MODBUS/DeviceNet Master
Software Development Guide
for Network Programmable
Model 777,777-P, CIO-DN, CIO-120-DN, COM-DN

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MODBUS MASTER SOFTWARE DEVELOPMENT GUIDE

This guide is addressed to systems integrators who will be developing software for a MODBUS master device to communicate with the Model 777 and 777Plus family of products. Experienced programmers should note that, Table 1and Appendix A contain the Model 777 memory maps.

The MODBUS master device would typically be a Programmable Logic Controller (PLC) or a Personal Computer (PC) that will communicate with one or more slave devices. A PLC normally would have the MODBUS command protocols and Cyclic Redundancy Check (CRC) word calculation routines built into it, so the programmer would not have to develop them. If programming a Personal Computer, these would have to be developed.

If programming a PC, it may be worth noting that it is the responsibility of the master controller to initiate communication. In other words, the master controller must be programmed to periodically poll the slave devices and initiate a request for data or to issue a command to the Model 777 to stop or reset the Model 777's control relay. When the Model 777 responds with the requested data or confirmation of the stop command, it is the responsibility of the master controller to determine if the information arrived correctly with no communication errors. If there are communication errors or if there is a time-out waiting for a response, it is the responsibility of the master controller to reissue the command to the slave device. If the response arrives correctly, the master controller is then required to further process the data to put it in a form suitable for viewing by an operator.

MODBUS Protocol on an RS-485 Network
The Model 777 uses the MODBUS protocol in Remote Terminal Unit (RTU) mode to receive commands and send information as a slave device on an RS-485 network. The RTU mode essentially means that the characters sent between the master and slave devices are binary numbers, not ASCII digits.

RS-485 uses a differential voltage signal to represent the zeros and ones. The RS-485 standard allows a single network to contain up to 4000 feet of shielded twisted-pair network cable. The cable only needs to be 22 or 24 gauge to transmit 4000 feet at 9600 baud. Refer to SymCom's *Installation Instructions for Model RS485MS-2W* for more information.

The MODBUS standard allows up to 255 devices on a single network, but the address restrictions of the Model 777 allow only 99 different addresses. In a practical sense, it is difficult to scan more than 20 or 30 devices in a timely manner.

Special Hardware

Each Model 777 requires a Model RS485MS or RS485MS-2W Communication Module to connect to the RS-485 network. It is important to recognize that the nine-pin connector on the Model 777 is NOT an RS232 connector! The Communication Module provides electrical isolation from the high voltages present in the Model 777 and it also converts the 5 volt signals from the microcontroller to RS-485 levels.

MODEL RS485MS-2W COMMUNICATION MODULE

The Model RS485MS or RS485MS-2W Communications Module serves two very important functions. The module electrically isolates the communications network from the high voltages present in the Model 777 and also converts the communications signals from the microcontroller's 5 volt levels into RS-485 levels.

The Model 777 is connected to high AC voltages with a floating ground circuit. As long as there are three balanced line voltages present, the resulting ground level will often be near case ground. However, if one phase is lost or if the line voltages become unbalanced, the floating ground may be as much as 480 volts above the case ground. The Communication Module has two high speed optical isolation chips on the Receive and Transmit pins and a low speed opto-isolator on the Transmit/Receive pin to isolate the communication network from the AC line voltages. In addition, a separate isolated power supply system provides power for the transceiver used for RS-485 level conversion. The Model RS485MS-2W also provides a power source for a remotely mounted Model RM-1000.

The second function of the Communication Module is to convert the microcontroller signal levels to RS-485 levels. The microcontroller is a CMOS unit with 0 and 5 volt levels. The signals from the microcontroller go through resistors to provide current-limiting before connecting to the 9 pin external connector. Therefore, the 9 pin sub-d connector on the Model 777 provides un-isolated CMOS signals and is **NOT** RS232 or TTL compatible.

IMPORTANT

DO NOT PLUG A MODEM OR ANY OTHER PC-COMPATIBLE SERIAL DEVICE INTO THE 9-PIN CONNECTOR OF THE 777!

Master Device I/O Port

Your MODBUS master device should have an RS-485 port. If your master device only has RS-232 ports, an RS-232 to RS-485 converter will be required. Before ordering a converter, you may need to know if you can program your master device to independently control the RTS line. Some RS-232 to RS-485 converters use the RS-232 signal called RTS (Request-To-Send) to turn on the RS-485 lines before transmitting a command. If your master device cannot control the RTS line, you will need to order an RS-232 to RS-485 converter that automatically turns on the RS-485 line whenever a command is being written.

Communication Parameters

The default communication parameters for a standard Model 777 are:
9600 baud **EVEN** parity **8** data bits **1** stop bit

Bench Testing Communications

You can apply ordinary single phase 120VAC power to a 480 volt Model 777 on the L1 and L2 terminals and set the operating parameters. Some of the earliest Rev B models may require higher voltages, such as 125 to 140VAC to set the operating parameters. However, you must supply 160VAC if you want to test the communications with the Model RS485MS or RS485MS-2W connected. If you only have 120 volt power available, you may need to use a 2:1 step up transformer to supply 240VAC to conduct the communications test.

Note that the Model 777 will not start with only L1 and L2 connected, but you can read the voltage registers to test the communications.

MODBUS Memory and Data Location Terminology / Register vs. Address

The MODBUS standard defines a memory location in terms of registers and addresses. The “register” numbering system starts Xxxxxx1 and goes up to X65536, where the leading X is a reference number that designates a register type. The “address” numbering system starts at 0 rather than 1 and does not contain a prefix. The prefix indicates which read and write functions should be used to get or set the corresponding location. The Modicon MODBUS Protocol Reference Guide refers to these XX references, such as 4X reference for holding registers. However, the MODBUS standard that can be found at www.MODBUS-ida.org does not use these “references”.

Older standards and products tend to use a 5-digit numbering system for registers. (Ex: 40,001 for the first holding register) However, other documentation is written using a 6-digit numbering system, which makes sense since MODBUS supports registers up to 65536. (Ex: 400,001 for the first holding register).

The “address” numbering system is defined in the standard to describe the message that is actually sent to the physical communications bus. By starting the addresses at 0 rather than 1 and by truncating the register type prefix or reference, the number of usable memory or data locations is maximized. This document will use the terms “address” and “location” interchangeably to refer to the actual address placed on the bus to get the intended piece of data.

Physical Address Versus Logical Address

In our older versions of documentation (DOC777-01 & DOC777-02), we often referred to the “physical” address which is the actual address used inside the Model 777 code. References to the “physical” address were dropped in DOC777-03 and DOC777-04. The “physical” address also happens to conform to the “register” number as defined by the MODBUS standard. The Model 777 takes the incoming logical byte address from the MODBUS command, increments it to point to the next byte, and then returns the number of words requested from physical memory. The “logical” address referred to the actual address that was sent on the communications bus. The “logical” address is/was less than the “physical” address. The logical address is equal to the ‘address’ as defined by the MODBUS standard. It should be noted that the “physical” and “logical” designations are actually opposite to what an end user might expect. An end user may consider the register numbers to be ‘logical’ addresses and the “address” to be physical, because the register is manipulated to come up with the “address” which is placed on the bus.

Some of the previous documents were written more from the perspective of the product designer rather than that of the end user. To better conform to the standard nomenclature, this document will be written more from the end user perspective using the “register” and “address” terminology as defined by the MODBUS standard. By clearly defining both the “register” and “address” numbering systems, this document should be equally clear to those that are using software utilities that use the “register” or “address” location numbering systems and those that are writing their own software to talk to the Model 777 family of products.

Model 777 Commands

The Model 777 will respond to four MODBUS commands.

1. **INSTRUCTION CODE 03 Read Holding Registers - to read a block of words**
   The 03 code is used to read data from the Model 777.

2. **INSTRUCTION CODE 04 Read Input Registers - to read a block of words The**
   04 code is used to read data from the Model 777.

3. **INSTRUCTION CODE 06 Preset Single Register - to write one value**
   The 06 code is used to send a command to stop the motor attached to the Model 777. The 06 code can also be used to modify the setpoints of the Model 777.

4. **INSTRUCTION CODE 16 Preset Multiple Registers (777 Supports only 1 register write)**
   The 16 code is used to modify the setpoints of the Model 777.

Broadcast is not supported.

Read Command Example

A typical request for a model 777 would be to ask for the 4 voltages starting at address 43, or 2B hexadecimal, which are the Voltage in Phase C-A, the Voltage in Phase B-C, the Voltage in Phase A-B, and the Average Voltage. In the example below, the values will be returned as 481, 476, 483 and 480 volts for these variables.

Assume that the Model 777 has been programmed with a device address of A02. The MODBUS command message from the master device to a slave device would look like:

Byte	Contents	Example (in Hex)	
1	Address of Slave Device	02	
2	Command to Slave Device	03	
3	High Byte of Address	00	(Address of VCA)
4	Low Byte of Address	2B	
5	High Byte of Number of Words	00	(Read 4 words)
6	Low byte of Number of Words	04	
7	LOW byte of CRC word	34	
8	HIGH byte of CRC word	32	

The above sequence would be a request to read 4 words (8 bytes) starting at address 43. The normal response from the slave device to the master device would look something like:

Byte	Contents	Example (in Hex)	
1	Address of Slave Device	02	
2	Echo of Command to Slave Device	03	
3	Number of Bytes sent back	08	
4	High Byte of Word at 002C	01	(VCA = 481)
5	Low Byte of Word at 002C	E1	
6	High Byte of Word at 002E	01	(VBC = 476)
7	Low Byte of Word at 002E	DC	
8	High Byte of Word at 0030	01	(VAB = 483)
9	Low Byte of Word at 0030	E3	
10	High Byte of Word at 0032	01	(VAVG = 480)
11	Low Byte of Word at 0032	E0	
12	LOW byte of CRC word	8A	
13	HIGH byte of CRC word	41	

The voltage values listed would be values that might be expected from a 480 volt system.

***Note*:** The CRC (Cyclic Redundancy Check) word is sent with the Low byte first followed by the High byte.

The CRC bytes are sent in a different order from the order of the Address and Number-Of-Words-To-Send words. The Address and Number-Of-Words-To-Send words are sent with the high byte first followed by the low byte.

Write Command Example

If a Model 777 has been programmed with a device address of A01, the command to turn off the relay would be:

Byte	Contents	Example (in Hex)	
1	Address of Slave Device	01	
2	Command to Slave Device	06	
3	High Byte of Address	00	(Address of COMLINE)
4	Low Byte of Address	64	
5	High Byte of Value to write	00	(Sending STOP command)
6	Low Byte of Value to write	DD	
7	LOW byte of CRC word	08	
8	HIGH byte of CRC word	4C	

The above sequence would be a request to write 1 byte starting at address 100, or 64 hexadecimal, which is the address of the command word, COMLINE. Refer to Appendix A (Table 64 and **Table** 65) for more information about Model 777 commands.

The normal response from the Model 777 is to echo the same byte sequence back to the master device. This is a confirmation that the command was carried out.

CRC Testing

If you need to test your CRC calculations, you can generate a STOP command exactly like the one above and compare the CRC bytes that your program generates with the CRC bytes listed above. If you set the Model 777's address to A01 and send the above string, the Model 777 should turn off its relay and the display should show "**oFF**". If the first six bytes are exactly like the above sequence, the Model 777 will ONLY respond correctly if the CRC bytes are also exactly like the above sequence. If the Model 777 receives any other CRC bytes, it will assume a communication error occurred and will NOT turn off its relay.

NOTE: If you are using an oscilloscope to capture the sequence of bits that are being transmitted, note that the MODBUS RTU mode specifies that the LEAST significant bit of each byte is transmitted first. Thus, for the sequence above, you would see a Start bit, followed by a high, then low, low, low, then low, low, low, low, followed by the Parity and Stop bits for the first byte (01 hex) sent.

Similarly, the command to reset the same Model 777 would be:

Byte	Contents	Example (in Hex)	
1	Address of Slave Device	01	
2	Command to Slave Device	06	
3	High Byte of Address	00	(Address of COMLINE)
4	Low Byte of Address	64	
5	High Byte of Value to write	00	(Sending RESET command)
6	Low Byte of Value to write	AA	
7	LOW byte of CRC word	48	
8	HIGH byte of CRC word	6A	

Again, note the CRC bytes. These STOP and RESET command examples are excellent test commands to verify CRC calculations and communication problems since the only thing that will change in a particular installation is the address of the Model 777 and, of course, the CRC bytes. For example, if the Model 777 has been programmed with device address A11, then the series of bytes would be:

Byte	Contents	Example (in Hex)	
1	Address of Slave Device	0B	
2	Command to Slave Device	06	
3	High Byte of Address	00	(Address of COMLINE)
4	Low Byte of Address	64	
5	High Byte of Value to write	00	(Sending RESET command)
6	Low Byte of Value to write	AA	
7	LOW byte of CRC word	48	
8	HIGH byte of CRC word	C0	

Notice that in this example, only the Address of the Model 777 and the CRC bytes have changed from the series of bytes sent to the Model 777 at device address A01.

READING VERSUS WRITING SETPOINT VALUES (Legacy)

It is important to note a distinction between reading byte values listed in Appendix A (**Table** 63), the Limits or Setpoint block, and writing byte values to change operating parameters of the Model 777.

> Note: When reading byte values, the MODBUS READ command (03) will return two bytes for every word requested. When writing to a variable that is listed as a single byte, the MODBUS WRITE command (06) will only modify the single byte specified by that address.

As an example, if we send a MODBUS Read command (03) to read OC, the Over Current Trip Limit, starting at address 236 and read 1 word, we would receive the values for both OC (the Over Current Trip Limit), and UC (the Under Current Trip Limit).

When writing to a single byte value, ONLY the byte at that address will be changed. In other words, if we wanted to change UC (the Under Current Trip Limit), we would write a single byte, such as a value of 25 to address 237 and it would only change the single byte that represents UC (the Under Current Trip Limit).

The Write command sends a zero as the High Byte of the data, which would seem to write a Zero value into the byte representing OC, the Over Current Trip Limit. However, the Model 777 is specifically scanning each write address and determining if it is a single byte value or a double byte value. In this case, only the Under Current Trip Limit byte would be changed. The Over Current Trip Limit byte would not be changed.

Currently, the only two byte values that can be modified by a MODBUS Write command (06) are:

Address	Code	Description
211	LKMSK	Field Change Lock Mask
215	HKW	High Kilowatt Trip Limit
221	LKW	Low Kilowatt Trip Limit
230	LV	Low Voltage Trip Limit
232	HV	High Voltage Trip Limit

All other Read/Write values can only be modified by writing a single byte to the address.

A second implication of this is that you can read from certain addresses, but you cannot write to them. For example, you can send a read command to start reading address 231 and you will receive the low byte of the Low Voltage Trip Limit and the high byte of the High Voltage Trip Limit. But if you try to write to address 231, you will receive a Negative Acknowledgement (NAK) code indicating an invalid address.

Number of Write Operations
The Model 777 Limits are stored in Electrically Erasable Programmable Read Only Memory (EEPROM). EEPROM has a finite number of write cycles before the memory is unable to hold a new value. The current implementation of the Model 777 is rated at 100,000 writes to the EEPROM.

If an application were programmed to re-write a given setpoint too often, the EEPROM could be unable to hold the value. In earlier versions of the Model 777, the setpoints had to be changed by pressing and releasing the RESET button, so it would take a concerted effort to cycle the setpoints too many times, but a network application could easily write a value too many times. For example, if an application wrote the HV or High Voltage limit once every second for 24 hours a day, in less than 12 days the 100,000 limit could be exceeded.

If there is a concern about the setpoints being changed by an operator, the application should read the value of the setpoints and compare them to the desired setpoints and only change the setpoints when a discrepancy is detected.

The Model 777 Limits can be read indefinitely without degradation of the EEPROM.

Special Notes When Using the 4X Addresses

Some software packages, such as Human-Machine-Interface (HMI) software packages for PLCs, can only use registers from 400001 to 465536 in the MODBUS 03 and 06 commands.

If this is the case, add 400001 to the addresses in the tables to select the start of the data to read. Many of these software packages will automatically subtract the 400001 part of the address before sending the actual address in the MODBUS command. However, notice that the addresses in Appendix A refer to the Starting Address. These addresses do NOT represent a typical 4X register address.

Processing Byte Data

The Model 777 is byte-oriented. Some MODBUS slave devices are word-oriented and return the value of one variable in each word requested. In the previous Read examples, where the voltages are being read, each word in the response contains two bytes that represent a value for only one variable. However, there are instances where the Model 777 will return 2 bytes for each word requested, but each byte contains data from two different variables.

If you look at Appendix A (**Table** 62), Run Time Information for VUNBAL (Voltage Unbalance) and CUNBAL (Current Unbalance), you will see an example of this. If you request one word starting at address 40061, you will get both the Voltage Unbalance and the Current Unbalance values returned in one word. If you request one word starting at address 40062, you will get both the Current Unbalance and the Current Multiplier returned in one word. Your application will have to separate the High byte value from the Low byte value.

If your master device's programming language does not have byte-wise AND and SHIFT functions, you may have to treat the word as an integer and divide by 256 to get the High byte value. Then multiply the result by 256 and subtract that from the original word to get the Low byte value.

As an example, assume the voltage unbalance is 2% and the current unbalance is 5%. If we read starting location 40061, the Model 777 will return the 16 bit value 517. If we divide 517 by 256, we get VUNBAL, the voltage unbalance, which is 2%. If we multiply the resulting value (2) by 256, we get 512. If we subtract 512 from 517, we get CUNBAL, the current unbalance, which is 5%.

Internally Mapping Byte Addresses (Legacy)

Since the addresses in Appendix A represent BYTE addresses, not WORD addresses, you may have to interpret the data based on a different address map used internally in your application. As an example of what would be a typical read request, assume we want to read all of the Run Time information in a single read block. If you start reading at REGISTER 40044 and ask for 15 words, you would expect to fill internal registers 40044 through 40058. You could consider the resulting internal memory map to look like:

Model 777

Internal 4X Register	Address	Description
40044	43	Voltage from Phase C to Phase A
40045	45	Voltage from Phase B to Phase C
40046	47	Voltage from Phase A to Phase B
40047	49	Average Voltage
40048	51	Current in Phase C
40049	53	Current in Phase B
40050	55	Current in Phase A
40051	57	Average Current
40052	59	Voltage Unbalance * 256 + Current Unbalance
40053	61	Current Multiplier * 256 + Power factor angle
40054	63	Ground Fault Current * 256
40055	65	Remaining Rapid Cycling Restart Delay
40056	67	Remaining Normal Restart Delay
40057	69	Remaining Undercurrent Trip Restart Delay
40058	71	Motor Run Hours

Note that the addresses in the first column represent only addresses used inside your application. Based on the table above, you might be tempted to read the three current registers by issuing a READ command starting at address 40048 and ask for 3 words. This will not return the currents.

Instead, you need to use the 4X STARTING address from Appendix A and then re-interpret the resulting internal register addresses. For example, in order to read only the three current values, you need to use the starting REGISTER 40052 and ask for 3 words. The data will then appear to be mapped for your application as:

Model 777

Internal 4X Register	Address	Description
40052	51	Current in Phase C
40054	53	Current in Phase B
40056	55	Current in Phase A

If this causes problems in your application, it might be best to pick a starting address block and always ask for the same starting address and number of words in order to read the data from the Model 777.

Similarly for reading the Setpoint values, you could ask for a single block of data starting at location 230 and request 11 words. The equivalent internal register map would look like:

Model 777

Internal 4X Register	Address	Description
40231	230	LV (Low Voltage Trip Limit)
40232	232	HV (High Voltage Trip Limit)
40233	234	VUB * 256 + MULT
40234	236	OC * 256 + UC
40235	238	CUB * 256 + TC
40236	240	RD1 * 256 + RD2
40237	242	RD3* 256 + #RU
40238	244	#RF * 256 + UCTD
40239	246	GF * 256 + LF1
40240	248	LF2 * 256 + LF3
40241	250	LF4 * 256 + ADDR

However, for writing Setpoint values, the (MODBUS) address listed in Appendix A (**Table** 63) is required to write a value. See the section "READING VERSUS WRITING SETPOINT VALUES" for more information. As an example, if you wanted to reset the UC value. You would read the Setpoint values as a block, and mask off the UC setting at internal 4X address 40234 in order to determine the present value. If the UC was set to 20 and you wanted to change it to 15, you would have to write the new value, 15, to register 40238 (per Table 1) in order to change the UC value. Then you may want to re-read the entire block starting at register 40231, requesting 11 words, in order to verify that the UC value did change.

DATE RELATED FEATURES
Over time, certain features have been added to the basic Model 777. Often, the date of manufacture will allow you to tell if a particular Model 777 has a certain feature or not.

Date Code
The date of manufacture is coded in the Model 777 serial number. You should see the serial number on the Model 777 sticker in the form 777VYYMMSSSS. The YYMM portion is the year and month representing the date of manufacture. The V represents the voltage and SSSS represents a serial build number.

Older Protocol
The Model 777 was initially developed with a proprietary communications protocol from Cimetrics. Generally speaking, units built since the middle of 1997 have used the MODBUS protocol. However, certain versions continued to use the Cimetrics protocol for a period after that. The MODBUS protocol was listed as Option 11. During the late 1990's, all Model 777's with MODBUS protocol had a label with "MODBUS" printed on it near the 9 pin sub-d connector.

If you have any older Model 777's that have the Cimetrics protocol, contact SymCom at 800-843-8848 for upgrade details.

Network Programming and Motor Run Hours
Model 777's built before September 2001 were not network programmable. In other words, you could not use the MODBUS 06-Write command to change the setpoints. Also the Motor Run Hour (MRH) information was not available before this date.

If the date code is prior to 0109 (Year = 2001, Month = Sept), the Model 777 will have to be updated if you require network programming. Please contact SymCom for information about upgrades.

Clearing Last Fault
Model 777's built before February 2002 did not respond to a CLEAR LAST FAULT Command (hexadecimal 77). The CLEAR LAST FAULT command was added at the same time that the "cLr" function was added to the Ground Fault position on the front of the Model 777.

These units can be identified by turning the Model 777's MODE SELECT switch to the "GF" mode. Note the Ground Fault reading. Turn the DISPLAY/PROGRAM pot fully clockwise. Press and hold the RESET/PROGRAM button. You should see "Loc" in the Model 777 display. Slowly rotate the DISPLAY/PROGRAM pot counterclockwise. You should see "Loc" followed by "unL". If you continue turning the pot and you see "cLr", the unit has the Clear Last Fault feature. If you only see "Loc" and "unL", then the unit does not have this feature. Be sure to turn DISPLAY/PROGRAM pot to the unL or Loc setting before releasing the RESET/PROGRAM button so that you don't accidentally change the Ground Fault setting.

