

LUFP7 Telemecanique

User's manual

Gateway
Profibus-DP / Modbus RTU





NOTE

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1. Introduction

1.1. Introduction to the User Guide

Chapter 1 Introduction (page 6) describes the gateway, the user guide that comes with it and the terms used in it.

Chapter 2 Hardware Implementation of the LUF7 Gateway (page 13) gives an introduction to the gateway and describes all the items used when setting it up, both inside (thumb wheels) and outside (cables and connectors) the gateway.

Chapter 3 Signalling (page 23) describes the six LEDs on the front of the gateway.

Chapter 4 Software Implementation of the Gateway (page 24) describes the successive steps for setting the gateway up with its default configuration, with a PLC using Profibus-DP. LUF7 gateways are shipped pre-configured to allow you to interface a Profibus-DP master with 8 predefined Modbus slaves (TeSys U motor starters).

Chapter 5 Gateway Initialization and Diagnostics (page 37) describes two registers in the gateway's memory reserved for initializing and carrying out diagnostics on the gateway. They are only exchanged between the Profibus-DP master and the gateway.

Chapter 6 Configuring the Gateway (page 44) describes how to use the "ABC-LUF7 Configurator" software application, which allows you to modify or create a new configuration for the gateway and shows the various features of this software (add or remove a Modbus slave, add or change a Modbus command, etc.).

This chapter also shows the changes to be made to software implementation operations in SyCon and PL7 PRO.

Appendix A: Technical Characteristics (chapter 7, page 86) describes the technical aspects of both the gateway and the Profibus-DP and Modbus RTU networks it is interfaced with.

Appendix B: LUF7 Gateway GSD File (chapter 8, page 90) details and describes the content of the GSD file shipped with the gateway. The file can be used for the setup tools to recognize the LUF7 gateway as a Profibus-DP subscriber with communication features of its own.

Appendix C: Default Configuration (chapter 10, page 94) describes the main features of the default configuration of the LUF7 gateway. However, it does not go into AbcConf in detail.

Appendix D: Sample Use under PL7 PRO (chapter 11, page 97) gives an advanced example using the LUF7 gateway's default configuration. This example exploits the command and monitoring registers for 8 TeSys U motor starters and uses the aperiodic read and write services used to access the value of any motor starter parameter.

Appendix E: Profibus-DP Data and Diagnostics (chapter 12, page 104) repeats the information described in the *Implementation manual* of the TSX PBY 100 coupler for Premium PLCs. It also provides the values of these data and the results of these diagnostics for the LUF7 gateway.

Appendix F: Modbus Commands (chapter 13, page 108) describes the content of the Modbus command frames supported by the LUF7 gateway.

1. Introduction

1.2. Introduction to the LUPF7 Gateway

The LUPF7 gateway allows a master located on a Profibus-DP network to enter into a dialogue with the slaves on a Modbus RTU network. This is a generic protocol converter operating in a way which is transparent to the user.

This gateway allows you to interface many products marketed by *Schneider Electric* with a Profibus-DP network. These include TeSys U motor starters, Altivar drivers and Altistart soft start- soft stop units.

1.3. Terminology

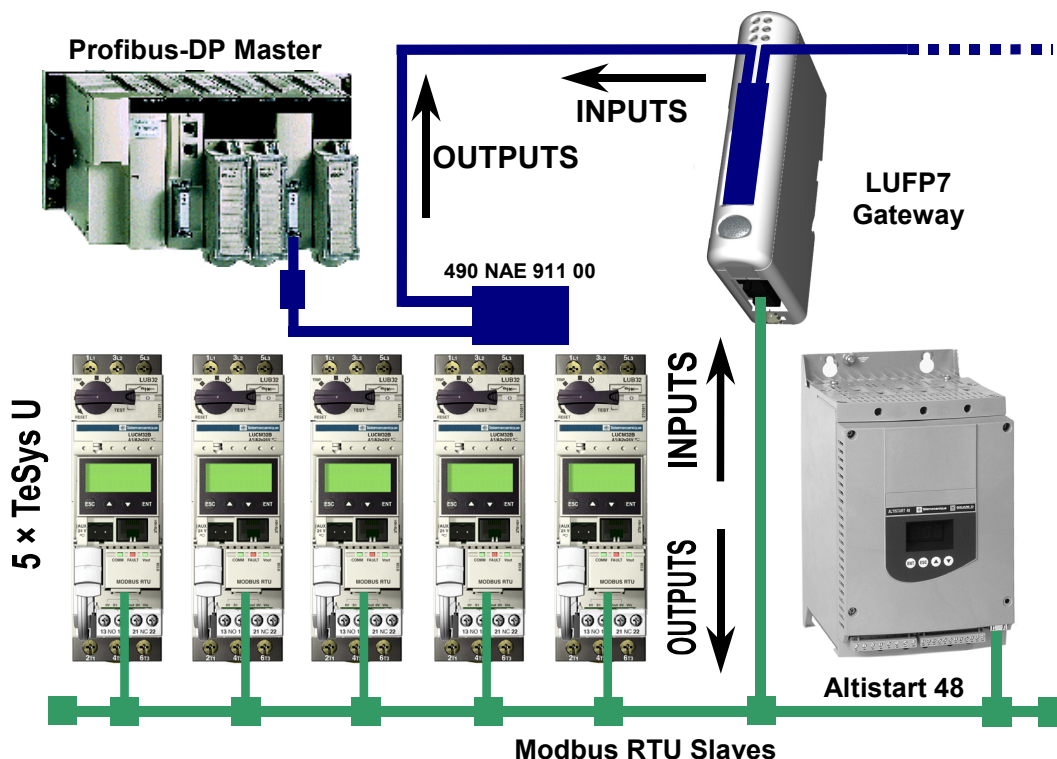
Throughout this document, the term “user” refers to any person or persons who may need to handle or use the gateway.

The term “RTU”, which refers to the Modbus RTU communication protocol, will be omitted most of the time. As a result, the simple term “Modbus” will be used to refer to the Modbus RTU communication protocol.

As is still the case with all communication systems, the terms “input” and “output” are somewhat ambiguous. To avoid any confusion, we use a single convention throughout this document. So the notions of “input” and “output” are always as seen from the PLC, or the Profibus-DP master.

Hence, an “output” is a command signal sent to a Modbus slave, whereas an “input” is a monitoring signal generated by this same Modbus slave.

The diagram below shows the flows of “inputs” and “outputs” exchanged between a Profibus-DP master and Modbus RTU slaves via the LUPF7 gateway:



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1. Introduction

1.4. Notational Conventions

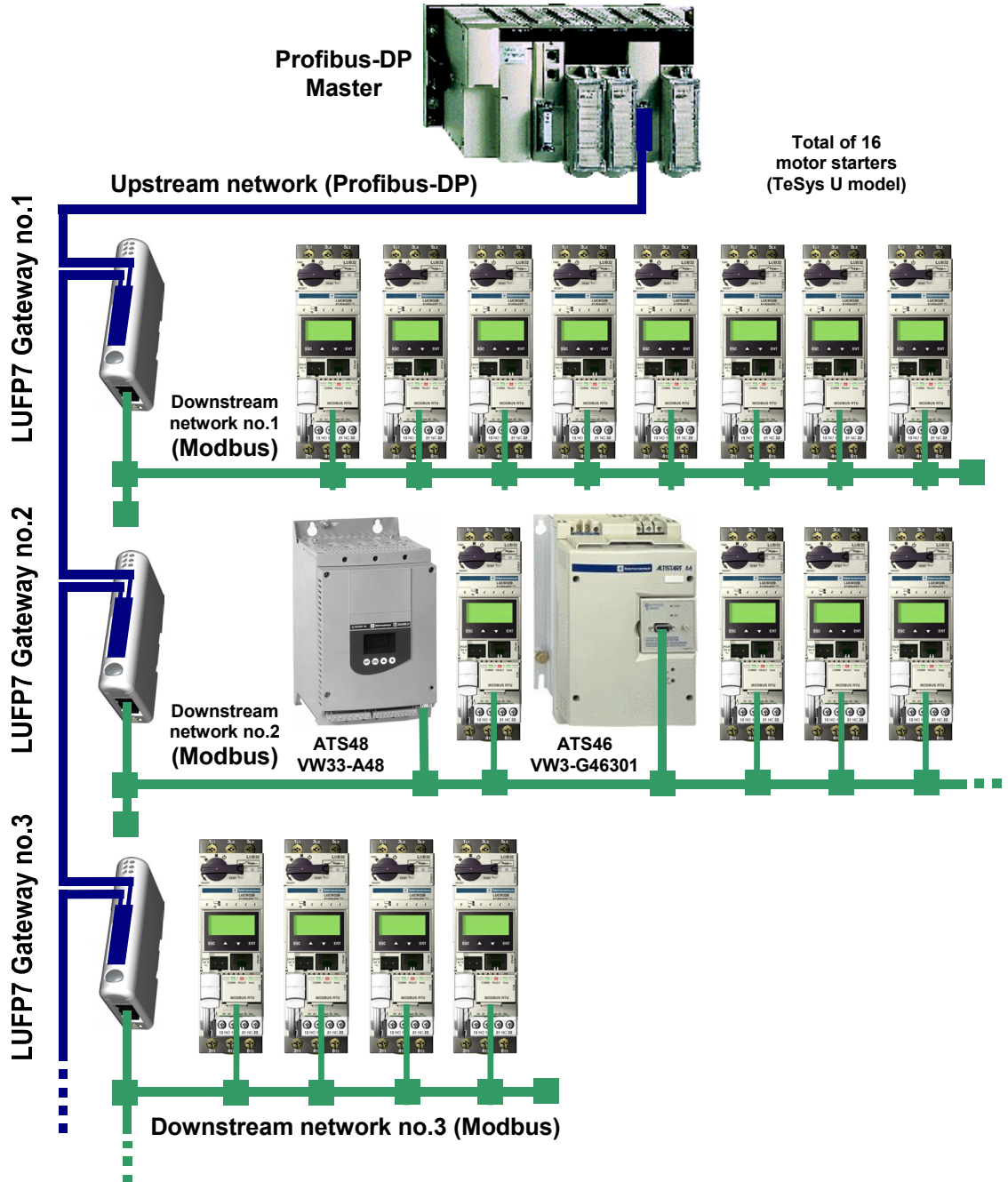
- 16#•••..... Value expressed in hexadecimal, which is equivalent to the H•••, •••h and 0x••• notations, sometimes used in other documents. **N.B.** The AbcConf software uses the 0x••• notation.
e.g. 16#0100 = 0x0100 = 256.
- 02#••• •••..... Value expressed in binary. The number of ‘.’ digits depends on the size of the item of data represented. Each nibble (group of 4 bits) is separated from the other nibbles by a space.
Examples: byte 2#0010 0111 = 39, word 2#0110 1001 1101 0001 = 16#69D1 = 27089.
- AbcConf..... Abbreviation that refers to the tool used to configure and implement the LUF7 gateway: “ABC-LUF7 Configurator”.
- ASIC..... Integrated circuits specific to a given user and application, covering two major families: pre-characterised processes and pre-distributed networks.
- ATS..... Abbreviation of “Altistart” (soft start- soft stop unit).
- ATV..... Abbreviation of “Altivar” (drive).
- CRC..... Cyclical Redundancy Check.
- LED..... Light-Emitting Diode.
- DP..... Decentralised Periphery (remote I/O). Profibus version or *protocol* meant for quick communication with remote I/O. This is the only Profibus protocol supported by the LUF7 gateway.
- DPM1..... Class 1 DP master: the central automatic control of a Profibus-DP network. It resets and controls I/O transfers and slave diagnostics on the network. One can have several DPM1 stations on a given Profibus-DP network, each one steering its own slaves.
- DPM2..... Class 2 DP master: The programming, configuration, and diagnostic device of a Profibus-DP network.
- Fieldbus..... A term referring to the upstream Profibus-DP network in AbcConf.
- FMS..... Profibus-FMS messaging system that defines the objects and application services applicable to these objects. By extension, the Profibus version or *protocol* dedicated to complex and advanced communication tasks at the cell level. This protocol is not supported by the LUF7 gateway.
- GSD..... Electronic equipment database, also called GSD *file*. This term designates the format of the files (“.gsd” extension) that are used by a Profibus master configuration and adjustment tool to configure their exchanges according to that same protocol.
- Handshake..... An old term referring to the two registers used for initialising and carrying out diagnostics of the LUF7 gateway. This term has been replaced by the expression “Control/Status Byte”.
- LRC..... Longitudinal Redundancy Check.
- Node..... A term referring to the connection point of a Modbus slave under AbcConf.
- PA..... Profibus version or protocol dedicated to process automation. This protocol is not supported by the LUF7 gateway.
- PDP..... Profibus-DP (see “DP” above).
- LSB:..... Least significant byte in a 16-bit word.
- MSB:..... Most significant byte in a 16-bit word.
- PI..... Profibus International. This term designates the international organization for users of the Profibus protocol. It is responsible for federating Profibus skills centres, scattered throughout the 20 largest industrial countries. The list of user groups of the Profibus protocol is available on the Profibus web site, at <http://www.profibus.com/>. To get general-purpose support on Profibus, please email to PI, at: Profibus_international@compuserve.com.
- PNO..... This term designates the national and local associations of Profibus protocol users.
- PPO..... Parameter Process data Object. This term designates the type and size of the data exchanged between a Profibus master and slave. In the case of the LUF7 gateway, PPOs are not used to configure its exchanges on the Profibus network.
- Profibus..... PROcess Field BUS.
- Sub-Network..... A term referring to the downstream Modbus network under AbcConf.
- TSDI..... Initiating station request time.
- TSDR..... Answering station response time.
- XML..... EXtensive Markup Language. The language used by AbcConf to import/export the configuration of a Modbus slave.

1. Introduction

1.5. Additional Documentation

In the case of Modbus slaves, the features, services and adjustment of the Modbus communications are not dealt with in this document.

1.6. Introduction to the Communication “System” Architecture



1. Introduction

Each LUF7 Profibus-DP / Modbus RTU gateway allows one of the PLCs on the Profibus-DP network to command, control and configure up to 8 Modbus slaves. Other Profibus-DP masters on that same network can only control them. If there are more than 8 Modbus slaves, you will need to use an appropriate number of LUF7 gateways. In the same way, if the exchanges with the Modbus slaves require more than 25 Modbus commands (that is to say more than 50 queries and responses), you will have to distribute the Modbus slaves over several gateways.

The LUF7 gateway behaves both as a Profibus-DP slave on the upstream network and as a Modbus RTU master on the downstream network.

See chapter 7.2 Communication Characteristics, page 86 if you would like to read about the technical communication characteristics of the LUF7 gateway.

The gateway can carry out its data exchanges (inputs and outputs of all types) with the Modbus slaves cyclically, aperiodically or in an event-driven way. All of these Modbus exchanges make up the gateway's "Modbus scanner" and we use the "ABC-LUF7 Configurator" software application to configure this scanner's exchanges. Every data element exchanged in that manner is made available for the Profibus-DP master, who may access it on a periodic basis. The only aperiodic interchange possible with the LUF7 gateway is the explicit Profibus-DP diagnostic interchange.

The diagram on the left page illustrates the distribution of several slaves throughout three Modbus RTU downstream networks, each one being interfaced with the Profibus-DP master PLC using a LUF7 gateway.

1.7. Principle Used to Configure and Operate the LUF7 Gateway

The gateway is part of a family of products (referred to as LUF7●) designed to meet generic needs for connection between two networks using different communication protocols.

The software elements common to all these gateways (a configuration tool known as "ABC-LUF7 Configurator" and the on-board Modbus software) cohabit with the specific features of the network upstream of each of them (Profibus-DP in the case of the LUF7 gateway) generically. This is one of the reasons why the interfacing between the upstream network and the Modbus network is carried out entirely via the gateway's physical memory.

⇒ The exchanges between the gateway (which operates as a Modbus master) and the Modbus slaves are wholly configured using the "ABC-LUF7 Configurator". This configuration tool goes into great detail (setting timers for exchanges, communication modes, frame content, etc.), which makes it all the more delicate to use. So a whole chapter in this guide (chapitre 6 Configuring the Gateway, page 44) has been devoted to this tool.

By configuring the queries and responses for Modbus commands via this tool the user can create links between a part of the content of the corresponding Modbus frames and the content of the gateway's physical memory (input memory for the content of the Modbus responses and output memory for the content of the queries).

⇒ The exchanges between the Profibus-DP master PLC and the LUF7 gateway should be configured in such a way that the Profibus-DP master can read the input data and write the output data from the gateway, but *only* the data used for the Modbus exchanges (see previous point).

1. Introduction

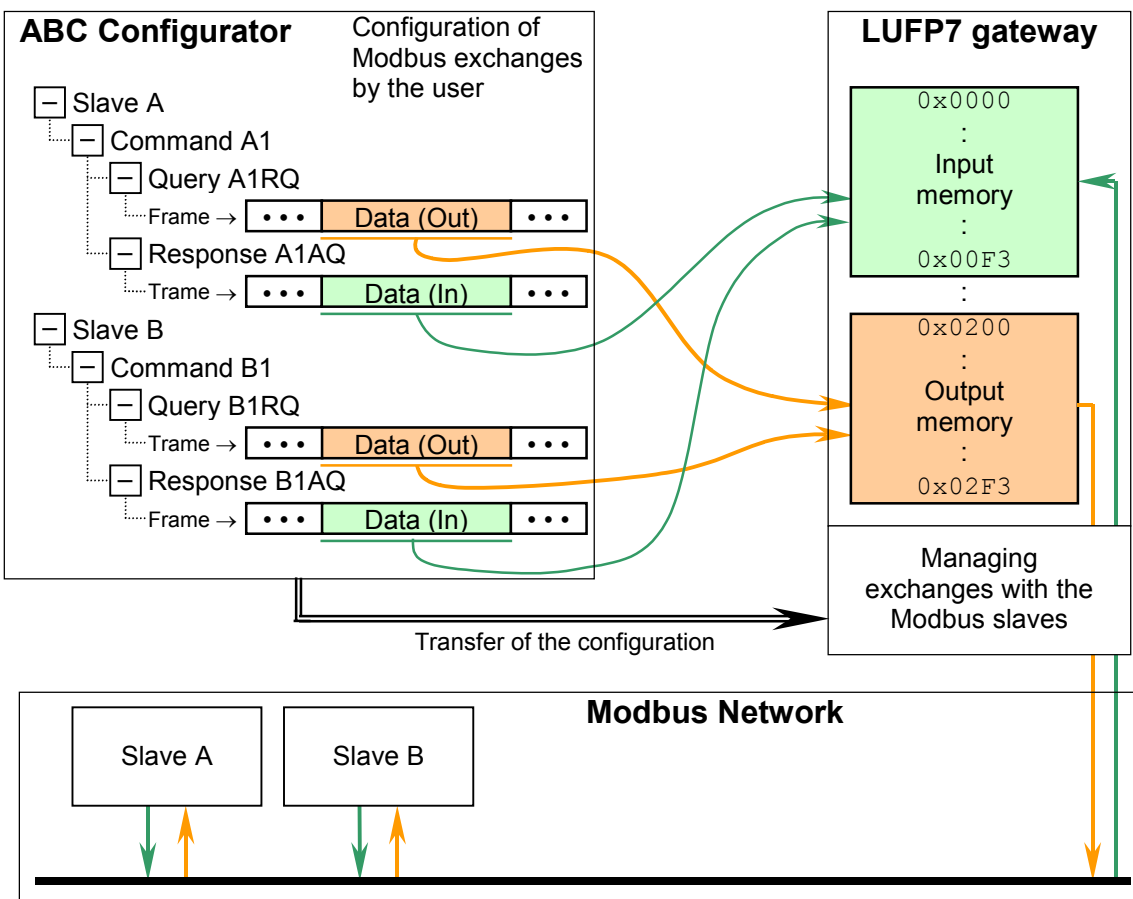
⇒ Each LUF7 gateway is shipped pre-configured so as to make it easier to operate and the factory settings can be used as a basis for a configuration which will best meet the user's expectations. The typical operations applicable to this default configuration are described in chapter 6 Configuring the Gateway, page 44.

The Profibus-DP network is totally separate from the Modbus network. The frames on a network are not directly "translated" by the gateway to generate frames on the other network. Instead, the exchanges between the content of the gateway's memory and the Modbus slaves make up a system which is independent of the one which is entrusted with managing the exchanges between this same memory and the Profibus-DP master.

So the user must ensure that the size of the Profibus-DP data corresponds to the size of the memory used for the Modbus exchanges, because the gateway configures its Profibus-DP exchanges on the basis of the memory used by the Modbus frames.

The two synopses which follow illustrate the independent management of each of the two networks:

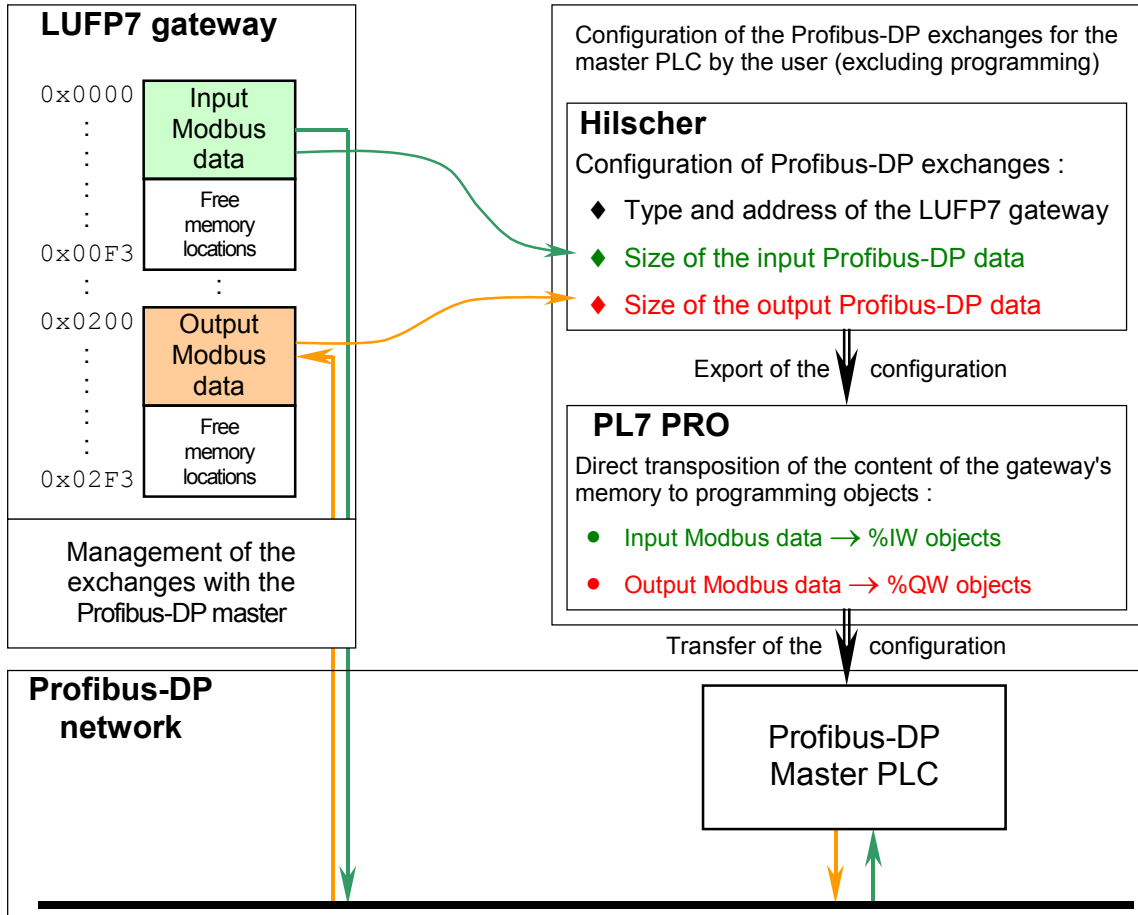
— Managing Gateway ↔ Modbus slaves exchanges —



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1. Introduction

— Managing Gateway ↔ Profibus-DP master exchanges —



2. Hardware Implementation of the LUF7 Gateway

2.1. On Receipt

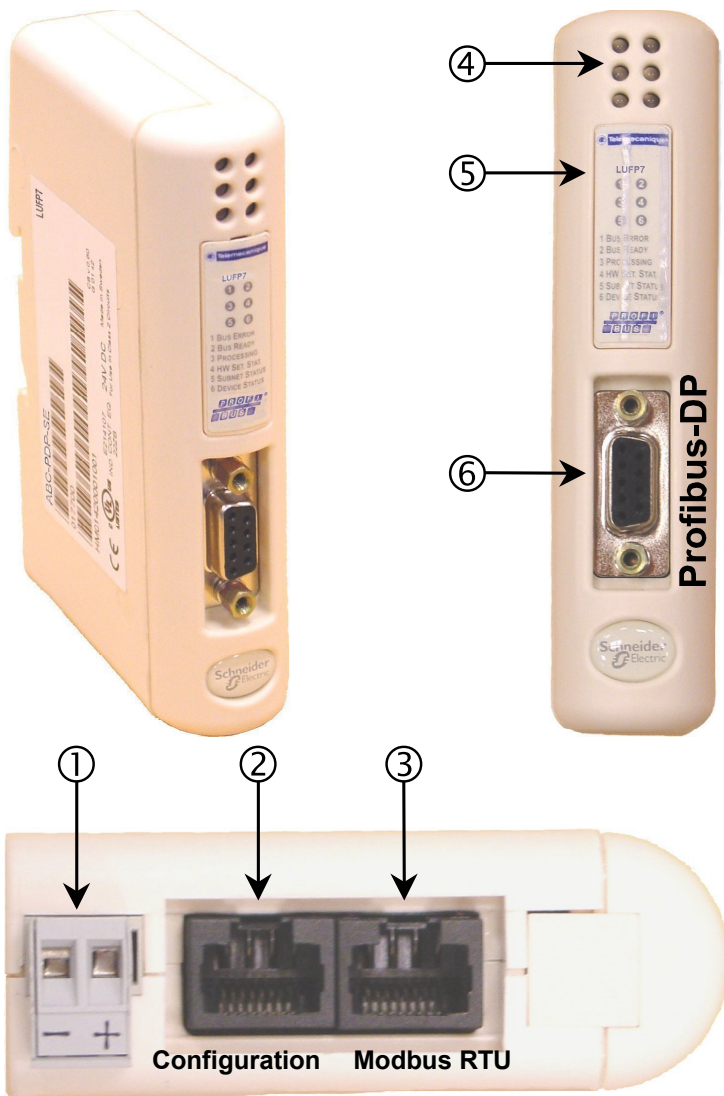
After opening the packaging, check that the following element is there:

- One LUF7 Profibus-DP / Modbus RTU gateway.

2.2. Introduction to the LUF7 Gateway

The cables and other accessories for connecting to Profibus-DP and Modbus networks need to be ordered separately.

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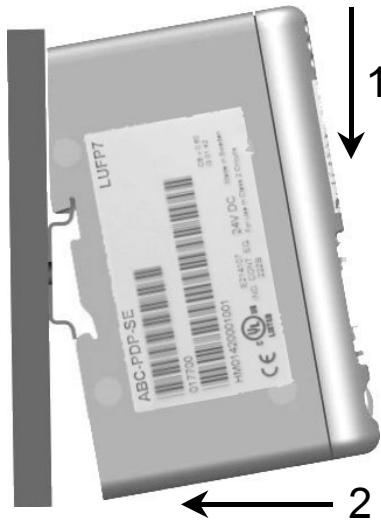
Legend:

- ① Detachable power connector for the gateway ($\approx 24V \pm 10\%$).
- ② Female RJ45 connector to a PC running AbcConf configuration software.
- ③ Female RJ45 connector for the downstream Modbus RTU network.
- ④ Six diagnostic LEDs.
- ⑤ Removable cover for the coding wheels used to configure the gateway, shown and described in chapter 2.7 Configuring the Profibus-DP Communication Features, page 22. The label describing the LEDs is stuck onto this cover.
- ⑥ Female Profibus-DP connector.

2. Hardware Implementation of the LUF7 Gateway

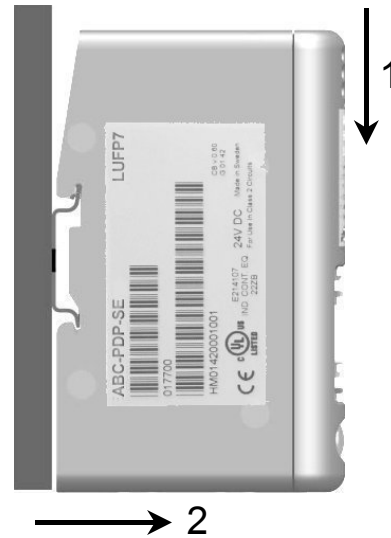
2.3. Mounting the Gateway on a DIN Rail

Mounting the gateway



Start by fitting the rear base of the gateway to the upper part of the rail, pushing downwards (1) to compress the gateway's spring. Then push the gateway against the DIN rail (2) until the base of the gateway box fits onto the rail.

Removing the gateway

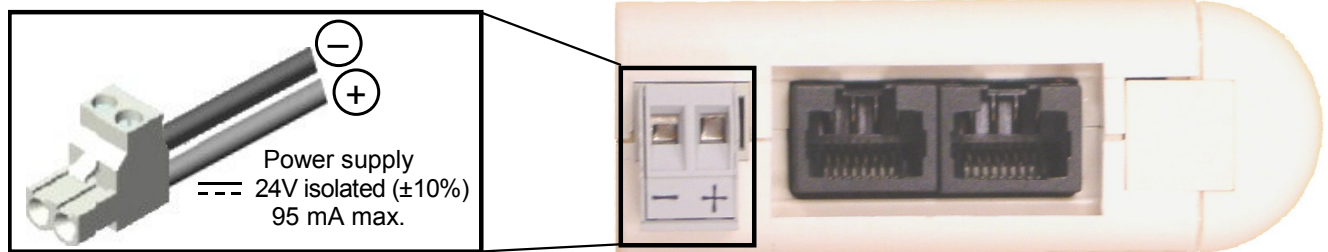


Start by pushing the gateway downwards (1) to compress the gateway's spring. Then pull the bottom of the gateway box forwards (2) until the box comes away from the rail.

N.B. The spring is also used to earth the gateway (Protective Earth).

2.4. Powering the Gateway

Profibus-DP / Modbus RTU gateway – View from underneath



N.B. The negative 24V power supply terminal --- should be connected to the installation's earth.

2. Hardware Implementation of the LUF7 Gateway

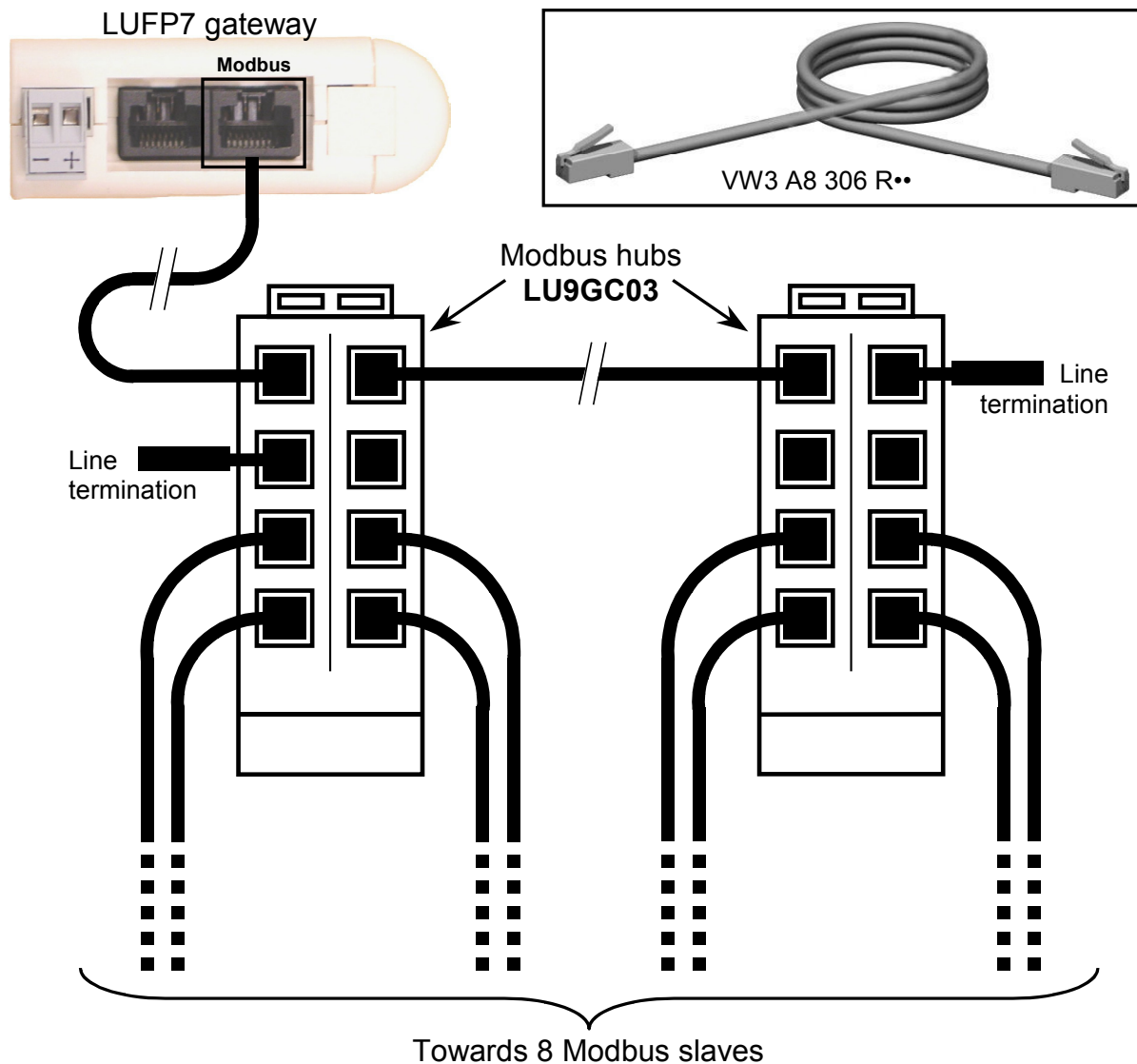
2.5. Connecting the Gateway to the Modbus Network

Three typical examples of Modbus connection for the gateway and its slaves are shown below. There are many other possible Modbus connections, but they are not covered in this document.

2.5.1. Examples of Modbus Connection Topologies

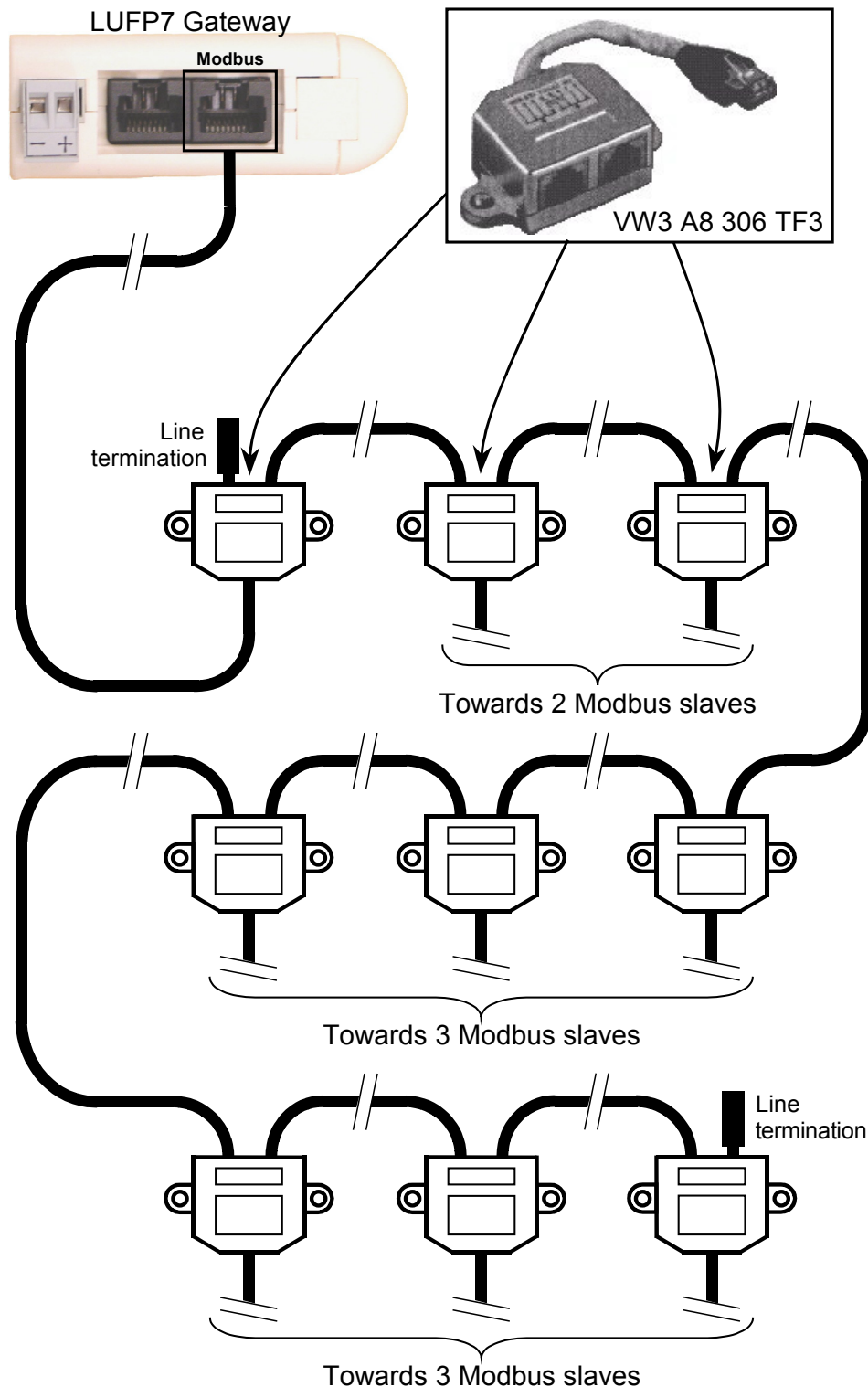
- **“Star” topology:** This topology uses LU9GC03 Modbus hubs, which have 8 female RJ45 connectors. These hubs should be placed close to the Modbus slaves to which they are connected using VW3 A8 306 R•• cables. On the other hand, the nature of the cable connecting the LUF7 gateway to one of these hubs will depend on the network architecture, so long as there is a male RJ45 connector at each end. If necessary, one or two line terminations may be directly connected to the hubs.

The connections are shown below:



2. Hardware Implementation of the LUF7 Gateway

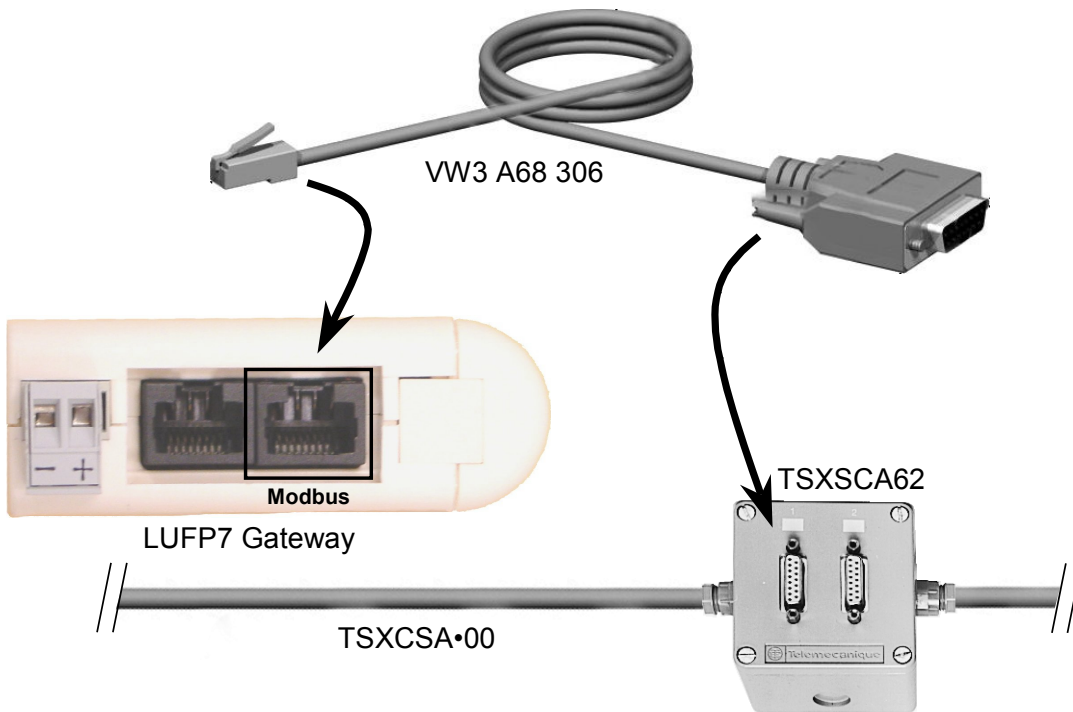
- **“Bus” topology with VW3 A8 306 TF3 drop boxes:** This topology uses VW3 A8 306 TF3 drop boxes to connect each of the Modbus slaves to the main section of the Modbus network. Each box should be placed in the immediate vicinity of the Modbus slave it is associated with. The cable for the main section of the Modbus network must have male RJ45 connectors (like the VW3 A8 306 R•• cable used for the “star” topology). The lead between the drop box and the slave or the Modbus gateway is an integral part of this box. The connections are shown below:



2. Hardware Implementation of the LUF7 Gateway

- **“Bus” topology with tap boxes:** This topology is similar to the previous one, except that it uses TSXSCA62 subscriber connectors and/or TSXCA50 subscriber connectors. We recommend using a VW3 A68 306 connection cable and the TSXCSA•00 Modbus cables. Connect the RJ45 connector on the VW3 A68 306 cable to the Modbus connector on the LUF7 gateway.

The connections are shown below:



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2.5.2. Pin Outs

In addition to the pin out for the connector on the gateway, the one on the VW3 A68 306 cable is also shown below, as it is the only Modbus cable which does not exclusively use RJ45 connections.

