NETWORK SYSTEM

Devicenet Network

- Devicenet Introduction
- Configure Devicenet Network
- Control devices via Devicenet
- Back up on DeviceNet
- PowerFlex 700S inverter
- Control PowerFlex 700S via devicenet

Ethernet Network

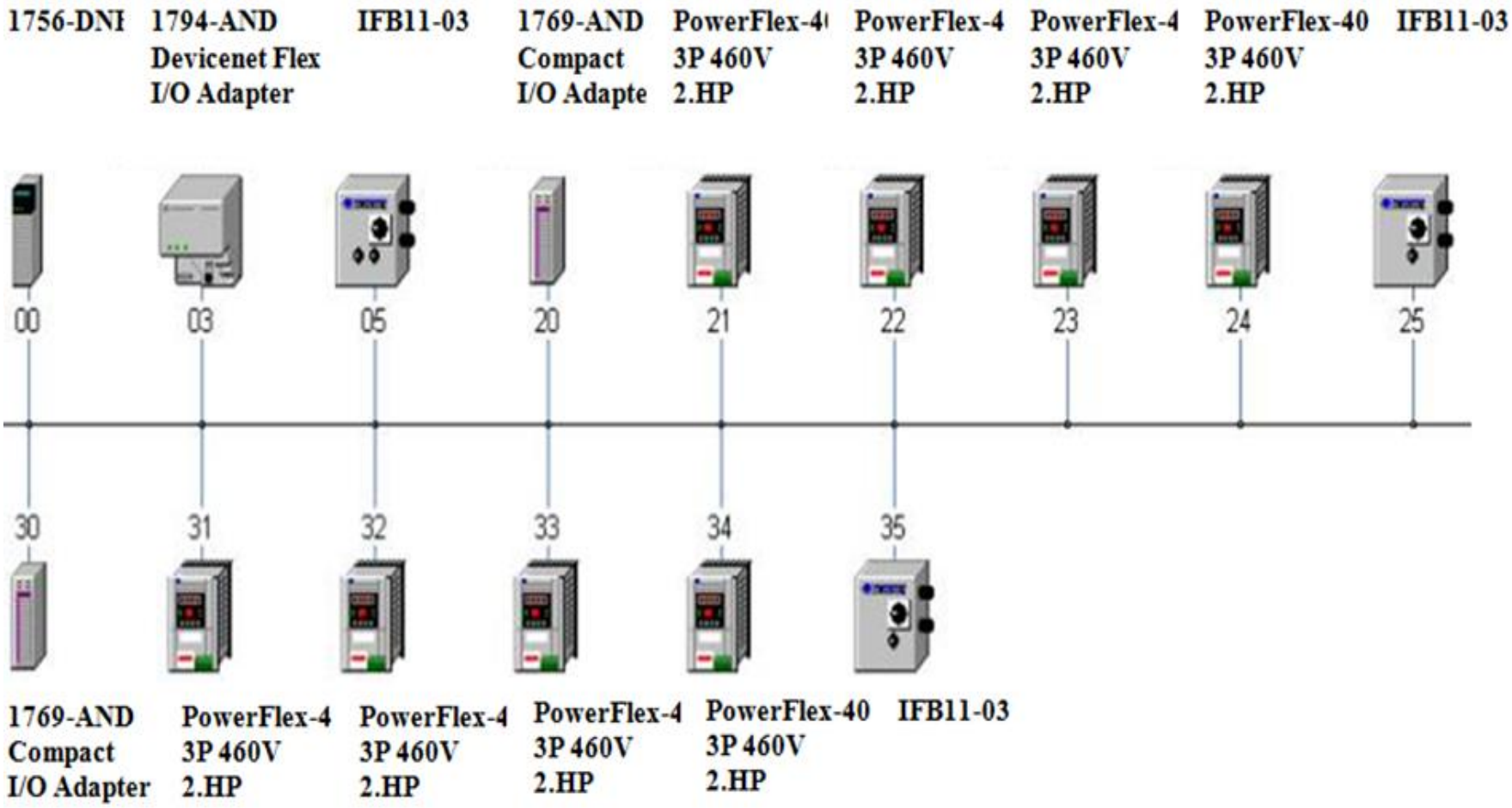
- Ethernet Introduction
- Configure Ethernet Network
- Control devices via Ethernet

ControlNet Network

- ControlNet Overview
- Configure ControlNet Network
- Control devices via ControlNet

DEVICENET NETWORK

DeviceNet Overview

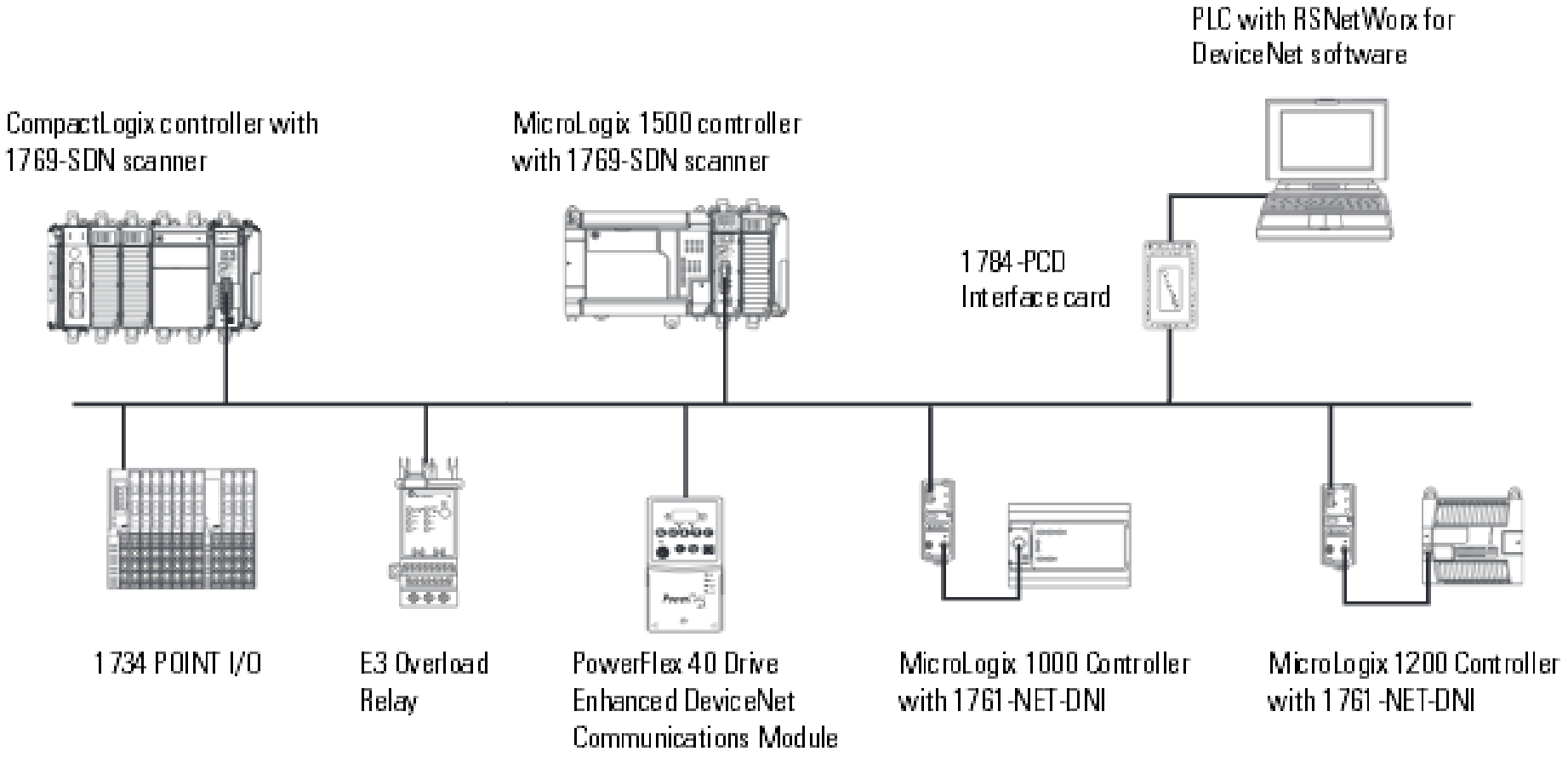


Up to 64 nodes(0-63) in DeviceNet Network

There are one Master and Slaves

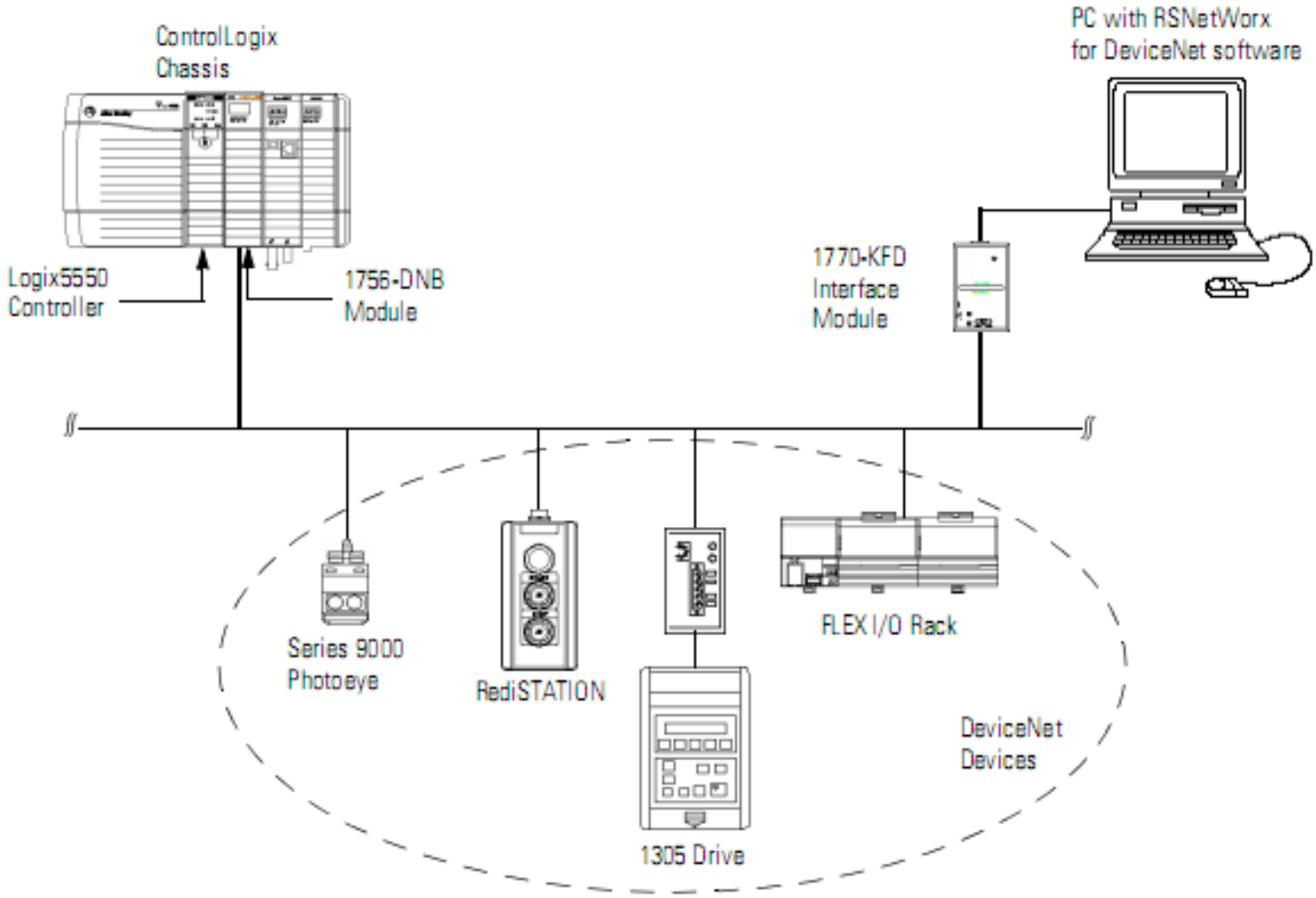
DEVICENET NETWORK

Communication between DeviceNet Devices and CompactLogix via 1769 SDN Module



DEVICENET NETWORK

Communication between DeviceNet Devices and CompactLogix via 1756 DNB Module



DEVICENET NETWORK

DeviceNet Features and Functionality

Network size	Up to 64 nodes
Network Length	125Kbps: 500m 250Kbps: 250m 500Kbps: 100m
Data Packets	0-8 byte
Bus Topology	Linear (trunkline/dropline);power and signal on the same network cable
Bus Addressing	Peer to Peer, MultiMaster hoặc Master/Slave
System Features	Removal and replacement of devices from the network under power

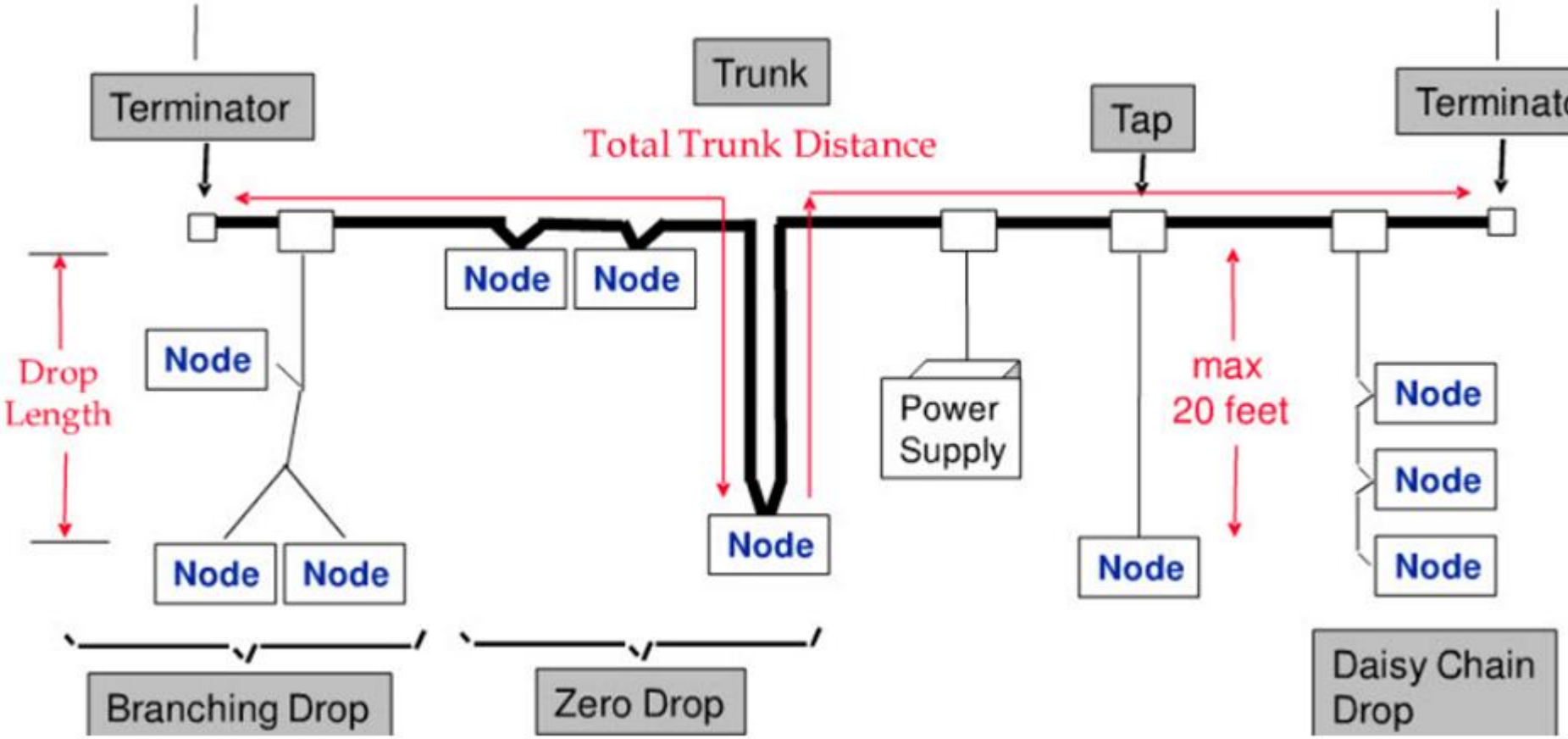
DEVICENET NETWORK

Assign an address to each Devices

Give this device	This address	Notes
Scanner	0	If you have multiple scanners, give them the lowest addresses in sequence (0, 1…).
Any device on the network except the scanner	1…61	• Give the lower addresses to devices with 15 bytes or more of input or output data. • Gaps between addresses are OK and have no effect on system performance. If you are uncertain of the final lay-out of your system, leave gaps between addresses. This gives you some flexibility as you develop your system.
Computer interface to the network	62	If you connect a computer directly to the DeviceNet network, use address 62 for the computer. • Many computer interface devices use this address as their default. • The 1784-U2DN device can connect a computer directly to a DeviceNet network.
No device	63	Always leave address 63 open. Out of the box, most DeviceNet devices are preset for address 63. • Some devices have no switches or push button to set the address. They require software, such as RSNetWorx for DeviceNet software to change the address. This means that you must first place it on the network at its preset address of 63 before you can change the address. • If another device is already using address 63, there will be an address conflict and you won't be able to communicate with the newly connected device. • Leaving address 63 open makes it possible to configure a new device. • The auto-address recovery feature also requires address 63 to be open.

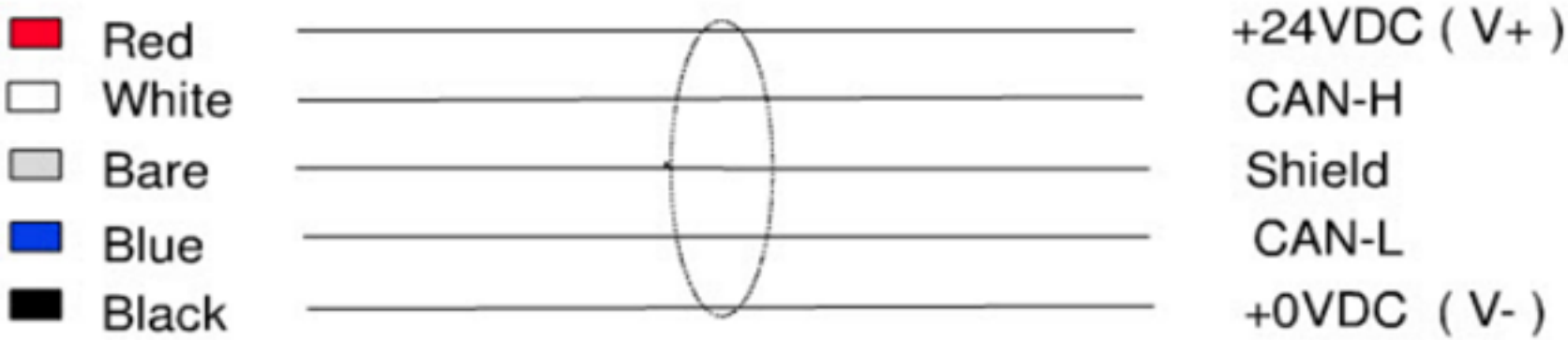
DEVICENET NETWORK

Bus Topology



DEVICENET NETWORK

DeviceNet Cable

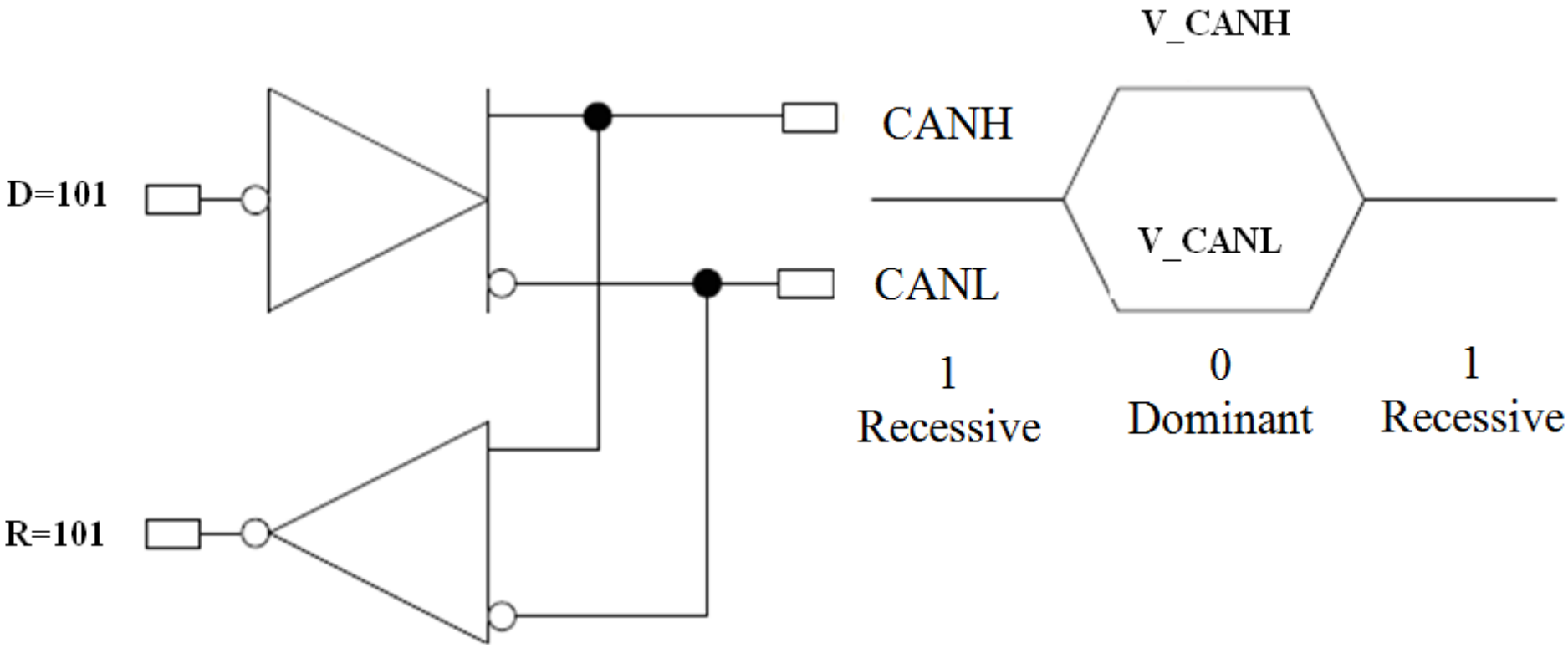


DeviceNet Cable specifications

- 5 conductors, 1 pair of 24volts DC Power, 1 pair for can communication, one shield.
- Maximum current for 24 volts power DC is 3 amps.

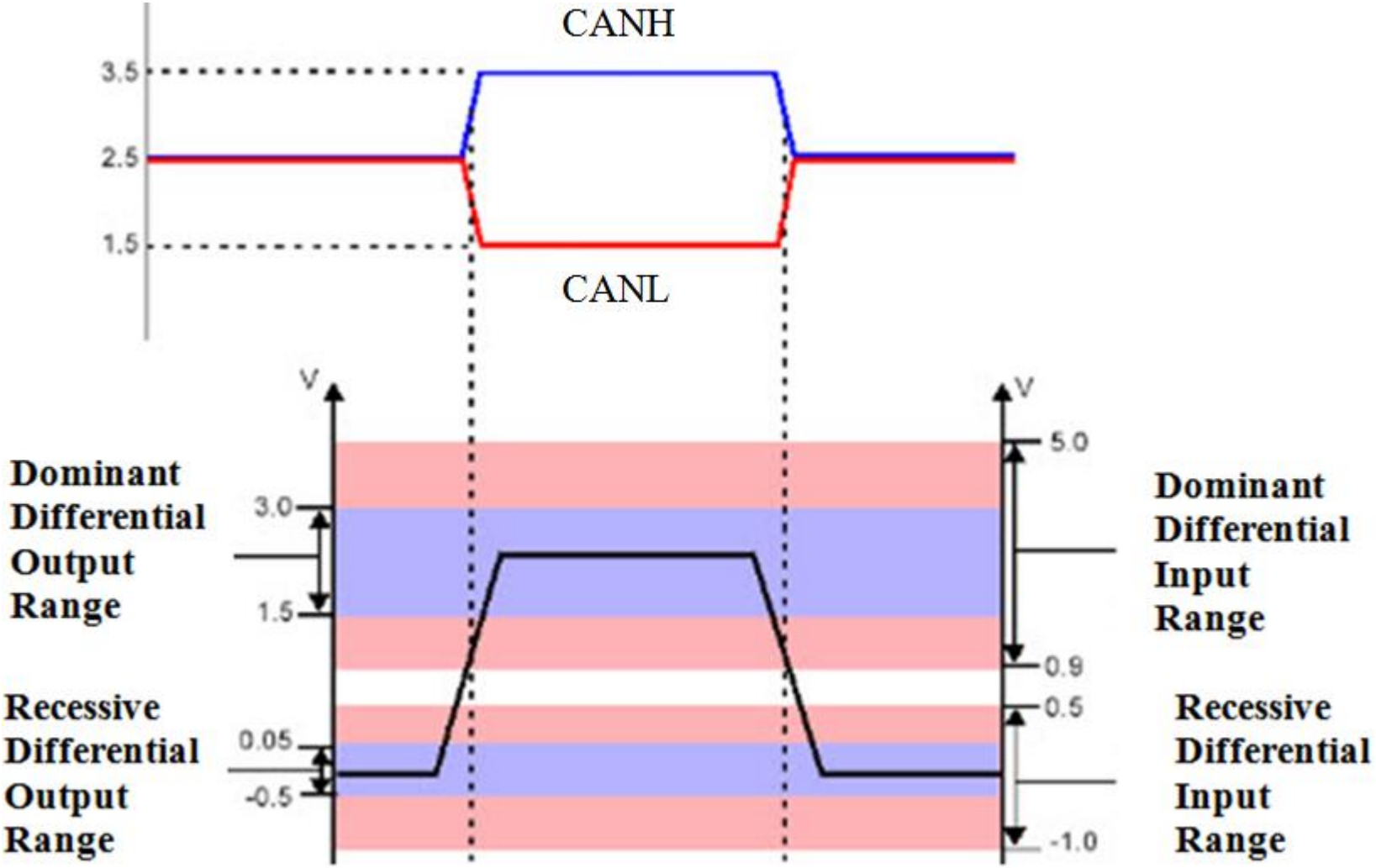
DEVICENET NETWORK

The Inverted Logic of DeviceNet Bus



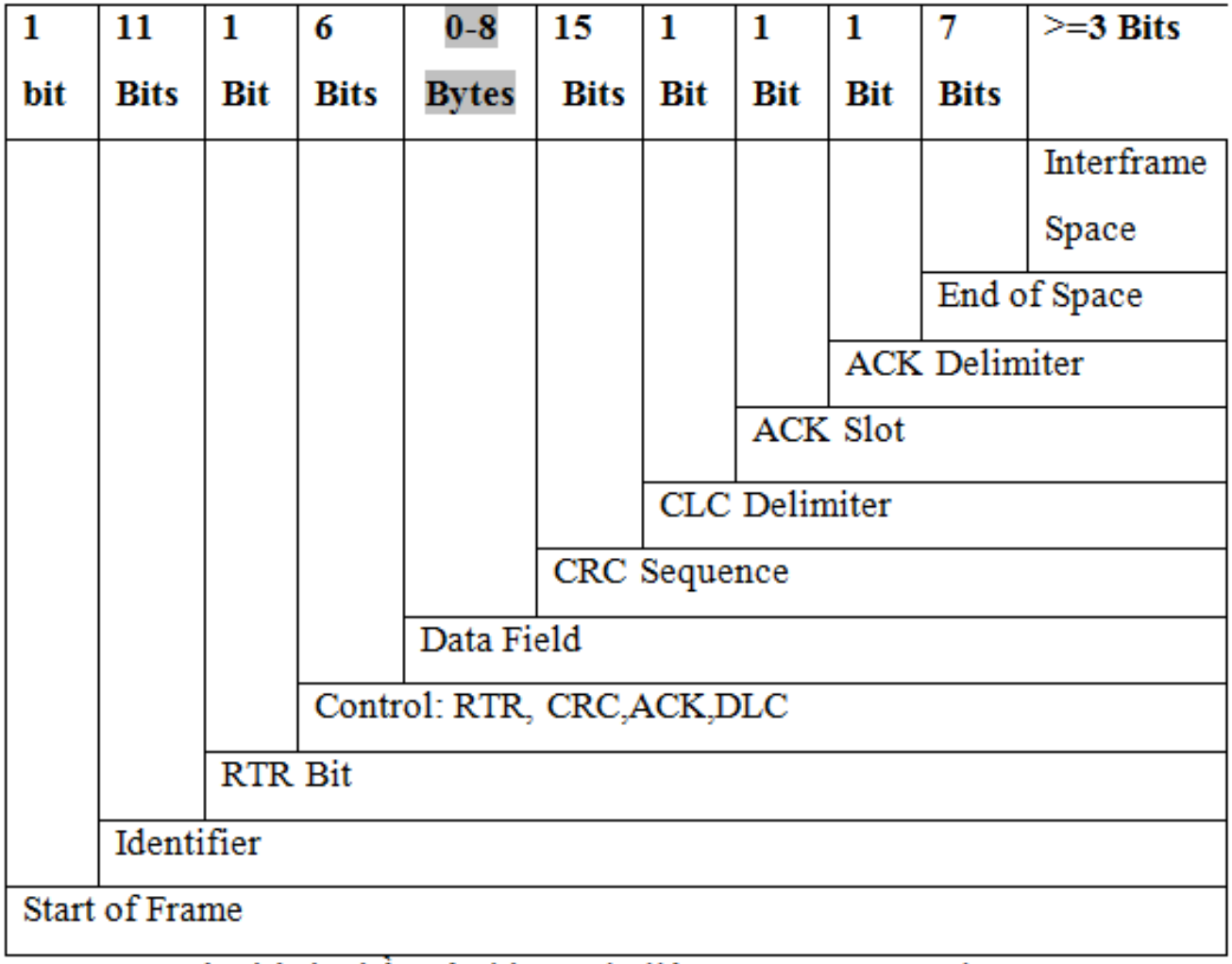
DEVICENET NETWORK

The Inverted Logic of a DeviceNet Bus



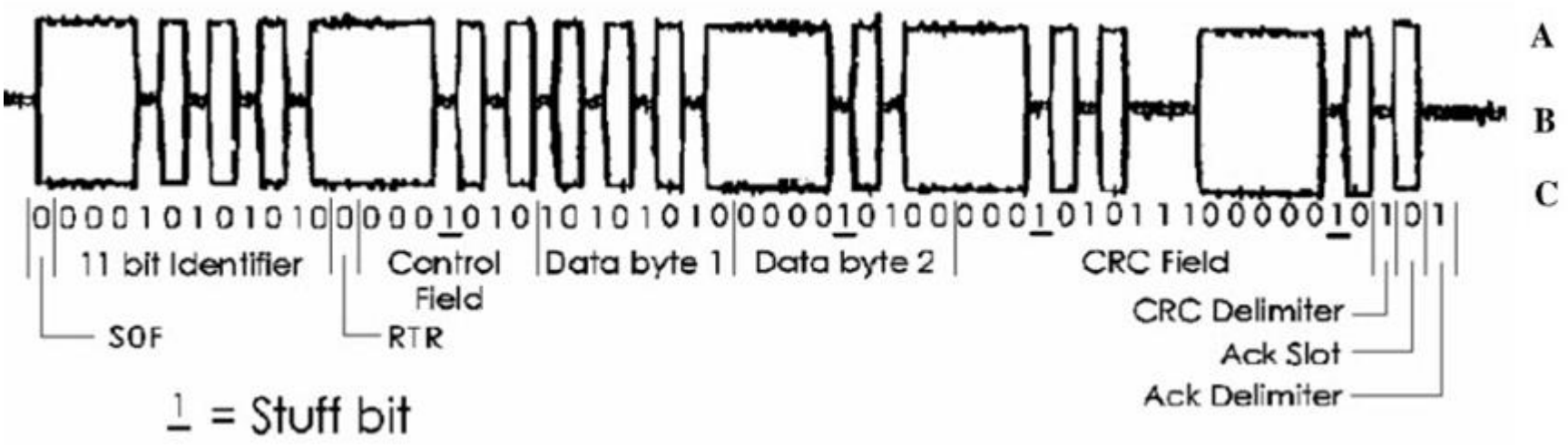
DEVICENET NETWORK

DeviceNet Data Frame



DEVICENET NETWORK

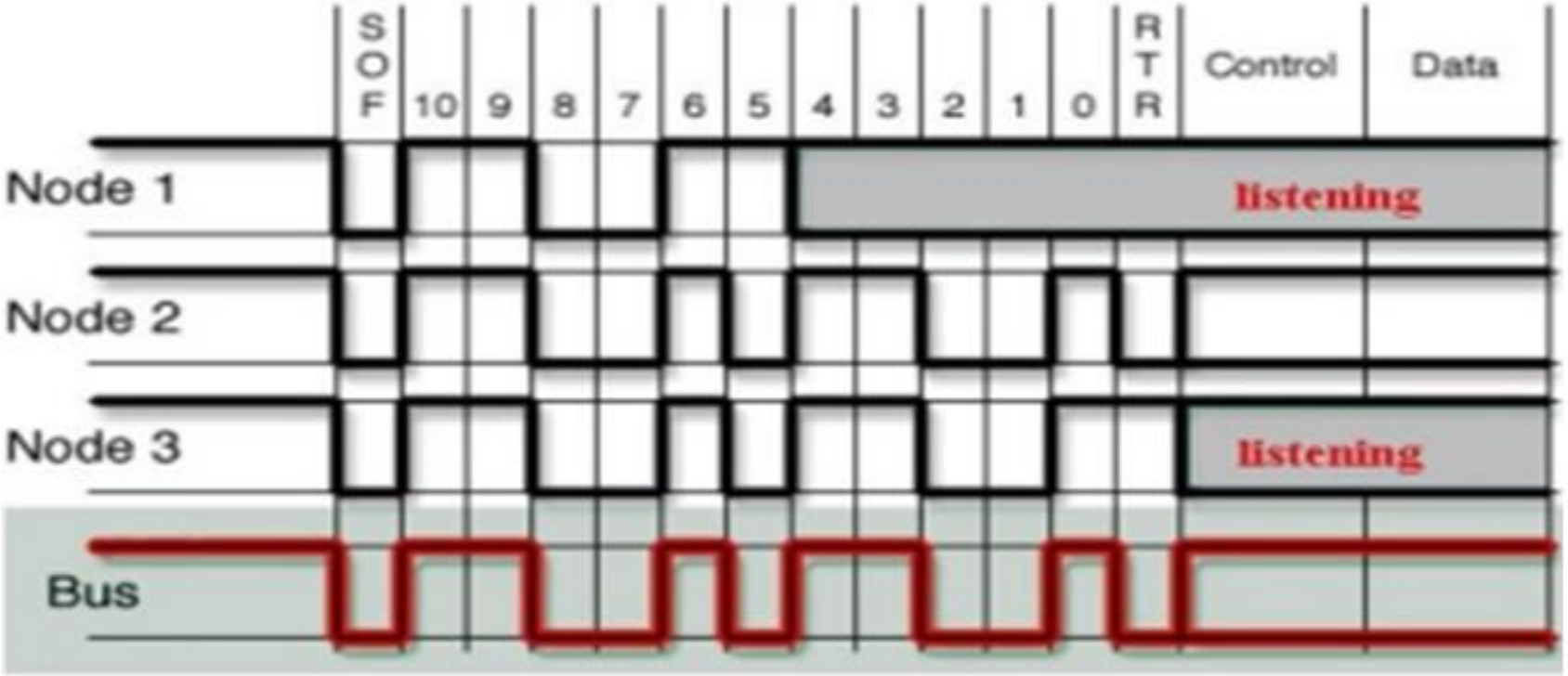
Logic State of Data Frame



Identifier field *and* ***RTR bit*** *are used to identify which node has right to access bus*

DEVICENET NETWORK

Arbitration of DeviceNet Bus



If a node transmitting a recessive bit receives a dominant bit while sending **the arbitration field**, it stops transmitting

The winner of all nodes transmitting simultaneously is the one with the **lowest-numbered 11-bit identifier**

DEVICENET NETWORK MESSAGES

DeviceNet supports two types of messaging: **Explicit Messaging** and **I/O Messaging**

Explicit Messages: Used between two devices for configuration and diagnostic data transfer. They are low priority and not time-critical.

I/O Messages is time-critical and have high priority

Basic Format of Explicit Messages

Destination node address	Service code	Class ID	Instance ID	Attribute ID	Data

Destination Node Address: The node address of the Unit that is sending the explicit messages (commands)

Service Code, Class ID, Instance ID, Attribute ID: The parameters used for specifying the command, processing object, and processing content.

EXPLICIT MESSAGES

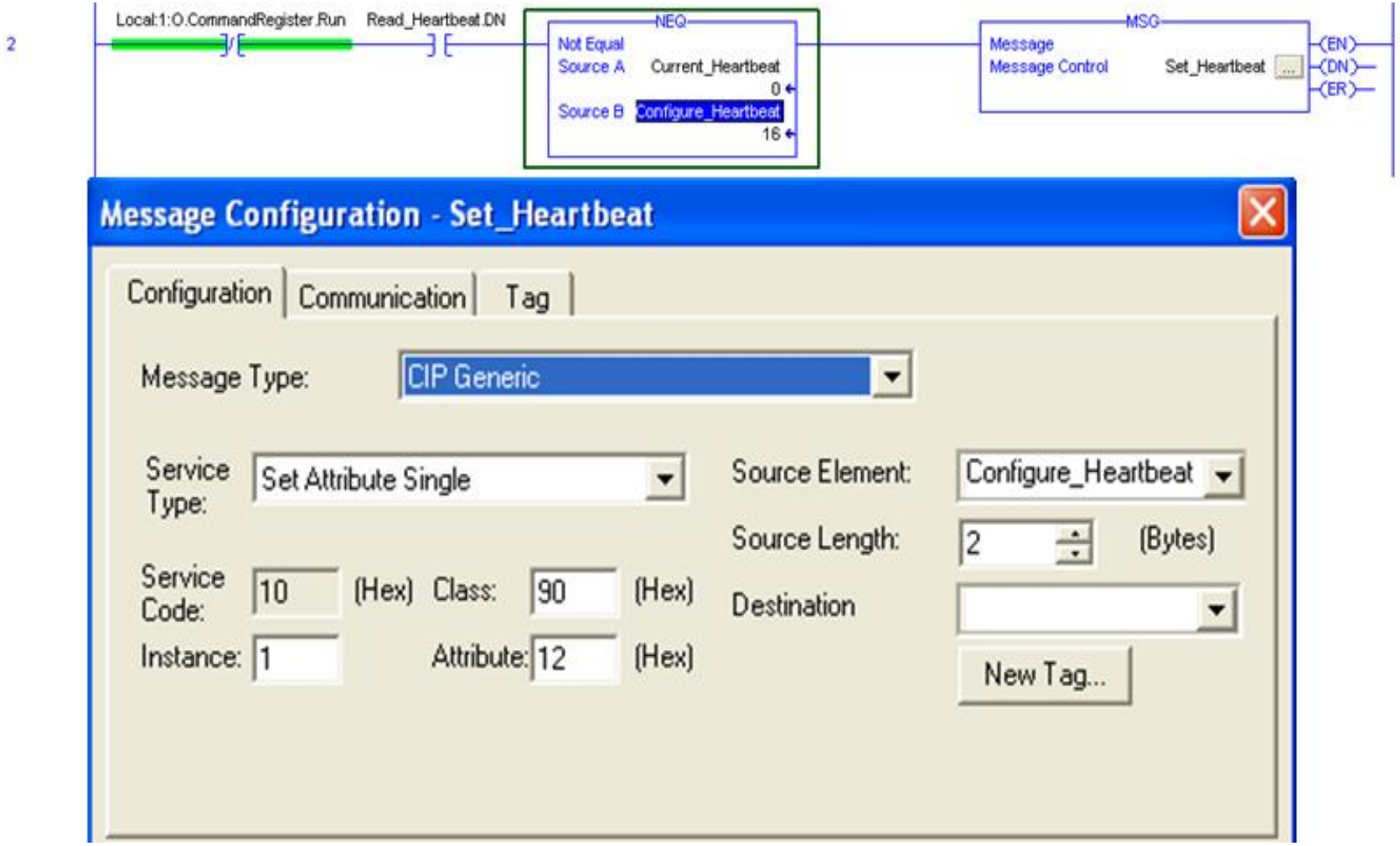
Service Code, Class ID, Instance ID, Attribute ID of Devices

Service Code	Class ID	Instance ID	Attribute ID	Description
0E Hex	01	01	01	Get Vendor ID
0E Hex	01	01	02	Get Device Type
0E Hex	01	01	03	Get Product Code
0E Hex	01	01	04	Get Revision
0E Hex	01	01	05	Get Status
0E Hex	01	01	06	Get Serial Number
0E Hex	01	01	07	Get Product Name
0E Hex	03	01	01	Get MAC ID
0E Hex	03	01	02	Get Baudrate
10 Hex				Set MAC ID
10 Hex				Set Baudrate
10 Hex	**90**	**01**	**12**	**Set Heartbeat to a device**
0E Hex	**90**	**01**	**12**	**Read Heartbeat from a device**
05 Hex				Reset Device

If we know Service, Class, Instance and Attribute of Devices, we can access any data of devices.

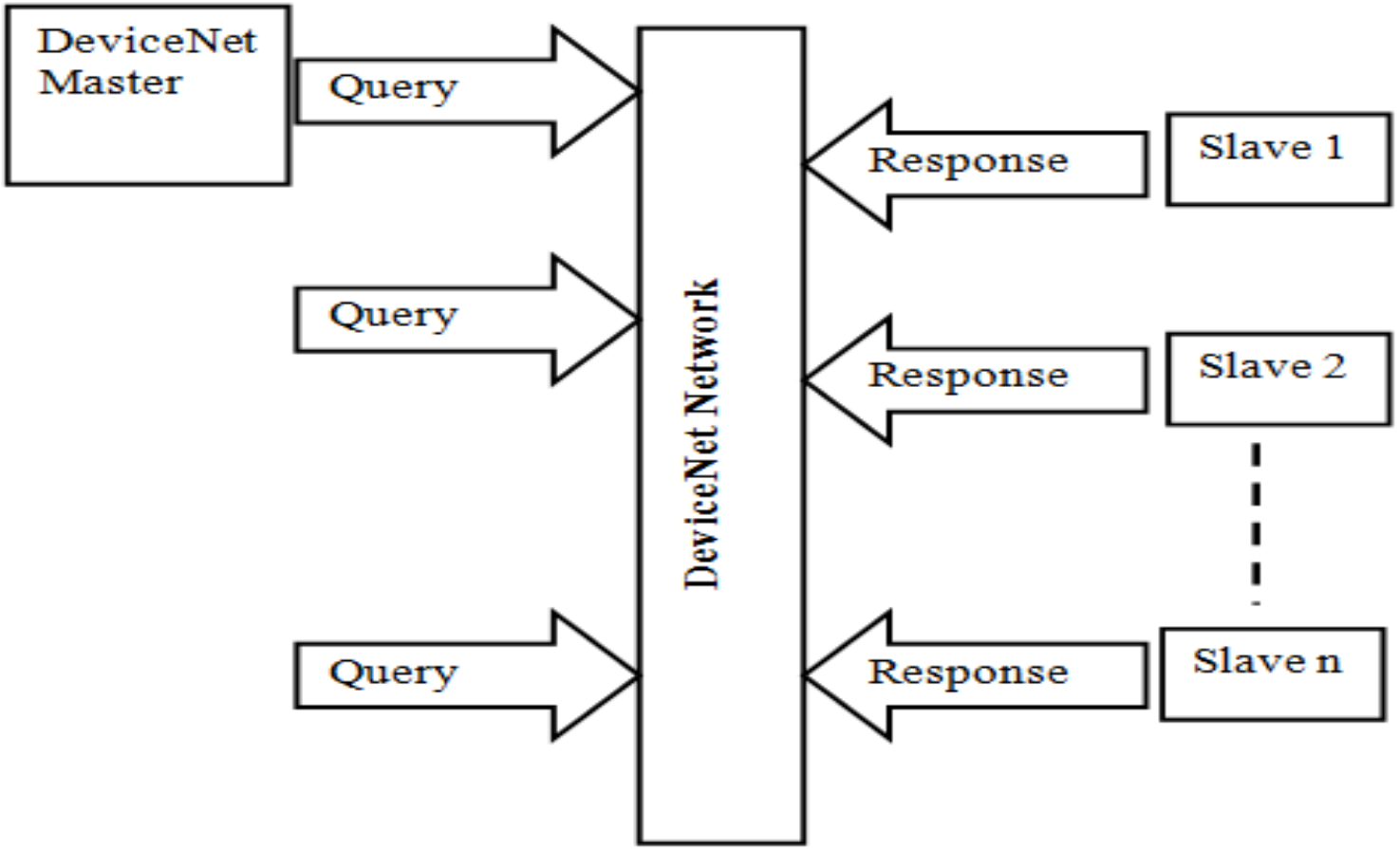
EXPLICIT MESSAGES

Setting heartbeat for Device using Service Code, Class Code, Instance Code and Attribute Code



I/O MESSAGES

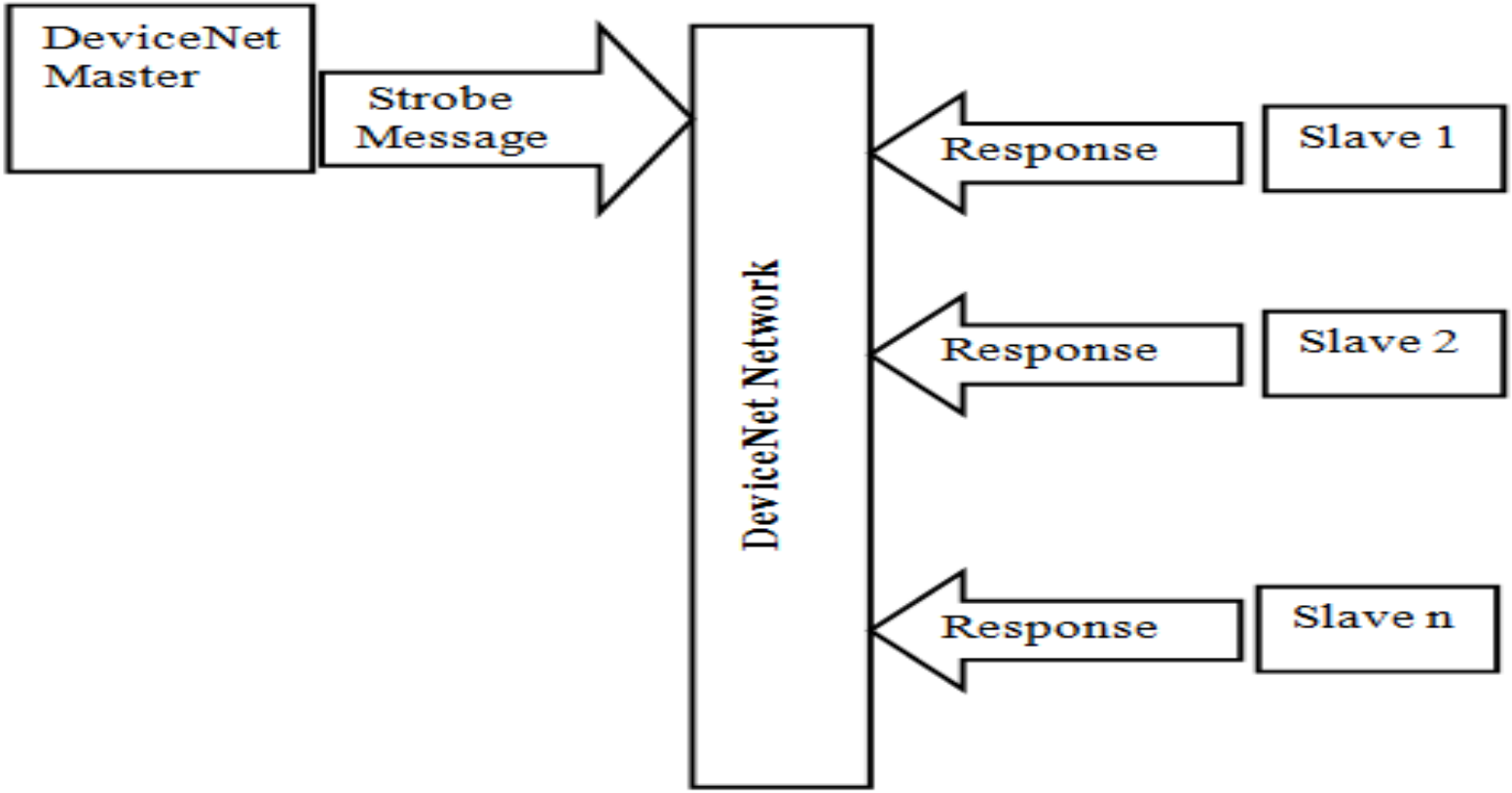
Polled I/O Messages: Master Scanner automatically sends a message containing outputs to each slave with a connection configured for polling. The slave sends back a response containing input data. Polling therefore requires 2 messages to update the I/O data for each polled device



Polling is the most accurate but least efficient method of updating I/O data

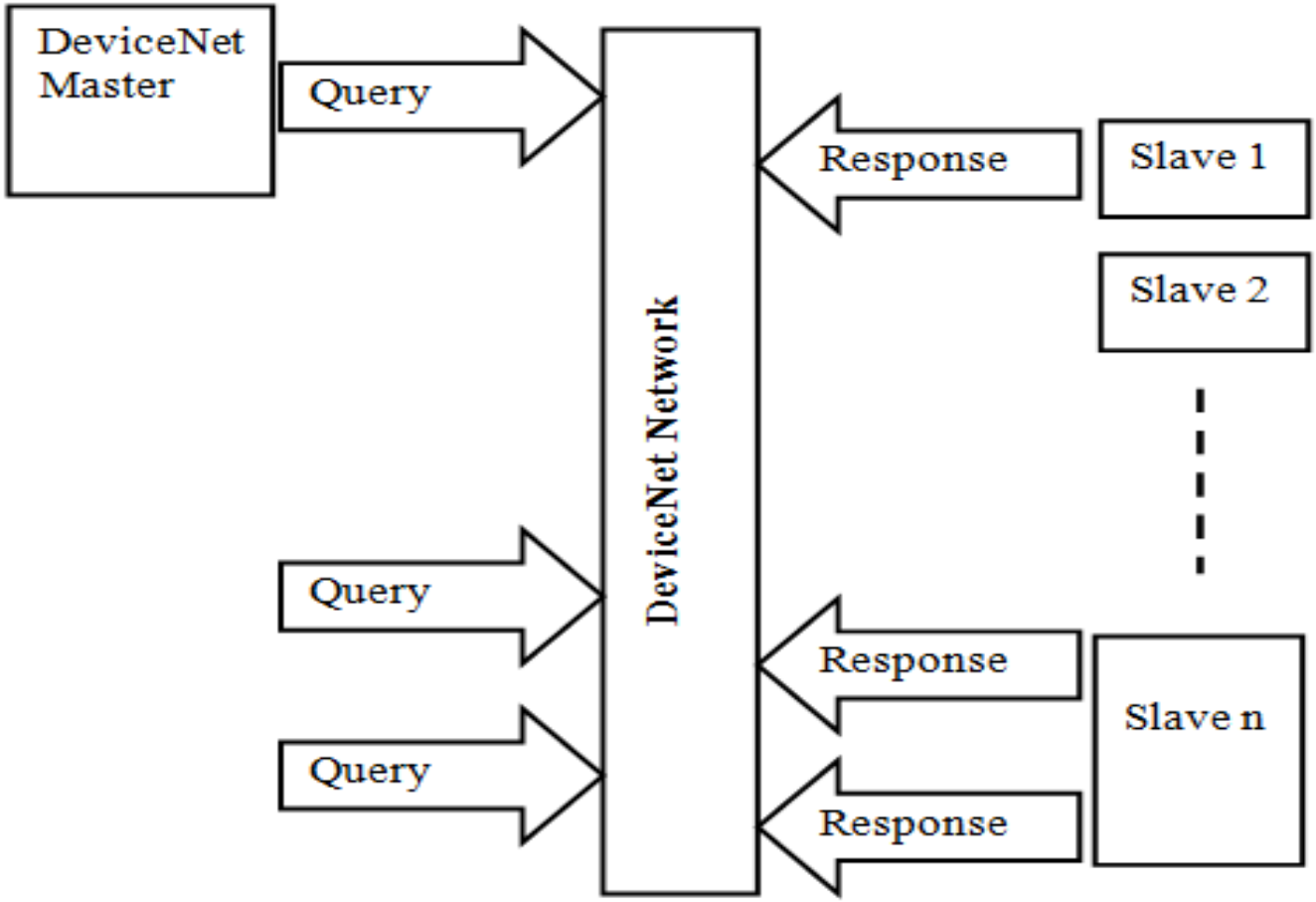
I/O MESSAGE

Strobed I/O Messages: The master produces a single Strobe request message that is consumed by all devices with a connection configured for strobing, requesting their current status. This occurs at the rate selected using the Scan Interval parameter of the DeviceNet Master Module



I/O MESSAGES

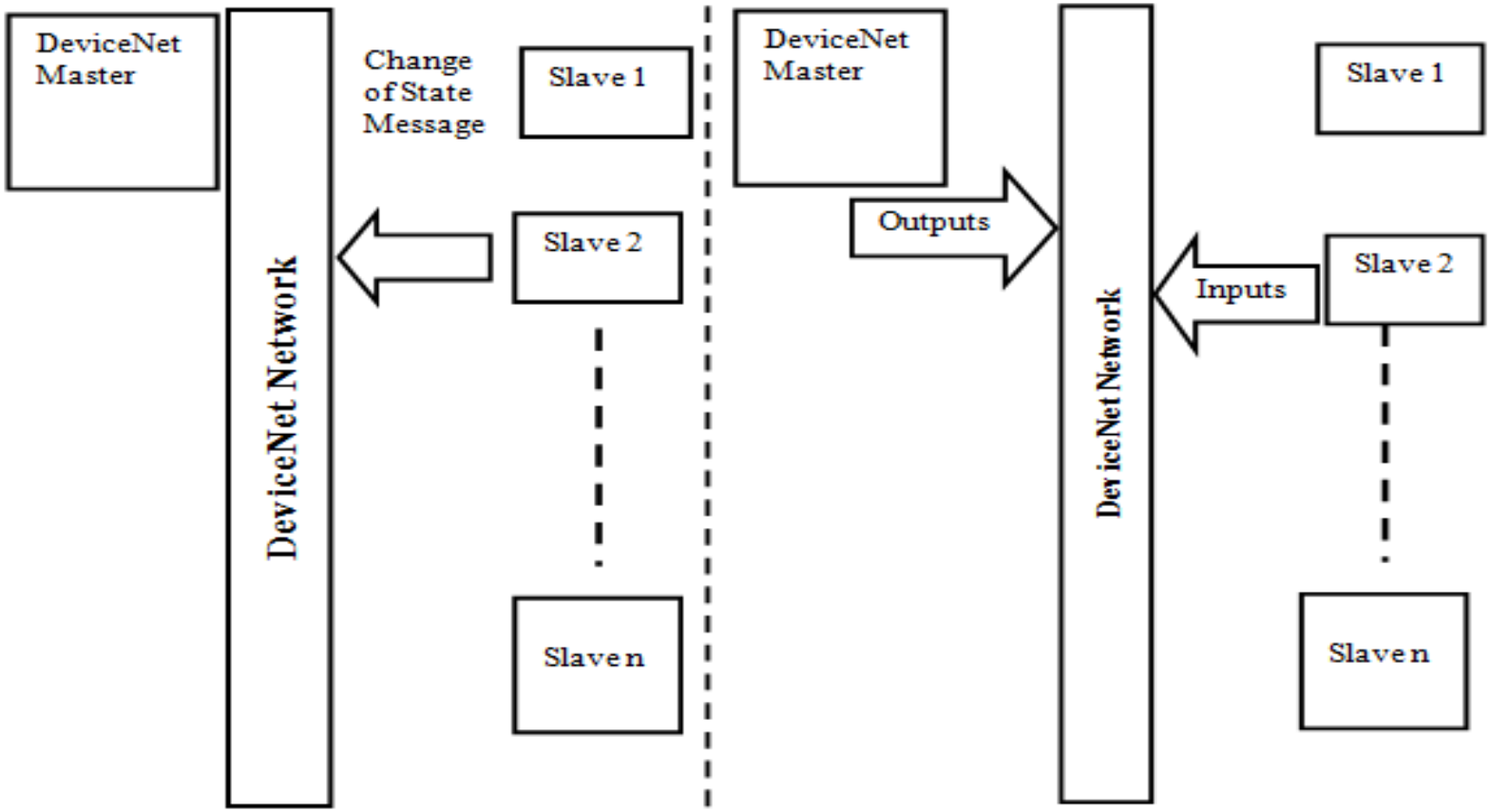
Cyclic I/O Messages: The Master Scanner automatically sends a message containing outputs to a device with a connection configured for Cyclic update. The device sends back a response containing input data



Unlike Polled messaging, Cyclic messaging can use a different interval as configured for each slave

I/O MESSAGE

COS I/O Messages: A connection configured for **Change-of-State** (COS) I/O Messaging is activated only when the device sends a message to the master, reporting a change of status. The master then sends an output message to the device and the device responds with its input data

