MUCM DF1

Installation and Programming Manual

This Manual describes the MUCM application for interfacing Allen-Bradley DF1 devices to a master of another protocol.

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Introduction

The Niobrara MUCM is a TSX Momentum® compatible module that is capable of running multiple applications for performing communication translations between serial protocols. This document covers an application that allows masters of various protocols to communicate with DF1 devices. This setup allows the master to be placed onto an existing Data Highway network via a DF1 to Data Highway bridge.

One application is required to be loaded into the MUCM: app1.qcm contains the DF1 and other serial drivers, and the configuration software. This application must be running for the system to properly perform.

Port 1 of the MUCM is to be connected to the master to provide the interface to the DF1 device. Port 2 is the DF1 port, and can be connected point to point with the DF1 device or, optionally, could be connected to a daisy chain of DF1 half duplex devices using RS-232 to RS-485 convertors. The MUCM supports many DF1 devices including Helm Instrument Company's Loadgard Serial Interface. These devices are accessed via the master protocol by selecting the node ID assigned to each slave (0-254).

Port 1 is also the configuration port. When Application 2's RUN/HALT switch is switched to the memory protect mode, it interfaces to an ASCII terminal to provide the user with a simple way to reconfigure the two serial ports.

The MUCM may be mounted on a DIN rail, or directly to a wall via mounting holes.

2
Installation

Module Installation

1 Mount the MUCM in an appropriate location on a DIN rail or in a cabinet.

Software Installation

The application files for the MUCM are included in the DF1.ZIP file. This file must be unzipped using an application like 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 DF1.ZIP file is located at

ftp.niobrara.com/mucm/DF1/DF1.zip

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

ftp.niobrara.com/mucm/DF1/DF1.pdf

The DF1 communications protocol is available from Allen-Bradley at:

www.ab.com/manuals/cn/17706516.pdf

Serial Connections to the MUCM

Port 1 to Master

If connecting to a Modicon PLC, the Niobrara cable MU2 is ideal for this connection since it includes a screw terminal RS-232 connection for the MUCM and a 9-pin male RS-232 Modicon-style pinout for the PLC. This cable pinout is described in Figure 2-1.

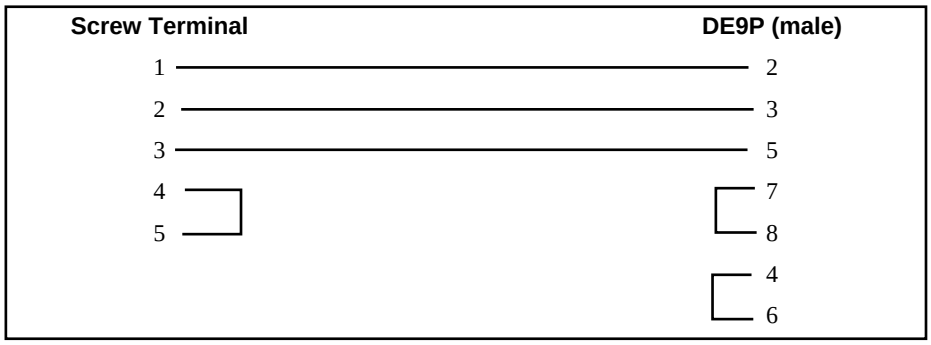

Figure 2-1 MUCM to RS-232 DTE Port (9-pin) (MU2 Cable)

For an RS-485 connection to SY/MAX devices, Port 1 of the MUCM will be set to be RS-485. The Niobrara cable MU7 is ideal for this connection since it includes an RJ45 RS-485 connection for the MUCM and a 9-pin male RS-485 SY/MAX-style pinout at the other end. This cable pinout is described in Figure 2-2.

