# DMD1050T

Satellite Modem Board

Installation and Operation Manual

MN-DMD1050T or CD-DMD1050T          Revision 1

# Errata A for MN-DMD1050T Rev 1

## *Comtech EF Data Documentation Update*

# DMD1050T

## Satellite Modem Board

## Installation and Operation Manual

**Subject:** Changed: Table 3-1 DMD HDLC Interoperation; Chapter 6, Section 6.3 DMD input level specification; Chapter 7, Section 7.7.2.1; Section 7.7.3.1

Added: Figure 6-15 DMD1050T Input Level Specification;

**Errata Part Number:** ER-DMD1050T-EA1     (*Errata documents are not subject to revision.*)

**PLM CO Number:** C-0036024

**Comments:** The new information will be included in the next released revision of the manual.

For users who want more control over traffic, the 10/100 Ethernet interface provides additional QOS controls, and new features, such as port based priorities, strict priority queuing and the ability to operate in a FIFO-like mode.

The full duplex capability of the standard 10/100 interface allows it to pass up to 20 Mbps in each direction over the satellite.

The DMD1050T supports Radyne HDLC, Comtech HDLC and 570 Managed Swich modes, offering compatibility with all the configurations of Comtech products shown in Table 3-1.

Table 3-1 DMD1050T HDLC Interoperation

| Modem Model | Ethernet Interface | HDLC |
|---|---|---|
| DMD20[1] | PLR5171 10/100 | Radyne |
| DMD20 LBST[1] | PLR5171 10/100 | Radyne |
| DMD20[1] | PLR5497 10/100 | Radyne |
| DMD1050 Legacy[1] | N/A | Radyne |
| DMD20[1] | PLR5584 10/100/1000 | Radyne |
| DMD20 LBST[1] | PLR5584 10/100/1000 | Radyne |
| DMD50[1] | PLR5584 10/100/1000 | Radyne |
| DMD2050[1] | PLR5584 10/100/1000 | Radyne |
| DMD2050[1] | PLR5584-1 10/100/1000 | Radyne |
| DMD2050E[1] (Standard Configuration) | PLR5584-1 10/100/1000 | Radyne |
| SLM-5650A | Gigabit Bridge Card, Bridge Mode (1.1.2) | Comtech |
| SLM-5650A | Network Processor Card (GIGE Bridge Mode) | Radyne |
| CDM-570 | Managed switch Mode | Managed 570 |
| CDM-625 | Managed switch Mode | Managed 570 |
| [1] Interoperates in any common selectable mode | | |

## 3.7.1.1    Configure the Modem to use the Ethernet Data Interface

When the optional Ethernet Data Interface Card is selected, all of the Ethernet related menus can be used to control the interface.

1.  Setup the Tx Interface Menu to: (see Chapter 7)

    a.  Set the Terrestrial Interface to Ethernet

    b.  Set the Ethernet Flow Control as desired

    c.  Set the Ethernet Daisy Chain as desired

    d.  Set the Ethernet QOS Type as desired

    e.  Set the Ethernet QOS Queue as desired

## 6.3    Demodulator

| Demodulation | BPSK, QPSK, and OQPSK, 8PSK, 8QAM, 16QAM | |
|---|---|---|
| IF Tuning Range | L-Band Tuning Range | 950 to 2050 MHz in 1 Hz Steps |
| Impedance | SMA, 50 Ohm, F-Type 75 Ohm (Optional) | |
| Connector | SMA, F-Type (Optional) | |
| Return Loss | SMA 2.0:1 | |
| Spectrum | Selectable and Meets MIL-188-165A or INTELSAT IESS | 308/309/310 Compliant |
| Input Level | -55 to +10 dBm and 10 log (Symbol Rate) -120 dBm / Hz, SR < 2500 k | |
| Total Input Power | +20 dBm or +40 dBc (the Lesser) | |
| FEC | Viterbi, K = 7 at 1/2, 3/4 and 7/8 Rate, | |
| | Rate Sequential 1/2 Rate, 3/4, 7/8 (Optional) | |
| | Trellis 2/3 | |
| | Turbo Product Code (Optional) | |
| | BPSK 5/16, 21/44 | |
| | QPSK/OQPSK 21/44, 3/4, 7/8 | |
| | 8PSK/8QAM/16QAM 3/4, 7/8 | |
| | Low Density Parity Check (Optional) | |
| | BPSK 1/2 | |
| | QPSK/OQPSK 1/2, 2/3, 3/4 | |
| | 8PSK/8QAM 2/3, 3/4 | |
| | 16QAM 3/4 | |
| Decoder Options | Reed-Solomon INTELSAT (DVB Optional) | |
| | Custom (N, K) Reed-Solomon | |
| Descrambler | OM-73, CCITT V.35 or IBS | |
| Acquisition Range | Programmable ±1 kHz to ± 255 kHz | |
| Reacquisition Range | Programmable ±1 Hz to 25000 Hz | |
| Sweep Delay Value | 0 to 6000 seconds in 100 msec Steps | |

## 6.4    Plesiochronous Buffer

| Size | 0 msec to 64 msec |
|---|---|
| Centering | Automatic on Underflow/Overflow |
| Centering Modes | IBS: Integral Number of Frames |
| | IDR: Integral Number of Multi-Frames |
| Clock | External, Rx Recovered or SCT (Internal) |

## 6.12 DMD Input Level Specification

Equation 1 – Minimum Input Signal Level above 2500k Symbols per Second

$$-55\ dBm\ to +10\ dBm,, Symbol\ Rates\ \geq 2500\ kSPS$$

and

Equation 2 - Minimum Input Signal Level Below 2500k Symbols per Second

$$10\log(Symbol\ Rate) - \frac{120dBm}{Hz}\ to + 10\ dBm, Symbol\ Rates\ < 2500\ kSPS$$
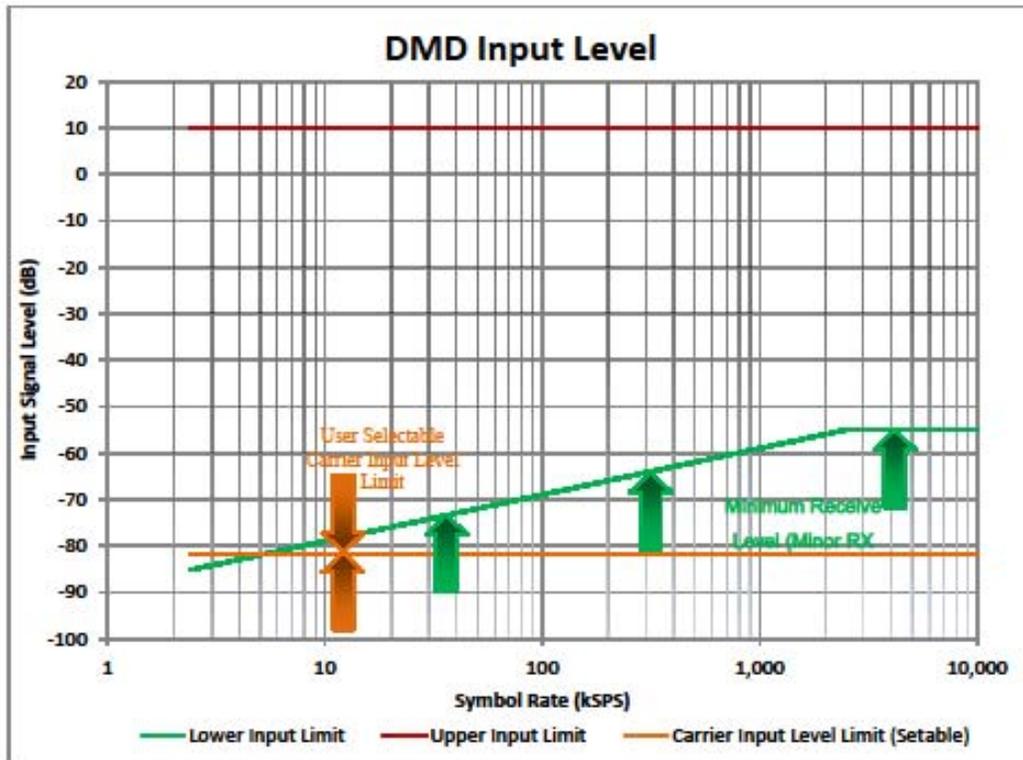


Figure 6-15. DMD1050T Input Level Specification

Use this to invert the direction of rotation for PSK modulation. Normal meets the IESS Specification.

### Sweep Range (kHz):

- ±0 to 255 kHz

Set the acquisition range for the demodulator.

### Sweep Delay (sec):

- 0.0 – 900.0 sec

Set the reacquisition delay time in 1/10th second increments.

### Reacquisition Range (Hz):

- 0 – 32000 Hz

Set the reacquisition sweep in 1 Hz increments.

### Adj Carrier Pwr:

- Normal, Suppressed

Set the adjacent carrier as Normal or Suppressed (High Power). The unit will increase or decrease post dissemination gain as necessary.

### Fast Acquisition:

- DISABLED, ENABLED

Disable or enable the Rx Fast Acquisition capability.

### Carrier Input Level Limit:

- -30 to 90 dBm

Adjust the low-level threshold limit for input power. You can specify a minimum operational signal level at which the system can operate. This allows you to have some control in tuning a real signal, as opposed to an adjacent bleed through, or some other rogue signal.

An Input power level below the threshold limit causes a major Input Level alarm on the demodulator. However, this could be problematic to a software algorithm for auto-assist antenna acquisition. The problem could occur if the algorithm uses signal lock as a parameter for antenna signal acquisition that is not specifically qualified with the Input Level indicator. This is most applicable to the DMD1050 and DMD1050T card based modems.

**ETH HDLC:**

- RADYNE, COMTECH, MANAGED 570

RADYNE HDLC is supported by all legacy Radyne products that do not allow configuration of the HDLC, or Comtech modems that use the Network Processor card in Gigabit Bridge mode. COMTECH HDLC is supported by the SLM5650A Modem with Ethernet Bridge Card. MANAGED 570 HDLC is for other Comtech HDLCs, such as the CDM-570 and CDM-625 in standard bridge mode. See Table 3-1.

## 7.7.3.1.1    ASYNC page section

**Async Mode:**

- **ES-ES, ESC ENHANCED**

ES-ES is the normal IBS Async Channel. ESC ENHANCED is applicable for Closed Net. It uses the Overhead Signaling bytes in the IBS Overhead to pass asynchronous data.

**ES Interface:**

- **RS-232, RS-485**

Select the ES interface type.

**ES Baud Rate:**

- **150 - 19200**

Select the ES baud rate in Enhanced Async Mode.

**ES Bits/Char:**

- **7,8**

Select 7- or 8-bit data.

# Errata B for MN-DMD1050T Rev 1

*Comtech EF Data Documentation Update*

# DMD1050T

## Satellite Modem Board

## Installation and Operation Manual

MN-DMD1050T-Revision-1

**Subject:** Add Appendix I, Compatibility with other DMD Modems

**Errata Part Number:** ER-DMD1050T-EB1    (*Errata documents are not subject to revision.*)

**Comments:** The new information will be included in the next released revision of the manual.

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# Appendix I. Compatibility with Other DMD Modems

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**I.1     Compatibility with Other DMD Modems**

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | **Legacy Modes** | | | | |
| BPSK | Viterbi | 1/2 | 2.4 – 5,000 | Standard | Standard | Standard | 2.4 – 15,000 | Standard | Standard |
| QPSK | Viterbi | 1/2 | 4.8 – 10,000 | Standard | Standard | Standard | 4.8 – 30,000 | Standard | Standard |
| | | 3/4 | 7.2 – 15,000 | Standard | Standard | Standard | 7.2 – 45,000 | Standard | Standard |
| | | 7/8 | 8.4 – 17,500 | Standard | Standard | Standard | 8.4 – 52,000 | Standard | Standard |
| | Viterbi + RS | 1/2 | 4.8 – 10,000 * R / N | RS Feature | RS Feature | RS Feature | 4.8 – 30,000 * R / N | RS Feature | Standard |
| | | 3/4 | 7.2 – 15,000 * R / N | RS Feature | RS Feature | RS Feature | 7.2 – 45,000 * R / N | RS Feature | Standard |
| | | 7/8 | 8.4 – 17,500 * R / N | RS Feature | RS Feature | RS Feature | 8.4 – 52,000 * R / N | RS Feature | Standard |
| | Sequential | 1/2 | 4.8 – 2,048 | Sequential Feature | Sequential Feature | Sequential Feature | 4.8 – 2,048 | Sequential Feature | Sequential Feature |
| | | 3/4 | 7.2 – 2,048 | Sequential Feature | Sequential Feature | Sequential Feature | 7.2 – 2,048 | Sequential Feature | Sequential Feature |
| | | 7/8 | 8.4 – 2,048 | Sequential Feature | Sequential Feature | Sequential Feature | 8.4 – 2,048 | Sequential Feature | Sequential Feature |
| OQPSK | Viterbi | 1/2 | 4.8 – 10,000 | Standard | Standard | Standard | 4.8 – 30,000 | Standard | Standard |
| | | 3/4 | 7.2 – 15,000 | Standard | Standard | Standard | 7.2 – 45,000 | Standard | Standard |
| | | 7/8 | 8.4 – 17,500 | Standard | Standard | Standard | 8.4 – 52,000 | Standard | Standard |
| | Viterbi + RS | 1/2 | 4.8 – 10,000 * R / N | RS Feature | RS Feature | RS Feature | 4.8 – 10,000 * R / N | RS Feature | Standard |
| | | 3/4 | 7.2 – 15,000 * R / N | RS Feature | RS Feature | RS Feature | 7.2 – 15,000 * R / N | RS Feature | Standard |
| | | 7/8 | 8.4 – 17,500 * R / N | RS Feature | RS Feature | RS Feature | 8.4 – 17,500 * R / N | RS Feature | Standard |
| | Sequential | 1/2 | 4.8 – 2,048 | Sequential Feature | Sequential Feature | Sequential Feature | 4.8 – 2,048 | Sequential Feature | Sequential Feature |
| | | 3/4 | 7.2 – 2,048 | Sequential Feature | Sequential Feature | Sequential Feature | 7.2 – 2,048 | Sequential Feature | Sequential Feature |
| | | 7/8 | 8.4 – 2,048 | Sequential Feature | Sequential Feature | Sequential Feature | 8.4 – 2,048 | Sequential Feature | Sequential Feature |
| 8PSK | Trellis | 2/3 | 9.6 – 20,000 | 8PSK Feature | 8PSK Feature | 8PSK Feature | 9.6 – 52,000 | 8PSK Feature | Standard |
| | Trellis + RS | 2/3 | 9.6 – 20,000 * R / N | 8PSK + RS Feature | 8PSK + RS Feature | 8PSK + RS Feature | 9.6 – 52,000 | 8PSK + RS Feature | Standard |
| 16QAM | Viterbi | 3/4 | 14.4 – 20,000 | 16QAM Feature | 16QAM Feature | 16QAM Feature | 14.4 – 52,000 | 16QAM Feature | Standard |
| | | 7/8 | 16.8 – 20,000 | 16QAM Feature | 16QAM Feature | 16QAM Feature | 16.8 – 52,000 | 16QAM Feature | Standard |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| | Viterbi + RS | 3/4 | 14.4 – 20,000 * R / N | 16QAM + RS Feature | 16QAM + RS Feature | 16QAM + RS Feature | 14.4 – 52,000 | 16QAM + RS Feature | Standard |
| | | 7/8 | 16.8 – 20,000 * R / N | 16QAM + RS Feature | 16QAM + RS Feature | 16QAM + RS Feature | 16.8 – 52,000 | 16QAM + RS Feature | Standard |
| DVB Modes | | | | | | | | | |
| BPSK | Viterbi | 1/2 | 2.4 – 4,608 | DVB Feature | DVB Feature | DVB Feature | 2.4 – 4,608 | DVB Feature | DVB Feature |
| | | 2/3 | 3.2 – 6,144 | DVB Feature | DVB Feature | DVB Feature | 3.2 – 6,144 | DVB Feature | DVB Feature |
| | | 3/4 | 3.6 – 6,912 | DVB Feature | DVB Feature | DVB Feature | 3.6 – 6,912 | DVB Feature | DVB Feature |
| | | 5/6 | 4.0 – 7,680 | DVB Feature | DVB Feature | DVB Feature | 4.0 – 7,680 | DVB Feature | DVB Feature |
| | | 7/8 | 4.2 – 8,064 | DVB Feature | DVB Feature | DVB Feature | 4.2 – 8,064 | DVB Feature | DVB Feature |
| QPSK | Viterbi | 1/2 | 4.8 – 9,216 | DVB Feature | DVB Feature | DVB Feature | 4.8 – 9,216 | DVB Feature | DVB Feature |
| | | 2/3 | 6.4 – 12,288 | DVB Feature | DVB Feature | DVB Feature | 6.4 – 12,288 | DVB Feature | DVB Feature |
| | | 3/4 | 7.2 – 13,824 | DVB Feature | DVB Feature | DVB Feature | 7.2 – 13,824 | DVB Feature | DVB Feature |
| | | 5/6 | 8.0 – 15,359 | DVB Feature | DVB Feature | DVB Feature | 8.0 – 15,359 | DVB Feature | DVB Feature |
| | | 7/8 | 8.4 – 16,127 | DVB Feature | DVB Feature | DVB Feature | 8.4 – 16,127 | DVB Feature | DVB Feature |
| 8PSK | Trellis | 2/3 | 9.6 – 18,431 | 8PSK + DVB Feature | 8PSK + DVB Feature | 8PSK + DVB Feature | 9.6 – 18,431 | 8PSK + DVB Feature | DVB Feature |
| | | 5/6 | 12.0 – 20,000 | 8PSK + DVB Feature | 8PSK + DVB Feature | 8PSK + DVB Feature | 12.0 – 20,000 | 8PSK + DVB Feature | DVB Feature |
| | | 8/9 | 12.8 – 20,000 | 8PSK + DVB Feature | 8PSK + DVB Feature | 8PSK + DVB Feature | 12.8 – 20,000 | 8PSK + DVB Feature | DVB Feature |
| 16QAM | Trellis | 3/4 | 14.4 – 20,000 | 16QAM + DVB Feature | 16QAM + DVB Feature | 16QAM + DVB Feature | 14.4 – 20,000 | 16QAM + DVB Feature | DVB Feature |
| | | 7/8 | 16.8 – 20,000 | 16QAM + DVB Feature | 16QAM + DVB Feature | 16QAM + DVB Feature | 16.8 – 20,000 | 16QAM + DVB Feature | DVB Feature |
| TPC Modes | | | | | | | | | |
| BPSK | TPC | 5/16 | 1.5 – 3,125 | TPC Feature + HW16 | TPC Feature + HW18 | — | 1.5 – 9,375 | TPC Feature + HW16 | Standard |
| | | 21/44 | 2.3 – 4,773 | TPC Feature + HW14 | TPC Feature | TPC Feature | 2.3 – 14,318 | TPC Feature + HW14 | Standard |
| | TPC (SHORT) | 7/8-S | 4.2 – 8,750 | TPC Feature + HW15 | — | — | 4.2 – 20,000 | TPC Feature + HW15 | — |
| QPSK | TPC | 21/44 | 4.6 – 9,545 | TPC Feature + HW14 | TPC Feature | TPC Feature | 4.6 – 20,000 | TPC Feature + HW14 | Standard |
| | | 3/4 | 7.2 – 15,000 | TPC Feature + HW14 | TPC Feature | TPC Feature | 7.2 – 20,000 | TPC Feature + HW14 | Standard |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
|  |  | 7/8 | 8.4 – 17,500 | TPC Feature + HW14 | TPC Feature | TPC Feature | 8.4 – 20,000 | TPC Feature + HW14 | Standard |
|  |  | 0.495 | 64.0 – 6,132 | TPC Feature + HW15 | — | — | 64.0 – 6,132 | TPC Feature + HW15 | — |
|  |  | 0.793 | 64.0 – 6,132 | TPC Feature + HW15 | — | — | 64.0 – 6,132 | TPC Feature + HW15 | — |
|  | TPC (SHORT) | 7/8-S | 64.0 – 17,500 | TPC Feature + HW15 | — | — | 64.0 – 20,000 | TPC Feature + HW15 | — |
| OQPSK | TPC | 21/44 | 4.6 – 9,545 | TPC Feature + HW-2 | TPC Feature | TPC Feature | 4.6 – 20,000 | TPC Feature + HW14 | Standard |
|  |  | 3/4 | 7.2 – 15,000 | TPC Feature + HW-2 | TPC Feature | TPC Feature | 7.2 – 20,000 | TPC Feature + HW14 | Standard |
|  |  | 7/8 | 8.4 – 17,500 | TPC Feature + HW-2 | TPC Feature | TPC Feature | 8.4 – 20,000 | TPC Feature + HW14 | Standard |
|  |  | 0.495 | 64.0 – 6,132 | TPC Feature + HW15 | — | — | 64.0 – 6,132 | TPC Feature + HW15 | — |
|  |  | 0.793 | 64.0 – 6,132 | TPC Feature + HW15 | — | — | 64.0 – 6,132 | TPC Feature + HW15 | — |
|  | TPC (SHORT) | 7/8-S | 64.0 – 17,500 | TPC Feature + HW15 | — | — | 64.0 – 20,000 | TPC Feature + HW15 | — |
| 8PSK | TPC | 3/4 | 10.8 – 20,000 | 8PSK + TPC Feature + HW14 | 8PSK + TPC Feature | 8PSK + TPC Feature | 10.8 – 20,000 | 8PSK + TPC Feature + HW14 | Standard |
|  |  | 7/8 | 12.6 – 20,000 | 8PSK + TPC Feature + HW14 | 8PSK + TPC Feature | 8PSK + TPC Feature | 12.6 – 20,000 | 8PSK + TPC Feature + HW14 | Standard |
|  |  | 0.495 | 64.0 – 6,132 | 8PSK + TPC Feature + HW15 | — | — | 64.0 – 6,132 | 8PSK + TPC Feature + HW15 | — |
|  |  | 0.793 | 64.0 – 6,132 | 8PSK + TPC Feature + HW15 | — | — | 64.0 – 6,132 | 8PSK + TPC Feature + HW15 | — |
|  |  | 0.750 | — | — | — | — | 20,000.1 – 52,000 | 8PSK + TPC Feature + HW15 | — |
|  |  | 0.875 | — | — | — | — | 20,000.1 – 52,000 | 8PSK + TPC Feature + HW15 | — |
| 8QAM | TPC | 3/4 | 10.8 – 20,000 | 8QAM + TPC Feature + HW16 | 8QAM + TPC Feature + HW18 | — | 10.8 – 20,000 | 8QAM + TPC Feature + HW16 | Standard |
|  |  | 7/8 | 12.6 – 20,000 | 8QAM + TPC Feature + | 8QAM + TPC Feature + | — | 12.6 – 20,000 | 8QAM + TPC Feature + | Standard |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | HW16 | HW18 | | | HW16 | |
| 16QAM | TPC | 3/4 | 14.4 – 20,000 | 16QAM + TPC Feature + HW14 | 16QAM + TPC Feature | 16QAM + TPC Feature | 14.4 – 20,000 | 16QAM + TPC Feature + HW14 | Standard |
| | | 7/8 | 16.8 – 20,000 | 16QAM + TPC Feature + HW14 | 16QAM + TPC Feature | 16QAM + TPC Feature | 16.8 – 20,000 | 16QAM + TPC Feature + HW14 | Standard |
| | | 0.495 | 64.0 – 6,132 | 16QAM + TPC Feature + HW15 | — | — | 64.0 – 6,132 | 16QAM + TPC Feature + HW15 | — |
| | | 0.793 | 64.0 – 6,132 | 16QAM + TPC Feature + HW15 | — | — | 64.0 – 6,132 | 16QAM + TPC Feature + HW15 | — |
| | | 0.750 | — | — | — | — | 20,000.1 – 52,000 | 16QAM + TPC Feature + HW15 | — |
| | | 0.875 | — | — | — | — | 20,000.1 – 52,000 | 16QAM + TPC Feature + HW15 | — |
| 165B Turbo Modes | | | | | | | | | |
| BPSK | Turbo | 1/2 | 64 – 5,000 | — | EBEM Feature + HW17 | — | 64 – 15,000 | EBEM Feature + HW17 | Standard |
| | | 2/3 | 64 – 6,667 | — | EBEM Feature + HW17 | — | 64 – 20,000 | EBEM Feature + HW17 | Standard |
| | | 3/4 | 64 – 7,500 | — | EBEM Feature + HW17 | — | 64 – 22,500 | EBEM Feature + HW17 | Standard |
| | | 7/8 | 64 – 8,750 | — | EBEM Feature + HW17 | — | 64 – 26,250 | EBEM Feature + HW17 | Standard |
| | | 19/20 | 64 – 9,500 | — | EBEM Feature + HW17 | — | 64 – 28,500 | EBEM Feature + HW17 | Standard |
| QPSK | Turbo | 1/2 | 64 – 10,000 | — | EBEM Feature + HW17 | — | 64 – 30,000 | EBEM Feature + HW17 | Standard |
| | | 2/3 | 64 – 13,333 | — | EBEM Feature + HW17 | — | 64 – 40,000 | EBEM Feature + HW17 | Standard |
| | | 3/4 | 64 – 15,000 | — | EBEM Feature + HW17 | — | 64 – 45,000 | EBEM Feature + HW17 | Standard |
| | | 7/8 | 64 – 17,500 | — | EBEM Feature + HW17 | — | 64 – 52,500 | EBEM Feature + HW17 | Standard |
| | | 19/20 | 64 – 19,000 | — | EBEM Feature + HW17 | — | 64 – 57,000 | EBEM Feature + HW17 | Standard |
| 8PSK | Turbo | 1/2 | 256 – 15,000 | — | EBEM Feature + HW17 | — | 256 – 45,000 | EBEM Feature + HW17 | Standard |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| | | 2/3 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 60,000 | EBEM Feature + HW17 | Standard |
| | | 3/4 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 67,500 | EBEM Feature + HW17 | Standard |
| | | 7/8 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 78,750 | EBEM Feature + HW17 | Standard |
| | | 19/20 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 85,500 | EBEM Feature + HW17 | Standard |
| 16APSK | Turbo | 1/2 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 60,000 | EBEM Feature + HW17 | Standard |
| | | 2/3 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 80,000 | EBEM Feature + HW17 | Standard |
| | | 3/4 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 90,000 | EBEM Feature + HW17 | Standard |
| | | 7/8 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 105,000 | EBEM Feature + HW17 | Standard |
| | | 19/20 | 256 – 20,000 | — | EBEM Feature + HW17 | — | 256 – 114,000 | EBEM Feature + HW17 | Standard |
| LDPC Modes | | | | | | | | | |
| BPSK | HP-LDPC | 1/2 | 2.4 – 5,000 | LDPC Feature + HW16 | LDPC Feature + HW18 | LDPC Feature + HW20 | 2.4 – 15,000 | LDPC Feature + HW16 | LDPC Feature |
| | ULL-LDPC | 1/2 | 2.4 – 4,933 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 14,799 | LDPC Feature + HW19 | LDPC Feature |
| QPSK | HP-LDPC | 1/2 | 4.8 – 10,000 | LDPC Feature + HW16 | LDPC Feature + HW18 | LDPC Feature + HW20 | 4.8 – 20,000 | LDPC Feature + HW16 | LDPC Feature |
| | | 2/3 | 6.4 – 13,333 | LDPC Feature + HW16 | LDPC Feature + HW18 | LDPC Feature + HW20 | 6.4 – 20,000 | LDPC Feature + HW16 | LDPC Feature |
| | | 3/4 | 7.2 – 15,000 | LDPC Feature + HW16 | LDPC Feature + HW18 | LDPC Feature + HW20 | 7.2 – 20,000 | LDPC Feature + HW16 | LDPC Feature |
| | ULL-LDPC | 1/2 | 4.7 – 9,866 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 20,000 | LDPC Feature + HW19 | LDPC Feature |
| | | 2/3 | 6.3 – 13,078 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 20,000 | LDPC Feature + HW19 | LDPC Feature |
| | | 3/4 | 7.0 – 14,685 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 20,000 | LDPC Feature + HW19 | LDPC Feature |
| OQPSK | HP-LDPC | 1/2 | 4.8 – 10,000 | LDPC Feature + HW16 | LDPC Feature + HW18 | LDPC Feature + HW20 | 4.8 – 20,000 | LDPC Feature + HW16 | LDPC Feature |
| | | 2/3 | 6.4 – 13,333 | LDPC Feature + HW16 | LDPC Feature + HW18 | LDPC Feature + HW20 | 6.4 – 20,000 | LDPC Feature + HW16 | LDPC Feature |
| | | 3/4 | 7.2 – 15,000 | LDPC Feature + HW16 | LDPC Feature + HW18 | LDPC Feature + HW20 | 7.2 – 20,000 | LDPC Feature + HW16 | LDPC Feature |
| | ULL-LDPC | 1/2 | 4.7 – 9,866 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 20,000 | LDPC Feature + HW19 | LDPC Feature |
| | | 2/3 | 6.3 – 13,078 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 20,000 | LDPC Feature + HW19 | LDPC Feature |
| | | 3/4 | 7.0 – 14,685 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 20,000 | LDPC Feature + HW19 | LDPC Feature |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| 8PSK | HP-LDPC | 2/3 | 9.6 – 20,000 | 8PSK + LDPC Feature + HW16 | 8PSK + LDPC Feature + HW18 | 8PSK + LDPC Feature + HW20 | 9.6 – 20,000 | 8PSK + LDPC Feature + HW20 | LDPC Feature |
| | | 3/4 | 10.8 – 20,000 | 8PSK + LDPC Feature + HW16 | 8PSK + LDPC Feature + HW18 | 8PSK + LDPC Feature + HW20 | 10.8 – 20,000 | 8PSK + LDPC Feature + HW16 | LDPC Feature |
| 8QAM | HP-LDPC | 2/3 | 9.6 – 20,000 | 8QAM + LDPC Feature + HW16 | 8QAM + LDPC Feature + HW18 | 8QAM + LDPC Feature + HW20 | 9.6 – 20,000 | 8QAM + LDPC Feature + HW16 | LDPC Feature |
| | | 3/4 | 10.8 – 20,000 | 8QAM + LDPC Feature + HW16 | 8QAM + LDPC Feature + HW18 | 8QAM + LDPC Feature + HW20 | 10.8 – 20,000 | 8QAM + LDPC Feature + HW16 | LDPC Feature |
| 16QAM | HP-LDPC | 3/4 | 14.4 – 20,000 | 16QAM + LDPC Feature + HW16 | 16QAM + LDPC Feature + HW18 | 16QAM + LDPC Feature + HW20 | 14.4 – 20,000 | 16QAM + LDPC Feature + HW16 | LDPC Feature |
| **TX Direct Sequence Spread Spectrum** | | | | | | | | | |
| BPSK | HP-LDPC-OFF | 1/2 | 2.4 – 5,000 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 15,000 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 2.4 – 2,500 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 7,500 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x4 | | 2.4 – 1,250 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 3,750 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 2.4 – 625 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 1,875 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 2.4 – 313 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 937 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | HP-LDPC-OFF | 1/2 | 2.4 – 4,933 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 4,933 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 2.4 – 2,467 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 2,466 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| | FACTOR x4 | | 2.4 – 1,233 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 – 1,233 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 2.4 - 617 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 - 616 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 2.4 - 308 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 2.4 - 308 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| QPSK | HP-LDPC-OFF | 1/2 | 4.8 – 10,000 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 10,000 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 4.8 – 5,000 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 5,000 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x4 | 1/2 | 4.8 – 2,500 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 2,500 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 4.8 – 1,250 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 1,250 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 4.8 - 625 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 625 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | HP-LDPC-OFF | | 4.7 – 9,866 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 9,866 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 4.7 – 4,933 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 4,933 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x4 | 1/2 | 4.7 – 2,467 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 2,466 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 4.7 – 1,233 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 1,233 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 4.7 - 617 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 616 | LDPC Feature + HW19 | DSSS Feature + |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | LDPC Feature |
| | HP-LDPC-OFF | | 6.3 – 13,078 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 13,078 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 6.3 – 6,539 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 6,539 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x4 | 2/3 | 6.3 – 3,270 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 3,269 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 6.3 – 1,635 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 1,634 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 6.3 0 817 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 0 817 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | HP-LDPC-OFF | | 7.0 – 14,685 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 14,686 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 7.0 – 7,342 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 7,342 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x4 | 3/4 | 7.0 – 3,671 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 3,671 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 7.0 – 1,836 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 1,835 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 7.0 - 918 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 - 917 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| OQPSK | HP-LDPC-OFF | 1/2 | 4.8 – 10,000 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 10,000 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 4.8 – 5,000 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 5,000 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| | FACTOR x4 | | 4.8 – 2,500 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 2,500 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 4.8 – 1,250 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 1,250 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 4.8 – 625 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.8 – 625 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | HP-LDPC-OFF | | 4.7 – 9,866 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 9,866 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 4.7 – 4,933 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 4,933 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x4 | 1/2 | 4.7 – 2,467 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 2,466 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 4.7 – 1,233 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 1,233 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 4.7 – 617 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 4.7 – 616 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | HP-LDPC-OFF | | 6.3 – 13,078 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 13,078 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 6.3 – 6,539 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 6,539 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x4 | 2/3 | 6.3 – 3,270 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 3,269 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 6.3 – 1,635 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 1,634 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 6.3 – 817 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 6.3 – 817 | LDPC Feature + HW19 | DSSS Feature + |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | LDPC Feature |
| | HP-LDPC-OFF | | 7.0 – 14,685 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 14,686 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x2 | | 7.0 – 7,342 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 7,342 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x4 | 3/4 | 7.0 – 3,671 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 3,671 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x8 | | 7.0 – 1,836 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 – 1,835 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| | FACTOR x16 | | 7.0 - 918 | LDPC Feature + HW19 | — | LDPC Feature + HW20 | 7.0 - 917 | LDPC Feature + HW19 | DSSS Feature + LDPC Feature |
| **Satellite Framing** | | | | | | | | | |
| ALL | IDR 96K | — | T1/E1 / T2/E2 | IDR Feature, Framing Only + HW9 for IESS | IDR Feature for Framing | IDR Feature, Framing Only + HW9 for IESS | T1/E1 / T2/E2 / T3/E3 | IDR Feature, Framing Only + HW9 for IESS | IDR Feature for Framing |
| | IBS 1/15 | — | N x 64, 64 – 1536, 2048 | IBS Feature + HW9 for IESS | IBS Feature (Framing Only) | IBS Feature (Framing Only) | N x 64, 64 – 1536, 2048 | IBS Feature | IBS Feature |
| | EF AUPC | — | Less than 20,000 | AUPC Feature | AUPC Feature | AUPC Feature | Less than 20,000 | AUPC Feature | Standard |
| | EDMAC | — | — | EDMAC Feature Framing Only | EDMAC Feature Framing Only | EDMAC Feature Framing Only | — | EDMAC Feature Framing Only | EDMAC Feature Framing Only |
| | SCC | — | — | Enhanced Async Feature | Enhanced Async Feature (Framing Only) | Enhanced Async Feature | — | Enhanced Async Feature | Enhanced Async Feature |
| | EFFICIENT D&I | — | N x 64, 64 – 1536, 2048 | Drop and Insert Feature | Drop and Insert Feature (Framing Only) | Drop and Insert Feature | N x 64, 64 – 1536, 2048 | IDR Feature, Framing Only + HW9 for IESS | Drop and Insert Feature (Framing Only) |
| | EBEM | — | — | — | EBEM Feature + HW5 | — | — | — | — |
| **Ethernet HDLC Framing** | | | | | | | | | |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| ALL | RADYNE | — | — | Standard + HW22 | Standard (10/100) | Standard (10/100) | — | Standard + HW22 | Standard (10/100/1000) |
| | COMTECH | — | — | Standard + HW22 | Standard (10/100) | — | — | Standard + HW22 | Standard (10/100/1000) |
| | MANAGED 570 | — | — | Standard + HW22 | Standard (10/100) | — | — | Standard + HW22 | Standard (10/100/1000) |
| **TRANSEC (HW28) Counter Mode (Interoperable with MD-1366)** | | | | | | | | | |
| BPSK | Turbo | 1/2 | 64 – 5,000 | — | EBEM Feature + HW28 | — | 64 – 15,000 | EBEM Feature + HW28 | Standard |
| | | 2/3 | 64 – 6,667 | — | EBEM Feature + HW28 | — | 64 – 20,000 | EBEM Feature + HW28 | Standard |
| | | 3/4 | 64 – 7,500 | — | EBEM Feature + HW28 | — | 64 – 22,500 | EBEM Feature + HW28 | Standard |
| | | 7/8 | 64 – 8,750 | — | EBEM Feature + HW28 | — | 64 – 26,250 | EBEM Feature + HW28 | Standard |
| | | 19/20 | 64 – 9,500 | — | EBEM Feature + HW28 | — | 64 – 28,500 | EBEM Feature + HW28 | Standard |
| QPSK | Turbo | 1/2 | 64 – 10,000 | — | EBEM Feature + HW28 | — | 64 – 30,000 | EBEM Feature + HW28 | Standard |
| | | 2/3 | 64 – 13,333 | — | EBEM Feature + HW28 | — | 64 – 40,000 | EBEM Feature + HW28 | Standard |
| | | 3/4 | 64 – 15,000 | — | EBEM Feature + HW28 | — | 64 – 45,000 | EBEM Feature + HW28 | Standard |
| | | 7/8 | 64 – 17,500 | — | EBEM Feature + HW28 | — | 64 – 52,500 | EBEM Feature + HW28 | Standard |
| | | 19/20 | 64 – 19,000 | — | EBEM Feature + HW28 | — | 64 – 57,000 | EBEM Feature + HW28 | Standard |
| 8PSK | Turbo | 1/2 | 256 – 15,000 | — | EBEM Feature + HW28 | — | 256 – 45,000 | EBEM Feature + HW28 | Standard |
| | | 2/3 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 60,000 | EBEM Feature + HW28 | Standard |
| | | 3/4 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 67,500 | EBEM Feature + HW28 | Standard |
| | | 7/8 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 78,750 | EBEM Feature + HW28 | Standard |
| | | 19/20 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 85,500 | EBEM Feature + HW28 | Standard |
| 16APSK | Turbo | 1/2 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 60,000 | EBEM Feature + HW28 | Standard |
| | | 2/3 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 80,000 | EBEM Feature + HW28 | Standard |
| | | 3/4 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 90,000 | EBEM Feature + HW28 | Standard |
| | | 7/8 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 105,000 | EBEM Feature + HW28 | Standard |
| | | 19/20 | 256 – 20,000 | — | EBEM Feature + HW28 | — | 256 – 114,000 | EBEM Feature + HW28 | Standard |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| TRANSEC (HW28) Block Mode Mode (Interoperable with SLM-5650A) HW-27 Frame Expansion: (3 + 16 * N) / (16 * N), N = 1…16 ||||||||||
| BPSK | TPC | 5/16 | 1.5 – 2,632 | TPC Feature + HW27 | TPC Feature + HW27 | — | 1.5 – 7,895 | TPC Feature + HW27 | Standard |
| BPSK | TPC | 21/44 | 2.3 – 4,019 | TPC Feature + HW27 | TPC Feature + HW27 | TPC Feature + HW27 | 2.3 – 12,057 | TPC Feature + HW27 | Standard |
| QPSK | TPC | 21/44 | 4.6 – 8,038 | TPC Feature + HW27 | TPC Feature + HW27 | TPC Feature + HW27 | 4.6 – 20,000 | TPC Feature + HW27 | Standard |
| QPSK | TPC | 3/4 | 7.2 – 12,632 | TPC Feature + HW27 | TPC Feature + HW27 | TPC Feature + HW27 | 7.2 – 20,000 | TPC Feature + HW27 | Standard |
| QPSK | TPC | 7/8 | 8.4 – 14,737 | TPC Feature + HW27 | TPC Feature + HW27 | TPC Feature + HW27 | 8.4 – 20,000 | TPC Feature + HW27 | Standard |
| OQPSK | TPC | 21/44 | 4.6 – 8,038 | TPC Feature + HW27 | TPC Feature + HW27 | TPC Feature + HW27 | 4.6 – 20,000 | TPC Feature + HW27 | Standard |
| OQPSK | TPC | 3/4 | 7.2 – 12,632 | TPC Feature + HW27 | TPC Feature + HW27 | TPC Feature + HW27 | 7.2 – 20,000 | TPC Feature + HW27 | Standard |
| OQPSK | TPC | 7/8 | 8.4 – 14,737 | TPC Feature + HW27 | TPC Feature + HW27 | TPC Feature + HW27 | 8.4 – 20,000 | TPC Feature + HW27 | Standard |
| 8PSK | TPC | 3/4 | 10.8 – 18,947 | 8PSK + TPC Feature + HW27 | 8PSK + TPC Feature + HW27 | 8PSK + TPC Feature + HW27 | 10.8 – 20,000 | 8PSK + TPC Feature + HW27 | Standard |
| 8PSK | TPC | 7/8 | 12.6 – 20,000 | 8PSK + TPC Feature + HW27 | 8PSK + TPC Feature + HW27 | 8PSK + TPC Feature + HW27 | 12.6 – 20,000 | 8PSK + TPC Feature + HW27 | Standard |
| 8QAM | TPC | 3/4 | 10.8 – 18,974 | 8PSK + TPC Feature + HW27 | 8PSK + TPC Feature + HW27 | 8PSK + TPC Feature + HW27 | 10.8 – 20,000 | 8PSK + TPC Feature + HW27 | Standard |
| 8QAM | TPC | 7/8 | 12.6 – 20,000 | 8PSK + TPC Feature + HW27 | 8PSK + TPC Feature + HW27 | 8PSK + TPC Feature + HW27 | 12.6 – 20,000 | 8PSK + TPC Feature + HW27 | Standard |
| 16QAM | TPC | 3/4 | 14.4 – 20,000 | 16QAM + TPC Feature + HW27 | 16QAM + TPC Feature + HW27 | 16QAM + TPC Feature + HW27 | 14.4 – 20,000 | 16QAM + TPC Feature + HW27 | Standard |
| 16QAM | TPC | 7/8 | 16.8 – 20,000 | 16QAM + TPC Feature + HW27 | 16QAM + TPC Feature + HW27 | 16QAM + TPC Feature + HW27 | 16.8 – 20,000 | 16QAM + TPC Feature + HW27 | Standard |
| BPSK | HP-LDPC | 1/2 | 2.4 – 4,211 | LDPC Feature + HW27 | LDPC Feature + HW27 | LDPC Feature + HW27 | 2.4 – 12,632 | LDPC Feature + HW27 | LDPC Feature |
| BPSK | ULL-LDPC | 1/2 | 2.4 – 4,154 | LDPC Feature + HW27 | — | LDPC Feature + HW27 | 2.4 – 12,463 | LDPC Feature + HW27 | LDPC Feature |
| QPSK | HP-LDPC | 1/2 | 4.8 – 8,421 | LDPC Feature + HW27 | LDPC Feature + HW27 | LDPC Feature + HW27 | 4.8 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| QPSK | HP-LDPC | 2/3 | 6.4 – 11,228 | LDPC Feature + HW27 | LDPC Feature + HW27 | LDPC Feature + HW27 | 6.4 – 20,000 | LDPC Feature + HW27 | LDPC Feature |

| Modulation | Code | Rate | Data Rate Range (kbps) | DMD20 / DMD20 LBST HW1 + HW6 | DMD1050 / DMD1050T / DMD1050TS HW3 + HW8 | OM20 HW1 + HW6 | Data Rate Range (kbps) | DMD50 / DMD2050 HW2 + HW7 | DMD2050E / DMD2050EU HW2 + HW7 + HW24 |
|---|---|---|---|---|---|---|---|---|---|
| OQPSK | | 3/4 | 7.2 – 12,632 | LDPC Feature + HW27 | LDPC Feature + HW27 | LDPC Feature + HW27 | 7.2 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | ULL-LDPC | 1/2 | 4.7 – 8,308 | LDPC Feature + HW27 | — | LDPC Feature + HW27 | 4.7 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | | 2/3 | 6.3 – 11,013 | LDPC Feature + HW27 | — | LDPC Feature + HW27 | 6.3 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | | 3/4 | 7.0 – 12,366 | LDPC Feature + HW27 | — | LDPC Feature + HW27 | 7.0 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | HP-LDPC | 1/2 | 4.8 – 8,421 | LDPC Feature + HW27 | LDPC Feature + HW27 | LDPC Feature + HW27 | 4.8 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | | 2/3 | 6.4 – 11,228 | LDPC Feature + HW27 | LDPC Feature + HW27 | LDPC Feature + HW27 | 6.4 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | | 3/4 | 7.2 – 12,632 | LDPC Feature + HW27 | LDPC Feature + HW27 | LDPC Feature + HW27 | 7.2 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | ULL-LDPC | 1/2 | 4.7 – 8,308 | LDPC Feature + HW27 | — | LDPC Feature + HW27 | 4.7 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | | 2/3 | 6.3 – 11,013 | LDPC Feature + HW27 | — | LDPC Feature + HW27 | 6.3 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| | | 3/4 | 7.0 – 12,366 | LDPC Feature + HW27 | — | LDPC Feature + HW27 | 7.0 – 20,000 | LDPC Feature + HW27 | LDPC Feature |
| 8PSK | HP-LDPC | 2/3 | 9.6 – 16,842 | 8PSK + LDPC Feature + HW27 | 8PSK + LDPC Feature + HW27 | 8PSK + LDPC Feature + HW27 | 9.6 – 20,000 | 8PSK + LDPC Feature + HW27 | LDPC Feature |
| | | 3/4 | 10.8 – 18,947 | 8PSK + LDPC Feature + HW27 | 8PSK + LDPC Feature + HW27 | 8PSK + LDPC Feature + HW27 | 10.8 – 20,000 | 8PSK + LDPC Feature + HW27 | LDPC Feature |
| 8QAM | HP-LDPC | 2/3 | 9.6 – 16,842 | 8QAM + LDPC Feature + HW27 | 8QAM + LDPC Feature + HW27 | 8QAM + LDPC Feature + HW27 | 9.6 – 20,000 | 8QAM + LDPC Feature + HW27 | LDPC Feature |
| | | 3/4 | 10.8 – 18,947 | 8QAM + LDPC Feature + HW27 | 8QAM + LDPC Feature + HW27 | 8QAM + LDPC Feature + HW27 | 10.8 – 20,000 | 8QAM + LDPC Feature + HW27 | LDPC Feature |
| 16QAM | HP-LDPC | 3/4 | 14.4 – 20,000 | 16QAM + LDPC Feature + HW27 | 16QAM + LDPC Feature + HW27 | 16QAM + LDPC Feature + HW27 | 14.4 – 20,000 | 16QAM + LDPC Feature + HW27 | LDPC Feature |

# DMD1050T

## Satellite Modem Board

## Installation and Operation Manual

# Table of Contents

# Figures

# Tables

# PREFACE

## About this Manual

This manual describes the installation and operation of the DMD1050T.

## Cautions and Warnings

> NOTE: A Note gives important data about the equipment or task..

> CAUTION
>
> A Caution gives important data about a hazard that can cause injury to persons or damage to property.

> WARNING
>
> A WARNING gives important data about a hazard that can cause death or serious injury.

## Patents and Trademarks

See all of Comtech EF Data's Patents and Patents Pending at http://patents.comtechefdata.com.

Comtech EF Data acknowledges that all trademarks are the property of the trademark owners.

## Product Support

For all product support, please call:

**+1.240.243.1880**

**+1.866.472.3963 (toll free USA)**

## Related Documents

- Department of Defense (DOD) MIL-STD-188-165A, Interoperability and Performance Standards for SHF Satellite Communications PSK Modems (FDMA Operation) (dated November 2005)
- Department of Defense (DOD) MIL-STD-188-114A, Electrical Characteristics of Digital Interface Circuits
- EN300-421 and EN301-210 ETSI
- INTELSAT Earth Station Standards IESS-308, -309, -310, and -315

# Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product.  In most cases, the warranty period is two years. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original warranty or a 90 day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

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

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging.  Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

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The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

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The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

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Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose.  The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

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

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# Chapter 1.  Introduction

The DMD1050T Satellite Modem Board, is designed for satellite IP, telecom, video and internet applications.

## 1.1    Overview

- Full Duplex L-Band satellite modem card
- MIL-STD-188-165A standards
- FIPs 140-2 Transmision Security
- IDR, IBS and DVB
- Data rates up to 20 Mbps



**Figure 1-1 DMD1050T Satellite Board Modem (Top View)**

The DMD1050T's remote accessibility rivals all others in the field. Remote control is via Radyne Link Level Protocol (RLLP), Ethernet 100 Base-T SNMP and Web Browser. It includes control of all the modem's features, plus software maintenance. The DMD1050T shows monitor and control functions on a PC screen.

Additional options and configuration, such as Monitor and Control, can be activated in seconds via the Web Browser.

Compatibility is maintained with other modems, such as the DMD2050E, SLM-5650A, DMD2050, DMD50, DMD20 and the DISA-certified, MIL-188-165 compliant DMD15L, for seamless substitution and addition to existing systems.

The DMD1050T offers built in standard interfaces that are selectable from MIL-188-114A and a Dual Port Ethernet Bridge.

## 1.2    DMD1050T Configurations

You can configure the DMD1050T in different ways:

- Features and options installed when the unit is ordered
- Feature upgrades
- Hardware options you can install at your location
- Options installed in a unit at a Comtech service center

### 1.2.1 Features/Options Installed at Time of Order

Features installed when the unit is ordered are options pre-installed/initialized in the factory before shipment. You can see these from the web browser.

Factory installed options are chassis and board configurations that occur during manufacture.

### 1.2.2 Feature Upgrades

Feature upgrades are an easy way of changing the feature set for an installed modem. Feature upgrades are how most options are implemented.

Purchase feature upgrades any time by contacting Comtech EF Data.

## 1.3    Function Accessibility

With a terminal or personal computer and a serial link, you have access to all functions for remote monitoring and control.

# Chapter 2.  Installation

This section provides instructions on unpacking and installation, as well as storage of the unit.

## 2.1    Installation Requirements

Installation of the DMD1050T Modem Board requires adequate planning by the user to ensure no damage will occur to the unit. Package design considerations for the modem board include mounting, temperature limits, adequate ventilation, limited vibration, no exposure to condensation/ moisture and a stable power source.

Mating connectors are supplied with each unit. A full description of the modems pin outs can be found in Section 4. Appendix E gives details of the various connectors and mating connectors supplied.

> **WARNING - DANGER OF EXPLOSION – LITHIUM BATTERY**
>
> This unit contains a lithium battery. You must replace the lithium battery with the same or equivalent battery that is recommended by the manufacturer. You must dispose of used batteries as required by local and national regulations. Make sure to prevent static discharge that can cause damage to the Modem Board.

> **CAUTION - TRAFFIC DISRUPTION**
>
> Before you connect power to the unit, disconnect the transmit output from the operating ground station equipment.
>
> Communication traffic can be disrupted by connecting power to a unit when the configuration settings are not known and possibly incorrect.

> **CAUTION - EQUIPMENT DAMAGE**
>
> Electrostatic discharge (ESD) causes damage to the equipment.
> Before you touch the equipment, obey the ESD precautions.

## 2.2    Unpacking

The DMD1050T Universal Satellite Modem is packaged carefully, to avoid damage. The container arrives with these items:

- DMD1050T Modem Board
- Installation and Operation Manual

## 2.3    Removal and Assembly

The DMD1050T Modem Unit is assembled fully when shipped.

Carefully unpack the unit.

Make sure that all of the shipped items are in the container.

## 2.4    Installation Considerations

The operating temperature range for the DMD1050T is 0° to +60°C. It is designed to be conduction cooled. Heat spreaders conduct from heat generating components to the edges of the assembly.

You can use airflow for cooling, as long as you make sure sufficient airflow is provided so that the rail temperatures do not exceed +60°C.

When installed to use conduction cooling, it is best to attach to the metal side rails. See the orange arrows in Figure 2-1. There are four mounting holes on each side for this purpose.
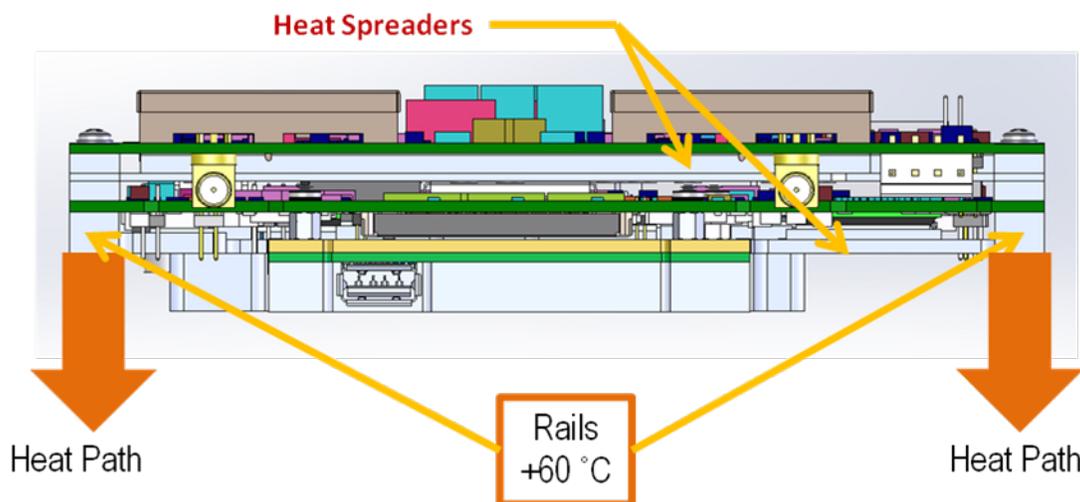


Figure 2-1. Heat Path

Make sure the Modem board has adequate spacing between it and other products, to avoid cross talk or electrical shorts. Do not put Modems immediately above or below a high EMF generator, to prevent output signal corruption and incorrect receive operation.

Do not install the DMD1050T in an unprotected outdoor location, where there is direct contact with rain, snow, wind or sun.

## 2.4.1 Tools Required

The only tools necessary are those used for installing and tightening the eight screws that attach the unit.

⚠️ **CAUTION – EQUIPMENT DAMAGE**

When you install the modem assembly, make sure it is not put under stress and thus damaged.

## 2.5 DMD1050T Initial Configuration Check

The DMD1050T is shipped from the factory with preset factory defaults. Upon initial power-up, do a user check to examine the shipped modem configuration.

⚠️ **CAUTION – EQUIPMENT DAMAGE**

Make sure to select the DMD1050T Interface Type (MIL-188-114A or Ethernet Data Interface) before you install the mating connectors. Failure to do this can cause damage to the Data Interface.

## 2.5.1 Standard DMD1050T Factory Configuration Settings

Use of Strap Code 26 can set the modem configuration. For an explanation and listing of available Strap Codes, see Appendix G. The Frequency and Modulator Output Power are set independently of the strap code.

| Modulator: | |
|---|---|
| Data Rate: | 2.048 Mbps |
| Mode: | Closed Network |
| Satellite Framing: | None |
| Scrambler: | V.35 (IESS) |
| Inner FEC: | 1/2 Rate Viterbi |

| Modulator: | |
|---|---|
| Outer FEC: | Disabled |
| Modulation: | QPSK |
| Frequency: | 950 MHz |
| Modulator Output Power: | -20 dBm |

| Demodulator: | |
|---|---|
| Data Rate: | 2.048 Mbps |
| Mode: | Closed Network |
| Satellite Framing: | None |
| Scrambler: | V.35 (IESS) |
| Inner FEC: | 1/2 Rate Viterbi |
| Outer FEC: | Disabled |
| Modulation: | QPSK |
| Frequency: | 950 MHz |

To lock up the modem:

- Enter **IF Loopback Enable** in the Test Menu

- or -

- Connect a Loopback Cable from TX port to RX port

⚠ **CAUTION – NETWORK MALFUNCTION**

Using the modem's loopback capabilities with the Ethernet data interface can cause undesirable network loops. Before you do any data test with an Ethernet interface, make sure to use two modems connected back-to-back. If you use one modem and a loopback, it can cause unwanted results.

## 2.6    Modulator Checkout

The Modulator checkout descriptions assume that the DMD1050T is installed in a suitable location with clean, stable DC power. Make sure that DC spikes do not occur during initial power up.

## 2.6.1  Initial Power-Up

**CAUTION – EQUIPMENT DAMAGE**

Make sure that the modem's input DC power is clean, stable and free of spikes. If the input DC power is poor quality, it can cause damage to the unit.

**CAUTION - TRAFFIC DISRUPTION**

Before you connect power to the unit, disconnect the transmit output from the operating ground station equipment.

Communication traffic can be disrupted by connecting power to a unit when the configuration settings are not known and possibly incorrect.

NOTE:  New units are shipped with the transmit carrier set to OFF.

You can do the initial field checkout of the modem using the Web Browser or the Terminal Mode. Both have the advantage of giving full screen access to all of the modem's parameters. However, a separate terminal or computer running a Terminal Program is necessary. The modem is configured with the Web Browser enabled.

## 2.6.2  M&C Web Browser Setup

The Ethernet M&C (J11) Interface requires a standard RJ45 Male connector. The Ethernet Interface is shipped from the factory in an addressable, default condition that gives you access to the unit. This condition is identified as **IP TEST MODE**.

| Boot Modes: IPTEST | |
|---|---|
| IP Address Mask | 255.255.255.000 |
| Modem IP Address | 192.168.0.238 |
| TRANSEC IP Address | 192.168.0.239 |
| Server IP Address | 192.168.000.101 |
| Router IP Address | 192.168.000.102 |

See Appendices C & D for set up of the Ethernet M&C Interface.

Connect an Ethernet cable between the unit and a computer that has web browser capability. Open the browser and enter the default web address for the unit.

See Chapter 7 for a description of the GUI Interface operation and parameters. See Appendix C and Appendix D for setup of the TCP-IP interface and Web browser.

## 2.6.3  M&C Terminal Setup

You can do the initial field checkout of the modem in Terminal Mode. The Terminal Mode gives you full screen access to the modem's parameters. However, it  requires a separate terminal or computer running a terminal program such as Hyper-terminal, and connection to the applicable pins on the Remote Port connector (J3).

You can change these settings via the Web Browser.

| Recommended Terminal Settings | |
|---|---|
| Emulation Type: | VT-100 |
| Baud Rate: | 19.2 K |
| Data Bits: | 8 |
| Parity: | No Parity (Fixed) |

## 2.6.3.1      Web Browser and Terminal Interfaces Reset

If you cannot use the Web Browser or Terminal interface, reset the interface defaults.

To reset the interface defaults, use the shorting plug (CNRSHUNT). Do these steps:

1.     Make sure the electrical power to the unit is disconnected.
2.     Find the JP1 and JP2 connectors.
3.     Find pins 1 and 2 on the JP1 and JP2 connectors.
4.     Install the CNRSHUNT shorting plug on pins 1 and 2 of JP1, and pins 1 and 2 of JP2.
5.     Connect the electrical power to the unit.

This resets the interface defaults. See Section 3 for more information.

## 2.7    Storage

Store the unit in its original packaging. Store the unit in a dry location, where the temperature is stable. Keep it away from direct contact with rain, snow, wind, sun or anything that may cause damage to it.

# Chapter 3.  Theory of Operation

## 3.1    DMD1050T Hardware

The DMD1050T uses three printed circuit cards in its design. The standard configuration consists of:

- L-Band Assembly
- Digital Baseband Assembly
- FIPs 140-2 TRANSEC Security module

This configuration includes built in data interfaces and several software upgrade options.

A block diagram of the DMD1050TE is shown in Figure 3-1.
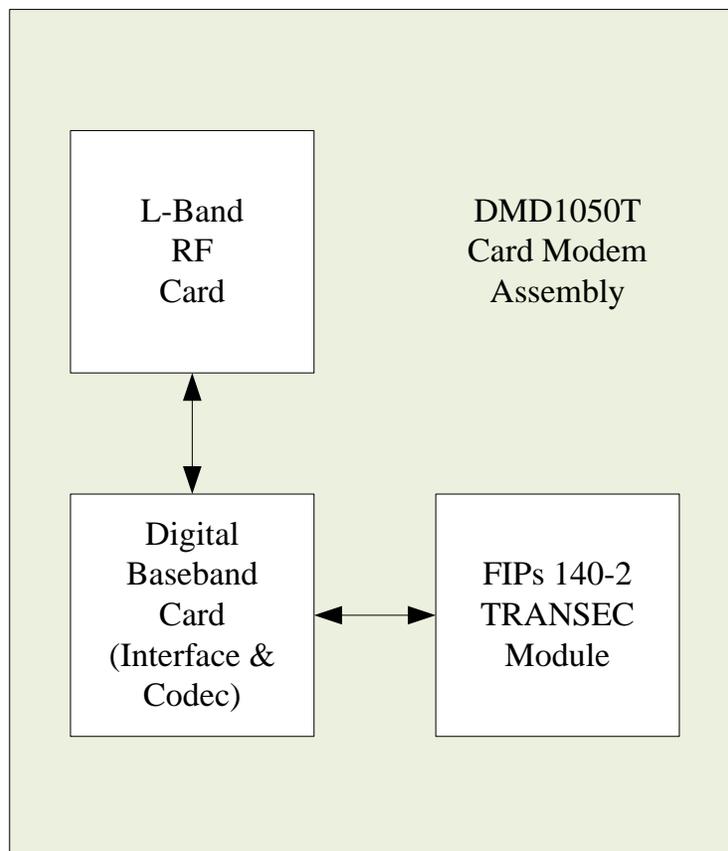


**Figure 3-1 DMD1050T Block Diagram**

## 3.1.1  L-Band Printed Circuit Card

The L-Band/IF Printed Circuit Card consists of:

- Analog modulation function

- Analog complex down conversion

- Two wide-band digital synthesizers

The block diagram of the L-Band Assembly is shown in Figure 3-2.
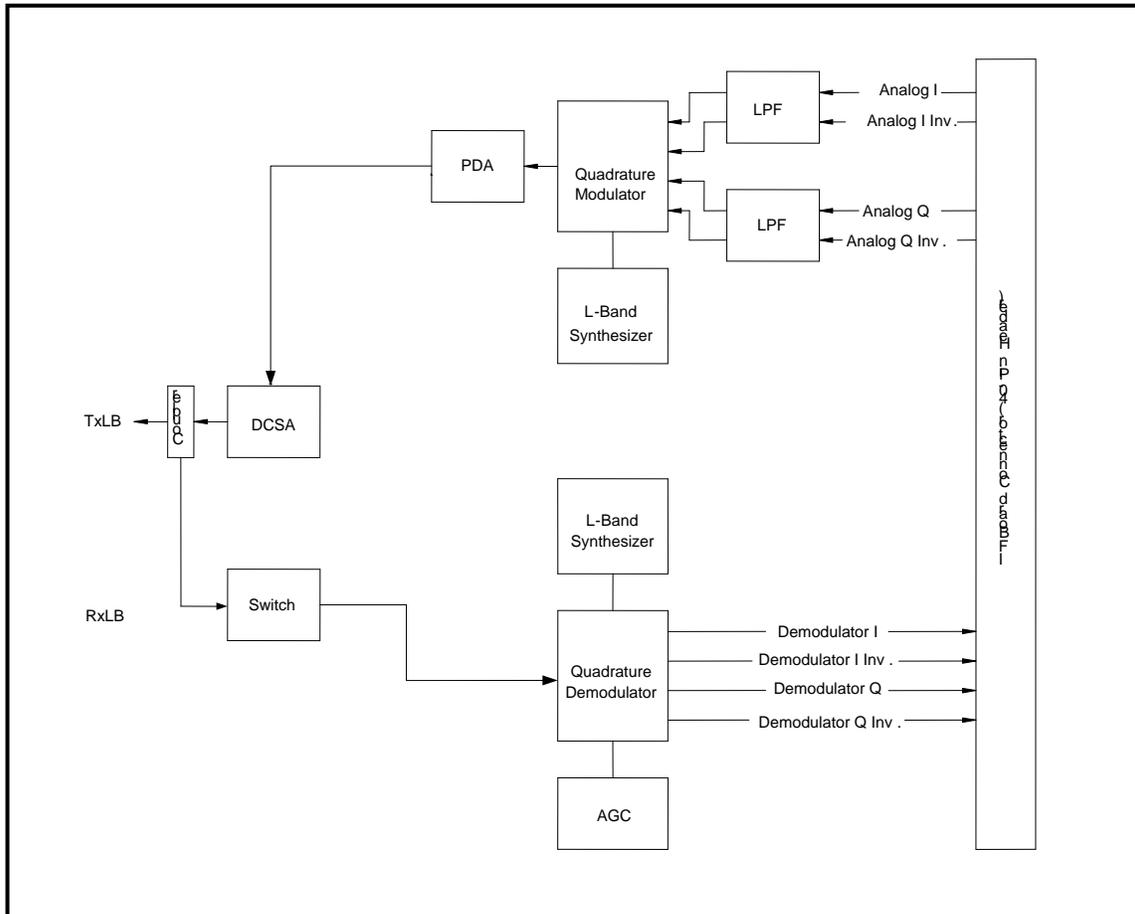


**Figure 3-2 L-Band Assembly**

In the modulator, analog in-phase (I) and quadrature (Q) signals are generated on the Digital Baseband Printed Circuit Card, routed to the L-Band Printed Circuit Card and modulated at the desired frequency.

The L-Band modulated signal is then passed through a microprocessor-controlled variable attenuator, providing gain control of the output signal.

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

## 3.1.2  Baseband Processing Printed Circuit Card

The advent of million-plus gate count FPGAs, advanced logic synthesis tools and DSPs providing hundreds of MIPs supported the design of a software-configurable modem. Large, fast FPGAs now provide designers with what is essentially an on-the-fly programmable ASIC.

High speed, complex digital logic functions that previously could only be implemented in dedicated integrated circuits, are now downloaded from a micro-controller through a serial or peripheral interface. When a new digital logic function is needed, a new configuration file is loaded into the FPGA. There is no limit to the number of digital logic configurations available to the FPGA, aside from the amount of Flash memory available to the system microprocessor for storage of configuration files.

