PMEUCM Hardware

Installation Manual

This manual covers the PMEUCM hardware features and installation procedures.

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

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

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1 Introduction

The Niobrara PMEUCM is a device capable of running a custom application for performing communication translations between serial and/or Ethernet protocols for the Modicon M580 Automation platform. This document provides on overview of the hardware features and installation guide.

The current model is PMEUCM0302 with two RS-232 serial ports, two 100BaseTX Ethernet ports, a M580 backplane Ethernet port, a LED display block, a front panel LCD, five-way navigation switch, and a SD memory card slot.

The three Ethernet ports are all independent of each other. Each port has its own IP Address ,Subnet Mask, and Default Gateway. Ethernet messages cannot be directly passed from one port to another.

Ethernet ports E1 and E2 are mounted on the bottom of the module enclosure. These are 100BaseTX auto-sensing standard Ethernet ports.

A 3rd Ethernet port is located on the rack backplane interface. This Ethernet port connects to an M580 Ethernet rack and provides the DIO data exchange with the M580 CPU.

The PMEUCM mounts in an Ethernet slot of any BME XBP rack. The PMEUCM may be used in the CPU rack of a non-HSBY M580 CPU. It may also be used in an Ethernet remote I/O rack using a BME CRA 312 10 interface on both HSBY and stand-alone CPUs.

2 Installation

WARNING: Do not connect the PMEUCM to any Ethernet or serial network before configuring the appropriate network addresses. Duplicate network address may lead to improper network communication, equipment damage, injury, or death.

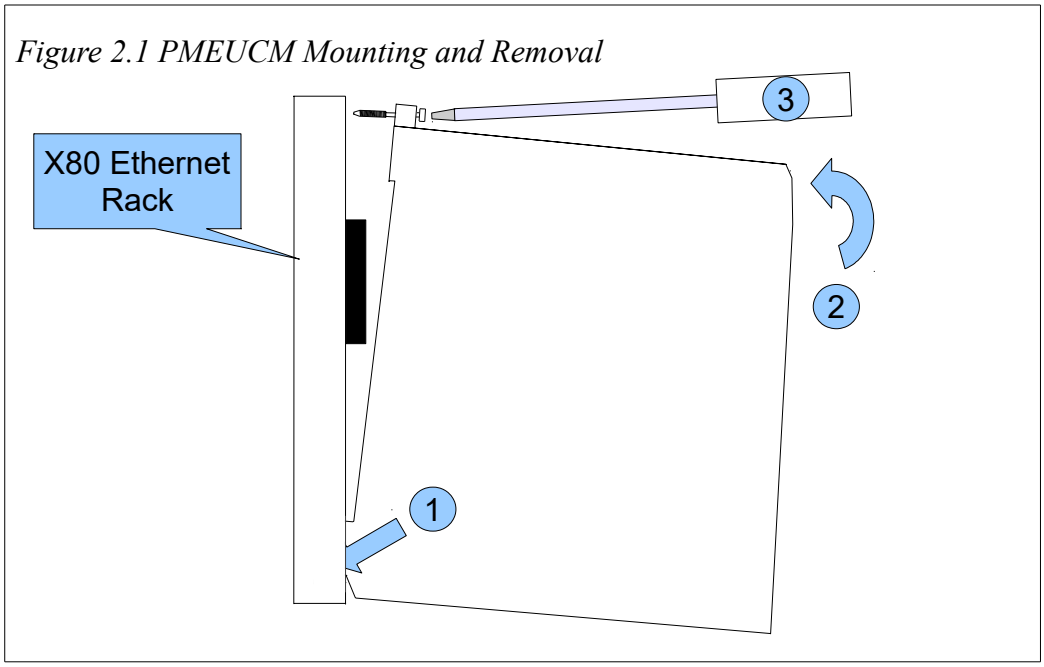
Device Mounting/Removal

(1) Position the two pins on the reverse side of the module in the corresponding Ethernet slot on the rack.

(2) Rotate the PMEUCM towards the top of the rack so that the module sits flush with the back of the rack.

(3) Tighten the safety screw to ensure that the module is held in place on the rack. (See Figure 2.1 PMEUCM Mounting and Removal)

Figure 2.1 PMEUCM Mounting and Removal



Power Supply

The PMEUCM takes one slot in the Modicon M580 backplane. The PMEUCM only uses the 24Vdc power from the rack. The RS-232 serial ports provide 5Vdc for optionally powering the Niobrara DDC2I Isolated RS-232<>RS-485 converter. The power requirements of the PMEUCM0302 with and without DDC2I units attached are shown in Table 2.1: Module Power Requirements:

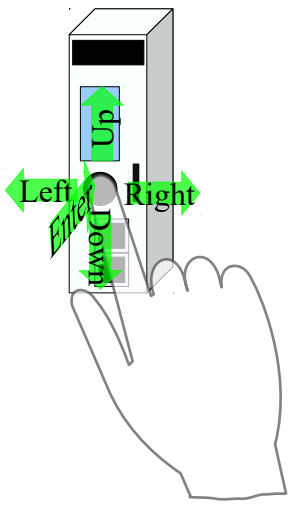
Table 2.1: Module Power Requirements

Usage	Nominal Power	Maximum Power
Module without DDC2Is	1.8W	2.2W
Module with 1 DDC2I	2.5W	2.9W
Module with 2 DDC2Is	3.2W	3.6W

Navigation Switch

The five-way navigation switch is used as the key pad input in the PMEUCM. Place a finger on the joystick and rock the switch in the direction the cursor needs to move. Rock the switch right for RIGHT, left for LEFT, up for UP, down for DOWN, and press straight in, toward the module, for ENTER.