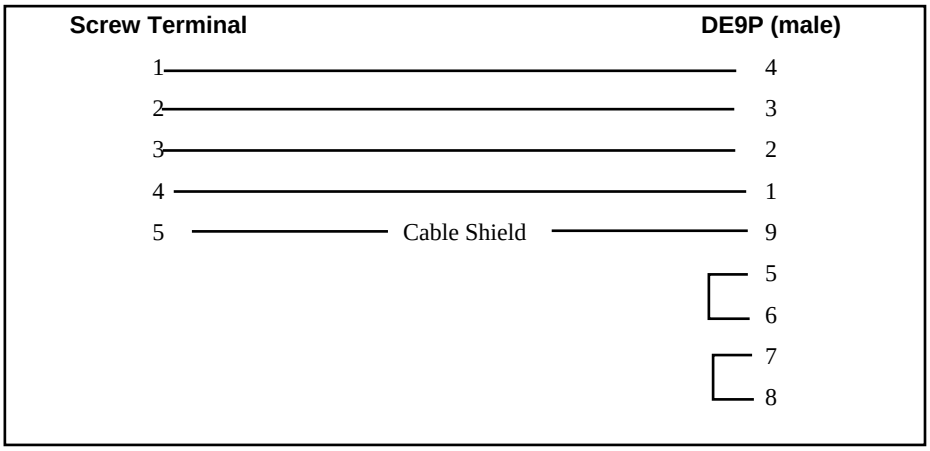

Figure 2-2 RS-485 SY/MAX Port (9-pin) (MU7 Cable)

The master must be configured to match the serial settings of the MUCM Port 1. The supported baud rates by both units are 1200, 2400, 9600, and 19200. 19200 baud is the default.

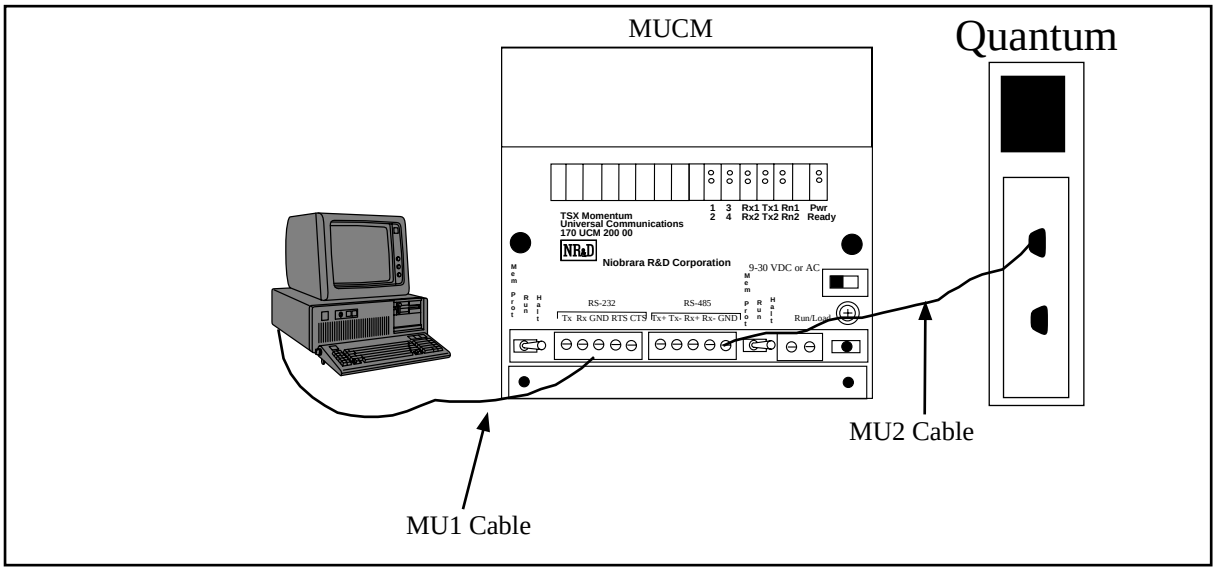

Figure 2-3 MUCM Layout

Port 2 to the Personal Computer

A physical connection must be made from the personal computer to the MUCM in order to download the applications. This link may be a serial connection from a COM port on the personal computer to the RS-232 port on the MUCM. The Niobrara MU1 cable may be used for this connection. This cable is shown in Figure 2-4.

