

PLC134 LAB 1.1: DEVICENET TROUBLESHOOTING

Student Name: _____

Student ID: _____

LAB OUTCOMES:

1. Explain troubleshooting using a 1756-DNB module
2. Explain troubleshooting using the component indicators
3. Explain troubleshooting using RSNetWorx for DeviceNet

LAB PROCESS:

This Lab Exercise will cover troubleshooting a DeviceNet network using Module Diagnostic indicators, 1756-DNB tags / properties, scrolling display, and RSLinx

Part 1

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

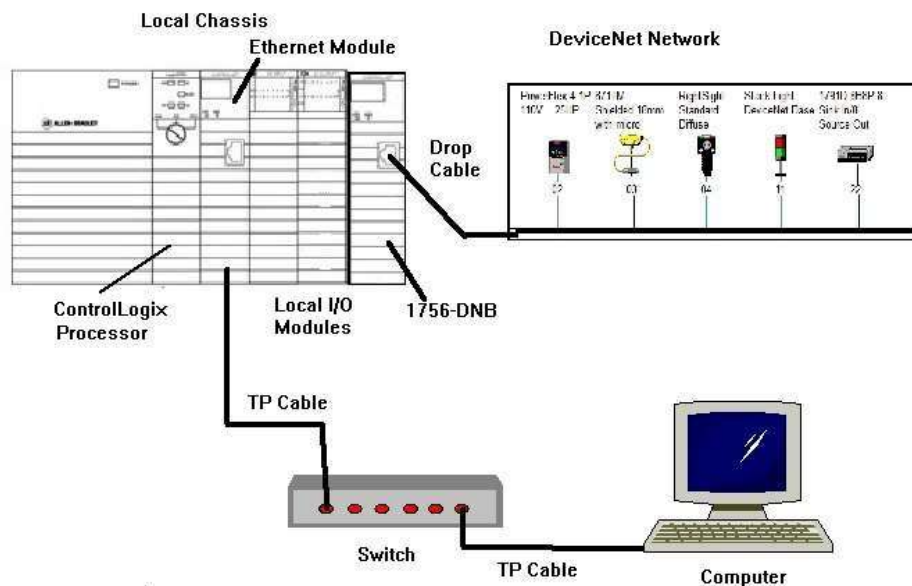


Figure 1-A

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.

STUDIO 5000

1. Import the PLC220_Module_6_Dnet.L5K file into Studio 5000
2. Download PLC220_Module_6_Dnet.ACD to the ControlLogix Demo
3. Place the ControlLogix processor into PROGRAM Mode.

RSNetWorx

1. Open RSNetWorx for DeviceNet.



Figure 2-A

2. Load the PLC220_Module6.dnt to the 1756-DNB Scanner Module.
3. Place the ControlLogix processor and 1756-DNB Scanner Module in RUN Mode
4. Verify operation

Note: These are the same files used in Module 4/5 Lab Exercises, just renamed



Figure 3-A

Ladder File for Module 5 Lab Exercise 3

Node Address of RightSight Photoeye:

5. When all the DeviceNet configuration settings are matched to all the DeviceNet components correctly - note:
 - State of the three diagnostic indicators on the 1756-DNB Module are MOD/NET, I/O, OK are solid GREEN
 - 1756-DNB Display shows
 - RUN – 1756-DNB mode
 - A#00 – 1756-DNB Address – 00
 - Status diagnostic indicators on the RightSight Photoeye and 871TM Proximity Switch are solid GREEN

Note: to view Network diagnostic indicator for Stack Light Base – Stack Light Modules (Lens) must be removed from Stack Light Base

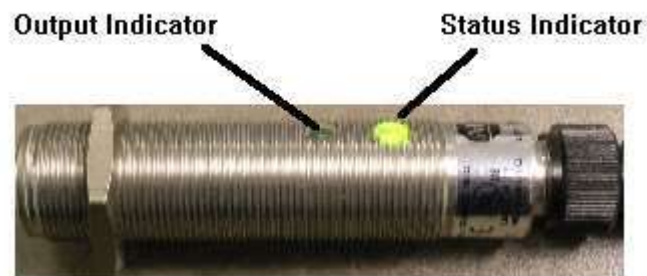


Figure 4-A
Indicators 871TM Proximity Switch

- Page 68 of Allen_Bradley_DeviceNet_Media_Sensors_IO.pdf handout contains additional information on 871TM Proximity Switch indicators

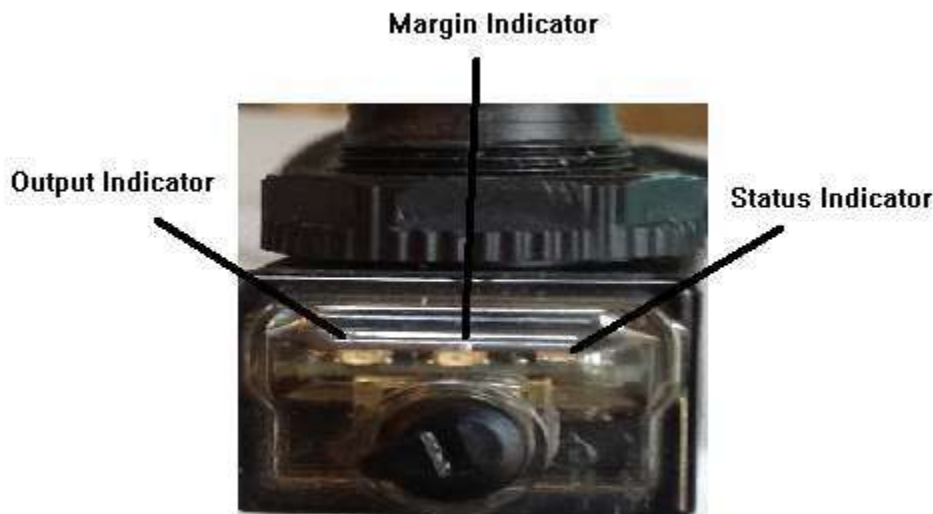


Figure 5-A

RightSight Photoeye Indicators

- Page 60 of Allen_Bradley_DeviceNet_Media_Sensors_IO.pdf handout contains additional information on RightSight Photoeye indicators
- Page 3-2 of 855t-Stack_Light_User_Manual.pdf handout contains information on Stack Light indicator locations
- Page 5-2 of 855t-Stack_Light_User_Manual.pdf handout contains information on Stack Light indicator.

