

**User manual for the MODBUS  
TCP INTERFACE on LTMs and  
multi bypasses**

**UPS/NTA GB/MODBUS TCP MTC.A**

15/02/2007

## FOREWORD

We thank you for the trust you have in the Uninterruptible Power Systems and LTMs/Bypasses designed by Socomec Sicon.

This equipment is fitted with up to date technology and power semiconductors (IGBT) including a digital micro-controller.

Our equipment complies with standard IEC EN 62040-2.

**CAUTION:** "This is a product for restricted sales distribution to informed partners. Installation restrictions or additional measures may be needed to prevent disturbances".

SOCOMECSICON UPS reserves the right to make any changes to data without prior notice.

## SAFETY REQUIREMENTS

### *Using conditions:*

Do read carefully this manual before using.  
Whatever the repairs, they must be made only by authorised staffs which have been suitably trained.

### *Reference to the using of the LTM*

Respect the safety requirements.  
Do read carefully the operating instructions of the LTM/Bypass prior to any intervention.  
For an optimal operation, it is recommended to maintain the ambient temperature and humidity of the UPS environment below the values specified by the manufacturer.

This equipment meets the requirements of the European directives applied to this product. As a consequence, it is labelled as follows:



## ENVIRONMENT CONCERNED REGULATION

### *Recycling of electrical products and equipment*

Provision is made in European countries to break up and recycle materials making up the system. The various components must be disposed of in accordance with the legal provisions in force in the country where the system is installed.

## 1. INTRODUCTION

### General

The **LTM/BYPASS range of SOCOMECSICON** proposes an interface of *MODBUS TCP* type for direct connection of LTM/BYPASSES systems to the Ethernet network.

This manual describes the features of the connection as well as the data available through the network.

### Ethernet Interface

The interface proposes 2 types of connection:

- the « real port » mode, for which the host detects the communication as a standard serial port.
- the full TCP mode as per specifications « *modbus-ida* ».

This document does not describe the way the MODBUS TCP protocol is managed. For further details, please visit the official website [www.modbus-ida.org](http://www.modbus-ida.org). A summary of IDA specifications can be found at the end of the document.

The MODBUS TCP protocol for **LTM/BYPASS** equipment uses *Input Registers -3-* with a 16 bit coding for data reading and *Write single Registers -6-* for LTM management.

The data field is composed of words with a most significant byte (MSB) and a less significant byte (LSB) read as follows:

| DATA (WORD)     |                |                |                |
|-----------------|----------------|----------------|----------------|
| MSB             |                | LSB            |                |
| b <sub>7</sub>  | b <sub>0</sub> | b <sub>7</sub> | b <sub>0</sub> |
| b <sub>15</sub> |                | b <sub>0</sub> |                |

### Data decoding

#### Binary data

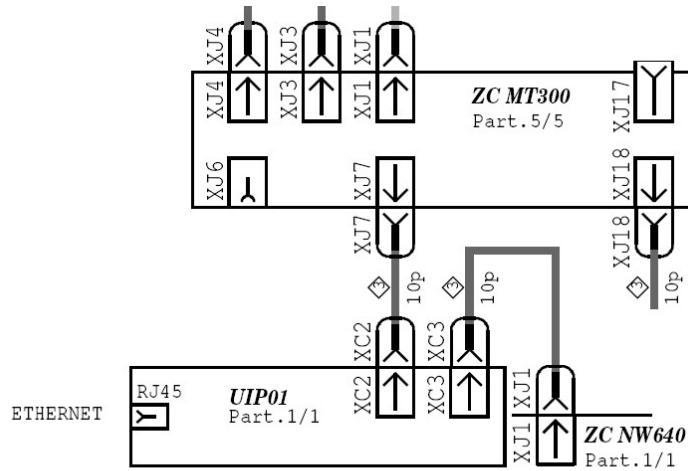
They consist of the status and alarms of the LTM. Each bit of each word corresponds to a data. When set at 1 in a word, the bit means the status or alarm is active.

#### Analogue data (measurement and counter data)

They consist of a 16-bit word. Some values are expressed in decimals bearing a sign or not (i.e. 0 to 65535 or -32767 to 32767) or in hexadecimal coding (0x0000 to 0xFFFF).