The DMD1050T Baseband Processing Printed Circuit Card provides a flexible architecture that allows many different modes of terrestrial and satellite framing, various FEC options, digital voice processing and several different modulation/demodulation formats. Also included on the Baseband Printed Circuit Card are a MIL-188-114A/RS-422 synchronous interface and a two-port 10/100 Ethernet Bridge interface.
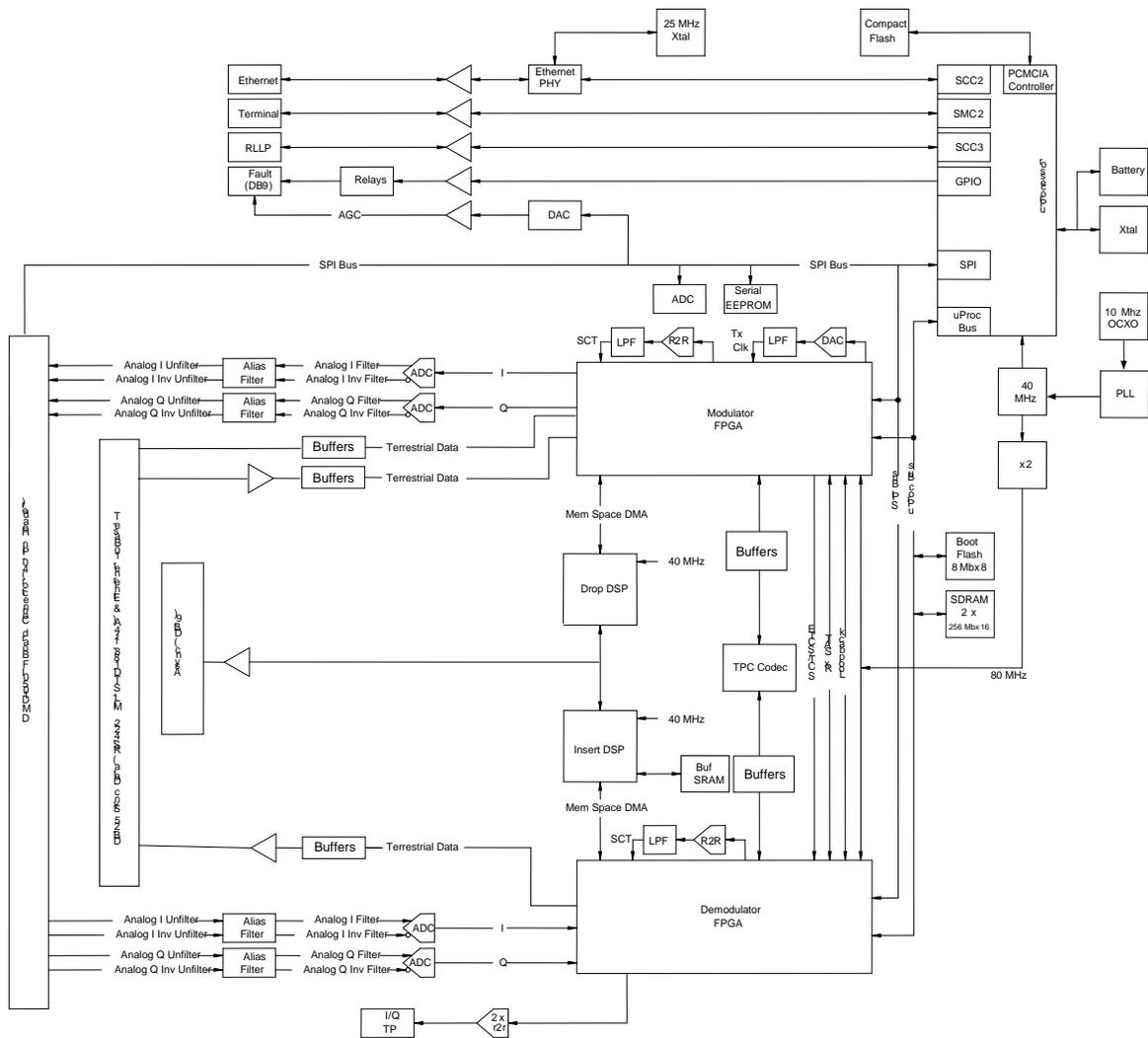
**Figure 3-3 DMD1050T Baseband Processing Card Block Diagram**

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

- Programmable part setup and initialization

- Continuous control and adjustment of some functions

- Calibration

- Monitoring fault status

- Calculating and displaying measurements

- Calculations

- User monitor and control interface including any remote interface

- Unit configuration and feature set

The M&C System is based on a powerful microprocessor with a large amount of Flash memory. Several bus architectures are used to interconnect the M&C to all components of the DMD1050T. Communication to the outside world is done via connections to the remote port, terminal port, Ethernet port and alarm port. The M&C runs on software programmed into its Flash memory. The memory can be reprogrammed via the Ethernet port to allow changes in software.

### 3.1.3 FIPs 140 Level 2 TRANSEC Security Module

The DMD1050T Modem Card is optionally equipped with the FIPs 140 Level 2 TRANSEC Security Module in standalone operation with the DMD1050T Modem.

The FIPS Module is a standalone, independently-certified optional card that is secured to the DMD1050T baseband processing card. It does bulk encryption and decryption of traffic over the satellite, using the AES-256 algorithm.

The DMD1050T is fully compatible and interoperable in all specified modes of operation with KIV-19 Provisional and KG-95-1 Provisional Transmission Security (TRANSEC) equipment used by the Government.
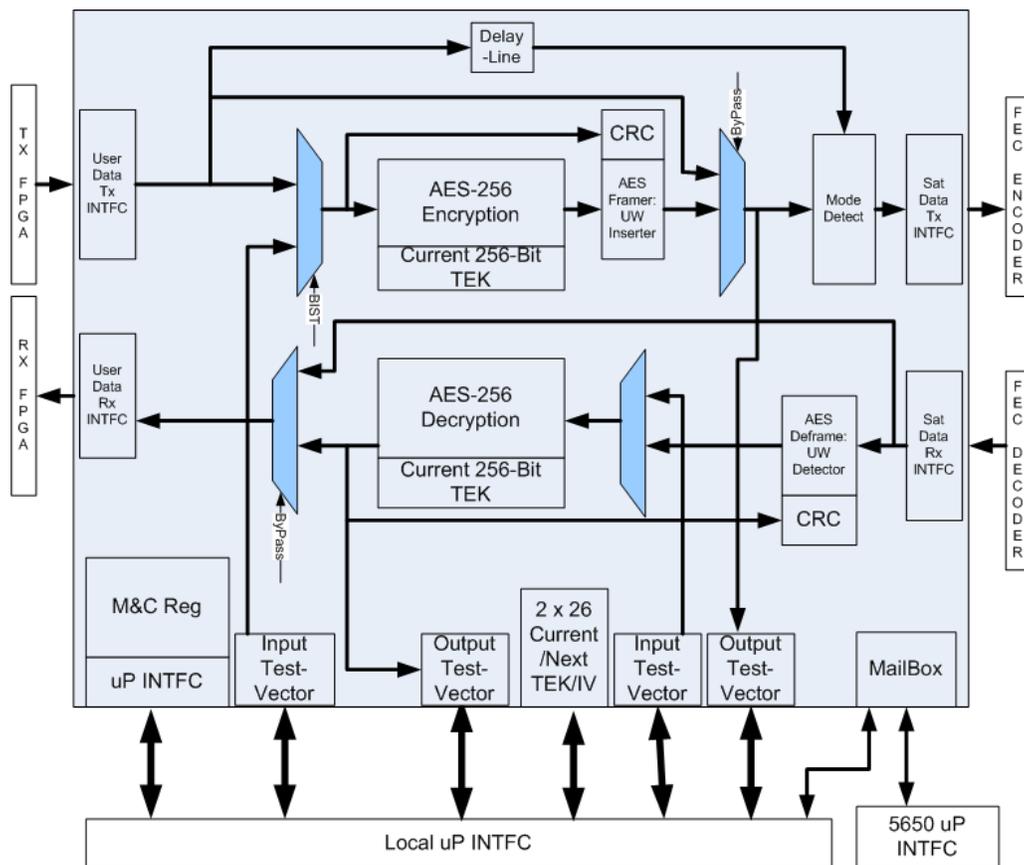


**Figure 3-4 DMD1050T FIPs 140 Level 2 TRANSEC Processing Module Block Diagram**

## 3.2    DMD1050T Functional Block Diagram

Figure 3-5 shows the DMD1050T Functional Blocks. The modem is shown in a typical application with customer data, Tx/Rx RF equipment and an antenna.

### 3.2.1 Baseband Processing

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

The DMD1050T supports IBS & IDR compatible framing modes. Because the modem does not have all supporting interfaces as stipulated by IESS308/309, it is not 100% compliant. IBS and IDR framing modes are supported in a Closed Network Mode.

### 3.2.2 Tx Baseband Processing

The Tx Data and Clock enters the baseband processor, passes through a rate adapting FIFO and enters the framer processor. In Closed-Net mode, the data passes through the framer unaltered. In IDR & IBS framing enabled mode, it adds the applicable framing, as defined in IESS-308 and 309. The data is then sent to the Reed-Solomon encoder.

The Reed-Solomon encoder encodes the data into Reed-Solomon blocks. The blocks are then interleaved and synchronized to the frame pattern, as defined by the selected specification (IESS-308, IESS-309, DVB, etc.). After Reed-Solomon encoding, the composite data and clock are applied to the Baseband Loopback Circuit.

### 3.2.2.1    Direct Sequence Spread Spectrum (DSSS)

Because the DMD1050T is ideal for systems with very small dishes, or on-the-move systems, there is an increased interest in Spectrum Spreading. To meet this need, optional **DSSS** is available for the DMD1050T.

DSSS works by modulating the normal carrier with a pseudo-random PN sequence (chips) at a much higher chip rate. The chip rate is determined by the carrier's symbol rate and a multiplying (spreading) factor.

The DMD1050T offers spreading in this LDPC MODCOD:

- HP-LDPC BPSK Rate ½

The spreading factors currently supported are 1 (Spreading Off), 2, 4, 8 and 16, up to a maximum chip rate of 10 Mcps. You can select from among four built-in, pseudo-random PN sequences. Thus, multiple spread carriers can occupy the same bandwidth in a Code-Division Multiple Access (CDMA) manner.

When using large spreading factors, the DMD1050T also exhibits a high tolerance to jamming, up to 24 dB, and a low probability of detection/interception.

Additionally, there is no loss in performance with spreading enabled on the DMD1050T.
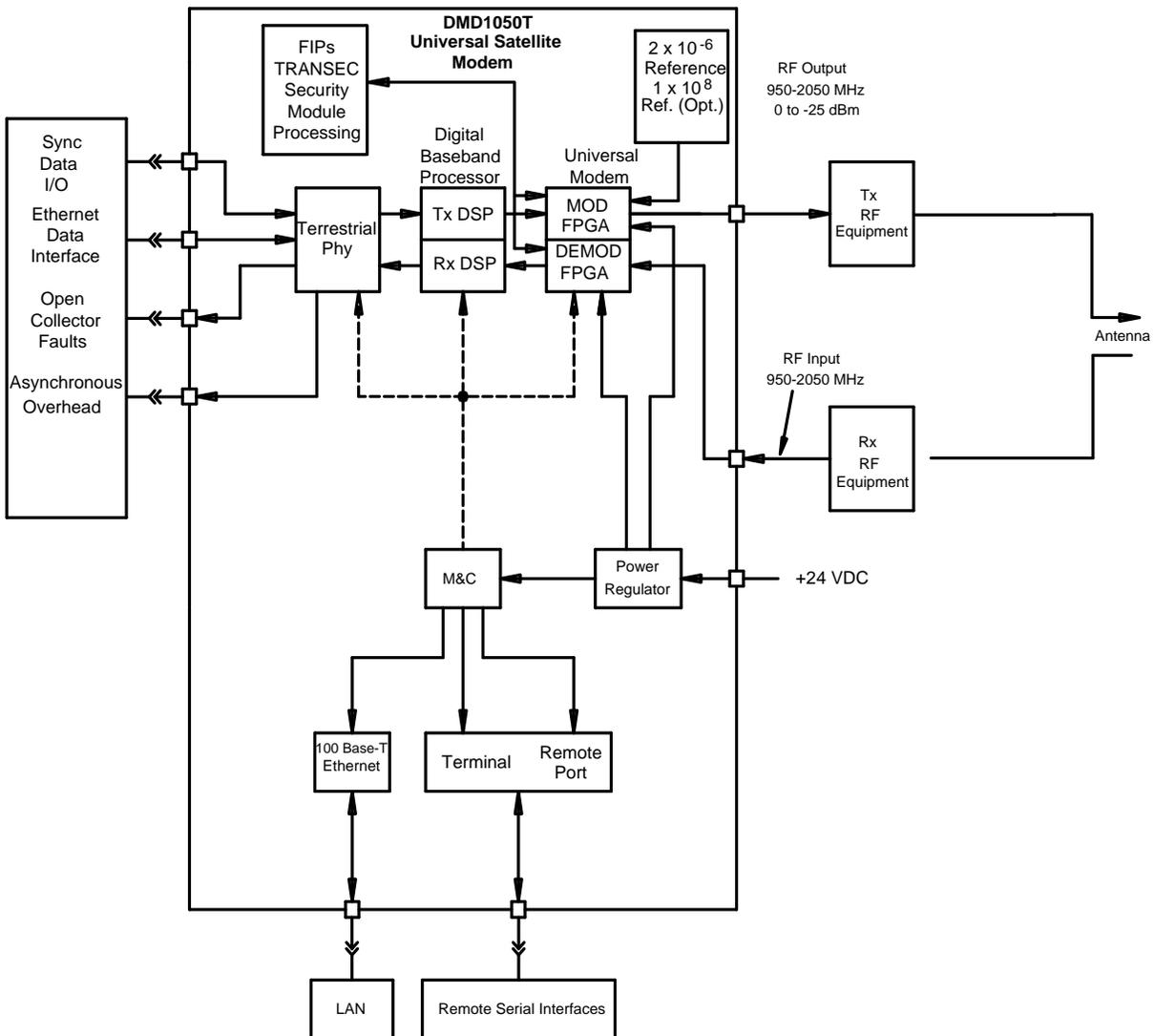
Figure 3-5 DMD1050T Universal Satellite Modem Functional Block Diagram

### 3.2.3 Rx Baseband Processing

The Receive Processor performs the inverse function of the Transmit Processor. Data received from the satellite passes through the BB Loopback Circuit to the Reed-Solomon decoder to the deframer. The

deframer acquires the IBS/IDR/DVB frame, synchronizes the Reed-Solomon decoder, and extracts the received data and overhead from the frame structure. It puts the data into the PD buffer, sending the overhead data to the UIM. The data is extracted from the buffer and is sent to the UIM. Backward Alarm indications are sent to the M&C Subsystem.

## 3.2.4  FIPs Module Processing

The FIPs Module on the DMD1050T does bulk encryption and decryption of traffic over the satellite using the AES-256 algorithm. The DMD1050T AES encryption uses Code Block Chaining (CBC) mode to do the encryption and decryption of the user data.

All encryption occurs directly before the FEC encoder, and decryption occurs just after the FEC decoder.

The FIPs module maintains a local copy of the Traffic Encryption Keys (TEK) and the Initialization Vectors (IV). It also provides Built-In Self Test (BIST) functions, per the FIPS 140-2 level requirements. Finally, it provides a simple framing structure with the primary purpose of allowing the decryption engine on the receive side to recover AES block alignment. However, the framing structure can also provide a means for lossless TEK rollover.

TRANSEC Overhead Rate = (3 + 16 * N) / (16 * N), where N is the Encryption Frame Length

### 3.2.4.1  Access to the FIPs Module HTTPS Interface

See Chapter 8 or Chapter 9 for details on getting access to the functions of the FIPs TRANSEC Module.

## 3.3  Monitor & Control (M&C)

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

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

The DMD1050T supports these M&C protocols:

- Terminal Interface (Section 3.3.1)

- Remote Port Interface (Section 3.4)

- Web Browser (Section 3.5)

- M&C Default/Reset Plug Settings (Sections 3.6)

- SNMP (Simple Network Management Protocol) (See the MN-DMDREMOTEOP Remote Protocol Manual)

## 3.3.1 Terminal Port/ES-ES Communications (J3)

J3 functions as the Modem Remote Port, Terminal Port or ES-ES Communications. For Terminal port application, it supports an asynchronous control protocol. It can be configured to support either RS-232 or RS-485 signal levels. This port is intended for use in computer-based remote M&C. All functions of the modem can be monitored and controlled from this port via a common terminal connected to the Terminal Port. This function is selected from the Web browser.

This port is also dedicated for ES-ES Communications. The port can be configured for a number of communications protocols. Overhead data to/from the UIM is routed to/from the framer/deframer. This port can be configured to support either RS-232 or RS-485 signal levels.

The baud rate and protocol can be selected from the Web Browser.

## 3.3.2 Terminal Mode Control

The DMD1050T Terminal Mode Control allows the use of an external terminal or computer to monitor and control the modem from a full screen, interactive presentation operated by the modem itself. No external software is required, other than VT-100 Terminal Emulation Software (e.g., Procomm) for a computer when used as a terminal. The Control Port is typically used as an RS–232 connection to the terminal device. The RS-232 operating parameters can be set using the modem's Web browser, and stored in Non-volatile memory for future use. See the Remote Protocol Manual TM117.

## 3.3.3 Modem Terminal Mode Control

The modem can be monitored and controlled interactively in the Terminal Mode, with a full screen presentation of current settings and status. Programming is done by selecting the item to be modified and pressing the terminal key of the option number. For example, to change the transmit data rate, enter 33 at the terminal. The modem responds by presenting the options available and requesting input. Two types of input can be requested. If the input is multiple choice, select the desired choice by pressing the Space bar. When the desired option is shown, press the Enter key to select that option. The other possible input type requires a numerical input, such as entering a frequency or data rate.

This type of input is followed by pressing the Enter key. Abort input at any time by pressing the ESC key. Invalid input keys cause an error message to be shown on the terminal.

The Terminal Control Mode supports serial baud rates of 150, 300, 1200, 2400, 4800, 9600, 19200 and 38400. The connection must be set for 8 data bits, 1 stop bit and no parity (8,N,1). Three terminal emulations are supported: VT-100, WYSE 50 and ADDS-VP.

Use the character $ for setting the screen when the terminal is used for the first time. The non-volatile memory is reset.

## 3.3.4 Modem Setup for Terminal Mode

Terminal Mode communications and protocol are set from the Web browser by setting the Control Mode parameter to Terminal. Then, set the Modem Port, Term Baud and Emulation Parameters as desired. Next, connect a terminal to the J1connector.

All operating software for the Terminal Mode is contained in the DMD1050T modem internal control software.

These actions initiate full screen terminal mode printing and redrawing of the full screen: a break signal on the communications line, pressing ESC on the terminal, or Power On of the modem.

The Terminal Mode shows the status of all user parameters controlled and read by the processor. It offers a menu that allows changes to any controlled parameter.

The Terminal Mode uses eight screens, each of which have the basic contents of the three modem monitor and control areas, as set in the Web browser matrix columns. Use this screen for setting the parameters of the Modulator, Demodulator, Event, Alarm, Latched Alarm and Interface areas.

The Terminal Control Mode is menu-driven. The permitted values for each item number are shown. To change an item, enter its number and press the Enter key. If the parameter to be changed requires a numeric value, enter the number and press the Enter key.  If the parameter is non-numeric, press the Space bar to cycle through the list of available entries.

Items that do not have ID numbers are Status only, and cannot be changed.

## 3.3.5 Connect the Terminal

1.  Connect the computer to the DMD1050T Remote Connector (J3) using an RS-232 cable.

2.  Select Terminal Mode in the Web Browser

3.  Make sure the emulation software has these settings:

    - 8 data bits

- no parity
- 1 stop bit

### 3.3.6  Terminal Screens

See MN-DMDREMOTEOP, the Remote Protocol Manual (TM117).

## 3.4    Modem Remote Communications (RLLP)

The Remote Port on J3 allows for control and monitoring of parameters and functions via an RS-232
Serial Interface, or RS-485 for RLLP Protocol.

Enter Equipment Remote Mode setup from the Web Browser interface, System menu. First, set the
Remote Port Control to Remote, then set the Multidrop Address as necessary, then set the Remote
Interface to RS232 or RS485.

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

### 3.4.1  RLLP 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 typically established
on one or more full-duplex, 9600-baud, 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.

See MN-DMDREMOTEOP, the Remote Protocol Manual (TM117) for the RLLP Protocol.

## 3.5    Modem Setup for Ethernet M&C (J11)

This port is dedicated for Ethernet Communications supporting SNMP, FTP and Web Browser to the
DMD1050T base modem, and Secure HTTP (HTTPS) independently to the FIPs module. The port is
configured for 100 Base-T communications protocols. The Ethernet M&C interface uses a standard RJ45

Male connector. The Ethernet Interface is shipped from the factory in an addressable BOOT MODE state, that allows you to get access to the unit. This BOOT MODE state is set to IP TEST.

Connect an Ethernet cable between the unit and a computer that has web browser capability. Open the browser, and enter the default web address for the unit.

## 3.6    M&C Default/Reset Plug Settings (JP1 & JP2)

If you are having difficulty getting access to the Web Browser or the Terminal Interface, reset the M&C interface settings. Do this by putting the supplied jumper/shunts, CNRSHUNT, on both the JP1 and JP2 connectors, across pins 1 and 2. Power cycle the modem. See Chapter 4 and Appendix D for details.

The default reset procedure resets these M&C items:

- TCP-IP BOOT MODE is set to IP TEST, (modem address 192.168.0.238)
- Remote Control Mode is set to Terminal
- Terminal port is set to RS232
- Web Browser Names and Passwords are reset,  (See the Web Browser Setup Guide, Appendix D)

Once default settings have been activated, remove the Jumpers.

## 3.7    Ethernet Data Interface – (J10)

With its multi-port interface, automatic Learning and Aging, Auto-Crossover, Auto-Polarity, Auto-Negotiation and embedded Quality of Service, the Enhanced Ethernet Interface offers true Plug-n-Play connectivity.

If the Ethernet Data Interface is selected, then the Tx Clock Source defaults to SCTE, and the Clock Polarity defaults to Normal.

The Ethernet Bridge Interface makes it easy to connect LANs via satellite. Select Ethernet as the terrestrial interface, and connect the LAN into any of the two RJ-45 connectors on the unit.

The DMD1050T Ethernet Interface maintains backward compatibility with all of these products:

- DMD20/DMD20 LBST/DMD50/DMD2050/DMD2050E and the OM20 with HDLC selection RADYNE
- SLM-5650A using a Gigabit Bridge card with HDLC Comtech
- CDM-570/CDM-625 with the HDLC selection Managed 570

It allows for all higher level protocols, like DHCP, UDP, TCP, HTTP and FTP, etc., to pass transparently through the level 2 Bridge interface, and operates with its line speed learning capability. Ethernet packet traffic is forwarded immediately to the applicable ports without unnecessary startup delay.

For users who want more control over traffic, the 10/100 Ethernet interface provides additional QOS controls, and new features, such as port based priorities, strict priority queuing and the ability to operate in a FIFO-like mode.

The full duplex capability of the standard 10/100 interface allows it to pass up to 20 Mbps in each direction over the satellite.

The DMD1050T supports Radyne HDLC, Comtech HDLC and 570 Managed Swich modes, offering compatibility with all the configurations of Comtech products shown in Table 3-1.

<div align="center">Table 3-1 DMD1050T HDLC Interoperation</div>

| Modem Model | Ethernet Interface | HDLC |
|---|---|---|
| DMD20[1] | PLR5171 10/100 | Radyne |
| DMD20 LBST[1] | PLR5171 10/100 | Radyne |
| DMD20[1] | PLR5497 10/100 | Radyne |
| DMD1050 Legacy[1] | N/A | Radyne |
| DMD20[1] | PLR5584 10/100/1000 | Radyne |
| DMD20 LBST[1] | PLR5584 10/100/1000 | Radyne |
| DMD50[1] | PLR5584 10/100/1000 | Radyne |
| DMD2050[1] | PLR5584 10/100/1000 | Radyne |
| DMD2050[1] | PLR5584-1 10/100/1000 | Radyne |
| DMD2050E[1] (Strandard Configuration) | PLR5584-1 10/100/1000 | Radyne |
| SLM-5650A | Gigbit Brige Card, Bridge Mode (1.1.2) | Comtech |
| CDM-570 | Managed switch Mode | Managed 570 |
| CDM-625 | Managed switch Mode | Managed 570 |
| [1] Interoperates in any common selectable mode | | |

## 3.7.1.1    Configure the Modem to use the Ethernet Data Interface

When the optional Ethernet Data Interface Card is selected, all of the Ethernet related menus can be used to control the interface.

1. Setup the Tx Interface Menu to: (see Chapter 7)
   a. Set the Terrestrial Interface to Ethernet
   b. Set the Ethernet Flow Control as desired
   c. Set the Ethernet Daisy Chain as desired
   d. Set the Ethernet QOS Type as desired
   e. Set the Ethernet QOS Queue as desired
   f. The Tx Clock is set to SCTE automatically

      i.   The Tx Clock Polarity is set to Normal automatically

2.      Setup the Rx Interface Setup Menu to: (see Chapter 7)

      a.   Set the Terrestrial Interface to Ethernet.

      b.   Set the Buffer Size to Zero (provides minimum delay).

      c.   Buffer Clock is set to Rx Sat.

      d.   Set the Buffer Clock Polarity to Normal.

## 3.7.1.2      Ethernet Flow Control

When Ethernet Flow Control is disabled, if a packet is received for transmission and no packet buffer space is available, the incoming packet is discarded.

When Ethernet Flow Control is enabled, flow control is used to throttle the transmission station to avoid overrunning the transmit buffers. This overrun would cause packets to be dropped. The throttling mechanism used depends on the interface, and whether it is half- or full-duplex.

## 3.7.1.3      Half-Duplex Flow Control

In half-duplex mode, the unit uses industry standard backpressure to support flow control:

- When available buffer space is almost gone, the modem causes a collision on the input port when it senses an incoming packet. This collision causes the transmitting station to back off, and retry the transmission.
- The interface will stop causing collisions, as soon as free buffer space becomes available.

## 3.7.1.4      Full-Duplex Flow Control

In full-duplex mode, the interface implements IEEE 8802.3x flow control:

- When available buffer space is almost gone, the unit sends out a pause frame with the maximum pause time, to stop the remote nodes from transmitting.
- The interface sends out another pause frame with the pause time set to zero, as soon as free buffer space becomes available.

## 3.7.1.5      Ethernet Daisy Chain

When Ethernet Daisy Chain is disabled, Port 2 on the Ethernet Data Interface operates normally. Data received on Port 2 that is not addressed to other equipment on the LAN side, is transmitted over the satellite.

When Port 2 is selected for Daisy Chain, any data received on Port 2 is forwarded to one of the other LAN side ports (Port 1) and is not transmitted over the satellite. This is useful in a point-to-multipoint configuration, as shown in Figure 3-6.

## 3.7.1.6      Ethernet QOS Type

When Normal QOS is selected, the interface sets a packet's priority based on these criteria:

- IEEE 803.3ac Tag when present
- IPv4 Type of Service / Differentiated Services Field
- Ipv6 Traffic Class

When Port Based QOS is selected, the interface sets the priority of a packet based on the port on which it arrived:

- Port 1 (JS2) has the highest priority
- Port 2 (JS3) has the second highest priority

## 3.7.1.7      Ethernet QOS Queue

When Fair Weighted queuing is selected, the interface transmits packets at a rate of 8, 4, 2 and 1, from the highest priority queue to the lowest, respectively. With Fair Weighted queuing, all queues with data in them are guaranteed to receive some bandwidth.

When Strict Priority is selected, the interface transmits packets from the highest priority queue until it is empty. It then begins transmitting data from the next highest priority queue. If higher priority data arrives, the interface finishes the current packet, and then goes back to transmitting packets from the higher priority queue, until it is empty again. Be careful when selecting Strict Priority, because it is possible for the lower priority queues to be stalled indefinitely.

## 3.7.1.8      Set Up the DMD1050T Ethernet Bridge to Operate Like a FIFO

In certain circumstances, it can be desirable to have the Ethernet interface operate in a FIFO-like manner, with no reordering of packets. This can be established by using a single port on the Ethernet interface, and setting the Ethernet QOS Type to Port Based, and the Ethernet QOS Queue to Strict Priority. When set up and used in this manner, the packets are transmitted in the exact order in which they are received.
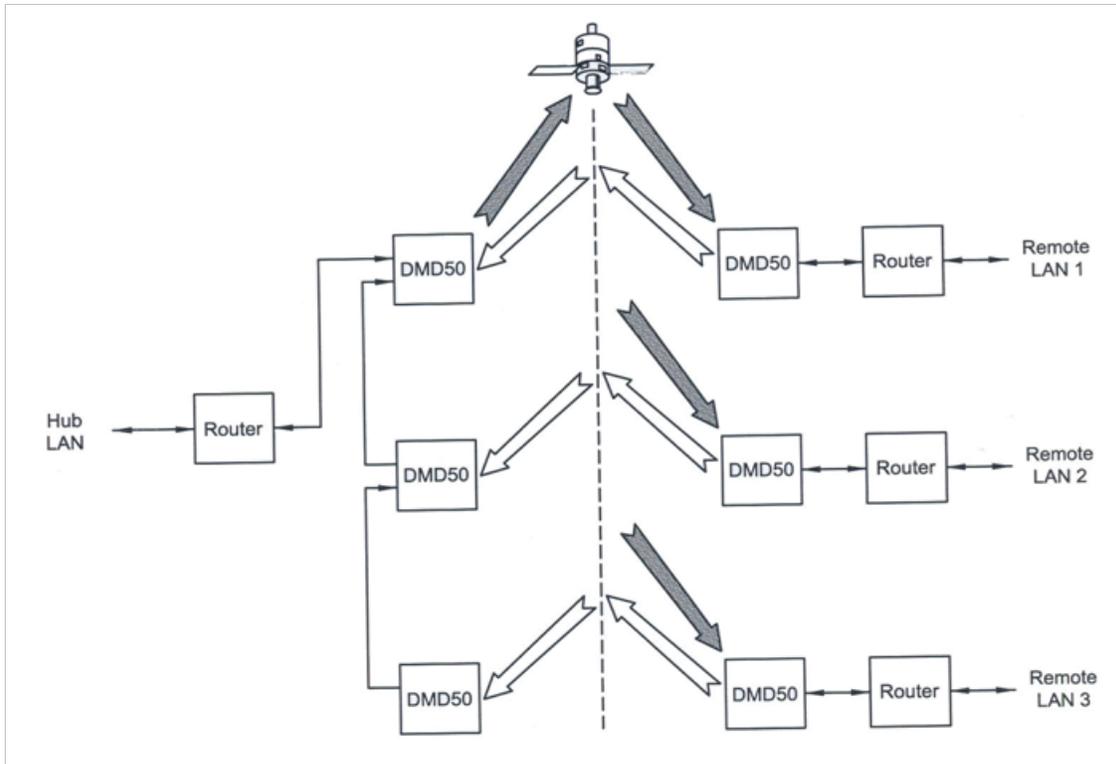
**Figure 3-6 Point-to-Multipoint with Daisy Chaining**

## 3.7.1.9    Packet Statistics

These statistics are available from the Monitor Menu, when the Ethernet Data Interface is selected.

- **Total Packets:** shows the total number of Ethernet packets received from the satellite
- **Error Packets:** shows the total number of Ethernet packets received from the satellite that had errors
- **Packet Error Rate:** shows the Ethernet Packet Error Rate (PER) from the satellite
- **Packet Statistics Reset:** allows you to reset the Ethernet Total Packets and Ethernet Error Count by pressing Enter
- **Link Status:** These statuses are available in the Monitor Menu/Link Status Sub-Menu, when the Ethernet Data Interface is selected:
  - o **Port 2 Status:** shows the current status of LAN Port 1
  - o **Port 3 Status:** shows the current status of LAN Port 2
  - o For each of these ports, the status can have one of these values/meanings:
    - ▪ **Down:** link is down
    - ▪ **Unresolved:** cannot agree on connection speed
    - ▪ **10 Mbps Half:** connected at 10 Base-T Half Duplex
    - ▪ **10 Mbps Full:** connected at 10 Base-T Full Duplex

▪ **100 Mbps Half:** connected at 100 Base-T Half Duplex

▪ **100 Mbps Full:** connected at 100 Base-T Full Duplex

If all LAN Ports are down, a Tx Data Activity Minor Alarm is generated.

If the WAN Port is down, a Tx and Rx Ethernet WAN Major Alarm is generated.

## 3.8    Internal Clock

The time and date are used to time-stamp system events. You can change the time and date via the Web Browser.

## 3.9    Loopback Features (Terrestrial & IF)

The modem allows for several different loopbacks:

- IF Loopback – Tx IF port is looped back to the Rx IF port
- Tx Terrestrial Loopback - Tx Data port is looped back to the Rx Data port after the interface driver/receiver (prior to the framing unit)
- Tx Baseband Loopback - Tx Data port is looped back to the Rx Data port after the interface driver/receiver (after the framing unit)
- Rx Terrestrial Loopback - Receive Data from the satellite is looped back for retransmission to the satellite, providing a far end loopback (prior to the framing unit)
- Rx Baseband Loopback - Receive Data from the satellite is looped back for retransmission to the satellite, providing a far end loopback (after the framing unit)
- Tx/Rx Terrestrial Loopback - provides both Terrestrial loopbacks simultaneously
- Tx/Rx Baseband Loopback - provides both Baseband loopbacks simultaneously

See Figure 3-7 through Figure 3-9 for loopback functional block diagrams.

⚠ **CAUTION: DATA LOSS POSSIBLE**

To run any type of data test with an Ethernet interface, you must use two modems connected back-to-back. Using the modem's loopback with the Ethernet data interface causes unwanted network loops and useless results.
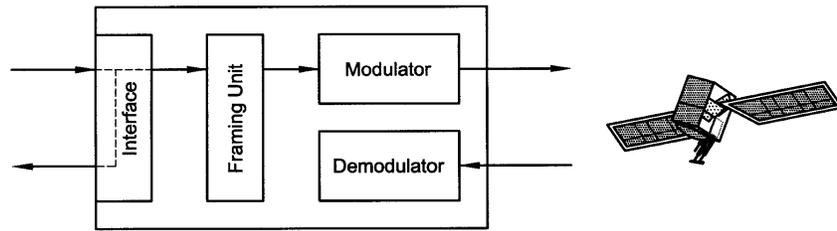
Tx Terrestrial Loopback
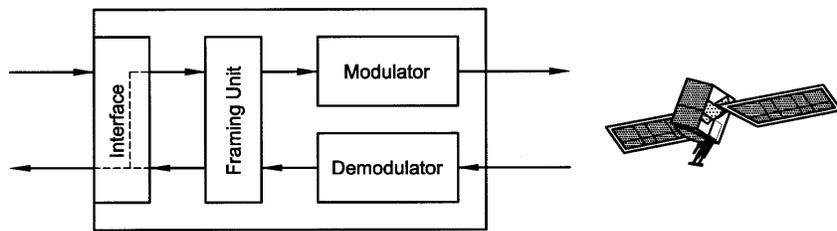


Rx Terrestrial Loopback
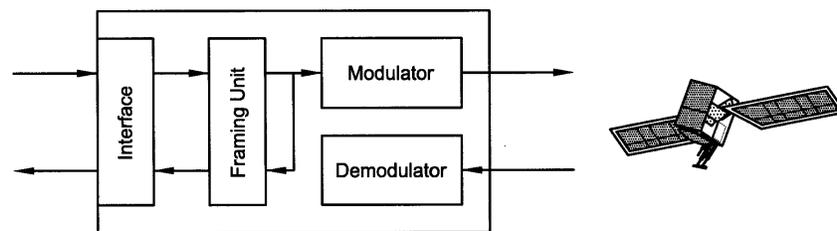


Tx Baseband Loopback

Figure 3-7 Loopback Functional Block Diagram

Rx Baseband Loopback
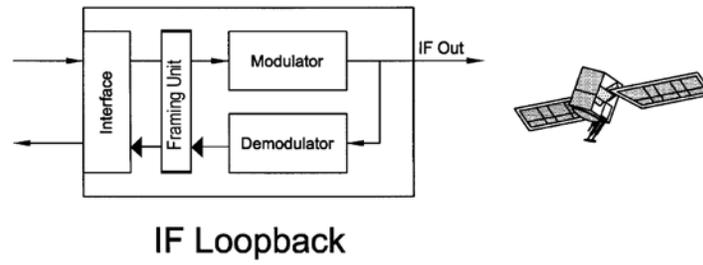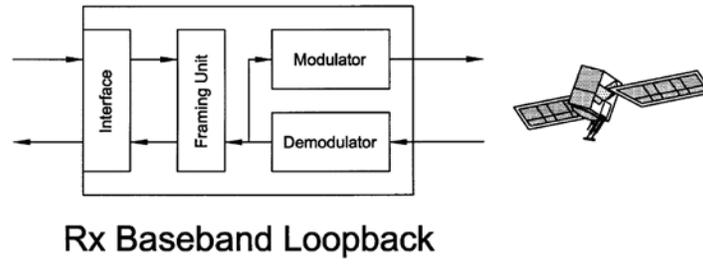
IF Loopback

**Figure 3-8 Loopback Functional Block Diagram**

Tx/Rx Terrestrial Loopback

Tx/Rx Baseband Loopback
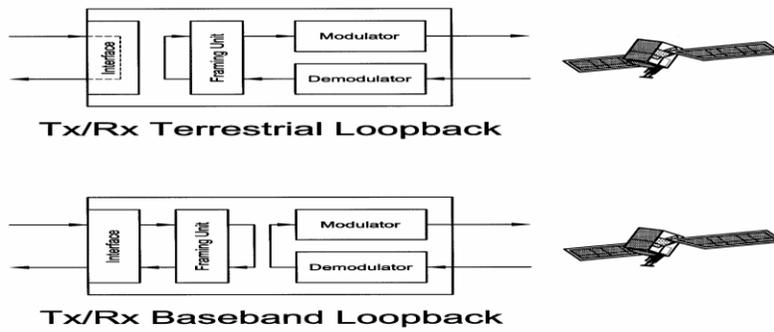
**Figure 3-9 Loopback Functional Block Diagram**

## 3.10  DMD1050T Clocking Options

The DMD1050T supports several clocking options that can be recovered from the satellite or the terrestrial links. The clocking options allow you to decide which clock best fits the application. Figure 3-10 shows a diagram on how the modem processes the clocks for the Tx Clock source and the Rx Buffer Clock source. Tx and Rx Clocks can be locked independently.

DMD1050 CLOCKING AND POLARITY
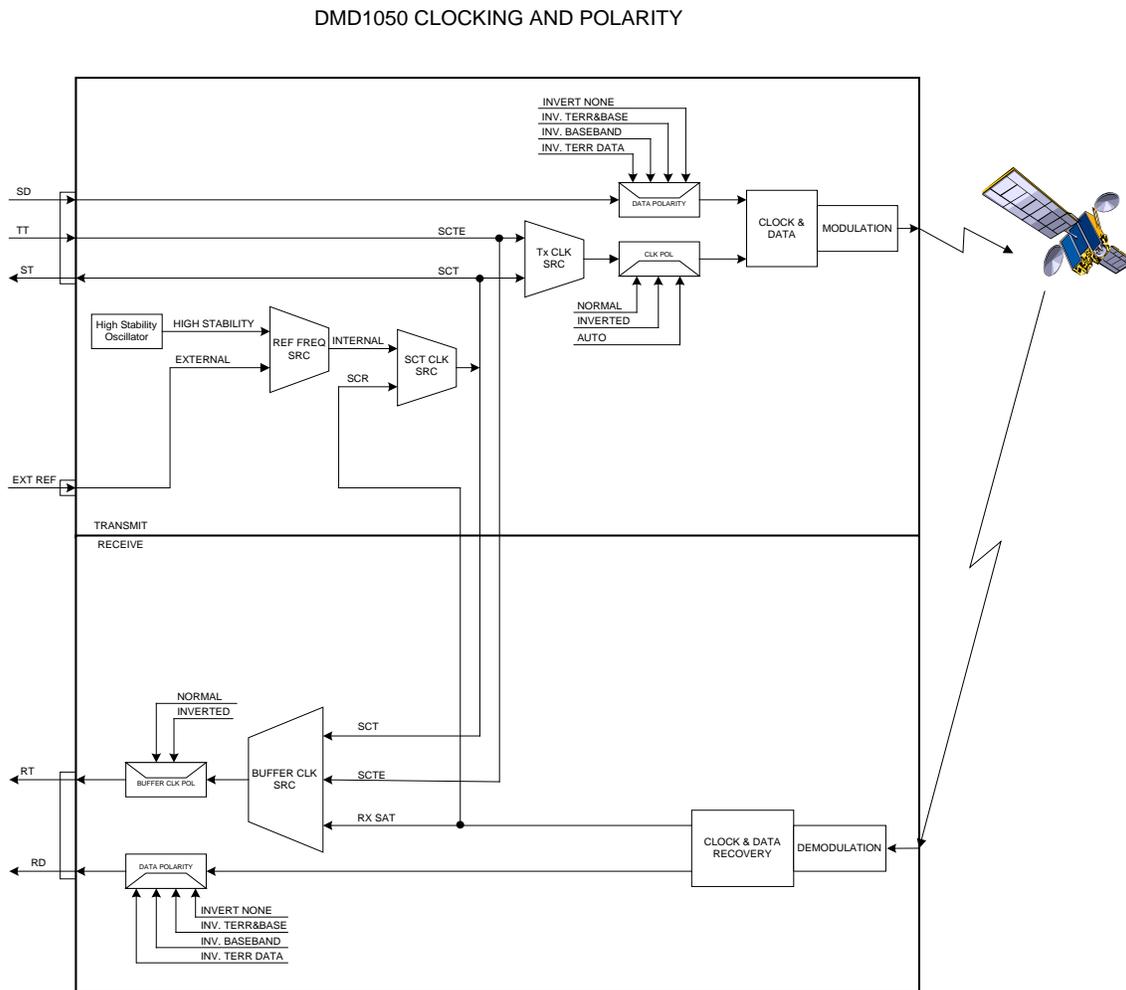


Figure 3-10 Clocking and Polarity Diagram

## 3.10.1     Tx Clock Options

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

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

### 3.10.1.1    SCTE: Serial Clock Transmit External

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

Figure 3-10 shows how the Transmit Terrestrial Data enters the modem and is clocked into a deter FIFO. Data is clocked out of the FIFO by the Modulator Clock. The Modulator Clock and Phase-Locked Loop (PLL), along with the Dejitter FIFO, reduce the input jitter. Jitter reduction exceeds the jitter transfer specified in CCITT G.821.

SCTE is sometimes referred to as Tx Terrestrial Timing or Terminal Timing. Terminal Timing is a reference to the RS422 or MIL 188-114A synchronous interfaces.

### 3.10.1.2    SCT: Serial Clock Transmit

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

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

If SCT is selected, then Terrestrial data that is synchronous to the SCT Clock must be supplied by the modem. The terminal equipment uses the SCT as its clock source. The Autophase Circuit makes sure that the data is clocked correctly into the modem automatically. A return clock is not necessary. The Clock Polarity must be set to Auto.

### 3.10.2    Rx Buffer Clock Options

The DMD1050T supports several Rx Buffer clock options that can be recovered from the satellite, from terrestrial links or internally. The clocking options allow you to decide which clock best fits the application.

Figure 3-10 shows how the modem processes the clocks for the Tx Clock and the Rx Buffer Clock. Tx and Rx Clocks can be locked independently. These Buffer clock selections are available on the DMD1050T:

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

The DMD1050T handles Rx Buffer clock selections based on source priority levels. See Appendix D.

You assign priorities to the clock sources based on source selections. Source 1 has the highest priority, and Source 3 has the lowest priority. If a fallback clock is selected, and activity is lost at the highest priority source, the modem will fall back to the next highest priority clock that has activity. When activity resumes on a higher priority source, the modem resumes using the higher priority source.

| Clock Source | | Priority |
|---|---|---|
| Rx SAT | 1 of | 3 |
| SCTE | 2 of | 3 |
| SCT | 3 of | 3 |

## 3.10.3      Rx SAT Clock

The Rx SAT clock is recovered from the satellite that is received from the distant end. If selected, the Buffer Clock is locked to the Rx SAT clock.

## 3.10.4      SCTE: Serial Clock Transmit External

When SCTE is selected as the Rx Buffer clock, the modem receives the clock from the Transmit Terrestrial interface.

## 3.10.5      SCT: Serial Clock Transmit

If SCT clock is selected as the Rx Buffer clock source, then it must be configured for Internal. SCT is sometimes referred to as Internal Timing or Send Timing (ST).

## 3.10.5.1     External Reference:  J9 SMA Female

This is not actually a clock, but does have some clocking implications. When the external reference is used, the master oscillator in the DMD1050T is locked to the external reference, and the internal accuracy and stability of the DMD1050T assumes that of the External Reference. Therefore, not only are

the transmit frequencies of the DMD1050T locked to the external reference, but the modem's internal SCT Oscillator is locked to the external reference as well.

## 3.11  Ethernet Data Interface

The modem supports dual port 10/100 Base T Interface. When selected,  the Tx Clock Source defaults to SCTE, and the Clock Polarity defaults to Normal. In addition, the Buffer Clock defaults to RxSat, and the Buffer Clock Polarity defaults to Normal. See Appendix C for interface set up and supporting features.

## 3.12  Reed-Solomon Codec

See Figure 3-11, Figure 3-12 and Table 3-2.

Using a Reed-Solomon (R-S) Outer Codec concatenated with a Convolutional Inner Codec is an effective way to produce very low error rates, even for poor signal-to-noise ratios, while requiring only a small increase in transmission bandwidth.

Typically, concatenating an R-S Codec requires an increase in transmission bandwidth of only 9 – 12%, while producing a greater than 2 dB improvement in $E_b/N_o$. R-S is a block Codec, where K data bytes are fed into the encoder, which adds 2t = (N – K) check bytes to produce an N byte R-S block. The R-S decoder can then correct up to "t" erred bytes in the block.

### 3.12.1  Reed-Solomon Operation in the DMD1050T

When the Reed-Solomon Codec is enabled, data is fed to the R-S Encoding Section of the DMD1050T, where it is scrambled, formed into blocks, R-S encoded and interleaved. Unique words are added so that the blocks can be reformed in the Receiving Modem (See Figure 3-11 and Figure 3-12). Data is then sent to the modulator, where it is encoded convolutionally, modulated and transmitted to the satellite.

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

### 3.12.2  Reed-Solomon Code Rate

The Standard R-S Code Rate is defined by (N, K) where N is the total R-S block size in bytes - data + check bytes -, and K is the number of data bytes input into the R-S Encoder. The transmission rate expansion required by the R-S Codec is then defined by N/K. In Closed Net Mode, the DMD1050T allows these N and K settings: (126, 112), (219, 201), (194, 178), (225, 205). Table 3-2 shows IBS/IDR compliant modes. Custom Reed Solomon rates are available as an option.

## 3.12.3        Interleaving

The DMD1050T allows for interleaving depths of 4 or 8 R-S Blocks, so burst errors are spread over 4 or 8 R-S blocks to enhance the error correction of the R-S Codec. In Closed Network Mode, set the interleaver depth to 4 or 8 manually. In DVB Network Mode, the DMD1050T sets the interleaver depth to 12, automatically.
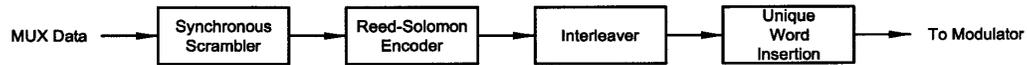


**Figure 3-11 Reed-Solomon Encoder Functional Block Diagram**
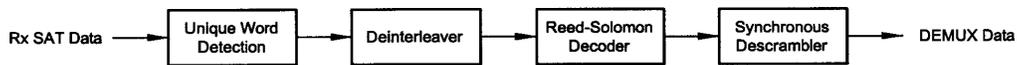


**Figure 3-12 Reed-Solomon Decoder Functional Block Diagram**

**Table 3-2 Reed Solomon Codes**

| Service Type | Data Rate (Kbps) | R-S Code (n, k, t) [1] | Bandwidth Expansion [ (n/k) -1 ] | Interleaving Depth | Maximum [2] R-S Codec Delay (ms) |
|---|---|---|---|---|---|
| Small IDR | 64 | (126, 112, 7) | 0.125 | 4 | 115 |
| (With 16/15 O/H) | 128 | (126, 112, 7) | 0.125 | 4 | 58 |
| | 256 | (126, 112, 7) | 0.125 | 4 | 29 |
| | 384 | (126, 112, 7) | 0.125 | 4 | 19 |
| | 512 | (126, 112, 7) | 0.125 | 4 | 15 |
| | 768 | (126, 112, 7) | 0.125 | 4 | 10 |
| | 1024 | (126, 112, 7) | 0.125 | 4 | 8 |
| | 1536 | (126, 112, 7) | 0.125 | 4 | 5 |
| IDR | 1544 | (225, 205,10) | 0.0976 | 4 | 9 |
| (With 96 Kbps O/H) | 2048 | (219, 201, 9) | 0.0896 | 4 | 7 |
| | 6312 | (194, 178, 8) | 0.0899 | 4 | 2 |
| | 8448 | (194, 178, 8) | 0.0899 | 4 | <2 |
| 8PSK | 1544 | (219, 201, 9) | 0.0896 | 8 | 18 |
| | 2048 | (219, 201, 9) | 0.0896 | 8 | 13 |
| | 6312 | (219, 201, 9) | 0.0896 | 8 | 4 |
| | 8448 | (219, 201, 9) | 0.0896 | 8 | 3 |
| DVB | All | (204, 188, 8) | 0.0851 | 12 | - |
| [1]  n = code length, k = information symbols and t = symbol error correcting capability. | | | | | |
| [2]  Design objective. | | | | | |

## 3.13   DMD1050T Automatic Uplink Power Control (AUPC) Operation

The modem has an optional, built-in provision for AUPC. AUPC is useful when operating power levels are affected by environmental changes in the atmosphere. AUPC attempts to adjust local power output to maintain a constant $E_b/N_o$ at the receiver location.

The modem supports three versions of AUPC. They include Radyne AUPC, EF AUPC and Near Side AUPC. Radyne AUPC and EF AUPC use satellite overhead to send messages between the local and remote ends of an SCPC link. The messaging is done with IBS 1/15 and EF AUPC Framing messages.

Strap Code 26 use can set some of the modem configuration. See Appendix G for an explanation and tabular listing of available Strap Codes. The Frequency and Modulator Output Power are set independently of the strap code.

## 3.13.1      Radyne AUPC

In this case, Target $E_b/N_o$ is the remote value the local unit wants to maintain by adjusting the local power level.

Radyne AUPC can be set to operate on either or both directions of a link, but always requires a bi-directional channel. Enabling AUPC on one side of the link will activate AUPC on the distant end of the link. It is necessary that both the Modulator and Demodulator be set to the applicable framing for AUPC options to be editable and for the AUPC function to operate correctly.

Examples of the basic Radyne AUPC Operations:

- Assume that the two modems, one at each end of the link, are set to Radyne AUPC operation. Only one direction is discussed, but the same functions can occur in both directions simultaneously.
- The Local Modem is transmitting to the Remote modem under normal conditions, and the Remote modem has a receive $E_b/N_o$ of 7.5 dB. The Local modem has been set to a Target $E_b/N_o$ of 7.5 dB with an output power level of -15 dBm.
- It starts to rain at the Remote site, and the $E_b/N_o$ drops to –7.0 dB, then to –6.8 dB. The Remote Modem is sending update messages of its $E_b/N_o$ constantly to the Local modem. When the Local modem sees the drop in the remote $E_b/N_o$, it starts to raise the output power slowly, and continues to adjust, if the remote $E_b/N_o$ continues to drop. As the rain increases in intensity, the remote $E_b/N_o$ decreases, but the Local modem continues to increase its power level to compensate.
- When the rain decreases, the Local modem sees the remote $E_b/N_o$ start to increase. The Local modem lowers its power level.
- The operation is a feedback control loop, with the added complication of a significant time delay.

## 3.13.2 EF AUPC

In this case, Target $E_b/N_o$ indicates the local unit wants the remote unit to maintain a power level sufficient to provide the local $E_b/N_o$ value.

EF AUPC can be set to operate on either or both directions of a link, but always requires a bi-directional channel. Enabling AUPC on one side of the link activates AUPC on the distant end of the link. It is necessary that both the Modulator and Demodulator be set to the applicable framing for AUPC options to be editable, and for the AUPC function to operate correctly.

Examples of the basic EF AUPC Operations:

- Assume that the two modems, one at each end of the link, are set to AUPC operation. Only one direction is discussed, but the same functions can occur in both directions simultaneously.
- The local modem is transmitting to a modem at a remote locale under normal conditions. The remote modem has a receive $E_b/N_o$ of 7.5 dB. The local modem has been set with a Target $E_b/N_o$ of 7.5 dB, and has a current power output of –15 dBm.
- It starts to rain at the local site, and the $E_b/N_o$ drops to –7.0 dB, then to –6.8 dB. The local modem is sending update messages of its $E_b/N_o$ to the remote modem constantly. When the remote modem sees the drop in the $E_b/N_o$, it begins to raise its output power slowly, and continues to do so until the Target $E_b/N_o$ is restored at the local site.
- When the rain decreases, the local modem's $E_b/N_o$ starts to increase. The remote modem lowers its power level to restore the target value.
- The operation is a feedback control loop, with the added complication of a significant time delay.

## 3.13.3 Near Side AUPC

Near Side AUPC is a loop back system that adjusts the broadcast uplink signal when local conditions change. This is done by having the Near Side AUPC attempt to adjust the outbound power to compensate for local weather.

The local receiver must be tuned and locked to the transmitter, and then the internal $E_b/N_o$ is used for feedback. This creates a Tx-Satellite-Rx control loop.

Near Side AUPC is used primarily for broadcast applications, because the modem cannot expect to receive data from a distant location. Near Side AUPC can be used with any satellite framing mode.

There are safeguards built into the AUPC System. First, the modulator has two parameters, which allow control of the maximum and minimum output power Levels. Second, a nominal, or default, power level is specified, which takes effect if the receive signal or messaging is lost. This nominal power must be set to a level high enough to re-establish communications, regardless of rain fade.

EF AUPC also gives some control over the rate of power change; while Radyne and Near Side AUPC use optimized rates for rain fade compensation.

### Table 3-3 Local AUPC Functions

| Function | AUPC Available Options | Description |
|---|---|---|
| AUPC MODE | DISABLE, NEARSIDE, RADYNE, EFDATA | Enables/Disables the AUPC to function locally |
| NOMINAL POWER | 0 TO -25 dB | Sets default output power to be used |
| MINIMUM POWER | 0 TO -25 dB | Sets minimum output power to be used |
| MAXIMIM POWER | 0 TO -25 dB | Sets maximum output power to be |
| TARGET Eb/No | 4.0 TO 16 dB | Desired $E_b/N_0$ of remote modem |
| TRACKING RATE | 6.0 to 0.5 dB/MIN | Adjustable in .5dB increments |
| LOCAL CL ACTION | HOLD, MAXIMUM, NOMINAL | Allows user to determine what power setting the remote modem will use in the event of a carrier loss at the local side. |
| REMOTE CL ACTION | HOLD, MAXIMUM, NOMINAL | This setting allows users to determine what local output power setting to use in the event that the remote end has a carrier loss. |
| 1. The AUPC Menus are located under the Modulator Menu, as shown in Section 4. | | |
| 2. The EF AUPC Menu shows when EFAUPC Framing is enabled in the Demod and Mod set up menus. | | |

### Table 3-4 Remote AUPC Functions (EF AUPC Only)

| Function | AUPC Available Options | Description |
|---|---|---|
| AUPC MODE | Disable, EFDATA | Enables/Disables the AUPC to function remotely |
| LOOPBACK | Enabled/Disabled | Loop back test over satellite link |
| Tx 2047 TEST BER | Enabled/Disabled | Initiates 2047 Test pattern BER Test |
| Rx 2047 BER | Status Menu | Identifies the BER status on the distant Rx side |
| AUPC DEF LVL | | Sets default output power |
| The Remote AUPC Menus are supported only by EFAUPC | | |

## 3.14  Asynchronous Overhead Operation (J3)

This port is dedicated for ES-ES Communications as well. You can configure the port for several Asyncronous communications protocols. Protocols supported are Standard IBS ES-ES, Enhancd Asyncronous and SCC. Overhead data to/from the UIM is routed to/from the framer/deframer. You can configure this port to support either RS-232 or RS-485 signal levels.

You can select the baud rate and protocol from the Web Browser.

The Asynchronous Framing/Multiplexer is capable of multiplexing a relatively low speed overhead channel onto the terrestrial data stream, resulting in a slightly higher combined or aggregate data rate through the modem. The overhead channel is recovered at the far end. This added channel is called variously: "An Overhead Channel", "Service Channel", "Async Channel" or, in IESS terminology, an "ES-to-ES Data Channel."  The basic frame structure used by the multiplexer is that specified in the IESS-309 Standard, resulting in a 16/15 Aggregate to through-Data Ratio.

IBS 1/15 framing supports two Asnchrounous protocols.

- For Regular Async:
    - (ES-to-ES), the Baud Rate is approximately 1/2000 of the Data Rate listed in Table 3-3.
- For Enhanced Async:
    - (Radyne Proprietary Async.), the Baud Rate is selectable, but Data Rate is limited. See Table 3-3 for differences between Regular and Enhanced Async.

The maximum Baud Rate is 19,200 bps for IBS Async. Two software-controlled modes are designed into the card to best use the available bits: Standard IBS ES-to-ES and IBS ( Enhanced Async).

The Async Channel can be set under software-control to either RS-232 or RS-485 mode. The pin assignments for both modes are shown in Table 3-5. The RS-485 setting controls the output into tri-state, when the modem is not transmitting data, allowing multiple modem outputs to be connected.

### Table 3-5 Pin Assignments

| Kbps | Baud Rate Example for Standard IBS | Kbps | Baud Rate Example for Enhanced Mode |
|------|-----------------------------------:|------|------------------------------------:|
| 128  | 64  | 9.6  | 300  |
| 256  | 128 | 19.2 | 600  |
| 384  | 192 | 32   | 600  |
| 512  | 256 | 64   | 1200 |
| 640  | 320 | 128  | 2400 |
| 768  | 384 | 192  | 4800 |
| 896  | 448 | 256  | 4800 |
| 1024 | 512 | 320  | 9600 |
| 1152 | 576 | 384  | 9600 |

| Kbps | Baud Rate Example for Standard IBS | Kbps | Baud Rate Example for Enhanced Mode |
|------|-----------------------------------|------|-------------------------------------|
| 1280 | 640 | 448 | 9600 |
| 1408 | 704 | 512 | 9600 |
| 1536 | 768 | 576 | 9600 |
| 1664 | 832 | 640 | 19200 |
| 1792 | 896 | 704 | 19200 |
| 1920 | 960 | 768 | 19200 |
| 1920 | 960 | 768 | 19200 |
| 2048 | 1024 | 832 | 19200 |
| | | 896 | 19200 |
| | | 960 | 19200 |
| | | 1024 | 19200 |
| | | 1088 | 19200 |
| | | 1152 | 19200 |
| | | 1216 | 19200 |
| | | 1280 | 19200 |
| | | 1344 | 19200 |
| | | 1408 | 19200 |
| | | 1472 | 19200 |
| | | 1536 | 19200 |
| | | 1600 | 19200 |
| | | 1664 | 19200 |
| | | 1728 | 19200 |
| | | 1792 | 19200 |
| | | 1856 | 19200 |
| | | 1920 | 19200 |
| | | 1984 | 19200 |
| | | 2048 | 19200 |

## 3.15 Standard IBS ES-to-ES Mode

In the first, or Normal, mode, all bit assignments are per the IBS standard. The bits of Overhead Housekeeping byte 32 are used as shown in Table 3-6:

### Table 3-6 IBS Standard

| Bit 1 | ES-to-ES Data Channel | This bit is routed directly to the ES-to-ES Data Channel. Its data rate is 1/512th of the aggregate rate (or 1/480th of the through terrestrial data rate), and is typically used to super-sample an asynchronous data channel. |
|-------|----------------------|---------|

| Bit 2 | Frame Alignment | Part of the Frame Alignment word |
|---|---|---|
| Bit 3 | Backward Alarm | Transmit and Receive, with main processor to activate Main Alarm/LED |
| Bit 4 | Multiframe Message | As per IBS |
| Bits 5 and 6 | Spare | Not used |
| Bits 7 and 8 | Encryption Utilization | Not used |

The ratio of the Through Terrestrial Data Channel Rate to the aggregate rate is 15/16. The standard transmit and receive channels of the ES-to-ES Data Channel in a Standard IBS Mode are raw channels operating at the specific bit rate, as controlled by the data channel rate, without buffering. In addition, no clocks are provided with this channel. Because the data rate provided is rarely exactly that required for a standard rate device, the only method of communicating using this channel is to allow it to super-sample the user data.

## 3.16   Enhanced Asynchronous Mode (Proprietary)

Because many of the frame bits in the standard IBS mode are not used, an Enhanced Multiplexer Mode can be engaged under software control.

Because this mode changes the use of many of the framed non-data bits, this mode is usable only when the DMD1050T is at both ends of a link. In this mode, the overhead signaling bytes 16 and 48 can be used to implement a significantly higher speed ES-to-ES Data Channel under software control. When implemented, this rate is 16 times that of the normal ES-to-ES IBS mode, or 1/30th of the terrestrial data rate (1/32nd of the aggregate rate).

The IBS 1/15 framing mode MUST be selected for Asynchronous channel operation to be available.

## 3.17   Satellite Control Channel (SCC) – J3

The SCC format uses a variable overhead rate to transmit an asynchronous data channel, in addition to the normal data channel. The SCC asynchronous mode implemented on the DMD20 is Pass Thru Mode.

In Pass Thru Mode, there is no formatting or deformatting of the input data in the buffer, and it is transmitted on a first-in first-out basis. In-band data entering the remote port is inserted into the user data stream. The in-band data is received and passed on to the user without any deformatting or depacketizing. The maximum in-band rate supported is 115200 bps.

The Asynchronous Data Interface (J3) is a 10-pin Dual Row header. The data interface can be configured for RS232 or RS485 via the Web Browser or Terminal Screen.

## 3.17.1　　　SCC Framing Structure

Each SCC frame consists of:

- A 10-bit synchronization pattern called the Synchronizing Word
- Multiple variable length slots filled with user data
- Multiple 10-bit control words that contain eight bits of in-band data (the extra two bits are for the async start/stop)

The number of user data slots and control words per frame is selected by the SCC Control Ratio Parameter. This can be any value from 1 to 1, through 1 to 7. A higher ratio allows a lower overhead rate, but because there are less Sync Words, there is a higher acquisition time.

These examples show control ratios of 1 to 3 and 1 to 1. Example 1 shows three Control Words for every Synchronizing Word, and Example 2 shows one Control Word for every Synchronizing Word.

| Sync Word | User Data | Control Word | User Data | Control Word | User Data | Control Word | User Data | Sync Word |
|-----------|-----------|--------------|-----------|--------------|-----------|--------------|-----------|-----------|
| 10 bits | n bits | 10 bits | n bits | 10 bits | n bits | 10 bits | n bits | 10 bits |

One Frame
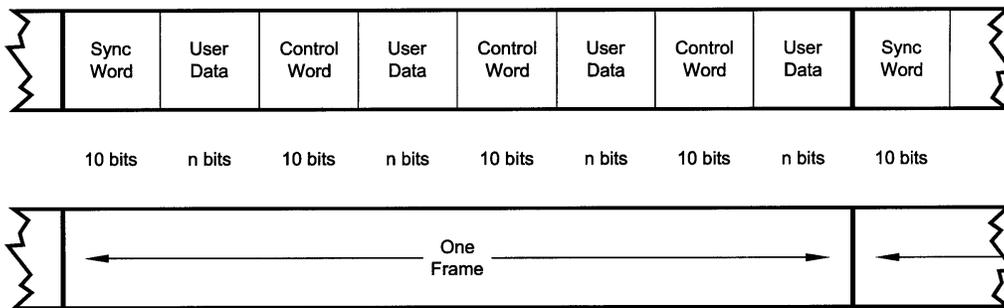
**Example 1: 1 to 3 Control Ratio**

| Sync Word | User Data | Control Word | User Data | Sync Word | User Data | Control Word | User Data | Sync Word |
|-----------|-----------|--------------|-----------|-----------|-----------|--------------|-----------|-----------|
| 10 bits | n bits | 10 bits | n bits | 10 bits | n bits | 10 bits | n bits | 10 bits |

One Frame　　　　　　One Frame
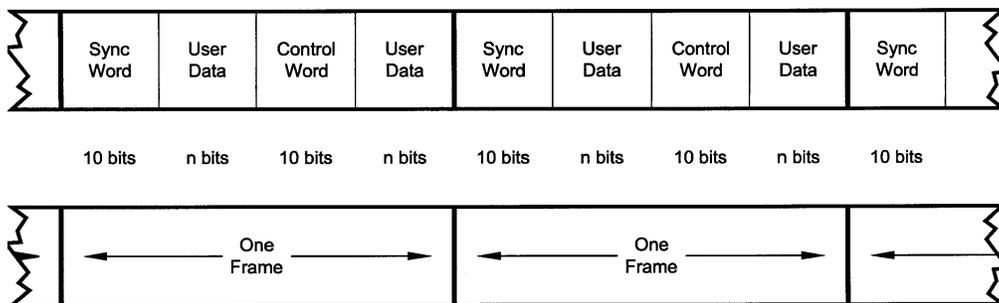
**Example 2: 1 to 1 Control Ratio**

The Control Ratio of the receiving units must match the Control Ratio of the transmitting unit.

## 3.17.2      Aggregate Data Rate

Aggregate Data Rate = User Data Rate + In-Band Rate + Synchronizing Overhead Rate

Because SCC must adjust the overhead so that there are an equal number of user data bits in each slot, the synchronizing overhead cannot be calculated easily. However, dividing the In-Band Rate by the Control Ratio can approximate it. The basic calculation of this rate is shown:

Aggregate Date Rate = User Data Rate + In-Band Rate + (In-Band Rate/Control Ratio)

| User Data                                    Rate | In-Band Rate | Synchronizing Overhead |
|---|---|---|
| ← Aggregate Data Rate → | | |
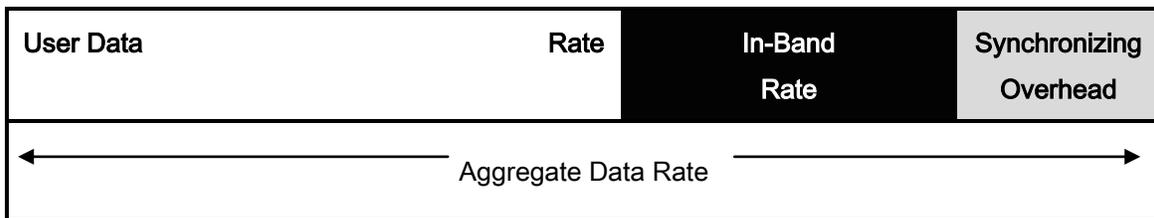
As an example, given these parameters:

User Data Rate:    1,024,000 bps

In-Band Rate:       19,200 bps

Control Ratio:      1 to 7

Aggregate data rate = 1,024,000 + 19,200 + (19,200/7) or approximately 1,045,942 (actually 1045974).

