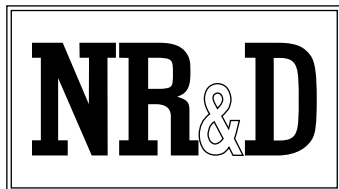


UCM Modbus Poller

Installation and Programming Manual

This Manual describes the UCM applications for interfacing Modbus Slave networks to a SY/MAX PLC.

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Introduction

The Niobrara UCM4 is a SY/MAX[®] compatible module that is capable of running multiple applications for performing communication translations between serial protocols. This document covers a set of application that moves I/O data in a SY/MAX PLC to/from Modbus RTU serial devices.

The applications are called APP1.UCM, APP2.UCM, APP3.UCM, and APP4.UCM. APP1.UCM is loaded into the UCM's Port 1 and provides the interface a network of Modbus Slaves attached to UCM Port 1. This application can perform READ and WRITE operations on the Holding Registers (4x) in a variety of slaves. Each operation is configured by a group of 5 registers per operation through the SY/MAX backplane. APP2 through APP4 may be optionally loaded into the QUCM to provide parallel networks of devices.

The UCM4 will be mounted in a SY/MAX register rack and will need to be rack addressed by the PLC for up to 12047 registers to gain access to the I/O for up to 4 separate Modbus networks.

Module Installation

- 1 Remove power from the rack.
- 2 Mount the UCM4-S in an available slot in the register rack. Secure the screw at the bottom of the module.
- 3 Apply power to the rack.

Software Installation

The application files for the UCM4 are included in the MODBUS.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 MODBUS.ZIP file is located at

<http://ftp.niobrara.com/ucm/modbus/modbus.zip>

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

<http://ftp.niobrara.com/ucm/modbus/modbus.pdf>

Serial Connections to the UCM4-S

Port 1 r

Port 1 of the UCM4-S is RS-232 and the RTU Interface box is also RS-232. The RTU Interface includes a 9-pin RS-232 connection.

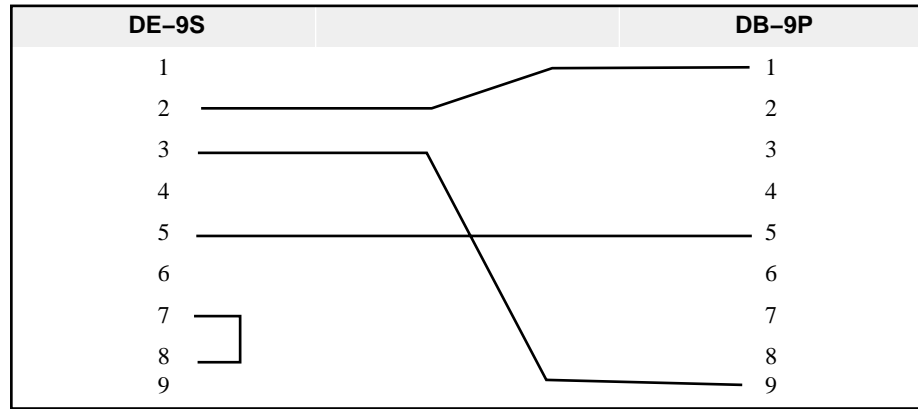


Figure 2-1 Dupline RS-232 Cable Pinout

The UCM4-S Port 1 and the Dupline Modbus-RTU Interface must be configured for the same baud rate. The UCM application should be set to 9600 baud and no parity.

