Schneider Electric

AB DH485 Protocol
XBT N/R/RT

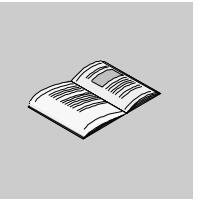
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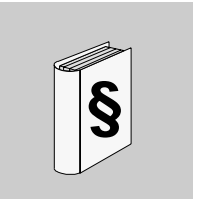
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Safety Information



Important Information

NOTICE

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



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



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

⚠ DANGER

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

⚠ WARNING

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

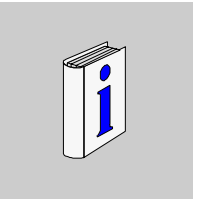
⚠ CAUTION
CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

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

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About the Book



At a Glance

Document Scope

This document describes communication between automation systems and the XBT N/R/RT product range using the AB DH485 protocol.

Validity Note

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

Related Documents

Title of Documentation	Reference Number
XBT N/R/RT Instruction sheet	W916810140111 A07
XBT N/R/RT User Manual	33003962
Vijeo-Designer Lite	Online help

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

Product Related Information

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

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

Since the XBT N/R/RT terminals are not designed to pilot safety critical processes, no specific instructions apply in this context.

User Comments

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

Compatibility

1

Compatibility

Overview

The DH485 protocol available for XBT terminals can be used to communicate with the following Allen Bradley process controllers:

- SLC-5/0X PLCs
- Micrologix

Operating Principle

2

Overview

This chapter describes the operating principle of XBT terminals in applications using the AB DH485 protocol.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop.
- Separate or redundant control paths must be provided for critical for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.*
- Each implementation of a Magelis XBT N/R/RT must be individually and thoroughly tested for proper operation before being placed into service.

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

*For additional information, refer to NEMA ICS 1.1 (latest edition), *Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control*

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
General Information on Bus Communications	12
Operating Principle	13

General Information on Bus Communications

Overview

The XBT terminals can be connected to PLCs using different protocols. This document describes the communication using the DH485 protocol with the XBT terminal acting as client.

Roles of XBT Terminals

The terminals are usually connected to a communication equipment (PLC or other) via a field bus. The XBT and the PLCs work autonomously of each other.

XBT terminals perform the following functions:

- monitoring function: XBT terminals visualize the processes that are active in the PLCs and indicate alarm states
- command function: XBT terminals send information to the PLC upon user request

Roles of Buses

A bus system provides the possibility to connect different devices via a unique cabling.

Roles of Protocols

The protocol defines the language that is spoken by all the equipment connected to the bus.

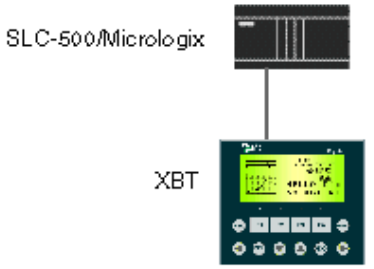
Operating Principle

Overview

The DH485 protocol is an Allen Bradley communication protocol.

The link between the XBT terminal and the Allen Bradley PLCs is one of the following types

- point-to-point
- multidrop



⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

The protocol must be installed and used by authorized and properly trained personnel.

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

Software Configuration

3

Overview

This chapter contains the protocol parameters you must configure in the Vijeo-Designer Lite software for operating XBT terminals in DH485 applications.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Vijeo-Designer Lite	16
Protocol - AB DH485 Dialog Box	18
Configuring Equipment Addresses	20
Equipment Address Dialog Box	22

Vijeo-Designer Lite

Overview

Use the Vijeo-Designer Lite software to configure your XBT terminal for DH485 protocol applications.