KW Units
Currently, only the Model 777 KW's have the Kilowatt information (RTKW) available. If you have a Model 777 KW, you will not be able to set the UnderCurrent Limit (UC) to anything other than 0 (No UC trip). If you have a regular Model 777, you will not be able to set the Low Kilowatt Limit (LKW) to anything other than 0 (OFF).

You should also be aware that the Model 777 KW units do not allow the Under Current Trip Delay to be set by the front of the Model 777. That position is taken up by the KW Input Scaling Factor. It is still possible to change the Under Current Trip delay for KW units, but it must be done by using a MODBUS master device to send a Write (06) command to change the UCTD setpoint at address 245.

Related Documentation
SymCom can provide documentation for connecting Model 777's in an RS-485 network (*Installation Instructions for Model RS485MS-2W*). Documentation is also available which describes troubleshooting RS-485 communication problems using an oscilloscope (*Advanced RS485 & Modbus Troubleshooting*). If you need to develop MODBUS master Software for an RM-2000, request the *RM-2000 Software Development Guide*.

PROCESSING THE RUN TIME INFORMATION (Legacy)

Current Multiplier
The Current Multiplier for the Run Time (RTMULT) information is a Read-Only, single byte value at address 61 which can be interpreted as an integer with a value 0 to 255 decimal.

For Multiplier values 1-10: Actual Current = Raw Current / (Multiplier * 10)

For Multiplier value 11: Actual Current = Raw Current * 0.4

For Multiplier values 12 - 79: Actual Current = Raw Current * Multiplier / 20

For Multiplier values 80-200: Actual Current = Raw Current / (Multiplier)

For Multiplier values >200: Actual Current = Raw Current * (Multiplier - 200) / 40

Restart Delays Remaining
The restart delay remaining times (RD1R, RD2R, and RD3R) need to be multiplied by 0.569 to be converted to seconds. RD2R and RD3R read out in seconds even though the limit is in minutes.

Restart Delay Remaining (seconds) = [Restart Reading] * 0.569

Power Factor
You must take the Cosine of the power factor angle to calculate the Power Factor.

Power Factor = Cos([power factor angle])

The power factor angle is read as a value in degrees. If your Cosine function requires the angle to be expressed in *radians*, you can convert degrees to radians by multiplying by (Pi / 180.0)

Voltages
The voltages read correctly as integer values. No calculating is necessary to display the same value that the Model 777 displays.

Note that some installations have Potential Transformers (PT's) installed to reduce to voltage to the Model 777. If this is the case, your application may require a voltage multiplier to scale the voltage readings back up to the actual value. This is usually required for a Medium Voltage unit like the 777-MV.

Kilowatts
The kilowatts need to be divided by 100.

Kilowatts = [KW reading] / 100

PROCESSING THE LIMIT (SETPOINT) INFORMATION (Legacy)

Current Multiplier
The Current Multiplier for Limits (MULT) is a Read/Write single byte value at address 235 which can be interpreted as an integer with a value 0 to 255 decimal. It applies directly to OC (the Overcurrent Trip Limit) and to UC (the Undercurrent Trip Limit). GF (the Ground Fault Trip Limit) uses the MULT factor, but the Ground Fault Trip Limit must also be divided by 10.

For Multiplier values 1-10: Trip Limit = Raw Limit value / Multiplier

For Multiplier value 11: Trip Limit = Raw Limit value * 4.0

For Multiplier values 12 - 79: Trip Limit = Raw Limit value * Multiplier / 2

For Multiplier values 80-200: Trip Limit = (Raw Limit value * 10) / (Multiplier)

For Multiplier values >200: Trip Limit = Raw Limit value * (Multiplier -200) / 4

NOTE: MULT values of 1-10 represent a loop count for the standard Model 777. Values 11 and greater represent CT ratios. Refer to Table 5 though Table 7 for the CT ratio represented by a particular value.

Ground Fault Trip Limit

If the raw Ground Fault limit (GF) reads 255 (FF hex), the unit will not trip on a Ground Fault.
The Ground Fault limit uses the Limits Current Multiplier (MULT), but the calculations are similar to the Run Information current calculations, since the raw Ground Fault value is 10 times actual. For example:
For Multiplier values 1-10 Ground Fault Limit = Raw GF value / (Multiplier * 10)
Etc.

Unbalance Limits

If either the voltage (VUB) or current (CUB) unbalance limit is 255 (FF hex), the unbalance limit is turned OFF.

Restart Delays

The RD1, RD2 and RD3 limits are one half of the actual setting. Therefore the readings must be multiplied by 2 to get to the actual limit setting. For the standard Model 777, the RD1 Restart Delay is in seconds, and the RD2 and RD3 delays are in minutes.

Number of Restarts after an Undercurrent Fault

If #RU reads 255 (FF hex), the unit will automatically restart after all undercurrent faults.
Note that if #RU is zero, the unit will not start after an undercurrent fault until the Reset button is pressed or a RESET command is sent to the Model 777.

Number of Restarts after any other Fault

The #RF value contains certain bit settings. If Bit 0 (the least significant bit) is set, the Number of Restarts will apply to over current faults. Bits 1 through 3 represent the Number of Restarts. A value of 0 to 4 is the Number of Restarts. If the value is 5, the unit will automatically restart after any other fault.

As an example, if #RF contains the decimal value 11, it represents the bit pattern “0 0 0 0 1 0 1 1”. This means that the unit will automatically start after other faults, including over current.

Low Kilowatt Trip Limit

If the Low Kilowatt trip limit (LKW) reads 0, the unit will not trip on Low Kilowatts.

If you are programming a 777-KW from a PLC, you can set LKW to any value from 0 to 65000 (650 KW), regardless of the KW Input Scaling Factor. If you are programming a 777-KW unit from the front panel, you must first set the Input Scaling Factor (1 through 4) and then set the Low Kilowatt Limit.

High Kilowatt Trip Limit

If the High Kilowatt trip limit (HKW) reads 65535, the unit will not trip on High Kilowatts. Also, if bit 7 of ENDIS is clear, the unit will not trip on High Kilowatts.

If you are programming a 777-KW from a PLC, you can set HKW to any value from 0 to 65535. If you are programming a standard Model 777, the HKW value can only be set to 65535. The HKW value cannot be set from the front panel of the 777.

Enable/Disable Trip Bits

If bit 7 of ENDIS is clear, the unit will not trip on High Kilowatts. Future bit definitions are reserved.

WRITING LIMIT (SETPOINT) VALUES (Legacy)

Table 1 - Limits Information for Network Programming

Addr	4X Write REGISTER	Code	Description	Bytes	Min Value	Max Value
211	40212	LKMSK	Field Lock Mask	2	0	65535
214	40215	ENDIS	Enable/Disable Trip	1	0	255
215	40216	HKW	High Kilowatt Trip Value = KW * 100	2	0	65535 (Disabled)
221	40222	LKW	Low Kilowatt Trip Value = KW * 100	2	0	65000 (650 KW)
. . .						
For Model 77C						
226	40227	LIN	Linear OC Trip Delay	1	2	60 (seconds)
227	40228	TU	Time Units	1	0	3
. . .						
For Model 601						
226	40227	HF	Over Frequency (35.0 + Value/5 i.e. 0=35.0, 200=75.0)	1	0	200
227	40228	LF	Under Frequency	1	0	200
228	40229	TD1				50
229	40230	TD2				50
. . .						
For All Models						
230	40231	LV	Low Voltage Trip	2	170	< HV, 524
232	40233	HV	High Voltage Trip	2	172, > LV	528
234	40235	VUB	Voltage Unbalance	1	2	15, (255=Disable)
235	40236	MULT	Current Multiplier (See Table 5-Table 7)	1	1	255
236	40237	OC	Over Current Trip	1	20, > UC	100
237	40238	UC	Under Current Trip	1	(0=Disable), 10	< OC, 98
238	40239	CUB	Current Unbalance	1	2	25, (255=Disable)
239	40240	TC	Trip Class (133, 138, 143, 148, 158 with Jam)	1	5, 10, 15, 20, 30 (Add 128 for Jam)	
240	40241	RD1	Restart Delay 1 Value = 1/2 of RD1 Time. (RD1 time = 0 to 500 seconds)	1	0	250
241	40242	RD2	Restart Delay 2 Value = 1/2 of RD2 Time. (RD2 time = 2 to 500 minutes)	1	1	250
242	40243	RD3	Restart Delay 3 Value = 1/2 of RD3 Time. (RD3 time = 2 to 500 minutes)	1	1	250
243	40244	#RU	Restarts (After UC)	1		
244	40245	#RF	Restarts (Other trips) Num. Restarts = 0,1,2,3,4 or 5 (5=Auto) RF value = (2 x Num. Restarts) (+ 1 for OC)	1		11
245	40246	UCTD	UC Trip Delay	1	2	60 (seconds)
246	40247	GF	Ground Fault (x 10) (3.0 to 20.0 amps)	1	200	200

Table 2. Limit Information By Model

Variable	777	777HVR	777575	777LR	777HVR-LR	777575-LR	777MV
Unit Code	1	2	3	11	12	13	31
Low Voltage	170-524	340-523	450-649	170-524	340-523	450-649	85-262
High Voltage	172-528	341-528	451-660	172-528	341-528	451-660	86-264
Curr. Mult	Table 5	Table 5	Table 5	Table 6	Table 6	Table 6	Table 7
Over Curr.	20-100	20-100	20-100	20-100	20-100	20-100	20-61
Under Curr.	0,10-98	0,10-98	0,10-98	0,10-98	0,10-98	0,10-98	0,10-45

Table 3 Model Codes - Addresses 253 and 254

Unit Code	Model
777	Model 777
77	Model 77C (Single phase voltage and current monitor)
601	Model 601 (3 phase voltage monitor only)

Table 4 Model Revisions - Address 224

Model	(Model Revision) Minor Software Revision	Model	(Model Revision) Minor Software Rev
777	04	777-KW	47
777-HVR	27	777-LR-KW	48
777-575	05	777-575-KW	50
777-LR	02	777-MV	38
777-HVR-LR	07		
777-575-LR	08		

MULT Current Multiplier Values

Table 5 For Standard Model 777:

1-10 = Looping Multiplier
11 = 100:5 CT's
12 = 150:5 CT's
16 = 200:5 CT's
24 = 300:5 CT's
32 = 400:5 CT's
40 = 500:5 CT's
48 = 600:5 CT's
56 = 700:5 CT's
64 = 800:5 CT's

Table 6 For LR models (Low Range)

100: 100:5 CT's
200: 200:5 CT's

Table 7 **For 777 MV (Medium Voltage)**

202 = 25:5 CT's
204 = 50:5 CT's
206 = 75:5 CT's
208 = 100:5 CT's
212 = 150:5 CT's
216 = 200:5 CT's
224 = 300:5 CT's
232 = 400:5 CT's
240 = 500:5 CT's
248 = 600:5 CT's

Table 8 - Fault Codes Used in the Model 777

Code	Definition
0	Cleared
1	High Voltage (Model 601)
2	Low Voltage (Model 601)
4	Contactor Failure
6	Single Phased Current
7	Ground Fault
8	Current Unbalance
10	Overcurrent
11	Undercurrent
13	Over Frequency (Model 601)
14	Under Frequency (Model 601)
15	Low Kilowatt Trip (Low Power)
16	PTC Off
17	High Kilowatt Trip (High Power)

Table 9 - Error Code bit values

Bit	Definition
0	Low Voltage
1	High Voltage
2	Voltage Unbalance
3	Under Current/Low KW
4	Reverse Phase Error
5	Current Unbalance
6	Voltage Single-Phase
7	Current Single-Phase

Table 10 - Overload Status bit values

Bit	Definition
0	Overload Detected
1	Ground Fault Detected
2	High KW
7	Relay ON

Table 11 - Trip Reason bit values

Bit	Definition
0	Fault Lockout
1	Network OFF Command
2	Contactor Failure
3	Undercurrent / Low KW
4	Over Current
5	Ground Fault
6	Current Unbalance
7	Current Single-Phase
8	Network PTC OFF Command
9	High KW trip

Table 12 - Network Status bits

Bit	Definition
0	Network Communication Watchdog Timer Enabled
1	Network Programming Enabled
2	Display Lock

Note: Only bit 0 is Writable, bits 1 & 2 are Read-Only. Refer to Appendix A (**Table** 65) for commands 68, 85, 136 & 153 to set and clear bits 1 and 2.

The 777-P uses a 16 bit memory map, where all setpoints and real-time values will be read and written as 2 byte numbers. The 777-P supports the legacy memory map that contains both 16 bit and 8 bit parameters. Because of this difference when reading OC, UC, GF setpoint from the legacy memory map, in some cases the values will not match the front panel display. This is caused by rounding by converting from an 8 bit memory map to a 16 bit memory map. All trip conditions are based on what is displayed on the front panel.

Table 13-Run Time Information (777-P)

DeviceNet C,I,A	16 Bit Modbus Address		Code and Description	Notes
	Hex	Dec		
29,01,A7	0x01	40002	MAJORVR Major: Minor Software Revision 777-P 777-HVR-P 777-575-P 777-LR-P 777-HVR-LR-P 777-575-LR-P 777-MV-P 777-KW/HP-P 777-KW/HP-575-P 777-KW/HP-HVR-P 777-KW/HP-LR-P	 0xrr04 0xrr27 0xrr05 0xrr02 0xrr07 0xrr08 0xrr38 0xrr47 0xrr50 0xrr52 0xrr48
29,01,A6	0x02	40003	UNITID Product Code 777-P 777-HVR-P 777-575-P 777-LR-P 777-HVR-LR-P 777-575-LR-P 777-MV-P 777-KW/HP-P 777-KW/HP-575-P 777-KW/HP-HVR-P 777-KW/HP-LR-P	 1 2 3 11 12 13 31 41 43 42 51
29,01,A6	0x03	40004	MODELCD Model Code	
2C,01,64	0x04	40005	Scale Factor Current Scale Factor	10 or 100
0F,21,01 29,01,C1	0x05	40006	OLSTAT OLSTAT bits	Bit 0: LV detected Bit 1: HV detected Bit 2: VUB detected Bit 3: UC detected or LPR[1] Bit 4: RP detected Bit 5: CUB detected Bit 6: vSP detected Bit 7: cSP detected Bit 8: OC detected Bit 9: GF detected Bit 10: HPR detected[1] Bit 11: LCV detected Bit 12: Reserved[2] Bit 13: Reserved[2] Bit 14: Reserved[2] Bit 15: Fault Relay Closed
0F,20,01 29,01,C0	0x06	40007	TRIPRN Trip Reason bits	Bit 0: Man. Reset required Bit 1: Off command issued Bit 2: Tripped on CF Bit 3: Tripped on UC or LPR[1] Bit 4: Tripped on OC Bit 5: Tripped on GF Bit 6: Tripped on CUB Bit 7: Tripped on cSP Bit 8: Tripped on PTC Bit 9: Tripped on Hpr[1] Bit 10: Tripped on LCV Bit 11: Reserved[2] Bit 12: Reserved[2] Bit 13: Reserved[2] Bit 14: Reserved[2] Bit 15: Reserved[2]
		Notes	1. Applies to 777-KW/HP-XXX-P 2. Reserved bits state is undefined	

Table 13-Run Time Information (777-P)

DeviceNet C,I,A	16 Bit Modbus Address		Code and Description	Notes	
	Hex	Dec			
NA	0x07	40008	LF1 Last Fault	Code	Definition
				0	Cleared
				1	Reserved[2]
				2	Reserved[2]
				4	Contactor Failure
				6	Single Phased Current
				7	Ground Fault
				8	Current Unbalance
				9	Reserved[2]
				10	Overcurrent
				11	Undercurrent
				12	Reserved[2]
				13	Reserved[2]
				14	Reserved[2]
				15	Low Kilowatt Trip (Low Power)[1]
				16	PTC Off
				17	High Kilowatt Trip (High Power)[1]
				18	Reserved[2]
				19	Low control voltage trip
NA	0x08	40009	LF2 Second to Last Fault	Code	Definition
				0	Cleared
				1	Reserved[2]
				2	Reserved[2]
				4	Contactor Failure
				6	Single Phased Current
				7	Ground Fault
				8	Current Unbalance
				9	Reserved[2]
				10	Overcurrent
				11	Undercurrent
				12	Reserved[2]
				13	Reserved[2]
				14	Reserved[2]
				15	Low Kilowatt Trip (Low Power)[1]
				16	PTC Off
				17	High Kilowatt Trip (High Power)[1]
				18	Reserved[2]
				19	Low control voltage trip
NA	0x09	40010	LF3 Third to Last Fault	Code	Definition
				0	Cleared
				1	Reserved[2]
				2	Reserved[2]
				4	Contactor Failure
				6	Single Phased Current
				7	Ground Fault
				8	Current Unbalance
				9	Reserved[2]
				10	Overcurrent
				11	Undercurrent
				12	Reserved[2]
				13	Reserved[2]
				14	Reserved[2]
				15	Low Kilowatt Trip (Low Power)[1]
				16	PTC Off
				17	High Kilowatt Trip (High Power)[1]
				18	Reserved[2]
				19	Low control voltage trip
		Notes	1. Applies to 777-KW/HP-XXX-P 2. Reserved bits state is undefined		

Table 13-Run Time Information (777-P)

DeviceNet C,I,A	16 Bit Modbus Address		Code and Description	Notes
	Hex	Dec		
NA	0x0A	40011	LF4 Fourth to Last Fault	Code / Definition 0 Cleared 1 Reserved[2] 2 Reserved 4 Contactor Failure 6 Single Phased Current 7 Ground Fault 8 Current Unbalance 9 Reserved[2] 10 Overcurrent 11 Undercurrent 12 Reserved[2] 13 Reserved[2] 14 Reserved[2] 15 Low Kilowatt Trip (Low Power)[1] 16 PTC Off 17 High Kilowatt Trip (High Power)[1] 18 Reserved[2] 19 Low control voltage trip
0F,15,01 29,01,AA	0x0B	40012	RD1R Remaining RD1 time	RD1 (Seconds)=Raw Value/2 RD1 (Minutes)=Raw Value/120
0F,16,01 29,01,AB	0x0C	40013	RD2R Remaining RD2 time	RD2 (Seconds)=Raw Value/2 RD2 (Minutes)=Raw Value/120
0F,17,01 29,01,AC	0x0D	40014	RD3R Remaining RD3 time	RD3 (Seconds)=Raw Value/2 RD3 (Minutes)=Raw Value/120
0F,0A,01 2C,01,07 2C,01,6F	0x0E	40015	Capacity Thermal Capacity Remaining	%
0F,1F,01 77,01,08	0x0F	40016	PFANGLE Power factor angle	Degrees
0F,19,01 29,01,B2	0x10	40017	RTKW Kilowatts	Actual KW=Raw Value/100
0F,0B,01 2C,01,6E	0x11	40018	GFCUR Ground Fault Current	Actual GF Amps=Raw Value/100
2C,01,67	0x12	40019	IC Current in Phase C	Actual Amps=Raw Value/Current Scale Factor
2C,01,66	0x13	40020	IB Current in Phase B	Actual Amps=Raw Value/Current Scale Factor
2C,01,65	0x14	40021	IA Current in Phase A	Actual Amps=Raw Value/Current Scale Factor
2C,01,68	0x15	40022	IAVG Average Current	Actual Amps=Raw Value/Current Scale Factor
0F,,01,2F 0F,0C,01 2C,01,72	0x16	40023	CUNBAL Current Unbalance	%
0F,1C,01 77,01,06	0x17	40024	VCA Voltage from Phase C to Phase A	Volts
0F,1B,01 77,01,05	0x18	40025	VBC Voltage from Phase B to Phase C	Volts
0F,1A,01 77,01,04	0x19	40026	VAB Voltage from Phase A to Phase B	Volts
0F,1D,01 77,01,03	0x1A	40027	VAVG Average Voltage	Volts
0F,1E,01 0F,30,01 77,01,07	0x1B	40028	VUNBAL Voltage Unbalance	%
		Notes	1. Applies to 777-KW/HP-XXX-P 2. Reserved bits state is undefined	

Current Scale Factor
The 777-P has a read only scale factor at location 0x04. The value will scale OC, UC and real-time currents. This value will be either 10 or 100.

Actual Current = Raw Current / Scale Factor

Ground Fault Current
Ground fault needs to be divided by 100
Actual GF Current (Amps) =Raw GF/100

Restart Delays Remaining
The restart delay remaining times (RD1R, RD2R, and RD3R) need to be divided by 2 to be converted to seconds. If a parameter is setup to count in minutes it needs to be divided by 120 minutes

Restart Delay Remaining (seconds) = [Restart Reading] / 2
Restart Delay Remaining (minutes) = [Restart Reading] / 120

Power Factor
You must take the Cosine of the power factor angle to calculate the Power Factor.

Power Factor= Cos([power factor angle])

The power factor angle is read as a value in degrees. If your Cosine function requires the angle to be expressed in *radians*, you can convert degrees to radians by multiplying by (Pi / 180.0)

Voltages
The voltages read correctly as integer values. No calculating is necessary to display the same value that the Model 777 displays.

Note that some installations have Potential Transformers (PT's) installed to reduce to voltage to the Model 777. If this is the case, your application may require a voltage multiplier to scale the voltage readings back up to the actual value. This is usually required for a Medium Voltage unit like the 777 MV.

Kilowatts
The kilowatts need to be divided by 100.

Kilowatts= [KW reading] / 100

PROCESSING THE LIMIT (SETPOINT) INFORMATION (777-P)

Current Scale Factor
The 777-P has a read only scale factor at location 0x04. The value will scale OC, UC and real-time currents. This value will be either 10,100

Current Multiplier Setpoint
The Current Multiplier (MULT) is a Read/Write single byte value at location 0x67 which can be interpreted as an integer with a value 1 to 255 decimal. This value is multiplied by actual measured current. This will affect the reported A, B, C phase currents and the GF current.

Current Divisor Setpoint
The Current Divisor (Div) is a Read/Write single byte value at location 0x66 which can be interpreted as an integer with a value 1 to 255 decimal. The actual measured current is divided by this value. This will affect the reported A, B, C phase currents and the GF current.

Together MULT and Div should represent the external wiring of the device. For example the 777 is set up with 150:5 CTs with 5 passes through the round holes. The user would then set up the unit as follows:

MULT= (150/5) =30
Div=5 passes

The 777 will now read 150A when 150A are running through the primary of the external CT.

