QUCM GE Multilin 169 PLUS

Installation and Programming Manual

This Manual describes the QUCM application for interfacing GE Multilin 169 PLUS Relay devices to a Modbus/TCP Ethernet system.

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Introduction

The Niobrara QUCM is a TSX Quantum® compatible module that is capable of running multiple applications for performing communication translations between serial protocols. This document covers an application that places GE Multilin 169 Plus Relay devices on a Modbus/TCP Ethernet network. The Multilin 169 Plus Motor Management Relay does not support the standard Modbus RTU serial protocol. This QUCM application polls networks of these relays in their native protocol and provides an interface for Modbus/TCP Ethernet devices so the data may be accessed as standard Modbus Holding Registers (4x) These devices may then be accessed by Modbus/TCP Clients such as Square D POWERLOGIC® System Manager Software.

The application, "app1.qcm" is compiled and loaded into Application 1 of the QUCM-SE with the Auto-Start feature enabled for stand-alone operation. The application includes multiple threads for simultaneously servicing both serial ports and the Ethernet port. Threads 1 and 2 provide the interface for up to two Multilin 169 PLUS Rely networks on QUCM Ports 1 and 2. Threads 3, 4, 5, 6, and 7 provide Modbus/TCP Servers for emulating the Multilin data as Modbus Holding Registers (4x) over Ethernet. Thread 8 provides a web server for quick reference of relay data using a common browser.

A Modicon two (or more) slot Quantum rack and appropriate Quantum power supply is needed for mounting the QUCM-SE.

Port 1 of the QUCM is always configured for a Multilin 169 network and will support up to 20 relays. Port 2 may be configured for a Multilin network and also support up to 20 relays or it may also be configured for a combination PNIM/Modbus RTU network and support up to 32 PNIM and/or Modbus RTU slaves.

The Multilin relays may be connected to a QUCM port using a Niobrara DDC2I Isolated RS-232<>RS-485 converter. An NR&D MM0 cable is used to connect the RJ45 port on the QUCM-SE to the RJ45 port on the DDC2I. The DDC2I is powered by the QUCM-SE. All six DIP switches on the DDC2I must be ON to provide 2-wire, multidrop RS-485 with termination and biasing. The DDC2I and MM0 are also used for connecting PNIM or Modbus devices to the QUCM.

The Multilin relays must be addressed in the range of 1 to 20 inclusive on each network. The incoming Destination Index value will be used for selecting the target relay data where Index 1 selects the data for unit 1 on Port 1 and Index 40 selects the data for unit 20 on Port 2. The QUCM-SE will support up to five simultaneous Modbus/TCP clients for access to the relay data.

If Port 2 is set to PNIM/Modbus mode then Destination Index accesses of 21 through 40 will return error messages and the PNIM/Modbus devices are accessed as Index values 101 through 132 inclusive.

2
Installation

Module Installation

1 Mount the QUCM in an available slot in the register rack. Secure the screw at the bottom of the module.

Software Installation

The application files for the QUCM are included in the M169.ZIP file. This file must be unzipped using PKUNZIP.EXE. A copy of PKUNZIP is included on the standard NR&D software disk and is also available at www.niobrara.com. The latest version of the M169.ZIP file is located at

ftp.niobrara.com/qucm/multilin/m169.zip

The latest version of this document in pdf format is located at:

ftp.niobrara.com/qucm/multilin/m169.pdf

Serial Connections to the QUCM-SE

Port 1 (and Port 2) to Multilin 169 PLUS Relays

The serial ports of the QUCM-SE are RS-232 while the Multilin relay is 2-wire RS-485. The Niobrara DDC2I converter with an MM0 cable is ideal for this connection since it includes an RJ45 RS-232 connection for the QUCM-SE and an optically isolated RS-485 port with removable screw terminals. The cable pinout from the DDC2I to the Multilin meters is described in Figure 2-1. It is advised to add a 220 ohm terminating resistor between A and B on the last relay in the network chain.

The Multilin relays will be configured so their "Slave Address" is within the range of 01 through 20 for each network attached to the QUCM-SE. Figure 2-2 shows two networks of relays connected to a single QUCM-SE.

DDC2I		Multilin 169 Plus		Multilin 169 Plus
TX+	———	47 (A)	———	47 (A)
TX-	———	46 (B)	———	46 (B)

