L5351
DeviceNet
Communications
Interface

Technical Manual
HG353798   Issue 3

Safety Information

Please read this information BEFORE installing the equipment.

Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, and to enable the user to obtain maximum benefit from the equipment.

Application Area

The equipment described is intended for industrial motor speed control.

Personnel

Qualified personnel should carry out installation, operation and maintenance of the equipment. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

REFER TO YOUR MAIN PRODUCT MANUAL FOR SPECIFIC SAFETY INFORMATION ABOUT THE DEVICE YOU ARE CONTROLLING

CHAPTER 1   INTRODUCTION

This manual covers the hardware and software installation for configuring DeviceNet to interface with the Link system. The reader should have the software, RSLogix, RSNetWorx, RSLinx, and Configuration Editor/DSD installed on the computer and a working knowledge of the software prior to configuring the DeviceNet interface. Contact the supplier of the above software if any difficulties are encountered installing the software installing.

HARDWARE REQUIRED

The following hardware is required for DeviceNet set-up and operation:

- L5351 Link card installed in a L5392 or L5300.
- DeviceNet scanner card installed in a PLC.
- a 24VDC Supply (> 1 amp rating)
- A PC running Windows 95/98 or NT

SOFTWARE REQUIRED

Rockwell / Allen Bradley

- **RS**Logix, **RS**NetWorx, and **RS**Linx

SSD Drives

- Configuration Editor >5.10 or DSD
- The L5351 DeviceNet LinkCard and the EDS file (electronic data sheet) are shipped from Eurotherm Drives.

CONFIGURATION BASICS

Configuring the L5351 consists of two basic parts. The first is configuring the host Link module with the definition of "register" function blocks and their and interconnection with other Link function blocks on the Link fiber-optic ring. The L5351 appears as an I/O device to the rest of the Link system. The second resides in the DeviceNet master (such as a PLC DeviceNet Scanner module) and defines the number and type of parameters to transfer and how to map them to PLC memory.

Each node on the DeviceNet network can transfer a maximum of 127 words. The L5351 is a node on the network. A maximum of three L5351's can be inserted into each L5300 or L5392. Each card is considered a separate node. As a result, the Link system, using three L5351 LinkCards in one L5300 or L5392, can transfer a maximum of

381 words. The PLC will be the limiting factor. Allen Bradley's PLC 5, using DeviceNet scanner card equipped with two ports, has the maximum capability of processing 357 words. Allen Bradley's SLC 500, using DeviceNet scanner card equipped with one port, has the maximum capability of processing 150 words.

CHAPTER 2   INSTALLING THE CARDS

This chapter covers the installation of the L5351 LinkCard in a L5392 LinkStation. Prior to handling the cards, discharge any static electricity from your person by using a proper ESD protection kit. If you do not have an ESD kit, touch a panel ground to discharge any static electricity from your person. Take necessary precautions to disconnect and lockout any power sources that might be affected while doing this procedure.

Step 1.   Remove the cover**.**

Disconnect power and remove all connections from the L5392 or L5300.

Squeeze the tabs on each side of the L5392 or L5300. This allows you to remove the plastic cover.
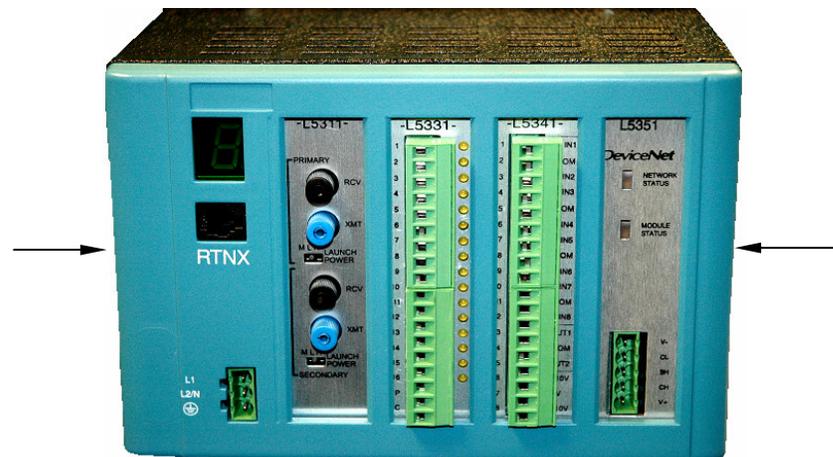
Step 2.   Inserting the L5351 Link Card**.**

Insert the L5351 Link Card(s) into the desired slot(s). Slot number 1 is usually reserved for the L5311 RTNX card. If you do not have a L5311 card in your system the L5351 can be inserted into any one of the four available slots. Make note of the slot the L5351 card location.

Step 3.   Replace the cover**.**

Replace the cover by inserting the plastic cover until the tabs on the side snap into place.

CHAPTER 3   CONNECTING THE L5351

This chapter describes the electrical connections to the L5351
LinkCard.

L5351

*Device**Net***

NETWORK
STATUS

MODULE
STATUS

BLACK	V-
BLUE	CL
BARE	SH
WHITE	CH
RED	V+
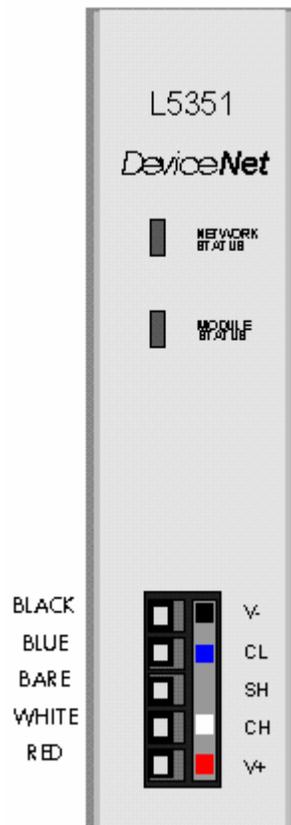
The communications cable should be two-pair, shielded, twisted pairs.
The end to end length and the wire gauge will determine the baud rate
used around the network.

The following table shows the maximum cable length using the two different types of cable and the different baud rates.

Data Rates	125 KBPS	250 KBPS	500 KBPS
Thick Trunk Length Signal and drain (18 gauge) Power (15 gauge)	500 m (1,640 ft)	250 m (820 ft)	100 m (328 ft)
Thin Trunk Length Signal (24 gauge) Power and drain (22 gauge)	100 m (328 ft)	100 m (328 ft)	100 m (328 ft)
Maximum Drop Length	6m (20 ft)	6m (20 ft)	6m (20 ft)
Cumulative Drop Length	156 m (512 ft)	78 m (256 ft)	39 m (128 ft)

This table lists of the connections to the L5351 LinkCard.

Pin Number	Wire Color	Abbreviation	Description
1	Black	V-	Power Return
2	Blue	Data Low	Data Line
3	Clear	Shield	Shield
4	White	Data High	Data Line
5	Red	V+	Positive Voltage

The supply voltage to V- and V+ can be supplied locally using an external power supply or over the network using the PLC power supply. The voltage range is 11 vdc to 24 vdc. The voltage is generally supplied by the PLC. The LinkCard L5351 current consumption at 24 VDC is 30 mA.

CHAPTER 4   CONFIGURING LINK

This chapter covers making a simple Link DeviceNet configuration.

The example uses a L5392 with the L5351 was installed in slot J2. The L5311 RTN card is inserted in slot J1.

