TeSys T LTM R EtherNet/IP with a Third-Party PLC

Quick Start Guide

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About the Book

At a Glance

Document Scope

The scope of this document is to provide a single reference for configuring and connecting the TeSys T and the Allen-Bradley programmable logic controller (PLC).

You do not need any other document to perform this task.

For more details about other capabilities of TeSys T motor management controller, consult the related documents listed below.

Validity Note

The information described in this Quick Start Guide is valid for the hardware and software used in the application example provided. The same procedures can be used with different versions of the hardware and software given provided that compatible versions are used.

Related Documents

Title of Documentation	Reference Number
TeStys T LTM R Ethernet Modbus TCP/Ethernet IP - User Manual	1639505EN

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

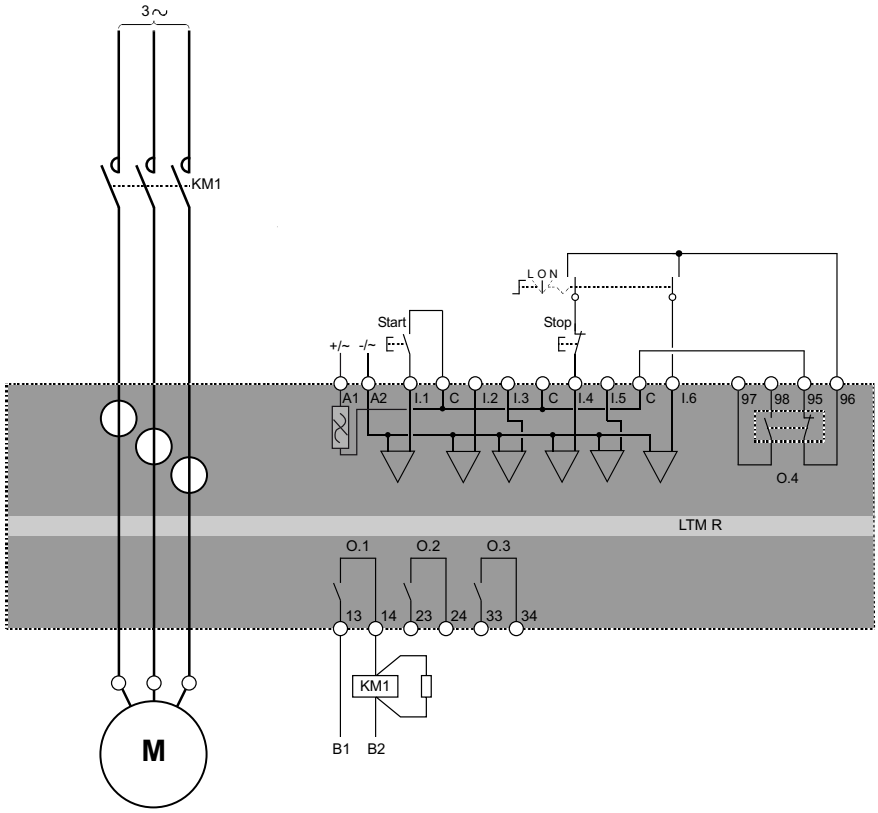
Presentation of the Application

Introduction

The application example helps you to define Direct On Line (D.O.L.) motor starter:

- for a 3-phase motor, class 10, 5.5 kW (7.5 hp) at 440 V, 50 Hz, rated current In = 10.5 A, three-wire independent D.O.L.
- protected and controlled by an LTM R controller connected to a thrid-party PLC over EtherNet/IP communication protocol

Wiring Diagram



L Terminal strip control
O Off
N Network control

Logic Inputs of the LTM R Controller

The controller LTM R has 6 logic inputs:

- available via field wiring terminals I.1- I.6
- internally powered by the control voltage of the LTM R controller (the input voltage is the same voltage as the controller supply voltage)
- isolated from the inputs of the LTM E expansion module

The 3 Common (C) terminals of the LTM R controller are connected to the A1 control voltage via an internal filter. For more information, refer to the *TeSys T LTM R Ethernet Modbus TCP/EtherNet IP User Manual*.

NOTICE
LOGIC INPUTS DESTRUCTION HAZARD ● Connect the LTM R controller's inputs using the 3 Common (C) terminals connected to the A1 control voltage via an internal filter. ● Do not connect the Common (C) terminal to the A1 or A2 control voltage inputs. **Failure to follow these instructions can result in equipment damage.**

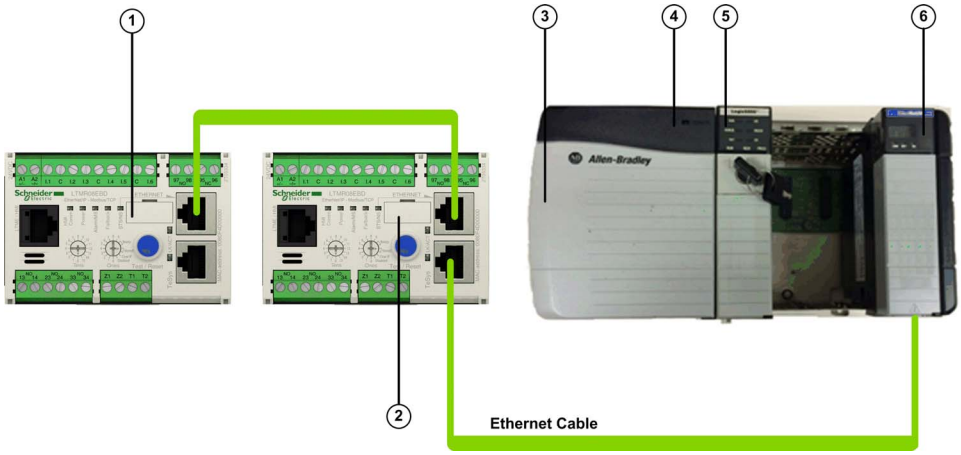
For more information, refer to the *TeSys T LTM R Ethernet Modbus TCP/EtherNet IP User Manual*.

Logic Inputs of the LTM E Expansion Module

The 4 logic inputs on the LTM E expansion module (I.7 - I.10) are not powered by the control voltage of the LTM R controller.

For more information, refer to the *TeSys T LTM R Ethernet Modbus TCP/EtherNet IP User Manual*.

Communication Architecture



Legend	Commercial Reference	Description
1, 2	LTMR27EBD	LTM R controller communicating over Ethernet TCP / Modbus or EtherNet/IP
3 to 6		Allen-Bradley Programmable Logic Controller (PLC) from Rockwell Automation
3	1756-A4	Allen-Bradley ControlLogix chassis with 4 slots
4	1756-PA72	Allen-Bradley ControlLogix power supply 120...240 V AC (5 V/10 A)
5	1756-L655	Allen-Bradley ControlLogix Logix55655 controller, revision 16
6	1756-ENBT	Allen-Bradley ControlLogix EtherNet/IP master scanner: network card for the PLC to exchange information between TeSys T and the PLC

Software Tools

The following software tools must be used for this application. Their use requires a basic knowledge.

Commercial Reference	Freeware	Description
9357-ENETL3	–	RSNetWorx for EtherNet/IP application for configuring and monitoring EtherNet/IP networks and configuring connected devices.
9324-RLD300ENE	–	RSLogix Designer configuring and programming software for the Allen-Bradley Logix5000 familly of controller.
–	*SE TeSys T MMC L EIP*	A TeSys® T Motor Management Controller system without an expansion module, configurable via the HMI port. The variant enables you to preserve your local configuration.
–	*SE TeSys T MMC L EV40 EIP*	A TeSys® T Motor Manangement Controller system with expansion module, configurable via the HMI port. The variant enables you to preserve your local configuration
–	*SE TeSys T MMC R EIP*	A TeSys® T Motor Management Controller system without expansion module configurable via the network.
–	*SE TeSys T MMC R EV40 EIP*	A TeSys® T Motor Management Controller system with expansion module configurable via the network.

