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06/30/2003	1.0	Initial Release	RF

Octal T1 Module 2 (OTM2)

Module Manual

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William J. Hughes Technical Center
Atlantic City International Airport, NJ 08405

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Originator:	R. France	06/30/2003
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CIE ENGINEERING INC.
6001 Woodlake Lane, Alexandria, VA 22310 (703) 922-7061

Title: Octal T1 Module 2 (OTM2) Module Manual

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1.0 INTRODUCTION

This Module Manual provides detailed information about the Octal T1 Module 2 (OTM2).

The OTM2 module is part of the NEXCOM Real Time Platform (RTP). The RTP handles the real-time functions of the Prototype Radio Interface Unit (PRIU) and/or the Prototype Ground Network Interface (PGNI). It provides NEXCOM timing and scheduled message delivery service between the Sub-Network Simulator (SNS), Voice Channel Modules (VCMs) and the Multimode Digital Radios (MDRs).

The OTM2 has been developed for the **NEXCOM Group (ACB-560)** of the Federal Aviation Administration's William J. Hughes Technical Center. The NEXCOM Group supports the following NEXCOM programs:

Next Generation A/G Communications System (NEXCOM)

Rapid Prototype Development Effort (RPDE)

NEXCOM System Demonstrations

1.1 PURPOSE

The purpose of this document is to present Octal T1 Module 2 (OTM2) specifications and operating instructions.

1.2 DOCUMENT CONVENTIONS

N/A.

1.3 INTENDED AUDIENCE AND READING SUGGESTIONS

This document is intended for NEXCOM developers and testers.

1.4 REFERENCES

The following references apply to the OTM2:

- DOT/FAA Interface Control Document, Multimode Digital Radio (MDR)/Radio Interface Unit (RIU), DTFA01-01-D-03009, NAS-IC-41033502, July 23, 2001 – V3.0.
- Voice Channel Module 2 (VCM2) User Manual, CIE Document FA100-00098, June 27, 2003 - V1.0.
- OTM-VCM Interface Control Document, CIE Document FA100-00066, January 30, 2002 - V1.0.
- SNS-RTP Interface Control Document, CIE Document FA100-00065, January 30, 2002 - V1.0.

1.5 REVISION HISTORY

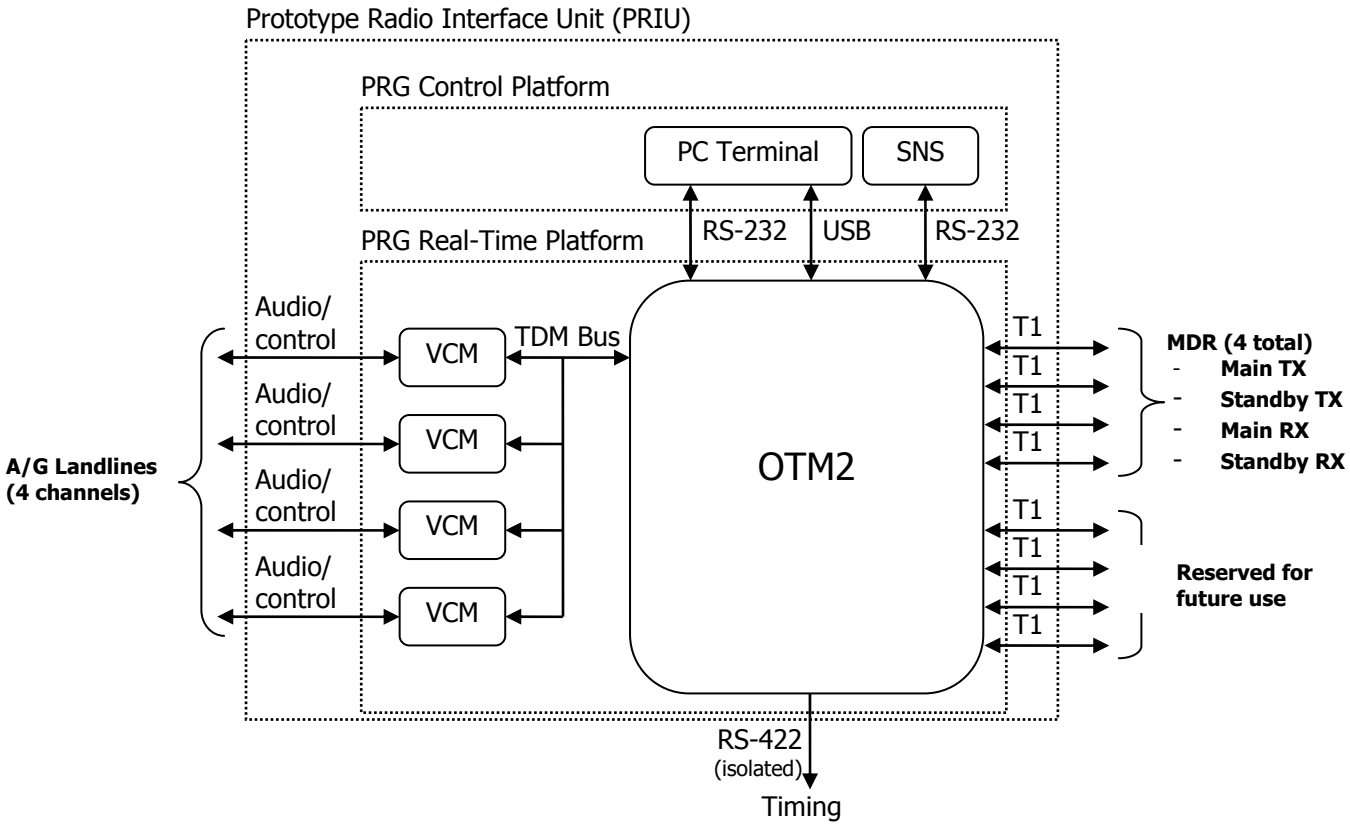
Date	Revision	Description of Changes
06/30/2003	1.0	Initial Release

2.0 GENERAL DESCRIPTION

2.1 OVERVIEW

Figure 1 provides an interface diagram depicting the OTM2 connections for the PRIU. The OTM2 also supports a number of other system configurations (e.g., Prototype Ground Network Interface – PGNI; Ground Reference Prototype – GRP). The OTM2 provides NEXCOM timing and provides message routing services between the SNS, VCM and T1-interfaced equipment.