6. Place the 1756-DNB module in IDLE Mode

- Status of MOD/NET indicator:
- Status of I/O indicator:
- Status of OK indicator:
- Display Information:

7. Place the 1756-DNB module in RUN Mode

Place the ControlLogix processor in PROGRAM Mode

- Status of 1756-DNB MOD/NET indicator:
- Status of 1756-DNB I/O indicator:
- Status of 1756-DNB OK indicator:
- 1756-DNB Display Information:

8. Place the ControlLogix processor in RUN Mode
9. Remove the RightSight Photoeye from the DeviceNet Network

- Status of 1756-DNB MOD/NET indicator:
- Status of 1756-DNB I/O indicator:
- Status of 1756-DNB OK indicator:
- 1756-DNB Display Information:

A#XX – Node Address of 1756-DNB

E#XX – Error Code

N#XX- Node Address (MAC ID) of problematic network device.

Flashing RED MOD/NET indicator – Minor / Recoverable Fault

- Pages 27-37 of 1756-DNB_Installation.pdf handout contains information on 1756-DNB Error Codes and diagnostic indicators

10. Navigate to RSLinx RSWho window.
Drill down to A, DeviceNet to view DeviceNet network
Note Red X on RightSight Photoeye icon



Figure 6-A

RSLinx Red X on Photoeye Icon Left window



Figure 7-A

RSLinX Red X on Photoeye Icon Right window

11. Navigate to RSNetWorx for DeviceNet- Ensure RSNetWorx for DeviceNet is Online
Click the Diagnostic tab below the Network Layout window.

