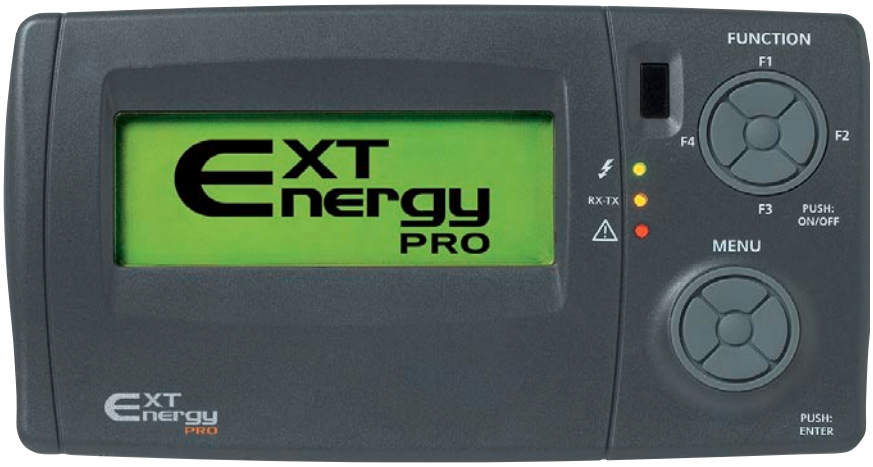
Energy XT PRO
Communication *Protocols*



1 CONTENTS

2 USE OF MANUAL

In order to refer to the manual quickly and easily, customers may find the following useful:

Call-outs

Callout column:
Callouts on the topics described are placed to the left of the text to allow the user to find the required information quickly.

Cross references

Cross references:
All the words in *italics* are listed in the index with a reference to the page where they are described in more detail;
the text below serves as an example:
"activation of the alarm stops the *compressors*"
The italics indicate that under Compressors in the index there is a reference to the page where compressors are described in more detail.
If the online Help on the PC is used, the words in italics become proper hyperlinks (automatic links activated by a click of the mouse) that connect the different sections in the manual and allow you to navigate through the document.

Highlighted icons:

Some parts of the text are highlighted in the callout column using icons with the following meanings:

Note: draws attention to a specific topic that users should take into account.

Tip: highlights a suggestion that helps users to understand and *use* the information on the topic described.

Attention! : **highlights**

1. **information that may damage the system or place persons, equipment, data, etc at risk if not known. These sections must always be read prior to *use*.**
2. **a specific topic that users should take into account so that the system does not malfunction or is used improperly.**

3 GENERAL DESCRIPTION

The purpose of this manual is to describe the UART *COM1* and COM 3 serials on the Energy XTPR

4 UART SERIALS ON ENERGY XT-PRO

UART serials

The Energy XTPRO has two UART communication ports named *COM1* and *COM3*.

COM1

***COM1*:**

It is a RS485 serial with signals RS485+,RS485- and RS485GND

COM3

***COM3*:**
It is a RS232 serial with signals TX, RX, CTS, RTS and DTR (fixed). It can be accessed, although in different ways, via a DB9 connector and a MOLEX connector (situated next to COM4) that "returns" the signals TX,RX and RTS **to TTL electrical level**.

"param." table COM1 and COM3:

The *COM1* and *COM3* "parameterization" list is below:

Parameter Name	Description
PAR_ANA_BIOS_187	Device serial address family
PAR_ANA_BIOS_190	*COM1* protocol selection 2=*Micronet* 3=*Modbus*/RTU
PAR_ANA_BIOS_191	*COM1* baud selection 0=9600 b/s 1=19200 b/s 2=38400 b/s
PAR_ANA_BIOS_192	*COM1* parity selection 0=null 1=odd 2=even
PAR_ANA_BIOS_193	*COM3* protocol selection 0=*Televis* 1=*Televis* MODEM 2=*Micronet* 3=*Modbus*/RTU 4=*Modbus*/ASCII
PAR_ANA_BIOS_194	*COM3* baud selection 0=9600 b/s 1=19200 b/s 2=38400 b/s
PAR_ANA_BIOS_195	*COM3* parity selection 0=null 1=odd 2=even
PAR_BOO_BIOS_19	Selection 7/8 data bits *COM3* 0=7 data bits 1=8 data bits
PAR_BOO_BIOS_20	RTS signal management 0=normal management: -12V received,+12V transmitted 1=always +12V to supply external converters RS232-RS485

The board address is the same for serial *COM1* and serial *COM3*.
It is a byte consisting of 2 parts:

- The MSB nibble is the device family and is a parameter saved in the EEPROM (PAR_ANA_BIOS_187);
- The LSB nibble is the device address that is read using the three dip switches DIP2,3,4 (maximum of 8 devices can be connected);

- For example if J2=ON,J3=OFF,J4=OFF the LSB nibble will be 1
- For example if J2=ON,J3=OFF,J4=OFF the LSB nibble will be 3

The operating protocol on serials *COM1* and *COM3* and the serial address of the device depends on the operating mode of the Energy XTPRO. The protocol changes on *COM1* after the first 15 seconds after start-up without problems of the XTPRO.

The next two sections explain what has been stated here.

Start-up without card

4.1 COM1 and COM3 vs start-up without IIC card

When it is switched on the instrument checks for any HW problems and makes sure that all the data necessary for launching the application is present.
If the data in the external FLASH is not available or when the FLASH, external RAM or EEPROM are not usable, the following error messages are displayed:

- product codes and external FLASH device code incorrect ERR[1].
- External RAM check error ERR[2].
- Linker table programming error ERR[3].
- Menu descriptor programming error ERR[4].
- Corrupt unrecoverable external EEPROM ERR[5].
- TIC programming error ERR[6].

If none of these anomalies occurs, normal start-up occurs.

These are the settings for *COM1* and *COM3* in these situations:

Situation	**Error**	**Mode**	**RS232**			**RS485**		
			Protocol	Address	Par.	Protocol	Address	Par.
Application does not exist or is incomplete	ERR[3], ERR[4] or ERR[6]	Energy XT-Pro "in Emergency" mode	*Televis*	Dip-Switch	19200, E, 8, 1	ISaGRAF	Dip-Switch	19200, N, 8, 1
HW Problems	ERR[1], ERR[2] or ERR[5]		*Televis*	Dip-Switch	19200, E, 8, 1	UNet	Dip-Switch	9600,x, 8, 1
Normal start-up	None	Energy XT-Pro "Pre-programmed"	From Parameter	Dip-Switch+ FAMILY	From parameter	ISaGRAF in first 15 secs. after start-up.	Dip-Switch	19200, N, 8, 1
						Selection from parameter if ISaGRAF connection is not established within 15 sec.	Dip-Switch+ FAMILY	From Parameter

- **ERR[1], ERR[2] or ERR[5] presence enable always Unet protocol (Diop-switch 9600, x, 8, 1**

NOTE: in the table ISaGRAF coincides with the *Workbench*

If the Energy XTPRO is communicating with the parameter-selected protocol on *COM1*, you can go to the *Workbench* communication protocol (Debug Mode ON) and vice versa (Debug Mode OFF) using the XTK keyboard, going to the SERVICE menu and selecting the correct function.

4.2 COM1 and COM3 vs start-up with IIC card

start-up without IIC recovery card

If the instrument identifies the RECOVERY CARD at start-up *COM1* and *COM3* do as follows:

IIC CARD	**Situation**	**Error**	**Mode**	**RS232**			**RS485**		
				Protocol	Address	Par.	Protocol	Address	Par.
Security Code	HW Problems	ERR[3], ERR[4] or ERR[6] + If HW problems ERR[1], ERR[2] or ERR[5]	Energy XT-Pro "in Emergency" mode	*Televis*	Dip-Switch	19200, E, 8, 1	UNet	Dip-Switch	9600, x, 8, 1
	NO HW problems						ISaGRAF	Dip-Switch	19200,N,8,1

NOTE: in the table ISaGRAF coincides with the *Workbench* and the security code indicates the RECOVERY card.

4.3 "COM1" serial (RS485)

4.3.1 Use

This is used to connect the Energy XTPRO to the outside world but it is also the only place where the *WORKBENCH* can be connected to the Energy XT and communicate with it. This serial can be used to perform operations on the internal and external flash of the microcontroller for downloading the BIOS-*WORKBENCH* interface tables, navigation menu and *WORKBENCH* application programme (TIC+BD). It is a "slave" serial and therefore packages are not spontaneously emitted from this serial but only response packages according to the *protocols* indicated below.

The communication speed and parity will be controlled by the HW and the protocol used as far as possible.

4.3.2 Protocols Usable on "COM1"

WORKBENCH

WORKBENCH

For connection of the instrument and the *WORKBENCH*. Also used for downloading the BIOS-*WORKBENCH* interface tables, navigation menu and *WORKBENCH* application programme (TIC+BD).

Micronet

Micronet

For connecting the instrument as SLAVE to an RS485 network containing devices such as TelevisCompact, *Televis* (via PC Interface), or ParamManager as MASTER host.

MODBUS

MODBUS

For connecting the instrument as SLAVE to an RS485 network containing any *MODBUS* HOST as MASTER host (also on PC). The *MODBUS* protocol will only be an RTU type with a fixed baud rate of 9600 bps

4.3.3 COM1 PARAMETERIZATION FOR WORKBENCH PROTOCOL

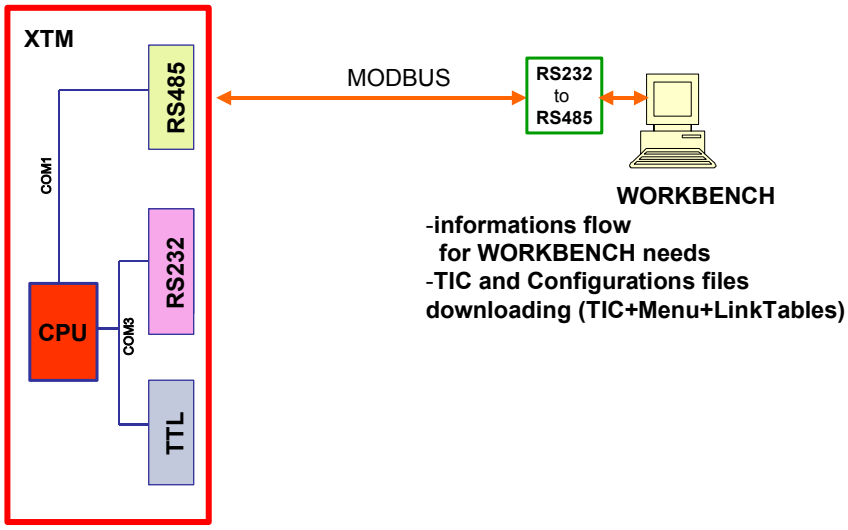
*COM1*_BAUD	19200
*COM1*_PARITY	null
*COM1*_DATA	8
*COM1*_STOP	1

4.3.4 COM1 PARAMETERIZATION FOR Micronet and MODBUS PROTOCOLS (parameters in EEPROM highlighted)

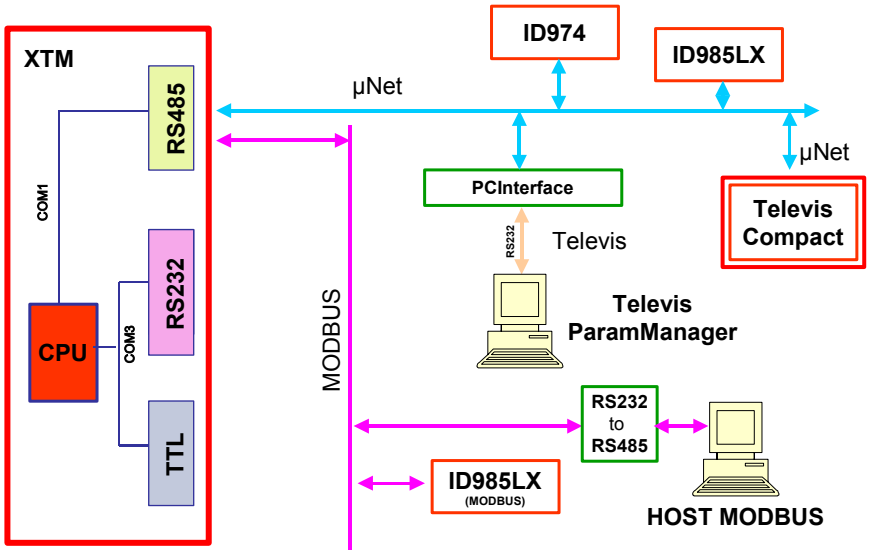
	Micronet	***ModBUS*/RTU**
***COM1*_PROTOCOLTYPE**	**2**	**3**
***COM1*_BAUD**	**hot**	**9600**
0 : 9600 b/s	x	
1 : 19200 b/s	x	
2 : 38400 b/s	x	
***COM1*_PARITY**	**Odd/even**	**hot**
0 : null		**x**
1 : odd		**x**
2 : even		**x**
***COM1*_DATA**	**8**	**8**
7 : 7 data bits		
8 : 8 data bits		
***COM1*_STOP**	**1**	**1**
1 :1 stop bit		
2 :2 stop bits		

4.3.5 Topology of local RS485

Energy XTPRO: RS485 Network connections (Debug Mode ON)



Energy XTPRO: RS485 Network connections (Debug Mode OFF)



NOTE. For Debug Mode ON/OFF refer to section ***COM1 and COM3 vs start-up without IIC card***.

