Profibus Remote Master

User Manual

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Schneider Electric

Table of Contents

I. 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 an imminently hazardous situation, which, if not avoided, **will result in** death, serious injury, or equipment damage.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result in** death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result in** injury or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result in** equipment damage.

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.

II. General Safety Instructions

For the user

1. General information

The current documentation is intended for persons technically qualified to install, use and service the products described herein. It contains the necessary information for proper use of the products. However, for advanced use of our products, please contact your nearest dealer for additional information.

In addition to reading the instructions in the current document, please pay particular attention to the specific product manuals.

The content of this documentation is not binding and cannot extend or limit warranties.

2. Personnel qualifications

Only **qualified persons** are authorized to install, use and service the products. Use by unqualified persons or failure to follow the safety instructions of this document, the manuals and/or those affixed to the devices, can result in irremediable harm or damage to persons and equipment. The following personnel are deemed to be **qualified persons** for:

• Equipment operation: Personnel who operate the machines and/or processes via a Human Machine Interface connected to the PLC. Operators cannot modify the PLC configuration (hardware or software) or its application program. The PLC must be used by persons who have received training and have been informed of the major risks involved in working in an industrial environment.

• Preventive and corrective maintenance: Persons who modify the PLC hardware configuration and/or its application program and install the software updates supplied by the manufacturer. These persons must:

- be trained in PLC programming and operation and

- have the experience and technical knowledge required to be aware of the risks (electrical hazards in particular) involved in their job and the ways of reducing these risks for themselves, third parties and the equipment being used.

3. Usage compliance

The products described in the current documentation **comply with currently applicable European Directives** (CE marking). However, they can only operate correctly with the applications for which they were intended as described in the documentation, and with approved products.

As a general rule, if all the handling, transportation, and storage recommendations and installation, operation and maintenance instructions are followed, the products will operate correctly without risk for personnel or hardware.

4. Device installation and set-up

It is important to follow the rules below when installing and setting up the devices. If system installation includes devices more than thirty meters away from each other, the basic cabling rules set out in the TSX DG GND user guide must also be closely followed.

• Strict compliance with the safety instructions provided in this documentation or on the equipment to be installed and implemented, is absolutely essential.

• Make sure that the installation is carried out in compliance with regulations of the user country,

Install the equipment in a suitable environment:

- **Open equipment** must be incorporated into other units designed for safety protection (cabinets, chests, etc.). IP54 protection, for instance means that the device must be protected from metal dusts,

- **Closed equipment** may be installed in two ways:

- In a casing (cabinet, chest) or,

- Directly without any additional protection, if the PLCs or associated systems (power supply modules, etc.) already carry a protection index equivalent to IP20 or higher. This type of installation is implemented in premises with restricted access and a low level of pollution, not exceeding 2, such as control stations or rooms without any machines or activities that generate dust or any other metal particles. The outside walls are therefore deemed to be the PLC's casing.

• If the device is connected permanently to a mains supply, the wiring system must include an emergency cut-out and a surge protection and ground fault circuit-breaker. If this is not the case, ground the mains plug with easy access. **Always connect the device to the protective earth (PE) in compliance with existing standards** (for example: use the green/yellow wires in accordance with the NFC 15 100 standard)**.**

• LV circuits must have a protective earth connection to ensure dangerous voltage detection.

• Before powering up the device, check that the nominal voltage is the same as the mains voltage.

• If the device requires a 24 or 48 V DC power supply, protect the low voltage circuits. Only use power supplies which comply with existing standards.

• Check that the power voltages are within the tolerance ranges defined in the technical specifications for the devices.

• Always ensure that power restoration (immediate, hot or cold) will not create a hazard for personnel or equipment.

• Ensure that emergency stop devices remain effective in any equipment operation mode, even when abnormal (for example, in the event of a cut wire). Resetting these devices should not result in uncontrolled or undefined restarts.

• Position the signal cables so that the automation functions will not be disrupted by any capacitive, inductive or electromagnetic influences, etc.

• Install the automation devices and their controlling devices so that they are protected against any adverse incident.

• Adequate safety precautions must be applied to inputs and outputs to prevent the lack of signals from causing undefined states in the automation devices.

5. Device operation

Because PLC’s are components of a control system, the safety of the entire automated system, including that of the installation and the application, cannot be dealt with in this document. For further information, see IEC 1131-4, describing risk reduction measures for PLC users.

The system designer should use **devices external to the PLC** to provide protection against un-signaled active internal PLC faults which are deemed dangerous to the application. Fault remediation may require various technologies such as mechanical, electromagnetic, pneumatic or hydraulic solutions (i.e.: direct wiring of the limit switch and emergency stop detectors on movement control contactor coils).

To protect against dangerous faults that can affect the output and pre-actuator circuits, it is advisable to make use of the PLC's extensive processing capacity (i.e.: it’s ability to use input control to monitor the proper execution of program commands).

See the documentation of the specific products involved for more information on operation safety.

6. Electrical, mechanical and thermal specifications

Detailed information about the electrical, mechanical and thermal specifications of the device is available in the associated technical documentation (installation manuals, service instructions).

7. Environmental conditions

In the industry, the micro-environmental conditions surrounding the electronic devices can be very diverse. For this reason, the following rules concerning the PLCs and their associated modules must be followed.

There are two types of equipment:

• **"Open"** equipment can have an active and accessible electrical component and must be incorporated into other units designed for safety protection (cabinets, chests, etc.).

• **"Closed"** equipment is enclosed on all sides, except maybe on the mounting side to avoid the personnel coming into accidental contact with active and mobile parts inside the device and to protect it

from foreign body penetration (average size: IEC 61131-2), in compliance with the recommendations relating to mechanical rigidity, inflammability and stability (if applicable). This kind of equipment has a degree of protection equivalent to at least IP20.

8. Preventive and corrective maintenance

8.1 Servicing

• When replacing parts or components, only use factory approved parts.

• In all cases, before servicing a device, disconnect the power supply from the device (unplug the power cord or open the power cut-out device).

• Before servicing an onsite mechanical device, disconnect its power supply and mechanically lock the moving parts.

• Before removing a module, a memory cartridge, a PCMCIA card, etc., check the documentation to see if this operation should be carried out with the power off or on. Always closely follow the instructions given in the documentation.

• On positive logic outputs or negative logic inputs, take all the necessary precautions to prevent any disconnected wires from coming into contact with the mechanical ground (risk of unwanted commands).

8.2 Replacing and recycling used batteries

When replacing batteries, use the same type of batteries and place used, spent or damaged batteries with toxic waste. Do not place in fire, open, recharge or weld lithium and mercury batteries as the may explode.

Directive 91/157/EEC of the March 18th 1991 Council relating to batteries and accumulators containing certain hazardous materials.

8.3 Product end-of-life

Contact your local dealer for information on how to dispose of used products in compliance with current regulations.

III. About the Book

At a Glance

Document Scope

This manual describes how to install and configure the TCSEGPA23F14F communication module, hereafter called Profibus Remote Master or PRM.

Related Documents

Title of documentation	Reference Number
Ethernet Network Modules – User Manual	35006192.11
Unity Pro – Operating Modes (Chapter FDT container)	33003101.07
Modicon M340 Communication – Ethernet (Chapter on Software configuration / IO scanner)	31007131.04
Premium Communication – Ethernet (Chapter on Software configuration / IO scanner)	35006192.09
Quantum Communication – Ethernet (Chapter on Software configuration / IO scanner)	33002467.03

Validity Note

The data and illustrations found in this book are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

Product related Warnings

Schneider Electric assumes no responsibility for any errors that may appear in this document. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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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 ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When controllers are used for applications with technical safety requirements, please follow the relevant instructions.

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

Failure to observe this product related warning can result in injury or equipment damage.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com

IV. PRM System Overview

Scope of this Part

This part contains the overview of the PRM and its operating environment.

What's in this Part?

This part contains the following chapters:

1. Presentation

Overview

This chapter provides an overview of the Profibus Remote Master (PRM) module.

General Description

The PRM is a standalone module designed to provide Profibus DPV0 & DPV1 master capability to the M340, Premium and Quantum ranges. It is integrated in the PLC architecture as a Modbus TCP slave.

The Profibus configuration is done using the FDT/DTM technology. A software package of 3 DTMs is delivered with the PRM:

- the “PRM Master DTM” to be used inside Unity Pro, as a Profibus configuration tool capable of configuring the PRM to manage cyclic exchanges,
- the “Generic Profibus Device DTM” for devices delivered without a Device DTM but having a GSD file,
- the “PRM CommDTM” to be used inside any FDT frame for communicating with Profibus devices from a Device DTM through the PRM.

The PRM module has a Premium single width module form factor. It can be mounted standalone on a DIN rail, a grid or a panel, or as a Premium module on the Premium rack.

The PRM Master DTM provides all of the elements for the PRM module configuration and control by the PLC inside Unity Pro, including the Profibus configuration, the scan of the PRM process image by the PLC on Ethernet and all Profibus device variable creation.

Several PRM modules can be connected to the same Ethernet network.

Key features

Key features of the PRM module:

- Provides transparent access from Unity Pro or asset management tools to the Profibus devices
- PROFIBUS DP V0 & DPV1 Master
- Up to 125 Profibus devices with a total of less than 4 Kbytes input data and 4 Kbytes output data
- 2 Ethernet ports with an embedded switch
- SNMP V2 agent, Schneider Private MIB
- Faulty Device Replacement (FDR)
- Compatible with M340, Premium and Quantum
- Compatibility with Premium and Quantum Hot Stand By architectures

Key features of the PRM Master DTM

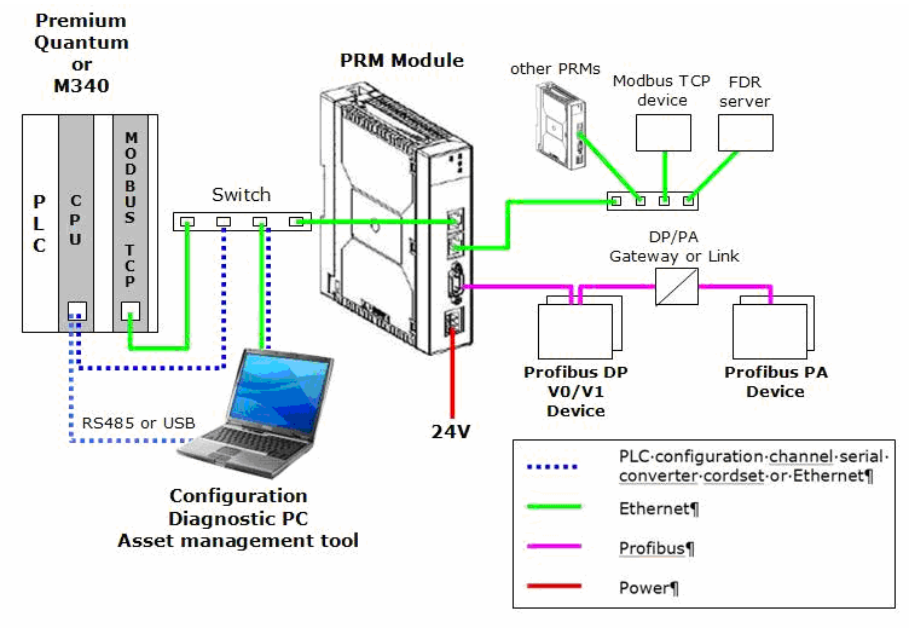
- Profibus topology description by instantiating Device DTMs in the FDT frame browser
- Profibus network scan capability
- PLC I/O Scanner lines automatically configured in Unity Pro to scan the PRM process image
- Ready-to-use structured variables automatically created in Unity Pro for the Profibus devices
- Configuration saved as part of the Unity Pro application

2. System Overview

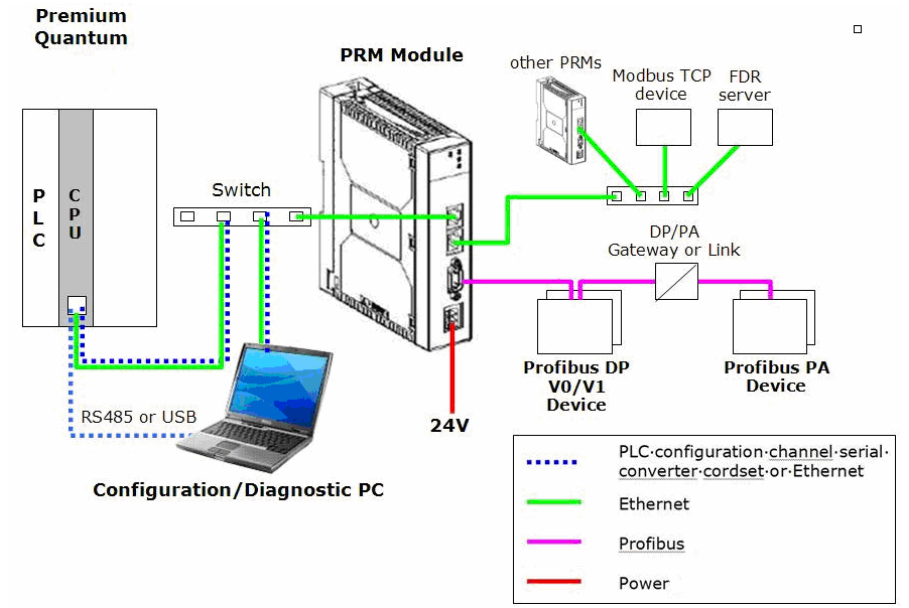
Overview

This section presents an overview of the system in which the PRM is integrated on a hardware and software point of view.

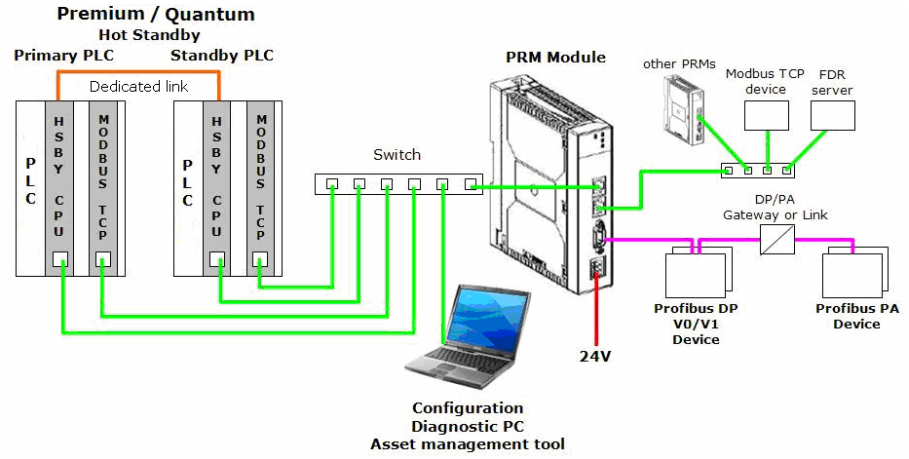
PRM module in its operating environment



Using an Ethernet module

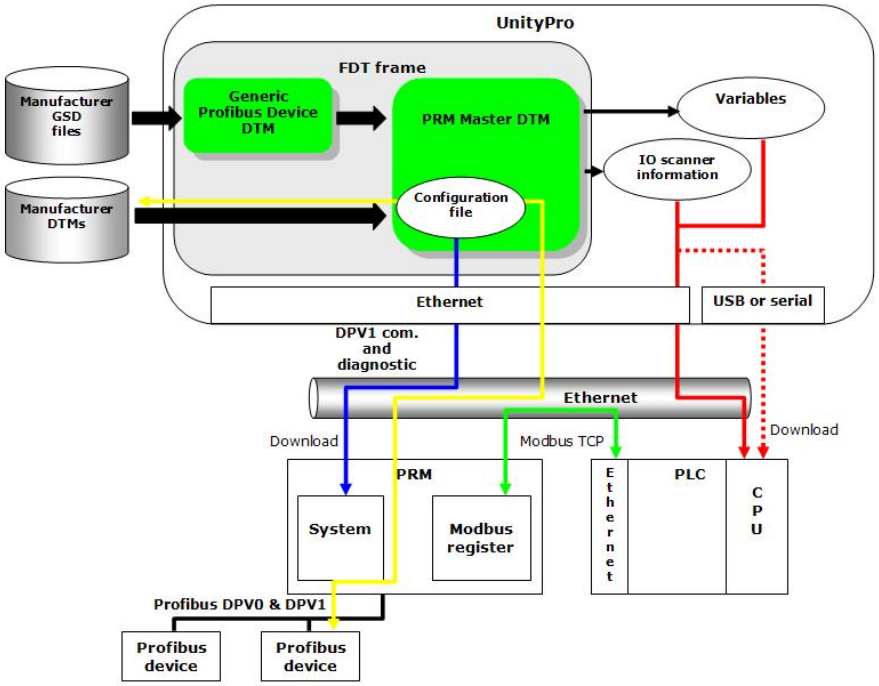


Using the Ethernet port of the CPU

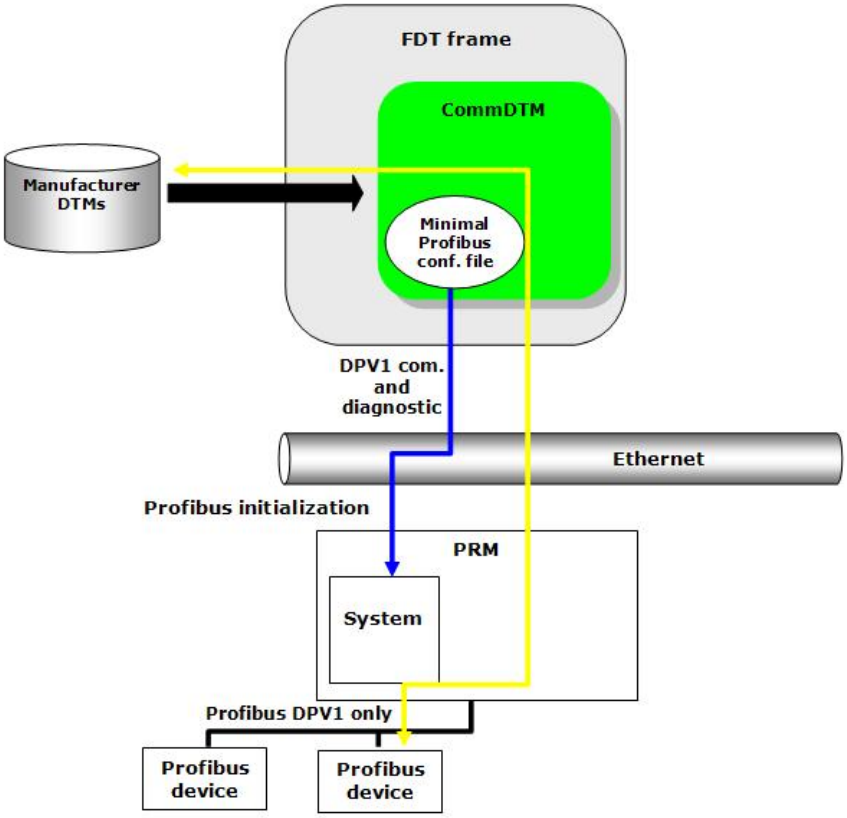


Hot Standby architecture

PRM Master DTM and its environment



PRM Comm DTM and its environment



Limitations

- Only one Master DTM can be connected to the PRM at a time
- Up to three Comm DTMs can be connected simultaneously. Any further connections will be denied
- Each connected DTM can issue up to 8 requests simultaneously (so up to 32 requests if 4 DTMs are connected).

3. When using Master DTM or CommDTM

Scope of this Chapter

This chapter describes the features of PRM Master DTM and CommDTM and the conditions of their use.

What's in this Chapter?

This chapter contains the following sections:

PRM Master DTM

At a Glance

Presentation of the PRM Master DTM interface and its Profibus DP services management

Presentation

FDT frame	Comm DTM	Device DTM
Unity Pro	PRM Master DTM	Manufacturer
		Generic

The PRM Master DTM is Included in the PRM module software package. It is a Communication DTM (Device Type Manager).
It is designed for use with Unity Pro which is a FDT frame application.

In addition to its standard CommDTM features, it offers the following ones:

- Configuration of the PRM (General configuration, Profibus DPV0 and DPV1 configuration, IO mapping),
- Generation of configuration file and download into the PRM,
- PRM module diagnostics (General and Profibus information) and Profibus device diagnostics,
- Profibus fieldbus discovery capability,
- Link with Unity Pro by automatically exporting device variable descriptions and generating Ethernet IO Scanner lines in the PLC configuration.

Also included is a Generic Profibus Device DTM, usable within Unity Pro in relation to the PRM master DTM. It enables the configuration of any Profibus device, for which no device DTM is available, as long as it has a GSD file. This DTM will parse the GSD file to evaluate information needed to start the device by a DPV0 and DPV1 master and to get its IO Mapping.

Profibus DP services

DP services	Class	Yes/No	From where
DPV0	Class 1	Yes	PLC
	Class 2	Yes	PLC
DPV1	Class 1	Yes	PLC
	Class 2	Yes	PLC Master DTM Device DTM

PRM CommDTM

At a Glance

Presentation of the PRM CommDTM interface and its Profibus DP services management

Presentation

FDT frame	Comm DTM	Device DTM
Unity Pro	PRM CommDTM	Manufacturer
Pactware or Fieldcare		

The PRM CommDTM is included in the PRM module software package. It is a Communication DTM (Device Type Manager).

It enables communication from a Device DTM to the device through the PRM. Device DTMs use DPV1 class 2 requests.

The CommDTM provides the following features:

- Configuration of the PRM for DPV1 class 2 services when needed.
- Diagnostic of the PRM and of the devices declared in the FDT frame.
- Profibus fieldbus discovery capability.

The PRM CommDTM can be used in both Unity Pro and other FDT frame containers, especially Asset Management Tools.

Note: the PRM master DTM and PRM CommDTM can be used simultaneously inside Unity Pro:

- It is generally useful when Profibus network contains few devices which are not incorporated in the Data-exchange (cyclic) communication.
- It can also be a workaround for manufacturer device DTMs that do not provide correct device class 1 settings. In this case, the generic Profibus Device DTM based on the device GSD must be used with the PRM Master DTM. But the device DTM can be used also in parallel with the CommDTM.

Profibus DP services

DP services	Class	Yes/No	From where
DPV0	Class 1	No	
	Class 2	No	
DPV1	Class 1	No	
	Class 2	Yes	CommDTM

4. Hardware & Software requirements

Scope of this Chapter

This chapter contains the description of all hardware and software required for setting up the PRM module as well as its operating environment

What's in this Chapter?

This chapter contains the following sections:

Computer

Hardware

For the Master DTM, please refer to the Unity Pro requirements.

The following requirements are applicable for the CommDTM.

System with Microsoft Windows Vista Business Edition 32-bit
System: Pentium IV 2.4 GHz Processor or higher, recommended 3.0 GHz
RAM memory: 1 GB minimum; recommended: 2 GB
Hard disk: minimum available free space 8 GB, recommended 20 GB.

or

System with Microsoft Windows XP Professional Edition
System: Pentium 1.2GHz Processor or higher, recommended 3.0 GHz
RAM memory: 512 MB minimum; recommended: 1 GB
Hard disk: minimum available free space 8 GB, recommended 20 GB
Microsoft Internet Explorer 5.5 or higher

DVD-ROM drive (Writer recommended): for software installation.

Display: Minimum VGA (800x600). Recommended: SVGA (1024x768 or higher) with high color 24 bits.

Pointing device: Mouse or compatible devices.

Communication port and protocol: Ethernet TCP/IP (RJ45)

Software

Web Browser : Internet Explorer 5.5 or higher

PLC programming software: Unity Pro v5.0

FDT frame application:
- Unity Pro v5.0,
- or other FDT frame application for the CommDTM

PLCs

Model and reference

The PRM is compatible with the latest versions of the M340, Premium and Quantum CPUs.

The configuration must include a Modbus TCP Ethernet port to scan the PRM. It can be an Ethernet communication module (ETY or NOE) or the Premium / Quantum CPU embedded port where an IO scanner can be configured.

The PRM can be included in a Premium and Quantum hot standby architecture.

Please refer to the Release Notes for the minimum required versions of the CPU and Ethernet modules.

Profibus devices

Profibus DP and PA devices

Hardware:
PNO certified devices are recommended.
http://www.profibus.com/

Software:
Associated manufacturer Profibus DTM or GSD file
FDT Group certified Device DTMs are recommended.
http://www.fdtgroup.org/

Profibus DP/PA coupler

All types of couplers are supported:

- Segment coupler
- Gateway-type segment coupler
- DP/PA link

Gateway-type segment couplers are recommended:

- transparency on a software configuration point of view: PA devices are seen as DP devices
- No restriction on PROFIBUS PA data volume
- Support of PROFIBUS DP high transfer rates

Miscellaneous

Ethernet switch

The PRM module is equipped with an integrated 2-port Ethernet switch which is sufficient for common applications involving one PLC and one PRM. For larger applications with more than 1 PC or 1 PLC, an external multi-port Ethernet switch is recommended.

Power Supply

The PRM module requires an external 24V power supply to be connected to its power terminal block. If the PRM module is integrated in the same electrical cabinet as the PLC, it can be connected to the same power supply. You must ensure that the provided power is sufficient for the installation.

Cables

Ethernet cable: Cat. 5 STP (Shielded Twisted Pair) with RJ45 connectors conforming to TIA-EIA-568A.

Profibus cable: shielded twisted pair (refer to part "**Hardware: installation and characterisrics**" for cable characteristics).

V. Hardware: installation and characteristics

Scope of this Part

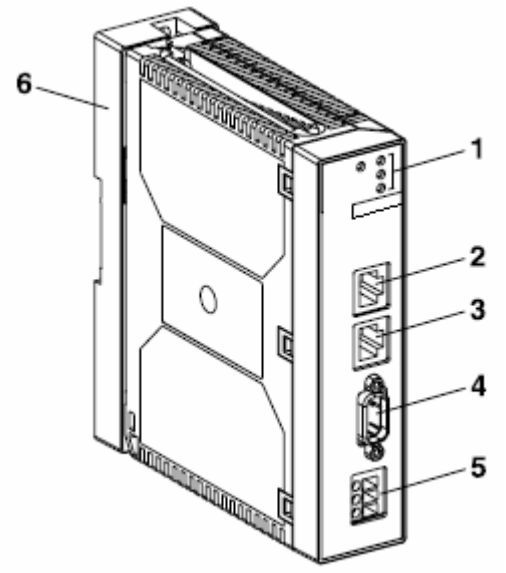
This part describes the hardware setup of the system and provides the PRM hardware characteristics.

What's in this Part?