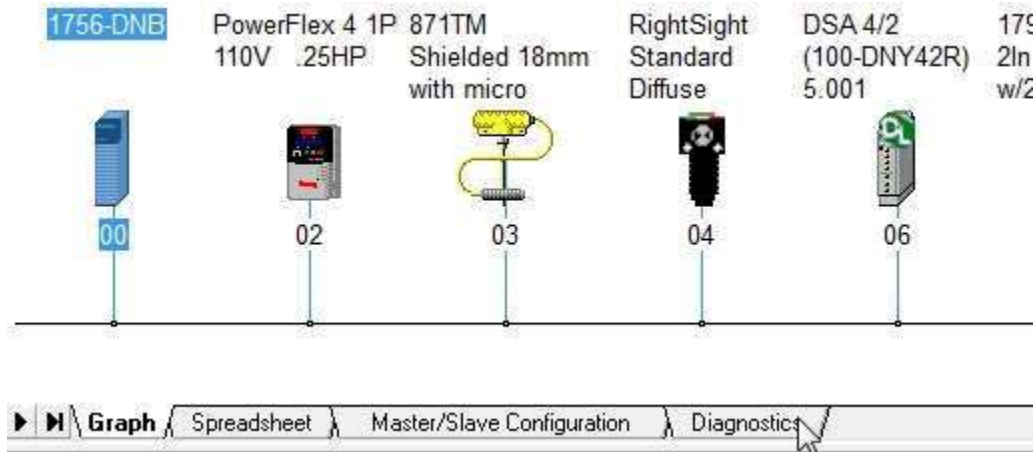


Figure 8-A
Diagnostic Tab – RSNetWorx for DeviceNet

12. The Network Layout window changes to the Diagnostic view.



Figure 9-A
Diagnostic View – Network Layout Window

13. Click the Start button at the Upper left side corner of the Diagnostic window to open the Diagnostic utility.

The Start Diagnostic window opens – See Figure 10-A

Click the Continue Button to start the Diagnostic utility

See Figure 10-A

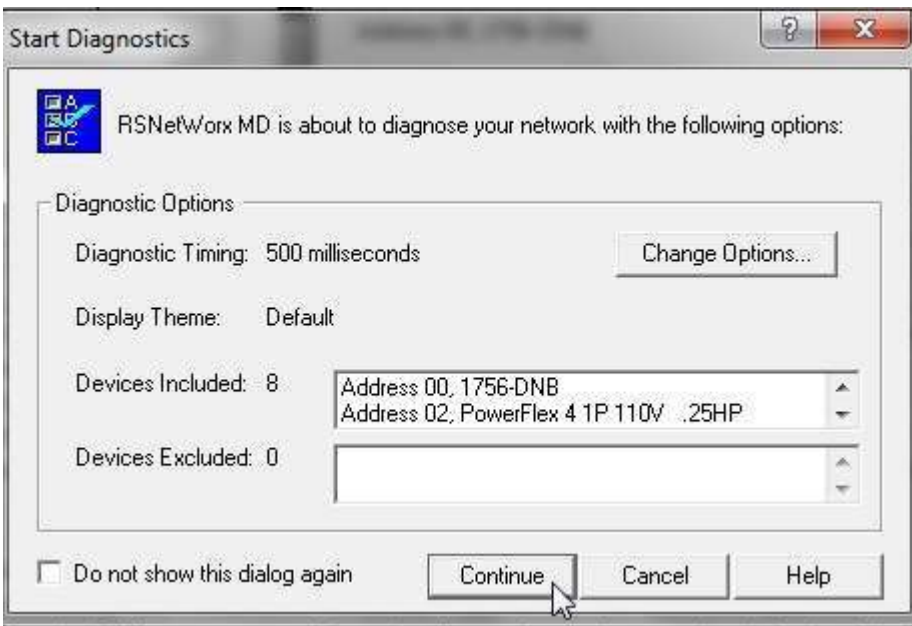


Figure 10-A
Start Diagnostic Window RSNetWorx for DeviceNet

14. The Initializing diagnostics... windows opens indicating the diagnostic utility is running.

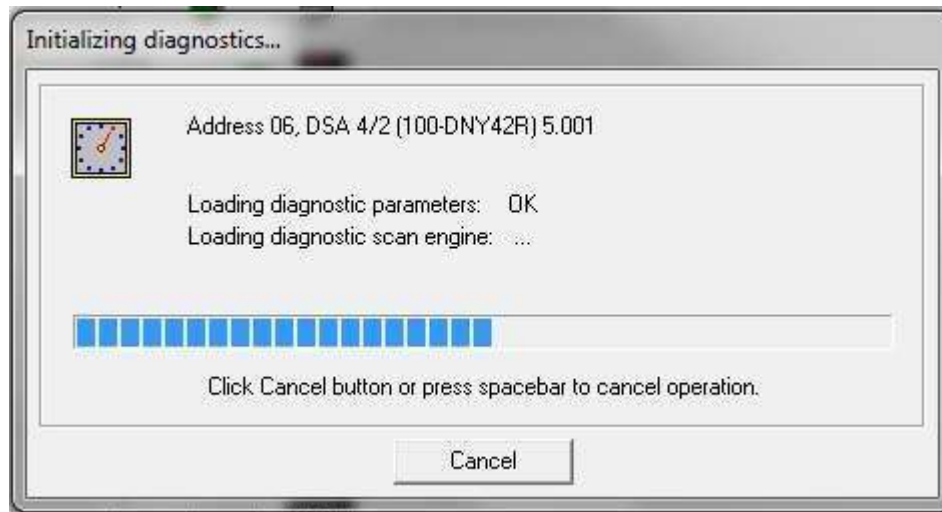


Figure 11-A

Initializing diagnostics. Window RSNetWorx for DeviceNet

15. Once the Diagnostic utility has scanned the DeviceNet network the Network Health Monitor window opens. – See Figure 12-A

