LinMot®

MC-Link with Ethernet/IP Interface

User Manual

This document applies to the following controllers:
B8050-ML-IP

Document version 4.5 / Whp, January 2019

Table of Content

1 System overview

The LinMot Ethernet/IP controllers have the following functionalities:

Device Property	Value / Remark
Minimal Ethernet/IP cycle time	2 ms
DHCP -Support	Supported
EDS Support	Not yet supported from AB
IEEE1588 (CIP-Synch)	For 3rd 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

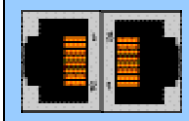
All User Manuals are distributed with the LinMot-Talk configuration software the newest version could be downloaded from the LinMot homepage in the download section.

Ref	Title	Source
1	User Manual Motion Control SW	www.linmot.com
2	LinMot Drive Configuration over Fieldbus Interfaces SG4	www.linmot.com
3	Usermanual_MC_Link_with_Ethernet_IP_SG5.pdf	www.linmot.com

2 Connecting to the Ethernet/IP Network

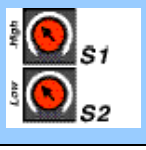
2.1 Pin Assignment of the Connectors X17-X18

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, where S1 sets the high digit and S2 the low digit.

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

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

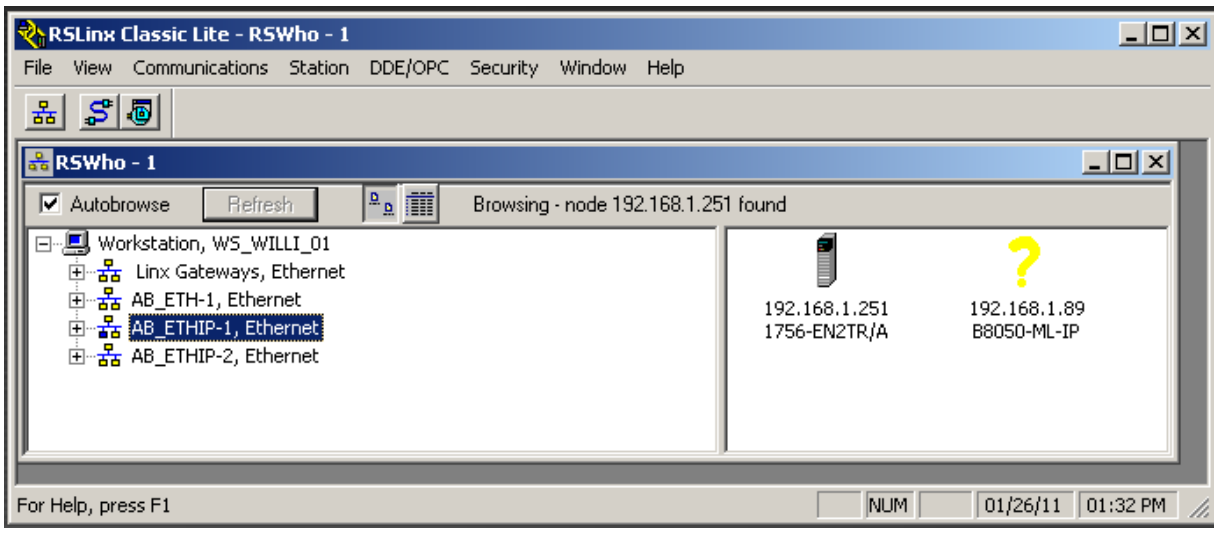
3 Setup in the PLC

IMPORTANT: Use only AB PLC firmware 18.0 or higher!

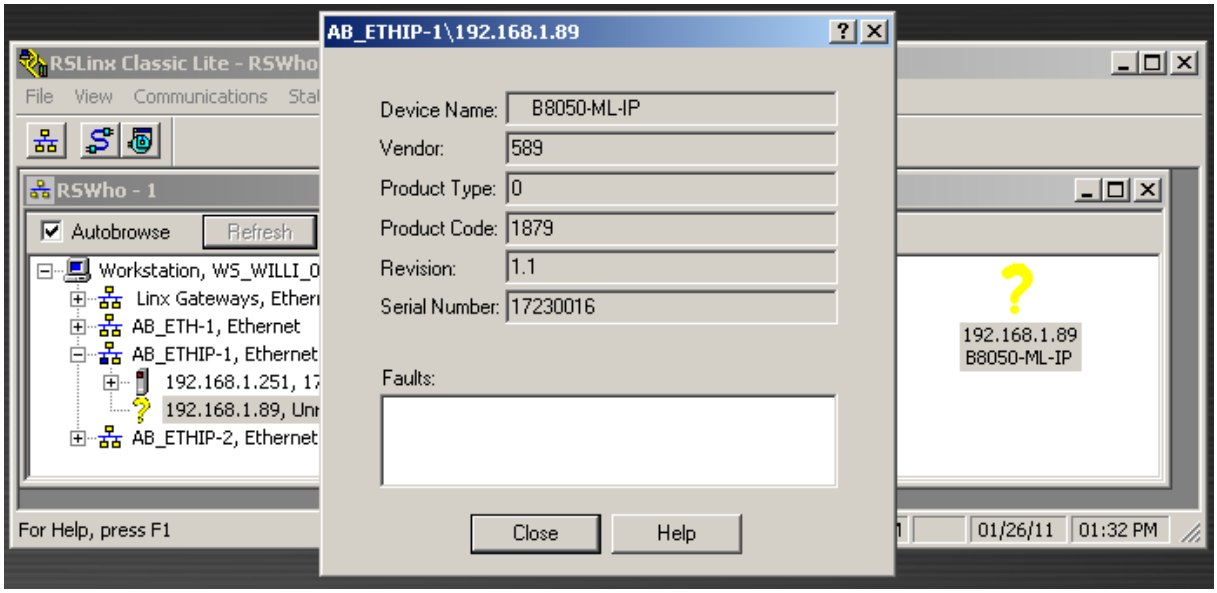
The following steps describe the integration of a LinMot Ethehernet/IP controller in the PLC. In the example an Allen Bradley master PLC is used. RSLinx tool can only be used to see if the device is on the network and under which IP-address it can be accessed. The whole configuration is done in the PLC, 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” B8050-ML-IP



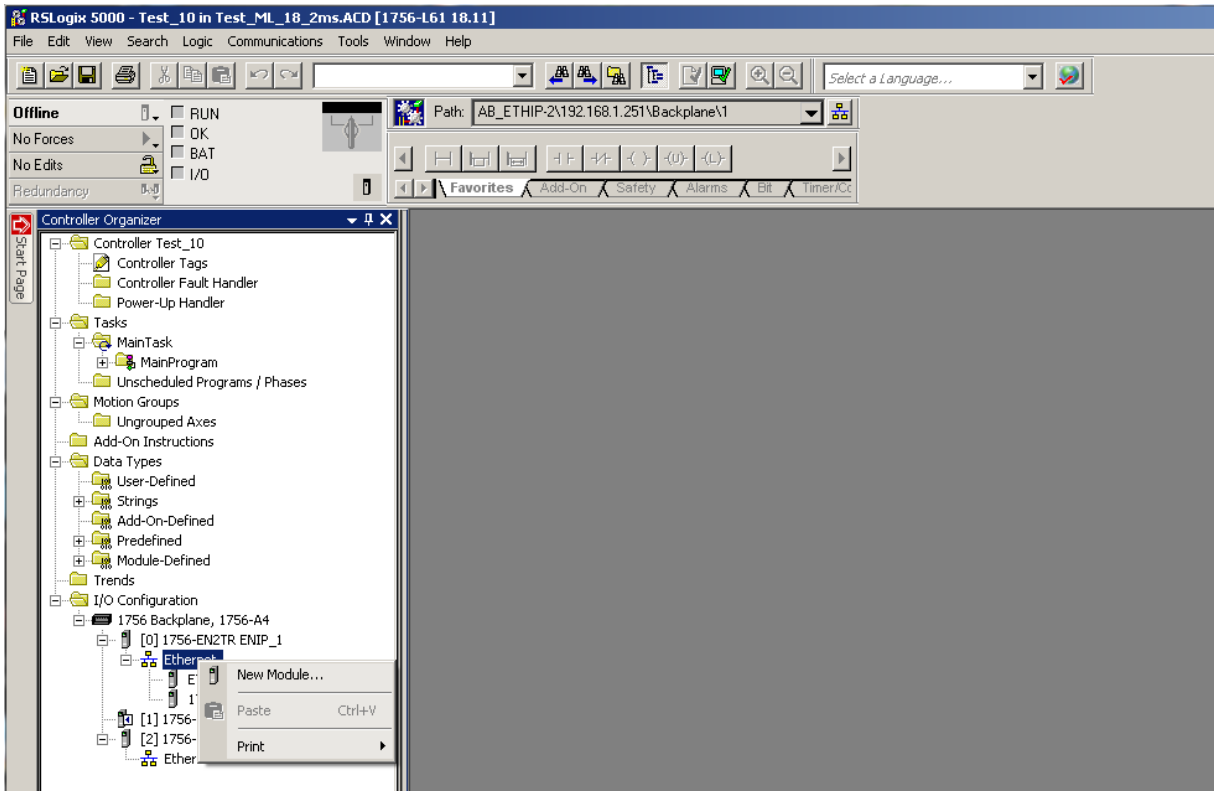
LinMot device with the IP address 192.168.1.89 in the RSLinx tool



