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01/30/2003	1.0	Initial Release	KD

AIR/GROUND COMMUNICATIONS
ACB-560

Octal T1 Module (OTM)
Module Manual

This document has been prepared for:

Federal Aviation Administration
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Title: Octal T1 Module (OTM) Module Manual

CAGE No. 07MD5 **No.** FA100-00020

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1.0 INTRODUCTION

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

The OTM 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 OTM 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 (OTM) specifications and operating instructions.

1.2 DOCUMENT CONVENTIONS

N/A.

1.3 INTENDED AUDIENCE AND READING SUGGESTIONS

This document is intended for NEXCOM contractors.

1.4 REFERENCES

Reference documentation includes:

- Octal T1 Module (OTM) Module Manual, CIE Document FA100-00020, v1.0, 01/30/2002.
- Voice Channel Module (VCM) Module Manual, CIE Document FA100-00002, v1.0, 1/30/2002.
- OTM-VCM Interface Control Document, CIE Document FA100-00066, v1.0, 1/30/2002.
- SNS-RTP Interface Control Document, CIE Document FA100-00065, v1.0, 1/30/2002.
- Multimode Digital Radio/Radio Interface Unit Interface Control Document, NAS-IC-41033502, V3.0, 07/23/2001.

1.5 REVISION HISTORY

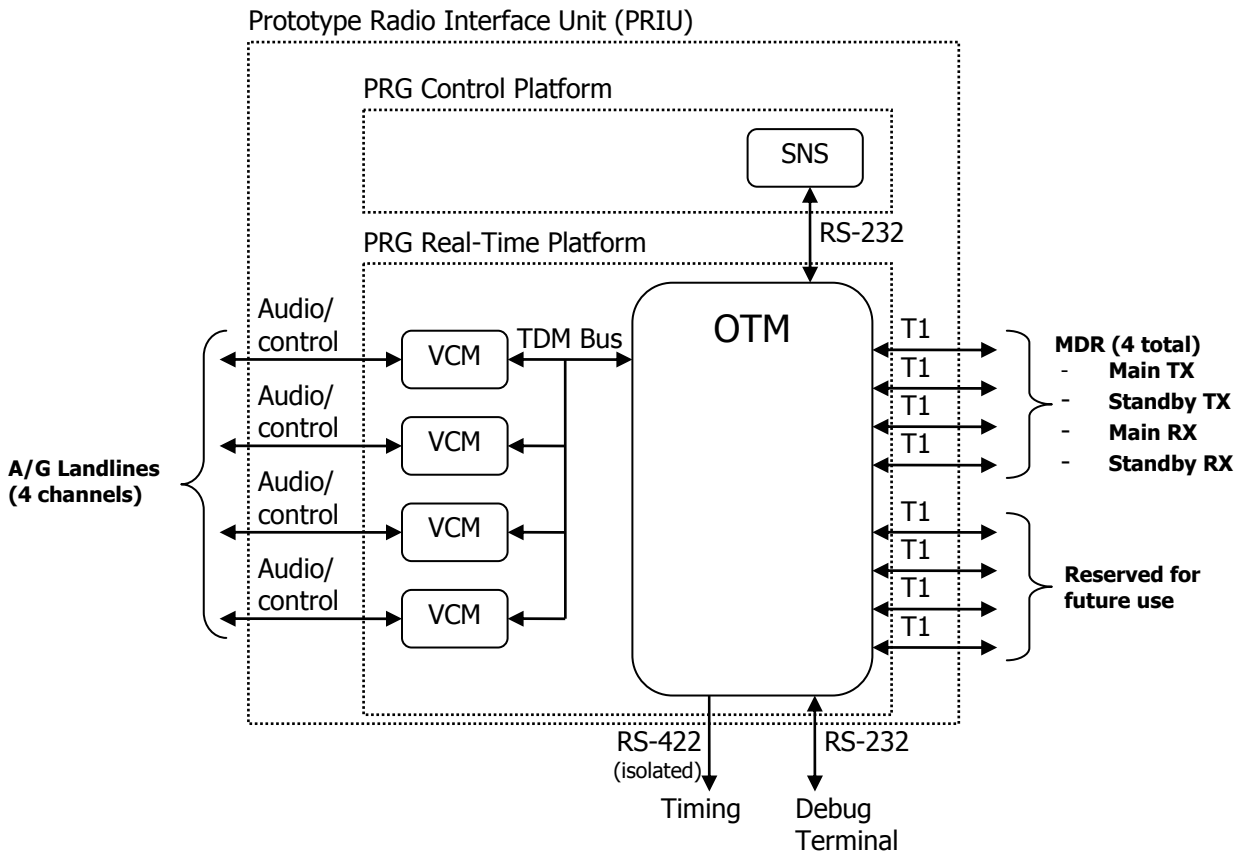
Date	Revision	Description of Changes
01/30/2003	0.1	Initial Release

2.0 GENERAL DESCRIPTION

2.1 OVERVIEW

Figure 1 provides an interface diagram depicting the OTM connections for the PRIU. The OTM also supports a number of other system configurations (e.g., Prototype Ground Network Interface – PGNI; Ground Reference Prototype – GRP).

Figure 1. Octal T1 Module (OTM) System Connection Diagram (PRIU configuration shown)



The OTM provides NEXCOM timing and provides message routing services between the SNS, VCM and T1-interfaced equipment.