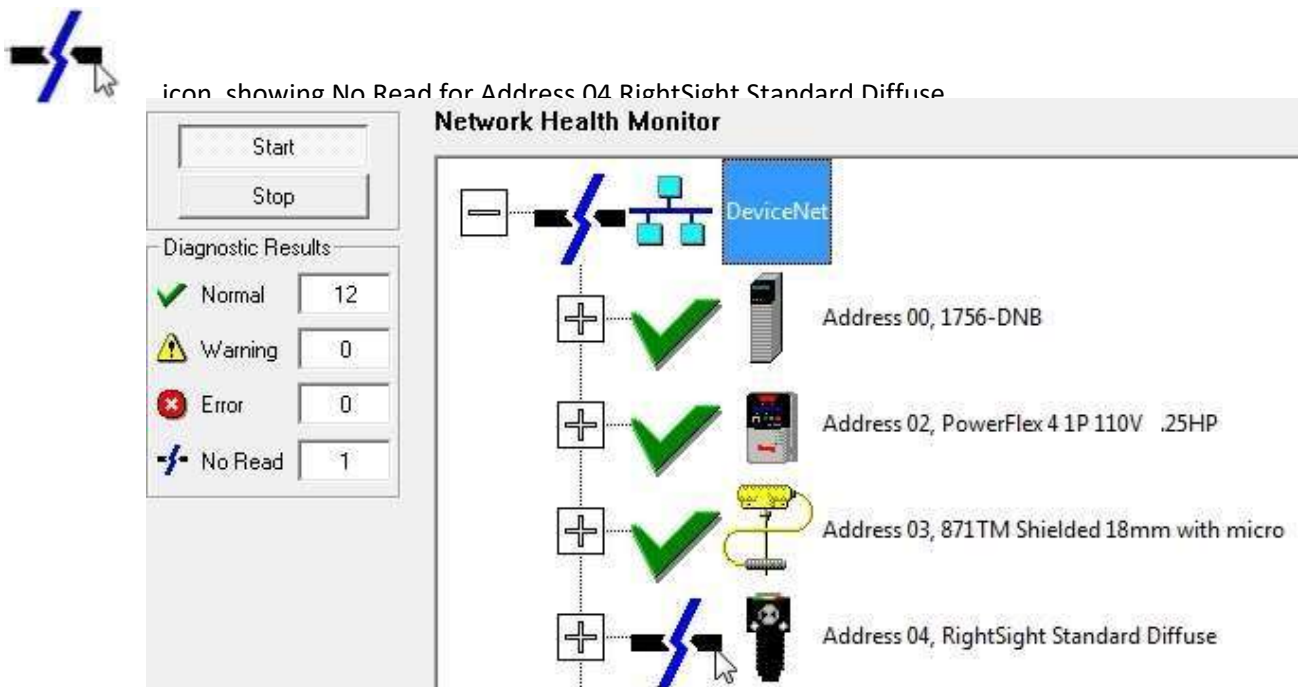


Figure 12-A

Network Health Monitor Window RSNetWorx for DeviceNet

16. As the Utility continues to scan the DeviceNet network Error icons appear on the Network Health Monitor window.

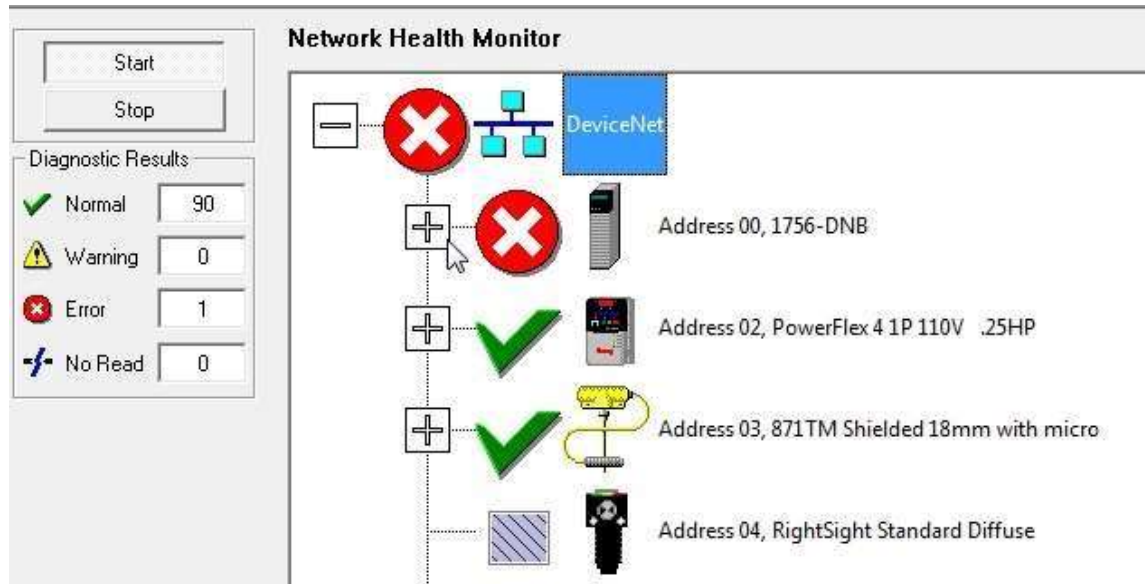


Figure 13-A
Network Health Monitor Window Error Icons

17. Click the + sign to the left of the Error icon to the left of the 1756-DNB icon.

A list of all the available DeviveNet Nodes (0-63) appears

Find the Error icon to the left of the RightSight Photoeye node – See Figure 14-A

Note: In this example the RightSight Photoeye is Node 04 on the DeviceNet network.

Node address maybe different on other DeviceNet Demo Boards

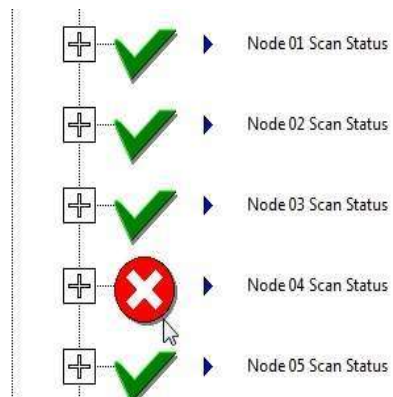


Figure 14-A
DeviceNet Node List – Diagnostic Utility

18. Click the + sign to the left of the Error icon – Node 04 Scan Status in the example to view the Error for the device.



Figure 15-A

Node Scan Status List – Diagnostic Utility

19. Double click the Error icon Slave Present On Network to view Troubleshooter window.

Troubleshooter window shows Fault Code 78 –
Same as E# 78 on 1756-DNB display



Figure 16-A
Troubleshooter Window – Node 04 Scan Status

20. Click the Troubleshooter – Red X upper right corner of Troubleshooter window to close the Troubleshooter window.
21. Click the Stop button on the upper left corner of the Network Health Monitor Window to Stop the Diagnostic utility.



Figure 17-A
Diagnostic Utility – Stop Button

Click the Graph tab on the lower part of the Network Health Monitor window return to Graph view of the Network layout window.

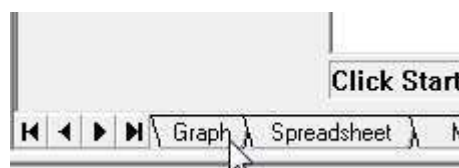


Figure 18-A

Graph Tab

22. Browse the DeviceNet network to show RightSight Photoeye is missing

Choose Network -> Signal Pass Browse from RSNetWorx Menu Toolbar to Browse DeviceNet Network.



Figure 19-A
Single Pass Browse

 icon will appear above RightSight Photoeye – Node missing

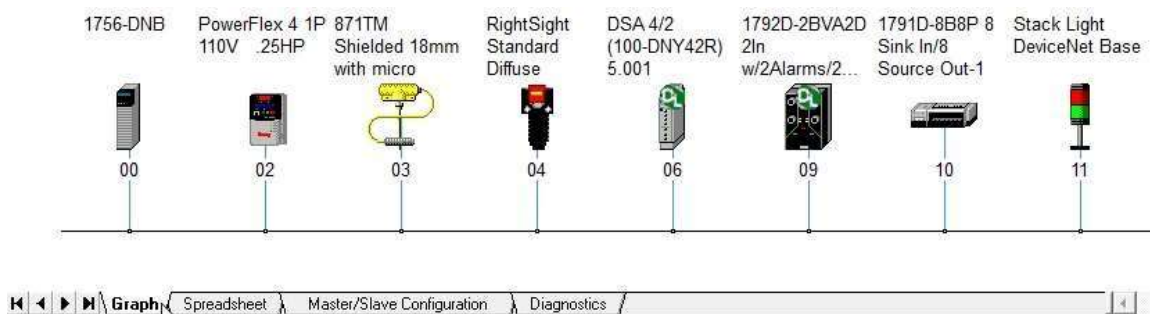



Figure 20-A
RightSight Photoeye Missing

Note: Multiple Browsers may be required for  icon to appear on RightSight Photoeye icon.