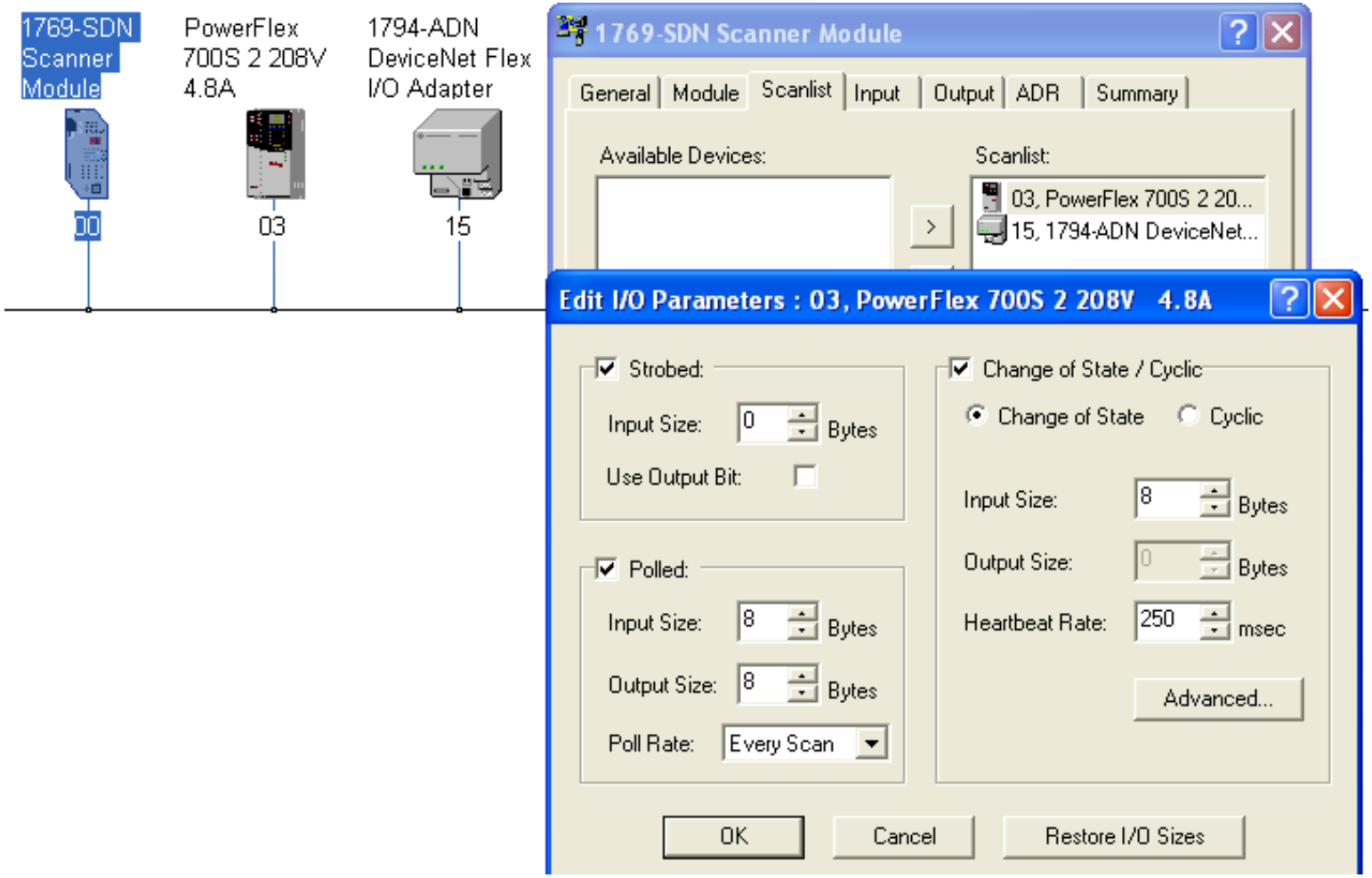


Devices Produces Change of State Message

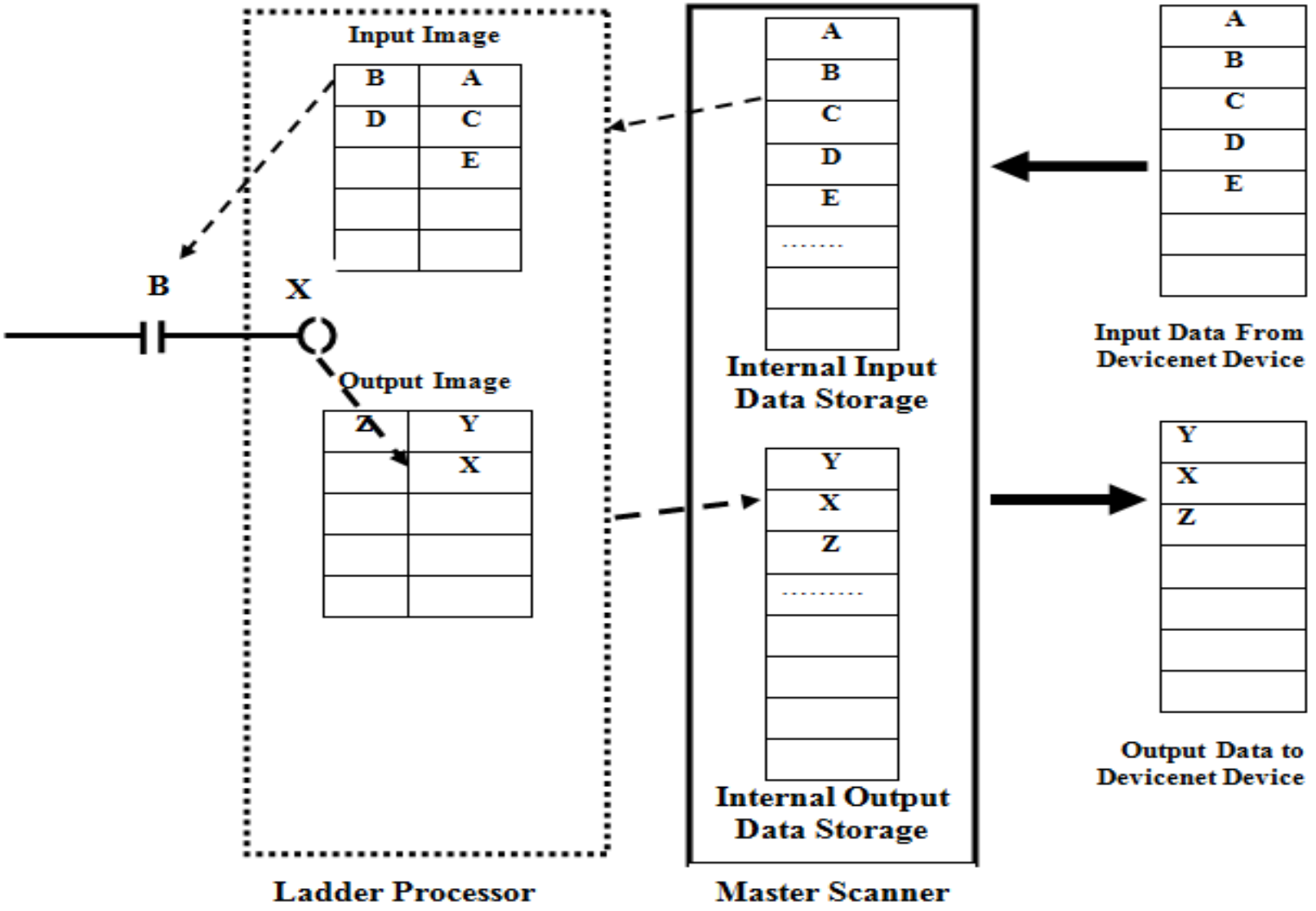
Master sends Outputs, Devices Replies

I/O MESSAGE

Selecting I/O message to transfer between Master and Slave

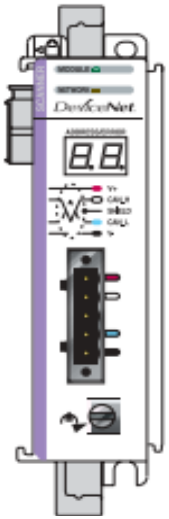


MASTER SCANER DATA FLOW



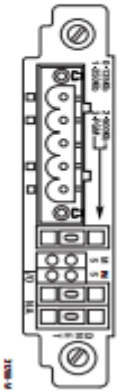
MASTER SCANNER

CompactLogix™ Scanner 1769-SDN



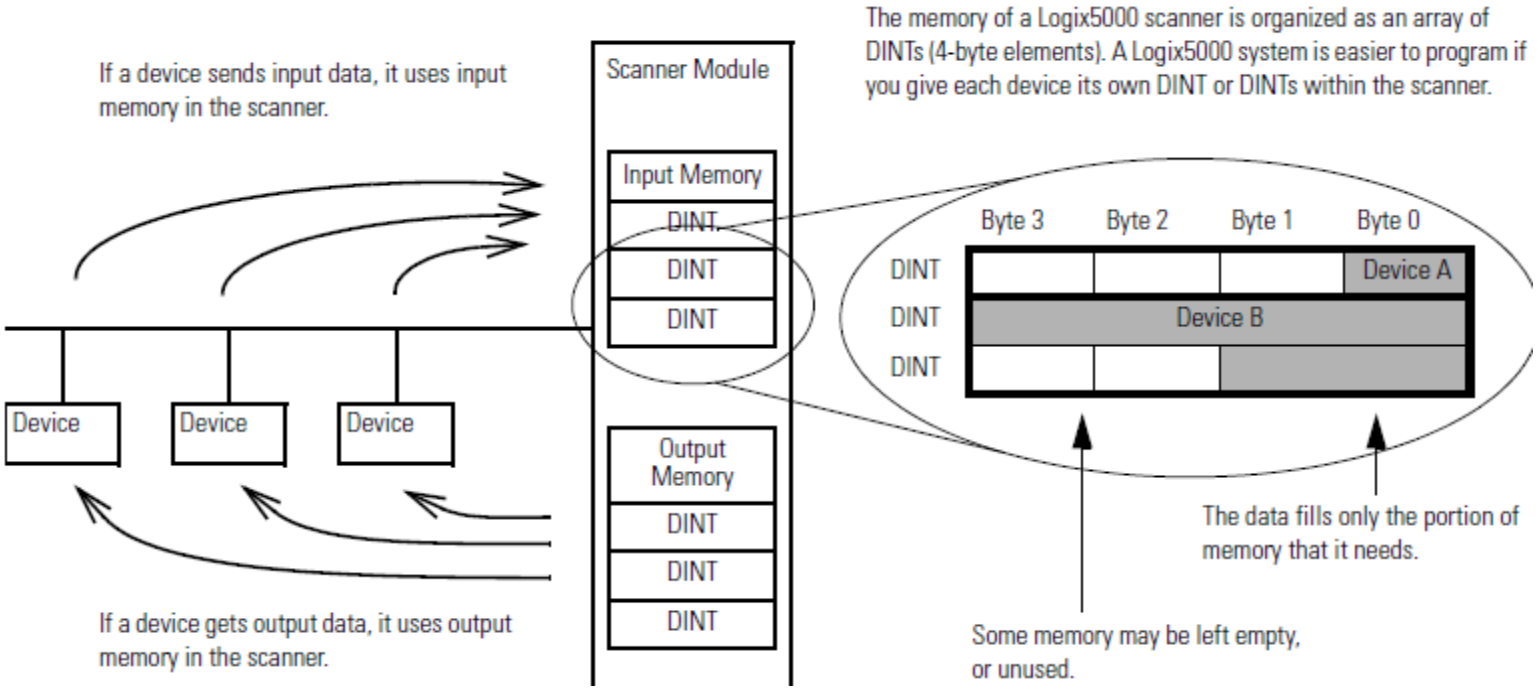
ControlLogix® Scanner 1756-DNB

DriveLogix™ and FlexLogix™ Communication Card 1788-DNBO



EtherNet/IP to DeviceNet Linking Device 1788-EN2DN

SCANNER MEMORY



Check the I/O Limits of the Scanner

Once you tally the input and output data for the network, make sure it is within the limits of the scanner. If they exceed the limits, use multiple scanners.

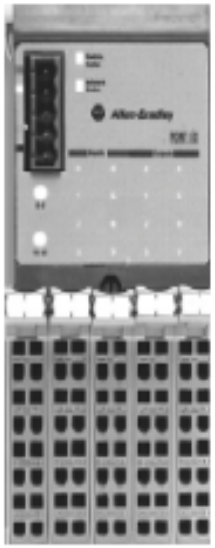
Scanner	Maximum input data (DINTs)	Maximum output data (DINTs)
1756-DNB	124	123
1769-SDN	90	90
1788-CN2DN	124	123
1788-EN2DN	124	123
1788-DNBO	124	123

DEVICENET SLAVES

POINT™ I/O Interface
1734-PDN

POINT™ I/O Adapter
1734-ADN and 1734-ADNX

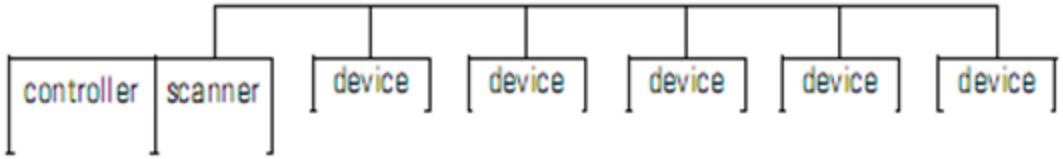
POINT™Block I/O Module
1734D



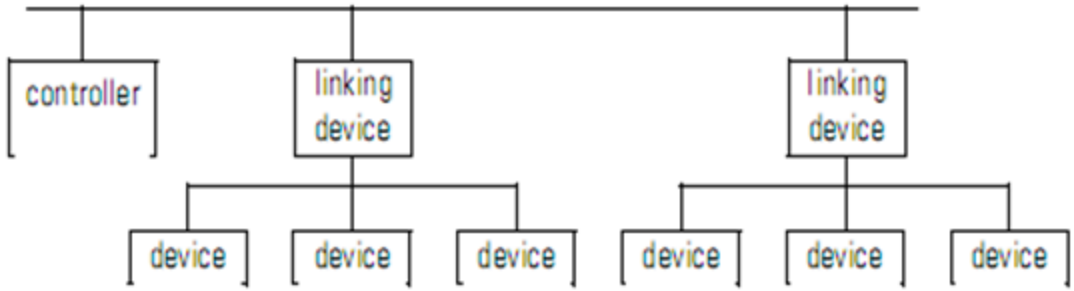
FLEX™ I/O Adapter
1794-ADN

DEVICENET NETWORK CONFIGURATION

- 1. Choose whether to use a single network or several distributed networks.
  - single network



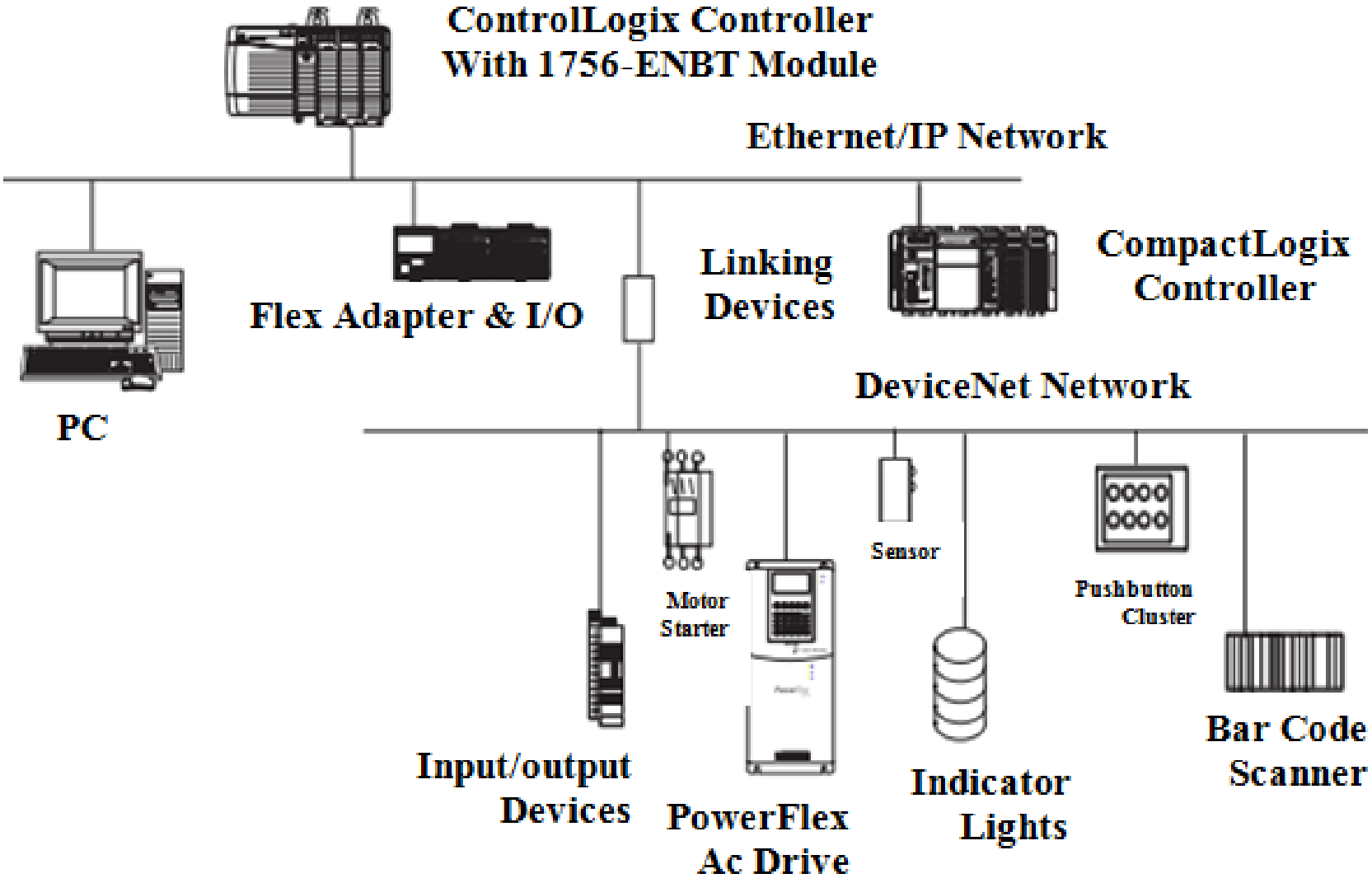
  - several smaller distributed networks (subnets)



- 2. Choose a scanner.

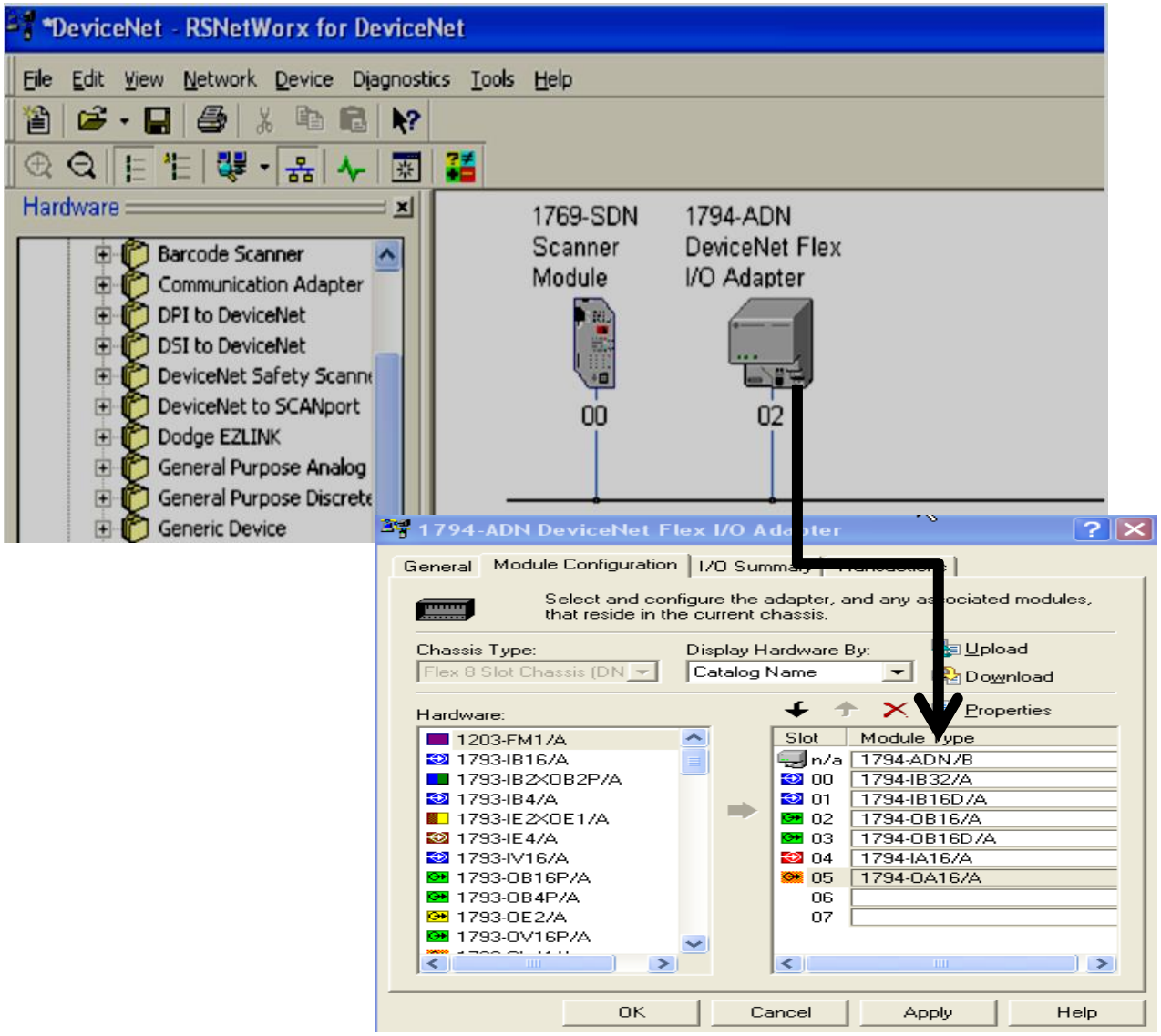
If you are using:	And the main network is:	Use this scanner:
single network	→	Corresponding scanner for your controller
subnets	EtherNet/IP	EtherNet/IP to DeviceNet Linking Device 1788-EN2DN
	ControlNet™	ControlNet to DeviceNet Linking Device 1788-CN2DN

DEVICENET NETWORK CONFIGURATION



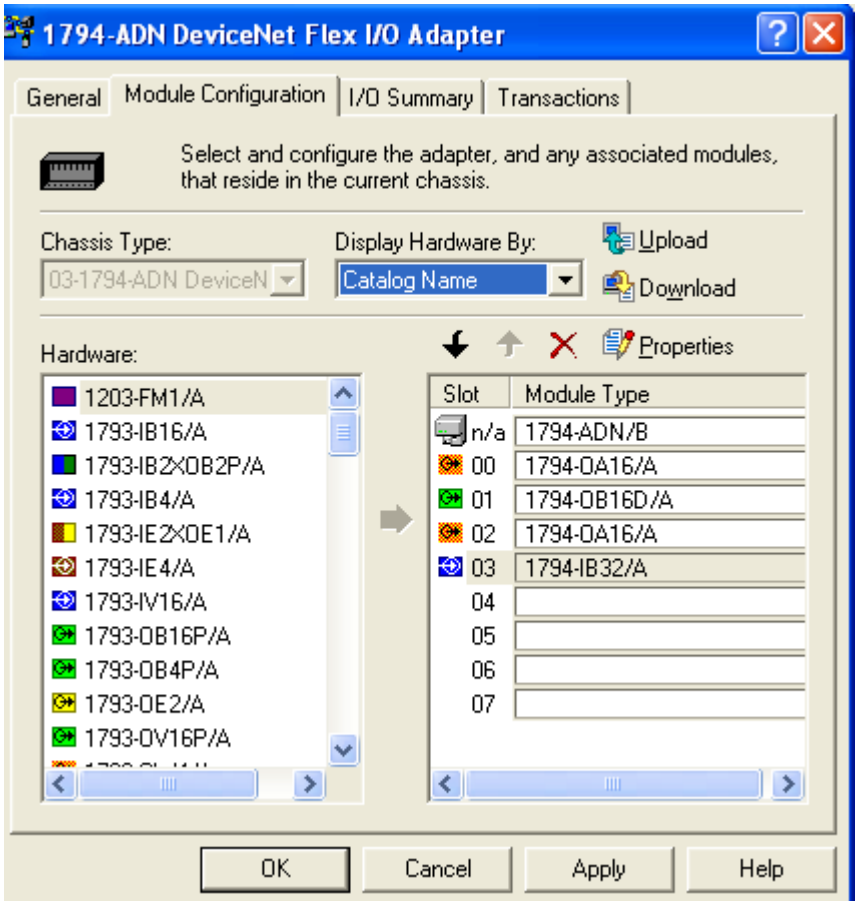
DEVICENET NETWORK CONFIGURATION

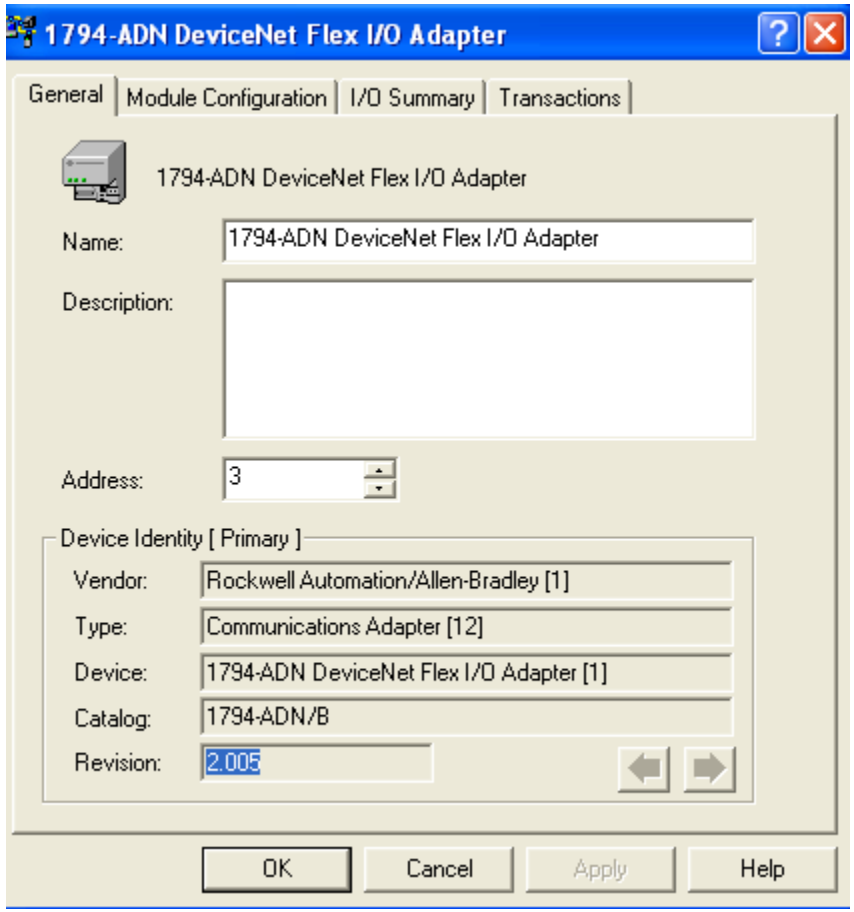
Configure I/O modules for Slaves by RSnetwork for Devicenet



DEVICENET NETWORK CONFIGURATION

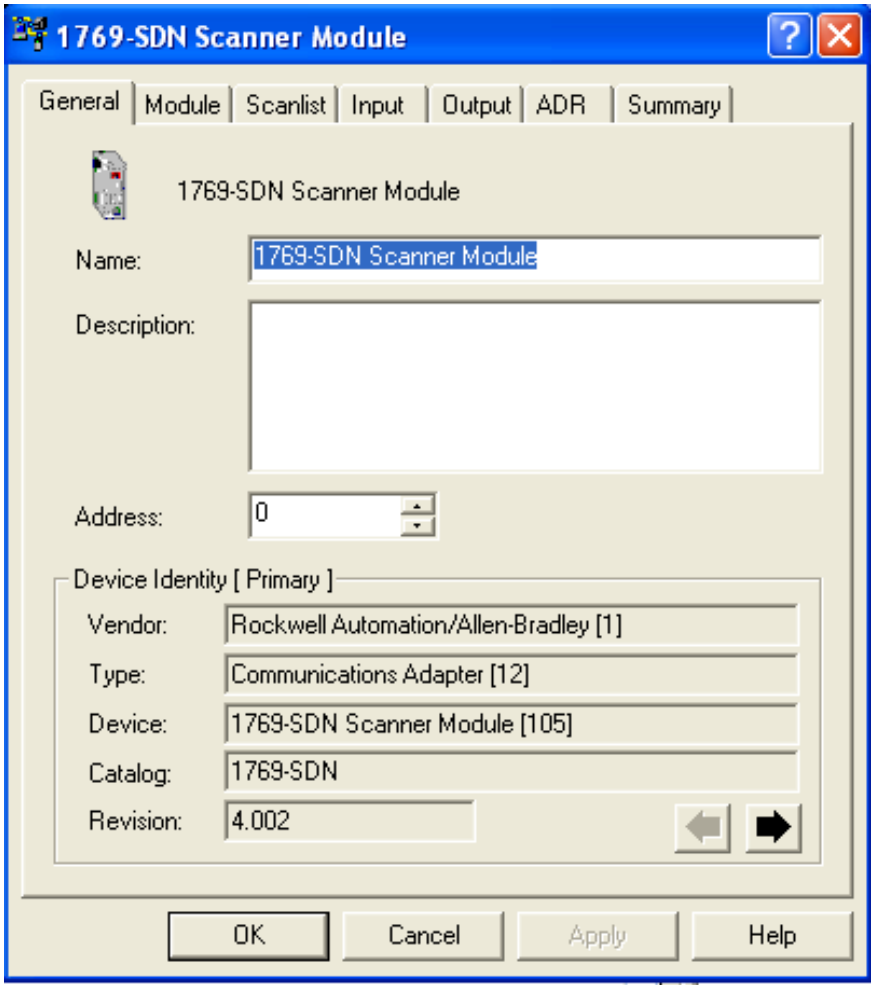
Configure offline





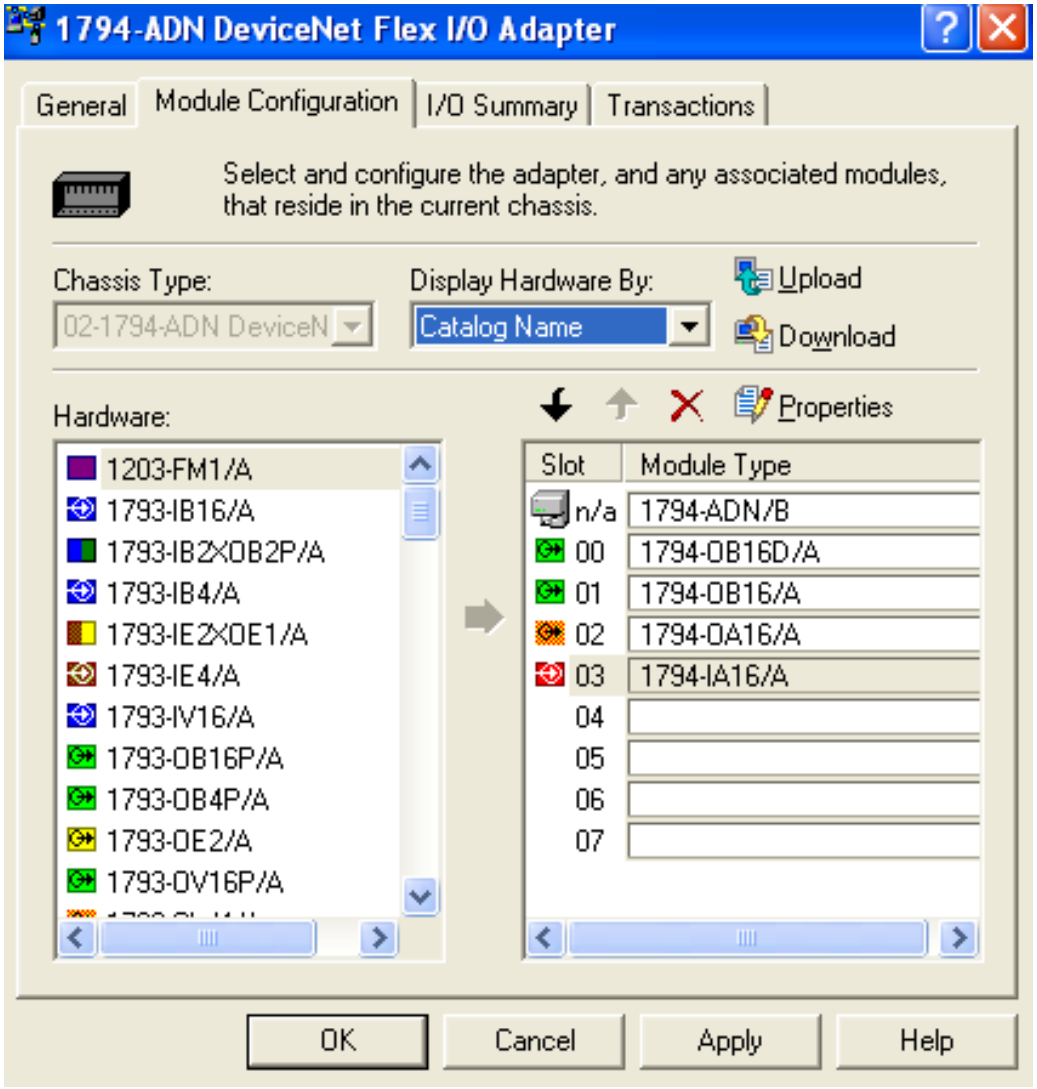
DEVICENET NETWORK CONFIGURATION

Configure offline



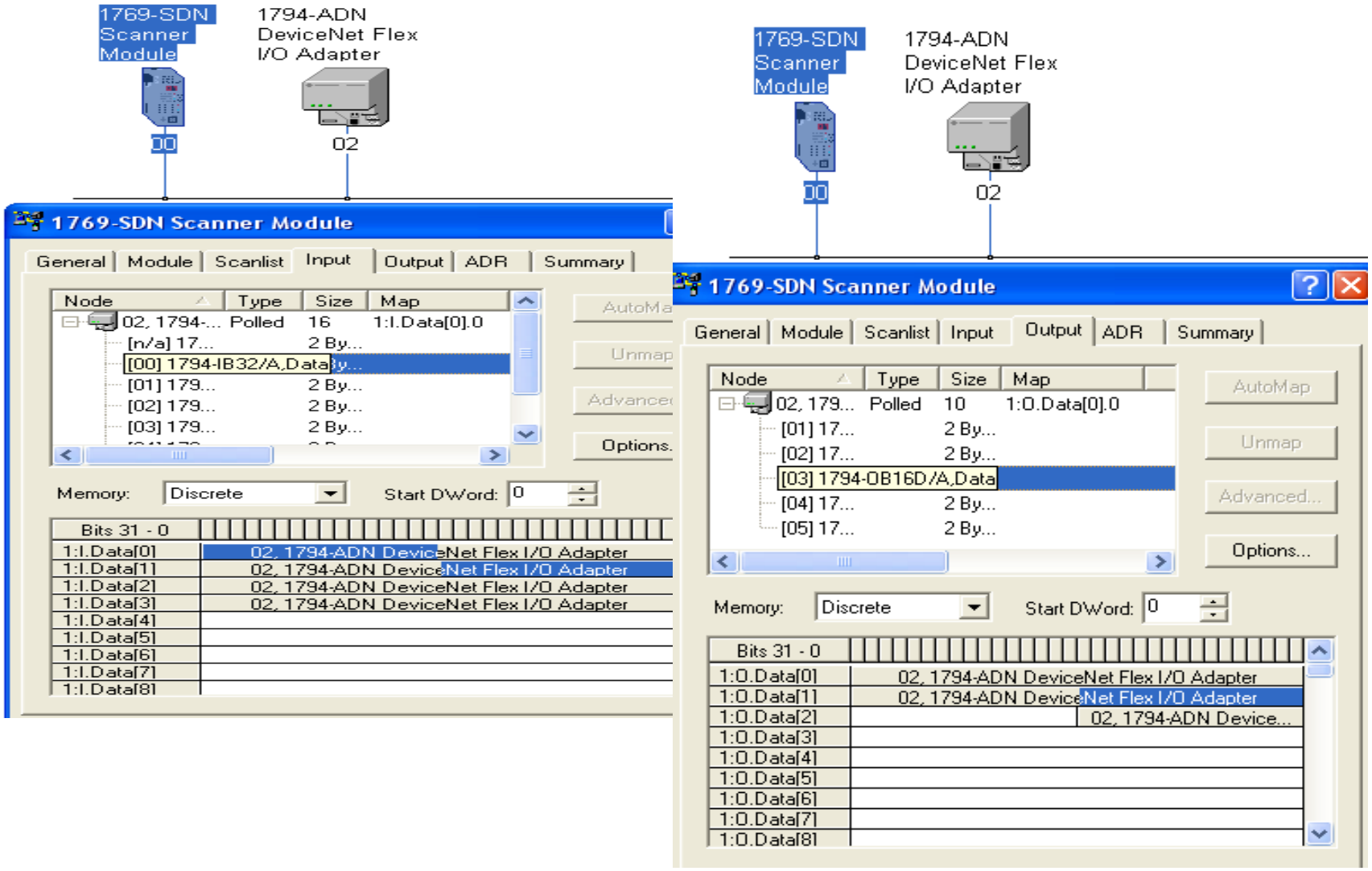
DEVICENET NETWORK CONFIGURATION

Configure offline



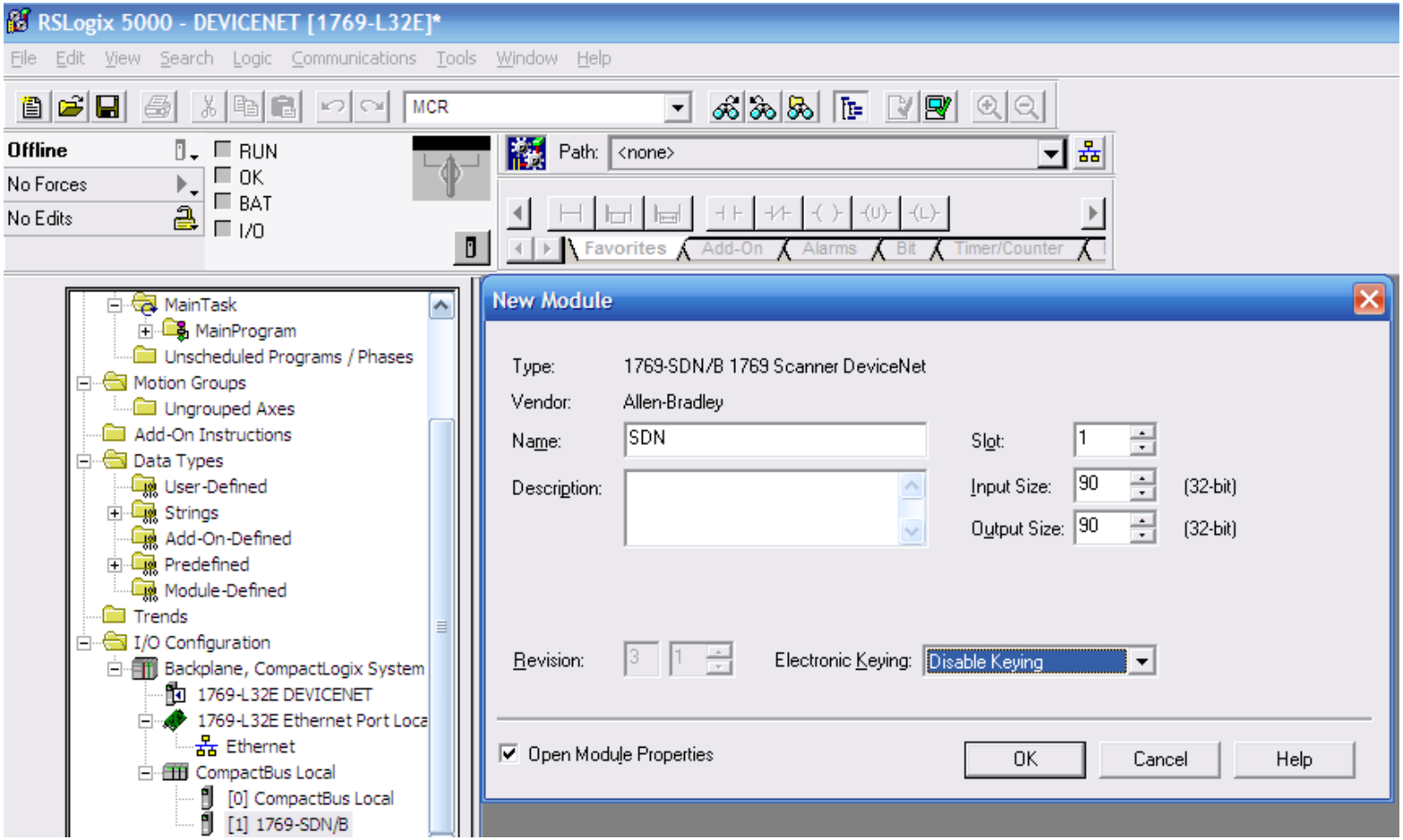
DEVICENET NETWORK CONFIGURATION

Configure I/O address for modules in Master Scanner



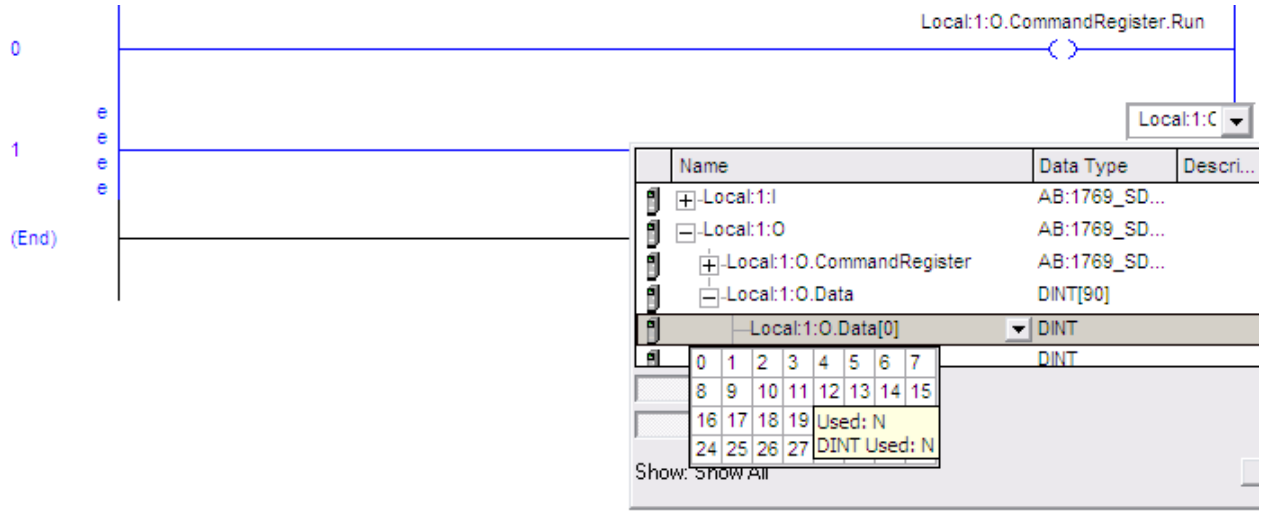
DEVICENET NETWORK CONFIGURATION

Insert Master Scanner into Project using RSLogix5000



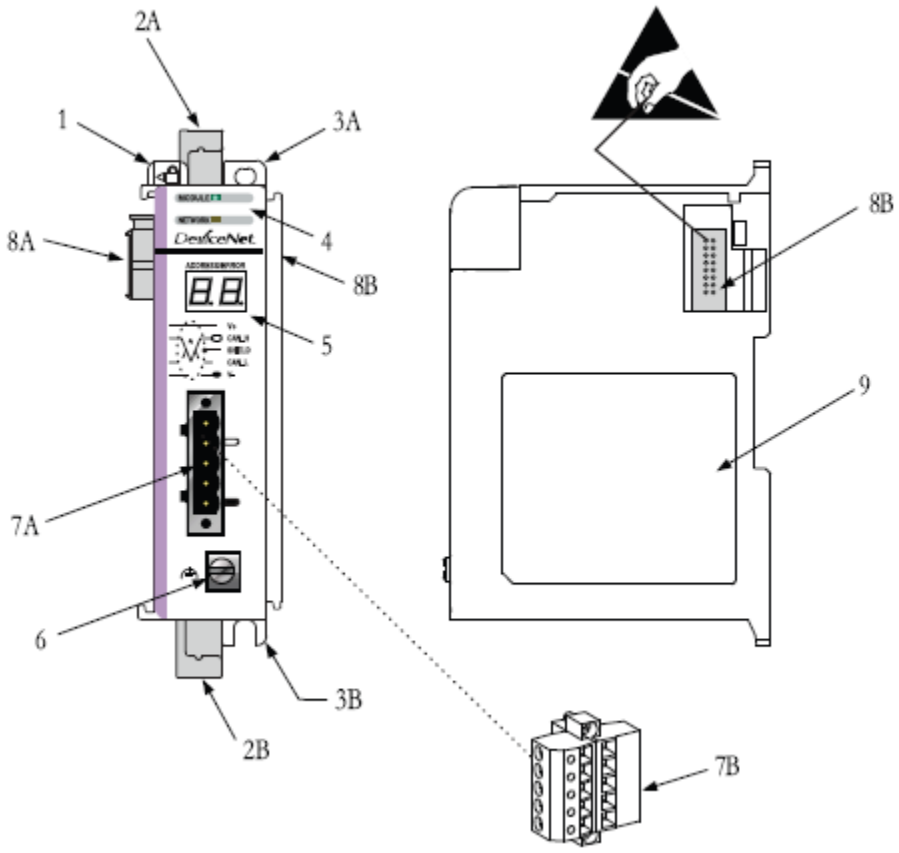
DEVICENET NETWORK CONFIGURATION

Creating logic to exchange I/O data over Devicenet Network



COMPACTLOGIX DEVICENET SCANNER

1769 SDN(Devicenet Master)

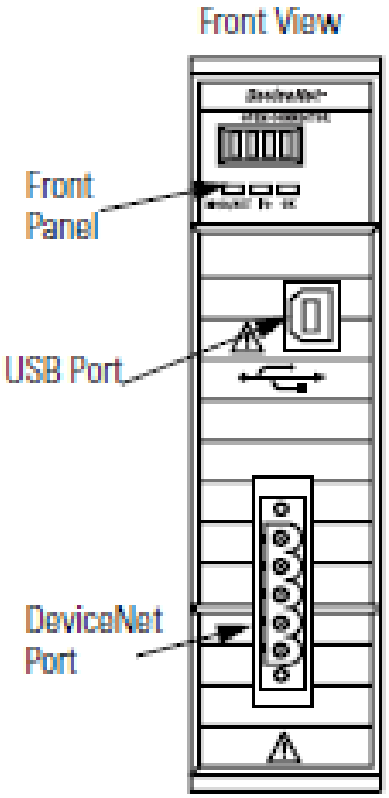


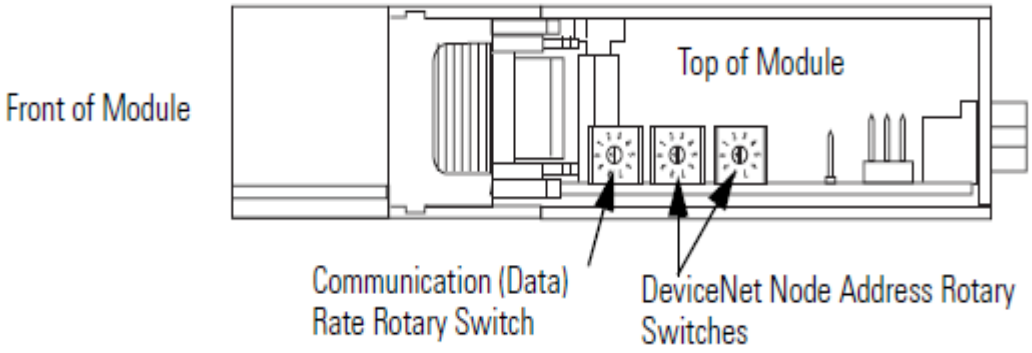
Module Features

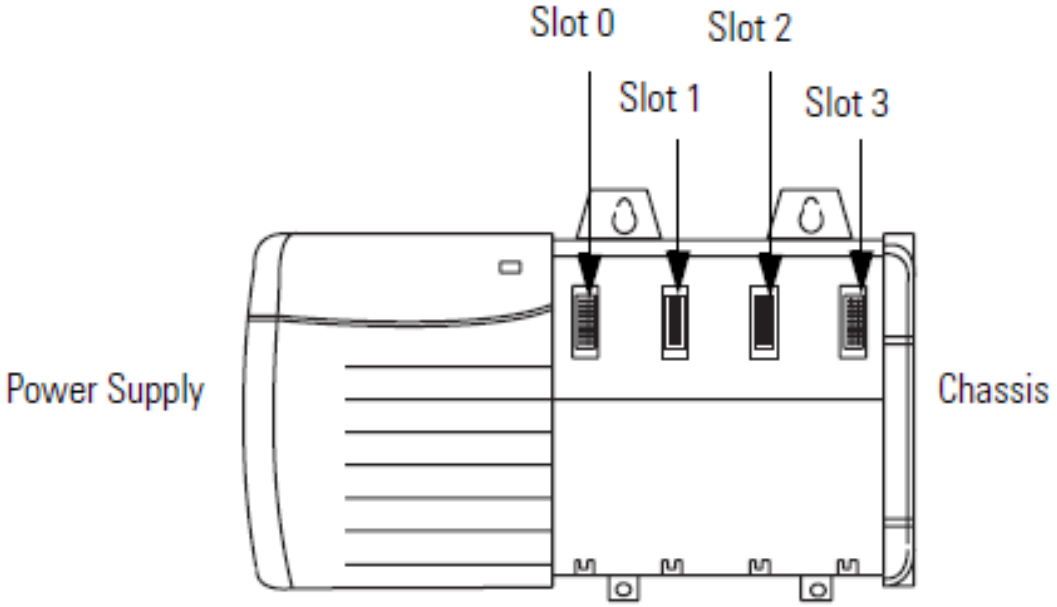
Item	Description
1	Bus lever (with locking function)
2A	Upper DIN rail latch
2B	Lower DIN rail latch
3A	Upper panel mounting tab
3B	Lower panel mounting tab
4	Module and Network status LEDs
5	Address and Error numeric display
6	Grounding screw
7A	DeviceNet mating male receptacle
7B	Removable DeviceNet female connector
8A	Movable bus connector with female pins
8B	Bus connector with male pins
9	Nameplate label

CONTROLNET DEVICENET SCANNER

1756 DNB (Devicenet Master)

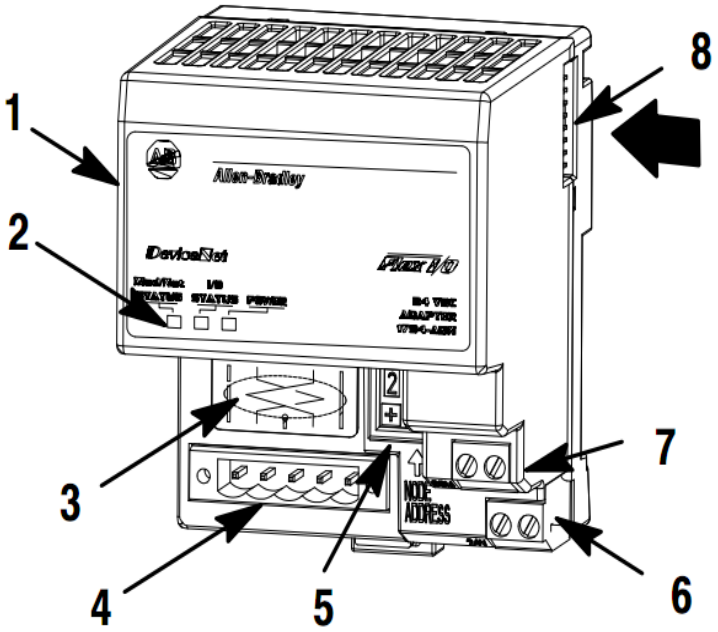






DEVICENET SLAVE

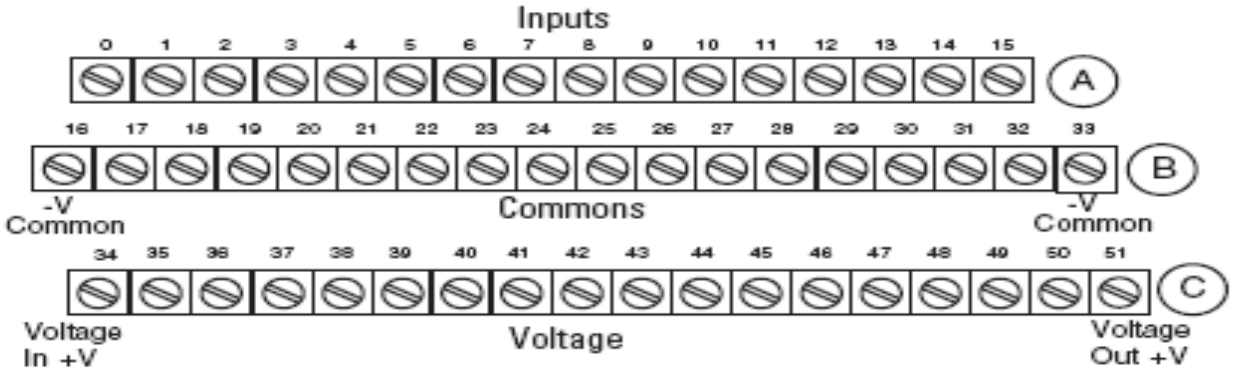
1794 ADN(DeviceNet Slave)



DEVICENET I/O MODULES

Flex I/O 1794-IB8, IB16.

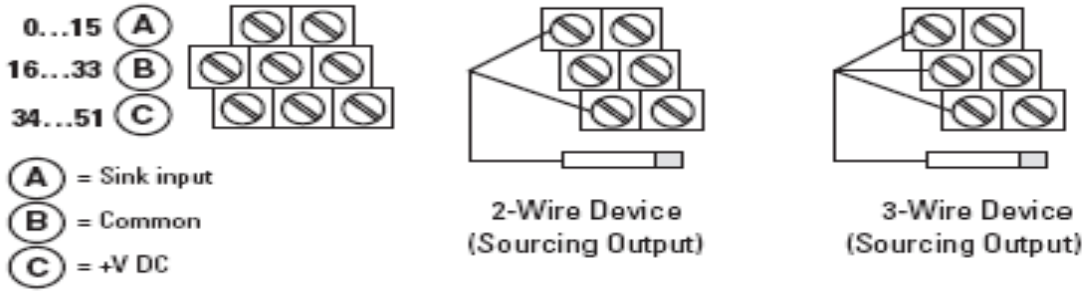
1794-TB3 and -TB3S Terminal Base Wiring for 1794-IB8, -IB16, and -IB16K



Connect V common to terminal B-16.
Connect +V to terminal C-34.
Use B-33 and C-51 to daisy-chain to the next terminal base unit.

(1794-TB3 shown)

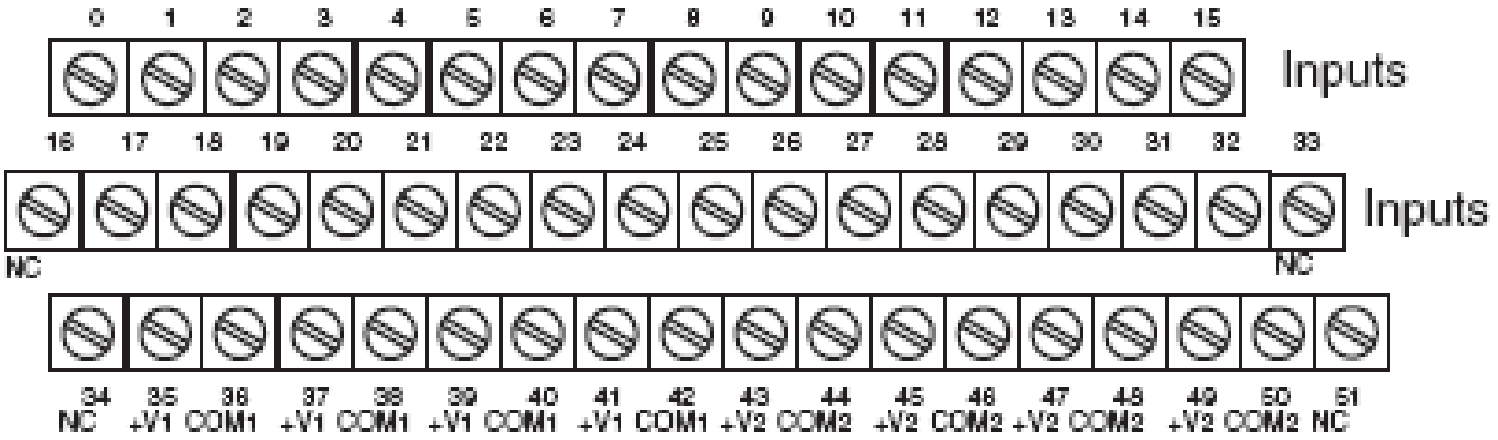
2- and 3-Wire Input Wiring for 1794-IB8, -IB16, and -IB16K



DEVICENET I/O MODULES

Flex I/O 1794-IB32

1794-TB32 or -TB32S Terminal Base Wiring for the 1794-IB32



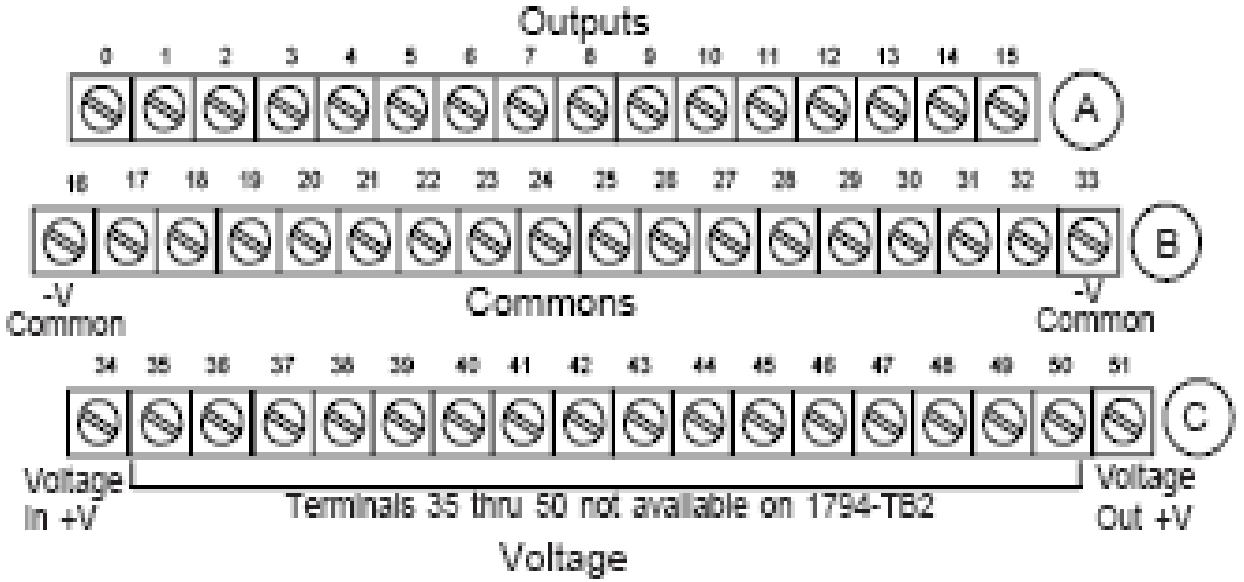
(1794-TB32 shown)

+V1 = Terminals 35, 37, 39, and 41
+V2 = Terminals 43, 45, 47, and 49
COM1 = Terminals 36, 38, 40, and 42
COM2 = Terminals 44, 46, 48, and 50
NC = No connections (terminals 16, 33, 34, and 51)

DEVICENET I/O MODULES

Flex I/O 1794-OB18,OB16.

