

MODBUS OPERATION



Model	Chameleon CTM-150/152 modem
Revision	1.3

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Revision Control

Description	Revision	Date
Customer Release	revision 1.0	2009
Updated documentation	1.1	05-25-09
Updated documentation	1.2	06-18-09
Updated to include new modbusadd syntax for serial slave devices	1.3	02-28-11

1 CTM-15X MODBUS Operation

The CTM-15X firmware version R1.2.0 and above support the MODBUS protocol commonly used in SCADA applications. The modem can be configured as one of three types of MODBUS devices:

- MODBUS slave with its own MODBUS ID
- MODBUS serial master gateway
- MODBUS slave gateway for a single serial slave and multiple TCP slaves (default configuration)

This application note details how to setup a CTM-15X CDMA wireless data modem in MODBUS mode. The MODBUS connection uses the CDMA/GPRS packet data network so is able to provide the advantages of high data rates, and being always connected so available for quicker response times. Over-the-air

	configured as MODBUS gateways
<i>cmd modbusmode 1</i>	Set modem to be a MODBUS serial RTU master gateway
<i>cmd port 9600 8 n 1 0</i>	Set MODBUS serial master with baud rate of 9600bps, 8 data bits, no parity, 1 stop bit and no flow control
<i>cmd modbusidmap 1 123.2.1.2 502</i>	Add an entry to the MODBUS ID to slave modem IP map. Repeat this command for MODBUS IDs = 2 to 247.
<i>cmd modbusidmap</i>	List all entries in MODBUS ID to slave modem IP map
<i>cmd mode 6</i>	Set the modem to auto connect to both the wireless network and the MODBUS host interface
<i>cmd save</i>	Save the modem configuration to non-volatile memory
<i>cmd pwrmode 2</i>	Power cycle the modem for the configuration to take effect

2.2 MODBUS Slave Gateway Modem Configuration

The following set of modem commands will configure the modem to act as a MODBUS slave gateway using MODBUS RTU between the modem and the MODBUS serial slave devices, and using MODBUS RTU over UDP over-the-air.

<i>cmd factory</i>	Reset modem configuration to factory defaults
<i>cmd modbusctm130 1</i>	Set modem to use MODBUS RTU over UDP over-the-air to maintain backward compatibility with CTM13x modems configured as MODBUS gateways
<i>cmd modbusmode 0</i>	Set modem to be a MODBUS slave gateway
<i>cmd modbusdel 0</i>	Delete all previously configured entries of MODBUS slave IDs
<i>cmd port 9600 8 n 1 0</i>	Set MODBUS serial slave device with baud rate of 9600bps, 8 data bits, no parity, 1 stop bit and no flow control
<i>cmd modbusadd 1 Serial R</i>	Set the serial port slave device to have a slave ID of 1 and to use MODBUS RTU as the serial transmission mode.
<i>cmd modbusadd</i>	List all entries in MODBUS slave list

<i>cmd mode 6</i>	Set the modem to auto connect to both the wireless network and the MODBUS host interface
<i>cmd save</i>	Save the modem configuration to non-volatile memory
<i>cmd pwrmode 2</i>	Power cycle the modem for the configuration to take effect

3 MODBUS Command Reference

3.1 General MODBUS Command Reference

The modem provides a set of common commands used for configuring both types of MODBUS gateways. These commands are used for enabling the CTM-15X modem to initiate the MODBUS host interface, for configuring the over-the-air protocol, and for configuring the transmission mode used between the CTM-15X modem and the MODBUS device.

modbusctm130 *n* (enable backward compatibility with CTM13x MODBUS messages over-the-air)

This command enables MODBUS backward compatibility with the CTM-13X by using MODBUS RTU encapsulated in UDP packets for messages transmitted/received over-the-air. The CTM-13X modems only use MODBUS RTU over UDP as the over-the-air protocol for communicating between other modems configured as MODBUS master and slave gateways.

<i>n = 0</i>	use MODBUS TCP for over-the-air communications (default)
<i>n = 1</i>	use MODBUS RTU over UDP for over-the-air communications

A **cmd save**, and a power cycle are required before the modem is configured to use the specified MODBUS over-the-air protocol.

Examples:

```
cmd modbusctm130 1 Set MODBUS gateway to send/receive MODBUS RTU over UDP messages
cmd modbusctm130 Query the currently configured MODBUS over-the-air protocol
```

modbusmode *n* (sets the MODBUS gateway mode)

This command sets the specified MODBUS gateway mode of the modem, specifically, the transmission mode between the modem configured as the serial master gateway and the MODBUS serial device connected to the modem.

<i>n = 0</i>	slave gateway (default)
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<i>n = 1</i>	RTU master gateway
<i>n = 2</i>	ASCII master gateway

A **cmd save**, and a power cycle are required before the modem is placed in the specified MODBUS gateway mode.

mode *n* (sets connection mode)

This command sets the required connection mode of the modem.

<i>n = 1</i>	manual connection (default)
<i>n = 2</i>	auto connect to the network
<i>n = 3</i>	auto connect to the network and go directly into PPP mode
<i>n = 4</i>	auto connect to both the network and the PAD host interface
<i>n = 5</i>	auto connect to the network and serial LCD (future)
<i>n = 6</i>	auto connect to both the network and the MODBUS host interface
<i>n = 7</i>	auto connect to both the network and the ZigBee mode
<i>n = 8</i>	auto connect to both the network and the ElmScan tool for OBD II

A **cmd mode 6**, a **cmd save**, and power cycles are required before the modem is placed in MODBUS mode.