This gives an overhead ratio of 1,045,974/1,024,000 = 1.021

Another constraint changes the actual Aggregate Data Rate. The user data slot size is limited to 2,500 bits. Because of this, the modem increases the in-band rate to reduce the user data slot size. This happens only at higher user data rates.

> NOTE:  The Maximum In-Band rate is 115200. The Async interface Rate must be equal or greater in value.

## 3.17.3      Overhead Rate Comparison

The SCC Overhead Ratio varies, depending on the User Data Rate, the In-Band Rate and the Control Ratio. This gives SCC the advantage of lower overhead rates when compared to IBS, which has a fixed

overhead ratio of 16/15 or 1.067. Table 3-7 gives some examples of SCC overhead rates for different user data and control ratios.

### Table 3-7 SCC Overhead Rates

| User Data Rate | In-Band Rate | Control Ratio | Aggregate Data Rate | Overhead Ratio |
|---|---|---|---|---|
| 512,000 | 19,200 | 1/7 | 533,974 | 1.043 |
| 1,024,000 | 19,200 | 1/7 | 1,045,974 | 1.021 |
| 2,048,000 | 19,200 | 1/7 | 2,069,951 | 1.011 |
| 3,072,000 | 19,200 | 1/7 | 3,093,943 | 1.007 |
| 4,096,000 | 19,200 | 1/7 | 4,117,951 | 1.005 |
| 6,312,000 | 19,200 | 1/7 | 6,337,248 | 1.004 |
| 6,312,000 | 19,200 | 1/3 | 6,337,606 | 1.004 |
| 6,312,000 | 19,200 | 1/1 | 6,350,418 | 1.006 |

## 3.17.4      Actual Overhead Rate Calculation

The modem calculates the minimum in-band rate to limit the size of the user data slots to 2,500 bits. The result is truncated to an integer.

Minimum In-Band = (User Data Rate * Control Ratio)/((Control Ratio + 1) * 250)

Using the larger of Minimum In-Band or the selected In-Band, the modem calculates the number of bits for each user data slot. The result is truncated to an integer.

Slot Bits = (User Data Rate * (Control Ratio * 10))/(In-band Rate * (Control Ratio + 1))

NOTE:  Slot bits of 0 are invalid.

The ratio the modem uses is actually:     Actual Ratio = (Slot Bits + 10)/Slot Bits

Example 1:

User Data Rate: 1,024,000 bps

In-Band Rate: 19,200 bps

Control Ratio: 1 to 7

Minimum In-Band = (1,024,000 * 7)/((7 + 1) * 250) = 3,584 (less than In-Band Rate)

Slot Bits = (1,024,000 * (7 * 10))/(19,200 * (7 + 1)) = 466

Actual Ratio = (466 + 10)/466 = 1.021

Example 2:

User Data Rate: 6,312,000 bps

In-Band Rate: 19,200 bps

Control Ratio: 1 to 7

## 3.17.5  SCC Overhead Channel Setup

1.  Set the Framing Mode (located under Mod and Demod Data Menus) to SCC.
    After doing this, two new menus show to the right of the Framing Menu, for both the Mod and
    Demodulator:
    **SCC CTL RATIO**
    **SCC INBAND RATE**

2.  Set the desired SCC control ratio:
    SCC CTL RATIO {1/1, 1/2, 1/3, 1/4, 1/5, 1/6, 1/7}
    This allows you to simulate the framing used by the  Satellite Control Channel Option (Pass-Thru
    Mode only). The SCC CTL RATIO is the ratio of overhead in-band data to synchronizing words.

3.  Set the desired SCC in-band rate:
    SCC INBAND RATE {300 to 115200}
    This allows you to request the rate of in-band data for the overhead channel. This sets the
    overhead amount only. The actual amount of data that can be passed through the overhead
    channel will be set under ES Baud Rate.

4.  Go to Interface > General > Tx ASYNC MODE.

5.  Set the desired ES Interface type:
    ES INTERFACE {RS-232, RS-485}
    This allows you to select the interface type.

6.      Set the desired baud rate for the ASYNC Port (J1).

This will be the baud rate that will pass through the overhead channel:

ES BAUD RATE {150 - 115200}

This allows you to select the baud rate of the ASYNC port (J1) in SCC Mode.


7.      Set the desired ES BITS/CHAR:

ES BITS/CHAR {7,8}

This allows you to choose between 7 or 8 bits of data.


8.      Go to Interface > General > Rx ASYNC MODE and repeat Steps 5 through 7.

The physical connection to the overhead channel is a 10 pin dual row male header (J1). See Appendix E for mating connector details.

### Table 3-8 SCC Overhead Chart Examples (Viterbi 3/4 w/V.35 Scrambler)

| Modem Data Rate Kbps | SCC Control Channel Rate | In-Band Overhead Rate Setting | Symbol Rate |
|---|---|---|---|
| 9.6 | 1/1 | 300 | 6800 |
| 9.6 | 1/2 | 300 | 6700 |
| 9.6 | 1/3 | 300 | 6667 |
| 9.6 | 1/4 | 300 | 6650 |
| 9.6 | 1/5 | 300 | 6641 |
| 9.6 | 1/6 | 300 | 6634 |
| 9.6 | 1/7 | 300 | 6629 |
| 9.6 | 1/1 | 9600 | 19200 |
| 9.6 | 1/2 | 9600 | 17067 |
| 9.6 | 1/3 | 9600 | 15543 |
| 9.6 | 1/4 | 9600 | 14400 |
| 9.6 | 1/5 | 9600 | 14400 |
| 9.6 | 1/6 | 9600 | 14400 |
| 9.6 | 1/7 | 9600 | 14400 |
| 512 | 1/1 | 9600 | 354165 |
| 512 | 1/2 | 9600 | 350948 |
| 512 | 1/3 | 9600 | 349867 |
| 512 | 1/4 | 9600 | 349346 |
| 512 | 1/5 | 9600 | 349201 |
| 512 | 1/6 | 9600 | 348802 |
| 512 | 1/7 | 9600 | 348658 |

## 3.18   DMD1050T ID Codes (Feature Upgrades)

The modem has unique ID codes that allow you to add feature upgrades to the modem without returning the unit to the factory.

You must use these ID codes when you want additional features added to a unit. After purchase, Comtech supplies a new ID code that must be entered in the ID code field. Once the new ID code is entered, the modem activates the new features.

## 3.19   Strap Codes

The Strap Code is a quick set key that sets many of the modem parameters. For quick setup of the DMD1050T, Strap Codes are very helpful. When a Strap Code is entered, the modem is configured automatically for the code's corresponding data rate, overhead, code rate, framing, scrambler type and modulation.

Example of how to set a Strap Code:

1.     On the Web interface **Modulator Menu**, click the **Transmit** tab.
2.     Click **General**.
3.     Find **Strap Code**.
4.     Click inside the box, and go to the **New Strap Code** submenu.
5.     Enter **16**.

The DMD1050T is configured automatically to the parameters for Strap Code 16.

See Appendix G for the Strap Code options.

# Chapter 4. Rear Panel Interface

This section discusses the electrical interfaces on the rear panel. All locations are as seen from the rear of the unit, unless specified otherwise.

## 4.1    DMD1050T Connections

All DMD1050T connections are made to labeled connectors located on the Modem Board. See Figure 4-1, Figure 4-2, Figure 4-3 and Figure 4-4.

You must use the correct connector to make any connection to the DMD1050T. See Appendix E for information about the connectors that are used with the DMD1050T.

The DMD1050T consists of these assemblies:

- RF Board (PL-0021834)
- Baseband Modem Board (PL-0021833)
- FIPs Security Module (PL-0000192)

J3
Pin 1

J3
BUC & LNB
INPUT POWER

J2
SMA
OPT (F)
RX L-BAND

J6
COMPACT
FLASH CARD

J1
SMA
OPT (F)
TX L-BAND
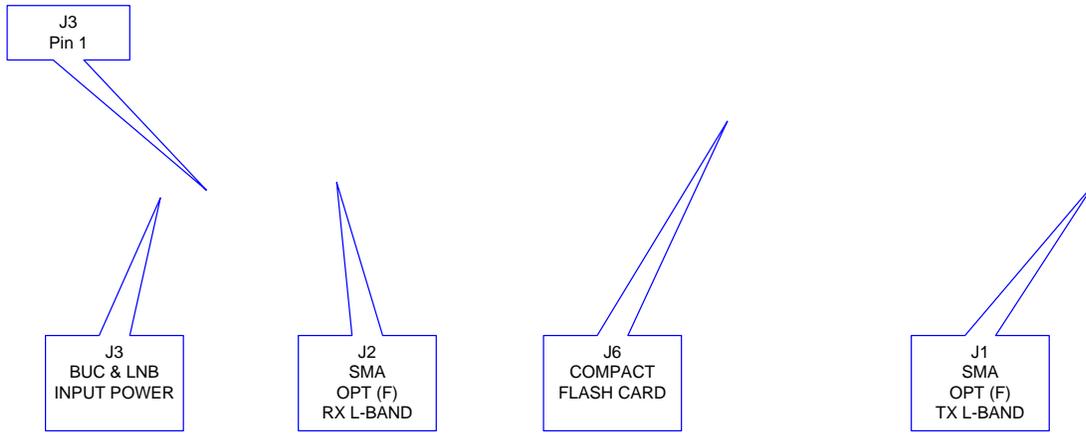
**Figure 4-1 DMD1050T Front View**

J16
Pin 1

J16
INPUT POWER

J9
SMA (F)
EXT REF
INPUT

U96
HIGH
STABILITY
OSCILLATOR

J11
RJ45 M&C

J10
TWIN RJ45
ETHERNET
DATA
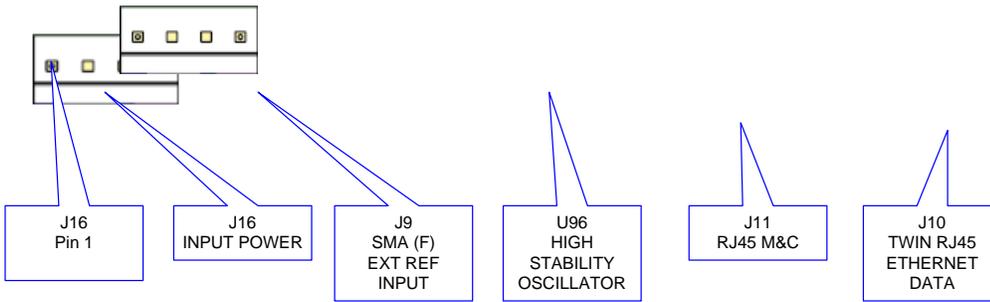
**Figure 4-2. DMD1050T Rear View**

J2 SMA
OPT (F)
RX L-BAND

J6
COMPACT
FLASH CARD

J1 SMA
OPT (F)
TX L-BAND

J10
TWIN RJ45
ETHERNET
DATA

J11
RJ45
M&C

HIGH
STABILITY
OSCILLATOR

J9
SMA
FEMALE

J16
INPUT POWER
24V
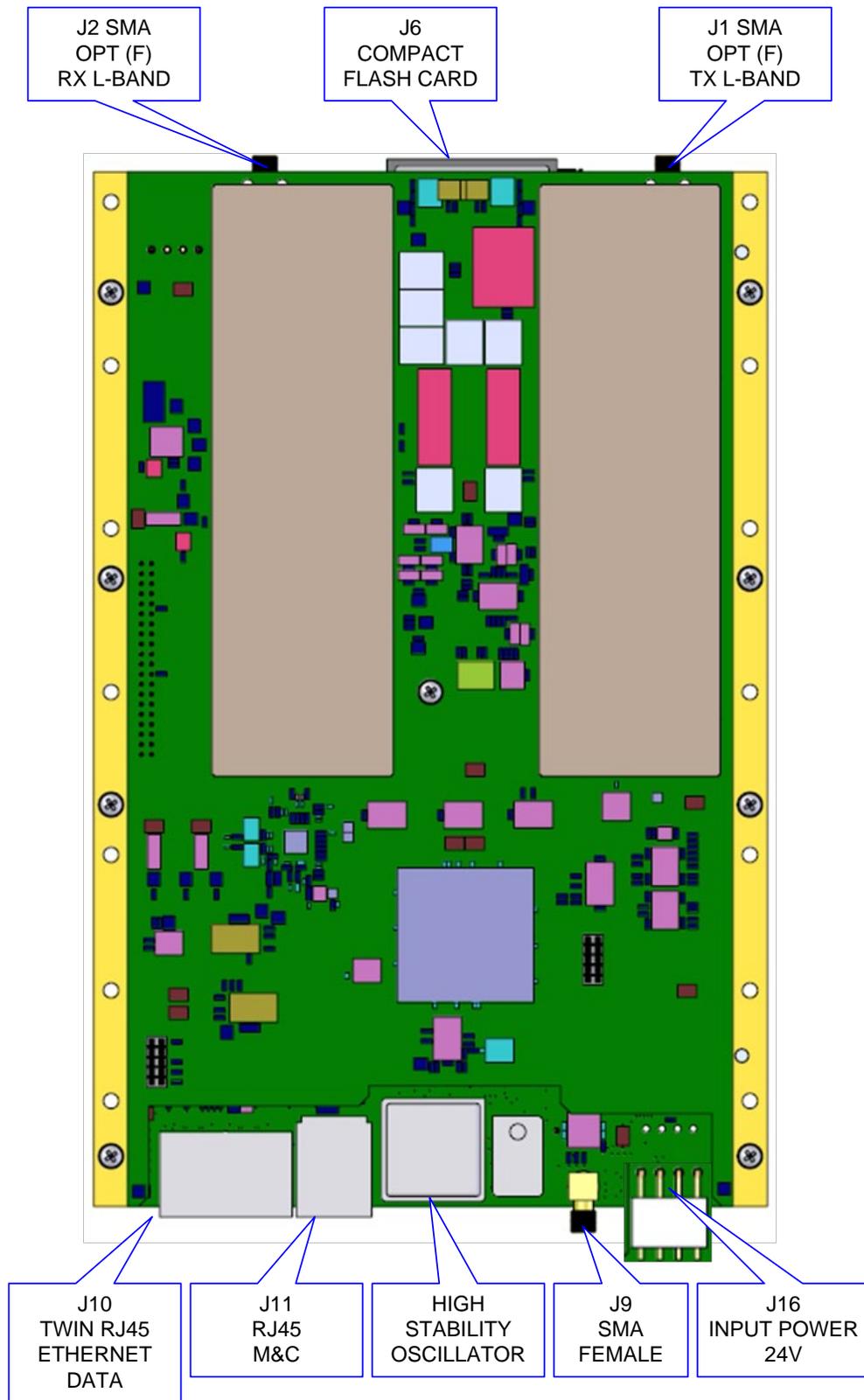
**Figure 4-3. RF Board (PL-0021834)**
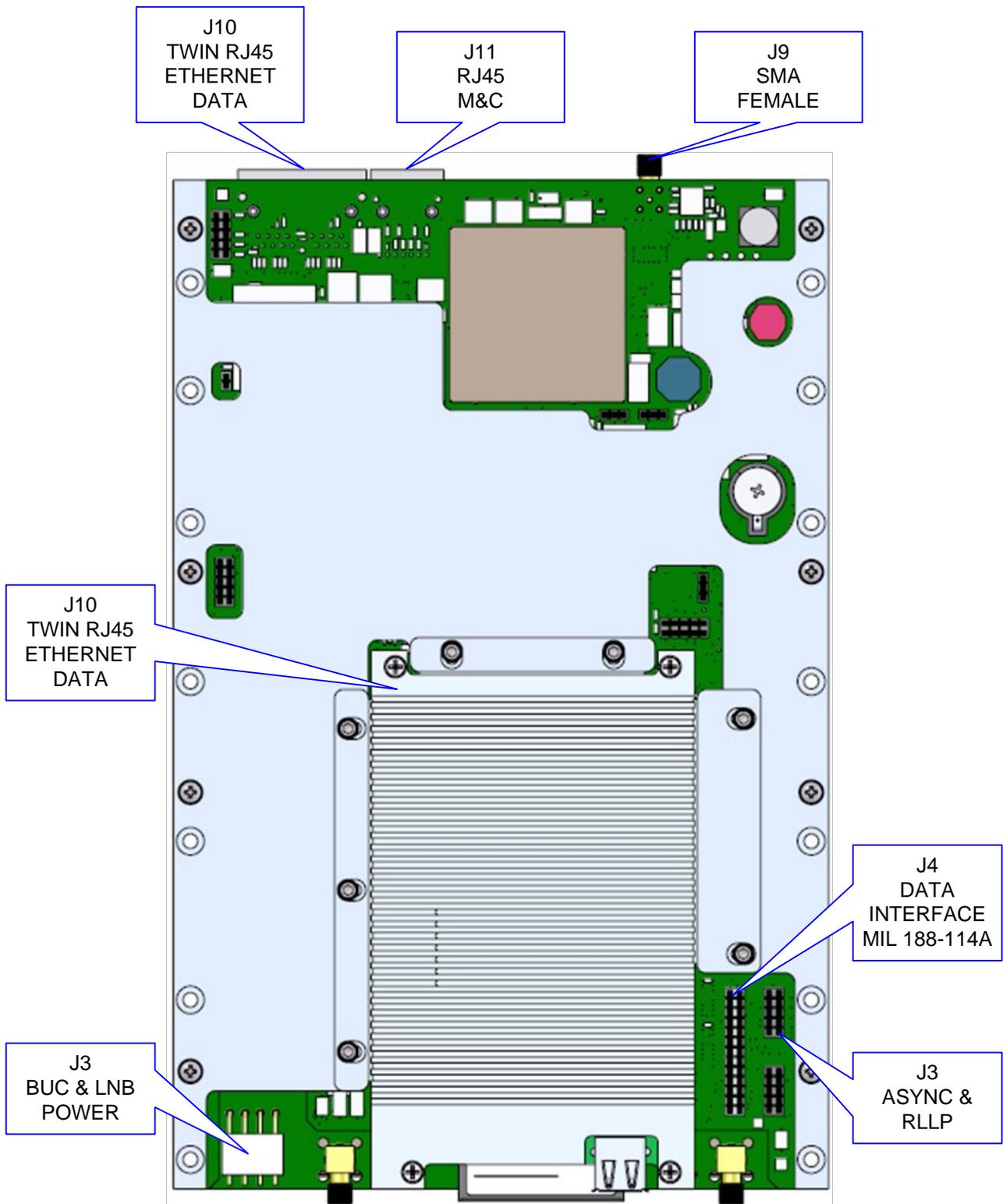
Figure 4-4. Baseband Modem Board (PL-0021833)

## 4.2 Compact Flash (J6)

A minimum 256 Mbit flash memory card stores all the modem M&C and operational data. It must be installed when the modem is operating.

## 4.3 Power Input (J16)

The Input DC Power for the modem board requires:

- +21 to +24 Volts DC
- 4 Pin Crimp Terminal Housing
- Mfg (Molex) P/N:  26-60-5040

### Table 4-1. DC Input Power Ports (J16)

| Pin No. | Signal Name | Signal |
|---------|-------------|--------|
| 1 | Ground | GND |
| 2 | Ground | GND |
| 3 | 24 Volts DC | --- |
| 4 | 24 Volts DC | --- |

## 4.4 BUC & LNB Power Input (J3)

The BUC and LNB input connector allows you to inject DC voltage externally for the BUC and LNB voltage.

- 4 Pin Crimp Terminal Housing
- Mfg (Molex) P/N:  26-60-5040

### Table 4-2. BUC & LNB DC input connector (J3)

| Pin No. | Signal Name | Signal |
|---------|-------------|--------|
| 1 | LNB DC Input | |
| 2 | Ground | GND |
| 3 | Ground | GND |
| 4 | BUC DC Input | |

## 4.5    Modem Connections (Standard)

### 4.5.1  EXT REF (J9)

The External Reference Port is a 50 Ohm Female SMA Connector. It accepts these frequencies:

| MHz | | | | | |
|------|-------|-----|-------|-----|------|
| 1.0 | 1.544 | 2.0 | 2.048 | 5.0 | 10.0 |

Input Level:      0.1 Vp-p to 5 Vp-p (Sine or Square wave)

### 4.5.2  TX L-Band IF (J1)

The Transmit IF Output Port is a 50 Ohm SMA Female Connector that is used for L-Band IF.

The power level is programmable from 0 to -25 dBm, in 0.1 dBm steps.

The IF Frequency is programmable from 950 to 2050 MHz, in 1 Hz Steps.

### 4.5.3  RX L-Band IF (J2)

The Receive IF Input Port is a 50 Ohm SMA Female Connector that is used for L-Band IF.

The IF Frequency is programmable from 950 to 2050 MHz, in 1 Hz Steps.

### 4.5.4  ASYNC & Remote Port (J3) – 10-Pin Dual Row Header

This port supports both Asynchronous and Remote interfaces. The remote port supports RS485 or RS232. This port is a 10-pin dual row header.

- 10-Pin Dual Row
- Mfg (Samtec) P/N:  TSW-1-05-7-G-D

**Table 4-3. ASYNC & Remote Ports (J3)**

| Pin No. | Signal Name | Signal | Direction |
|---------|-------------|-----------|-----------|
| 1 | RX_ASYNC_B | 485/RXD_B | Output |
| 2 | RX_ASYNC_A | 485/RXD_A | Output |
| 3 | TX_ASYNC_B | 485/TXD_B | Input |
| 4 | TX_ASYNC_A | 485/TXD_A | Input |
| 5 | RX_RLLP_B | 485/CTS | Input |
| 6 | RX_RLLP_A | 485-A_232 | Input |

| Pin No. | Signal Name | Signal | Direction |
|---------|-------------|--------|-----------|
| 7 | TX_RLLP_B | 485-B | Output |
| 8 | TX_RLLP_A | 485-A_232 | Output |
| 9 | Ground | GND | --- |
| 10 | No Connect | --- | --- |

## 4.5.5   Default/Shorting Plug (JP1 JP2) - 3 Pin Male Connector

If you are having difficulty opening the Web Browser or the Terminal Interface, you can reset the M&C interface settings. Use the supplied default plug (CNRSHUNT).

1. Install the default plug across pins 1 and 2 of JP1 and JP2 connectors.
2. Cycle the power.
3. The interface default settings will reset.

Default jumper/shunts are with the supplied connector kit. The default jumper might be installed between pins 2 and 3.

1. Reposition the jumper across pins 1 & 2.
2. After the default settings have been activated, remove the Jumpers.

See Figure 4-5 and **Error! Reference source not found.**.

**Table 4-4-4. Default/Reset connections:  3-Pin male Connector (JP1 & JP2)**

| Install shunt/jumper Between Pins No. |
|---------------------------------------|
| Pin 1 & 2 |

JP1

JP2

Pin 1

Pin 2
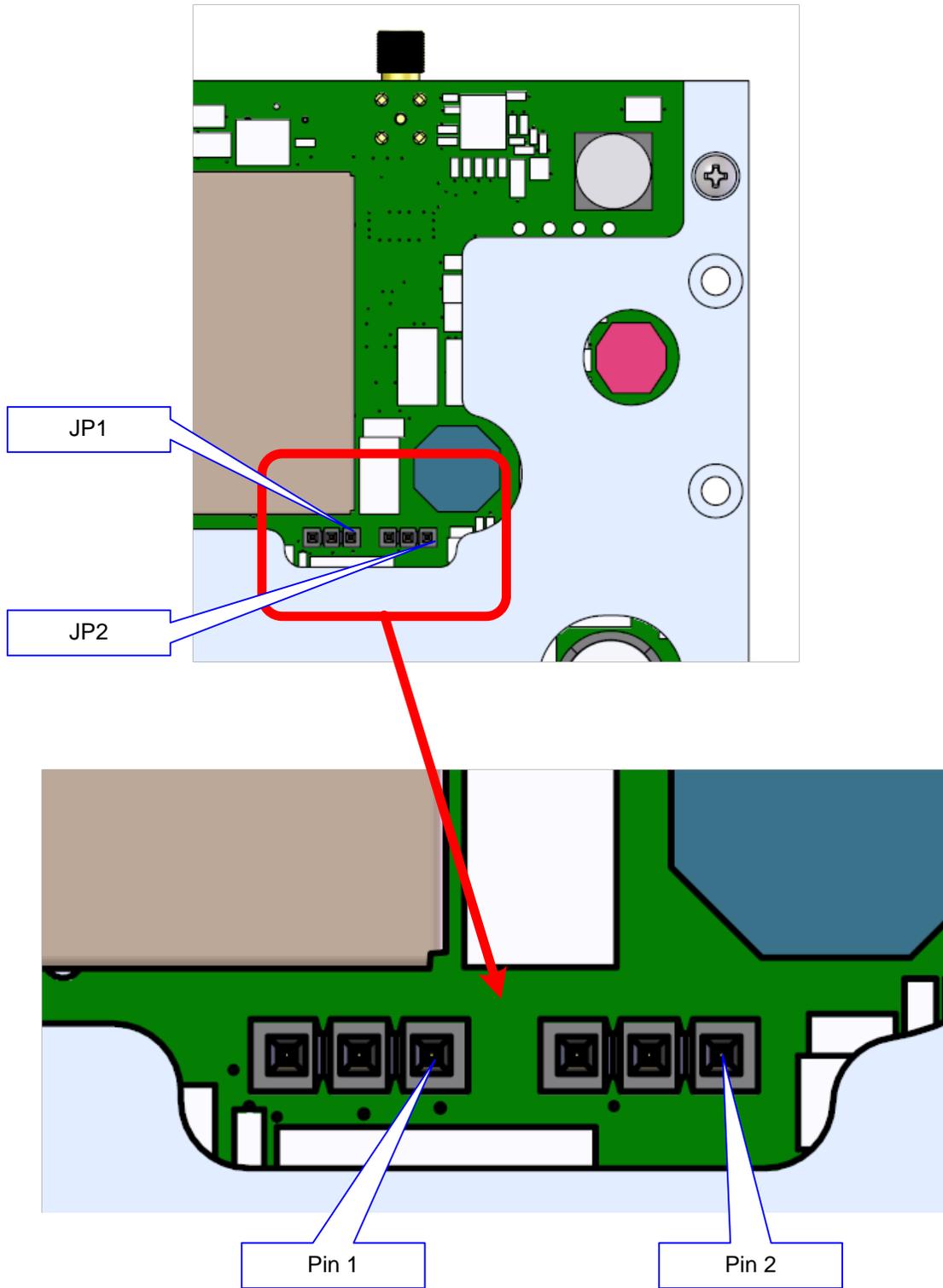
**Figure 4-5. Default/Shorting Plug (JP1 and JP2)**

## 4.5.6  MIL-188-114A (J4)

The MIL-188-114A port is an RS422 interface.

- 26-Pin Dual Row Male Header
- Mfg (Samtec) P/N:  TSW-1-13-7-G-D

### Table 4-5 MIL-188-114A Port (RS-422) 26-Pin Dual Row Header (J2)

| Pin No. | Signal Name | Signal | Direction |
|---------|-------------|--------|-----------|
| 1 | Ground | --- | --- |
| 2 | Send Data B (+) | SD-B | Input |
| 3 | Send Data A (-) | SD-A | Input |
| 4 | Send Timing A (-) | ST-A | Output |
| 5 | Receive Data A (-) | RD-A | Output |
| 6 | Receive Data B (+) | RD-B | Output |
| 7 | Request To Send A (-) | RS-A | Input |
| 8 | Receive Timing A (-) | RT-A | Output |
| 9 | Clear To Send A (-) | CS-A | Output |
| 10 | Modulator Fault - Open Collector | MF | Output |
| 11 | Data Mode A (-) | DM-A | Output |
| 12 | Request To Send B (+) | RS-B | Input |
| 13 | Ground | GND | --- |
| 14 | Data Terminal Ready A (-) | TR-A | Input |
| 15 | Receiver Ready A (-) | RR-A | Output |
| 16 | Demodulator Fault | DF | Output |
| 17 | Receive Timing B (+) | RT-B | Output |
| 18 | Data Mode B (+) | DM-B | Output |
| 19 | Receiver Ready B (+) | RR-B | Output |
| 20 | Data Terminal Ready B (+) | TR-B | Input |
| 21 | Terminal Timing B (+) | TT-B | Input |
| 22 | Terminal Timing A (-) | TT-A | Input |
| 23 | Send Timing B (+) | ST-B | Output |
| 24 | Antenna AGC | --- | Output |
| 25 | Clear T Send B (+) | CS-B | Output |
| 26 | No Connect | --- | --- |

## 4.5.7  Ethernet M&C (J11)

The Ethernet M&C Port is a 10 Base-T Interface. J9 is used for the Monitor & Control (M&C) functions of the unit. The physical interface is a standard female RJ-45 connector.

## 4.5.8  Ethernet Data Interface (J10)

The DMD1050T Ethernet Data Interface provides two RJ-45, Auto-Crossover and Auto-Sensing, 10/100 Ethernet Data Ports. The physical interfaces are twin female RJ-45 connectors.

# Chapter 5.  Maintenance and Troubleshooting

⚠️ **WARNING - DANGER OF EXPLOSION – LITHIUM BATTERY**

This unit contains a lithium battery. You must replace the lithium battery with the same or equivalent battery that is recommended by the manufacturer. You must dispose of used batteries as required by local and national regulations. Make sure to prevent static discharge that can cause damage to the Modem Board.

## 5.1    Periodic Maintenance

The DMD1050T does not require periodic maintenance.

## 5.2    Troubleshooting

First, examine all interface signals for correct operation. If a unit is suspected of a defect in field operations after that, replace the unit with another known working DMD1050T. If a problem still exists, examine the wiring or power.

Table 5-1 is a brief list of problems that can be caused by failures of the modem, or by incorrect setup or configuration for the type of service.

**Table 5-1 Symptoms and Possible Causes**

| SYMPTOM | POSSIBLE CAUSE |
|---|---|
| The Modem does not acquire the incoming carrier. | Incorrect receive input to the modem |
| | Receive Carrier Level is too low |
| | Receive Carrier Frequency is outside of the acquisition range |
| | Transmit Carrier is incompatible |
| | Modem is in Test Mode |
| The Async Port is not configured correctly. | Switches are set incorrectly |

## 5.2.1  Alarm Faults

### 5.2.1.1        Major Tx Alarms

| Alarm | Possible Cause |
|---|---|
| FPGA CFG | Shows a transmit FPGA hardware failure |
| DSP CFG | Shows a transmit FPGA failure |
| SCT Clock PLL | Shows that the Tx SCT Clock PLL is not locked.  This alarm flashes during certain parameter changes.  A steady display shows a problem in the modem configuration. |
| SYM Clock PLL | Shows that the Tx Symbol Clock PLL is not locked.  This alarm flashes during certain parameter changes.  A steady display shows a problem with the incoming clock to the modem (SCTE). |
| LB Synth PLL | Shows that the Tx L-Band Synthesizer is not locked.  This alarm flashes during certain parameter changes.  A steady display shows a configuration problem in the modem. |
| Ethernet WAN | Shows that the WAN Port is down |
| TRANSEC Ready | Shows that the TRANSEC Security Module has not indicated it is ready for data |

### 5.2.1.2        Major Rx Alarms

| Alarm | Possible Cause |
|---|---|
| FPGA CFG | Shows a receive FPGA hardware failure |
| DSP CFG | Shows a receive DSP failure |
| SIGNAL LOCK | Shows that the demod is unable to lock to a signal |
| FRAME LOCK | Shows that the Framing Unit is unable to find the expected framing pattern |
| MULTIFRAME LOCK | Shows that the Framing Unit is unable to find the expected framing pattern |
| LB SYNTH PLL | Shows that the Rx L-Band Synthesizer is not locked.  This alarm flashes during certain parameter changes.  A steady display shows a problem in the modem configuration. |
| Ethernet WAN | Shows that the WAN Port is down |

## 5.2.1.3      Minor Tx Alarms

| Alarm | Possible Cause |
| --- | --- |
| TERR CLK ACT | Shows no Terrestrial Clock activity |
| TERR DATA ACT | Shows no Tx Data activity |
| TX TERR AIS | Shows that AIS has been detected in the Tx Data Stream |
| TX DVB FRAME LOCK | Shows that the Tx Input Data Stream Framing does not match the selected Tx Terr Framing.  Incorrect Tx Terr Framing is selected.  Incorrectly framed Tx Input Data Stream exists. |
| Clock Src Fallback | Shows the SCTE clock has fallen back to internal SCT |
| TPC Conflict Chk | Shows there is a TPC mismatch |

## 5.2.1.4      Minor Rx Alarms

| Alarm | Possible Cause |
| --- | --- |
| BUFF UNDERFLOW | Shows that a Doppler Buffer underflow has occurred |
| BUFF NEAR EMPTY | Shows that the Doppler Buffer is about to underflow |
| BUFF NEAR FULL | Shows that the Doppler Buffer is about to overflow |
| BUFF OVERFLOW | Shows that a Doppler Buffer overflow has occurred |
| RX DATA ACTIVITY | Shows that there is no Rx Data activity; for the Ethernet Interface, shows that no Ethernet port is active (no cable is connected) |
| SAT AIS | Shows that AIS has been detected in the receive satellite data stream |
| IFEC LOCK | Shows that the Inner Codec is not locked |
| TPC Conflict Chk | Shows there is a TPC mismatch |
| OFEC LOCK | Shows that the Reed-Solomon Decoder is not locked |
| INTERLEAVER | Shows that the Reed-Solomon Interleaver is not synchronized |
| EBNO (dB) | Shows that the Eb/No is outside of limits |
| IBS BER | Shows that there are more than one in 1000 bits in error in IBS mode |
| RX DVB FRAME LOCK | Shows that the Rx Satellite Data Stream Framing is not DVB |
| Encryption | TRANSEC Module is enabled but not synchronized |

## 5.2.1.5      Common Major Alarms

| Alarm | Possible Cause |
|---|---|
| TERR FPGA CFG | Shows an Interface Card FPGA configuration failure, likely caused by a missing or incorrect file |
| CODEC FPGA CFG | Shows Turbo Codec Card FPGA configuration failure, likely caused by a missing or incorrect file |
| CODEC Dev CFG | Shows Turbo Codec ASIC failed to program |
| +1.5V RX SUPPLY | Shows the measured voltage of the 1.5 Volt Rx power bus inside the modem |
| +1.5V TX SUPPLY | Shows the measured voltage of the 1.5 Volt Tx power bus inside the modem |
| +3.3V SUPPLY | Shows the measured voltage of the +3.3 Volt power bus inside the modem |
| +5V SUPPLY | Shows the measured voltage of the +5 Volt power bus inside the modem |
| +12V SUPPLY | Shows the measured voltage of the +12 Volt power bus inside the modem |
| -12V SUPPLY | Shows the measured voltage of the -12 Volt power bus inside the modem |
| +20V SUPPLY | Shows the measured voltage of the +20 Volt power bus inside the modem |
| EXT CLOCK ACT | Shows that the External Clock is not active |
| EXT REF ACT | Shows no activity on the External Reference |
| EXT REF LOCK | Shows that the External Reference PLL is not locked |
| Transec Pwr Test | Shows the TRANSEC module has failed POST (Power-On Self Test) |

## 5.2.2  Alarm Masks

The DMD1050T does a high degree of self-monitoring and fault isolation.  The alarms for these faults are separated into categories:

- Active Alarms
- Common Equipment Faults

Alarms recorded in the event buffer are the same as those in the alarm buffer.

You can mask certain alarms.  When an alarm is masked, the Fault Relays are not asserted, but the Alarm is shown. This feature is very helpful during debugging, or to lock out a known failure.

⚠ **CAUTION: DATA LOSS POSSIBLE**

Masked alarms can cause undesirable modem performance .

## 5.2.2.1    Active Alarms

### 5.2.2.1.1    Major Alarms

Major Alarms mean a modem hardware failure.  Major Alarms can flash briefly during modem configuration changes and during power-up, but should not stay lit.  Alarms are grouped into Transmit and Receive Alarms. Transmit and Receive alarms are completely independent.

### 5.2.2.1.2    Minor Alarms

Minor Alarms mean that a problem can persist outside the modem, such as loss of Terrestrial Clock, loss of terrestrial data activity, or a detected transmit or receive AIS condition.

Alarms are grouped into Transmit and Receive Alarms. Transmit and Receive alarms are completely independent.

## 5.2.2.2    Common Equipment Faults

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

## 5.2.2.3    Latched Alarms

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

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# Chapter 6.  Technical Specifications

## 6.1    Data Rates

| | |
|---|---|
| BPSK Uncoded | 4.8 Kbps to 10.0 Mbps |
| 5/16 Rate BPSK | 2.4 Kbps to 3.125 Mbps |
| 21/44 Rate BPSK | 2.4 Kbps to 4.773 Mbps |
| 1/2 Rate BPSK | 2.4 Kbps to 5.0 Mbps |
| 3/4 Rate BPSK | 3.6 Kbps to 7.5 Mbps |
| 7/8 Rate BPSK | 4.2 Kbps to 8.75 Mbps |
| QPSK Uncoded | 9.6 Kbps to 20.0 Mbps |
| 21/44 Rate QPSK | 4.8 Kbps to 9.545 Mbps |
| 1/2 Rate QPSK | 4.8 Kbps to 10.0 Mbps |
| 2/3 Rate QPSK | 6.4 Kbps to 13.333 Mbps |
| 3/4 Rate QPSK | 7.2 Kbps to 15.0 Mbps |
| 7/8 Rate QPSK | 8.4 Kbps to 17.5 Mbps |
| 21/44 Rate OQPSK | 4.8 Kbps to 9.545 Mbps |
| 1/2 Rate OQPSK | 4.8 Kbps to 10.0 Mbps |
| 2/3 Rate OQPSK | 6.4 Kbps to 13.333 Mbps |
| 3/4 Rate OQPSK | 7.2 Kbps to 15.0 Mbps |
| 7/8 Rate OQPSK | 8.4 Kbps to 17.5 Mbps |
| Rate 2/3 8PSK | 9.6 Kbps to 20.0 Mbps |
| Rate 3/4 8PSK | 10.8 Kbps to 20.0 Mbps |
| Rate 7/8 8PSK | 14.4 Kbps to 20.0 Mbps |
| Rate 2/3 8QAM | 9.6 Kbps to 20.0 Mbps |
| Rate 3/4 8QAM | 10.8 Kbps to 20.0 Mbps |
| Rate 7/8 8QAM | 14.4 Kbps to 20.0 Mbps |
| 3/4 Rate 16QAM | 14.4 Kbps to 20.0 Mbps |
| 7/8 Rate 16QAM | 16.84 Kbps to 20.0 Mbps |

## 6.2   Modulator

| | | |
|---|---|---|
| Modulation | BPSK, QPSK, and OQPSK, 8PSK, 8QAM, 16QAM | |
| L-Band Tuning Range | 950 to 2050 MHz in 1 Hz Steps | |
| Impedance | SMA, 50 Ohm or F-Type 75 Ohm (Optional) | |
| Connector | SMA, or F-Type (Optional) | |
| Return Loss | SMA 2.0:1 | |
| Output Power | 0 to -25 dB | |
| Output Stability | L-Band, ±1.0 dB Over Frequency and Temperature | |
| Output Spectrum | Selectable and Meets MIL-188-165A or IESS 308/309/ 310 | Power Spectral Mask |
| Spurious | -55 dBc In-Band | |
| | -45 dBc Out-of-Band | |
| On/Off Power Ratio | >60 dB | |
| Scrambler | OM-73, CCITT V.35 or IBS | |
| FEC | Viterbi, K = 7 at 1/2, 3/4 and 7/8 | |
| | 2/3 Rate Trellis | |
| | Turbo Product Code (Optional) | |
| | BPSK 5/16, 21/44 | |
| | QPSK/OQPSK 21/44, 3/4, 7/8 | |
| | 8PSK/8QAM/16QAM 3/4, 7/8 | |
| | Low Density Parity Check (Optional) | |
| | BPSK 1/2 | |
| | QPSK/OQPSK 1/2, 2/3, 3/4 | |
| | 8PSK/8QAM 2/3, 3/4 | |
| | 16QAM 3/4 | |
| Outer Encoder Options | Reed-Solomon INTELSAT (DVB Optional) | |
| | Custom (N, K) Reed-Solomon | |
| Spread Spectrum | Direct Sequence x2, x4, x8, and x16 (Optional with LDPC) | |
| Data Clock Source | Internal, External, Rx Recovered | |
| Internal Stability | +/- 1 x 10$^{-6}$ | |
| High Stability (optional) | +/- 5 x 10$^{-8}$ | |

## 6.3  Demodulator

| | | |
|---|---|---|
| Demodulation | BPSK, QPSK, and OQPSK, 8PSK, 8QAM, 16QAM | |
| IF Tuning Range | L-Band Tuning Range | 950 to 2050 MHz in 1 Hz Steps |
| Impedance | SMA, 50 Ohm, F-Type 75 Ohm (Optional) | |
| Connector | SMA, F-Type (Optional) | |
| Return Loss | SMA 2.0:1 | |
| Spectrum | Selectable and Meets MIL-188-165A or INTELSAT IESS | 308/309/310 Compliant |
| Input Level | -55 to +10 dBm | |
| Total Input Power | +20 dBm or +40 dBc (the Lesser) | |
| FEC | Viterbi, K = 7 at 1/2, 3/4 and 7/8 Rate, | |
| | Rate Sequential 1/2 Rate, 3/4, 7/8 (Optional) | |
| | Trellis 2/3 | |
| | Turbo Product Code (Optional) | |
| | BPSK 5/16, 21/44 | |
| | QPSK/OQPSK 21/44, 3/4, 7/8 | |
| | 8PSK/8QAM/16QAM 3/4, 7/8 | |
| | Low Density Parity Check (Optional) | |
| | BPSK 1/2 | |
| | QPSK/OQPSK 1/2, 2/3, 3/4 | |
| | 8PSK/8QAM 2/3, 3/4 | |
| | 16QAM 3/4 | |
| Decoder Options | Reed-Solomon INTELSAT (DVB Optional) | |
| | Custom (N, K) Reed-Solomon | |
| Descrambler | OM-73, CCITT V.35 or IBS | |
| Acquisition Range | Programmable ±1 kHz to ± 255 kHz | |
| Reacquisition Range | Programmable ±1 Hz to 25000 Hz | |
| Sweep Delay Value | 0 to 6000 seconds in 100 msec Steps | |

## 6.4  Plesiochronous Buffer

| | |
|---|---|
| Size | 0 msec to 64 msec |
| Centering | Automatic on Underflow/Overflow |
| Centering Modes | IBS: Integral Number of Frames |
| | IDR: Integral Number of Multi-Frames |
| Clock | External, Rx Recovered or SCT (Internal) |

## 6.5     Monitor and Control

Ethernet 10/100 Base-T/Web Browser/SNMP, Remote RS-485/Terminal RS-232

## 6.6     Terrestrial Interfaces

| MIL-188-114A | All Rates, Differential, Clock/Data, DCE | |
|---|---|---|
| Ethernet 2 Port 10/100 Base-T | Two RJ-45, Auto-Crossover, Auto-Sensing, 10/100 Ethernet | Data Ports.  Complies with IEEE 802.3 and IEEE 802.3u. |

## 6.7     Environmental

| Prime Power | +21 to +24.5 Volts DC |
|---|---|
| Operating Temperature | 0 to +60°C, 95% Humidity, Non-Condensing |
| Storage Temperature | -20 to 70°C, 99% humidity, Non-Condensing |

## 6.8     Physical

| Size | 1.442" x 6.675" x 9.125" 6.675" W x 10.3 D x 1.442" H / (17.78 x 23.12 x 2.54 cm) |
|---|---|
| Weight | 3.45 Pounds (1.56 Kg) |

## 6.9  Data Rate Limits

### 6.9.1  Non-DVB

| Modulation | Code Rate | Min Data Rate | Max Data Rate |
|---|---|---|---|
| BPSK | NONE | 4800 | 10000000 |
| BPSK | VIT 1/2 | 2400 | 5000000 |
| BPSK | VIT 3/4 | 3600 | 7500000 |
| BPSK | VIT 7/8 | 4200 | 8750000 |
| BPSK | SEQ 1/2 | 2400 | 2048000 |
| BPSK | SEQ 3/4 | 3600 | 2048000 |
| BPSK | SEQ 7/8 | 4200 | 2048000 |
| BPSK | TPC 5/16 | 2400 | 3125000 |
| BPSK | TPC 21/44 | 2400 | 4772727 |
| BPSK | TPC 3/4 | 3600 | 7500000 |
| BPSK | TPC 7/8 | 4200 | 8750000 |
| BPSK | LDPC 1/2 | 2400 | 5000000 |
| QPSK | NONE | 9600 | 20000000 |
| QPSK | VIT 1/2 | 4800 | 10000000 |
| QPSK | VIT 3/4 | 7200 | 15000000 |
| QPSK | VIT 7/8 | 8400 | 17500000 |
| QPSK | SEQ 1/2 | 4800 | 2048000 |
| QPSK | SEQ 3/4 | 7200 | 2048000 |
| QPSK | SEQ 7/8 | 8400 | 2048000 |
| QPSK | TPC 21/44 | 4582 | 9545454 |
| QPSK | TPC 3/4 | 7200 | 15000000 |
| QPSK | TPC 7/8 | 8400 | 17500000 |
| QPSK | LDPC 1/2 | 4800 | 10000000 |
| QPSK | LDPC 2/3 | 6400 | 13333333 |
| QPSK | LDPC 3/4 | 7200 | 15000000 |
| OQPSK | NONE | 9600 | 20000000 |
| OQPSK | VIT 1/2 | 4800 | 10000000 |
| OQPSK | VIT 3/4 | 7200 | 15000000 |
| OQPSK | VIT 7/8 | 8400 | 17500000 |
| OQPSK | SEQ 1/2 | 4800 | 2048000 |
| OQPSK | SEQ 3/4 | 7200 | 2048000 |
| OQPSK | SEQ 7/8 | 8400 | 2048000 |

| Modulation | Code Rate | Min Data Rate | Max Data Rate |
|------------|-----------|---------------|---------------|
| OQPSK | TPC 21/44 | 4582 | 9545454 |
| OQPSK | TPC 3/4 | 7200 | 15000000 |
| OQPSK | TPC 7/8 | 8400 | 17500000 |
| OQPSK | LDPC 1/2 | 4800 | 10000000 |
| OQPSK | LDPC 2/3 | 6400 | 13333333 |
| OQPSK | LDPC 3/4 | 7200 | 15000000 |
| 8PSK | TRE 2/3 | 9600 | 20000000 |
| 8PSK | TPC 3/4 | 10800 | 20000000 |
| 8PSK | TPC 7/8 | 12600 | 20000000 |
| 8PSK | LDPC 2/3 | 9600 | 20000000 |
| 8PSK | LDPC 3/4 | 10800 | 2000000 |
| 8QAM | TPC 3/4 | 10800 | 20000000 |
| 8QAM | TPC 7/8 | 12600 | 20000000 |
| 8QAM | LDPC 2/3 | 9600 | 20000000 |
| 8QAM | LDPC 3/4 | 10800 | 2000000 |
| 16QAM | VIT 3/4 | 14400 | 20000000 |
| 16QAM | VIT 7/8 | 16800 | 20000000 |
| 16QAM | TPC 3/4 | 14400 | 20000000 |
| 16QAM | TPC 7/8 | 16840 | 20000000 |
| 16QAM | LDPC 3/4 | 14400 | 20000000 |

## 6.9.2   DVB

| 187 Mode | | | |
|---|---|---|---|
| Modulation | Code Rate | Min Data Rate | Max Data Rate |
| BPSK | VIT 1/2 | 2400 | 4583333 |
| BPSK | VIT 2/3 | 2934 | 6111111 |
| BPSK | VIT 3/4 | 3300 | 6875000 |
| BPSK | VIT 5/6 | 3667 | 7638888 |
| BPSK | VIT 7/8 | 3850 | 8020833 |
| QPSK | VIT 1/2 | 4400 | 9166666 |
| QPSK | VIT 2/3 | 5867 | 12222222 |
| QPSK | VIT 3/4 | 6600 | 13750000 |
| QPSK | VIT 5/6 | 7334 | 15277777 |
| QPSK | VIT 7/8 | 7700 | 16041666 |
| 8PSK | TRE 2/3 | 8800 | 18333333 |
| 8PSK | TRE 5/6 | 11000 | 20000000 |
| 8PSK | TRE 8/9 | 11550 | 20000000 |
| 16QAM | TRE 3/4 | 13200 | 20000000 |
| 16QAM | TRE 7/8 | 15400 | 20000000 |

| 188 Mode | | | |
|---|---|---|---|
| Modulation | Code Rate | Min Data Rate | Max Data Rate |
| BPSK | VIT 1/2 | 2400 | 4607843 |
| BPSK | VIT 2/3 | 2950 | 6143790 |
| BPSK | VIT 3/4 | 3318 | 6911764 |
| BPSK | VIT 5/6 | 3687 | 7679738 |
| BPSK | VIT 7/8 | 3871 | 8063725 |
| QPSK | VIT 1/2 | 4424 | 9215686 |
| QPSK | VIT 2/3 | 5899 | 12287581 |
| QPSK | VIT 3/4 | 6636 | 13823529 |
| QPSK | VIT 5/6 | 7373 | 15359476 |
| QPSK | VIT 7/8 | 7742 | 16127450 |
| 8PSK | TRE 2/3 | 8848 | 18431372 |
| 8PSK | TRE 5/6 | 11059 | 20000000 |
| 8PSK | TRE 8/9 | 11797 | 20000000 |

| 188 Mode | | | |
|---|---|---|---|
| Modulation | Code Rate | Min Data Rate | Max Data Rate |
| 16QAM | TRE 3/4 | 13271 | 20000000 |
| 16QAM | TRE 7/8 | 15483 | 20000000 |

| 204 Mode | | | |
|---|---|---|---|
| Modulation | Code Rate | Min Data Rate | Max Data Rate |
| BPSK | VIT 1/2 | 2400 | 5000000 |
| BPSK | VIT 2/3 | 3200 | 6666666 |
| BPSK | VIT 3/4 | 3600 | 7500000 |
| BPSK | VIT 5/6 | 4000 | 8333333 |
| BPSK | VIT 7/8 | 4200 | 8750000 |
| QPSK | VIT 1/2 | 4800 | 10000000 |
| QPSK | VIT 2/3 | 6400 | 13333333 |
| QPSK | VIT 3/4 | 7200 | 15000000 |
| QPSK | VIT 5/6 | 8000 | 16666666 |
| QPSK | VIT 7/8 | 8400 | 17500000 |
| 8PSK | TRE 2/3 | 9600 | 20000000 |
| 8PSK | TRE 5/6 | 12000 | 20000000 |
| 8PSK | TRE 8/9 | 12800 | 20000000 |
| 16QAM | TRE 3/4 | 14400 | 20000000 |
| 16QAM | TRE 7/8 | 16800 | 20000000 |

## 6.10   BER Specifications

### 6.10.1      BER Performance (Viterbi)
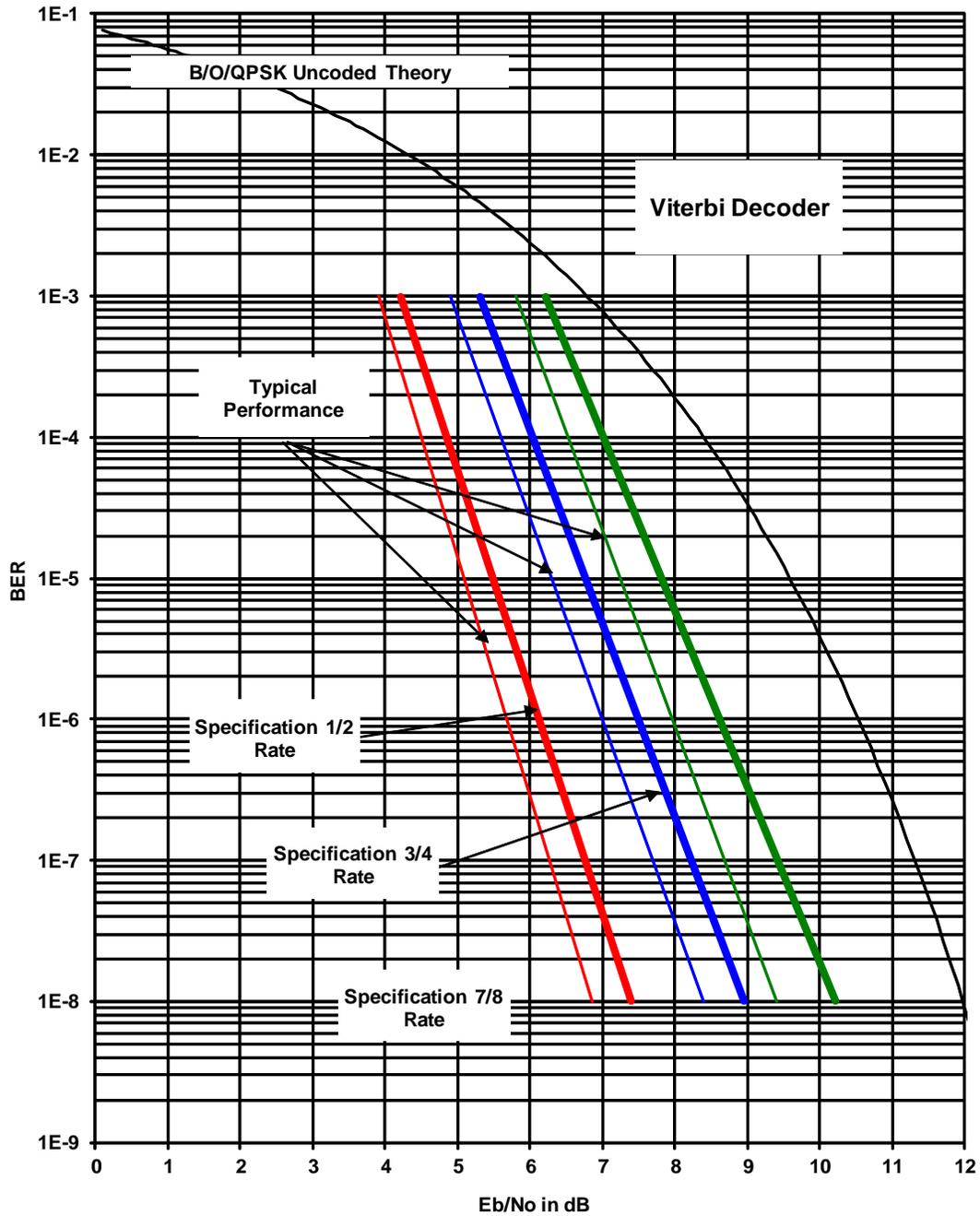


Figure 6-1. DMD1050T B/0/QPSK BER Performance (Viterbi)

Note:  Eb/No values include the effect of using differential decoding and v.35 descrambling.

## 6.10.2    BER Performance (Sequential)
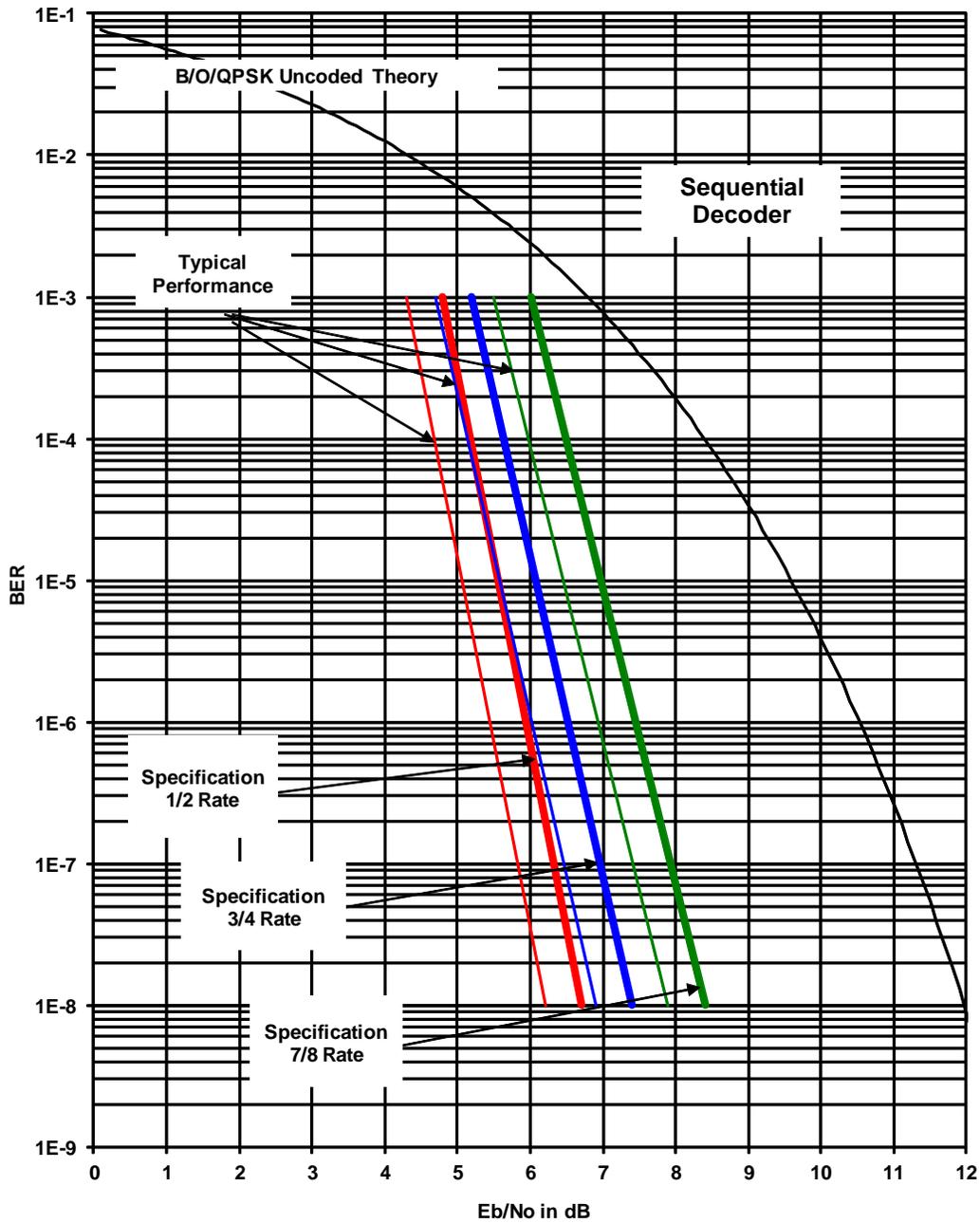


Figure 6-2. DMD1050T B/0/QPSK BER Performance (Sequential)

Note:  Eb/No values include the effect of using differential decoding and v.35 descrambling.

## 6.10.3      BER Performance (Viterbi - w/Reed-Solomon)
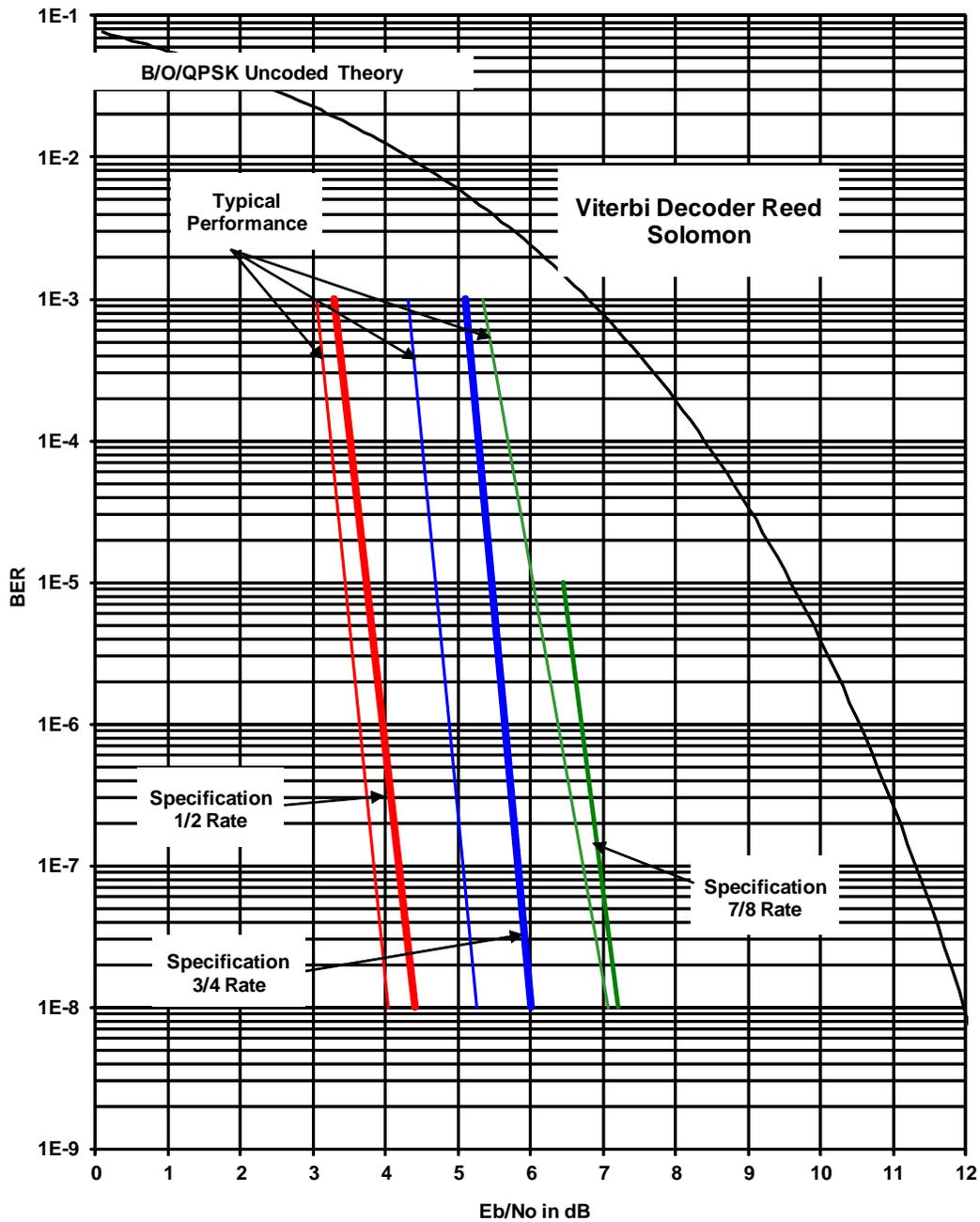


Figure 6-3. DMD1050T B/O/QPSK BER Performance (Viterbi – w/RS)

Note:  Eb/No values include the effect of using differential decoding.

## 6.10.4          BER Performance (8PSK Trellis)
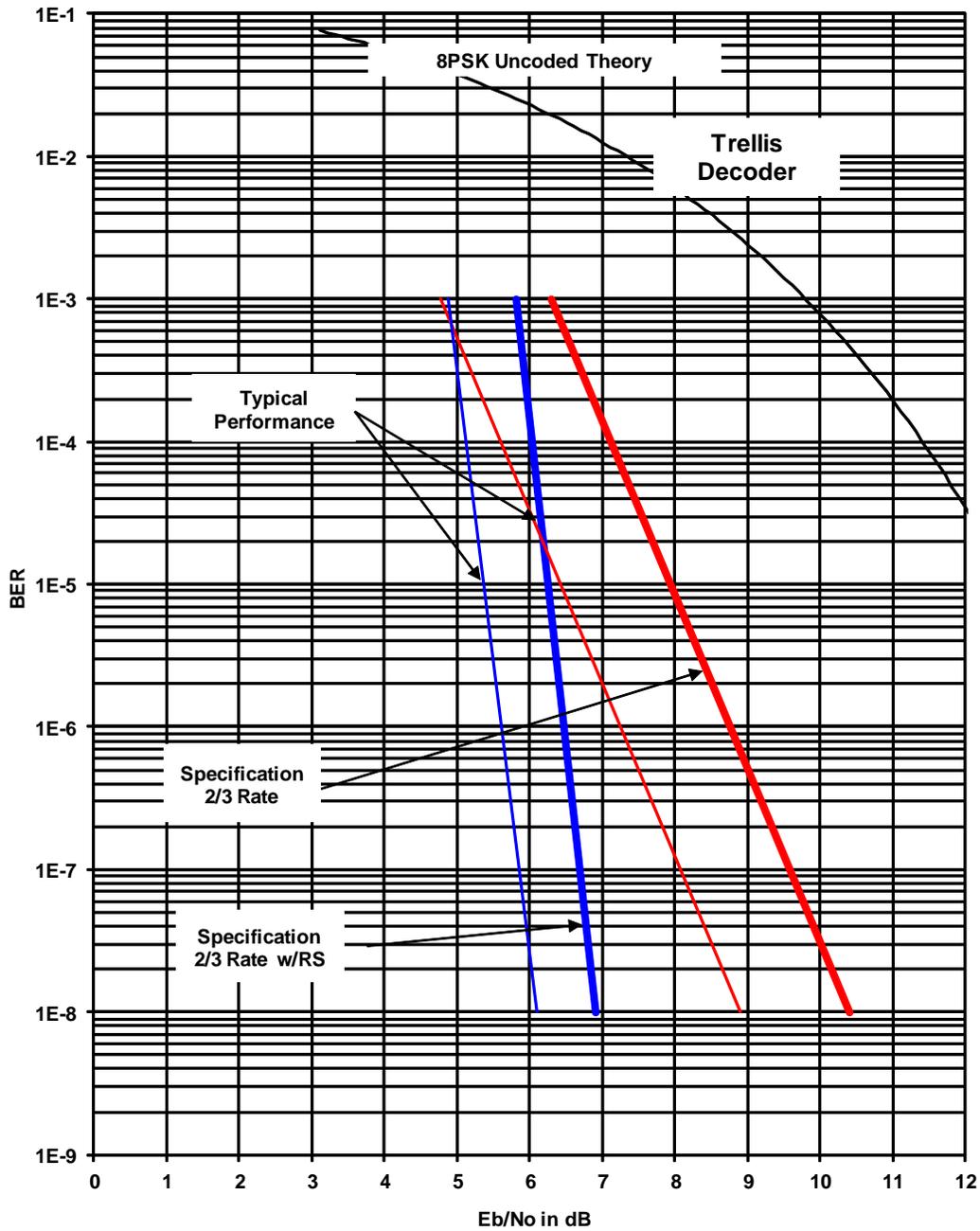


Figure 6-4. DMD1050T 8PSK BER Performance (Trellis)

Note:  Eb/No values include the effect of using differential decoding and v.35 descrambling.