2.2 FEATURES

The Octal T1 Module (OTM) 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 CONNECTORS & INDICATORS

The OTM includes the following connectors and LED displays:

- SNS Interface (1 each) – serial interface with SNS for audio and control messages
- Debug Interface (1 each) – terminal command interface for unit configuration
- Monitor Interface (1 each) – for factory use only
- Timing Interface (1 each) – system timing interface
- Test Interface (1 each) – for factory use only
- T1 Interfaces (8 each) – T1 port interfaces with MDRs and other modules
- DIN-96 Interface (1 each) – external DC power and TDM Bus interface
- LED Indicators (26 each) – unit mode and status information

Figure 2 contains illustrations of the OTM interface panels showing the location of connectors and LEDs. The following sections contain connector/pinout and LED display information. See "4.0 UNIT OPERATION" for functional information.

3.1 SNS INTERFACE

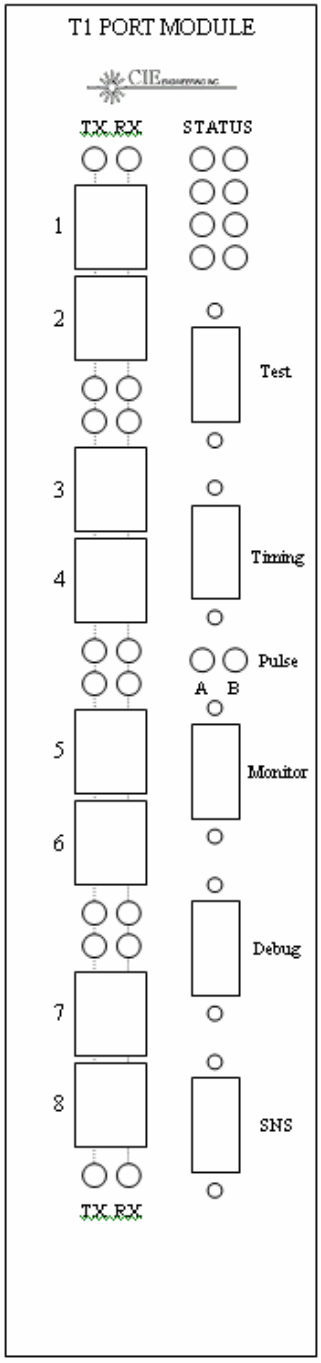
The Sub-Network Simulator (SNS) interface is an RS-232 based serial interface that supports message-based communication between the PRG-RTP and the PRG-CP. The OTM SNS interface is permanently configured as a DCE device. Table 1 provides connector pin and signal information.

Table 1. SNS Interface (SNS) – Signal Descriptions

Symbol	Pin	Pin Type	Name/Function
SNS_CD	1	O	Carrier Detect: Not used
SNS_RD	2	O	Receive Data:
SNS_TD	3	I	Transmit Data:
SNS_DTR	4	I	Data Terminal Ready: Not used
GND	5	GND	Signal Ground
SNS_DSR	6	O	Data Send Ready: Not used
SNS_RTS	7	I	Request to Send: Not used
SNS_CTS	8	O	Clear to Send: Not used
SNS_RI	9	O	Ring Indicator: Not used

Note: The standard OTM software configuration uses a "three-wire" interface, i.e. SNS_RD, SNS_TD and GND.

Figure 2. OTM Front Panel



The SNS connector is a standard DB-9F (socket type pins). The SNS interface uses the standard asynchronous communication protocol with the following communication parameters:

- 115200 bps, 8 data bits, 1 stop bit, no parity, no flow control.

3.2 DEBUG INTERFACE

The Debug interface is an RS-232 based serial interface that supports OTM control and monitoring. The OTM Debug interface is permanently configured as a DCE device. A standard one-to-one interface cable can be used for PC-to-OTM communication. A terminal emulation program, e.g. HyperTerminal, can be used to communicate with the OTM Debug interface. Error! Reference source not found. provides connector pin and signal information.

Table 2. Host Interface (HOST) – Signal Descriptions (J5)

Symbol	Pin	Type	Name/Function
DEBUG_CD	1	O	Carrier Detect: Not used.
DEBUG _RD	2	O	Receive Data:
DEBUG _TD	3	I	Transmit Data:
DEBUG _DTR	4	I	Data Terminal Ready:
GND	5	GND	Signal Ground
DEBUG _DSR	6	O	Data Send Ready:
DEBUG _RTS	7	I	Request to Send:
DEBUG _CTS	8	O	Clear to Send:
DEBUG _RI	9	O	Ring Indicator: Not used.

Note: The standard OTM software configuration uses a "three-wire" interface, i.e. DEBUG_RD, DEBUG_TD and GND.

The OTM Debug connector is a standard DB-9F (socket type pins). The Debug interface uses the standard asynchronous ASCII communication protocol with the following communication parameters:

- 115200 bps, 8 data bits, 1 stop bit, no parity, no flow control.

3.3 MONITOR INTERFACE

The Monitor Interface is for factory use only.

3.4 TIMING INTERFACE

The Timing Interface provides access to four NEXCOM timing signals: the T1 reference clock, the VDL frequency synthesizer, and two software controlled pulse outputs. The signals are opto-isolated, RS-422 signals. See section TBD for more information.

