QUCM DF1

Installation and Programming Manual

This Manual describes the QUCM application for interfacing Allen-Bradley DF1 devices to a master of another protocol, including Modbus/TCP.

Effective: 08 May 2008

Niobrara Research & Development Corporation
P.O. Box 3418 Joplin, MO 64803 USA

Telephone: (800) 235-6723 or (417) 624-8918
Facsimile: (417) 624-8920
www.niobrara.com

Modicon, TSX Quantum Automation, Modbus, Modbus Plus are registered trademarks of Schneider Automation.

Helm Loadgard Serial Interface is a trademark of Helm Instrument Company, Inc.

Allen-Bradley, A-B, DF1, DH-485, SLC-500 and Data Highway are trademarks of Allen-Bradley Company.

Subject to change without notice.

Contents

Figures

Tables

1
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 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 QUCM: qucm_df1_app1.qcm contains the DF1 driver and other serial and Modbus/TCP drivers, and the configuration software. This application must be running for the system to properly perform.

Port 1 of the QUCM is to be connected to the DF1 device. Port 2 may be connected to a Modbus or RNIM master. The QUCM supports many DF1 devices including Helm Instrument Company's Loadgard Serial Interface, SLC-5/0x processors, and the DF1 bridges manufactured by Allen-Bradley. These devices are accessed via the master protocol by selecting the node ID assigned to each slave (0-254).

The QUCM is configured through a website. The website allows the user to change several characteristics of the QUCM, and configure all the devices that will be connected to the DF1 port.

A Modicon two (or more) slot Quantum rack and appropriate Quantum power supply, or the Niobrara QXBP-001 is needed for mounting the QUCM.

2
Installation

Module Installation

1 Mount the QUCM in an available slot in the register rack, or in the QXBP-001. Secure the screw at the bottom of the module.

Software Installation

The application files for the QUCM are included in the QUCM_DF1_SETUP.EXE file. This is a self-extracting zip file that will install the DF1 application to the user's hard drive.. The latest version of QUCM_DF1_SETUP.EXE is located at

www.niobrara.com/apps/qucm/df1/QUCM_DF1_SETUP.EXE

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

www.niobrara.com/apps/qucm/df1/df1.pdf

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

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

Serial Connections to the QUCM-OE

Port 2 to Master

If connecting to a Modicon PLC, Port 2 of the QUCM-OE will be set to be RS-232. The Niobrara cable MM2 is ideal for this connection since it includes an RJ45 RS-232 connection for the QUCM-OE and a 9-pin male RS-232 Modicon-style pinout for the PLC. This cable pinout is described in Figure 2-1.

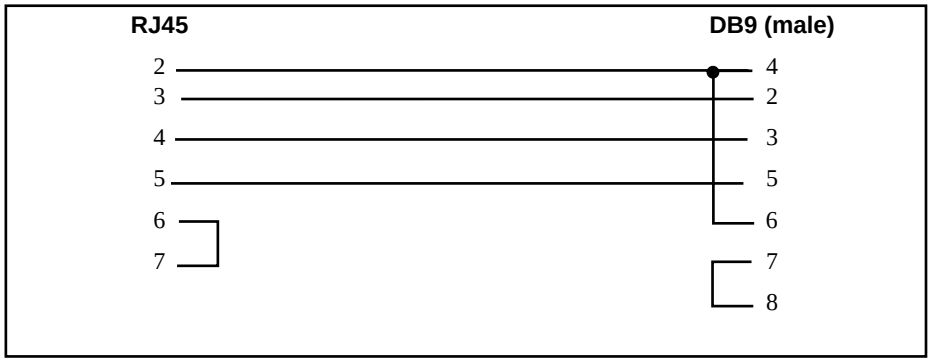

Figure 2-1 QUCM-OE to Modicon RS-232 Port (9-pin) (MM2 Cable)

For an RS-485 connection to SY/MAX devices, Port 2 of the QUCM-OE will be set to be RS-485. The Niobrara cable MM7 is ideal for this connection since it includes an RJ45 RS-485 connection for the QUCM-OE and a 9-pin male RS-485 SY/MAX-style pinout at the other end. This cable pinout is described in Figure 2-2.

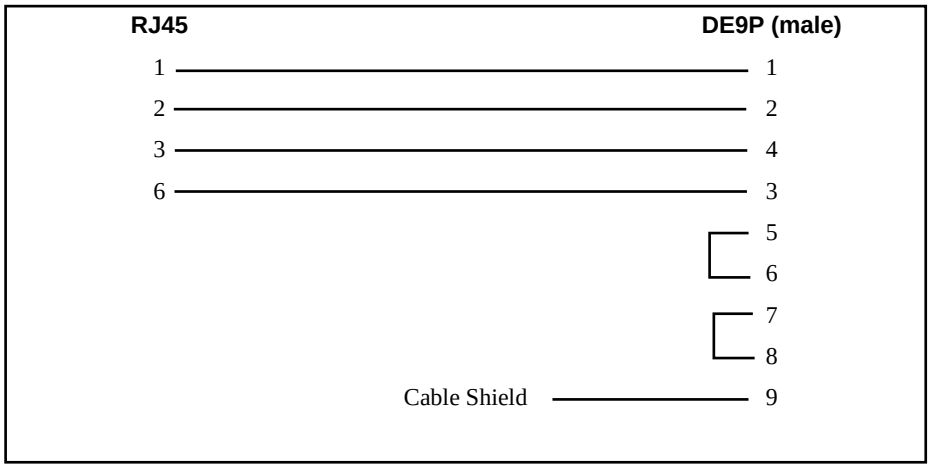

Figure 2-2 RS-485 SY/MAX Port (9-pin) (MM7 Cable)