Figure 2-1 DDC2I to Relay pinout

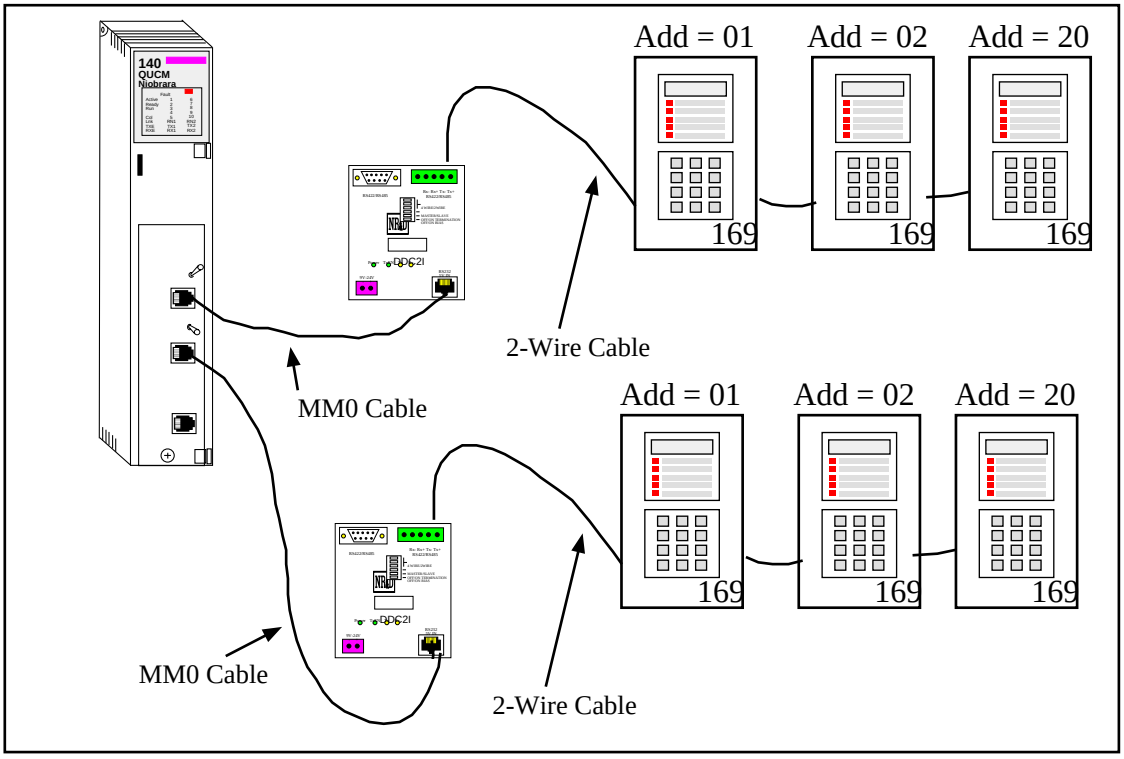

Figure 2-2 Layout with two Multilin Networks

Port 1 to the Personal Computer

A physical connection must be made from the personal computer to the QUCM in order to configure the Ethernet parameters of the QUCM-SE. This link may be a serial connection from a COM port on the personal computer to the RS-232 port on the QUCM-SE. The Niobrara MM1 cable may be used for this connection. This cable pinout is shown in Figure 2-4.

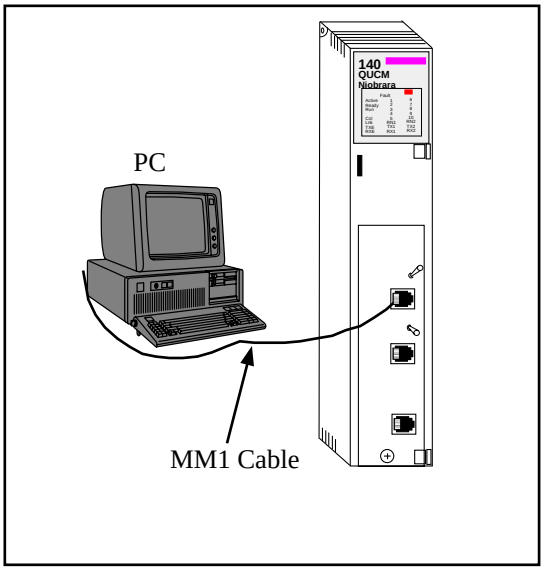

Figure 2-3 PC Connection to QUCM-SE serial port

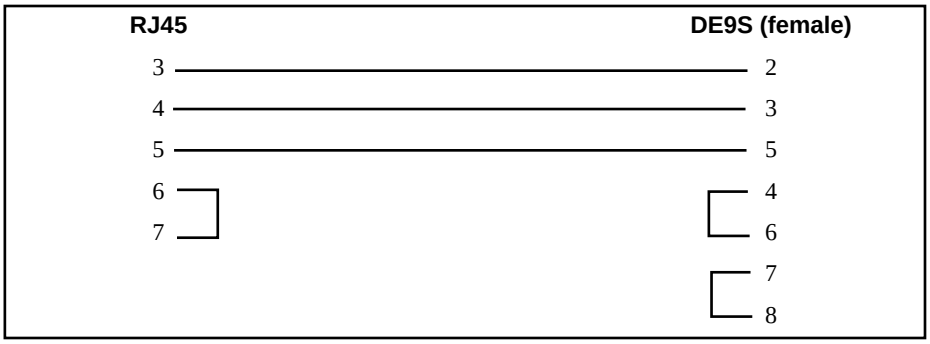

Figure 2-4 QUCM-SE to RS-232 PC DCE Port (9-pin) (MM1 Cable)

Loading the Applications into the QUCM

The QUCM is rapidly evolving so be sure to upgrade the firmware in the module before loading the latest version of APP1.QCC. Most likely the QCOMPILE.EXE has been updated, so be sure to use the newest version. Firmware upload is as follows:

1 Remove the module form the rack.

2 Move the RUN/LOAD switch on the back of the module to LOAD.

3 Replace the module in the rack and apply power.

4 Only the 3 light should be on. (The Link and RX E-net lights may be on if the E-net port is connected and there is traffic.)

