Twido and Altivar
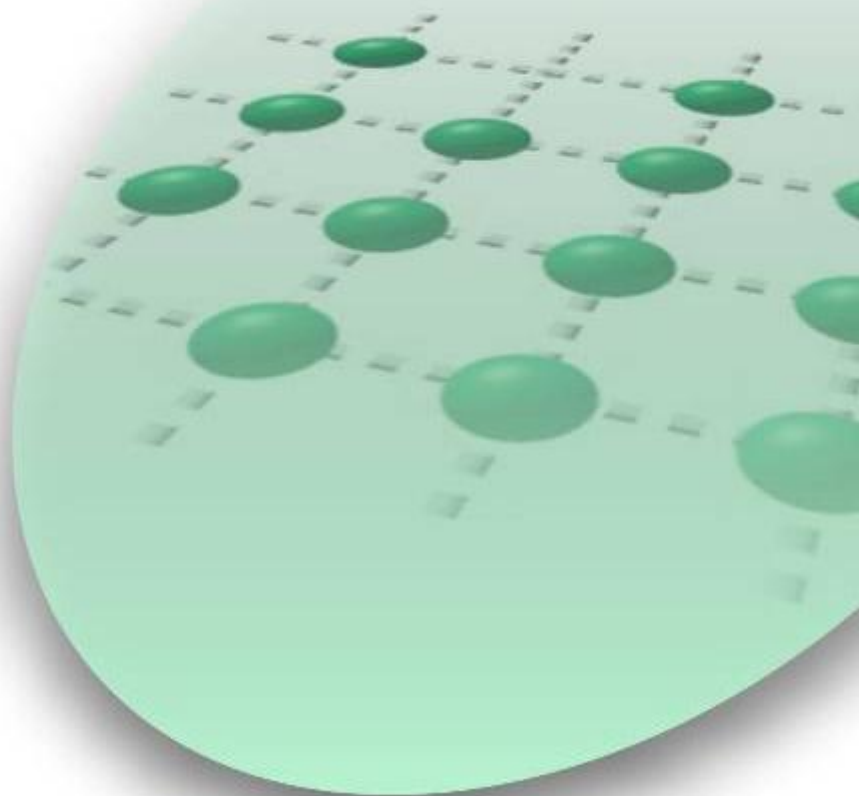# Magelis and Remote Operation
System User Guide

[source code]

Merlin Gerin
Square D
Telemecanique

Schneider
Electric
Building a New Electric World

Contents

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
CB	Circuit Breaker
HMI	Human Machine Interface; here a Magelis XBT-N display unit
Modbus	Communication connection/protocol
PLC	Programmable Logic Controller; here a Twido PLC
PS	Power Supply
SW	Switch
VVD	Variable Velocity Drive

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 machinery automation systems
- Decentralised automation systems supplementary to large and medium size machinery

Buildings/Services

- Access control and surveillance management
- Ventilation and shadowing control

| Application	Description	Example
Control of a roll gate	The application controls the opening and closing of gates to protect the entry of a plant or an area.	
Window mover in a greenhouse	The application controls air conditioning in a greenhouse.	
Window- and awning mover	Sample-product: the assembled device consists of a controller box, AC-motor and reduction gear unit with integrated over travel switches and motion tracking via digital pulses.	

System

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

Architecture

Overview   The system is designed as a remote control for a drive unit. A low end PLC controls a directly connected VVD – AC motor unit with Over Travel Switches. The drive parameters (time, speed, etc.) can be changed at the VVD user panel. The user controls and visualization are implemented with a Magelis display unit with a remote connection to the PLC via Modbus.

Layout
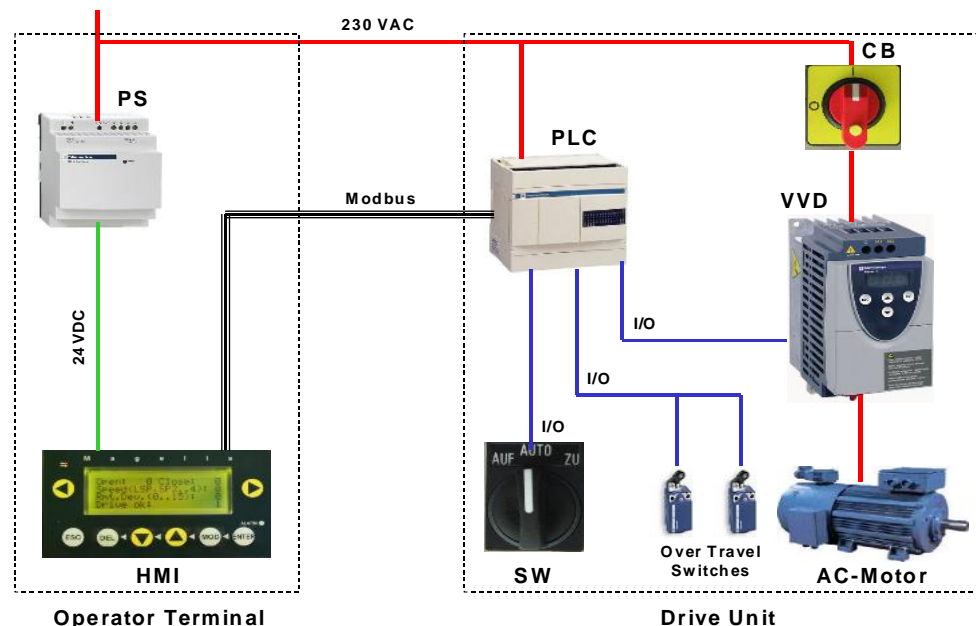
Components   **Hardware:**

- Magelis XBT-N Compact Display Unit (HMI)
- Twido Compact Base Unit (PLC)
- Phaseo power supply (PS)
- Altivar ATV 11 (VVD)
- Circuit Breaker (CB)
- Selector Switch (SW)

