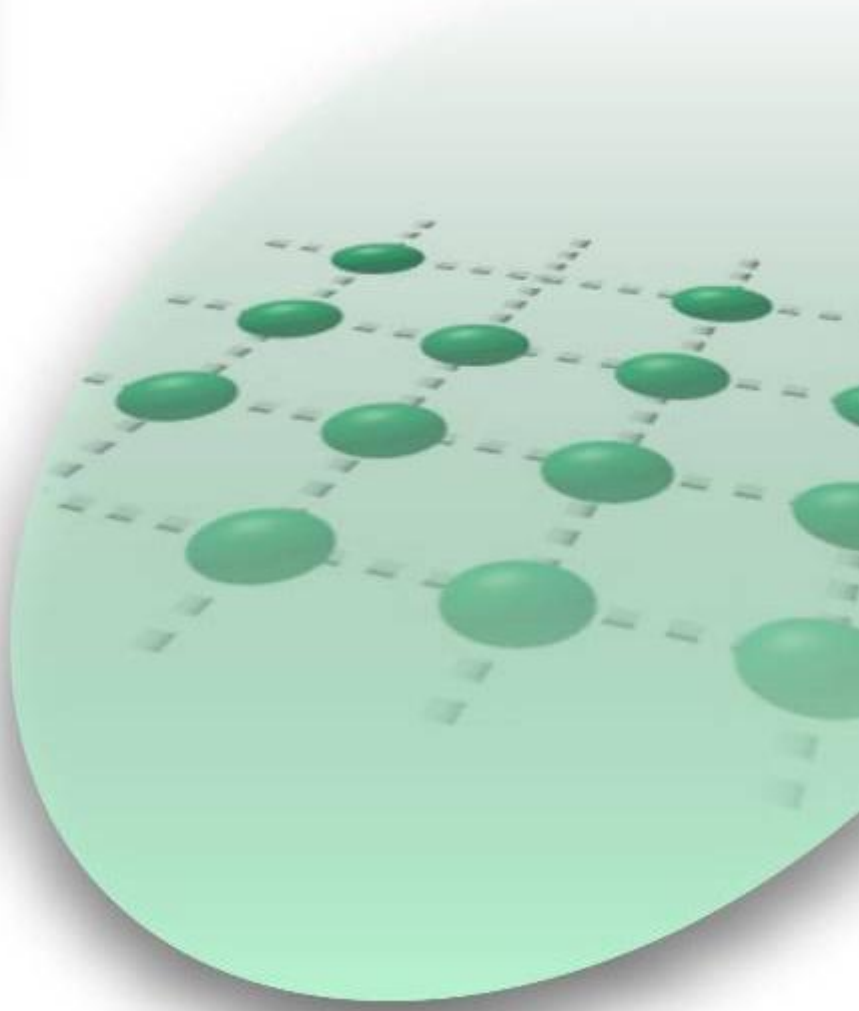
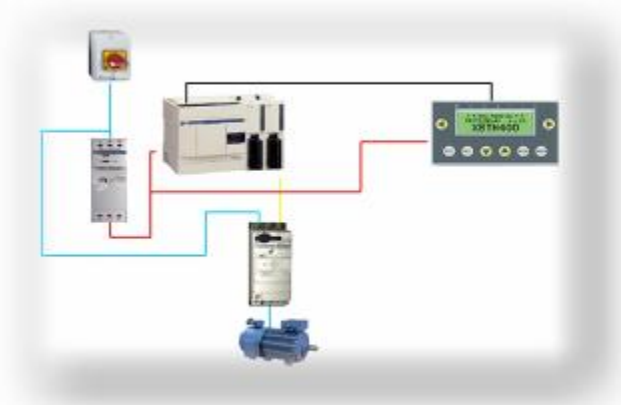


Twido and TeSys Phaseo and Magelis *System User Guide* [source code]



33003480.02

Merlin Gerin
Square D
Telemecanique

Schneider
 **Electric**
Building a New Electric World

Mar 2006

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Introduction

This document is intended to provide a quick introduction to the described System. It is **not** intended to replace any specific product documentation. On the contrary, it offers additional information to the product documentation, for installing, configuring and starting up the system.

A detailed functional description or the specification for a specific user application is **not** part of this document. Nevertheless, the document outlines some typical applications where the system might be implemented.

Abbreviations

Word / Expression	Signification
PLC	Programmable Logic Controller
HMI	Human Machine Interface
VVD	Variable Velocity Drive
PC	Personal Computer
AC	Alternating current
DC	Direct current
PS	Power supply
I/O	Input / Output
CB	Circuit Breaker
ESTOP	Emergency Stop
Twido	The generic range name for a Schneider midrange PLC
Phaseo	The generic range name for the Schneider power supply devices
Magelis	The generic range name for all the Schneider HMI devices
Altivar	The generic range name for all the Schneider VVD devices
Telefast	The generic range name for the Schneider distributed I/O devices

Application Source Code

Introduction

Examples of the source code used to attain the system function as described in this document can be downloaded from our „Village“ website under [this](#) link.

Typical Applications

Introduction

Typical applications or sub-applications which use systems as outlined in the following chapters are seen in the following market sectors:

Industry






- Small automation systems using transportation machinery (e.g. Conveyor)
- Decentralised automation systems supplementing large and medium sized machinery

Buildings/Services

- Ventilator Control
- Heating Control

Energy & Infrastructure

- RTU for Pump or Valve controlling (pipeline or fountain)
- RTU for Energy measurement station
- Filter cleaning control in waterworks

Application	Description	Example
Ventilation Control	The application controls a ventilation system in an industrial building . Continuous measuring of the temperature between two set points controls the start /stop of the ventilation.	
Heating Control	The application controls a heating system of a building.	
RTU for Pump control or Valve control (pipeline or fountain)	The application controls a fountain in an infrastructure network of a municipal services company. It is possible to control the system remotely via modem.	 
Filter cleaning control in waterworks	The application controls and cleans the filter of a waterworks. With a "Step by Step" program the filter will be cleaned by air followed by fresh water . It is also possible to control the system remotely via modem.	

System

Introduction

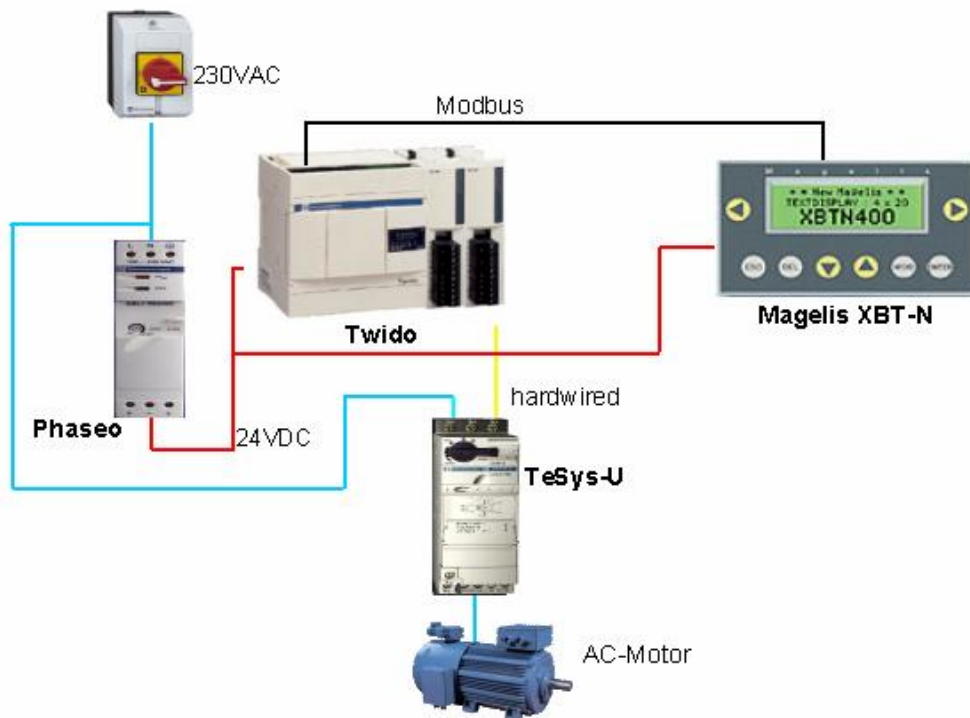
The system chapter describes the architecture, the components, the dimensions and the number of components used within this system.