5 Connect the PC to QUCM Port 1 with a MM1 cable.

6 From the command line enter

> fwload qucmtcp.fwl com1:

Be sure to have the colon after the PC's com port name. The download will only take a few minutes and will inform when finished.

7 Remove the module from the rack and change the switch back to RUN.

8 It is a good idea to press the RESET button after a firmware change.

It is recommended to use the Ethernet capabilities of QLOAD to load APP1.QCC into the QUCM. Set up the IP parameters of the module by the following method:

1 Move Switch 1 to Halt.

2 Connect the PC to QUCM Port 1 with a MM1 cable.

3 From the command line enter

>zapreg32 com1:9600,e,8,1 255 -b

This will start zapreg32 in Modbus RTU mode to slave address 255. Use the arrow and Page Up/Down keys to move to register 46. The IP parameters are shown below for a unit with the IP = 206.223.51.161 subnet Mask = 255.255.255.0, Default Gate = 206.223.51.1, Modbus/TCP port number = 503, Telnet Port number = 23:

Register	Description	Example (decimal)
46	IP MSByte	206
47	IP	223
48	IP	51
49	IP LSByte	161
50	SN Mask	255
51	SN Mask	255
52	SN Mask	255
53	SN Mask	0
54	Def. Gate	206
55	Def. Gate	223
56	Def. Gate	51
57	Def. Gate	1
58	TCP Control	7 (leave this at 7)
59	Reserved	0
60	Reserved	0
61	Reserved	0
62	TCP backstep	100 (leave this at 100)
63	Modbus Port	503 (this defaults to 502)
64	Telnet Port	23 (this defaults to 23)
65	Quiet Timer	900 (leave this at 900)
66	Clients	-1 (leave this at -1)

4 After entering the IP parameters, attempt to ping the module to verify the settings.

> ping 206.223.51.161

5 Verify a connection to the internal Modbus/TCP server with zapreg32.

> zapreg32 206.223.51.161:503 255

Should connect to the QUCM on port 503 with Destination index 255.

6 Load the APP1 file with qload.

> qload 1 app1 206.223.51.161:503 -a

Will load the file into application 1’s flash and set the program to automatically start on power-up.

7 Place Switch 1 in RUN. The RN1 light should come on.

Connect the DDC2I(s) to QUCM-SE Port(s) 1 (and/or 2). The QUCM-SE will begin attempting to communicate with the attached devices.

3

Operation

The Multilin 169 Plus relay network may consist of up to 20 slaves. The QUCM application supports up to two full networks and automatically determines which Multilin units are active on each serial port. The application is written in such a manner to search for non-responding relays periodically while having a minimum impact on the polling of the known active devices.

The known active devices on each port are continuously polled to retrieve their "Actual Values" and occasionally polled to retrieve their "Setpoint Values". These values are stored internally in the QUCM for access by Modbus/TCP Clients or the built-in web server. It takes three messages to each relay to gather all of the "Actual Data" and four messages to gather the "Setpoint Data" for each relay. The application guarantees that the Modbus/TCP (and web server) data polled on a relay will be from a single series of polls of the device.

Register List

Table 3-1 provides the description of the 193 Holding Registers assigned for each possible slave.

NOTE: All reads of registers > 193 will receive x8000 (hex) for the reply.

NOTE: The Modbus/TCP server supports opcode 03 Holding Register reads, opcode 100 Random Access Holding Register Reads, and optionally opcode 16 Holding Register Writes for the Setpoint Data.

Table 3-1 Holding Register List

Holding Register	Description
1	Device Status (lsb = 1 if device active)
2	Phase 1 Current (0-1800A)
3	Phase 2 Current (0-1800A)
4	Phase 3 Current (0-1800A)
5	Average Current (0-1800A)
6	Hottest Stator Temperature (0-200C)
7	Unbalance Ratio (0-31%)
8	Ground Fault Current (0-255) in A or 0.1A depending on the CT
9	Bargraph Count (0-24)
10	Hottest Stator RTD # (1-6)
11	Hottest Stator Temperature (0-201)
12	RTD 1 Temperature (0-201) 200 means temp >= 200C. 201 means broken RTD.
13	RTD 2 Temperature (0-201)
14	RTD 3 Temperature (0-201)
15	RTD 4 Temperature (0-201)
16	RTD 5 Temperature (0-201)
17	RTD 6 Temperature (0-201)
18	RTD 7 Temperature (0-201)
19	RTD 8 Temperature (0-201)
20	RTD 9 Temperature (0-201)
21	RTD 10 Temperature (0-201)
22	Hottest Stator RTD # since last access (1-6)
23	Hottest Stator temperature since last access (0-200C)
24	Max RTD 7 Temperature since last access (0-200C)
25	Max RTD 8 Temperature since last access (0-200C)
26	Max RTD 9 Temperature since last access (0-200C)
27	Max RTD 10 Temperature since last access (0-200C)
28	Estimated time to trip in seconds (0-65535)
29	Motor load (% of full load) (0-1200%)
30	Thermal Capacity Used (0-100%)
31	Running Hours since commissioning (0-65535)
32	# of starts since commissioning (0-255)
33	# of trips since commissioning (0-255)
34	# of O/L trips since commissioning (0-255)

