Premium and Atrium Using Unity Pro

Modbus Plus Network

User Manual

10/2014

35006188.10

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

⚡ The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

⚠ This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

At a Glance

Document Scope

This document presents the Modbus Plus communication on Premium and Atrium PLCs.

Validity Note

This documentation is valid for Unity Pro V8.1 or later.

The technical characteristics of the devices described in this document also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the model number/product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

Related Documents

Title of Documentation	Reference Number
Modicon Modbus Plus Network, Planning and Installation Guide	31003525
Premium and Atrium using Unity Pro, Processors, racks and power supply modules, Implementation manual	35010524 (English), 35010525 (French), 35006162 (German), 35012772 (Italian), 35006163 (Spanish), 35012773 (Chinese)

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter, and apply this product.

Follow all local and national safety codes and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Chapter 1
General

Aim of this Chapter

This chapter provides an overview of the main characteristics of a communication on Modbus Plus.

What Is in This Chapter?

This chapter contains the following topics:

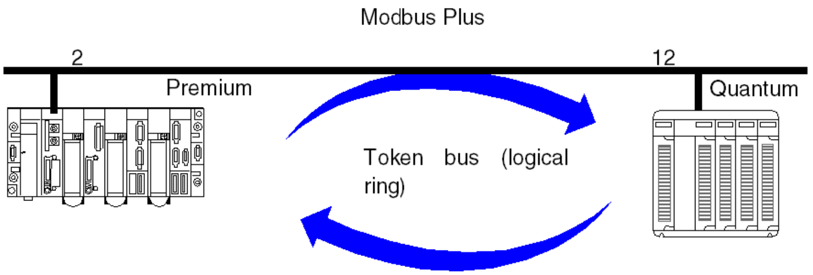
Introduction

Introduction

Modbus Plus communication is used to exchange data between all the devices connected on the bus.

The Modbus Plus protocol is based on the principle of logical token passing. Each station of a single network is identified by an address from 1 to 64, and each station accesses the network on receiving a token. Duplicated addresses are not valid.

Example of network:



A Modbus Plus communication channel is made up of three main functions:

- Point-to-point data exchanges via message system, using the Modbus protocol.
- Global data broadcast exchanges between all of the stations taking part in the exchange.
- Specific multidrop data exchanges via peer cop services.

Associated Manuals

For further information, you may consult the following manuals:

Title	Description
Modicon Modbus Plus Network, Planning and Installation Guide *(see page 8)*	Detailed description of Modbus Plus network implementation.
Premium and Atrium using Unity Pro, Processors, racks and power supply modules, Implementation manual	Hardware implementation for Premium/Atrium processors.

Compatibility

Hardware

This type of communication is available for Premium and Atrium PLCs.

NOTE: Modbus Plus cards can only be used in slots located on the processors. It is impossible to use SCY 21••• type modules.

Redundancy cannot be ensured on a Modbus network using Premium/Atrium PLCs.

Software

The Modbus Plus PCMCIA card TSX MBP 100 can process four communication functions simultaneously.

The number of objects per communication function is from 1 to 125 words of useful read data and from 1 to 120 words of useful write data (the maximum frame is 256 bytes).

For a communication from a Premium/Atrium PLC to a Quantum PLC, it is necessary to shift the address settings. To access an address object **n** from a Quantum PLC, the communication function on the Premium side must have the address **n-1**.

The **Peer Cop** service is supported only by Premium/Atrium PLCs.

When configuring the inputs and outputs for the **Peer Cop** service, it is possible to allocate up to 32 internal words for each connection point of the local bus. The total number of words must not exceed 500 internal words.

Integration into an X-Way Architecture

At a Glance

A Modbus Plus segment can be integrated into an X-Way network architecture.

Under certain operating conditions, communication is possible between stations on different networks.

Communication to a Modbus Plus Network

A client application connected to a Fipway or Ethernet TCP/IP network can communicate with a Modbus Plus station via the Modbus protocol.

To do this, you must indicate the X-Way network address of the Premium PLC connected to the Modbus Plus segment and the Fipway network, and the number of the destination Modbus Plus station.

The syntax is as follows:

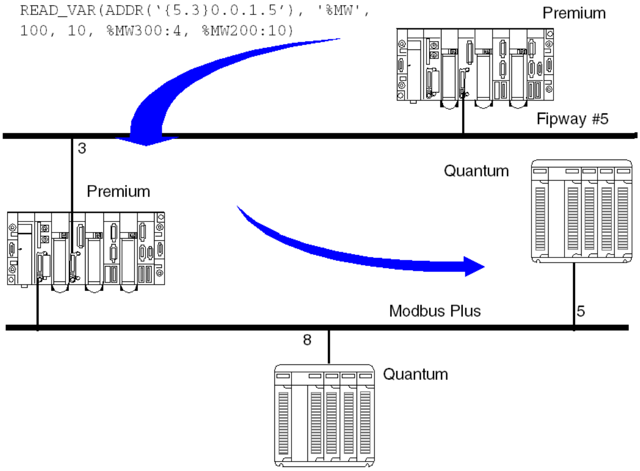
{network number . station number}0. 0.1. Modbus Plus station number

Example

In this example, the Fipway station {5.3} has a Modbus Plus connection, meaning that any remote Fipway station that wishes to communicate with a Modbus Plus station (for example station 5) must use this address.

```
READ_VAR(ADDR('{5.3}0.0.1.5'), '%MW', 100, 10,%MW300:4, %MW200:10)
```

Configuration example


READ_VAR(ADDR('{5.3}0.0.1.5'), '%MW',
100, 10, %MW300:4, %MW200:10)
Premium
Fipway #5
3
Quantum
Premium
Modbus Plus
5
8
Quantum

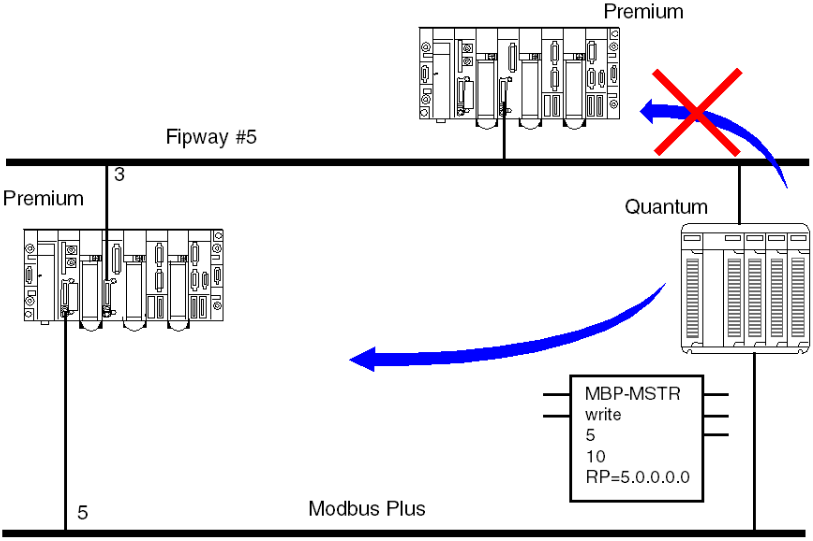
NOTE: The routing between Fipway and Modbus Plus is performed automatically by the system. In a network architecture, it is not necessary to declare a bridge station.

Communication from a Modbus Plus Network

If a Modbus Plus segment is integrated into an X-Way architecture, a Quantum station cannot communicate with the stations connected on another network of the architecture (for example Fipway or Ethernet TCP/IP). Communication is only possible with the local Premium.

Example

The Quantum PLC sends a write request to modify five words in the application of the Premium PLC on the Modbus Plus network (%MW10, ...), but does not have access to the other stations on Fipway.



Integration into a Modbus Plus Architecture

At a Glance

In a Modbus Plus architecture, an application of a Quantum PLC can communicate with a Premium or Atrium PLC or vice versa.

Premium to Quantum

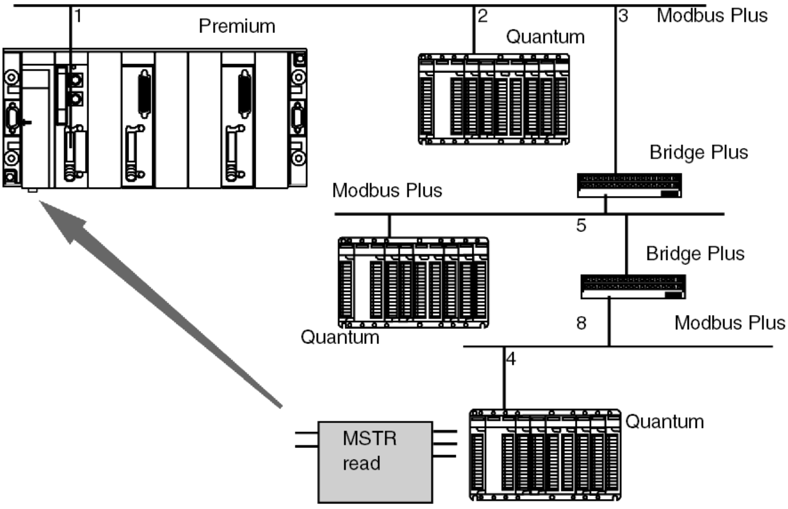
Communication by a Premium/Atrium PLC to a remote station is described in the exchange service on remote networks.

Quantum to Premium

Communication of a Quantum PLC to a Premium/Atrium PLC is available via MSTR blocks.

In this case, the Premium or Atrium PLCs are servers, meaning that all the Modbus Plus stations connected in a network architecture, up to a maximum of five levels, can communicate with each other.

Example



The Quantum station sends a read request to the Premium station using the following address path: 8.5.1.0.0 (routing path).

The MSTR function block can be used to read or write internal words from a Premium or Atrium station. The parameter of the MSTR function block's slave register directly indicates the address of the internal word %MW of the PLC application. This function block can also be used to read or reset the statistic counters of a Premium or Micro station. This request is executed by the PCMCIA card.

Peer Cop Service

Introduction

The Peer Cop service is an automatic exchange mechanism between stations connected to the same local Modbus Plus segment.

This service is used to maintain constant control over inputs / outputs which have been remoted by implicit exchanges.

The Premium PLCs support two types of Peer Cop transfer:

- specific inputs
- specific outputs

Specific Inputs and Outputs

The specific inputs and outputs are point to point services which use the multicast protocol (multistations). Each message contains one or several destination addresses for sending the data. This function is used to exchange data to several stations without repetition.

Report

Three types of report are associated with the specific inputs and outputs:

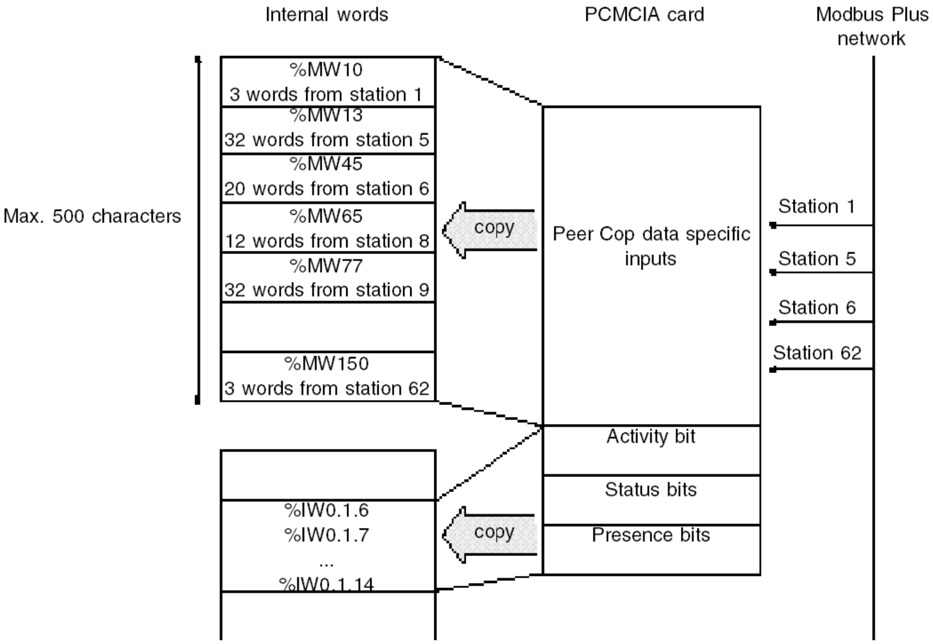
- activity bit: provides information on the availability and validity of the status bits
- status bits (to the number of one bit per station):
  - ensure coherence between the number of specific inputs configured and the number of specific inputs received
  - indicate if the specific inputs have been received during the Timeout
- presence bits (to the number of one bit per station): indicate if the specific inputs have been refreshed

NOTE: The presence bits are only valid for the specific inputs.