## 2. INSTALLATION OF THE MODBUS TCP PCB

### Layout diagram



### Installation of the MODBUS TCP interface

The interface has been integrated to the electronic system of the LTM/BYPASS. The integration depends on the range of LTM/BYPASS systems (DIN support, on a sheet metal panel...).

The Ethernet connector RJ45 is intended for the connection to the network.

## Setting by default of the serial connection (compulsory step)

Baudrate: 9600 bauds  
 Parity: none  
 Data: 8 bits  
 Stop: 1 bit  
 Slave: 1

The parameters of the serial connection can be programmed from the control panel. **If this function can not be accessed, default parameters are then used.**



The connection must be set as conditions mentioned above. If need be, the configuration can be modified through the user interface.

*Configuration screen of the control panel*

|               |             |                           |             |   |
|---------------|-------------|---------------------------|-------------|---|
| 9 6 0 0       | S A N S     | N o d ' e s c l a v e : 1 | 1 b i t     | ^ |
| V i t e s s e | P a r i t é | S t o p                   | R e t o u r | V |
| F1            | F2          | F3                        | F4          |   |

The activation of the serial connection is programmed by the Servicing department during the LTM/BYPASS commissioning or PCB installation. (SOCOMECSUPERVISOR DEVICE set at NO)

## Description of LEDs

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|                        |                |                        |
|------------------------|----------------|------------------------|
| Yellow LED RJ45:       | ON:            | Line detected          |
|                        | Blinking:      | Searching line         |
|                        | OFF:           | No Ethernet line       |
| Green LED RJ45:        | ON:            |                        |
|                        | OFF:           | No traffic             |
|                        | Blinking:      | MODBUS TCP Traffic     |
| Interface green LED TX | ON:            | when transmitting data |
| Interface green LED RX | ON:            | when receiving data    |
| LED 5V iso             | Interface live |                        |

## Features

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IEEE 802.3  
10/100Base-T  
10/100Mbps (auto sensing)  
mode Half-duplex & Full-duplex (auto sensing)  
RJ-45

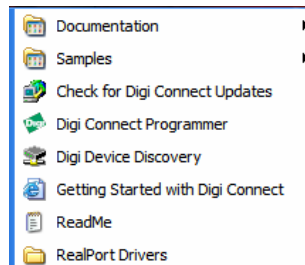
## 3. DEFAULT SETTING OF THE MODBUS TCP INTERFACE

### **Default setting**

DHCP mode by default. No IP address set by default  
 Mode MODBUS TCP  
 Port TCP 502

### **Configuration software**

Configuration tools are to be installed on a PC with WINDOWS. The setup programme is on the CD provided with the interface. A new programme group has been created.



### **Searching the LTMs connected to the Ethernet**

The utility program « *Digi Device Discovery* » is for viewing the IP and MAC addresses of each LTM.

### **Accessing http pages**

Data related to connection and module setting can be accessed using the web interface. The « home page » can be opened either by means of the « *Discovery* » utility or the Internet browser by selecting the IP address indicated by the « *Discovery* » utility.

Access to pages is protected by a « login » and a password.

Login by default: root

Password: dbps

### **Downloading firmware**

By default the module is programmed with the firmware for the MODBUS TCP function.

In case of « real port » mode, the firmware on the CD must first be downloaded.

For any other configurations, please refer to the DIGI® manual available on the CD.

#### 4. MODBUS TCP DATA MAP FOR LTM/BYPASS systems

##### General data map of MODBUS TCP input frames

| § | Description       | Start address |         | Length of the data map in words | JBUS function |
|---|-------------------|---------------|---------|---------------------------------|---------------|
|   |                   | Hexa          | Decimal |                                 |               |
| 1 | Status and alarms | 0x0000        | 0       | 16                              | 3 for reading |
| 2 | Measurements      | 0x0010        | 16      | 64                              | 3 for reading |
| 3 | Controls          | 0x0040        | 64      | 1word/control                   | 6 for writing |

*How to read data:*

The status and alarms map must be read thoroughly (start address and length of data map).

The measurement data map can be addressed word by word or by set of words, but without exceeding the length of the map (from 0x0000 to 0x003F).

