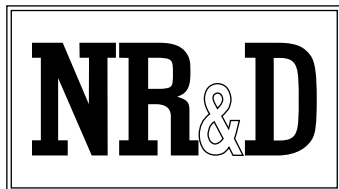


QUCM Domino Printer

Installation and Programming Manual

This Manual describes the QUCM application for interfacing a Domino Printer to a Modicon Quantum PLC system.

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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 provides a PLC controlled interface with a Domino "A Series" printer using the A-comm Communications Protocol.

The QUCM-OE must be used in the local Quantum PLC processor rack. The module is configured as an NOE-771-01 in the PLC and the I/O Scanner table is used to define the location of the printer data in the PLC.

The application, "qcm_domino_app1.qcm" is compiled and loaded into Application 1 of the QUCM-OE. The application includes multiple threads for simultaneously servicing the printer, Modbus/TCP, Modbus Serial, and a built-in Web Server.

Serial Port 1 of the QUCM is used to connect to the Domino Printer via RS-232. A Niobrara MM1 cable is needed to load the application into the QUCM.

Installation

QUCM Installation

Mount the QUCM in an available slot in the register rack. Secure the screw at the bottom of the module.

Serial Connections to the QUCM-OE

Port 1 to Domino Printer

The serial port of the QUCM-OE must be switched to RS-232. The Niobrara cable MM3 is used to connect to the 3773H cable provided by Domino. The MM3 cable pinout is shown in Figure 2-1.

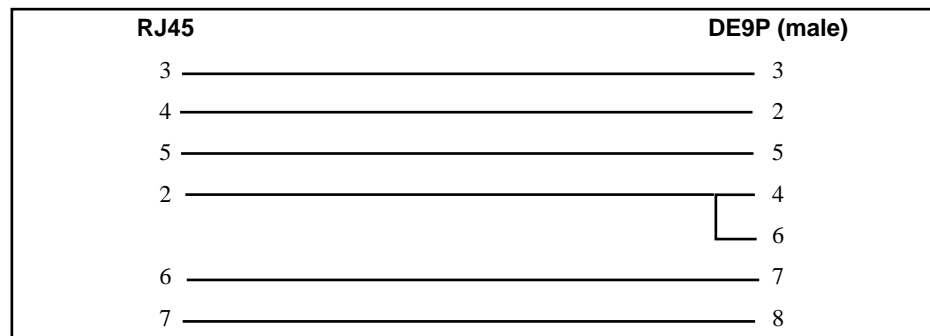


Figure 2-1 QUCM-OE to RS-232 (9-pin) (MM3 Cable)

Port 2 to the Personal Computer

A physical connection must be made from the personal computer to the QUCM in order to load the QUCM application program. This link may be a serial connection from a COM port on the personal computer to the RS-232 port on the QUCM-OE. The

Niobrara MM1 cable may be used for this connection. This cable pinout is shown in Figure 2-3.