Figure 1. Octal T1 Module 2 (OTM2) Block Diagram



2.2 FEATURES

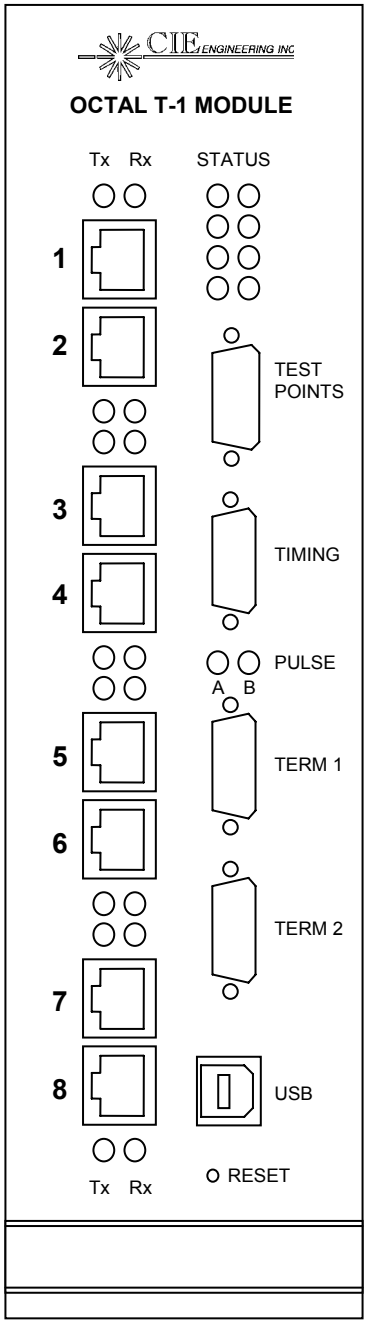
The Octal T1 Module 2 (OTM2) provides the following features:

- Generates NEXCOM timing channel on T1 ports
- Scheduled message transmission (for MDR messages)
- Supports PCM audio stream and/or VDL-3 compressed voice messages over TDM Bus
- Field upgradeable software (via Debug Terminal)
- Four RS-422 timing signals on Timing port (externally available)

3.0 CONTROLS, INDICATORS & INTERFACES

Figure 2 is an illustration of the OTM2 front panel showing the location of all controls, indicators and interfaces.

Figure 2. OTM2 Front Panel



3.1 T1 INTERFACES (PORT 1 - PORT 8)

The T1 interfaces use standard RJ-48 connectors and standard T1 pinouts. See Figure 2 for a front panel illustration showing the location of the T1 ports. There are eight T1 connectors on the OTM2.

Table 1. T1 Ports 1 through 4 – Signal Descriptions

Signal	Pin	Pin Type	Description
RX Tip	1	I	Receive Tip, Positive
RX Ring	2	I	Receive Ring, Negative
	3		
TX Tip	4	O	Transmit Tip, Positive
TX Ring	5	O	Transmit Ring, Negative
	6		
	7		
	8		

3.2 TEST POINTS INTERFACE

The Test Points Interface is a standard DB-15F (sockets) connector. See Figure 2 for a front panel illustration showing the location. This interface is reserved for future use.

3.3 TIMING INTERFACE

The Timing Interface is a standard DB-9M (pins) connector. Optically isolated, differential system timing signals are routed to this connector for monitoring purposes. See Figure 2 for a front panel illustration showing the location.

Table 2. Test Points Interface – Signal Descriptions

Signal	Pin	Pin Type	Description
D1544P	1	O	1.544 MHz, Positive
D31K5P	2	O	31.5 KHz, Positive
DLPBN	3	O	Pulse B, Negative
DLPAN	4	O	Pulse A, Negative
ISOGND	5	GND	Optical Isolation Ground
D1544N	6	O	1.544 MHz, Negative
D31K5N	7	O	31.5 KHz, Negative
DLPBP	8	O	Pulse B, Positive
DLPAP	9	O	Pulse A, Positive

3.4 RS-232 TERMINAL INTERFACES (TERM 1 AND 2)

The RS-232 Terminal Interface is compatible with standard personal computer (PC) serial ports. The RS-232 TERM interface is permanently configured as a DCE device. A standard "one-to-one" interface cable (male-to-female) can be used for PC-to-OTM2 communication.

Table 3. RS-232 Terminal Interface (TERM 1 and 2) – Signal Descriptions

Signal	Pin	Pin Type	Description
COM_CD	1	O	COM Carrier Detect:
COM_RD	2	O	COM Receive Data:
COM_TD	3	I	COM Transmit Data:
COM_DTR	4	I	COM Data Send Ready:
GND	5	GND	Signal Ground
COM_DSR	6	O	COM Data Terminal Ready:
COM_RTS	7	I	COM Clear To Send:
COM_CTS	8	O	COM Request To Send:
COM_RI	9	O	COM Ring Indicator:

The OTM2 RS-232 Terminal connectors are standard DB-9F (sockets). See Figure 2 for a front panel illustration showing the location.

The TERM interface uses the standard asynchronous ASCII communication protocol configured at 115200 bps, 8 data bits, 1 stop bit, no parity, h/w handshaking.

3.5 USB TERMINAL INTERFACE (TERM 3)

The Universal Serial Bus (USB) Terminal Interface is compatible with standard personal computer (PC) USB ports. The OTM2 is configured as a self powered USB function device. A standard USB interface cable can be used for PC-to-OTM2 communication.

Table 4. USB Terminal Interface (TERM 3) – Signal Descriptions

Signal	Pin	Pin Type	Description
Vbus	1	I	+5 V Bus Power
D-	2	I/O	Data (Negative Differential)
D+	3	I/O	Data (Positive Differential)
GND	5	GND	Signal Ground

The OTM2 USB connector is a standard Series "B" plug. See Figure 2 for a front panel illustration showing the location. The PC USB connector is a standard Series "A" plug.

A terminal emulation program can be used on the PC in conjunction with the FT8U232/245 Virtual Com Port (VCP) device driver from FTDI. The VCP driver makes the OTM2 terminal look like a standard COM port device. The VCP

terminal is configured at 8 data bits, 1 stop bit, no parity, and no handshaking. The baud rate setting is ignored and data is transferred at the maximum rate possible for the device driver.