*Incoming data structure:*

| example of 6 words |                |                 |                |                 |                |                 |                |                 |                |                 |                |
|--------------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| 1                  | 2              | 3               | 4              | 5               | 6              | 7               | 8              | 9               | 10             | 11              | 12             |
| MSB 0              | LSB 0          | MSB 1           | LSB 1          | MSB 2           | LSB 2          | MSB 3           | LSB 3          | MSB 4           | LSB 4          | MSB 5           | LSB 5          |
| WORD 0             |                | WORD 1          |                | WORD 2          |                | WORD 3          |                | WORD 4          |                | WORD 5          |                |
| b <sub>15</sub>    | b <sub>0</sub> | b <sub>15</sub> | b <sub>0</sub> | b <sub>15</sub> | b <sub>0</sub> | b <sub>15</sub> | b <sub>0</sub> | b <sub>15</sub> | b <sub>0</sub> | b <sub>15</sub> | b <sub>0</sub> |
| D15                | D00            |                 |                |                 |                |                 |                |                 |                |                 |                |
| M00                |                | M01             |                | M02             |                | M03             |                | M04             |                | M05             |                |



**MODBUS TCP data map of status and alarms**

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Each word is explained bit by bit.

**0000h : Status Source 1**

|     |                              |      |          |
|-----|------------------------------|------|----------|
| D0: | Load on source 1             | D8:  | Not used |
| D1: | Static Switch (CS) 1 closed  | D9:  | Not used |
| D2: | Load on maintenance bypass 1 | D10: | Not used |
| D3: | Reserved                     | D11: | Not used |
| D4: | Source 1 out of tolerances   | D12: | Not used |
| D5: | Source 1 absent              | D13: | Not used |
| D6: | Q41 closed                   | D14: | Not used |
| D7: | Not used                     | D15: | Not used |

**0001h : Status Source 2**

|     |                              |      |          |
|-----|------------------------------|------|----------|
| D0: | Load on source 2             | D8:  | Not used |
| D1: | Static Switch (CS) 2 closed  | D9:  | Not used |
| D2: | Load on maintenance bypass 2 | D10: | Not used |
| D3: | Reserved                     | D11: | Not used |
| D4: | Source 2 out of tolerances   | D12: | Not used |
| D5: | Source 2 absent              | D13: | Not used |
| D6: | Q42 closed                   | D14: | Not used |
| D7: | Not used                     | D15: | Not used |

**0002h : Output status**

|     |                               |      |                          |
|-----|-------------------------------|------|--------------------------|
| D0: | Source 1 preferred            | D8:  | Output out of tolerances |
| D1: | Q30 closed                    | D9:  | Output absent            |
| D2: | Load on preferred source      | D10: | Not used                 |
| D3: | Load on alternate source      | D11: | Not used                 |
| D4: | CS of preferred source closed | D12: | Not used                 |
| D5: | CS of alternate source closed | D13: | Not used                 |
| D6: | Load not supplied             | D14: | Not used                 |
| D7: | Sources synchronised          | D15: | Not used                 |

**0003h : General status**

|     |                      |      |             |
|-----|----------------------|------|-------------|
| D0: | Transfer in progress | D8:  | Not used    |
| D1: | Not used             | D9:  | Not used    |
| D2: | Not used             | D10: | Not used    |
| D3: | Not used             | D11: | Reserved    |
| D4: | Not used             | D12: | Reserved    |
| D5: | Not used             | D13: | Remote mode |
| D6: | Not used             | D14: | Reserved    |
| D7: | Not used             | D15: | Reserved    |

**0004h : Alarms**

|     |   |      |                  |
|-----|---|------|------------------|
| D0: | Imminent stop                                 | D8:  | Alarm CS2        |
| D1: | Detection Icc (short circuit current)         | D9:  | Electronic alarm |
| D2: | Transfer locked                               | D10: | Not used         |
| D3: | Transfer impossible                           | D11: | Not used         |
| D4: | Return impossible                             | D12: | Not used         |
| D5: | Maintenance bypass alarm (Q5x and Q30 closed) | D13: | Not used         |
| D6: | Overload                                      | D14: | Not used         |
| D7: | Alarm CS1                                     | D15: | General alarm    |