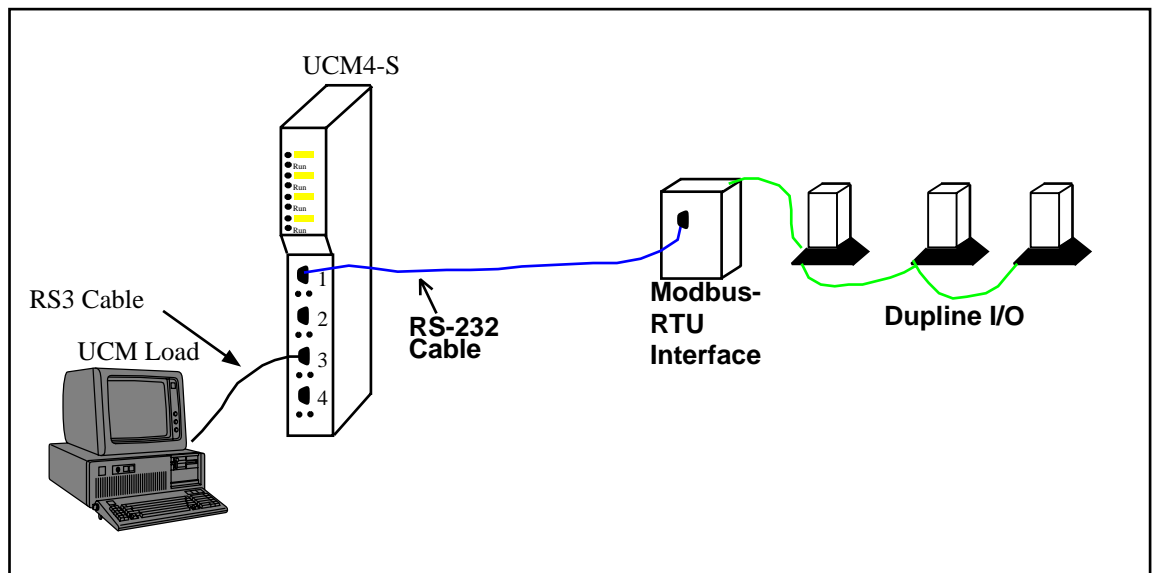


Figure 2-2 UCM4-S Layout

The system layout will be as shown in Figure 2-2. The UCM4-S Port 1 is connected to the Modbus box with the RS-232 cable in Figure 2-1. The Modbus box is connected to a Dupline Network. The Modbus-RTU Interface is DIP switch selected to be Modbus Slave Address 1.

Port 2, 3, or 4 to the Personal Computer

A physical connection must be made from the personal computer to the UCM 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 UCM4-S. The Niobrara RS3 cable may be used for this connection. This cable pinout is shown in Figure 2-3.

If remote configuration is desirable, Port 2 of the UCM may be connected to a spare SY/MAX mode port of the EPE5-TCP, MEB-TCP, SPE4, or Square D NIM by means of an SC902 cable with its external power supply. The network module port should

be set for SY/MAX mode, 9600 baud, EVEN parity, 8 data bits, 1 stop bit, and BCC error checking.

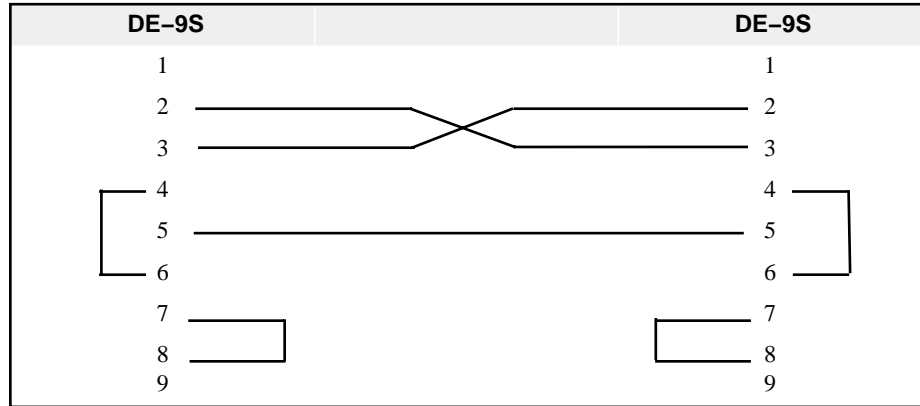


Figure 2-3 RS3 Pinout

Loading the Applications into the UCM4

Four batch files are included to assist loading the programs into the UCM4. Connect the computer to Port 2 (or Port 3 or Port 4) of the UCM4. If the computer operating system is DOS or Windows 3.x (16 bit) then run either DOS1.BAT for COM1: or DOS2.BAT for the PC's COM2:. If the computer operating system is Windows 95/98 or NT then run WIN1.BAT for COM1: or WIN2.BAT for COM2: These files will automatically load the program into the proper port and set it for Auto-Start. After completion of the loading, the green RUN light at the top of the UCM should light on Port 1.