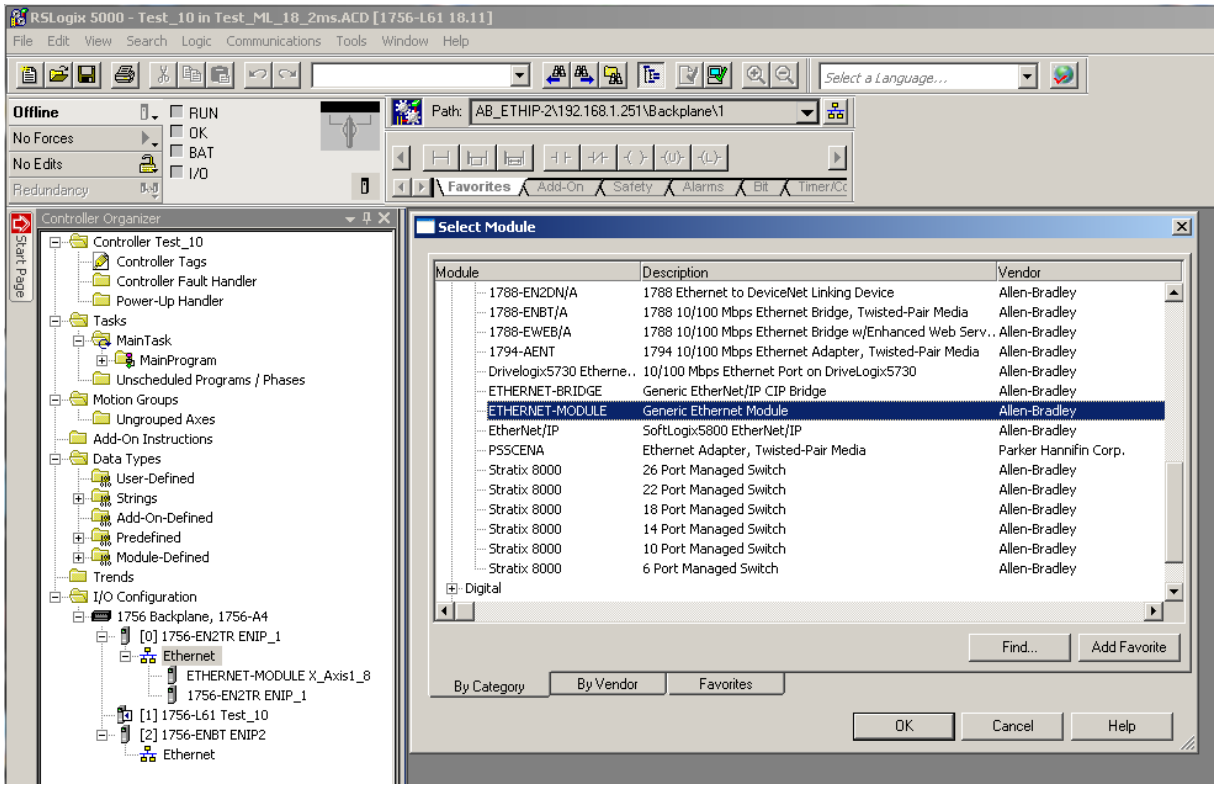
LinMot device properties

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



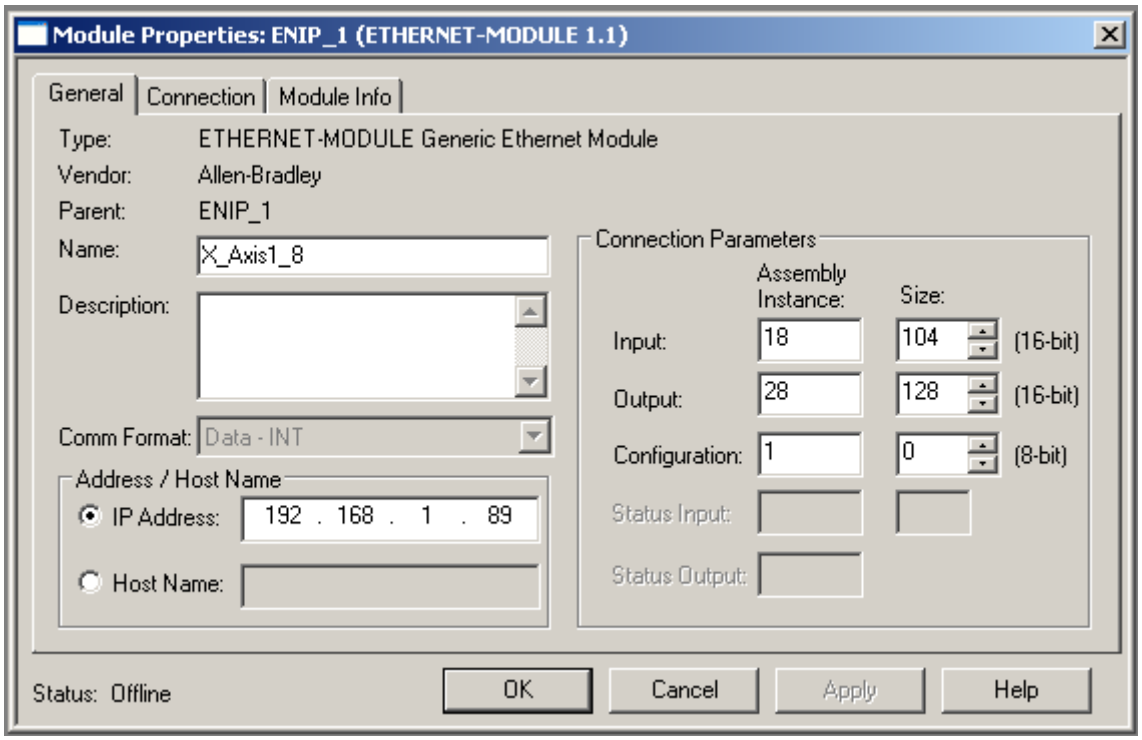
Then you have to select in the Communications Module the ETHERNET-MODULE


RSLogix 5000 - Test_10 in Test_ML_18_2ms.ACD [1756-L61 18.11]
File Edit View Search Logic Communications Tools Window Help
Offline
No Forces
No Edits
Redundancy
RUN
OK
BAT
I/O
Path: AB_ETHIP-2\192.168.1.251\Backplane\1
Favorites Add-On Safety Alarms Bit Timer/Cc
Controller Organizer
Start Page
Controller Test_10
Controller Tags
Controller Fault Handler
Power-Up Handler
Tasks
MainTask
MainProgram
Unscheduled Programs / Phases
Motion Groups
Ungrouped Axes
Add-On Instructions
Data Types
User-Defined
Strings
Add-On-Defined
Predefined
Module-Defined
Trends
I/O Configuration
1756 Backplane, 1756-A4
[0] 1756-EN2TR ENIP_1
Ethernet
ETHERNET-MODULE X_Axis1_8
1756-EN2TR ENIP_1
[1] 1756-L61 Test_10
[2] 1756-ENBT ENIP2
Ethernet
Select Module
Module
Description
Vendor
1788-EN2DN/A
1788 Ethernet to DeviceNet Linking Device
Allen-Bradley
1788-ENBT/A
1788 10/100 Mbps Ethernet Bridge, Twisted-Pair Media
Allen-Bradley
1788-EWEB/A
1788 10/100 Mbps Ethernet Bridge w/Enhanced Web Serv..
Allen-Bradley
1794-AENT
1794 10/100 Mbps Ethernet Adapter, Twisted-Pair Media
Allen-Bradley
Drivelogix5730 Etherne..
10/100 Mbps Ethernet Port on DriveLogix5730
Allen-Bradley
ETHERNET-BRIDGE
Generic EtherNet/IP CIP Bridge
Allen-Bradley
ETHERNET-MODULE
Generic Ethernet Module
Allen-Bradley
EtherNet/IP
SoftLogix5800 EtherNet/IP
Allen-Bradley
PSSCENA
Ethernet Adapter, Twisted-Pair Media
Parker Hannifin Corp.
Stratix 8000
26 Port Managed Switch
Allen-Bradley
Stratix 8000
22 Port Managed Switch
Allen-Bradley
Stratix 8000
18 Port Managed Switch
Allen-Bradley
Stratix 8000
14 Port Managed Switch
Allen-Bradley
Stratix 8000
10 Port Managed Switch
Allen-Bradley
Stratix 8000
6 Port Managed Switch
Allen-Bradley
Digital
Find...
Add Favorite
By Category
By Vendor
Favorites
OK
Cancel
Help

