
CPU Modules

7

At a Glance

Introduction

This chapter provides information on the specifications, LED indicators and description and error codes for the Quantum CPU modules.

The following table shows an overview of the Quantum CPU modules.

CPU	SRAM (bytes)	Ladder	Registers	Extended	984 Ladder Performance	Max IEC Program
140CPU11302	256 k	8 k	10 k	none	0.3 - 1.4 ms/k	109 k
140CPU11303	512 k	16 k	10 k	none	0.3 - 1.4 ms/k	368 k
140CPU21304	768 k	32 k or 48 k	57 k or 28 k *	80 k or 0 k *	0.3 - 1.4 ms/k	606 k
140CPU42402	2 M	64 k	57 k	96 k *	0.1 - 0.5 ms/k	570 k
140CPU43412	2 M	64 K	57 K*	96 k	0.1 - 0.5 ms/k	896 k
140CPU43412A	2 M	64K	57 K*	96 k	0.1 - 0.5 ms/k	896 k
140CPU53414	4 M	64 K	57 K*	96 k	0.9 - 0.45 ms/k	2.5 M
140CPU53414A	4 M	64 K	57 K*	96K	0.1 - 0.5 ms/k	2.5 M

*Refer to the individual specification pages for detailed information.

What's in this Chapter?

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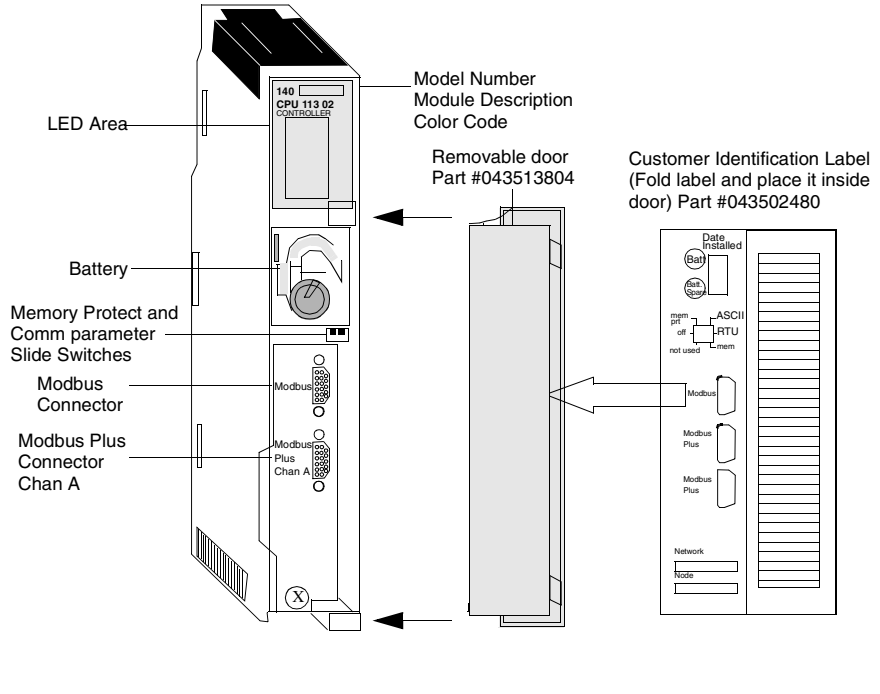
140CPU11302 CPU Module

Overview

The following provides information on the 140CPU11302 Controller module – CPU 256 K, 1xModbus Plus, Max IEC Program 109 K (requires IEC-only Exec.)

CPU Module

The following figure shows the CPU Module and its components.



Specifications

The following table shows the specifications for the 140CPU11302 CONTROLLER module.

Specifications	
984 Ladder Logic	8 k words max
Reference Capacity	
Discrete	8192 In and 8192 Out max
Register	9999 max
Local I/O (Main Backplane)	
Maximum I/O Words	64 In and 64 Out*
Maximum Number of I/O Racks	2 (Requires expander)
Remote I/O	
Maximum I/O Words per Drop	64 In / 64 Out*
Maximum Number of Remote Drops	31
Distributed I/O	
Maximum Number of Networks per System	3**
Maximum Words per Network (For every DIO drop, there is a minimum of two words input of overhead.)	500 In and 500 Out
Maximum Words per Node	30 In and 32 Out
Watchdog Timer	250 ms (S/W adjustable)
Logic Solve Time	0.3 ms / k to 1.4 ms / k
Battery	3 V Lithium
Service Life	1200 mAh
Shelf Life	10 years with 0.5% loss of capacity per year
Battery Load Current @ Power-off	
Typical	5 μ A
Maximum	110 μ A
Communication	
Modbus (RS-232)	1 serial port (9-pin D-shelf)
Modbus Plus (RS-485)	1 network port (9-pin D-shell)
General	

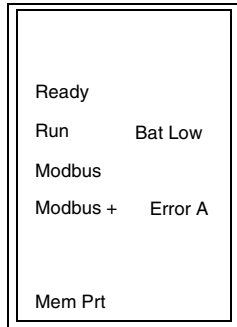
Specifications		
Diagnostics	Power Up	Runtime
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	780 mA	
Power Dissipation	3.9 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Maximum Number of NOM, NOE, and MMS modules (any combination)	2	

* This information can be a mix of Discrete or Register I/O. For each word of register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured – one word of Register I/O must be subtracted from the total available.