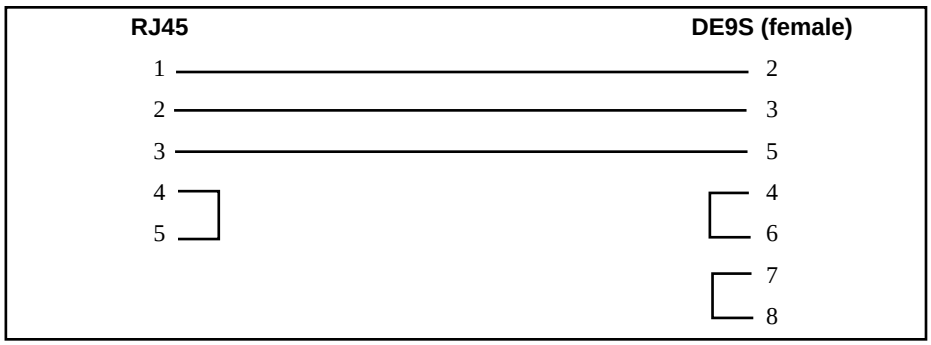

Figure 2-4 MUCM to RS-232 PC DCE Port (9-pin) (MU1 Cable)

Loading the Applications into the MUCM

The MUCM 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 Move the RUN/LOAD switch on the module to LOAD.

2 Only the Pwr light should be on.

3 Connect the PC to MUCM Port 1 with an MU1 cable.

4 From the command line enter

> fwload mucm.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.

5 Change the switch back to RUN.

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

Next, load APP1.QCC into the MUCM by the following method:

1 Move Switch 1 to Halt.

2 Connect the PC to MUCM Port 1 with an MU1 cable.

3 Load the QRPC file with qload.

> qload 1 app1 com1:9600,e,8,1 -a

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

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

5 Place Switch 2 in the HALT position until ready to configure the MUCM.

DF1 to MUCM Port 2

After the software has been installed into the MUCM, Port 2 becomes the DF1 port. The connection for the MUCM to the Allen-Bradley DF1 to Data Highway convertor should be accomplished with the Niobrara SC902-ST if the convertor's port is set to RS-232(Refer to Figure 2-3). If the convertor's port is set to RS-422, the diagram for that cable is located in figure 2-5.

Figure 2-5 MUCM RS-422 to DF1/Data Highway Convertor RS-422

3
Master Protocol to DF1 Bridge

After the software has been loaded, and the RN1 light is lit, the MUCM is ready to be used as a bridge between various protocols and Df1. A Modbus master should use opcode x03 for an unprotected read, and opcode x06 or x16 for unprotected writes. Any other opcode will not be translated. A SY/MAX priority or non-priority read or write will also be translated. The master will transmit a normal query, and the MUCM will transparently pass the slave ID to the DF1 device. The exception to this is if the user forces the route to always be 1. This option only works with RNIM. On the DF1 side, the MUCM will use a predefined source ID that can be configured from the configuration page. The default source ID is 0.

Note: Since Allen-Bradley PLC's register spaces begin with 0 instead of 1, the master must ask for a register number that is one higher than the actual desired register number.

Configure the MUCM

The MUCM is configured by a hyperterminal session. The PC is connected to the MUCM's Port 1 with an MU1 cable. Configure the hyperterminal session for 9600 baud, no parity, 8 data bits, 1 stop bit, no handshaking. The MUCM will set itself to these settings, and transmit the configuration page when the Application 2 Run/Halt switch is placed in the Memory Protect postion.

When the Application 2 switch has been set to Memory Protect, it will transmit the configuration page to the hyperterminal. If at any time the information is not displayed, or is displayed incorrectly, pressing the Enter key will cause the MUCM to retransmit the same page. From this main page, the user can configure Port 1 and the DF1 port. The user can also select an option that will display all current settings. To select an option, simply press the correspoding number for the option desired. There is no need to press the Enter key.

Port 1 Configuration

The Modbus configuration page allows the user to select the baud rate, parity, data bits, stop bits, protocol, and if necessary, the RNIM address that will be used to communicate with the master. The defaults are 19200, None, 8, 1, Modbus RTU, and 1 respectively. Be sure that these settings match the settings for the master. Again, simply press the corresponding number for the desired option.

When an option is selected, the MUCM will display the current setting, as well as all available options for that particular setting. To accept the current setting, press the Enter key. To change the setting, press the number of the desired option. The MUCM will save that setting, and return to the previous configuration page. To exit the Port 1

configuration page, press the X key. This will return the user to the main configuration page.

