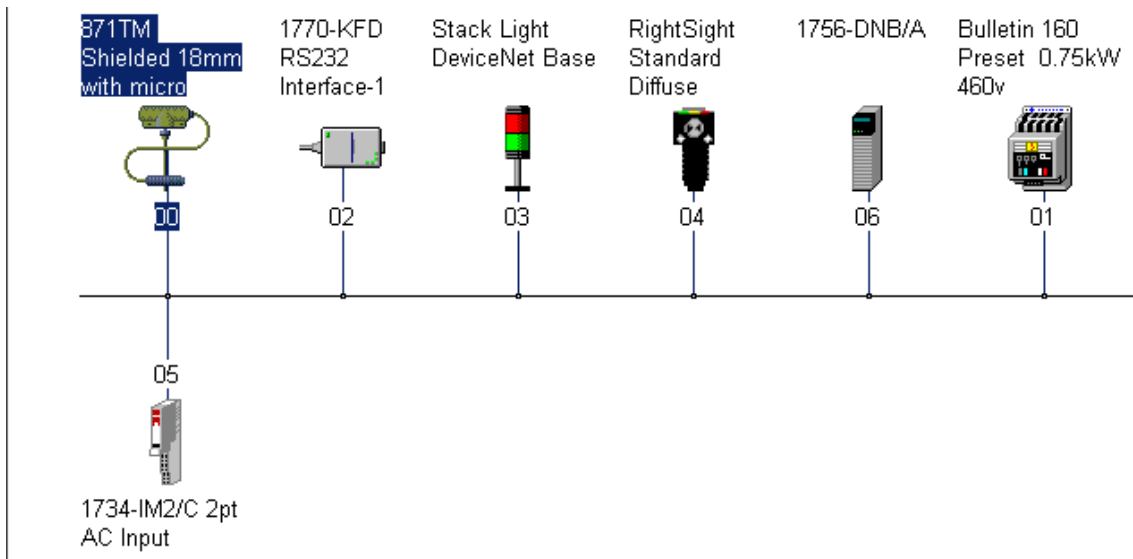


Module 4



DeviceNet

Overview

Network Components

Student Materials

Student Materials for Module 4: Network Components: Hardware & Software

Lesson Objective

By the end of this session, students should be able to:

1. Identify hardware components of a DeviceNet Network
2. Identify software components of a DeviceNet Network.

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Introduction:

DeviceNet is an open network that is controlled by the Open DeviceNet Vendor Association, Inc. In comparison to legacy Allen Bradley networks, DeviceNet is most closely associated with Remote I/O. While there are similarities between Remote I/O and DeviceNet, there are many differences.

A wide range of devices can be installed on DeviceNet. I/O components such as photoelectric sensors, proximity switches, pushbutton stations, light stacks and limit switches can all be directly connected on DeviceNet. Complex devices such as graphic displays, AC drives, motor starters / overloads and bar code scanner can also be installed on DeviceNet.

DeviceNet Specifications:

1. Network cable length is base on network speed.

500 Kbps – 100 meters (328 ft)*

250 Kbps - 250 meters (820 ft)*

125 Kbps – 500 meters (1640 ft)*

* based on round media

2. Connection to PLC systems through scanner modules
3. I/O devices and complex devices on the same connection.
4. Power (24 VDC) and communication signals run in the same cable.
5. Network based on Producer / Consumer model to improve performance
Messaging types include;
 - Cyclic
 - Polled
 - Change-of-state(COS)
 - Strobed (Multicast)
6. Network device may have built-in intelligence for easier configuration and troubleshooting.
7. Network configuration is done with RSNetWorx for DeviceNet software.
8. Node Address 0 – 63

64 total nodes per network

Note: There are many control vendors that manufacture DeviceNet products. This Module covers Allen Bradley DeviceNet products.

Hardware Components

Allen Bradley DeviceNet Interface Scanner:

Scanner modules acts as an interface between DeviceNet components and a PLC processor.

Tasks of interface modules include:

- Read device inputs
- Write device outputs
- Stores network information
- Monitors status of network and network devices

Interface Modules are located in a PLC chassis. The particular interface module will depend on the PLC architecture.