The applications may be loaded with the following for PC com port 1:

```
>ucmload32 1 app1 com1:9600,e,8,1 -a  
>ucmload32 2 app2 com1:9600,e,8,1 -a  
>ucmload32 3 app3 com1:9600,e,8,1 -a  
>ucmload32 4 app4 com1:9600,e,8,1 -a
```


Register List

The UCM4 should be rack addressed for at most 1047 registers to allow the PLC access to all data and statistics. The configuration registers are described in the following tables:

Table 3-1 Global Control

UCM Register	PLC I/O Direction	Description
1	Input	UCM Control - Bit 1 on to run app1.ucm
2	Input	UCM Status - Bit 16 on if app1 running
3	Input	UCM Line Number - normally zero
4	Input	UCM Status - Bit 16 on if app2 running
5	Input	UCM Line Number - normally zero
6	Input	UCM Status - Bit 16 on if app3 running
7	Input	UCM Line Number - normally zero
8	Input	UCM Status - Bit 16 on if app4 running
9	Input	UCM Line Number - normally zero
10	Output	Port 1 Config Bits 1-15 baud rate, bit 16 Parity
11	Output	Port 2 Config
12	Output	Port 3 Config
13	Output	Port 4 Config
14	Output	Port 1 Timeout (10mS Units) Min. value = 50
15	Output	Port 2 Timeout
16	Output	Port 3 Timeout
17	Output	Port 4 Timeout
18	Output	Delay Between Polls (10mS Units)

Table 3-2 Poll Entries 1 through 5

UCM Register	PLC I/O Direction	Description
19	Output	Number of Poll Entries
20	Input	Entry 1 - Configuration bits 1-8 are Modbus Slave address, (0-255) bits 9-10 are UCM Port (1-4) bit 16 is 0=Read, 1=WRITE
21	Output	Entry 1 - Local Register (must be < 1048)
22	Output	Entry 1 - Remote Register
23	Output	Entry 1 - Count (must be < 120)
24	Input	Entry 1 - Status Bit 1 - ON if slave replies, OFF if timeout Bit 2 - ON if Exception Reply, OFF if good reply Bit 3 - ON if poll configuration is bad, OFF if ok Bit 4 - Toggles with each poll operation
25	Output	Entry 2 - Configuration
26	Output	Entry 2 - Local Register
27	Output	Entry 2 - Remote Register
28	Output	Entry 2 - Count
29	Input	Entry 2 - Status
30	Output	Entry 3 - Configuration
31	Output	Entry 3 - Local Register
32	Output	Entry 3 - Remote Register
33	Output	Entry 3 - Count
34	Input	Entry 3 - Status
35	Output	Entry 4 - Configuration
36	Output	Entry 4 - Local Register
37	Output	Entry 4 - Remote Register
38	Output	Entry 4 - Count
39	Input	Entry 4 - Status
40	Output	Entry 5 - Configuration
41	Output	Entry 5 - Local Register
42	Output	Entry 5 - Remote Register
43	Output	Entry 5 - Count
44	Input	Entry 5 - Status

Overview

The APPx programs run continuously checking the lists of polls. If a poll entry has the UCM port that matches the port then a Modbus RTU message is built to generate a Read or Write. The status of the message is indicated by the fifth register of the poll entry. Bit 1 will be on if the slave replied. Bit 2 will be on if an error was returned by the slave. Bit 3 will be on if the configuration for the poll is bad. Bit 4 will toggle with every completed Read or Write, and thus may be used as a trigger for moving Read data around in the SY/MAX PLC.

If a UCM port is not used, then don't bother to load the application for that port. This will save CPU operations that aren't needed and speed up the module.

UCM Lights

The Green RUN light on the top panel of the module should be on when the port is running the application. If this light is not on the the program is either not loaded or has been stopped.

The Red User light on the top panel of the module indicates an error is occurring such as a timeout or bad checksum. Normally this light will be off. When it becomes illuminated then the user should check the statistical counters to determine the cause of the error.

The Yellow TX light directly under Port 1 indicates the flow of data from the UCM. This light should normally be blinking on and off during normal communication. If the green run light is on but this TX light never blinks then check that the serial cable is connected to Port 1 and wired properly. Be sure to check that Pins 7 and 8 are jumpered together.

The Yellow RX light directly under Port 1 indicates the flow of data from the Modbus network to the UCM. This light will blink with every character that is received by the UCM. If the TX light is blinking but the RX light is not blinking then check the

Modbus Network for integrity as well as all of the slaves to be sure that they are powered up and that they have the proper slave address, baud rate, and parity.