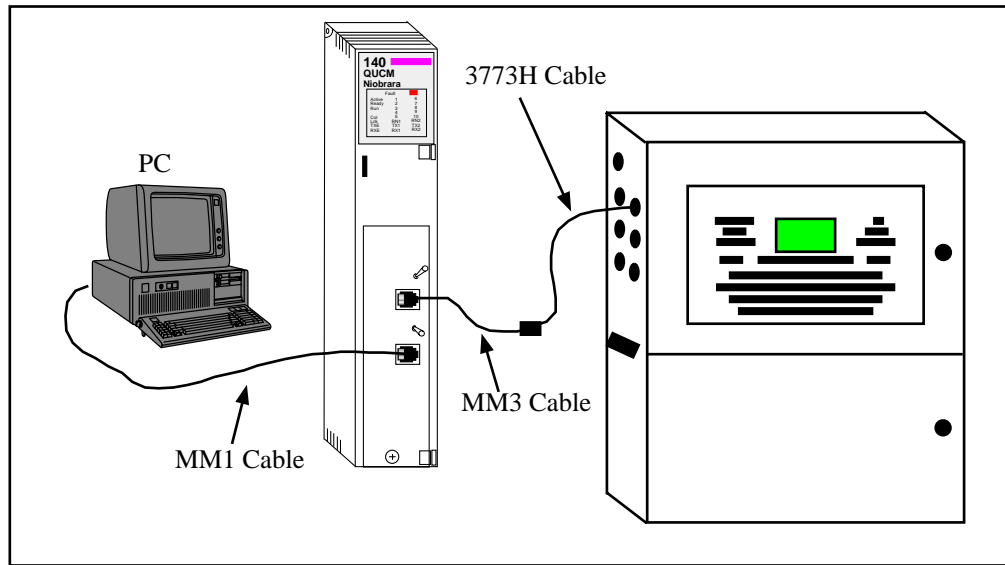


Figure 2-2 Connections to QUCM-OE serial ports

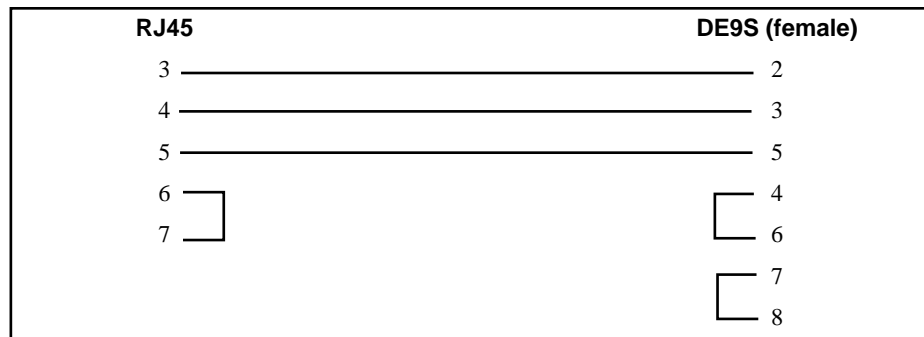


Figure 2-3 QUCM-OE to RS-232 PC Port (9-pin) (MM1 Cable)

Printer Configuration

The Domino Printer must have its serial port configured for 38400 baud, 8 data bits, 1 stop bit, and parity NONE.

Loading the Applications into the QUCM

The QUCM-OE must use the qucmtcpl.fwl firmware included in the QUCM_SETUP.EXE file. This firmware is dated 25Jan2006 or later.

FWLOAD QUCM Firmware Update.

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 From the Windows' Start button select:
"Start, Programs, Niobrara, QUCM, FWLOAD QUCM Firmware"
Verify that the file to load is qucmtcp1.fw.
Also verify that the proper PC serial port is selected.
- 7 Press the "Start Download" button. The download will only take a few minutes and it will notify the user when finished.
- 8 Remove the module from the rack and change the switch back to RUN.



Figure 2-4 FWLOAD of QUCM Firmware

QLOAD Application 1

- 1 Application 1 and 2 Switches must be in HALT.
- 2 Press "Start, Programs, Niobrara, QUCM, Apps, Domino, QLOAD Domino Application 1"
- 3 Verify that the file to load is qucm_domino_app1.qcc

- 4 Select the Modbus Serial Tab
- 5 Verify the proper PC's com port is selected.
- 6 Verify the the baud rate is 9600, 8 bits, Even parity and ASCII is NOT checked.
- 7 Select the Application 1 Radio Button.
- 8 Press the Start Download button. QLOAD will open a progress window to show the status of the download.

After downloading the application, move switch 1 to RUN and the RN1 should come on.