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

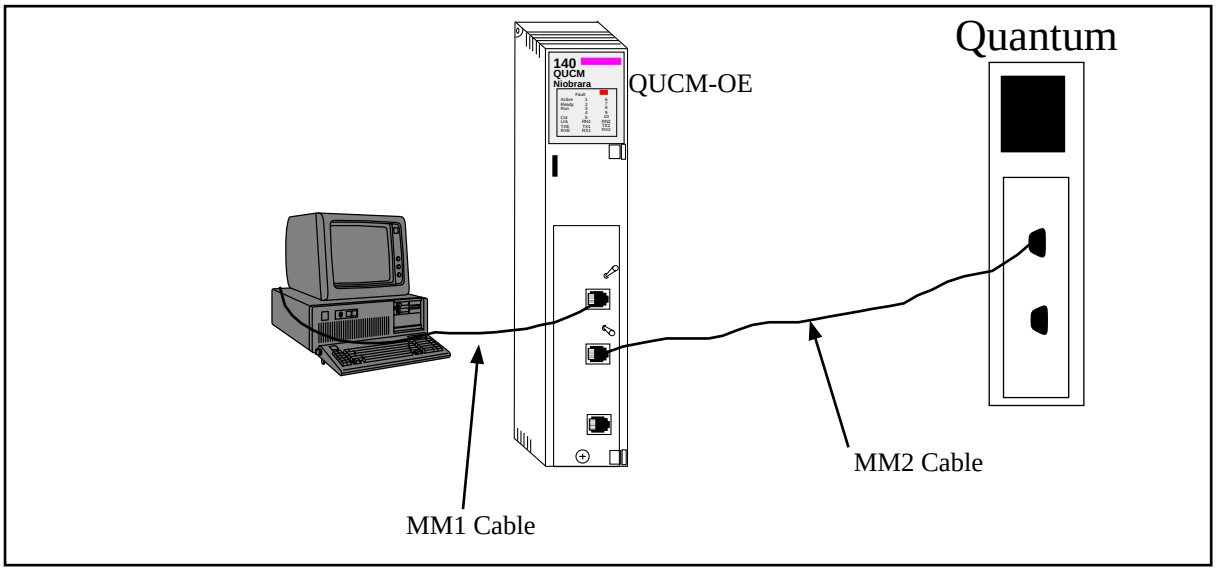

Figure 2-3 QUCM-OE Layout

Port 1 to the Personal Computer

A physical connection must be made from the personal computer to the QUCM 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 QUCM-OE, or an Ethernet connection between the computer and the QUCM-OE. The Niobrara MM1 cable may be used for the serial connection. This cable is shown in Figure 2-4.

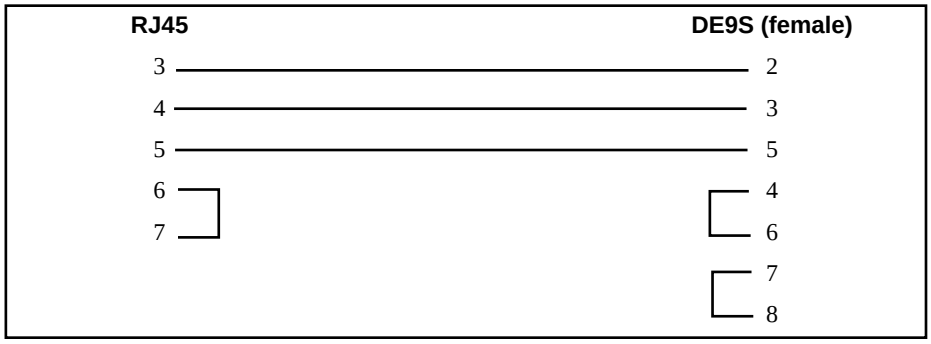

Figure 2-4 QUCM-OE to RS-232 PC DCE Port (9-pin) (MM1 Cable)

Loading the Applications into the QUCM

The QUCM-OEE or QUCM-OE must use the qucmtcpl.fwl or qucmtcpl.qcc firmware included in the QUCM_DF1_SETUP.EXE file. This firmware is dated 11OCT2007 or later. There are two ways to upgrade the firmware of the QUCM-OE: QLOAD and FWLOAD.

Using NRDTOOL to set the IP Address

It is recommended to use the Ethernet capabilities of QLOAD to load the firmware, and qucm_df1_app1.qcc into the QUCM. Set up the IP parameters of the module by the following method:

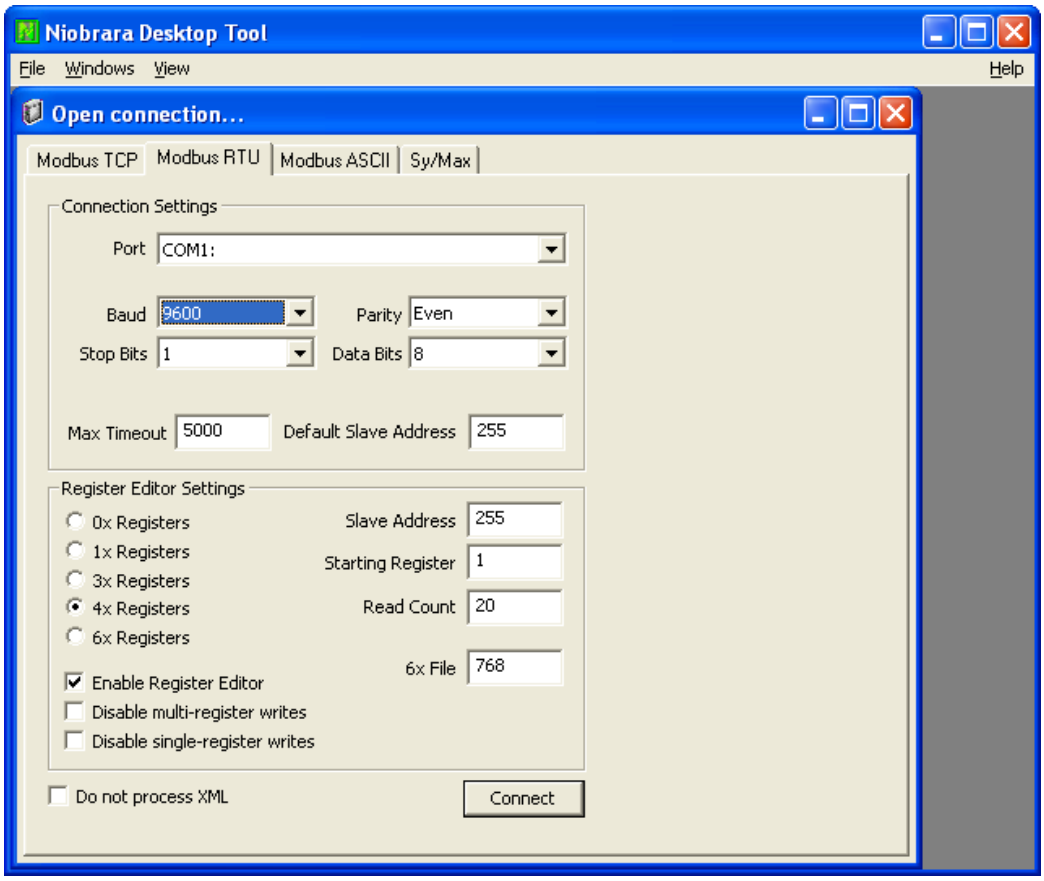

Figure 2-5 Setup NRDTOOL

1 Move Switch 1 and Switch 2 to Halt.

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

3 In the personal computer, go to Start>All Programs>Niobrara>NrdTool. This will start NRDTool. Set up NRDTool as shown in Figure 2-5. Use the arrow and Page Up/Down keys to move to register 46. The IP parameters are shown in Figure 2-6 for a unit with the IP = 206.223.51.238 subnet Mask = 255.255.255.0, Default Gate = 206.223.51.1, Modbus/TCP port number = 503

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

```
> ping 206.223.51.238
```

5 Verify a connection to the internal Modbus/TCP server with NRDTool (should connect to the QUCM on port 503 with Destination index 255).