**Requires the use of the 140NOM2x00 Option Processor.–

LED Indicators and Descriptions

The following figure shows the CPU LED indicators.



The following table shows the LED descriptions.

LED Descriptions		
LEDs	Color	Indication when On
Ready	Green	The CPU has passed powerup diagnostics.
Run	Green	The CPU has been started and is solving logic. (See the following table for Run LED error codes).
Modbus	Green	Communications are active on the Modbus port.
Modbus +	Green	Communications are active on the Modbus Plus port.
Mem Prt	Amber	Memory is write protected (the memory protect switch is on).
Bat Low	Red	The battery needs replacing.
Error A	Red	Indicates a communications error on the Modbus Plus network.

LED Error Codes The following table show the number of times the Run LED blinks for each type of error, and the crash codes possible for that group (all codes are in hex) for the 140CPU11302 module.

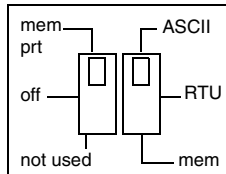
LED Error Codes		
Number of Blinks	Code	Error
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	Code	Error
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
626	bad modbus state tmr0_evt	
627	bad modbus state trn-int	
628	bad modbus state rcv-int	
631	bad interrupt	
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the communication parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available for the CPU11302.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following communication parameters are set and cannot be changed.

ASCII Communication Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following communication parameters are set and cannot be changed.

RTU Communication Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign communication parameters to the port in software; the following parameters are valid.

Valid Communication Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Data Bits	7 / 8	
Stop Bits	1 / 2	
Parity	Enable/Disable Odd/Even	
Device Address	1 ... 247	

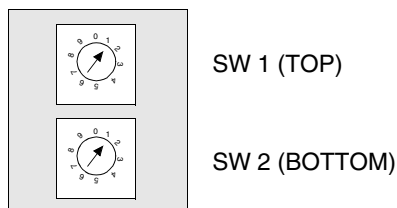
Rear Panel Switches

Two rotary switches are located on the rear panel of the CPU. They are used for setting the Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.

The following figure shows SW1 and SW2.



The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

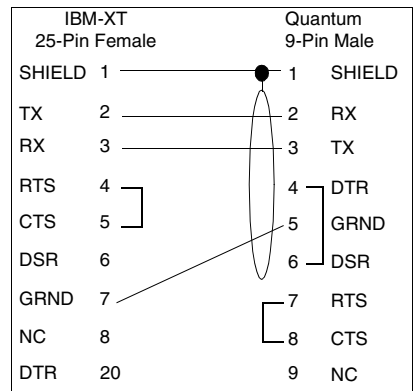
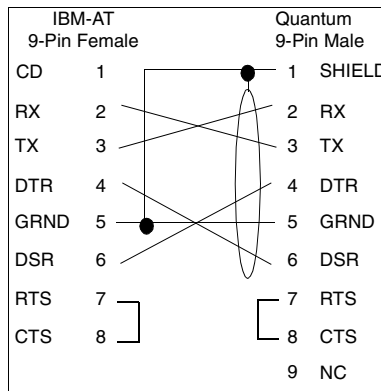
Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA2620 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

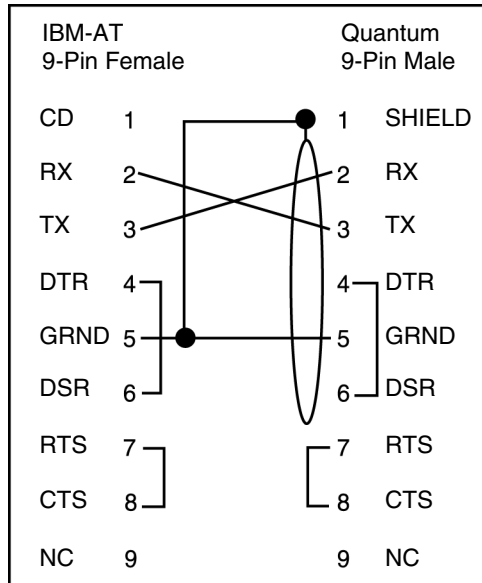
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for nine-pin and 25-pin connections.



Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for nine-pin portable (laptop) computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

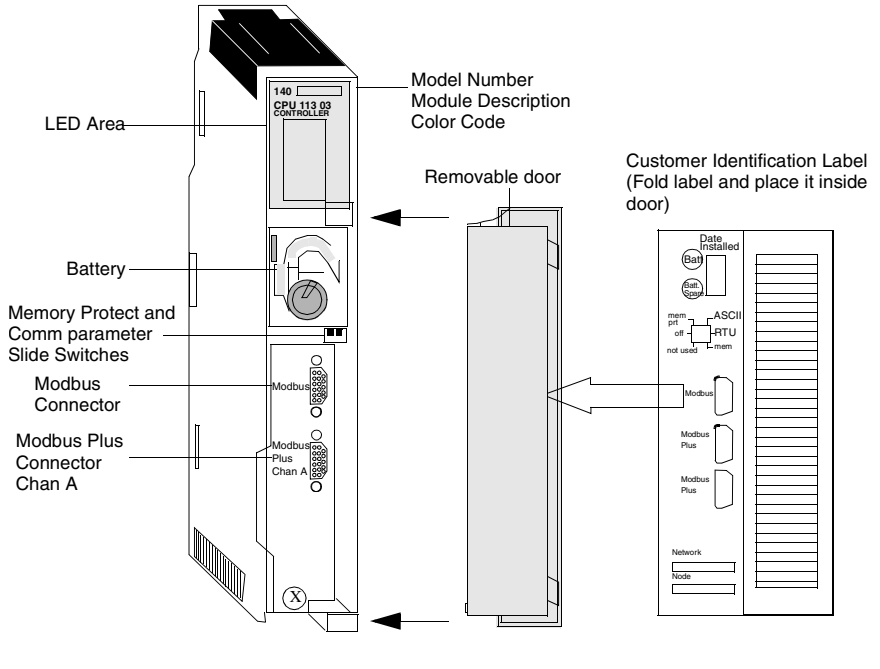
140CPU11303 CPU Module

Overview

The following provides information on the 140CPU11303 Controller module – CPU 512 k, 1xModbus Plus, Max IEC Program 368 K (requires IEC Exec.)

CPU Module

The following figure shows the CPU Module and its components.



Specifications

The following table shows the specifications for the 140CPU11303 CONTROLLER module.

Specifications	
984 Ladder Logic	16 k words max
Reference Capacity	
Discrete	8192 In and 8192 Out max
Register	9999 max
Local I/O (Main Backplane)	
Maximum I/O Words	64 In and 64 Out*
Maximum Number of I/O Racks	2 (Requires expander)
Remote I/O	
Maximum I/O Words per Drop	64 In / 64 Out*
Maximum Number of Remote Drops	31
Distributed I/O	
Maximum Number of Networks per System	3**
Maximum Words per Network (For every DIO drop, there is a minimum of two words input of overhead.)	500 In and 500 Out
Maximum Words per Node	30 In and 32 Out
Watchdog Timer	250 ms (S/W adjustable)
Logic Solve Time	0.3 ms / k to 1.4 ms / k
Battery	
	3 V Lithium
Service Life	1200 mAh
Shelf Life	10 years with 0.5% loss of capacity per year
Battery Load Current @ Power-off	
Typical	7 μ A
Maximum	210 μ A
Communication	
Modbus (RS-232)	1 serial port (9-pin D-shell)
Modbus Plus (RS-485)	1 network port (9-pin D-shell)
General	

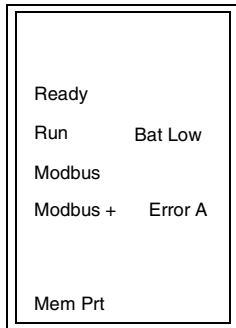
Specifications		
Diagnostics	Power Up	Runtime
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	790 mA	
Power Dissipation	3.95 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Maximum Number of NOM, NOE, and MMS modules (any combination)	2	

* This information can be a mix of Discrete or Register I/O. For each word of register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured - one word of Register I/O must be subtracted from the total available.

**Requires the use of the 140NOM21x00 Option Processor.

LED Indicators and Descriptions

The following figure shows the CPU11303 LED indicators.



The following table shows the CPU11303 LED descriptions.

LED Descriptions		
LEDs	Color	Indication when On
Ready	Green	The CPU has passed powerup diagnostics.
Run	Green	The CPU has been started and is solving logic (see the following table for Run LED error codes).
Modbus	Green	Communications are active on the Modbus port.
Modbus +	Green	Communications are active on the Modbus Plus port.
Mem Prt	Amber	Memory is write protected (the memory protect switch is on).
Bat Low	Red	The battery needs replacing.
Error A	Red	Indicates a communications error on the Modbus Plus network.

LED Error Codes The LED Error Codes table shows the number of times the Run LED blinks for each type of error and the crash codes possible for that group (all codes are in hex). The following table shows the blinking run LED error codes.

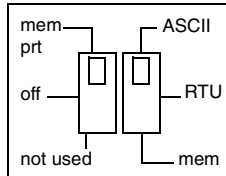
LED Error Codes		
Number of Blinks	Code	Error
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	Code	Error
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
626	bad modbus state tmr0_evt	
627	bad modbus state trn-int	
628	bad modbus state rcv-int	
631	bad interrupt	
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the communication parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following communication parameters are set and cannot be changed. The following table shows the ASCII communication port parameters.

