



OEM Command Reference for Mooring Line Modem System

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CHANGE HISTORY

Date of Release	Revision Number	Purpose
Sept 10, 2010	1	▪ Initial Release
April 24, 2012	2	▪ To reflect firmware 1.3 functionality

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MLM OEM Command Reference V2

Applicability

This manual describes the functionality embodied in **firmware version 1.3** .

Release Notes For Firmware Version 1.3

The following changes have been implemented in firmware version 1.3

Highlights

- There is now a single command (XTP) to the HEM that will establish a transparent link with an SSM (page 23).
- There is now an option to have an open channel timeout of infinite duration (page 34).
- The escape sequence that is used to transition the channel from transparent mode to command mode has increased robustness. The escape sequence (Now up to 16 (unique) characters in length, as specified by the user) is preceded by and followed by a guard time during which the data channel must be idle (pages 38-39).
- The polling feature has been upgraded so that the user can configure the actual polling command that is transmitted by the HEM (up to 16 characters in length). Furthermore, the target “group” used by the polling command may now be specified by the user. Finally, the minimum polling duration is now 1 minute (pages 29-33).
- The transmit buffering has been upgraded. The size of the buffers is now a maximum of 512+1280 bytes (as opposed to 1024+256 in version 1.0). (page 35).

Infinte Open Channel Duration

There is now a new EE parameter in the HEM. If enabled, **MDOCPERM** will override any values associated with **MDOCDUR** and create an infinite open channel timeout.

This feature is best used in conjunction with host computer code that can detect if the channel has gone down and has the code necessary to recover the channel (e.g. if the HEM has been reset, but the SSM is still on a link)

Transparent Escape Sequence

The transparent escape sequence is utilized in two distinct ways. It is the sequence that is serially transmitted to the HEM used to transition the channel from transparent mode back to command mode.

When transmitted to an SSM, it will cause the SSM to enter command mode.

The transparent escape sequence is comprised of up to 16 unique ASCII characters. Beyond the character string itself, the transparent escape sequence may be configured for two possible distinct operating modes. The user may select to utilize a guard period of silence before and after the escape character sequence to provide additional protection from false triggering of the escape sequence.

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The relevant new EE parameters are:

TPESC – the escape sequence of up to 16 characters; the default is x01 x01 x01

TPESCTO – this configures the time guard-band preceding and following the ASCII escape sequence. To be useful, this time must be less than ZTO (sleep timeout) and less than TPCTO (transparent character timeout) if (TPCTO) used. The default value for TPESCTO is 750ms.

TPESCTOEN – this enables the time guard band feature associated with the escape sequence. The default is enabled.

TPESCLEN is no longer used in 1.3.

Polling

The polling feature has been significantly enhanced as the user can now define/configure a flexible polling command string of up to 16 ASCII characters. Other enhancements include the capability to address a specific group during the poll. This target group address is configurable. The flexibility of the polling feature is further enhanced by the option of transmitting a serial wakeup character to the instrument connected to the SSM. The wakeup character itself may also be specified. Finally, the user may also opt to send the sleep command to the SSM once the polled data has been collected by the HEM.

The relevant new EE parameters are:

PCMD – this is the user specified command (Up to 16 ASCII characters) that is transmitted by the HEM during a poll.

The default is x46 x30 x30 , which corresponds to F00 .

PWUPCHAR – this is the character that is transmitted by the SSM to the connected instrument before the SSM transmits the polling command. There is no specific time delay between the wakeup character and the polling command. This is purely defined by the baud rate. The default is x0D .

PWUPEN – This enables the transmission of the wakeup character

PSLPEN – This enables the transmission of the “zzz” command (go to sleep) to an SSM once the HEM has collected the poll output data from the SSM. The default is enabled.

PADD – This is the polling address of the target group. The default is 00.

PINT – This is still the polling interval, however the minimum allowable interval is now 1 minute (was 5 minutes in 1.0).

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Transmit Buffers

The size of the transmit buffers has been changed. The 512 byte buffer (Transmit Buffer) fills first. When the number of bytes in the buffer is equal to the number specified by TPMXC (default 512), the modem begins to transmit the data. If retries have been enabled, the data will not be flushed from the buffer until the ACK has been received from the far end. If retries are not enabled, the data is flushed from the buffer when the whole message (in this example, 512 bytes) has been transmitted.

If the modem connected instrument or host transmits more than 512 bytes (or the number of bytes specified by TPMXC) to the modem, this data will not be lost. This data will begin to fill up the 1280 byte buffer (Queuing buffer).

Once the data in the transmit buffer has been successfully transmitted, the transmit buffer is flushed and the next consecutive 512 bytes (or the number of bytes specified by TPMXC) is transferred from the queuing buffer to the transmit buffer and subsequently sent out on the mooring line channel.

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About this Manual

This manual describes all the commands which are suitable for general use with RBR's Mooring Line Modem System (MLMS). All normal operations can be performed using these commands.

HEM, SSM firmware versions 1.00 or later is assumed; earlier versions may have limited functionality or no support at all for some of the commands described here.

The manual is divided into two main sections:

1. A "Command Reference" section which describes the commands individually in detail.
2. An "EEPROM Reference" section which describes configurable parameters individually in detail.

This manual and other documents can be found online at our website (www.rbr-global.com).

Caution

Please note that commands other than those described in this manual do exist, but are only used for test or configuration purposes. These commands are not needed in normal use and are deliberately not documented.

General Points

Unless discussing commands which specifically affect baud rates, the standard serial communications parameters for the MLMS are assumed:

HEM: 115200 Baud, 8 data bits, No parity, 1 stop bit

SSM: 19200 Baud, 8 data bits, No parity, 1 stop bit

When sending commands to either the HEM or SSM, it is necessary to include a terminating sequence of either the ASCII carriage-return and/or line-feed characters. Any response from the HEM or SSM will begin with a horizontal-tab, and be terminated by both the ASCII carriage-return and line-feed characters.

Command characters can be upper or lower case. Some commands require hexadecimal input (input characters denoted by X), others require decimal input (input characters denoted by D).