## 6.10.5    BER Performance (16QAM Viterbi)
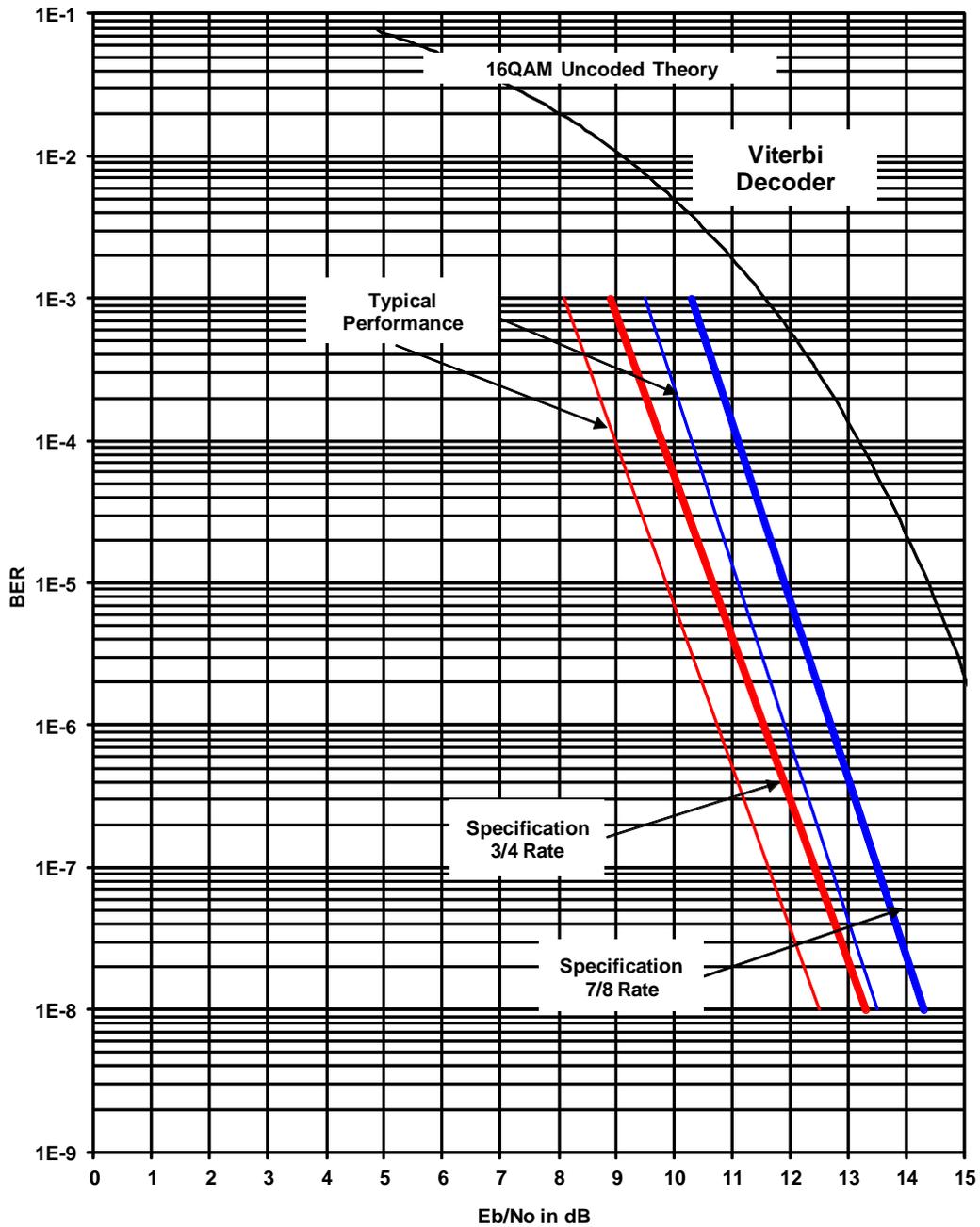


Figure 6-5. DMD1050T 16QAM BER Performance (Viterbi)

Note:  Eb/No values include the effect of using differential decoding and v.35 descrambling.

## 6.10.6        BER Performance (16QAM Viterbi w/Reed-Solomon)
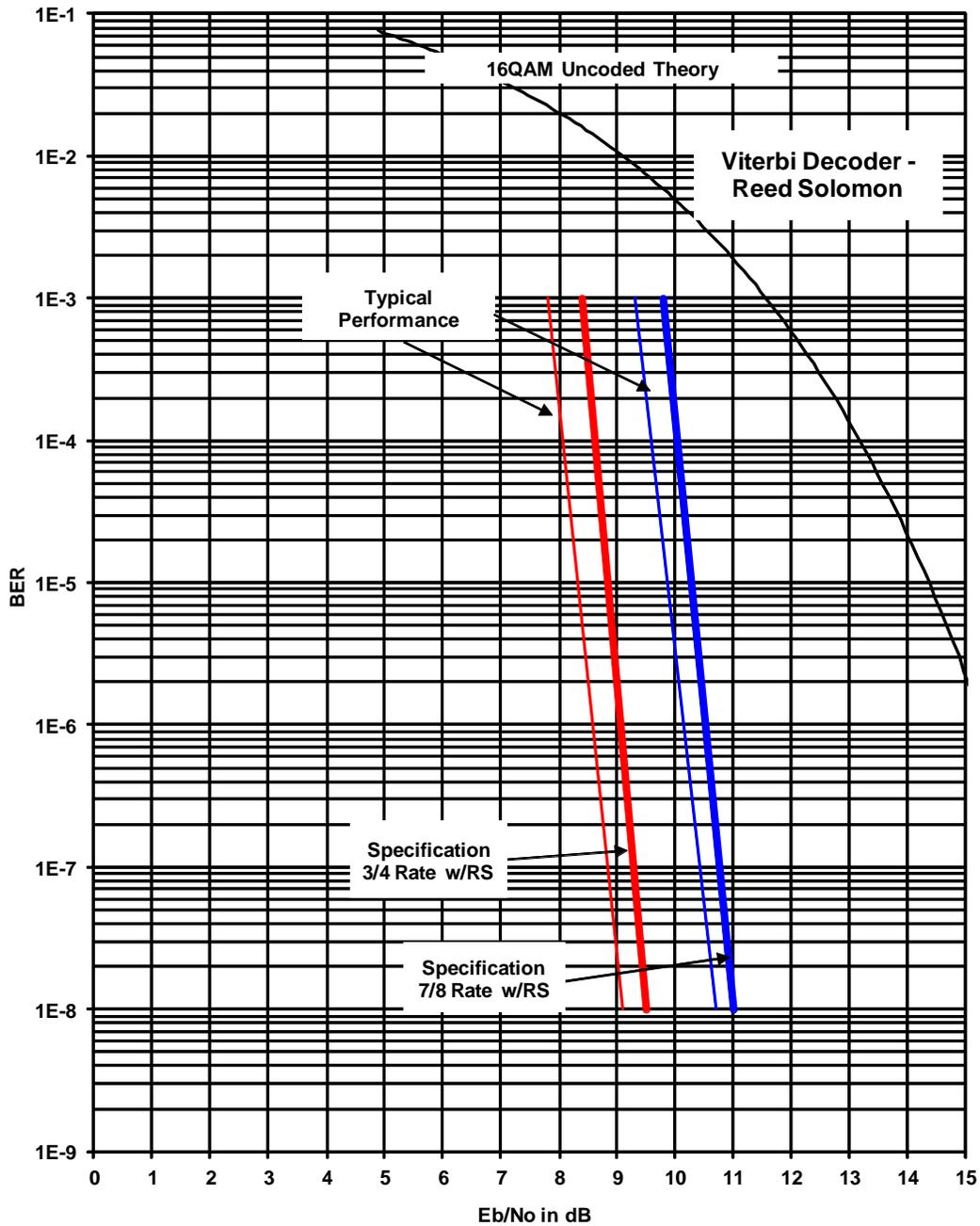


Figure 6-6. DMD1050T 16QAM BER Performance (Viterbi w/RS)

Note:  Eb/No values include the effect of using differential decoding.

## 6.10.7        BER Performance ((O)QPSK Turbo)
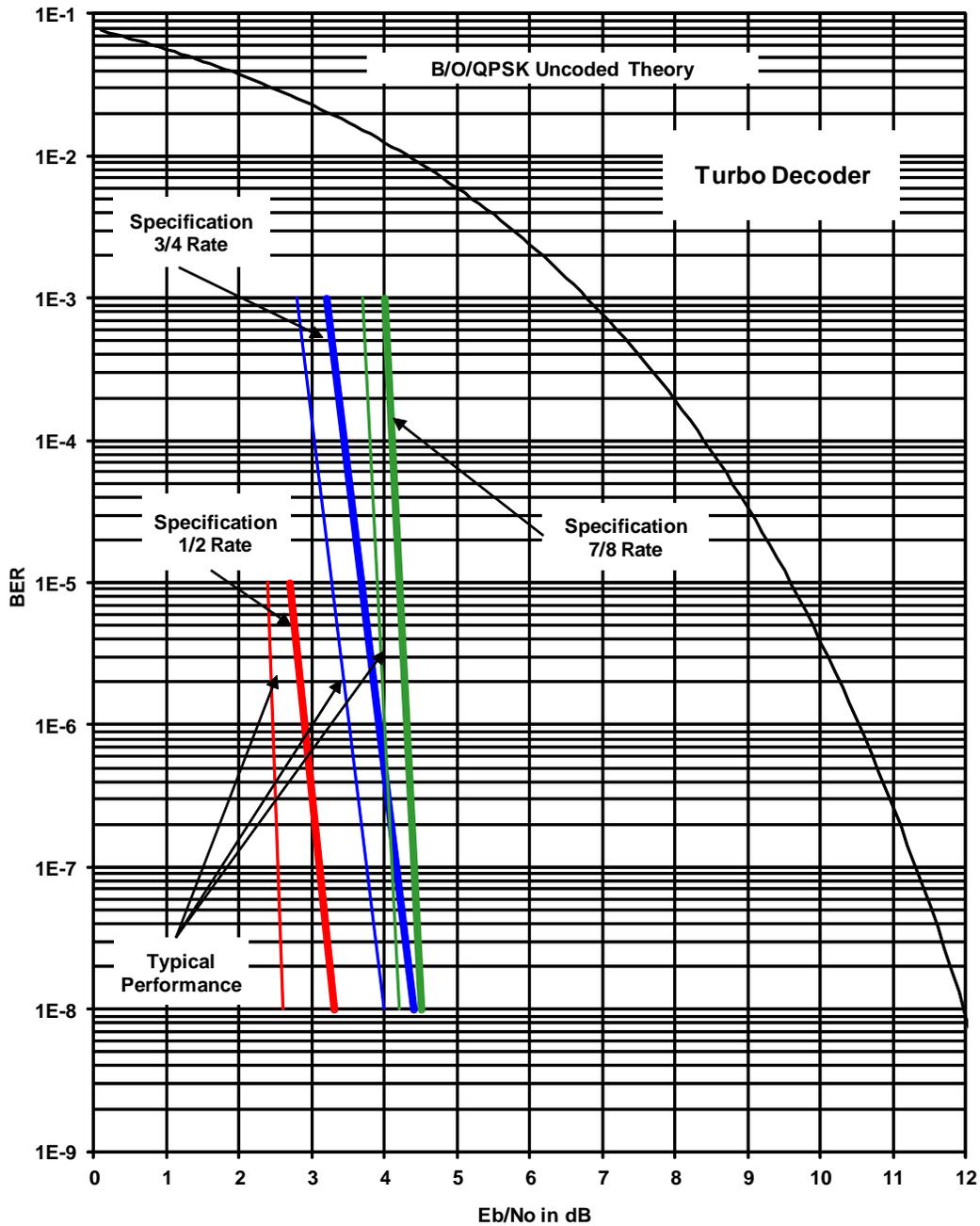


Figure 6-7. DMD1050T (O)QPSK BER Performance (Turbo)

## 6.10.8        BER Performance (BPSK Turbo)
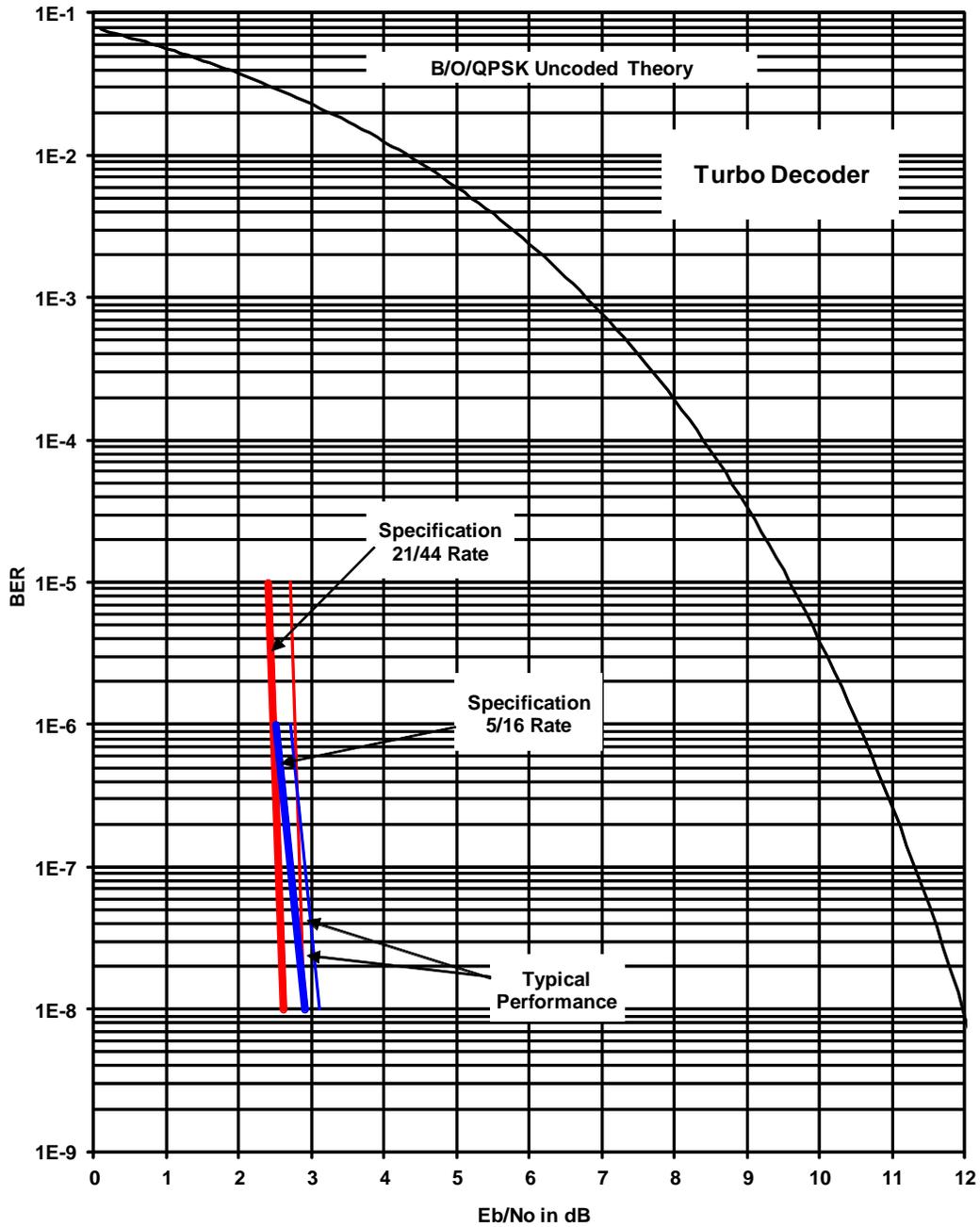
Figure 6-8. DMD1050T BPSK BER Performance (Turbo)

## 6.10.9        BER Performance (8PSK Turbo)
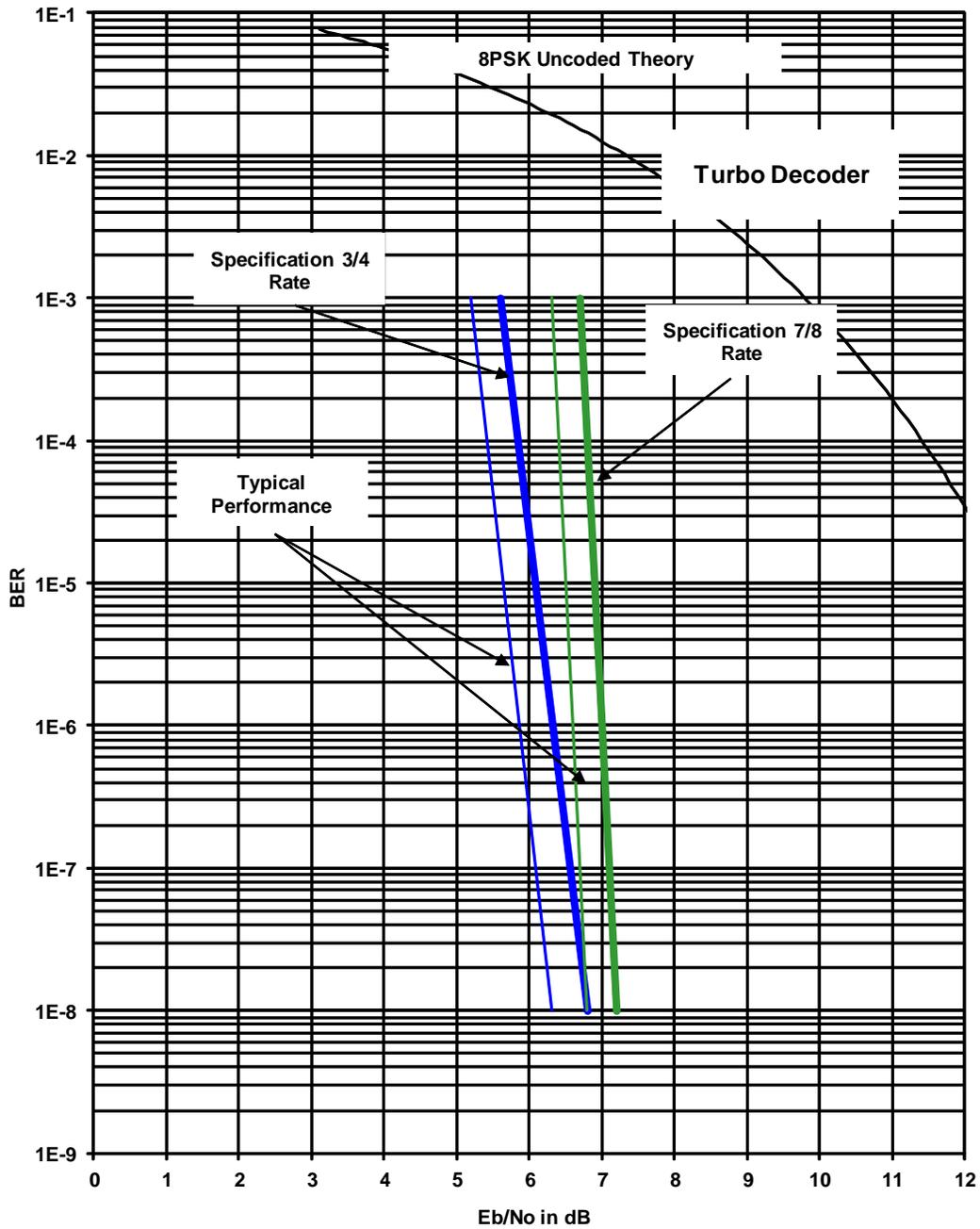


Figure 6-9. DMD1050T 8PSK BER Performance (Turbo)

## 6.10.10    BER Performance (16QAM Turbo)
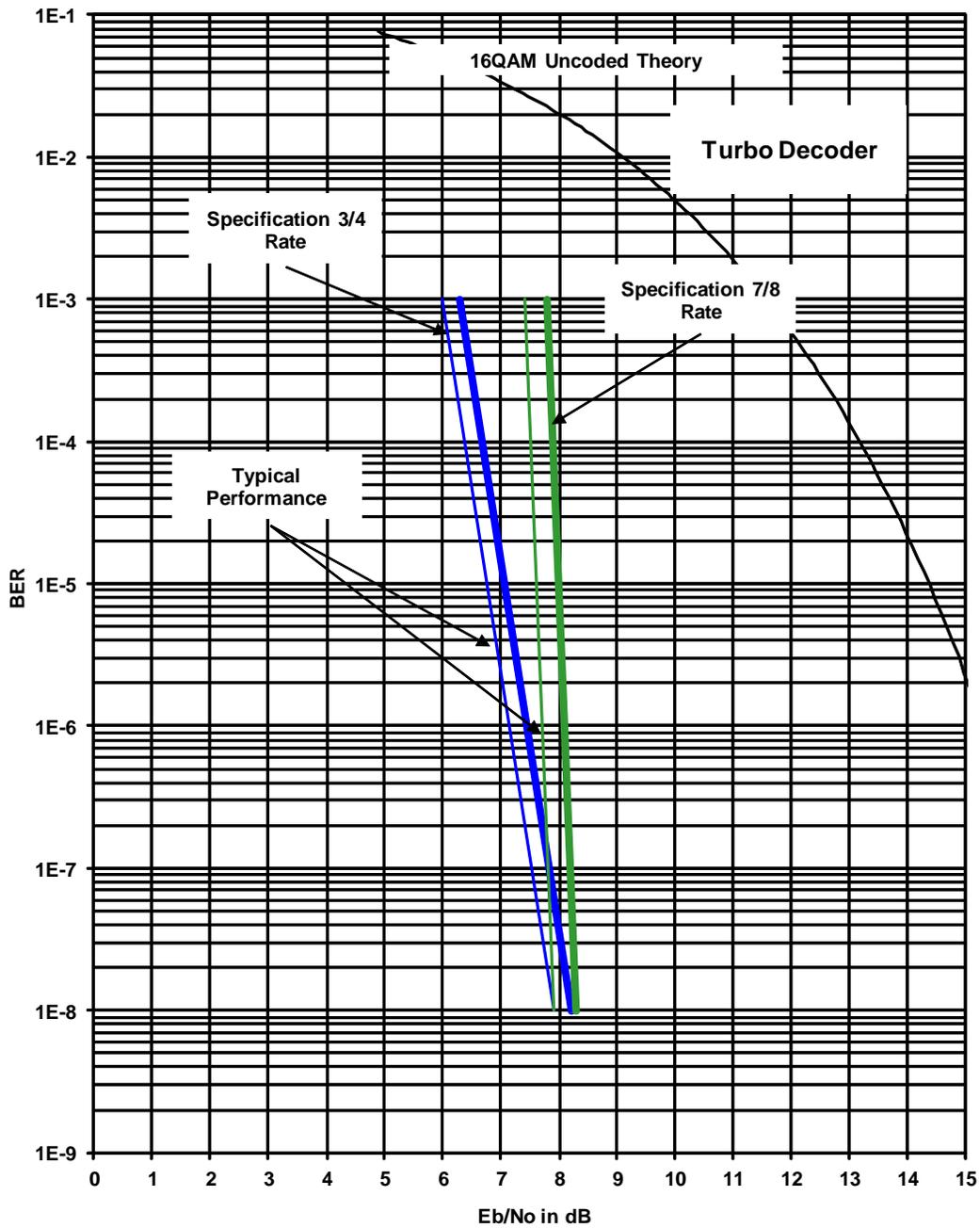


Figure 6-10. DMD1050T 16QAM BER Performance (Turbo)

## 6.10.11    B/O/QPSK BER Performance (LDPC)
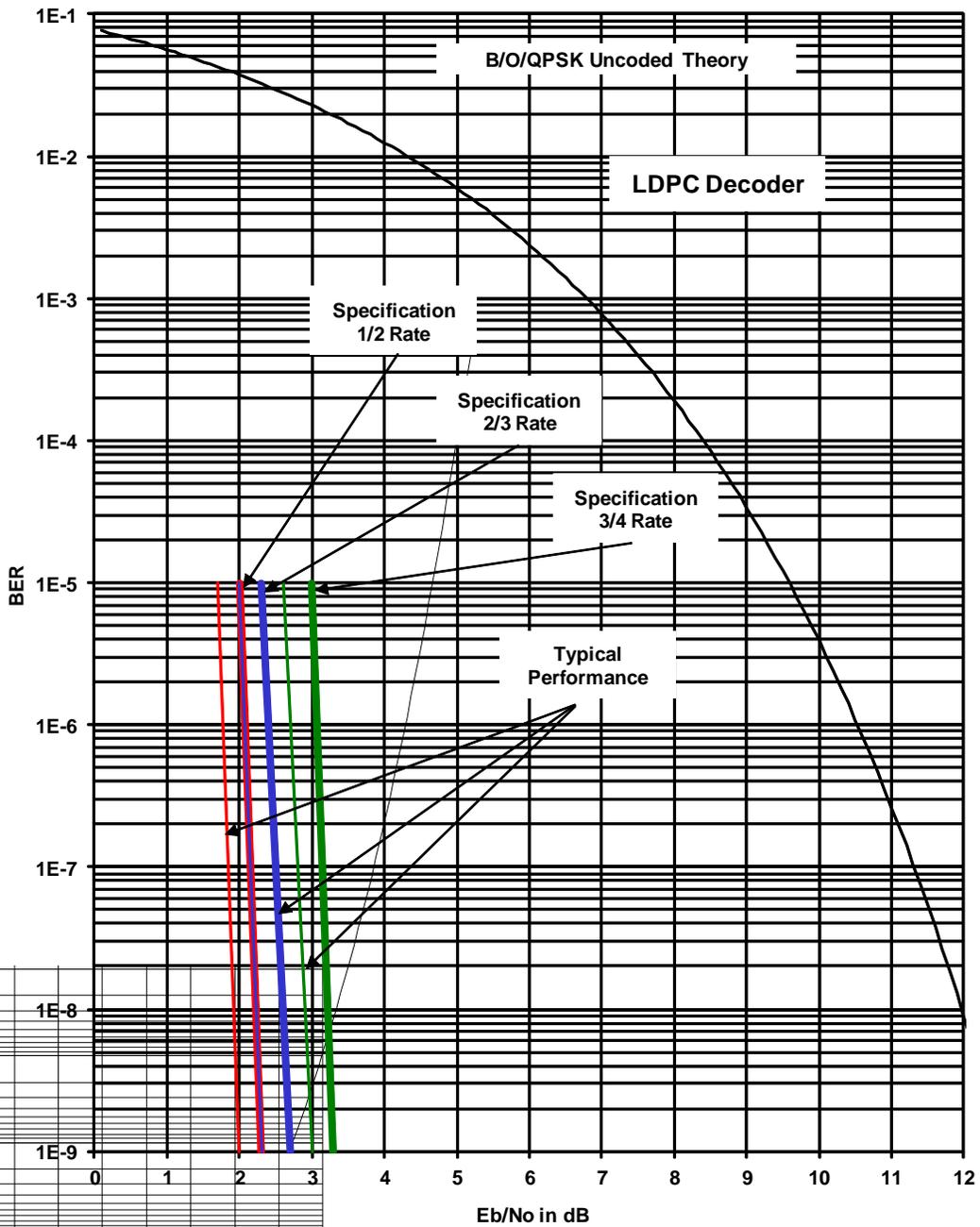


Figure 6-11. DMD1050T B/O/QPSK BER Performance (LDPC)

## 6.10.12    8PSK/8QAM BER Performance (LDPC)
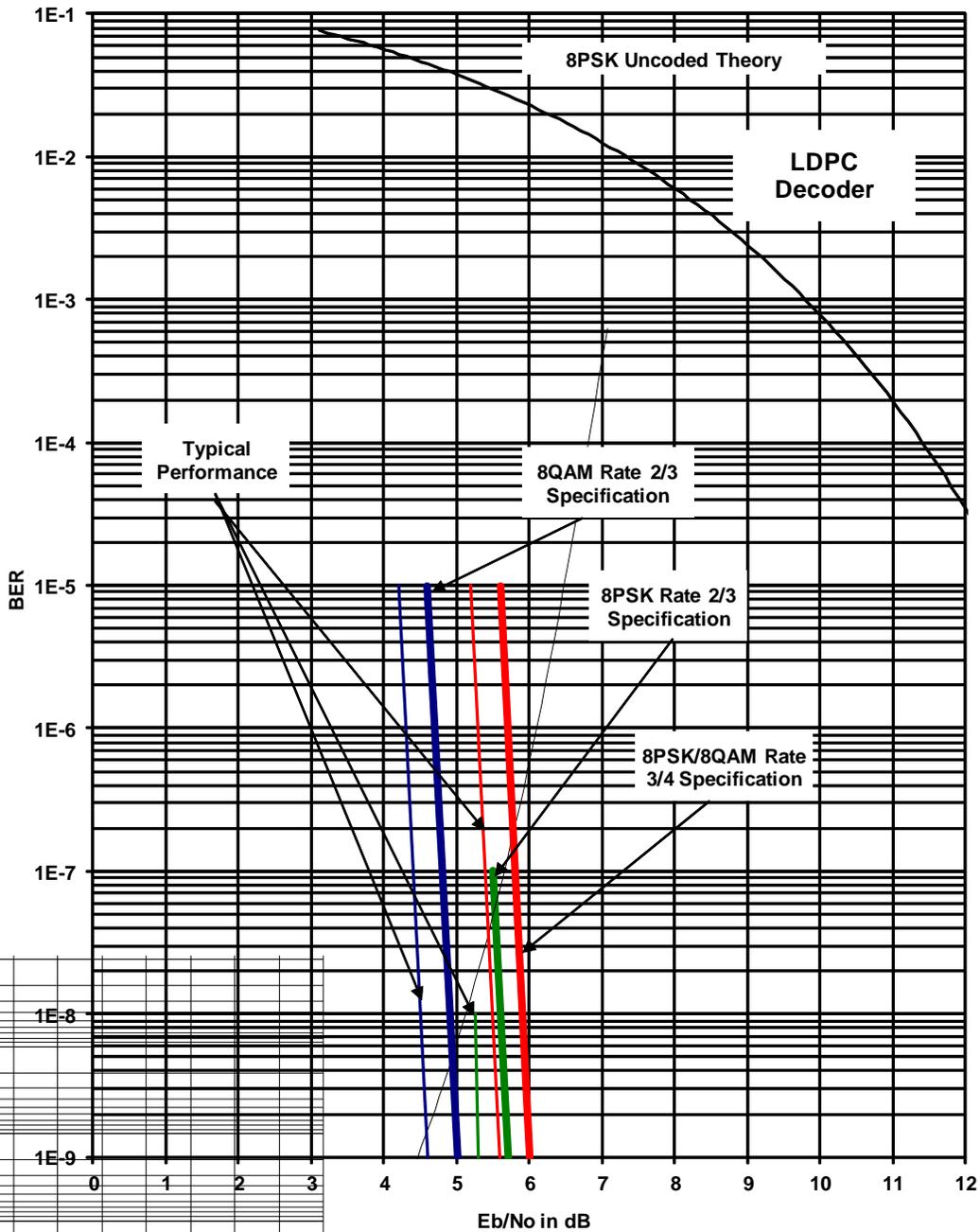
Figure 6-12. DMD1050T 8PSK/8QAM BER Performance (LDPC)

## 6.10.13    16QAM BER Performance (LDPC)
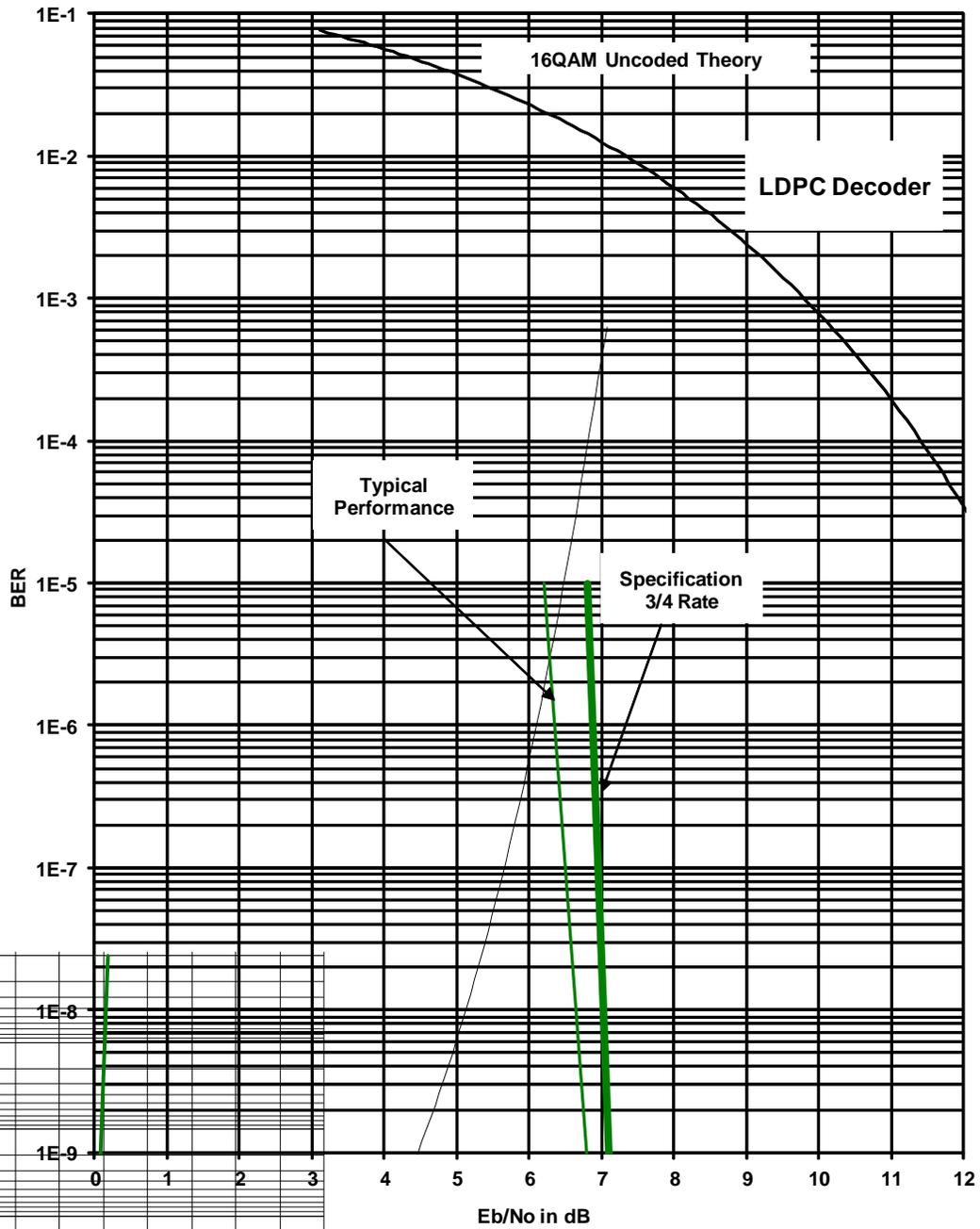
Figure 6-13. DMD1050T 16QAM BER Performance (LDPC)

| Table 6-1 - B/O/QPSK BER Performance (Viterbi) | | | | | | |
|---|---|---|---|---|---|---|
| **BER** | **Specification** | | | **Typical** | | |
| | **1/2 Rate** | **3/4 Rate** | **7/8 Rate** | **1/2 Rate** | **3/4 Rate** | **7/8 Rate** |
| 1E-3 | 4.2 dB | 5.3 dB | 6.2 dB | 3.9 dB | 4.9 dB | 5.8 dB |
| 1E-4 | 4.8 dB | 6.1 dB | 7.1 dB | 4.5 dB | 5.6 dB | 6.5 dB |
| 1E-5 | 5.5 dB | 6.8 dB | 7.9 dB | 5.1 dB | 6.3 dB | 7.2 dB |
| 1E-6 | 6.1 dB | 7.6 dB | 8.6 dB | 5.7 dB | 7 dB | 7.9 dB |
| 1E-7 | 6.7 dB | 8.3 dB | 9.3 dB | 6.2 dB | 7.7 dB | 8.6 dB |
| 1E-8 | 7.4 dB | 8.9 dB | 10.2 dB | 6.8 dB | 8.4 dB | 9.4 dB |
| 1E-9 | 8.2 dB | 9.7 dB | 11 dB | 7.4 dB | 9.1 dB | 10.1 dB |
| 1E-10 | 9 dB | 10.3 dB | 11.7 dB | 8.1 dB | 9.8 dB | 10.5 dB |

| Table 6-2 - B/O/QPSK BER Performance (Sequential) | | | | | | |
|---|---|---|---|---|---|---|
| **BER** | **Specification** | | | **Typical** | | |
| | **1/2 Rate** | **3/4 Rate** | **7/8 Rate** | **1/2 Rate** | **3/4 Rate** | **7/8 Rate** |
| 1E-3 | 4.8 dB | 5.2 dB | 6 dB | 4.3 dB | 4.7 dB | 5.5 dB |
| 1E-4 | 5.2 dB | 5.7 dB | 6.4 dB | 4.7 dB | 5.2 dB | 5.9 dB |
| 1E-5 | 5.6 dB | 6.1 dB | 6.9 dB | 5.1 dB | 5.6 dB | 6.4 dB |
| 1E-6 | 5.9 dB | 6.5 dB | 7.4 dB | 5.4 dB | 6.1 dB | 6.9 dB |
| 1E-7 | 6.3 dB | 7 dB | 7.9 dB | 5.8 dB | 6.5 dB | 7.4 dB |
| 1E-8 | 6.7 dB | 7.4 dB | 8.4 dB | 6.2 dB | 6.9 dB | 7.9 dB |
| 1E-9 | 7.1 dB | 7.8 dB | 8.9 dB | 6.6 dB | 7.4 dB | 8.4 dB |
| 1E-10 | 7.4 dB | 8.3 dB | 9.4 dB | 6.9 dB | 7.8 dB | 8.9 dB |

| Table 6-3 - B/O/QPSK BER Performance (Viterbi - w/RS) | | | | | | |
|---|---|---|---|---|---|---|
| **BER** | **Specification** | | | **Typical** | | |
| | **1/2 Rate** | **3/4 Rate** | **7/8 Rate** | **1/2 Rate** | **3/4 Rate** | **7/8 Rate** |
| 1E-3 | 3.3 dB | 5.1 dB | - | 3 dB | 4.3 dB | 5.3 dB |
| 1E-4 | 3.5 dB | 5.3 dB | - | 3.2 dB | 4.5 dB | 5.7 dB |
| 1E-5 | 3.8 dB | 5.4 dB | 6.5 dB | 3.4 dB | 4.7 dB | 6 dB |
| 1E-6 | 4.1 dB | 5.6 dB | 6.7 dB | 3.6 dB | 4.9 dB | 6.4 dB |
| 1E-7 | 4.2 dB | 5.8 dB | 6.9 dB | 3.8 dB | 5.1 dB | 6.7 dB |
| 1E-8 | 4.4 dB | 6 dB | 7.2 dB | 4 dB | 5.3 dB | 7.1 dB |
| 1E-9 | 4.7 dB | 6.1 dB | 7.5 dB | 4.2 dB | 5.4 dB | 7.4 dB |
| 1E-10 | 5 dB | 6.3 dB | 7.8 dB | 4.4 dB | 5.6 dB | 7.7 dB |

| Table 6-4 - 8PSK BER Performance (Trellis) | | | | |
|---|---|---|---|---|
| **BER** | **Specification** | | **Typical** | |
| | **2/3 Rate** | **2/3 Rate w/RS** | **2/3 Rate** | **2/3 Rate w/RS** |
| 1E-3 | 6.3 dB | 5.8 dB | 4.8 dB | 4.9 dB |
| 1E-4 | 7.3 dB | 6.1 dB | 5.6 dB | 5.1 dB |
| 1E-5 | 8.2 dB | 6.3 dB | 6.4 dB | 5.4 dB |
| 1E-6 | 9 dB | 6.5 dB | 7.2 dB | 5.6 dB |
| 1E-7 | 9.8 dB | 6.7 dB | 8.1 dB | 5.8 dB |
| 1E-8 | 10.4 dB | 6.9 dB | 8.9 dB | 6.1 dB |
| 1E-9 | 11.1 dB | 7.1 dB | 9.7 dB | 6.3 dB |
| 1E-10 | 11.9 dB | 7.3 dB | 10.5 dB | 6.6 dB |

| Table 6-5 - 16QAM BER Performance (Viterbi) | | | | |
|---|---|---|---|---|
| **BER** | **Specification** | | **Typical** | |
| | **3/4 Rate** | **7/8 Rate** | **3/4 Rate** | **7/8 Rate** |
| 1E-3 | 8.9 dB | 10.3 dB | 8.1 dB | 9.5 dB |
| 1E-4 | 9.8 dB | 11.1 dB | 9 dB | 10.3 dB |
| 1E-5 | 10.7 dB | 11.9 dB | 9.9 dB | 11.1 dB |
| 1E-6 | 11.5 dB | 12.7 dB | 10.7 dB | 11.9 dB |
| 1E-7 | 12.4 dB | 13.5 dB | 11.6 dB | 12.7 dB |
| 1E-8 | 13.3 dB | 14.3 dB | 12.5 dB | 13.5 dB |
| 1E-9 | 14.2 dB | 15.1 dB | 13.4 dB | 14.3 dB |
| 1E-10 | 15 dB | 15.9 dB | 14.2 dB | 15.1 dB |

| Table 6-6 - 16QAM BER Performance (Viterbi w/RS) | | | | |
|---|---|---|---|---|
| **BER** | **Specification** | | **Typical** | |
| | **3/4 Rate** | **7/8 Rate** | **3/4 Rate** | **7/8 Rate** |
| 1E-3 | 8.4 dB | 9.8 dB | 7.8 dB | 9.3 dB |
| 1E-4 | 8.6 dB | 8.1 dB | 8.1 dB | 9.6 dB |
| 1E-5 | 8.9 dB | 8.3 dB | 8.3 dB | 9.9 dB |
| 1E-6 | 9.1 dB | 8.6 dB | 8.6 dB | 10.2 dB |
| 1E-7 | 9.3 dB | 8.8 dB | 8.8 dB | 10.4 dB |
| 1E-8 | 9.5 dB | 9.1 dB | 9.1 dB | 10.7 dB |
| 1E-9 | 9.8 dB | 9.3 dB | 9.3 dB | 11 dB |
| 1E-10 | 10 dB | 9.6 dB | 9.6 dB | 11.3 dB |

| Table 6-7 - (O)QPSK BER Performance (Turbo) | | | | | |
|---|---|---|---|---|---|
| BER | Specification | | | Typical | | |
| | 1/2 Rate | 3/4 Rate | 7/8 Rate | 1/2 Rate | 3/4 Rate | 7/8 Rate |
| 1E-3 | - | 3.2 dB | 4 dB | - | 2.8 dB | 3.7 dB |
| 1E-4 | - | 3.4 dB | 4.1 dB | - | 3 dB | 3.8 dB |
| 1E-5 | 2.7 dB | 3.6 dB | 4.2 dB | 2.4 dB | 3.2 dB | 3.9 dB |
| 1E-6 | 2.9 dB | 3.8 dB | 4.3 dB | 2.6 dB | 3.4 dB | 4 dB |
| 1E-7 | 3.1 dB | 4.1 dB | 4.4 dB | 2.8 dB | 3.7 dB | 4.1 dB |
| 1E-8 | 3.3 dB | 4.4 dB | 4.5 dB | 3 dB | 4 dB | 4.2 dB |

| Table 6-8 - BPSK BER Performance (Turbo) | | | | |
|---|---|---|---|---|
| BER | Specification | | Typical | |
| | 5/16 Rate | 21/44 Rate | 5/16 Rate | 21/44 Rate |
| 1E-5 | - | 2.7 dB | - | 2.4 dB |
| 1E-6 | 2.7 dB | 2.9 dB | 2.5 dB | 2.6 dB |
| 1E-7 | 2.9 dB | 3.1 dB | 2.7 dB | 2.8 dB |
| 1E-8 | 3.1 dB | 3.3 dB | 2.9 dB | 3 dB |

| Table 6-9 - 8PSK BER Performance (Turbo) | | | | |
|---|---|---|---|---|
| BER | Specification | | Typical | |
| | 3/4 Rate | 7/8 Rate | 3/4 Rate | 7/8 Rate |
| 1E-3 | 5.6 dB | 6.7 dB | 5.4 dB | 6.3 dB |
| 1E-4 | 5.8 dB | 6.8 dB | 5.6 dB | 6.4 dB |
| 1E-5 | 6 dB | 6.9 dB | 5.8 dB | 6.5 dB |
| 1E-6 | 6.2 dB | 7 dB | 6 dB | 6.6 dB |
| 1E-7 | 6.4 dB | 7.1 dB | 6.2 dB | 6.7 dB |
| 1E-8 | 6.8 dB | 7.2 dB | 6.6 dB | 6.8 dB |

| Table 6-10 - 16QAM BER Performance (Turbo) | | | | |
|---|---|---|---|---|
| BER | Specification | | Typical | |
| | 3/4 Rate | 7/8 Rate | 3/4 Rate | 7/8 Rate |
| 1E-3 | 6.3 dB | 7.8 dB | 6 dB | 7.4 dB |
| 1E-4 | 6.7 dB | 7.9 dB | 6.4 dB | 7.5 dB |
| 1E-5 | 7 dB | 8 dB | 6.7 dB | 7.6 dB |
| 1E-6 | 7.4 dB | 8.1 dB | 7.1 dB | 7.7 dB |
| 1E-7 | 7.8 dB | 8.2 dB | 7.5 dB | 7.8 dB |
| 1E-8 | 8.2 dB | 8.3 dB | 7.9 dB | 7.9 dB |

| Table 6-11 - B/O/QPSK BER Performance (LDPC) | | | | | |
|---|---|---|---|---|---|
| **BER** | **Specification** | | | **Typical** | | |
| | **1/2 Rate** | **2/3 Rate** | **3/4 Rate** | **1/2 Rate** | **2/3 Rate** | **3/4 Rate** |
| 1E-5 | 2 dB | 2.3 dB | 3 dB | 1.7 dB | 2 dB | 2.6 dB |
| 1E-9 | 2.3 dB | 2.7 dB | 3.3 dB | 2 dB | 2.3 dB | 3 dB |

| Table 6-12 - 8PSK / 8-QAM Rate BER Performance (LDPC) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **BER** | **8PSK** | | | | **8-QAM** | | | |
| | **Specification** | | **Typical** | | **Specification** | | **Typical** | |
| | **2/3 Rate** | **3/4 Rate** | **2/3 Rate** | **3/4 Rate** | **2/3 Rate** | **3/4 Rate** | **2/3 Rate** | **3/4 Rate** |
| 1E-5 | - | 5.6 dB | - | 5.2 dB | 4.6 dB | 5.6 dB | 4.2 dB | 5.2 dB |
| 1E-9 | 5.7 dB | 6 dB | 5.3 dB | 5.6 dB | 5 dB | 6 dB | 4.6 dB | 5.6 dB |

| Table 6-13 - 16QAM BER Performance (LDPC) | | |
|---|---|---|
| **BER** | **Specification** | **Typical** |
| | **3/4 Rate** | **3/4 Rate** |
| 1E-5 | 6.8 dB | 6.2 dB |
| 1E-9 | 7.1 dB | 6.8 dB |

| Table 6-14.  IBS/IDR Compliant Framing Modes | | | | |
|---|---|---|---|---|
| **BER** | **Specification** | | **Typical** | |
| | **IBS** | **IDR** | **IBS** | **IDR** |
| | **1/2 Rate** | **3/4 Rate** | **3/4 Rate** | **3/4 Rate** |
| 1E-3 | 4.1 dB | 5.2 dB | 4.2 dB | 4.35 dB |
| 1E-4 | 4.6 dB | 6.0 dB | 4.9 dB | 5.25 dB |
| 1E-5 | 5.3 dB | 6.7 dB | 5.6 dB | 5.9 dB |
| 1E-6 | 6.0 dB | 7.5 dB | 6.3 dB | 6.6 dB |
| 1E-7 | 6.6 dB | 8.2 dB | 6.9 dB | 7.3 dB |
| 1E-8 | 7.1 dB | 8.7 dB | 7.5 dB | 7.8 dB |

## 6.11  ACG Output Voltage

The AGC Output Voltage is a function of the Input Power Level in dBm. The AGC Output Voltage is found on the Alarm connector Pin 24 of J2.
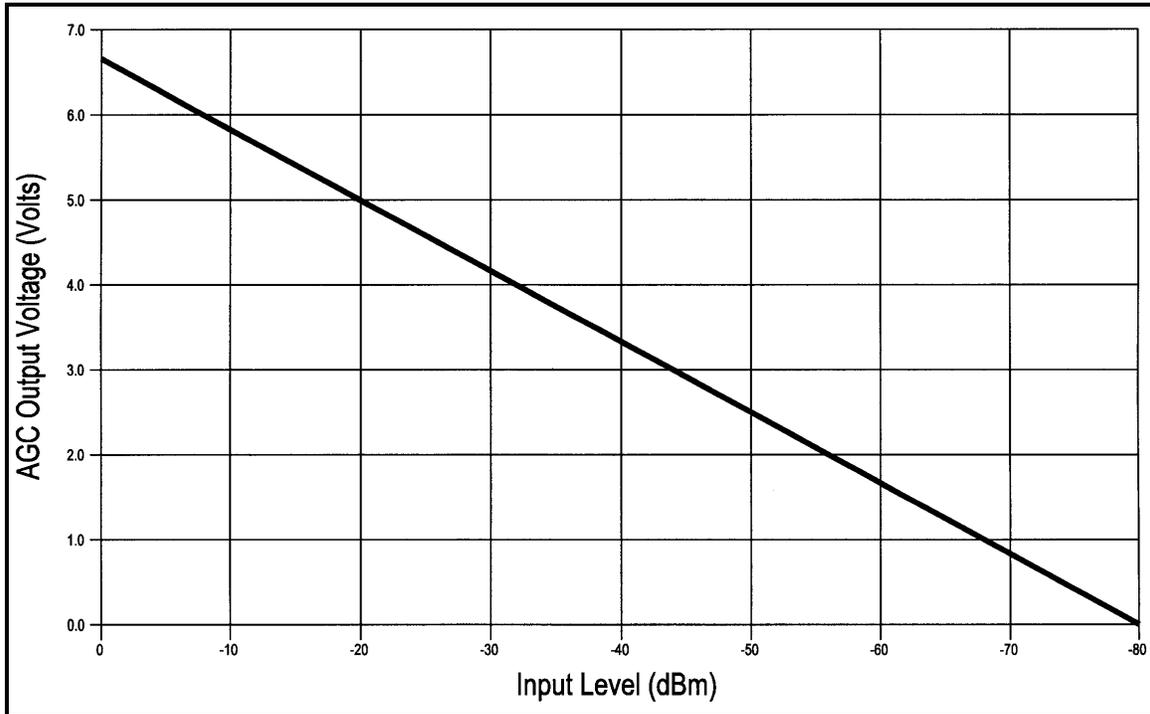


Figure 6-14.  AGC Voltage Monitor

# Chapter 7. Web Browser

## 7.1 Web Browser User Interface

This chapter contains instructions for how to configure the interface for both the base modem board and the FIPs TRANSEC module. The Web applications are described as well.

## 7.2 Configuring Your PC

Get access to the Web Browser interface through the RJ45 (J11), MagJack on the DMD1050T.

You must use Microsoft Internet Explorer 6 or greater to use the Web Browser menus.

## 7.3 Graphical User Interface

The Graphical User Interface (GUI) is designed to look like the front panel interface of a DMD product. Figure 7-1 is an example of a GUI layout. For users familiar with the front panel interface, adjusting to the GUI interface should be easy.

The GUI Interface is divided into functional areas: the DMD-style front panel display simulation, navigation tab area, information/data entry and product information and contact areas.
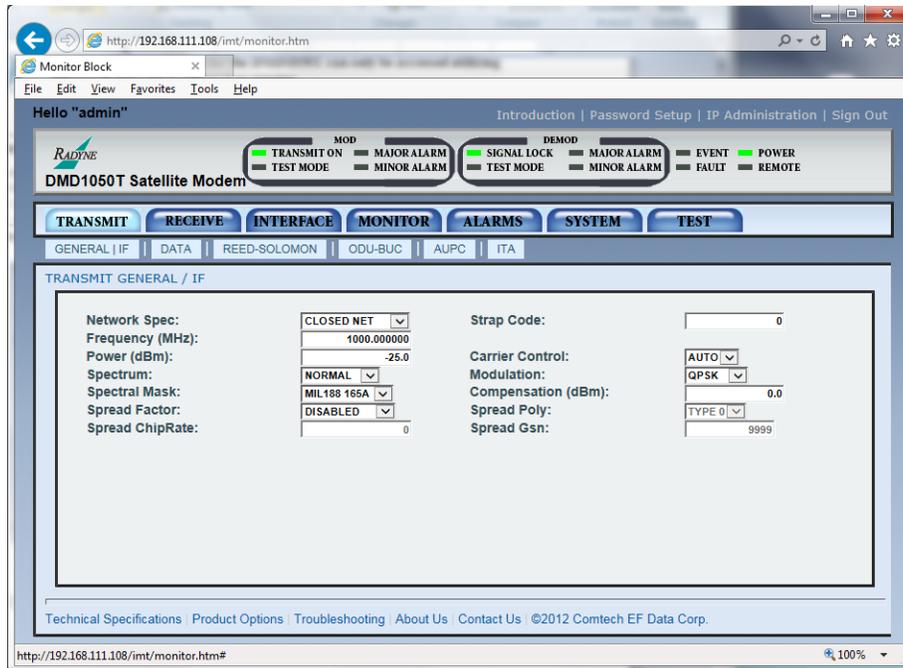
Figure 7-1 Web User Interface example

## 7.3.1  Screen Areas

- Product Name - shows which product is connected to the interface

- Product Name/Location - shows the name and location of the unit

- Alarm and Monitor - shows fault and performance status

- Menu Tabs - give access to data and control entry; move the cursor to a tab and a submenu opens

- Data Entry Area - edit parameters in this area

- Product and Contact Information - gives access to technical trouble-shooting, product options and specifications; select **Contact Us** to email Customer Service

## 7.3.2  Navigation

The navigation scheme consists of tabs and submenus that correspond to the front panel top-level menu selections. When you move the mouse cursor over a tab, the tab opens a submenu. These submenus often correspond to the front panel sub-menus, but some are combined.

Figure 7-2 Navigation Tabs example



Figure 7-3 Navigation Tabs Submenus example

A content page shows under the navigation menus. At the top of the page, breadcrumb links remind you how to get to the page.

## 7.3.3 LED Indicators

LEDs show the operational status of the DMD1050T. The LED colors have these meanings:

- Green means operations are normal
- Yellow means a operations are not normal
- Red means a fault condition exists that is causing lost communications



Figure 7-4 LED examples

Table 7-1 LED Indicators

| Modem LED Indicators | | |
|---|---|---|
| LED | Color | Meaning |
| Power | Green | The unit is on. |
| Fault | Red | A hardware fault exists for the unit. |
| Event | Yellow | A condition or event occurred, and is stored in memory. See the events from the GUI or in the Terminal Mode. |
| Remote | Green | The unit is updating firmware via FTP. |

| Modulator LED Indicators | | |
|---|---|---|
| LED | Color | Meaning |
| Transmit On | Green | The Modulator transmitter is on. |
| Major Alarm | Red | The Transmit Direction has failed, losing traffic. |

| Modulator LED Indicators | | |
|---|---|---|
| LED | Color | Meaning |
| Minor Alarm | Yellow | A Transmit Warning condition exists. |
| Test Mode | Yellow | The transmitter is doing a Test Mode activity. |

| Demodulator LED Indicators | | |
|---|---|---|
| LED | Color | Meaning |
| Signal Lock | Green | The receiver locked to an incoming carrier and data, including FEC Sync. |
| Major Alarm | Red | The Receive Direction has failed, losing traffic. |
| Minor Alarm | Yellow | A Receive Warning condition exists. |
| Test Mode | Yellow | The receiver is doing a Test Mode activity. |

## 7.4    Introduction page



**Figure 7-5. Introduction page example**

This page shows when the web browser starts. The bottom of the page has links for Technical Specifications, Product Options, Troubleshooting, About Us and Contact us.

The Introduction page gives an overview of the product. It has no configurable items. The main menus and submenus are:

- Introduction

- Password Setup
  - Access
  - Preferences
- IP Administration
  - Modem Addressing
  - Configure Apps
  - Configure PC
- Monitor and Control
  - Transmit
  - Receive
  - Interface
  - Monitor
  - Alarms
  - System
  - Test

## 7.4.1 Login Screen



**Figure 7-6. Login Screen example**

The Login screen shows when you click any of these tabs: **Password Setup**, **IP Administration** or **Monitor & Control**. Log in, using the correct **User Name** and **Password**. The factory default **User Name** and **Password** are both **admin**. See Section 7.4.3 for more information.

## 7.5     Password Setup

Use the **Access** page to set up access to the system for multiple operators.

## 7.5.1  Access page
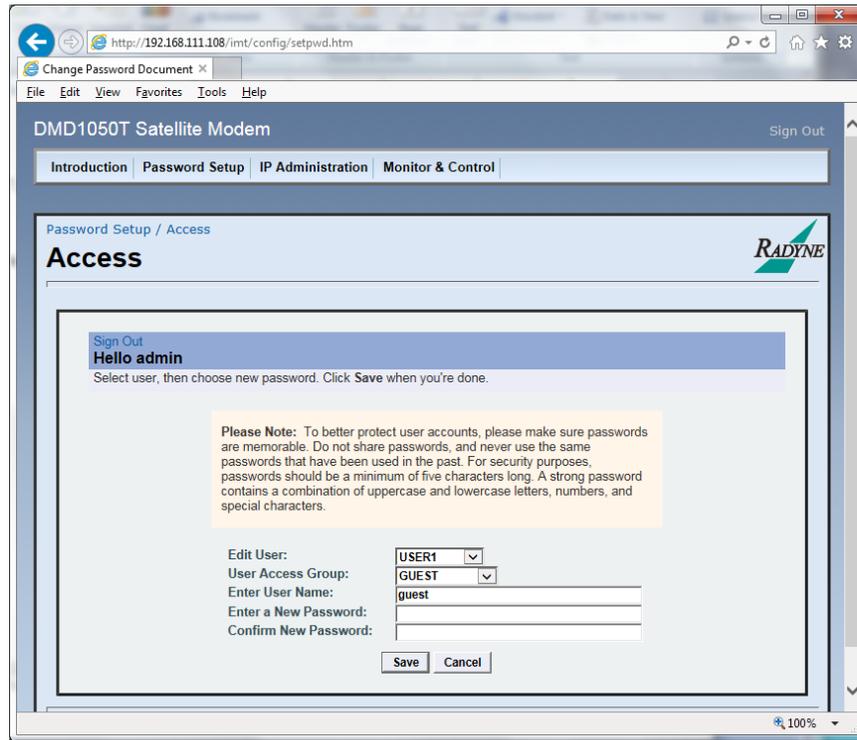


**Figure 7-7. Access page example**

### Edit User:

- USER 1, USER 2, USER 3

Select the user number.

### User Access Group:

- GUEST, OPERATOR, ADMIN

Assign the selected user to an access level group.

### Enter User Name:

Assign the user name used for login.

Enter a New Password:

Assign the password used for login.

Confirm New Password:

Enter the password again; it must match the previously entered Password exactly.

## 7.5.2  Preferences page
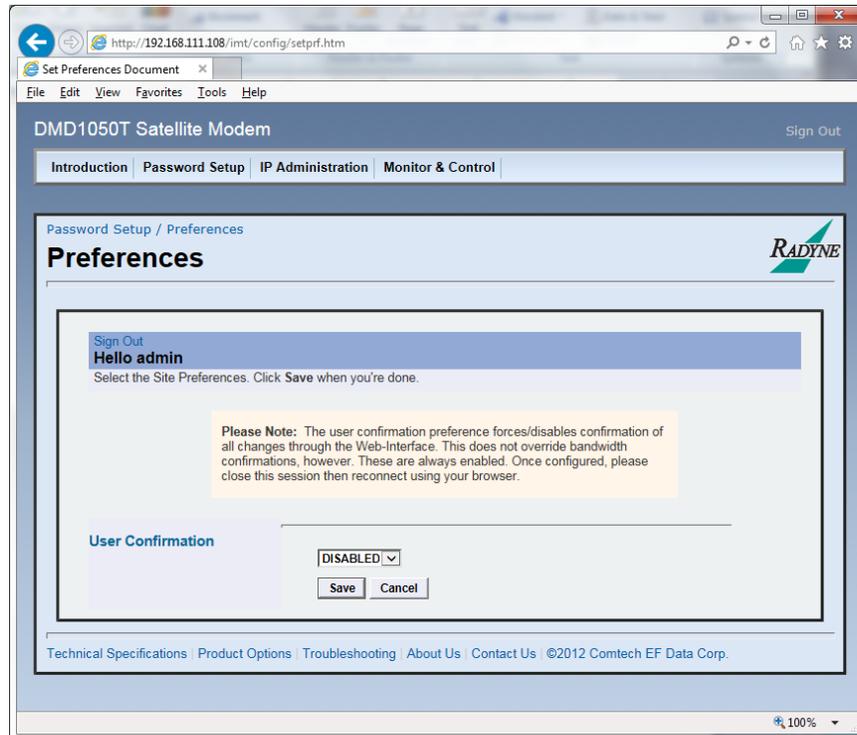


**Figure 7-8 Preferences page example**

User Confirmation:

- DISABLED, ENABLED

Use this to disable or enable change confirmation to occur for all changes made in the Web interface.
Bandwidth changes are always confirmed, no matter what the selection is for **User Confirmation**.

## 7.6          IP and Application Administration

## 7.6.1  Modem Addressing page

The Modem Addressing page tells you how to configure the modem, applications and PC.
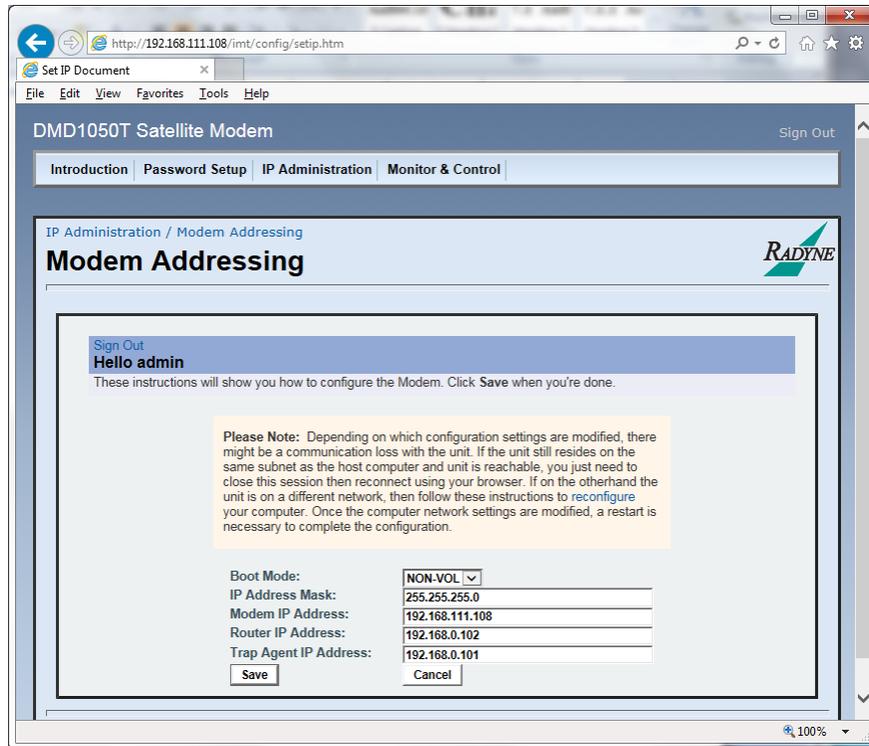
**Figure 7-9 Modem Addressing page example**

Boot Mode:

- DEFAULT, NON-VOL, BOOTP, IP TEST

**DEFAULT:** All of the parameters in Table 7-3 through Table 7-8 are set, and do not change until the boot mode changes.

**Table 7-2 IP Parameters**

| IPMASK: | 255.000.000.000 |
|---|---|
| MODEM IPADDR: | 010.000.000.001 |
| SERVER IP ADDR: | 010.001.001.001 |
| ROUTER IP ADDR: | 010.000.001.001 |

**IP TEST:** The IP Test boot mode has a behavior similar to the default boot mode. The Terminal, IP, SNMP, FTP and Web parameters changed by the default setting are reset by the IP Test boot mode as well. However, the IP addresses are set as shown in Table 7-4:

### Table 7-3 IP Test

| IP ADDRESS MASK: | 255.255.255.0 |
|---|---|
| MODEM IP ADDRESS: | 192.168.000.238 |
| SERVER IP ADDRESS | 192.168.000.101 |
| ROUTER IP ADDRESS: | 192.168.000.102 |
| TRANSEC IP ADDRESS: | 192.168.000.239 |

**NON-VOL:**  Stores and uses IP Mask and addresses you provide.

**BOOTP:**  At boot time, use BOOTP protocol to get names, masks and IP Addresses of the modem, router and server.

IP Address Mask:

- XXX.XXX.XXX.XXX

The IP Address Mask of the local network is expressed in a decimal format. It must be a valid TCP/IP Mask. Set this field before changing the Modem or Router Address.

Modem IP Address:

- XXX.XXX.XXX.XXX

The IP Address of the modem must be consistent for the mask defined. This address is expressed in decimal format. Broadcast and loopback addresses are not allowed. These are addresses with all subnet bits set to 0 or 1.

Server IP Address:

- XXX.XXX.XXX.XXX

This is 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 is specified, the address is assumed to be reachable via the router. Broadcast and loopback addresses are not allowed. These are addresses with all subnet bits set to 0 or 1.

Router IP Address:

- XXX.XXX.XXX.XXX

This is the IP Address of the Local Network Router. If a router exists on the local network, this address must be consistent with the IP Mask and the subnet of the modem. Otherwise, the address must be set to

a foreign address. This address is expressed in decimal format. Broadcast and loopback addresses are not allowed. These are addresses with all subnet bits set to 0 or 1.