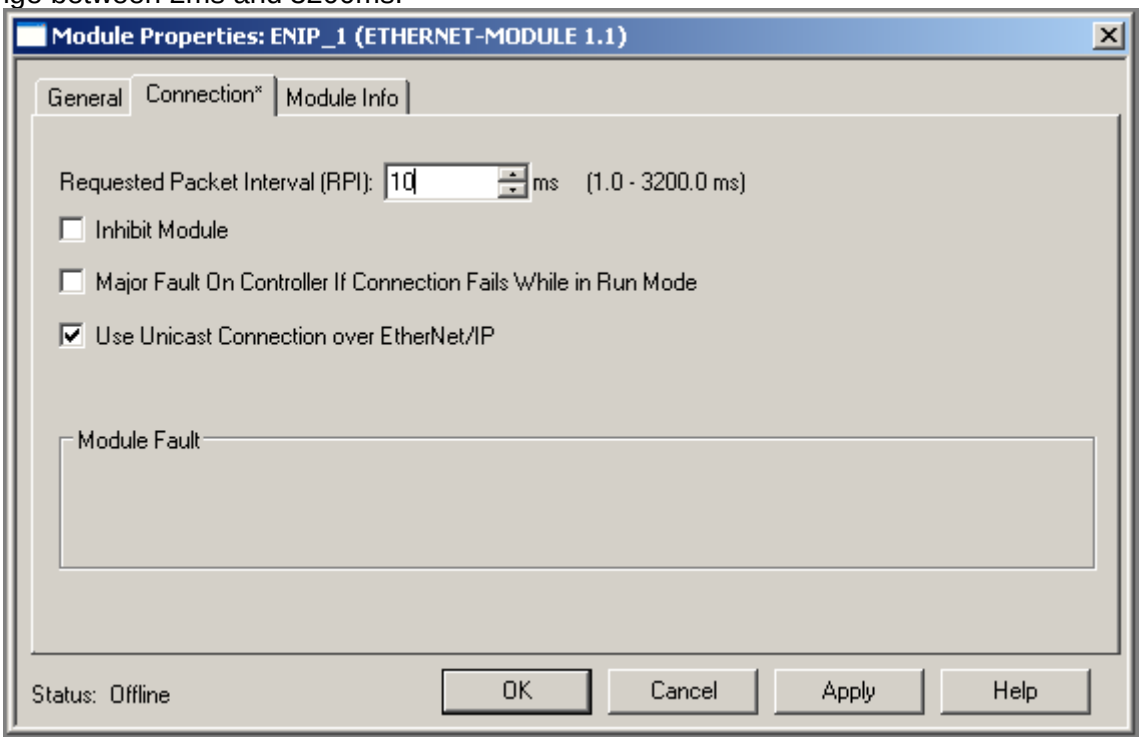
Under the Module Properties you can define the module specific data:

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

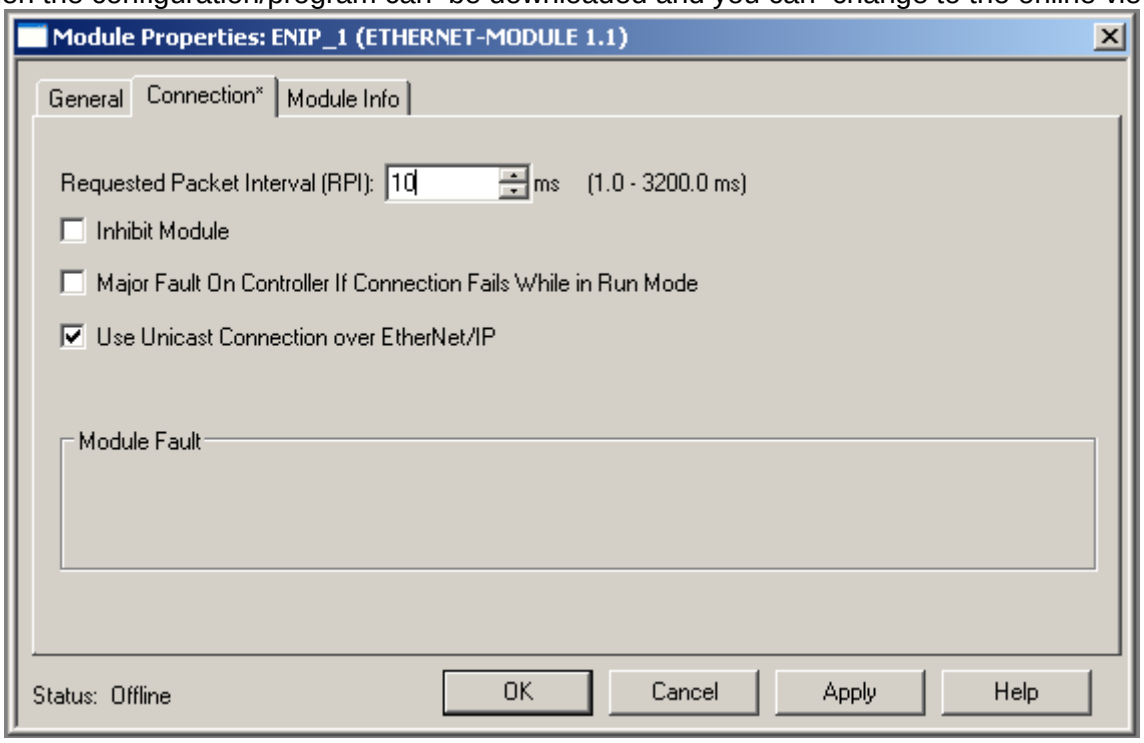
Be careful defining theses parameters, because only a correct setting will run in the in the Ethernet/IP network. Only the name can be defined freely.



In the Connection Tab of the Module Properties the desired cycle time is specified in the range between 2ms and 3200ms.

