USER'S MANUAL

Teleterm

M2 Series RTU's

Models C232xA

User Manual

SCOPE

Products Covered by this Manual

This User Manual provides information on how to install, configure and use the Teleterm M2 Series RTU's.

This manual covers the following product Models:

Model	Description
C2320A	Teleterm M2G RTU with internal GSM/GPRS modem
C2321A	Teleterm M2S RTU with RS232E serial port
C2322A	Teleterm M2C RTU with Conet network port
C2323A	Teleterm M2E RTU with Ethernet network port
C2324A	Teleterm M2R RTU with Spread Spectrum Radio network port
C2326A	Teleterm M2A RTU with internal CDMA modem

Manual Revision History

Date	Revision	Comments
2 Feb 2006	1	Initial Issue

Software Copy Available

This manual is available in Adobe Acrobat pdf format.

The pdf file is named UMC2320AR01.pdf

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1. GENERAL DESCRIPTION

1.1 Overview

The TELETERM M2 Series of RTU's is designed specifically for industrial telemetry and remote I/O applications, combining powerful industrial network communications features with ease of use.

The TELETERM M2 Series RTU is available with a wide range of communications network options to enable communication with a broad selection of devices and machines.

All I/O and configuration data variables are automatically accessible through Data Interchange Registers in a single "Data Interchange Table", allowing the implementation of Remote I/O systems "out of the box".

Conventional remote I/O systems can be implemented without the need for any programming, but the inclusion of programming capability in the M2 Series with the powerful EziForth Workbench programming software allows sophisticated local control functions to be performed.

The optional SD Card Slot provides the ability to store readings on a removable SD Card for remote logging applications. The data written to the SD Card is under control of the User Program, allowing flexibility of file structure and contents.

A Teleterm M2 Series RTU provides the ideal low cost remote interface to your assets or processes to provide the control and information that you need to optimise your operations.

The M2 RTU's are all equipped with 12 direct Binary and Analogue Inputs and Outputs. Each I/O can be uniquely configured as an input or output; analogue or digital. An RS232/485 serial port supporting a number of protocols including Modbus and Conet/s allowing signals from a variety of sources to be monitored and controlled via the M2 RTU communications network of choice.

As a basic I/O outstation, the M2 RTU's are easily configurable using the free Omniset configuration software. Using Omniset PRO, the M2 Series can also be configured remotely over the installed network.

Figure 1.1: Front View of the Teleterm M2G with internal GSM modem

1.2 Product Feature Matrix

The following table identifies the features available on each of the products in the range:

Product	Order Code	12 I/O	RS232/ RS485 Port	SD Card (optional)	GSM/ GPRS Port	RS232 (Port 2)	Conet Port	Ethernet Port	Radio Port	CDMA Port
M2G	C2320A	✓	✓	✓	✓					
M2S	C2321A	✓	✓	✓		✓				
M2C	C2322A	✓	✓	✓			✓			
M2E	C2323A	✓	✓	✓				✓		
M2R	C2324A	✓	✓	✓					✓	
M2A	C2325A	✓	✓	✓						✓

Table 1-1 – Product Feature Matrix

1.3 Feature Descriptions

1.3.1 I/O Terminals

The Teleterm M2 is equipped with 12 software configurable input/output points (IO points). Each IO point can be individually configured as digital or analogue, input or output selected from the options given in the following table:

I/O Point	Terminal No.	Digital Input	Analogue Input	Digital Output	Analogue Output
1	5	Yes	0-30Vdc	Yes	-
2	6	Yes	0-30Vdc	Yes	-
3	7	Yes	0-5Vdc	Yes	-
4	8	Yes	0-5Vdc	Yes	-
5	9	Yes	0-5Vdc	Yes	-
6	10	Yes	0-5Vdc	Yes	-
7	11	Yes	0-5Vdc	Yes	-
8	12	Yes	0-5Vdc	Yes	-
9	13	Yes	0-5Vdc	Yes	-
10	14	Yes	0-5Vdc	Yes	-
11	15	Yes	0-30Vdc	-	0/4-20mA
12	16	Yes	0-30Vdc	-	0/4-20mA

(See the specifications section for electrical specifications of each IO point option)

Table 1-2 – I/O Configuration Options

1.3.2 Port 1 (RS232/RS485 Serial Port)

The Teleterm M2 RTU is equipped with a user serial port, labelled PORT 1, on the front of the unit. This serial port is used as a communications port to third party equipment in normal mode and for configuration in programming mode.

The pushbutton is used to switch between normal mode and programming mode.

This serial port can be wired for RS232 or RS485 communications.

In normal mode, the serial port can be configured for a number of protocol sets:

a) Modbus protocol (Master or Slave device, ASCII or RTU protocol) is available on this port allowing easy connection to other third party products such as Alarm Annunciators, PLC's DCS or SCADA systems.

b) Conet/s protocol is available for integration into Conet networks and for programming the Teleterm M2.

c) User control which allows custom protocols to be implemented in the EziFORTH programming language in the M2 RTU.

1.3.3 Port 2 (Network Port)

Each M2 RTU is equipped with a network port called PORT 2. The type of network port is dependent upon the Model of M2 RTU. The following table gives an overview of the available network port options and their applications:

Product	Order Code	Network	Description
M2G	C2320A	GSM	The M2G is equipped with an internal GSM modem capable of communicating over standard GSM mobile phone networks using dial-up, SMS or GPRS data services. The M2G is ideally suited for communicating with remote assets over very large distances (even different countries).
M2S	C2321A	RS232	The M2S is equipped with a second RS232 serial port with full hand-shaking capabilities suitable for interfacing to external modems, or to any other equipment capable of supporting a RS232 connection. The M2S is ideally suited for interfacing to external modems or to other third party equipment using the RS232 standard.
M2C	C2322A	Conet	The M2C is equipped with a Conet network port. Conet is the world's most rugged Industrial LAN, capable of running over existing plant cabling up to 10 kilometres. Up to 126 nodes may be connected to a Conet network in a peer-to-peer architecture. The M2C is ideally suited for local in-plant communications where the cost of laying special networking cable is considered uneconomical for the application, but where existing cabling (of any sort) is already in place.

M2E	C2323A	Ethernet	The M2E is equipped with a 10/100 Ethernet port via an RJ45 connector. The M2E is ideally suited for directly connecting the M2 RTU to an Ethernet network.
M2R	C2324A	Radio	The M2R is equipped with an internal FHSS digital radio transceiver operating in the licence free radio bands. FHSS stands for Frequency Hopping Spread Spectrum and is an advanced technique for implementing secure error-free radio communications in the presence of high interference. The M2R is ideally suited for communications in areas where cable connections are impossible, and distances are relatively short (between 0.5km and 10km dependent upon the model and antenna selected) (See the selection guide for choosing the model appropriate for your country of use.)
M2A	C2325A	CDMA	The M2A is equipped with an internal CDMA modem capable of communicating over standard CDMA mobile phone networks using dial-up, SMS or 1XRTT data services. The M2A is ideally suited for communicating with remote assets over very large distances where GSM coverage does not exist. (Only available in certain countries)

Table 1-3 – Network Selection and Applications

2. Installing the Teleterm M2 RTU

2.1 Connecting the Internal Clock Battery

Before installing the Teleterm M2, the internal clock battery must be connected.

The Teleterm M2 is shipped from the factory with a “Battery Protector Tab” protruding from the left side of the unit. Pull on the tab to remove before use.

See section 5 for battery replacement details.