Example for the Inputs

The data blocks are copied in full from the PCMCIA card to the internal word space, reserved during configuration.

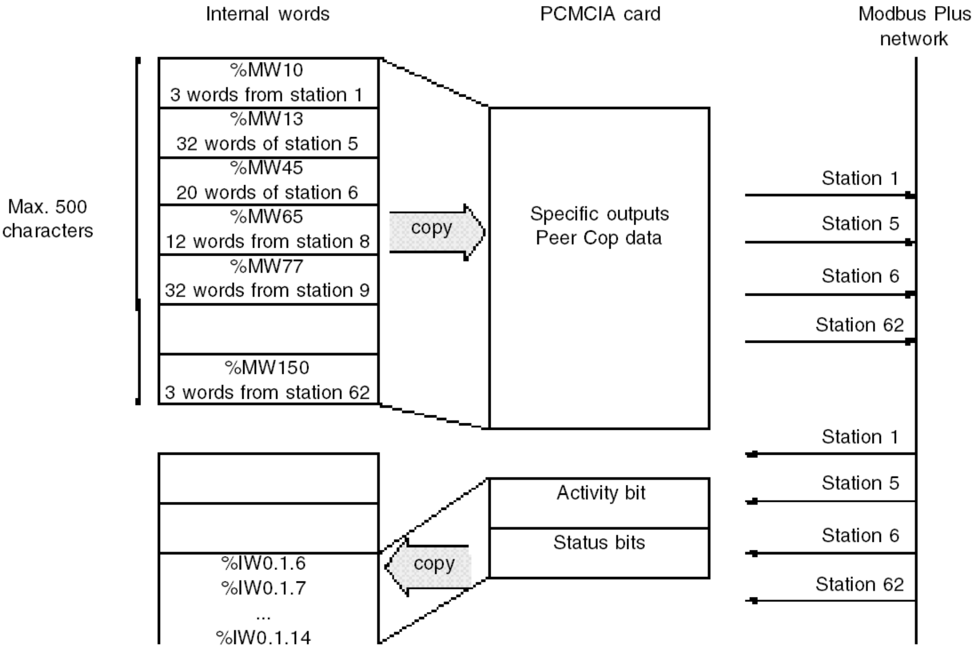
In the following example, the address of the first internal word is %MW10.



Example for the Outputs

The data blocks are copied in full from the internal word space, reserved during configuration, to the PCMCIA card. The reports are copied from the PCMCIA card to the language objects.

In the following example, the address of the first internal word is %MW10.



Installation Phase Overview

Introduction

The software installation of the application-specific modules is carried out from the various Unity Pro editors:

- in offline mode
- in online mode

If you do not have a processor to connect to, Unity Pro allows you to carry out an initial test using the simulator. In this case the installation *(see page 19)* is different.

The following order of installation phases is recommended but it is possible to change the order of certain phases (for example, starting with the configuration phase).

Installation Phases with Processor

The following table shows the various phases of installation with the processor:

Phase	Description	Mode
Declaration of variables	Declaration of IODDT-type variables for the application-specific modules and variables of the project.	Offline (1)
Programming	Project programming.	Offline (1)
Configuration	Declaration of modules.	Offline
	Module channel configuration.	
	Entry of configuration parameters.	
Association	Association of IODDTs with the channels configured (variable editor).	Offline (1)
Generation	Project generation (analysis and editing of links).	Offline
Transfer	Transfer project to PLC.	Online
Adjustment/Debugging	Project debugging from debug screens, animation tables.	Online
	Modifying the program and adjustment parameters.	
Documentation	Building documentation file and printing miscellaneous information relating to the project.	Online (1)
Operation/Diagnostic	Displaying miscellaneous information necessary for supervisory control of the project.	Online
	Diagnostic of project and modules.	
Key:		
(1)	These various phases can also be performed in the other mode.	

Implementation Phases with Simulator

The following table shows the various phases of installation with the simulator.

Phase	Description	Mode
Declaration of variables	Declaration of IODDT-type variables for the application-specific modules and variables of the project.	Offline (1)
Programming	Project programming.	Offline (1)
Configuration	Declaration of modules.	Offline
	Module channel configuration.	
	Entry of configuration parameters.	
Association	Association of IODDTs with the modules configured (variable editor).	Offline (1)
Generation	Project generation (analysis and editing of links).	Offline
Transfer	Transfer project to simulator.	Online
Simulation	Program simulation without inputs/outputs.	Online
Adjustment/Debugging	Project debugging from debug screens, animation tables.	Online
	Modifying the program and adjustment parameters.	
Key:		
(1)	These various phases can also be performed in the other mode.	

NOTE: The simulator is only used for the discrete or analog modules.

Chapter 2
Presentation of the PCMCIA TSX MBP 100 Card

Section 2.1
Connection of the TSX MBP 100 Card

Aim of this Section

This section deals with the hardware installation of TSX MBP 100 PCMCIA Modbus Plus cards.

What Is in This Section?

This section contains the following topics:

Connecting the TSX MBP100 Card

General

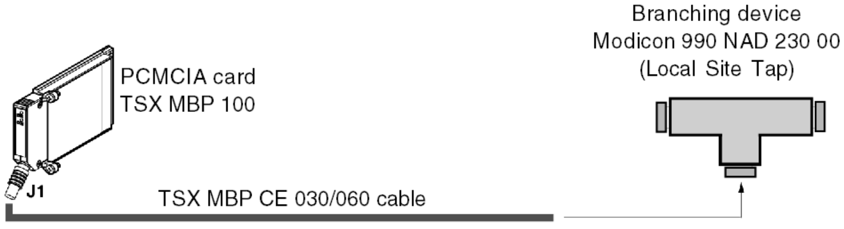
The **TSX MBP 100** PCMCIA card is connected to the Modbus Plus network using the **TSX MBP CE 030** branch cable, 3 m long, or the **TSX MBP CE 060**, 3 m long. This cable is connected to Modicon branch device (local site tap) **990NA23000**.

For information on how to install a Modbus Plus network, refer to the Modicon Modbus Plus Network, Planning and Installation Guide *(see page 8)*.

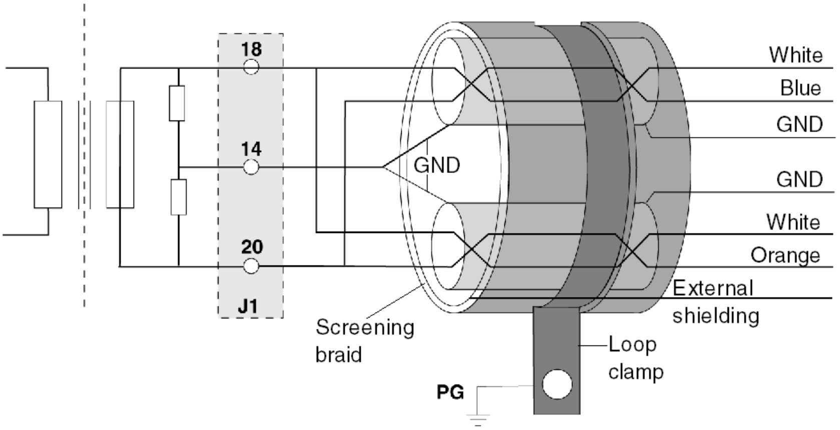
General Principle for Connecting the PCMCIA Card

Principle

Illustration:



Description of the TSX MBP CE 030/060 cable:



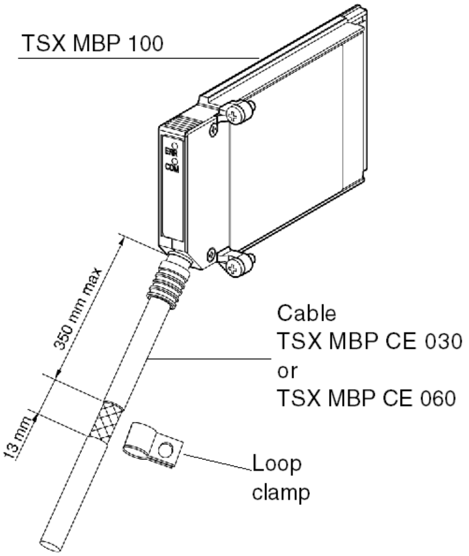
NOTE: Important: The cable's main shielding is grounded using a metal clamp in contact with the screening braid, which itself is fixed to the frame supporting the rack.

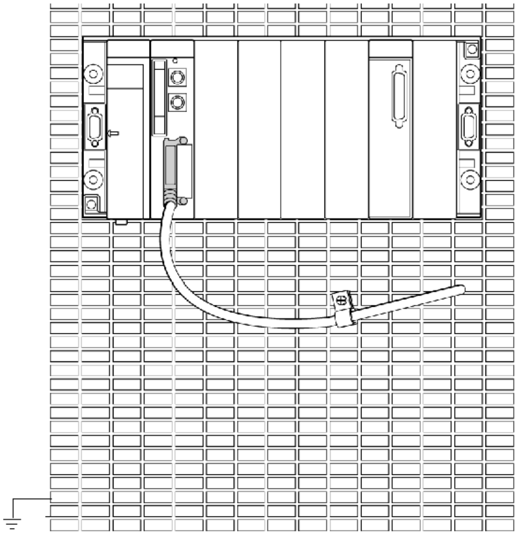
NOTE: This cable must be grounded, even if there is no PCMCIA card present.

Grounding the TSX MBP CE 030/060 Cable

Procedure

The cable connecting the PCMCIA card to the Modicon branching device must be grounded as shown below:

1	Clip the loop clamp onto the cable. This loop clamp is delivered with the Modicon branching device (Local Site Tap), product reference **990 NAD 230 00**.	 TSX MBP 100 350 mm max 13 mm Cable TSX MBP CE 030 or TSX MBP CE 060 Loop clamp

2	Fix the clamp + cable unit to the frame. The frame itself is connected to the ground.	

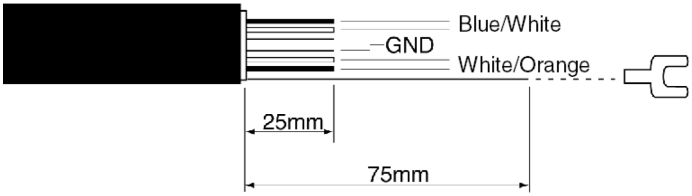
Connecting the TSX MBP CE 030/060 Cable to Modicon Connection Device 990 NAD 230 00

General

TSX MBP CE 030/060 cables are made up of two distinct sets of shielded twisted pair wires and one external shielded ground wire, which makes a total of seven wires.

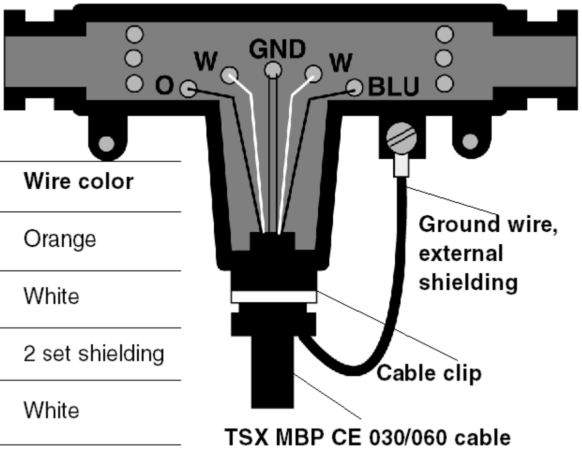
Connection Procedure

To connect the cable to the Modicon device follow the procedure below:

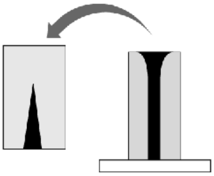
Step	Action
1	Identify the wires: ● A first set of wires marked with the colors White and Orange, with one stripped shielded wire. ● A second set of wires marked with the colors White and Blue, with one stripped shielded wire. ● The external shielded wire Note: It is important to correctly identify the two sets of twisted pairs since the two white wires are not interchangeable
2	Set up the cable according to the dimensions given in the following illustration. Illustration: 
3	Insert the cable in the Modicon device and keep it in place using a clip.