1756-DNB MODULE TAGS USED FOR TROUBLESHOOTING

1. Use RSLogix / Studio 5000 software monitor the PLC220_Module_6_Dnet.ACD Project file in the ControlLogix processor.
2. Navigate to Controller Tags in the Controller Organizer window

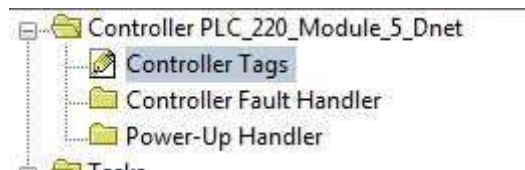


Figure 21-A
Controller Tags – ControlLogix Processor

3. Click the + sign to the left Local:6:S to view structure of Status tag elements.
1756-DNB Module in Slot 6 ControlLogix Chassis.
S – Status tags

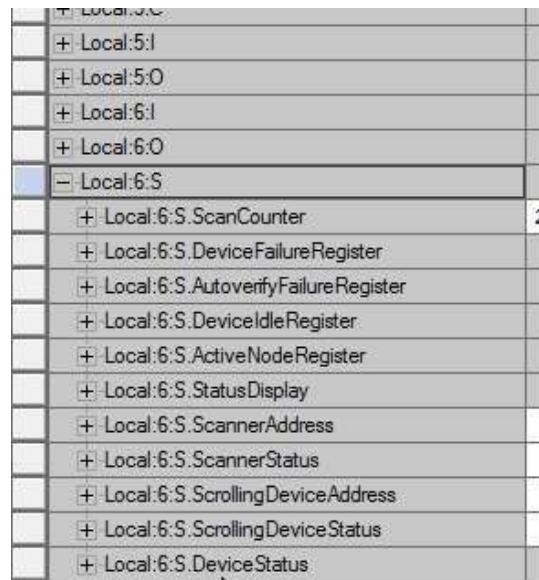


Figure 22-A
1756-DNB Status Tags

4. Click the + sign to the left of the Local:6:S.DeviceFailureRegister Array

+ Local:6:S.ScanCounter	2#0000_0000_00...		Binary	DINT
- Local:6:S.DeviceFailureRegister	{...}	{...}	Binary	SINT[8]
+ Local:6:S.DeviceFailureRegister[0]	2#0001_0000		Binary	SINT
+ Local:6:S.DeviceFailureRegister[1]	2#0000_0000		Binary	SINT
+ Local:6:S.DeviceFailureRegister[2]	2#0000_0000		Binary	SINT
+ Local:6:S.DeviceFailureRegister[3]	2#0000_0000		Binary	SINT
+ Local:6:S.DeviceFailureRegister[4]	2#0000_0000		Binary	SINT
+ Local:6:S.DeviceFailureRegister[5]	2#0000_0000		Binary	SINT
+ Local:6:S.DeviceFailureRegister[6]	2#0000_0000		Binary	SINT
+ Local:6:S.DeviceFailureRegister[7]	2#0000_0000		Binary	SINT

Figure 23-A

DeviceFailureRegister Array

Note: DeviceFailureRegister Array is a 8 Element Array of SINT Data types

SINT DATA Type – 8 Bit Integer

8 Element Array – Index values 0-7

8 x 8 = 64

There is a bit to represent every possible Node on a DeviceNet network

Local:6:S.DeviceFailureRegister[0] – Nodes 0-7

Local:6:S.DeviceFailureRegister[1] – Nodes 8-15

Local:6:S.DeviceFailureRegister[2] – Nodes 16-23

Local:6:S.DeviceFailureRegister[3] – Nodes 24-31

Local:6:S.DeviceFailureRegister[4] – Nodes 32-39

Local:6:S.DeviceFailureRegister[5] – Nodes 40-47

Local:6:S.DeviceFailureRegister[6] – Nodes 48-55

Local:6:S.DeviceFailureRegister[7] – Nodes 56-63

In Figure 23-A, bit 4 in Element Local:6:S.DeviceFailureRegister[0] is a 1.

Node 4 on the DeviceNet Network has failed.

For this example Node 4 is the RightSight Photoeye

4. Click the + sign to the left of the Local:6:S.StatusDisplay Array

+ Local:6:S.ActiveNodeRegister	{...}	{...}	Binary	SINT[8]
- Local:6:S.StatusDisplay	{...}	{...}	Binary	SINT[4]
+ Local:6:S.StatusDisplay[0]	2#0100_0001		Binary	SINT
+ Local:6:S.StatusDisplay[1]	2#0010_0011		Binary	SINT
+ Local:6:S.StatusDisplay[2]	2#0011_0000		Binary	SINT
+ Local:6:S.StatusDisplay[3]	2#0011_0000		Binary	SINT
+ Local:6:S.ScannerAddress	16#00		Hex	SINT

Figure 24-A
StatusDisplay Array

The StatusDisplay Array is a 4 Element Array of SINT Data types

Each Element in the StatusDisplay Array represent one of the characters on the 1756-DNB Module's alphanumeric display – 4 characters total

Change the Style of the StatusDisplay Array to ASCII to view character representation of the Binary values in the Array

Click in the Style column of Local:6:S.StatusDisplay[0] element to view a drop-down selection box

Select ASCII for the selection box chooses.

See Figure 25-A

- Local:6:S.StatusDisplay	{...}	{...}	Binary	SINT[4]
+ Local:6:S.StatusDisplay[0]	2#0100_0101		Binary	SINT
+ Local:6:S.StatusDisplay[1]	2#0010_0011		Binary	SINT
+ Local:6:S.StatusDisplay[2]	2#0011_0111		Binary	SINT
+ Local:6:S.StatusDisplay[3]	2#0011_1000		Hex	SINT
+ Local:6:S.ScannerAddress	16#00		ASCII	SINT

Figure 25-A
Change to ASCII Style

Change all 4 array elements' Style to ASCII to view the 1756-DNB Module's Display information.