- Standard AC-Motor according to the application requirement
- Limit switches (2 pcs.) according to the application requirement

|	
Components Contd.	**Software:** • XBT-L1000 Version 4.30 for Magelis HMI configuration • Programming Cable XBT Z915 • Twidosoft Version 2.5 for PLC programming • Programming Cable TSXPCX1031 • PowerSuite Version 1.50 optional for Altivar parameterization • Programming Cable VW3 A8106
Quantities of Components	For each control device you need only one of each component, except the limit switches (2 pieces). If you have a large number of identical applications an alternative architecture is discussed in the appendix.
Dimension	The compact size of the PLC (integrated power supply) and the VVD allows to implement the parts into one cabinet with a size of 200x300x200mm (BxHxW). For the intended application area the cabinet, as well as the cable outlets, have to be water and dust resistant (IP 54 recommended). The Magelis display unit can be integrated into the front panel of electric control cabinets or operator desks. Depending on the local situation the display units may need their own power supplies or may be supplied from the PLC's power supply.

Installation

Introduction

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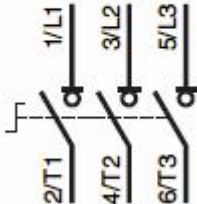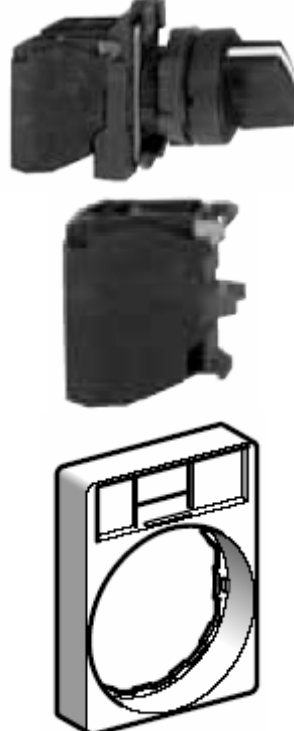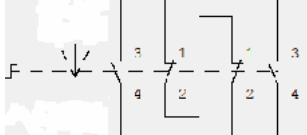
Layout

Operator Terminal   **Drive Unit**
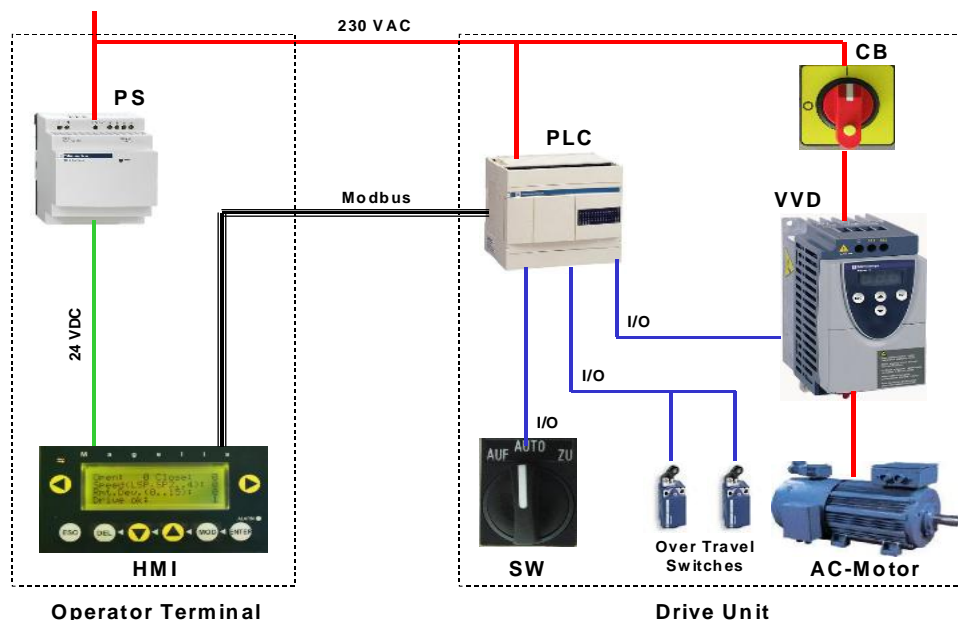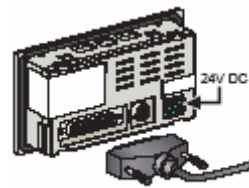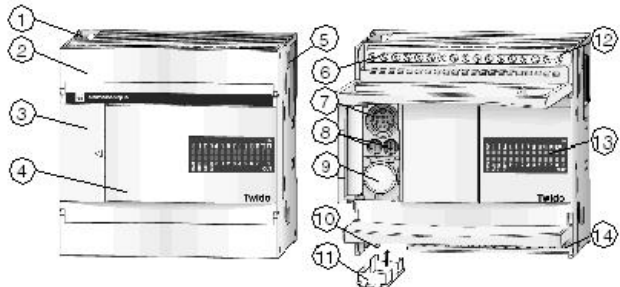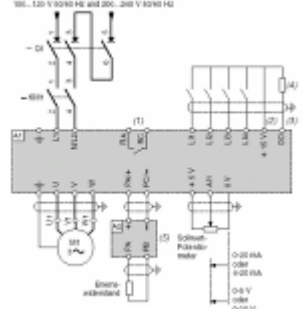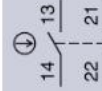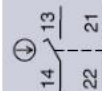
Twido PLC Inputs	DC In Com	connected to OV DC (common)
	DC In 0	nc (pulse counter input for optional extension)
	DC In 1	nc (pulse counter input for optional extension)
	DC In 2	Over Travel Switch Close Position
	DC In 3	Over Travel Switch Open Position
	DC In 4	Selector Switch Auto
	DC In 5	Selector Switch Hand_Open
	DC In 6	Selector Switch Hand_Close
	DC In 7	Fault-Relay RA from ATV 11