3.6 RESET

The Reset Button is a recessed momentary switch that, when pushed, will cause a hardware reset to occur on the OTM2 module. See Figure 2 for a front panel illustration showing the location.

3.7 LED INDICATORS

Figure 3 shows a detail of the block of STATUS LEDs with numbers to reference individual LED locations with. See **Table 5** for the description on these LEDs.

Figure 3. OTM2 Status LEDs

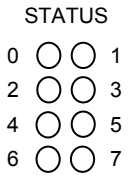


Table 5. Status LED – Descriptions

Identifier	Usage
0	Run-Time LED: Blinks GREEN at one second boundaries. Indicates that system software is functioning normally.
1	Epoch LED: Blinks GREEN at epoch boundaries (every 6 seconds).
2	SNS Status LED: Controlled by SNS via LED Control Message
3	SNS Status LED: Controlled by SNS via LED Control Message
4	ICC Receive LED: Winks GREEN for each message received from active VCMs.
5	ICC Transmit LED: Winks GREEN for each message transmitted to active VCMs.
6	SNS Receive LED: Winks GREEN for each message received from the SNS.
7	SNS Transmit LED: Winks GREEN for each message transmitted to the SNS.

The LEDs labeled PULSE A and B light red when the corresponding Pulse signals on the "TIMING" front panel connector are active. Refer to the PULSE command in Section 7.0.

There are two LED indicators adjacent to each of the RJ-48 T1 interface connectors on the OTM2. The LEDs labeled "Tx" are used to indicate the state and activity of the Tx T1 interfaces and the LEDs labeled "Rx" are used to indicate the state and activity of the Rx T1 interfaces . See **Error! Reference source not found.** for details.

Table 6. LED TI Data Indicators

LED INDICATOR	Red	Green	Off
TX	T1 transmit errors	Message transmitted on T1, no errors	No data, no error
RX	No connection or clock, T1 receive errors	Message received on T1, no errors	No data, no error

4.0 INSTALLATION

4.1 BASIC INSTALLATION

The OTM2 is mounted in the RTP chassis at the factory. To install the OTM2 system connections, follow the steps below and reference Figure 1.

Note: The following cables are required (but not supplied): One T1 crossover cable per MDR connection and an SNS serial interface cable. In addition, a terminal interface cable is recommended, but not supplied.

1. Connect the SNS serial cable to the TERM port defined to be the SNS communication interface with the CMODE command. The default setting is TERM1.
2. Optionally, connect the PC running the terminal emulation program to the TERM port defined to be a command interface with the CMODE command. The default settings are TERM2 or USB (TERM3). The OTM2 command interface is meant to be used with a terminal emulator program such as Procomm or HyperTerminal.
3. Connect the T1 interface cables from the four MDRs to the MDR1 - 4 T1 ports defined by the HMODE command as shown in Figure 1. The Default MDR ports are as follows: MDR1 - T1 port 5, MDR2 - T1 port 6, MDR3 - T1 port 7, MDR4 - T1 port 8.

4.2 INSTALLING THE OPTIONAL USB DRIVERS

If the USB interface is used, insure the FT8U232/245 Virtual Com Port (VCP) device driver from FTDI is installed on the PC. The VCP device driver and installation instructions can be found at http://www.ftdichip.com/FTDriver.htm - NOPNP. Be sure to select the proper driver for the operating system being used.

The default settings for the Virtual Com Port should be maintained. The settings are found in the Windows Device Manager when the USB port is connected and the OTM2 is on. To modify/verify the settings:

1. In the Windows Device Manager, select Ports (COM & LPT) - USB Serial Port (COM number that the device was installed with).
2. Right click the mouse and select "Properties".
3. On the "Port Settings" tab. Insure the following settings are selected: 9600 Bits per second, 8 Data bits, None for Parity, 1 Stop bit and None for Flow control.
4. Click on the "Advanced" button. Insure the following settings are selected: 4096 Receive (Bytes), 4096 Transmit (Bytes), 16 for Latency Timer (msec), 0 Minimum Read Timeout (msec), 0 Minimum Write Timeout (msec) and nothing checked in Miscellaneous Options are the default settings.

Note: The COM Port Number can be changed to any unused port at the user's preference.

5.0 FUNCTIONAL DESCRIPTION

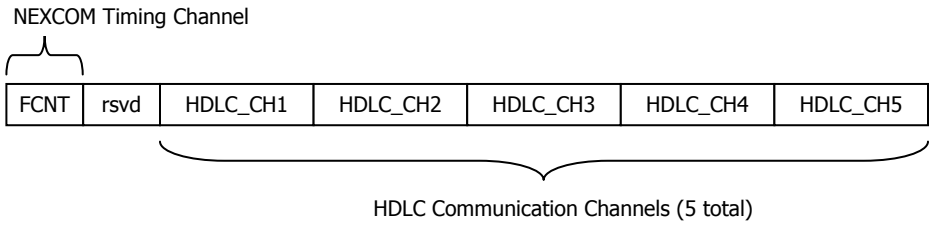
5.1 T1 INTERFACE

The OTM2 includes 8 separate T1 interface ports. All 8 ports are timed to the T1 Reference Clock frequency. In addition, the Extended Super Frame (ESF) framing bit for all 8 ports are forced into alignment during port initialization. Further, the NEXCOM timing channel (timeslots 1 and 2) are also forced into alignment during port initialization. The OTM2 ensures that the ESF transmit frame boundary is aligned with the NEXCOM epoch boundary for all 8 T1 ports.

The T1 framing format is summarized as follows: ESF framing, B8ZS, elastic stores disabled, robbed bit signaling disabled, LBO compatible with 0 to 133 feet.

The standard port assignments for MDR connections are ports 5 through 8 (the lower four T1 interface ports). The standard port assignment for remote landline connections is port 4.

Figure 4. T1 Timeslot Utilization



FCNT NEXCOM Timing Channel: Each T1 frame within a NEXCOM 6-second epoch is uniquely identified with an incrementing frame count number. Two T1 timeslots are dedicated to frame count identification (timeslots #0 and #1).

