

# PLC134 LAB 1.3: EXPLICIT MESSAGING

Student Name: \_\_\_\_\_

Student ID: \_\_\_\_\_

## LAB OUTCOMES:

1. Demonstrate how to setup an explicit message instruction in a ControlLogix PLC to send parameter information to a DeviceNet device
2. Demonstrate how to setup an explicit message instruction in a ControlLogix PLC to receive parameter information from a DeviceNet device

## LAB PROCESS:

Download the project files necessary for this Lab. Then follow the steps in **Part 1**.

PLC\_134\_Module\_1\_PF4\_VFD.DNT

PLC\_134\_Module\_1\_PF4\_Mess.ACD

### Part 1

Many DeviceNet components have configurable parameters and read only parameters to control /view information about a device. This lesson will use the MSG instruction in the ControlLogix PLC to send and receive information from a DeviceNet component. ControlLogix literature refers to this type of data transfer as Explicit Messaging. This lesson will cover Explicit Messaging to a: PowerFlex 4 VFD

## Equipment Required:

Computer with RSLogix 5000 / Studio 5000 software

    RSLinx software

    RSNetWorx for DeviceNet software

    Ethernet Port

ControlLogix Demo board with 1756-DNB module, 1756-processor

    1756-Ethernet Communication Module

    Discrete Input / Output Modules

DeviceNet Demo Board with 871TM Prox switch

RightSight Standard Diffuse Photoelectric Sensor  
855T – Stack Light  
1791D 8B8P Compact Block I/O  
PowerFlex 4 VFD

Note: Other components are also installed on DeviceNet Demo Board

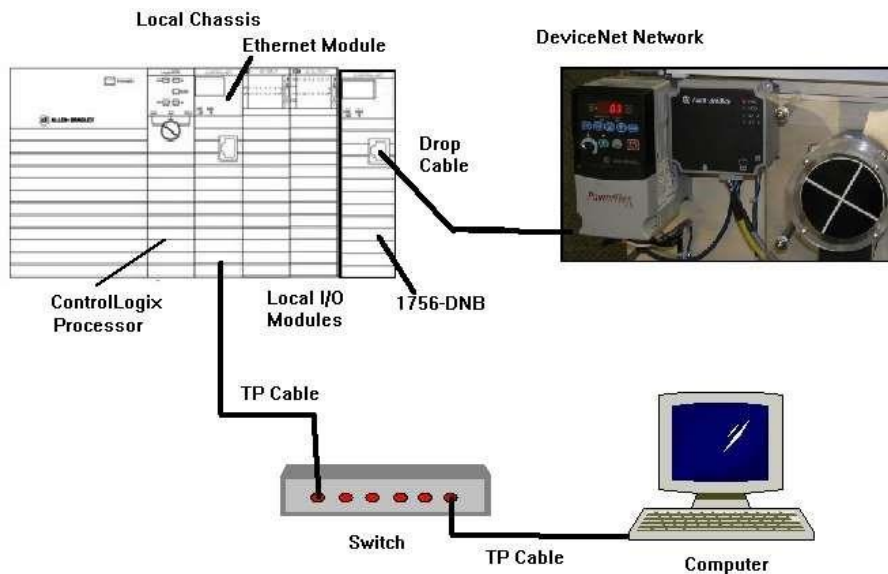


Figure 1-A Ensure all the DeviceNet

component's cables are connected to the IDC taps on the bottom of the DeviceNet Demo Board

Twisted pair Ethernet cables from Computer Ethernet Port the 1756-EtherNet Module Note: the cable may be directly connected - no Switch required

DeviceNet drop cable to connect the DeviceNet Demo Board to the front port on the 1756-DNB Module located on the ControlLogix Demo Board.

Power-up ControlLogix and DeviceNet Demo Boards

Note: If the display on the 1756-DNB Module shows - No Network Power – the 1756-DNB Module is not receiving power from the DeviceNet network (drop cable) cable.

In the Lab exercise a connection will be made from the computer's Ethernet Port thru RSNetWorx for DeviceNet using a RSLinx, EtherNet/IP Driver to connect to the DeviceNet network

Ensure the Computer can connect to the ControlLogix Demo board using the 1756 – Ethernet Communication Module with an EtherNet/IP driver.

Note: DeviceNet Scanner Module - 1756-DNB – located in slot 6.

Download PLC\_134\_Module\_1\_PF4\_VFD.DNT to the 15756-DNB Scanner Module

Import PLC\_134\_Module\_1\_PF4\_Mess.L5K to Studio 5000 software

Download PLC\_134\_Module\_1\_PF4\_Mess.ACD ControlLogix processor

### **PowerFlex 4 VFD Parameters:**

The PowerFlex 4 VFD contains over 100 parameters.

Ensure that Parameters 36 – Start Source and 38 – Speed Reference are programmed for Comm Port (Current Value).