ASCII Communication Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following communication parameters are set and cannot be changed.

RTU Communication Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign communication parameters to the port in software; the following parameters are valid.

Valid Communication Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

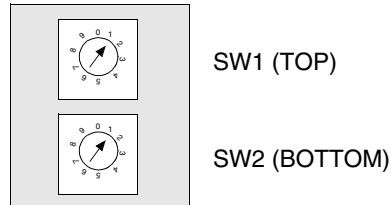
Rear Panel Switches

Two rotary switches (refer to the illustration and table that follow) are located on the rear panel of the CPU. They are used for setting the Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.

The following figure shows SW1 and SW2 switches.



The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

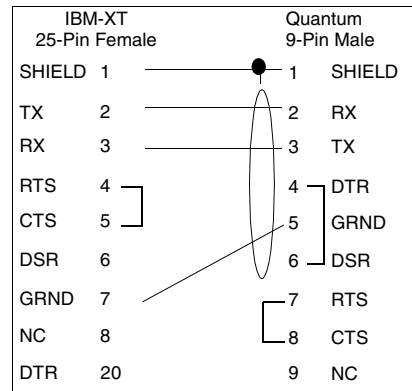
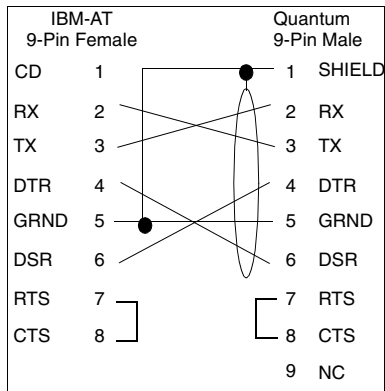
Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

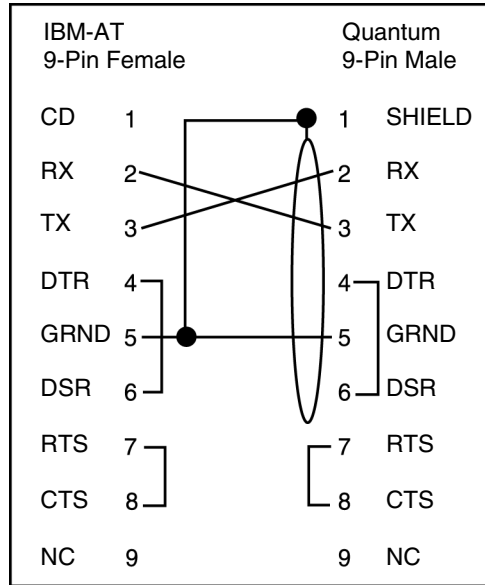
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for nine-pin and 25-pin connections.



**Modbus Ports
Pinout
Connections for
Portable
Computers**

The following figure shows the Modbus port connections for nine-pin portable computer connections.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	N/C: No Connection
DSR: Data Set Ready	CD: Carrier Detect

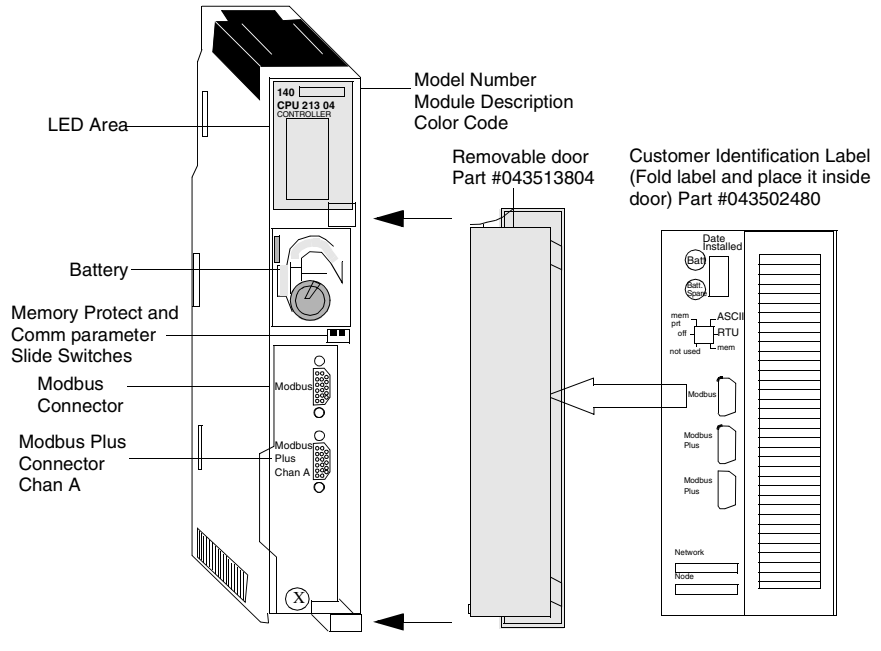
140CPU21304 CPU Module

Overview

The following provides information on the 140CPU21304 Controller module – CPU 768 K, MATH, 1xModbus Plus, Max IEC Program 606 K.