35	# of rapid trips since commissioning (0-255)		
36	# of U/B trips since commissioning (0-255)		
37	# of G/F trips since commissioning (0-255)		
38	# of RTD trips since commissioning (0-255)		
39	# of start trips since commissioning (0-255)		
40	# of S/C trips since commissioning (0-255)		
41	Lockout Time (0-60 minutes)		
42	Pre-trip average current (0-1800A)		
43	Pre-trip unbalance ratio (0-31%)		
44	Pre-trip Ground fault current (0-255)		
45	Pre-trip maximum stator # (1-6)		
46	Pre-trip maximum stator temperature (0-200C)		
47	Learned avg. Istart (0-1800A)		
48	Learned last Istart (0-1800A)		
49	Learned K factor (3-25)		
50	Learned running cool time (5-60 minutes)		
51	Learned stopped cool time (5-60 minutes)		
52	Learned acceleration time (0-255 in 0.5sec)		
53	Learned start capacity (10-90%)		
54	Communication status (0-255)		
55	Motor Current status (0-3) (See Table 3-2)		
56	Motor Alarm Status (0-65535) (See Table 3-3)		
57	Motor Trip Status (0-65535) (See Table 3-4)		
58	Setpoint Status byte 1 (0-255)		
59	Setpoint Status byte 2 (0-255)		
60	Setpoint Status byte 3 (0-255)		
61	LED Data bitmap		
62	TRPMSGCONT		
63	TIMEOUT		
64	spare		
65	spare (END of ACTUAL DATA)		
66	Phase C.T. Ratio (START of SETPOINT DATA)		(20 to 1500)
67	Motor Full Load Current		(10 to 1500A)
68	Acceleration Time	(x 0.5 Seconds)	(1 to 251)
69	Starts Per Hour		(1 to 6)
70	Unbalance Alarm Level	%	(4 to 31)
71	Unbalance Alarm Delay	Seconds	(3 to 255)
72	Unbalance Trip Level	%	(4 to 31)

73	Unbalance Trip Delay	Seconds	(3 to 255)
74	Ground Fault C.T. Ratio	x 50	(1 to 5)
75	Ground Fault Alarm Level		(1 to 11)
76	Ground Fault Alarm Delay	Seconds	(1 to 255)
77	Ground Fault Trip Level		(1 to 11)
78	Ground Fault Trip Delay	x 0.5 Seconds	(0 to 41)
79	Undercurrent Level	Amps	(1 to 1001)
80	Undercurrent Delay	Seconds	(1 to 255)
81	Rapid Trip Level	x 1.5 FLC	(3 to 10)
82	Rapid Trip Delay	x 0.5 Seconds	(1 to 250)
83	Short Circuit Level	x 0.5 FLC	(3 to 10)
84	Short Circuit Delay	x 0.5 Seconds	(0 to 41)
85	Immediate Overload	x 0.001 FLC	(101 to 151)
86	Phase C.T. Secondary		(9 to 10)
87	Number of Stator RTDs		(0 to 6)
88	RTD 1 Alarm Level	C	(0 to 201)
89	RTD 1 Trip Level	C	(0 to 201)
90	RTD 7 Alarm Level	C	(0 to 201)
91	RTD 7 Trip Level	C	(0 to 201)
92	RTD 8 Alarm Level	C	(0 to 201)
93	RTD 8 Trip Level	C	(0 to 201)
94	RTD 9 Alarm Level	C	(0 to 201)
95	RTD 9 Trip Level	C	(0 to 201)
96	RTD 10 Alarm Level	C	(0 to 201)
97	RTD 10 Trip Level	C	(0 to 201)
98	Selected Overload Curve		(1 to 8)
99	Trip Time at 1.05 x FLC		(1 to 12000)
100	Trip Time at 1.10 x FLC		(1 to 12000)
101	Trip Time at 1.20 x FLC		(1 to 12000)
102	Trip Time at 1.30 x FLC		(1 to 12000)
103	Trip Time at 1.40 x FLC		(1 to 12000)
104	Trip Time at 1.50 x FLC		(1 to 2000)
105	Trip Time at 1.75 x FLC		(1 to 2000)
106	Trip Time at 2.00 x FLC		(1 to 2000)
107	Trip Time at 2.25 x FLC		(1 to 2000)
108	Trip Time at 2.50 x FLC		(1 to 2000)
109	Trip Time at 2.75 x FLC		(1 to 2000)
110	Trip Time at 3.00 x FLC		(1 to 2000)
111	Trip Time at 3.50 x FLC		(1 to 2000)
112	Trip Time at 4.00 x FLC		(1 to 2000)
113	Trip Time at 4.50 x FLC		(1 to 2000)
114	Trip Time at 5.00 x FLC		(1 to 2000)
115	Trip Time at 5.50 x FLC		(1 to 2000)
116	Trip Time at 6.00 x FLC		(1 to 2000)