NOTE: When Pass-Thru is selected for Port 1, only baude rate, parity, stop bits, and data bits may be chosen for both ports. All other values may be changed, but will have no effect on the application.

DF1 Configuration

The DF1 configuration page allows the user to change the settings for the DF1's port. Possible settings are baud rate, parity, data bits, stop bits, message timeout, node ID, and starting register. The first four are set in the same manner as for the Modbus port. Their default settings are 19200, None, 8, and 1, respectively.

The message timeout feature allows the user to select how long the MUCM will wait for a reply to a query. The default timeout is 10000ms. The timeout is fully programmable by typing the desired time in milliseconds. Valid times are 0 to 30000ms.

The node ID is the DF1 network ID that identifies each device on the network. Each node must have a unique ID. The default ID for the MUCM is 0. To change the ID, select Node ID from the DF1 configuration page, and type the desired number, followed by the Enter key. Valid numbers are 0-254.

The starting register allows the user to determine whether the translation starts at register 0 or 1. Allen-Bradley PLC's feature a register 0. If the starting register is set to zero, then register 0 will actually be mapped to register 1 on Port 1. Otherwise, the registers will map one to one.

Automatic Polling Configuration

Revisions of this application dated 20 August or later have the ability to automatically read or write registers in a DF1 device. The setup is located in the options for the DF1 port. The user can select the entry number, local and remote registers, register count, direction, and slave address. The local register is the register in the MUCM that will be used to store the data. The remote register is the register in the DF1 device.

4
Examples

Example 1

Figure 4-1 displays an example Modbus to DF1 bridge using a Modicon Bridge/Multiplexer to bridge between Modbus Plus and Modbus RTU. A Quantum PLC polls the DF1 device across Modbus Plus, and the MUCM converts the message to DF1.

The Quantum sends a query using the MSTR block out the Modbus Plus port with a route of 35, 2, 1. Port 2 of the Bridge/MUX has been configured as a network port to which multiple devices may be connected. The message is therefore received by the Bridge/MUX(drop 35), translated to Modbus RTU, and routed out port 2 to slave device 1.

The MUCM will receive the Modbus RTU message at port 1 for device 1, translate the message to DF1, and route it out port 2 to Node ID 1. When the DF1 device responds to the query, the MUCM will receive the response at port 2, convert the message to Modbus RTU, and route back out port 1. The Bridge/MUX will receive the reply, and route the appropriate Modbus Plus message back to the PLC.