Figure 1-A
ControlLogix 1756-DNB Scanner Module



Figure 2-A
SLC 500 1747-SDN Scanner Module



Figure 3-A
CompactLogix 1769-SDN Scanner Module

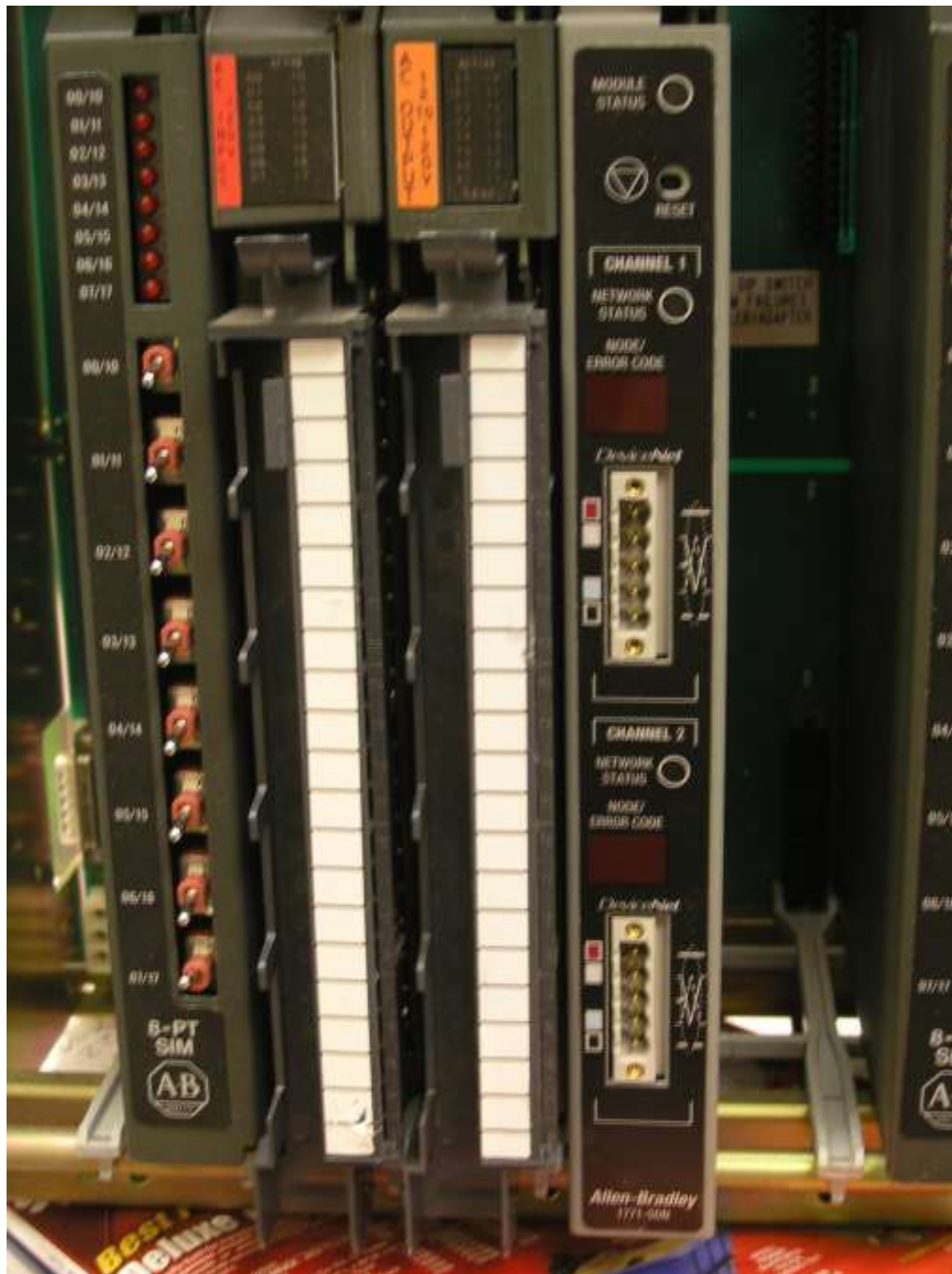


Figure 4-A
PLC 5 1771-SDN Scanner Module

Allen Bradley Computer Interfaces:

Computer interfaces allows a PC to be a node on a DeviceNet Network for configuration and monitoring. Functions of network interfaces are similar to 1784-KT(X), 1784-PCMK and 1747-PIC devices on Allen Bradley legacy networks.

To connect to a DeviceNet network using a PC's RS-232 port, use a 1770-KFD module.



Figure 5-A
1770-KFD Interface

A second type of Interface to connect a computer to a DeviceNet network- using a computer's PC Card interface slot, is a 1784-PCD card.