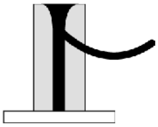
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>Connect the wires to the device, following the diagram below.
Diagram:

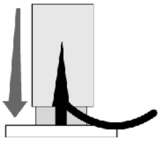
Branching device Modicon 990 NAD 230 00



<table>
<tr><th>Terminal</th><th>Wire color</th></tr>
<tr><td>O</td><td>Orange</td></tr>
<tr><td>W</td><td>White</td></tr>
<tr><td>GND</td><td>2 set shielding</td></tr>
<tr><td>W</td><td>White</td></tr>
<tr><td>BLU</td><td>Blue</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>Remove the plastic hood from the terminal to connect each wire:


</td></tr>
<tr><td>6</td><td>Place each wire in the corresponding terminal slot:


</td></tr>
</table>

Step	Action
7	Replace the hoods, and using a screwdriver press them to engage the wires in their slots: 
8	Finally, fix an open terminal to the external shielding wire either by soldering or crimping, and connect it to the ground screw of the device as shown in stage 4 of the drawing.

Chapter 3
Software Installation

Aim of this Chapter

This chapter describes the different possibilities for configuring, supervising and diagnosing a Modbus Plus station.

What Is in This Chapter?

This chapter contains the following sections:

Section 3.1
Configuration

Aim of this Section

This section describes the configuration of a PCMCIA card TSX MBP 100.

What Is in This Section?

This section contains the following topics:

Method for Configuring a Modbus Plus Network

At a Glance

The creation and configuration of a Modbus Plus network has four main steps:

- creation of a Modbus Plus logic network
- configuration of a Modbus Plus logic network
- declaration of the Modbus Plus PCMCIA card
- association of the card with the logic network

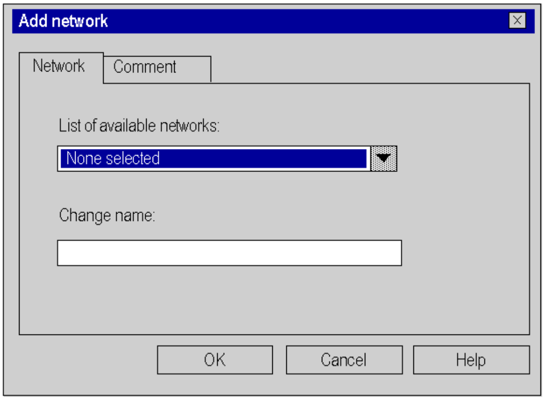
These four methods are presented in the remainder of this documentation.

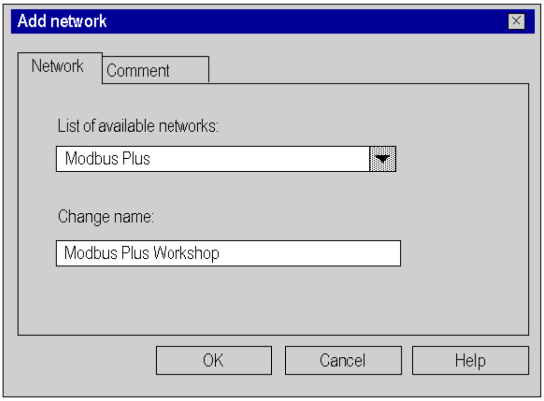
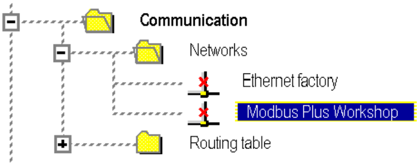
NOTE: The advantage of this method is that from stage two onwards, you can devise your communication application (you are not obliged to have the hardware to begin work) and use the simulator to test its operation.

NOTE: The first two phases are run from the project browser and the next two from the hardware configuration editor.

How to Create a Modbus Plus Logic Network

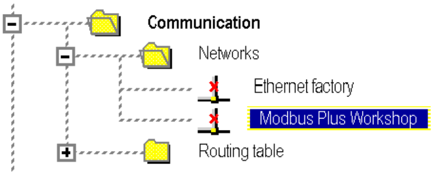
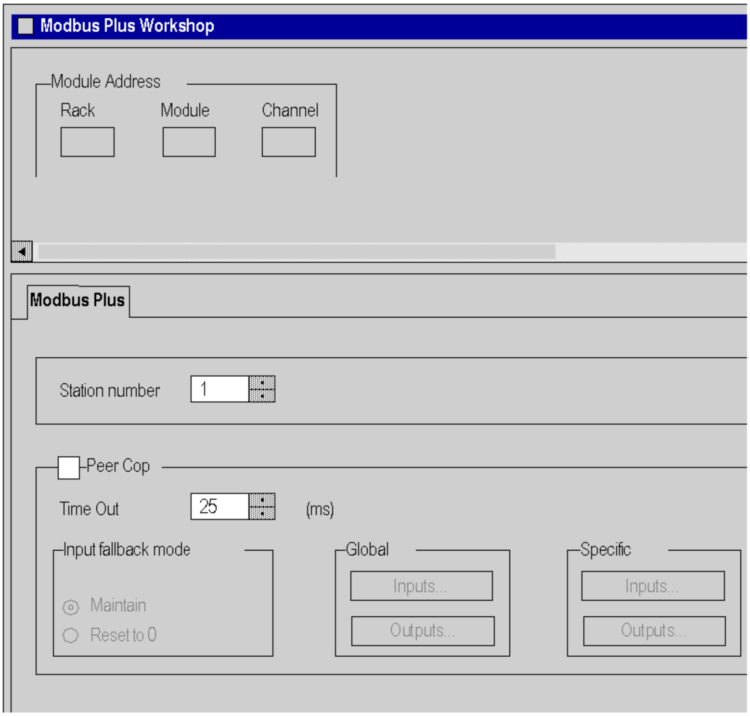
The following tables present the procedure for creating a Modbus Plus logic network.

Step	Action
1	Right-click the **Networks** subdirectory of the **Communication** directory of the Project browser and select the **New network** option. **Result**:  Add network Network Comment List of available networks: None selected Change name: OK Cancel Help

Step	Action
2	Select **Modbus Plus** from the list of available networks and select a meaningful name for it. **Result**:  List of available networks: Modbus Plus Change name: Modbus Plus Workshop **Note**: If you click the **Comments** tab you can also enter a comment if you wish.
3	Click **OK**, and a new logic network is created. **Result**: We have just created the Modbus Plus network which appears in the project browser.  Communication Networks Ethernet factory Modbus Plus Workshop Routing table **Note**: As you can see, a small icon indicates that the logic network is not associated with a PLC device.

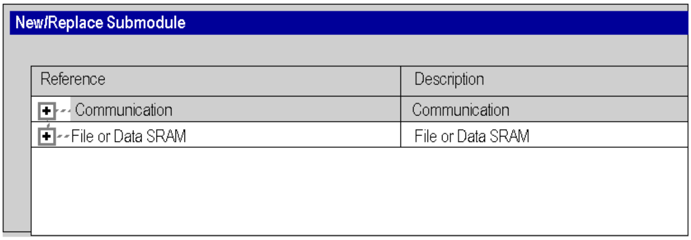
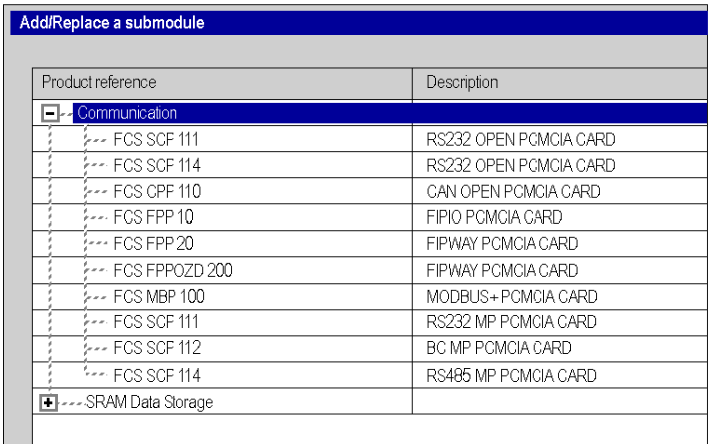
How to Access the Configuration of the Modbus Plus Logic Network

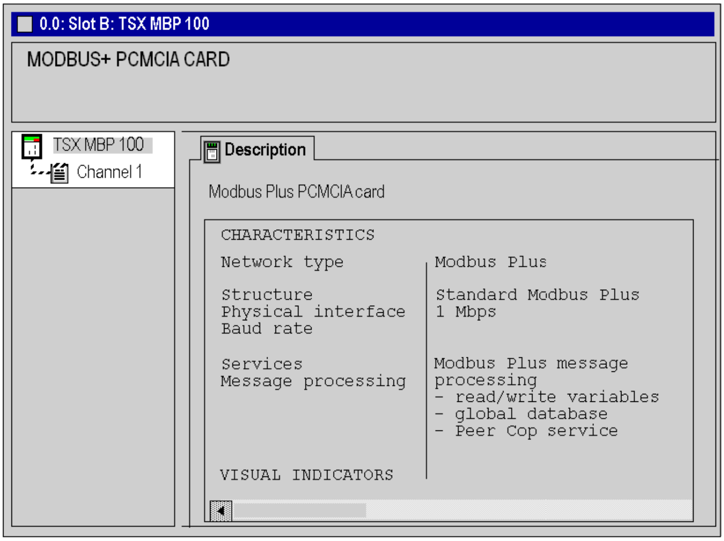
The following table presents the procedure for accessing the configuration of the Modbus Plus logic network.

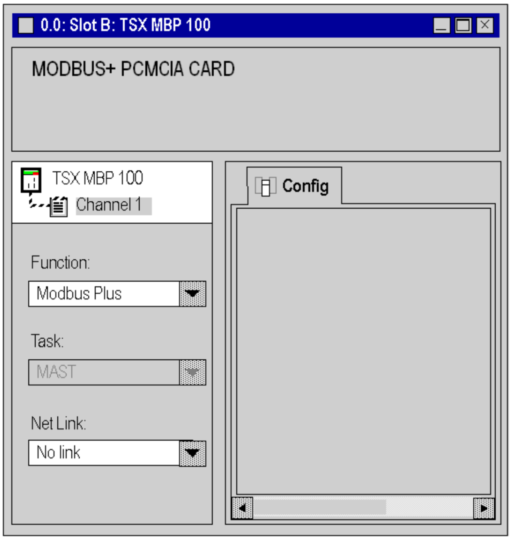
Step	Action
1	Open the project browser in order to see the logic networks of your application.  Communication Networks Ethernet factory Modbus Plus Workshop Routing table **Result**:
2	Right-click the Modbus Plus logic network to be configured and select **Open**. **Result**: The Modbus Plus configuration screen appears. This screen is described in the remainder of this documentation *(see page 41)*.  Modbus Plus Workshop Module Address Rack Module Channel Modbus Plus Peer Cop Input fallback mode Maintain Reset to 0 Global Inputs... Outputs... Specific Inputs... Outputs... Station number 1 □ Peer Cop Time Out 25 (ms) ○ Maintain ○ Reset to 0

How to Declare the Modbus Plus PCMCIA Card

The following table presents the procedure for physically declaring the Modbus Plus PCMCIA card in the processor.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Open the hardware configuration editor.</td></tr>
<tr><td>2</td><td>Double click the PCMCIA communication card slot (bottom slot).
<strong>Result:</strong> The card type selection window appears.