⚠ WARNING

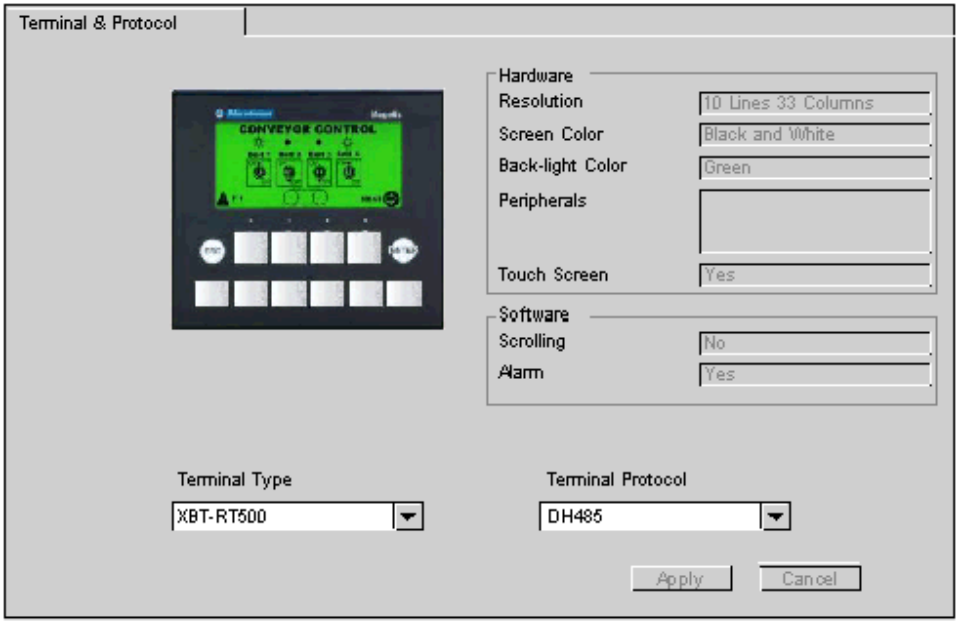
INCOMPATIBLE SOFTWARE

Use only Schneider Electric manufactured or approved software to program hardware.

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

Opening the Protocol - AB DH485 Dialog Box

To open the **Protocol - AB DH485** dialog box in Vijeo-Designer Lite for setting the protocol parameters, proceed as follows:

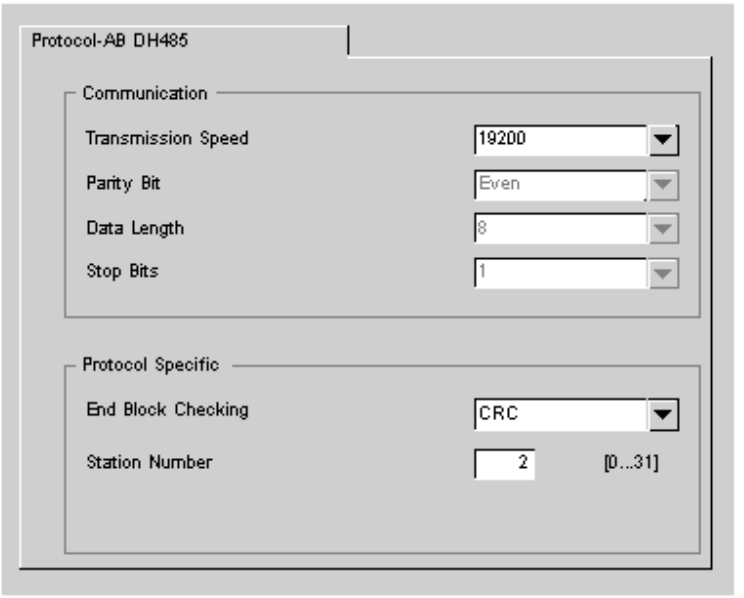
Step	Action
1	Start Vijeo-Designer Lite. To create a new application, continue with step 2, if you have already created a DH 485 application, skip steps 2 and 3 and execute step 4.
2	From the application browser on the left-hand side of the Vijeo-Designer Lite window select the item **Configuration** → **Terminal & Protocol**. **Result**: The following dialog box will be displayed on the right-hand side of the Vijeo-Designer Lite window. 
3	From the **Terminal Protocol** list in the lower right corner select the item **AB DH485** and click **Apply**.
4	Select from the application browser the item **Protocol - DH485**. **Result**: The dialog box **Protocol - AB DH485** will be displayed on the right-hand side of the Vijeo-Designer Lite window where you can configure the protocol parameters for DH485 communication.

Protocol - AB DH485 Dialog Box

Purpose

Use this dialog box to configure the protocol parameters for DH485 communication.