3.2 MODBUS Serial Master Gateway Command Reference

The following section provides commands used to configure the modem as a MODBUS serial master gateway. For the following commands to be applied, the modem must be configured for MODBUS mode using **cmd mode 6** and configured as a serial master gateway using either **cmd modbusmode 1** or **cmd modbusmode 2**.

port *n d p s f* (serial port settings)

This command configures the modem's serial port baud rate and data format. After implementing this command it will be necessary to change the baud rate of the MODBUS master or slave device connected to the modem to match the new configuration. Use

<i>n = 1200</i>	1200 Baud
<i>n = 2400</i>	2400 Baud
<i>n = 4800</i>	4800 Baud
<i>n = 9600</i>	9600 Baud
<i>n = 19200</i>	19200 Baud
<i>n = 38400</i>	38400 Baud
<i>n = 57600</i>	57600 Baud
<i>n = 115200</i>	115200 Baud
<i>d = 5,6,7 or 8</i>	number of data bits
<i>p = n or N</i>	no parity
<i>p = e or E</i>	even parity

<i>p = o or O</i>	odd parity
<i>s = 1 or 2</i>	number of stop bits
<i>f = 0</i>	no flow control
<i>f = 1</i>	software flow control
<i>f = 2</i>	hardware flow control

The current port setting can be queried by using the **port** command without parameters.

For MODBUS RTU configuration to function properly **d = 8** must be entered. (This configuration is in accordance with the MODBUS specification)

Examples:

<i>cmd port 115200 8 n 1 2</i>	baud rate=115200bps, 8 data bits, no parity, 1 stop bit and hardware flow control
<i>cmd port 9600</i>	sets the baud rate to 9600
<i>cmd port</i>	returns the current port value

modbusidmap n a.a.a.a p (set up MODBUS ID to modem IP:port map)

This command sets up the MODBUS ID to modem IP for each remote MODBUS slave device (i.e. another CTM-15X modem configured as a MODBUS slave gateway). The default for all entries is *n 0.0.0.0*. Use *n 0.0.0.0 0* to erase an entry. One entry is added at a time with a limit of up to 247 entries (each entry requires a unique ID). To change an entry, one must first erase it then enter the changed IP address and port number.

<i>n = 1 to 247</i>	MODBUS ID, in decimal
<i>a.a.a.a = 0.0.0.0 to 255.255.255.255</i>	MODBUS slave modem IP address, in decimal
<i>p = 0 to 65535</i>	Port that the slave modem will be listening on, in decimal

Examples:

<i>cmd modbusidmap 1 123.1.2.3 502</i>	Set the MODBUS master gateway to forward messages for the slave device with ID 1 to port 502 of the modem at 123.1.2.3
<i>cmd modbusidmap 1 0.0.0.0</i>	Clear the MODBUS ID to modem IP entry for slave ID 1
<i>cmd modbusidmap 1 123.1.2.4 502</i>	Change slave ID 1 entry to the modem at 123.1.2.4
<i>cmd modbusidmap 0 0.0.0.0</i>	Clear all MODBUS ID to modem IP entries
<i>cmd modbusidmap</i>	Query all MODBUS ID to modem IP entries

3.3 MODBUS Slave Gateway Command Reference

The following section provides commands used to configure the modem as a MODBUS slave gateway. For the following commands to be applied, the modem must be configured for MODBUS mode using **cmd mode 6** and configured as a slave gateway using **cmd modbusmode 0**.

When the MODBUS slave gateway is enabled, the gateway will look at its MODBUS slave list to handle all MODBUS functions and traffic. This MODBUS gateway is able to function as:

- MODBUS TCP slave gateway
- MODBUS Serial slave gateway
- Self MODBUS device (one only allowed)

The MODBUS slave gateway will be using the default port of 502.

To add a MODBUS slave device entry to the MODBUS list. One entry is added at a time with a limit of up to 247 entries (each entry requires a unique ID). MODBUS TCP slaves, serial slaves and self slave can be added to the list. For the MODBUS self slave, the entry on the MODBUS list will be "Localhost, id".

modbusadd (query MODBUS slave gateway list)

To display all the entries in the MODBUS list. Read only.

Example:

cmd modbusadd displays the MODBUS list

(192.168.1.20,247)	TCP slave device with ID = 247
(Localhost,10)	self slave device with ID = 10
(19200.N.8.1 A,155)	serial slave device (baud 19200, no parity, 8 data, 1 stop, ASCII, no flow control)
with ID = 155	

modbusadd id nnn.nnn.nnn.nnn (add a MODBUS TCP slave)

id = 1 to 247 MODBUS ID
nnn.nnn.nnn.nnn = 1.0.0.0 to 255.255.255.255 MODBUS slave IP address

modbusadd id Serial m (add a MODBUS serial slave)

Adds a MODBUS Serial Slave

id = 1 to 247 MODBUS ID

m = a or A ASCII transmission mode

m = r or R RTU transmission mode

Notes:

- The MODBUS slave gateway will use the serial port settings configured using the **port** command for all serial slaves.
- For MODBUS RTU configuration to function properly **d = 8** must be entered for the **port** command. (This configuration is in accordance with the MODBUS specification)
- *modbusadd* will return "Invalid IP address (Sx)" followed by an "OK" if *modbusadd* is configured with parameters missing or incorrect parameters. Ensure that the *modbusadd* parameters match those from the above list.

4 Technical Support/Warranty:

**Cypress Solutions Service
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