Table 3. Timing Interface – Signal Descriptions (J16)

Symbol	Pin	Type	Name/Function
TIMING_1544	1, 6	O	T1 Reference Clock: 1.544 MHz
TIMING_DDS	2, 7	O	VDL Frequency Synthesizer: Default frequency = 31.5 kHz
TIMING_PB	3, 8	O	Pulse B Output: Software controlled to rise/fall at specified frame counts within the NEXCOM epoch.
TIMING_PA	4, 9	O	Pulse A Output: Software controlled to rise/fall at specified frame counts within the NEXCOM epoch.
TIMING_GND	5	GND	Ground: Isolated from OTM signal ground.

Note: The pin pairs above provide the positive and negative conductors of the balanced RS-422 output, respectively.

3.5 TEST INTERFACE

The Test Interface is for factory use only.

3.6 T1 INTERFACES

The OTM includes eight T1 interfaces. The RJ45 connector and pinout are compliant with the T1 interface standard.

Table 4. T1 Interface – Signal Descriptions (J1 – J8)

Symbol	Pin	Type	Name/Function
T1_XRTIP	1	I	Receive Analog Tip Input Pin
T1_XRRING	2	I	Receive Analog Ring Input Pin
T1_NULL	3	-	Not used.
T1_XTTIP	4	O	Transmit Analog Tip Input Pin
T1_XTRING	5	O	Transmit Analog Ring Input Pin
T1_NULL	6	-	Not used.
T1_NULL	7	-	Not used.
T1_NULL	8	-	Not used.

3.7 BACKPLANE INTERFACE

The OTM 96-pin DIN backplane interface carries power and the Time Division Multiplexed (TDM) inter-module communication bus. The power interface includes +5V and +24V power rails. The TDM interface includes four low-voltage differential signal (LVDS) conductor pairs. The OTM serves as the TDM bus master.

Table 8. DIN 'A' – Signal Descriptions (J16)

Symbol	Pins	Type	Name/Function
DIN_GND	A1, A4, A14, A19, A23, A24, A25, A26, B23, B24, B25, B26, C8, C14, C23, C24, C25, C26	GND	Ground
DIN_5V	A27, A28, A29, A30, B27, B28, B29, B30, C27, C28, C29, C30	+5V	Power Rail
DIN_24V	A31, A32, B31, B32, C31, C32	+24V	Power Rail
DIN_TCLK	C15, A15	O	TDM Clock. Nominal frequency = 3.072 MHz.
DIN_TFS	C16, A16	O	TDM Frame Sync. Nominal frame rate = 8 kfps
DIN_TTXD	C17, A17	O	TDM Transmit Data.
DIN_ TRXD	C18, A18	I	TDM Receive Data.

Note: The DIN_Tx pin pairs above provide the positive and negative conductors of the balanced LVDS signals, respectively.

3.8 LED INDICATORS

The OTM provides 26 LED indicators. The LEDs are bicolor (RED/GREEN). They can be divided into 3 groups: Status LEDs, T1 Port LEDs and Pulse LEDs.

3.8.1 Status LEDs

The OTM includes eight status LEDs located in the upper right portion of the front panel.

Figure 3. OTM Status LEDs

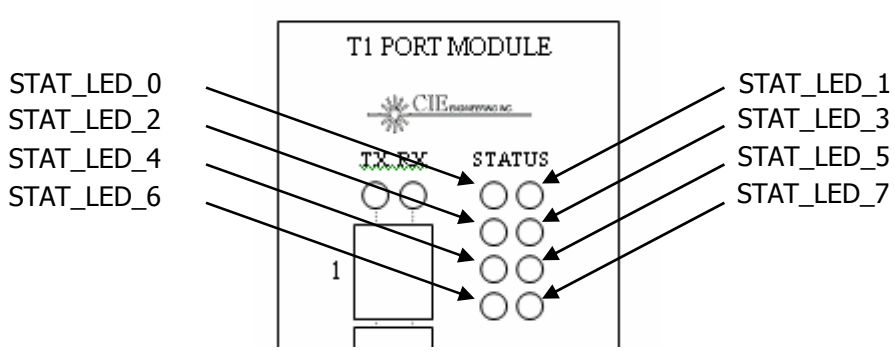


Table 5. Status LED – Descriptions

Identifier	Usage
STAT_LED_0	Run-Time LED: Blinks GREEN at second boundaries. Indicates that system software is functioning normally.
STAT_LED_1	Epoch LED: Blinks GREEN at epoch boundaries (every 6 seconds).
STAT_LED_2	SNS Status LED: Controlled by SNS via LED Control Message
STAT_LED_3	SNS Status LED: Controlled by SNS via LED Control Message
STAT_LED_4	ICC Receive LED: Winks GREEN for each message received from active VCMs.
STAT_LED_5	ICC Transmit LED: Winks GREEN for each message transmitted to active VCMs.
STAT_LED_6	SNS Receive LED: Winks GREEN for each message received from the SNS.
STAT_LED_7	SNS Transmit LED: Winks GREEN for each message transmitted to the SNS.

3.8.2 T1 LEDs

The OTM includes eight pairs of T1 LEDs located next to the T1 interface connectors.