New/Replace Submodule
<table>
<tr><th>Reference</th><th>Description</th></tr>
<tr><td>⊞ Communication</td><td>Communication</td></tr>
<tr><td>⊞ File or Data SRAM</td><td>File or Data SRAM</td></tr>
</table>
</td></tr>
<tr><td>3</td><td>Open up the <strong>Communication</strong> line by clicking the<strong>+</strong> sign.
<strong>Result:</strong>

Add/Replace a submodule
<table>
<tr><th>Product reference</th><th>Description</th></tr>
<tr><td>⊟ Communication</td><td></td></tr>
<tr><td>FCS SCF 111</td><td>RS232 OPEN PCMCIA CARD</td></tr>
<tr><td>FCS SCF 114</td><td>RS232 OPEN PCMCIA CARD</td></tr>
<tr><td>FCS CPF 110</td><td>CAN OPEN PCMCIA CARD</td></tr>
<tr><td>FCS FPP 10</td><td>FIPIO PCMCIA CARD</td></tr>
<tr><td>FCS FPP 20</td><td>FIPWAY PCMCIA CARD</td></tr>
<tr><td>FCS FPPOZD 200</td><td>FIPWAY PCMCIA CARD</td></tr>
<tr><td>FCS MBP 100</td><td>MODBUS+ PCMCIA CARD</td></tr>
<tr><td>FCS SCF 111</td><td>RS232 MP PCMCIA CARD</td></tr>
<tr><td>FCS SCF 112</td><td>BC MP PCMCIA CARD</td></tr>
<tr><td>FCS SCF 114</td><td>RS485 MP PCMCIA CARD</td></tr>
<tr><td>⊞ SRAM Data Storage</td><td></td></tr>
</table>
</td></tr>
<tr><td>4</td><td>Select the Modbus Plus TSX MBP 100 card and then confirm with <strong>OK</strong>.
<strong>Result:</strong> The hardware configuration editor is displayed.</td></tr>
</table>

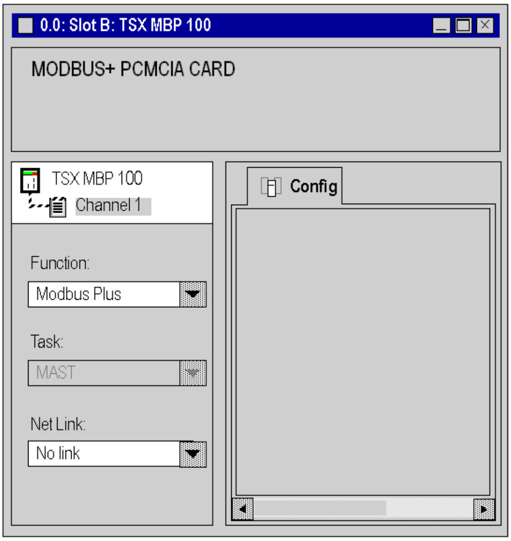
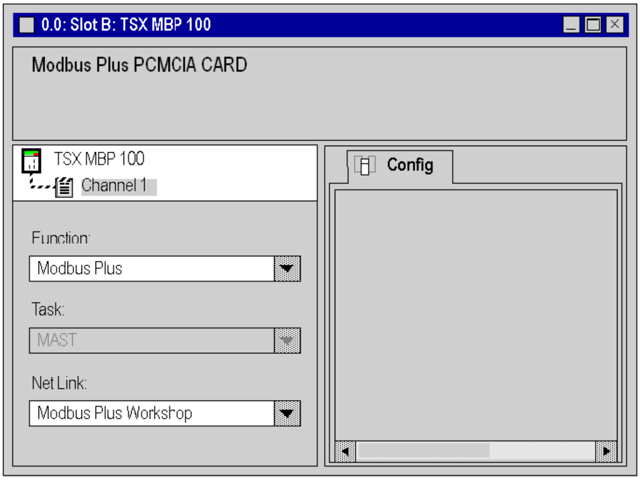
Step	Action
5	Double click the PCMCIA communication card of the processor. **Result:**  0.0: Slot B: TSX MBP 100 MODBUS+ PCMCIA CARD TSX MBP 100 Channel 1 Description Modbus Plus PCMCIA card CHARACTERISTICS Network type: Modbus Plus Structure: Standard Modbus Plus Physical interface: 1 Mbps Baud rate Services: Modbus Plus message processing Message processing: - read/write variables - global database - Peer Cop service VISUAL INDICATORS

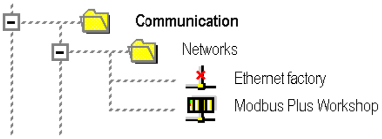
Step	Action
6	Select the channel and choose the Modbus Plus function. **Result:**  0.0: Slot B: TSX MBP 100 MODBUS+ PCMCIA CARD TSX MBP 100 Channel 1 Function: Modbus Plus Task: MAST Net Link: No link
7	Confirm the modification and close the window. **Result**: The Modbus Plus PCMCIA card is configured. All that remains now in order for it to work is to associate it with a logic network. **Note**: Confirmation is not mandatory, the modification is effective from step 6 onwards.

How to Associate the Logic Network

The following table presents the procedure for associating the Modbus Plus logic network to the PCMCIA card that you have just declared.

Step	Action
1	Open the hardware configuration editor.

Step	Action
2	Double click the PCMCIA card slot. **Result:**  0.0: Slot B: TSX MBP 100 MODBUS+ PCMCIA CARD TSX MBP 100 Channel 1 Function: Modbus Plus Task: MAST Net Link: No link Config
3	In the **Function** field select the network to be associated with the card. **Result:**  0.0: Slot B: TSX MBP 100 Modbus Plus PCMCIA CARD TSX MBP 100 Channel 1 Function: Modbus Plus Task: MAST Net Link: Modbus Plus Workshop Config

Step	Action
4	Confirm your choice and close the window. **Result:** The Modbus Plus Atelier logical network is associated with the TSX MBP 100 card. The address of the module is written in the logic network configuration window. The icon associated with this logical network changes and indicates the link with a PLC.  Communication Networks Ethernet factory Modbus Plus Workshop

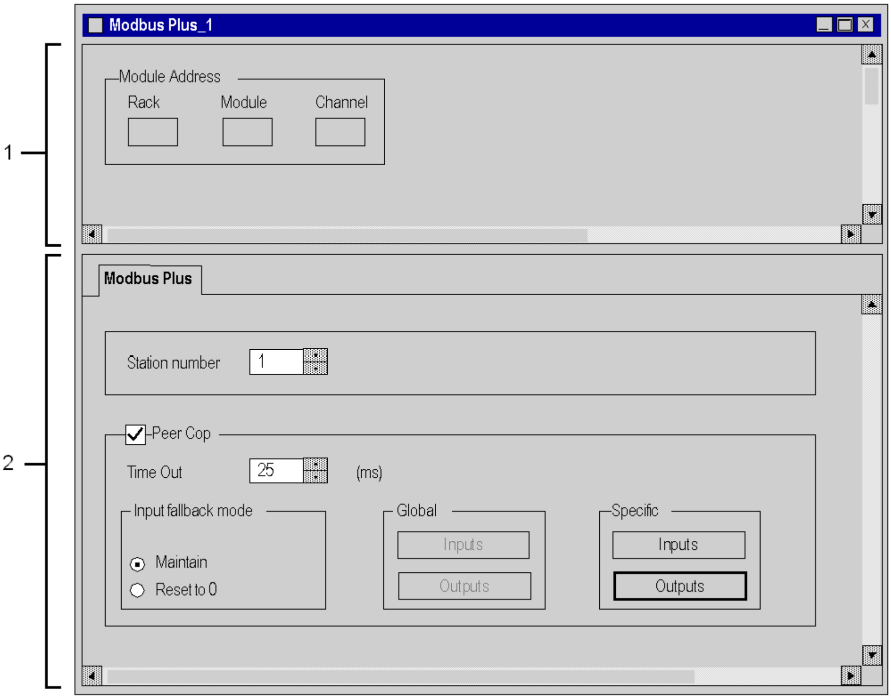
Modbus Plus Configuration Screen

Introduction

This screen is split into 5 zones that enable the declaration of the communication channel and configuration of parameters necessary for a Modbus Plus link.

Figure

The figure below show a configuration screen for a PCMCIA TSX MBP 100 card accessible for the communication tab of the project browser.



Station number 1

☑ Peer Cop

Time Out 25 (ms)

Input fallback mode

● Maintain

○ Reset to 0

Description

The following table presents the various elements of the configuration screen and their functions.

Address	Element	Function
1	**Address** zone	The address zone is empty if the logic network has not been associated with the hardware, it contains the address of the PCMCIA Modbus Plus card when the association has been made *(see page 38)*.
2	**Configuration** zone	This zone allows configuration of the Modbus Plus link. It is broken down into two types of information: ● the station address ● the parameters of the Peer Cop utility

Accessible Modbus Plus functions

Introduction

Depending on the communication media chosen, certain parameters cannot be modified. These appear in gray.

Accessible Functions

The table below summarizes the various possible choices:

Functions	TSX MBP 100
Input fallback mode	Accessible if the Peer Cop checkbox is checked
Global inputs and outputs	This area is available only on Quantum PLCs.
Specific inputs and outputs	Accessible if the Peer Cop checkbox is checked (Premium and Atrium PLCs)

Modbus Plus Configuration Parameters

Introduction

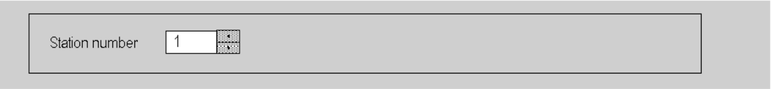
After configuring the communication channel, you need to enter the parameters intended for the Modbus Plus link.

These are split into two zones:

- the **Station number** zone
- the **Peer Cop** zone

Addressing Parameter

Illustration of the Station number zone:

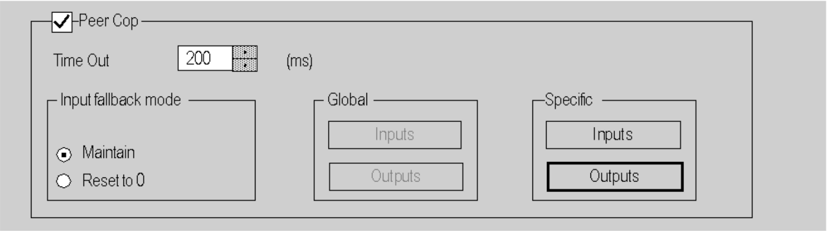


Station number 1

This parameter allows the address (or connection point) of the station on the Modbus Plus network to be defined; it is a number between 1 and 64.

Peer Cop Parameters

This window can only be accessed by checking the **Peer Cop**: checkbox



☑ Peer Cop

Time Out 200 (ms)

Input fallback mode

● Maintain

○ Reset to 0

This allows you to:

- enter the value of the **Time Out**: refresh time of inputs in milliseconds. This allows specification of the maximum time for which the inputs coming from the remote stations must be updated in the PCMCIA card. In the event that the data are not refreshed in the time stated, an error is detected.
  - the default value is 500 ms,
  - values between 20 ms and 2 s,
  - the increment is 20 ms.

- enter the **Input Fallback Mode**:
  - maintained,
  - Reset to zero.
- accessing the values of the **specific inputs** and **specific outputs**. *Peer Cop Service, page 15*

NOTE: The global inputs and outputs are not used on the Premium PLCs, they can be configured on the Quantum PLCs.

Configuration of the Global data of the Peer Cop Utility

Introduction

If you have checked the **Peer Cop** box, you must specify the starting address and the size of the data to be exchanged.

These data are stored in the internal words of the application. *Peer Cop Service, page 15*

Configuration Rules

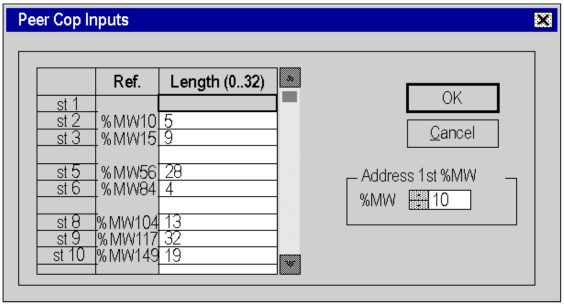
The input words field cannot superimpose on the output words field.

The internal words corresponding to the specific inputs or outputs are latched continuously.

The maximum size of the specific data must not exceed 1,000 words (500 words max. for the inputs and 500 words max. for the outputs).

Specific Inputs

After selecting the **Inputs** button of the **Specific** zone, the following window appears.



Peer Cop Inputs

	Ref.	Length (0..32)
st 1		
st 2	%MW10	5
st 3	%MW15	9
st 5	%MW56	28
st 6	%MW84	4
st 8	%MW104	13
st 9	%MW117	32
st 10	%MW149	19

Address 1st %MW

%MW 10

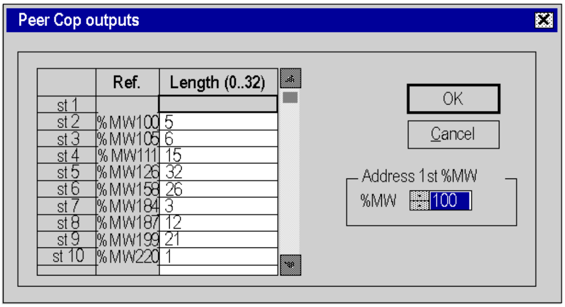
For each connection point of the local bus segment, the user must define:

- the starting address in the table of internal words (%MW)
- the size of the exchanges, from 0 to 32 words per station, on the local bus segment

NOTE: The line of the local station (1 in this example) appears grayed out, it is not possible to associate input words with it.

Specific Outputs

After selecting the **Specific outputs** button, the following window appears.



	Ref.	Length (0..32)
st 1		
st 2	%MW100	5
st 3	%MW105	6
st 4	%MW111	15
st 5	%MW126	32
st 6	%MW158	26
st 7	%MW184	3
st 8	%MW187	12
st 9	%MW199	21
st 10	%MW220	1

Address 1st %MW

%MW 100

For each connection point of the local bus segment, the user must define:

- the starting address in the table of internal words (%MW)
- the size of the exchanges, from 0 to 32 words per station, on the local bus segment

Section 3.2
Programming

Aim of this Section

This section describes the tools available to program the operation of and to obtain information on a Modbus Plus network managed by the TSX MBP 100 card.