34		Minimum Freq	0.0 Hz
35		Maximum Freq	60 Hz
36		Start Source	Comm Port
37		Stop Mode	Ramp, CF
38		Speed Reference	Comm Port
39		Accel Time 1	10.0 Sec

Figure 2-A  
Parameters 36 and 37 – Current Value

Using 22a-Powerflex\_4\_User\_Manual.pdf handout determine the Parameter numbers of

- Output Voltage:
- Jog Frequency:

One Explicit Message will monitor the PowerFlex 4 VFD's Output Voltage

The second Explicit Message will change the value of the PowerFlex 4 VFD's Jog Frequency

### **Explicit Messaging Parameter Write:**

Monitor the PLC\_134\_Module\_1\_PF4\_Mess.ACD Offline.

Rungs 0 – 6 are the instruction that will control / monitor the PowerFlex 4 VFD.

Note: This is the information covered in the VFD Lab Exercise

Rungs 7 and 8 are the Explicit Message instructions.

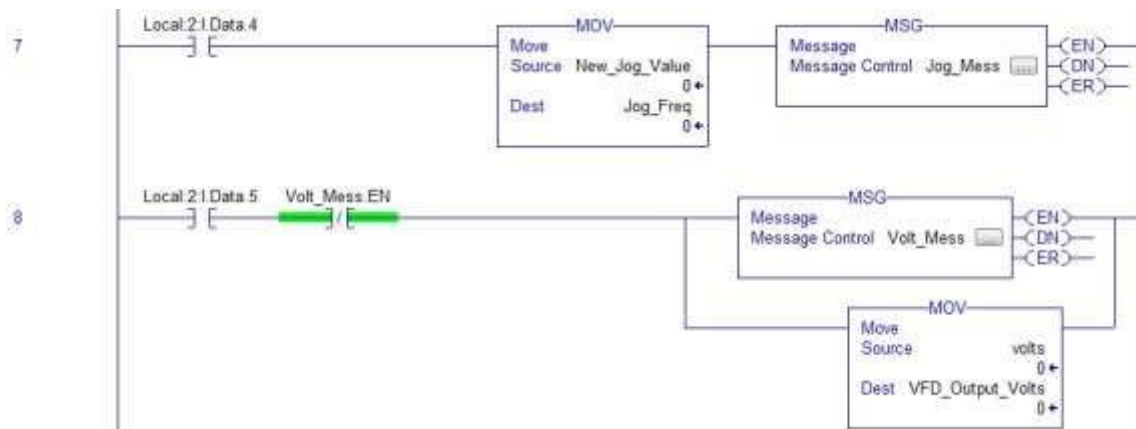


Figure 3-A  
Ladder Logic Explicit Message Instructions

Double click the ellipse box to open the MSG instruction's Configuration window.



Figure 4-A  
Rung 7 – MSG Instruction

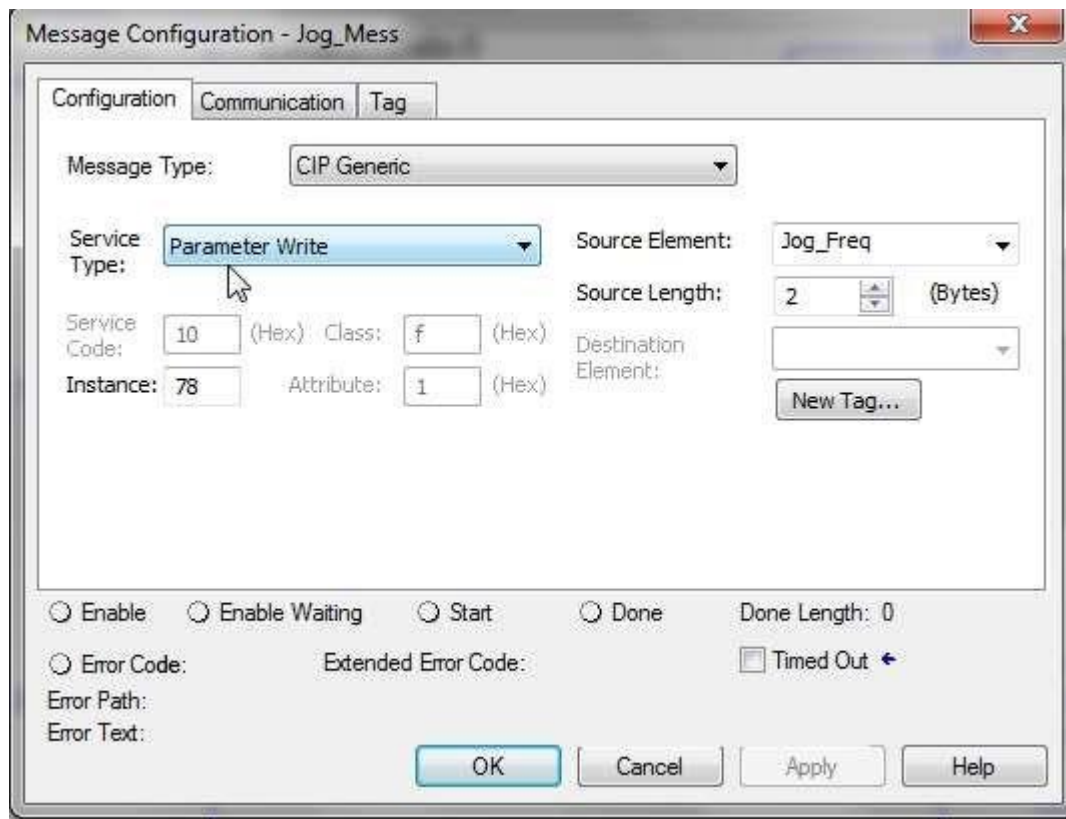


Figure 5-A  
Rung 7 – MSG Instruction- Configuration Tab

Message Type: CIP Generic for Explicit Message

Service Type: Parameter Write – This Message instruction will Write (send) data to the device – PowerFlex 4 VFD