4.4 “COM3” serial (RS232 / TTL)

4.4.1 Use

This serial can be used to connect the Energy XTPRO to the outside world.
This serial not only performs “slave” functions but can also spontaneously issue data packets. An example, in *MODEM control*, is its initialization string. It supports standard types of PTSN or GSM (for remote programming only) MODEM with RS232 serial connection (MODEM 485, MODEMFAX Class 1 or 2, are not implemented).

The communication speed and parity are parameter-controlled.

4.4.2 Protocols

Micronet ***Micronet***
To connect the instrument as SLAVE to a local network containing *Televis* as MASTER host (via PCInterface).

MODBUS ***MODBUS***
To connect the instrument as SLAVE
to a local network containing a *MODBUS* HOST on PC (not yet identified) as MASTER host. The *MODBUS* can be RTU (fixed baud rate of 9600 b/s) or ASCII
to a remote communication MODEM with a *MODBUS* HOST on PC (not yet identified). CAUTION, this is only possible if *MODBUS*/ASCII is used

TELEVIS ***TELEVIS***
To connect the instrument locally with *Televis* HOST on PC.

TELEVIS for MODEM ***TELEVIS for MODEM***
To connect the instrument to a remote communication MODEM with *Televis* HOST on PC.

4.4.3 COM3 PARAMETERIZATION (parameters in EEPROM highlighted)

	Micronet	*ModBUS*/RTU	*ModBUS*/ASCII	*Televis*	*Televis* MODEM
***COM3*_PROTOCOLTYPE**	**2**	**3**	**4**	**0**	**1**
***COM3*_BAUD**	**hot**	**9600**	**hot**	**hot**	**hot**
0 : 9600 b/s	x		x	x	x
1 : 19200 b/s	x		x	x	x
2 : 38400 b/s	x		x	x	x
***COM3*_PARITY**	**Odd/even**	**hot**	**hot**		
0 : null		**x**	**x**		
1 : odd		**x**	**x**		
2 : even		**x**	**x**		
***COM3*_DATA**	**8**	**8**	**hot**	**8**	**8**
7 : 7 data bits			**x**		
8 : 8 data bits			**x**		
***COM3*_STOP**	**1**	**auto (*)**	**auto (*)**	**1**	**1**
1 :1 stop bit		**x**	**x**		
2 :2 stop bits		**x**	**x**		

NOTE (*)
by default *COM3*_STOP = 1, but:
if (*COM3*_PROTOCOLTYPE = *Modbus*/RTU e *COM3*_PARITY = null)
then *COM3*_STOP = 2

```
if (COM3_PROTOCOLTYPE = Modbus/ASCII)
        then
                if (COM3_PARITY = null and COM3_DATA = 7)
                        then COM3_STOP = 2
                        otherwise COM3_STOP = 1 /* (even and odd parity with data 7)
                                                   or (data 8 with any parity)*/
```

NOTE: If communication occurs via Modem and the protocol is *Modbus*/ASCII then operating is guaranteed for most modems if 1 stop, 8 data, parity null and 1 stop For other settings, it is important to check if the modem supports the data format.

4.4.4 MODEM control

A MODEM can be connected on *COM3* (RS232) for a fixed telephone network. GSM for remote BIOS programming.

Here is the list of parameters for the Energy XTPRO MODEM set-up:

Parameter Name	Description
PAR_BOO_BIOS_18	Modem enabling
PAR_MSG_BIOS_9	Modem initialization string (first part)
PAR_MSG_BIOS_10	Modem initialization string (continuation)
PAR_MSG_BIOS_11	Modem hangup string
PAR_ANA_BIOS_229	RS232 protocol selection
PAR_ANA_BIOS_230	Baud RS232

With PAR_BOO_BIOS_18=1 the modem is initialized when XTPRO is switched on and modem operations are enabled.

PAR_MSG_BIOS_9 and PAR_MSG_BIOS_10 are the first and second part of the modem initialization string. PAR_MSG_BIOS_10 is used only if a string that is longer than 20 characters is requested; if this is the case, make sure there are no spaces in the first part of the string (PAR_MSG_BIOS_9) since it will be truncated otherwise.
This is an example of a string that is used for most modems included those specified in the note:

AT&F&C1&D2E0X1S0=0

In many cases, we advise you to also set the value at which the connection will be forced in the string. For example, for the US ROBOTICS modem AT&F&C1&D2E0X1S0=0&N6 can be used where &N6 forces the connection at 9600 bps.

The "S0=0" part of the initialization string forces the modem not to hang up automatically. Hanging up is always effected by the XTPRO. With "S0=n" hanging up is effected by the XTPRO at the first RING.

PAR_MSG_BIOS_11 is the "Hang up" string that is used for disconnection. This is an example of a string that is used for most modems included those specified in the note:

ATH0

The parameter PAR_ANA_BIOS_229 is used to select a protocol on RS232 that supports *modem control*. More specifically:

- PAR_ANA_BIOS_229 = *Televis for Modem*;
- PAR_ANA_BIOS_229 = ASCII *MODBUS*;

Only these 2 *protocols* guarantee the *use* of NULL fixed parity (RTU *MODBUS* allows it to be selected but is a real-time control protocol).

PAR_ANA_BIOS_230 defines the communication speed between XTPRO and the modem. For a GSM modem it must always be set to 9600 bps. For an analogue modem, we recommend selecting a speed that is lower than the connection speed between 2 modems. In practice, 9600 bps is the value that guarantees connectivity in any situation. To force the US ROBOTICS modem to communicate at 9600 bps add &N6 to the initialization string.

Checking the presence of the modem is enabled when parameter PAR_BOO_BIOS_18=TRUE and it performs a periodic check on the state of the modem line and/or connection every minute.
This sequence disconnects (if still active) and reinitializes the modem.
The sequence is activated if a connection as master or slave is already active and if there is no data flow and known commands are not received. If there is no connection, the procedure is normally repeated every minute.
The sequence is interrupted if the modem does not respond to the command sent and generates a "modem HW failure" alarm [VAR_BOO_BIOS_13]; it is also interrupted if the modem responds with the string "ERROR" if the "modem SW failure" alarm is activated [VAR_BOO_BIOS_14].
In both cases, a new connection or send SMS request is accepted and the alarm is reset if completed successfully.

Note for sending SMSs

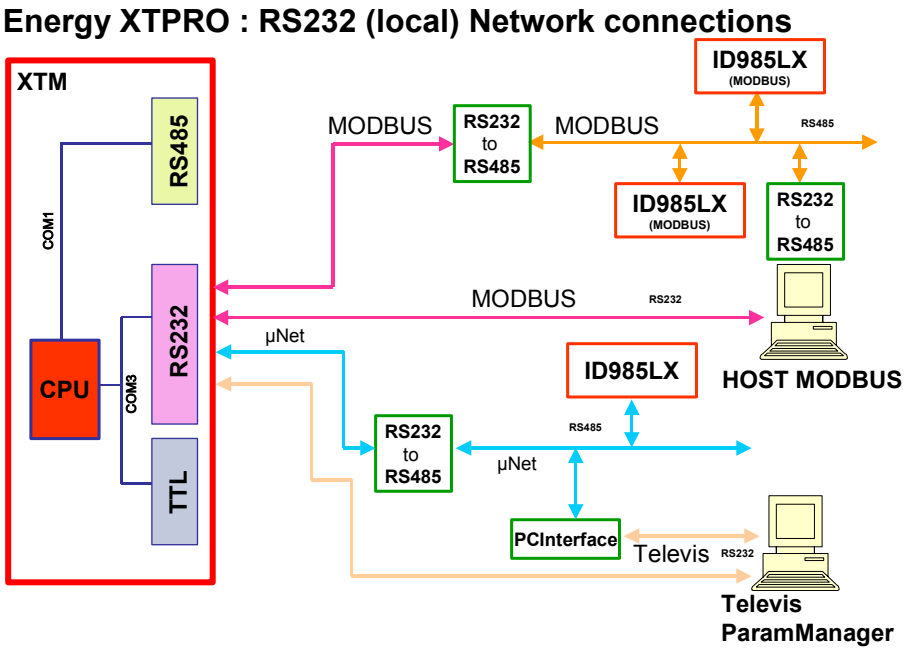
To send short text messages (SMSs) using a GSM modem make sure that the modem is already fitted with a **SIM card** with all the network services already activated and the PIN code unlocked and correct power supply and antenna. XTPRO does not check the presence/lack of signal where the modem has been installed.
To *use* a GSM modem, the parameters must be set as described above. It is also important to check that the parameter PAR_ANA_BIOS_230 is set to 9600 bps.

The modem call and sending of SMSs are controlled in the user application programme by way of the *Workbench* C Functions supplied by Eliwell for Energy XTPRO.

MODEM/FAX and GSM used

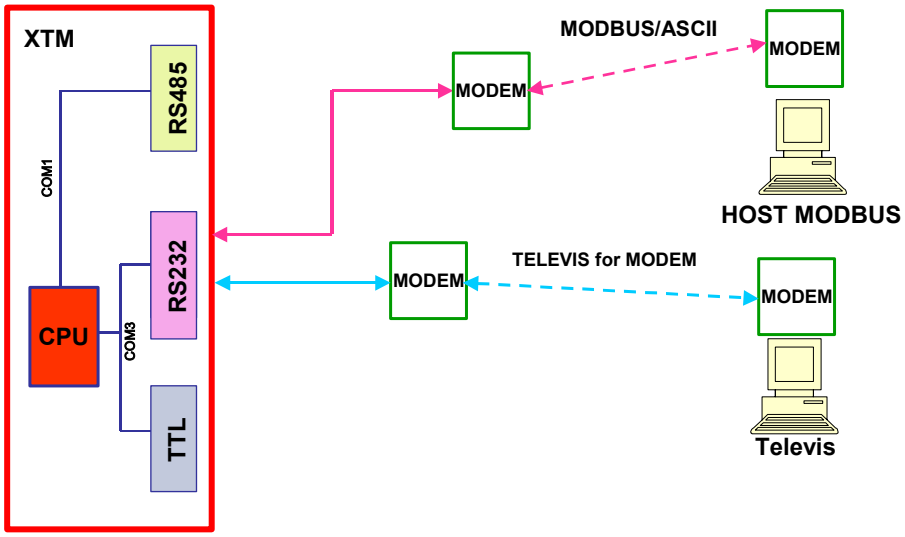
List of some MODEMS/FAXES and GSMS used:

3COM U.S.Robotics 56K Message Modem
3COM U.S.Robotics 56K FaxModem
Wavecom WMOD2 DUAL BAND MODEM (GSM modem for remote BIOS programming)


Energy XTPRO : RS232 (local) Network connections
XTM
RS485
COM1
RS232
CPU
COM3
TTL
MODBUS
RS232
to
RS485
MODBUS
RS485
ID985LX
(MODBUS)
ID985LX
(MODBUS)
RS232
to
RS485
MODBUS
RS232
HOST MODBUS
µNet
ID985LX
RS485
RS232
to
RS485
µNet
PCInterface
Televis
RS232
Televis
ParamManager