It is possible for the SSM to execute these commands remotely from the HEM over an established modem link. To send a command to the SSM using this method, prefix a '.' to the command in the command mode of the HEM. The response will be displayed on the HEM serial port beginning with a prefixed '.'.

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Example: `.BV<cr><lf>`
`.<t>battery voltage: 10.2V<cr><lf>`

If a link is not established or the modem is busy, the response will be:
`<t>*error* this is not allowed at this time<cr><lf>`

Multiple commands can be sent on a single line (terminated by either a `<cr>` or `<lf>`) by separating them with a semi colon. A limitation to this is that only 250 characters can be entered before a `<cr>` or `<lf>`, and only the first 250 bytes of the command responses will be output. All commands will be executed, however the command responses may be muted. This also applies to sending commands to the SSM from the HEM over an established modem link. Only commands marked with an asterisk are capable in executing in this manner; those that aren't will display:

`<t>*error* this command is not allowed now<cr><lf>`

Example: `.A; BV; INFO<cr><lf>`
`.<t>RBR HEM-1000 1.000 051921<cr><lf>`
`<t>*error* this command is not allowed now<cr><lf>`
`<t>#051921, HEM-1000 HW rev. B1, FW rev. 1.000 (May 26, 2010)<cr><lf>`

Formatting and Other Conventions

Commands to the logger are shown in **BOLD TYPE**.

Responses from the logger are shown in **BOLD TYPE**.

In cases where the actual information varies, a place holder is shown in *italic type*.

The prefix 0x is used when describing numbers in hexadecimal (base-16) notation.

The following notation is used for some special, non-printing characters:

`<cr>` ASCII carriage-return: 13, 0x0D, or Ctrl-M.

`<lf>` ASCII line-feed: 10, 0x0A, or Ctrl-J.

`<t>` ASCII horizontal-tab: 9, 0x09, or Ctrl-I.

Error Messages

The generic response to an unrecognized command is:

`<t>*error* unknown command<cr><lf>`

The generic response to a recognized command with an invalid parameter is:

`<t>*error* invalid parameter<cr><lf>`

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Example 1. Sending “hello” string to SSM serial port

Using the following default settings for the EEPROM parameters:

TPSNDC	0x0D	(<cr> prompts message)
TPSDEN	1	(sending on character enabled)
TPESCC	0x01	(<ctrl-A> is the escape character)
TPESCCNT	3	(count of escape characters required)

The steps required to do send the string are:

1. Open a connection with the desired SSM
2. Ensure the SSM serial port baud rate is configured correctly
3. Enter transparent mode
4. Send the string
5. Exit transparent mode
6. Close the channel

```
X 223344<cr>
    <t>channel requested (with ssm 223344)...GRANTED<cr><lf>
.EE BAUD 4800<cr>
    .<t>baud rate BAUD: 4800<cr><lf>
TP<cr>
    ***transparent mode***<cr><lf>
hello<cr>
<ctrl-A><ctrl-A><ctrl-A>
    ***command mode***<cr><lf>
X K<cr>
    <t>channel closed<cr><lf>
```

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Example 2. Getting battery voltages from all SSMs

The steps required to do this are:

1. Perform discovery to discover all SSMs
2. Open a group connection with all SSMs
3. Open a secondary individual channel with a specific SSM
4. Request battery voltage
5. Open a secondary individual channel with a different SSM
6. Request battery voltage
7. Close the channel

```
DISC<cr>
    <t>discovery requested<cr><lf>
    <t>049509<cr><lf>
    <t>051959<cr><lf>
    <t>discovery complete OK<cr><lf>
X 00<cr>
    <t>channel requested (with group 00)...GRANTED<cr><lf>
XS 049509<cr>
    <t>channel switch requested (with ssm 049509)...GRANTED<cr><lf>
.BV<cr>
    .<t>battery voltage: 10.2V<cr><lf>
XS 051959<cr>
    <t>channel switch requested (with ssm 051959)...GRANTED<cr><lf>
.BV<cr>
    .<t>battery voltage: 10.6V<cr><lf>
X K<cr>
    <t>channel closed<cr><lf>
```

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Command Reference

A – Unit Identification

Command: **A**
Response: **RBR SSS-1000 MM.mmm DDDDDD**
Purpose: Get MLM unit identification
Applies to: HEM, SSM
See also: Command **INFO**

This will return the ID of the unit, where *SSS* = ‘**HEM**’ or ‘**SSM**’, *MM.mmm* is the firmware revision (*MM* may be a single digit) and *DDDDDD* is the zero padded 6 digit serial number of the unit.

Example: **A<cr>**
<t>RBR HEM-1000 1.000 051921<cr><lf>

BV – Battery Voltage

Command: **BV**
Response: **battery voltage: XX.XV**
Purpose: Get the current battery voltage
Applies to: HEM, SSM
See also:

This will return the battery voltage of the unit, where *XX.X* is the battery voltage in volts. If above 24.0V, ‘>**24 . 0V**’ will be returned. If below 5.0V, ‘<**5 . 0V**’ will be returned.

Example: **BV<cr>**
<t>battery voltage: 10.2V<cr><lf>

Example: **BV<cr>**
<t>battery voltage: <5.0V<cr><lf>

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DISC – Discovery

Command: **DISC**
Response: see below
Purpose: To discover all SSMs in the MLMS
Applies to: HEM
See also: Command **SSM**

This command will attempt to auto-discover all the SSMs connected to the HEM. This command is only possible if not in an open channel already. Depending on the size of the SSM network, this could take up to a minute. As an SSM is discovered, its ID will be output on the serial port. This command will clear the existing list first, and then save the result to EEPROM. Accessing the list post-command can be done through the command **SSM**.