Architecture

Overview

The system is built up with a low end PLC with control and visualisation via a small text display to control the connected drive controller and AC motor unit. It includes a safety protection in the form of an emergency stop and mains switch. The starter controller is hard-wired to the I/O-module of the Twido which controls the AC-Motor and reads messages from the TeSys-U – alarm-module for error indication. The Magelis XBT-N with an integrated 4 function keypad on the frontside is the human interface for parameter setting and also displays the application status in text form.

Layout



Components**Hardware:**

- Twido Modular (PLC)
- Phaseo power supply (PS)
- TeSys-U Starter Controller (SC)
- Magelis XBT-N (HMI)
- Standard AC-Motor

Software:

- Twidosoft Version 2.0
 - Magelis XBTL1003M V4.2
-

Amount of Components

You only require one of each listed component to build this application.

Dimension

The compact size of the Twido PLC, power supply, and TeSys-U allow the parts to be mounted in a single cabinet of size 220x200x200mm (HxWxD).
The Magelis XBT-N HMI could be built into the front door of the cabinet.

Installation

Introduction

This chapter describes the steps necessary to install the hardware and to set up the software to attain the following application architecture.


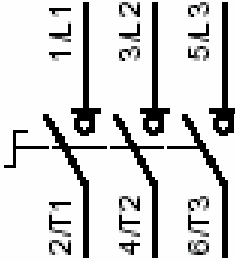

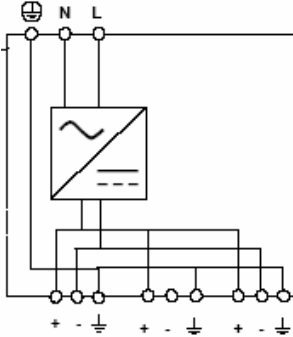
Layout



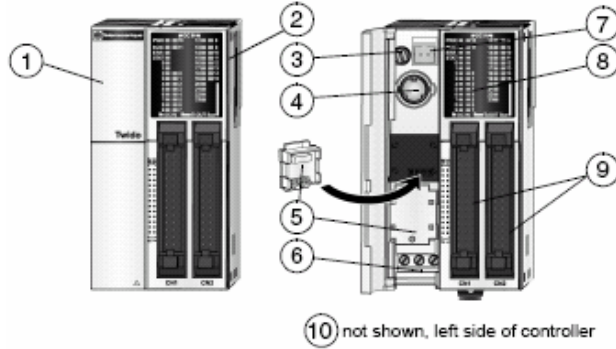
Hardware

General

- All devices can be mounted in a cabinet.
This mainly requires M5*18mm bolts and a 35mm DIN rail for fixing
- 230VAC wiring between the main switch, emergency stop, TeSys-U and AC-Motor
- 24VDC wiring between the power supply and PLC. The XBT-N is powered from the PLC via the Modbus communication cable.

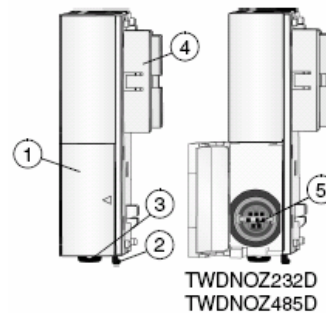
<p>Main switch VCF-02GE</p>		
<p>Power Supply ABL7RE2402</p>		

**Twido
TWDLMDA20DRT**



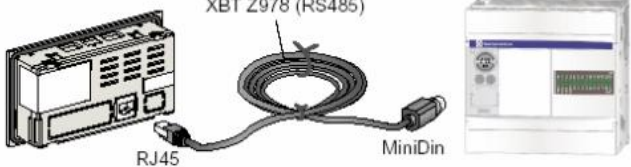
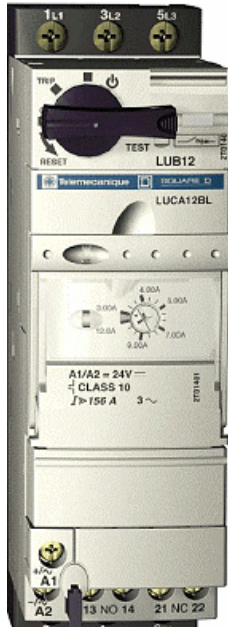
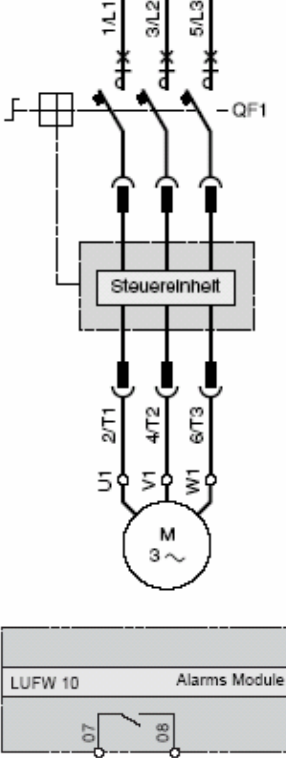


Label	Description
1	Hinged lid
2	Expansion connector
3	Analog potentiometer
4	Serial port 1
5	Cartridge covers
6	24 VDC power supply terminals
7	Analog voltage input connector
8	LEDs
9	I/O terminals
10	Communication connector

**Twido
Extension Comm
TWDNOZ485D**



Label	Part	Description
1	Hinged door	Opens to access the serial port 2.
2	Clamp	Secures the module to a DIN rail.
3	Latch button	Holds/releases the module from a controller.
4	Communication connector	Connects to a Modular controller.
5	Serial port 2	Adds an optional second RS485 or RS232 serial port to a Modular controller.

<p>HMI Magelis Text terminal XBT-N200</p>		
<p>HMI Magelis Communication cable XBTZ978</p>	<p>XBT N200 / XBT N400 + Twido / Micro / Premium / Nano XBT Z978 (RS485)</p> 	
<p>Motor Starter TeSys-U</p> <ul style="list-style-type: none"> • LUB12 Basis Unit • LUCB12FU Control unit • LUFW10 Alarm unit 		

Software

General

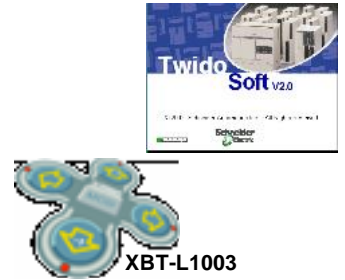
For the implementation of this system you need the following software tools:

- Twidosoft for programming the PLC.
- XBT-L1003 for designing the Magelis text display lines.