Twido PLC Outputs	Ry.OUT Com0	+15VDC from ATV 11
	Ry.OUT 0	Open to ATV 11 LI1 (Forward)
	Ry.OUT 1	Close to ATV 11 LI2 (Reverse)
	Ry.OUT 2	Speed0 to ATV 11 LI3 (Select 2 preset speeds)
	Ry.OUT 3	Speed1 to ATV 11 LI4 (Select 4 preset speeds)

Twido +24 VDC	+24 V	to ATV 11 Fault Relay
		to Selector Switch
		to Over Travel Switches

ATV 11	LI1 .. LI4	to Twido Ry.OUT 0 .. 3
	RA	Fault Relay to Twido DC In 7
	RC	+24 V from Twido

ATV 11 + 15VDC	+15 V	to Twido Ry.OUT Com0

The described wiring is needed to fulfil the functions of the example application.

Hardware

Circuit Breaker **VN 12** **incl.** **Handle Unit** KCC1YZ		**VN-12, VN-20**
Selector Switch **XB5AD33** **incl.** **2 Switch Units** **ZBE102,** **Plate Holder** **ZBZ34** **Plate** **e.g. ZBY-02284**		
Power supply **ABL7RM24011**		

Magelis Compact Display Unit **XBT-N401**		 24V DC SubD25
Twido Compact Base Unit **TWDLCAA16DRF**		

Label	Description
1	Mounting hole
2	Terminal cover
3	Hinged lid
4	Removable cover to operator display connector
5	Expansion connector - On both 24DRF and 40DRF series compact bases
6	Sensor power terminals
7	Serial port 1
8	Analog potentiometers - TWDLCAA10DRF and TWDLCAA16DRF have one
9	Serial port 2 connector - TWDLCAA10DRF does not have one
10	100-240 VAC power supply terminals on TWDLCA▪▪▪DRF series 24 VDC power supply terminals on TWDLCD▪▪▪DRF series
11	Cartridge connector - located on the bottom of the controller
12	Input terminals
13	LEDs
14	Output terminals

VVD Altivar **ATV11PU18M2E**		
Over Travel Switch **e.g.** **XCKD2121P16**		**XCKP** 13 21 2 Kontakte „Ö+S" 14 22 Mit Sprungfunktion 13 21 2 Kontakte „Ö+S" 14 22 Ohne Sprungfunktion

Software

General

The main software part of the application is to program the Twido PLC logic with the configuration of the binary input/output and the communication setup. This is done with the programming tool for Twido PLCs, **TwidoSoft.**

The HMI-application on the Magelis display unit is set up using the **XBT-L1000** configuration software.

The Altivar 11 VVD could be set up and parametrized by using the front panel on the devices, but for more convenience and the possibility of **data storage** it is recommended that you use the **PowerSuite** software.

You need to have a Microsoft Windows 2000 or Windows XP operating system installed on your PC. To start the installation put the CDs in the CD or DVD drive of your PC. The CD typically starts automatically due to the "Auto-Start" functionality of the PC. Please follow the installation routine. In case of problems please check the installation guideline delivered with the product.

The Software installation paths on the hard disk are by default:

- XBT-L1000   C:\Program Files\Schneider Electric\XBT-L1000

- Twidosoft   C:\Program Files\Schneider Electric\TwidoSoft

- PowerSuite   C:\Program Files\Schneider Electric\PowerSuite

Communication

General

The data exchange between the Magelis display unit and the Twido PLC is done via Modbus communication. For the communication line a Modbus-compatible cabling is needed. The configuration of Modbus communication is integrated in the XBT-L1000 software for the Magelis display unit and in TwidoSoft for the Twido PLC. No extra configuration software is needed.

HMI Magelis Communication cable XBTZ9680	
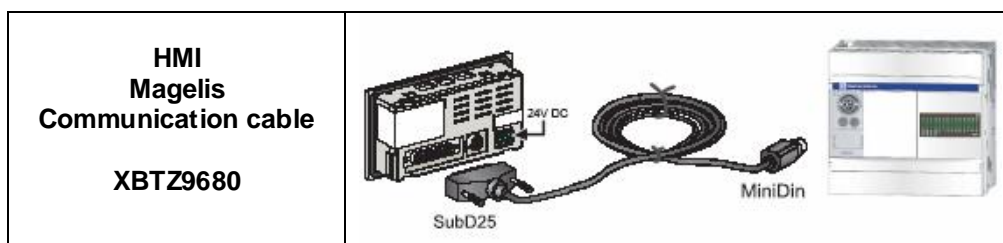
Implementation

Introduction

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

The presented applications have to be regarded as examples, not as proven productivity solutions, especially for safety reasons. They are only intended to give an idea of how to implement real applications.

Function

Functional description

1. On the Magelis display unit set 'Open' or 'Close' to '1' to start rotation of the motor in the corresponding direction.

2. Only run the motor in "Open" direction if it's not in open, end position; respectively for "Close".

3. Select 'Speed' from '0' to '3'. The motor runs with the corresponding speed presets configured in ATV11 (Low Speed, Preset Speed 2 to 4). This is possible as pre-selection or after motor start.

4. The control device allows you to run the motor in hand-mode. Hand mode overrides commands from Magelis display unit and always resets to the lowest speed.