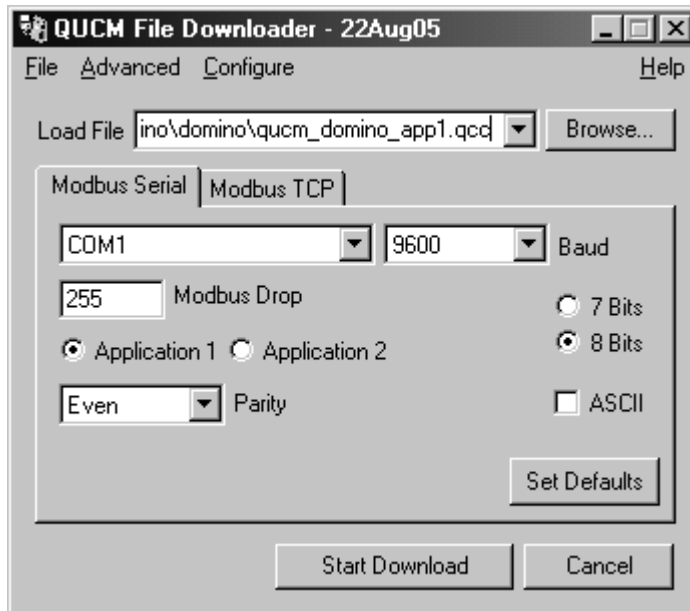


Figure 2-5 QLOAD of Application 1

PLC I/O Scanner Configuration

The QUCM must be added in the I/O Map as an NOE-771-01. The QUCM then may have its Ethernet I/O Scanner configured. The first six I/O Scanner entries are the only ones that are supported. The descriptions of each entry are shown in Table 2-1.

Specify IP Address - Check this box.

IP Address - Set the IP Address of the QUCM.

Subnet Mask - Set the Subnet Mask of the QUCM.

Gateway - Set the default gateway for the QUCM.

Framing - Normally this would be set for ETHERNET II.

Health Block - This is the starting 3x register or 1x coil of the 128 bits of status for the I/O Scanner.

Diagnostic Block (Device Control Block) - This setting is ignored by the QUCM. Leave blank.

Slave IP Address - This setting is ignored by the QUCM. Leave 0.0.0.0 or 1.1.1.1 for Unity.

Unit ID - This setting is ignored by the QUCM.

Health Timeout - This setting is ignored by the QUCM. Leave at 0.

Repetitive Rate - This setting is ignored by the QUCM. Leave at 0.

Read Ref Master (RD Master Object) - This setting is ignored by the QUCM. Leave blank or set to %MW1.

Read Ref Slave (RD Slave Index) - This setting is ignored by the QUCM. Leave blank or 0.

Read Length - This setting is ignored by the QUCM. Leave at 0.

Last Value (Input) - This setting is ignored by the QUCM. Leave at Hold Last.

Write Ref Master (WR Master Object) - This is the PLC location that holds the starting register for a given block of data. This value must be a 4x register or %MW. Table 2-1 shows the definitions of each of the six I/O Scan entries.

Write Ref Slave - This value must be 40001 through 40006 for entries 1 through 6 of the scan table. Unity requires the values to be 1 through 6.

Write Length - This setting is must be 1 for entries 1 through 6 of the scan table.

Table 2-1 Write Ref Master Definitions

Scan Entry	Description	Length (in words)	More Information
1	PLC Command Register	1	Table 2-4
2	PLC TOD Clock Starting Register	8	Table 2-5
3	Start of Message Name Block	50	Table 2-6
4	Start of Message Text Block	1001	Table 2-8
5	Serial Number	2	Table 2-9
6	Start of QUCM Status Block	20	Table 2-10

Table 2-2 Concept I/O Scanner Example

X	Specify IP					IP Address	206.223.51.145	Subnet	255.255.255.0			
						Gateway	206.223.51.1	Framing	Ethernet II			
	Master Module (slot)	Slot 5: 140-NOE-771-01										
	Health Block	300123										
	Diagnostic Block											
	Slave IP Address	Unit ID	Health Tout	Rep Rate	Read Ref Master	Read Ref Slave	Read Len	Last Value	Write Ref Master	Write Ref Slave	Write Len	Notes
1	0.0.0.0	1	0	0			0	Hold	400009	400001	1	PLC Command
2	0.0.0.0	2	0	0			0	Hold	400101	400002	1	TOD Clock
3	0.0.0.0	3	0	0			0	Hold	400901	400003	1	Message Name
4	0.0.0.0	4	0	0			0	Hold	401001	400004	1	Message Text
5	0.0.0.0	5	0	0			0	Hold	400951	400005	1	Serial Number
6	0.0.0.0	6	0	0			0	Hold	400010	400006	1	Status Block
7												
8												
9												