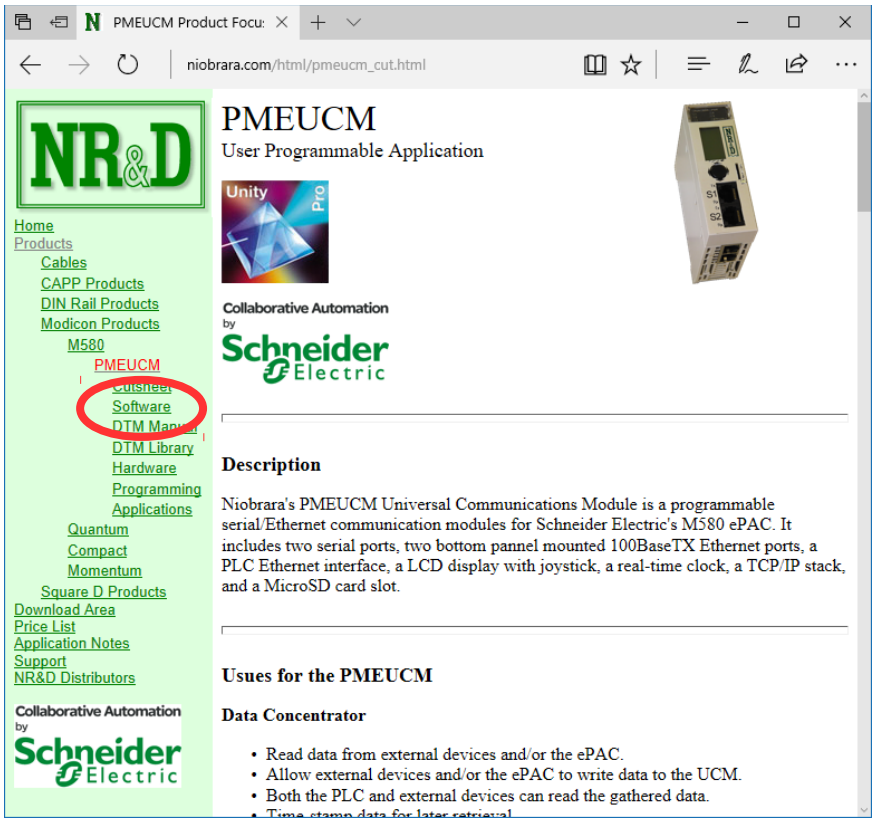
Figure 2.2: Five-way Navigation Switch



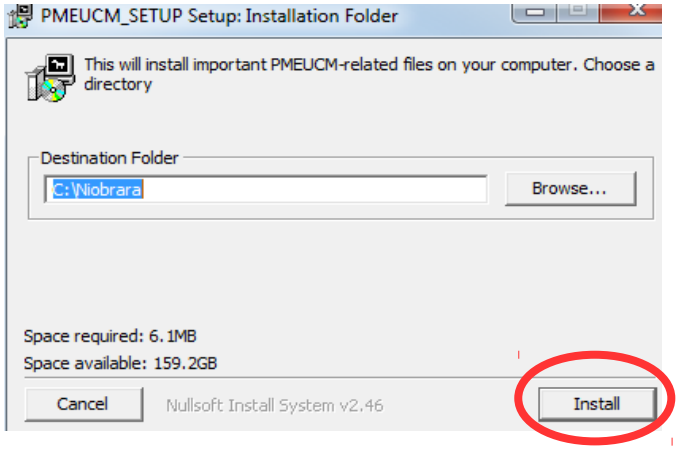
3 Adding the PMEUCM to Unity Pro

Unity Pro versions 8.1 and higher provide a method for adding third party modules to their hardware catalog. Niobrara provides the necessary .cpx file as part of PMEUCM_SETUP.EXE. The user may access this file at:

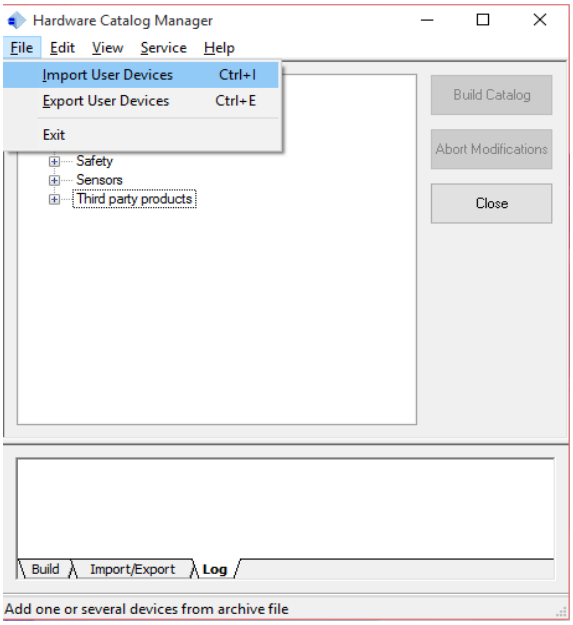
http://www.niobrara.com/html/pmeucm_cut.html



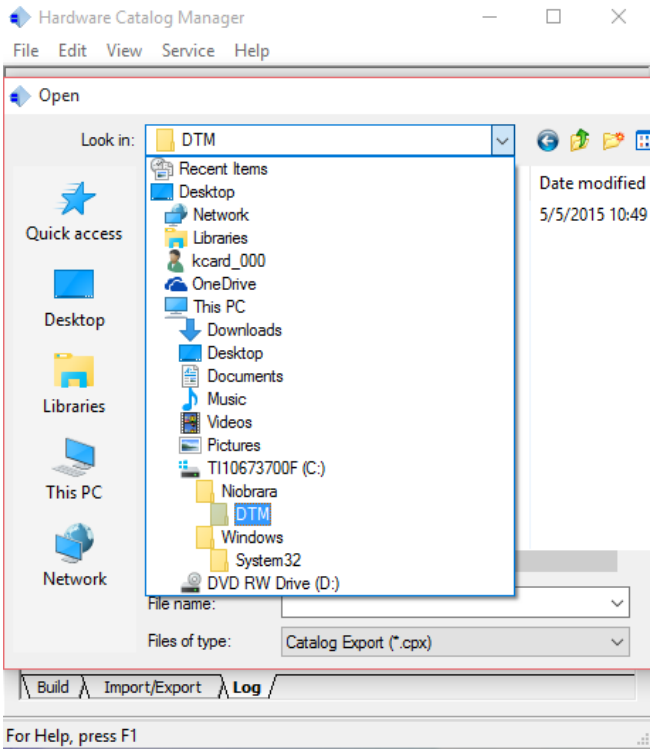
Download and run PMEUCM_SETUP.EXE. A box will appear prompting the user to choose a directory in which to install. The default is C:\Niobrara, as shown below.



After the program is finished, start the Hardware Catalog Manager, located at Start>All Programs>Schneider Electric. In the File menu, click on Import User Devices, as shown below.



Choose the folder where PMEUCM_SETUP.EXE installed the .cpx file.