Table 6. T1 Port LED – Descriptions	
Identifier	**Usage**
T1 TRANSMIT (8 LEDs)	GREEN: Framers are transmitting messages without an error RED : Framers detect errors while transmitting messages BLANK: No activity
T1 RECEIVE (8 LEDs)	GREEN: Framers are receiving messages without an error RED : Framers detect errors while receiving messages or loss of connection with other framer BLANK: No activity

3.8.3 Pulse LEDs

The OTM includes two pulse LED indicators.

Table 7. Pulse LED – Descriptions	
Identifier	**Usage**
PULSE A PULSE B	Controlled by Test Bed Pulse Control Message from SNS, RED only LED is on when Frame Count reaches the desired negative (falling) edge LED is off when Frame Count reaches the desired positive (rising) edge

4.0 FUNCTIONAL DESCRIPTION

This section contains a description of the following OTM areas:

- T1 Interface
- SNS Control
- TDM Bus Interface
- Timing and Synchronization
- Timing Port

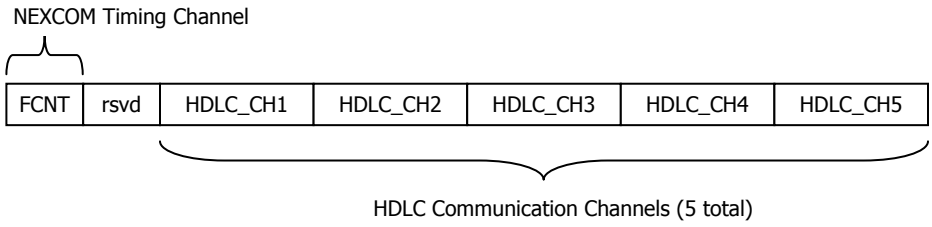
4.1 T1 INTERFACE

The OTM 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 OTM 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, no 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 OTM uses HDLC_CH1 by default (timeslots #5-#8). The OTM can be reconfigured to use any one of the five available channels.

Two types of delivery services are available for OTM 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.

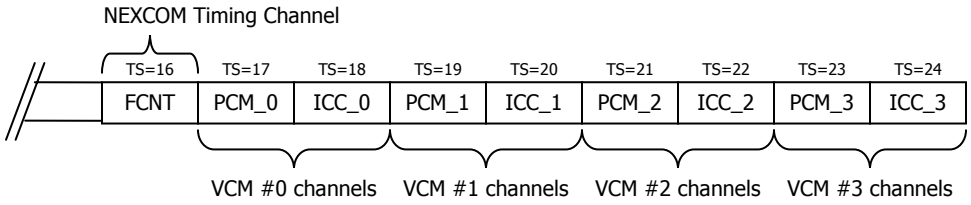
4.2 SNS CONTROL

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

4.3 TDM BUS DESCRIPTION

The TDM bus is located on the system backplane and supports OTM-VCM inter-module communication. The OTM 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 OTM broadcast the current frame count identifier in slot 16. The VCMs communicate directly with the OTM 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



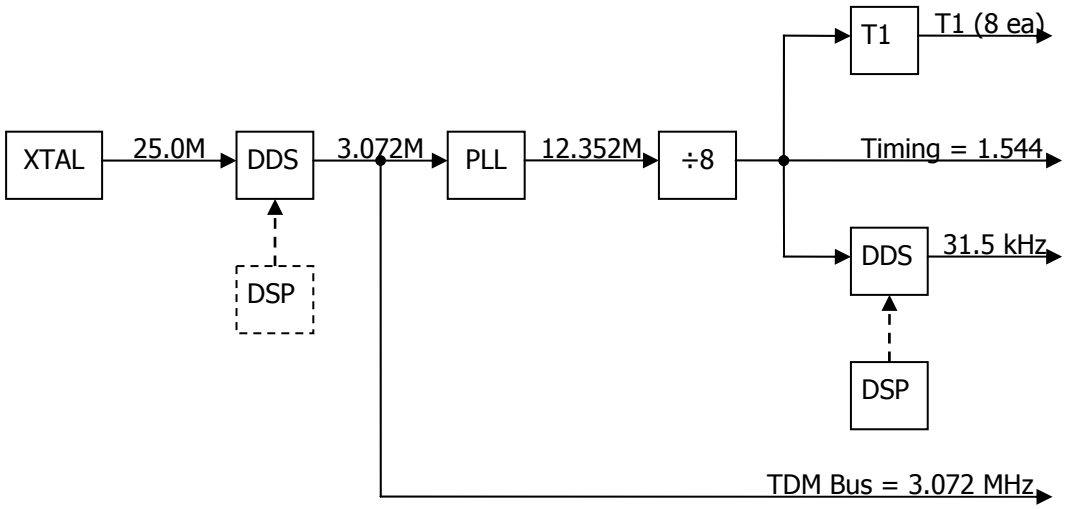
FCNT	NEXCOM Timing Channel: Each T1 frame within a NEXCOM 6-second epoch is uniquely identified with an incrementing frame count number. Two T1 timeslots are dedicated to frame count identification (timeslots #0 and #1).
PCM_x	PCM Voice Data Channel: A separate linear (PCM) voice channel path is provided 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.