If already in an open channel, the response will be:

```
<t>*error* discovery not allowed now<cr><lf>
```

If discovery fails at some point, the response will be:

```
<t>*error* discovery<cr><lf>
```

After a successful discovery, the response will be:

```
<t>discovery complete OK<cr><lf>
```

Example: **DISC<cr>**

```
<t>discovery requested<cr><lf>  
<t>049509<cr><lf>  
<t>051959<cr><lf>  
<t>discovery complete OK<cr><lf>
```

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EE – EEPROM Parameters

Command: **EE *param***, **EE *param value***, **EE *param R***, **EE HELP**,
EE RESET

Response: see below

Purpose: To alter a configurable parameter

Applies to: HEM, SSM

See also: EEPROM Reference section

Many parameters are stored within the EEPROM. This command is used to alter/view these parameters. These parameters are listed in the EEPROM Parameters reference section of this document.

EE *param* displays the current value of the parameter *param*.

EE *param value* sets the value of the parameter *param* to *value*.

EE *param R* sets the value of the parameter *param* to the default value.

The response to these will be:

```
<t>param_description param: value<cr><lf>
```

If entering an illegal parameter, the response will be:

```
<t>*error* invalid ee parameter<cr><lf>
```

If entering an illegal value, the response will be:

```
<t>*error* invalid ee parameter value<cr><lf>
```

EE HELP displays a list of all configurable parameters with their range of possible values and their default value. The format of the help table lines is:

```
<t>param           [possible_values (default_value)]<cr><lf>  
<t>                param_description<cr><lf>
```

EE RESET resets all the EEPROM parameters to their default values. The response to this will be:

```
<t>resetting all eeprom<cr><lf>
```

Example: **EE ZTO 100<cr>**

```
<t>sleep timeout (10ms) ZTO: 100<cr><lf>
```

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HELP – Display Help

Command: **HELP**, **HELP cmd**, **HELP EE param**
Response: help table
Purpose: Display all commands
Applies to: HEM, SSM
See also:

This displays help for the commands and EEPROM parameters.

HELP will display a table of all the available commands.

HELP cmd will display the help line for command **cmd**.

HELP EE param will display the help line for EEPROM parameter **param**.

The format of the help lines for commands requiring parameters is (command parameter options are separated by a '|'):

```
<t>command [optionA|optionB...]<cr><lf>  
<t> command_description<cr><lf>
```

For commands not requiring parameters:

```
<t>command command_description<cr><lf>
```

The format of the help lines for EEPROM parameters is as described in the **EE** command.

INFO – Display Unit Information

Command: **INFO**
Response: **#DDDDDD**, **SSS-1000 HW rev. XX**, **FW rev. MM.mmm**
(DATE)
Purpose: Display information about the unit
Applies to: HEM, SSM
See also: Command **A**

This will return the ID of the unit, where **DDDDDD** is the zero padded 6 digit serial number, **SSS** = '**HEM**' or '**SSM**', **XX** is an alphanumeric hardware descriptor, **MM.mmm** is the firmware revision (**MM** may be a single digit) and **DATE** is the firmware build date '**MONTH DATE, YEAR**'.

Example: **INFO<cr>**
<t>#051001, HEM-1000 HW rev. B1, FW rev. 1.000 (May 26,
2010)<cr><lf>

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LID – RBR Logger ID Fetch

Command: **LID, LID G, LID R**
Response: **logger id: DDDDDD**
Purpose: Obtain and assume attached RBR logger ID for modem addressing
Applies to: SSM
See also: EEPROM **LIDEN**

If configured to do so (see EEPROM parameter LIDEN), the SSM will attempt to obtain the ID (serial number) of an RBR logger attached to its serial port upon power up/reset by sending the character **<cr>**, waiting 100ms, and then sending the character **'A'**. This command allows the SSM to attempt to obtain the ID of the RBR logger at any point in time afterwards. **DDDDDD** will be the zero padded 6 digit ID if a valid logger ID exists, otherwise it will be the string **'none'**.

LID G forces a new attempt to obtain the RBR logger ID. A broadcast of this could be used to get all SSMs to poll their attached loggers for their IDs.

LID displays the stored RBR logger ID.

The response to these commands will be:
`<t>logger id: DDDDDD<cr><lf>`

LID R clears the stored RBR logger ID. The response to this command will be:
`<t>logger id: none<cr><lf>`

Example: **LID<cr>**
`<t>logger id: 023456<cr><lf>`

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PNOW – Poll now [Updated for F/W 1.3]

Command: **PNOW**
Response: see below
Purpose: Poll all SSMs now
Applies to: HEM
See also: EEPROM **PDEL**, **PINT**, **PCMD**, **PADD**, **PSLPEN**, **PWUPEN**, **PWUPCHAR**, **PEN**, **PDISP**

This command will trigger all RBR loggers and third party instruments connected to SSMs to take respond to the poll command as specified by the EE parameter **PCMD**. If applicable, sample data will be reported back to the HEM (the sampling and reporting is referred to together as polling). The SSM serial port output will be optionally transmit a serial wakeup character (if enabled) (e.g. <cr> for the RBR logger) followed by the command string as specified by the parameter **PCMD**. After a duration of **PDEL**, the HEM will collect the data from all the SSMs. Subsequently, the HEM will output all the data to its serial port at once.

This command performs the same function as a scheduled poll, however all but the logger output data will be muted on a scheduled poll. If non-RBR loggers/instruments are connected on the serial ports, this will produce unknown serial port output.

If already in an open channel, the response will be:

```
<t>*error* poll not allowed now<cr><lf>
```

If the poll fails at some point, the response will be:

```
<t>*error* poll<cr><lf>
```

After a successful poll, the response will be:

```
<t>poll complete OK<cr><lf>
```

Example: **PNOW<cr>**

```
<t>poll requested<cr><lf>  
<ALL CONNECTED SSM LOGGER OUTPUT>  
<t>poll complete OK<cr><lf>
```

RESET – Resetting the Unit

Command: **RESET**
Response:
Purpose: To reset the MLM unit
Applies to: HEM, SSM
See also:

This will immediately prompt a soft reset of the unit.

MLM OEM Command Reference V2

SSM – List of Attached SSMs

Command: **SSM**, **SSM S**, **SSM R**, **SSM A DDDDDD**, **SSM D DDDDDD**
Response: see below
Purpose: To access and edit the list of attached SSMs
Applies to: HEM
See also: Command **DISC**

This command regulates the list of SSMs attached to the HEM. This is meant to be used by the user to determine the SSMs present on the line after a discovery command has been executed. *DDDDDD* must be zero padded 6 digit decimal number greater than 000032.