In local configuration mode, the parameter Config via Network Port Enable must be disabled. This mode preserves the local configuration made using the Magelis® XBT or Somove through the HMI port and prevents PLC configuration via the network.

In remote configuration mode, the parameter Config via Network Port Enable must be enabled. This enables the PLC to remotely configure the LTM R controller.

NOTE: In remote mode, the parameters overwritten by the PLC will be lost. This mode is useful when replaceing faulty devices.

The Config via Network Port Enable parameter is set by default.

Ethernet Network

Protocol: EtherNet/IP is an application layer protocol treating devices on the network as a series of objects. It is an implementation of the common industrial protocol (CIP) over TCP/IP.

The network carries control data and the properties of the device being controlled. It enables you to operate either in a client/server mode or a peer-to-peer mode.

Two main types of messages can be exchanged:
- Implicit messaging, dedicated to fast exchanges of process data.
- Explicit messaging, dedicated to slower exchanges such as configuration, settings, or diagnostics data.

Fallback Strategy Configuration for the TeSys T on the EtherNet/IP Network

When communication between the LTM R controller and either the network or the HMI is lost, the LTM R controller is in a fallback condition. The behaviour of logic outputs O.1 and O.2 following a communication loss is determinded by:
- the operating mode and
- the Network Port Fallback Setting and HMI Port Fallback Setting Parameters.

Fallback setting selection can include:

Port Fallback Setting	Description
Hold (O.1, O.2)	Directs the LTM R controller to hold the state of logic outpus O.1 and O.2 as of the time of the communication loss.
Run	Directs the LTM R controller to perform a Run command for a 2-step control sequence on the communication loss.
O.1, O.2 Off	Directs the LTM R controller to turn off both logic outputs O.1 and O.2 following a communication loss.
O.1, O.2 On	Directs the LTM R controller to turn on both logic outputs O.1 and O.2 following a communication loss.
O.1 On	Directs the LTM R controller to turn on only logic output O.1 following a communication loss.
O.2 On	Directs the LTM R controller to turn on only logic output O.2 following a communication loss.

The following table indicates which fallback options are available for each operating mode:

Port Fallback Setting	Operating Mode					
	Overload	Independent	Reverser	2-step	2-speed	Custom
Hold (O.1, O.2)	Yes	Yes	Yes	Yes	Yes	Yes
Run	NO	NO	NO	Yes	No	No
O.1, O.2 Off	Yes	Yes	Yes	Yes	Yes	Yes
O.1, O.2 On	Yes	Yes	NO	NO	NO	Yes
O.1 On	Yes	Yes	Yes	NO	Yes	Yes
O.2 On	Yes	Yes	Yes	NO	Yes	Yes

NOTE: When you select a network or HMI fallback setting, you selection must identify an active control source.

Setting up TeSys T

LTM R Settings with DTM

SoMove software is a Microsoft® Windows®-based application, using the open FDT/DTM technology. SoMove contains DTMs for different devices. The TeSys T DTM is a specific DTM that enables the configuration, monitoring, control, and customization of the control functions of the LTM R controller, as part of the TeSys T motor management system. For TeSysT EtherNet/IP you will need at least DTM version 2.8.x.x.

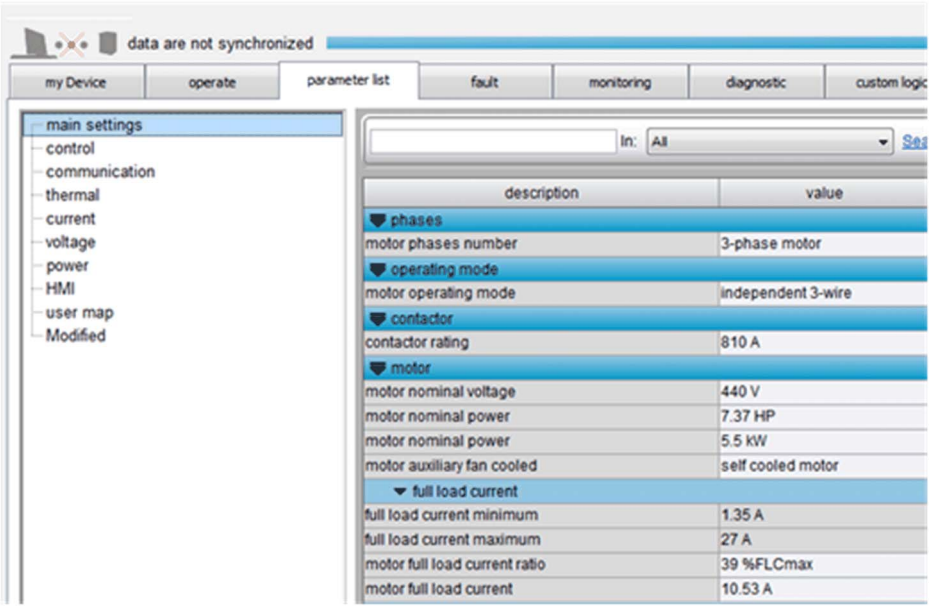
The TeSys T DTM can be used to:

- Configure parameters for the LTM R controller
- Display information about the LTM R controller configuration and operation
- Display the status of detected faults and warnings in the LTM R controller
- Control the motor
- Customize operating modes

The quick start guide introduces the protection and network settings to define to start your TeSysT. For more information refer to *TeSys T DTM for SoMove FDT Container Online Help* embedded in the DTM software.

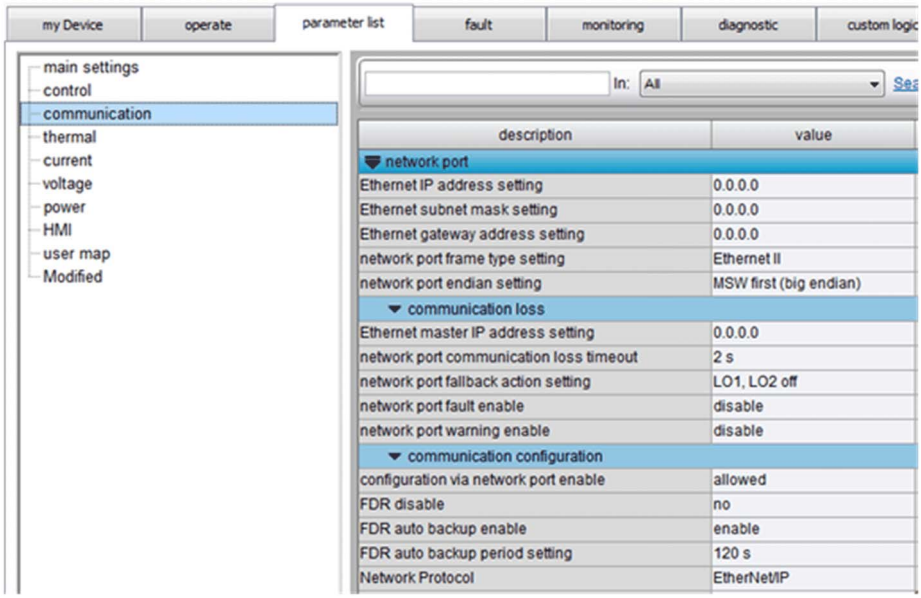
Protection Settings

The table shows the steps to set the protection settings:

Step	Action
1	Connect the device to the DTM and make sure that the Tesys T is in configuration mode.
2	Select the **Device** → **command** → **enter configuration**.
3	Select **main settings** in the **parameter list** tab.
4	Set the configuration as follows: ● **motor operating mode**: independent 3 wire ● **motor nominal voltage**: 440 V ● **motor nominal power**: 5.5 kW ● **motor full load current**: 10.53 A 
5	Select the **Device** → **command** → **exit configuration** to exit protection settings.