**0005h : Faults 1**

|     |                                      |      |                        |
|-----|--------------------------------------|------|------------------------|
| D0: | Preventive alarm temperature CS1     | D8:  | Reserved               |
| D1: | Temperature CS1                      | D9:  | Output voltage sensor  |
| D2: | Reserved                             | D10: | Electronic temperature |
| D3: | Power supply Driver CS1              | D11: | Not used               |
| D4: | Ventilation CS1 (if option provided) | D12: | Not used               |
| D5: | Reserved                             | D13: | Standard power supply  |
| D6: | Phase rotation source 1              | D14: | Input supply 1         |
| D7: | Critical overload CS1                | D15: | Input supply 2         |

**0006h : Faults 2**

|     |                                      |      |  |
|-----|--------------------------------------|------|--|
| D0: | Preventive alarm temperature CS2     | D8:  | Reserved                                   |
| D1: | Temperature CS2                      | D9:  | Not used                                   |
| D2: | Reserved                             | D10: | Not used                                   |
| D3: | Power supply driver CS2              | D11: | Not used                                   |
| D4: | Ventilation CS2 (if option provided) | D12: | Not used                                   |
| D5: | Reserved                             | D13: | Optional power supply (if option provided) |
| D6: | Phase rotation source 2              | D14: | Power supply MT610 (if option provided)    |
| D7: | Critical overload CS2                | D15: | Reserved                                   |

**0007h : Controls enabled**

|     |          |      |                   |
|-----|----------|------|-------------------|
| D0: | Reserved | D8:  | Remote/local mode |
| D1: | Reserved | D9:  | Not used          |
| D2: | Reserved | D10: | Not used          |
| D3: | Reserved | D11: | Not used          |
| D4: | Reserved | D12: | Not used          |
| D5: | Reserved | D13: | Not used          |
| D6: | Reserved | D14: | Not used          |
| D7: | Reserved | D15: | Not used          |

**0008h to 000Fh: Not used**

**MODBUS TCP data map of measurements**

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|              |                                     |          |                         |
|--------------|-------------------------------------|----------|-------------------------|
| <b>0010h</b> | phase to phase voltage U13 source 1 | Volts    |                         |
| <b>0011h</b> | phase to phase voltage U21 source 1 | Volts    |                         |
| <b>0012h</b> | phase to phase voltage U32 source 1 | Volts    |                         |
| <b>0013h</b> | Frequency source 1                  | Hz x 100 | example: 4993 = 49,93Hz |
| <b>0014h</b> | output voltage V1                   | Volts    |                         |
| <b>0015h</b> | output voltage V2                   | Volts    |                         |
| <b>0016h</b> | output voltage V3                   | Volts    |                         |
| <b>0017h</b> | load rate                           | %        | example: 51 = 51Hz      |
| <b>0018h</b> | crest factor                        | x10      | example: 14 = 1,4       |
| <b>0019h</b> | Frequency source                    | Hz x 100 | example: 4993 = 49,93Hz |
| <b>001Ah</b> | Reserved                            |          |                         |
| <b>001Bh</b> | Reserved                            |          |                         |
| <b>001Ch</b> | Reserved                            |          |                         |
| <b>001Dh</b> | Reserved                            |          |                         |
| <b>001Eh</b> | Reserved                            |          |                         |
| <b>001Fh</b> | Reserved                            |          |                         |
| <b>0020h</b> | phase to phase voltage U13 source 2 | Volts    |                         |
| <b>0021h</b> | phase to phase voltage U21 source 2 | Volts    |                         |
| <b>0022h</b> | phase to phase voltage U32 source 2 | Volts    |                         |
| <b>0023h</b> | Frequency source 2                  | Hz x 100 | example: 4993 = 49,93Hz |
| <b>0024h</b> | output current phase 1              | Amperes  |                         |
| <b>0025h</b> | output current phase 2              | Amperes  |                         |
| <b>0026h</b> | output current phase 3              | Amperes  |                         |
| <b>0027h</b> | Phase shift source 1 and source 2   | μ second |                         |
| <b>0028h</b> | Electronic temperature              | °C       |                         |
| <b>0029h</b> | Output power - phase L1             | kVA      |                         |
| <b>002Ah</b> | Output Power - phase L2             | kVA      |                         |
| <b>002Bh</b> | Output Power - phase L3             | kVA      |                         |
| <b>002Ch</b> | Reserved                            |          |                         |
| <b>002Dh</b> | Reserved                            |          |                         |
| <b>002Eh</b> | Reserved                            |          |                         |
| <b>002Fh</b> | Reserved                            |          |                         |

