TeSys U Modbus

Quick Start Guide

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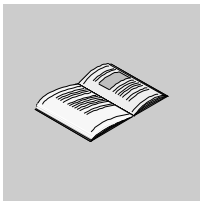
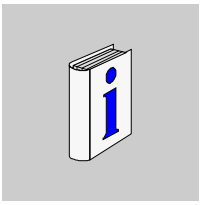




About the Book

At a Glance

Document Scope

The Quick Start Guide uses an application example to describe the different steps to quickly install, configure, and control TeSys U motor starters. With this Quick Start Guide, you can easily set up a Modbus communication network, provided that you have a basic knowledge in PLCs and application software (Unity Pro). You do not need any other document to perform this task.

For more details about other capabilities of TeSys U motor starters, consult the related documents listed below.

Related Documents

Title of Documentation	Reference Number
TeSys U LULC032-033 Modbus Communication Module - User's Manual	1743234
TeSys U Communication Variables - User's Manual	1744082
TeSys U LUB/LUS Starters - Instruction Sheet	1629984
TeSys U LUCA/LUCB/LUCC/LUCD Control Units - Instruction Sheet	AAV40503
TeSys DFB Offer - User Manual	1672600

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

User Comments

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

Introduction

1

What's in this Chapter?

This chapter contains the following topics:

Presentation of the Application

Introduction

The application example helps you to define Direct On Line (D.O.L.) motor starters step by step, in order to:
- provide thermal magnetic protection,
- control the motor, and
- obtain contactor feedback and circuit breaker trip feedback.

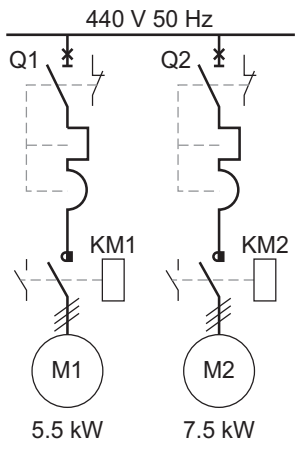
Description of the Application

- Motor 1 (M1):
  3-phase motor, class 10, 5.5 kW (7.5 hp) at 440 V, 50 Hz, rated current In = 10.5 A, D.O.L.
- Motor 2 (M2):
  3-phase motor, class 20, 7.5 kW (10 hp) at 440 V, 50 Hz, rated current In = 14.7 A, D.O.L. with remote monitoring of motor load.

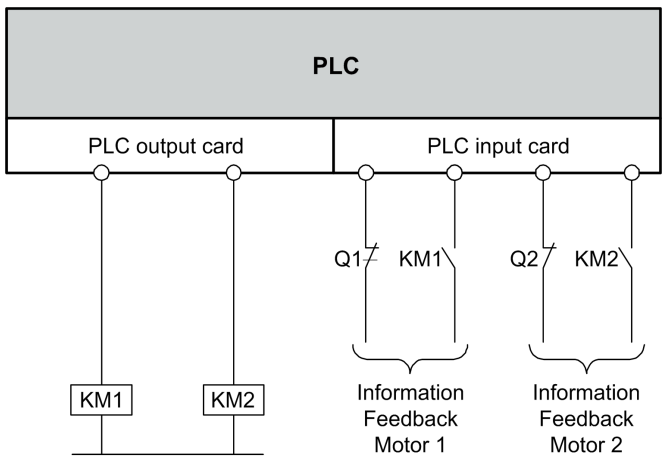
Traditional Solution

The scheme below shows wiring in the traditional solution: all control and feedback information is wired through a PLC.

Power Scheme

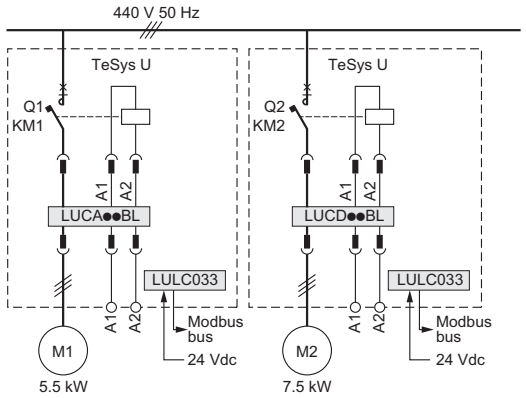
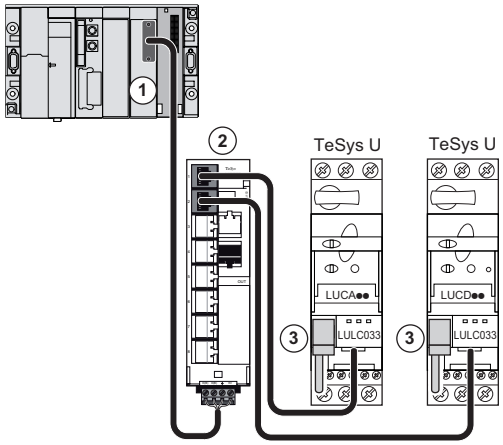


Control Scheme



The Schneider Electric Solution with Tesys U Motor Starter

Power and Control Schemes in the Schneider Electric Solution

Power Scheme	Control Scheme
	 1. TSX SCY 11601 Modbus master coupler with integrated port for RS 485 2. LU9GC3 splitter box with 8 RJ45 connectors for bus connection to LULC033 module and screw terminals (24 V) 3. LU9BN11L prewired coil connection