5. The motor stops when setting 'Open' or 'Close' to '0' or when arriving in one of the end positions.

6. 'Drive Ok' indicates 'power on' for the ATV11.
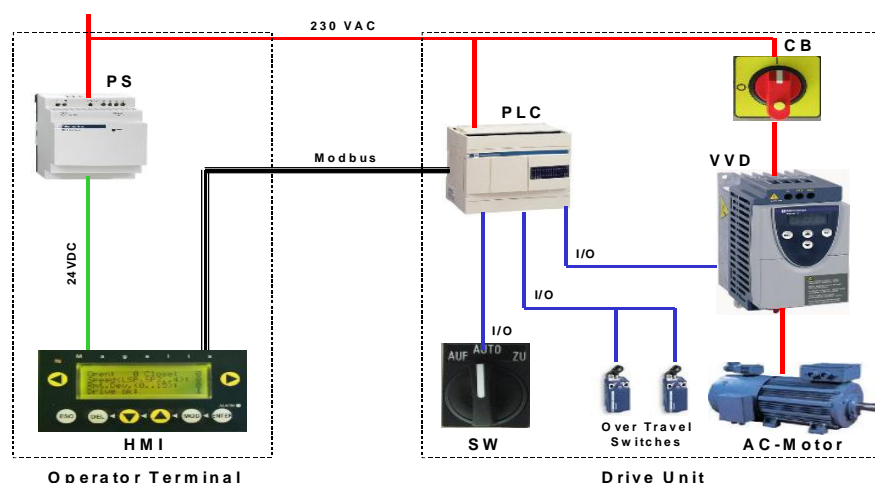
HMI

Introduction

The HMI application is written with the XBT-L1000 tool. This chapter explains how to install the pre-built Magelis application on the XBT-N display unit.

For developing other applications different to the example provided, detailed knowledge of PLC/HMI systems is needed, here especially Magelis display units and XBT-L1000 software.

Preliminaries

1. XBT-L1000 is installed on the PC.
2. The XBT-N application file 'Grnh.dop' is stored at the default location on the PC(C:\Program Files\Schneider Electric\XBT-L1000\Apps).
3. The XBT-N display unit is powered up.
4. The programming cable (XBT Z915) connects the PC with the XBT-N display unit.

When XBT-L1000 is started the first time a blank programming environment with the Terminal Type selection dialog appears. 'Cancel' exits this dialog.	
The Open-File dialog is accessed by selecting 'File/Open', the 'Grnh'-application has to be selected. Once selected, the XBT-N application is presented in the application page. Now the application can be explored. The XBT-N application can be simulated on the PC by selecting 'Simulation/Simulation Application.	
'Transfer/Export' transfers the application to the XBT-N display unit. The XBT-L1000 software shows the progress of the transfer. After completion, the display unit reports 'Download Completed' on its screen. Now the programming cable can be disconnected from the XBT-N display unit. When connecting the data cable to a running Twido PLC the display will report 'Connecting in Progress'. Once the connection is established, the application appears on the display unit's screen.	
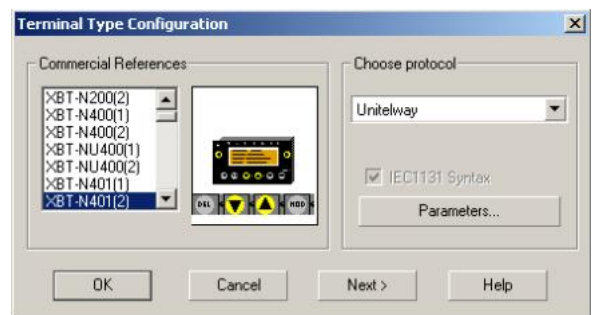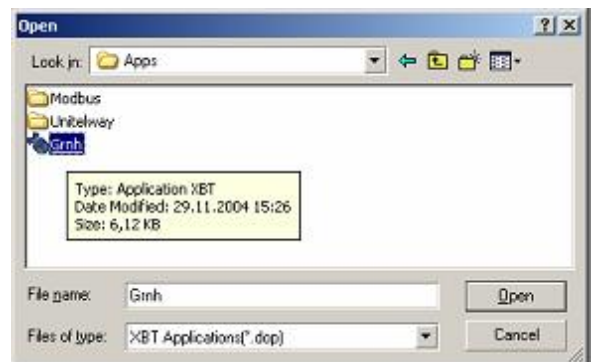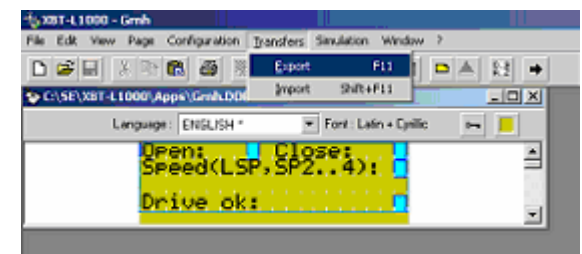
PLC

Introduction

The user application is written with the TwidoSoft tool. This chapter explains how to install the pre-built Twido-application in the Twido-controller and how to run and monitor it.

For developing other applications different to the example the reader needs detailed knowledge of PLC/HMI systems, here especially Twido PLC and Twidosoft.

Preliminaries

1. Twidosoft is installed on the PC.
2. The TwidoSoft application file 'Greenhouse.twd' is stored at the default location on the PC (C:\Program Files\Schneider Electric\TwidoSoft\Applications).
3. The Twido PLC is powered up.
4. The programming cable (TSXPCX1031) connects the PC with the Twido PLC.