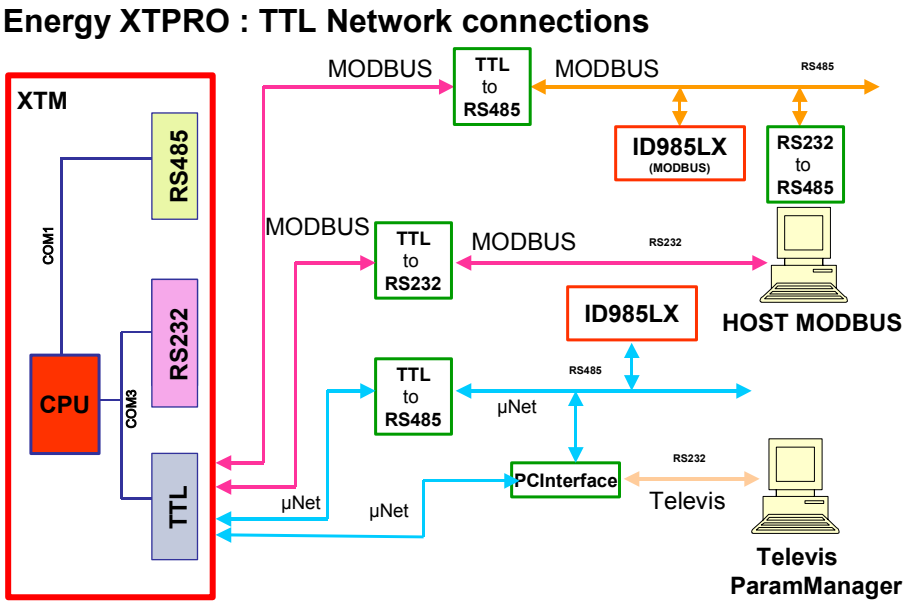
4.4.5 Topology of remote RS232

Energy Network connections XTPRO :RS232 (remote)



NOTE: the possibility of MODEM + *MODBUS* refers to *MODBUS*/ASCII

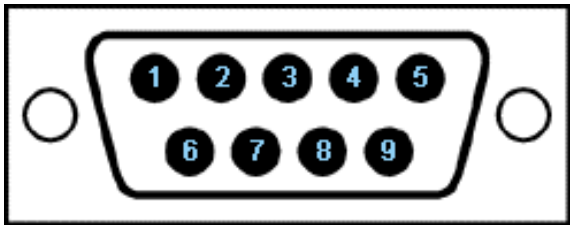
4.4.6 Topology of local TTL



4.4.7 SUB-D 9 MALE poles of Energy XT

SUB-D 9 MALE poles of Energy XT
(standard RS232 interface)

The pin configuration for the connection for the RS232 standard interface is shown here:



Contact N°	Code	Description
1	CD (or DCD)	Carrier Detect
2	**RxD**	**Receive Data**
3	**TxD**	**Transmit Data**
4	**DTR**	**Data Terminal ready**
5	**GND**	**Signal Ground**
6	DSR	Data Set ready
7	**RTS**	**Request to send**
8	**CTS**	**Clear to Send**
9	RI	Ring Indicator

Indicated in bold type the HW pins for the EnergyXT application.
Pin 8 CTS is not used at present and therefore the control of HW flow is not currently available

5 USER INFORMATION ON COM1 AND COM3

Both *TELEVIS* and *MODBUS* must be possible from the *Micronet* protocol:

Information	***Micronet*** **and** ***TELEVIS*** **command**	***MODBUS*** **command**
Read / write parameters and/or variables	*Resource read/write extended command*	3/16
Read / write clock	*Resource read/write extended command. Time synchronization extended command*	3/16
Read alarms	*Resource read/write extended command*	3
Block updating of state of outputs by controllers	*State read/write logical command*	16
Read/write state of digital outputs	*Digital outputs read/write logical command* *Resource read/write extended command*	3/16
Read / write state of analogue outputs	*Analogue outputs read/write logical command* *Resource read/write extended command*	3/16
Read the analogue inputs	Analogue inputs *read/write logical command.* *Resource read/write extended command*	3
Read the digital inputs	Digital inputs *read/write logical command.* *Resource read/write extended command*	3
Enable modification of COLD parameters	*State read/write logical command*	3/16
Activation of BIOS functions	*Resource read/write extended command*	3/16
Password Acknowledgement for communication enabling	*Password acknowledgement resource extended command*	**16**
FW/HW version including machine CRC (extra subfield)	**master file code command**	**43**
"Compressed" information on presence of active alarms, modified parameters..	State read/write *extended command*	**3**
Network connected device	***polling command***	**None**

Only the information obtainable via the serial shown in **bold type** on the previous table will always be accepted by Energy XTPRO in read mode.
The other information is accepted at different acceptance levels with a password using the serial command linked to **Password Acknowledgement for communication enabling.**
More specifically:

- READ PASSWORD for enabling read-only commands
- USER PASSWORD for enabling read and write commands.
- ADMININSTRATOR PASSWORD for enabling read and write commands (not USER modifiable).

Since Energy XTPRO does not have a STATIC allocation of the resources linked to the application, this is different for every *WORKBENCH* application. The XTPRO resources CANNOT therefore by read in PHYSICAL mode.

The resources can be accessed in "mixed" LOGICAL-PHYSICAL mode according to the *WORKBENCH* application but irrespective of the BIOS (if the same BIOS version is used). For more detailed information, refer to the section on ***WORKBENCH and BIOS Resources***.

5.1 WORKBENCH and BIOS Resources

WORKBENCH and BIOS Resources

In this document, *WORKBENCH* or BIOS resources refer to the variables declared in a *WORKBENCH* project dictionary that allow a *Modbus* address.

For the *WORKBENCH* application and BIOS, it may be:

- a PARAMETER (that can be saved in the EEPROM)
- a VARIABLE (that cannot be saved in the EEPROM)

PARAMETERS and VARIABLES can be NUMERIC or MESSAGE.

If the resources belong to the BIOS their *Modbus* address will only vary according to the BIOS version used.
Users cannot modify its *Modbus* address.
If they belong to the *WORKBENCH* application, users will assign them the *Modbus* address.

5.2 WORKBENCH and BIOS resources access mode

From the table in the previous section, you can see that there are 3 categories of command:

- ***Resource read/write extended command***
- ***Extended command***
- ***Read/write logical command***

Let's examine the access to information characteristics.

5.2.1 Resource read/write extended command

This is a LOGICAL-PHYSICAL command that affects the *WORKBENCH* project resources (i.e. for the variables in a *WORKBENCH* project with a *Modbus* address).
These resources may belong to the BIOS or the *WORKBENCH* application.
If they belong to the BIOS their *Modbus* address will only vary according to the BIOS version used. Users cannot modify its *Modbus* address.

If they belong to the *WORKBENCH* application, users will assign them the *Modbus* address.
Please refer to the ***WORKBENCH and BIOS Resources*** section.

5.2.2 Extended command

This is a LOGICAL command that only depends on the BIOS and not on *WORKBENCH*.
This must not be confused with the ***Resource read/write extended command***.
It is used in this specification for Time Synchronization and File Downloading.

5.2.3 Read/write logical command

This is a LOGICAL command since it affects the logical areas. The items in each logical area are accessed via 2 coordinates (Area Index, Item Index).
The structure of the logical areas only depends on the BIOS and not on *WORKBENCH* as does the significance of the items in the areas currently in this specification version that is ABSOLUTE.

6 STRUCTURE OF MICRONET & TELEVIS COMMANDS

6.1 Parameter/variable read/write extended command

This command reads BIOS and *WORKBENCH* parameters and variables that have a *Modbus* address.

IMPORTANT:
The write function DOESN'T responds :

- if the user writes a variable without authentication
- if the password is wrong

See **Password Acknowledgement** and/or **Enable modification of COLD parameters** commands.

6.2 Password Acknowledgement resource extended command

This command received from the PC is used so that the PC can tell ENERGY XTPRO what its password is and see if it is a user that is authorized to communicate.

Types of password

Types of password:

- READ PASSWORD for enabling read-only commands
- USER PASSWORD for enabling read and write commands.
- ADMININSTRATOR PASSWORD for enabling read and write commands (not USER modifiable).

The parameters associated with the PASSWORDS are indicated below

Parameter Name	Description
PAR_MSG_BIOS_5	Read only password: string of 10 characters
PAR_MSG_BIOS_6	User password: string of 10 characters
PAR_MSG_BIOS_7	Administrator password: string of 10 characters

IMPORTANT:
the PASSWORD is acknowledged using the write command according to the following rules:

if the PASSWORD has not been acknowledged yet then
the response will be NACK.
if not
if the PASSWORD has been acknowledged the first time then
the response will be ACK and the enables given by the PASSWORD are activated
if it is a READ_PASSWORD, the read/write of the READ PASSWORD itself will be enabled
if it is a USER_PASSWORD, the read/write of the USER PASSWORD of the READ PASSWORD will be enabled
if it is an ADMIN_PASSWORD, the read/write of the two previous passwords and its own will be enabled.
If
the PASSWORD has been acknowledged for a second time then
the response will be ACK and the enables given by the PASSWORD are disabled

6.3 Time synchronization extended command

This is used to set seconds, minutes, hours, day of the week, day of the month, month, year,

6.4 File Download extended command

This command is used to download files created in the *WORKBENCH* application with these characteristics:

- They are binary files
- They will have these names: 000.txt, 001.txt, 002.txt, … , 255.txt
- They have been created by "adding" strings with a maximum of 120 characters

NOTE: if downloading is not completed, the file is left open. To close it, synchronization is requested for an inexistent file. If synchronization finds a file that has been left open by a previous download, it closes it and opens the necessary file (this may be the same one).

6.5 Digital outputs read/write logical command

This command is used to read and/or force the state of the Energy XTPRO relays.

NOTE: the write operation is successfully completed if the **Block updating of state of outputs by controllers** command has been previously launched and accepted.

6.6 Analogue outputs read/write logical command

This command is used to read and/or force the value of the Energy XTPRO analogue outputs.

NOTE: the write operation is successfully completed if the **Block updating of state of outputs by controllers** command has been previously launched and accepted.

6.7 Analogue inputs read logical command.

This command is used to read the value of the Energy XTPRO probes.

6.8 Digital inputs read logical command.

This command is used to read the state of the Energy XTPRO digital inputs.

6.9 State read/write logical command

This command is used to read and force some Energy XTPRO states or features.
They are listed below:

- Information if parameters have been modified
- Information on presence of active alarms (BIOS and USER if the USER correctly sets the BIOS variable called VAR_ANA_BIOS_3 that controls the XTK keyboard LED)

Block updating of state of outputs by controllers. This only applies if Block Timeout has been previously set at a value than is not 0.

- Block Timeout (expressed in seconds, max. 10 minutes)

Configuration enable from serial

- CheckSum TabMaker
- Crc programs *Workbench* irrespective of compilation data
- Crc programs *Workbench* according to the compilation data
- *Workbench* symbols Crc
- CheckSum MenuMakerPRO

An index is associated with each of these and is used in the serial command:

index	Description of item	Always legible	Writable (after password acknowledgement)
1	Info if parameters have been modified	X	X
2	Info on presence of active alarms	X	X
3	Not used		
4	Not used		
5	Not used		
6	Block updating of state of outputs by controllers.	X	X
7	Block Timeout	X	X
8	Not used		
9	Configuration enable from serial	X	X
10	Not used		
11	Not used		
12	CheckSum TabMaker (MSB)	X	
13	CheckSum TabMaker (LSB)	X	
14	Crc programs *Workbench* independently of compilation data (MSB)	X	
15	Crc programs *Workbench* independently of compilation data (LSB)	X	
16	Crc programs *Workbench* according to the compilation data (MSB)	X	
17	Crc programs *Workbench* according to the compilation data (LSB)	X	
18	*Workbench* symbols Crc (MSB)	X	
19	*Workbench* symbols Crc (LSB)	X	
20	CheckSum MenuMakerPRO (MSB)	X	
21	CheckSum MenuMakerPRO (LSB)	X	

The most important states/functions are described below:

index	Description of item	value	Always legible	Writable (after password acknowledgement)
1	Info if parameters have been modified	0: not modified (READ) 0: reset flag (WRITE) 1: modified (READ)	X	X
2	Info on presence of active alarms	0: not present 1: resettable 3: active	X	X
6	Block updating of state of outputs by controllers (2)	0: Unblocks outputs, always performed + reset Block Timeout 1: Block outputs, only performed if Block Timeout is not 0	X	X
7	Block Timeout	Time in seconds (max. 600 sec.) NOTE: if set to 0 a block is not reset	X	X
9	Configuration enable from serial. This is used to write COLD parameters	0:_DEVI_RICHIEDERE_INGRESSO_IN_CONFIGURAZIONE_ (READ) 1: Not used 2:_ATTENDI_INGRESSO_IN_CONFIGURAZIONE_ (READ) 3:_PUOI_RICHIEDERE_INGRESSO_IN_CONFIGURAZIONE_ (READ) 4:_RICHIEDO_CONFIGURAZIONE_ (WRITE) 5:_SEI_IN_CONFIGURAZIONE_ (READ) 6:_ESCI_DALLA_CONFIGURAZIONE_ (WRITE) (1)	X	X

NOTE (1):

- to go into configuration mode, first read item 9.

  if the response is 0 then you must write item 9 with value 4 to start the sequence established in *Workbench* that starts configuration mode. During the sequence when item 9 is read, 2 is obtained. At the end of the sequence when item 9 is read, 5 is obtained.

  if the response is 3 then item 9 must be written with value 4. Subsequent reading of item 9 results in 5

- to quit the configuration mode, item 9 must be set to 6 so that the *Workbench* application activates the exit sequence. During the sequence when item 9 is read, 3 is obtained. At the end of the sequence, when item 9 is read, 0 is obtained.

