MUCM SATO

Installation and Programming Manual

This Manual describes the MUCM application for interfacing a SATO M-8400 barcode printer to an MUCM.

Effective: 18 May, 2007

NR&D
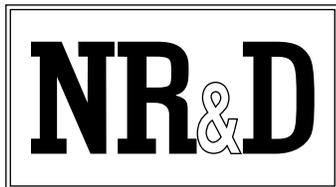
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Introduction

The Niobrara MUCM is a Modicon Momentum® compatible module that is capable of running multiple applications for communicating with serial device. This document covers an application that allows PLC data to be sent to a SATO M-8400 barcode printer. A Momentum PLC or communication tophat is used to provide the information to be printed on the barcode. The printer is connected to the MUCM's RS-232 port.

Only one of the two application areas are used for this data concentrator application: mucm_sato_app1.qcm is compiled and loaded into application area 1 of the MUCM.

The MUCM contains its own power supply and needs a source of 9 to 30 Volts, AC or DC. An ideal 12VAC transformer is available from NR&D as part number TR121-ST.

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Installation

Installation of the MUCM should go quickly, with the necessary materials. The following items are necessary:

- MUCM

- MU1 cable (or equivalent can be built; see Figure 2-2)

- Power source for MUCM (use NR&D part TR121-ST or available power)

- Cabling between MUCM and SATO printer may be built or purchased. All mating connectors are supplied with MUCM; network cabling is not provided. The MU18 cable may be used to connect to the SATO 25-pin RS-232 port.

- DIN rail for mounting

Module Installation

1   Mount the MUCM on a DIN rail, or mount as desired using screws through the two holes provided. The DIN rail or mounting screws should be Earth-grounded for the MUCM serial ports' transient suppression.

2   Supply power to the MUCM; NR&D's TR121-ST may be used, or any available power source 9-30 Volts AC or DC.

Software Installation

The application files for the MUCM and this instruction manual are included in the MUCM_SATO_SETUP.EXE file. This file is self-extracting and my be opened from the Niobrara CD and is also available at www.niobrara.com. The latest version of the MUCM_SATO_SETUP.EXE file is located at
        http://www.niobrara.com/html/apps/mucm/sato.html

The MUCM_SETUP.EXE file should also be installed on the computer to ensure that the latest MUCM firmware and QLOAD are properly installed.

Serial Connections to the MUCM

Port 1 to SATO M-8400 Printer

Port 1 of the MUCM is RS-232 so a simple 4-wire cable is required to connect to the master device. Printer's Tx signal will connect to the MUCM's Rx, and the printer's Rx signal will connect to the MUCM's Tx. Signal ground must run from the printer to the MUCM, and the CTS input to the MUCM will be connected to the DTR pin on the printer. The printer will also have its RTS and CTS handshaking pins shorted together. The Niobrara MU18 cable may be used. (See Figure 2-1).

MUCM		DE25P (male)
Tx	————————————————	3
Rx	————————————————	2
Gnd	————————————————	7
RTS		6
CTS	————————————————	20
		4
		5
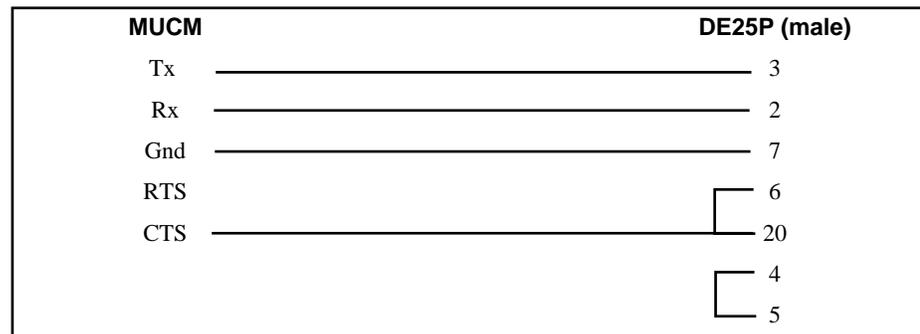
Figure 2-1   MUCM to RS-232 SATO RS-232C Port (25-pin male) (MU14 Cable)

Port 1 to PC for Setup

A physical connection must be made from the personal computer to the MUCM in order to download the application. This link is 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 2-2.