2.2 Mounting the Teleterm M2

The Teleterm Teleterm M2 is designed to be clipped to one of the following mounting rails:

Top Hat Section (DIN) Rail 35/7.5mm in accordance with EN 60715: 1981
Top Hat Section (DIN) Rail 35/15mm in accordance with EN 60715: 1981
G Section Rail 32mm in accordance with EN 60715: 1981

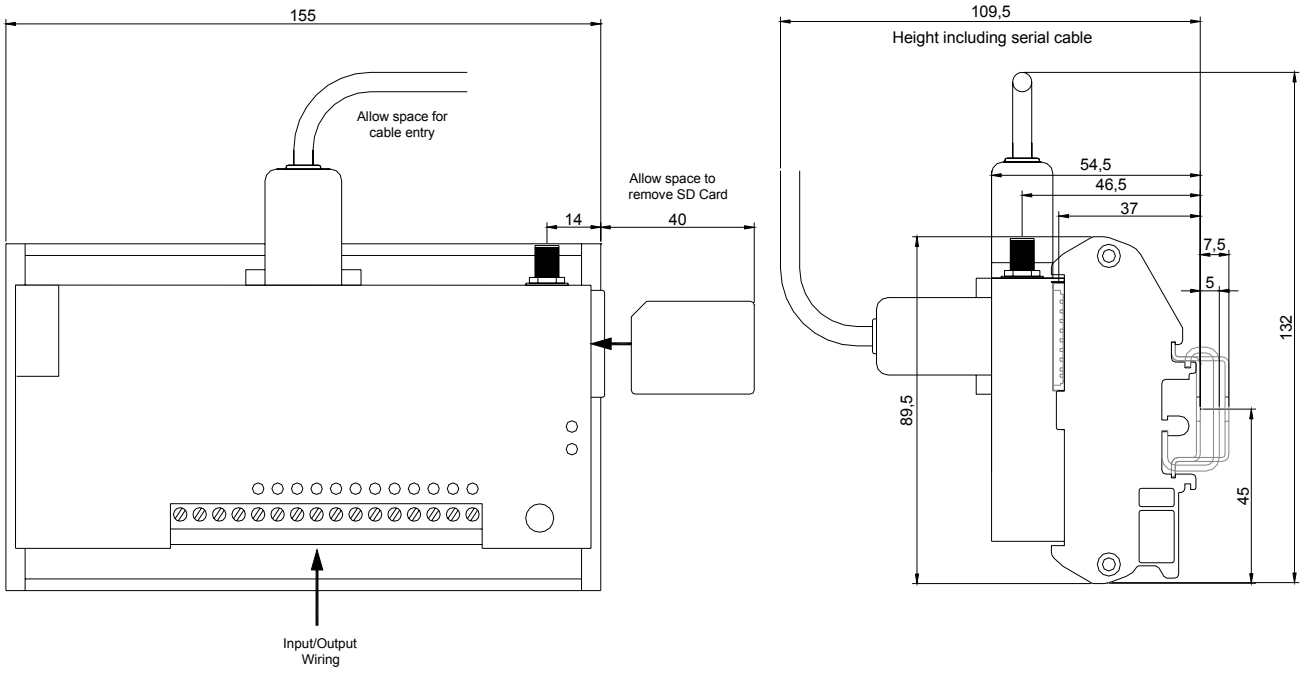


Figure 2.1: Mechanical Mounting Dimensions for the Teleterm M2

2.3 Connecting Serial Port 1

The supplied RS232 serial cable can be used to connect the Teleterm M2 to a standard PC compatible COM port for configuring the unit.

If connecting to a different device, the selection of either RS232 or RS422/RS485 is achieved by specific wiring of the serial port connector. No internal links need be changed to select between RS232 and RS422/485.

Pin number	Communication Standard	
	RS232	RS485
1	Do not connect	Rx Data + (In)
2	Rx Data (In)	Rx Data – (In)
3	Tx Data (Out)	Do not connect
4	Do not connect	Tx Data+ (Out)
5	Ground	Ground
6	Do not connect	Vcc
7	RTS (Out)	Do not connect
8	CTS (In)	Do not connect
9	Do not connect	Tx Data – (Out)

Table 2-1: Pin allocation of serial port 1 connector on Teleterm M2.

NOTE: The RTS and CTS handshaking lines are available for applications that require them. It is not a requirement of the CPU to use handshaking. In most applications connecting the RTS and CTS handshaking lines is not necessary.

2.4 Allocating direct Inputs and Outputs

The Teleterm M2 has a unique feature of allowing each I/O point to be software configured as analogue or digital, input or output, for the best possible utilisation of I/O in any application.

The following table gives the possible options for each I/O Point:

IO Point	Terminal No.	Digital Input	Analogue Input Max.	Analog I/P Resolution	Digital Output	Analogue Output Max.
1	5	Yes	0-30Vdc	30mV	Yes	-
2	6	Yes	0-30Vdc	30mV	Yes	-
3	7	Yes	0-5.5Vdc	6mV	Yes	-
4	8	Yes	0-5.5Vdc	6mV	Yes	-
5	9	Yes	0-5.5Vdc	6mV	Yes	-
6	10	Yes	0-5.5Vdc	6mV	Yes	-
7	11	Yes	0-5.5Vdc	6mV	Yes	-
8	12	Yes	0-5.5Vdc	6mV	Yes	-
9	13	Yes	0-5.5Vdc	6mV	Yes	-
10	14	Yes	0-5.5Vdc	6mV	Yes	-
11	15	Yes	0-30Vdc	30mV	-	0-23mA
12	16	Yes	0-30Vdc	30mV	-	0-23mA

Table 2-2 - I/O Point Configuration Options

Review your I/O requirements, and then make the optimum allocation of the I/O, taking into account the variations in specification of each I/O Point.

2.5 Connecting Digital Inputs

Digital Inputs must be connected in accordance with the following schematic:

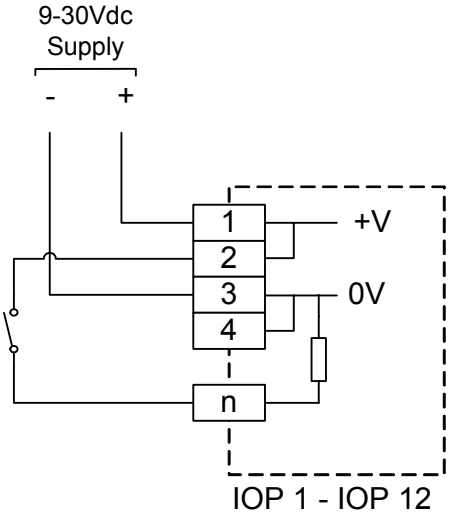


Figure 2.2 - Digital Input Connections

Digital Input Specifications:

Parameter	Condition	Value
LED Indication	Input On	Green LED On
Absolute Maximum Input Voltage		30Vdc
Minimum High Level Input Voltage		3Vdc
Maximum Low Level Input Voltage		2Vdc
Input Current	Vin = 5V	0.7mA
Input Current	Vin = 10V	1.7mA
Input Current	Vin = 12V	2.2mA
Input Current	Vin = 24V	4.7mA
Input Current	Vin = 30V	6.0mA

2.6 Connecting Digital Outputs

Digital Outputs must be connected in accordance with the following schematic:

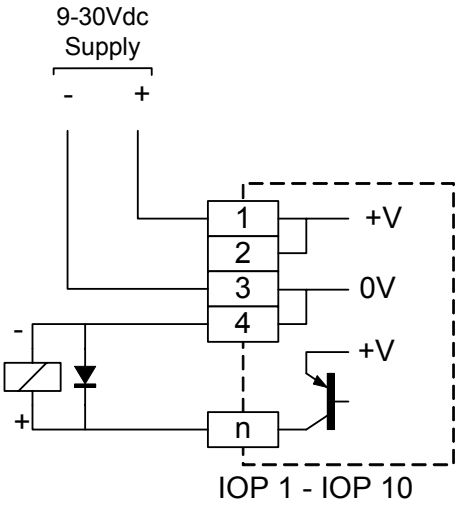


Figure 2.3 - Digital Output Connections

Digital Output Specifications:

Parameter	Condition	Value
LED Indication	Output On	Green LED On
Maximum Continuous Output Current		50mA
Maximum Peak Output Current	10ms max	200mA
Minimum High Level Output Voltage		$+V_{PSU}$ – 2.5V

NOTE: The use of digital outputs is reserved for future functionality in the Teleterm M2.

