Application of DeviceNet and Motor Insight

How to Control and Monitor a C441 Motor Insight via DeviceNet

Application:

The purpose of this application example is to demonstrate how to control and monitor a Motor Insight motor protection relay from a DeviceNet scanner. The DeviceNet interface module for the Motor Insight contains 4 inputs and 2 outputs. One of the outputs is used to control the contactor via the normally closed fault relay contact (95/96 contact) on the Motor Insight. The Motor Insight provides a high level of protection for the motor and will not close the fault relay contact (de-energize the fault relay) if any condition exists that could damage the motor. It will also open the fault relay contact should such a condition occur while the motor is running.

This application example does not use any particular DeviceNet scanner, but provides information for configuring one of the C441K/L DeviceNet interface modules to be polled by a DeviceNet scanner. Rockwell's RSNetworx DeviceNet commissioning software is used in this application example because it is the most common DeviceNet commissioning software. The difference between the C441K and C441L is that the K module has 120vac inputs and the L module has 24vdc inputs. Both modules have 4 inputs and 2 relay outputs.

Overview:

The Motor Insight is a motor protection relay which can be used with any contactor. This application note will show how to wire a Motor Insight to a contactor and will also configure the C441K/L module to be ready to be polled by any DeviceNet scanner. There are numerous data parameters that may be monitored from a Motor Insight including: individual phase currents, average of the three phase currents, individual phase voltages, average of the three phase voltages, motor power, voltage unbalance, current unbalance, power factor, ground fault current, frequency, thermal capacity and a fault queue. This application example will use Input Assembly 110 to monitor 10 different parameters from the Motor Insight and Output Assembly 105 to control it.

The following shows the various Input and Output Assemblies for the Motor Insight:

Input Assemblies:
1. Input Assembly 50: Faulted bit – 1 byte
2. Input Assembly 51: Faulted and Warning bits – 1 byte
3. Input Assembly 107: Fault and Warning bits along with the status for the 4 inputs and 2 outputs – 1 byte
4. Input Assembly 100: Select up to 4 parameters to monitor from Table 1 below – 8 bytes
5. Input Assembly 110: Select up to 10 parameters to monitor from Table 1 below – 20 bytes

Output Assemblies:
1. Output Assembly 2: Fault Reset bit – 1 byte
2. Output Assembly 105: Fault Reset bit and control for the 2 outputs – 1 byte
3. Output Assembly 111: Bit Strobe Command – Polled data will be used for this example. Refer the Motor Insight user manual (Chapter 8), publication MN04209001E for information on this Output Assembly.

| Value	Description
0	RMS Current – Phase IA
1	RMS Current – Phase IB
2	RMS Current – Phase IC
3	Composite I/O Data
4	Field Inputs
5	RMS Current AVG
6	RMS Voltage VAB
7	RMS Voltage VBC
8	RMS Voltage VCA
9	RMS Voltage AVG
10	Total KW
11	Voltage Unbalance Percent
12	Current Unbalance Percent
13	Apparent Power Factor
14	Residual Ground Current Deciamps
15	Frequency
16	Overload Thermal Pile
17	Trip Reason
18	Overload Status
19	Error Code

Table 1

Control of the contactor is accomplished via a hard-wired output on the Motor Insight's DeviceNet module. The system controller and its DeviceNet scanner control the output via DeviceNet. This output is wired in series with the N.C. Fault Relay contact (95/96) on the Motor Insight to control the contactor. The controller program energizes an output on the Motor Insight's DeviceNet module to close the contactor and turns the output off to open the contactor. If a fault occurs, the N.C. Fault Relay contact on the Motor Insight will open and the program will be notified immediately. 10 different parameters are being continuously monitored from the Motor Insight as well. For this example, Input Assembly 110 and Output Assembly 105 will be used.

Part Numbers used for this Application Example

(1) C441BA   2 - 9A; 200-240VAC (50/60Hz) Motor Insight
(1) C441K   DeviceNet interface module with I/O for the Motor Insight
(1) Contactor
DeviceNet Cable, 24vdc power supply and other hardware needed to put together a DeviceNet system.