MUCM		DB9S (female)
Tx	————————————————	2
Rx	————————————————	3
SG	————————————————	5
RTS		7
CTS		8
		4
		6
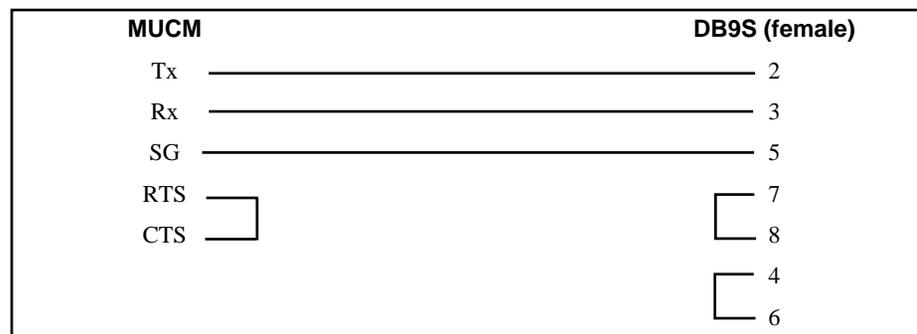
Figure 2-2   MUCM to PC RS-232 (MU1 Cable)

Loading the Applications into the MUCM

Install the MUCM_SETUP.EXE file

The MUCM is rapidly evolving so be sure to upgrade the firmware in the module before loading the latest version of MUCM_SATO_APP1.QCC. Most likely the QCOMPILE.EXE has been updated so be sure to use the newest version. The

MUCM-001 and MUCM-002 use different firmware files: MUCM1.FWL is for the MUCM-001; MUCM.FWL is for the MUCM-002. Firmware upload is as follows:

1   Move the RUN/LOAD switch on the module to LOAD. The MUCM may reboot, and the Tx1 LED should flash once per second, very briefly.

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

3   Press "Start, Program Files, Niobrara, MUCM, FWLOAD MUCM Firmware". A window like Figure 2-3 should open.

4   The file "c:\Niobrara\Firmware\mucm.fwl" should be selected. This is the firmware file for the MUCM-002.

5   Select the proper PC COMM port.

6   Press "Start Download" to begin the upgrade. This should only take a few minutes to complete.

7   Change the yellow switch back to RUN.

8   Close FWLOAD.

Figure 2-3   FWLOAD Window

Next, load MUCM_SATO_APP1.QCC into the MUCM:

1   Move Switches 1 and 2 to Halt.

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

3   Press the "Start, Programs, Niobrara, MUCM, Apps, SATO, QLOAD SATO Application 1". A window like Figure 2-4 should open.

4   Verify that the file "c:\Niobrara\Apps\MUCM\SATO\mucm_sato_app1.qcc" is selected. If not, browse for that file.

5   Verify that the following are true:

   a. Application 1 radio button is selected

   b. Modbus Serial is selected

   c. The proper PC comm port is selected

   d. Baud Rate = 9600

   e. Modbus Drop = 255

   f. ASCII is NOT checked

g. 8 Bit radio button is selected

h. Parity is Even.

6   Press the "Start Download" button. This download will take several minutes to complete.

7   Place Switch 1 in RUN. The RN1 light should come on.
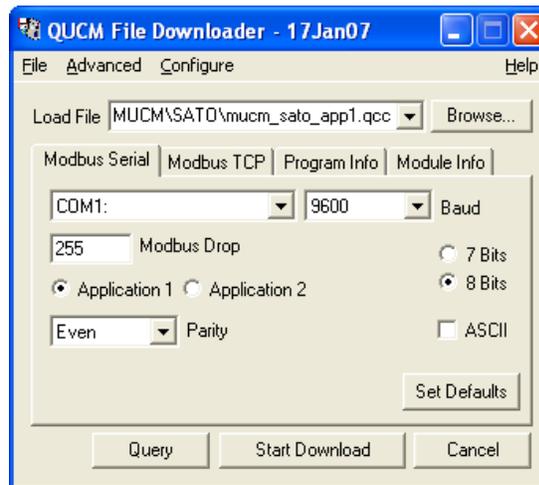
Figure 2-4   QLOAD Window

Printer Setup

The SATO printer must be configured properly to match the MUCM.

1   Power up the printer.

2   Make sure the printer is OFFLINE. If the printer is ONLINE then press the LINE button so the display and green LED show OFFLINE.