What Is in This Section?

This section contains the following topics:

Read and Write Service on a local Segment

Introduction

A Premium or Atrium PLC can exchange data with stations connected on the local Modbus Plus network.

Data Exchange

The `READ_VAR` and `WRITE_VAR` functions can be used to access bits, internal words or input/output words on remote stations on a single local segment in read/write mode.

The address setting from a Premium station will be, for example:

- in read
  ```
  READ_VAR (ADDR(’0.0.1.10’), ’%MW’, 10, 20, %MW100:4, %MW10:20)
  ```
- in write
  ```
  WRITE_VAR (ADDR(‘0.0.1.10’), ‘%MW’, 10, 20, %MW10:20, %MW100:4)
  ```

The following table describes the different parameters of the function.

Parameter	Description
ADDR(‘0.0.1.10’)	Address of the destination device of the message: ● 0 : rack number (always 0 as the card is in the processor) ● 0 : processor slot: 0 or 1 ● 1 : PCMCIA channel ● 10 : destination station number
‘%MW’	Type of object to read or write, for example: internal words
10	Address of the first word to read or write
20	Number of words to read or write
%MW10:20	When reading: content of the response When writing: value of the words to be written
%MW100:4	Management table *(see Unity Pro, Communication, Block Library)*, containing: ● the activity bit, ● the operation report, ● the communication report, ● the time-out, ● the number of bytes sent or received.

Correspondence of the Types of Objects

The following tables describe the correspondence between types of objects between Premium/Atrium and Quantum PLCs.

In the case where a Premium/Atrium PLC sends the request and a Quantum PLC receives it.

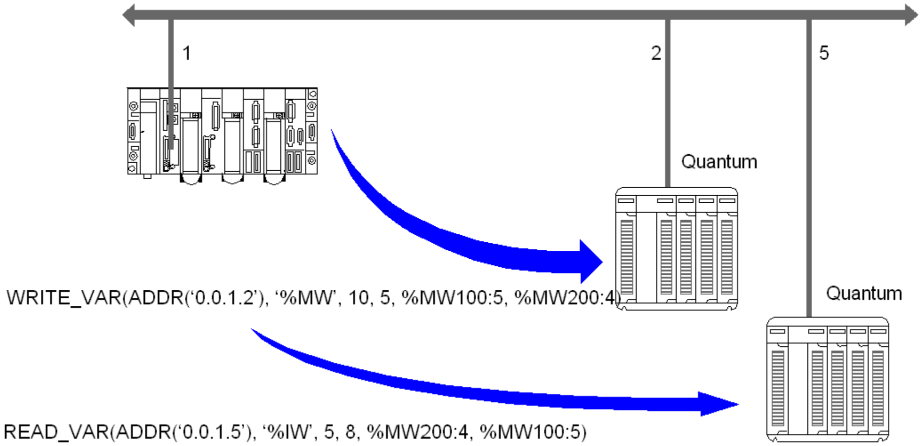
`READ_VAR` or `WRITE_VAR` function	Premium/Atrium object type	Responding Quantum object
'%MW'	internal words	4x... memory area
'%M'	Internal bits	0x... memory area
'%IW'	input words	3x... memory area
'%I'	input bits	1x... memory area

In the case where a Quantum PLC sends via a MSTR function block.

MSTR function block	Responding Premium/Atrium object
READ	%MW
WRITE	%MW

Example

The Premium application writes 10 internal words to the Quantum PLC (address 2) and reads 5 input words from the Quantum PLC (address 5).



WRITE_VAR(ADDR('0.0.1.2'), '%MW', 10, 5, %MW100:5, %MW200:4)

READ_VAR(ADDR('0.0.1.5'), '%IW', 5, 8, %MW200:4, %MW100:5)

The internal words to write to station 2 are located at address 10.

The input words to read from station 5 are located at address 5.

Exchange Service on Remote Modbus Plus Networks

Introduction

A Premium or Atrium PLC can exchange data with stations connected on other Modbus Plus segments, via BP85 Bridge Plus gateways.

Accessing a Remote Station

To access a remote station connected to another network segment, the full routing path must be indicated in the information to be sent.

You must first indicate in the request the address of the first destination connection point on the local bus.

You must then specify in the data to be sent each address of the devices which will enable transmission to the destination station.

Data Exchange

This type of exchange is accessible using the `SEND_REQ` function. To differentiate between the reading and writing of data from a remote station, a request code is associated with the `SEND_REQ` function. These are explicit exchanges managed by the application.

The address setting from a Premium station will be, for example:

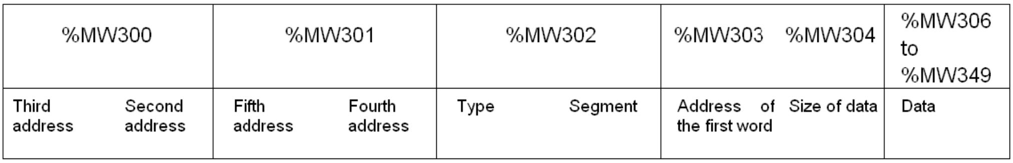
- in read
  ```
  SEND_REQ (ADDR('0.0.1.61'), 16#36, %MW300:500, %MW600:4, %MW450:15)
  ```
- in write
  ```
  SEND_REQ (ADDR('0.0.1.61'), 16#37, %MW300:50, %MW600:4, %MW450:150)
  ```

The following table describes the different parameters of the function.

Parameter	Description
ADR#('0.0.1.61')	Address of the destination device of the message: ● 0 : rack number (always 0 as the card is in the processor) ● 0 : processor slot: 0 or 1 ● 1 : PCMCIA channel ● number of the destination connection point on the local bus: 61
16#36 16#37	Request code to read objects Request code to write objects
%MW300:50	Address path, length, data to be transmitted
%MW600:4	Activity bit, exchange report, length
%MW450:150	Address, length of the data to be received

Coding of Data

The read/write request data is coded in the internal words, to be sent as follows.

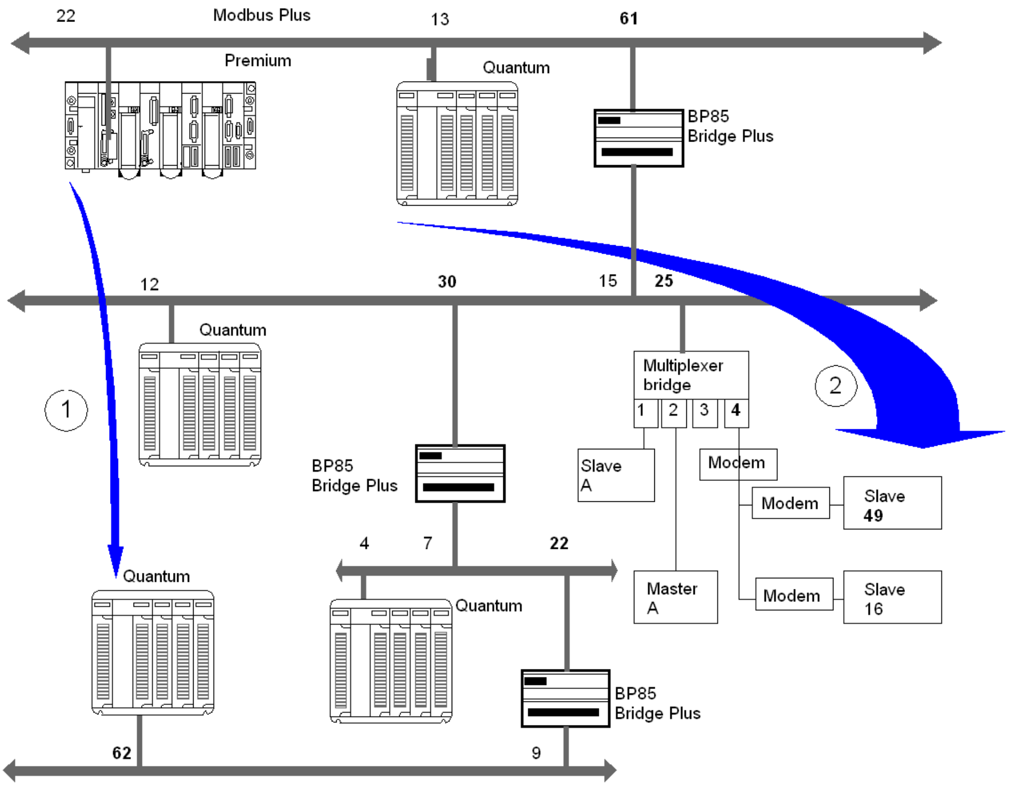


%MW300		%MW301		%MW302		%MW303	%MW304	%MW306 to %MW349
Third address	Second address	Fifth address	Fourth address	Type	Segment	Address of the first word	Size of data	Data

Examples of Exchanges on Remote Networks

At a Glance

The following illustration shows the two types of exchange which are processed as follows:



Example 1

Reading, using a Premium PLC, of 120 internal words at address 80 of the Quantum station (local address 62) requires:

- The routing path to access the Quantum station: 61, 30, 22, 62, 0.
- The read request code: 16#36.
- The real size of the data to be transmitted (memorized in %MW603): 10 bytes.

```
SEND_REQ(ADDR('0.0.1.61'), 16#36, %MW300:5, %MW600:4, %MW450:120)
```

Coding of the data to be transmitted:

Parameters	Values	Description
%MW300	0x161E	Second and third crossing point addresses (30, 22)
%MW301	0x003E	Fourth and fifth crossing point addresses (62, 0)
%MW302	0x0768	Segment 104 and type 7 (according to the type of variable to be read or written)
%MW303	80	Address of the first internal word to be read in the Quantum station
%MW304	120	Size of the data to be read (in number of bytes, the size of useful data is between 1 and 125 words in read mode)
No data		

NOTE: After the execution of the `SEND_REQ` function, it is necessary to reclassify the bytes in the correct order.

Example 2

Writing, using a Premium PLC, of 50 internal words at address 560 of slave 49 connected to port 4 of the multiplexer bridge requires:

- The routing path to access the slave: 61, 25, 4, 49, 0.
- The write request code: 16#37.
- The real size of the data to be transmitted (memorized in %MW603): 110 bytes.
- The values of the data to be written (memorized in %MW305 to %MW354).
- The response (memorized in %MW450:1): does not contain any data to be received, but should have a minimum length of one word.

```
SEND_REQ(ADDR('0.0.1.61'), 16#37, %MW300:55, %MW600:4, %MW450:1)
```

Coding of the data to be transmitted:

Parameters	Values	Description
%MW300	0x0419	Second and third crossing point addresses (25, 4)
%MW301	0x0031	Fourth and fifth crossing point addresses (49, 0)
%MW302	0x0768	Segment 104 and type 7 (according to the type of variable to be read or written)
%MW303	560	Address of the first internal word to be written in the Quantum station
%MW304	50	Size of the data to be written (in number of bytes, the size of useful data is between 1 and 120 words in write mode)
%MW305 to %MW354		Data to be written
%MW603	110	Real size of the data to be transmitted with this function (in bytes)

Diagnostics Service

Introduction

A Premium or Atrium PLC can read or reset to zero the local or remote error counters on a local Modbus Plus network.

Data Exchange

This type of exchange is accessible using the `SEND_REQ` function. To differentiate between the reading and writing of data from a remote station, a request code is associated with the `SEND_REQ` function.

The address setting from a Premium station will be, for example:

- to read the counters
  `SEND_REQ (ADDR('0.0.1.5'), 16#A2, %MW100:1, %MW300:4, %MW200:20)`
- to reset the counters to zero
  `SEND_REQ (ADDR('0.0.1.5'), 16#A4, %MW100:1, %MW300:4, %MW200:1)`

The following table describes the different parameters of the function.

Parameter	Description
ADDR('0.00.5.10')	Address of the destination device of the message: ● 0 : rack number (always 0 as the card is in the processor) ● 0 : processor slot: 0 or 1 ● 1 : PCMCIA channel ● 5 : number of the destination connection point on the local bus
16#A2 16#A4	Request code to read the counters Request code to reset the counters to zero
%MW100:1	No data to send
%MW200:20 %MW200:1	No response on reception Content of the error counters
%MW300:4	Activity bit, exchange report, length

NOTE: The length parameter in the report words is initialized to 0 before the request is sent.

List of Counters

The following table shows all the counters.