This part contains the following chapters:

5. Overview

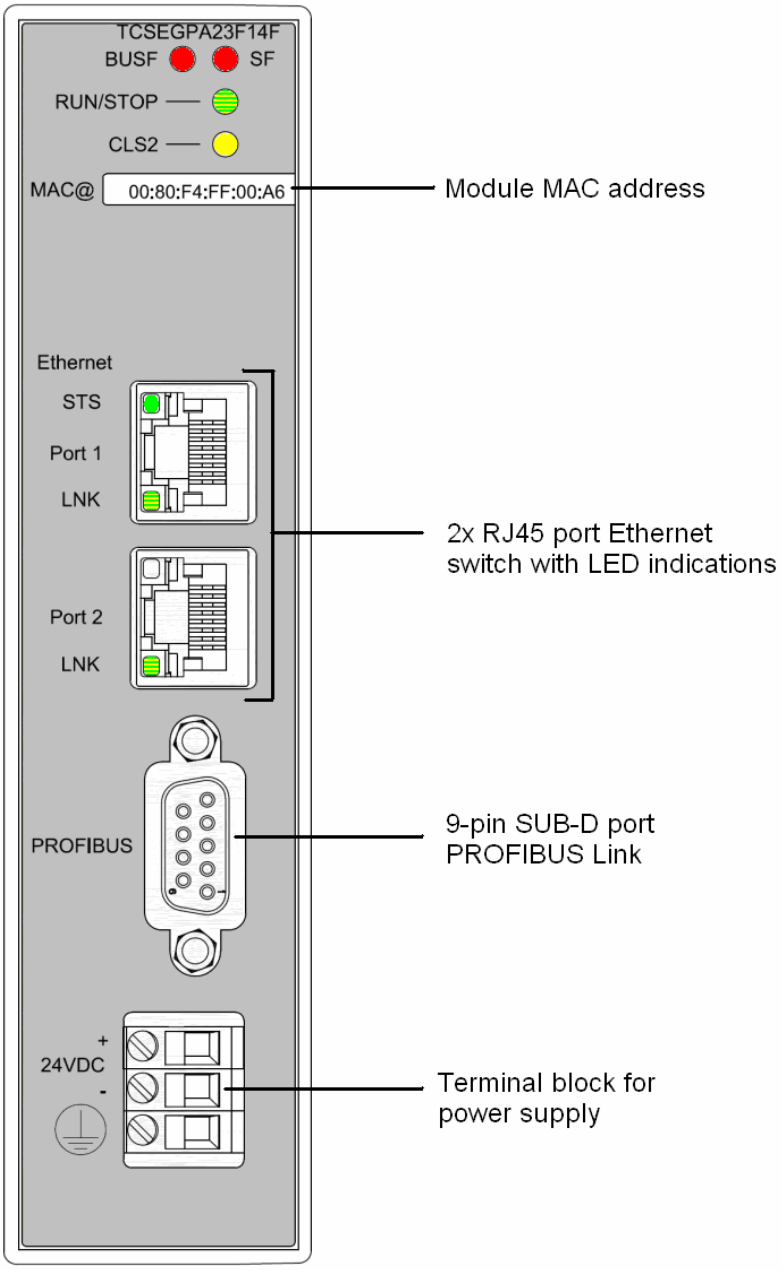
General view



PRM module

Reference	Description
1	4 LED indicators (See Diagnostics):
	- System fault detected
	- Bus fault detected
	- Run
	- CLS2
2 and 3	RJ45 connectors for Ethernet link (integrated switch)
4	9-pin SUB D connector for Profibus link
5	Screw terminal for 24 VDC power supply connection (See Power Supply)
6	Support plate for fixing the module directly to an AM1-DE200/DP200 DIN rail or to a Telequick AM1-PA pre-slotted plate

Front panel


TCSEGPA23F14F
BUSF
SF
RUN/STOP
CLS2
MAC@
00:80:F4:FF:00:A6
Module MAC address
Ethernet
STS
Port 1
LNK
Port 2
LNK
2x RJ45 port Ethernet
switch with LED indications
PROFIBUS
9-pin SUB-D port
PROFIBUS Link
+
24VDC
-
Terminal block for
power supply

6. Installation of the module

Scope of this Chapter

This chapter describes the hardware setup of the module.

What's in this Chapter?

This chapter contains the following sections:

PRM IP address setting, rotary switches

IP Addresses Assignment

Before setting up the PRM, it is recommended that you identify all existing Ethernet devices on the network along with their IP addresses and assign IP addresses to new devices.

Consult your system administrator to determine if you must configure new IP, gateway and subnet mask addresses. If the administrator assigns new address parameters, you must configure the module from your programming panel.

Device	IP Address
Computer	
PLC CPU	
PLC Ethernet module	
PRM (factory default IP address)	
PRM dedicated IP address	
FDR/DHCP server	

⚠ CAUTION

DUPLICATE ADDRESS HAZARD

Do not connect the module to your network until you have ensured that its IP address will be unique on the network. Two devices with the same IP address can cause unpredictable operation of your network.

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

Rotary switches

The rotary switches are on the back of the module and must be set up prior to mounting the PRM module. Once the module is mounted, they will no longer be accessible.

Their primary role is to define the PRM IP address assignment mode:

By default, the PRM is configured to use the **factory IP address**: 10.10.xxx.yyy, where xxx and yyy are the last two numbers of the MAC address in decimal format. The MAC address is written on the front panel of the module.

The lower switch is used to chose the IP addressing mode between ***DHCP*** and ***Stored***; the upper switch is used in the DHCP mode for additional information:

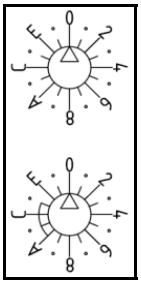
- **DHCP**: the IP address is requested by the PRM to a DHCP server using a hardware device name.
  The device name is a string
  - starting with the module reference: **TCSEGPA23F14F**
  - followed by a configurable numerical extension, in decimal from 000 to 159, based on the switches values:
    Extension = Tens value (upper switch setting x 10)
    + Unit value (Lower switch setting).

  For example if the upper switch is set to F (15) and the lower switch to 2, then the device name is TCSEGPA23F14F152

- **Stored**: the IP address is configured by the DTM ("Dedicated IP address" setting) and stored in the PRM as part of the PRM configuration file.

2 additional modes can also be triggered in some specific cases:

- **Clear IP**: temporary mode to delete the PRM configuration file including the stored IP address
- **Recovery**: specific Firmware update mode when the normal mode using the DTM is not working. To be used with the assistance of technical support only.



Switch	Position	Description/Meaning
Lower	0-9	**DHCP** mode selection Unit value of the device name extension (0,1,2,…9)
	A, B, C or D	**Stored** mode**:** IP comes with Conf file
	E	**Clear IP**: Configuration file deletion
	F	**Recovery**
Upper	0 to F (hexa)	Tens value of the device name extension (0, 1, .. 15). Used when the DHCP mode is selected.

Note: the factory default setting is: upper switch at 0, lower switch at C
Note: the rotary switches position is read at power up only.

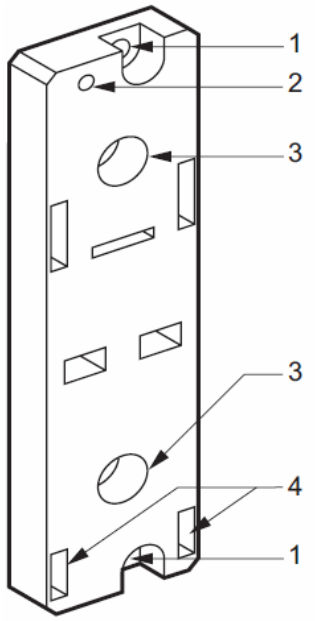
PRM module mounting

At a glance

The PRM module can be installed either:

- With its support plate as a standalone module on a DIN rail, grid or panel
- Without its support plate as a Premium module inside the rack

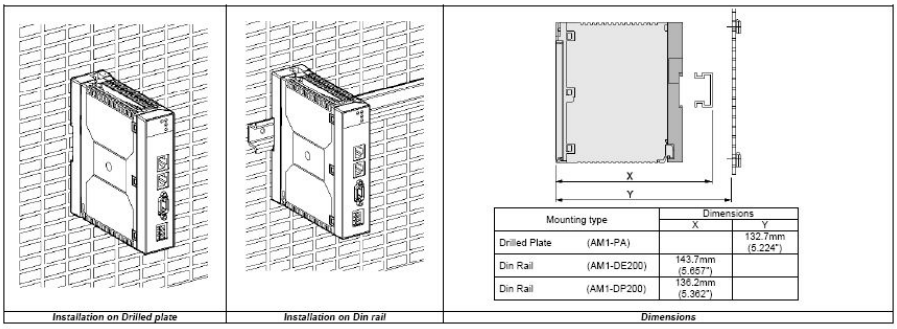
Support plate



Label	Meaning
1	Two holes diameter 5.5 mm (7/32 in) allowing the support plate to be fixed to a panel or to an AM1-PA pre-slotted plate, with a center distance of 140 mm (5.51 in). Tightening torque: 1 to 1.2 N-m (8.8 to 10.6 lb-in).
2	M4 fixing hole for securing the PRM module.
3	Two holes diameter 6.5 mm (0.26 in) allowing the support plate to be fixed to a panel or to an AM1-PA pre-slotted plate with a center distance of 88.9 mm (3.5 in).
4	Slots for positioning the pins located at the bottom and rear of the module

Mounting on a DIN rail or Plate

Illustration of the module mounted on an **AM1-DE200** or **AM1-DP200** rail or on an **AM1-PA** plate:



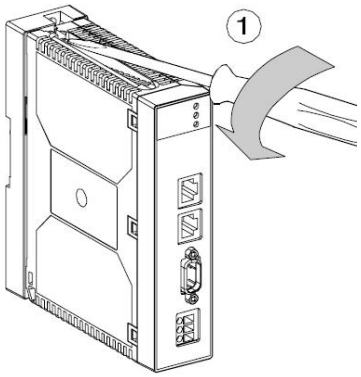
Mounting on a Premium rack

Mechanically, the PRM is mounted like other Premium modules. The support plate must be removed before mounting in this case.

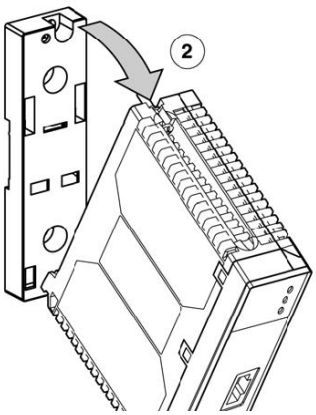
Electrically, the PRM doesn't use the rack connector for communication or for power supply. It must be powered by an external power supply.

To detach the module from its support plate, follow the steps below:

Step 1: Unfasten the screw located in the top of the module to loosen it from its support.



Step 2: Pivot the module forwards and disengage the pins from the holes located in the bottom of the support.

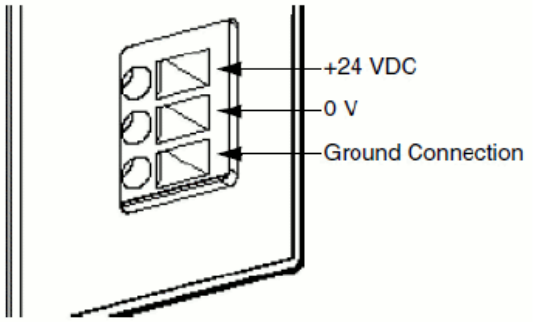


Refer to the Premium documentation for a description of the installation on the rack.

Ground connection

Grounding the PRM module

Functional Ground (FG) is available on the power connector in order to discharge high frequency noise.



The module is grounded using the metal plate at the rear of the module. When the module is in place, these metal plates are in contact with the metal of the support plate. Shielded connectors (RJ45 Ethernet, SubD9 Profibus) are also connected to FG.

To avoid an electric shock caused by indirect contact, FG must be connected to the protective ground.

For more information on grounding, refer to the *Grounding and Cabling User Manual.*

DANGER

HAZARD OF ELECTRIC SHOCK

Connect the Functional Ground terminal to the Protective Earth (PE) before connecting the Ethernet and Profibus shielded cable.

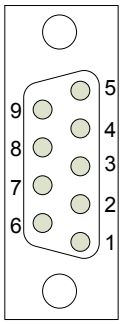
When you remove connections, disconnect the ground wire last.

Always use suitable insulation equipment for these operations.

Failure to follow these instructions will result in death or serious injury.

Profibus connection

PRM Profibus Connector



No.	Signal
1	Earth
2	Not connected
3	PFB B
4	RTS
5	PFB 0Vdc
6	PFB 5Vdc
7	Not connected
8	PFB A
9	Not connected

Profibus cabling

The following references should be used for cables and connectors :

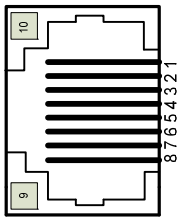
Reference	Description
TSX PBS CA 100/200	Profibus cable: in lengths of 100 or 400 m
490 NAD 911 03	**Connectors** 9-way SUB-D type male connector with line terminator (yellow)
490 NAD 911 04	**Connectors** 9-way SUB-D type male connector intermediate connection (gray)
490 NAD 911 05	**Connectors** 9-way SUB-D type male connector intermediate connection with a Sub-D type female interface (gray)

See the Part XVI "***Introduction to Profibus DP***" for the Profibus cable type descriptions.

Ethernet connection

RJ45 Ethernet Connector

Illustration of the RJ45 shielded connector for the Ethernet link :



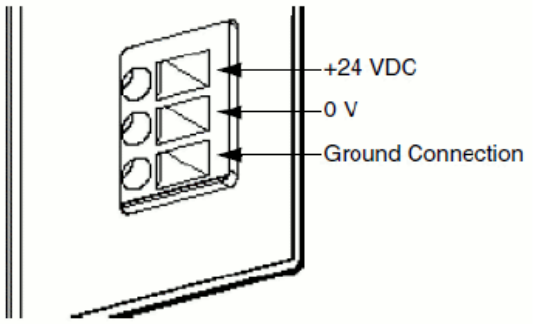
No.	Signal
1	Tx+
2	Tx-
3	Rx+
4	Not connected
5	Not connected
6	Rx-
7	Not connected
8	Not connected
9	Link/Activity LED
10	Link Status LED

Ethernet cables

Category 5 Shielded Twisted Pair (STP) with RJ45 connectors conforming to TIA-EIA-568A.

Power Supply

Description



Leg.	Description
+24 VDC	24 Volt DC input terminal
0 V	0 Volt input terminal
Ground Connection	Functional Ground - Grounded terminal connected to the PRM chassis

The PRM module must be powered by an external 24VDC industrial power supply unit which must be compliant with the characteristics in the section “Electrical characteristics” (Part V, Chapter 3).

The power supply must be local: cable length < 30 m.
An external fast-acting fuse must be used.
The PRM module is protected against reverse wiring.

⚠ CAUTION

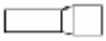
IMPROPER FUSE SELECTION

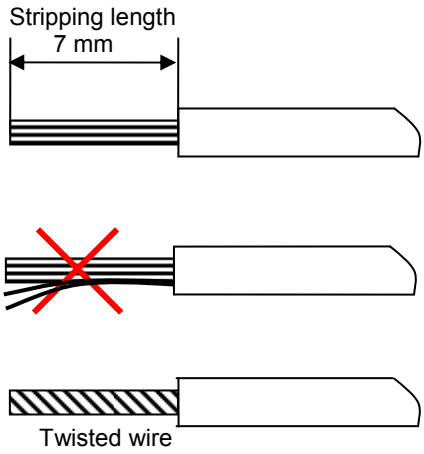
Use fast-acting fuses to protect the electronic components of the module from overcurrent and reverse polarity of the input/output supplies. Improper fuse selection could result in damage to the module.

Failure to follow these instructions can result in injury or equipment damage

Power cord preparation

Wherever possible, use wires that are 0.2 to 2.5 mm (24 - 12 AWG) for the power cord, and twist the wire ends before attaching the terminals.

- Solid or stranded wire may be used.
- For stranded wire, improperly twisting the wire ends may cause short loops. To avoid this, use DZ5CE/AZ5CE cable ends. 



Connecting the Power Cord

Proceed as followed :

- Make sure that the power supply module is POWERED OFF,
- Insert the wire end in the corresponding hole of the power connector and tighten it by using a flat blade screwdriver (Size 0.6 x 3.5 mm).

Set Power ON

Power-up the power supply module.

The PRM module LEDs will light up to indicate that the power is on and the module is booting (approximately 30 s).

Refer to the chapter ***Diagnostics & Troubleshooting > LED*** for the meaning of the LEDs.

7. Hardware characteristics

Scope of this Chapter

This chapter describes the PRM hardware characteristics.

What's in this Chapter?

This chapter contains the following sections:

Electrical characteristics

Parameter	Minimum	Nominal	Maximum
Supply Voltage	18 VDC	24 VDC	30VDC
Ripple Factor (Vp-p)			10%
Permissible overvoltage (for one hour and for 24 hours)			34 VDC
Current Consumption		150 mA @24VDC	200mA @24VDC
Power Loss		3.6W	4.8W
Length of power outage in the absence of power supply	10 ms		

Standards

Compliance with standards

Item	Complied Regulatory Standards
Automation products standard	IEC61131-2
CSA Requirements	CSA22.2 No. 142
CSA certification for Hazardous Locations	CSA 22.2 No.213 Class I Division 2 Groups ABCD
UL Requirements	UL508
Merchant Navy agencies certifications	IACS E10
CE Marking - Conformity to European Directives : 1. EMC Directive No 2004/108/EC 2. LV Directive No 2006/95/EC	

DANGER

EXPLOSION HAZARD

This equipment is suitable for use in hazardous locations Class 1, Division 2, Groups A, B, C and D only or non-hazardous locations.
Do not disconnect unless power has been switched off or the area is known to be non-hazardous.

Failure to follow these instructions will result in death or serious injury.

Condition of use

Applicable conditions

Conditions of use :

- temperature :
    - TCSEGPA23F14F: 0°C to 60°C,
    - TCSEGPA23F14FK: -25°C to 70°C
- relative humidity : 10-95% (without condensation)
- Cooling : Convection, No fan
- altitude : 2,000 m (Operational)
- vibration resistance :
    - 2G sinusoidal with plate or Premium rack mounting
    - 1G sinusoidal with DIN rail mounting

Storage conditions :

- temperature : -40°C to 85°C,
- relative humidity : 10-95% (non-condensing)

VI. Software installation

Scope of this Part

This part describes the installation process of the PRM Master DTM, PRM CommDTM and Profibus Device DTMs.

What's in this Part?

This part contains the following chapters:

8. PRM Master DTM installation

Introduction

The CD-ROM included in the PRM module packaging contains 2 independent setups:

- PRM Master DTM and Generic Profibus DTM
- PRM CommDTM

They can be installed on the same computer.

Before installing or uninstalling them, check that they are not currently in use.

Installation step by step

1. Insert the installation CD-ROM in the CD or DVD drive of the computer.
2. A menu should be automatically opened. If this is not the case, open the CD root with the Windows Explorer and open the Readme file for instructions on how to proceed.
3. Open and read carefully the Readme file and the Release Notes
4. Select the Master DTM installation.
5. Select the language for the installation assistant and click on ***OK*** for validation.
6. Confirm at the “Welcome” screen with ***Next***
7. Read the End User License Agreement, confirm that you agree by ticking the “**I accept the terms in the license agreement**” box and click on “Next” to continue.
8. Keep the suggested destination folder or change it by clicking on the ***Change …*** button. Then click on ***Next.***
9. Click on ***Install.***
10. Click on ***Finish*** to exit the end of installation of the PRM Master DTM.

Note : Next step is to update the DTM catalog of Unity Pro to have the Master DTM visible inside the catalog, refer to the chapter “**Update DTM catalog of the FDT frame**”

9. PRM CommDTM installation

Introduction

The PRM CommDTM can be installed even if Unity Pro software is not present on the computer.

The CD-ROM included in the PRM module packaging contains 2 independent setups:

- PRM Master DTM and Generic Profibus DTM
- PRM CommDTM

They can be installed on the same computer.

Before installing or uninstalling them, check that they are not currently in use.

Installation step by step

1. Insert the installation CD-ROM in the CD or DVD drive of the computer.
2. A menu should be automatically opened. If it is not the case, go to the CD root with Windows Explorer and open the Readme file for instructions on how to proceed.
3. Open and read carefully the Readme file and the Release Notes
4. Select the CommDTM installation.
5. Select the language for the installation assistant and click on ***OK*** for validation.
6. Confirm at the “Welcome” screen with ***Next***
7. Read the End User License Agreement, confirm that you agree by ticking the “**I accept the terms in the license agreement**” box and click on “Next” to continue.
8. Keep the suggested destination folder or change it by clicking on the ***Change …*** button. Then click on ***Next.***
9. Click on ***Install.***
10. Click on ***Finish*** to exit the end of installation.

Note : Next step is to update the DTM catalog of the FDT frame to have the CommDTM visible inside the catalog. Refer to the chapter “**Update DTM Catalog of the FDT frame**”

10. Profibus Devices DTMs installation

Introduction

The Profibus network description is done using Device DTMs from the DTM catalog of the FDT frame (Unity Pro or another frame for the CommDTM).
There are 2 ways to populate the DTM catalog:

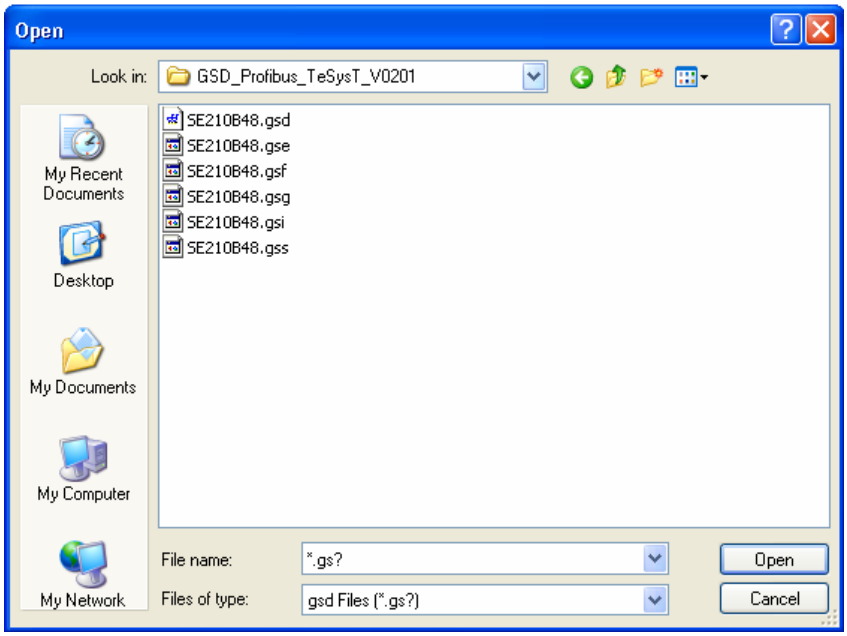
- For all frames, by installing a DTM delivered by the device manufacturer,
- For Unity Pro usage only, using the Master DTM, by adding a GSD file in the library of Generic DTMs.

Manufacturer Device DTM installation

Prior to adding the device, the DTM must be installed on the computer. A setup is delivered by the manufacturer. Then the DTM catalog of the FDT frame must be updated.

Add a GSD file to library of Generic DTMs

The PRM Master DTM includes an interface for converting any GSD file into a generic DTM in order to be integrated into the DTM catalog.
1- In the Unity Pro menu bar, select ***Tools > DTM Browser***
2- In the ***DTM Browser***, select the ***PRM_Master***
3- Right-click (DTM contextual menu) and select ***Device menu > Add GSD In Library***
4- Browse and select the .GSD file of the device to add to the library.



5- Modify if necessary the ***Device DTM Name*** field (Maximum 26 alphanumeric characters and click on ***OK*** for validation.

6- A message box confirms that the GSD has been added into the library and ask for the update of the catalog. Click on **OK** to exit.

Next step is to update the DTM catalog to have this Generic DTM visible.

Remove a GSD from library

1- In the Unity Pro menu bar, select ***Tools > DTM Browser.***

2- In the ***DTM Browser***, select the ***PRM_Master***

3- Right-click to open the DTM contextual menu and select ***Device menu > Remove GSD From Library***; it opens a window

4- Select in this window the Profibus device GSD to be removed from library.

5- Click on the ***Remove*** button

6- A confirmation is asked, click on ***OK*** for validation.

7- A message box confirms that the GSD has been removed from the library and ask for the update of the catalog. Click on **OK** to exit.

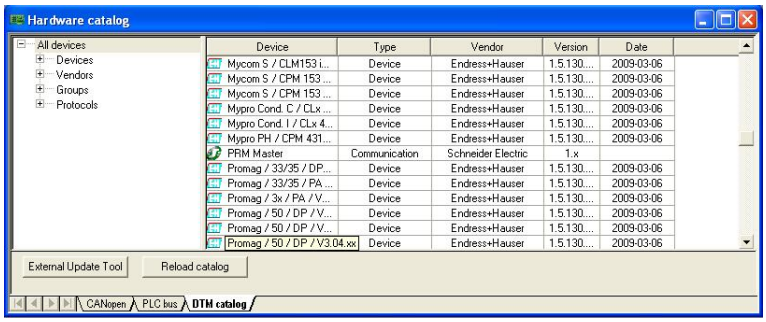
11. Update the DTM Catalog of the FDT frame

Introduction

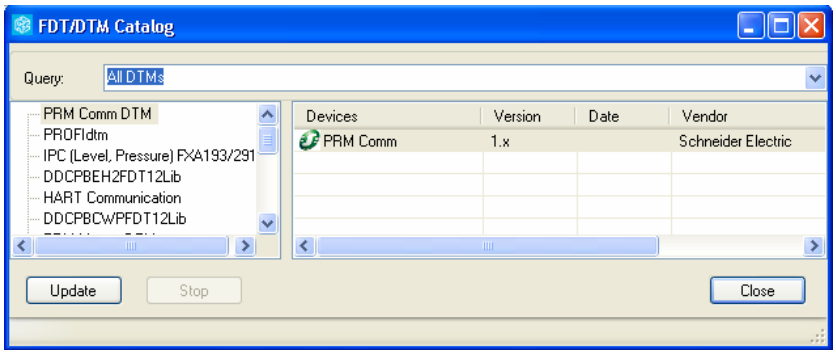
After all changes (Add/remove GSD or install/uninstall DTM), the DTM catalog must be updated.

Update DTM Catalog inside Unity Pro

1- Launch ***Unity Pro*** application and open the Unity project.
2- Select in the Unity Pro menu bar ***Tool > Hardware Catalog*** *(Alt+2).*
3- Select the ***DTM catalog*** tab in the ***Hardware catalog*** windows.



4- Click on the ***External Update Tool*** button, to open a dedicated tool for the update of the **FDT/DTM Catalog**

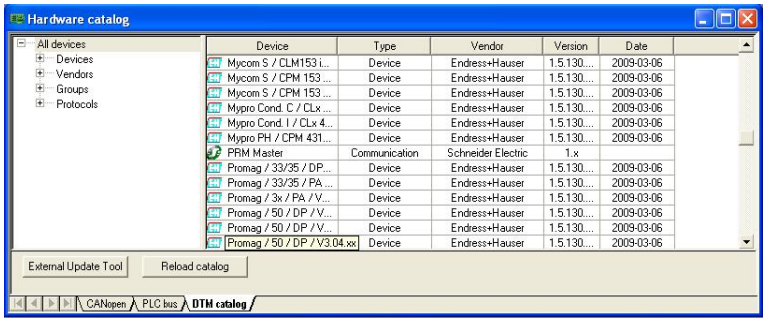


5- Click on the ***Update*** button for starting the update.

6- When the update is done, click on the ***Close*** button to close the tool.

7- When back in the ***Hardware Catalog***, click on the ***Reload Catalog*** button to take into account the result of the update in the Unity Pro hardware catalog.

When the update is complete, all the Device DTMs will be displayed on the right panel.



8- Check for the presence of all the devices you want to connect to the Profibus network in the list of the **DTM catalog.**

VII. Configuration of the PRM using the Master DTM

Scope of this Part

This part describes the configuration process using the PRM Master DTM.

The configuration is done in 3 parts:

- Description of the Profibus network using the Unity Pro DTM browser
- PRM and Profibus devices settings using the Master DTM
- Link the IO scanner with the Master DTM and update the application using the Unity Pro IO scanner tab.

What's in this Part?

This part contains the following chapters:

12. Description in the Unity Pro DTM browser

Introduction

The first step of the configuration is to describe the Profibus network in the Unity Pro DTM browser. This is done by adding devices from the DTM catalog, first the PRM using the Master DTM and then the Profibus slaves under the Master DTM node.

Note: the DTM catalog must have been updated after the DTM installation.

An alternative to adding the devices one by one, if the network already exists, is to launch a fieldbus discovery from the Master DTM. Refer to the chapter ***Master and Comm DTM – Online actions > Profibus network discovery.***

This section explains the procedure for adding and deleting devices and provides the list of the commands available form the Master DTM contextual menu.

