



Ethernet/IP Interface 4.2

User Manual

This document applies to the following controllers:
E1250-IP-xx
E1450-IP-xx
(with Ethernet/IP Interface SW installed)

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1 System overview

The LinMot Ethernet/IP servo controllers have the following functionalities:

Device Property	Value / Remark
Minimal Ethernet/IP cycle time	1 ms
DHCP -Support	Supported
EDS Support	Not yet supported from AB
IEEE1588 (CIP-Synch)	For 3 rd parties not supported from AB
DLR Support (Device Level Ring Protocol)	No

Ethernet/IP is a real time Ethernet protocol based on the standard Ethernet protocols TCP/IP and UDP/IP.

For further information on Ethernet/IP please visit: <http://www.odva.org>

1.1 References


All user manuals are distributed with the LinMot-Talk configuration software. The newest version can also be downloaded from the LinMot homepage in the download section.

Ref	Title	Source
1	User Manual Motion Control SW	www.linmot.com
2	LinMot Servo Controller Configuration over Fieldbus Interfaces SG5	www.linmot.com

2 Connecting to the Ethernet/IP Network


2.1 Pin Assignment of the Connectors X17-X18

The Ethernet/IP connector is a standard RJ45 female connector with a pin assignment as defined by EIA/TIA T568B:

X17 – X18		RealTime Ethernet Connector	
	Pin	Wire color code	Assignment 100BASE-TX
	1	WHT/ORG	Rx+
	2	ORG	Rx-
	3	WHT/GRN	Tx+
	4	BLU	-
	5	WHT/BLU	-
	6	GRN	Tx-
	7	WHT/BRN	-
	8	BRN	-
case		-	-
RJ-45		Use standard patch cables (twisted pair, S/UTP, AWG26) for wiring. This type of cable is usually referred to as a "Cat5e-Cable".	

2.2 Default IP Address Settings

The default IP address is 192.168.001.xxx, where the last byte xxx is defined via the two Hex-Switches S1 and S2. S1 sets the high and S2 the low digit.

S1, S2:	IP Selectors	
	S1	Bus ID High (0h...Fh)
	S2	Bus ID Low (0h...Fh)



IMPORTANT: The switch value S1 = S2 = 0 (factory default setting) is a special configuration which acquires the IP address via DHCP.

3 Setup in the PLC

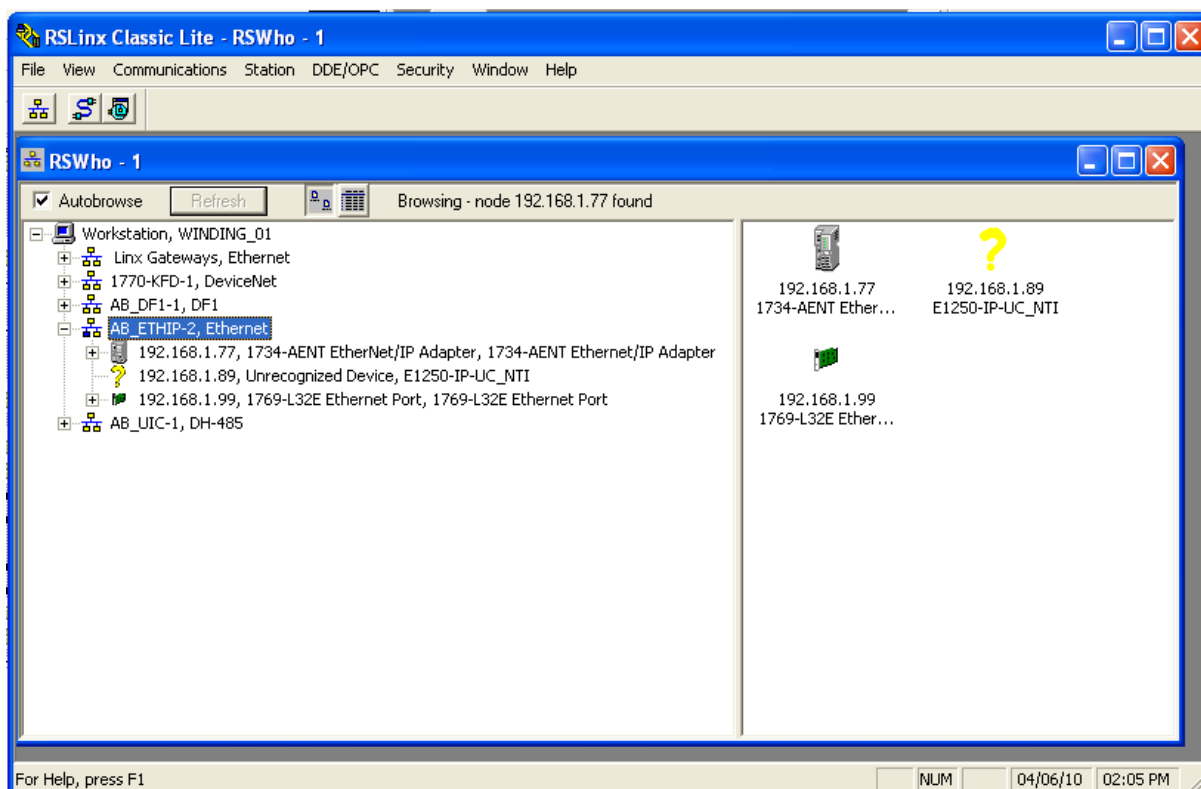


IMPORTANT: Use only AB PLC firmware 18.0 or higher!

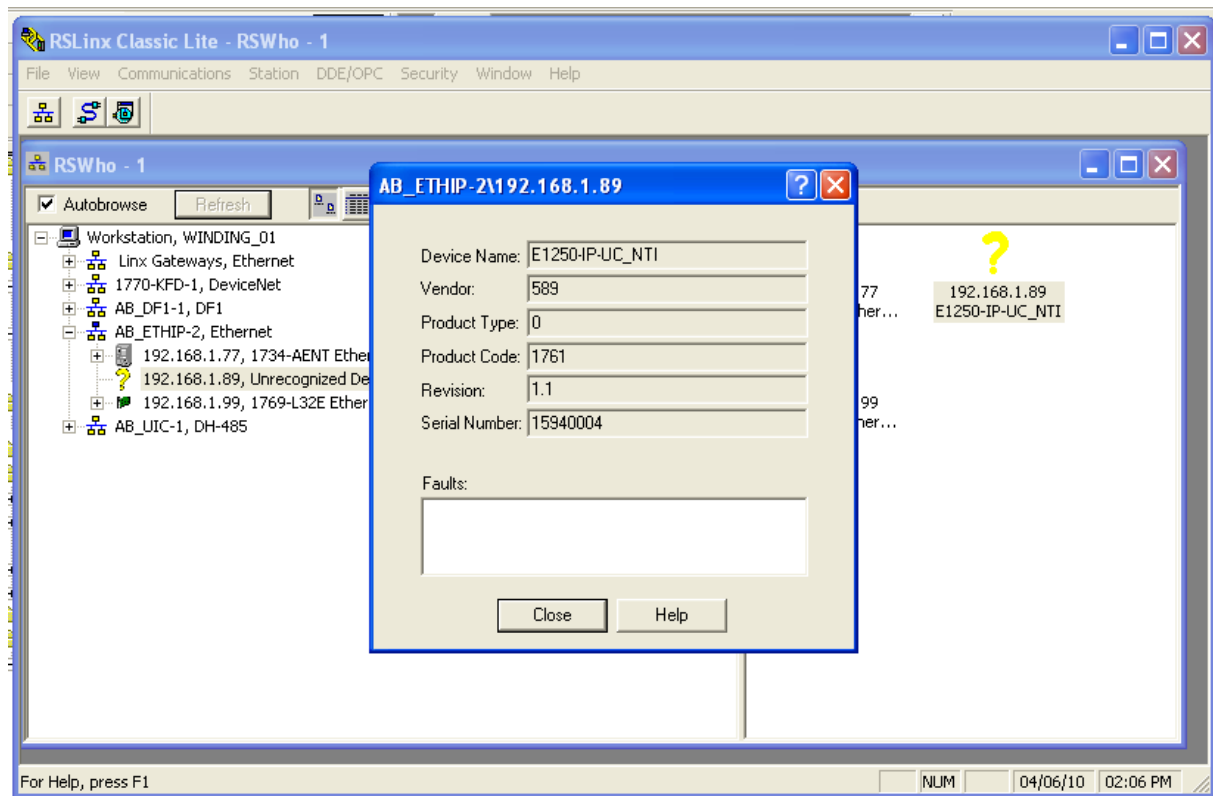
The following steps describe the integration of a LinMot Ethernet/IP servo controller in the PLC. In the example an Allen Bradley master PLC is used. RSLinx tool can only be used to see if the device is on the network and under which IP-address it can be accessed. The whole configuration is done in the PLC, which is described in Chapter 3.2.