Your PC needs a Microsoft Windows operation system (Windows 98, 2000, or XP).

The Software installation path on your hard disk is by default:

- Twidosoft \Program Files\Schneider Electric\Twidosoft
- XBT-L1003 \Program Files\Schneider Electric\XBT-L1000



Communication

General

It is a hard-wired configuration with no communication via a bus system. For HMI functionality the Magelis XBT-N is connected to the Twido PLC via Modbus RTU protocol. For this communication you must parameterize the Modbus port in the PLC and the HMI and also the additional dialog table in the HMI application to process the information.

Implementation

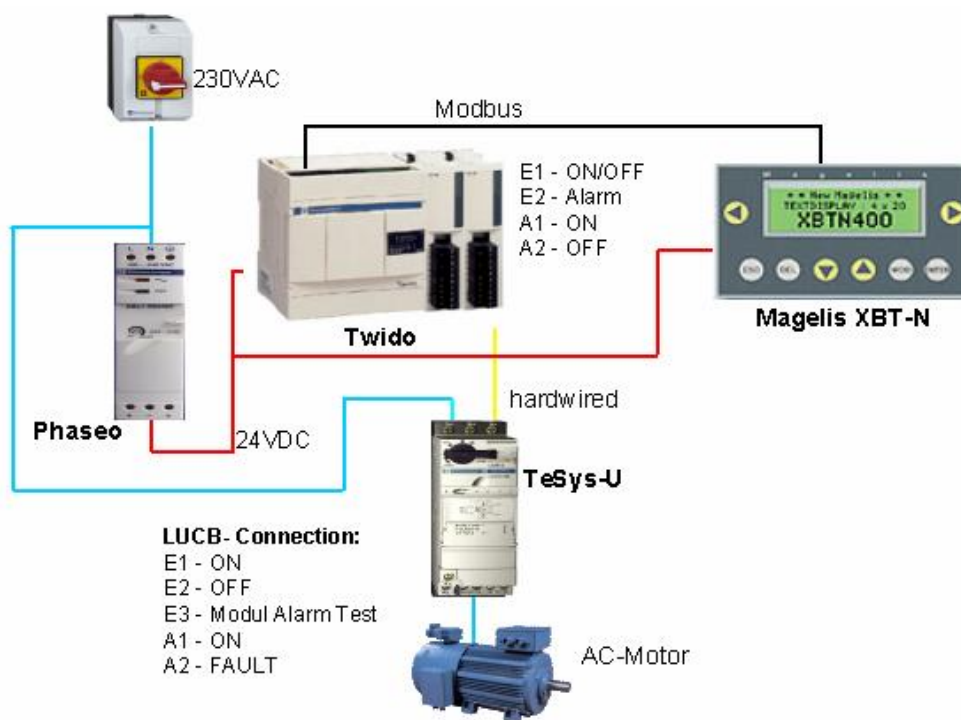
Introduction

The implementation chapter describes all steps necessary to initialize, parameterize, program and to start-up the system.

Function

Functional description

- Text Line 1:** Operation Modus RUN / STOP, MANUAL / AUTO
Select the Operation Mode Manual or Auto on the HMI.
In MANUAL the Motor can be Started/Stopped.
In AUTO the motor RUNs for an interval of 1 minute and then STOPs for 1 minute before starting up again.
- Text Line 2:** FAULT: NO / YES blinking
When the Modul Alarm Button on the LUCB is pressed the fault indication blinks.
- Text Line 3:** DATE / TIME / OPERATION (Minutes - Counter)
Displays PLC System Time / Date and a Software counter of operation time.



HMI

Introduction

The HMI section describes the different steps needed to initialize, parameterize and program the HMI database and also the screens to fulfill the above description of the system functions.

The HMI application for Magelis XBT-N200 is created and implemented using the HMI software tool XBT-L1000.

Configuration of the HMI

1. Select Terminal type
2. Terminal Parameter (Format of Date/Time, Password ...)
3. Protocol parameter (protocol, speed, timeout ...)
4. Equipment Symbols (naming for variables)
5. Dialog table (communication table between HMI ↔ PLC)
6. Application Language
7. Special characters (user defined)
8. Function keys (mode with impulse commands)

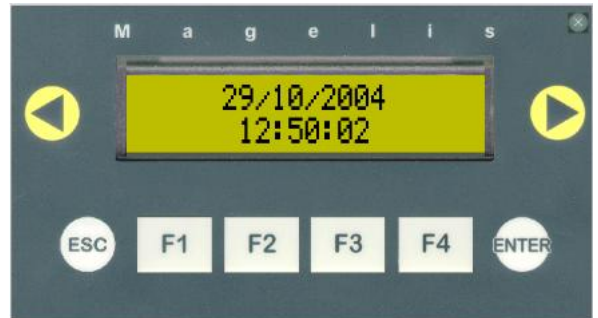
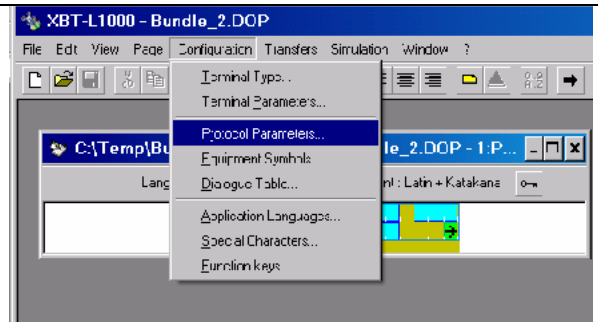
Information on HMI screens

Page 1:

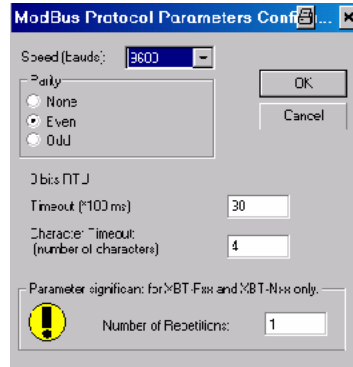
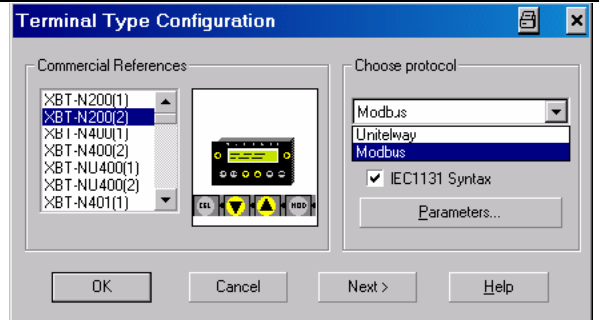
- F1: MAN/AUTO to select the operation mode (Twido reference %MW0 + %MW2)
- F2: RUN/STOP to start/stop the motor (Twido reference %MW1)
- Link to 2nd Page for DATE/TIME

Page 2:

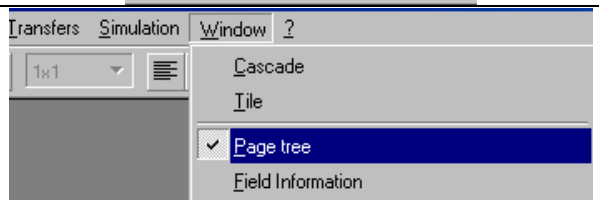
- Screen with DATE/TIME:



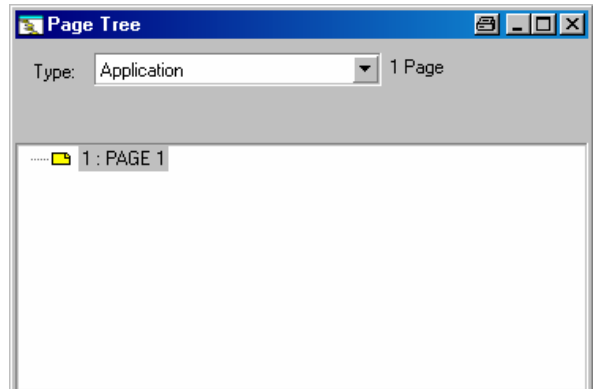
Select the required XBT reference (XBTN200(2) and in the same dialog select “parameters..” to set the times for the communication protocol (Modbus) and the parameters for the communication



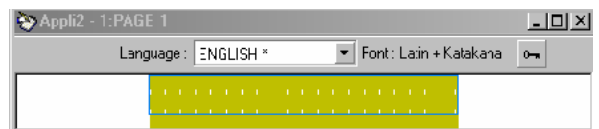
On selecting “**Window – Page tree**” the “Page Tree” window automatically opens.



Here the user can select the HMI pages. In our example there is only one page for the application.



The pictures shows a new page without contents.

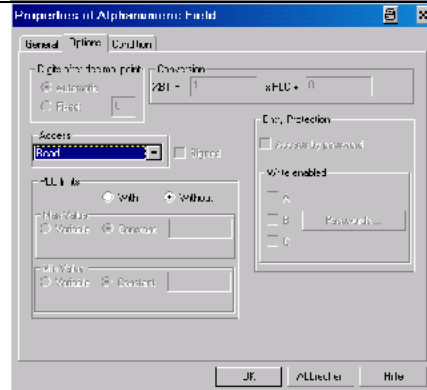
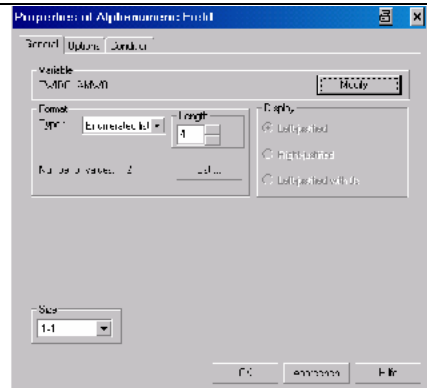


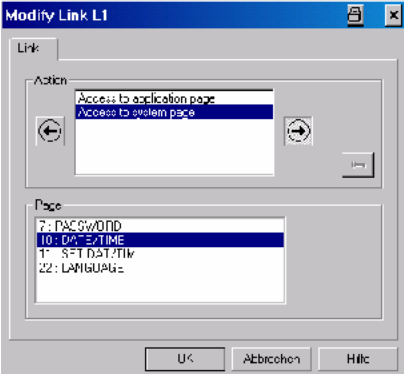
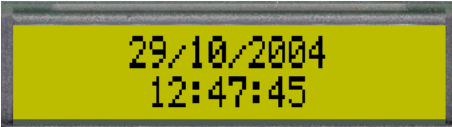
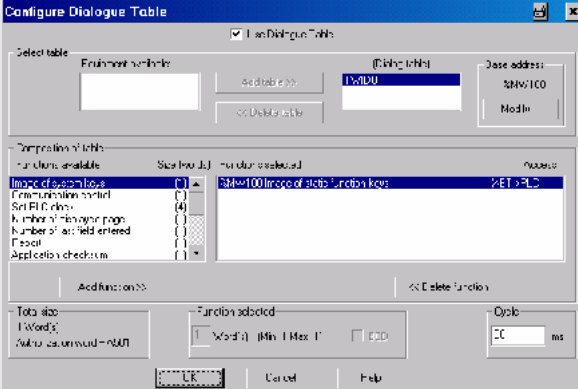
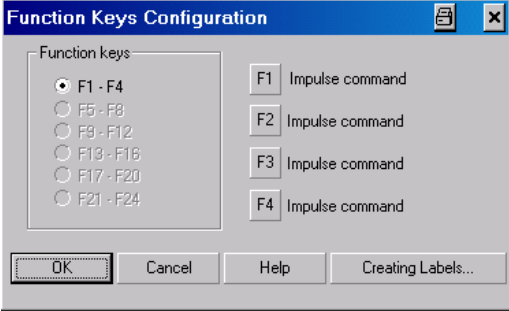
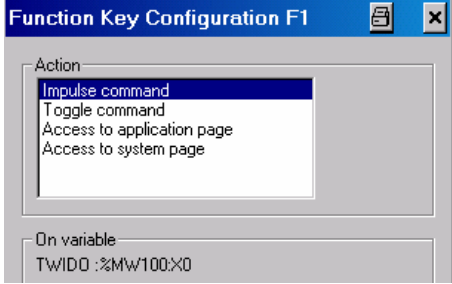
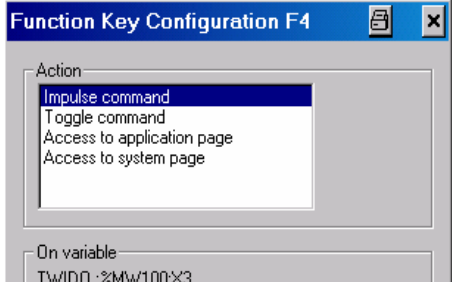
Here you see the finished page for our application, which includes static text and variables.

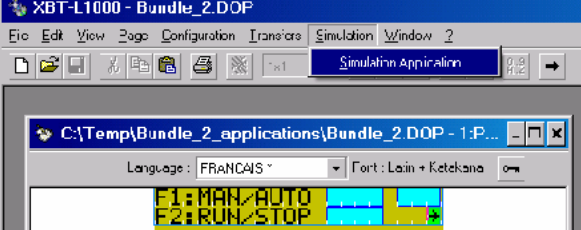

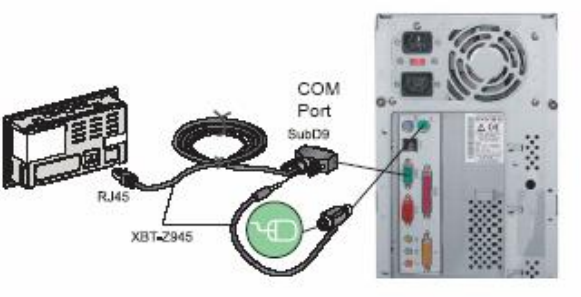
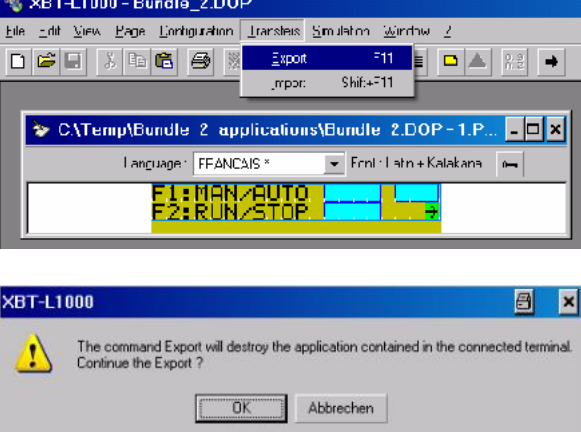
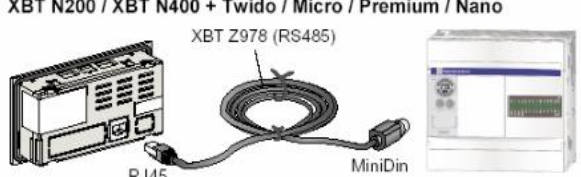