Service Code: Based on Service Type, i.e. Parameter Write Service Type is Service Code 10 – Note: Hex format

Class: f - for PowerFlex VFDs – Note: Hex format

Attribute: 1 – for PowerFlex VFDs – Note: Hex format

Instance: 78 – Parameter number where the data is sent (Write) – Note: decimal format

Source Element: Tag in the processor that contains the data value to Write (send) to the PowerFlex 4 VFD  
See MOV instruction Rung 7.

Source Element: Length: Data Size – PowerFlex 4 Parameter data size – 16 bits (2 Bytes)

Destination Element: Blank – Instance value determines Destination – Parameter #

Click the Communication tab

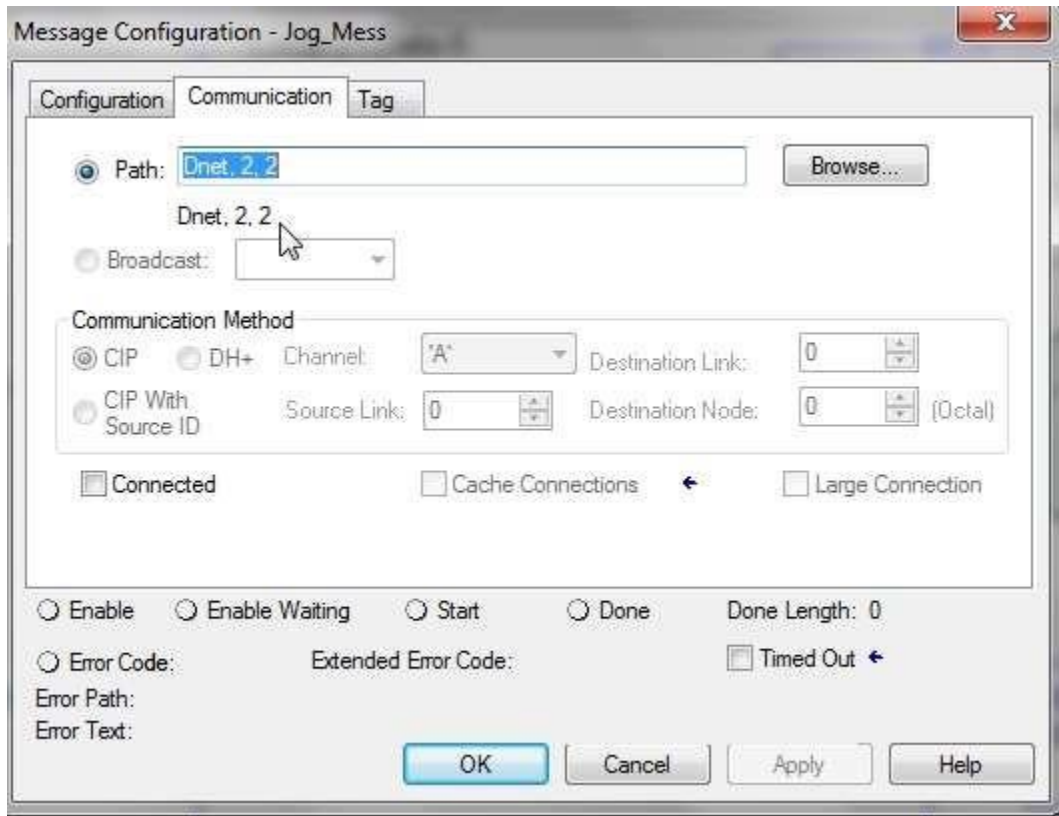


Figure 6-A

Rung 7 – MSG Instruction- Communication Tab

Path: DeviceNet Network location of the component receiving the data.