CPU Module

The following figure shows the CPU Module and its parts.



Specifications

The following table shows the specifications for the CPU21304 controller module.

Specifications				
User Logic/Reference Capacity	984 Ladder Logic	Discrete	Register	Extended Register
	32 k words	64 k	57 k	80 k
	48 k words	64 k	28 k	0 k
	57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16			
Discrete	64 k - any mix			
Local I/O (Main Backplane)				
Maximum I/O Words	64 In and 64 Out*			
Maximum Number of I/O Racks	2 (Requires expander)			
Remote I/O				
Maximum I/O Words per Drop	64 In and 64 Out*			
Maximum Number of Remote Drops	31			
Distributed I/O				
Maximum Number of Networks per System	3**			
Maximum Words per Network (For every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out			
Maximum Words per Node	30 In and 32 Out			
Watchdog Timer	250 ms (S/W adjustable)			
Logic Solve Time	0.3 ms / k to 1.4 ms / k			
Battery	3 V Lithium			
Service Life	1200 mAh			
Shelf Life	10 years with 0.5% loss of capacity per year			
Battery Load Current @ Power-off				
Typical	5 μ A			
Maximum	110 μ A			
Communication				
Modbus (RS-232)	1 serial port (9-pin D-shell)			

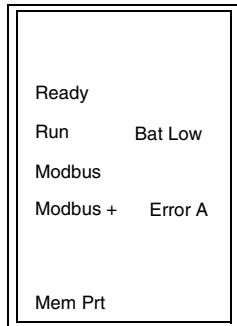
Specifications		
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
General		
Diagnostics	Power Up	Runtime
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	900 mA	
Power Dissipation	4.5 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Maximum Number of NOM, NOE, and MMS modules (any combination)	2	

*This information can be a mix of Discrete or Register I/Os. For each word of Register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured - one word of Register I/O must be subtracted from the total available.

**Requires the use of the 140NOM2x00 Option Processor.

LED Indicators and Descriptions

The following figure shows the CPU LED indicators.



The following table shows the CPU LED descriptions.

LED Descriptions		
LEDs	Color	Indication when On
Ready	Green	The CPU has passed powerup diagnostics.
Run	Green	The CPU has been started and is solving logic (see the following table for Run LED error codes).
Modbus	Green	Communications are active on the Modbus port.
Modbus +	Green	Communications are active on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).
Bat Low	Red	The battery needs replacing.
Error A	Red	Indicates a communications error on the Modbus Plus network.

LED Error Codes The Blinking Run LED Error Codes table shows the number of times the Run LED blinks for each type of error and the crash codes possible for that group (all codes are in hex).

The following table shows the run LED error codes for the 140CPU21304.

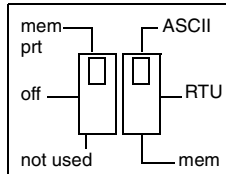
LED Error Codes		
Number of Blinks	Code	Error
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	Code	Error
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
626	bad modbus state tmr0_evt	
627	bad modbus state trn-int	
628	bad modbus state rcv-int	
631	bad interrupt	
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the communication parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following communication parameters are set and cannot be changed

ASCII Communication Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following communication parameters are set and cannot be changed.

RTU Communication Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign communication parameters to the port in software; the following parameters are valid.

Valid Communication Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

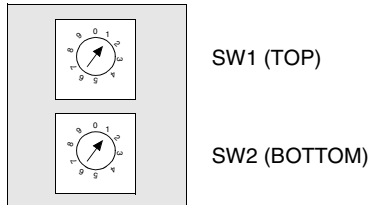
Rear Panel Switches

Two rotary switches (refer to the illustration and table below) are located on the rear panel of the CPU. They are used for setting Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.

The following figure shows SW1 and SW2.



The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

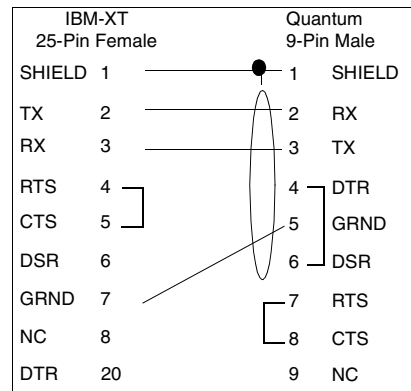
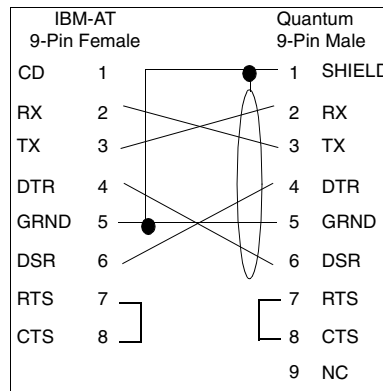
Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