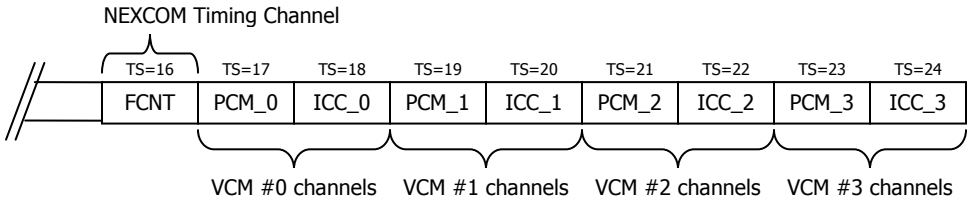
HDLC_CHx HDLC Communication Channels: Four T1 timeslots are grouped together to form an HDLC communication channel. Only one channel is active at any given time. The OTM2 uses HDLC_CH1 by default (timeslots #5-#8). The OTM2 can be reconfigured to use any one of the five available channels.

Two types of delivery services are available for OTM2 T1 transmit messages: scheduled message delivery and immediate message delivery. The scheduled message delivery service transmits queued messages at a specified frame within the NEXCOM epoch. There are 48000 frames in the 6-second NEXCOM epoch. The immediate message delivery service transmits queued messages as soon as possible.

5.2 TDM BUS DESCRIPTION

The TDM bus is located on the system backplane and supports OTM-VCM inter-module communication. The OTM2 serves as the TDM bus master. It drives the bus clock and framing signals. The bus operates at 3.072 Mbps and includes 24 timeslots. Each timeslot is 16 bits wide. The OTM2 broadcast the current frame count identifier in slot 16. The VCMs communicate directly with the OTM2 over dedicated timeslots 17 through 24 and do not communicate with each other. Two slots are dedicated to each potential VCM module. The first slot carries PCM voice data. The second slot supports a message based protocol bus called the Inter-Card Communication (ICC) bus. The ICC messages support VDL Mode 3 compressed voice and a small number of VCM control/status commands. The remaining slots (slots 1 through 15) are not used by the OTM. Figure 5 provides the TDM timeslot utilization.

Figure 5. TDM Bus Timeslot Utilization



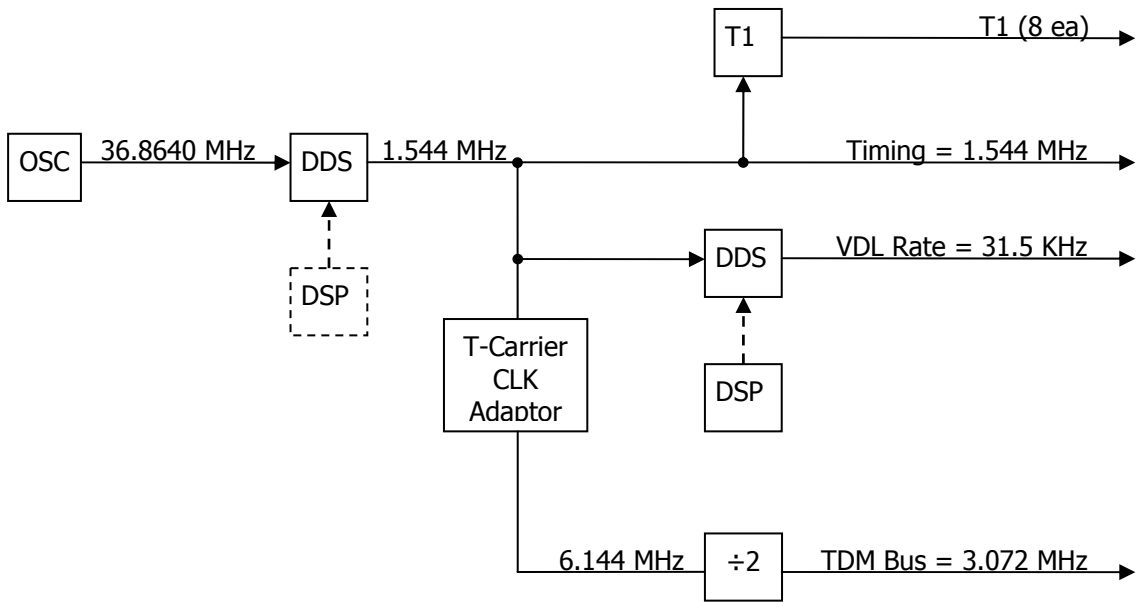
FCNT	NEXCOM Timing Channel: Each T1 frame within a NEXCOM 6-second epoch is uniquely identified with an incrementing frame count number. Two T1 timeslots are dedicated to frame count identification (timeslots #0 and #1).
PCM_x	PCM Voice Data Channel: A separate linear (PCM) voice channel path is provided for each potential VCM module.
ICC_x	ICC Message Channel: Message based traffic is carried over ICC timeslots. A separate ICC channel is provided for each potential VCM module.

5.3 TIMING AND SYNCHRONIZATION

For NON-GPS, all timing is locked to local oscillator reference (includes T1 frequency and TDM bus and Test Bed Frequency Generator). This oscillator is unrelated to DSP and UART crystals.

The OTM2 serves as the clock master for the Real Time Platform. It presently uses an on-board oscillator to generate system timing; however, the platform could lock the timing chain to an external T1 timing reference using DSP control of the primary DDS. The oscillator and primary DDS is used to generate a 1.544 MHz T1 reference clock. It also provides a 3.072 MHz TDM bus clock. The OTM2 hardware is capable of supporting external T1 timing derived from a GPS referenced source.

Figure 6. OTM2 Timing Diagram



5.4 TIMING PORT

The OTM2 Timing Interface includes the following four signal outputs:

- Programmable Pulse Output A
- Programmable Pulse Output B
- T1 Reference Clock (1544 kHz nominal)
- VDL Frequency Synthesizer (31.5 kHz nominal)

The timing signals can be used to trigger external equipment to capture important NEXCOM timed events such as an RF burst or RIU-MDR messages.

The Programmable Pulse Outputs can be individually programmed to be asserted/released on any T1 frame boundary in the 6 second epoch scheduling window (NEXCOM epoch). Two separate pulses are provided. Each frame in this scheduling window is numbered with a frame count that ranges from 0 to 47999 (decimal). For example, pulse #A can be configure to be asserted at frame count = 0000 and released at frame count = 8000. This will create a one second pulse aligned with the beginning of the NEXCOM epoch. Positive and negative edges of the pulse are independently programmable. The pulses can be used to trigger external equipment to capture

specific T1 HDLC messages or RF bursts. It also can be used to insure these messages are transmitted accurately within the NEXCOM epoch.

