

# TAC Xenta<sup>®</sup>



Engineering TAC Xenta 913

**t.a.c.** 



TAC Xenta<sup>®</sup>

Engineering TAC Xenta 913

**t.a.c.** <sup>®</sup>

Copyright © 2004 TAC AB. All rights reserved.

This document, as well as the product it refers to, is only intended for licensed users. TAC AB owns the copyright of this document and reserves the right to make changes, additions or deletions. TAC AB assumes no responsibility for possible mistakes or errors that might appear in this document.

Do not use the product for other purposes than those indicated in this document.

Only licensed users of the product and the document are permitted to use the document or any information therein. Distribution, disclosure, copying, storing or use of the product, the information or the illustrations in the document on the part of non-licensed users, in electronic or mechanical form, as a recording or by other means, including photo copying or information storage and retrieval systems, without the express written permission of TAC AB, will be regarded as a violation of copyright laws and is strictly prohibited.

Trademarks and registered trademarks are the property of their respective owners. Microsoft® and Windows® are registered trademarks of The Microsoft Corporation.

Trademarks and registered trademarks are the property of their respective owners.

TAC Vista®, TAC Menta®, TAC Xenta® and TAC I-talk® are registered trademarks of TAC AB.

# Contents

<b>1</b>	<b>Introduction</b>	<b>7</b>
1.1	Typographic Conventions .....	7
<b>2</b>	<b>Understanding the TAC Xenta 913</b>	<b>9</b>
2.1	The Target System .....	9
2.2	Example System.....	10
<b>3</b>	<b>Surveying the Target System Installation</b>	<b>13</b>
3.1	Learning About the Target Devices .....	13
3.2	Surveying the Target Equipment .....	13
3.3	Checking the Operation of the Target Devices .....	14
3.4	Example Target Survey .....	14
<b>4</b>	<b>Designing the TAC Xenta 913 Installation</b>	<b>15</b>
4.1	Positioning the TAC Xenta 913 Related Equipment .....	15
4.2	Examining Alternative Positions.....	15
4.3	Example Installation.....	16
<b>5</b>	<b>Connecting to the Target System</b>	<b>17</b>
5.1	RS232 Serial Connection .....	17
5.2	RS485 Serial Connection .....	18
5.3	RS422 Serial Connection .....	18
5.4	Dual RS232 and RS422/485 Connection .....	18
5.5	Example Connection .....	19
<b>6</b>	<b>Installing the Required Software</b>	<b>21</b>
6.1	TAC Xenta 913 Installation Kit .....	21
6.2	TAC XBuilder Installation Kit.....	21
6.3	I/Link Configuration Editor Installation Kit .....	21
6.3.1	I/Link Configuration Editor Version Number.....	22
<b>7</b>	<b>Creating a TAC Xenta 913 Project</b>	<b>23</b>
7.1	Creating an TAC XBuilder Project .....	23
7.2	Add the Required I/Link Interface .....	23
<b>8</b>	<b>Configuring the TAC Xenta 913</b>	<b>25</b>
8.1	Starting the I/Link Editor .....	25
8.2	Opening the Target Devices Editor.....	26
8.3	Defining the Target Devices .....	26
8.4	Defining the Target Systems.....	27
8.5	Defining the Target Device Types .....	27
8.6	Defining the Target Device I/O Values .....	28
8.7	Configuring Device I/O Values .....	29

---

<b>9</b>	<b>Testing Target Communications</b>	<b>31</b>
9.1	Reviewing TAC XBuilder's Target Object Tree .....	31
9.2	Creating a Diagnostics Web Page .....	32
9.3	Connecting a Diagnostics Terminal .....	33
9.4	Testing Target Communications .....	33
9.4.1	Verbosity .....	33
9.4.2	Logging To File .....	34
9.4.3	TAC Xenta 913 Communications .....	34
9.5	Diagnosing Incorrect Target Communications .....	34
<b>10</b>	<b>Configuring the LonWorks Gateway</b>	<b>39</b>
10.1	Creating LonWorks Network Variables .....	39
10.2	Connecting I/O Signals.....	40
10.3	Connecting to Another Xenta IP Device .....	41

# 1 Introduction

This manual describes a particular process. For information on certain products, we refer you to the manual for the product in question.

For information on how to install software, we refer you to the instructions delivered with the software.

If you discover errors and/or unclear descriptions in this manual, please contact your TAC representative.



## Note

We are continuously improving and correcting our documentation. This manual may have been updated.

Please check our Docnet site at [www.tac.com](http://www.tac.com) for the latest version.

## 1.1 Typographic Conventions

Throughout the manual four specially marked texts may occur.



## Warning

Used to emphasize operations that can cause serious personal injury or damage to property if not handled correctly.



## Caution

Used to emphasize operations that can cause serious problems if not handled correctly.



## Note

Used to emphasize certain information.



## Hint

Used to emphasize processes that may ease operation.



## 2 Understanding the TAC Xenta 913



### Note

This Commissioning Guide describes the steps required to install and commission the TAC Xenta 913. An example ModBus target network and configuration is used to demonstrate the general procedures required to set up and utilize a TAC Xenta 913 communications gateway.

This handbook refers to a specific example. The example files are installed at the same time as the I/Link Configuration Editor. When installed, the location is:

C:\TAC XBuilder Projects\DemoCromptonModbus.

As shown in the diagram Fig. 2.1, the TAC Xenta 913 acts as a gateway between a LonWorks system and the targeted third party system. Using the applicable communications protocol, the Xenta 913 can read values from the target system and make them available to the LonWorks system. Similarly, LonWorks variables can be written to the target system. The Ethernet connection is used for configuring the Xenta 913, for diagnosing target communications, and may also be used to exchange variables with other Xenta IP devices.

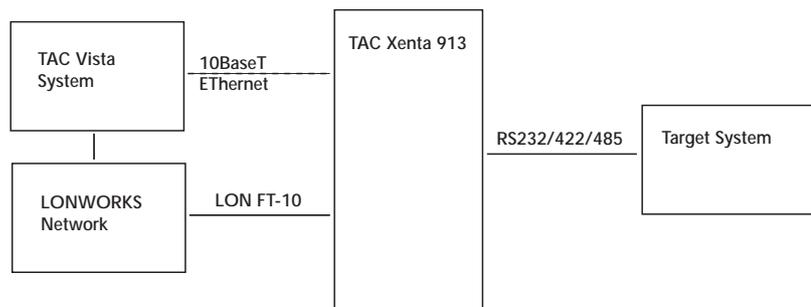


Fig. 2.1: TAC Xenta 913

### 2.1 The Target System

The TAC Xenta 913 includes interface drivers for a number of serial communication protocols. Any target equipment that can communicate via an RS232/422/485 serial network using one of the supported protocols is suitable for integration using the Xenta 913.

The most common types of target network are outlined in Fig. 2.2.

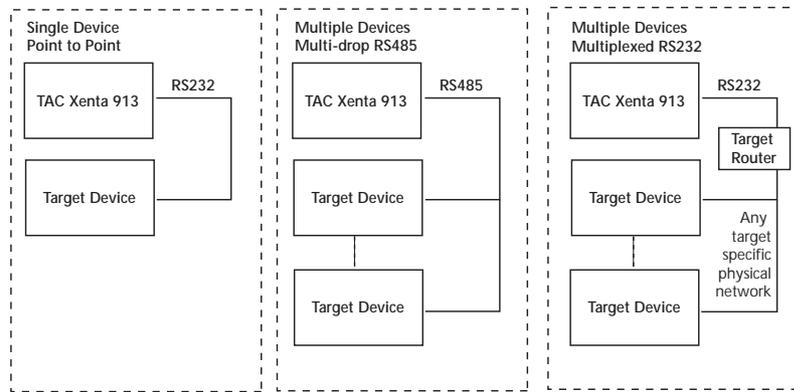


Fig. 2.2: Networks



The TAC Xenta 913 allows parallel operation of both RS232 and RS422/485 to the target. So both types of serial equipment can be connected at the same time, as long as both use the same baud rate and communications protocol.