When TwidoSoft is started a blank programming environment appears. The Open-File dialog is accessed by selecting 'File/Open', the 'Greenhouse'-application has to be selected.	
The application will be opened, the programming environment remains blank. 'View/Application Browser' opens the Application Browser on the left side of the screen. 'Program/Ladder editor' opens the Ladder Viewer on the right side. Now the application can be explored.	
The communication interface to be used for downloading the application to the Twido PLC has to be configured ('PLC/Select a connection'). 'COM1' or 'COM2' can be checked.	
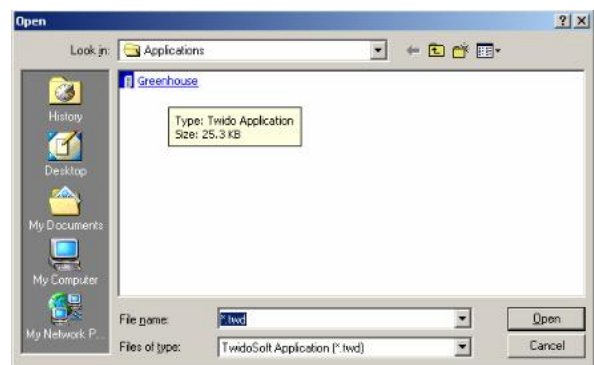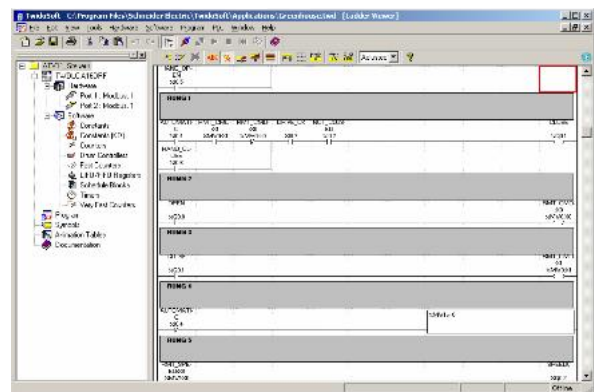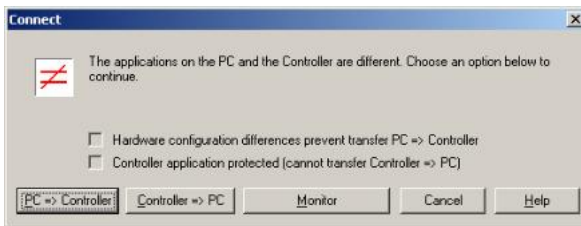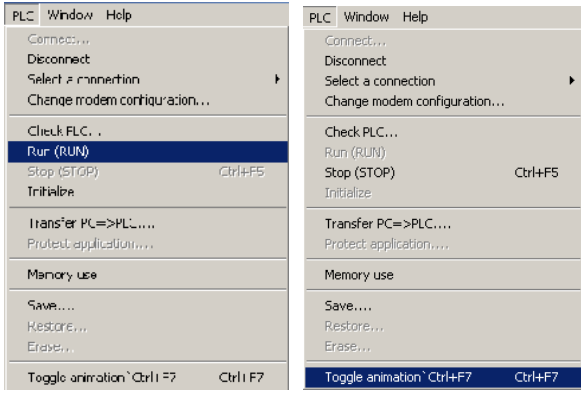
TwidoSoft is now ready to transfer the application to the Twido controller. Selecting 'PLC/Connect' will open the connect dialog. In the case that any other dialog appears confirm that dialog and select 'PLC/Connect' again. Once in the connect dialog, push 'PC=>Controller' and the transfer starts.	
⚠️	Some information dialogs may appear. Read these dialogs carefully and confirm them.
The PLC is now ready to run the application. Selecting 'PLC/Run' starts the application. Selecting 'PLC/Toggle animation' monitors the working PC.	

Application Data Transfer

Introduction For a better understanding of the example application the following table shows the access of XBT-N fields to PLC variables.

Tag Mapping

XBT-N401 Fields			Twido Symbols	
Field Name	Addess	direction	Symbol Name	Address
Open	%MW0:X0	<>	RMT_CMD	%MW0:X0
Close	%MW0:X1	<>	"	%MW0:X1
Speed	%MW1	<>	RMT_SPEED	%MW1
Drive ok	%MW5:X0	<-	STAT_DRV	%MW5:X0

Devices

Introduction

The Devices section describes the different steps needed to initialize and parameterize the device logic/behavior to fulfil the described system functionality.
The ATV 11-devices are initialized and parameterized using the PowerSuite tool.

General

The ATV 11 parameters can be set via the ATV front panel. The advantage of using the PowerSuite tool is to have the data storage on PC and the possibility to print out documentation.

Also the tool can help in online optimization of the parameters.