## 7.6.2  Configure Applications page
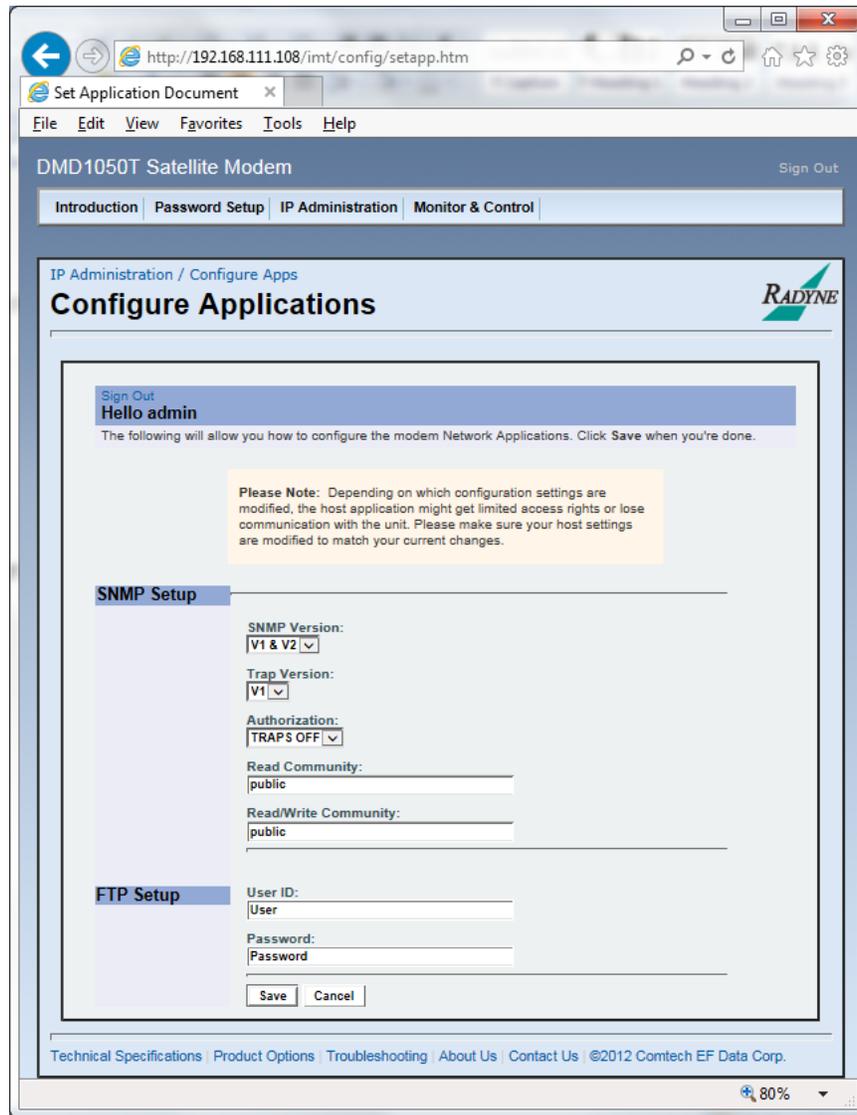


**Figure 7-10 Configure Applications page example**

The **SNMP Setup** page section contains:

SNMP Version:

- V1 & 2, V3

Default = V1 & V2

Trap Version:

- V1 & 2

Default = V1

Authorization:

- TRAPS ON, TRAPS OFF

Default = TRAPS OFF

Read Community:

Public is the Default

Read/Write Community:

Public is the Default

The FTP Setup page section contains:

UserID:

Enter the **UserID** for the FTP connection.

Password:

Enter the **Password** for the FTP connection.

Table 7-4 SNMP Parameters

| SNMP VERSION:  V1 & V2 | | | |
| --- | --- | --- | --- |
| TRAP VERSION:   V1 | | | |
| AUTHORIZATION: TRAPS OFF | | | |
| RD COMMUNITY:  PUBLIC | | | |
| RDWR COMMUNITY:  PUBLIC | | | |
| USER 1 Viewer-md5 | USER 2 Viewer-sha | USER 3 Oper-md5 | USER 4 Oper-sha |
| ACCESS GROUP VIEWER | ACCESS GROUP VIEWER | ACCESS GROUP OPER | ACCESS GROUP OPER |
| AUTH PASSWORD Viewer | AUTH PASSWORD Viewer | AUTH PASSWORD Oper | AUTH PASSWORD Oper |
| PRIV PASSWORD Viewer | PRIV PASSWORD Viewer | PRIV PASSWORD Oper | PRIV PASSWORD Oper |
| AUTHENTICATION MD5 | AUTHENTICATION SHA | AUTHENTICATION MD5 | AUTHENTICATION SHA |
| PRIVACY DES | PRIVACY DES | PRIVACY DES | PRIVACY DES |

Table 7-5. FTP Parameters

| USER ID: | User |
| --- | --- |
| PASSWORD: | Password |

Table 7-6. Web Parameters

| Confirmation: disabled | | |
| --- | --- | --- |
| USER 1 guest | USER 2 oper | USER 3 admin |
| ACCESS GROUP guest | ACCESS GROUP oper | ACCESS GROUP admin |
| AUTH PASSWORD guest | AUTH PASSWORD oper | AUTH PASSWORD admin |

Table 7-7. Terminal and Remote Port Parameters

| Type | VT100 |
| --- | --- |
| Baud rate | 19200 |
| Interface | RS232 |
| Remote control | Terminal |

## 7.6.3  Configure the PC page
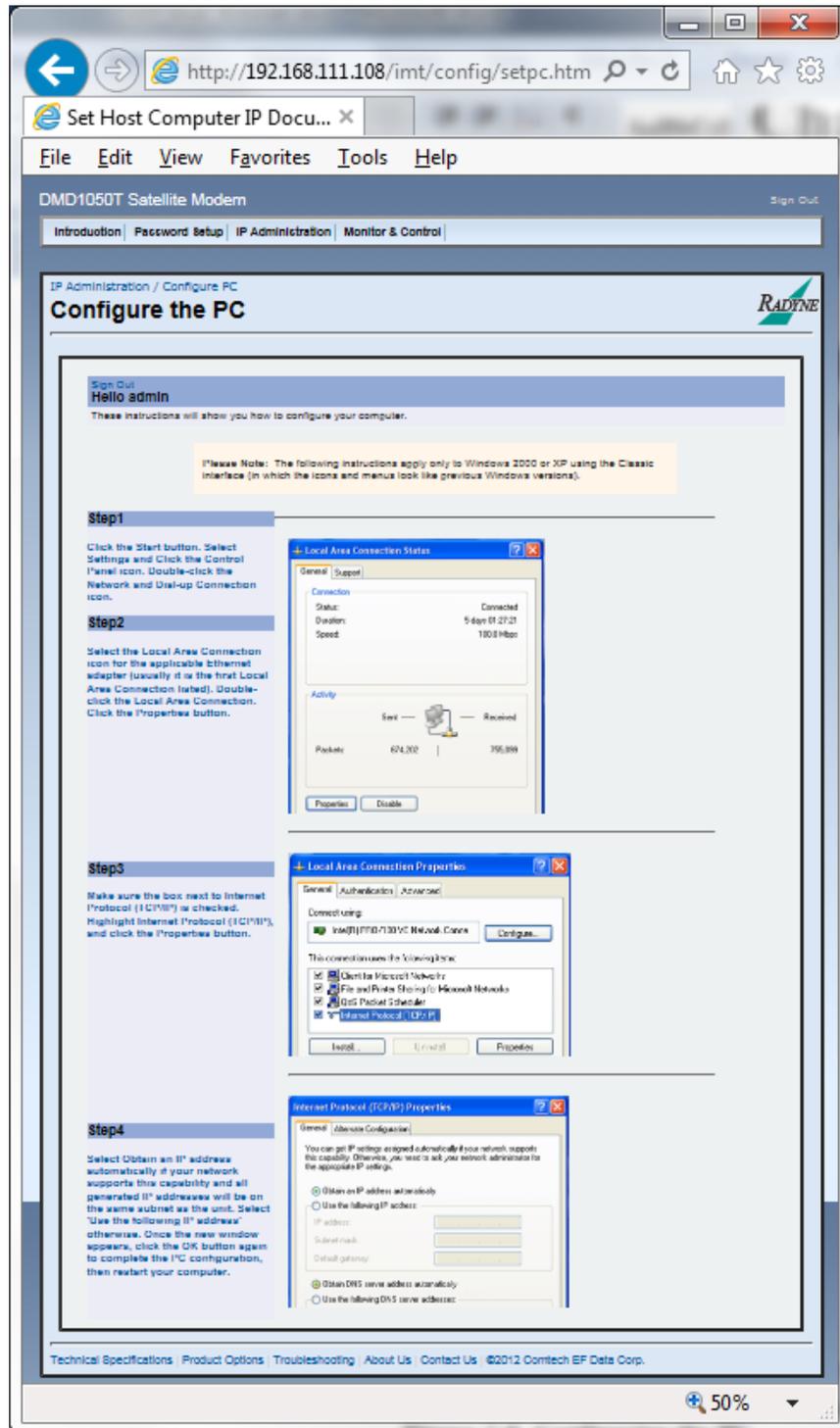


Figure 7-11 Configure the PC page example

## 7.7    Monitor and Control Menu

Use this menu to get access to all modem functions that are monitored and/or controlled.

### 7.7.1  Transmit Menu

The Transmit menu has these submenus: General/IF, Data, Reed Solomon, ODU-BUC and AUPC.

### 7.7.1.1       Transmit General / IF page
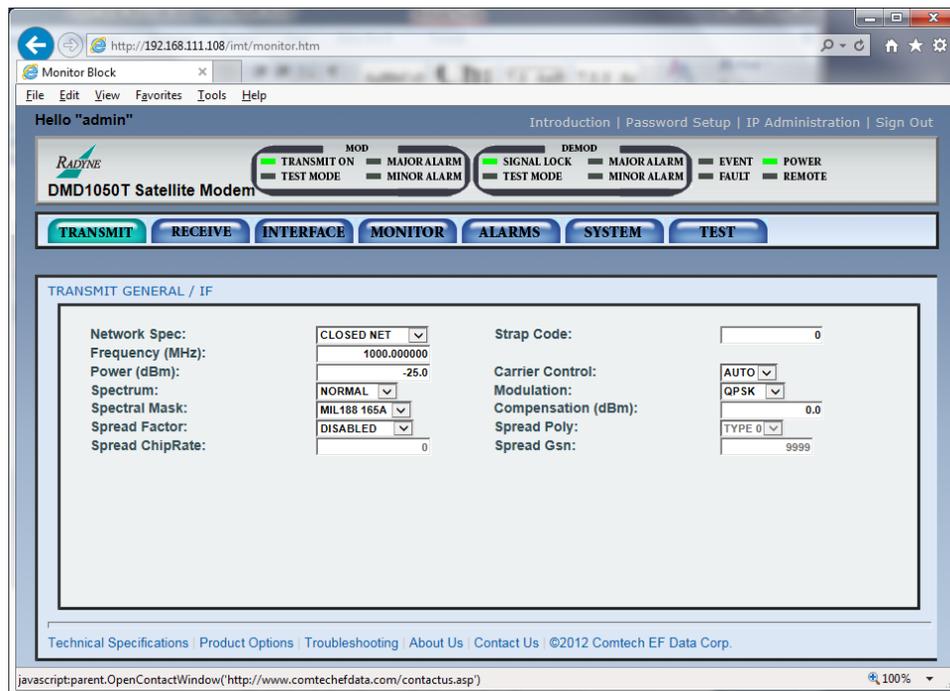


**Figure 7-12 Transmit General | IF page example**

Network Spec:

- CLOSED NET, MILSTD 188 165A, DVB SAT

Supports IDR and IBS Framing Modes in Closed Net

The Network Spec Command sets parameters in the modem to meet a set specification. The purpose is to eliminate keystrokes and compatibility problems. Additionally, data rates not compatible with the selected network specification are not allowed.

If you enter the data rate, then select the mode of operation, the data rate must be compatible with the selected mode of operation.

These parameters are set and cannot be changed while the unit is in the selected mode of operation:

| MIL 188 165A: | (MILSTD-188-165A) |
|---|---|
| Data Rates: | 9.6 K – 20.0 Mbps |
| Framing: | None |
| Scrambler: | OM73 |
| Spectrum: | MIL 188 165A |
| DVB: | EN301-201 and EN300-421 |
| Data Rates: | All Rates |
| Framing Type: | DVB |
| Scrambler Type: | DVB |
| Spectrum Mask: | DVB 0.25, 0.35 |
| Closed Net: | All possible combinations allowed, however, the DVB settings require the DVB network specification. |

Strap Code:

The Strap Code is a quick set key that sets many modem parameters. See Appendix G. Parameters set by strap code include:

- Data Rate
- Inner Code Rate
- Satellite Framing
- Scrambler
- Drop and Insert
- Outer Code Rate (Reed-Solomon)
- Modulation

Frequency (MHz):

- 950 - 2050 MHz

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

Power (dBm):

- 0 to -25 dBm

Enter the Transmitter Power Level.

Carrier Control:

- ON, OFF, AUTO, VSAT, RTS

Select the carrier type. See Appendix B.

Spectrum:

- NORMAL, INVERTED

Use this to invert the direction of rotation for PSK Modulation. **Normal** meets IESS Specification. Spectral inversion can be required if the BUC LO is higher in frequency than the BUC output frequency. This creates a spectral inversion, and the IF spectrum must be inverted again to compensate.

Modulation:

- QPSK, BPSK, OQPSK, 8PSK, 8QAM, 16QAM

Select the modulation type.

Spectral Mask:

- MIL-188-165A, Intelsat 0.35, DVB SAT 0.35, DVB SAT 0.25

Set the spectral shape of the Tx Data Filter.

Compensation:

- 0.0 – 1.0

Use this to offset the output power by up to 1 dBm. Use as a correction for user cabinet connectors.

Spread Factor:

- DISABLED, FACTOR x2, FACTOR, x4, FACTOR x8, FACTOR x16

Select the Tx spreading factor. This is only selectable if the modem is set to output BPSK+LDPC.

Spread Poly:

- TYPE 0, TYPE 1

Use one of the two built-in Pseudo PN patterns, 0 or 1.

Spread ChipRate:

Use this to see the spreader chip rate.

Spread GSN:

- 0000 - 9999

Set the spreader's gold sequence number.

## 7.7.1.2 Transmit / Data Menu
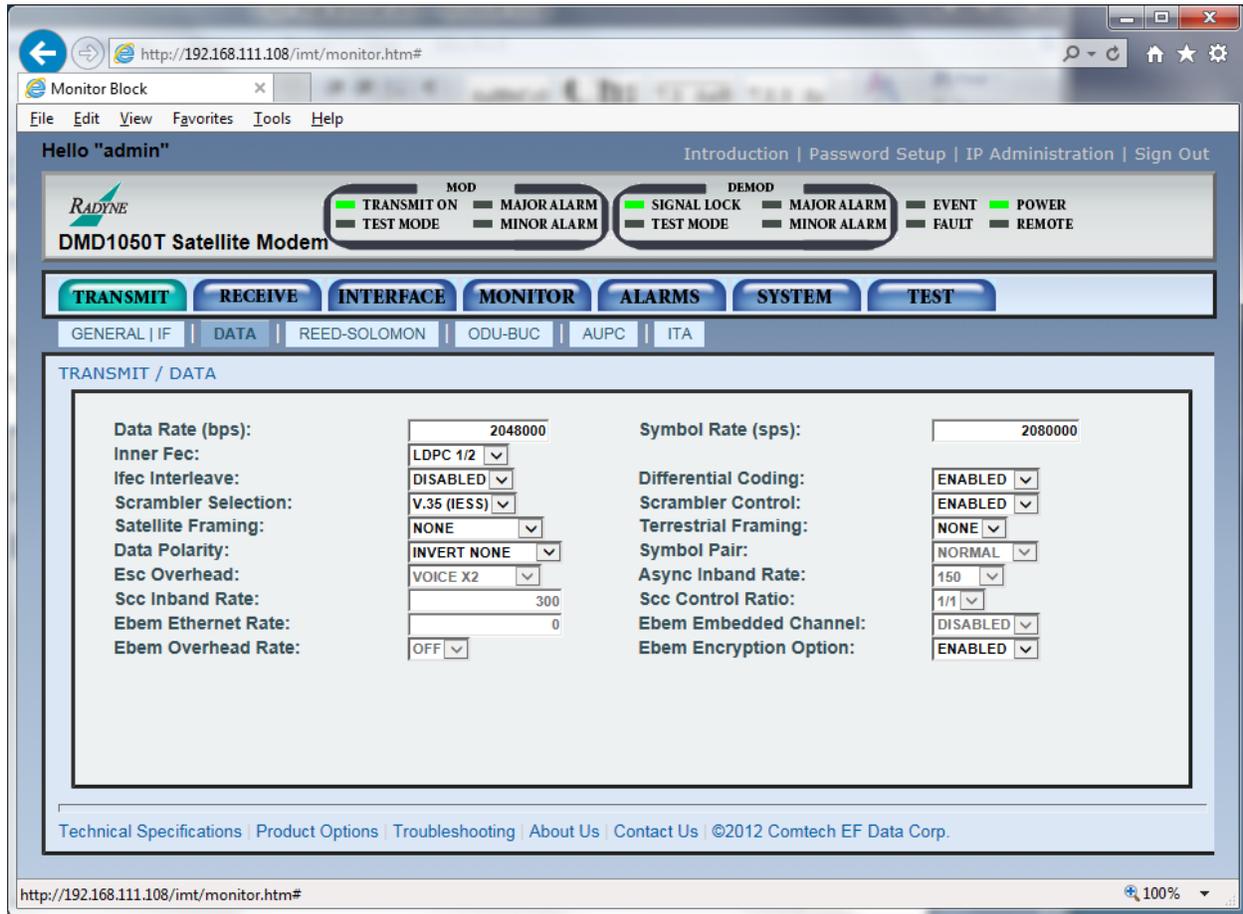


Figure 7-13 Transmit / Data Menu

Data Rate (bps):

Set the Data Rate in bps steps. See the technical specifications for data rates.

Symbol Rate (sps):

Use to see the Symbol Rate.

Inner FEC:

- Viterbi1/2, 3/4, 7/8, None
- Optional FEC Rates:
    - o Sequential1/2, 3/4, 7/8
    - o Trellis 8PSK2/3
    - o Turbo5/16, 21/44, 3/4, 7/8

- o   LDPC1/2, 2/3, 3/4
- o   CSC3/4
- o   DVB VIT2/3, 5/6
- o   DVB Trellis3/4, 5/6, 7/8, 8/9

Select the Tx Code Rate and Type.

TPC Interleaver:

- DISABLE, ENABLE

Disable or enable the TPC Interleaver.

This is valid only for Radyne turbo codes TPC.495 and TPC.793. It is available only for Radyne Legacy Turbo. Contact Comtech EF Data for availability.

Differential Coding:

- ENABLED, DISABLE

Enable or disable the Differential Encoder. An enabled encoder ensures correct phase lock. This may not be adjustable in some modes.

Scrambler Selection:

- NONE, V.35-IESS, V.35 CITT, V.35 EF, IBS w/Optional Framing and optional Reed-Solomon, Reed-Solomon Scrambler w/Optional Framing, CCITT, V.35FC, OM-73, V.35EF_RS, TPC SCRAMBLER (Turbo Codec), DVB, EDMAC

Select the descrambler type.

Scrambler Control:

- ENABLED, DISABLE

Enable or disable scrambler operation.

Satellite Framing:

- 1/15 (IBS), 1/15 (Async), 96 Kbps (IDR), DVB, EDMAC, EFAUPC, SCC, None

Select the framing type. This is used only with IDR, IBS or Asynchronous Interface.

Terrestrial Framing:

- NONE, 188, 204 DVB Only

Data Polarity:

- INV. TERR & BASE, INV. BASEBAND, INV.TERR DATA, NONE

Use to invert the Tx Data polarity.

Symbol Pair:

- NONE, SWAPPED

Use to swap the I & Q Channels. BPSK Mode Only.

ESC Overhead:

- VOICE X2, DATA 64KBPS

IDR ESC Channel used for Voice or 64 K data channel.

SCC Control Ratio:

- 1:1,1:2, 1:3, 1:4, 1:5, 1:6, 1:7

Set the ratio of overhead in-band data to synchronizing words. Use this to simulate the framing used by the Satellite Control Channel Option. This is available only when Tx Satellite Framing is set to SCC.

SCC Inband Rate:

- 300 to 200000

Use to request the rate of in-band data for the overhead channel. This is available only when Tx Satellite Framing is set to SCC.

Async Inband Rate:

- 75, 150, 300, 600. 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

Use to select the Async Inband Rate.

EBEM Ethernet Rate**: Future Option**

EBEM Embedded Channel**: Future Option**

EBEM Overhead Rate**: Future Option**

EBEM Encryption:

- DISABLED, ENABLED

Use to encrypt the transmit data. This is available when a FIPs Module is installed on the DMD1050T and the transit FEC is either TPC or LDPC.

## 7.7.1.3    Transmit / Reed-Solomon Menu

These selections are active only when the Reed-Solomon option is installed.
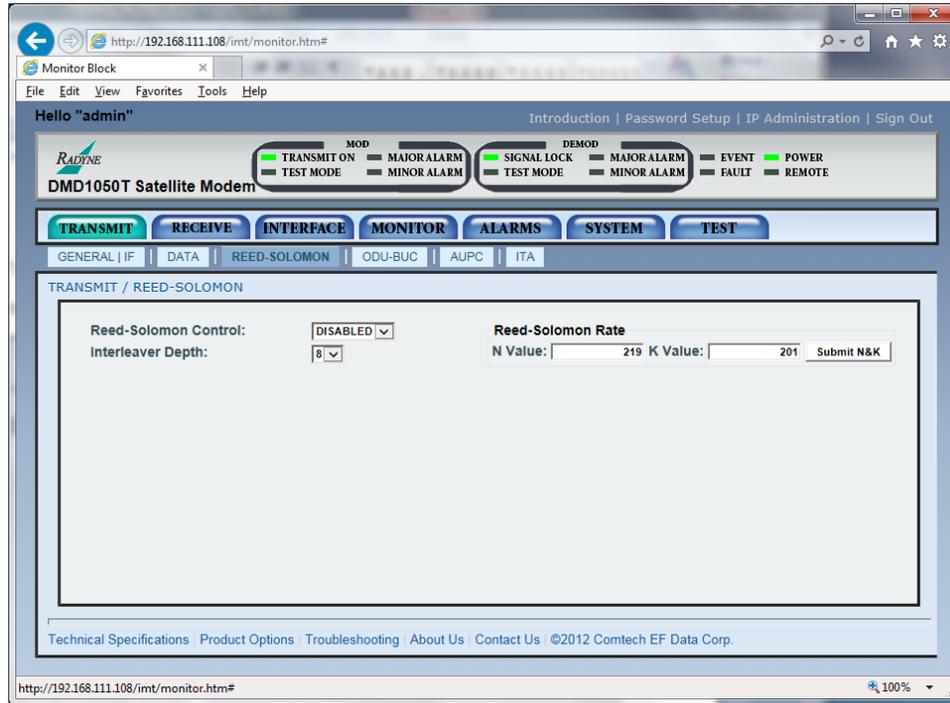


**Figure 7-14 Transmit / Reed-Solomon Menu**

Reed-Solomon Control:

- ENABLED, DISABLE

Used to Enable/Disable the Reed-Solomon Encoder.

Reed-Solomon Rate

**N Value, K Value:**

In Closed Net Mode, you can select custom R-S Codes. This shows the currently used n, k Reed-Solomon Codes.

Interleaver Depth:

- 4, 8, 12

Select the Reed-Solomon interleaver depth. In Closed Net Mode, you can select a depth of 4, 8 or 12.

## 7.7.1.4          Transmit / ODU-BUC Menu
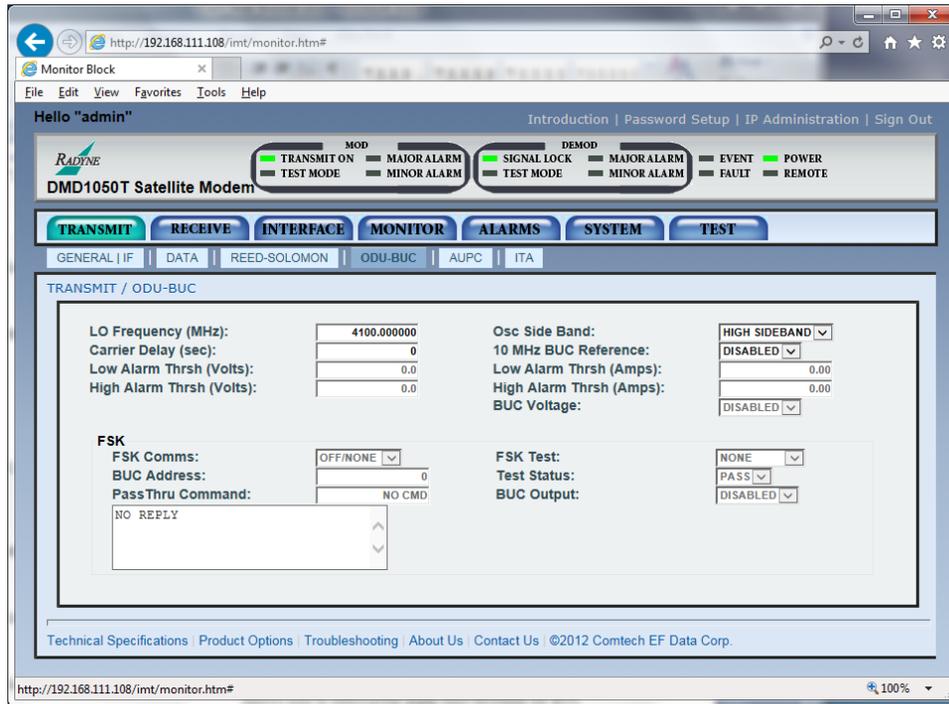


**Figure 7-15 Transmit / ODU-BUC Menu**

LO Frequency (MHz):

Enter the Local Oscillator frequency of the BUC LO, so that the uplink frequency shows correctly. Refer to the BUC manufacturer's specifications.

Osc Side Band:

- LOW SIDEBAND, HIGH SIDEBAND:

Select the location of the BUC LO. You must enter the location of the BUC LO for the UPLINK FREQUENCY to show correctly. The BUC LO can be higher or lower in frequency than the BUC output frequency. If the BUC LO is higher in frequency, then you must enter HIGH SIDEBAND.

Carrier Delay (sec):

- 0 to 255

Select the time delay to occur after power-up, before the Tx Carrier can be enabled. This allows time for the BUC to stabilize.

10 MHz BUC Reference:

- ENABLED, DISABLED

Enable or disable the 10 MHz BUC reference clock.

Low Alarm Thrsh (Volts):

- 0.00

Set the lower alarm limit/threshold for the BUC voltage.

Low Alarm Thrsh (Amps):

- 0.00

Set the lower alarm limit/threshold for the BUC current.

High Alarm Thrsh (Volts):

- 0.00

Set the high alarm limit/threshold for the BUC voltage.

High Alarm Thrsh (Amps):

- 0.00

Set the high alarm limit/threshold for the BUC current.

BUC Voltage:

- ENABLED, DISABLED

Enable or disable the BUC supply voltage.

FSK Comms:

- Not Available on the DMD1050T

FSK Test:

- Not Available on the DMD1050T

BUC Address:

- Not Available on the DMD1050T

Test Status:

- Not Available on the DMD1050T

Pass Thru Command:

- Not Available on the DMD1050T

BUC Output:

- ENABLED, DISABLED

Enable or disable the BUC output.

## 7.7.1.5    Transmit / AUPC Menu
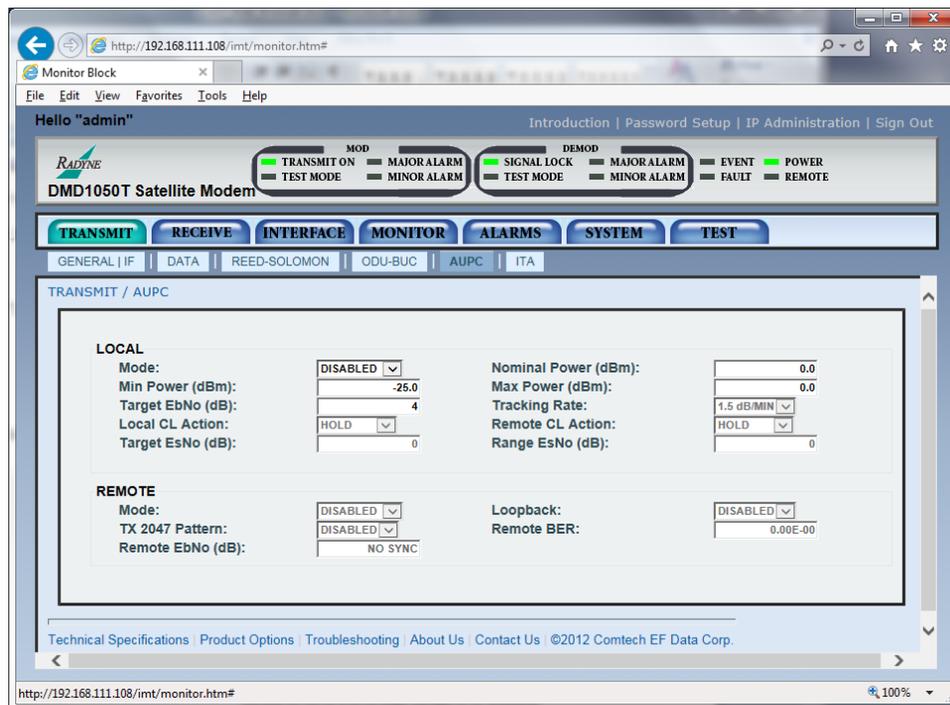


**Figure 7-16 Transmit / AUPC Menu**

## 7.7.1.5.1    LOCAL

The LOCAL page section contains the local configuration parameters for the AUPC function.

### Mode:

- DISABLED, NEARSIDE, RADYNE, EFDATA

DISABLED **-** enable or disable the local AUPC function of the local modem.

EFDATA **-** enables the EFDATA local AUPC function. If the remote or local demodulator loses lock, the output power level adjusts to the settings in the REMOTE CL ACTION or LOCAL CL ACTION menu.

RADYNE **-** enables the Radyne local AUPC function. If the remote demodulator loses lock, the local output power level adjusts to the nominal level. This nominal power must be set to a level high enough to re-establish communications, regardless of rain fade.

NEARSIDE **-** enables the NEARSIDE local AUPC function. If the local demodulator loses lock because of signal loss, the output power level adjusts to the nominal level. This nominal power must be set to a level high enough to re-establish communications, regardless of rain fade.

### Nominal Power (dBm):

- 0 to -25 dB

Set the nominal Transmit Power. The nominal transmit power is the default output power level.

### Min Power (dBm):

- 0 to -25 dB

Set the minimum transmit power.

**EFDATA -** for EFDATA mode, the minimum transmit power is the lowest power setting used when the local modem commands a decrease of the transmit power from the remote modem.

**RADYNE -** for RADYNE mode, the minimum transmit power is the lowest power setting used when the remote modem commands a decrease of the transmit power from the local modem.

**NEARSIDE -** for NEARSIDE mode, the minimum transmit power is the lowest power setting used by the local modem when the Eb/No increases above the Eb/No target.

### Max Power (dBm):

- 0 to -25 dB

Set the maximum transmit power.

**EFDATA -** for EFDATA mode, the maximum transmit power is the highest power setting that the local modem uses when the local modem commands an increase in transmit power from the remote modem.

**RADYNE** - for RADYNE mode, the maximum transmit power is the highest power setting used when the remote modem commands an increase of the transmit power from the local modem

**NEARSIDE -** for NEARSIDE mode, the maximum transmit power is the highest power setting used by the local modem when the Eb/No decreases below the Eb/No target.

**Target Eb/No (dB):**

- 4.0 to 16 dB

Set the $E_b/N_o$ for the local receiver.

**EFDATA -** for EFDATA mode, this setting is compared to the local received $E_b/N_o$, and commands the remote modem to increase or decrease transmit power.

**RADYNE -** for RADYNE mode, this setting is compared to the remote $E_b/N_o$, and commands the local modem to increase or decrease the local transmit power.

**NEARSIDE -** for NEARSIDE mode, this setting is compared to the received $E_b/N_o$ of the local modem, and commands the local modem to increase or decrease transmit power.

**Tracking Rate:**

- 0.5 to 6.0

Set the rate at which the commands to increase or decrease transmit power are sent. Each command will result in a 0.5 dB increase or decrease in transmit power from the remote transmitter. The tracking rate is adjustable from 0.5 dB to 6.0 dB per minute, in 0.5 dB steps. This is only available when EFDATA is the framing selection.

**Local CL Action:**

- HOLD, NOMINAL, MAXIMUM

Set the remote transmit power setting used when the local modem receiver loses lock. The setting can be HOLD (no action taken), NOMINAL (the nominal transmit power setting is used), or MAXIMUM (the maximum transmit power setting is used). This is only available when EFDATA is the framing selection.

**Remote CL Action:**

- HOLD, NOMINAL, MAXIMUM

Set the local transmit power setting used when the remote modem receiver loses lock. The setting can be HOLD (no action taken), NOMINAL (the nominal transmit power setting is used), and MAXIMUM (the maximum transmit power setting is used).

## 7.7.1.5.2    REMOTE

The REMOTE page section contains the remote configuration parameters for the AUPC function. Remote AUPC menus are available only when the modem is configured for EFDATA mode.

Mode:

- DISABLE, EFDATA

Enable or disable the AUPC function of the remote modem. The remote AUPC function is the local modem response to commands for a change to the transmit power in 0.5 dB steps, and the command to change to the setting in the REMOTE CL ACTION menu of the remote modem, upon receiver loss of lock.

Loopback:

- DISABLE, ENABLE

Enable or disable the Baseband Loopback Test mode of the remote modem.

TX 2047 Pattern:

- DISABLE, ENABLE

Enable or disable the Transmit 2047 Pattern Test mode of the remote modem.

Remote BER:

This shows the BER measurement of the receive 2047 Pattern test mode of the remote modem. BER is reported from the $1x10^{-5}$ to $1x10^{-7}$ in tenth decade steps. If the pattern does not synchronize, or is out of range, NO DATA is shown.

When modems are configured for RADYNE AUPC, the remote Eb/No shows in the MONITOR menus.

## 7.7.2 Receive Menu

The Receive menu has these sub menus; General | IF, Data, Reed Solomon, CNC, ODU-LNB and ITA.

## 7.7.2.1     Receive General | IF page
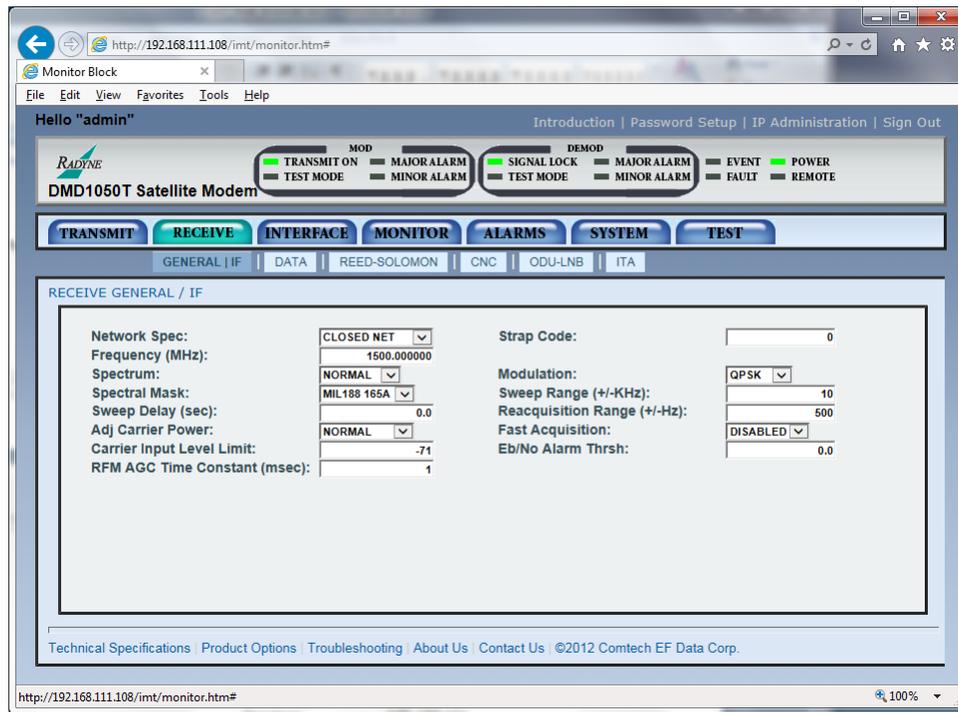


**Figure 7-17 Receive General | IF page example**

**Network Spec:**

CLOSED NET, MIL 188 165A, DVB SAT

Supports IDR and IBS Framing Modes in Closed Net

To meet a set specification, the Network Spec command sets several parameters in the modem. The purpose is to eliminate keystrokes and compatibility problems. Additionally, data rates not covered by the selected specification are not allowed. The selected Network Spec must be compatible with the selected data rate.

These parameters cannot be changed while the unit is in the selected Network Spec:

MIL\188-165A:

- MILSTD-188-165A
- For Data Rates:  9.6 K – 20.0 Mbps
- Framing: None
- Scrambler: OM73
- Spectrum: MIL 188 165

DVB:

- Per EN301 201 and 300 421
- Data Rates: All Rates
- Framing Type: DVB
- Scrambler Type: DVB
- Spectrum Mask: DVB 0.25, 0.35

Closed Net:

All possible combinations allowed; however, DVB settings require the DVB Network Spec.

### Strap Code:

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

- Data Rate
- Inner Code Rate
- Satellite Framing
- Scrambler
- Drop and Insert
- Outer Code Rate (Reed-Solomon)
- Modulation

### Frequency (MHz):

- 950 – 2050 MHz

Enter the Modulator IF Frequency in 1 Hz increments.

### Spectrum:

- Normal, Inverted

Use this to invert the direction of rotation for PSK demodulation. Normal meets the IESS Specification.

### Demodulation:

- QPSK, BPSK, OQPSK, 8PSK, 8QAM, 16QAM

Select the demodulation type.

### Spectral Mask:

- MIL-188-165A, Intelsat 0.35, DVB 0.35, DVB 0.25

Use this to invert the direction of rotation for PSK modulation. Normal meets the IESS Specification.

### Sweep Range (kHz):

- ±0 to 255 kHz

Set the acquisition range for the demodulator.

### Sweep Delay (sec):

- 0.0 – 900.0 sec

Set the reacquisition delay time in 1/10th second increments.

### Reacquisition Range (Hz):

- 0 – 32000 Hz

Set the reacquisition sweep in 1 Hz increments.

### Adj Carrier Pwr:

- Normal, Suppressed

Set the adjacent carrier as Normal or Suppressed (High Power). The unit will increase or decrease post dissemination gain as necessary.

### Fast Acquisition:

- DISABLED, ENABLED

Disable or enable the Rx Fast Acquisition capability.

### Carrier Input Level Limit:

- -30 to 90 dBm

Adjust the low level threshold limit for input power. An Input power level below the threshold limit causes a major alarm on the demodulator.

EB/NO Alarm Thrsh

- to 9.90 dB

Set the $E_b/N_o$ for the local receiver. This setting is compared to the Rx $E_b/N_o$, and commands the remote modem to increase or decrease transmit power as necessary.

## 7.7.2.2      Receive / Data page
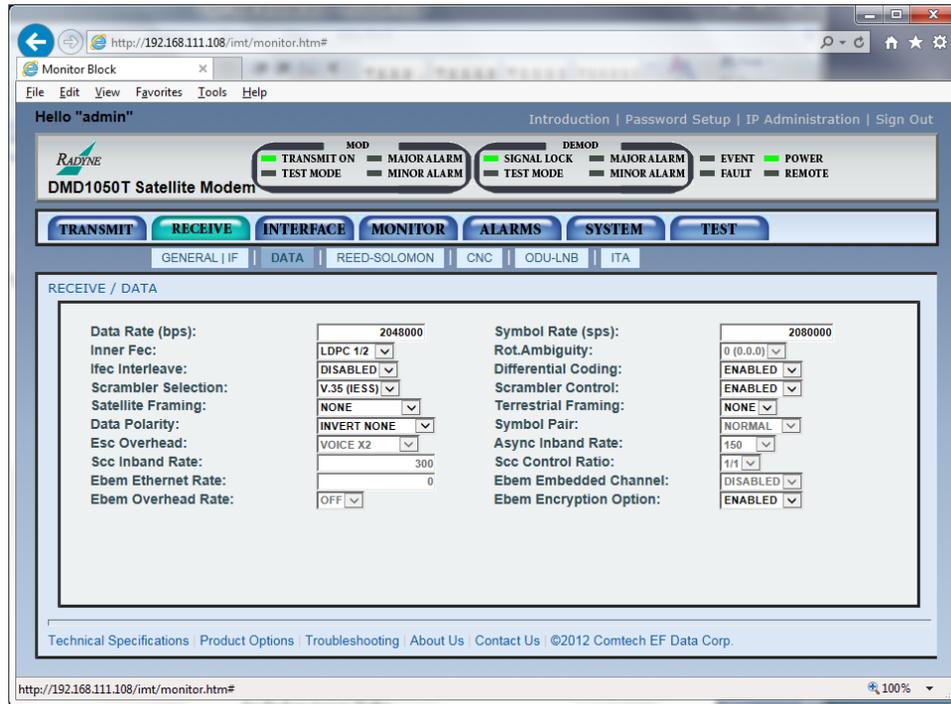


**Figure 7-18 Receive / Data page example**

### Data Rate (bps):

Use the keypad to set the Data Rate in bps steps. See the technical specifications for data rates.

### Symbol Rate (sps):

Use this to see the Symbol Rate.

### Inner Fec:

- Viterbi: 1/2, 3/4, 7/8, None
- Optional FEC Rates:
    - Sequential: 1/2, 3/4, 7/8
    - Trellis 8PSK: 2/3
    - Turbo: 5/16, 21/44, 3/4, 7/8
    - LDPC: 1/2, 2/3, 3/4
    - CSC: 3/4
    - DVB VIT: 2/3, 5/6
    - DVB Trellis: 3/4, 5/6, 7/8, 8/9

Select the Rx Code Rate and Type.

### TPC Interleaver:

- DISABLED, ENABLED

Disable or enable the TPC Interleaver. This is valid only for Radyne turbo codes TPC.495 and TPC.793. This is available only for Radyne legacy Turbo. Contact the factory for availability.

### Differential Coding:

- ENABLED, DISABLE

Enable or disable the Differential Decoder. Enable the decoder for correct phase lock. This is not adjustable in some modes.

### Scrambler Selection:

- NONE, V.35-IESS, V.35 CITT, V.35 EF, IBS w/Optional Framing and optional Reed-Solomon, Reed-Solomon Scrambler w/Optional Framing, CCITT, V.35FC, OM-73, V.35EF_RS, TPC SCRAMBLER (Turbo Codec), DVB, EDMAC

Select the descrambler type.

### Scrambler Control:

- ON, OFF

Enable or disable the descrambler operation.

### Satellite Framing:

- 1/15 (IBS), 1/15 (Async), 96 Kbps (IDR), EDMAC, EFAUPC, SCC, None

Select the Framing Type. This is used only with IDR, IBS, or Asynchronous Interface.

### Terrestrial Framing:

- NONE, 188, 204 DVB only

Select the Receive Terrestrial Framing.

### Data Polarity:

- INV. TERR & BASE, INV. BASEBAND, INV.TERR DATA, NONE

Use this to invert the Rx Data polarity.

**Symbol Pair:**

- NONE, SWAPPED

Use this to swap the I & Q Channels. (BPSK Mode Only)

**ESC Overhead:**

- VOICE X2, DATA 64KBPS

IDR ESC Channel is used for Voice or 64 K data channel.

**SCC Control Ratio:**

- 1/1, 1/2, 1/3, 1/4, 1/5, 1/6, 1/7

This is available only when SCC is selected for the Rx Satellite Framing.

Use it to simulate the framing used by the  Satellite Control Channel option (Pass Thru Mode only). The SCC CTL RATIO is the ratio of overhead in-band data to synchronizing words.

**SCC Inband Rate**

- 300 to 200000

This is available only when SCC is selected for the Rx Satellite Framing.

Use this to request the rate of in-band data for the overhead channel.

**Async Inband Rate:**

- 75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

Select the Async Inband Rate.

**EBEM Ethernet Rate: Future Option**

**EBEM Embedded Channel: Future Option**

**EBEM Overhead Rate: Future Option**

**EBEM Encryption:**

- DISABLED, ENABLED

Use this to encrypt the transmit data. This is available when a FIPs Module is installed on the DMD1050T and the transmit FEC is TPC or LDPC.

## 7.7.2.3        Receive / Reed-Solomon page
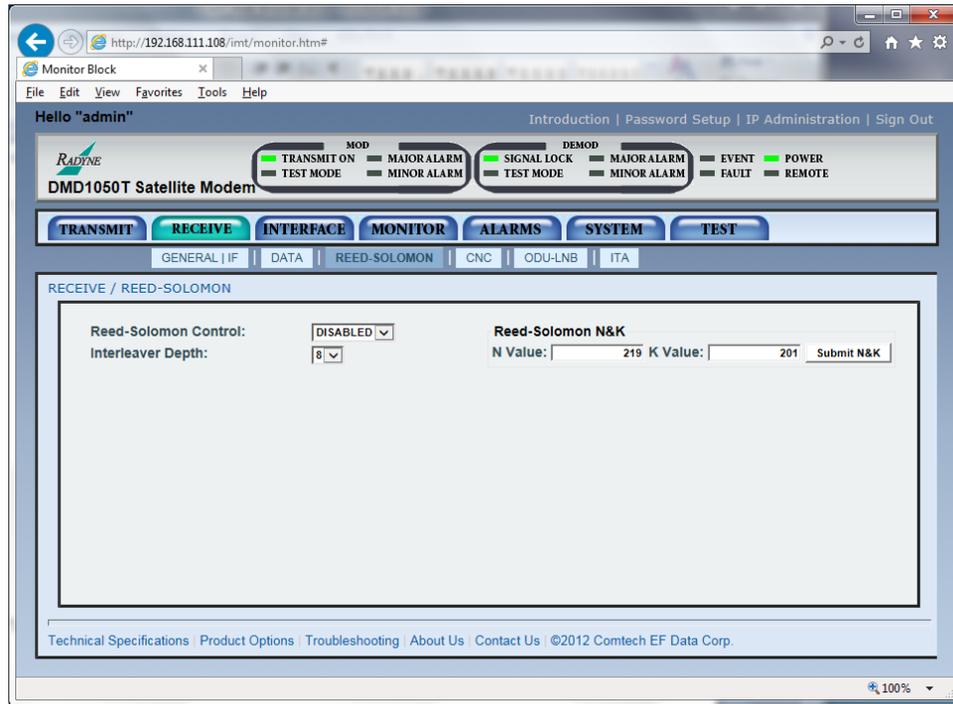


Figure 7-19 Receive / Reed-Solomon page example

**Reed-Solomon Control:**

- Enabled, Disabled

Enable or Disable the Reed-Solomon Encoder.

**Reed-Solomon N Value:**

This shows the N value in use, Reed-Solomon Codes. In Closed Net Mode, the select custom R-S Codes if the optional Reed-Solomon Card is installed.

**Reed-Solomon K Value:**

This shows the K value in use, Reed-Solomon Codes. In Closed Net Mode, select custom R-S Codes if the optional Reed Solomon Card is installed.

**Rx Interleaver Depth:**

- 4, 8, 12

Select the Reed-Solomon interleaver depth. In Closed Net Mode, you can select a depth of 4 or 8.

## 7.7.2.4        ODU-LNB page
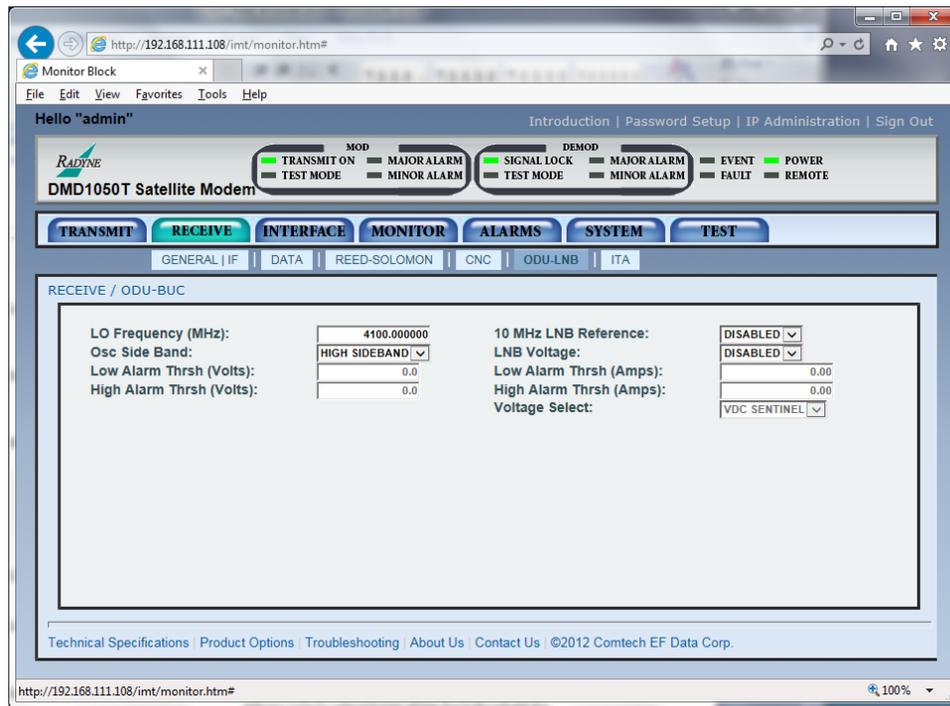


**Figure 7-20 RECEIVE / ODU-LNB page example**

### LO Frequency (MHz):

Enter the Local Oscillator frequency in MHz to cause the downlink frequency to show correctly. Refer to the LNB manufacturer's specifications.

### 10 MHz LNB Reference:

- ENABLED, DISABLED

Enable or disable the 10 MHz BUC reference clock.

### Osc Side Band:

- LOW SIDEBAND, HIGH SIDEBAND

Select the location of the LNB LO. Enter the location of the LNB LO to cause the UPLINK FREQUENCY to show correctly. The LNB LO can be higher or lower in frequency than the LNB output frequency. If the LNB LO is higher in frequency, then you must enter HIGH SIDEBAND.

### LNB Voltage:

- ENABLED, DISABLED

Enable or disable the LNB supply voltage.

**Low Alarm Thrsh:**

- 0.00 Volts

Select the lower alarm limit/threshold for the LNB voltage.

**Low Alarm Thrsh:**

- 0.00 Amps

Select the lower alarm limit/threshold for the LNB current.

**Hi Alarm Thrsh:**

- 0.00 Volts

Select the high alarm limit/threshold for the LNB voltage.

**Hi Alarm Thrsh:**

- 0.00 Amps

Select the high alarm limit/threshold for the LNB current.

**Voltage Select:**

- 13 VDC, 15 VDC, 18 VDC, 20 VDC

Select the voltage required by the LNB. Refer to the LNB manufacturer's specifications.

## 7.7.3  Interface Menu

## 7.7.3.1       Interface / TX Setup page
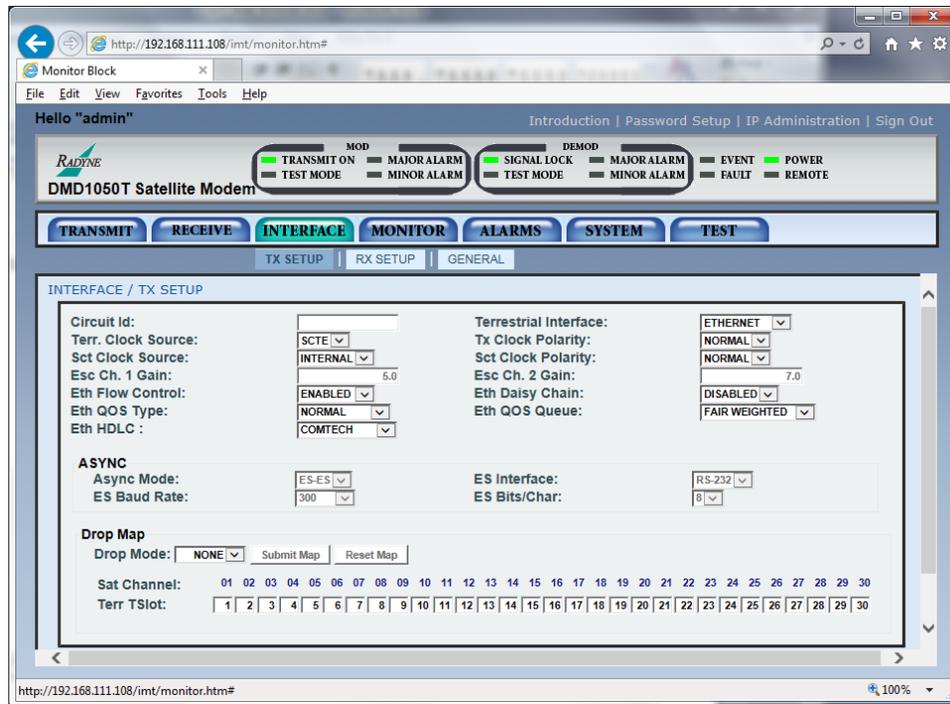


**Figure 7-21 Interface / TX Setup page example**

### Circuit ID :

Enter a Tx Circuit Identifier. Circuits can have an identifier of up to 11 alphanumeric characters, such as LINK1.

### Terrestrial Interface:

- MIL 188-114A, ETHERNET

Select the Transmit Type.

### Terr. Clock Source:

- SCTE, SCT

Select the Transmit Clock Source.

### Tx Clock Polarity:

- AUTO, NORMAL, INVERTED

Select the Clock Polarity for the Tx Terrestrial Clock relative to the Tx Data. Select **Auto** to cause the unit to detect wrong polarity and correct it automatically.

### SCT Clock Source:

- INTERNAL (SCT), SCR (Rx SAT CLK)

Select the SCT Source to be the SCT Oscillator or the RX Satellite Clock. Rx SAT CLK is for loop timing.

### SCT Clock Polarity:

- AUTO, NORMAL, INVERTED

Select the Clock Polarity for the Tx Terrestrial Clock relative to the Tx Data. Select **Auto** to cause the unit to detect wrong polarity and correct it automatically.

### Eth Flow Control:

- DISABLED, ENABLED

Disable or enable flow control. This is only visible when Ethernet is selected as the interface type.

### Eth Daisy Chain:

- DISABLED, ENABLE

Disable the Ethernet Port Daisy Chaining or enable it on Port 2. This is only visible when Ethernet is selected as the interface type.

### Eth QOS Type:

- NORMAL, PORT BASED

Select the priority hierarchy for processing an IEEE 803.0ac Tag, Ipv4 Type of Service Field/Differentiated Services Field, or Ipv6 Traffic Class Field. The Port Based priority overrides any standard priority. When operating in this mode, Port 1 has the highest priority and Port 2 has the lowest.

### Eth QOS Queue:

- FAIR WEIGHTED, STRICT PRIORITY

Select the queue weighting of 8, 4, 2 or 1, so that even the lowest priority traffic gets some bandwidth. Strict Priority makes sure that the higher priority traffic transmits before the lower priority traffic.

⚠️ CAUTION

Strict Priority can severely limit lower priority traffic.

**ETH HDLC:**

- RADYNE, COMTECH, MANAGED 570

COMTECH HDLC is supported by the SLM5650A Modem with Ethernet Bridge Card. MANAGED 570 HDLC is for other Comtech HDLCs, such as the CDM-570 and CDM-625.

## 7.7.3.1.1   ASYNC page section

**Async Mode:**

- **ES-ES, ESC ENHANCED**

ES-ES is the normal IBS Async Channel. ESC ENHANCED is applicable for Closed Net. It uses the Overhead Signaling bytes in the IBS Overhead to pass asynchronous data.

**ES Interface:**

- **RS-232, RS-485**

Select the ES interface type.

**ES Baud Rate:**

- **150 - 19200**

Select the ES baud rate in Enhanced Async Mode.

**ES Bits/Char:**

- **7,8**

Select 7- or 8-bit data.

## 7.7.3.2        Interface / RX Setup page
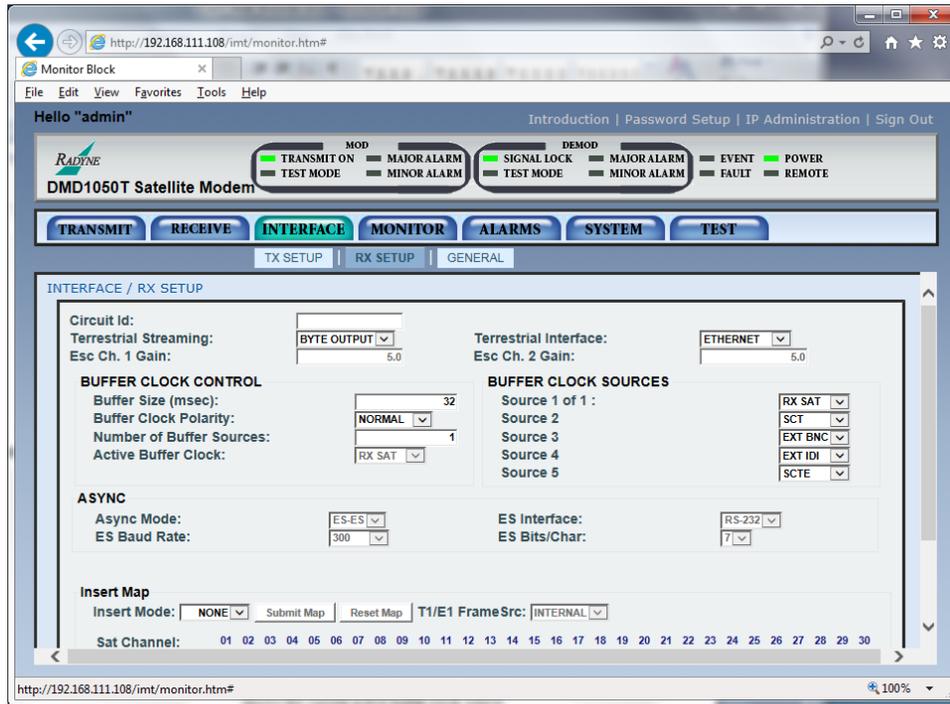


**Figure 7-22 Interface / RX Setup page example**

### Circuit ID:

Enter an Rx Circuit Identifier. Circuits can have up to an 11-character alphanumeric identity, such as DLINK1.

### Terrestrial Streaming:

- **BYTE OUTPUT, PACKET OUTPUT**

ASI only, BYTE OUTPUT = continuous, PACKET OUTPUT = burst

### Terrestrial Interface:

- **ETHERNET, MIL-188-114A**

Select the Receive Type.

## 7.7.3.2.1        BUFFER CLOCK CONTROL page section

### Buffer Size (msec):

- **0 - 64 msecs**

Set the Doppler Buffer Size in msec.

**Buffer Clock Polarity:**

- **NORMAL, INVERTED**

Select the Buffer Clock Polarity for the Tx Terrestrial Clock, relative to the Tx Data. If the G.703 Interface is active, the **Buffer Clock Polarity** cannot be changed.

**Number of Buffer Sources:**

- **1 – 5**

Select up to 5 clock sources.

**Active Buffer Clock:**

- **RXSAT, EXTBNC, SCTE, SCT, EXT IDI**

Read only, shows the active buffer clock source.

## 7.7.3.2.2    BUFFER CLOCK SOURCES page section

**Source 1 of 1 (2,3,4,5):**

- SCTE (External), SCT (Internal), RX SAT

You must assign priorities to the clock sources. The highest priority is 1, and 5 is the last resort.

## 7.7.3.2.3    ASYNC  page section

**Async Mode:**

- ES-ES, ESC ENHANCED

ES-ES is the normal IBS Async Channel. ESC ENHANCED is applicable for Closed Net. It uses the Overhead Signaling bytes in the IBS Overhead to pass asynchronous data.

**ES Interface:**

- RS-232, RS-485

Select the interface type.

**ES Baud Rate:**

- 150 - 19200

Select the baud rate in Enhanced Async Mode.

**ES Bits/Char:**

- 7,8

Select 7- or 8-bit data.

---

## 7.7.3.3     Interface / General page
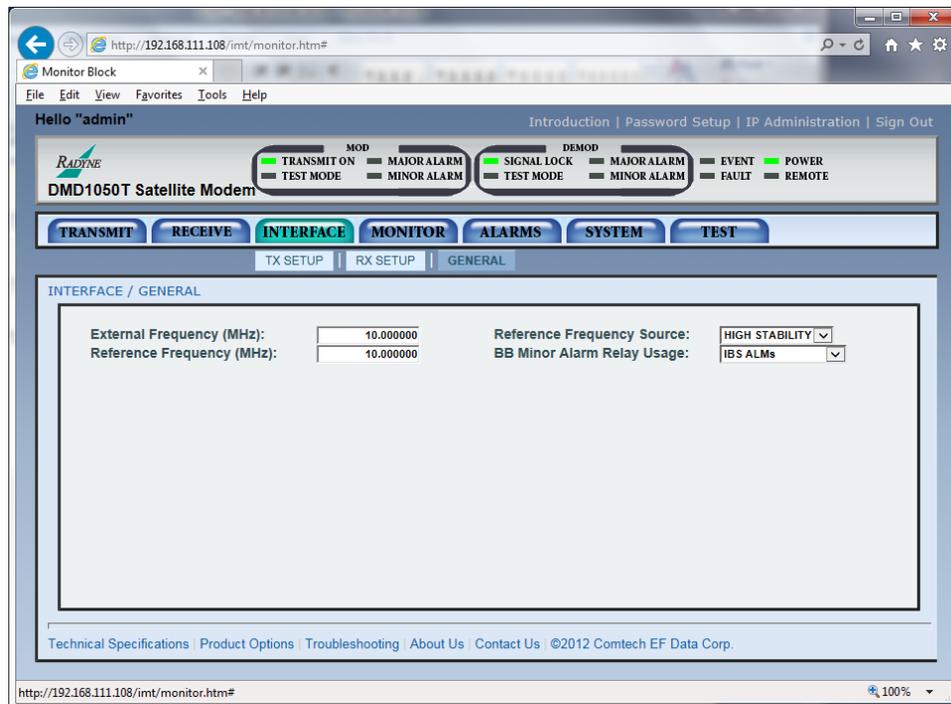


**Figure 7-23 Interface / General page example**

**External Frequency (MHz):**

- Variable Through Data Rate

Enter the external clock frequency in MHz.

**Reference Frequency Source:**

- EXTERNAL, HIGH STABILITY

Select the Frequency Reference Source.

**Reference Frequency (MHz):**

Enter the Frequency Reference Source in MHz.

## 7.7.4  Monitor Menu

## 7.7.4.1        Monitor | Voltages page
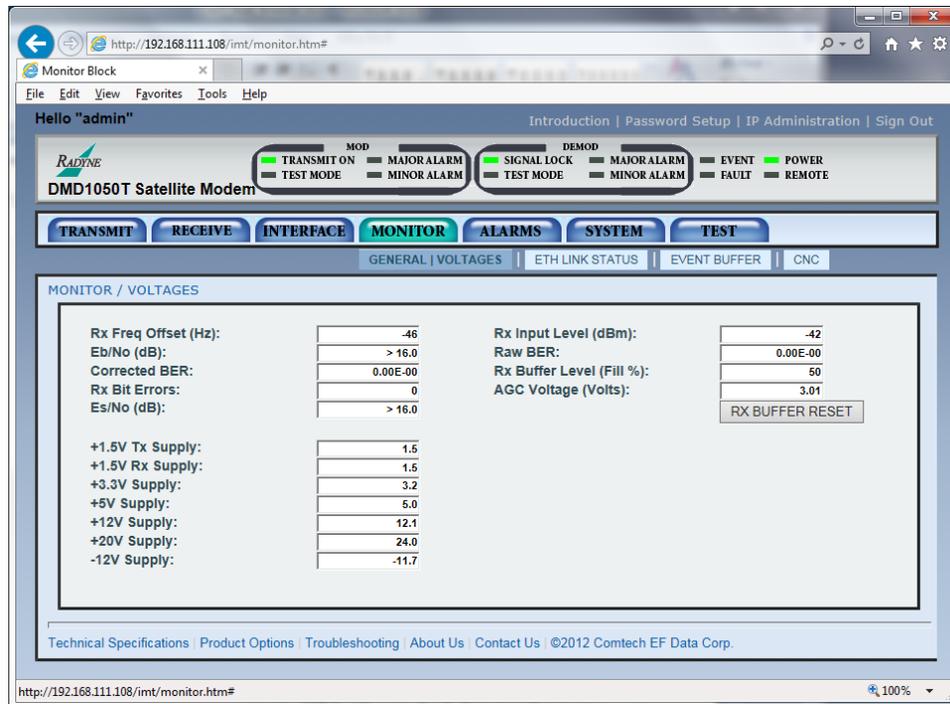


**Figure 7-24 Monitor | Voltages page example**

### Rx Offset Frequency (Hz):

Read only, this shows the received carrier frequency offset as measured by the modem.

### Rx Input Level (dBm):

Read only, this shows the estimated receive signal level as seen by the Demodulator.

### Eb/No (dB):

Read only, this shows the estimated $E_b/N_o$ as seen by the demodulator.

### REMOTE EB/NO (dB):

Read only, this shows the estimated $E_b/N_o$ of the Remote site when configured for Radyne AUPC.

### Raw BER:

Read only, this shows the estimated channel error rate (before decoding) measured by the modem.

### Corrected BER:

Read only, this shows an estimated corrected bit error rate of the modem. Depending on the symbol rate the modem is running, the high-end performance scale will vary (10 E$^{-9}$, 10$^{-10}$ or 10$^{-11}$). At some symbol rates, a better-than-scale reading shows as 0.0 x 10$^{-00}$. At other symbol rates, it shows as E**. In both cases, they mean performance is better than the scale upper limit.

**Rx Buffer Level (Fill %):**

- 0 – 100%

Read only, this shows the status of the Doppler Buffer.

**Es/No (dB):**

Read only, this shows the estimated Es/No as seen by the demodulator.

**RX Buffer Reset button:**

Use the button to re-center the Doppler Buffer each time the ENTER key is pressed while a Web browser page is open.

**Rx Bit Errors:**

Read only, this shows the error count from the Viterbi Decoder.

**+1.5V TX Supply:**

Read only, this shows the measured voltage of the 1.5 Volt Tx power bus inside the modem.

**+1.5V RX Supply:**

Read only, this shows the measured voltage of the 1.5 Volt Rx power bus inside the modem.

**+3.3V Supply:**

Read only, this shows the measured voltage of the +3.3 Volt power bus inside the modem.

**+5V Supply:**

Read only, this shows the measured voltage of the +5 Volt power bus inside the modem.

**+12V Supply:**

Read only, this shows the measured voltage of the +12 Volt power bus inside the modem.

**+20V Supply:**

Read only, this shows the measured voltage of the +20 Volt power bus inside the modem.