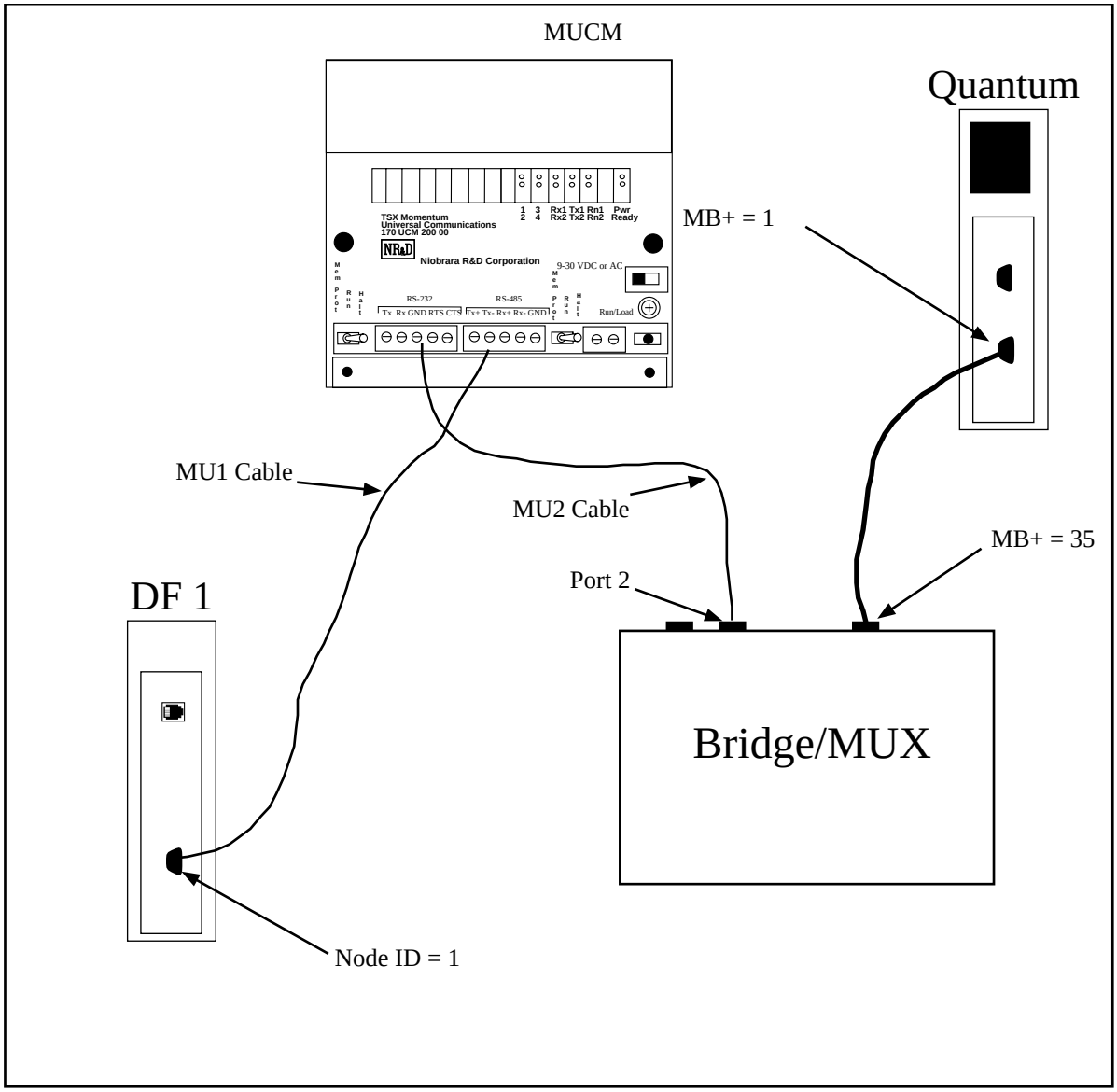

Figure 4-1 Modbus Plus Example

Example 2

Figure 4-2 displays an example of how the MUCM could be used to put data from a DF1 device onto Modbus TCP.

This example allows the SMS computer to see the data in the DF1 device connected to port 2 of the MUCM. The EPE5's Port 1 must be set to Modbus Gate protocol, and an MU7 cable should be used between the EPE5 and the MUCM. The MUCM's port 1 must be set to RS-422 communications.

Table 4-1 shows the entry that must be in the Modbus Server table for the PC to be able to communicate with the DF1 device. SMS will connect to the EPE5-TCP using index 1. Index 1 points to the entry in the server table, and routes the message out Port 1 to the MUCM, which sends the message to the DF1 device.