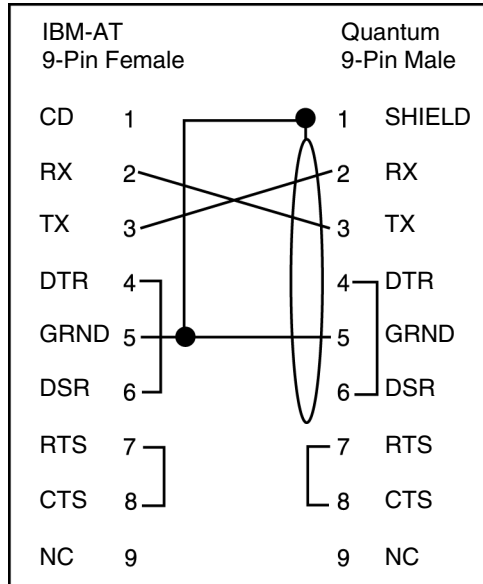
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for nine-pin and 25-pin connections.



**Modbus Ports
Pinout
Connections for
Portable
Computers**

The following figure shows the Modbus port pinout connections for nine-pin portable computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

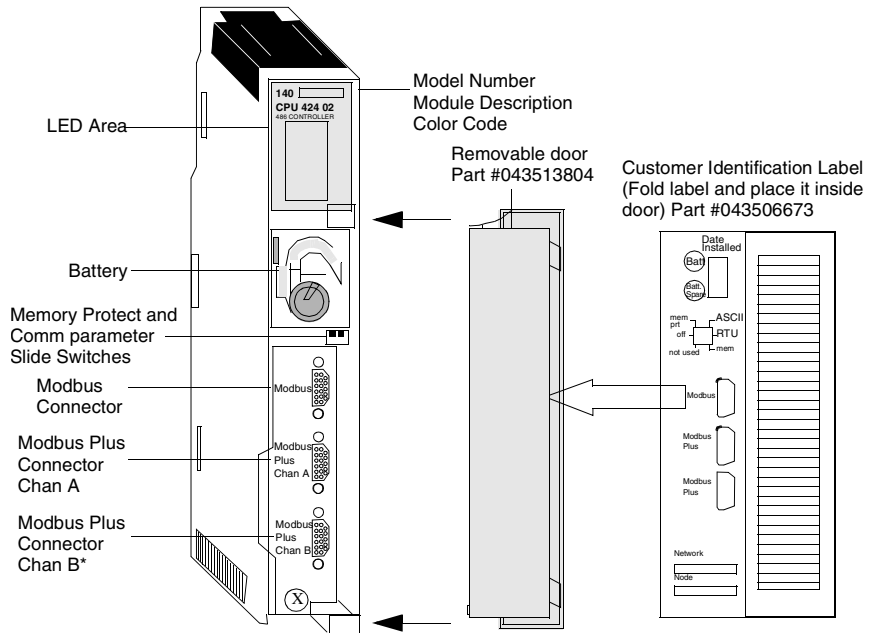
140CPU42402 CPU Module

Overview

The following provides information on the 140CPU42402 Controller module – CPU 2 M, MATH, 2xModbus Plus, Max IEC Program 570 K.

CPU Module

The following figure shows the CPU module and its components.



Specifications

The following table shows the specifications for the 140CPU42402 CONTROLLER module.

Specifications				
User Logic/Reference Capacity	984 Ladder Logic	Discrete	Register	Extended Register
	64 k words	64 k	57 k	96 k
57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16				
Reference Capacity				
Discrete	64 k - any mix			
Local I/O (Main Backplane)				
Maximum I/O Words	64 In and 64 Out*			
Maximum Number of I/O Racks	2 (Requires expander)			
Remote I/O				
Maximum I/O Words per Drop	64 In and 64 Out*			
Maximum Number of Remote Drops	31			
Distributed I/O				
Maximum Number of Networks per System	3**			
Maximum Words per Network (For every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out			
Maximum Words per Node	30 In and 32 Out			
Watchdog Timer	250 ms (S/W adjustable)			
Logic Solve Time	0.1 ms / k to 0.5 ms / k			
Battery	3 V Lithium			
Service Life	1200 mAh			
Shelf Life	10 years with 0.5% loss of capacity per year			
Battery Load Current @ Power-off				
Typical	7 μ A			
Maximum	210 μ A			
Communication				

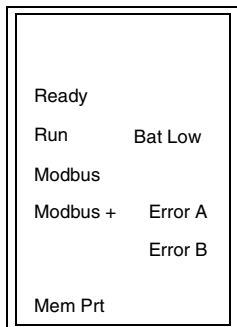
Specifications		
Modbus (RS-232)	1 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	2 (redundant) network ports (9-pin D-shell)	
General		
Diagnostics	Power Up	Runtime
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	1.8 A	
Power dissipation	9 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60 °C	
Maximum Number of NOM, NOE, and MMS modules (any combination)	6	

*This information can be a mix of Discrete or Register I/Os. For each word of Register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured-one word of Register I/O must be subtracted from the total available.

**Requires the use of the 140NOM2x00 Option Modules.

LED Indicators and Descriptions

The following figure shows the CPU LED indicators.