SSM will display all SSM ids entered into the list. The response to this will be:

```
<t>list of attached SSMs (d):<cr><lf>  
<t>id1<cr><lf>  
<t>id2<cr><lf>  
...
```

where *d* is the number of attached SSMs, and *idX* are zero padded 6 digit IDs. The maximum number of attached SSMs is 32. If no SSMs are in the list, the response will be:

```
<t>list of attached SSMs (none)<cr><lf>
```

SSM S will save the current list to EEPROM (for preservation over power cycle). The response to this will be:

```
<t>attached ssm ids saved<cr><lf>
```

SSM R will reset the list (clear all SSM id entries). The response to this will be:

```
<t>attached ssm ids reset<cr><lf>
```

SSM A DDDDDD will add the zero padded 6 digit ID *DDDDDD* to the list. The response to this will be:

```
<t>SSM DDDDDD is in the attached list<cr><lf>
```

If there is no space in the list, the response will be:

```
<t>*error* not enough space in the list<cr><lf>
```

SSM D DDDDDD will delete the zero padded 6 digit ID *DDDDDD* from the list. The response to this will be:

```
<t>SSM DDDDDD is NOT in the attached list<cr><lf>
```

Example: **SSM A 001232<cr>**
<t>SSM 001232 is in the attached list<cr><lf>

Example: **SSM D 123456<cr>**
<t>SSM 123456 is NOT in the attached list<cr><lf>

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T – Date and Time

Command: **T yyyy/mm/dd hh:mm:ss, T**
Response: **YYYY/MM/DD HH:MM:SS**
Purpose: Set/get date and time for the HEM
Applies to: HEM
See also:

T yyyy/mm/dd hh:mm:ss will set the current date and time of the HEM (24 hour clock). The year must begin with '20'.

T will return the current date and time of the HEM.

An error in the date will cause the response to be:

```
<t>*error* date<cr><lf>
```

An error in the time will cause the response to be:

```
<t>*error* time<cr><lf>
```

Example: **T 2010/05/11 15:20:00<cr>**
<t>2010/5/11 15:20:00<cr><lf>

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TP – Transparent Mode

Command: **TP**
Response: *****transparent mode*****
Purpose: Enter transparent mode
Applies to: HEM
See also: Commands **XTP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSNDC2**, **TPSCTO**, **TPCTOEN**, **TPESCC**, **TPESCCCNT**, **TPACK**, **TPACKDSP**, **TPNAKDSP**

If a channel is open between the HEM and an SSM or a group of SSMs, the HEM can enter transparent mode through this command. The transparent mode is characterized by the EEPROM parameters listed above.

TP enters the transparent mode. To exit the transparent mode (ie. revert to command mode), enter the escape sequence as defined by **TPESC**, **TPESCTO** and **TPESCTOEN**. These three parameters define the escape sequence of up to 16 characters (configurable) as well as an optional guard time before and after the escape sequence. Successfully reverting to the command mode from the transparent mode will result in the system responding with:

```
***command mode***<cr><lf>
```

If an open channel is not currently granted, the response will be:

```
<t>*error* this command is not allowed now<cr><lf>
```

Example: **TP<cr>**
*****transparent mode***<cr><lf>**

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X – Channel Connection

Command: **X id, X K**
Response: see below
Purpose: To open a channel between the HEM and a/multiple SSMs
Applies to: HEM
See also: Commands **XS, X?**; EEPROM **MDOCDUR, MDRTRY, GID1, GID2, GID3**

This command regulates opening and closing communication channels between the HEM and SSMs. Connections are characterized by the above EEPROM parameters.

X id will attempt a channel connection and will take on the order of 3s for the channel to be successfully granted.

For group connection, *id* must be a zero padded 2 digit number from 00 to 32. 00 represents a broadcast to everyone, while the other numbers correspond to group addresses that **GID1, GID2, GID3** can be set to. For a successful connection, the response will be:

```
<t>channel requested (with group id)...GRANTED<cr><lf>
```

For an unsuccessful connection, the response will be:

```
<t>channel requested (with group id)...*error*<cr><lf>
```

For a single SSM connection, *id* must be a zero padded 6 digit number larger than 000032. For a successful connection, the response will be:

```
<t>channel requested (with ssm id)...GRANTED<cr><lf>
```

For an unsuccessful connection, the response will be:

```
<t>channel requested (with ssm id)...*error*<cr><lf>
```

If a channel is already currently opened, the response will be:

```
<t>*error* channel already open<cr><lf>
```

X K will shut down (kill) the channel connection (that is in command mode), and takes effect immediately. The response will be:

```
<t>channel closed<cr><lf>
```

If a channel is not currently open, the response will be:

```
<t>*error* channel is not open<cr><lf>
```

Example: **X 00<cr>**

```
<t>channel requested (with group 00)...GRANTED<cr><lf>
```

Example: **X 123456<cr>**

```
<t>channel requested (with ssm 123456)...GRANTED<cr><lf>
```

Example: **X K<cr>**

```
<t>channel closed<cr><lf>
```

MLM OEM Command Reference V2

XTP – Transparent Mode Channel Connection [New for F/W 1.3]

Command: **XTP id, XTP K**
Response: see below
Purpose: To open a transparent channel between the HEM and a/multiple SSMs
Applies to: HEM
See also: Commands **X, XS, X?, TP**; EEPROM **MDOCDUR, MDRTRY, GID1, GID2, GID3**

This command provides the same functionality as the X command followed by the TP command. This command provides some convenience in that only one command is required to be transmitted instead of two commands.

This command regulates opening and closing a transparent communication channels between the HEM and SSMs. Connections are characterized by the above EEPROM parameters.

XTP id will attempt a channel connection and will take on the order of 3s for the channel to be successfully granted. Once the channel connection is established in command mode, the HEM will automatically send the **TP** command, resulting in the transparent channel being established.