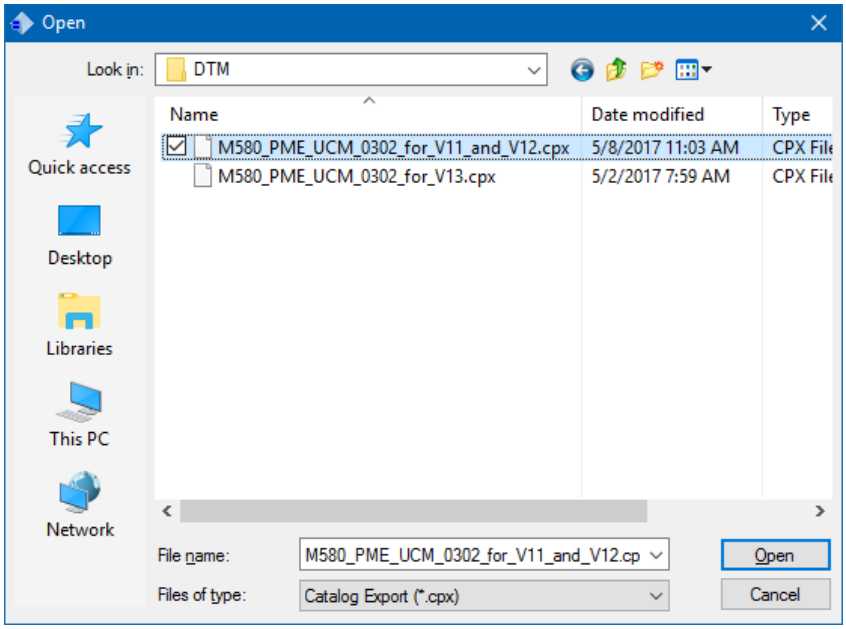
Choose the folder where PMEUCM_SETUP.EXE installed the .cpx file.
This is normally the 'c:\Niobrara\PMEUCM\DTM\' folder.

Inside the DTM folder is a file for Unity V11, V11.1, and V12:

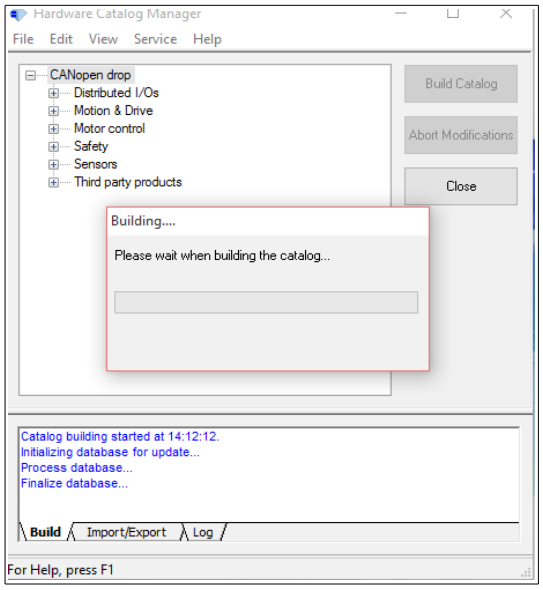
M580_PME_UCM_0302_for_V11_and_V12.cpx

Also present is a cpx file for Unity V13:

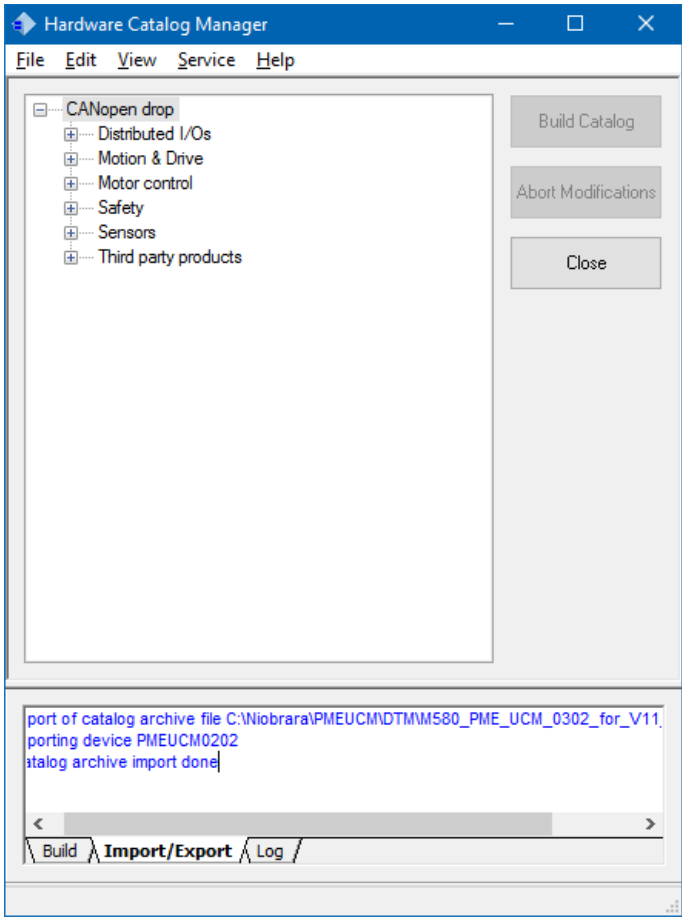
M580_PME_UCM_0302_for_V13.cpx



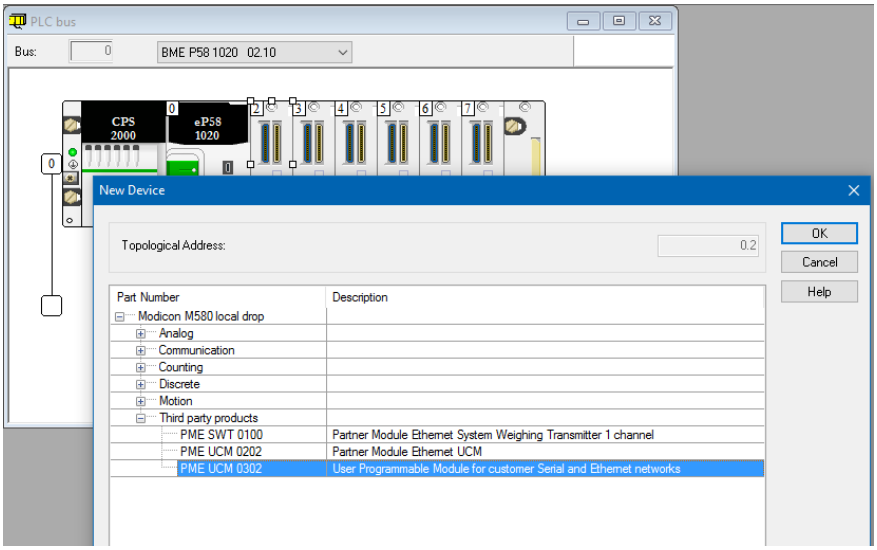
The Hardware Catalog Manager will show a dialog box displaying its progress.