1794-TB2, -TB3 and -TB3S Terminal Base Wiring for 1794-OB8, -OB8EP, -OB8EPK, -OB16, -OB16P and -OB16PK



(1794-TB3 shown)

Connect -V (Supply Common) to terminal B-16

Connect +V (Supply +Voltage) to terminal C-34

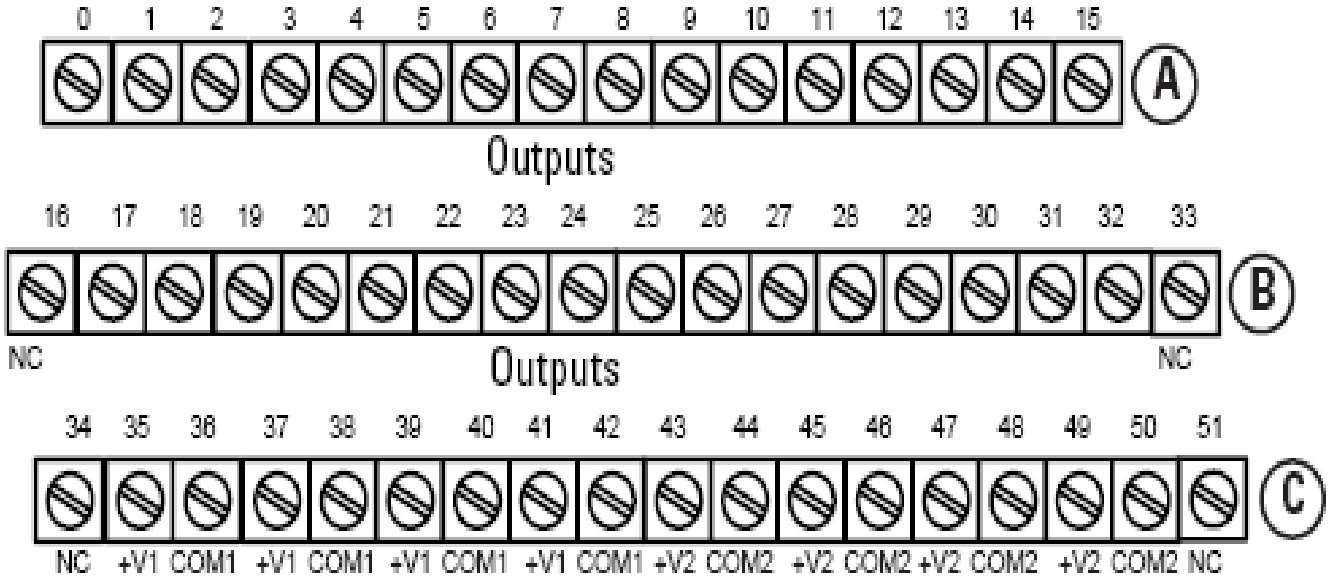
(Use B-33 and C-51 for daisy-chaining to next terminal base unit.)

Total current draw through the terminal base is limited to 10A. Separate power connections to each terminal base may be necessary.

DEVICENET I/O MODULES

Flex I/O 1794-OB32.

1794-TB32 and -TB32S Terminal Base Wiring for 1794-OB32P



(1794-TB32 shown)

+V1 = Terminals 35, 37, 39 and 41

+V2 = Terminals 43, 45, 47 and 49

COM1 = Terminals 36, 38, 40 and 42

COM2 = Terminals 44, 46, 48 and 50

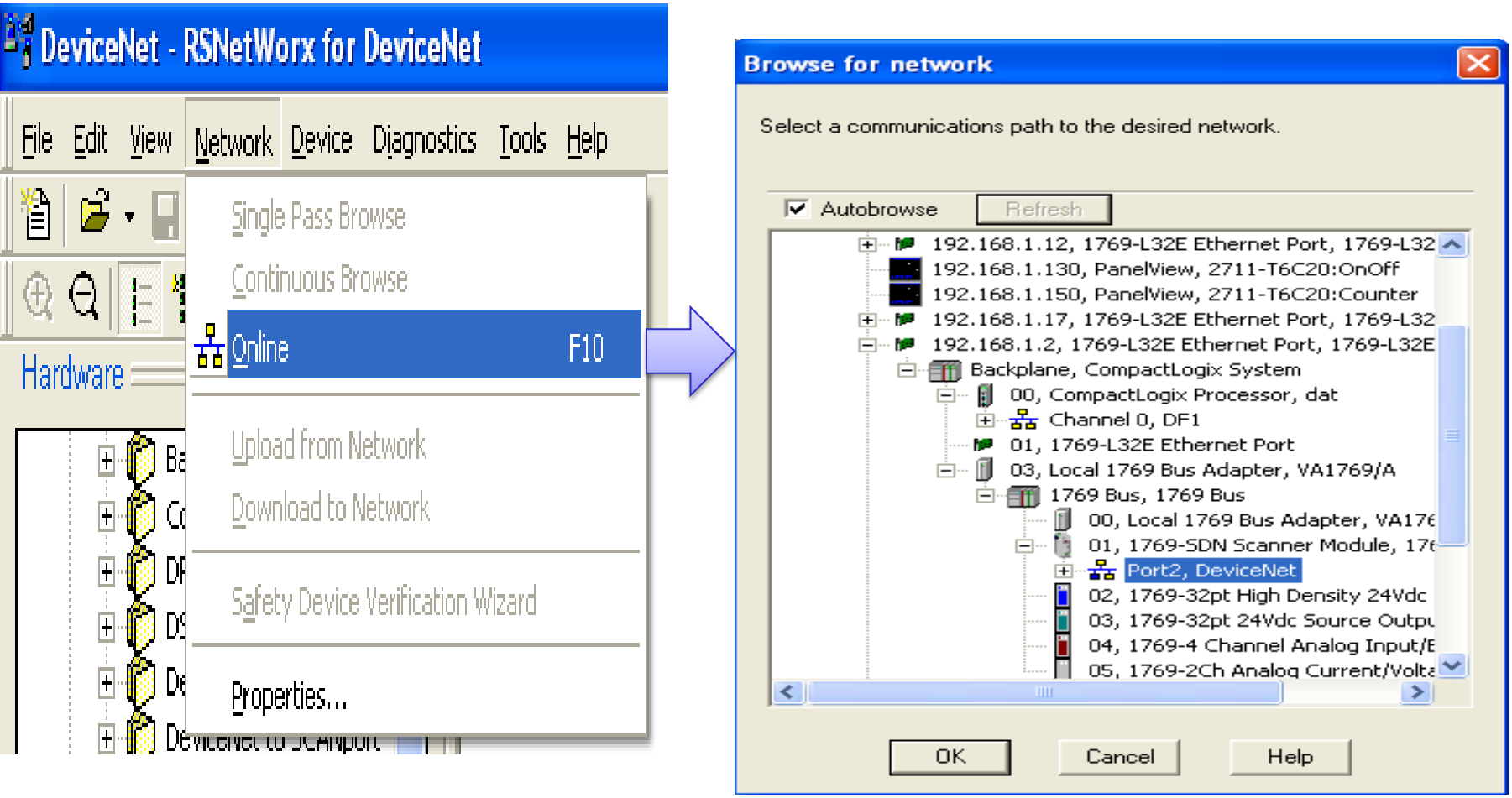
NC = No connections (terminals 16, 33, 34 and 51)

CONTROL DEVICES VIA D_NET

1. Connecting Devices to DeviceNet Network
2. Setting the address of Scanner and other devices
3. Creating Scanlist file by RSnetwork for devicenet
4. Configuring I/O memory area of modules
5. Downloading the configuration to Scaner
6. Creating a Project in RSlogix5000
7. Writing logic program
8. Downloading the program to PLC

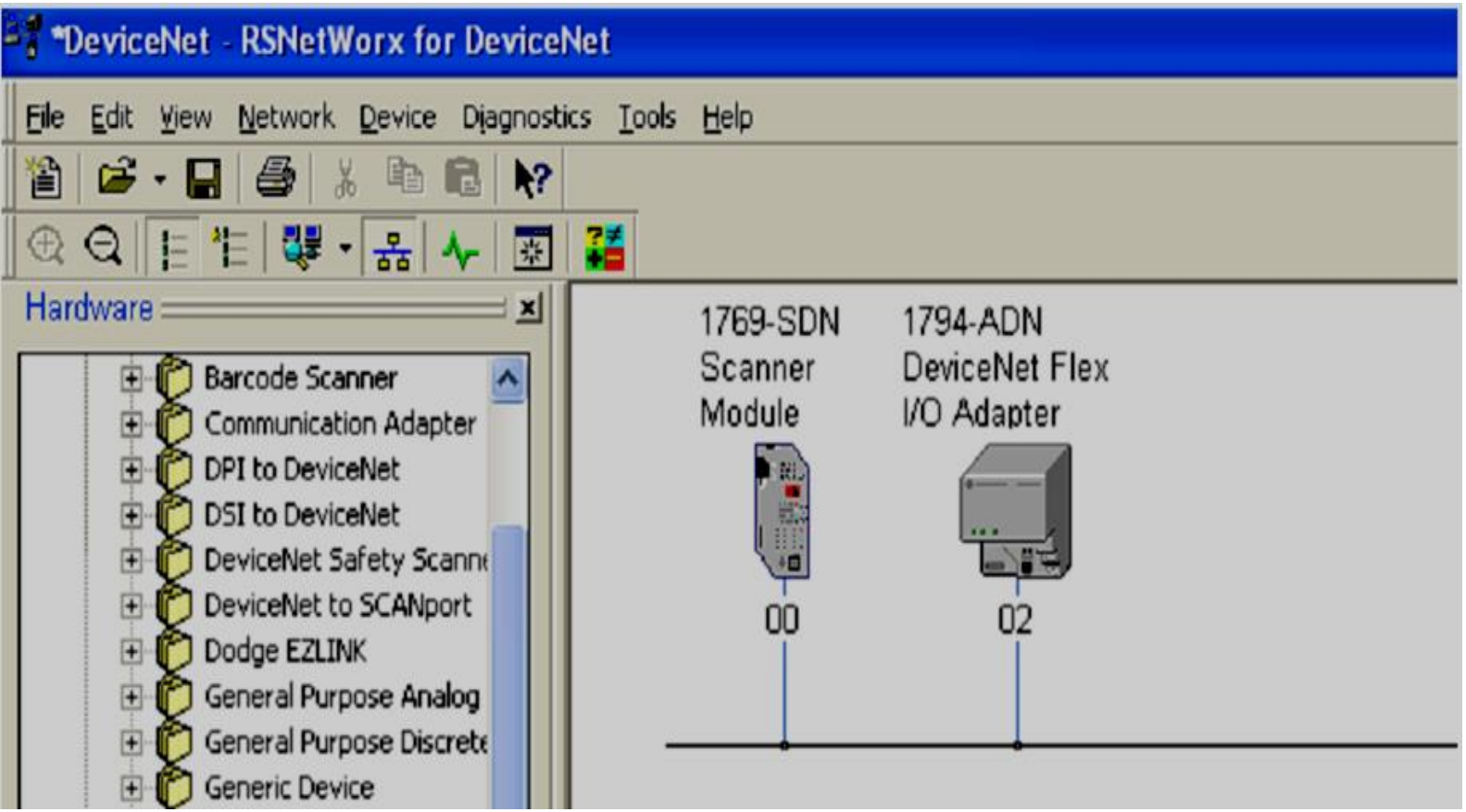
CONTROL DEVICES VIA D_NET

- Creating Scanlist file by Rsnetwork for Dnet



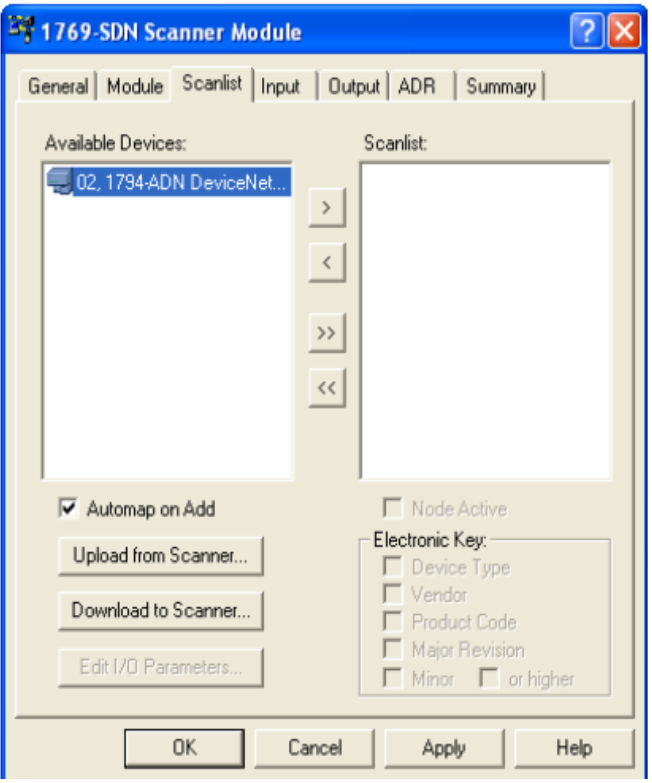
CONTROL DEVICES VIA D_NET

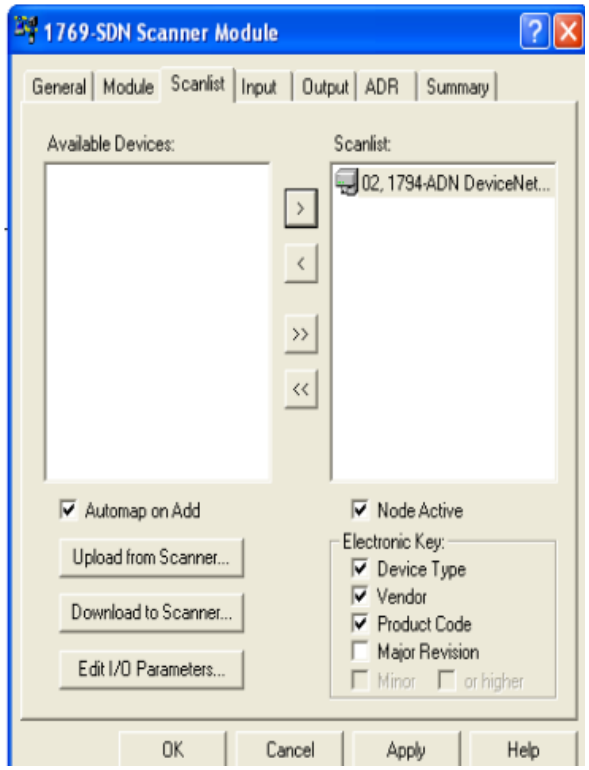
Depend on system hardware, Scanlist file is different



CONTROL DEVICES VIA D_NET

Add devices to Scanlist

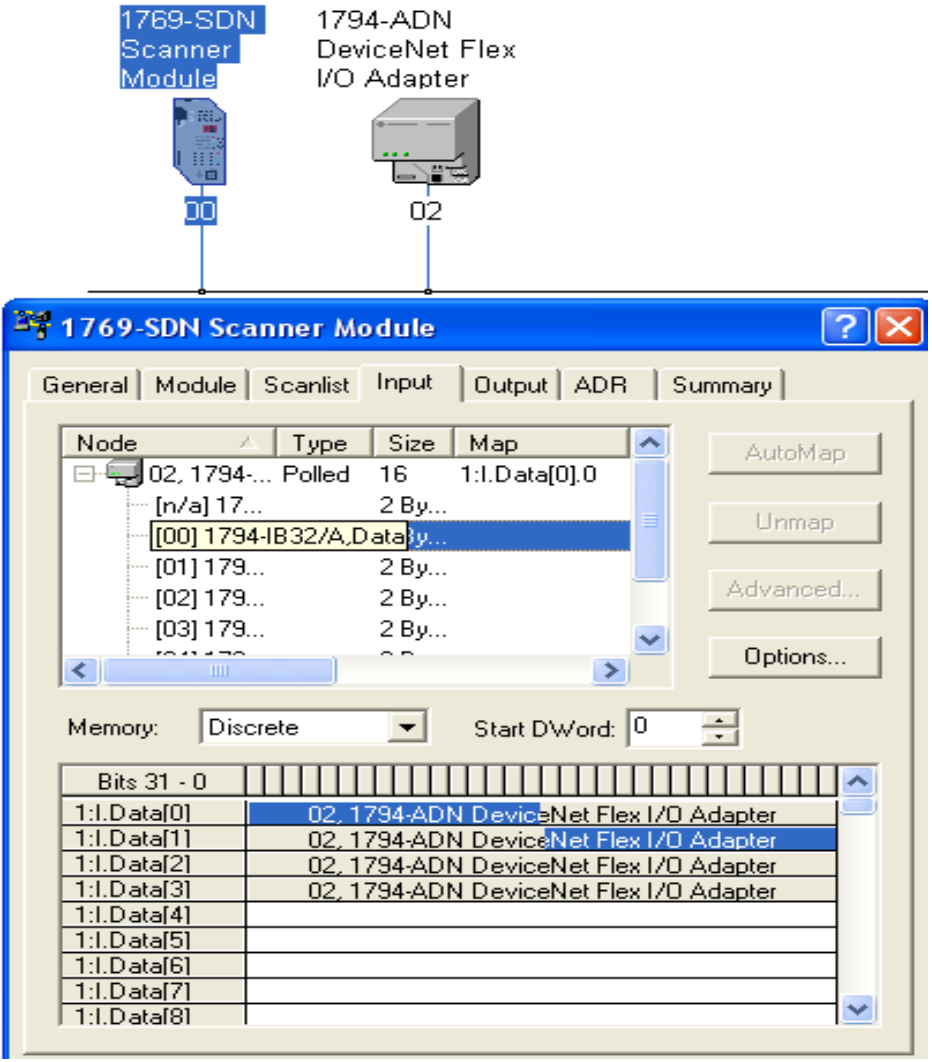


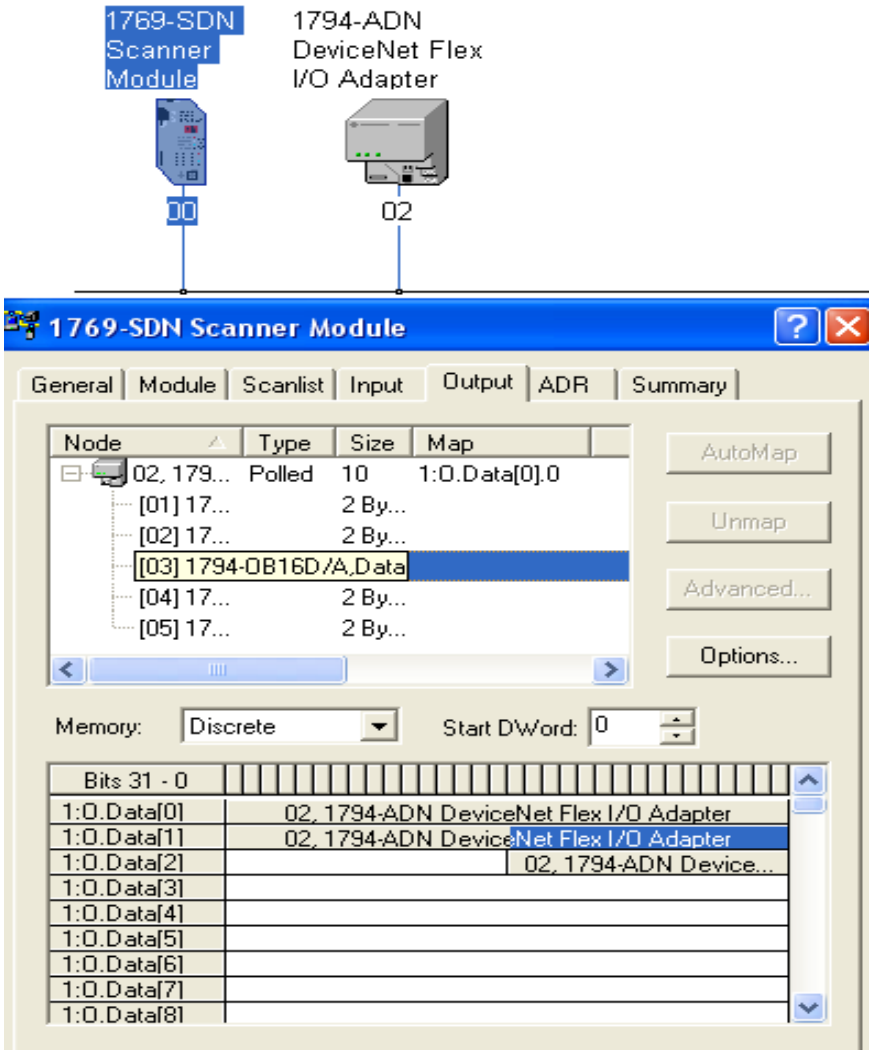


Select Scaner module/upload/ Click Scanlist tab/ choose devices to add to Scanlist

CONTROL DEVICES VIA D_NET

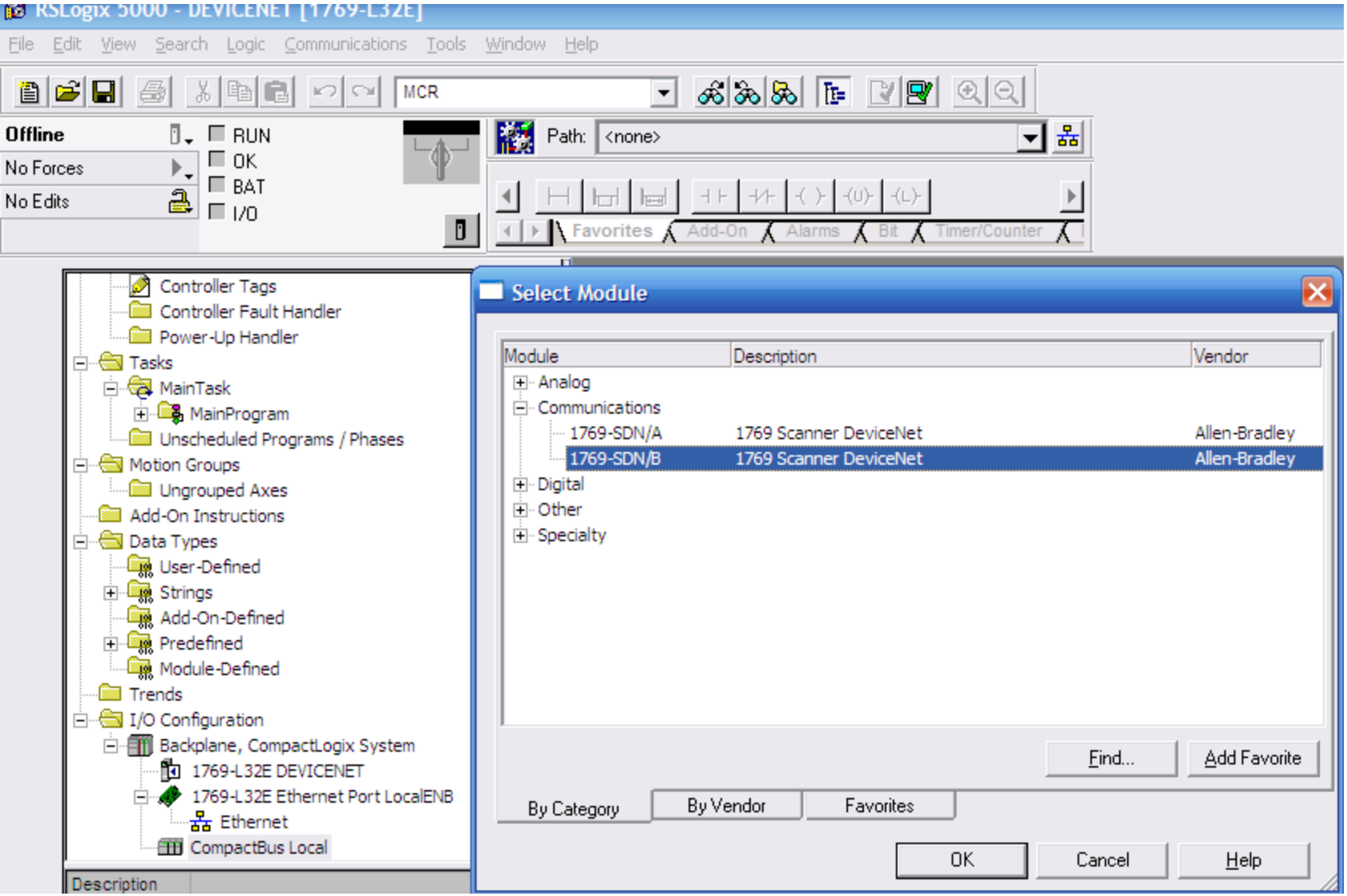
Specify I/O memory areas of modules at Input and Output tab then download to Scanner module.





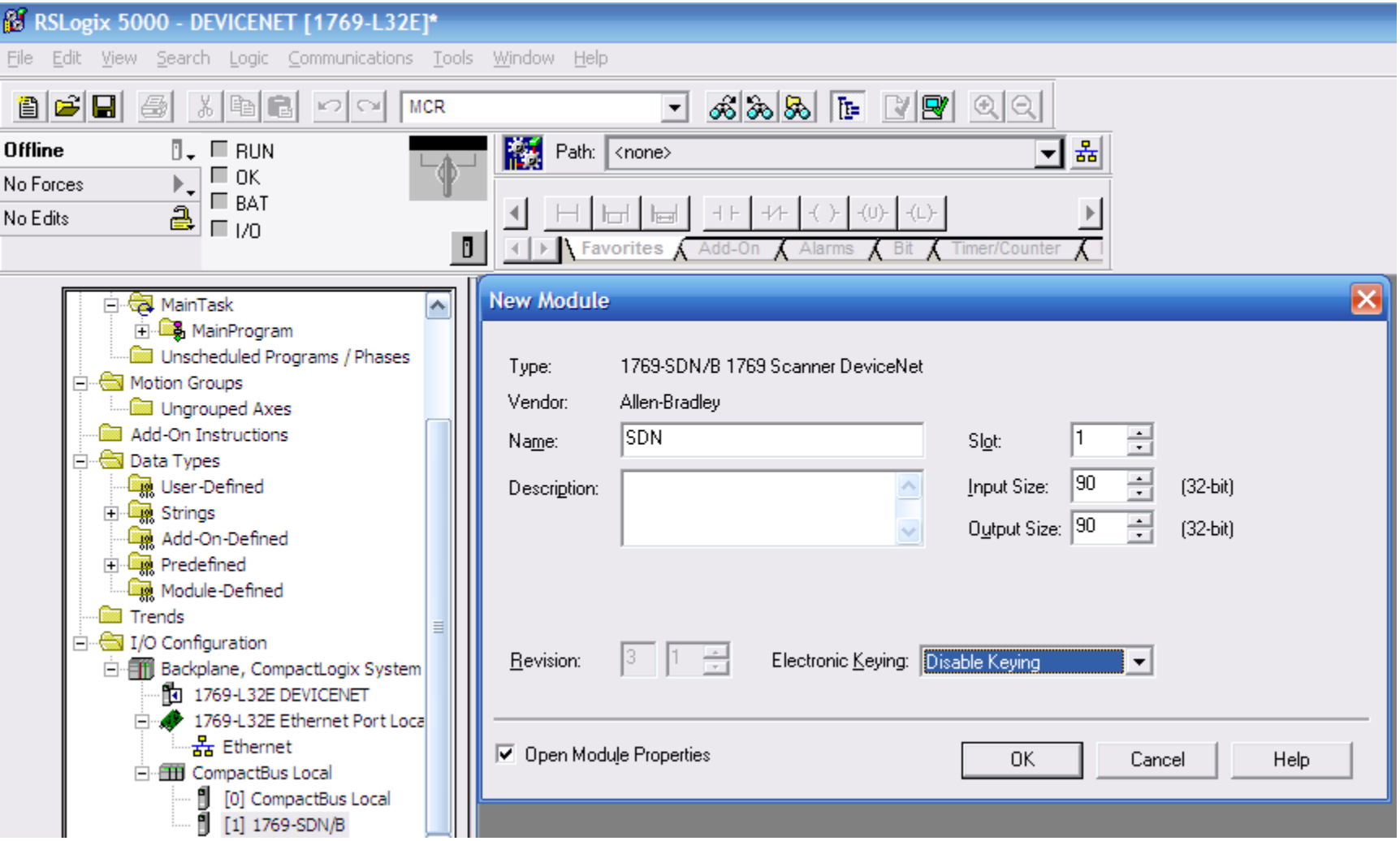
CONTROL DEVICES VIA D_NET

- Creating a project in RSlogix5000 and add a Scanner



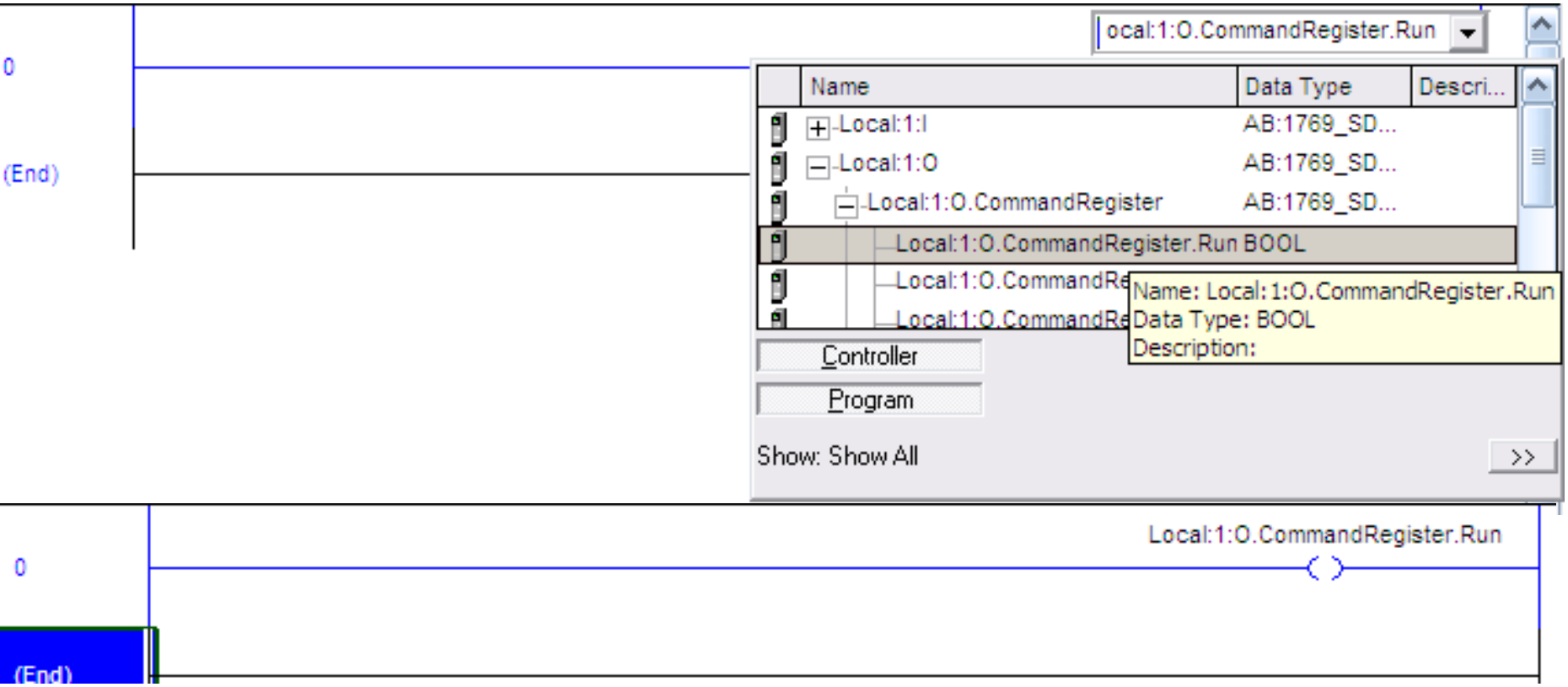
CONTROL DEVICES VIA D_NET

Configuring the Scanner Module



CONTROL DEVICES VIA D_NET

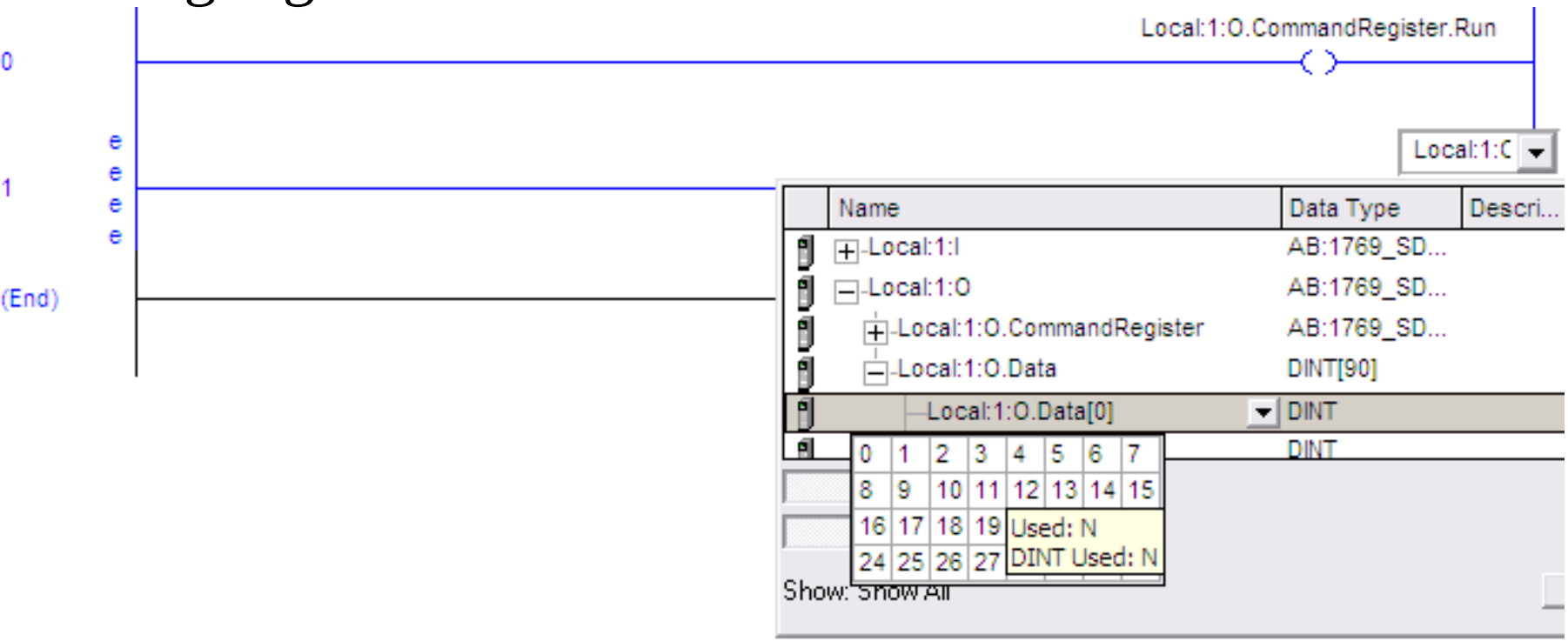
Writing a simple program in Rslogix 5000.



Notice:**CommandResister.Run** instruction must be executed to run devicenet network

CONTROL DEVICES VIA D_NET

Writing logic to access I/O modules.



DEVICENET NETWORK TROUBLE SHOOTING

Status code (decimal)	Description	Action
65	The AutoScan option is on and the device is in idle mode.	None.
70	The address of the device is already in use by another device on the network.	Change the address of the device to an unused address.
71	Illegal data in scan list.	Reconfigure the scan list and remove any illegal data.
72	*No* communication with the device.	Inspect the device and verify connections.
73	Device's identity information does not match electronic key in scanner	• Make sure that the correct device is at this address. • Make sure that the device matches the specified electronic key (vendor, product code, product type).
74	Data overrun on port detected.	• Modify your configuration and check for invalid data. • Check network communication traffic.
75	Either or both of the following: • The device does *not* have a scan list. • The device has *not* received communication from any other device	Check that the device has: • scan list • properly wired connection to the network
76	No direct network traffic for scanner.	None. The scanner hears other network communication but does *not* hear any directed to it.
77	During initialization, the data size expected by the device does *not* match the scan list entry.	Check the device and the scan list for the correct input and output size for the device.

DEVICENET NETWORK TROUBLE SHOOTING

78	Device is *not* communicating or communication is intermittent.	• Check that the device has a properly wired connection to the network. • Check that the device has power. • If the device is polled, make sure the interscan delay is long enough for the device to return its data.
79	Scanner has failed to transmit a message.	• Make sure that your scanner is connected to a valid network. • Check for disconnected cables.
80	Scanner is in idle mode.	To run the network: 1. Put controller in run/remote run mode. 2. Turn on the following member of command register for the scanner:
81	Controller has set the scanner to the faulted mode.	See if the following bit of the command register for the scanner is on: …O.CommandRegister.Fault
82	Error detected in sequence of fragmented I/O messages from device.	• Check scan list device to make sure that its input and output data sizes are correct. • Check the configuration of the device.
83	Device returns error responses when the scanner attempts to communicate with it.	• Check the accuracy of the scan list. • Check the configuration of the device. The device may be in another scanner's scan list. • Cycle power to the device.
84	Scanner is initializing the DeviceNet network.	None. This code clears itself once the scanner attempts to initialize all the devices on the network.

DEVICENET NETWORK TROUBLE SHOOTING

85	During runtime, the device is sending the wrong size of data.	Contact Rockwell Automation support. See the back of this publication.
86	Device is in idle state/mode (*not* producing data) while the scanner is in run mode.	• Check the configuration and status of the device. • If you set up an interlock between 2 scanners (controllers), make sure both scanners are in run mode.
88	In shared inputs, the I/O parameters (polled, strobed, etc.) *do not* match between the scanners.	Use the same I/O parameters for the device in both scanners.
89	Scanner failed to configure a device using the Automatic Device Recovery (ADR) parameters	• Make sure that you installed a compatible device. • The offline configuration for the device does not match the actual (online) configuration of the device.
90	Controller has set the scanner to the disabled mode.	See if the following bit of the command register for the scanner is on: …O.CommandRegister.DisableNetwork

91	Bus-off condition (communication problem)	• Cycle power to the device.
		• Make sure all devices are at the same baud rate.
		• Make sure there is *no* short circuit between a CAN line (blue or white) and a power or shield line (black, red, shield).
		• Check for any of the following sources of noise:
		  • Close proximity to a high voltage power cable
		  • Improper or no termination resistor
		  • Improper grounding
		• Check for a device that is producing noise or inappropriate data on the network.

DEVICENET NETWORK TROUBLE SHOOTING

92	The DeviceNet cable is *not* supplying power to the communication port.	• Make sure the network has 24V dc power. • Check the connection to the device.
95	The firmware of the device is currently being updated.	None. Do not disconnect the device while the update is in progress. You will lose any existing data in the device's memory.
96	Communication port is in test mode.	None.
97	Controller has set the scanner to the halted mode.	1. See if the following bit of the command register for the scanner is on: ...O.CommandRegister.HaltScanner 2. Cycle power to the scanner.
98	General firmware error.	Replace device.
99	System failure.	Replace device.

CONTROL DEVICES VIA D_NET

EX_1

Set up a devicenet network includes two nodes.

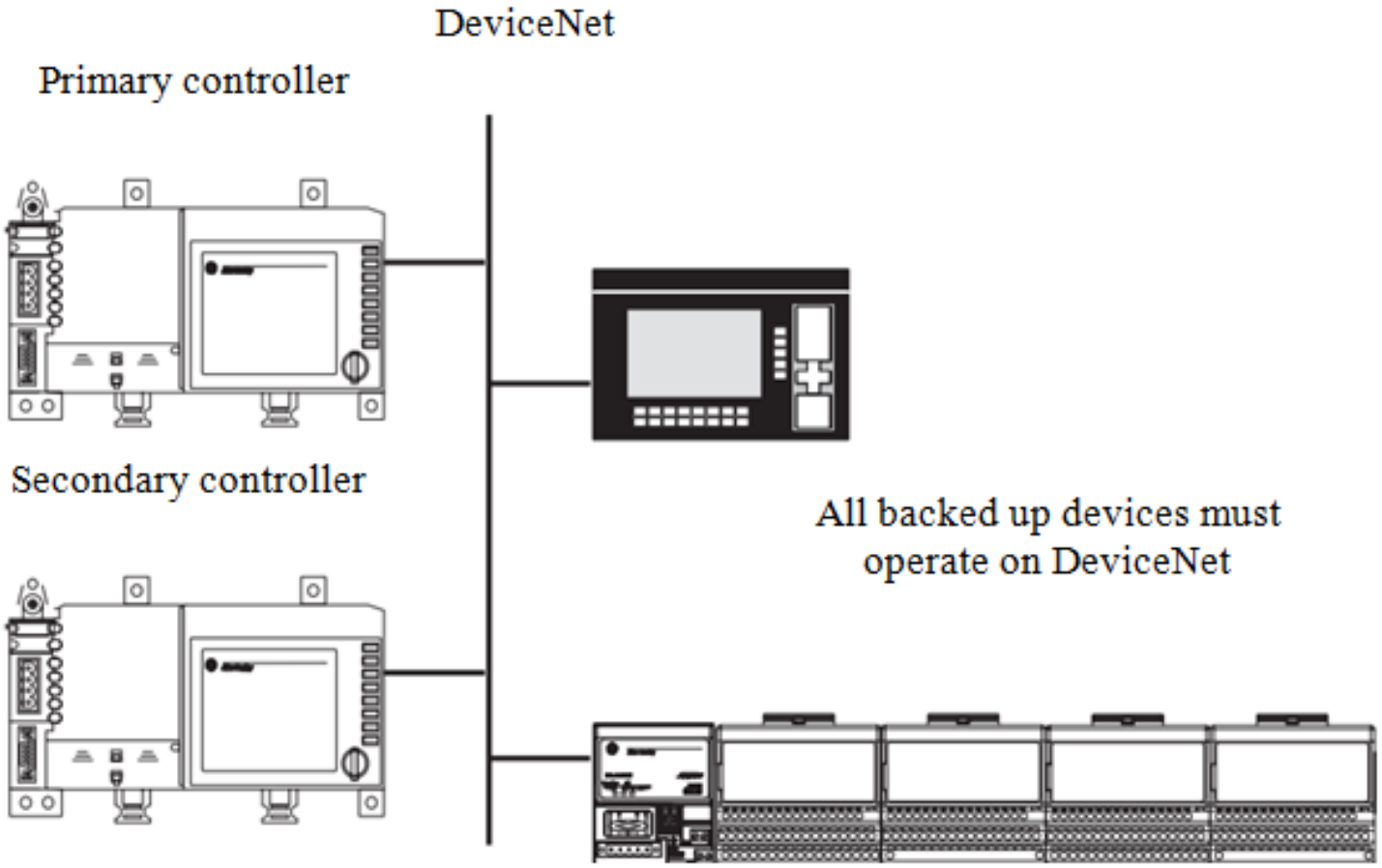
- Scaner has Address 0
- Slave has Address 4 and I/O modules
- Two buttons and one Motor are connected to I/O devicenet modules to Start and Stop the Motor.

EX_2

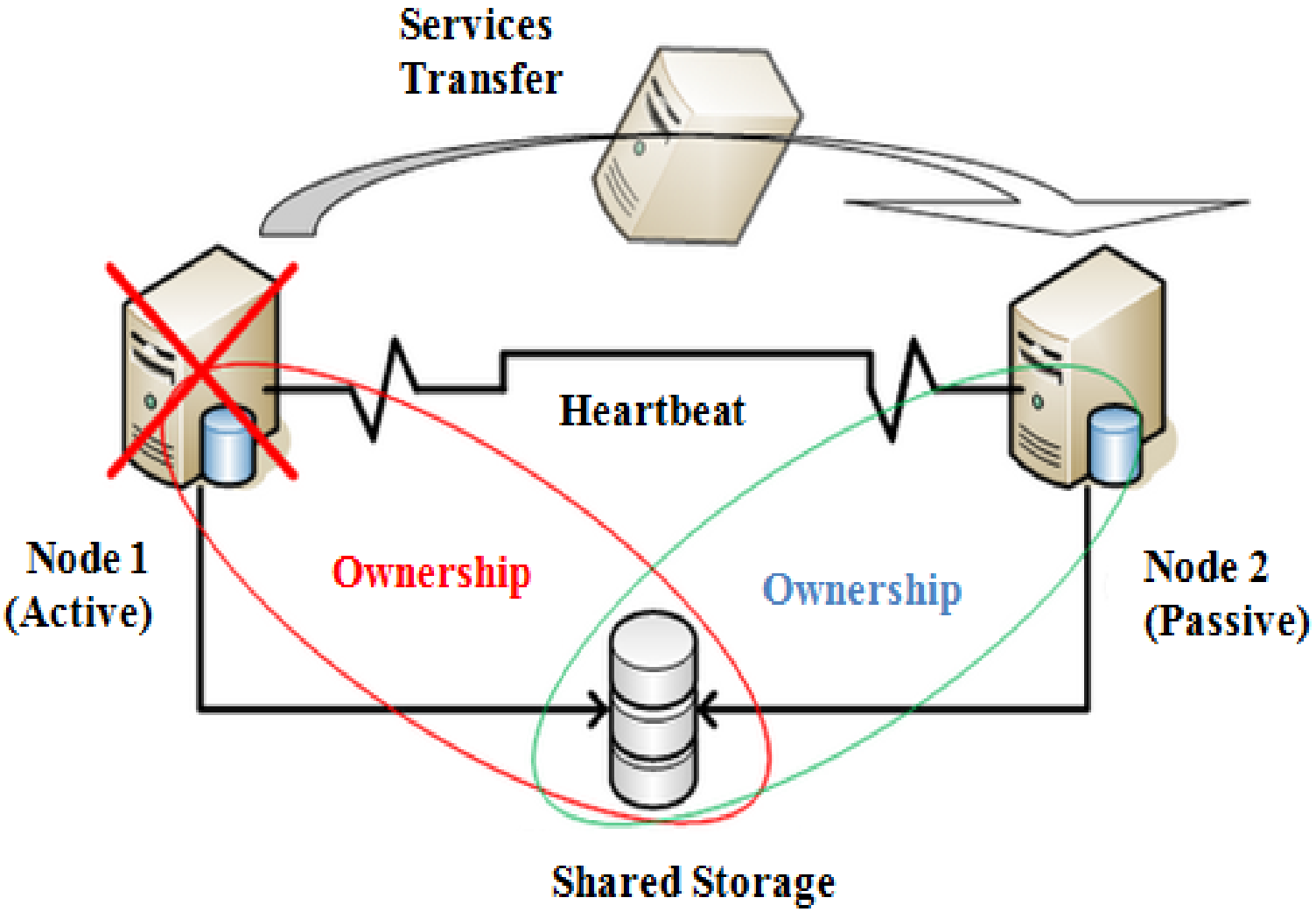
Set up a devicenet network includes two nodes.

- Scaner has Address 0
- Inverter(PowerFlex) is slave with address 4
- Start, Stop motor and increase,decrease motor speed from controller

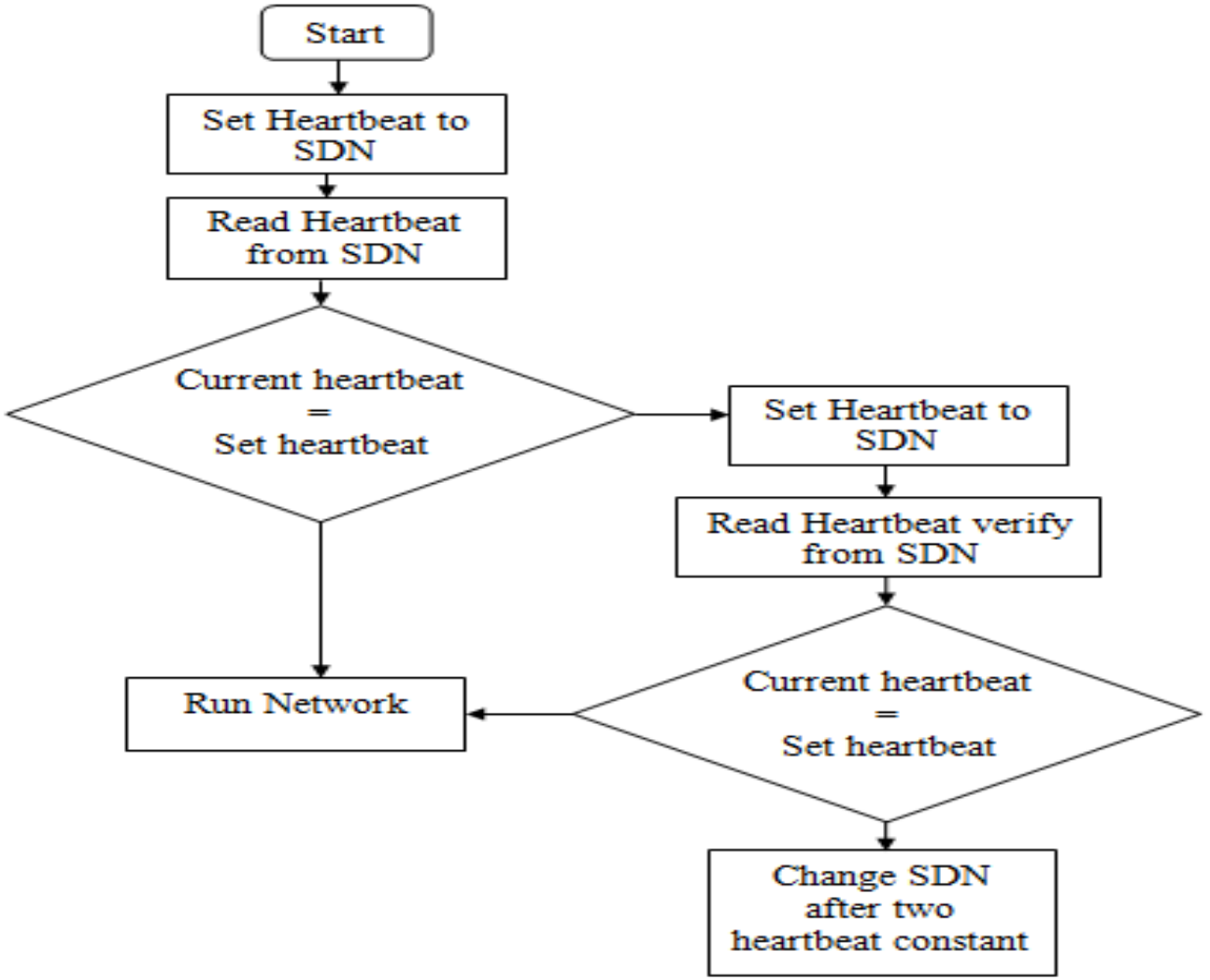
BACK UP ON DEVICENET NETWORK



BACK UP ON DEVICENET NETWORK



BACK UP ON DEVICENET NETWORK



BACK UP ON DEVICENET NETWORK

Configure the Back up system. *Follow these steps to configure a CompactLogix backup system on the DeviceNet network.*

1. Install all I/O and operator interfaces that you need to back up on the DeviceNet network.
2. Connect a CompactLogix controller with a 1769-SDN scanner module to the DeviceNet network.
3. Set the scanner module node address to 0 *(or the lower of the two node addresses reserved for the CompactLogix controller backup system).*
4. Apply power to the controller and the network.
5. Use RSNetWorx for DeviceNet software to download the network's scanlist to the 1769-SDN scanner module

(You can either use a scanlist from a new configuration or from a previously-used configuration. If the scanlist is a new configuration, we recommend that you save it to a new project for later use)

BACK UP ON DEVICENET NETWORK

6. Use RSLogix 5000 programming software to download the appropriate user program to the CompactLogix controller
(The program should contain the explicit messages that enable the backup feature for this controller and scanner module: Next section).
7. Put the controller into Run mode.
8. Either disable power to the controller or disconnect the scanner module from the DeviceNet network
(This controller will be the secondary controller)
9. Connect the other CompactLogix controller with a 1769-SDN scanner module on the network.
10. Set the node address to 0
11. Apply power to the controller and scanner module

BACK UP ON DEVICENET NETWORK

12. Use RSNetWorx for DeviceNet software to download the same scanlist used in step 5

(It may be necessary to browse the network again before downloading the scanlist. This second browsing of the network allows RSNetWorx for DeviceNet software to establish communication to the new scanner module at the same node number as the previous scanner)

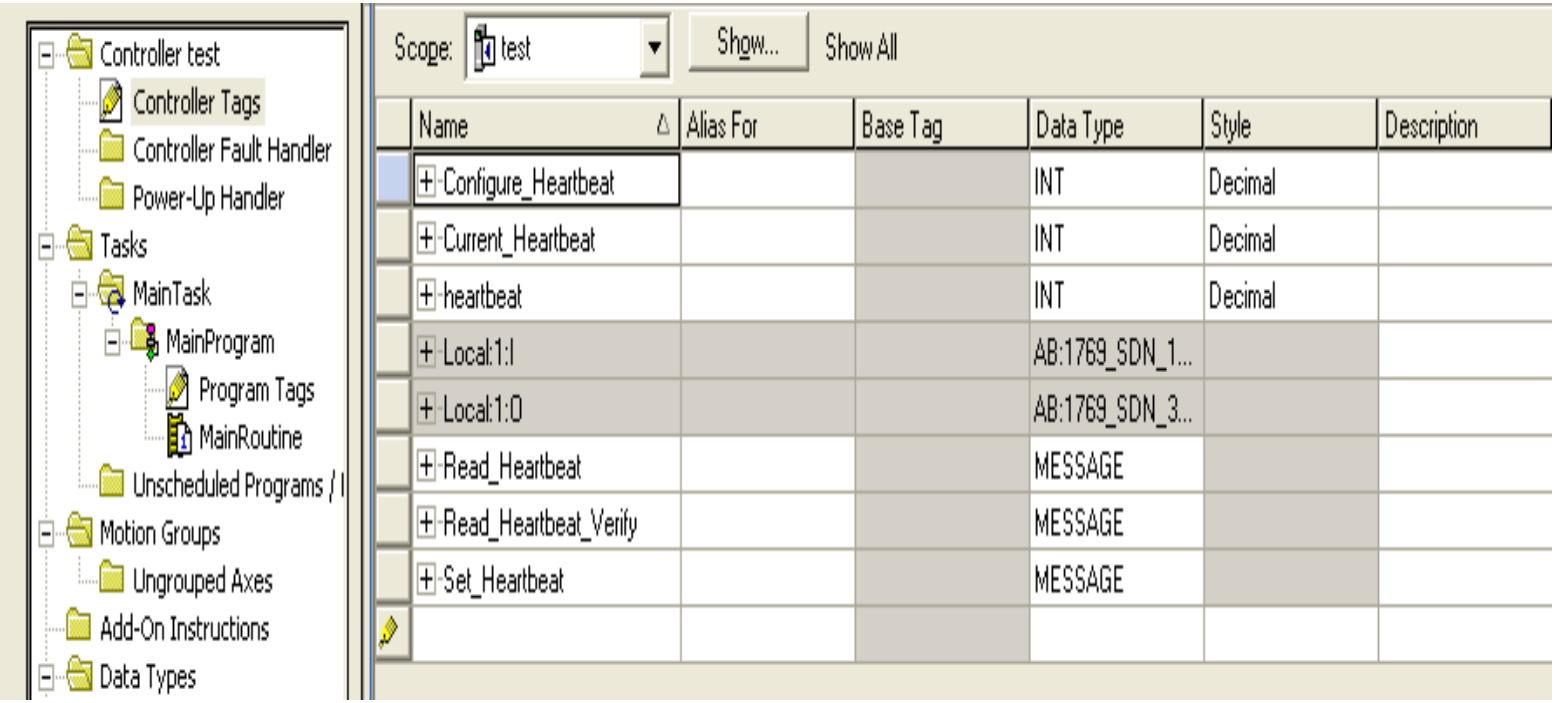
13. Use RSLogix 5000 programming software to download the user program to the second CompactLogix controller as you did in **step 6.**

(Typically, you download the same user program to the second CompactLogix controller as you did to the first. However, unlike the scanlists, the user programs in the controllers do not have to be identical).