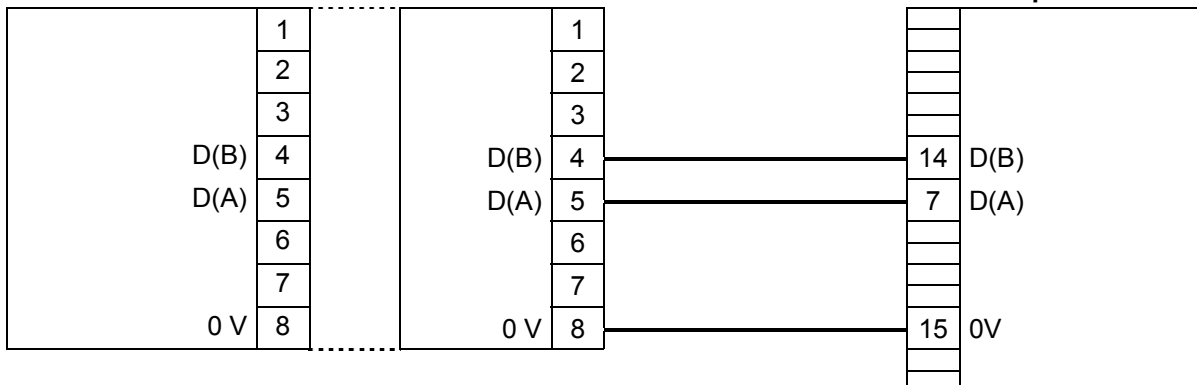
— LUF7 connector —

Female RJ45

— VW3 A68 306 cable for TSXSCA62 box —

Male RJ45

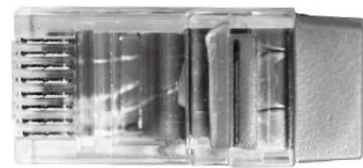
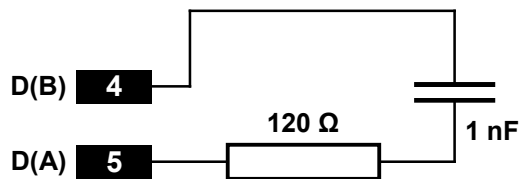
Male 15-point SUB-D



2. Hardware Implementation of the LUF7 Gateway

2.5.3. Wiring Recommendations for the Modbus Network

- Use a shielded cable with 2 pairs of twisted conductors,
- connect the reference potentials to one another,
- maximum length of line: 1,000 metres
- maximum length of drop line / tap-off: 20 metres
- do not connect more than 9 stations to a bus (slaves and one LUF7 gateway),
- cable routing: keep the bus away from power cables (at least 30 cm), make crossings at right angles if necessary, and connect the cable shielding to the earth on each unit,
- adapt the line at both ends using a line terminator (see diagram and VW3 A8 306 RC termination below).



— Line termination recommended at both ends of the line —

— VW3 A8 306 RC line termination —

To make it easier to connect the units using the topologies described in chapter 2.5.1 Examples of Modbus Connection Topologies, page 15, various accessories are available in the *Schneider Electric* catalogue:

1) Hubs, drops, taps, and line terminations:

- LU9GC03 hub This passive box has 8 female RJ45 connectors. Each of these connectors can be connected to a Modbus slave, to a Modbus master, to another Modbus hub, or to a line termination. ("star" topology)
- VW3 A8 306 TF3 drop box..... This passive box includes a short lead with a male RJ45 connector allowing it to be connected directly to a Modbus slave, without having to use a different cable. It is fitted with 2 female RJ45 connectors for the connection of two Modbus cables of the VW3 A8 306 R•• type. ("bus" topology with VW3 A8 306 TF3 drop boxes)
- 2-way TSXSCA62 subscriber connector. This passive box has a printed circuit fitted with screw terminals and allows the connection of 2 subscribers to the bus (2 female 15 point SUB-D connectors). It includes the line termination when the connector is located at the end. It is fitted with 2 screw terminals for the connection of two double twisted pair Modbus cables. ("bus" topology with tap boxes)
- TSXCA50 tap box..... This passive box allows a Modbus unit to be connected to a screw terminal. It includes the line termination when the connector is located at the end. It is fitted with 2 screw terminals for the connection of two double twisted pair Modbus cables. ("bus" topology with tap boxes)
- VW3 A8 306 RC double termination Each of these two red passive boxes is a male RJ45 connector 3 cm long containing an RC line termination (see diagram and illustration above). Only the abbreviation "RC" is shown on these boxes. (all topologies)

2. Hardware Implementation of the LUF7 Gateway

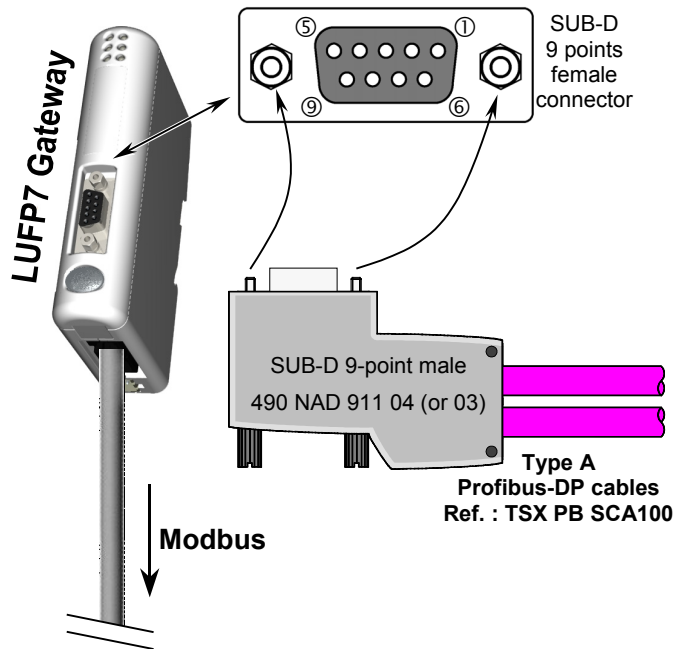
2) Cables:

- VW3 A8 306 R•• Modbus cable..... Shielded cable with a male RJ45 connector at each end.
("star" topology / "bus" topology with tap boxes)
- VW3 A68 306 Modbus cable..... Shielded cable with a male RJ45 connector and a male 15 point SUB-D connector. It is used to connect a Modbus subscriber (slave or master) to a TSXSCA62 or TSXCA50 box.
("bus" topology with tap boxes)
- Shielded double twisted pair Modbus cable..... Bare cable (without connectors) used to make up the main section of the Modbus network. There are three items available: TSXCSA100 (100 m), TSXCSA200 (200 m), and TSXCSA500 (500 m).
("bus" topology with branch boxes)

2.6. Connecting the LUF7 gateway to the Profibus-DP Network

Connect the SUB-D 9-point male plug on the Profibus-DP connector to the Profibus-DP plug on the LUF7 gateway.

Connections are illustrated here:



ENGLISH

2.6.1. Pin Outs

LUF7 plug 9-point SUB-D female		490 NAD 911 04/03 connector 9-point SUB-D male		Type A cables (TSX PB SCA100)	
	1		1	Incoming A cable	
	2		2	Outgoing A cable	
D(B)	3		3	B-line / RxD/TxD +	
RTS	4		4	Request To Send (1)	
GND	5		5	GND Réseau (2)	
+5V	6		6	+5V Réseau (2)	
	7		7		
D(A)	8		8	A-line / RxD/TxD -	
	9		9		
Grounding / Shielding		Shielding / Grounding			

- (1) This signal is not mandatory and may be ignored for the LUF7 gateway.
- (2) The "GND" and "+5V" pins are meant to supply the line termination if it is present in the connector being used.

2. Hardware Implementation of the LUF7 Gateway

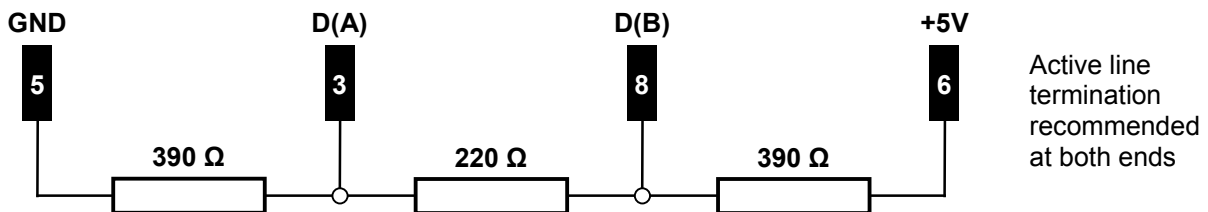
2.6.2. Wiring Recommendations for the Profibus-DP Network

- Use a shielded cable with a twisted pair of copper conductors, preferably a type A Profibus-DP cable.
- Connect the reference potentials to one another,
- You may choose the transmission rate, within limits ranging from 9.6 kbit/s to 12 Mbit/s. The choice is made at network startup and applies to all network subscribers.
- The maximum length of the line (segment) is inversely proportional to the transmission rate.

Transmission rate (bit/s)	9,6 k	19,2 k	93,75 k	187,5 k	500 k	1,5 M	3, 6 or 12 M
Distance/segment (m)	1 200	1 200	1 200	1 000	400	200	100
With 3 repeaters	4 800	4 800	4 800	4 000	2 000	800	400

Experience shows that these lengths may be doubled using lines with a section of 0.5 mm².

- Do not connect more than 32 master or slave stations per segment without a repeater, 127 maximum (repeaters included) with the 3 repeaters; don't use more than 3 repeaters
- Cable routing: keep the bus away from power cables (at least 30 cm), make crossings at right angles if necessary and connect the cable shielding to the earth on each unit,
- The network ends on an active line termination, at each segment end (see diagram below); many suppliers have provided their cables with switchable line terminations. The LUF7 gateway has no internal line termination and therefore applies a 5V voltage between pins 5 and 6 of its Profibus-DP plug in order to allow for the use of an external line termination when the gateway is at the end of the line.

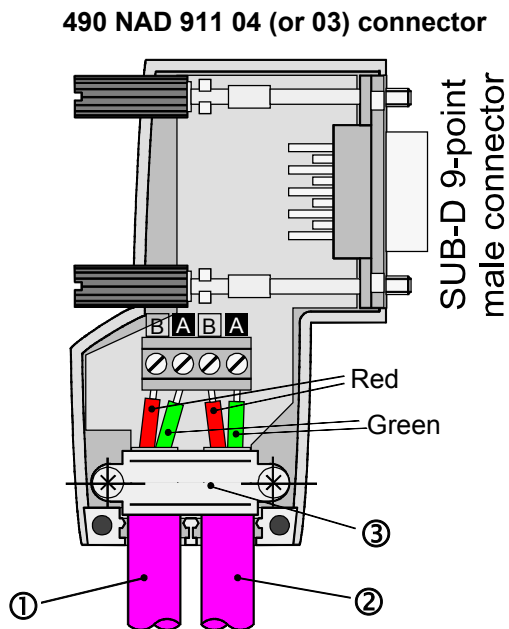


N.B. if you use a 490 NAD 911 03 connector on each of the two stations located at segment end, you won't have to use an external line termination, since a line termination is integrated to that type of connector. However, if you must disconnect a station to which such a connector is connected, move the connector to another station on the same network so that the line termination continues to be supplied. If you do not wish to make that type of arrangement, preferably use connectors featuring a switchable line termination.

2. Hardware Implementation of the LUF7 Gateway

To connect stations to the Profibus-DP network more easily, several accessories are offered in the *Schneider Electric* catalogue:

- Single twisted pair type A Profibus-DP cable (100 m long): **TSX PB SCA100**. If you use a different cable, please check that its electric characteristics are as close as possible to those of type A cables (see chapter 7.2 Communication Characteristics, page 86).
- Line connector: **490 NAD 911 04**. The SUB-D 9-point male plug on that connector should not be connected to a station located at the segment end, as the connector has no line termination. This passive box contains a printed circuit fitted with one or two terminal boxes with screws for connecting one incoming Profibus-DP cable and one outgoing Profibus-DP cable.
- End of line connector: **490 NAD 911 03**. The SUB-D 9-point male plug on that connector must be *imperatively* connected to a station located at segment end, since the connector has a line termination. This passive box contains a printed circuit fitted with one terminal box with screws for connecting one incoming Profibus-DP cable.



Legend:

- ① Incoming A cable.
- ② Outgoing A cable (absent in the case of the 490 NAD 911 03 connector).
- ③ Cable collar; the cable sheath must be uninsulated, at the most, in the middle of the collar.

2. Hardware Implementation of the LUFP7 Gateway

2.7. Configuring the Profibus-DP Communication Features

This configuration should be carried out when the gateway is powered off.

This task is limited to configuring the gateway's Profibus address, as the communication speed on the Profibus network (9.6 kbits/s to 12 Mbits/s) is automatically detected by the gateway.

The two coding wheels used for configuring the gateway's address are hidden behind the gateway cover ⑤ (see illustration in chapter 2.2 Introduction to the LUFP7 Gateway, page 13). To remove this cover, all you have to do is insert the end of a small flat screwdriver between the top of the hood and the gateway box, and then to pull it out delicately.

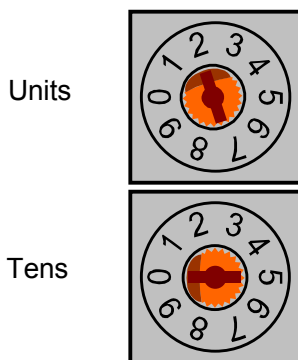


The power supply of the gateway must be turned off before opening the cover.

Once the cover has been removed, make sure that you touch neither the electrical circuits nor the electronic components.

2.7.1. Encoding the Gateway Address

The LUFP7 gateway is identified on the Profibus-DP bus by its address, ranging from 1 to 99.

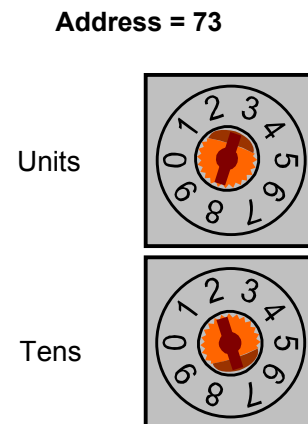
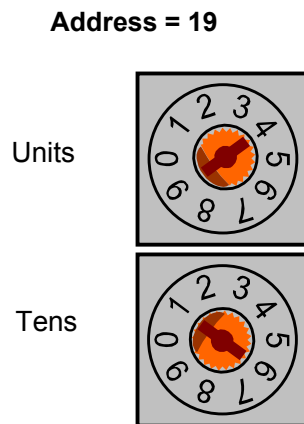


The gateway's Profibus-DP address depends on the position of the two coding wheels represented on the left, in their factory-setting positions (default address = 2).

This address is the sum of the decimal values given by the angular positions of the bottom coding wheel (tens) and the top coding wheel (units).

Any change to the gateway's address shall be taken into account only once it is powered on again.

Examples:

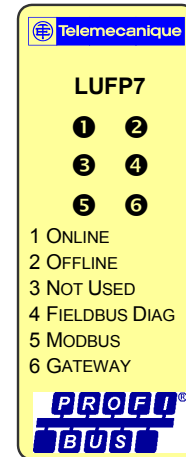
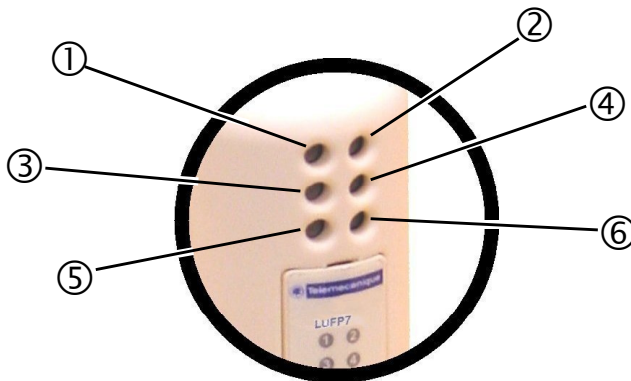


2.7.2. No Internal Line Termination

The LUFP7 gateway has no active line termination. You must therefore use a Profibus-DP connector with such a termination if you place the gateway at one of the ends of a bus segment.

3. Signalling

The gateway's 6 LEDs and the descriptive label on the removable cover which hides its two coding wheels (gateway address) allow you to diagnose the status of the gateway:



DEL	LED → Gateway state
1 ONLINE	Off: Profibus-DP bus: Gateway off-line
	Green: Profibus-DP bus: Gateway on-line (exchanges are possible)
3 NOT USED	Off: —
5 MODBUS	Off: No power
	Flashing (green): No Modbus communications
	Green: Modbus communications OK
	Red: Loss of communication with at least one Modbus slave (2)

LED	LED → Gateway state
2 OFFLINE	Off: Profibus-DP bus: gateway on-line
	Red: Profibus-DP bus: Gateway off-line (exchanges are impossible)
4 FIELDBUS DIAG	Off: Gateway initialization achieved
	Flashing red (1 or 2 Hz): Gateway configuration error. (1)
	Flashing red (4 Hz): Error when resetting the gateway on Profibus-DP. (1)
6 GATEWAY	Off: No power
	Flashing (red/green): Configuration absent / not valid ↳ Use <i>AbcConf</i> to load a valid configuration
	Green: Gateway currently being initialized and configured
	Flashing (green): Gateway is in running order: Configuration OK

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(1) Specific errors indicated by the LED 4 FIELDBUS DIAG:

- Flashing red LED (1 Hz): input and/or output data length is invalid.
↳ Check the overall length of the gateway data, under *AbcConf* ("Monitor" option from the "Sub-Network" menu), then adjust exchanges with the gateway accordingly, using the Profibus-DP network configuration software (e.g.: SyCon).
- Flashing red LED (2 Hz): User parameter data length and/or content is invalid.
- Flashing red LED (4 Hz): Error when resetting the ASIC in charge of Profibus-DP communications.

(2) The LED 5 MODBUS becomes red whenever you use incorrect values in the outputs corresponding to the queries of the two aperiodic services designed to read/write the value of any parameter of a Modbus slave (see chapter 4.2.10 Description of Services Assigned to Gateway Inputs/Outputs, page 34). This LED will only revert to its former green state if you reuse these very same services, but with correct values. More generally, this LED becomes red, then reverts to a green state, on loss and recovery of the communications with any Modbus slave.



N.B. If the LED 6 DEVICE STATUS is flashing following a sequence beginning with one or more red flashes, we advise you to note down the order of this sequence and give this information to the *Schneider Electric* support service.

4. Software Implementation of the Gateway

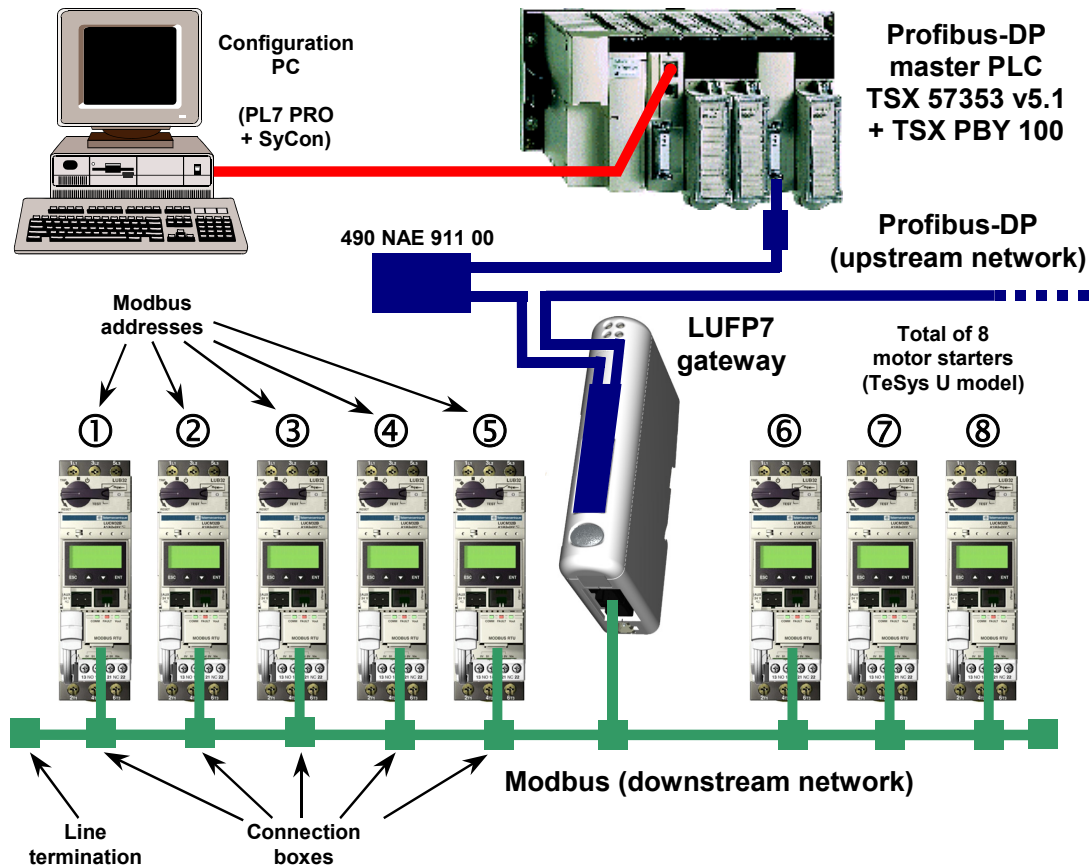
4.1. Introduction

This chapter gives an introduction to a quick implementation of the LUF7 gateway, using its default configuration. All LUF7 gateways ship pre-configured.

This pre-configuration means that the user does not have to configure the LUF7 gateway using AbcConf. This configuration is described in order to allow the gateway to be used with a configuration tool for Profibus-DP master PLCs. As an example this implementation will use Sycon (version \geq V2.5.0.0), the multi-network configuration software marketed by *Hilscher* (Réf.: TLX L FBC 10 M), PL7 PRO (version \geq V3.0) and a Telemecanique PLC from the Premium range (e.g. TSX 57353 v5.1) to which the appropriate Profibus-DP communication board shall be added (TSX PB5 100 coupler).

4.1.1. System Architecture

The default configuration for an LUF7 gateway allows it to control, monitor and configure 8 TeSys U motor starters:



Please see chapter 2 Hardware Implementation of the LUF7 Gateway, page 13, for the hardware implementation of the default configuration.



If you are using fewer than 8 TeSys U motor starters, you will need to adapt the gateway configuration using the “ABC-LUF7 Configurator” software (see chapter 6 Configuring the Gateway, page 44, and chapter 6.6 Deleting a Modbus Slave, page 49).

4. Software Implementation of the Gateway

4.1.2. Configuring the Motor Starters

Each motor starter should be configured as follows:

Protocol:	Modbus RTU slave	Start bits	1
Modbus address	1 to 8	Parity	None
Bitrate	19,200 bits/s	Parity bit	0
Data bits	8	Stop bits	1

When using a TeSys U motor starter with a Modbus communication module (LULC031 module), the configuration parameters for the RS485 connection are automatically detected, only the Modbus address of the motor starter needs to be configured.

4.1.3. Modbus Cycle Time

The LUF7 gateway's default configuration sets a cycle time of 300 ms on Modbus commands for each of the 8 TeSys U motor starters.

4.1.4. Managing Degraded Modes

The default management for degraded modes is described below. This description only applies to a Premium PLC fitted with a TSX PBY 100 coupler. Please refer to chapter 6.11.2.1 Managing degraded modes, page 71, if you want to change the degraded mode management of one or several Modbus commands.

Desired behaviour		Event			
		Premium PLC: CPU stop or failure	Disconnection of the upstream Profibus-DP network	Failure of the LUF7 gateway	Disconnection of the downstream Modbus network
Output	Reset	"Outputs" option equal to "Reset" (1)	Yes	Depending on the configuration of the TeSys U motor starters (2)	
	Hold	"Outputs" option equal to "Hold" (1)	—		
Inputs	Reset	—	Yes		

(1) The "Outputs" option is described in chapter 4.2.8 Importing the Configuration of the Profibus-DP Network under PL7 PRO, page 31. Under PL7 PRO, it can be accessed from the configuration screen for the TSX PBY 100 board.

(2) The desired behaviour with regard to the outputs should be directly configured on each of the TeSys U motor starters.

You may also refer to chapter 4.2 Degraded application mode of the *Implementation manual – TSX PBY 100 – PROFIBUS-DP* (ref.: TSX DM PBY 100E) for further details regarding the processing of degraded modes by the TSX PBY 100 board.

4. Software Implementation of the Gateway

4.2. Gateway Configuration under PL7 PRO and SyCon

The Profibus-DP master must be configured so that it has access to all of the data described in chapters 10.2.1 Input Data Memory Area, page 95, and 10.2.2 Output Data Memory Area, page 96.

The following chapters describe the steps in PL7 PRO (version \geq V3.0) and SyCon (version \geq V2.5.0.0) which you will need to go through so that the gateway is correctly recognised by the Profibus-DP master PLC.

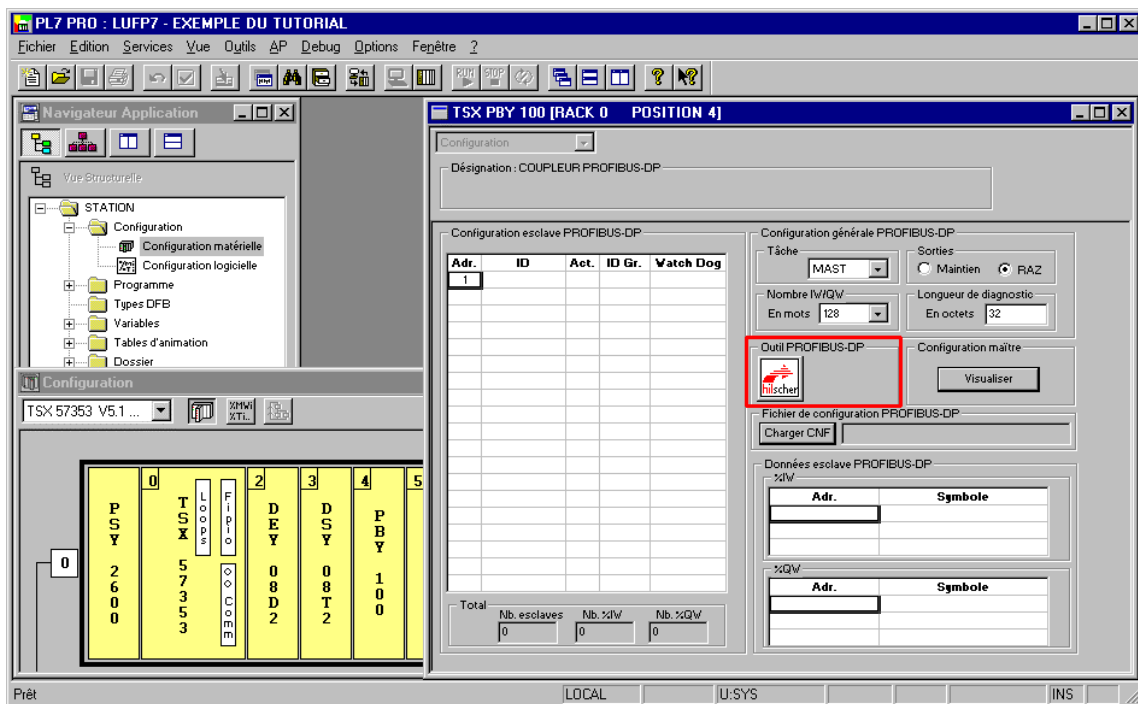


The Profibus-DP network which is described in the following chapters only includes one master (TSX 57353 v5.1 + TSX PBY 100) and one slave (LUFP7 gateway). So you will need to adapt the addressing of the inputs and outputs shown below (%IW and %QW) according to any other slaves on the Profibus-DP network which you need to configure.

4.2.1. Setting Up the Hardware Configuration under PL7 PRO

Under PL7 PRO, create a new application or open an application for which you want to add a Profibus-DP network.

Edit the hardware configuration of this application, add a PBY 100 board and then edit its configuration by double-clicking on its location in the rack.



Click on the “hilscher” button (enclosed in a red box above) to start the SyCon configuration tool.

N.B. This button is not displayed if you have not installed SyCon on your PC.

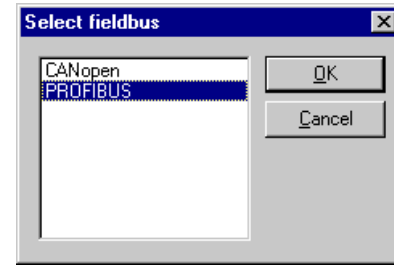
4. Software Implementation of the Gateway

4.2.2. Creating a Profibus-DP Network under SyCon



Select the “New” option from the “File” menu to create a new configuration, by selecting the “PROFIBUS” network.

This option creates an empty network segment in the SyCon main window.

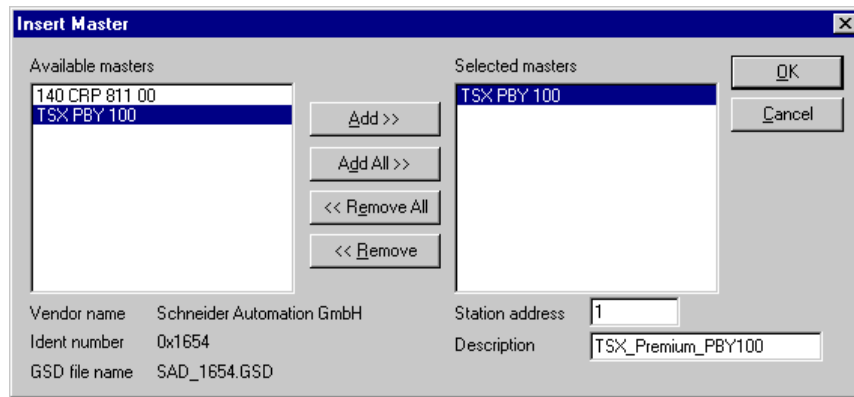
In this guide, we shall immediately save this configuration and name it “LUFFP7 - Tutorial Example.pb”.



4.2.3. Selecting and Adding the Profibus-DP Master Station

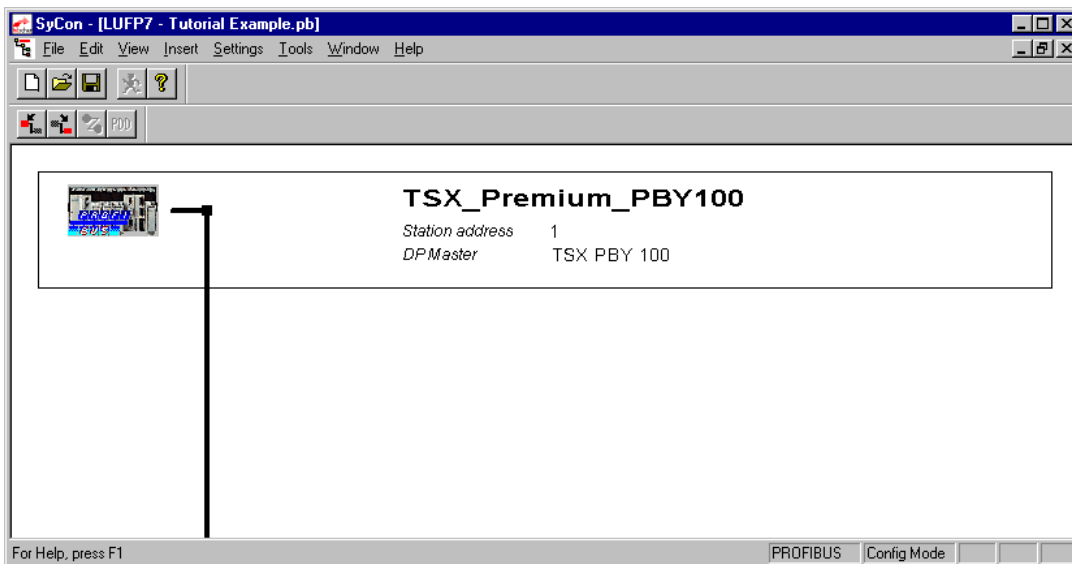
Select the “Master...” option from the “Insert” menu (or click on the  button). Move the mouse pointer (which now looks like a ) to the position where you want to add the Profibus-DP master, and left-click.

Select the “TSX PBV 100” master, then click “Add >>”. If need be, edit its address and name.



Once back to the SyCon main window, the selected master appears in the selected insertion position:

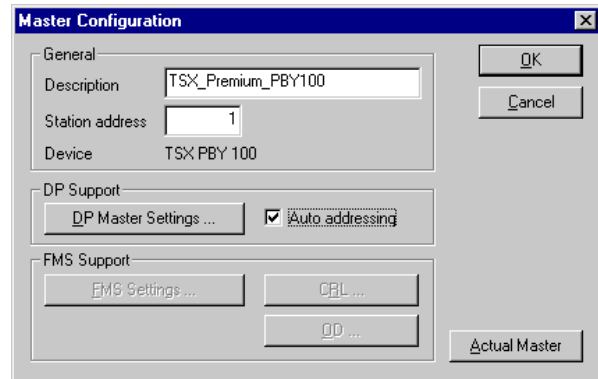
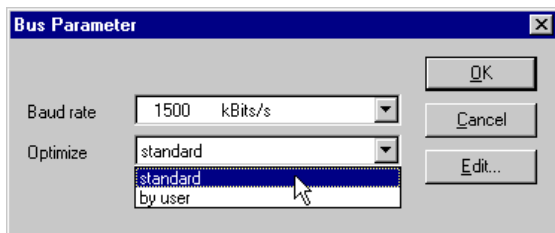
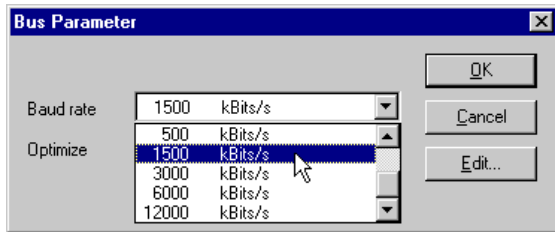
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4. Software Implementation of the Gateway

Double-click on the line that corresponds to the Profibus-DP master to open the “Master Configuration” window.

In the “DP Support” frame, verify that the “Auto addressing” box has been checked.



Lastly, select the Profibus-DP master and run the “Bus Parameter...” option from the “Settings” menu to configure the Profibus-DP network baud rate.



The “Optimize” option must remain equal to “standard”, except in case of knowledgeable users who want to edit critical Profibus-DP network settings (accessible via the “Edit...” button).

4.2.4. Setting up the Gateway Description Files

The GSD file that describes the gateway must be located on the PC hard drive so that SyCon can access it any time. Preferably place the file inside the directory that contains all the GSD files used by SyCon. The description and content of that GSD file are both in chapter 8 Appendix B: LUFP7 Gateway GSD File, page 90.

This file can be found on the CD LU9CD1 : “Tele071F.gsd”.

- ➔ To import that file under SyCon, run the “Copy GSD” option from the “File” menu and select the GSD file mentioned above from the CD. If the command completes successfully, the following message is displayed: “The import of the GSD file was successful.”

Then, install the symbols representing the gateway under SyCon. The corresponding files are on the CD LU9CD1 : “LUFP7_S.DIB”, “ LUFP7_R.DIB”, and “ LUFP7_D.DIB”.



- ➔ Copy these files into “C:\Program Files\Hilscher\SyCon\Fieldbus\PROFIBUS\BMP”, if this is the path where you have installed SyCon on your PC. All these operations should be conducted using Windows Explorer, for example, as SyCon cannot proceed to their installation.

The symbols that represent each of these three files are given below:

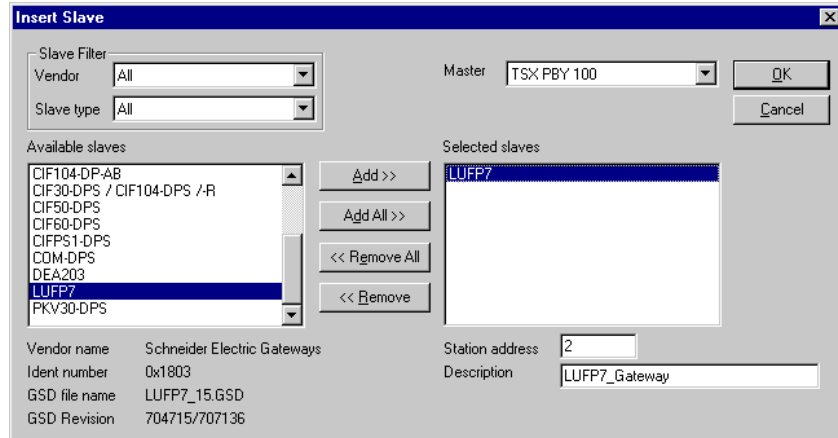


4. Software Implementation of the Gateway

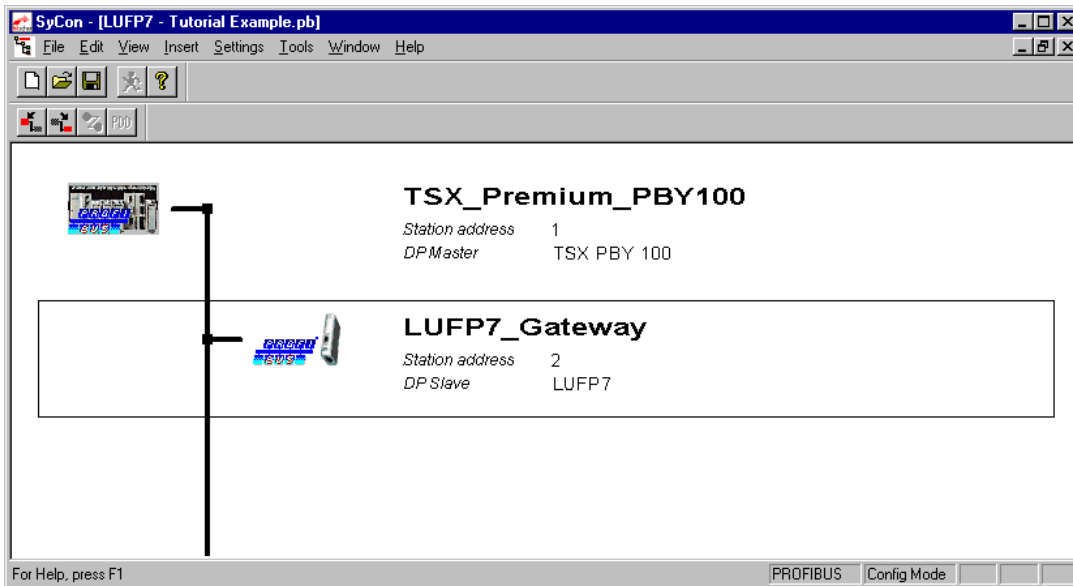
4.2.5. Selecting and Adding the Gateway to the Profibus-DP Network

Run the “Slave...” option from the “Insert” menu (or click on the  button). Move the mouse pointer (which now looks like a ) to the position where you want to add the LUFF7 gateway, then left-click.

In the window that appears, select the “LUFF7” slave, then click the “Add >>” button. If need be, edit its address and name. Gateway address configuration is detailed in chapter 2.7.1 Encoding the Gateway Address, page 22.



Once back to the SyCon main window, the selected slave appears in the selected insertion position:



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4.2.6. Editing and Configuring the Gateway

Double-click on the line that corresponds to the LUFF7 gateway. The "Slave Configuration" window appears. Conduct the following operations:

- In the list of available modules, select the module called “IN/OUT: 32 Byte (16 word)”. Click the “Append Module” button to add it to the list of modules configured for the gateway. This module occupies one “Slot” and consists of a 16-word I/O module (both in IW and OW). It is intended to allow the exchange of the various data presented in chapters 10.2.1 Input Data Memory Area, page 95, and 10.2.2 Output Data Memory Area, page 96.

4. Software Implementation of the Gateway

- In the “Assigned master” frame, check that the Profibus-DP master previously configured is selected. If not, select it. **N.B.** Only the "Assigned master" can control the DP slave to which it has been allocated during the configuration phase. Other DPM1 masters can only read its I/O values.
- In the "General" frame, verify that the two boxes "Activate device in actual configuration" and "Enable watchdog control" are both checked. If not, please check both.
- Validate the operations conducted by clicking on “OK”.

The left-hand portion of this area specifies the gateway's maximum capacity, whilst the right-hand portion lists the currently configured "Modules".

Module	Inputs	Outputs	In/Out	Identifier
IN/OUT: 6 Byte (3 word)			3 Word	0x72
IN/OUT: 8 Byte (4 word)			4 Word	0x73
IN/OUT: 10 Byte (5 word)			5 Word	0x74
IN/OUT: 12 Byte (6 word)			6 Word	0x75
IN/OUT: 14 Byte (7 word)			7 Word	0x76
IN/OUT: 16 Byte (8 word)			8 Word	0x77
IN/OUT: 32 Byte (16 word)			16 Word	0x7F

Slot	Idx	Module	Symbol	Type	I Adr.	I Len.	Type	O Adr.	O Len.
1	1	IN/OUT: 32 Byte (16 word)	Module1	I/W	0	16	O/W	0	16

N.B. Don't use the “Symbolic Names” option to name the I/O exchanged with the gateway. This operation is useless because the symbols you shall define under SySon would not be exported and retrieved under PL7 PRO!



If you create or edit a configuration using AbcConf (see chapter 6 Configuring the Gateway, page 44), you should be aware that the total size of the inputs and outputs, for all the configured modules, should be identical to the size of the data configured under AbcConf. They correspond to all the bytes exchanged with the Modbus slaves via the “Data” fields of the Modbus frames, to the two words reserved for downstream Modbus network management (see chapter 5 Gateway Initialization and Diagnostics, page 37), if it has not been disabled, and also to the two read parameter read/write counters. Any “free memory location” inserted between two data elements, regardless of its size, is included in the bytes exchanged.

N.B. If the "Length of input data" or the "Length of output data" configured for the gateway (under SyCon) differs from the total size of the gateway input memory area or the total size of the gateway output memory area (under AbcConf), the gateway shall refuse going on line (LED ❶ off and LED ❷ red) and the configuration error shall be indicated (LED ❹ flashing red, at 1 Hz). Please see chapter 3 Signalling, page 23.

4. Software Implementation of the Gateway

4.2.7. Saving and Exporting the Profibus-DP Network Configuration

Save the configuration by giving it a name (“Save” or “Save As...” option from the “File” menu). The configuration of the Profibus-DP network is then saved in a “.pb” file.