## 2.2 Example System

To help demonstrate the TAC Xenta 913 configuration process, a simple example system is described throughout this document. In the example, the target system consists of two Crompton Integra 1580 power meters connected via a multi-drop RS485 ModBus network, as outlined in Fig. 2.3.

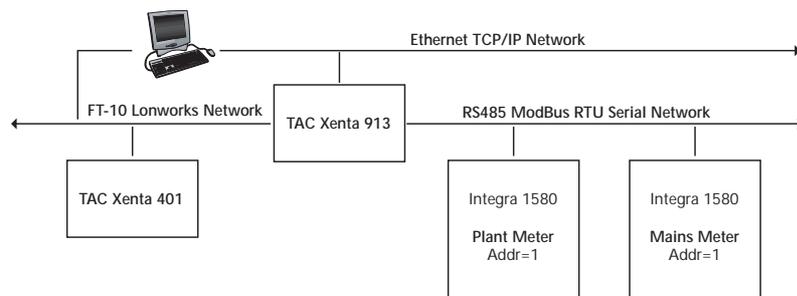


Fig. 2.3: Example system

It is recommended that the example system is studied and understood to help to clarify the frequent references to it throughout this document.

A detailed description of the Integra 1580 Power Meter is supplied in the separate document **Integra1580.pdf**, and the associated ModBus communications in **IntegraComms.pdf**. (Both documents can be found in C:\TAC XBuilder Projects\DemoCromptonModbus on the computer where the TAC I/Link Configuration Editor is installed. See note on page 9.)

For the purposes of the example, one power meter is considered to be connected to the power supply of a plant room, and is called **Plant** throughout this document. Similarly, the other power meter is considered to be connected to the power supply for the rest of the building, and is thus called **Mains** throughout this document.

For the example, the Xenta 913 is configured to read both the voltage and current of the 3 phases, as well as the average power factor, frequency and overall energy. Additionally, to demonstrate device control rather than simple monitoring, the Xenta 913 is also configured to be able to write a **demand calculation period** value to each meter.

To demonstrate the gateway functionality, the selected meter values are connected to equivalent LonWorks network variables within the Xenta 913. Consequently, the LonWorks network variables are available to Vista and/or LonMaker, and can be bound to suitable network variables in the Xenta 401 if required (although configuring the Xenta 401, and binding network variables to it, is beyond the scope of this document).

In addition to the LonWorks network variables, an example Values web page is created in the Xenta 913 to demonstrate the applicable set-up procedures. A Values page allows an Internet browser to be used to monitor and control values within the Xenta 913.



## 3 Surveying the Target System Installation

Normally, the target system will have been installed and commissioned before you are required to install the Xenta 913. Of course, it is possible to install the Xenta 913 first, but it cannot be fully commissioned until the target equipment is operational. So, in normal cases, the first step is to survey an existing installation and verify the operation of the target devices.

### 3.1 Learning About the Target Devices

It is essential to understand the operation of all the different types of device in the target system to effectively commission the TAC Xenta 913. As you have placed an order for the Xenta 913, it is assumed that you already have an understanding of the target system's operation, as well as a clear goal when connecting an Xenta 913 to it.

Once familiar with the basics of the target system, the next step is to thoroughly read and comprehend any documentation supplied with the target devices. Look for information that will help you understand the operation of each of the different types of device, and note the values that are to be monitored and/or controlled by the Xenta 913.

### 3.2 Surveying the Target Equipment

A site survey should be carried out to locate and identify all of the target devices. Where applicable, the type and address of each slave device should be identified and a suitable name assigned. For target systems containing multiple devices, it may be necessary to change each device's network address to ensure it can be uniquely identified by the Xenta 913's communications driver. Furthermore, any device communications parameters, such as baud rate, must be set to the same value on each target device, and recorded for applying to the Xenta 913's serial channel.

Using the available target-device documentation, determine the I/O values that are available, as well as their associated addresses within the device. Other value parameters, such as units and data format, should also be identified.

## 3.3 Checking the Operation of the Target Devices

Many of the problems normally attributed to the Xenta 913 are in fact caused by incorrect configuration or operation of the target equipment itself. So, before connecting the Xenta 913, it is important to verify that each of the target devices is operating correctly.

It is not necessary at this stage to test the target communications. This can be left until later when the communications cables have been wired to the Xenta 913.

## 3.4 Example Target Survey

The procedure for setting an Integra 1580 meter's ModBus address is described on page 4 of the **Integra1580.pdf** user manual. As shown in Chapter 2.2, "Example System", on page 10, the Plant meter is assigned ModBus address 1, and the Mains meter is assigned address 5.

A tabular summary of the meter's I/O values and associated ModBus register addresses is contained in the Appendix of the **Integra-Comms.pdf** protocol guide starting on page 29. For each example meter, the gateway is configured to read input registers 00 to 0A (Voltage and Current), 3E (average power factor), 46 (frequency), 48 (W.hr import), and to both read and write holding register 02 (demand calculation period).

## 4 Designing the TAC Xenta 913 Installation

As shown in Chapter 2, “Understanding the TAC Xenta 913”, on page 9, the Xenta 913 consists of a single hardware unit. It is necessary to select a suitable location for this device, as outlined in the following section.

### 4.1 Positioning the TAC Xenta 913 Related Equipment

Normally, both the Xenta 913 and related equipment, such as controllers and power supplies, will be housed in a wall-mounted panel located in a suitable plant room. The panel may contain a variety of other Xenta controllers or third party equipment, or it may be dedicated to the Xenta 913 system. Either way, the Xenta 913 must connect to a Vista Lon-Works system on one side and to the target system on the other.

Because the Xenta 913 connects to the target system devices via an RS232 or RS485 serial link, all devices must be located within an appropriate distance of each other. For RS232 links, the maximum distance is normally 10 to 30m, whereas for RS422 or RS485 links, the maximum distance is normally 100 to 1000m. Please check the documentation for the target devices to determine the applicable maximum cable length for the serial link.

### 4.2 Examining Alternative Positions

In addition to the previously-mentioned positioning guideline, you should also consider alternatives in order to find out what works best on your site. For instance, consider the following points:

- Can the Xenta 913 and related equipment fit into an existing panel, or is a separate panel required?
- Is it best to locate all the equipment in the same room, or would a better alternative be to have the Xenta 913 equipment panel available somewhere nearby?
- Is there a permanent Ethernet connection available for the Xenta 913? If not, can it be mounted where ready access to it is possible

in order to temporarily connect a PC for configuration and diagnostics monitoring?

Remember that time spent finding a suitable location for the Xenta 913 equipment will simplify both installation and testing, and possibly reduce overall commissioning costs.

## 4.3 Example Installation

For the example system, it is likely that the two power meters would already be mounted on their own switchboard, or possibly on two separate switchboards. In either case, it is probably not possible to mount the Xenta 913 and related equipment on the same switchboard. So in this case, a separate panel would be required.