2.7 Connecting Analogue Inputs

Analogue Inputs must be connected in accordance with the following schematic:

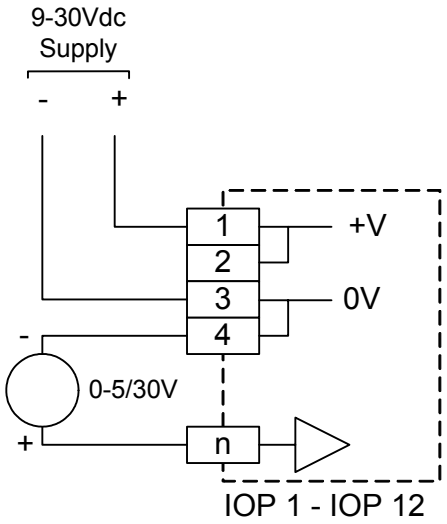


Figure 2.4 - Analogue Input Connections

Analogue Input Specifications:

I/O Points 1,2, 11 and 12

Parameter	Value
LED Indication	None
Absolute Maximum Input Voltage	30Vdc
Input Impedance Minimum	1MΩ
Minimum Measurable Input Voltage	0V
Maximum measurable Input Voltage	30V
Resolution	30mV (10 bits)
Accuracy	0.1% of reading + 1 bit

I/O Points 3 to 8

Parameter	Value
LED Indication	None
Absolute Maximum Input Voltage	30Vdc
Input Impedance Minimum	280kΩ
Minimum Measurable Input Voltage	0V
Maximum measurable Input Voltage	5.5V
Resolution	6mV (10 bits)
Accuracy	0.1% of reading + 1 bit

2.8 Connecting Analogue Outputs

Analogue Outputs must be connected in accordance with the following schematic:

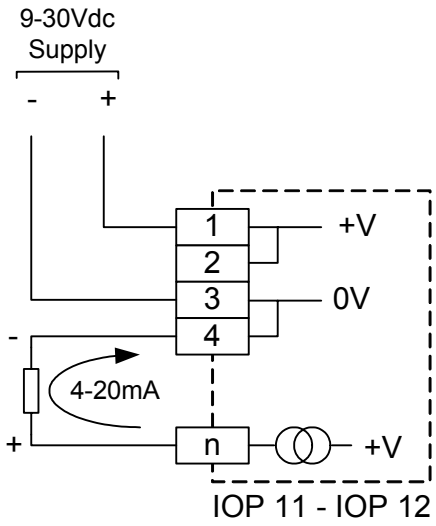


Figure 2.5 - Analogue Output Connections

Analogue Output Specifications:

Parameter	Value
LED Indication	None
Maximum Output Voltage Drive	$+V_{PSU}$ – 5.0V
Minimum Controllable Output Current	0mA maximum
Maximum Controllable Output Current	23mA minimum
Output Resolution	25µA
Output Accuracy	0.1% of reading + 1 bit

2.9 Connecting Network Port 2

2.9.1 Teleterm M2G (Model C2320A) with internal GSM modem

2.9.1.1. Inserting the GSM Network SIM Card (Model C2330A only)

The Teleterm M2G requires a SIM card (not supplied) to enable the Teleterm M2G to operate on the selected GSM mobile phone network.

To insert the SIM card:

1. Remove the top cover of the Teleterm M2 by undoing the two hex screws holding the top cover of the unit, using a 2.5mm hex key (supplied). The cover is connected to the unit by the internal antenna cable, so be careful not to place any strain on this cable while removing the cover or inserting the SIM card.

2. Insert the SIM card into the SIM card holder you will see in the centre of the unit. Take special care that the SIM card is correctly seated in the connector, and that the SIM card holder is properly closed. Press firmly down and slide forward to close securely.

3. Replace the top cover.

2.9.1.2. Connecting the Antenna

The supplied Antenna's cable should be screwed into the Antenna socket. Do not over tighten. This connector should be only finger tight to avoid damage.

The antenna connector is found on the top of Teleterm M2A.

2.9.1.3. Positioning the Antenna

The antenna should be placed away from the Teleterm M2G in a position that gives the best possibility of a good signal on the mobile phone network. Avoid proximity of the antenna to shielding materials such as metal enclosures.

The signal strength of the chosen location can be easily checked by holding a mobile phone (connected to the same network) in the intended position of the antenna, and checking that the signal strength on the phone is good.

CAUTION: The antenna emits RF energy on a continuous basis, and should be positioned away from sensitive instrumentation, and away from areas where close proximity to personnel on a regular basis would occur.

2.9.2 Teleterm M2S (Model C2321A) with second Serial Port

The M2S is equipped with a second serial port called PORT 2 suitable for driving a modem or other external serial device. The pin-out for PORT 2 is given in the following table:

Pin number	In/Out	Name	Description
1	I	CD	Carrier Detect
2	I	RD	Received Data
3	O	TD	Transmitted Data
4	O	DTR	Data Terminal Ready
5	-	SG	Signal Ground
6	I	DSR	Data Set Ready
7	O	RTS	Request To Send
8	I	CTS	Clear To Send
9	I	RI	Ring Indicator

Table 2.3: Pin allocation of PORT 2 serial port connector on M2S.

NOTE: This port is not isolated, and the Signal Ground is connected internally to the M2S Power Supply 0 Volt connection.

2.9.3 Teleterm M2C (Model C2322A) with Conet network port

It is recommended that the Teleterm M2C be connected to the Conet network using the C6169 Conet Termination Board and interconnecting cable. This ensures the integrity of the Conet network during maintenance of the RTU, and provides additional surge suppression and protection to the Teleterm M2C.

See the C6169 Datasheet with application notes for full Conet installation details.

Pin number	Description
2	Signal +
5	Cable screen (S)
8	Signal -
1, 3, 4, 6, 7 and 9	No connection

Table 2.4: Pin allocation of Conet port connector on the Teleterm M2C

2.9.4 Teleterm M2E (Model C2323A) with Ethernet Network Port

The M2E provides a standard Untwisted Pair Ethernet interface utilising a RJ45 connector suitable for direct connection to a 10/100 Ethernet system.

The M2E must be configured with a fixed IP address suitable for use on your Ethernet network.

Consult your network administrator/consultant for further details of the Ethernet connectivity and setup before powering up the M2E on to your Ethernet network.

2.9.5 Teleterm M2R (Model C2324A) with Radio Network Port

2.9.5.1. Connecting the Antenna

The M2R RTU is equipped with an SMA antenna connector found on the top edge of Teleterm M2R RTU.

The appropriate antenna suitable for the application must be selected and purchased separately.

Screw the antenna's cable into the Antenna socket. Do not over tighten. This connector should be only finger tight to avoid damage.

2.9.5.2. Positioning the Antenna

The antenna should be placed away from the Teleterm M2R in a position that gives the best possibility of good reception. Avoid proximity of the antenna to shielding materials such as metal enclosures.

The signal strength of the chosen location can be easily checked by using the Omniset configuration software.

CAUTION: The antenna emits RF energy on a continuous basis, and should be positioned away from sensitive instrumentation, and away from areas where close proximity to personnel on a regular basis would occur.

2.9.6 Teleterm M2A (Model C2326A) with internal CDMA modem

2.9.6.1. Registering the Teleterm M2 on the CDMA network

The Teleterm M2A must be registered on the customer selected CDMA network before the unit can operate.

The Teleterm M2 for CDMA networks is supplied with an Electronic Serial Number (ESN). This number can be found on a label attached to the unit.

This ESN must be supplied to the CDMA network operator when registering the unit for operation on the CDMA network.

2.9.6.2. Connecting the Antenna

The supplied Antenna's cable should be screwed into the Antenna socket. Do not over tighten. This connector should be only finger tight to avoid damage.

The antenna connector is found on the top of Teleterm M2A.

2.9.6.3. Positioning the Antenna

The antenna should be placed away from the Teleterm M2A in a position that gives the best possibility of a good signal on the mobile phone network. Avoid proximity of the antenna to shielding materials such as metal enclosures.