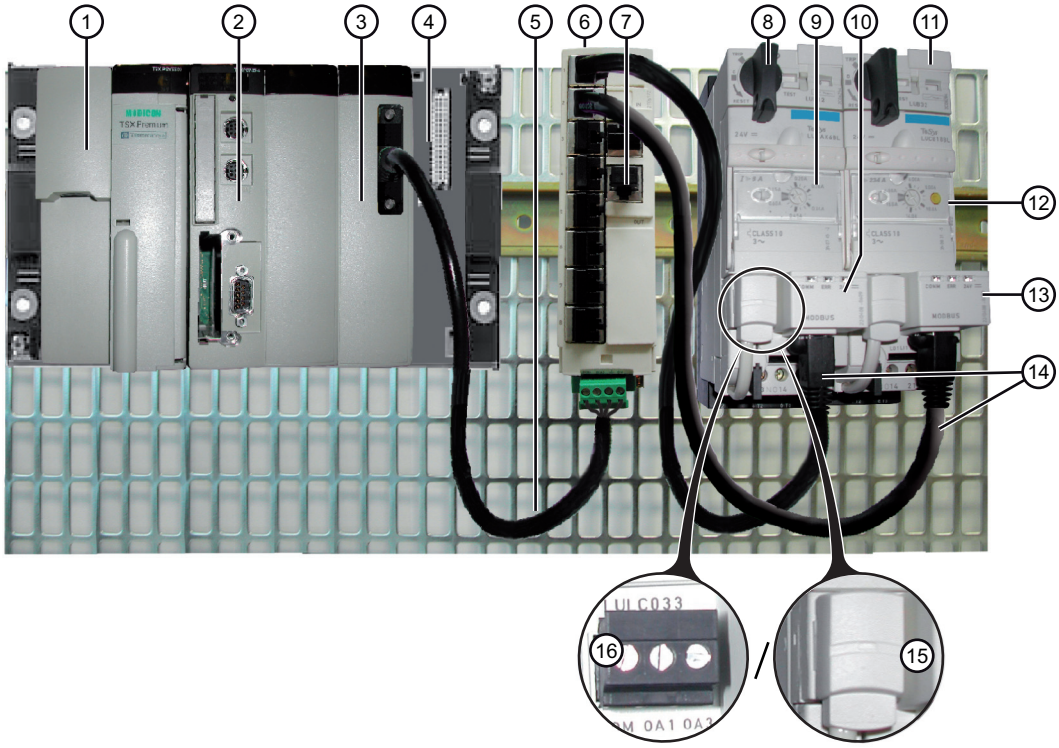
Control Units Used in the Schneider Electric Solution

The Schneider Electric solution presented in this Quick Start Guide uses TeSys U to meet different client needs.

- LUCA12BL is a standard control unit used with motor 1 for basic needs:
  - control a motor remotely (start/stop)
  - provide status information (ready, running, fault condition)
- LUCD18BL is an advanced control unit used with motor 2 for advanced needs, in addition to the standard ones:
  - warning
  - automatic and remote reset via the bus
  - indication of the motor load
  - differentiation of faults

Architecture of the TeSys U System

The following architecture describes the main components of the TeSys U system mounted on a plate:



Legend	Commercial Reference	Description
1+2+3+4		Premium Programmable Logic Controller (PLC) including 3 modules: power supply (1), processor (2), and communication (3) on a rack (4)
1	TSX PSY 5500M	Premium power supply module
2	TSX P57 354M	Premium processor
3	TSX SCY 11601	Premium communication module including 1 sub-D 25 connector
4	TSX RKY 6	Premium single rack (6 positions), enabling all Premium modules to be mechanically and electrically fitted.
5	TSX SCY CM6030	3 m (10 ft) cable equipped with a 25-pin SUB-D connector and stripped at the other end
6	LU9GC3	Splitter box with 10 RJ45 connectors (8 for node connections) and 1 screw terminal (24 V)
7	VW3 A8 306 RC	Line terminator
8	LUB12	TeSys U power base
9	LUCA12BL	Standard control unit
10, 13	LULC033	Modbus communication module
11	LUB32	TeSys U power base
12	LUCD18BL	Advanced control unit
14	VW3 A8 306 R10	1 m (3.3 ft) cable with 2 RJ45 connectors
15	LU9BN11L	Prewired coil connection (optional), or
16	(standard connection coming with LULC033)	Plug-in terminal block, for wire-to-wire control of A1/A2 terminals

Software Tools

The following software tools must be used to set the applications. Their use requires a basic knowledge.

Commercial Reference	Freeware	Description
UNY SPU EFP CD40	–	Unity Pro Extra Large V4.0 (and later versions) programming software for Premium PLC.
UNY SPU EFM CD40	–	Unity Pro Extra Large V4.0 (and later versions) programming software for M340 PLC.
–	DFB library including Ctrl_cmd_mdb_u_add•	TeSys U control/command for Modbus SL. Download the TeSys U DFB library from the www.schneider-electric.com website.