The RS485 cabling instructions for the Integra power meters begin on page 5 of the **IntegraComms.pdf** protocol guide. As cable lengths of up to 1200m are allowed, it would be easily possible to locate the Xenta 913 panel where convenient access to an Ethernet connection was available.

## 5 Connecting to the Target System

It is beyond the scope of this document to describe the physical installation of a TAC Xenta 913. Instead, this is assumed to have been correctly installed in a suitable location, and connected to a LonWorks network and Ethernet as applicable. Consequently, the following section only describes the connection of the target system's serial link.

It is necessary for all devices on a serial link, including the Xenta 913, to be suitably grounded. Consequently, all the power supplies used must be grounded, or any floating power supplies must have their common terminal grounded. If not, communication problem may occur.

### 5.1 RS232 Serial Connection

The **RS232 A** port of the Xenta 913 is used for connecting to an RS232 target system. Depending on the target system's connection point, the applicable serial kit should be ordered together with the Xenta 913. Based on the TAC 0FL-3972-001 Cable Guide, the different cable types to use for most of the different RS232 connection types are shown in Table 5.1, "Connections":

Table 5.1: Connections

Target Type	#Pins	Adaptor	Cable	Part Number(s)
DTE (Male)	25	A2 (DCE)	L1	0-073-0919
<b>DTE (Male)</b>	<b>9</b>	<b>A1 (DCE)</b>	<b>L1</b>	<b>0-073-0920</b>
DCE (Female)	25	A3 (DTE)	L1	0-073-0916
DCE (Female)	9	A1 + 9 pin male-male crossover	L1	0-073-0920 + third party
Screw Terminal	N/A	A1 + 9 pin male to flying lead	L1	0-073-0920 + third party



The most common type of target RS232 connection is a 9 pin Male DTE, highlighted in Table 5.1, "Connections", which requires the TAC, supplied 0-073-0920 serial kit. For target equipment without a "D" connector a third party 9 pin DTE to flying lead cable may be required. Similarly, target equipment fitted with a 9 pin Female DCE connector will require a third party 9 pin Male DTE to 9 pin Male DTE adaptor with Tx/Rx crossover.

## 5.2 RS485 Serial Connection

The **RS485 A** port of the Xenta 913 is used for connecting to a two-wire RS485 target system. Normally, the same type of cable used to interconnect the target devices can be used. On the Xenta 913, the terminals labelled RX/TX+ and RX/TX- should be connected to the + and - terminals of the target devices, respectively.

## 5.3 RS422 Serial Connection

The **RS485 A** port of the Xenta 913 is used for connecting to a four-wire RS422 target system. Normally, the same type of cable used to interconnect the target devices can be used. On the Xenta 913, the terminals labelled RX/TX+ and RX/TX- should be connected to the receiver + and - terminals of the target devices, respectively, while the terminals labelled RX+ and RX- should be connected to the transmitter + and - terminals of the target devices, respectively.

An RS422 link is sometimes used instead of the RS232 for single-device point to point communications. However, it may also be used instead of the RS485 for multi-drop communications, if the target equipment supports this.

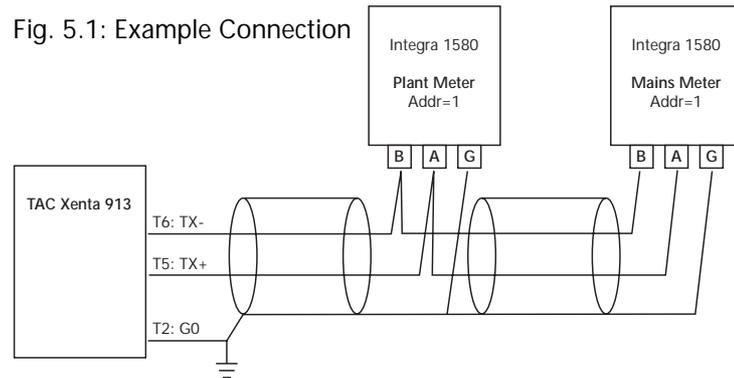
## 5.4 Dual RS232 and RS422/485 Connection

It is possible to simultaneously connect to an RS232 and an RS422/485 target system. However, the target systems must communicate using the same baud rate and protocol, as well as provide a multi-device addressing capability. In this case, although the target devices may be on separate networks, each must have a unique address within the system.

## 5.5 Example Connection

A suitable cable diagram for the Example System outlined in Table 2.2, “Example System” is shown in Table 5.1, “Example Connection”.

Fig. 5.1: Example Connection



The meter connection and cabling detail is taken from the **Integra-Comms.pdf** protocol guide.

It is assumed that the power meters are correctly grounded to the mains earth in addition to the ground provided by the cable shield.

The Xenta 913 is also shown as being grounded to the mains earth. This ground connection must be provided either through a ground referenced power supply, or via a separate ground connection if a floating power supply is used.

The cable diagram above does not include the 120 ohm terminating resistors that are shown in the *IntegraComms.pdf* cable diagram. This is because, for a simple network as the one in the example, terminating resistors would probably not be required unless cable distances were above 200m. However, if longer cable lengths were required, or if a large number of communication errors were observed during normal operation, then the terminating resistors would be fitted.



## 6 Installing the Required Software



### Note

Before configuring a TAC Xenta 913, it will be necessary to have the latest Xenta 913 application software, as well as version 1.2 or higher of XBuilder and the I/Link Configuration Editor plug-in for it.

### 6.1 TAC Xenta 913 Installation Kit

The TAC Xenta 913 installation kit is supplied as a single executable file. Running the executable will request the IP address of the Xenta 913 to be programmed, and once this has been entered, the application will be downloaded to it.

Please refer to the applicable documentation for a more detailed description of the installation procedure. However, in most cases, the Xenta 913 will have been delivered with the latest application software pre-installed.

### 6.2 TAC XBuilder Installation Kit

The XBuilder installation kit is supplied as a single executable file. Running the executable will request the directory to install XBuilder in, and once this has been entered, the application will be installed to it.

In addition, the program directory, installing XBuilder, also creates a default project directory called **TAC XBuilder Project**. Please refer to the applicable documentation for a more detailed description of the installation procedure.

### 6.3 I/Link Configuration Editor Installation Kit

The I/Link Configuration Editor installation kit is supplied as a single executable file. Running the executable will request the directory to install the associated files in, and once this has been entered, the files will be copied to it.

The files relating to the example (Chapter 2.2, “Example System”, on page 10) are installed in the TAC XBuilder project folder, which by default is set to "C:\TAC XBuilder Projects", i.e. the example will be installed in “C:\TAC XBuilder Projects\DemoCromptonModbus”. If the I/Link Configuration Editor is installed before any version of

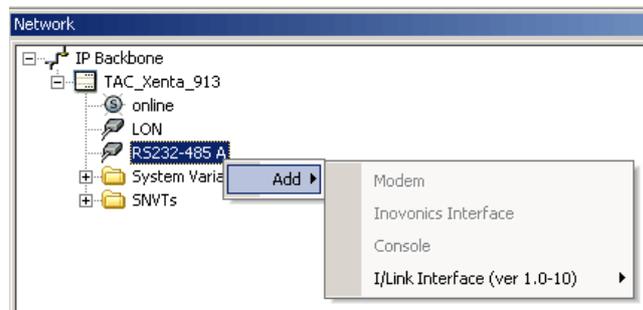
XBuilder, the example will always be installed in the default folder. Data sheets for the Crompton devices are also copied into this directory as .pdf files.