For group connection, *id* must be a zero padded 2 digit number from 00 to 32. 00 represents a broadcast to everyone, while the other numbers correspond to group addresses that **GID1, GID2, GID3** can be set to. For a successful connection, the response will be:

```
<t>channel requested (with group id)...GRANTED<cr><lf>
```

For an unsuccessful connection, the response will be:

```
<t>channel requested (with group id)...*error*<cr><lf>
```

For a single SSM connection, *id* must be a zero padded 6 digit number larger than 000032. For a successful connection, the response will be:

```
<t>channel requested (with ssm id)...GRANTED<cr><lf>
```

```
***transparent mode***
```

For an unsuccessful connection, the response will be:

```
<t>channel requested (with ssm id)...*error*<cr><lf>
```

If a channel is already currently opened, the response will be:

```
<t>*error* channel already open<cr><lf>
```

XTP K will shut down (kill) the channel connection, and takes effect immediately. Note that this command is *only recognized* by the HEM if the channel is in command mode. (**XTP K** provides the same functionality as **X K**.)

```
<t>channel closed<cr><lf>
```

MLM OEM Command Reference V2

If a channel is not currently open, the response will be:

```
<t>*error* channel is not open<cr><lf>
```

Example: **XTP 00<cr>**

```
<t>channel requested (with group 00)...GRANTED<cr><lf>
```

Example: **XTP 123456<cr>**

```
<t>channel requested (with ssm 123456)...GRANTED<cr><lf>
```

Example: **XTP K<cr>**

XS – Channel Connection Switch

Command: **XS id**

Response: see below

Purpose: To switch between individual SSM connections on an open channel

Applies to: HEM

See also: Commands **X**, **X?**; EEPROM **MDOCDUR**, **MDRTRY**, **GID1**, **GID2**, **GID3**

Once in a group channel connection has been established, this command can be used to open a temporary secondary connection between the HEM and a select SSM. *id* can be either a zero padded 2 digit number from 00 to 32 to start a sub-group secondary channel, or a zero padded 6 digit number larger than 000032 to start a individual secondary channel. While any address is allowed, it should be noted that this command only has an effect on the SSMs that are currently on the open channel, ie. if you open a channel with group 01 and then perform a '**XS 00**' command, then only those SSMs belonging to group 01 will be listening to the subsequent channel traffic (the others are asleep). If the setup of any secondary channel fails, the HEM reverts the channel to the original group address.

For a successful connection with an individual SSM, the response will be:

```
<t>channel switch requested (with ssm id)...GRANTED<cr><lf>
```

For an unsuccessful connection, the response will be:

```
<t>channel switch requested (with ssm id)...*error*<cr><lf>
```

For a successful connection with an (sub)group of SSMs, the response will be:

```
<t>channel switch requested (with group id)...GRANTED<cr><lf>
```

For an unsuccessful connection, the response will be:

```
<t>channel switch requested (with group id)...*error*<cr><lf>
```

If a channel is not currently open, the response will be:

```
<t>*error* channel is not open<cr><lf>
```

If a channel is currently open, but is not a group channel the response will be:

```
<t>*error* channel is not a group channel<cr><lf>
```

Example: **XS 123456<cr>**

```
<t>channel switch requested (with ssm 123456)...  
GRANTED<cr><lf>
```


MLM OEM Command Reference V2

X? – Channel Status

Command: **X?**
Response: see below
Purpose: To view the status of the modem connection
Applies to: HEM
See also: Commands **X**, **XS**; EEPROM **MDOCDUR**, **MDRTRY**, **GID1**, **GID2**, **GID3**

This returns the status of the channel connections. One of the following will be returned:

If a channel is not currently open, the response will be:

```
<t>channel is not open<cr><lf>
```

If a channel is open with group *XX* and currently not on a secondary channel, the response will be:

```
<t>group (XX) channel open<cr><lf>
```

If a channel is open with group *XX*, and currently on a secondary channel with SSM *DDDDDD*, the response will be:

```
<t>group (XX) channel open with ssm DDDDDD<cr><lf>
```

If a channel is open with a single SSM *DDDDDD*, the response will be:

```
<t>channel open with ssm DDDDDD<cr><lf>
```

Example: **X?<cr>**

```
<t>group (01) channel open with ssm 051929<cr><lf>
```

ZZZ – Sleep

Command: **ZZZ**
Response:
Purpose: To put the MLM unit to sleep
Applies to: HEM, SSM
See also: EEPROM **ZTO**, **HWF**

This will immediately force the unit to sleep.

If **HWF** is enabled and RTS is asserted, the response will be:

```
<t>*error* sleep not allowed now<cr><lf>
```

MLM OEM Command Reference V2

EEPROM Parameters

Note: EEPROM parameter hexadecimal values are displayed with an 'x' in front of the ASCII hexadecimal value. This 'x' is not required when entering hexadecimal values.

All EEPROM parameters are displayed like this (see **EE** command from Command Reference section):

```
<t>param_description param: value<cr><lf>
```

MLM OEM Command Reference V2

BAUD – Baud Rate

Parameter: **BAUD**
Description: **baud rate**
Values: 300, 1200, 2400, 4800, 9600, 19200 (SSM)
300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 (HEM)
Default: 115200 (HEM), 19200 (SSM)
Applies to: HEM, SSM
See also:

This parameter defines the baud rate of the serial communications port. This will always be with 8 data bits, no parity and 1 stop bit (8-N-1).

Example: **EE BAUD 115200<cr>**
<t>baud rate BAUD: 115200<cr><lf>

ZTO – Sleep Timeout

Parameter: **ZTO**
Description: **sleep timeout (10ms)**
Values: 100-65534
Default: 1000
Applies to: HEM, SSM
See also: Command **ZZZ**

This parameter defines the sleep timeout (no serial port activity) of the unit. The parameter is defined in units of 10ms, with a default value of 1000 (10s).

Example: **EE ZTO 100<cr>**
<t>sleep timeout (10ms) ZTO: 100<cr><lf>

MLM OEM Command Reference V2

HWF – Hardware Flow Control

Parameter: **HWF**
Description: **hardware flow control enable**
Values: 0, 1
Default: 0
Applies to: HEM
See also: Command **ZZZ**

This parameter defines whether the hardware flow control of the HEM (CTS/RTS) is enabled or not.