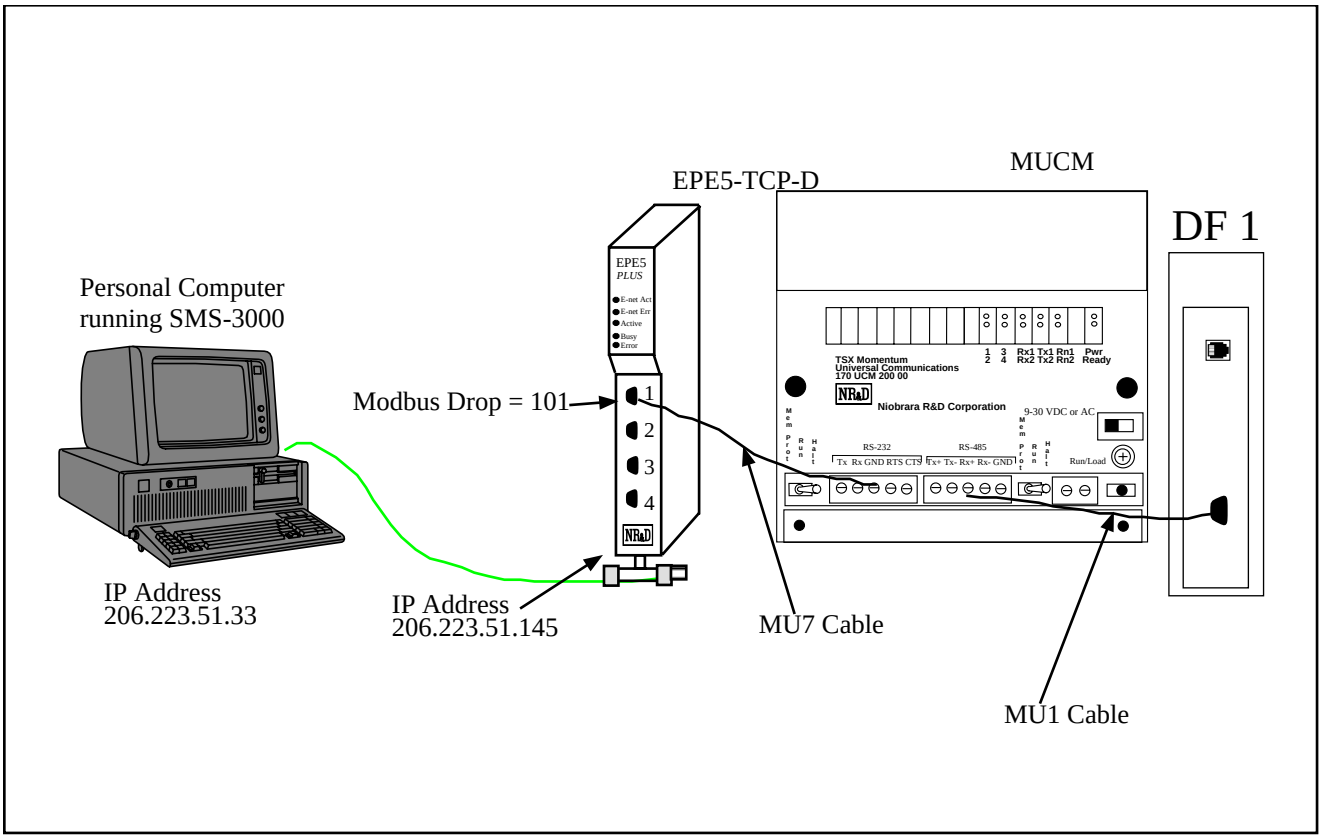

Figure 4-2 Modbus TCP Example

Table 4-1 Server Index Table For EPE5-TCP

Drop	TYPE	Route
1	OTHER	101,1

Example 3

This example describes the use of the DF1 application to interface a Quantum PLC to a Helm Loadgard Serial Interface. The configuration and connection to the Quantum is the same as in Example 1. Figure 4-3 shows the connection from the MUCM to the Loadgard.

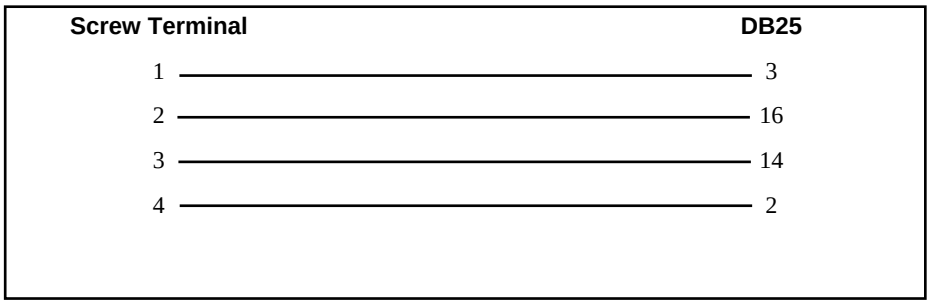

Figure 4-3 MUCM RS-422 to Helm Loadgard Serial Interface

Example 4

This example describes an interface between an RNIM radio network and an Allen-Bradley SLC 5/04 processor. A SY/MAX Model 650 will poll the remote PLC via a network of RNIM's and radios.