Counter number	Meaning
1	Retransmit deferral error counter
2	Receive buffer DMA overrun error counter
3	Repeated command received counter
4	Frame size error counter
5	Receiver collision abort error counter
6	Receiver alignment error counter
7	Receiver CRC error counter
8	Bad-packet-length error counter
9	Bad link address error counter
10	Transmit buffer DMA underrun error counter
11	Bad internal packet length error counter
12	Bad mac function code error counter
13	Communication retry counter
14	Communication failed error counter
15	Good receive packet success counter
16	No response received error counter
17	Exception response received error counter
18	Unexpected path error counter
19	Unexpected response error counter
20	Forgotten transaction error counter

Global Data Exchange Service

Introduction

The global data exchange service is a simple exchange mechanism used to send broadcast messages between stations connected to the same Modbus Plus network.

During the course of an exchange, a station which has a token can broadcast words to other stations connected to the network. A receiving station takes the content of the words sent by the transmitting station, saves them to the PCMCIA card memory, then sends them back onto the network. The same applies to each station which passes the token.

NOTE: The transfer of data from one station to another is performed automatically.

To read the transmitted global data, the application of the receiver station must read from its PCMCIA card.

Precautions for Use

For Premium and Atrium PLCs, this service is provided by specific communication functions (`WRITE_GDATA` and `READ_GDATA`), which carried out by the application periodically. It is not a built-in feature of Peer Cop transactions.

A Premium or Atrium PLC can broadcast a maximum of 32 words.

Writing Global Data

This type of exchange is accessible using the `WRITE_GDATA` function.

The address setting from a Premium station will be, for example:

```
WRITE_GDATA (ADDR(‘0.0.1.SYS’), %MW100:x, %MW200:4)
```

The following table describes the different parameters of the function.

Parameter	Description
ADDR(‘0.0.1.SYS’)	Address for a broadcast: ● 0 : rack number (always 0 as the card is in the processor) ● 0 : processor slot: 0 or 1 ● 1 : PCMCIA channel ● system channel: transmission for all stations on the network
%MW100:x	Content of the global data to be sent (x = 1 to 32 words)
%MW200:4	Activity bit, exchange report, length

Reading Global Data

This type of exchange is accessible using the `READ_GDATA` function.

The address setting from a Premium station will be, for example:

```
READ_GDATA (ADDR(’0.0.1.10’), %MW300:4, %MW30:32)
```

The following table describes the different parameters of the function.

Parameter	Description
ADDR(‘0.0.1.10’)	Address of the transmitting device of the message: ● 0 : rack number (always 0 as the card is in the processor) ● 0 : processor slot: 0 or 1 ● 1 : PCMCIA channel ● number of the station transmitting the data: 10
%MW300:4	Activity bit, exchange report, length
%MW30:32	Content of global data

NOTE: The length of the global data actually read is contained in the length word of the activity report (e.g.: %MW304). When length = 0, this means there is no new global data available in the station specified in the request.

Section 3.3
Debugging

Aim of this Section

This section describes the debugging of a TSX MBP 100 PCMCIA card.

What Is in This Section?

This section contains the following topics:

Modbus Plus Debug Screen

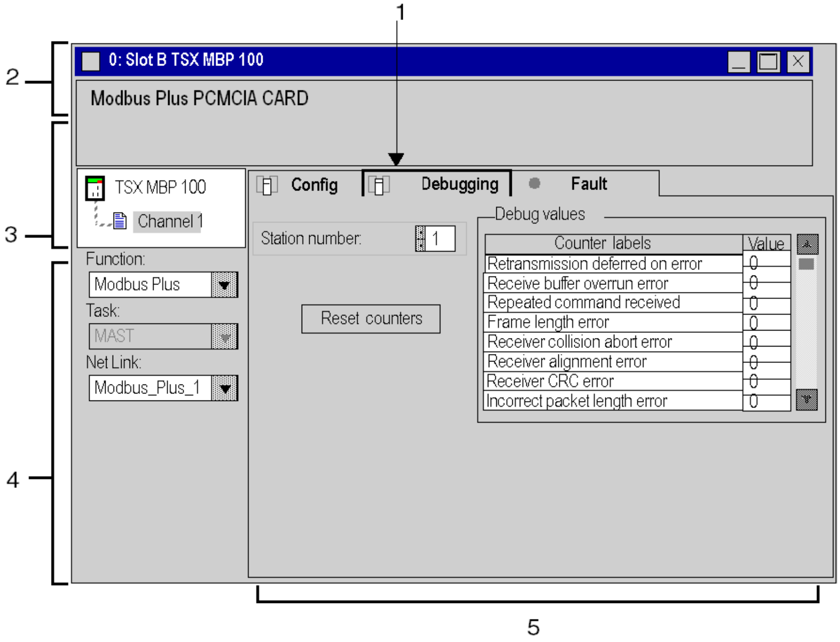
At a Glance

This screen is broken down into 5 zones, 3 zones that are identical to the configuration screen and two zones specific to the debugging.

The Debug tab (zone 1) is a zone in which you can modify the debug parameters for the Modbus Plus channel.

Illustration

The figure below shows a screen for configuration of a PCMCIA TSX MBP 100 card.



0: Slot B TSX MBP 100

Modbus Plus PCMCIA CARD

TSX MBP 100
Channel 1

Function: Modbus Plus

Task: MAST

Net Link: Modbus_Plus_1

Station number: 1

Debug values

Counter labels	Value
Retransmission deferred on error	0
Receive buffer overrun error	0
Repeated command received	0
Frame length error	0
Receiver collision abort error	0
Receiver alignment error	0
Receiver CRC error	0
Incorrect packet length error	0

Description

The following table presents the various elements of the configuration screen and their functions.

Number	Element	Function
1	Tabs	The tab in the foreground indicates the current mode (**Debug**).
2	**Module area**	Contains the abbreviated title of the module.

Number	Element	Function
3	**Channel area**	This zone indicates the channel on which the debugging is carried out. In our case a single channel is available for the TSX MBP 100 card.
4	**Global Parameters area**	This zone allows the general parameters associated with the channel to be chosen: ● **Function:** for a TSX MBP 100 card a single function is available, the Modbus Plus function ● **Task:** defines the task (**MAST** or **FAST** or **AUX0/1**) in which the channel's explicit exchange objects will be exchanged ● **Net Link:** defines the logic network with which the Modbus Plus card is associated
5	**Debug** zone	This zone lets you debug the Modbus Plus link. It is broken down into two types of information: ● the station address ● debug values

Modbus Plus Debug Screen

At a Glance

The three elements of the Modbus Plus debug zone are as follows:

- the **Station number** zone
- the **Debug value** zone
- the **Reset counters** button

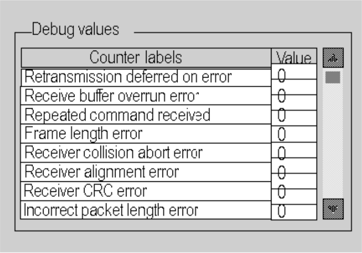
Station Number

The zone, identical to that in configuration, is used to select:

- either the local station
- or the remote station

Debug Values

The window looks like this:



Debug values

Counter labels	Value
Retransmission deferred on error	0
Receive buffer overrun error	0
Repeated command received	0
Frame length error	0
Receiver collision abort error	0
Receiver alignment error	0
Receiver CRC error	0
Incorrect packet length error	0

This window displays the different fault counters of a station connected to the Modbus Plus network.

By default, the screen proposes the default counters of the local station. It is possible to view the fault counters of a local station or of a remote station.

NOTE: To access the fault counters of a remote station, you must first select the number of the remote station.

Reset Counters

The **Reset Counters** button resets the default counters to zero.

Chapter 4
Modbus Plus Language Objects

Aim of this Chapter

This chapter describes the language objects associated with the Modbus Plus communication channel.

What Is in This Chapter?

This chapter contains the following sections:

Section 4.1

Language Objects and IODDTs for Modbus Plus Communication

Aim of this Section

This section provides an overview of general points relating to Modbus Plus communication language objects and IODDTs.

What Is in This Section?

This section contains the following topics:

Introduction to Language Objects for Modbus Plus Communication

General

The IODDTs are predefined by the manufacturer. They contain input/output language objects belonging to a channel of an application-specific module.

Modbus Plus communication has two associated IODDTs:

- `T_COM_STS_GEN`, which applies to communication protocols except Fipio and Ethernet,
- `T_COM_MBP`, which is specific to Modbus Plus communication

NOTE: IODDT variables can be created in two different ways:

- Using the **I/O objects** *(see Unity Pro, Operating Modes)* tab
- Data Editor *(see Unity Pro, Operating Modes)*

Language Object Types

Each IODDT contains a group of language objects which are used to control them and check their operation.

There are two types of language object:

- **implicit exchange objects**, which are automatically exchanged on each cycle of the task associated with the module
- **explicit exchange objects**, which are exchanged on the application’s request, using explicit exchange instructions

Implicit exchanges concern the status of the modules, the communication signals, the slaves, etc.

Explicit exchanges are used to set up the module’s parameters and for module diagnostics.

Implicit Exchange Language Objects Associated with the Application-Specific Function

At a Glance

An integrated application-specific interface or the addition of a module automatically enhances the language objects application used to program this interface or module.

These objects correspond to the input/output images and software data of the module or integrated application-specific interface.

Reminders

The module inputs (`%I` and `%IW`) are updated in the PLC memory at the start of the task, the PLC being in RUN or STOP mode.

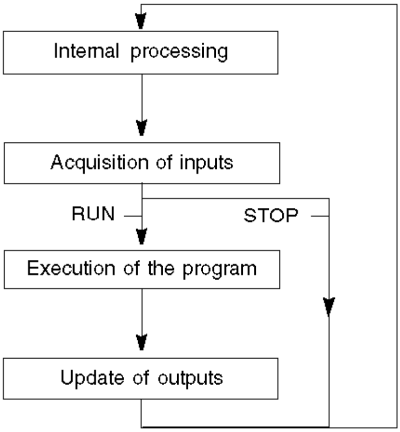
The outputs (`%Q` and `%QW`) are updated at the end of the task, only when the PLC is in RUN mode.

NOTE: When the task occurs in STOP mode, either of the following are possible, depending on the configuration selected:

- outputs are set to fallback position (fallback mode)
- outputs are maintained at their last value (maintain mode)

Figure

The following diagram shows the operating cycle of a PLC task (cyclical execution).



Explicit Exchange Language Objects Associated with the Application-Specific Function

Introduction

Explicit exchanges are performed at the user program’s request using these instructions:

- READ_STS *(see Unity Pro, I/O Management, Block Library)* (read status words)
- WRITE_CMD *(see Unity Pro, I/O Management, Block Library)* (write command words)
- WRITE_PARAM *(see Unity Pro, I/O Management, Block Library)* (write adjustment parameters)
- READ_PARAM *(see Unity Pro, I/O Management, Block Library)* (read adjustment parameters)
- SAVE_PARAM *(see Unity Pro, I/O Management, Block Library)* (save adjustment parameters)
- RESTORE_PARAM *(see Unity Pro, I/O Management, Block Library)* (restore adjustment parameters)

These exchanges apply to a set of %MW objects of the same type (status, commands or parameters) that belong to a channel.

These objects can:

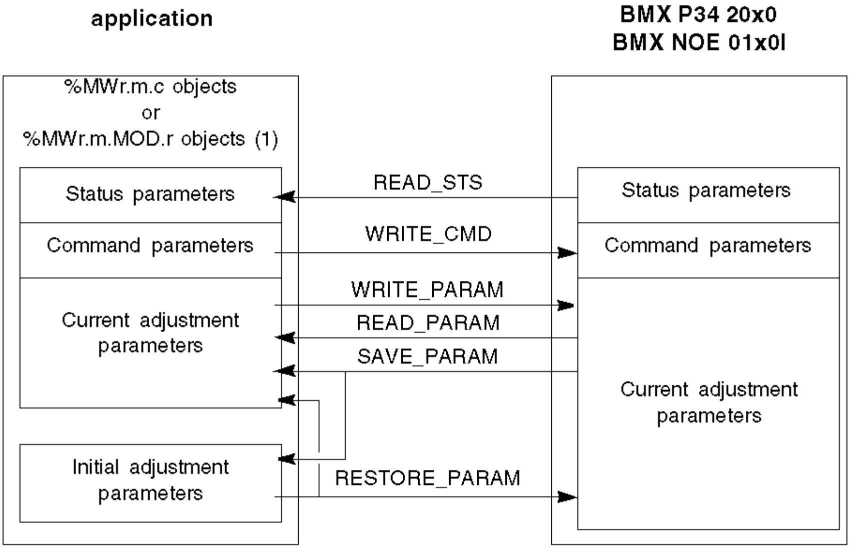
- provide information about the module (for example, type of error detected in a channel)
- have command control of the module (for example, switch command)
- define the module’s operating modes (save and restore adjustment parameters in the process of application)

NOTE: To avoid several simultaneous explicit exchanges for the same channel, it is necessary to test the value of the word EXCH_STS (`%MWr.m.c.0`) of the IODDT associated to the channel before calling any EF addressing this channel.