Example: **EE HWF 1<cr>**
<t>hardware flow control enable HWF: 1<cr><lf>

GIDx – Group ID

Parameter: **GID1/GID2/GID3**
Description: **group id 1/group id 2/group id 3**
Values: 00-32
Default: 00
Applies to: SSM
See also: Commands **X, XS, X?**; EEPROM **MDOCDUR, MDRTRY**

This parameter defines a group id that can be used to address a group of SSMs. If an SSM has not been assigned a group id, this value will represent the ‘everyone id’ (00).

Example: **EE GID3 23<cr>**
<t>group id 3 GID3: 23<cr><lf>

Example: **EE GID2 R<cr>**
<t>group id 2 GID2: 00<cr><lf>

MLM OEM Command Reference V2

PEN – Poll Enable [Updated for F/W 1.3]

Parameter: **PEN**
Description: **poll enable**
Values: 0, 1
Default: 0
Applies to: HEM
See also: Command **PNOW**; EEPROM **PINT**, **PCMD**, **PADD**, **PSLPEN**, **PWUPEN**, **PWUPCHAR**, **PDEL**, **PDISP**

This parameter defines whether the scheduled polling should be enabled. Once enabled, this will trigger all instruments connected to (selected) SSMs to receive the command string specified by the PCMD EE parameter. For example, PCMD has been set to “F00” and this command sent to an RBR logger, the logger will immediately take a sample and report that sample back to the HEM, which will then output the data to its serial port.

Example: **EE PEN 1<cr>**
<t>poll enable PEN: 1<cr><lf>

PINT – Poll Interval Time [Updated for F/W 1.3]

Parameter: **PINT**
Description: **poll interval time (min)**
Values: 1-65535
Default: 5
Applies to: HEM
See also: Command **PNOW**; EEPROM **PEN**, **PCMD**, **PADD**, **PSLPEN**, **PWUPEN**, **PWUPCHAR**, **PDEL**, **PDISP**

This parameter defines the polling interval of time in minutes.

Example: **EE PINT 120<cr>**
<t>poll interval time (min) PINT: 120<cr><lf>

MLM OEM Command Reference V2

PDEL – Poll Delay [Updated for F/W 1.3]

Parameter: **PDEL**
Description: **poll delay time (10ms)**
Values: 50-3000
Default: 500
Applies to: HEM
See also: Command **PNOW**; EEPROM **PINT**, **PCMD**, **PADD**, **PSLPEN**, **PWUPEN**, **PWUPCHAR**, **PEN**, **PDISP**

This parameter defines the delay between the broadcast of command string as specified by the PCMD EE parameter to (selected) SSM connected instruments and the start of the retrieval of the instrument replies (should be longer than the time it takes the slowest instrument to respond).

Example: **EE PDEL 1000<cr>**
<t>poll delay time (10ms) PDEL: 1000<cr><lf>

PDISP – Poll Display [Updated for F/W 1.3]

Parameter: **PDISP**
Description: **poll display enable**
Values: 0, 1
Default: 0
Applies to: HEM
See also: Command **PNOW**; EEPROM **PINT**, **PCMD**, **PADD**, **PSLPEN**, **PWUPEN**, **PWUPCHAR**, **PDEL**, **PEN**

This parameter enables the display of '**<zero padded 6 digit ID>: ' before all output received from an RBR logger or SSM connected third party instrument during a poll. If no output is received after the PDEL interval, the ID will be terminated with a '<cr><lf>'**.

Poll output example:

```
123456: TIM 100623103500 22.9962 FET<cr><lf>  
123457: <cr><lf>  
036459: TIM 100623103500 24.2343 FET<cr><lf>
```

Example: **EE PDISP 1<cr>**
<t>poll display enable PDISP: 1<cr><lf>

MLM OEM Command Reference V2

PCMD – Poll Command String [New for F/W 1.3]

Parameter: **PCMD**
Description: **poll command string**
Values: x00-xFF
Default: 46 30 30 (F00)
Applies to: HEM
See also: Command **PNOW**; EEPROM **PEN**, **PINT**, **PDISP**, **PWUPEN**, **PSLPEN**, **PADD**, **PDEL**, **PWUPCHAR**

This parameter defines the command string of up to 16 ASCII characters that the HEM transmits when it performs the polling function.

The command string is entered as a string of ASCII numbers that represent the command string. The command to display the command string slightly differs from the command to set the command string. (**Note that the “s” required to set the parameter**).

Example of setting a poll command string of F00:

```
EE PCMD S 46 30 30<cr>  
<t>poll command string PCMD: x46, x30, x30<cr><lf>
```

Example of displaying the poll command string:

```
EE PCMD <cr>  
<t>poll command string PCMD: x46, x30, x30<cr><lf>
```

PWUPEN – Poll Wakeup Character Enable [New for F/W 1.3]

Parameter: **PWUPEN**
Description: **poll wakeup character enable**
Values: 0, 1
Default: 1
Applies to: HEM
See also: Command **PNOW**; EEPROM **PEN**, **PINT**, **PDISP**, **PCMD**, **PSLPEN**, **PADD**, **PDEL**, **PWUPCHAR**

This parameter enables the transmission of a “throw away” serial character used to wake up an SSM connected instrument before the actual command used during the poll is transmitted to the instrument.

Example: **EE PWUPEN 0<cr>**
<t>poll wakeup char enable PWUPEN: 0<cr><lf>

MLM OEM Command Reference V2

PWUPCHAR – Poll Wakeup Character [New for F/W 1.3]

Parameter: **PWUPCHAR**
Description: **poll wakeup character**
Values: x00-xFF
Default: x0D
Applies to: HEM
See also: Command **PNOW**; EEPROM **PEN**, **PINT**, **PDISP**, **PWUPEN**, **PSLPEN**, **PADD**, **PDEL**, **PCMD**

This parameter specifies the character transmitted on the serial link to the SSM connected instrument to wake it up. This is transmitted before the command specified by the EE parameter PCMD is sent. The gap between the wakeup character and the beginning of the polling command is approximately 100ms.