3.1 RSLinx Classic

In the RSLinx the LinMot device should occur under the defined IP address as “Unrecognized Device”



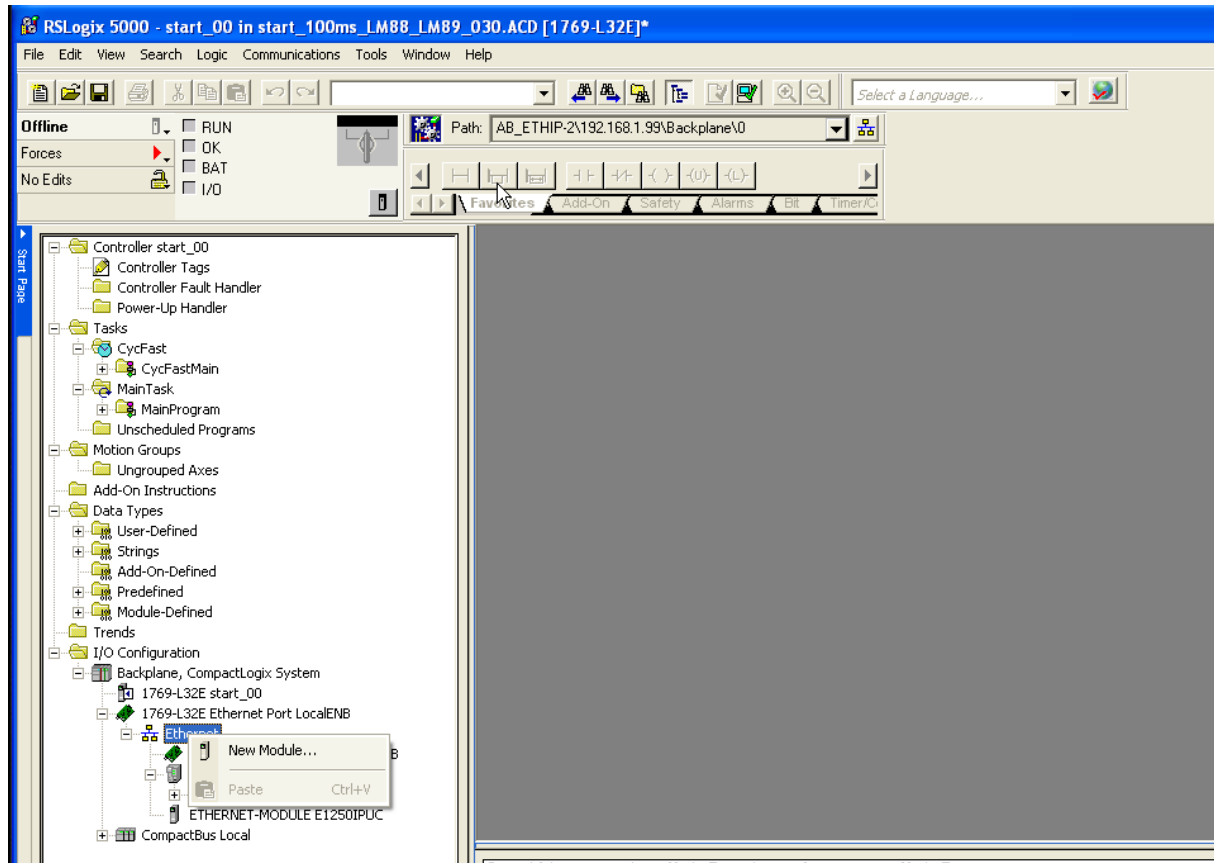
LinMot device with the IP address 192.168.1.89 in the RSLinx tool



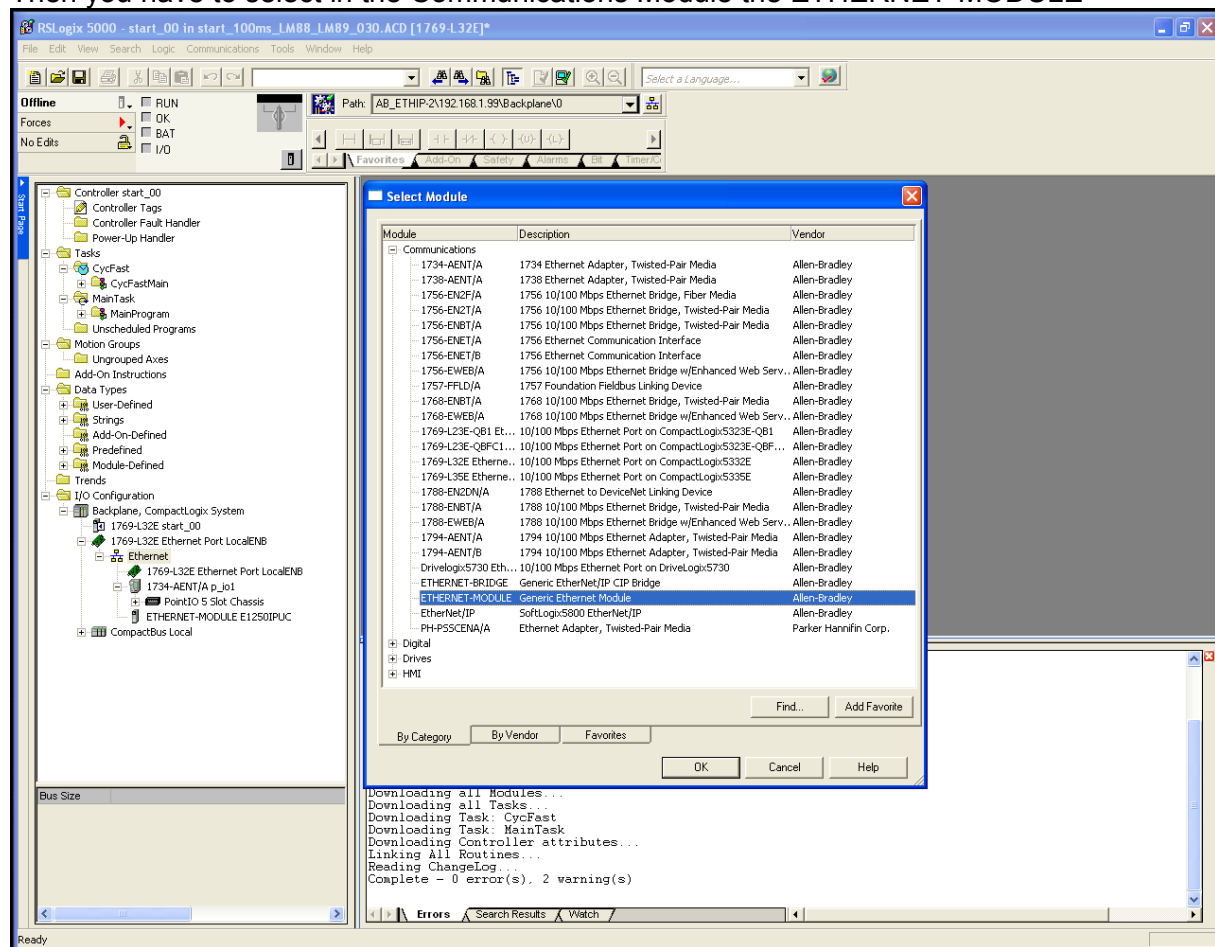
LinMot device properties

3.2 LinMot Configuration in the PLC

The LinMot can be configured in the I/O configuration section, in the Ethernet section as a New Module



Then you have to select in the Communications Module the ETHERNET-MODULE



Under the Module Properties you can define the module specific data:

- Name
- Comm Format in the example a 16 bit Format is chosen!
- IP Address
- Input Assembly instance and size
- Output Assembly Instance and size

Be careful when defining these parameters, because only a correct setting will run in the Ethernet/IP network. Only the name can be defined freely.