Open the DTM browser

In the Unity Pro Menu bar, select ***Tools > DTM Browser.***

Add PRM Master DTM

The first device to add is the PRM by instantiating the PRM Master DTM at the first level of the DTM connectivity tree:

1- In the ***DTM Browser***, select ***Host PC***, then right-click and select ***Add …***
2- In the ***Add*** pop-up windows, select ***PRM Master*** from Schneider Electric

Device	Type	Vendor
PRM Master	Communication	Schneider Electric

3- Click on ***Add DTM*** button to add.

4- User can then change the ***Alias Name*** in the property box. This alias name is used in the PLC application in order to identify the PRM
5- Click on ***OK*** for validation.

The PRM Master is added at the first level in the ***DTM Browser***.

Add Profibus Devices

The Profibus slaves must be added in the DTM browser as child nodes of the Master DTM:

1- In the ***DTM Browser***, select **< 1 >PRM_Master**,

2- right-click (Master DTM contextual menu) and select ***Add ….***

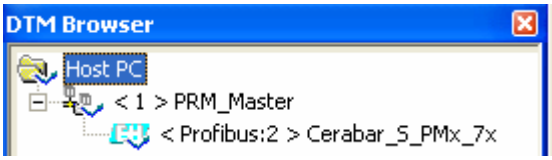
The ***Add*** popup window shows the list of available DTM devices.

3- Select the device to add and click on the ***Add DTM*** button for validation.

4- User can then change the ***Alias Name*** in the property box. The alias name is used in the PLC application in order to identify the device.

5- Click on ***OK*** for validation.
Add new device process starts.

The new Profibus device is added under the ***PRM Master instance***.



Repeat this sequence for each device you want to connect to the Profibus network. The default address assigned can be changed later, see the paragraph ***Settings in the Master DTM > Profibus devices parameters > Profibus Address setting***.

Delete PRM Master DTM

1- In the ***DTM Browser***, select the Master DTM instance to delete, then right-click to access to the DTM contextual menu and select ***Delete.***

2- In the ***Delete*** confirmation dialog, click on ***Yes*** to confirm.

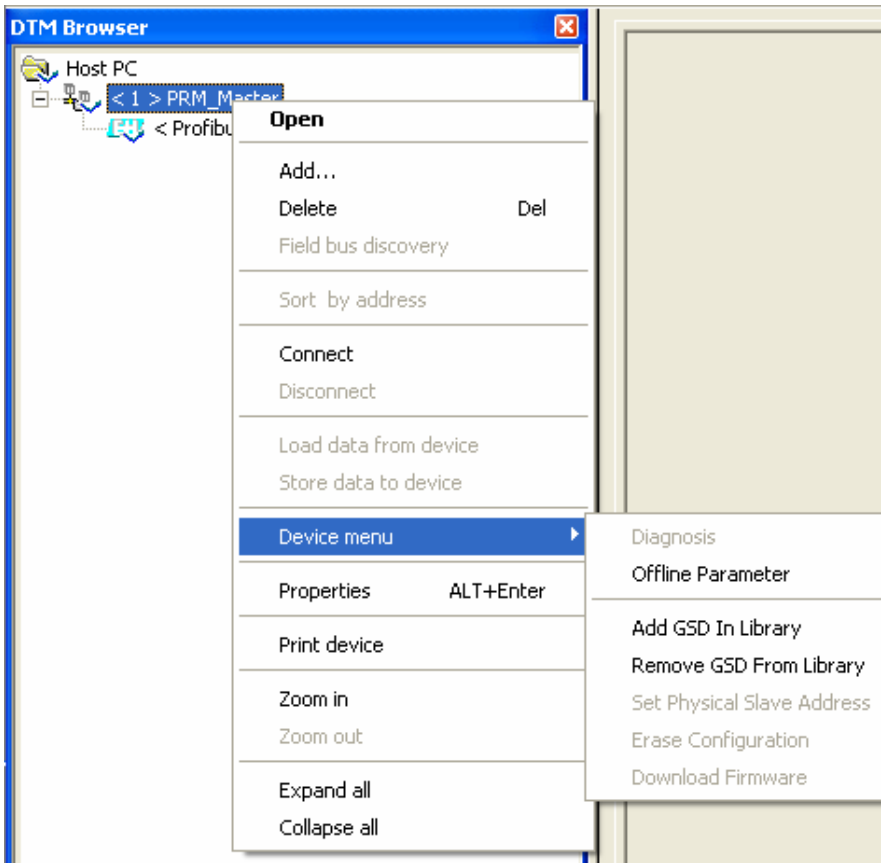
Delete Profibus device DTM

1- In the ***DTM Browser***, select the ***Profibus device DTM*** to be deleted***,*** then right-click and select ***Delete*** *(Del)**.***

2- In the ***Delete*** confirmation dialog, click on ***Yes*** to confirm.

Master DTM contextual menu

The DTM contextual menu is accessible from the Unity Pro DTM browser by right-clicking on the DTM instance:



Depending on the DTM state (online or offline), some commands are not accessible and are shown in gray.

Generic commands:

Name	Description
Open	Open the configuration window in offline or the diagnostic window in online (same as double-click ion the DTM node)
Add	Add a device as slave of the PRM
Delete	Delete the Master DTM
Fieldbus discovery (online)	Scan the connected physical devices to create the corresponding field bus connection topology
Sort by address	Display the child DTMs sorted according to the device address in ascending order.
Connect	From offline mode to online mode
Disconnect (online)	From online mode to offline mode
Load data from device (online)	not managed by the Master DTM
Store data to device (online)	Download the configuration into the PRM
Properties	Provides information on the DTM
Print device	Print the configuration settings

Specific commands accessible from the PRM Master ***Device menu***:

Name	Description
Diagnosis (online)	Open the diagnostic window
Offline parameter	Open the configuration window
Add GSD in library	Install a Generic DTM
Remove GSD From Library	Uninstall a Generic DTM
Set Physical Slave Address (online)	Tool to send a command to a slave for configuring physically its address
Erase Configuration (online)	Erase the configuration stored in the PRM
Download Firmware (online)	Transfer a new firmware to the PRM

13. Settings in the Master DTM

Scope of this Chapter

This chapter describes the different settings in the Master.

What's in this Chapter?

This chapter contains the following sections:

Introduction

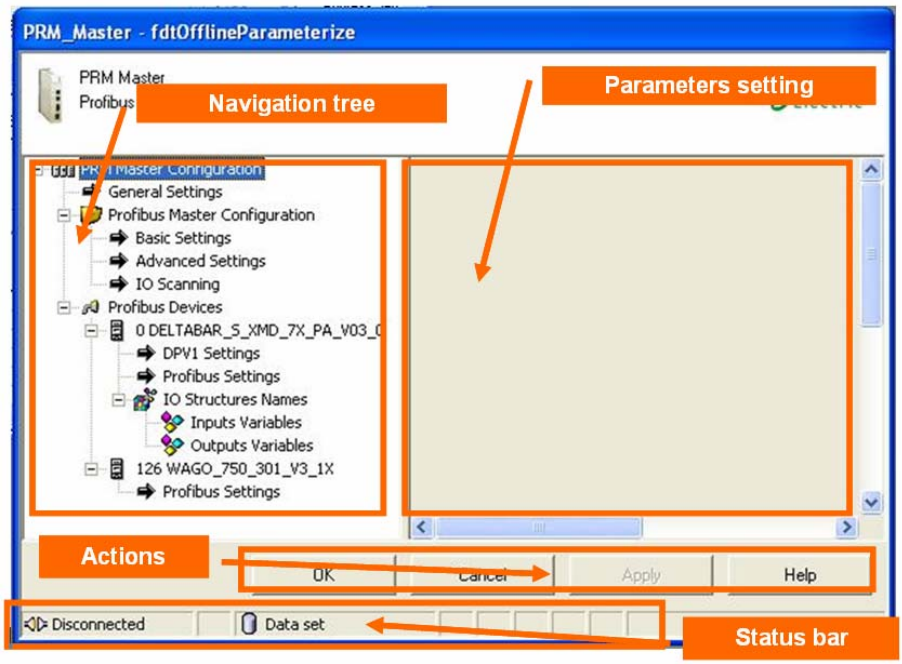
Open the configuration window

1- In the Unity Pro Menu bar, select ***Tools > DTM Browser.***

2- In the ***DTM Browser***, select ***< - > PRM_Master instance***, then double-click

The DTM window organization

The window is organized in different areas as defined by the FDT/DTM standard: a navigation tree, an application area for parameters settings, an action area, a status bar and an identification area at the top.



Navigation tree

It provides a structured view of the different configuration panels. Clicking on a node of the tree will open the associated panel.

The upper part concerns the PRM itself:

- ***General Settings***
- ***Profibus Master Configuration***

The lower part under the node ***Profibus Devices*** concerns the slaves.

The device list is automatically updated when devices are added / removed in the DTM browser. This list can be globally expanded or collapsed by right-clicking on the ***Profibus Devices*** node.

Parameter setting

Default values

At the PRM level, the following parameters must be adapted to the physical configuration:

- ***General settings***
- ***Profibus Master Configuration > Basic settings***

It is recommended to keep the default values for the other parameters.

At the device level, most of the default values are coming from information provided by the Device DTM. It is recommended to check all the parameters. They may be the cause of a device malfunction.

Parameters with an automatic or manual mode

These parameters have a checkbox in front of the value field.

- Automatic mode (default):

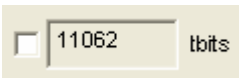
  The checkbox is unchecked. The value field is grayed and cannot be written. It contains the proposed default value. This default value is dynamic most of the time, meaning it is changed automatically when adding / removing devices or when changing other parameters.

- Manual mode:

  By ticking in the check box, the field background changes to white allowing the value to be modified.

The default value can be re-applied by un-checking the box.

Example:



Automatic mode (default), read only

Manual mode, the value can be changed

⚠ CAUTION

INCORRECT EXCHANGES WITH DEVICES

Do not change the default values without having the necessary knowledge. Inappropriate settings can result in a malfunction in the Profibus exchanges with the devices including I/O exchanges.

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

Detection of an out of range parameter value

Values are tested against minimum and maximum limits. An incorrect value in a field is shown by an exclamation mark at the left side of the concerned field and also on the associated nodes in the navigation tree. The value remains unchanged until a correct value is entered.

Detection of a parameter value change

A change of a parameter is shown by a pencil on the left side of the field and also in the navigation tree in front of each of the concerned nodes. The new value is applied and the pencils disappear by clicking on OK or Apply in the action area.

Action area

The action area is used after parameter changes. The options are:

- ***OK*** button to save and exit,
- ***Cancel*** button to exit without save,
- ***Apply*** button to save only.

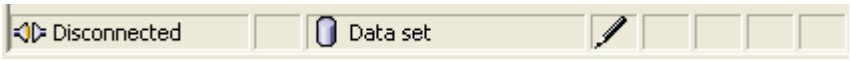
The ***help*** button provides context sensitive online help.

Status bar

The Status bar provides the following information:

DTM connection state		Data source		State of instance data set	
	Connected		Data Set		Valid modified
	Disconnected		Device		Invalid modification
	Comm Problems				

Example:

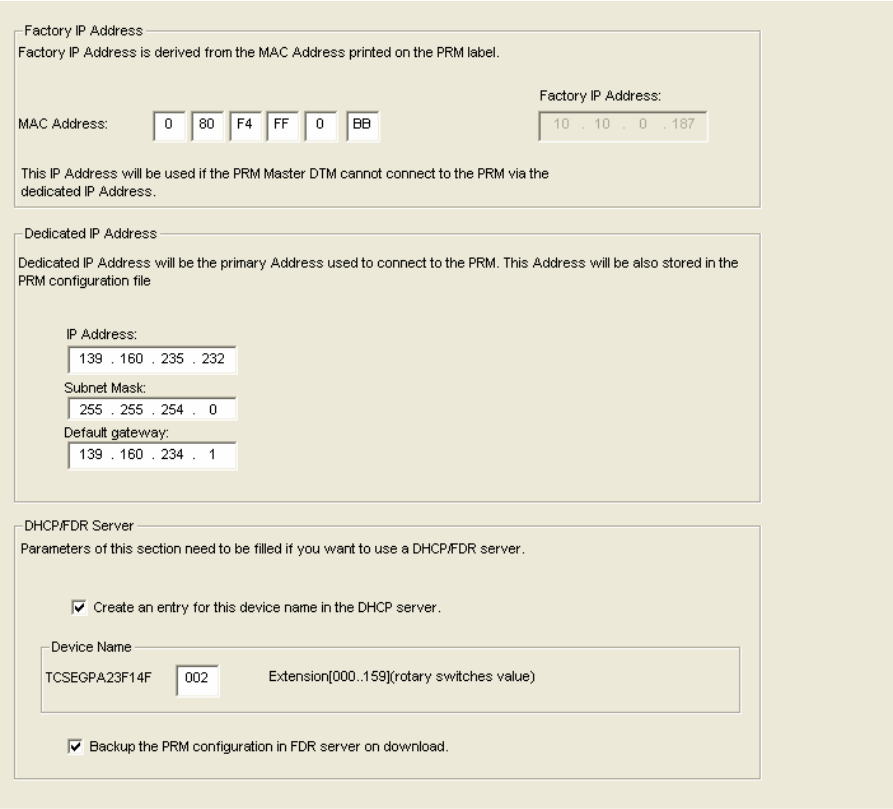


PRM general settings

At a glance

In the navigation tree, select ***General Settings.***

This panel enables the configuration of the ***Factory IP address*** , the ***Dedicated IP address*** and the ***DHCP / FDR server***.



It is used

- by the DTM for the connection to the PRM
- by the PRM, as part of its configuration, and in conjunction with the rotary switches settings, for its IP address assignment.

The rotary switches define the IP address configuration mode: ***Stored mode*** (the IP address is configured by the application and stored in the PRM) or ***DHCP mode***.
Refer to the section ***Hardware: installation and characteristics > Installation of the module > PRM IP address setting, rotary switches*** for details on the PRM rotary switches settings.

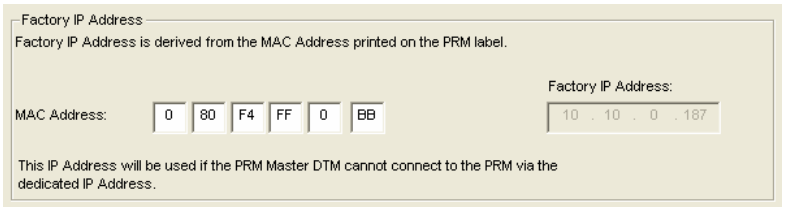
Factory IP Address setting

Usage of this address

This address will be used

- By the DTM for addressing the PRM when it doesn't answer to the ***Dedicated IP address***
- By the PRM
  - In Stored mode if there is no configuration in the PRM, for example before the first download
  - In DHCP mode while the DHCP server is not responding or if there is an address inconsistency between the DHCP server and the PRM configuration

How to set this address



Check the MAC address on the front face of the PRM module and report it in the appropriate fields in the ***Factory IP Address*** section.

The ***Factory IP Address*** assignment is in relation with the PRM module MAC Address according to the following rule :

If MAC Address = 0:80:F4:FF:xx_{Hex}:$yy_{Hex,}$

then IP Address = 10.10.aaa.bbb with aaa_{Dec}=xx_{Hex} and bbb_{Dec}=yy_{Hex}

In our example, the MAC Address of the module is 00:80:F4:FF:00:BB.

Notice the change in the ***Factory IP Address*** field (BB_{Hex}=187_{Dec}): 10.10.0.187

Dedicated IP Address setting

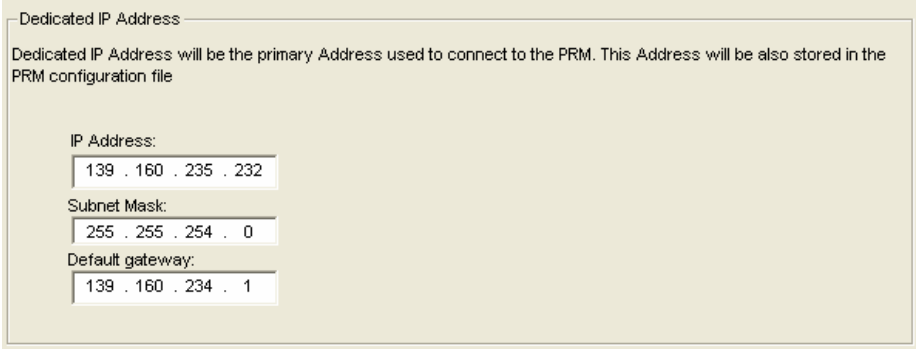
Usage of this address

This information will be used:

- By the DTM as the primary address for addressing the PRM
- By the PRM in Stored mode, as its configured IP address
- To configure the DHCP server in case it has to be used, see next chapter.
- To set the PRM IP address in the IO scanner

How to set this address

In the ***Dedicated IP Address*** section, fill the IP Address, Subnet Mask and Default gateway fields.



DHCP/FDR server setting

At the bottom of the screen, 2 options are proposed when the PRM is in the DHCP mode:

- creation of an entry for the PRM in the DHCP server
- backup in the FDR server

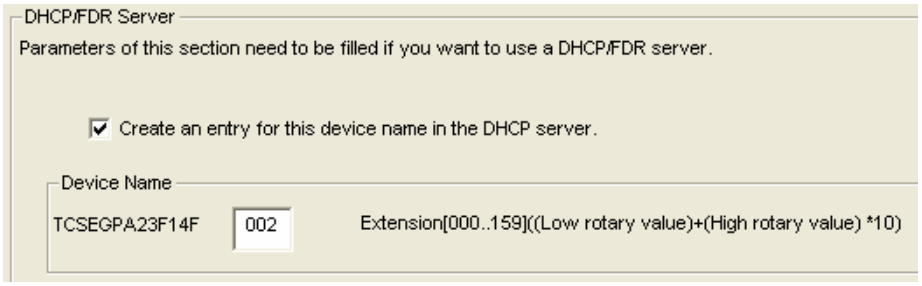
Creation of an entry for the PRM in the DHCP server

There are 2 ways of doing this:

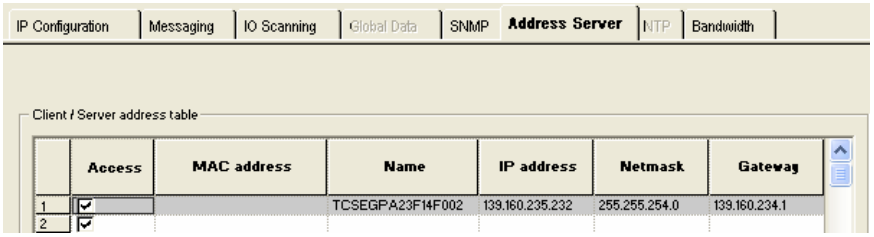
- automatic mode that can be used only when using the DHCP server managed by the Ethernet channel linked to the PRM, This is the recommended mode.
- manual mode to be used in the other cases

Automatic mode

Tick the ***Create an entry for this device….*** check box and provide the DeviceName Extension with the value set on the rotary switches.



The Address Server service of the Ethernet channel will be automatically enabled and an entry will be created for the PRM with the following information:
- the DeviceName with the extension provided in this screen
- the IP address, Subnet mask and Gateway values entered in the “Dedicated IP address” area.



It will be effective only after the update of the PRM in the Unity Pro IO scanning tab.

Note: In this mode the PRM is checking the consistency between the IP address part of its configuration and the one served by the DHCP server. In case of inconsistency, it will use the factory address.

Manual mode

If another DHCP server is used, the check box must left unchecked, and the DHCP server must be configured manually.

Backup in the FDR server

The M340, Premium and Quantum Ethernet channels are FDR servers, meaning they can restore the PRM configuration in the event that a PRM is replaced

To use this feature, tick the “Backup the PRM configuration in FDR Server on download” checkbox.

The configuration will be automatically saved to the FDR Server each time there is a new configuration downloaded to the PRM.

⚠ CAUTION

INCORRECT SERVED ADDRESS

- The DHCP server must be active and properly configured at PRM boot up time.
- Check that only one DHCP server is present on the Ethernet network

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

⚠ CAUTION

INCORRECT SERVED CONFIGURATION BY THE FDR SERVER

- Check that the Ethernet module firmware version is as described in the Hardware & Software requirements chapter
- On M340, check that the SDCard is present in the NOE module
- On Premium and Quantum, the Ethernet module must be active at least 2 minutes after the PRM download to have the configuration stored in the Flash of the FDR server. Do not download the PLC immediately after the PRM or download the PLC before the PRM.
- If you are using a Premium or Quantum copro as the FDR server, following a PRM download, the copro must be kept running at least 2 minutes to have time to store the PRM configuration in Flash. Consequently, after a change impacting the PRM and the PLC application, do not download the CPU immediately after having downloaded the PRM, as the CPU will reboot the Ethernet copro which may not have finished storing the PRM configuration in Flash. So 2 solutions:
  - download the CPU before the PRM
  - or download the CPU after the PRM but after at least 2 minutes

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

Profibus Master parameters

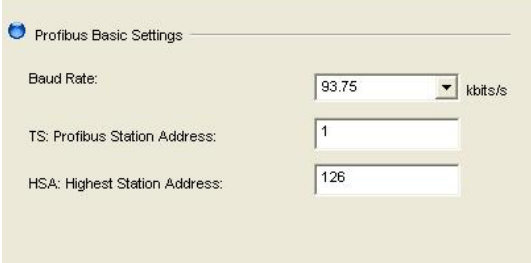
Introduction

This topic describes the different settings for the configuration of the Profibus Master featured by the PRM, including:

- Basic Settings
- Advanced Settings

Basic Settings

In the navigation tree, select ***Profibus Master Configuration*** > ***Basic Settings***.



- Set the ***Baud Rate*** (in Kbps) of the Profibus network: 9.6, 19.2, 31.25, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000 or 12000 Kbps. The baud rate selected should be supported by all slaves in the configuration. The baud rate should be selected depending on the cable length, see chapter "***Profibus DP***"

- Set the ***TS: Profibus Station Address*** for the PRM module (Master Profibus). TS should be different than any other slaves address on the Profibus network, it should also be less-than or equal to the HSA below:

Min: 0 Max: 126 Default: 1

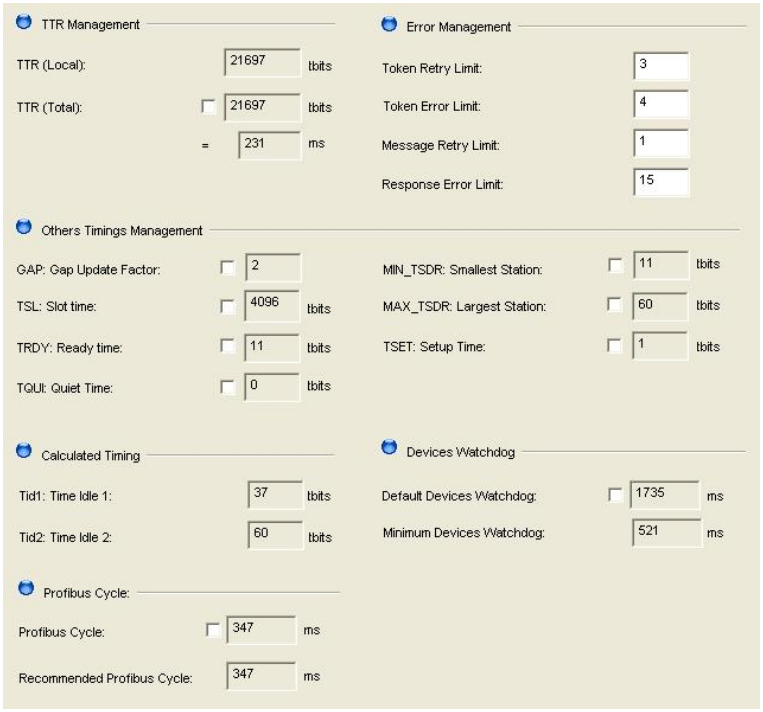
- Set the ***HSA: Highest Station Address***. This is the highest station address of the active stations (masters). Passive stations (slaves) can have a higher address than the HSA.
  A low HSA is better for Profibus performance.
  When using a single master (ie PRM only), the most effective value for HSA is equal to the TS value (i.e.: TS = HSA = 1):

Min:1 Max: 126 Default: 126

Advanced Settings

In the navigation tree, select ***Profibus Master Configuration > Advanced Settings***.

These advanced settings are intended for expert users, in order to optimize the performance of the Profibus network. By default all values are automatically calculated by the configuration tool in order to have optimized Profibus cycle time and no issues on the Profibus network. Nevertheless each parameter can be set manually.



TTR (Target Rotation Time) Management

- **TTR (Local)** (in tbits) (read only) is automatically calculated and indicates the maximum time available for a token circulation (time for Profibus token to be passed to another master and be back).
  It takes in account the number of slaves with their IO size (data exchanges telegram), different telegrams needed and their duration times (FDL status, global control, pass token), all mandatory timing with respect to the Profibus standard (time slot, min and max Tsdr, Tqui, Tset, …) and a safety margin which allows bandwidth for acyclic messages (DPV1, …)

  Note : TTR_{local}[µs] = TTR_{local}[tbit] / Baudrate

- **TTR (Total)** (in tbits) (read/write): This field allows you to increase the value of the local TTR. This is particularly required when running multiple masters. Indeed, the TTR local calculation doesn't take into account another master's presence on the Profibus network. In addition, when running multiple masters, it is highly recommended that all masters run with the same TTR.
  The value **MUST** be in the range:

Min: value of TTR (Local) Max: 16777215 Default: value of TTR (Local)

Error Management:

- **Token Retry Limit** (read/write) is the number of times that a Profibus Master tries to pass the token before deciding that a station is not there. Value must be in the following range:

Min: 0 Max: 15 Default: 3

- **Token Error Limit** (read/write) is the maximum number of detected errors in 256 token cycles. Value must be in the following range:

Min: 0 Max: 255 Default: 4

- **Message Retry Limit** (read/write) is the number of telegram repetitions if the address doesn't react. Value must be in the following range:

Min: 0 Max: 15 Default: 1

- **Response Error Limit** (read/write) is the maximum number of detected errors in 16 successive messages.
  Value must be in the following range:

Min: 1 Max: 15 Default: 15

Other Timing Management

- **GAP: Gap Update Factor:** (read/write): The range of addresses between 2 consecutive active stations is called GAP. This GAP is submitted to a cyclic check during which the system identifies the station condition (not ready, ready or passive).

Min: 1 Max: 100

- **TSL: Slot Time** (in tbits) (read/write) is the maximum time the PRM will wait, after the transmission of a request, for the reception of the first byte (Tchar) of an answer. (It allows detecting a timeout.) It can be increased when repeaters are used in the Profibus network topology. The value must respect the rule:

Min: 37 Max: 16383

- **TRDY: Ready Time** (in tbits) (read/write) is the time after which the transmitting master will answer frame:

Min: 11 Max: 255

- **TQUI: Quiet time** (in tbits) is the time that a station may need to switch from sending to receiving. It must respect the rule:

TQUI < MIN_TSDR Min: 0 Max: 255

- **MIN_TSDR: Smallest Station** (in tbits) is the minimum time that a Profibus DP slave must wait before it may answer. It must respect the rule:

TQUI < MIN_TSDR Min: 11 Max: 1023

- **MAX_TSDR: Largest Station** (in tbits) is the maximum time that a Profibus DP slave may take in order to answer. Calculation of MAX_TSDR must respect the rule:

Min: 37 Max: 65525

- **TSET: Setup Time** (in tbits) is the reaction time on an event. Calculation of TSET must respect the rule:

Min: 1 Max: 494

Default values

The default values depend on the baud rate. They have been defined at 45.45 and 93.75kbits/s for respectively the Siemens and Pepperl & Fuchs SK1 DP/PA coupler. These couplers have specific timing requirements; please check all the settings with the documentation of the coupler you are using.

Calculated Timing:

Those timings are in read only and given for information.