3   Press the ENTER button. The display should show Enter Mode to Edit M.

4   Press the right arrow button to show mode I.

5   Step through the interface setting to set the following values:

a. Interface = RS232C

b. Baud Rate = 19200 Bps

c. Stop Bit = 2 bits

d. Parity = No

e. Data Bit Length = 8 bits

f. Protocol = Xon/Xoff

g. Multidrop = No

6   Press the F1 key to move back up the menu to Edit I.

7   Press the right arrow key to choose Edit S.

8   Set the sensor = 6.

9   Press the F1 twice key to move back up to OFFLINE.

NOTICE: Testing at Niobrara has revealed that the baud rate setting on the M-8400 printer does not actually match the real communication rate of the printer. Setting the printer to 19200 actually puts the serial port at 9600 baud and thus the MUCM is actually configured for 9600 baud operation. Testing also demonstrated the the serial port must be set for 8 data bits, 2 stop bits, and NO parity.

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Operation

The SATO M-8400 MUCM application uses Port 1 for to connect to the printer. Port 2 of the MUCM is not used by the application and remains in Modbus RTU slave mode at 9600,E,8,1 at drop number 255. An RS-232<>RS-485 converter would be required to connect the MUCM port 2 to an PC (NR&D cable SC912).

The MUCM tophat interface provides the control for operating the SATO printer from the PLC.

TOPHAT OUTPUT Registers

Table 3-1   MUCM Output Register List

Register	Measurement	Notes
4x0001	Command bitmap from PLC	Bit 0 - Set to print Message, clear when 3x0005-1 is cleared.
4x0002	Coil Number MSW	If coil number = 4224061 (dec) = x0064743d (hex) then
4x0003	Coil Number LSW	register 2 = x0064 (hex) and register 3 = x743d (hex)
4x0004	Gross Weight	
4x0005	Tare Weight	
4x0006	Net Weight	
4x0007	Stock Number MSW	If Stock Number = 50324301 (dec) = x02ffe34d (hex) then
4x0008	Stock Number LSW	register 7 = x02ff (hex) and register 8 = xe34d (hex)
4x0009	Large Integer on Right	(1,2,3)
4x0010	Fraction High Byte/Low Byte in hex	The value 5/16 = x0510 (hex)
4x0011	Stored Text Pointer	1=COPPER ROD, CDA Allow...
4x0012 through 4x0032	Not used	

TOPHAT INPUT Registers

Many Momentum tophats do not allow the output words to be viewed so this application copies registers 4x0001 through 4x0011 into 3x0011 through 3x0021 to aid troubleshooting.

Table 3-2   MUCM Input Register List

Register	Measurement	Notes
3x0001	App1 Status	Should be x8000 (hex)
3x0002	App1 Halt Line Number	Should be 0 normally
3x0003	App2 Status	Ignored
3x0004	App2 Halt Line Number	Ignored
3x0005 through 3x0009	Not Used	
3x0010	SATO Status bitmap	bit 0 - Xon/Xoff, 1=Ok to print bit 1 - Message printing when on, clears when finished printing.
3x0011	Copy of Command bitmap from PLC	Bit 0 - Set to print Message, clear when 3x0005-1 is cleared.
3x0012	Copy of Coil Number MSW	If coil number = 4224061 (dec) = x0064743d (hex) then
3x0013	Copy of Coil Number LSW	register 12 = x0064 (hex) and register 13 = x743d (hex)
3x0014	Copy of Gross Weight	
3x0015	Copy of Tare Weight	
3x0016	Copy of Net Weight	
3x0017	Copy of Stock Number MSW	If Stock Number = 50324301 (dec) = x02ffe34d (hex) then
3x0018	Copy of Stock Number LSW	register 17 = x02ff (hex) and register 18 = xe34d (hex)
3x0019	Copy of Large Integer on Right	(1,2,3)
3x0020	Copy of Fraction High Byte/Low Byte in hex	The value 5/16 = x0510 (hex)
3x0021	Copy of Stored Text Pointer	1=COPPER ROD, CDA Allow...
3x0022 through 3x0032	Not used	

PLC Operation

The configuration of the PLC depends upon the tophat selected for the MUCM. If the Ethernet tophat is used then the easiest solution is to use an Ethernet I/O scanner in the PLC to do a combination 32 word Read/Write. Peer cop would be the best solution for a MB+ tophat

1   The PLC clears bit 0 of MUCM output register 1. (bit 0 is the lsb, bit 15 is msb).

2   The PLC loads the Coil Number (long integer) into MUCM outputs 2 and 3. The MSW goes into register 2 and the LSW in register 3. For example, if the Coil Number = 1234567 (decimal) which is expressed as x0012d687 in hexadecimal then the value x0012 (hex) = 18 (dec) would be loaded into register 2 and xd687 (hex) = 54919 (unsigned) = -10617 (signed) would be loaded into register 3.