It may be necessary to re-install the I/Link Configuration Editor plug-in whenever a new type of target system has been added, or the I/Link with an existing target has been updated. Although it is not necessary to re-install XBuilder after updating the I/Link Configuration Editor, it may need to be re-started to ensure that it detects any newly-installed interfaces.

### 6.3.1 I/Link Configuration Editor Version Number

Due to the fact that the I/Link Configuration Editor is a plug-in for TAC XBuilder, the version number can be found using XBuilder.

In the network view in XBuilder, select **RS232-485** and **Add** to view the I/Link Configuration Editor Version Number.



# 7 Creating a TAC Xenta 913 Project

The TAC Xenta 913 is configured using TAC XBuilder (version 1.2 or higher). Some of XBuilder's capabilities lie outside the scope of this document, so please refer to the applicable documentation for more information. Similarly, this document does not describe all of the procedures available for setting up LonWorks network variables and web Values pages, because these are the same as for the Xenta 511.

## 7.1 Creating an TAC XBuilder Project

A separate XBuilder project must be created for every Xenta 913 that is to be configured. To create a suitable project, start XBuilder and follow these steps.

- 1 Select **File, New Project**.
- 2 In the **Create New Project** dialog, first enter a descriptive name for the project, then select the **X913 Project** template and click **OK**.
- 3 In the **Project Settings** dialog, enter a suitable description for the project, then select the applicable default project settings. Click **OK**.
- 4 From the network tree, make sure that the **IP Backbone** root node is selected, then enter the applicable property values for the Xenta 913 and associated web page.
- 5 Also from the network tree, select the **TAC\_Xenta\_913** node, and then enter the applicable property values for it. The most important property is the Xenta 913's IP address, which must be correctly set in order to allow the final project configuration to be downloaded to it. Also ensure that the correct **Hardware version** is selected (it must be type 2 if an RS422 or RS485 serial connection is being used).

## 7.2 Add the Required I/Link Interface

An I/Link is a protocol converter that can be implemented within the Xenta 913. I/Links are configured via an Excel spreadsheet that acts as a plug-in to XBuilder. So once an XBuilder project has been created, the appropriate I/Link Interface should be added so that it can be configured to match the target system.

To add an I/Link Interface, first expand the **TAC\_Xenta\_913** node of the network tree. Then follow these steps.

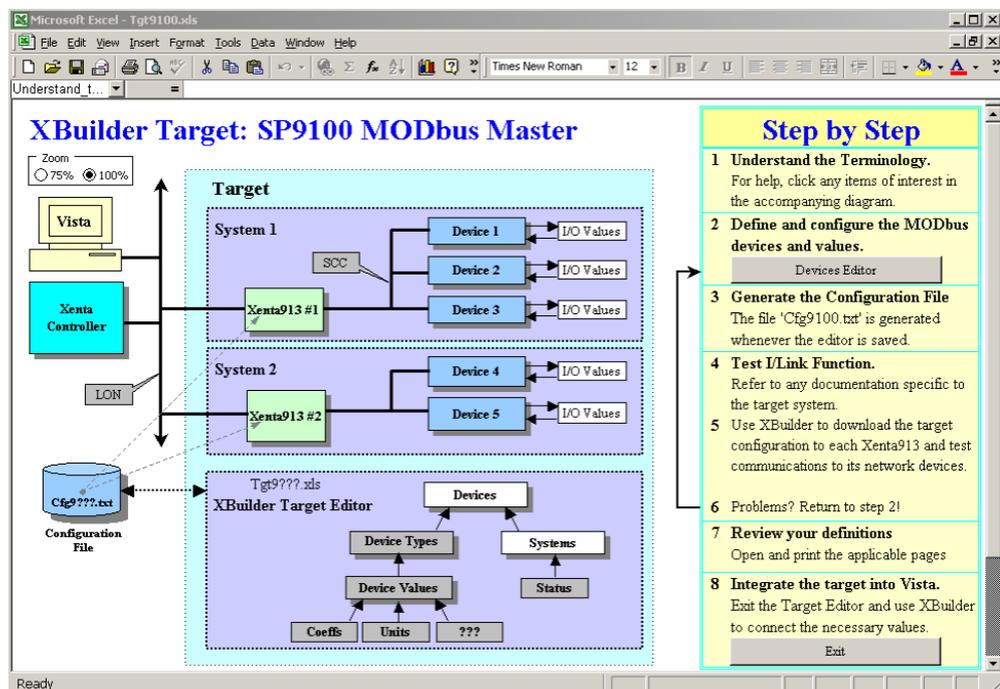
- 1 Right click the **RS232 A** or **RS232-485** node (depending on the hardware version), select **Add**, select **I/Link Interface**, then select the applicable type of communications protocol from the available list (eg, **MODbus Master**, **BACnet Serial PTP**, etc).
- 2 In the **I/Link Dialog**, select **Create** if you want to create a new interface or **Import** if you want to browse to an already available interface.
- 3 If a new I/Link is added then a pop-up dialog will appear verifying whether or not it is to be created. Select **Yes** to create the selected I/Link Interface within the current XBuilder project and to start Excel. If requested, select **Enable Macros** in order to proceed with editing the I/Link's configuration.
- 4 Once a new I/Link configuration has been created, it may be necessary to repeat step 1. However, once the I/Link configuration has been successfully created, step 1 will result in the I/Link being loaded and appearing in the network tree.

## 8 Configuring the TAC Xenta 913

The screen captures in the following description use the Example System outlined on page 4, and which is defined in the XBuilder project **DemoCromptonModbus**. It may be useful to open this project in XBuilder and use it to step through the follow sequence.

### 8.1 Starting the I/Link Editor

Right click the I/Link node in the XBuilder network tree (named **MODbus Master: Power** in the example project). Selecting **Edit** will then start Excel ready for editing the I/Link configuration, as per the ModBus Master example shown below.



It is worth spending some time on reviewing the information in this screen before proceeding. From within the editor, select any block in the diagram to view additional help. Once you understand the editor's terminology, proceed to the next step.

Once the I/Link has been configured, return to this screen. Save the spreadsheet to generate the **Cfg9100.txt** file, then exit in order to return to XBuilder for further editing.

## 8.2 Opening the Target Devices Editor

Normally, pressing the **Devices Editor** button on the opening screen immediately opens the table where the various target devices can be defined. However, if the **Cfg9???.txt** file contains different data than the spreadsheet, then a dialog will request confirmation of which configuration to use.

Click **Yes** to load the configuration from the **Cfg9???.txt** file and overwrite the one in the spreadsheet. Only press **No** if you are very sure that the spreadsheet contains the the most up-to-date configuration.

## 8.3 Defining the Target Devices

The **Devices Editor** is a table where the various target devices can be defined, as in the ModBus Master example shown below.

System Devices Summary : SP9100 MODbus Master							Close	
Device Description				Insert Row	Delete Rows	Device Identification		
+	System	#	+	Type	Function	ID	Addr	Ref
	Power	1		Integra : Power Monitor	Example Meter : Plant	Power Plant	1	0
		2		Integra : Power Monitor	Example Meter : Mains	Power Mains	5	1
		3						2
		4						2

Every device should be assigned a descriptive ID, such as the **Plant** and **Mains power meters** in the example. Each device may also require one or more target-specific fields, such as the ModBus address fields in the example. Holding the mouse pointer over a column heading may provide additional information about these fields.