PowerSuite screen after program start: After reading the instructions press "Alt+F" to continue .	
Select the device ATV 11 for this application example.	
Select exactly the device type of ATV 11 according to the catalogue number for this application example. **Ensure that the values in the 'Drive Identification' section match the characteristics of the used AC-motor!**	
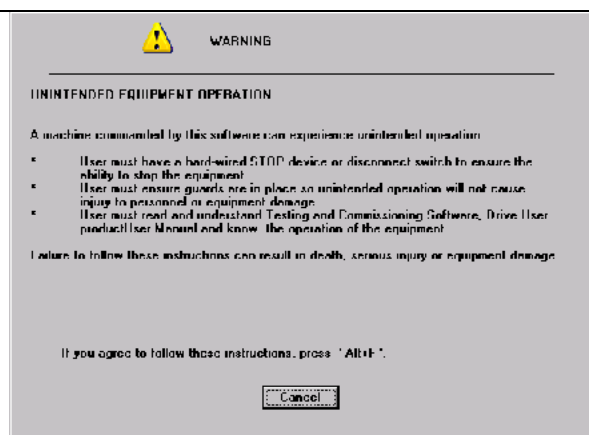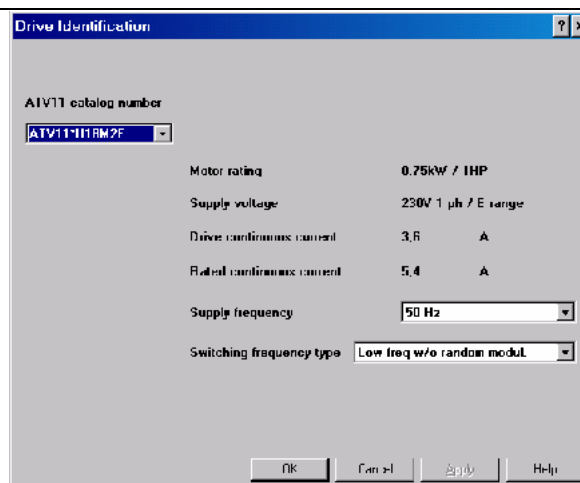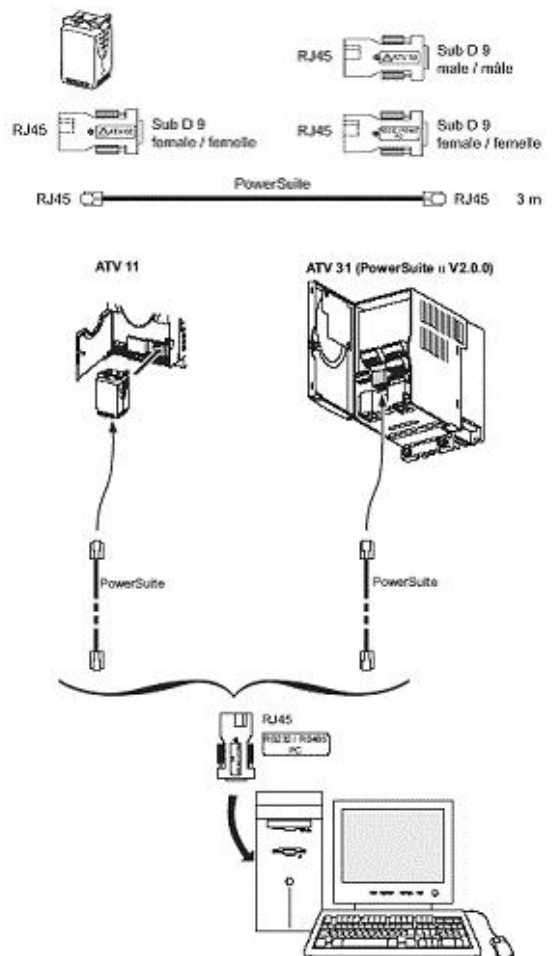
Parameterizing the AC-Motors, for this example use the default settings. **Again make sure that the values in the 'Motor control' section on the 'Motor characteristics' tab match the used AC-motor.**	
Now you can store the settings on the PC. Use the Menu button with the disk symbol.	
Check and establish the connection between the PC and the Altivar	
Transfer of the settings to the ATV. Select in the toolbar "Link - Transfer File".	

Appendix

Detailed Component List

Part-No.	Type / Software	Revision/Version

• XBT-N401
• TWDLCAA16DRF
• XBTZ9680
• ABL7RM2401
• ATV11PU18M2E
• VN 12
• KCC1YZ
• XB5AD33
• ZBE102
• ZBZ34
• ZBY-02284
• XCKD2121P16
	• Magelis XBT-N Compact Display Unit
	• Twido Compact Base Unit
	• Magelis communication cable
	• Phaseo power supply
	• Altivar ATV 11
	• Circuit Breaker
	• Handle Unit for CB
	• Selector Switch
	• 2 Switch Units for SW
	• Plate Holder
	• Plate, e.g.
	• 2 Over Travel Switches, e.g.
	• Standard AC-Motor, e.g.
	   ALTEUM0040001 - 0,75Kw, 4-pol
	   Form TE80 230VAC single phase	

• XBT-L1003 • XBT Z915 • TWDSPU1001V10 • VW3 A8104 • VW3 A8106	• XBT-L1000 Configuration Software • Programming Cable • Twidosoft incl. Programming Cable • PowerSuite Configuration Software • ATV Connection Kit	• Version 4.30 • Version 2.5 • Version 1.50

Component Features

Component

Twido Compact PLC: TWDLCAA16DRF

The Compact 16 I/O controller:
- has 9 digital inputs and 7 relay outputs
- has 1 analog potentiometer
- has 1 integrated serial port
- has a slot for an additional serial port
- accepts one optional cartridge (RTC or memory - 32 KB only)
- accepts an optional operator display module

Magelis Display Unit: XBT-N401

- Operating mode: Display and Control
- Display: 4X20 matrix (character mode only)
- Characteristics:
- 24V DC power supply
- Point-to-point, multipoint, multidrop mode link
- Unitelway, Modbus protocols
- Indicator lights

Power supply Phaseo: ABL7RM2401

- 100..240V AC / 24V DC

- 1,3 A

VVD Altivar: ATV11PU18M2E

- 0.75KW, 230VAC single phase

- Integrated class B EMC filter

- Temperature range :- 10 ... + 50°C

- Speed range from 1 to 20 (0...200 Hz)

- Speed regulation by flux vector control

- Protection of drive and of motor

- Compact, side by side mounting , DIN rail mounting possible

Alternative Solution

Architecture

Motivation

The implementation discussed above is useful for applications with just a few devices (gates, windows, ..) to control. Having a large number of devices it could be sufficient to have only **one** HMI to observe and control all these devices arbitrary or sequentially. Such a solution simplifies cabling and needs only one Magelis display unit and therefore reduces space on the operator panel. On the other hand another central PLC for distributing and managing communication to the single devices is needed.

Introduction

The implementation chapter gives some additional hints for **the distributed automation solution**. No detailed example is given because of the dependency of a certain distributed solution from real application situations.

The presented applications have to be regarded as examples, not as proven productivity solutions, especially for safety reasons. They are only intended to give an idea how to implement real applications.

Function

Functional description

1. The functionality related to each single device is the same as described above.

2. No HMI unit is connected directly to a device.

3. Several devices are connected to a managing PLC. This PLC is controlled by one HMI unit.

4. The Magelis HMI terminal offers the selection of one remote device ('Rmt.Dev.' set from '0' to '15') in addition to its functionality described above.

5. Optional alarm reporting, positioning via move tracking etc. could complete the application.

Installation

Introduction   This chapter describes the steps involved to install the hardware and to setup the software to fulfill the following application architecture.

