBJECT-TYPE
    SYNTAX  Counter32
    ACCESS  read-only
    STATUS  current
    DESCRIPTION
      "Reordered packet count for the Gig Ethernet card."
    ::= { radSNMP_Mod_Status 30 }

  radTerrEthClrStats OBJECT-TYPE
    SYNTAX  INTEGER {
      toggle0(0),
      toggle1(1)
    }
    ACCESS  read-write
    STATUS  current
    DESCRIPTION
      "Clears the Gig Ethernet card statistics."
    ::= { radSNMP_Mod_Status 31 }


END
```


RADYNE

Glossary

G

A	
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	
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

C	
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
D	
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
E	
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

F	
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
G	
g	Force of Gravity
GHz	Gigahertz
GND	Ground
H	
HSSI	High-Speed Serial Interface
HW	Hardware
Hz	Hertz (Unit of Frequency)
I	
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)
J	
J	Joule

K	
Kbps	Kilobits per Second
Kbps	Kilobytes per Second
kg	Kilogram
kHz	Kilohertz
Ksps	Kilosymbols per Second
L	
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LO	Local Oscillator
M	
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
N	
NC	Normally Closed
NO	Normally Open
ns	Nanoseconds
NVRAM	Non-Volatile Random Access Memory
N/C	No Connection or Not Connected
O	
OQPSK	Offset Quadrature Phase Shift Keying
P	
PC	Personal Computer
PD Buffer	Plesiochronous/ Doppler Buffer
PLL	Phase Locked Loop
ppb	Parts per Billion
ppm	Parts per Million
P/N	Part Number

Q	
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
R	
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.
S	
SCC	Satellite Control Channel. A Radyne ComStream satellite format.
SEQ	Sequential
SYNC	Synchronize
T	
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
U	
UART	Universal Asynchronous Receiver/Transmitter
UUT	Unit Under Test
V	
V	Volts
VAC	Volts, Alternating Current
VCO	Voltage Controlled Oscillator
VDC	Volts, Direct Current
VIT	Viterbi Decoding

W X Y Z	
W	Watt
Misc.	
µs	Microsecond
16QAM	16 Quadrature Amplitude Modulation
8PSK	8 Phase Shift Keying