Module Properties: LocalENB (ETHERNET-MODULE 1.1)

General* | Connection | Module Info

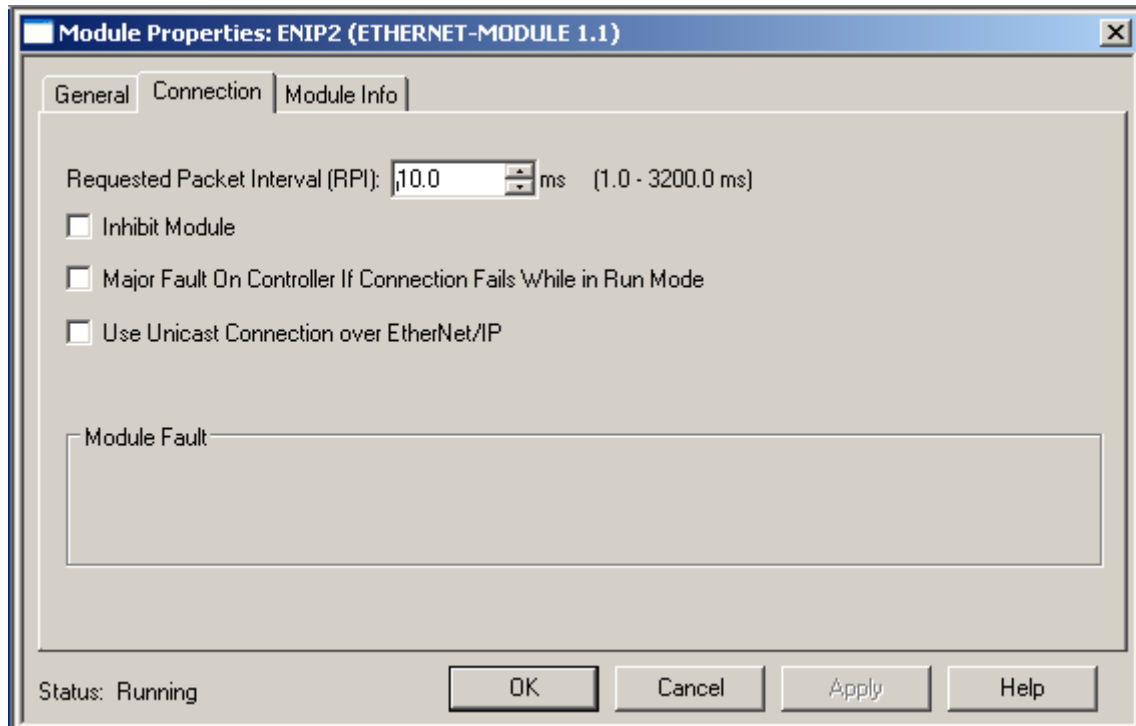
Type: ETHERNET-MODULE Generic Ethernet Module
Vendor: Allen-Bradley
Parent: LocalENB
Name: X_Axis
Description:
Comm Format: Data - INT
Address / Host Name:
☒ IP Address: 192 . 168 . 1 . 89
☐ Host Name:
Status: Offline

Connection Parameters

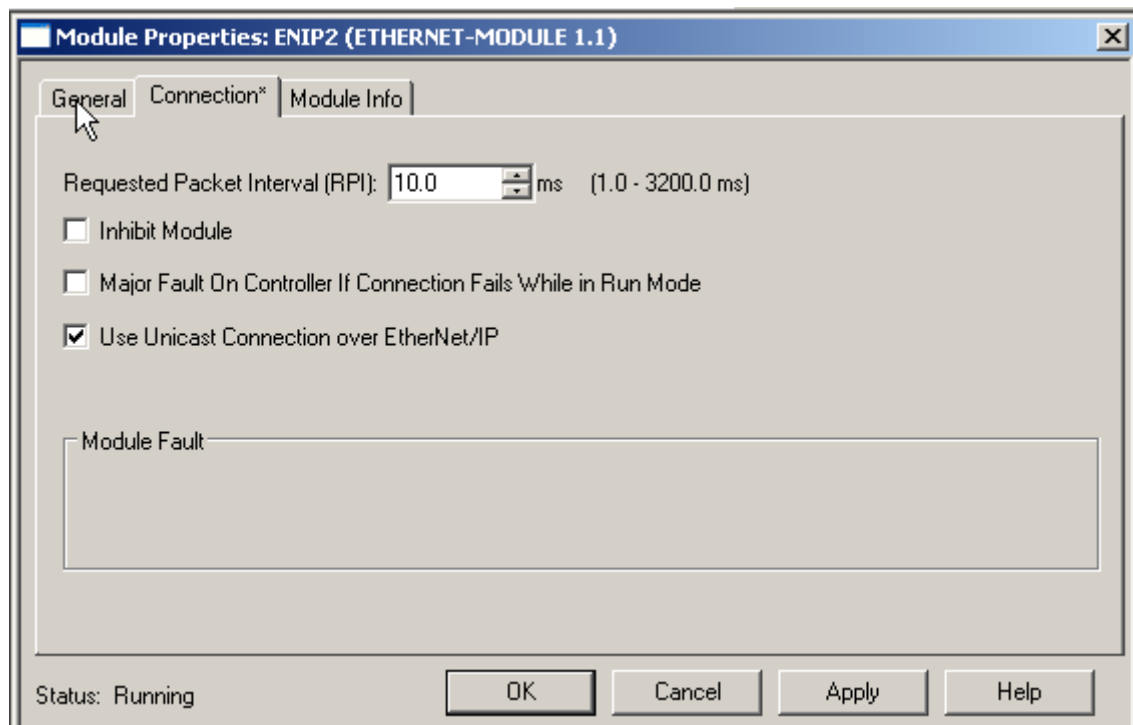
	Assembly Instance:	Size:	
Input:	16	9	(16-bit)
Output:	32	12	(16-bit)
Configuration:	1	0	(8-bit)
Status Input:			
Status Output:			

OK Cancel Apply Help

In the Connection tab of the Module Properties the desired cycle time is specified in the range between 1ms and 3200ms.

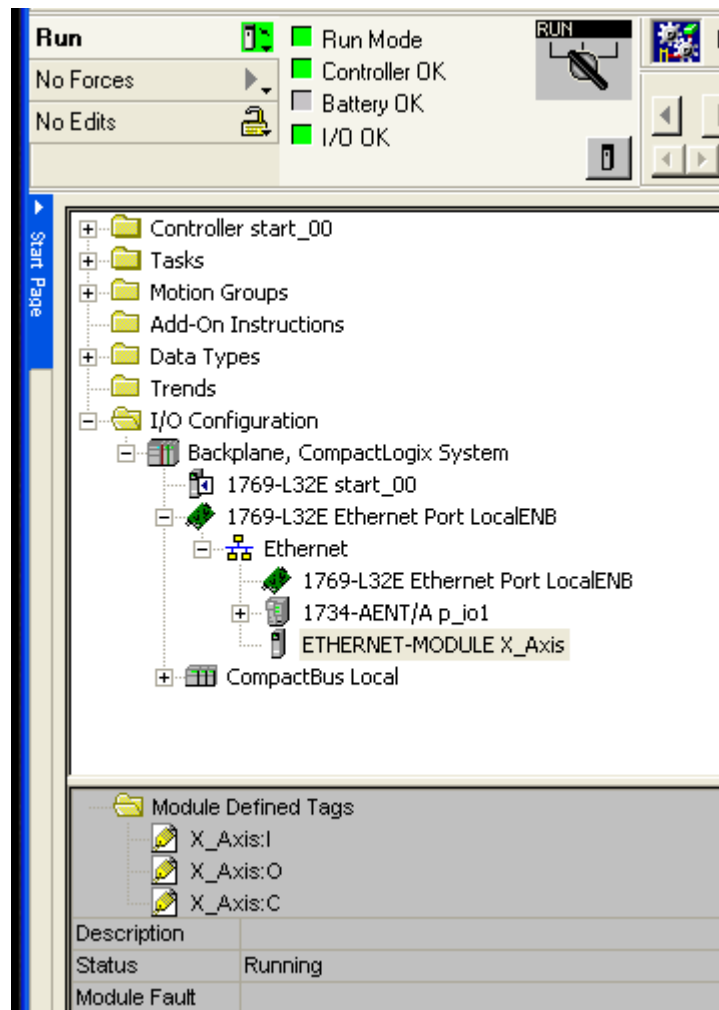


Then the configuration/program can be downloaded and you can change to the online view.



It is recommended to use Unicast Connection type, with this type no problems were known.

If all is set up correctly the LinMot module status should be running



The screenshot shows the LinMot-Talk1100 - V3.11 Build 20100104 application window. The left pane displays a project tree for 'Unnamed, IP: 192.168.2.4 (DEVELOPER)'. The right pane shows a table of connection parameters and their values.

Name	Value	RawData	UPID
Connection State	Established	0003h	9056
Originator IP Address	192.168. 1.252		9057
O -> T Connection Type	Point to Point	0002h	9104
O -> T Assembly Instance	20h	20h	9076
O -> T API	10 ms	00002710h	9072
O -> T Timeout	160 ms	00027100h	9075
O -> T Size	30	001Eh	9073
O -> T Sequence Number	561217	00089041h	9074
T -> O Connection Type	Multicast	0001h	9120
T -> O Assembly Instance	10h	10h	9092
T -> O API	10 ms	00002710h	9088
T -> O Size	20	0014h	9089
T -> O Sequence Number	562915	000896E3h	9090
O -> T Cycle Time	10039.9 us	0001882Fh	9112
Minimal O -> T Cycle Time	9778.8 us	00017DFCh	9113
Maximal O -> T Cycle Time	10325.7 us	00019359h	9114

In the LinMot-Talk configuration software the Ethernet/IP connection state can be watched under variables\Ethernet/IP:O ->T, T-> O config. If everything was set up correctly, the connection state should change to established when powered on after a certain time. In this state both counters O → T and T → O should count up depending on the configured period time.