PLC Inputs and Outputs

The UCM's rack addressable registers will always have a Status (SY/MAX bits 17 through 32) of either xA000 (PLC writeable Output) or xE000 (PLC read-only Input). By default the UCM's registers default to PLC Outputs and have a Status of xA000. If a register is modified by the UCM application or by an external SY/MAX write through one of the serial ports then that register changes from a PLC output (xA000) to a PLC input (xE000).

Most of the registers in this application are PLC Inputs and have a status of xE000. The registers that map to Dupline Receivers are PLC Outputs and have a status of xA000. Do not write to these registers from one of the serial ports on the UCM or the output will change to an input and the PLC will no longer be able to modify the value. If this happens then the UCM will need to have its power cycled to return to the normal I/O mapping.

Overview

The UCM4-S Port 1 and the Dupline Modbus-RTU Interface must be configured for the same baud rate. The UCM application should be set to 9600 baud and no parity.

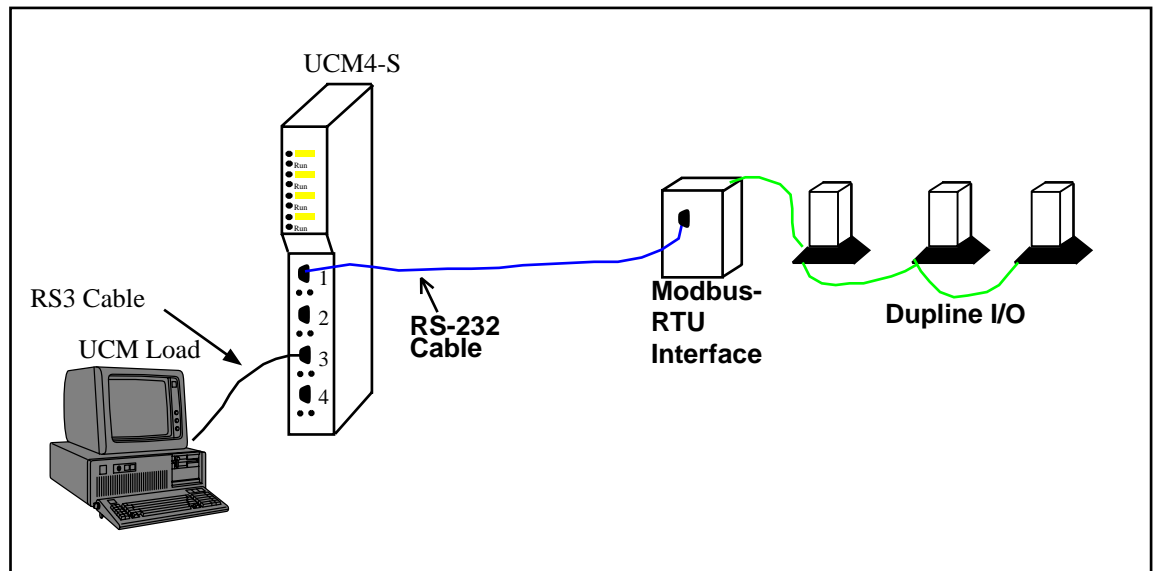


Figure 5-1 UCM4-S Layout

The system layout will be as shown in Figure 5-1. The UCM4-S Port 1 is connected to the Modbus box with the RS-232 cable in Figure 2-1. The Modbus box is connected to a Dupline Network. The Modbus-RTU Interface is DIP switch selected to be Modbus Slave Address 1.

UCM Port Configuration

Only app1.ucm is required for this system. Do not load app2, app3, or app4. After loading app1, configure register 10 through 18 as follows from the SY/MAX PLC.

Table 5-1 Example Global Control

UCM Register	PLC I/O Direction	Value (Hex)	Value (Decimal)	Description
1	Input	0001	1	UCM Control - Bit 1 on to run app1.ucm
2	Input	8000	32768	UCM Status - Bit 16 on if app1 running
3	Input	0000	0	UCM Line Number - normally zero
4	Input	0000	0	UCM Status - Bit 16 on if app2 running
5	Input	0000	0	UCM Line Number - normally zero
6	Input	0000	0	UCM Status - Bit 16 on if app3 running
7	Input	0000	0	UCM Line Number - normally zero
8	Input	0000	0	UCM Status - Bit 16 on if app4 running
9	Input	0000	0	UCM Line Number - normally zero
10	Output	2580	9600	Port 1 Config Bits 1-15 baud rate, bit 16 Parity
11	Output	0000	0	Port 2 Config
12	Output	0000	0	Port 3 Config
13	Output	0000	0	Port 4 Config
14	Output	00C8	200	Port 1 Timeout (10mS Units) Min. value = 50
15	Output	0000	0	Port 2 Timeout
16	Output	0000	0	Port 3 Timeout
17	Output	0000	0	Port 4 Timeout
18	Output	0000	0	Delay Between Polls (10mS Units)

Register 1 has a value of 1 to indicate that only application 1 is running.