When it is finished, it will appear as below.



Close the Hardware Catalog Manager, and start Unity Pro. The PMEUCM can now be chosen from the Hardware Catalog under the "Third party products" section.



The PMEUCM is now ready to have its DTM configured. For more information on this process, please refer to the PMEUCM DTM manual.

4 Ethernet Configuration

The PMEUCM includes three Ethernet ports: E1, E2, and the M580 Backplane.

The IP Address, Subnet Mask, Default Gateway settings are configured as follows:

- E1 and E2 Ports:
  - Front Panel LCD/Joystick using the OS screens
  - Front Panel LCD/Joystick using custom screens inside an application
  - User Application may set all parameters based on data from M580 PLC
  - User Application may set all parameters based on DTM configuration
  - DHCP or BOOTP
- Backplane Port is only configurable from Unity Pro and the M580 CPU.

Setting the E1 IP Address

The PMEUCM E1 port defaults to a fixed IP Address of 10.10.10.10. This is easy to change through the use of the five-way navigation switch. Most custom applications require a fixed IP Address. Press the navigation switch to the right six times to step through the "> Main > Config > Comms > Ethernet > Enet 1 > Address " pages.

For this example, E1 will be configured for the IP Address of 192.168.1.17.

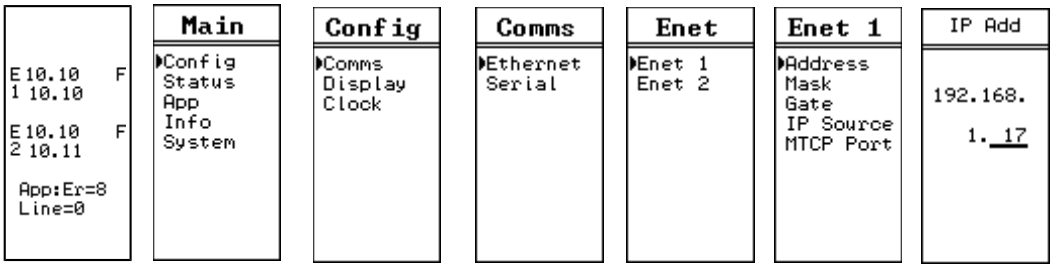


Figure 4.1: IP Address Source Screen

If a fixed address is required, make sure that the IP Source is set to Fixed, then select the Address page. The ⬆ and ⬇ navigation switch are used to adjust the values while the ➡ and ⬅ navigation switch move between fields. The ↵ key is used to accept the new value.

Setting the Subnet Mask

The Subnet Mask edit page is designed to quickly step through the valid bit-mapped options. Pressing the ⬆ and ⬇ navigation switch adjusts the mask value. The ↵ key is used to accept the new value.

For this example, the E1 Subnet Mask will be set to 255.255.255.0.

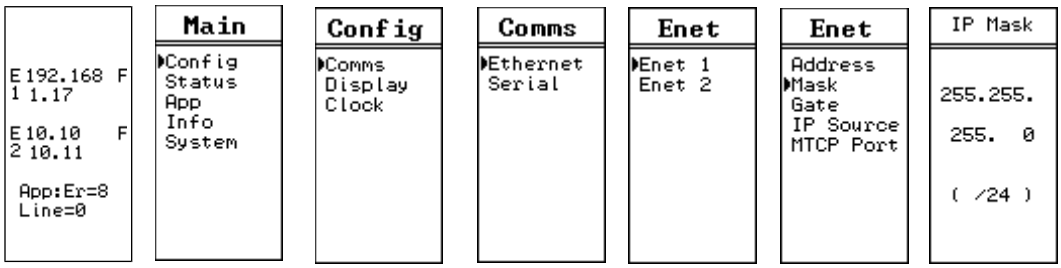


Figure 4.2: Subnet Mask Screens

Setting the Default Gateway

The Default Gate edit page functions just like the IP Address edit page.

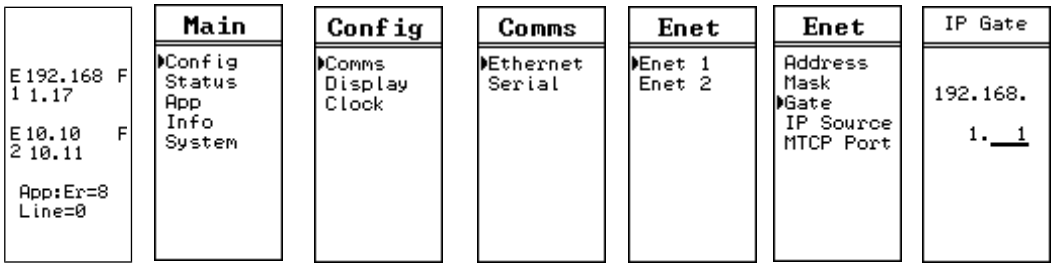


Figure 4.3: Default Gate Screen

In this example the Default Gateway is configured for 192.168.1.1.

Setting the OS Server Port Number

The most custom applications include their own Modbus/TCP server so it is required to change the PMEUCM OS server from port 502 to 503. This will allow loading the application remotely without needing to halt the application from the front panel.

For this example, the OS Modbus/TCP server port is set to 503.