[-] Local:6:S.StatusDisplay	{...}	{...}	Binary	SINT[4]
[+] Local:6:S.StatusDisplay[0]	'N'		ASCII	SINT
[+] Local:6:S.StatusDisplay[1]	'#'		ASCII	SINT
[+] Local:6:S.StatusDisplay[2]	'0'		ASCII	SINT
[+] Local:6:S.StatusDisplay[3]	'4'		ASCII	SINT

Figure 26-A
Change to ASCII Style

The value column of the StatusDisplay Array elements now mirrors the actual display on the 1756-DNB Module

Figure 26-A shows N#04 – Node 04 failed on the DeviceNet Network.
In the example Node 04 is the address of the RightSight Photoeye

5. Click the + sign to the left of the Local:6:I.StatusRegister tag to view tag bits

[-] Local:6:I	{...}	{...}		AB:1756_DNB_5...
[-] Local:6:I.StatusRegister	{...}	{...}		AB:1756_DNB_St...
[+] Local:6:I.StatusRegister.Run	1		Decimal	BOOL
Local:6:I.StatusRegister.Fault	0		Decimal	BOOL
Local:6:I.StatusRegister.DisableNetwork	0		Decimal	BOOL
Local:6:I.StatusRegister.DeviceFailure	1		Decimal	BOOL
Local:6:I.StatusRegister.Autoverify	0		Decimal	BOOL
Local:6:I.StatusRegister.CommFailure	0		Decimal	BOOL
Local:6:I.StatusRegister.DupNodeFail	0		Decimal	BOOL
Local:6:I.StatusRegister.DnetPowerDetect	0		Decimal	BOOL

Figure 27-A
1756-DNB StatusRegister Tag

Each bit contains status information about the Devicenet Network connected to the 1756-DNB Module

Local:6:I.StatusRegister.Run – mode of the 1756-DNB Module 1-RUN , 0-IDLE

Local:6:I.StatusRegister.Fault –1-Network Faulted , 0-Network Not Faulted

Note: In Figure 27-A tag value of Local:6:I.StatusRegister.DeviceFailure is a 1

A 1 indicates there is a Node on the DeviceNet Network has failed, i.e. RightSight Photoeye

Note: Chapter 7 of the 1756-DNB_User Manual.pdf handout contains addition information about 1756-DNB diagnostic indicators and alphanumeric display

Appendix A of the 1756-DNB_User Manual.pdf handout contains additional information on 1756-DNB tag structure

Pages 27 – 42 of the 1756-DNB_Installation.pdf handout contains addition information on the error codes, display information and tag structure of the 1756-DNB Module.

1756-DNB PROPERTIES

1. Navigate to the I/O Configuration Folder in the Controller Organizer window in Studio/RSLogix 5000 software.

A yellow triangle on the 1756-DNB icon indicates there is a problem with the 1756-DNB Module

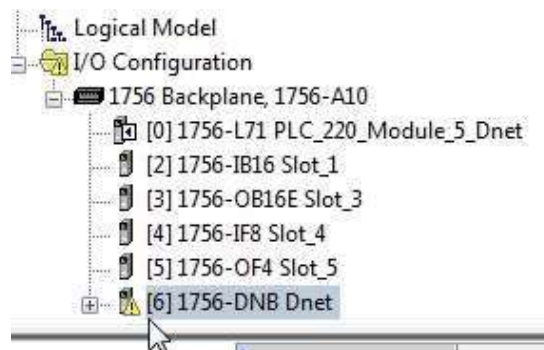


Figure 28-A
1756-DNB Yellow Ttriangle

Right click on the 1756-DNB Module and select Properties from the context menu.