Representation



Elements of the dialog box

Element	Description
Communication	
Transmission Speed	Select the transmission speed (in bit/s) on your DH485 bus from the list. Make sure to configure the same transmission speed for all devices connected to the bus.
Parity Bit	You cannot edit this parameter because in DH485 communications the parity is always even.
Data Length	You cannot edit this parameter because in DH485 communications the length of user data is always 8 bits.
Stop Bits	You cannot edit this parameter because in DH485 communications always 1 stop bit is used.

Element	Description
Protocol Specific	
End Block Checking	Select the error checking method (BBC or CRC) that should be executed. ● Select **BCC** (Block Check Character) for rapid, 8-bit format error checking. ● Select **CRC** (Cyclic Redundancy Checking) for less rapid but more reliable, 16-bit format error checking.
Station Number	Enter the unique address (between 0 and 31) of the XBT terminal in the network.

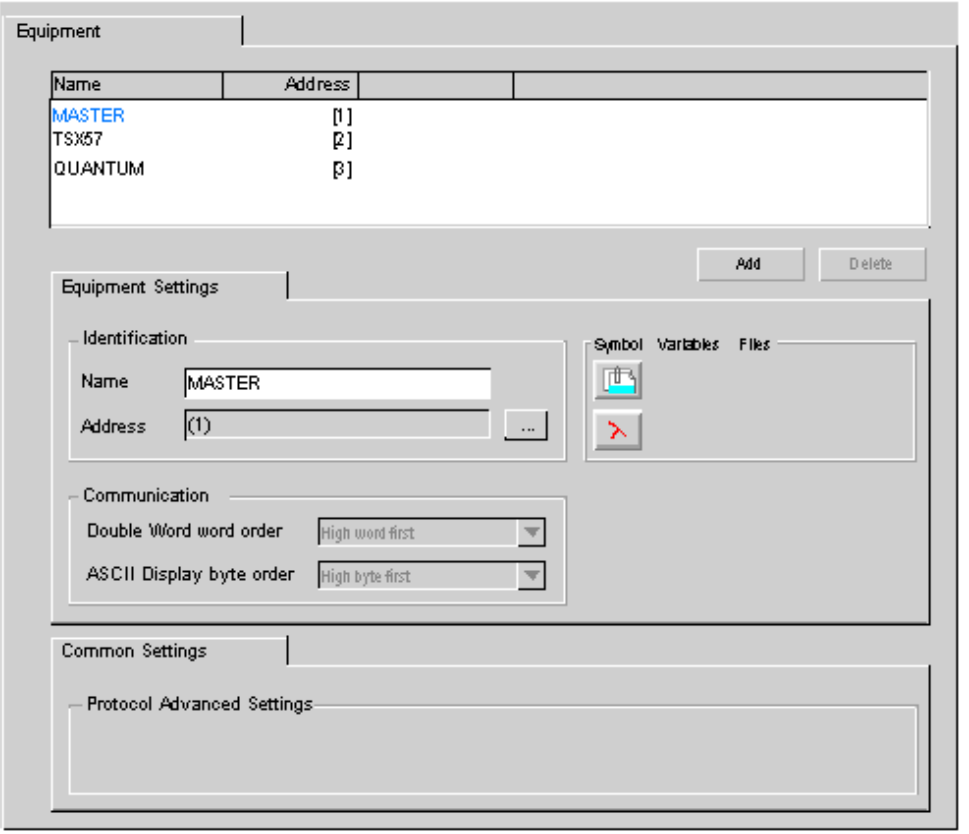
Configuring Equipment Addresses

Overview

Use the Vijeo-Designer Lite software to configure addresses for the equipment your XBT terminal should communicate with.

Opening the Equipment Address Dialog Box

To open the **Equipment Address** dialog box in Vijeo-Designer Lite for configuring DH485 equipment addresses, proceed as follows:

Step	Action
1	Start Vijeo-Designer Lite.
2	From the application browser on the left-hand side of the Vijeo-Designer Lite window select the item **Equipments**. **Result**: The following dialog box will be displayed on the right-hand side of the Vijeo-Designer Lite window. 
3	In the **Equipments** dialog box select a slave device from the list.
4	In the **Equipment Settings** → **Identification** box below click the **...** button right to the **Address** text box. **Result**: The **Equipment Address** dialog box will be displayed where you can configure an address for the selected equipment.