Table 2-3 Unity I/O Scanner Example

TCP/IP 10/100 Regular connection						Module Address RackModule 1 3	No Messaging Yes IO Scanning No Global Data No SNMP No Address Server					
	Health Block	%IW123	Device Control Block									
	Slave IP Address	Unit ID	Health Tout	Rep Rate	RD Master Object	Read Ref Slave	Read Len	Last Value	Write Ref Master	WR Slave Index	WR Len	Description
1	1.1.1.1	1	0	0	%MW1	0	0	Hold	%MW9	1	1	PLC Command
2	1.1.1.1	2	0	0	%MW1	0	0	Hold	%MW101	2	1	TOD Clock
3	1.1.1.1	3	0	0	%MW1	0	0	Hold	%MW901	3	1	Message Name
4	1.1.1.1	4	0	0	%MW1	0	0	Hold	%MW1001	4	1	Message Text
5	1.1.1.1	5	0	0	%MW1	0	0	Hold	%MW951	5	1	Serial Number
6	1.1.1.1	6	0	0	%MW1	0	0	Hold	%MW10	6	1	Status Block
7												
8												
9												

PLC Command Register

The first entry in the I/O Scanner tells the QUCM where to look for the PLC Command Register. The individual bits of this register control the action of the QUCM and consequently the Domino printer. The normal operation is that the PLC will load up the appropriate values in the Message Name, Text, and Serial Number blocks and then set corresponding command bit. The QUCM will then pull out the proper data

from the PLC, perform the appropriate action, and then signal the PLC that the action is completed by setting a bit in QUCMstatus[0]. In most cases the PLC will then need to clear the bit in PLCcommand[0] and wait for the QUCMstatus[0] bit to then clear before setting the bit again.

Table 2-4 PLC Command Register Bitmap

Block entry	Description	Notes
bit 0	Print Message	Message Name stored in PLC gets printed.
bit 1	Send Message to Printer	Message Name and Text stored in PLC gets sent to Printer.
bit 2	Send new Serial Number to Printer	Long Serial Number value for Message Name stored in PLC gets sent to Printer.
bit 3	Set Printer Clock to PLC Time	Sets both the QUCM and Printer Clocks.
bit 4	Clear Product Count in Printer	
bit 5	Query Serial Number from Printer	Queries Serial Number for Message Name stored in PLC and returns to QUCMstatus[18] and [19]
bit 6	All Messages OFF-LINE	Removes all messages from Printer's Print queue.
bit 7	Read Product Count from Printer	

PLC TOD Clock

Entry 2 in the I/O Scanner table is the starting register of the PLC TOD Clock. These 8 registers are defined in Table 2-5. When the PLC sets PLCcommand[0].3 then the QUCM will poll the data from the PLC TOD Clock, set its own clock, and send the new time/date to the Printer. The QUCM will then set QUCMstatus[0].3 when the clocks are all set.

Table 2-5 PLC TOD Clock Block

Block Entry	Description	Notes
TOD[0]	Command Bitmap	See PLC Documentation
TOD[1]	Day of Week	1=Sunday
TOD[2]	Month	1-12
TOD[3]	Day	1-31
TOD[4]	Year	Last 2 digits of year (assumes 20xx)
TOD[5]	Hours	0-23
TOD[6]	Minutes	0-59
TOD[7]	Seconds	0-59

Message Name Block

The Message Name is a 50 word block of registers in the PLC where the cable name data is stored in packed ASCII (two characters per register). The string is terminated with the following ASCII characters [EOT]. Table 2-6 shows an example of the name "Test 123 ABC[EOT]".

Table 2-6 Message Name Block

Block Entry	Example Data (hex)	Example (ASCII)
Name[0]	5465	Te
Name[1]	7374	st
Name[2]	2031	1
Name[3]	3233	23
Name[4]	2041	A
Name[5]	4243	BC
Name[6]	5B45	[E
Name[7]	4F54	OT
Name[8]	5D00]

Message Text Block

The Message Name is a block of 1000 words with the print string stored in packed ASCII format. There are several embedded codes that may be used to insert a sequential footage code, do not print, insert date codes, and end of text. Table 2-7 shows the possible embedded codes. Table 2-8 shows the register data for "Test [MMM/DD/YYYY][EOT]" where MMM is the Text Month attribute, DD is the day, and YYYY is the four digit year attribute.