When the user sets the MULT Setpoint from the front panel, the valid range is 1-10, 100,150,200,300,400,500,600,700,800. This setpoint is not directly changeable from the network. Multiplier and Divisor parameters are used to set MULT from the network. For example if the user sets MULT on the front to 7, the multiplier parameter=1 and the divisor parameter=7. If the user sets MULT on the front to 100 (100:5 CTs) the multiplier parameter=20 and divisor parameter=5. As a general rule when setting multiplier and divisor parameters, the multiplier is equal to the CT ratio and the divisor is equal to the number of passes through the 777 windows. For example if using 100:5 CTs; the user must set the multiplier parameter to 20 (CT primary divided by CT secondary), and the divisor parameter to 5 (5 passes through 777 round holes when using external CTs; *see 777 installation guide*). Note the display will not necessarily show the values of the Multiplier and Divisor parameters.

Overcurrent/Undercurrent Trip Setpoint
The overcurrent and undercurrent setpoints are scaled by the scale factor of the device at location 0x04. To write these setpoints first read the scale factor and multiply by actual amps and write this value. A read of these setpoint must be divided by the scale factor to get actual amps.

Writing OC/UC
Scale factor=10
Actual Amps=10.1A
Value to Write=Actual Amps*Scale Factor=101

Reading OC/UC
Value Read/Scale Factor=Actual Amps
Scale factor=10
Value Read=101
Actual Amps=10.1A

Ground Fault Trip Setpoint
If the raw Ground Fault limit (GF) reads 65535 (0xFFFF), the unit will not trip on a Ground Fault.
The Ground Fault limit is actual current * 100. For example if the user wants to set 15.12Amps of ground fault the user would write 1512 to location 0x68.

Unbalance Setpoint
If either the voltage (VUB) or current (CUB) unbalance limit is 255 (0xFF), the unbalance limit is turned OFF.

Number of Restarts after an Undercurrent Fault
If #RU reads 255, the unit will automatically restart after all undercurrent faults. (Note that if #RU is zero, the unit will not start after an undercurrent fault until the Reset button is pressed or a RESET command is sent to the Model 777.)

Number of Restarts after any other Fault
The #RF value contains certain bit settings. If Bit 0 (the least significant bit) is set, the Number of Restarts will apply to over current faults. Bits 1 through 3 represent the Number of Restarts. A value of 0 to 4 is the Number of Restarts. If the value is 5, the unit will automatically restart after any other fault.

As an example, if #RF contains the decimal value 11, it represents the bit pattern “0 0 0 0 1 0 1 1”. This means that the unit will automatically start after other faults, including over current.

Low Kilowatt Trip Setpoint
If the Low Kilowatt trip limit (LKW) reads 0, the unit will not trip on Low Kilowatts.

If you are programming a 777-P-KW from a PLC, you can set LKW to any value from 0 to 65535 (655.35 KW), regardless of the KW Input Scaling Factor. If you are programming a 777-KW unit from the front panel, you must first set the Input Scaling Factor (1-4 for KW and 5-8 for HP) and then set the Low Kilowatt Limit.

High Kilowatt Trip Setpoint

If the High Kilowatt trip limit (HKW) reads 65535, the unit will not trip on High Kilowatts. Also, if bit 7 of ENDIS is clear, the unit will not trip on High Kilowatts.

If you are programming a 777-KW from a PLC, you can set HKW to any value from 0 to 65535. The HKW value cannot be set from the front panel of the 777.

CommParams Setpoint

The Comm. Parameters setpoint allows the user to set the communication settings for communicating with the 777-P. This register is composed of 3 bits:

Bit 0: 0=Communicate with no parity
1=Communicate with parity

Bit 1: 0=Communicate with odd parity
1=Communicate with even parity

Bit 2: 0=Communicate at 9600 Baud
1=Communicate at 19200 Baud

Immediately after this register is written communication will continue at the new settings.

Linear Overcurrent Trip

Lin (linear trip class) is another parameter used to determine when the unit will trip when an overload condition detected. The linear trip class and thermal trip class will run at the same time. When calculating overcurrent trip times, the fastest time of the thermal and linear features is used. For example a linear trip class setting of L10 will trip the overload if the current >= the OC setpoint for 10s. A setting Off will turn the linear trip feature off. A setting of L00 will trip the overload in <=1 second. From the network the trip time is set in half seconds for example L10 would read from the network as 20. Setting this value over the network to 20 would result in linear trip time of 10 seconds.

ENDIS Setpoint

This register allows the user to disable a trip feature without changing the setpoint of that trip. In this registers are 8 bits to control individual trip setpoints. If a trip is disabled with this register, the front panel will show the disabled value for that setpoint even though the value of the setpoint is preserved. If the trip setpoint is disabled from the front panel and the user enables the trip with this register, the enable will have no effect, and the trip will still be disabled.

Bit 0: 0 = GF trip disabled
1 = GF trip enabled
Bit 1: 0 = VUB trip disabled
1 = VUB trip enabled
Bit 2: 0 = CUB trip disabled
1 = CUB trip enabled
Bit 3: 0 = UC trip disabled
1 = UC trip enabled
Bit 4: Reserved
Bit 5: Reserved
Bit 6: Reserved
Bit 7*: 0 = LPR trip disabled
1 = LPR trip enabled
Bit 8*: 0 = HPR trip disabled
1 = HPR trip enabled

*Note: Applies to 777-KW/HP

LOW CONTROL VOLTAGE TRIP

LCV = (LV Setpoint* LCV_Pcnt)

If the Low Control Voltage trip is enabled and if the average voltage drops below the Low Control Voltage (LCV) limit while the motor is running, the unit will trip and shut off the motor. The average voltage must stay below the LCV for LCVTD seconds before the unit will trip. The trip condition will cause the unit to check the number of restarts for other faults (#RF). If #RF permits a restart attempt, this unit wills time out the rapid cycling delay (RD1) before allowing the control contacts to close. The unit will display ‘CLo’ on the seven-segment LED front display to indicate that Low Control Voltage is the reason for the trip.

On power up, the 777-P will time out RD1 (the rapid cycling delay) and then check if the average voltage is within the low voltage limit (LV) and the high voltage limit (HV). If the voltage is within limits, the control relay will close and the unit will allow the motor to start. If the motor is not drawing current and the voltage goes above HV or goes below LV, the control relay will be opened and the motor will not be allowed to start until the voltage comes back within LV and HV. This is a hold-off condition and it will not change if the LCV trip feature is enabled.

If the LCV trip feature is disabled, once the 777-P detects current flowing, there will be no voltage trip. In other words if current is flowing and the average voltage goes above HV or below LV or below LCV, the unit will continue to keep the control relay closed and allow the motor to run.

The Low control voltage trip is controlled by 4 registers:

LCV_Dly: Low control voltage trip delay at location 0x83
LCV_Pcnt: Low control voltage percentage at location 0x84
cfgCtrl Bit 9:1= Low control voltage trip enable at location 0x85
LV: Low voltage setpoint at location 0x6D

cfgCtrl Setpoint

Bit 0: 0 = UCTD/LPRTD* in seconds
1 = UCTD/LPRTD* in minutes
Bit 1: 0 = RD1 in seconds
1 = RD1 in minutes
Bit 2: 0 = RD2 in seconds
1 = RD2 in minutes
Bit 3: 0 = RD3 in seconds
1 = RD3 in minutes
Bit 4: 0 = *HPR TD in seconds
1 = *HPR TD in minutes
Bit 5: Reserved
Bit 6: 0 = 3 phase voltage device
1 = Single phase voltage device
1. VUB and vSP disabled
2. HV and LV based on L1 instead of Average Voltage
3. L2, L3=0
3. RP disabled
4. CF trip disabled

Bit 7: 0 = 3 phase current device
1 = Single phase current device
1. Current average calculated as (A+B+C)/2
2. CF trip disabled
3. GF trip disabled
4. CUB and cSP trip disabled

Note: If both single phase current and single phase voltage bits are set, the product will operate as follows in addition to the notes above

5. Power is calculated Vavg*Iavg*PF

Bit 8: 0 = Enable RP hold-off
1 = Disable RP hold-off
Bit 9: 0 = Disable low control voltage trip
1 = Enable low control voltage trip
Bit 10: Reserved
Bit 11: Reserved
Bit 12: Reserved
Bit 13: Reserved
Bit 14: Reserved
Bit 15: 0 = Disable emergency run feature
1 = Enable emergency run feature
When reset button is held for 4 seconds the relay will energize and the display will flash “o r”. When the button is released the relay will return to its original state.

*Note: Applies to 777-KW/HP

CUBTD

The actual CUB trip time is calculated using the following equation:
Trip Time (seconds)=(CUBTD/(IUBmeasured-(IUBsp-1)))*.5 seconds

IUBmeasured=10%
IUBsp=5%
CUBTD=60
Trip Time=5 seconds

Motor Acceleration

If motor acceleration feature is enabled the 777-P will ignore tripping on selected faults for a duration of the motor acceleration trip delay. After the motor acceleration time delay has expired, and the fault is still present the normal trip delay for that fault will apply. If the fault occurs after the motor acceleration time has expired, the normal trip time for the fault will apply.
Motor Acceleration Control Bits
Bit 0: Reserved
Bit 1: Reserved
Bit 2: 1 = Motor acceleration trip delay applies to CF trip
Bit 3: 1 = Motor acceleration trip delay applies to UC/LPR* trip

Bit 4: Reserved
Bit 5: 1 = Motor acceleration trip delay applies to GF trip
Bit 6: 1 = Motor acceleration trip delay applies to CUB trip
Bit 7: 1 = Motor acceleration trip delay applies to cSP trip
Bit 8: Reserved
Bit 9: 1 = Motor acceleration trip delay applies to HKW* trip
Bit 10: 1 = Motor acceleration trip delay applies to LCV trip
Bit 11: Reserved
Bit 12: Reserved
Bit 13: Reserved
Bit 14: Reserved
Bit 15: Reserved

*Note: Applies to 777-KW/HP

Motor acceleration trip delay is only active when the motor starts. The MATD register sets the motor acceleration trip delay in half seconds.

Start Count/Duration Feature

Ten registers are used to log the duration of up to 4 run durations and log the number of starts. The run durations are stored in a rolling buffer where the most recent run duration is stored in registers StrDur1U:StrDur1HL as 24 bit minute count. The last run duration is stored in StrDur4U:StrDur4HL. Start count is stored in StrCntU:StrCntHL as 24 bit counter. These registers are writable, but will only accept a value of 0. If any register is written to 0 all registers will be reset to 0.

Hot OC Per

This feature will reduce the trip time on overcurrent by the percentage stored at HotOCPer. This will happen 1 minute of the motor running. The recovery time after overload will not be affected. This reduced trip time will be active until thermal capacity remaining returns to 100%.

Trip Inhibit

This feature will allow the user to inhibit the overload from tripping on specific faults. By writing the correct mask to this location the overload will ignore tripping on the fault as long as the mask is written as 1's. The mask is cleared every half second, so the user must continually write the mask for the fault to be inhibited. Note that each trip counter for the inhibited fault is cleared, so all trip delays start from the beginning once the user has stopped writing the inhibit register.

Modbus Assembly

The Modbus assembly allows the master controller to read setpoints and real-time data in any order independently of the published memory map. To configure the assemblies, use Solutions to write parameters MBAssem500WrdXX and MBAssem501WrdXX. The parameters that can be entered into MBAssem500WrdXX and MBAssem501WrdXX can be found in Table 13 and Table 14. The value entered into each parameter is the Modbus address of the parameter that the user desires to view. Figure 2 show a Modbus assembly configured for 23,24,25,26 which if the user reads 0x500 for 4 word the assembly will return Vca, Vbc, Vab, and Average Voltage respectively.

Assembly 0x500

Assembly 500 allows a read of 37 parameters. To read, generate a Modbus read with 0x500 as the read address and then number of registers field will specify how many parameters.

Assembly 0x501

Assembly 501 allows a read of 25 parameters. To read, generate a Modbus read with 0x501 as the read address and then number of registers field will specify how many parameters.

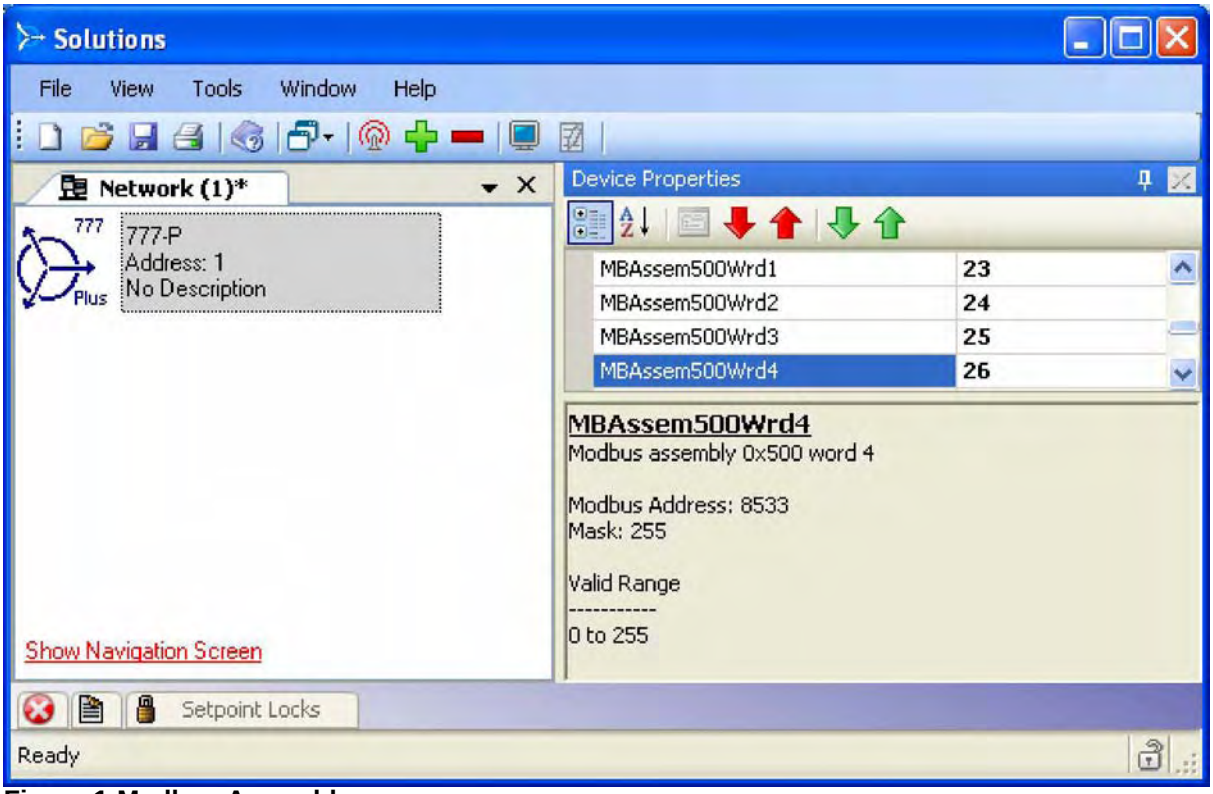

Figure 1-Modbus Assembly

Setting Up Solutions for Modbus Networks

Step 1. Start Solutions

Step 2. Select **Modbus RTU** from the **Select Network Connection Type** dialog box (see Figure 2)

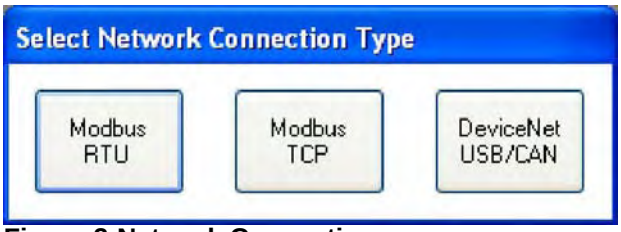

Figure 2-Network Connection

Step 3. Click **Auto Detect Units** on left hand navigation pane (see Figure 3-Empty Network View)

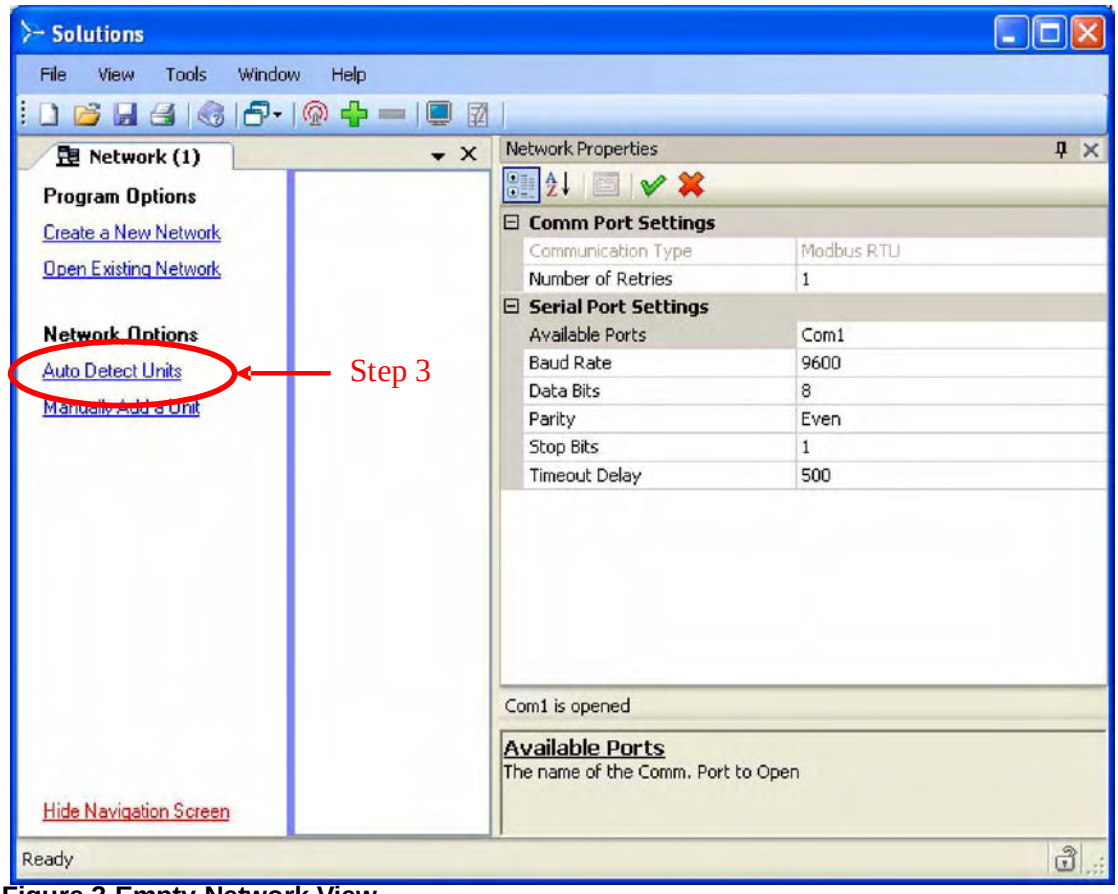

Figure 3-Empty Network View

Step 4. Click the desired device to edit the device parameters (see Figure 4)

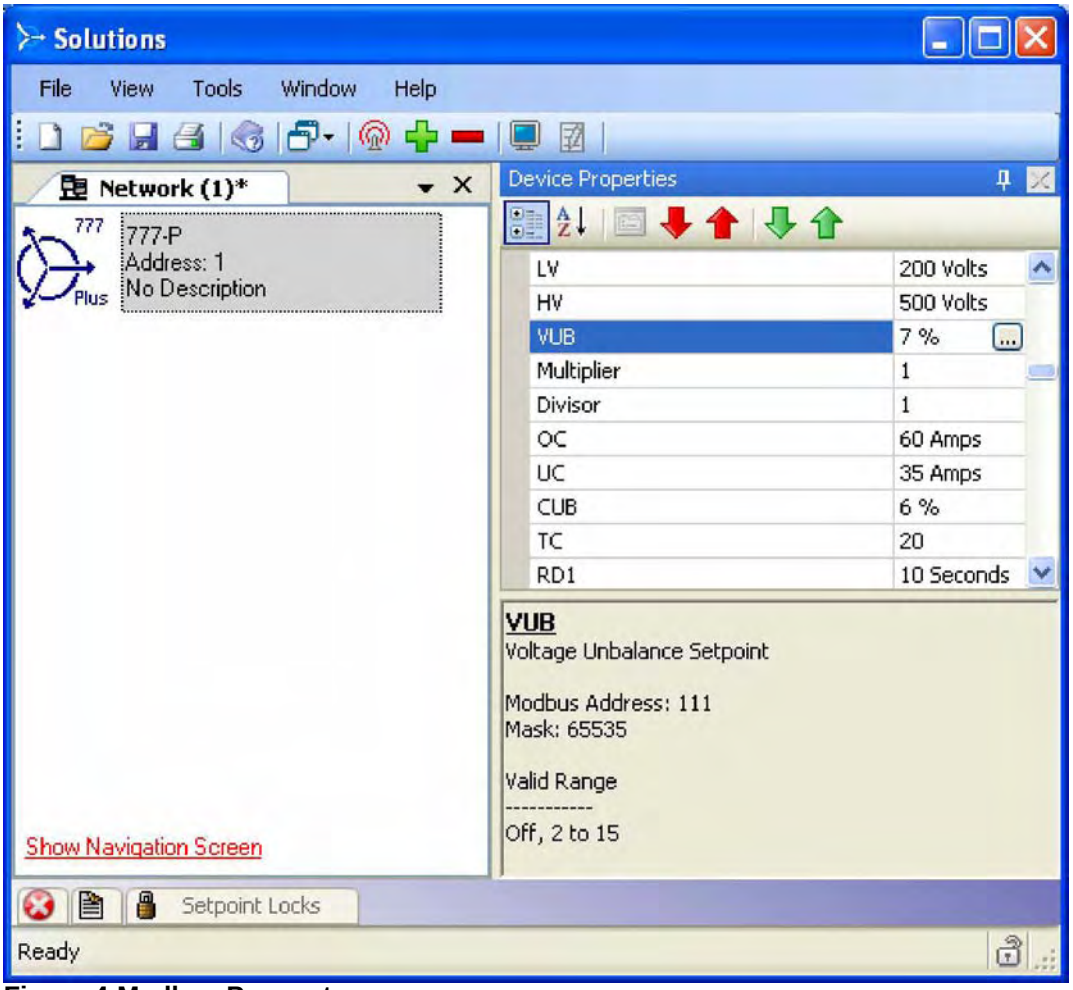

Figure 4-Modbus Parameters

Table 14-Limit (Setpoint) Values (777-P)