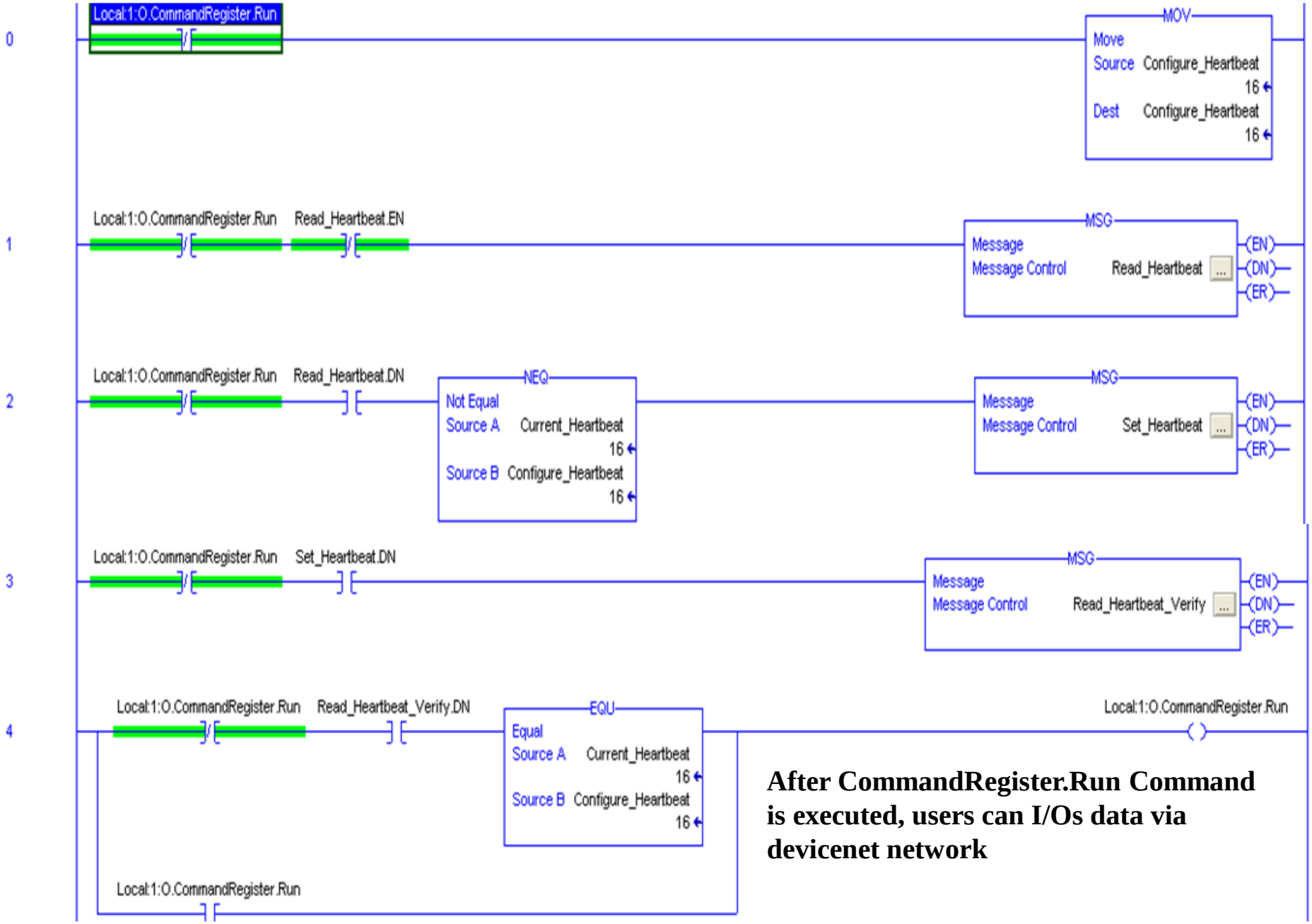
BACK UP ON DEVICENET NETWORK

14. Put the controller into Run mode.
(This controller is now ready to use and is the primary controller).
15. Reapply power to the secondary controller and/or reconnect the secondary scanner module to the DeviceNet subnet

CREATING TAGS FOR BACKUP

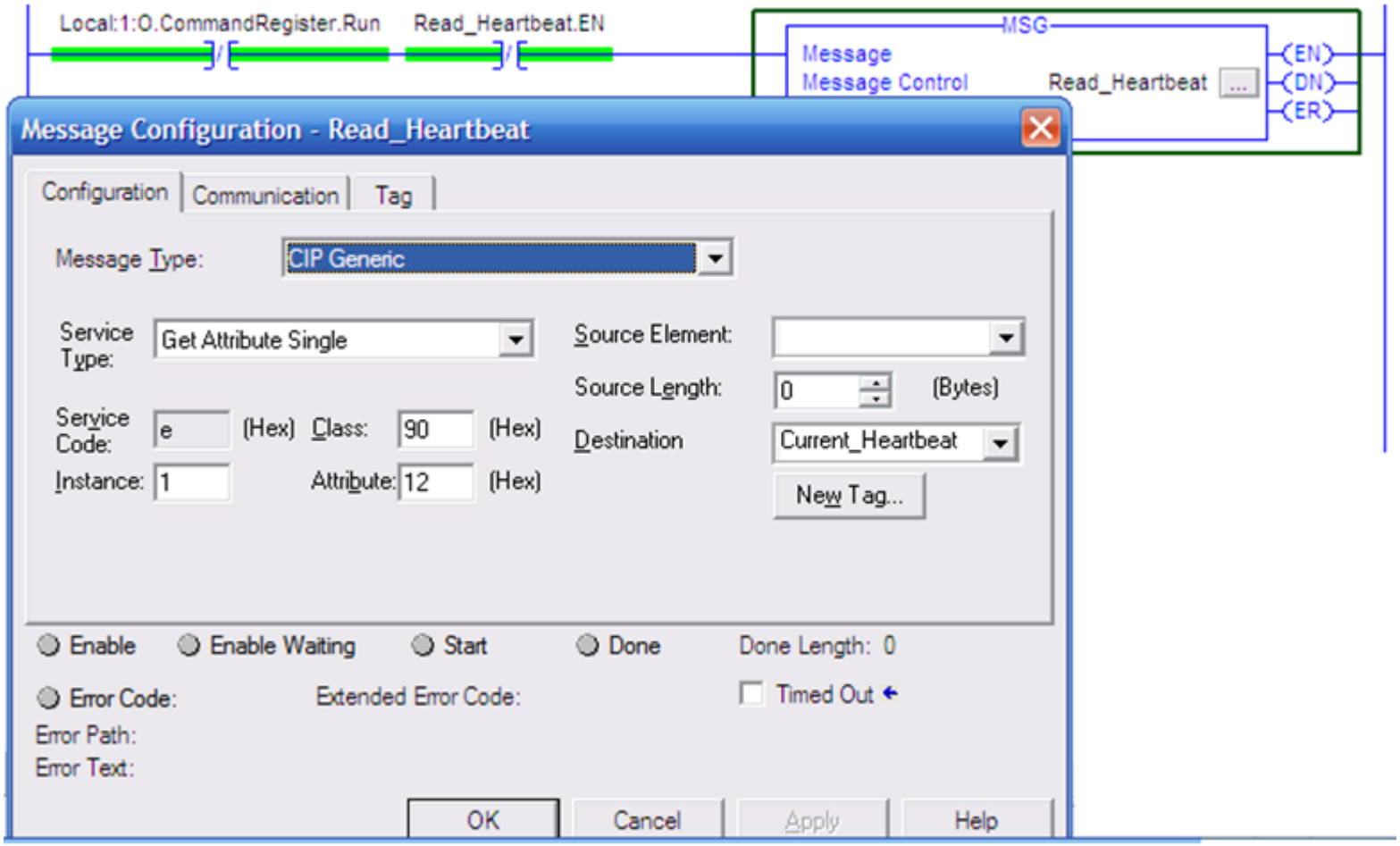


WIRTING LOGIC FOR BACKUP

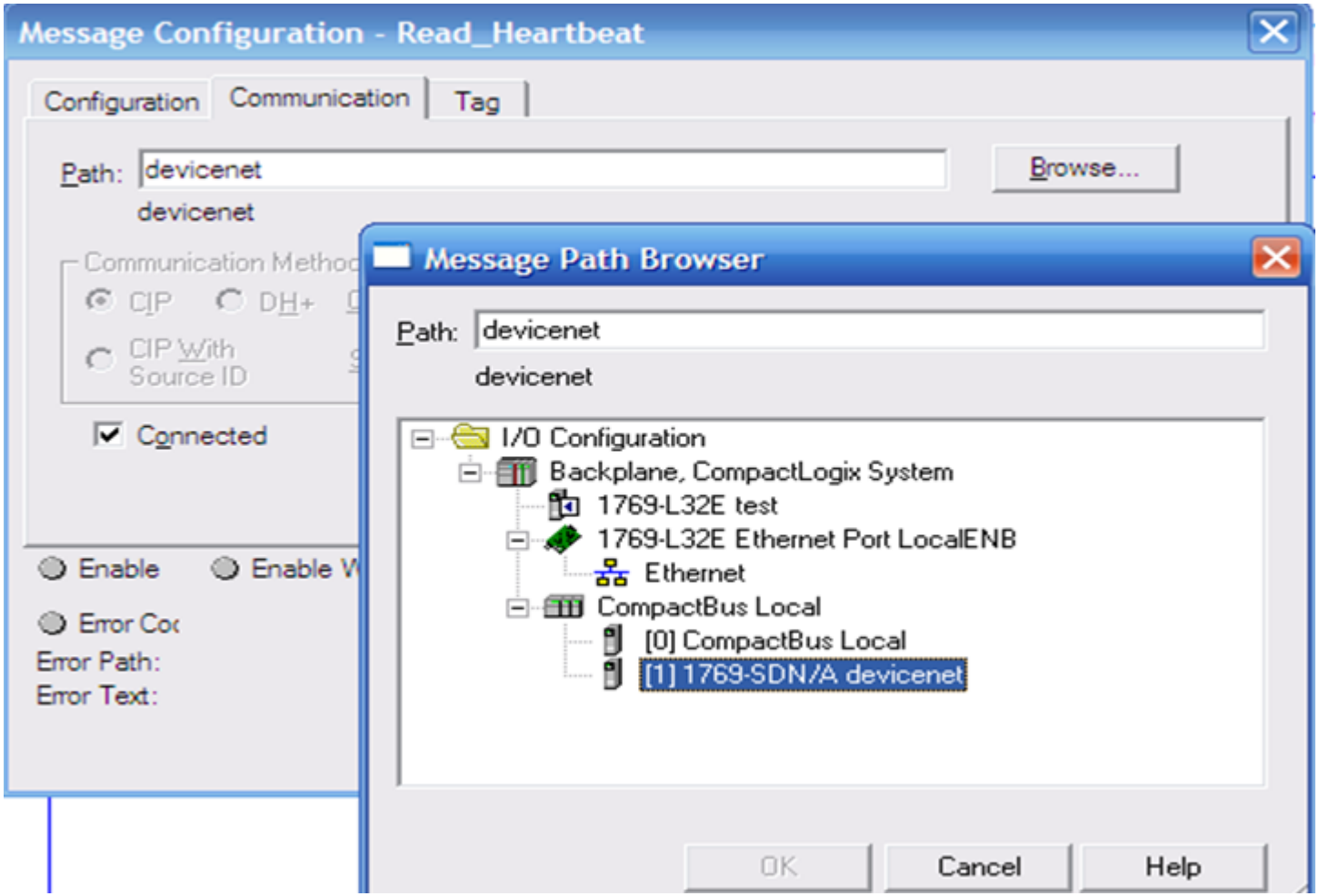


After CommandRegister.Run Command is executed, users can I/Os data via devicenet network

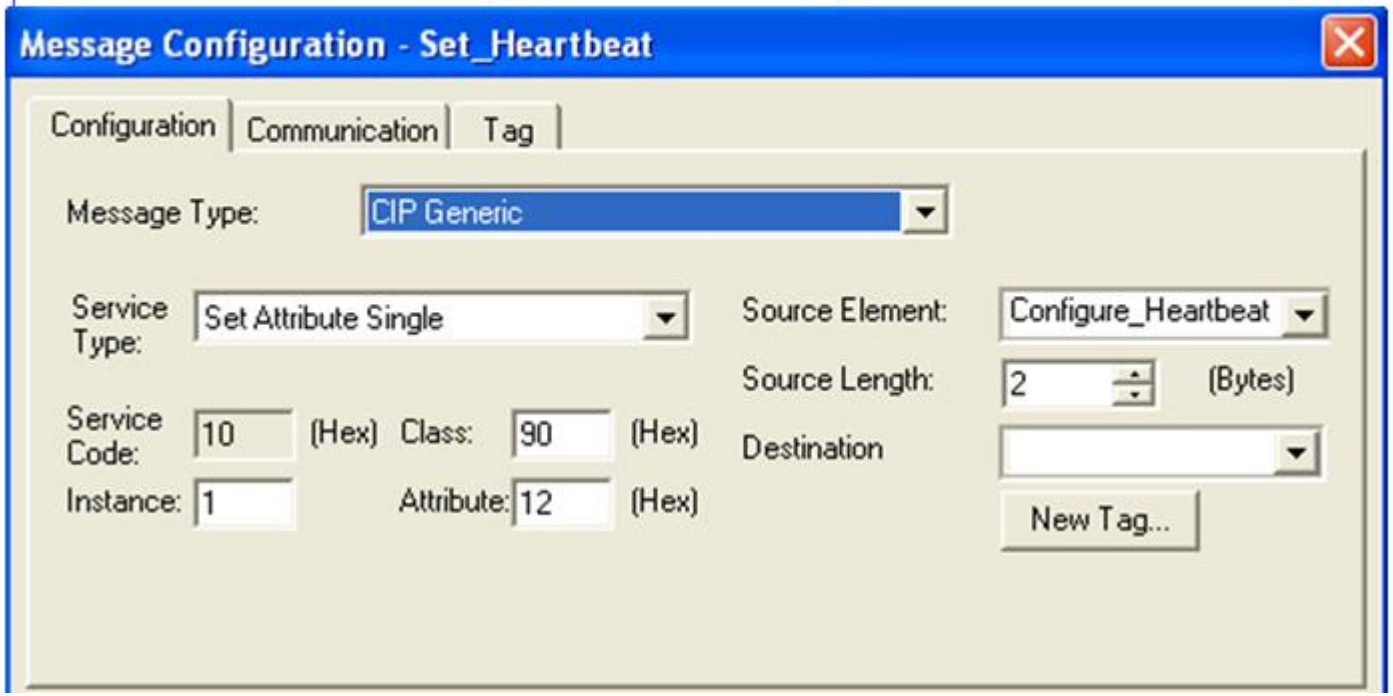
CONFIGURING MSG TO GET HEARBEAT



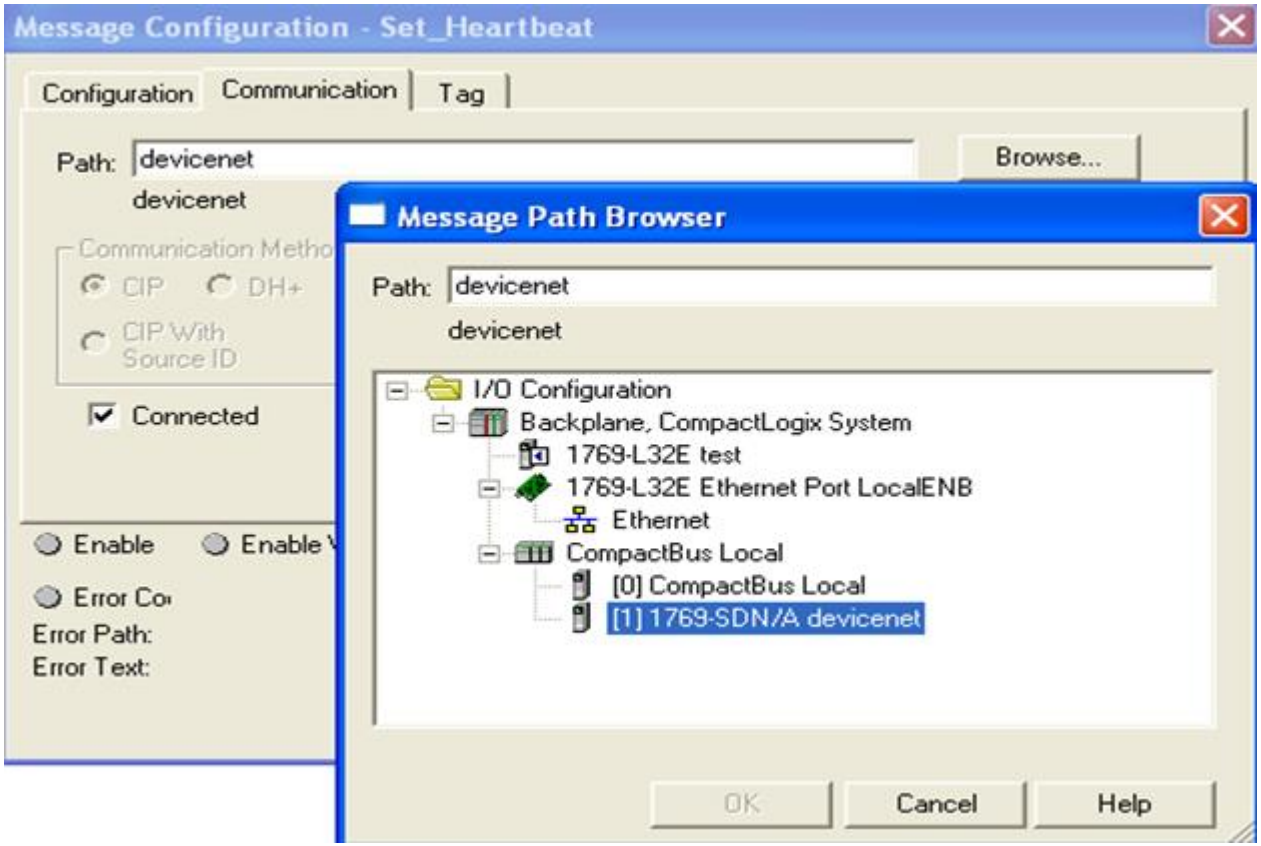
SELECTING SDN TO GET HEARTBEAT



CONFIGURING MSG TO SET HEARTBEAT



SELECTING SDM TO SET HEARTBEAT



DATA TRANSFER BETWEEN CONTROLLERS

Transfer data via Ethernet network

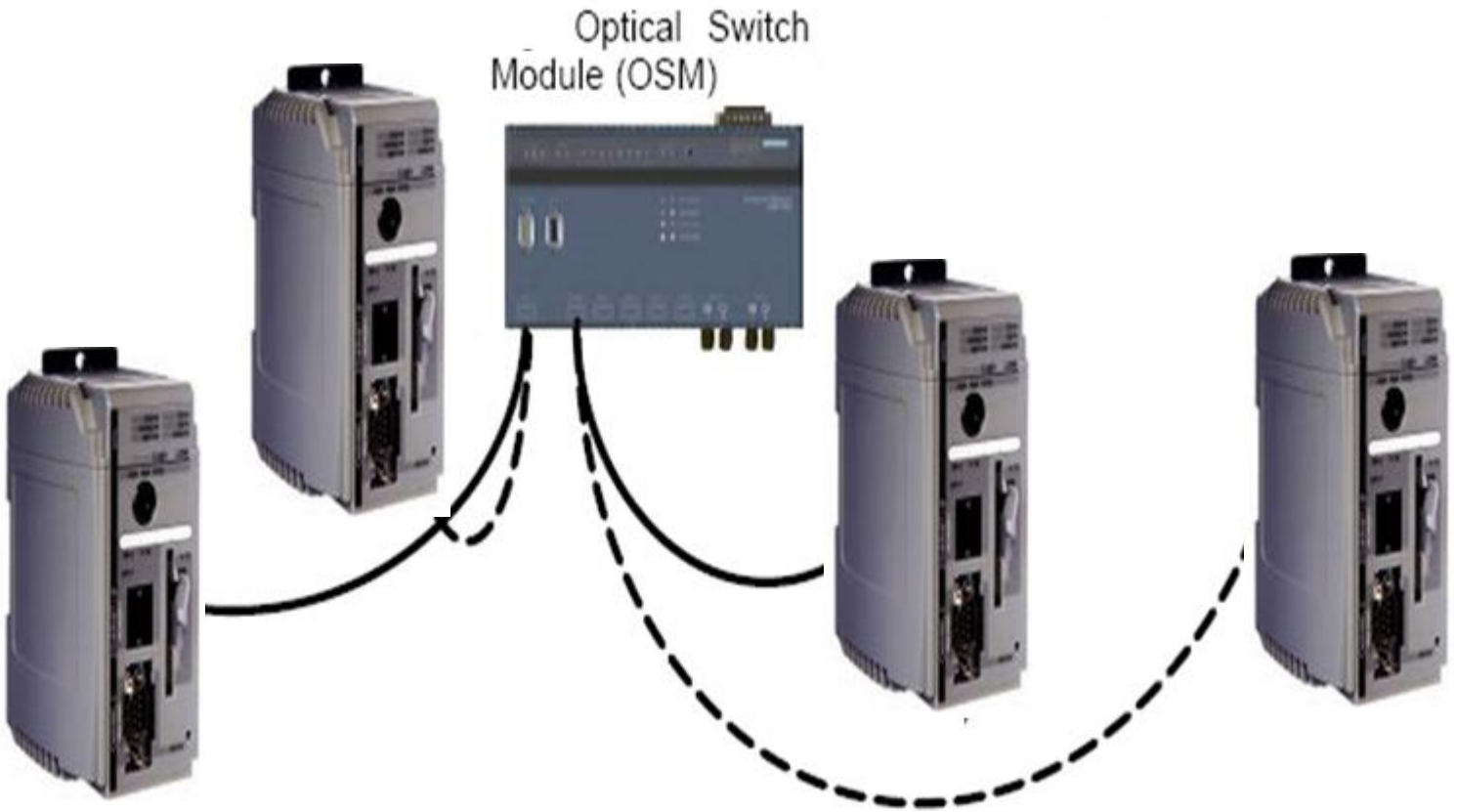
Each device must has a different address

192.168.1.20
255.255.255.0

192.168.1.21
255.255.255.0

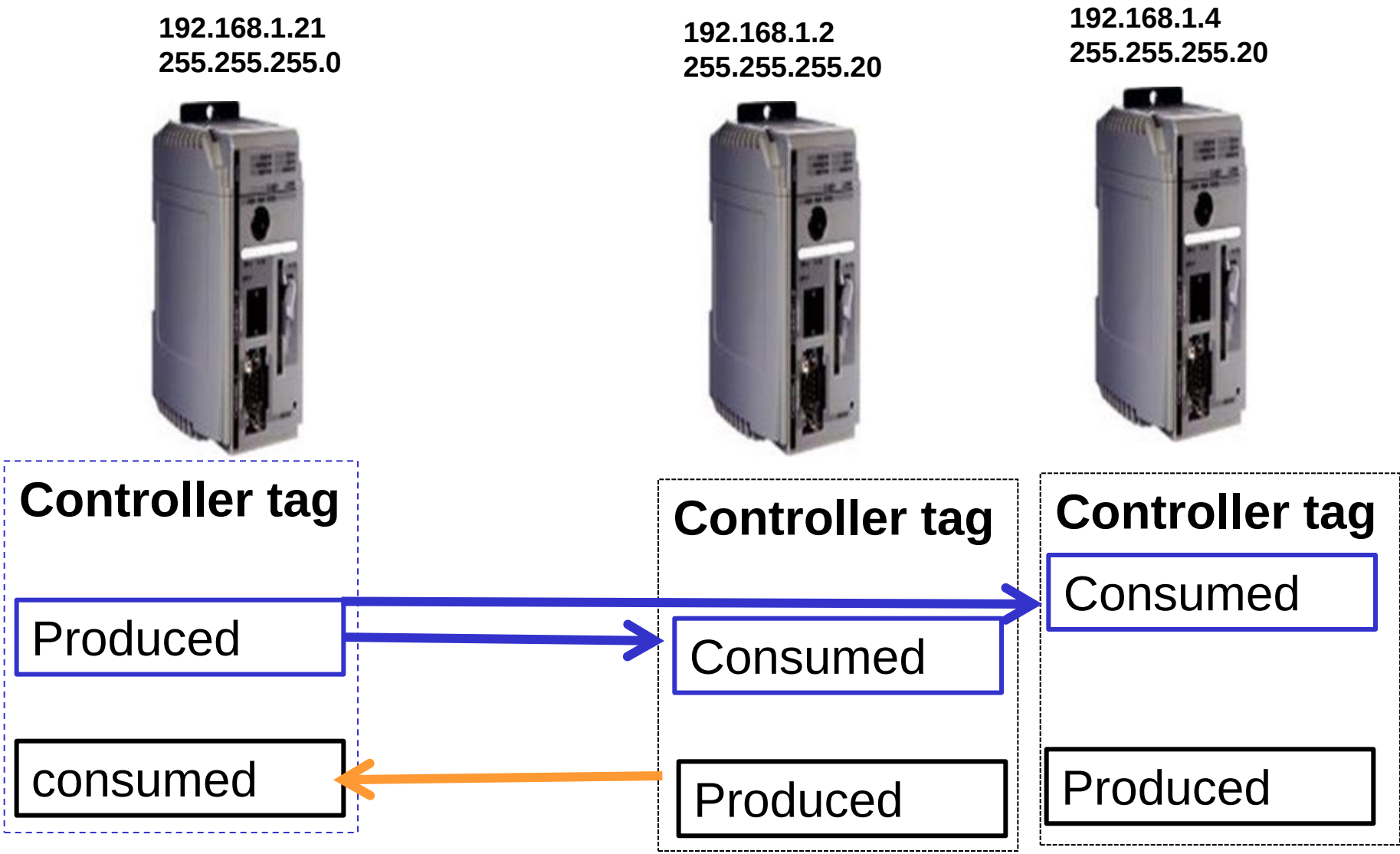
192.168.1.24
255.255.255.0

192.168.1.25
255.255.255.0



DATA TRANSFER BETWEEN CONTROLLERS

Transfer data via Ethernet network by produced and consumed tag



DATA TRANSFER BETWEEN CONTROLLERS

Tag guidelines for Produced and Consumed Data

Guideline	Details
Create the tags at the controller scope.	You can share only controller-scoped tags.
Use one of these data types: · DINT · REAL · array of DINTs or REALs · user-defined	• To share other data types, create a user-defined data type that contains the required data. • Use the same data type for the produced tag and corresponding consumed tag or tags.
Limit the size of the tag to ≤500 bytes.	If transferring more than 500 bytes, create logic to transfer the data in packets. A size of < 125 DINT words will keep total bytes within 500. This helps reduce the total number of packets for transactions.
Combine data that goes to the same controller.	If producing several tags for the same controller: • Group the data into one or more user-defined data types. This method uses fewer connections than does producing each tag separately. • Group the data according to similar update intervals. To conserve network bandwidth, use a greater RPI for less critical data. For example, you could create one tag for data that is critical and another tag for data that is not as critical.

DATA TRANSFER BETWEEN CONTROLLERS

Produced and Consumed Tag Definitions

Term	Definition
Produced tag	A tag that a controller makes available for use by other controllers. Multiple controllers can simultaneously consume (receive) the data. A produced tag sends its data to one or more consumed tags (consumers) without using logic. The produced tag sends its data at the RPI of the consuming tag.
Consumed tag	A tag that receives the data of a produced tag. The data type of the consumed tag must match the data type (including any array dimensions) of the produced tag. The RPI of the consumed tag determines the period at which the data updates.

Connections for Produced and Consumed Tags

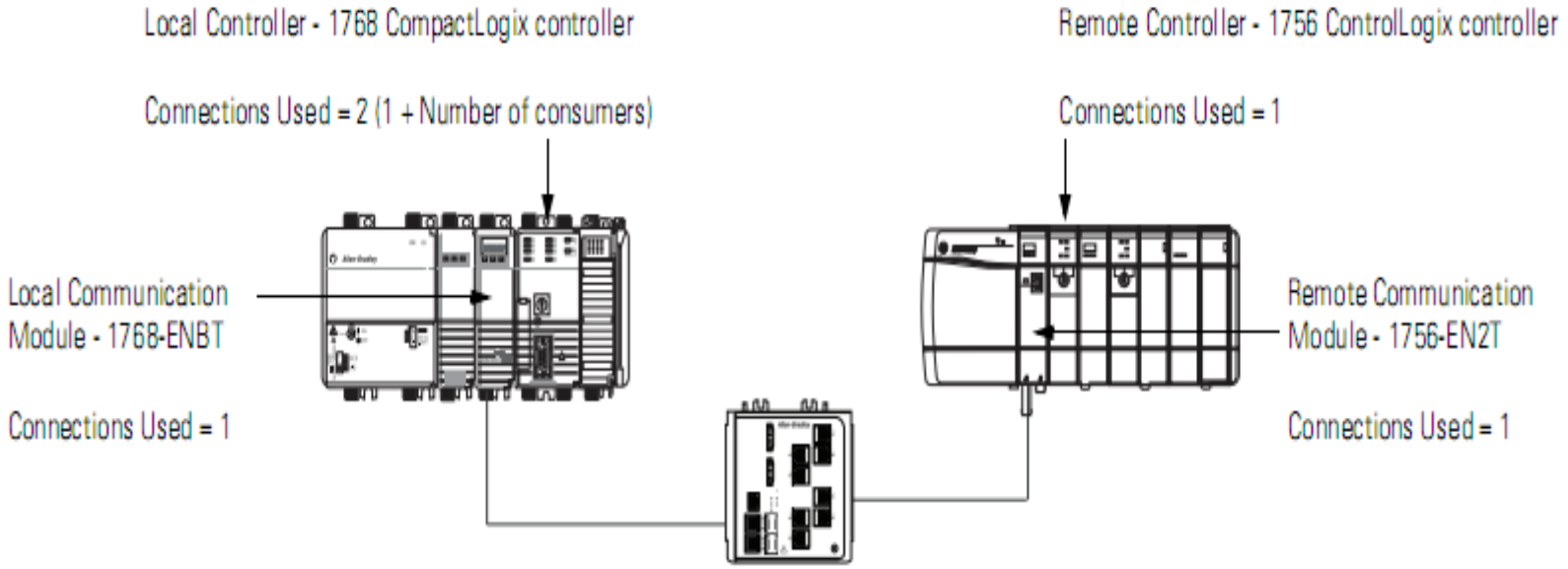
Tag Type	Required Connections
Produced	The local controller (producing) must have one connection for the produced tag and the first consumer and one more connection for each additional consumer (heartbeat). The produced tag requires two connections. As you increase the number of controllers that can consume a produced tag, you also reduce the number of connections the controller has available for other operations, such as communication and I/O.
Consumed	Each consumed tag requires one connection for the controller that is consuming the tag.

DATA TRANSFER BETWEEN CONTROLLERS

Number Connections for Produced and Consumed Tags

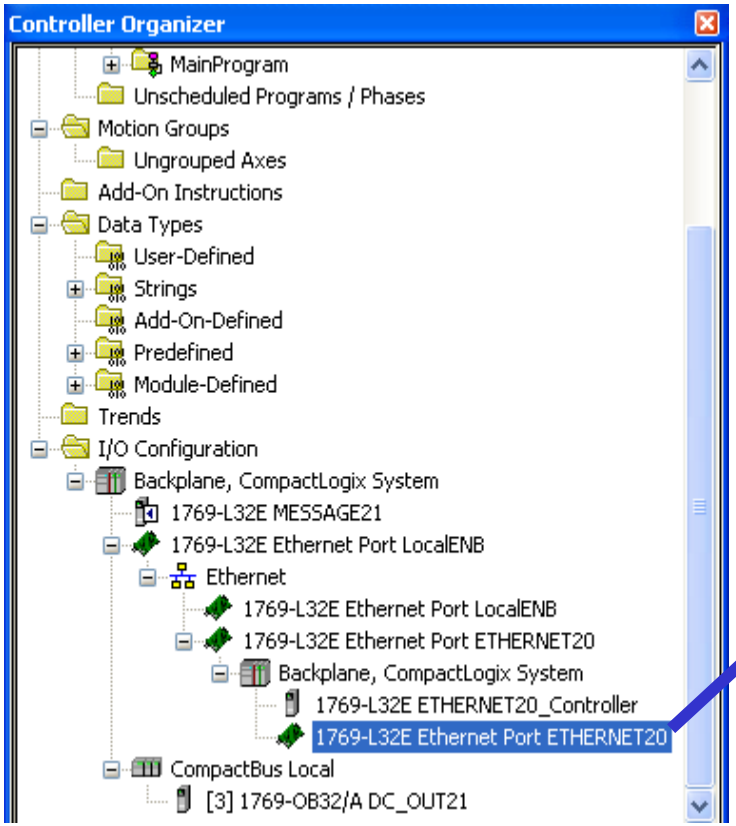
Type of Tag	Device	Number of Connections Used
Produced tag	Logix5000 controller	Number_of_consumers + 1
	EtherNet/IP module	1
Consumed tag	Logix5000 controller	1
	EtherNet/IP module	

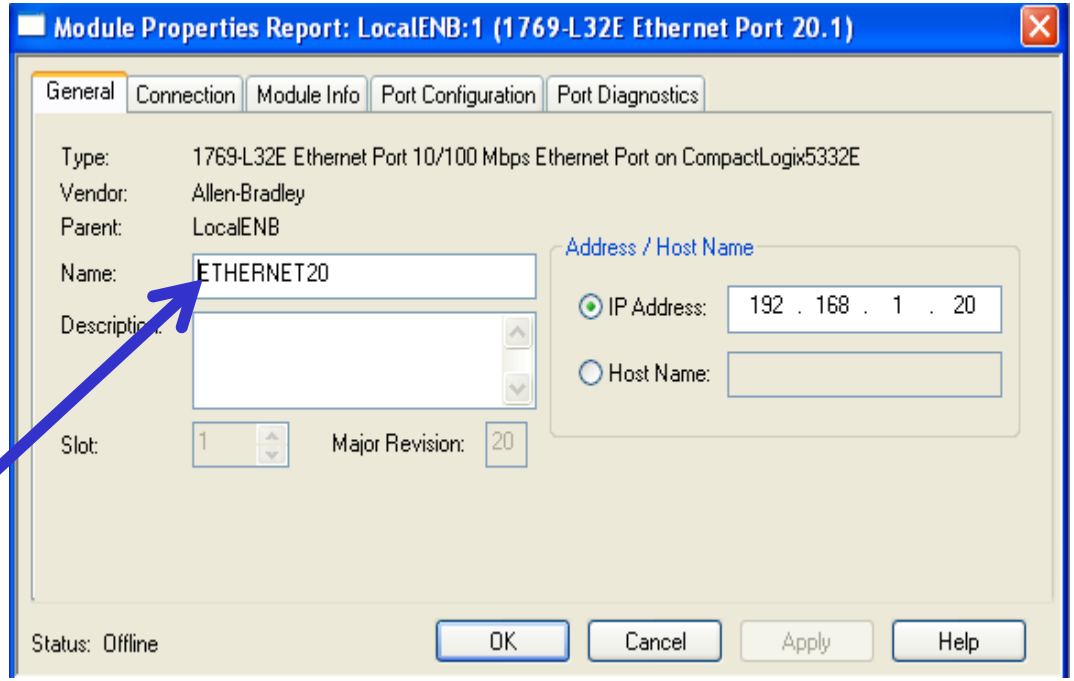
Example of Number Connections for Produced and Consumed Tags



DATA TRANSFER BETWEEN CONTROLLERS

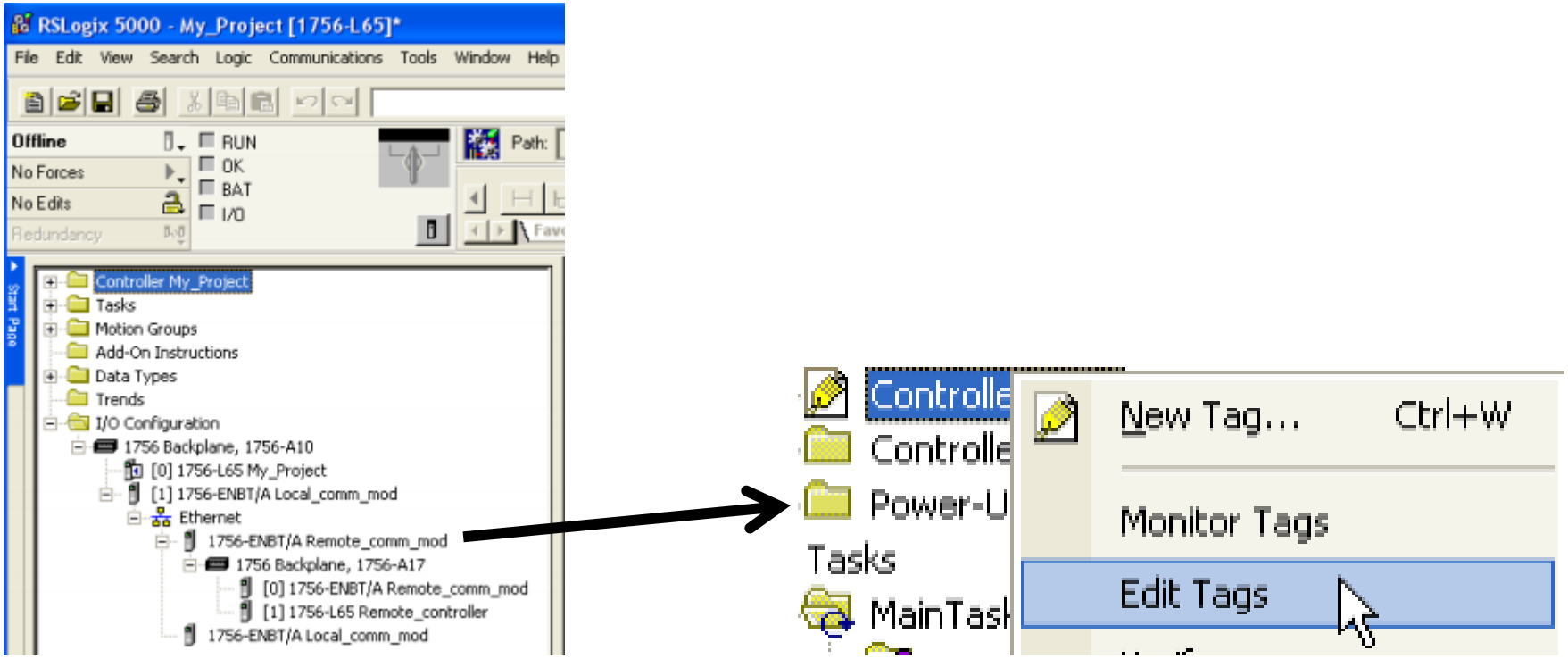
Create and configure a Produced Tag: Add the **consumer controller** via ethernet network then create controller tags





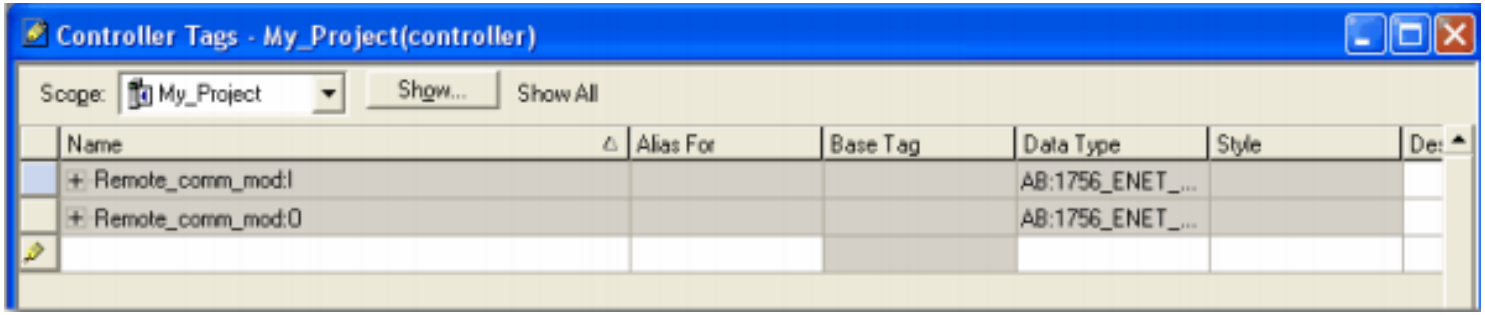
DATA TRANSFER BETWEEN CONTROLLERS

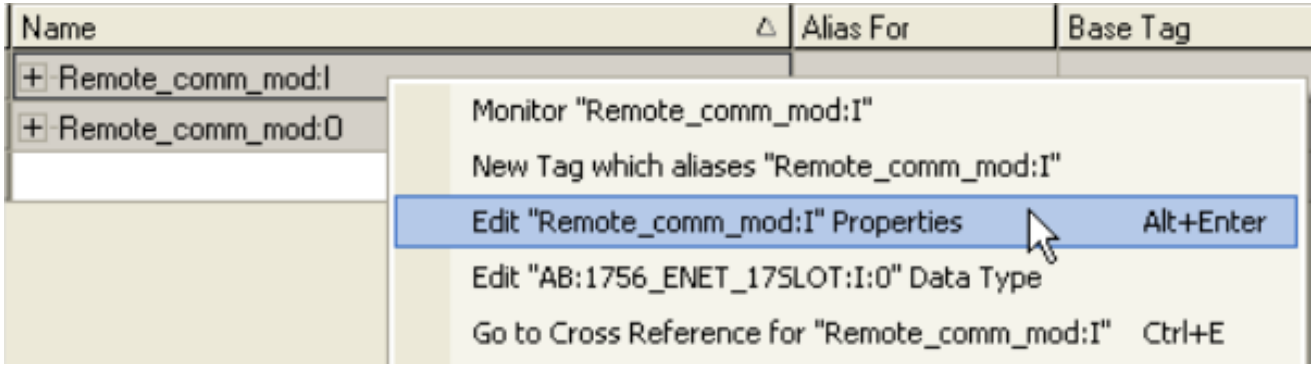
Create and configure a Produced Tag: Add the **consumer controller** via ethernet network then create controller tags



DATA TRANSFER BETWEEN CONTROLLERS

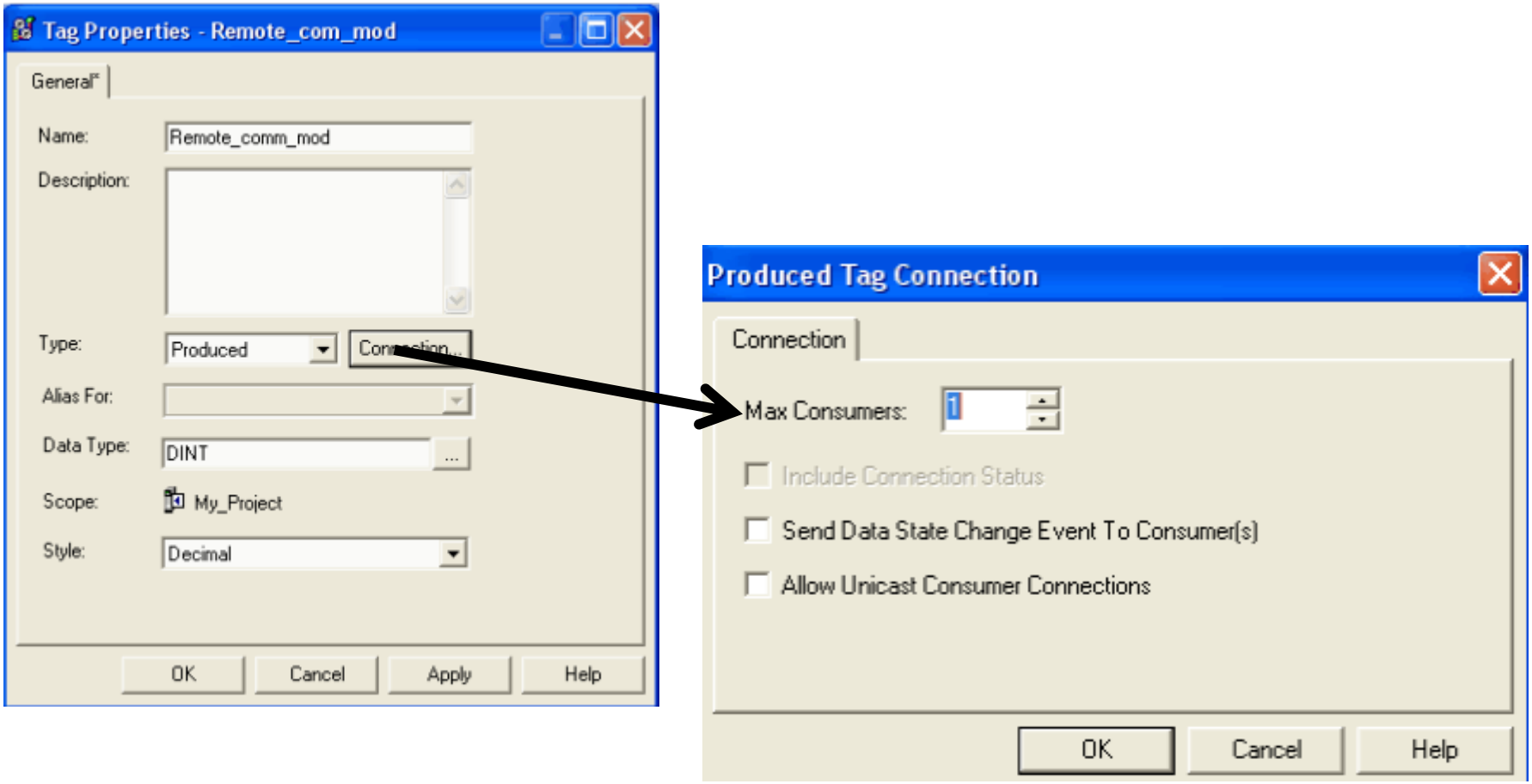
Edit properties of Produced Tags





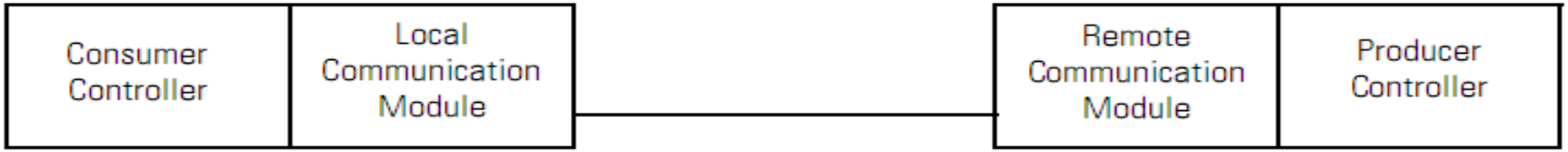
DATA TRANSFER BETWEEN CONTROLLERS

Choose Tag type is **Produced** then choose connection tab to add Max consumers

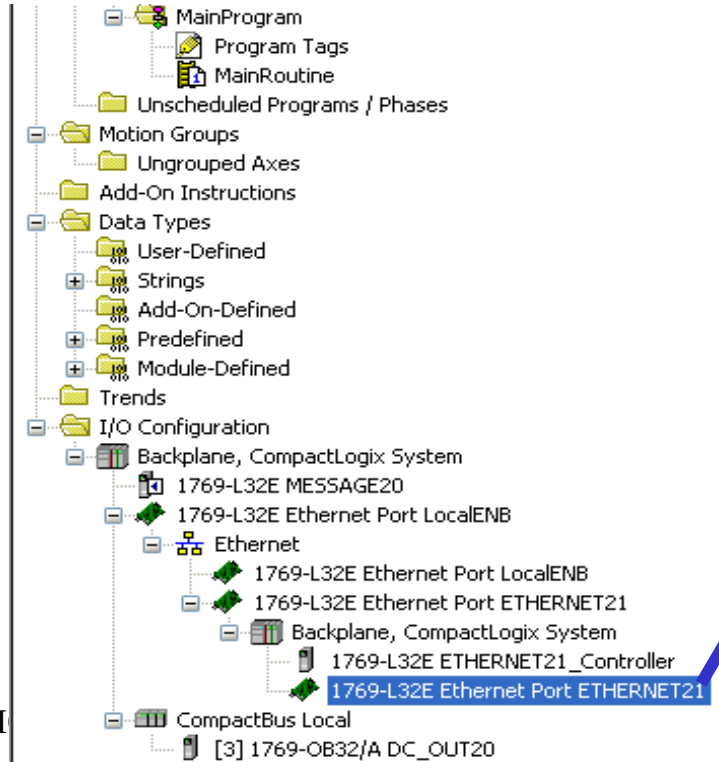


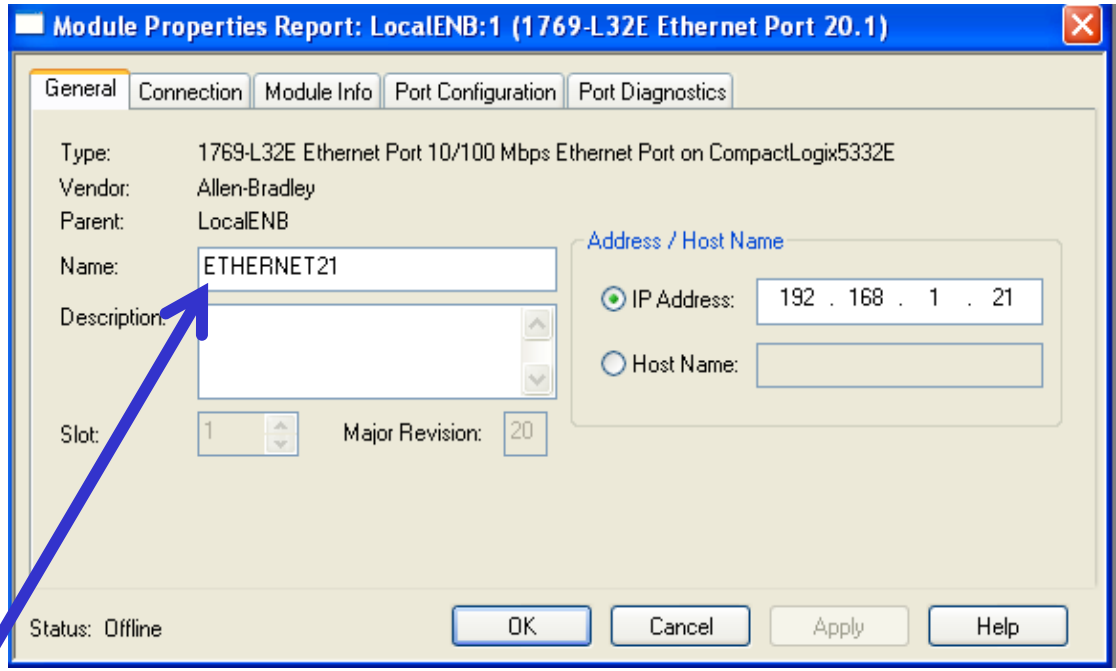
DATA TRANSFER BETWEEN CONTROLLERS

Consumed Tag is produced and configured by another controller



Create and configure a consumed Tag: Add the producer controller via ethernet network then create controller tags



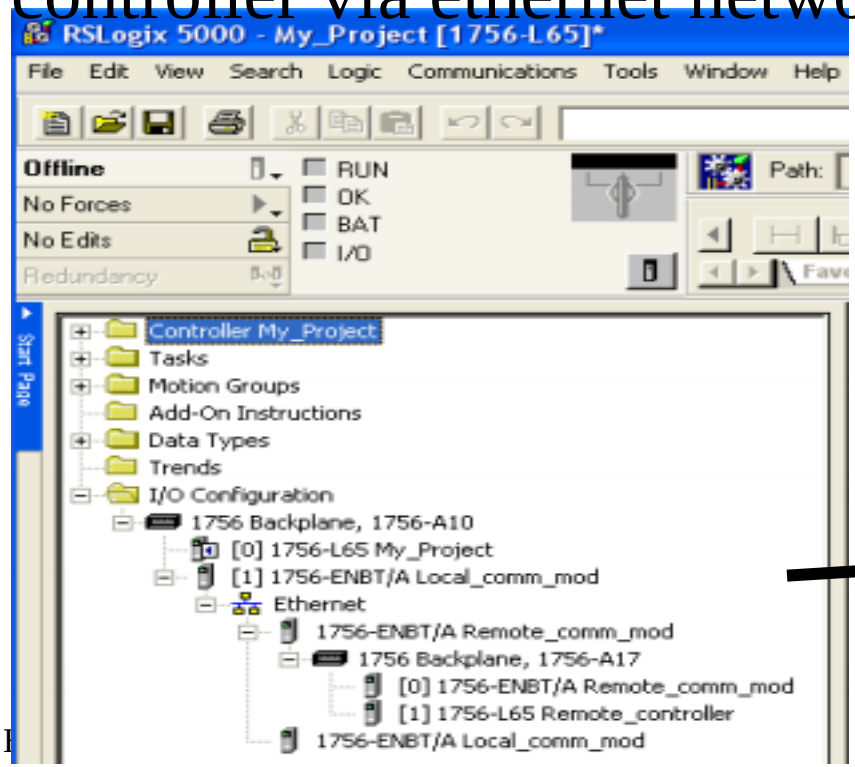


phuongtv@hcmute.edu.vn_0908248231

DATA TRANSFER BETWEEN CONTROLLERS

Consumed Tag is produced and configured by another controller

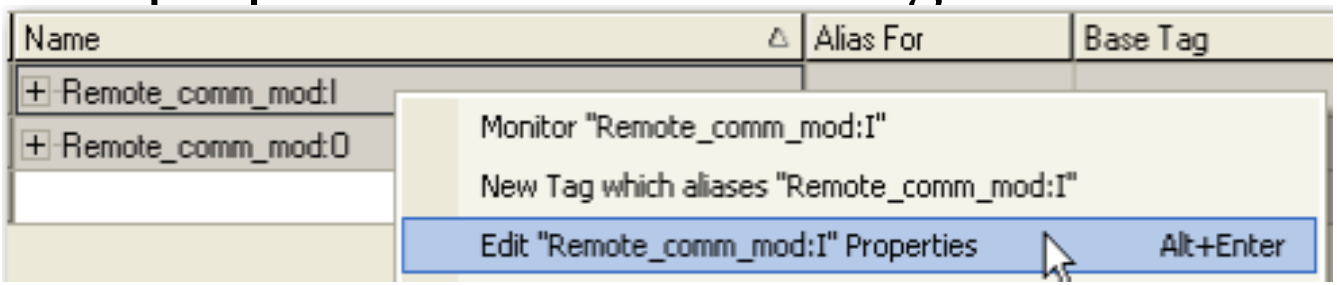
Create and configure a consumed Tag: Add the producer controller via ethernet network then create controller tags



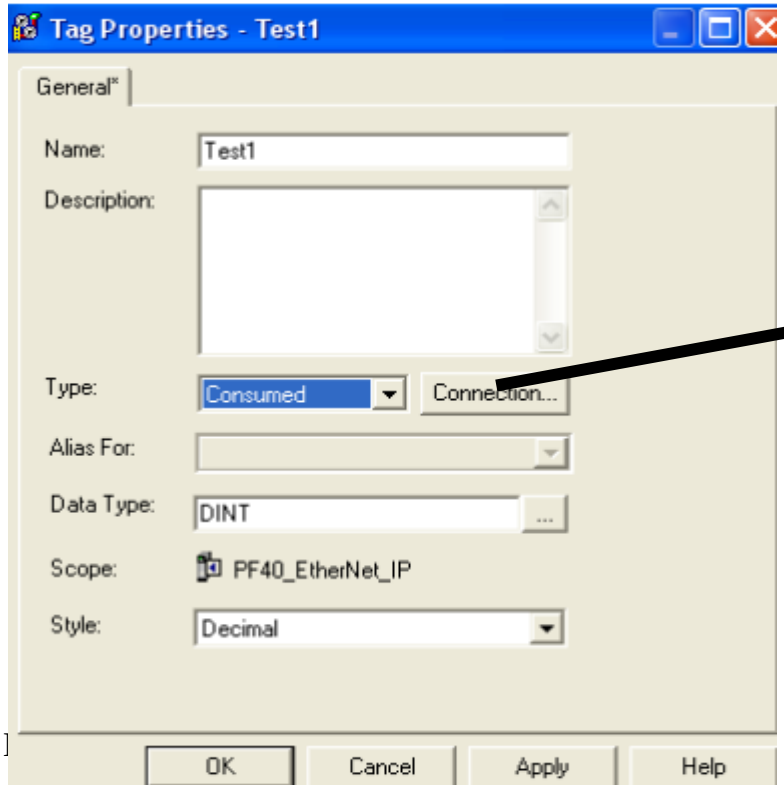
phuongtv@hcmute.edu.vn_0908248231

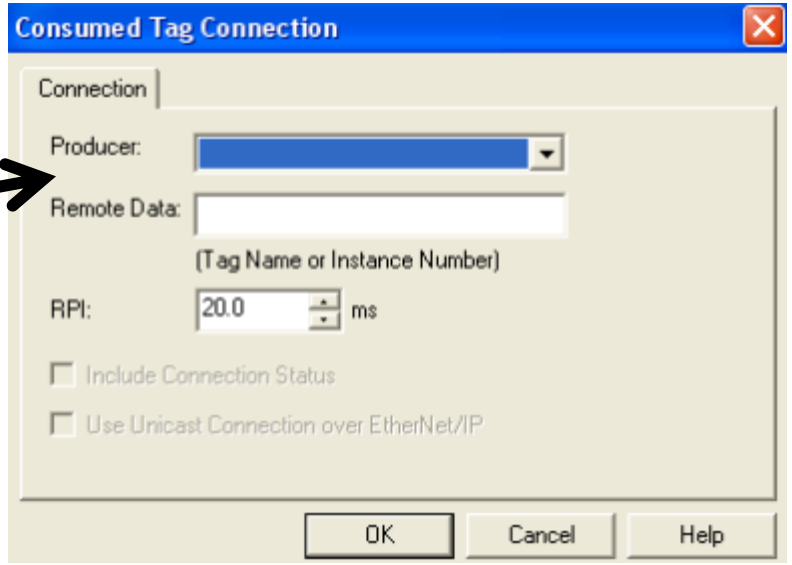
DATA TRANSFER BETWEEN CONTROLLERS

Edit properties of controller tag



Choose Tag type is **consumed** then choose connection tab to connect to producer controllers





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DATA TRANSFER BETWEEN CONTROLLERS

Transfer data via Ethernet network by Message control

Ins 192.168.1.21
255.255.255.0

192.168.1.4
255.255.255.20

Controller tag
Tag1, tag2..