Network Conditions

Protocol: Modbus

Baud Rate: 19,200 bps

Data bits: 8

Stop bit: 1

Parity: even

Addresses:
- 1 for TeSys U motor 1
- 2 for TeSys U motor 2

Setting Up TeSys U

2

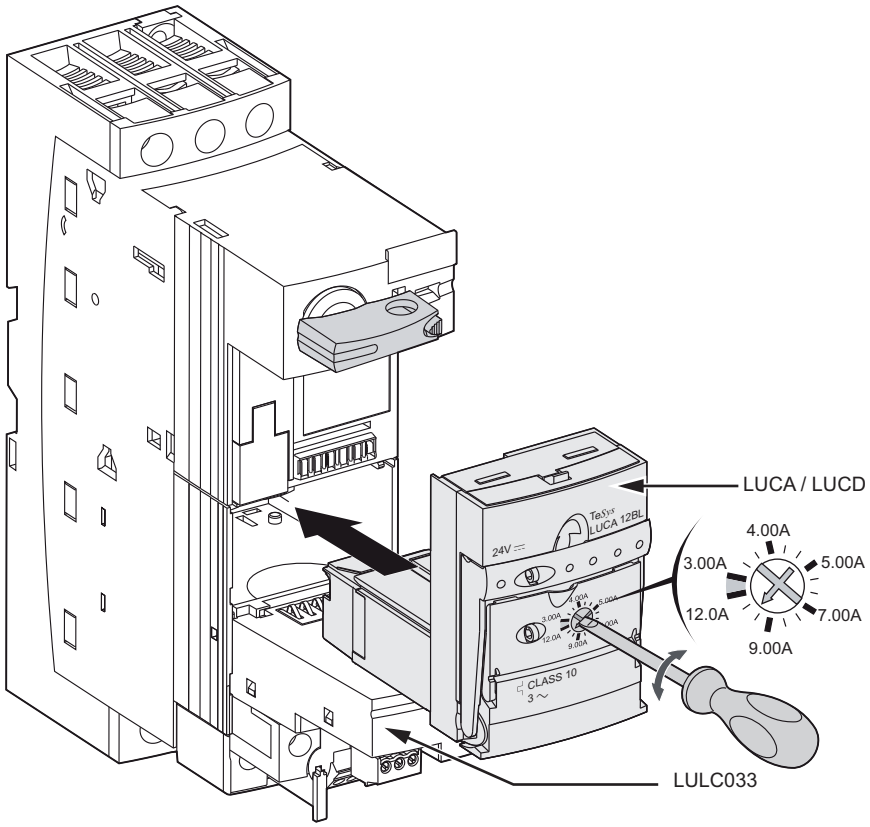
What's in this Chapter?

This chapter contains the following topics:

LUCA12BL and LUCD18BL Settings

Setting Current on the Control Units

The figure below shows how to set current on the control unit using a screwdriver (LUCA12BL here):



Current Setting Values

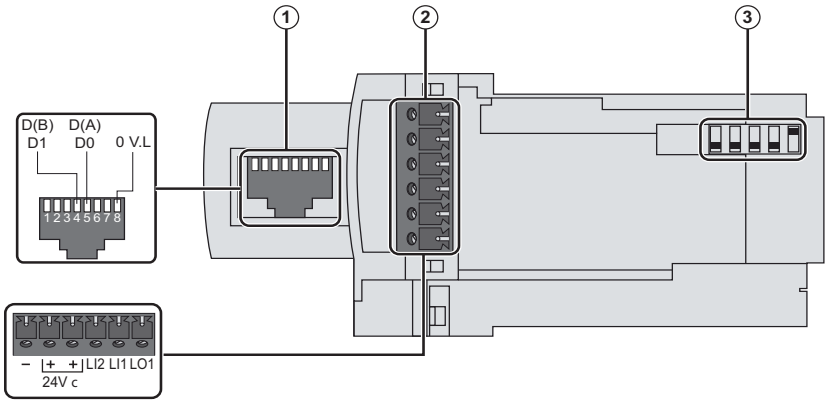
The table below shows the settings for LUCA12BL (Standard Control Unit) and LUCD18BL (Advanced Control Unit):

Control Unit	Motor	Current Setting Range	Motor Nominal Power	Current Setting Value = Motor Rated Current
LUCA12BL	M1	3..12 A	5.5 kW (7.5 hp)	10.5 A
LUCD18BL	M2	4.4..18 A	7.5 kW (10 hp)	14.7 A

LULC033 Connectors, and Address Settings

Presentation

Use the DIP switches, under the LULC033 communication module, to set the Modbus address.



1 RJ45 connector
2 Input/Output terminal block and 24 Vdc
3 Address

Address

Assign an address from 1 to 31, using the 5 switches (SW1 to SW5). Address 0 (zero) is not allowed and is considered as an invalid configuration.

In the application, addresses are 1 and 2:

SW5	SW4	SW3	SW2	SW1	Address
0	0	0	0	1	1 (default value)
0	0	0	1	0	2

Address 1 for TeSys U Motor 1	Address 2 for TeSys U Motor 2
	

Setting Up Communication Network to a PLC

3

Introduction

This chapter describes how to set communication to a PLC step by step using Unity Pro software. The PLC can be:

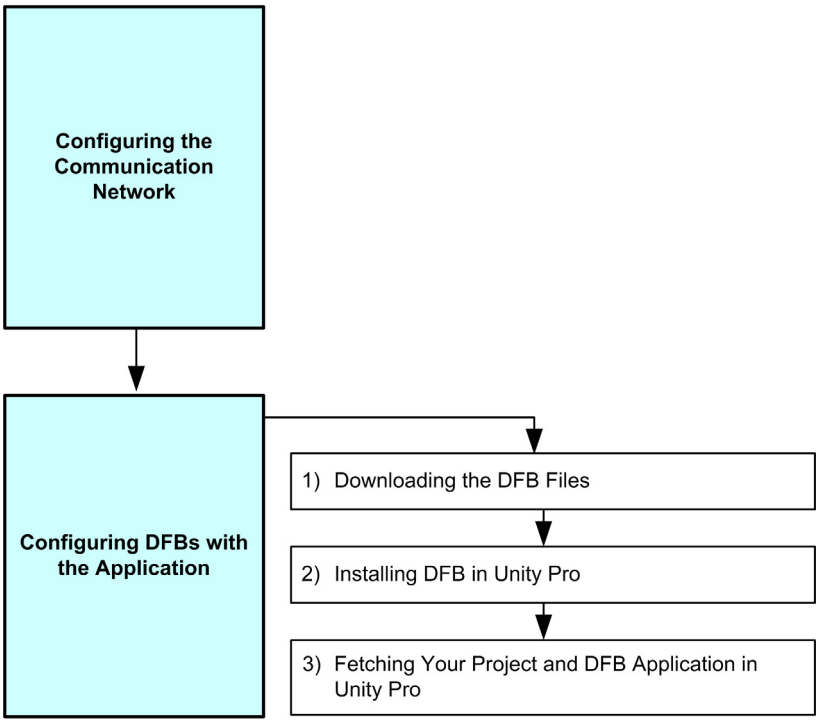
- Premium, or
- Modicon M340

What's in this Chapter?