DeviceNet C,I,A	16 Bit Modbus Address		Code and Description	Range	Default
	Hex	Register			
29,01,92	0x64	40101	ComLine Command Line	0x33: PTC Fault and Turn Model 777 OFF 0x44: Enable Network Programming 0x55: Disable Network Programming 0x66: Clear Motor Run Hours 0x77: Clear Last Fault 0x88: Enable Network Watchdog Timer 0x99: Disable Network Watchdog Timer 0xAA: Reset Model 777 0xDD: Turn Model 777 OFF	0
2C,01,B0	0x66	40103	Divisor Divisor	1-255	1
2C,01,B1	0x67	40104	MULT Multiplier	1-255	1
2C,01,89	0x68	40105	GF Ground Fault 777-xxx-P 777-xxx-LR-P	 .30-640 Amps .15-640 Amps	 10 1
2C,01,93	0x69	40106	UC Under Current 777-xxx-P 777-xxx-LR-P	 .5-1120.0 Amps .10-1120.0 Amps	 35 3.5
2C,01,03	0x6A	40107	OC Over Current 777-xxx-P 777-xxx-LR-P	 1.0-1120.0 Amps .10-1120.0 Amps	 60 6.0
2C,01,97	0x6B	40108	CUB Current Unbalance	2-25 %,Off (255)	7
2C,01,81	0x6C	40109	TC Trip Class	2-127[2];133-255 (J2-J127)	10
77,01,14	0x6D	40110	LV Low Voltage 777 777-HVR 777-575 777-MV	 170-524 Volts 340-523 Volts 450-649 Volts 85-262 Volts	200
77,01,15	0x6E	40111	HV High Voltage 777 777-HVR 777-575 777-MV	 172-528 Volts 172-528 Volts 451-660 Volts 86-264 Volts	500
77,01,07	0x6F	40112	VUB Voltage Unbalance	2-15 %,Off (255)	6
2C,01,AD	0x73	40116	RD1 Rapid Cycling Restart Delay	0-500 seconds	10
2C,01,AE	0x74	40117	RD2 Restart Delay after OC fault	2-500 seconds	8
2C,01,AF	0x75	40118	RD3 Restart Delay after UC fault	2-500 seconds, A (65535)	20
2C,01,92	0x76	40119	UCTD Under Current Trip Delay	2-255s	5
2C,01,B0	0x77	40120	#RU Number of restarts after UC fault	0, 1, 2, 3, 4, A (automatic) **RU Values** 0–4 0–4 A 255	1
		Notes	1. Only applies to 777-KW/HP-XXX-P 2. Trip classes above 109 will set but the internal time will be that of TC=109 3. Read only bit 4. Reserved bits should be maintained as 0		

Table 14-Limit (Setpoint) Values (777-P)

DeviceNet C,I,A	16 Bit Modbus Address		Code and Description	Range	Default
	Hex	Register			
2C,01,B1	0x78	40121	#RF Number of restarts after OC,cSP,CUB,LCV,HPR[1] fault	0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA 0 = manual, A = continuous, oc = automatic restart after RD2 expires **RF Value** **Decimal Value** 0 1 1 2 oc1 3 2 4 oc2 5 3 6 oc3 7 4 8 oc4 9 A 10 ocA 11	OC1
NA	0x79	40122	ADDR Modbus device address	1-255	1
NA	0x7A	40123	ComParam Communication Parameter Bits	**Communications** **Value** 9600,N,1 0x00 9600,E,1 0x03 9600,O,1 0x01 19200,N,1 0x04 19200,E,1 0x07 19200,O,1 0x05	9600,E,1
29,01,7C 2C,01,B9	0x7B	40124	ENDIS Enable/Disable bits	Bit 0: GF Trip Enabled Bit 1: VUB Trip Enabled Bit 2: CUB Trip Enabled Bit 3: UC Trip Enabled Bit 4: Reserved[4] Bit 5: Reserved[4] Bit 6: LPR Trip Enabled[1] Bit 7: HPR Trip Enabled[1]	15
29,01,C3	0x7C	40125	NETST Network Status bits	Bit 0: Network Watchdog Enabled Bit 1: Network Program Disabled Bit 2: Front panel locked Bit 3: Reserved[4] Bit 4: Reserved[4] Bit 5: Reserved[4] Bit 6: Reserved[4] Bit 7: Reserved[4]	0
29,01,A9	0x7D	40126	MRH Motor Run Hours	0-65535 Hours	0
29,01,BF	0x80	40129	LKW[1] Low Kilowatt Trip Limit	Off (0),.01-655.35 KW	0
	0x81	40130	HKW[1] High KW trip limit	.01-655.34 KW,Off (65535)	65535
2C,01,BA	0x82	40131	KWS[1] KW Scale Factor	0-4=LKW displayed as KW 5-8=LKW displayed as HP	2
2C,01,BB	0x83	40132	LCV_DLY Low Control Voltage Trip Delay	1-120 seconds	2
2C,01,BC	0x84	40133	LCV_Pcnt Low Control Voltage Percentage	0-120 %	80
29,01,C4	0x85	40134	cfgCtrl Configuration Control bits	Bit 0: UCTD/LPRTD in minutes Bit 1: RD1 in minutes Bit 2: RD2 in minutes Bit 3: RD3 in minutes Bit 4: HPR TD in minutes[1] Bit 5: Reserved[4] Bit 6: Single phase voltage device Bit 7: Single phase current device Bit 8: Disable RP hold-off Bit 9: Enable low control voltage trip Bit 10: Reserved[4] Bit 11: Reserved[4] Bit 12: Reserved[4] Bit 13: Reserved[4] Bit 14: Reserved[4] Bit 15: Enable emergency run	RD2=Minutes RD3=Minutes
		Notes	1. Only applies to 777-KW/HP-XXX-P 2. Trip classes above 109 will set but the internal time will be that of TC=109 3. Read only bit 4. Reserved bits should be maintained as 0		

Table 14-Limit (Setpoint) Values (777-P)

DeviceNet C,I,A	16 Bit Modbus Address		Code and Description	Range	Default
	Hex	Register			
29,01,B9	0x87	40136	LIN Linear OC Trip Delay	0-254 ½ seconds, Off (255)	Off
2C,01,BD	0x8D	40142	CUBTD CUB Time Delay	1-127	60
2C,01,BE	0x8E	40143	MACtrl Motor Acceleration Control Bits	Bit 0: Reserved[4] Bit 1: Reserved[4] Bit 2: Motor acceleration trip delay applies to CF trip Bit 3: Motor acceleration trip delay applies to UC/LPR trip Bit 4: Reserved[4] Bit 5: Motor acceleration trip delay applies to GF trip Bit 6: Motor acceleration trip delay applies to CUB trip Bit 7: Motor acceleration trip delay applies to cSP trip Bit 8:Reserved[4] Bit 9: Motor acceleration trip delay applies to HKW trip[1] Bit 10: Motor acceleration trip delay applies to LCV trip Bit 11: Reserved[4] Bit 12: Reserved[4] Bit 13: Reserved[4] Bit 14: Reserved[4] Bit 15: Reserved[4]	0
2C,01,BF	0x8F	40144	MATD Motor Acceleration Time Delay	0-255 ½ seconds	0
2C,01,C0	0x90	40145	HPRTD[1] High Power Trip Delay	0-255 seconds	5
2C,01,C1	0x91	40146	StrCntU Start Count Upper Byte	0 Starts	0
2C,01,C1	0x92	40147	StrCntHL Start Count High: Low Bytes	0 Starts	0
2C,01,C2	0x93	40148	StrDur1U Start Duration 1 Upper Byte	0 Minutes	0
2C,01,C2	0x94	40149	StrDur1HL Start Duration 1 High: Low Byte	0 Minutes	0
2C,01,C3	0x95	40150	StrDur2U Start Duration 2 Upper Byte	0 Minutes	0
2C,01,C3	0x96	40151	StrDur2HL Start Duration 2 High: Low Byte	0 Minutes	0
2C,01,C4	0x97	40152	StrDur3U Start Duration 3 Upper Byte	0 Minutes	0
2C,01,C4	0x98	40153	StrDur3HL Start Duration 3 High: Low Byte	0 Minutes	0
2C,01,C5	0x99	40154	StrDur4U Start Duration 4 Upper Byte	0 Minutes	0
2C,01,C5	0x9A	40155	StrDur4HL Start Duration 4 High: Low Byte	0 Minutes	0
	0x9B	40156	HotOCPer Hot Overcurrent Percentage	1-115%	100
NA	0x9C	40157	Backdoor Modbus address	0-255	127
NA	0xA1	40162	Trip Inhibit Control	Bit 0: Reserved Bit 1: Reserved Bit 2: CF Trip Inhibit Bit 3: UC/LPR[1] Trip Inhibit Bit 4: OC Trip Inhibit Bit 5: GF Trip Inhibit Bit 6: CUB Trip Inhibit Bit 7: cSP Trip Inhibit Bit 8: Reserved Bit 9: HPR Trip Inhibit[1] Bit 10: LCV Trip Inhibit	0
NA	0x2153	48531	MBAssebmly500Wrd0	0-255	2
NA	0x2154	48532	MBAssebmly500Wrd1	0-255	3
NA	0x2155	48533	MBAssebmly500Wrd2	0-255	4
NA	0x2156	48534	MBAssebmly500Wrd3	0-255	5
NA	0x2157	48535	MBAssebmly500Wrd4	0-255	6
NA	0x2158	48536	MBAssebmly500Wrd5	0-255	7
NA	0x2159	48537	MBAssebmly500Wrd6	0-255	8
NA	0x215A	48538	MBAssebmly500Wrd7	0-255	9
NA	0x215B	48539	MBAssebmly500Wrd8	0-255	10
NA	0x215C	48540	MBAssebmly500Wrd9	0-255	11
NA	0x215D	48541	MBAssebmly500Wrd10	0-255	12
		Notes	1. Only applies to 777-KW/HP-XXX-P 2. Trip classes above 109 will set but the internal time will be that of TC=109 3. Read only bit 4. Reserved bits should be maintained as 0		

Table 14-Limit (Setpoint) Values (777-P)

DeviceNet C,I,A	16 Bit Modbus Address		Code and Description	Range	Default
	Hex	Register			
NA	0x215E	48542	MBAssebmly500Wrd11	0-255	13
NA	0x215F	48543	MBAssebmly500Wrd12	0-255	14
NA	0x2160	48544	MBAssebmly500Wrd13	0-255	15
NA	0x2161	48545	MBAssebmly500Wrd14	0-255	16
NA	0x2162	48546	MBAssebmly500Wrd15	0-255	17
NA	0x2163	48547	MBAssebmly500Wrd16	0-255	18
NA	0x2164	48548	MBAssebmly500Wrd17	0-255	19
NA	0x2165	48549	MBAssebmly500Wrd18	0-255	20
NA	0x2166	48550	MBAssebmly500Wrd19	0-255	21
NA	0x2167	48551	MBAssebmly500Wrd20	0-255	22
NA	0x2168	48552	MBAssebmly500Wrd21	0-255	23
NA	0x2169	48553	MBAssebmly500Wrd22	0-255	24
NA	0x216A	48554	MBAssebmly500Wrd23	0-255	25
NA	0x216B	48555	MBAssebmly500Wrd24	0-255	26
NA	0x216C	48556	MBAssebmly500Wrd25	0-255	27
NA	0x216D	48557	MBAssebmly500Wrd26	0-255	28
NA	0x216E	48558	MBAssebmly500Wrd27	0-255	29
NA	0x216F	48559	MBAssebmly500Wrd28	0-255	30
NA	0x2170	48560	MBAssebmly500Wrd29	0-255	31
NA	0x2171	48561	MBAssebmly500Wrd30	0-255	102
NA	0x2172	48562	MBAssebmly500Wrd31	0-255	103
NA	0x2173	48563	MBAssebmly500Wrd32	0-255	104
NA	0x2174	48564	MBAssebmly500Wrd33	0-255	105
NA	0x2175	48565	MBAssebmly500Wrd34	0-255	106
NA	0x2176	48566	MBAssebmly500Wrd35	0-255	107
NA	0x2177	48567	MBAssebmly500Wrd36	0-255	108
NA	0x2178	48568	MBAssebmly501Wrd0	0-255	109
NA	0x2179	48569	MBAssebmly501Wrd1	0-255	110
NA	0x217A	48570	MBAssebmly501Wrd2	0-255	111
NA	0x217B	48571	MBAssebmly501Wrd3	0-255	112
NA	0x217C	48572	MBAssebmly501Wrd4	0-255	113
NA	0x217D	48573	MBAssebmly501Wrd5	0-255	114
NA	0x217E	48574	MBAssebmly501Wrd6	0-255	115
NA	0x217F	48575	MBAssebmly501Wrd7	0-255	116
NA	0x2180	48576	MBAssebmly501Wrd8	0-255	117
NA	0x2181	48577	MBAssebmly501Wrd9	0-255	118
NA	0x2182	48578	MBAssebmly501Wrd10	0-255	119
NA	0x2183	48579	MBAssebmly501Wrd11	0-255	120
NA	0x2184	48580	MBAssebmly501Wrd12	0-255	121
NA	0x2185	48581	MBAssebmly501Wrd13	0-255	122
NA	0x2186	48582	MBAssebmly501Wrd14	0-255	123
NA	0x2187	48583	MBAssebmly501Wrd15	0-255	124
NA	0x2188	48584	MBAssebmly501Wrd16	0-255	125
NA	0x2189	48585	MBAssebmly501Wrd17	0-255	126
NA	0x218A	48586	MBAssebmly501Wrd18	0-255	127
NA	0x218B	48587	MBAssebmly501Wrd19	0-255	128
NA	0x218C	48588	MBAssebmly501Wrd20	0-255	129
NA	0x218D	48589	MBAssebmly501Wrd21	0-255	130
NA	0x218E	48590	MBAssebmly501Wrd22	0-255	131
NA	0x218F	48591	MBAssebmly501Wrd23	0-255	2
NA	0x2190	48592	MBAssebmly501Wrd24	0-255	3
		Notes	1. Only applies to 777-KW/HP-XXX-P 2. Trip classes above 109 will set but the internal time will be that of TC=109 3. Read only bit 4. Reserved bits should be maintained as 0		

DEVICENET CONFIGURATION

The CIO DeviceNet I/O Module can be configured using a software tool such as SymCom's *Solutions* software, *RSNetworx* or *CHStudio*. An EDS (electronic data sheet) file is required with each software tool to provide the location, value and size of the device's configurable attributes.

Accessing Variables

Variables on the node are accessed using a Path, which is composed of:

- The Class ID
- The Instance ID
- The Attribute ID

The classes available in the solid state overload relay are grouped into three parts:

- Classes required for all equipment connected to the DeviceNet network, whatever their functionality
- Classes relating to the overload relay profile, as defined by ODVA
- Classes relating to the 777Plus overload relay, allowing access to all internal variables: configuration, adjustment, monitoring, etc.

SOFTWARE CONFIGURATION

EDS and ICO Files

EDS (electronic data sheet) files are required for DeviceNet network and DeviceNet master software configuration. An EDS file contains information about configurable attributes for a device, including object addresses of each parameter.

The ICO file includes a SymCom 777 Plus icon to personalize the configuration software.

The EDS and ICO files are available on our website, www.symcom.com. Upload the EDS file to your system to access relevant files.

Equipment Setup

1. Connect the DeviceNet trunk cable to the DeviceNet scanner interface being used.
2. Connect the CIO DeviceNet I/O Module to the network using the DeviceNet terminals on the front of the unit.
3. Check that the 24VDC power supply disconnect switch is ON and that 24VDC is present on the DeviceNet network cable (V+ and V- at any location).

Table 15-Class Attributes (Class ID 01hex)

Attribute ID	Access Rule	Name	Data Type	Value	Details
1	Get	Revision	UINT	1	--

Table 16-ID Class (Class ID 01hex)

Attribute ID	Access Rule	Name	Data Type	Value	Details
1	GET	Vendor ID	UINT	958	SymCom Inc.
2	GET	Product Type	UINT	3 7	Motor Overload General Purpose Discrete I/O*
3	GET	Product Code	UINT	 0 2 4 5 7 8 27 38 47 48 50 52 2050 2052 2053 2055 2056 2075 2086 2095 2096 2098 2100	 Standalone CI0-DN* 777-LR-P w/COM-DN 777-P w/COM-DN 777-575-P w/COM-DN 777-HVR-LR-P w/COM-DN 777-575-LR-P w/COM-DN 777-HVR-P w/COM-DN 777-MV-P w/COM-DN 777-KW/HP-P w/COM-DN 777-KW/HP-LR-P w/COM-DN 777-KW/HP-575-P w/COM-DN 777-KW/HP-HVR-P w/COM-DN 777-LR-P w/CIO-DN 777-P w/CIO modules 777-575-P w/CIO modules 777-HVR-LR-P w/CIO modules 777-575-LR-P w/CIO modules 777-HVR-P w/CIO modules 777-MV-P w/CIO modules 777-KW/HP-P w/CIO modules 777-KW/HP-LR-P w/CIO modules 777-KW/HP-575-P w/CIO modules 777-KW/HP-HVR-P w/CIO modules
4	GET	Revision			
		Major Revision	USINT		
		Minor Revision	USINT		
5	GET	Status	WORD		
6	GET	Serial Number	UDINT		
7	GET	Name	SHORT_STRING		
8	GET	State	USINT		
		Notes	* Applies to CIO modules		

DeviceNet Object (Class ID 03_{HEX})

The DeviceNet Object provides the status and configuration of a DeviceNet node.

Table 17 - Class Attributes (Class ID 03hex)

Attribute ID	Access Rule	Name	Data Type	Value	Details
1	GET	Revision	UINT	1	--
2	GET	Max Instances	UINT	1	1 defined instance

Table 18 - Instance Attributes (Class ID 03hex)

Attribute ID	Access	Name	Data Type	Value	Details
1	GET/SET	MAC ID	USINT	0-63	Ref = 63
2	GET/SET	Baud rate	USINT	0-2	0 = 125k 1 = 250 k 2 = 500 k
3	GET/SET	BOI (BusOff interrupt)	BOOL	--	Upon BusOff event: 0: CAN component remains in BusOff 1: Component is reset—communication resumes
4	GET/SET	BusOff counter	USINT	0-255	Number of occurrences of BusOff state
5	GET	Allocation information	BYTE USINT	-- 0-63	Allocation choice Master address (255 not allocated)

Table 19 - Class Service (Class ID 03hex)

Service Code	Service Name	Description
OE_{hex}	Get_Attribute_Single	Read an attribute

Table 20 - Instance Service (Class ID 03hex)

Service Code	Service Name	Description
OE_{hex}	Get_Attribute_Single	Read an attribute
10_{hex}	Set_Attribute_Single	Write an attribute
$4B_{hex}$	Allocate Master/Slave Connection Set	Allocation connection master/slave
$4C_{hex}$	Release Master/Slave Connection Set	Release connection master/slave

Assembly Object Class Code 0x04

Output Assemblies

Output Assemblies allow control of the CIO modules using a polled message. These assemblies allow the CIO modules to reset the 777-P relay and the open and close the output relays.

Table 21 - Bit Definition

Bit	Description	
Fault Reset	0	No change
	1	Reset fault relay
Fault Relay	0	Close Fault Relay
	1	Open Fault Relay
OutA	0	Open output A relay
	1	Close output A relay
OutB	0	Open output B relay
	1	Close output B relay
In 1	0	Input 1 open
	1	Input 1 closed
In 2	0	Input 2 open
	1	Input 2 closed
In 3	0	Input 3 open
	1	Input 3 closed
In 4	0	Input 4 open
	1	Input 4 closed

Assemblies for Stand Alone CIO module

Output Assemblies

Table 22 - Assembly Object Class Instance 32

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
						Out B*	Out A*
Notes			* Applies to CIO modules				

Input Assemblies

Table 23 - Assembly Object Class Instance 3

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
				In 4*	In 3*	In 2*	In 1*
Notes			* Applies to CIO modules				

Table 24 - Assembly Object Class Instance 190

Data Type	Description	Units
UINT	Operating Status	Bit 0:A relay closed* Bit 1:B relay closed* Bit 2:Reserved Bit 3:Reserved Bit 4:Input 1 closed* Bit 5:Input 2 closed* Bit 6:Input 3 closed* Bit 7:Input 4 closed* Bit 8:Reserved Bit 9:Reserved Bit 10:Tripped Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:MAC ID fixed from overload Bit 15:Reserved
Notes		* Applies to CIO modules

Assemblies for CIO module (with overload)

Table 25 - Bit Definitions

Bit	Description	
Fault Reset	0	No change
	1	Reset fault relay
Fault Relay	0	Fault relay open
	1	Fault relay closed
Out A	0	Output A is open
	1	Output A is closed
Out B	0	Output B is open
	1	Output B is closed
In 1	0	Input 1 open
	1	Input 1 closed
In 2	0	Input 2 open
	1	Input 2 closed
In 3	0	Input 3 open
	1	Input 3 closed
In 4	0	Input 4 open
	1	Input 4 closed
Faulted	0	Overload is not faulted
	1	Overload is faulted
Warning	0	No Pending Trip
	1	Pending Trip

Output Assemblies

Table 26 - Assembly Object Class Instance 2

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
					Fault Reset		

Table 27 - Assembly Object Class Instance 101

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
							Out A*
Notes	* Applies to CIO modules						

Table 28 - Assembly Object Class Instance 103

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
					Fault Reset		Out A*
Notes	* Applies to CIO modules						

Table 29 - Assembly Object Class Instance 104

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
						Out B*	Out A*
Notes	* Applies to CIO modules						

Table 30 - Assembly Object Class Instance 105

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
					Fault Reset	Out B*	Out A*
Notes	* Applies to CIO modules						

Table 31 - Assembly Object Class Instance 110

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
					Fault Relay	Out B*	Out A*
Notes	* Applies to CIO modules						

Input Assemblies

Table 32 - Assembly Object Class Instance 50

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
							Faulted

Table 33 - Assembly Object Class Instance 51

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
						Warning	Faulted

Table 34 - Assembly Object Class Instance 106

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
			In2*	In1*	Out A*	Warning	Faulted
Notes	* Applies to CIO modules						

Table 35 - Assembly Object Class Instance 107

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	In4*	In3*	In2*	In1*	Faulted	Out B*	Out A*
Notes	* Applies to CIO modules						

Table 36 - Assembly Object Class Instance 120

Data Type	Description	Units
UINT	Average Current * 10	Amps
UINT	Average Voltage	Volts
UINT	Measured Kilowatts	KW*100
UINT	Operating Status	Bit 0:A relay closed* Bit 1:B relay closed* Bit 2:Fault relay closed Bit 3:Reserved Bit 4:Input 1 closed* Bit 5:Input 2 closed* Bit 6:Input 3 closed* Bit 7:Input 4 closed* Bit 8:Reserved Bit 9:Current is flowing Bit 10:Tripped Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:MAC ID fixed from overload Bit 15:Modbus comm. failure
	Notes	* Applies to CIO modules

Table 37 - Assembly Object Class Instance 121

Data Type	Description	Units
UINT	Average Current * 10	Amps
UINT	Average Voltage	Volts
UINT	Measured Kilowatts	KW*100
UINT	Measured GF * 10	Amps
USINT	Measured Current Unbalance	%
USINT	Measured Voltage Unbalance	%
UINT	Error Code	Bit 0: LV detected Bit 1: HV detected Bit 2: VUB detected Bit 3: UC detected Bit 4: RP detected Bit 5: CUB detected Bit 6: vSP detected Bit 7: cSP detected Bit 8: OC detected Bit 9: GF detected Bit 10: HPR detected Bit 11: LCV detected Bit 12: Reserved Bit 13: Reserved Bit 14: Reserved Bit 15: Fault Relay Closed
UINT	Operating Status	Bit 0:A relay closed* Bit 1:B relay closed* Bit 2:Fault relay closed Bit 3:Reserved Bit 4:Input 1 closed* Bit 5:Input 2 closed* Bit 6:Input 3 closed* Bit 7:Input 4 closed* Bit 8:Reserved Bit 9:Current is flowing Bit 10:Tripped Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:MAC ID fixed from overload Bit 15:Modbus comm. failure
	Notes	* Applies to CIO modules

Table 38 - Assembly Object Class Instance 190

Data Type	Description	Units
UINT	Operating Status	Bit 0:A relay closed* Bit 1:B relay closed* Bit 2:Fault relay closed Bit 3:Reserved Bit 4:Input 1 closed* Bit 5:Input 2 closed* Bit 6:Input 3 closed* Bit 7:Input 4 closed* Bit 8:Reserved Bit 9:Current is flowing Bit 10:Tripped Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:MAC ID fixed from overload Bit 15:Modbus comm. failure
	Notes	* Applies to CIO modules

The CIO modules supports two custom input assemblies. These assemblies are configured by selecting parameters. For input assembly 100, program attributes 7-10 of Class 0xB4 by selecting parameter instances from the Parameter Object Table see Table 51. To end the list, set the parameter instance to "0". The process is the same for input assembly 150, except attributes 25-74 of Class 0xB4 are used.