Add/Modify: Text Alphanumeric fields Link

Properties of the fields (select with a double-click on the field):



	
<p>Screen of page 2: DATE/TIME:</p>	
<p>Fill in the dialog table to configure the communication between HMI and PLC. The table contains the function variables, such as, communication control, report, PLC clock, page number etc, the PLC base address, cycle time of communication and the authorisation code.</p>	
<p>Linking information to the function key.</p> <p>In the dialogue table the PLC base address is %MW100. This word contains the image of the function keys. The function key F1 is located at Bit 0 of the word %MW100. F1: %MW100:X0 F4: %MW100:X3)</p>	  <p>.....</p> 

<p>Simulation of HMI functionality offline. (without a connected HMI). With the menu function "Simulation" the user can see the Magelis on the PC screen and simulate its operation.</p>	 <p>The screenshot shows the 'Simulation' menu option highlighted in the software interface. The main display area shows 'F1: MAN/AUTO' and 'F2: RUN/STOP'.</p>												
<p>On pressing the function keys, the screen displays the real functionality and a separate window shows the content of the page variable and dialog table.</p>	 <p>The screenshot shows the simulated HMI screen with function keys F1-F4. A 'PLC Simulation V 1,2 - BUNDLE 2' dialog table window is open, displaying the following data:</p> <table border="1" data-bbox="1114 564 1388 712"> <thead> <tr> <th>Equipment</th> <th>Variable</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>T%M0</td> <td>%Mx0</td> <td>0</td> </tr> <tr> <td>T%M0</td> <td>%Mx1</td> <td>0</td> </tr> <tr> <td>T%M0</td> <td>%Mx2</td> <td>0</td> </tr> </tbody> </table>	Equipment	Variable	Value	T%M0	%Mx0	0	T%M0	%Mx1	0	T%M0	%Mx2	0
Equipment	Variable	Value											
T%M0	%Mx0	0											
T%M0	%Mx1	0											
T%M0	%Mx2	0											
<p>Download, i.e. Export, of an application to the Magelis XBT-N200. Plug the communication cable XBT-Z945 into the PC and the XBT-N. The XBT-L1003 package includes the cable and necessary software.</p>	 <p>The diagram illustrates the connection of the XBT-Z945 communication cable. One end is an RJ45 connector plugged into the PC's network port, and the other end is a SubD9 connector plugged into the 'COM Port' of the XBT-N200 HMI.</p>												
<p>Select the menu "Transfers" - then "Export" to download the application. After a moment a popup menu will ask the user if he wishes to continue or abort: press ok to download.</p>	 <p>The top screenshot shows the 'Export' menu option selected under the 'Transfers' menu. The bottom screenshot shows a warning dialog box with the text: 'The command Export will destroy the application contained in the connected terminal. Continue the Export?' with 'OK' and 'Abbrechen' buttons.</p>												
<p>Connect the Magelis XBT-N HMI to the PLC, using the communication cable XBT-Z978</p>	 <p>The diagram shows the XBT-Z978 (RS485) communication cable. One end is an RJ45 connector connected to the HMI, and the other end is a MiniDin connector connected to the PLC.</p>												

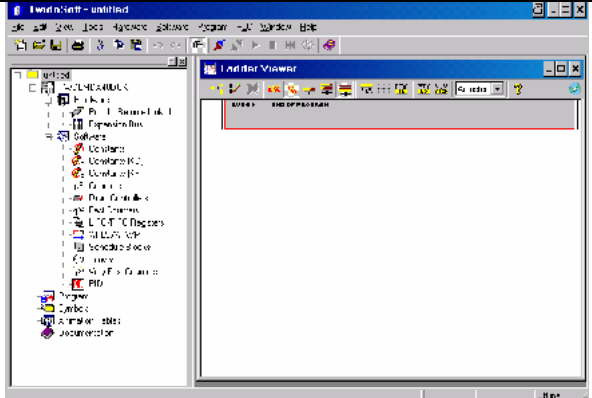
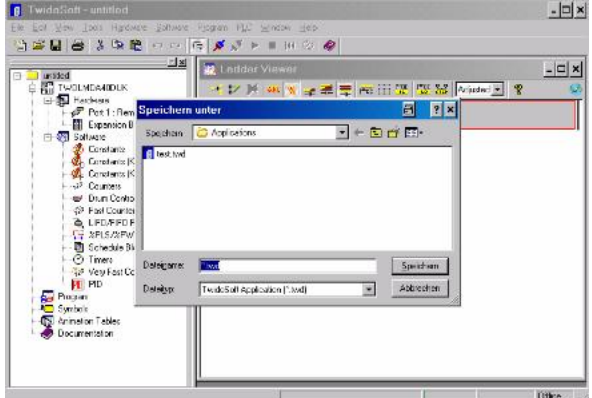
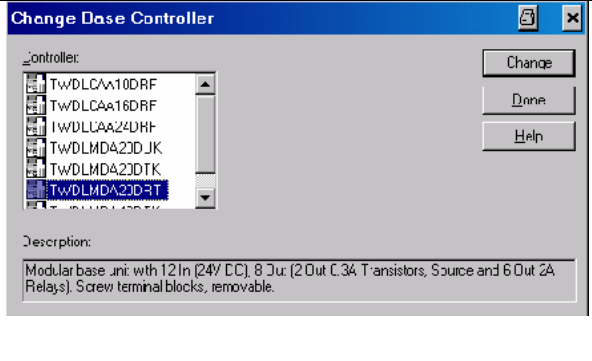
PLC

Introduction

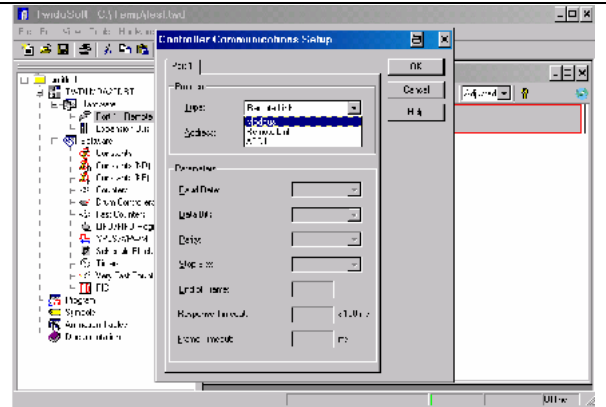
The PLC section describes the different steps needed to initialize, parameterize, and program the PLC to attain the above description of the system function. The user application is written with the Twidosoft programming tool.