The 650 generates a TREAD or TWRITE with a route of 100,0,53,153. The MUCM is set for RNIM address 53, and will translate the message to a DF1 unprotected read or write at address 153. The MUCM may also translate it to address 1 if the forced route option is set.

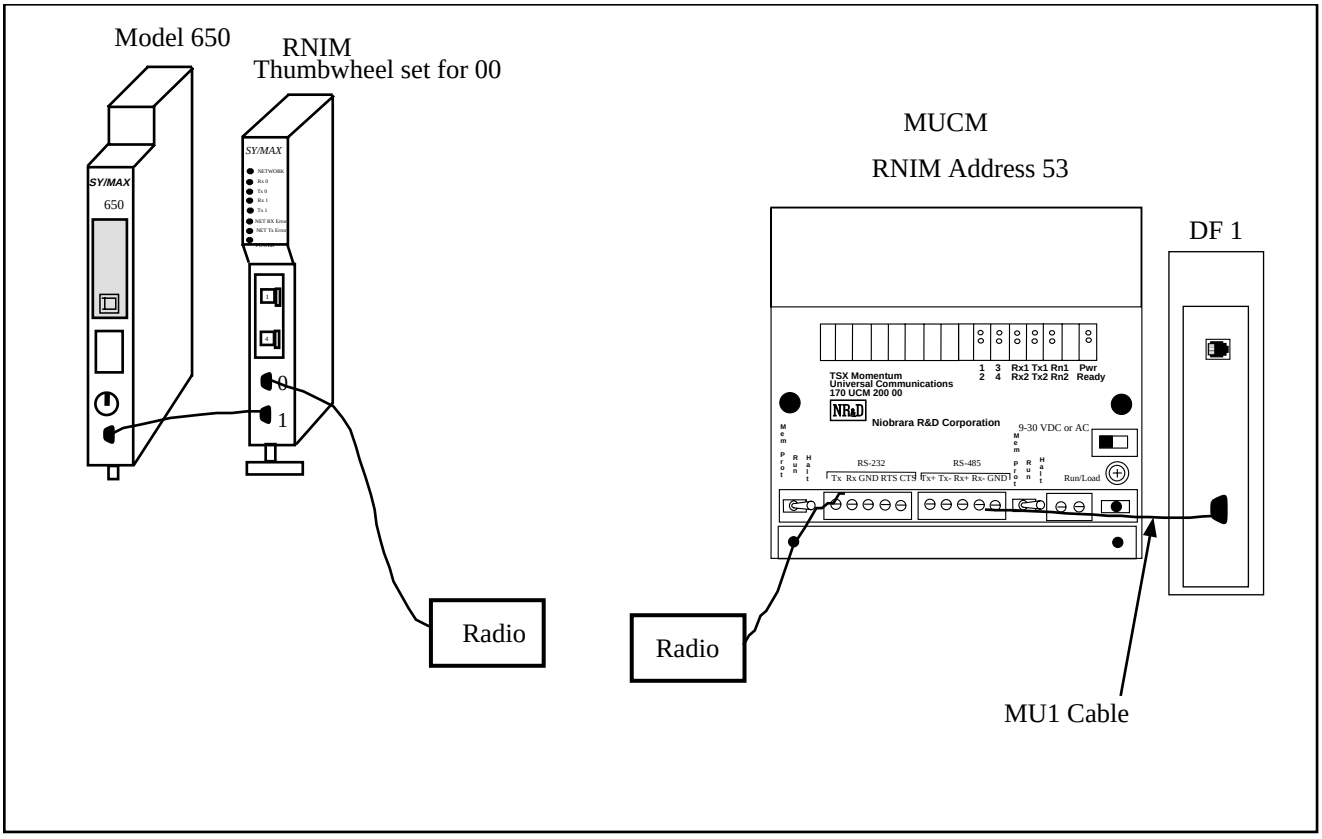

Figure 4-4 RNIM Example

Example 5

Example 5 is a continuation of example 4, but with a second DF1 device daisy chained to the the MUCM through a modem. In this configuration, it is necessary for harware handshaking. This is what the Pass-thru mode is used for. Figure 4-5 shows this example.