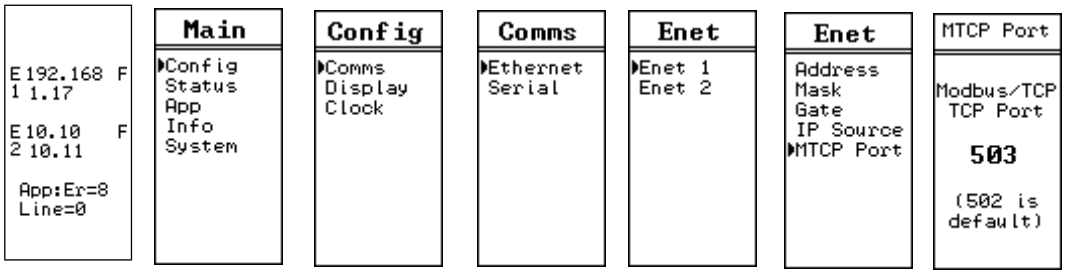


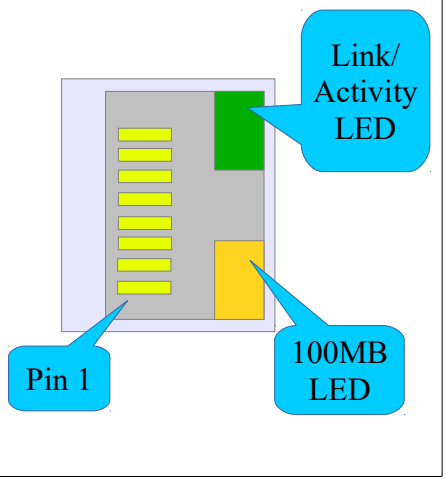
Figure 4.4: Changing the OS TCP port from 502 to 503

Ethernet Connection to PC

After the IP Address is configured for the PMEUCM, it is safe to connect the Ethernet port E1 to the network. The PMEUCM includes a standard RJ-45 Ethernet connector with indicators for Link/Activity (green LED) and 100Mb (amber LED). (See Figure 4.5 Ethernet Port) The green Link/Activity light illuminates when the PMEUCM has a valid link to the attached network port and blinks off while experiencing network traffic. The 100Mb amber LED is

illuminated when the Ethernet port has negotiated 100Mb operation and off while configured for 10Mb operation.

Figure 4.5 Ethernet Port



The PMEUCM's Ethernet port supports 10/100BaseTX auto-crossover operation. Standard CAT5 cables may be used to connect the PMEUCM to Ethernet switches and hubs.

5 Application Loading

Loading the Application into the PMEUCM

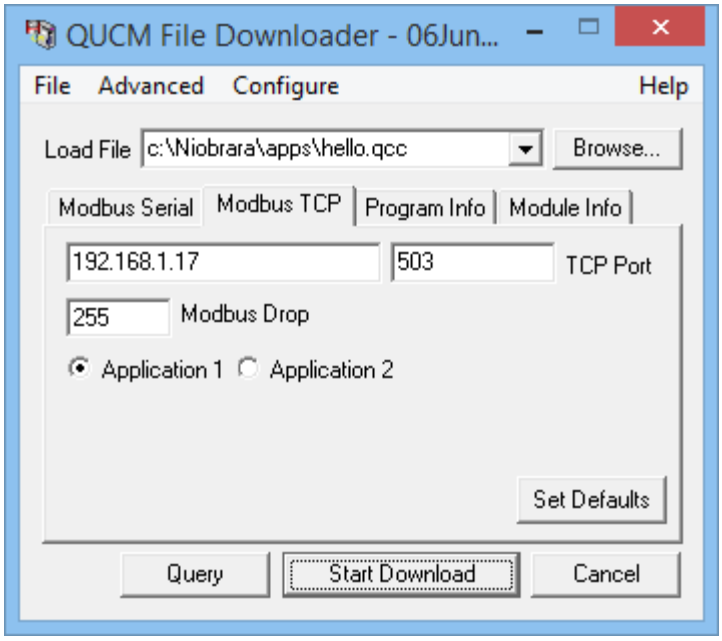
NOTE: For this example, the custom application will be hello.qcc. This file should be installed into the c:\Niobrara\apps\ folder on the computer.

The QLOAD program is used to install the compiled hello.qcc program. This is done through Modbus/TCP Ethernet.

NOTE: The custom application may be running during the QLOAD operation. It is not necessary to stop the custom program before doing the QLOAD.

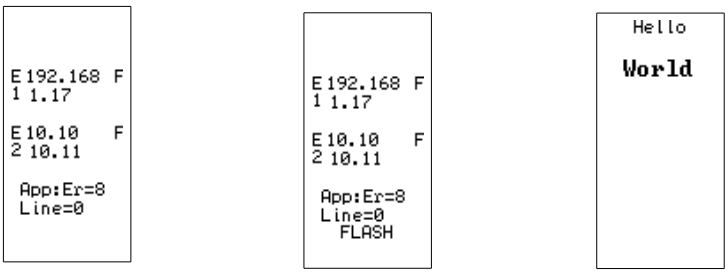
1. The PMEUCM must be powered and connected to the same Ethernet network as the PC.
2. Start QLOAD.EXE. The Windows Start Menu link is “Start, Programs, Niobrara, QUCM, QLOAD”.
3. Click on the Browse button and select the hello.qcc file to be loaded.
4. Click on the “Modbus/TCP” tab and verify the following:
    1. The proper IP Address of the PMEUCM (192.168.1.17).
    2. The TCP Port number is 503.
    3. The Modbus Drop is 255.
    4. The Application 1 radio button is selected.
5. Press the “Start Download” button. QLOAD will open a progress bar to show the status of the download.

Figure 5.1: QLOAD hello.qcc



After the qload is finished, the PMEUCM will complete the storage of the application to FLASH memory. When finished, the application should start and the screen should change to show "Hello World".

Figure 5.2: PMEUCM Screens before, during, and after QLOAD of hello.qcc



Before *During* *After*

6 Loading New OS Firmware over Ethernet

Updating the PMEUCM Firmware

It may become necessary to update the PMEUCM OS firmware. This may be done over the Ethernet using QLOAD.

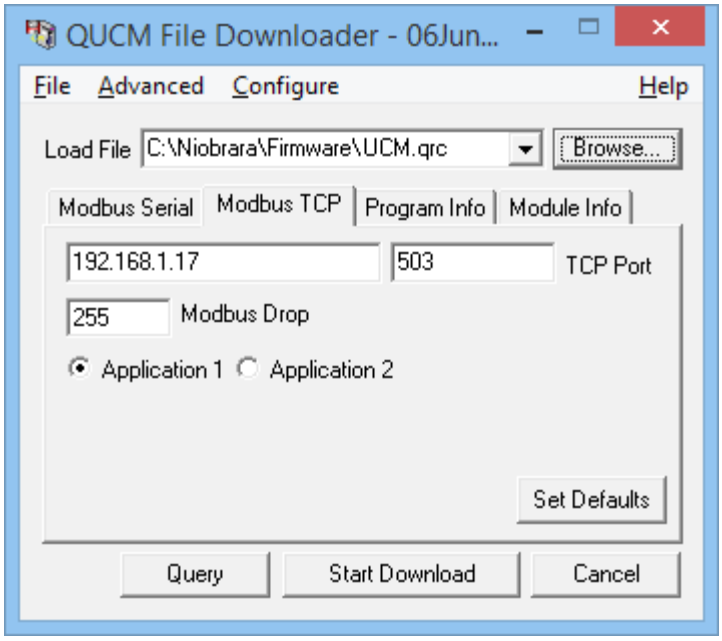
NOTE: The QLOAD operation may be done while the custom program is running. It is not necessary to halt the custom program to perform the OS firmware upgrade.