This extended solution is designed to remotely manage several drive units. The device layout remains as described above. A new component is the supervision PLC between the Magelis display unit and the remote drives.

Layout
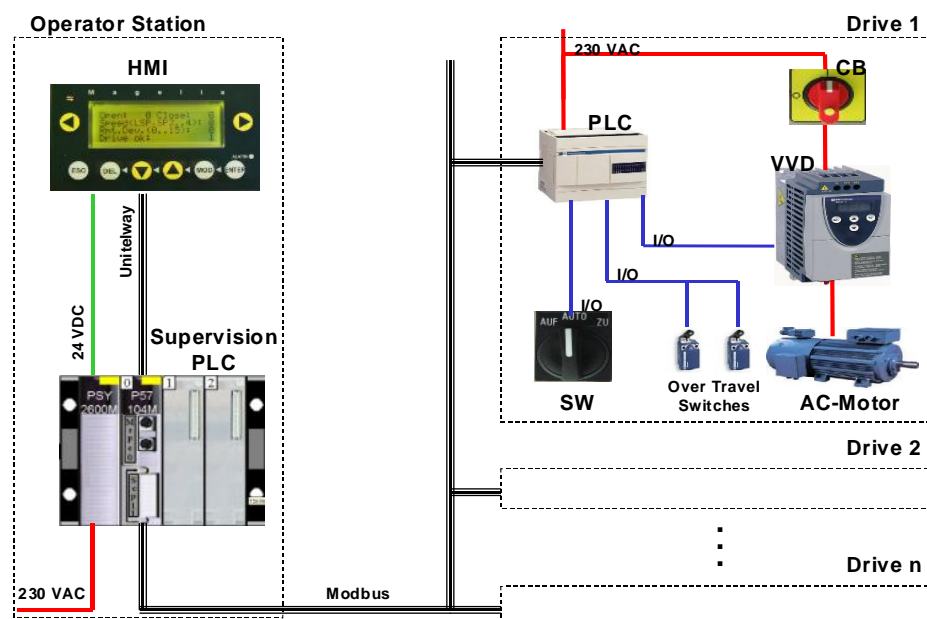
Hardware
- The main new component is the Supervision PLC. This is a Unity Premium CPU.
- The Display Unit is connected via Unitelway to the Supervision-PLC.
- The Supervision PLC communicates via Modbus with the devices.
- The Display Unit needs no own Power Supply, it is supplied from PLC.

Software   In addition to the software tools mentioned above Unity Pro XL has to be installed on your PC.

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

Unity Pro XL   C:\Program Files\Schneider Electric\Unity Pro

Communication   The data exchange between the Magelis display unit and the Supervision PLC is done via Unitelway communication. The data exchange between the Supervision PLC and the Twido PLCs is done via Modbus communication. For this communication line a Modbus-compatible RS-485 cabling is needed.

The configuration of communication channels is integrated in the XBT-L1000 software for the Magelis display unit, in Unity Pro for the Premium PLC and in TwidoSoft for the Twido PLCs. No extra software is needed.

Implementation

HMI

Introduction

The HMI application is written with the XBT-L1000 tool. This chapter explains how to install the pre-built Magelis application on the XBT-N display unit.

Preliminaries

1. XBT-L1000 is installed on the PC.

2. The XBT-N application file 'GrnhDist.dop' is stored in the default location on the PC(C:\Program Files\Schneider Electric\XBT-L1000\Apps).

3. The XBT-N display unit is powered up.

4. The programming cable (XBT Z915) connects the PC with the XBT-N display unit.

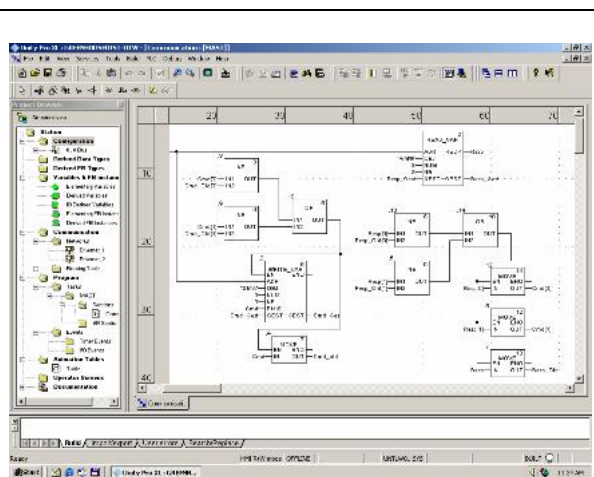| |
|---|
| The proceeding for the alternative solution on the XBT-N display unit is the same as described above exept using a different pre-built application named 'GrnhDist.dop'. This application contains an extra input field for selection of a remote device on the XBT-N display unit. |
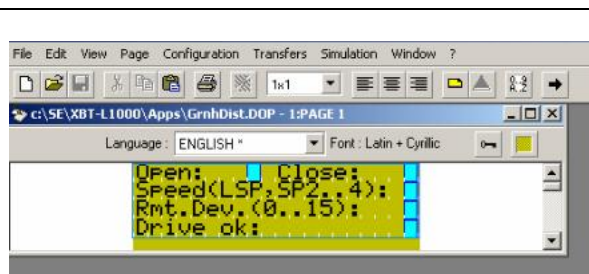
Supervision PLC

Introduction The user application is written with Unity Pro XL software. This chapter explains how to install the pre-built Unity-application on the Premium-PLC and how to run and monitor it.