**0030h to 003Fh:** Not used

## MODBUS TCP data map of controls

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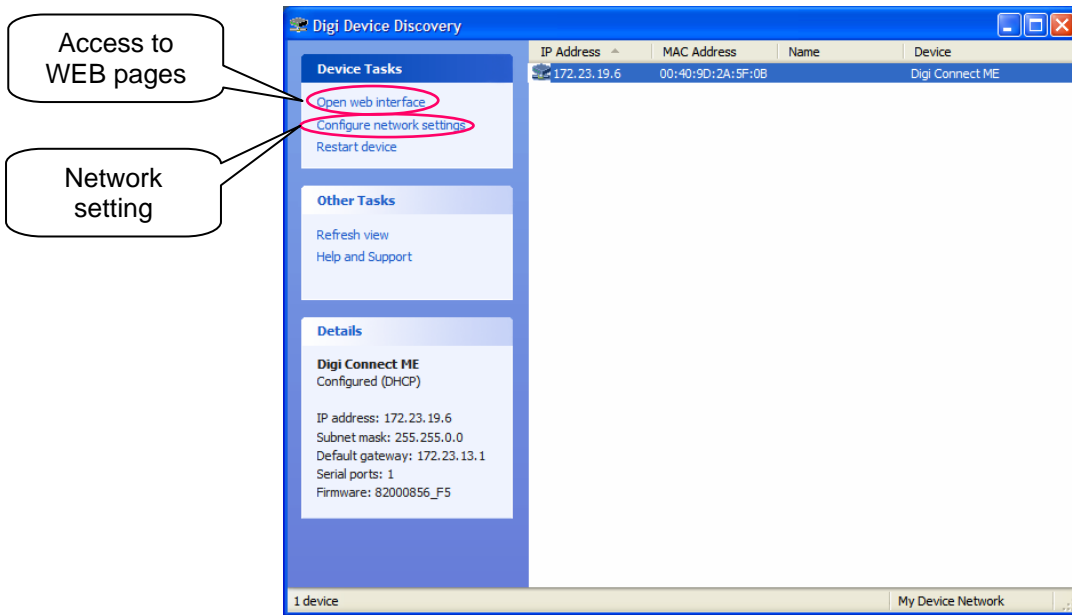
Each control corresponds to an address. Write value « 1 » at the corresponding address to activate the control.

- 0040h** : Closing of CS on preferred source
- 0041h** : Closing of CS on alternate source
- 0042h** : Closing CS1
- 0043h** : Closing CS2
- 0044h** : Load stop
- 0045h** : Alarm reset
- 0046h** : Transfer locked
- 0047h** : Source 1 preferred
- 0048h** : Source 2 preferred
- 0049h** : Reserved
- 004Ah** : Reserved
- 004Bh** : Reserved
- 004Ch** : Reserved
- 004Dh** : Reserved
- 004Eh** : Reserved
- 004Fh** : Reserved

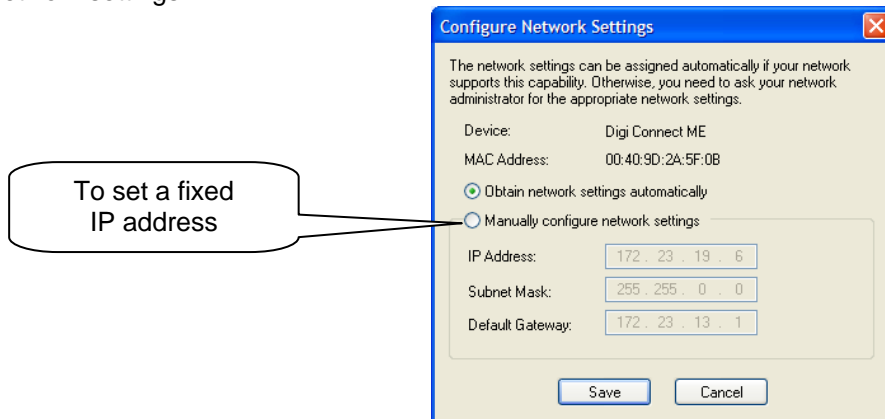
NOTE: A value different from zero at the address activates the control.