NOTE: The PMEUCM will be offline while the OS firmware operation is underway. The Firmware upgrade takes about 30 seconds after the QLOAD operation is finished. The PMEUCM will reboot after completing the upgrade.

NOTE: The previous version of the custom program will remain and automatically restart after the OS version upgrade is completed.

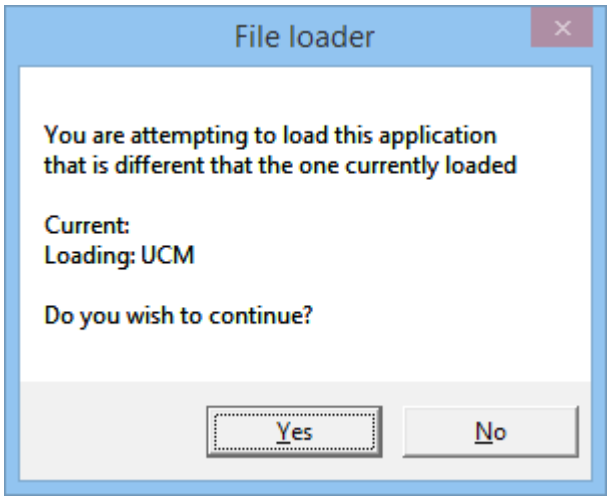
1. The PMEUCM must be powered and connected to the same Ethernet network as the PC.
2. Start QLOAD.EXE. The Windows Start Menu link is “Start, Programs, Niobrara, QUCM, QLOAD”.
3. Click on the Browse button and select PMEUCM.qrc.
4. Click on the “Modbus/TCP” tab and verify the following:
    1. The proper IP Address of the PMEUCM (192.168.1.17).
    2. The TCP Port number is 503.
    3. The Modbus Drop is 255.
    4. The Application 1 radio button is selected.
6. Press the “Start Download” button. QLOAD will open a progress bar to show the status of the download.

Figure 6.1: QLOAD OS Firmware



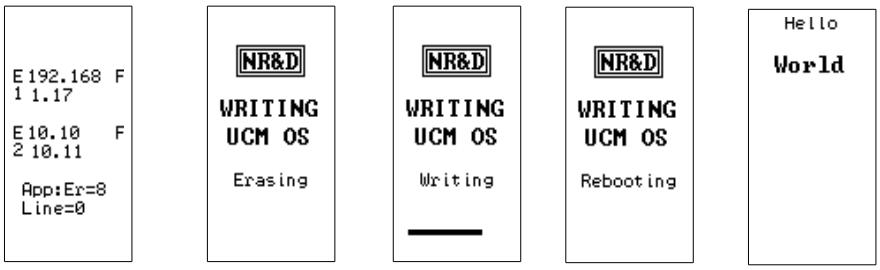
A warning screen may appear indicating that the PMEUCM firmware is being loaded into a module with another custom application loaded. Simply select "Yes" to proceed.

Figure 6.2: QLOAD OS Firmware Warning



After the completion of the download, the PMEUCM will apply the new OS. All communication to the PMEUCM will cease while the OS is being updated. This operation will take about 20 seconds to complete.

Figure 6.3: PMEUCM Screens during QLOAD of PMEUCM.qrc



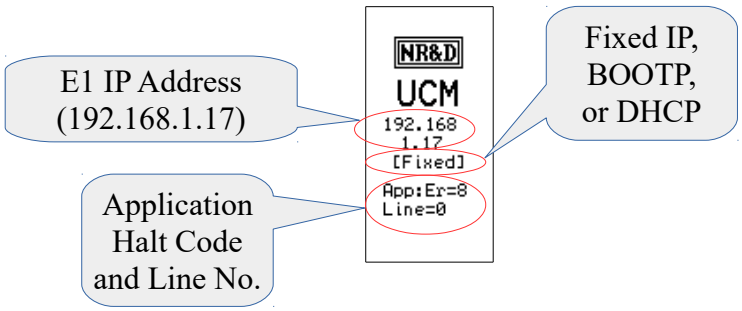
Before *Erasing* *Writing* *Rebooting* *Restart*

After the OS upgrade is finished, the PMEUCM will reboot and the original application will start running.

7 Front Panel Operation of OS

Once a custom PMEUCM application writes to the LCD, it claims control of the LCD and five-way navigation switch. Before this time, or when the application is halted, the PMEUCM OS controls the LCD and five-way navigation switch.

Figure 7.1: PMEUCM OS Splash Screen with Single E1 Port (or E2 not in Dual IP mode)



PMEUCMs with only a single Ethenet port (or if E2 is not in Dual IP mode) show a splash screen with the following data:

- IP Address of the PMEUCM (192.168.1.17)
- Source of the IP Address
  - Fixed – Set by the front panel or internal registers and stored to EEPROM
  - BOOTP – Set by an external BOOTP Server, reset on every boot
  - DHCP – Set by an external DHCP Server, reset on every boot
- Application Runtime Error – See Table 7.1: Runtime Halt Codes

Table 7.1: Runtime Halt Codes

Code	Meaning
x80xx	Application Running, if xx nonzero, xx=last halting error (in hex)
x4000	Application Halted while loading a new version
0	Terminated by clearing all thread run bits
1	STOP statement executed
2	Illegal instruction exception
3	Division by Zero
4	Out of heap space for ON CHANGE
5	Out of heap space for ON RECEIVE
6	Unsupported run-time call, likely compiler/firmware mismatch
7	Parameter or array index out of range
8	Downloaded code corrupt, CRC Error
9	CPU Address exception
10	Stack Underflow
11	TCP Error -1, likely compiler/firmware mismatch
12	TCP Error -2, contact Niobrara
13	TCP Error -3, not enough sockets or buffers, See register 66. Also IP address or gateway not initialized
14	Hardware not authorized to run user code

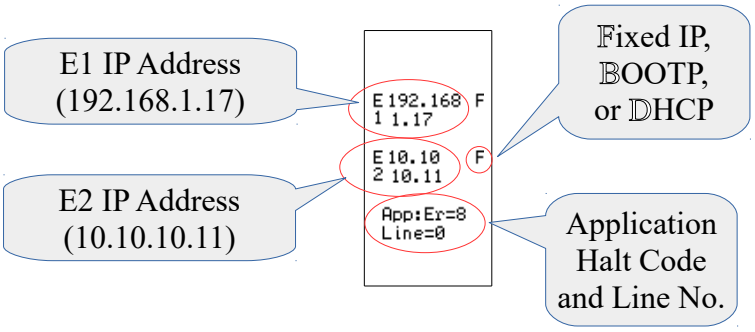
Halted Line Number – Source code line number causing the runtime error.