The T1 Reference Clock operates at the T1 frequency used to drive all external T1 ports, i.e. it is the same clock that drives the RIU-MDR T1 interface. The T1 Reference Clock is derived from an on-board crystal oscillator operating at 25 MHz.

The VDL Frequency Synthesizer is synthesized from the T1 Reference Clock. It is nominally set to operate at the VDL RF bit rate, i.e. 31.5 kHz, but can be adjusted to any frequency between 0 to 500 kHz (1 milliHertz resolution) via the SNS or Debug Terminal port. For example, this clock could be configured to operate at the VDL RF symbol rate, i.e. 10.5 kHz.

All four signal outputs are RS-422 opto-isolated signals.

5.5 SNS CONTROL

The SNS interface carries two types of message traffic: control and status messages directed toward the OTM2 and data message traffic destined for the VCM and/or T1 ports. See the SNS-PRG Interface Control Document for more details.

5.6 MULTI-TERMINAL SUPPORT

More than one terminal can be connected to the OTM2 at any one time. TERM2 is the default command interface port and it is the only terminal that shows the progress of the startup sequence. It is also the terminal to use for downloading software upgrades. Any terminal can be used for command entry or SNS communication by setting the port mode with the CMODE command. Command responses are sent to the terminal that the command was entered on. Hardware handshaking is used on the RS-232 terminals (TERM1 and TERM2) to prevent data loss. The USB terminal (TERM3) is inherently a lossless communication device.

5.7 TIME OF DAY

The OTM2 module does NOT have a real time clock that will maintain the time through a power cycle. It does have the ability to maintain the time of day, once it is set with TIME and DATE commands, as long as power is continuously applied to the module. The date reflects the correct number of days in a month, but does not support leap year changes. The time is updated every 125 micro seconds synchronous with the system timing. When the time is being set, it calculates the frame count value that is represented by the entered time and waits until that frame count to set the clock. This is done to synchronize the time of day with the epoch. Consequently, if the referenced time of day used to set the clock is not synchronous to the source of the epoch, there may be as much as a 6 second difference between the set time of day and the referenced time.

6.0 OPERATION

6.1 TYPICAL OPERATING PROCEDURES

The OTM2 is typically controlled by the SNS (an external software control system). Consequently, no user interface is required to control the OTM2, but OTM2 status can be monitored on the module front panel (see Section 3.7). Optionally, the user can connect a terminal to one of the command port interfaces (TERM2 or USB) to get additional module status and/or to assert debug configuration control/status (see below).

6.2 USING THE TERMINAL INTERFACE

6.2.1 Configuring HyperTerminal

1. Start up HyperTerminal; this will usually prompt you for the creation of a new connection template. If you have already started with a connection, then you will need to go to the 'Call' menu and disconnect. This will enable you to modify the properties under the 'file' menu.
2. On the "Connect To" tab, select the connection using the COM port that the OTM2 is connected to.
3. Press the 'Configure' button and select 115,200 baud, 8 data bits, 1 stop bit, no parity, and h/w flow control.
4. On the "Settings" tab, select Backspace key sends "Del", emulate a VT100 terminal and, in Terminal Setup, check "132 column mode" for the best viewing of the data.
5. Save the configuration in the "file" menu to some convenient name. You may create a shortcut using Windows Explorer, to this configuration file and place it on your Desktop or Start Menu to allow easy access when restarting HyperTerminal.

6.2.2 OTM2 configuration using HyperTerminal

Here is an example of initializing OTM2 using the Terminal Emulator program HyperTerminal on a PC.

1. When the power is supplied to the OTM2 you should see the text of the OTM2 startup screen appear within the HyperTerminal display window. If you are connected to the USB Terminal port and the Terminal Emulation program is running when power is applied to the OTM2, you must perform a "disconnect" and "call" in the Terminal Emulation program to start communicating with the OTM2. This is due to the fact that a USB device is removed from the system when it is powered off, so the connection is lost.
2. Use the "**?**" at any time to display a short help screen summarizing the commands available within the OTM2. Use the "**?** " followed by a command or parameter to display a short help screen summarizing the command or parameter options.
3. Set the date by typing "**DATE MM/DD/YYYY**", then **<ENTER>** on the terminal where **MM** is the two digit month, **DD** is the two digit day of the month, **YYYY** is the four digit year. Set the time of day by typing "**TIME HH:MM:SS**", then **<ENTER>**, where, **HH** is the two digit hour, **MM** is the two digit minute and **SS** is the two digit seconds.
4. By default, MDR ports are already assigned to T1 ports. The assignments can be seen by typing "**HMODE**", then **<ENTER>** on the command interface port. "HPORT" is the T1 port as labeled on the front panel and "PMODE" is the logical assignment of that port. The assignments can be changed with the HMODE command. For example, change MDR1 to T1 port 4 by typing "**HMODE 4 MDR1**", then **<ENTER>.** MDR1 is now assigned to the T1 port labeled Port 4 on the front panel.

5. By default, HDLC channel 1 will be used on all T1 ports. That can be changed by typing "**HCHAN * 2**", then **<ENTER>** to change all 8 T1 ports to HDLC channel 2 or typing "**HCHAN 1 2**", then **<ENTER>** to change only the T1 port 1 to HDLC channel 2.

6.3 UPGRADING OTM2 SOFTWARE

The Firmware program contained in the OTM2 is field upgradeable via the serial port on TERM2. Please contact CIE Engineering regarding the availability of upgrade programs.

The procedure to upgrade the software is as follows:

1. Connect a terminal to TERM2. Make sure that the terminal has hardware handshaking disabled for this procedure.
2. Apply power to the module or perform a reset with the recessed button on the front panel.

   "Booting …" and a spinning cursor will appear on the terminal for a few seconds.
3. Press the escape key during the spinning cursor, before the startup sequence begins printing to the screen.

   This will stop the boot sequence and provide a DSP Debugger prompt, which is a "!".
4. Type "DL" and then <ENTER> on the terminal.

   The flash memory will be erased and the user will be asked to pick a file.
5. Transfer the file from the terminal program. In HyperTerminal go to the "Transfer" menu and click on "Send File".
6. Select the S record file that has been supplied for upgrade and use the Xmodem transfer protocol.
7. Send the file.