NOTE (2): also see Block Timeout.

6.10 POLLING command

This MASTER command requires a generic response (ACKNOWLEDGE) to be sent by the selected SLAVE in order to establish if the device is connected to the line or not or cannot reply for some other reason (anomalies).

6.11 Master File Codes Command

6.11.1 FAMILY & RELEASE reading command

This reads the codes in the ROM for the software family and the BIOS release version.

6.11.2 DATA EMISSIONE RELEASE reading command

This reads the issue date of the BIOS release.

6.11.3 POLI (VIS/MOD) code reading command

This reads the **POLI (6bit-VIS/10bit-MOD)** device code stored in the EEPROM in the PAR_ANA_BIOS_188 parameter.

6.11.4 PCH code reading command

This reads the PAR_ANA_BIOS_188 parameter in the EEPROM.

6.11.5 CRC code reading command

This readsthe PAR_MSG_BIOS_4 parameter.

7 STRUCTURE OF MODBUS COMMANDS

The *MODBUS* protocol is implemented by creating a biunique relationship with the *MICRONET* & *TELEVIS* ***Resource read/write extended command*** and ***Read/write logical command*** following a rule for formatting the address field (16 bit) of the **3 Read Holding Registers** and **16 Write Multiple Registers** commands of the *MODBUS* protocol. Where this is not possible, it goes on to commands 20 and 21 treating the data as files. The **Master File Code** is compared with the **43 Read Device Identification** command.

7.1 Commands 3 and 16

ADDRESS															
bit 16	bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1

7.1.1 If (bit 16 = 0) then it is a Resource read/write extended command

In the Energy XTPRO application the command returns the 16 bit value of the VARIABLE or PARAMETER that has the *MODBUS* address indicated in *Workbench*.

NOTE for reading/writing strings:

- **The strings MUST be written ONLY one at a time**
- **The strings MUST be read ONLY one at a time**
- **Strings with 5 characters are treated by *MODBUS* as strings with 6 characters. Therefore when it is being read, the 6th byte of the 5 character string has no significance and in writing is "discarded" by the XTPRO even if it MUST be written in the *MODBUS* frame (parity must be maintained).**
- **Refer to the section *Examples with Modscan32* for Command 3 and 16 with bit=0 for detailed information on how to write the command**

NOTE for reading/writing numerical parameters:

- **Numeric parameters are read and written as they are stored in the EEPROM. Therefore, if a parameter has a decimal point and does not have a multiplier it is read/written in tenths. If it has a multiplier and does not have a decimal point it is read/written divided by the multiplier compared with reading in *Workbench*. If it has a decimal point and a multiplier they are both combined.**

7.1.2 If (bit 16 = 1) then it is a read/write logical command

If that is the case:
the value of the field between bit 15 and bit 9 indicates the logical area and the value of the field between bit 8 and bit 1 indicates the item index (NP) of the logical area

ADDRESS															
bit 16	bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1
1	Logical area							Item index (NP)							

Logical area: 08h USCITE_DIGITALI
NPj = number of item of Digital Output Logical Area that contains the state (1=ON,0=OFF) of the 16 digital outputs with index j+(15*(j-1)) , (j+1)+(15*(j-1)), (j+2)+(15*(j-1)), … , (j+15)+(15*(j-1)) with j>0 and NPj≥0.
VALj = in MSbit contains the state of the digital output (j+15)+(15*(j-1)), … , in LSbit the state of the digital output j+(15*(j-1))

NOTE: for the USCITE_DIGITALI area the write operation is successfully completed if the **Block updating of state of outputs by controllers** command has been previously launched and accepted.

Logical area: 09h USCITE_ANALOGICHE
NPj = number of item of Analogue Output Logical Area that contains the value in % of the analogue outputs with index j+(j-1), (j+1)+(j-1) con j>0 e NPj≥0.
VALj = in MSByte contains the value in % of the analogue output (j+1)+(j-1) and in LSByte contains the value j+(j-1)

NOTE: for the USCITE_ANALOGICHE area the write operation is successfully completed if the **Block updating of state of outputs by controllers** command has been previously launched and accepted.

Logical area: 03h INGRESSI_ANALOGICI
NPj = number of item of Analogue Input Logical Area that contains the value in tenths of Temperature or pressure of analogue input j with j>0 and NPj≥0.
VALj = analogue input value j in tenths
if (analogue input is faulty)
then VALj = 8000h
if (analogue input does not exist)
then VALj = 8001h

Logical area: 04h INGRESSI_DIGITALI
NPj = number of item of Digital Input Logical Area that contains the state (0=Not energized,1=energized) of the 16 digital inputs with index j+(15*(j-1)) , (j+1)+ (15*(j-1)), (j+2) +(15*(j-1)), … , (j+15) +(15*(j-1)) with j>0 and NPj≥0.
VALj = in MSbit contains the state of the digital input (j+15)+(15*(j-1)), … , in LSbit the state of the digital output j+(15*(j-1))

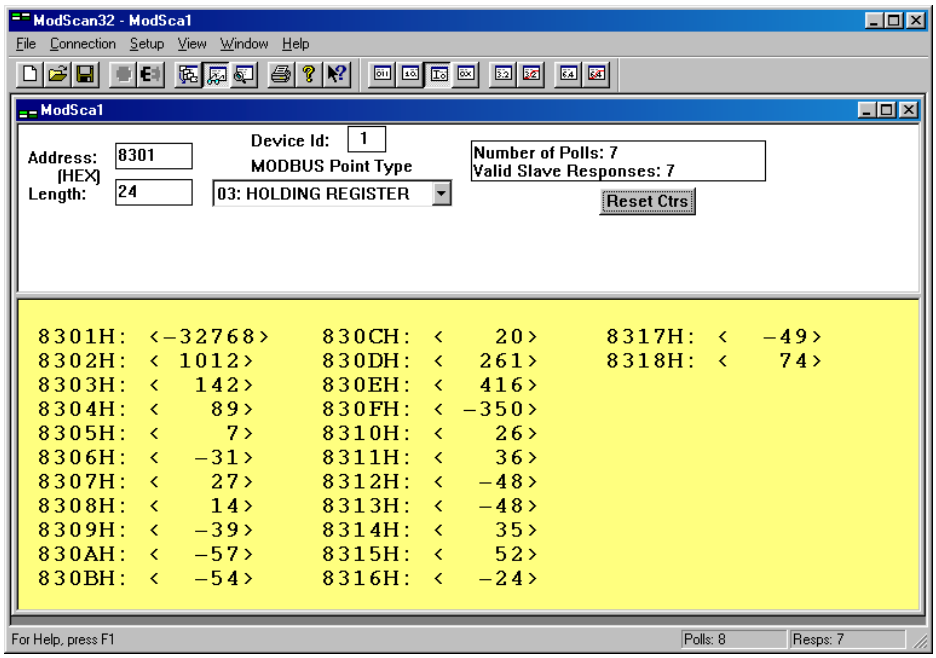
Logical area: 05h STATES
This is the list of items in the STATES area. For more information see the section on the *State read/write logical command* in the *MICRONET* & *TELEVIS* commands

NP	Description of item	Always legible	Writable (after password acknowledgement)
1	Info if parameters have been modified	X	X
2	Info on presence of active alarms	X	X
3	Not used		
4	Not used		
5	Not used		
6	Block updating of state of outputs by controllers.	X	X
7	Block Timeout	X	X
8	Not used		
9	Configuration enable from serial	X	X
10	Not used		
11	Not used		
12	CheckSum TabMaker (MSB)	X	
13	CheckSum TabMaker (LSB)	X	
14	Crc programs *Workbench* independently of compilation data (MSB)	X	
15	Crc programs *Workbench* independently of compilation data (LSB)	X	
16	Crc programs *Workbench* according to the compilation data (MSB)	X	
17	Crc programs *Workbench* according to the compilation data (LSB)	X	
18	*Workbench* symbols Crc (MSB)	X	
19	*Workbench* symbols Crc (LSB)	X	
20	CheckSum MenuMakerPRO (MSB)	X	
21	CheckSum MenuMakerPRO (LSB)	X	

7.1.3 Examples with Modscan32 for Command 3 with bit16=1

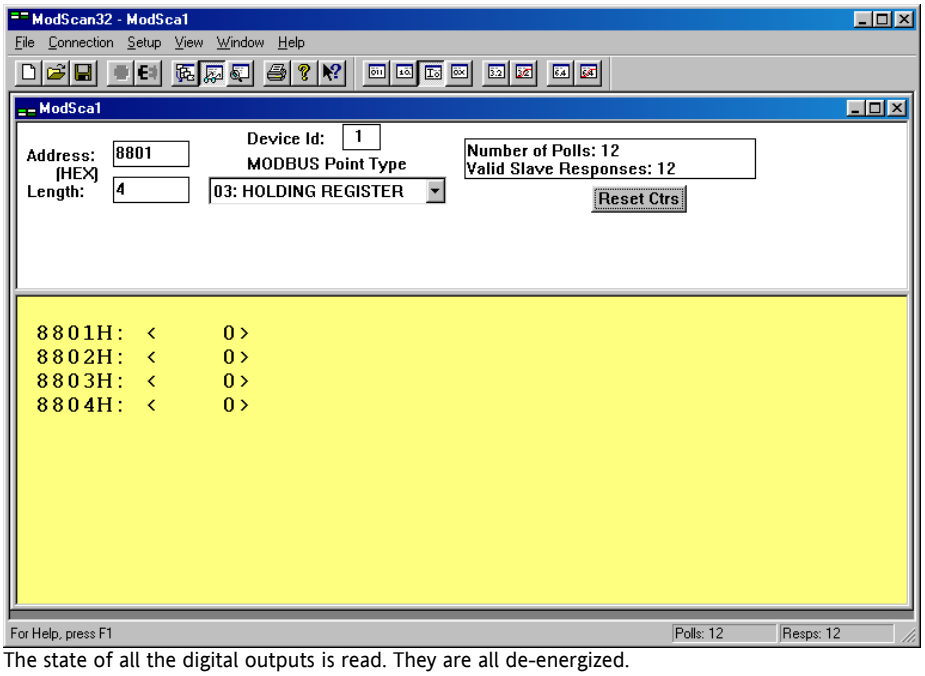
The examples have been created using an Energy XTMH with two XTEH external expansions. Note that Modscan32 in the Address field contains the address that you wish to read+1. This means that the Modscan address 0x8301 corresponds to reading the logical area 3 starting with item 0 (i.e. the first item).

Reading probes logical area



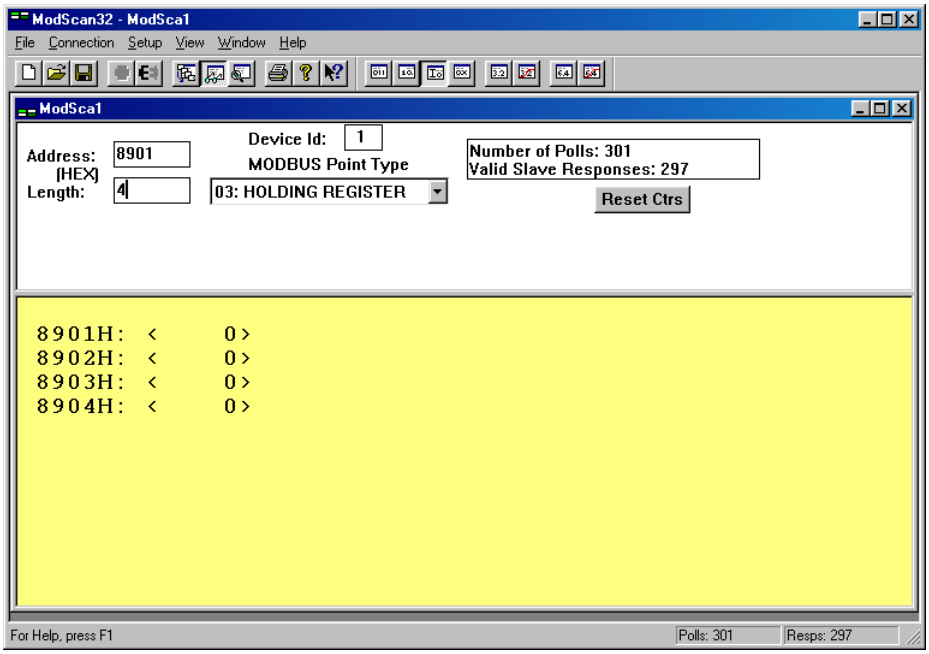
Probes from AI1 to AI16 of the XTMH base (from 8301H to 8310H) are read + the four probes on the first external expansion (from 8311H to 8314H) + the four probes on the second external expansion module (from 8315H to 8318H). Note that AI1 on the XTMH is faulty (8000H = -32768). All values are expressed in tenths.