- **Tid1: Time Idle1** (in tbits) is the time between the acknowledgement frame or token frame reception and the transmission of the next frame

- **Tid2: Time Idel2** (in tbits) is the time between the transmission of an unconfirmed packet and the transmission of the next packet.
  Calculation of Tid1 and Tid2 parameters must respect the following rule:

Tid1 = Max(Tsyn+Tsm, MIN_TSDR) Tid2 = Max(Tsyn+Tsm, MAX_TSDR) with Tsyn= 33 Tsm= 2 + 2* TSET + TQUI

Devices Watchdog

Watchdog value in this panel is applied to all Profibus devices in the configuration. However, this global value can be overwritten in the device configuration panel.

- **Default Devices Watchdog** (in ms) (read /write) value defines the watchdog value assigned by default to all devices in the configuration:
  When the checkbox is unchecked (default behavior), this field cannot be modified and contains :

Default Devices Watchdog =: 5 * Profibus Cycle

  When the checkbox is checked, this field can be modified and must respect the following rule:

Min: 1, 5 * Profibus Cycle (Minimum Devices Watchdog) Max: 650000

  The default watchdog value is compatible with devices directly attached to the DP fieldbus. For devices under a DP/PA gateway (Link, SK3) the watchdog must be modified as they are refreshed at a lower rate.

- **Minimum Devices Watchdog** (in ms) (read only) value is provided as information as the minimal watchdog value which can be assigned. It is calculated by

Minimum Watchdog value = 1,5 * Profibus Cycle

Profibus Cycle

- **Profibus Cycle** (in ms) (read/Write) field defines the cyclic time the master will respect between two IO Data Exchange sequences. This parameter can be increased by the user when the Profibus network load does not allow the processing of acyclic requests.

This Parameter will respect the following rule:

Min: max ((1,5 * TTR Total) , max (all min slave interval values)) Max: 65535

The Min Slave Interval of each device comes automatically with each Device DTM, but can be changed in the device configuration panel.

Multi-master configuration

⚠ CAUTION

UNEXPECTED BEHAVIOR IN A MULTI-MASTER CONFIGURATION

Check that the Baud rate, HSA and TTR have the same value for all the masters.

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

IO scanning parameters

Introduction

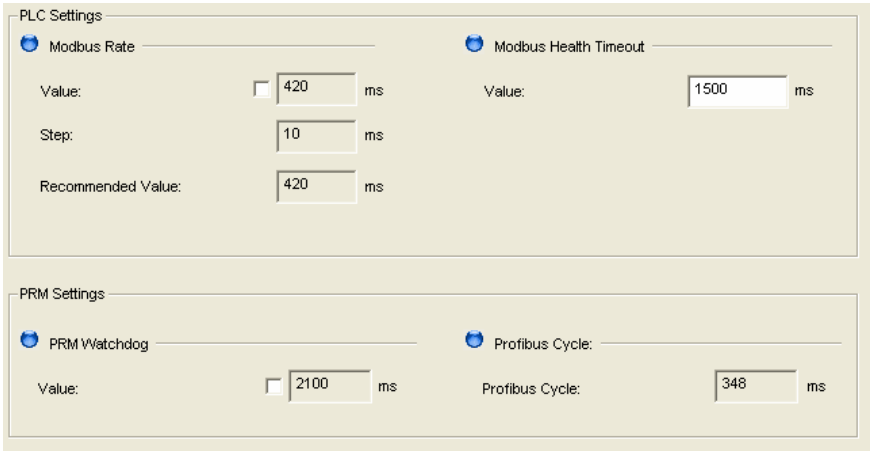
The Profibus slave inputs and outputs are stored by the PRM in its process image. In order to make them available to the PLC application, this process image has to be scanned by the PLC. This is done using the PLC IO scanning service.

The configuration is done in 2 parts:

- Set the parameters in the Master DTM
- Add the PRM in the IO scanning tab in Unity Pro

Set the parameters

In the DTM navigation tree, select ***Profibus Master Configuration > IO Scanning***



Modbus Rate

- **Value** of Modbus Rate (in ms) (read/write): Defines the “repetitive rate” parameter of the I/O scanner for the PRM. This is the period at which the PRM will be scanned. This value will be automatically rounded up to a multiple of the “Step” parameter.
  This Parameter must respect the following rule:

Min: 0 , IO scan requests will be sent as fast as possible by the IO scanner (value depends on the PLC type) Max: 50,000 ms Default : recommended value

- **Step** (in ms) (read only): The value of the “Repetitive Rate step” parameter defined in the Unity Pro IO Scanning configuration panel.
  Typical default value is 10 ms or 16 ms, depending on the PLC type.

- **Recommended Value** (in ms) (read only) is calculated by the Master DTM according to the Profibus cycle.

Recommended Value = [Max(“Number of IO scanner line * 1 ms”, “Profibus Cycle *1,2”)] upper modulo of Step

Modbus Health

- **Value** of Modbus Health (in ms) (read/write): Sets the “Health Timeout” parameter for all PRM IO Scanner lines. The health timeout field sets the maximum interval between the responses from a remote device. It must be in the range:

Min: 300 Max: 65535 Default: 1500

It must be at least twice the Modbus Rate to avoid any timeout detection by the IO scanner.

NOTE: **this parameter is not automatically updated; check that the value remains compatible with the Modbus rate value** especially when other parameters are managed in the automatic mode (check boxes unchecked). As an example, the Modbus rate is changing with the baud rate, particularly pay attention that this change is not linear especially in the range 45.45 and 93.75kbits/s where specific timing values are defined for the DP/PA couplers.

PRM Watchdog

- **Value** of PRM Watchdog (in ms) (read / write): If PRM watchdog expires before an IO scan or Modbus request is received, the PRM will consider the PLC disconnected.

  The default value is calculated with the following rule:

PRM Watchdog = max (Modbus Rate * 5, 100) in ms

  This value can be increased.

Profibus Cycle (in ms) (read only): Shown as a reference value for setting the Modbus rate.

Fallback Strategy

There is another parameter in the Unity Pro IO scanner which is called “Last value (input)” and defines the fallback strategy on inputs from the device in case of communication errors.

This parameter is fixed for the PRM to the value “Set to 0”, meaning that the inputs from the PRM will be seen at 0 by the PLC in case of a communication error.

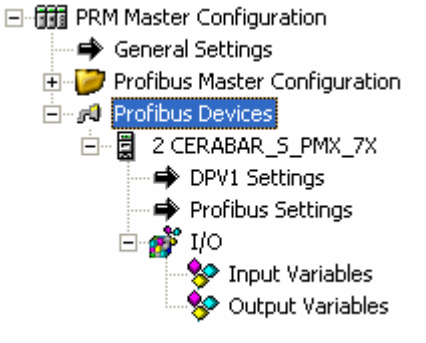
Profibus devices parameters

Introduction

This section describes the settings of the Profibus devices.

The devices added under the PRM Master instance in the DTM browser are shown in the Master DTM navigation tree under the node ***Profibus Devices***.

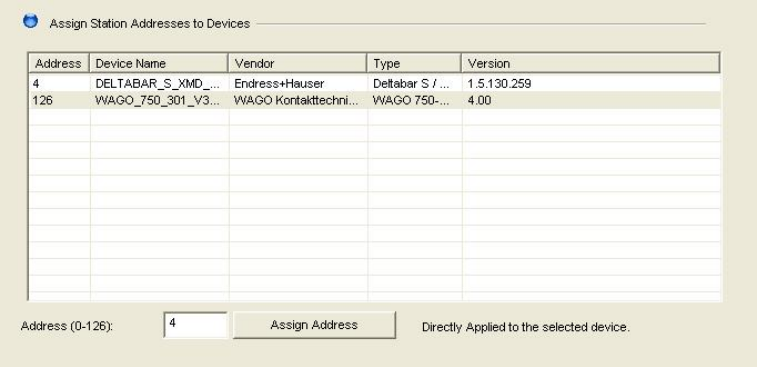
The list is sorted by ascending address and updated when a device is added or deleted in the DTM Browser. It can be expanded or collapsed.



Profibus Address setting

In the navigation tree, select ***Profibus Devices.***

The purpose of this panel is to assign Profibus addresses to the devices:



In the right panel, select the Profibus device to change its address.

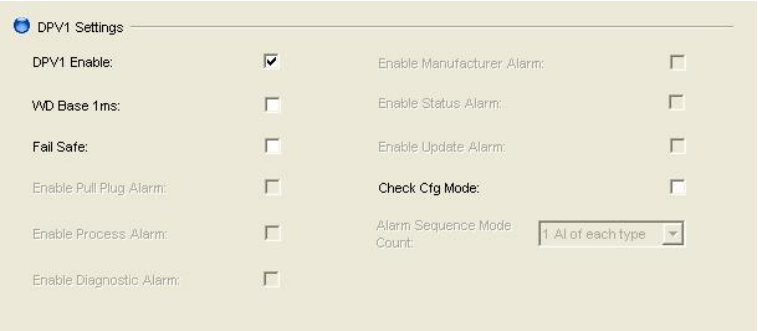
Modify the value in the address field (for example "5" for the new address) and click on the ***Assign Address*** button to apply the change.
Repeat this sequence for each Profibus device as required.

Important: The ***Assign Address*** feature IS NOT DESIGNED to physically set the Profibus address on the device. The Profibus address of the device must be set directly on the device (using switches, etc.) or by using the Set Slave Address command. See the chapter ***Master and CommDTM – Online actions > Set Physical Slave Address.***

DPV1 Settings

In the DTM navigation tree, expand the device node to be modified and select the **DPV1 Settings** node.

This node is present only for devices that support DPV1. This capability is reported by the Device DTM.



- **DPV1 Enable** (Read / Write): Indicates if the slave supports DPV1 Class 1 access (read and write) or alarms. **If the device does not support these DPV1 services this parameter must be unchecked**. The default value is based on the information provided by the Device DTM.

- **WD Base 1ms** (Read / Write): Indicates if the device should use the 1ms base time for watchdog time calculation. See the chapter "**Profibus Settings**" below for watchdog time calculation.
  By default, the field will be unchecked which sets the watchdog base to 10 ms.
  Note: the watchdog value is always shown in the configuration panel in ms regardless of this time base setting.

- **Fail Safe** (Read / Write): The failsafe mode determines the behavior of the DP Slave outputs when the Profibus Master is in CLEAR state:
  - If the slave is configured to be failsafe and supports this feature, then it will apply its own fallback value (the Master sends outputs with 0 length data)
  - If not, the Master sends output data at 0

  If this feature is supported by the device, the check box must be checked.
  If the device does not support it, this parameter must be unchecked.
  The default value is based on the information provided by the Device DTM.

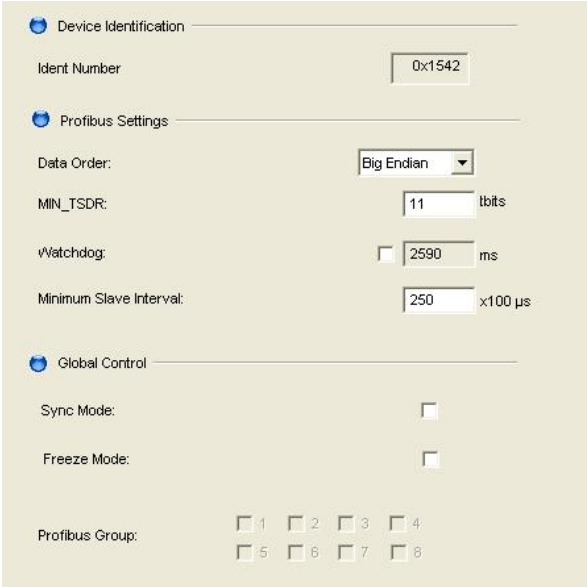
- The following parameters are shown in grey as alarms are not supported by the PRM in the present version: **Enable Pull Plug Alarm, Enable Process Alarm, Enable Diagnostic Alarm, Enable Manufacturer Specific Alarm, Enable Status Alarm, Enable Update Alarm**

- **Check Cfg Mode** (Read / Write): This checkbox is used to define the reaction to the reception of configuration data. If the check box is not set, the check is as described in EN 50170. If the check box is set, the check is made according to a specific user definition. By default, the field will be unchecked.

- **Alarm Sequence Mode count** (Read only): This parameter specifies the maximum number of possible active alarms for the device. As the PRM doesn't support alarms, this field is fixed to the minimum possible value and can not be modified.

Profibus Settings

In the navigation tree, expand the device node to be modified and select the ***Profibus Settings*** node.



Profibus Settings

- **Data Order** (Read / Write): Is the byte-ordering when accessing the device, two values are possible:
  - Little endian
  - Big endian (default)

- **MIN_TSDR** (in tbits) (Read / Write): Is the minimum time that a PROFIBUS-DP slave must wait before it answers. It must respect the rule:

Min: 11 Max: 1023 Default: 11

- **Watchdog** (in ms) (Read / Write): Is used to monitor cyclic communication and must be significantly higher than the time required for one Profibus cycle. If a slave does not receive a request frame for a period of time longer than the watchdog time, it will revert to its initial, power-up state and cyclic communication will have to be re-established.

  The minimum and default values are defined by the ***Profibus Master Configuration > Advanced Settings***.

  The value can be changed. The maximum is 650,000 ms.

  Note: The default value will be too short for a PA device as it is calculated for a DP device based on the DP baud rate. Refer to the chapter ***Diagnostics & Troubleshooting > Troubleshooting*** for a method for defining a new value.

- **Minimum Slave Interval** (in 100µs) (Read/Write): This is the minimal time that the Profibus must wait between two IO data exchanges with this device. The default value proposed comes from the Device DTM. It can be changed, but must be within the following range:

Min:1 Max: 65535

  Notes:
  - This value has an impact on the Profibus cycle
  - For a PA device please check that the value is compatible with the DP/PA gateway (refer to the chapter ***Diagnostics & Troubleshooting > Troubleshooting***).

Global Control

- **Sync Mode** (Read / Write): User data transmission Synchronization control commands enable the synchronization of outputs. Sync Mode is unchecked by default.

- **Freeze Mode** (Read / Write): User data transmission Synchronization control commands enable the synchronization of inputs. Freeze Mode field is unchecked by default.

- **Profibus Group** (Read / Write): Specifies which groups the slave belongs to. A slave can be in multiple groups at a time (from 1 through 8). Groups are used by the master when it sends a Sync or Freeze command. Profibus Group checkboxes are enabled when Sync Mode or Freeze Mode checkboxes are checked.

Profibus devices I/O variables

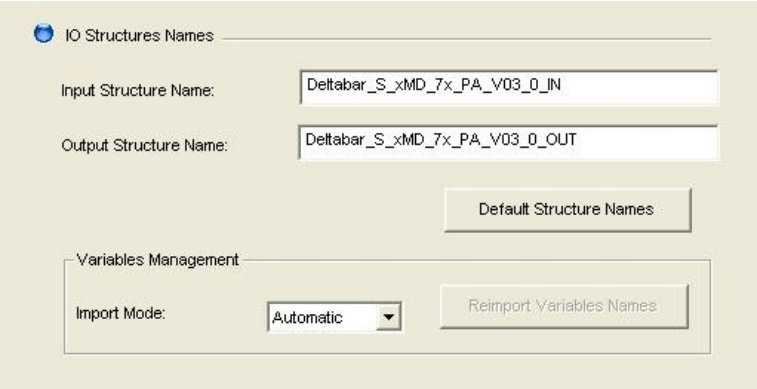
At a glance

The Device DTM provides a description of the cyclic input and output variables. At the very least it contains the size of the input and output data areas. Recent Manufacturer Device DTMs provide the names and types of variables as well.

These variables are mapped inside structured variables to be accessible by the PLC application, one for the inputs and one for the outputs.

IO Structure Names of Devices

In the navigation tree, expand the device node to be modified and select the ***I/O*** node.



The structured variable names (also called “IO structure names”) are by default <AliasName>_IN and <AliasName>_OUT, <AliasName> being the alias name defined in the DTM browser when adding the DTM.

These names can be changed in the associated fields ***Input Structure Name*** and ***Output Structure Name***.

Note: The DDT types are named T_<AliasName>_IN and T_<AliasName>_OUT when adding the DTM and cannot be renamed afterwards.

The default IO Structure Names can be returned to default values by clicking on the ***Default Structure Names*** button. This button can be used to update the structure name after a change in the device alias name as it is not done automatically.

Variable Management mode

In the selected device sub-tree, select the ***I/O*** node***.***

In the ***Variable Management*** section***,*** 2 import modes are present to manage the variable descriptions:

- **Automatic mode** (default): Names and types can be read in the ***Input Variables*** and ***Output Variables*** panels as pre-defined by the Device DTM but cannot be changed. Modifications inside the Device DTM impacting this description are automatically taken into account.
- **Manual mode**: Names and types can be read in the ***Input Variables*** and ***Output Variables*** panels as described by the Device DTM and can be changed. Modifications inside the Device DTM impacting this description are not automatically taken into account. The user must manage the consistency manually.

The button ***Reimport Variables Names*** is accessible to re-import the pre-defined variables provided by the Device DTM. Previous modifications done in the panels are overwritten.

⚠ CAUTION

INCORRECT DEVICE INPUT AND OUTPUT VALUES

In Manual mode, the I/O description must be kept consistent with the device configuration.

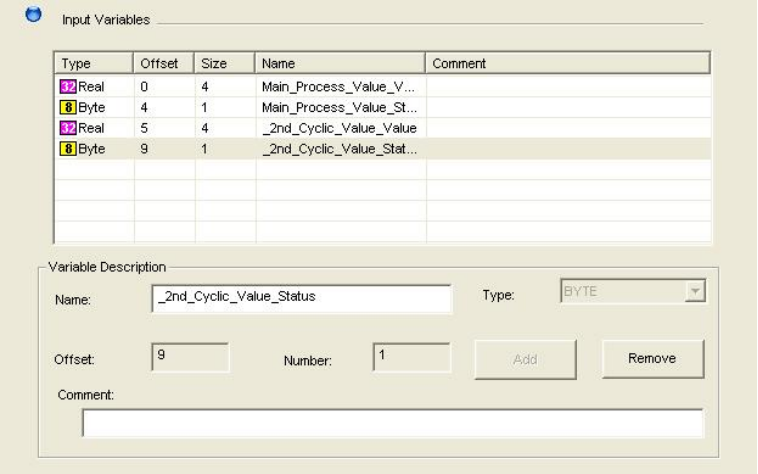
Failure to follow these instructions can result in injury or equipment damage.

Inputs/Outputs Variables

Click on ***Inputs Variables*** or ***Outputs Variables*** under the ***I/O*** node. The variables are listed in the table.

Default variables

By default the types and names are those pre-defined by the Device DTM.



- The types are checked and may have been converted to a type supported by Unity Pro.
- The names are checked and may be changed to be compatible with Unity Pro rules and settings. For example if leading digits are not allowed in the Unity Pro project settings, an underscore is added at the beginning of the name.

If the variables are not described by the Device DTM, only one line is shown with the type “free” meaning these bytes are free to be assigned to variables.

The Generic DTM provides the variable description at the module level: one array of bytes per module with the size and name described in the GSD.

How to modify the default variables

The import mode must be set to Manual.

How to change a name or a comment of an existing variable:

- Select the variable in the table
- Do the modification in the lower part of the panel.
- The name is checked against Unity Pro rules and settings. Errors are shown by a red exclamation mark. A tool tip provides details on the error.

How to change the type of the variable or the offset:

- If a variable already exists at the same place, it must be removed first: select the variable in the table and click on remove.
- Then the variable can be defined: select the free bytes in the table, choose the appropriate type and click on add.

⚠ CAUTION

INCORRECT DEVICE INPUT AND OUTPUT VALUES

When manually defining the variables, check the consistency of this description with the input and outputs of the device very carefully. The order of the variables and the types must be the same.
Incorrect type definition can result in byte inversion.

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

14. Link creation and update in the I/O scanner

Introduction

When configuration of the Master DTM is complete, the following steps are:

- Create the link between the Master DTM and the IO scanner by adding the PRM in the I/O scanning configuration, and update the application
- build the PLC application

Link creation and update in Unity Pro

Add the PRM in the IO scanning tab:

1 - Select the network on which the PRM is connected in the Unity Pro Project Browser under the ***Communication > Network*** node

2 - Select the IO scanning tab

3 - Select the line where you want to add the PRM

4 - Click on the "**...**" button to open the Device Name property box.

5 - Select the Master DTM to be linked with

6 - Click on the ***OK*** button

At this time the link is created but does not have the information from the Master DTM

A popup will ask for the IP address of the Master DTM. If it is already done, it will be taken into account in the Update steps.

7 - Enter RD length and WR length. These must be long enough for the expected configuration. On Premium and M340, where the %MW is required to be consecutive, it is recommended to reserve more space than needed for future evolutions of the Profibus configuration.

8 - Validate

Update:

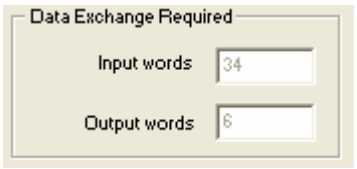
9 - Click on the "**...**" button to open the Device Name property box.

10 - Click on the ***Update*** button

The variables, the IO scanner lines associated with the PRM and potentially the address server entry for the PRM are created based on the information provided by the Master DTM.

To know the size really used by the current configuration:

10- Click on the "**...**" button to open the Device Name property box. The information is provided as shown below:



Refer to the Unity Pro online help for a precise description of the operating modes of the IO scanning tab.

Further Updates

Each time there is a modification done in the Profibus configuration impacting the application, an update is necessary:

- The PRM device name is shown in red in the tab
- Click on the "…" button to open the Device Name property box.
- Click on the Update button

  The variables, the IO scanner lines associated with the PRM and potentially the address server entry for the PRM are updated based on the information provided by the Master DTM.

Build

When the application is updated, a build is necessary.

Refer to the Unity Pro online help for a description of the application operating modes.

Next step

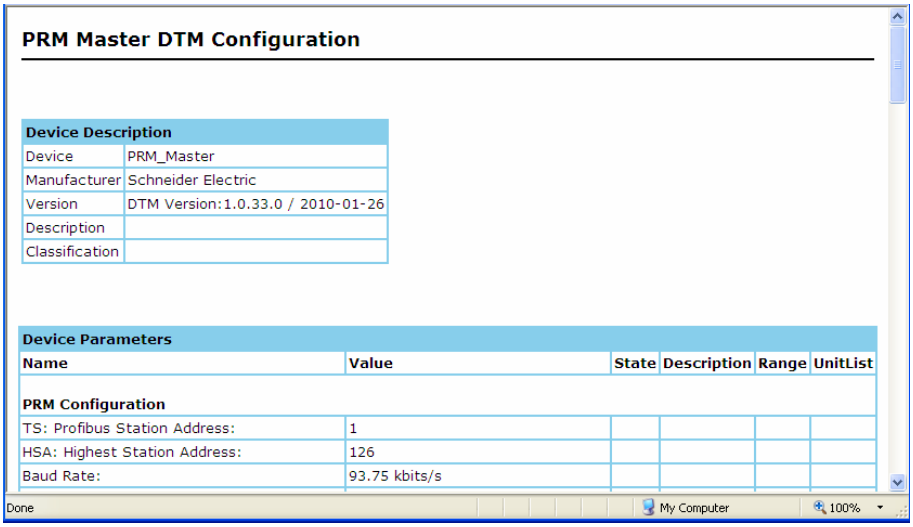
The configuration must be downloaded to the PRM and the application to the PLC. Refer to the part ***PRM configuration download and Start.***

15. Print

Print the configuration

1- In the Unity Pro Menu bar, select ***Tools > DTM Browser.***
2- In the ***DTM Browser***, select PRM Master instance, right-click (Master DTM contextual menu)
3- Select ***Print Device*** to start the printing.

The details of the Master DTM printing are displayed inside a web page on the computer screen, it shows all settings of the Master DTM.
To print this document, use the print feature of the web browser.



PRM Master DTM Configuration

Device Description	
Device	PRM_Master
Manufacturer	Schneider Electric
Version	DTM Version:1.0.33.0 / 2010-01-26
Description	
Classification	

Device Parameters					
Name	**Value**	**State**	**Description**	**Range**	**UnitList**
PRM Configuration					
TS: Profibus Station Address:	1				
HSA: Highest Station Address:	126				
Baud Rate:	93.75 kbits/s				

Done | My Computer | 100%

VIII. Configuration of the CommDTM

Scope of this Part

This part describes the configuration process for using the PRM CommDTM within a frame FDT application such as Unity Pro.

It is described using Unity Pro, but it can be done in a similar way in another FDT frame application.

This is done in 2 parts:

- Description of the Profibus network using the DTM browser
- PRM settings using the Comm DTM

Then the CommDTM can be connected to the PRM to access the diagnostic features and the Device DTMs can be used online.

What's in this Part?

This part contains the following chapters:

16. Description in the DTM browser

The first step of the configuration is to describe the Profibus network in the DTM browser. This is done by adding devices from the DTM catalog, first the PRM using the CommDTM, then the Profibus slaves under the CommDTM node.

Refer to the chapter ***Configuration of the PRM using the Master DTM > Description in the Unity Pro DTM browser***. The procedure is the same; simply replace Master DTM with CommDTM.

An alternative to adding the devices one by one, if the network already exists, is to launch a fieldbus discovery from the CommDTM. Refer to the chapter ***Master and CommDTM – Online actions > Profibus network discovery.***

17. Settings in the CommDTM

Scope of this Chapter

This chapter describes the different steps to configure the CommDTM.

What's in this Chapter?

This chapter contains the following sections:

Introduction

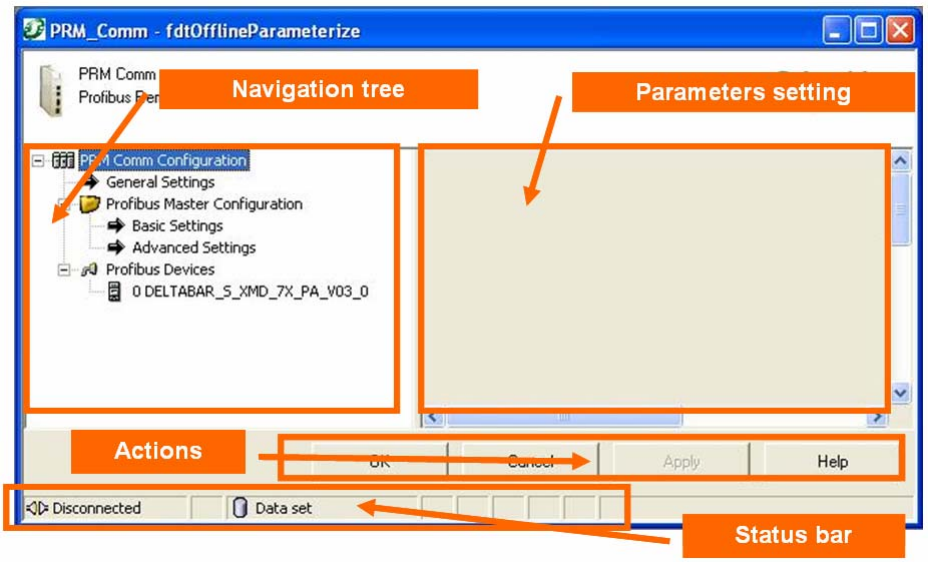
Open the configuration window

1- In the Unity Pro Menu bar, select ***Tools > DTM Browser.***

2- In the ***DTM Browser***, select **< - >** ***PRM_Comm instance***, then double-click

The DTM window organization

The window is organized into different areas as defined by the FDT/DTM standard: a navigation tree, an application area for parameters setting, an action area, a status bar and an identification area at the top.



Navigation tree

This provides a structured view of the different configuration panels. Clicking on a node in the tree will open the associated panel.

The upper part concerns the PRM itself:

- ***General Settings***
- ***Profibus Master Configuration***

The lower part under the node ***Profibus Devices*** concerns the slaves.

The device list is automatically updated when devices are added / removed in the DTM browser. This list can be globally expanded or collapsed by right-clicking on the ***Profibus Devices*** node.