Network Settings

The table shows the steps to set the network settings:

Step	Action
1	Connect the device to the DTM and make sure that the Tesys T is in configuration mode.
2	Select the **Device** → **command** → **enter configuration**.
3	Select **main settings** in the **communication** tab.
4	Set the configuration as follows: ● **Ethernet IP address setting**: expected ● **Ethernet subnet mask setting**: set according to Ethernet network ● **Network Protocol**: EtherNet/IP 
5	Select the **Device** → **command** → **exit configuration** to exit network settings.
6	Make sure to perform a power cycle of the device after the network setting.

Setting up Communication Network to a PLC

Introduction

This chapter describes step by step how to set the EtherNet/IP communication including the TeSys T motor starters and an Allen-Bradley PLC using:

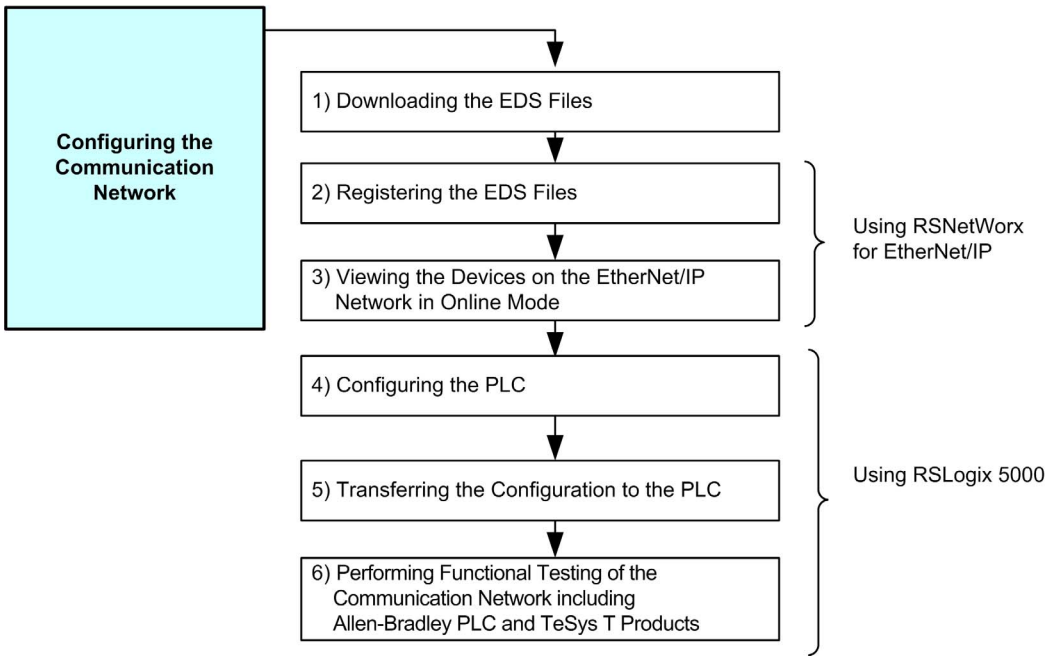
- RSNetWorx for EtherNet/IP configuration software for network configuration, and
- RSLogix 5000 for PLC configuration.

Prerequisite

Before you start configuring the application, RSLinx, RSNetWorx for EtherNet/IP, and RSLogix 5000 software from Rockwell Automation must be

- correctly installed on your computer,
- activated, and
- correctly configured to communicate with the PLC.

Configuration Process



1) Downloading the EDS Files

The following table describes the steps to follow to download the EDS files associated with Tesys T from the www.schneider-electric.com website:

Step	Action
1	Open the Schneider Electric website: www.schneider-electric.com.
2	Type *TeSys T* in the Search field.
3	In the **Product Ranges** section, click **TeSys T**.
4	Click the **Downloads** tab, and then **Software/Firmware**.
5	Select **EDS file for TeSys T EIP** and download the *EIP_EDS 1.1.10* file on your hard disk. Select for both TeSysT SE TeSysT MMC R EIP file.
6	Extract the *EIP_EDS 1.1.10* file into a single directory to your hard disk.

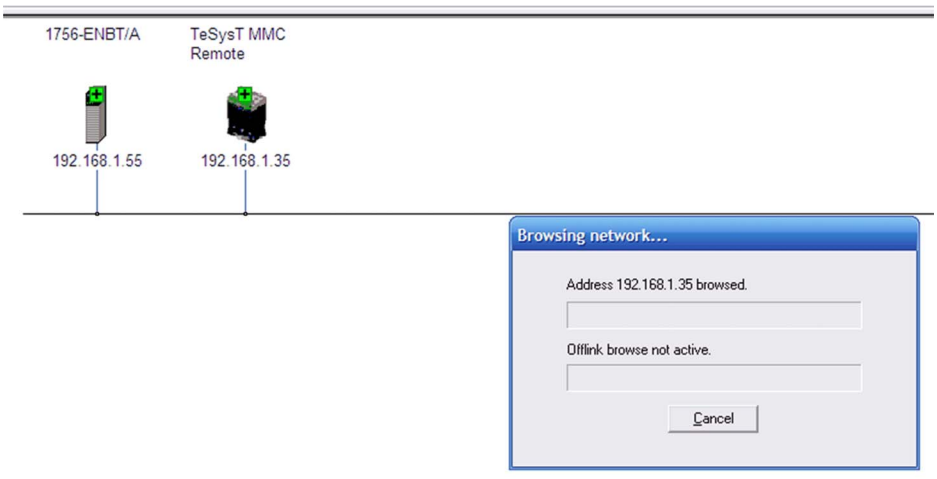
2) Registering the EDS Files using RSNetWorx for EtherNet/IP

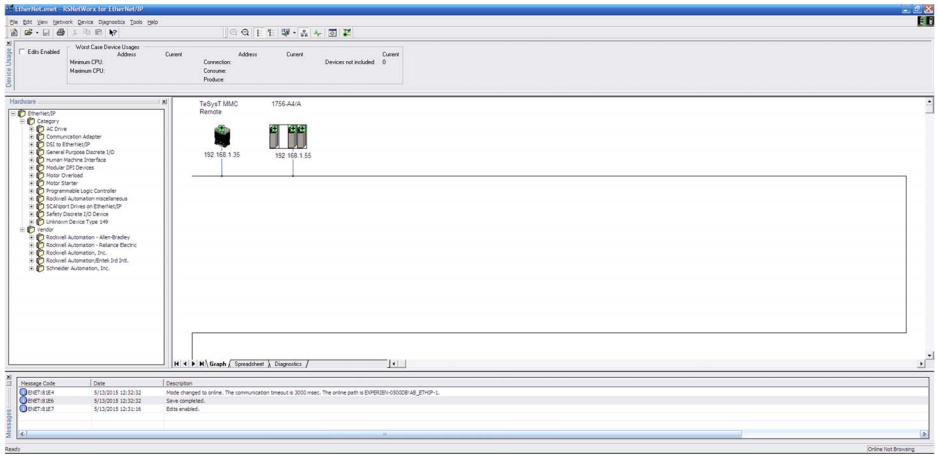
To register the starter-controllers' EDS in the EDS library of RSNetWorx for EtherNet/IP software, follow the procedure below:

Step	Action	Result
1	Start **RSNetWorx for EtherNet/IP**.	
2	Select the menu command **Tools** → **EDS Wizard...**	The **Wizard** welcome screen opens.
3	Click **Next**.	The **Options** screen opens.
4	Select **Register an EDS file(s)** and click **Next**.	The **Registration** screen opens.
5	Select **Register a directory of EDS files** and browse to the directory in which you unzipped the EDS files.	
6	Click **Next**.	The **EDS File Installation Test Results** screen opens.
7	Click **Next**.	The **Change Graphic Image** screen opens. The 4 **TeSys T** are listed in the **Product Types** field as motor starters.
8	Click **Next**.	The **Final Task Summary** screen opens.
9	Verify that the devices have been registered and click **Next**.	The completion screen opens.
10	Click **Finish**.	The **EDS Wizard** closes. You can find the EDS recorded into the hardware library under **EtherNet/IP** → **Vendor** → **Schneider Automation, Inc.** → **Motor Starter**

3) Viewing the Devices on the EtherNet/IP Network in Online Mode using RSNetWorx for EtherNet/IP

The process for viewing the devices on the EtherNet/IP network in online mode using RSNetWorx for EtherNet/IP software is described below:

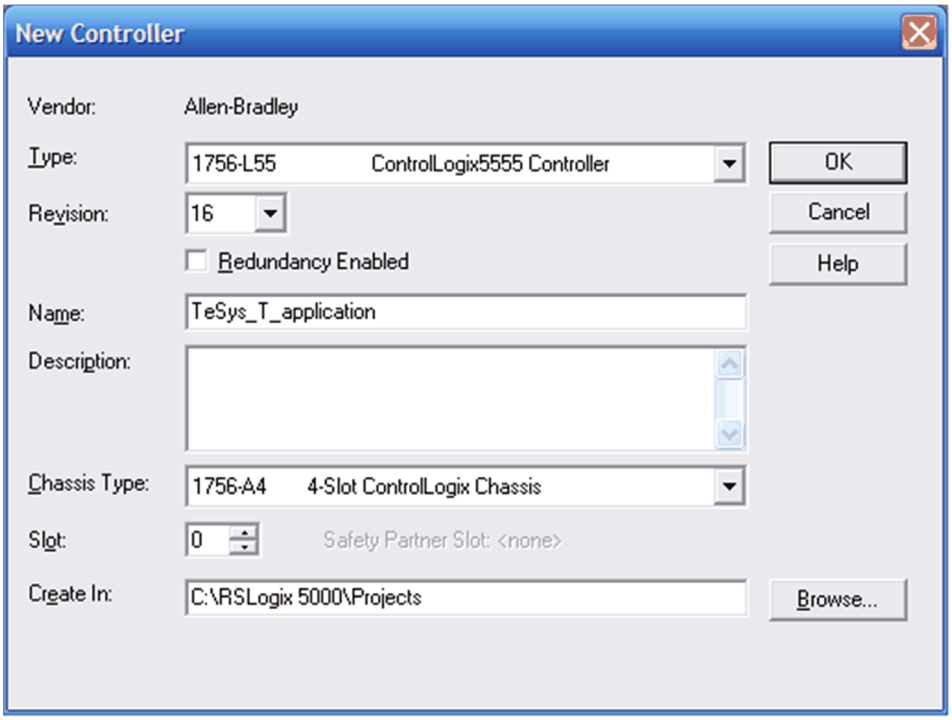
Step	Action
1	Connect the appropriate programming cable from your PC to the Allen-Bradley PLC.
2	Connect each device to the network.
3	From **RSNetWorx for EtherNet/IP** software, select the menu command **Network** → **Online**. **Result:** The **Browsing Network** dialog box opens as the system discovers devices present on the network. 

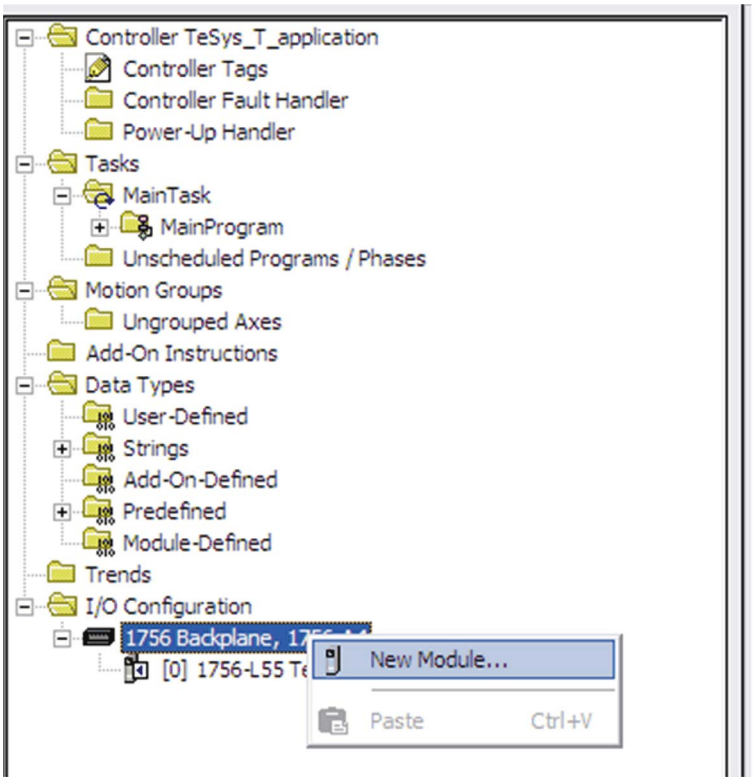
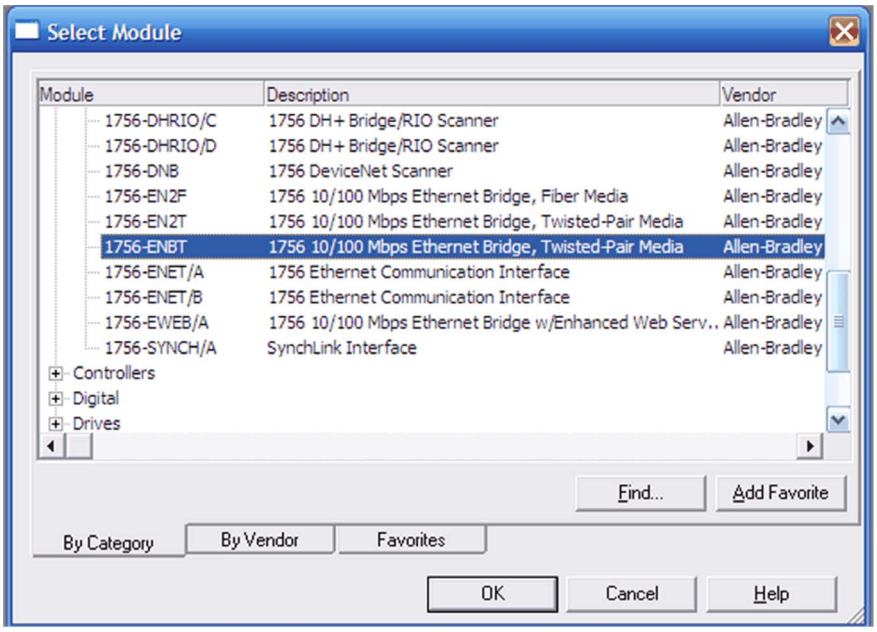
Step	Action
4	**Result:** When the **Browsing Network** dialog box finishes, the physically connected devices appear in the configuration view including the Tesys T. The IP addresses appear below each icon. 