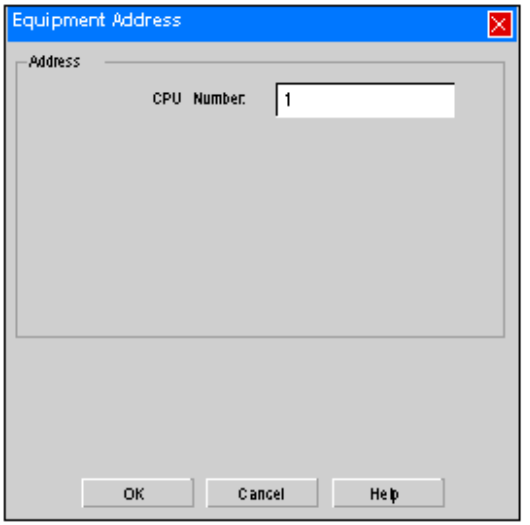
Equipment Address Dialog Box

Purpose

Use this dialog box to configure the address of equipments connected to the network.

Representation

DH485 equipment address



Elements of the dialog

Element	Description
CPU Number	Enter the address (between 0 and 31) for the selected equipment.
OK button	Click the **OK** button to assign the entered address to the selected equipment.
Cancel button	Click the **Cancel** button to discard the changes and to close the dialog box.
Help button	Click the **Help** button to open the Vijeo-Designer Lite online help.

Variable Types Supported

4

Variable Types Supported

Table of Variable Types Supported by the XBT

The following table lists all DH485 variables XBT terminals can access.

Variable Type Supported	DH485 Syntax	Identifiers
Bit	Nf:i/j	• f:(0...255) • i: (0...255) • j: (0...15)
Word, String, Double Word	Nf:i	• f:(0...255) • i: (0...255)
Floating Point	Ff:i	• f:(0...255) • i: (0...255)

File Number f

Indicates the number of the file in the process controller that the operator wishes to access.

Index i

Indicates the item number in the selected field (word number).

Index j

It will only be possible to access this field if the selected data type is Nf:i/j.

It indicates the position of the bit in the word (selected by i field).

Cables and Connectors

5

Overview

This chapter specifies the cables and connectors required for XBT terminals in DH 485 applications.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Cables	26
SUB-D 25 Pin Connections	30

Cables

Technical Data

The following table lists the cables required to connect XBT terminals to the SLC /Micrologix PLCs in multidrop or point-to-point applications.

Connected Device	Terminal	Physical Link	Cable Reference	Length
SLC/Micrologix, point-to-point	XBT N401/N410 XBT R410/R411	RS232	XBT Z9732	2.5 m (8.2 ft.) (SUB-D25 <--> Micrologix 1000)
	XBT RT500/RT511	RS485	XBT Z9734**	2.5 m (8.2 ft.) (RJ45 <--> Micrologix 1000)
SLC/Micrologix, multidrop (via 1761-NET-AIC provided by Allen Bradley)	XBT N401/N410 XBT R410/R411	RS232	XBT Z9730	2.5 m (8.2 ft.) (SUB-D25 <--> SUB-D9)
	XBT RT500/RT511		XBT Z9741*	2.5 m (8.2 ft.) (SUB-D25 <--> SUB-D9)

*
- **XBT RT 511**: you must add a XBT ZG939 cable adapter (SUB-D25 <-> RJ45)
- **XBT RT 500**: you must add a XBT ZG939 cable adapter (SUB-D25 <-> RJ45) and a XBT ZRTPW for power supply.

