



Application of EtherNet/IP and Motor Insight

How to Control and Monitor a C441 Motor Insight with a Freedom Contactor via EtherNet/IP and a CompactLogix PLC

Application:

The purpose of this application example is to demonstrate how to control and monitor a Motor Insight motor protection relay operating in conjunction with a Freedom Contactor over Ethernet/IP. The Ethernet module for the Motor Insight contains 4 inputs and 2 outputs. One of the outputs is used to control the Freedom 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 uses a CompactLogix controller with embedded Ethernet/IP scanner to control and monitor the Motor Insight over Ethernet/IP. Any Ethernet/IP scanner may be used for this purpose, including the 1756-ENBT with a ControlLogix PLC.

Overview:

The Motor Insight is a motor protection relay which can be used with any contactor. This application note will show how to connect a CompactLogix PLC to a Motor Insight for control and monitoring over Ethernet/IP. 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 (20 bytes) to monitor 10 different parameters from the Motor Insight and Output Assembly 105 (1 byte) for control. The various Input and Output Assemblies for the Motor Insight on Ethernet/IP via a C441R or C441T can be found in chapter 6 of the C441 Ethernet Module User Manual, publication MN04200002E.

The following table shows the parameters monitored with Input Assembly 110:

Bytes	Description
0,1	Device Status
2,3	RMS Current – L1
4,5	RMS Current – L2
6,7	RMS Current – L3
8,9	Trip Reason
10,11	RMS Current AVG
12,13	RMS Voltage L1-L2
14,15	RMS Voltage L2-L3
16,17	RMS Voltage L3-L1
18,19	RMS Voltage AVG

Table 1

Control of the Freedom Contactor is accomplished via a hard-wired output on the Motor Insight's Ethernet module. The CompactLogix PLC and its Ethernet/IP scanner port control the output via the network. This output should be wired in series with the N.C. Fault Relay contact (95/96) on the Motor Insight to control the Freedom Contactor. An AUX contact on the contactor may then be wired into an input on the C441 Ethernet module for positive feedback as to the state of the contactor. The C441R Ethernet module has 120vac inputs for this purpose and the C441T has 24vdc inputs for this purpose. This application example will show how to configure a CompactLogix PLC with an embedded Ethernet/IP port to poll a C441 Motor Insight via Ethernet/IP and the C441R/T Ethernet module. This data will then be mapped to Input and Output tags in the CompactLogix.

Then, all that is left is to write the program to control and monitor the motor via the Motor Insight motor protection relay. The program energizes an output on the Motor Insight's Ethernet 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.