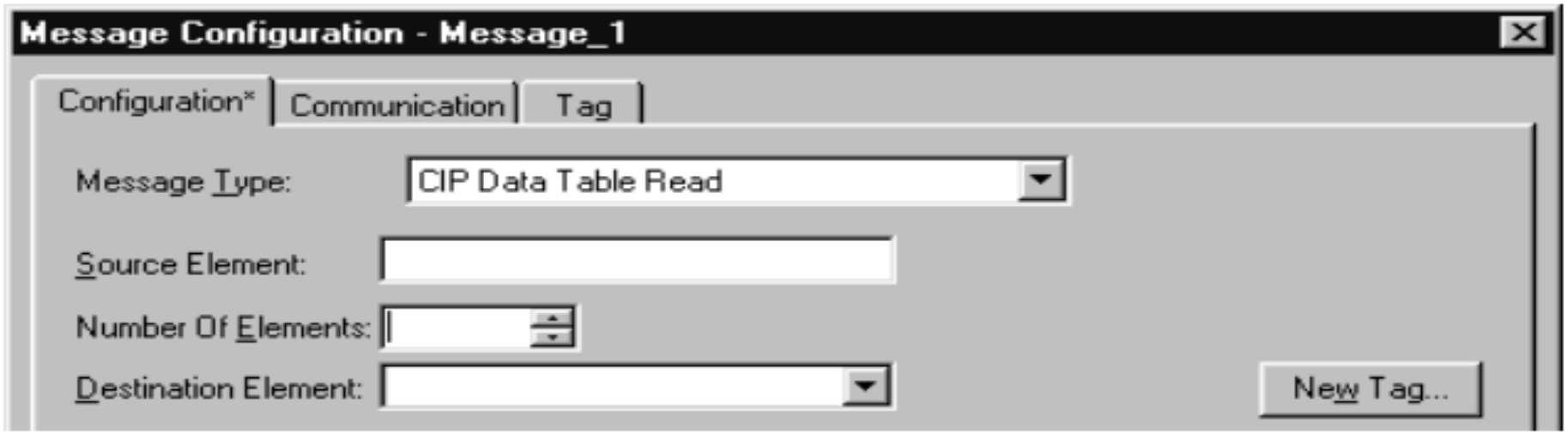
Controller tag
Tag1, tag2..

Message control
Data table write
Data table read

Message control
Data table write
Data table read

DATA TRANSFER BETWEEN CONTROLLERS

Use Message instruction to read, write data

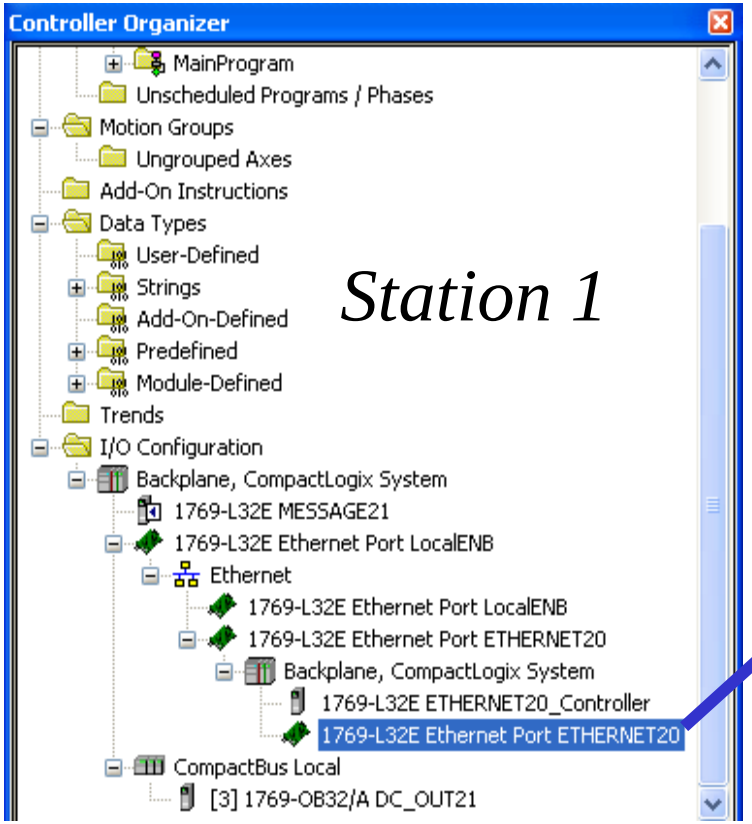


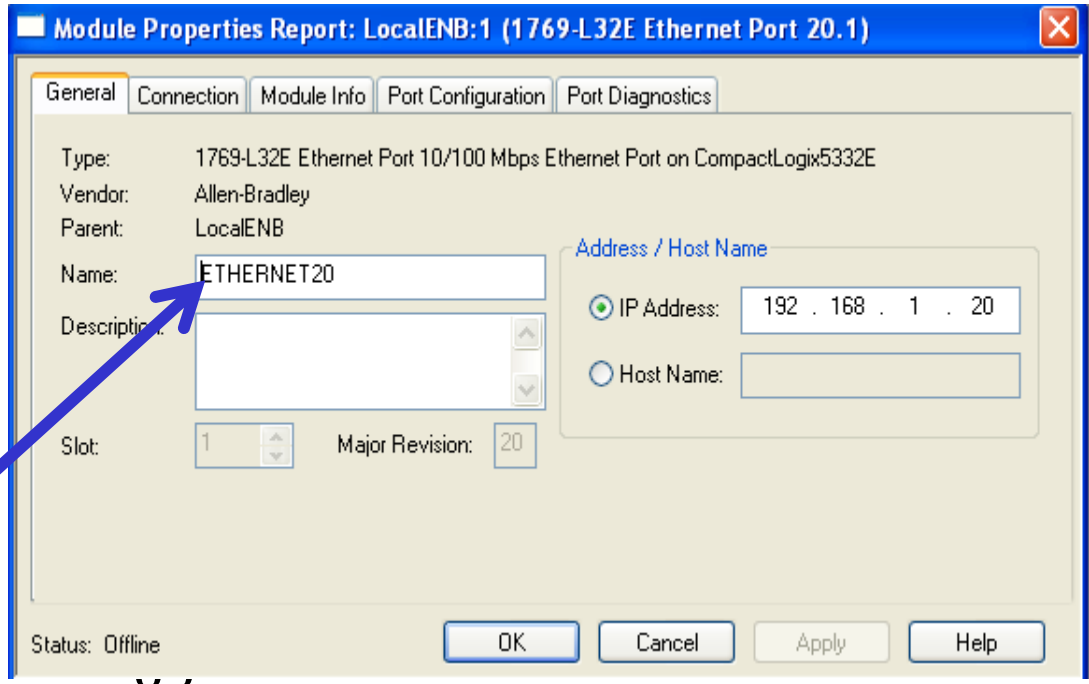
If The Target Device Is a	Select One Of These Message Types
Logix5000 controller	CIP Data Table Read
	CIP Data Table Write
I/O module that you configure using RSLogix 5000 software	Module Reconfigure
	CIP Generic

DATA TRANSFER BETWEEN CONTROLLERS

Use Message instruction to read, write data

To transfer data, add an Ethernet module and set IP address of remote station in hardware configuration transfer station and vice versa.

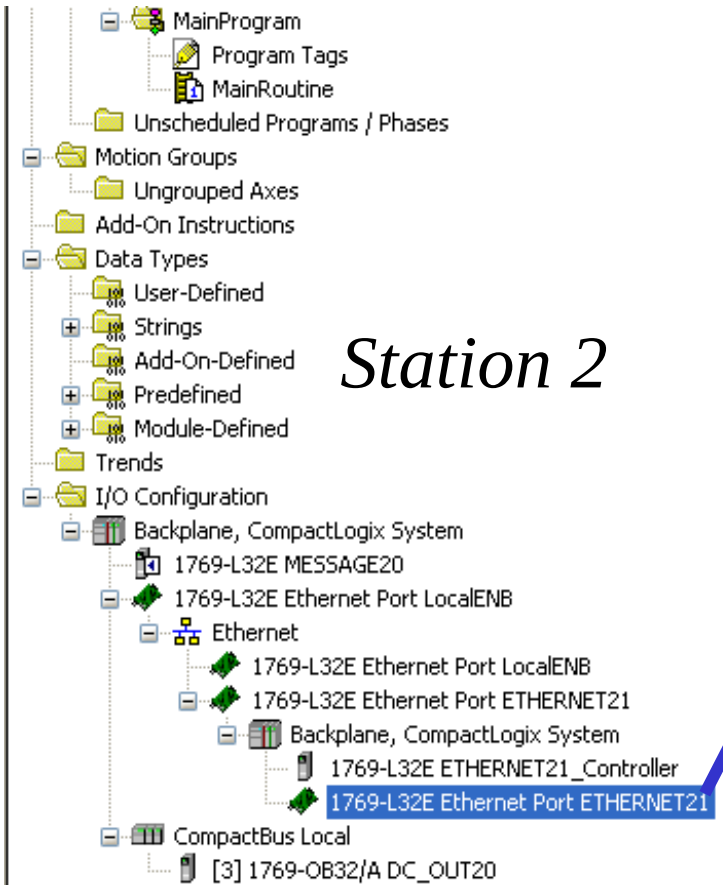




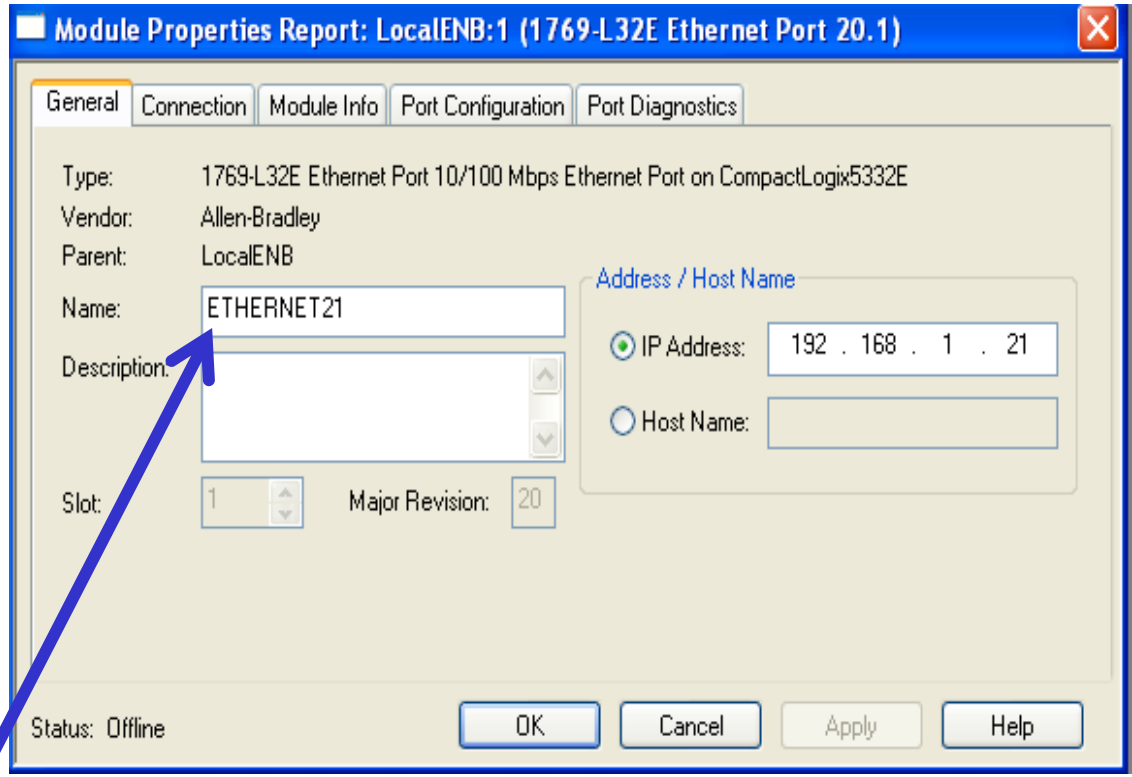
DATA TRANSFER BETWEEN CONTROLLERS

Use Message instruction to read, write data

add an Ethernet module and set IP address of remote station in hardware configuration transfer station and vice versa.



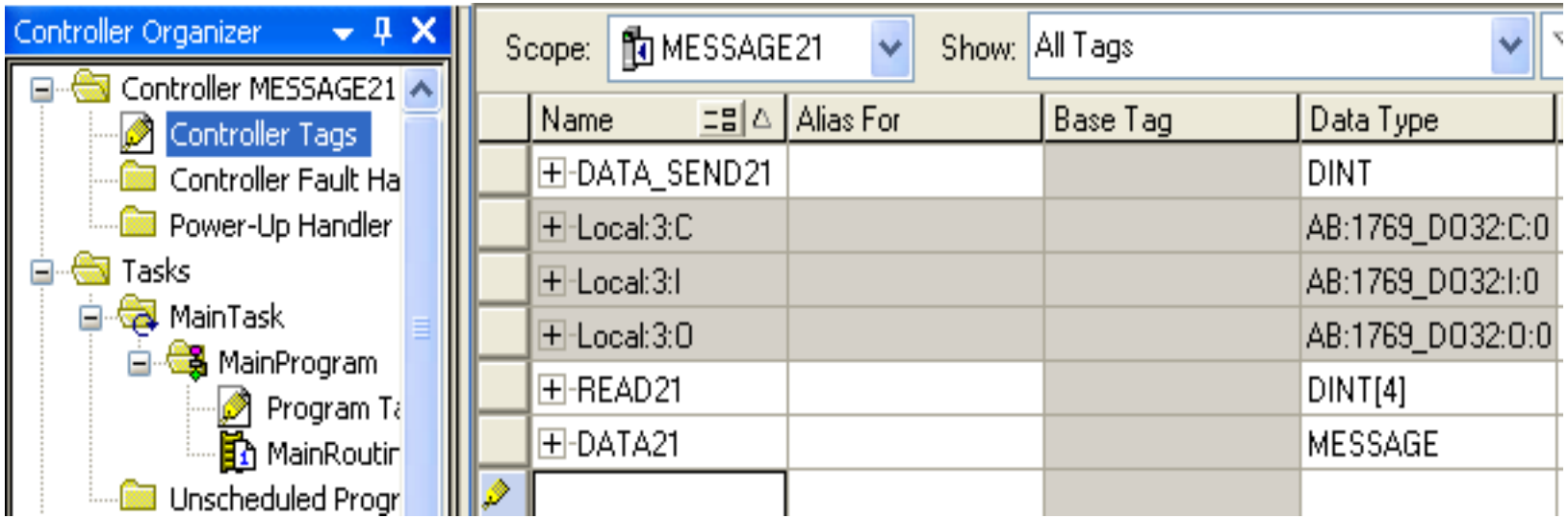
Station 2

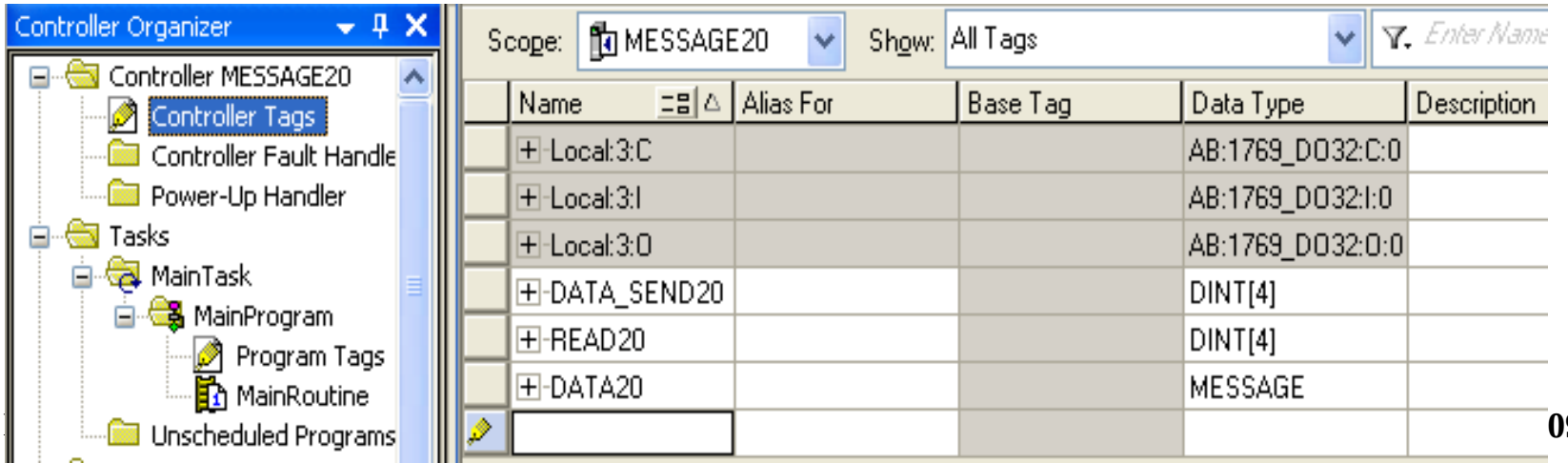


DATA TRANSFER BETWEEN CONTROLLERS

Use Message instruction to read, write data

Create tags in controller tag for each station.

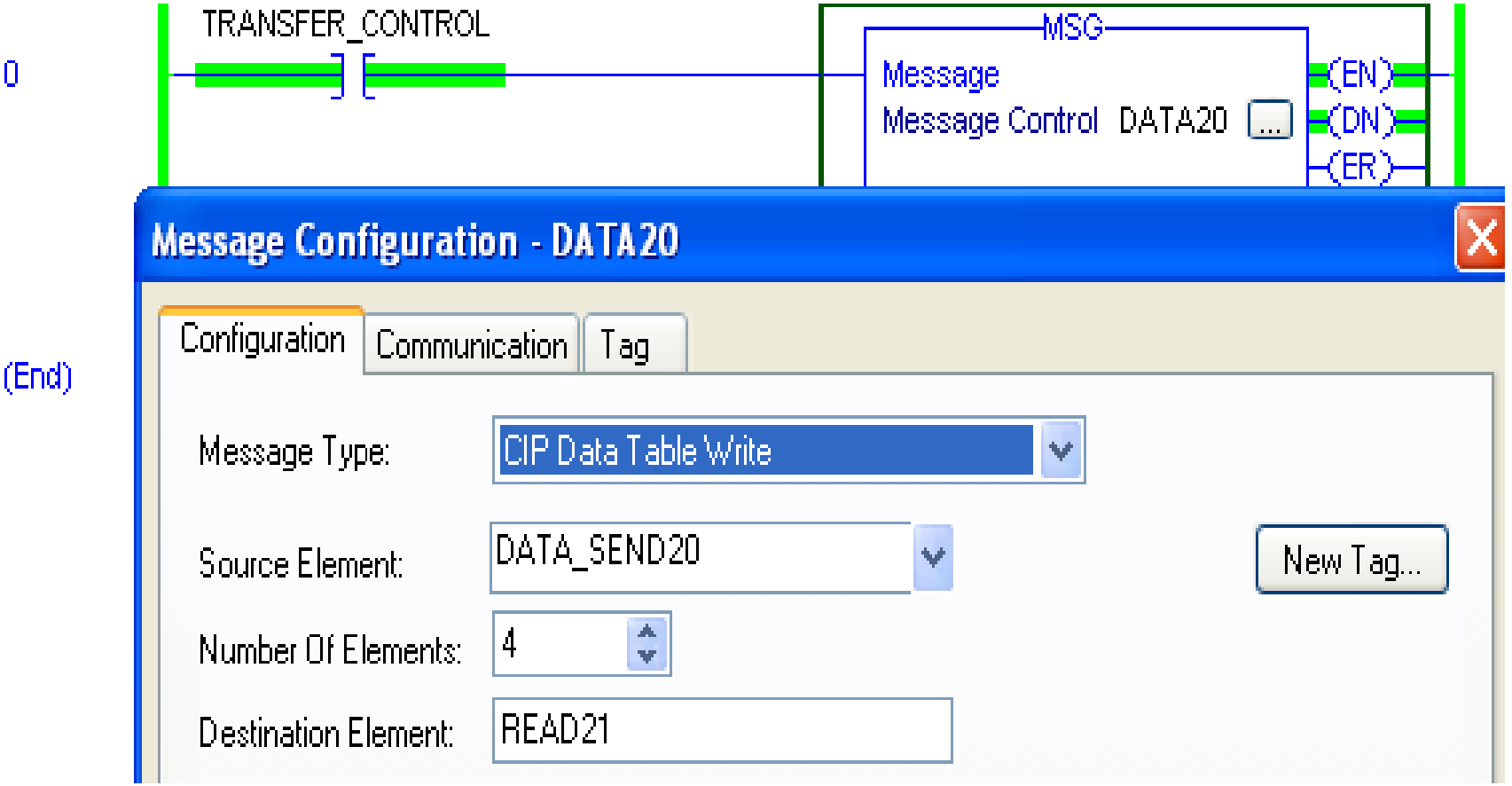




DATA TRANSFER BETWEEN CONTROLLERS

Use Message instruction to read, write data

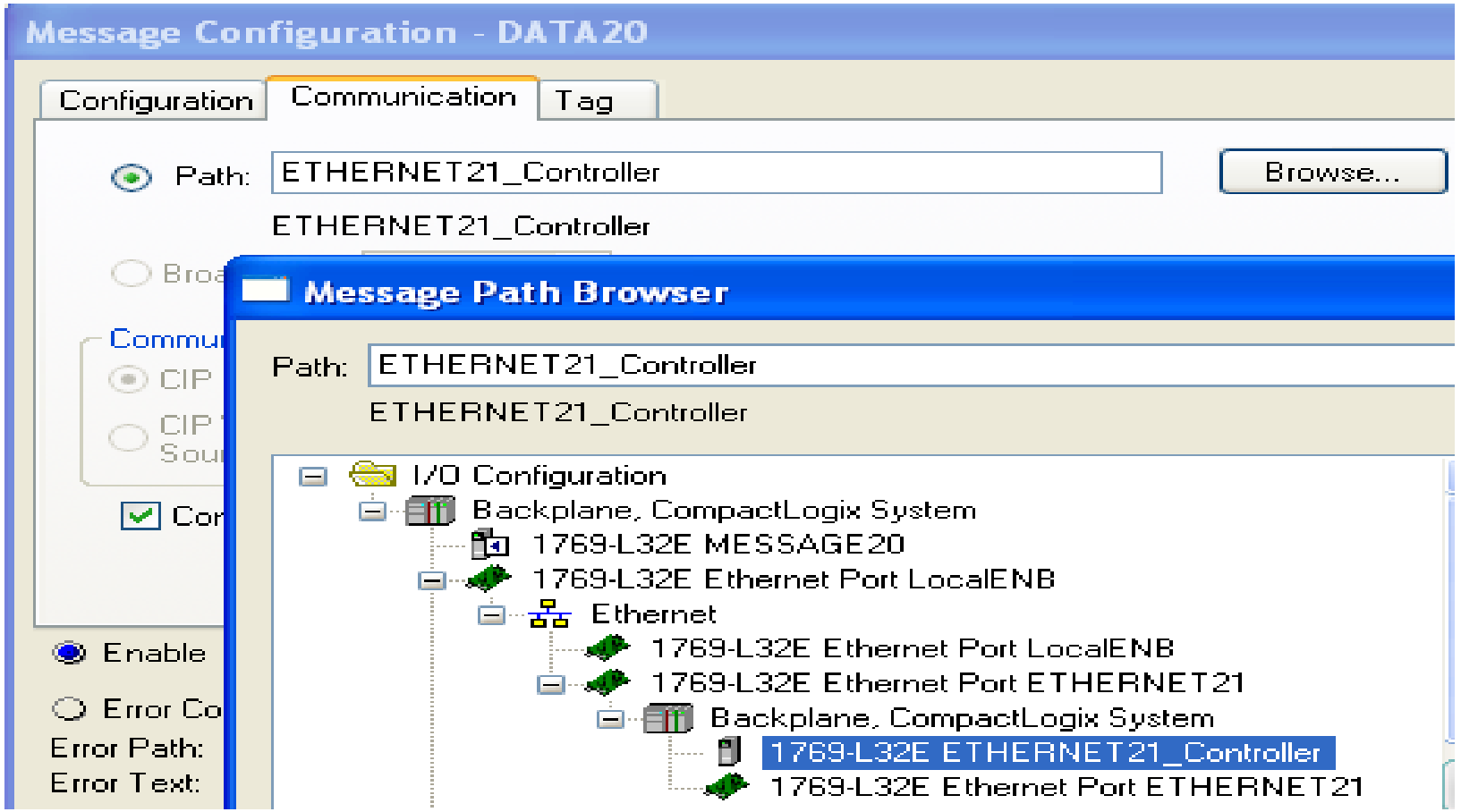
Add and configure parameters for Message control Ins (only for one station)



DATA TRANSFER BETWEEN CONTROLLERS

Use Message instruction to read, write data

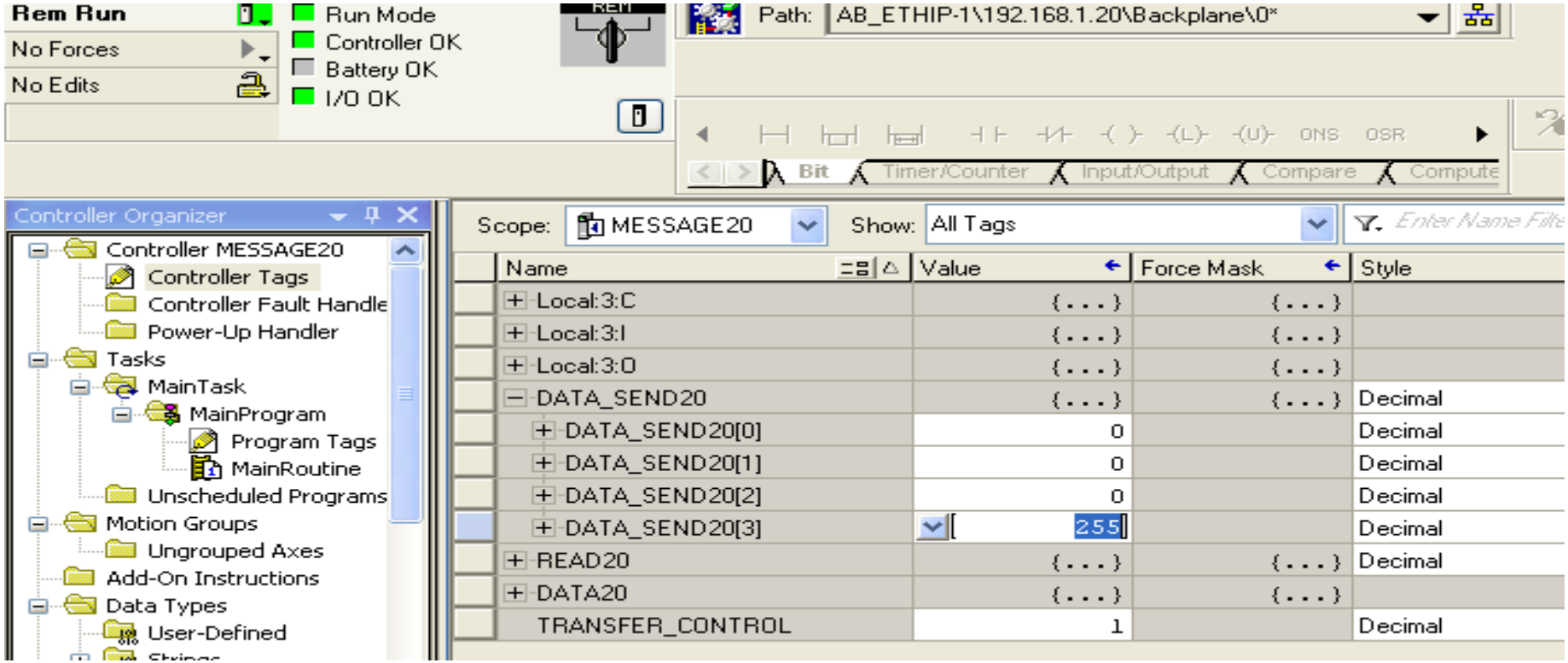
Add and configure parameters for Message control Ins



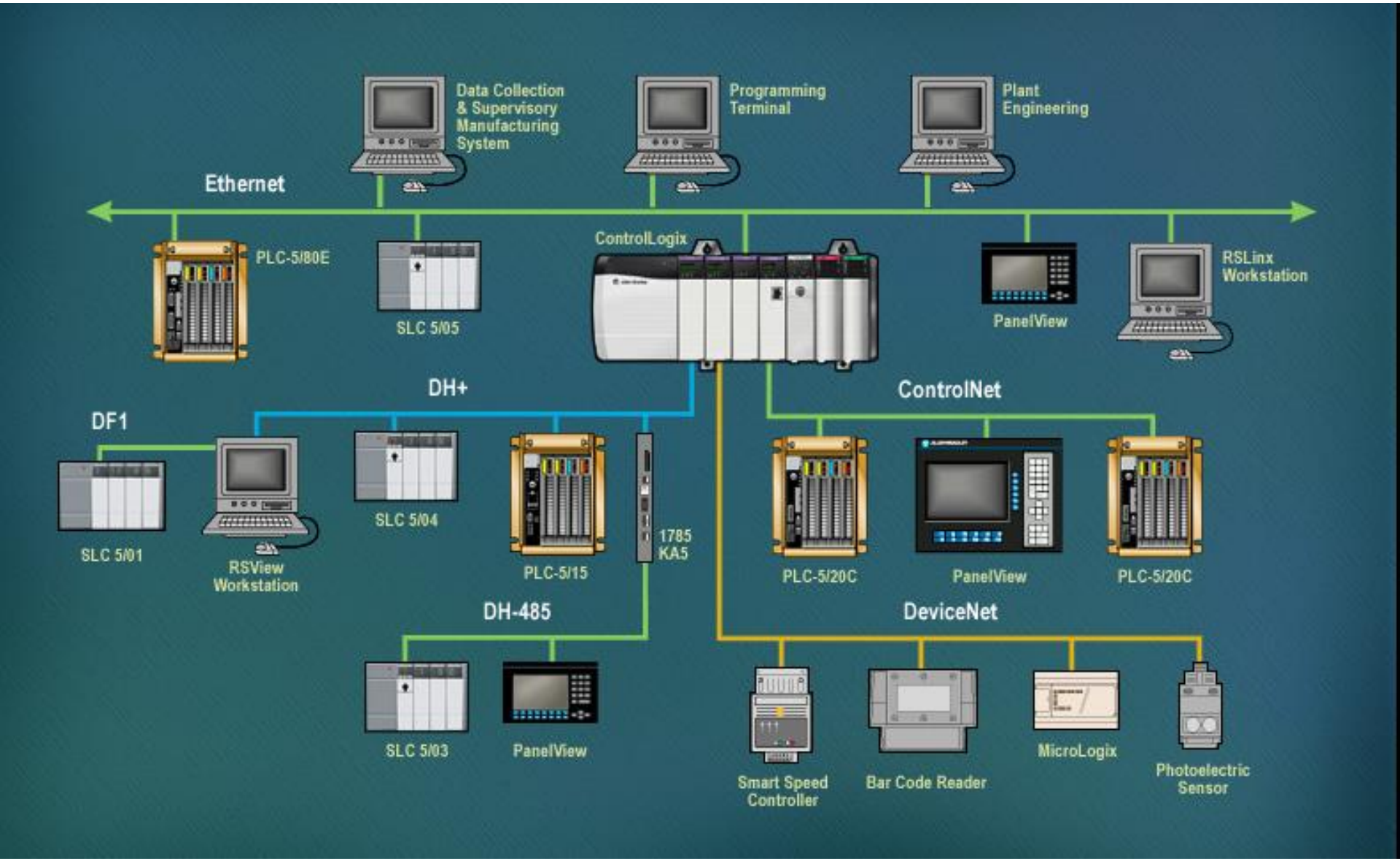
DATA TRANSFER BETWEEN CONTROLLERS

Use Message instruction to read, write data

Download program to plc and check respondent of data



CONTROLNET OVERVIEW



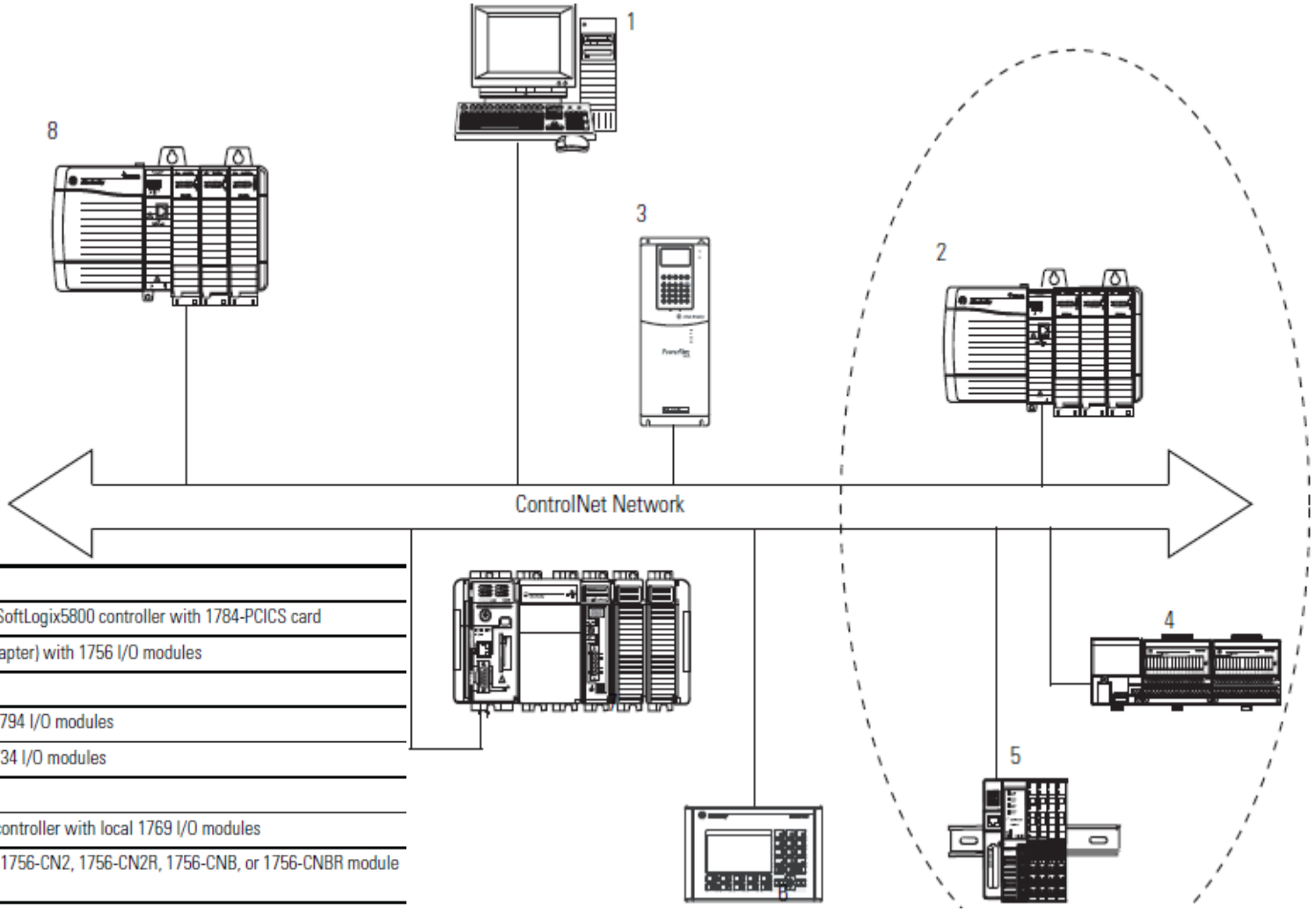
CONTROLNET OVERVIEW

The ControlNet network provides high-speed transmission of **time-critical I/O** and **interlocking data** and **messaging data.**

The ControlNet network is most often used in these ways:

- As the default network for the ControlLogix platform
- As a backbone to multiple distributed DeviceNet networks
- As a peer interlocking network

Use ControlNet Communication Modules in a Control System



Item	Description
1	Personal computer running SoftLogix5800 controller with 1784-PCICS card
2	1756-CNB module (as an adapter) with 1756 I/O modules
3	PowerFlex 700S drive
4	1794-ACN15 adapter with 1794 I/O modules
5	1734-ACNR adapter with 1734 I/O modules
6	PanelView terminal
7	CompactLogix 1769-L35CR controller with local 1769 I/O modules
8	ControlLogix controller with 1756-CN2, 1756-CN2R, 1756-CNB, or 1756-CNBR module as the scanner

Use ControlNet Communication Modules in a Control System

- The controllers produce and consume tags among themselves.
- The controllers initiate MSG instructions that send/receive data or configure devices.
- The computer uploads and downloads projects to the controllers.
- The computer configures devices on the ControlNet network and configures the network itself.

Exchange Information on a ControlNet Network

- With unscheduled data, the device from which a message originates, such as a Logix5000 controller, contains the path information that makes sure the message reaches its consumers
- Scheduled data in Logix-based systems use the producer/consumer networking model
- The controller can also produce data for other controllers to consume.
- Digital input modules produce (multicast) their data either upon a change of state (COS) or periodically

Control I/O Via ControlNet Network

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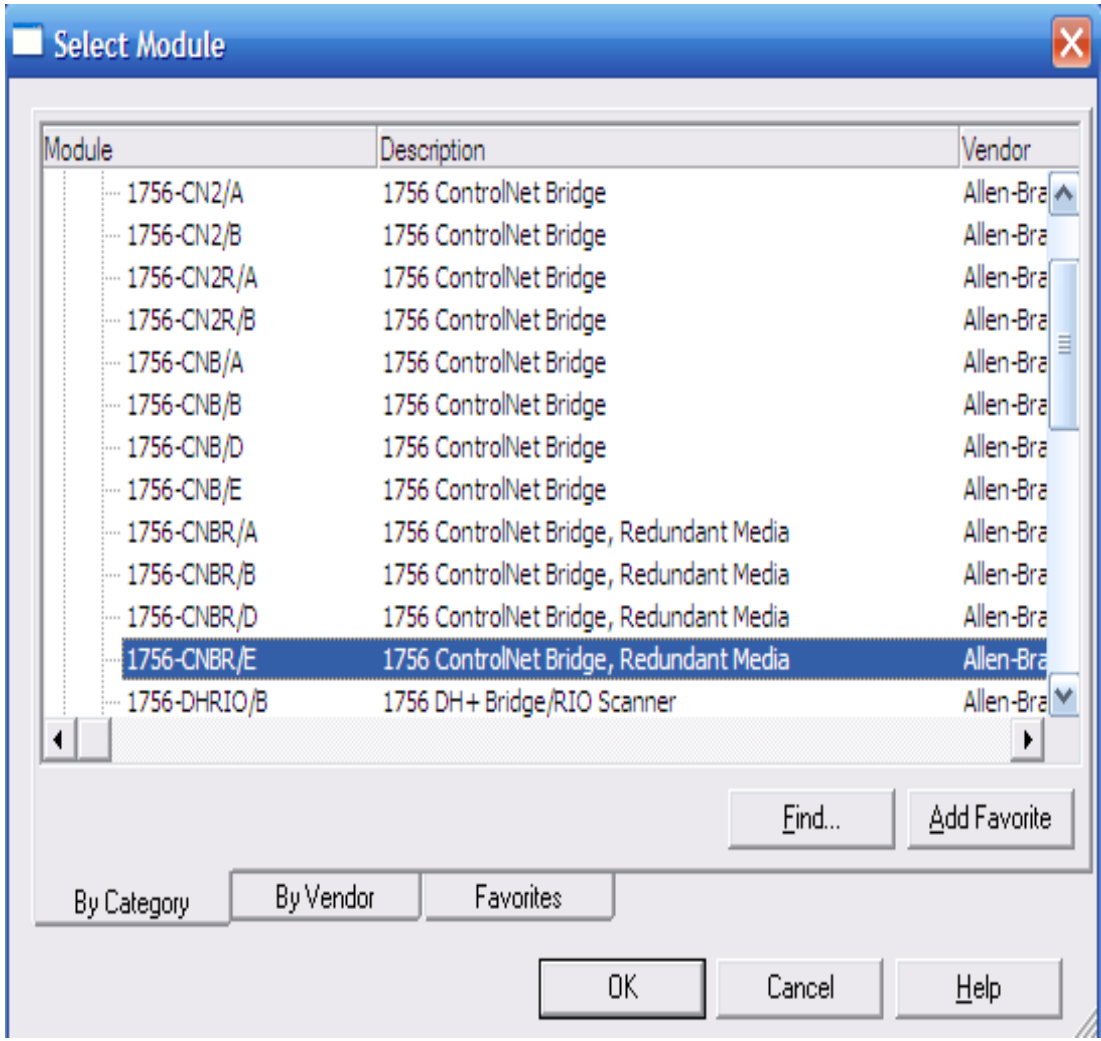
CONTROLNET MODULES

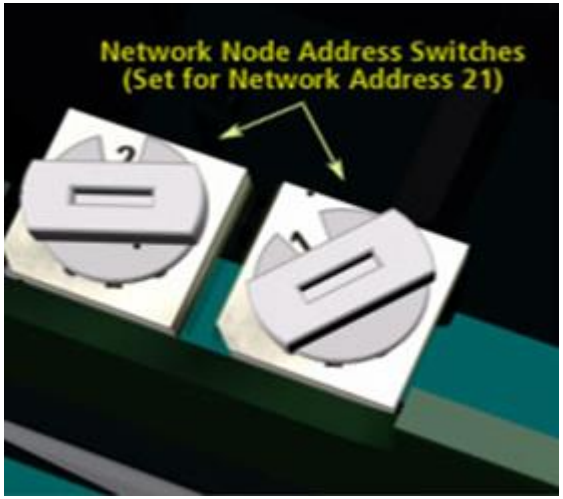
1756-CNB

1756-CNBR

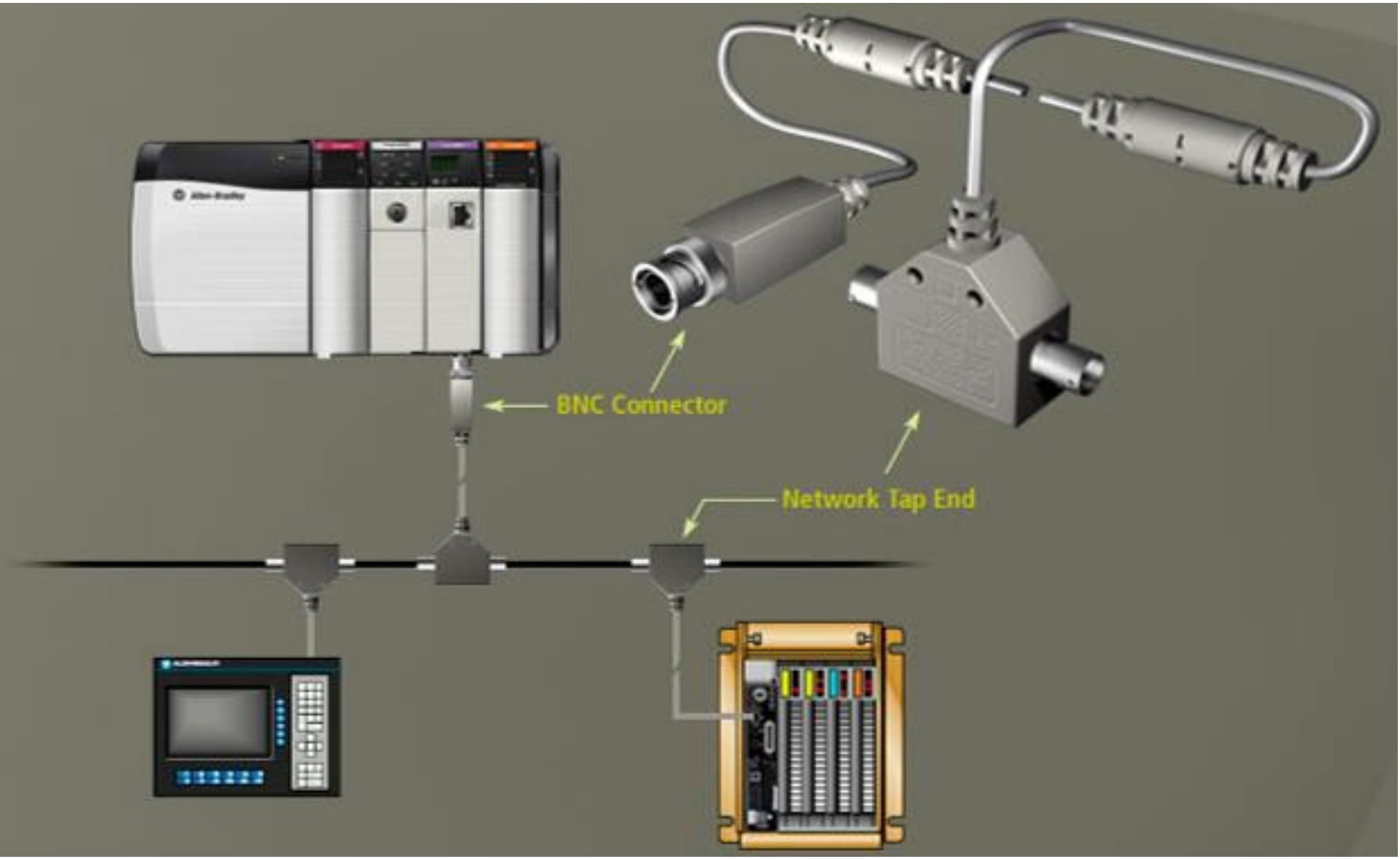


INSTALLING CONTROLNET MODULES

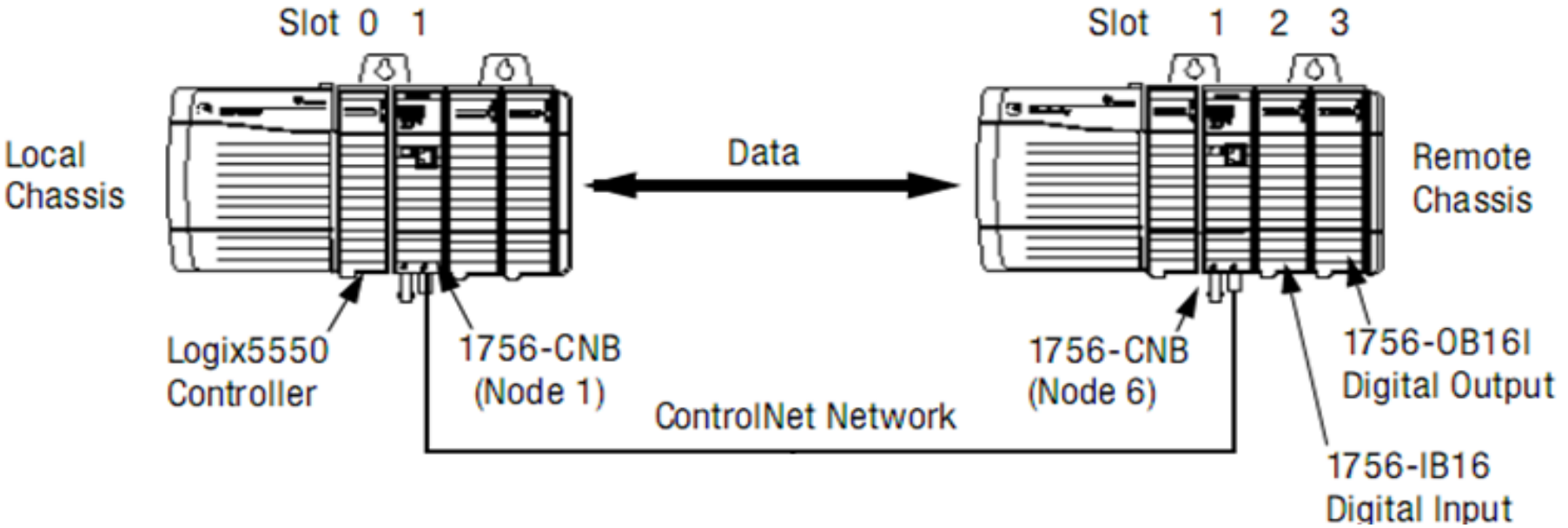
SETTING MODULE ADDRESS



CONTROLNET CABLE



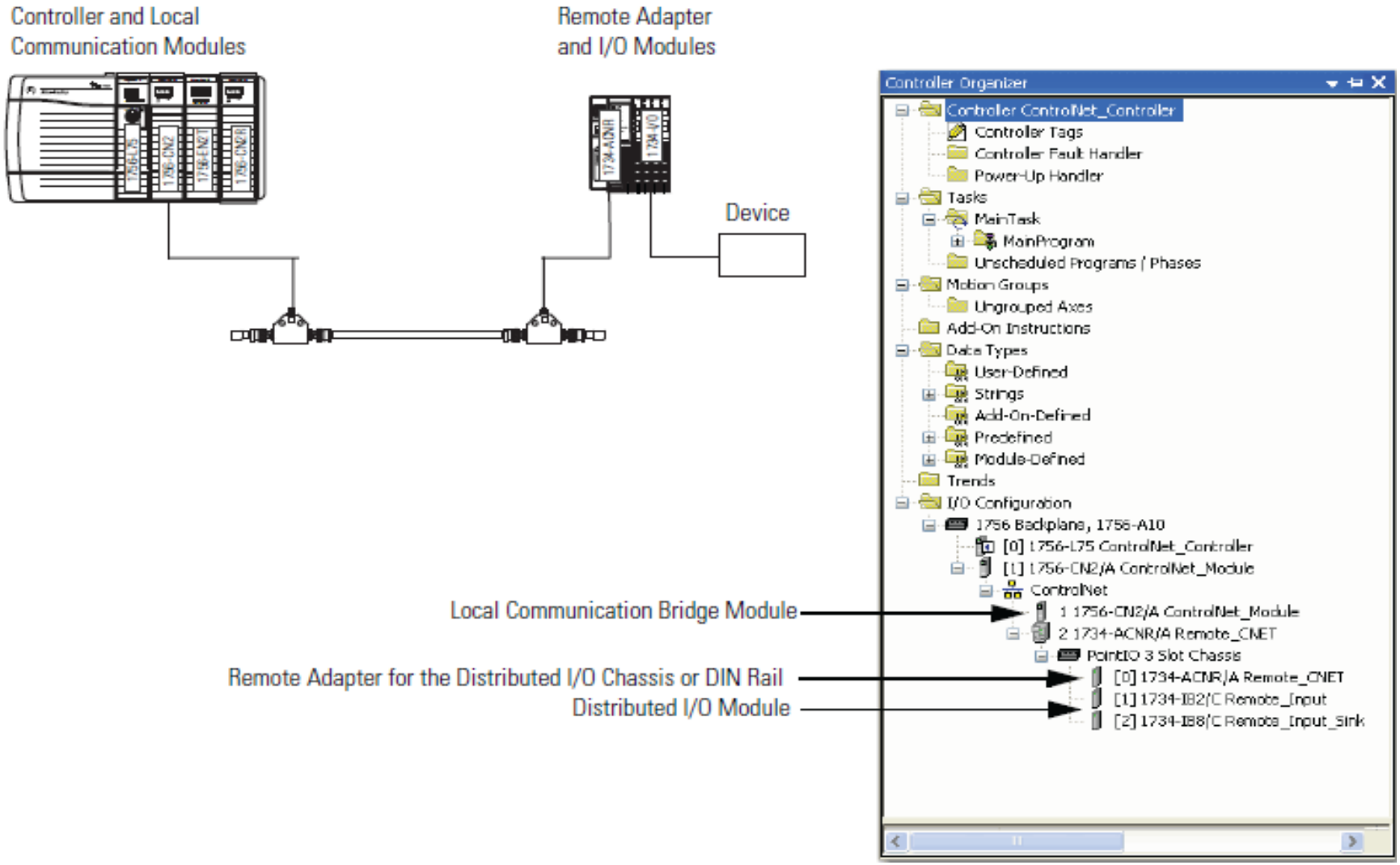
Control I/O Via ControlNet Network



When configure a remote ControlNet communication module or an I/O module, connection format must be choosen. There are two type of communication format **Direct or Rack-optimized connection**