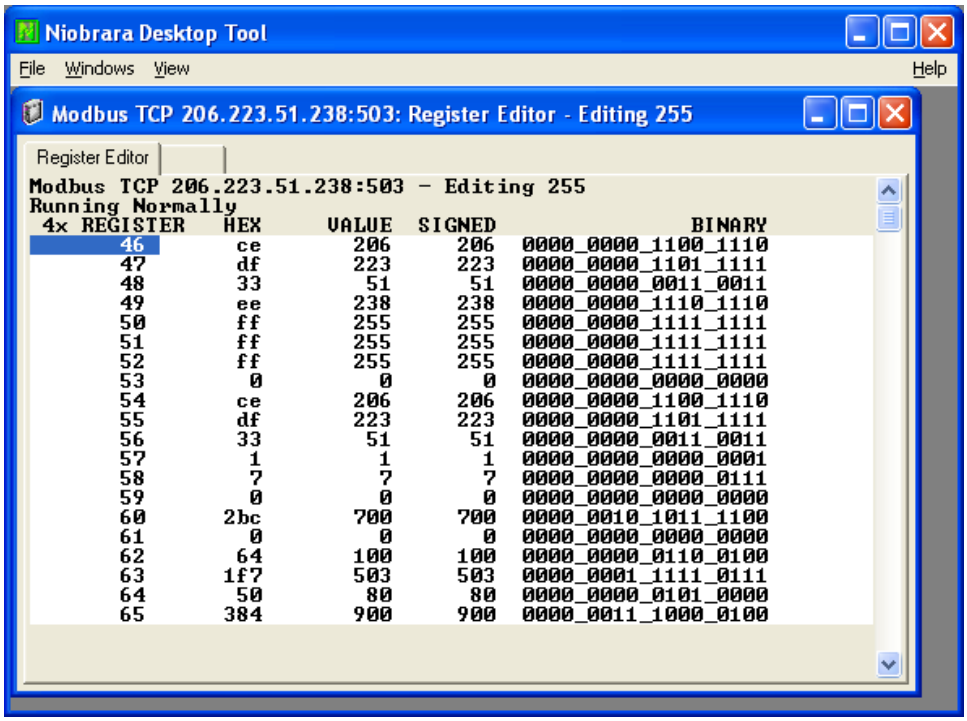

Figure 2-6 Use NRDTOOL to set IP Address

QLOAD QUCM Firmware Update

QLOAD is a convenient method for upgrading the firmware of a QUCM, especially if the QUCM already has an IP Address. A direct serial connection to the module is not required, the module does not need to be powered down, and the entire process may be done remotely across the Ethernet.

1 Application 1 Switch must be in RUN.

2 Start QLOAD.EXE

3 Click on the Browse button and select the file qucmtcpl.qcc.

4 Select the Application 1 Radio Button.

5 Verify the following: The Modbus/TCP tab is selected, the IP Address of the QUCM is entered correctly, the TCP Port number is set to 503, and the Modbus Drop is set to 255.

6 Press the Start Download button. QLOAD will open a progress window to show the status of the download. Wait approximately 20 seconds for the upgrade to fin-

ish after the download is complete. The unit should be ready to receive the new version of qucm_df1_app1.qcc.

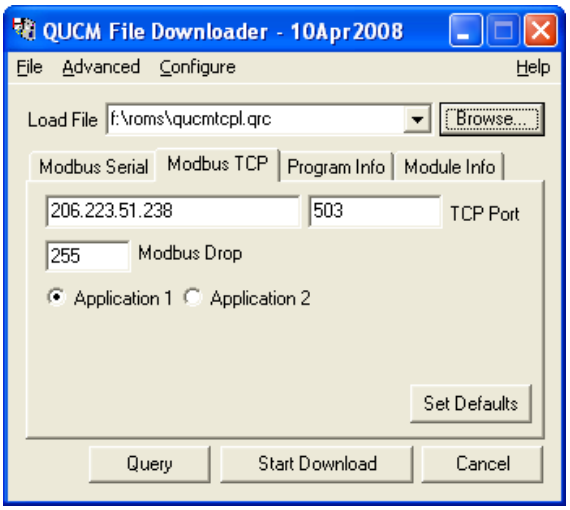

Figure 2-7 QLOAD the QUCM Firmware

FWLOAD QUCM Firmware Update.

If the QUCM has corrupt firmware or completely non-responsive then the old method of using FWLOAD may be required.

Firmware upload is as follows:

1 Remove the module from 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.. Make sure that Port 1 is set to RS232 mode with the slide switch below the port.