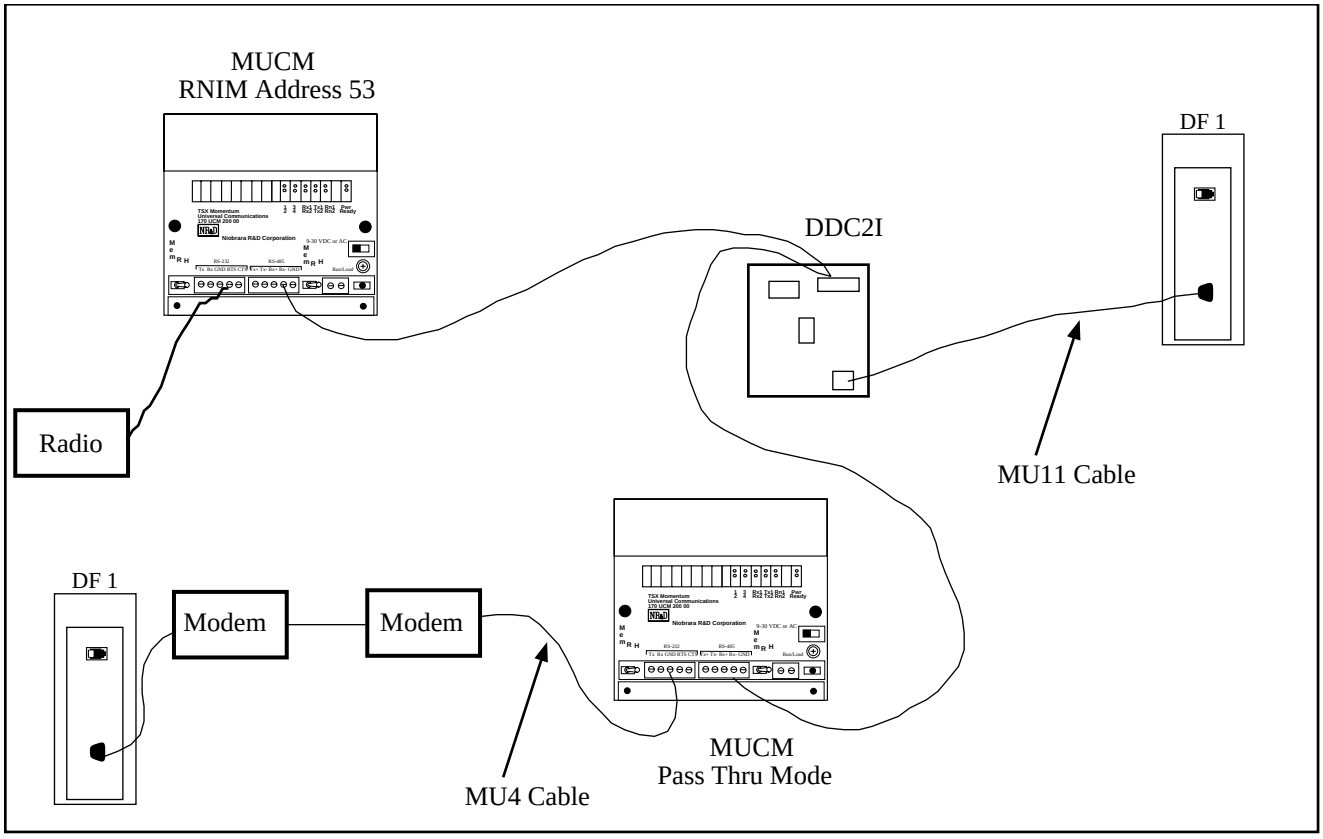

Figure 4-5 Pass Thru Example

5
Troubleshooting

Module Lights

The MUCM has several lights that indicate the status of the module. Table 5-1 shows the meanings of these lights.

Table 5-1 Module Lights

Light	Meaning
Pwr	This light will be on while there is power to the module.
Ready	This light will be on while a tophat is communicating to the MUCM.
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 MUCM-SE has 10 application driven lights numbered 1-10. The meaning of these lights while the APP1 program is running is shown in Table 5-2.

Table 5-2 User Light Definitions

Light	Meaning
1	Lights when a DF1 read is sent
2	Lights when a DF1 write is sent
3	Lights when application is in config mode.
4	Lights when application is in config mode.