## 7.7.4.2 Monitor / Eth Link Status page
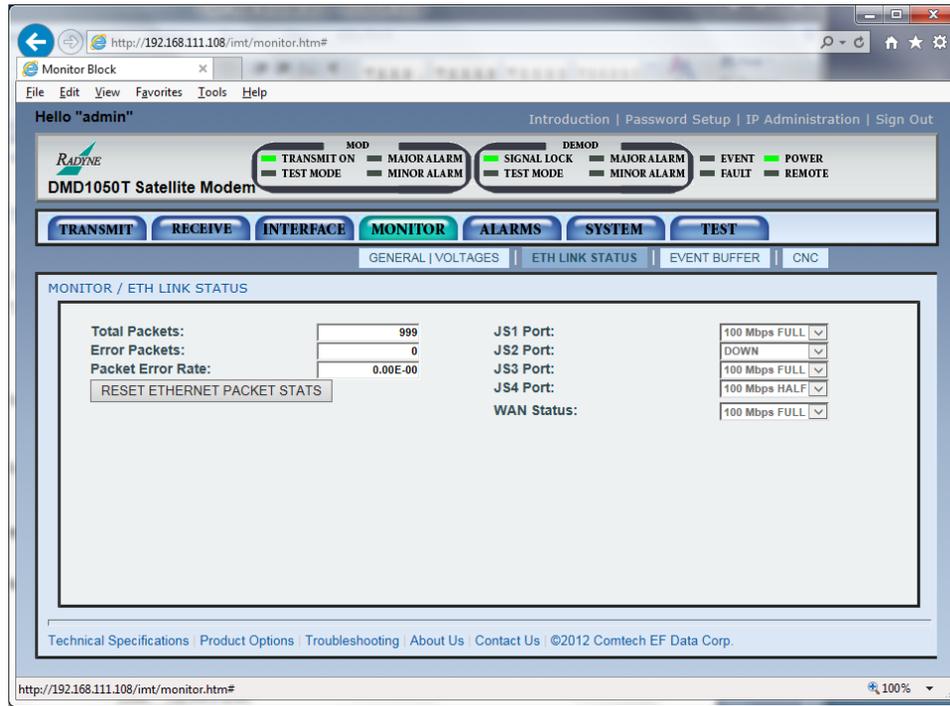


Figure 7-25 Monitor / ETH Link Status page example

### Total Packets:

This shows the total number of Ethernet packets received from the satellite. It is visible only when the interface type is Ethernet.

### Error Packets:

This shows the number of erred Ethernet packets received from the satellite. It is visible only when the interface type is Ethernet.

### PKT Error Rate:

This shows the satellite Packet Error Rate. It is visible only when the interface type is Ethernet.

### Reset Ethernet Packet Stats:

Click this button to reset the Ethernet packet statistics. It is visible only when the interface type is Ethernet.

### PORT JS1 STATUS:

This shows the status of the MnC Port. See the status types in Section 7.7.4.2.1.

PORT JS2 STATUS:

This shows the status of the LAN Port 1. See the status types in Section 7.7.4.2.1.

PORT JS3 STATUS:

This shows the status of the LAN Port 2. See the status types in Section 7.7.4.2.1.

PORT JS4 STATUS:

This shows the status of the FIPS Module Port. See the status types in Section 7.7.4.2.1.

WAN STATUS:

This shows the status of the WAN Port. See the status types in Section 7.7.4.2.1.

## 7.7.4.2.1    Port Status types

- Down - the link is down.
- Unresolved – cannot agree on connection speed.
- 10 Mbps Half – connected at 10 Base-T Half Duplex.
- 10 Mbps Full – connected at 10 Base-T Full Duplex.
- 100 Mbps Half – connected at 100 Base-T Half Duplex.
- 100 Mbps Full – connected at 100 Base-T Full Duplex.
- Unused – the port is not available.

## 7.7.4.3        Event Menu
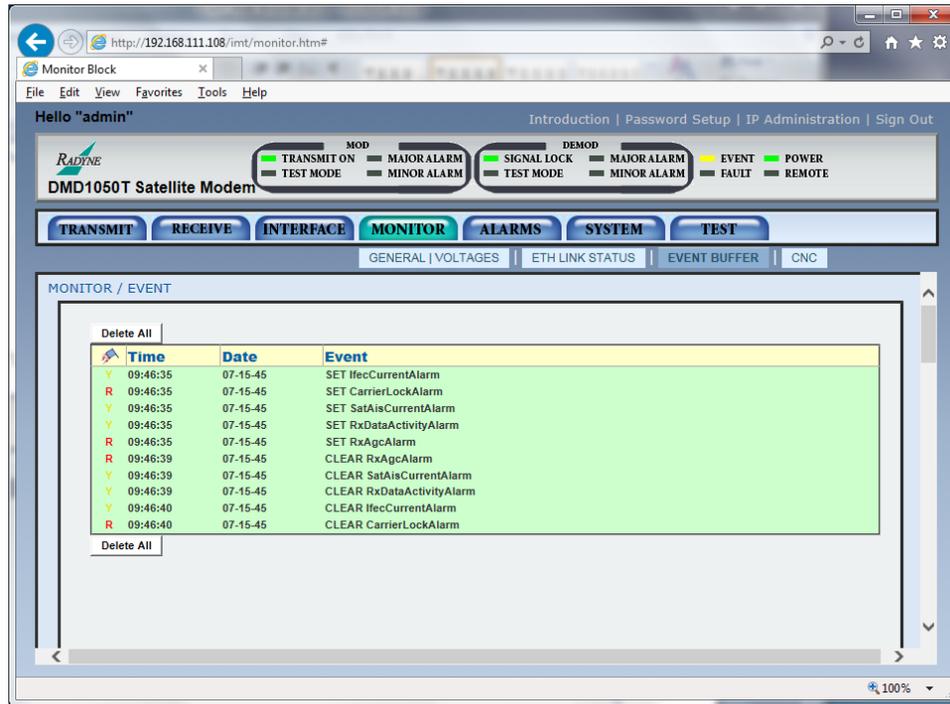


**Figure 7-26 Event Menu example**

**Delete All:**

Use this button to delete all events in the buffer.

Event Type:

- I - Informational
- Y - Yellow alarm means a transmit or receive warning condition
- R - Red alarm means a transmit or receive failure, losing traffic

You can sort the Event Buffer by warning level, time, date or event description. Use the log to help examine event occurrences.

## 7.7.4.4      Alarms Menu

## 7.7.4.5      Alarms / Transmit page
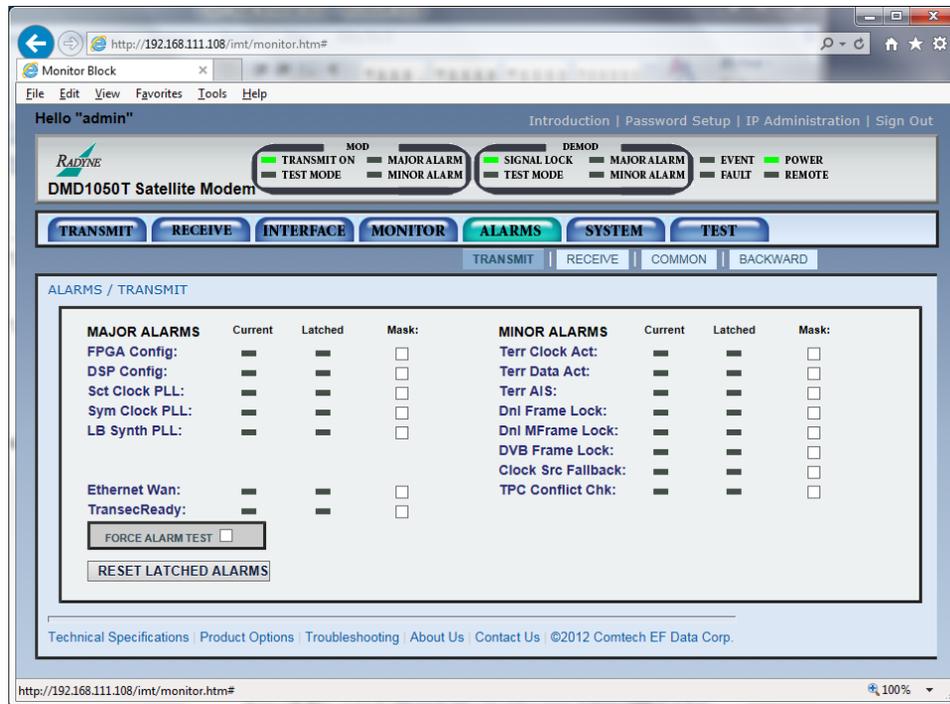


**Figure 7-27 Alarms /Transmit page example**

### 7.7.4.5.1      MAJOR ALARMS page section

#### FPGA Config:

- Pass/Fail, Unmasked/Masked

This shows a transmit FPGA configuration failure exists.

#### DSP Config:

- Pass/Fail, Unmasked/Masked

This shows a transmit DSP configuration failure exists.

#### Sct Clock PLL:

- Pass/Fail, Unmasked/Masked

This shows that the Tx SCT Clock PLL is not locked. This alarm flashes during certain modem parameter changes. A steady glow means a configuration failure exists in the modem.

**Sym Clock PLL:**

- Pass/Fail, Unmasked/Masked

This shows that the Tx Symbol Clock PLL is not locked. This alarm flashes during certain modem parameter changes. A steady glow means a problem exists with the incoming clock to the modem (SCTE).

**LB Synth PLL:**

- Pass/Fail, Unmasked/Masked

This shows that the Tx L-Band Synthesizer is not locked. This alarm flashes during certain modem parameter changes. A steady glow means a configuration problem exists in the modem.

**Ethernet WAN:**

- Pass/Fail, Unmasked/Masked

When the interface card has a fault and is not passing data, this glows. It works only when the Ethernet Card is installed, and the Ethernet Interface is selected.

**TRANSEC READY:**

- Pass/Fail, Unmasked/Masked

This glows when the TRANSEC module is ready to pass data.

## 7.7.4.5.2    MINOR ALARMS page section

**Terr Clock Act:**

- Pass/Fail, Unmasked/Masked

This glows when no Terrestrial Clock activity exists.

**Terr Data Act:**

- Pass/Fail, Unmasked/Masked

This glows when no Tx Data activity exists.

**Terr AIS:**

- Pass/Fail, Unmasked/Masked

This glows when AIS has been detected in the Tx Data Stream.

### DVB Frame Lock:

- Pass/Fail, Unmasked/Masked

This glows when Tx input data stream framing does not match the user-selected TX TERR FRAMING.

### FORCE ALARM TEST

Click this button to force alarms.

### RESET LATCHED ALARMS

Click this button to reset (clear) all Latched Alarms.

## 7.7.4.6    Alarms / Receive page
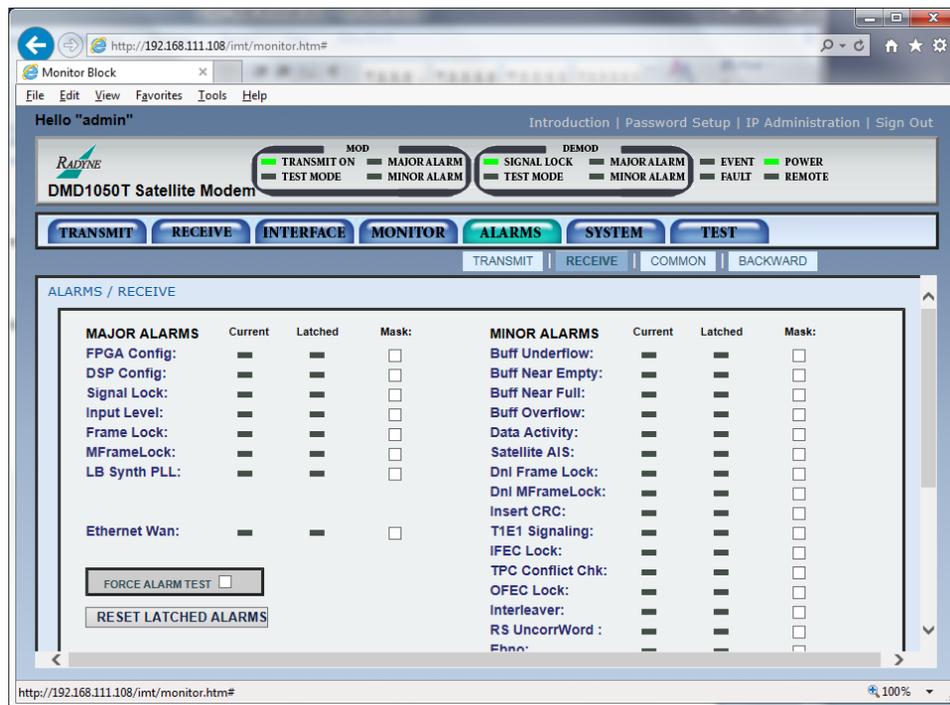


Figure 7-28 Alarms / Receive page example

## 7.7.4.6.1    MAJOR ALARMS page section

### FPGA Config:

- Pass/Fail, Unmasked/Masked

This shows a receive FPGA hardware failure exists.

### DSP Config:

- Pass/Fail, Unmasked/Masked

This shows a receive DSP failure exists.

### Signal Lock:

- Pass/Fail, Unmasked/Masked

This shows that the demod cannot lock to a signal.

### Input Level;

- Pass/Fail, Unmasked/Masked

This shows Rx signal level has fallen below input threshold.

### Frame Lock:

- Pass/Fail, Unmasked/Masked

This shows that the Framing Unit cannot find the expected framing pattern.

### MFramelock:

- Pass/Fail, Unmasked/Masked

This alarm flashes during certain modem parameter changes. A steady glow means a problem exists with the incoming clock to the modem (SCTE).

### LB Synth PLL:

- Pass/Fail, Unmasked/Masked

This shows that the Rx L-Band Synthesizer is not locked. This alarm flashes during certain modem parameter changes. A steady glow means a configuration problem exists in the modem.

### Ethernet WAN:

- Pass/Fail, Unmasked/Masked

This shows that the interface card is faulted and is not passing data. It glows only when the Ethernet Card is installed and the Ethernet Interface is selected.

## 7.7.4.6.2    MINOR ALARMS page section

**Buffer Underflow:**

- Pass/Fail, Unmasked/Masked

This shows that a Doppler Buffer underflow has occurred.

**Buff Near Empty:**

- Pass/Fail, Unmasked/Masked

This shows that the Doppler Buffer is about to underflow.

**Buff Near Full:**

- Pass/Fail, Unmasked/Masked

This shows that the Doppler Buffer is about to overflow.

**Buffer Overflow:**

- Pass/Fail, Unmasked/Masked

This shows that a Doppler Buffer overflow has occurred.

**Rx Data Activity:**

- Pass/Fail, Unmasked/Masked

This shows that there is no Rx Data activity.

**Satellite AIS:**

- Pass/Fail, Unmasked/Masked

This shows that AIS has been detected in the receive satellite data stream.

**IFEC Lock:**

- Pass/Fail, Unmasked/Masked

This shows that the Framing Unit cannot find the expected framing pattern.

**OFEC Lock:**

- Pass/Fail, Unmasked/Masked

This shows that the Reed-Solomon Decoder is not locked.

**Interleaver:**

- Pass/Fail, Unmasked/Masked

This shows that the Reed Solomon Interleaver is not synchronized.

**RS Uncorr. Word:**

- Pass/Fail, Unmasked/Masked

This shows status of the Reed Solomon uncoded word fault.

**Ebno:**

- Pass/Fail, Unmasked/Masked

This shows that the Eb/No is outside of limits.

**Rx Level:**

- Pass/Fail, Unmasked/Masked

This shows if the Rx level is below allowable limits.

**IBS BER:**

- Pass/Fail, Unmasked/Masked

This shows that there is more than one in 1000 bits in error in IBS Mode.

**DVB Frame Lock:**

- Pass/Fail, Unmasked/Masked

This shows that the Rx Satellite Data Stream Framing is not DVB.

**RESET LATCHED ALARMS**

Click this button to reset (Clear) all Latched Alarms

**FORCE ALARM TEST**

Click this button to force alarms.

## 7.7.4.7 Alarms / Common page



Figure 7-29 Alarms / Common Menu page example

## 7.7.4.7.1 COMMON ALARMS page section

### Terr FPGA Cfg:

- Pass/Fail, Unmasked/Masked

This shows an Interface Card FPGA configuration failure.

### Codec FPGA Cfg:

- Pass/Fail, Unmasked/Masked

This shows a Turbo Codec Card FPGA configuration failure.

### Codec Dev Cfg:

- Pass/Fail, Unmasked/Masked

This shows a Turbo Codec Card ASIC configuration failure.

### ExtRef Activity:

- Pass/Fail, Unmasked/Masked

This shows an External Reference Activity failure.

**ExtRef Lock:**

- Pass/Fail, Unmasked/Masked

## 7.7.4.7.2      VOLTAGE  ALARMS page section

**+1.5V RX Supply**

- Pass/Fail, Unmasked/Masked

Shows the measured voltage of the 1.5 Volt Rx power bus that is inside the modem.

**-1.5V TX Supply**

- Pass/Fail, Unmasked/Masked

Shows the measured voltage of the 1.5 Volt Tx power bus that is inside the modem.

**+3.3V Supply**

- Pass/Fail, Unmasked/Masked

Shows the measured voltage of the +3.3 Volt power bus that is inside the modem.

**+5V Supply**

- Pass/Fail, Unmasked/Masked

Shows the measured voltage of the +5 Volt power bus that is inside the modem.

**+12V Supply**

- Pass/Fail, Unmasked/Masked

Shows the measured voltage of the +12 Volt power bus that is inside the modem.

**+20V Supply**

- Pass/Fail, Unmasked/Masked

Shows the measured voltage of the +20 Volt power bus that is inside the modem.

**RESET LATCHED ALARMS**

Click this button to reset (Clear) all Latched Alarms.

## 7.7.4.8    Alarms / Backward page
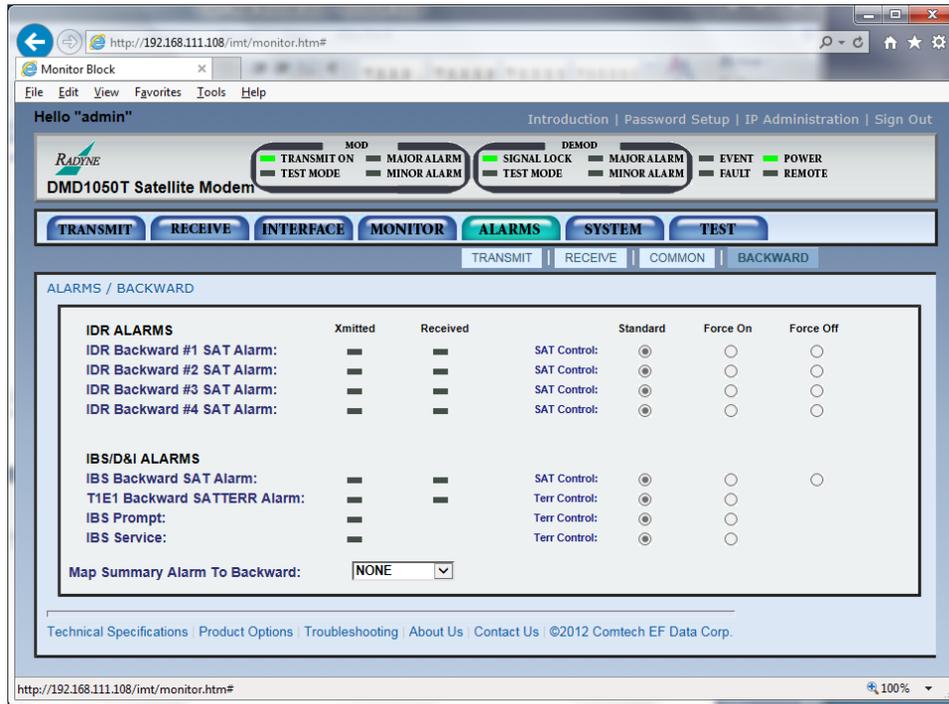


**Figure 7-30 Alarms / Backward page example**

IBS and IDR Backward Alarms are only available through a user interface, such as Web Browser, SNMP, Terminal Screens and RLLP. Physical contacts are not available for the backward alarms.

## 7.7.4.8.1    IDR ALARMS page section

**IDR Backwards #1 SAT Alarm:**

- Pass/Fail, Unmasked/Masked

**IDR Backwards #2 SAT Alarm:**

- Pass/Fail, Unmasked/Masked

**IDR Backwards #3 SAT Alarm:**

- Pass/Fail, Unmasked/Masked

**IDR Backwards #4 SAT Alarm:**

- Pass/Fail, Unmasked/Masked

## 7.7.4.8.2          IBS/D&I ALARMS page section

**IBS Backward SAT Alarm:**

- Pass/Fail, Unmasked/Masked

**T1E1 Backward SATERR Alarm:**

- Pass/Fail, Unmasked/Masked

**IBS Prompt:**

- Pass/Fail, Unmasked/Masked

**IBS Service:**

- Pass/Fail, Unmasked/Masked

## 7.7.5  System Menu

## 7.7.5.1       System / Terminal & Remote page



**Figure 7-31 System / Terminal & Remote page example**

**Remote Port Control:**

- TERMINAL, COMPUTER

Select either terminal RS-232 control, or remote port M&C RS-232/-485 control.

**Terminal Emulation:**

- VT-100, WYSE50, VT100

Select the emulation type.

### Terminal Baud Rate:

- 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

Enter the terminal baud rate.

### Multidrop Address:

- 32 - 255

Enter the Remote Port Multidrop Address.

### Remote Baud Rate:

- 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38,400, 57,600, 115200

Enter the Remote Port Baud Rate.

### Remote Interface:

- RS-232, RS-485

Enter the Remote Port interface type.

## 7.7.5.2 System / HW/FW Configuration page
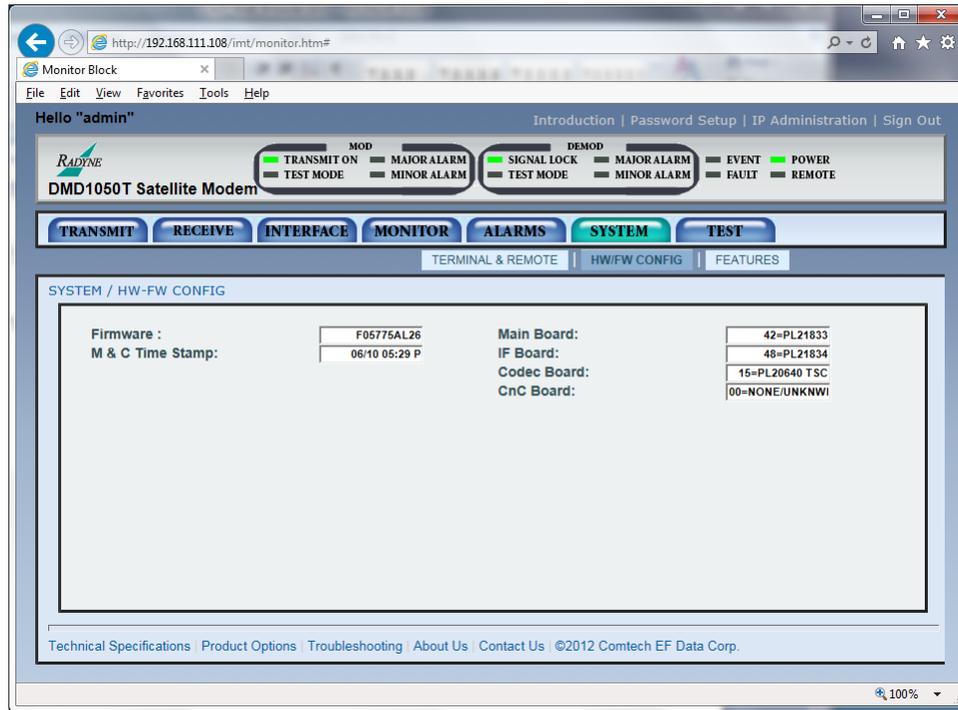


Figure 7-32. System / HW/FW Configuration page example

**Firmware Revision:**

This shows the installed firmware revision.

**M&C Revision:**

This shows the installed Monitor and Control revision.

**Main Board:**

This shows the Radyne part number for the Baseband Board Assembly.

**IF Board:**

This shows the Radyne part number for the IF Board Assembly.

**Terr Intf Board:**

This shows the Radyne assembly number for the Terrestrial Interface Assembly.

**Codec Board:**

This shows the Radyne part number for the Codec Board.

## 7.7.5.3        System / Features page
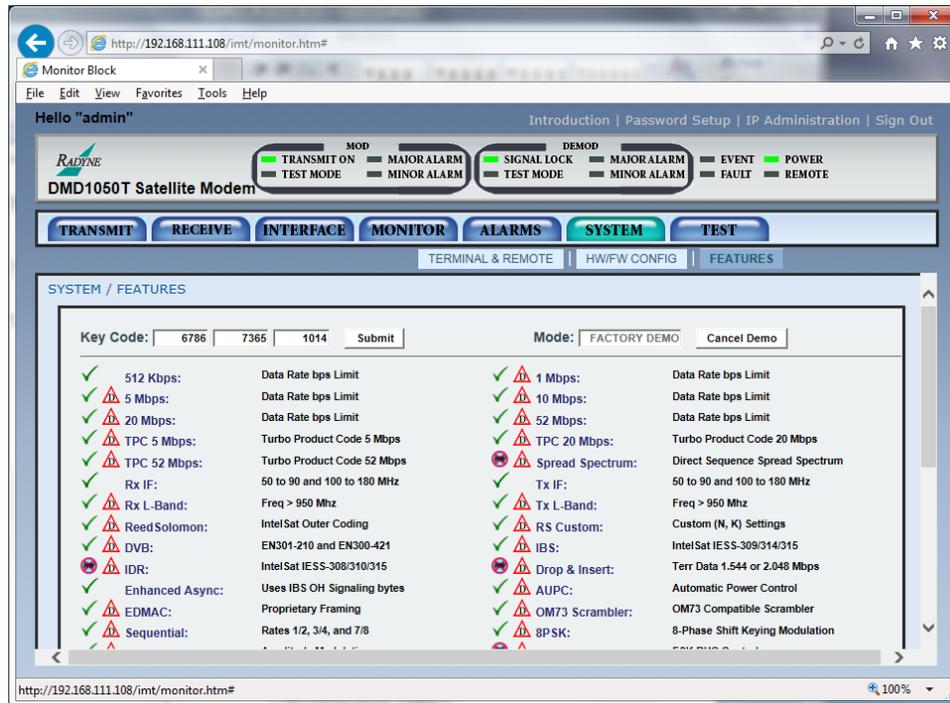


Figure 7-33 System / Features page example

The Web Browser menu lets you see actively enabled features. Adjacent to each feature is a series of symbols that show feature status.

| | |
|---|---|
| ✓ | Installed |
| (HW) | No hardware available; requires hardware for upgrade |
| ⚠ | Feature is in Demo Mode and will expire |
| 🔑 | Key Code Required |
| ☎ | Call customer service. Feature is enabled, but the required hardware is not detected or has failed. |

You can upgrade features using the Web Browser interface.

## 7.7.6 Test Menu

## 7.7.6.1    Test Pattern | Carrier page
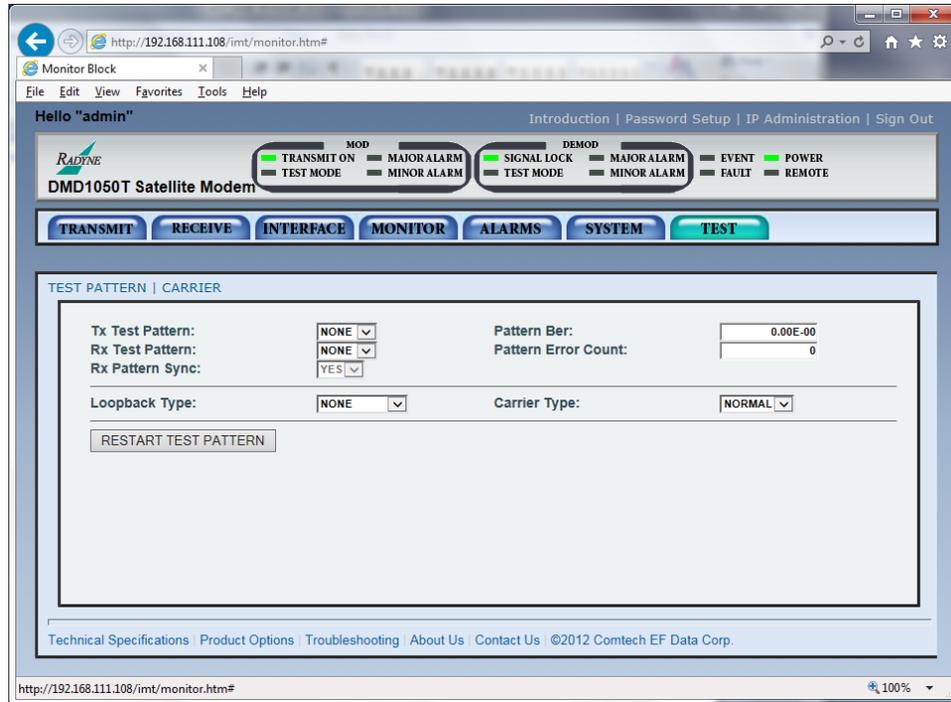


Figure 7-34 Test Pattern | Carrier page example

⚠️ CAUTION

You can cause undesirable network loops by using the modem's loopback capabilities with the Ethernet data interface.

To run any type of data test with an Ethernet interface, you must use two modems connected back-to-back. Do not use one modem and a loopback.

Tx Test Pattern:

- NONE, 2047, 2^15-1, 2^23-1

Use this to enable the available transmit test patterns.

Rx Test Pattern:

- NONE, 2047, 2^15-1, 2^23-1

Use this to enable the available receive test pattern.

**Rx Pattern Sync:**

- YES, NO

Yes means that the received test pattern is in sync.

**Loopback Type:**

- NONE, TERR RX, BASEBAND RX, TERR TX, BASEBAND TX, IFEC TX, IF, BASEBAND RX/TX

**Pattern Ber:**

- NO SYNC, nnnn x $10^{-n}$

This shows the measured Bit Error Rate for the received test pattern.

**Pattern Error Count:**

- NO SYNC, nnnn x $10^{n}$

This shows the number of errors detected by the test pattern checker.

**Carrier Type:**

- NORMAL, CW, DUAL, OFFSET POS FIR, NEG FIR

**RESTART TEST PATTERN:**

Click this button to reset the test pattern counter and generator.

## 7.7.6.2    Test / IQ Plot Menu

This shows the RX I/Q sampled data as seen by the receiver.
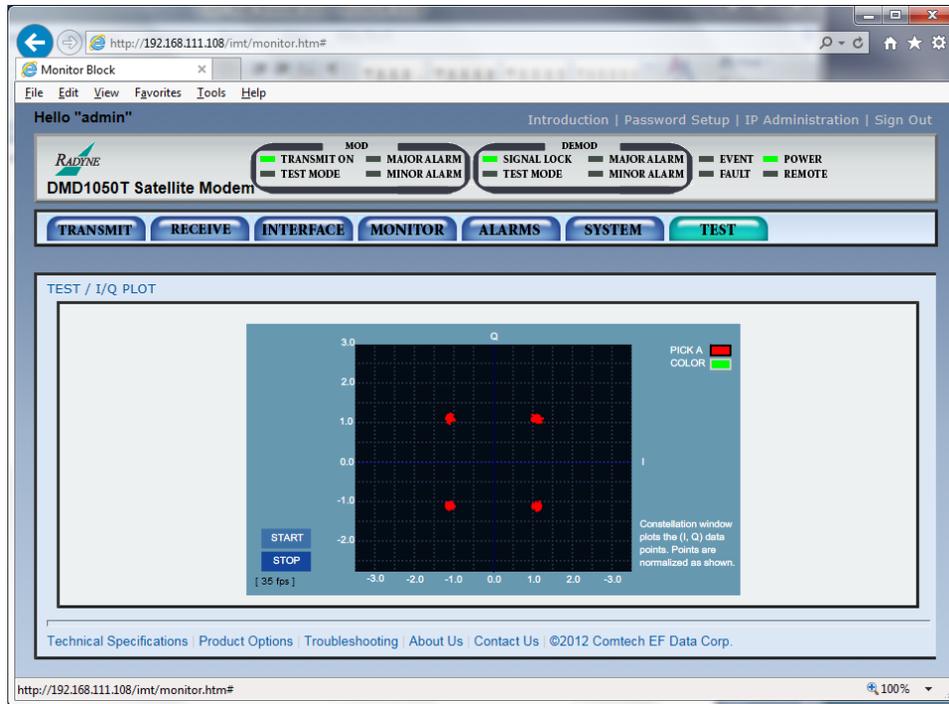
Figure 7-35 Test / IQ Plot page example

**PICK A COLOR:**

- RED, GREEN

**START:**

Click **START** to run the I/Q Plot.

**STOP:**

Click **STOP** to end the I/Q Plot.

## 7.7.6.3 Test / Spectrum Plot page

This shows the RX Input spectrum sampled data as seen by the receiver, with a center frequency of the receiver's tuned frequency.
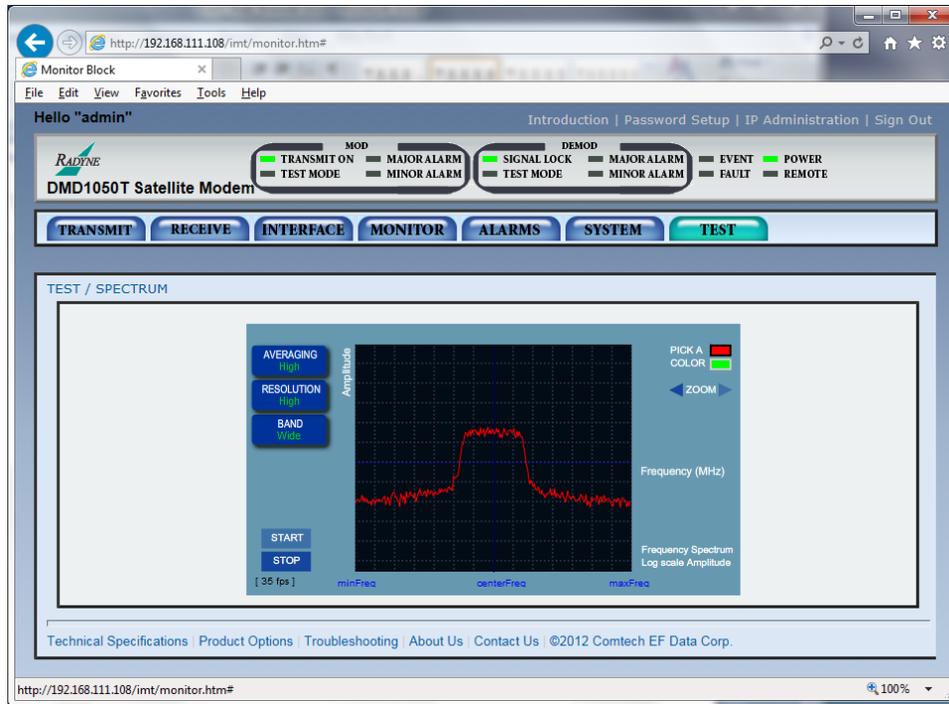
**Figure 7-36 Test / Spectrum Plot page example**

**PICK A COLOR:**

- RED, GREEN

**START:**

Click **START** to run the Spectrum Plot.

**STOP:**

Click **STOP** to end the Spectrum Plot.

## 7.8    TRANSEC Module Overview

The DMD1050T Satellite Modem board can be equipped with the optional FIPs 140 Level 2 certified TRANSEC Module. The TRANSEC Module operates in standalone mode with the DMD1050T Base Modem board.

The DMD1050T is fully compatible and interoperable in all specified modes of operation with KIV-19 Provisional and KG-95-1 Provisional Transmission Security (TRANSEC) equipment currently used by the Government.

MIL-STD-188-114A data rates are higher, up to 20 Mbps.

## 7.9    FIPs TRANSEC Module HTTPS Interface

The user can control and monitor operation of the FIPs TRANSEC Module from its HTTPS (Secure HTTP) Interface.

Tabs at the top of each page allow you to select secondary pages.



The pages in the FIPs TRANSEC Module HTTPS Interface have been designed for optimal performance when using Microsoft's Internet Explorer Ver. 7.0 or higher or Mozilla Firefox Ver. 2.0 or higher. The examples shown use Internet Explorer Ver. 7.0.

## 7.10    Get Access to the TRANSEC Module HTTPS Interface

In the **Address** window of the Web browser, enter: **https://www.xxx.yyy.zzz**

(where www.xxx.yyy.zzz is the IP address of the SLM-5650A TRANSEC Module)



**Figure 7-37 Web Browser Address Window example**

On the access agreement screen, you must click **I AGREE** to open the security module.
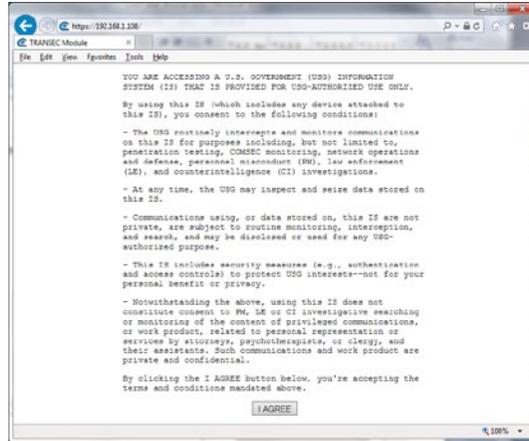
**Figure 7-38 Access Agreement example**

To proceed to the FIPs TRANSEC module, select **Crypto Officer** and click **Go!**



**Figure 7-39**

On the **Login** page, enter a valid Crypto Officer **User Name** and Crypto Officer **Password**.

Click **Log In**.
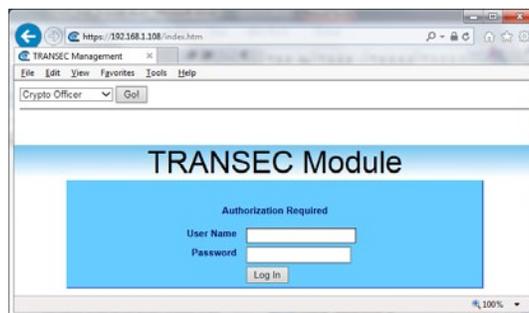


**Figure 7-40**

Defaults are:

- Username:  **comtech**
- Password:  **comtech**

The FIPs TRANSEC Module User Name and Password are each restricted to a minimum of 7 and a maximum of 25 characters, excluding: (ASCII Code 58), < (ASCII Code 60), > (ASCII Code 62), (ASCII Code 34) and ~ (ASCII Code 126).

After the User Name and Password are accepted, the **FIPs TRANSEC Module** home page opens. Click any tab or hyperlink to continue.

Legacy IE browser versions can be used, such as Internet Explorer 6.0. However, Comtech EF Data Technical Support does not provide support services for older browsers. If you have problems connecting to the secure web interface using an older browser, try this troubleshooting technique:

1. Go to the **Tools | Internet Options | Advanced** tab:
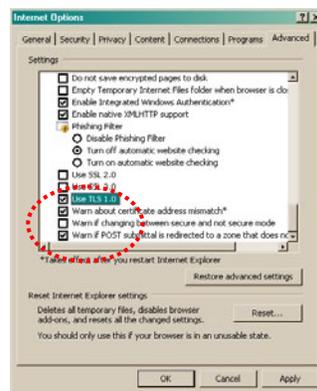


2. Under the **Security** heading, disable the Secure Sockets Layers **SSL 2.0** and **SSL 3.0**.
3. Enable the Transport Layer Security **TLS 1.0**.
4. After you finish troubleshooting, enable **SSL** again.

## 7.11  HTTPS GUI Screen Menus

These main menus show on the startup screen:

- Configuration
- Status
- Log
- Firmware
- Upload

## 7.12 Home page

Use this page to identify the operational firmware version for the FIPs TRANSEC Module.

To go to this page from anywhere in the Web interface, click the Comtech logo.
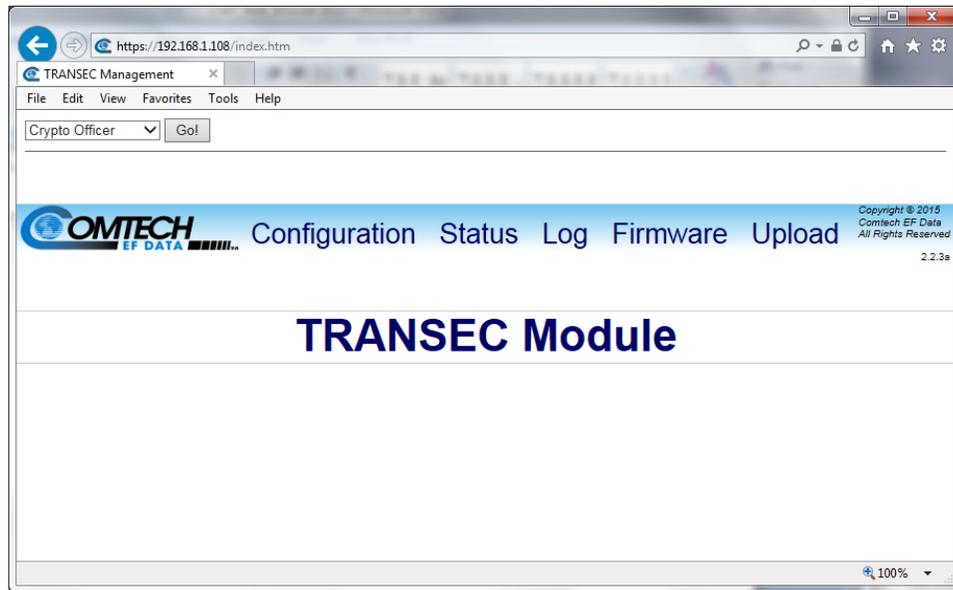


Figure 7-41 Home page example

## 7.13   Configuration page
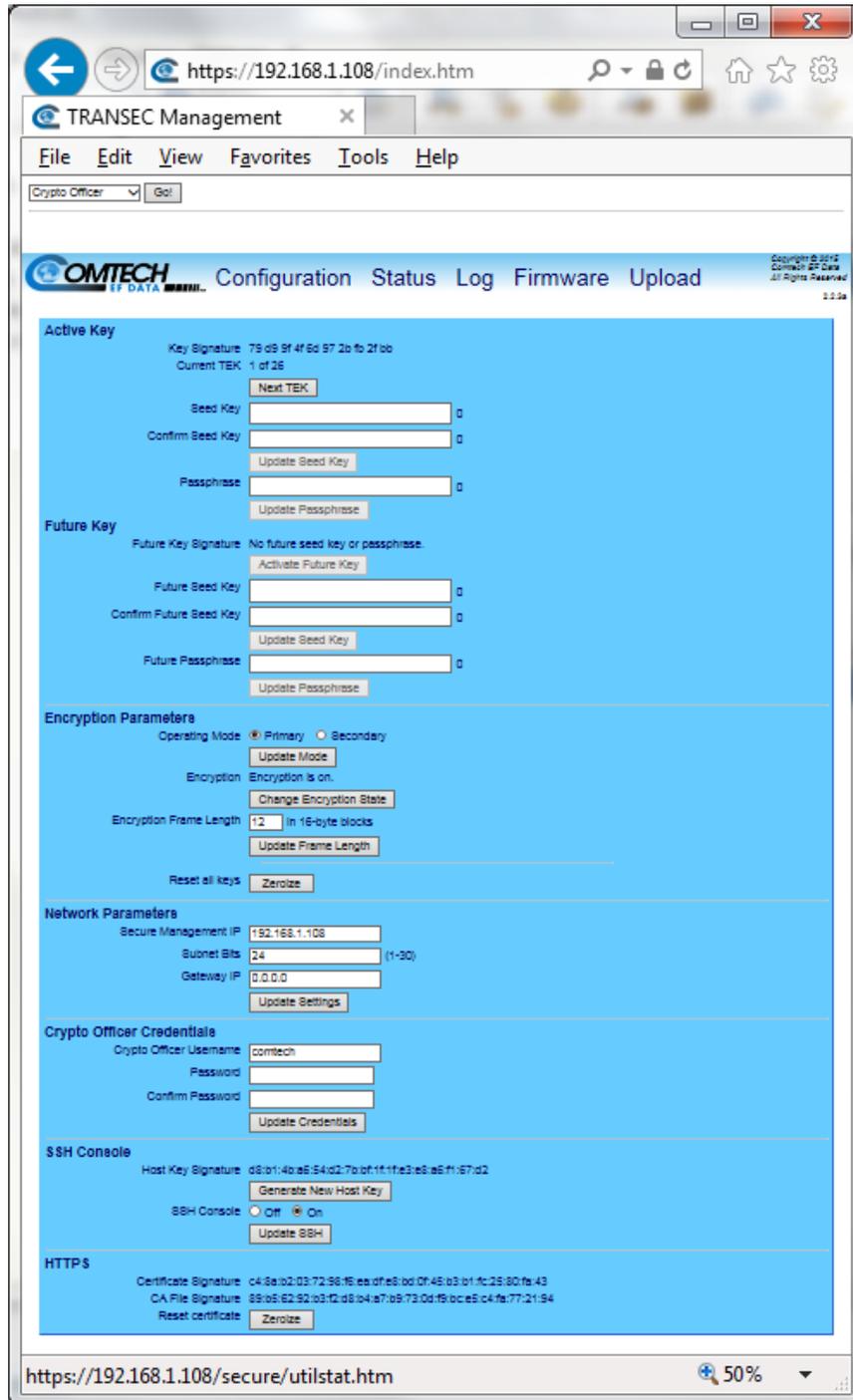


Figure 7-42 Configuration page example

## 7.13.1        Active Key page section

**Key Signature** (read-only)

This is a signature, or fingerprint, of the Transmission Encryption Keys (**TEKs**) generated by the **Seed Key** and **Passphrase**. You can compare signatures on different modems to make sure that each has the same **Seed Key** and **Passphrase**.

The **TEKs** are updated only when a **Passphrase** is submitted.

**Current TEK** (read-only)

You can generate 26 TEKs from the **Seed Key** and **Passphrase**. The active **TEK** (1 through 26) shows here.

To change the encryption key in use, click **Next TEK** to select the next key in the set of 26 TEKs.

The **Next TEK** button is disabled when the module is in secondary mode, and the **Current TEK** mirrors the TEK used by the connected primary modem.

The TEK number never decreases. You cannot reuse a previous key.

To reset the TEK to 1, click **Activate Future Key**.

**Seed Key**

Enter a 32-character **Seed Key** to generate TEKs when the TRANSEC Module is given a **Passphrase**.

**Confirm Seed Key**

Enter the **Seed Key** again, to confirm its accuracy.

Click **Update Seed Key** to save the confirmed change.

**Enter Passphrase**

Enter a 10- to 32-character **Passphrase** that is combined with the **Seed Key** to generate TEKs.

Click **Update Passphrase** to save the change.

## 7.13.2        Future Key page section

**Activate Future Key**

You can program a second **Seed Key** and **Passphrase** to generate a second set of TEKs. These keys will be dormant until you activate them by clicking **Activate Future Key**. These events occur after you click **Activate Future Key:**

- Active TEKs are replaced by TEKs generated with the **Future Seed Key** and **Future Passphrase**.
- The **Current TEK** is reset to 1.
- Secondary modems connected to this modem will activate their **Future Keys**.

The **Activate Future Key** button is available only when these conditions are true:

- The modem is in **Primary** mode; see **Encryption Mode**.
- The **Current TEK** is greater than 1.

**Future Seed Key**

Enter a 32-character **Future Seed Key** to generate a **TEK** when the TRANSEC Module receives a **Future Passphrase**.

**Confirm Future Seed Key**

Enter the **Future Seed Key** again to confirm its accuracy.

Click **Update Seed Key** to save the confirmed change.

**Future Passphrase**

Enter a 10- to 32-character **Passphrase** that is combined with the **Seed Key** to generate TEKs.

Click **Update Passphrase** to save the change.

## 7.13.3        Encryption Parameters page section

**Operating Mode**

Set encryption in the TRANSEC Module as **Primary** or **Secondary**.

In **Primary** mode, the TRANSEC Module lets you advance the TEK and activate the future key independently of any other modems.

In **Secondary** mode, the TRANSEC Module's TEK mirrors the TEK of the primary modem automatically. The module activates the future key when the primary modem activates its future key.

Click **Update Mode** to activate the changed mode.

**Encryption**

Click **Change Encryption State** to show the **On** and **Off** radio buttons. This control helps prevent accidental changes to the Encryption State.

When the Encryption State is **On**, the data traffic is encrypted by the TRANSEC Module, using the current TEK. This encrypted data is delivered to the base modem for transmission, regardless of the state of the receiving modem.

These three parameters must match for encrypted communication to commence between two TRANSEC Module-equipped modems:

- **Seed Key**
- **Passphrase**
- **Encryption Frame Length**

Select **On** or **Off**, then click **Update Encryption** to save the selection. This action hides the **On/Off** radio buttons and updates the status messge: **Encryption is On** or **Encryption is Off**.

### Encryption Frame Length

Specify the length of the Advanced Encryption Standard (AES) 256 encryption frame. The acceptable range is from 1 (fast acquisition, high overhead ) to 255 (slower acquisition, low overhead).

Enter the **Encryption Frame Length** and click **Update Frame Length** to save the change.

### Reset all keys

Click **Zeroize** to reset all encryption keys to default values. All encryption keys in the module's memory and the flash are reset.

### Run self tests

Click **Test** to run the module's cryptographic self tests.
If the tests succeed, the module resumes operation.

If the tests fail, the module reports an error to the event log.

If encryption is enabled and the tests fail, the module stops transmitting data, to protect its integrity.

## 7.13.4     Network Parameters page section

### Secure Management IP

Use this to change the IP address of the TRANSEC Module to work with your operational environment.

If this text box changes, you must repeat the process in **Section7.10**, using the new IP address, to regain access to the TRANSEC Web Interface.

### Subnet Bits

Use this to change the IP subnet mask of the TRANSEC Module to work with your operational environment.

### Gateway IP

Use this to change the default gateway of the TRANSEC Module to work with your operational environment.

The IP address entered in the text box must match the subnet of the Secure Management IP. If it does not, then the Gateway IP text box will default to 0.0.0.0.

Click **Update Settings** to save the changes.

## 7.13.5 Crypto Officer Credentials page section

This section is where you set a TRANSEC Module **Crypto Officer Username** and Crypto Officer **Password.** Each field can have a minimum of **7** and a maximum of **25** characters, excluding **:** (ASCII Code 58), **<** (ASCII Code 60), **>** (ASCII Code 62), **"** (ASCII Code 34) and **~** (ASCII Code 126).

The default for both the **Crypto Officer Username** and **Password** is **comtech**.

### Crypto Officer Username

Use this text box to enter a new **Crypto Officer Username**.

### Password

Use this text box to enter a new **Password** for the new **Crypto Officer Username**.

### Confirm Password

Enter the new **Password** again to confirm its accuracy.

Click **Update Credentials** to save the new **Crypto Officer Username** and **Password**.

## 7.13.6 SSH (Secure Shell) Console page section

### Host Key Signature

This key signature, or fingerprint, helps to identify the TRANSEC Module when connecting through SSH. SSH clients typically show the host key signature when they connect to a system for the first time. The user can compare the host key the SSH client shows with the host key the TRANSEC Module shows to make sure they are the same.

Click **Generate New Host Key** to generate a new host key that identifies the TRANSEC Module uniquely. After this, SSH clients that have connected to the TRANSEC Module previously, when they connect again, will warn or notify you that the host key has changed.

### SSH Console

Click **On** or **Off** to set administrative access to the console, then click **Update SSH** to save this setting.

## 7.14   Status page
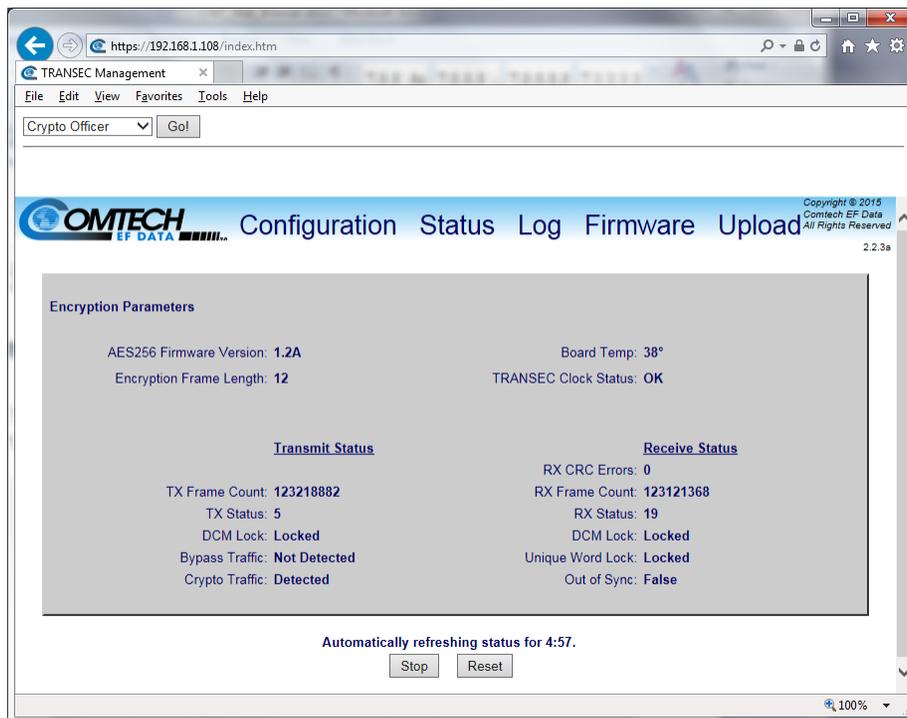


**Figure 7-43 Status | Module Status page**

### 7.14.1      Encryption Parameters page section

#### AES256 Firmware Version

This shows the version of the AES 256 core.

#### Encryption Frame Length

This shows the configured AES 256 frame length.

#### Board Temp

This shows the temperature of the TRANSEC Module.

TRANSEC Clock Status

This shows the DCM locked status for the AES 256 core.

## 7.14.2    Transmit Status page section

### TX Frame Count

This shows the number of transmitted AES 256 frames.

### TX Status

This shows the value of the Tx Status register.

### DCM Lock

This shows the state of the Tx DCM lock.

### Bypass Traffic

This shows the encryption status; **Bypass on** means Encryption is off.

### Crypto Traffic

When **Detected** shows, the module has sampled outgoing traffic and verified it has been encrypted.

When **Not Detected** shows, encryption is off, or the module cannot verify encrypted traffic.

### BIST Done

This shows whether or not the AES 256 core is analyzing the results of its Built-in Self Test (BIST) for the TRANSEC Tx.

## 7.14.3    Receive Status page section

### RX CRC Errors

This shows the count of received CRC errors.

### RX Frame Count

This shows the number of received AES 256 frames.

### RX Status

This shows the value of the Rx Status register.

**DCM Lock**

This shows the state of the Rx DCM lock.

**Unique Word Lock**

This shows that the decryption engine has found the unique word, and has locked to it.

**Out of Sync**

This shows that an out-of-sync condition was detected by the encryption engine.

**BIST Done**

This shows whether or not the AES 256 core is analyzing the results of its Built-in Self Test (BIST) for the TRANSEC Rx.

## 7.14.4      Automatic Refresh Status Timer  page section

For the duration of the countdown timer, the page updates automatically. When the timer reaches **0:00**, the page stops updating to conserve system resources.

To stop the timer, click **Stop.** To restart the timer from the beginning, click **Reset**.

## 7.15  Log (Event Log)

Use this page to see the events log specific to the TRANSEC Module, and to monitor and troubleshoot the TRANSEC Module.
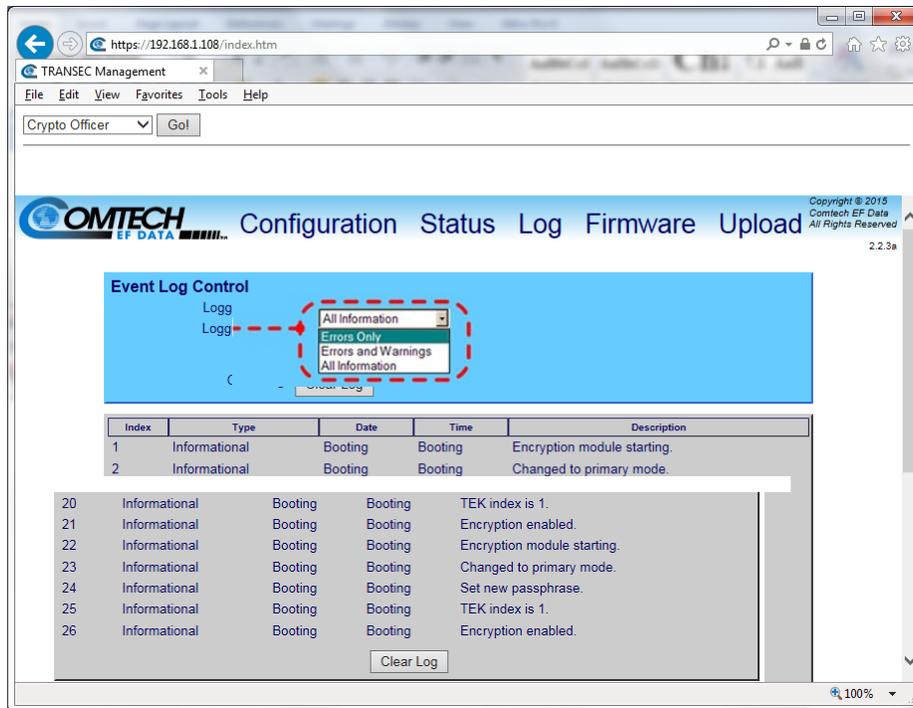
Figure 7-44 Log page (TRANSEC log)

## 7.15.1       Event Log Control page section

### Logging On/Off

Use this to enable or disable logging of event messages.

### Logging Level

Use this drop-down menu to control the maximum filtering level of log messages. Choices are **Errors Only**, **Errors and Warnings** and **All Information**.

Click **Submit** to save these settings.

## 7.15.2       Event Log page section

### Index

The event messages are numbered in the order in which they are received.

### Type

**Type** shows the severity of the event.

### Date

This shows the date on which the event was logged, uses MONTH/DAY/YEAR format.

### Time

This shows the time of day when the event was logged, uses 24-hour format.

### Description

This gives a brief description of the event.

Click **Clear Log** to clear the event log of all messages. The event log is reset to zero entries.

## 7.15.2.1    Event Types

Event types are described here, and listed by order of severity, from least to worst case.

### Type: Informational

This is a normal operational status change; e.g., a successful password or configuration change.

Severity: Minimum, the event logged is for reference only.

### Type: Warning

This is a status change that the system might not accept or expect; e.g., setting the future passphrase without first setting the future seed key, entering an invalid remote command, etc.

Severity: Moderate, see the applicable sections of this manual to troubleshoot, then repeat command or procedure as needed.

### Type: Minor

This is an error condition that the system should be able to recover from without affecting the operation of the system; e.g., encountering software bug, etc.

Such events are not recorded in the Events Log.

Severity: Moderate, when convenient, report the issues to Comtech EF Data Customer Support.

### Type: Major

This is a more severe error that can mean a degradation of the system stability exists; e.g., out-of-range temperature readings for the TRANSEC Module, etc.

Severity: Maximum, contact Comtech EF Data Customer Support as soon as possible.

**Type: Critical**

This is the most severe error level, meaning that system failure has occurred or is imminent; e.g., memory allocation failure, OS failure, etc.

Severity: Maximum, contact Comtech EF Data Customer Support **immediately** to arrange for an RMA and in-factory service

## 7.16    Firmware
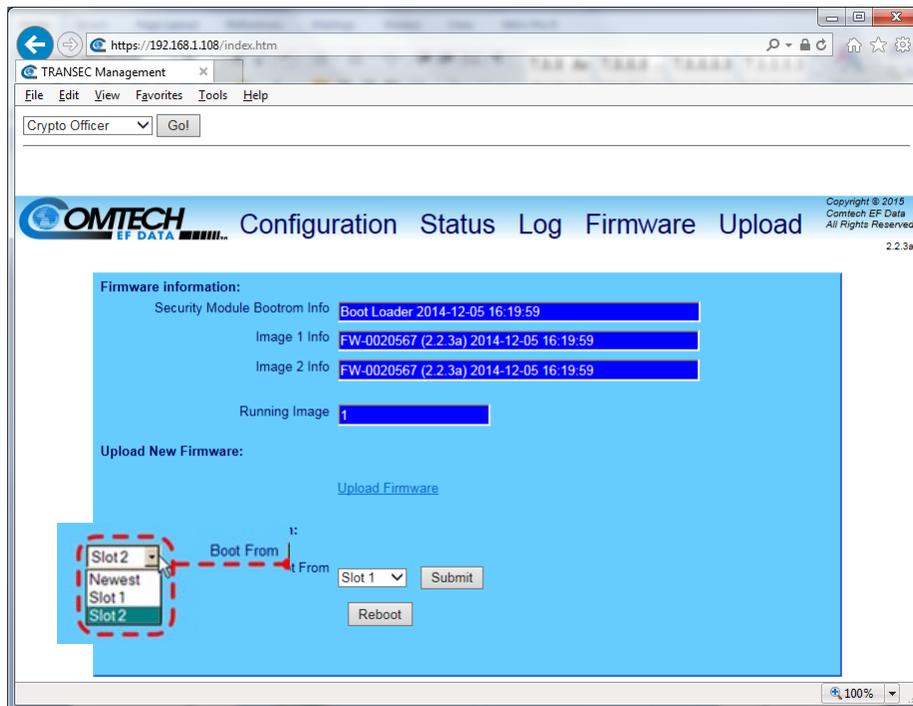


Figure 7-45 Firmware Page

## 7.17   Upload

Use this *read-only* page to see the **Firmware Information** window. Use the information to make sure that the correct firmware is loaded into the unit.
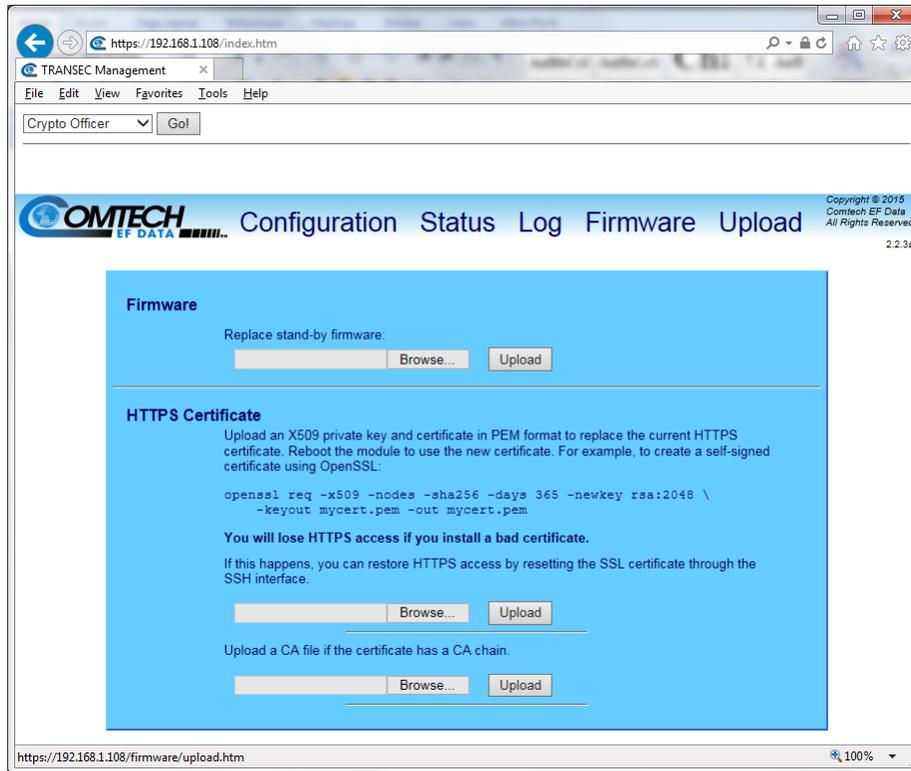


**Figure 7-46. Upload page**

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# Chapter 8.  TRANSEC Module HTTPS Interface

## 8.1    TRANSEC Module Overview

The DMD1050T Satellite Modem Board is equipped with the optional TRANSEC Module Interface.

The DMD1050T is fully compatible and interoperable in all specified modes of operation, with KIV-19 Provisional and KG-95-1 Provisional Transmission Security (TRANSEC) equipment used by the Government.

The TRANSEC Module Interface provides a proxy function of HTTPS connections to the Base Modem. Thus, a secure HTTPS connection to the TRANSEC Module allows secure user access to all Base Modem parameters through this indirect proxy connection. The secure management interfaces supported by the TRANSEC Module Interface are listed here:

| Base Modem | TRANSEC Module |
|---|---|
| HTTPS (Proxy via TRANSEC Module) | HTTPS |
| SNMPv3 | SSH |

## 8.2    TRANSEC Module HTTPS Interface

You can control and monitor operation of the DMD1050T TRANSEC Module from its HTTPS (Secure HTTP) Interface. Hold the cursor over the tabs at the top of each page. Select from the available nested hyperlinks.



The pages in the DMD1050T TRANSEC Module HTTPS Interface have been designed for optimal performance when using Microsoft's Internet Explorer Ver. 7.0 or higher, or Mozilla Firefox Ver. 2.0 or higher. The examples use Internet Explorer Ver. 7.0.

## 8.3    Open the TRANSEC Module HTTPS Interface

From the PC, type the IP address of the DMD1050T TRANSEC Module into the **Address** area of the Web browser. In the example, www.xxx.yyy.zzz represents the IP address of TRANSEC Module.



If a Security Alert shows, click **Continue to this website** to continue.
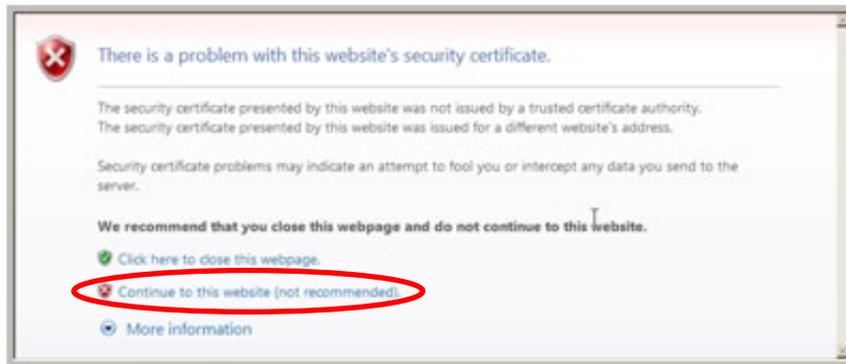


From any page in the TRANSEC Module HTTPS interface, use the **Interface Navigator** to select one of the modes of operation.