Reading Digital Outputs logical area



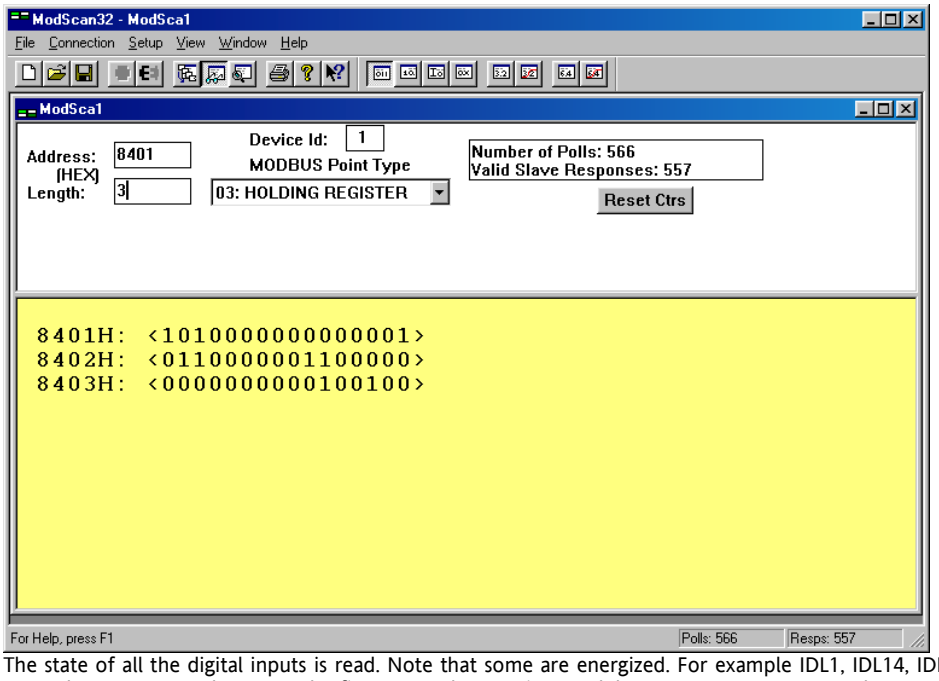
The state of all the digital outputs is read. They are all de-energized.

Reading Analogue Outputs logical area



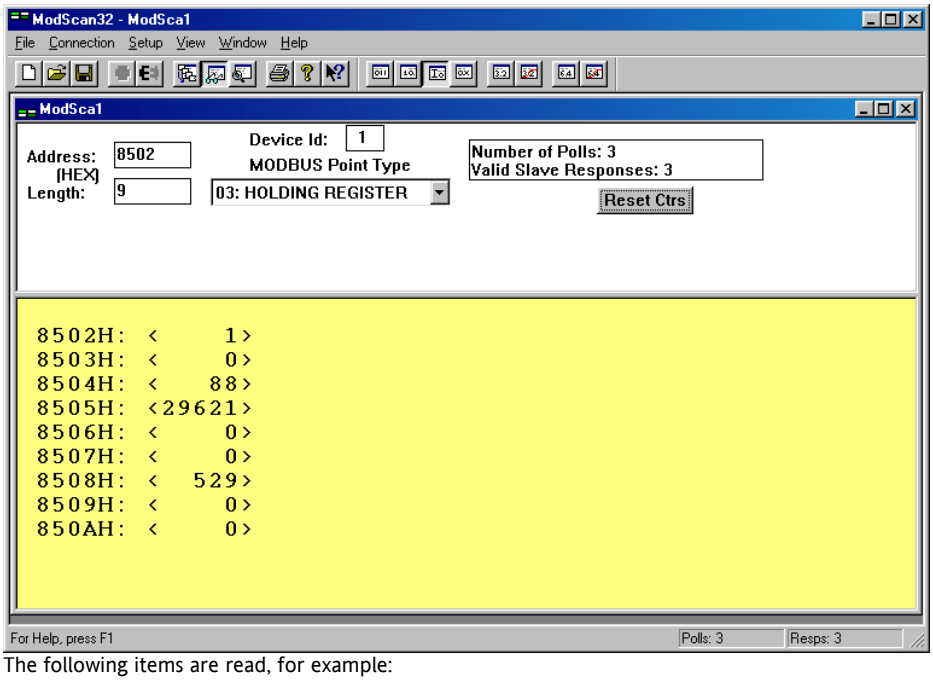
The value of all 8 AOs equalling 0 % is read.

Reading Digital Inputs logical area



The state of all the digital inputs is read. Note that some are energized. For example IDL1, IDL14, IDL16 and IDL22 on the XTMH base + IDL1 and IDL8 on the first external expansion module + IDL1, IDL5 e IDL8 on the second external expansion module.

Reading State logical area

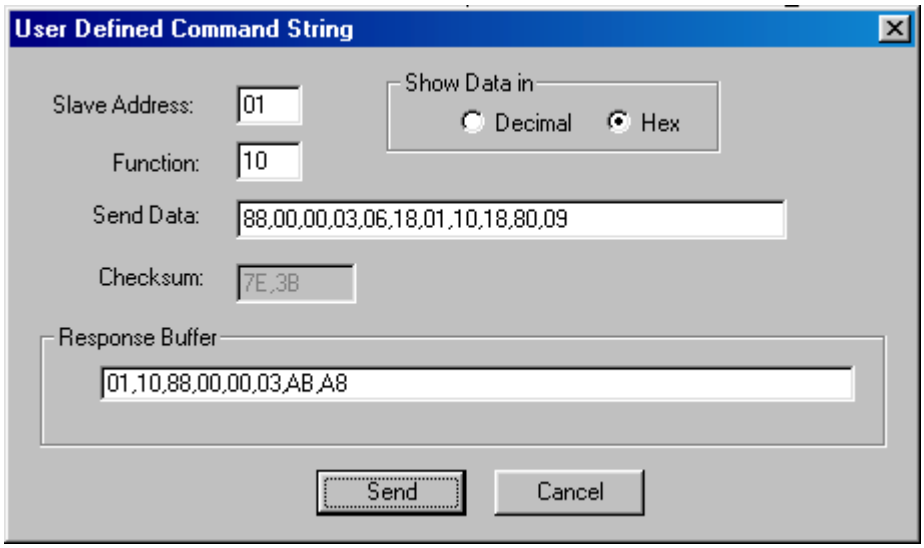


The following items are read, for example:

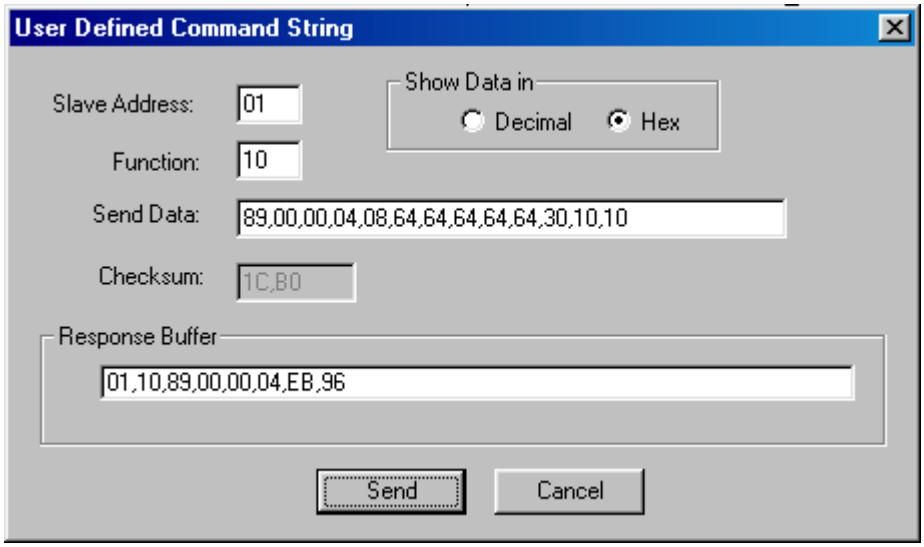
NP	Description of item
1	Info if parameters have been modified
2	Info on presence of active alarms
3	Not used: insignificant value
4	Not used: insignificant value
5	Not used: insignificant value
6	Block updating of state of outputs by controllers.
7	Block Timeout
8	Not used
9	Configuration enable from serial
10	Not used

7.1.4 Examples with Modscan32 for Command 16 with bit16=1

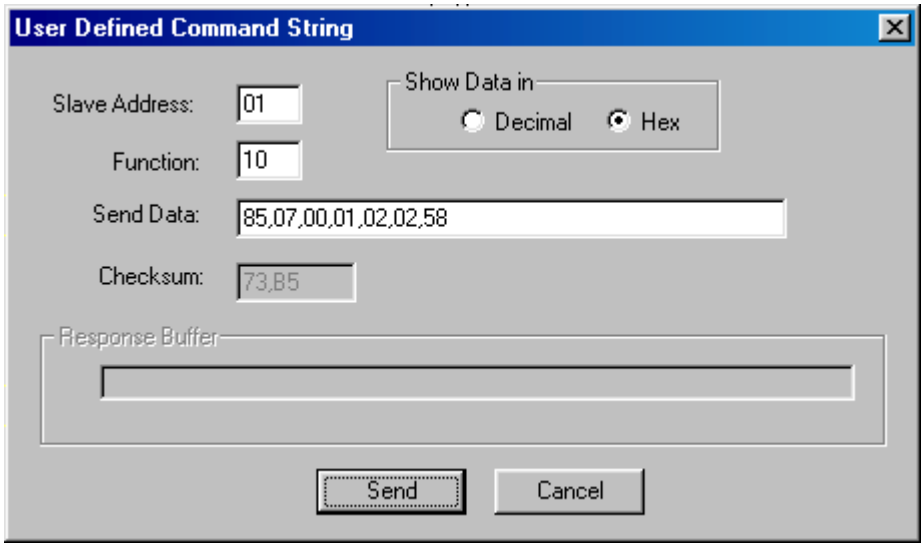
Reading NO on Digital Outputs logical area



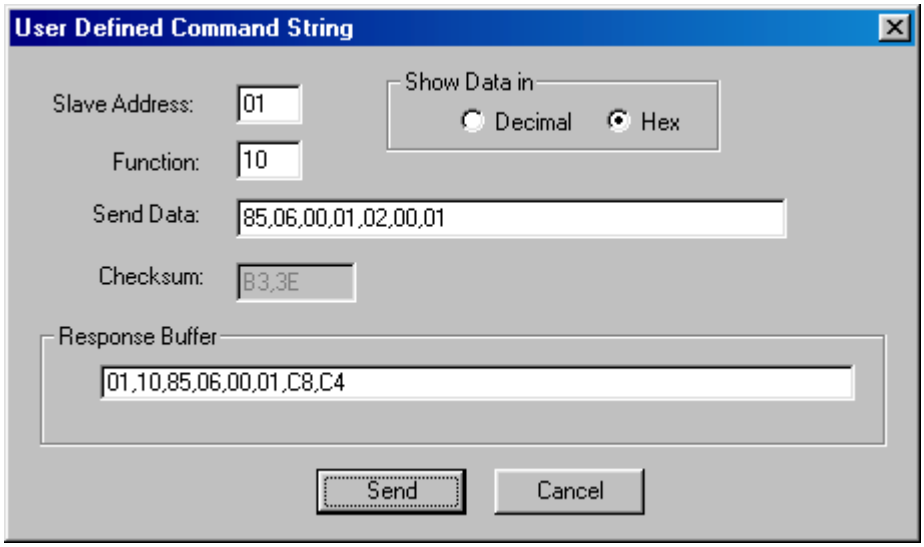
Reading AO on Digital Outputs logical area



Writing item 7 of States area to 600 (Block Timeout)



Writing item 6 of States area to 1 (Block updating of state of outputs by controllers)