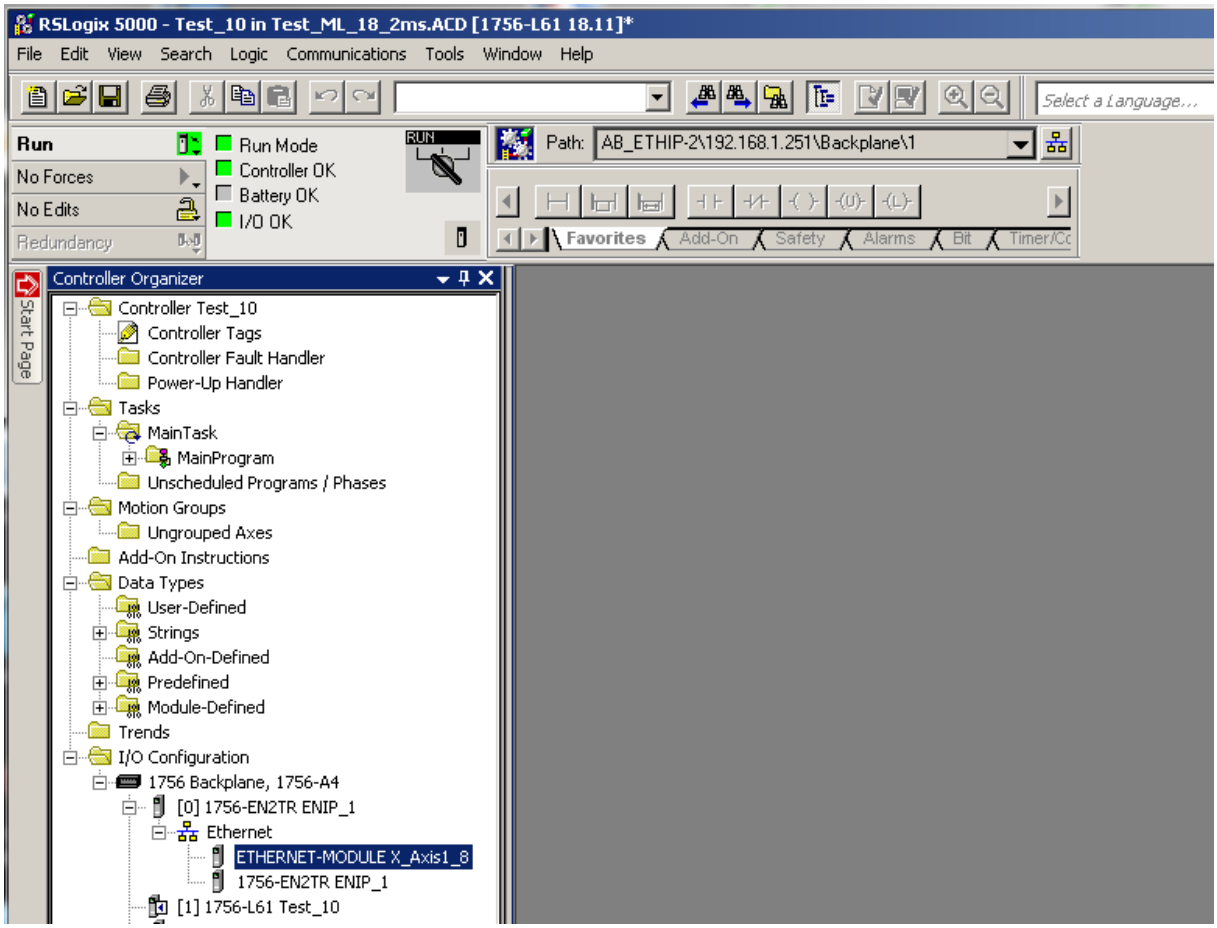


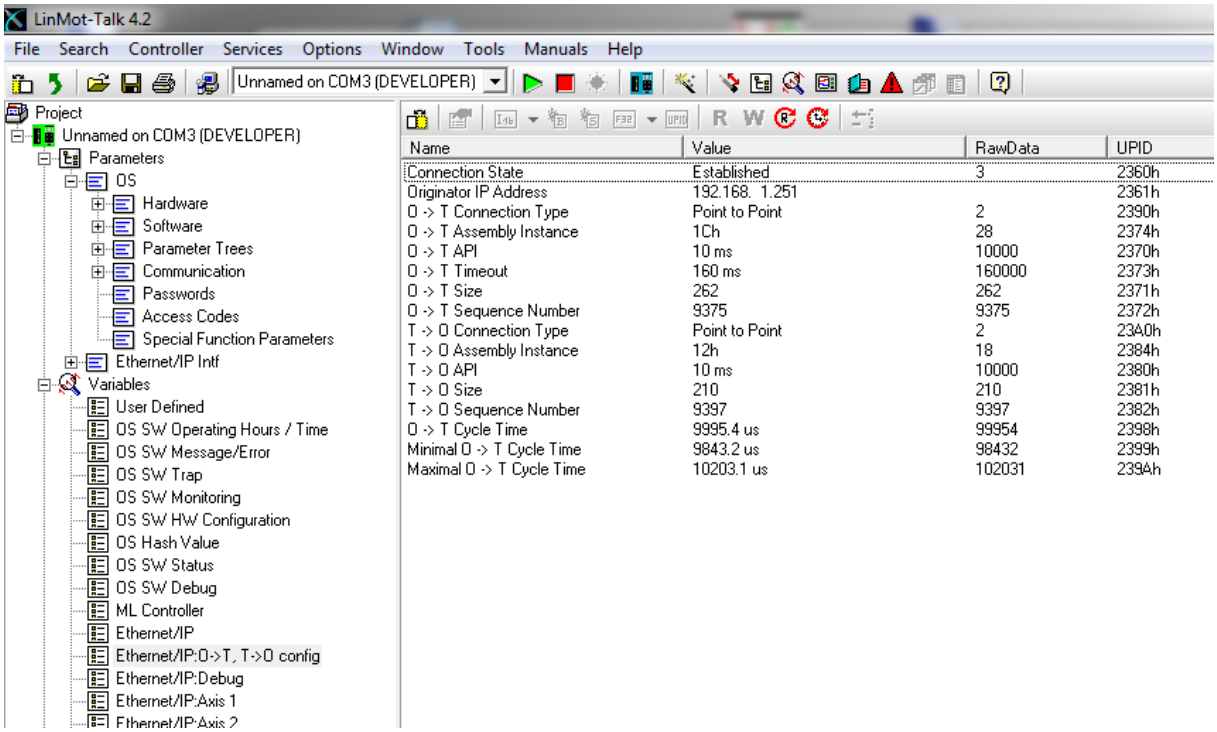
Then the configuration/program can be downloaded and you can change to the online view.



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

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





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.

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 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	The controller runs without Ethernet/IP.
Enable	The 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 controller.

Ethernet/IP Intf\Ethernet Configuration\ IP Configuration Mode
This parameter defines how the IP address is assigned.

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

IMPORTANT: The Switch value **S1 = 0** and **S2 = 0** (factory default setting) acquiring IP address via **DHCP** is activated instead.

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 Gatway 1st Byte	Highest byte of Default Gatway
Default Gatway 2nd Byte	Mid high byte of Default Gatway
Default Gatway 3rd Byte	Mid low byte of Default Gatway
Default Gatway 4th Byte	Lowest byte of Default Gatway

5 Realtime IO Data Mapping

For each axis a container of data is exchanged which allows to control the axis and even to configure it over the exchanged real time data.

5.1 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 same for the different fieldbus interfaces. For this reason, the functionality is described in documentation [2] “Drive Configuration over Fieldbus”.

5.1.1 O → T Mapping of one axis

In this real time IO Mapping the 16 bit control word the 16 bit motion command header and motion command parameters are exchanged. The size of this mapping is 32 bytes or **16 words** for each configured axis.

O-> T Data Mapping of one axis		
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

5.1.2 T → O Mapping of one axis

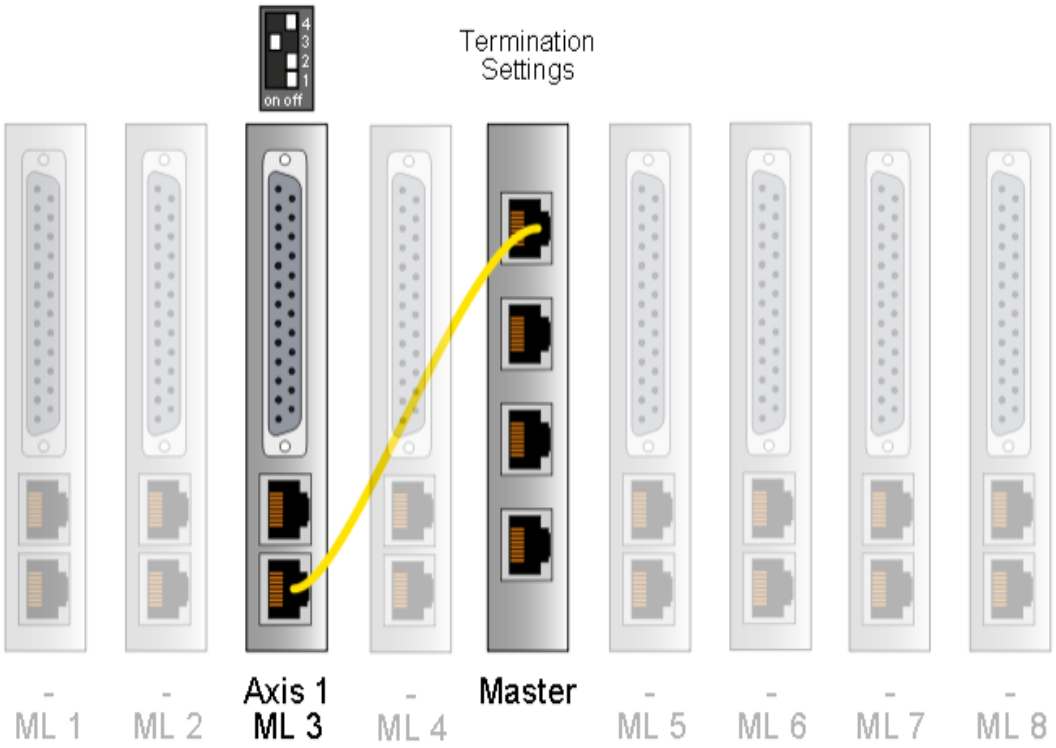
In this real time IO mapping the StateVar for the main state machine and several other helpful data are exchanged. The size of this mapping is 26 bytes or **13 words** for each configured axis.

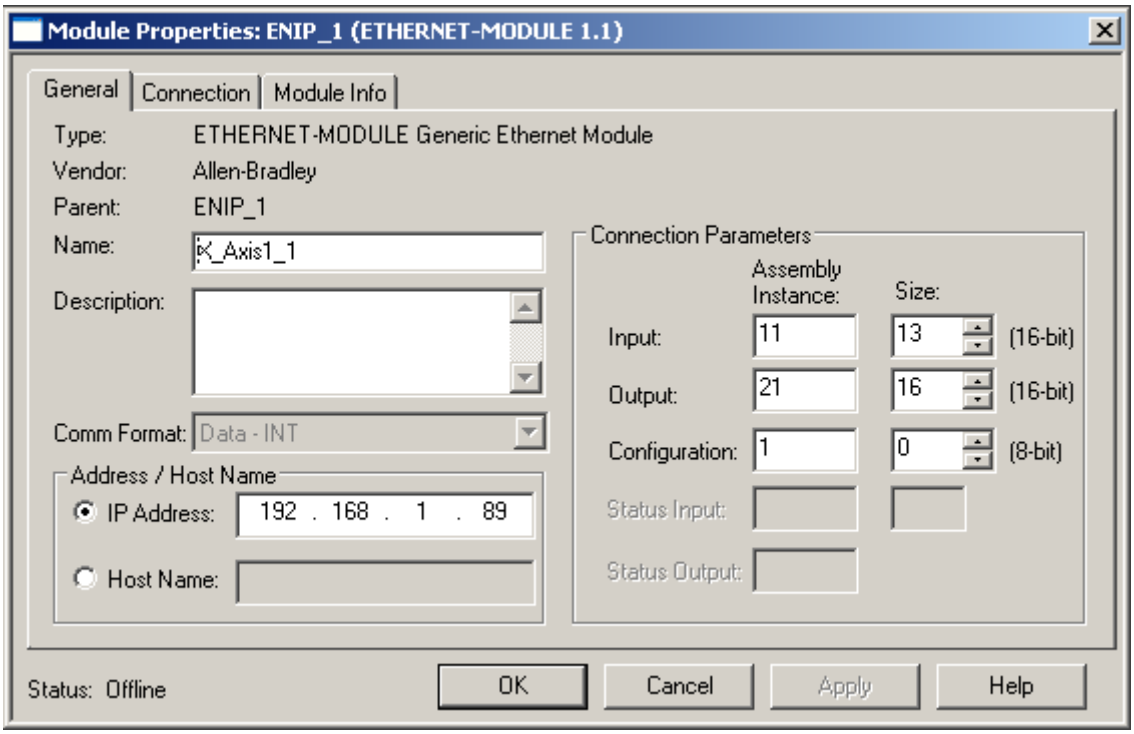
Assembly Class Instance 24		
Byte Offset	***Description***	***Size / Type***
00h	MC SW StateVar	Uint16 / coded state depending
02h	MC SW StatusWord	Uint16 / Bit coded
04h	MC SW WarnWord	Uint16 / Bit coded
06h	MC SW DemandPosition	Int32 / Position [100nm]
0Ah	MC SW ActualPosition	Int32 / Position [100nm]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

The use of the Control word and Motion Command interface is described in [1]. The real time configuration module is descibed in [2].