117	Trip Time at 6.50 x FLC		(1 to 2000)
118	Trip Time at 7.00 x FLC		(1 to 2000)
119	Trip Time at 7.50 x FLC		(1 to 2000)
120	Trip Time at 8.00 x FLC		(1 to 2000)
121	Overload Trip Assignment		(16 to 18)
122	Unbalance Trip Assignment		(16 to 18)
123	Short Circuit Trip Assignment		(16 to 18)
124	Rapid Trip Assignment		(16 to 18)
125	Stator Trip Assignment		(16 to 18)
126	RTD Trip Assignment		(16 to 18)
127	Ground Fault Trip Assignment		(16 to 18)
128	Acceleration Trip Assignment		(16 to 18)
129	Phase Reversal Trip Assignment		(16 to 18)
130	Starts Per Hour Trip Assignment		(16 to 18)
131	Speed Switch Trip Assignment		(16 to 18)
132	Differential Input Trip Assignment		(16 to 18)
133	Single Phase Trip Assignment		(16 to 18)
134	Spare Input Trip Assignment		(16 to 18)
135	Start Trip Assignment		(16 to 18)
136	Overload Warning Assignment		(13 to 16)
137	Ground Fault Alarm Assignment		(13 to 16)
138	Unbalance Alarm Assignment		(13 to 16)
139	Undercurrent Alarm Assignment		(13 to 16)
140	Stator RTD Alarm Assignment		(13 to 16)
141	RTD Alarm Assignment		(13 to 16)
142	No Sensor Alarm Assignment		(13 to 16)
143	Self-Test Assignment		(13 to 16)
144	Spare Input Alarm Assignment		(13 to 16)
145	Default Display Line Code		(1 to 40)
146	Default Display Page Code		(1 to 10)
147	RTD Bias Minimum Value	C	(0 to 200)
148	RTD Bias Maximum Value	C	(0 to 200)
149	Default Running Cool Time	Minutes	(1 to 45)
150	Default Stopped Cool Time	Minutes	(5 to 65)
151	D/A Output Parameter		(45 to 48)
152	Alarm Relay Latchcode		(1 to 4)
153	Relay Failsafe Code		(1 to 8)
154	Speed Switch Delay	x 0.5 Seconds	(1 to 250)
155	Spare Input Alarm Delay	Seconds	(1 to 255)
156	Spare Input Trip Delay	Seconds	(1 to 255)
157	Default K		(1 to 20)
158	Slave Function Byte 1		(0 to 255)
159	Slave Function Byte 2		(0 to 255)
160	Slave Function Byte 3		(0 to 255)

161	Slave Function Byte 4			(0 to 255)
162	Slave Function Byte 5			(0 to 255)
163	Slave Function Byte 6			(0 to 255)
164	User Relay Force Code			(x1B to x20) hex
165	User RTD Force Code			(0 to 10)
166	User RTD Force Code Value	C		(0 to 201)
167	User Analog Force Code			(x21 to x24) hex
168	Time between last update of Actual Values		Seconds	
169	Unused			
170	Age of this Actual Values Data		Seconds	
171	Time between last update of Setpoint Values		Seconds	
172	Age of this Setpoint Values Data		Seconds	
173	Number of Stator RTDs			(0-6)
174	RTD 1 Alarm Level	C		(0 to 201)
175	RTD 1 Trip Level	C		(0 to 201)
176	RTD 2 Alarm Level	C		(0 to 201)
177	RTD 2 Trip Level	C		(0 to 201)
178	RTD 3 Alarm Level	C		(0 to 201)
179	RTD 3 Trip Level	C		(0 to 201)
180	RTD 4 Alarm Level	C		(0 to 201)
181	RTD 4 Trip Level	C		(0 to 201)
182	RTD 5 Alarm Level	C		(0 to 201)
183	RTD 5 Trip Level	C		(0 to 201)
184	RTD 6 Alarm Level	C		(0 to 201)
185	RTD 6 Trip Level	C		(0 to 201)
186	RTD 7 Alarm Level	C		(0 to 201)
187	RTD 7 Trip Level	C		(0 to 201)
188	RTD 8 Alarm Level	C		(0 to 201)
189	RTD 8 Trip Level	C		(0 to 201)
190	RTD 9 Alarm Level	C		(0 to 201)
191	RTD 9 Trip Level	C		(0 to 201)
192	RTD 10 Alarm Level	C		(0 to 201)
193	RTD 10 Trip Level	C		(0 to 201)

Table 3-2 Motor Current Status

Status Value	Meaning
0	Motor Stopped (Iavg < 10% FLC)
1	Motor Running Normal (Iavg < 1FLC)
2	Motor in O/L (Iavg > 1FLC)
3	Motor Starting

Table 3-3 Motor Alarm Status

Alarm Bit	Meaning if bit = 1
16 (lsb)	Immediate O/L Warning
15	Ground Fault Alarm
14	Unbalance Alarm
13	Undercurrent Alarm
12	Stator RTD Alarm
11	Bearing RTD Alarm
10	Broken Sensor Alarm
9	Self-Test Failure
8	Spare Input Alarm
7	Undefined
6	Undefined
5	Undefined
4	Undefined
3	Undefined
2	Undefined
1 (msb)	Undefined

Table 3-4 Motor Trip Status

Alarm Bit	Meaning if bit = 1
16 (lsb)	Overload Trip
15	Unbalance Trip
14	Short Circuit Trip
13	Rapid Trip
12	Stator RTD Trip
11	RTD Trip
10	Ground Fault Trip
9	Acceleration Time Trip
8	Phase Reversal Trip
7	Starts Per Hour Trip
6	Speed Switch Trip
5	Differential Input Trip
4	Single Phase Trip
3	Spare Input Trip
2	Start Inhibit Trip
1 (msb)	Undefined

Slave Addresses

The data from the possible 40 slaves is accessed via Modbus/TCP by the Destination Index field of the Modbus/TCP message. Table 3-5 displays the 40 supported Destination Index values and the associated Relay.