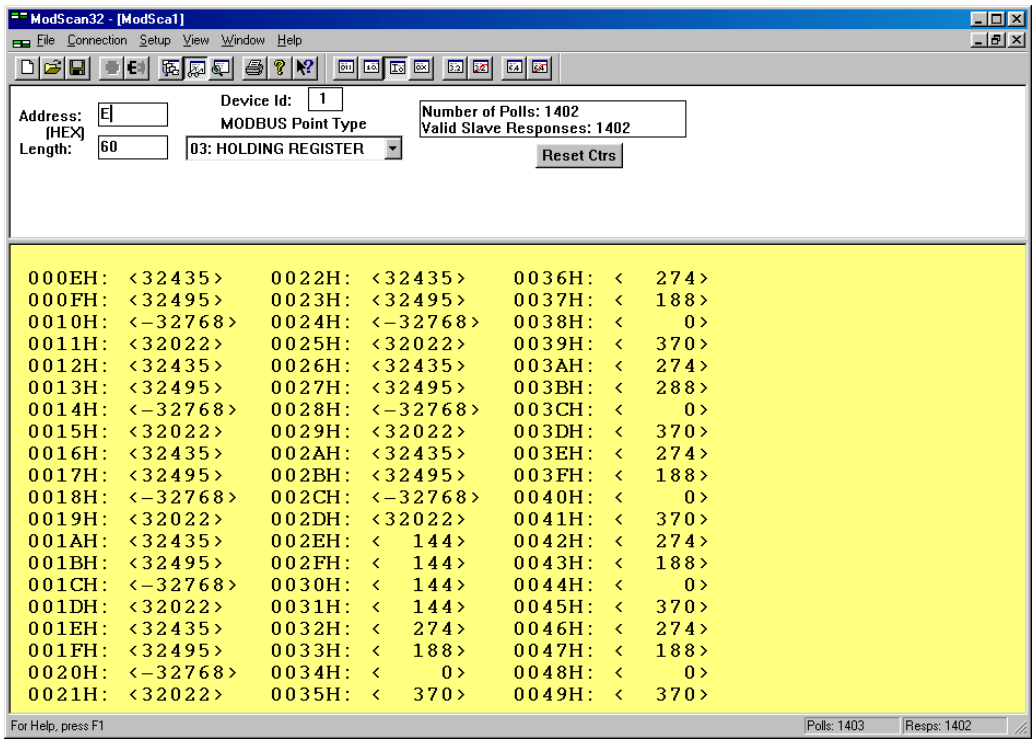


7.1.5 Examples with Modscan32 for Command 3 with bit16=0

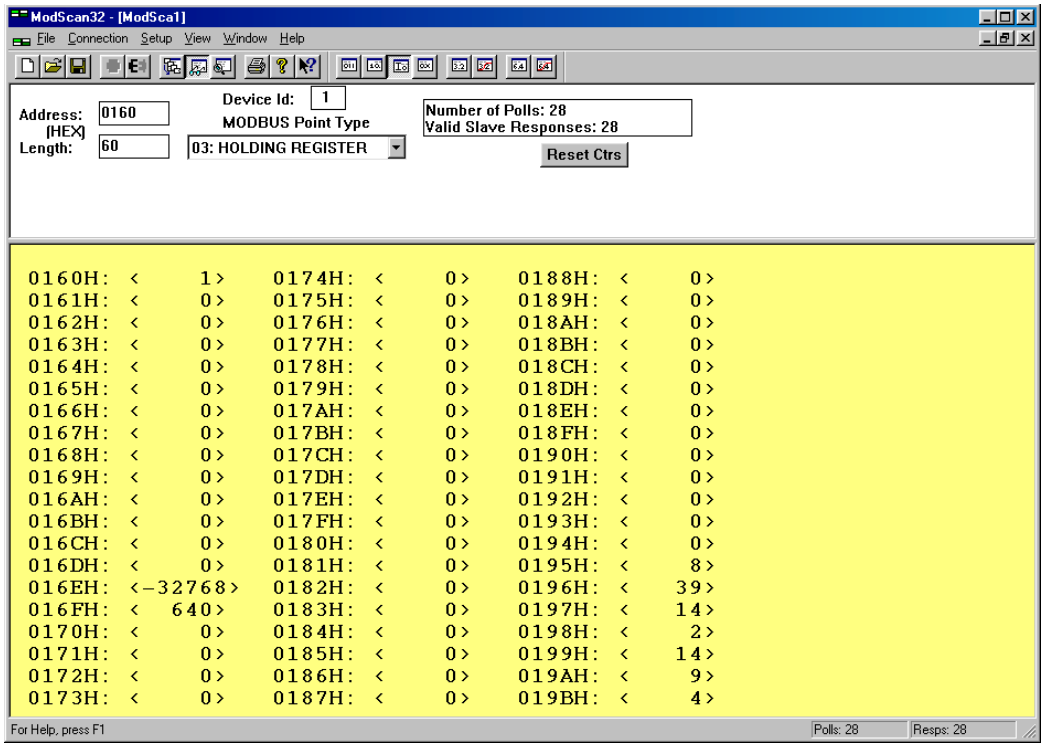
The examples have been created using an Energy XTMH with two XTEH external expansions.

Note that Modscan32 in the Address field contains the address that you wish to read+1. This means that the Modscan address 0x000E corresponds to reading the Modscan address 0x000D on the Energy XTPRO.

Reading numeric parameters

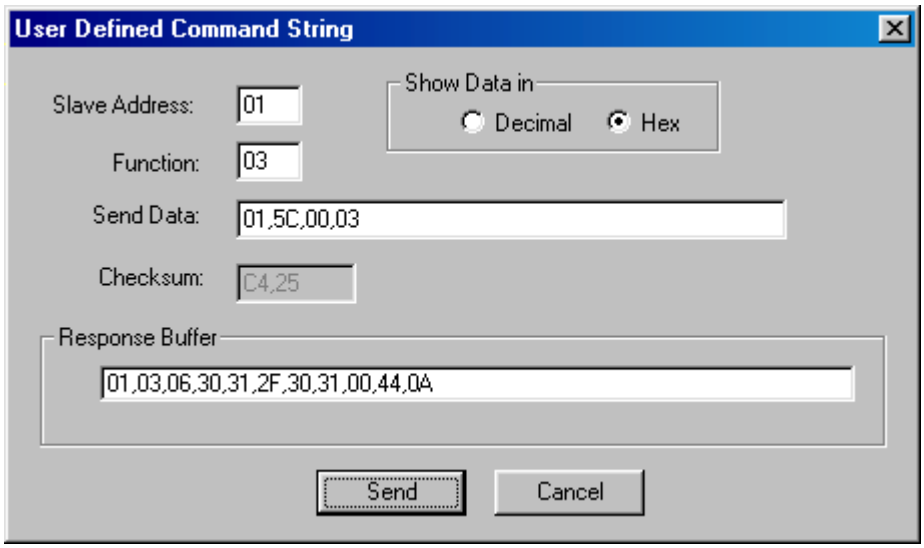


Reading numeric variables



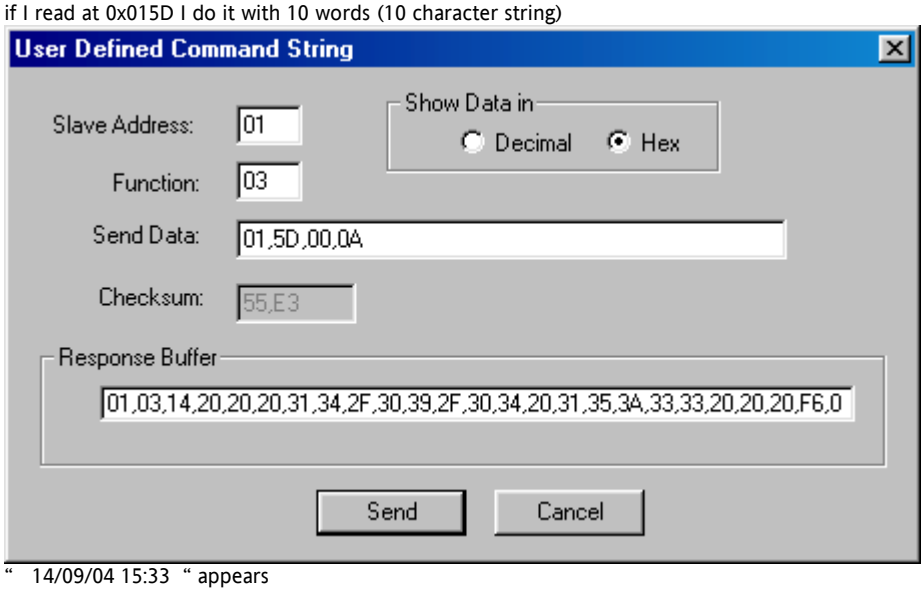
Reading string variables

if I read at 0x015C I do it with 3 words (5 character string)



"01/01" appears

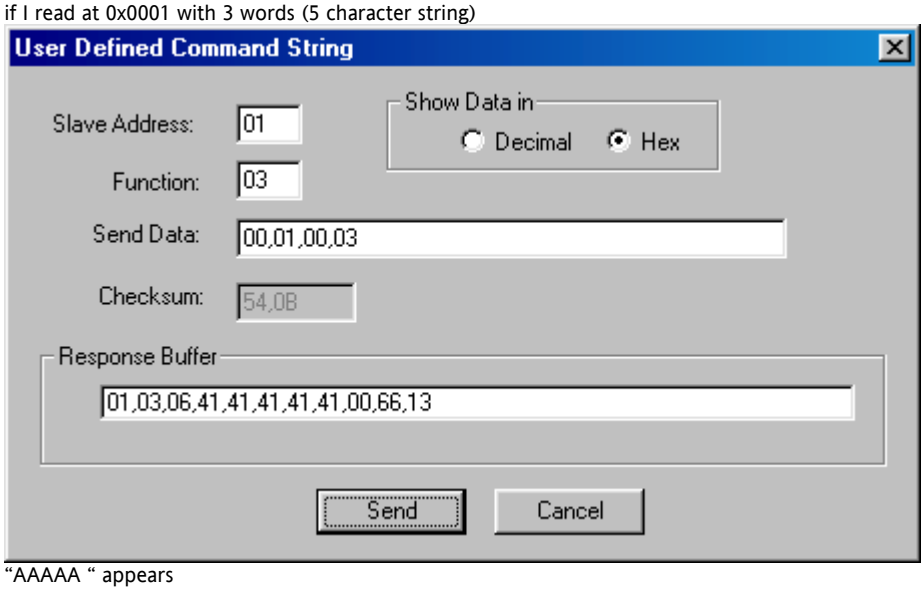
if I read at 0x015D I do it with 10 words (10 character string)



“ 14/09/04 15:33 “ appears

Reading string parameters

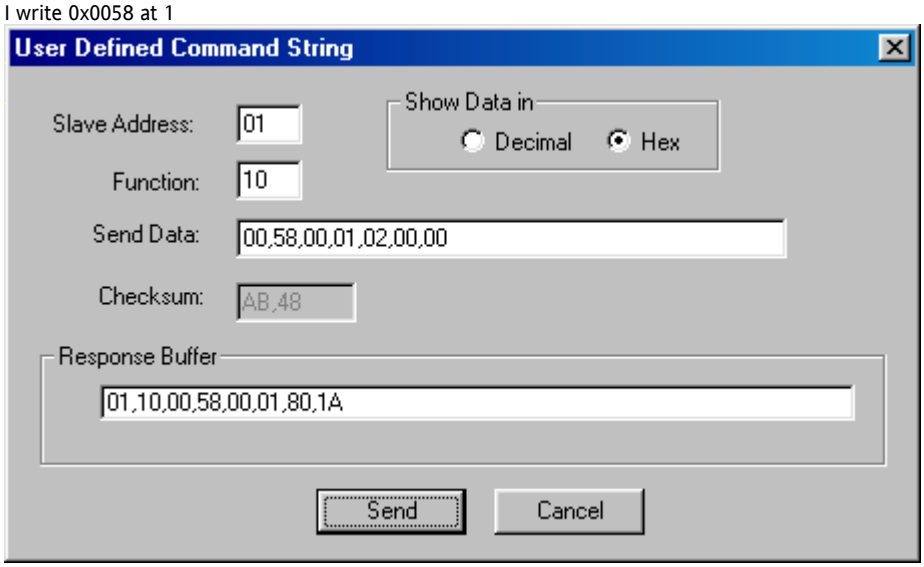
if I read at 0x0001 with 3 words (5 character string)