Part Numbers used for this Application Example

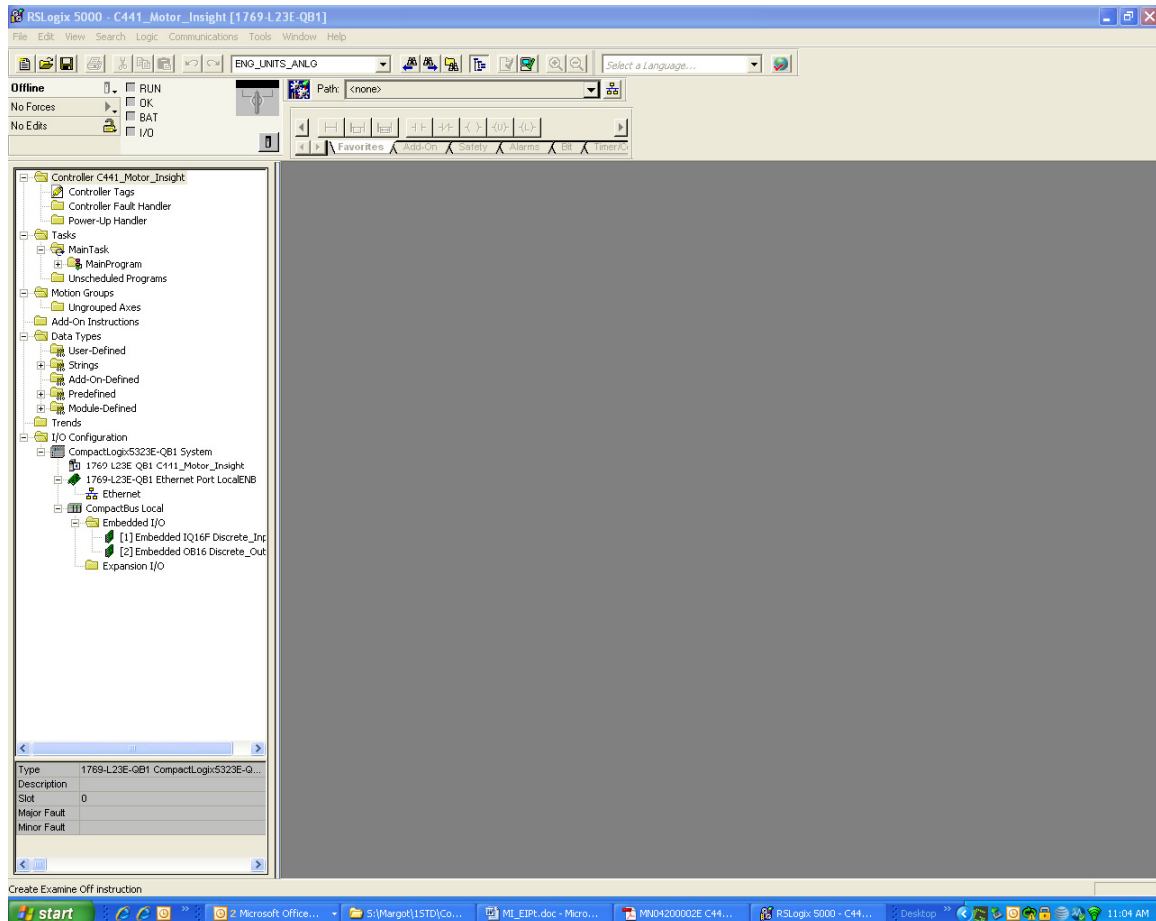
- | | |
|-------------------|--|
| (1) C441BA | 2 - 9A; 200-240VAC (50/60Hz) Motor Insight |
| (1) C441R/T | Ethernet interface module with I/O for the Motor Insight |
| (1) CN15DN3 | Freedom Contactor |
| (1) 1769-L23E-QB1 | CompactLogix PLC |