** **XBT RT 500**: you must add a XBT ZG939 cable adapter for power supply.

Multidrop Connection Diagram

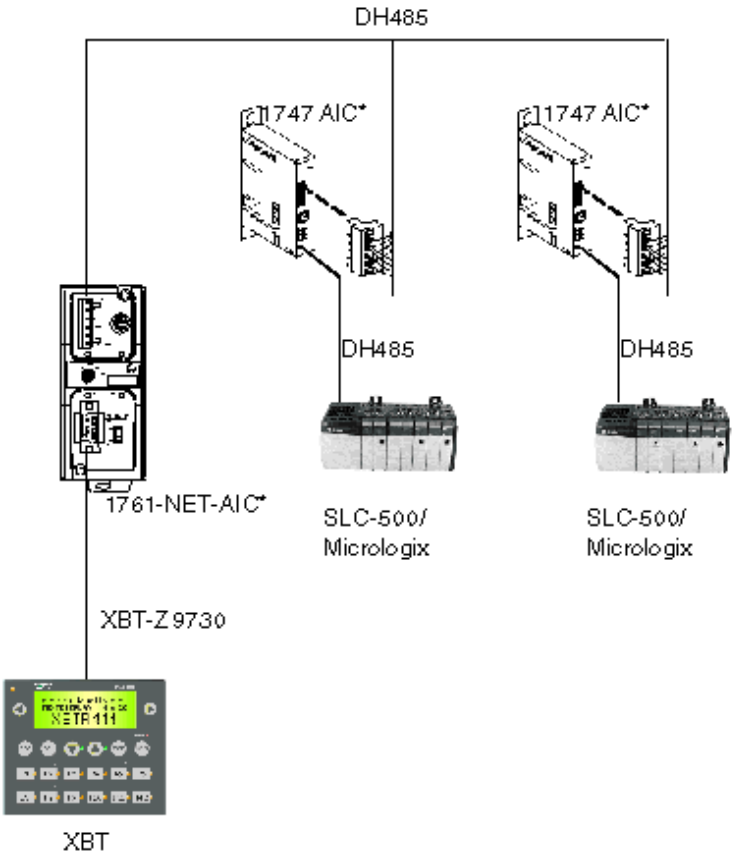
⚠ CAUTION

POWERED CONNECTORS

Connect the serial link and printer link to the XBT with the power OFF.

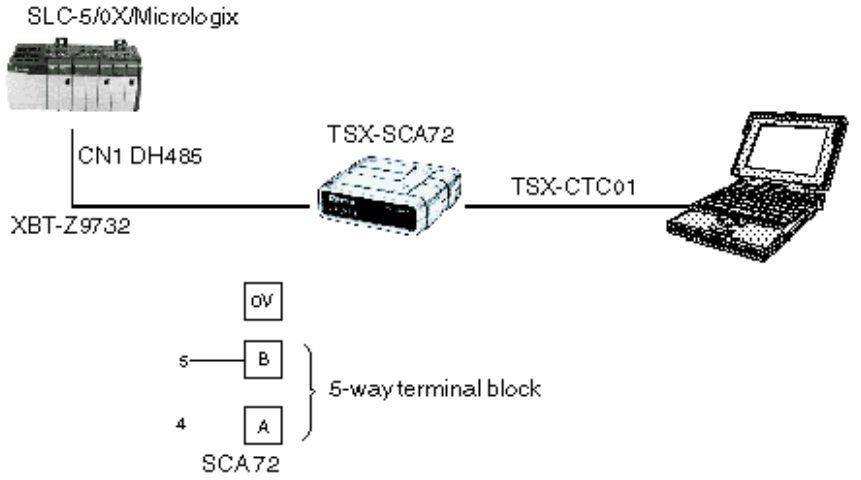
Failure to follow these instructions can result in injury or equipment damage.