NOTE: Attempts to access data from slaves that are not responding will result in a Modbus/TCP exception code x0B. If Port 2 is configured for Multilin 169 mode then attempting to access devices > 40 will also result in an exception code x0B response.

Table 3-5 Destination Index Slave Table

Index	QUCM Port	Slave		Index	QUCM Port	Slave
1	1	1		21	2	1
2	1	2		22	2	2
3	1	3		23	2	3
4	1	4		24	2	4
5	1	5		25	2	5
6	1	6		26	2	6
7	1	7		27	2	7
8	1	8		28	2	8
9	1	9		29	2	9
10	1	10		30	2	10
11	1	11		31	2	11
12	1	12		32	2	12
13	1	13		33	2	13
14	1	14		34	2	14
15	1	15		35	2	15
16	1	16		36	2	16
17	1	17		37	2	17
18	1	18		38	2	18
19	1	19		39	2	19
20	1	20		40	2	20

If Port 2 is set for PNIM/Modbus then accesses to Indexes 21 through 40 will result in error x0B replies and accesses of Indexes 101 though 132 will result in messages being routed out Port 2 in either the PNIM or Modbus RTU protocol. The QUCM will attempt one protocol and then the other until it determines the type of device at a given slave address.

The supported slave addresses for PNIM and/or Modbus RTU slaves is shown in Table 3-6. All PNIM and/or Modbus RTU slaves must be set to the same baud rate and parity.

Table 3-6 PNIM/Modbus Destination Index Slave Table

Index	QUCM Port	Slave		Index	QUCM Port	Slave
101	2	1		117	2	17
102	2	2		118	2	18
103	2	3		119	2	19
104	2	4		120	2	20
105	2	5		121	2	21
106	2	6		122	2	22
107	2	7		123	2	23
108	2	8		124	2	24
109	2	9		125	2	25
110	2	10		126	2	26
111	2	11		127	2	27
112	2	12		128	2	28
113	2	13		129	2	29
114	2	14		130	2	30
115	2	15		131	2	31
116	2	16		132	2	32

4

Examples

Example 1

Figure 4-1 displays an example Multilin system with a QUCM-SE and two networks of Multilin 169 Plus relays. Port 1 of the QUCM-SE has a NR&D DDC2I RS-232<>RS-485 converter connected with an MM0 cable to three 169 relays. The relays are set to Slave Address 01, 02, and 03. QUCM Port 2 also has three 169 meters set to Slave Address 01, 12, and 19.