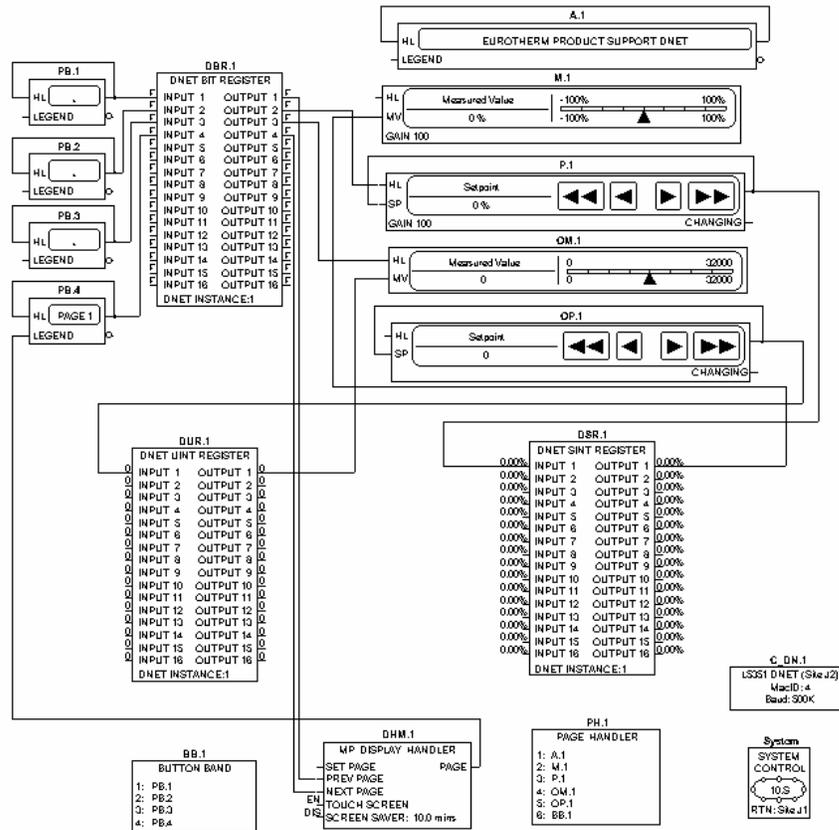**Step 1.**   Select BLOCK :: LINKCARD :: L5351
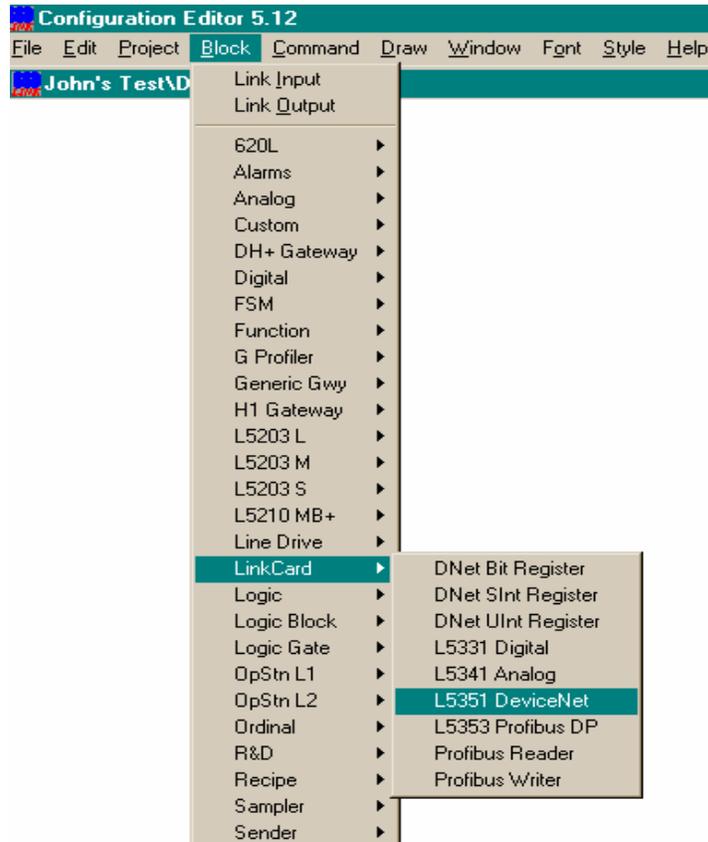
This inserts the DeviceNet handler block in the configuration. This block is used to identify the MAC id number, Baud rate, L5351 site location and the order of the DeviceNet registers.
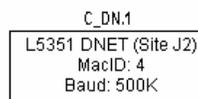
Step 2.   Insert the types of registers you require for your system. The example configuration has one of each type (Bit, Unsigned and Signed registers).

Drive System Designer 1.03

File   Edit   Project   Block   Command   Draw   Window   Font   Style   Help

John's DSD\10OPSTA

A.1
HL   EUROTHERM PRODUCT SUPPORT DNET
LEGEND

M.1
HL   Measured Value   -100%   100%
MV   0%   -100%   ▲   100%
GAIN 100

P.1
HL   Setpoint   ◄◄ ◄ ► ►►
SP   0%
GAIN 100   CHANGING

OM.1
HL   Measured Value   0   32000
MV   0   0   ▲   32000

OP.1
HL   Setpoint   ◄◄ ◄ ► ►►
SP   0
                                          CHANGING

PB.1
HL
LEGEND

PB.2
HL
LEGEND

PB.3
HL
LEGEND

PB.4
HL   PAGE 1
LEGEND

DBR.1
DNET BIT REGISTER
INPUT 1   OUTPUT 1
INPUT 2   OUTPUT 2
INPUT 3   OUTPUT 3
INPUT 4   OUTPUT 4
INPUT 5   OUTPUT 5
INPUT 6   OUTPUT 6
INPUT 7   OUTPUT 7
INPUT 8   OUTPUT 8
INPUT 9   OUTPUT 9
INPUT 10   OUTPUT 10
INPUT 11   OUTPUT 11
INPUT 12   OUTPUT 12
INPUT 13   OUTPUT 13
INPUT 14   OUTPUT 14
INPUT 15   OUTPUT 15
INPUT 16   OUTPUT 16
DNET INSTANCE:1

DUR.1
DNET UINT REGISTER
0 INPUT 1   OUTPUT 1   0
0 INPUT 2   OUTPUT 2   0
0 INPUT 3   OUTPUT 3   0
0 INPUT 4   OUTPUT 4   0
0 INPUT 5   OUTPUT 5   0
0 INPUT 6   OUTPUT 6   0
0 INPUT 7   OUTPUT 7   0
0 INPUT 8   OUTPUT 8   0
0 INPUT 9   OUTPUT 9   0
0 INPUT 10   OUTPUT 10 0
0 INPUT 11   OUTPUT 11 0
0 INPUT 12   OUTPUT 12 0
0 INPUT 13   OUTPUT 13 0
0 INPUT 14   OUTPUT 14 0
0 INPUT 15   OUTPUT 15 0
0 INPUT 16   OUTPUT 16 0
DNET INSTANCE:1

DSR.1
DNET SINT REGISTER
0.00% INPUT 1   OUTPUT 1   0.00%
0.00% INPUT 2   OUTPUT 2   0.00%
0.00% INPUT 3   OUTPUT 3   0.00%
0.00% INPUT 4   OUTPUT 4   0.00%
0.00% INPUT 5   OUTPUT 5   0.00%
0.00% INPUT 6   OUTPUT 6   0.00%
0.00% INPUT 7   OUTPUT 7   0.00%
0.00% INPUT 8   OUTPUT 8   0.00%
0.00% INPUT 9   OUTPUT 9   0.00%
0.00% INPUT 10   OUTPUT 10 0.00%
0.00% INPUT 11   OUTPUT 11 0.00%
0.00% INPUT 12   OUTPUT 12 0.00%
0.00% INPUT 13   OUTPUT 13 0.00%
0.00% INPUT 14   OUTPUT 14 0.00%
0.00% INPUT 15   OUTPUT 15 0.00%
0.00% INPUT 16   OUTPUT 16 0.00%
DNET INSTANCE:1