Parameter setting

Default values

At the PRM level, the following parameters must be adapted to the physical configuration:

- ***General settings***
- ***Profibus Master Configuration > Basic settings***

It is recommended to keep the default values for the advanced parameters.

Parameters with an automatic or manual mode

These parameters have a checkbox in front of the value field.

- Automatic mode (default):

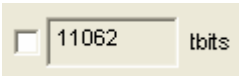
  The checkbox is unchecked. The value field is grayed and cannot be written. It contains the proposed default value. This default value is, in most cases, dynamic, meaning it is changed automatically when adding / removing devices or when changing other parameters.

- Manual mode:

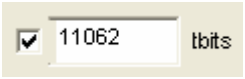
  By ticking in the check box, the field background changes to white, allowing changes to the value.

The default value can be re-applied by un-checking the box.

Example:



Automatic mode (default), read only



Manual mode, the value can be changed

⚠ CAUTION

INCORRECT EXCHANGES WITH DEVICES

Do not change the default values without having the necessary knowledge. Inappropriate settings can result in a malfunction of the Profibus exchanges with the devices including I/O exchanges.

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

Detection of an out of range parameter value

Values are tested against minimum and maximum limits. An incorrect value in a field is shown by an exclamation mark at the left side of the concerned field and also on the associated node in the navigation tree. The value remains unchanged until a correct value is entered.

Detection of a parameter value change

A change of a parameter is shown by a pencil on the left side of the field and also in the navigation tree in front of each concerned node. The new value is applied and the pencils disappear by clicking on OK or Apply in the action area.

Action area

The action area is used after parameters change. Options are:

- ***OK*** button to save and exit,
- ***Cancel*** button to exit without save,
- ***Apply*** button to save only.

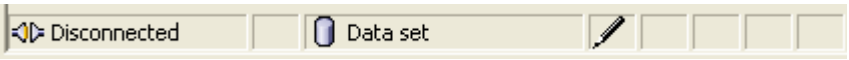
The ***help*** button provides context sensitive online help.

Status bar

The Status bar provides the following information:

DTM connection state		Data source		State of instance data set	
	Connected		Data Set		Valid modification
	Disconnected		Device		Invalid modification
	Comm Problems				

Example:

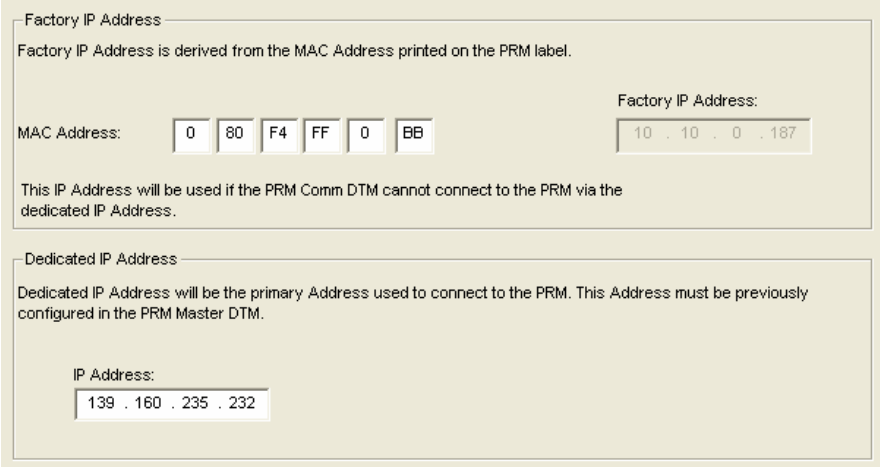


PRM general settings

At a glance

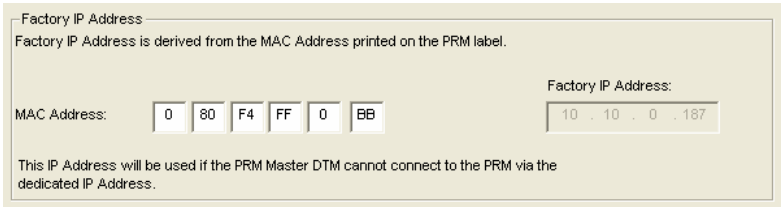
In the navigation tree, select ***General Settings.***

This panel enables the configuration of the ***Factory IP address*** and the ***Dedicated IP address***



It is used by the DTM to address the PRM.

Factory IP Address setting



Check the MAC address on the front face of the PRM module and report it in the appropriate fields in the ***Factory IP Address*** section.

The ***Factory IP Address*** assignment is in relation with the PRM module MAC Address according to the following rule :

If MAC Address = 0:80:F4:FF:xx_{Hex}:$yy_{Hex,}$

then IP Address = 10.10.aaa.bbb with aaa_{Dec}=xx_{Hex} and bbb_{Dec}=yy_{Hex}

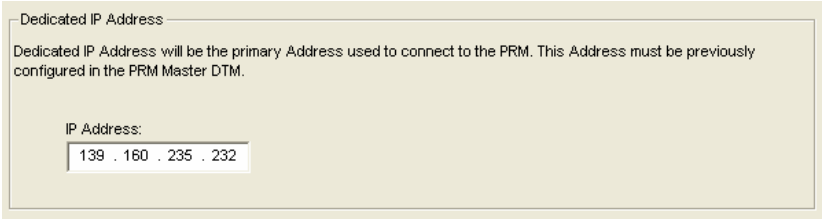
In our example, the MAC Address of the module is 00:80:F4:FF:00:BB.

Notice the change in the ***Factory IP Address*** field (BB_{Hex}=187_{Dec}):

This factory IP address will be used by the DTM as a default IP address to address the PRM.

Dedicated IP Address setting

In the ***Dedicated IP Address*** section, fill the IP Address fields.



This information will be used by the DTM to address the PRM.

Profibus Master parameters

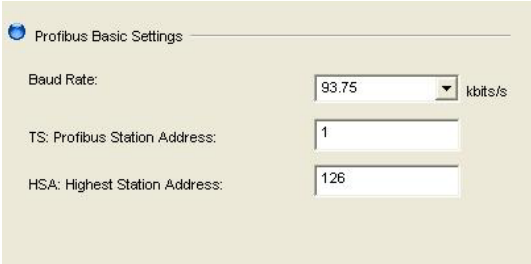
Introduction

This topic describes the different settings for the configuration of the Profibus Master featured by the PRM, including:

- Basic Settings
- Advanced Settings

Basic Settings

In the navigation tree, select ***Profibus Master Configuration*** > ***Basic Settings***.



- Set the ***Baud Rate*** (in Kbps) of the Profibus network: 9.6, 19.2, 31.25, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000 or 12000 Kbps. The baud rate selected should be supported by all slaves in the configuration. The baud rate should be selected depending the cable length, see chapter "Profibus DP"

- Set the ***TS: Profibus Station Address*** for the PRM module (Master Profibus). TS should be unique amongst all other slaves on the Profibus network, it should also be less than or equal to the HSA below:

Min: 0 Max: 126 Default:1

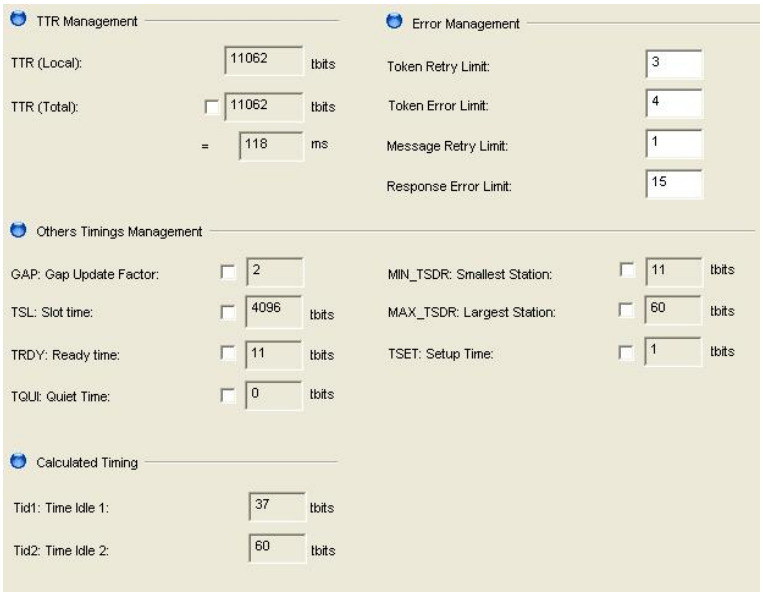
- Set the ***HSA: Highest Station Address***. This is the highest station address of the active stations (masters). Passive stations (slaves) can have a higher address than the HSA.
  HSA will impact the general performance of the Profibus DP. The higher it is, the higher the Profibus DP cycle time will be.
  When using a single master (i.e.: PRM only), it is most efficient to set the HSA equal to the TS parameter (Ideally: TS=HSA=1):

Min:1 Max:126 Default:126

Advanced Settings

In the navigation tree, select ***Profibus Master Configuration > Advanced Settings***.

These advanced settings are intended for expert users, in order to optimize the performance of the Profibus network. By default all values are automatically calculated by the configuration tool in order to have an optimized Profibus cycle time and no issues on the Profibus network. Nevertheless each parameter can be set manually by modifying the following values.



TTR (Target Rotation Time)Management

- **TTR (Local)** (in tbits) (read only): Is automatically calculated and indicates the maximum time available for a token circulation (time for Profibus token to be passed to another master and be back).

  It takes into account the number of slaves with their IO size (data exchanges telegram), different telegrams needed and their duration times (FDL status, global control, pass token), all mandatory timing with respect to the Profibus standard (time slot, min and max Tsdr, Tqui, Tset, …) and a safety margin which warrants bandwidth for acyclic messages (DPV1, …)

  Note : TTR_{local}[µs] = TTR_{local}[tbit] / Baudrate

- **TTR (Total)** (in tbits) (read/write): This field allows you to increase the value of the local TTR. This is required in the event that multiple masters are running. Indeed, the TTR local calculation doesn't take into account another master's presence on the Profibus network. In addition, in case of several masters, it is highly recommended that all master run with the same TTR.
  The value **MUST** be in the range:

Min: value of TTR (Local)
Max: 16777215
Default: value of TTR (Local)

Error Management:

- **Token Retry Limit** (read/write): Is the number of times that a Profibus Master tries to pass the token before deciding that a station is not there. Value must be in the following range:

Min: 0
Max: 15
Default: 3

- **Token Error Limit** (read/write): Is the maximum number of detected errors in 256 token cycles. Value must be in the following range:

Min: 0 Max: 255 Default: 4

- **Message Retry Limit** (read/write): Is the number of telegram repetitions if the address doesn't react. Value must be in the following range:

Min: 0 Max: 15 Default: 1

- **Response Error Limit** (read/write): Is the maximum number of detected errors in 16 successive messages.
  Value must be in the following range:

Min: 0 Max: 15 Default: 15

Other Timing Management

- **GAP: Gap Update Factor:** (read/write): The range of addresses between 2 consecutive active stations is called GAP. This GAP is submitted to a cyclic check during which the system identifies the station condition (not ready, ready or passive).

Min: 1 Max: 100

- **TSL: Slot Time** (in tbits) (read/write) is the maximum time the PRM will wait, after the transmission of a request, for the reception of the first byte (Tchar) of an answer. (It allows detecting a timeout.) It can be increased when repeaters are used in the Profibus network topology. The value must respect the rule:

Min: 37 Max: 16383

- **TRDY: Ready Time** (in tbits) (read/write) is the time after which the transmitting master will answer frame:

Min: 11 Max: 255

- **TQUI: Quiet time** (in tbits) is the time that a station may need to switch from sending to receiving. It must respect the rule:

TQUI < MIN_TSDR Min: 0 Max: 255

- **MIN_TSDR: Smallest Station** (in tbits) is the minimum time that a Profibus DP slave must wait before it may answer. It must respect the rule:

TQUI < MIN_TSDR Min: 11 Max: 1023

- **MAX_TSDR: Largest Station** (in tbits) is the maximum time that a Profibus DP slave may take in order to answer. Calculation of MAX_TSDR must respect the rule:

Min: 37 Max: 65525

- **TSET: Setup Time** (in tbits) is the reaction time on an event. Calculation of TSET must respect the rule:

Min: 1 Max: 494

Default values

The default values depend on the baud rate. They have been defined at 45.45 and 93.75kbits/s for respectively the Siemens and Pepperl & Fuchs SK1 DP/PA coupler. These couplers have specific timing requirements; please check all the settings with the documentation of the coupler you are using.

Calculated Timing:

Those timings are in read only and given for information.

- **Tid1: Time Idle1** (in tbits) is the time between the acknowledgement frame or token frame reception and the transmission of the next frame

- **Tid2: Time Idel2** (in tbits) is the time between the transmission of an unconfirmed packet and the transmission of the next packet.
  Calculation of Tid1 and Tid2 parameters must respect the following rule:

Tid1 = Max(Tsyn+Tsm, MIN_TSDR) Tid2 = Max(Tsyn+Tsm, MAX_TSDR) with Tsyn= 33 Tsm= 2 + 2* TSET + TQUI

Multi-master configuration

⚠ CAUTION

UNEXPECTED BEHAVIOR IN A MULTI-MASTER CONFIGURATION

Check that the Baud rate, HSA and TTR have the same value for all the masters.

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

Profibus devices parameters

Introduction

This section describes the settings of the Profibus devices.

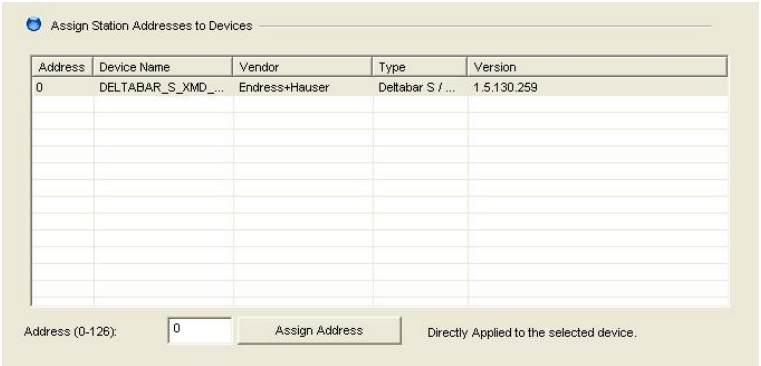
The devices added under the *PRM Comm* instance in the DTM browser are shown in the Comm DTM navigation tree under the node ***Profibus Devices***.

The list is sorted by ascending address and updated when a device is added or deleted in the DTM Browser. It can be expanded or collapsed.

Profibus Address setting

In the navigation tree, select ***Profibus Devices.***

The purpose of this panel is to assign the Profibus address of the devices as they are defined at the device level:



In the right panel, select the Profibus device to change its address.

Modify the value in the address field (for example "5" for the new address) and click on the ***Assign Address*** button to confirm the change.
Repeat this process for each Profibus device, as required.

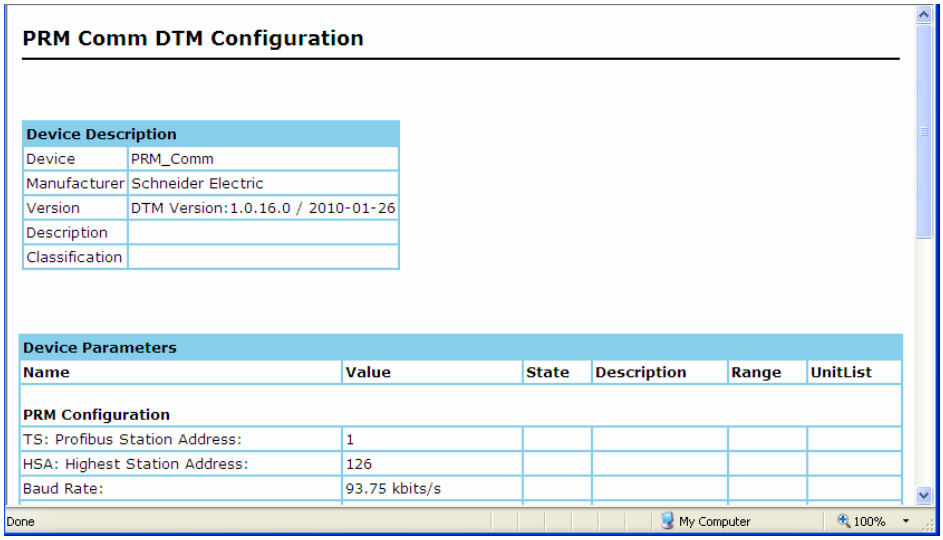
Important: The ***Assign Address*** feature IS NOT DESIGNED to set the Profibus address in the device itself, only in the software. The Profibus address of the device can be set directly on the device (switches, etc.) or by using the Set Slave Address command. See the chapter ***Master and Comm DTM – Online actions > Set Physical Slave Address.***

18. Print

Print Device parameters

1- In the Unity Pro Menu bar, select ***Tools > DTM Browser.***
2- In the ***DTM Browser***, select the PRM Comm instance
3- Right-click (DTM contextual menu) and select ***Print Device*** to start the printing.

The details of the CommDTM printing are displayed inside a web page on the computer screen showing all settings of the CommDTM.
To print this document, use the print feature of the web browser.



PRM Comm DTM Configuration

Device Description	
Device	PRM_Comm
Manufacturer	Schneider Electric
Version	DTM Version:1.0.16.0 / 2010-01-26
Description	
Classification	

Device Parameters

Name	Value	State	Description	Range	UnitList
PRM Configuration					
TS: Profibus Station Address:	1				
HSA: Highest Station Address:	126				
Baud Rate:	93.75 kbits/s				

IX. Configuration of a device using the Generic DTM

Scope of this Part

This part describes the configuration process and the use of the Generic DTM.

What's in this Part?

This part contains the following chapters:

19. Introduction

Preconditions

Before using the Generic DTM for a device on a PC, it must be installed on the PC. This is done using the associated GSD file and the menu of the Master DTM.

Refer to the ***Software installation*** chapter for a precise description of the operating modes.

Notes:

- A project using a Generic DTM configured on one PC can be used on another PC where the Generic DTM is not installed, but the device configuration cannot be changed. A message is shown by the Generic DTM when opening it.
- Adding the GSD into the library and updating the catalog is insufficient to have the Generic DTM fully functional. The project must be closed and reopened.

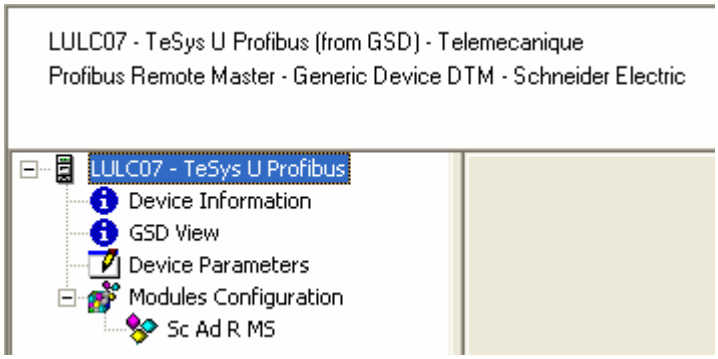
Once the installation phase is complete, the device can be found in the DTM catalog and must be added into the DTM browser the same as a manufacturer Device DTM.

Configuration panels

In the ***DTM Browser*** select the Profibus device and double-click on it.

The navigation tree of the Generic DTM has the following nodes:

- ***Device Information***: read only panel containing the major information extracted from the GSD file
- ***GSD view***: read only panel containing the contents of the GSD file
- ***Device parameters*** (optional)
- ***Modules Configuration***



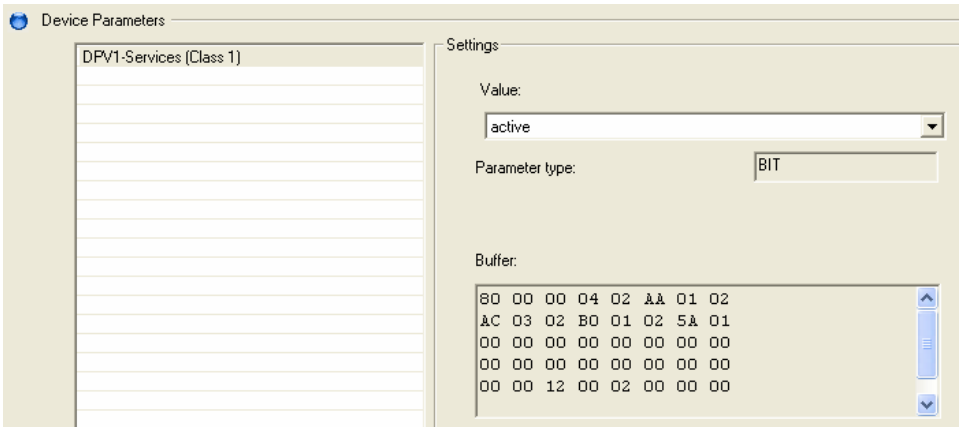
20. Device parameters

This screen is visible only if the header of station parameters is provided in the GSD.

On the left side of the panel are all parameters found in the GSD file, displayed in a grid.

To change a parameter: select the parameter in the grid and it will activate the corresponding box on the right side of the panel (Settings).

These settings will be used to generate the parameter buffer sent to the device when it starts. The values are shown in the Buffer area.



21. Modules Configuration

At a glance

The configuration is done is 2 steps:

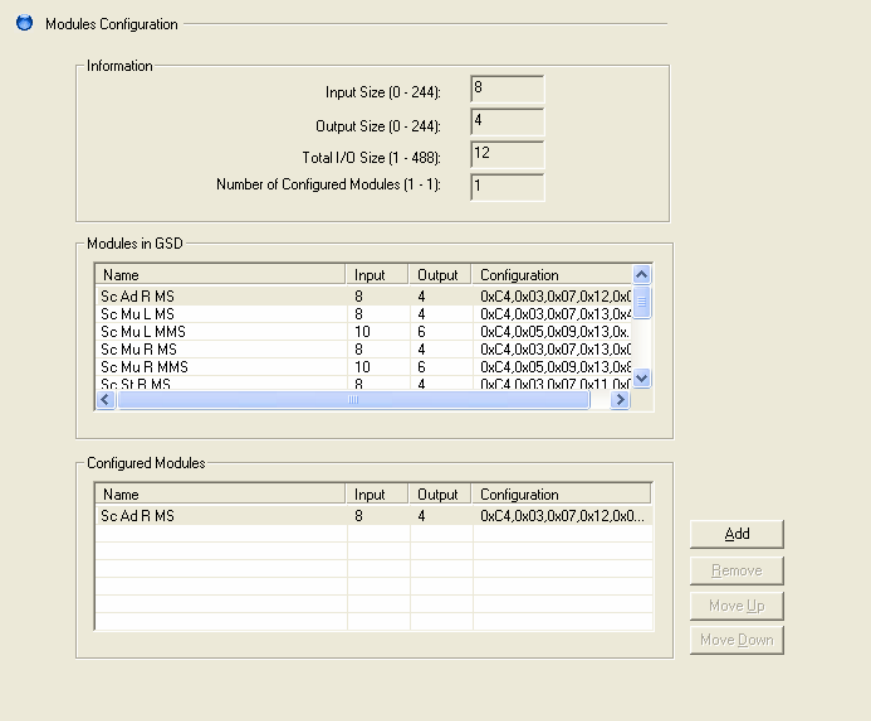
1- add the modules

2- configure all the modules that have parameters

Add the modules

1- Select the node ***Modules configuration*** in the DTM navigation tree

The list of the possible modules defined in the GSD are listed in the section ***Modules in GSD***



2- Select the module to be added in the ***Modules in GSD*** section and click on ***Add*** button.

The module is added to the ***Configured Modules*** list and to the Generic DTM navigation tree under the ***Modules Configuration*** node

3- Repeat to add more modules as needed.

4- Click on ***Apply*** button to validate.

The Master DTM is updated with the information provided by the Generic DTM including the I/O description part.

Remove a Module

1 - Select the module to remove in the ***Configured Modules*** section and click on ***Remove*** button.

The module is removed from the ***Configured Modules*** list and from the Generic DTM navigation tree under the ***Modules Configuration*** node

2- Click on the ***Apply*** button to validate.

The Master DTM is updated. The module is removed from the configuration and the associated I/Os are removed.

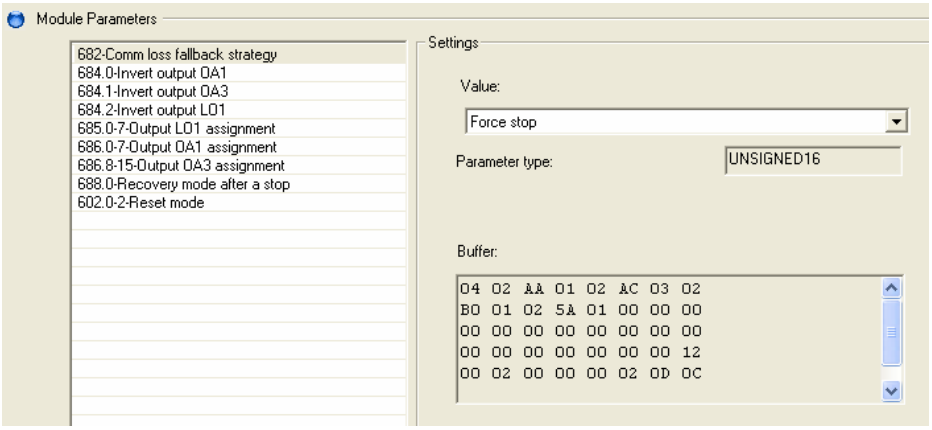
Configure a module

Click on the associated module node under ***Modules Configuration*** in the DTM navigation tree.

On the left side of the panel, all parameters found in the GSD are displayed in a grid.

To change a parameter: select the parameter in the grid and it will activate the corresponding box on the right side of the panel (***Settings***).

These settings will be used to generate the parameter buffer sent to the device when it starts. The values are shown in the ***Buffer*** area.

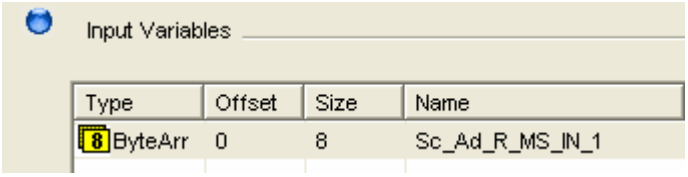


I/Os variables associated to a Generic DTM

The Generic DTM provides an I/O description to the Master DTM at the module level. It consists in an array of bytes (or a byte) per module having the name of the module as described in the GSD plus an extension. This extension is _IN_<n> for inputs and _OUT_<n> for outputs, <n> being a placeholder for the number of the module, starting at 1.

It can be seen in the Master DTM under the nodes ***I/O > Input variables*** or ***Output variables*** of the device.

For example for a device having 1 module named Sc_Ad_R_MS:



For each module, the array of bytes must be replaced with the corresponding variables as described in the device documentation.

Refer to the chapter ***Configuration of the PRM using the Master DTM > Profibus devices I/O variables.***

X. PRM configuration download and Start

Scope of this Part

This part describes the steps that have to be done after the configuration phase when using the Master DTM inside Unity Pro.

What's in this Part?

This part contains the following chapters:

22. Store configuration into the PRM

Scope of this Chapter

This chapter describes how to load the configuration into the PRM module after configuration is complete.

It describes also how to erase it, which is necessary in certain cases.

What's in this Chapter?

This chapter contains the following sections:

Store the configuration into the PRM

Introduction

Once the configuration is done and validated, it must be downloaded to the PRM by using the ***Store data to device*** command. This command is available from the Master DTM context menu when in online mode.

How to

1- In the Unity Pro menu bar, select ***Tools > DTM Browser.***

2- In the ***DTM Browser***, select ***< - >PRM_Master.***

3- Right-click on the ***PRM_Master node*** (Master DTM contextual menu) and select ***Connect***

4- Then right-click and select ***Store data to device.***

The configuration is stored in the PRM module and the PRM module reboots automatically.