**Crypto Officer:** Connects to the secure TRANSEC Module HTTPS Interface (**User Name** and **Password** required).

**Modem Operator:** Connects to the Base Modem HTTP Interface. See Chapter 7. Web Browser for more information.

To continue to the TRANSEC Module HTTPS Interface pages, select **Crypto Officer** from the drop-down, then click **Go!.**
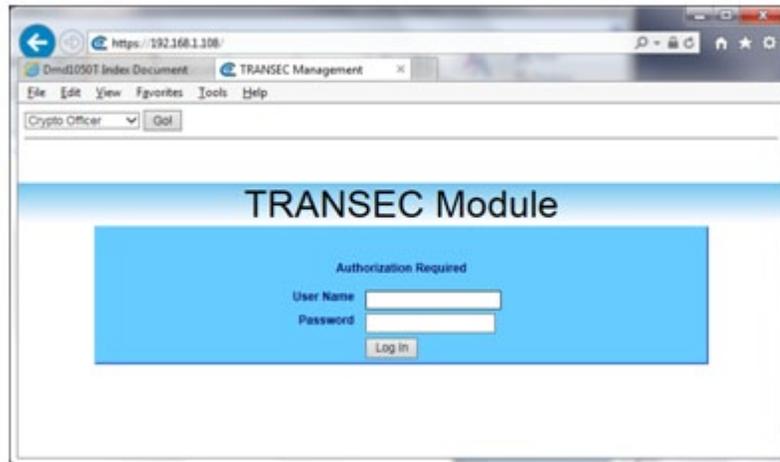


On the **Login** page, type in a valid Crypto Officer **User Name** and Crypto Officer **Password** . The default for both is **comtech.** Click **Log In**.

The TRANSEC Module User Name and Password are each restricted to a minimum of 7 and a maximum of 25 characters, excluding: (ASCII Code 58), < (ASCII Code 60), > (ASCII Code 62), " (ASCII Code 34), and ~ (ASCII Code 126).

Once the **User Name** and **Password** are accepted, the TRANSEC Module **Home** page opens. See Figure 8-1. Click any tab or hyperlink to continue.

While legacy IE browser versions ( e.g., Internet Explorer 6.0), can be used, Comtech EF Data Technical Support does not support services for these older browsers. If you have problems connecting to the secure web interface using an older browser, try this troubleshooting tip:

1. From the browser tool bar, go to the **Tools | Internet Options | Advanced** tab. See Figure 8-1.
2. Under the **Security** heading, use the check boxes to:
   a. Disable the Secure Sockets Layers (SSL 2.0 and SSL 3.0).
   b. Enable the Transport Layer Security (TLS 1.0).
3. Make sure to enable SSL again, once troubleshooting is finished.
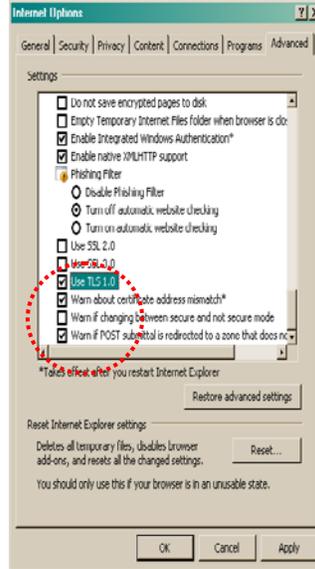
Figure 8-1 Tools | Internet Options | Advanced | Security Settings

## 8.3.1  HTTPS Interface Menu Tree

This menu tree diagram shows the options available via the TRANSEC Module HTTPS Interface:

| Interface Navigator Drop-down Menu | Page Navigation Tabs | | | | |
|---|---|---|---|---|---|
| | Configuration | Status | Log | Firmware | Upload |
| Crypto Officer | | | | | |
| Modem Operator | | | | | |
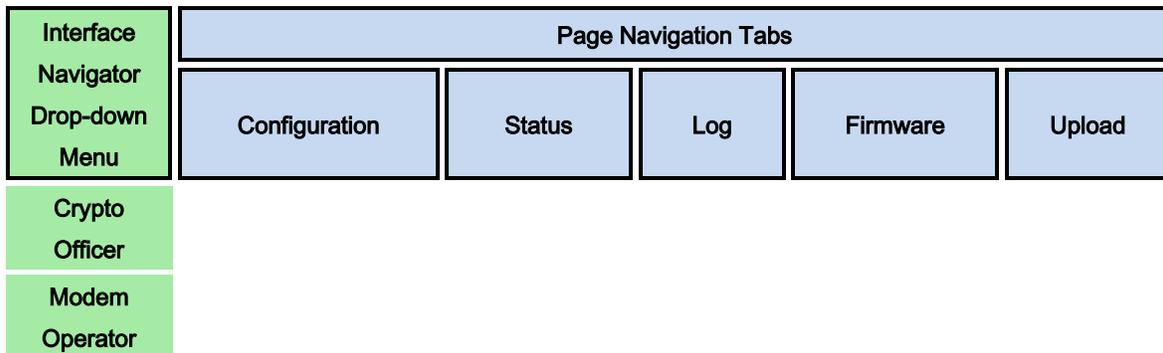
The **Interface Navigator Drop-down Menu** and its selections (shown in green) allow secure access to one of the DMD1050T's three, distinct Web interfaces.

Once **Crypto Officer** (i.e., the TRANSEC Module HTTPS Interface) is selected, the four, available navigation tabs (shown in blue) are available:

| Configuration | Status | Log | Firmware | Upload |
|---|---|---|---|---|

Click any tab or hyperlink to continue.

## 8.4    TRANSEC Module HTTPS Interface Page Descriptions

### 8.4.1  Home page

The DMD1050T TRANSEC Module's operational (Firmware) Version shows on the **Home** page. Click the Comtech logo anywhere in the HTTPS Interface to go to the **Home** page.
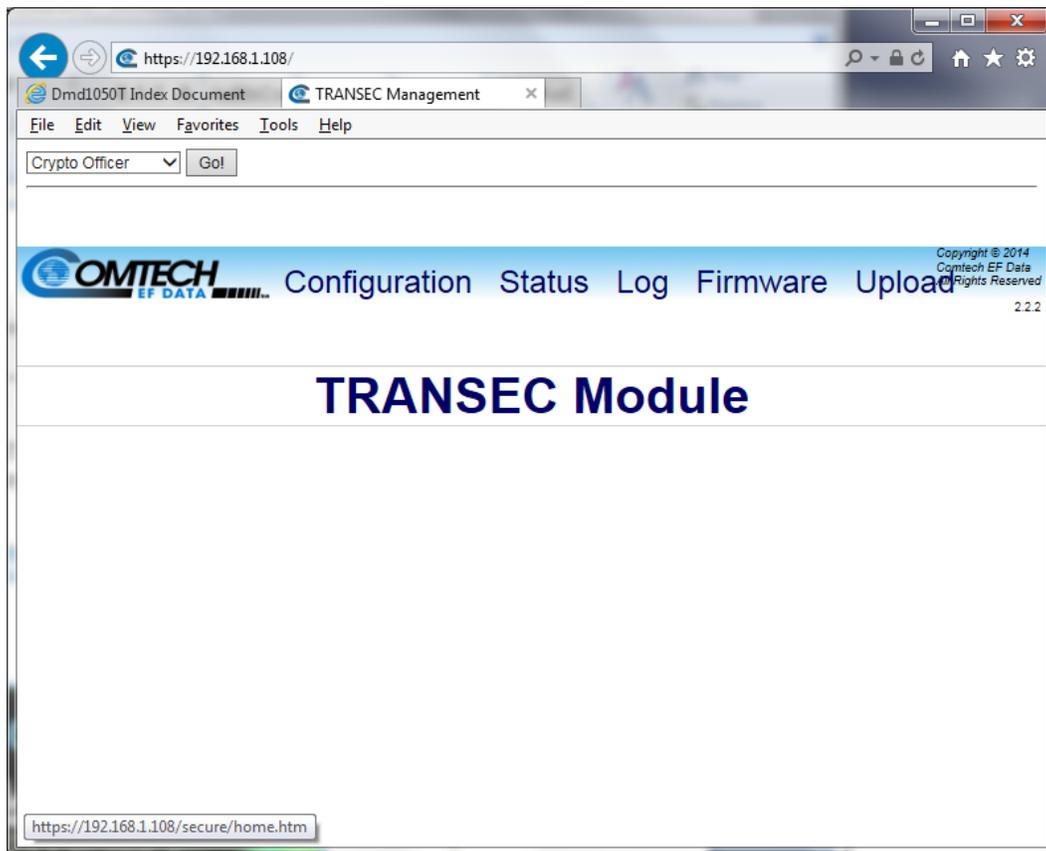


Figure 8-2. Home page

## 8.4.2   Configuration page
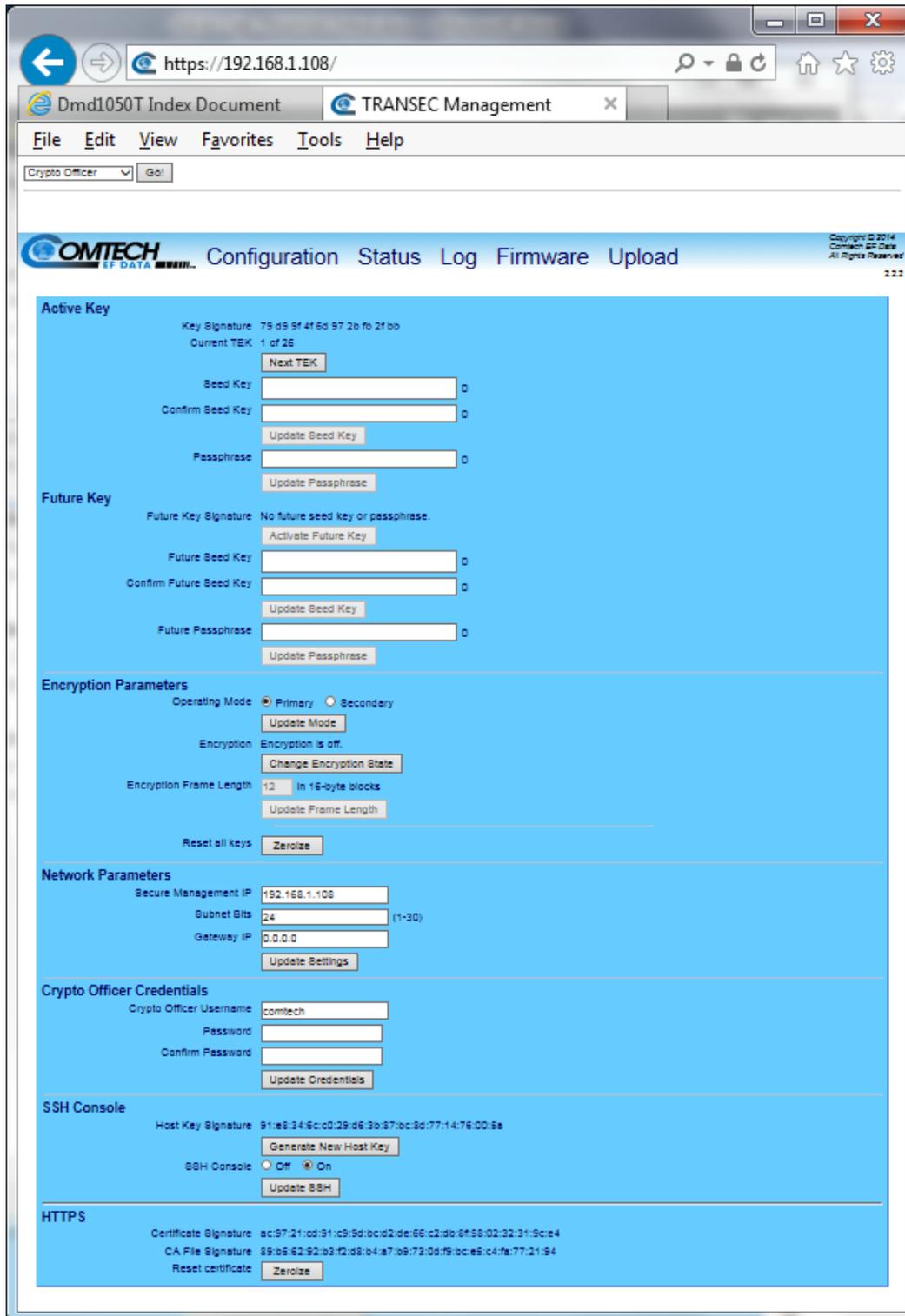


Figure 8-3. Configuration Page

## 8.4.2.1        Active Key

### 8.4.2.1.1        Key Signature (read-only)

This is a signature, or fingerprint, of the Transmission Encryption Keys (TEKs) generated by the Seed Key and Passphrase. Use it to compare signatures on different modems, to make sure that each has the same Seed Key and Passphrase.

The TEKs are updated only when a Passphrase is submitted.

### 8.4.2.1.2        Current TEK (read-only)

Current TEK shows the number of the active TEK that is encrypting traffic. You can generate 26 TEKs from the Seed Key and Passphrase.

To change the encryption key in use, click **Next TEK** to select the next key in the set of 26 TEKs.

The TEK number cannot decrease. You cannot reuse a previous key. To reset the TEK to 1, you must click **Activate Future Key**.

When the module is in Secondary mode, the **Next TEK** button is disabled. In this mode, the current TEK mirrors the TEK used by the connected primary modem.

### 8.4.2.1.3        Seed Key (write-only)

To generate TEKs when the TRANSEC Module is given a Passphrase, enter a 32-character Seed Key in this text box.

### 8.4.2.1.4        Confirm Seed Key (write-only)

Enter the newly created Seed Key in this text box, to confirm it is accurate.

After you confirm the Seed Key, click **Update Seed Key** to save this change.

### 8.4.2.1.5        Enter Passphrase (write-only)

This entry accepts a 10- to 32-character Passphrase that combines with the Seed Key to generate TEKs.

After you enter the Passphrase, click **Update Passphrase** to save this change.

## 8.4.2.2　　　Future Key

### 8.4.2.2.1　　Activate Future Key

You can program a second Seed Key and Passphrase to generate a second set of TEKs. These keys are dormant until you click **Activate Future Key**.

After you click **Activate Future Key**:

- The TEKs generated with the Future Seed Key and Future Passphrase replace the active TEKs.
- The Current TEK is reset to 1.
- Secondary modems connected to this one activate their Future Keys.

The Activate Future Key button is available only when these conditions are true:

- The modem is in Primary mode.
- The Current TEK is more than 1.

### 8.4.2.2.2　　Future Seed Key (write-only)

When the TRANSEC Module receives a Future Passphrase, enter a 32-character Future Seed Key to generate a TEK.

### 8.4.2.2.3　　Confirm Future Seed Key (write-only)

Enter the newly created Future Seed Key in this text box, to confirm it is accurate.

After you confirm the Future Seed Key, click **Update Seed Key** to save this change.

### 8.4.2.2.4　　Future Passphrase (write-only)

This entry accepts a 10- to 32-character Passphrase that combines with the Seed Key to generate TEKs.

After you enter the Passphrase, click **Update Passphrase** to save this change.

## 8.4.2.3　　　Encryption Parameters

### 8.4.2.3.1　　Operating Mode

Set the encryption Operating Mode to Primary or Secondary.

In Primary mode, the TRANSEC Module lets you advance the TEK number and activate the future key, independently of any other modems.

In Secondary mode, the TRANSEC Module's TEK number automatically mirrors that of the primary modem. The module activates the future key when the primary modem activates its future key.

Click **Update Mode** when done.

## 8.4.2.3.2   Encryption

Click **Change Encryption State** to show the **On** and **Off** radio buttons. This control helps prevent the Encryption State from accidental change.

Select **On** to cause data traffic to be encrypted using the current TEK. This encrypted data is delivered to the base modem for transmission,  regardless of the state of the receiving modem.

Three parameters must match for encrypted communication between two TRANSEC Module-equipped modems to begin:

- Seed Key
- Passphrase
- Encryption Frame Length

Select the Encryption state, then click **Update Mode.** The selected state is saved, and the **On** and **Off** radio buttons are hidden. The Encryption state message changes to show the new state: **Encryption is On** or **Encryption is Off**.

## 8.4.2.3.3   Encryption Frame Length

Use this text box to specify the length of the Advanced Encryption Standard (AES) 256 encryption frame. The acceptable range is from 1 (fast acquisition, high overhead ) to 255 (slower acquisition, low overhead).

After you enter the Encryption Frame Length, click **Update Frame Length** to save this change.

## 8.4.2.3.4   Reset all keys

To reset all encryption keys in the module's memory and flash to default values, click **Zeroize**.

Click **Test** to run the module's cryptographic self tests.

- If the tests succeed, the module resumes operation.
- If the tests fail, the module reports an error to the event log.
- If encryption is on, and the tests fail, the module stops transmitting data.

## 8.4.2.4        Network Parameters

### 8.4.2.4.1    Secure Management IP

Use this text box to change the IP address of the TRANSEC Module to suit the operational environment.

If this text box changes, you must repeat the steps in Section 8.3, using the new IP address, to regain access to the TRANSEC Web Interface.

### 8.4.2.4.2    Subnet Bits

Allows users to change the IP subnet mask of the TRANSEC Module to suit their own operational environment.

### 8.4.2.4.3    Gateway IP

Use this to change the default gateway of the TRANSEC Module to be applicable to the operational environment.

> NOTE:  The IP address entered in the text box must match the subnet of the Secure Management IP. If it does not, then the Gateway IP text box will default to 0.0.0.0.

Click **Update Settings** to save changes made to any of these parameters.

## 8.4.2.5        Crypto Officer Credentials

Create a TRANSEC Module **Crypto Officer Username** and **Crypto Officer Password.** Note that are each restricted to a minimum of **7,** and a maximum of **25** characters, excluding: (ASCII Code 58), **<** (ASCII Code 60), **>** (ASCII Code 62), **"** (ASCII Code 34), and **~** (ASCII Code 126).

The default for both the **Crypto Officer Username** and **Password** is **comtech**.

After the **Username** is entered and the **Password** is confirmed, click **Update Credentials** to save this change.

## 8.4.2.6        Secure Shell (SSH) Console

### 8.4.2.6.1    Host Key Signature

This key signature, or fingerprint, helps to identify the TRANSEC Module when connecting through SSH. Typically, SSH clients show the host key signature when they connect to a system for the first time. You

can compare the host key the SSH client shows with the host key of the TRANSEC Module to make sure that they are the same.

Click **Generate New Host Key** to generate a new host key that identifies the TRANSEC Module uniquely.

After a new host key is generated, SSH clients that have connected to the TRANSEC Module previously will notify or warn users that the host key has changed, when they connect again.

### 8.4.2.6.2    SSH Console

Click **On** or **Off** to set administrative access to the console. Click **Update SSH** to save this setting.

## 8.4.3  Status | Module Status
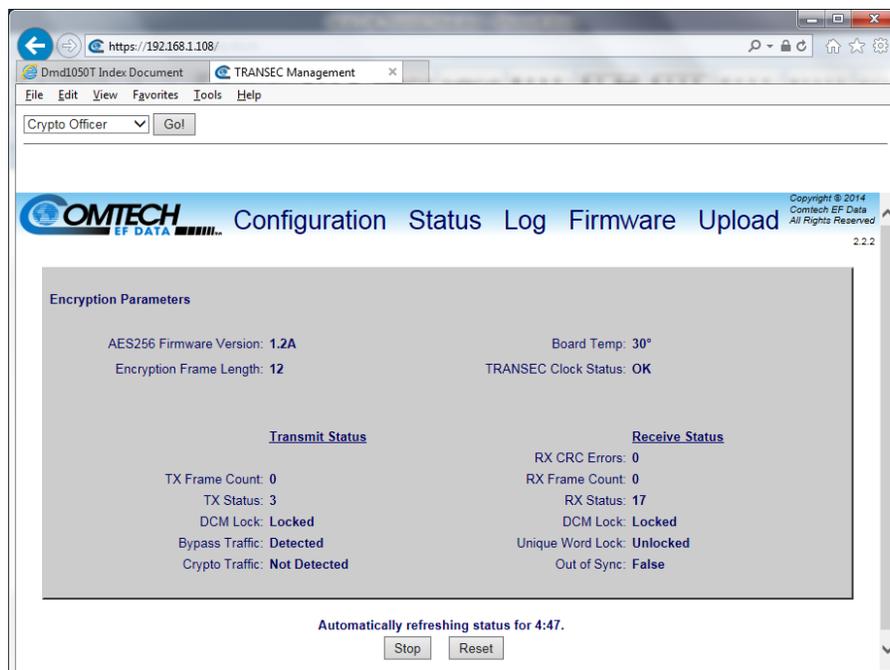


Figure 8-4. Module Status page

### 8.4.3.1     Encryption Parameters

**AES256 Firmware Version**:

- Identifies the version of the AES 256 core

**Encryption Frame Length**:

- Shows the configured AES 256 frame length

**Board Temp**:

- Shows the temperature of the TRANSEC Module

**TRANSEC Clock Status**:

- Shows the DCM locked status for the AES 256 core

## 8.4.3.2    Transmit Status

**TX Frame Count**:

- Shows the number of transmitted AES 256 frames

**TX Status**:

- Describes the value of the Tx Status register

**DCM Lock**:

- Shows the state of the Tx DCM lock

**Bypass Traffic**:

- Shows the encryption status (**Bypass on** means **Encryption off**)

**Crypto Traffic**:

- When **Detected**, the module samples outgoing traffic and verifies it has been encrypted. When **Not Detected**, encryption is off, or the module cannot verify encrypted traffic.

**BIST Done**:

- Shows whether or not the AES 256 core is analyzing the results of its Built-in Self Test (BIST) for the TRANSEC Tx

## 8.4.3.3    Receive Status

**RX CRC Errors**:

- Shows the count of received CRC errors

**RX Frame Count**:

- Shows the number of received AES 256 frames

**RX Status**:

- Shows the value of the Rx Status register

**DCM Lock:**

- Shows the state of the Rx DCM lock

**Unique Word Lock:**

- Shows that the decryption engine has found the unique word and locked to it

**Out of Sync:**

- Shows that an out-of-sync condition has been detected by the encryption engine

**BIST Done:**

- Shows whether or not the AES 256 core is analyzing the results of its Built-in Self Test (BIST) for the TRANSEC Rx

## 8.4.3.4     Automatic Refresh Status Timer

The page updates automatically for the duration of the countdown timer. To help conserve system resources, the updates stop when the timer reaches **0:00**.

To override the timer manually, click **Stop** to interrupt, or **Reset** to restart the timer.

## 8.4.3.5     Log

Use this page to see the events log specific to the TRANSEC Module, and to monitor and troubleshoot the health of the TRANSEC Module.
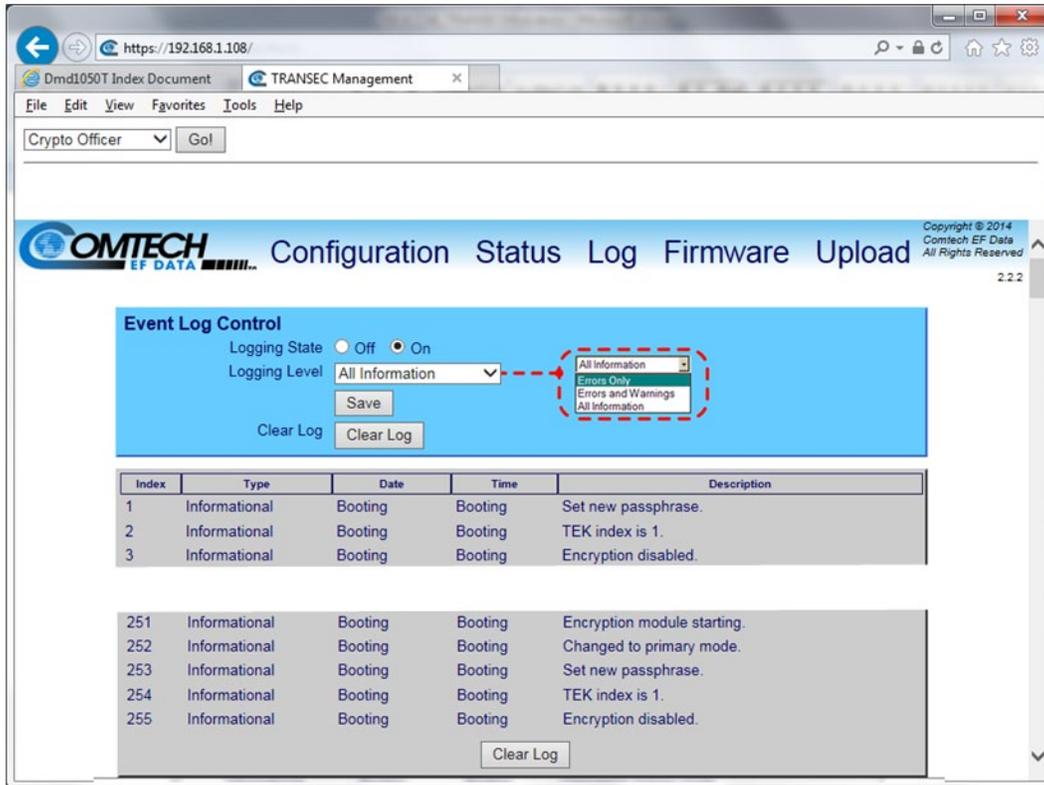
**Figure 8-5 Log Page**

## 8.4.3.6      Event Log Control

### Logging On/Off:

- Enables/disables logging of event messages

### Logging Level:

- This drop-down menu controls the maximum filtering level of messages. Choices are Errors Only, Errors and Warnings, and All Information.

Click **Submit** to save the settings.

## 8.4.3.7      Event Log

### Index:

- The event messages are numbered in the order they are received.

### Type:

- Describes the severity of the event.

**Date**:

- Shows the date when the event was logged, using MONTH/DAY/YEAR format.

**Time**:

- Shows the time of day when the event was logged, in 24-hour format.

**Category**:

- All messages in this log are categorized as EventLog.

## 8.4.3.7.1    Event Log Message Types

Event Log Message Types are listed here by order of severity, from least to worst.

**Informational:**

- Normal operational status change; e.g., successful password or configuration setting change
- Level of Severity / User Action:
    - o  Minimum / Event logged is for user reference only.

**Warning:**

- Status change that the system might not accept or expect; e.g., setting the future passphrase without first setting the future seed key, entering an invalid remote command, etc.
- Level of Severity / User Action:
    - o  Moderate / See the applicable sections of this manual to troubleshoot, then repeat command or procedure as necessary.

**Minor:**

- Error condition that the system recovers from typically, without affecting its operation; e.g., encountering software bug, etc.
- Such events are not recorded in the Events Log
- Level of Severity / User Action:
    - o  Moderate / Contact Comtech EF Data Customer Support when convenient; use the DMD1050T TRANSEC Module Web Interface Home page, or use the DMD1050T Web Server Interface Home.

**Major:**

- A more severe error that means system stability has degraded; e.g., out-of-range temperature readings for the TRANSEC Module, etc.
- Level of Severity / User Action:
    - o  Maximum / Contact Comtech EF Data Customer Support as soon as possible

**Critical:**

- The most severe error level, meaning system failure has occurred, or is imminent; e.g., memory allocation failure, OS failure, etc.
- Level of Severity / User Action:
  - Maximum / Contact Comtech EF Data Customer Support immediately; arrange for RMA / in-factory service

**Clear Log:**

To clear the event log of all messages, click **Clear Log**. The event log is reset to zero entries.

## 8.4.4  Firmware Info

Use this scrollable, read-only page to see the **Firmware Information** window. The information shown helps you to make sure that the correct firmware is loaded in the unit.
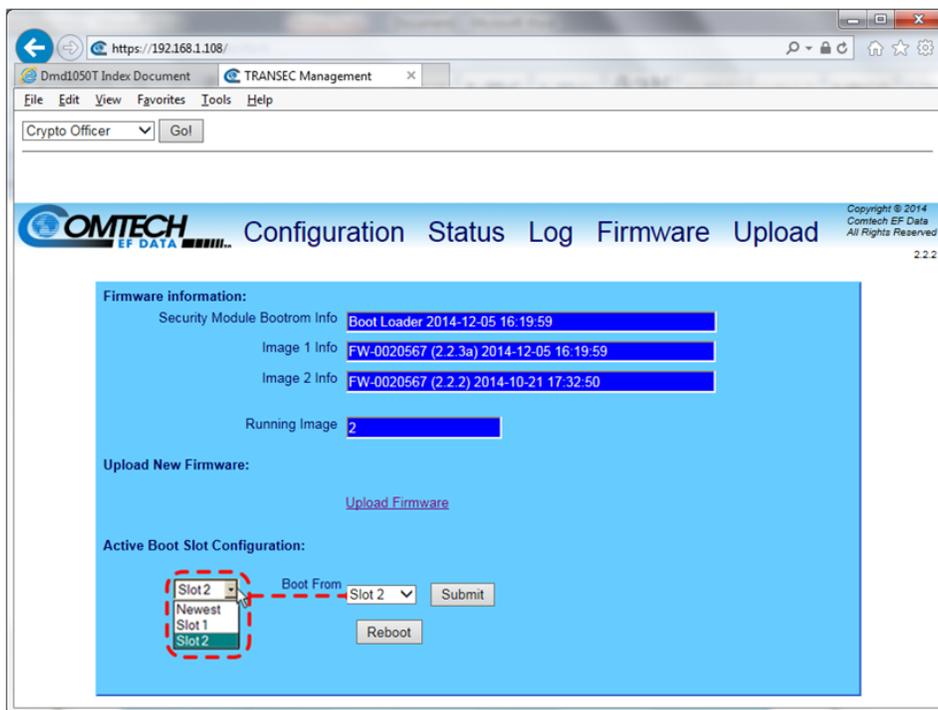


**Figure 8-6 Firmware Unit Info Page**
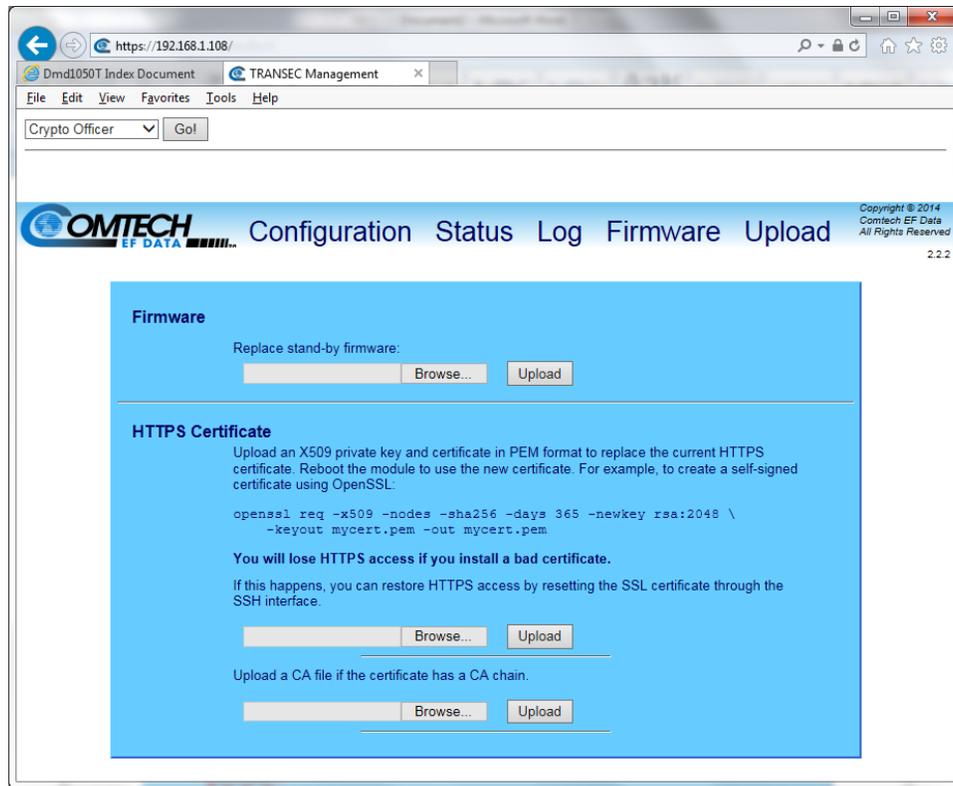
## 8.5    TRANSEC Module Update Procedure

### 8.5.1  Get the Firmware Update Files

Firmware updates for the TRANSEC Module are not available from the Comtech EF Data Web site.

Instead, contact Comtech EF Data Customer Support to request Firmware updates for the TRANSEC Module.

1.  Contact Comtech EF Data Customer Support during normal business hours.

2.  Request delivery of the Unified TRANSEC Module firmware update files.

3.  The Customer Support representative will arrange for full firmware access information and download privileges at that time.

4.  To help with identification, use the **TRANSEC Module HTTPS Interface > Firmware Info**, to see the Bootrom, Bulk1 and Bulk2 firmware loads information.

5.  Create a temporary directory on an external PC.
    This example uses drive letter **c:**. You can use any valid, writable drive letter.

    a.  Windows Explorer:

        i.   Select **File > New > Folder** to create a new directory.

        ii.  Rename the new directory to "temp", or another unused name. Example: c:\temp

    b.  Windows Command-line:

     i.  Click **Start** on the Windows taskbar

     ii.  Click **Run...**

c.  Otherwise, depending on Windows versions prior to Windows 95, click the **MS-DOS Prompt** icon from the Main Menu.

     i.  Open a Command-line window:

     ii.  For Windows 95 or Windows 98, type **command**.

     iii.  For any Windows versions later than Windows 98, type **cmd** or **command**.

     iv.  Alternatively, from **Start**, select **All Programs > Accessories > Command Prompt**.

     v.  At the Command-line prompt (c:\>), type **mkdir temp** or **md temp**

The commands **mkdir** and **md** mean make directory. This is the same as creating a new folder in Windows Explorer.

6. Make sure a subdirectory was created. Example: c:\temp

7. Download the correct firmware file from Comtech EF Data Customer Support to the temporary directory.
The DMD1050T TRANSEC Module firmware is **FW-0020567x**, where "x" is the firmware revision letter.

8. Extract this file to the temporary directory: Fw-0020567x.bin, where "x" is the revision letter of the module bulk image file.

9. Confirm that the files were extracted to the specified temporary directory:

a. Use Command-line to type **cd c:\temp,** to change to the temporary directory.

**b.** Use the **dir** command to list the files in the temporary directory.

## 8.5.2  Connect the PC to the DMD1050T

1. Connect the PC to the modem's Ethernet via a hub or a switch; or, directly to the PC with a crossover cable.

2. To confirm the connection and communication, send a ping command to the TRANSEC Module:

a. Find the IP address of the TRANSEC Module, using the modem's Web Browser interface or the terminal interface.

b. Use Command-line to type **ping xxx.xxx.xxx.xxx**, where xxx.xxx.xxx.xxx is the TRANSEC Module's IP address.

c. Examine the response to confirm whether or not the module is connected and communicating.

## 8.5.3  Log In to the TRANSEC Module

3. Open a secure Web session with the TRANSEC Module via its HTTPS Interface. The example uses Internet Explorer Version 7.0.

4.    In the **Address** area of the Web browser, type **https://xxx.xxx.xxx.xxx**, where xxx.xxx.xxx.xxx is the IP address of the TRANSEC Module:



5.    Select **Crypto Officer** from the selection list in the upper left corner of the page.
6.    Click **Go!**.



7.    At the **Login** page, enter the **User Name** and **Password**:
      a.    Factory default **User Name** is **comtech**
      b.    Factory default **Password** is **comtech**

## 8.5.4  Update the TRANSEC Module bulk firmware

1.    Go to the **Upload** page:
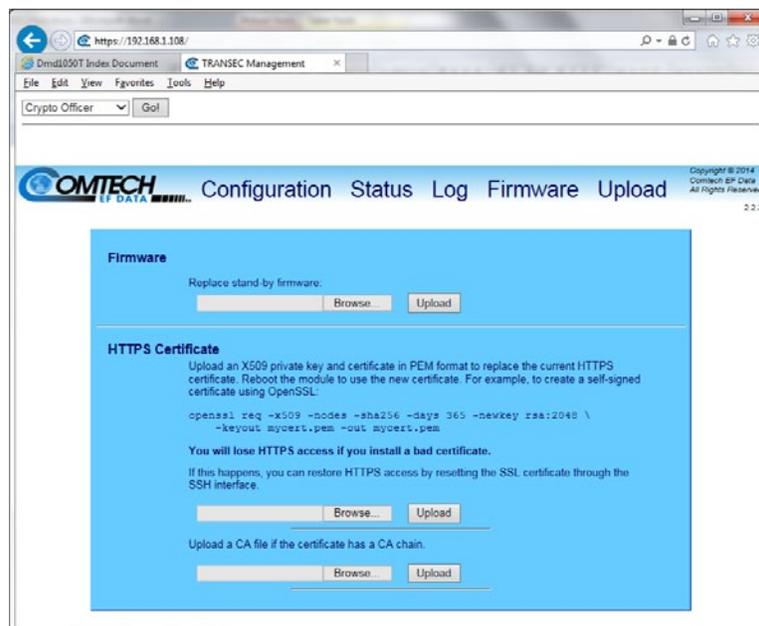


2.    In the **Firmware** section of the page, browse to the update file on the PC:
      a.    Click **Browse**. The **Choose File** dialog box opens.
      b.    Find the temporary folder created for the file download;

       c.    Double-click the folder name.

       d.    Select the module bulk image file, then click **Open**. The filename shows in the **Upgrade Bulk File** text box.

3.    Click **Upload**.

4.    Wait while the file transfers.

While the TRANSEC Module transfers and uploads the file, the **Firmware Application Process** page shows a progress bar.
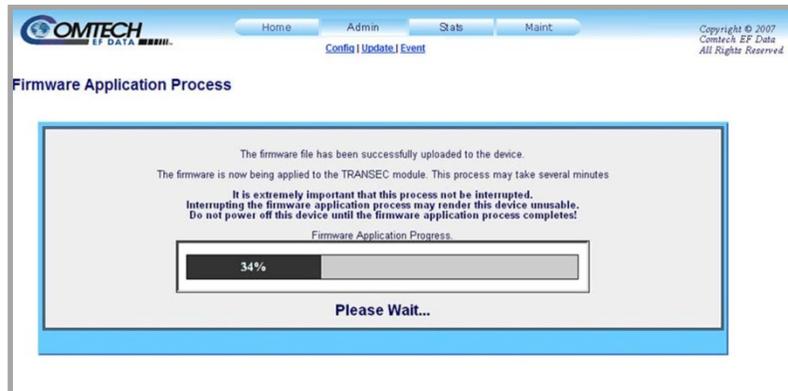


Allow sufficient time for the file to upload. Approximately five minutes is necessary for the process to finish.

 **CAUTION**

    Any power failure during this process will cause the TRANSEC Module to fail.

If an error occurs during the Firmware Application Process, this error message shows:
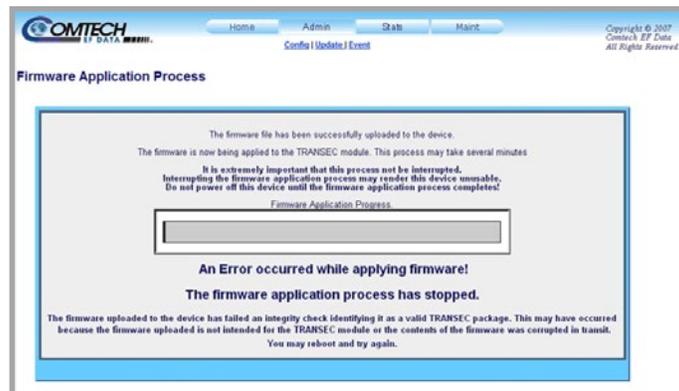


For troubleshooting purposes, common reasons for errors are:

- Power Failure

- Loss of Ethernet signal (e.g., disconnection of Ethernet cable)
- Attempting to load incorrect firmware

Upon successful completion of the transfer, the progress bar shows **100%,** and the message **Firmware Application Process Complete!** shows:
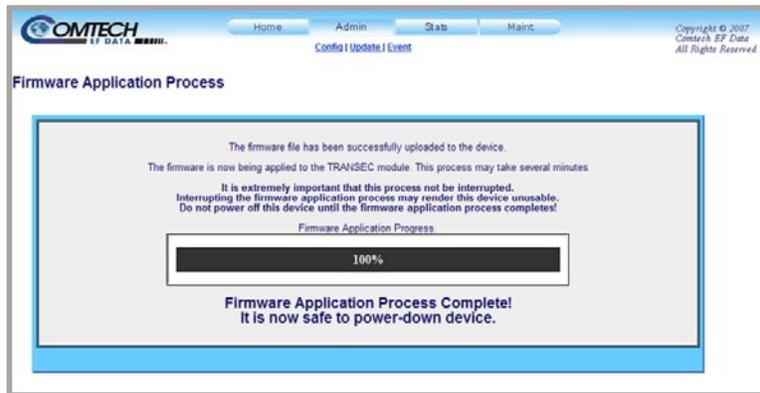


## 8.5.5 Confirm the upload

1. On the **Admin | Update Firmware** page, **make sure** that the uploaded firmware shows in the correct **Security Module Bulk Info** slot.
2. Otherwise, update the **Active Boot Slot Configuration:**
   a. Use the drop-down menu to select **Newest.**
   This causes the TRANSEC Module to boot using the firmware with the most recent build date.
   b. Click **Submit**.
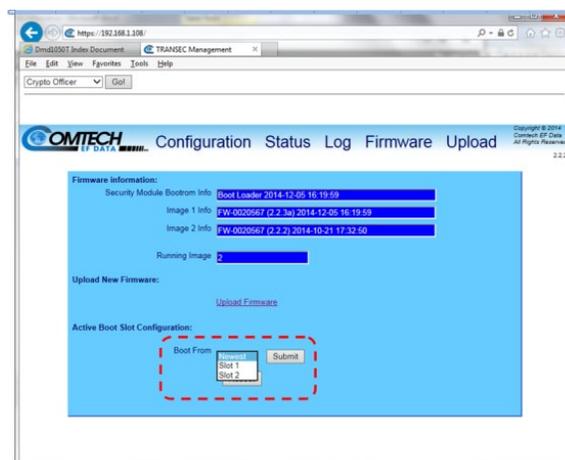


## 8.5.6 Reboot the modem

1. Click **Reboot Now!** to boot the TRANSEC Module with the new firmware:
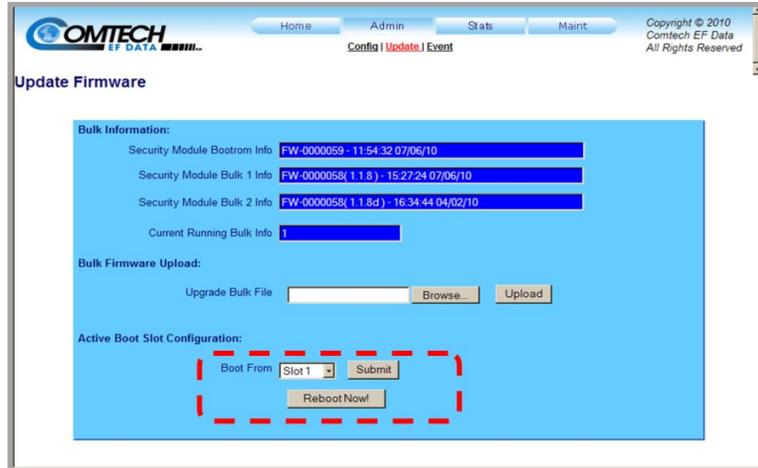
The modem reboots with the new firmware loaded as configured:



2.  After the modem reboots, you must restart the TRANSEC Module HTTPS Interface session.

3.  To load the second image, repeat the steps in Sections 8.5.4 through 8.5.5.

# Chapter 9. TRANSEC Module SSH CLI Operation

## 9.1 Overview

This chapter describes the Command Line Interface (CLI) user menu system provided with the DMD1050-T Satellite Modem's optional TRANSEC Module via a SSH (Secure Shell) interface.

The SSH interface allows you to change operating parameters similar to those found on the TRANSEC Module HTTPS Interface. You can use the monitoring, configuration and control operations available via the module's HTTPS Interface.

See **Chapter 8 TRANSEC Module HTTPS Intergface**, for detailed information about the command functionality.

## 9.1.1 SSH User Access

When connecting via SSH, you must have network connectivity to the TRANSEC Module. This connectivity can be via a local LAN, a remote LAN, or via a satellite link from another modem.

As in Chapter 8, PuTTY is used. It is a free and open source terminal emulator application used as a serial console client for SSH, Telnet, rlogin and raw TCP computing protocols.

While the TRANSEC Module CLI main and nested screens are identical across terminal emulator applications, setup can differ slightly. This chapter assumes you are familiar with the preferred SSH interface.

Once connected to the TRANSEC Module via the SSH interface, you must enter a login name and password (the defaults for both are **comtech**). Once a valid login and password are entered, the CLI Main Menu opens. See Figure 9-1.
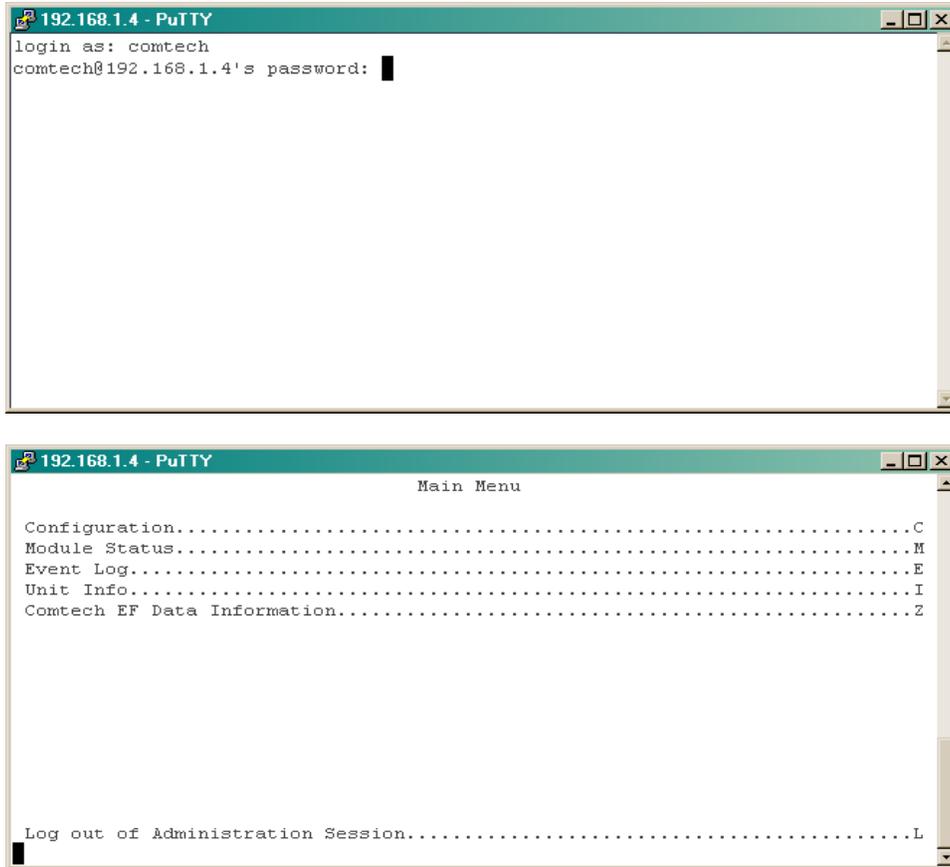
Figure 9-1 Login screen and Main Menu examples

## 9.2    Command Line Interface (CLI)

### 9.2.1  CLI Menu System – Parallel Functionality

The CLI allows you to change operating parameters in a manner similar to that of monitor, configure and control functions using the Web browser menus. See Chapter 8.

### 9.2.2  CLI Menu – Common Information, Navigation, Operation Features

With some exceptions, the screen examples in this chapter use these standards:

| Menu Options/Fields | Entry | Description |
| --- | --- | --- |
| [Text field example] | [RO] | Typically found in the body of the screen. This means the field is a read-only status/informational message. No user action is required for this item. |
| Logout of Administration Session | L | Found at the bottom of the screen. Allows you to log out of the SSH session. |

| Menu Options/Fields | Entry | Description |
|---|---|---|
| Exit Menu | X | Found at the bottom of the screen. Allows you to exit the current menu and return to the parent menu. Alternately, press the **Esc** key to do the same action. |

Typically, once any mnemonic is entered, you are prompted to type in a functional selection, an alphanumeric configuration string, or an operational value. This prompt shows at the bottom of the active screen. It is a selection choice and/or a blank prompt (a solid bar), as shown in this example:



If a parameter is rejected for any reason, an error shows at the top of the screen, along with an explanation:



## 9.2.2.1    Save

Before you end the CLI session, make sure to save changes to permanent storage. Unsaved changes remain active as long as the modem remains in operation; however, unsaved changes are lost if, for example, the unit loses power.

Use the **S** command on any menu to save changed parameters. A prompt asks you to confirm that all changes will be permanent:

## 9.2.2.2 Log out

Use the **L** command to log out of a CLI session. A prompt asks you to confirm that the session should be ended:

```
This will end your console session.
        Are you sure? (Y/N)
```

## 9.2.3 Main Menu

```
                              Main Menu

Configuration.................................................................C
Module Status.................................................................M
Event Log.....................................................................E
Unit Info.....................................................................I
Comtech EF Data Information...................................................Z













Log out of Administration Session.............................................L
```
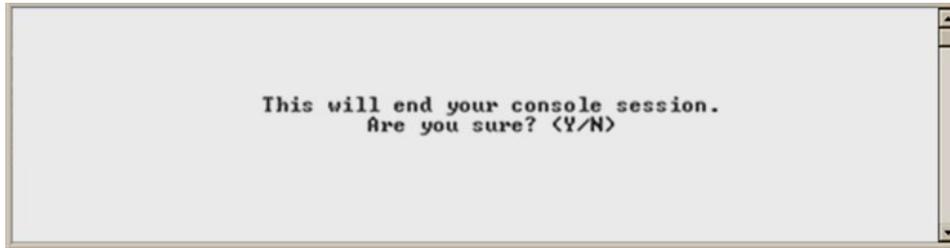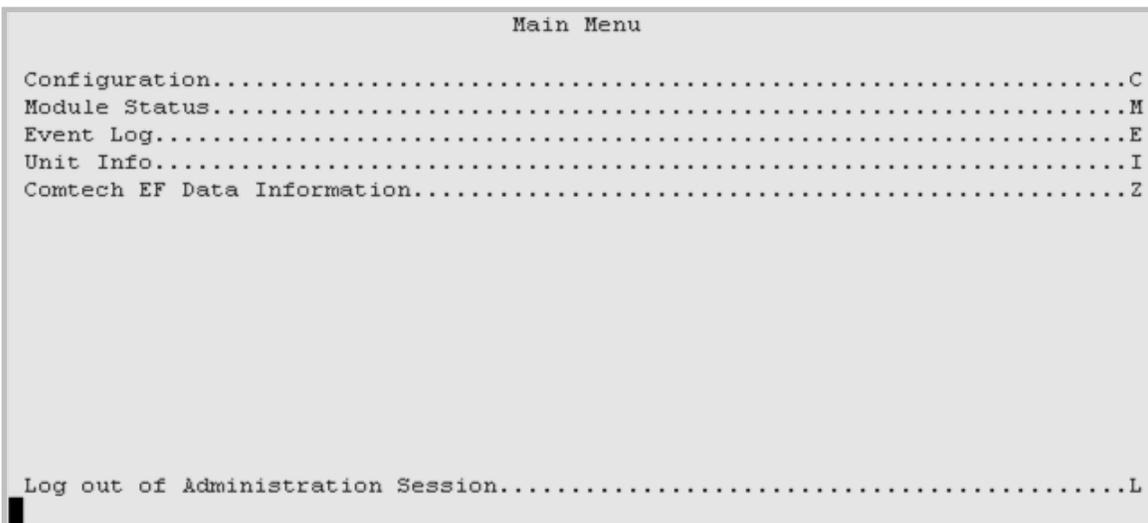
**Figure 9-2 Main Menu example**

The **Main Menu** is the CLI's primary navigation screen. All selections open submenus. See Table 9-1.

**Table 9-1 CLI Submenus**

| Submenu | Entry | Function/Description |
|---|---|---|
| Configuration | C | The Configuration Menu screen lets you configure the TRANSEC Module encryption features. |
| Module Status | M | The Module Status screen has no other menus. This read-only screen shows the TRANSEC Module's existing operating parameters. |

| Submenu | Entry | Function/Description |
|---|---|---|
| Event Log | E | Opens the Event Log screen. Use it to monitor and control operational faults and alarms. |
| Unit Info | I | Opens the Unit Info screen. Use it to to change the firmware bootup settings and system reboot controls. |
| Comtech EF Data Information | Z | Opens the Comtech EF Data Information screen. It has no other menus. This read-only screen gives customer support contact information. |

## 9.2.4  Configuration Menu [C]



```
                         Configuration Menu

                     [Operating mode: Primary]
Active Encryption Key.......................................................A
Future Encryption Key.......................................................F
Encryption Settings.........................................................E
Network Configuration.......................................................N
Crypto Officer Credentials..................................................C
SSH Console.................................................................S




Log out of Administration Session...........................................L
Exit Menu...................................................................X
```

Figure 9-3 Configuration Menu example

Table 9-2 Configuration Menu options

| Menu Options/Fields | Entry | Description |
|---|---|---|
| [Operating mode:] | [RO] | Identifies the modem's active **Encryption Mode** as **Primary** or **Secondary** |
| Active Encryption Key | A | Opens the **Active Encryption Key Menu** |
| Future Encryption Key | F | Opens the **Future Encryption Key Menu** |
| Encryption Settings | E | Opens the **Encryption Menu** |
| Network Configuration | N | Opens the **Network Menu** |
| Crypto Officer Credentials | C | Opens the **Credentials Menu** |
| SSH Console | S | Opens the **SSH Console Menu** |

## 9.2.4.1 Configuration | Active Encryption Key Menu [A]

```
                        Active Encryption Key Menu

Key Signature.......................[ 75 8e f6 8e 95 0a 22 55 a4 ff ]
Seed Key............................[   ].................................K
Confirm Seed Key....................[   ].................................C
Seed Key fields.....................[ Unchanged ]
Passphrase..........................[   ].................................P


Current TEK.........................[ 3 ]
Next TEK...................................................................N



 Note:  The TRANSEC Module will generate new TEKs and a new key signature only
when you enter and apply a passphrase.





Log out of Administration Session..........................................L
Exit Menu..................................................................X
```

Figure 9-4 Active Encryption Key Menu example

Table 9-3 Active Encryption Key Menu options

| Menu Options/Fields | Entry | Description/User Prompt |
|---|---|---|
| [Key Signature] | [RO] | The active **Key Signature** is shown here. |
| Seed Key | K | Enter a 32-character active **Seed Key** to generate a **TEK** when the TRANSEC Module is given a **Passphrase**. |
| Confirm Seed Key | C | Confirm the active **Seed Key** . |
| [Seed Key fields] | [RO] | Shows the status of the active **Seed Key** in real time. |
| Passphrase | P | Enter a 10- to 32-character **Passphrase** that is combined with the active **Seed Key** to generate **TEKs**. |
| [Current TEK] | [RO] | Identifies the **Current TEK** (1 through 26). |
| Next TEK | N | Generates the next available **TEK**; the **Current TEK** field updates accordingly. **Note:** This command is disabled when the module is in secondary mode, and the **Current TEK** mirrors the **TEK** used by the connected primary modem. |

## 9.2.4.2      Configuration | Future Encryption Key Menu [F]

```
                        Future Encryption Key Menu

Key Signature......................[ No future seed key or passphrase. ]
Seed Key...........................[   ]..................................K
Confirm Seed Key...................[   ]..................................C
Seed Key fields....................[ Unchanged ]
Passphrase.........................[   ]..................................P



  Note:  The TRANSEC Module will generate new TEKs and a new key signature only
when you enter and apply a passphrase.








Log out of Administration Session........................................L
Exit Menu................................................................X
```

Figure 9-5 Future Encryption Key Menu example

The **Future Encryption Key Menu** has options or fields that are identical to those on the **Active Encryption Key Menu**. However, all commands are applicable to **Future Encryption Keys** only:

Table 9-4 Future Encryption Key Menu options

| Menu Options/Fields | Entry | Description/User Prompt |
|---|---|---|
| [Key Signature] | [RO] | The future **Key Signature** is shown here. |
| Seed Key | K | Enter a 32-character future **Seed Key** to generate a **TEK** when the TRANSEC Module is given a **Passphrase**. |
| Confirm Seed Key | C | Confirm the future **Seed Key** . |
| [Seed Key fields] | [RO] | Shows the status of the future **Seed Key** in real time. |
| Passphrase | P | User is prompted to enter a 10- to 32-character **Passphrase** that is combined with the previously entered future **Seed Key** to generate TEKs. |

| Menu Options/Fields | Entry | Description/User Prompt |
|---|---|---|
| Activate Future Key | I (Not shown) | Activates the future **Seed Key** and resets the **TEK** index to 1.<br>**Note:** This option shows only when all of these are true:<br>  a)  the module is in primary mode<br>  b)  you have entered a future **Seed Key** and **Passphrase**<br>  c)  you have advanced the current **TEK** so that it is in the range of 2 to 26 |

## 9.2.4.3  Configuration | Encryption Menu [E]



```
                              Encryption Menu

  Encryption........................[ Disabled ]............................E
  Operating Mode....................[ Primary ]..............................O
  Frame Length......................[ 16 ]..................................F

  Zeroize All Keys..........................................................Z
  Run Self Tests............................................................R




  Log out of Administration Session.........................................L
  Exit Menu.................................................................X
```

**Figure 9-6 Encryption Menu example**

**Table 9-5 Encryption Menu options**

| Menu Options/Fields | Entry | Description |
|---|---|---|
| Encryption | E | Prompts you to set the **Encryption Mode** operation:<br>0 – Disabled                    1 – Enabled |
| Operating Mode | O | Prompts you to set the **Operating Mode** operation:<br>0 – Primary                    1 – Secondary |
| Frame Length | F | Specify the length of the AES 256 encryption frame, from 1 to 255. |
| Zeroize All Keys | Z | Resets all encryption keys in the module's memory and flash to default values. |

| Menu Options/Fields | Entry | Description |
|---|---|---|
| Run Self Tests | R | Runs the module's cryptographic self tests.<br>If the tests succeed, the module resumes operation.<br>If the tests fail, the module reports an error to the event log.<br>If encryption is enabled and the tests fail, the module stops transmitting data, for protection. |

## 9.2.4.4 Configuration | Network Menu [N]
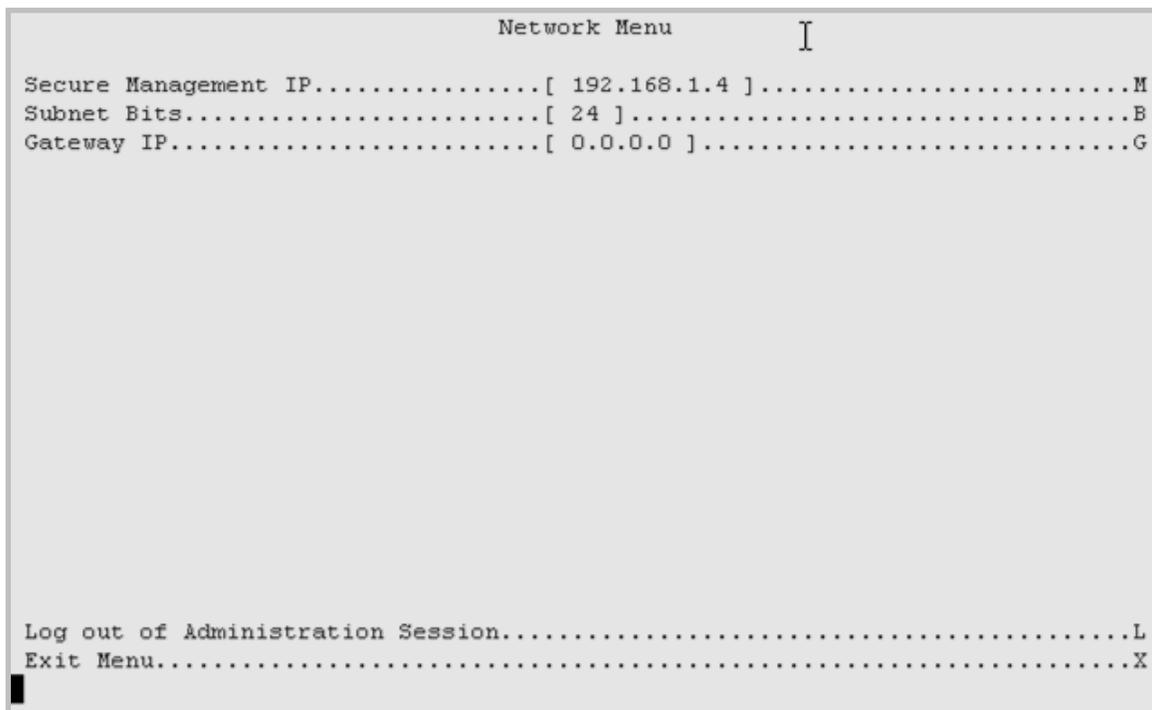


**Figure 9-7 Network Menu example**

**Table 9-6 Network Menu options**

| Menu Options/Fields | Entry | Description |
|---|---|---|
| Secure Management IP | M | Change the TRANSEC Module IP address as necessary.<br>**Note:** If this address is changed, you must repeat the login process for the SSH interface, using the new IP address, to regain access to the TRANSEC Module SSH CLI. |
| Subnet Bits | B | Change the IP subnet mask of the TRANSEC Module as necessary. |
| Gateway IP | G | Change the TRANSEC Module IP gateway address as necessary.<br>**Note:** If this address is changed, it must match the subnet of the **Secure Management IP**. If it does not match, then the Gateway IP text box will default to 0.0.0.0. |

## 9.2.4.5        Configuration | Credentials Menu [C]

```
                              Credentials Menu

Crypto Officer User Name...........[ comtech ]...............................U
Crypto Officer Password............[   ].......................................P
Confirm Password...................[   ].......................................C
Password fields....................[ Unchanged ]




Log out of Administration Session.............................................L
Exit Menu.....................................................................X
█
```

**Figure 9-8 Credentials Menu example**

**Table 9-7 Credentials Menu options**

| Menu Options/Fields | Entry | Description |
|---|---|---|
| Crypto Officer User Name | U | Enter the desired User Name. |
| Crypto Officer Password | P | Enter the desired Password. |
| Confirm Password | C | Confirm the Password just entered. |
| [Password Fields] | [RO] | Shows the status of the password field in real time. |

The Crypto Officer User Name and Password are each restricted to a minimum of 7 and a maximum of 25 characters. Excluded are:

:        ASCII Code 58

<        ASCII Code 60

>        ASCII Code 62

"        ASCII Code 34

~        ASCII Code 126

## 9.2.4.6      Configuration | SSH Console Menu [S]

```
                                   SSH Console Menu

Host Key Signature........[ 94:fb:ef:0f:f3:90:51:d9:67:de:4b:a6:b0:db:f1:37 ]
Generate new host key......................................................G
SSH...............................[ On ]....................................S

















Log out of Administration Session..........................................L
Exit Menu..................................................................X
```

Figure 9-9 SSH Console Menu example

Table 9-8 SSH Console Menu options

| Menu Options/Fields | Entry | Description |
|---|---|---|
| [Host Key Signature] | [RO] | Shows the key signature, or fingerprint, which helps to identify the TRANSEC Module when connecting through SSH. |
| Generate new host Key | G | Generate a new host key that uniquely identifies the TRANSEC Module. |
| SSH | S | Change the Secure Shell Console operation:<br>0 – Off                                                              1 – On |

## 9.2.5　Module Status screen [M]

```
                         Encryption Parameters

AES256 Version            1.39          Operating Mode        Primary
Encryption Frame Length 16              Board Temperature     54 C
                                        TRANSEC Clock Status  OK


         Transmit Status                         Receive Status
Tx Frame Count  0                       Rx Frame Count   0
Tx Status       1                       Rx Status        17
DCM Lock        Locked                  DCM Lock         Locked
Bypass Traffic  Not Detected            Rx CRC Errors    0
Crypto Traffic  Not Detected            Unique Word Lock Unlocked
BIST Done       No                      BIST Done        No





                      Press Any Character to Continue
■
```

**Figure 9-10 Module Status screen example**

The read-only **Module Status** screen, shows the operating parameters for the TRANSEC Module Interface:

- AES 256 Version
- Encryption Frame Length
- Operating Mode
- Board Temperature
- TRANSEC Clock Status
- Transmit Status
- Receive Status

Press any key to return to the **Main Menu**.

## 9.2.6  Event Log Menu [E]

```
                              Event Log Menu

Logging.............................[ On ]....................................M
Logging Level.....................[ All Information ].......................E

View Event Log..............................................................V
Clear Event Log.............................................................C

















Log out of Administration Session...........................................L
Exit Menu...................................................................X
```

**Figure 9-11 Event Log Menu example**

**Table 9-9 Event Log Menu options**

| Menu Options/Fields | Entry | Description |
|---|---|---|
| Logging | M | Sets recording of events and alarms:<br>0 – Off                                    1 – On |
| Logging Level | E | Sets the level of information collected for the Events Log:<br>**0** – Errors Only                    **1 –** Errors and Warnings<br>**2 -** All Information |
| View Event Log | V | Shows the tally of events logged since the last time the Log was cleared. |
| Clear Event Log | C | Clears the event log of all messages. Once selected, you see this prompt:<br>     This action will clear the event log.<br>     Are you sure? (Y/N)<br>Enter **Y** or **N**. If **Y** is entered, the event log is reset to zero entries, and you see this prompt:<br>     Event log cleared.<br>     Press Any Character to Continue.<br>Press any key to return to the **Event Log Menu**. |

## 9.2.7  Unit Info Menu [ I ]

See Appendix H for information about the TRANSEC Module firmware update process.

```
                              Unit Info Menu

Bootrom Info...............[ FW-0000059 - 17:17:13 06/03/10 ]
Bulk 1 Info...............[ FW-0000058( 1.1.7k ) - 17:23:58 05/01/09 ]
Bulk 2 Info...............[ FW-0000058( 1.1.8f ) - 17:17:13 06/03/10 ]
Boot From.........................[ Slot 2 ]................................B

Reboot..........................................................................R




Log out of Administration Session.............................................L
Exit Menu.....................................................................X
```

**Figure 9-12 Unit Info Menu example**

The **Unit Information Menu** shows information so that you can make sure the correct firmware is loaded.

**Table 9-10 Unit Information options**

| Menu Options/Fields | Entry | Description |
|---|---|---|
| [Bootrom Info] | [RO] | Shows the bootrom firmware. |
| [Bulk 1 Info] | [RO] | Shows the firmware version loaded into Slot 1. |
| [Bulk 2 Info] | [RO] | Shows the firmware version loaded into Slot 2. |
| Boot From | B | Select the firmware boot source for modem operations: **0 – Newest** selects the most current firmware residing in either Slot 1 or Slot 2, automatically **1 – Slot 1** selects the firmware in the Slot 1 location **2 – Slot 2** selects the firmware in the Slot 2 location **Note:** If the **Boot From** selection is changed, you must reboot the modem so that the firmware selection is loaded for operation. |

| Menu Options/Fields | Entry | Description |
|---|---|---|
| Reboot | R | Reboots the modem. When selected, you see this prompt:<br><br>    This action will reboot the TRANSEC module.<br>    Are you sure? (Y/N)<br><br>Enter **Y** or **N**. If **Y** is entered, the reboot process begins by closing the SSH CLI.<br><br>    THIS MODEM WILL REBOOT<br>    IN FIVE SECONDS!<br>    BOOTING MODEM…<br>    …PLEASE WAIT<br>    INITIALIZING MODEM…<br><br>Once the modem reboots, you must start a new SSH CLI session to resume use of this interface. |

## 9.2.8  Comtech EF Data Information screen [Z]



**Figure 9-13 Comtech EF Data Information screen example**

The **read-only Comtech EF Data Information** screen shows basic contact information for Comtech EF Data Sales and Customer Support.