Dnet – Name of the 1756-DNB Scanner in the Project File's I/O Configuration

Determines Slot Location of 1756-DNB Scanner Module

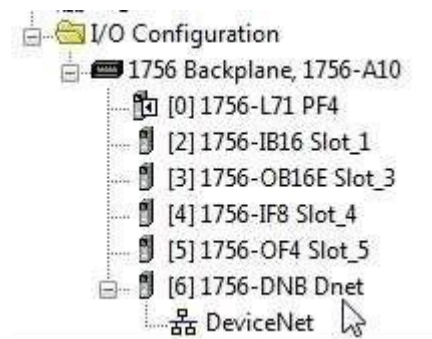


Figure 7-A  
I/O Configuration for PLC\_220\_Module\_6\_PF4\_Mess.ACD File

Note: 1756-DNB Dnet Module – Slot 6 location

Dnet, 2, 2  
└── 1756-DNB Scanner - DeviceNet Port

Dnet, 2, 2  
└── Node Address [MAC ID] of Device

Click the Browse button to view Project's I/O Configuration

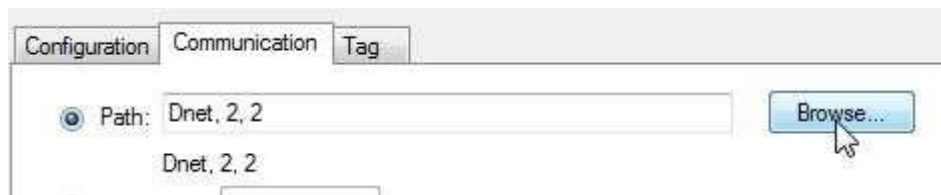


Figure 8-A  
Browse Button- Message Instruction – Communication Tab

Message Path Browser Window displays 1756-DNB Scanner slot location and name

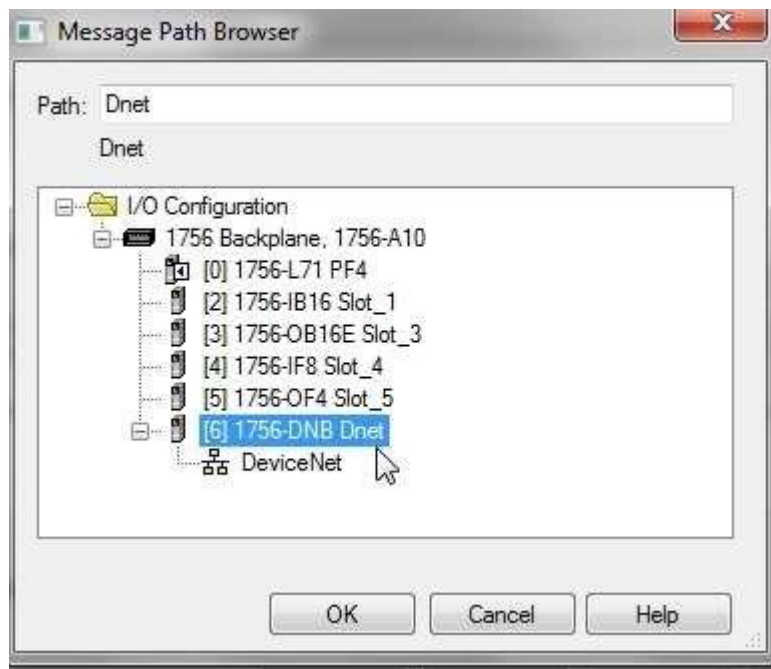


Figure 9-A  
Message Instruction – Message Path Browser Window

1756-DNB slot location [6] – Slot 6

1756-DNB name - Dnet

**Explicit Messaging Parameter Read:**

Monitor the PLC\_220\_Module\_6\_PF4\_Mess.ACD Offline.

Rungs 0 – 6 are the instruction that will control / monitor the PowerFlex 4 VFD.

Note: This is the information covered in the VFD Lab Exercise

Rungs 7 and 8 are the Explicit Message instructions.



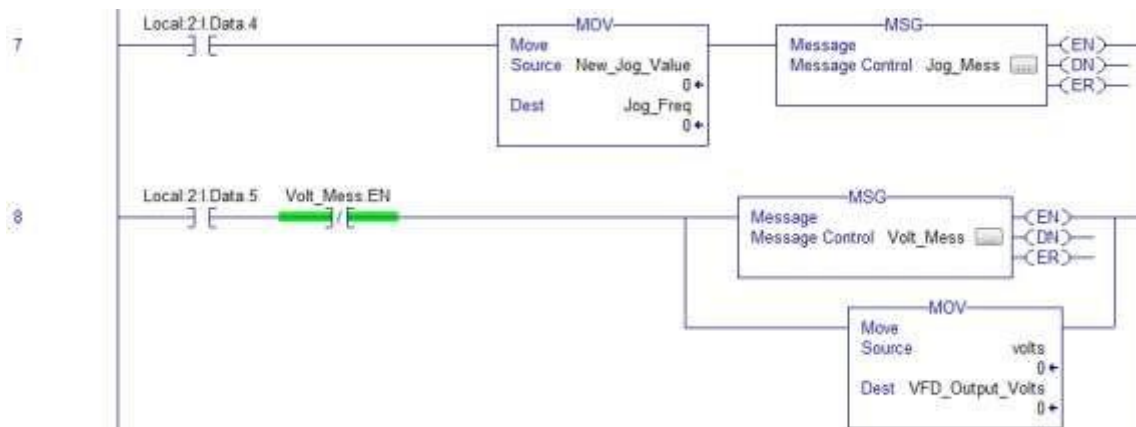


Figure 10-A  
Ladder Logic Explicit Message Instructions

Note: Message Control Tag for Rung 7 MSG Instruction – Jog\_Mess

Note: Message Control Tag for Rung 8 MSG Instruction – Volt\_Mess

Double click the ellipse box to open the MSG instruction's Configuration window.