Note: the connection is done using the ***Dedicated IP address*** or the ***Factory address*** depending on the General settings configuration panel.

Erase Configuration

Introduction

This command is available from the Master DTM context menu when in online mode.

It's main purpose is to change the IP address of a PRM which is in ***Stored*** mode and already has a configuration:

- First erase the configuration from the PRM using this command
- Then modify and save the configuration with the new dedicated IP address and finally, download the new configuration. As the PRM has no stored configuration, it is accessible by the DTM using the Factory Address.

This can also be done using the ***Clear IP*** position of the rotary switches.

Connect to PRM module and erase configuration

To erase the configuration using the Master DTM, the PRM module must be connected.

1- In the Unity Pro menu bar, select ***Tools > DTM Browser.***

2- In the ***DTM Browser***, select ***< - >PRM_Master.***

3- Right-click (Master DTM contextual menu) and select **Connect.**

4- Right-click and select ***Device Menu > Erase configuration.***

The configuration is erased from the PRM module and the PRM module reboots automatically.

23. PRM Reboot

Introduction

There is a reboot after a PRM ***Store to device*** or an ***Erase*** command.

The PRM checks the consistency between its last received configuration (CRC_IO of the configuration) and the application running in the PLC (CRC_IO written by the PLC as part of the IO scanner exchanges).

2 types of reboot

If the PRM is not running (meaning there is no link with the PLC), the reboot is immediate after a download or an erase.

If the PRM is running (meaning the IO scanner is running and the CRC_IO are consistent) , after the download of a new configuration, the type of reboot depends on the value of the CRC_IO of the new configuration:

- If the CRC_IO is not modified, the change is local to the PRM, then the reboot is **immediate**
- If the CRC_IO is modified, and the PLC must also be downloaded to be consistent with the PRM configuration, then the reboot is **synchronized**.

After an erase, if the PRM is running, the reboot is synchronized.

The principle of a synchronized reboot is as follows:

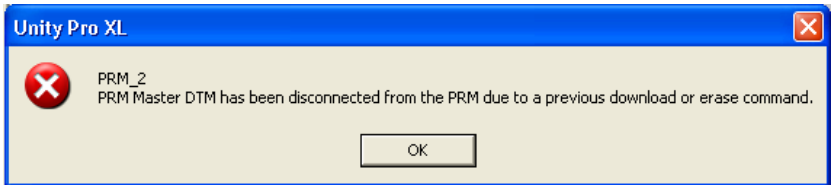
- The new configuration is stored in the PRM, but is not applied immediately, and the previous configuration remains active
- The reboot takes place only when the PRM is no longer scanned by the PLC.

Immediate reboot

The PRM download and reboot has the following steps after the Store to device command:

- a confirmation dialog for the download is shown with a message explaining that the PRM will need to reboot at the end of the download and the Master DTM will be disconnected
- the transfer of the configuration file takes place, reporting it's progress with a progress bar
- a first message is shown at the end of the transfer explaining that the reboot will take place immediately

- a second message is shown when the Master DTM is disconnected



- a ***Disconnect*** and then ***Connect*** must be done on the Master DTM in the DTM browser

Synchronized reboot

The PRM download and reboot has the following steps after the Store to device command:

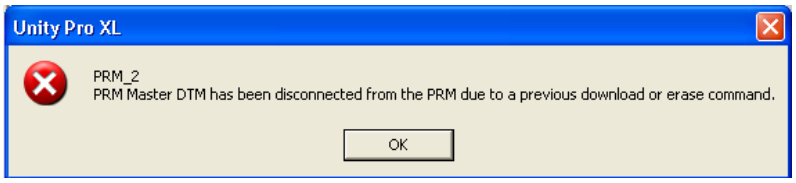
- A confirmation dialog for the download is shown with a message explaining that the PRM will need to reboot at the end of the download and the Master DTM will be disconnected.
- The transfer of the configuration file is takes place, reporting its progress with a progress bar.
- A message is shown at the end of the transfer explaining that the PLC needs to be disconnected from the PRM to take into account the new configuration file. Disconnected here means that the PRM is no longer scanned by the PLC.

  The previous configuration stays active.

  The CommDTMs potentially connected to the PRM are disconnected and cannot be connected again until the reboot is complete.

- The application must be updated and built offline to be consistent with the PRM configuration.
- The PLC must be downloaded with this new application and restarted.

  The STOP of the PLC will trigger the PRM reboot, a disconnection message for the Master DTM is shown



- a ***Disconnect*** and ***Connect*** must be done on the Master DTM in the DTM browser

NOTE: it is strongly recommended to do all the steps up to the end and validate globally that the change is OK. Do not let the system in an intermediary stage where the change is ready in the PRM but not yet applied because the PLC is still scanning the PRM. The change might be applied at an inappropriate time (a power outage as an example).

24. PRM Start

Precondition

After the reboot, if the PLC is running with the same CRC_IO as the PRM, the link is established between the PLC and the PRM.

The PRM_MASTER_STATUS is in the STOP state.

Refer to the chapter ***Exchanges from the PLC and variables > Implicit exchanges*** to have a description of this status.

Start

The PRM must be started to activate the IO exchanges on Profibus.

This is done from the PLC application using the PRM_MGT DFB.

Refer to the PRM DFB library documentation.

The PRM_MASTER_STATUS is now in the RUN state.

XI. Configuration changes using the Master DTM

Scope of this Part

This part describes how configuration changes may impact changes on the PRM module, Unity Pro and the PLC.

What's in this Part?

This part contains the following chapters:

25. Changes from the Master DTM

How to do these changes?

These changes are possible only with the Master DTM in offline mode, meaning it must be disconnected from the PRM.

Steps are:

- Make the changes in the configuration screens.

  The changed values are identified by a pencil icon 
- Validate globally the changes by clicking on
  - ***OK*** button to validate and exit.
  - ***Apply*** button to validate only.

Impact of changes

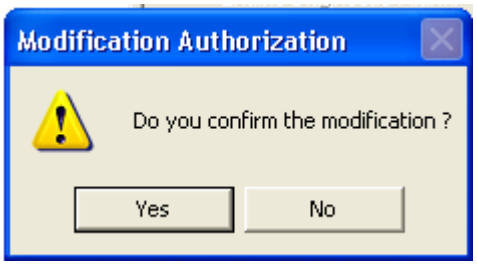
Assuming that the application was previously in the BUILT state and Unity Pro was online (connected to the PLC), there are 2 main cases depending on the type of changes:

Case #1, PRM only: The change has an impact on the PRM but no impact on the PLC configuration:

It can be done with the PLC connected and running.

The steps are:

1- Confirm the modification



The application is shown in a NOT BUILT state in the Unity Pro status bar

2- Download the PRM with the new configuration using the ***Connect*** and ***Store to device*** commands. The CRC_IO of the configuration is not changed, the PRM will reboot immediately after the download.

3- Build the application using the Build changes button (), changes are done in the PLC online.

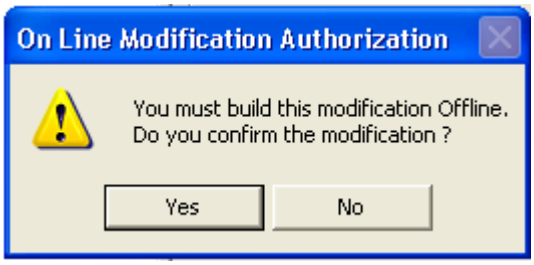
Example of this type of change: changing a device's Profibus settings.

Case #2, PRM & PLC: The change has also an impact on the IO scanner configuration and/or process image layout

This must be done with the PLC disconnected

Steps are:

1- Confirm the modification, the message shows that this change must be done with Unity Pro offline (the PLC disconnected)



The application is shown in a NOT BUILT state

2- Download the PRM with the new configuration using the ***Connect*** and ***Store to device*** commands. The CRC_IO of the configuration is changed and the PRM will not reboot immediately after the download.

3- Update the application in the IO scanning tab. The PRM instance is shown in red.

4- Disconnect the PLC

5- Build the application

6- Connect and download the PLC, confirm the STOP of the PLC, restart the PLC

Example of this type of change: change the type of a variable, change the IO scanner parameters

26. Changes from Unity Pro

From the DTM browser

The following changes can be done from the DTM browser:

- Add / Remove a Profibus device behind a Master DTM
  Must be done offline (PLC disconnected).
  An update of the application using the IO scanning tab is necessary.
  The PRM and the PLC configuration must be downloaded.
  Operating modes as described above in case #2, PRM & PLC.

- Rename the Master DTM
  Can be done online (PLC connected).
  An update of the application using the IO scanning tab is necessary.
  The PRM structured variables are renamed accordingly.
  It has no impact on the PRM configuration.

- Rename a device behind the Master DTM
  Can be done online (PLC connected).
  The device structured variables are not renamed accordingly. It must also be changed in the Master DTM if needed.
  It has no impact on the PRM configuration.

- Add a Profibus device behind a CommDTM
  Can be done online (PLC connected).

From the IO scanning tab

The following changes can be done in the IO scanning tab: the reserved size for the PRM (Read and Write length), the repetitive rate step, or the start index.

All these changes must be done offline (PLC disconnected).

The PRM must be downloaded as it has an impact on its configuration.

Operating modes as described above in case #2, PRM & PLC.

27. Changes from a Device DTM

From a Generic DTM

- Add/remove a module
  Must be done offline (PLC disconnected).
  An update of the application using the IO scanning tab is necessary.
  The PRM and the PLC must de downloaded.
  Operating modes as described above in case #2, PRM & PLC.

- Change device parameters
  Can be done online (PLC connected).
  The PRM must be downloaded as it has an impact on its configuration.
  Operating modes as described above in case #1, PRM only.

From a manufacturer Device DTM

Most of the changes in a Device DTM have no impact on the PRM configuration. Changes must be applied directly to the device by the ***Store data to device*** command from the Device DTM if they are done offline.

Exceptions are changes that modify the Profibus parameters or Profibus configuration of the device.

For example in some DTMs it is possible to disable some process values.

Those changes have an impact on the PRM configuration and the PLC. They are directly applied and are not cancellable.

Operating modes as described above in case #2, PRM & PLC (except the confirmation message).

XII. Exchanges from the PLC and variables

Scope of this Part

This part describes the different types of exchanges done by the PLC with the PRM or the Profibus devices, and the variables available in the program.

What's in this Part?

This part contains the following chapters:

28. Implicit exchanges

Scope of this Chapter

This chapter describes the implicit exchanges done by the PLC, the variables available in the program and their content.

What's in this Chapter?

This chapter contains the following sections:

Principles

Introduction

The Implicit exchanges are the exchanges automatically configured by adding the PRM to the I/O scanning tab.

It consists of the exchange of the implicit area of the PRM process image. This area contains:

- The Device inputs and outputs exchanged cyclically on Profibus
- 2 variables at the PRM level

The associated variables are automatically created and mapped on the corresponding IO scanner %MW areas.

Notes:

- The variables are seen at 0 (fallback value) when the PRM doesn't answer to the IO scanning requests (power off, booting, wrong IP address, etc.).
- The device IO variables are stored by device address ascending order. So adding a new device with a higher Profibus address than the existing ones will not change the %MW already allocated for the devices.

Device IO Variables

For each device having inputs and outputs, 2 structured variables are created with the structure names defined in the Master DTM.

These structured variables contain elementary variables with the names and types defined in the inputs and outputs panels of the Master DTM.

These variables can be directly used by the program assuming that their types and the device byte-ordering have been correctly defined in the Master DTM. The conversion between big-endian used on Profibus and little-endian used by the PLC is automatically done.

Example:

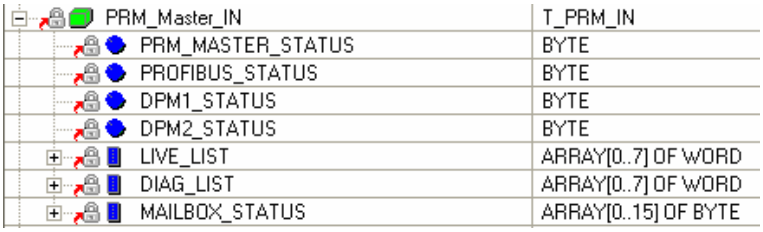
For a device named Deltabar_S in the DTM browser, the following variables are automatically created (if all default settings are used):

Name	Type	Address
Deltabar_S_IN	T_Deltabar_S_IN	%MW30
Main_Process_Value_Value	REAL	%MW30
Main_Process_Value_Status	BYTE	%MW32
_2nd_Cyclic_Value_Value	REAL	%MW34
_2nd_Cyclic_Value_Status	BYTE	%MW36
_3rd_Cyclic_Value_Value	REAL	%MW38
_3rd_Cyclic_Value_Status	BYTE	%MW40
Deltabar_S_OUT	T_Deltabar_S_OUT	%MW502
Display_Value_Value	REAL	%MW502
Display_Value_Status	BYTE	%MW504

PRM Variables

2 variables:

- 1 input variable: <*PRM Master instance name*>_IN, containing the PRM status



PRM_Master_IN	T_PRM_IN
PRM_MASTER_STATUS	BYTE
PROFIBUS_STATUS	BYTE
DPM1_STATUS	BYTE
DPM2_STATUS	BYTE
LIVE_LIST	ARRAY[0..7] OF WORD
DIAG_LIST	ARRAY[0..7] OF WORD
MAILBOX_STATUS	ARRAY[0..15] OF BYTE

- 1 output variable: <*PRM Master instance name*>_OUT, containing the CRC_IO written by the PLC in the PRM for the consistency check

Process Image devices inputs and outputs areas

Input area

This area:

- is initially set to 0
- is refreshed with Profibus inputs when the Profibus stack is in the OPERATE and CLEAR state
- will be left unchanged if the Profibus stack returns in the STOP state

Its size is up to 4,044 bytes.
The variables are stored in a little-endian format to be directly used by the PLC.

Output area

This area:

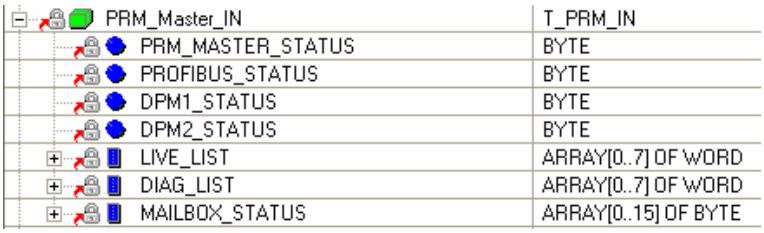
- is initially set to 0
- is written by the PLC as part of the IO scanner configuration
- is taken into account by the Profibus master only in the OPERATE state

Its size is up to 4,092 bytes.
The variables are stored in a little-endian format.

Variables detailed description

PRM status

This variable provides the following information



PRM_Master_IN	T_PRM_IN
PRM_MASTER_STATUS	BYTE
PROFIBUS_STATUS	BYTE
DPM1_STATUS	BYTE
DPM2_STATUS	BYTE
LIVE_LIST	ARRAY[0..7] OF WORD
DIAG_LIST	ARRAY[0..7] OF WORD
MAILBOX_STATUS	ARRAY[0..15] OF BYTE

PRM_MASTER_STATUS: status of the connection with the PLC

Value (dec.)	Meaning
0	PRM not responding to the PLC IO scanner requests (2)
1	NO CONF: no configuration file is stored in the PRM, communication with the PLC is not possible, this value cannot be seen by the PLC (1)
2	NO LINK: link is not established between the PRM and the PLC. Possible issues: - Ethernet: cable disconnected, network issue (1) - PLC: PLC in STOP, I/O scanner lines not running (1) - CRC_IO mismatch between the PLC application and the PRM configuration
3	STOP: IO scan running, CRC_IO OK but Start command not received from the PLC
4	RUN: Start command received, Profibus I/O exchanges can start

(1): on a DTM perspective only, as seen in the DTM diagnostic screens
(2): on a PLC perspective only, as seen in the application variables

PROFIBUS_STATUS: status of the Profibus network

Value (dec.)	Meaning
0	Profibus is not in OPERATE or CLEAR state
9	Connection not established with at least one device
10	Diagnostic asked by at least one device
11	Connection not established with at least one device and diagnostic asked by at least one device
12	BUS FAULT detected by the master
16	All is OK

DPM1_STATUS: status of the Profibus master especially regarding the IO cyclic exchanges

Value (dec.)	Meaning
0	INIT, this value cannot been seen by the PLC
1	Profibus master Offline: no configuration file is stored in the PRM and no DTM connected, this value cannot be seen by the PLC
2	STOP: Profibus master is initialized. Token is exchanged. However Data Exchange is not activated. It is possible to ask for acyclic class 2 requests. However acyclic class 1 requests can't be accepted.
3	OPERATE: following a Start from the PLC. Profibus master is initialized. Token is exchanged. Data Exchange is activated. It is also possible to ask for acyclic requests.
4	CLEAR: Profibus master is initialized. Token is exchanged. Data Exchange is activated. However, if Inputs are normally read, output won't be sent (Profibus device should go in fail state if supported by them). It is possible to ask for acyclic requests.

DPM2_STATUS: Current number of pending acyclic Profibus requests (class2, DPV1, slave diagnostic, etc.) from DTMs or PLCs.
The maximum is 8 requests from the PLC and 32 from the DTMs.

Live_List and Diag_List
These are two fields, each of 128 bits, 1 bit per device on the Profibus network.
For each of these two fields:

- Bit 0 corresponds to Profibus station address 0
- Bit x corresponds to Profibus station address x

The live list and the diag list flags are managed only for configured devices (class 1 communication) and are valid only when the Profibus stack is in OPERATE or CLEAR states. Otherwise, all bits will be set to 0.

For each device, the two bits must be interpreted as follows:

Live bit	Diag bit	Meaning
0	0	This state is reported in the three following cases: • system init state (temporary state) • for non-configured devices, as a definitive state • for configured devices, when the Profibus stack is not in OPERATE or CLEAR state
0	1	Communication not established with the device
1	0	Communication with the device is OK and there is no diagnostic asked by the device
1	1	Communication with the device is OK but there is a diagnostic asked by the device

Mailbox_Status
It provides a status per mailbox.
The mailboxes are used by the PRM DFBs for the commands and explicit exchanges.

CRC_IOMAPPING

This 32-bit value is expected to be written by the PLC and should contain the CRC_IO that identifies uniquely a configuration I/O mapping.

This area:

- Is initially set to 0 (also in case of restart of PRM).
- Is written by the PLC as part of the IO scanner configuration:
  - if the value is equal to CRC_IO contains in the configuration file, the writing is accepted
  - if the value is false (no configuration file or different value), the writing is rejected and the field is reset to the value 0
- This field will be also reset to 0 by the PRM when a PLC disconnection is detected.

29. Explicit exchanges

Introduction

The following explicit exchanges can be done by using the PRM DFBs:

- get the PRM full status
- do explicit exchanges with the Profibus devices (read or write data record or get diagnosis)
- send sync and freeze commands

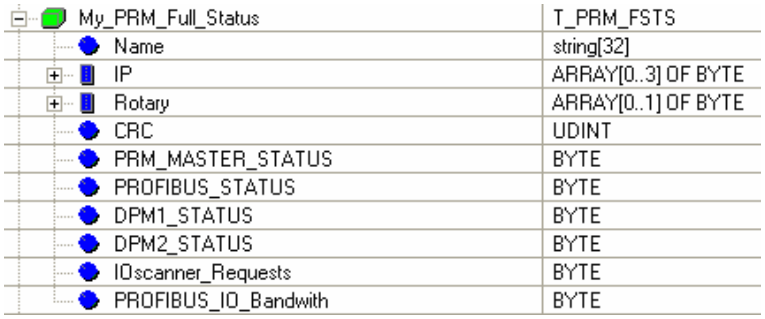
The PRM full status is read from the explicit area of the PRM Process Image.

The other explicit exchanges and commands are done using the PRM mailboxes in the explicit area of the Process Image to initiate DPV1 requests, diagnostic requests or SYNC/FREEZE commands on Profibus.

Refer to the PRM DFBs library documentation for a description of the usage of these DFBs.

PRM full status

The PRM_MGT DFB can be used to get the PRM full status variable:



My_PRM_Full_Status	T_PRM_FSTS
Name	string[32]
IP	ARRAY[0..3] OF BYTE
Rotary	ARRAY[0..1] OF BYTE
CRC	UDINT
PRM_MASTER_STATUS	BYTE
PROFIBUS_STATUS	BYTE
DPM1_STATUS	BYTE
DPM2_STATUS	BYTE
IOscanner_Requests	BYTE
PROFIBUS_IO_Bandwith	BYTE

It contains the following additional variables compared to the PRM_Status:

- **Name**
  Name assigned to the PRM instance in the DTM browser.
  If no configuration file is present, all characters are 0.

- **IP Address**
  IP address of the PRM.

- **Rotary switches positions**
  Rotary[0]: position of the lower rotary switch
  Rotary[1]: position of the upper rotary switch

- **IO Scanner Status**
  Number of Modbus IO scan requests received within a cycle.

- **Profibus IO Bandwith**
  This value is the percentage of the Profibus cycle which is consumed to manage the Data Exchange operation.
  In a single master context, it can, in particular, provide a good overview of the Profibus Network load and of the capability of the master to process acyclic requests on the network.
  IO Bandwith = (Data Exchange Management Time) / Profibus Cycle * 100
  This value is valid only when the Profibus stack is in OPERATE mode

Profibus explicit exchanges

The RDDIAG, WRREC and RDREC DFBs can be used to manage explicit exchanges from the PLC application with the Profibus slaves. The PRM must be in RUN.

Sync / Freeze Sync and Freeze commands can be sent from the PLC application using a dedicated DFB. The PRM must be in RUN.

XIII. Diagnostics & Troubleshooting

Scope of this Part

This part describes all diagnostic functions and provides some tips for troubleshooting.

What's in this Part?

This part contains the following chapters:

30. LED

Scope of this Chapter

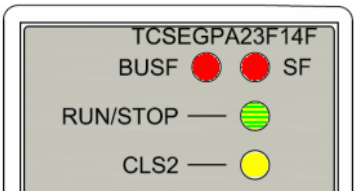
This chapter describes the different states of the LEDs and their meanings.

What's in this Chapter?

This chapter contains the following sections:

System LEDs

LEDs description



SF (System failure)
Blocking error detected or absence of a configuration file:

LED status	Description/Meaning
Solid	•Default state at power up during the self-tests, •A blocking error has been detected, either at Hardware or Firmware. This state is definitive until reboot.
Blinking	No configuration file detected in Flash at boot up time
Off	A valid configuration file has been detected in Flash at boot up time

BUSF (Bus fault)
Profibus bus fault or device fault detected:

LED status	Description/Meaning
Solid	Bus fault detected on the Profibus network
Blinking	Device fault detected on the Profibus network
Off	No fault detected

RUN/STOP
Profibus master state:

LED status	Description/Meaning
Solid yellow	Stop
Blinking green	Clear
Solid green	Operate
Off	Profibus master offline

CLS2 (Class 2 activity)
This led is flashing when Profibus acyclic requests, from the PLC or the DTMs, are processed.

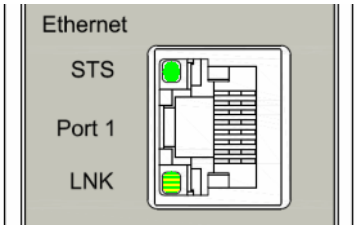
Global view by PRM state

PRM State	SF (red)	BUSF (red)	RUN/STOP (Green/Yellow)	CLS2 (Yellow)
• Power off	Off	Off	Off	Off
• System error	Solid	Off	Off	Off
No configuration file in Flash				
• No DTM connected	Blinking	Off / Solid	Off	Off
• DTM connected	Blinking	Off / Solid	Solid Yellow	X
Configuration file in Flash				
• Profibus in Stop	Off	X	Solid Yellow	X
• Profibus in Clear	Off	X	Blinking green	X
• Profibus in Operate	Off	X	Solid green	X

X: all states are possible.

Ethernet LEDs

Ethernet LEDs



Reported Status	STS (Link Status) (GREEN)	LNK (Link/Activity) (GREEN/YELLOW)	Remarks
Link not OK	X	Off	
100Mbps link, no activity	X	Solid Green	
100Mbps link with activity	X	Blinking Green	
10Mbps link, no activity	X	Solid Yellow	
10Mbps link with activity	X	Blinking Yellow	
Ready and no detected error	Solid	X	
Invalid MAC address or no valid IP parameters	2 flashes	X	Applies when rotary switch is in Clear IP position
Duplicate IP detected	4 flashes	X	Applies if a duplicate IP Address is detected when trying to use the Default IP address
Waiting for BootP/DHCP address	5 flashes	X	Applies when PRM is waiting for DHCP response
Default IP address	6 flashes	X	Applies when DHCP server response is not consistent with IP@ in configuration file.

31. Diagnostic from the Master DTM

At a Glance

The diagnostic features of the Master PRM operate in online mode and provide information relative to the PRM on which the Master DTM is connected.

The configuration in the PC and in the PRM must be equal. If this is not the case, a message is shown when opening the diagnostic panel and the diagnosis is limited to information on the PRM itself (nothing available about the slaves).

The navigation tree provides the following nodes:

- PRM: diagnostic information about the PRM itself, hardware and firmware versions, IP addressing, etc.

- PLC connection: state of the connection with the PLC

- Profibus master: state of the Profibus master

- Profibus devices:

- one node per configured slave

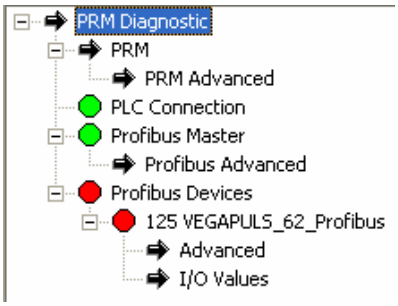
- provides the content of the slave diagnostic request and the values of the I/O (read only).

How to access to the PRM diagnosis

Step	Action
1	In the Unity Pro menu bar, select ***Tools > DTM Browser***
2	Select the ***PRM Master*** instance in the browser
3	Right click to open the contextual menu and select ***Connect***
4	Double click on the ***PRM Master*** instance (or in the contextual menu select Open or Device menu → Diagnosis)

Global diagnostic using the LED icons in the navigation tree

The LED icons available on the different nodes of the navigation tree provide a global view of the PRM, the bus and the devices:



The meaning of each LED is provided in the corresponding panel.