The Twido application is split into:

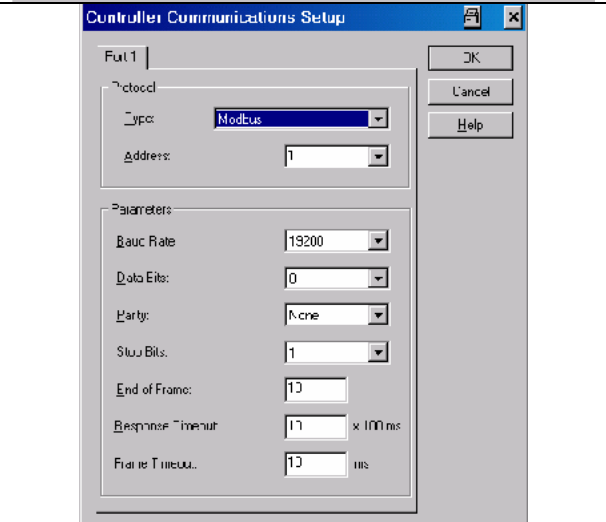
- The Hardware module
- Communication port, address and protocol
- Option : additional Com port TWDNOZ485D for the HMI Modbus communication
- Download Application program


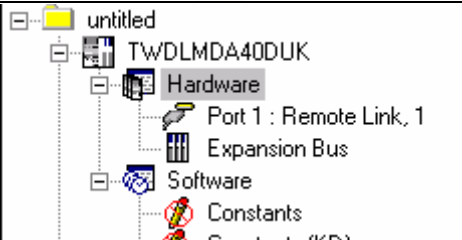
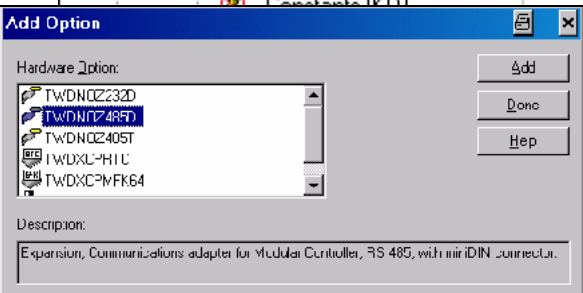
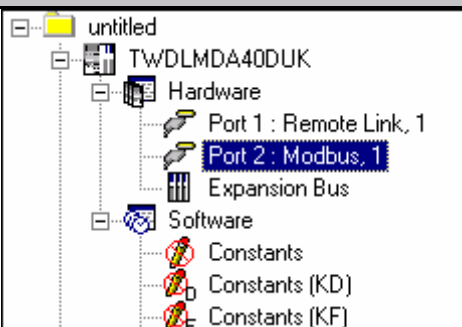
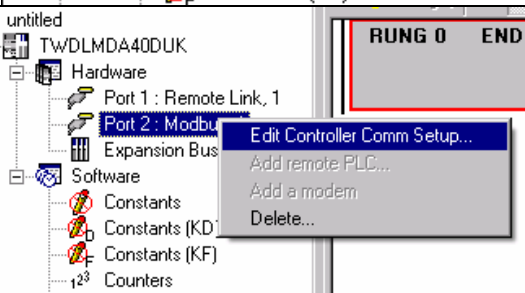
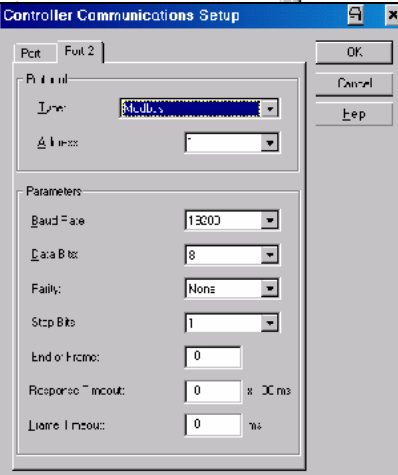
<p>Hardware module: When you start Twidosoft you can choose to either create a new application or open an existing one. For a new PLC application select “File” and “new program”.</p>	
<p>If you selected “new” or if you have changed an existing application, store your application using either the disk icon or the menu “save as”.</p>	
<p>The default hardware module listed in the browser screen is the TWDLMDA40DUK. In our application we are using the TWDLMDA20DRT. So you must change the base controller. Select the default module, with the left mouse button open the dialog “Change Base Controller” and select the correct module TWDLMDA20DRT</p>	

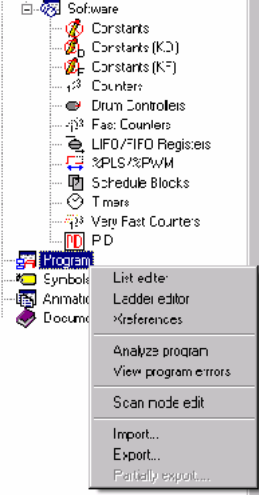
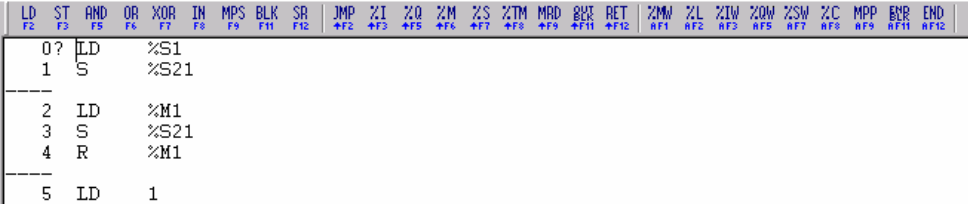

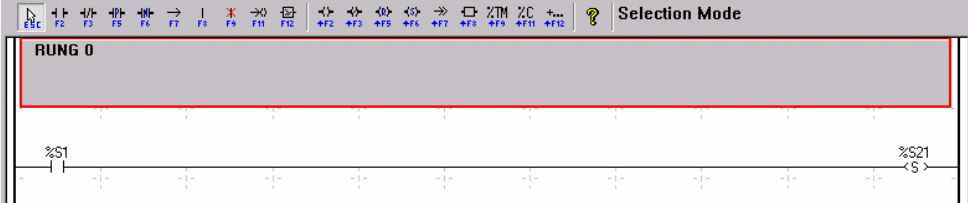
Communication port:
 The next step is to configure the communication port. Select the "Port 1" icon in the project browser and open the "Controller Communication Setup" window with the left mouse button. Under "Protocol" select the Modbus protocol, which is used for the Magelis HMI communication.



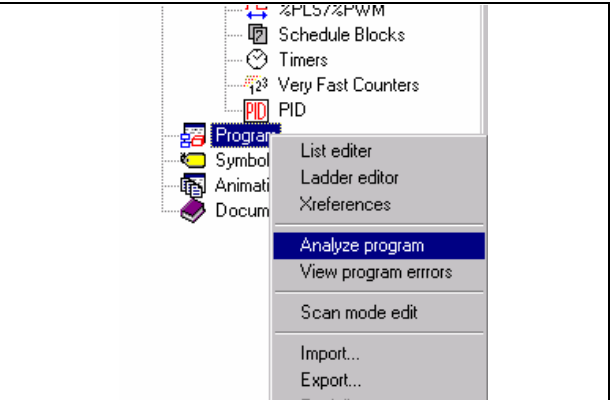
After choosing Modbus and the MB-Address 1 in our application, you can use the standard communication parameters (19200,8,1,N) by clicking on "OK".