In order to export this configuration for PL7 PRO, follow these steps:

- Select the line that corresponds to the Profibus-DP master (TSX PBY 100).
- Run the “Export ► ASCII” option from the “File” menu. The newly-created file bears the “.cnf” extension.
N.B. the filename must comply with the “DOS 8.3” format, i.e. it must include a name limited to 8 characters and a 3-character extension (here, “.cnf”).
- Once these operations are completed, quit SyCon.

4.2.8. Importing the Configuration of the Profibus-DP Network under PL7 PRO

Back to PL7 PRO (see chapter 4.2.1 Setting Up the Hardware Configuration under PL7 PRO, page 26), click on the “Load CNF” button. Using the options in the window that appears, select the “.cnf” file that was saved beforehand (see previous chapter).

Once this import is completed, the full path to this file appears on the right of the “Load CNF” button and the “PROFIBUS-DP slave configuration” frame displays the two configured stations, i.e. “TSX PBY 100”, at the address 1, and “LUF7”, at the address 2.

In the case of the LUF7 gateway, the default values allocated to the configuration options of the “General PROFIBUS-DP configuration” frame can be kept (see table below). Edit them accordingly if you configure other slaves on the same Profibus-DP network.

Optional	Default value	Possible values
Task	MAST	MAST or FAST
Used to select the type of system task that will steer the Profibus-DP network. N.B. The PL7 PRO application is also subdivided into a “Mast Task” and a “Fast Task”.		
Outputs	Reset	Hold or Reset
Determines whether the %QW outputs meant for the Profibus-DP slaves are held or reset to zero when the associated task (see above) is stopped, as this stop does not cause the TSX PBY 100 board to stop. N.B. if the gateway’s “Control/Status Byte” option is equal to “Enabled” (which is not the case for its default configuration), resetting the outputs also resets the “Profibus-DP master control word,” and therefore a communication disruption request on the Modbus downstream network (see chapter 5.2.1 Profibus-DP Master Control Word, page 38).		
IW/QW number	128 words	32, 64, 128 or 242 words
Determines the number of words used for the input of the TSX PBY 100 board, as well as for its outputs. The “Total” frame indicates the total number of inputs and outputs, all slaves included. The value allocated to the “IW/QW number” option should be greater than, or equal to, the greatest of these two numbers. The LUF7 gateway only requires 16 words (whether for inputs or for outputs). Therefore, we could use a size of 32 words. However, it is preferable to keep the default value, should other slaves be configured.		
Diagnostic length	32 bytes	6 to 244 bytes
Determines the maximum length of a diagnostic on the Profibus-DP network. N.B. This length should be sufficient to host the longest diagnostic for all the slaves on the network. If the length is insufficient, the slaves concerned shall not be active on the bus because their diagnostic shall be invalid. The “diagnostic length” is equal to 6 bytes in the case of the LUF7 gateway.		

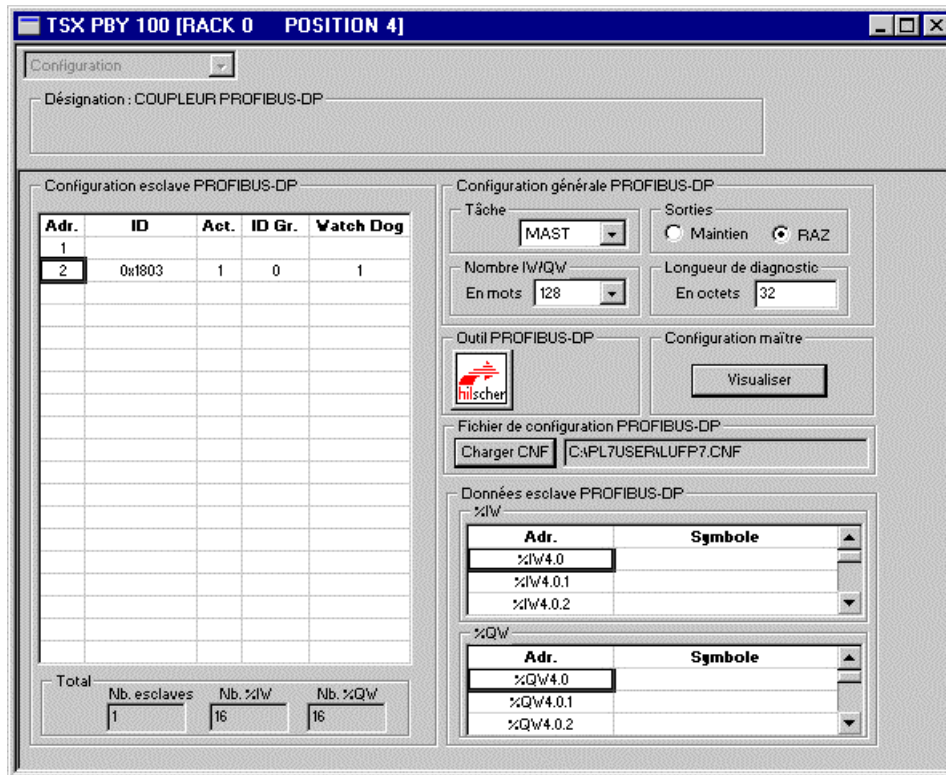
N.B. You may also request the configuration of the Profibus-DP master by clicking the “View” button in the “Master configuration” frame.

4. Software Implementation of the Gateway

4.2.9. Configuring the Gateway I/O under PL7 PRO

Using the information located in the selected ".cnf" file, PL7 PRO establishes a direct relation between the data for each Profibus-DP slave and its equivalent I/O.

To view the LUFF7 gateway I/O, click on the line of the address 2 station in the "PROFIBUS-DP slave configuration" frame.



If you use the vertical sliders in the "PROFIBUS-DP slave data" frame, you can see that the gateway's 16 input words have been allocated to inputs %IW4.0 to %IW4.0.15 and that its 16 outputs words have been allocated to outputs %QW4.0 to %QW4.0.15.

N.B.: these allocations are valid only for the gateway's default configuration and for a gateway which is the only slave on the Profibus-DP network. If you configure other slaves on the same Profibus-DP network, it may be that gateway input and output allocation, as it is illustrated above, is amended according to the order in which the slaves and their modules have been declared under SyCon. Then, you can use the PL7 PRO window, presented above, to check the allocation of the input and output words of the gateway and other Profibus-DP slaves.

4. Software Implementation of the Gateway

The correspondence between the content of the gateway's input memory (see chapter 10.2.1 Input Data Memory Area, page 95) and the PLC inputs "%IW4.0" to "%IW4.0.15" is given in the following table:

Service	PLC input	Description	
		Bit 15.....Bit 8	Bit 7.....Bit 0
Managing the downstream Modbus network	%IW4.0	Gateway status word	
Periodic communications — Monitoring of TeSys U motor starters	%IW4.0.1	Value of the motor starter ① status register	
	%IW4.0.2	Value of the motor starter ② status register	
	%IW4.0.3	Value of the motor starter ③ status register	
	%IW4.0.4	Value of the motor starter ④ status register	
	%IW4.0.5	Value of the motor starter ⑤ status register	
	%IW4.0.6	Value of the motor starter ⑥ status register	
	%IW4.0.7	Value of the motor starter ⑦ status register	
	%IW4.0.8	Value of the motor starter ⑧ status register	
Aperiodic communications Reading the value of a motor starter parameter (RESPONSE)	%IW4.0.9	Free memory location	Slave no. (16#01-16#08)
	%IW4.0.10	Function No. (16#03)	Bytes read (16#02)
	%IW4.0.11	Value of the parameter read (16#xxxx)	
Aperiodic communications Writing the value of a motor starter parameter (RESPONSE)	%IW4.0.12	Slave No. (16#01-16#08)	Function No. (16#06)
	%IW4.0.13	Address of the parameter written (16#xxxx)	
	%IW4.0.14	Value of the parameter written (16#xxxx)	
Aperiodic communications ("Trigger bytes" for the responses)	%IW4.0.15	Read parameter response counter	Write parameter response counter

The correspondence between the content of the gateway output storage (see chapter 10.2.2 Output Data Memory Area, page 96) and the outputs of the "%QW4.0" to "%QW4.0.15" automatic controls is as follows:

Service	PLC output	Description	
		Bit 15.....Bit 8	Bit 7.....Bit 0
Managing the downstream Modbus network	%QW4.0	Profibus-DP master control word	
Periodic communications — Controlling TeSys U motor starters	%QW4.0.1	Value of the motor starter ① command register	
	%QW4.0.2	Value of the motor starter ② command register	
	%QW4.0.3	Value of the motor starter ③ command register	
	%QW4.0.4	Value of the motor starter ④ command register	
	%QW4.0.5	Value of the motor starter ⑤ command register	
	%QW4.0.6	Value of the motor starter ⑥ command register	
	%QW4.0.7	Value of the motor starter ⑦ command register	
	%QW4.0.8	Value of the motor starter ⑧ command register	
Aperiodic communications Reading the value of a motor starter parameter (QUERY)	%QW4.0.9	Slave No. (16#01-16#08)	Function No. (16#03)
	%QW4.0.10	Address of the parameter to be read (16#xxxx)	
	%QW4.0.11	Number of parameters to be read (16#0001)	
Aperiodic communications — Writing the value of a motor starter parameter (QUERY)	%QW4.0.12	Slave number (16#01-16#08)	Function number (16#06)
	%QW4.0.13	Address of the parameter to be written (16#xxxx)	
	%QW4.0.14	Value of the parameter to be written (16#xxxx)	
Aperiodic communications ("Trigger bytes" for the queries)	%QW4.0.15	Read parameter query counter	Write parameter query counter



Whenever you create or change a configuration using AbcConf (see chapter 6 Configuring the Gateway, page 44), you should be aware that, if you configure an odd number of input (or output) bytes, PL7 PRO converts the last byte to the 16-bit format instead of leaving it in bits 8-15 of the last word. Its value is therefore placed into bits 0-7 of the last word.

e.g. If you use 33 input words and the last input word is equal to 16#64 (8-bit format), the word %IW4.0.16 is therefore equal to 16#0064 (16-bit format) and not 16#64••.

4. Software Implementation of the Gateway

4.2.10. Description of Services Assigned to Gateway Inputs/Outputs

Managing the downstream Modbus network: Refer to chapter 5.3 Diagnostic Only, page 41, for a detailed description of that service, and to chapter 11.2 LUF7 Gateway Initialization and Diagnostics, page 98, for an advanced sample use. In the case of the gateway's default configuration, under AbcConf, the "Control/Status Byte" field of the "ABC" element is equal to "Enabled but no startup lock."

Periodic communications (inputs): The value of each of the 8 words for this service corresponds to the value of the status register of a TeSys U motor starter (register located at address 455).

Periodic communications (outputs): The value of each of the 8 words for this service corresponds to the value to be sent to the command register of a TeSys U motor starter (register located at address 704).

Refer to chapter 11.3 Controlling and Supervising the 8 TeSys U Motor Starters, page 100, for a sample use of these "periodic communications" services.

Aperiodic communications: Refer to chapter 11.4 Reading and Writing any TeSys U Motor Starter Parameter, page 101, for a simple example of these "aperiodic communications".

These aperiodic communications services offer functions similar to those of "parameter area PKW" which can be found on certain *Schneider Electric* products, such as some ATV drives.

- **Sample reading of a motor starter parameter:**

Reading of the 1st fault register (address = 452 = 16#01C4) on TeSys U motor starter no. 5.

The initial values of %QW4.0.15 and %IW4.0.15 are equal to 16#0613.

The result of the reading is 16#0002 (magnetic fault).

Output	Value	Meaning (MSB + LSB)
%QW4.0.9	16#0503	Slave no. + Function no.
%QW4.0.10	16#01C4	Parameter address
%QW4.0.11	16#0001	Number of parameters
%QW4.0.15	16#0713	"Trigger byte" for the query (PF)

Input	Value	Meaning (MSB + LSB)
%IW4.0.9	16#0005	(not used) + Slave no.
%IW4.0.10	16#0302	Slave no. + Number of bytes
%IW4.0.11	16#0002	Value read
%IW4.0.15	16#0713	"Trigger byte" for the response (PF)

- **Sample writing of a motor starter parameter:**

Writing of the 2nd command register (address = 705 = 16#02C1) on TeSys U motor starter no. 7 at the value 16#0006 (clear statistics + reset thermal memory).

The initial values of %QW4.0.15 and %IW4.0.15 are equal to 16#0713.

The result of the writing is a command echo, that is to say that the values of the "address parameter" and "value to be written" fields are identical in both the query and the response.

Output	Value	Meaning (MSB + LSB)
%QW4.0.12	16#0706	Slave no. + Function no.
%QW4.0.13	16#02C1	Parameter address
%QW4.0.14	16#0006	Value to be written
%QW4.0.15	16#0714	"Trigger byte" for the query (PF)

Input	Value	Meaning (MSB + LSB)
%IW4.0.12	16#0706	Slave no. + Function no.
%IW4.0.13	16#02C1	Parameter address
%IW4.0.14	16#0006	Written value
%IW4.0.15	16#0714	"Trigger byte" for the response (PF)





Avoid writing incorrect values in outputs which correspond to the aperiodic communication services described above, as they would lead to the transmission of an incoherent Modbus frame. It is therefore up to the Profibus-DP master PLC application to manage them.

In addition, do not ever use these services in "Broadcast" mode (Modbus address = 0).

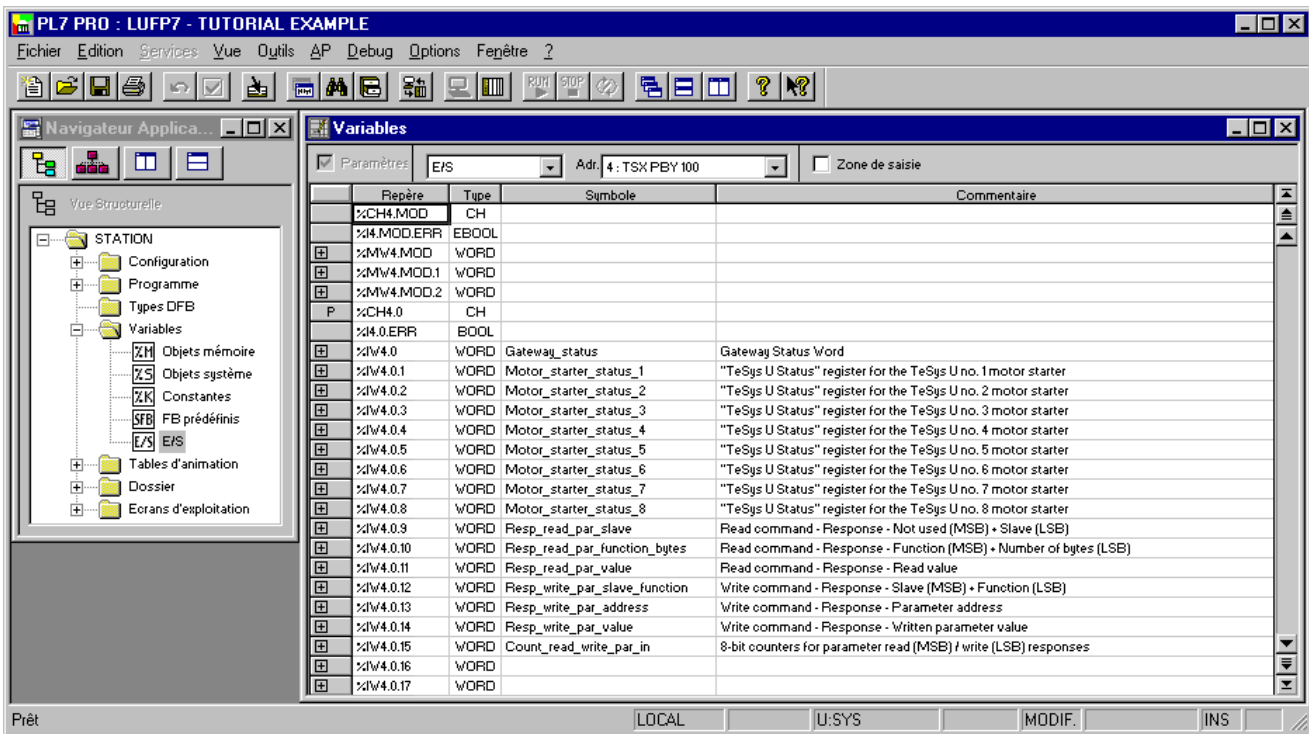
4. Software Implementation of the Gateway

4.2.11. Validating and Saving the Configuration of the TSX BP 100 Coupler

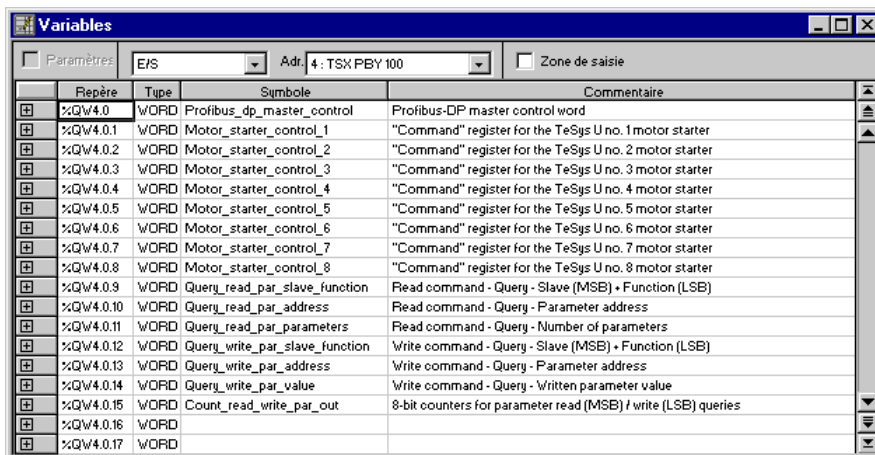
- ➔ Validate the various operations conducted under PL7 PRO using the  button.
- ➔ Close the configuration window of the TSX PBV 100 coupler.
- ➔ In the PLC's hardware configuration window, click on the  button again.
- ➔ Save the PL7 PRO application by giving it a name.

4.2.12. Allocating Symbols to the Gateway Inputs and Outputs

Allocating symbols to the gateway I/O is possible only under PL7 PRO, as SyCon does not export such symbols to the ASCII export file. Once these symbols are defined, they are used in the configuration window of the TSX PBV 100 coupler previously described.



Repère	Type	Symbole	Commentaire
%CH4.MOD	CH		
%I4.MOD.ERR	EBOOL		
%Mw4.MOD	WORD		
%Mw4.MOD.1	WORD		
%Mw4.MOD.2	WORD		
P %CH4.0	CH		
%I4.0.ERR	BOOL		
%Iw4.0	WORD	Gateway_status	Gateway Status 'word
%Iw4.0.1	WORD	Motor_starter_status_1	"TeSys U Status" register for the TeSys U no. 1 motor starter
%Iw4.0.2	WORD	Motor_starter_status_2	"TeSys U Status" register for the TeSys U no. 2 motor starter
%Iw4.0.3	WORD	Motor_starter_status_3	"TeSys U Status" register for the TeSys U no. 3 motor starter
%Iw4.0.4	WORD	Motor_starter_status_4	"TeSys U Status" register for the TeSys U no. 4 motor starter
%Iw4.0.5	WORD	Motor_starter_status_5	"TeSys U Status" register for the TeSys U no. 5 motor starter
%Iw4.0.6	WORD	Motor_starter_status_6	"TeSys U Status" register for the TeSys U no. 6 motor starter
%Iw4.0.7	WORD	Motor_starter_status_7	"TeSys U Status" register for the TeSys U no. 7 motor starter
%Iw4.0.8	WORD	Motor_starter_status_8	"TeSys U Status" register for the TeSys U no. 8 motor starter
%Iw4.0.9	WORD	Resp_read_par_slave	Read command - Response - Not used (MSB) + Slave (LSB)
%Iw4.0.10	WORD	Resp_read_par_function_bytes	Read command - Response - Function (MSB) + Number of bytes (LSB)
%Iw4.0.11	WORD	Resp_read_par_value	Read command - Response - Read value
%Iw4.0.12	WORD	Resp_write_par_slave_function	Write command - Response - Slave (MSB) + Function (LSB)
%Iw4.0.13	WORD	Resp_write_par_address	Write command - Response - Parameter address
%Iw4.0.14	WORD	Resp_write_par_value	Write command - Response - Written parameter value
%Iw4.0.15	WORD	Count_read_write_par_in	8-bit counters for parameter read (MSB) / write (LSB) responses
%Iw4.0.16	WORD		
%Iw4.0.17	WORD		





Repère	Type	Symbole	Commentaire
%Qw4.0	WORD	Profibus_dp_master_control	Profibus-DP master control word
%Qw4.0.1	WORD	Motor_starter_control_1	"Command" register for the TeSys U no. 1 motor starter
%Qw4.0.2	WORD	Motor_starter_control_2	"Command" register for the TeSys U no. 2 motor starter
%Qw4.0.3	WORD	Motor_starter_control_3	"Command" register for the TeSys U no. 3 motor starter
%Qw4.0.4	WORD	Motor_starter_control_4	"Command" register for the TeSys U no. 4 motor starter
%Qw4.0.5	WORD	Motor_starter_control_5	"Command" register for the TeSys U no. 5 motor starter
%Qw4.0.6	WORD	Motor_starter_control_6	"Command" register for the TeSys U no. 6 motor starter
%Qw4.0.7	WORD	Motor_starter_control_7	"Command" register for the TeSys U no. 7 motor starter
%Qw4.0.8	WORD	Motor_starter_control_8	"Command" register for the TeSys U no. 8 motor starter
%Qw4.0.9	WORD	Query_read_par_slave_function	Read command - Query - Slave (MSB) + Function (LSB)
%Qw4.0.10	WORD	Query_read_par_address	Read command - Query - Parameter address
%Qw4.0.11	WORD	Query_read_par_parameters	Read command - Query - Number of parameters
%Qw4.0.12	WORD	Query_write_par_slave_function	Write command - Query - Slave (MSB) + Function (LSB)
%Qw4.0.13	WORD	Query_write_par_address	Write command - Query - Parameter address
%Qw4.0.14	WORD	Query_write_par_value	Write command - Query - Written parameter value
%Qw4.0.15	WORD	Count_read_write_par_out	8-bit counters for parameter read (MSB) / write (LSB) queries
%Qw4.0.16	WORD		
%Qw4.0.17	WORD		

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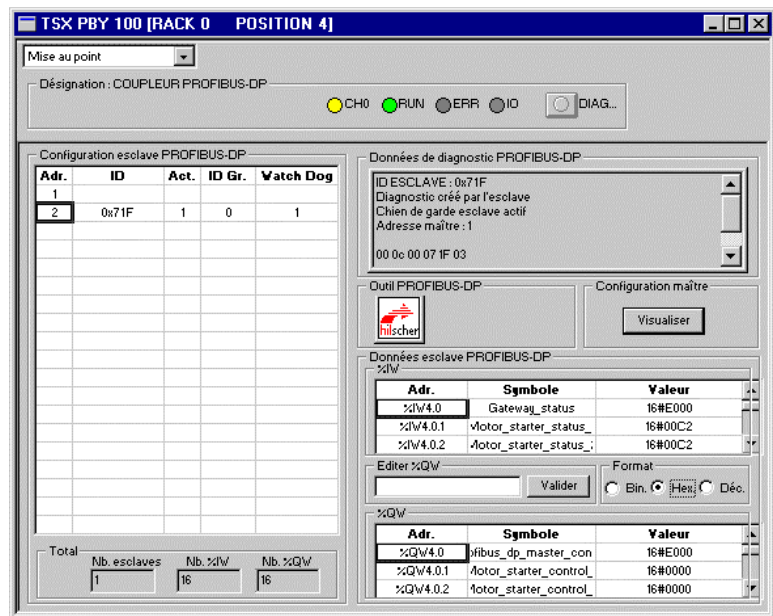
4. Software Implementation of the Gateway

4.2.13. Using and Monitoring the TSX PBY 100 Coupler Configuration

After validating all the changes previously made, you may check the configuration of the TSX PBY 100 coupler, the Profibus-DP network, and the LUF7 gateway by downloading the PL7 PRO application to the PLC and conducting a monitoring operation using the TSX PBY 100 coupler debug screen.

- ➔ Transfer the application from the PC to the PLC by running the “Transfer program...” option from the “PLC” menu (or click on the  button) and selecting “PC -> PLC”.
- ➔ Switch from the **OFFLINE** to the **ONLINE** mode by running the “Connect” option from the “PLC” menu (or click on the  button).
- ➔ Initialize and start the PLC application using the “Init...” and “Run...” options from the “PLC” menu.
- ➔ Open the “Hardware configuration” and the TSX PBY 100 board configuration. Then, switch from “Configuration” to “Debug” and select the line that corresponds to the LUF7 gateway.

The content of the “PROFIBUS-DP diagnostic data” frame enables you to view the gateway’s Profibus-DP diagnostics, while the “PROFIBUS-DP slave data” frame enables you to view and change the values of the gateway I/O. An example is given on the right.



4.2.14. Developing a Profibus-DP Application

The Profibus-DP master PLC taken as an example is a TSX 57353 v5.1, marketed by *Telemecanique*. A sample PLC application, developed under PL7 PRO, is presented in chapter 11 Appendix D: Sample Use under PL7 PRO, page 97. This example uses the PLC, the gateway and the 8 TeSys U motor starters shown in the Software Implementation of the Gateway.

5. Gateway Initialization and Diagnostics

Each of the three sub-chapters 5.2, 5.3 and 5.3.2 describes the principle used to initialize and carry out diagnostics on the gateway using each of the three options offered by the gateway. These options can be configured via AbcConf, by changing the assignment of the “Control/Status Byte” field for the “ABC” element (see chapter 6.12.2 “ABC” Element, page 82). The links between these sub-chapters and these options are as follows:

“Control/Status Byte” field	Sub-chapter.....	Page
Enabled	5.2 Full Management.....	37
Enabled but no startup lock	5.3 Diagnostic Only	41

5.1.1. Disabled 5.3.2 Profibus-DP Master Control Word

The output word located at addresses 16#0200 (MSB) and 16#0201 (LSB) in the gateway’s output memory constitutes the Profibus-DP master command word. Its structure is described below:

Bits	Description
15	<p>FB_HS_CONFIRM: Acknowledgement bit of a gateway diagnostic</p> <p>The Profibus-DP master must compare the value of the FB_HS_CONFIRM bit to the value of the ABC_HS_SEND bit (bit 15 in the gateway’s status word). If these two values are different, this means that the gateway has transmitted a new diagnostic to the Profibus-DP master.</p> <p>To tell the gateway that it has read a diagnostic, the Profibus-DP master must copy the value of the ABC_HS_SEND bit to the FB_HS_CONFIRM bit. This allows the gateway to issue a new diagnostic.</p> <p>Summary:</p> <ul style="list-style-type: none"> • If (FB_HS_CONFIRM = ABC_HS_SEND) → The gateway’s status word contains a diagnostic which has already been acknowledged by the Profibus-DP master. So the gateway is free to use this status word to place another diagnostic there. • Else → A new diagnostic is available in the gateway’s status word. The Profibus-DP master can read this diagnostic, but must also copy the value of ABC_HS_SEND to FB_HS_CONFIRM in order to allow the gateway to generate new diagnostics.
0-14	Reserved.

Simplified Operation	43
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The option chosen in the default configuration is “Enabled but no startup lock.”

5.2. Full Management



Until it receive an order to start up the Modbus exchanges from the Profibus-DP master, the LUF7 gateway does not transmit any queries on the Modbus network. The Profibus-DP master can then deactivate these exchanges by inverting this startup order. Subsequently these two orders may be reiterated by the Profibus-DP master.

The Modbus exchange startup order is located in a 16-bit register occupying the addresses 16#0200 and 16#0201 in the gateway’s memory (outputs). A second 16-bit register, located at the addresses 16#0000 and 16#0001 (inputs), allows the gateway to send diagnostics to the Profibus-DP master.

So you must configure your Profibus-DP master so that it has access to the first two bytes of the gateway’s output data area, as well as to the first two bytes of the gateway’s input data area (see chapter 4.2 Gateway Configuration under PL7 PRO and SyCon, page 26).

5.2.1. Profibus-DP Master Control Word

The output word located at addresses 16#0200 (MSB) and 16#0201 (LSB) in the gateway's output memory constitutes the Profibus-DP master command word. Its structure is described below:

Bits	Description
15	<p>FB_HS_CONFIRM: Acknowledgement bit of a gateway diagnostic</p> <p>The Profibus-DP master must compare the value of the FB_HS_CONFIRM bit to the value of the ABC_HS_SEND bit (bit 15 in the gateway's status word). If these two values are different, this means that the gateway has transmitted a new diagnostic to the Profibus-DP master.</p> <p>To tell the gateway that it has read a diagnostic, the Profibus-DP master must copy the value of the ABC_HS_SEND bit to the FB_HS_CONFIRM bit. This allows the gateway to issue a new diagnostic.</p> <p>Summary:</p> <ul style="list-style-type: none">• If (FB_HS_CONFIRM = ABC_HS_SEND) → The gateway's status word contains a diagnostic which has already been acknowledged by the Profibus-DP master. So the gateway is free to use this status word to place another diagnostic there.• Else → A new diagnostic is available in the gateway's status word. The Profibus-DP master can read this diagnostic, but must also copy the value of ABC_HS_SEND to FB_HS_CONFIRM in order to allow the gateway to generate new diagnostics.

5. Gateway Initialization and Diagnostics

Bits	Description
14	<p>FB_HS_SEND: New command from the Profibus-DP master</p> <p>Before changing the value of FB_DU, the Profibus-DP master must compare the values of FB_HS_SEND and ABC_HS_CONFIRM (bit 14 of the gateway's status word). If these two values are different, this means that the gateway has not yet acknowledged the previous Profibus-DP master command. Else, the Profibus-DP master can issue a new command, updating the FB_DU bit according to the nature of its command (shutdown or activation of Modbus exchanges), then toggling the value of the FB_HS_SEND bit to inform the gateway that it has sent it a new command.</p> <p>Summary:</p> <ul style="list-style-type: none"> • If (FB_HS_SEND ≠ ABC_HS_CONFIRM) → The Profibus-DP master command word still contains a command which has not yet been acknowledged by the gateway. So the Profibus-DP master cannot use this word to place a new command in it. • Else → The previous command of the Profibus-DP master has been acknowledged by the gateway, which allows it to transmit a new command. In this case, it changes the value of the FB_DU bit, then toggles the value of the FB_HS_SEND bit.
13	<p>FB_DU: Modbus exchange startup</p> <p>The setting of this bit to one by the Profibus-DP master allows communications between the gateway and the Modbus slaves. Resetting it to zero is used to inhibit them.</p> <p>When the Profibus-DP master sets this bit to one, it is preferable for all of the output data it has placed in the gateway's output memory to be up-to-date ("FB_DU" means "FieldBus – Data Updated"). If they are not, these data will be transmitted to the Modbus slaves "as it."</p>
0-12	Reserved.

The correct use of this command word by the Profibus-DP master, to transmit a new command to the gateway, goes through the following steps:

- Checking of (FB_HS_SEND = ABC_HS_CONFIRM).
- ↳The command, that is to say the value of the FB_DU bit, is updated.
- ↳The value of the FB_HS_SEND bit is inverted.

N.B. It is possible to simplify this use as follows:

- The FB_DU and FB_HS_SEND bits are set to one to activate the Modbus communications.
- The FB_DU and FB_HS_SEND bits are reset to halt Modbus communications.

On the other hand, **do not write directly in 16-bit format** in the Profibus-DP master command word, because this would disrupt the operation of the transfer of the gateway diagnostics (undesired change to FB_HS_CONFIRM). However, during some debug or test phase, you could, for instance, write 16#6000 in the Profibus-DP master command word (that is to say 16#6000 in the %QW4.0 output word) in order to activate the Modbus communications, and 16#0000 to stop them.

5. Gateway Initialization and Diagnostics

5.2.2. Gateway Status Word

The input word located at addresses 16#0000 (MSB) and 16#0001 (LSB) in the gateway's input memory constitutes the gateway's status word. Its structure is described below:

Bits	Description
15	ABC_HS_SEND: New gateway diagnostic (See description of bit 15 of the Profibus-DP master command word, FB_HS_CONFIRM.)
14	ABC_HS_CONFIRM: Acknowledgement bit of a Profibus-DP master command (See description of bit 14 of the Profibus-DP master command word, FB_HS_SEND.)
13	ABC_DU: Modbus exchanges activated The gateway activates this bit to tell the Profibus-DP master that the Modbus data located in its input memory area have all been updated at least once since the last activation of FB_DU ("ABC_DU" means "ABC – Data Updated"). These Modbus input data include every data in responses from all Modbus slaves, for both periodic commands and aperiodic commands. This bit is deactivated by the gateway when the FB_DU bit is deactivated, that is to say when the Profibus-DP master demands a shutdown of Modbus exchanges. N.B. Once it is active, this bit is not deactivated if there are any communication errors with the Modbus slaves. To signal this type of error, the gateway uses bit 12 of its status word.
12	Periodicity of Modbus exchanges The gateway activates this bit provided that it is periodically communicating with all of the Modbus slaves. It deactivates it as soon as it loses communication with one of them. The "Reconnect time (10ms)", "Retries" and "Timeout time (10ms)" elements of each of the Modbus queries (see chapter 6.11.2.2 Configuring the Query, page 72) are used to determine whether communication is lost, then restored. N.B. If a number of periodic exchanges are configured for the same Modbus slave, only one of them needs to remain active for the periodic communications with this slave to be declared active.
8-11	EC: Error code associated with the Modbus network Code of the error detected on the Modbus network by the gateway and transmitted to the Profibus-DP master.
0- 7	ED: Error data item associated with the Modbus network Data item associated with the EC error code.

The correct use of this status word by the Profibus-DP master, to read a diagnostic generated by the gateway, goes through the following steps:

- Checking of (ABC_HS_SEND ≠ FB_HS_CONFIRM).
- ↳ Reading of the value of ABC_DU to determine whether all of the Modbus input data are up-to-date.
- ↳ Reading of the value of the bit 12 to determine whether the periodicity of the Modbus communications has been maintained.
- ↳ Reading of the values of EC and ED to check for any error detected by the gateway on the Modbus network (see table on the next page).
- ↳ Copying of the value of the ABC_HS_SEND bit to the FB_HS_CONFIRM bit.



This last step is essential because it allows the gateway to transmit a future diagnostic in order not to "lose" any further error reporting! Even if you do not wish to read the content of the gateway's status word, it is preferable to automate this step in your Profibus-DP master software.

5. Gateway Initialization and Diagnostics

The values of the EC and ED fields are described in the table below:

EC	Description of the error	ED	Notes
2#0000	Re-transmissions on the Modbus network	Number of re-transmissions (1)	Total number of re-transmissions carried out on the sub-network, for all slaves.
2#0001	A Modbus slave is missing	Address of the missing Modbus slave	—
2#0010	Several Modbus slaves are missing	—	—
2#0011	Excessive data in a Modbus response	Address of the Modbus slave involved	This error occurs when the gateway receives too much data in the response sent by one of its Modbus slaves.
2#0100	Unknown Modbus error	Address of the Modbus slave involved	—

- (1) The re-transmission counter used to signal this error is not reset when the gateway generates this error code. If there are recurrent communication problems on the Modbus network, the gateway will generate this same diagnostic repeatedly, so as to tell the Profibus-DP master the total number of re-transmissions carried out as often as possible. This counter is reset when its value exceeds its maximum value (counter modulo 256: 16#FF → 16#00).



In the case of de-connection of one or several device on the Modbus sub-network, the LUF7 gateway will first report re-transmission errors several times and then the error “A Modbus slave is missing” or “Several Modbus slaves are missing”. Later on when the LUF7 will proceed to reconnection attempt, only the re-transmission error will be reported. Due to this, the indication of the errors error “A Modbus slave is missing” or “Several Modbus slaves are missing” may be perceived as very brief.

5.3. Diagnostic Only

The gateway uses a 16-bit register, located at the addresses 16#0000 and 16#0001 in its memory (inputs), to send diagnostics to the Profibus-DP master. A second 16-bit register, located at the addresses 16#0200 and 16#0201 (outputs), allows the Profibus-DP to acknowledge each of these diagnostics.

So you must configure your Profibus-DP master so that it has access to the first two bytes of the gateway's output data area, as well as to the first two bytes of the gateway's input data area (see chapter 4.2 Gateway Configuration under PL7 PRO and SyCon, page 26).

5.3.1. Gateway Status Word

The input word located at addresses 16#0000 (MSB) and 16#0001 (LSB) in the gateway's input memory constitutes the gateway's status word. Its structure is described below:

Bits	Description
15	ABC_HS_SEND: New gateway diagnostic (See description of bit 15 of the Profibus-DP master command word, FB_HS_CONFIRM.)
14	Reserved.

5. Gateway Initialization and Diagnostics

Bits	Description
13	<p>ABC_DU: Modbus exchanges activated</p> <p>The gateway activates this bit to tell the Profibus-DP master that the Modbus data located in its input memory area have all been updated at least once since the last activation of FB_DU (“ABC_DU” means “ABC – Data Updated”). These Modbus input data include every data in responses from all Modbus slaves, for both periodic commands and aperiodic commands.</p> <p>This bit is deactivated by the gateway when the FB_DU bit is deactivated, that is to say when the Profibus-DP master demands a shutdown of Modbus exchanges.</p> <p>N.B. Once it is active, this bit is not deactivated if there are any communication errors with the Modbus slaves. To signal this type of error, the gateway uses bit 12 of its status word.</p>
12	<p>Periodicity of Modbus exchanges</p> <p>The gateway activates this bit provided that it is periodically communicating with all of the Modbus slaves. It deactivates it as soon as it loses communication with one of them.</p> <p>The “Reconnect time (10ms)”, “Retries” and “Timeout time (10ms)” elements of each of the Modbus queries (see chapter 6.11.2.2 Configuring the Query, page 72) are used to determine whether communication is lost, then restored.</p> <p>N.B. If a number of periodic exchanges are configured for the same Modbus slave, only one of them needs to remain active for the periodic communications with this slave to be declared active.</p>
8-11	<p>EC: Error code associated with the Modbus network</p> <p>Code of the error detected on the Modbus network by the gateway and transmitted to the Profibus-DP master.</p>
0- 7	<p>ED: Error data item associated with the Modbus network</p> <p>Data item associated with the EC error code.</p>

The correct use of this status word by the Profibus-DP master, to read a diagnostic generated by the gateway, goes through the following steps:

- Checking of (ABC_HS_SEND ≠ FB_HS_CONFIRM).
- ↳ Reading of the value of ABC_DU to determine whether all of the Modbus input data are up-to-date.
- ↳ Reading of the value of the “Periodicity of Modbus exchanges” bit to determine whether the periodicity of the Modbus communications has been maintained.
- ↳ Reading of the values of EC and ED to check for any error detected by the gateway on the Modbus network (see table page 41).
- ↳ Copying of the value of the ABC_HS_SEND bit to the FB_HS_CONFIRM bit.



This last step is essential because it allows the gateway to transmit a future diagnostic in order not to “loose” any further error reporting! Even if you do not wish to read the content of the gateway’s status word, it is preferable to automate this step in your Profibus-DP master software.

5. Gateway Initialization and Diagnostics

5.3.2. Profibus-DP Master Control Word

The output word located at addresses 16#0200 (MSB) and 16#0201 (LSB) in the gateway's output memory constitutes the Profibus-DP master command word. Its structure is described below:

Bits	Description
15	FB_HS_CONFIRM: Acknowledgement bit of a gateway diagnostic The Profibus-DP master must compare the value of the FB_HS_CONFIRM bit to the value of the ABC_HS_SEND bit (bit 15 in the gateway's status word). If these two values are different, this means that the gateway has transmitted a new diagnostic to the Profibus-DP master. To tell the gateway that it has read a diagnostic, the Profibus-DP master must copy the value of the ABC_HS_SEND bit to the FB_HS_CONFIRM bit. This allows the gateway to issue a new diagnostic. Summary: <ul style="list-style-type: none">• If (FB_HS_CONFIRM = ABC_HS_SEND) → The gateway's status word contains a diagnostic which has already been acknowledged by the Profibus-DP master. So the gateway is free to use this status word to place another diagnostic there.• Else → A new diagnostic is available in the gateway's status word. The Profibus-DP master can read this diagnostic, but must also copy the value of ABC_HS_SEND to FB_HS_CONFIRM in order to allow the gateway to generate new diagnostics.
0-14	Reserved.

5.4. Simplified Operation

The two 16-bit registers located at addresses 16#0000-16#0001 (inputs) and 16#0200-16#0201 (outputs) are no longer used for "managing the downstream Modbus network". These two registers are no longer reserved and so these addresses can be used to exchange data with the Modbus slaves ("Data Location" attribute of "Data" type frame fields).

The Profibus-DP master's command word and the gateway's status word, which we will be talking about in the rest of this document, do not exist anymore. So the two warnings pages 55 and 60 should be ignored, and the input and output ranges in the gateway's memory therefore go respectively from 16#0002-16#00F3 to 16#0000-16#00F3 and from 16#0202-16#02F3 to 16#0200-16#02F3.

6. Configuring the Gateway

Each part of this chapter describes a separate step allowing the user to personalize the gateway configuration, according to his own particular needs. Each part gives an introduction to a basic operation isolating it from the rest of the configuration and describing the operations to be carried out using AbcConf (mainly) and SyCon (where necessary), and their implications for the gateway's general behaviour.

In each case, the first two steps are required, as they allow you to establish the dialogue between the gateway and the PC software allowing you to configure it, that is to say AbcConf.