This chapter contains the following topics:

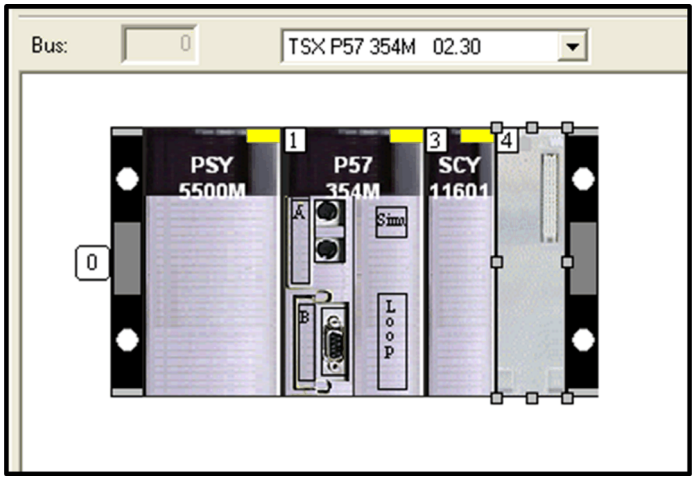
3.1 Configuring TeSys U on the Modbus Network with Unity Pro (for a Premium PLC)

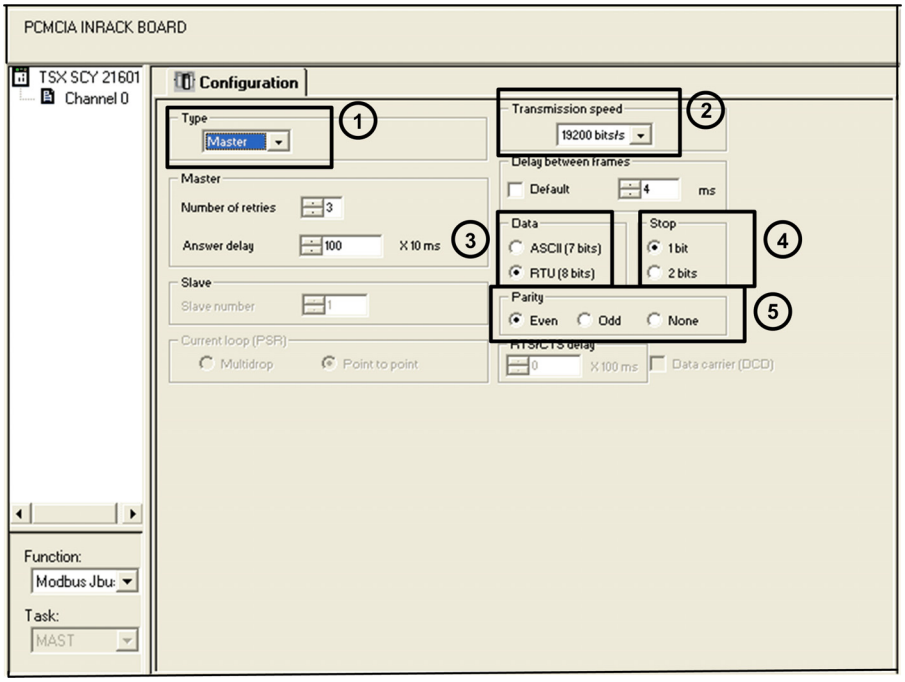
Configuration Process for a Premium PLC



Configuring the Application Network

Configuration steps with **Unity Pro XL** software are as follows:

Step	Action
1	Start **Unity Pro XL** V4.0 software.
2	Configure the Premium PLC for Modbus: ● From the **File** menu, create a new project. ● In the **New Project** window, expand the Premium list and select TSX P57 354M. ● Confirm by clicking **OK**.
3	From the **Structural view** of the **Project Browser**, select **Configuration** → **0 : PLC bus** → **0 : TSX RKY 6**, and then double-click to see the configuration: 

Step	Action
4	Double-click the master coupler device to open the Configuration window:  Check for the following values: **1.** Type: **Master** **2.** Baud rate: **19 200 bits/s** **3.** Data: **RTU (8 bits)** **4.** Stop: **1 bit** **5.** Parity: **even**
5	Select **Edit** → **Validate**, or click ☑ to validate the configuration.
6	Select **Build** → **Rebuild all project** to rebuild the project. If the values are correct (no error), the NOT BUILT state changes to BUILT.
7	Save your application as an .STU file.
8	Connect the appropriate programming cable from your PC to the Premium PLC.
9	Power up the Premium PLC.
10	Click **Connect** in Unity Pro XL.
11	Click the **PLC** menu: the Transfer Project To PLC window opens. Click the **Transfer** button.
12	Click the **Run** icon.