6 Start the program FWLOAD.EXE

7 Select the Browse button and select the file QUCMTCPL.FWL.

8 Select the comm port of the PC.

9 Press "Start Download".

10 When the download is completed, remove the module from the rack and change the switch back to RUN.

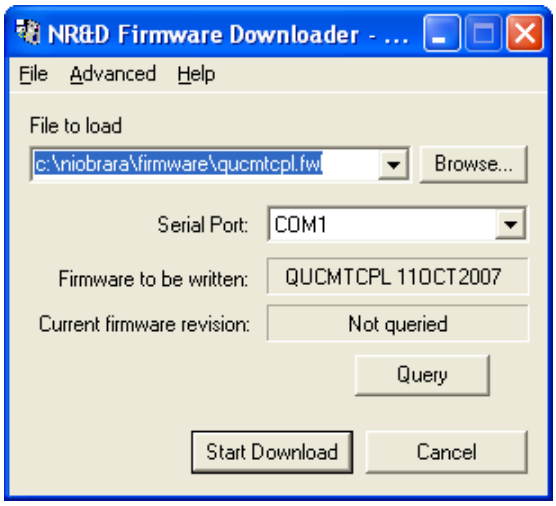

Figure 2-8 FWLOAD the QUCM Firmware

QLOAD QUCM_DF1_APP1

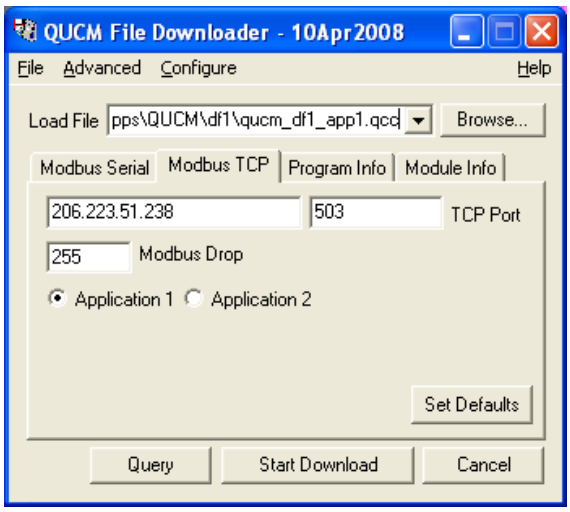

Figure 2-9 QLOAD of APP1

1 Application 1 Switch must be in RUN. Leave Application 2 Switch in HALT.

2 Go to Start>All Programs>Niobrara>QUCM>Apps>DF1>QLOAD DF1 Application 1.

3 Verify the following: The Modbus/TCP tab is selected, the IP Address of the QUCM is entered correctly, the TCP Port number is set to 503, and the Modbus Drop is set to 255.

4 Press the Start Download button. QLOAD will open a progress window to show the status of the download.

After downloading the application, the RN1 light should be on. Open a web browser and point it to the IP Address of the QUCM for configuration.

DF1 to QUCM Port 1

After the software has been installed into the QUCM, Port 1 becomes the DF1 port. The connection for the QUCM to the Allen-Bradley DF1 to DH-485 convertor or the SLC-5/0x is the same as the connection to the PC if the convertor's or PLC'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 2-10.

Figure 2-10 QUCM-OE RS-422 to DF1/DH-485 Convertor RS-422

If connecting the QUCM to the Allen-Bradley DF1 to DH+ bridge, the connection is the MM20. See figure 2-11.

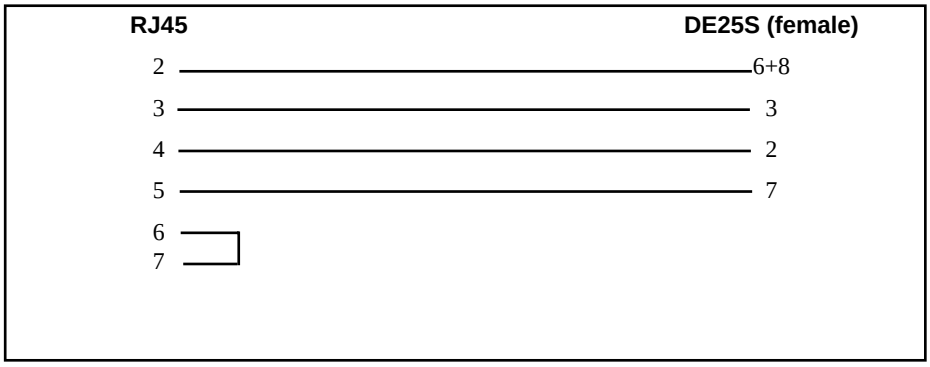

Figure 2-11 QUCM-OE RS-232 to DF1/DH+ Convertor (MM20)

3
Web Server

Main Page

The Main page displays a summary of the configured DF1 devices. The table will display the Modbus/TCP Destination Index, associated Modbus starting and ending registers, DF1 device address, DF1 file type, and DF1 file number. The page also displays the total number of configured devices.

Figure 3-1 shows an example page with two logical devices configured to talk to the same DF1 address. Entry 1 reads the N9 registers by accessing the Modbus registers 1-250. Entry two has the same Modbus index, but reads the N50 registers by polling registers 500-750. The devices could also be set up as two different Modbus indeces, but both starting at register 1.

At the bottom of the Main page are links to Statistics on this QUCM, and a page for configuring this QUCM. At the left side are the same links, and a link for some help related to this application.