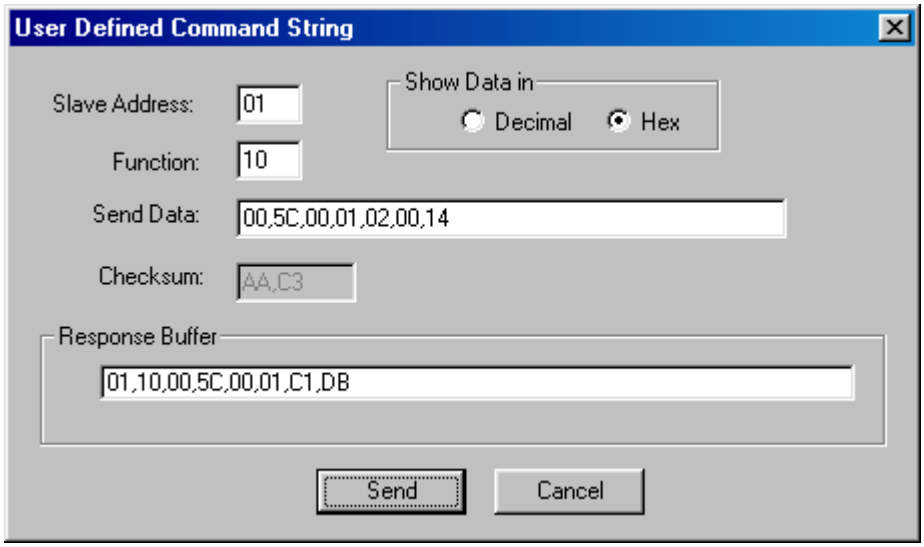
“AAAAA “ appears

7.1.6 Examples with Modscan32 for Command 16 with bit16=0

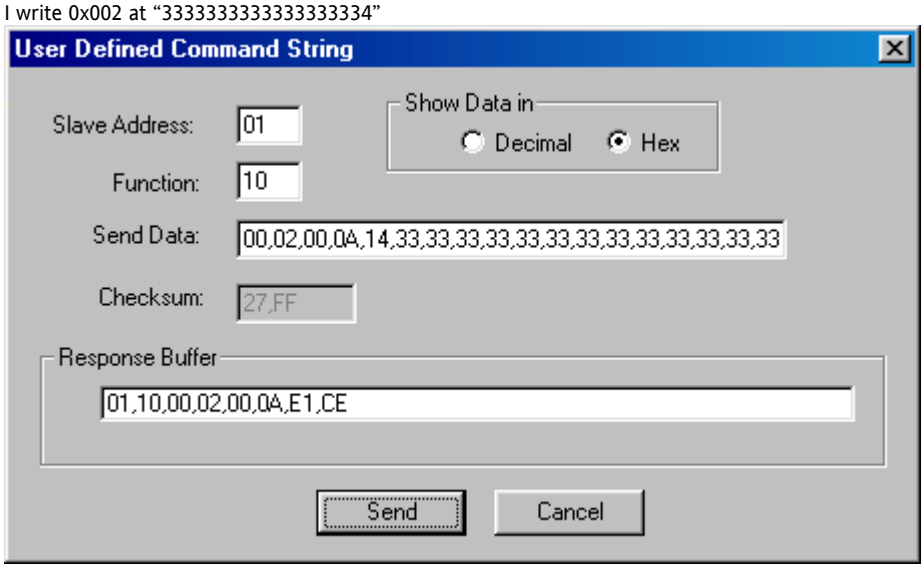
I write 0x0058 at 1

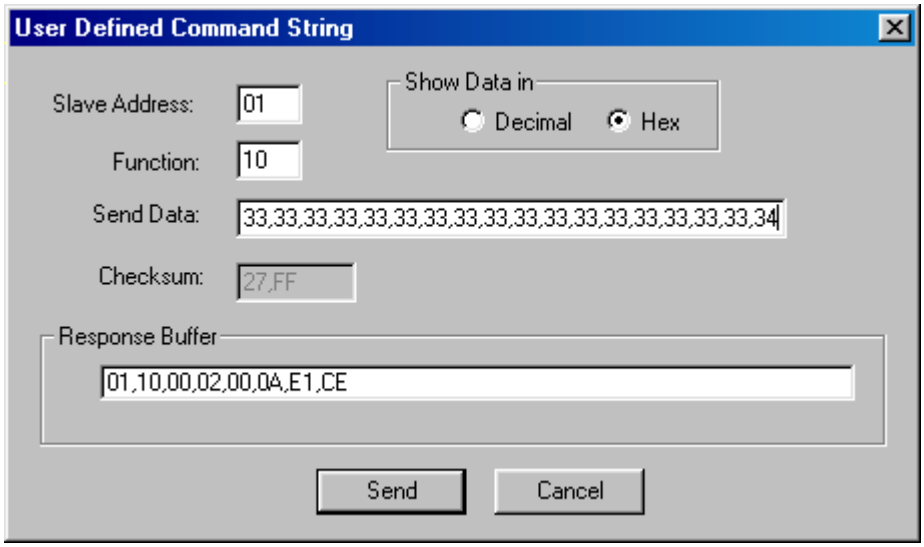


I write 0x005C at 10 to 20

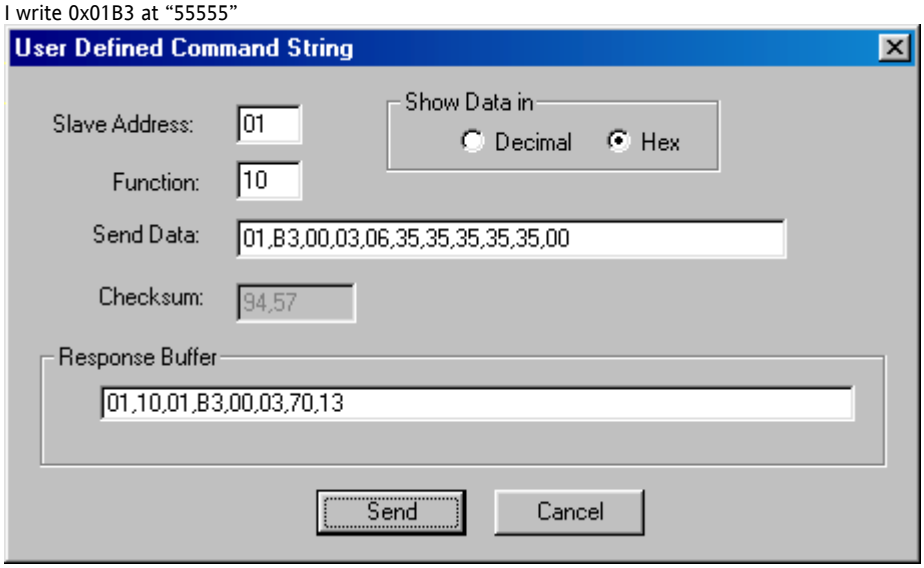


I write 0x002 at “3333333333333333334”





I write 0x01B3 at “55555”



7.2 Command 20

The **20 Read File Record** command is used to download files created in the *WORKBENCH* application with these characteristics:

- They are binary files
- They will have these names: 000.txt, 001.txt, 002.txt, … , 255.txt
- They have been created by "adding" strings with a maximum of 120 characters

The command has been implemented so that data can only be requested for one file at a time (data cannot be requested for several files in the same frame).

Format of request PDU

Function code	1 Byte	0x14	Fixed value equal to command code
Byte Count	1 Byte	7	Fixed value
Sub-Req x Reference Type	1 Byte	6	Fixed value
Sub-Req x File Number	2 Bytes	N_FILE	File name = number of file that you want to download. E.g.: 023.txt -> 23dec therefore N_FILE = 17h
Sub-Req x Record Number	2 Bytes	0…N_REC	File record index: 0=give me the first (Synchronization) otherwise=give me the next ones
Sub-Req x Record Length	2 Bytes	0x3D	Fixed value equal to size in words of record

NOTE:
The first frame must have the Record Number at 0 so that the Energy XTPRO can be positioned, i.e. synchronized on the first record of the file. Subsequent frames will have a Record Number that is not 0 (it may be any value except 0: to clarify the situation, reading successive records in the same file could be an ascending number) to indicate that resynchronization is not required and other records in the file can be sent. If the Record Number is placed at 0 during downloading, the XTPRO repositions itself on the first record of the selected file.

NOTE:
if downloading is not completed, the file is left open. To close it, synchronization is requested for an inexistent file. If synchronization finds a file that has been left open by a previous download, it closes it and opens the necessary file (this may be the same one).

Format of response PDU

Function code	1 Byte	0x14	Fixed value equal to command code
Resp. data length	1 Byte	0x7C	Fixed value
Sub-Req x file resp. length	1 Byte	0x7B	Fixed value
Sub-Req x Reference Type	1 Bytes	6	Fixed value
Sub-Req x Record Data	122 Bytes		Record data indexed by request command

Structure of data contained in Sub-Req x 122 byte long Record Data:

first byte	LEN	Number of bytes actually belonging to the downloaded record counted from third byte. Successive data has no significance and must not therefore be considered
second byte	CODE	0x00=End of file download 0x01=Good data, you can continue downloading 0xFB=No synchronization 0xFC=Buffer tx not available (downloading on other serial) 0xFD=Item reading error 0xFE=file does not exist or opening error 0xFF=file empty
third byte		first data point of record
:		
:		
one hundred and twenty second byte		one hundred and twenty first data point of record

NOTE:
The response to a request for an item in the collection without initial synchronization has the value 0xFB in the CODE field and length LEN =0.
The response to a request for an item in the collection when a collection is being downloaded from the other serial has the value 0xFC in the CODE field and length LEN =0.
To signal errors in reading a record in the collection, the response will have these values in the CODE field:

- 0xFD=Item reading error
- 0xFE=Collection does not exist
- 0xFF=collection is empty

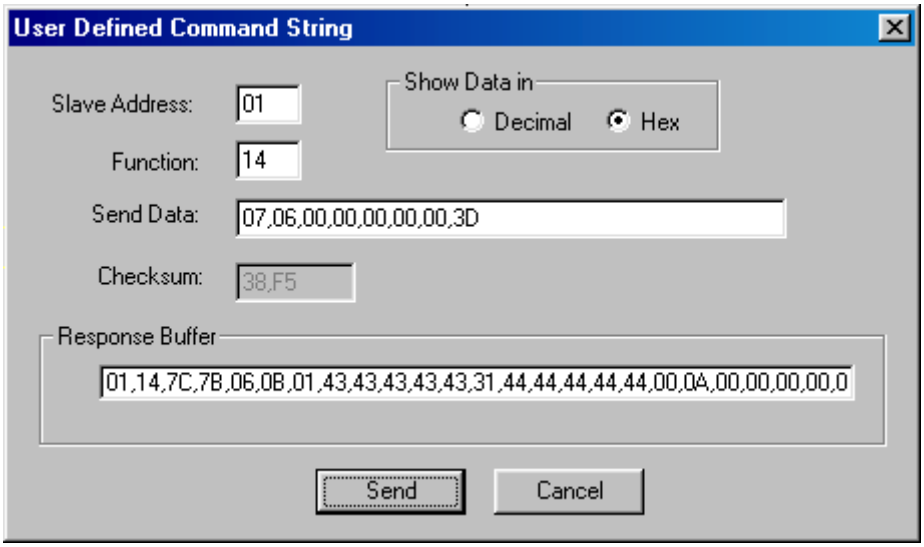
and length LEN =0.

During downloading of data CODE=0 and the length LEN is the exact number of useful data in the data field. At the end of downloading the field CODE=0 and LEN =0.
From this point onwards, the lack of synchronization will be signalled at each request.

When CODE=0xFC (buffer already used by the other serial) downloading of data must be completed with the other serial. Alternatively, to immediately reset the procedure, the serial that has begun downloading may immediately terminate it by sending the request to start downloading an inexistent file.

7.2.1 Example with Modscan32 for Command 20

The following records "CCCCC1DDDDD","DDDDD2CCCCC" and "CCCCC3DDDDD" have been written in the Energy XTPRO FileSystem in the "000.txt" file. I synchronize on the "000.txt" file and read the first record.



7.3 Command 43

The **43 Read Device Identification** command is used with the **Master File Command** of the *MICRONET* & *TELEVIS protocols*.