Each target device must be assigned to a system, such as the two power meters belonging to the **Power** system in the example. If the applicable system does not exist for a device, press the **+** button in the System column's heading to open the Systems Editor in order to define one.

A device must also be of a specific type, such as the **Integra: Power Monitor** in the example. If the applicable device type does not exist for a device, press the **+** button in the Type column's heading to open the Device Types editor in order to define it.

Rows can be added to and deleted from the table by selecting a cell in the appropriate row before clicking **Insert Row** or **Delete Row**, respectively.

When all the applicable target devices have been defined, click the **Close** button to return to the initial startup screen.

## 8.4 Defining the Target Systems

The **Systems Editor** is a table where the target system's properties can be defined, as in the ModBus Master example shown below.

System I/Links Summary : SP9100 MODbus Master <span style="float: right;">Close</span>										
Target System				I/Link Communications						
#	ID	Description	Ref	Interface	Baud	Parity	Data Bits	Stop Bits	Mode	Ref
1	Power	Demo Power Metering	0	RS485	9600	None	8	2	RTU	0
2			1							1

A system should be assigned a descriptive ID, such as the **Power** system in the example. Each system may also require one or more target-specific fields, such as the ModBus communication parameters in the example. Holding the mouse pointer over a column heading may provide additional information about these parameters.



### Note 1

Although it is possible to define more than one system, in most cases, only one will be defined per XBuilder project.



### Note 2

For some systems, it is necessary to choose either the RS232 or the RS485 as the interface type. If *any* of the target equipment uses the RS485 then this option must be selected, otherwise the RS232 is preferable. However, if the RTS signal is not being used, then it will be possible to select the RS485 as the interface type and still operate both the RS232 and the RS485 ports in parallel.

When the target system has been defined, click **Close** to return to the **Devices Editor**. The defined system should then be available in the drop down **System** list in the Devices table.

## 8.5 Defining the Target Device Types

The **Device Types Editor** is a table where the types of device on a target system can be defined, as in the ModBus Master example shown below.

SP9100 MODbus Master <span style="float: right;">Close</span>					
Device Type Summary					
#	+	Type	Function	ID	Ref
1		Integra	Power Monitor	Integra : Power Monitor	0
2					1

Each device type must be assigned to a suitable set of I/O values, such as the **Integra** device type in the example. If the applicable set of I/O values does not exist for a device type, click the **+** button in the Type

column's heading to open the DeviceValues Editor in order to define them.

A suitable function descriptor should be selected for each device type, such as the **Power Monitor** function in the example. If the applicable function does not exist for a device type, then select the **Generic** function descriptor as a default.

When the necessary device types have been defined, click the **Close** button to return to the **Devices Editor**. The defined device type should then be available in the drop down **Type** list in the Devices table.

## 8.6 Defining the Target Device I/O Values

The **Device I/O Values Editor** is a table where the various I/O values of a target device type can be defined, as in the ModBus Master example shown below.

Device Input/Output Values : SP9100 MODbus Master													Close		
Integra		Insert Rows	Delete Rows	Value							Data				
Device	I/O	Name	Device	I/O	#	Type	+	Coeff	Format	+	Units	Addr	+	Bit Mask	#
Integra	In	Volts P1	Integra	In	1	Real		None	R.0.0		V	30001		32 bits (0-31)	1
		Volts P2	Integra	In	2	Real		None	R.0.0		V	30003		32 bits (0-31)	2
		Volts P3	Integra	In	3	Real		None	R.0.0		V	30005		32 bits (0-31)	3
		Current P1	Integra	In	4	Real		None	R.0.0		A	30007		32 bits (0-31)	4
		Current P2	Integra	In	5	Real		None	R.0.0		A	30009		32 bits (0-31)	5
		Current P3	Integra	In	6	Real		None	R.0.0		A	30011		32 bits (0-31)	6
		PF Ave	Integra	In	7	Real		M=100, B=0	R.0.0		%	30063		32 bits (0-31)	7
		Frequency	Integra	In	8	Real		None	R.0.0		Hz	30071		32 bits (0-31)	8
		TotalEnergy	Integra	In	9	Real		M=0.001, B=0	Uint		kWh	30073		32 bits (0-31)	9
		ActDmdPeriod	Integra	In	10	Real		None	Uint		min	40003		32 bits (0-31)	10
	Out	ReqDmdPeriod	Integra	Out	1	Real		None	Uint		min	40003		32 bits (0-31)	11
															12

Each set of I/O values should be assigned a descriptive device type ID, such as the **Integra** device type in the example. Within each device type's set, groups of Input and Output values should be defined, with all the input values defined first, followed by any output values. An input value is read from the target system, whereas an output value is written to it.



### Note

The in-signals, in the I/O column, in every device *must* be listed *before* the out-signals. If not, the I/Link Configure Editor will not work.

Every I/O value should be assigned a descriptive name, such as the **Volts P1** and **ReqDmdPeriod** values in the example. A value's Type, conversion coefficient, format, and units are always required. And each value may also require one or more target-specific fields, such as the ModBus address and bit mask fields in the example. If a required field value is not available in a drop down list, click the corresponding + **button** to activate the applicable sub-editor in order to define it.

Holding the mouse pointer over a column heading may provide additional information about a parameter. Rows can be added to and deleted from the table by selecting a cell in the appropriate row before clicking **Insert Row** or **Delete Row**, respectively.

Once the necessary I/O value sets have been defined, click the **Close** button to return to the **Device Types Editor**. The defined value sets should then be available in the drop down **Type** list in the Device Types table.

## 8.7 Configuring Device I/O Values

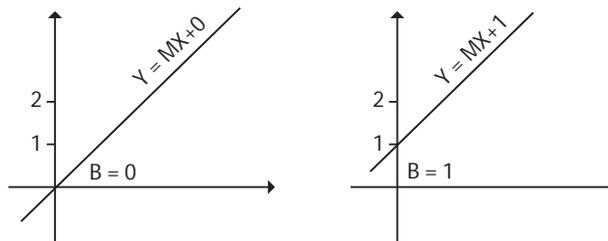
Each I/O value defined in the **Device Values Editor** must be configured to match the equivalent value in a target device, as well as provide a suitable signal for use in XBuilder. This is achieved by setting each value's parameters appropriately, as outlined below.

Name	Device	I/O	#	Type	+	Coeff	Format	+	Units	Addr	+	Bit Mask
Volts P1	Integra	In	1	Real		None	R.0.0		V	30001		32 bits (0-31)
Volts P2	Integra	In	2	Real		None	R.0.0		V	30003		32 bits (0-31)
Volts P3	Integra	In	3	Real		None	R.0.0		V	30005		32 bits (0-31)
Current P1	Integra	In	4	Real		None	R.0.0		A	30007		32 bits (0-31)
Current P2	Integra	In	5	Real		None	R.0.0		A	30009		32 bits (0-31)
Current P3	Integra	In	6	Real		None	R.0.0		A	30011		32 bits (0-31)
PF Ave	Integra	In	7	Real		M=100, B=0	R.0.0		%	30063		32 bits (0-31)
Frequency	Integra	In	8	Real		None	R.0.0		Hz	30071		32 bits (0-31)
TotalEnergy	Integra	In	9	Real		M=0.001, B=0	U. int		kWh	30073		32 bits (0-31)
ActDmdPeriod	Integra	In	10	Real		None	U. int		min	40003		32 bits (0-31)
ReqDmdPeriod	Integra	Out	1	Real		None	U. int		min	40003		32 bits (0-31)

A value's **Type** should correspond to that of the equivalent value in the target device. In the example, the values are all of the type Real. For most ModBus systems, the value type would be **Integer**, but the Integra 1580 meter is unusual because all its values are 32 bit Reals, as specified in the **IntegraComms.pdf** protocol guide.