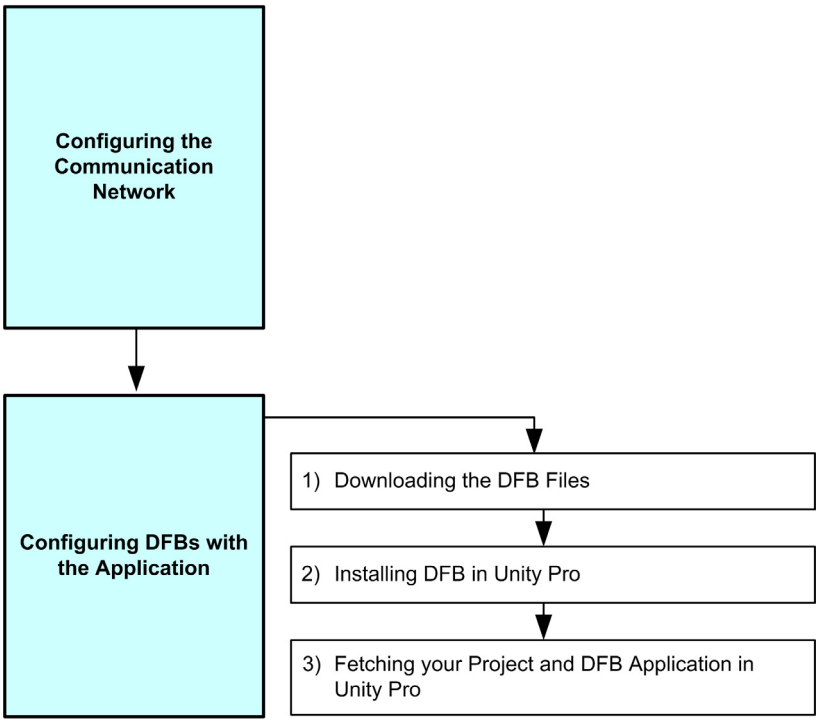
Performing Functional Testing of the Communication Network

To test the configuration, wiring, and communication with Unity Pro XL software proceed as follows:

Step	Action
1	From the **Structural view** of the **Project Browser**, select your configuration.
2	In the Configuration window, select the Debug tab.
3	In Channel test, select the slave number 1 and click on the **Identification** button.
4	A pop-up window opens and should display that the exchange is OK. The LED COMM of the TeSys U blinks once for each Identification request received.

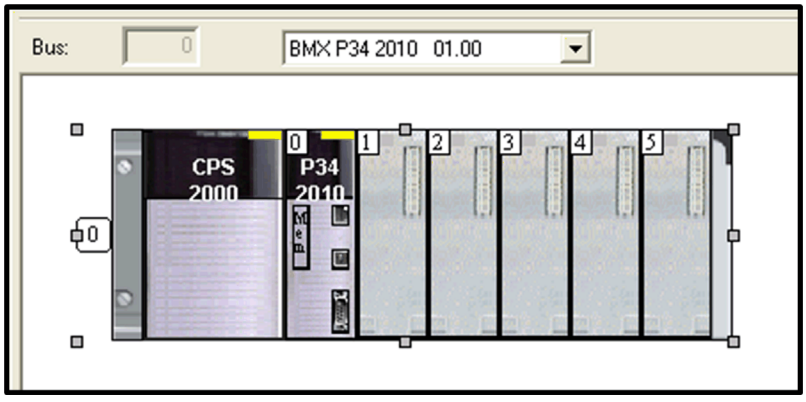
3.2 Configuring TeSys U on the Modbus Network with Unity Pro (for an M340 PLC)

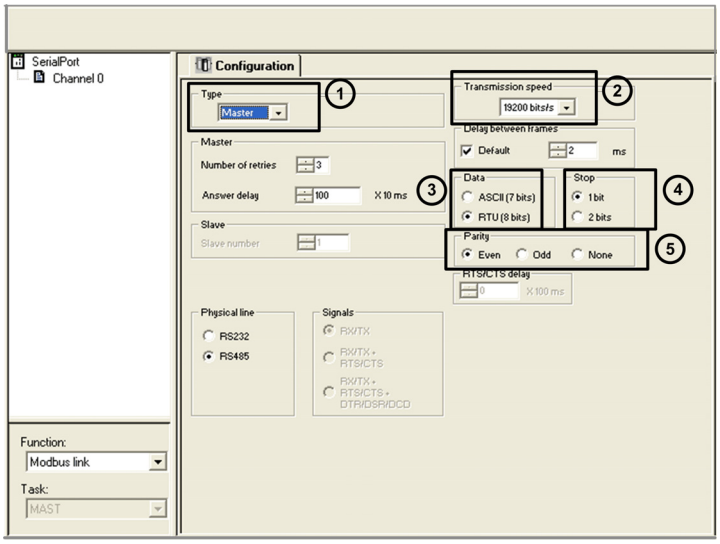
Configuration Process for a Modicon M340 PLC



Configuring the Application Network

Configuration steps with **Unity Pro XL** software are as follows:

Step	Action
1	Start **Unity Pro XL** V4.0 software.
2	Configure the Modicon M340 PLC for Modbus: ● From the **File** menu, create a new project. ● In the **New Project** window, expand the Modicon M340 list and select BMX P34 2010. ● Confirm by clicking **OK**.
3	From the **Structural view** of the **Project Browser**, select **Configuration** → **0 : PLC bus** → **0 : BMX XBP 0600**, and then double-click to see the configuration: 

Step	Action
4	Double-click the master coupler device to open the Configuration window:  Check for the following values: **1.** Type: **Master** **2.** Baud rate: **19 200 bits/s** **3.** Data: **RTU (8 bits)** **4.** Stop: **1 bit** **5.** Parity: **even**
5	Select **Edit** → **Validate**, or click  to validate the configuration.
6	Select **Build** → **Rebuild all project** to rebuild the project. If the values are correct (no error), the NOT BUILT state changes to BUILT.
7	Save your application as an .STU file.
8	Connect the appropriate programming cable from your PC to the M340 PLC.
9	Power up the M340 PLC.
10	Click **Connect** in Unity Pro XL.
11	Click the **PLC** menu: the Transfer Project To PLC window opens. Click the **Transfer** button.
12	Click the **Run** icon.

Performing Functional Testing of the Communication Network

To test the configuration, wiring, and communication with Unity Pro XL software proceed as follows:

Step	Action
1	From the **Structural view** of the **Project Browser**, select your configuration.
2	In the Configuration window, select the Debug tab.
3	In Channel test, select the slave number 1 and click on the **Identification** button.
4	A pop-up window opens and should display that the exchange is OK. The LED COMM of the TeSys U blinks once for each Identification request received.