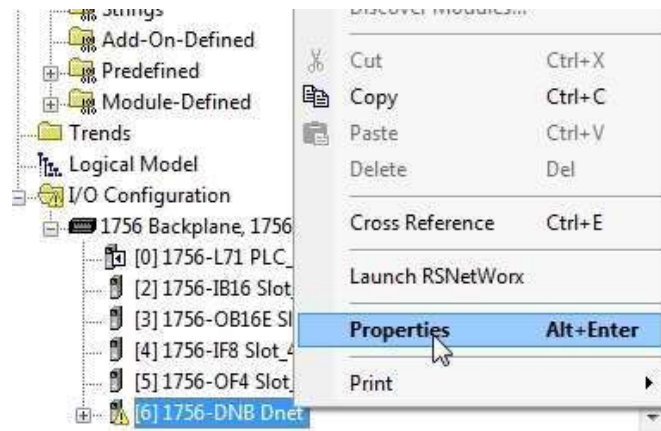


Figure 29-A
1756-DNB Properties

2. General Tab

Lower left corner shows module is faulted

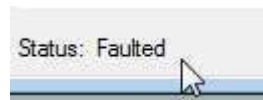


Figure 30-A
1756-DNB Faulted

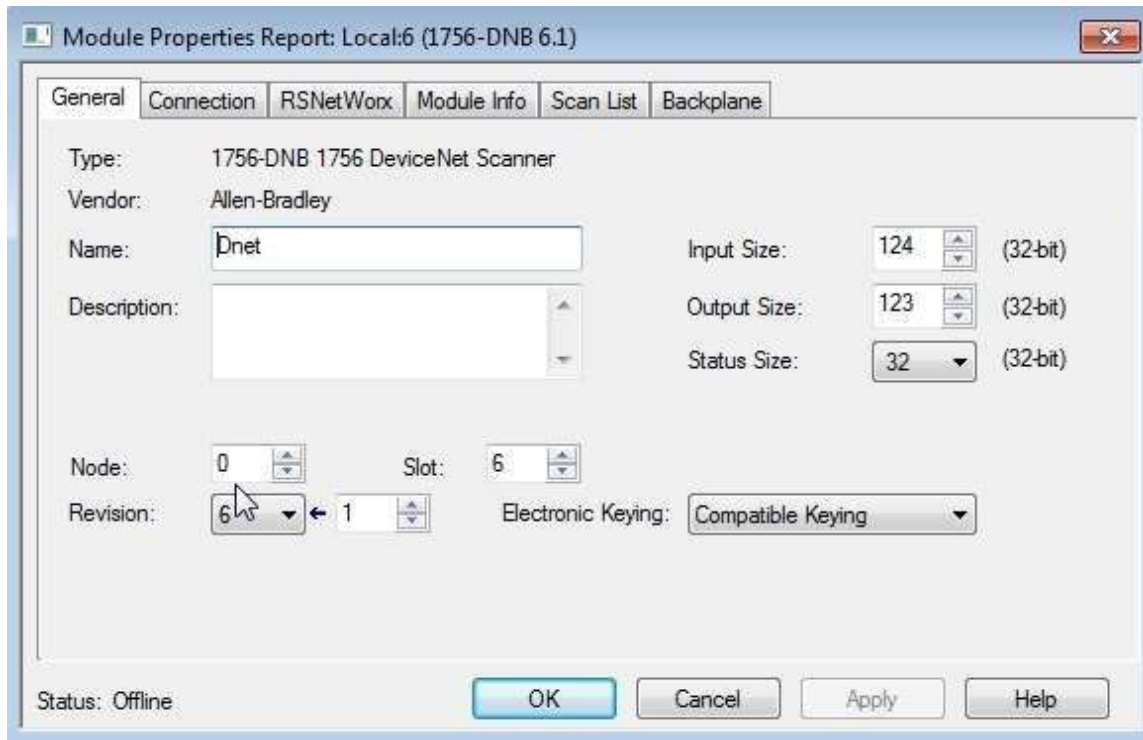


Figure 31-A
1756-DNB General Tab

General tab information

- Node: Node Address
- Slot: Slot Location of 1756-DNB Module
- Revision Information
- Electronic Keying Information
- Input Size – Number of Input Array Elements
- Output Size – Number of Output Array Elements
- Status Size – Number of Status Elements

3. Click the Connection tab

If the 1756-DNB Module is faulted the possible cause is shown in the Module Fault region of the Connection tab

See Figure 32-A

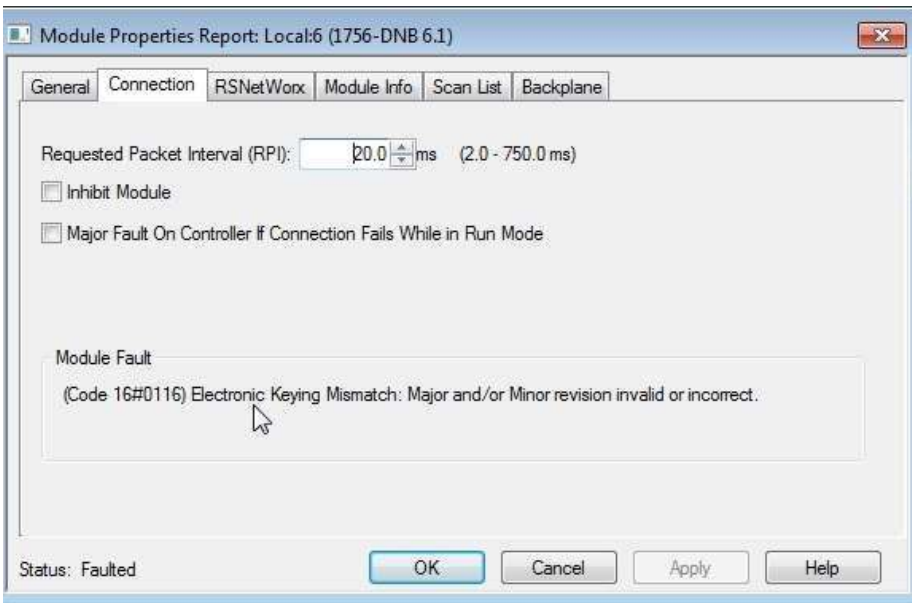
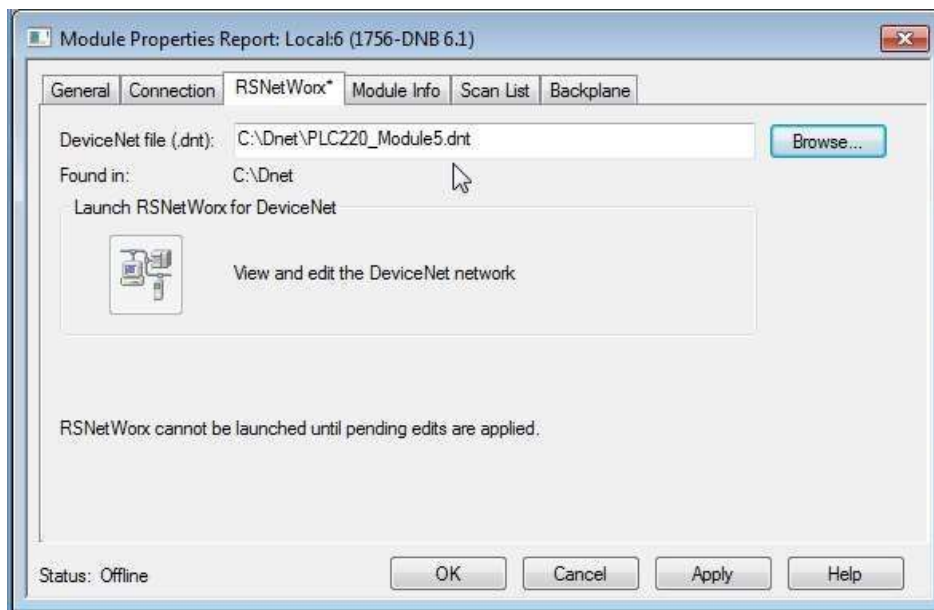


Figure 32-A
1756-DNB General Tab

4. Click the RSNetWorx tab

The RSNetWorx File that is associated the 1756-DNB can be displayed.