C_DN.1
LSOS1 DNET (Site J2)
MacID: 4
Baud: 500K

BB.1
BUTTON BAND
1: PB.1
2: PB.2
3: PB.3
4: PB.4

DHM.1
MP DISPLAY HANDLER
SET PAGE   PAGE
PREV PAGE
NEXT PAGE
EN TOUCH SCREEN
DIS SCREEN SAVER: 10.0 mins

PH.1
PAGE HANDLER
1: A.1
2: M.1
3: P.1
4: OM.1
5: OP.1
6: BB.1

System
SYSTEM
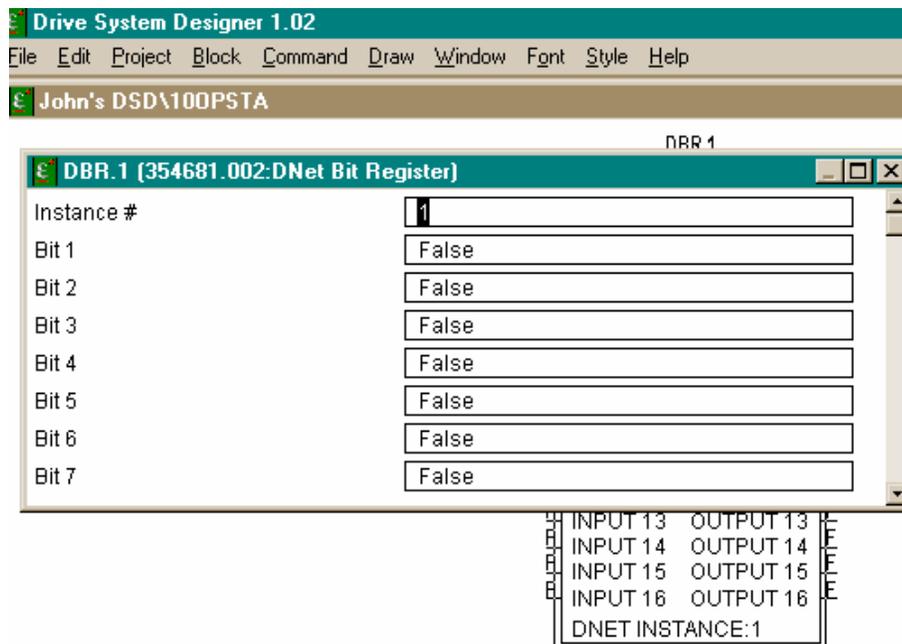CONTROL
10.S
RTN: Site J1

Step 3.   Double-click on the DeviceNet handler block to enter the L5351 site address, Mac Id number, baud rate, and the DeviceNet registers.
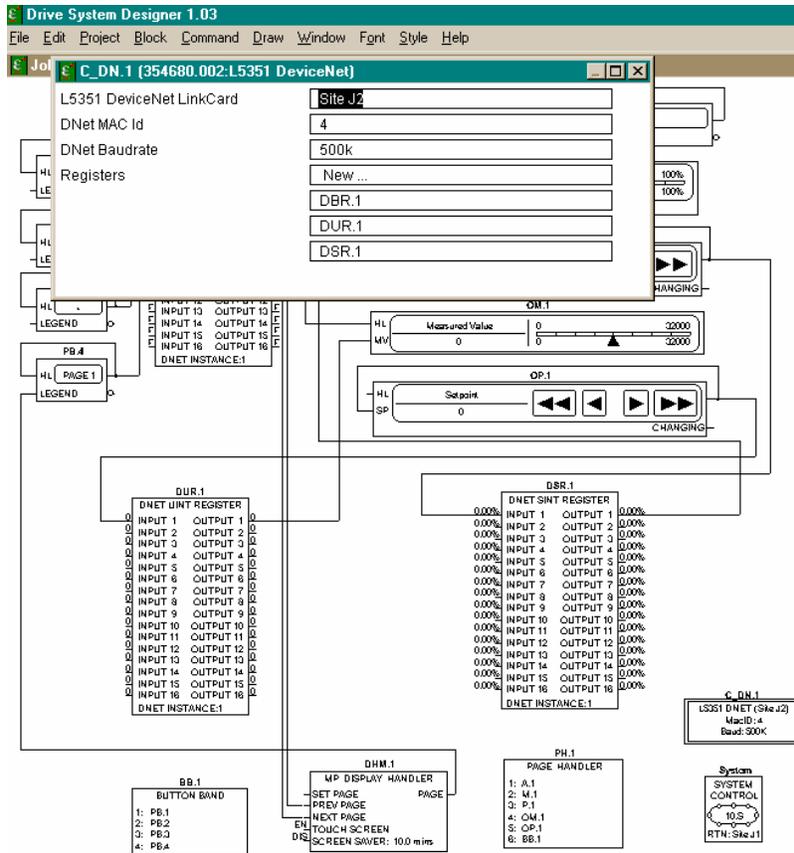
Note. The order of the registers in the DeviceNet handler must match the scanner card in the PLC. If the order is does not match communications between the L5351 card and the PLC will fail.

Step 4. Double-click on the register blocks to enter the instance number. Instance numbers are assigned to each type of blocks. The instance numbers start at 1 and increase with each consecutive block.

> **Note.** Each type of register has its own set of instance numbers. The example configuration, there is only one instance of each register type so each is assigned an instance number 1.

DBR 1

Drive System Designer 1.02

File Edit Project Block Command Draw Window Font Style Help

John's DSD\100PSTA

DBR.1 (354681.002:DNet Bit Register)

Instance #	1
Bit 1	False
Bit 2	False
Bit 3	False
Bit 4	False
Bit 5	False
Bit 6	False
Bit 7	False

INPUT 13   OUTPUT 13
INPUT 14   OUTPUT 14
INPUT 15   OUTPUT 15
INPUT 16   OUTPUT 16
DNET INSTANCE:1

The links inside your configuration are connected in the same fashion as the normal I/O modules. The example configuration was made using pushbuttons, meters, and potentiometers. Refer to the appendices for a complete copy of the configuration.

CHAPTER 5   CONFIGURING DEVICENET

This chapter contains information about the setup and configuration of the DeviceNet Scanner interface. The example uses a SLC 5/04 PLC and 1747-SDN-scanner card.

Installing the EDS file

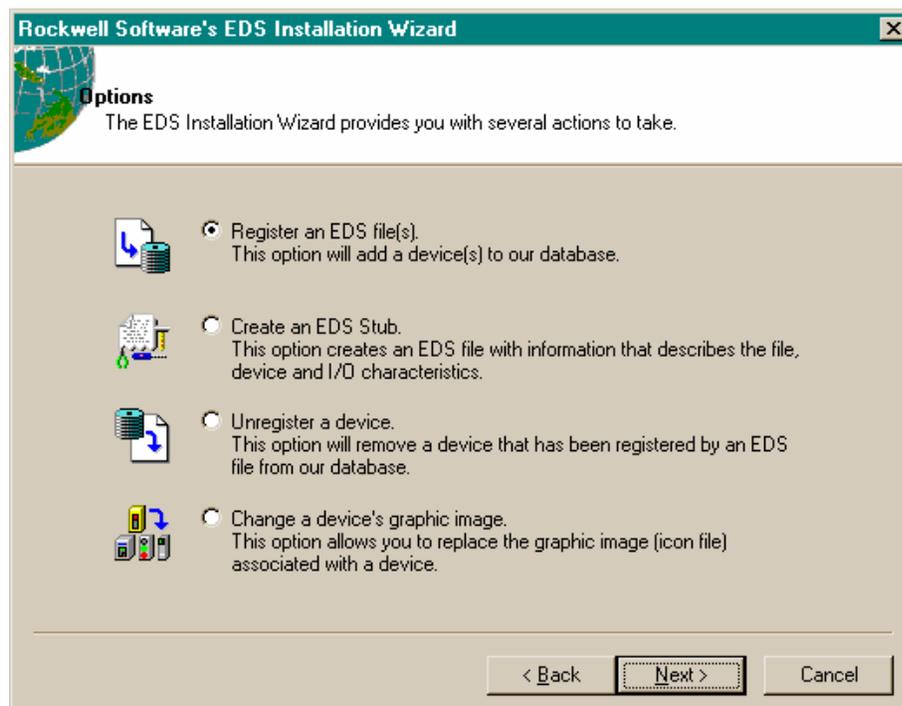> **Step 1.**   Launch RSNetWorx for DeviceNet.
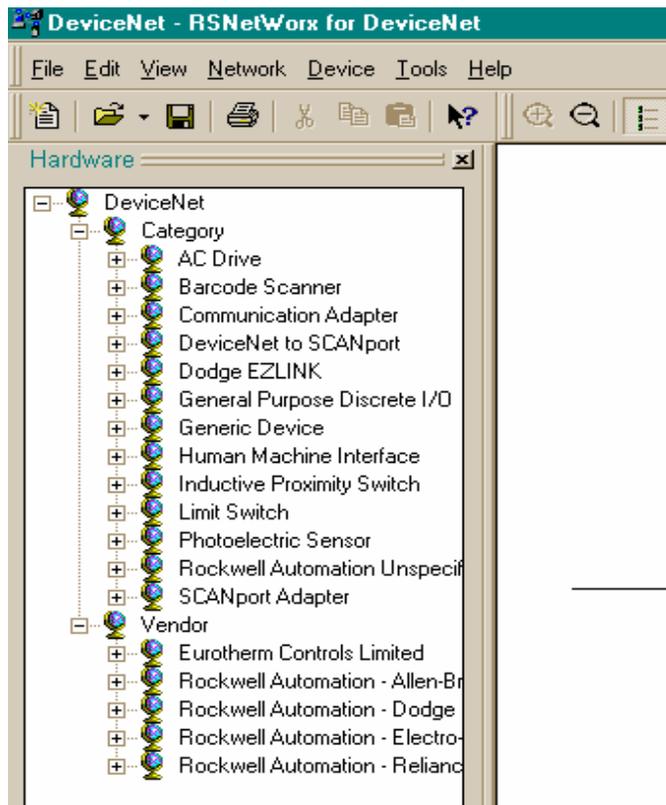
Step 2.   Select "Tools :: EDS WIZARD**…**".