3.3 Getting started with the Watch window

In this section the basics of the LinMot device handling are explained. Instead of programming the LinMot, data is directly influenced with the watch window. So, for the next steps, map the modules input data and output data in the quick watch window as below.

In the following examples it is assumed, that a motor has been configured, the power supply is on, and the servo controller is correctly embedded in the Ethernet/IP network.

The screenshot shows the RSLogix 5000 software interface. The top menu bar includes File, Edit, View, Search, Logic, Communications, Tools, Window, and Help. The top toolbar contains various icons for file operations and execution. The left pane shows the project tree with folders like Controller start_00, Tasks, Motion Groups, Add-On Instructions, Data Types, Trends, I/O Configuration, and CompactLogix System. The main workspace displays the Watch window, which is divided into two sections: 'Current Routine' and 'Quick Watch'.

The 'Quick Watch' section contains a table with the following columns: Name, Scope, Value, Force Mask, and Description. The table lists various variables and their current values.

Name	Scope	Value	Force Mask	Description
- X_Axis:1	Controller	{...}	{...}	
+ X_Axis:1.Data	Controller	{...}	{...}	
+ X_Axis:1.Data[0]	Controller	512		
+ X_Axis:1.Data[1]	Controller	16560		
+ X_Axis:1.Data[2]	Controller	128		
+ X_Axis:1.Data[3]	Controller	0		
+ X_Axis:1.Data[4]	Controller	0		
+ X_Axis:1.Data[5]	Controller	-24		
+ X_Axis:1.Data[6]	Controller	-1		
+ X_Axis:1.Data[7]	Controller	0		
+ X_Axis:1.Data[8]	Controller	0		
- X_Axis:0	Controller	{...}	{...}	
+ X_Axis:0.Data	Controller	{...}	{...}	
+ X_Axis:0.Data[0]	Controller	0		
+ X_Axis:0.Data[1]	Controller	0		
+ X_Axis:0.Data[2]	Controller	0		
+ X_Axis:0.Data[3]	Controller	0		
+ X_Axis:0.Data[4]	Controller	0		
+ X_Axis:0.Data[5]	Controller	0		
+ X_Axis:0.Data[6]	Controller	0		
+ X_Axis:0.Data[7]	Controller	0		
+ X_Axis:0.Data[8]	Controller	0		
+ X_Axis:0.Data[9]	Controller	0		
+ X_Axis:0.Data[10]	Controller	0		
+ X_Axis:0.Data[11]	Controller	0		

3.3.1 Control Word

The Control Word is mapped to the output data word 0. If setting this value to 1 the “Switch On” bit (bit 0) of the control word is set

Watch List:	Name	Scope	Value	Force Mask	Description
Current Routine	X_Axis:I	Controller	{...}	{...}	
Quick Watch	X_Axis:I.Data	Controller	{...}	{...}	
	+ X_Axis:I.Data[0]	Controller	2048		
	+ X_Axis:I.Data[1]	Controller	16567		
	+ X_Axis:I.Data[2]	Controller	128		
	+ X_Axis:I.Data[3]	Controller	-51		
	+ X_Axis:I.Data[4]	Controller	-1		
	+ X_Axis:I.Data[5]	Controller	-51		
	+ X_Axis:I.Data[6]	Controller	-1		
	+ X_Axis:I.Data[7]	Controller	-2		
	+ X_Axis:I.Data[8]	Controller	-1		
	X_Axis:O	Controller	{...}	{...}	
	X_Axis:O.Data	Controller	{...}	{...}	
	+ X_Axis:O.Data[0]	Controller	1		
	+ X_Axis:O.Data[1]	Controller	0		
	+ X_Axis:O.Data[2]	Controller	0		
	+ X_Axis:O.Data[3]	Controller	0		
	+ X_Axis:O.Data[4]	Controller	0		
	+ X_Axis:O.Data[5]	Controller	0		
	+ X_Axis:O.Data[6]	Controller	0		
	+ X_Axis:O.Data[7]	Controller	0		
	+ X_Axis:O.Data[8]	Controller	0		
	+ X_Axis:O.Data[9]	Controller	0		
	+ X_Axis:O.Data[10]	Controller	0		
	+ X_Axis:O.Data[11]	Controller	0		

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File Search Controller Services Options Window Tools Manuals Help

Unnamed, IP: 192.168.2.4 (DEVELOPER)

Project: Unnamed, IP: 192.168.2.4 (DEVELOPER)

Control Panel Parameters Variables

User Defined

OS SW Operating Hours / Time

OS SW Message/Error

OS SW Monitoring

OS SW HW Configuration

OS SW Debug

IO Config

MC SW Overview

MC SW E1200 Debug

MC SW Motor

MC SW X13 Ext Sensor

MC SW Current Controller

MC SW Control Word

MC SW Status Word

MC SW Warnings

MC SW Phase Search

MC SW Linearizing

MC SW Motion Interface

MC SW Winding

MC SW Capture, Trigger & Mapped Inputs

MC SW VA interpolator

MC SW Curve

MC SW PVT Stream

MC SW Monitoring

MC SW Errors

MC SW Encoder CAM

MC SW Motor Data Sheet

MC SW Command Table

MC SW Force Control

MC Remanent Variables

ControlPanel Tokens

Operating Hour Counter

Ethernet/IP

Ethernet/IP D>T, T>D config

Control

0: Switch On.....1 Interface

1: Safety Volt. Enable.....1 Digital Input X4.12

2: /Quick Stop.....1 Forced by Parameter

3: Enable Operation.....1 Forced by Parameter

4: /Abort.....1 Forced by Parameter

5: /Freeze.....1 Forced by Parameter

6: Go To Position.....0 Interface

7: Error Acknowledge.....0 Interface

8: Jog Move +.....0 Interface

9: Jog Move -.....0 Interface

10: Special Mode.....0 Interface

11: Home.....0 Interface

12: Clearance Check.....0 Interface

13: Go To Initial Position.....0 Interface

14: Linearizing.....0 No Source Specified

15: Phase Search.....0 No Source Specified

Control Word: 003Fh

Override Value

Enable Manual Override

IO Panel

Enable Manual Override

Override Value

Actual Value

X4.12 - Input

X4.11 - Input

X4.10 - Input

X4.9 - Input

X4.8 - Input

X4.7 - Input

X4.6 - Input

X4.5 - Input

X4.4 - Input

X4.3 - Input

Status

0: Operation Enabled.....1

1: Switch On Active.....1

2: Enable Operation.....1

3: Error.....0

4: Safety Volt. Enable.....1

5: /Quick Stop.....1

6: Switch On Locked.....0

7: Warning.....1

8: Event Handler Active.....0

9: Special Motion Active.....0

10: In Target Position.....0

11: Homed.....0

12: Fatal Error.....0

13: Motion Active.....0

14: Range Indicator 1.....1

15: Range Indicator 2.....0

Status Word: 4087h

Op. Main State: 08h

Op. Sub State: 00h

Motor Hot Sensor.....0

Motor Short Time Overload.....0

Motor Supply Voltage Low.....0

Motor Supply Voltage High.....0

Position Lag Always.....0

Position Lag Standing.....0

Controller Hot.....0

Motor Not Homed.....1

PTC Sensor 1 Hot.....0

PTC Sensor 2 Hot.....0

RR Hot Calculated.....0

Reserved.....0

Reserved.....0

Interface Warn Flag.....0

Application Warn Flag.....0

Warm Word: 0080h

Logged Error Code: 0000h

Monitoring

Connection Status: Online

Firmware Status: Running

Motor Status: Switched On

Op. State: Operation Enabled

Motor Not Homed

Actual Position: 0.00 mm

Demand Position: -0.01 mm

Force Factor: Motor not homed

Motor Current: 0.00 A

Logic Supply Volt.: 25.46 V

Motor Supply Volt.: 79.69 V

Enable Manual Override: ☐

-10 mm -1 mm +1 mm +10 mm

Command Category: Most Commonly Used

Command Type: No Operation [0000h]

Count Nibble (Toggle Bits): 0h ☐ Auto Increment Count Nibble

Name	Offs.	Description	Scaled Value	Int. Value (Dec)	Int. Value (Hex)
Header	0	0000h: No Operation	0	0	0000h

Read Command Send Command

This can also be monitored with the LinMot-Talk software.

Setting the control word to 2049 sets also the “Home” bit (Bit 11) in the control word. Wait until the input word 0 “State Var” has the value 2319 (0x090F) Main State 9 (Homing) Sub State 0x0F (Homing finished).