E2 in Dual IP Mode

The E2 port may be configured to operate independently from E1. Both ports have their own IP Address, Subnet Mask, and Default Gateway. When E2 is in independent mode, the front splash screen is changed to show both port's IP Addresses as well as an abbreviation letter to indicate the source of the IP Address.

- “F” is for Fixed IP Addresses
- “B” is for BOOTP
- “D” is for DHCP

Figure 7.2: PMEUCM OS Splash Screen with E2 in Dual IP Mode



Main Menu

Use the navigation switch to maneuver around the menu system.

Figure 7.3: PMEUCM OS Main Menu

- Config – Allows changes to Ethernet, Serial, Display, and Clock
- App – Allows changes to the state of the installed Application: Run, Halt, Mem Protect, Erase, and Restart.
- Info – Reports information about the PMEUCM such as serial number, MAC address, firmware revision, and installed options.
- System – Allows Reset of PMEUCM to factory Defaults and software reboot.

8 Front Panel Operation of BOOT Loader

It may become necessary to enter the PMEUCM's BOOT Loader feature. The following conditions may require entering the BOOT Loader:

- PMEUCM OS is corrupted due to a power cycle while a firmware upgrade was underway.
- An error in a custom program is causing the module to continuously reboot.

NOTE: It is not recommended to use the CONFIG menus inside the BOOT Loader for editing Ethernet and serial port parameters. The OS CONFIG menus include many features that are not accessible inside the BOOT Loader.

Enter the BOOT Loader

To Enter the BOOT loader operation, push in the joystick and hold it in while cycling power on the PMEUCM.

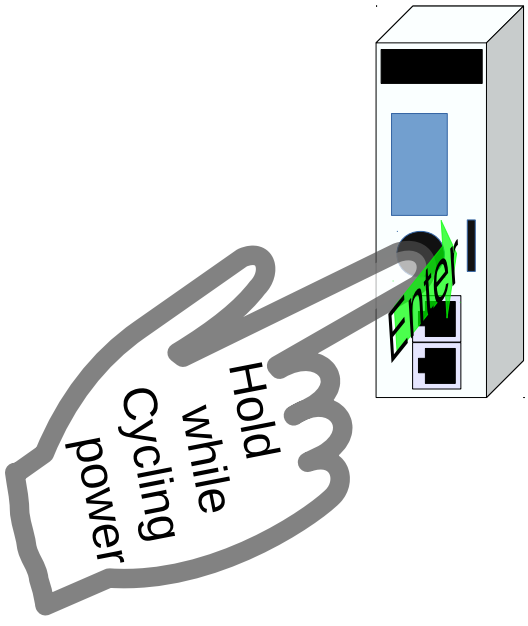


Figure 8.1: PMEUCM BOOT LOADER

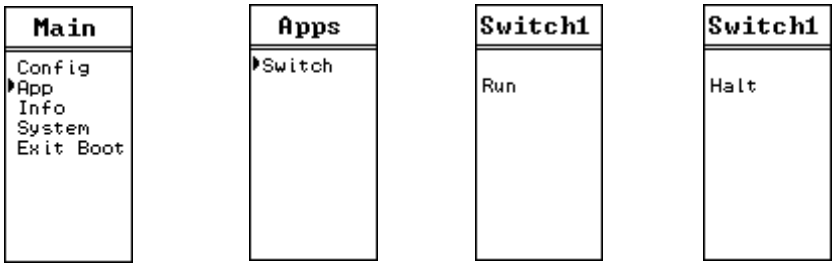
Booting *Splash* *Press Right Arrow* *Main Menu*

Use the five-way navigation switch to move around the menu system.

App, Switch

In cases where the custom application needs to be halted, the APP>Switch may be changed from RUN to HALT within the BOOT Loader.

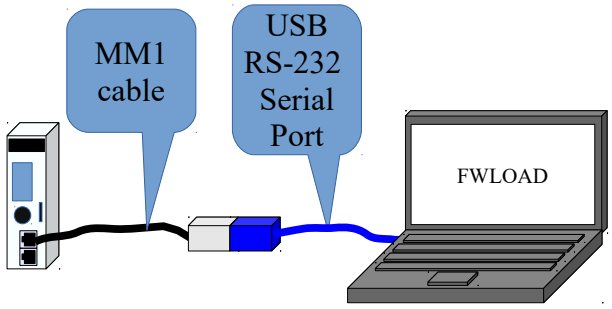
Figure 8.2: APP > Switch > Run to Halt



Loading OS Firmware using FWLOAD

If the PMEUCM is in a state where the OS has been corrupted, the method of recovery is to use the FWLOAD program to load firmware through serial port 1. The Niobrara MM1 cable is useful for connecting a standard 9-pin PC RS-232 serial port to PMEUCM RJ45 port S1.