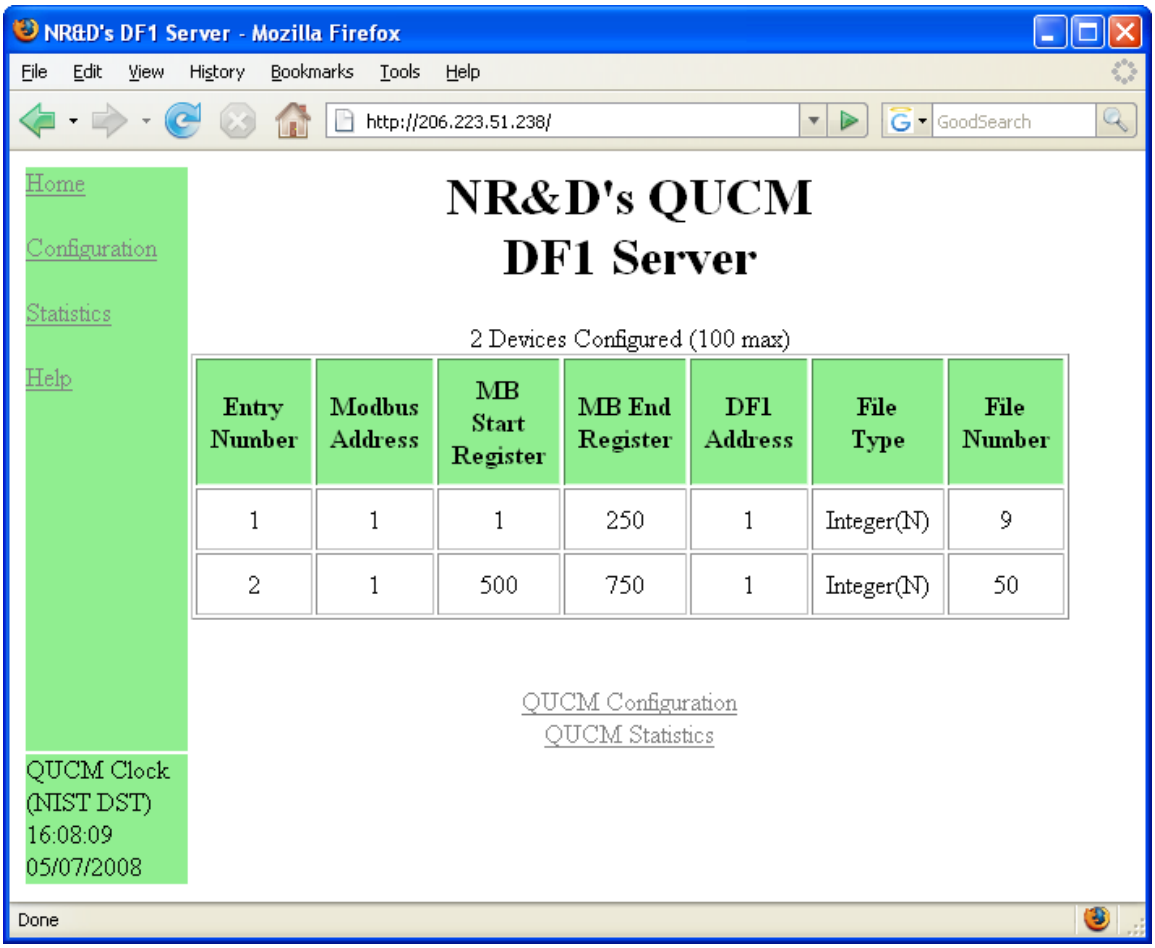

Figure 3-1 Main Web Page

Configure QUCM

At the bottom of the Main page is a link to configure the QUCM. (See Figure 3-2). The password may need to be entered before access to this page is granted. The default password is "master" and is case sensitive. The password may be altered from the "Change Password" page.

A link is provided for altering the password. The current password must be verified before the new password is edited. The new password must be entered twice for verification. If it has been longer than three minutes since a password protected setting has been altered then the user will be prompted to enter the password.

NOTE: This password protection is not very secure and is only intended to prevent accidental modification to the QUCM configuration. The user should implement other more stringent protection such as firewalls and isolated networks to ensure the safety of the system.

NOTE: Once a password has been accepted by the QUCM, any connection is allowed to modify settings until the timer expires; not just the user who entered the password.

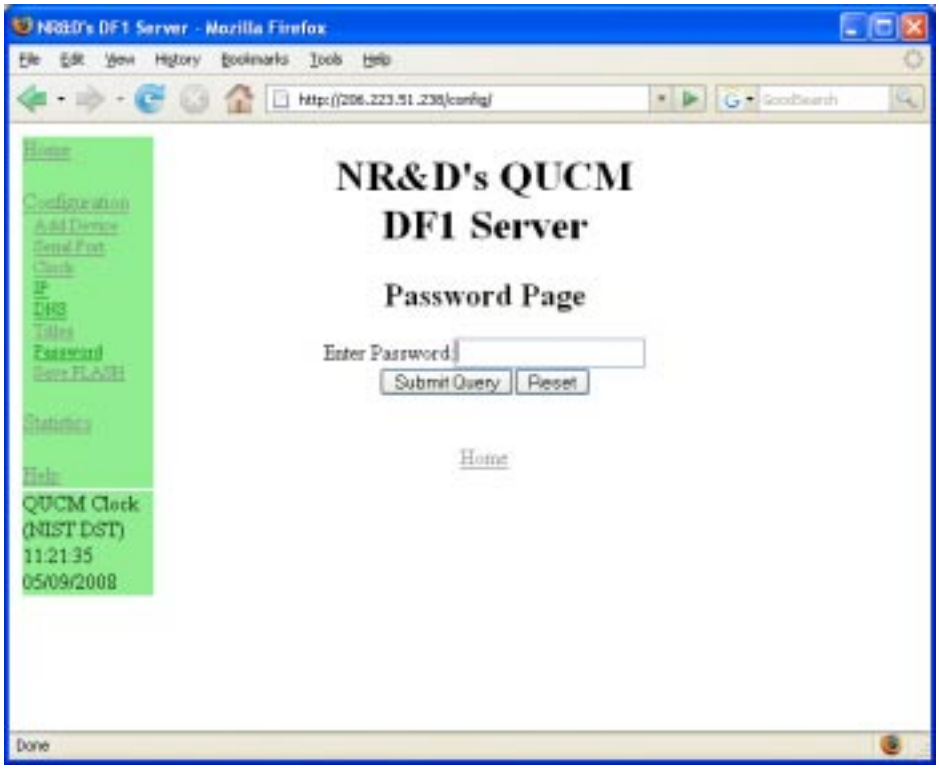

Figure 3-2 Enter Password Page

After entering a successful passoword a screen like Figure 3-3 is displayed. Each DF1 device configured is shown with a link to edit the device paramters or remove the device. Links below are given to add a new device, alter the serial port configuration, change the password, change the IP address, change the title, and save the configuration to FLASH.