   The file will be transferred and validated. It may take several minutes to transfer the file, do not remove power or reset during the transfer.
8. Cycle power or perform a reset.

   After normal booting, the new software version will be displayed at startup or with the VERSION command.

7.0 TERMINAL COMMAND REFERENCE

7.1 GENERAL

The command interface is structured so that each command may have optional parameters. If the parameters are entered, the command will set the values supplied. If the parameters are not entered, the command will display the state of the settings for the parameters that were supplied. The optional parameters are shown inside square brackets **[]**. If there are multiple optional parameters and the second optional parameter is supplied, the first must also be supplied.

For example, **CMODE** has two optional parameters **[CPORT]** and **[PTYPE]**. If **CMODE** is entered with no parameters, the settings for all ports will be displayed. If **CMODE** and a value for **[CPORT]** are entered, then the setting for only that port will be displayed. If **CMODE** and a value for **[CPORT]** and **[PTYPE]** are entered, then the **[PTYPE]** values will be set for the given **[CPORT]**. If **CMODE** and a value for **[PTYPE]** are entered without a value for **[CPORT]**, an error message will be displayed indicating an invalid parameter. If a command that is not recognized is entered with or without parameters, an error message will be displayed indicating an invalid command.

7.2 EVENT RELATED COMMANDS

Note: For optimal system performance, do not enable message printouts with the EVENT commands. The EVENT messages are provided to assist with system troubleshooting (if required).

7.2.1 Event SNS Messages

Command:	EVTSMSG
Description:	Displays messages to and from the SNS.
Syntax	EVTSMSG [CPORT TENABLE RENABLE]
Parameters;	Displays/modifies the state of Transmit Enable and Receive Enable and the port it will be display on. Valid port numbers are 1 – 3 where 1 is TERM1, 2 is TERM2 and 3 is USB. Valid TENABLE and RENABLE parameters are E for Enable and D for Disable.
Notes:	

Examples:	`TERM2: EVTSMSG`
	`CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`TERM2: EVTSMSG 3 E E {Display SNS Tx and Rx messages on USB port}`
	`OK`

Related Commands:	
Non-Volatile:	No

7.2.2 Event PCM Messages

Command:	EVTPMSG
Description:	Displays Tx and Rx PCM messages.
Syntax	EVTPMSG [CPORT TENABLE RENABLE]
Parameters:	Displays/modifies the state of Transmit Enable and Receive Enable and the port it will be display on. Valid port numbers are 1 – 3 where 1 is TERM1, 2 is TERM2 and 3 is USB. Valid TENABLE and RENABLE parameters are E for Enable and D for Disable.
Notes:	

Examples:	`TERM2: EVTPMSG`
	`CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`TERM2: EVTPMSG 3 E E {Display PCM Tx and Rx messages on USB port}`
	`OK`

Related Commands:	
Non-Volatile:	No

7.2.3 Event ICC Messages

Command:	EVTIMSG
Description:	Displays Tx and Rx ICC messages.
Syntax	EVTIMSG [VCHAN] [CPORT TENABLE RENABLE]
Parameters:	If [VCHAN] is supplied, displays/modifies the state of Transmit Enable and Receive Enable and the port it will be display on for the given VCHAN messages. Valid VCHAN numbers are 1 – 4. Valid port numbers are 1 – 3 where 1 is TERM1, 2 is TERM2 and 3 is USB. Valid TENABLE and RENABLE parameters are E for Enable and D for Disable.
Notes:	

Examples:	`TERM2: EVTIMSG`
	`VCHAN = 1, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`VCHAN = 2, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`VCHAN = 3, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`VCHAN = 4, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`TERM2: EVTIMSG 1 3 E E {Display ICC 1 Tx and Rx messages on USB port}`
	`OK`

Related Commands:	
Non-Volatile:	No

7.2.4 Event HDLC Messages

Command:	EVTHMSG
Description:	Displays Tx and Rx HDLC messages.
Syntax	EVTHMSG [HPORT] [CPORT TENABLE RENABLE]
Parameters:	If [HPORT] is supplied, displays/modifies the state of Transmit Enable and Receive Enable and the port it will be display on for the given HPORT messages. Valid HPORT numbers are 1 – 8. Valid port numbers are 1 – 3 where 1 is TERM1, 2 is TERM2 and 3 is USB. Valid TENABLE and RENABLE parameters are E for Enable and D for Disable.
Notes:	

Examples:	`TERM2: EVTHMSG`
	`HPORT = 1, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`HPORT = 2, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`HPORT = 3, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`HPORT = 4, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`HPORT = 5, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`HPORT = 6, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`HPORT = 7, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`HPORT = 8, CPORT = TERM2, TENABLE = disabled, RENABLE = disabled`
	`TERM2: EVTHMSG 5 3 E D {Display HDLC Port 5 Tx only messages on USB port}`
	`OK`

Related Commands:	
Non-Volatile:	No

7.3 COMMAND INTERFACE RELATED COMMANDS

7.3.1 Command Port Configuration

Command:	CCFG
Description:	Displays/modifies the configuration of the UART ports.
Syntax	CCFG [UPORT] [BAUD PARITY DATABITS STOPBITS FLOWCTL]
Parameters:	If [UPORT] is supplied, displays/modifies the configuration of that port. Valid port numbers are 1 – 2 where 1 is TERM1, and 2 is TERM2. Valid [BAUD] parameters are integer baud values Valid PARITY parameters are E-Even, O-Odd or N-None Valid DATABITS parameters are 5...8 Valid STOPBITS parameters are 1-1 stop bit, 2-2stopbits for data bits=6…8 and 1.5 stop bits for databits=5 Valid FLOWCTL parameters are H-hardware, S-software or N-None
Notes:	

Examples:	`TERM2: CCFG`
	`CPORT = TERM2, BAUD = 115200, PARITY = None, DATABITS = 8, STOPBITS = 1, FLOWCTL = None`
	`CPORT = TERM1, BAUD = 115200, PARITY = None, DATABITS = 8, STOPBITS = 1, FLOWCTL = None`
	`TERM2: CCFG 1 115200 N 8 1 H`
	`OK`