Configuring the Motor Insight for Ethernet Communications

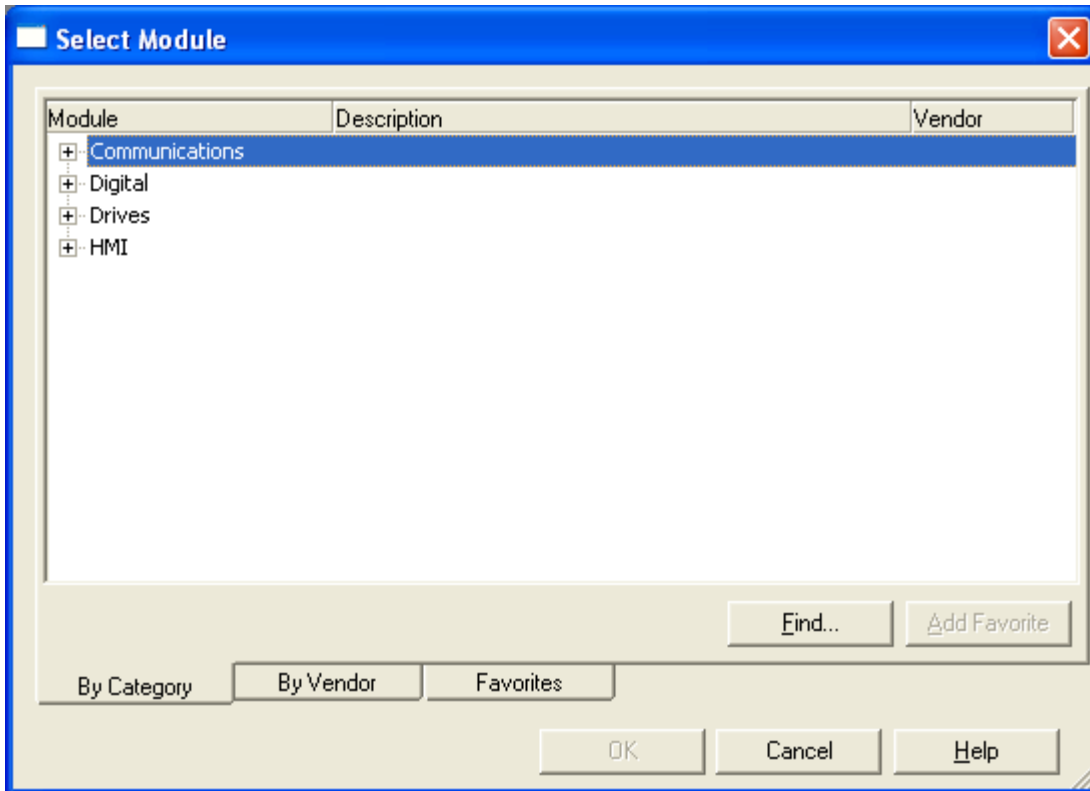
Refer to the user manual for Motor Insight, publication MN04209002E for information on configuring your Motor Insight for the motor it will be protecting and other features. The C441 Ethernet Interface module's IP Address can be initially configured via dip switches on the module. Section 4.2 in the Ethernet module's user manual describes the functionality of the dip switches with regard to configuring it for an initial IP Address so a final static IP Address can be set via its web pages. Be careful to use the label on the side of the module to determine the On/Off setting for these dip switches. Do not look at the dip switch module itself for the On/Off position for these switches.

Configuring the CompactLogix PLC to poll the Motor Insight via RSLogix5000

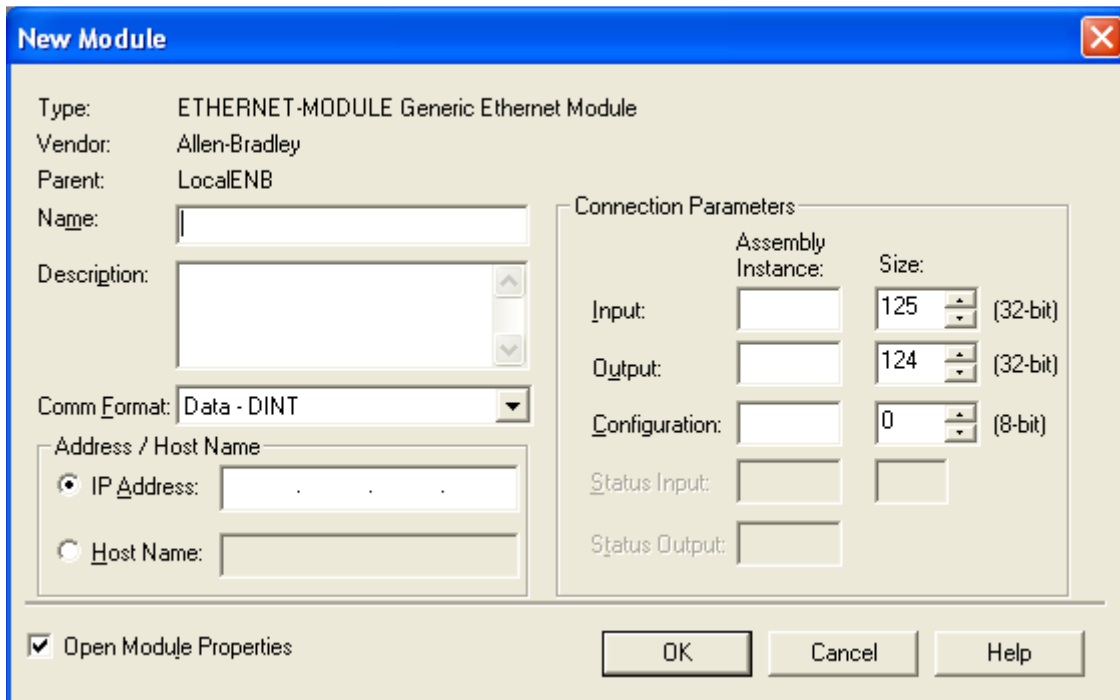
Create a project in RSLogix5000. On the left portion of the screen, under I/O Configuration and Ethernet is where the Ethernet/IP slave devices are configured for polling by the Ethernet/IP master, per the following:



For a CompactLogix PLC with embedded Ethernet port under I/O Configuration, right click on “Ethernet” then select “New Module” and the following window will open:



Click the plus sign to the left of Communications and select “ETHERNET-MODULE Generic Ethernet Module” near the bottom of the list. Click OK and the following window will open:



1. Enter a name like C441 or Motor Insight. This will be used for the tags that RSLogix5000 creates for this device.
2. Choose a Comm Format. Data-SINT must be used because the Output Assemblies for the C441 are all 1 byte.
3. Enter the IP Address of the C441
4. Enter the following for the Connection Parameters. Any of the I/O assemblies shown in the C441 Ethernet manual may be used. For this example Input Assembly 110 and Output Assembly 105 are used.
5. The Configuration file is not used, but something must be entered.

The screenshot shows the 'Module Properties' dialog box for 'eip_scanner_10 (ETHERNET-MODULE 1.1)'. The dialog is divided into several sections:

- General Information:**
 - Type: ETHERNET-MODULE Generic Ethernet Module
 - Vendor: Allen-Bradley
 - Parent: eip_scanner_10
 - Name: C441
 - Description: (Empty text box)
- Communication Settings:**
 - Comm Format: Data - SINT
 - Address / Host Name:
 - IP Address: 192 . 168 . 1 . 3
 - Host Name: (Empty text box)
- Connection Parameters:**

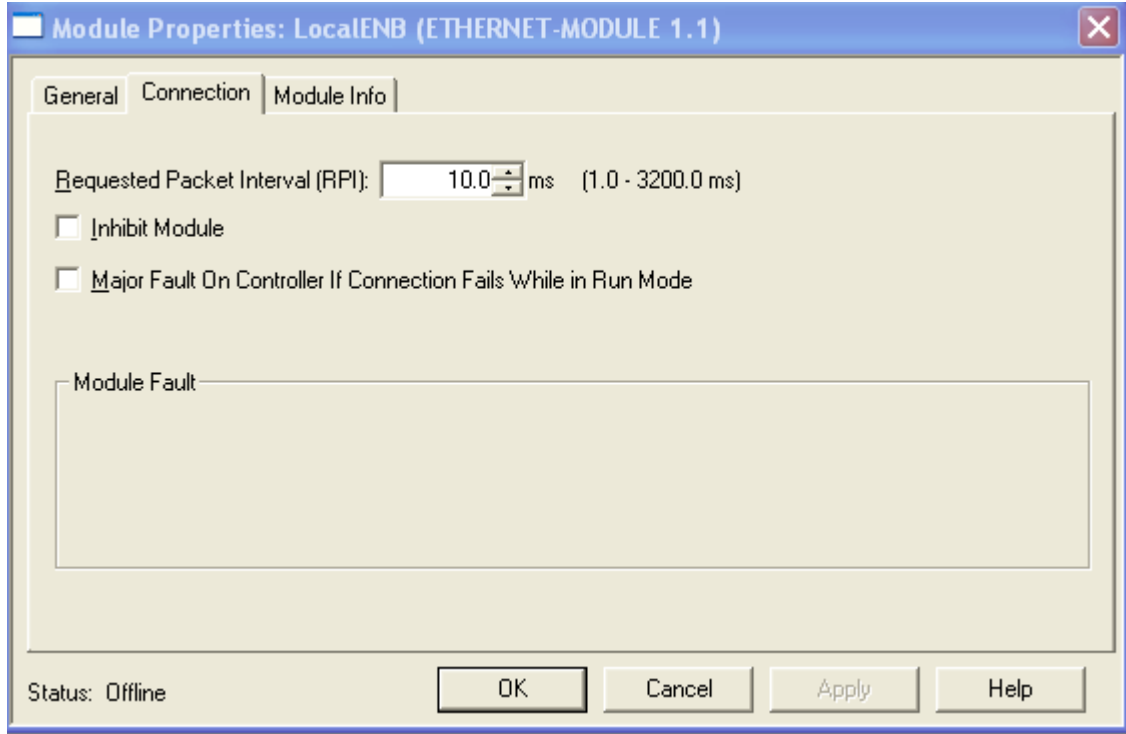
	Assembly Instance:	Size:	
Input:	110	20	(8-bit)
Output:	105	1	(8-bit)
Configuration:	1	0	(8-bit)
Status Input:			
Status Output:			