Motor Insight Control Wiring Diagram
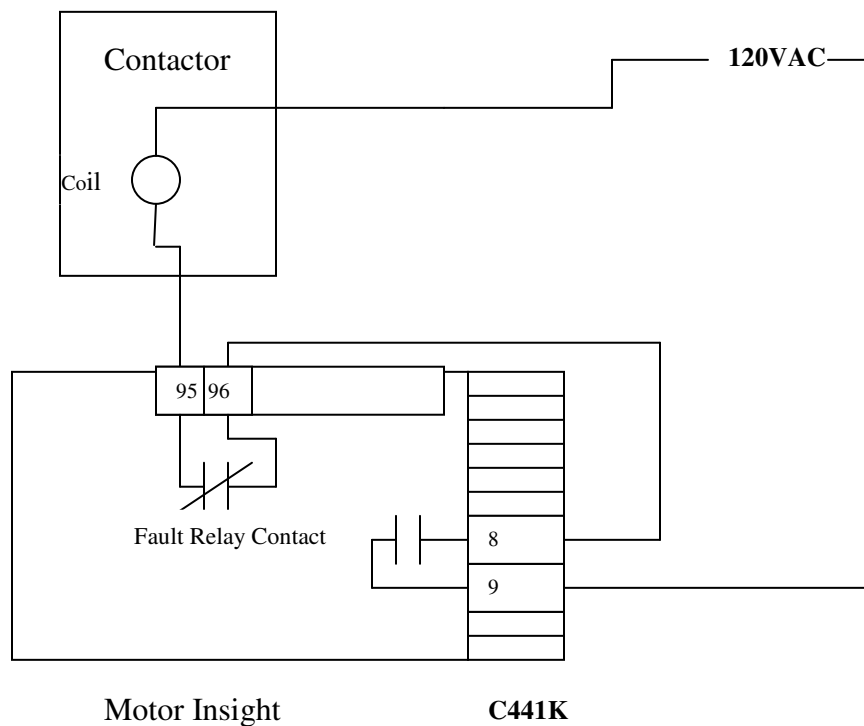
Per the Control Wiring diagram above, the normally open relay contact across pins 8 and 9 on the DeviceNet Interface module for the Motor Insight DeviceNet module (C441K) is controlled via the DeviceNet network. If the normally closed relay contact (95/96) on the Motor Insight is in its normal state, then the Motor Insight is not tripped and when the output on the C441K is energized, the contactor will energize, starting the motor. The output on the C441K is controlled via DeviceNet by the DeviceNet scanner and the system controller. Input Assembly 110 is used in this example to monitor 10 different parameters and Output Assembly 105 is used to reset the Motor Insight and to control the relay output on the C441K. Terminals 8 & 9 on the C441K is the relay output contact.

DeviceNet Connections

DeviceNet supports two methods for connecting devices to the network. Daisy-chain and trunk-line / drop-line are the two network topologies allowed for DeviceNet. For this example, trunk-line / drop-line is used, with a drop for each of the following devices:

1. DeviceNet scanner
2. C441K Motor Insight DeviceNet module with 120vac I/O
3. 24vdc network power supply

Note: Be sure to terminate both physical ends of the DeviceNet trunk cable with 121-Ohm, 1%, ¼ watt metal film termination resistors.

Configuring the Motor Insight for DeviceNet Communications

Please refer to the Motor Insight module's user manual, publication MN04209001E for information on configuring your Motor Insight for the motor it will be protecting and other features. The DeviceNet Interface module for the Motor Insight is discussed in Chapter 8 of that manual. It is configured for Baud Rate and MAC ID with dip switches located on the module. For this example, 125K Baud and MAC ID 1 will be used for the Motor Insight. Connect the DeviceNet Interface module to the Motor Insight. Before applying power, set the dip switches. The state of the 8 dip switches for this application example are:

Switch Number	Setting
1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	OFF
8	ON

Dip Switches 1 and 2 set the baud rate. Both OFF indicates 125K baud. Switch 1 OFF and 2 ON indicates 250K baud and both switches ON indicates 500K baud. Dip Switches 3-8 set the MAC ID of the device. These switches are set using weighted binary. In other words, switch 8 has a value of 1, switch 7 a value of 2, switch 6 a value of 4 and so on. Then, add the weighted values of all switches that are ON to obtain the MAC ID.

Power the Motor Insight. It is now configured to be MAC ID 1 at 125K baud on DeviceNet.