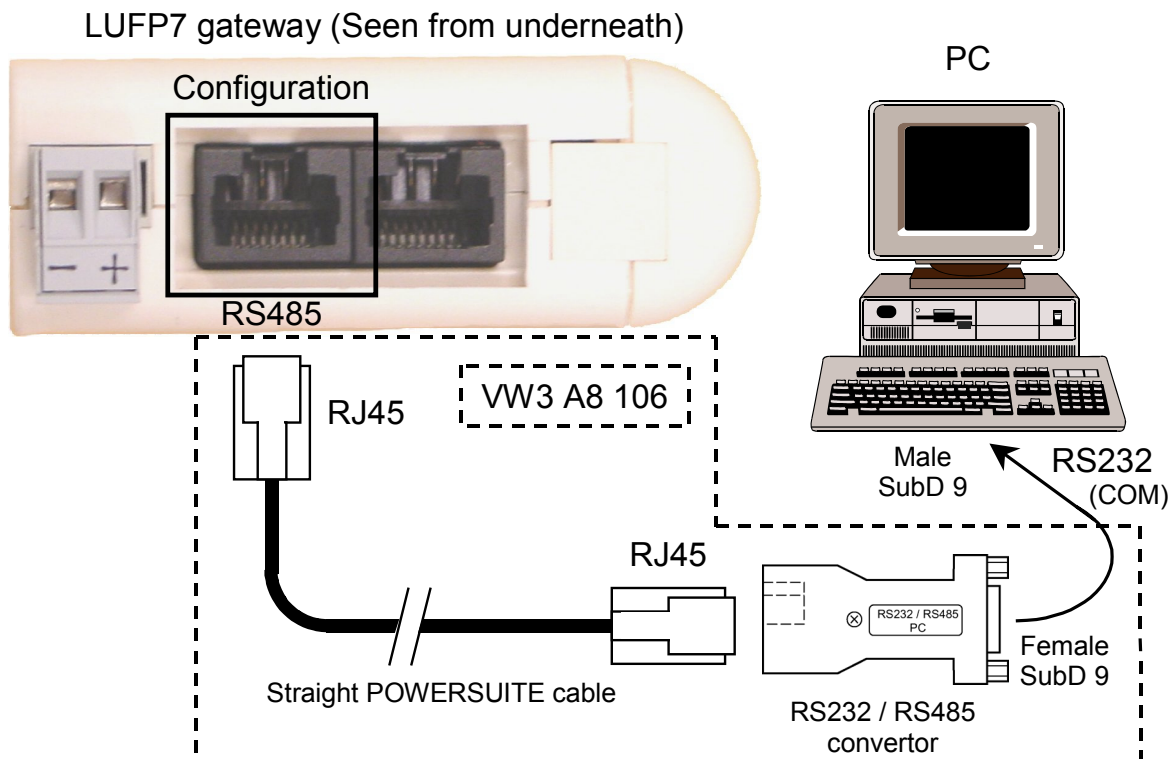
We strongly recommend that you read chapter 4 Software Implementation of the Gateway, page 24, because all of the operations carried out in AbcConf or SyCon are based on the principle that we are using the default configuration of the LUF7 gateway.

6.1. Connecting the Gateway to the Configuration PC

This step is required when setting up the gateway configuration application, AbcConf.

Connecting the gateway to one of the serial (COM) ports on a PC requires a straight PowerSuite cable and a RS232/RS485 converter. These two items are the same as those allowing dialogue with drives and soft start-stop units using the **PowerSuite** application and are both available from the catalogue (ref.: VW3 A8 106).

Ensure that you use the "POWERSUITE" cable and the "RS232 / RS485 PC" converter. An "ATV28 before 09 / 2001" cable and an "ATV 58" converter are also supplied with these items, but they should not be used with the LUF7 gateway.

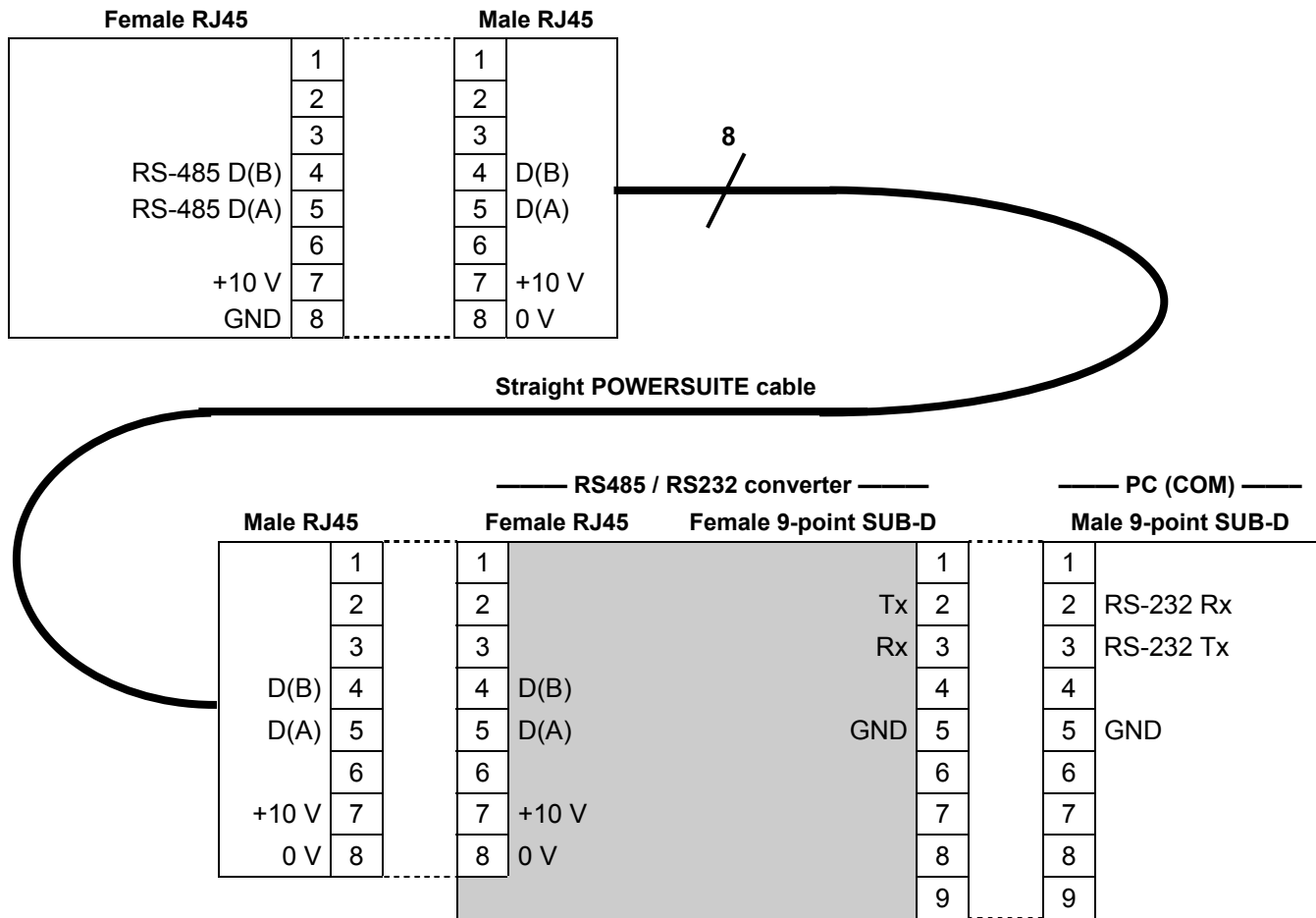


Once the gateway has been connected to a PC with the PowerSuite cable and the RS232/RS485 converter, you can change its configuration using "ABC-LUF7 Configurator", more generally referred to as "AbcConf". This configurator also allows you to carry out a few diagnostics on the gateway.

6. Configuring the Gateway

6.1.1. Pin Outs

— LUF7 (Configuration) —



N.B. The inversion of the Rx and Tx signals between the gateway and the PC is shown on the 9-point SUB-D connectors, because beyond this junction, the RS-232 signals are replaced by the D(A) and D(B) polarisations of the RS-485 signals.

6.1.2. RS-232 Link Protocol

There is no need to configure the PC's COM port, as AbcConf uses a specific setup which replaces the one for the port being used. This replacement is temporary and is cancelled as AbcConf stops using this serial port, that is to say when AbcConf is closed.

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6. Configuring the Gateway

6.2. Installing AbcConf

The minimum system requirements for AbcConf are as follows:

- ProcessorPentium 133 MHz
- Free hard disk space 10 Mb
- RAM..... 8 Mb
- Operating systemMS Windows 95 / 98 / ME / NT / 2000
- BrowserMS Internet Explorer 4.01 SP1


The AbcConf installation program can be found on the CD LU9CD1. To install it, run “ABC-LUFP_Setup.exe”, then follow the on-screen instructions.

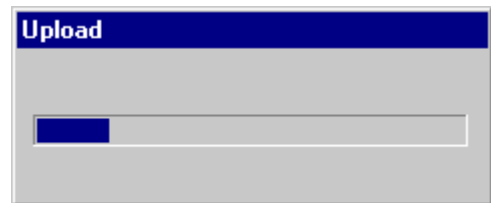
You can read about how to use AbcConf in a user manual entitled **AnyBus Communicator – User Manual** which is also on the CD LU9CD1 “ABC_User_Manual.pdf”. We strongly recommend that you read this manual when using AbcConf, because this guide will only describe the various features it provides in relation to using the LUFP7 gateway.

6.3. Importing the Gateway Configuration

Before you can make any changes to the gateway configuration, you will first need to import its current configuration. If you already have this configuration on your hard disk, all you will need to do is open the file corresponding to this configuration.

Check that the gateway has a valid configuration and that it is working properly, that is to say that LED ⑥ GATEWAY is flashing green.

In AbcConf, choose “Upload configuration from ABC-LUFP” from the “File” menu or click on the  button, in the AbcConf toolbar. A window called “Upload” will then open and a progress bar shows you the state of progress of the gateway configuration uploading process. This window disappears as soon as the whole configuration has been successfully uploaded.



This step is particularly important if you wish to read details about the content of the gateway’s default configuration, after unpacking it. You can then use this configuration as a template for any changes you wish to make subsequently, thus avoiding having to create all of the items and reducing the potential risk of error.




Save this configuration to your hard disk so that it is always available. This will allow you to reconfigure the gateway “cleanly” should the configuration become invalid, if you were to download an invalid configuration, for example.

N.B. The LUFP7 gateway’s default configuration can be found on the CD supplied with the gateway, at the following location, if your CD drive is disk “D:” on the PC: “D:\Fieldbus\PROFIBUS\CFG-files\LUFP7.cfg”.

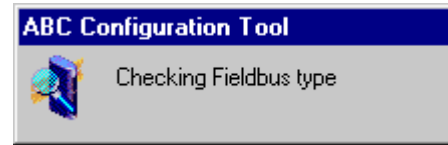
6. Configuring the Gateway

6.4. Transferring a Configuration to the Gateway

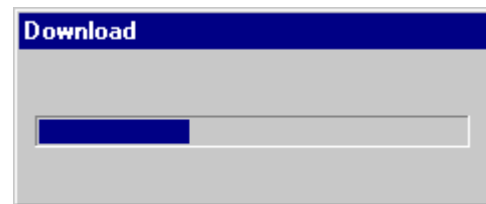
When using AbcConf, you can transfer the configuration you are editing to the gateway at any time.

Choose “Download configuration to ABC-LUFP” from the “File” menu or click on the  button, in the AbcConf toolbar.

AbcConf initializes a check test of the gateway type. **During this test, the PC should not carry out any other operations, as this could lead to AbcConf apparently freezing up and slow down the PC’s general operation for several minutes!** The test then continues and the PC returns to normal running speed.



Once this test has finished, a window called “Download” opens and a progress bar shows the state of progress for the transfer of the configuration to the gateway. You must never interrupt this operation, otherwise you will have to start it again from the beginning.



Check that the transfer has been correctly carried out: LED ⑥ GATEWAY should be flashing green.

If this LED is flashing red/green, save the configuration you were editing, open the file containing the default configuration for LUFP7 gateways, then transfer it to the gateway. This will restore it to a known initial state. You can then continue with the configuration you were transferring, and make any corrections which may be necessary.

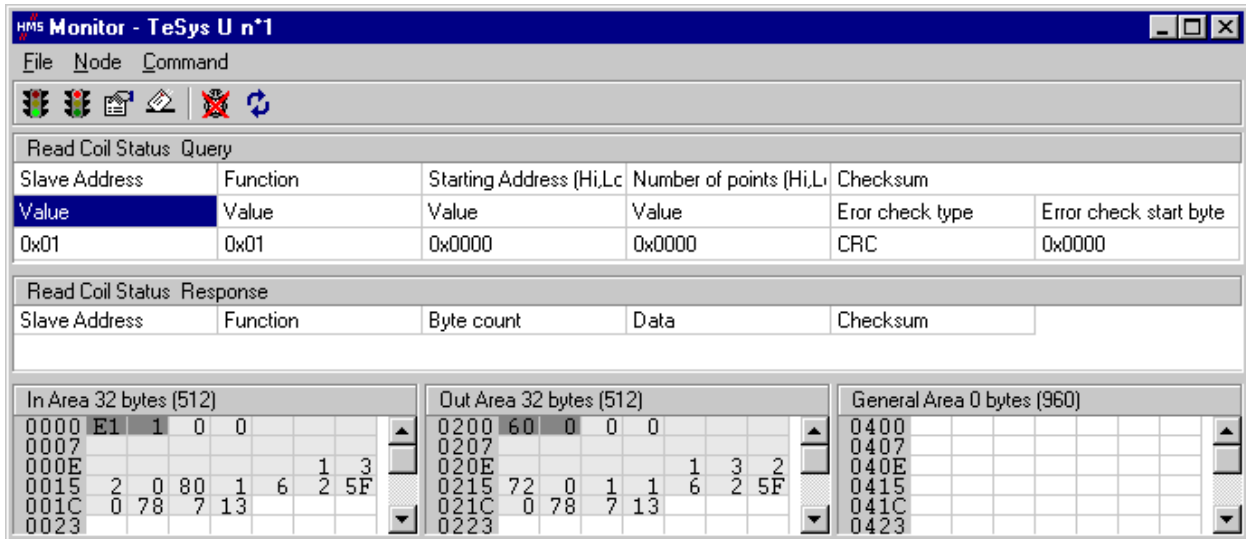
If the gateway and its master DPM1 are both connected via a Profibus-DP network, LED ④ FIELDBUS DIAG will begin to flash red at a frequency of 1 Hz if changes have to be made under SyCon. This occurs if you change the total size of the input data and/or the total size of the output data exchanged with the Modbus slaves.

ENGLISH 6.5. Monitoring the Content of the Gateway’s Memory

One of the main commands that you will need to use when setting up the gateway is the command allowing you to read the contents of the gateway’s memory and to display it in a window used for this purpose. This will be particularly useful when you are working on your PLC configurations and applications. However, it only shows data from the “Data” and “Preset Data” fields configured in the “Query” and “Response” elements of just one of the Modbus slaves, plus the content of the gateway’s two reserved registers, located at memory addresses 16#0000-16#0001 (gateway status word) and 16#0200-16#0201 (Profibus-DP master command word).

To monitor the content of the gateway’s memory, start by selecting the node corresponding to the Modbus slave whose data you wish to view, then choose “Monitor” from the menu whose name corresponds to the name of the previously selected node. A monitoring window then appears. The sample window shown at the top of the next page corresponds to a view of the contents of the memory exchanged, using the gateway’s default configuration, with the “TeSys U n°1” motor starter.

6. Configuring the Gateway



The upper part of this window allows you to choose a Modbus command, to edit its contents, then to send it to the Modbus network (“Command” menu). The response will then be displayed in this same part. Please see chapter 2.10 Node monitor in the AbcConf user manual, entitled **AnyBus Communicator – User** for further information about how to use this window. This manual can be found on the CD LU9CD1 : “ABC_User_Manual.pdf”.




The lower part of this window allows you to view the content of the gateway’s memory, but only the bytes used in frames for queries and responses frames for commands and transactions configured for the selected node. The values of the gateway’s two reserved words (addresses 16#0000-16#0001 and 16#0200-16#0201) are also shown, whichever node is selected.

In the window shown above, the data displayed correspond to the values at the memory locations designated by the “Data” fields in the commands and transactions configured for the “TeSys U n°1” node, that is to say the following commands: “Read Holding Registers”, “Preset Multiple Registers”, “Transactions 1”, and “Transactions 2”.

N.B. The data exchanged with the Modbus slave previously selected are displayed MSB-first, that is in the MSB / LSB order (as read from left to right, with growing memory addresses), provided that the “Byte Swap” option from the “Data” or “Preset Data” element of the corresponding Modbus command was set to “No swapping” (see chapter 6.11.2.4 Configuring the Content of the Query Frame, page 76). This also holds true for the two reserved words dedicated to the management of the downstream Modbus network.

However, but only as far as the “TeSys U n°1” node is concerned, the data beginning at addresses 16#0013, 16#0018, 16#0212, and 16#0218 (see chapter 10.2 Content of the Gateway’s DPRAM Memory, page 95) follow the same byte order than the content of the frames they are related to (see Appendix F: Modbus Commands, page 108), from first to last byte (checksum excluded), and following growing addresses in the memory of the gateway. Finally, bytes 16#001E, 16#001F, 16#021E, and 16#021F correspond to the reception and emission counters for these frames (“Trigger bytes” from Transactions 1 and 2).

A brief description of the toolbar buttons of this window is given below:

-  Stop / Start communications with the selected node.
-  Select / Send the Modbus command shown in the upper part of the window
-  Stop / Resume refreshing the data displayed in the lower part of the window

6. Configuring the Gateway

6.6. Deleting a Modbus Slave

This step allows you, for instance, to free up a location on the downstream Modbus network, known as the “Sub-Network” in AbcConf, in order to replace one Modbus slave with another.

In fact the gateway’s default configuration already allows it to communicate with eight TeSys U motor starters, whereas the maximum number of Modbus slaves with which it can communicate is limited to eight.

If the gateway is used to manage exchanges on a Modbus network with fewer than eight TeSys U motor starters, it is preferable to delete the redundant TeSys U motor starters from the gateway configuration. In fact, the deterioration in performances linked to the absence of one or more TeSys U motor starters is such that it is preferable to carry out this operation using AbcConf.



If you wish to retain the read/write aperiodic services for the value of a motor starter parameter, **never delete the first configured TeSys U motor starter**, because the two transactions associated with these services are configured for this motor starter.

In fact, these two transactions are sent to any Modbus slave, because the value of the “slave number” field in the Modbus queries associated to them is fully managed by the Profitus-DP master PLC software (bits 8 to 15 of outputs %QW4.0.9 and %QW4.0.12).

Procedure for deleting a Modbus slave

1) Select the node corresponding to the Modbus slave you wish to delete from the configuration. If this is the only node remaining in the configuration, you will not be able to delete it, as the downstream Modbus network must include at least one slave.

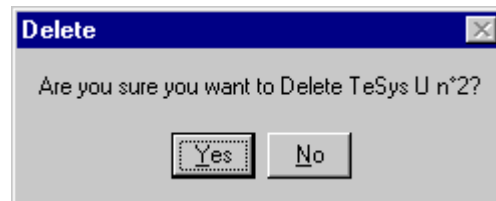
2) Right click on the icon or the name of this Modbus slave. A menu pops up underneath the mouse cursor.

or

In the AbcConf main menu, pull down the menu whose name corresponds to the name of the previously selected node.

3) On this menu, click on “Delete”. The confirmation window shown below then appears, asking you to either confirm that you want to delete the selected node (“TeSys U n°2” in the example shown here) or cancel the operation.

4) If you confirm that you want to delete the node, the menu disappears, along with the previously selected node. Otherwise, the node will still be there once the window disappears.



Keyboard shortcut: “Del” key.

Adjusting the gateway’s memory (optional step):

The data previously exchanged between the gateway and the Modbus slave which has just been deleted will free up locations in the gateway’s memory. If you want to optimize the exchanges between the gateway’s memory and the master PLC Profibus-DP coupler inputs/outputs, you will need to change the configuration of all the other Modbus slaves in order to adjust the content of the gateway’s memory.

6. Configuring the Gateway

However, these operations are not necessary when deleting a single slave. Conversely, they become almost essential when most of the Modbus slaves are deleted, because these deletions divide up the gateway's memory.

Please see chapter 6.11 Adding and Setting Up a Modbus Command, page 68, which describes all of the changes you can make to the configuration of each of the Modbus commands.

6.7. Adding a Modbus Slave

This operation allows you to add a Modbus slave whose type is different from those of the other Modbus slaves in the configuration. On the other hand, if the slave type is the same as one of the previously configured slaves, it is preferable to copy this slave rather than to create a new one.

An additional import/export feature also allows you to individually save the complete configuration of a Modbus slave, in order to have access to it in AbcConf, from any configuration and at any time.

These two features are only available provided that there are less than 8 Modbus slaves declared, which is not the case in the default configuration, as it comprises 8 TeSys U motor starters.

Adding a new type of Modbus slave:

Use one of the two methods shown below:

- a) Select "Sub-Network", then choose "Add Node" from the "Sub-Network" menu. A new node is added after all the other configured nodes. By default, its name is "New Node".
- b) Select one of the nodes located under the "Sub-Network" element, then choose "Insert New Node" from the menu whose name corresponds to the name of the selected node. A new node is added just before the selected node. By default, its name is "New Node".

All of the steps in configuring the new node are described in chapter 6.10 Changing a Modbus Slave Configuration, page 67.

Copying a previously configured Modbus slave:

Select the node corresponding to the slave whose configuration you want to copy, then choose "Copy" from the menu whose name corresponds to the name of the selected node. **Keyboard shortcut:** "Ctrl C".

Then use one of the two methods shown below:

- a) Select "Sub-Network", then choose "Paste" from the "Sub-Network" menu. A new node is added after all the other configured nodes. Its name and its whole configuration are identical to that of the node you copied. **Keyboard shortcut:** "Ctrl V".
- b) Select one of the "Sub-Network" nodes, then choose "Insert" from the menu whose name corresponds to the selected node. A new node is added just before the one which is selected. Its name and its whole configuration are identical to that of the node you copied.

As the new node and the original node are identical in every way, you will need to change (1) the name of the node, (2) the address of the corresponding Modbus slave and (3) the location of the data exchanged between the gateway's memory and this Modbus slave. All of these operations are described in chapter 6.10 Changing a Modbus Slave Configuration, page 67, and in chapter 6.11 Adding and Setting Up a Modbus Command, page 68.

6. Configuring the Gateway

Importing/exporting a Modbus slave configuration:

AbcConf offers the possibility of independently saving and loading the configuration of a node on the downstream “Sub-Network”. For instance, this will allow you to build a library of Modbus slave templates, so that you can use them in any configuration.

To save the configuration of a Modbus slave, select the node it corresponds to, then choose “Save Node” from the menu whose name corresponds to the name of the selected node. A dialog box will then appear asking you to save the configuration (export in XML format).

To insert a node using the XML file containing a Modbus slave configuration as a template, use one of the two methods shown below:

- a) Select “Sub-Network”, then choose “Load Node” from the “Sub-Network” menu. A dialog box asks you to choose a file containing a Modbus slave configuration (import in XML format). A new node is added after all the other configured nodes. Its name and its whole configuration are identical to those of the Modbus slave, as it was configured when it was saved.
- b) Select one of the “Sub-Network” nodes, then choose “Insert from File” from the menu whose name corresponds to the name of the selected node. A new node is added just before the selected node. Its name and its whole configuration are identical to those of the Modbus slave, as it was configured when it was saved.

You will then change (1) the name of the node, (2) the address of the corresponding Modbus slave and (3) the location of the data exchanged between the gateway’s memory and this Modbus slave. All of these operations are described in chapter 6.10 Changing a Modbus Slave Configuration, page 67, and in chapter 6.11 Adding and Setting Up a Modbus Command, page 68.

6. Configuring the Gateway

6.8. Changing the Periodic Data Exchanged with a Modbus Slave

This operation consists of replacing, adding or deleting periodic data exchanged with one of the Modbus slaves. With each of these operations, we shall take the default configuration of the LUF7 gateway as an example, that is to say that any changes previously made will have been cancelled at the start of each operation. In addition, the operations to be carried out are shown as part of a targeted example.

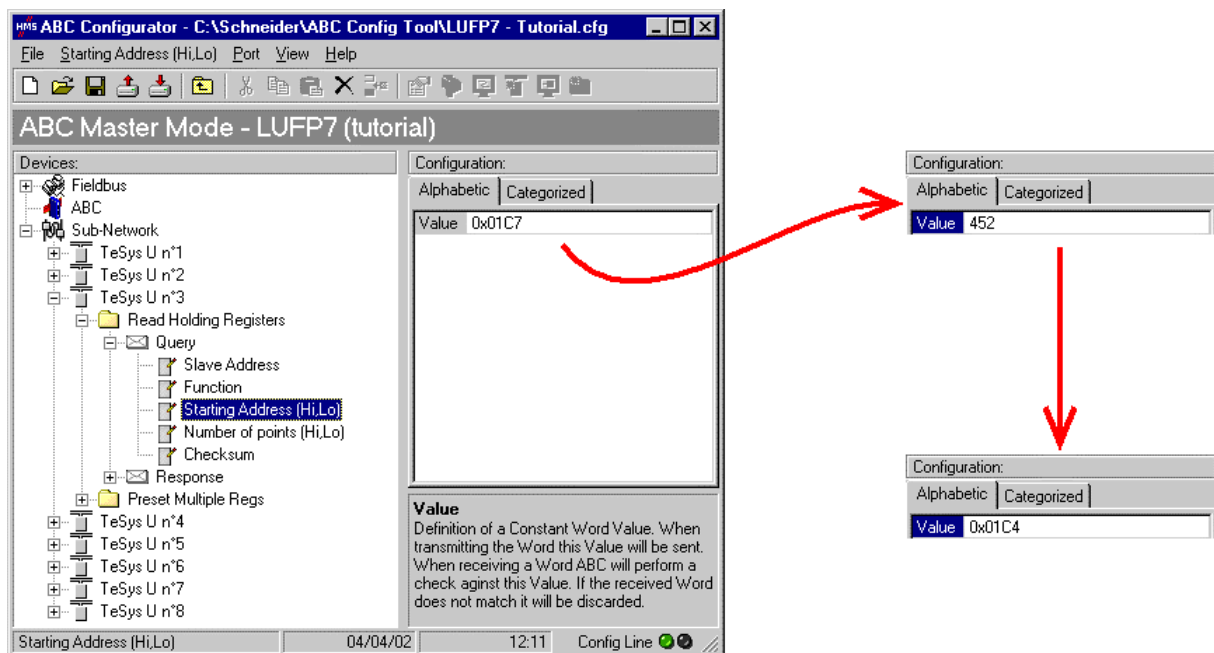
You must never forget to save the changes you have made, or to transfer the whole configuration to the gateway. This will allow you to check that the configuration is valid.

6.8.1. Replacing a periodic input data element

E.g. “TeSys U n°3” motor starter. We are trying to replace the monitoring of the “TeSys U Status Register” (address 455 = 16#01C7) with the monitoring of the “1st Fault Register” (address 452 = 16#01C4).

The operation is a very simple one and consists purely of changing the value of the “Starting Address (Hi, Lo)” element of the “Query” from the “Read Holding Registers” command (Modbus command for reading the values of a number of registers).

Select this element, then change its value as shown below. You can enter the address of the parameter in decimal format. AbcConf will automatically convert it to hexadecimal.



This operation in no way changes the content of the gateway’s memory, because we do not need to change the values of the “Data length” and “Data location” fields of the “Data” element of the “Response” to the aforementioned command. So no additional operations will be necessary, either in AbcConf, or in SyCon.

On the other hand, the Profibus-DP master PLC software will have to take account of the change in the nature of the corresponding input. In the chapter 10.2.1 Input Data Memory Area, page 95, the description of the word located at address 16#0006 becomes “value of the motor starter © 1st default register”. This word corresponds to the PLC input word %IW4.0.3 (see chapter 4.2.9 Configuring the Gateway I/O under PL7 PRO, page 32).

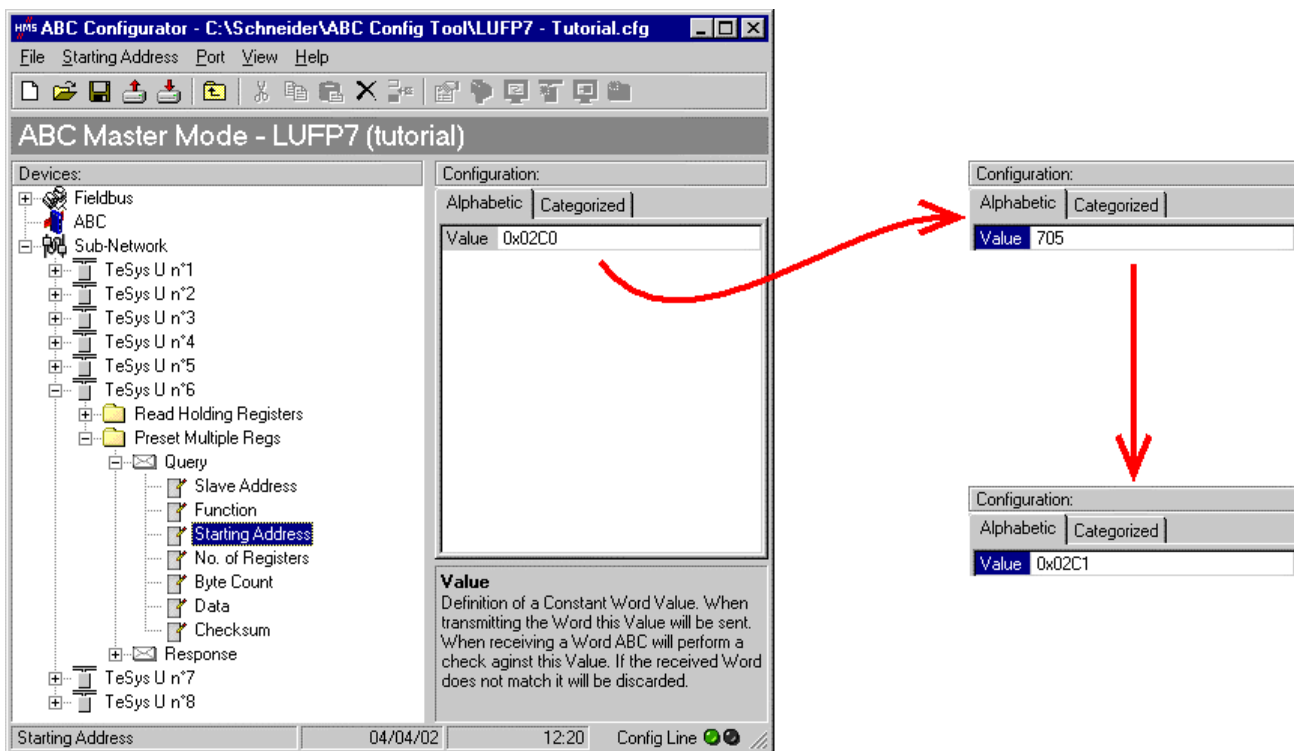
6. Configuring the Gateway

6.8.2. Replacing an Output Periodic Data Element

E.g. “TeSys U n°6” motor starter. We are trying to replace the control of the “Command Register” (address 704 = 16#02C0) with the control of the “2nd Command Register” (address 705 = 16#02C1).

The operation consists of changing the value of the “Starting Address” in the “Query” and in the “Response” for the “Preset Multiple Registers” command (Modbus command for writing values of a number of registers).

Select “Starting Address” from the “Query”, then change its value as shown below. You can enter the address of the parameter in decimal format. AbcConf will automatically convert it to hexadecimal. **Do the same for the “Starting Address” element of the “Response”** because the gateway checks the value of this field when it receives each Modbus response. If the value does not correspond to that of the query, the gateway will ignore the response.



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This operation in no way changes the content of the gateway’s memory, because we do not need to change the values of the “Data length” and “Data location” fields of the “Data” element of the “Query”. So no additional operations will be necessary, either in AbcConf, or in SyCon.

On the other hand, the Profibus-DP master PLC software will have to take account of the change in the nature of the corresponding output. In chapter 10.2.2 Output Data Memory Area, page 96, the description of the word located at address 16#020C becomes “value of the motor starter © 2nd command register”. This word corresponds to PLC output word %QW4.0.6 (see chapter 4.2.9 Configuring the Gateway I/O under PL7 PRO, page 32).

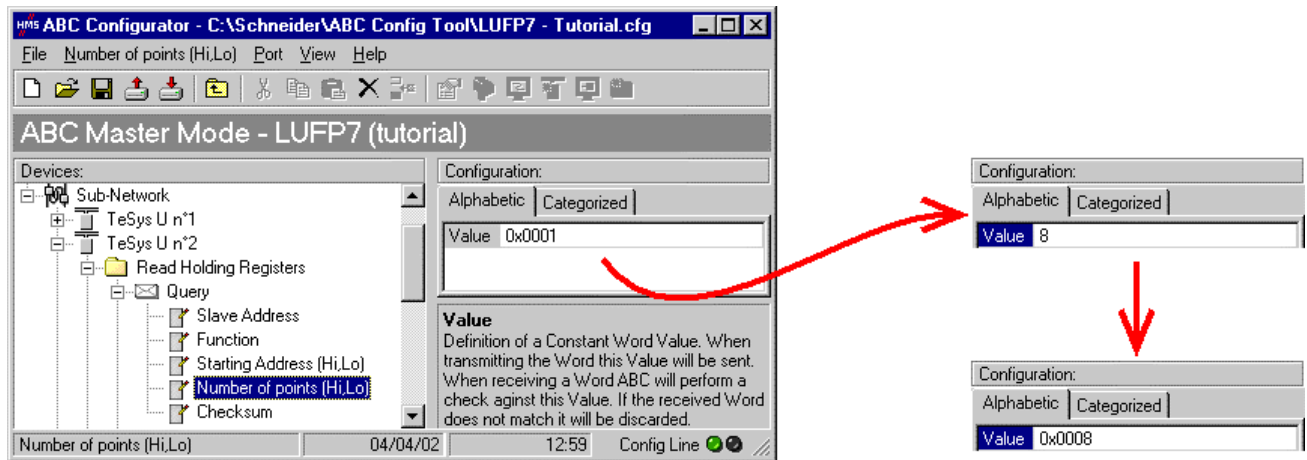
6. Configuring the Gateway

6.8.3. Increasing the Amount of Periodic Input Data

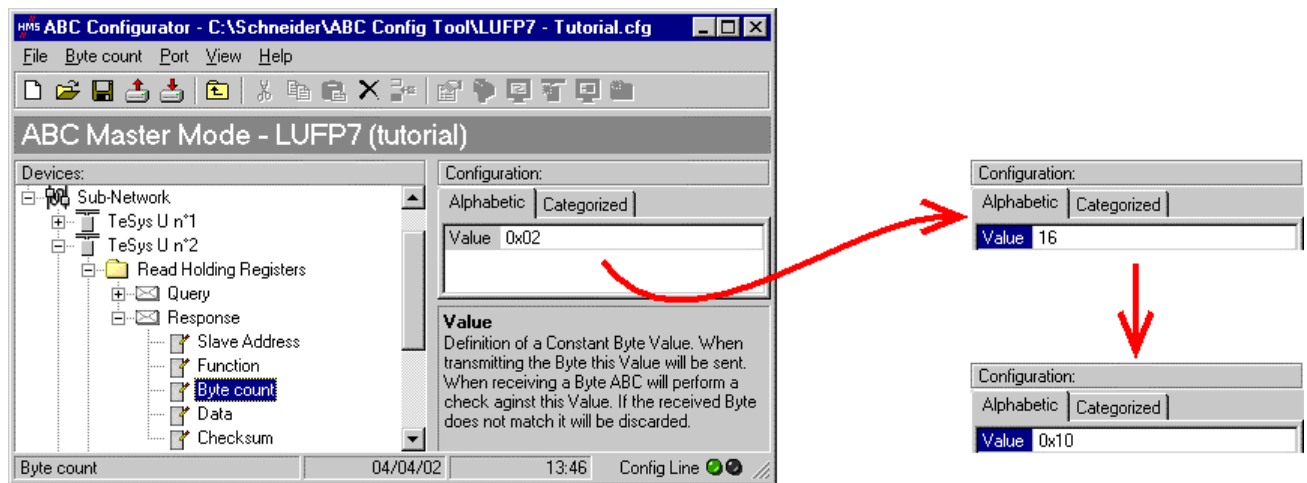
E.g. “TeSys U n°2” motor starter. We are trying to complete the monitoring of this motor starter starting from the currently monitored register, that is to say “TeSys U Status Register” (address 455 = 16#01C7), and going as far as the “Reserved: 2nd Warning Register” (address 462 = 16#01CE). The number of registers monitored is therefore increased from 1 to 8.

In this case, there are quite a lot of operations to be carried out. They are described in order below:

- 1) Changing the number of registers monitored: This step consists of changing the value of “Number of points (Hi, Lo)” element of the “Query” from the “Read Holding Registers” command (Modbus command for reading the values of a number of registers). Select this element, then change its value as shown below. AbcConf will automatically convert any value entered in decimal to hexadecimal.



- 2) Changing the number of data bytes in the Modbus response: The number of bytes read from the “TeSys U n°2” motor starter memory increases from 2 to 16, as the number of registers monitored has increased from 1 to 8. Select the “Byte count” element from the “Response” and change its value as shown below. AbcConf will automatically convert any value entered in decimal to hexadecimal.

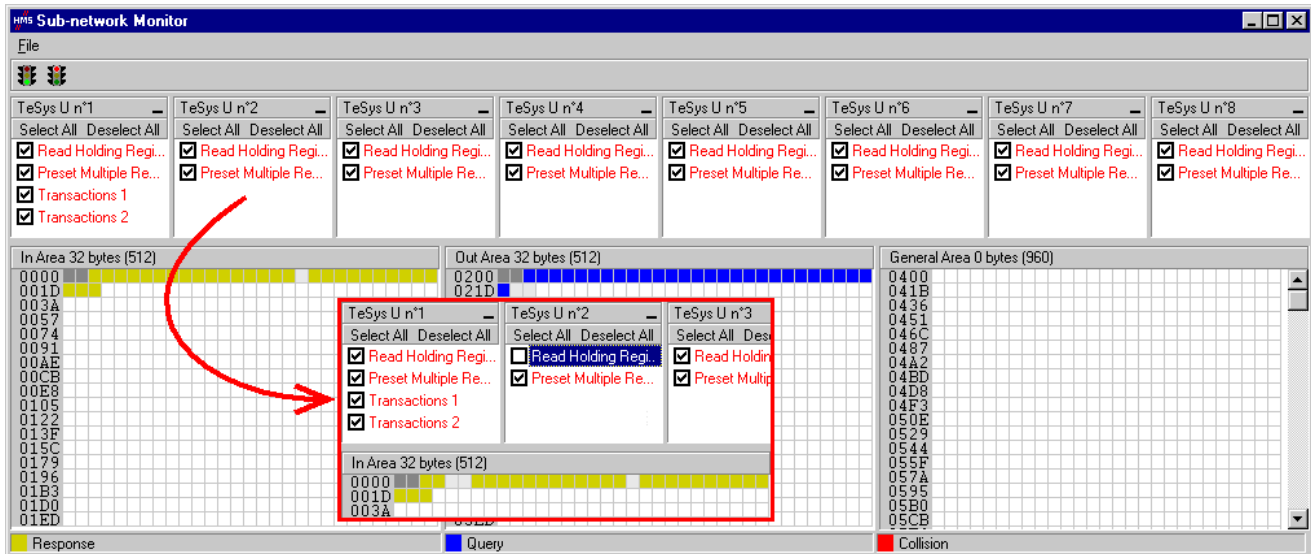


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6. Configuring the Gateway

- 3) Changing the location of the Modbus data received in the gateway's memory: As the number of bytes read (see previous step) has increased from 2 to 16, the Modbus data received must be placed at a different location in the gateway's memory, and the size of the memory occupied must also be adjusted appropriately.

If you are not certain how much of the gateway's memory is currently occupied, select "Sub-Network" and choose "Monitor" from the "Sub-Network" menu. The following window appears, allowing you to see how much of the gateway's memory is occupied.



To see which memory locations are occupied by data from the command you are interested in, all you have to do is uncheck the box corresponding to the "Read Holding Registers" command from the "TeSys U n°2" node, as shown above. We can see that the Modbus data received in response to this command occupy 2 bytes located from address 16#0004.



The memory locations 16#0000 and 16#0001 are reserved (see chapter 5 Gateway Initialization and Diagnostics, page 37). So you will not be able to place any Modbus data in these locations.

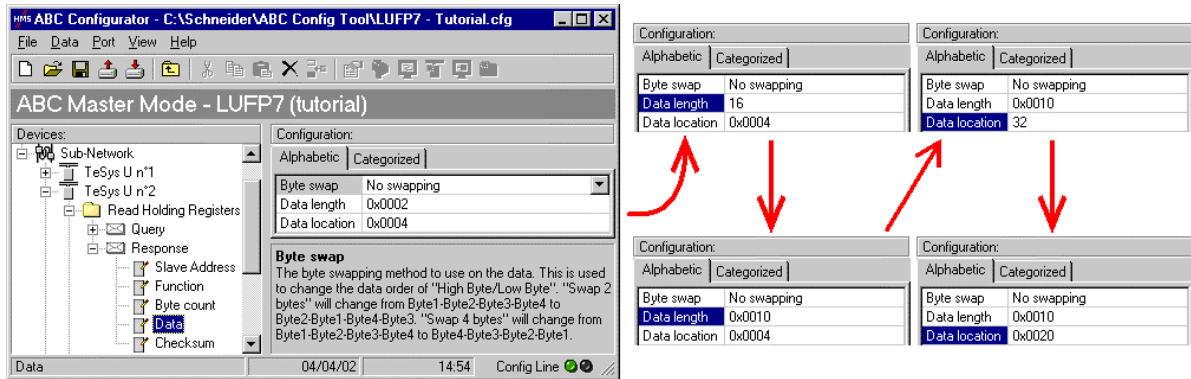
The sizes displayed above the graphics areas of this window ("In Area 32 bytes" and "Out Area 32 bytes") correspond to the total input and output sizes you must configure using the modules presented under SysCon (see point 6) on next page).

If you wish to place the 16 bytes of Modbus data which will be received by the gateway for this command into memory, once the changes have been made, we will have to move all the other input data by 14 bytes, which may be tedious, or change the memory location of the block of data received. In the example described here, we will be using the second solution, although the first solution is actually preferable, in principle, as it avoids leaving any "holes" in the gateway's memory, thus optimising the transfer of all of the data to the Profibus-DP master PLC. The TSX PB5 100 coupler may exchange up to 242 input words with Profibus-DP slaves. If communication with a larger number of slaves is required, if possible, try to limit the volume of exchanges with the LUF7 gateway. In that case, leaving such "blanks" in the gateway memory is not advisable.