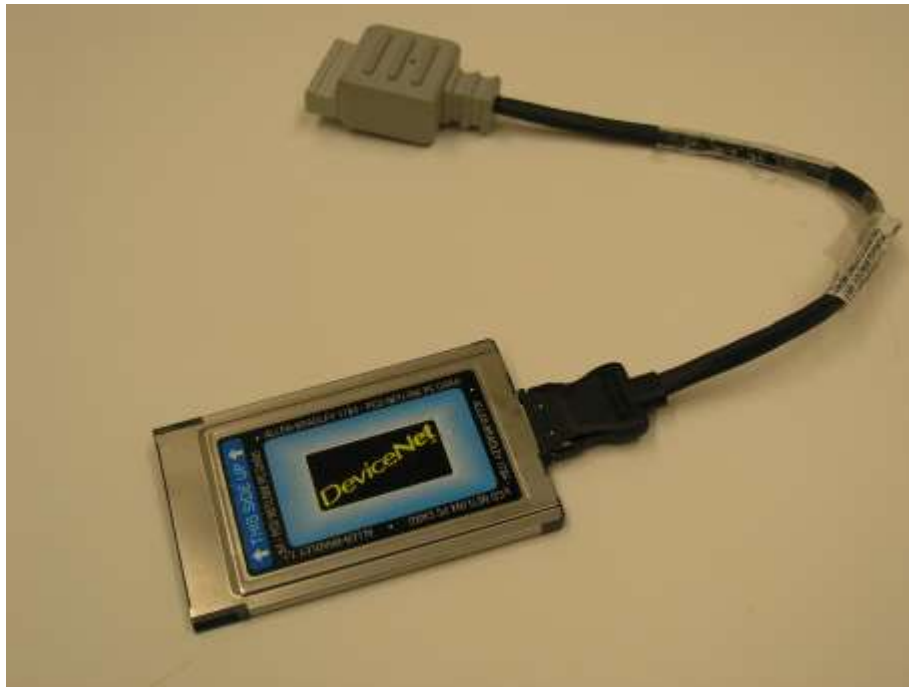


Figure 6-A
1784-PCD Interface

Other Interfaces such as a 1784-PCIDS card is available for desktop PCs.

Computer Interfaces use drivers in RSLinx to place the computer as a node on a DeviceNet network.

Computer Interfaces are optional. Connections to a DeviceNet network can be made thru Communication modules / Communication ports on PLC systems.

For example when working with ControlLogix, a connection to a 1756-Ethernet Module will allow communication thru the chassis backplane to a 1756-DNB module to monitor / configure a DeviceNet network.

DeviceNet Cabling:

DeviceNet topology is a trunk line network with drop lines or daisy-chained. The network is terminated at both ends with resistors (121 ohms, 1%, ¼ W). Network cables carry both power and communication signals.