A value's **Coeff** is the conversion coefficient that should be applied in order to convert the "raw" value of the target device into an "absolute" value. In the example, most meter values are floating point and so represent an absolute value without conversion. However, for the **PF Ave** value in the example, a raw power factor value in the range of -1.0 to 1.0 is multiplied by 100 to represent the power factor as a percentage.

Note that M is related to the gradient, whereas B is related to the offset value in the formula  $Y=MX + B$ .



The **Format** field indicates how the absolute value is presented as an XBuilder signal. For most of the values in the example, the values should be presented as real values to one decimal place (format='R0.0'). However, the two Demand Period values are presented as an unsigned whole number of minutes, even though the meter records the value as a real.

The **Units** field indicates the type of engineering units applicable to the absolute value after the conversion coefficient has been applied. For discrete values (format=**Digital**), the units are provided as a set of state descriptors defined in the 'Digital States' columns of the Units Editor table. All other formats are considered to be 'analog' values so the units are selected from the set defined in the **Analog Units** column of the Units Editor table.

Ideally, all analog units should match a standard unit within XBuilder. For example, entering the standard V or kV allows XBuilder to recognise the signal's units category as voltage, whereas it may not successfully recognise other names such as Volts, kilovolts, etc. Check the XBuilder documentation for a full list of standard unit names, if the supplied standard units list does not contain the required unit type.

The **Addr** and **Bit Mask** fields in the example are specific to the ModBus target. For the Integra meters, the addresses are as specified in the appendix of the 'IntegraComms.pdf' protocol guide, but with the stated hex addresses converted to decimal and 1 added (that is, the **Power Factor Average** value address is hex 003E or decimal 62, so adding 1 produces a ModBus Input register address of 30063). And because all Integra values are 32 bit reals, all masks are set to 32 bits.

## 9 Testing Target Communications

When ready, the TAC XBuilder operator can generate and then download to the TAC Xenta 913 a new I/Link configuration for testing target communications. It is not necessary, or even advisable, to configure the LonWorks network variables at this stage. However, to aid testing, it will be useful to create one or more web pages for monitoring and controlling the target system's values.

### 9.1 Reviewing TAC XBuilder's Target Object Tree

After running the I/Link's Configuration Editor spreadsheet, the target's object tree can be read into XBuilder for further processing, as in the ModBus Master example shown below.

The screenshot shows the 'Network' window in TAC XBuilder. The left pane displays a hierarchical tree structure. The 'TAC\_Xenta\_913' node is expanded to show 'R5232-485 A', which contains a 'MODbus Master: Power' node. This node is highlighted and expanded to show a list of variables: ComsFail, OutsFail, InsFail, Power.Plant, and a sub-tree for Power.Plant including ComsFail, Volts P1, Volts P2, Volts P3, Current P1, Current P2, Current P3, PF Ave, Frequency, TotalEnergy, ActDmdPeriod, and ReqDmdPeriod. Other nodes in the tree include IP Backbone, online, LON, and System Variables.

The right pane shows the configuration details for the selected 'MODbus Master: Power' node:

General	
Name	MODbus Master: Power
Description	Demo Power Metering
Driver	
Code	SP9100
Type	MODbus Master
Comms	RS485
Baud	9600
Parity	None
DataSiz	8
StopBits	2
Mode	RTU

In the above screen capture, the highlighted node is the previously configured I/Link to the Example System (Chapter 2.2, “Example System”, on page 10.) Right clicking this node and selecting **Edit** will restart the I/Link editor for modifying the target configuration, while selecting **Update** will cause the target configuration to be re-loaded if changes were made outside of XBuilder.

The name of the highlighted I/Link node shows the type of target communications as well as the user-assigned system name (as entered via the **Define the Target Systems** step described in the **Configuring the**

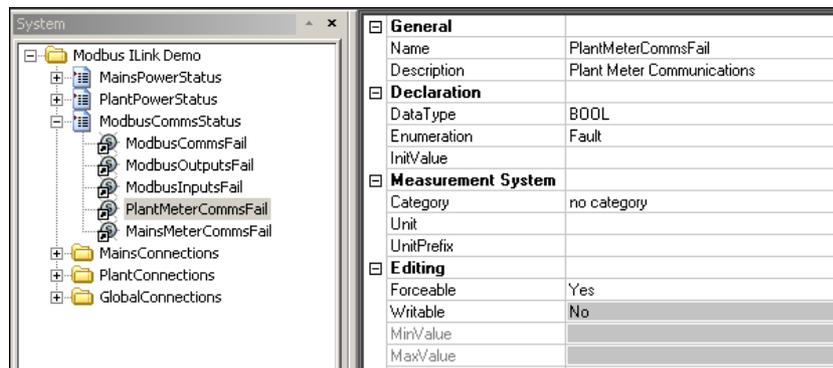
**I/Link** section). The properties view shows additional information about the system, including the selected communication parameters.

Just below the I/Link node in the example, there are three status signals, namely ComsFail, OutsFail, and InsFail. These status signals are different for each type of target system, with the three shown only being applicable to the example ModBus Master Xenta 913. However, if present, the status signals are usually alarms that indicate a major communications fault on the target system.

Beneath the status signals are the two power meter devices defined in the example system, namely **Power.Plant** and **Power.Mains**. Every I/Link will contain at least one device. Each has I/O signals that either reflect values in the corresponding target device, or show the status communications to the device within the Xenta 913.

## 9.2 Creating a Diagnostics Web Page

The various status and I/O signals of a Xenta 913 can be connected to other signals within the Xenta 913 in order to implement the required gateway function. In addition, they can be displayed in a web Values page, either for the operator or for general diagnostics during commissioning. An example values page for the ModBus Master example is shown below.



In the above screen capture, the highlighted node is a Values page entry created for the Plant power meter's ComsFail status value. It was created by dragging the appropriate ComsFail node from the Network tree and dropping it onto the ModbusCommsStatus Values page in the System tree. The value's name and description were then changed from the XBuilder generated default to produce the entry shown above.

Once the desired Values pages have been created, the project can be generated and downloaded to the Xenta 913, ready for testing communications with the target system.

## 9.3 Connecting a Diagnostics Terminal

It is very unusual for a Xenta 913 to work properly when first tested, so a diagnostics test will most probably be required.

A web browser such as Internet Explorer can be connected to the Xenta 913 web server and used to monitor and control the target I/O values via the previously-created Values pages. But, if the values don't update, or appear incorrect, it can be very difficult to diagnose the problem from just the Values pages. So the Xenta 913 includes a communications log that can be used to monitor the actual communications traffic with the target system.

The web browser can be used to control and view the communications log. However, the process is generally not as easy or as effective as using a PC terminal application like HyperTerm. So if diagnostics are necessary, and it is possible to do this, connect a PC terminal application to the **RS232 B** channel of the Xenta 913 using the appropriate cable from cable kit 0-073-0920. This connection is only required during initial diagnostics, and can be removed when completed.

Once the terminal is connected, power up the Xenta 913 and associated equipment. If the terminal has been correctly connected, then the boot-up and Xenta 913 startup messages should appear on the terminal. If not, then review the documentation of both the terminal application and the Xenta 913 to try and locate and correct the problem. However, terminal connection problems are unlikely at this stage because the terminal application was probably used to set the Xenta 913's initial IP address anyway.