Watch List:	Name	Scope	Value	Force Mask	Descript
Current Routine	- X_Axis:I	Controller	{...}	{...}	
Quick Watch	- X_Axis:I.Data	Controller	{...}	{...}	
	+ X_Axis:I.Data[0]	Controller	2319		
	+ X_Axis:I.Data[1]	Controller	19511		
	+ X_Axis:I.Data[2]	Controller	0		
	+ X_Axis:I.Data[3]	Controller	0		
	+ X_Axis:I.Data[4]	Controller	0		
	+ X_Axis:I.Data[5]	Controller	-159		
	+ X_Axis:I.Data[6]	Controller	-1		
	+ X_Axis:I.Data[7]	Controller	44		
	+ X_Axis:I.Data[8]	Controller	0		
	- X_Axis:O	Controller	{...}	{...}	
	- X_Axis:O.Data	Controller	{...}	{...}	
	+ X_Axis:O.Data[0]	Controller	2049		
	+ X_Axis:O.Data[1]	Controller	0		
	+ X_Axis:O.Data[2]	Controller	0		
	+ X_Axis:O.Data[3]	Controller	0		
	+ X_Axis:O.Data[4]	Controller	0		
	+ X_Axis:O.Data[5]	Controller	0		
	+ X_Axis:O.Data[6]	Controller	0		
	+ X_Axis:O.Data[7]	Controller	0		
	+ X_Axis:O.Data[8]	Controller	0		
	+ X_Axis:O.Data[9]	Controller	0		
	+ X_Axis:O.Data[10]	Controller	0		
	+ X_Axis:O.Data[11]	Controller	0		

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File Search Controller Services Options Window Tools Manuals Help

Project: Unnamed, IP: 192.168.2.4 (DEVELOPER)

Control Panel

Parameters

Variables

User Defined

OS SW Operating Hours / Time

OS SW Message/Error

OS SW Trap

OS SW Monitoring

OS SW HW Configuration

OS SW Status

OS SW Debug

IO Config

MC SW Overview

MC SW E1200 Debug

MC SW Motor

MC SW X13 Ext Sensor

MC SW Current Controller

MC SW Control Word

MC SW Status Word

MC SW Warnings

MC SW Phase Search

MC SW Lineizing

MC SW Motion Interface

MC SW Winding

MC SW Capture, Trigger & Mapped Inputs

MC SW VA interpolator

MC SW Curve

MC SW PVT Stream

MC SW Monitoring

MC SW Errors

MC SW Encoder CAM

MC SW Motor Data Sheet

MC SW Command Table

MC SW Force Control

MC Remanent Variables

ControlPanel Tokens

Operating Hour Counter

Ethernet/IP

Ethernet/IP-DiAG-T, T-DiAG-Conf

Control

0: Switch On.....1 Interface

1: Safety Volt. Enable.....1 Digital Input X4.12

2: /Quick Stop.....1 Forced by Parameter

3: Enable Operation.....1 Forced by Parameter

4: /Abort.....1 Forced by Parameter

5: /Freeze.....1 Forced by Parameter

6: Go To Position.....0 Interface

7: Error Acknowledge.....0 Interface

8: Jog Move +.....0 Interface

9: Jog Move -.....0 Interface

10: Special Mode.....0 Interface

11: Home.....1 Interface

12: Clearance Check.....0 Interface

13: Go To Initial Position.....0 Interface

14: Lineizing.....0 No Source Specified

15: Phase Search.....0 No Source Specified

Control Word: 083Fh

Override Value

Enable Manual Override

Status

0: Operation Enabled.....1

1: Switch On Active.....0

2: Enable Operation.....1

3: Error.....0

4: Safety Volt. Enable.....1

5: /Quick Stop.....1

6: Switch On Locked.....0

7: Warning.....0

8: Event Handler Active.....0

9: Special Motion Active.....0

10: In Target Position.....1

11: Homed.....1

12: Fatal Error.....0

13: Motion Active.....0

14: Range Indicator 1.....1

15: Range Indicator 2.....0

Status Word: 4C37h

Warn Word: 0000h

Op. Main State: 09h

Op. Sub State: 0Fh

Logged Error Code: 0000h

Monitoring

Connection Status: Online

Firmware Status: Running

Motor Status: Switched On

Op. State: Homing

Actual Position: -0.02 mm

Demand Position: 0.00 mm

Force Factor: 100.00 %

Motor Current: 0.04 A

Logic Supply Volt: 25.46 V

Motor Supply Volt: 79.69 V

IO Panel

Enable Manual Override

Override Value

Actual Value

X4.12 - Input

X4.11 - Input

X4.10 - Input

X4.9 - Input

X4.8 - Input

X4.7 - Input

X4.6 - Input

X4.5 - Input

X4.4 - Input

X4.3 - Input

Enable Manual Override: ☐ -10 mm -1 mm +1 mm +10 mm

Command Category: Most Commonly Used

Command Type: [No Operation (000h)]

Count Nibble (Toggle Bits): 0h ☐ Auto Increment Count Nibble

Name	Offs.	Description	Scaled Value	Int. Value (Dec)	Int. Value (Hex)
Header	0	000h: No Operation	0	0	0000h

Read Command Send Command

Then the Control Word can be set to 1 again, the controller will change to Main State 8 (Operation Enabled) Sub State 0xC0 (Homed and In Target Position), the corresponding input word 0 has the value 2240.

Watch List:	Name	Scope	Value	Force Mask	Description
Current Routine	- X_Axis:I	Controller	{...}	{...}	
Quick Watch	- X_Axis:I.Data	Controller	{...}	{...}	
	+ X_Axis:I.Data[0]	Controller	2240		
	+ X_Axis:I.Data[1]	Controller	19511		
	+ X_Axis:I.Data[2]	Controller	0		
	+ X_Axis:I.Data[3]	Controller	0		
	+ X_Axis:I.Data[4]	Controller	0		
	+ X_Axis:I.Data[5]	Controller	-156		
	+ X_Axis:I.Data[6]	Controller	-1		
	+ X_Axis:I.Data[7]	Controller	44		
	+ X_Axis:I.Data[8]	Controller	0		
	- X_Axis:O	Controller	{...}	{...}	
	- X_Axis:O.Data	Controller	{...}	{...}	
	+ X_Axis:O.Data[0]	Controller	1		
	+ X_Axis:O.Data[1]	Controller	0		
	+ X_Axis:O.Data[2]	Controller	0		
	+ X_Axis:O.Data[3]	Controller	0		
	+ X_Axis:O.Data[4]	Controller	0		
	+ X_Axis:O.Data[5]	Controller	0		
	+ X_Axis:O.Data[6]	Controller	0		
	+ X_Axis:O.Data[7]	Controller	0		
	+ X_Axis:O.Data[8]	Controller	0		
	+ X_Axis:O.Data[9]	Controller	0		
	+ X_Axis:O.Data[10]	Controller	0		
	+ X_Axis:O.Data[11]	Controller	0		

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File Search Controller Services Options Window Tools Manuals Help

Project: Unnamed, IP: 192.168.2.4 (DEVELOPER)

Control Panel Parameters Variables

Control Word: 003Fh

Override Value: Enable Manual Override

IO Panel

Enable Manual Override

Override Value: Actual Value

Command Category: Most Commonly Used

Command Type: No Operation (000h)

Count Nibble (Toggle Bits): 0h

Auto Increment Count Nibble

Name	Offs	Description	Scaled Value	Int. Value (Dec)	Int. Value (Hex)
Header	0	000h: No Operation	0	0	0000h

Read Command Send Command

Monitoring

Connection Status: Online

Firmware Status: Running

Motor Status: Switched On

Op. State: Operation Enabled

Actual Position: -0.02 mm

Demand Position: 0.00 mm

Force Factor: 100.00 %

Motor Current: 0.04 A

Logic Supply Volt: 25.46 V

Motor Supply Volt: 79.69 V

3.3.2 Motion Command Interface

The rest of the output data (O.data[1]..O.data[11]) is mapped to the “Motion Command Interface”

The first word (O.data[1]) is the motion command header, the rest (O.data[1]..O.data[11]) is the command specific motion parameter set. In the next example we will setup a “Predef VAI Go To Pos (020xh)” Motion Command. First we set the target position low word (O.data[2]) to 0 then the target position high word (O.data[3]) to 2 and the motion command header (O.data[1]) to 513 (0201h).