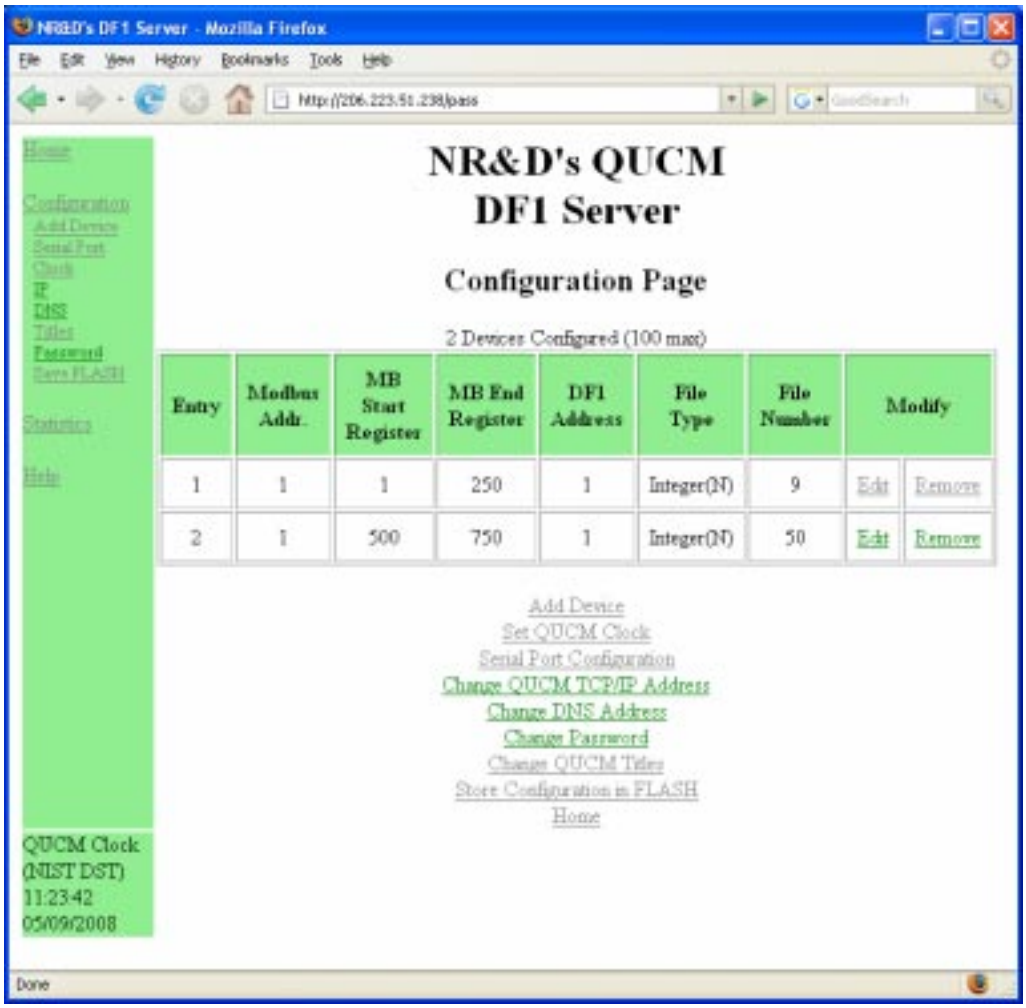

Figure 3-3 Configuration Page

Add Device

The Add Device link is used to add a new DF1 device to the list. A screen like Figure 3-4 is displayed. There is a text field for the Modbus/TCP Destination Index.

There are text fields for the starting and ending registers that the master will use to access the DF1 device. These will help determine the register space to be read from the slave.

There is a text box for the DF1 slave address. Set this to the device address of the DF1 slave..

There is a pull-down for the file type used by the DF1 slave. Valid choices are Status, Bit, Timer, Counter, Control, Integer, Floating Point, Output, Input, String, ASCII, and BCD.

There is a text field for the file number. This, combined with the file type, make up the register space to be read.

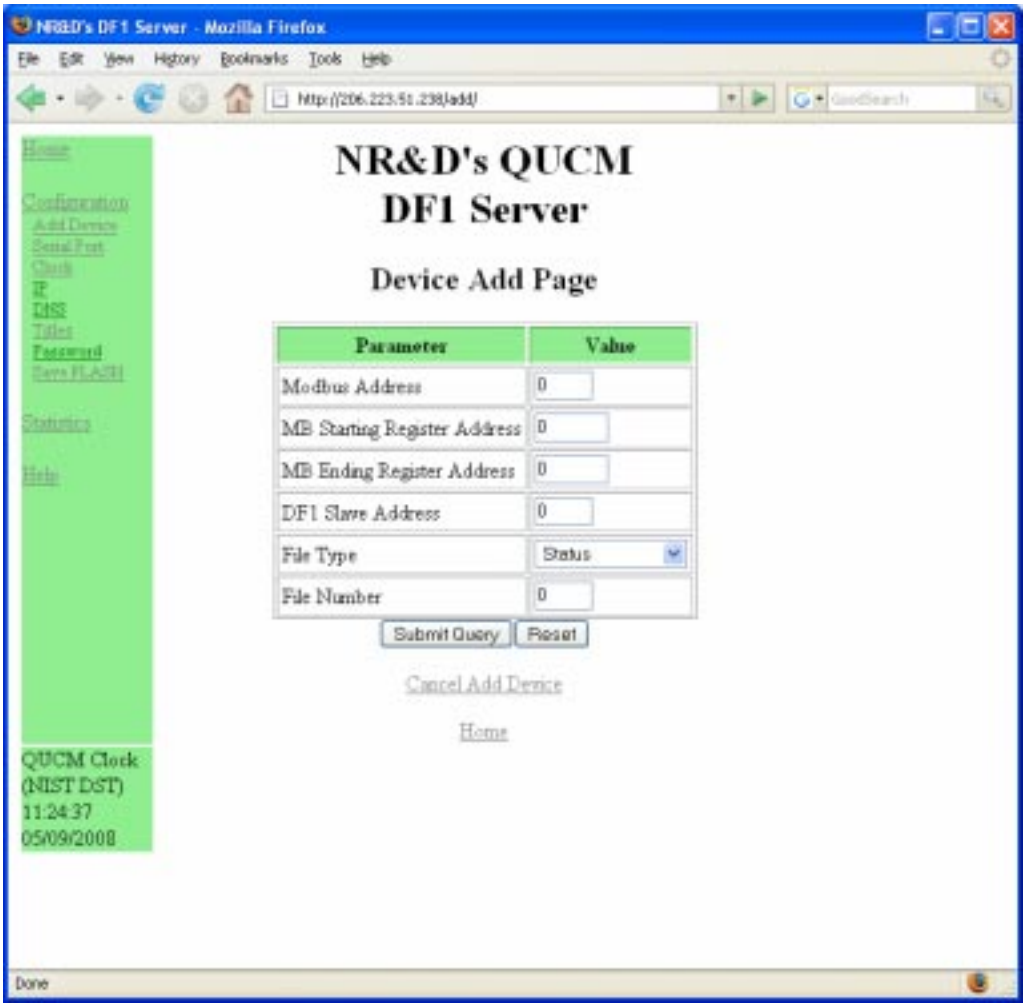

Figure 3-4 Add Device Page

Serial Port Configuration

The Serial Port Configuration page allows the altering of the baud rates and parity of QUCM port 1 and 2, the Protocol of Port 2.

Port 1 is fixed as a DF1 Master. Its parity may be set to NONE or EVEN. Its baud rate may be set to 1200, 2400, 9600, or 19200. 19200 is recommended. If connected to a modem or radio, Port 1 may be given a time to delay after RTS has been raised. Also, the timeout values may be set for an ACK and a message timeout on the DF1 side.

Port 2 may be set to Modbus RTU Slave or RNIM Slave. Its parity may be set to EVEN or NONE and its baud rate may be set to 1200, 2400, 4800, 9600, or 19200.