Table 2-7 Embedded Message Codes

Text	Description
[EOT]	End of Text, must be at the end of the print message.
[DNP]	Do Not Print
[SQFTG]	Insert sequential footage code
[MMDDYYYY]	MM = two digit month MMM = text month DD = day of month YYYY = four digit year YY = two digit year JD = julian day of the year WN = week number DOW = day of week

Table 2-8 Message Text Block

Block Entry	Example Data (hex)	Notes
text[0]	5465	Te
text[1]	7374	st
text[2]	205B	[
text[3]	4D4D	MM
text[4]	4D44	MD
text[5]	4459	DY
text[6]	5959	YY
text[7]	595D	Y]
text[8]	5B45	[E
text[9]	4F54	OT
text[10]	5D00]

Serial Number Block

The Serial Number is a block of 2 words that form a long integer read from the PLC by the QUCM. The first word is the high word and the second is the low word. The QUCM will read the Message Name and Serial Number from the PLC and then send the new serial number to the stored Message Name in the printer. Table 2-9 shows an example of the serial number 1234567 (decimal) = x0012D687 (hex).

Table 2-9 Serial Number Block

Block Entry	Example Data (hex)
Serial[0]	0012
Serial[1]	D687

QUCM Status Block

The QUCM Status is a block of 20 words written to the PLC by the QUCM. Table 2-10 shows the definitions of the QUCM Status Block.

Table 2-10 QUCM Status Block

Block Entry	Description	Notes
QUCMstatus[0]	QUCM Status Bitmap	bit 0 = Printer told to print message bit 1 = Message Text sent to printer bit 2 = Serial Number sent to printer bit 3 = Printer Clock Set bit 4 = Product Count Cleared bit 5 = Query Serial Number Finished bit 6 = All messages Off-Line Finished bit 7 = Product Count Finished bit 15 = Printer communicating with QUCM OK
QUCMstatus[1]	Products Detected HI	High word of long value
QUCMstatus[2]	Products Detected LO	Low word of long value
QUCMstatus[3]	Products Printed HI	High word of long value
QUCMstatus[4]	Products Printed LO	Low word of long value
QUCMstatus[5]	Machine Time ON in Hrs HI	High word of long value
QUCMstatus[6]	Machine Time ON in Hrs LO	Low word of long value
QUCMstatus[7]	Jet Time ON in Hrs	High word of long value
QUCMstatus[8]	Jet Time ON in Hrs	Low word of long value
QUCMstatus[9]	Pump Time ON in Hrs	High word of long value
QUCMstatus[10]	Pump Time ON in Hrs	Low word of long value
QUCMstatus[11]	Ink Temperature	
QUCMstatus[12]	Gun Body Temperature	
QUCMstatus[13]	Sensor Bitmap	bit 0 = State of Gutter Sensor bit 1 = State of Cabinet Monitor
QUCMstatus[14]	Ink Level	0=Empty, 1=Low, 2=OK, 3=High
QUCMstatus[15]	Solvent Level	0=Empty, 1=Low, 2=OK, 3=High
QUCMstatus[16]	Print Engine State Bitmap	bit 0 = Fault bit 1 = Standby bit 2 = Ink ON, Jet OFF bit 3 = Jet ON, MOD OFF bit 4 = Jet ON, HV OFF bit 5 = Sequencing ON bit 6 = Sequencing OFF bit 7 = Bleeding Head bit 8 = Resetting Modulation bit 9 = Manual
QUCMstatus[17]	Cabinet Monitor State Bitmap	bit 0 = OK bit 1 = Fault
QUCMstatus[18]	Serial Number from Printer	High word of long value
QUCMstatus[19]	Serial Number from Printer	Low word of long value

The QUCM Domino Printer application supports a simple Web server to aid in testing operations of the system.

Main Page

The main (Home) web page shows the revision of the QUCM application, the serial port configurations, the status of the PLC rack communication, the currently loaded Message Name, Message, Serial Number, and the source of the present message. Additionally, the hexadecimal values of the QUCM's active Name and Message Text are displayed. Links are provided to view the Config Extension Data, Upload a message from the printer, store a message back to the PLC, and Build a message from the ProtocolFileBuilder PC program.

If the message includes non-printable attributes then they are displayed as a link with a roll-over box to show the attribute fields. These links are not yet functional and will return to the home page if clicked.