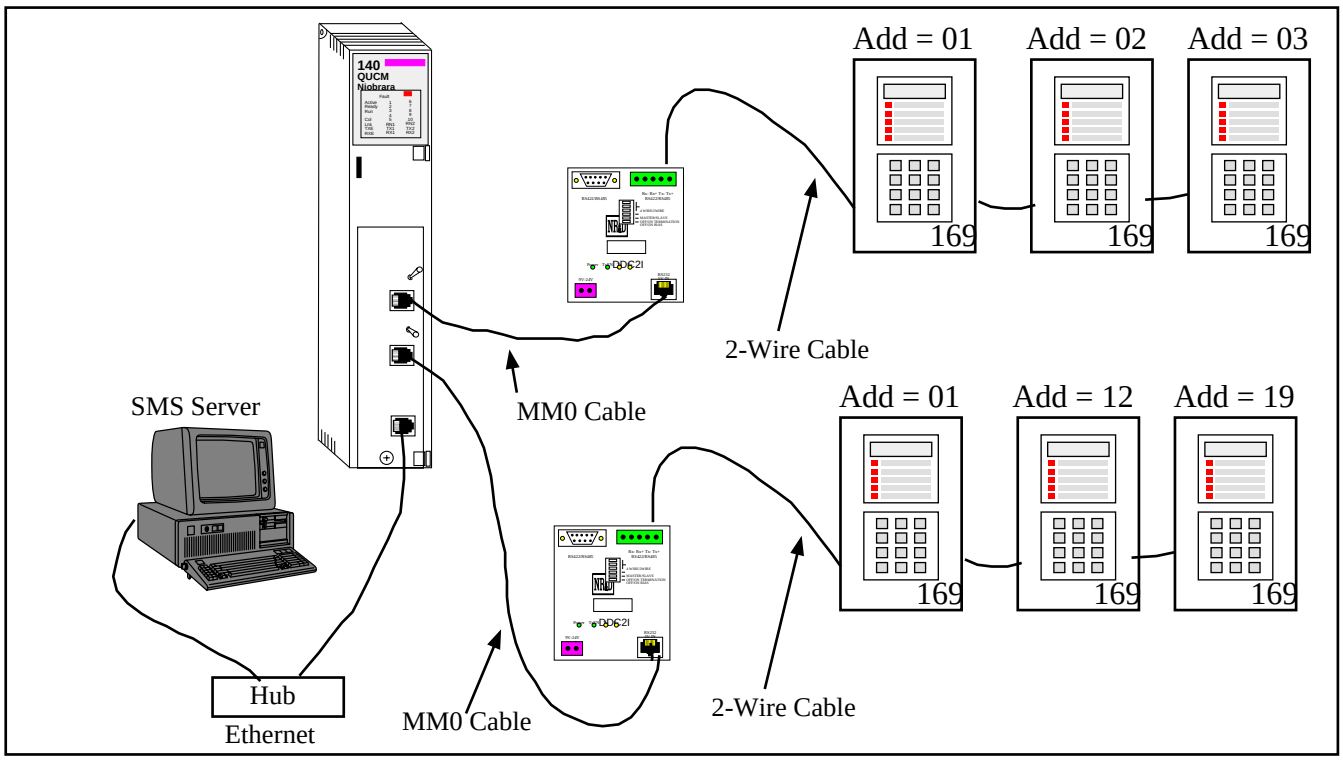

Figure 4-1 Example with two Multilin Networks

The QUCM-SE is connected to an Ethernet Hub via a 10BaseT cable. Also on the Ethernet network is an SMS-3000 system that needs data from the 169 Relays.

SMS may be configured where the relays are a "Powerlogic Compatible" or "Modbus Compatible". The QUCM application will accept normal Modbus/TCP Holding Reads (opcode 03) or Powerlogic Random Reads (opcode 100). The Index values are shown in Table 4-1.

Table 4-1 SMS Index List

Index	Target Relay
1	Port 1, Relay 1
2	Port 1, Relay 2
3	Port 1, Relay 3
21	Port 2, Relay 1
32	Port 2, Relay 12
39	Port 2, Relay 19

Example 2

Figure 4-2 displays an example Multilin system with a QUCM-SE with one network of Multilin 169 Plus relays and a second network with a POWERLOGIC CM2000 meter, a Multilin 269 relay, and a Modicon Momentum PLC.

Port 1 of the QUCM-SE has a NR&D DDC2I RS-232<>RS-485 converter connected with an MM0 cable to the three 169 relays. The relays are set to Slave Address 01, 02, and 03.

QUCM Port 2 also has a NR&D DDC2I RS-232<>RS-485 converter connected with an MM0 cable its RS-485 devices. The CM2000 communicates with the PNIM protocol and is set for Slave Address 01. The Multilin 269 relay and Momentum PLC communicate with the Modbus RTU protocol and are set for Slave Addresses 2, and 3. The Multilin Relay only has a 2-wire RS-485 connection so the CM and PLC are also wired for 2-wire by simply jumpering the IN+ to OUT+ and IN- to OUT-.

The QUCM-SE is connected to an Ethernet Hub via a 10BaseT cable. Also on the Ethernet network is an SMS-3000 system that needs data from all of the Devices.