The EDS Installation Wizard welcome screen will appear.

The EDS Wizard creates a directory and registers the L5351 EDS file. The Wizard guides the reader through this process.

Step 3.   Select the "Register an EDS file(s)" option**.**

Step 4. Enter the location of your EDS file; "a:" in this example**.**

Step 5. Click the Choose File button**.**

Step 6. Select the EDS file; L5351a.eds and click the Open button**.**
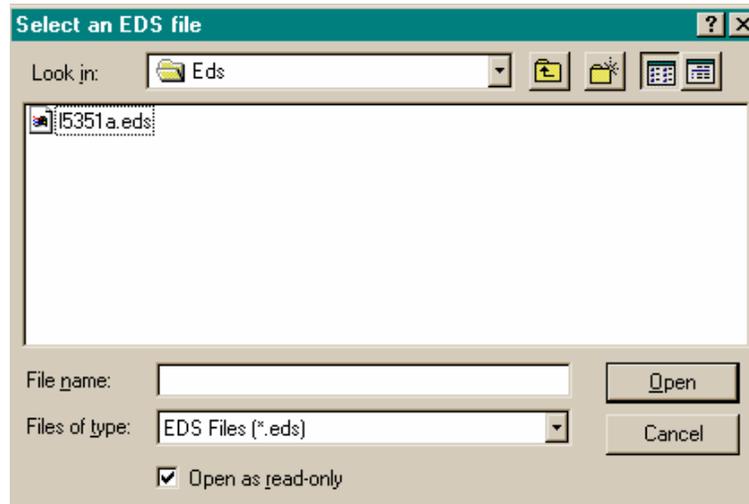
This fills in the EDS path. **Note** that the figure below shows the path to the K: drive. The previous example figures would have a path like A:\L5351a.eds.
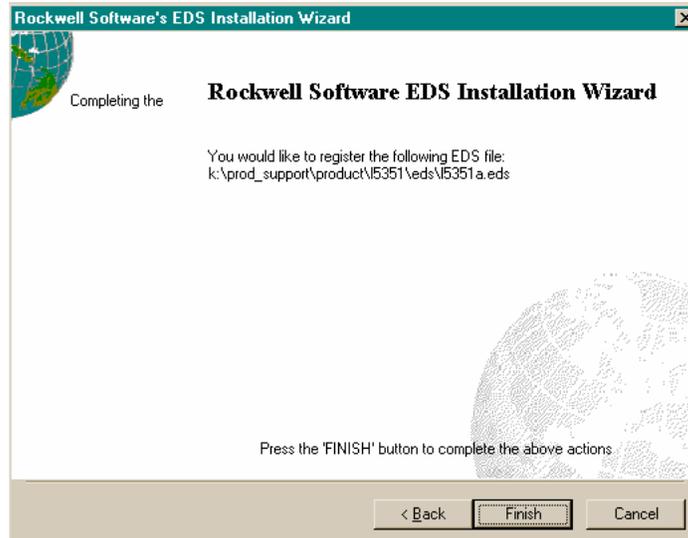
Step 7. The Wizard tests the EDS file**.**
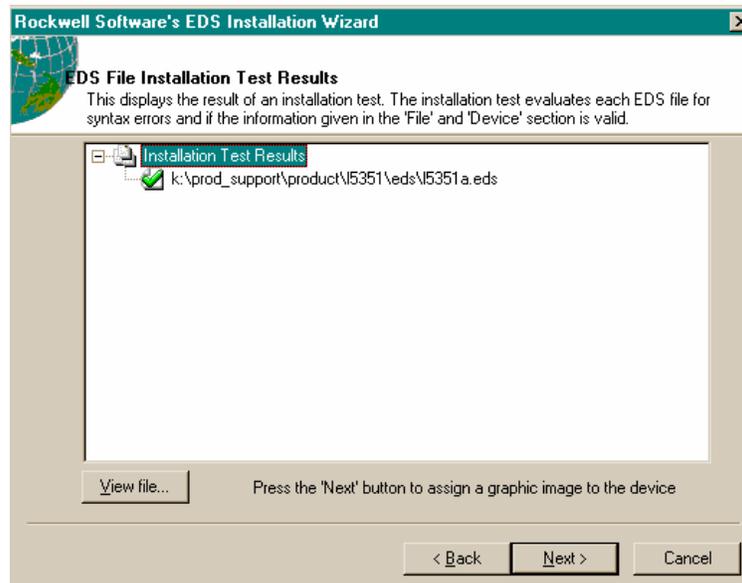
Step 8. Leave the graphic image unchanged and click the "Next" button to continue**.**
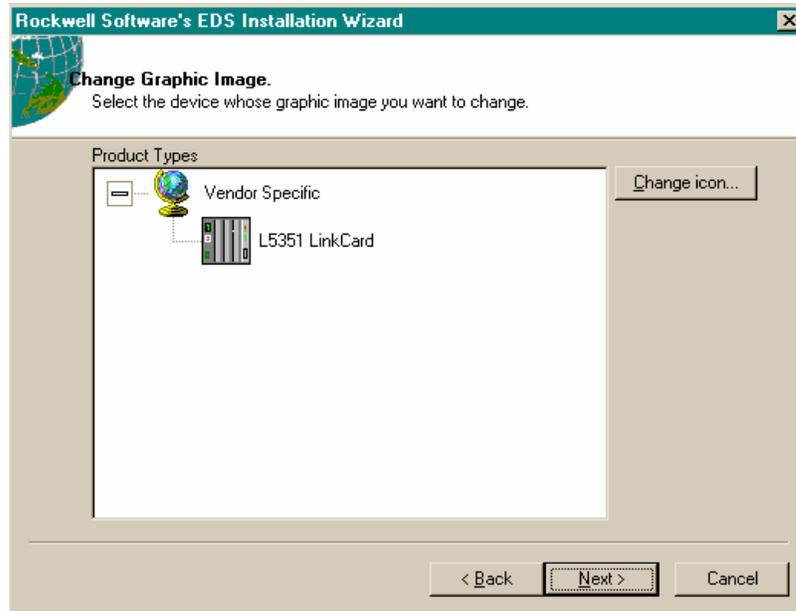
**Step 9.** Click the "Finish" button to exit the Wizard**.**

Communications Setup

**Step 1.** Install the DeviceNet scanner card in the PLC rack**.**

In the example, the scanner card is installed in slot number two. After installing of the DeviceNet scanner card in your PLC, it is necessary to configure the card with the correct number and type of registers. The configuration of the scanner card is done through the DeviceNet network.

Launch RSLinx before programming of the devices on your DeviceNet network.