4.4 TIMING AND SYNCHRONIZATION

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

The OTM serves as the clock master for the Real Time Platform. It presently uses an on-board crystal 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 crystal is used to generate a 1.544 MHz T1 reference clock. It also provides a 3.072 MHz TDM bus clock. Finally, the OTM hardware is capable of supporting external T1 timing derived from a GPS referenced source.

Figure 6. OTM Timing Diagram



4.5 TIMING PORT

The OTM 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.

5.0 DEBUG COMMAND REFERENCE

This section contains a description of OTM debug commands.

5.1 BAUD: SERIAL PORT BAUD RATE

The BAUD command enables the user to change the baud rate for OTM serial ports, i.e., the SNS port and the Debug Terminal Port.

The settings are **non-volatile** (automatically saved to flash memory). This command is **write only**.

BAUD Command

Attribute	Description	
Syntax	**baud X Y** <change port baud rate>	
Parameters	X	Serial Port ID. Selects port to adjust. 0 Selects SNS port 1 Selects Debug Terminal port
	Y	Baud Rate. Entered as a multi-digit, decimal value. Valid range is 110 to 921600 (standard modem rates only). The default for both ports is 115200.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0	
See Also	HWFC, UART	

The example below change the SNS baud rate to 19200 bps.

BAUD Example

```
POTM: baud 0 19200
POTM:
```

NOTE: *The OTM does not provide an explicit response to this command. Use the UART command to display the current settings.*

5.2 HWFC: SERIAL PORT FLOW CONTROL

The HWFC command enables/disables hardware flow control for OTM serial ports, i.e., the SNS port and the Debug port.

The settings are **non-volatile** (automatically saved to flash memory). This command is **write only**.

HWFC Command

Attribute	Description	
Syntax	**hwfc X Y**	<enable/disable flow control>
Parameters	X	Serial Port ID. Selects port to adjust. 0 Selects SNS port 1 Selects Debug Terminal port
	Y	Flow Control. Entered as a multi-digit, 0 Disables HW flow control 1 Enables HW flow control
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0	
See Also	BAUD, UART	

The example below enables hardware flow control on the SNS port.

HWFC Example

```
POTM: hwfc 0 1
POTM:
```

NOTE: *The OTM does not provide an explicit response to this command. Use the UART command to display the current settings.*

5.3 UART: PORT CONFIGURATION

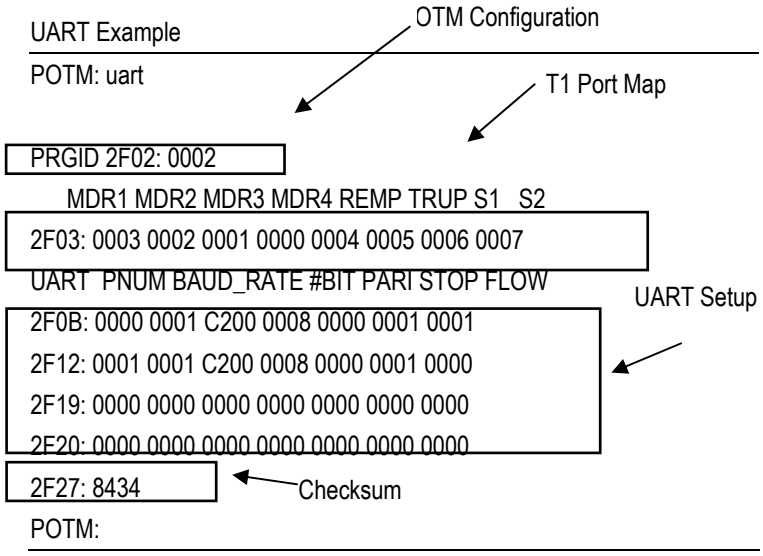
The UART command displays all of the non-volatile OTM configuration settings. The saved settings include UART baud rate, UART flow control, OTM type, and T1 port assignments.

This command is **read only**.

UART Command

Attribute	Description	
Syntax	**uart**	<print flash settings>
Parameters	None.	
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0	
See Also	BAUD, HWFC, PPT, PRG	

The example below shows the OTM response to the UART command. The response includes four major sections. The sections in the response are described below:



OTM Configuration. The OTM configuration (or PRGID) configures the general operation of the OTM module. The setting 0x0002 corresponds to NEXCOM GRP operation.

OTM Type

PRGID	Operating Mode
0	NEXCOM Prototype Radio Interface Unit (PRIU).
1	NEXCOM Prototype Ground Network Interface (PGNI).
2	NEXCOM Ground Reference Prototype (GRP).

T1 Port Map. The T1 Port Map displays the assigned functions for each of the 8 T1 framers. The four MDR functions are assigned to Framers #3 through #0.

T1 Port Map

Function	Description
MDR1 MDR2 MDR3 MDR4	MDR Ports. The OTM can support up to four active MDR interfaces. The OTM routes messages between the SNS port and these four MDR ports.
REMP	Remote T1 Port. This T1 port is used for NEXCOM GNI-to-RIU communications when a T1 landline is available.
TRUP	Timing Reference Unit (TRU) Port. The TRU provides UTC-based NEXCOM timing. The TRU is an optional module for the NEXCOM Real Time Platform.
S1 S2	Reserved for future use.