3.3 Configuring DFBs with the Application

Presentation

The TeSys DFB (Derived Function Blocks) offer has been developed to simplify and optimize the integration of TeSys U starter-controllers in PLC applications.

The Ctrl_cmd_mdb_u_add• DFBs are dedicated to the control and command of a single TeSys U starter-controller (up to 32 A/15 kW or 20 hp) with any control unit and an LULC033 Modbus communication module through the Modbus SL (Serial Line) network.

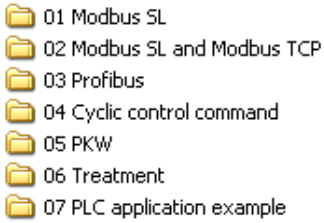
The Ctrl_cmd_mdb_u_add• DFBs are:
- **Ctrl_cmd_mdb_u_addr**, which uses XWAY addressing and is dedicated to Premium PLCs,
- **Ctrl_cmd_mdb_u_addm**, which uses a different addressing method and is dedicated to M340 PLCs.

1. Downloading the DFB Files
2. Installing DFB in Unity Pro
3. Fetching Your Project and DFB Application in Unity Pro

For more information, see the *TeSys DFB Offer User manual*.

1) Downloading the DFB Files

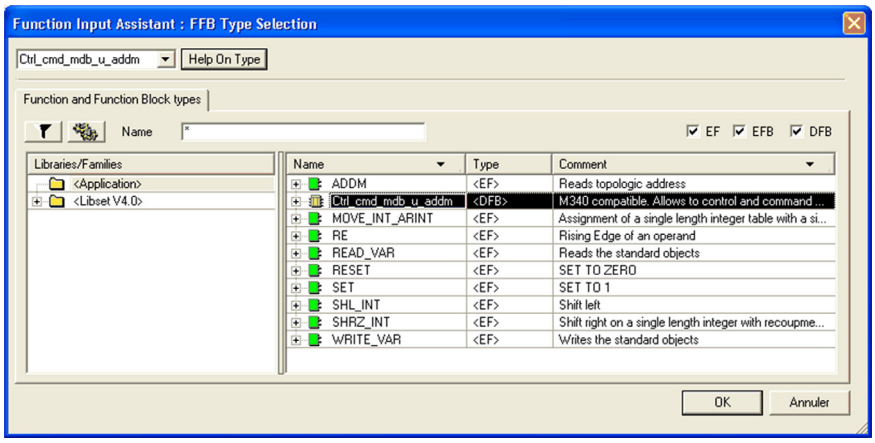
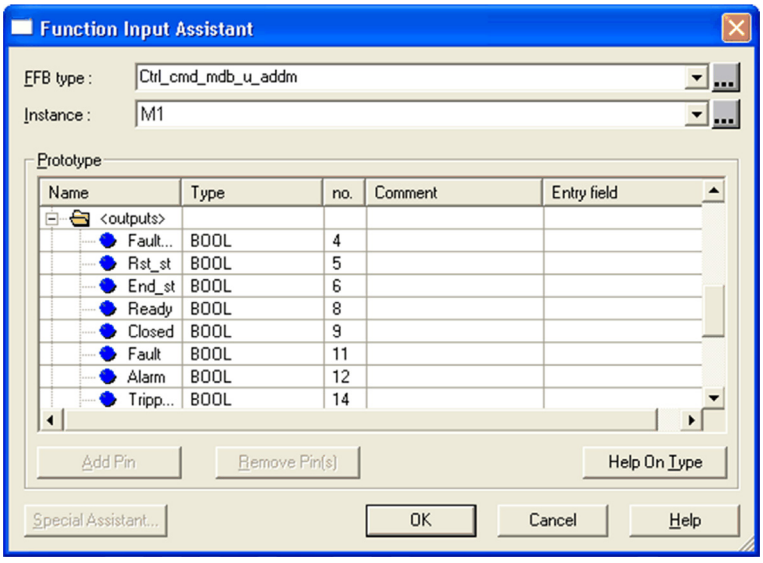
The following table describes the steps to follow to download the TeSys DFB offer from the www.schneider-electric.com website:

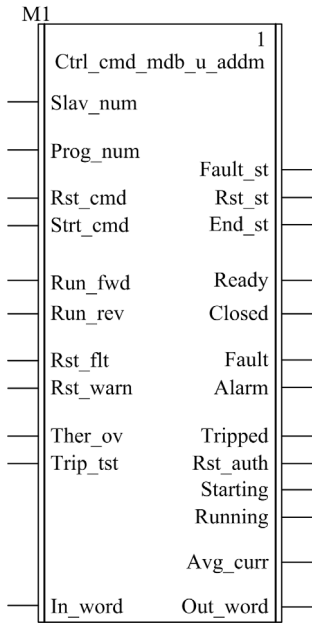
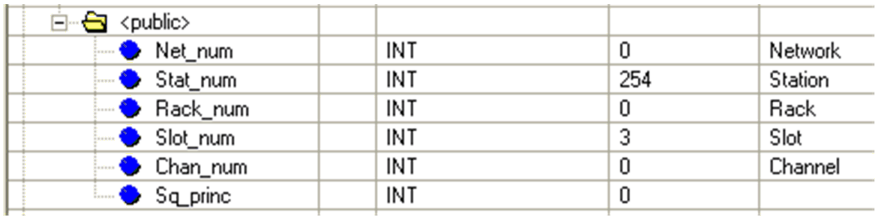
Step	Action
1	Open the Schneider Electric website: www.schneider-electric.com
2	Click **Products and Services**, and then click **Automation and Control**.
3	In the **Downloads** section of the left menu bar, click **Current offers**
4	• In the **Choose a function** drop-down list, select **Motor Control**. • In the **Choose a range** drop-down list, select **TeSys U**. • In the **Choose a type of document** drop-down list, select **Software/Firmware**. Click **>Find**.
5	Select **TeSys DFB offer package** and download the zip file on your hard disk.
6	Extract the TeSys DFB offer package.zip file content to a single directory on your hard disk. 2 directories, PL7 Pro and Unity Pro, will be created, each of them containing the following folders: 