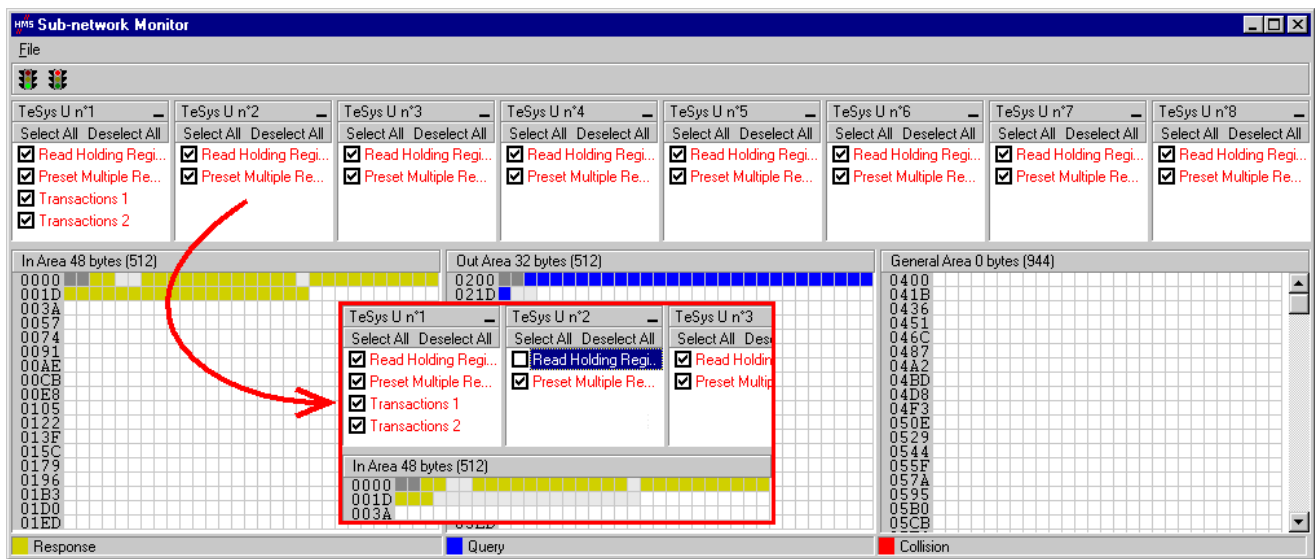
So we will be placing the 16 bytes of data from address 16#0020 (32 in decimal), that is to say directly after the input data for the gateway's default configuration.

Close the "Sub-network Monitor" window, then once you are back in the main AbcConf window, select the "Data length" and "Data location" fields of the "Data" element from the "Response" one after another and change their values as shown at the top of the next page. AbcConf will automatically convert any value entered in decimal to hexadecimal.

6. Configuring the Gateway



To check that these changes have been entered into the configuration, choose “Monitor” from the “Sub-Network” menu again:



In point 6), you shall make sure that the total input and output sizes of the configured modules are the same as the exchange sizes displayed in the “Sub-network Monitor.” In the current example, “In Area 48 bytes” and “Out Area 32 bytes” imply that the modules combined under SysCon must have a total of 24 IW and 16 OW.

- 4) Transferring this configuration to the gateway: Please see chapter 6.4 Transferring a Configuration to the Gateway, page 47. Check that the configuration is valid (LED 6 GATEWAY flashing green). However, the gateway configuration is now different from the one taken into account by the Profibus-DP coupler with respect to the gateway (difference in the total length of input data), the LED 4 FIELDBUS DIAG therefore becomes flashing red at a frequency of 1 Hz, providing that the gateway is connected to the Profibus-DP network and to its DPM1 master.
- 5) Saving this configuration to your PC's hard disk.
- 6) Changing the number of data received by the Profibus-DP coupler: Under SyCon, change the list of modules configured for the gateway (see chapter 4.2.6 Editing and Configuring the Gateway, page 29). Since we have added 16 bytes after the input data in the gateway memory, the coupler should be configured to receive a block of input data with 16 bytes more from the gateway.

In this case, all you have to do is add an “INPUT: 16 Byte (8 word)” module after the module configured for the gateway, as the number of input bytes in the default configuration is even (word-aligned).

6. Configuring the Gateway



Under SyCon, all the configured modules start from an even address (word-aligned). When you change a configuration that includes a one-byte module, you must remove it (“Remove module” button or double-click on the module in the list of configured modules, see page 65) before adding “IN/OUT”, “INPUT” and “OUTPUT” modules to the list of configured modules. This type of module should therefore only be at the end of the list.

N.B. removing the 2 input bytes located at addresses 16#0004 and 16#0005 in the gateway memory has no impact on the overall size of the input data transmitted to the Profibus-DP coupler. These bytes become “Free memory locations”, like the byte at address 16#0012.

In this example, the modules configured for the gateway are listed on the right.

Slot	Idx	Module	Symbol	Type	I Adr.	I Len.	Type	Q Addr.	Q Len.
1	1	DEFAULT: 8 TeSys U starters	Module1	IW	0	16	QW	0	16
2	1	INPUT: 16 Byte (8 word)	Module2	IW	16	8			

Then you should save and export the configuration of the Profibus-DP network, as described in chapter 4.2.7 Saving and Exporting the Profibus-DP Network Configuration, page 31.

- 7) Configuring the Profibus-DP master PLC inputs: under PL7 PRO, import the new configuration of the Profibus-DP network (see chapter 4.2.8 Importing the Configuration of the Profibus-DP Network under PL7 PRO and following chapters, from page 31). Words %IW4.0.16 to %IW4.0.23 are now displayed in the “PROFIBUS-DP slave data” frame of the TSX PBY 100 coupler configuration window, providing that the address 2 station is selected in the list of the “PROFIBUS-DP slave configuration” frame.

We get the correspondence represented on the next page, derived from the one used for the gateway default configuration. The changes in relation to the default configuration are shown by a greyed-out background, like the “free memory locations”.

6. Configuring the Gateway

Service	PLC input	Description	
		Bit 15	Bit 7 Bit 0
Managing the downstream Modbus network	%IW4.0	Gateway status word	
Periodic communications — Monitoring of TeSys U motor starters	%IW4.0.1	Value of the motor starter ① status register	
	%IW4.0.2	Free memory location	
	%IW4.0.3	Value of the motor starter ③ status register	
	%IW4.0.4	Value of the motor starter ④ status register	
	%IW4.0.5	Value of the motor starter ⑤ status register	
	%IW4.0.6	Value of the motor starter ⑥ status register	
	%IW4.0.7	Value of the motor starter ⑦ status register	
Aperiodic communications — Reading the value of a motor starter parameter (RESPONSE)	%IW4.0.8	Value of the motor starter ⑧ status register	
	%IW4.0.9	Free memory location	Slave no. (16#01-16#08)
	%IW4.0.10	Function number (16#03)	Number of bytes read (16#02)
Aperiodic communications — Writing the value of a motor starter parameter (RESPONSE)	%IW4.0.11	Value of the parameter read (16#xxxx)	
	%IW4.0.12	Slave number (16#01 to 16#08)	Function number (16#06)
Aperiodic communications ("Trigger bytes" for the responses)	%IW4.0.13	Address of the parameter written (16#xxxx)	
	%IW4.0.14	Value of the parameter written (16#xxxx)	
Periodic communications — Monitoring of TeSys U motor starter ②	%IW4.0.15	Read parameter response counter	Write parameter response counter
	%IW4.0.16	Value of the "TeSys U Status Register"	
	%IW4.0.17	Value of the "Complementary Status Register"	
	%IW4.0.18	Value of the "K7 Status Register"	
	%IW4.0.19	Value of the "K7 Status Register 2 (free format)"	
	%IW4.0.20	Value of the "K7 Status Register 3 (free format)"	
	%IW4.0.21	Value of the "Warning Number" register	
%IW4.0.22	Value of the "Warning Register"		
	%IW4.0.23	Value of the "Reserved : 2nd Warning Register"	

- 8) Transferring the Profibus-DP coupler configuration: Once changes have been made to the Profibus-DP coupler configuration, it is necessary to validate the hardware configuration of the PLC rack, and to transfer the whole application to the Premium PLC on which the coupler is located. Please see chapter 4.2.13 Using and Monitoring the TSX PBY 100 Coupler Configuration, page 36.

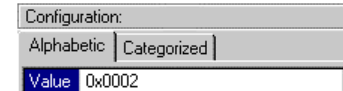
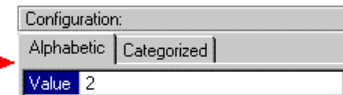
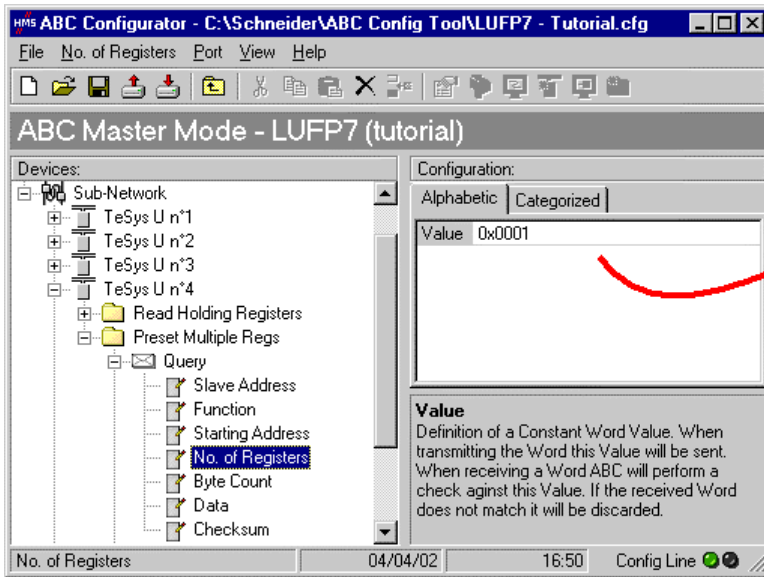
6.8.4. Increasing the Amount of Periodic Output Data

E.g. "TeSys U n°4" motor starter. We are attempting to complete the control for this motor starter whilst retaining the currently controlled "Command Register" (address 704 = 16#02C0), and adding the following next register, that is to say "2nd Command Register" (address 705 = 16#02C1). The number of registers controlled is therefore increased from 1 to 2.

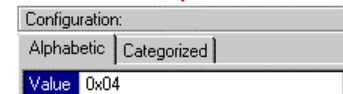
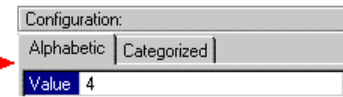
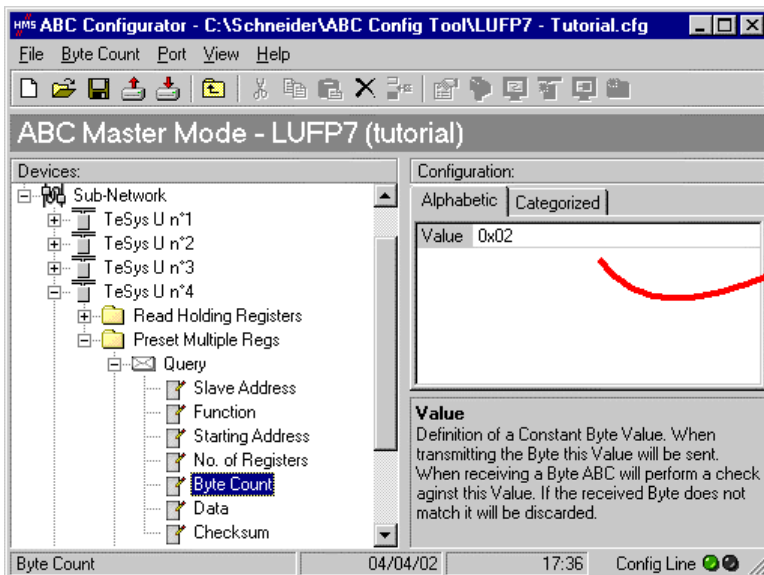
There are quite a lot of operations to be carried out. They are described in order below:

- 1) Changing the number of registers controlled: This step consists of changing the value of the "No. of Registers" in the "Query" and in the "Response" for the "Preset Multiple Registers" command (Modbus command for writing values of a number of registers). Start by selecting "Starting Address" from the "Query", then change its value as shown at the top of the next page. AbcConf will automatically convert any value entered in decimal to hexadecimal. **Do the same for the "Starting Address" element of the "Response"** because the gateway checks the value of this field when it receives each Modbus response. If the value does not correspond to that of the query, the gateway will ignore the response.

6. Configuring the Gateway



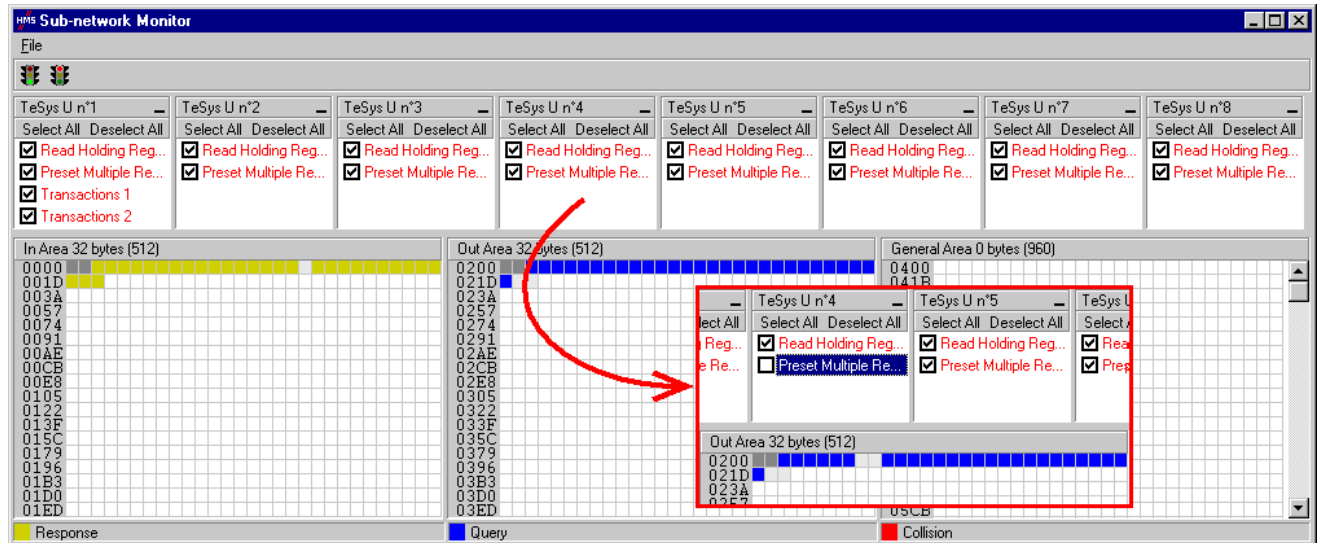
- 2) Changing the number of data bytes in the Modbus query: The number of bytes written into the memory of the “TeSys U n⁴” motor starter memory increases from 2 to 4, as the number of registers controlled has increased from 1 to 2. Select the “Byte count” element from the “Query” and change its value as shown below. AbcConf will automatically convert any value entered in decimal to hexadecimal.



- 3) Changing the location of the Modbus data transmitted into the gateway’s memory: As the number of bytes written (see previous step) has increased from 2 to 4, the Modbus data to be transmitted to the “TeSys U n⁴” motor starter must be placed at a different location in the gateway’s memory, and the size of the memory occupied must also be adjusted appropriately.

If you are not certain how much of the gateway’s memory is currently occupied, select “Sub-Network” and choose “Monitor” from the “Sub-Network” menu. The window shown at the top of the next page appears, allowing you to see how much of the gateway’s memory is occupied.

6. Configuring the Gateway



To see which memory locations are occupied by data from the command you are interested in, all you have to do is uncheck the box corresponding to the “Preset Multiple Registers” command from the “TeSys U n°4” node, as shown above. We can see that the Modbus data transmitted with the query corresponding to this command occupy 2 bytes located from address 16#0208.



Memory locations 16#0200 and 16#0201 are reserved (see chapter 5 Gateway Initialization and Diagnostics, page 37). So you will not be able to place any Modbus data in these locations.

The sizes displayed above the graphics areas of this window (“In Area 32 bytes” and “Out Area 32 bytes”) correspond to the total input and output sizes you must configure using the modules presented under SysCon (see point 6) on next page).

If you wish to place the 4 bytes of Modbus data which will be transmitted by the gateway for this command into memory, once the changes have been made, we will have to move all the other output data by 2 bytes, which may be tedious, or change the memory location of the block of data transmitted. In the example described here, we will be using the second solution, although the first solution is actually preferable, in principle, as it avoids leaving any “holes” in the gateway’s memory, thus optimising the transfer of all of the data from the Profibus-DP master PLC. The TSX PBY 100 coupler can exchange up to 242 output words with Profibus-DP slaves. If communication with a larger number of slaves is required, if possible, try to limit the volume of exchanges with the LUF7 gateway. In that case, leaving such “blanks” in the gateway memory is not advisable.

We will place the 4 bytes of data from address 16#0220 (544 in decimal). **N.B.** As far as possible, place the data at even addresses in order to align the Modbus data (in 16-bit format) on the %QW4.0.x outputs of the Profibus-DP TSX PBY 100 coupler.

Close the “Sub-network Monitor” window, then once you are back in the main AbcConf window, select the “Data length” and “Data location” fields of the “Data” element from the “Query” one after another and change their values as shown at the top of the next page. AbcConf will automatically convert any value entered in decimal to hexadecimal.

6. Configuring the Gateway

The screenshot shows the HMS ABC Configurator interface. On the left, a tree view shows the configuration for 'Sub-Network' with modules TeSys U n'1 through n'4. The 'Data' configuration is highlighted. On the right, four configuration windows are shown, each with a 'Data length' field. Red arrows point from the 'Data length' field in the top-left window (value 4) to the 'Data length' fields in the other three windows, which show the value 0x0004. The 'Data location' field in the top-right window is 544, and in the bottom-right window, it is 0x0220.

To check that these changes have been entered into the configuration, choose “Monitor” from the “Sub-Network” menu again:

The screenshot shows the HMS Sub-network Monitor interface. It displays a grid of data exchange between modules TeSys U n'1 through n'8. The 'In Area 32 bytes' and 'Out Area 36 bytes' are shown. A red box highlights the configuration for TeSys U n'4 and TeSys U n'5, showing 'Read Holding Reg...' and 'Preset Multiple Re...' options. A red arrow points from the 'Out Area 36 bytes' header to the highlighted configuration box.

ENGLISH



In point 6), you shall make sure that the total input and output sizes of the configured modules are the same as the exchange sizes displayed in the “Sub-network Monitor.” In the current example, “In Area 32 bytes” and “Out Area 36 bytes” imply that the modules combined under SysCon must have a total of 16 IW and 18 OW.

- 4) Transferring this configuration to the gateway: Please see chapter 6.4 Transferring a Configuration to the Gateway, page 47. Check that the configuration is valid (LED 6 GATEWAY flashing green). However, the gateway configuration is now different from the one taken into account by the Profibus-DP coupler with respect to the gateway (difference in the total length of input data), the LED 4 FIELDBUS DIAG therefore becomes flashing red at a frequency of 1 Hz, providing that the gateway is connected to the Profibus-DP network and to its DPM1 master.
- 5) Saving this configuration to your PC's hard disk.
- 6) Changing the number of data transmitted by the Profibus-DP coupler: Under SyCon, change the list of modules configured for the gateway (see chapter 4.2.6 Editing and Configuring the Gateway, page 29). Since we have added 4 bytes after the output data in the gateway memory, the coupler should be configured to issue an additional 4-byte output data block for the gateway.

6. Configuring the Gateway

In this case, all you have to do is add an "INPUT: 4 Byte (2 word)" module after the module configured for the gateway, as the number of input bytes in the default configuration is even (word-aligned).



Under SyCon, all the configured modules start from an even address (word-aligned). When you change a configuration that includes a one-byte module, you must remove it ("Remove module" button or double-click on the module in the list of configured modules, see page 65) before adding "IN/OUT", "INPUT" and "OUTPUT" modules to the list of configured modules. This type of module should therefore only be at the end of the list.

N.B. Removing the 2 output bytes located at addresses 16#0208 and 16#0209 in the gateway memory has no impact on the overall size of the input data transmitted to the Profibus-DP coupler. These bytes become "Free memory locations", like the byte at address 16#0012.

In this example, the modules configured for the gateway are listed on the right.

Slot	Idx	Module	Symbol	Type	I Adr.	I Len.	Type	Q Addr.	Q Len.
1	1	DEFAULT: 8 TeSys U starters	Module1	Iw	0	16	Qw	0	16
2	1	OUTPUT: 4 Byte (2 word)	Module2				Qw	16	2

Then you should save and export the configuration of the Profibus-DP network, as described in chapter 4.2.7 Saving and Exporting the Profibus-DP Network Configuration, page 31.

- 7) Configuring the Profibus-DP master PLC outputs: under PL7 PRO, import the new configuration of the Profibus-DP network (see chapter 4.2.8 Importing the Configuration of the Profibus-DP Network under PL7 PRO and following chapters, from page 31). Words %QW4.0.16 and %QW4.0.17 are now displayed in the "PROFIBUS-DP slave data" frame of the TSX PBY 100 coupler configuration window, providing that the address 2 station is selected in the list of the "PROFIBUS-DP slave configuration" frame.

We get the correspondence represented on the next page, derived from the one used for the gateway default configuration. The changes in relation to the default configuration are shown by a greyed-out background, like the "free memory locations".

6. Configuring the Gateway

Service	PLC output	Description	
		Bit 15.....Bit 8	Bit 7.....Bit 0
Managing the downstream Modbus network	%QW4.0	Profibus-DP master control word	
Periodic communications — Controlling TeSys U motor starters	%QW4.0.1	Value of the motor starter ① command register	
	%QW4.0.2	Value of the motor starter ② command register	
	%QW4.0.3	Value of the motor starter ③ command register	
	%QW4.0.4	Free memory location	
	%QW4.0.5	Value of the motor starter ⑤ command register	
	%QW4.0.6	Value of the motor starter ⑥ command register	
	%QW4.0.7	Value of the motor starter ⑦ command register	
Aperiodic communications — Reading the value of a motor starter parameter (QUERY)	%QW4.0.8	Value of the motor starter ⑧ command register	
	%QW4.0.9	Slave number (16#01-16#08)	Function number (16#03)
	%QW4.0.10	Address of the parameter to be read (16#xxxx)	
Aperiodic communications — Writing the value of a motor starter parameter (QUERY)	%QW4.0.11	Number of parameters to be read (16#0001)	
	%QW4.0.12	Slave number (16#01-16#08)	Function number (16#06)
	%QW4.0.13	Address of the parameter to be written (16#xxxx)	
Aperiodic communications ("Trigger bytes" for the queries)	%QW4.0.14	Value of the parameter to be written (16#xxxx)	
	%QW4.0.15	Read parameter query counter	Write parameter query counter
Periodic communications — Controlling motor starter TeSys U ④	%QW4.0.16	Value of the "Command Register"	
	%QW4.0.17	Value of the "2nd Command Register"	

- 8) Transferring the Profibus-DP coupler configuration: Once changes have been made to the Profibus-DP coupler configuration, it is necessary to validate the hardware configuration of the PLC rack, and to transfer the whole application to the Premium PLC on which the coupler is located. Please see chapter 4.2.13 Using and Monitoring the TSX PBY 100 Coupler Configuration, page 36.

6.9. Deleting Aperiodic Parameter Data

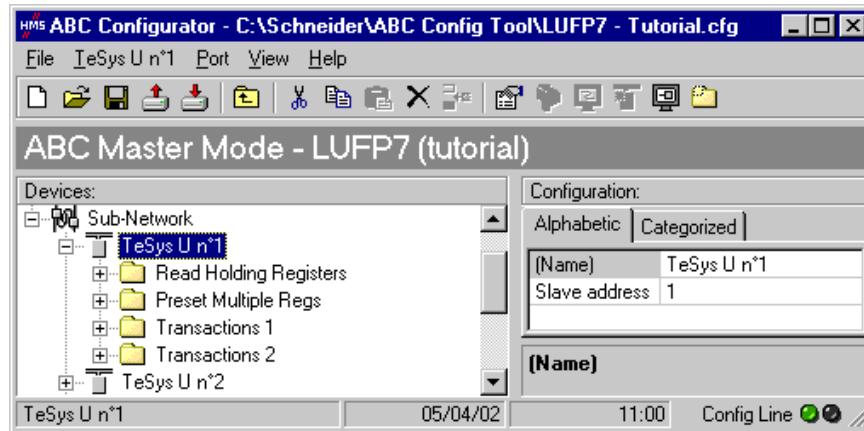
If your PLC application does not need the aperiodic service for reading/writing parameter data on Modbus slaves, you can delete the associated commands. If you also intend to add Modbus data, and therefore use new locations in the gateway's memory, it is preferable to delete the aperiodic commands from the start, so that you can reuse the memory locations.

However, if you don't need to use the aperiodic service for parameter data under PL7 PRO, you don't need to change the gateway configuration nor the Profibus-DP coupler configuration for the gateway, as both should be equivalent (same numbers of inputs and outputs). Do not conduct any of the operations described here. The Modbus exchanges related to this setting shall not be carried out if the related data are not changed by the Profibus-DP master PLC. So deleting associated Modbus commands becomes optional.

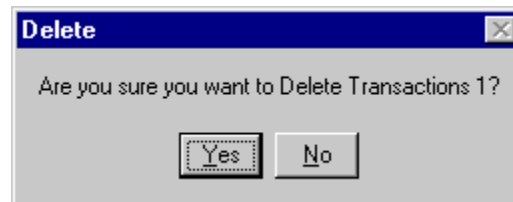
The operations you will need to carry out are described in order below:

- 1) Displaying parameter data commands: Select the very first node of the downstream Modbus network, "TeSys U n°1", and expand the tree structure showing its commands and transactions. The screen should look like the one at the top of the next page.

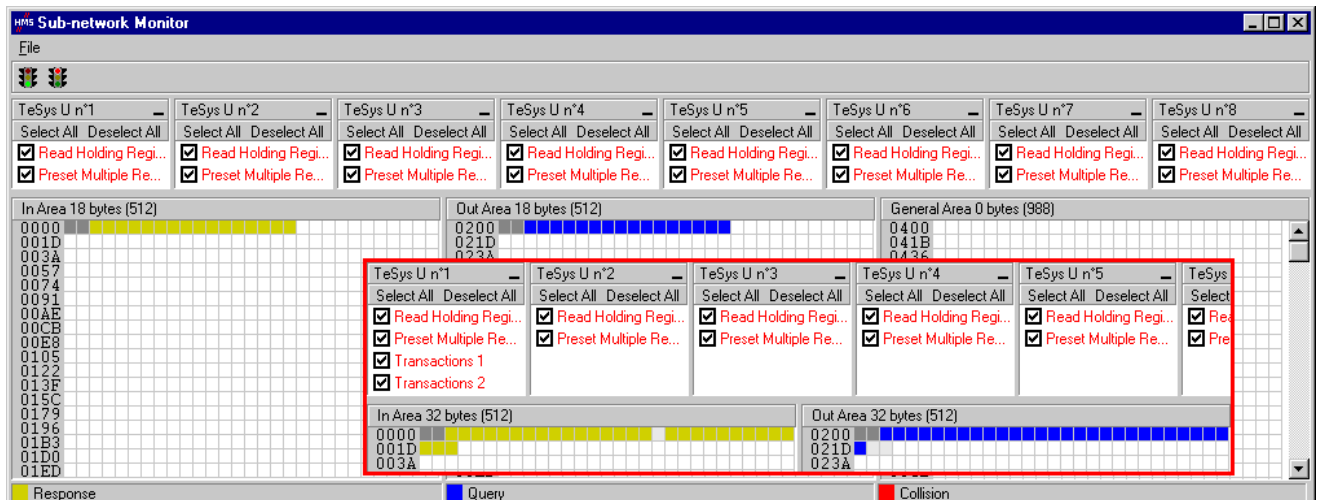
6. Configuring the Gateway



- 2) Deleting the read command for a parameter: Select the personalized “Transactions 1” command and delete it with the “De1” key (or “Delete” from the menu whose name corresponds to the name of the selected node). A request for confirmation appears, asking you whether or not to proceed deleting the “Transactions 1” command. In this case confirm with the “Yes” button.



- 3) Deleting the write command for a parameter: Back in the main AbcConf window, the “Transactions 1” command has been deleted. The second personalised command, “Transactions 2” is automatically renamed “Transactions 1”, but retains all of its setup. Now delete this one in the same way as you did with the previous command.
- 4) Checking the new memory occupation: If you wish to check how much of the gateway’s memory is now occupied, select “Sub-Network” and choose “Monitor” from the “Sub-Network” menu. The following window appears, allowing you to see how much of the gateway’s memory is occupied by Modbus data. The part framed in red represents the memory occupation before the deletion of the two setup commands. It has been inlaid in the illustration below so that you can see the effects of the deletion operations we have just carried out.



6. Configuring the Gateway

You will note that the “TeSys U n°1” section now only has the two Modbus commands common to the eight TeSys U motor starters, and that the memory locations which corresponded to the two personalised commands are now free.

N.B. The free memory location at address 16#0012 in the gateway’s memory is no longer part of the gateway’s inputs, because there is no input data used beyond this address.



In point 7), you shall make sure that the total input and output sizes of the configured modules are the same as the exchange sizes displayed in the “Sub-network Monitor.” In the current example, “In Area 18 bytes” and “Out Area 18 bytes” imply that the modules combined under SysCon must have a total of 9 IW and 9 OW.

- 5) Transferring this configuration to the gateway: Please see chapter 6.4 Transferring a Configuration to the Gateway, page 47. Check that the configuration is valid (LED 6 GATEWAY flashing green). However, the gateway configuration is now different from the one taken into account by the Profibus-DP coupler with respect to the gateway (difference in the total length of input and output data), the LED 4 FIELDBUS DIAG therefore becomes flashing red at a frequency of 1 Hz, providing that the gateway is connected to the Profibus-DP network and to its DPM1 master.
- 6) Saving this configuration to your PC’s hard disk.
- 7) Changing the number of data received and the number of data transmitted by the Profibus-DP coupler: Under SyCon, change the list of modules configured for the gateway (see chapter 4.2.6 Editing and Configuring the Gateway, page 29). Since now you only have 18 input data bytes and 18 output data bytes in the gateway memory, the coupler should be configured to receive an 18-byte input data block from the gateway and to transfer an 18-byte output data block to the gateway.

The module that corresponds to the gateway's default configuration should not be kept, as the numbers of inputs and outputs it represent exceeds the new numbers of gateway inputs and outputs. Remove “Module1”, i.e. the “IN/OUT: 32 Byte (16 word)” module, from the list of modules configured for the gateway. To achieve that, double-click on the entry that corresponds to the module or press the “Remove Module” button after selecting it. Then, a confirmation window appears, asking you whether you want to confirm the module removal. Click “Yes”. Back to the “Slave configuration” window, the list of modules configured for the gateway is now empty.

Then, you should add the modules whose combination shall make it possible to have a total equal to the desired numbers of input and output bytes. Thus, for example, to have 18 input bytes and 18 output bytes, we shall use an “IN/OUT: 2 bytes (1 word)” module and one “IN/OUT: 16 Bytes (8 word)” module. This module combination is the quickest to configure, all the more so since the maximum number of modules that can be configured is limited to 24 for the LUF7 gateway. Using 9 “INPUT modules: 2 Bytes (1 word)” and 9 “OUTPUT modules: 2 Bytes (1 word)” modules for a total of 18 input bytes and 18 output bytes remains possible, but this solution is not appropriate when using modules!

Scroll the list of available modules, select the “IN/OUT: 2 Bytes (1 word)” module and add it to the list of modules configured for the gateway. Do the same for the “IN/OUT: 16 Bytes (8 word)” module.

In the example used here, the list of modules configured for the gateway should be identical to the one on the right. This list corresponds to the changes described above and the combination of modules it contains is optimum, as it uses a minimum number of modules.

Slot	Idx	Module	Symbol	Type	I Adr.	I Len.	Type	O Addr.	O Len
1	1	IN/OUT: 2 Byte (1 word)	Module1	Iw	0	1	Ow	0	1
2	1	IN/OUT: 16 Byte (8 word)	Module2	Iw	1	8	Ow	1	8

6. Configuring the Gateway

Then you should save and export the configuration of the Profibus-DP network, as described in chapter 4.2.7 Saving and Exporting the Profibus-DP Network Configuration, page 31.

- 8) Configuring the inputs and outputs of the Profibus-DP master PLC: under PL7 PRO, import the new configuration of the Profibus-DP network (see chapter 4.2.8 Importing the Configuration of the Profibus-DP Network under PL7 PRO and following chapters, from page 31). Only words %IW4.0 to %IW4.0.8 and %QW4.0 to %QW4.0.8 are now displayed in the "PROFIBUS-DP slave data" frame of the TSX PBY 100 coupler configuration window, providing that the address 2 station is selected in the list of the "PROFIBUS-DP slave configuration" frame.

We get the two correspondences represented below, derived from the ones used for the gateway default configuration.

Service	PLC input	Description			
		Bit 15	Bit 8	Bit 7	Bit 0
Managing the downstream Modbus network	%IW4.0	Gateway status word			
Periodic communications — Monitoring of TeSys U motor starters	%IW4.0.1	Value of the motor starter ① status register			
	%IW4.0.2	Value of the motor starter ② status register			
	%IW4.0.3	Value of the motor starter ③ status register			
	%IW4.0.4	Value of the motor starter ④ status register			
	%IW4.0.5	Value of the motor starter ⑤ status register			
	%IW4.0.6	Value of the motor starter ⑥ status register			
	%IW4.0.7	Value of the motor starter ⑦ status register			
	%IW4.0.8	Value of the motor starter ⑧ status register			

Service	PLC output	Description			
		Bit 15	Bit 8	Bit 7	Bit 0
Managing the downstream Modbus network	%QW4.0	Profibus-DP master control word			
Periodic communications — Controlling TeSys U motor starters	%QW4.0.1	Value of the motor starter ① command register			
	%QW4.0.2	Value of the motor starter ② command register			
	%QW4.0.3	Value of the motor starter ③ command register			
	%QW4.0.4	Value of the motor starter ④ command register			
	%QW4.0.5	Value of the motor starter ⑤ command register			
	%QW4.0.6	Value of the motor starter ⑥ command register			
	%QW4.0.7	Value of the motor starter ⑦ command register			
	%QW4.0.8	Value of the motor starter ⑧ command register			

- 9) Transferring the Profibus-DP coupler configuration: Once changes have been made to the Profibus-DP coupler configuration, it is necessary to validate the hardware configuration of the PLC rack, and to transfer the whole application to the Premium PLC on which the coupler is located. Please see chapter 4.2.13 Using and Monitoring the TSX PBY 100 Coupler Configuration, page 36.

6. Configuring the Gateway

6.10. Changing a Modbus Slave Configuration

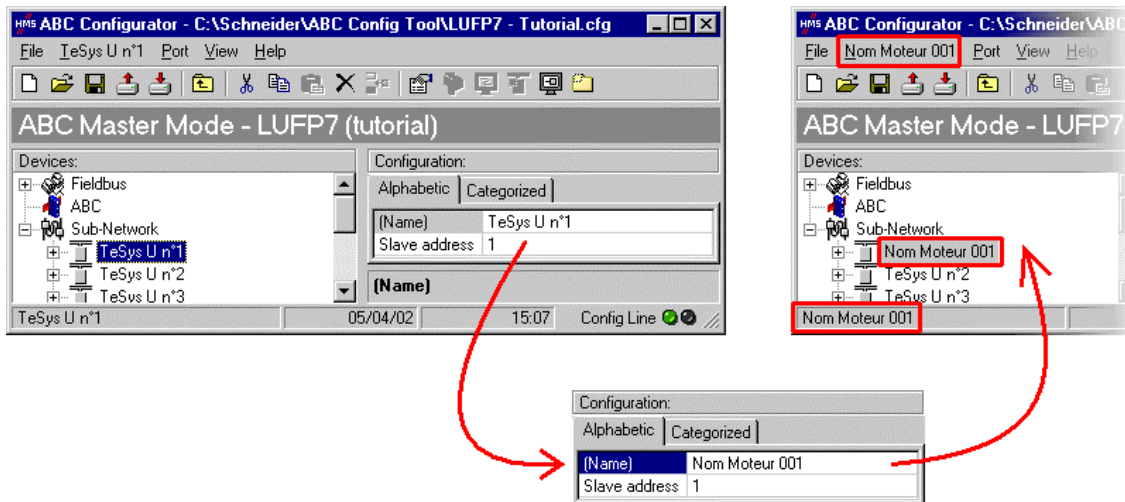
Configuring a Modbus slave itself remains very simple because it only involves the name and the Modbus address of the node to which it corresponds. On the contrary, configuring Modbus commands is much more complete and is the subject of a separate object of its own (see chapter 6.11 Adding and Setting Up a Modbus Command, page 68).

You will need to change the configuration of a Modbus slave when you add a new Modbus unit (see chapter 6.7 Adding a Modbus Slave, page 50), using any method.

Changing the name of the node which corresponds to a Modbus slave is used to distinguish it from the other nodes when the configuration of its Modbus commands has been changed, for instance.

6.10.1. Changing the name of a Modbus slave

To carry out this operation, all you have to do is select the node which corresponds to the Modbus slave involved ("Devices:" section), click on the current name (value of the "(Name)" field, in the "Configuration:" section), then change it. After confirming the new name ("Enter" key or click outside the name's data entry field), this will become effective in AbcConf, and the name of the node will be automatically updated in the "Devices:" section. An example is given below. The three red frames shown in this example show the consequences of the change made.



6.10.2. Changing the Address of a Modbus slave

To carry out this operation, all you have to do is select the node which corresponds to the Modbus slave involved ("Devices:" section), click on the value of the current address (value of the "Slave address" field, in the "Configuration:" section), then change it.

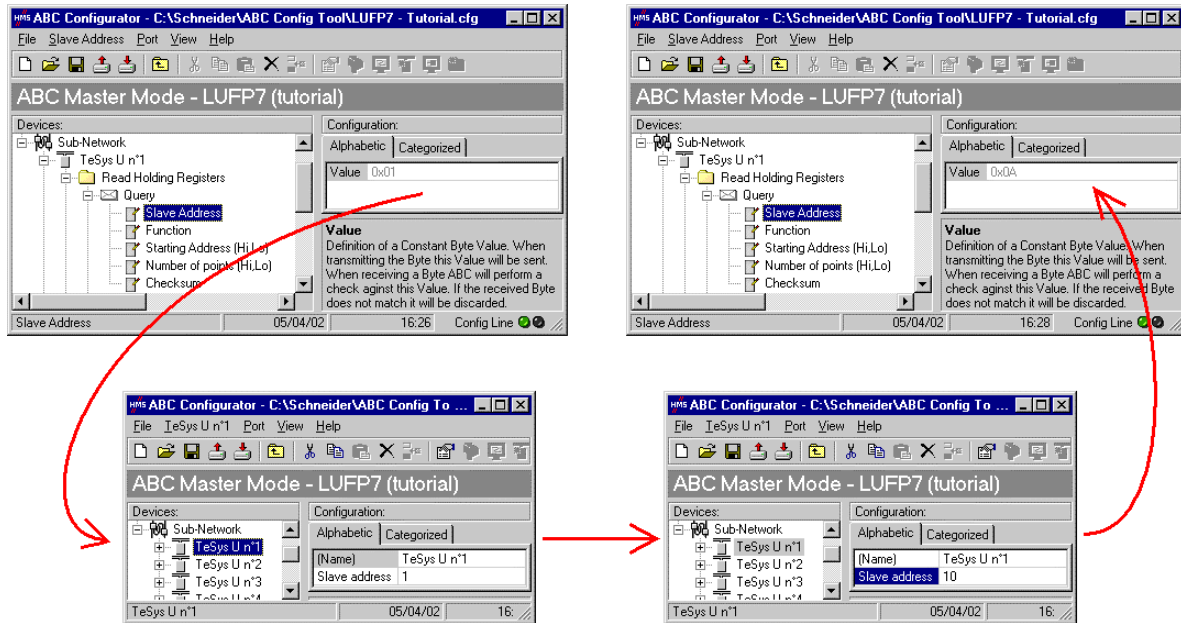
Reminder: The address of a Modbus slave must be between 1 and 247.



If you use Modbus slaves belonging to the *Schneider Electric* Speed Variation range, such as Altistarts or Altivars, do not configure ANY slaves at the addresses 65, 126 or 127 on the same Modbus network as these products, because these addresses are reserved when using these products.

After confirming the new address ("Enter" key or click outside the data entry field of the address of the Modbus slave), this will become effective in AbcConf, and the values of the "Slave Address" elements of the queries and responses in the Modbus commands for the selected node will be automatically updated. An example is given on the next page, but the updating of a single "Slave Address" element is shown:

6. Configuring the Gateway



6.11. Adding and Setting Up a Modbus Command

6.11.1. With the TeSys U Motor Starters

With TeSys U motor starters, the main use of adding a Modbus command consists of allowing you to control or monitor additional registers, without having to change the elements in the default configuration. So, the operation of the periodic and aperiodic communication services remains the same as for the default configuration, unlike the operations described in the various parts of chapter 6.8 Changing the Periodic Data Exchanged with a Modbus Slave, page 52.

Instead of adding a command and fully configuring it, it is a better idea to copy one of the two default commands for TeSys U motor starters, “Read Holding Registers” (reading/monitoring) or “Preset Multiple Registers” (writing/controlling), and to paste it into the list of Modbus commands for the appropriate node.

To copy an already configured Modbus command, select it, then choose “Copy” from the menu whose name corresponds to the name of the selected command. **Keyboard shortcut:** “Ctrl C”. Then continue using one of the two methods shown below:

- Select the node corresponding to the Modbus slave for which you wish to add this command (e.g. “TeSys U n°4”), then choose “Paste” from the menu whose name corresponds to the selected node. A new command is added after all the other configured commands for this node. The whole of its configuration is identical to that for the previously copied command. **Keyboard shortcut:** “Ctrl V”.
- Select one of the commands for the node involved, then choose “Insert” from the menu whose name corresponds to the selected command. A new command is added just before the one which is selected. The whole of its configuration is identical to that for the previously copied command.