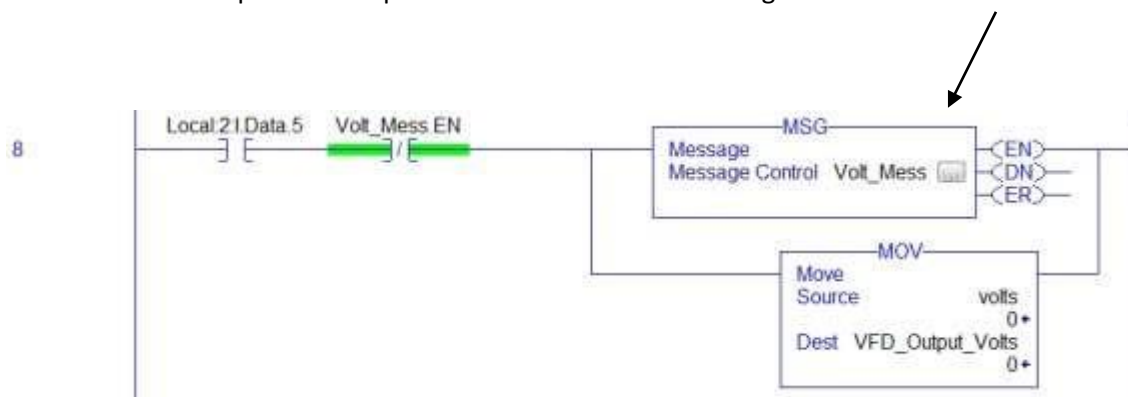


Figure 11-A  
Rung 8 – MSG Instruction

See Devicenet\_22comm-D\_User\_Manual.pdf pages 6-1 through 6-10 for additional MSG configuration information.

Message Configuration - Volt\_Mess

Configuration | Communication | Tag

Message Type: CIP Generic

Service Type: Parameter Read

Service Code: e (Hex) Class: f (Hex) Instance: 4 Attribute: 1 (Hex)

Source Element: Source Length: 0 (Bytes) Destination Element: volts

Enable Enable Waiting Start Done Done Length: 0

Error Code: Extended Error Code: Timed Out

Error Path: Error Text:

OK Cancel Apply Help

Figure 12-A  
Rung 8 – MSG Instruction- Configuration Tab

Message Type: CIP Generic for Explicit Message

Service Type: Parameter Read – This Message instruction will Read (receive) data from the device – PowerFlex 4 VFD

Service Code: Based on Service Type, i.e. Parameter Read Service Type is Service Code e – Note: Hex format

Class: f - for PowerFlex VFDs – Note: Hex format

Attribute: 1 – for PowerFlex VFDs – Note: Hex format

Instance: 4 – Parameter number where the data is received (Read) – Note: decimal format

Source Element: Blank – Instance value determines Source Element – Parameter #

Source Element: Length: 0

Destination Element: Tag in the processor that receives the data value from PowerFlex 4 VFD parameter 4  
See MOV instruction Rung 8.

Click the Communication tab



Figure 13-A  
Rung 8 – MSG Instruction- Communication Tab

Path: DeviceNet Network location of the component sending the data.  
Dnet – Name of the 1756-DNB Scanner in the Project File's I/O Configuration  
Determines Slot Location of 1756-DNB Scanner Module receiving data