Register 2 has a value of x8000 to indicate that the program is running.

Register 10 has bit 16 cleared to indicate parity = NONE.

Register 14 is set to 200 to create a two second timeout.

Poll Configuration Registers

For this example, the SY/MAX PLC needs to read the binary data from Dupline point A1 through P8. This data is stored in Modbus Holding Registers 1 through 8 as shown in the Dupline documentation. Poll Entry 1 Reads this data and places it in registers 50 through 57. Also, the SY/MAX PLC needs to write the outputs A1 through J8. Poll Entry 2 performs this write from registers 60 through 64.

Register 19 is set to the value 2 because there are two poll operations.

Poll 1 Configuration

Register 20 is the configuration value for Poll 1 and is set to x0101. Bit 16 is clear to indicate a Read. The lower nibble in the upper byte is b01 to indicate UCM Port 1. The lower byte is set to x01 to indicate Modbus slave 01.

Register 21 is the UCM local register and is set to 50.

Register 22 is the Dupline remote register and is set to 1.

Register 23 is the register count and is set to 8.

Register 24 is the status from the UCM and is either x0001 or x0009 to indicate that the slave is responding.

Poll 2 Configuration

Register 25 is the configuration value for Poll 1 and is set to x8101. Bit 16 is set to indicate a Write. The lower nibble in the upper byte is b01 to indicate UCM Port 1. The lower byte is set to x01 to indicate Modbus slave 01.

Register 26 is the UCM local register and is set to 60.

Register 27 is the Dupline remote register and is set to 1.

Register 28 is the register count and is set to 5.

Register 29 is the status from the UCM and is either x0001 or x0009 to indicate that the slave is responding.

Table 5-2 Poll Entries 1 and 2

UCM Register	PLC I/O Direction	Value (Hex)	Value (Decimal)	Description
19	Output	2	2	Number of Poll Entries
20	Input	0101	257	Entry 1 - Configuration bits 1-8 are Modbus Slave address, (0-255) bits 9-10 are UCM Port (1-4) bit 16 is 0=Read, 1=WRITE
21	Output	0032	50	Entry 1 - Local Register (must be < 1048)
22	Output	0001	1	Entry 1 - Remote Register
23	Output	0008	8	Entry 1 - Count (must be < 120)
24	Input	0001 or 0009	1 or 9	Entry 1 - Status Bit 1 - ON if slave replies, OFF if timeout Bit 2 - ON if Exception Reply, OFF if good reply Bit 3 - ON if poll configuration is bad, OFF if ok Bit 4 - Toggles with each poll operation
25	Output	8101	33025	Entry 2 - Configuration
26	Output	003C	60	Entry 2 - Local Register
27	Output	0001	1	Entry 2 - Remote Register
28	Output	0005	5	Entry 2 - Count
29	Input	0001 or 0009	1 or 9	Entry 2 - Status

Poll Data Registers

The data from/for the two polls is in registers 50 through 64.

Table 5-3 Poll Data for 1 and 2

UCM Register	PLC I/O Direction	Description
50	Input	Dupline Read Data B8-A1
51	Input	Dupline Read Data D8-C1
52	Input	Dupline Read Data F8-E1
53	Input	Dupline Read Data H8-G1
54	Input	Dupline Read Data J8-I1
55	Input	Dupline Read Data L8-K1
56	Input	Dupline Read Data N8-M1
57	Input	Dupline Read Data P8-O1
58	Output	Not Used
59	Output	Not Used
60	Output	Dupline Write Data B8-A1
61	Output	Dupline Write Data D8-C1
62	Output	Dupline Write Data F8-E1
63	Output	Dupline Write Data H8-G1
64	Output	Dupline Write Data J8-I1