(*) Provided by Allen Bradley



How to Connect a PC in Point-to-Point Mode to the DH485 Network

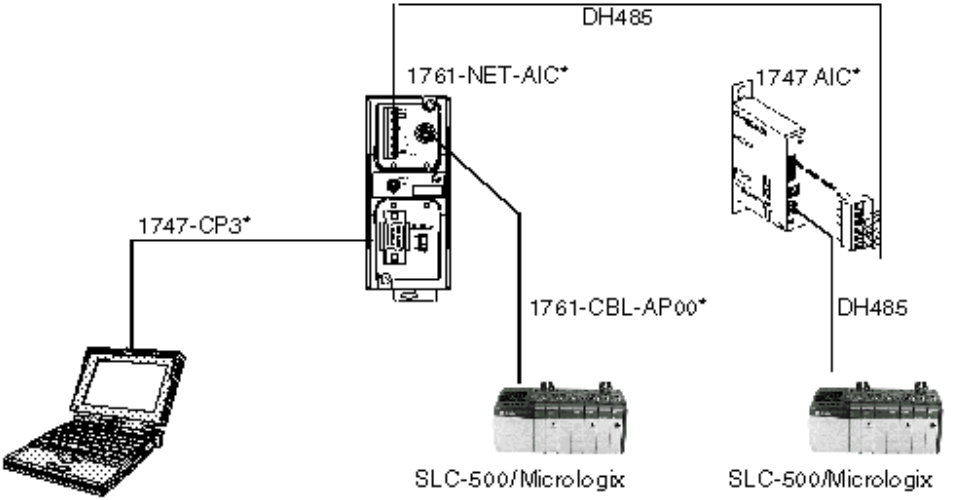
⚠ CAUTION
POWERED CONNECTORS Connect the serial link and printer link to the XBT with the power OFF. **Failure to follow these instructions can result in injury or equipment damage.**



How to Connect a PC in Multidrop Mode to a DH485 Network

⚠ CAUTION
POWERED CONNECTORS Connect the serial link and printer link to the XBT with the power OFF. **Failure to follow these instructions can result in injury or equipment damage.**

(*) Provided by Allen Bradley


DH485
1761-NET-AIC*
1747 AIC*
1747-CP3*
1761-CBL-AP00*
DH485
SLC-500/Micrologix
SLC-500/Micrologix

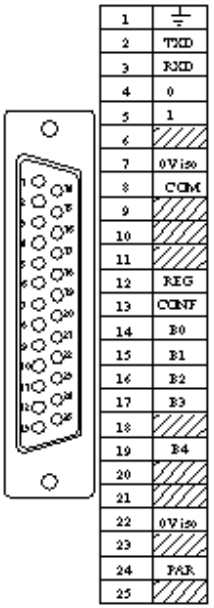
SUB-D 25 Pin Connections

Overview

The following XBT terminals provide a SUB-D25 connector on their rear panels:

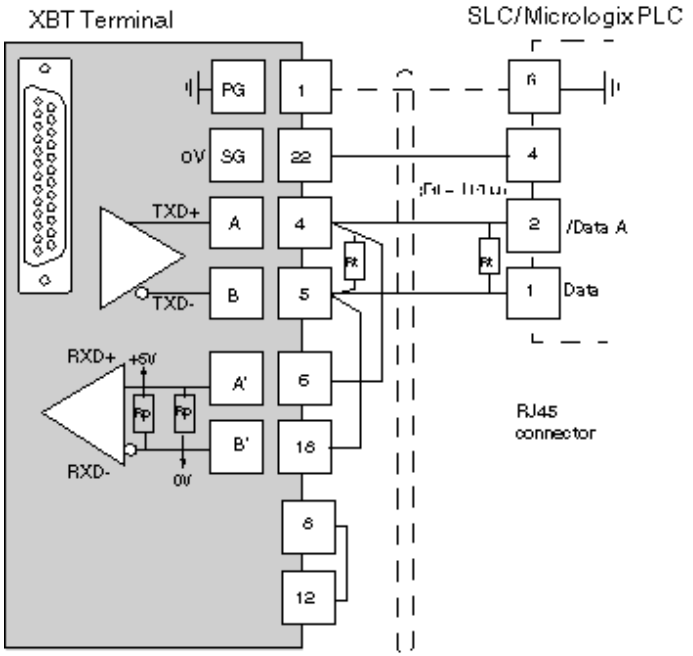
- XBT N401
- XBT N410
- XBT R410
- XBT R411

The pin assignment of the SUB-D25 connector is shown in the following figure.



Wiring

The illustration below shows the wiring:



Rt line impedance matching resistor

NOTE: RP resistors are integrated into the XBT and feature:

- 4.7 kΩ for XBT N
- 470 Ω for XBT R
- 600 Ω for XBT RT

Diagnostics

6

XBT Detected Error Indication

Overview

XBT terminals indicate detected errors in different ways

- by displaying question marks ?????? on alphanumerical fields
- by displaying crosses for graphic objects
- by displaying hash characters in alphanumerical fields
- by blinking alphanumerical fields
- by issuing system error messages

The following paragraphs list these three detected errors and their possible reasons.