If the RSNetWorx file (*.dnt) is displayed, the .dnt file along with RSNetWorx for DeviceNet can be initiated from this tab

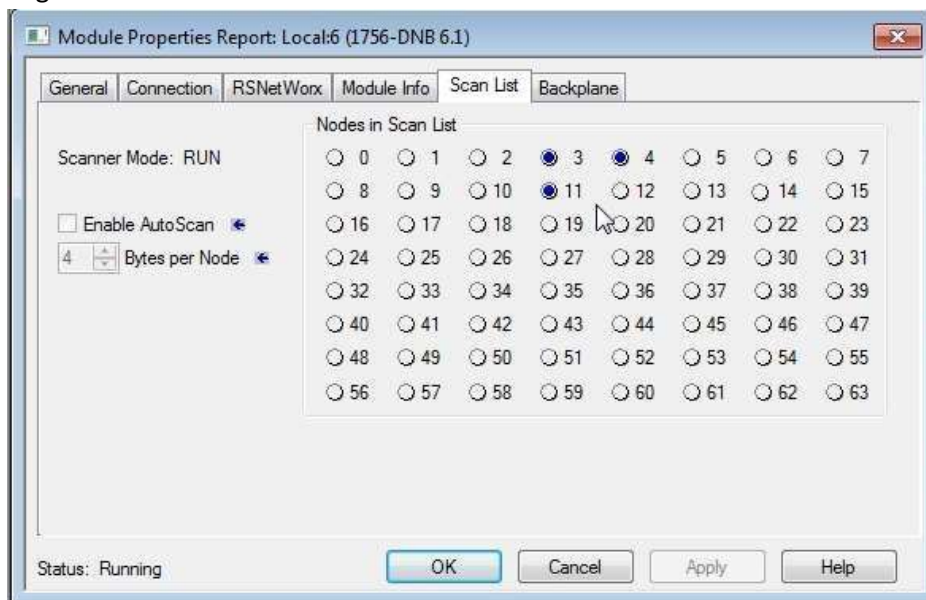


See Figure 33-A
RSNetWorx Tab

Note: Including the .dnt RSNetWorx file on this tab is optional.

5. Click the Scan List tab

The Scan List tab displays the Nodes in the Scanlist of the 156-DNB DeviceNet Configuration.



See Figure 34-A
Scan List Tab

6. Reinstall the RightSight Photoeye to the DeviceNet Network □ Status of 1756-DNB MOD/NET indicator:

- Status of 1756-DNB I/O indicator:
- Status of 1756-DNB OK indicator:
- 1756-DNB Display Information:

7. Navigate to RSLinx and view the DeviceNet network components

No Red X on Node 04 RightSight Photoeye



See Figure 35-A

RSLinx – No Red X on Node 04 Component

8. Navigate to RSNetWorx for DeviceNet

Note:  still shown on RightSight Photoeye icon.

See Figure 36-A

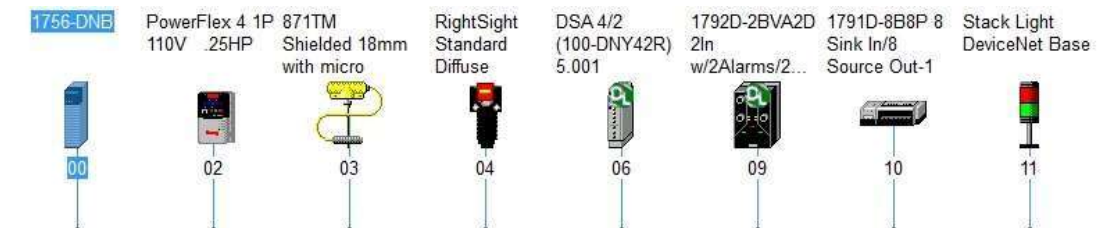


Figure 36-A

RSNetWorx for DeviceNet

9. Initiate a Single Pass Browse -

Network -. Single Pass Browse from RSNetWorx for DeviceNet Menu Toolbar



Figure 37-A
Single Pass Browse

Once the Browse is completed view DeviceNet icon on Network Layout window

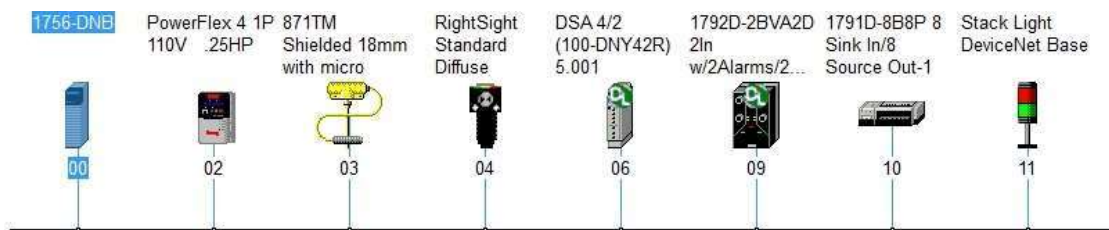


Figure 38-A
RightSight Photoeye Connected

Note:  absent from RightSight Photoeye icon.

Note: Since the settings of the RightSight Photoeye that was reconnected matched the configuration stored in the 1756-DNB Module the network recovered from the error(s).

Review Questions

1. True or False. Other components on a DeviceNet Network will continue to operate if one component fails.

2. An Error Code appears on the 1756-DNB display as?
 - a) N#
 - b) A#
 - c) E#
 - d) C#

3. Where is the DeviceNet Network Configuration stored?
 - a) Processor in the PLC System
 - b) In the ControlLogix Communication Mode
 - c) 1756-DNB Mode
 - d) RSLinx

4. True or False RSNWorx for DeviceNet can be set-up to continually browse a DeviceNet Network.

5. 1756-DNB module tags show which type of information
 - a) 1756-DNB Mode
 - b) Network Faulted
 - c) Display Information
 - d) Faulted Nodes
 - e) All of the above

6. True or False. The Network Layout window in RSNWorx for Device has multiple views

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: _____

DOL DISCLAIMER:

This product was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.



This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).