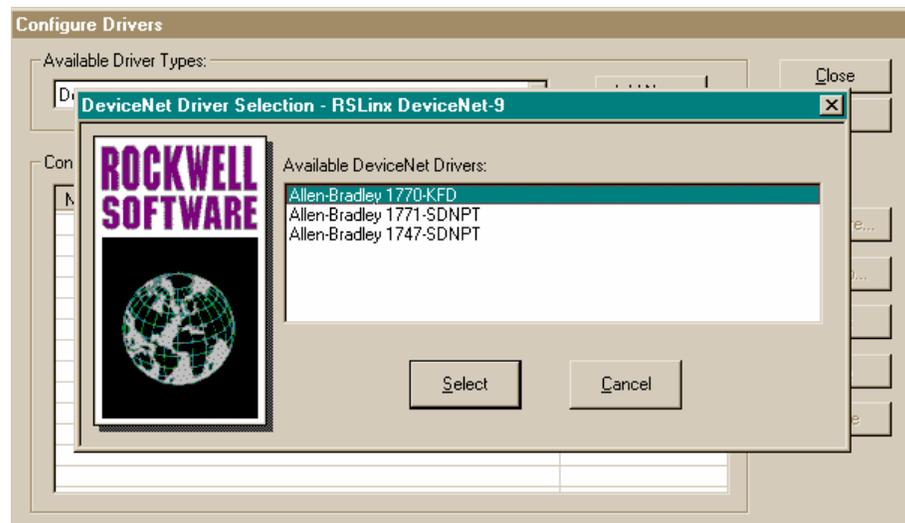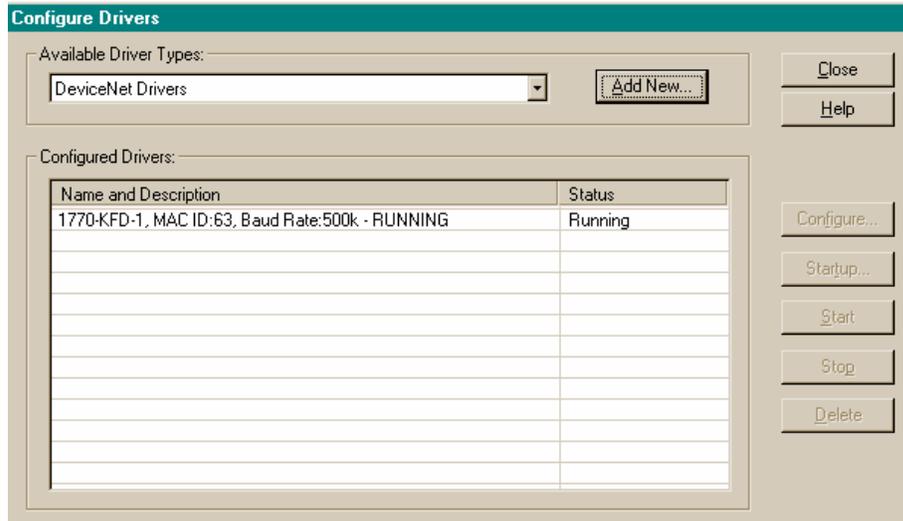**Step 2.** Click on the COMMUNICATIONS :: CONFIGURE DRIVERS**.**
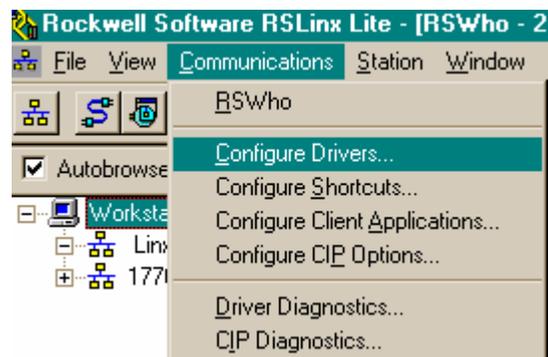
Step 3.   Select "DeviceNet Drivers"**.**
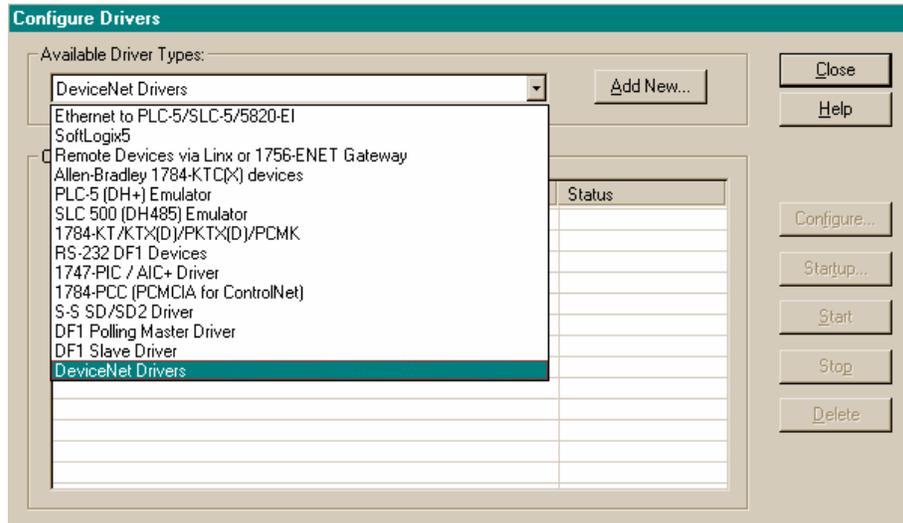
Step 4.   Select the driver for the scanner card you are using. The example is using a 1770-KFD**.**

RSLinx will poll the interface for settings that may already be loaded. If the interface has been preloaded, it may be necessary to modify the address, baud rates, and the port selection.

The software will automatically go on-line with the interface.

If a PLC driver is also installed, the PLC driver cannot be running at the same time as the DeviceNet driver. Stop the PLC driver by highlighting the driver and clicking the stop button.

With the DeviceNet driver running, close the configure window and minimize the RSLinx program. The RSLinx program needs to run in the background.

The following figure shows how the RSLinx program should look when the communication network is up and running.
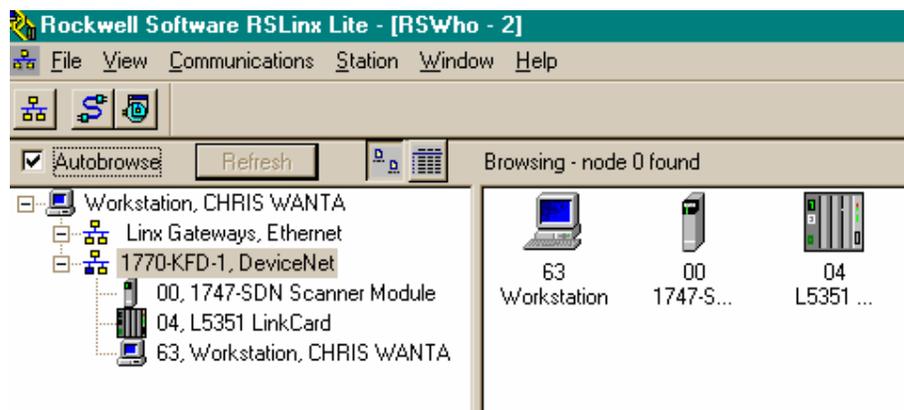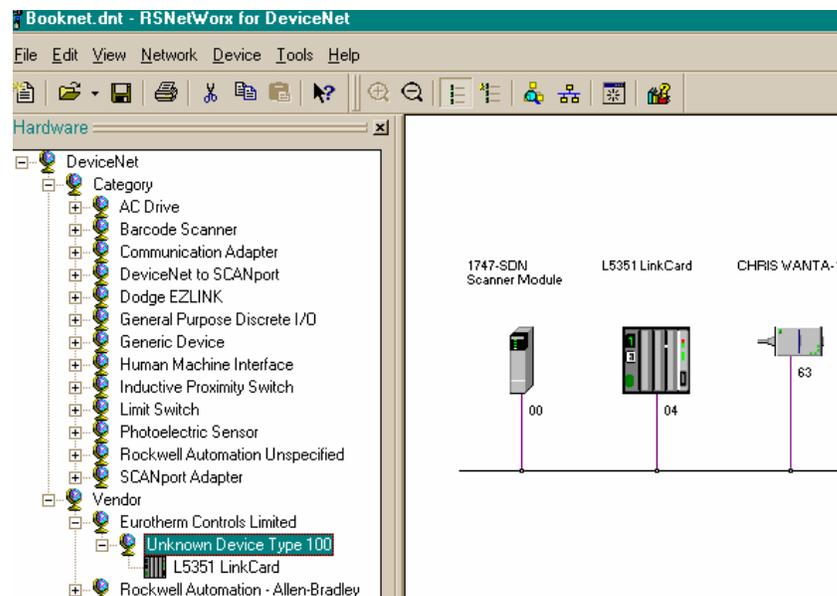
Configuring the DeviceNet Scanner

After completing the communications set-up, start programming the DeviceNet module. Launch RSNetWorx program.

Step 1. Select the communication adapter that is being used for your application**.**

The example used the 1770-KFD and 1747-SDN rev 3. Double-clicking on the icon places the selected device in the DeviceNet network.
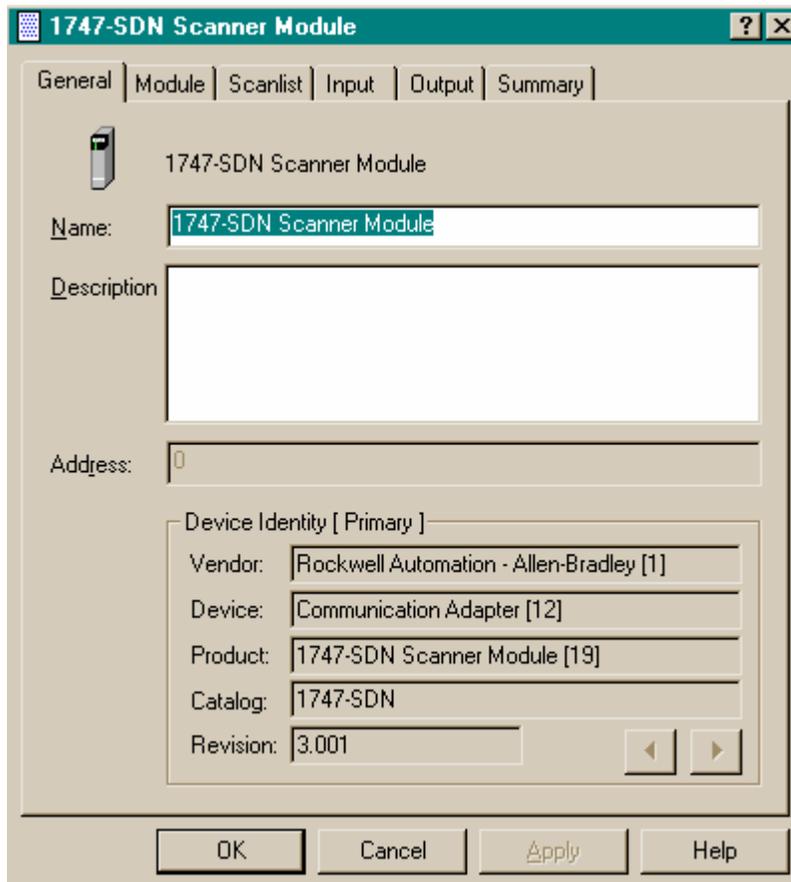