NOTE: Explicit Exchanges are not supported when Modicon M340 Analog and Digital I/O modules are configured behind a M340 Ethernet Remote I/O adapter module in a Quantum EIO Ethernet Configuration. As a consequence, it is not possible to setup a module’s parameters from the PLC application during operation.

General Principle for Using Explicit Instructions

The diagram below shows the different types of explicit exchanges that can be made between the application and module.



(1) Only with READ_STS and WRITE_CMD instructions.

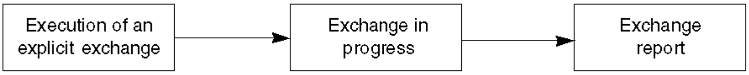
Managing Exchanges

During an explicit exchange, check performance to see that the data is only taken into account when the exchange has been correctly executed.

To do this, two types of information is available:

- information concerning the exchange in progress *(see page 71)*
- the exchange report *(see page 72)*

The following diagram describes the management principle for an exchange.



NOTE: In order to avoid several simultaneous explicit exchanges for the same channel, it is necessary to test the value of the word EXCH_STS (`%MWr.m.c.0`) of the IODDT associated to the channel before calling any EF addressing this channel.

Management of Exchanges and Reports with Explicit Objects

At a Glance

When data is exchanged between the PLC memory and the module, the module may require several task cycles to acknowledge this information. All IODDTs use two words to manage exchanges:

- `EXCH_STS` (`%MWr.m.c.0`): exchange in progress
- `EXCH_RPT` (`%MWr.m.c.1`): report

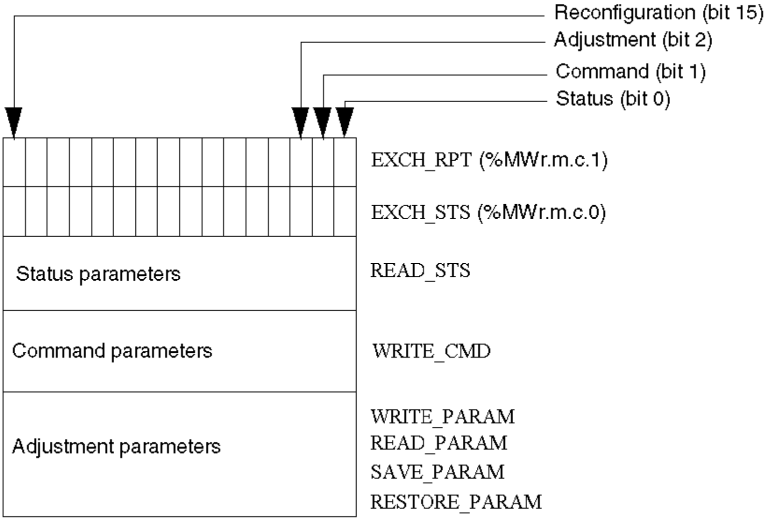
NOTE:

Depending on the localization of the module, the management of the explicit exchanges (`%MW0.0.MOD.0.0` for example) will not be detected by the application:

- For in-rack modules, explicit exchanges are done immediately on the local PLC Bus and are finished before the end of the execution task. So, the `READ_STS`, for example, is always finished when the `%MW0.0.mod.0.0` bit is checked by the application.
- For remote bus (Fipio for example), explicit exchanges are not synchronous with the execution task, so the detection is possible by the application.

Illustration

The illustration below shows the different significant bits for managing exchanges:



Description of Significant Bits

Each bit of the words `EXCH_STS` (`%MWr.m.c.0`) and `EXCH_RPT` (`%MWr.m.c.1`) is associated with a type of parameter:

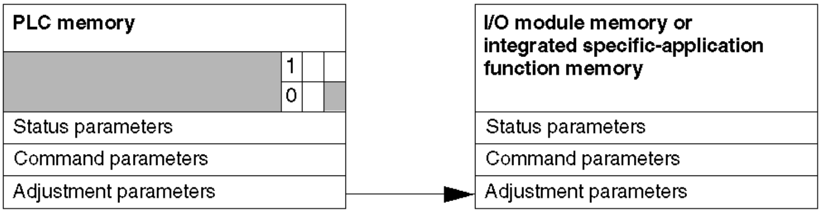
- Rank 0 bits are associated with the status parameters:
  - The `STS_IN_PROGR` bit (`%MWr.m.c.0.0`) indicates whether a read request for the status words is in progress.
  - The `STS_ERR` bit (`%MWr.m.c.1.0`) specifies whether a read request for the status words is accepted by the module channel.
- Rank 1 bits are associated with the command parameters:
  - The `CMD_IN_PROGR` bit (`%MWr.m.c.0.1`) indicates whether command parameters are being sent to the module channel.
  - The `CMD_ERR` bit (`%MWr.m.c.1.1`) specifies whether the command parameters are accepted by the module channel.
- Rank 2 bits are associated with the adjustment parameters:
  - The `ADJ_IN_PROGR` bit (`%MWr.m.c.0.2`) indicates whether the adjustment parameters are being exchanged with the module channel (via `WRITE_PARAM, READ_PARAM, SAVE_PARAM, RESTORE_PARAM`).
  - The `ADJ_ERR` bit (`%MWr.m.c.1.2`) specifies whether the adjustment parameters are accepted by the module. If the exchange is correctly executed, the bit is set to 0.
- Rank 15 bits indicate a reconfiguration on channel **c** of the module from the console (modification of the configuration parameters + cold start-up of the channel).
- The *r*, *m* and *c* bits indicates the following elements:
  - the **r** bit represents the rack number.
  - The **m** bit represents the position of the module in the rack.
  - The **c** bit represents the channel number in the module.

NOTE: **r** represents the rack number, **m** the position of the module in the rack, while **c** represents the channel number in the module.

NOTE: Exchange and report words also exist at module level `EXCH_STS` (`%MWr.m.MOD`) and `EXCH_RPT` (`%MWr.m.MOD.1`) as per IODDT type `T_GEN_MOD`.

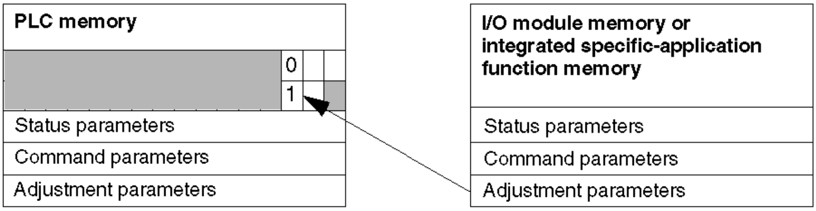
Example

Phase 1: Sending data by using the `WRITE_PARAM` instruction



When the instruction is scanned by the PLC processor, the **Exchange in progress** bit is set to 1 in `%MWr.m.c`.

Phase 2: Analysis of the data by the I/O module and report.



When the data is exchanged between the PLC memory and the module, acknowledgement by the module is managed by the `ADJ_ERR` bit (`%MWr.m.c.1.2`).

This bit makes the following reports:

- **0:** correct exchange
- **1:** faulty exchange)

NOTE: There is no adjustment parameter at module level.

Execution Indicators for an Explicit Exchange: EXCH_STS

The table below shows the control bits of the explicit exchanges: `EXCH_STS` (`%MWr.m.c.0`)

Standard symbol	Type	Access	Meaning	Address
STS_IN_PROGR	BOOL	R	Reading of channel status words in progress	%MWr.m.c.0.0
CMD_IN_PROGR	BOOL	R	Command parameters exchange in progress	%MWr.m.c.0.1
ADJ_IN_PROGR	BOOL	R	Adjust parameters exchange in progress	%MWr.m.c.0.2
RECONF_IN_PROGR	BOOL	R	Reconfiguration of the module in progress	%MWr.m.c.0.15

NOTE: If the module is not present or is disconnected, explicit exchange objects (`READ_STS` for example) are not sent to the module (`STS_IN_PROG` (%MWr.m.c.0.0) = 0), but the words are refreshed.

Explicit Exchange Report: EXCH_RPT

The table below shows the report bits: `EXCH_RPT` (`%MWr.m.c.1`)

Standard symbol	Type	Access	Meaning	Address
STS_ERR	BOOL	R	Error reading channel status words (1 = failure)	%MWr.m.c.1.0
CMD_ERR	BOOL	R	Error during a command parameter exchange (1 = failure)	%MWr.m.c.1.1
ADJ_ERR	BOOL	R	Error during an adjust parameter exchange (1 = failure)	%MWr.m.c.1.2
RECONF_ERR	BOOL	R	Error during reconfiguration of the channel (1 = failure)	%MWr.m.c.1.15

Counting Module Use

The following table describes the steps realised between a Couting Module and the system after a power-on.

Step	Action
1	Power on.
2	The system sends the configuration parameters.
3	The system sends the adjust parameters by WRITE_PARAM method. **Note:** When the operation is finished, the bit %MWr.m.c.0.2 switches to 0.

If, in the begining of your application, you use a WRITE_PARAM command, you must wait until the bit %MWr.m.c.0.2 switches to 0.

Section 4.2
Language Objects and Generic IODDT Applicable to Communication Protocols

About this Section

This section presents the language objects and generic IODDT applicable to all communication protocols except Fipio and Ethernet.

What Is in This Section?

This section contains the following topics:

Details of IODDT Implicit Exchange Objects of Type T_COM_STS_GEN

Introduction

The following table presents the IODDT implicit exchange objects of type `T_COM_STS_GEN` applicable to all communication protocols except Fipio and Ethernet.

Error Bit

The table below presents the meaning of the detected error bit `CH_ERROR` (`%Ir.m.c.ERR`).

Standard Symbol	Type	Access	Meaning	Address
CH_ERROR	EBOOL	R	Communication channel error bit.	%Ir.m.c.ERR

Details of IODDT Explicit Exchange Objects of Type T_COM_STS_GEN

Introduction

This section presents the T_COM_STS_GEN type IODDT explicit exchange objects applicable to all communication protocols except Fipio and Ethernet. It includes the word type objects whose bits have a specific meaning. These objects are presented in detail below.

Sample Variable Declaration: IODDT_VAR1 of type T_COM_STS_GEN

Observations

- In general, the meaning of the bits is given for bit status 1. In specific cases an explanation is given for each status of the bit.
- Not all bits are used.

Execution Flags of an Explicit Exchange: EXCH_STS

The table below shows the meaning of channel exchange control bits from channel EXCH_STS (%MWr.m.c.0).

Standard Symbol	Type	Access	Meaning	Address
STS_IN_PROGR	BOOL	R	Reading of channel status words in progress.	%MWr.m.c.0.0
CMD_IN_PROGR	BOOL	R	Current parameter exchange in progress.	%MWr.m.c.0.1
ADJ_IN_PROGR	BOOL	R	Adjustment parameter exchange in progress.	%MWr.m.c.0.2

Explicit Exchange Report: EXCH_RPT

The table below presents the meaning of the exchange report bits EXCH_RPT (%MWr.m.c.1).

Standard Symbol	Type	Access	Meaning	Address
STS_ERR	BOOL	R	Reading error for channel status words.	%MWr.m.c.1.0
CMD_ERR	BOOL	R	Error during command parameter exchange.	%MWr.m.c.1.1
ADJ_ERR	BOOL	R	Error during adjustment parameter exchange.	%MWr.m.c.1.2

Standard Channel Faults, CH_FLT

The table below shows the meaning of the bits of the status word CH_FLT (%MWr.m.c.2). Reading is performed by a READ_STS (IODDT_VAR1).

Standard Symbol	Type	Access	Meaning	Address
NO_DEVICE	BOOL	R	No device is working on the channel.	%MWr.m.c.2.0
1_DEVICE_FLT	BOOL	R	A device on the channel is inoperative.	%MWr.m.c.2.1
BLK	BOOL	R	Terminal block not connected.	%MWr.m.c.2.2
TO_ERR	BOOL	R	Time out exceeded anomaly.	%MWr.m.c.2.3

Standard Symbol	Type	Access	Meaning	Address
INTERNAL_FLT	BOOL	R	Internal detected error or channel self-testing.	%MWr.m.c.2.4
CONF_FLT	BOOL	R	Different hardware and software configurations.	%MWr.m.c.2.5
COM_FLT	BOOL	R	Interruption of the communication with the PLC.	%MWr.m.c.2.6
APPLI_FLT	BOOL	R	Application detected error (adjustment or configuration).	%MWr.m.c.2.7

Section 4.3
Language Objects of the IODDT Specific Modbus Plus

Object of this Sub-chapter

This sub-chapter describes the implicit and explicit language objects of the IODDT specific Modbus Plus, `T_COM_MBP`.