2) Installing DFB in Unity Pro

Step	Action
1	From **Start** button, **All Programs** menu, browse to **Schneider Electric** → **Unity Pro** → **Types Library Update**.
2	In the **Types Library Update** window, browse to **04 Cyclic control command** → **FAMILY.DSC** and open it. **NOTE:** The application version you select must be compliant with Unity Pro.
3	Click the **Install family** button. A pop-up window appears, with the following message: “The installation has succeeded”. Then, exit.

3) Fetching Your Project and DFB Application in Unity Pro

Step	Action
1	Start Unity Pro software.
2	Open the DFB section of a program. From **Edit** menu, get **Data Selection...** sub-menu. An empty Function Input Assistant window opens. First item is FFB type. Browse to get the Ctrl_cmd_mdb_u_add• Modbus DFB: Ctrl_cmd_mdb_u_addm in this example. The following window opens:  Confirm with **OK**.
3	The Function Input Assistant window now displays your selection: 

Step	Action
4	The DFB graphical representation for Ctrl_cmd_mdb_u_addm is displayed:  **NOTE:** The content of Ctrl_cmd_mdb_u_addr is identical.
5	To operate Ctrl_cmd_mdb_u_addr DFB for a Premium PLC, you must configure the public variables. In this application, they are at least the slot number (slot_num) and the rack number (rack_num):  To operate Ctrl_cmd_mdb_u_addm DFB for an M340 PLC, use the default values for this application.

Input Characteristics

The following table describes the Ctrl_cmd_mdb_u_add• DFB inputs and their availability according to the control unit:

Input	Type	Range	Default Value	Description	LUCA	LUCD
Slav_num	INT	1...31	1	Modbus slave number	√	√
Prog_num	INT	1...30	–	See *Program Number, page 19*	√	√
Rst_cmd	EBOOL	0...1	0	Reset command	√	√
Strt_cmd	EBOOL	0...1	0	Start command	√	√
Run_fwd	EBOOL	0...1	0	Motor run forward command	√	√
Run_rev	EBOOL	0...1	0	Motor run reverse command	√	√
Rst_flt	EBOOL	0...1	0	Reset device (if register 451 = 102 or 104, fault acknowledgment causes a return to communication module factory settings)	√	√
Rst_warn	EBOOL	0...1	0	Reset warning (for example, communication loss)	√	√
Ther_ov	EBOOL	0...1	0	Automatic thermal overload fault test	–	–
Trip_tst	EBOOL	0...1	0	Overcurrent trip test via communication bus	–	–
In_word	INT	–	–	This input is only used when program number is 10, 20, or 30. See next table and program number description.	–	–

The following table describes the In_word input:

Input	Type	Bit	Description	LUCA	LUCD
In_word	INT	0	Motor run forward command	√	√
		1	Motor run reverse command	√	√
		2	Reserved	–	–
		3	Reset device (if register 451 = 102 or 104, fault acknowledgment causes a return to communication module factory settings)	√	√
		4	Reserved	–	–
		5	Automatic thermal overload fault test	–	–
		6	Overcurrent trip test via communication bus	–	–
		7	Reserved	–	–
		8	Reset warning (for example, communication loss)	√	√
		9...15	Reserved	–	–

Program Number

The program number enables the user to select bit or word control.

The following table describes the programs of the DFB:

Program Number	Description
1	Read registers 455 and 456, then write register 704 (systematic)
2	Read registers 455 and 456, then write register 704 (conditional)
3	Write register 704
10	Same as program 1 but using the In_word input and the Out_word output
20	Same as program 2 but using the In_word input and the Out_word output
30	Same as program 3 but using the In_word input and the Out_word output

Output Characteristics

The following table describes the Ctrl_cmd_mdb_u_add• DFB outputs and their availability according to the control unit:

Output	Type	Range	Default Value	Description	LUCA	LUCD
Fault_st	EBOOL	0...1	0	Fault detected	√	√
Rst_st	EBOOL	0...1	0	Reset state	√	√
End_st	EBOOL	0...1	0	End state	√	√
Ready	EBOOL	0...1	0	System ready: the rotary handle is turned to On position and there is no fault	√	√
Closed	EBOOL	0...1	0	Pole status: closed	√	√
Fault	EBOOL	0...1	0	All faults	√	√
Alarm	EBOOL	0...1	0	All warnings	√	√
Tripped	EBOOL	0...1	0	System tripped: the rotary handle is turned to Trip position	√	√
Rst_auth	EBOOL	0...1	0	Fault reset authorized	–	√
Starting	EBOOL	0...1	0	Start in progress: 0 = descending current is lower than 150 % FLA 1 = ascending current is greater than 10 % FLA	–	√
Running	EBOOL	0...1	0	Motor running with detection of current, if greater than 10 % FLA	–	√
Avg_curr	INT	0...200	0	Average motor current (x 1 % FLA)	–	√
Out_word	INT	–	–	This output is only used when program number is 10, 20, or 30. See next table and program number description.	–	

The following table describes the Out_word output:

Output	Type	Bit	Description	LUCA	LUCD
Out_word	INT	0	System ready: the rotary handle is turned to On position and there is no fault.	√	√
		1	Pole status: closed	√	√
		2	All faults	√	√
		3	All warnings	√	√
		4	System tripped: the rotary handle is turned to Trip position.	√	√
		5	Fault reset authorized	–	√
		6	Reserved	–	–
		7	Motor running with detection of current, if greater than 10% FLA	–	√
		8...13	Average motor current (% FLA) 32 = 100% FLA 63 = 200% FLA	–	√
		14	Reserved	–	–
		15	Start in progress: 0 = descending current is lower than 150% FLA 1 = ascending current is greater than 10% FLA	–	√