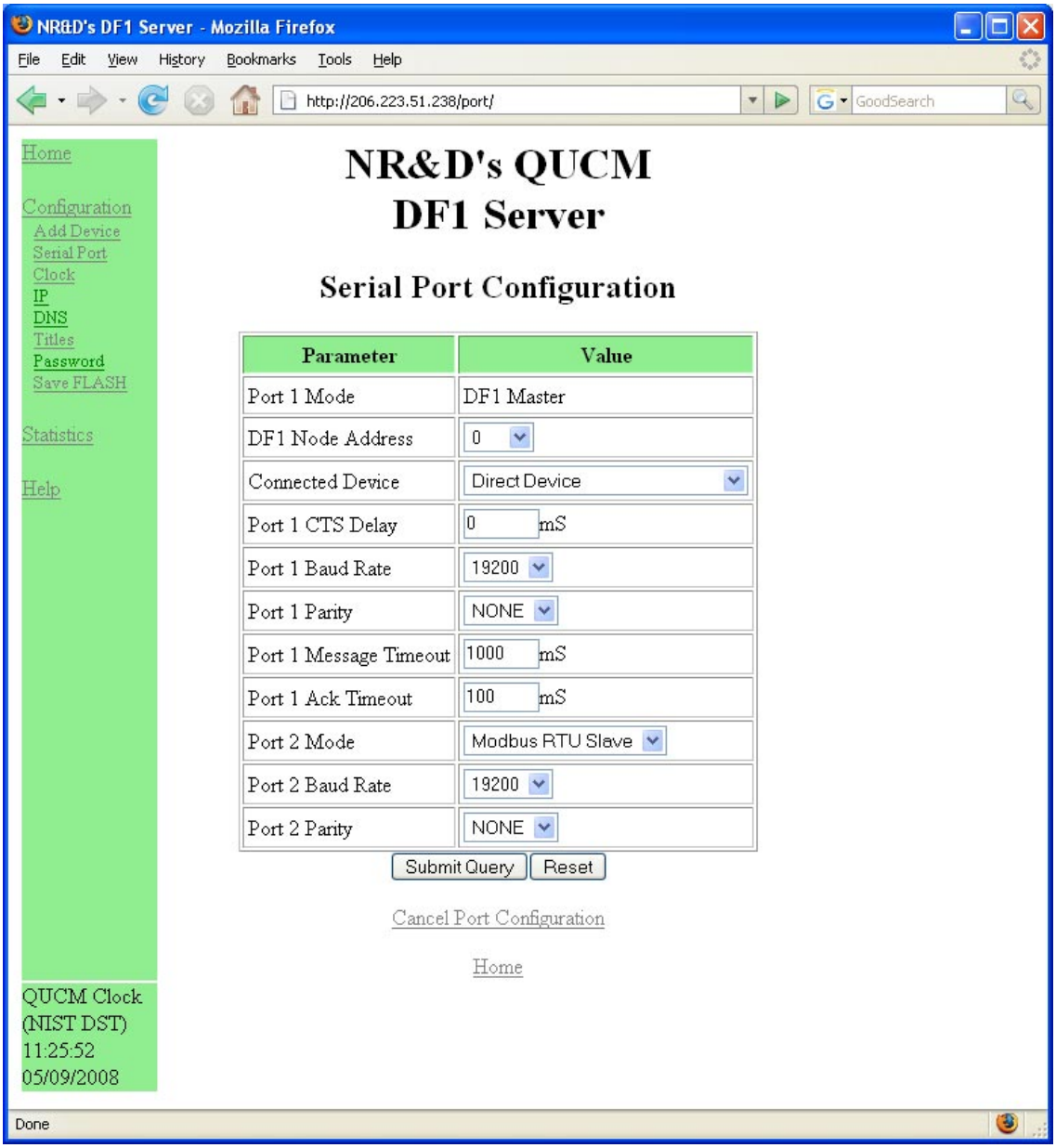

Figure 3-5 Serial Port Page

Save Settings to FLASH

After completion of the configuration, be sure to save the settings to flash. Otherwise the modifications will be lost on the next power cycle of the QUCM. Once the settings are saved to flash, the QUCM's configuration, including its IP settings, will be safe indefinitely.

Statistics Page

At the bottom of the Main page is a link to some statistical information. There is a page about this QUCM, (See Figure 3-6), and a page about the configured devices (See Figure 3-7).