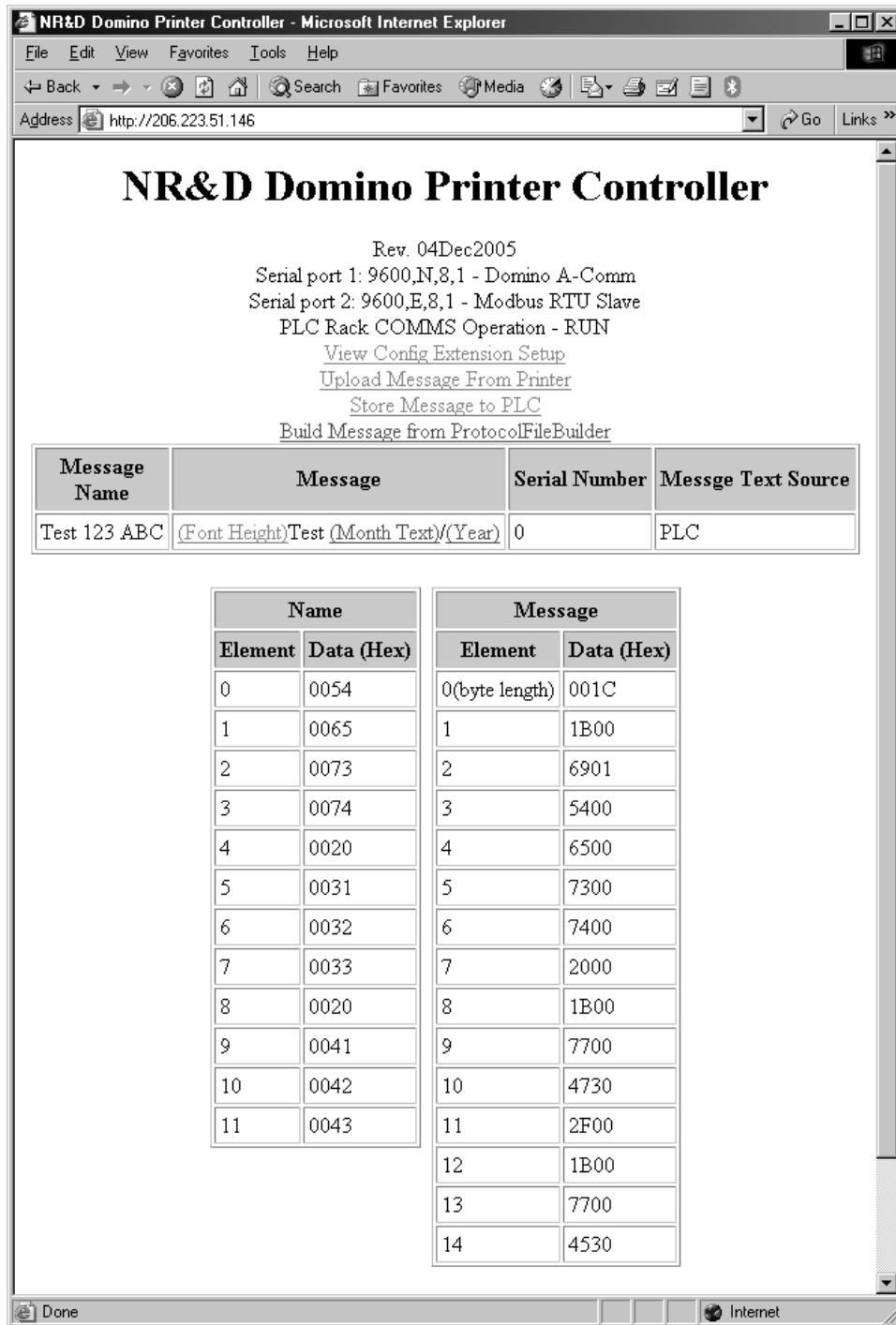


Figure 3-1 QUCM Home Page

Config Extension Page

The Config Extension web page shows the PLC 4x registers used by this application as well as the data that the QUCM reads from or writes to the PLC.