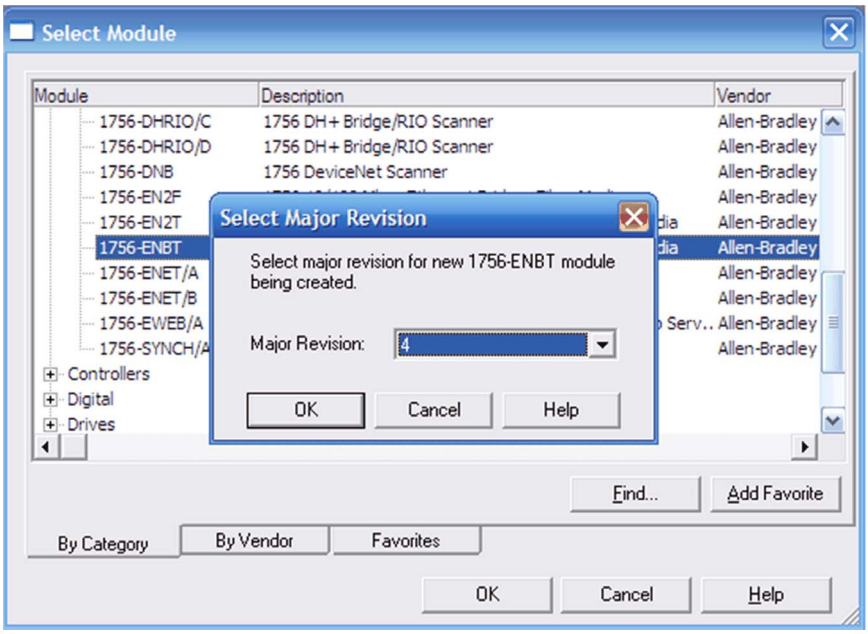
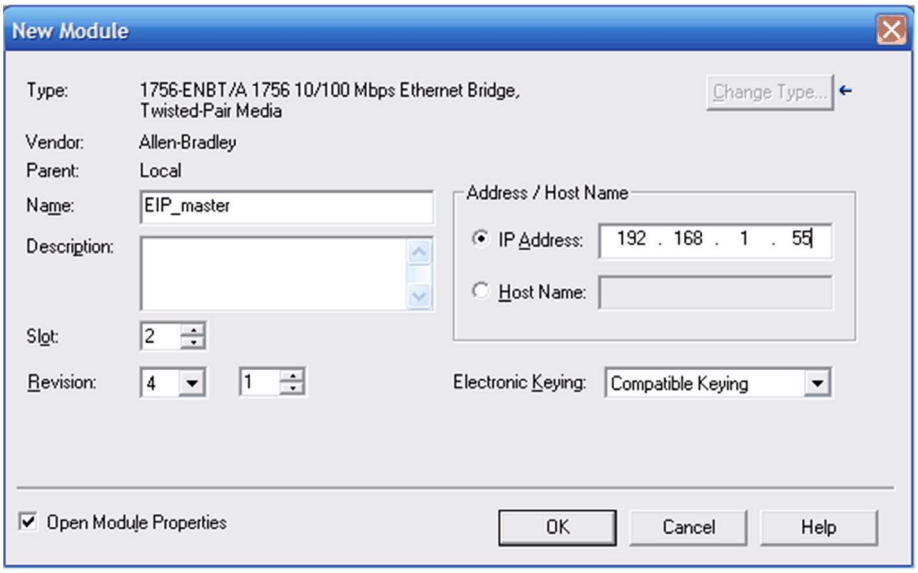
4) Configuring the PLC using RSLogix 5000

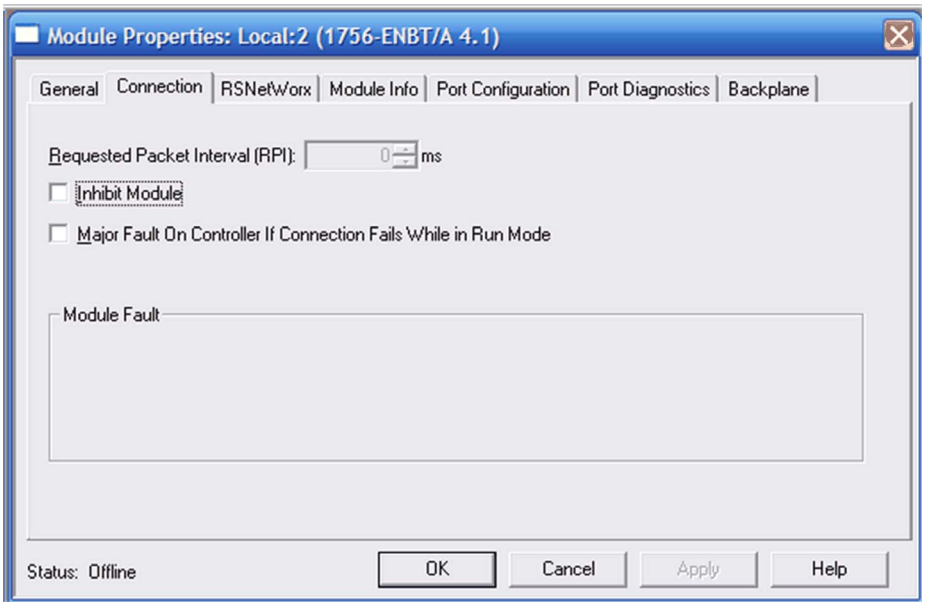
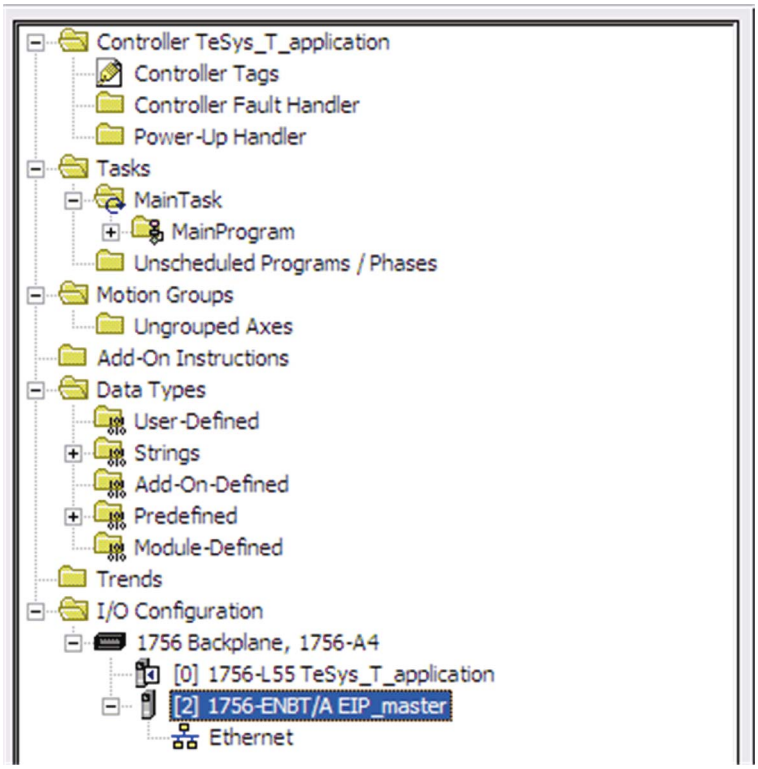
The process for configuring the PLC using RSLogix 5000 software is described below:

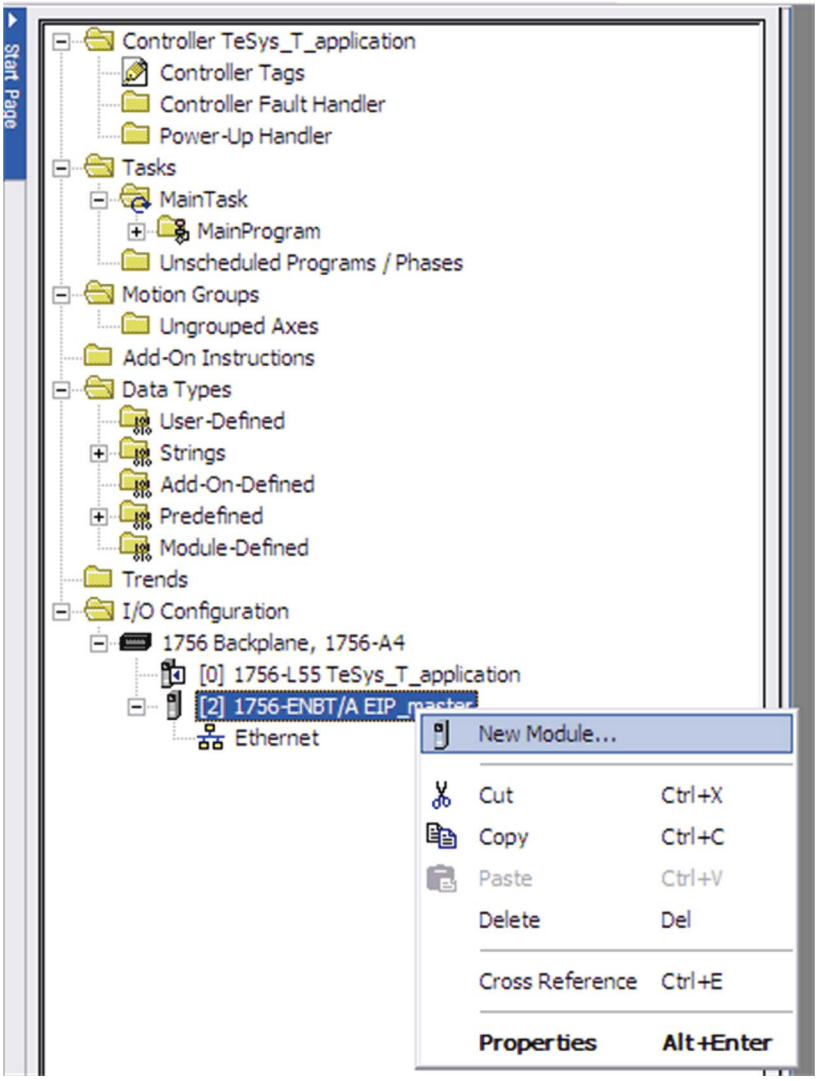
Step	Action
1	Start **RSLogix 5000** software.
2	Create a project by selecting the command **File** → **New**. **Result:** The **New Controller** dialog box opens.

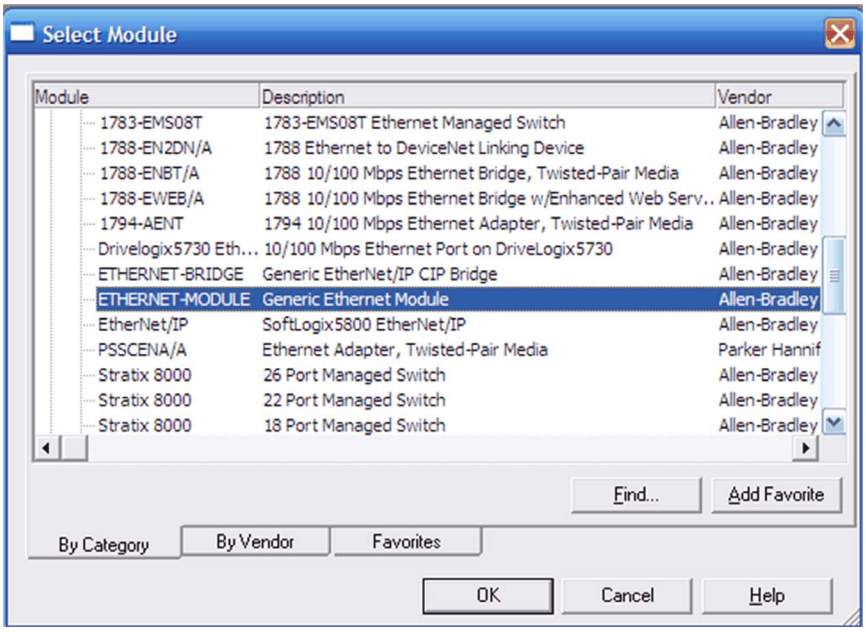
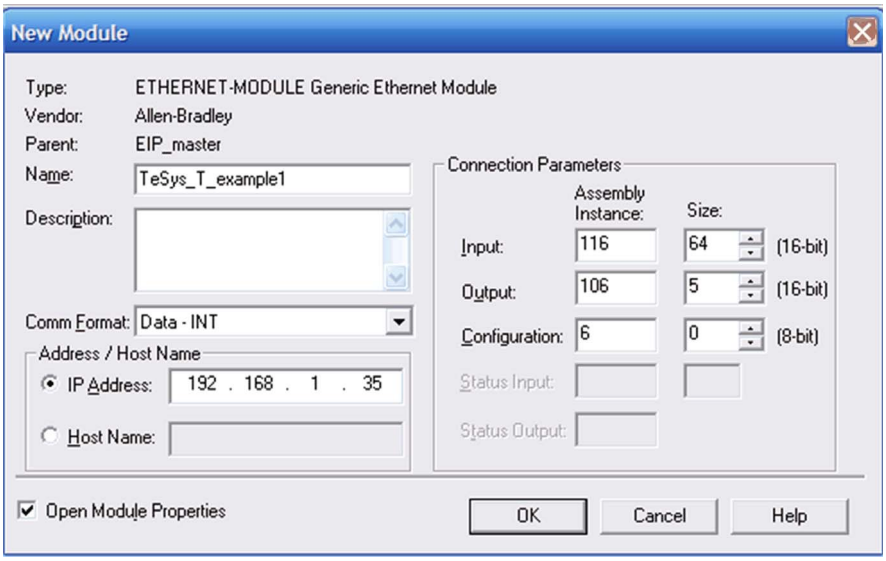
Step	Action
3	Set the characteristics of the controller used in the application example: • **Type**: 1756-L55 Controller ControlLogix5555 • **Revision**: 16 • **Name**: Enter a controller name, for example TeSys_T_application. The name is used to create the project file; the *.acd* extension is automatically appended to this name. • **Chassis Type**: 1756-A4 4-Slot ControlLogix Chassis • **Slot**: 0, which is the slot number for this controller. **NOTE:** In ControlLogix, controllers occupy a numbered slot in the chassis and can be placed in any slot. It is also possible to place multiple controllers in the same chassis. • **Create in**: Enter the directory in which you want to store the project file. 
4	Click **OK** to confirm the selected settings and to create the project.