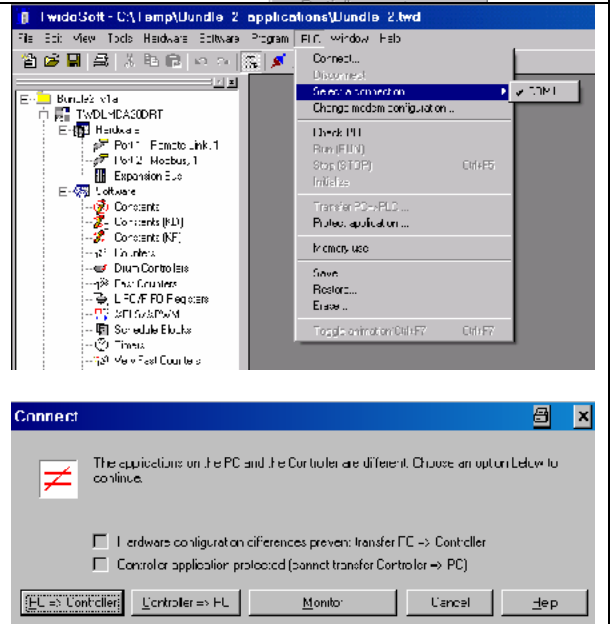
<p>Option: additional Com port TWDNOZ485D for the HMI Modbus communication.</p>	
<p>Select "Hardware" in the project browser and open it with a left mouse click.</p>	
<p>Add the TWDNOZ485D shown in the "add option" dialog</p>	
<p>Select Port2: Modbus,1 in the project browser.</p>	
<p>And with a left mouse click you can open the Editor for the communication setup</p>	
<p>In this dialog you can setup the Modbus port for the HMI communication. The parameters must be synchronised in both devices (HMI and PLC)</p>	

<p>Insert Application Program</p>	<p>The PLC program (the Twidosoft source) for this application can be found in a file accompanying this document. The following steps explain how to input the user logic:</p>
<p>First you choose the programming language editor:</p> <ul style="list-style-type: none"> • List Editor (IL, AWL) • Ladder Editor (LD, KOP) 	
<p>The List Editor screen:</p> <p>Use the toolbar to select the List editor functions : e.g. LD for Load or SR for set register</p> 	
<p>The Ladder Editor screen:</p>	
<p>With a click on second icon in the toolbar ("Edit") you can select the Ladder editor functions : e.g. Contact, Set Coil or Timer</p> 	

If you have finished inputting your program, click on Program in the project browser with the left mouse button and select “analyze program”. Twidosoft checks the source for faults and gives warnings.

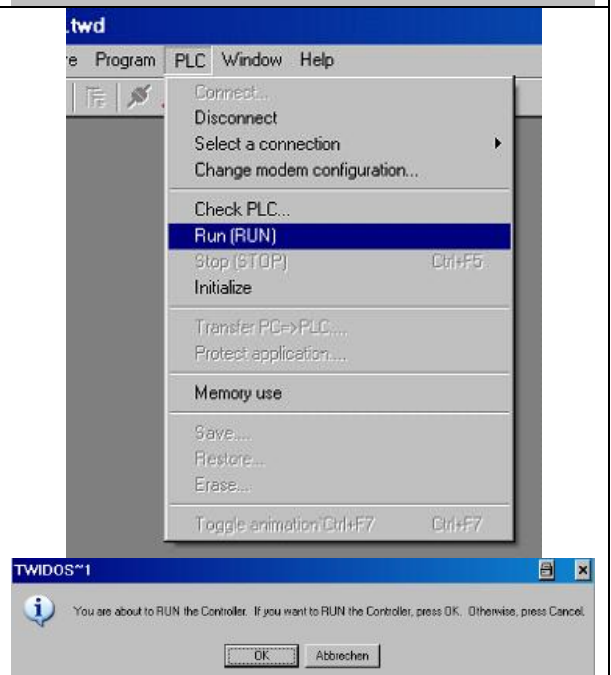


Before you can transfer the application to the PLC you must configure the communication port of the PC. After you have connected the Twido controller to your PC using the Twido connecting cable TSXPCU1030, you can test the connection with the “Check PLC” selection in the “PLC” menu. If the test is successful choose the menu “Connect” to load the program into the controller.



After successfully transferring your program to the controller you can start it by selecting “RUN” in the “PLC” menu.

Before you start the PLC (i.e. before selecting “RUN”) in running mode refer to the safety instructions of the application !



Devices

Introduction

The devices section describes the different steps needed to initialize and parameterize the device logic/behaviour to fulfill the description of the system functionality.

General

There are no devices to be configured within this system.

Appendix

Detailed Component list

Type / Software	Revision/Version
<ul style="list-style-type: none">• Twido Modular - TWDLMDA20DRT• Twido Extension Comm - TWDNOZ485D• Twidosoft V2.0 - TWDSPU1001V10M (Programming-Software. Documentation + Programming cable)• Magelis Text Terminal XTBN200• Cable XBT-N-PLC - XBTZ978• Magelis Software - XBTL1003M• Phaseo power supply - ABL7RE2402• TeSys-U - LUB12, Basic unit• TeSys-U - LUCB12FU, Control unit• TeSys-U - LUFW10, Alarm unit• Vario switch - disconnecter VCF02GE - main switch• Harmony Style 5 emergency stop XALK174G (ESTOP)• Standard AC-Motor. ALTEUM0040001 - 0,75Kw, 4-pol, Form TE80 230VAC single phase	
Twidosoft	V2.0
XBTL1003M	V4.30

Component Features

**PLC:
Twido -
Modular**

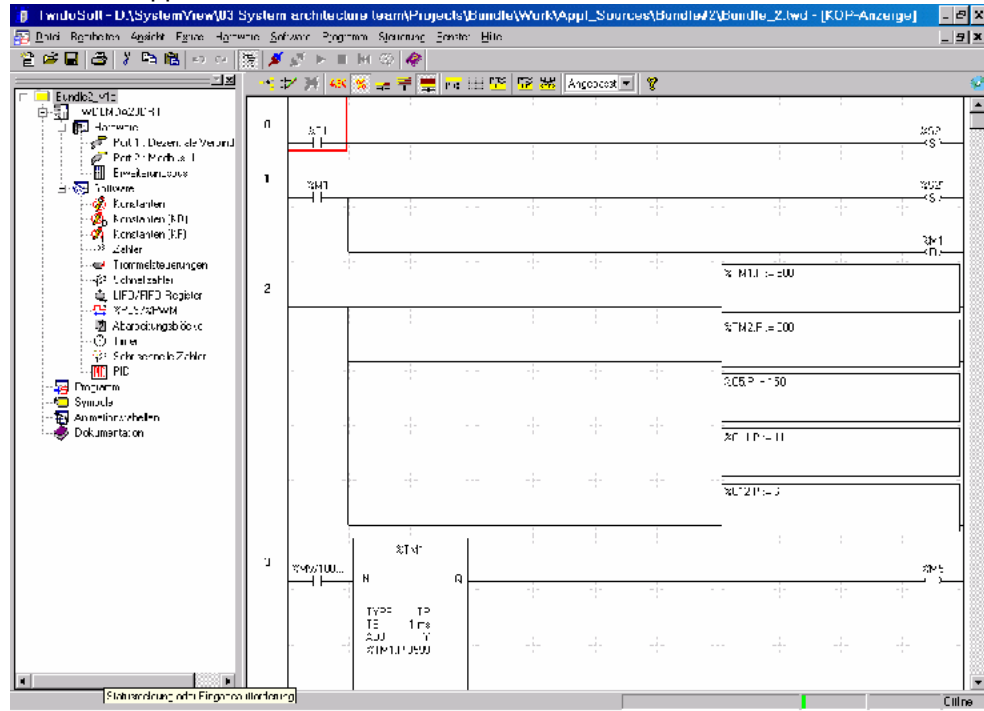
TWDLMDA20DRT, the Modular 20 I/O controller:

- Ladder (KOP) and List (AWL) programming languages
- 12 digital inputs
- 6 relay outputs
- 2 transistor source outputs
- 1 analog voltage input connector
- 1 analog potentiometer
- 1 integrated serial port
- terminal block for wiring
- up to 7 expansion I/O modules
- up to 2 AS-Interface V2 bus interface modules
- accepts both optional cartridges (RTC and memory - 32 KB or 64 KB)
- either an optional operator display expansion module or an optional communication expansion module

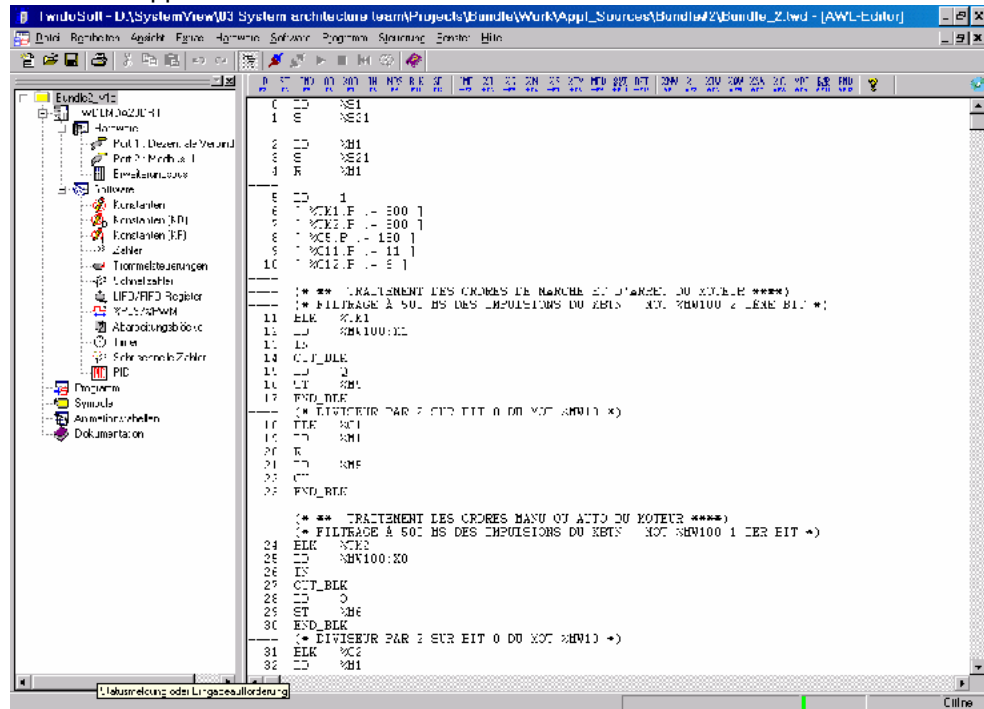


Twidosoft allows you to not only view your program in either list or ladder format, but allows you to switch back and fore between the two formats.

Twidosoft Application screen - **Ladder Editor:**



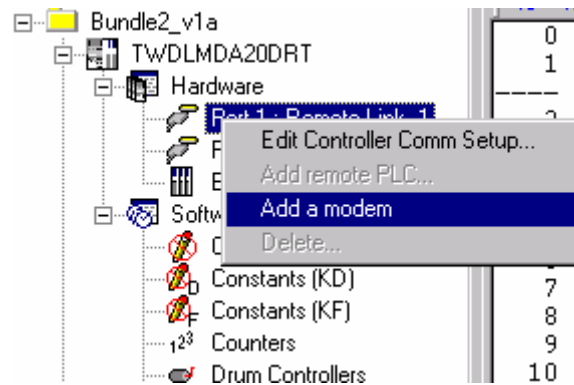
Twidosoft Application screen - **List Editor:**



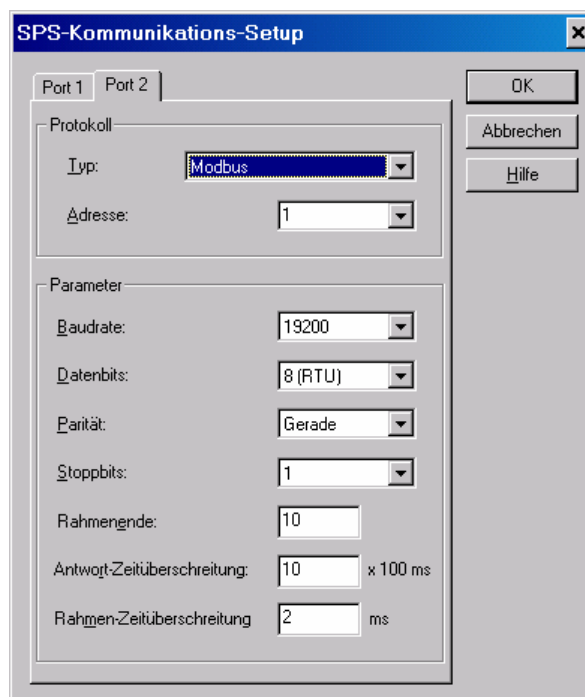
TwidoSoft

Twidosoft Communications Menu

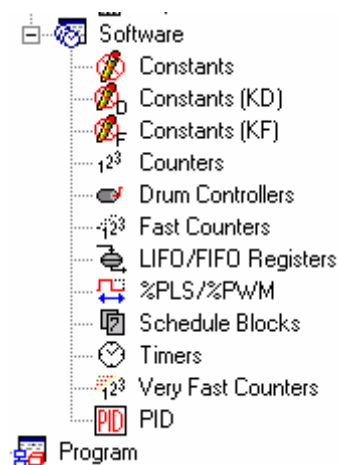
Port 1 for remote link with additional Modem: **RTU**



Port 2 for Modbus communication, in/out application to XBT-N-HMI:



Integrated Functions



**Phaseo
Power Supply:
ABL7RM2401**

- 240VAC / 24 VDC
- 1,3 A



**TeSys-U
Motor Starter**

LUB12
Basis Unit

LUCB12FU
Control unit

LUFW10
Alarm unit

Operating Conditions

- Power: 5 hp at 480 VAC
- Ia: 7.5 A
- Class 10 overload protection
- Utilisation category: AC-43
- 3-wire control:
- Control circuit voltage: 230 VAC



Functions Performed

- Short-circuit protection with level of protection of 42 kA at 480 VAC (10 kA at 600 VAC).
- Type 2 total co-ordination of protection devices conforming to EN 60947-6-2 (continuity of service) in case of a short-circuit.
- Electronic protection against thermal overloads with an adjustment current range of 4.
- Load switching (2 million operating cycles in category AC-43).
- Indication of motor status by N.C. or N.O. contact.
- Interlock between the motor starter control and the handle position; not possible to start motor when the switch is in the OFF position.

**Magelis
HMI
XBT-N200**

Text Display (LCD) :

- lines 20 characters for XBT-N200 (No big font)
- Fonts : standard, katakana
- Direct connection to PLC
- RJ45 port for point to point communication
- Protocol Unitelway-Modbus point to point
- No 24 VDC power supply needed
- power supplied from PLC's com port (5Vdc directly on the PLC connection cable or on the computer cable during the download)



Keys

- services keys and 2 keys for the links with other pages
- customisable service keys configurable as function keys
- All the functionality of the XBT-H811510

Contact

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As standards, specifications and designs change from time to time, please ask for confirmation of the information given in this publication.