Table 39 - Object Model Definitions for CIO-DN, CIO-120-DN

Object Class	Class ID	Need	No. of Instances	Effect on Behavior	Interface
Identity	0x01	Req.	1	Supports the reset service	Message Router
Message Router	0x02	Opt.	1	No effect	Explicit Message Connection
DeviceNet	0x03	Req.	1	Configures node attributes	Message Router
Assembly	0x04	Req.	3	Defines I/O data format	Message Router, Assembly, or Parameter Object
DeviceNet Connection	0x05	Req	2	Logical ports into or out of the device	I/O connection or Message Router
Control Supervisor	0x29	Req.	1	Manages SSOLR functions, operational states, and control	Message Router, Assembly, or Parameter Object
Overload	0x2C	Req.	1	Provides SSOLR configuration	Message Router, Assembly, or Parameter Object
Acknowledge Handler	0x2B	Opt.	1		I/O Connection or Message Router

Table 40 - Assembly Object Class Code 0x04

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 41 - Assembly Object--Class Code 0x04, Explicit

Attribute ID	Access Rule	Name	Data Type	Value
3	SET	Data	Array of Byte	

Table 42 - Connection Object Class Code 0x05

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 43 - Connection Object--Class Code 0x05, Instance 1 Explicit

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	State	USINT	0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out
2	GET	Instance type	USINT	0 = Explicit
3	GET	Transport class trigger	BYTE	--
4	GET	Produced connection ID	UINT	10xxxxxx011 Xxxxxx = Node address
5	GET	Consumed connection ID	UINT	10xxxxxx011 Xxxxxx = Node address
6	GET	Initial comm. characteristics	BYTE	--
7	GET	Produced connection size	UINT	8
8	GET	Consumed connection size	UINT	7
9	GET/SET	Expected packet rate	UINT	--
12	GET/SET	Watchdog timeout action	USINT	--
13	GET	Produced connection path length	UINT	--
14	GET/SET	Produced connection path	EPATH	--
15	GET	Consumed connection path length	UINT	--
16	GET/SET	Consumed connection path	EPATH	--

Table 44 - Connection Object Class Code 0x05

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 45 - Connection Object--Class Code 0x05, Instance 2 Polled

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	State	USINT	0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out
2	GET	Instance type	USINT	1 = I/O
3	GET	Transport class trigger	BYTE	--
4	GET	Produced connection ID	UINT	10xxxxxx011 xxxxxx = Node address
5	GET	Consumed connection ID	UINT	10xxxxxx011 xxxxxx = Node address
6	GET	Initial comm. characteristics	BYTE	--
7	GET	Produced connection size	UINT	1-50
8	GET	Consumed connection size	UINT	0-8
9	GET/SET	Expected packet rate	UINT	--
12	GET/SET	Watchdog timeout action	USINT	--
13	GET	Produced connection path length	UINT	--
14	GET	Produced connection path	EPATH	--
15	GET	Consumed connection path length	UINT	--
16	GET	Consumed connection path	EPATH	--
100	GET/SET	Output Assembly	USINT	
101	GET/SET	Input Assembly	USINT	

Table 46 - Discrete Input Class Code 0x08

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 47 - Discrete Input Point Object – Class Code 0x08

Instance	Attribute	Services	Variable Type	Description	Notes
1	3	GET	BOOL	Input 1	1=Closed, 0=Open*
2	3	GET	BOOL	Input 2	1=Closed, 0=Open*
3	3	GET	BOOL	Input 3	1=Closed, 0=Open*
4	3	GET	BOOL	Input 4	1=Closed, 0=Open*
		Notes	* Applies to CIO modules		

Table 48 - Discrete Output Class Code 0x09

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 49 - Discrete Output Point Object – Class Code 0x09

Instance	Attribute	Services	Variable Type	Description	Notes
1	3	GET	BOOL	Fault Relay	1=Closed, 0=Open
2	3	GET/SET	BOOL	Output A	1=Closed, 0=Open*
3	3	GET/SET	BOOL	Output B	1=Closed, 0=Open*
		Notes	* Applies to CIO modules		

Table 50 - Parameter Object – Class 0x0F, All Instances

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Value	--	Actual value of parameter
2	GET	Link Path Size	USINT	6
3	GET	Link Path	EPATH	Depends on instance
4	GET	Descriptor	UINT	Depends on instance
5	GET	Data type	UINT	Depends on instance
6	GET	Data size	UINT	2

Table 51 - Parameter Class Code 0x0F

Instance	Services	Variable Type	Description	Value
1	GET	UINT	Phase A current x 10	Amps
2	GET	UINT	Phase B current x 10	Amps
3	GET	UINT	Phase C current x 10	Amps
4	GET	UINT	Average current x 10	Amps
5	GET	UINT	GF current x 10	Amps
6	GET	UINT	Phase A current % of FLA	%
7	GET	UINT	Phase B current % of FLA	%
8	GET	UINT	Phase C current % of FLA	%
9	GET	UINT	Average current % of FLA	%
10	GET	UINT	% Thermal capacity	%
11	GET	UINT	Raw GF current x 100	Amps
		Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules	

Table 51 - Parameter Class Code 0x0F

Instance	Services	Variable Type	Description	Value
12	GET	UINT	% CUB Measured	%
13	GET	UINT	Time to reset	.5 seconds
14	GET	UINT	Trip Status	BIT 0:Reserved Bit 1:OC Warn/Trip Bit 2:cSP Warn/Trip Bit 3:GF Warn/Trip Bit 4:Reserved Bit 5:Reserved Bit 6:UC Warn/Trip Bit 7:Reserved Bit 8:CUB Warn/Trip Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
15	GET	UINT	Warn Status	
16	GET	UINT	Trip Bits 0	Bit 0:Reserved Bit 1:Overcurrent trip Bit 2:Current single phase trip Bit 3:Ground fault trip Bit 4:Reserved Bit 5:Reserved Bit 6:Undercurrent trip Bit 7:PTC trip Bit 8:Current unbalance trip Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
17	GET	UINT	Trip Bits 1	
18	GET	UINT	Trip Bits 2	
19	GET	UINT	Trip Bits 3	
20	GET	UINT	Device Status	Bit 0:Tripped Bit 1:Warning Bit 2:Out A is closed Bit 3:Out B is closed Bit 4:Input 1 is closed Bit 5:Input 2 is closed Bit 6:Input 3 is closed Bit 7:Input 4 is closed Bit 8:Motor is running Bit 9:Ground Fault Bit 10:Mobus comm. good Bit 11:PTC tripped Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Fault relay closed
21	GET	UINT	RD1 remaining	.5 seconds
22	GET	UINT	RD2 reaming	.5 seconds
23	GET	UINT	RD3 remaining	.5 seconds
24	GET	UINT	Run Hours	Hours
25	GET	UINT	Measured KW	KW * 100
26	GET	UINT	Voltage L1-L2	Volts
27	GET	UINT	Voltage L2-L3	Volts
28	GET	UINT	Voltage L3-L1	Volts
29	GET	UINT	Average Voltage	Volts
30	GET	UINT	% VUB measured	%
31	GET	UINT	PF Angle	Degrees
			Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules

Table 51 - Parameter Class Code 0x0F

Instance	Services	Variable Type	Description	Value
32	GET	UINT	Trip Reason	Bit 0: Man. Reset required Bit 1: Off command issued Bit 2: Tripped on CF Bit 3: Tripped on UC/LPR[1] Bit 4: Tripped on OC Bit 5: Tripped on GF Bit 6: Tripped on CUB Bit 7: Tripped on cSP Bit 8: Tripped on PTC Bit 9: Tripped on Hpr[1] Bit 10: Tripped on LCV Bit 11: Reserved Bit 12: Reserved Bit 13: Reserved Bit 14: Reserved Bit 15: Reserved
33	GET	UINT	Error Code	Bit 0: LV detected Bit 1: HV detected Bit 2: VUB detected Bit 3: UC/LPR[1] detected Bit 4: RP detected Bit 5: CUB detected Bit 6: vSP detected Bit 7: cSP detected Bit 8: OC detected Bit 9: GF detected Bit 10: HPR detected[1] Bit 11: LCV detected Bit 12: Reserved Bit 13: Reserved Bit 14: Reserved Bit 15: Fault Relay Closed
34	GET	UINT	DeviceNet Module Status	Bit 0:A relay closed* Bit 1:B relay closed* Bit 2:Fault relay closed Bit 3:Reserved Bit 4:Input 1 closed* Bit 5:Input 2 closed* Bit 6:Input 3 closed* Bit 7:Input 4 closed* Bit 8:Reserved Bit 9:Current is flowing Bit 10:Tripped Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:MAC ID fixed from overload Bit 15:Modbus comm. failure
35	GET	UINT	Scale Factor	1,10,100
36	GET	UINT	Input Assembly 3 Value	Bit 0:Input 1 closed* Bit 1:Input 2 closed* Bit 2:Input 3 closed* Bit 3:Input 4 closed*
37	GET	USINT	Input Assembly 50 Value	Bit 0:Overload faulted
38	GET	USINT	Input Assembly 51 Value	Bit 0:Overload faulted Bit 1:Pending fault
39	GET	USINT	Input Assembly 106 Value	Bit 0:Overload faulted Bit 1:Pending fault Bit 2:Out A closed* Bit 3:Input 1 closed* Bit 4:Input 2 closed*
40	GET	USINT	Input Assembly 107 Value	Bit 0:Out A closed* Bit 1:Out B closed* Bit 2:Fault relay closed Bit 3:Input 1 closed* Bit 4:Input 2 closed* Bit 5:Input 3 closed* Bit 6:Input 4 closed*
41	GET	DINT	Start Count	Starts
42	GET	DINT	Start Duration 1	Minutes
43	GET	DINT	Start Duration 2	Minutes
44	GET	DINT	Start Duration 3	Minutes
		Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules	

Table 51 - Parameter Class Code 0x0F

Instance	Services	Variable Type	Description	Value
45	GET	DINT	Start Duration 4	Minutes
46	GET	USINT	Scale Factor	
47	GET	USINT	Current Unbalance	%
48	GET	USINT	Voltage Unbalance	%
		Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules	

Table 52 - Control Supervisor Class Code 0x29

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 53 - Control Supervisor Object – Class Code 0x29

Instance	Attribute	Services	Variable Type	Description	Notes
1	3	GET/SET	BOOL	Output A	1=Output A energized* 0=Output A de-energized*
1	4	GET/SET	BOOL	Output B	1=Output B energized* 0=Output B de-energized*
	6	GET	USINT	Control Supervisor State	**Value** **State** 2 Not Ready 3 Ready 7 Faulted
1	7	GET	BOOL	Forward Running	1=Current is flowing and Output A* is energized 0=Current is not flowing or Output A* is de-energized
1	8	GET	BOOL	Reverse Running*	1=Current is flowing and Output B is energized 0=Current is not flowing or Output B is de-energized
	10	GET	BOOL	Fault Status	1=Overload is faulted 0=Overload is not faulted
1	12	GET/SET	BOOL	Fault Reset	0->1 = Fault Reset 0 = No Action
1	13	GET	UINT	Fault Code	Special DeviceNet Codes
1	14	GET	UINT	Control Supervisor Warn Code	**Value** **Fault** 21=OC Overcurrent 22=SP Current Single Phase 26=CUB Current Unbalance 27=GF Ground Fault
1	17	SET	BOOL	Force Fault	0->1 Force a fault—open 777 relay 1->0 No Change
1	100	GET	UINT	Run Hrs	Run Hours
1	114	GET	WORD	Trip Status	BIT 0:Reserved Bit 1:OC Warn/Trip Bit 2:cSP Warn/Trip Bit 3:GF Warn/Trip Bit 4:Reserved Bit 5:Reserved Bit 6:UC Warn/Trip Bit 7:Reserved Bit 8:CUB Warn/Trip Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
1	115	GET	WORD	Warning Status	
1	116	GET	WORD	Trip Log 0 Last trip to occur	BIT 0:CUB Trip BIT 1:Reserved BIT 2:Reserved BIT 3:Reserved BIT 4:Reserved BIT 5:Reserved BIT 6:Reserved BIT 7:Reserved BIT 8:Reserved BIT 9:OC Trip BIT 10:SP Trip BIT 11:GF Trip BIT 14:UC Trip BIT 15:Reserved
1	117	GET	WORD	Trip Log 1 Second last trip to occur	
1	118	GET	WORD	Trip Log 2 Third last trip to occur	
1	119	GET	WORD	Trip Log 3 Fourth last trip to occur	
1	121	GET	WORD	Device Status	Bit 0:Tripped Bit 1:Warning Bit 2:Out A is closed* Bit 3:Out B is closed* Bit 4:Input 1 is closed* Bit 5:Input 2 is closed* Bit 6:Input 3 is closed* Bit 7:Input 4 is closed* Bit 8:Motor is running Bit 9:Ground Fault Bit 10:Mobus comm. good Bit 11:PTC tripped Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Fault Relay Closed
			Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules	

Table 53 - Control Supervisor Object – Class Code 0x29

Instance	Attribute	Services	Variable Type	Description	Notes
1	124	GET	WORD	Trip Enable	Bit 0:GF trip enable Bit 1:VUB trip enabled Bit 2:CUB trip enabled Bit 3:UC trip enabled Bit 4:Reserved Bit 5:Reserved Bit 6:LPR trip enabled[1] Bit 7:HPR trip enabled[1] Bit 8:Reserved Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
1	126	GET/SET	BOOL	Trip Reset	0->1 = Fault Reset 0 = No Action
1	127	GET/SET	BOOL	Force Fault	0->1 = Force Fault 0= No Action
1	128	GET/SET	BOOL	Force Fault Status	1=Force Fault Overload 0=No Action
1	146	GET/SET	UINT	Comline	**Value** **Command** 0x33 PTC High Temp Shut OFF (HIC) 0x44 Network Program Enable 0x55 Network Program Disable 0x66 Clear Run Hours 0x88 Clear Fault History 0x99 Enable Network Watchdog Timer 0xAA Start 0xDD Stop
1	148	GET/SET	BOOL	Remote Host Watchdog/Idle trip	1=Idle condition
1	149	GET	WORD	DeviceNet Watchdog Status	Bit 0:Remote host watchdog Bit 1:Idle State Bit 2:Slave watchdog Bit 3:Reserved Bit 4:Reserved Bit 5:Reserved Bit 6:Reserved Bit 7:Reserved Bit 8:Reserved Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
1	164	GET	UINT	Unit Type	
1	165	GET	UINT	Unit ID	**Value** Hardware 1 777-P 2 777-HVR-P 3 777-575-P 11 777-LR-P 12 777-HVR-LR-P 13 777-575-LR-P 31 777-MV-P 41 777-KW/HP-P 43 777-KW/HP-575-P 42 777-KW/HP-HVR-P 51 777-KW/HP-LR-P
1	166	GET	UINT	Model Code	
1	167	GET	UINT	Overload Software Revision	**Value** **Device** 0xmr04 777-P 0xmr27 777-HVR-P 0xmr05 777-575-P 0xmr02 777-LR-P 0xmr07 777-HVR-LR-P 0xmr08 777-575-LR-P 0xmr38 777-MV-P 0xmr47 777-KW/HP-P 0xmr50 777-KW/HP-575-P 0xmr52 777-KW/HP-HVR-P 0xmr48 777-KW/HP-LR-P
1	169	GET/SET	UINT	Motor Run Hours	
1	170	GET	UINT	RD1 Remaining	Rapid-Cycle Timer (.5 seconds)
1	171	GET	UINT	RD2 Remaining	Motor Cool-Down Timer (.5 seconds)
Notes			1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules		

Table 53 - Control Supervisor Object – Class Code 0x29

Instance	Attribute	Services	Variable Type	Description	Notes
1	172	GET	UINT	RD3 Remaining	Dry-Well Recovery Timer (.5 seconds)
1	173	GET/SET	UINT	RD1 Setting Rapid-Cycle Timer setting	0-500 seconds
1	174	GET/SET	UINT	RD2 Setting Motor Cool-Down Timer setting	2-500 minutes
1	175	GET/SET	UINT	RD3 Setting Dry-Well Recovery Timer setting	2-500,A (65535) minutes
1	176	GET/SET	UINT	#RU Number of restart attempt after Undercurrent fault	0, 1, 2, 3, 4, A (automatic) **RU Values** 0–4 0–4 A 255
1	177	GET/SET	UINT	#RF Number of Restart attempts after all faults except UC	0, 1, oc1, 2, oc2, 3, oc3, 4, oc4, A, ocA 0 = manual, A = continuous, oc = automatic restart after RD2 expires **Value** **#RF** 1 0 2 1 3 OC1 4 2 5 OC2 6 3 7 OC3 8 4 9 OC4 10 A 11 OCA
1	178	GET	UINT	Power KW * 100	**Measured power**
1	179	GET	UINT	Power	Power in Horsepower
1	181	GET/SET	BOOL	Ground Fault Trip Enable	1=GF trip enabled 0=GF trip disabled
1	182	GET/SET	BOOL	Jam Enabled	1=JAM trip enabled 0=JAM trip disabled
1	183	GET/SET	BOOL	Undercurrent Trip Enabled	1=UC trip enabled 0=UC trip disabled
1	184	GET/SET	BOOL	CUB Trip Enabled	1=CUB trip enabled 0=CUB trip disabled
1	185	GET/SET	UINT	OC Linear Trip Setpoint	0254 ½ seconds 255 (Off)
1	190	GET/SET	UINT	High Power Setpoint[1]	0-655.34 KW (65535) Off
1	191	GET	UINT	Low Power Setpoint[1]	Off (0),1-655.35 KW
1	192	GET	WORD	Trip Status	Bit 0:Manual Reset Required Bit 1:Off command issued Bit 2:Tripped on CF Bit 3:Triped on UC or LPR[1] Bit 4:Tripped on OC Bit 5:Tripped on GF Bit 6:Tripped on CUB Bit 7:Triped on cSP Bit 8:Tripped on PTC Bit 9:Tripped on HPR[1] Bit 10:Tripped on LCV Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
1	193	GET	WORD	Pending Trip Status	Bit 0:LV Pending Bit 1:HV Pending Bit 2:VUB Pending Bit 3:UC/LPR[1] Pending Bit 4:RP Pending Bit 5:CUB Pending Bit 6:vSP Pending Bit 7:cSP Pending Bit 8:OC Pending Bit 9:GF Pending Bit 10:HPR Pending[1] Bit 11:LCV Pending Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Fault Relay Closed
			Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules	

Table 53 - Control Supervisor Object – Class Code 0x29

Instance	Attribute	Services	Variable Type	Description	Notes
1	195	GET/SET	WORD	Modbus Network Status Bits	Bit 0:Modbus network watchdog enabled Bit 1:Modbus program disabled Bit 2:Front panel locked Bit 3:Reserved Bit 4:Reserved Bit 5:Reserved Bit 6:Reserved Bit 7:Reserved Bit 8:Reserved Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
1	196	GET/SET	WORD	Device Configuration Bits	Bit 0:UCTD in minutes Bit 1:RD1 in minutes Bit 2:RD2 in minutes Bit 3:RD3 in minutes Bit 4:HPRTD in minutes[1] Bit 5:Reserved Bit 6:Single phase voltage device Bit 7:Single phase current device Bit 8:Disable RP hold-off Bit 9:Enable LCV Trip Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Enable emergency run
			Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules	

Table 54 - Connection Object Class Code 0x2C

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 55 - Overload Object – Class Code 0x2C