Example: **EE PWUPCHAR <cr>**
<t>poll wakeup char PWUPCHAR: x0D<cr><lf>

Example: **EE PWUPCHAR 0a<cr>**
<t>poll wakeup char PWUPCHAR: x0A<cr><lf>

PSLPEN – Poll Sleep Enable [New for F/W 1.3]

Parameter: **PSLPEN**
Description: **poll sleep enable**
Values: 0,1
Default: 1
Applies to: HEM
See also: Command **PNOW**; EEPROM **PEN**, **PINT**, **PDISP**, **PWUPEN**, **PWUPCHAR**, **PADD**, **PDEL**, **PCMD**

This parameter enables the transmission of the sleep command (ZZZ) to an SSM after the HEM has retrieved the results of the poll.

Example: **EE PSLPEN 1<cr>**
<t>poll sleep enable (zzz) PSLPEN: 1<cr><lf>

MLM OEM Command Reference V2

PADD – Poll Address [New for F/W 1.3]

Parameter: **PADD**
Description: **poll address**
Values: 00-32
Default: 00 (Broadcast to all units)
Applies to: HEM
See also: Command **PNOW**; EEPROM **PEN**, **PINT**, **PDISP**, **PWUPEN**, **PWUPCHAR**, **PSLPEN**, **PDEL**, **PCMD**, **GIDx**

This parameter specifies the group identification number that will be addressed for the polling cycle.

Example: **EE PADD 01<cr>**
<t>poll address PADD: 01<cr><lf>

LIDEN – RBR Logger ID Enable

Parameter: **LIDEN**
Description: **RBR logger id retrieval enable**
Values: 0, 1
Default: 1
Applies to: SSM
See also: Command **LID**

This parameter defines whether on power-up/reset, the SSM will attempt to obtain the ID of an RBR logger attached to its serial port. If this is enabled, the SSM will send the character **<cr>**, wait 100ms, and then send the character 'A' to the serial port on power up, expecting the logger ID string in return.

Example: **EE LIDEN 1<cr>**
<t>RBR logger id retrieval enable LIDEN: 1<cr><lf>

MLM OEM Command Reference V2

MDOCDUR – Open Channel Timeout

Parameter: **MDOCDUR**
Description: **modem open channel timeout (10ms)**
Values: 25-65534
Default: **500**
Applies to: HEM
See also: Commands **X, XS, XTP, X?**; EEPROM **MDRTRY, MDOCPERM, GID1, GID2, GID3**

This parameter defines the length of time of no channel activity after which the unit should close/leave the open channel. The channel activity requisite is a successful RX or TX. This value is defined in units of 10ms, so the default value is 5s.

Example: **EE MDOCDUR 1000<cr>**
<t>modem open channel timeout (10ms) MDOCDUR: 1000<cr><lf>

MDOCPERM – Modem Permanent Open Channel Enable [New for F/W 1.3]

Parameter: **MDOCPERM**
Description: **modem permanent open channel enable**
Values: 0,1
Default: 0
Applies to: HEM
See also: Commands **X, XS, XTP, X?**; EEPROM **MDRTRY, MDOCDUR, GID1, GID2, GID3**

This parameter enables the feature that makes the open channel timeout infinite. This feature should only be used in special circumstances. If enabled, this will override any value specified in MDOCDUR.

Example: **EE MDOCPERM 0<cr>**
<t>modem open channel permanent MDOCPERM: 0<cr><lf>

MLM OEM Command Reference V2

MDRTRY – Message Transmission Retry

Parameter: **MDRTRY**
Description: **modem maximum retry count**
Values: 0-5
Default: 1
Applies to: HEM, SSM
See also: Commands **X, XS, X?**; EEPROM **MDOCDUR, GID1, GID2, GID3**

This parameter defines the maximum number of retries for any transparent mode message requiring an ACK.

Example: **EE MDRTRY 2<cr>**
<t>modem maximum retry count MDRTRY: 2<cr><lf>

TPMXC – Transparent Maximum Characters [New for F/W 1.3]

Parameter: **TPMXC**
Description: **transparent max chars before send**
Values: 8-512
Default: 512
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPSNDC, TPSNDEN, TPSNDC2, TPSCTO, TPCTOEN, TPESCC, TPESCCCNT, TPACK, TPACKDSP, TPNAKDSP**

This parameter defines the number of serial characters received that will prompt a transparent mode transmission. ie. if there has been no transmission for 512 characters, and the 512th character has just been received, a message will be queued from transmission containing these 512 bytes. This is always enabled.

Example: **EE TPMXC 512<cr>**
<t>transparent max chars before send TPMXC: 512<cr><lf>

MLM OEM Command Reference V2

TPSNDC – Transparent Send Character

Parameter: **TPSNDC**
Description: **transparent send char**
Values: x00-xFF
Default: x0D
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMAXC**, **TPSNDEN**, **TPSNDC2**, **TPSCTO**,
TPCTOEN, **TPESCC**, **TPESCCCNT**, **TPACK**, **TPACKDSP**, **TPNAKDSP**

This parameter defines which character, when typed, will prompt a transmission in transparent mode. This must be enabled with **TPSNDEN**.

Example: **EE TPSNDC 0A<cr>**
<t>transparent send char TPSNDC: x0A<cr><lf>

TPSNDEN – Transparent Send Character Enable

Parameter: **TPSNDEN**
Description: **transparent send char enable**
Values: 0, 1
Default: 1
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDC2**, **TPSCTO**,
TPCTOEN, **TPESCC**, **TPESCCCNT**, **TPACK**, **TPACKDSP**, **TPNAKDSP**

This parameter enables the **TPSNDC** ability to send a transmission on a certain character entry in transparent mode.