Configuring the C441K/L Module for Selected I/O Assemblies

Any valid DeviceNet commissioning software may be used to configure the C441 Motor Insight via one of the C441K/L DeviceNet interface modules for Input Assembly 110 and Output Assembly 105. For this example, Rockwell's RSNetworx for DeviceNet commissioning software will be used. Start RSNetworx and the following screen will be displayed:
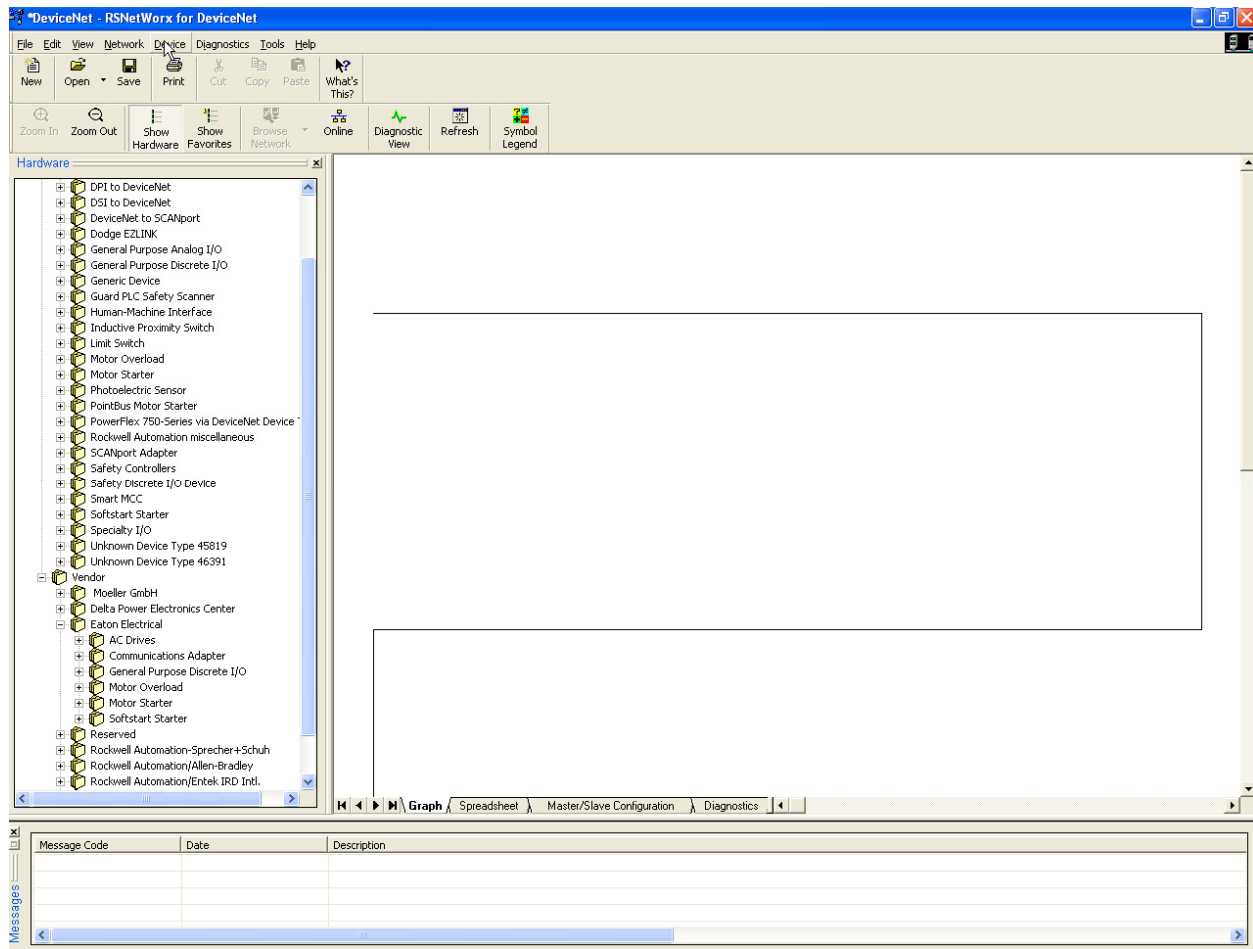
Select the Tools drop down menu, then EDS Wizard and follow the directions to register the eds files for the C441 Motor Insight. These files are located at the following link:

http://www.eaton.com/Electrical/USA/ProductsandServices/AutomationandControl/ContactorsStarters/OverloadRelays/C441OverloadRelays/index.htm

Select the Documentation tab, then Software Downloads to access the DeviceNet eds files.