For developing applications different from that provided, detailed knowledge of PLC/HMI systems is needed; here especially Premium PLC and Unity Pro software.
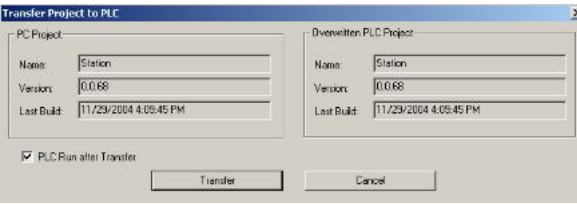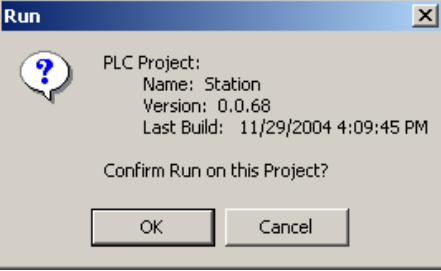
Preliminaries 1. Unity Pro XL is installed on the PC.

2. The TwidoSoft application file 'GreenhouseDist.stu' is stored at the default location on the PC (C:\Documents and Settings*user*\My Documents).

3. The Premium PLC is powered up.

4. The programming cable (TSXPCX1031) connects the PC with the Premium PLC.

When Unity Pro XL is started a blank programming environment appears. The Open-File dialog is accessed by selecting 'File/Open', the 'Greenhouse'-application should be selected. The Application is opened and can be explored. 'Build/Rebuild All Project' compiles the application.	
Unity Pro XL now is ready to transfer the application to the Twido controller. Selecting 'PLC/Connect' establishes a connection between the PC and the PLC. The appropriate Unitelway-address for this connection is pre-configured in the project, 'Standard Mode' (not 'Simulation Mode') is enabled. Selecting 'PLC/Transfer Project to PLC' starts the transfer procedure.	
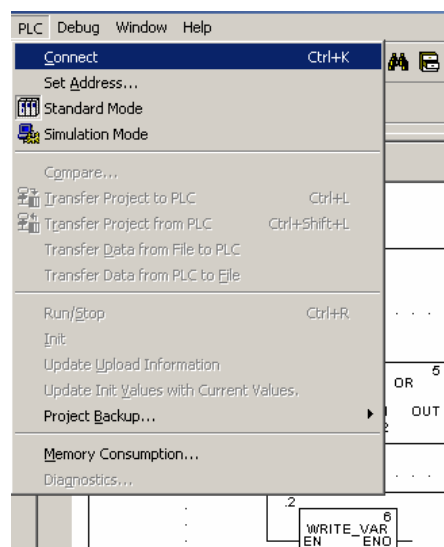
|	
A dialog appears which gives some information about the projects on the PC and on the PLC. The 'PLC Run after Transfer' box should be checked. 'Transfer' starts the data transmission to the PLC.	
After completion of the transfer a dialog asks for confirmation to run the PLC with the transferred project.	

Twido PLCs

Introduction   The user application is written with the TwidoSoft tool. This chapter explains how to install the pre-built Twido-application on the Twido-controller and how to run and monitor it.

Preliminaries   1. Twidosoft is installed on the PC.

2. The TwidoSoft application file 'Greenhouse.twd' is stored at the default location on the PC (C:\Program Files\Schneider Electric\TwidoSoft\Applications).

3. The Twido PLC is powered up.

4. The programming cable (TSXPCX1031) connects the PC with the Twido PLC.

The proceeding for the alternative solution on the Twido PLC is exactly the same as described above. The identical pre-built application 'Greenhouse.twd' is used.	
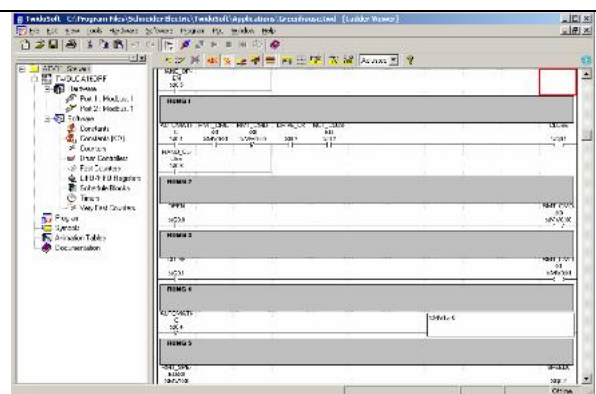
Application Data Transfer

Introduction   For a better understanding of the extended example application, the following table shows the access of XBT-N fields to variables of the Supervision PLC and also the data exchange to a single Device PLC.

Tag Mapping

XBT-N401 Fields			Premium Variables			Twido Symbols	
Field	Address	dir	Variable	Array [0..2] of Int	dir	Symbol	Address
Open	%MW0:X0	<>	Cmd[0]	HMI Command	->	RMT_CMD	%MW0:X0
Close	%MW0:X1	<>	"	"	->	"	%MW0:X1
Speed	%MW1	<>	Cmd[1]	HMI Speed	->	RMT_SPEED	%MW1
Rmt.Dev.	%MW2	<>	Cmd[2]	Remote Channel			
			Resp[0]	Device Current Status	<-	STAT_CMD	%MW3
			Resp[1]	Device Current Speed	<-	STAT_SPEED	%MW4
Drive ok	%MW5:X0	<-	Resp[2]	Device Drive Ok	<-	STAT_DRV	%MW5:X0

Devices

Introduction

The ATV 11-devices are initialized and parameterized using the PowerSuite tool.

The proceeding for the alternative solution on the ATV 11 - VVD is exactly the same as described above.

Component List

The component list below specifies the components of the extended solution which are needed in addition to the components already listed.

Remark: The Phaseo power supply is not needed in this configuration.

Part-No.	Type / Software	Revision/Version
• TSX RKY 4EX • TSX PSY 2600M • TSX P57 104M • TSX SCP 114 • TSX SCP CU 4030	• Premium Rack • Power Supply • CPU • RS485 MP PCMCIA Card • Premium Communication Cable	
• TWD XCA RJ030 • TWD XMT5	• Communication Cable with Mini-DIN-Connector (one for each Drive Unit) • Mounting Kit (optional)	
• TSX PCX 1031	• Unity Pro XL • Programming Cable	• Version 2.0

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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.