Instance	Attribute	Services	Variable Type	Description	Notes
1	3	GET/SET	INT	Overcurrent Trip Setting 777 777-LR	 1.0-1120.0 Amps * Param 46 .10-1120 Amps * Param 46
1	4	GET/SET	USINT	Trip Class without Jam prefix	2-127
1	5	GET	INT	Average Current X 10	
1	6	GET	USINT	% Current Unbalance (measured)	
1	7	GET	USINT	% Thermal Capacity Remaining	
1	8	GET	INT	CurrentL1 (Amps)	Phase 1 Current X 10
1	9	GET	INT	CurrentL2 (Amps)	Phase 2 Current X 10
1	10	GET	INT	CurrentL3 (Amps)	Phase 3 Current X 10
1	11	GET	INT	GF Current (Amps)	Ground Fault Current X 10
1	100	GET	UINT	Scale Factor	Current Scale Factor 1, 10, or 100
1	101	GET	INT	L1 Current (Amps)	L1 Current X attribute 100
1	102	GET	INT	L2 Current (Amps)	L2 Current X attribute 100
1	103	GET	INT	L3 Current (Amps)	L3 Current X attribute 100
1	104	GET	INT	Average Current (Amps)	Average Current X attribute 100
1	105	GET	INT	L1 %OC	Current L1 as % of OC Trip Setting
1	106	GET	INT	L2 %OC	Current L2 as % of OC Trip Setting
1	107	GET	INT	L3 %OC	Current L3 as % of OC Trip Setting
1	108	GET	INT	Avg Current %OC	Average Current as % of OC Trip Setting
1	110	GET	INT	GF Current (Amps)	Ground Fault Current X 100
1	111	GET	USINT	%Therm	%Thermal Capacity Remaining
1	113	GET	UINT	OL Time to Reset (.5 Seconds)	Time remaining before 777 resets
1	114	GET	INT	%CUB	% Current Unbalance (measured)
1	129	GET/SET	USINT	TC Setting Trip Class without Jam prefix	2-127
1	130	GET/SET	BOOL	Jam Enabled	1=Jam Enabled 0=Jam Disabled
1	131	GET/SET	BOOL	Ground Fault Trip Enabled	1=Ground Fault Trip Enabled 0=Ground Fault Trip Disabled
1	132	GET/SET	BOOL	Undercurrent Trip Enabled	1=Undercurrent Trip Enabled 0=Undercurrent Trip Disabled
1	133	GET/SET	BOOL	CUB Trip Enabled	1=Current Unbalance Trip Enabled 0=Current Unbalance Trip Disabled
1	137	GET/SET	UINT	GF Setting Ground Fault Trip Setting 777 777-LR	 .30-640 Amps * 100 .15-640 Amps *100
1	146	GET/SET	UINT	UCTD/LPR[1] Undercurrent Trip Delay	2-255 Seconds
1	147	GET/SET	UINT	UC Setting Undercurrent Trip Setting 777 777-LR	 1-1120 Amps * Param 46 .10-1120 Amps * Param 46
			Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules	

Table 55 - Overload Object – Class Code 0x2C

Instance	Attribute	Services	Variable Type	Description	Notes
1	151	GET/SET	UINT	CUB Limit Current Unbalance Setting	2-25 %
1	176	GET/SET	UINT	Divisor	1-255
1	177	GET/SET	UINT	Multiplier	1-255
1	180	GET/SET	BYTE	DeviceNet Network Watchdog Control	Bit 0:Fault relay watchdog enabled Bit 1:Relay A watchdog enabled* Bit 2:Relay B watchdog enabled* Bit 3:Reserved Bit 4:Reserved Bit 5:Reserved Bit 6:Reserved Bit 7:Reserved
1	181	GET/SET	BOOL	GF Enable	1=GF Trip Enabled 0=GF Trip Disabled
1	182	GET/SET	BOOL	TC Jam Enable	1=JAM Trip Enabled 0=JAM Trip Disabled
1	183	GET/SET	BOOL	UC Enable	1=UC Trip Enabled 0=UC Trip Disabled
1	184	GET/SET	BOOL	CUB Enable	1=CUB Trip Enabled 0=CUB Trip Disabled
1	185	GET/SET	WORD	Enable/Disable Bits	Bit 0:GF Trip Enabled Bit 1:VUB Trip Enabled Bit 2:CUB Trip Enabled Bit 3:UC Trip Enabled Bit 4:Reserved Bit 5:Reserved Bit 6:Low Power Trip Enabled[1] Bit 7:High Power Trip Enabled[1] Bit 8:Reserved Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
1	186	GET/SET	UINT	KW Scale Factor	1-8 1-4 LPR Setpoint front displayed as KW[1] 5-8 LPR Setpoint front displayed as HP[1]
1	187	GET/SET	UINT	Low Control Voltage Trip Delay	0-120 seconds
1	188	GET/SET	UINT	Low Control Voltage Percentage	1-120 %
1	189	GET/SET	UINT	CUB Trip Delay	1-127
1	190	GET/SET	WORD	Motor Acceleration Config Bits	Bit 0:Reserved Bit 1:Reserved Bit 2:MATD applies to CF trip Bit 3:MATD applies to UC,LPR[1] trip Bit 4:Reserved Bit 5:MATD applies to GF trip Bit 6: MATD applies to CUB trip Bit 7: MATD applies to cSP trip Bit 8:Reserved Bit 9: MATD applies to HKW trip[1] Bit 10: MATD applies to LCV trip Bit 11: MATD applies to HOT trip Bit 12:Reseved Bit 13:Reserved Bit 14:Reseverd Bit 15:Reserved
1	191	GET/SET	UINT	Motor Acceleration Trip Delay	0-255 ½ Seconds
1	192	GET/SET	UINT	High Power Trip Delay	2-255 Seconds[1]
1	193	GET	DWORD	Start Count	0
1	194	GET	DWORD	Start Duration 1	0
1	195	GET	DWORD	Start Duration 2	0
1	196	GET	DWORD	Start Duration 3	0
1	197	GET	DWORD	Start Duration 4	0
1	199	GET/SET	UINT	Hot OC Percentage	100
			Notes	1. Applies only to 777-KW/HP-XXX-P * Applies to CIO modules	

Table 56 - Connection Object Class Code 0x77

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 57 - Voltage Monitor Object – Class Code 0x77

Instance	Attribute	Services	Variable Type	Description	Notes
1	3	GET	UINT	Voltage Average Average Voltage (measured)	 Volts
1	4	GET	UINT	Voltage L1-L2 Voltage from L1 to L2	 Volts
1	5	GET	UINT	Voltage L2-L3 Voltage from L2 to L3	 Volts
1	6	GET	UINT	Voltage L3-L1 Voltage from L3 to L1	 Volts
1	7	GET	UINT	%VUB % Voltage Unbalance (measured)	 %
1	8	GET	UINT	PF Angle Power Factor Angle	 °
1	20	GET/SET	UINT	LV Setting Low Voltage Limit 777 777-MV 777-575 777-HVR	 170-524V 85-262V 450-649V 340-523V
1	21	GET/SET	UINT	HV Setting High Voltage Limit 777 777-MV 777-575 777-HVR	 172-528V 86-264V 451-660V 172-528V
1	22	GET/SET	UINT	VUB Setting %Voltage Unbalance Limit	 2-15%
1	23	GET/SET	BOOL	VUB Enable	1=Enable 0=Disable

Table 58 - Connection Object Class Code 0x78

Attribute ID	Access Rule	Name	Data Type	Value
1	GET	Revision	UINT	1

Table 59 - DeviceNet Object – Class Code 0x78

Instance	Attribute	Services	Variable Type	Description	Notes
1	3	GET	UINT	Input Assembly 3	See input assembly section for details
1	50	GET	UINT	Input Assembly 50	See input assembly section for details
1	51	GET	UINT	Input Assembly 51	See input assembly section for details
1	106	GET	UINT	Input Assembly 106	See input assembly section for details
1	107	GET	UINT	Input Assembly 107	See input assembly section for details
1	190	GET	UINT	Input Assembly 190	See input assembly section for details

Table 60 - DeviceNet Object – Class Code 0xB4

Instance	Attribute	Services	Variable Type	Description	Notes
1	5	GET/SET	USINT	Fragmented Explicit Acknowledgment Timeout	(10 ms)
1	7	GET/SET	USINT	Input Assembly 100, Word0	
1	8	GET/SET	USINT	Input Assembly 100, Word1	
1	9	GET/SET	USINT	Input Assembly 100, Word2	
1	10	GET/SET	USINT	Input Assembly 100, Word3	
1	16	GET/SET	USINT	Output Assembly Output Assembly Instance No.	
1	17	GET/SET	USINT	Input Assembly Input Assembly Instance No.	
Notes			* Applies to CIO modules		

Table 60 - DeviceNet Object – Class Code 0xB4

Instance	Attribute	Services	Variable Type	Description	Notes
1	23	GET/SET	WORD	DeviceNet Watchdog Control	Bit 0:Send Off on DeviceNet watchdog Bit 1:Relay A opens on DeviceNet watchdog* Bit 2:Relay B opens on DeviceNet watchdog* Bit 3:Reserved Bit 4:Reserved Bit 5:Reserved Bit 6:Reserved Bit 7:Reserved Bit 8:Reserved Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
1	24	GET/SET	WORD	CIO Relay Control	Bit 0:Reserved Bit 1:Reserved Bit 2:Reserved Bit 3:Reserved Bit 4:Invert A relay* Bit 5:Invert B relay* Bit 6:Reserved Bit 7:Reserved Bit 8:Reserved Bit 9:Reserved Bit 10:Reserved Bit 11:Reserved Bit 12:Reserved Bit 13:Reserved Bit 14:Reserved Bit 15:Reserved
1	25	GET/SET	USINT	Input Assembly 150, Word0	
1	26	GET/SET	USINT	Input Assembly 150, Word1	
1	27	GET/SET	USINT	Input Assembly 150, Word2	
1	28	GET/SET	USINT	Input Assembly 150, Word3	
1	29	GET/SET	USINT	Input Assembly 150, Word4	
1	30	GET/SET	USINT	Input Assembly 150, Word5	
1	31	GET/SET	USINT	Input Assembly 150, Word6	
1	32	GET/SET	USINT	Input Assembly 150, Word7	
1	33	GET/SET	USINT	Input Assembly 150, Word8	
1	34	GET/SET	USINT	Input Assembly 150, Word9	
1	35	GET/SET	USINT	Input Assembly 150, Word10	
1	36	GET/SET	USINT	Input Assembly 150, Word11	
1	37	GET/SET	USINT	Input Assembly 150, Word12	
1	38	GET/SET	USINT	Input Assembly 150, Word13	
1	39	GET/SET	USINT	Input Assembly 150, Word14	
1	40	GET/SET	USINT	Input Assembly 150, Word15	
1	41	GET/SET	USINT	Input Assembly 150, Word16	
1	42	GET/SET	USINT	Input Assembly 150, Word17	
1	43	GET/SET	USINT	Input Assembly 150, Word18	
1	44	GET/SET	USINT	Input Assembly 150, Word19	
1	45	GET/SET	USINT	Input Assembly 150, Word20	
1	46	GET/SET	USINT	Input Assembly 150, Word21	
1	47	GET/SET	USINT	Input Assembly 150, Word22	
1	48	GET/SET	USINT	Input Assembly 150, Word23	
1	49	GET/SET	USINT	Input Assembly 150, Word24	
1	50	GET/SET	USINT	Input Assembly 150, Word25	
1	51	GET/SET	USINT	Input Assembly 150, Word26	
1	52	GET/SET	USINT	Input Assembly 150, Word27	
1	53	GET/SET	USINT	Input Assembly 150, Word28	
1	54	GET/SET	USINT	Input Assembly 150, Word29	
1	55	GET/SET	USINT	Input Assembly 150, Word30	
1	56	GET/SET	USINT	Input Assembly 150, Word31	
1	57	GET/SET	USINT	Input Assembly 150, Word32	
1	58	GET/SET	USINT	Input Assembly 150, Word33	
		Notes	* Applies to CIO modules		

Table 60 - DeviceNet Object – Class Code 0xB4

Instance	Attribute	Services	Variable Type	Description	Notes
1	59	GET/SET	USINT	Input Assembly 150, Word34	
1	60	GET/SET	USINT	Input Assembly 150, Word35	
1	61	GET/SET	USINT	Input Assembly 150, Word36	
1	62	GET/SET	USINT	Input Assembly 150, Word38	
1	63	GET/SET	USINT	Input Assembly 150, Word40	
1	64	GET/SET	USINT	Input Assembly 150, Word41	
1	65	GET/SET	USINT	Input Assembly 150, Word42	
1	66	GET/SET	USINT	Input Assembly 150, Word43	
1	67	GET/SET	USINT	Input Assembly 150, Word44	
1	68	GET/SET	USINT	Input Assembly 150, Word45	
1	69	GET/SET	USINT	Input Assembly 150, Word46	
1	70	GET/SET	USINT	Input Assembly 150, Word47	
1	71	GET/SET	USINT	Input Assembly 150, Word48	
1	72	GET/SET	USINT	Input Assembly 150, Word49	
1	73	GET/SET	USINT	Input Assembly 150, Word50	
1	74	GET/SET	USINT	Input Assembly 150, Word51	
1	127	GET/SET	USINT	Set to standalone*	Write this to 0 to set to standalone
1	140	GET/SET	USINT	Power Up Options	Bit 0: Flex Addressing Enabled
1	141	GET/SET	USINT	Trip Inhibit High Byte*	Bit 0: Reserved Bit 1: HPR Trip Inhibit Bit 2: LCV Trip Inhibit
1	142	GET/SET	USINT	Trip Inhibit Low Byte*	Bit 0: Reserved Bit 1: Reserved Bit 2: CF Trip Inhibit Bit 3: UC Trip Inhibit Bit 4: OC Trip Inhibit Bit 5: GF Trip Inhibit Bit 6: CUB Trip Inhibit Bit 7: cSP Trip Inhibit
1	143	GET/SET	USINT	CIO Setup*	Bit 0: Input 1 is used as trip inhibit
			Notes	* Applies to CIO modules	

Flexible Addressing Enabled

When flexible addressing is enabled the DeviceNet module can be in either of the modes below:

Fixed Addressing

On power up of the DeviceNet module, if the Modbus address of the overload is < 64 then the DeviceNet module will set the DeviceNet address to the overload address and this address cannot be set from the DeviceNet network.

Variable Addressing

On power up of the DeviceNet module, if the Modbus address of the overload is > 63, then the DeviceNet module will use the last valid DeviceNet address, and this address can be set from the DeviceNet network.

Flexible Addressing Disabled

The DeviceNet address can only be set from the DeviceNet network.

Setup Using EDS Files

Each CIO-DN,CIO-120-DN,COM-DN, overload pair must use a DeviceNet EDS file to work with SymCom solutions. Each EDS file has an icon associated with it. These EDS and icon files can be found at www.symcom.com. **Table** 61 below shows the device and required EDS and ICON files.

Table 61 - EDS Files

Overload	CIO Module	COM-DN	Icon File
777-P	777-P_CIO_xxxx.eds	777-P_CM_xxxx.eds	777Plus.ico
777-575-P	777-575-P_CIO_xxxx.eds	777-575-P_CM_xxxx.eds	777Plus.ico
777-HVR-P	777-HVR-P_CIO_xxxx.eds	777-HVR-P_CM_xxxx.eds	777Plus.ico
777-KW/HP-P	777-KWHP-P_CIO_xxxx.eds	777-KWHP-P_CM_xxxx.eds	777Plus.ico
777-KW/HP-HVR-P	777-KW/HP-HVR-P_CIO_xxxx.eds	777-KWHP-HVR-P_CM_xxxx.eds	777Plus.ico
777-KW/HP-575-P	777-KWHP-575-P_CIO_xxxx.eds	777-KWHP-575-P_CM_xxxx.eds	777Plus.ico
777-LR-P	777-LR-P_CIO_xxxx.eds	777-LR-P_CM_xxxx.eds	777Plus.ico
777-575-LR-P	777-575-LR-P_CIO_xxxx.eds	777-575-LR-P_CM_xxxx.eds	777Plus.ico
777-HVR-LR-P	777-HVR-LR-P_CIO_xxxx.eds	777-HVR-LR-P_CM_xxxx.eds	777Plus.ico
777-KW/HP-LR-P	777-KWHP-LR-P_CIO_xxxx.eds	777-KWHP-LR-P_CM_xxxx.eds	777Plus.ico
777-MV-P	777-MV-P_CIO_xxxx.eds	777-MV-P_CM_xxxx.eds	777Plus.ico

Configuring Devices using SymCom Solutions software

Step 1. Start Solutions
Step 2. Click the **DeviceNet USB/CAN** button

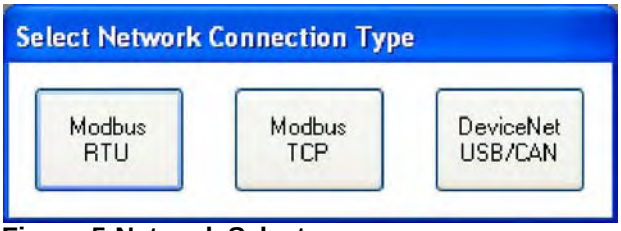

Figure 5-Network Select

Step 3. Select **Tools** > **Device Manager.** Solutions Studio will bring up the dialog to import EDS files.

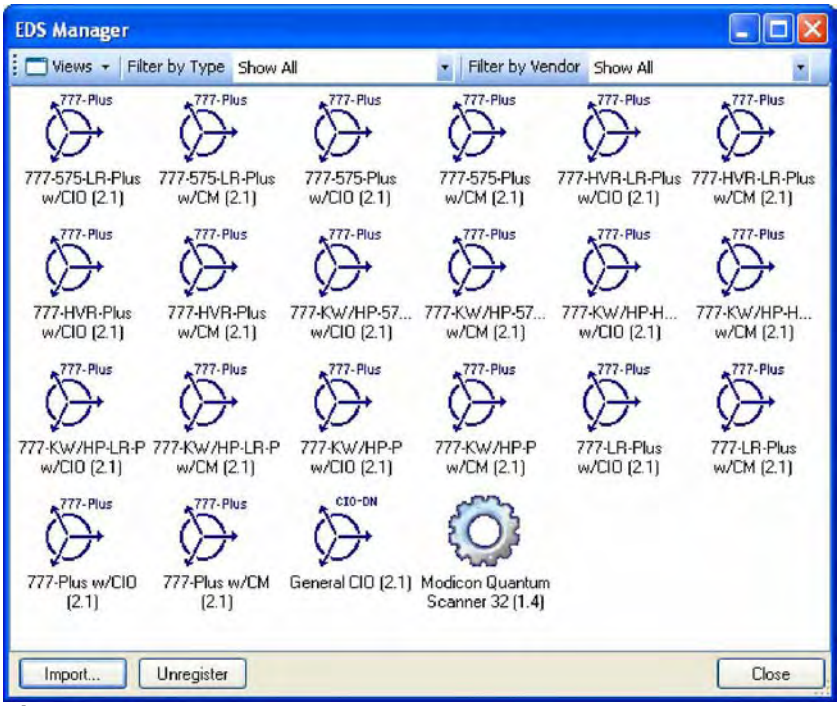

Figure 6-EDS Manager

Step 4. Click the **Import…** button to bring up the **Import EDS** dialog box. Select the EDS files downloaded and click the **Open** button.

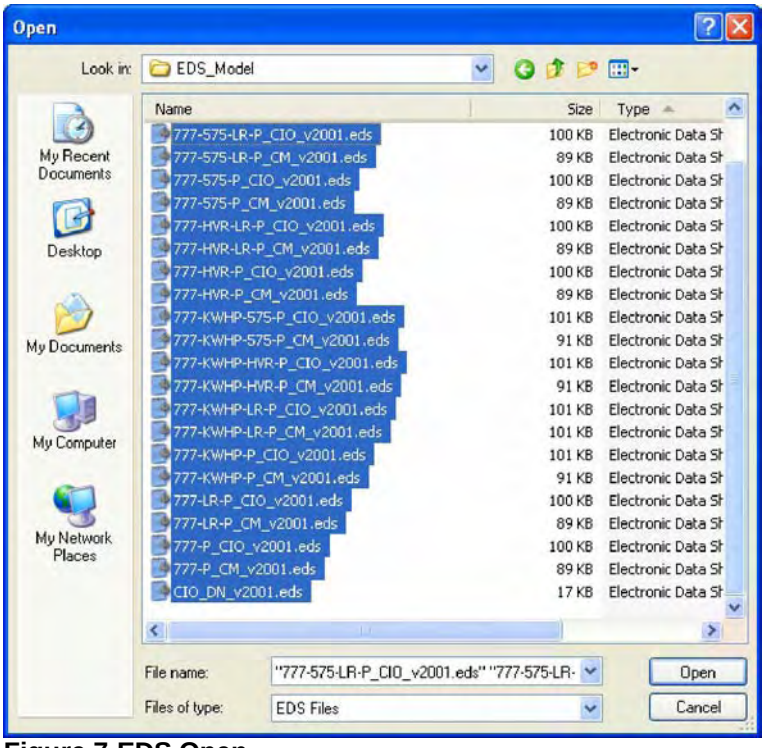

Figure 7-EDS Open

Step 5. Click **Auto Detect Units** button in the **Navigation Screen**

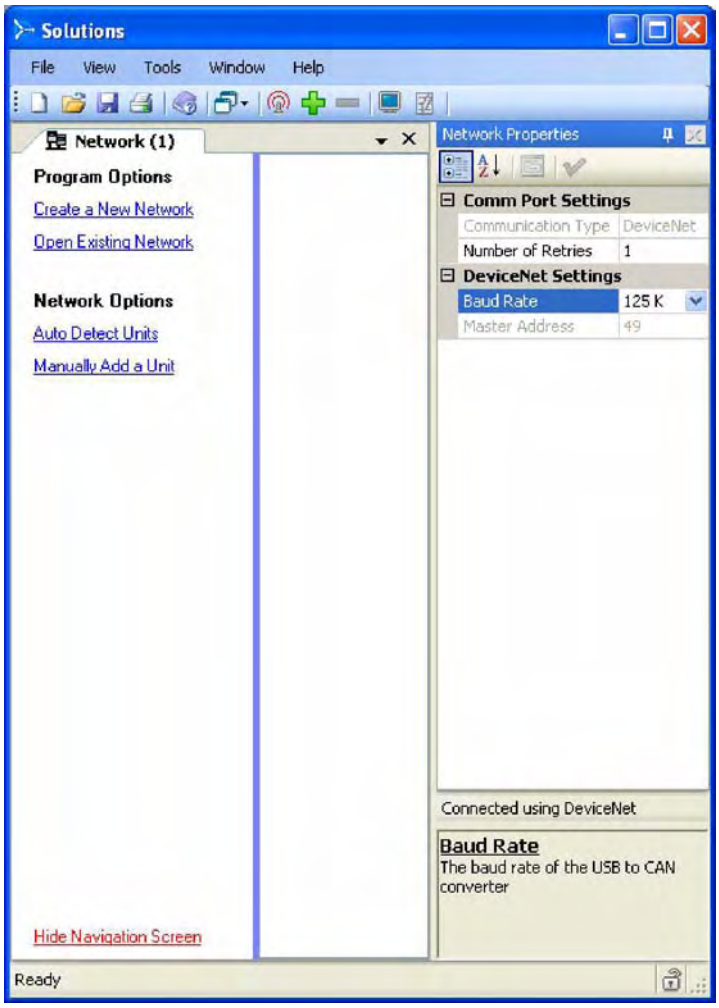

Figure 8-Network View

Step 6. The first time a DeviceNet network is commissioned all nodes will be at the same address and appear to a configuration tool as faulted devices. When a device is faulted, Solutions will show the dialog in Figure 9.