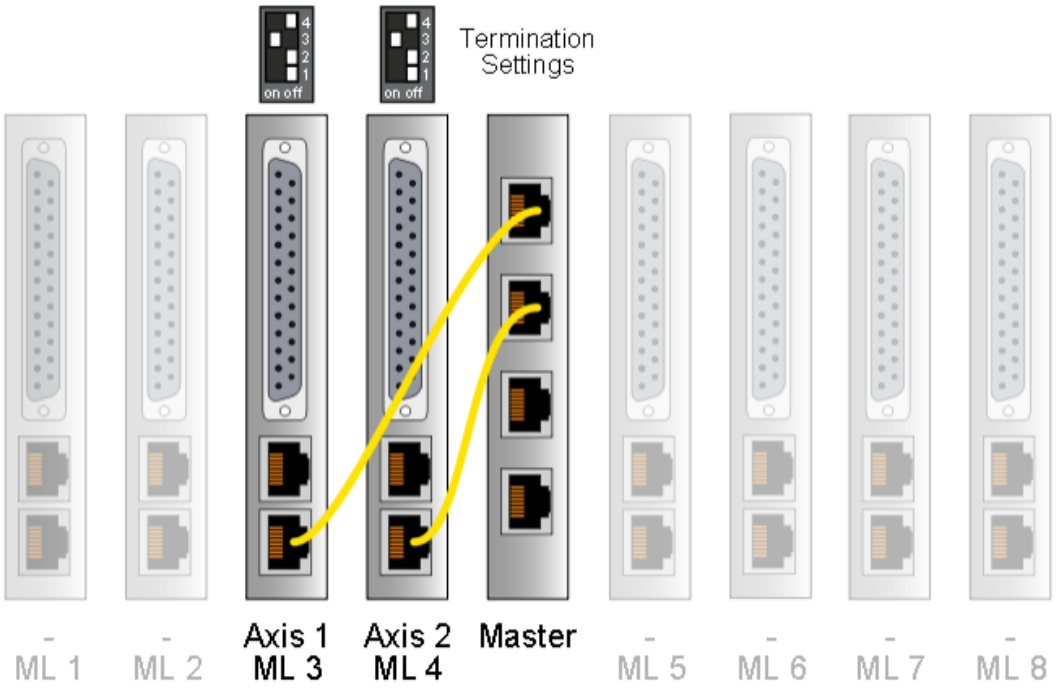
5.2 PLC Setup with different numbers of Axis