3   The PLC loads the Gross Weight into register 4.

4   The PLC loads the Tare Weight into register 5.

5   The PLC loads the Net Weight into register 6.

6   The PLC loads the Stock Number (long integer) into registers 7 and 8.

7   The large integer on the right (1,2,3) is loaded into register 9.

8   The fractional wire size is loaded into register 10 with the numerator in the high byte and the denominator in the lower byte. For example if the wire size is 5/16 then the value in register 10 would be x0510 (hex) = 1296 (dec).

9   An index to stored text is loaded into register 11. The following table shows the current text settings:

Index Value	Description
1	COPPER ROD, CDA ALLOY 1100 TEMPER M20 AS ROLLED

10 The PLC checks MUCM INPUT register 5. If bit 0 is ON and bit 1 is OFF then the PLC sets OUTPUT register 1 bit 0. The MUCM will then set INPUT 10 bit 1 and send the data to the printer. When the printer is finished printing the MUCM will clear INPUT 10 bit 1 and the PLC should then clear OUTPUT 1 bit 0 and goes back to step 1.

If bit 0 is ON then the printer is ready to print. Bit 0 is ON when the printer sends an Xon and off when the printer sends Xoff. This bit must be on before the MUCM will send the print data to the printer.

If bit 1 is OFF then the MUCM is ready to receive the print data from the PLC. The MUCM turns ON bit 1 when after the PLC sets OUTPUT 1 bit 0 and clears this bit when the printer is finished printing.

Peer Cop Example

For this example, a Quantum PLC is connected via its native Modbus Plus port to a Momentum Modbus Plus tophat. Peer cop is enabled in the Quantum, and specific data has been set up such that the MUCM shares registers 400001-400032 and 300001-300032 with the PLC. The ladder code for this situation is shown below.
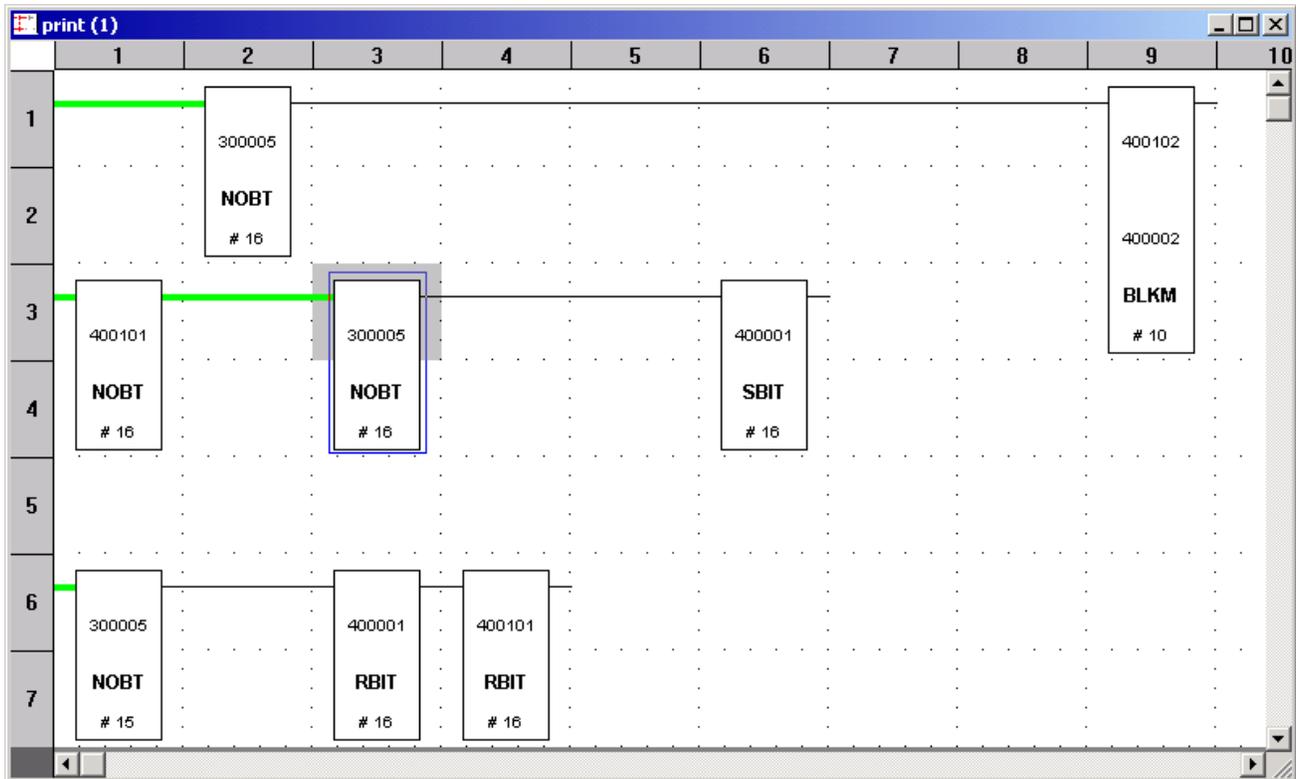
Figure 3-1   Quantum Ladder Code