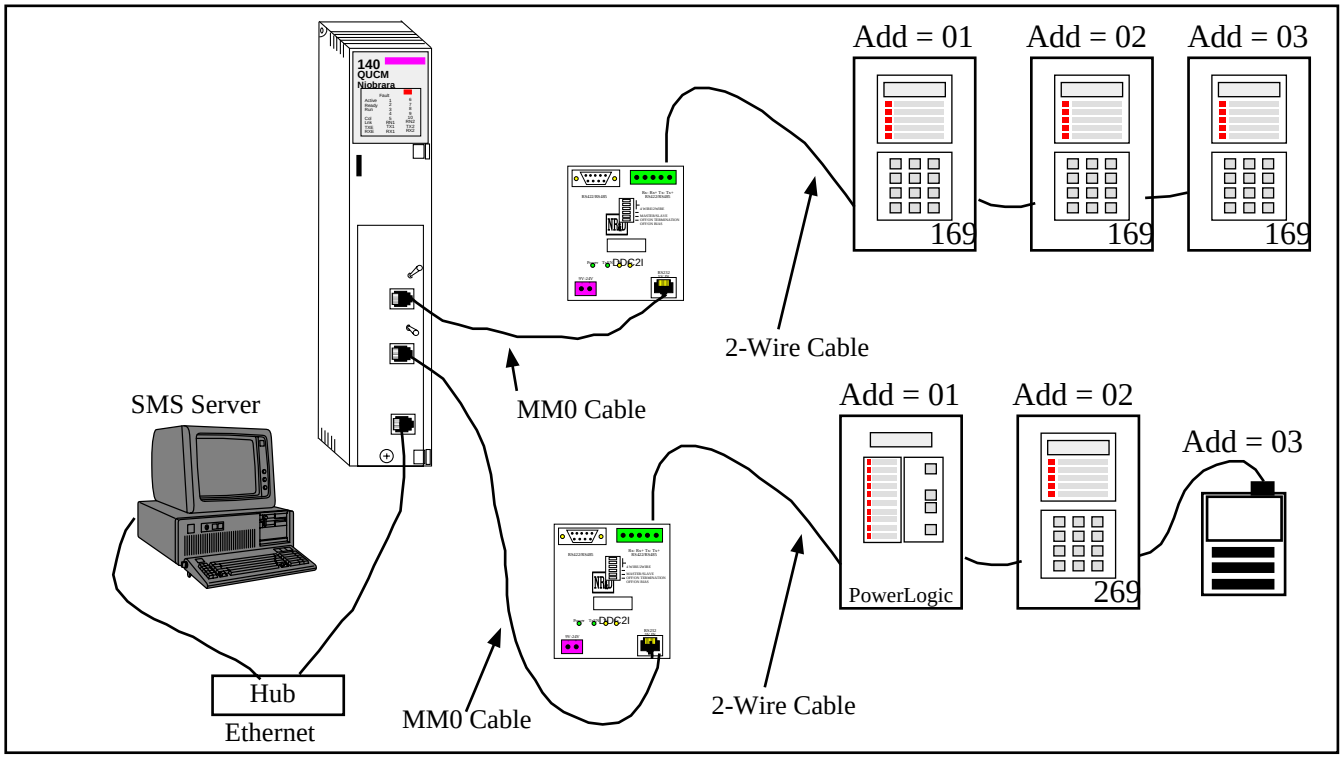

Figure 4-2 Example with one Multilin Network and one PNIM/Modbus Network

SMS may be configured where the 169 relays are a "Powerlogic Compatible" or "Modbus Compatible". The CM2000 is configured as a CM2000. The 269 Relay and PLC are configured as "Modbus Compatible". The Index values are shown in Table 4-2.

Table 4-2 SMS Index List

Index	Target Relay
1	Port 1, Relay 1
2	Port 1, Relay 2
3	Port 1, Relay 3
101	Port 2, CM2000
102	Port 2, Relay 269
103	Port 2, PLC

The QUCM application will pass all incoming Modbus/TCP messages routed to Modbus devices on port 2. Thus the PLC may be programmed with Modsoft, Concept, or Proworks Nxt by selecting Modbus/TCP as the connection type with the IP address of the QUCM and Index 103. The newer versions of the Multilin support software may also use Modbus/TCP to access the 269 relay for setup.

5

Web Server

Main Page

The Main page dynamically adjusts for two different views based on the setup configured for QUCM Port 2. When Port 2 is configured for Multilin 169 Mode the Main page shows a table with elements for the 40 possible relays. If a relay is not responding to queries from the QUCM then the table entry will have a gray background and display the text "Offline". If the relay is responding to queries then the cell will display "Online" along with a short description of the status of the relay. The Online message is a hypertext link that will display the "Actual" data for that relay. If the relay is not tripped then the cell will display the state of the motor.

- Motor Stopped
- Motor Running Normal
- Motor in O/L
- Motor Starting

If the Relay is tripped then the cell background will change to yellow and one or more of the following messages will be displayed.

- Overload Trip
- Unbalance Trip
- Short Circuit Trip
- Rapid Trip
- Stator RTD Trip
- RTD Trip
- Ground Fault Trip

Figure 5-3 shows an example page with Port 2 set for Multilin 196 mode with Relay #30 online and its motor stopped.

At the bottom of the Main page are links to Niobrara's WWW site, Statistics on this QUCM, and a page for configuring Port 2 of this QUCM.

6
Troubleshooting

Module Lights

The QUCM-SE has several lights that indicate the status of the module. Table 6-1 shows the meanings of these lights.

Table 6-1 Module Lights

Light	Meaning
Fault	The module has a catastrophic fault.. Call the factory.
Active	This light will be on if the module is in a traffic copped slot in a Quantum PLC system and the PLC is in RUN.
Ready	This light should always be on (as long as it isn't in firmware load).
Run	This light will be on if the module is in a traffic copped slot in a Quantum PLC system and the PLC is in RUN.
Col	Comes on when an Ethernet collision occurs.
Lnk	Is on when LINK is established on the 10BaseT port.
TXE	Comes on when the module is transmitting on the Ethernet port.
RXE	Comes on when the module is receiving on the Ethernet port.
RN1	This light should be on to indicate app1 is running.
TX1	Comes on when the module is transmitting on serial port 1.
RX2	Comes on when the module is receiving on serial port 1.
RN2	This light should not come on since there is no app2 loaded.
TX1	Comes on when the module is transmitting on serial port 1.
RX2	Comes on when the module is receiving on serial port 1.

User Lights

The QUCM-SE has 10 application driven lights numbered 1-10. The meaning of these lights while the APP1 program is running is shown in Table 6-2.

Table 6-2 User Light Definitions

Light	Meaning
1	Comes on after a timeout without a reply from a slave on QUCM Port 1. Stays on for about 1 second.
2	Comes on after a timeout without a reply from a slave on QUCM Port 2. Stays on for about 1 second.
3	Comes on when Thread 3 has an open Modbus/TCP connection.
4	Comes on when Thread 4 has an open Modbus/TCP connection.
5	Comes on when Thread 5 has an open Modbus/TCP connection.
6	Comes on when Thread 6 has an open Modbus/TCP connection.
7	Comes on when Thread 7 has an open Modbus/TCP connection.
8	Comes on when Thread 8 has an open web server connection.
9	Comes on while the Password Timer is running.
10	Comes on while Setpoint writes are being sent to a Multilin slave.