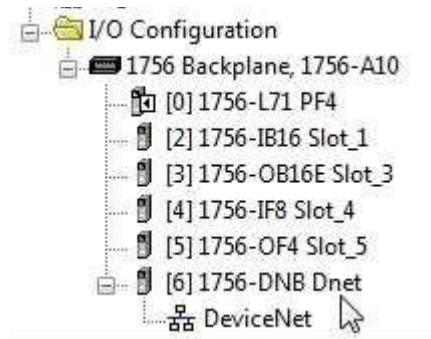


Figure 14-A

I/O Configuration for PLC\_220\_Module\_6\_PF4\_Mess.ACD File

Note: 1756-DNB Dnet Module – Slot 6 location

Dnet, 2, 2  
└─ 1756-DNB Scanner - DeviceNet Port

Dnet, 2, 2  
└─ Node Address [MAC ID] of Device

Click the Browse button to view Project's I/O Configuration

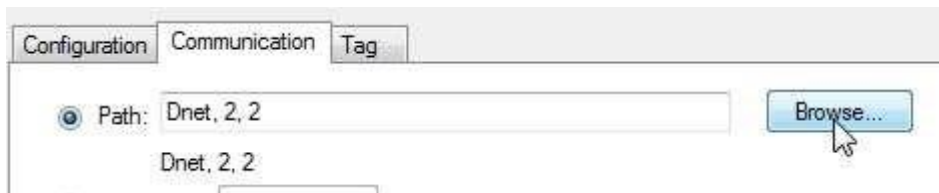


Figure 15-A

Browse Button- Message Instruction – Communication Tab

Message Path Browser Window displays 1756-DNB Scanner slot location and name

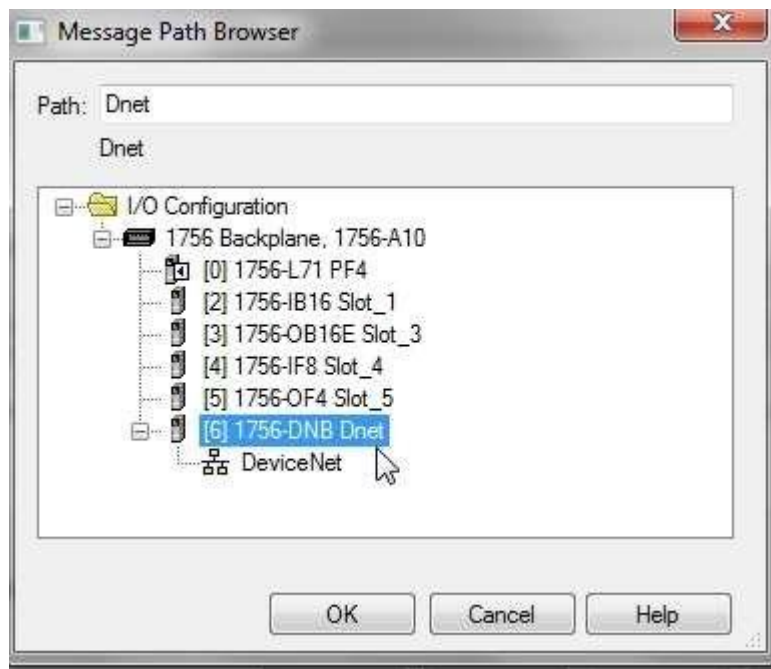


Figure 16-A  
Message Instruction – Message Path Browser Window

1756-DNB slot location [6] – Slot 6

Note: NC (XIO) – Volt\_Mess.EN- contact on Rung 8 will continually toggle the MSG instruction when Local:2:I.Data.5 – (SS5 Switch on ControlLogix Demo) – is True/ON (right position).

### **Verify MSG operation:**

Go Online to ControlLogix processor

Place ControlLogix processor in RUN Mode

Place 1756-DNB Scanner in RUN Mode

If the PowerFlex 4 VFD is faulted, press the Stop button on the Drive's keypad Unit to Reset Fault.

Press the blue Escape button (Esc) on PowerFlex 4 until the Numeric Display on the VFD reads 0.0

1. Verify PLO on ControlLogix Demo Board is ON – VFD ready to Run

2. Enter the value of 600 in the Speed tag on Rung 6 MOV instruction

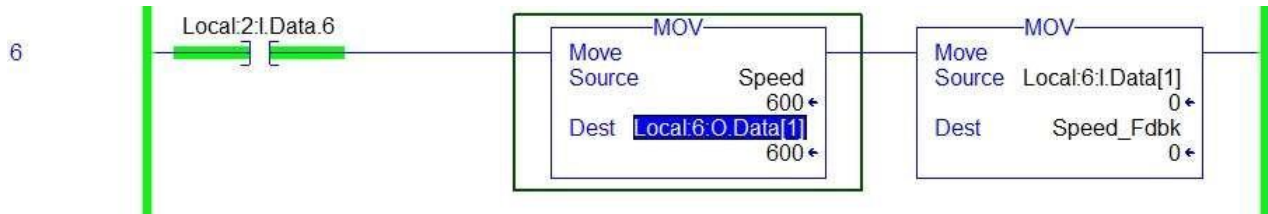


Figure 17-A  
Speed Tag Rung 6

Ensure Local:2:I.Data.6 – SS6 Switch on ControlLogix Demo Board is ON (right position)

3. Rung 2 – Press PB2 Pushbutton to Start VFD

What value is Displayed on VFD?

What frequency is the VFD outputting to the motor?

4. Ensure Local:2:I.Data.5 – SS5 Switch on ControlLogix Demo Board is ON (right position)

What is the value of the volts tag – MOV instruction – Rung 8?

Where is the volts tag value originating from?

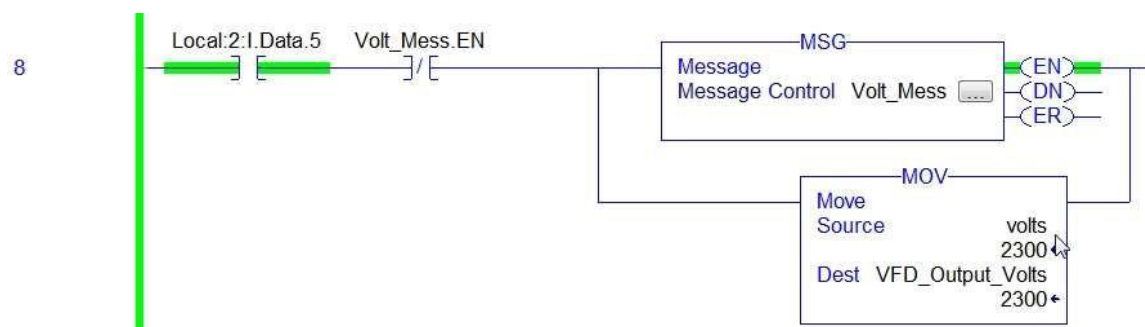


Figure 18-A  
Volts Tag Rung 8

5. Navigate to RSNetWorx for DeviceNet software

Ensure RSNetWorx for DeviceNet is monitoring the network (Online).