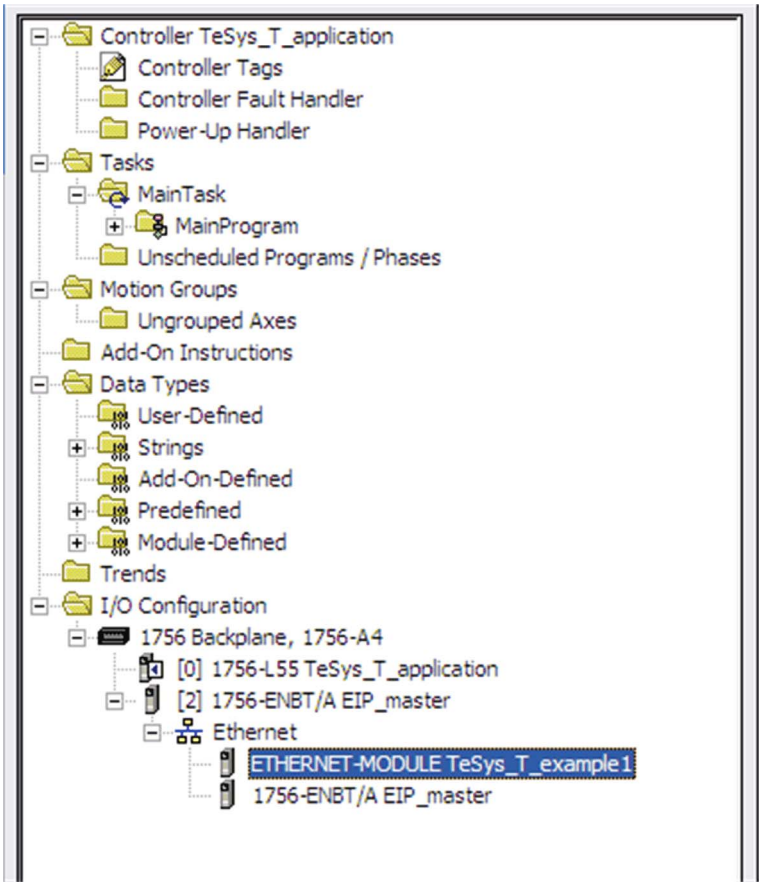
Step	Action
5	Right-click **I/O Configuration** → **1756 Backplane, 1756-A4** in the main screen to add the EtherNet/IP master. **Result:** The **Select Module** dialog box opens. 
6	Expand the **Communications** tree in the **Select Module** dialog box, and then select the EtherNet/IP communication module. The figure shows **1756-ENBT** as the EtherNet/IP communication module as an example: 

Step	Action
7	Select the **Major Revision** for the EtherNet/IP communication module used in the application, and then click **OK** to confirm the major revision. **Result**: The **New Module** dialog box opens. 
8	Set the characteristics of the Ethernet/IP communication module used in the application example: ● **Name:** EIP_master ● **Slot:** 2, which is the slot number for this Ethernet/IP communication module. **NOTE:** In ControlLogix, controllers occupy a numbered slot in the chassis and can be placed in any slot. It is also possible to place multiple communication cards in the same chassis. ● **Major Revision:** 4, which was confirmed in the **Select Major Revision** dialog box. ● **Minor Revision:** 1 ● **IP Address:** 192.168.1.55 
9	Click **OK** to confirm the selected settings. **Result**: The **Module Properties** dialog box opens.

Step	Action
10	Click **OK** to confirm the addition of communication module. 
11	The Ethernet/IP Communication module is displayed under **I/O Configuration** on the main screen. 

Step	Action
12	Right-click **I/O Configuration → 1756 Backplane, 1756-A4 → [2] 1756-EBNT/A EIP_master** in the main screen to add the TeSys T module. **Result**: The **Select Module** dialog box opens. 

Step	Action
13	Expand the **Communications** tree in the **Select Module** dialog box, and then select **ETHERNET-MODULE Generic Ethernet Module**. 
14	Click **OK** to confirm the Ethernet module. **Result**: The **New Module** dialog box opens.
15	Set the characteristics of the Generic Ethernet module communication module used in the application example: ● **Name:** TeSys_T_example1 ● **Comm Format:** Data-INT ● **IP Address:** 192.168.1.35 ● **Input Assembly Instance:** 116 ● **Input size:** 64 ● **Output Assembly Instance:** 106 ● **Output size:** 5 ● **Configuration Assembly Instance:** 6 ● **Configuration size:** 0 **NOTE:** The Tesys T supports several different input and output assemblies. Refer to the *TeSys T LTM R Ethernet Modbus TCP/IP User Manual*. 
16	Click **OK** to confirm the selected settings. **Result**: The **Module Properties** dialog box opens.

Step	Action
17	Click **OK** to confirm the addition of communication module.
18	The TeSys T module is displayed under **I/O Configuration** on the main screen. 
19	In the standard toolbar, click **Communication** → **Select Recent Path**. **Result:** The **Select Recent Communications Path** dialog box opens, from which you can choose a communications path from among the most recent paths stored on the PC.

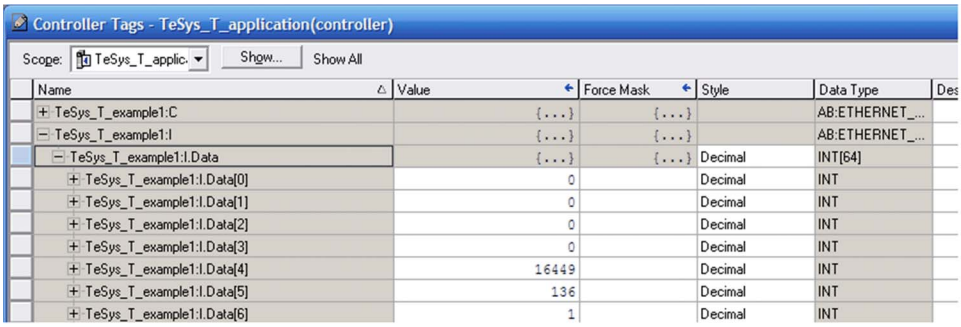
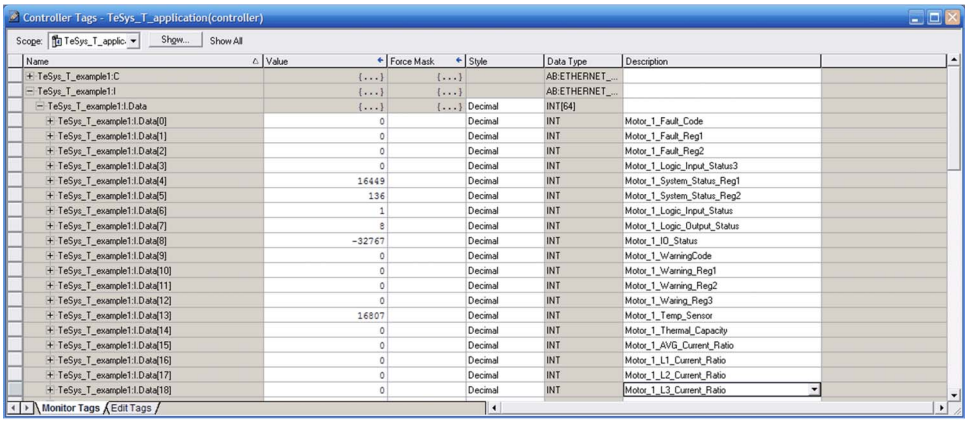
5) Transferring the Configuration to the PLC using RSLogix 5000

The process for monitoring the controller's tags and values assigned to them using RSLogix 5000 software is described below:

Step	Action
1	Turn the key located on the front of the PLC processor to the **PROG** position.
2	In RSLogix 5000 software, set the operational mode to **Offline**.
3	Select the menu command **Communications** → **Download**. **Result:** The **Download** dialog box opens.
4	Confirm the download by clicking button **Download** when prompted in the dialog box. **Result:** A message indicates that the download is complete, in the results window at bottom of the screen.