Watch List:	Name	Scope	Value	Force Mask	Description
Current Routine	- X_Axis:1	Controller	{...}	{...}	
Quick Watch	- X_Axis:1.Data	Controller	{...}	{...}	
	+ X_Axis:1.Data[0]	Controller	2241		
	+ X_Axis:1.Data[1]	Controller	3639		
	+ X_Axis:1.Data[2]	Controller	0		
	+ X_Axis:1.Data[3]	Controller	0		
	+ X_Axis:1.Data[4]	Controller	2		
	+ X_Axis:1.Data[5]	Controller	-250		
	+ X_Axis:1.Data[6]	Controller	1		
	+ X_Axis:1.Data[7]	Controller	72		
	+ X_Axis:1.Data[8]	Controller	0		
	- X_Axis:0	Controller	{...}	{...}	
	- X_Axis:0.Data	Controller	{...}	{...}	
	+ X_Axis:0.Data[0]	Controller	1		
	+ X_Axis:0.Data[1]	Controller	513		
	+ X_Axis:0.Data[2]	Controller	0		
	+ X_Axis:0.Data[3]	Controller	2		
	+ X_Axis:0.Data[4]	Controller	0		
	+ X_Axis:0.Data[5]	Controller	0		
	+ X_Axis:0.Data[6]	Controller	0		
	+ X_Axis:0.Data[7]	Controller	0		
	+ X_Axis:0.Data[8]	Controller	0		
	+ X_Axis:0.Data[9]	Controller	0		
	+ X_Axis:0.Data[10]	Controller	0		
	+ X_Axis:0.Data[11]	Controller	0		

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File Search Controller Services Options Window Tools Manuals Help

Unamed, IP: 192.168.2.4 (DEVELOPER)

Project

- Unamed, IP: 192.168.2.4 (DEVELOPER)
 - Control Panel
 - Parameters
 - Variables
 - User Defined
 - OS SW Operating Hours / Time
 - OS SW Message/Error
 - OS SW Trap
 - OS SW Monitoring
 - OS SW HW Configuration
 - OS SW Status
 - OS SW Debug
 - IO Config
 - MC SW Overview
 - MC SW E1200 Debug
 - MC SW Motor
 - MC SW X13 Ext Sensor
 - MC SW Current Controller
 - MC SW Control Word
 - MC SW Status Word
 - MC SW Warnings
 - MC SW Phase Search
 - MC SW Linearizing
 - MC SW Motion Interface
 - MC SW Winding
 - MC SW Capture, Trigger & Mapped Inputs
 - MC SW VA interpolator
 - MC SW Curve
 - MC SW PVT Stream
 - MC SW Monitoring
 - MC SW Errors
 - MC SW Encoder CAM
 - MC SW Motor Data Sheet
 - MC SW Command Table
 - MC SW Force Control
 - MC Remanent Variables
 - ControlPanel Tokens
 - Operating Hour Counter
 - Ethernet/IP
 - FilePanel/IP (N-T-T-T-0 conf)

Control

0: Switch On...1 Interface

1: Safety Volt. Enable...1 Digital Input X4 12

2: /Quick Stop...1 Forced by Parameter

3: Enable Operation...1 Forced by Parameter

4: /Abort...1 Forced by Parameter

5: /Freeze...1 Forced by Parameter

6: Go To Position...0 Interface

7: Error Acknowledge...0 Interface

8: Jog Move...0 Interface

9: Jog Move...0 Interface

10: Special Mode...0 Interface

11: Home...0 Interface

12: Clearance Check...0 Interface

13: Go To Initial Position...0 Interface

14: Linearizing...0 No Source Specified

15: Phase Search...0 No Source Specified

Control Word: 003Fh

Override Value

Enable Manual Override

IO Panel

Enable Manual Override

Override Value

Actual Value

X4 12 - Input

X4 11 - Input

X4 10 - Input

X4 9 - Input

X4 8 - Input

X4 7 - Input

X4 6 - Input

X4 5 - Input

X4 4 - Input

X4 3 - Input

Status

0: Operation Enabled...1

1: Switch On Active...1

2: Enable Operation...1

3: Error...0

4: Safety Volt. Enable...1

5: /Quick Stop...1

6: Switch On Locked...0

7: Warning...0

8: Event Handler Active...0

9: Special Motion Active...1

10: In Target Position...1

11: Homed...1

12: Fatal Error...0

13: Motion Active...0

14: Range Indicator 1...0

15: Range Indicator 2...0

Status Word: 0E37h

Op. Main State: 08h

Op. Sub State: CTh

Monitoring

0: Motor Hot Sensor...0

1: Motor Short Time Overload...0

2: Motor Supply Voltage Low...0

3: Motor Supply Voltage High...0

4: Position Lag Always...0

5: Position Lag Standing...0

6: Controller Hot...0

7: Motor Not Homed...0

8: PTC Sensor 1 Hot...0

9: PTC Sensor 2 Hot...0

10: RR Hot Calculated...0

11: Reserved...0

12: Reserved...0

13: Reserved...0

14: Interface Warm Flag...0

15: Application Warm Flag...0

Warm Word: 0000h

Logged Error Code: 0000h

Connection Status: Online

Firmware Status: Running

Motor Status: Switched On

Op. State: Operation Enabled

Actual Position: 13.08 mm

Demand Position: 13.11 mm

Force Factor: 100.00 %

Motor Current: 0.07 A

Logic Supply Volt.: 25.46 V

Motor Supply Volt.: 79.70 V

Enable Manual Override: ☐

-10 mm -1 mm +1 mm +10 mm

Command Category: Most Commonly Used

Command Type: Predef VAI Go To Pos (020xh)

Count Nibble (Toggle Bits): 1h ☐ Auto Increment Count Nibble

Name	Offs.	Description	Scaled Value	Int. Value (Dec)	Int. Value (Hex)
Header	0	020xh: Predef VAI Go To P...	513	513	0201h
1. Par	2	Target Position	13.1072 mm	131072	00020000h

Read Command Send Command

Press the “read Command” button and you see the command which was sent.

We will use the same command to move back to 0mm. Change the target position high word to 0. Then change the count nibble in the motion command header to 0.

Watch List:	Name	Scope	Value	Force Mask	Description
Current Routine	- X_Axis:I	Controller	{...}	{...}	
Quick Watch	- X_Axis:I.Data	Controller	{...}	{...}	
	+ X_Axis:I.Data[0]	Controller	2240		
	+ X_Axis:I.Data[1]	Controller	20023		
	+ X_Axis:I.Data[2]	Controller	0		
	+ X_Axis:I.Data[3]	Controller	0		
	+ X_Axis:I.Data[4]	Controller	0		
	+ X_Axis:I.Data[5]	Controller	1205		
	+ X_Axis:I.Data[6]	Controller	0		
	+ X_Axis:I.Data[7]	Controller	-329		
	+ X_Axis:I.Data[8]	Controller	-1		
	- X_Axis:O	Controller	{...}	{...}	
	- X_Axis:O.Data	Controller	{...}	{...}	
	+ X_Axis:O.Data[0]	Controller	1		
	+ X_Axis:O.Data[1]	Controller	512		
	+ X_Axis:O.Data[2]	Controller	0		
	+ X_Axis:O.Data[3]	Controller	0		
	+ X_Axis:O.Data[4]	Controller	0		
	+ X_Axis:O.Data[5]	Controller	0		
	+ X_Axis:O.Data[6]	Controller	0		
	+ X_Axis:O.Data[7]	Controller	0		
	+ X_Axis:O.Data[8]	Controller	0		
	+ X_Axis:O.Data[9]	Controller	0		
	+ X_Axis:O.Data[10]	Controller	0		
	+ X_Axis:O.Data[11]	Controller	0		

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Unsaved, IP: 192.168.2.4 (DEVELOPER)

Project: Unnamed, IP: 192.168.2.4 (DEVELOPER)

Control Panel Parameters Variables

Control Word: 003Fh

Override Value

Enable Manual Override

Control

Status

Monitoring

Op. State: Operation Enabled

Actual Position: 0.12 mm

Demand Position: 0.00 mm

Force Factor: 100.00 %

Motor Current: -0.33 A

Logic Supply Volt: 25.46 V

Motor Supply Volt: 79.70 V

Enable Manual Override: ☐ -10 mm -1 mm +1 mm +10 mm

Command Category: Most Commonly Used

Command Type: Predel VAI Go To Pos (0200h)

Count Nibble (Toggle Bits): 0h ☐ Auto Increment Count Nibble

Name	Offs.	Description	Scaled Value	Int. Value (Dec)	Int. Value (Hex)
Header	0	0200h: Predel VAI Go To P...	512	512	0200h
1. Par	2	Target Position	0 mm	0	00000000h

Read Command Send Command

In the next example we are going to use the most common motion command “VAI Go To Pos (010xh)”. In this example we define the motion command in the control panel first.

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Project: Unnamed, IP: 192.168.2.4 (DEVELOPER)

Control Panel Parameters Variables

Control Word: 003Fh

Override Value: Enable Manual Override

IO Panel: Enable Manual Override, Override Value, Actual Value

Enable Manual Override: ☐ -10 mm -1 mm +1 mm +10 mm

Command Category: Most Commonly Used

Command Type: VAI Go To Pos (010xh)

Count Nibble (Toggle Bits): 0h ☐ Auto Increment Count Nibble

Name	Offs.	Description	Scaled Value	Int. Value (Dec)	Int. Value (Hex)
Header	0	010xh: VAI Go To Pos	256	256	0100h
1. Par	2	Target Position	50 mm	500000	0007A120h
2. Par	6	Maximal Velocity	1 m/s	1000000	000F4240h
3. Par	10	Acceleration	1 m/s ²	100000	000186A0h
4. Par	14	Deceleration	2 m/s ²	200000	00030D40h

Read Command Send Command

Then we put the same values in the watch window. First the motion parameters then the motion header!