## 9.4 Testing Target Communications

To test an Xenta 913, target communications should be monitored using the diagnostics log via either a PC terminal or a web page. Several commands are provided to support testing, as described below. These commands can be activated using either a web browser or a PC terminal. From a web browser, the commands are activated from the Xenta 913 utilities page. From a terminal, the verbosity is changed by typing the command at the dsh prompt.

### 9.4.1 Verbosity

The amount of information recorded by the diagnostics log is controlled by the verbosity level. The default verbosity level of 1 shows only communications error messages, whereas a verbosity level of 0 disables the log altogether. A medium verbosity level of 6 or 7 generally shows I/O value activity, which can be very useful for finding configuration errors.

At a verbosity level of 9, the log will record all communications activity between the Xenta 913 and the target system. But the large volume of messages resulting may obscure simple configuration problems, so this

is normally only used in short bursts to locate protocol faults or TAC Xenta 913 software bugs.

Verbosity can be set using the following command format:

**vx v N**

where **vx** identifies an Xenta 913 value exchange command, **v** selects the verbosity parameter, and **N** is the required verbosity level (0 to 9). Simply typing **vx v** will report the current verbosity level.

## 9.4.2 Logging To File

Normally, the communications log activity is only shown on the terminal screen, so older messages are lost. However, it is possible to enable or disable logging to file by using the following command format.

**vx l H**

where **vx** identifies an I/Link value exchange command, **l** (letter L) selects the log-to-file parameter, and **H** is the maximum number of hours the log should be enabled (0 to 25). Simply typing **vx l** will toggle logging to file on or off. Typing **vx l 0** will immediately turn off logging to file, whereas an H value greater than 0 will enable logging to file for up to the requested number of hours.

The log file is best viewed from the utilities web page, although ftp can be used to upload it from the Xenta 913 for further processing (it is located in the file `\configdb\vx\comlog.txt`).

## 9.4.3 TAC Xenta 913 Communications

TAC Xenta 913 communications can be started and stopped at any time without restarting the whole application. Stopping and restarting the Xenta 913 is a useful way of re-loading a modified target configuration. When the Xenta 913 is first started, there is a 10 second pause before the I/Link starts up, allowing the I/Link to be prevented from running at all when conducting a separate test.

The I/Link can be started and stopped using the following command format.

**vx s S**

where **vx** identifies an I/Link value exchange command, **s** selects the start/stop parameter, and **S** is the required Stop/Start mode (0 for stop, 1 for Start). Simply typing **vx s** will toggle the I/Link communications on or off.

## 9.5 Diagnosing Incorrect Target Communications

Run the diagnostics log at the appropriate verbosity level and monitor the resulting communications activity. If necessary, record the log to file for later playback.

The type of log data is dependent on the target system. But the basic form should resemble the following log excerpts from the ModBus Master example.

#### Example Log: Correct Operation

```
VX   --- TAC Value Exchange Module ----
VX   SP7240 2.10 : Modbus Master
VX   System Power:Demo Power Metering
VX   28 values defined
LNK  Opened MBUS 2.10 onto RS232-485 A (COM_2)
REQ:  Fetch 1:30001-30012
XVAL  Power:ComsFail=0 (x0)
XVAL  Plant:ComsFail=0 (x0)
XVAL  Plant:Volts P1=258.305
XVAL  Plant:Volts P2=0
XVAL  Plant:Volts P3=0
XVAL  Plant:Current P1=0
XVAL  Plant:Current P2=0
XVAL  Plant:Current P3=0
REQ:  Fetch 5:30001-30012
XVAL  Mains:ComsFail=0 (x0)
XVAL  Mains:Volts P1=0
XVAL  Mains:Volts P2=0
XVAL  Mains:Volts P3=0
XVAL  Mains:Current P1=0
XVAL  Mains:Current P2=0
XVAL  Mains:Current P3=0
REQ:  Fetch 1:30063-30064
XVAL  Plant:PF Ave=0
REQ:  Fetch 5:30063-30064
XVAL  Mains:PF Ave=0
REQ:  Fetch 1:30071-30074
XVAL  Plant:Frequency=0
XVAL  Plant:TotalEnergy=0
REQ:  Fetch 5:30071-30074
XVAL  Mains:Frequency=0
XVAL  Mains:TotalEnergy=0
REQ:  Fetch 1:40003-40004
XVAL  Plant:ActDmdPeriod=30
REQ:  Fetch 5:40003-40004
XVAL  Mains:ActDmdPeriod=30
REQ:  Fetch 5:30001-30012
REQ:  Fetch 1:30001-30012
REQ:  Fetch 5:30063-30064
REQ:  Fetch 1:30063-30064
REQ:  Fetch 5:30071-30074
REQ:  Fetch 1:30071-30074
REQ:  Fetch 5:40003-40004
```

Messages prefixed by REQ indicate the type of request that was sent out to the target system (in the example, the first REQ message retrieved a range of ModBus registers from the Plant power meter slave device at address 1). The XVAL-prefixed messages indicate a change to an I/O value (in the above example, the third XVAL message indicates that

Plant:Volts P1 was read from the meter as 258.305 volts). Obviously, the types and format of messages is dependent on the target, but should be reasonably self-explanatory.

#### Example Log: Modbus Timeout Error

```
!MBM Timeout receiving response from slave 5
REQ: Fetch 1:40003-40004
!MBM Timeout receiving response from slave 1
REQ: Fetch 5:40003-40004
!MBM Timeout receiving response from slave 5
MBM Retrying failed slave 5
MBM Retrying 4 failed output(s)/range(s)
REQ: Write 1:40003
!MBM Timeout receiving response from slave 1
REQ: Write 5:40003
!MBM Timeout receiving response from slave 5
```

The messages prefixed by !MBM in this log indicate that a ModBus device has not responded. The mostly likely cause of such errors depends on how many target devices are affected. Consequently, consider the following:

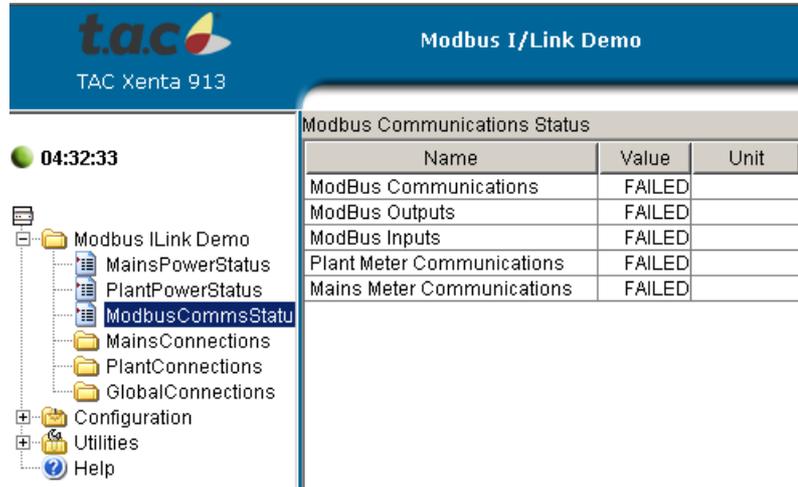
- If the fault is to a single unit only, then this indicates a fault in that particular device, or possibly the wiring to it. Alternatively, it may indicate an address mismatch in the I/Link configuration.
- If all units have failed, this is an indication of a fault in the I/Link equipment, or possibly the serial connection to it. Alternatively, it may indicate the incorrect setting of the I/Link's communications parameters.