As the new Modbus command and the original Modbus command are identical, you will need to make changes to the fields **highlighted in blue** in one of the two diagrams at the top of the next page, depending on whether this is the “Preset Multiple Registers” command or a “Read Holding Registers” command (see chapter 6.8 Changing the Periodic Data Exchanged with a Modbus Slave, page 52). The correspondence between the various elements which appear in these tree structures and the standard Modbus terminology is located to their right:

6. Configuring the Gateway

Name of the Modbus command	
Modbus query	↕ Frame ↕
Slave no.	Slave no.
Function no.	Function no.
No. of the 1st word (MSB / LSB)	No. of the 1st word (MSB / LSB)
Number of words (MSB / LSB)	Number of words (MSB / LSB)
Number of bytes	Number of bytes
... Values of the words (MSB/LSB)...	... Values of the words (MSB/LSB)...
CRC16 (LSB / MSB)	CRC16 (LSB / MSB)
Modbus response	↕ Frame ↕
Slave no.	Slave no.
Function no.	Function no.
No. of the 1st word (MSB / LSB)	No. of the 1st word (MSB / LSB)
Number of words (MSB / LSB)	Number of words (MSB / LSB)
CRC16 (LSB / MSB)	CRC16 (LSB / MSB)

Byte swap	No swapping
Data length	0x0002
Data location	0x0204

Name of the Modbus command	
Modbus query	↕ Frame ↕
Slave no.	Slave no.
Function no.	Function no.
No. of the 1st word (MSB / LSB)	No. of the 1st word (MSB / LSB)
Number of words (MSB / LSB)	Number of words (MSB / LSB)
CRC16 (LSB / MSB)	CRC16 (LSB / MSB)
Modbus response	↕ Frame ↕
Slave no.	Slave no.
Function no.	Function no.
Number of bytes read	Number of bytes read
... Values of the words (MSB/LSB)...	... Values of the words (MSB/LSB)...
CRC16 (LSB / MSB)	CRC16 (LSB / MSB)

Byte swap	No swapping
Data length	0x0002
Data location	0x0004

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N.B. in all cases, the “Query / Slave Address” and “Response / Slave Address” elements are automatically updated by AbcConf according to the node in which the command is located. Their values cannot be changed by the user. In the same way, the “Query / Function” and “Response / Function” fields depend on the nature of the Modbus command and cannot be changed by the user.

The operations to be carried out are more or less the same as those consisting of changing the default commands. For the “Read Holding Registers” command, please see chapter 6.8.1 Replacing a periodic input data element, page 52, and chapter 6.8.3 Increasing the Amount of Periodic Input Data, page 54. For the “Preset Multiple Registers” command, please see chapter 6.8.2 Replacing an Output Periodic Data Element, page 53, and chapter 6.8.4 Increasing the Amount of Periodic Output Data, page 58.

6. Configuring the Gateway

6.11.2. With a Generic Modbus Slave

Unlike the previous chapter, here we will be looking at adding and setting up a Modbus command which is different from those configured by default with the LUFF7 gateway. We will benefit from this occasion to exhaustively describe the fields allowing you to set up the management of communications for a command of this sort.

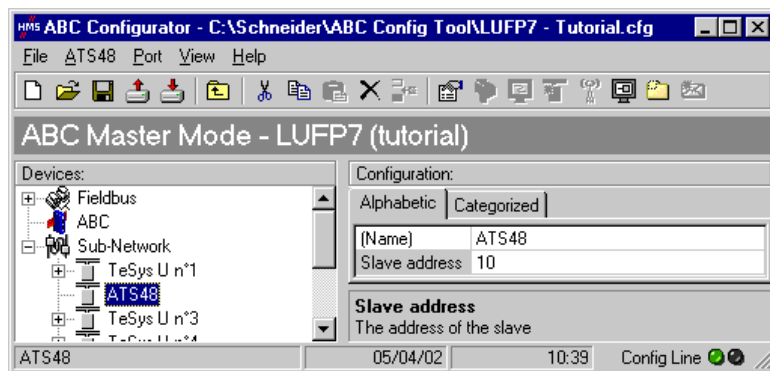
Please see chapter 13 Appendix F: Modbus Commands, page 108, for a list of the Modbus functions supported by the LUFF7 gateway. If you need to use a command which is not supported by the gateway, you can configure one. A command of this sort is included in a specific element called "Transactions" or becomes a new Modbus command in its own right. Please see the next chapter, § 6.11.3 Adding a Special Modbus Command, page 80, for further details on this subject.

E.g. To illustrate the various operations to be carried out and the explanations given, we will be taking the example of a Altistart starter, the ATS48, and a Modbus command recognised both by the gateway and the ATS48. This is the "Preset Single Register" command, whose function code is 6 and which allows you to write the value of a unique output word. This function will be used to periodically write the value of the ATS48's CMD command register, located at address W400 (address 400 = 16#0190).

Since the gateway's default configuration already has 8 Modbus slaves, you will need to delete one of them, such as the "TeSys U n°2" node, for example, and to add a new node in its place (see chapter 6.6 Deleting a Modbus Slave, page 49, and chapter 6.7 Adding a Modbus Slave, page 50). **Reminder:** We strongly advise you not to delete the "TeSys U n°1" node, as it contains the commands corresponding to the read and write services for a parameter in a Modbus slave.

We rename the "New Node", which has just been created, in "ATS48", and we assign it the Modbus address 10, as shown here:

We then proceed to add the "Preset Single Register" command by choosing "Add Command" from the "ATS48" menu.

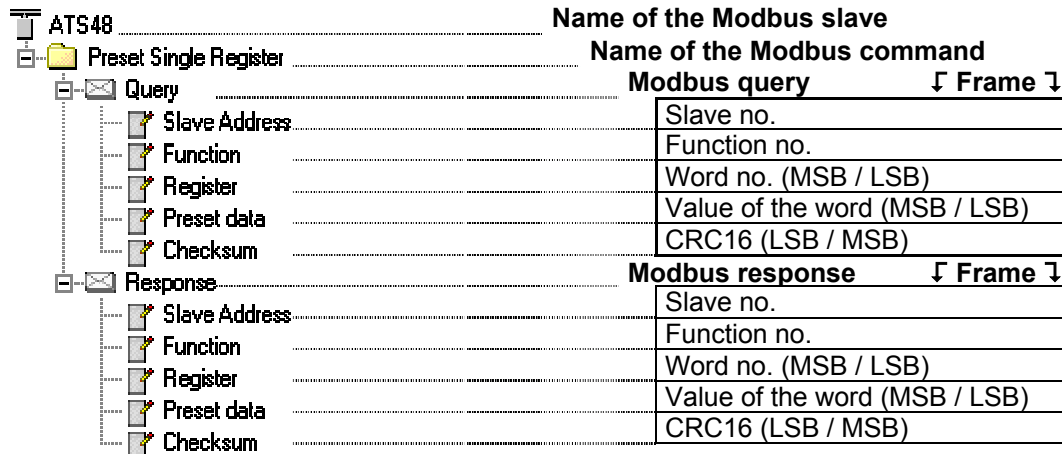


In the window which appears (shown opposite), select the "0x06 Preset Single Register" command and choose "Select" from the "File" menu.

Back in the main AbcConf window, the "Preset Single Register" command now appears in the list of Modbus commands for the "ATS48" node.

Expand the full tree structure for this command, shown at the top of the next page. The correspondence between the various elements which appear in this tree structure and the standard Modbus terminology is located to its right.

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These elements can be configured using AbcConf. There is a description of them in the following chapters. We will then return to the example of the ATS48 to illustrate how to use these elements.

6.11.2.1. Managing degraded modes

Due to the number of hardware elements and software tools used, the following table shows a summary of the various degraded modes in a Profibus-DP application. This description only applies to a Premium PLC fitted with a TSX PBY 100 coupler:

Desired behaviour		Event			
		Premium PLC: CPU stop/failure (1)	Disconnection of the upstream Profibus-DP network (2)	Failure of the LUF7 gateway (3)	Disconnection of the downstream Modbus RTU network (2) (3)
Outputs	Reset	"Outputs" option equal to "Reset"	"Offline options for fieldbus" = "Clear"	Depending on the configuration of the Modbus slaves	
	Hold	"Outputs" option equal to "Hold"	"Offline options for fieldbus" = "Freeze"		
	No refresh	—	"Offline options for fieldbus" = "No Scanning"	—	
Inputs	Reset	—	Always		"Offline options for sub-network" = "Clear"
	Hold	—	—		"Offline options for sub-network" = "Freeze"

- (1) The "Outputs" option is described in chapter 4.2.8 Importing the Configuration of the Profibus-DP Network under PL7 PRO, page 31. Under PL7 PRO, it can be accessed from the configuration screen for the TSX PBY 100 board.
- (2) The "Offline options for fieldbus" and "Offline options for sub-network" are described in the next chapter.
- (3) The behaviour desired with regard to the outputs should be directly configured on each of the Modbus slaves. In the case of drives marketed by *Schneider Electric*, for instance, resetting the outputs is configured by setting the NTO bit to 0 (communication control), and they are held by setting NTO to 1 (suppression of communication control).

You may also refer to chapter 4.2 Degraded application mode of the *Implementation manual – TSX PBY 100 – PROFIBUS-DP* (ref.: TSX DM PBY 100E) for further details regarding the processing of degraded modes by the TSX PBY 100 board.

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6.11.2.2. Configuring the Query

Select the “Query” element from the Modbus command. The various elements of the configuration of the query for this command are shown opposite. The values displayed correspond to the default values for any new command.

These elements allow you to configure how the whole command is managed, including how degraded modes are managed (number of re-transmissions, for example).


Alphabetic	Categorized
Minimum time between broadcasts (10ms)	100
Offline options for fieldbus	Clear
Offline options for sub-network	Clear
Reconnect time (10ms)	1000
Retries	3
Timeout time (10ms)	100
Trigger byte address	0x05FF
Update mode	Cyclically
Update time (10ms)	100

Each of these elements is described, in order, in the table below. When a unit is assigned to an element, it is shown in brackets after the name of the element.

Configuration element	Description
Minimum time between broadcasts (10ms)	<p>This element is only relevant if you have added a “Broadcaster” node (see chapter 6.13 Adding a Broadcaster Node, page 85). This parameter then allows you to specify a waiting time following the transmission of the selected broadcast command. The next Modbus message, whatever it is, will only be transmitted by the gateway once this time has elapsed. So it needs to be long enough to allow the slowest Modbus slave to process the command which has been broadcast. This parameter is not used by commands which do not belong to a broadcaster node.</p> <p>With the LUF7 gateway’s default configuration, this feature has not been used, so as to control the Modbus slaves individually.</p>
Offline options for fieldbus	<p>This element affects the data sent to the Modbus slave, but only in the query to which this element belongs to, whenever the gateway is disconnected from the Profibus-DP network. This element takes one of the following three values:</p> <ul style="list-style-type: none"> - ClearFrom now on all data sent to the Modbus slave using this query is set to 16#0000 (resetting of the output data in the gateway’s memory). - FreezeAll data sent to the Modbus slave using this query retains its current values (the output data in the gateway’s memory is frozen). - NoScanning ... The query is no more transmitted to the Modbus slave by the gateway
Offline options for sub-network	<p>This element affects the data sent to the Profibus-DP master PLC whenever the query to which this element belongs to has not been answered with a response by the Modbus slave (no response). This element takes one of the following two values:</p> <ul style="list-style-type: none"> - ClearFrom now on the data sent to the Profibus-DP master PLC is set to 16#0000 (resetting of the input data in the gateway’s memory). - FreezeFrom now on the data sent to the Profibus-DP master PLC retains its current values (the input data in the gateway’s memory is frozen). <p>N.B. exception responses issued by the Modbus slaves do not trigger the use of these “Offline options!”</p>
Reconnect time (10ms)	<p>If there is no response from the Modbus slave to a query, or following the receipt of an incorrect response, the gateway uses the “Retries” and “Timeout time (10ms)” elements to carry out re-transmissions. If the Modbus slave has still not responded correctly following these re-transmissions, the gateway stop sending it the corresponding query for a period of time which can be adjusted using “Reconnect time (10ms)”.</p> <p>When this period is over, the gateway attempts to restore communication with the Modbus slave.</p>

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6. Configuring the Gateway

Configuration element	Description
Retries	<p>This element indicates the number of re-transmissions carried out by the gateway if there is no response from the Modbus slave to a query, or if the response is incorrect. This re-transmission process ceases as soon as the gateway gets a correct response within a given time. If none of the re-transmissions has allowed the gateway to obtain a correct response, the Modbus slave is deemed to be off-line, but only in relation to the command in question. The gateway then uses the “Offline options for sub-network” and “Reconnect time (10ms)” elements and the LED  MODBUS becomes red. This LED will only revert to a green state if the Modbus command is answered with a correct response, once the reconnection has started (see element “Reconnect time (10ms)”).</p> <p>If the number of re-transmissions is set to 0, the process described above will not be run.</p>
Timeout time (10ms)	<p>This element represents the time that the Modbus slave will wait for a response. If a response has not reached the gateway within the given time, configured using the “timeout time (10ms)” element, the gateway proceeds to a re-transmission. This process continues until it reaches the last re-transmission allowed (see “Retries”), then the gateway declares the Modbus slave off-line, but only for the command to which the “timeout time (10ms)” belongs to.</p>
Trigger byte address	<p>This element is only used by the gateway if “Update mode” is set to “Change of state on trigger”. In this case, it specifies the address, in the gateway’s output memory (16#0202 to 16#02F3), of an 8-bit counter managed by the Profibus-DP master.</p> <p>When the value located at this address is changed by the Profibus-DP master but <i>different from zero</i>, the query configured with a “Change of state on trigger” related to this address is transmitted to the Modbus slave. So the Profibus-DP master must have access to this counter in the same way as for the periodic output registers sent to TeSys U motor starters.</p> <p>In comparison to the “On data change” mode, this mode allows you to send a command on a specific order from the Profibus-DP master if, for example, the latter is unable to update all data from of any given query at the same time.</p> <p>N.B. In the specific case of the gateway’s default configuration, the “Transactions 1” and “Transactions 2” personalized command mode for the “TeSys U n°1” node is set to “Change of state on trigger”. These aperiodic commands are respectively used to read and write the value of a parameter of one of the Modbus slaves.</p> <p>The “Trigger byte address” elements of the “Query” elements of these two commands are configured at addresses 16#021E and 16#021F. These are the “parameter read/write request counters”. Considered under Profibus-DP, SyCon, and PL7 PRO, these two data are configured the same way as the other outputs (see chapter 4.2.9 Configuring the Gateway I/O under PL7 PRO, page 32) and both correspond to the %QW4.0.15 output.</p> <p>To transmit one of these two commands, the Profibus-DP master PLC must first of all update all of the data to be transmitted on the Modbus network for this command (addresses 16#0212 to 16#0217 or addresses 16#0218 to 16#021D), then change the value of the associated counter (address 16#021E or 16#021F). The gateway will then transmit the query corresponding to the command.</p> <p>N.B. The “trigger byte” does not have to be an item of output data updated by the Profibus-DP master. In fact it is quite possible that it may be an input between 16#0002 and 16#00F3. In this case, the Modbus slave which updates this byte will condition the exchanges of the command you’re currently configuring.</p>

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Configuration element	Description
Update mode	<p>This element is used to specify the transmission mode for the query on the Modbus network. It takes one of the following four values:</p> <ul style="list-style-type: none"> - Cyclically..... Default communication mode. The query is transmitted periodically on the Modbus network (see “Update time”). - On data change..... The gateway transmits the query on the Modbus network when at least one item of data from this query is changed by the Profibus-DP master. So this is an aperiodic communication mode. For instance, this is not the case with the queries associated with “Transactions 1” and “Transactions 2” personalized commands for the “TeSys U n°1” node of the gateway’s default configuration. These queries are transmitted when at least one of the values of their output data (addresses 16#0212 to 16#0217 or addresses 16#0218 to 16#0220D) is changed by the Profibus-DP master. So all data from a single query must be updated by the Profibus-DP master at the same time. If you are not certain whether your software is able to update all the output data from a query at the same time, we recommend using “Change of State on trigger” mode for these two commands. - Single Shot..... This transmission mode only allows a single Modbus exchange for the whole of the time that the gateway is operating. This exchange takes place just after the initialization of the gateway. - Change of state on trigger..... With this aperiodic communication mode, the Modbus query is sent every time that the Profibus-DP master changes the value of an 8-bit counter designated by the “Trigger byte address” element. Please see the description of this element for further information about how to use this communication mode.
Update time (10ms)	This element is only used by the gateway if “Update mode” is set to “Cyclically”. In this case, it specifies the query’s transmission period on the Modbus network.

E.g.: With the ATS48, we will be using the configuration shown opposite. The most notable points of this configuration are:

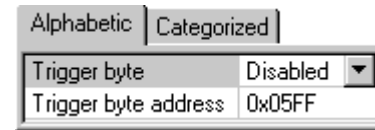
- On disconnection the data is reset on one of the two networks.
- 3 re-transmissions with a 100 ms timeout.
- Periodic communications with a cycle time set to 300 ms.

Alphabetic Categorized	
Minimum time between broadcasts (10ms)	100
Offline options for fieldbus	Clear
Offline options for sub-network	Clear
Reconnect time (10ms)	1000
Retries	3
Timeout time (10ms)	10
Trigger byte address	0x05FF
Update mode	Cyclically
Update time (10ms)	30

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6.11.2.3. Configuring the Response

Next select the “Response” element from the Modbus command. The various elements of the configuration of the response for this command are shown opposite. The values displayed correspond to the default values for any new command.



These elements allow you to configure a single aspect of managing the command, described below. Each of them is described, in order, in the table below.

Configuration element	Description
Trigger byte	<p>This element is used by the gateway to activate the unitary incrementation of an 8-bit counter in order to notify the Profibus-DP master of the receipt of a new response to the associated Modbus command. It takes one of the following two values:</p> <ul style="list-style-type: none"> - Disabled Default configuration. The gateway does not increment any counter on receipt of the Modbus response. - Enabled Each time that the gateway receives a new response to the associated Modbus command, it increments the value of an 8-bit counter designated by the “Trigger byte address” element (see below). If used, this counter allows the Profibus-DP master, for example, to only consider the response’s corresponding data when this counter’s value is incremented.
Trigger byte address	<p>This element is only used by the gateway if the element “Trigger byte” is set to “Enabled”. In this case, it specifies the address, in the gateway’s input memory (16#0002 to 16#00F3), of an 8-bit counter managed by the gateway.</p> <p>When the gateway receives a response to the associated Modbus command, it increments the value of this counter in a unitary manner (value = value+1). So the Profibus-DP master must have access to this counter in the same way as for the periodic input registers from the TeSys U motor starters.</p> <p>This mode allows the Profibus-DP master to be informed that a new response is available. This can be useful, for example, if it is possible that the data from two consecutive responses may be identical.</p> <p>N.B.: In the specific case of the gateway’s default configuration, the “Trigger byte” element for responses to the “Transactions 1” and “Transactions 2” personalized commands of the “TeSys U n°1” node is set to “Enabled”. Hence, the management of responses to read and write commands for parameters is event driven.</p> <p>The “Trigger byte address” elements of the “Response” elements of these two commands are configured at addresses 16#001E and 16#001F. These are the “parameter read/write response counters”. Considered under Profibus-DP, SyCon, and PL7 PRO, these two data are configured the same way as the other inputs (see chapter 4.2.9 Configuring the Gateway I/O under PL7 PRO, page 32) and both correspond to the %IW4.0.15 input.</p>

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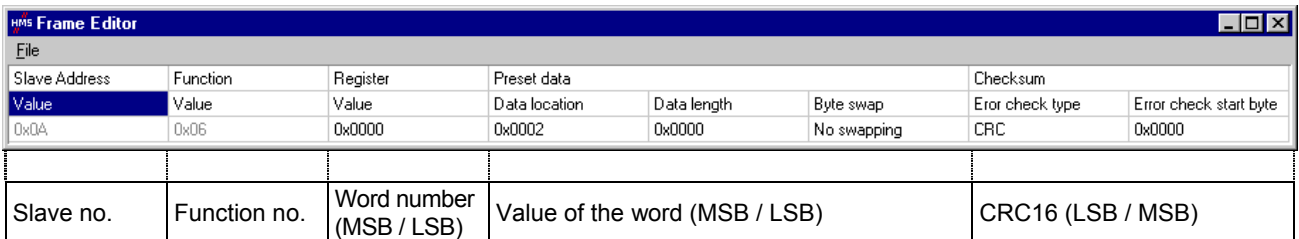
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Configuration element	Description
Trigger byte address (contd.)	The Profibus-DP master PLC will be able to detect the receipt of a response from a Modbus slave by comparing the previous value and the current value of the associated counter (address 16#001E or 16#001F). If there is a <i>unitary incrementation</i> of this counter, the PLC may, for example, read all of the data from the response (addresses 16#0013 to 16#0017 or addresses 16#0018 to 16#001D) and allow the transmission of a new query for reading or writing the value of a parameter (using a “Trigger byte” for the queries). Contrarily to the counter one can associate to the queries of any command, a response’s “Trigger byte” is a true modulo 256 counter, <i>i.e.</i> zero must be managed (... 254, 255, 0, 1, 2 ...).

E.g.: With the ATS48, we do not want the response to be event driven. So we will be retaining the default configuration.

6.11.2.4. Configuring the Content of the Query Frame

The window shown below is obtained using “Edit Frame” from the “Query” menu. Unlike the tree structure in the main AbcConf window, this display has the advantage of showing all of the frame’s fields at the same time as well as their values. The values displayed below correspond to the values assigned by default to the Modbus command query we have created. The correspondence with the content of the corresponding Modbus frame has been added underneath this window.



HMS Frame Editor							
File							
Slave Address	Function	Register	Preset data			Checksum	
Value	Value	Value	Data location	Data length	Byte swap	Error check type	Error check start byte
0x0A	0x06	0x0000	0x0002	0x0000	No swapping	CRC	0x0000
Slave no.	Function no.	Word number (MSB / LSB)	Value of the word (MSB / LSB)			CRC16 (LSB / MSB)	

Edit the values which are not greyed out, one after another. There is a description of them below.

The nature of a frame’s fields depends on the Modbus command to which it corresponds. However, a certain number of these fields are common to all frames, whereas others are common to a number of them. The description of those shown above is given on the next page, as a part of the example described at the beginning of the chapter 6.11.2.

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Field in the frame	Size in the frame	Description
Slave Address	1 byte	This field cannot be changed by the user and its value is greyed out to inform him of the fact. AbcConf updates the value of this field automatically using the address of the Modbus slave corresponding to the current node. N.B.: This field is common to queries for all Modbus commands. <i>E.g.:</i> The value of this field is set to the address of the Modbus slave which corresponds to the “ATS48” node, that is to say to 16#0A.
Function	1 byte	This field cannot be changed by the user and its value is greyed out to inform him of the fact. AbcConf updates the value of this field automatically using the function code for the corresponding Modbus command. N.B.: This field is common to queries for all Modbus commands. <i>E.g.:</i> The value of this field is set to the code for the “Preset Single Register” command (writing the value of an output word), that is to say 16#06.
Register	2 bytes	Address of an output word, or of a register, in the Modbus slave’s memory. So this field designates the memory object to which the command relates. N.B.: This field is common to queries for all Modbus commands whose purpose is to access one or more locations in the memory of a Modbus slave. When accessing several memory locations, the “Register” field designates the address of the first word affected by the command. <i>E.g.:</i> The value of this field should be changed by entering the address of the CMD command register, that is to say 400 (16#0190). This value will be automatically converted to hexadecimal if the user enters it in decimal.
Preset Data	2 bytes or more for a block of data	<p>Data Location: Address, in the gateway’s output data memory (16#0202 to 16#02F3), of the item of data to be transmitted in the “Preset Data” field for the query’s frame. N.B.: The “Data location” field is used for each frame that allows you to exchange some data between the Modbus slaves and the Profibus-DP master. In this case it designates the starting address of the block of data to be transmitted. N.B.: As far as possible, ensure that the data is located at even addresses in order to align the Modbus data (in 16-bit format) on the QW4.0.x outputs of the Profibus-DP coupler. <i>E.g.:</i> The value to be assigned to the ATS48’s CMD register should be placed in the gateway’s output data memory area. We will be using the first free location starting at an even address, that is to say the one located at 16#0220, with the gateway’s default configuration.</p> <p>Data length: Length of the block of output data, in the gateway’s memory, whose values must be transmitted in the “Preset Data” field of the query’s frame. It is expressed in number of bytes. N.B.: The “Data length” field is always used together with the “Data location” field, described above. <i>E.g.:</i> Since the “Preset Single Register” command is used to write the value of a single register (16-bit), the value of the “Data length” field must be set to 2. See the documentation for each Modbus slave to find out the maximum amount of 8-bit data which can be placed in “Data” type fields in queries and responses for this slave. With the ATS48, for instance, it is limited to 30 16-bit words.</p>

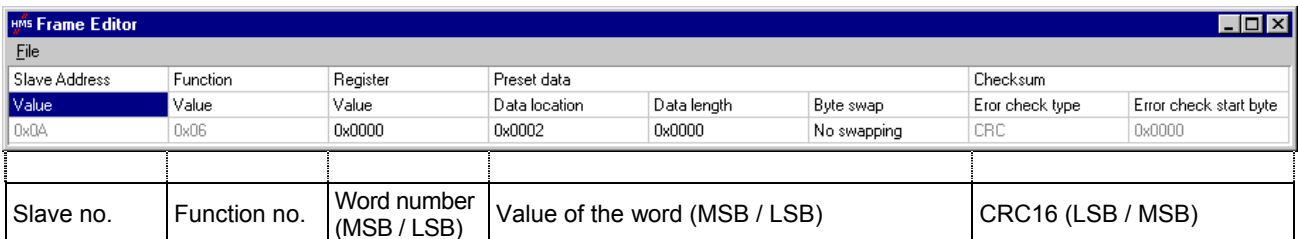


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Field in the frame	Size in the frame	Description
Preset Data (contd...)		<p>Byte swap: Specifies whether the output data bytes to be transmitted to the Modbus slave must be swapped before being placed in the Modbus frame or not. The three possible values are as follows:</p> <ul style="list-style-type: none"> - No swapping Default configuration. The data is sent in the same order as they appear in the gateway's memory. This is the case which must be used by default, because for an item of 16-bit data, the most significant byte is placed first in the Modbus frame and is always written into the gateway's memory by a Profibus-DP master with the most significant byte first. - Swap 2 bytes The bytes to be transmitted are swapped two by two. - Swap 4 bytes The bytes to be transmitted are swapped four by four. This is rarely used, as it only relates to 32-bit data. The principle is similar to that of the previous case, "Swap 2 bytes". <p><i>E.g.:</i> We will be using the "No swapping" value, because the two bytes of the value to be written into the ATS48's CMD register, as transmitted by the TSX PBY 100 coupler, are placed into the gateway's memory in most significant / least significant order.</p>
Checksum	2 bytes	<p>Error check type: Type of error check for the frame.</p> <ul style="list-style-type: none"> - CRC Default method. This is the method adopted for the Modbus RTU protocol. - LRC This method relates to the Modbus ASCII protocol. So it should not be used in this case. - XOR Simple "OR Exclusive" applied to the frame's bytes. <p><i>E.g.:</i> The LUPF7 gateway is specifically designed for the Modbus protocol RTU mode. The default value, "CRC", should not be changed.</p>
		<p>Error check start byte: Indicates the number of the byte, in the frame, from which the calculation of the "checksum" should begin. The first byte in each frame carries the number 0.</p> <p><i>E.g.:</i> The calculation of a frame's checksum should always begin with the first byte. The value of this field should therefore remain set to zero.</p>

6.11.2.5. Configuring the Content of the Response Frame

The window shown below is obtained using "Edit Frame" from the "Response" menu. The values shown in it correspond to the values assigned by default to the Modbus command response we have created. The correspondence with the content of the corresponding Modbus frame has been added underneath this window.



HMS Frame Editor							
File							
Slave Address	Function	Register	Preset data			Checksum	
Value	Value	Value	Data location	Data length	Byte swap	Error check type	Error check start byte
0x0A	0x06	0x0000	0x0002	0x0000	No swapping	CRC	0x0000
Slave no.	Function no.	Word number (MSB / LSB)	Value of the word (MSB / LSB)			CRC16 (LSB / MSB)	

Edit the values which are not greyed out, one after another.

There is a description of them below, but also see the previous chapter, as the nature of the content of response frames is very similar to that of the fields in Modbus query frames.

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If the value of a field from the response of a Modbus slave is different from that configured via AbcConf, the response will be rejected by the gateway. It will then proceed to a re-transmission of the query, provided that at least one re-transmission has been configured for this command (see chapter 6.11.2.2 Configuring the Query, page 72). Of course, this remark does not relate to the data itself, that is to say the Modbus frame fields configured using the “Data location,” “Data length,” and “Byte swap” elements.

Field in the frame	Size in the frame	Description
Slave Address	1 byte	Identical to that of the query’s “Slave Address” field.
Function	1 byte	Identical to that of the query’s “Function” field.
Register	2 bytes	Identical to that of the query’s “Register” field, since the Modbus response of any “Preset Single Register” command is an echo to the corresponding query. Here you should also enter the address of the memory object to which the command relates. <i>E.g.:</i> Enter the value 400, converted to 16#0190 by AbcConf.
Preset Data	2 bytes or more for a block of data	Data Location: Address, in the gateway’s input data memory (16#0002 to 16#00F3), of the item of data received in the “Preset Data” field for the response’s frame. N.B. As far as possible, ensure that the data is located at even addresses in order to align the Modbus data (in 16-bit format) on the %IW4.0.x inputs of the Profibus-DP coupler. <i>E.g.:</i> The value sent back as an echo to the command must be placed in the gateway’s input data memory area. We shall use the first two free bytes following the input data of the default configuration, i.e. addresses 16#0020-16#0021.
		Data length: Length of the block of input data received in the “Preset Data” field of the response frame. It is expressed in number of bytes. <i>E.g.:</i> The value of the “Data length” field must be set to 2.
		Byte swap: Identical to that of the query’s “Byte swap” field. <i>E.g.:</i> We will also be using the “No swapping” value, for the same reasons as with the query.
Checksum	2 bytes	Error check type: Identical to that of the query’s “Error check type” field.
		Error check start byte: Identical to that of the query’s “Error check start byte” field. However, these two fields cannot be changed by the user and their values are greyed out to reflect this. AbcConf updates the values of these fields automatically using those of the query’s “Error check type” and “Error check start byte” fields.

6. Configuring the Gateway

6.11.3. Adding a Special Modbus Command

Apart from the standard Modbus commands covered in the previous chapter, it is possible to create two types of special Modbus commands: Modbus commands using the same template as standard commands and Modbus commands whose nature and frame content can be completely changed by the user.

6.11.3.1. Modbus Commands Based on Standard Commands

You create a command of this type from the “Select Command” window (see chapter 6.11.2 With a Generic Modbus Slave, page 70), by choosing “Add Command” from the “Command” menu. The window shown below appears. It shows the structure of the future command’s query and response frames, which will then be added to the list of available Modbus commands. This structure includes the standard elements, that is to say the “Slave Address”, “Function” and “Checksum” fields, described in previous chapters.

The screenshot shows the HMS Command Editor window. It has a menu bar with 'File' and 'Column'. Below the menu bar, there are two text boxes: 'Command Name: New Command' and 'Command ID: 0xA'. To the right of the Command ID is a checkbox labeled 'Allow Broadcasting' which is currently unchecked. Below these fields are two tables. The first table is for the 'Query' frame, and the second is for the 'Response' frame. Both tables have four columns labeled 1, 2, 3, and 4. The rows in both tables are: 'DisplayName', 'ObjectType', and 'Value'.

Query	1	2	3	4
DisplayName	Slave Address	Function	Data	Checksum
ObjectType	Byte	Byte	Data	Checksum
Value	[SlaveAddress]	ID	User	User

Response	1	2	3	4
DisplayName	Slave Address	Function	Data	Checksum
ObjectType	Byte	Byte	Data	Checksum
Value	[SlaveAddress]	ID	User	Depend

Please see chapter 2.12 Command editor in the AbcConf user manual, entitled **AnyBus Communicator – User Manual** for further information about creating standard Modbus commands. This manual can be found on the CD LU9CD1 : “ABC_User_Manual.pdf”.

6.11.3.2. Modbus Commands which Can Be Completely Changed by the User

In AbcConf, these commands are known as “Transactions”. Unlike in the previous case, the whole structure of the query and response frames associated with these commands correspond to an association of input or output data in the gateway’s memory (“Data” fields), constants in Byte, Word or DWord format and a final “Checksum” field.

All of the data contained in the query and response “Data” fields of a “Transactions” command are managed by the Profibus-DP master, including the “Slave address” and “Function” fields if these are placed in a “Data” field. For instance, this allows you to manage all of the Modbus frame fields from the Profibus-DP master if all of the query and response fields of a “Transactions” element (excluding “Checksum”) are “Data” type fields.

N.B.: You must *not* place more than one “Data” field in any Modbus frame. This guarantees that all of the data involved will be processed by the gateway at the same time.

6. Configuring the Gateway

Constants in Byte, Word or DWord format allow you to relieve the Profibus-DP master by placing the values of these constants in Modbus query frames (constants in "Query" elements) or by comparing them to the values located in the Modbus responses (constants in "Response" elements). These comparisons are used to accept (identical values) or reject (different values) the Modbus responses in the same way as for standard Modbus commands. The Profibus-DP master does not have access to these constants. They are mainly used to replace fields such as "Slave address," "Function," "Starting Address," etc.

Please see the section on "Actions on request/response" in chapter 2.6.4 Transaction and in chapter 2.6.6 Frame objects in the AbcConf user manual, entitled **AnyBus Communicator – User Manual** for further information about how to handle "Transaction" type commands. This manual can be found on the CD LU9CD1 : "ABC_User_Manual.pdf".

The LUF7 gateway's default configuration includes two "Transaction" commands. These are aperiodic commands used for reading and writing the value of a Modbus slave parameter (necessarily a TeSys U motor starter with the default configuration). They are configured solely for the "TeSys U n°1" node, as the address of the slave is controlled by the Profibus-DP master via the first byte of the "Data" field, which corresponds to the "Slave Address" field in standard Modbus commands. This allows the Profibus-DP master to send this command to all of the Modbus slaves, slave by slave, through the first byte of the "Data" field. The remaining fields of the frames used by these two commands are also placed in the same "Data" field. So the Profibus-DP master has access to all of the content of the frames in these two commands, excluding the checksum.

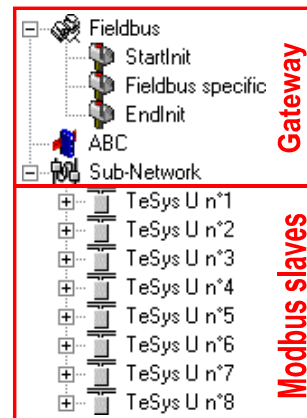
6.12. Configuring the General Characteristics of the Gateway

This operation relates to the gateway's general characteristics ("Fieldbus" to "Sub-Network" elements), whereas the previous chapters described the configuration of the Modbus slaves (elements located under the "Sub-Network" element).

The "Fieldbus" element describes the upstream network, that is to say the Profibus-DP network in the case of the LUF7 gateway.

The "ABC" and "Sub-Network" elements describe the downstream network, that is to say the Modbus RTU network in the case of the LUF7 gateway, and allow you to identify the software version in the gateway.

The configuration of these three elements, plus the commands they give access to, are described in the next three chapters.



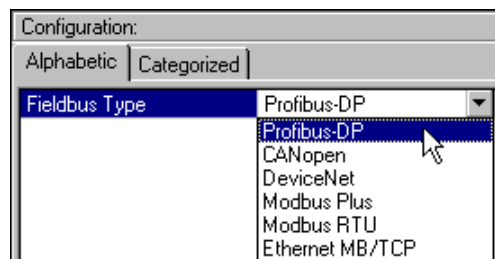
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6.12.1. "Fieldbus" Element

Below this element there is a list of the mailboxes configured by default. These elements are not described here, as they are only designed for the internal management of the gateway. These mailboxes can neither be changed nor deleted. Both their number and their nature depend on the type of upstream network.

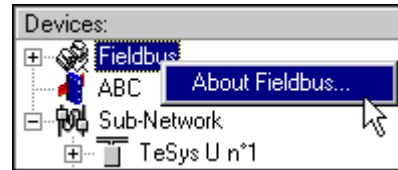
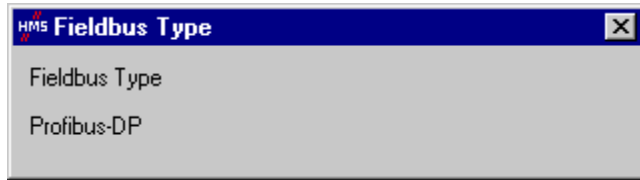
When the "Fieldbus" element is selected, you can select the type of upstream network. With the LUF7 gateway, you must select the "Profibus-DP" network.

If your PC is connected to the gateway using the PowerSuite cable and you are using AbcConf in "on-line" mode when AbcConf starts up, the type of upstream network will be automatically detected.



6. Configuring the Gateway

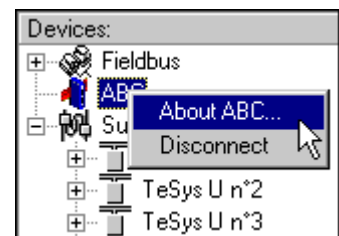
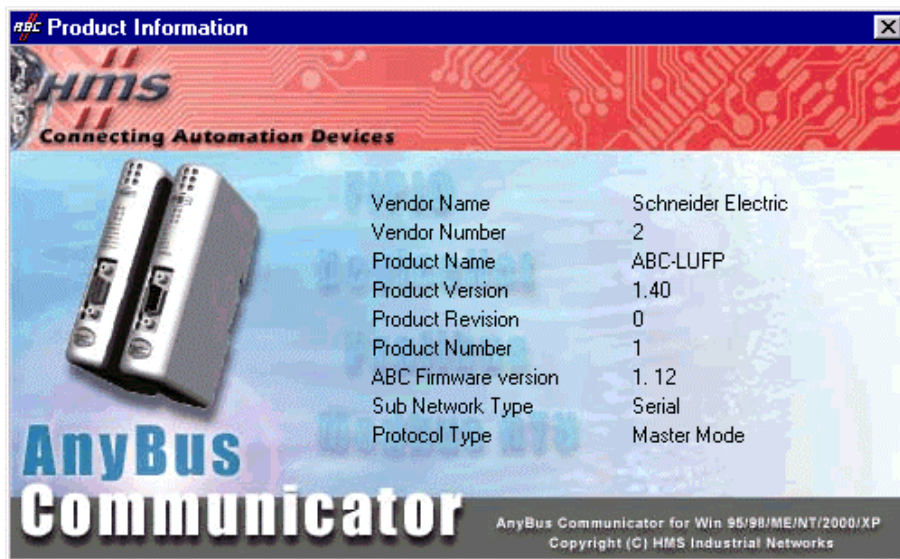
The only command accessible from the “Fieldbus” menu is “About Fieldbus...”.



In “on-line” mode (see chapter 6.12.2 “ABC” Element, page 82), the window shown opposite will be displayed. In “off-line” mode the word “Unknown” will replace “Profibus-DP” to show that the type of upstream network cannot be identified.

6.12.2. “ABC” Element

The two commands accessible from the “ABC” menu are “About ABC...” and “Disconnect” (or “Connect” if you are in “off-line” mode).



- Running “About ABC...” allows AbcConf to upload and display information showing the software version on the PC and the software version in the gateway.

An example is shown opposite.

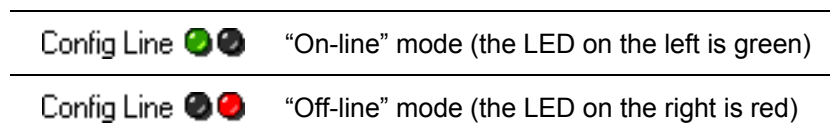
When you run “About ABC...” in “off-line” mode, the last three fields are replaced by “Unknown” to show that the gateway software version cannot be identified.

N.B.: Only the software version in the gateway’s Modbus card is displayed. This software is common to several types of gateway marketed by *Schneider Electric*. The gateway’s Profibus-DP board software version is not accessible.

- The “Disconnect” command allows you to go from “on-line” to “off-line” mode. It is only available in “on-line” mode. It is replaced by “Connect” once you are in “off-line” mode.

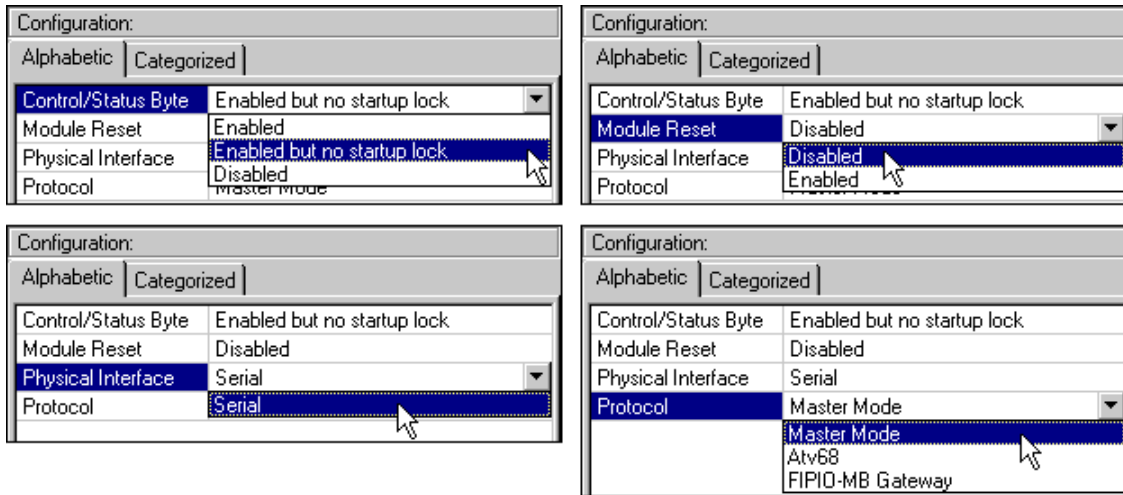
Apart from these two exclusive commands, the transition to “on-line” mode is requested by AbcConf when certain events do occur (AbcConf is launched, use of “Upload” and “Download” commands, etc.).

AbcConf’s connection mode is displayed to the right of its status bar:



6. Configuring the Gateway

Apart from the “Control/Status Byte” and “Module Reset” options, the configuration of the LUPF7 gateway’s “ABC” element should not be changed. Out of the four options shown below, the last two should therefore retain the values shown: “Serial” and “Master Mode”.