NOTE: *Framer identifiers are assigned in the bottom-to-top direction. Framer #0 is the bottom port.*

UART Setup. The OTM UART device is a quad-port part. Currently, ports #0 and #1 are used and the remaining two ports are reserved.

UART Setup

Field	Description
PNUM	UART Port Number. 0 = SNS 1 = Debug
BAUD_RATE	UART Baud Rate. This field consists of a long word (32-bits total). The baud rate is displayed in hexadecimal. For example, the value 0001C200 corresponds to 115200 bps.
#BIT	UART Number of Data Bits
PARI	UART Parity. 0 = NONE.
STOP	UART Number of Stop Bits
FLOW	UART Hardware Flow Control. 0 = ENABLED 1 = DISABLED

Checksum. The checksum field is used to validate the data stored in OTM flash memory.

5.4 PRINTSNE: ENABLE SNS MESSAGE PRINTING

The PRINTSNE command enables the printing of SNS traffic to the Debug port.

PRINTSNE Command

Attribute	Description	
Syntax	**printsne**	<enable SNS debug print>
Parameters	None.	
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0	
See Also	ENDSNE	

NOTE: *Prior to version 6.0, the command 'print sne' was used.*

5.5 ENDSNE: DISABLE SNS MESSAGE PRINTING

The ENDSNE command disables the printing of SNS traffic to the Debug port.

ENDSNE Command

Attribute	Description
Syntax	**endsne** <disable SNS debug print>
Parameters	None.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0
See Also	PRINTSNE

NOTE: *Prior to version 6.0, the command 'end sne' was used.*

5.6 HMONITOR: ENABLE SNS LEAD CHARACTER PRINTING

The HMONITOR command prints the lead character in SNS messages to the Debug port. This command can be used in place of PRINTSNE if traffic volume is high and the UART baud rate is low.

PRINTSNE Command

Attribute	Description
Syntax	**hmonitor** <enable SNS lead char print>
Parameters	None.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0
See Also	HEND

5.7 HEND: DISABLE SNS LEAD CHARACTER PRINTING

The HEND command disables the lead character printing of SNS messages to the Debug port.

PRINTSNE Command

Attribute	Description
Syntax	**hend** <disable SNS lead char print>
Parameters	None.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0
See Also	HMONITOR

5.8 CAPSTART: ENABLE MDR RECEIVE MESSAGE PRINTING

The CAPSTART command enables printing of MDR receive messages to the Debug port. Messages are converted to printable ASCII text strings.

CAPSTART Command

Attribute	Description
Syntax	**capstart** <enable MDR message print>
Parameters	None.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0
See Also	CAPSTOP

5.9 CAPSTOP: DISABLE MDR RECEIVE MESSAGE PRINTING

The CAPSTOP command disables printing of MDR receive messages to the Debug port.

CAPSTOP Command

Attribute	Description
Syntax	**capstop** <disable MDR message print >
Parameters	None.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0
See Also	CAPSTART

5.10 COUNTER: PRINT SYSTEM COUNTERS

The COUNTER command prints system MDR message counters, frame count error counters, and PCM voice message counters.

COUNTER Command

Attribute	Description
Syntax	**counter** <print system counters>
Parameters	None.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0
See Also	SETCOUNTER

COUNTER Example

```
POTM: counter
Counter In   29E8: 0000 0F22
Counter Out  29EA: 0000 0F22
Cur FC Late  2EA5: 0000
Mqu FC Late  2EA6: 0000
UpLink Cnt   2D90: 0000
DownLink Cnt 2D91: 0000
POTM:
```

The printed fields are described below.

Counter In. This 32-bit field contains the number of MDR Transmit Request messages received from the SNS port. It includes Remote port count if applicable. In the example above, the OTM has received 0x00000F22 (or 3874) transmit requests.

Counter Out. This 32-bit field contains the total number of MDR messages received over all four MDR T1 ports. It includes Remote port count if applicable.

Cur FC Late. This 16-bit field contains a count of messages that were discarded because the transmit frame count field was out of range. The frame count is out of range when the frame count is not in the range of between 10 and 4000 later than the system frame count in OTM.

Mqu FC Late. This 16-bit field contains a count of messages that were discarded because the transmit frame count field was out of sequence. The frame count is out of sequence when the transmit frame count is earlier than #FCNT to send the last message in the message queue plus 2 frame counts or later than 4010 frame counts of the frame count of the last message in the message queue.

UpLink Cnt. This 16-bit field contains a count of PCM linear voice messages that forwarded to an MDR.

DownLink Cnt. This 16-bit field contains a count of PCM linear voice messages received from an MDR that were forwarded to the VCM.

5.11 SETCOUNTER: RESETS SYSTEM COUNTERS

The SETCOUNTER command resets the 6 counters printed with the COUNTER command.

SETCOUNTER Command

Attribute	Description
Syntax	**setcounter** <clears system counters>
Parameters	None.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0
See Also	COUNTER

SETCOUNTER Example

```
POTM: setcounter
Reset Counter
29E8: 0000 0000
29EA: 0000 0000
2EA5: 0000
2EA6: 0000
2D90: 0000
2D91: 0000
POTM:
```

5.12 QUEALL: PRINT UART QUEUE STATUS

The QUEALL command prints UART device queue status.

This command is intended for factory use only.