Figure 3-6 QUCM Statistics Web Page

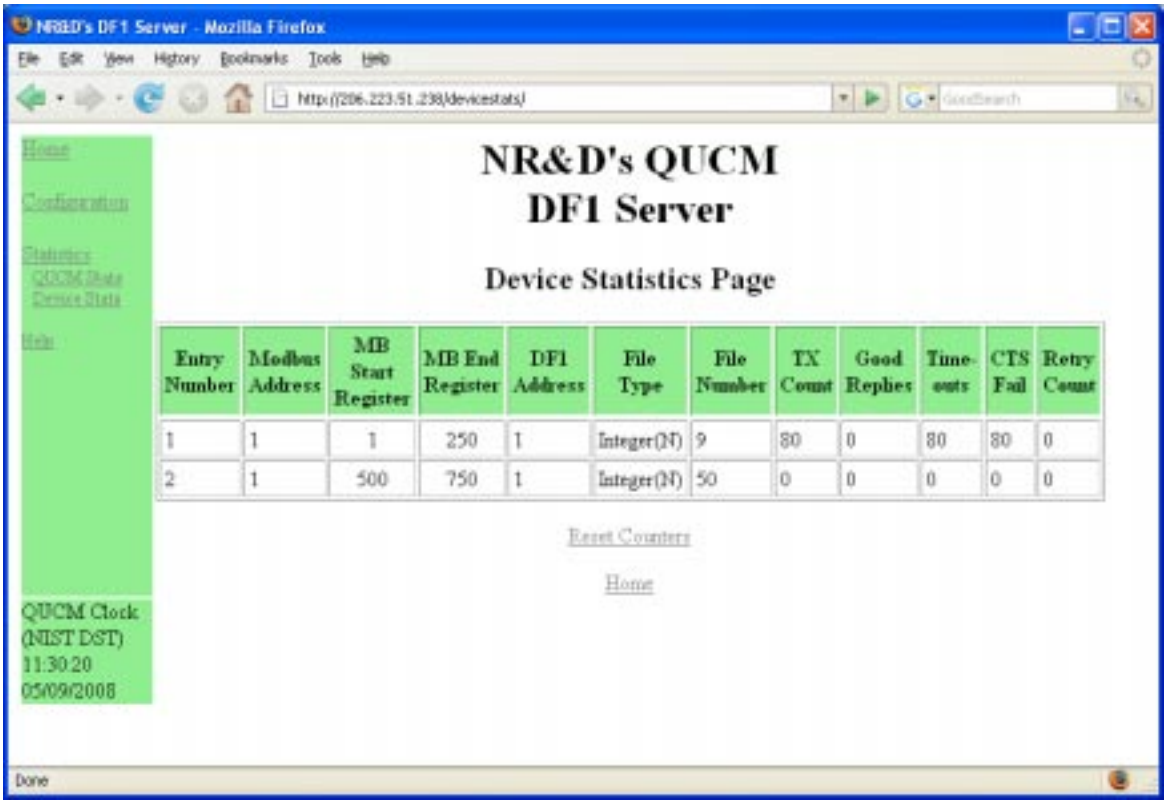

Figure 3-7 Device Statistics Web Page

4
Examples

Example 1

Figure 4-1 displays an example Modbus/TCP to DF1 bridge from a Modicon Quantum PLC. The Quantum PLC polls the DF1 device across Modbus/TCP, and the QUCM converts the message to DF1.

The Quantum sends a query using its I/O Scanner with an index of 1 and a register address of 1. The QUCM has been programmed so that index 1 and starting register 1 will be sent to DF1 address 1, polling N9 registers.

The QUCM will receive the Modbus/TCP message device 1, register 1, translate the message to DF1, and route it out port 1 to Node ID 1. When the DF1 device responds to the query, the QUCM will receive the response at port 1, convert the message to Modbus/TCP, and route back out the Ethernet port.

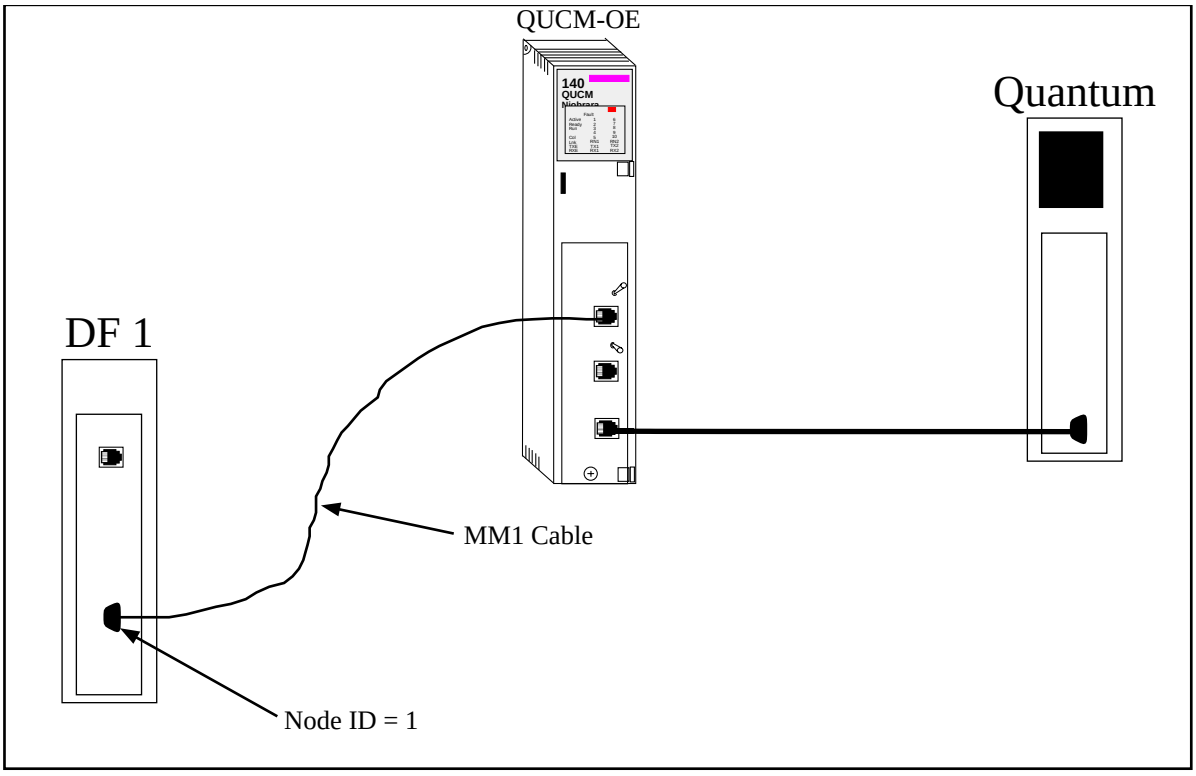

Figure 4-1 Modbus/TCP Example

Example 2

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 QUCM to the Loadgard. For this example, Port 1 of the QUCM must be set to RS-422.

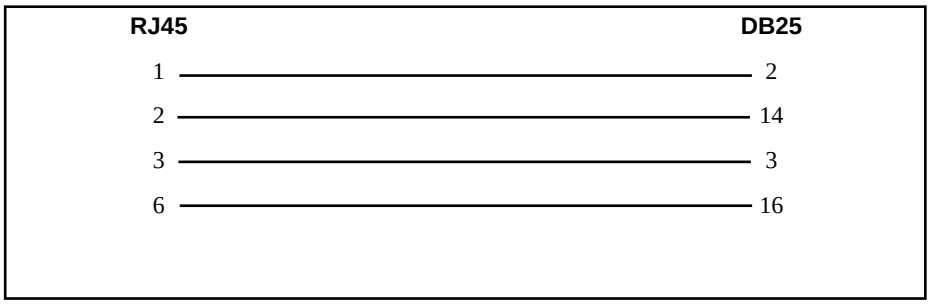

Figure 4-2 QUCM-OE RS-422 to Helm Loadgard Serial Interface

5
Troubleshooting

Module Lights

The QUCM-OEE 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
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-OE 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 Modbus/TCP socket 1 is open.
4	Lights when Modbus/TCP socket 2 is open.
5	Lights when Modbus/TCP socket 3 is open.
6	Lights when Modbus/TCP socket 4 is open.
7	Lights when Modbus/TCP socket 5 is open.
8	Not Used
9	Lights when a telnet session is open.
10	Lights when a web socket is open.