The signal strength of the chosen location can be easily checked by holding a mobile phone (connected to the same network) in the intended position of the antenna, and checking that the signal strength on the phone is good.

CAUTION: The antenna emits RF energy on a continuous basis, and should be positioned away from sensitive instrumentation, and away from areas where close proximity to personnel on a regular basis would occur.

2.10 Powering up the Teleterm M2

Upon power up, the Teleterm M2 will take approximately a few seconds to initialise the system and connect to the network. The front panel LED's will all light for a short period before switching to their operational state.

3. Configuring the Teleterm M2

3.1 Overview

The Teleterm M2 is configured using the 'Omniset' software utility version 7.3 or above.

Omniset is a Windows98/NT/2000/XP compatible software package designed to configure a wide range of Omniflex products, including the Teleterm Teleterm M2.

Omniset is available in two versions:

The standard Omniset software is on the CD supplied with the Teleterm M2 RTU.

Omniset may also be downloaded for free from the Omniflex web site www.omniflex.com .

Omniset allows the Teleterm M2 to be configured through the serial port on the front of the unit.

The EziFORTH Workbench software is used for more advanced programming of the Teleterm M2.

3.2 Incompatibility with Previous Versions of Omniset and DITview.

3.2.1 Versions of Omniset prior to 7.3

The Teleterm M2 is only compatible with Omniset or Omniset PRO Version 7.3 onwards. If you have a previous version of Omniset installed on your computer, then you need to upgrade to the latest version.

You can check which version of Omniset you have installed by opening Omniset and then selecting the "Help>About…" menu item.

3.2.2 What if I have DITview installed?

The 'DITview' software utility cannot be used to configure the Teleterm M2.

DITview has been superseded by Omniset PRO.

Omniset 7.3 shipped with Teleterm M2 can be installed together with DITview on your computer. Alternatively, enquire with your Omniflex representative about upgrading your DITview software to the latest version of Omniset PRO.

3.3 Installing Omniset from the CD supplied

Omniset is Windows98/NT/2000/XP compatible, and requires access to an RS232 port on your Windows computer.

If your computer does not have a serial port available for use with Omniset, then inexpensive USB-to-Serial Converter modules are readily available that can be used with Omniset.

To install Omniset from the CD supplied, follow these steps:

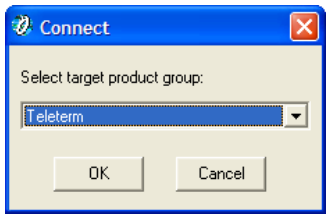
1. Insert the CD into the CD drive of your computer. The Omniset installation should start automatically. If it does not, then, using Windows Explorer, navigate on the CD drive to the 'Omniset' directory and double click the file 'setup.exe'.
2. Follow the prompts on the screen to complete the installation.
3. Select the COM port that you wish to use with Omniset by selecting 'COM Port' on the Data menu.
4. Omniset uses "templates" to customise its appearance to suit the product being configured. Omniset is supplied with a complete library of templates for all Omniflex products, including the Teleterm Teleterm M2. This library is frequently being updated

with new products and enhancements. If your computer is connected to the Internet, you can easily check for and download the latest template library by selecting “Update Template Library from Web…” on the Omniset File menu. Follow the prompts to update your template library to the latest version. If you installed Omniset from the CD supplied with your Teleterm M2, and you do not have access to the Internet then do not worry. You will already have the template necessary to configure the Teleterm Teleterm M2 (although it may not be the latest version available).

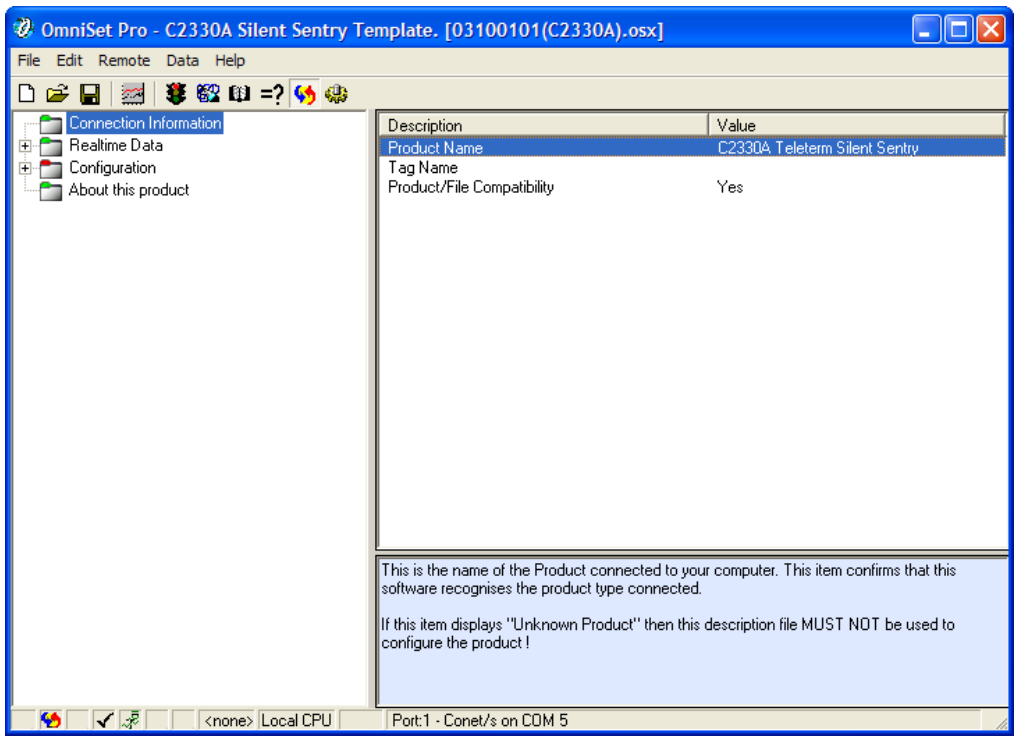
3.4 Connecting Omniset to the Teleterm M2 for first time

To setup the Teleterm M2 using Omniset, follow this procedure:

1. Plug the programming cable supplied into the serial port on the front of the Teleterm M2 (marked Port 1) and into a serial port on your computer.
2. Ensure that the Omniset software utility is running on your computer.
3. Hold down the MODE pushbutton on the Teleterm M2, until the MODE LED indicator starts to flash green and red alternatively. This places the Teleterm M2 into programming mode.
4. Select ‘Connect...’ from the File menu.
   Select the ‘Teleterm’ Product Group when prompted, and press OK:



5. If successfully connected, you should see the following screen in Omniset:



Check that the Product Name is correct for the version of Teleterm M2 connected and that the Product/File Compatibility is 'Yes'.

6. Make sure that the Sync button  is depressed, and that the Sync mode icon is present in the Status bar at the bottom of the Omniset window. This indicates that Omniset is in Sync mode, and that the data visible in Omniset is synchronised with the Teleterm M2 connected. In this Sync mode, any changes that you make in Omniset will automatically be written to the Teleterm M2. If Sync mode is NOT enabled, then changes you make to the configuration will NOT be written automatically to the Teleterm M2. You can write these values manually to the Teleterm M2 by selecting "Write Current Group" or "Write All Groups" from the "Data" menu.

You are now ready to view or change any of the parameters in the Teleterm M2.

3.5 Overview of the Teleterm M2 Configuration Template

The pane on the left of the Omniset window shows a list of Groups of Items to be viewed or changed, arranged in Folders. Select a Group in the group pane on the left, to see the contents of the individual Items for that Group in the item pane on the right.

By selecting either a Group, or an Item, Help information will be displayed for that Group or Item in the Help pane below the Item pane at the bottom of the Omniset window.

See the Omniset Help for a more detailed description of the operation of Omniset.

There are two important Groups in the left group pane:

The Real-Time Data Group contains the current status of all data items in the Teleterm M2. Select one of the Real-Time Data Groups to see the current data in the Teleterm M2.