Step	Action
5	Switch the controller to Run mode: turn the key to the **RUN** position on the front of the PLC processor. The **RUN** LED of the PLC processor turns green on and the program is launched.

6) Performing Functional Testing of the Communication Network Including Allen-Bradley PLC and TeSys T Products

Step	Action
1	In the RSLogix 5000 Controller Organizer, select **Controller Tesys_T_application** → **Controller Tags**, and then right-click **Monitor Tags**. **Result:** The **Controller Tags** window appears.
2	Select the **Monitor Tags** tab at the bottom of the Controller Tags window.
3	Expand the tag name **TeSys_T_example1:1** → **TeSys_T_example1:I.Data** → **TeSys_T_example1:I:Data[4]** to view the values assigned to the tags. 
4	Name the topological addresses in such a way to avoid programming with names which do not provide any information of the contents of the memory location. Refer to the user's manuals *TeSys T LULC09 DeviceNet Communication Module* and *TeSys T Communication Variables* for details. In the application example, the following tags names are used for Motor 1): 

Instance 100: LTM R Control Registers

This assembly contains several control registers commonly used with an LTM R controller.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
path: 6C : 01 : 05 (Register 704)		path: 6C : 01 : 04 (Register 703)		path: 6C : 01 : 01 (Register 700)	
LSB (least significant bit)	MSB (most significant bit)	LSB	MSB	LSB	MSB

Instance 106: EIOS_TeSys T Output

This assembly is vendor specific. All registers are in little endian.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
path: 6C : 01 : 01 (Register 700)		path: 6C : 01 : 02 Reserved (value = 0)		path: 6C : 01 : 03 Reserved (value = 0)	

Byte 6	Byte 7	Byte 8	Byte 9
path: 6C : 01 : 04 Reserved (value = 0)		path: 6C : 01 : 05 (Register 704)	

Instance 110: LTM R Monitoring Registers (with dynamic configuration)

This assembly contains several monitoring registers commonly used with an LTM R controller. You can choose registers by setting 1-3 attributes of TeSys T Monitoring Control Object. For more information, refer to *TeSys T LTM R Ethernet Modbus TCP/IP User Manual*.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Register pointed using path: C6 : 01 : 05		Register pointed using path: C6 : 01 : 06		Register pointed using path: C6 : 01 : 07		Register pointed using path: C6 : 01 : 08	
LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB

Instance 116: EIOS_TeSys T Input

This assembly is vendor specific. All registers are in little endian.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
path: 68 : 01 : 02 (Register 451)		path: 68 : 01 : 03 (Register 452)		path: 68 : 01 : 04 (Register 453)		path: 68 : 01 : 05 (Register 454)	

Byte 8	Byte 9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15
path: 68 : 01 : 06 (Register 455)		path: 68 : 01 : 07 (Register 456)		path: 68 : 01 : 08 (Register 457)		path: 68 : 01 : 09 (Register 458)	

Byte 16	Byte 17	Byte 18	Byte 19	Byte 20	Byte 21	Byte 22	Byte 23
path: 68 : 01 : 0A (Register 459)		path: 68 : 01 : 0B (Register 460)		path: 68 : 01 : 0C (Register 461)		path: 68 : 01 : 0D (Register 462)	

Byte 24	Byte 25	Byte 26	Byte 27	Byte 28	Byte 29	Byte 30	Byte 31
path: 68 : 01 : 0E (Register 463)		path: 68 : 01 : 0F (Register 464)		path: 68 : 01 : 10 (Register 465)		path: 68 : 01 : 11 (Register 466)	

Byte 32	Byte 33	Byte 34	Byte 35	Byte 36	Byte 37	Byte 38	Byte 39
path: 68 : 01 : 12 (Register 467)		path: 68 : 01 : 13 (Register 468)		path: 68 : 01 : 14 (Register 469)		path: 68 : 01 : 15 (Register 470)	

Byte 40	Byte 41	Byte 42	Byte 43	Byte 44	Byte 45	Byte 46	Byte 47
path: 68 : 01 : 16 (Register 471)		path: 68 : 01 : 17 (Register 472)		path: 68 : 01 : 18 (Register 473)		path: 68 : 01 : 19 (Register 474)	

Byte 48	Byte 49	Byte 50	Byte 51	Byte 52	Byte 53	Byte 54	Byte 55
path: 68 : 01 : 1A (Register 475)		path: 68 : 01 : 1B (Register 476)		path: 68 : 01 : 1C (Register 477)		path: 68 : 01 : 1D (Register 478)	

Byte 56	Byte 57	Byte 58	Byte 59	Byte 60	Byte 61	Byte 62	Byte 63
path: 68 : 01 : 1E (Register 479)		path: 68 : 01 : 1F (Register 480)		path: 68 : 01 : 20 (Register 481)		path: 68 : 01 : 21 (Register 482)	

Byte 64	Byte 65	Byte 66	Byte 67	Byte 68	Byte 69	Byte 70	Byte 71
path: 68 : 01 : 22 (Register 483)		path: 68 : 01 : 23 (Register 484)		path: 68 : 01 : 24 (Register 485)		path: 68 : 01 : 25 (Register 486)	

Byte 72	Byte 73	Byte 74	Byte 75	Byte 76	Byte 77	Byte 78	Byte 79
path: 68 : 01 : 26 (Register 487)		path: 68 : 01 : 27 (Register 488)		path: 68 : 01 : 28 (Register 489)		path: 68 : 01 : 29 (Register 490)	

Byte 80	Byte 81	Byte 82	Byte 83	Byte 84	Byte 85	Byte 86	Byte 87
path: 68 : 01 : 2A (Register 491)		path: 68 : 01 : 2B (Register 492)		path: 68 : 01 : 2C (Register 493)		path: 68 : 01 : 2D (Register 494)	

Byte 88	Byte 89	Byte 90	Byte 91	Byte 92	Byte 93	Byte 94	Byte 95
path: 68 : 01 : 2E (Register 495)		path: 68 : 01 : 2F (Register 496)		path: 68 : 01 : 30 (Register 497)		path: 68 : 01 : 31 (Register 498)	

Byte 96	Byte 97	Byte 98	Byte 99	Byte 100	Byte 101	Byte 102	Byte 103
path: 68 : 01 : 32 (Register 499)		path: 68 : 01 : 33 (Register 500)		path: 68 : 01 : 34 (Register 501)		path: 68 : 01 : 35 (Register 502)	

Byte 104	Byte 105	Byte 106	Byte 107	Byte 108	Byte 109	Byte 110	Byte 111
path: 68 : 01 : 36 (Register 503)		path: 68 : 01 : 37 (Register 504)		path: 68 : 01 : 38 (Register 505)		path: 68 : 01 : 39 (Register 506)	

Byte 112	Byte 113	Byte 114	Byte 115	Byte 116	Byte 117	Byte 118	Byte 119
path: 68 : 01 : 3A (Register 507)		path: 68 : 01 : 3B (Register 508)		path: 68 : 01 : 3C (Register 509)		path: 68 : 01 : 3D (Register 510)	

Byte 120	Byte 121	Byte 122	Byte 123	Byte 124	Byte 125	Byte 126	Byte 127
path: 68 : 01 : 3E (Register 511)		path: 68 : 01 : 3F (Register 512)		path: 68 : 01 : 40 (Register 513)		path: 68 : 01 : 41 (Register 514)	

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