**ANNEXE 1: SETTING OF THE INTERFACE USING DIGI DEVICE DISCOVERY<sup>1</sup>**

Searching the LTMs connected to the Ethernet

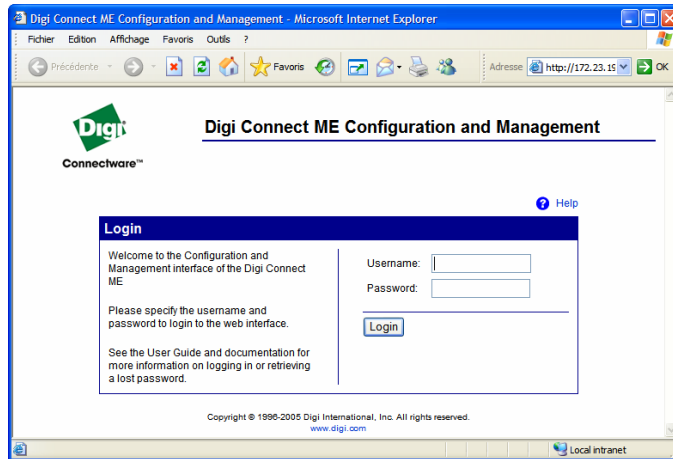


Network settings:



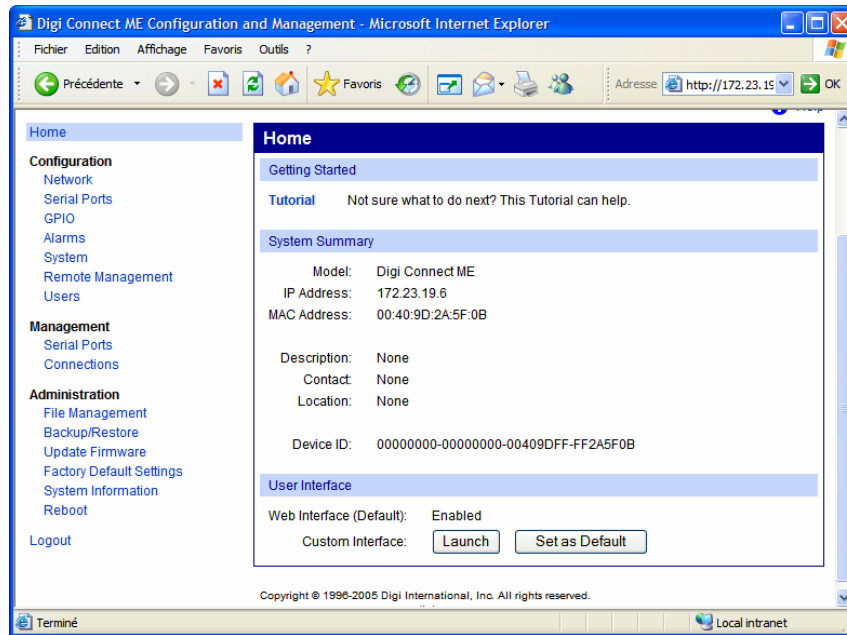
<sup>1</sup> Digi is a registered brand.