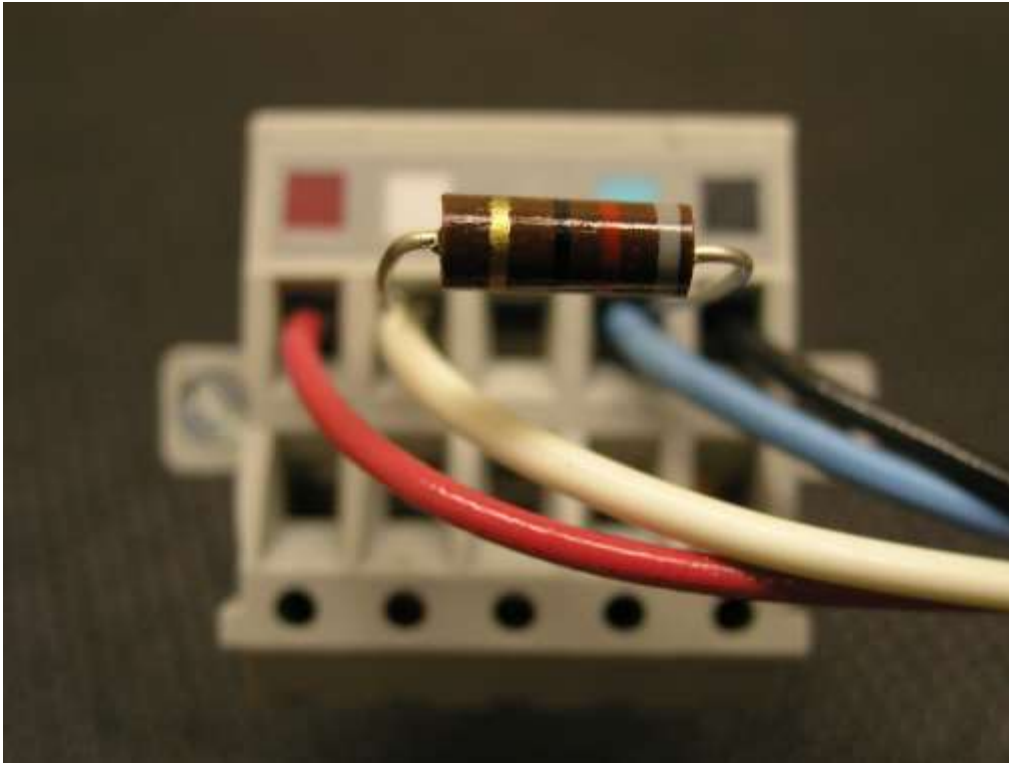


Figure 7-A
Open Style Connector with Terminating Resistor

Note: Terminating Resistors are installed only at end devices on a DeviceNet network.
Resistor is placed across signal (White and Blue) wires

Red and Black connections used for 24VDC power.

Two styles of cable can be used on a DeviceNet network:

- Round Cables – 5 conductors
- Flat Cables – 4 conductors

Round Cables:

Two styles of round cables used on DeviceNet are:

- Thick – 12.2mm outer diameter
- Thin – 6.9mm outer diameter

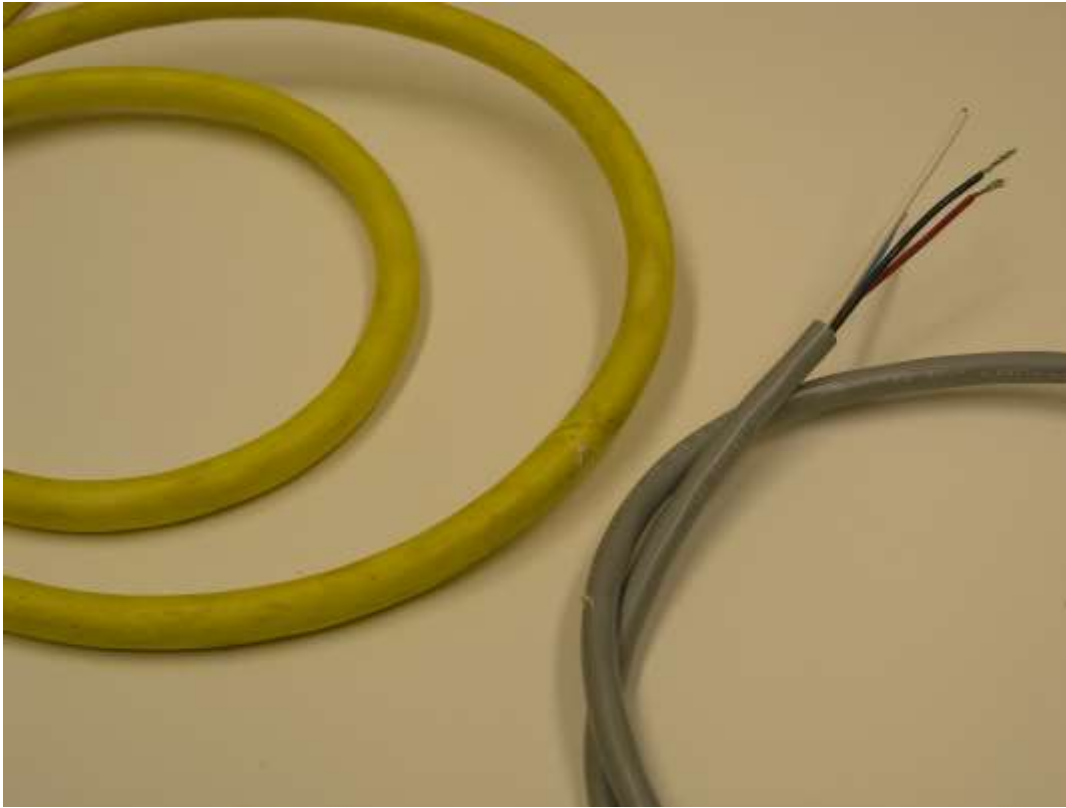


Figure 8-A
Thick and Thin Round Cables

Both styles of cables can be trunk or drop lines. Thick cables are primarily used as trunk lines. Trunk length based on network speed. Drop lines 6 meters or less.