Figure 8.3: FWLOAD OS Firmware Cable Connection



Start > Programs > Niobrara > FWLOAD PMEUCM Firmware

Figure 8.4: FWLOAD OS Firmware

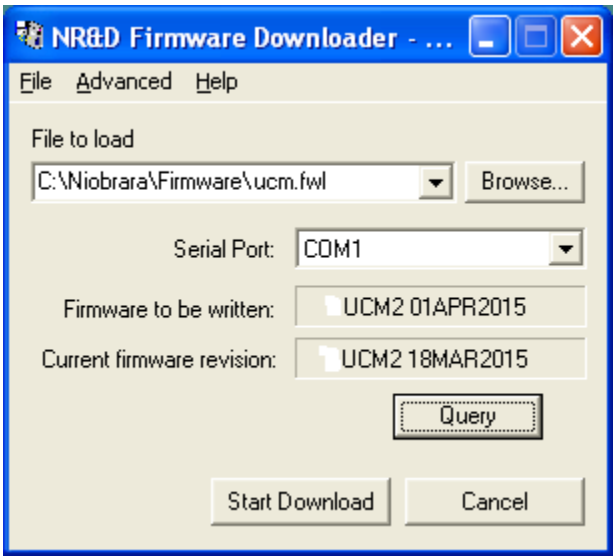


Figure 8.5: FWLOAD OS Firmware Commit

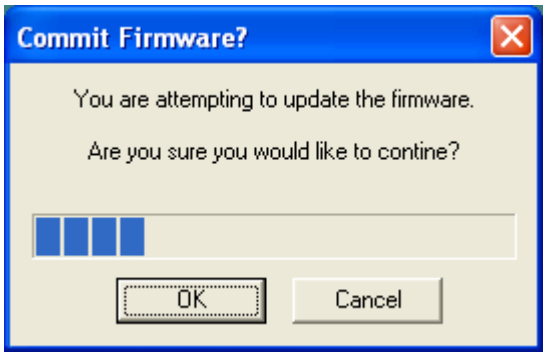
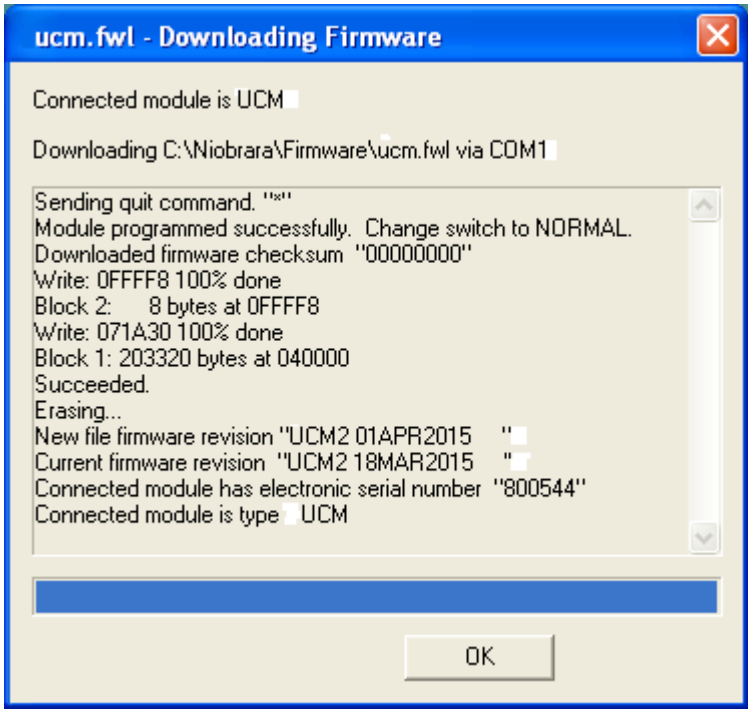


Figure 8.6: FWLOAD OS Firmware Completion



Exiting the BOOT Loader

Simply select “Exit Boot” from the main menu. The PMEUCM will reboot and return to normal operation.

9 Serial Ports

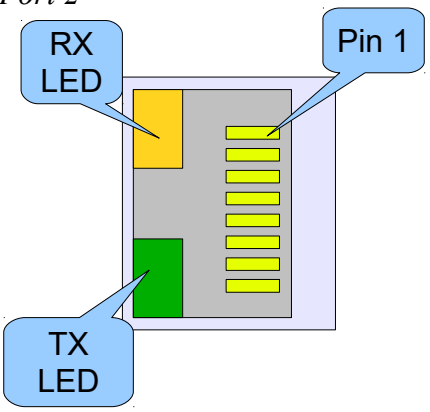
Serial Ports

The PMEUCM includes two RS-232 serial ports with an RJ-45 connector for each.

NOTE: Port 1 is electrically isolated from Port 2.

RS-232 Ports

Figure 9.1 RS-232 Port 1 and Port 2



The RJ-45 connectors are used for RS-232 operation. The pin configuration is shown in . The Niobrara MM1 cable is used to connect one of these ports to the a standard 9-pin serial port on a PC. Table 9.1: RJ45 RS-232 Pinout

RS-232 Pinout	
Pin	**Function**
1	+5 VDC
2	DSR (pulled high)
3	Data TX
4	Data RX
5	Signal GND
6	RTS
7	CTS
8	Chassis GND

Serial Port Native Operation

Like the LCD, the two serial ports are “owned” by the PMEUCM OS while the application is halted, or until the custom application attempts access. Both ports are in Modbus RTU Slave mode and the baud rate, parity, data bits, stop bits, drop number, and driver mode are controlled by the OS settings. These settings may be adjusted from the front panel.

NOTE: If a custom application is running, it may alter the ports settings of the serial ports.

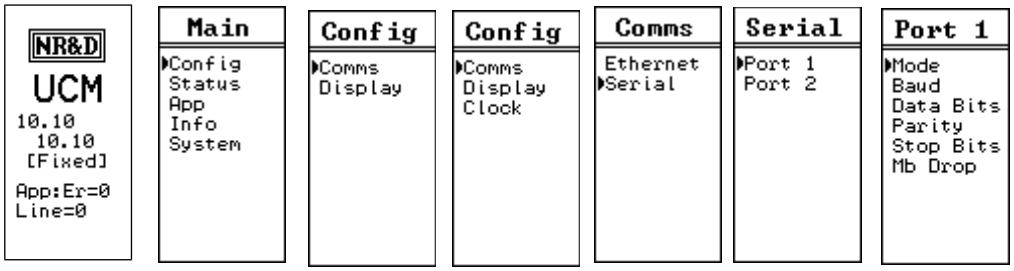


Figure 9.2: Serial Port Menu

- Mode – Sets the physical interface in use
  - RS-232 – Uses the RJ45 connector.
- Baud – Sets the baud rate for the port. Supported values range from 50 to 115200 bps.
- Data Bits – Must be set for 8 bits for Modbus RTU operation.
- Parity – Possible values are NONE, EVEN, and ODD.
- Stop Bits – Possible values are 1 and 2.

- Mb Drop – Sets the Modbus Slave address to access the OS while the application is halted. The PMEUCM always responds to drop 255 while in this state.