The following table shows the CPU LED descriptions.

LED Descriptiosn		
LEDs	Color	Indication when On
Ready	Green	The CPU has passed powerup diagnostics.
Run	Green	The CPU has been started and is solving logic (see the following table for Run LED error codes).
Modbus	Green	Communications are active on the Modbus port.
Modbus +	Green	Communications are active on the Modbus Plus port.
Mem Prt	Amber	Memory is write protected (the memory protect switch is on).
Bat Low	Red	The battery needs replacing.
Error A	Red	Indicates a communications error on the redundant Modbus Plus port A (140CPU42402 only).
Error B	Red	Indicates a communications error on the redundant Modbus Plus port B (140CPU42402 only).

LED Error Codes The following table shows the run LED error codes for the CPU42402.

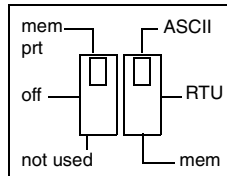
LED Error Codes		
Number of Blinks	Code	Error
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	Code	Error
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
626	bad modbus state tmr0_evt	
627	bad modbus state trn-int	
628	bad modbus state rcv-int	
631	bad interrupt	
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the comm parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available for the CPU42402 module.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following comm parameters are set and cannot be changed.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following comm parameters are set and cannot be changed.

RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign comm parameters to the port in software; the following parameters are valid.

Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

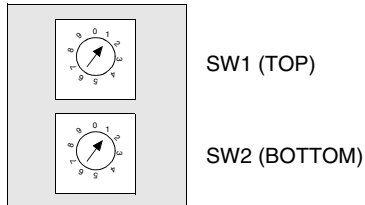
Rear Panel Switches

Two rotary switches (refer to the following illustration) are located on the rear panel of the CPU. They are used for setting Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.

The following figure shows SW1 and SW2.



The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

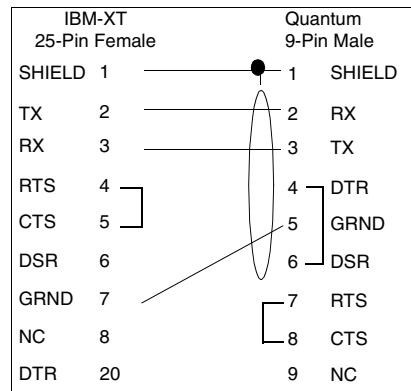
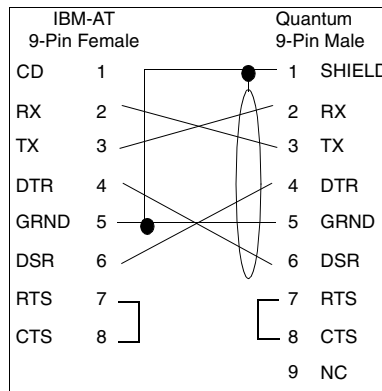
Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

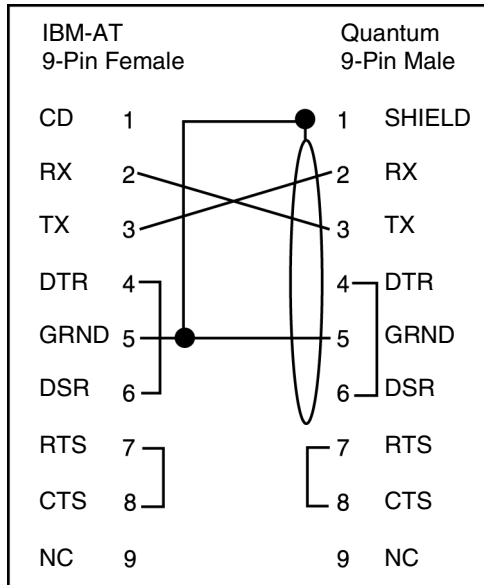
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for nine-pin and 25-pin connections.



**Modbus Ports
Pinout
Connections for
Portable
Computers**

The following figure shows the Modbus port pinout connections for nine-pin portable computers