Upload PowerFlex 4 Parameters



Figure 19-A  
Upload PowerFlex 4 Parameters

From the Parameters tab on PowerFlex 4 Properties window – Click Monitor to view PowerFlex 4 Parameters Online.

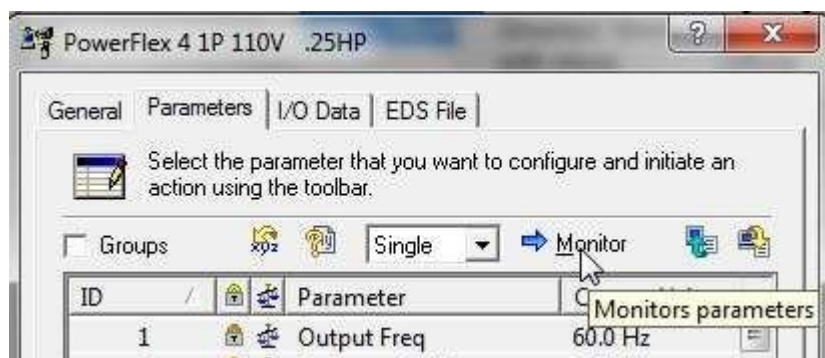


Figure 20-A  
Monitor PowerFlex 4 Parameters Online

View Current Value of Output Voltage Parameter.

ID	Parameter	Current Value
1	Output Freq	60.0 Hz
2	Commanded Freq	60.0 Hz
3	Output Current	0.18 A
4	Output Voltage	230.0 V
5	DC Bus Voltage	331.7 V
6	Drive Status	XXXXXXXX XXX

Figure 21-A  
Monitor Output Voltage Parameter Online

Output Voltage Parameter #:

Output Voltage Current Value:

Compare Output Voltage Parameter Current Value to volts tag – Rung 8 ControlLogix

Explain:

6. Enter the value of 300 in the Speed tag on Rung 6 MOV instruction

What value is displayed on VFD?

What frequency is the VFD outputting to the motor?

What is the value of the volts tag – MOV instruction – Rung 8?

Where is the volts tag value originating from?

Is the volts tag continually being updated?

Explain:

7. Navigate to RSNetWorx for DeviceNet software

Ensure RSNetWorx for DeviceNet is monitoring the network (Online).

Upload PowerFlex 4 Parameters

View the Output Volts Parameter in the PowerFlex 4 VFD.

Output Voltage Parameter #:

Output Voltage Current Value:

Compare Output Voltage Parameter Current Value to volts tag – Rung 8 ControlLogix



Explain:

8. Stop the VFD – Press PB1 Pushbutton on ControlLogix Demo Board

See Rung 1 – ControlLogix Ladder Logic File

What Pushbutton on the ControlLogix Demo Board will Jog the PowerFlex 4 VFD?

9. Press PB3 on ControlLogix Demo Board

Hold down PB3 Pushbutton

PB3 causes what to occur to the PowerFlex 4 VFD?

What Frequency is the VFD outputting to the motor?

What Voltage is the VFD outputting to the motor?

Release PB3 Pushbutton

10. Navigate to RSNetWorx for DeviceNet software

Ensure RSNetWorx for DeviceNet is monitoring the network (Online).

Upload PowerFlex 4 Parameters

View the Jog Frequency Parameter in the PowerFlex 4 VFD.

Jog Frequency Parameter #:

Jog Frequency Current Value:

Compare Jog Frequency Parameter Current Value to VFD frequency output when PB3 Pushbutton was pressed

Explain:

11. Navigate to ControlLogix Ladder Logic File – Rung 7

Ensure SS4 Switch on ControlLogix Demo Board is OFF (left position)

Enter 180 in the New\_Jog\_Value tag in MOV instruction – Rung 7.

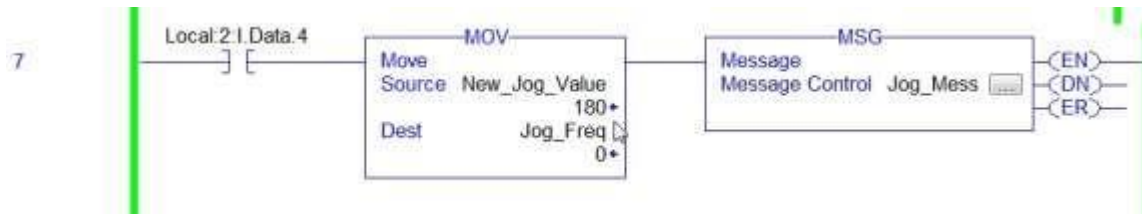


Figure 22-A  
New\_Jog\_Value Tag Rung 7

Turn SS4 Switch on ControlLogix Demo Board ON (right position)

12. Press PB3 on ControlLogix Demo Board

Hold down PB3 Pushbutton

What Frequency is the VFD outputting to the motor?