Step 2. Select the L5351 EDS file from VENDOR :: EUROTHERM CONTROLS LIMITED :: UNKNOWN DEVICE TYPE 100 :: L5351 LINKCARD**.**

This is the file that was installed previously in this chapter. Double-clicking the L5351 icon places it on the DeviceNet network.

Step 3. Double-click on the scanner icon in the network window on the right**.**

This will display the information for the scanner and allow the scanner parameters to be programmed.

The scanner card is configured with the exact number of bytes that are being used in the DeviceNet network. In the example Link configuration, one of each type of register was selected (Bit, Signed, and Unsigned registers).

REGISTER TYPE	TRANSMIT	RECEIVE
BIT	1 WORD / 2 BYTES	1 WORD / 2 BYTES
SIGNED	16 WORDS / 32 BYTES	16 WORDS / 32 BYTES
UNSIGNED	16 WORDS / 32 BYTES	16 WORDS / 32 BYTES

The total number of bytes being transmitted and received can be determined by multiplying the total number of words by 2. The example program has a total of 66 transmit bytes and 66 receive bytes. The number of bytes being transferred to/from the DeviceNet scanner and the Link registers must match. If the number of bytes does not match, the communications will fail. These values are setup for the scanner card in the RSNetWorx program.
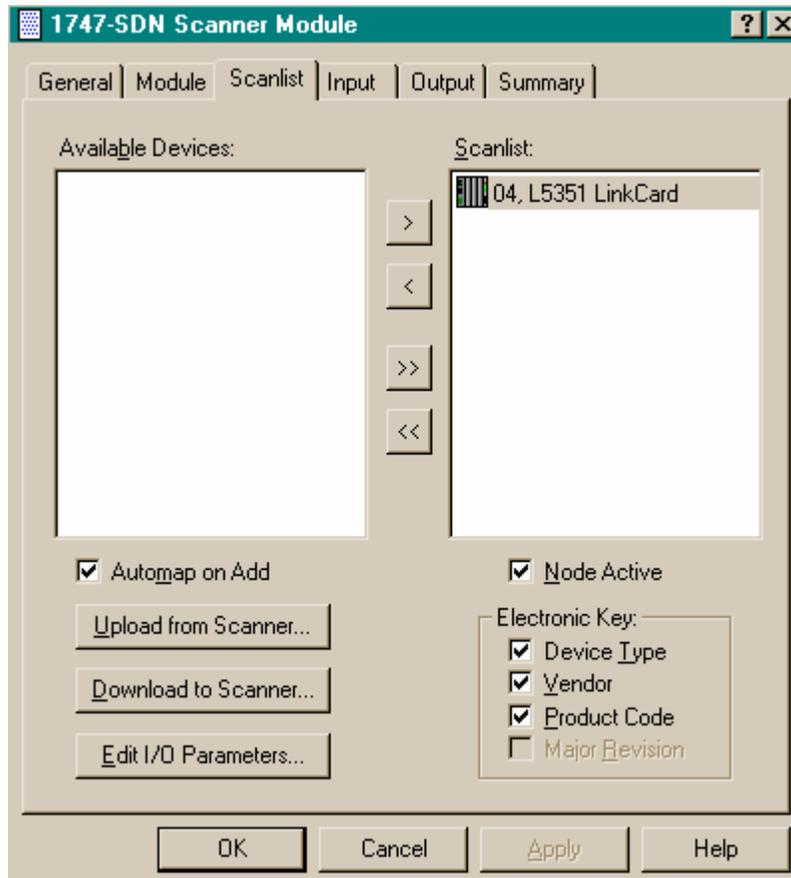
The scanlist is a list of available devices. The L5351 Linkcard should be appear on the left side. If it does not, return to the beginning of this chapter for details on the installing the EDS file. Add the L5351 to the scanlist by highlighting it in the available devices list and clicking the ">" button. When the L5351 has been moved the scanlist should appear like the above picture.

Step 4.   Editing I/O parameters**.**

Click on the button labeled "Edit I/O Parameters," this will allow the parameters to be changed. Select the "Polled" checkbox and enter the Rx and Tx sizes. Set the "Poll Rate" to Every Scan.

Note. The example has a total of 66 transmit bytes and 66 receive bytes.

Mapping

Our example is using a SLC 5/04; this PLC uses messages to transfer the data. Click on the tab labeled Input or Output to enter the mapping. Enter the map manually or use the AutoMap feature. Automap fills in all the addresses automatically. You must assign a map for both Inputs and Outputs.
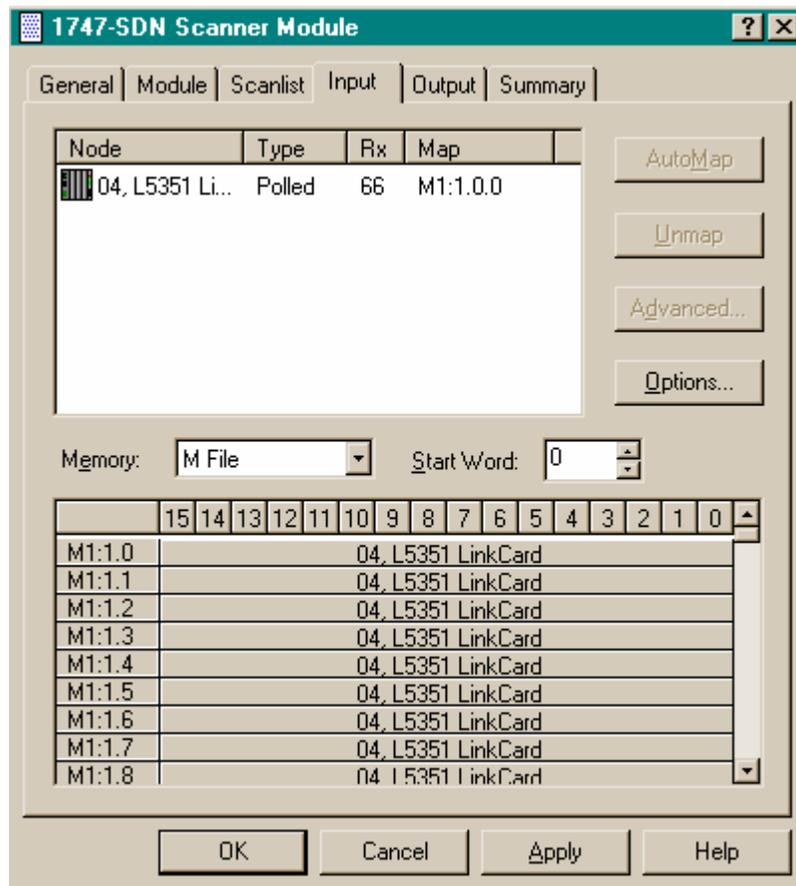
Enabling the DeviceNet Scanner

The DeviceNet scanner card is enabled by writing to the first output bit of the slot where the card is located. In the example, the scanner card is located in slot 1 in the PLC. In the program, B3: 0 writes to O: 1.0, which is the enable bit.

CHAPTER 6   TROUBLESHOOTING

The following table is a list of codes that can appear on the DeviceNet scanner card.