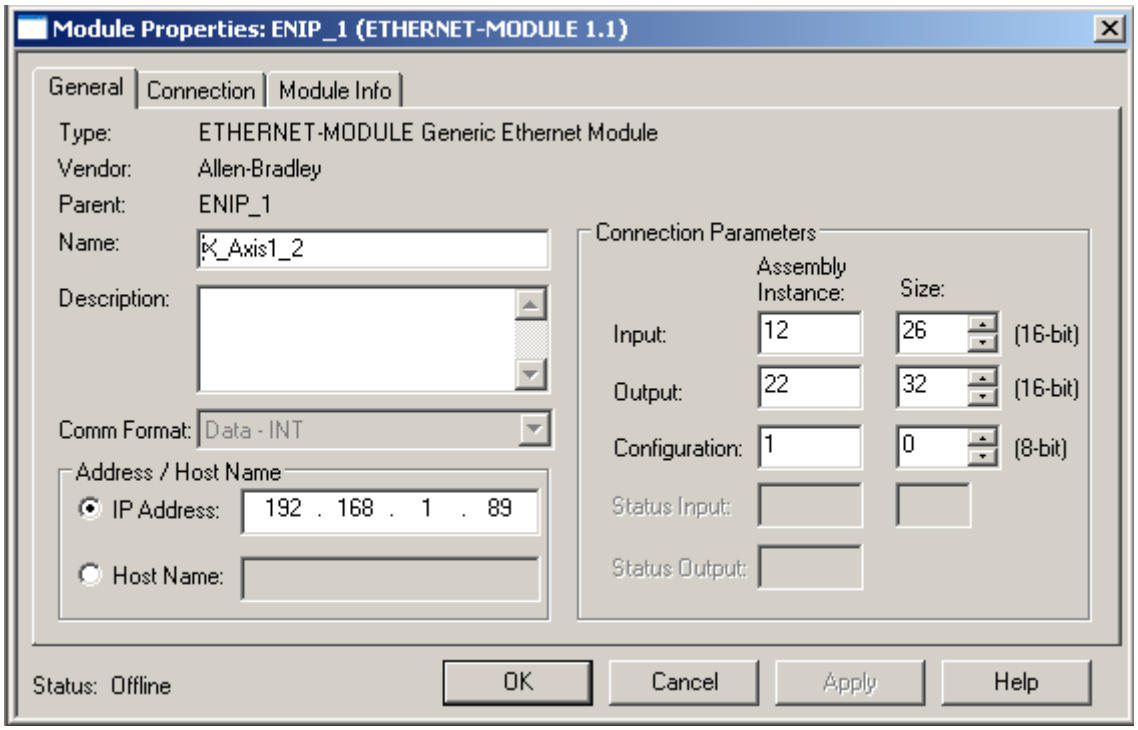
5.2.1 PLC Setup with 1 Axis



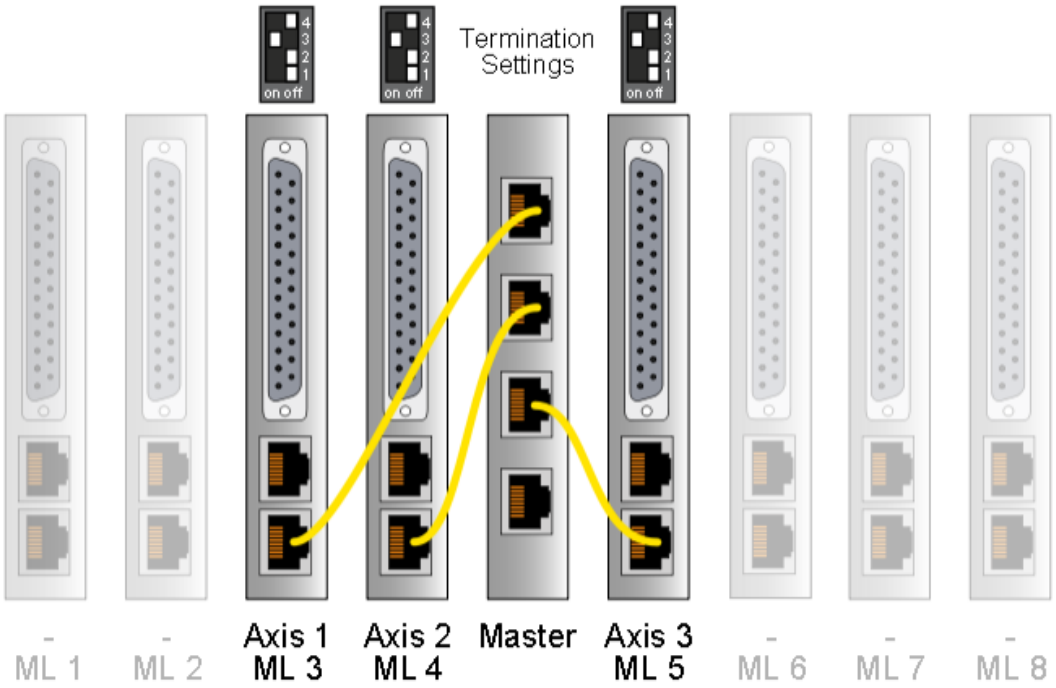


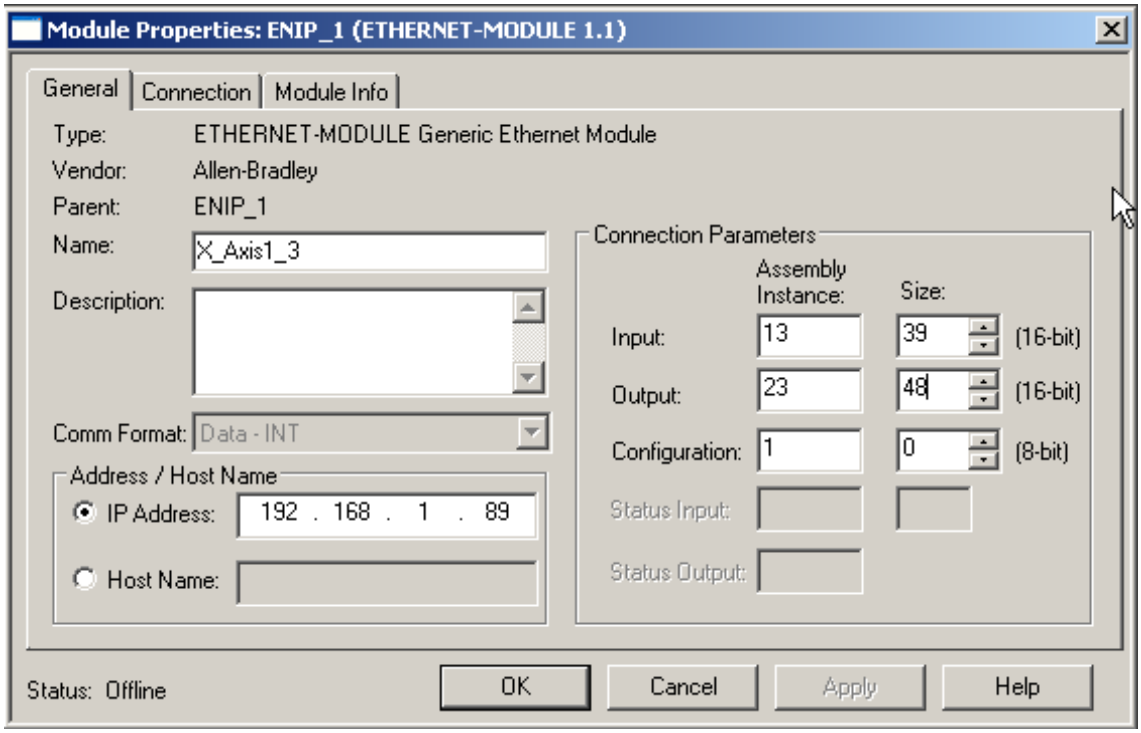
5.2.2 PLC Setup with 2 Axis



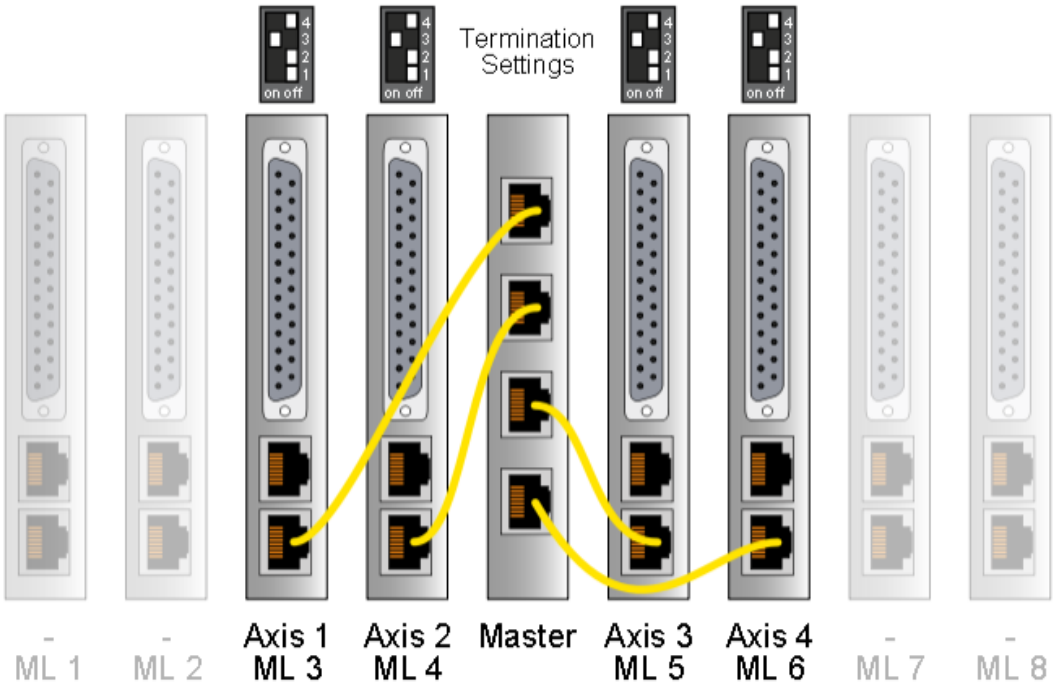


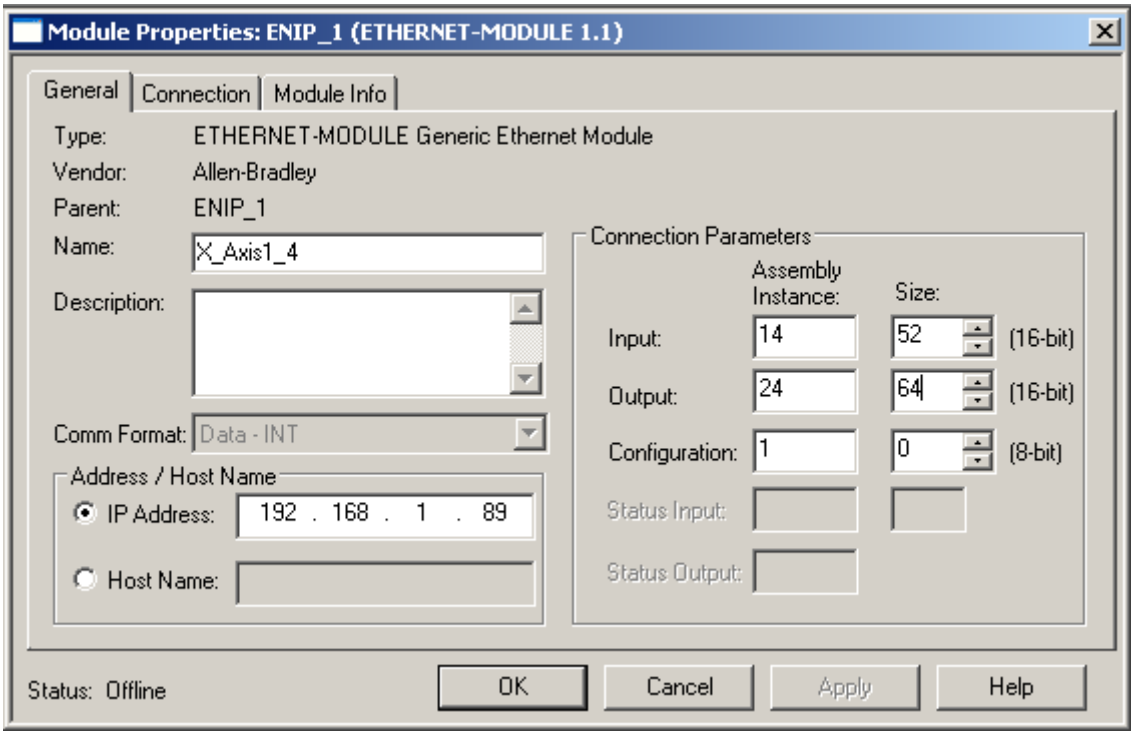
5.2.3 PLC Setup with 3 Axis



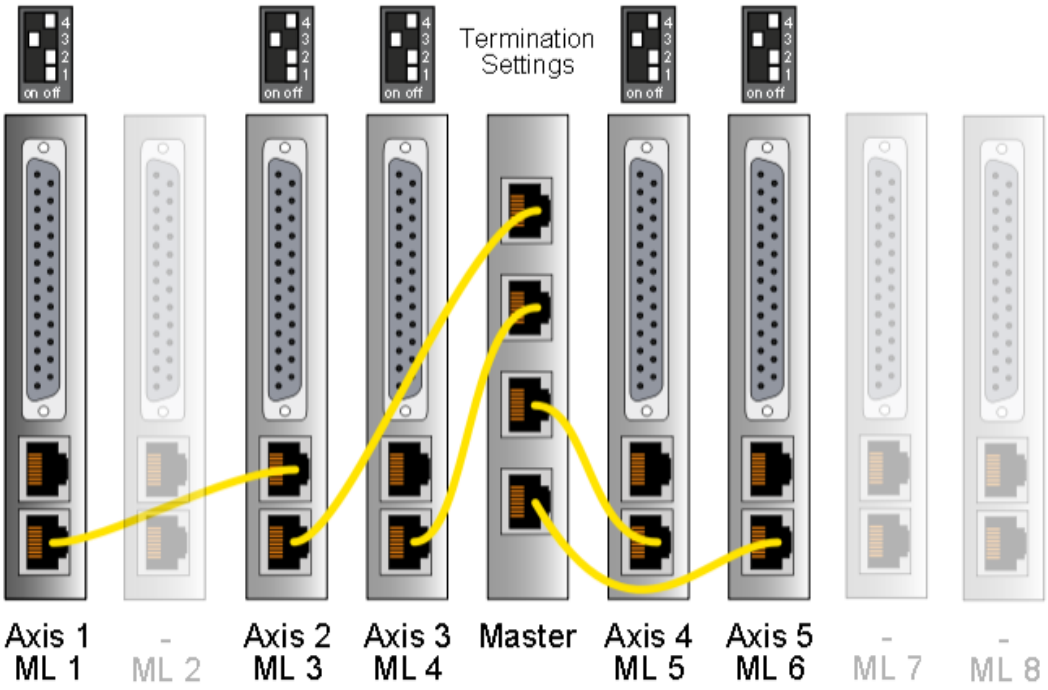


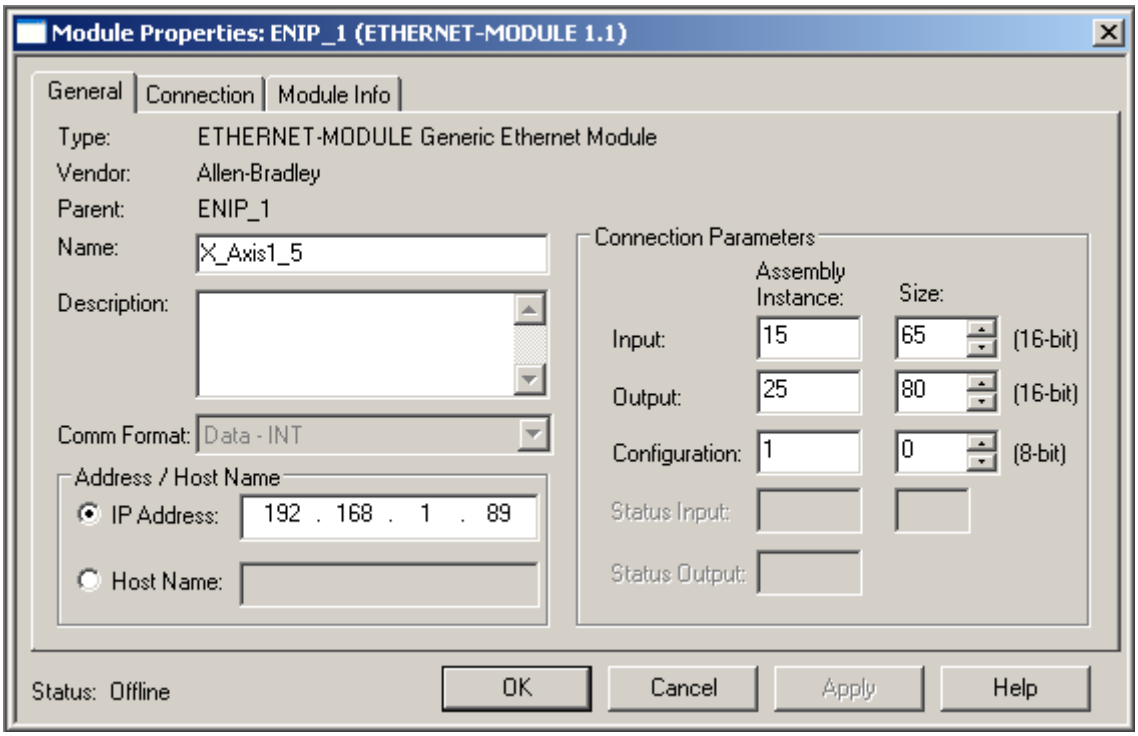
5.2.4 PLC Setup with 4 Axis



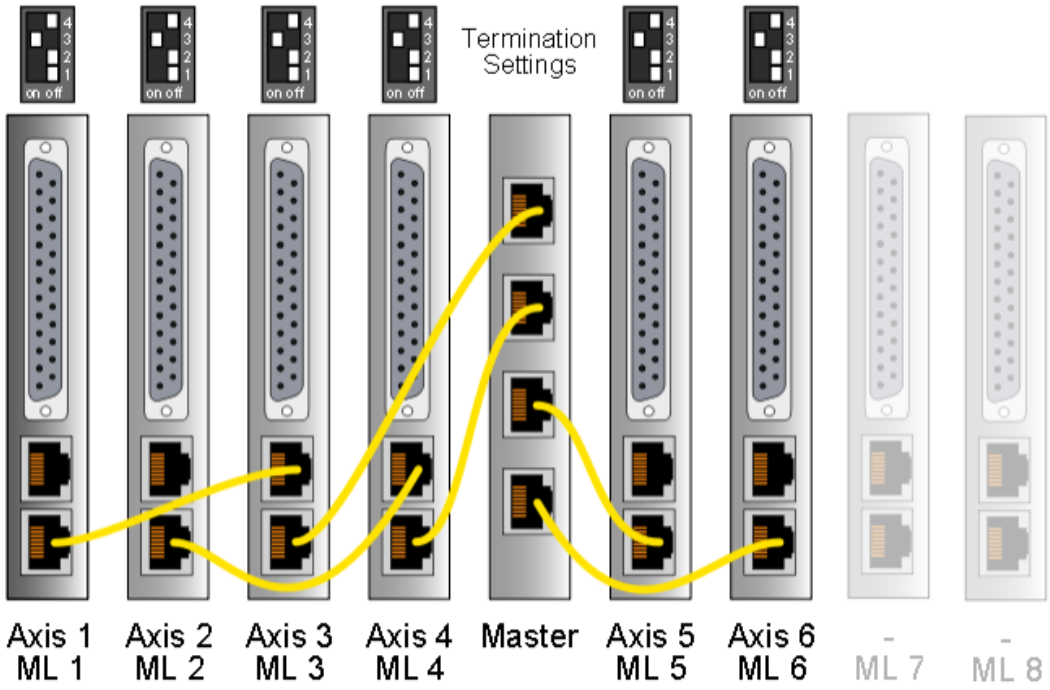


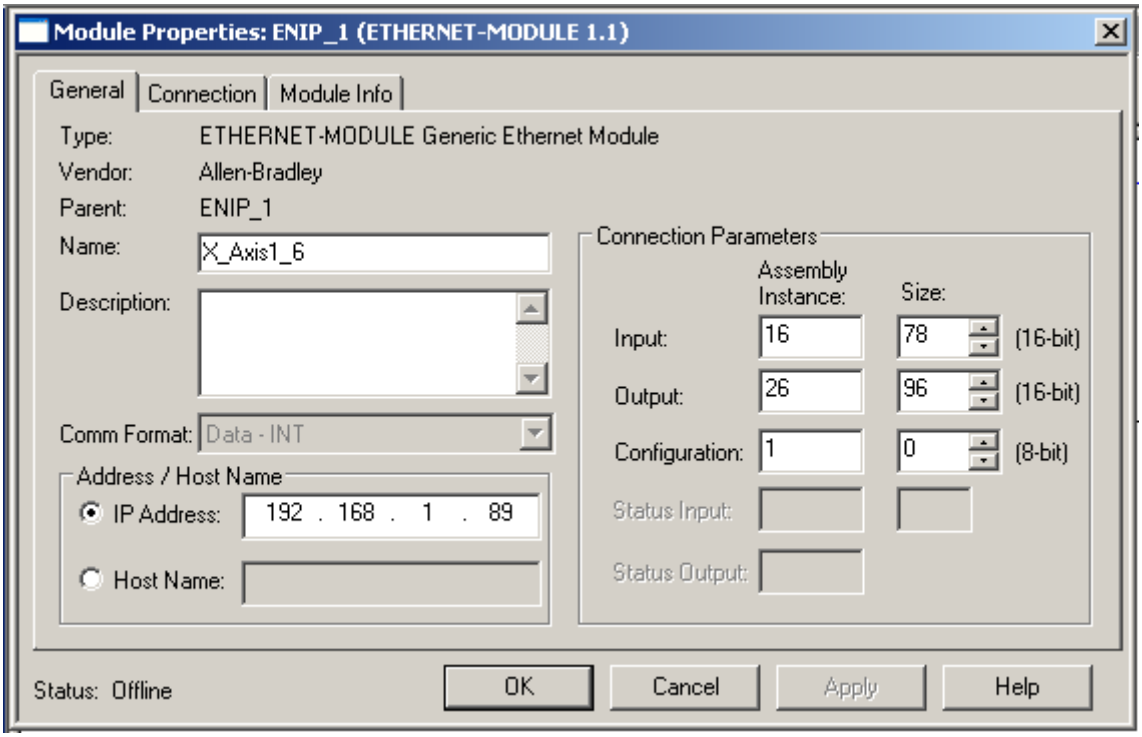
5.2.5 PLC Setup with 5 Axis



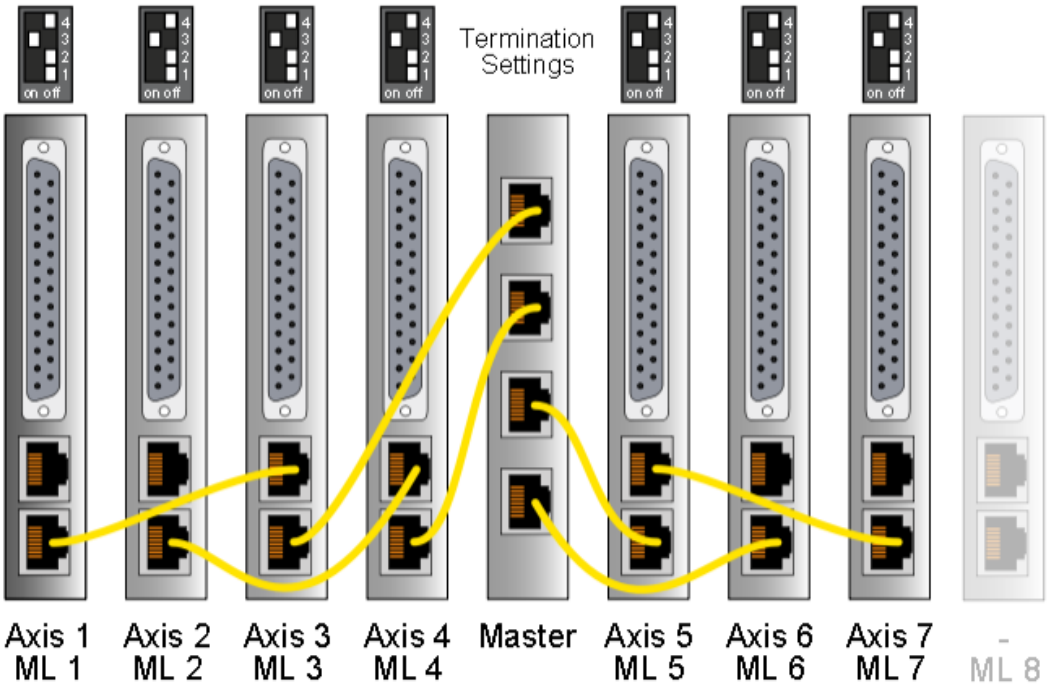


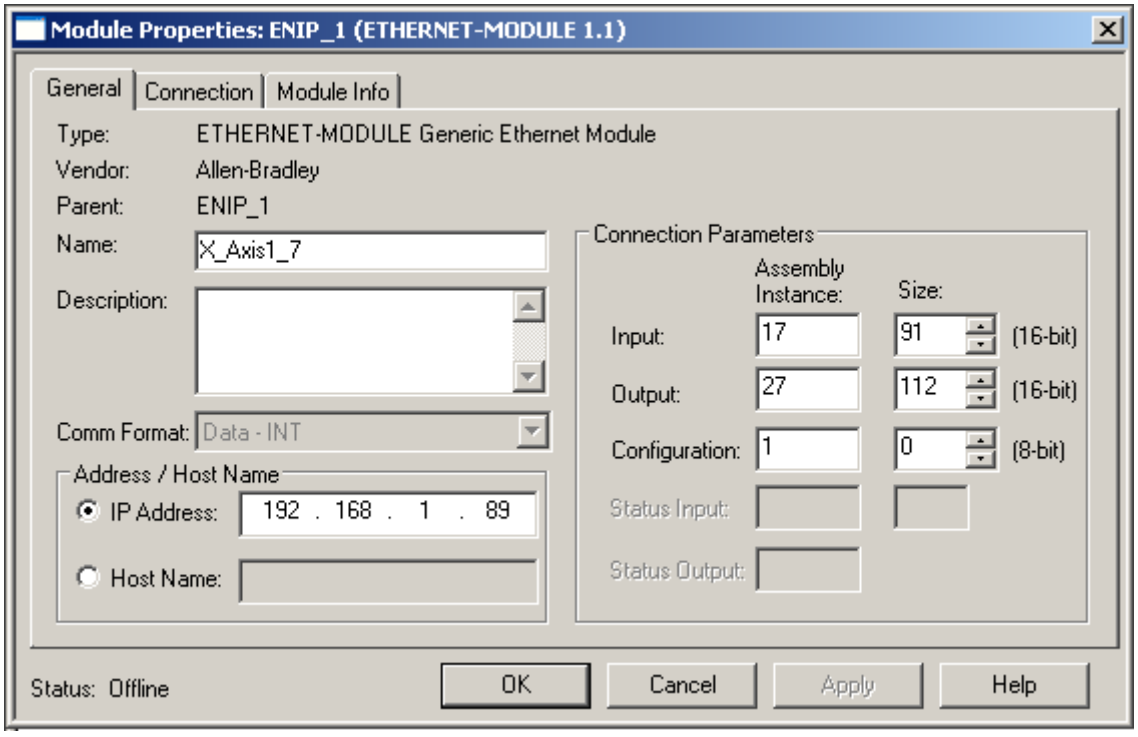
5.2.6 PLC Setup with 6 Axis



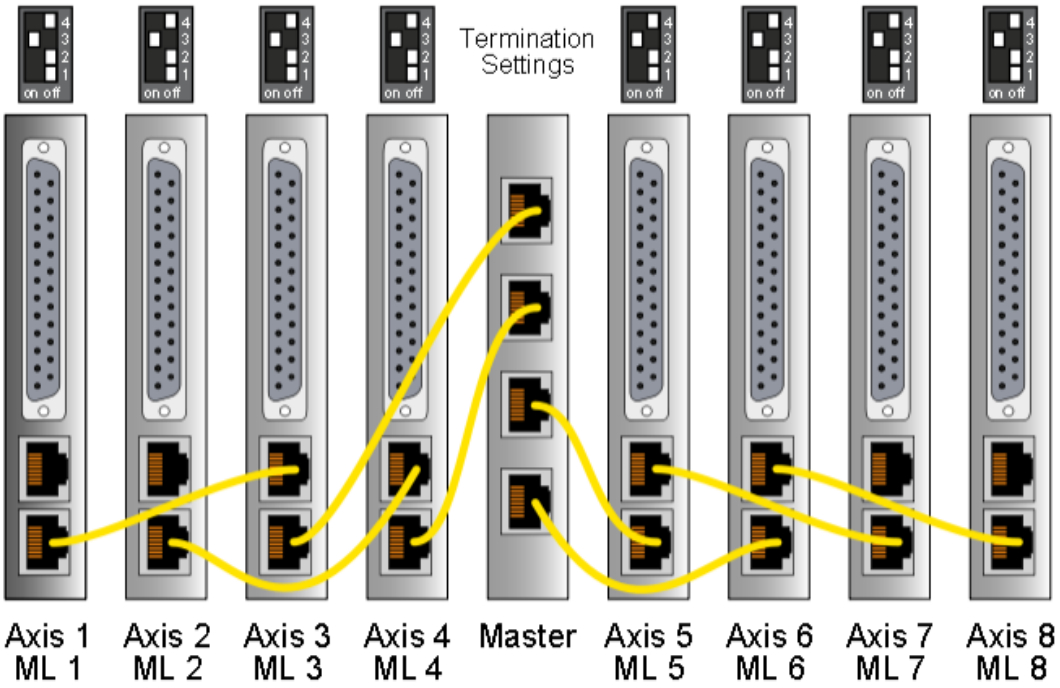


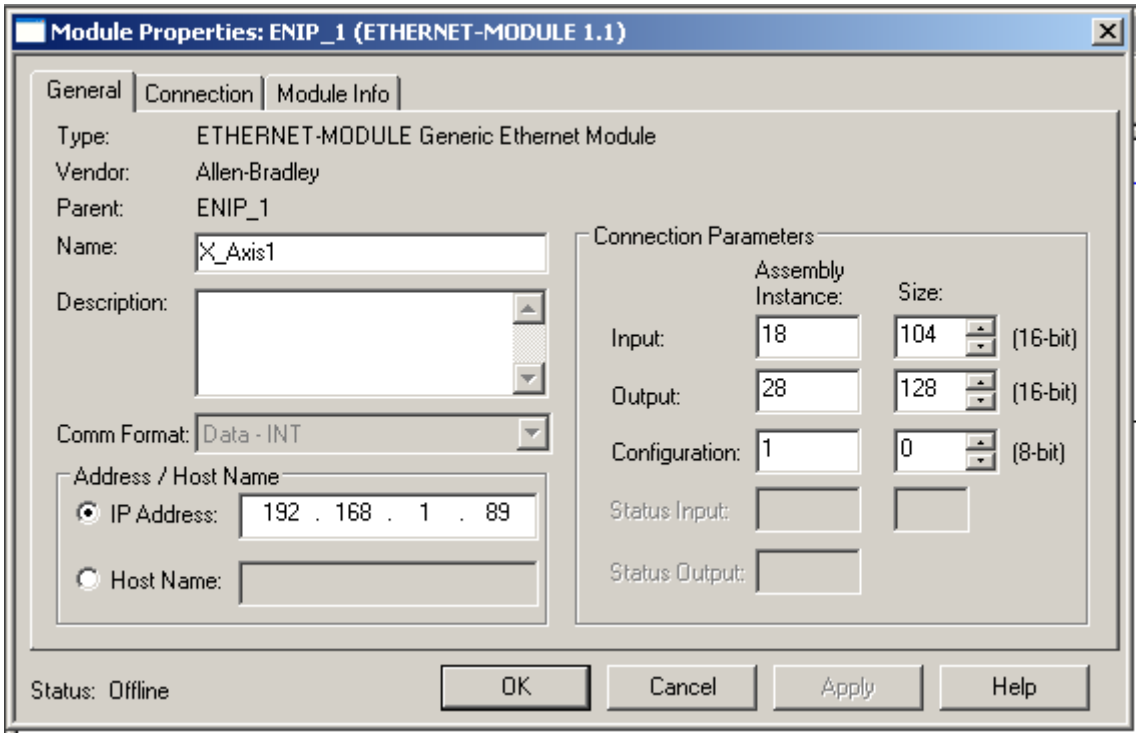
5.2.7 PLC Setup with 7 Axis





5.2.8 PLC Setup with 8 Axis