- LED on the ***PLC Connection*** node

LED Color	Meaning
Red	NO LINK: link not established between the PRM and the PLC. Possible issues: - Ethernet: cable disconnected, network issue - PLC: PLC in STOP, I/O scanner lines not running - CRC_IO mismatch between the PLC application and the PRM configuration
Yellow	STOP: IO scan running, CRC_IO OK but Start command not received from the PLC
Green	RUN: Start command received
Gray	NO CONF: PRM not configured

- LED on the ***Profibus Master*** node

LED Color	Meaning
Red	bus fault detected
Green	Profibus in OPERATE
Yellow/Green	Profibus in CLEAR
Yellow	Profibus in STOP

- LED on the ***Profibus Devices*** node

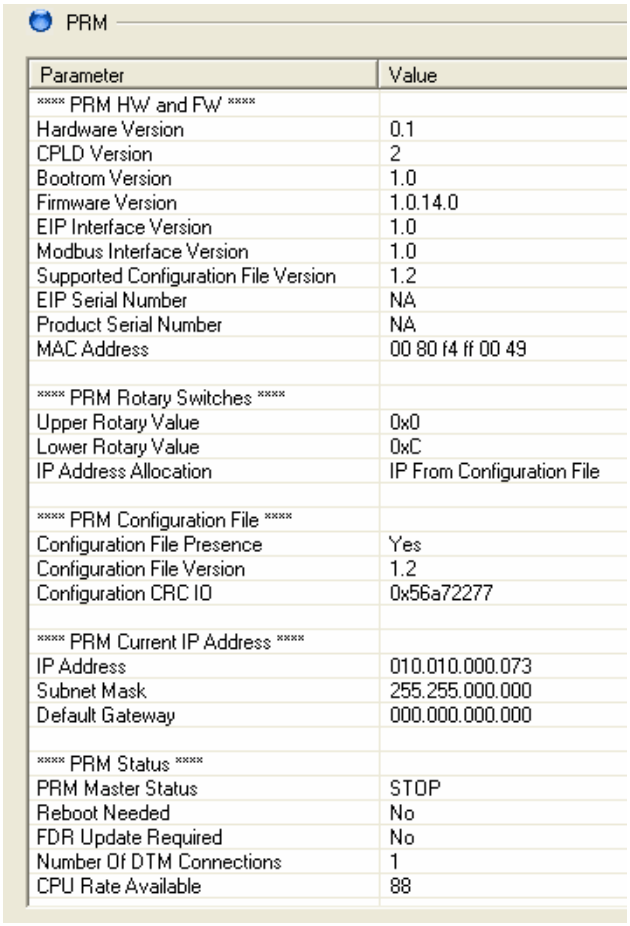
LED Color	Meaning
Gray	No data exchange (Profibus STOP state or device not configured)
Red	Connection not established with at least one device
Green	Communication is OK and there is no diagnostic asked by a device
Yellow	Diagnostic asked by at least one device
Yellow/Red	Connection not established and diagnostic asked by at least one device

- LED on each device node

LED Color	Meaning
Gray	Profibus stack is not in OPERATE or CLEAR state
Red	Communication not established with the device
Green	Communication with the device is OK and there is no diagnostic asked by the device
Yellow	Communication with the device is OK but there is a diagnostic asked by the device

PRM

In the navigation tree, select ***PRM*** sub-tree to view information of the PRM module:



Parameter	Value
**** PRM HW and FW ****	
Hardware Version	0.1
CPLD Version	2
Bootrom Version	1.0
Firmware Version	1.0.14.0
EIP Interface Version	1.0
Modbus Interface Version	1.0
Supported Configuration File Version	1.2
EIP Serial Number	NA
Product Serial Number	NA
MAC Address	00 80 f4 ff 00 49
**** PRM Rotary Switches ****	
Upper Rotary Value	0x0
Lower Rotary Value	0xC
IP Address Allocation	IP From Configuration File
**** PRM Configuration File ****	
Configuration File Presence	Yes
Configuration File Version	1.2
Configuration CRC IO	0x56a72277
**** PRM Current IP Address ****	
IP Address	010.010.000.073
Subnet Mask	255.255.000.000
Default Gateway	000.000.000.000
**** PRM Status ****	
PRM Master Status	STOP
Reboot Needed	No
FDR Update Required	No
Number Of DTM Connections	1
CPU Rate Available	88

Description of the parameters:

PRM hardware and firmware:

Parameter	Value	Description
Hardware Version	x.y	x :Major version y :Minor version
CPLD Version	x	0<x<16 : CPLD Version
Boot Rom version	x.y	x :Major version y :Minor version
Firmware version	x.y.z.w	x :Major version y :Minor version z :Very minor changes w : reserved for old version to be patched
EIP Interface version	x.y	x :Major version y :Minor version
Modbus Interface version	x.y	x :Major version y :Minor version
Supported configuration file version	x.y	x :Major version y :Minor version
EIP Serial Number	0xXXXX	Identification number returned in EIP Identity object
Product Serial Number	String Format	Serial number as appearing on the PRM side
MAC Address	xx.xx.xx.xx.xx.xx	MAC Address of the PRM

PRM rotary switches:

Parameter	Value	Description
Upper Rotary Value	'0 – F'	Rotary position as detected at startup
Lower Rotary Value	'0 – F'	Rotary position as detected at startup
IP Address Allocation	IP DHCP	Current Address obtained from the DHCP server
	IP From Factory	Factory IP address
	IP From Configuration file	Dedicated IP address taken from configuration file

PRM configuration file:

Parameter	Value	Description
Configuration file presence	'Yes' or 'No'	Indicates if the PRM was containing a configuration file at startup
Configuration file version	x.y	Configuration file version 0.0 if no configuration file
CRC IO mapping	Value	Checksum used to warrant configuration consistency between the PLC application and the PRM #### if no configuration file

PRM current IP address:

Parameter	Value	Description
IP Address	XXX.XXX.XXX.XXX	Current IP address used by the PRM
Subnet mask	XXX.XXX.XXX.XXX	Current Subnet mask used by the PRM
Default gateway	XXX.XXX.XXX.XXX	Current Default IP address used by the PRM

PRM status:

Parameter	Value	Description
PRM Master Status	NO CONF NO LINK STOP RUN	PRM not configured No or bad CRC_IO received CRC_IO received and OK Start command received
Reboot Needed	Yes / No	Yes means the PRM configuration has been updated by the Master DTM and the PRM needs to reboot to apply the new configuration
FDR Update Required	Yes / No	Yes means the FDR server is activated and a new configuration has been downloaded then it should be transferred to the FDR server
Number of CommDTM Connections	0 – 4	Number of DTMs currently connected to PRM. It includes both master DTM and CommDTM
CPU Rate Available	0 < x < 100	Estimation of the CPU used (dynamic data)

PRM Advanced diagnosis

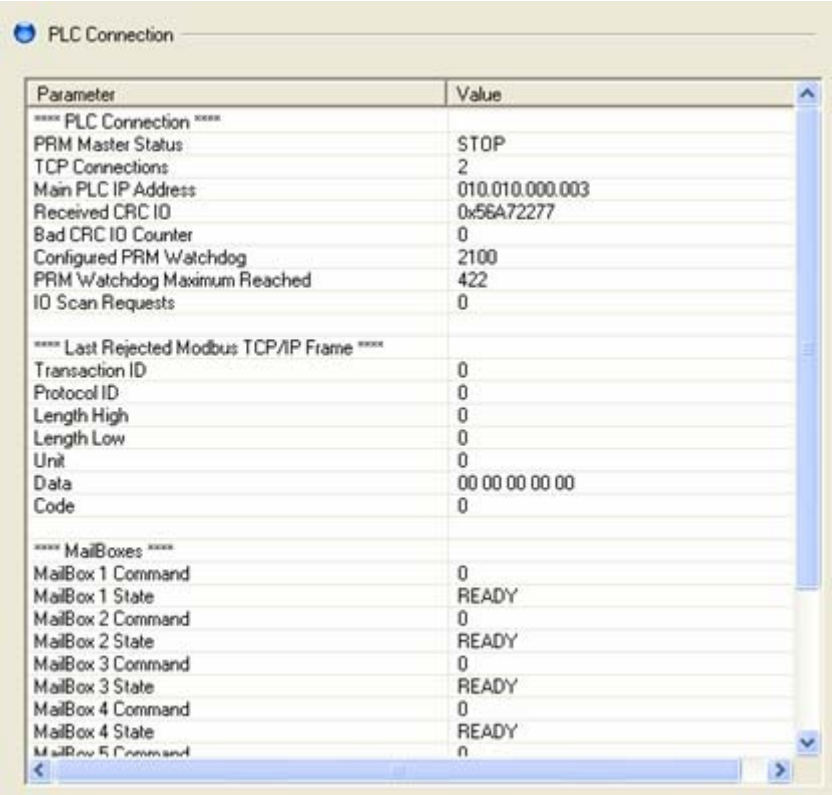
Double-click on ***PRM → PRM advanced diagnosis*** to view all of the parameter values for the PRM module.
This table presents internal counters which trace the PRM activity.

This data could be helpful to solve possible problems in assistance with Schneider technical support

PLC connection

In the navigation tree, select ***PLC connection*** for access to diagnostic information related to the communication with the PLC.

Connection here doesn't mean only the physical connection between the PLC and the PRM but also the logical link between both (IO scan running, match of CRC_IO, Start command from the PLC).



Description of the parameters:

Parameter	Value	Description
PRM Master Status	NO CONF NO LINK STOP RUN	PRM not configured No or bad CRC_IO received CRC_IO received and OK Start command received
TCP Connections number		Number of TCP connections currently maintained by the PRM
Main PLC IP address	xxx.xxx.xxx.xxx.	IP address of the Ethernet module managing the IO scanner « xxx.xxx.xxx.xxx" if no PLC connected
CRC IO	DWORD value	CRC IO put by the PLC which connected successfully "xxxxxxx" if no PLC connected
Bad CRC_IO Counter		Counter incremented each time a bad CRC IO writing is performed.
Configured PRM Watchdog	ms	Value extracted from the configuration file (visible in IO scanning Panel)
PRM Watchdog Maximum reached	ms	Maximum measured time by the MODBUS_LIVE_CHECKED state machine (0 if no PLC connected) This counter is reset after Main PLC disconnection
IO Scan Request		Number of IO scan requests received within a cycle

Profibus Master diagnosis

Click on ***Profibus Master*** to view diagnostic information related to the Profibus Master interface of the PRM module.

Name	Value	Description
Profibus Master State	STOP OPERATE CLEAR	Current mode of operation of the Profibus stack
Pending Acyclic Requests		Number of requests currently on processing in the PRM

Profibus Advanced diagnosis

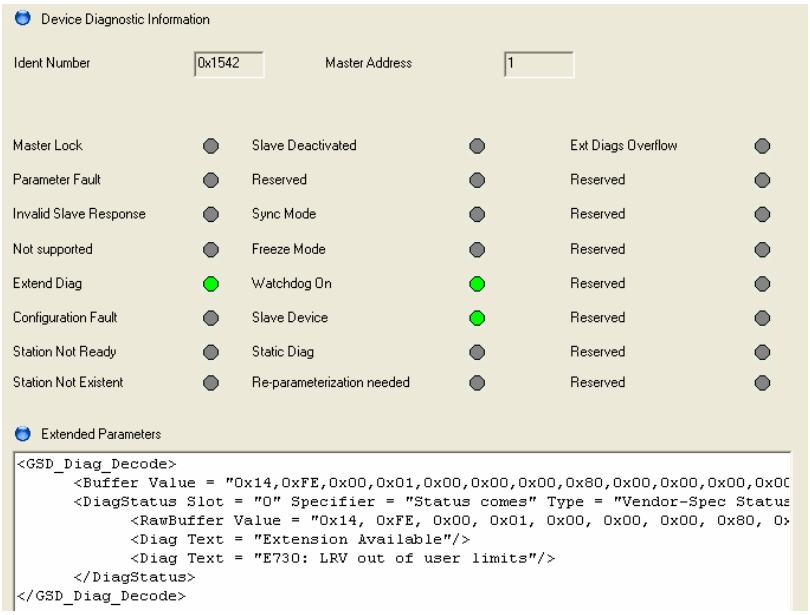
(For technical support internal use only)

In the navigation tree, select ***Profibus Master > Profibus Advanced*** to view advanced diagnostic information related to the Profibus Master.

This table presents internal counters to trace the PRM activity.

Profibus Devices diagnosis

1- Click on ***Profibus Devices*** to develop the sub-tree with all the devices.
2- Select the ***Device name*** to view its diagnostic information.



This panel contains status information and alarms as reported by the 6 first bytes of the slave diagnostic request:

"Led" fields

The content of the 3 first bytes are shown as one LED per bit.
The LED color is gray when the bit is at 0, red for an error, green for an indication.

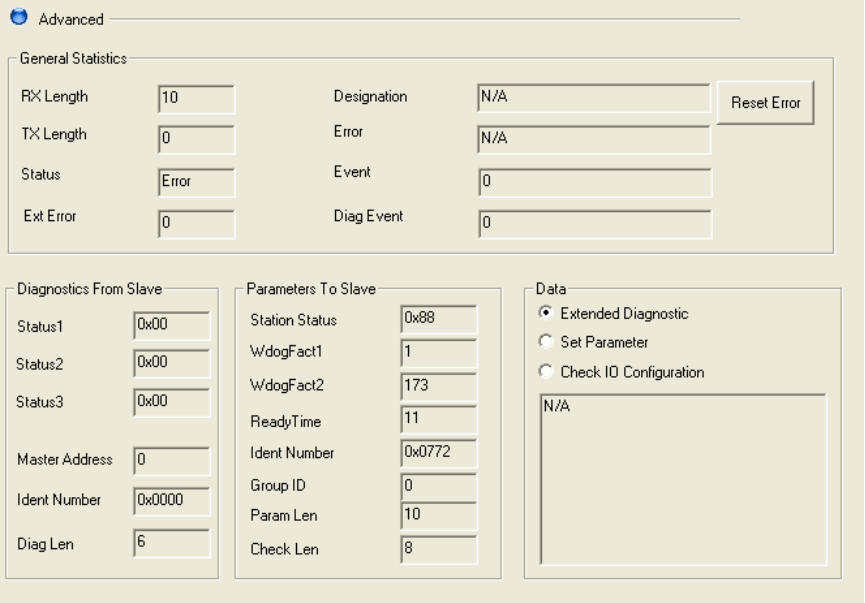
- **Master Lock:** Set by master if slave has been parameterized by another master.
- **Parameter Fault (red):** Set by slave if last parameter frame was wrong
- **Invalid Slave Response (red)**:.Set by master in case of an invalid response
- **Not Supported (red)**: Set by slave if the slave doesn't support the required function.
- **Extend Diag**: Set by slave to indicate a diagnostic entry is in the slave-specific diagnostic area.
- **Configuration Fault (red)**: Set by slave if it detects a mismatch in configuration data.
- **Station_Not_Ready (red)**: Set by the slave if slave not ready for data exchange
- **Station_Non_Existent (red)**: Set by the master if slave doesn't exist
- **Slave Deactivated**: Set by the master if slave has been marked inactive within the slave parameter set and is removed from cyclic processing.
- **Sync Mode**: Set by slave after it has received a Sync command.
- **Freeze Mode**: Set by slave after it has received the Freeze command.
- **Watchdog On**: Set by slave to indicate Watchdog is active.
- **Slave Device:** Slave sets this bit at 1
- **Static Diag**: Slave sets this bit to cause the master to retrieve diagnostic information until this bit is cleared (the slave sets it if it's not able to provide user data).
- **Re-Parameterization needed**: Set by a slave if it needs to be parameterized and cleared once parameterization is complete.
- **Ext Diags Overflow**: Set if there is more diagnostic information than specified in Ext_Diag_Data. For example, slave sets this if the slave has more diagnostic data than it can enter into its send buffer. Set by the master if the slave sends more diagnostic information than it can enter into its diagnostic buffer.

Extended Parameters Extended diagnostic information if available in the slave diagnostic request answer. Displayed as formatted text strings unless the GSD information is not available from the Device DTM (raw buffer in this case).

Ident Number device ident number (or 0xFFFF if data not accessible)
Master Address master that has parameterized the slave (255 if any)

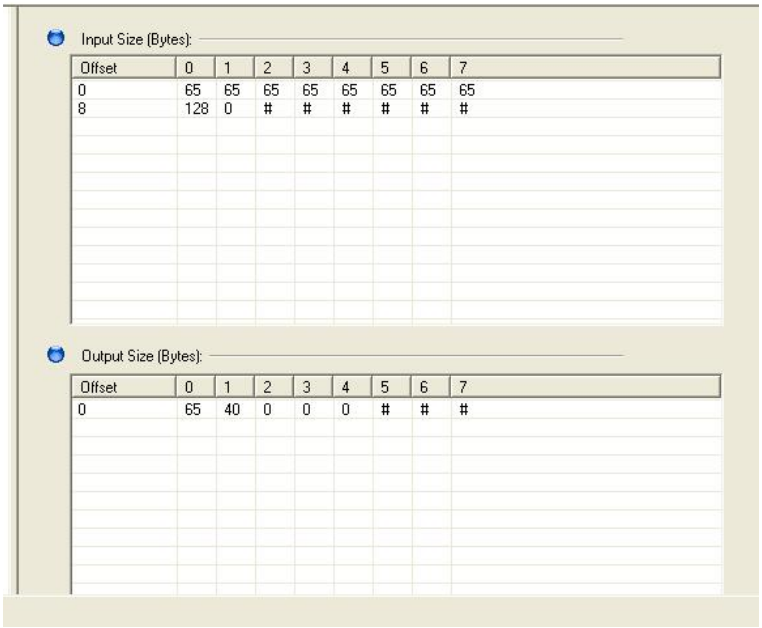
Profibus devices Advanced diagnosis

In the navigation tree, select ***Profibus Devices > Device Name > Advanced*** to view advanced diagnostic information related to the device.



Profibus Devices I/O values

Click on ***Profibus Devices > Device Name > I/O Values*** to view the values of its inputs and outputs. If an Input or output is not available the character "**#**" will be displayed instead of a value.



32. Diagnostic from the CommDTM

The CommDTM provides globally the same diagnosis features as the Master DTM.

The navigation tree provides the following nodes:

- PRM: diagnostics about the PRM itself, hardware and firmware versions, IP addressing, etc.

- PLC connection: state of the connection with the PLC

- Profibus master: state of the Profibus master

- Profibus devices:

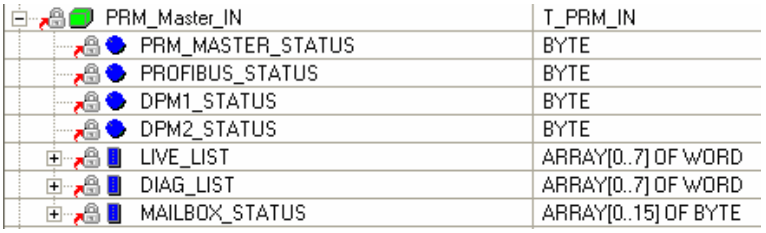
- one node per slave part of the PRM configuration and also inserted as a child of the CommDTM in the DTM browser

- provides the content of the slave diagnostic request

33. Diagnostic from the PLC application

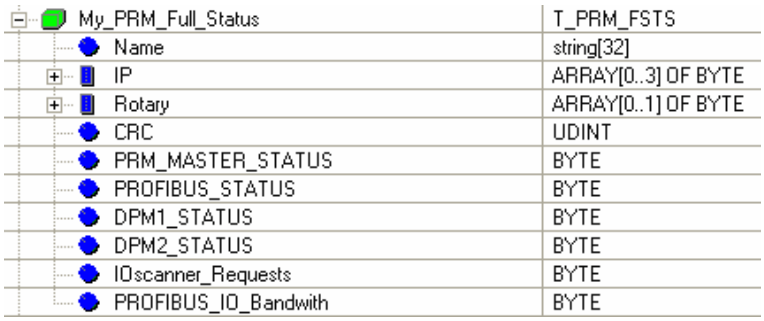
The PLC has access to the following information:

- By implicit exchanges to the ***PRM status*** contained in the <*PRM Master instance name*>_IN variable



PRM_Master_IN	T_PRM_IN
PRM_MASTER_STATUS	BYTE
PROFIBUS_STATUS	BYTE
DPM1_STATUS	BYTE
DPM2_STATUS	BYTE
LIVE_LIST	ARRAY[0..7] OF WORD
DIAG_LIST	ARRAY[0..7] OF WORD
MAILBOX_STATUS	ARRAY[0..15] OF BYTE

- By explicit exchanges using the PRM_MGT DFBs to the ***PRM full status***



My_PRM_Full_Status	T_PRM_FSTS
Name	string[32]
IP	ARRAY[0..3] OF BYTE
Rotary	ARRAY[0..1] OF BYTE
CRC	UDINT
PRM_MASTER_STATUS	BYTE
PROFIBUS_STATUS	BYTE
DPM1_STATUS	BYTE
DPM2_STATUS	BYTE
IOscanner_Requests	BYTE
PROFIBUS_IO_Bandwith	BYTE

- diagnostic information related to the devices using the RDDIAG block

For further details on the content of the ***PRM status*** and ***PRM full status***, refer to chapter "***Exchanges from the PLC and variables***"

For further information on the DFBs, refer to the PRM DFBs library documentation

34. SNMP

Scope of this Chapter

This chapter describes the Simple Network Management Protocol (SNMP) and the Schneider private MIB for the PRM module.

What's in this Chapter?

This chapter contains the following sections:

SNMP Communication in UDP/IP

At a Glance

The SNMP standard (Simple Network Management Protocol) defines network management solutions in terms of protocol and supervised data exchange. The SNMP architecture is based on the following key elements:

- The **Manager** is used to supervise all or part of the network.
- One or more **Agents**. Each device being supervised has a software module called an **Agent** used by the SNMP protocol.
- An **MIB** (Management Information Base) is a database or collection of objects updated by the agents.

The SNMP agent service is implemented on the PRM module. The SNMP protocol allows a Manager to access MIB objects in the PRM module.
The **MIB-II** is used to manage TCP/IP communication layers.
The **MIB Ethernet Transparent Factory** allows a Manager to access data on the messaging service on port 502.

The SNMP Protocol

The SNMP protocol defines 5 types of messages between agent and manager..
These messages are stored in **UDP** data-grams.

Messages from the manager to an agent:

- Get_Request: message used to obtain the value of one or more variables
- Get_Next_Request: used to obtain the value of subsequent variables
- Set_Request: used to position the value of a variable

Messages from an agent to the manager:

- Get_Response: used by the agent to return the variable value requested
- Trap: used by the agent to signal an event to the Manager (unauthorized access attempt or rebooting of the device)

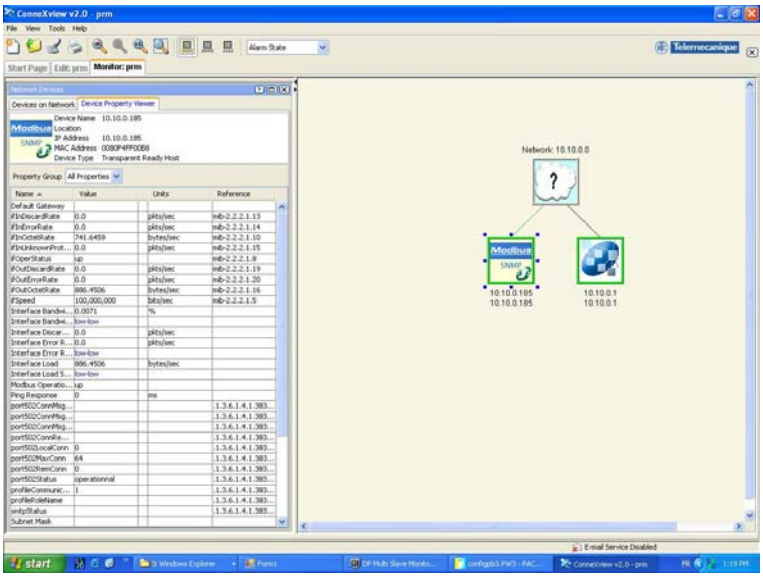
The PRM module supports both SNMP Version 1 and 2 with the following community names :

- Read community : public
- Write community : public

Supported MIB

At a Glance

User can access in Read Only to the PRM MIB objects by using SNMP client application such as Schneider's ConneXview software (SNMP V1).



The PRM module supports:

- standard MIB-2, defined by the RFC1213, which is used to manage the TCP/IP communication layer,
- Schneider private MIB

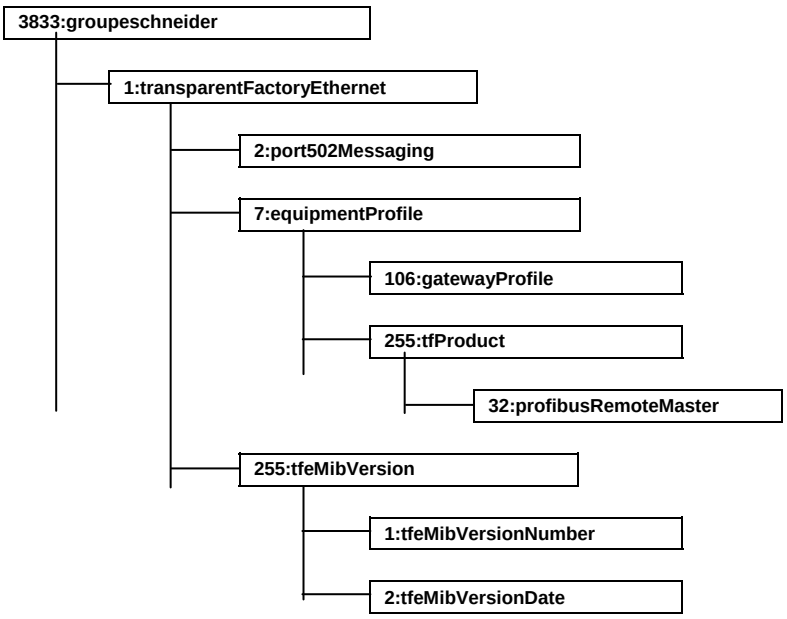
The object identifier for the root of the Groupe Schneider subtree is **1.3.6.1.4.1.3833** and represents a path to the subtree as follows :

iso(1)
org(3)
dod(6)
internet(1)
private(4)
enterprise(1)
groupeschneider(3833)

The Groupe Schneider's private MIB is in accordance with the Structure of Management Information (SMI) used by SNMP and defined in RFC-1155.

Schneider Private MIB

The Schneider private MIB contains mainly Transparent Factory Ethernet MIB which allows a Manager access to objects of the following sections:



port502Messaging Section

Supported objects of the **port502Messaging** section:

- **Port502Status(1):** the status of the service (Idle, Operational),
- **Port502SupportedProtocols(2):** the supported protocols (**Modbus only**),
- **Port502MaxConn(4):** the maximum TCP connection number supported by the Port502 Entity,
- **Port502LocalConn(5):** the TCP connection number currently opened by the local Port502 Entity, This value must always be 0 as the PRM is not a Modbus client.
- **Port502RemoteConn(6):** the TCP connection number currently opened by the remote entity to the local Port502 Entity. This value is the number of open TCP client connections on the PRM
- **Port502ConnTable(8):** a table containing Port502 TCP specific information (MsgIn, MsgOut, …),
- **Port502MsgIn(9):** the total number of Port502 messages received from the network,
- **Port502MsgOut(10):** the total number of Port502 messages sent from the network,
- **Port502MsgOutErrs(11):** the total number of error messages build by the Port502 entity,

equipementProfile Section

Supported objects of the **equipementProfile** section:

- **profileProductName(1):** the commercial name of the Communication product in a String form. This is equal to TCSEGP13F14F.
- **profileVersion(2):** the software version of the Communication product in a String Vx.y form. This is equal to the firmware version number.
- **profileComServices(3) :** list of the communication services supported by the profile (Port502Messaging)
- **profileGlobalStatus(4)** : the global status of the Communication product. It should have the following values:

  nok (1), -- the module is in a Nok state

  ok (2), -- the module is in an ok state
- **profileIpConfigMode(5)**: the IP Configuration mode of the communication product (local, served).
- **profileRoleName(6)**: the Device name of the device for the IP Address Management (if it exists). The name used to get the IP Address from a remote DHCP server. TCSEGP13F14FXXX if DHCP is configured, or empty string otherwise.
- **profileSlot(10)**: Position of the communication module inside the rack if there is one : always 0.
- **profileCPUType(11):** the identification of the Host for which the communication module is a part (if it exists),
- **profileTrapTableEntriesMax(12)**: The maximum numbers of entries in the Trap Table. **(always 0, no Trap Table provided)**
- **profileSpecificId(14):** A unique Profile Specific Identification, (**always enterprises.3833.1.7.106**)
- **profileIpAddress(15):** The IP address of the SNMP Agent. (**== current IP address from PRM**)
- **profileIpNetMask(16):** The subnet mask associated with the IP address of the SNMP Agent. The value of the mask is an IP address with all the network bits set to 1 and all the hosts bits set to 0,
  (== current IP subnet mask address from PRM)
- **profileIpGateway(17):** The default Gateway IP address of the SNMP Agent, **(== current IP Gateway address from PRM)**
- **profileMacAddress(18):** The Ethernet media-dependent address of the SNMP agent. **(== MAC address from PRM)**
- **profileImplementationClass(19):** A textual description of the implementation class supported by the product. Implementation Class: Value = “A15”

profibusRemoteMaster Section

Supported objects of the **profibusRemoteMaster** section:

- **SysDescr:** Schneider Electric TCSEGPA 23F14F PROFIBUS Remote Master
- **SysObjectID:** 1.3.6.1.4.1.3833.1.7.255.32
- **SysUpTime:** Time since the last system re-initialization
- **SysContact** Ex: admin (**empty by Default**) Textual identification of the contact person. Administratively assigned name that can only be set by the SNMP Manager. Must be stored persistently inside the PRM
- **SysName:** Default value should be the name used to get the IP Address from a remote DHCP server. TCSEGP13F14F_XX if DHCP is configured, or TCSEGP13F14F otherwise. Administratively assigned name that can only be set by the SNMP Manager. Must be stored persistently inside the PRM
- **SysLocation:** (**empty by Default**) Administratively assigned name that can only be set by the SNMP Manager. Must be stored persistently inside the PRM
- **SysService:** Value indicating the set of provided services. Bits 0 through 6 of this value correspond to ISO layers 1 through 7: 1: Physical; 2: data-link; 3: internet (IP); 4: end-to-end (TCP); 5: session; 6: presentation; 7: application. The value is computed by adding $2^{(L-1)}$ with L=Layer Number. Example: For a Support of physical and data-link layers SysService = $2^0 + 2^1 = 3$

tfeMibVersion Section

Supported objects of the **tfeMibVersion** Section:

- **tfeMibVersionNumber:** v1.04
- **tfeMibVersionDate:** 22Sept08

35. Troubleshooting

PRM Module

Issue	Possible cause	Solution
No LEDs lighting on PRM	Bad or no power supply.	Check the power supply

Connection to the PRM

Issue	Possible cause	Solution
Can not connect to the PRM.	Bad IP address	- Check connection cable. - Check IP address in PRM configuration. - Check PRM MAC address. - Check IP address using “ping” command.
	Bad Subnet mask	Check subnet mask in PRM configuration, network connection on Windows and PLC configuration.
	Bad Gateway address (when using a router between PRM and Unity Pro station).	Check Gateway address in PRM configuration and network connection on Windows.
	DHCP mode	- Check PRM configuration, see chapter “PRM general settings”. Verify DHCP server is running. - Check that the role-name is configured correctly (rotary switches).
	Communication errors	- Force to auto-negotiation in TCP/IP properties for all devices connected to Ethernet. - Check there is no IP address conflict through the LED STS behavior.
	Ethernet Link on the PC Network interface not present.	Connect the Ethernet cable to the PC network interface.