It is assumed that an outside device is writing registers with the appropriate data. This device writes the data to 400101-400111. The device should load the label data into 400102-40111, then set register 40101 to 1. The PLC will be constantly moving the data in 400102-40111 to 400002-400011. When 400101 is set to 1, if register 300005(status register) is also 1, then the PLC will set register 400001 to 1. This will cause the MUCM to write the data from 400002-400011 to the printer. The MUCM will then set 300005 to a value of 2. This will cause the third rung of the segment to clear registers 400001 and 400101. If the printer is offline, or it is currently printing, the least significant bit of 300005 will not be set, and will prevent the PLC from copying data into any of the registers between 400001 and 400011.

Testing and Troubleshooting
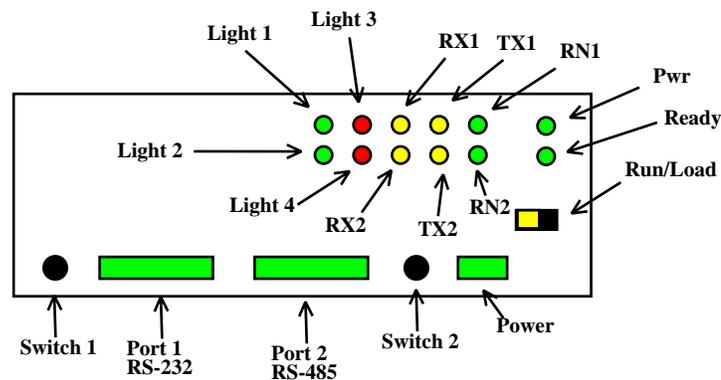
Figure 4-1   MUCM Lights and Switches

Switches

- Switch 1 controls the running of the SATO application.

  — Mem Prot - The far left position protects the application space from being overwritten.

  — Run - The middle position is the normal running setting for this switch. The RN1 light should be on and other lights may be on or flashing to indicate operation.

  — Halt - The right position of this switch halts the application. Move to this position when loading new versions of the application with qload.

- Switch 2 is ignored.

- The Run/Load switch is used for loading firmware into the MUCM with FWLOAD. Normally, this switch is in RUN but is moved to LOAD before starting the download. Light 3 is ON when the switch is in LOAD.

MUCM Lights

The MUCM has several lights to give indication of activity of the application and serial ports.

- The **Pwr** light is green and indicates that the MUCM is powered and booted.

- The **Ready** light is green and indicates that the MUCM is communicating with a tophat adapter. This light will not be on because the a tophat is not used.

- The green **RN1** light indicates that the application is running. This light should be on when the switch 1 is in RUN or MEM PROT. If the switch is in a run position but the RN1 light is off then qload the application.

- The green **RN2** light indicates that an application 2 is running. This light should always be off in the SATO application.

- The yellow **Tx1** light indicates that the MUCM RS-232 port is transmitting data. This light will flash as the MUCM sends data to the printer.

- The yellow **Rx1** light indicates that the MUCM RS-232 port is receiving data. This light will flash was the printer sends Xon/Xoff to the MUCM.

- The yellow **Tx2** light indicates that the MUCM RS-485 port is transmitting data. This light should normally be occasionally flashing as the MUCM polls the Compressors.

- The yellow **Rx2** light indicates that the MUCM RS-485 port is receiving data. This light should normally be occasionally flashing as the Compressor replies to a request from the MUCM.

- **Light 1** is a green light controlled by the application. If light 1 is on then the SATO printer has sent an Xon and ready to print and off when the printer sends an Xoff. This light matches the state of INPUT[10] bit 0.

- **Light 2** is a green light controlled by the application. If light 2 is on then the PLC has triggered the MUCM to send the information to the printer. This light matches the state of OUTPUT[1] bit 0.

- **Light 3** is a red light controlled by the application and is not used

- **Light 4** is a red light controlled by the application and is not used.