Public Variables Characteristics

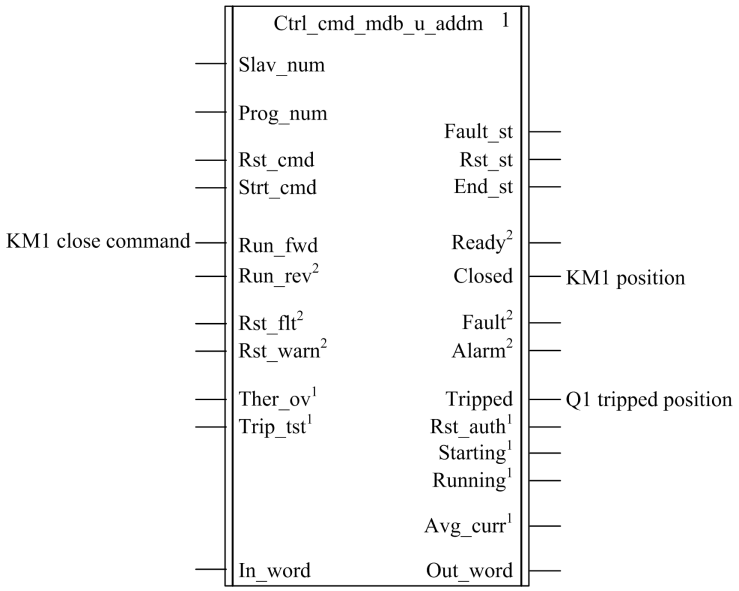
The following table describes the Ctrl_cmd_mdb_u_addr DFB public variables using XWAY addressing and their availability according to the control unit:

Public Variable	Type	Range	Default Value	Description	LUCA	LUCD
Net_num	INT	100...255	0	Network address	√	√
Stat_num	INT	0...255	0	Station address	√	√
Rack_num	INT	0...7	0	Destination rack address	√	√
Slot_num	INT	0...10	0	Destination slot address	√	√
Chan_num	INT	0...1	0	Destination channel address	√	√
Sq_princ	INT	0...7	0	Reserved for support	√	√

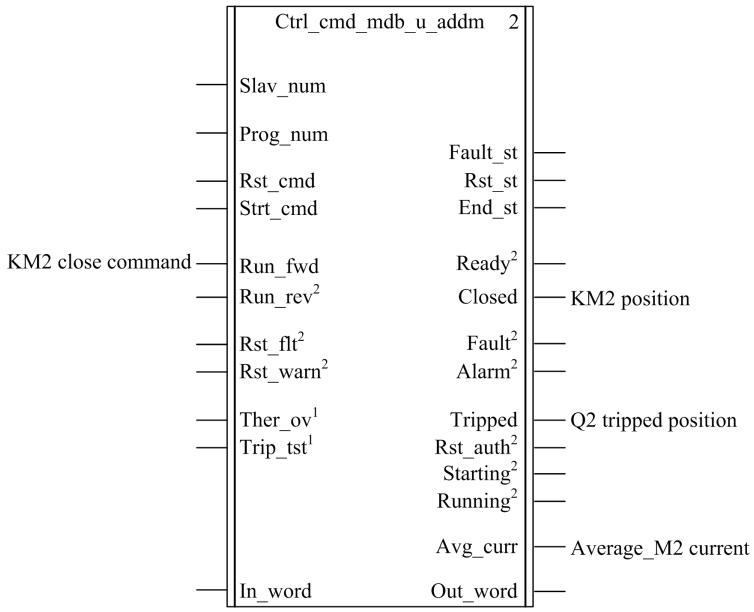
The following table describes the Ctrl_cmd_mdb_u_addm DFB public variables using M340 addressing and their availability according to the control unit:

Public Variable	Type	Range	Default Value	Description	LUCA	LUCD
Rack_num	INT	0...7	0	Destination rack address	√	√
Slot_num	INT	0...10	0	Destination slot address	√	√
Chan_num	INT	0...1	0	Destination channel address	√	√
IP_addr1	INT	0...255	0	First byte of IP address	√	√
IP_addr2	INT	0...255	0	Second byte of IP address	√	√
IP_addr3	INT	0...255	0	Third byte of IP address	√	√
IP_addr4	INT	0...255	0	Fourth byte of IP address	√	√
Sq_princ	INT	0...7	0	Reserved for support	√	√

Programming DFB (= M1) for Motor 1

Step	Action
1	Link the Run_fwd M1 input to the motor 1 start condition.
2	Link the M1 outputs to PLC variables for use in the program: ● Closed M1 output = position of the KM1 contactor ● Tripped M1 output = tripped position of the Q1 TeSys U
3	Check that M1, for Motor 1, displays as follows:  **1** Not applicable **2** Applicable but not used; can be managed by the PLC application **NOTE:** The content of Ctrl_cmd_mdb_u_addr is identical.

Programming DFB (= M2) for Motor 2

Step	Action
1	Link the Run_fwd M2 input to the motor 2 start condition.
2	Link the M2 outputs to PLC variables for use in the program: ● Closed M2 output = position of the KM2 contactor ● Tripped M2 output = tripped position of the Q2 TeSys U
3	Link the Avg_curr M2 output to a PLC register for use of motor 2 average current in the program.
4	Check that M2, for Motor 2, displays as follows:  **1** Not applicable **2** Applicable but not used; can be managed by the PLC application **NOTE:** The content of Ctrl_cmd_mdb_u_addr is identical.