5 conductors in round cables:

- Red +24 Vdc
- Black -24 Vdc
- White CAN_H
- Blue CAN_L
- Bare drain(shield)

Devices are connected to the network using open style connectors. (Similar to Allen Bradley's Remote I/O or Data Highway Plus networks). See Figure 7-A.

Flat Cables:

Flat cable, called Kwiklink cable, is used for trunk lines only. Device connections to Kwiklink via Insulation Displacement Connector (IDC) taps. Kwiklink cable is keyed so taps are properly oriented on the cable. Taps, terminators and power supply taps screw onto the Kwiklink cable (vampire tap).



Figure 9-A
Flat / Kwiklink Cable

4 conductors in Kwiklink cables:

- Red +24 Vdc
- Black - 24 Vdc
- White CAN_H
- Blue CAN_L

Note: No shield conductor on Flat / Kwiklink cable.

Components found attached to Flat / Kwiklink cables

- Insulation Displacement Connector (IDC) taps
for connections of DeviceNet components to the network
- Terminators
At each end of the Flat / Kwiklink cables – functions as terminating resistors
- Open Connectors
Used to supply 24VDC power to the DeviceNet network
Used to transition between Flat / Kwiklink cables and round cables



Figure 10-A
Insulation Displacement Connector (IDC) Tap



Figure 11-A
Terminator Tap



Figure 12-A
Open Style Tap

See Allen_Bradley _DeviceNet_ Media_Sensors_IO.pdf - pages 2-3 and 7 -50 for addition information on Device Media

Power Supplies:

Many I/O DeviceNet components, i.e. prox switches, photoelectric devices, receives all their power from the network cable.

Other devices on the DeviceNet network, like VFDs or HIMs, require external power for the device. The 24 VDC power in the DeviceNet cable powers the DeviceNet interface port on the device.

DeviceNet is designed based on 8 amp current capabilities. (Class1 CL1 cable). Thick round cables.

Per NEC, CEC regulations some cabling is allowed only 4 amps (Class2 CL2 cable). Local regulations may also limit the amount of current in a DeviceNet cable.

Nominal voltage: 24 Vdc, not to exceed 3.25% of nominal voltage
Power supplies should have current limiting capabilities per NEC Code.

Additional information on Power Supplies and Cabling can be found in
OVDA_Installation_Planning.pdf

Software Components

Two Rockwell Software packages used to design, troubleshoot and monitor a DeviceNet network are:

- RSLinx
- RSNetWorx

RSLinx:

RSLinx provides the communication drivers for connecting RSNetWorx for DeviceNet to a DeviceNet network.

RSLinx also includes the drivers for computer interface components such as 1770-KFD and 1784-PCD interfaces

RELinx provide some limited monitoring capabilities of DeviceNet components.

Note: Any network configuration is prepared using RSNetWorx for DeviceNet software.