QUEALL Command

Attribute	Description
Syntax	**queall** <prints UART queue status>
Parameters	None.
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0
See Also	QQUEALL

In the example below, the first two data lines (marked 0T and 0R) provide the transmit and receive queue status for the SNS port. The second two data lines (marked 1T and 1R) provide transmit and receive queue status for the Debug port.

QUEALL Example

```
POTM: queall
QUExxxx: Free Size Page WPtr RPtr EAdd SAdd
0T:22A8: 0400 0400 0000 0DC3 0DC3 0EA8 0AA9
0R:22AF: 0400 0400 0000 11AD 11AD 12A8 0EA9
1T:22BC: 016C 0200 0000 085E 07BB 09A8 07A9
1R:22C3: 0100 0100 0000 0A4A 0A4A 0AA8 09A9
POTM:
```

NOTE: *Prior to version 6.0, the command 'que all' was used.*

The printed fields are described below.

Free. This 16-bit field contains the number of free bytes in the queue.

Size. This 16-bit field contains the size of the queue.

Page. This 16-bit field contains the page location of the queue. The ADSP-2188M has a total of seven pages, each sized at 8K words.

WPtr. This 16-bit field contains the queue write pointer.

RPtr. This 16-bit field contains the queue read pointer.

EAdd. This 16-bit field contains the queue end address.

SAdd. This 16-bit field contains the queue start address.

5.13 QQUEALL: PRINT MISCELLANEOUS QUEUE STATUS

The QQUEALL command prints queue status for the PCM linear voice message queues and for active VCM ICC message queues. If no VCMs are detected, only the PCM linear voice message queue status is displayed.

This command is intended for factory use only.

QQUEALL Command

Attribute	Description	
Syntax	**qqueall**	<prints miscellaneous queue status>
Parameters	None.	
Releases	3.0, 3.1, 4.0, 4.1, 4.2, 5.0, 6.0	
See Also	QUEALL	

In the example below, only the PCM linear voice message queue status is displayed.

QQUEALL Example

```
POTM: qqueall
MQUExx: Page Addr InvA MaxS CWAd NWAd CWPt CRAd NRAd CRPt
T:1000: 0008 0800 1000 0102 0800 0800 0800 0800 0800 0800
R:100A: 0008 0000 0800 0102 0000 0000 0000 0000 0000 0000
POTM:
```

NOTE: *Prior to version 6.0, the command 'qque all' was used.*

5.14 HDLCCLR: CLEAR HDLC COUNTERS

The HDLCCLR command clears all HDLC counters.

HDLCCLR Command

Attribute	Description	
Syntax	**hdlcclr**	<clear HDLC counters>
Parameters	None.	
Releases	4.0, 4.1, 4.2, 5.0, 6.0	
See Also	HDLCPCNT	

HDLCCLR Example

```
POTM: hdlcclr
DONE
```

5.15 HDLCPCNT: PRINT HDLC COUNTERS

The HDLCPCNT command prints all HDLC counters.

HDLCPCNT Command

Attribute	Description	
Syntax	**hdlcpcnt**	<prints HDLC counters>
Parameters	None.	
Releases	4.0, 4.1, 4.2, 5.0, 6.0	
See Also	HDLCCLR	

Counters for all eight T1 ports ports are provided. The status is printed for Framer #0 through Framer #7.

HDLCPCNT Example

```
POTM: hdlcpcnt
HCNT: TBSY ROPN RCLS RDRP RABT RCRC ROVR RMAX TUDR TMSG RMSG DMSG
24D7: 0000 0000 0000 0000 0000 0000 0000 0000 0000 03C8 03C8 0000
24E3: 0000 0000 0000 0000 0000 0000 0000 0000 0000 03C8 03C8 0000
24EF: 0000 0000 0000 0000 0000 0000 0000 0000 0000 03C9 03C9 0000
24FB: 0000 0000 0000 0000 0000 0000 0000 0000 0000 03C9 03C9 0000
2507: 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
2513: 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0002 0000
251F: 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
252B: 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
POTM:
```

The printed fields are described below.

TBSY. This 16-bit field contains the number of detected transmitter busy events.

ROPN. This 16-bit field contains the number of missed HDLC message opening flags.

RCLS. This 16-bit field contains the number of missed HDLC message closing flags. A closing flag can be missed when hardware FIFO overflows occur or when the maximum message size of 520 bytes is exceed.

RDRP. This 16-bit field contains the number of dropped data bytes. Received data bytes can be dropped if the OTM software buffers are full.

RABT. This 16-bit field contains the number of aborted HDLC frames detected by the HDLC controller.

RCRC. This 16-bit field contains the number of cyclical redundancy check (CRC) errors detected by the HDLC controller.

ROVR. This 16-bit field contains the number of detected HDLC receiver hardware overflows.

RMAX. This 16-bit field contains the number of messages that exceeded the 520-byte message limit.

TUDR. This 16-bit field contains the number of detected transmitter underrun events. An underrun event occurs when the hardware HDLC transmit FIFO empties without receiving a transmit end-of-message (TEOM) command.

TMSG. This 16-bit field contains the number of transmitted HDLC messages.

RMSG. This 16-bit field contains the number of received HDLC messages.

DMSG. This 16-bit field contains the number of dropped HDLC receive messages (e.g., due to queue full conditions).