Question Marks and Crosses

When question marks ?????? and crosses XXXXXX are displayed on the display of your XBT terminal, a transmission error has occurred. To correct this, check the following:

If...	**Then ...**
question marks are displayed	verify that all cables are correctly connected.
question marks are displayed	verify that the communication parameters set in the **Protocol - AB DH485** dialog box are identical for all equipment connected to the bus i.e. same transmission speed, same use of parity.
question marks are displayed	the XBT terminal may have received no response from the PLC.

Hash Characters

Hash characters displayed in alphanumerical fields on your XBT terminal indicate that the value to be displayed is too long for this alphanumerical field and cannot completely be displayed. The value `100` can, for example, not be displayed in a 2-digit alphanumerical field. To correct this, enter a shorter value or adapt the size of the alphanumerical field so that it can display any of the possible values of the PLC variable.

Blinking Alphanumerical Fields

Blinking alphanumerical fields on your XBT terminal indicate that the value of this field has exceeded or fallen below a user-defined threshold.

System Error Messages

A variety of system error messages is by default configured for the terminals. All these standard system messages are assigned a panel number 200+x. A distinction is made between system error messages indicating communication interruptions and status messages provoked by inputs at the terminal.

These 2 message types differ by the numbers they are assigned and by the way they are displayed at the terminal as shown in the list below:

System Error Message Caused by:	System Error Message Numbers	Display Mode
Communication Interruptions	201 – 204	To indicate that a communication interruption has occurred, the message is displayed in a popup dialog box every 10 seconds.
Input at Terminal	241 – 258	The status message is displayed as a response to user input at the terminal.

Messages Caused by Communication Interruptions

Messages 201 to 204 are issued by the terminal to indicate that a communication interruption has occurred. They are displayed in a popup dialog every 10 seconds.

If...	Then ...
message `201: DIALOG TABLE AUTHORIZATION INCORRECT` is displayed	the authorization word in the dialog table does not have the expected value. (Refer to the Vijeo-Designer Lite online help for information on how this word is working.) To correct this, verify that: ● you are connected to the right PLC ● the memory of your PLC is not corrupted ● the correct value is saved on the PLC
message `202: DIALOG TABLE WRITING IMPOSSIBLE` is displayed	the write cycle to the dialog table of the PLC could not be ended. This condition may have the following causes: ● too much load on the communication bus ● EMC disturbances on the communication bus
message `203: DIALOG TABLE READING IMPOSSIBLE` is displayed	the read cycle from the dialog table of the PLC could not be ended. This condition may have the following causes: ● too much load on the communication bus ● EMC disturbances on the communication bus

Messages Caused by Input at the Terminal

Messages 242 to 254 are issued by the XBT as a response to user input at the terminal. These messages are displayed directly after the operator has sent an incorrect command to the terminal and will persist until the user has corrected the entered command or value. Messages 255 to 258 are status messages displayed after the user has initiated an operation at the terminal to indicate that it has (or has not) been accepted and is in progress.

If...	Then ...
message `241: IMPOSSIBLE TO READ VARIABLE` is displayed	the terminal has attempted to read a variable and could not retrieve its value. This condition may have the following causes: ● too much load on the communication bus ● EMC disturbances on the communication bus
message `242: IMPOSSIBLE TO WRITE VARIABLE` is displayed	the terminal has attempted to write in a memory area of the equipment and has received a negative acknowledgement or no acknowledgement at all. This condition may have the following causes: ● too much load on the communication bus ● EMC disturbances on the communication bus

If...	Then ...
messages 243 to 249 are displayed	correct the value or command you have entered as indicated by the message.
message 250: LANGUAGE IMPOSED BY PLC is displayed	the PLC forces the terminal to use a language. This language cannot be changed by the operator. For more information see the Vijeo-Designer Lite online help, functions of the dialog table.
messages 251 or 252 are displayed	correct the value or command you have entered as indicated by the message.
message 253: PASSWORD IMPOSED BY PLC is displayed	you cannot change the password at the terminal because it is forced by the PLC. For more information see the Vijeo-Designer Lite online help, functions of the dialog table.
message 254: PROTECTED ACCESS PAGE is displayed	you are trying to access a page that is password protected but you do not have the required authorization level.
messages 255 to 258 are displayed	the commands you entered at the terminal are executed or not executed, as indicated in these status messages.