The Configuration Group contains all the Items that can be configured in a Teleterm M2.

The value of an Item in the right hand pane can be changed in a number of ways:

1. Double-click the Item or
2. Right Click the Item and select "New Value…" from the options provided.

Enter the new value in the dialogue box and then press Enter or the 'OK' button.

Once you have completed the configuration of your Teleterm M2, you should save your configuration to your hard drive, so you have a backup of the configuration.

Remember that if your Omniset is not synchronised to your target Teleterm M2 when you make any changes in Omniset, these changes will not be written to the Teleterm M2 until you press the "Write" or "Write All" button.

3.6 Quick Configuration

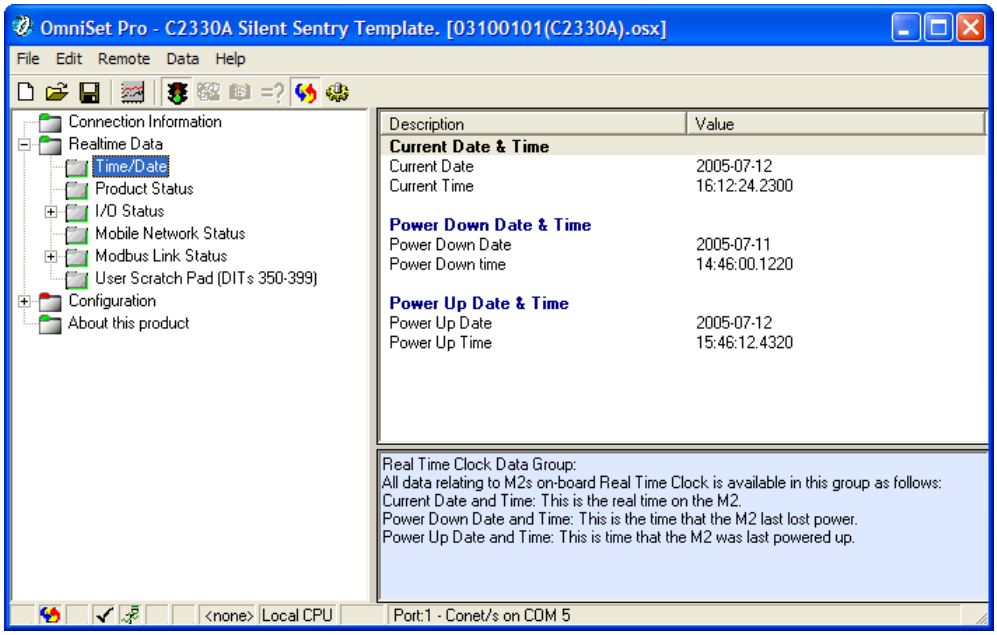
This procedure is recommended to check the Teleterm M2 operation for the first time. This provides the minimum amount of configuration necessary to achieve a simple functional test. This will give you a good starting point for further customisation to suit your specific application.

3.6.1 Set the Real-time Clock

The Real Time Clock Data Group shows the current date and time in the Teleterm M2, the time and date of the last power down, and the time and date of the last power up.

To set the real-time clock, write the current time and date to the relevant Data Items in this Data Group. The clock will run immediately from this new time when it is written to

the Teleterm M2. To change a data item, double the Item, or right click and select "**New Value…**".

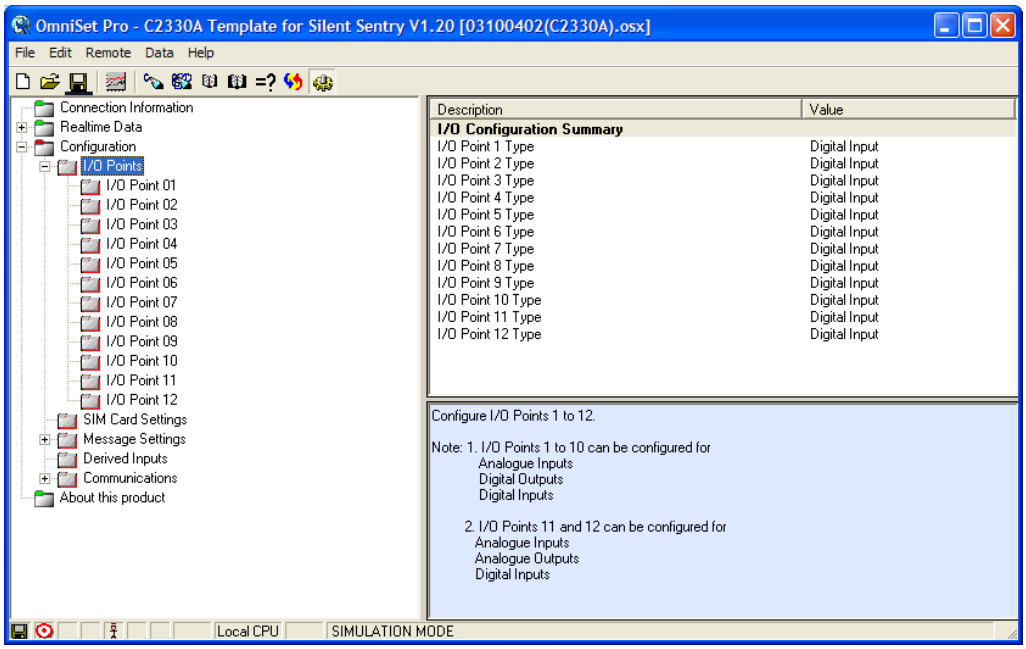


3.6.2 Set the I/O Points to the type required

The default setting as shipped from the factory is with all inputs set as digital inputs.

Ensure that these inputs as set as Digital Inputs by selecting the I/O Points Group. This gives a summary of each Input setting.

For detailed configuration of each Input to suite your application, select the actual I/O Point in the left Group pane.



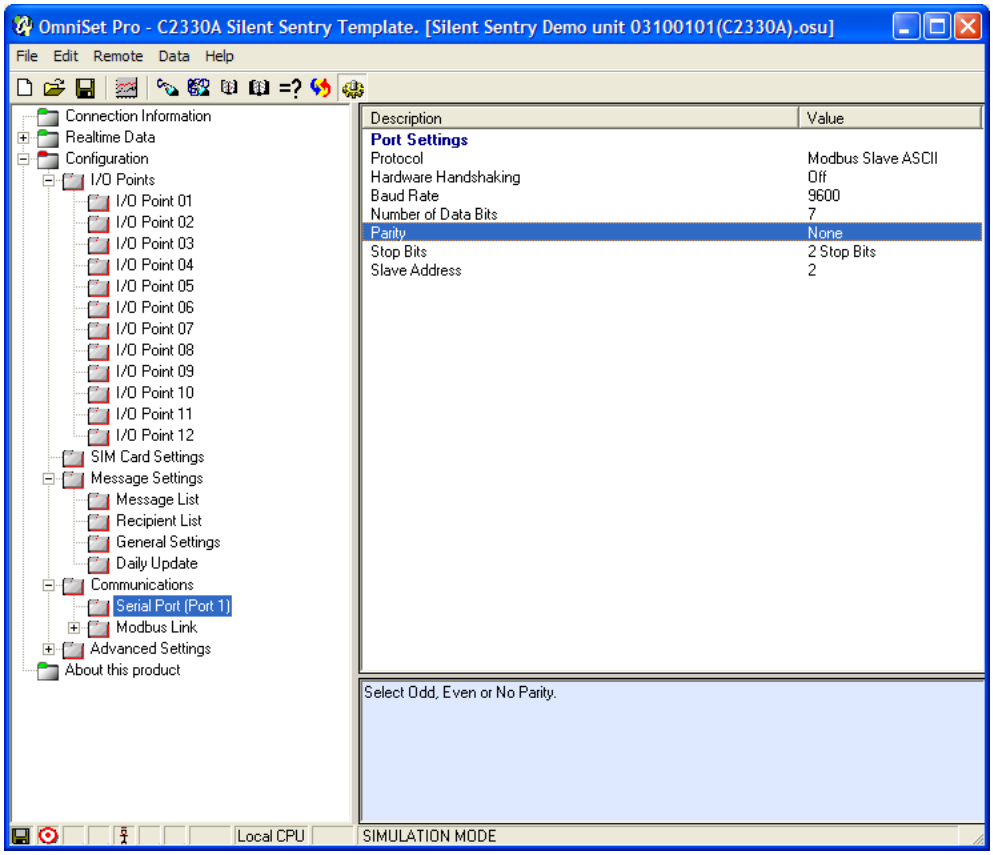
3.7 Configuring the Serial Port 1

If you are not using the serial port for any purpose other than configuration of the Teleterm M2, then it is not necessary to change any settings in this group.