Communication with the PLC

Issue	Possible cause	Solution
Error detected in all the PRM lines in the IO scanner	See connection problems above.	
	Modbus health too small compared to Modbus rate	Increase the Modbus health value
Error detected in some PRM lines in IO scanner	Number of max. Modbus TCP connection exceeded (64)	
All implicit variables at 0	Another PLC is already exchanging Profibus data with the PRM.	Keep only 1 PLC scanning the PRM
Wrong input data in the PLC for one device, for example byte inversion inside a REAL value	Bad I/O description in the Master DTM, for example wrong types used	Check the IO variables description of the device

Profibus network

Issue	Possible cause	Solution
Cyclic Communication not working with Profibus devices	Configuration not correct	Check the device configuration (especially the watchdog, DPV1_enable and Failsafe value)
	Bad cabling	Check Profibus cables and connectors, see hardware installation chapter.
	Multi-master network interferences	Check the parameters are consistent between the master (baud rate, HAS, TTR)
Error detected in the DFBs reading or writing parameters in devices	Acyclic communication not working with Profibus devices	- See cyclic communication not working if DPV1 class 1 used. - Check error code returned by DFB.
Device DTM cannot be connected	Configuration not correct	Check the device configuration, use the DTM diagnostic screens
	Bad cabling	Check Profibus cables and connectors, see hardware installation chapter.
Device PA not ready	Default watchdog too short (not adapted to PA baud rate)	- Set the baud rate to 45.45k - Select the manual mode for the watchdog of this device, this value will no longer be automatically updated - Set back the real baud rate The watchdog is now set to a value compatible with PA
Recommended Profibus cycle >> 1.5 * TTR	A PA device defined with a big Minimum Slave Interval	If the device is under a SK3 this parameter can be reduced down to 6.

XIV. Master and CommDTM – Online actions

Scope of this Part

This part describes the actions that can be done online from the Master DTM or CommDTM.

The following actions are described in other chapters or sections:

- ***Store data to device*** and ***Erase configuration*** in the part ***PRM configuration download and Start***
- ***Diagnostics*** in the chapter ***Diagnostic & Troubleshooting > From the Master DTM and CommDTM***
- ***Download firmware*** in the chapter ***PRM operating modes > Firmware update***

What's in this Part?

This part contains the following chapters:

36. Profibus network discovery

Introduction

The Master and CommDTM have the capability to scan the Profibus devices. They provide the list of found devices to the FDT frame.

How to select this command

1- In the DTM Browser, select the PRM Master instance (or PRM Comm instance)

2- Right-click and select ***Connect***

3- When the connect mode is active, right-click to select ***Fieldbus discovery***.

Master DTM

Refer to the Unity Pro online help for a description of the way the result is shown.

Comm DTM

The way the result is shown depends on the FDT frame. Refer to the associated documentation.

Note: The CommDTM interface is FDT1.2.1 compliant.

37. Set Physical Slave Address

Introduction

This command is available from the contextual menu of the Master and CommDTM in online mode. This is a tool to send a command to a slave to physically set its address. A lot of devices have no switches to configure their address and are accessible only with address 126 until they receive this “Set Slave Address” command with the chosen address.

It is recommended to do this before integrating the device into the configuration. The slave address in the configuration must be then assigned to the address set in the device.

How to select the command

This feature is operating only in online mode and cannot be performed when Data exchange is on going with the device.

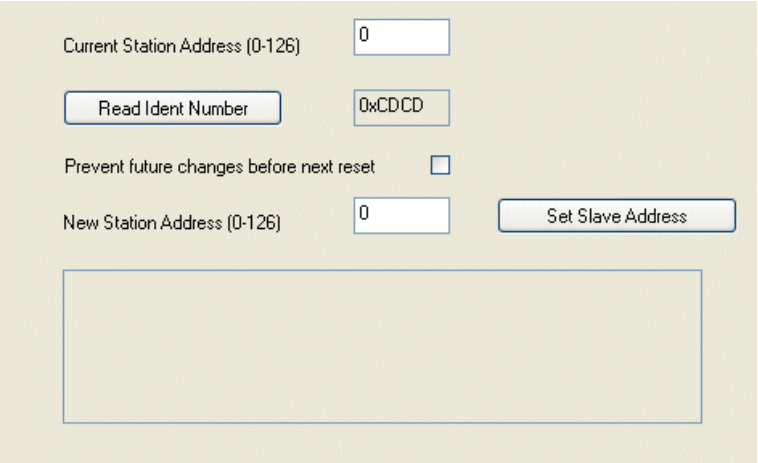
1- In the DTM Browser, select the PRM Master instance (or PRM Comm instance)

2- Right-click (DTM contextual menu) and select ***Connect***

3- When the connect mode is active, right-click and select ***Device menu > Set Physical Slave Address***.

Settings

A popup windows displays different parameters to set:



Current Station Address (0-126) (Read / Write): the user must enter the current station address.

Min: 0 Max: 126

Read Ident Number button: allow you to read the ident number of the device having the address specified in ***Current Station Address***. If ident number cannot be read, an error message will be displayed in the result area and the Ident Number field will contain 0xFFFF.

Prevent Future Changes Before Next Reset (Read / Write): when this check box is set and the Set Slave Address is pushed (and address parameters are valid), the device is expected to disallow future changes to the physical address until the next reset of the device.

New Station Address (Read / Write): will contain the new address for the device the user wants to change.
Value for this parameter must be in the range:

Min: 0 Max: 126

The panel also contains a result area which will show the result of the action done on the device.

Enter the new address in the ***New Station Address (1-126)*** field, and click on ***Set Slave Address*** button to write into the device***.***

The new Profibus slave address is set in the device.

XV. PRM operating modes

Scope of this Part

This part describes the following PRM operating modes: firmware update and field replacement.

What's in this Part?

This part contains the following chapters:

38. Firmware update

Overview

This section contains all information related to the update of the PRM module firmware.

General Description

The firmware and the configuration of the PRM module are stored in a non-volatile Flash Memory.
The Firmware can be updated. During the update, the concerned flash area will be replaced with new binary code.

The command is available form the contextual menu of the Master DTM in online mode.

How to

1- With Windows Explorer, copy the new firmware file in the following directory:

- By default

c:\Program Files\Schneider Electric\ PRM master DTM\ Firmware\

- Or <*Your_installation_directory*>\Firmware\

2- Rename it **PRMOS.bin**

3- In the Menu bar of Unity Pro, select ***Tools > DTM Browser.***

4- In the ***DTM Browser***, select < - >***PRM_MASTER***.

5- Right-click on it (Master DTM contextual menu) and select ***Connect.***

6- Right-click on it and select ***Device menu > Download Firmware***.

CAUTION

IRREPARABLE EQUIPMENT DAMAGE

During the firmware update process:

- Do not power off the PRM module
- Do not interrupt the communication between the PC and the PRM

Failure to follow these instructions can result in equipment damage.

The new firmware has been downloaded into the PRM and the PRM will reboot with the new firmware.

The firmware version can be checked using the PRM Basic Diagnostic screen.

39. PRM replacement

Scope of this Chapter

This chapter describes the management of the replacement of the PRM module.

What's in this Chapter?

This chapter contains the following sections:

FDR Service Activation

Overview

The PRM module is a FDR-compliant device.

The FDR (Faulty Device Replacement) service offers a method of handling device replacement without disrupting the system or interrupting service. If a device fails, replacing that device is easy:

- The new device must have the rotary switches in the same position as the old one
- When the new device is physically connected to the network, the system (including the new device) is able to:
  - provide the replacement device with the IP address of the previous device
  - restore the device application parameters in order to restart the device with the same configuration as before

DHCP/FDR setting in PRM Master DTM

This service requires some specific settings:

- The DHCP / FDR server must be activated in the PLC Ethernet module scanning the PRM.
- The configuration file of the PRM module must be automatically stored in the FDR server on download.
- The IP address setting of the PRM module must be in DHCP mode instead of the Stored mode. A Role Name, based on the setting of the rotary switches (cf. Rotary switches setting) will be assigned to the PRM module.
- An entry must be created for the PRM in the DHCP server

These settings are done in the General Setting configuration panel of the PRM Master DTM:

1- In the DTM Browser window, double-click on the ***PRM MASTER*** to access to the PRM Configuration Tool.

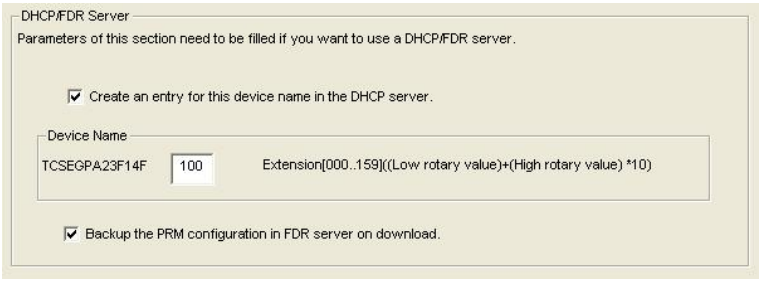
2- In the navigation tree, select ***General Settings.***

3- Tick both cases ***Create an entry for ….*** and ***Backup the PRM configuration in FDR …***
The extension of the device name must be provided as it is set on the rotary switches: for example the rotary switches are set as followed :

Upper switch: "A"

Lower switch: "0"

Then the extension of the Device Name will take the value "***100"***, and the Role Name of the PRM module will be "TCSEGPA23F14F**100".**



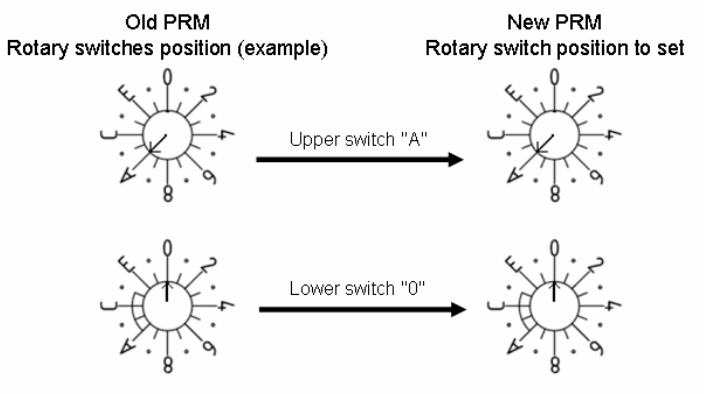
Refer to the chapter ***Configuration of the PRM using the Master DTM > Settings in the Master DTM.***

PRM Replacement

How to proceed?

- Remove the PRM module to be replaced:
    - Disconnect the Profibus connector from the PRM module,
    - Disconnect the Ethernet RJ45 connector from the PRM module,
    - Disconnect the power supply from the PRM module,

- Take the new PRM module
    - Set its lower rotary switch in "E" position (Configuration file deletion) in order to clear all existing configuration file,
        - Connect power supply wires ,,
        - The PRM module is booting and the configuration file is deleted
        - Disconnect the power supply from the PRM module,
    - Check the positions of the rotary switches of the old PRM module,
    - Set the rotary switches of the new PRM module identical to the old one.



    - Place the new PRM module in the same location as the old one,
    - Connect the Profibus connector to the PRM module,
    - Connect the Ethernet RJ45 connector,
    - Connect the power supply,
    - The PRM module is booting and starts exchanges with the FDR server in order to get its configuration,
    - After the reboot the PRM is operational for data exchange with the PLC.

Note: the new PRM is working in replacement of the old one despite it has another MAC address. An update of the MAC Address in the Master DTM configuration screens (General settings) is needed only in case of a communication issue using DHCP in order to use the default IP based on the MAC address.

XVI. Introduction to Profibus DP

Scope of this Part

This part contains an overview of Profibus DP fieldbus including technical characteristics

What's in this Part?

This part contains the following chapters:

40. Presentation of Profibus DP

Introduction

Profibus is a vendor-independent, open fieldbus standard for a wide range of applications in manufacturing, process and building automation. Vendor independence and openness are guaranteed by the Profibus standard EN 50 170. With Profibus, devices of different manufacturers can communicate without special interface adjustments. Profibus can be used for both high-speed time critical data transmission and extensive complex communication tasks. The Profibus family consists of three compatible versions.

Profibus DP

Optimized for high speed and inexpensive hookup, this Profibus version is designed especially for communication between automation control systems and distributed I/O at the device level. Profibus-DP can be used to replace parallel signal transmission with 24 V or 4-20 mA.

PROFIBUS Protocol (OSI model)

OSI Layer		PROFIBUS		
7	Application	DPV0	DPV1	DPV2
6	Presentation			
5	Session			
4	Transport			
3	Network			
2	Data Link	FDL		
1	Physical	EIA-485	Optical	MBP

To utilize these functions, various service levels of the DP protocol were defined:

- DP-V0 provides the basic functionality of DP, including
  - cyclic data exchange,
  - station, module and channel-specific diagnostics

- DP-V1 contains enhancements geared towards process automation, in particular
  - acyclic data communication for parameter assignment
  - alarm handling
- DP-V2 for isochronous mode and data exchange broadcast (slave-to-slave communication)

Profibus PA

Profibus PA is designed especially for process automation. It permits sensors and actuators to be connected on one common bus line through a dedicated DP/PA gateway or link between the Profibus DP and Profibus PA networks, even in intrinsically-safe areas. Profibus PA permits data communication and power over the bus using a 2-wire technology according to the international standard IEC 1158-2.

Profibus FMS

Profibus FMS is the general-purpose solution for communication tasks at the cell level. Powerful FMS services open up a wide range of applications and provide great flexibility. Profibus FMS can also be used for extensive and complex communication tasks. This protocol is the first developed for Profibus, but it is no longer currently used.

Profibus specifies the technical and functional characteristics of a serial fieldbus system with which decentralized digital controllers can be networked together from the field level to the cell level.

Profibus master and slave

Profibus distinguishes between master devices and slave devices.

Master devices determine the data communication on the bus. A master can send messages without an external request when it holds the bus access rights (the token). Masters are also called '**active stations**' in the Profibus protocol.

Slave devices are peripheral devices. Typical slave devices include input/output devices, valves, drives and measuring transmitters. They do not have bus access rights and they can only acknowledge received messages or send messages to the master when requested to do so. Slaves are also called '**passive stations**'.

Profibus master class 1 (DPM1) or class 2 (DPM2)

Profibus DP Master class 1 (DPM1)

A class 1 master handles the normal communication or exchange of data with the slaves assigned to it.

This is typically a PLC.

It uses **cyclic communication** to exchange process data with its associated slaves.

The class 1 master sets the baud rate and the slave's auto-detect this rate.

Each slave device is assigned to one master and only that master may write output data to that slave. Other masters may read information from any slave, but can only write output data to their own assigned slaves.

Profibus DP Master class 2 (DPM2)

A class 2 master is a special device primarily used for commissioning slaves and for diagnostic purposes. This is typically a Supervisor.

It uses **acyclic communication** over what is known as the **MS2 channel**.

A DPM2 does not have to be permanently connected to the bus system.

Cyclic communication

The DP master class 1 cyclically exchanges data with all of the slaves assigned to it.

This service is configured. During the configuration process, master and slave addresses are assigned, the bus parameters are defined, the types and numbers of modules (in the case of modular slaves) are specified, user-selectable parameter choices are made, etc.

Before data exchange can take place, the master will send parameterization and configuration telegrams to all of its assigned slaves. These parameters and configuration data are checked by the slaves. If both are valid, the master will initiate cyclic I/O data communication with the slave devices.

Acyclic communication

In addition to the cyclic data exchange, the Profibus protocol has the option of acyclic communication. This service is not configured.

There are 2 different communication channels possible between the requested master and the slave:

- **MS1 channel** (MS1 connection): can only be established if cyclic data exchange is taking place between that master (DPM1) and the slave
- **MS2 channel** (MS2 connection): is possible with several masters simultaneously, but the connection must be established explicitly by the master.

Acyclic reading and writing of data requires an established MS1 or MS2 connection.

For the MS1 channel, 3 conditions must be satisfied:

- The slave device must support the MS1 channel (key *C1_Read_Write_supp* at 1 in the GSD file)
- The DPV1_enable bit must be set during the parameter assignment
- Data exchange is taking place

For the MS2 channel, the connection must be explicitly initiated by the master. The maximum number of possible MS2 connections to the slave must not be reached. The connection can be closed by either the master or the slave device.

41. Profibus DP cables and connector

Topology of Profibus DP

Profibus devices are connected in a bus structure. Up to 32 stations (master or slaves) can be connected in one segment. The bus is terminated by an active bus terminator at the beginning and end of each segment. Both bus terminations must always be powered. When more than 32 stations are used, repeaters (line amplifiers) must be used to connect the individual bus segments.

Profibus DP cable description

Only one type of cable can be used for Profibus network :

Parameter	Type A
Surge Impedance	135…165Ω (3 to 20 MHz)
Capacity	<30 pF/m
Loop Resistance	<110 Ω/km
Wire gauge	>0.64 mm
Conductor area	>0.34 mm²

The maximum cable length depends on the transmission speed and cable type. The specified cable length can be increased using the repeaters. The use of more than 3 repeaters in series is not recommended.

Baudrate (kbps)	9.6	19.2	93.75	187.5	500	1500	3000-12000
Length A (m)	1200	1200	1200	1000	400	200	100

Profibus DP connector description

DB9 Pin Description	DB9 Pin#	DB9 Termination with PRM
Chassis ground	1	
Reserved	2	
Data+ / B	3	In case of termination connect this pin to Pin 8 (Data - / A) with 220 ohm resistor
Tx enable	4	
Isolated ground	5	Connect this pin to Pin 8 (Data - / A) with 390 ohm resistor
Voltage plus	6	Connect this pin to Pin 3 (Data + / B) with 390 ohm resistor
Reserved	7	
Data- / A	8	
Reserved	9	

XVII. Glossary

A

ASCII	**American Standard Code for Information Interchange**. Pronounced "aski". This is an American code (but now an international standard) which allows all alphanumerical characters used in English, punctuation marks, some graphics characters and various commands to be defined with 7 bits.

B

Bit	Contraction of Binary Digit. This is the binary unit of information content, which can represent two separate values (or states): 0 or 1. A field of 8 bits constitutes 1 **byte**.

C

Communication DTM CommDTM	Software interface facilitating the communication between FDT frame application and field devices using Device DTMs
Configuration	The configuration comprises all the data that defines the device (invariable) and that is necessary to the operation of the module.
CRC	**Cyclic Redundancy Check**: Type of hash function used to produce a checksum – a small, fixed number of bits – against a block of data, such as a packet of network traffic or a block of a computer file.

D

DHCP	**Dynamic Host Configuration Protocol**: Protocol allowing a station connected to the network to obtain its configuration dynamically.
DIN	**Deutsches Institut für Normung**: German standards institute.
DP-V0	**DP-V0** (IEC 61784-1) is the basic stage of the PROFIBUS DP communication protocol. DP-V0 devices (master and slaves) perform the following basic functionalities: - Cyclic exchange of I/O data between controlling and slave devices - Device, Identifier (module) and Channel related Diagnosis - Parametrization of DP-slaves - Configuration of DP-slaves
DP-V1	**DP-V1** is the first stage of extension of PROFIBUS DP after DP-V0. DP-V1 devices shall comply with the following features: - Device related diagnosis is replaced by status and alarms. - The first three octets of the user parameterization data are now standardized Optionally these devices may support: - Acyclic communication (MS1, MS2) - If alarms are used, MS1 shall be supported
DP-V2	**DP-V2** is the second stage of extension of PROFIBUS DP after DP-V1. DP-V2 devices shall comply with the following features: - Data Exchange Broadcast (DxB) for slave to slave communication (publisher/subscriber principle). - Isochronuos Mode (time tick synchronized operating slaves, e.g. drives) - Up- and/or download of Load Region Data (domains) - Function Invocation - Clock Control (synchronization within slaves) and Time Stamping - Redundancy
DPM1	**DP Master Class 1** (IEC 61158-5): a controlling device which controls several DP-Slaves (field devices). Usually programmable (logic) controllers or process control systems are hosts for master class 1.

DPM2	**DP Master Class 2** (IEC 61158-5): A controlling device which manages configuration data (parameter sets) and diagnosis data of a DP-Master (Class 1). Additionally the DP-Master (Class 2) can perform all communication capabilities of a DP-Master (Class 1). Usually personal computers are hosts for DP Master Class2 for programming, parameterizing, diagnozing, and monitoring purposes.
DTM	**Device Type Manager** provides a unified structure for accessing device parameters, configuring and operating the devices, and diagnosing problems. One can distinguish between three kinds of DTMs. • Device Type Managers for a device class with direct access to a communication component are named **Communication DTM.** • DTMs which are used for routing between different protocols (i. e. from PROFIBUS to HART) are named **Gateway DTM**. • A DTM that represents a field device is called **Device DTM**. A Device DTM interacts with a Communication DTM or Gateway DTM to access its field device.
Device DTM	The **Device DTM** is a software driver developed by the device manufacturer for each of his devices or group of devices. It provides functions for accessing device parameters, configuring and operating the devices, calibrating, and diagnosing problems.

F

FDL	**Fieldbus Data Link Layer** (IEC 61158-4): The fieldbus data link layer provides basic time-critical messaging communications between devices in an automation environment. Type 3 of the IEC standard defines a protocol and the services for PROFIBUS DP. The maximum system size is an unlimited number of links of 127 nodes, each with 66 SAP-addresses.
FDR	**Faulty Device Replacement**: Automatic configuration recovery service provided by the module.
FDT technology	**Field Device Tool** standardizes the communication and configuration interface between all field devices and host systems. FDT provides a common environment for accessing the devices' most sophisticated features. Any device can be configured, operated, and maintained through the standardized user interface – regardless of supplier, type or communication protocol.
FDT frame application	FDT-enabled application e. g. engineering system or asset management tool. The Frame Application is a software program that implements Device DTMs and CommDTMs.
Flash memory	Form of non-volatile computer memory that can be electrically erased and reprogrammed.
FTP/TFTP	**File Transfer Protocol/Trivial File Transfer Protocol**: Network file transfer protocol.

G

GND	**Ground Signal**: Common return for the other connections.
GSD file	**GSD file** contains information about the basic capabilities of a Profibus DP device. It is shipped with the device, or can be downloaded from the vendor's own web site. With a GSD file, system integrators can determine basic data such as the communications options and the available diagnostics.

H

HTTP	**HyperText Transfer Protocol**: Network transfer protocol for documents written in hypertext (links).

I

IO Scanner IO Scanning	Service provided by the Ethernet modules and configured by Unity Pro. The IO scanner makes it possible to periodically read or write to/from remote inputs/ouputs on the Ethernet network, without requiring any specific programming.
IP	**Internet Protocol**: Data-oriented protocol used for communicating data across a packet-switched internetwork (i.e. the Internet).

ISO	**International Standards Organization**. The ISO code is the most widely used. Formats, symbols, transmission rules are all covered by ISO standards. AFNOR is a member of ISO.
M	
M340	Schneider Electric PLC range
MAC Address	**Media Access Control address**. The hardware address of a device. A MAC address is assigned to an Ethernet TCP/IP module in the factory.
MIB	**Management Information Base**: Database used by the SNMP protocol for network management and containing information on data transmission, station or router components, etc. • MIB II: standard MIB • Schneider Automation MIB: private MIB
MS0	IEC 61158-5: Application relationship for the following purposes: - cyclic exchange of the I/O data with the DPM1 - cyclic exchange of the Input Data between DP-slaves (DXB) - acyclic data transfer for parameterisation, configuration and diagnosis (DPM1) - acyclic transfer of commands to a set of field devices (DPM1) - cyclic transfer of synchronisation messages to a set of field devices (DPM1) - acyclic read of the I/O data (DPM2) - acyclic read of configuration information (DPM2) - acyclic read of diagnosis information (DPM2) - acyclic write of remanent parameter (DPM2).
MS1	IEC 61158-5: Connection-oriented application relationship for the following purposes: - acyclic read and write of variables - acyclic transfer of alarms - up- and/or download of load region data - invocation of stateless and/or state-oriented functions.
MS2	IEC 61158-5: Connection-oriented application relationship for the following purposes: - acyclic read and write of variables - up- and/or download of load region data - invocation of stateless and/or state-oriented functions.
P	
PLC	**Programmable Logic Controller**: It is a small computer used for automation of industrial processes, such as control of machinery on factory assembly lines.
Premium	Schneider Electric PLC range
Q	
Quantum	Schneider Electric PLC range
R	
RS485	Serial connection standard operates at +/-5V differential. The connection uses the same wire for transmission and receipt. Their "3-status" outputs allow them to switch to listening mode when transmission is completed.
S	
SNMP	**Simple Network Management Protocol**: Network management protocol for controlling a network remotely by polling the stations for their status and modifying their configuration, performing security tests and viewing information relating to data transmission. It can also be used to manage software and databases remotely.
T	
TCP	**Transmission Control Protocol**: Virtual circuit protocol that is one of the core protocols of the Internet protocol suite, often simply referred to as TCP/IP.
TCP/IP	Transmission Control Protocol/Internet Protocol : the set of communications protocols that implement the protocol stack on which the Internet and most commercial networks run.

Time out	**Expiry of a waiting time.** Stops the application or disconnects after a lengthy period of non-use.

U

Unity Pro	Schneider Electric PLC programming software.
URL	**Uniform Resource Locator**: The global address of documents and other resources on the World Wide Web.
USB	Universal Serial Bus: a serial bus standard to connect devices to a host computer

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