Figure 9-Faulted Unit Recovery

By click Send ICF Request the user can identify the faulted device and assign it an appropriate address. The CIO modules will identify themselves by flashing alternate red and green LEDs. The COM-DN attached to a 777-P will show ICF on the display of the 777-P.

Step 7. Change the address of the device by clicking **Recover this Device**.

Step 8. Repeat Step 6 and Step 7 for all faulted devices.

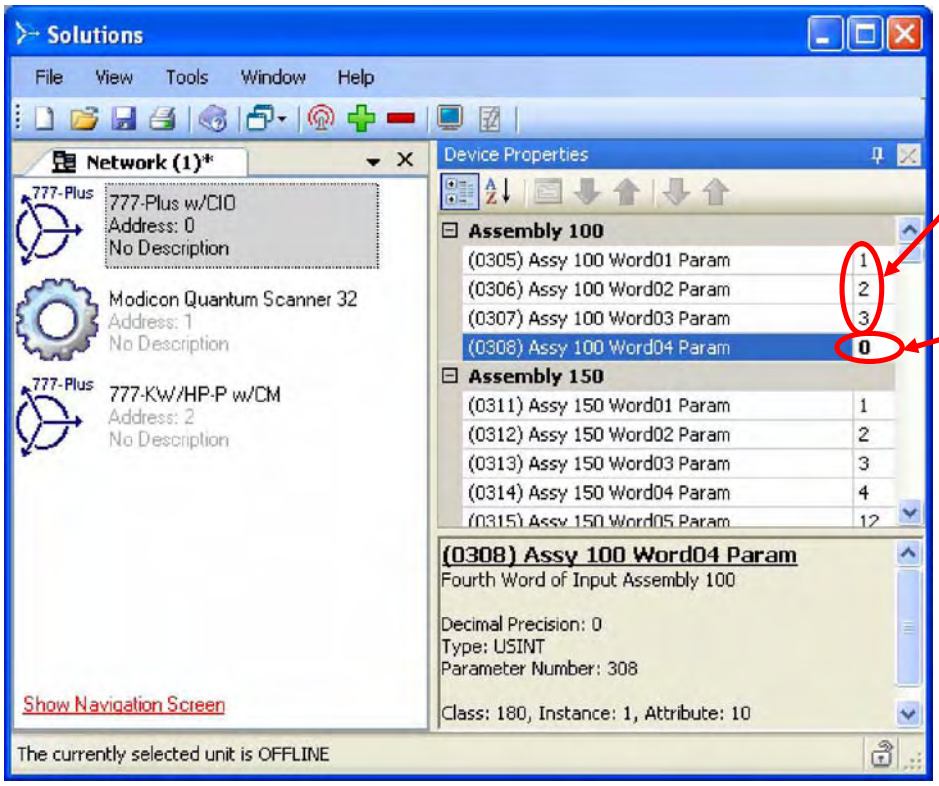

Figure 10-Variable Input Assembly

Step 9. **Configuring Variable Assembly**

Step a. Click on a device to edit the parameters of the device

Step b. Enter Parameters to monitor with a poll. In this case, parameters 1, 2, 3 are L1, L2, L3 voltages respectively. These values must match values in the parameter class (see **Table** 51)

Step c. End the list of parameters with 0.

Step d. Setup input assembly for assembly 100

Step e. Setup output assembly for desired relay control (see **Table** 26 through **Table** 30)

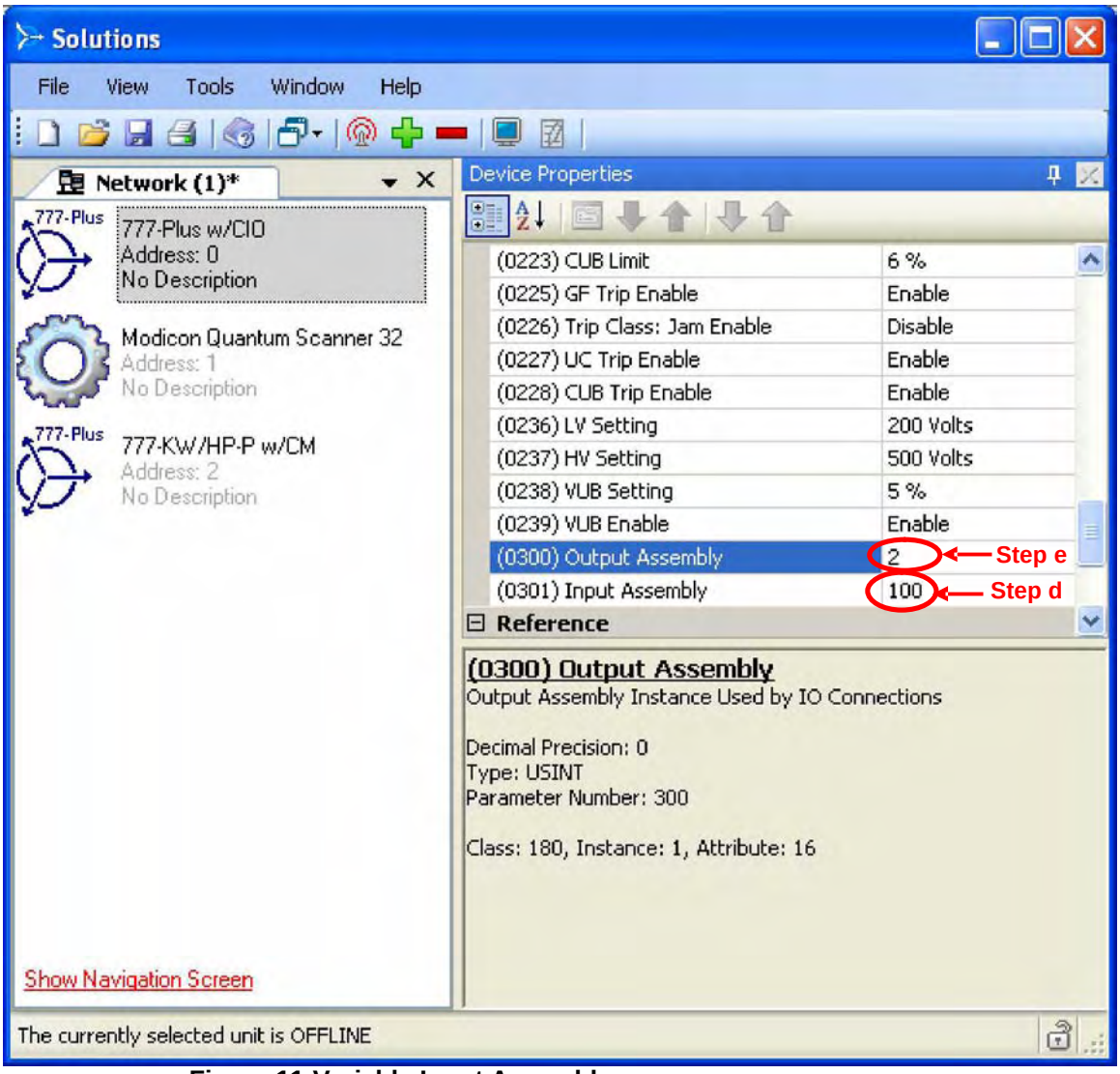

Figure 11-Variable Input Assembly

Step 10. Click the scanner icon, and click **Download From Scanner** button on the **Scanner Settings** tab.

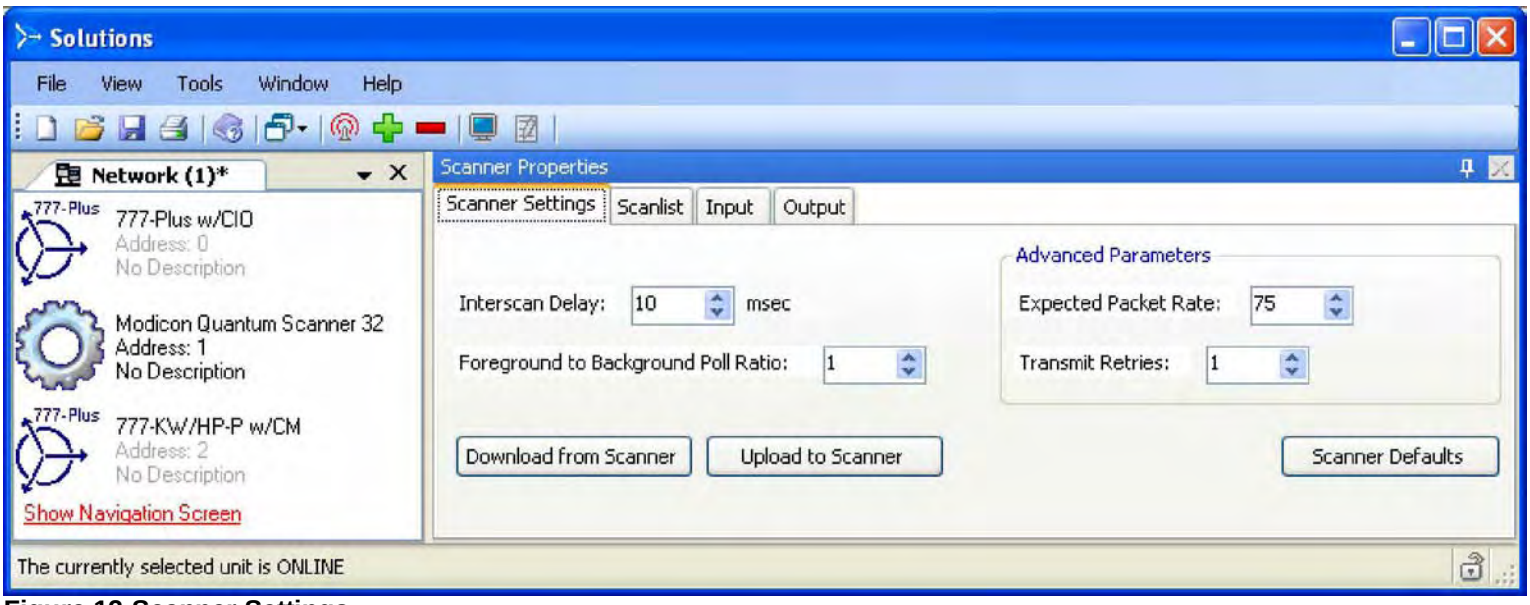

Figure 12-Scanner Settings

Step 11. Click the **Scanlist** tab, and select the device to scan from the **Available Devices:** window
Step 12. Click the **>** button to move the selected device to the **Scanlist:** window

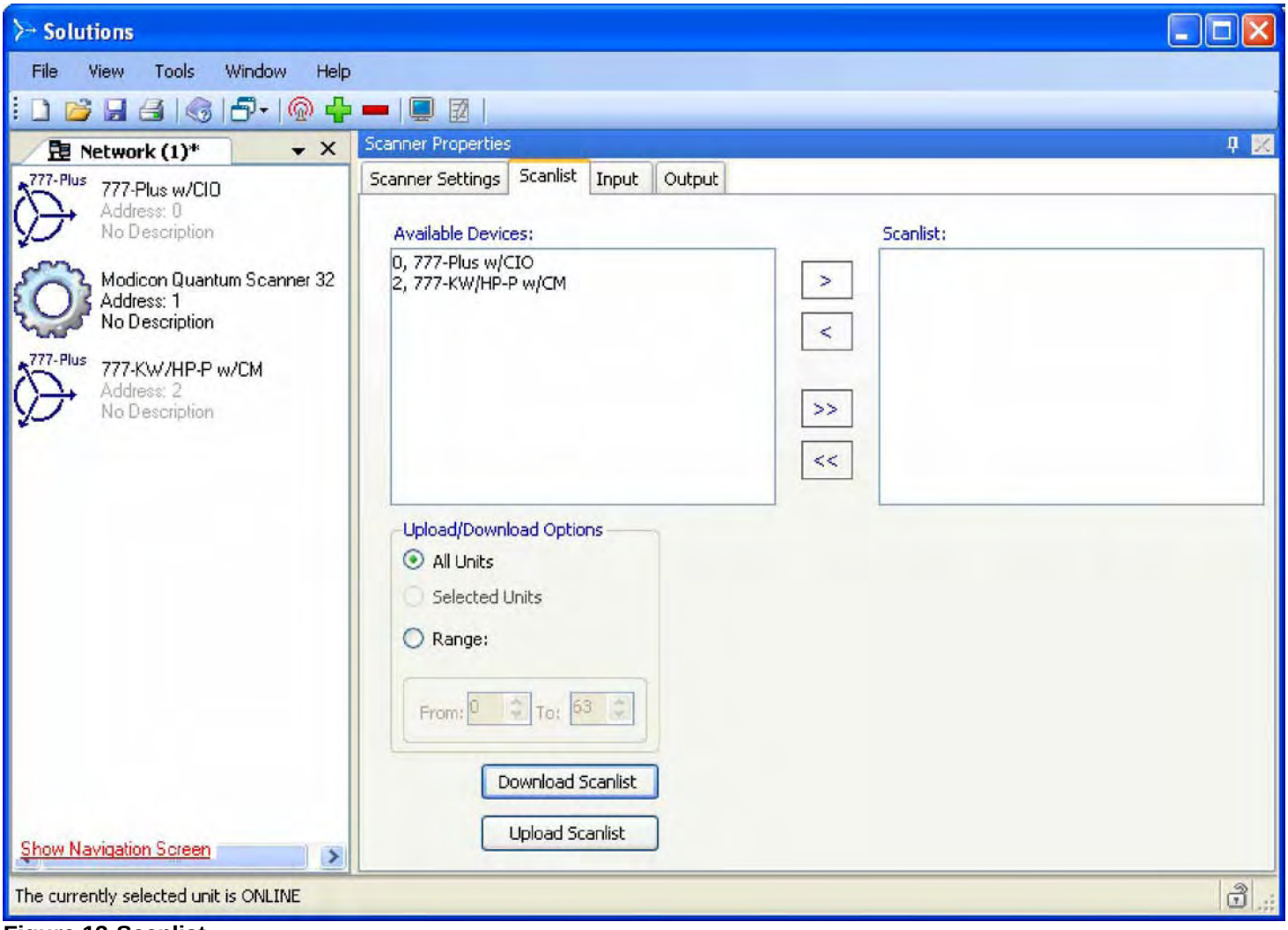

Figure 13-Scanlist

Step 13. Click the device in the **Scanlist:** window, Verify that the scan parameters are correct for the device; these should automatically be imported from the device EDS file.

Step 14. Click **Download Scanlist** button to download the **Scanlist:** windows devices to the scanner.

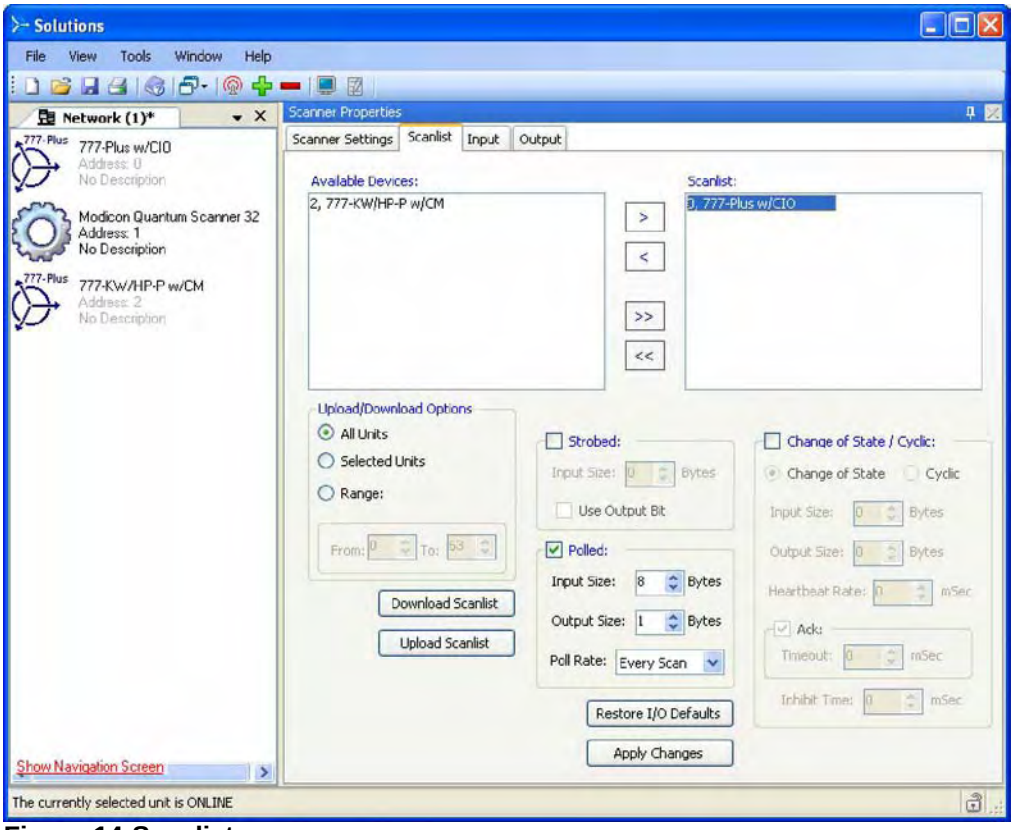

Figure 14-Scanlist

Step 15. Click the **Input** tab in the **Scanner Properties** window. Setting up the input and output map in this example we will assume using input assembly 100 which is 8 bytes and we will be using output assembly 104 see Table 29 which is 1 byte.

Step 16. Select the device to be configured.

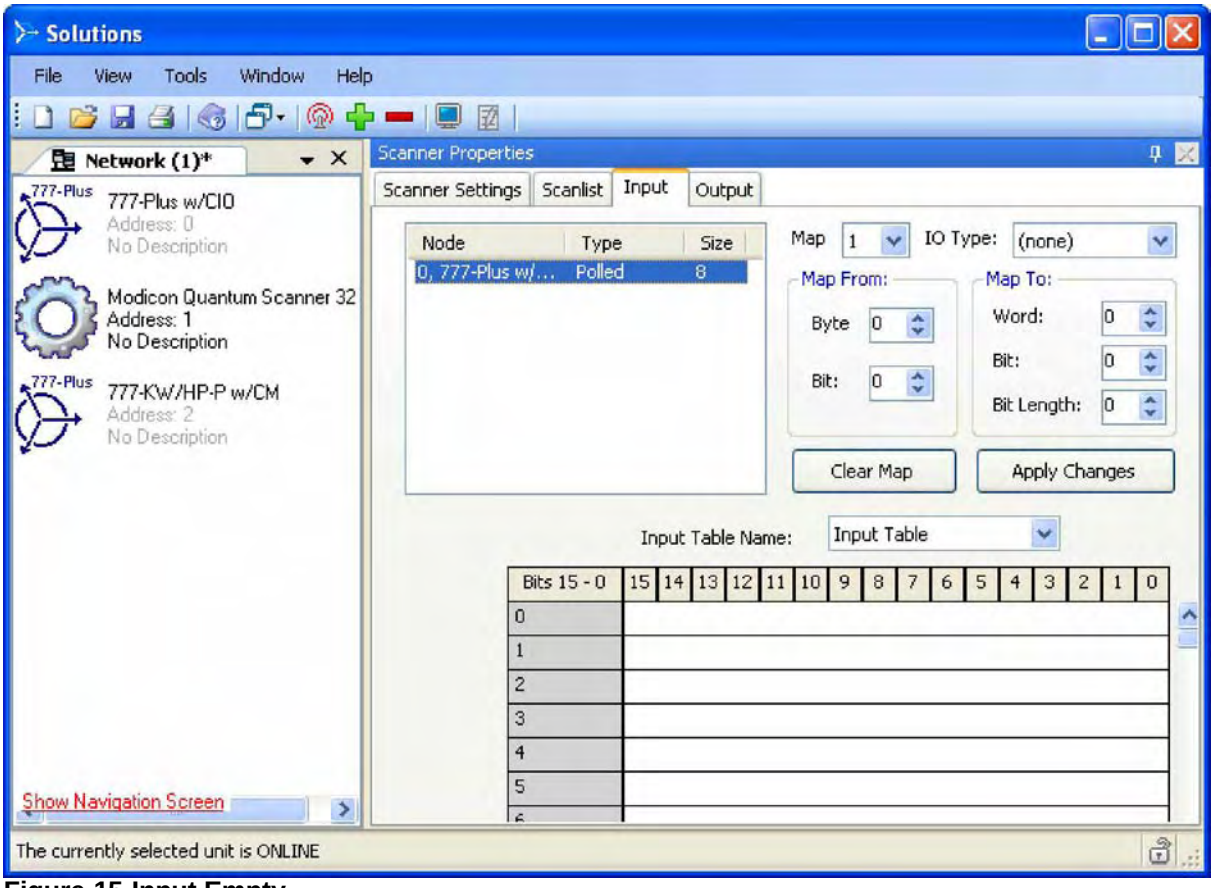

Figure 15-Input Empty

Step 17. Select the Map number from the **Map** drop down box. Solutions allows up to 4 maps
Step 18. Select **Polled** from the **IO Type** drop down box.
Step 19. Select the Byte number in the **Byte** drop down box in the **Map From:** panel. For example: using assembly 100 we look at the first word in the parameter view see Table 51. In this case the first word is 1 which is L1 current * 10 see **Error! Reference source not found.**. We know that each parameter is 2 bytes longs so when selecting the **Byte** from the **Map From:** panel, always use even number to get both the high and low bytes of that parameter.
Step 20. Adjust the **Word:** drop down box in the **Map To:** panel, to match the word number where the scanner will store the data coming in from the poll command.
Step 21. Adjust the **Bit Length** drop down box to 16. All parameter are 2 bytes or 16 bits in length.
Step 22. Click the Apply Changes button to commit map changes.
Step 23. Repeat Step 17 through Step 22 for all parameter to be mapped. In the case of input assembly 100 the user could map all 4 parameters; this is shown in Figure 16