Press any key to return to the **Main Menu**.

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# Appendix A.  Product Options

## A.1    Hardware Options

These optional hardware assemblies are available:

- PL-0000192      FIPs 140-2 Transmission Security (TRANSEC) Module

## A.2    Internal High-Stability

The DMD1050T can be equipped with the +/- 5 x 10-8 or better Stability Frequency Reference as an add-on enhancement. This is a factory upgrade only.

## A.3    Customized Options

The DMD1050T can be customized for specific requirements. Most modifications or customizations occur through firmware and or software changes.

These are examples of the customization types available:

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

Contact the Comtech EF Data Customer Service or Sales Department for all customization requests.

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# Appendix B. Carrier Control

## B.1 States

The DMD1050T transmitter turns off the carrier output automatically when the modem finds there is a major alarm. This prevents the carrier from outputting an unknown spectrum and disturbing adjacent carriers. To override this automatic drop of the carrier, mask the alarm that is causing the fault. Masking causes the modulator output spectrum to transmit, even when the fault occurs.

These Carrier Control states are available:

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

## B.2 Carrier Off

Modulator output is disabled.

## B.3 Carrier On

In the user interface, turn modulator output off before reprogramming modulator functions that can change the output spectrum. After this change, you must enter **Yes** to re-enable output.

When using the terminal, turn the modulator off while reprogramming modulator functions that can change the output spectrum. After the reprogramming, you must turn the output on manually.

## B.4 Carrier Auto

In the user interface, turn modulator output off before reprogramming modulator functions that can change the output spectrum. After the change, the output turns on automatically.

When using the terminal, turn the modulator off while reprogramming modulator functions that can change the output spectrum. After the change, the output turns on automatically.

## B.5   Carrier VSat

Use the interface to turn Modulator output off before reprogramming modulator functions that can change the output spectrum. After the change, you must enter **Yes** to re-enable output.

When using the terminal, turn the modulator off while reprogramming modulator functions that can change the output spectrum. After reprogramming, you must turn the output on manually.

Additionally, VSat mode disables the modulator's output if the modem's demodulator does not have signal lock. When signal lock returns to the demodulator, the modem's modulator turns the carrier on again.

## B.6   Carrier RTS

Use the interface to turn Modulator output off before reprogramming modulator functions that can change the output spectrum. After the change, you must enter **Yes** to re-enable output.

When using the terminal, turn the modulator off while reprogramming modulator functions that can change the output spectrum. After reprogramming, you must turn the output on manually.

Additionally, RTS (Request To Send) mode enables the modulator's output based on the RTS lead of the data interface. When RTS is enabled on the data interface, the modulator turns the carrier on. When the RTS is disabled, the modulator turns the carrier off.

# Appendix C. TCP/IP Ethernet Setup

## C.1    Introduction

The modem supports SNMP, FTP protocols and the Web Browser. Use of the protocols depends on the correct setup of the TCP-IP menus. Use this document only as a guideline for setting up the TCP-IP menus.

Contact the IT manager for guidance to make sure setup is successful. For additional information on the WEB or SNMP configurations and descriptions, see the Remote Protocol Manual (TM117).

## C.2    TCP/IP Network Configuration

Each unit requires configuration with the correct network settings. Contact the IT manager for valid IP address mask, modem, server and router IP addresses.

1.    Use the dumb terminal System menu.
2.    Select the TCP / IP sub menu.
3.    Enter the TCP / IP menu.

These sub menus will show, but their order can vary.

### C.2.1 Boot Mode submenu

Use the **BootMode** submenu to select the operating boot mode for the TCP/IP. Several selections are available.

> ( ! )    NOTE:  When configuring the modem for the Web Browser, you must set **Boot Mode** to **NON-VOL**.

The DMD1050T is set with the Boot Mode configured as **Default** when shipped from the factory. Verify that the Boot Mode is **Default**.

To access the unit via the Ethernet port, set the Boot Mode to **IP TEST**. This sets the IP parameter to an accessible address. To use an alternate address, set the Boot Mode to NON-VOL.

As an example, we will use a new modem IP address of 172.018.100.205 for the remaining of the TCP-IP setup procedure. Contact the IT manager for guidance to make sure setup is successful.

## C.2.1.1 Default selection

If the Ethernet interface is not used, select the **Default** mode. IP Address or mask changes are not permitted while in this mode of operation.

The IP addresses are not accessible. These parameters are set, and cannot change, until the **Boot Mode** is changed.

- IP MASK                255.000.000.000

- MODEM IP ADDR          010.000.000.001

- SERVER IP ADDR         010.001.001.001

- ROUTER IP ADDR         010.000.001.001

## C.2.1.2 BOOTp selection

At boot time, if **BOOTp** is enabled, the modem uses the **BOOTp** protocol to get names, masks and IP Addresses of the modem, router and server from the Network Manager automatically. This must be consistent with the tag expected by the user's **BOOTp** server. If **BOOTp** is disabled, the modem ignores the **BOOT SERVER TAG** setting.

## C.2.1.3 NON-VOL selection

**NON-VOL** allows for setting up all required IP Addresses. It stores the information to the non-volatile memory. The modem restores the saved settings into the correct fields when the power cycles.

## C.2.1.4 IP TEST selection

The **IP TEST** selection is similar to the **Default** selection. When **IP TEST** is enabled, these preset parameters are programmed. They do not change until the selection is changed.

- IP MASK                255.255.255.000

- MODEM IP ADDR          192.168.000.238

- SERVER IP ADDR         192.168.000.101

- ROUTER IP ADDR         192.168.000.102

- TRANSEC IP ADDR        192.168.000.239

To edit these parameters, change the boot mode to **NON-VOL**.

## C.2.2 BOOT SERVER TAG submenu

This allows you to select the operating boot tag when operating in the **BOOTp** mode. The default setting of 206 is selected automatically when the boot mode is set to **DEFAULT** (factory preset mode).

## C.2.3 MODEM HOST submenu

This shows the operating unit Host name, such as DMD20. It is read only.

## C.2.4 IP ADDR MASK submenu

This allows you to enter the IP Address Mask. Enter the IP Address Mask based on the Network settings. Contact the IP Administrator if you do not know this address.

Example IP Address Mask: 255.255.000.000

## C.2.5 MODEM IP ADDR submenu

This allows you to enter the Modem's individual network IP Address. Each device on the network must have a unique address. Contact the IP Administrator for the correct address setting.

Example Modem IP Address: 172.018.100.215

## C.2.6 SERVER IP ADDR submenu

This allows you to set up the Network Server IP Address. This address is for the Host that optionally boots the DMD20 on power-up, and is the SNMP Trap Server. This IP Address must be consistent with the Modem IP Address. Broadcast and loop back addresses are not allowed.

Example Server IP Address: 172.018.004.250

## C.2.7 ROUTER IP ADDR submenu

This allows you to set up the Network Router IP Address. If a router exists on the local network, and it is to be used, this address must be consistent with the IP Address Mask and the subnet of the modem. If no router is present, then the address must be set to a foreign address. Broadcast and loop back addresses are not allowed.

Example for router not used:  Router IP Address: 010.000.001.001

## C.2.8 MODEM EADDR submenu

This shows the Modem (Unit) Ethernet Address. The Modem Ethernet Address is configured at the factory. It is a unique, Radyne equipment identifier address.

Example: 0010650903EB

## C.2.9 ETHER RATE submenu

This shows the operating Ethernet port data rate. If multiple rates are available, then you can specify the Ethernet port data rate (10BaseT).

Example Ethernet port Data Rate: 10 MBPS/HD

## C.3    Network Configuration Summary

If the example information was entered for all the submenus, then here is the TCP/IP configuration summary for a no router specified setup:

1. Boot Mode =                 NON-VOL
2. Bootp Server Tag =          206
3. Modem Host=                 DMD1050T
4. IP Address Mask =           255.255.0.0
5. Modem IP Address =          172.18.100.215
6. Server IP Address =         172.18.4.250
7. Router IP Address =         010.000.001.001
8. Modem Ethernet Address=  001065nnnnnn
9. Ethernet Rate =             10 MBPS/HD

## C.4    Ethernet Test

## C.4.1 Connect the Modem Ethernet Cable to a Network Link

Connect the Network Switch (Hub) to the Modem Ethernet port (J11) using standard RJ-45 to RJ-45 10BaseT (CAT-5) Cables as shown:
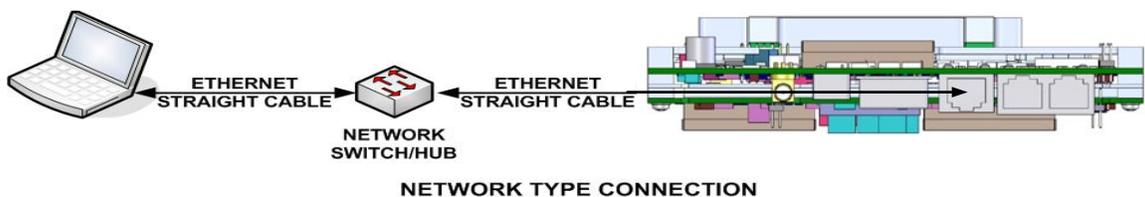


**Figure C-1 DMD1050T Ethernet Network Connection**

## C.4.2 Connect the Modem Ethernet Cable Directly to a Computer (without a Network)
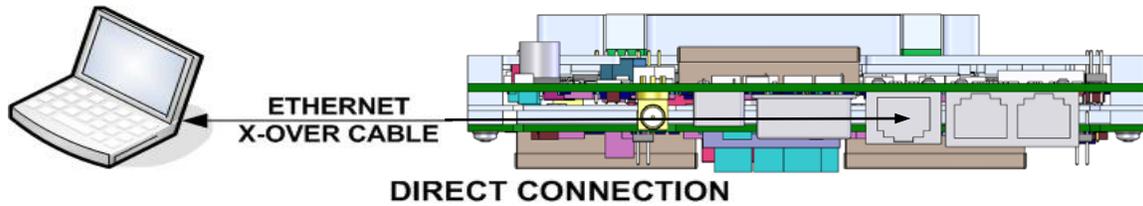


Make sure the Computer TCP/IP is configured correctly. You can use this setup procedure as a guide.

For  Windows 2000 or XP Classic Only:

1.     Click the **Start** button

2.     Select **Settings**

3.     Click the **Control Panel** icon

4.     Double click the **Network Connections** icon

5.     Select the **Local Area Connection** icon for the applicable Ethernet adapter. Usually, it is the first Local Area Connection listed.

6.     Double click the **Local Area Connection**

7.     Click the **Properties** icon



**Figure C-2 Local Area Connection Status Box**

8.     Make sure that the box adjacent to **Internet Protocol (TCP/IP)** is checked

9.     Select **Interconnect Protocol (TCP/IP)**

10.    Click the **Properties** button
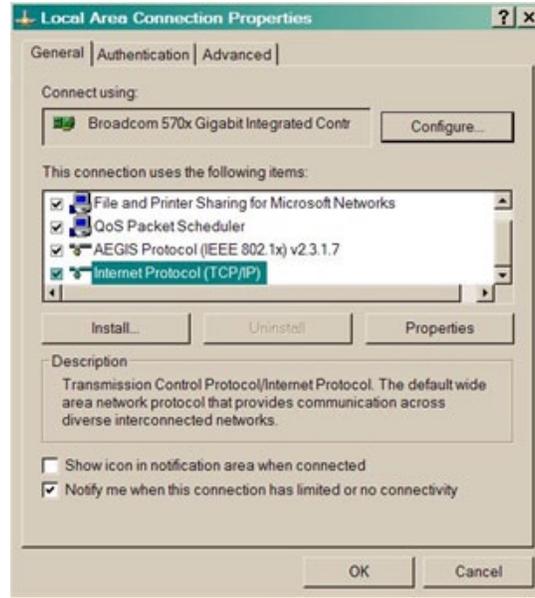
**Figure C-3. Local Area Connection Properties Box**

11.     Select **Use the following IP Address**

12.     Enter an **IP Address** that is offset by five or so numbers from the equipment address. The computer and the equipment to which it is connecting cannot have identical addresses.

13.     Enter a **Subnet Mask**. This must be identical to the subnet mask programmed into the equipment.

14.     Click the **OK** button to complete the PC Configuration.

NOTE:  Some computers require the computer to be restarted for the changes to take effect.
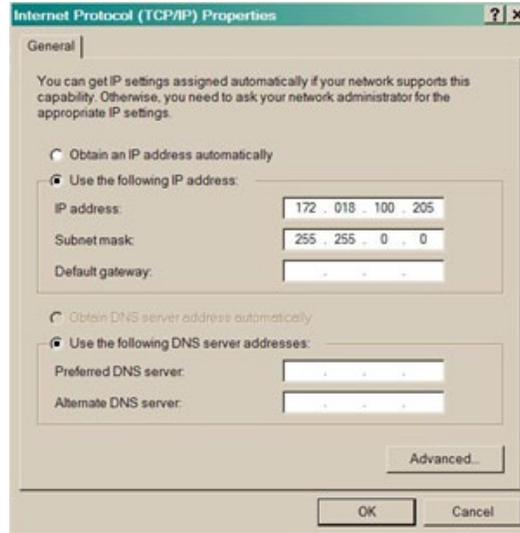
**Figure C-4 Internet Protocol (TCP/IP) Properties Box**

15.     To reconnect the computer to a network, select **Obtain an IP address automatically**

## C.5     Test the Ethernet Connection using the Ping Command (Optional)

To make sure that connectivity and settings are correct, use the **ping** command. The results of the **ping** command will show if the Host (Equipment) is responding correctly.

1.     Open an MSDOS command prompt.

```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
```

2.     At the command prompt, enter **ping xxx.xx.xxx.xxx**

where xxx.xx.xxx.xxx is the IP Address of the equipment to be tested.

```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.


C:\> ping 172.18.100.215
```

3.     If the **ping** succeeds, the screen shows:

```
C:\>ping 172.18.100.215
```

```
Pinging 172.18.100.215 with 32 bytes of data:


Reply from 172.18.100.215: bytes=32 time=109ms
TTL=64

Reply from 172.18.100.215: bytes=32 time<1ms
TTL=64

Reply from 172.18.100.215: bytes=32 time=2ms
TTL=64

Reply from 172.18.100.215: bytes=32 time=123ms
TTL=64


Ping statistics for 172.18.100.215:

    Packets: Sent = 4, Received = 4, Lost = 0
(0% loss),

Approximate round trip times in milli-seconds:

    Minimum = 0ms, Maximum = 123ms, Average =
58ms
```

4. If the **ping** is unsuccessful, the screen shows:

```
C:\>ping 172.18.100.215


Pinging 172.18.100.215 with 32 bytes of data:


Request timed out.

Request timed out.

Request timed out.

Request timed out.


Ping statistics for 172.18.100.215:

Packets: Sent = 4, Received = 0, Lost = 4 (100%
loss),
```

5. For an unsuccessful response, check these items:
   a. The correct cables are connected to the Ethernet port, and they are secured.
   b. The Link Light is illuminated.
   c. The IP Address matches the Modem's IP Address.
   d. The Server and Modem are on the same subnet.

# Appendix D. Web Browser
# Setup Guide

## D.1    Introduction

This section gives setup instructions to access the Web Browser through the RJ45 Ethernet interface. The Web user interface allows for complete monitoring and control of all modem parameters and functions, via a 10BaseT Ethernet connection.

## D.2    Required Items

- Modem
- RJ45 to RJ45 CAT5 Ethernet cable
- Computer
- Default Plug/Jumper if necessary for JP1 and JP2

## D.3    Web Interface Setup Guidelines

### D.3.1 Prepare the DMD1050T for Web Setup

The unit leaves the factory with the IP addresses pre-configured to an accessible IP address, known as IP TEST MODE.

If you have difficulty getting access to the Web Browser interface, install the Default Jumper/Plug that will change the IP addresses to an accessible address.

To reset IP addresses, install the Default Plug between pins 1 and 2 on JP1 and JP2. Jumpers are supplied in the connector kit. This changes the IP network setting so you can get access to it.

1. Turn power off to the DMD1050T.
2. Install the Reset jumper between pins 1 and 2 of JP1 and JP2 connector. See Figure 4-5 for the jumper location.
3. Turn power on for the DMD1050T.

4.   Let it run for two minutes.

5.   Turn power off for the DMD1050T.

6.   Remove the Reset jumper from JP1 and JP2.

The IP addresses are configured as listed here:

| Boot Modes: | IPTEST |
|---|---|
| Bootp Server Tag: | 206 |
| IP Address Mask: | 255.255.255.000 |
| Modem IP Address: | 192.168.0.238 |
| Server IP Address: | 192.168.000.101 |
| Router IP Address: | 192.168.000.102 |
| TRANSEC IP Address: | 192.168.0.239 |

To allow the computer to recognize the modem, the Subnet Masks of the computer and modem must match. The IP Address Mask is 255.255.255.000. Contact the network administrator to confirm IP addresses and masks.

1.   Turn power on to the unit.

2.   Connect the RJ45 cable from the DMD1050T to the computer/router/bridge, as shown in Figure D-1.
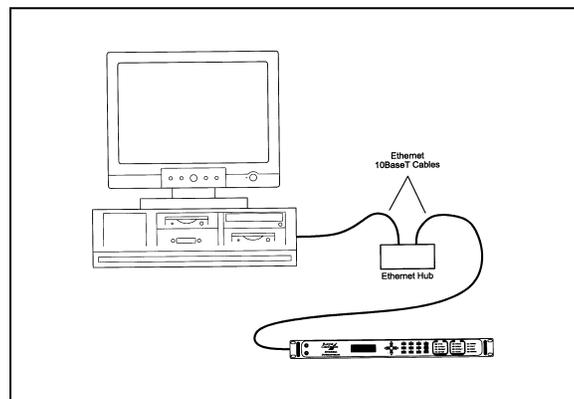


**Figure D-1 Ethernet Connection**

3.   Do a PING test to make sure there is communication between the modem and the computer. Example: ping 192.168.0.238

If everything is functioning correctly, replies from the modem show on the computer screen, along with the time it took to respond.

If unsuccessful, make sure of these items:

    A.    The cables are secure.

    B.    The Link Light is lit.

    C.    The IP Address matches the modem's IP Address.

    D.    The server and modem are on the same subnet.


4. Open the Web browser on the computer.
5. Enter the IP Address 192.168.0.238 in the address field.
6. Press the Enter key.
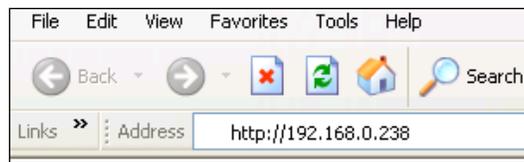


**Figure D-2 Internet Browser Address**

See Figure D-3. The Introduction page shows general information about the modem, features, capabilities and available options. Technical specifications and product options are available in a PDF format.
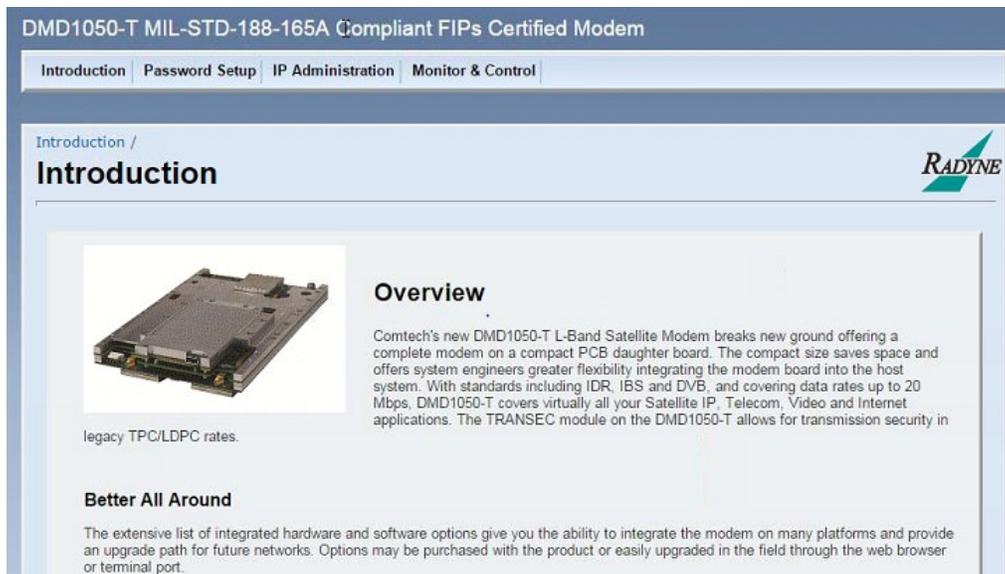


**Figure D-3 Web Browser - Modem Introduction Page**

Select any tab, and the modem requests authentication via a User Name and Password. The DMD1050T is configured initially with these defaults:

User Name:     **admin**

Password:       **admin**



**Figure D-4 Password Setup Screen**

The modem allows for specific administrative privileges for different users. See Sectio D.5.

## D.4     IP Network Change from the Initial Web Setup

### D.4.1 Configure the modem

The modem must be configured with the correct network settings. Contact your network administrator for an IP address mask, and modem, server and router IP addresses that are valid for your network.

To recognize a subnet, each system in the subnet must have the same subnet mask. Set this field before changing the Modem or Router Address. See Figure D-5.

1.   Configure the modem with the new subnet addresses.

   a.   From the modem introduction page, click the **IP ADMINISTRATION**.

   b.   Enter your **User Name** and **Password** on the logon popup.

   c.   Press **Enter**.

   d.   Change the **Boot Mode** to **NON-VOL**.

   NON-VOL - stores and uses IP Mask and addresses.

   e.   Change IP addresses and subnet mask to the recommended settings.

   f.   Click **Save** to accept the changes.

2.   Otherwise, click **Cancel** any time to abort changes and reload the existing IP network settings.
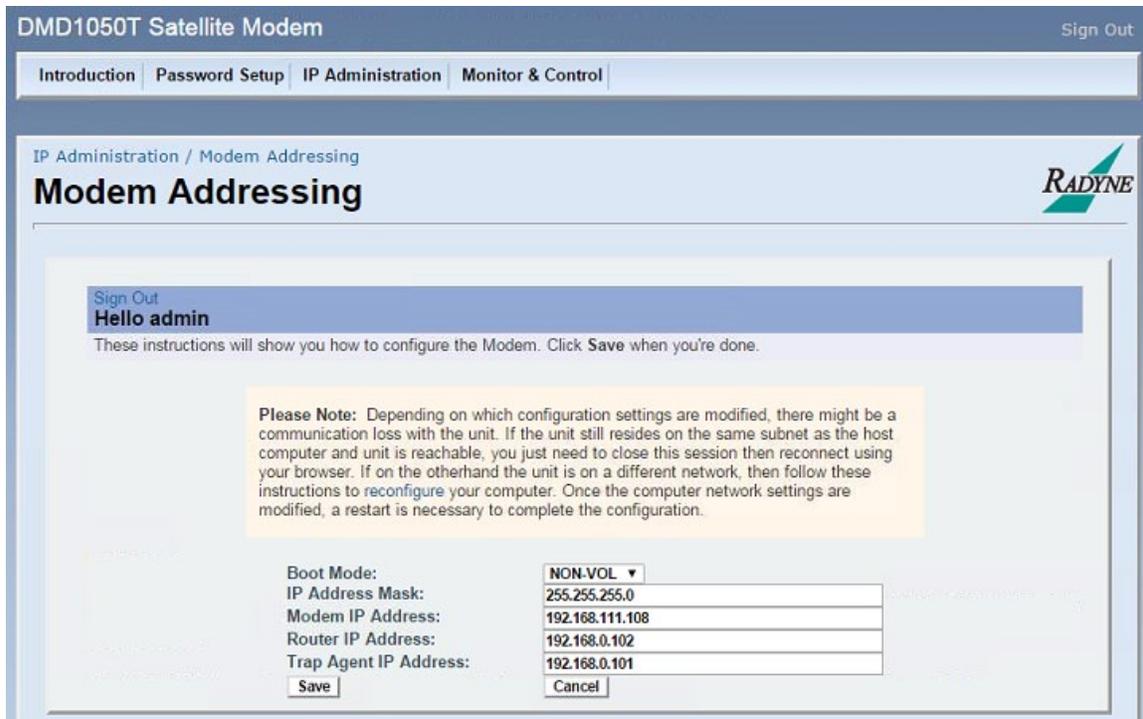
**Figure D-5 Modem Addressing Screen**

## D.4.2 Configure the Computer

The computer must be configured with the correct network settings that were used for the Modem. Contact your network administrator for an IP address mask and modem, server and router IP addresses valid for your network.

To recognize a subnet, each system in the subnet must have the same subnet mask. Set this field after the changes are made to the Modem. See Figure D-6.

1.  Configure the computer with the new subnet addresses.
    a.  Do a ping test to make sure there is communication between the modem and the computer.
        Example: ping 192.168.0.238
    b.  If communication is functioning correctly, replies from the modem show on the computer screen, along with the time it took to respond. Skip to Step 2.
    c.   If unsuccessful, make sure of these items:
        i.   The cables are secure.
        ii.  The Link Light is lit.
        iii. The IP Address matches the Modem's IP Address.
        iv.  The Server and Modem are on the same subnet.
2.  Open the Web browser on the computer. See Figure D-2.

3.  Enter the new IP Address assigned by the network administrator.

4.  Press **Enter**.

## D.5    WEB Users Setup and Configuration Control Options

We use authentication and authorization, together with a user database and a security realm, to design a secure site.

Users are people that need to have access to the system, and Groups contain users. Often, Groups represent category of users. Access rights and authentication make it possible to restrict/control access to a specific set of web users.

The web user database has three users. The initial default user names are **guest**, **oper** and **admin**. You can change any of the three user names.

The user name can have up to 14 alpha and numeric characters. Enter Alpha characters using the up and down arrow keys. Enter Numeric characters using the number keys.

| Web User | Authentication Password | Access Group |
|----------|-------------------------|--------------|
| guest    | guest                   | GUEST        |
| oper     | oper                    | OPER         |
| admin    | admin                   | ADMIN        |

**Access** levels include:

**GUEST -** Guests can navigate most of the site, and see modem parameter settings.

**OPER -** Operators can monitor and control modem parameter settings, and change their own passwords.

**ADMIN -** At this highest access level, the Administrator can monitor and control the modem's parameters, change any user's name and password, and change IP network settings. The **Admin** setting gives access to the entire site.

The **Password** must be memorable, never shared or reused. For better security, passwords must be a minimum length of five printable characters.
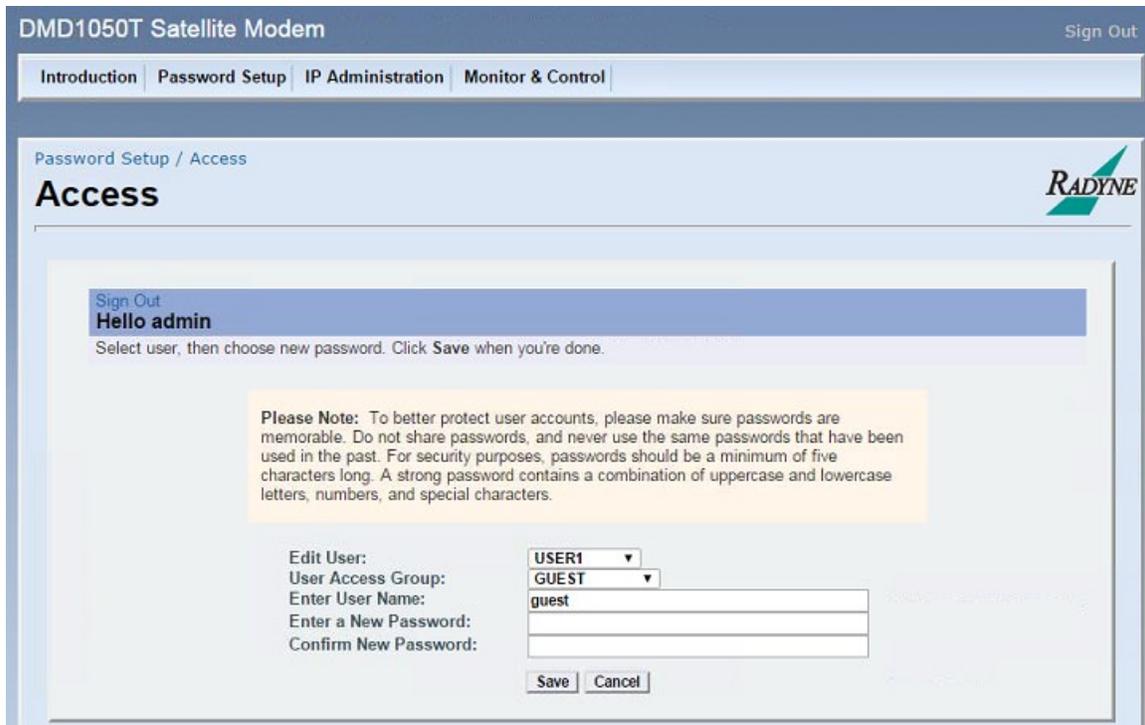
**Figure D-6 User Settings/Access Screen**

1.  On the modem introduction page, click the **ADMINISTRATION** tab.

2.  If necessary, enter your **User Name** and **Password** on the logon popup.

3.  Press **Enter**.

4.  Select **USER1**, **USER2** or **USER3** from the drop-down **Edit User** menu.
    The applicable **User Name** and access rights are updated on the screen.

5.  Select a new **User Name** if desired, and **Password**.

6.  Confirm the new **Password**.

7.  Click **Save**.

8.  Otherwise, click **Cancel** at any time to abort the changes and reload the existing user settings.

## D.5.1 Change the Password

Users can change their own Passwords. See Section D.5.

## D.5.2  Boot Mode Options (Reference only)

Boot Mode selections are based on the network's requirements for setting up the Web browser. Boot Mode options include:

### DEFAULT

During initialization (boot up), the modem restores the web settings to the standard IP Mask and addresses supplied by the modem. The modem is taken off the network and is not accessible. The Default settings are listed here:

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

### BOOTp

During initialization (boot up), the modem gets the names, masks and IP Addresses of the modem, router and server.

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

**IP TEST -** Stores and uses IP Mask and addresses to fixed settings as listed here:

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

# Appendix E. User Interface Connections

## E.1    User Interface Connections

Supplied mating connectors can be used, but are not required.

## E.2    Connector Kit part numbers

| CEFD P/N | Description | Connector Location |
|---|---|---|
| 1. CA/3446-9 | MIL-STD-188-114A | J4 |
| 2. CONN0003-040 | Shorting/default plug | JP1 & JP2 |
| 3. CNR102387-1 | Dual Row header 10 Pin | J3 |
| 4. CNR102387-6 | Dual Row Header 26 Pin | J4 |
| 5. TMR102548-6 | Receptacle Contacts | J3 & J4 |
| 6. CN/MOL04F12 | Conn Crimp 4 Terminal Housing | J3 & J16 |
| 7. TM/CPF08 | Terminal crimp 18-24AWG for 2139 | J3 & J16 |

## E.2.1  J3 & J4 Interface Connectors located on PCB

- J3: Async Interface Connector - 10Pin Dual Row: Mfg (Samtec) P/N: TSW-1-05-7-G-D

- J4: Mil 188-114A Connector - 26Pin Dual Row: Mfg (Samtec) P/N: TSW-1-13-7-G-D

- MFG: Samtec connector information

    o   TSW = Terminal strip series

    o   -1 = .100" Centers

    o   05 or 13 = Number of pins per row

    o   7 = Straight pin version dimensions

| Dimensions are in inches | | | |
|---|---|---|---|
| Style | A | B | C |
| -07 | .100 | 0.430 | 0.430 |

o   G = Gold plating

o   D = Dual Row.

## E.2.2  J3 & J4 Information on Supplied Interface Connectors

| J3 | Async Interface | 10Pin Dual Row: | Mfg (Tyco) P/N: 102387-1 |
|---|---|---|---|
| J4 | Mil 188-114A | 26Pin Dual Row: | Mfg (Tyco) P/N: 102548-6 |
| J16 | Receptacle Contacts | | Mfg (Tyco) P/N: 1-87309-4 |

## E.2.3  J3 & J16 Information on Supplied Interface Connectors for DC & BUC Power

| J16 | DC input Power | 4 Pin Crimp Terminal Hsg | Mfg (Molex) P/N: 09-50-3041 |
|---|---|---|---|
| J3 | BUC/LNB input | 4 Pin Crimp Terminal Hsg | Mfg (Molex) P/N: 09-50-3041 |

## E.3   Part Number Active08-56-0106

3.96mm (.156") Pitch KK® Crimp Terminal 2478, 18-24 AWG, Bag, Brass, 0.51μm (20μ") Selective Gold (Au)

## E.3.1  Part Details

| General | |
|---|---|
| Status | Active |
| Product Name | KK® |
| Molex Series | 2478 |
| Gender | Female |
| Wire Size [AWG] | 18, 20, 22, 24 |
| Wire Insulation Diameter | 2.79mm (.110") max. |
| Packaging | Bag |

| Physical | |
|---|---|
| Contact | Brass (CuZn) |
| Contact Material Thickness | 0.27mm (.011") |
| Plating Contact | 0.5µm (20µ") Gold (Au) Selective |
| Plating in Crimp Area | Gold (Au) Flash Overall |

| Reference | |
|---|---|
| Mating Pins | 1.14mm (.045") Round Pin, 1.14mm (.045") Square Pin |
| Termination | Good Crimps |
| 990 Catalog Page | J-62 |
| MX01 Catalog Page | D-3, L-52 |
| Old Part Number | 2478-1-(550)L |

NOTE:  Maximum Current 5.0A using 18AWG wire

| Application Tooling for 2139 | | |
|---|---|---|
| Region | Description | Product Number |
| Americas | Extraction Tool | 11-03-0016 |
| Americas | Mini-Mac Applicator | 11-18-2236 |

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# Appendix F.  Ethernet Data Interface

## F.1    Introduction

Just like the original Ethernet Bridge, the new Enhanced Ethernet Interface (EEI) makes connecting LANs via satellite easy to do. Simply select Ethernet as the terrestrial interface and connect the LAN into any of the four RJ-45 connectors on the back panel. With its multi-port interface, automatic Learning and Aging, Auto-Crossover, Auto-Polarity, Auto-Negotiation and embedded Quality of Service, the EEI offers true Plug-n-Play connectivity.

The EEI is backward-compatible with the original, and is configured easily for the same bridge-like operation. It allows all higher level protocols like DHCP, UDP, TCP, HTTP and FTP, etc., to pass transparently. Its line speed learning capability causes traffic to be forwarded immediately to the correct ports without unnecessary startup delay.

For more control over traffic, the EEI provides additional QoS controls and new features, such as port based priorities, strict priority queuing and operation in a FIFO-like mode.

The full duplex capability of the standard 10/100 EEI allows it to pass up to 20 Mbps for DMD1050T, and when installed in a DMD50 or DMD2050, 52 Mbps in each direction over the satellite.

The DMD1050T supports Radyne HDLC, Comtech HDLC and Managed 570 HDLC modes, offering compatibility with all other Comtech EF Data HDLC modes of operation.

## F.2    Point-to-Point Applications

Figure F-1 shows a typical application, connecting a remote office to the corporate headquarters via satellite. Because the EEI places no restrictions on the IP addresses or subnet masks chosen for a particular implementation, there is no lengthy setup required and no need to change any existing network configurations. Simply connect the WAN port of each router to the Modem and the satellite network is up and running.
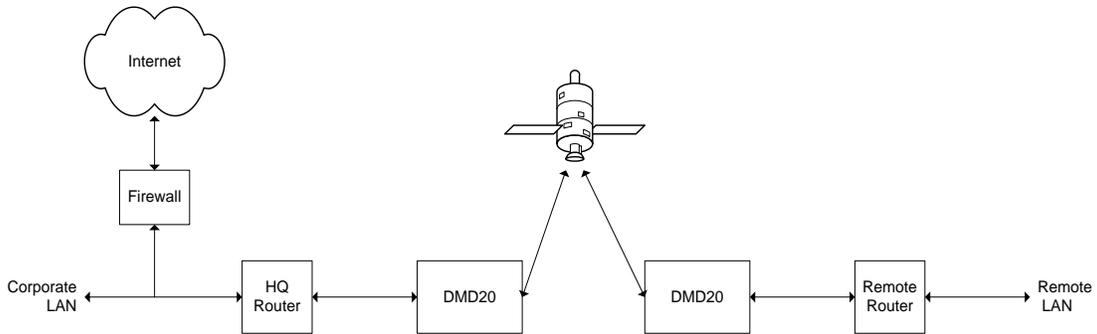
**Figure F-1 Point-to-Point Applications**

## F.3    Transparent Operation

In some situations, the remote site may be simply PCs that need to be connected to a central office for e-mail, file transfers or Internet access. In these cases, it is often best to have all of the network IP addresses assigned dynamically by a DHCP server. Because the EEI can be configured to work like a bridge and not like a router, the DHCP Requests and Responses required to bring the remote PCs online are passed across the satellite link transparently. As shown in Figure F-2, the four-port switch interface on the standard 10/100 EEI allows small remote networks to be set up without adding external switches or hubs.
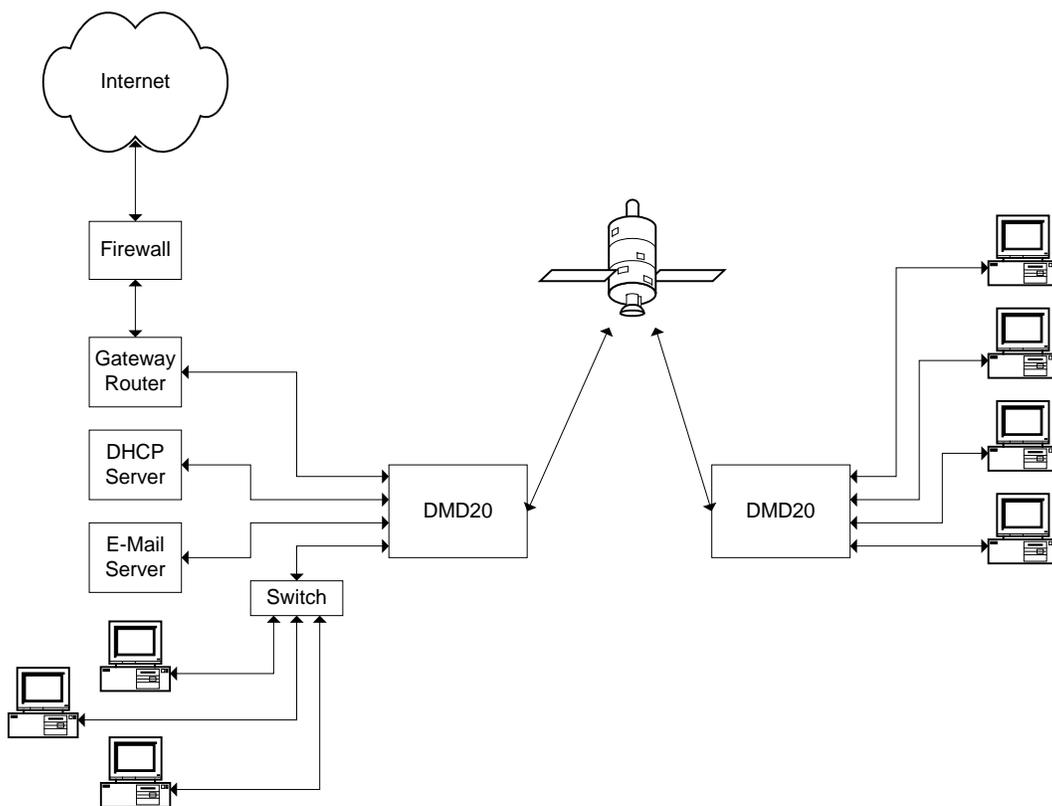


**Figure F-2 Central Office Assigns Network Addresses and Controls all Services**

## F.4    Point-to-Multipoint Applications

In many instances, customers need to connect multiple remote sites to a central hub. Because of the EEI's multi-port interface and daisy chain capability, the hub router does not need to know that there are multiple return paths. As the network grows, you will not need to change the network configuration or buy

additional router blades for the hub. Simply add the new hub demodulator to the end of the existing daisy chain. You can bring a new remote online without disrupting the existing traffic.

Figure F-3 shows how the DMD50, DMD20 and MD2401 multi demodulator can be used in the same network. They provide a large outbound carrier and various return carriers, typical of an internet café application.
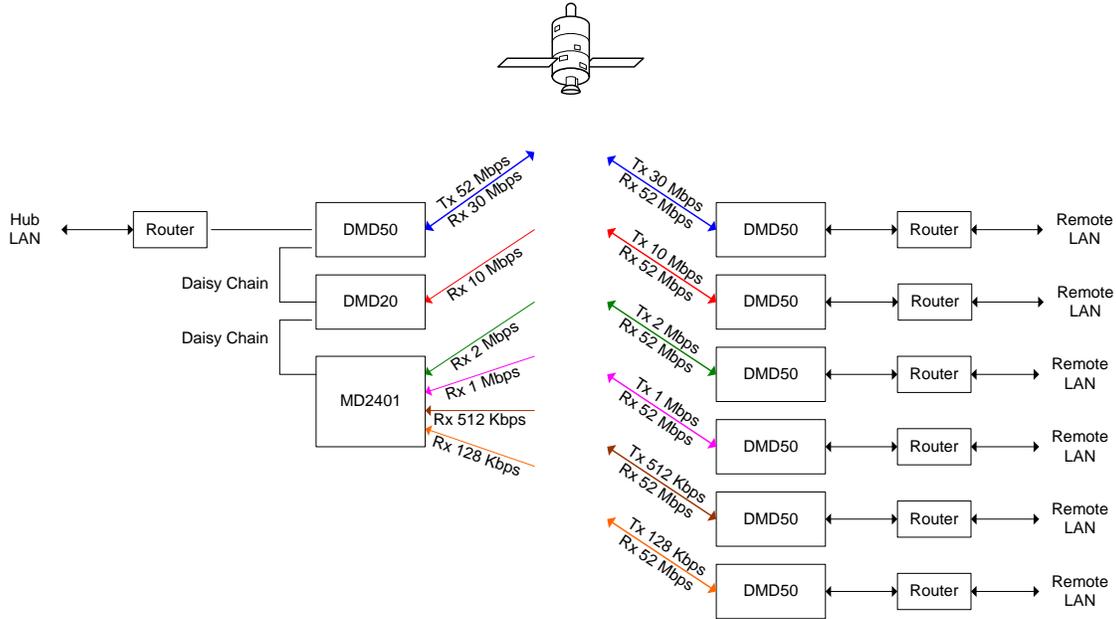


**Figure F-3 Point to Multipoint – Large Outbound, Smaller Returns**

## F.5    High Speed Mesh Applications

As shown in Figure F-4, the unique daisy chain capability of the EEI also lends itself to mesh networks. You can add more nodes to the mesh system without additional router blades or disruption of the existing traffic.
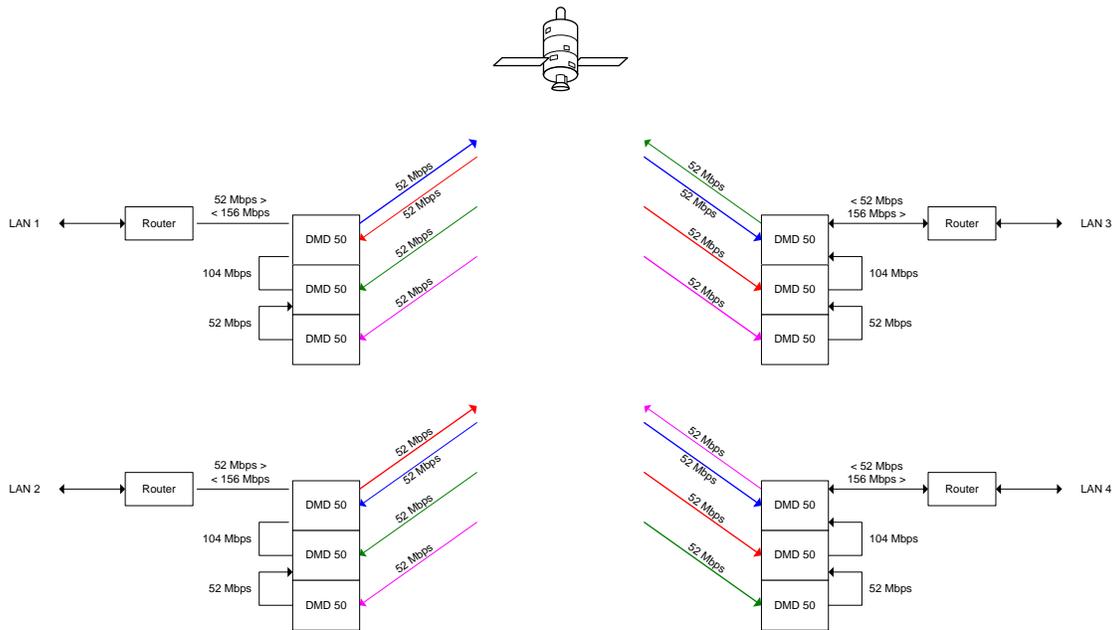
Figure F-4 High Speed Mesh

## F.6    Low Speed Mesh Applications

For mesh applications with data rates lower than 5 Mbps, the combination of a DMD20 and an MD2401 Multi-Demodulator can provide a simple 8PSK with Turbo solution that requires no IP configuration or network setup. See Figure F-5.

When configured with the Ethernet option, the MD2401 automatically multiplexes the packets received from the multiple data streams onto a single 10/100 Ethernet port.
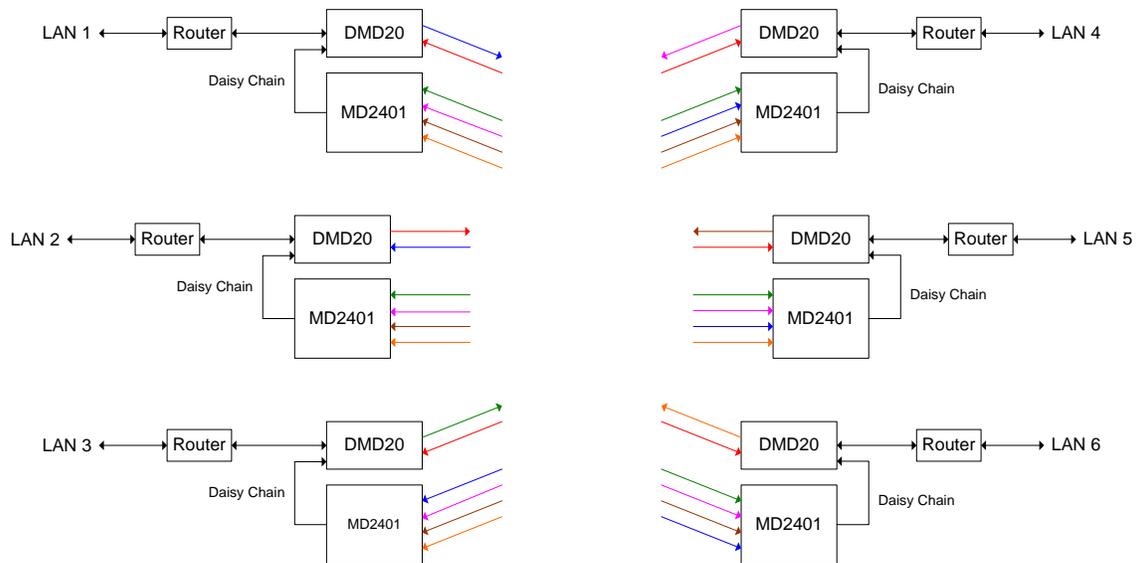


**Figure F-5 Low Speed Mesh**

## F.7 Remote Monitor and Control via SNMP

Simple Network Management Protocol (SNMP) is the most widely used protocol for network management available today. It provides a secure, open network standard, whereby you can use a PC with an MIB Browser to monitor and control almost any Cisco router, gateway or Radyne modem.

Because the Enhanced Ethernet Interface offers a multi-port Ethernet interface and daisy chain capability, you can control every modem easily from one central location. This is true for modems in complex point to multi-point systems, as well. This all occurs without extensive network setup or additional equipment at every remote site.

Figure F-6 shows complete Monitor and Control of all Radyne equipment from a centrally located PC at the Hub.
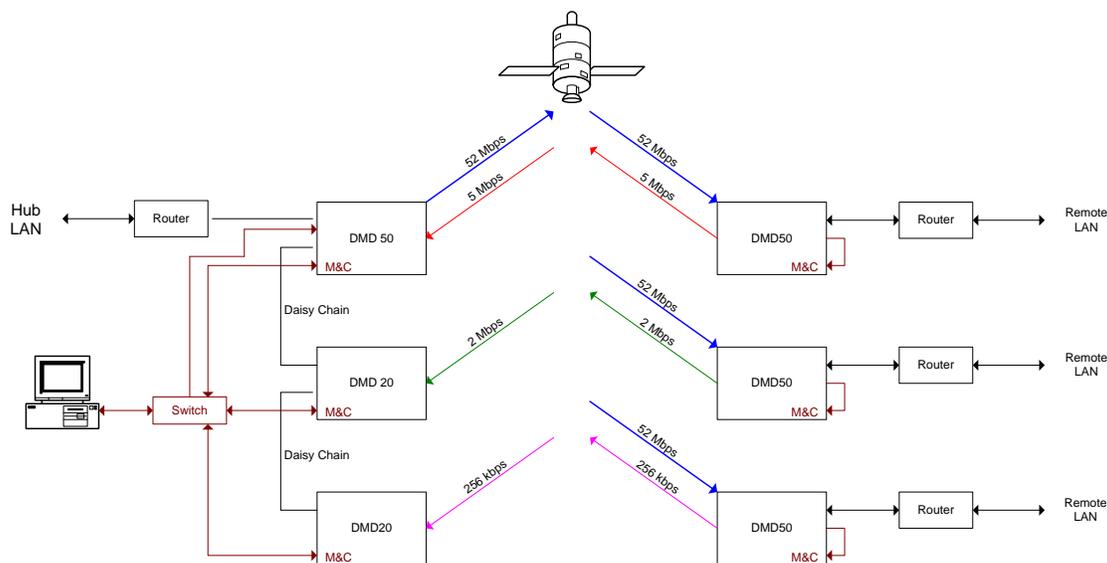
**Figure F-6 Remote Monitor and Control**

## F.8    Enhanced Quality of Service (QoS)

Most networks are comprised of various types of real-time and non real-time services. With its four prioritized output queues, the EEI can insure that higher priority traffic, like voice and network controls, do not wait behind low priority traffic, such as bulk transfers and games. In addition, EEI gives you more control over how the QOS determination is made, and how the queues are processed. In all cases, the QOS determinations and queuing are performed at line speed.

Figure F-7 shows the prioritized queues and the traffic associated with those queues normally.

**Prioritized Queues**
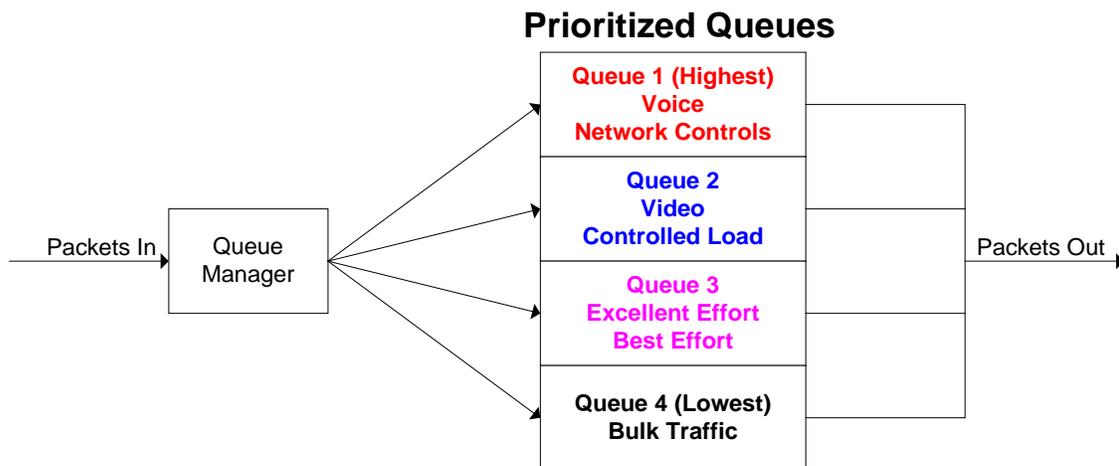


Figure F-7 Prioritized Traffic Queues

## F.8.1  Normal QOS

With Normal QOS selected, information contained in the packet determines traffic priority and queuing. This type of QOS is the default on the original Ethernet Bridge. It is what most users require, typically.

Normal QOS uses this packet information:

- When a packet contains an optional IEEE802.3ac tag, the EEI uses the IEEE802.1p priority information embedded in the tag.
- When a packet does not contain the optional tag, priority is determined using either:
  - IPv4 Type of Service / Differentiated Service field
    - or -
  - IPv6 Traffic Class field

## F.8.2  Port Based QOS

With Port Based QOS selected, the EEI ignores any QOS information embedded in the headers. Instead, priority and queuing are based on the port on which the traffic arrives. This type of QOS is used typically when the operator wants to control bandwidth allocation based on ports. However, it can be used to create a FIFO-like operation as well, where the data is transmitted in the exact order it is received. With Port Based QOS, Port 1 has the highest priority, and Port 2 on the standard 10/100 EEI.

## F.8.3  Fair Weighted Queuing

A fair weighted priority scheme allows higher priority traffic to move quickly through the system, while making sure lower priority traffic does not stall indefinitely. Fair weighted queues are the default on the original Ethernet Bridge. When fair weighted queuing is selected, packets are transmitted at rates of 8, 4, 2 and 1, from the highest to lowest priority queues respectively.

## F.8.4  Strict Priority Queuing

A strict priority scheme means that the highest priority traffic is always transmitted first, even if the lower priority traffic is stalled indefinitely. When Strict Priority queuing is selected, packets in the highest priority queue are transmitted until that queue is empty. Then, packets from the next highest priority queue are transmitted until the queue is empty, or a higher priority packet arrives. If a higher priority packet arrives before a lower priority queue is empty, that packet is the next packet transmitted.

> ⚠ **CAUTION**
>
> If Strict Priority Queuing is used, data in a lower priority queue might never be transmitted. Use with care.

## F.8.5  Satellite Packet Error Checking

Packet error checking is a standard part of any terrestrial Ethernet system. It uses the CRC contained in the Ethernet wrapper. When a CRC error is encountered, the packet is discarded by the router, switch or hub in which the error was detected.

A similar method is used over the satellite link, where bit errors result in a corrupted packet with a bad CRC. For the majority of the situations, the standard process of discarding these packets when found is preferred, because the packet can be retransmitted.

However, there are some cases where the end device must receive the erred packet, rather than no packet at all. Examples of two such situations include cryptography use or an end device with added error correction capability. For these customers, the EEI can turn off the satellite packet error checking, and

cause packets with bit errors to be output with a valid CRC, so that they pass through any routers or switches between the modem and the receiving device.

For all customers, the EEI maintains and reports satellite link statistics on total packets, erred packets and packet error rate (PER).

## F.8.6 Automatic Learning and Aging

The Automatic Learning and Aging function allows the EEI to connect to a network without requiring extensive setup and programming. The learning process makes sure that local LAN traffic stays on the local LAN. Only traffic that is not destined for other equipment on the local LAN is forwarded over the satellite link.

The aging process allows equipment to be shut off, moved or removed from the network completely, without tying up resources or requiring operator intervention. For example, a user might carry a laptop from remote office to remote office, and use it to check e-mail at the corporate office. The EEI handles the apparent movement of the laptop's MAC address from one position in the network to another, automatically.

The learned address database maintained by the EEI can hold up to 1024 MAC addresses. When a new LAN address is learned, it is put in the database and an aging timer is started. The aging timer is reset and restarted every time this learned address communicates. Finally, when the learned address has been inactive for more than 5 minutes, it is removed from the database. All of the processing needed for learning, searching and aging occurs at line speed, without any unnecessary delay at startup.

## F.8.7 Internal Buffer and Throttle

The EEI provides 120 Kb of internal data storage for Ethernet traffic buffering. When this buffer is almost full, industry standard backpressure, or an IEEE 802.3x Pause Frame, prevents the buffer from overrun. Together, the two provide an effective rate exchange and throttle between the Ethernet port and the satellite link.

## F.8.8 Adding Acceleration, Compression, Network Security and Traffic Shaping

Today, there are various acceleration, compression, IP security and traffic shaping solutions available from third party vendors. Some are proprietary implementations, while others use open standards, such as MIL-STD-2045-44000 and CCSDS 714.0-B-1. Your current network and routers might be using some. While different solutions, including none at all, make sense for different types of networks, the EEI is compatible with all of them.

## F.8.9 Any Data Rate, Modulation Type, FEC or Application

The EEI can be used with the right DMD20, DMD50 or DMD2050 to provide a transparent satellite connection at data rates ranging from 4.8 kbps to 20 Mbps. EEI can be used with any available FEC and Modulation Type, including DVB-S. EEI offers plug and play connectivity, regardless of the protocols used to transfer data between applications:

- IPv4 or IPv6
- Older standards, such as UDP and TCP
- Newer standards, such as RTP for MPEG Video and HTTPS for secure Internet access
- The latest SCTP usage as a transport mechanization for SIP
- With or without IPSec, regardless of how it is used
- Proprietary acceleration, an open network standard or no acceleration at all
- 10/100BaseT

EEI will pass transparently, any data transmitted via Ethernet, from one end of the satellite link to the other.

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# Appendix G. DMD1050T Strap Codes

## G.1    Introduction

The Strap Code is a key that quickly sets many of the modem parameters. For quick setup of the DMD1050T, Strap Codes are very helpful. Use Table G-1. DMD1050T Strap Codes (Dis = Disable), for a list of available strap codes.

When you enter a Strap Code, the modem is configured automatically for the code's corresponding data rate, overhead, code rate, framing, scrambler type and modulation. For example, on the Web interface page, **<Transmit> <General/IF>,** enter **26** in the **Strap Code:** field. The DMD1050T is then configured automatically to the parameters shown in Table G-1, in the highlighted row for Strap Code 26.

### Table G-1. DMD1050T Strap Codes (Dis = Disable)

| Strap Code (Decimal) | Data Rate (Kbps) | Overhead | Code Rate | Type | Framing Type | Scrambler Type | Reed-Solomon | Modulation | Mode |
|---|---|---|---|---|---|---|---|---|---|
| 12 | 2048 | 16-15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 24 | 56 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 33 | 56 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 34 | 64 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 36 | 64 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 40 | 128 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 48 | 128 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 65 | 256 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 66 | 256 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 68 | 320 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 72 | 320 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 80 | 384 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |

| Strap Code (Decimal) | Data Rate (Kbps) | Overhead | Code Rate | Type | Framing Type | Scrambler Type | Reed-Solomon | Modulation | Mode |
|---|---|---|---|---|---|---|---|---|---|
| 96 | 384 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 129 | 512 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 130 | 512 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 132 | 768 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 136 | 768 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 144 | 896 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 44 | 896 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 7 | 1344 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 11 | 1344 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 13 | 1536 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 14 | 1536 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 19 | 1544 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 21 | 1544 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 22 | 1920 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 25 | 1920 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 26 | 2048 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 28 | 2048 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 37 | 2368 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 38 | 2368 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 41 | 48 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 69 | 6312 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 70 | 8448 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 73 | 3152 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 74 | 3152 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 76 | 3264 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 81 | 3264 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |

| Strap Code (Decimal) | Data Rate (Kbps) | Overhead | Code Rate | Type | Framing Type | Scrambler Type | Reed-Solomon | Modulation | Mode |
|---|---|---|---|---|---|---|---|---|---|
| 97 | 1024 | 1 | 1/2 | VIT | CNT | V.35 (IESS) | Dis | QPSK | CNT |
| 98 | 1024 | 1 | 3/4 | VIT | CNT | V.35 (IESS) | Dis | QPSK | CNT |
| 134 | 192 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 137 | 192 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 138 | 320 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 140 | 320 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 100 | 448 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 146 | 448 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 104 | 576 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 148 | 576 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 152 | 640 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 161 | 640 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 162 | 704 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 164 | 704 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 193 | 832 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 194 | 832 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 196 | 896 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 208 | 896 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 224 | 960 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 15 | 960 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 30 | 1088 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 39 | 1088 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 43 | 1152 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 46 | 1152 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 51 | 1216 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 53 | 1216 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |

| Strap Code (Decimal) | Data Rate (Kbps) | Overhead | Code Rate | Type | Framing Type | Scrambler Type | Reed-Solomon | Modulation | Mode |
|---|---|---|---|---|---|---|---|---|---|
| 54 | 1280 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 57 | 1280 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 58 | 1344 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 67 | 1408 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 71 | 1408 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 75 | 1472 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 77 | 1472 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 78 | 1600 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 83 | 1600 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 85 | 1664 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 86 | 1664 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 89 | 1728 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 90 | 1728 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 92 | 1792 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 99 | 1792 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 102 | 1856 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 105 | 1856 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 106 | 2048 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 135 | 1984 | 16/15 | 1/2 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 139 | 1984 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |
| 45 | 3088 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 141 | 3088 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 176 | 4000 | 1 | 1/2 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 116 | 4000 | 1 | 3/4 | VIT | NONE | V.35 (IESS) | Dis | QPSK | CNT |
| 60 | 1344 | 16/15 | 3/4 | VIT | IBS | IBS | Dis | QPSK | CNT |

# Appendix H. Software Upgrade Procedure

## H.1   Software Upgrade Procedure

Use the terminal or the web interface to upgrade the board modem software.

## H.2   Terminal Software Upgrade

You can do field upgrades to the modem's feature set quickly and easily from the Terminal Port.

Purchased upgrades become part of the modem's permanent configuration.

Demonstration upgrades enable the optional features for a 30-day evaluation period.

## H.3   Required Equipment

The satellite modem board is the only equipment necessary for this procedure.

## H.4   Upgrade Procedure

### H.4.1 Find the available features

1.   Use the GUI interface
2.   Go to **System > Features**
3.   Click **Features**

The screen shows all available features. Checked features are those already purchased and installed.

### H.4.2 Find the Unit ID

1.   Use  the Terminal interface
2.   Go to **Main > Features**
3.   Find **Feature Id**

The **Feature Id** value on the top line is the 12-digit Unit ID. Example: 1 2 3 4 . 1 2 3 4 . 1 2 3 4

Your Sales Representative will ask you for the Unit ID and the desired feature set upgrades when taking your order.

## H.4.3 Purchase the Upgrades

Contact CEFD and order the upgrades. Once the order is processed, you will receive a 12-digit feature set upgrade code. This code works only on the modem for which it was ordered.

## H.4.4 Enter the Upgrade Code

1.    Enter the upgrade code from the terminal port:

   a.    On the **Enter Selection Number** line, type **45**

   b.    Press **Enter**

   c.    Enter the new code

   d.    Press **Enter**

If the code entered is correct, the **CODE ACCEPTED** message shows. The modem upgrade is finished.

Otherwise, the **INVALID CODE** message shows. Repeat all of Step 1, and make sure the code entered is correct.

⚠️ **CAUTION**

Make sure to enter the code correctly. After three unsuccessful attempts to enter a code, the modem locks out the upgrade and demonstration capability. To continue after the lock out, you must cycle power on the modem.

## H.5    Demonstration Procedure

The procedure for enabling a 30-day demonstration of the options is similar to the procedure used for permanently upgrading the features. However, at the end of 30 days, the demonstration features are disabled automatically.

At the end of the demonstration period, the modem reverts to its permanent configuration automatically. Traffic interruption can occur, even if demonstration features were active. Operator intervention is necessary to restore the data paths.

To avoid this interruption in service, cancel the demonstration before the end of the period. See Section H.6 for instructions.

## H.5.1 Find the available features

1. Use the GUI interface
2. Go to **System > Features**
3. Click **Features**

The screen shows all available features. Checked features are those already purchased and installed.

## H.5.2 Find the Unit ID

1. Use the Terminal interface
2. Go to **Main > Features**
3. Find **Feature Id**

The **Feature Id** value on the top line is the 12-digit Unit ID. Example: 1 2 3 4 . 1 2 3 4 . 1 2 3 4

The Customer Service representative will ask you for the Unit ID and the desired feature set when taking your request for a demonstration.

## H.5.3 Request a Demonstration

Contact Customer Service and request a demonstration. Once the request is processed, you will receive a 12-digit demonstration code. This code works once only, on the modem for which it was ordered.

## H.5.4 Enter the Demonstration Code

1. Enter the demonstration code from the terminal port:
   a. On the **Enter Selection Number** line, type **45**
   b. Press **Enter**
   c. Enter the new code
   d. Press **Enter**

If the code is entered correctly, the **CODE ACCEPTED** message shows.

Otherwise, the **INVALID CODE** message shows. Repeat all of Step 1, and make sure the code entered is correct.

⚠️ CAUTION

Make sure to enter the code correctly. After three unsuccessful attempts to enter a code, the modem locks out the upgrade and demonstration capability. To continue, you must cycle power on the modem.

## H.6    Cancel Demonstration Mode

You can cancel demonstration mode at any time. The modem then returns to normal operation.

You cannot restart a canceled demonstration. You must get a new demonstration code and start a new demonstration.

### H.6.1 Cancel a Demonstration Mode

1.    Go to the Terminal Port **Main Menu**

2.    Type **19**

3.    Press **Enter**

4.    On the **Enter Selection Number** line, type **45**

5.    Press **Enter**

6.    Use the numeric keypad to enter **0000 0000 0000**

7.    Press **Enter**

The modem ends the demonstration immediately. The feature set reverts to the permanent configuration.

## H.7    Web Browser Software Upgrade

You can upgrade features through the Web Browser interface.

## H.8    Monitor and Control

You can monitor and control all modem settings through the Web Browser interface. User rights control your level of access.

1.    From the **Modem Introduction** page, click the **MONITOR & CONTROL** tab

2.    If prompted, enter your **Username** and **Password**

3.    Press **Enter**

The screen shows enabled features.

**Figure H-1. Web Browser Menu example**

Each feature has symbols that show its status. The symbols include:

| | |
|---|---|
| ✓ | Installed |
| (HW) | No hardware available; Requires hardware for upgrade |
| ⚠ | Feature is in Demo Mode and will expire |
| 👆 | Key Code Required |
| ☎ | Call customer service<br>Feature is enabled, but the required hardware is not detected or has failed |

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