These four options allow you to configure certain of the gateway’s system aspects:

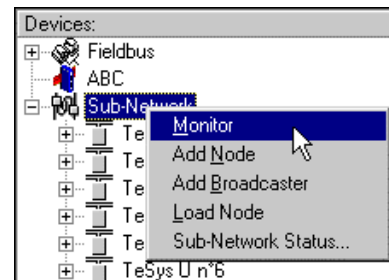
- Control/Status Byte: The three possibilities offered for this option are described in chapter 5 Gateway Initialization and Diagnostics, page 37.
- Module Reset: By default, this option prevents the gateway from reinitializing itself when there is an internal operation problem. Changing this option is mainly intended for “laboratory” type use.
- Physical Interface: The only possibility offered by this option shows that the physical interface of the downstream network of the gateway is a serial link.
- Protocol: This option should not be changed, because it indicates the type of protocol used on the network downstream of the gateway. With the LUPF7 gateway, “Master Mode” must be selected. The other possibilities available are reserved for other products from the same family as this gateway.

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6.12.3. “Sub-Network” Element

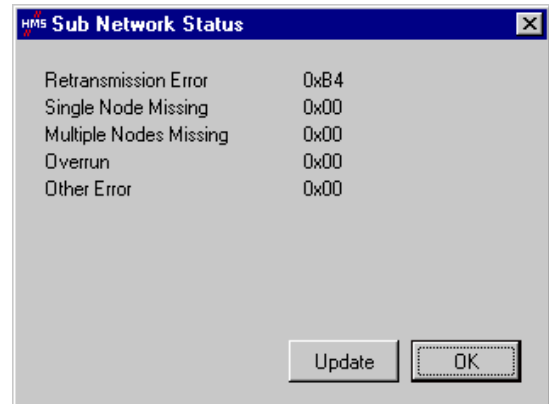
The five commands accessible from the “Sub-Network” menu are:

- “Monitor”: Allows you to view the correspondence between the data from Modbus commands and the content of the gateway’s memory. Examples of how to use this command are shown in chapters 6.8.3 (page 54), 6.8.4 (page 58) and 6.9 (page 63).
- “Add Node”: Allows you to add a new node on the downstream Modbus network. Each node corresponds to a different Modbus slave. This command is not available if there are already 8 Modbus slaves, which is the case with the gateway’s default configuration.
- “Add Broadcaster”: Allows you to add a broadcaster node (see chapter 6.13 Adding a Broadcaster Node, page 85).
- “Load Node”: Allows you to add a pre-configured node on the downstream Modbus network. The configuration for this node is contained in an XML file (see the section on “Importing/Exporting a Modbus slave configuration” in chapter 6.7 Adding a Modbus Slave, page 50). This command is not available if there are already 8 Modbus slaves, which is the case with the gateway’s default configuration.



6. Configuring the Gateway

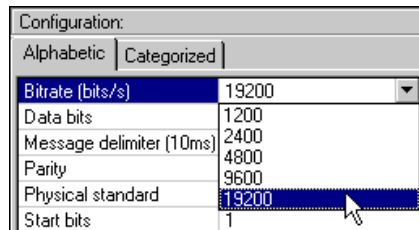
- "Sub-Network Status...": In "on-line" mode (see chapter 6.12.2 "ABC" Element, page 82), this command displays a window summarizing the values of the gateway's error counters. These counters are also used by the gateway to update the value of its status word (see chapter 5.2.2 Gateway Status Word, page 40). The "Update" button allows you to refresh the values of these counters.



When you run this command in "off-line" mode, all of the values displayed are replaced by the word "Unknown" to show that they cannot be read on the gateway. The "Update" button then becomes inaccessible.

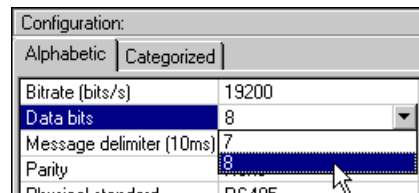
When the "Sub-Network" element is selected, you have access to all of the options allowing you to configure the gateway's communication protocol format on the Modbus network. The various settings you can make are described below. All of the Modbus slaves present must support this configuration and be configured appropriately.

- Bitrate (bits/s): The gateway supports a limited number of communication speeds. Choose the speed that suits your Modbus network.

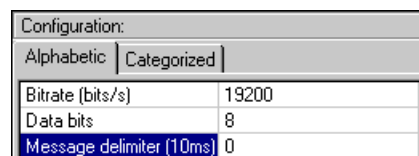


- Data bits: 8 bits (required).

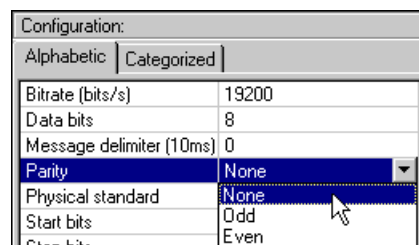
- Message delimiter (10ms): Period of silence added to the normal period of silence between the end of one message and the start of the next message. The normal period of silence corresponds to the time taken to transmit 3.5 characters.



- Parity: Choose the parity according to the format chosen for communications on your Modbus network.

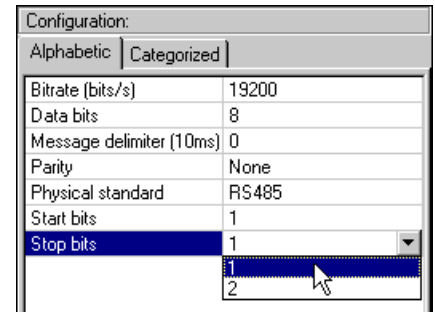
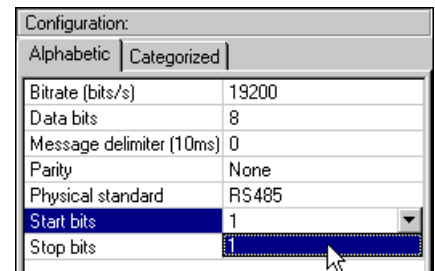
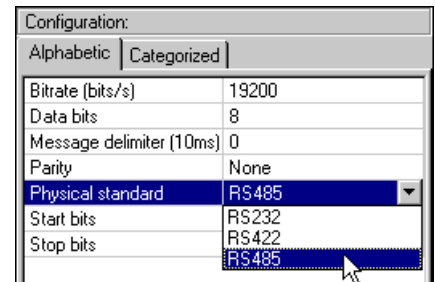


- Physical standard: RS485 (required).



- Start bits: 1 bit (required).

- Stop bits: 1 or 2 bits.



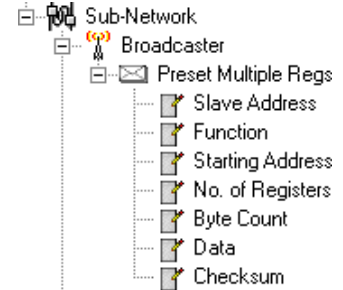
6. Configuring the Gateway

6.13. Adding a Broadcaster Node

A broadcaster node does not correspond to any Modbus slave in particular, as it applies to **all** Modbus slaves. All the commands which will be configured for this node will be transmitted with the “Slave Address” field set to 16#00. This means that all of the slaves will run the command, but that none of them will respond to it.

To add a broadcaster node, select “Sub-Network”, then choose “Add Broadcaster” from the “Sub-Network” menu. The broadcaster node created in this way does not count in the limit on the number of configurable nodes. A simple example is shown opposite:

The addition and configuration of a Modbus command in the list of broadcaster node commands is done in the same way as for other nodes, but with the following differences:



- The list of standard Modbus commands which can be used in broadcast is considerably smaller. Only functions 16#06 and 16#10 can be used (see list in chapter 6.11.2, page 70).
- The command is made up of a query, but does not include any response. The query bears the name of the command itself, instead of the name “Query.” Also, each broadcast command only consumes one of the 50 queries and responses allowed by the gateway, as there is no possible response for such a command.
- The value of the query’s “Minimum time between broadcasts (10ms)” field must be changed if the default value (1 second) is not suitable.
- The value of the query frame’s “Slave Address” field is set to 16#00.

Please see chapter 6.11.2.2 Configuring the Query, page 72, for further details on how to configure a Modbus query.

7. Appendix A: Technical Characteristics

7.1. Environment

Dimensions (excluding connectors)	Height: 120 mm Width: 27 mm Depth: 75 mm
External appearance	Plastic case with device for fixing to a DIN rail.
Torque	PSU connector: between 5 and 7 lbs.-in.
Power supply	<ul style="list-style-type: none"> === 24V insulated $\pm 10\%$ Maximum consumption: Around 95 mA Maximum internal consumption for all of the gateway's electronic cards, relating to the internal 5V PSU: 450 mA
Maximum relative humidity	95% without condensation or seepage, according to IEC 68-2-30
Ambient air temperature around the device, in a dry environment	According to IEC 68-2-1 Ab, IEC 68-2-2 Bb and IEC 68-2-14 Nb: <ul style="list-style-type: none"> • Storage: $-25^{\circ}\text{C} (\pm 3)$ to $+85^{\circ}\text{C} (\pm 2)$ • Operation: $- 5^{\circ}\text{C} (\pm 3)$ to $+70^{\circ}\text{C} (\pm 2)$
UL	E 214107 certificate "open type" category The product should be installed in an electrical cabinet or in an equivalent location.
EC	Certified as complying with European standards, unless otherwise stated.
Electromagnetic compatibility (EMC): Transmission	Complies with the EN 50 081-2:1993 (industrial environment) standard Tested according to class A radiation under the EN 55011:1990 standard
Electromagnetic compatibility (EMC): Immunity	Complies with the EN 50 082-2:1995 and EN 61 000-6-2:1999 (industrial environment) standard Tested according to the ENV 50 204:1995, EN 61000-4-2:1995, EN 61000-4-3:1996, EN 61000-4-4:1995, EN 61000-4-5:1995 and EN 61000-4-6:1996 standards.

7.2. Communication Characteristics

"Upstream" network	Profibus-DP																								
"Downstream" network	Modbus RTU																								
Profibus-DP characteristics	<ul style="list-style-type: none"> • Transmission method: PROFIBUS DIN 19245 Part 1. • Nature of network: Device-oriented bus (DeviceBus). • Network topology: multipoint linear topology (bus) with adapted and active line terminations (see chapter 2.6.2 Wiring Recommendations for the Profibus-DP Network, page 20). • Physical media: single twisted pair copper cable, shielded or not, preferably a type A Profibus-DP cable, with the following characteristics: <table style="width: 100%; border: none;"> <tr> <td style="padding-right: 20px;">- Impedance 135 to 165 Ω</td> <td>- Loop impedance 110 Ω/km</td> </tr> <tr> <td style="padding-right: 20px;">(nominal value 150 Ω)</td> <td>- Conductor diameter 0.64 mm</td> </tr> <tr> <td>- Capacity < 30 nF/km</td> <td>- Conductor section > 0,34 mm²</td> </tr> </table> • Connections: 9-point SUB-D connectors, preferably (see chapter 2.6.2 Wiring Recommendations for the Profibus-DP Network, page 20). • Communication speed: 9.6, 19.2, 45.45, 93.75, 187.5, 500, 1,500 or 12,000 kbits/s. • Maximum network length: the length of each segment (from one line termination to the other) is limited and depends upon the transmission rate. Using one, two, or three repeaters makes it possible to put such segments end to end; one can thus derive the maximum <i>total</i> length of the network, without changing the maximum length of each segment. <table style="width: 100%; border: none; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;">Transmission rate</th> <th style="text-align: center;">Maximum segment length</th> <th style="text-align: center;">Max. network length (with the tree repeaters)</th> </tr> </thead> <tbody> <tr> <td>Up to 93.75 kbits/s</td> <td>1,200 m</td> <td>4,800 m</td> </tr> <tr> <td>187.5 kbits/s</td> <td>1,000 m</td> <td>4,000 m</td> </tr> <tr> <td>500 kbits/s</td> <td>400 m</td> <td>2,000 m</td> </tr> <tr> <td>1,500 kbits/s</td> <td>200 m</td> <td>800 m</td> </tr> <tr> <td>12,000 kbits/s</td> <td>100 m</td> <td>400 m</td> </tr> </tbody> </table> 	- Impedance 135 to 165 Ω	- Loop impedance 110 Ω/km	(nominal value 150 Ω)	- Conductor diameter 0.64 mm	- Capacity < 30 nF/km	- Conductor section > 0,34 mm ²	Transmission rate	Maximum segment length	Max. network length (with the tree repeaters)	Up to 93.75 kbits/s	1,200 m	4,800 m	187.5 kbits/s	1,000 m	4,000 m	500 kbits/s	400 m	2,000 m	1,500 kbits/s	200 m	800 m	12,000 kbits/s	100 m	400 m
- Impedance 135 to 165 Ω	- Loop impedance 110 Ω/km																								
(nominal value 150 Ω)	- Conductor diameter 0.64 mm																								
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Transmission rate	Maximum segment length	Max. network length (with the tree repeaters)																							
Up to 93.75 kbits/s	1,200 m	4,800 m																							
187.5 kbits/s	1,000 m	4,000 m																							
500 kbits/s	400 m	2,000 m																							
1,500 kbits/s	200 m	800 m																							
12,000 kbits/s	100 m	400 m																							

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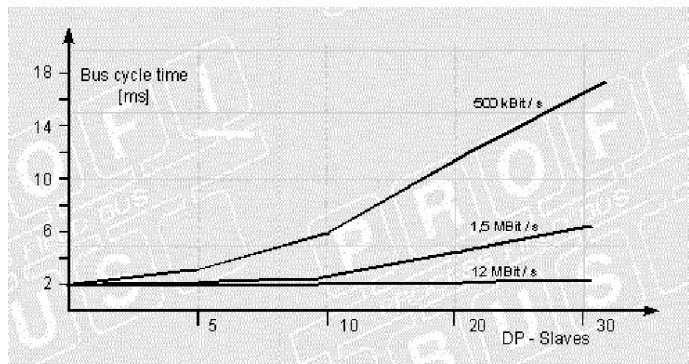
7. Appendix A: Technical Characteristics

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Profibus-DP characteristics (cont'd)

- Maximum number of stations: 32 stations per segment, repeater included; up to 126 stations with all three repeaters (repeaters included). Address 126 is reserved and should therefore not be used for exchanging data.
- Possible types of stations: there are three types of Profibus-DP stations:
 - Class 1 DP master (DPM1): PLC, PC, etc. exchanging information with DP slaves.
 - Class 2 DP master (DPM2): A programming, bus configuring, or commissioning device, used to configure the Profibus-DP network upon commissioning and operation, or supervision.
 - DP slave: Peripheral device that exchanges data cyclically with "its" active DPM1 station.
- Mono-master or multi-master network.
- Hybrid access method: Acyclical communication between masters using the transfer of a token (synchronisation); cyclical master/slaves communications (application data transfers).
- Up to 244 input bytes and 244 output bytes per DP slave; typical exchange of 32 bytes per slave.
- Operating modes: Functional operations (cyclical I/O exchanges), resetting to zero (input reading and output resetting), or disruption (only inter-master functions are allowed).
- Input (Freeze-Mode) and/or output (Sync-Mode) synchronisation of all DP slaves.
- Other services offered:
 - Verification of DP slaves configuration.
 - Advanced diagnostics on three hierarchical levels.
 - Allocation of DP slaves addresses.
 - DP slaves provided with a watchdog triggering timeout.
 - Protection of DP slaves' access to I/O.
- Possibility to connect or disconnect a station without impacting on communications between other stations.

Performance results: diagram presenting the bus cycle time of a mono-master Profibus-DP network, according to the number of DP slaves present on that network (with 2 input bytes and 2 output bytes per DP slave).



Test conditions: minimum slave time interval = 200 μs; TSDI = 37 × duration of one bit; TSDR = 11 × duration of one bit.


Profibus-DP LUFFP7 gateway specifics

- Network type: PROFIBUS EN 50 170 (DIN 19245).
- Protocol version: v1.10.
- Standard connections: Female SUB-D 9-point connector, which is recommended for baud rates exceeding 1.5 Mbits/s.
- All baud rates supported (9.6, 19.2, 93.75, 187.5, 500, 1,500, 3,000, 6,000 and 12,000 kbits/s); automatic baud rate detection.
- "DP slave" Profibus-DP station.
- Cyclical data transmissions: up to 244 input bytes and 244 output bytes; 416 bytes exchanged maximum, inputs and outputs included; 24 modules maximum used to configure these I/O.

7. Appendix A: Technical Characteristics

Profibus-DP LUF7 gateway specifics (cont'd)	<ul style="list-style-type: none"> • Profibus-DP address configured using 2 coding wheels (address between 1 and 99); address 0 is not allowed. • Profibus-DP diagnostics service: Yes (standard 6-byte diagnostic). • "Resetting to zero" operating mode (input reading and output resetting to zero) not supported. • Input synchronisation (Freeze-Mode) and output synchronisation (Sync-Mode) supported. • Gateway address allocated by a master: Service not supported. • Configuration conducted using a specific GSD file. • DP-V1 extensions not supported (transmission of non-cyclical data). • Galvanic gateway insulation from the network; D(A) and D(B) signal insulation using opto-couplers. 													
Modbus RTU characteristics	<ul style="list-style-type: none"> • Physical media: RS485 serial link • Network topology: Multipoint linear topology with adapted line terminations (impedance of 120 Ω in parallel with a capacity of 1 nF) • Communication speed: 1,200 to 57,600 kbits/s • Data bits: 8 • Subscriber addresses: 1 to 247. Address 0 reserved for broadcasting. Addresses 65, 126 and 127 reserved if drivers and/or starters from <i>Schneider Electric</i> are used on the same Modbus network. • Period of silence: Equivalent to the transmission of 3.5 characters. 													
Specific Modbus RTU features of the LUF7 gateway	<ul style="list-style-type: none"> • Maximum number of subscribers (excluding gateway): 8 Modbus slaves. • Maximum number of commands configured: Up to 50 Modbus queries and responses configured for the same gateway using AbcConf. • Communication speed: 1,200, 2,400, 4,800, 9,600, or 19,200 bits/s, configured using AbcConf. • Period of silence: Possibility of increasing the gateway's period of silence, in 10 ms steps, using AbcConf. • Parity: None, even or uneven, configured using AbcConf. • Start bits: 1 bit, configuration using AbcConf. • Stop bits: 1 or 2 bits, configuration using AbcConf. 													
Structure of the LUF7 gateway's memory: <div style="text-align: center;">Inputs</div>	<ul style="list-style-type: none"> • 2 bytes for the diagnostics of errors on the downstream network by the gateway (see chapter 5 Gateway Initialization and Diagnostics, page 37). • 242 bytes accessible by the Profibus-DP master in the form of input data (see chapter 10.2.1 Input Data Memory Area, page 95, for default use of these input data). • 268 input bytes inaccessible by the Profibus-DP master due to the maximum number of input bytes that can be exchanged with the gateway (see chapter 4.2.6 Editing and Configuring the Gateway, page 29). <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: left;">Addresses</th> <th style="text-align: center;">Input data area</th> </tr> </thead> <tbody> <tr> <td>16#0000</td> <td rowspan="2" style="text-align: center;">Gateway status word (unless "Control/Status Byte" = "Disabled")</td> </tr> <tr> <td>16#0001</td> </tr> <tr> <td>16#0002</td> <td rowspan="4" style="text-align: center;">Inputs accessible by the Profibus-DP master (242 bytes)</td> </tr> <tr> <td style="text-align: center;">⋮</td> </tr> <tr> <td>16#00F3</td> </tr> <tr> <td>16#00F4</td> </tr> <tr> <td style="text-align: center;">⋮</td> <td rowspan="2" style="text-align: center;">Inputs inaccessible by the Profibus-DP master (268 bytes)</td> </tr> <tr> <td>16#01FF</td> </tr> </tbody> </table>	Addresses	Input data area	16#0000	Gateway status word (unless "Control/Status Byte" = "Disabled")	16#0001	16#0002	Inputs accessible by the Profibus-DP master (242 bytes)	⋮	16#00F3	16#00F4	⋮	Inputs inaccessible by the Profibus-DP master (268 bytes)	16#01FF
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16#01FF														

7. Appendix A: Technical Characteristics

<p>Structure of the LUPF7 gateway's memory:</p> <p style="text-align: center;">Outputs</p>	<ul style="list-style-type: none"> • 2 bytes for the activation or inhibition of the downstream network by the gateway (see chapter 5 Gateway Initialization and Diagnostics, page 37). • 242 bytes accessible by the Profibus-DP master in the form of output data (see chapter chapitre 10.2.2 Output Data Memory Area, page 96, for default use of these output data). • 268 output bytes inaccessible by the Profibus-DP master due to the maximum number of output bytes that can be exchanged with the gateway (see chapter 4.2.6 Editing and Configuring the Gateway, page 29). <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Addresses</th> <th style="text-align: center;">Output data area</th> </tr> </thead> <tbody> <tr> <td>16#0200</td> <td style="text-align: center;">Profibus-DP master control word</td> </tr> <tr> <td>16#0201</td> <td style="text-align: center;">(except if "Control/Status Byte" = "Disabled")</td> </tr> <tr> <td>16#0202</td> <td style="text-align: center;">Outputs accessible by the Profibus-DP master</td> </tr> <tr> <td>16#02F3</td> <td style="text-align: center;">(242 bytes)</td> </tr> <tr> <td>16#02F4</td> <td style="text-align: center;">Outputs inaccessible by the Profibus-DP master</td> </tr> <tr> <td>16#03FF</td> <td style="text-align: center;">(268 bytes)</td> </tr> </tbody> </table>	Addresses	Output data area	16#0200	Profibus-DP master control word	16#0201	(except if "Control/Status Byte" = "Disabled")	16#0202	Outputs accessible by the Profibus-DP master	16#02F3	(242 bytes)	16#02F4	Outputs inaccessible by the Profibus-DP master	16#03FF	(268 bytes)										
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<p>Structure of the LUPF7 gateway's memory:</p> <p style="text-align: center;">General data</p>	<ul style="list-style-type: none"> • 1,024 bytes inaccessible through the Profibus-DP master. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Addresses</th> <th style="text-align: center;">General data area</th> </tr> </thead> <tbody> <tr> <td>16#0400</td> <td style="text-align: center;">Input area reserved for the Mailboxes</td> </tr> <tr> <td>16#051F</td> <td style="text-align: center;">(288 bytes)</td> </tr> <tr> <td>16#0520</td> <td style="text-align: center;">Output area reserved for the Mailboxes</td> </tr> <tr> <td>16#063F</td> <td style="text-align: center;">(288 bytes)</td> </tr> <tr> <td>16#0640</td> <td style="text-align: center;">Internal area reserved for the management</td> </tr> <tr> <td style="text-align: center;">:</td> <td style="text-align: center;">of the upstream network</td> </tr> <tr> <td>16#07BF</td> <td style="text-align: center;">(384 bytes; area not used by the LUPF7 gateway)</td> </tr> <tr> <td>16#07C0</td> <td style="text-align: center;">Internal area reserved for the control registers</td> </tr> <tr> <td>16#07FD</td> <td style="text-align: center;">(62 bytes / MSB first for 16-bit data)</td> </tr> <tr> <td>16#07FE</td> <td style="text-align: center;">Gateway status / Profibus-DP master control</td> </tr> <tr> <td>16#07FF</td> <td style="text-align: center;">(2 bytes)</td> </tr> </tbody> </table> <p style="margin-top: 20px;">  You can use the general data area for Modbus input data (from Modbus responses) if you do not want the Profibus-DP master to have access to them. In this case, <i>always use 16#4000 as the starting address</i>. If you use multiple times the same addresses in this area, the corresponding memory locations will be displayed in red in the "General Area" section of the "Sub-network Monitor" window (see page 55 for an example). However, this will have no consequences on the gateway during run-time. </p>	Addresses	General data area	16#0400	Input area reserved for the Mailboxes	16#051F	(288 bytes)	16#0520	Output area reserved for the Mailboxes	16#063F	(288 bytes)	16#0640	Internal area reserved for the management	:	of the upstream network	16#07BF	(384 bytes; area not used by the LUPF7 gateway)	16#07C0	Internal area reserved for the control registers	16#07FD	(62 bytes / MSB first for 16-bit data)	16#07FE	Gateway status / Profibus-DP master control	16#07FF	(2 bytes)
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16#07FE	Gateway status / Profibus-DP master control																								
16#07FF	(2 bytes)																								
<p>Data transfer order (swapping)</p>	<ul style="list-style-type: none"> • Profibus-DP network: MSB first and LSB last. • Modbus RTU network: MSB first and LSB last. • LUPF7 gateway MSB stored in the lowest memory address. <p>→ In most cases, the option which should be chosen for Modbus data stored in the gateway's memory is "No swapping". This option relates to all "Data" fields for Modbus queries and responses frames.</p>																								

8. Appendix B: LUF7 Gateway GSD File

The LUF7 gateway GSD file contains all the information and settings for configuring the gateway under Profibus-DP. This file, "Tele071F.gsd", is used by SyCon to generate information that will eventually be used by the DPM1 master PLC during setup phases.

Refer to chapter 4.2.4 Setting up the Gateway Description Files, page 28, to review the procedure for importing the GSD file under SyCon.

8.1. Identification Number

The most important information contained in the GSD file is the identification number "Ident_Number" of the device type it designates (DP slave or DPM1 master). This identification number is, in particular, used by a DPM1 master upon setting up its communications with a DP slave, in addition to checking its address on the Profibus-DP network.

The allocation of Profibus-DP identification numbers is reserved for the Profibus International (PI) association. As each identification number is unique and specific to each device type, you should change neither the number, nor the remainder of the provided GSD file. *Schneider Electric* reserves the rights to change the content of this file.

Sample Profibus-DP products, with their identification numbers and the related GSD files:

Schneider Electric product	Identification number	Name of the related GSD file
LUF7 gateway	16#071F	Tele071F.gsd
TEGO POWER	16#BECE	tk3110.gsd
ATV58	16#00B9	Tele00b9.gsd
ATV68	16#1234	VEE_1234.gsd
TSX PB5 100	16#1654	Sad_1654.gsd
ATV58/ATV66 gateway	16#2332	atvp2332.gsd

8.2. GSD File Content

<pre>===== ; Profibus Device Database of : ; Schneider Electric Gateways ; Model : LUF7 ; Description : Profibus-DP/Modbus Gateway ; Language : English ; Date : 14 November 2002 ; Author : Schneider Electric [EB/JFR] ;===== #Profibus DP GSD_Revision = 2</pre>	GSD file header.
<pre>; Device identification Vendor Name = "Schneider Electric" Model Name = "LUF7" Revision = "Version 1.0" Ident Number = 0x071F Protocol_Ident = 0 ; DP protocol Station Type = 0 ; Slave device FMS supp = 0 ; FMS not supported Hardware Release = "Version 1.41" Software_Release = "Version 1.12"</pre>	LUF7 gateway identification as a Profibus-DP device.

8. Appendix B: LUF7 Gateway GSD File

<pre> ; Supported baudrates 9.6_supp = 1 19.2_supp = 1 45.45_supp = 1 93.75_supp = 1 187.5_supp = 1 500_supp = 1 1.5M_supp = 1 3M_supp = 1 6M_supp = 1 12M_supp = 1 </pre>	<p>Communication rates supported by the LUF7 gateway.</p> <p>All rates should be mentioned in this section. The gateway supports all the baud rates of the Profibus-DP networks.</p>
<pre> ; Maximum responder time for supported baudrates MaxTsdr_9.6 = 60 MaxTsdr_19.2 = 60 MaxTsdr_45.45 = 60 MaxTsdr_93.75 = 60 MaxTsdr_187.5 = 60 MaxTsdr_500 = 100 MaxTsdr_1.5M = 150 MaxTsdr_3M = 250 MaxTsdr_6M = 450 MaxTsdr_12M = 800 </pre>	<p>Maximum response time of the gateway, depending on the baud rate of the Profibus-DP network.</p> <p>The response times specified for the gateway are standard values, compatible with the TSX PB100 coupler, for example.</p>
<pre> ; Supported hardware features Redundancy = 0 ; not supported Repeater Ctrl Sig = 2 ; TTL 24V Pins = 0 ; not connected Implementation_Type = "SPC3" </pre>	<p>General hardware characteristics specific to Profibus-DP.</p>
<pre> ; Supported DP features Freeze Mode supp = 1 ; supported Sync Mode supp = 1 ; supported Auto Baud supp = 1 ; supported Set_Slave_Add_supp = 0 ; not supported </pre>	<p>Supported and not supported Profibus-DP services.</p>
<pre> ; Maximum polling frequency Min_Slave_Intervall = 1 ; 100 us </pre>	<p>Maximum polling frequency / Minimum polling interval</p> <p>100 µs is the smallest interval that can be configured.</p>
<pre> ; Maximum supported sizes Modular_Station = 1 ; modular Max Module = 24 Max Input Len = 244 Max Output Len = 244 Max Data Len = 416 Modul_Offset = 1 </pre>	<p>The LUF7 gateway is a modular Profibus-DP device, i.e. the size of its I/O exchanges on the Profibus-DP network is configured by combining several modules together (see below).</p>
<pre> Fail Safe = 0 ; state CLEAR not accepted Slave_Family = 0 Max_Diag_Data_Len = 6 </pre>	<p>Supported and not supported Profibus-DP services (cont'd).</p> <p>The length of the gateway's diagnostic data should remain equal to 6. N.B. there are no parameter data (the "User_Prm_Data_Len" and "User_Prm_Data" parameters are therefore omitted).</p>
<pre> Bitmap Device = "LUF7 R" Bitmap Diag = "LUF7 D" Bitmap_SF = "LUF7 S" </pre>	<p>Names of the bitmap files used by SyCon to display the gateway's connection status.</p>
<pre> ; Definition of modules </pre>	<p>Beginning of the section where the modules used for configuring the sizes of the gateway inputs and outputs are defined.</p>

8. Appendix B: LUPF7 Gateway GSD File

```
Module = "IN/OUT: 1 Byte" 0x30
EndModule
;
Module = "IN/OUT: 2 Byte ( 1 word)" 0x70
EndModule
;
Module = "IN/OUT: 4 Byte ( 2 word)" 0x71
EndModule
;
Module = "IN/OUT: 6 Byte ( 3 word)" 0x72
EndModule
;
Module = "IN/OUT: 8 Byte ( 4 word)" 0x73
EndModule
;
Module = "IN/OUT: 10 Byte ( 5 word)" 0x74
EndModule
;
Module = "IN/OUT: 12 Byte ( 6 word)" 0x75
EndModule
;
Module = "IN/OUT: 14 Byte ( 7 word)" 0x76
EndModule
;
Module = "IN/OUT: 16 Byte ( 8 word)" 0x77
EndModule
;
Module = "IN/OUT: 32 Byte (16 word)" 0x7F
EndModule
;
Module = "IN/OUT: 64 Byte (32 word)" 0xC0,0x5F,0x5F
EndModule
;
Module = "IN/OUT: 128 Byte (64 word)" 0xC0,0x7F,0x7F
EndModule
;
Module = "INPUT: 1 Byte" 0x10
EndModule
;
Module = "INPUT: 2 Byte ( 1 word)" 0x50
EndModule
;
Module = "INPUT: 4 Byte ( 2 word)" 0x51
EndModule
;
Module = "INPUT: 6 Byte ( 3 word)" 0x52
EndModule
;
Module = "INPUT: 8 Byte ( 4 word)" 0x53
EndModule
;
Module = "INPUT: 10 Byte ( 5 word)" 0x54
EndModule
;
Module = "INPUT: 12 Byte ( 6 word)" 0x55
EndModule
;
Module = "INPUT: 14 Byte ( 7 word)" 0x56
EndModule
;
Module = "INPUT: 16 Byte ( 8 word)" 0x57
EndModule
;
Module = "INPUT: 32 Byte (16 word)" 0x5F
EndModule
;
Module = "INPUT: 64 Byte (32 word)" 0x40,0x5F
EndModule
;
```

Definition of the "IN/OUT" (inputs size = outputs size), "INPUT", and "OUTPUT" modules.

Modularity: under SyCon, one can combine all three types of modules (I/O, inputs, and outputs), up to the maximum number of modules "Max_Module", the maximum number of input bytes "Max_Input_Len", the maximum number of output bytes "Max_Output_Len", and the total maximum number of input and output bytes "Max_Data_Len". **You must not exceed any of these four limits.**

Example 1: should the gateway exchange 83 input bytes and 33 output bytes, you could combine the following modules:

- INPUT: 64 Byte (32 word)
- INPUT: 16 Byte (8 word)
- INPUT: 2 Byte (1 word)
- INPUT: 1 Byte
- OUTPUT: 32 Byte (16 word)
- OUTPUT: 1 Byte

Example 2: should the gateway exchange 33 input bytes and 34 output bytes, you could use the following combination:

- IN/OUT: 32 Byte (16 word)
- INPUT: 1 Byte
- OUTPUT: 2 Byte (1 word)

9. Appendix C: Default Configuration

```
Module = "INPUT: 128 Byte (64 word)" 0x40,0x7F
EndModule
;
Module = "OUTPUT: 1 Byte" 0x20
EndModule
;
Module = "OUTPUT: 2 Byte ( 1 word)" 0x60
EndModule
;
Module = "OUTPUT: 4 Byte ( 2 word)" 0x61
EndModule
;
Module = "OUTPUT: 6 Byte ( 3 word)" 0x62
EndModule
;
Module = "OUTPUT: 8 Byte ( 4 word)" 0x63
EndModule
;
Module = "OUTPUT: 10 Byte ( 5 word)" 0x64
EndModule
;
Module = "OUTPUT: 12 Byte ( 6 word)" 0x65
EndModule
;
Module = "OUTPUT: 14 Byte ( 7 word)" 0x66
EndModule
;
Module = "OUTPUT: 16 Byte ( 8 word)" 0x67
EndModule
;
Module = "OUTPUT: 32 Byte (16 word)" 0x6F
EndModule
;
Module = "OUTPUT: 64 Byte (32 word)" 0x80,0x5F
EndModule
;
Module = "OUTPUT: 128 Byte (64 word)" 0x80,0x7F
EndModule
```

10. Appendix C: Default Configuration

The configuration described below corresponds to the LUF7 gateway's default configuration.



This chapter mainly gives the user information about the performances obtained on the downstream Modbus network. It allows the user to decide whether, for example, he should change the period for cyclical exchanges with one or more of the TeSys U motor starters (see chapter 6 Configuring the Gateway, page 44).

10.1. Configuring Modbus Exchanges

The LUF7 gateway carries out four types of exchanges with each of the 8 TeSys U motor starters. The first two exchanges are cyclical and allow you to control and monitor the motor starter. The last two exchanges are aperiodic (only when there is a change in the values of the data to be transmitted to the motor starter) and allow you to read and change the value of any motor starter parameter.

Function	Modbus function	Number of bytes (1)	Exchange between the LUF7 gateway and the TeSys U motor starter
16#03	Read Holding Registers	11,5 + 10,5	Periodic reading (300 ms period) of the TeSys U motor starter's status register (address 455 = 16#01C7) only
16#10	Preset Multiple Registers	14,5 + 11,5	Periodic writing (300 ms period) of the TeSys U motor starter's status register (address 704 = 16#02C0) only
(16#03)	(Read Holding Register)	11,5 + 10,5	Aperiodic reading of the value of a single parameter, for a single TeSys U motor starter at a time (function and address supplied by the user)
(16#06)	(Preset Single Register)	11,5 + 11,5	Aperiodic writing of the value of a single parameter, for a single TeSys U motor starter at a time (function and address and value supplied by the user)

- (1) Number of bytes in the Query + number of bytes in the Response, plus a period of silence of 3.5 characters for each of these two frames (see description of the "Message delimiter (10ms)" parameter in chapter 6.12.3 "Sub-Network" Element, page 83). Each byte will be transmitted in the form of a group of 10 bits (8 data bits, 1 start bit and 1 stop bit). These values allow you to calculate the approximate amount of traffic on the downstream Modbus network as follows:

Volume of periodic traffic (300 ms period)..... [(11.5 + 10.5) + (14.5 + 11.5)] × (8 + 1 + 1) = 480 bits

For 1 TeSys U motor starter 1 × 480 × (1,000 ÷ 300) = 1,600 bits/s

For 8 TeSys U motor starters 8 × 480 × (1,000 ÷ 300) = 12,800 bits/s

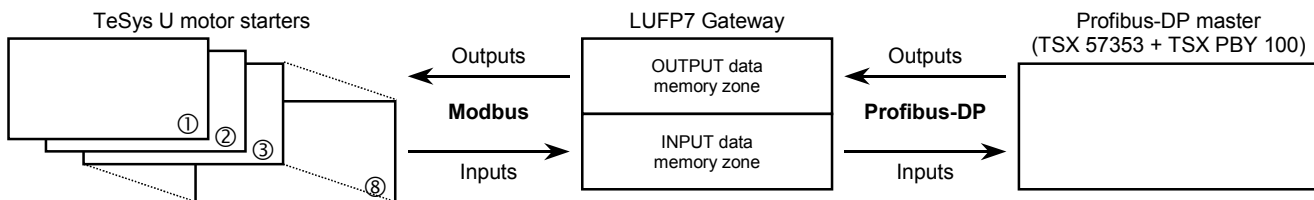
As a result, on a network operating at 9,600 bits/s, you will need to considerably increase the cycle time for all or part of the periodic Modbus commands. On the other hand, at a speed of 19,200 bits/s (default speed), the available bandwidth is sufficient to allow proper communications, even in occasional degraded mode (frames re-transmission), and to allow the use of aperiodic parameter reading/writing exchanges.

10. Appendix C: Default Configuration

10.2. Content of the Gateway's DPRAM Memory

The LUPF7 gateway's DPRAM memory contains all of the data exchanged between the gateway and the 8 TeSys U motor starters, as well as two special registers only exchanged between the gateway and the Profibus-DP master (words used for managing the downstream Modbus network).

The flow of data exchanged between the TeSys U motor starters, the gateway and the Profibus-DP master is shown below, in order to highlight the role of the gateway's memory in these exchanges:



N.B.: The total number of input and output bytes should be less than or equal to 416 bytes. It is therefore not possible to configure both the maximum number of input bytes and the maximum number of output bytes, which are both equal to 244 bytes.

10.2.1. Input Data Memory Area

The gateway has 244 input bytes. Only the first 32 bytes are used. Byte 12#0012 is used for adjusting the following 16-bit data, so that they can be aligned on even addresses, and for obtaining a total size of 32 input bytes. One should therefore configure only one 32-byte input/output module using a Profibus-DP configuration device such as SyCon.

ENGLISH

Service	Address	Size	Description
Managing the downstream Modbus network	16#0000	1 word	Gateway status word
Periodic communications — Monitoring of TeSys U motor starters	16#0002	1 word	Value of the motor starter ① status register
	16#0004	1 word	Value of the motor starter ② status register
	16#0006	1 word	Value of the motor starter ③ status register
	16#0008	1 word	Value of the motor starter ④ status register
	16#000A	1 word	Value of the motor starter ⑤ status register
	16#000C	1 word	Value of the motor starter ⑥ status register
	16#000E	1 word	Value of the motor starter ⑦ status register
	16#0010	1 word	Value of the motor starter ⑧ status register
—	16#0012	1 byte	Free memory location
Aperiodic communications — Reading the value of a motor starter parameter (RESPONSE)	16#0013	1 byte	Slave no. (16#01 to 16#08)
	16#0014	1 byte	Function number (16#03)
	16#0015	1 byte	Number of bytes read (16#02)
	16#0016	1 word	Value of the parameter read (16#xxxx)
Aperiodic communications — Writing the value of a motor starter parameter (RESPONSE)	16#0018	1 byte	Slave no. (16#01 to 16#08)
	16#0019	1 byte	Function number (16#06)
	16#001A	1 word	Address of the parameter written (16#xxxx)
	16#001C	1 word	Value of the parameter written (16#xxxx)
Aperiodic communications ("Trigger bytes" for the responses)	16#001E	1 byte	Read parameter response counter
	16#001F	1 byte	Write parameter response counter
—	16#0020	1 byte	Free input area (212 bytes)
	16#00F3	1 byte	
—	16#00F4	1 byte	Unusable input area (268 bytes)
	16#01FF	1 byte	

10. Appendix C: Default Configuration

10.2.2. Output Data Memory Area

The gateway has 244 output bytes. Only the first 32 bytes are used. One should therefore configure only one 32-byte input/output module using a Profibus-DP configuration device such as SyCon.

Service	Address	Size	Description
Managing the downstream Modbus network	16#0200	1 word	Profibus-DP master control word
Periodic communications — Controlling TeSys U motor starters	16#0202	1 word	Value of the motor starter ① command register
	16#0204	1 word	Value of the motor starter ② command register
	16#0206	1 word	Value of the motor starter ③ command register
	16#0208	1 word	Value of the motor starter ④ command register
	16#020A	1 word	Value of the motor starter ⑤ command register
	16#020C	1 word	Value of the motor starter ⑥ command register
	16#020E	1 word	Value of the motor starter ⑦ command register
	16#0210	1 word	Value of the motor starter ⑧ command register
Aperiodic communications — Reading the value of a motor starter parameter (QUERY)	16#0212	1 byte	Slave no. (16#01 to 16#08)
	16#0213	1 byte	Function number (16#03)
	16#0214	1 word	Address of the parameter to be read (16#xxxx)
	16#0216	1 word	Number of parameters to be read (16#0001)
Aperiodic communications — Writing the value of a motor starter parameter (QUERY)	16#0218	1 byte	Slave no. (16#01 to 16#08)
	16#0219	1 byte	Function number (16#06)
	16#021A	1 word	Address of the parameter to be written (16#xxxx)
	16#021C	1 word	Value of the parameter to be written (16#xxxx)
Aperiodic communications (“Trigger bytes” for the queries)	16#021E	1 byte	Read parameter query counter
	16#021F	1 byte	Write parameter query counter
—	16#0220 ...	1 byte	Free output area (212 bytes)
	16#02F3	1 byte	
—	16#02F4 ...	1 byte	Unusable output area (268 bytes)
	16#03FF	1 byte	

10.2.3. Total Number of Modbus Queries and Responses

The total number of Modbus queries and responses is equal to 36 (2 periodic queries and 2 periodic responses for each of the 8 TeSys U motor starters, plus 2 aperiodic queries and 2 aperiodic responses for all of these motor starters). Since the total number of the Modbus queries and responses one can configure for a single gateway is limited to 50, there is only 14 spare Modbus queries and responses (that is to say the equivalent of 7 Modbus commands).