Watch List: Current Routine Quick Watch

Name	Scope	Value	Force Mask	Description
X_Axis:0	Controller	{...}	{...}	
X_Axis:0.Data	Controller	{...}	{...}	
X_Axis:0.Data[0]	Controller	2241		
X_Axis:0.Data[1]	Controller	-29129		
X_Axis:0.Data[2]	Controller	0		
X_Axis:0.Data[3]	Controller	-24288		
X_Axis:0.Data[4]	Controller	7		
X_Axis:0.Data[5]	Controller	-24875		
X_Axis:0.Data[6]	Controller	7		
X_Axis:0.Data[7]	Controller	167		
X_Axis:0.Data[8]	Controller	0		
X_Axis:0.Data[9]	Controller	3392		
X_Axis:0.Data[10]	Controller	0		
X_Axis:0.Data[11]	Controller	0		

Errors Search Results Watch

Moving back to 0mm with the same motion command and the same parameters, just set the target position to 0 (O.Data[2] and O.Data[3]) then change the count nibble in the motion command header to 2 for example.

Watch List:	Name	Scope	Value	Force Mask	Description
Current Routine	[-] X_Axis:I	Controller	{...}	{...}	
Quick Watch	[-] X_Axis:I.Data	Controller	{...}	{...}	
	+ X_Axis:I.Data[0]	Controller	2242		
	+ X_Axis:I.Data[1]	Controller	20023		
	+ X_Axis:I.Data[2]	Controller	0		
	+ X_Axis:I.Data[3]	Controller	0		
	+ X_Axis:I.Data[4]	Controller	0		
	+ X_Axis:I.Data[5]	Controller	1543		
	+ X_Axis:I.Data[6]	Controller	0		
	+ X_Axis:I.Data[7]	Controller	-448		
	+ X_Axis:I.Data[8]	Controller	-1		
	[-] X_Axis:O	Controller	{...}	{...}	
	[-] X_Axis:O.Data	Controller	{...}	{...}	
	+ X_Axis:O.Data[0]	Controller	1		
	+ X_Axis:O.Data[1]	Controller	258		
	+ X_Axis:O.Data[2]	Controller	0		
	+ X_Axis:O.Data[3]	Controller	0		
	+ X_Axis:O.Data[4]	Controller	16960		
	+ X_Axis:O.Data[5]	Controller	15		
	+ X_Axis:O.Data[6]	Controller	-31072		
	+ X_Axis:O.Data[7]	Controller	1		
	+ X_Axis:O.Data[8]	Controller	3392		
	+ X_Axis:O.Data[9]	Controller	3		
	+ X_Axis:O.Data[10]	Controller	0		
	+ X_Axis:O.Data[11]	Controller	0		

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File Search Controller Services Options Window Tools Manuals Help

Project: Unnamed, IP: 192.168.2.4 (DEVELOPER)

Control Panel Parameters Variables User Defined OS SW Operating Hours / Time OS SW Trap OS SW Monitoring OS SW HW Configuration OS SW Status OS SW Debug IO Config MC SW Overview MC SW E1200 Debug MC SW Motor MC SW X13 Ext Sensor MC SW Current Controller MC SW Control Word MC SW Status Word MC SW Warnings MC SW Phase Search MC SW Linearizing MC SW Motion Interface MC SW Winding MC SW Capture, Trigger & Mapped Inputs MC SW VA interpolator MC SW Curve MC SW PVT Stream MC SW Monitoring MC SW Errors MC SW Encoder CAM MC SW Motor Data Sheet MC SW Command Table MC SW Force Control MC Remanent Variables ControlPanel Tokens Operating Hour Counter Ethernet/IP Ethernet/IP-D>T, T>D config Ethernet/IP-D>T, T>D config

Control

0: Switch On.....1 Interface
1: Safety Volt. Enable.....1 Digital Input X4.12
2: /Quick Stop.....1 Forced by Parameter
3: Enable Operation.....1 Forced by Parameter
4: /Abort.....1 Forced by Parameter
5: Freeze.....1 Forced by Parameter
6: Go To Position.....0 Interface
7: Error Acknowledge.....0 Interface
8: Jog Move +.....0 Interface
9: Jog Move -.....0 Interface
10: Special Mode.....0 Interface
11: Home.....0 Interface
12: Clearance Check.....0 Interface
13: Go To Initial Position.....0 Interface
14: Linearizing.....0 No Source Specified
15: Phase Search.....0 No Source Specified

Control Word: 003Fh
Override Value
Enable Manual Override

IO Panel

Enable Manual Override
Override Value Actual Value

X4.12 - Input
X4.11 - Input
X4.10 - Input
X4.9 - Input
X4.8 - Input
X4.7 - Input
X4.6 - Input
X4.5 - Input
X4.4 - Input
X4.3 - Input

Status

0: Operation Enabled.....1
1: Switch On Active.....1
2: Enable Operation.....1
3: Error.....0
4: Safety Volt. Enable.....1
5: /Quick Stop.....1
6: Switch On Locked.....0
7: Warning.....0
8: Event Handler Active.....0
9: Special Motion Active.....1
10: In Target Position.....1
11: Home.....1
12: Fatal Error.....0
13: Motion Active.....0
14: Range Indicator 1.....1
15: Range Indicator 2.....0

Status Word: 4E37h
Op. Main State 00h
Op. Sub State C2h

0: Motor Hot Sensor.....0
1: Motor Short Time Overload.....0
2: Motor Supply Voltage Low.....0
3: Motor Supply Voltage High.....0
4: Position Lag Always.....0
5: Position Lag Standing.....0
6: Controller Hot.....0
7: Motor Not Homed.....0
8: PTC Sensor 1 Hot.....0
9: PTC Sensor 2 Hot.....0
10: RR Hot Calculated.....0
11: Reserved.....0
12: Reserved.....0
13: Reserved.....0
14: Interface Warn Flag.....0
15: Application Warn Flag.....0

Warn Word: 0000h
Logged Error Code: 0000h

Monitoring

Connection Status: Online
Firmware Status: Running
Motor Status: Switched On

Op. State: Operation Enabled

Actual Position: 0.16 mm
Demand Position: 0.00 mm
Force Factor: 100.00 %
Motor Current: -0.45 A
Logic Supply Volt.: 25.46 V
Motor Supply Volt.: 79.70 V

Enable Manual Override: ☐ -10 mm -1 mm +1 mm +10 mm

Command Category: Most Commonly Used
Command Type: VAI Go To Pos (0104h)
Count Nibble (Toggle Bits): 2h ☐ Auto Increment Count Nibble

Name	Offs.	Description	Scaled Value	Int. Value (Dec)	Int. Value (Hex)
Header	0	0104h: VAI Go To Pos	258	258	0103h
1. Par	2	Target Position	0 mm	0	00000000h
2. Par	6	Maximal Velocity	1 m/s	1000000	000F4240h
3. Par	10	Acceleration	1 m/s ²	100000	000186A0h
4. Par	14	Deceleration	2 m/s ²	200000	00030D40h

Read Command Send Command

4 Ethernet/IP Parameters

4.1 Parameters

The Ethernet/IP interface has an additional parameter tree branch (Parameters → Ethernet/IP Intf), which can be configured with the distributed LinMot-Talk software. With these parameters, the Ethernet/IP communication parameters can be configured. The LinMot-Talk software can be downloaded from <http://www.linmot.com> under the section download, software & manuals.

Ethernet/IP Intf\ Dis-/Enable

With the Dis-/Enable parameter the LinMot servo controller can be run without the Ethernet Ethernet/IP interface going online. So in a first step the system can be configured and run without any bus connection.

Ethernet/IP\ Dis-/Enable	
Disable	Servo controller runs without Ethernet/IP.
Enable	Servo controller runs with Ethernet/IP connection.



IMPORTANT: If the Ethernet/IP interface is disabled, the integrated Ethernet/IP switch is not powered! No messages will be sent to other devices connected to the Ethernet-Network via the LinMot servo controller.

Ethernet/IP Intf\Ethernet Configuration\ IP Configuration Mode

This parameter defines how the IP address is assigned.

Ethernet/IP Intf\Ethernet Configuraton\ IP configuration Mode	
DHCP	IP address is acquired via DHCP mechanism.
Static by IP Configuration	IP address is defined with parameters only.
Static with switches S1 and S2 (DHCP)	IP address is defined with parameters and the last byte is defined with the value of the switches S1 and S2. The default IP address setting is 192.168.001.xxx (xxx stands for the value of the switches S1 and S2)



IMPORTANT: The switch value **S1 = 0** and **S2 = 0** (factory default setting) defines acquiring the IP address via **DHCP**.