The serial port (Port 1) on the Teleterm M2 comes equipped with three protocols:

1. Modbus Master (ASCII and RTU)
2. Modbus Slave (ASCII and RTU)
3. Conet/s protocol.
4. User Protocol (Requires an installed user program to access the serial port)

The required protocol including any address selection is made in the Configuration/Communications Group.



Remember to switch the Serial Port back to Normal Mode (by holding the MODE pushbutton down until the red/green flashing stops) or these serial port settings will not take effect.

3.8 Configuring the Conet/c Network Port (available on the M2C RTU only.)

The Conet/c Port selection switch is located on the top edge of the M2 RTU along side the Port 2 Conet Network connector. Use this switch to configure the Node address of the CPU on the Conet network and the desired CONET baud-rate (Normal or Slow).

Communications Protocol	Conet Address switch setting
Conet (Normal mode): Baud rate: 62,500 baud	**Switches 1-7: Conet ID**  (Set in binary Switch 1 = LSB Switch 7 = MSB) **Switch 8: Baud Rate** Switch 8 OFF = 62.5 kBaud [Switch shown set to Address 2, Normal baud rate]
Conet (Slow mode): Baud rate: 7,800 baud	Switches 1-7: Conet ID  Switch 8: Baud Switch 8 ON = 7.8 kBaud [Switch shown set to Address 2, Slow baud rate]

Table 3.1: Conet Port Address switch settings on the M2E RTU)

Each node on the Conet/c network should be allocated a unique address in sequence, starting at 1.

Please refer to the Conet Installation Guide and Conet Protocol Datasheet for more information on the CONET network.

3.9 Other Configuration Settings

There are a number of other settings that can be made in Omniset to fully configure your Teleterm M2. The settings for your particular M2 RTU will vary dependent upon the model. There is an Omniset Template customised for each version of M2 RTU.

Browse through all of the Configuration Groups in Omniset. The Help pane in Omniset will explain each of these additional settings.

3.10 Programming the M2 RTU in EziFORTH

Please refer to the separate EziFORTH Programmer's Manual.

4. Modbus and the Teleterm M2

4.1 Overview

A unique and powerful feature of the Teleterm M2 is its ability to read data from any device equipped with a Modbus port and send SMS Alarm messages based upon the contents of that data.

Examples of equipment that can be interrogated for alarm data are instruments such as PLC's, SCADA packages, on-line analysers, flow meters etc.

Modbus is the most popular standard for the exchange of data between industrial instrumentation today. Modbus is a well established reliable standard that is easy to use.

Modbus is a serial multi-drop Master/Slave protocol. This means that you can connect one or more Slave devices to a Master device over a serial communication link. If only one Slave device is being used, and the distance between the Master and Slave devices is less than 15m, then the simpler more popular RS232 electrical standard can be used. If two or more Slaves are to be connected to the Master Device, or the distance between the devices is greater than 15m, then the RS485 electrical standard must be used.

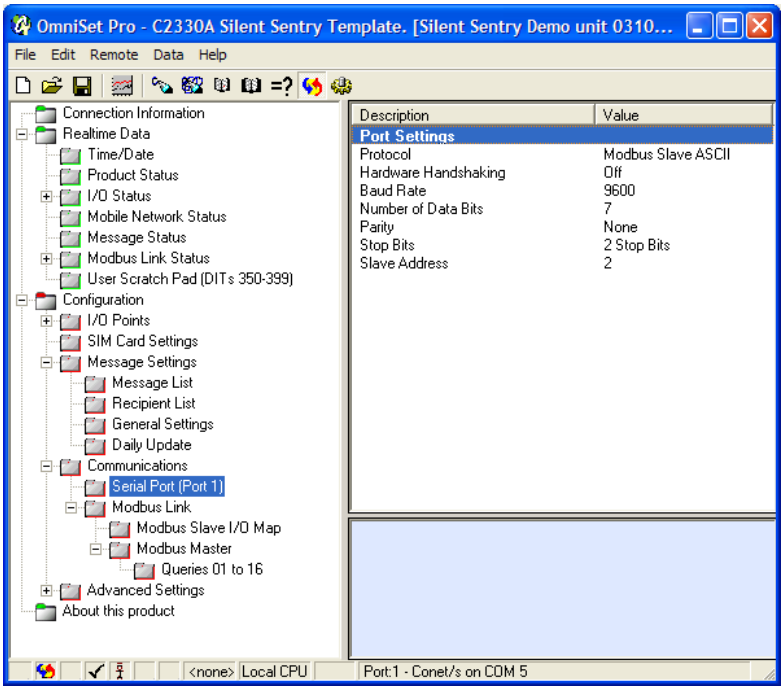
There are no internal settings in the Teleterm M2 for selecting RS232 or RS485. All that is required is to wire the appropriate pins of the serial connector for the chosen standard.

4.2 Modbus Slave

4.2.1 Selecting the Slave Protocol Details

Setting up Modbus Slave protocol only requires configuration of the serial port in the "Configuration/Communications/Serial Port" group, including ASCII and RTU mode, Baud Rate, Parity, number of Data bits and Stop bits etc.

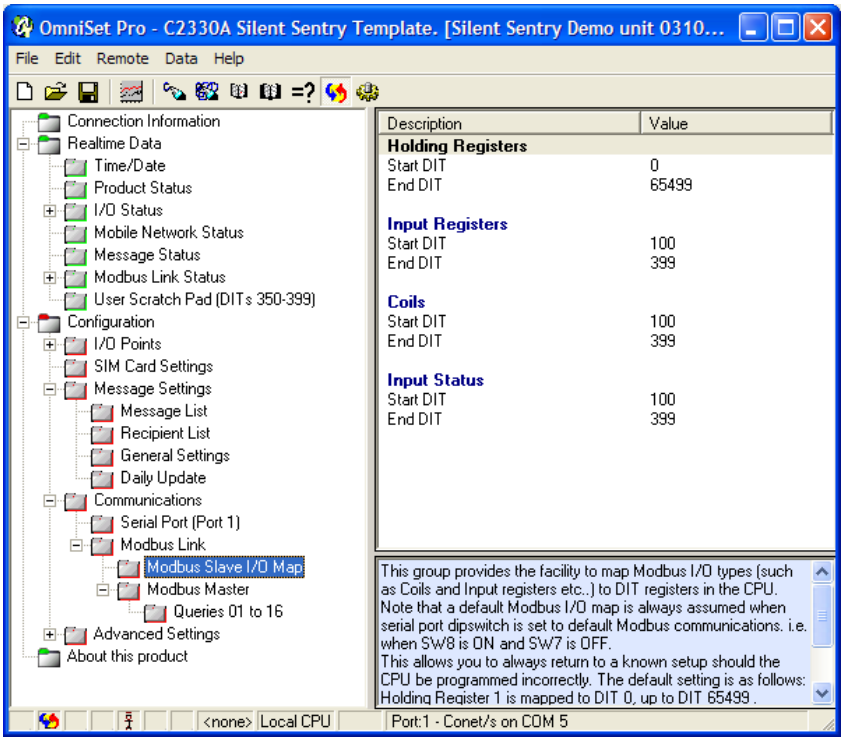
The simplest operating mode for Modbus Slave is to configure the Teleterm M2 (and the Master Device) as follows:



4.2.2 Modbus Data Register Mapping

The Modus protocol in the Teleterm M2 supports the reading and writing of a number of different types of data: Digital Status Inputs, Coil Outputs, Input Registers and Holding Registers.