Example: **EE TPSNDEN 1<cr>**
<t>transparent send char enable TPSNDEN: 1<cr><lf>

MLM OEM Command Reference V2

TPSNDC2 – Transparent Send Character Too

Parameter: **TPSNDC2**
Description: **transparent send char as well enable**
Values: 0, 1
Default: 0
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSCTO**,
TPCTOEN, **TPESCC**, **TPESCCCNT**, **TPACK**, **TPACKDSP**, **TPNAKDSP**

This parameter requires the **TPSNDC** character to be sent as well.

Example: **EE TPSNDC2 1<cr>**
<t>transparent send char as well enable: 1<cr><lf>

TPCTO – Transparent Character Timeout

Parameter: **TPCTO**
Description: **transparent char timeout (10ms)**
Values: 3-254
Default: 150
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSNDC2**,
TPCTOEN, **TPESCC**, **TPESCCCNT**, **TPACK**, **TPACKDSP**, **TPNAKDSP**

This parameter defines the serial port inactivity timeout which will prompt a transmission during transparent mode. The default value is 1.5s, and must be enabled with **TPCTOEN**.

Example: **EE TPCTO 10<cr>**
<t>transparent char timeout (10ms) TPCTO: 10<cr><lf>

MLM OEM Command Reference V2

TPCTOEN – Transparent Character Timeout Enable

Parameter: **TPCTOEN**
Description: **transparent char timeout enable**
Values: 0, 1
Default: 0
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSNDC2**,
TPCTO, **TPESCC**, **TPESCCCNT**, **TPACK**, **TPACKDSP**, **TPNAKDSP**

This parameter enables the ability to send a transmission after a serial port inactivity timeout **TPCTO** in transparent mode.

Example: **EE TPCTOEN 1<cr>**
<t>transparent char timeout enable TPCTOEN: 1<cr><lf>

TPESC – Transparent Escape Sequence [New for F/W 1.3]

Parameter: **TPESC**
Description: **transparent escape sequence**
Values: x00-xFF
Default: x01 x01 x01
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSNDC2**,
TPCTO, **TPCTOEN**, **TPESCCCNT**, **TPACK**, **TPACKDSP**, **TPNAKDSP**

This parameter defines the character sequence (up to 16 characters) utilized to revert an established link from transparent mode to command mode. Escape sequence is comprised of the character sequence as well as the guard time **TPESCTO** (if enabled)

(Note that the “s” required to set the parameter).

The transparent escape sequence is also used in the SSM to enter command mode either from transparent mode or from when the SSM is asleep.

Example: **EE TPESC s 01 02 33<cr>**
<t>transparent escape sequence TPESC: x01,x02,x33<cr><lf>

Example: In order to verify what the parameter is (in this example it was previously programmed as 01 01 01
EE TPESC<cr>
<t>transparent escape sequence TPESC: x01,x01,x01<cr><lf>

MLM OEM Command Reference V2

TPESCTO – Transparent Escape Timeout [New for F/W 1.3]

Parameter: **TPESCTO**
Description: **transparent escape guard time (10ms)**
Values: 3-6000
Default: 75
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPESC**, **TPSNDEN**,
TPSNDC2, **TPCTO**, **TPCTOEN**, **TPESCCNT**, **TPACK**, **TPACKDSP**,
TPNAKDSP

This parameter defines the minimum time gap required between the last transmitted data character and the beginning of the transparent escape sequence defined by the EE parameter **TPESC**. The guard time gap also applies to the time between the end of the transmission of the transparent escape sequence and the first character subsequently transmitted in command mode. If the guard time is not respected, the change in modes from transparent mode to command mode will not succeed. The default value of the timeout is 750ms.

Example: **EE TPESCTO 100<cr>**
<t>transparent escape timeout (10ms) TPESCTO: 100<cr><lf>

TPESCTOEN – Transparent Escape Timeout Enable [New for F/W 1.3]

Parameter: **TPESCTOEN**
Description: **transparent escape guard time enable**
Values: 0,1
Default: 1
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSNDC2**,
TPCTO, **TPCTOEN**, **TPESCC**, **TPACK**, **TPACKDSP**, **TPNAKDSP**

This parameter enables the use of the guard time interval on both sides (before and after) the transparent escape sequence.

Example: **EE TPESCTOEN 1<cr>**
<t>transparent escape timeout enable TPESCTOEN: 1<cr><lf>

MLM OEM Command Reference V2

TPACK – Transparent Request ACK [Updated for F/W 1.3]

Parameter: **TPACK**
Description: **transparent request ack enable**
Values: 0, 1
Default: 1
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSNDC2**,
TPCTO, **TPCTOEN**, **TPESCC**, **TPESCCCNT**, **TPACKDSP**, **TPNAKDSP**

This parameter determines whether each message requires an ACK or not in transparent mode. Parameters **TPACKDSP**, **TPNAKDSP** enable the serial port display of the ACK.

Example: **EE TPACK 1<cr>**
<t>transparent request ack enable TPACK: 1<cr><lf>

TPACKDSP – Transparent Display ACK Enable

Parameter: **TPACKDSP**
Description: **transparent display ack enable**
Values: 0, 1
Default: 0
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSNDC2**,
TPCTO, **TPCTOEN**, **TPESCC**, **TPESCCCNT**, **TPACK**, **TPNAKDSP**

This parameter enables a serial port output of ‘<ACK>’ after a successful message transmission in transparent mode.

Example: **EE TPACKDSP 1<cr>**
<t>transparent display ack enable TPACKDSP: 1<cr><lf>

MLM OEM Command Reference V2

TPNAKDSP – Transparent Display NAK Enable

Parameter: **TPNAKDSP**
Description: **transparent display nak enable**
Values: 0, 1
Default: 0
Applies to: HEM, SSM
See also: Command **TP**; EEPROM **TPMXC**, **TPSNDC**, **TPSNDEN**, **TPSNDC2**,
TPCTO, **TPCTOEN**, **TPESCC**, **TPESCCCNT**, **TPACK**, **TPACKDSP**

This parameter enables a serial port output of ‘<NAK>’ after an unsuccessful message transmission in transparent mode.

Example: **EE TPNAKDSP 1<cr>**
<t>transparent display nak enable TPNAKDSP: 1<cr><lf>