Ethernet/IP Intf\Ethernet Configuration\ IP Configuration

In this section the parameters for the IP address netmask, default gateway and multicast IP address are located.

Ethernet/IP Intf\Ethernet Configuration\ IP Configuration	
IP address 1st Byte	Highest byte of IP address
IP address 2nd Byte	Mid high byte of IP address
IP address 3rd Byte	Mid low byte of IP address
IP address 4th Byte	Lowest byte of IP address
Netmask 1st Byte	Highest byte of Netmask
Netmask 2nd Byte	Mid high byte of Netmask
Netmask 3rd Byte	Mid low byte of Netmask
Netmask 4th Byte	Lowest byte of Netmask
Default Gateway 1st Byte	Highest byte of Default Gateway
Default Gateway 2nd Byte	Mid high byte of Default Gateway
Default Gateway 3rd Byte	Mid low byte of Default Gateway
Default Gateway 4th Byte	Lowest byte of Default Gateway

5 Realtime IO Data Mapping

If you want to control the LinMot device just over the **Control Word** and the **Motion Command Interface** it is sufficient to use the mapping described in chapter 5. The different mappings over different instances are selected in the assembly class.

5.1 Default O → T and T → O Mapping

5.1.1 Default O → T Mapping Assembly Instance 32

In this real time IO mapping the 16 bit control word, the 16 bit motion command header and the motion command parameters are exchanged. The size of this mapping is 24 bytes or **12 words**. The AB generic Ethernet module adds another 6 bytes (status and counts) so the real exchanged size is 30 bytes.

Assembly Class Instance 32		
Byte Offset	Description	Size / Type
00h	MC SW ControlWord	Uint16 / Bit coded
02h	MC SW MotionCommandHeader	Uint16 / 12Bit Command 4Bit count nibble
04h	MC SW MotionCommandPar Bytes 00..03	Uint32 / Command specific
08h	MC SW MotionCommandPar Bytes 04..07	Uint32 / Command specific
0Ch	MC SW MotionCommandPar Bytes 08..11	Uint32 / Command specific
10h	MC SW MotionCommandPar Bytes 12..15	Uint32 / Command specific
14h	MC SW MotionCommandPar Bytes 16..19	Uint32 / Command specific

5.1.2 Default T → O Mapping Assembly Instance 16

In this real time IO Mapping the StateVar for the main state machine and several other helpful data is exchanged. The size of this mapping is 18 bytes or **9 words**. For the AB generic Ethernet module another 2 bytes (Status and counts) are added, so the real exchanged size is 20 bytes.

Assembly Class Instance 16		
Byte Offset	Description	Size / Type
00h	MC SW StateVar	Uint16 / coded state depending
02h	MC SW StatusWord	Uint16 / Bit coded
04h	MC SW WarnWord	Uint16 / Bit coded
06h	MC SW DemandPosition	Int32 / Position [100nm]
0Ah	MC SW ActualPosition	Int32 / Position [100nm]
0Eh	MC SW DemandCurrent	Int32 / Current [1mA]

For the configuration in PLC of this data refer to chapter 3.2 of this manual.

5.2 O → T and T → O Mapping With Configuration Module

With this real time IO configuration, an additional configuration module is mapped into the IO data communication. The functionality of this module is the same for all different fieldbus interfaces. For this reason, the functionality is described in the document [2] “Controller Configuration over Fieldbus”.

5.2.1 Default O → T Mapping Assembly Instance 40

In this real time IO Mapping the 16 bit control word, the 16 bit motion command header and the motion command parameters are exchanged. The size of this mapping is 32 bytes or **16 words**. The AB generic Ethernet module adds another 6 bytes (Status and counts) so the real exchanged size is 38 bytes.

Assembly Class Instance 40		
Byte Offset	Description	Size / Type
00h	MC SW ControlWord	Uint16 / Bit coded
02h	MC SW MotionCommandHeader	Uint16 / 12Bit Command 4Bit count nibble
04h	MC SW MotionCommandPar Bytes 00..03	Uint32 / Command specific
08h	MC SW MotionCommandPar Bytes 04..07	Uint32 / Command specific
0Ch	MC SW MotionCommandPar Bytes 08..11	Uint32 / Command specific
10h	MC SW MotionCommandPar Bytes 12..15	Uint32 / Command specific
14h	MC SW MotionCommandPar Bytes 16..19	Uint32 / Command specific
18h	Cfg Module Control Word	Uint16
1Ah	Cfg Module Index/..	Uint16
2Ch	Cfg Module Value/..	Uint32/Sint32

5.2.2 Default T → O Mapping Assembly Instance 24

In this real time IO mapping the StateVar for the main state machine and several other helpful data is exchanged. The size of this mapping is 26 bytes or 13 **words**. For the AB generic Ethernet module another 2 bytes (Status and counts) are added, so the real exchanged size is 28 bytes.

Assembly Class Instance 24		
Byte Offset	Description	Size / Type
00h	MC SW StateVar	Uint16 / coded state depending
02h	MC SW StatusWord	Uint16 / Bit coded
04h	MC SW WarnWord	Uint16 / Bit coded
06h	MC SW DemandPosition	Int32 / Position [100nm]
0Ah	MC SW ActualPosition	Int32 / Position [100nm]
0Eh	MC SW DemandCurrent	Int32 / Current [1mA]
12h	Cfg Module Status Word	Uint16
14h	Cfg Module Index/..	Uint16
16h	Cfg Module Value/..	Uint32/Sint32

In the PLC this is configured as followed:

5.2.3 PLC Setup of Mapping with Configuration Module

Module Properties: ENIP_1 (ETHERNET-MODULE 1.1)

General | Connection | Module Info

Type: ETHERNET-MODULE Generic Ethernet Module
Vendor: Allen-Bradley
Parent: ENIP_1
Name: X_Axis1
Description:
Comm Format: Data - INT
Address / Host Name:
☒ IP Address: 192 . 168 . 1 . 89
☐ Host Name:
Status: Offline

Connection Parameters

	Assembly Instance:	Size:	
Input:	24	13	(16-bit)
Output:	40	16	(16-bit)
Configuration:	1	0	(8-bit)
Status Input:			
Status Output:			

OK Cancel Apply Help

Configuration of LinMot axis with additional Configuration Module (4 word input and 4 word output direction).

5.2.4 Example of reading Parameter RAM value with Configuration Module

Reading RAM value (0x1101 = 4353; X_Axis1:O.Data[12]) P Gain Position Control Parameter Set A (UPID5026; X_Axis1:O.Data[13]) the result in this example is 15 (X_Axis1:I.Data[11] and X_Axis1:I.Data[12]). The data in the response is valid as soon the count nibble value in the response state (X_Axis1:I.Data[9]) changes to the same value as in the control Word (X_Axis1:O.Data[12]).

Watch					
Quick Watch		Enter Quick Watch List Name...			
Name	Scope	Value	Force Mask	Description	
X_Axis1:O	Controller	{...}	{...}		
X_Axis1:O.Data	Controller	{...}	{...}		
X_Axis1:O.Data[0]	Controller	63			
X_Axis1:O.Data[1]	Controller	514			
X_Axis1:O.Data[2]	Controller	0			
X_Axis1:O.Data[3]	Controller	12			
X_Axis1:O.Data[4]	Controller	0			
X_Axis1:O.Data[5]	Controller	0			
X_Axis1:O.Data[6]	Controller	0			
X_Axis1:O.Data[7]	Controller	0			
X_Axis1:O.Data[8]	Controller	0			
X_Axis1:O.Data[9]	Controller	0			
X_Axis1:O.Data[10]	Controller	0			
X_Axis1:O.Data[11]	Controller	0			
X_Axis1:O.Data[12]	Controller	4353			
X_Axis1:O.Data[13]	Controller	5026			
X_Axis1:O.Data[14]	Controller	0			
X_Axis1:O.Data[15]	Controller	0			
X_Axis1:I.Data	Controller	{...}	{...}		
X_Axis1:I.Data[0]	Controller	2242			
X_Axis1:I.Data[1]	Controller	3127			
X_Axis1:I.Data[2]	Controller	0			
X_Axis1:I.Data[3]	Controller	0			
X_Axis1:I.Data[4]	Controller	12			
X_Axis1:I.Data[5]	Controller	-193			
X_Axis1:I.Data[6]	Controller	11			
X_Axis1:I.Data[7]	Controller	14			
X_Axis1:I.Data[8]	Controller	0			
X_Axis1:I.Data[9]	Controller	1			
X_Axis1:I.Data[10]	Controller	5026			
X_Axis1:I.Data[11]	Controller	15			
X_Axis1:I.Data[12]	Controller	0			

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