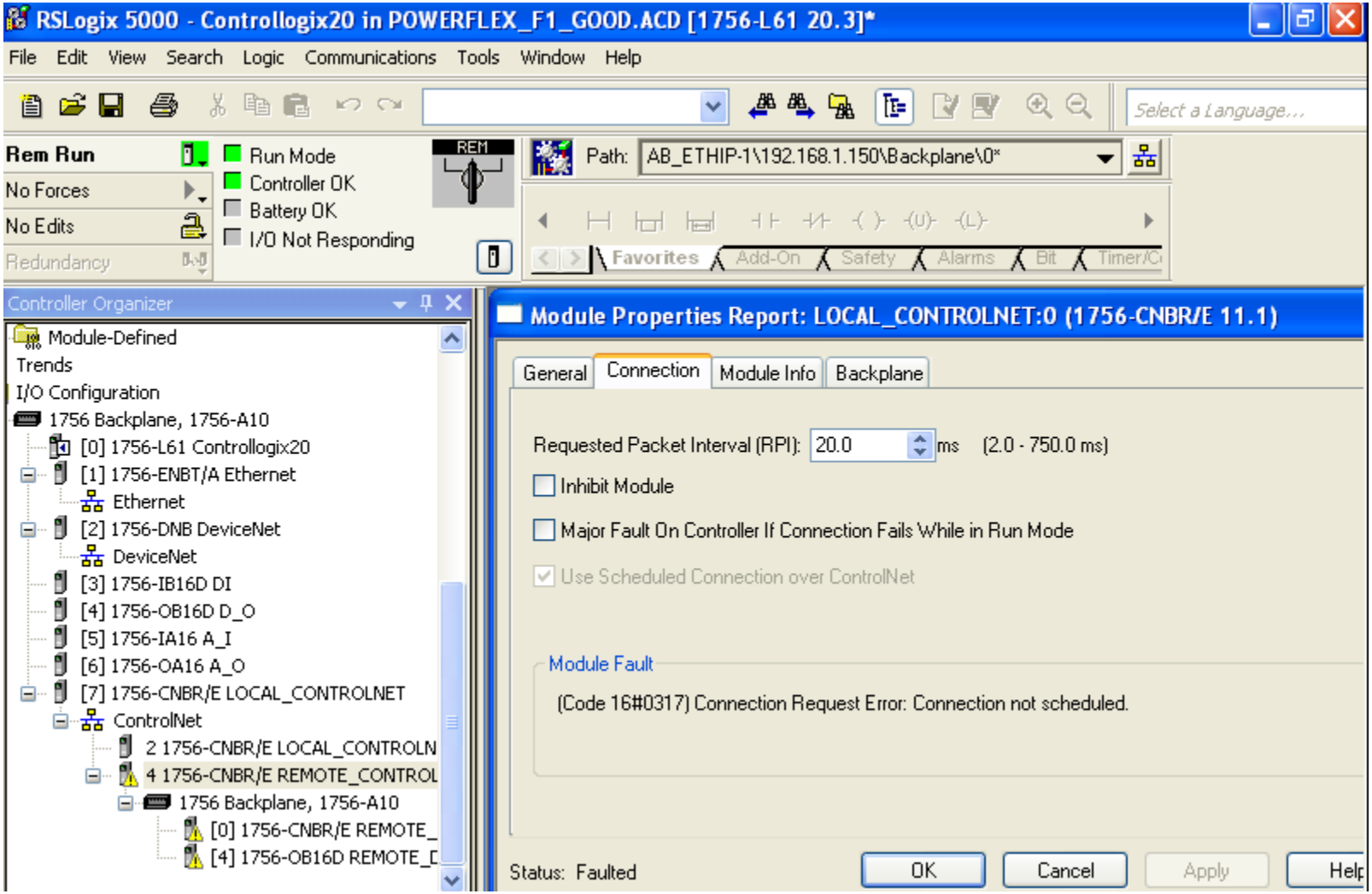
Control I/O Via ControlNet Network

Add Distributed I/O

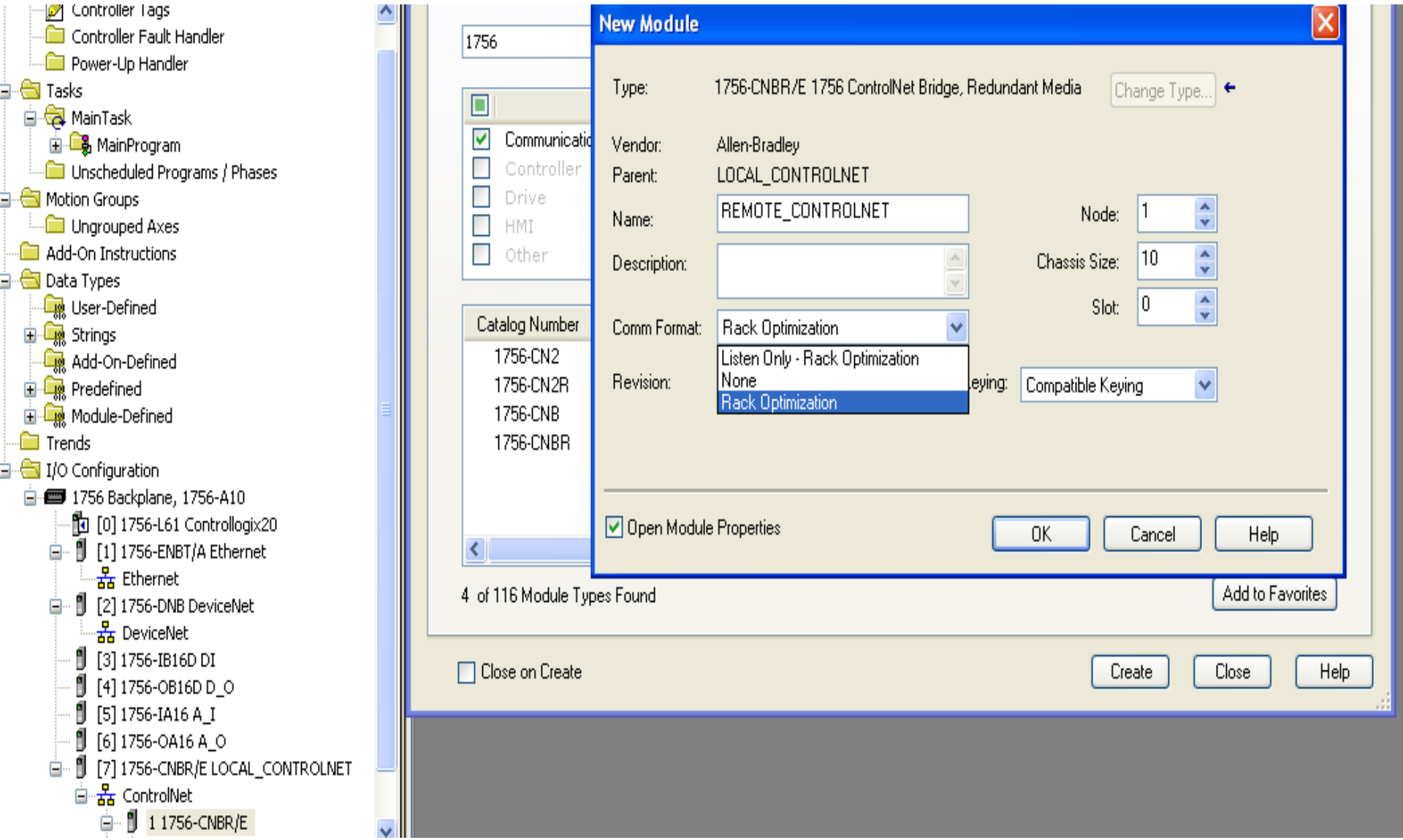


Control I/O Via ControlNet Network

Validate Connections



CHOOSING COMMUNICATION FORMAT



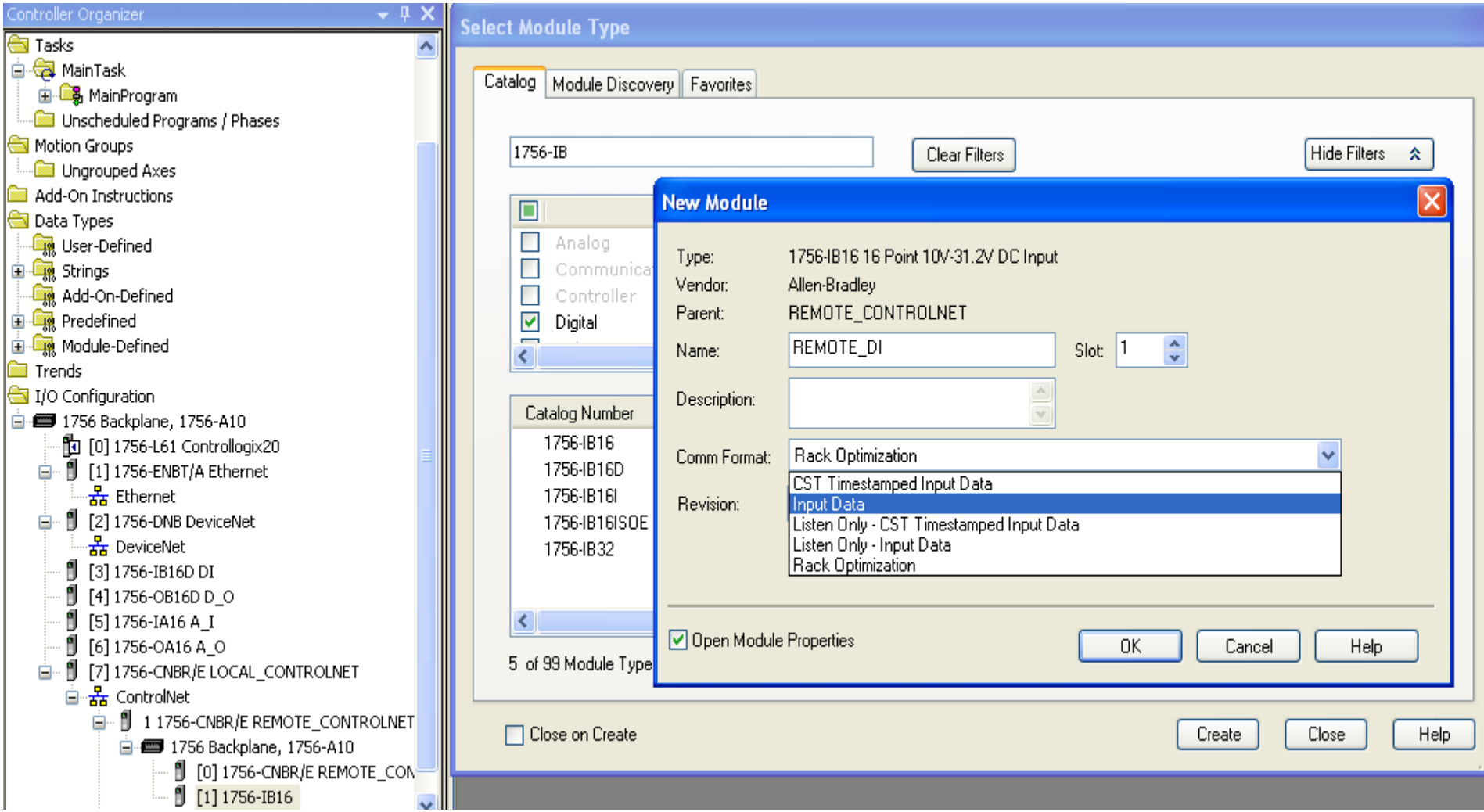
CHOOSING COMMUNICATION FORMAT

Communication Format with a Remote ControlNet Communication Module

Communication Format with a Remote ControlNet Communication Module	Criteria for Use
None	• When all of the remote I/O communicating with a controller via the remote ControlNet communication module use a Direct Connection communication format • When the connection is used for scheduled peer interlocking • When I/O will be mostly direct connections • When multiple controllers control the outputs in the chassis
Rack-optimized	• When some or all of the remote I/O communicating with a controller via the remote ControlNet communication module use a rack-optimized communication format • To minimize ControlNet network bandwidth when using large volume of digital I/O • If only one controller will control the I/O
Rack-optimized—Listen only	When some or all of the remote I/O communicating with a controller via the remote ControlNet communication module use a rack-optimized communication format

CHOOSING COMMUNICATION FORMAT

Communication Format with a Remote ControlNet Communication Module



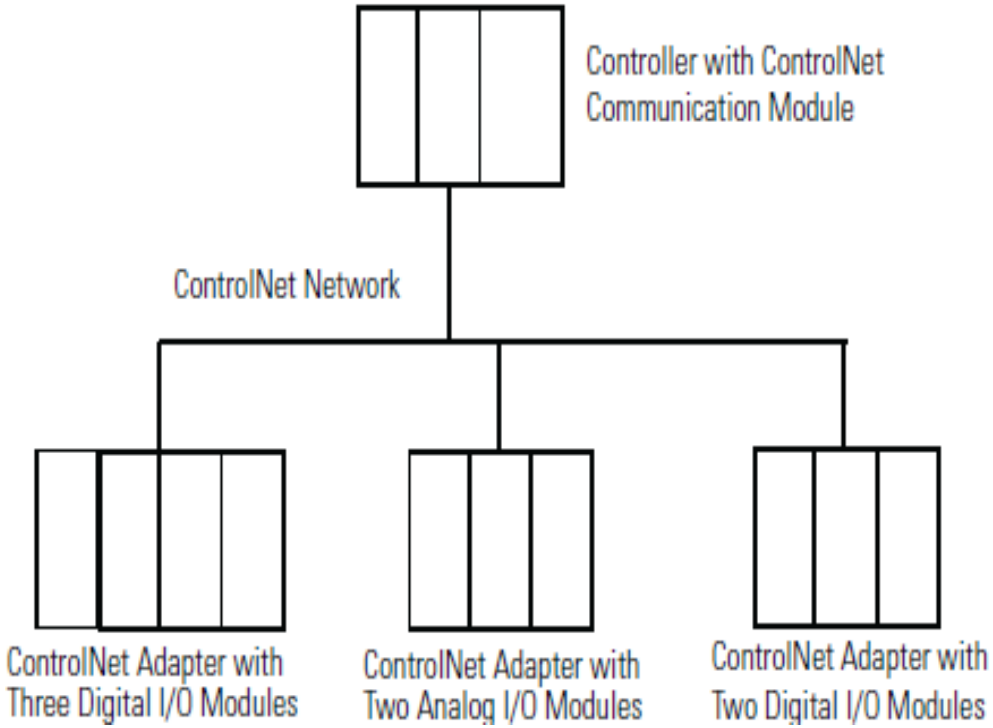
CHOOSING COMMUNICATION FORMAT

Communication Format with a Remote ControlNet Communication Module

I/O Module Type	Desired Connection	Required Communication Format
Digital module	Rack-optimized connection	Rack-optimized
	Direct connection or to use specialty features of the module, such as diagnostics, timestamps, or electronic fuses or Connection for listening to data from the module	• The data your controller needs from the I/O module. For example, if your application uses a 1756-IA16I module in a remote chassis that must provide timestamped input data, choose the CST Timestamped Input Data communication format. • A listen-only communication format that matches the data the I/O module is broadcasting to other controllers.
Analog module	Direct connection or to use specialty features of the module, such as diagnostics, timestamps, or electronic fuses or Connection for listening to data from the module	• The data your controller needs from the I/O module. For example, if your application uses a 1756-OF6CI module in a remote chassis that must provide floating point output data, choose the Float Data communication format. • A listen-only communication format that matches the data the I/O module is broadcasting to other controllers.

CHOOSING COMMUNICATION FORMAT

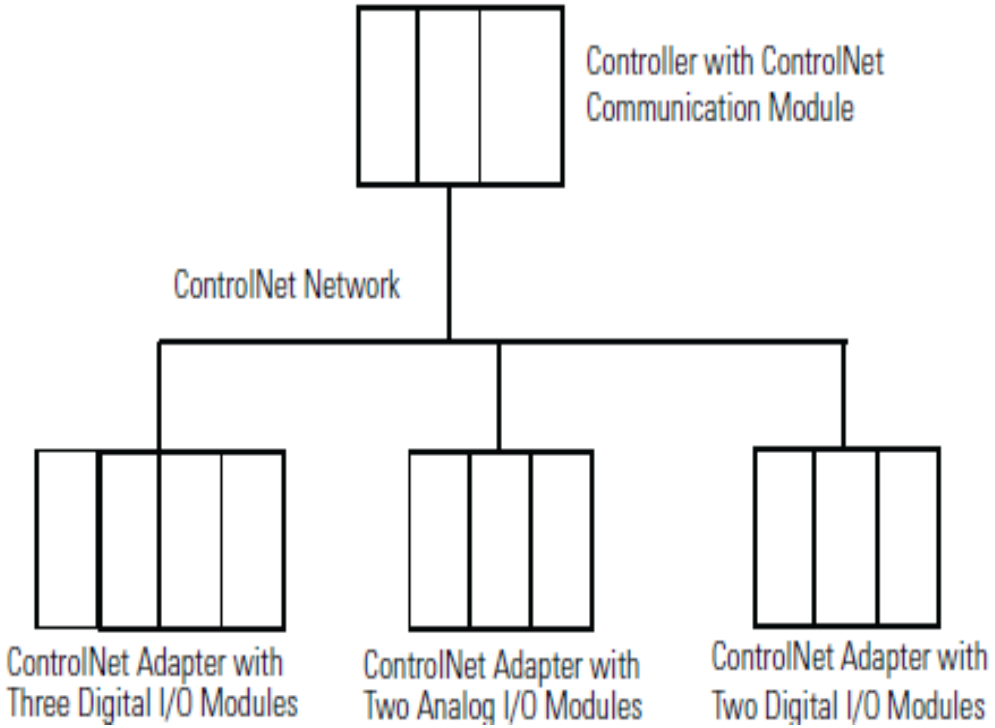
Direct connections for I/O modules



System Connections	Amount
Controller to local ControlNet communication module	0
Controller to ControlNet adapter[1] Direct connection for digital I/O modules Direct connection for analog I/O modules	0 5 digital 2 analog
Total connections used	7

CHOOSING COMMUNICATION FORMAT

Rack-optimized connections for I/O Modules



System Connections	Amount
Controller to local ControlNet communication module	0
Controller to ControlNet adapters with digital modules (rack-optimized connection to each adapter)	2
Controller to ControlNet adapter with analog modules (direct connection for each analog I/O module)	2
Total connections used	4

Control distributed I/O over a ControlNet network.

RSLogix 5000

- Configure hardware system: CPU, Local modules, Local ControlNet Module, Remote ControlNet Modules, Remote I/O Modules.
- Write program to control system
- Download program to the CPU

RSNetworx for ControlNet

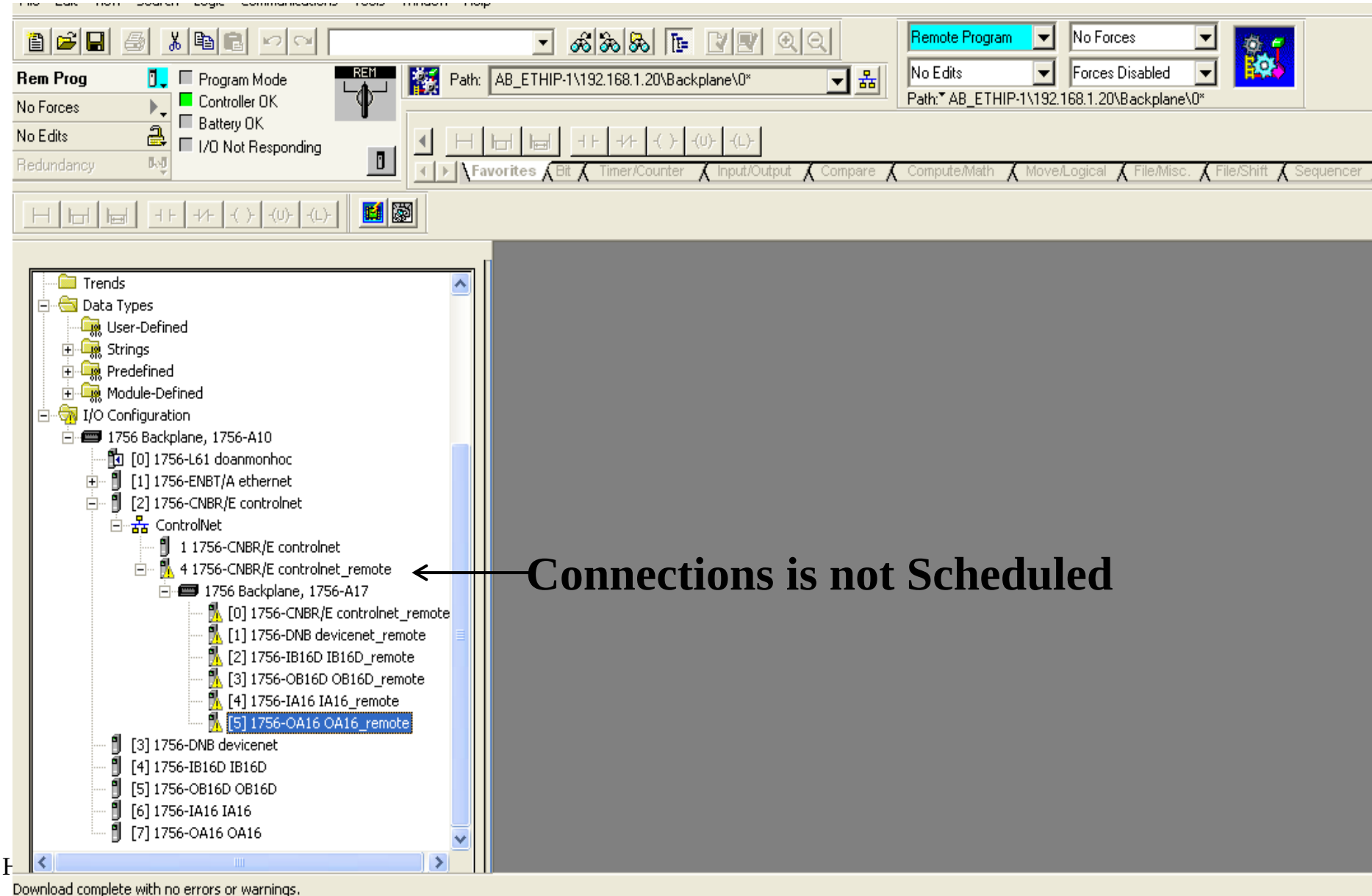
Schedule ControlNet Network

Rechedule controlnet network

Download to network

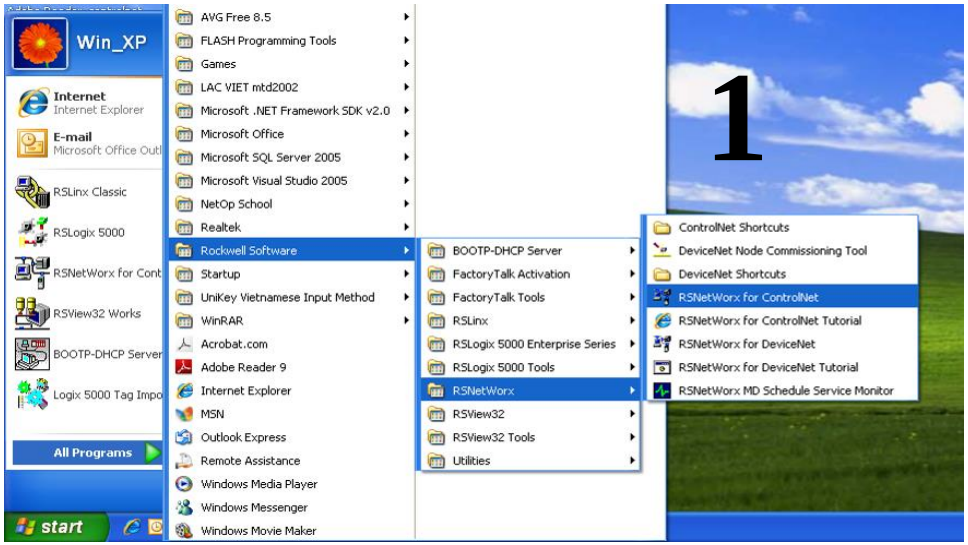
Control distributed I/O over a ControlNet network.

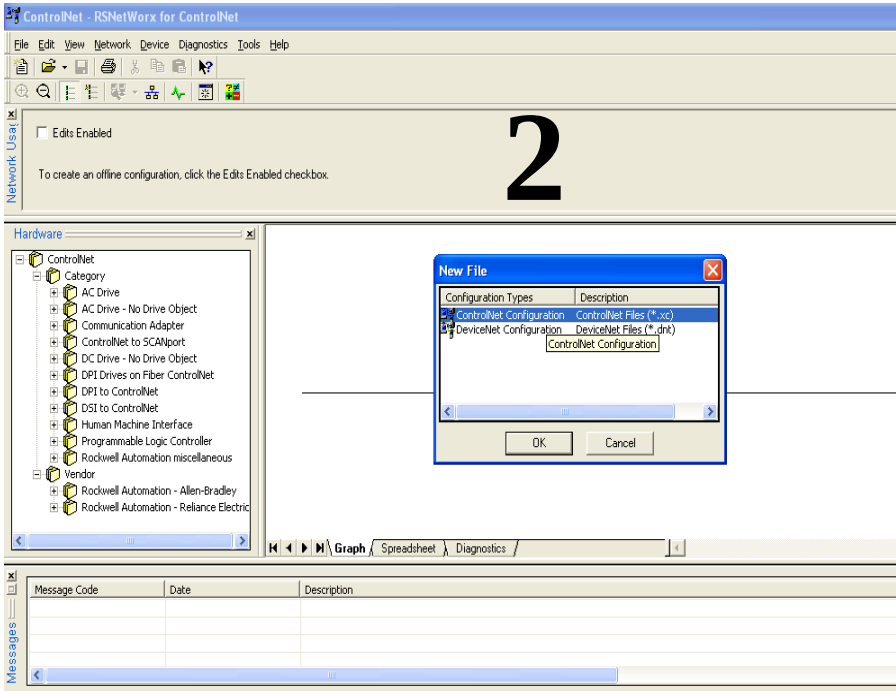
Using RSLogix 5000 to control system over ControlNet network

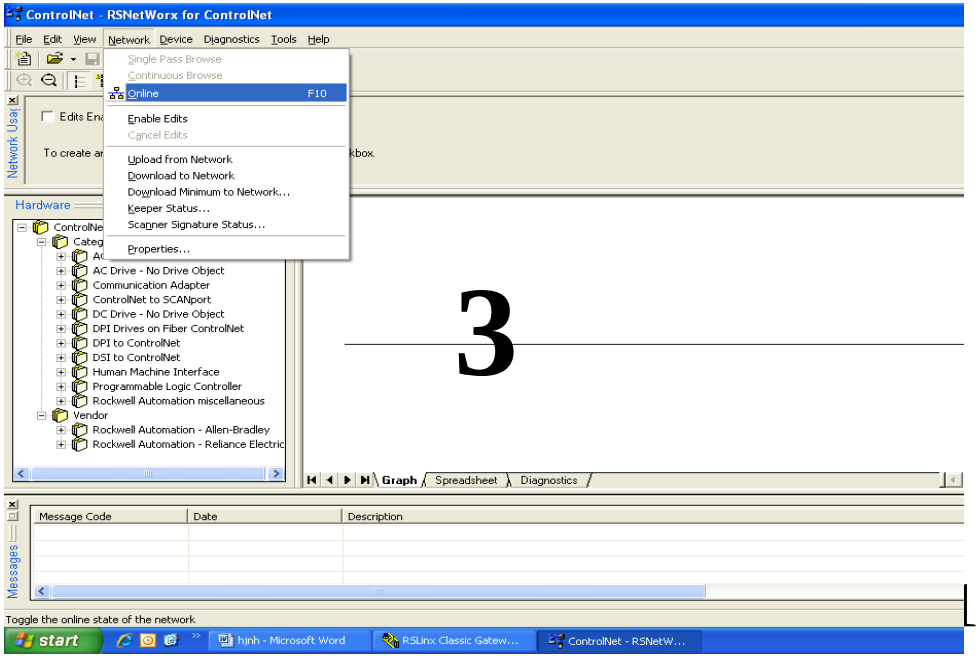


Control distributed I/O over a ControlNet network.

Schedule the Network







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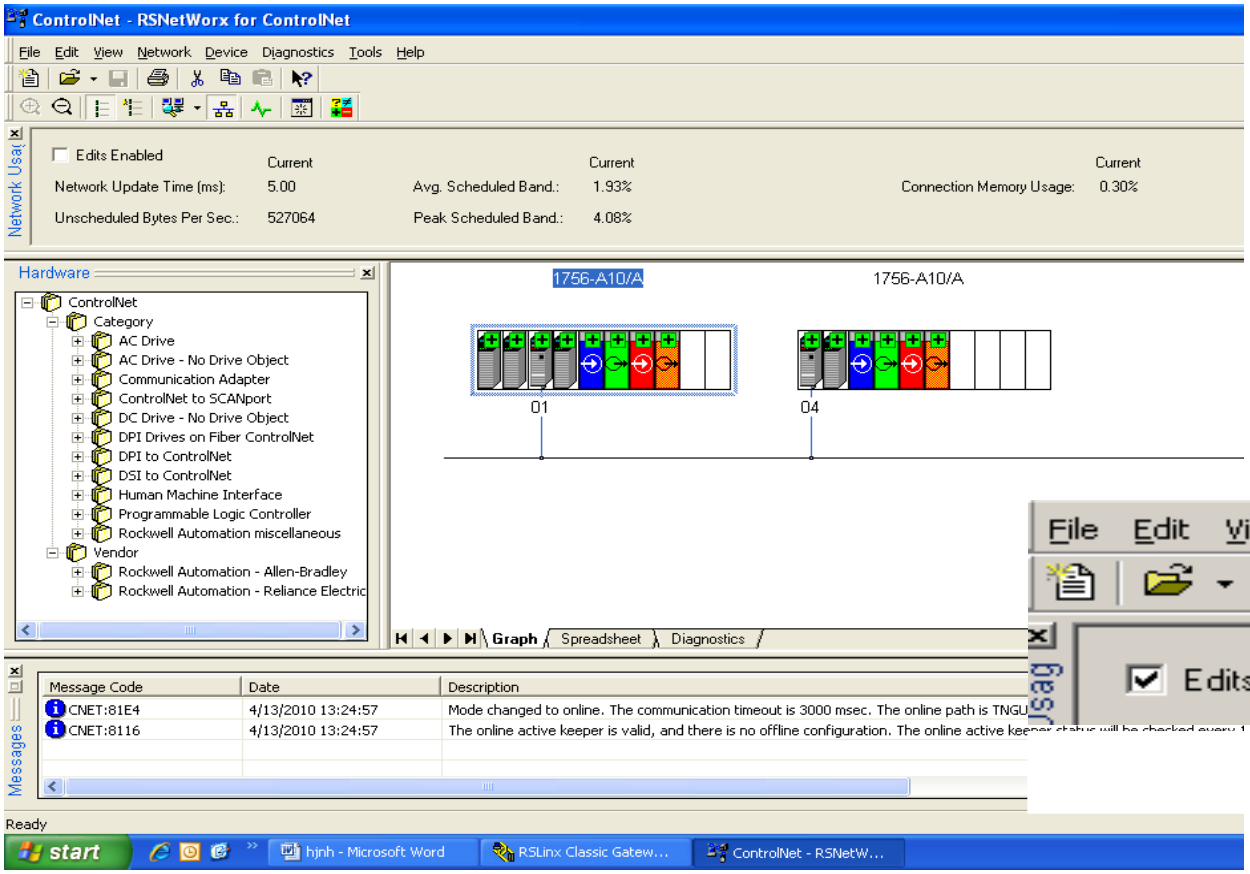
Control distributed I/O over a ControlNet network.

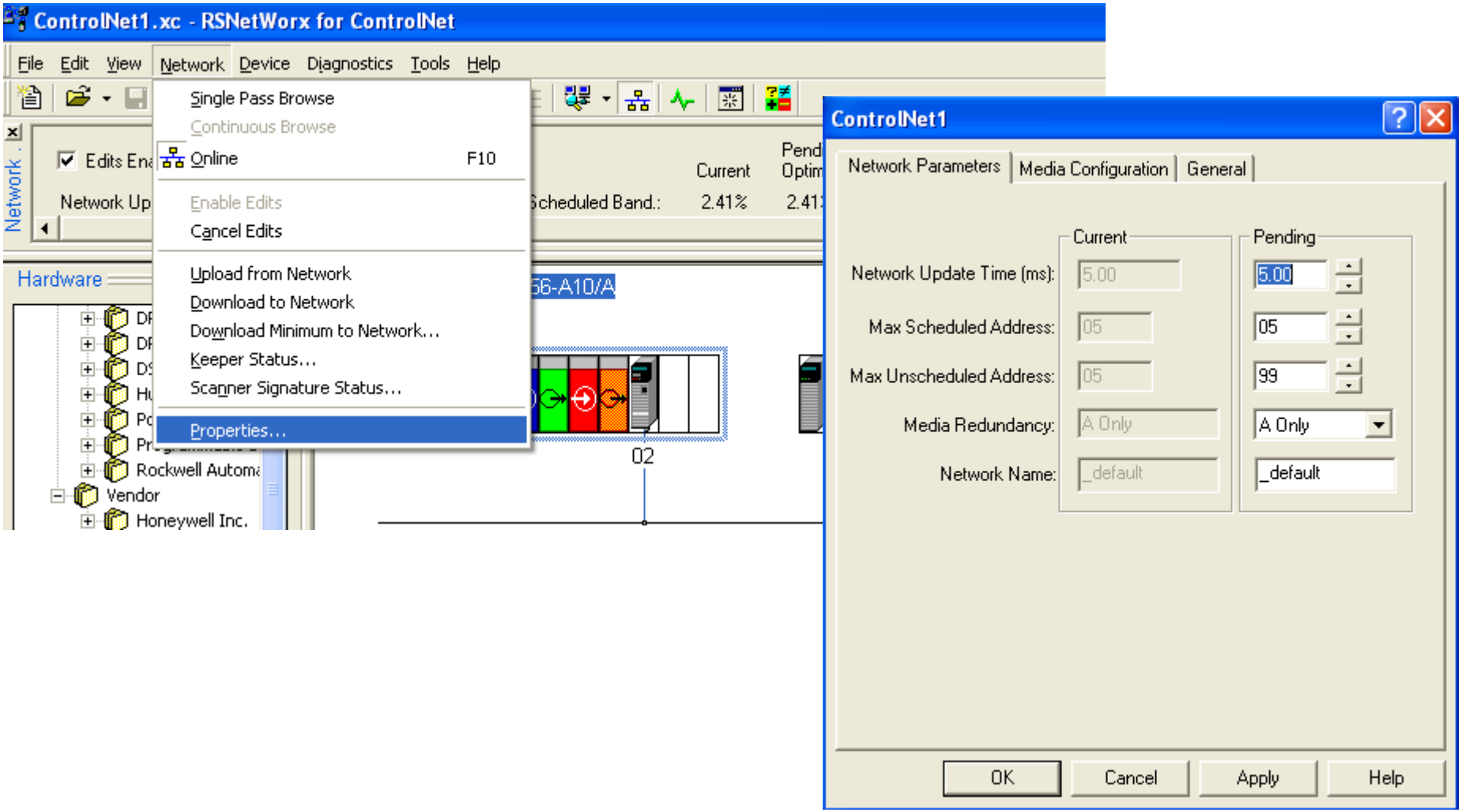
Schedule the Network



Check Edits Enabled, RSNetWorx for ControlNet software reads data in the ControlNet modules and builds a schedule for the network.

Control distributed I/O over a ControlNet network.

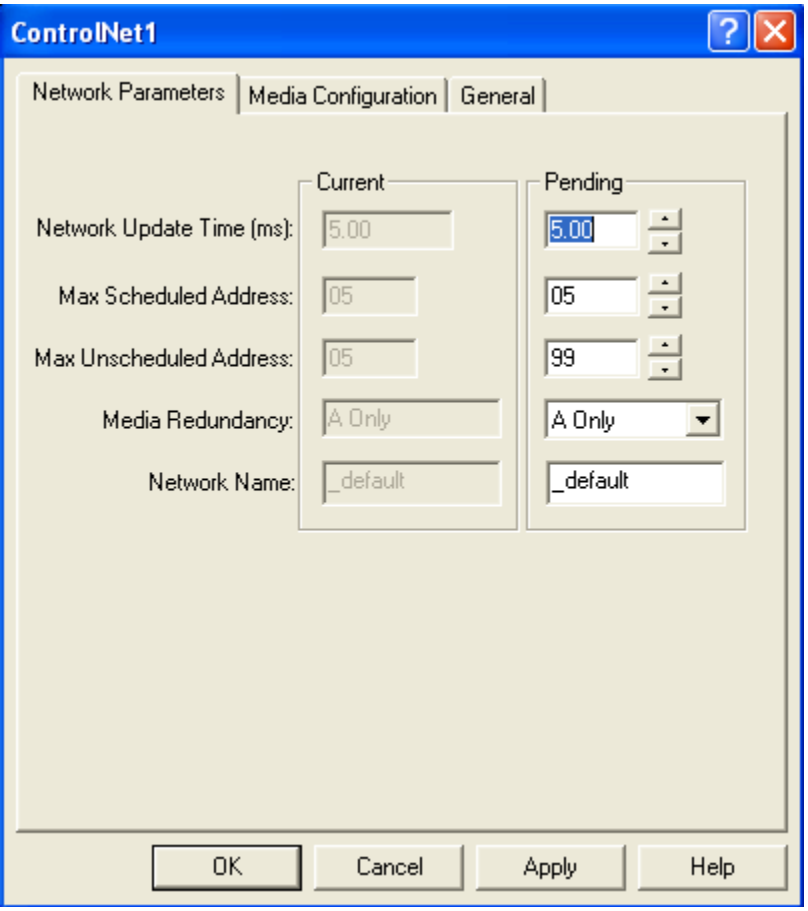
Schedule the Network



To change the network properties from default settings to those that best fit your network, from the Network menu, choose Properties

Control distributed I/O over a ControlNet network.

Schedule the Network

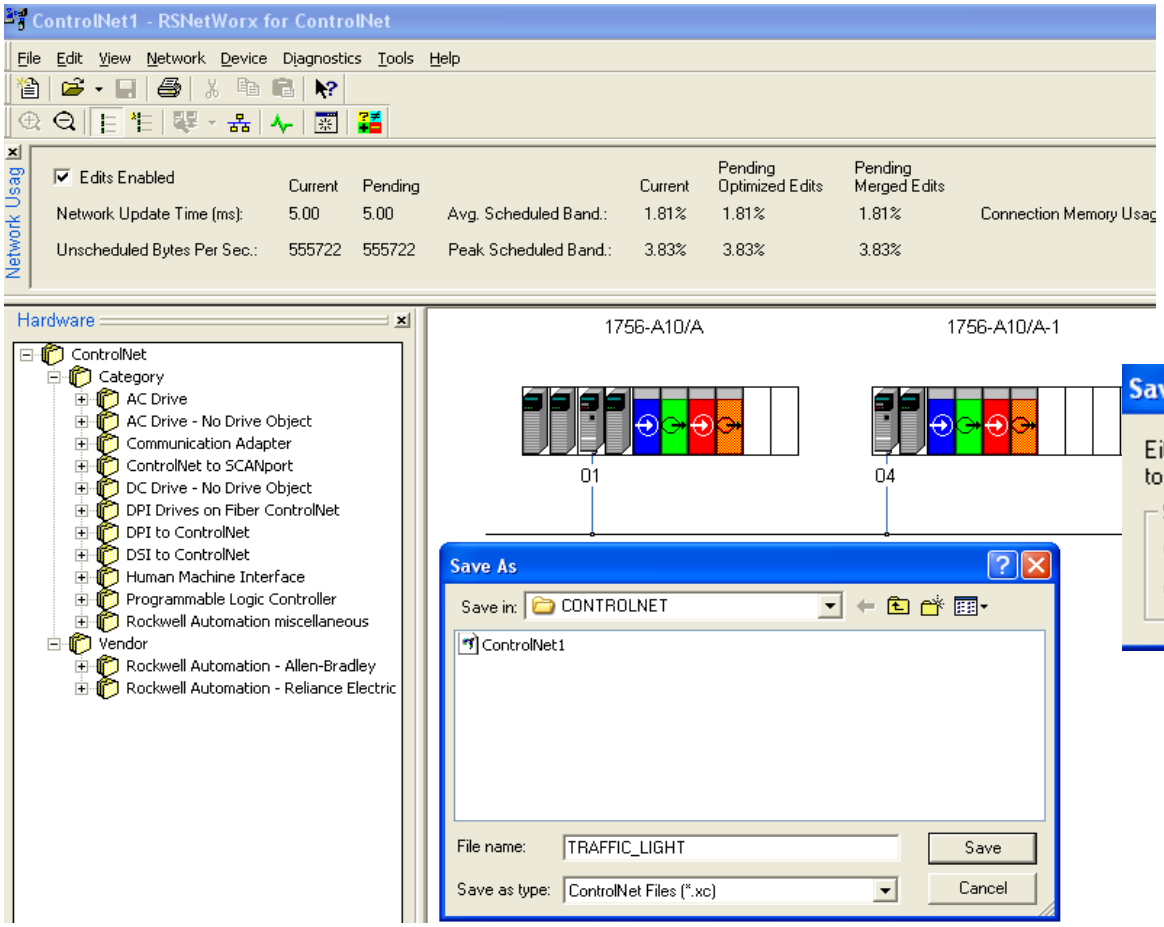


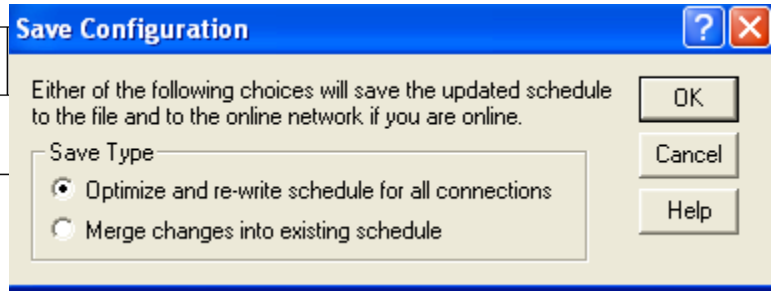
Parameter	Description
Network Update Time	The smallest user-configurable repetitive time cycle in milliseconds at which data can be sent on a ControlNet link.
Max Scheduled Address	The node with the highest network address that can use scheduled time on a ControlNet link. I/O data is transferred during scheduled time. RSNetWorx for ControlNet software sets this value. We recommend that you do not change it.
Max Unscheduled Address	The node with the highest network address that can use unscheduled time on a ControlNet link. Messaging data is transferred during unscheduled time. Nodes set at addresses higher than the maximum unscheduled node do not communicate on the network. For example, they will not display in RSLinx software.
Media Redundancy	Designates if the network uses media redundancy on any of the network communication modules.
Network Name	A user-defined name for the network.

change the network properties from default settings

Control distributed I/O over a ControlNet network.

Schedule the Network online



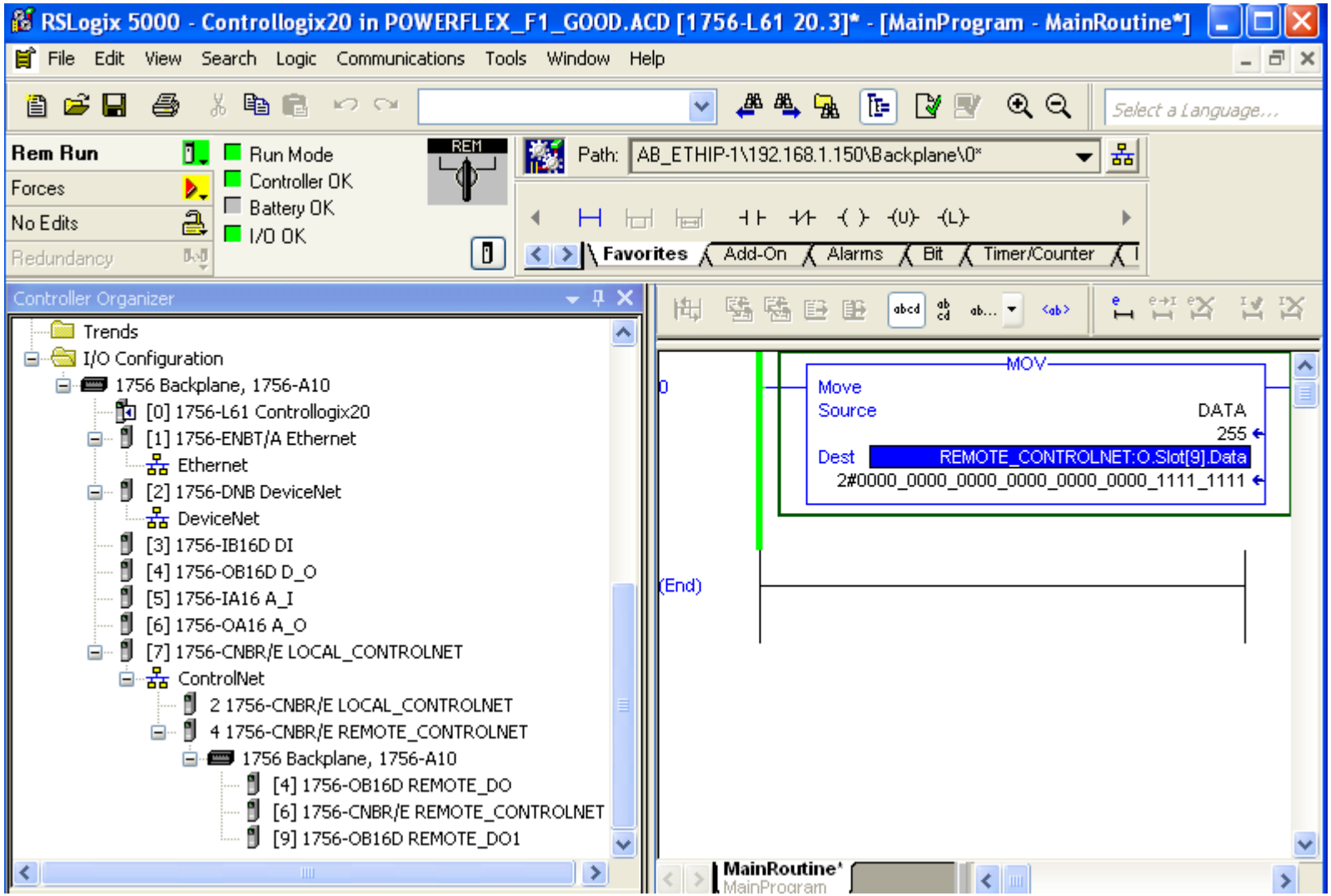


Save Scheduled File: From the Save Configuration dialog box, click Optimize and rewrite the schedule for all connections.

Selecting merge changes into the existing schedule, those controllers whose connections have not changed remain in Run mode rather than changing to Program mode

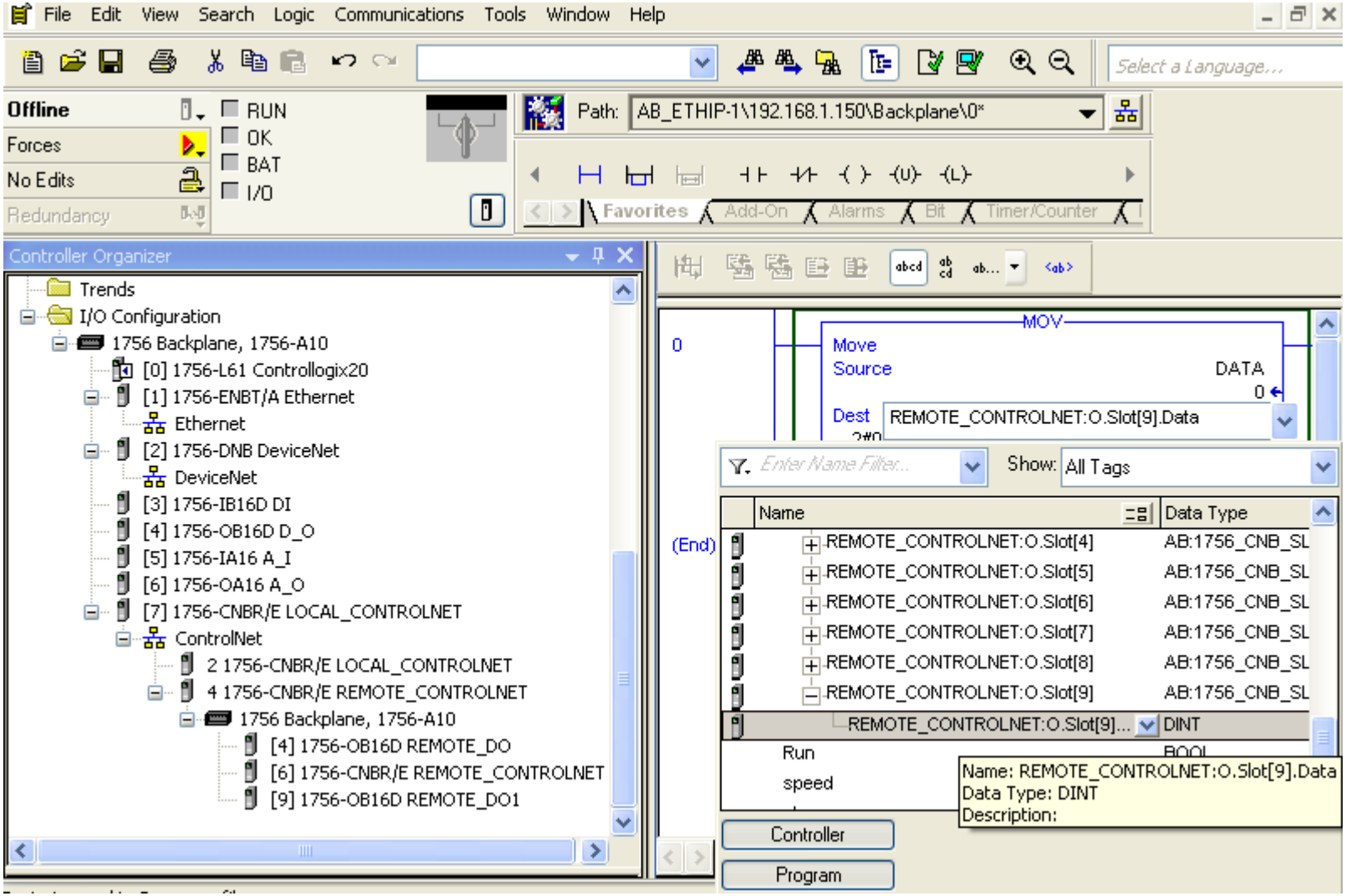
Control distributed I/O over a ControlNet network.

Schedule the Network online



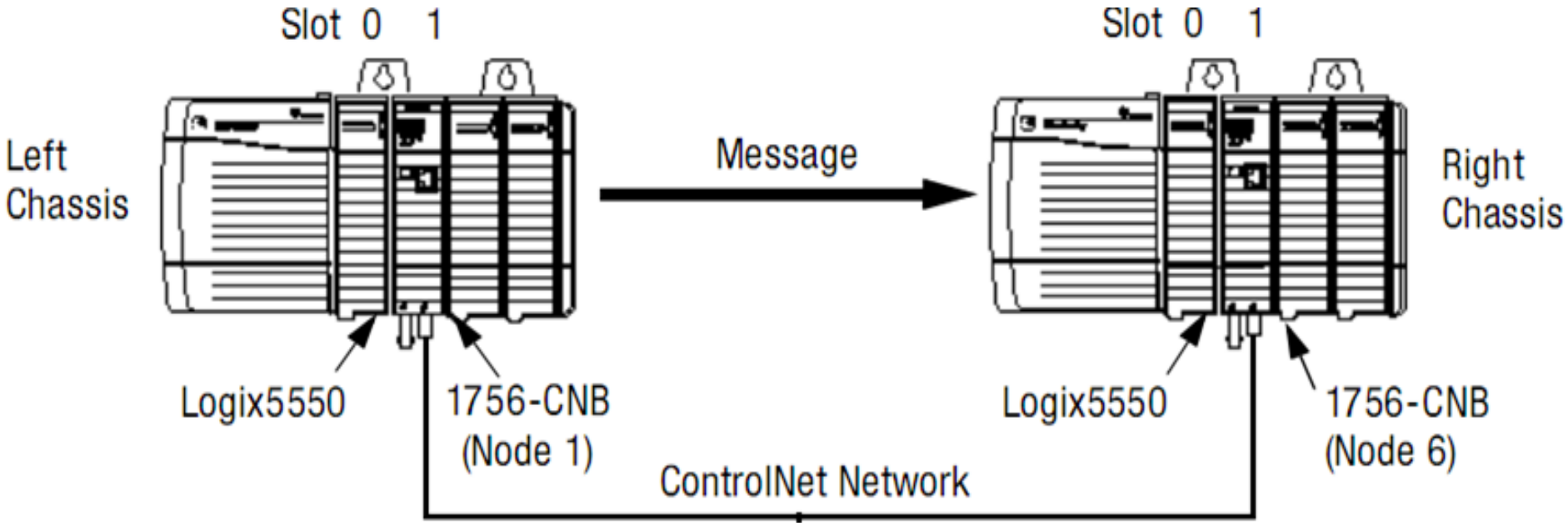
After saving, I/O modules are scheduled and good connection

Control distributed I/O over a ControlNet network.



Writing logic to exchange data with remote I/O modules based on their address in the system.

Produce and Consume Tags (interlock controllers)

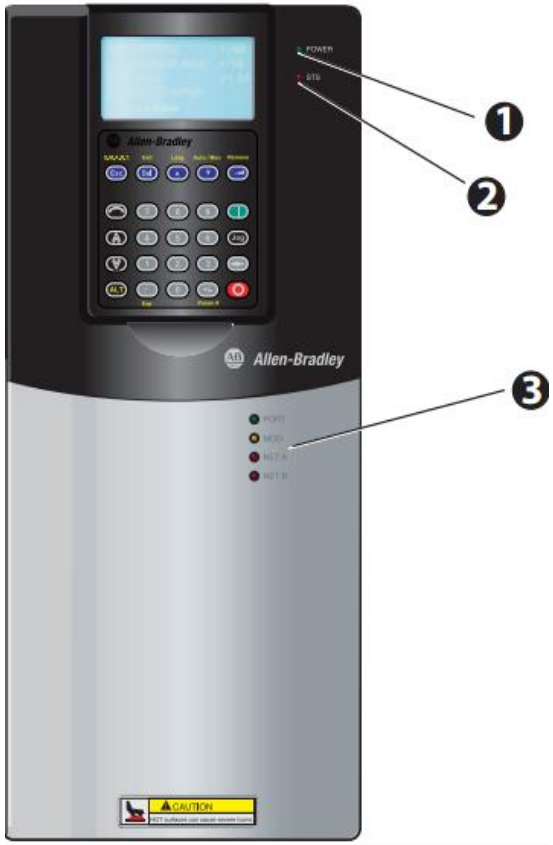


- Scheduled Message(Produced and consume)
- Unscheduled Message (MSG)

Configure hardware systerm and write logic as the same ethernet network **except path information**

Điều khiển biến tần PowerFlex 700s qua mạng DeviceNet

Đèn báo trạng thái biến tần



STT	Tên	Màu Sắc	Trạng thái đèn	Trạng thái biến tần
1	PWR (Power)	Xanh	Đứng yên	Biến tần đã được cấp nguồn
2	STS (Status)	Xanh	Chớp tắt	Biến tần đã sẵn sàng nhưng chưa chạy, không có lỗi xảy ra
			Đứng yên	Biến tần đang chạy, không có lỗi xảy ra
		Vàng	Chớp tắt	Cảnh báo loại 2, biến tần vẫn tiếp tục chạy
			Đứng yên	Cảnh báo loại 1, biến tần vẫn tiếp tục chạy
		Đỏ	Chớp tắt	Lỗi xảy ra
			Đứng yên	
3	PORT	Tham khảo thêm tài liệu *20-COMM-D DeviceNet Adapter User Manual*		
	MOD			
	NETA			
	NETB			

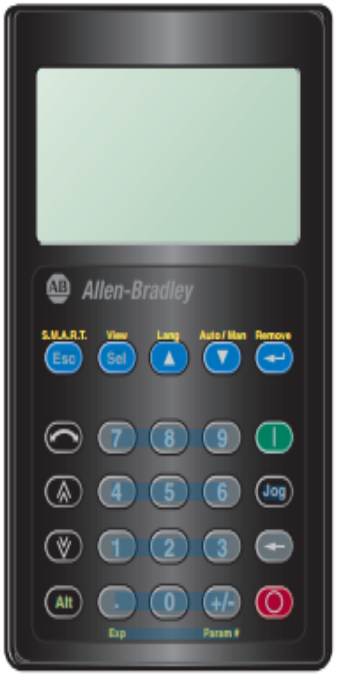
Có 2 cách cài đặt thông số cho biến tần PowerFlex điều khiển biến tần là: DriveExecutive và HIM Key Funtions.

- **HIM Key Funtions:** Cài đặt thông số bằng tay thông qua màn hình KeyPad.

- **DriveExcutive:** Cài đặt thông số qua phần mềm của hãng Allen Bradley cung cấp ứng dụng riêng cho biến tần PowerFlex 700s thông qua mạng DeviceNet.

HIM Key Functions

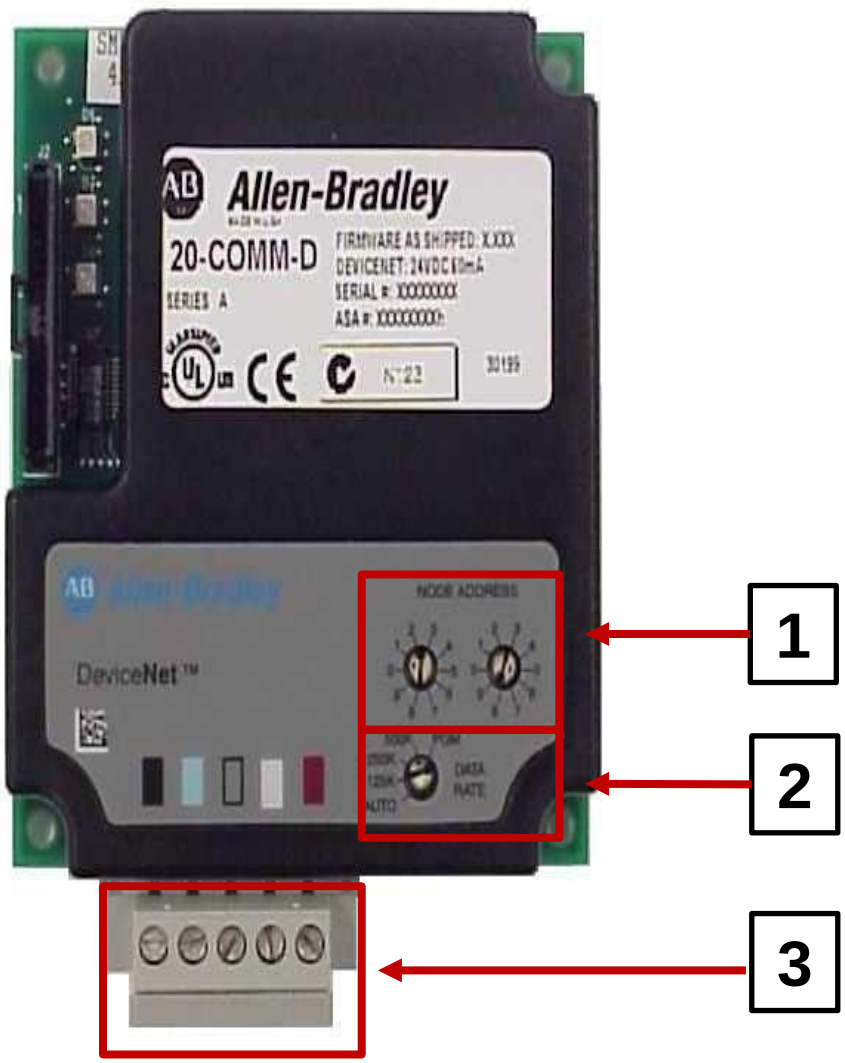
Key	Description
Esc	Exit a menu, cancel a change to a parameter value, or acknowledge a fault/alarm.
Sel	Select a digit, select a bit, or enter edit mode in a parameter screen.
▲	Scroll through options, increase a value, or toggle a bit.
▼	Scroll through options, decrease a value, or toggle a bit.
↵	Enter a menu, enter edit mode in a parameter screen, or save a change to a parameter value.
ALT	Access the function associated with a programming or numeric key. Provides access to the Large Format Display.
|	Start the drive.
O	Stop the drive or clear a fault.
Jog	Jog the drive.



Human Interface Module (HIM)

	Change direction.	The keys are active only when the HIM is granted Manual Control or Par 27 [Speed Ref A I] / 28 [Speed Ref B I] is set to: Option 12 "DPI Port 1" for a HIM installed in the drive cover or Option 13 "DPI Port 2" for a HIM connected by cable for handheld or remote installation option
	Increase speed.	
	Decrease speed.	

Module 20-COMM-D Adapter



Module 20-COMM-D Adapter là module làm nhiệm vụ liên kết truyền thông giữa biến tần và Scanner trong mạng DeviceNet.

1: Switch chọn địa chỉ node của biến tần trong mạng DeviceNet

2: Switch chọn tốc độ truyền dữ liệu (Baud rate)

3: Chân kết nối mạng DeviceNet:

Dây đỏ: +24VDC (V+)

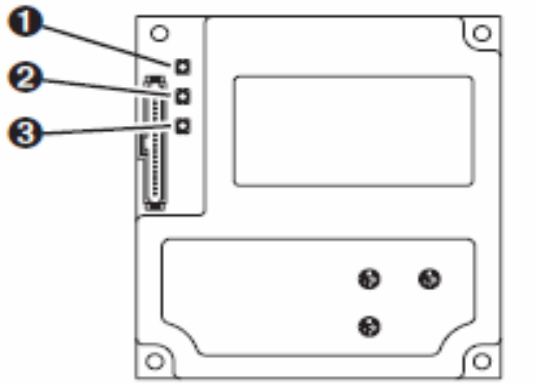
Dây trắng: CAN-H

Dây xanh: CAN-LOW

Dây đen: 0VDC (V-)

20-COMM-D LED INDICATOR

Item	Adapter Status Indicator Name
❶	PORT
❷	MOD
❸	NET A
❹	NET B (not used for DeviceNet)



Chức năng của từng LED chỉ thị		
STT	**Tên đèn chỉ thị**	**Chức năng**
1	PORT	Chỉ trạng thái của việc kết nối cáp DPI giữa biến tần và Adapter
2	MOD	Cho biết trạng thái của quá trình truyền thông trong mạng
3	NET	cho biết việc kết nối Adapter vào mạng có chính xác hay không

Cài đặt các thông số cho Adapter và biến tần

Để biến tần có thể truyền thông trong mạng DeviceNet thì cần phải cấu hình một số thông số cần thiết cho Adapter và biến tần (trên màn hình HIM). Bảng phía dưới là các thông số cần cài đặt cho Adapter DeviceNet.

Lưu ý:** Muốn cài đặt các thông số cho Adapter thì trong menu chính trên HIM, chọn menu ***Deviece Select, rồi sau đó chọn tiếp ***20-COMM-D***.

Thông số	Tên thông số	Chức năng
Pr 03	DN Addr Config	Thiết đặt địa chỉ của Node
Pr 05	DN Rate Config	Thiết lập data rate
Pr 09	Reset Module	Reset module (là việc làm rất cần thiết)
Pr 13	I/O Config	Cho phép hay không cho phép các dữ liệu truyền và nhận
Pr 25	M-S Input	Cho phép hay không cho phép dữ liệu nhận ở chế độ master-slave
Pr 26	M-S Output	Cho phép hay không cho phép dữ liệu gửi ở chế độ master-slave

Cài đặt các thông số cho Adapter và biến tần

Người dùng cần phải nhập một số thông số cơ bản sau để biến tần hoạt động:

Bước 1: Khai báo thông số định mức trên nhãn động cơ (***Motor Data***) ở mục ***Motor Control***.