What Is in This Section?

This section contains the following topics:

Details of the Implicit Exchange Objects of the IODDT of the T_COM_MBP Type

At a Glance

The tables below present the implicit exchange objects of the IODDT of the T_COM_MBP type that are applicable to the Modbus Plus communication.

Error Bit

The following table shows the meaning of the error bit CH_ERROR (%I0.0.1.ERR).

Standard symbol	Type	Access	Meaning	Address
CH_ERROR	EBOOL	R	Communication channel error bit	%I0.0.1.ERR

Refresh Indicators

The following table presents the meanings of the word bits, the refresh indicators of the global data of stations 1 to 64.

Standard symbol	Type	Access	Meaning	Address
STA_STS_1 to STA_STS_16	BOOL	R	Presence of station 1 to 16 respectively when exchanging data.	%IWr.m.c.2.0 to %IWr.m.c.2.15
STA_STS_17 to STA_STS_32	BOOL	R	Presence of station 17 to 32 respectively when exchanging data.	%IWr.m.c.3.0 to %IWr.m.c.3.15
STA_STS_33 to STA_STS_48	BOOL	R	Presence of station 33 to 48 respectively when exchanging data.	%IWr.m.c.4.0 to %IWr.m.c.4.15
STA_STS_49 to STA_STS_64	BOOL	R	Presence of station 49 to 64 respectively when exchanging data.	%IWr.m.c.5.0 to %IWr.m.c.5.15

NOTE: When set to 1, the bit from rank i indicates that the station’s global data is operational. The station is participating in the token exchange.

NOTE: where i = 0 to 15 of word

- %IWr.m.c.2.i for stations 1 to 16
- %IWr.m.c.3.i for stations 17 to 32
- %IWr.m.c.4.i for stations 33 to 48
- %IWr.m.c.5.i for stations 49 to 64

NOTE: If station i is disconnected, the bit from rank i is reset to 0 only after the global data has been read by the appplication using the EF "Read_Gdata" on this station or by a STOP/RUN from PLC.

NOTE: The use of STA_STS_i to test the presence of station i on Modbus + is possible only if EF Read_Gdata has been executed in the current cycle.

Indicators of Availability and Presence of Specific Inputs

The table below presents the indicators of availability and presence of specific inputs of stations on the network.

Standard symbol	Type	Access	Meaning	Address
STS_IN_STAT_1_8	BOOL	R	Byte 0: the specific inputs of all remote stations are available ● Bit 0 = 0 : the specific inputs are not available ● Bit 0 = 1 : the specific inputs are available ● Bits 1 to 7 : reserved Byte 1: a bit at 1 indicates the presence of a station that is transmitting specific inputs. Stations 1 to 8.	%IWr.m.c.6
IN_STAT_9_24	BOOL	R	A bit at 1 indicates the presence of a station that is transmitting specific inputs. Stations 9 to 24.	%IWr.m.c.7
IN_STAT_25_40	BOOL	R	A bit at 1 indicates the presence of a station that is transmitting specific inputs. Stations 25 to 40.	%IWr.m.c.8
IN_STAT_41_56	BOOL	R	A bit at 1 indicates the presence of a station that is transmitting specific inputs. Stations 41 to 56.	%IWr.m.c.9
IN_ST57_64_PRES1_8	BOOL	R	Byte 0: a bit at 1 indicates the presence of a station that is transmitting specific inputs. Stations 57 to 64. Byte 1: a bit at 1 indicates the presence of new specific inputs. Stations 1 to 8.	%IWr.m.c.10
IN_PRES_9_24	BOOL	R	A bit at 1 indicates the presence of new specific inputs. Stations 9 to 24.	%IWr.m.c.11
IN_PRES_25_40	BOOL	R	A bit at 1 indicates the presence of new specific inputs. Stations 25 to 40.	%IWr.m.c.12
IN_PRES_41_56	BOOL	R	A bit at 1 indicates the presence of new specific inputs. Stations 41 to 56.	%IWr.m.c.13
IN_PRES_57_64	BOOL	R	A bit at 1 indicates the presence of new specific inputs. Stations 57 to 64.	%IWr.m.c.14

Indicators of Availability and Presence of Specific Inputs

The table below presents the indicators of availability and presence of specific inputs of stations on the network.

Standard symbol	Type	Access	Meaning	Address
STS_OUT_STAT_1_8	BOOL	R	Byte 0: the specific outputs of all remote stations are available ● Bit 0 = 0 : the specific inputs are not available ● Bit 0 = 1 : the specific inputs are available ● Bits 1 to 7 : reserved Byte 1: a bit at 1 indicates the presence of a station that is receiving specific outputs. Stations 1 to 8.	%IWr.m.c.15

Standard symbol	Type	Access	Meaning	Address
OUTP_STAT_9_24	BOOL	R	A bit at 1 indicates the presence of a station that is receiving specific outputs. Stations 9 to 24.	%IWr.m.c.16
OUTP_STAT_25_40	BOOL	R	A bit at 1 indicates the presence of a station that is receiving specific outputs. Stations 25 to 40.	%IWr.m.c.17
OUTP_STAT_41_56	BOOL	R	A bit at 1 indicates the presence of a station that is receiving specific outputs. Stations 41 to 56.	%IWr.m.c.18
OUTP_STAT_41_56	BOOL	R	A bit at 1 indicates the presence of a station that is receiving specific outputs. Stations 57 to 64.	%IWr.m.c.19

Details of the Explicit Exchange Objects of the IODDT of the T_COM_MBP Type

At a Glance

This part presents the explicit exchange objects of the IODDT of the T_COM_MBP type that are applicable to the Modbus Plus communication. This groups together word type objects, the bits of which have a particular meaning. These objects are described in detail below.

Example of declaring a variable: **IODDT_VAR1** of type T_COM_MBP

Notes

- Generally speaking, the meaning of the bits is given for state 1 of this bit. In specific cases an explanation is given for each status of the bit.
- Not all bits are used.

Explicit Exchange Execution Indicator: EXCH_STS

The following table presents the meanings of the exchange control bits of the channel EXCH_STS (%MWr.m.c.0).

Standard symbol	Type	Access	Meaning	Address
STS_IN_PROGR	BOOL	R	Reading of the status words of the current channel.	%MWr.m.0.0
CMD_IN_PROGR	BOOL	R	Command parameters exchange in progress.	%MWr.m.c.0.1
ADJ_IN_PROGR	BOOL	R	Command parameters adjustment in progress.	%MWr.m.c.0.2

Explicit Exchange Report: EXCH_RPT

The table below presents the meanings of the report bitsEXCH_RPT (%MWr.m.c.1).

Standard symbol	Type	Access	Meaning	Address
STS_ERR	BOOL	R	Channel status words reading error.	%MWr.m.c.1.0
CMD_ERR	BOOL	R	Fault during a command parameters exchange.	%MWr.m.c.1.1
ADJ_ERR	BOOL	R	Fault during an adjustment parameters exchange.	%MWr.m.c.1.2

Standard Channel Faults, CH_FLT

The following table presents the meanings of the bits of the CH_FLT status word (%MWr.m.c.2). The reading is performed by a **READ_STS** (**IODDT_VAR1**).

Standard symbol	Type	Access	Meaning	Address
NO_DEVICE	BOOL	R	No device is working on the channel.	%MWr.m.c.2.0
1_DEVICE_FLT	BOOL	R	A device on the channel is faulty.	%MWr.m.c.2.1
BLK	BOOL	R	Terminal strip error (not connected).	%MWr.m.c.2.2
TO_ERR	BOOL	R	Timeout error (faulty wiring).	%MWr.m.c.2.3
INTERNAL_FLT	BOOL	R	Internal fault or channel self-test.	%MWr.m.c.2.4
CONF_FLT	BOOL	R	Different hardware and software configurations.	%MWr.m.c.2.5
COM_FLT	BOOL	R	Problem communicating with the PLC.	%MWr.m.c.2.6
APPLI_FLT	BOOL	R	Application fault (adjustment or configuration fault).	%MWr.m.c.2.7

Language Objects Associated with Configuration

At a Glance

This page describes all configuration language objects enabling Modbus Plus communication which can be displayed by the application program. These objects do not belong to the IODDT's of the channel.

Internal Constants

The following table describes the internal constants:

Object	Type	Access	Meaning
%KWr.m.c.0	INT	R	Type of channel: Byte 0 =38 for the Modbus Plus communication
%KWr.m.c.1	INT	R	Byte 0: station address
%KWr.m.c.2	INT	R	Activation of the Peer Cop utility: Byte 0 = 1: no Peer Cop utility Byte 0 = 2: Peer Cop utility)
		R	Behavior of Timeout Byte 1 = 1: inputs reset to zero Byte 1 = 2: inputs maintained at last value
%KWr.m.c.3	INT	R	Address of the first internal word %MW used for the reception of specific inputs
%KWr.m.c.4	INT		Address of the first internal word %MW used for the sending of specific outputs
%KWr.m.c.5	INT	R	Number of specific output words to be sent to connection point 1 and 2 ● byte 0: connection point 1 ● byte 1: connection point 2
%KWr.m.c.6	INT	R	Number of specific output words to be sent to connection point 3 and 4 ● byte 0: connection point 3 ● byte 1: connection point 4
...			...
%KWr.m.c.36	INT	R	Number of specific output words to be sent to connection point 63 and 64 ● byte 0: connection point 63 ● byte 1: connection point 64
%KWr.m.c.37	INT	R	Number of specific input words to be received at connection point 1 and 2 ● byte 0: connection point 1 ● byte 1: connection point 2

Object	Type	Access	Meaning
%KWr.m.c.38	INT	R	Number of specific input words to be received at connection point 3 and 4 ● byte 0: connection point 3 ● byte 1: connection point 4
...			...
%KWr.m.c.36	INT	R	Number of specific input words to be received at connection point 63 and 64 ● byte 0: connection point 63 ● byte 1: connection point 64
%KWr.m.c.69	INT	R	Time interval of the Timeout of the Peer Cop utility ● be 0 = 1 to 100: from 20 ms to 2 s

Section 4.4
The IODDT Type T_GEN_MOD Applicable to All Modules

Details of the Language Objects of the T_GEN_MOD-Type IODDT

At a Glance

All the modules of Premium PLCs have an associated IODDT of type `T_GEN_MOD`.

Observations

- In general, the meaning of the bits is given for bit status 1. In specific cases an explanation is given for each status of the bit.
- Not all bits are used.

List of Objects

The table below presents the objects of the IODDT:

Standard symbol	Type	Access	Meaning	Address
MOD_ERROR	BOOL	R	Module error bit	%Ir.m.MOD.ERR
EXCH_STS	INT	R	Module exchange control word.	%MWr.m.MOD.0
STS_IN_PROGR	BOOL	R	Reading of status words of the module in progress.	%MWr.m.MOD.0.0
EXCH_RPT	INT	R	Exchange report word.	%MWr.m.MOD.1
STS_ERR	BOOL	R	Fault when reading module status words.	%MWr.m.MOD.1.0
MOD_FLT	INT	R	Internal error word of the module.	%MWr.m.MOD.2
MOD_FAIL	BOOL	R	Internal error, module failure.	%MWr.m.MOD.2.0
CH_FLT	BOOL	R	Faulty channel(s).	%MWr.m.MOD.2.1
BLK	BOOL	R	Terminal block fault.	%MWr.m.MOD.2.2
CONF_FLT	BOOL	R	Hardware or software configuration fault.	%MWr.m.MOD.2.5
NO_MOD	BOOL	R	Module missing or inoperative.	%MWr.m.MOD.2.6
EXT_MOD_FLT	BOOL	R	Internal error word of the module (Fipio extension only).	%MWr.m.MOD.2.7
MOD_FAIL_EXT	BOOL	R	Internal fault, module unserviceable (Fipio extension only).	%MWr.m.MOD.2.8
CH_FLT_EXT	BOOL	R	Faulty channel(s) (Fipio extension only).	%MWr.m.MOD.2.9

Standard symbol	**Type**	**Access**	**Meaning**	**Address**
BLK_EXT	BOOL	R	Terminal block fault (Fipio extension only).	%MWr.m.MOD.2.10
CONF_FLT_EXT	BOOL	R	Hardware or software configuration fault (Fipio extension only).	%MWr.m.MOD.2.13
NO_MOD_EXT	BOOL	R	Module missing or inoperative (Fipio extension only).	%MWr.m.MOD.2.14

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