At the bottom of the dialog, there are five buttons: Cancel, < Back, Next >, Finish >>, and Help.

When using a ControlLogix PLC the Ethernet/IP scanner is a separate module and must be added to the I/O Configuration first. Then the Ethernet/IP slave devices are added under it.

1. Right click on the “1756 Backplane” and select “New Module”.
2. Then under Communications, select the Ethernet/IP scanner being used, such as the 1756-ENBT.
3. Then right click on “Ethernet” and select “ETHERNET-MODULE Generic Ethernet Module” as before. From this point, follow the steps above for the CompactLogix PLC.

After clicking OK to the New Module screen above, the following window will open:



Typically it's best to use the default value for RPI. The Module Info tab is used online only to view Product information and status.

Note: right click on "1769-L23E-QB1 Ethernet Port LocalENB" to open the Properties screen for the Ethernet/IP scanner. Enter the IP Address for the Ethernet/IP scanner here. Also, the Port Configuration tab may contain a different IP Address than was set offline on the General tab. This tab can only be viewed and modified online. So, once the project is downloaded to the controller, go online and open the property pages for the L23E controller to verify that the IP Address on the Port Configuration tab matches the one set on the General tab. If not, change the IP Address on the Port Configuration tab to match the one entered on the General tab. Then click the SET button to save it to the controller.

Click OK to the Module Properties screen and tags will be created under Controller Tags for the C441 Motor Insight. Since the Name used for this device was C441, that is what RSLogix5000 uses for the tag names for the device as follows:

Name	Value	Style	Data Type	Description	Alias
+ C441:C	{...}		AB:ETHERNET_MODULE:C:0		
+ C441:I	{...}		AB:ETHERNET_MODULE_SINT_20Byt...		
+ C441:O	{...}		AB:ETHERNET_MODULE_SINT_1Byte...		
+ Local:1:C	{...}		AB:Embedded_IQ16F:C:0		
+ Local:1:I	{...}		AB:Embedded_IQ16F:I:0		
+ Local:2:C	{...}		AB:Embedded_OB16:C:0		
+ Local:2:I	{...}		AB:Embedded_OB16:I:0		
+ Local:2:O	{...}		AB:Embedded_OB16:O:0		

Note that Configuration (C441.C), Input (C441.I) and Output (C441.O) tags have been created. Each will be set to the length entered on the Properties screen for the C441, except the Configuration tags. Since these tags are not used, they can be ignored. The Input and Output tags will correspond to the I/O layouts for the I/O Assemblies chosen. The layouts for the I/O Assemblies are shown in the C441 Ethernet module user manual, chapter 6. This Ethernet module interfaces the C441 OL, the C440 OL and the S611 soft starter to Ethernet/IP. So, be sure to look at the C441 Motor Insight section in Chapter 6 for the I/O assembly information.

When the program is downloaded, if the C441 is properly connected to the Ethernet/IP master via an Ethernet network, the I/O LED on the controller will be solid green if there are no errors. This same LED is represented online in RSLogix5000 as well. If the LED is flashing green, there is an issue with the Ethernet connection to the C441. The Connection tab for the C441 Properties will provide a fault code and description of the fault.

Supporting Documentation:

Manuals	Reference Number
Motor Insight User Manual	MN04209001E
C441 Ethernet Manual	MN04200002E

Additional Help:

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