Related Commands:	
Non-Volatile:	Yes

7.3.2 Command Port Mode

Command:	CMODE
Description:	Displays/modifies the mode of the ports.
Syntax	CMODE [CPORT] [PTYPE]
Parameters:	If [CPORT] is supplied, displays/modifies the mode of that port. Valid port numbers are 1 – 3 where 1 is TERM1, 2 is TERM2 and 3 is USB. Valid [PTYPE] parameters are C for Command Interface, S for SNS Interface and N for No interface.
Notes:	

Examples:	`TERM2: CMODE`
	`CPORT = TERM2, PTYPE = Command`
	`CPORT = TERM1, PTYPE = SNS`
	`CPORT = USB, PTYPE = Command`
	`TERM2: CMODE 3 S {Make USB the SNS Interface port}`
	`OK`

Related Commands:	
Non-Volatile:	Yes

7.3.3 Command Port Prompt

Command:	CPROMPT
Description:	Displays/modifies the state of prompting on ports.
Syntax	CPROMPT [CPORT] [ENABLE]
Parameters:	If [CPORT] is supplied, displays/modifies the state of prompting on that port. Valid port numbers are 1 – 3 where 1 is TERM1, 2 is TERM2 and 3 is USB. Valid [ENABLE] parameters are E for Enable and D for Disable.
Notes:	

Examples:	`TERM2: CPROMPT`
	`CPORT = TERM2, ENABLE = enabled`
	`CPORT = TERM1, ENABLE = enabled`
	`CPORT = USB, ENABLE = enabled`
	`TERM2: CPROMPT 2 D {Disable prompt on TERM2}`
	`OK`

Related Commands:	
Non-Volatile:	Yes

7.3.4 Command Port Echo

Command:	CECHO
Description:	Displays/modifies the state of echoing on ports.
Syntax	CECHO [CPORT] [ENABLE]
Parameters:	If [CPORT] is supplied, display/modify the state of echoing on that port. Valid port numbers are 1 – 3 where 1 is TERM1, 2 is TERM2 and 3 is USB. Valid [ENABLE] parameters are E for Enable and D for Disable.
Notes:	

Examples:	`TERM2: CECHO`
	`CPORT = TERM2, ENABLE = enabled`
	`CPORT = TERM1, ENABLE = enabled`
	`CPORT = USB, ENABLE = enabled`
	`TERM2: CECHO 2 D {Disable echo on TERM2}`
	`OK`

Related Commands:	
Non-Volatile:	Yes

7.4 TIME RELATED COMMANDS

7.4.1 Pulse

Command:	PULSE
Description:	Displays/modifies the values that drive the Pulse A and Pulse B signals.
Syntax	PULSE [EDGE] [SYSFCNT]
Parameters:	If [EDGE] is supplied, display/modify the state of that edge. Valid edge values are AP, AN, AC and AS for Pulse A and BP, BN, BC and BS for Pulse B. AP and BP represent the positive edge of the Pulse A and Pulse B signal, AN and BN represent the negative edge of the Pulse A and Pulse B signal. If [SYSFCNT] is entered for one of these edge values, the Pulse signal edge will occur at the set frame count. AS and BS will immediately Set the Pulse signal to a fixed positive state. AC and BC will immediately Clear the Pulse signal to a fixed negative state.
Notes:	AS, BS, AC and BC do not require a frame count parameter.

Examples:	`TERM2: PULSE`
	`AC, BC {Pulse A and Pulse B are both cleared}`
	`TERM2: PULSE AS {Immediately set Pulse A}`
	`OK`
	`TERM2: PULSE BC {Immediately clear Pulse B}`
	`OK`
	`TERM2: PULSE BP 100 {Set Pulse B positive edge at frame count 100}`
	`OK`
	`TERM2: PULSE BN A00 {Set Pulse B negative edge at frame count A00}`
	`OK`
	`TERM2: PULSE`
	`AS, BP = 100, BN = A00 {Reflect previous setting in example}`
	`OK`

Related Commands:	
Non-Volatile:	No

7.4.2 Frequency

Command:	FREQ
Description:	Displays/modifies the frequency of DDS 0 and DDS 1 internal frequency sources.
Syntax	FREQ [DDS] [FVALUE]
Parameters:	If [DDS] is supplied, display/modify the frequency of that DDS. Valid DDS parameters are 0 for DDS 0, 1 for DDS 1. Valid FVALUE parameters are a frequency in Hz
Notes:	Since DDS0 is the reference frequency for DDS1, setting DDS0 will calculate a new value for DDS1 and set it so that the resulting DDS1 frequency remains unchanged.

Examples:	`TERM2: FREQ`
	`DDS = DDS0, FVALUE = 1544000`
	`DDS = DDS1, FVALUE =  31500`
	`TERM2: FREQ 1 30000 {Set DDS1 to 30 KHz}`
	`OK`

Related Commands:	
Non-Volatile:	No

7.4.3 Time

Command:	TIME
Description:	Displays/sets the time of day.
Syntax	TIME [HH:MM:SS]
Parameters:	If [HH:MM:SS] is supplied, set the time of day. HH the two digit hour (24 hour format) MM the two digit minute SS the two digit seconds
Notes:	

Examples:	`TERM2: TIME 14:10:00 {Set the time to 2:10PM}`
	`14:10:00.000`
	`TERM2: TIME`
	`14:10:23.658 {Display the current time, including msecs}`

Related Commands:	DATE
Non-Volatile:	No

7.4.4 Date

Command:	DATE
Description:	Displays/sets the date.
Syntax	DATE [MM/DD/YYYY]
Parameters:	If [MM/DD/YYYY] is supplied, set the date. MM the two digit month DD the two digit day of the month YYYY the four digit year
Notes:	

Examples:	`TERM2: DATE 5/12/2003 {Set the date to May 12, 2003}`
	`May 12, 2003`
	`TERM2: DATE`
	`May 12, 2003 {Display the current date}`

Related Commands:	TIME
Non-Volatile:	No

7.5 HDLC MESSAGE RELATED COMMANDS

7.5.1 HDLC Channel

Command:	HCHAN
Description:	Displays/modifies the HDLC channel. The RIU/MDR ICD supports 5 different HDLC channels. The default HDLC channel is CHANNEL 1 (uses T1 time slots 5 through 8). Four other HDLC channels are available from timeslots 9 through 24. Each HDLC channel uses four T1 timeslots.
Syntax	HCHAN [HPORT] [CHAN]
Parameters:	If [HPORT] is supplied, set the timeslots for that port. Valid port values are 1 - 8, * 1 - 8 are the individual T1 port connectors on the front panel An * indicates all ports are to be set or displayed Valid channel numbers are 1 – 5
Notes:	