In any case, it is important to check all cabling and the configuration of the I/Link and associated slave devices whenever communication errors occur. The likely importance of errors depends on how regularly they occur. Consequently, consider the following:

- Infrequent errors may indicate a noisy cable, but can often be ignored. However, if the error frequency is such that one or more units are falsely flagged as failed, then corrective action will be required.
- If errors such as 'checksum mismatch' or 'bad data' occur regularly and repetitively, then this most probably indicates a software bug or a protocol implementation error. Such errors will need to be reported to TAC for correction, preferably accompanied by a representative log file.

The following screen capture shows the example Values page containing communication status values for the ModBus Master example. For a log containing the same number of timeout as the preceding example, it will be quite common for all status values to show **FAILED**. Of course, if the interface was working previously, then the FAILED

status values would indicate that a hardware fault had just arisen on the target system.



The screenshot displays the 'Modbus I/Link Demo' software interface. The top header includes the 't.a.c.' logo and 'TAC Xenta 913'. The main window is titled 'Modbus I/Link Demo'. On the left, a tree view shows the system structure, with 'ModbusCommsStatus' selected. The right pane displays a table titled 'Modbus Communications Status' with the following data:

Name	Value	Unit
ModBus Communications	FAILED	
ModBus Outputs	FAILED	
ModBus Inputs	FAILED	
Plant Meter Communications	FAILED	
Mains Meter Communications	FAILED	



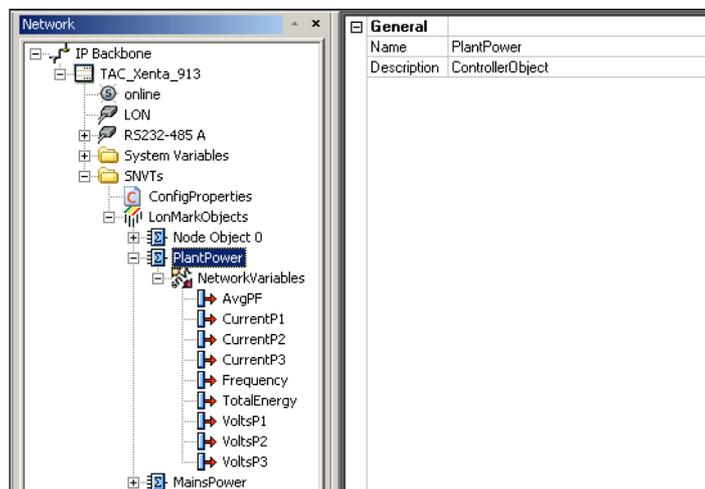
# 10 Configuring the LonWorks Gateway

Only when the target system has been fully configured and tested should it be connected to the LonWorks network. This is because it is likely that the target system's configuration will be changed regularly during testing, and it is an unnecessary complication to have to propagate these changes throughout the rest of the TAC Xenta 913. But once testing has been completed, it will be time to create the applicable LonWorks network variables and connect them to the corresponding target I/O signals.

## 10.1 Creating LonWorks Network Variables

In most cases, a LonWorks network variable is created for every I/O signal on the target system. This is what allows the Xenta 913 to act as a gateway between the target system and a Vista LonWorks network. Of course, not all signals will need to be connected through to LonWorks, and some may instead be connected to another Xenta IP device via Ethernet.

The following screen capture shows the LonWorks network variables that were created for the highlighted PlantPower meter. Although not a requirement, it often makes sense to create a LonWorks Controller Object corresponding to each target device, as in the ModBus Master example. Then, a network variable can be created for each I/O signal in the corresponding target device.



The above example shows network variables created as Xenta 913 SNVTs, which is the most common method. A network variable created

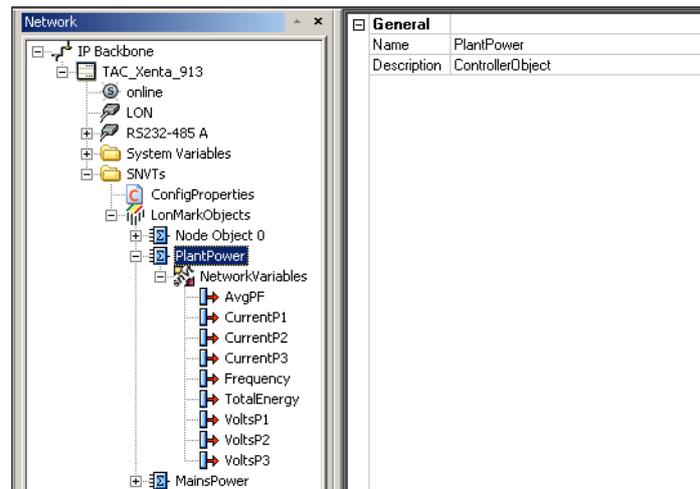
as a SNVT can be accessed by Vista and LonMaker, and can also be bound to a network variable in an external LonWorks node.

It is also possible to create network variables by importing them as a LonWorks XIF file. This may be preferable in some cases, but is beyond the scope of this document. In either case, once the network variable has been created, it can be connected in the same way regardless.

At this stage, the network variables have not yet been connected to the corresponding target values. Making these connections is described next.

## 10.2 Connecting I/O Signals

Target system I/O signals are bound to network variables using connection objects in XBuilder's System pane, as in the ModBus Master example shown below.



The screen capture shows the connections required for the example Mains Power meter. One connection has been expanded and its 'From' node highlighted. This connection is from the target power meter's phase 1 voltage to the corresponding LonWorks network variable.

A connection object is created by right clicking a folder node and selecting **Add Object**, and then **Connection Object**. The connection object can then be renamed to describe its function, and expanded to show its **From** and **To** nodes. Then, the required signal can be dragged from the Network pane and dropped onto a connection node according to signal direction. However, only signals with the same measurement category can be connected together.

Rather than create each connection object individually, these can be copied and pasted as required. However, each copied connection object will still need to be re-connected to the new signals in the Network pane, so it will be easier to use only copy and paste for connection objects whose signals have the same measurement category.

Additional **To** nodes can be added to a connection object by right clicking it and selecting **Add Output Signal**.

A signal can be connected to the **From** points of more than 1 connection object. However, although possible, it is not advisable to connect a signal to more than 1 **To** point.

## 10.3 Connecting to Another Xenta IP Device

In some cases, it is useful to be able to connect Xenta 913 signals to another Xenta IP device via Ethernet rather than via LonWorks. Xenta IP devices include the 511 and 913.

Connection via Ethernet requires the addition of an XBuilder project as a slave into the master XBuilder project. To do this, in the master XBuilder's network pane, right-click the root 'IP Backbone' node and select **Add**, then select **Other Projects Network**. The slave network's signals will then be available for connection as previously described.

In most cases, the master device will be a Xenta 511 because it provides a higher level of web server support than the Xenta 913. A Xenta 913 would only normally be the master of another Xenta 913, so that it could exchange signals directly rather than via LonWorks.





[www.tac.com](http://www.tac.com)

TAC helps people feel and function better, as a direct result of greater indoor climate. This is made possible by TAC's concept of Open Systems for Building IT<sup>®</sup>, which utilizes information technology to provide clients with advantages such as indoor climate optimization, energy savings, flexibility, security, reduced expenses and user-friendly operation.