Numeric Code Display Summary	Description	Action
0-63	Display is node address	Normal operation.
70	Module failure Duplicate address check.	Change Module address to another available address.
71	Illegal data in scan list table (node number alternately flashes).	Reconfigure scan list table and remove any illegal data.
72	Slave device stopped communications (node number alternately flashes).	Check field devices and verify connections.
73	Device's identity information does not match the electronic key in scan list table entry (node number alternately flashes).	Verify that the correct device is at this node number. Make sure that the device at the flashing node address matches the desired electronic key.
74	Data overrun on port detected	Modify your configuration and check for invalid data. Check network communication traffic.
75	No network traffic at all has been detected.	Verify connections.
76	No direct network traffic for scanner has been detected	None. The scanner hears other network communication.
77	Data size returned does not match scan list table entry (node number alternately flashes)	Reconfigure your module and change the addressing.
78	Slave device in scan list table does not exist (node number alternately flashes).	Add the device to the network or delete the scan list entry for that device.

Numeric Code Display Summary	Description	Action
79	Module has failed to transmit a message	Make sure your module is connected to a valid network. Check for disconnected cables.
80	Module is in the idle mode.	No action required. Enable control bit to put module in the Run mode
81	Module is in the fault mode	No specific action. Examine alternating number to determine fault.
82	Error detected in sequence of fragmented I/O messages from device (node number alternately flashes).	Check scan list table for slave device to make sure that input and output data lengths are correct. Check slave configuration.
83	Slave device is returning error responses when module attempts to communicate (node number alternately flashes).	Check accuracy of scan list table entry. Check slave device configuration.
84	Module is initializing DeviceNet channel.	This code will clear when initialization is complete.
85	Data size returned is bigger than expected.	Check scan list table entry for accuracy. Check slave node configuration
86	Device is producing idle state data while the scanner is in Run mode.	Check device configuration/slave node status.
88	This is not an error. At power up and reset, the module displays all 14 segments of the node address and status display LEDs.	None
90	User has disabled communication port.	Reconfigure your module. Check module command register.
91	Bus-off condition detected on comm. port.	Check DeviceNet connections and physical media integrity. Check system failed slave devices or other possible sources of networ interference.

Numeric Code Display Summary	Description	Action
92	No network power detected on comm. port.	Provide network power. Make sure that scanner drop cable is providing network to scanner comm.. port.
95	Application flash update in progress.	None. Do not disconnect the module while applicatio FLASH is in progress. You will lose any existing data in the scanner's memory.
97	Module halted by user.	Restart the module.
98, 99	Unrecoverable firmware or hardware failure.	Service or replace your scanner module.

L5351 DeviceNet LinkCard Module Status LED

This bi-color (green – red) LED provides device status. The table below shows the LED states.

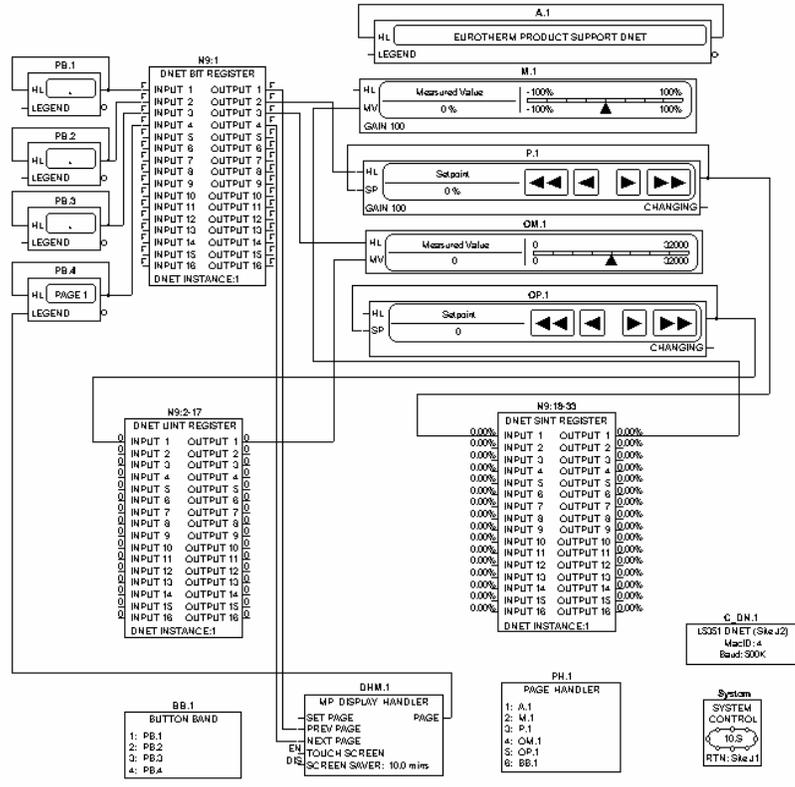| Status	LED state	Reason
Power Off	Off	• No power applied to the device • Host Link2 module is not running its configuration
Device in standby Needs to be commissioned	Flashing green	Device needs commissioning because of missing, incomplete or incorrect configuration
Device operational	Green	The device is operating in a normal condition
Minor Fault	Flashing Red	Recoverable fault
Unrecoverable fault	Red	Device has identified an unrecoverable fault. May need replacing.
Device Self-testing	Flashing Red and Green	Device in self-test mode

L5351 DeviceNet LinkCard Network Status LED

This bi-color (green – red) LED indicates the status of the communications link. The table below defines the different states of the Network Status LED.

Status	LED state	Reason
Power Off or not on-line	Off	The device is not on-line • The device has not yet completed the Dup_MAC_ID test • The device may not have power applied to it Check Module Status LED
On-line but not connected	Flashing green	The device is on-line, but has no connections in the established state • Passed the Dup_MAC_ID test, is on line but has no established connections • For a Group 2 only device: Device is not allocated to a master
Link OK, on-line, connected	Green	The device is on-line, has connections in the established state • For a Group 2 only device: Device is allocated to a master
Connection time-out	Flashing Red	One or more I/O connections are in the timed-out state
Critical Link failure	Red	Failed communication device. The device has detected an error that has rendered it incapable of communicating on the network Could be Dup_MAC_ID or Bus-off
Communication faulted Received Identify Communication Fault Request Long Protocol	Flashing Red and Green	Specific communication faulted device. The device has detected a network access error and is in the Communication Faulted state. It has subsequently received and accepted an Identify Communication Faulted requested-Long protocol message

APPENDIX A   SAMPLE CONFIGURATIONS

LINK CONFIGURATION

DEVICENET/PLC CONFIGURATION

DEVICENET/PLC CONFIGURATION CONT.

0004
```
-MOV-
Move
Source        B10:0
       0000000000000000<
Dest          M0:1.0
                  ?<
```

0005
```
-MOV-
Move
Source        N7:3
              18144<
Dest          M0:1.17
                  ?<
```