Controlling and Monitoring the Motor Insight over DeviceNet

After registering the eds files for the C441, shut RSNetworx down, then start it again. Go online with your DeviceNet network containing the C441 modules, each with a unique MAC ID. Select one of the module's icons, right click and choose Properties. The following screen will open:
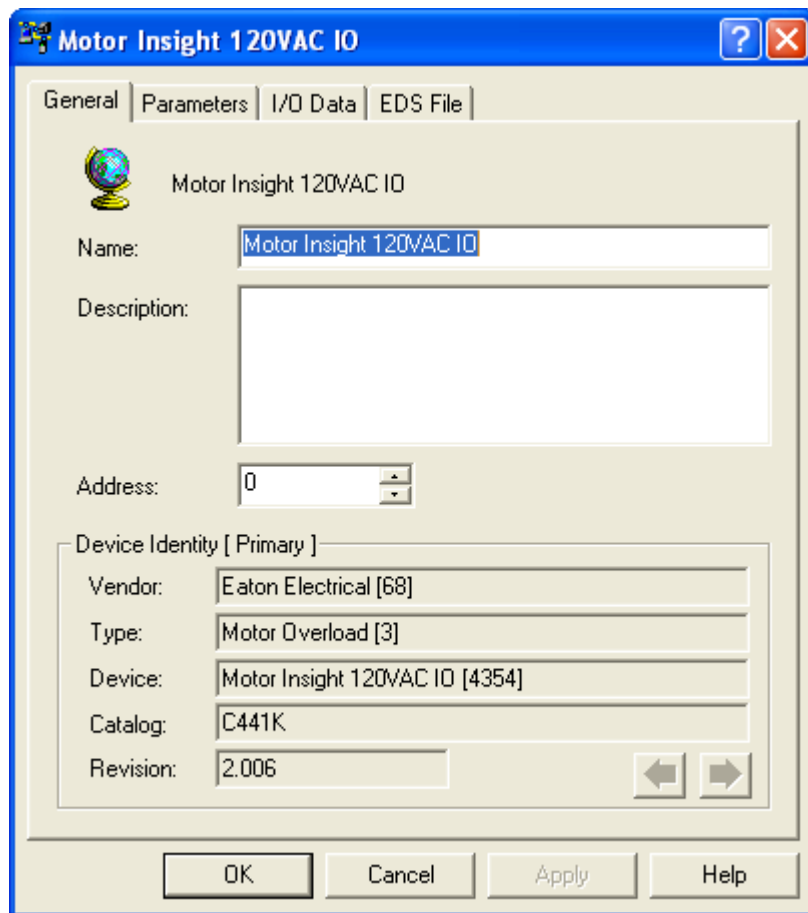
Click the Parameters tab and the software will prompt you to upload parameters from the C441. After uploading the parameters, scan down to parameter ID 81, "Poll Input Assembly Select". Change it from the default value of 100 to 110. Then select Parameter ID 83, "Poll Output Assembly Select" and verify that it is set to 105.

Since Input Assembly 110 is 20 bytes in length, or 10 words, we must select 10 values to monitor with Input Assembly 110. Parameter IDs 90-99 allow the selection of these 10 parameters for monitoring with Input Assembly 110. They will appear in the system controller in the order they are configured in the list. In other words, the value selected with Parameter ID 90 will be the first parameter received in the controller, followed by the parameter chosen with Parameter ID 91 and so on.

The Input Assembly 110 is 20 bytes in length and the Output Assembly 105 is 1 byte in length. Please refer to Chapter 8 in publication MN04209001E for layouts for all the I/O assemblies for the C441 Motor Insight. This is the information needed to set up a DeviceNet scanner to poll the C441 Motor Insight. The DeviceNet scanner needs to know the MAC ID of the DeviceNet slave as well as the following:

Input Assembly 110, length 20 bytes
Output Assembly 105, length 1 byte

Refer the the DeviceNet scanner's documentation for details on how to map this data to the system controller.

Supporting Documentation:

Manuals	Reference Number
Motor Insight User Manual	MN04209001E

Additional Help:

In the event additional help is needed, please contact the Technical Resource Center at 1-877-ETN-CARE.