6 Special Axis Errors for (M)B8050-ML-IP Systems

In some special cases the MC-Link controller modifies the status word and error codes in the process data to the PLC:

Error Codes	Description
0xA0	Axis not present
0xA1	Connection to axis has been lost

These errors are not logged in the ErrorLog of the (M)B8050, since they are not errors generated by that device. The (M)B8050 merely modifies the data sent to the PLC to indicate these errors there.

No Connection

A connection has never been established with the device, e.g. because no device is present or because of faulty cabling.

Process Data from the MC-Link Device to the PLC	Value	Despcription
Axis_x StateVar	0x04A0	Error 0xA0 is indicated
Axis_x StatusWord	0x0088	Error and warning flags are set
Axis_x Warn Word	0x4080	Not Homed and Intf warning flags are set
Axis_x Demand Current	0x0000	Demand current is indicated as 0

Connection Lost

A connection has once been established, but the device doesn't communicate anymore.

Process Data from the MC-Link Device to the PLC	Value	Despcription
Axis_x StateVar	0x04A1	Error 0xA1 is indicated
Axis_x StatusWord	0xXXXX | 0x0008	Last valid value is preserved and error flag is forced
Axis_x Warn Word	0xXXXX | 0x4000	Last valid value is preserved and Intf Warn flag is forced
Axis_x Demand Current	0xXXXX	Last valid value is preserved

7 Contact Addresses

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Phone: 262-743-2555

E-Mail: us-sales@linmot.com
Web: http://www.linmot-usa.com

Please visit http://www.linmot.com/contact to find the distributor closest to you.

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