Appendices



RS232/RS485 Recommendations

A

Overview

This chapter decribes the RS232/RS485 recommendations.

What's in this Chapter?

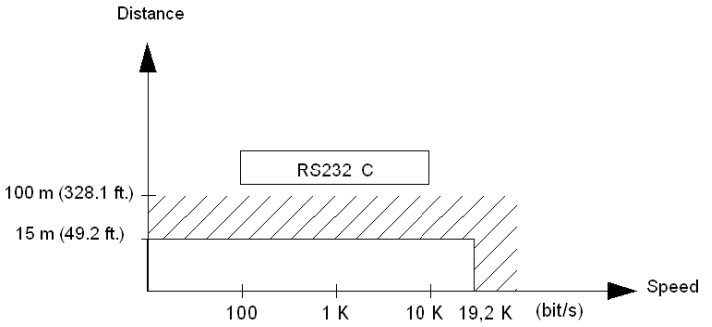
This chapter contains the following topics:

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RS232 Recommendations	40
RS485 Recommendations	41

RS232 Recommendations

Diagrams for RS232C Link

RS232C link



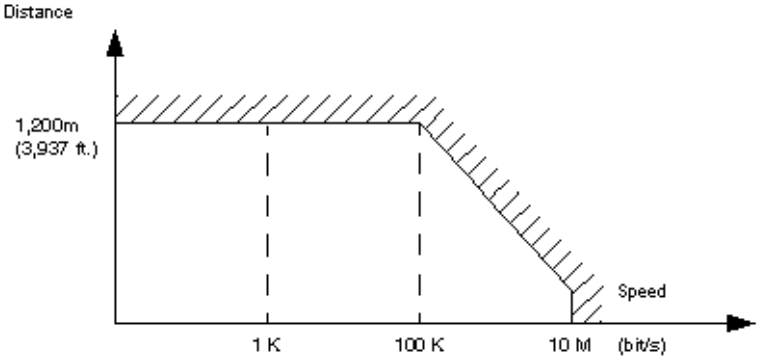
- Maximum length for the link is 15 m (49.2 ft.).
- Wiring = 3 shielded wires with a minimum cross-section of 0.6 mm^2 (AWG22)

NOTE: The maximum length including the RS232 link is 15 m (49.21 ft.), provided that the equipment connected to the XBT terminal is not subject to more stringent restrictions (refer to connected devices instruction sheet) and for XBT RT500 provided that the length of the cable is below 10 m (32.8 ft.) (because power is also supplied by this cable).

RS485 Recommendations

Diagrams for RS485 Link

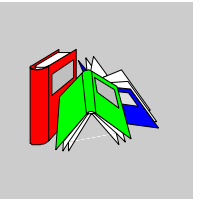
RS485 link



- Maximum length for the link is 1,200 m (3,937 ft.).
- Wiring = 2 shielded twisted wires with a minimum cross-section of 0.6 mm^2 (AWG22) and one 0 V wire

NOTE: The maximum length including the RS485 link is 1,200 m (3,937 ft.), provided that the equipment connected to the XBT terminal is not subject to more stringent restrictions (refer to connected devices instruction sheet) and for XBT RT500 provided that the length of the cable is below 10 m (32.8 ft.) (because power is also supplied by this cable).

Glossary



A

AWG

American wire gauge (wire diameter)

F

FCS

frame check sequence

M

Magelis

Generic commercial name of the range of Schneider HMI terminals.

P

PLC

programmable logic controller

R

RS232

recommended standard for connecting serial devices = EIA/TIA 232

RS485

recommended standard for connecting serial devices = EIA/TIA 485

V

Vijeo-Designer Lite

Configuration software for the low end Magelis range. It replaces the XBT-L1000 software.

X

XBT

Any HMI terminal (when it is not necessary to make a distinction).

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