What Voltage is the VFD outputting to the motor?

Release PB3 Pushbutton

13. Navigate to RSNetWorx for DeviceNet software

Ensure RSNetWorx for DeviceNet is monitoring the network (Online).

Upload PowerFlex 4 Parameters

View the Jog Frequency Parameter in the PowerFlex 4 VFD.

Jog Frequency Parameter #:

Jog Frequency Current Value:

Compare Jog Frequency Parameter Current Value to VFD frequency output when PB3 Pushbutton was pressed

Explain:

Compare Jog Frequency Parameter Current Value - Step 13 to Jog Frequency Parameter Current Value –Step 10

What caused the Jog Frequency Parameter Current Value to change?

Explain:

14. Navigate to ControlLogix Ladder Logic File – Rung 7

Ensure SS4 Switch on ControlLogix Demo Board is ON (right position)

Enter 290 in the New\_Jog\_Value tag in MOV instruction – Rung 7.

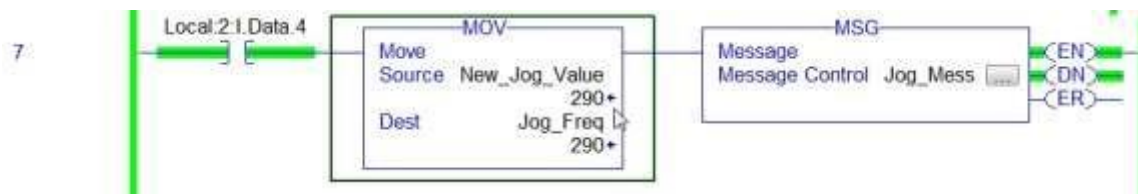


Figure 23-A  
290 New\_Jog\_Value Tag Rung 7

15. Press PB3 on ControlLogix Demo Board

Hold down PB3 Pushbutton

What Frequency is the VFD outputting to the motor?

What Voltage is the VFD outputting to the motor?

Release PB3 Pushbutton

16. Ensure RSNetWorx for DeviceNet is monitoring the network (Online).

Upload PowerFlex 4 Parameters

View the Jog Frequency Parameter in the PowerFlex 4 VFD.

Jog Frequency Parameter #:

Jog Frequency Current Value:

Compare Jog Frequency Parameter Current Value to New\_Jog\_Value tag in MOV instruction – Rung 7.

Explain:

17. Toggle SS4 Switch OFF then ON - ControlLogix Demo Board

Press and hold down PB3 Pushbutton on ControlLogix Demo Board

What Frequency is the VFD outputting to the motor?

Explain:

18. Ensure RSNetWorx for DeviceNet is monitoring the network (Online).

Upload PowerFlex 4 Parameters

View the Jog Frequency Parameter in the PowerFlex 4 VFD.

Jog Frequency Parameter #:

Jog Frequency Current Value:

What caused the Jog Frequency Parameter Current Value to change?

Explain:

**Review Questions**

1. True or False. Explicit Messaging can set device parameters from PLC logic.
2. The Message Type must be set to for DeviceNet Explicit Messaging:
  - a) Module Reconfigure
  - b) PLC Type Read
  - c) CIP Generic
  - d) PLC Type Write
3. In the Communication Path for the Message Instruction, the 1756-DNB DeviceNet Port is what value?
  - a) 0
  - b) 4
  - c) 1
  - d) 2.
4. True or False. Explicit messaging can monitor parameter values in DeviceNet components.
5. Which application is used to set-up a Message Instruction:
  - a) RSLinx
  - b) RSLogix 5000
  - c) RSNetWorx
  - d) Studio 5000
  - e) None of the above
6. True or False. A MSG instruction can monitor read-only parameters in a DeviceNet component.
7. True or False. RSNetWorx for DeviceNet can be used to configure VFD parameters.

8. True or False. Instance on the MSG Configuration tab refers to a DeviceNet component's Node Address
9. True or False. All network components will have the same message path.
10. A Message Path appears as DNET, 2, 4. DNET represents:
- a) The DeviceNet Network
  - b) The 1756-DNB name in the I/O Configuration
  - c) Name of the DeviceNet component the message is for.
  - d) None of the above
11. A Message Path appears as DNET, 2, 4. 4 represents:
- a) The DeviceNet Network
  - b) The 1756-DNB name in the I/O Configuration
  - c) Node address of DeviceNet component.
  - d) None of the above
12. A Message Path appears as DNET, 2, 4. 2 represents:
- a) The DeviceNet Network
  - b) The 1756-DNB name in the I/O Configuration
  - c) Node address of DeviceNet component.
  - d) The 1756-DNB Scanner's DeviceNet port

***The outcomes of this exercise (listed on page 1) specifies the skills that the Student must demonstrate to the Instructor. Once the Instructor is satisfied with the demonstration of Knowledge & Skills by the individual student, they will sign this document (for the student), then enter a 100% into the Hands-On Lab grade in Sakai.***

I verify that this student has completed all of the requirements of this Hands-On Assessment:

Student Name: \_\_\_\_\_

Faculty Signature: \_\_\_\_\_ Date: \_\_\_\_\_

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