These Modbus Data types are mapped to specific areas of the Teleterm M2's Scratch Pad Registers. It is not normally necessary to change this layout, but you may do so for specific applications. The default settings are as follows:



The most efficient data type to use is Holding Register Read (Modbus Function 3) and Holding Register Write (Modbus Function 16).

4.3 Modbus Master

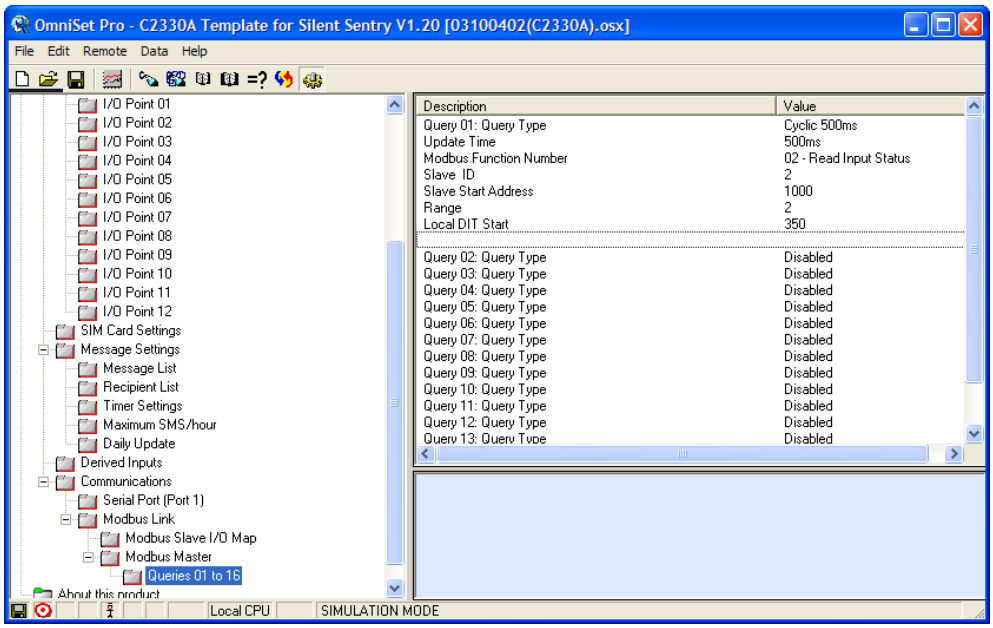
4.3.1 Selecting the Master Protocol Details

Setting up Modbus Master protocol requires configuration of the serial port in the "Configuration/Communications/Serial Port" group, including ASCII and RTU mode, Baud Rate, Parity, number of Data bits and Stop bits etc.

4.3.2 Query Blocks

In order to use the Modbus Master facility in the Teleterm M2 to get data from another Modbus Slave, "Query Blocks" have to be configured that tell the Teleterm M2 where to get the data from which Slave, where in the Teleterm M2 to place the data, and which Modbus Function to use to acquire the data.

Up to 16 Query Blocks can be configured in the Teleterm M2:



In the example shown above for Query 01, each data item has the following meaning:

Query Type Cyclic: This means that the query will repeat on a timed cycle as set.

Update Time: This setting shows often the query will be sent – in this case every 500 milliseconds (0.5 seconds).

Modbus Function Number: There are number of types of messages called “functions” that the Modbus protocol supports. Function 3 for reading general purpose Holding Registers is the most commonly used for this purpose because it is the most efficient for reading larger amounts of data.

Function	Description
1	Read Coil Status
2	Read Input Status
3	Read Multiple Holding Registers
4	Read Multiple Input Registers
5	Write Single Coil
6	Write Single Holding Register
15	Write Multiple Coils
16	Write Multiple Holding Registers

Slave ID: This is the Modbus Address of the Slave device to be polled.

Slave Start Address: This is the address of the first Holding Register to be read from the Slave device,

Range: This is the number of Holding registers to be read from the Slave device.

Local DIT Start: This is the starting address of the local Register in the Teleterm M2 where the data will be written. The registers in the range 350 to 399 are reserved for this purpose in the Teleterm M2.

Once the Queries required are configured, then you need to unplug the programming cable from the serial port, switch the serial port back to normal mode by holding down the Mode pushbutton until the OK light is steady green, and then plug in the slave device to the serial port.

5. The Data Interchange Table explained

5.1 DIT Table Layout

All data exchange with the M2 RTU is done via the “Data Interchange Table” (DIT). Any exchange of data between functions in the M2 RTU and with the outside world takes place through this DIT.

The Data Interchange Table (or DIT) in the M2 RTU is used for reading and writing all configuration and dynamic data in the M2.

The DIT is an array of 16 bit registers accessible from any function or communications port in the M2 RTU. Even the Omniset configuration template interfaces to the M2 RTU through the DIT.

The M2 has 400 registers for dynamic data, and 8000 registers for configuration.

Any of these registers may be accessed through any of the network ports, allowing conventional remote I/O systems to be implemented “out-of-the-box”.

The DIT address details for each value to be read and written is best found in the Omniset template file.

6. The Subscription Service Explained

6.1 Introduction to Subscriptions

Central to many applications involving communications across networks is the need to replicate data between nodes on the network.

Examples include a SCADA system acquiring data from remote telemetry units in the field; or a point-to-point telemetry application, where inputs are transmitted from one location to outputs at another location.

In all these cases, the traditional method is for a controlling master node to poll the slave nodes regularly for data in case something has changed. This crude method is an inefficient use of the limited network bandwidth, and is inherently slow in typical and worst case update times. It also limits the number of master nodes in the system to one, and makes the system update times very slow where many outstations are involved.

The Teleterm M2 provides a far superior mechanism to accomplish this commonly used function through its Subscription Service. The subscription Service runs on all Conet/c and Conet/e networks, and is supported on all Omniflex products supporting these network types. This allows the M2 RTU to be used as remote I/O for other Omniflex equipment such as the Maxiflex Process Automation Controller Suite of products.

The Subscription Service operates as follows:

The node requiring the data sets up a subscription with the source node, very much like you would subscribe to a magazine through your newsagent. You establish a magazine subscription by telling the newsagent which magazine you want, your home address, and how often you want it, and then the newsagent takes the responsibility on himself to send you the magazine whenever a new issue becomes available.

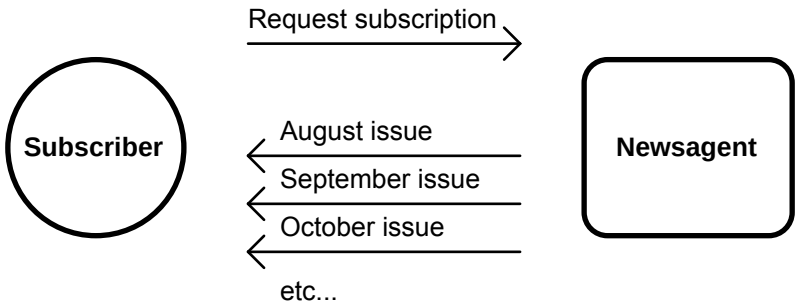


Figure 6.1 The Magazine Subscription Analogy.