Function code	1 Byte	0x2B	Fixed value equal to command code
MEI Type	1 Byte	0x0E	Fixed value
Read Device ID code	1 Byte	0x04	Fixed value to request an item
Object ID	1 Byte	0,1,2,0x80	ID info code 0 = Vendor Name 1 = Product Code (PCH+POLI) 2 = MajorMinorRevision (Fam+Ver) 0x80 = private (CRC)

Format of fixed part of response PDU

Function code	1 Byte	0x2B	Fixed value equal to command code
MEI Type	1 Byte	0x0E	Fixed value
Read Device ID code	1 Byte	0x04	Fixed value to request an item
Conform. Level	1 Byte	0x81	Fixed value
More follows	1 Byte	0x00	Fixed value
Next Object ID	1 Byte	0x00	Fixed value
Number of Object ID	1 Byte	0x01	Fixed value

Format of part following fixed part of PDU responding to Object ID = 0:

Object ID	1 Byte	0	Value of Object ID
Object Length	1 Byte	9	Fixed value
Object Value	9 Byte	string	'ELIWELL ' (NOTE: there is a final space that brings the total to 9 characters)

Format of part following fixed part of PDU responding to Object ID = 1:

Object ID	1 Byte	0	Value of Object ID
Object Length	1 Byte	9	Fixed value
Object Value	9 Byte	string	ASCII string containing <PCH code in 4 bytes>1 0x5F code separation byte('-')<POLI code in 4 bytes>

Format of part following fixed part of PDU responding to Object ID = 2:

Object ID	1 Byte	0	Value of Object ID
Object Length	1 Byte	9	Fixed value
Object Value	9 Byte	string	ASCII string containing <FAM code in 4 bytes>1 0x5F code separation byte('-')<VER code in 4 bytes>

Format of part following fixed part of PDU responding to Object ID = 0x80:

Object ID	1 Byte	0	Value of Object ID
Object Length	1 Byte	20	Fixed value
Object Value	20 Byte	string	ASCII string containing the CRC

Example:

CMD_**43** obj **0**	Reading master file information: obj 0 vendor: "**ELIWELL** "
CMD_**43** obj **1**	Reading master file information: obj 1 PCH_POLI_2: "**0000_0000**" -> 10_401 -> 16_1025 -> **PCH** =16 and **POLI** = 1025
CMD_**43** obj **2**	Reading master file information: obj 1 MSK_REL: "**00D5_0006**" -> D5_06 -> 213_06 -> **MSK** =213 and **REL** = 6

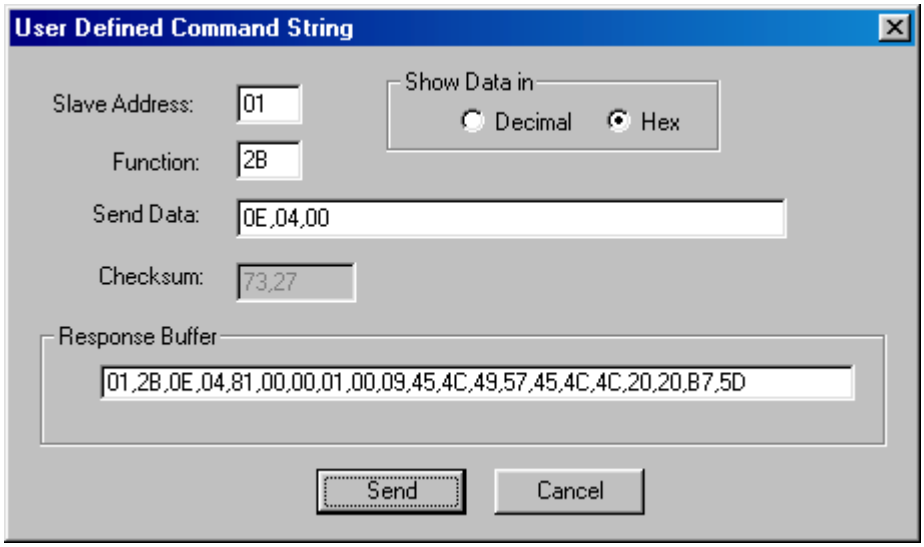
where:

- the OBJ 0: is a constant ASCII STRING for the company, we have decided to indicate "ELIWELL" excluding superscripts;
- the OBJ 1: is an ASCII STRING consisting of: the ASCII representation of the hexadecimal value of the PCH parameter formatted on 4 digits, the ASCII underscore symbol "_" excluding superscripts, the ASCII representation of the hexadecimal value of the POLI parameter formatted on 4 digits;

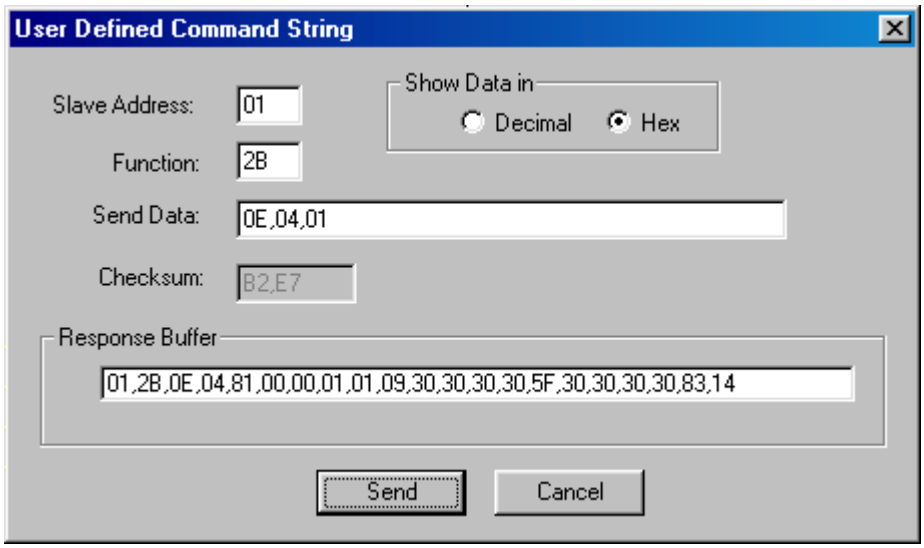
- the OBJ 2: is an ASCII STRING consisting of: the ASCII representation of the hexadecimal value of the MSK parameter formatted on 4 digits, the ASCII underscore symbol "_" excluding superscripts, the ASCII representation of the hexadecimal value of the REL value formatted on 4 digits;

7.3.1 Examples with Modscan32

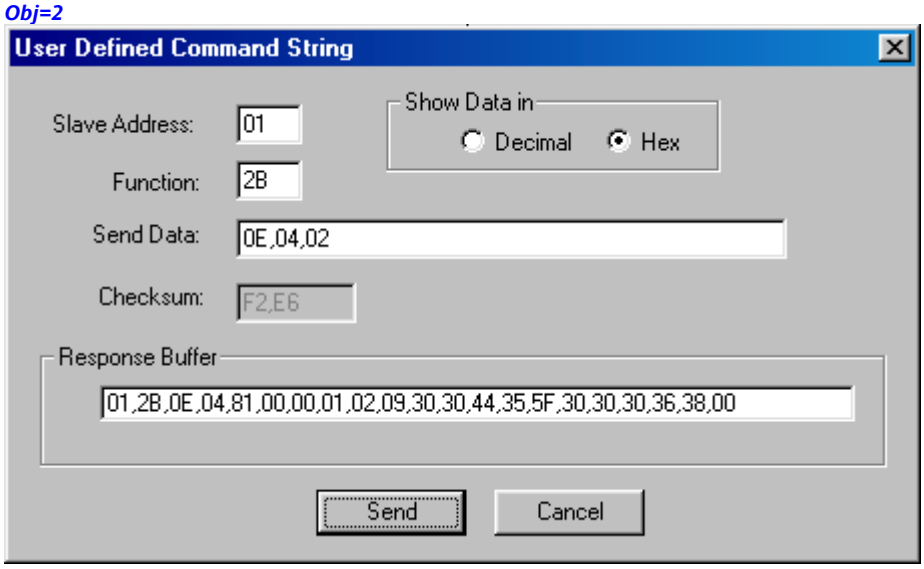
Obj=0 *Obj=0*



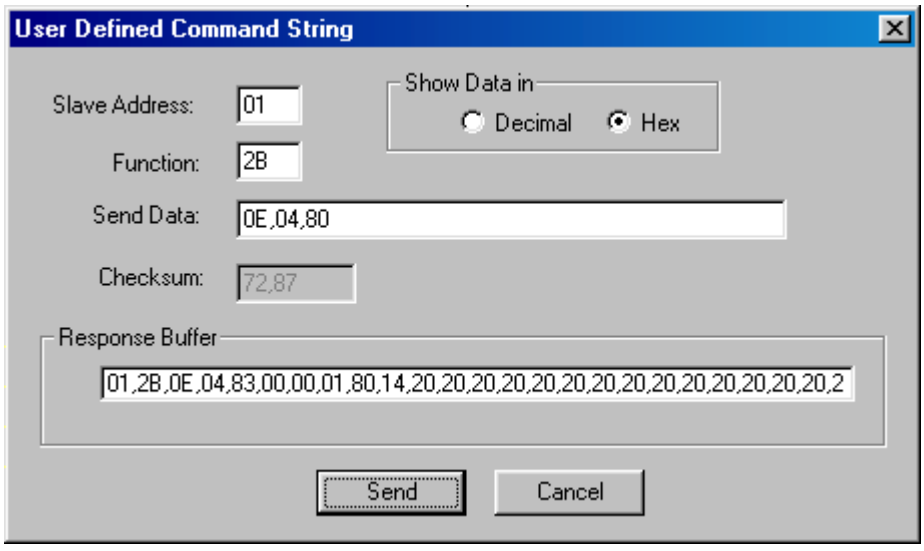
Obj=1 *Obj=1*

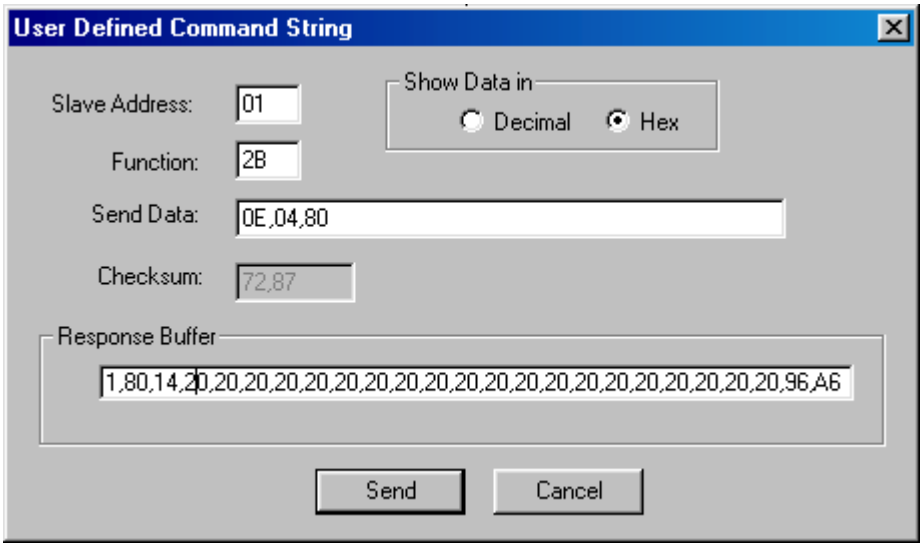


Obj=2 *Obj=2*



Obj=0x80 *Obj=0x80*




User Defined Command String
Slave Address:
01
Function:
2B
Show Data in
Decimal
Hex
Send Data:
0E,04,80
Checksum:
72,87
Response Buffer
1,80,14,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,20,96,A6
Send
Cancel

8 PERMITTED AND UNPERMITTED USE

8.1 Permitted Use

For safety purposes, it is important to make sure that the control device is installed and used in accordance with the instructions supplied and that no parts subject to dangerous voltage are accessible to users during ordinary operation.
The unit must be resistant to water and dust, depending on the application, and only be accessible using special tools. This unit can be fitted on domestic appliances and/or similar units used for air conditioning.
In accordance with the reference standards, this unit is classified:

- as an automatic electronic control device to be installed in a standalone configuration or on other units with regard to manufacturing;
- As a Type 1 control unit in relation to its manufacturing tolerances and derivatives with regard to its automatic operating characteristics;
- As a Class 2 device with regard to protection from electric shocks;
- As a Class A device with regard to software class and structure

8.2 Unpermitted Use

The *use* of the unit for applications other than those described is forbidden.

9 DISCLAIMER

9.1 Limited liability

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Although **Eliwell & Controlli** has taken all possible measures to guarantee the accuracy of this document, it declines any responsibility for any damage arising out of its *use*.

9.2 AppMaker and WORKBENCH

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10 ANALTIC INDEX

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