0006
```
-MOV-
Move
Source        N7:1
              3356<
Dest          M0:1.1
                  ?<
```
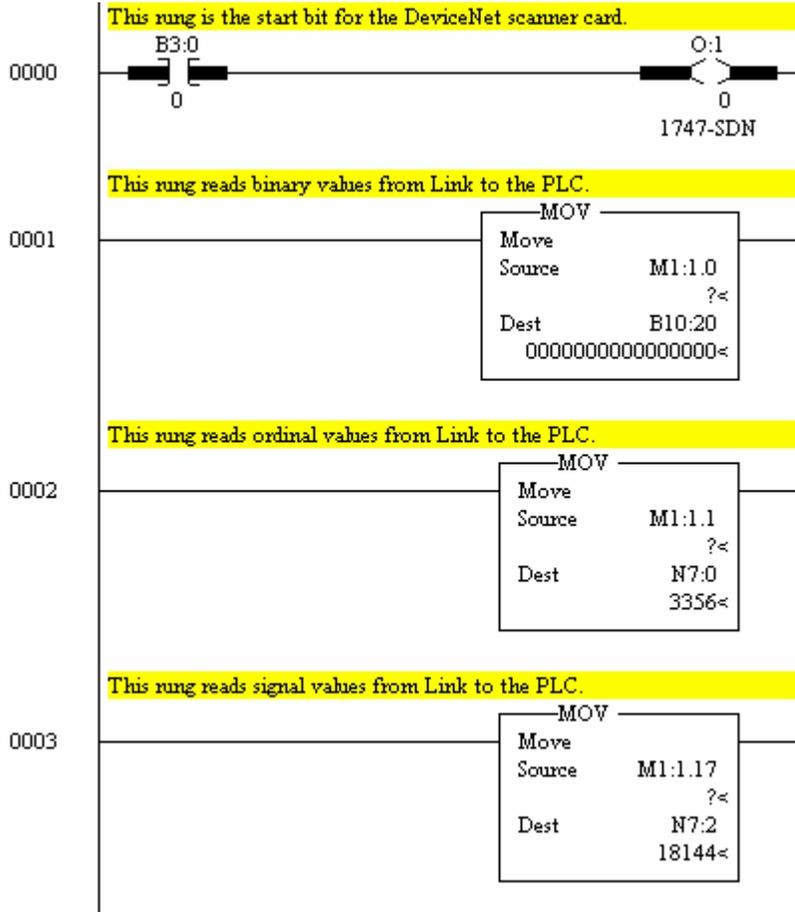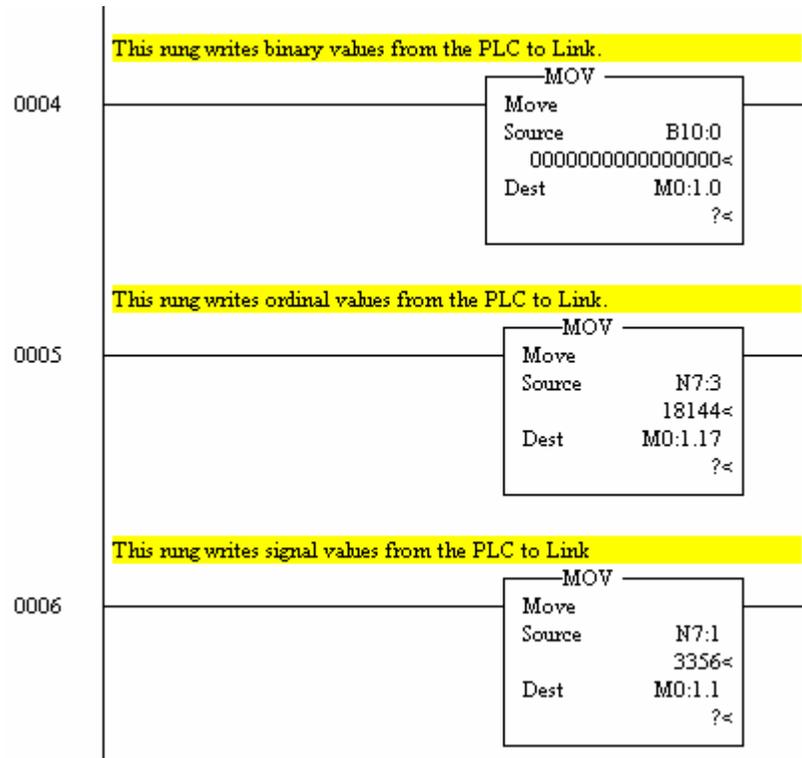
PLC 5 Sample configuration

This example uses a PLC-5/15 PLC and 1771-SDN-scanner card.

Configuring a system for use with a PLC 5 processor is similar to SLC 500 processor. The Link configuration is the same. The differences are in the configuring of the DeviceNet scanner card and in the PLC program.

The PLC 5 uses block transfers to move the data in and out of the plc processor. Insert a generic block transfer read and a generic block transfer write into the plc ladder program. Setup the block transfers as follows.

BLOCK TRANSFER READ	VALUE	GENERIC BLOCK TRANSFER
Rack	0	The rack where the scanner card is located.
Group	0	The slot number in the rack
Module	0	Always zero for single slot addressing
Control Block	N11:0	Control register location (5 consecutive registers required)
Data File	N10:1	First word of the data file
Length	62	Length of data transfer from the scanner
Continuous	No	Always select no

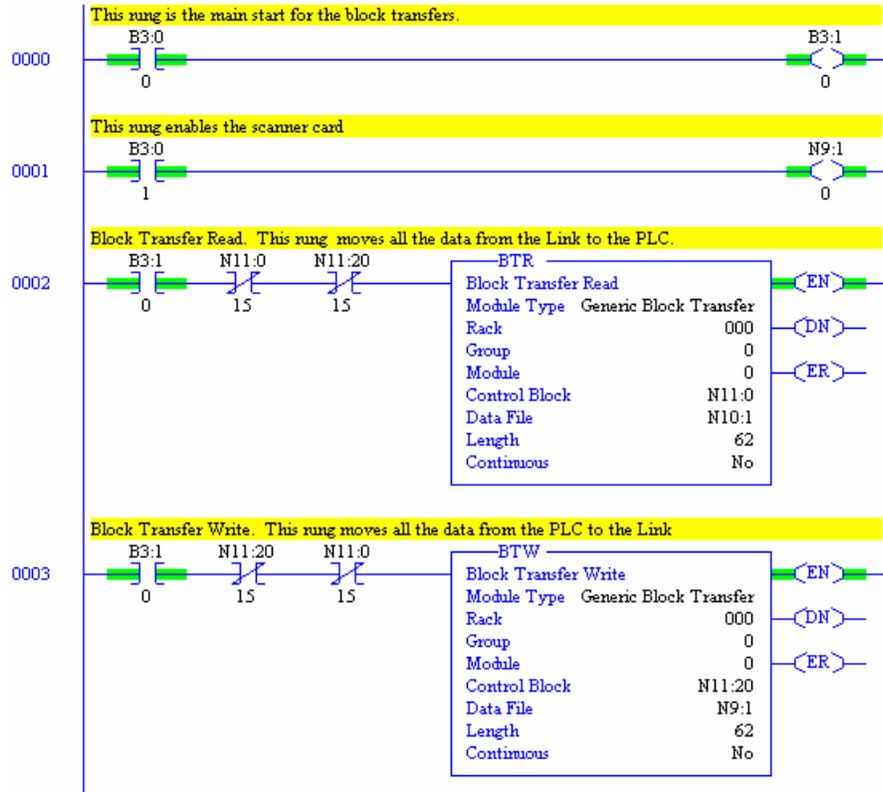| BLOCK TRANSFER WRITE	VALUE	GENERIC BLOCK TRANSFER
Rack	0	The rack where the scanner card is located.
Group	0	The slot number in the rack
Module	0	Always zero for single slot addressing
Control Block	N11:20	Control register location (5 consecutive registers required)
Data File	N9:1	First word of the data file
Length	62	Length of data transfer to the scanner
Continuous	No	Always select no

0000

This rung is the main start for the block transfers.

B3:0
0
─┤ ├─

B3:1
0
─( )─

0001

This rung enables the scanner card

B3:0
1
─┤ ├─

N9:1
0
─( )─

0002

Block Transfer Read. This rung moves all the data from the Link to the PLC.

B3:1   N11:0   N11:20
0   15   15
─┤ ├──┤/├──┤/├

```
──── BTR ────
Block Transfer Read
Module Type   Generic Block Transfer
Rack                        000
Group                         0
Module                        0
Control Block            N11:0
Data File                N10:1
Length                      62
Continuous                  No
```
─(EN)─
─(DN)─
─(ER)─

0003

Block Transfer Write. This rung moves all the data from the PLC to the Link

B3:1   N11:20   N11:0
0   15   15
─┤ ├──┤/├──┤/├

```
──── BTW ────
Block Transfer Write
Module Type   Generic Block Transfer
Rack                        000
Group                         0
Module                        0
Control Block            N11:20
Data File                N9:1
Length                      62
Continuous                  No
```
─(EN)─
─(DN)─
─(ER)─

APPENDIX B   TECHNICAL SPECIFICATIONS

Environmental

Operating temperature	0°C to 50°C (32 to 122^{0}F)
Storage temperature	-10 °C to +70 °C (14 to 158^{0}F)
Humidity	85% RAH. in a dry, non-condensing environment
Enclosure Rating	Touchsafe IP20. To be mounted inside a SSD Drives L53XX series enclosure

Supply

Supply Voltage	5VDC, supplied by backplane 11 - 24VDC, supplied by network
Current Consumption	120 mA @ 5VDC, 30 mA @ 24VDC
Power Dissipation	0.8 W

DeviceNet

Connection Types	Explicit messaging and polled I/O connections provided via Predefined Master/Slave connection set. Fragmentation supported for both polled I/O and explicit connections
Baud Rate	125K, 250K and 500Kbaud
Data Types	Bits, Unsigned Integers (*LINK* Ordinals), signed integers (*LINK* values)
Transport Class Trigger	Server Transport class 2
Indicators supported	Network status bi-color LED, Module status bi-color LED
DeviceNet loading	27 mA
Transfer delay	Typically < 7 ms *LINK* input to DeviceNet output and vice-versa
Configurability	LinkCard configuration performed using ConfigEd. DeviceNet network and PLC programmed independently
Connector type	5 pin Phoenix Combicon or equivalent. Cable connector part number MSTB 2.5/5-ST-5.08-AU

Physical

Height	120mm (4.72 in)
Width	32mm (1.25 in)
Depth	90mm (3.54in)
Weight	0.16 kg (0.35 lbs)