## Access to HTTP pages

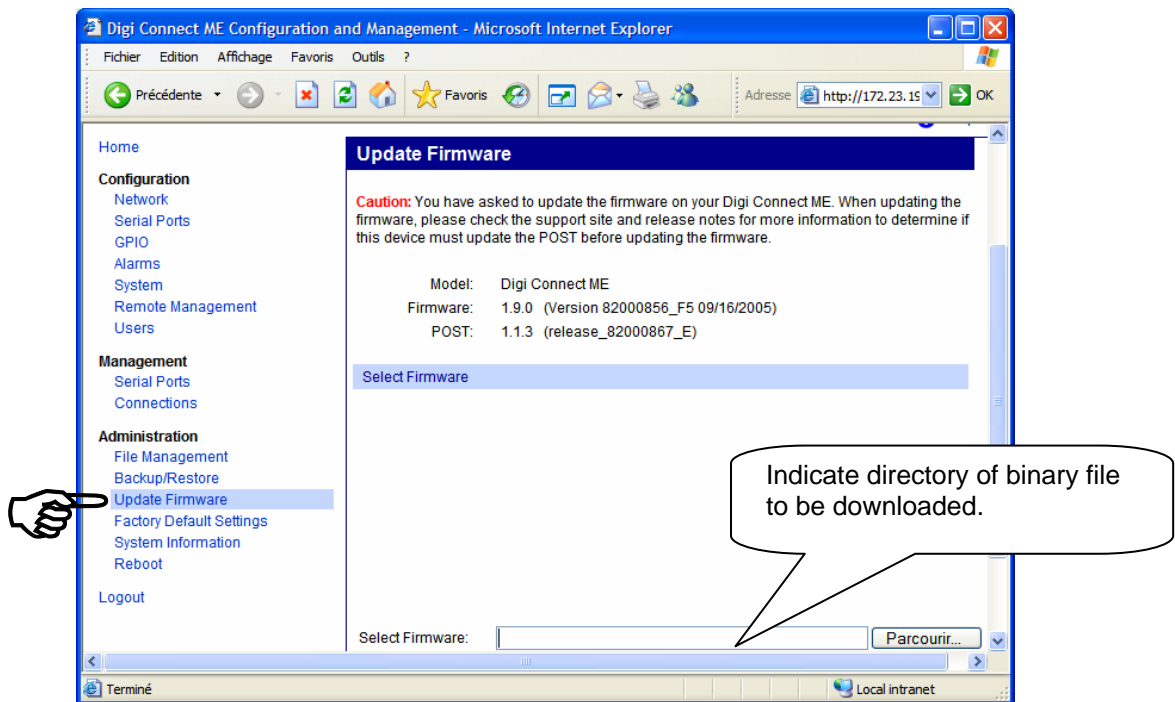


Login: root  
Password: dbps

Home Page:



Updating of the firmware:



Version of firmware:

MODBUS TCP: 82001164.bin

REAL PORT: 82000856\_F5.bin

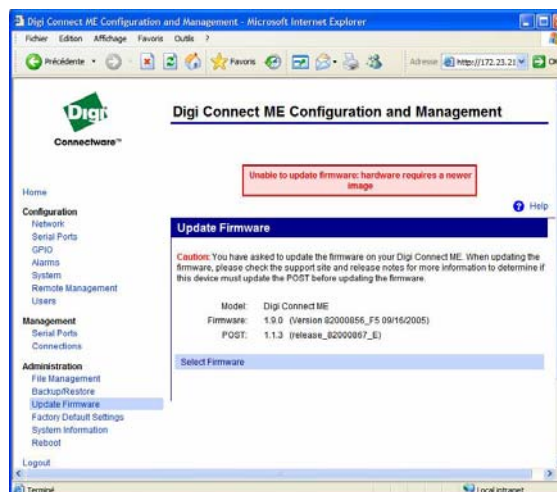
Click on

[Help](#) opens an on-line help window and a link to DIGI site if necessary.

After completing the downloading process, click on Reboot.  
Wait for at least 1 minute before trying to access the interface.

Problem during downloading process:

If the following screen appears during downloading, it is necessary to download the POST version of the firmware (available on the CD) as well as the firmware.



**ANNEXE 2: MODBUS TCP IDA specification**

The JBUS frames below are only examples:

REQUEST BY MASTER IN JBUS/MODBUS RTU MODE

Original frame: 01 03 1034 0003 40C5  
 Encapsulated frame: **0046 0000 0006** 01 03 1034 0003

where:

0046 corresponds to the transaction number  
 0000 corresponds to the protocol identifier  
 0006 corresponds to the number of bytes (length of the message)

Note:

The CRC is suppressed in the encapsulated JBus frame.

REPLY OF MTC IN JBUS/MODBUS RTU MODE

Original frame: 01 03 06 0002 0184 0000 1960  
 Encapsulated frame: **0046 0000 0009** 01 03 06 0002 0184 0000

where:

0046 corresponds to the transaction number  
 0000 corresponds to the protocol identifier  
 0009 corresponds to the number of bytes (length of the message)

Note:

The CRC is suppressed in the encapsulated JBus frame.