Examples:	`TERM2: HCHAN`
	`HPORT = 1, CHAN = 1`
	`HPORT = 2, CHAN = 1`
	`HPORT = 3, CHAN = 1`
	`HPORT = 4, CHAN = 1`
	`HPORT = 5, CHAN = 1`
	`HPORT = 6, CHAN = 1`
	`HPORT = 7, CHAN = 1`
	`HPORT = 8, CHAN = 1`
	`TERM2: HCHAN 1 2 {Set Port 1 to HDLC channel 2, timeslots 9-12}`
	`OK`
	`TERM2: HCHAN * 5 {Set all Ports to HDLC channel 5, timeslots 21-24}`
	`OK`

Related Commands:	
Non-Volatile:	No

7.5.2 HDLC Mode

Command:	HMODE
Description:	Displays/modifies the HDLC port mode.
Syntax	HMODE [HPORT] [PMODE]
Parameters:	If [HPORT] is supplied, display the statistics for that port. Valid port values are 1 - 8, * 1 - 8 are the individual T1 port connectors on the front panel An * indicates all ports are to be displayed. Valid PMODE values are MDR1, MDR2, MDR3, MDR4, REM, TRU
Notes:	

Examples:	`TERM2: HMODE`
	`HPORT = 1, PMODE = SPARE2`
	`HPORT = 2, PMODE = SPARE2`
	`HPORT = 3, PMODE = TRU`
	`HPORT = 4, PMODE = REM`
	`HPORT = 5, PMODE = MDR1`
	`HPORT = 6, PMODE = MDR2`
	`HPORT = 7, PMODE = MDR3`
	`HPORT = 8, PMODE = MDR4`
	`TERM2: HMODE 1 MDR1 {Move MDR1 to HDLC Port 1}`
	`OK`

Related Commands:	
Non-Volatile:	Yes

7.5.3 HDLC Delay

Command:	HDELAY
Description:	Displays/modifies the Feed Delay for the HDLC port.
Syntax	HDELAY [HPORT] [DELAY]
Parameters:	If [HPORT] is supplied, display the statistics for that port. Valid port values are 1 - 8, * 1 - 8 are the individual T1 port connectors on the front panel An * indicates all ports are to be displayed. Valid DELAY values are integer values greater than 0r equal to 4
Notes:	Currently all HDLC channels are set to the same Feed Delay

Examples:	`TERM2: HDELAY`
	`HPORT = 1, DELAY = 4`
	`HPORT = 2, DELAY = 4`
	`HPORT = 3, DELAY = 4`
	`HPORT = 4, DELAY = 4`
	`HPORT = 5, DELAY = 4`
	`HPORT = 6, DELAY = 4`
	`HPORT = 7, DELAY = 4`
	`HPORT = 8, DELAY = 4`
	`TERM2: HDELAY * 4 {Set the Feed Delay to 4 for all HDLC ports}`
	`OK`

Related Commands:	
Non-Volatile:	Yes

7.6 VOICE CHANNEL RELATED COMMANDS

7.6.1 Voice Channel Mode

Command:	VMODE
Description:	Displays/modifies the location of a voice channel.
Syntax	VMODE [VCHAN] [PLOC]
Parameters:	If [VCHAN] is supplied, set the location of that channel. Valid VCHAN values are 1 – 4. Valid PLOC values are L-local and R-remote
Notes:	The SMODE command will change these values to the default for that mode. VCHAN 5 refers to the MDR connection being Local or Remote.

Examples:	`TERM2: VMODE`
	`VCHAN = 1, PLOC = local`
	`VCHAN = 2, PLOC = local`
	`VCHAN = 3, PLOC = local`
	`VCHAN = 4, PLOC = local`
	`VCHAN = 5, PLOC = local`
	`TERM2: VMODE 1 R {Set Voice Channel 1 to Remote}`
	`OK`
	`TERM2: VMODE * R {Set all Voice Channels to Remote}`
	`OK`

Related Commands:	
Non-Volatile:	Yes

7.7 SYSTEM RELATED COMMANDS

7.7.1 System Mode

Command:	SMODE
Description:	Displays/modifies the system mode.
Syntax	SMODE [SYS]
Parameters:	If [SYS] is supplied, set the system to that mode. Valid SYS values are 0-RIU, 1-GNI, 2-PRG (default)
Notes:	The PRG mode is defined as standalone RIU operation (no GNI is connected). The VMODE settings will be changed by this command. The default settings are all voice channels are Remote when the system is a GNI and all voice channels are local when the system is an RIU or PRG

Examples:	`TERM2: SMODE`
	`SYS = PRG`
	`TERM2: SMODE 1 {Set the system to GNI mode}`
	`OK`
	`TERM2: VMODE * R {Set all Voice Channels to Remote}`
	`OK`

Related Commands:	
Non-Volatile:	Yes

7.8 MISCELLANEOUS COMMANDS

7.8.1 Version

Command:	VERSION
Description:	Display the version number of the software and the build date and time.
Syntax	VERSION
Parameters:	
Notes:	

Examples:	`TERM2: VERSION`
	`Version: 0.90`
	`Built:  May 23 2003 16:21:57`

Related Commands:	
Non-Volatile:	No

7.8.2 LED Test

Command:	LEDTEST
Description:	Test the LEDs by cycling all LEDs through all display colors.
Syntax	LEDTEST
Parameters:	
Notes:	
Examples:	`TERM2: LEDTEST` `OK`
Related Commands:	

Non-Volatile:	No

7.8.3 Help

Command:	?
Description:	Display a list of commands or help for a specific command or parameter.
Syntax	? [COMMAND/PARAMETER]
Parameters:	If [COMMAND/PARAMETER] is supplied, show detailed help for that command or parameter. A list of parameters for a specified command is shown when "? [COMMAND]" is entered.
Notes:	
Examples:	TERM2: ? ********** COMMAND LIST: CCFG CPROMPT CECHO CMODE HMODE VMODE SMODE PULSE FREQ HDELAY HCHAN EVTSMSG EVTPMSG EVTIMSG EVTHMSG TIME DATE LEDTEST VERSION Type ? followed by space then command for more info **********
Related Commands:	
Non-Volatile:	No