Thông số	Tên thông số	Chức năng
1	Motor NP Volts	Khai báo thông số điện áp định mức của động cơ
2	Motor NP FLA	Khai báo thông số dòng điện định mức của động cơ
3	Motor NP Hertz	Khai báo tần số định mức của động cơ
4	Motor NP RPM	Khai báo tốc độ định mức của động cơ
5	Motor NP Power	Khai báo công suất định mức của động cơ
7	Motor Poles	Khai báo số cực động cơ

Cài đặt các thông số cho Adapter và biến tần

Bước 2: Cài đặt thông số điều khiển tốc độ cho động cơ mục ***Speed Control***.

Thông số	Tên thông số	Chức năng
Par 17	Jog Speed 1	Cài đặt tốc độ chạy thử 1 cho động cơ
Par 18	Jog Speed 2	Cài đặt tốc độ chạy thử 2 cho động cơ
Par 27	Speed Ref A Sel	Chọn nguồn tần số cho biến tần Lưu ý: Par 27: Speed Ref A Sel =16 "DPI port 5". Khi set thông số này lên 16 thì ta không thể đặt tốc độ tham chiếu bằng HIM nữa mà bằng network (devicenet)
Par 30	Rev Speed Limit	Cài đặt tốc độ giới hạn khi động cơ chạy nghịch
Par 31	Fwd Speed Limit	Cài đặt tốc độ giới hạn khi động cơ chạy thuận
Par 32	Accel Time	Thời gian tăng tốc
Par 33	Decel Time	Thời gian giảm tốc

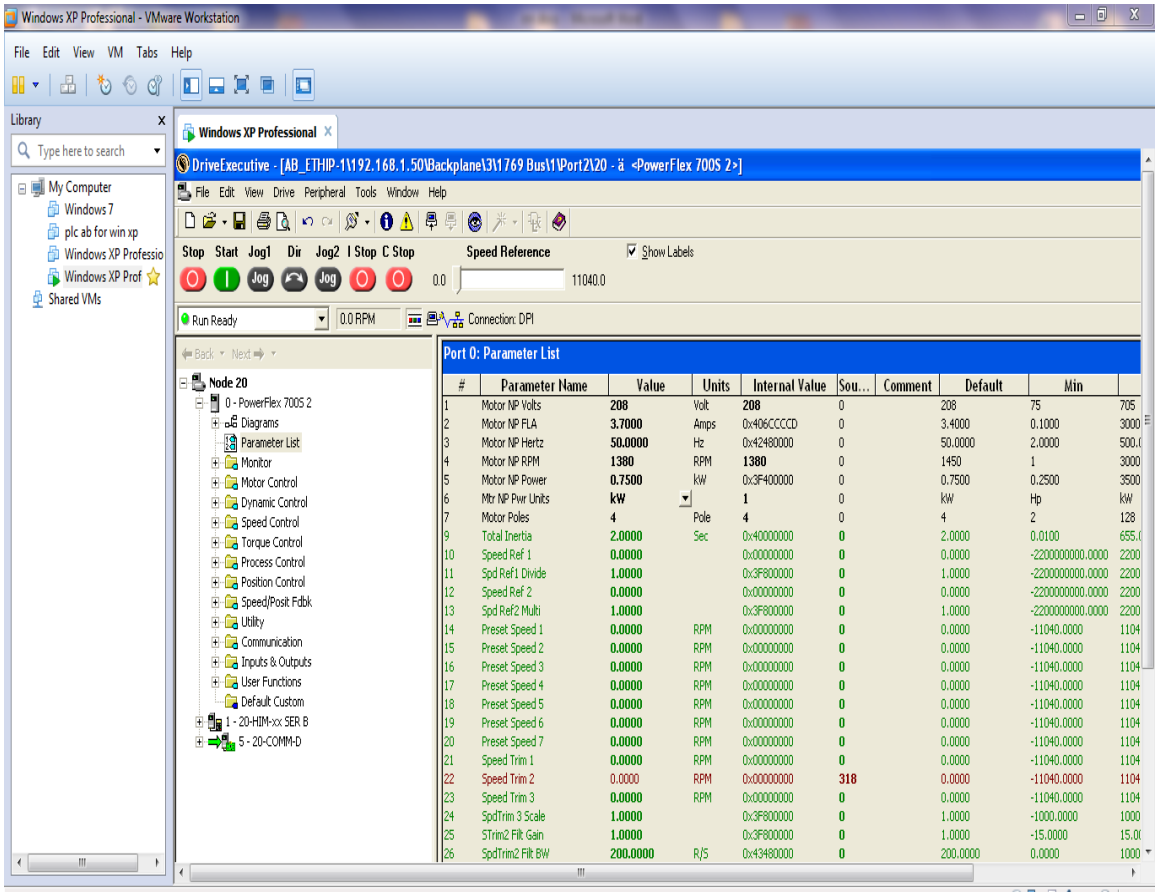
Cài đặt các thông số cho Adapter và biến tần

Bước 3: Giám sát tốc độ và các thông số liên quan của động cơ khi động cơ hoạt động vào mục ***Monitor***

Thông số	Tên thông số	Chức năng
Par 310	Output Freq	Tần số ngõ ra
Par 307	Output Voltage	Điện áp ngõ ra
Par 308	Output Current	Dòng điện ngõ ra
Par 311	Output Power	Công suất ngõ ra
Par 306	DC Bus Voltage	Điện áp trên Bus DC
Par 313	Heatsink Temp	Nhiệt độ tản nhiệt
Par 310	Output Freq	Tần số ngõ ra

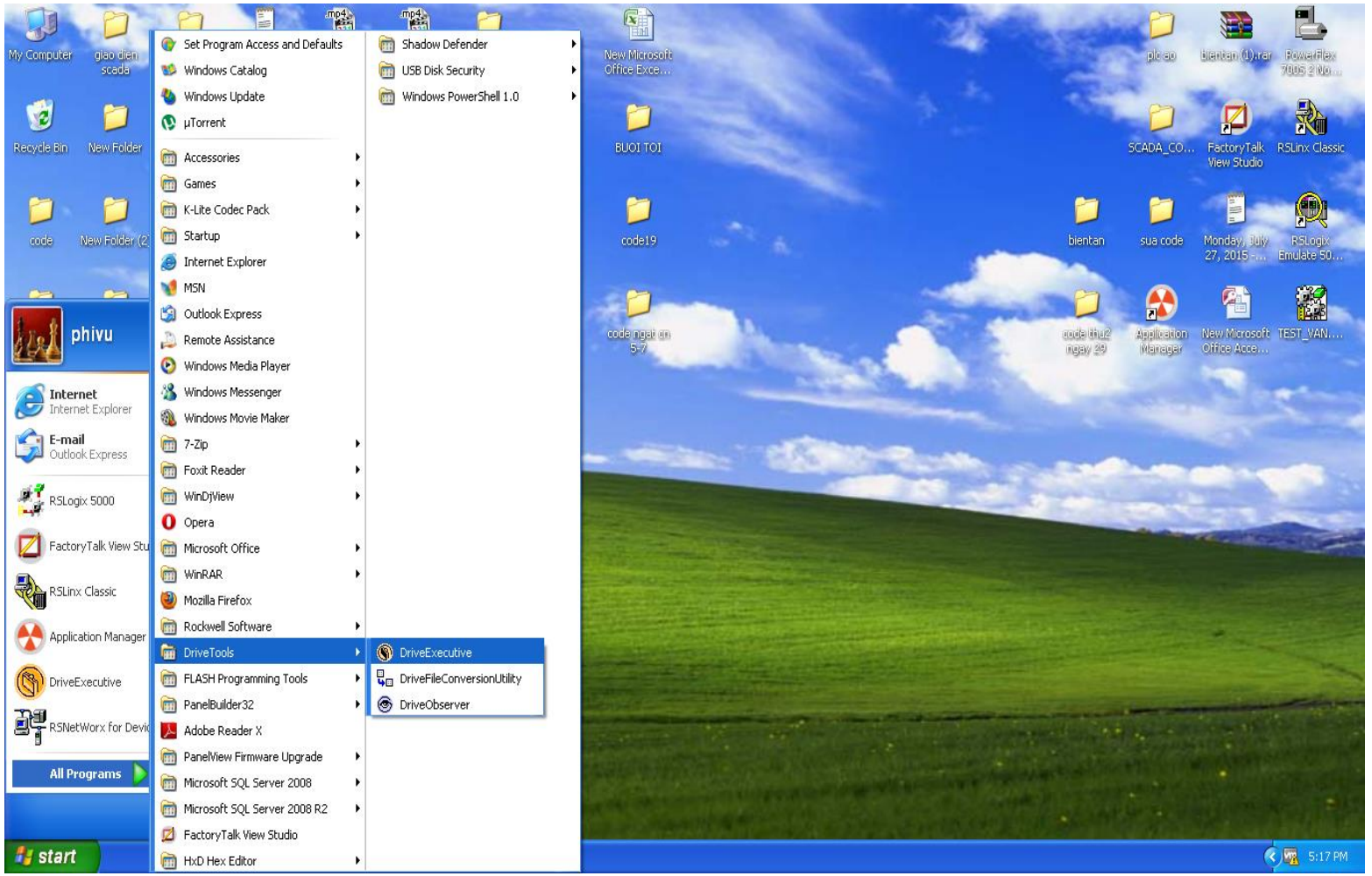
Đến đây, việc cài đặt các thông số phục vụ cho truyền thông xem như đã hoàn thành.

Driver Executive

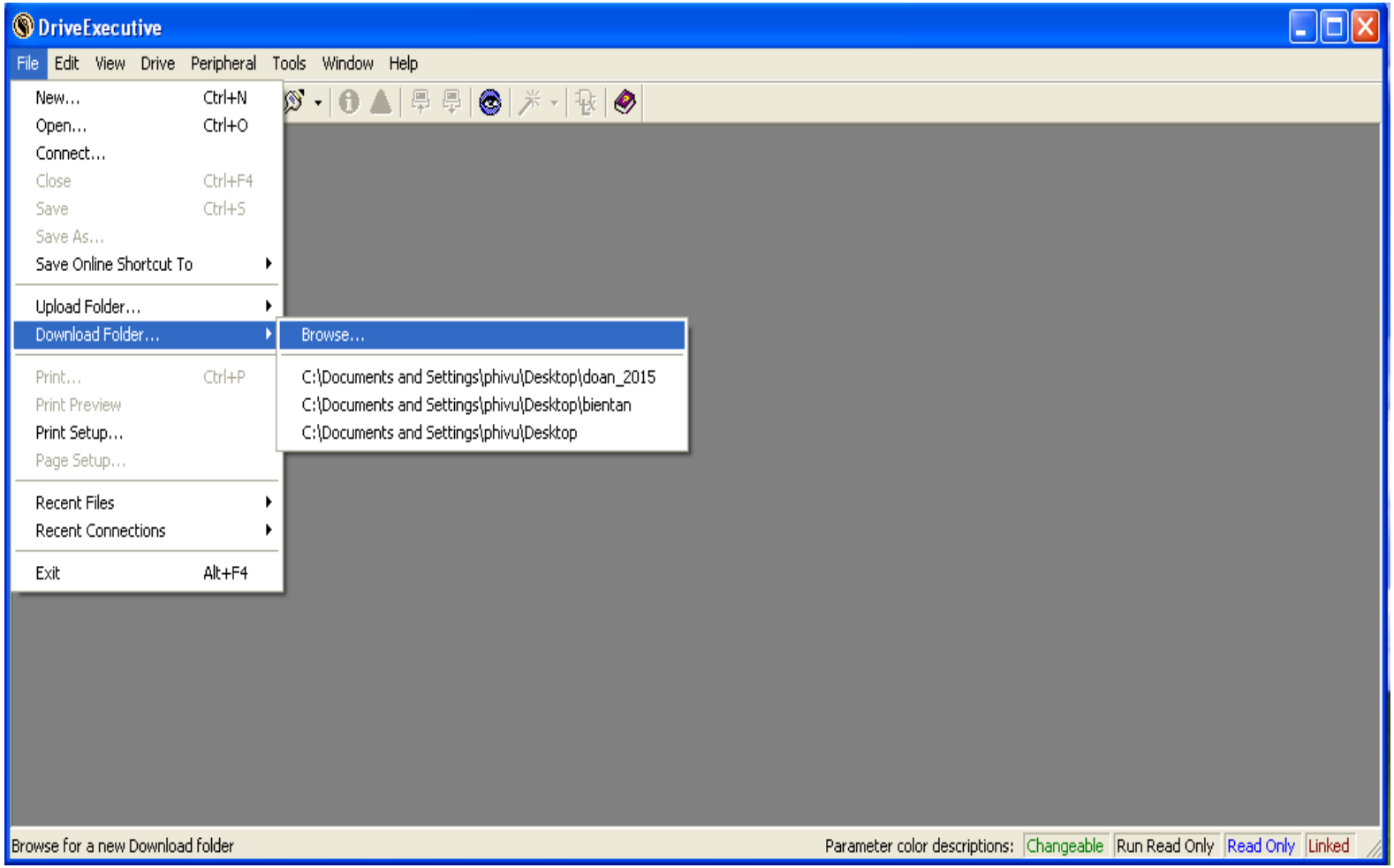


Phần mềm DriveExcutive sử dụng các ô nhớ truyền thông qua mạng DeviceNet để điều khiển động cơ và đọc tín hiệu hồi tiếp Encoder.

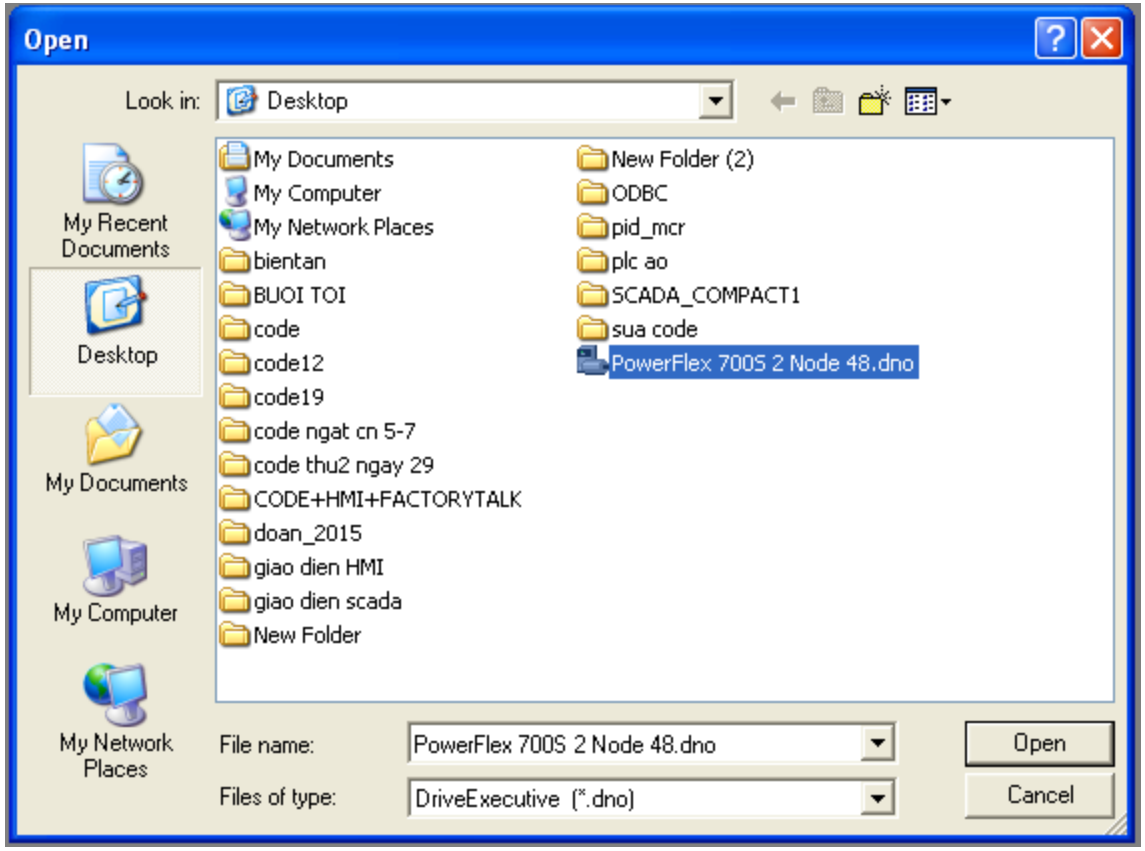
Mở phần mềm **DriveExecutive**



1. Download một chương trình có sẵn với các thông số phù hợp cho động cơ hoạt động

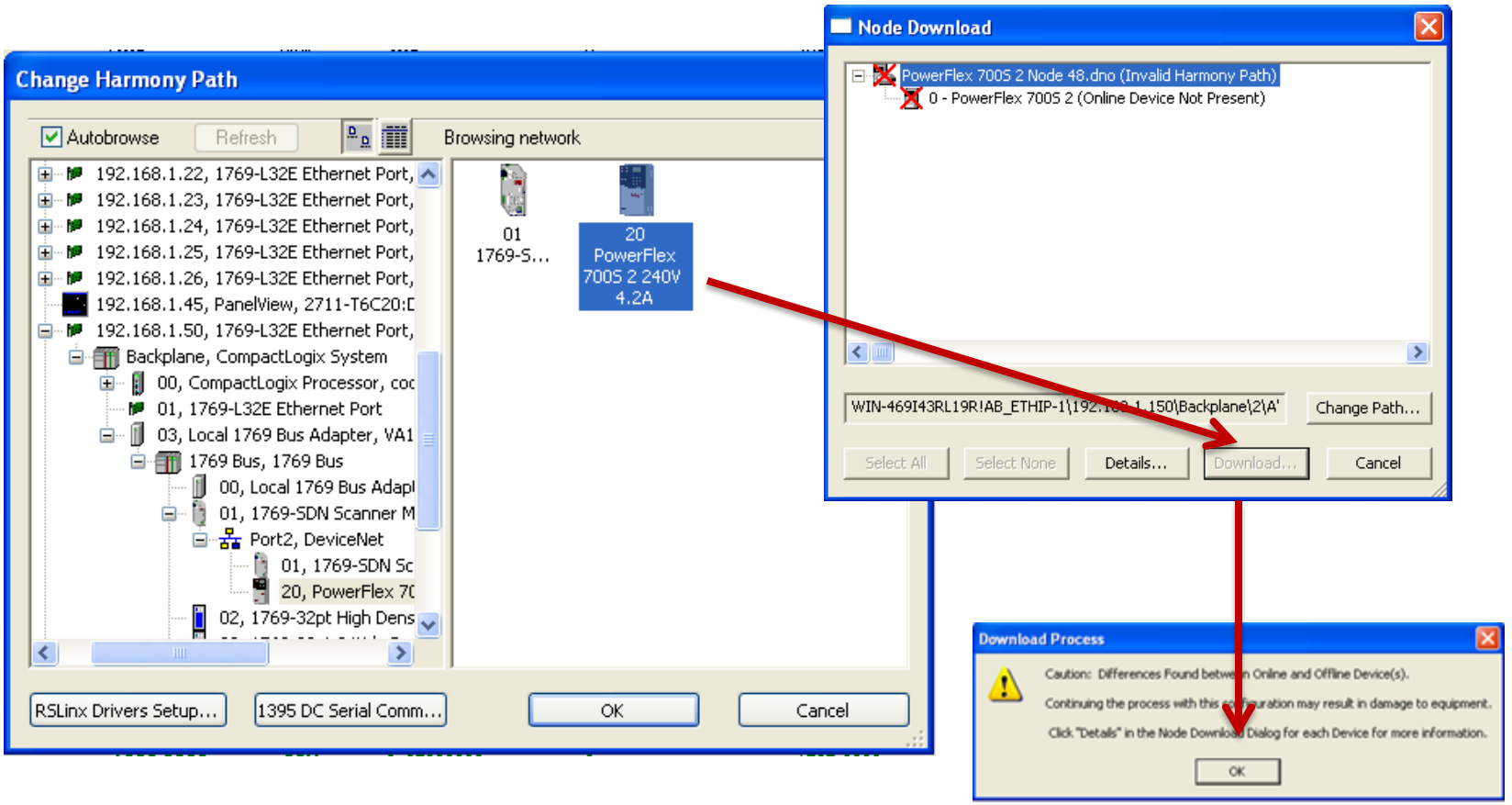


Chọn file cần **Download**

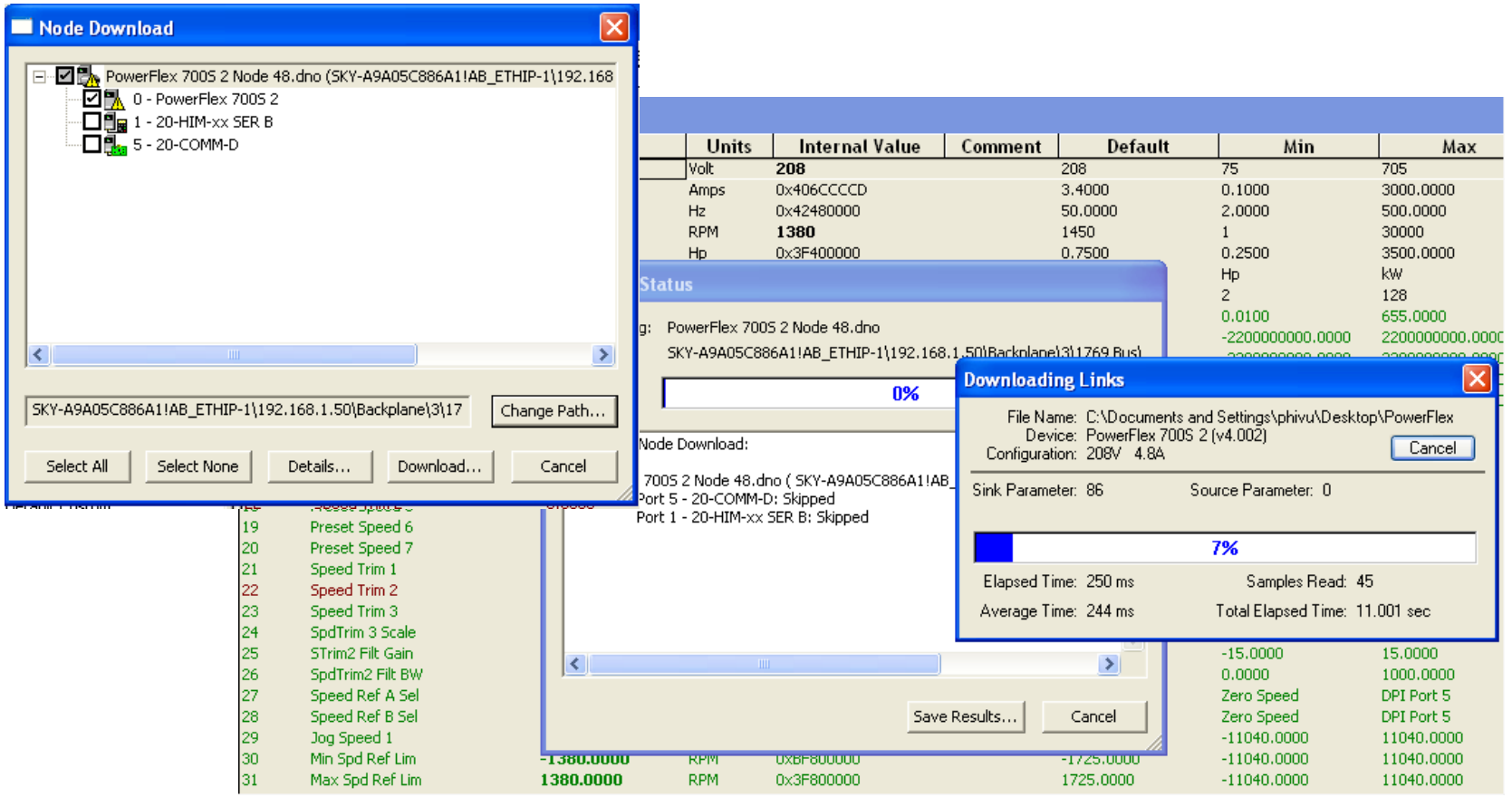


Nhấp vào **Change Path**… và chọn địa chỉ PLC có kết nối với biến tần

Nhấn **OK** tiếp theo nhấn **Download** để bắt đầu quá trình Download

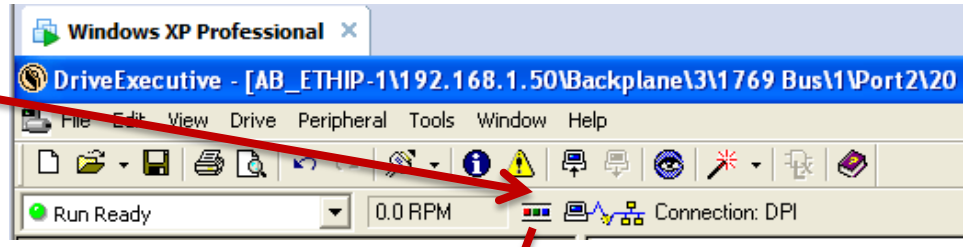


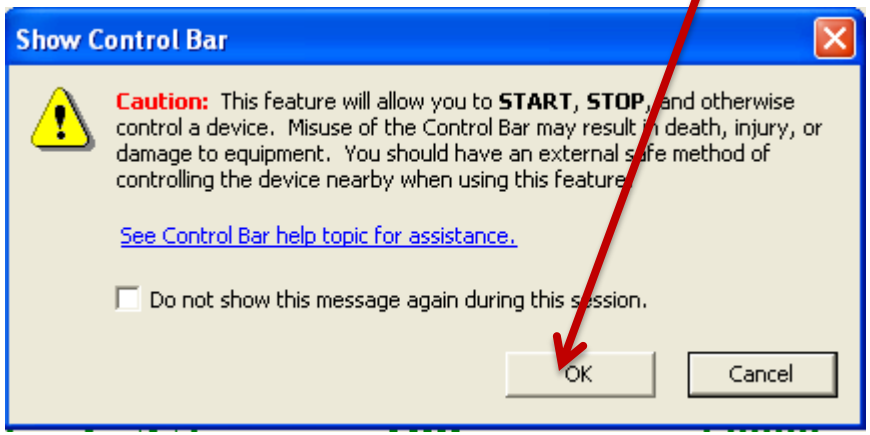
Quá trình **Dowload** thực hiện các thông số được dowload xuống biến tần.



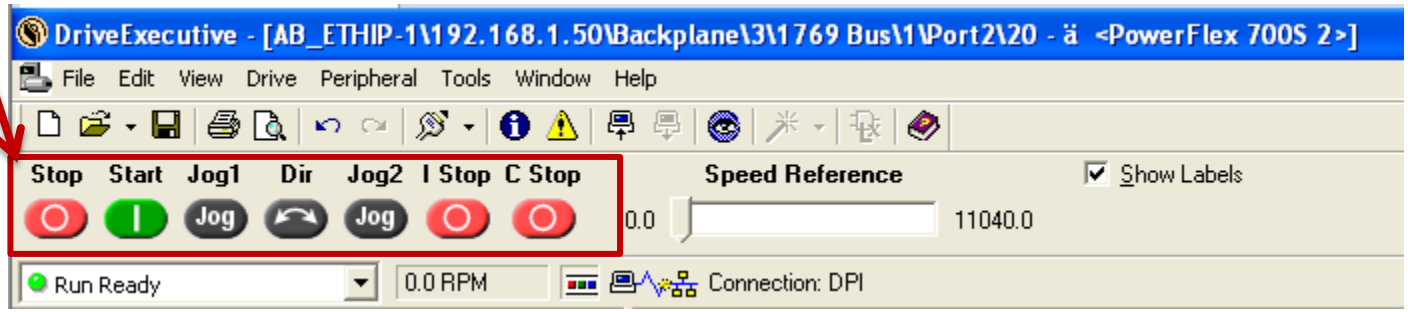
Điều khiển khởi động và chạy Jog trên phần mềm DriveExcuitive

Nhấn vào biểu tượng

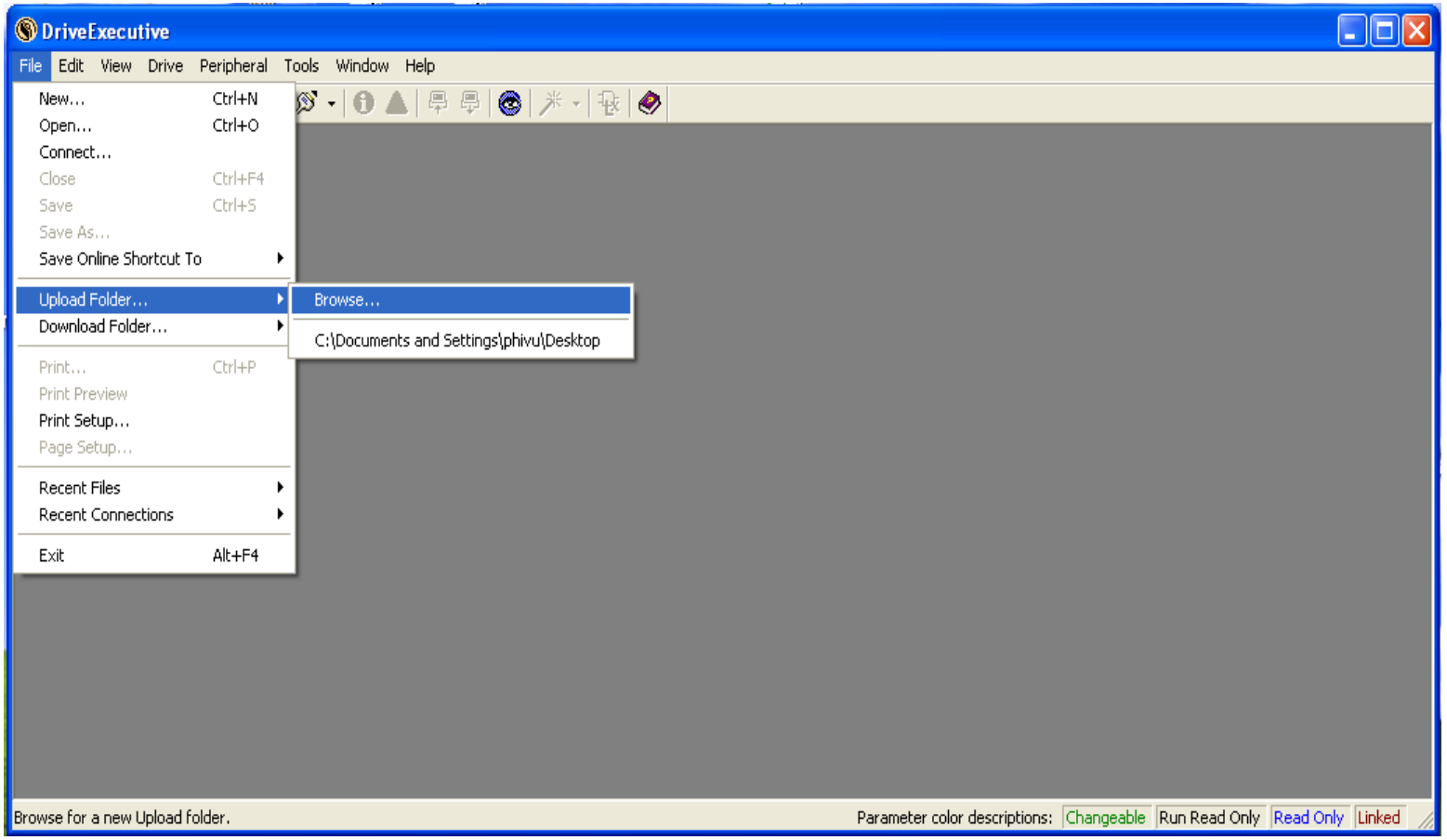




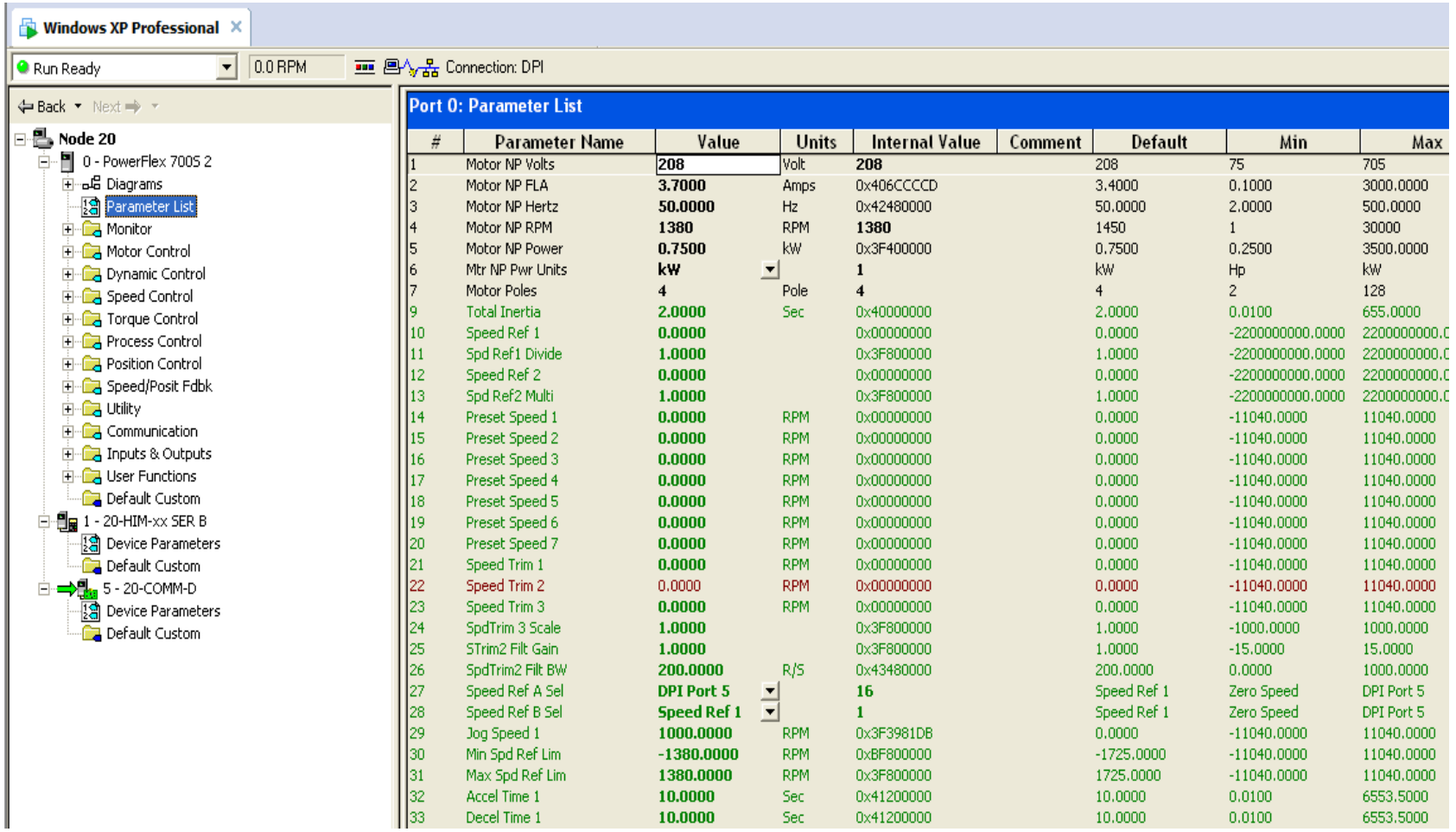
Nhấn nút điều khiển



2. Tương tự quá trình **Dowload** ta thực hiện quá trình **Upload** từ biến tần lên máy tính như sau



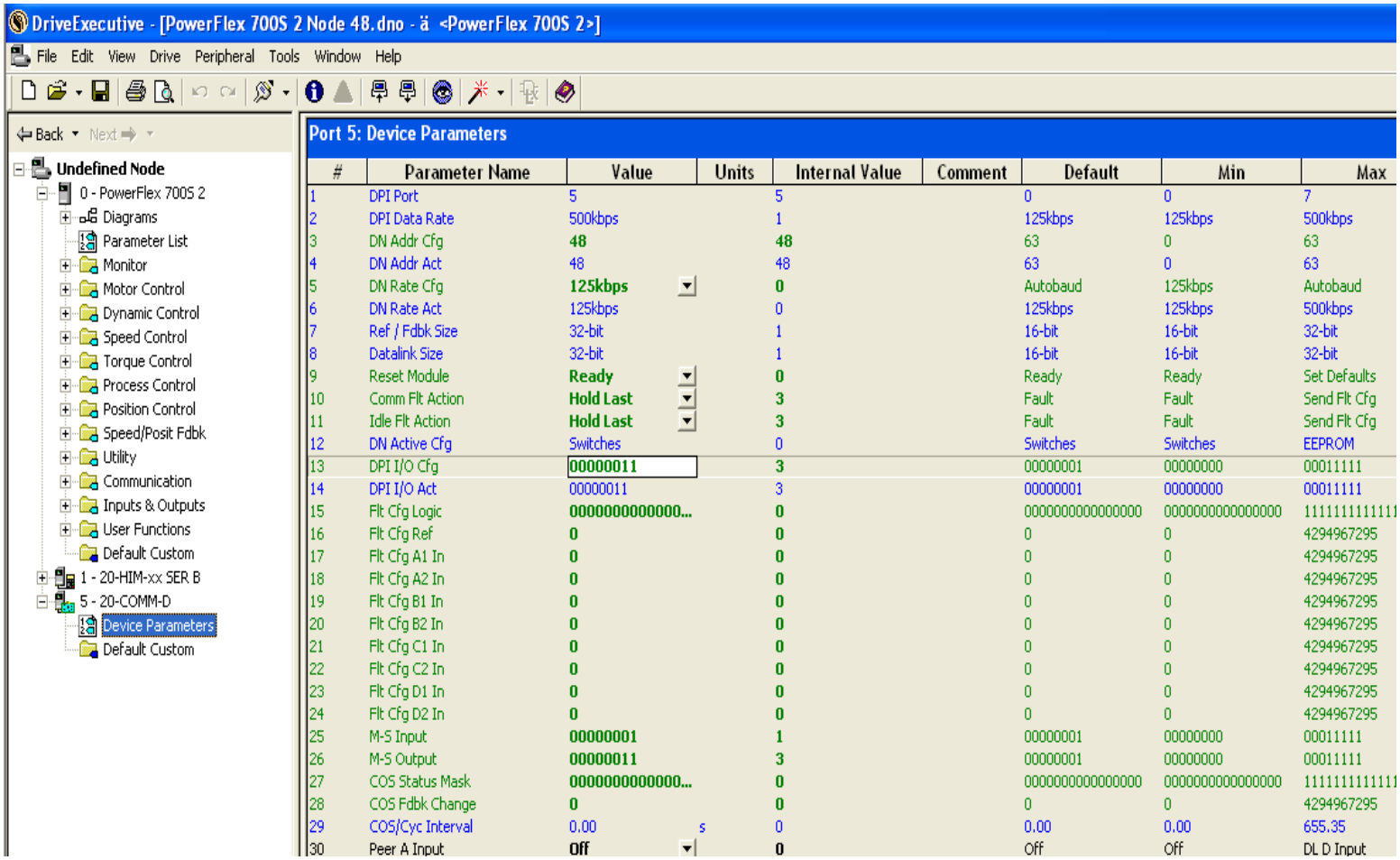
Cài đặt thông số định mức động cơ và giới hạn tốc độ, thời gian tăng tốc, giảm tốc và chế độ chạy Jog,…
Vào phần **Diagrams** => **Parameter List**



Port 0: Parameter List

#	Parameter Name	Value	Units	Internal Value	Comment	Default	Min	Max
1	Motor NP Volts	208	Volt	208		208	75	705
2	Motor NP FLA	3.7000	Amps	0x406CCCCD		3.4000	0.1000	3000.0000
3	Motor NP Hertz	50.0000	Hz	0x42480000		50.0000	2.0000	500.0000
4	Motor NP RPM	1380	RPM	1380		1450	1	30000
5	Motor NP Power	0.7500	kW	0x3F400000		0.7500	0.2500	3500.0000
6	Mtr NP Pwr Units	kW		1		kW	Hp	kW
7	Motor Poles	4	Pole	4		4	2	128
9	Total Inertia	2.0000	Sec	0x40000000		2.0000	0.0100	655.0000
10	Speed Ref 1	0.0000		0x00000000		0.0000	-2200000000.0000	2200000000.0
11	Spd Ref1 Divide	1.0000		0x3F800000		1.0000	-2200000000.0000	2200000000.0
12	Speed Ref 2	0.0000		0x00000000		0.0000	-2200000000.0000	2200000000.0
13	Spd Ref2 Multi	1.0000		0x3F800000		1.0000	-2200000000.0000	2200000000.0
14	Preset Speed 1	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
15	Preset Speed 2	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
16	Preset Speed 3	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
17	Preset Speed 4	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
18	Preset Speed 5	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
19	Preset Speed 6	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
20	Preset Speed 7	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
21	Speed Trim 1	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
22	Speed Trim 2	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
23	Speed Trim 3	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
24	SpdTrim 3 Scale	1.0000		0x3F800000		1.0000	-1000.0000	1000.0000
25	STrim2 Filt Gain	1.0000		0x3F800000		1.0000	-15.0000	15.0000
26	SpdTrim2 Filt BW	200.0000	R/S	0x43480000		200.0000	0.0000	1000.0000
27	Speed Ref A Sel	DPI Port 5		16		Speed Ref 1	Zero Speed	DPI Port 5
28	Speed Ref B Sel	Speed Ref 1		1		Speed Ref 1	Zero Speed	DPI Port 5
29	Jog Speed 1	1000.0000	RPM	0x3F3981DB		0.0000	-11040.0000	11040.0000
30	Min Spd Ref Lim	-1380.0000	RPM	0xBF800000		-1725.0000	-11040.0000	11040.0000
31	Max Spd Ref Lim	1380.0000	RPM	0x3F800000		1725.0000	-11040.0000	11040.0000
32	Accel Time 1	10.0000	Sec	0x41200000		10.0000	0.0100	6553.5000
33	Decel Time 1	10.0000	Sec	0x41200000		10.0000	0.0100	6553.5000

Cài đặt thông số truyền nhận dữ liệu.
Vào phần **5-20-COMM-D** => **Device Parameter**



#	Parameter Name	Value	Units	Internal Value	Comment	Default	Min	Max
1	DPI Port	5		5		0	0	7
2	DPI Data Rate	500kbps		1		125kbps	125kbps	500kbps
3	DN Addr Cfg	48		48		63	0	63
4	DN Addr Act	48		48		63	0	63
5	DN Rate Cfg	125kbps		0		Autobaud	125kbps	Autobaud
6	DN Rate Act	125kbps		0		125kbps	125kbps	500kbps
7	Ref / Fdbk Size	32-bit		1		16-bit	16-bit	32-bit
8	Datalink Size	32-bit		1		16-bit	16-bit	32-bit
9	Reset Module	Ready		0		Ready	Ready	Set Defaults
10	Comm Flt Action	Hold Last		3		Fault	Fault	Send Flt Cfg
11	Idle Flt Action	Hold Last		3		Fault	Fault	Send Flt Cfg
12	DN Active Cfg	Switches		0		Switches	Switches	EEPROM
13	DPI I/O Cfg	00000011		3		00000001	00000000	00011111
14	DPI I/O Act	00000011		3		00000001	00000000	00011111
15	Flt Cfg Logic	0000000000000...		0		0000000000000000	0000000000000000	1111111111111
16	Flt Cfg Ref	0		0		0	0	4294967295
17	Flt Cfg A1 In	0		0		0	0	4294967295
18	Flt Cfg A2 In	0		0		0	0	4294967295
19	Flt Cfg B1 In	0		0		0	0	4294967295
20	Flt Cfg B2 In	0		0		0	0	4294967295
21	Flt Cfg C1 In	0		0		0	0	4294967295
22	Flt Cfg C2 In	0		0		0	0	4294967295
23	Flt Cfg D1 In	0		0		0	0	4294967295
24	Flt Cfg D2 In	0		0		0	0	4294967295
25	M-S Input	00000001		1		00000001	00000000	00011111
26	M-S Output	00000011		3		00000001	00000000	00011111
27	COS Status Mask	0000000000000...		0		0000000000000000	0000000000000000	1111111111111
28	COS Fdbk Change	0		0		0	0	4294967295
29	COS/Cyc Interval	0.00	s	0		0.00	0.00	655.35
30	Peer A Input	Off		0		Off	Off	DL D Input

Cài đặt thông số định mức động cơ và giới hạn tốc độ, thời gian tăng tốc, giảm tốc và chế độ chạy Jog,…
Vào phần **Diagrams** => **Parameter List**

Cài đặt thông số Định mức động

Giao tiếp máy tính

Cài đặt chế độ Chạy thử

Cài đặt tốc độ Max và Min

Cài đặt thời gian tăng tốc, giảm tốc

Port 0: Parameter List

#	Parameter Name	Value	Units	Internal Value	Comment	Default	Min	Max
1	Motor NP Volts	208	Volt	208		208	75	705
2	Motor NP FLA	3.7000	Amps	0x406CCCCD		3.4000	0.1000	3000.0000
3	Motor NP Hertz	50.0000	Hz	0x42480000		50.0000	2.0000	500.0000
4	Motor NP RPM	1380	RPM	1380		1450	1	30000
5	Motor NP Power	0.7500	Hp	0x3F400000		0.7500	0.2500	3500.0000
6	Mtr NP Pwr Units	kW		1		kW	Hp	kW
7	Motor Poles	4	Pole	4		4	2	128
27	Speed Ref A Sel	DPI Port 5		16		Speed Ref 1	Zero Speed	DPI Port 5
28	Speed Ref B Sel	Speed Ref 1		1		Speed Ref 1	Zero Speed	DPI Port 5
29	Jog Speed 1	0.0000	RPM	0x00000000		0.0000	-11040.0000	11040.0000
30	Min Spd Ref Lim	-1380.0000	RPM	0xBF800000		-1725.0000	-11040.0000	11040.0000
31	Max Spd Ref Lim	1380.0000	RPM	0x3F800000		1725.0000	-11040.0000	11040.0000
32	Accel Time 1	10.0000	Sec	0x41200000		10.0000	0.0100	6553.5000
33	Decel Time 1	10.0000	Sec	0x41200000		10.0000	0.0100	6553.5000

Cài đặt thông số truyền nhận dữ liệu.
Vào phần **5-20-COMM-D** => **Device Parameter**

Tốc độ truyền

Chọn cách điều khiển

Port 5: Device Parameters

#	Parameter Name	Value	Units	Internal Value	Comment	Default	Min	Max
1	DPI Port	5		5		0	0	7
2	DPI Data Rate	500kbps		1		125kbps	125kbps	500kbps
3	DN Addr Cfg	48		48		63	0	63
4	DN Addr Act	48		48		63	0	63
5	DN Rate Cfg	125kbps		0		Autobaud	125kbps	Autobaud
6	DN Rate Act	125kbps		0		125kbps	125kbps	500kbps
7	Ref / Fdbk Size	32-bit		1		16-bit	16-bit	32-bit
8	Datalink Size	32-bit		1		16-bit	16-bit	32-bit
9	Reset Module	Ready		0		Ready	Ready	Set Defaults
10	Comm Flt Action	Hold Last		3		Fault	Fault	Send Flt Cfg
11	Idle Flt Action	Hold Last		3		Fault	Fault	Send Flt Cfg
12	DN Active Cfg	Switches		0		Switches	Switches	EEPROM
13	DPI I/O Cfg	00000011		3		00000001	00000000	00011111
14	DPI I/O Act	00000011		3		00000001	00000000	00011111
15	Flt Cfg Logic	00000000...		0		000000000000...	000000000000...	1111111111

Trong quá trình động cơ hoạt động có thể giám sát các thông số qua phần mềm DirveExcuitive

Vào phần **Motor Control** => **Monitoring**

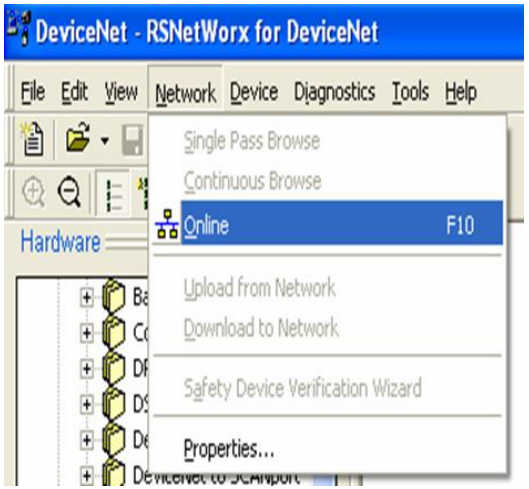
Port 0: Monitoring Group Parameters

#	Parameter Name	Value	Units	Internal Value	Comment	Default	Min	Max
525	Slip Ratio	0.00	Hz	0		0.00	0.00	327.67
526	Stator Frequency	0.0	%	0		0.0	-800.0	800.0
434	Mtr Vds Base	-2141		-2141		0	-8192	0
435	Mtr Vqs Base	7907		7907		0	0	8192
441	Vds Fdbk Filt	0		0		0	-32767	32767
442	Vqs Fdbk Filt	0		0		0	-32767	32767
497	Vqs Command	0	%	0		0	-200	200
498	Vds Command	0	%	0		0	-200	200
495	Iqs Command	0.0	%	0		0.0	-800.0	800.0
496	Ids Command	0.0	%	0		0.0	-800.0	800.0
499	Trq CurFdbk (Iq)	0.0000	P.U.	0x02C7D030		0.0000	-8.0000	8.0000
489	Flx CurFdbk (Id)	0.0000	P.U.	0x02C53DF0		0.0000	-8.0000	8.0000

Thiết lập cấu hình RSNetWork for DeviceNet

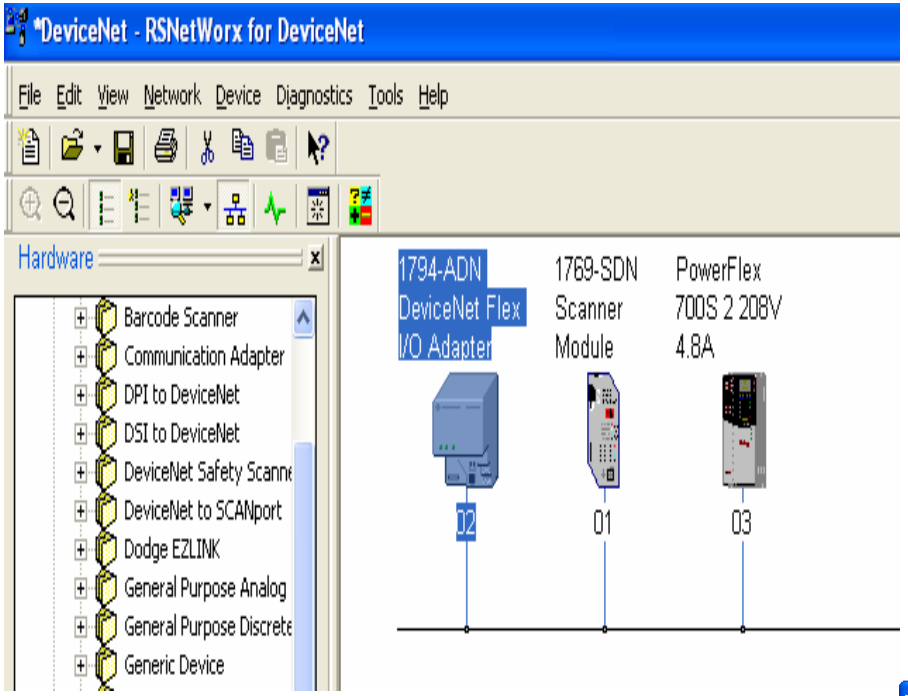
Phần mềm ***RSNetWorx for DeviceNet*** sẽ dùng để cấu hình vùng địa chỉ và số lượng các byte truyền nhận của Scanner cho biến tần.

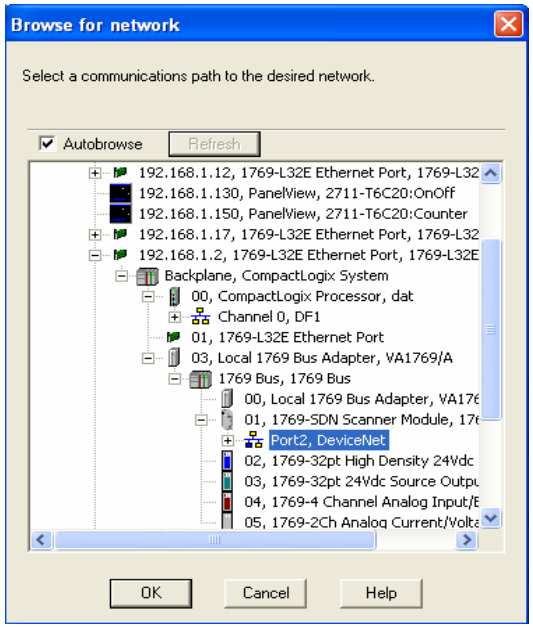
Bước 1: Khởi động phần mềm, chọn File New Go Online (để quét tất cả các thiết bị trong mạng). Dẫn tới đường dẫn trên Scanner (Chọn mạng DeviceNet muốn quét) Nhấn OK để xác nhận yêu cầu Upload hoặc Download.

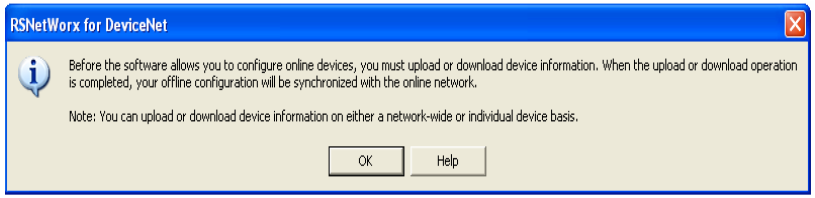


Thiết lập cấu hình RSNetWork for DeviceNet

Sau chu kì quét ta được:





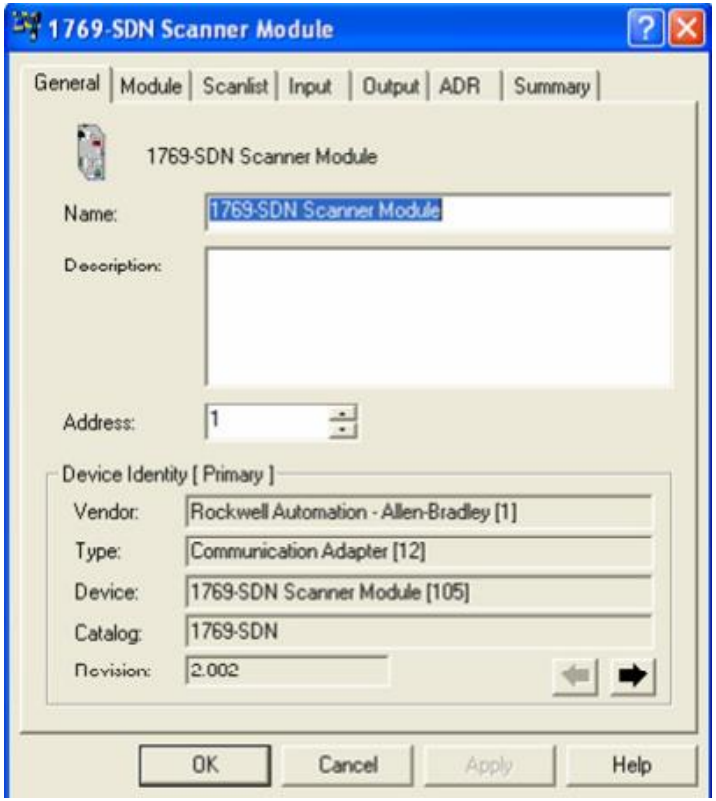


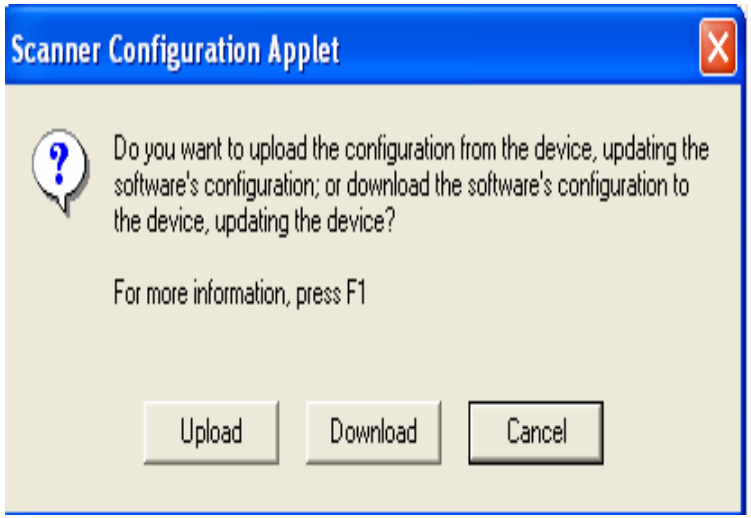
Cần lưu ý là ở ví dụ này biến tần sau khi quét có địa chỉ là 03 là do ta xoay Switch để chọn địa chỉ của Node.