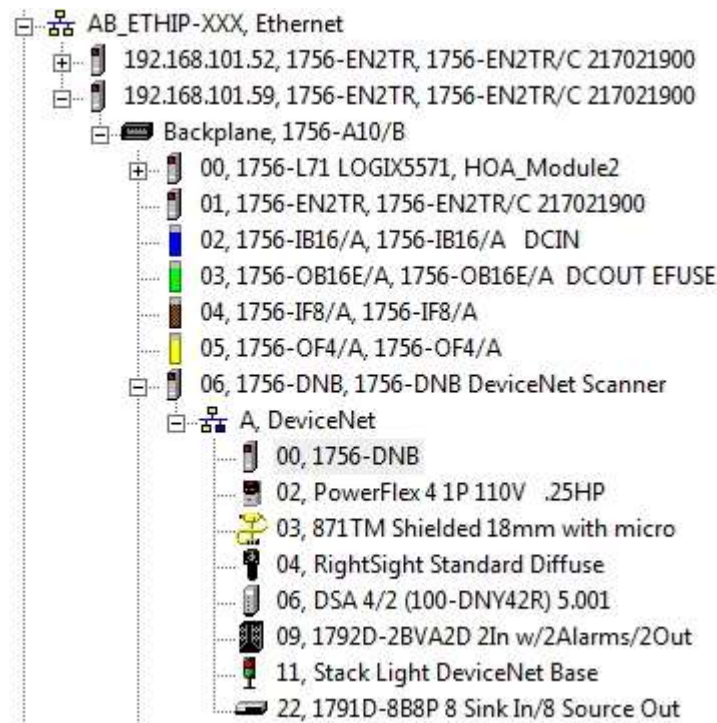


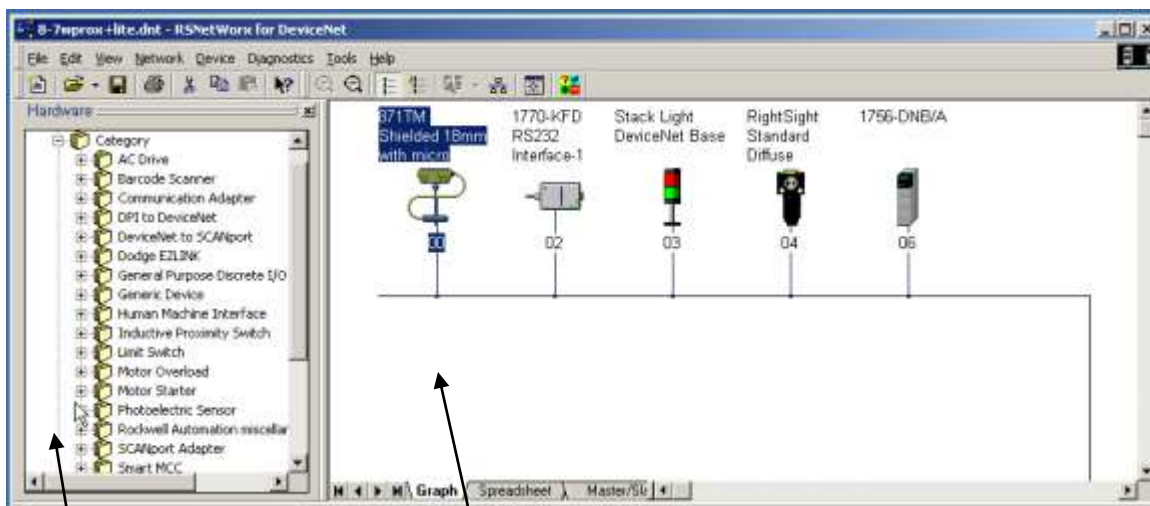
Figure 13-A
Viewing DeviceNet Components using RLink

RSNetWorx for DeviceNet:

RSNetWorx is a software package that allows designing, monitoring, installing devices, troubleshooting and saving of a DeviceNet network settings..



RSNetWorx Layout window to shows network devices.



Network Hardware
Selection

Network Layout

Figure 14-A
RSNetWorx for DeviceNet
Viewing Network Components

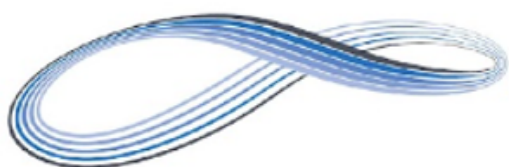
Review Questions

1. T F RSLinx allows monitoring of DeviceNet components
2. The software component that allows users to install / replace network devices:
 - a) RSLogix 5000
 - b) RSLinx Professional
 - c) RSLinx Gateway
 - d) RSNetWorx
3. Round thick DeviceNet cabling has how many conductors?
 - a) 2 plus shield
 - b) 3 plus shield.
 - c) 4 plus shield
 - d) 5 plus shield.
4. T F RSLinx allows users to save network configurations.
5. DeviceNet power in the network cable is _____ volts:
 - a) 120 Vac

- b) 24 Vdc
 - c) 12 Vdc
 - d) 5 Vdc
 - e) None of the above
-
- 6. T F Maximum load current in a DeviceNet network is 8 amps.
 - 7. T F A 1784-PCD interface scanner uses a computer's RS-232 port to connect to a DeviceNet network.
 - 8. T F DeviceNet can be connected to a PLC 5 system.
 - 9. T F All DeviceNet components are manufactured by Allen Bradley.
 - 10. Which interface scanner is used for a ControlLogix system :
 - a) 1770-KFD
 - b) 1756-DNB
 - c) 1784-PCD
 - d) 1746-SDN

Review Question Answers

- 1) T
- 2) d
- 3) c
- 4) F
- 5) b
- 6) T
- 7) F
- 8) T
- 9) F
- 10) b



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