So this reserve does not allow the addition of any single Modbus command for each of the TeSys U motor starters, as this would require the use of 16 Modbus queries and responses (1 query and 1 response for each of the 8 motor starters).

11. Appendix D: Sample Use under PL7 PRO

A practical example can be found on the CD LU9CD1. It is composed of four files.



- The first file, “LUF7_Tutorial_EN.pb”, is a SyCon file for a Profibus-DP network. It therefore represents the configuration of the Profibus-DP network, as it is described in the previous chapters. This file is useful only if you wish to change the configuration.
- The second file, “LUF7EN.cnf”, is the configuration file exported in ASCII format from SyCon. It corresponds to the configuration defined in the previous file. You must therefore generate a new “.cnf” file if you change the first file or use another “.pb” file.









The “LUF7EN.cnf” file should be copied to the “C:\PL7USER\” directory. If you copy it to another directory, you should specify its location, under PL7 PRO, using the “Load CNF” button available in the TSX PBY 100 board configuration screen.

- The third and fourth file, “lufp7_tutorial_EN_tsx57353.stx” and “lufp7_tutorial_EN_tsx57202.stx”, are PL7 PRO files and therefore represents the actual example for a TSX Premium PLC with respectively a TSX57353 processor and TSX57202 processor. The next chapters deal with its content and the way to use those files.

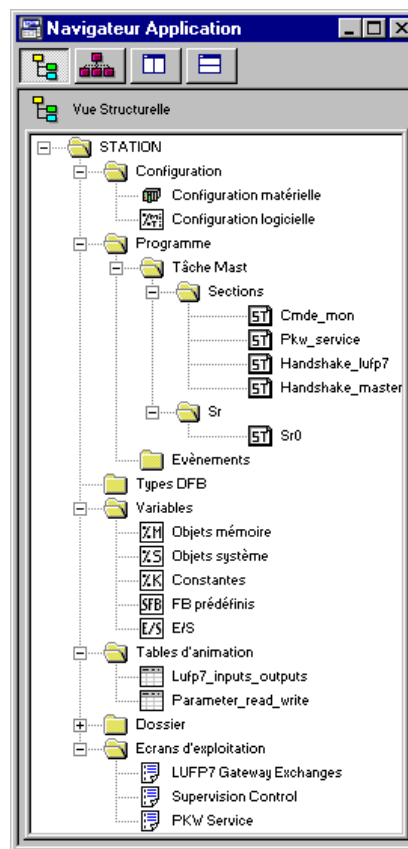
The configuration of the two SyCon files corresponds exactly to what is described in the previous chapters. Therefore, their content is not detailed here. However, the PL7 PRO file is described below, based on the structure of the program sections used and the related operating screens.

11.1. Overview of the “LUF7 - Tutorial Example”

In this example, the various program sections and sub-programs (icon ) and also the operations screens (icon ) are organized as follows:

- LUF7 gateway initialization and diagnostics:
 -  Handshake_luf7
 -  Handshake_master
 -  LUF7 Gateway Exchanges
- Control and supervision screen for the 8 TeSys U motor starters:
 -  Cmde_mon
 -  Sr0
 -  Supervision Control
- Reading and writing of any TeSys U motor starter parameter (service similar to the “parameter area PKW”):
 -  Pkw_service
 -  PKW Service

Each of the groupings presented above is described in an independent chapter.




11. Appendix D: Sample Use under PL7 PRO

This description remains concise, because it is only meant to describe the overall operation of the program and the way to use the related screen. If you need further detail, don't hesitate and review the actual content of the example under PL7 PRO.

The source code is commented by and large to help you understand how this works. Each "program" file starts with a short description of the way it operates, and each line includes a comment.

Each variable used has a symbol whose name describes its use. Use keyboard shortcuts "Ctrl+E" and "Ctrl+F" to display the variables by addresses (e.g. %MW80) or by symbols (e.g. Pkw_checked_boxes_slave).

Two animation tables (icon ) have been created, "Lufp7_inputs_outputs" and "Parameter_read_write." The first animation table presents the I/O that correspond to the exchanges with the LUF7 gateway, i.e. %IW4.0 to %IW4.0.15 and %QW4.0 to %QW4.0.15. The second table presents the I/O related to the aperiodic service for reading/writing the value of any motor starter parameter, and also some local variables used by this service. In the context of this example, this service is also called "PKW" due to its limited similarity with the PKW service implemented on a few other products from *Schneider Electric*. **N.B.** This service was not implemented the same way as the PKW service and must therefore not be used identically!

11.2. LUF7 Gateway Initialization and Diagnostics

The "LUF7 gateway exchanges" operating screen comprises four separate sections:

- Hexadecimal display of gateway input data (%IW4.0 to %IW4.0.15) in the **INPUTS** frame. These inputs are named and grouped in the same manner as in this guide (see chapter 4.2.9 Configuring the Gateway I/O under PL7 PRO, page 32). Of course, the display of these input data is correct only if the gateway default configuration is used.

A green/red LED indicates whether the various input data have already been updated by the gateway. It is associated to bit 13 (ABC_DU) of the gateway status word.



These input data include periodic Modbus data (controlling and monitoring) and aperiodic Modbus data (parameter reading/writing). In order for the LED to turn green, a parameter read command and a parameter write command must both have received a response from a Modbus slave!

A second green/red LED indicates whether the input data are updated on a periodic basis or not by the gateway, i.e. if periodic exchanges take place properly with all Modbus slaves. It is associated to bit 12 of the gateway status word. Unlike the first LED, only one Modbus command per slave should receive a response on a periodic basis for this LED to remain green.

- Hexadecimal display of gateway output data (%QW4.0 to %QW4.0.15) in the **OUTPUTS** frame. *Ditto*.

The green/red LED indicates whether the Profibus-DP master wants the gateway to communicate with the Modbus slaves. It is associated to bit 13 (FB_DU) of the Profibus-DP master control word, which is updated in the "Handshake_master" program, in accordance with the user controls described below. **See note (1).**

- User controls for enabling / disabling exchanges on the gateway Modbus sub-network. These two exclusive buttons are meant to switch the value of bit 13 (FB_DU) of the Profibus-DP master control word and to generate a new control meant for the gateway (see "Handshake_master" program description and chapter 5.2.1 Profibus-DP Master Control Word, page 38). **See note (1).**

11. Appendix D: Sample Use under PL7 PRO

- Comprehensive display of LUFP7 gateway diagnostics, via a thorough interpretation of the gateway status word (see chapter 5.2.2 Gateway Status Word, page 40). This interpretation is made in the program “Handshake_lufp7”.

A button appears as soon as a new diagnostic is made available by the gateway for the Profibus-DP master. Pressing that button takes the new value of the gateway status word into account and acknowledges the new diagnostic.

The “**Handshake_master**” program assists the screen presented on the previous page in conducting the following tasks:

- Display of two buttons meant for enabling and disabling exchanges on the gateway Modbus sub-network **See note (1)**.
- Transmission (to the gateway) of the command related to the button pressed by the user. This is done only once the gateway acknowledges the previous command, i.e. once bit 14 of the gateway status word has the same value as bit 14 of the Profibus-DP master control word. (1)

In that case, bit 13 of the Profibus-DP master control word is updated in accordance with the user command, and the value of its bit 14 is inverted to notify the gateway of the presence of a new command. **See note (1)**.

- (1) The LED, the two buttons, and the related processings, should not be used with the gateway default configuration as the choice retained for the “Control/Status Byte” option is “Enabled but no startup lock” (see chapter 5 Gateway Initialization and Diagnostics, page 37 and chapter 5.3 Diagnostic Only, page 41). These elements are therefore only meant to make this example compatible with the “Enabled” option (see chapter 5.2 Full Management, page 37).

The “**Handshake_lufp7**” program also assists the screen described on the previous page in conducting the following tasks:

- Display the button meant to take the content of the gateway status word into account. This button is displayed only if a new diagnostic is available, i.e. if the value of bit 15 of the gateway status word is different from that of bit 15 of the Profibus-DP master control word.
- When the user presses that button, the content of the gateway status word is analyzed in order to generate four separate messages according to the following data: gateway input data update/validity (bit 13), periodicity of Modbus exchanges (bit 12), error code (bits 8-11) and unit/nature of the data element related to the error code (bits 0-7).

Bit 15 of the Profibus-DP master control word is then set to the same value as bit 15 of the gateway status word to notify the gateway that the diagnostic has been taken into account and it can therefore deliver a new one.

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11.3. Controlling and Supervising the 8 TeSys U Motor Starters

The “**Supervision Control**” operating screen (see picture below) is meant to monitor the status of the 8 TeSys U motor starters, numbered from 1 to 8. It is also meant to control them individually using several buttons.

Registers 455 and 704 of each of the 8 TeSys U motor starters are used to conduct this control and supervision:

455 – TeSys U status register (IEC61915)

- Bit 0Motor starter ready
- Bit 1Contactor in the ON position (**1**)
- Bit 2Fault (*trip or dropout*)
- Bit 3Alarm presence
- Bit 4Specific: *Tripped* (**I >>**)
- Bit 5Specific: Fault reset authorized
- Bit 6Specific: A1-A2 supply
- Bit 7Specific: Motor running
- Bits 8-13 ...Motor current (2#10 0000 = 200%)
- Bit 14Reserved: Local control
- Bit 15Ramping (motor starting)

704 – (IEC61915) command register

- Bit 0Reserved: Run forward
- Bit 1Reserved: Run reverse
- Bit 2Reserved (stopping)
- Bit 3Reset
- Bit 4Reserved (emergency start)
- Bit 5Self test: Triggering test (*trip*)
- Bit 6Reserved (low speed)
- Bits 7-11 ...Reserved by the IEC61915 standard
- Bit 12Specific: Overload (*shunt trip*)
- Bit 13Specific: Pause (reserved for adjustment)
- Bits 14-15 .Specific: Reserved

These statuses and controls are grouped in two sections: “General Status”, for the general operating mode of the motor starters, and “Motor” for the general operating mode of controlled motors. The last section, “DEBUG COMM.”, displays the registers %IW and %QW used for each motor starter.

This screen is represented below, but only for the first motor starter, as it is identical for the 7 others.

Most displays in this operating screen are directly tied to the %MW registers containing the values of registers %IW4.0.1 to %IW4.0.8 and %QW4.0.1 to %QW4.0.8 (status and command registers of the TeSys U motor starters). Only the indirect controls and statuses are described below.

The “**Cmd_mon**” program conducts the following tasks:

- Copy the values of words %MW20 to %MW27 to output registers %QW4.0.1 to %QW4.0.8, and copy the values of input registers %IW4.0.1 to %IW4.0.8 to words %MW10 to %MW17.

These data are copied because word bit extraction can be carried out on %MW indexed words, but not on %IW indexed words. Actually, the sub-program “**Sr0**” uses word indexing to a large extent, as it makes it possible to process any motor starter, since it is designated by the word %MW0. *E.g.*: “%MW10[%MW0]:X13” is allowed, but not “%IW4.0.1[%MW0]:X13”.

Furthermore, the input and output words are copied one by one, as PL7 PRO does not support expressions such as “%IW4.0.1:8”.

- “**Sr0**” sub-program calling loop, whose purpose is to control and monitor of the 8 TeSys U motor starters. Upon each iteration of this loop, the word %MW0 (“Module”) takes a value from 0 to 7 in order to be used as an index for words %MW10 to %MW17 (inputs) and %MW20 to %MW27 (outputs).

TeSys U		n°1
General Status		1
Ready — ON	<input type="checkbox"/>	<input type="checkbox"/>
PAUSE — Start	[Start]	
Stop	[Stop]	
Alarm — Fault	<input type="checkbox"/>	<input type="checkbox"/>
? Fault reset ?	[NON]	
Fault reset	[]	
Tripped	[]	
Shunt Trip	[SHUNT]	
Test Trip	[TEST]	
MOTOR		
Motor current	[2]	
Motor current (%)	[6.25]	
Run Forward	[FOR]	
Run Reverse	[REV]	
Stopping	[STOP]	
DEBUG COMM.		
TeSys U command	[16#0001]	
TeSys U status	[16#02C3]	

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11. Appendix D: Sample Use under PL7 PRO

The “**Sr0**” sub-program is called once per motor starter from the “**Cmd_mon**” program. Each of these calls should be made with a different value in the word %MW0 (between 0 and 7) as it is used to index the status word and the command word of the same motor starter. The sub-program assists the screen presented on the previous page in conducting the following tasks:

- Determine the overall status of the motor starter with: **I >>** in case of triggering (*tripped*), **1** if the contactor on the motor starter is in the ON position, or **0** in all other cases.
- Use the commands generated by buttons **START** and **STOP** to set the motor starter in off-pause or in pause mode (bit 13 of the command word). **N.B.:** the "pause" mode should not be used for a normal application; you should rather use the **FOR**, **REV** and **STOP** buttons (see below).
- Activate the fault reset command (bit 3 of the command word) if the user pressed the **RAZ** button and the fault LED is on: . Once this command is on, it is cancelled as soon as the LED goes off: .
- Activate the self test command (*trip*) of the motor starter (bit 5 of the command word) if the user pressed the **TEST** button and the “Tripped” LED is off: . Once the command is on, it is cancelled as soon as the LED goes on: .
- Evaluate the value of the motor current, given as a percentage of the IR current value (unit = % FLA). Bits 8 (LSB) to 13 (MSB) of the motor starter status word are extracted and the appropriate unit (.e. 3,125% FLA), is then used to evaluate the current. The maximum value is therefore equal to 63, i.e. 196,875% FLA.
- Use buttons **FOR**, **REV** and **STOP** exclusively to enable only one of the three following controls at a time, while resetting the other two to zero, in descending priority order: stopping (bit 2 of the command word), run forward (bit 0), and run reverse (bit 1).

11.4. Reading and Writing any TeSys U Motor Starter Parameter



Although the term “PKW” is used in the current example, the service for which an example is described here should not be confused with the PKW service of other products from *Schneider Electric*. These two services are different but can also be compared due to their main purpose, which consists in reading/writing the value of any parameter on any Modbus slave.

However, contrarily to the true PKW service, the aperiodic parameter reading/writing service used here does not support the Modbus broadcast feature (i.e. *do not ever use address 0* to access all Modbus slaves at the same time!). In addition, the internal settings of the LUPF7 gateway cannot be accessed using this service.

The “**PKW Service**” operation screen allows the user to issue the reading or the writing of a register on any Modbus slave (mainly one of the 8 TeSys U motor starters from the default configuration). This screen is subdivided into a number of frames, described and displayed hereafter:

- The first frame, “Slave Address,” is used to select the station the aperiodic parameter reading/writing service will poll. Only one box can be checked at any given time. Depending on the box currently checked when the “SEND command” button is being pushed, the “Slave” field of the reading (MSB of %QW4.0.9) or writing (MSB of %QW4.0.12) command will be updated accordingly. The “Other address:” box allows the user to type in an address ranging from 1 to 247.

<p style="text-align: center;">Slave Address</p> <input type="checkbox"/> TeSys U n°1 motor starter <input type="checkbox"/> TeSys U n°2 motor starter <input checked="" type="checkbox"/> TeSys U n°3 motor starter <input type="checkbox"/> TeSys U n°4 motor starter <input type="checkbox"/> TeSys U n°5 motor starter <input type="checkbox"/> TeSys U n°6 motor starter <input type="checkbox"/> TeSys U n°7 motor starter <input type="checkbox"/> TeSys U n°8 motor starter <input type="checkbox"/> Other address: <input type="text" value="0"/>	<p style="text-align: center;">Parameter Address</p> <input type="text" value="455"/> <hr/> <p style="text-align: center;">Value for WRITING</p> <input type="text" value="0"/> <hr/> <p style="text-align: center;">Command</p> <input checked="" type="checkbox"/> Parameter Reading <input type="checkbox"/> Parameter Writing <hr/> <p style="text-align: center;">SEND command</p>
---	---

11. Appendix D: Sample Use under PL7 PRO

- The second frame, “Parameter Address,” allows you to set the address of the parameter to read/write. When the “SEND command” button is being pushed, the value currently set in this frame is copied into the “Read parameter address” field of the reading command (%QW4.0.10) *or* into the “Written parameter address” field of the writing command (%QW4.0.13).
- The third frame, “Value for WRITING,” will only be used if the “Parameter Writing” command is to be issued. The transfer of any value set in this frame into the “Written parameter value” field of the writing command (%QW4.0.14) is done whenever the “SEND command” button is being pushed, provided the “Parameter Writing” box is checked.
- The fourth frame, “Command,” allows you to select the command that will be issued for the aperiodic parameter reading/writing service: read command or write command. Only one box can be checked at any given time.
- The “SEND command” button triggers the update of the gateway’s *periodic* output data (%QW4.0.9 à %QW4.0.14) in such a way that the gateway will issue the command that matches the settings and values from the frames previously described. The reading command is issued using the %QW4.0.9 to %QW4.0.11 outputs and the writing command is issued using the %QW4.0.12 to %QW4.0.14 outputs. All these updates are performed in the “**Pkw_service**” program. A new command is issued and sent each time a modification is brought to the value of the MSB byte (for reading) or to the value of the LSB byte (for writing) of the %QW4.0.15 output.

E.g. In the example displayed above, the frames are used to issue a command intended to read (16#03, i.e. the function code that stands for the “Read Holding Registers” Modbus function) the value of the register no. 455 (address = 16#01C7) on the TeSys U motor starter no. 3 (16#03). The number of read parameters is necessarily equal to 1 (16#0001), but this data is still updated by the “**Pkw_service**” program because it is part of the Modbus command frame the gateway will issue.

- The next four frames, located beneath and apart from the other ones, are intended to display the output data, transmitted to the gateway so that it will issue the corresponding Modbus query, the input data, as received by the gateway from one of its Modbus slaves in response to this query, the counters used by the gateway to trigger the emission of a command, and the counters updated by the gateway in order to mark the reception of a response. The upper frame is dedicated to the reading command (%QW4.0.9 to %QW4.0.11 for the query sent by the gateway and %IW4.0.9 to %IW4.0.11 for the response sent back by the Modbus slave) and the middle frame is dedicated to the writing command (%QW4.0.12 to %QW4.0.14 for the query sent by the gateway and %IW4.0.12 to %IW4.0.14 for the response sent back by the Modbus slave). Finally, the lowest two frames display the counters (or “Trigger bytes”) associated to these queries and responses. The queries counters are transmitted to the gateway using the %QW4.0.15 output, whereas the responses counters are read using the %IW4.0.15 input. The contents of these two words is broken down in order to isolate the values of these 8-bit counters.

The **example** located at the top of the next page follows the previously described example, as the output and input data for the aperiodic parameter reading/writing service match the settings and values of the other frames. Here, the value of the parameter is equal to 16#02C3. The middle frame has no valid data because the gateway has not yet been requested by the Profibus-DP master to send any write command.

11. Appendix D: Sample Use under PL7 PRO

READING the value of a parameter			
Query (LUFP7 Outputs)		Response (LUFP7 Inputs)	
Slave (MSB) + Function (LSB)	16#0303	Slave (LSB)	16#0003
Read parameter address	16#01C7	Function(MSB)+Number of bytes(LSB)	16#0302
Number of read parameters	16#0001	Read parameter value	16#02C3

WRITING the value of a parameter			
Query (LUFP7 Outputs)		Response (LUFP7 Inputs)	
Slave (MSB) + Function (LSB)	16#0000	Slave (MSB) + Function (LSB)	16#0000
Written parameter address	16#0000	Written parameter address	16#0000
Written parameter value	16#0000	Written parameter value	16#0000

Queries counters		Responses counters	
Read counter (MSB)	1	Read counter (MSB)	1
Write counter (LSB)	0	Write counter (LSB)	0

The “Pkw_service” program includes the ST instructions that use the settings and values from the first frames of the previously described “PKW Service” operation screen. These instructions are mainly designed to update the PLC outputs that relate to the commands of the aperiodic parameter reading/writing service (%QW4.0.9 to %QW4.0.11 for the read command, %QW4.0.12 to %QW4.0.14 for the write command, and %QW4.0.15 for the counters associated to these two commands). This program processes the following tasks:

- Test of all the checkboxes from the “Slave” and “Command” parts of the screen. If none of the boxes from each of these two parts is currently checked, one of them will be checked by default (Slave = TeSys U no. 1; Command = Parameter Reading).
- Comparison of the values that correspond to these checkboxes over two consecutive PLC cycles in order to keep only one checked box at any given time in each part.
- When the “SEND command” button is detected as being pushed, this program first updates some local variables, then updates the outputs that relate to the aperiodic parameter reading/writing service. This two-times update procedure is intended to cut off the outputs update from the rest of the program. The output data of the gateway are update on a conditional basis:
 - **Parameter Reading** → Updates the %QW4.0.9 to %QW4.0.11 outputs in order for the gateway to issue the corresponding Modbus reading query (data displayed in the “Query (LUFP7 Outputs)” part of the “READING of a parameter value” frame). An 8-bit local counter is incremented each time a new query is issued (the 0 value being reserved, it will be replaced with 1), then transmitted to the gateway using the MSB byte of the %QW4.0.15 output.

The response from the polled slave will then be used by the gateway in order to update the %IW4.0.9 to %IW4.0.11 inputs (data displayed in the “Response (LUFP7 Inputs)” part of the “READING of a parameter value” frame). Each time such a response is received, the gateway increments the MSB byte of the %IW4.0.15 input in order to tell the Profibus-DP master that it has received a new response. This 8-bit counter is not used in this example.

- **Parameter Writing** → Updates the %QW4.0.12 to %QW4.0.14 outputs in order for the gateway to issue the corresponding Modbus writing query (data displayed in the “Query (LUFP7 Outputs)” part of the “WRITING of a parameter value” frame). An 8-bit local counter is incremented each time a new query is issued (the 0 value being reserved, it will be replaced with 1), then transmitted to the gateway using the LSB byte of the %QW4.0.15 output.

The response from the polled slave will then be used by the gateway in order to update the %IW4.0.12 to %IW4.0.14 inputs (data displayed in the “Response (LUFP7 Inputs)” part of the “WRITING of a parameter value” frame). Each time such a response is received, the gateway increments the LSB byte of the %IW4.0.15 input in order to tell the Profibus-DP master that it has received a new response. This 8-bit counter is not used in this example.

12. Appendix E: Profibus-DP Data and Diagnostics

The various elements presented here are detailed in the documentation of the Profibus-DP master you will have to use. In the case of the TSX PBY 100 coupler of the Premium automatic controls, for example, these elements are detailed in the **Implementation Manual – TSX PBY 100 – PROFIBUS-DP** (ref.: TSX DM PBY 100E), and in the PL7 PRO on line help (help path: Communication → Profibus-DP).

However, the most important elements are reproduced here in order to make the LUF7 gateway easier to use.

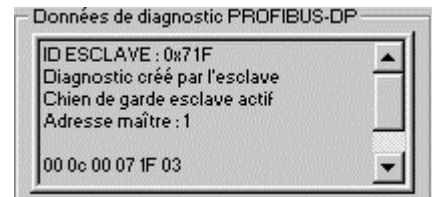
12.1. Gateway Profibus-DP Diagnostics

These diagnostics are the gateway's response to a specific command generated by a Profibus-DP master. This command enables the master to check the status of one of its slaves.

In the case of the LUF7 gateway, the response length is equal to 6 bytes, i.e. the minimum standard and mandatory length for a response to a diagnostic command.

Under PL7 PRO, this response can be viewed in two different ways:

- In the “Debug” screen of the TSX PBY 100 coupler, when the slave whose address corresponds to the gateway's is selected. The gateway Profibus-DP diagnostics are then displayed in the "PROFIBUS-DP diagnostic data". An example is given on the right. It is an excerpt from the screen represented in chapter 4.2.13 Using and Monitoring the TSX PBY 100 Coupler Configuration, page 36.
- Using the SEND_REQ function, the 16#0031 command code, and requesting specifically a diagnostic from the slave concerned.



The table below describes the structure and content of the gateway response to a Profibus-DP diagnostic command sent to it:

Bytes	Structure	Description
0	x0: not_reachable x1: not_ready x2: config_fault x3: ext_diag x4: not_supported x5: invalid_rsp x6: param_fault x7: master_lock	x0=1 if the slave is non connected or switched off x1=1 if the slave is not ready for data exchange x2=1 if there is a slave configuration error upon test request x3=1 if extended diagnostic (bytes 7-255); x3=0 for the LUF7 gateway x4=1 if the function is not supported by the slave x5=1 if there is an error in the slave's first response x6=1 if there is an error in the slave's last setting message x7=1 if the slave is already set up by another master module
1	x0: prm_required x1: diag_data_rdy x2: is_slave_diag x3: wdt_active x4: freeze_mode x5: sync_mode x6 (non utilisé) x7: inactive	x0=1 if the slave should be configured and set up again x1=1 if the slave generated a diagnostic to be processed by the master x2=0/1 if the diagnostic was created by the master / by the slave x3=1 if the slave's watchdog is active x4=1 if the selected slave inputs are frozen x5=1 if the selected slave outputs are frozen x7=1 if the slave is inactive (excluded from the processing)
2	x0..x6 (unused) x7: diag_overflow	x7=1 if the number of diagnostic bytes exceeds the size of the reception words
3	master_address	Address of the master module that sets up the slave
4-5	PNO_identifier	Slave's identification code
6-244	specific_diag (unused)	Optional specific diagnostic data (none for the LUF7 gateway)

12. Appendix E: Profibus-DP Data and Diagnostics

12.2. Gateway Configuration Data

These data are transmitted to the Profibus-DP master upon gateway initialization exchanges. These exchanges enable the Profibus-DP master to set up, configure, and diagnose each of the slaves. The TSX PBY 100 coupler conducts these setup exchanges, but they are not documented in its *Implementation Manual*. Please refer to the general documentation about the Profibus-DP standard if you want further information about initialization exchanges.

If you want to review the configuration data that have been exchanged during Profibus-DP slave setup, you may use the SEND_REQ function in an application developed using PL7 PRO. You must then use the 16#0031 command code and specifically request the reading of the configuration data for the slave concerned (see *Implementation Manual* of the TSX PBY 100 coupler).

The table below describes the structure and content of the response issued by the TSX PBY 100 coupler to a read command of the LUFP7 gateway configuration data:

Bytes	Name	Description
0-1	Total length	Total length of the configuration information, in bytes
2	Number of %IW	Total size of the input data in the %IW area
3	Number of %QW	Total size of the output data in the %QW area
4-5	%IW offset	Offset of the input data blocks in the %IW area
6-7	%QW offset	Offset of the output data blocks in the %QW area
8	Station Status	Configuration of the slave's services (see Profibus-DP standard)
9	Watchdog Factor 1	Slave timeout (see Profibus-DP standard):
10	Watchdog Factor 2	$Timeout = (Watchdog\ Factor\ 1) \times (Watchdog\ Factor\ 2) \times 10\ ms$
11	Min TSDR	Minimum slave TSDR (see Profibus-DP standard)
12-13	PNO_Identifier	Slave identification number (see Profibus-DP standard)
14	Group Flags	Identifiers that characterize the slave's group (see Profibus-DP standard)
15	Address ID	Slave's address on the bus
16	Modular slave	Value = 16#00 / 16#01 if the slave is a compact / modular equipment device
17	Active slave	Value = 16#00 / 16#01 if the slave is inactive/active on the network
18-19	Parameters size	Size (a bytes) of the parameters data block for that slave
20-21	Configuration data size	Size (b bytes) of the configuration data block for that slave
22-23	Size of the data used	Size (c bytes) of the data block used for that slave
24- (23+a)	Parameters	Parameters data block for that slave
(24+a)- (23+a+b)	Configuration data	Configuration data block for that slave
(24+a+b)- (23+a+b+c)	Data used	Data block used for that slave

12. Appendix E: Profibus-DP Data and Diagnostics

For the LUF7 gateway default configuration, the following response is received from the TSX PBY 100 coupler:

Bytes	Name	Value
0-1	Total length	16#0019
2	Number of %IW	16#10
3	Number of %QW	16#10
4-5	%IW offset	16#0000
6-7	%QW offset	16#0000
8	Station Status	16#38
9	Watchdog Factor 1	16#14
10	Watchdog Factor 2	16#01
11	Min TSDR	16#0B
12-13	PNO_Identifier	16#071F

Bytes	Name	Value
14	Group Flags	16#00
15	Address ID (1)	16#02
16	Modular slave	16#01
17	Active slave	16#01
18-19	Settings size	16#0000
20-21	Configuration data size	16#0001
22-23	Size of the data used	16#0000
—	Settings	—
24	Configuration data	16#7F
—	Data used	—

- (1) This value corresponds to the gateway address on the Profibus-DP network, and its value depends on the position of the two coding wheels described in chapter 2.7.1 Encoding the Gateway Address, page 22.

N.B. depending on the network configuration and status, the resulting data are likely not to be strictly identical to the ones presented above.

12.3. General Gateway Information

Another command, also sent to a Profibus-DP master, makes it possible to obtain less detailed information than a slave's configuration data, and the values of statistic counters related to the exchanges between the queried master and the slave.

If you wish to review the general information regarding a Profibus-DP slave, you may use the SEND_REQ function in an application developed using PL7 PRO. Then, you must use the 16#0031 command code and specifically request that the information for the slave concerned be read (see *Implementation Manual* of the TSX PBY 100 coupler).

The table below describes the structure and content of the response issued by the TSX PBY 100 coupler to a read command of the LUF7 gateway general information:

Bytes	Name	Description
0	Configured	16#01 if the slave was configured in accordance with Profibus
1	Operating	16#01 if the slave has been set up and operates properly
2-3	Number of %IW	Total size (words) of the input data in the %IW area
4-5	Number of %QW	Total size (words) of the output data in the %QW area
6	Input data size	Total size (bytes) of the input data on Profibus
7	Output data size	Total size (bytes) of the output data on Profibus
8	Diagnostic data size	Total size (bytes) of the first diagnostic received
9	Compact diagnostic	Compact diagnostic data for that slave
10	Diagnostic counter	Total number of diagnostic messages received from that slave
11	Exchange counter	Number of exchanges between the master and this defective slave
12	Unavailability counter	Number of times this slave is present but unavailable
13	Invalid response counter	Number of invalid responses for this slave

12. Appendix E: Profibus-DP Data and Diagnostics

For the LUF7 gateway default configuration, the following response is received from the TSX PBY 100 coupler:

Bytes	Name	Value
0	Configured	16#01
1	Operating	16#01
2-3	Number of %IW	16#0010
4-5	Number of %QW	16#0010
6	Input data size	16#20
7	Output data size	16#20

Bytes	Name	Value
8	Diagnostic data size	16#06
9	Compact diagnostic	16#00
10	Diagnostic counter (1)	16#0A
11	Exchange counter (1)	16#02
12	Unavailability counter (1)	16#03
13	Invalid response counter (1)	16#02

- (1) The values of all four counters vary while the coupler and gateway are operating. These are modulo 256 counters, i.e. their values loop back from 255 to 0.

13. Appendix F: Modbus Commands

Only the Modbus commands shown in the right-hand table are supported by the gateway. The structure of the query and response frames for each of these commands is then described in the following chapters.

Function code		Broadcast (1)	Modbus command
3	16#03	—	Read Holding Registers
6	16#06	Yes	Preset Single Register
16	16#10	Yes	Preset Multiple Registers

(1) The content of this column shows whether the command can be added (“Yes”) or not (“—”) to the list of a broadcaster node’s commands, known as “Broadcaster” in AbcConf.

In the following chapters, each byte of the query and response frames of a Modbus command are described, one after another, with the exception of the fields shown opposite. These are always present in the queries and responses of all Modbus commands.

The “Slave Address” and “Function” fields are the first two bytes of these frames. The two bytes of the “Checksum” are their last two bytes.

Slave Address	- Value cannot be changed (Modbus address: 1 to 247. Addresses 125, 126, and 127 prohibited)
Function	- Value cannot be changed (code of the Modbus command)
... Other fields Specific features of Modbus commands ...
Checksum (Lo)	- Type of error check
Checksum (Hi)	- Number of the 1st byte checked

The descriptions of the Modbus frames which appear in the following chapters are mainly intended to help you to configure the gateway’s Modbus exchanges using AbcConf. Please see the documentation of each Modbus slave to check for any restriction regarding these frames (number of registers which can be read or written in a single Modbus command, for example).

It is a better idea to get hold of a standard Modbus document, such as the guide entitled *Modicon Modbus Protocol Reference Guide* (ref.: PI-MBUS-300 Rev. J), so that you can see the correspondence between the elements displayed in AbcConf and the content of the corresponding Modbus frames. Here is an example of a correspondence for a full frame (including the start and end of frame fields shown above), based on the “Read Holding Registers” Command (16#03) (see chapter 13.1, page 109):

	Elements under AbcConf	Modbus frame fields	Size
Modbus query	Slave Address	Slave no.	1 byte
	Function	Function no.	1 byte
	Starting Address (Hi, Lo)	No. of the 1st word (MSB / LSB)	2 bytes
	Number of points (Hi, Lo)	Number of words (MSB / LSB)	2 bytes
	Checksum	CRC16 (LSB / MSB)	2 bytes
Modbus response	Slave Address	Slave no.	1 byte
	Function	Function no.	1 byte
	Byte count	Number of bytes read	1 byte
	Data	Value of 1st word (MSB / LSB)	2 bytes
	
		Value of last word (MSB / LSB)	2 bytes
Checksum	CRC16 (LSB / MSB)	2 bytes	

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13. Appendix F: Modbus Commands

Chapter 6.11 Adding and Setting Up a Modbus Command, page 68, also shows a few examples of correspondences between the elements displayed in AbcConf and the corresponding Modbus frame fields.

See also: Chapter 6.11.2 With a Generic Modbus Slave, page 70, and chapter 6.11.3 Adding a Special Modbus Command, page 80, if the implementation of one of these commands would be incompatible with its implementation in the gateway, for example. You then have to create a special Modbus command to compensate for this incompatibility.

N.B. here, the notions of “input” and “output” (and assimilated) are irrelevant, as all Modbus commands have access to all of a Modbus slave’s memory. However, these names are retained in order to comply with the terms used in the standard Modbus documentation.

13.1. “Read Holding Registers” Command (16#03)

Frame	Field	Value or properties
Query	Starting Address (MSB)	- Address of the 1st output / internal register
	Starting Address (LSB)	
	Number of points (PF)	- Number of output / internal registers
	Number of points (Pf)	
Response	Byte count	- Number of data bytes = Number of output / internal registers × 2
	Data (first register / MSB)	- Byte swap = “No swapping” (or “Swap 2 bytes”)
	Data (premier registre / Pf)	
	- Data length = Value of the “Byte count” field
	Data (demier registre / PF)	- Data location = Address in the gateway’s input memory
Data (demier registre / Pf)		

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13.2. “Preset Single Register” Command (16#06)

Frame	Field	Value or properties
Query	Register (MSB)	- Address of the output / internal register
	Register (LSB)	
	Preset data (MSB)	- Byte swap = “No swapping” (or “Swap 2 bytes”)
	Preset data (LSB)	- Data length = 16#0002 - Data location = Address in the gateway’s output memory
Response	Register (MSB)	- Byte swap = “No swapping” (or “Swap 2 bytes”)
	Register (LSB)	- Data length = 16#0002
	Preset data (MSB)	- Data location = Address in the gateway’s input memory
	Preset data (LSB)	N.B.: These data are an echo to the query. So in most cases there is no need to feed them back to the Profibus-DP master.



Instead of creating a link between the echo of the response to the “Preset Single Register” Command (16#06) and the memory area dedicated to the Profibus-DP inputs (16#0002-16#00F3), you’d better link it with the address 16#0400.

13. Appendix F: Modbus Commands

13.3. “Preset Multiple Registers” Command (16#10)

Frame	Field	Value or properties
Query	Starting Address (MSB)	- Address of the 1st output / internal register
	Starting Address (LSB)	
	Number of Registers (MSB)	- Number of output / internal registers
	Number of Registers (LSB)	
	Byte Count	- Number of data bytes = number of output / internal registers × 2
	Data (first register / MSB)	- Byte swap = “No swapping” (or “Swap 2 bytes”)
	Data (first register / LSB)	
	- Data length = Value of the “Byte count” field
	Data (last register / MSB)	- Data location = Address in the gateway’s output memory
Data (last register / LSB)		
Response	Starting Address (MSB)	- Address of the 1st output / internal register
	Starting Address (LSB)	
	Number of Registers (MSB)	- Number of output / internal registers
	Number of Registers (LSB)	

13.4. Modbus Protocol Exception Responses

When it cannot process a command dictated by a Modbus query, a slave sends an exception response instead of the normal response to the query.



With standard Modbus commands, the LUPF7 gateway considers that all exception responses which it receives from Modbus slaves are incorrect responses. As a result, it will carry out the re-transmissions configured for the queries involved.

If you want the software application for your Profibus-DP master to be able to specifically manage exception responses, you can replace the Modbus command, in AbcConf, with a personalized command (see chapter 6.11.3.2 Modbus Commands which Can Be Completely Changed by the User, page 80). This then allows you to feed back the “Slave Address” and “Function” fields to the Profibus-DP master.

The structure of an exception response is independent of the Modbus command associated with the “Function” field of the query involved. The whole frame of an exception response is shown below :

Slave Address	Modbus address (1 to 247; addresses 125, 126 and 127 prohibited): The value of this field is identical to that of the “Slave Address” field of the query involved.
Function	Command code, with exception indicator: The value of this field is set to 16#80 + the value of the “Function” field of the query involved.
Exception Code	Code indicating the nature of the error which has caused the exception response (see table on next page).
Checksum (Lo)	Error check
Checksum (Hi)	

13. Appendix F: Modbus Commands

Code	Name of the exception	Description of the exception
16#01	ILLEGAL FUNCTION	The query's "Function" command code is not implemented in the Modbus slave software, or it is unable to process it for the moment.
16#02	ILLEGAL DATA ADDRESS	The combination of the query's "Starting Address" and "No. of Registers" fields (or assimilated fields) gives access to one or more addresses which are not accessible on the Modbus slave.
16#03	ILLEGAL DATA VALUE	The value of one of the Modbus query's fields is outside the authorized limits. This error does not affect the content of the "Data" (or assimilated) fields, as this error only takes account of the fields used for managing the Modbus protocol.
16#04	SLAVE DEVICE FAILURE	An unrecoverable failure has occurred when processing the command.
16#05 (1)	ACKNOWLEDGE	The Modbus slave informs the gateway that it has accepted the command (acknowledgement), but that it will take too long to process it and it cannot afford to wait for the completion of this process before sending a response. The gateway should transmit subsequent queries in order to determine whether the command has finished or not.
16#06 (1)	SLAVE DEVICE BUSY	The Modbus slave informs the gateway that it is already in the process of running a command and therefore it cannot run the one transmitted to it. So the gateway should re-transmit the query subsequently.
16#07 (1)	NEGATIVE ACKNOWLEDGE	The Modbus slave informs the gateway that it cannot process the requested command. This exception only affects commands 13 and 14 (16#0D and 16#0E). These functions are not part of the standard Modbus commands and are not described in this document.
16#08 (1)	MEMORY PARITY ERROR	The Modbus slave informs the gateway that it has detected a parity error on the access to its own memory. This exception only affects standard commands 20 and 21 (16#14 and 16#15) which are not supported by the gateway.

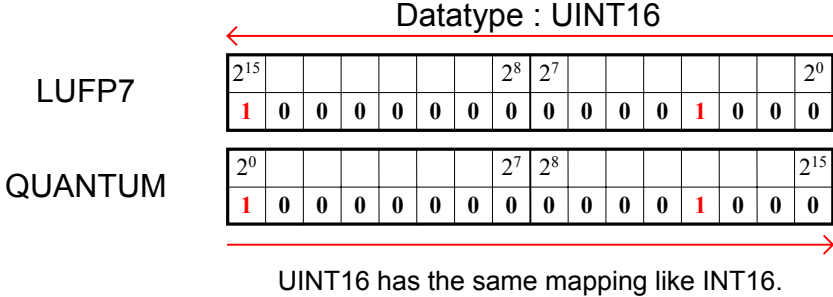
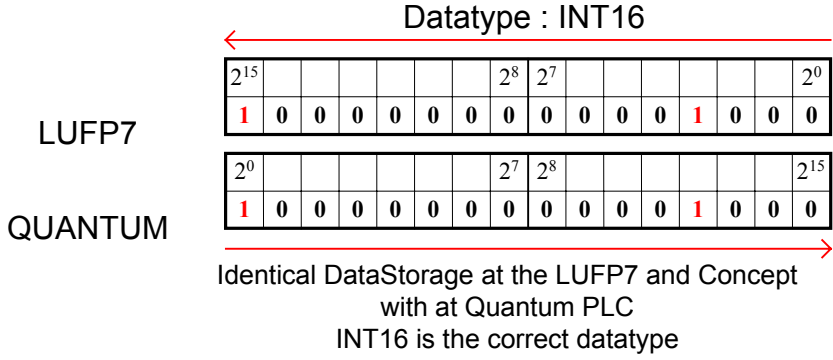
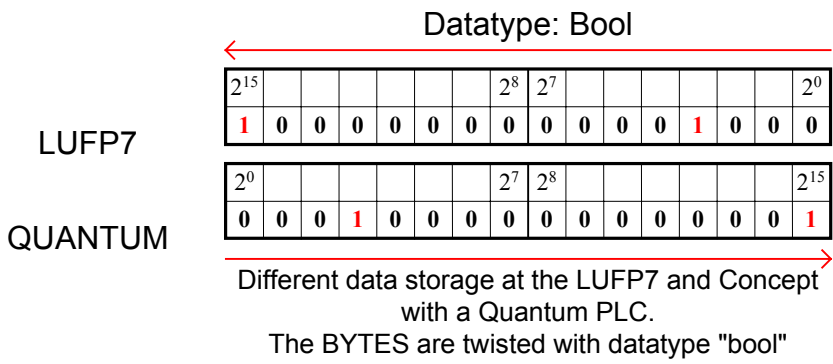
(1) Please see the standard Modbus documentation for further information about these various scenarios.

14. Appendix F : Concept and Quantum PLC

The default data type of Concept with a Quantum PLC is "BOOL".

As shown in the first drawing hereafter, "BOOL" should not be used for the data storage of the LUFFP7. The bytes (MSB/LSB) and bits are twisted with data type "BOOL".

The data type for the LUFFP7 gateway at Concept should be changed to "INT16" or "UINT16". In this case the data storage of the gateway and the PLC is identical.



14. Appendix F : Concept and Quantum PLC

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