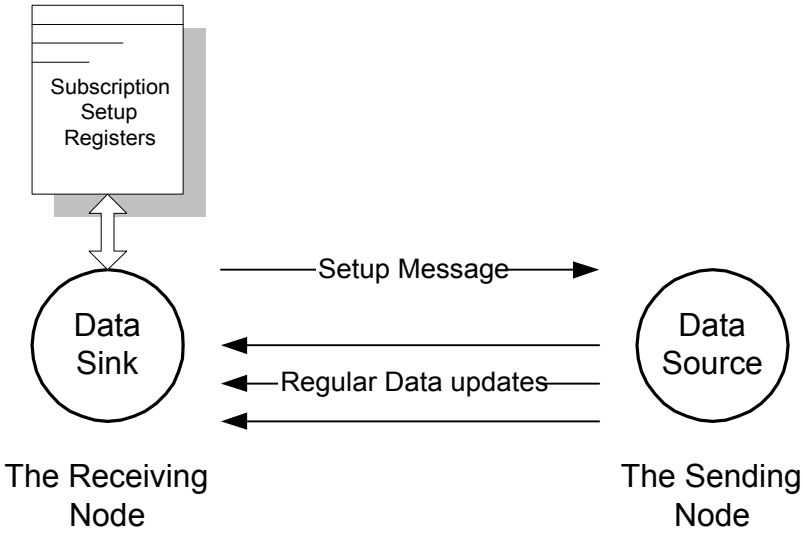
In the same way, the M2's Subscription Service allows the M2 (acting as a node on the network) to subscribe to a range of DIT registers on a remote node.

The remote node will then send the data at an agreed time interval, plus, if required, when the data changes state. The receiving node expects these regular updates, and will flag an error if the subscribed data is interrupted for any reason.

6.2 Setting up subscriptions

Just like the magazine subscription, the receiving M2 is responsible for setting up and maintaining subscriptions with other nodes to replicate data across the network. The advantages of using subscriptions over regular polling mechanisms are as follows:

1. Only one message is required on the network for a data update as opposed to two in a Request/Reply polling method. This reduces network overhead allowing more data throughput on the network.
2. The regular data updates can be much slower than the response time required for the system by using change-of-state detection. The Source node will send data immediately there is a change of state, providing the optimum system response, without the need to have a fast regular update time. This reduces network overhead allowing more/faster data throughput on the network when something does change.
3. On peer-to-peer networks multiple subscriptions can be configured between nodes in different directions, each of which would operate independently of any other. This provides far more flexibility than typical Poll/Response Master/Slave methods.



The node acting as a data “source” (the sending node) requires no user configuration to participate in a subscription contract with another node. The node acting as data “sink” (the receiving node) is configured by the user for the required data. The “sink” node then automatically manages the subscription including sending the requests to the data source, and managing errors in the process.

The following table shows the information required to configure a subscription:

ITEM	DESCRIPTION	VALID RANGE
Change-of-State Required	This sets whether the subscription data block will be sent when any data in the block changes.	Yes/No
Update time	This is the time between regular updates of data that will be sent whether the data has changed or not.	1 – 120 seconds
Local Port Number	This is the Network Port number on the network module in the local (receiving) system to which the network containing the remote (source) node is connected. This item is only required if a local network ID is specified for the Source Node Address, otherwise it should be set to 0.	0 – 3 On the T2 CPU: 0 = CPU network port 2 = CPU Serial Port Refer to the relevant module user manual for port numbers on modules in other I/O slots.
Destination DIT Start Address	This is the DIT register address where the data will start to be written in this CPU acting as the data sink.	0 – 65535
Source Node Address	This is the network address of the sending or source node from which the required data originates. This can be expressed as a local network address plus the local slot and port to which the network is connected, or it can be expressed as a global network address if network routing is configured in the CPU.	Local network addresses: 1 – 126 Global network addresses: 127 – 254
Source DIT Start Address	This is the DIT register address of the first register in the block of registers to be sent from the source node.	0 – 65535
Data Range	This is the number of 16 bit DIT registers that will be transferred in the subscription	1 – 120

Table 6.1 Subscription Configuration Information

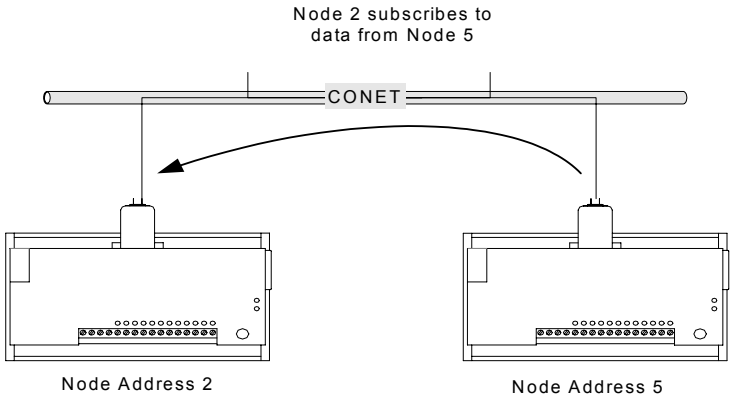
6.3 Number of subscriptions allowed

There is a limit to the number of subscriptions that a Teleterm M2 RTU can receive, and a limit to the number of subscriptions that it can send. The M2 RTU can be configured to receive subscriptions from a maximum of 2 other nodes and can send subscriptions to a maximum of 2 other receiving nodes.

In other words each M2 RTU can act as data sink for 2 subscriptions, and data source for 2 subscriptions simultaneously.

6.4 Subscription Application Example

Refer to the diagram of a simple network below:



Remote node 5 on the CONET network has digital information in DIT register 100. Node 2 needs to monitor these digital inputs. A regular update time of every 10s is quite satisfactory to determine that the remote system is still connected and functioning if nothing changes, but the data should be sent immediately if any of the digital inputs changes state.

Node 2 is the Destination node (it sets up the subscription and receives the data). Node 5 is the sending node, and requires no user configuration to participate in the subscription process.

Fill in the following data into one of the eight subscription blocks in the Subscription Table in the T2 CPU of Node 2 to configure this function:

NAME	VALUE	DESCRIPTION
Change of State Required	Yes	The data will also be sent whenever any bit the DIT registers 100 changes.
Update Time	10	The regular updates can be 10 seconds apart.
Local Port Number	0	The CONET network is Port 0 on the CPU
Destination DIT Start Address	100	This is the DIT Address where we want to start writing the received data.
Source Node Address	5	The local CONET ID on the Conet network
Source DIT Start Address	110	The Source Data start at DIT address 620
Data Range	1	We require 1 DIT register to be sent

Table 6.2 Subscription Block Data Example

When configured, Node 2 automatically requests a subscription with the data from Node 5 on the Conet network.

Node 5 undertakes to send the contents of its own DIT register 100 over the network to node 2 whenever any of the bits change, or every 10s if no change occurs in that time. The information will be placed in node 2's DIT register 110.

Node 2 can monitor the status of the subscription by monitoring the relevant bit in the Subscription Status DIT register. If this bit is clear then the subscription is operating successfully. If this bit is set, then the subscription has failed and received data is not valid, or the subscription has not been correctly set.

7. Maintenance

7.1 Battery Type

The Teleterm M2 is equipped with an internal clip-in battery for retaining the real time clock during power failures.

This battery is a type CR2032 Lithium Battery. This battery is commonly available from electronic stores or can be obtained from Omniflex by specifying Part Number 3.5701.001

It is recommended that the battery be replaced at least every three years, or when the battery low indicator in the Teleterm M2 shows LOW. (See the Real Time/Product Status Group in Omniset.

7.2 Battery Replacement Procedure

To replace the internal battery proceed as follows:

1. Remove the top cover of the Teleterm M2 by undoing the two hex cover screws on the top of the unit. The cover is connected to the unit by the internal antenna cable, so be careful not to place any strain on this cable while removing the cover or inserting the SIM card.
2. You will see the battery toward the left lower side of the unit.
3. Unclip the old battery and replace with a new battery
4. Replace the top cover.
5. Restore power to the Teleterm M2.
6. Using Omniset, check that the Battery Indicator is showing “Healthy”
7. Take care in disposing of the old Lithium battery to preserve the environment, and to prevent accidents.

8. Technical Support

Lifetime technical support for all Omniflex products is available by email on techsupport@omniflex.com.

Alternatively, you can check the knowledgebase on the Omniflex web site at www.omniflex.com.