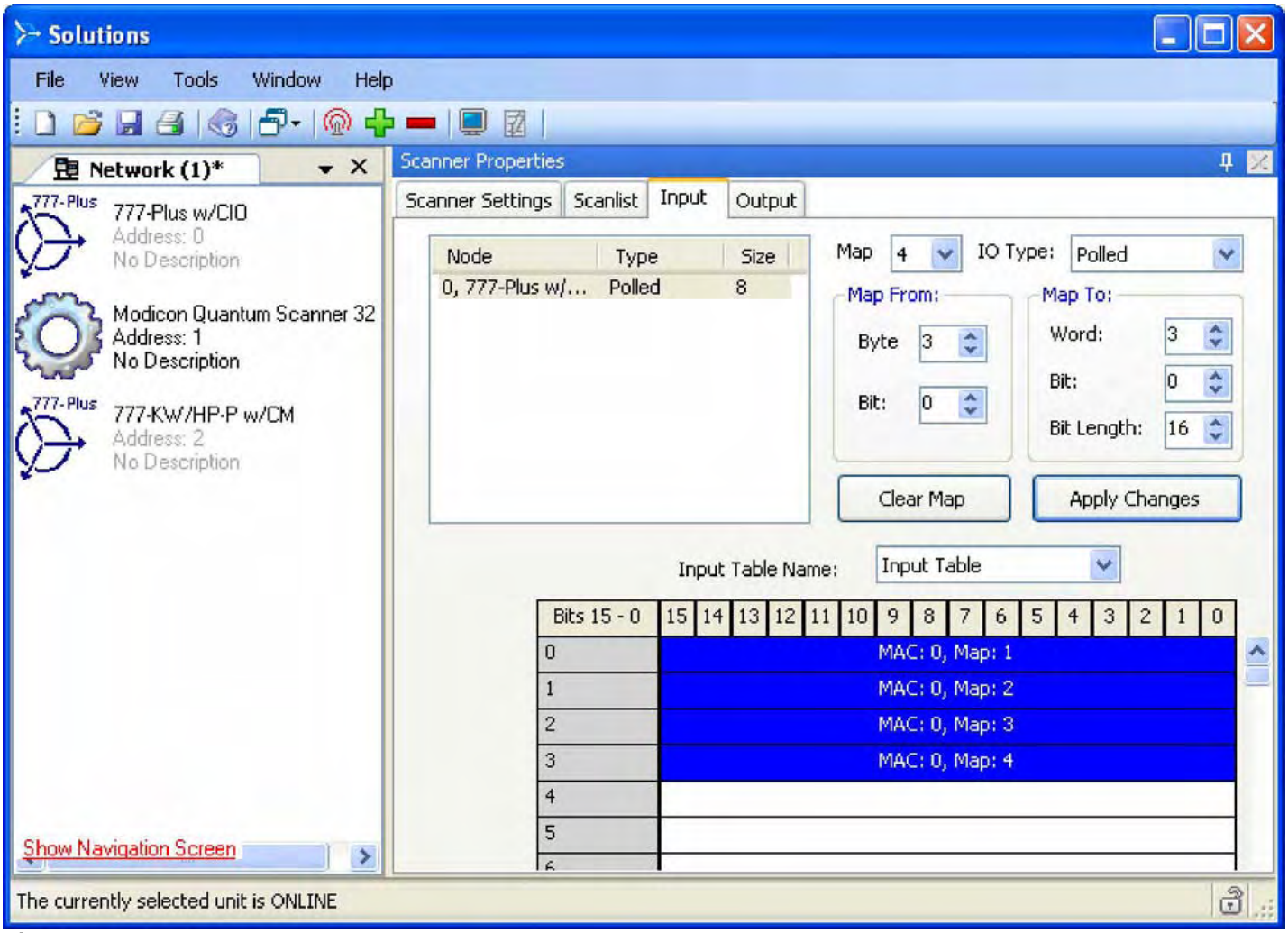

Figure 16-Input Map

Step 24. Click the **Output** tab in the **Scanner Properties** window. In this example we will be using output assembly 4 which is 1 byte long and controls the A and B relays of the CIO module.

Step 25. Select the device to be configured.

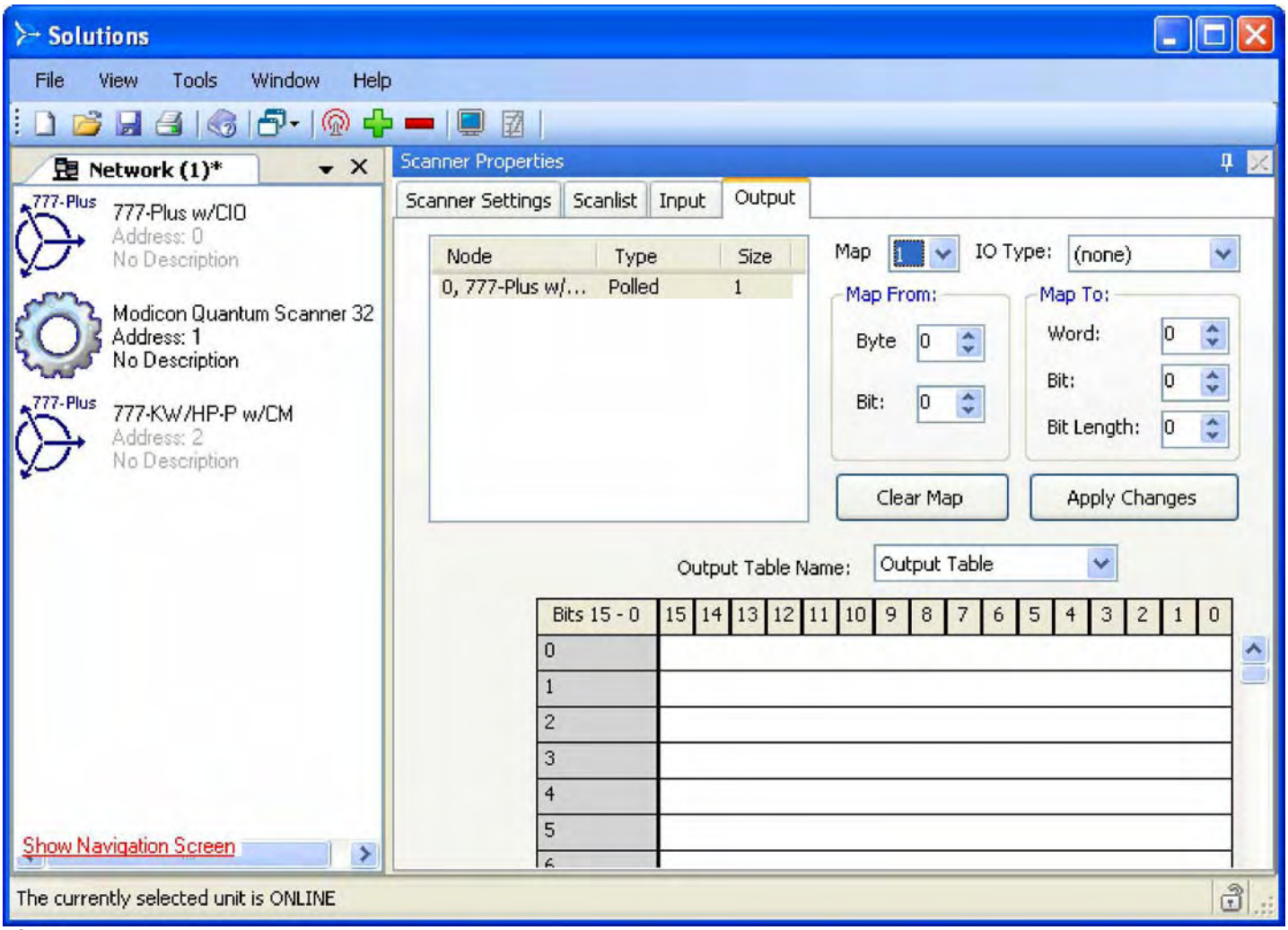

Figure 17-Output Empty

Step 26. Select the Map number from the **Map** drop down box. Solutions allows up to 4 maps
Step 27. Select **Polled** from the **IO Type** drop down box
Step 28. Select the Byte number in the **Byte** drop down box in the **Map From:** panel. For example: Using output assembly 104, this has 2 bits, bits 0 controls relay A , bit 1 controls relay B see **Table** 29.
Step 29. Adjust the **Bit:** drop down box in the **Map From:** panel, to matches the bit number for the relay to be controlled.
Step 30. Adjust the **Word:** drop down box in the **Map To:** panel to 0.
Step 31. Adjust the **Bit:** drop down box to match the bit of the relay to be controlled.
Step 32. Adjust the **Bit Length** drop down box to 1.
Step 33. Click the **Apply Changes** button to commit map changes.
Step 34. Repeat Step 26 through Step 33 for all parameter to be mapped. In the case of output assembly 4 there are only 2 relay bits to map as shown in Figure 18.

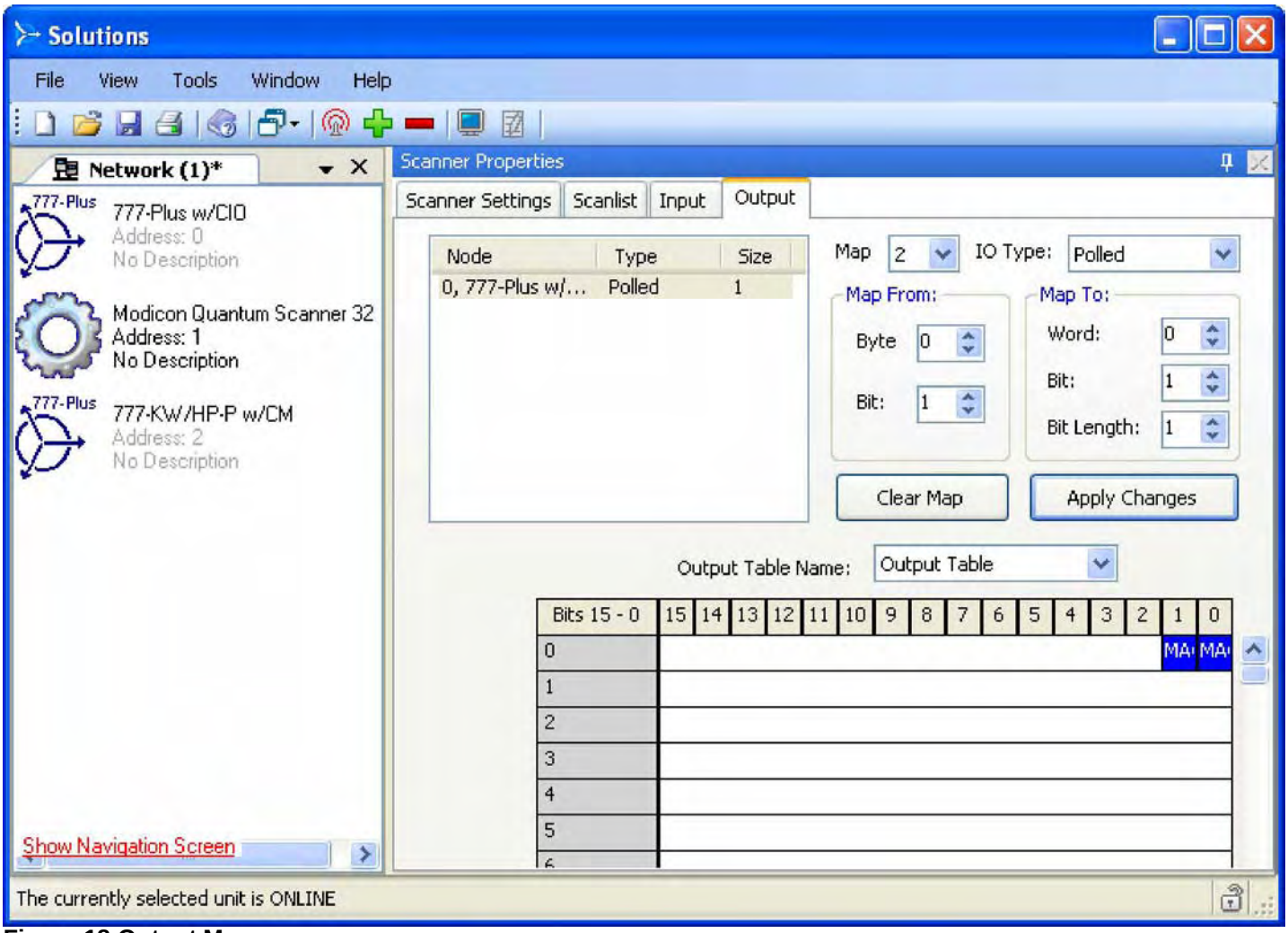

Figure 18-Output Map

Step 35. Click the **Scanlist** tab in the **Scanner Properties** window.
Step 36. Select the target device.
Step 37. Click the **Upload Scanlist** button to commit the mapping changes to the scanner.

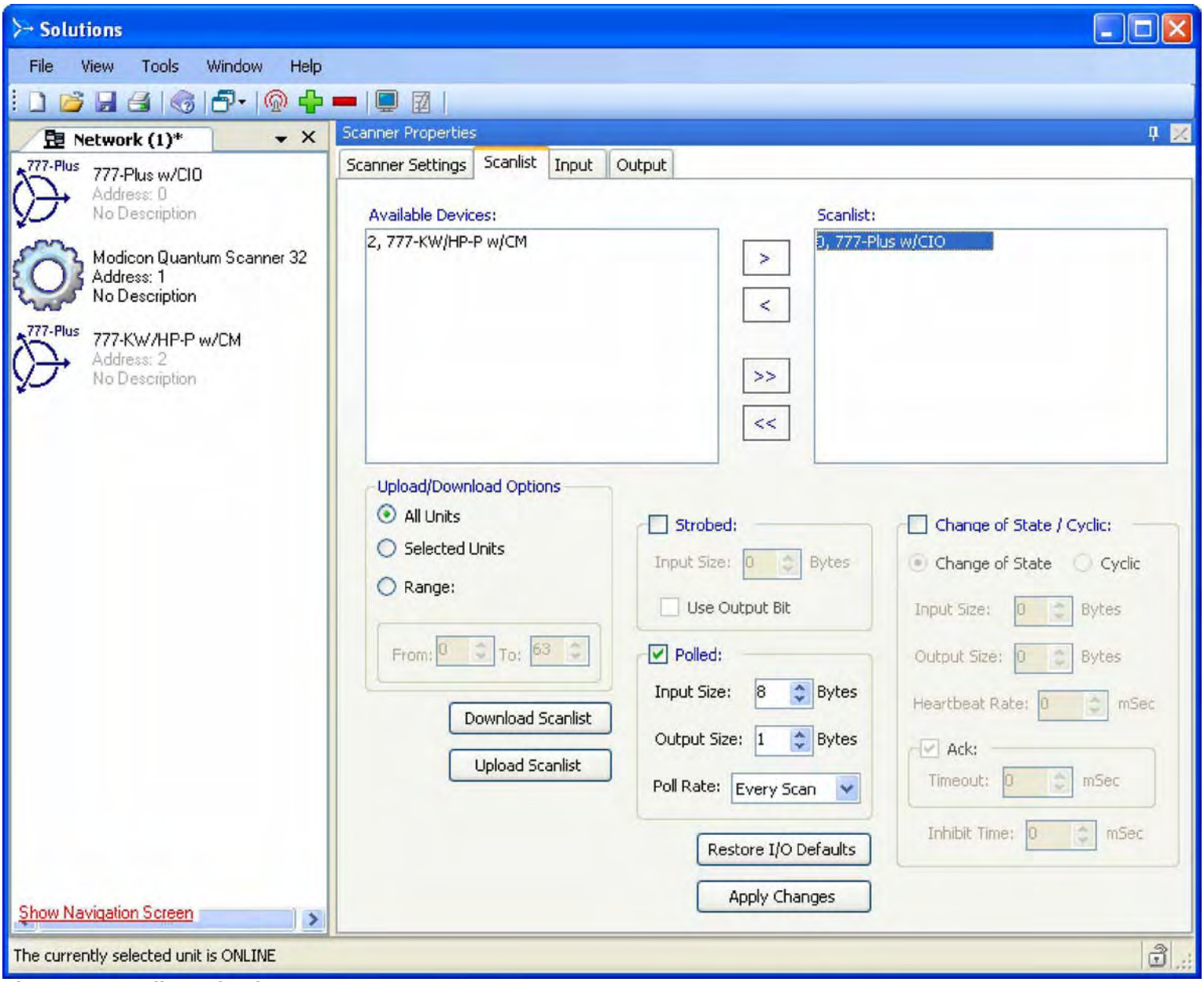

Figure 19-Scanlist Upload

APPENDIX A

MODEL 777 MEMORY LOCATIONS (Legacy)

Table 62 - Run Time Information

(MODBUS) Addr	Hex	4X * (Starting) REGISTER	Code	Description	Bytes
43	2B	40044	VCA	Voltage from Phase C to Phase A	2
45	2D	40046	VBC	Voltage from Phase B to Phase C	2
47	2F	40048	VAB	Voltage from Phase A to Phase B	2
49	31	40050	VAVG	Average Voltage	2
51	33	40052	IC	Current in Phase C	2
53	35	40054	IB	Current in Phase B	2
55	37	40056	IA	Current in Phase A	2
57	39	40058	IAVG	Average Current	2
59	3B	40060	VUNBAL	Voltage Unbalance	1
60	3C	40061	CUNBAL	Current Unbalance	1
61	3D	40062	RTMULT	Current Multiplier	1
62	3E	40063	PFANGLE	Power factor angle	1
63	3F	40064	GFCUR	Ground Fault Current	1
64	40	40065		NOT USED	1
65	41	40066	RD1R	Remaining Rapid Cycling Restart Delay	2
67	43	40068	RD2R	Remaining Normal Restart Delay	2
69	45	40070	RD3R	Remaining Undercurrent Trip Restart Delay	2
71	47	40072	MRH	Motor Run Hours (Not in all units)	2
73	49	40074	RTKW	Kilowatts (Not in all units)	2
75	4B	40076	TRIPRN	Trip Reason Code (See Table 11)	2
77	4D	40078	OLSTAT	Overload Status (See Table 10)	1
78	4E	40079	ERCODE	Error Code (See Table 9)	1
For Model 601 only:					
102	66	40103	FRQ6	Frequency, Model 601 (times 5)	2

* 4X – See section “SPECIAL NOTES WHEN USING THE 4X REGISTERS” for more information.

Table 63 - Limits (Setpoint) Information

(MODBUS) Addr	Hex	4X * (Starting) REGISTER	Code	Description	Bytes *
For Model 777, Major Rev 25 and newer					
211	D3	40212	LKMSK	Field Change Lock Mask	2 (R/W)
214	D6	40215	ENDIS	Enable/Disable Trip conditions	1 (R/W)
215	D7	40216	HKW	High KW trip limit	2 (R/W)
217	D9	40218	IMDLY	Time Delay before updating Imax	1 (R/W)
218	DA	40219	NETST	Network Status (See Table 12)	1 (R/W b0)
219	DB	40220	IMAX	Highest Recorded Current	2

(MODBUS) Addr	Hex	4X (Starting) (Write) REGSISTER	Code	Description	Bytes *
For Model 777, Major Rev 23 and newer					
221	DD	40222	LKW	Low Kilowatt Trip Limit	2 (R/W)
223	DF	40224	MAJORVR	Major Software Revision	1
224	E0	40225	MINORVR	Minor Software Rev (Model Rev.)	1

. . .

For Model 77C					
226	E2	40227	LIN	Linear OC Trip Delay	1 (R/W)
227	E3	40228	TU	RD1 & RD2 Time Units	1 (R/W)
. . .					
For Model 601					
226	E2	40227	HF	Over Frequency Limit (35.0 + Value/5)	1 (R/W)
227	E3	40228	LF	Under Frequency Limit (35.0 + Value/5)	1 (R/W)
228	E4	40229	TD1	(1-50)	1 (R/W)
229	E5	40230	TD2	(1-50)	1 (R/W)
. . .					
For All Models					
230	E6	40231	LV	Low Voltage Trip Limit	2 (R/W)
232	E8	40233	HV	High Voltage Trip Limit	2 (R/W)
234	EA	40235	VUB	Voltage Unbalance Trip Limit	1 (R/W)
235	EB	40236	MULT	Current Multiplier for Limits	1 (R/W)
236	EC	40237	OC	Over Current Trip Limit	1 (R/W)
237	ED	40238	UC	Under Current Trip Limit	1 (R/W)
238	EE	40239	CUB	Current Unbalance Trip Limit	1 (R/W)
239	EF	40240	TC	Trip Class	1 (R/W)
240	F0	40241	RD1	Rapid Cycling Restart Delay	1 (R/W)
241	F1	40242	RD2	Restart Delay after OC fault	1 (R/W)
242	F2	40243	RD3	Restart Delay after UC fault	1 (R/W)
243	F3	40244	#RU	Number of Restarts after UC fault	1 (R/W)
244	F4	40245	#RF	Number of Restarts after other faults	1 (R/W)
245	F5	40246	UCTD	Under Current Trip Delay	1 (R/W)
246	F6	40247	GF	Ground Fault Trip Limit (x 10)	1 (R/W)
247	F7	40248	LF1	Last Fault (See Table 8)	1
248	F8	40249	LF2	Second to Last Fault " "	1
249	F9	40250	LF3	Third to Last Fault " "	1
250	FA	40251	LF4	Fourth to Last Fault " "	1
251	FB	40252	ADDR	MODBUS Device Address	1
For Model 777, Rev B					
252	FC	40253	UNITID	Unit ID	1
253	FD	40254	MODELCD	Model Code (See Table **3**)	2
For Model 777, Rev A					
252	FC	40253	MMSN	Month Manufactured & Serial Number	2
254	FE	40255	YM	Year Manufactured	1

* (R/W) indicates Read / Write values. See section "READING VERSUS WRITING SETPOINT INFORMATION" for further information.

Table 64 - Command Location

(MODBUS) Addr	Hex	4X **(Starting /)** (Write) REGISTER	Code	Description		Bytes *
100	64	40101	COMLINE	Command Location	(See Table 1)	1 (R/W)

*** (R/W) Although this location can be read as well as written to, the value that is written to this location will be cleared (set to zero) after the command is processed.**

Command Codes
If a write request is issued to the Model 777 to write a 221 (or DD hex) to address 100, the Control relay will be requested to be turned off. Note that the request may not be executed immediately, but may require several hundred milliseconds to complete.

If a write request is issued to the Model 777 to write a 170 (or AA hex) to address 100, the Model 777 will be requested to be reset. If there are no voltage error conditions, the Model 777 control relay will be turned ON.

Table 65 - Command Codes
(for Writes to COMLINE at ADDRESS 100)

Code	Hex	Function
51	33	PTC Fault and Turn Model 777 OFF
68	44	Enable Network Programming
85	55	Disable Network Programming
102	66	Clear Motor Run Hours
119	77	Add “clr” as Last Fault
136	88	Enable Network Watchdog Timer
153	99	Disable Network Watchdog Timer
170	AA	Reset Model 777
221	DD	Turn Model 777 OFF