Thiết lập cấu hình RSNetWorx for DeviceNet

Bước 2: Cấu hình các ô nhớ truyền nhận:

Click vào Scanner Module, click vào tag Module, bảng thông báo yêu cầu Upload cấu hình hiện tại của các thiết bị xuất hiện,

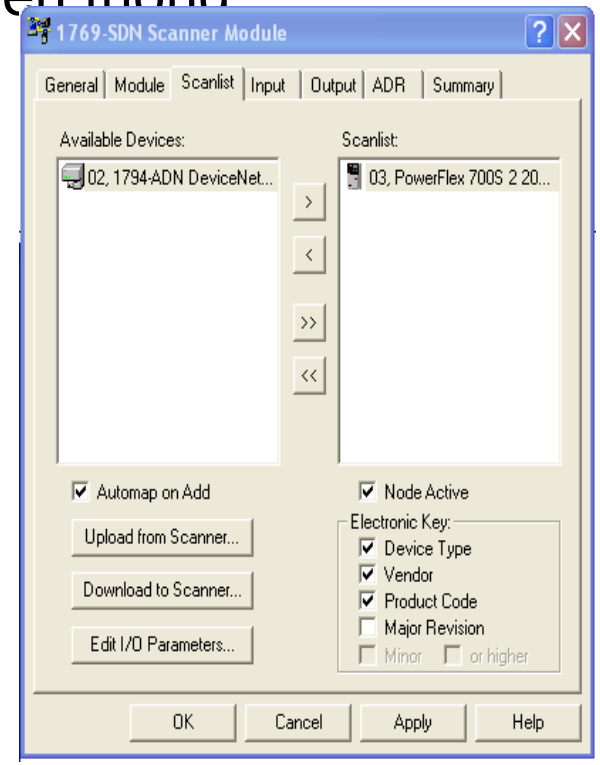


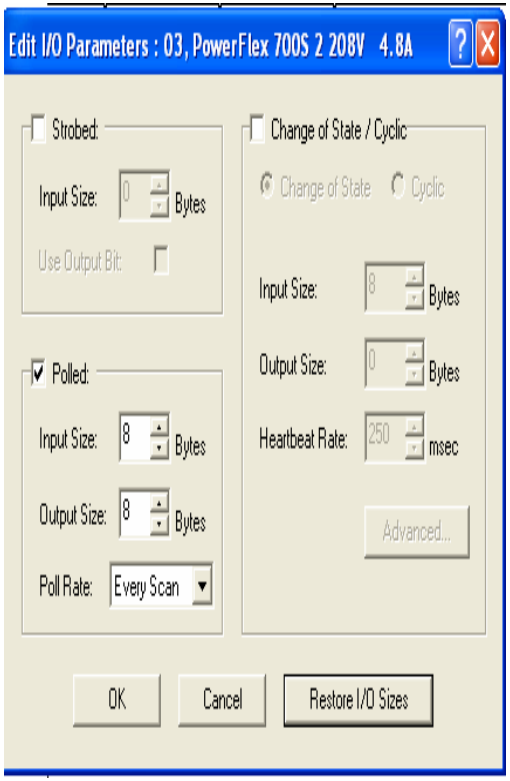


Thiết lập cấu hình RSNetWorx for DeviceNet

Bước 2: Cấu hình các ô nhớ truyền nhận:

Click vào tag Scanlist để thấy được tất cả các thiết bị mà Scanner quét được, đồng thời chọn các thiết bị muốn thiết lập truyền thông





Thiết lập cấu hình RSNetWork for DeviceNet

Click vào Edit I/O Parameters để thay đổi số byte truyền nhận của biến tần, đánh Check chọn kiểu truyền thông là Polled và chọn số byte nhận là 8 bytes và số byte nhận là 8 bytes (DWORD 0 và DWORD 1).

Bảng sau mô tả sự sắp xếp các ô nhớ và chức năng cụ thể của từng ô nhớ , ở đây Output có nghĩa là dữ liệu xuất từ PLC xuống , còn Input là đọc từ Biến tần về.

DWORD	Output I/O
0	Logic Command (LSW)
	Not Used
1	Reference (LSW)
	Reference (MSW)
2	Datalink In A1 (LSW)
	Datalink In A1 (MSW)
3	Datalink In A2 (LSW)
	Datalink In A2 (MSW)
4	Datalink In B1 (LSW)
	Datalink In B1 (MSW)
5	Datalink In B2 (LSW)
	Datalink In B2 (MSW)
6	Datalink In C1 (LSW)
	Datalink In C1 (MSW)
7	Datalink In C2 (LSW)
	Datalink In C2 (MSW)
8	Datalink In D1 (LSW)
	Datalink In D1 (MSW)
9	Datalink In D2 (LSW)
	Datalink In D2 (MSW)

DWORD	Input I/O
0	Logic Status (LSW)
	Not Used
1	Feedback (LSW)
	Feedback (MSW)
2	Datalink Out A1 (LSW)
	Datalink Out A1 (MSW)
3	Datalink Out A2 (LSW)
	Datalink Out A2 (MSW)
4	Datalink Out B1 (LSW)
	Datalink Out B1 (MSW)
5	Datalink Out B2 (LSW)
	Datalink Out B2 (MSW)
6	Datalink Out C1 (LSW)
	Datalink Out C1 (MSW)
7	Datalink Out C2 (LSW)
	Datalink Out C2 (MSW)
8	Datalink Out D1 (LSW)
	Datalink Out D1 (MSW)
9	Datalink Out D2 (LSW)
	Datalink Out D2 (MSW)

Thiết lập cấu hình RSNetWork for DeviceNet

Chức năng của từng bit trong Logic Command Word được mô tả như sau:

Logic Bits															Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
															x	Normal Stop	0 = Not Normal Stop 1 = Normal Stop
														x		Start (1)	0 = Not Start 1 = Start
													x			Jog 1	0 = Not Jog using [Jog Speed 1] 1 = Jog using [Jog Speed 1]
												x				Clear Fault (2)	0 = Not Clear Fault 1 = Clear Fault
										x	x					Unipolar Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
									x							Reserved	
								x								Jog 2	0 = Not Jog using [Jog Speed 2] 1 = Jog using [Jog Speed 2]
							x									Current Limit Stop	0 = Not Current Limit Stop 1 = Current Limit Stop
						x										Coast Stop	0 = Not Coast to Stop 1 = Coast to Stop
					x											Reserved	
				x												Reserved	
			x													Spd Ref Sel0	
		x														Spd Ref Sel1	
	x															Spd Ref Sel2	
x																Reserved	

Bits			
14	13	12	
0	0	0	= Spd Ref A
0	0	1	= Spd Ref B
0	1	0	= Preset 2
0	1	1	= Ref. 3 (Preset 3)
1	0	0	= Ref. 4 (Preset 4)
1	0	1	= Ref. 5 (Preset 5)
1	1	0	= Ref. 6 (Preset 6)
1	1	1	= Ref. 7 (Preset 7)

Thiết lập cấu hình RSNetWork for DeviceNet

Chức năng của từng bit trong Logic Status Word được mô tả như s

Logic Bits																Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Active	0 = Not Active 1 = Active
														x		Running	0 = Not Running 1 = Running
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Jogging	0 = Not Jogging 1 = Jogging
								x								Fault	0 = No Fault 1 = Fault
							x									Alarm	0 = No Alarm 1 = Alarm
						x										Flash Mode	0 = Not in Flash Mode 1 = In Flash Mode
					x											Run Ready	0 = Not Ready to Run 1 = Ready to Run
				x												At Limit (1)	0 = Not At Limit 1 = At Limit
			x													Tach Loss Sw	0 = Not Tach Loss Sw 1 = Tach Loss Sw
		x														At Zero Spd	0 = Not At Zero Speed 1 = At Zero Speed
	x															At Setpt Spd	0 = Not At Setpoint Speed 1= At Setpoint Speed
x																Enabled	0 = Not Enabled 1 = Enabled

Như vậy, việc điều khiển các chức năng cơ bản giờ đây được thực hiện bằng cách tác động lên từng bit.

Thiết lập cấu hình RSNetWork for DeviceNet

Việc cần làm tiếp theo là tốc độ tham chiếu cho động cơ:

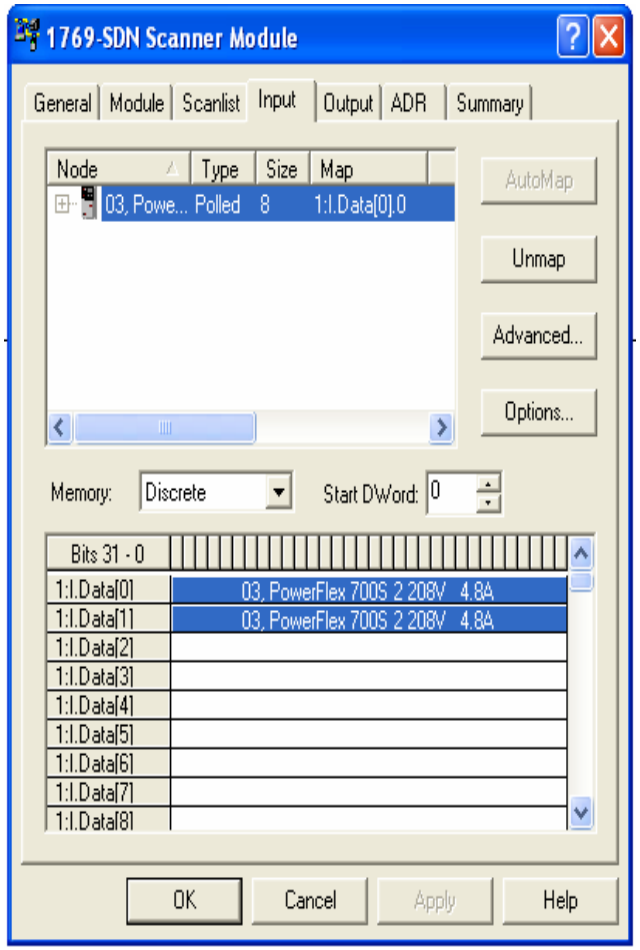
Giá trị mặc định của Par 07 [Ref / Fdbk size] là 16 bít, do vậy giá trị số lớn nhất có thể ghi vào Dword Reference là 32767; giá trị số lớn nhất này tương ứng với giá trị chứa trong Par 31 [Max Spd Ref Lim], do vậy ta muốn đặt tốc độ tham chiếu cho động cơ thì chỉ cần thực hiện phép tam suất đơn giản như sau:

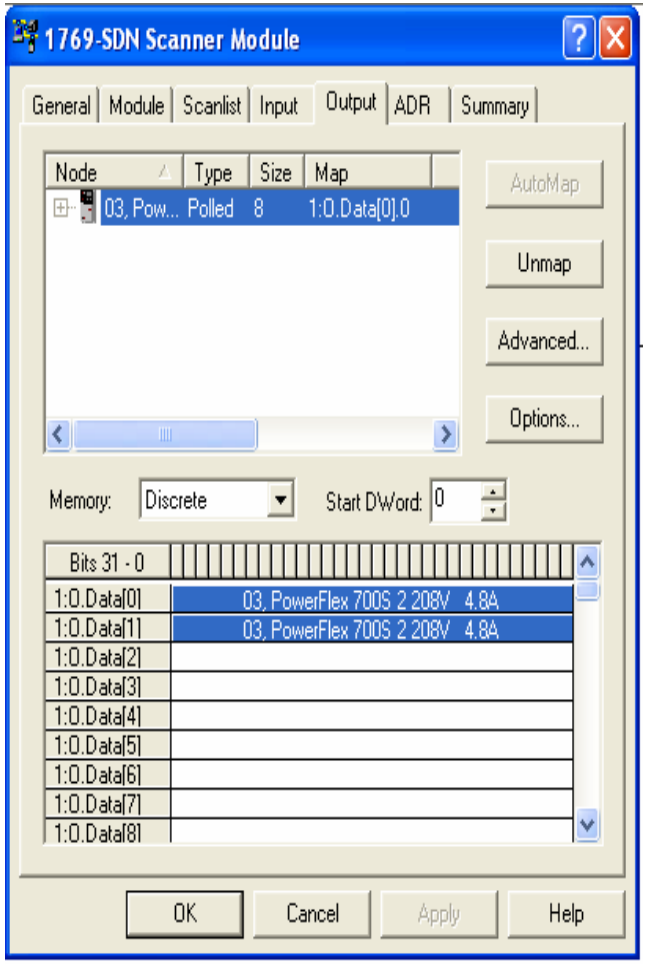
Max Spd Ref Lim ---------- 32767

Speed_Reference ---------- Giá trị số (ghi vào Dword 1 Output I/O)

Thiết lập cấu hình RSNetWork for DeviceNet

Bước 3: Xem chi tiết các vùng nhớ vào ra:





Thiết lập cấu hình RSNetWork for DeviceNet

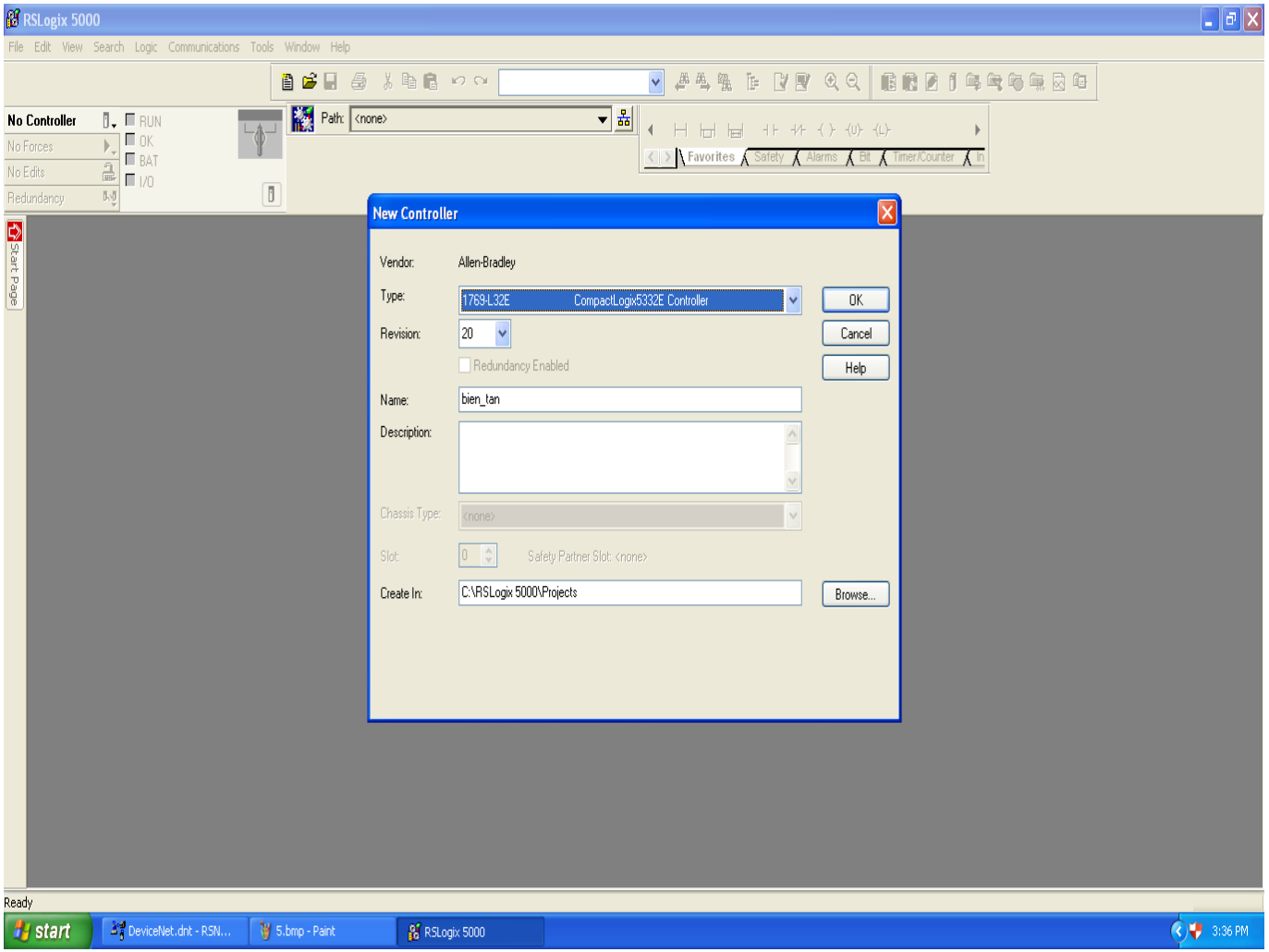
Bước 3: Xem chi tiết các vùng nhớ vào ra:

Tại vùng nhớ ngõ vào Input : LSW của Dword 1:I:Data[0] là Logic Status Word , MSW của Dword này không sử dụng.Tiếp theo LSW của Dword 1:I:Data[1] là giá trị Feedback , với giá trị Feedback này có thể tính được giá trị tốc độ (tần số) hiện tại của biến tần.

Tại vùng nhớ ngõ ra Output: LSW của Dword 1:O:Data[0] là Command Logic Word , MSW này không sử dụng. Tiếp theo LSW của Dword 1:O:Data[1] là giá trị Reference , có thể đặt tốc đọ tham chiếu cho biến tần bằng cách ghi giá trị số tương ứng vào Word này

Khởi tạo phần cứng Compactlogix 5000

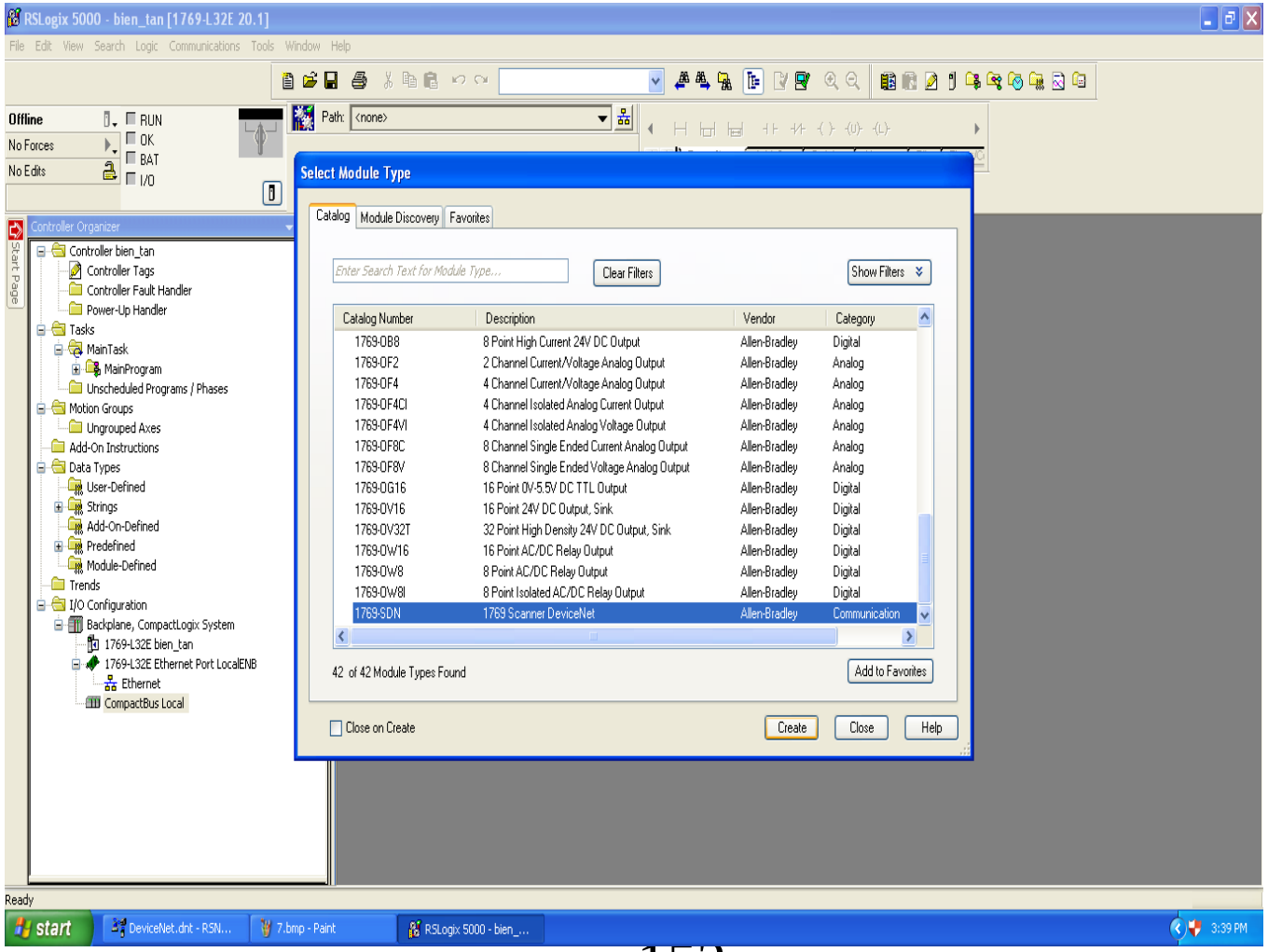
Chọn Compactlogix 1769-L32E trong mục New Controller



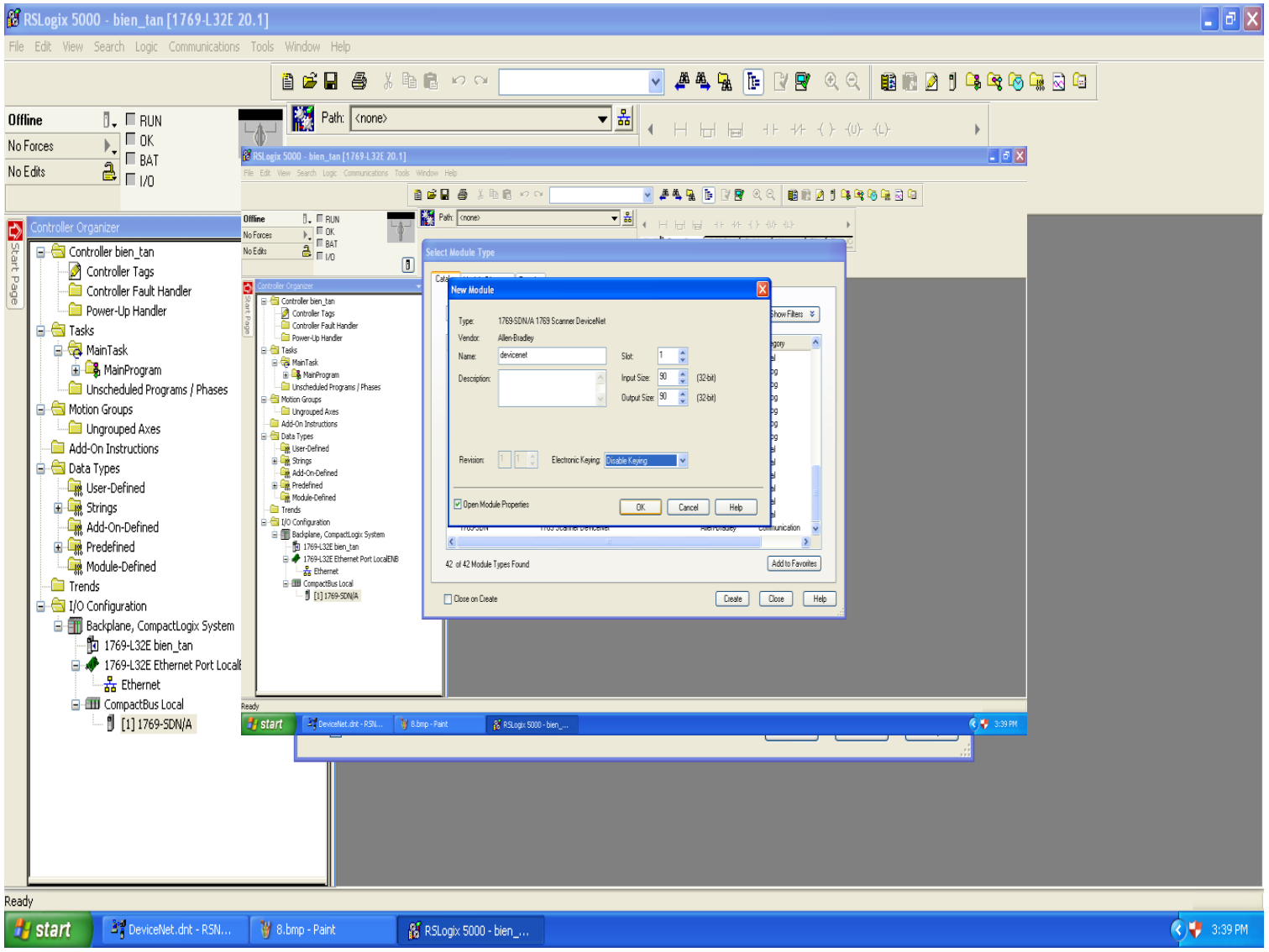
Khởi tạo phần cứng Compactlogix 5000

Tạo module mở rộng 1769-SDN.

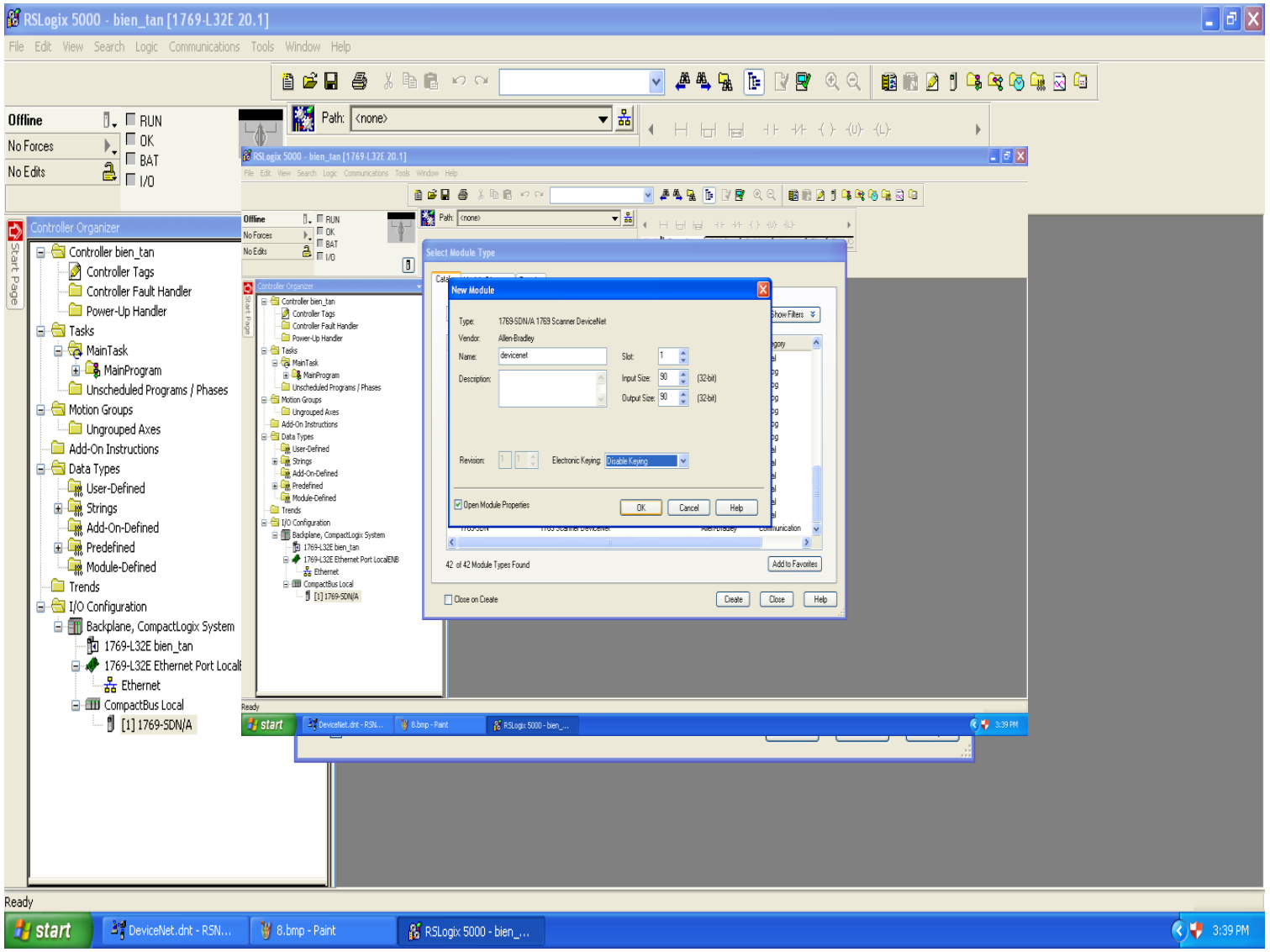
Chọn **CompactBus Local => New Module**



Khởi tạo phần cứng Compactlogix 5000



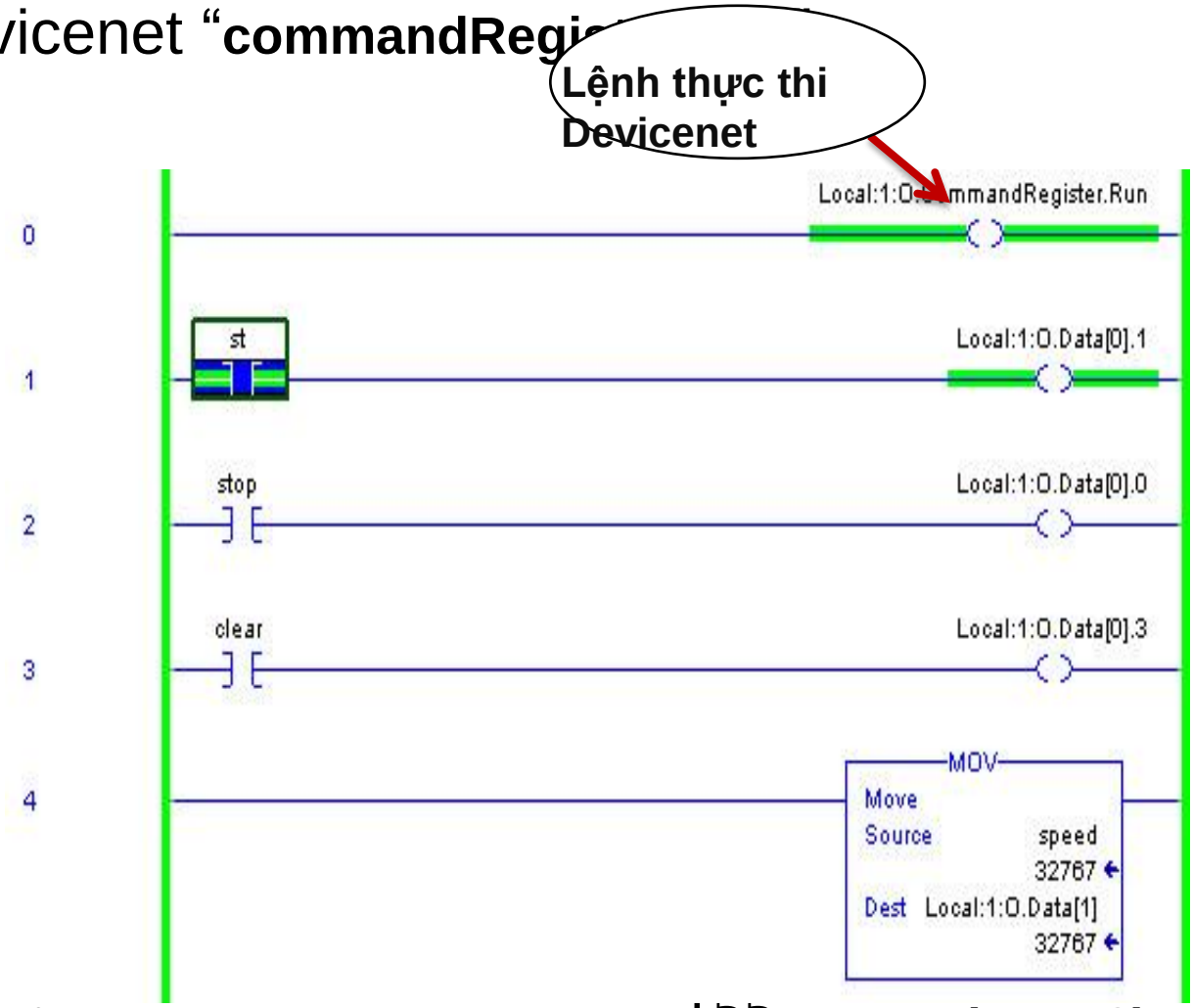
Khởi tạo phần cứng Compactlogix 5000



Khởi tạo Compactlogix 5000

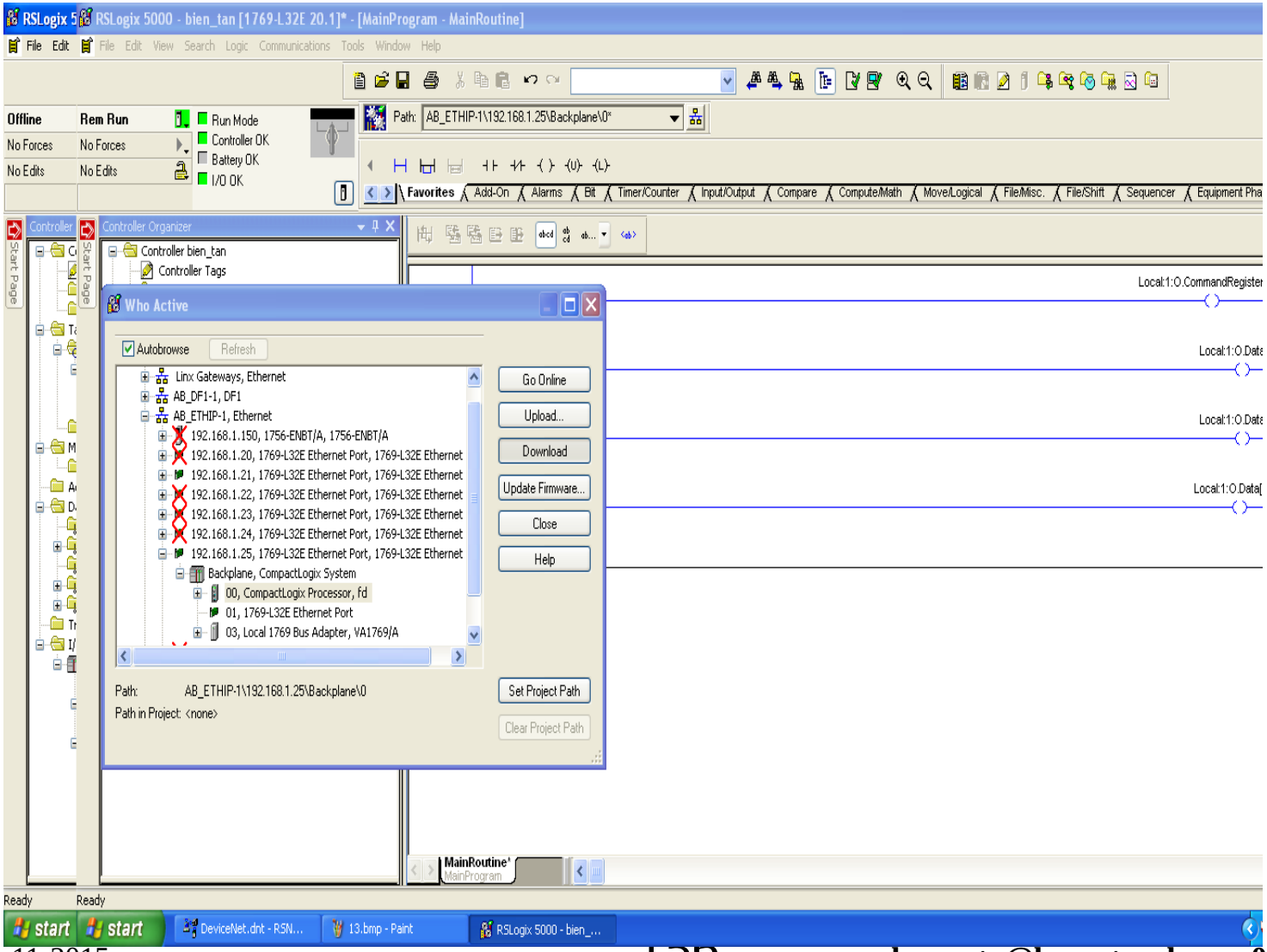
Ta vào MainRoutine viết chương trình Start, Stop, Clear và gán giá trị tốc độ xuống động cơ.

- *Lưu ý :* Để điều khiển được biến tần cần có lệnh thực thi Devicenet "**commandRegi**



Khởi tạo Compactlogix 5000

Vào **Communications => Who Active** để Download..



DATALINK

- DATALINK là vùng bổ sung chức năng giám sát và điều khiển các thông số của biến tần từ SCADA và PLC.
- Có 4 vùng DATALINK chính là A, B, C, D cho Output I/O và Input I/O của biến tần, trong mỗi Datalink lại chia nhỏ thành 2 vùng với qui ước số 1 và 2 đằng sau. Như vậy, mỗi Output và Input I/O của biến tần có tổng cộng 8 vùng DATALINK.

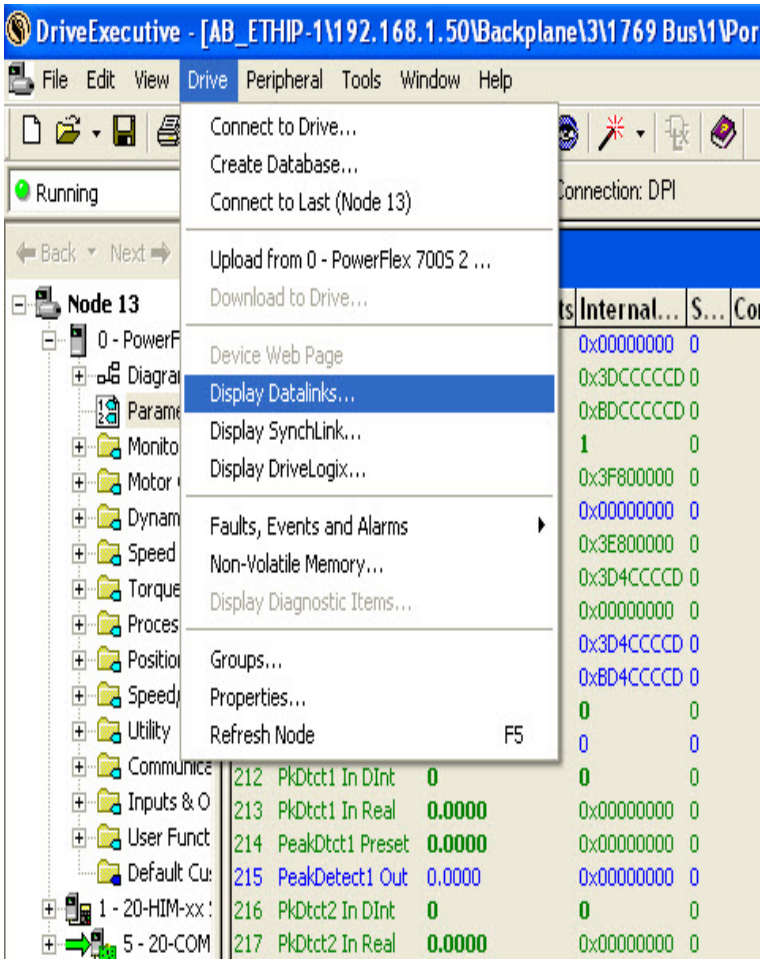
DWORD	Output I/O
0	Logic Command (LSW)
	Not Used
1	Reference (LSW)
	Reference (MSW)
2	Datalink In A1 (LSW)
	Datalink In A1 (MSW)
3	Datalink In A2 (LSW)
	Datalink In A2 (MSW)
4	Datalink In B1 (LSW)
	Datalink In B1 (MSW)
5	Datalink In B2 (LSW)
	Datalink In B2 (MSW)
6	Datalink In C1 (LSW)
	Datalink In C1 (MSW)
7	Datalink In C2 (LSW)
	Datalink In C2 (MSW)
8	Datalink In D1 (LSW)
	Datalink In D1 (MSW)
9	Datalink In D2 (LSW)
	Datalink In D2 (MSW)

DWORD	Input I/O
0	Logic Status (LSW)
	Not Used
1	Feedback (LSW)
	Feedback (MSW)
2	Datalink Out A1 (LSW)
	Datalink Out A1 (MSW)
3	Datalink Out A2 (LSW)
	Datalink Out A2 (MSW)
4	Datalink Out B1 (LSW)
	Datalink Out B1 (MSW)
5	Datalink Out B2 (LSW)
	Datalink Out B2 (MSW)
6	Datalink Out C1 (LSW)
	Datalink Out C1 (MSW)
7	Datalink Out C2 (LSW)
	Datalink Out C2 (MSW)
8	Datalink Out D1 (LSW)
	Datalink Out D1 (MSW)
9	Datalink Out D2 (LSW)
	Datalink Out D2 (MSW)

Giám sát quá trình hoạt động của biến tần

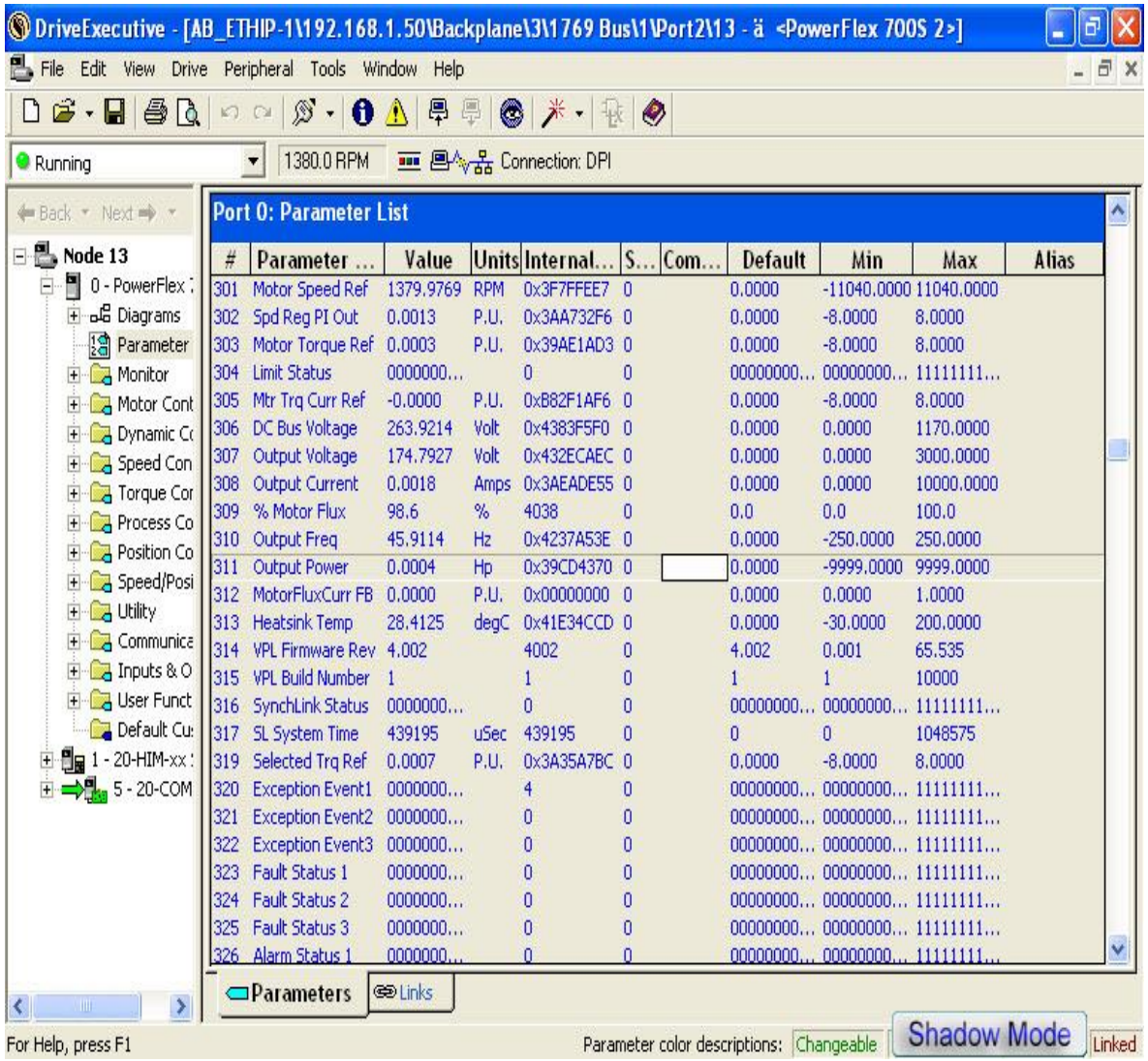
Để cấu hình cho việc đưa thông số nào từ biến tần lên phần mềm RSLogix 5000 để hiển thị

Vào **Driver** => **Display Datalink**



Giám sát quá trình hoạt động của biến tần

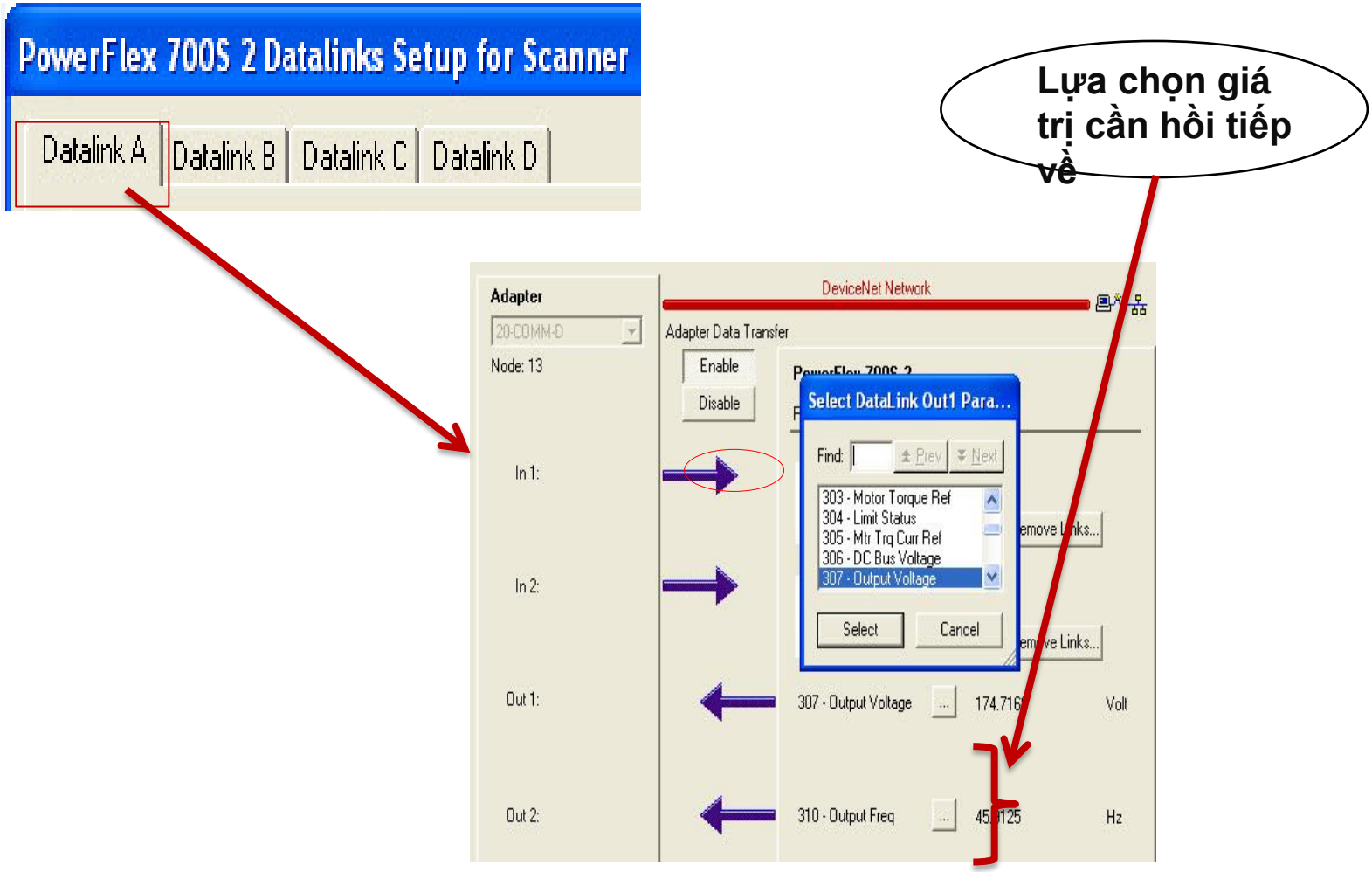
Các thông số feedback trong quá trình hoạt động của động cơ thuộc vùng Parameter 300 trở lên. Để chọn thông số cần giám sát cho Datalink vào **Diagrams** => **Parameter**



Giám sát quá trình hoạt động của biến tần

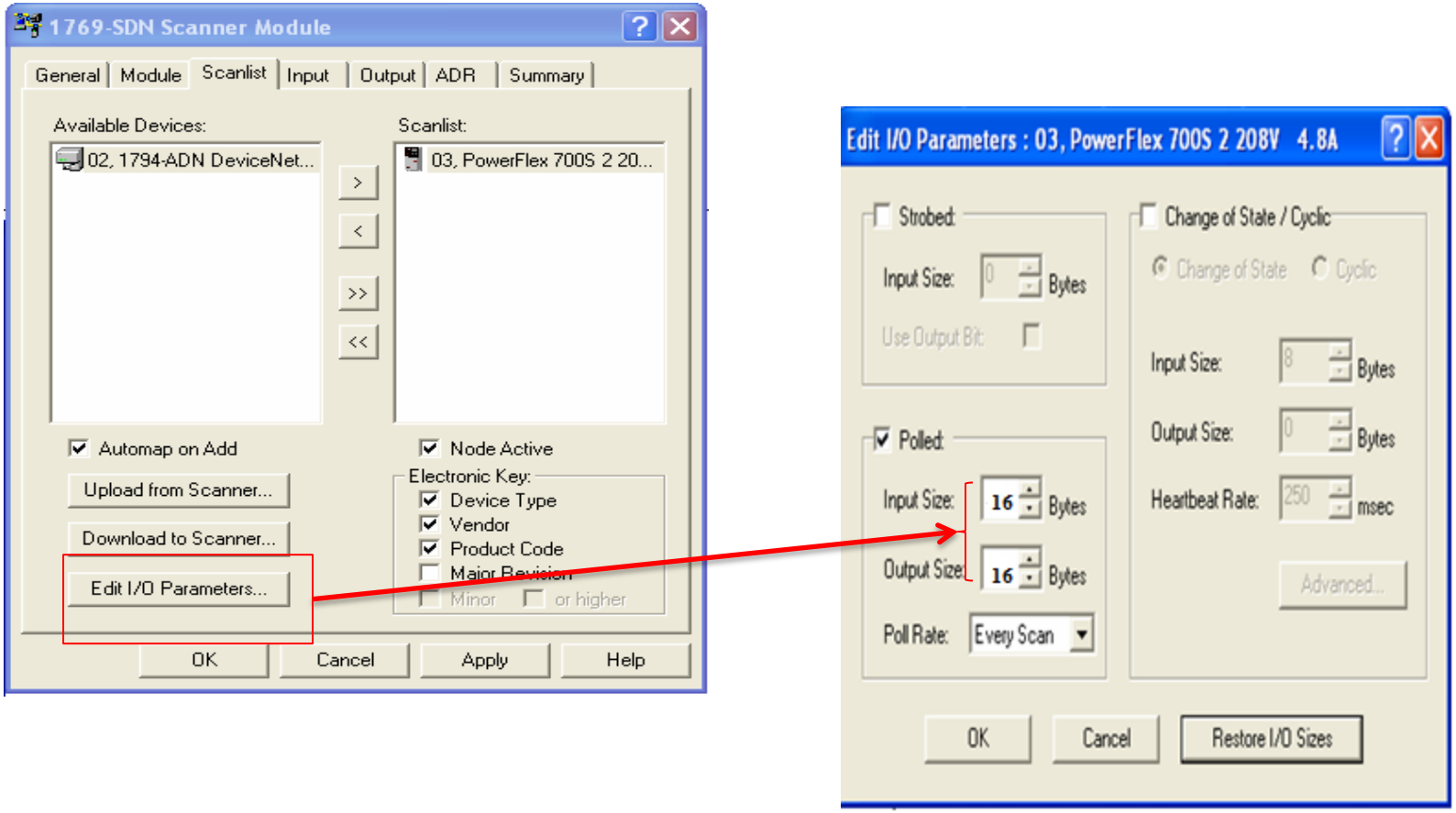
Các vùng để link dữ liệu feedback về (tham khảo slide 25) tùy theo mục đích sử dụng và yêu cầu chọn cho phù hợp.

Ví dụ sử dụng vùng Datalink A hồi tiếp Parameter 307 (ngõ ra điện áp) và 310 (ngõ ra tần số)



Giám sát quá trình hoạt động của biến tần

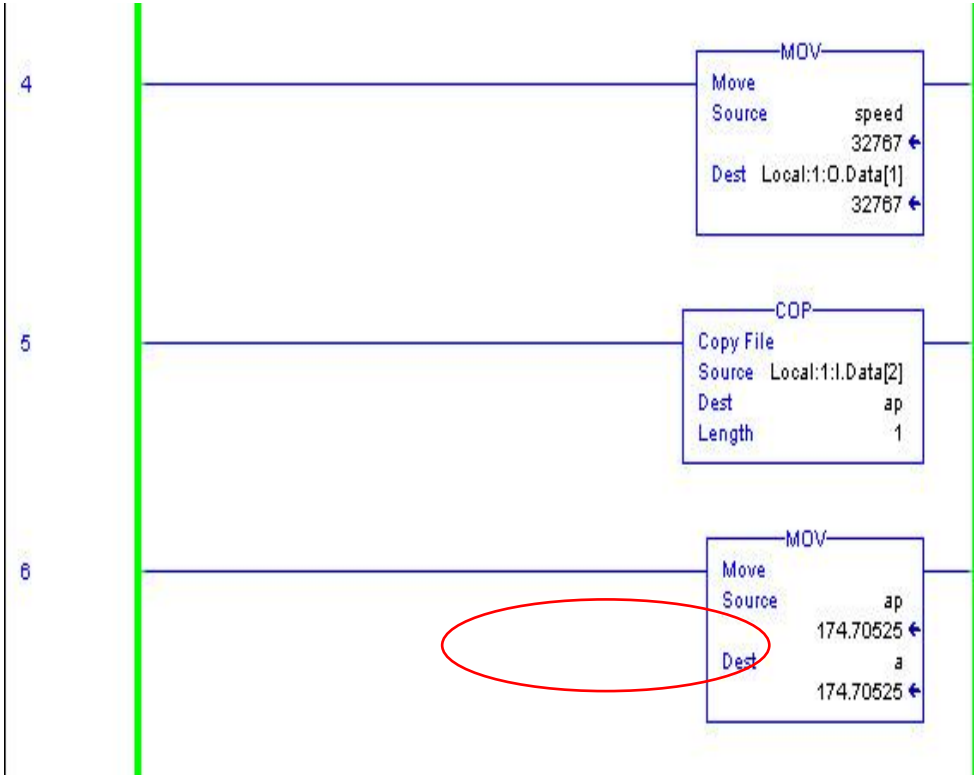
Vào phần Edit I/O Parameters cài đặt kích thước dữ liệu vào ra. Chú ý khi dùng Datalink hồi tiếp dữ liệu về dữ liệu vào ra phải là 16 bytes. Sau đó Download to Scanner.



Giám sát quá trình hoạt động của biến tần

Đưa dữ liệu lên chương trình điều khiển để dễ dàng giám sát và kiểm tra.

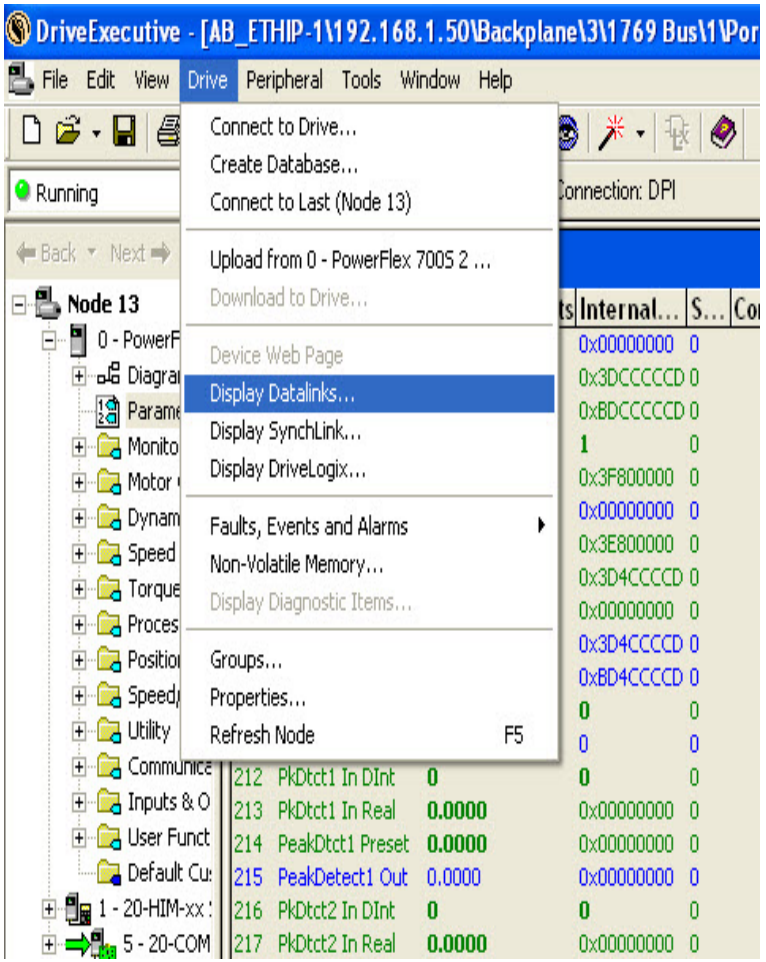
Dùng lệnh **COP** để copy dữ liệu của thông số cần feedback đồng thời để chuyển đổi kiểu dữ liệu từ DINT (*kiểu giao tiếp mạng*) trở về REAL (*kiểu dữ liệu của biến tần*), sau đó dùng lệnh **MOV** hiện thị dữ liệu feedback đưa về.



Giám sát quá trình hoạt động của biến tần

Để giám sát biết được trạng thái hoạt động của động cơ trong quá trình làm việc có đúng như các thông số đã cài đặt trước hay các sự cố xẩy ra để có biện pháp xử lý kịp thời.

Vào **Driver** => **Display Datalink**



Giám sát quá trình hoạt động của biến tần

Check dữ liệu từ DATALINK của biển tần đã hồi tiếp chính xác giá trị với RSLogix 5000?