[Home](#)

PLC Register	Value
Command Bitmap	4x00009 0000000000000010 bit 1 = Send Message to Printer.
TOD Clock	4x00101 12/04/2005 23:25:50
Message Name	4x00901 Test 123 ABC
Message Text	4x01001 (Font Height)Test (Month Text)/(Year)
Message Text Source	PLC
Serial Number (from PLC)	4x00951-952 0
QUCM Status Bitmap	4x00010 1000000000000010 bit 1 = Send Message to Printer. bit 15 = Printer communicating with QUCM.
Products Detected Count	4x00011-12 904396800
Products Printed Count	4x00013-14 2080388589
Machine Time (hrs)	4x00015-16 903741440
Jet ON Time (hrs)	4x00017-18 2013279715
Pump ON Time (hrs)	4x00019-20 30720
Ink Temperature	4x00021 33
Gun Body Temperature	4x00022 31
Sensor Bitmap	4x00023 00000001 bit 0 = Gutter Sensor ON.
Ink Level	4x00024 2 (OK)
Solvent Level	4x00025 3 (High)
Print Engine State Bitmap	4x00026 00000001 bit 0 = Fault.
Cabinet Monitor State Bitmap	4x00027 00000010 bit 1 = Fault.
Serial Number (from Printer)	4x00028-29 0

Figure 3-2 Config Extension Web Page

Upload Message from Printer

This page is used to query the printer for a stored message. The message name must be exactly match the stored name in the printer. A successfully queried message will be in the QUCM for display on the web page. It is then possible to load that message (name and text) back into the PLC by clicking the "Store Message to PLC" link.

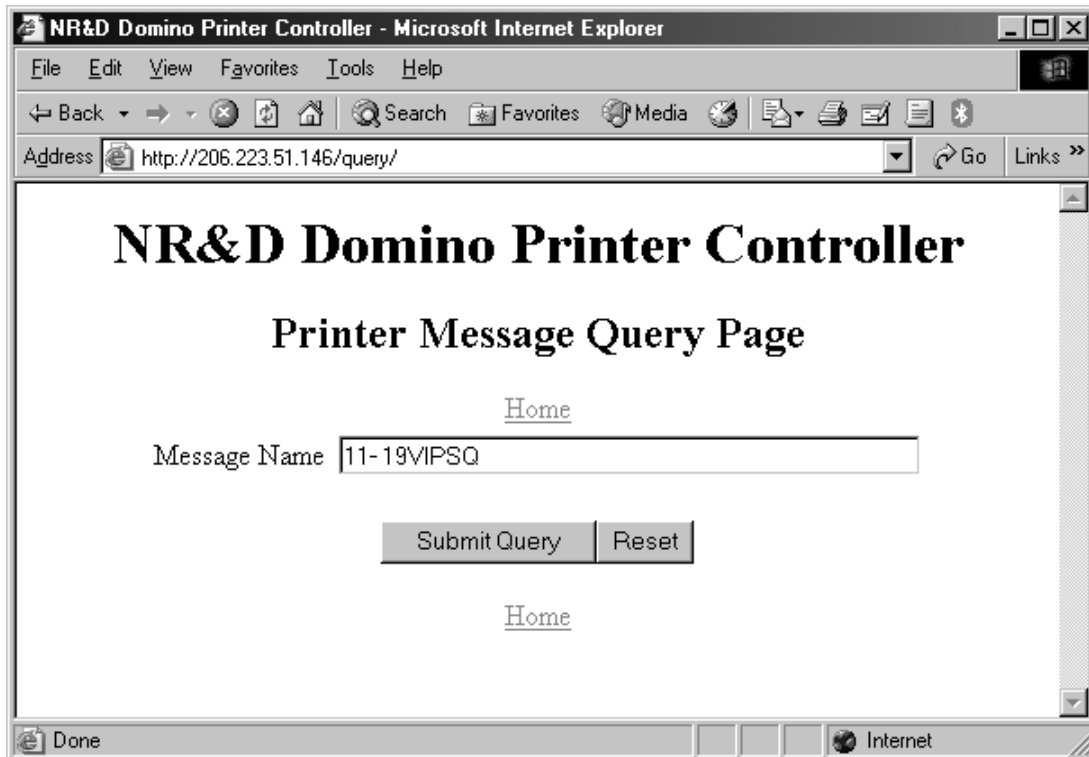


Figure 3-3 Upload Message from Printer Web Page

Build Message

This page is used to build a message in the QUCM and then load it into the PLC message area. The message name is entered as straight text terminated with [EOT]. The message text is also entered as straight text terminated with [EOT]. The QUCM then strips out the print message text. A successfully loaded message will be in the QUCM for display on the web page. It is then possible to load that message (name and text) back into the PLC by clicking the "Store Message to PLC" link.