5.16 MIC: VCM MICROPHONE CONTROL

The MIC command controls the VCM microphone setting.

MIC Command

Attribute	Description	
Syntax	**mic vID mic_ctl** <controls VCM mic setting>	
Parameters	vID	VCM ID. Valid Range is 0 to 3, inclusive
	mic_ctl	Mic Setting. Entered as signal character hexadecimal value.
Releases	5.0, 6.0	
See Also	HST	

MIC Example

```
POTM: mic 1 2
POTM:
```

NOTE:

mic_ctl Bit Field Assigment							
7	*6*	*5*	*4*	*3*	*2*	*1*	*0*
						ADCR	*ADCL*

ADCR Signal Enable. When set, the VCM shall enable the front panel MIC input to be used IN PLACE OF the ADCR (F1F2TX) and RCE PTT signals.
ADCL Signal Enable. When set, the VCM shall enable the front panel MIC input to be used IN PLACE OF the ADCL (UHFRX).

5.17 HST: VCM HEADSET CONTROL

The VCM command controls the VCM headset setting.

HST Command

Attribute	Description	
Syntax	**hst vID hValue** <controls VCM headset setting>	
Parameters	vID	VCM ID. Valid Range is 0 to 3, inclusive
	hValue	Headset Setting. Entered as signal character hexadecimal value.
Releases	5.0, 6.0	
See Also	MIC	

HST Example

POTM: hst 1 40
POTM:

NOTE:

hValue Bit Field Assignments

7	*6*	*5*	*4*	*3*	*2*	*1*	*0*
PRESET[2:0]			*OTMI*	*VDEC1*	*VDEC0*	*ADCR*	*ADCL*

PRESET *Preset Field: When set equal to zero, the remaining bits are used to control which signals are brought out to the monitor port. The preset defaults are shown below:*

0x000 No Preset. Use bits 0 through 4 to setup monitoring signal.
0x001 F1F2TX (ADCL). Uplink
0x010 F1F2RX (DAC2R) Downlink
0x011 F1F2 (sum of ADCL and DAC2R)
0x100 Reserved.
0x101 UHFTX (DAC2L) Uplink
0x110 UHFRX (ADCR) Downlink
0x111 UHF (sum of DAC2L and ADCR)

OTMI *OTM Signal Enable. When set, add the signal on the OTM input to the HST composite output.*

VDEC1 *VDEC1 Signal Enable. When set, add the signal from the linear output of the decoder for VOC1 to the HST composite output.*

VDEC0 *VDEC0 Signal Enable. When set, add the signal from the linear output of the decoder for VOC0 to the HST composite output.*

ADCR *ADCR Signal Enable. When set, add the signal from ADC Right to the HST composite output.*

ADCL *ADCR Signal Enable. When set, add the signal from ADC Left to the HST composite output.*

Note: If the OTM/debug port requests use of the VDEC1 and/or VDEC0 and the vocoder is not installed, the VCM shall report an error message.

5.18 PRG: OTM CONFIGURATION SETTING

The PRG command selects the general OTM operating configuration.

The settings are **non-volatile** (automatically saved to flash memory). This command is **write only**.

PRG Command

Attribute	Description	
Syntax	**prg X**	<controls OTM configuration setting>
Parameters	X	OTM Configuration. 0 NEXCOM Prototype RIU 1 NEXCOM Prototype GNI 2 NEXCOM Prototype GRP
Releases	6.0	
See Also	UART	

PRG Example

```
POTM: prg 2
POTM:
```

5.19 LEDTEST: LED TEST COMMAND

The LEDTEST command initiates the LED test sequence. Alternating patterns of GREEN and RED indications are displayed on the front panel LEDs. This test is used to verify proper function of front panel LEDs.

LEDTEST Command

Attribute	Description	
Syntax	**ledtest**	<initial LED test sequence>
Parameters	None.	
Releases	5.0, 6.0	
See Also	None.	

LEDTEST Example

```
POTM: ledtest
POTM:
```

***NOTE**: ledtest will allow test software control LEDs at runtime. After the test, OTM will back to normal state. The test will automatically stop, and cycling power is not needed.*

5.20 VERSION: DISPLAY SOFTWARE VERSION INFORMATION

The VERSION command commands the OTM to display the software version information.

VERSION Command		
Attribute	Description	
Syntax	**version**	<display software version info>
Parameters	None.	
Releases	5.0, 6.0	
See Also	None.	

VERSION Example

```
POTM: version
Built: Jan 24 2003, 12:15:41
```

5.21 PPT: T1 PORT FUNCTIONAL ASSIGNMENT

The PPT command assigns functionality to each of the 8 OTM T1 ports.

The settings are **non-volatile** (automatically saved to flash memory). This command is **write only**.

PPT Command		
Attribute	Description	
Syntax	**ppt pArray**	<assigns T1 port functions>
Parameters	PArray	Port Array.
Releases	5.0, 6.0	
See Also	UART	

PPT Example

```
POTM: ppt 01234567
POTM:
```

***NOTE**: Assign (Logical Port) MDR1, MDR2, MDR3, MDR4, REM, TRU, S1, S2 with Physical Port number: 0 – 7 (bottom to top)*
The OTM does not provide an explicit response to this command. Use the UART command to display the current settings.