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

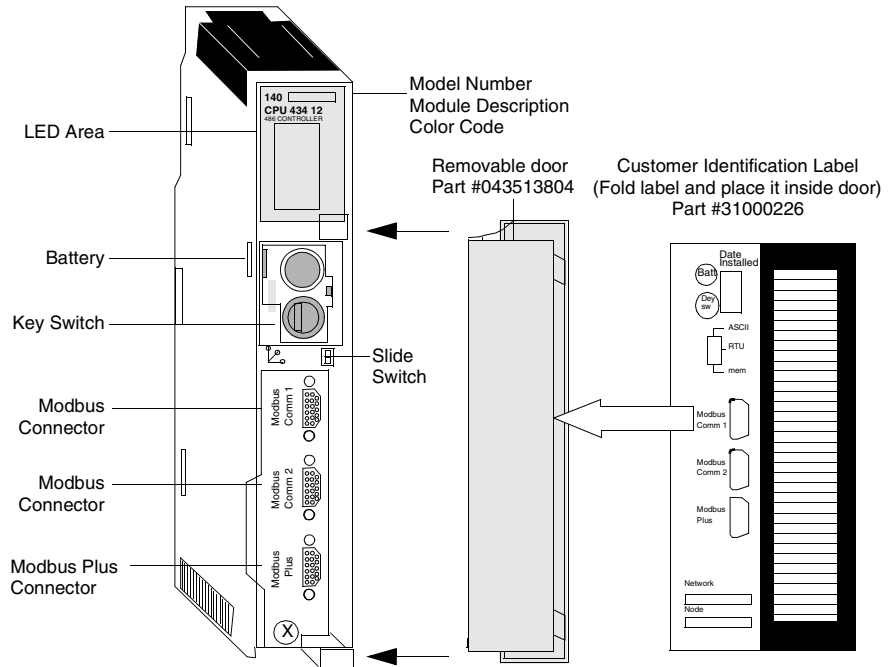
140CPU43412 CPU Module

Overview

The following provides information on the 140CPU43412 Controller module – CPU 2M, 1xModbus Plus, Max IEC Program – 896 k.

CPU Module

The following figure shows the CPU Module and its components.



Specifications

The following table shows the specifications for the CPU43412 CONTROLLER module.

Specifications				
User Logic/Reference Capacity	984 Ladder Logic	Discrete	Register	Extended Register
	64 k words	64 k	57 k	96 k
	57,766 4XX registers max Only if: 0XXX = 16 1XXX = 16 and 3XXX = 16			
Reference Capacity				
Discrete	64 k - any mix			
Local I/O (Main Backplane)				
Maximum I/O Words	64 In and 64 Out*			
Maximum Number of I/O Racks	2 (Requires expander)			
Remote I/O				
Maximum I/O Words per Drop	64 In and 64 Out*			
Maximum Number of Remote Drops	31			
Distributed I/O				
Maximum Number of Networks per System	3**			
Maximum Words per Network (for every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out			
Maximum Words per Node	30 In and 32 Out			
Maximum Number of Option Module Interfaces	Supports up to six network modules (i.e., Modbus Plus, Ethernet and Multi-Axis Motion option modules) using the option module interface technique (see <i>Quantum Network Interface Techniques, p. 45</i>). Note: Only two Modbus Plus modules can have full functionality, including Quantum DIO support.			
Watchdog Timer	250 ms (S/W adjustable)			
Logic Solve Time	0.1 ms / k to 0.5 ms / k			
Battery	3 V Lithium			
Service Life	1200 mAh			
Shelf Life	10 years with 0.5% loss of capacity per year			

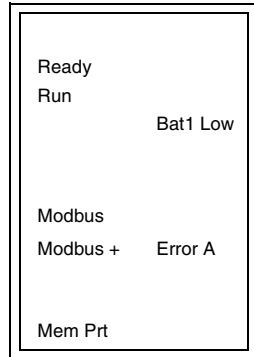
Specifications		
Battery Load Current at Power-off		
Typical	7 μ A	
Maximum	210 μ A	
Communication		
Modbus (RS-232)	2 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
General		
Diagnostics	Power Up	Runtime
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	1.8 A	
Power Dissipation	9W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Operating Temperature	0 ... 60° C	

*This information can be a mix of Discrete or Register I/Os. For each word of register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured – one word of Register I/O must be subtracted from the total available.

**Requires the use of two 140NOM21x00 Option Modules.

**LED Indicators
and Descriptions**

The following figure shows the LED indicators.



The following table shows the LED descriptions.

LEDS	Color	Indication when On
Ready	Green	The CPU has passed power-up diagnostics.
Run	Green	The CPU has been started and is solving logic.
Bat Low	Red	The battery needs replacing or is not present.
Modbus	Green	Communications are active on the Modbus port 1 or 2.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Indicates communications error on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).

LED Error Codes The following table shows the run LED error codes for the 140CPU43412.

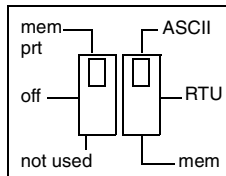
LED Error Codes		
Number of Blinks	Code	Error
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	Code	Error
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
626	bad modbus state tmr0_evt	
627	bad modbus state trn-int	
628	bad modbus state rcv-int	
631	bad interrupt	
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the comm parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available for the 140CPU43412 module.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following comm parameters are set and cannot be changed.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following comm parameters are set and cannot be changed.

RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign comm parameters to the port in software; the following parameters are valid.

Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

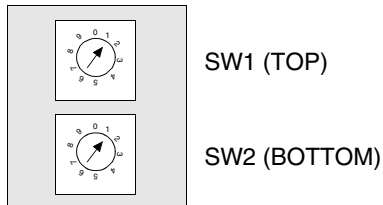
Rear Panel Switches

Two rotary switches (see the following illustration and table) are located on the rear panel of the CPU. They are used for setting Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.

The following figure shows SW1 and SW2.



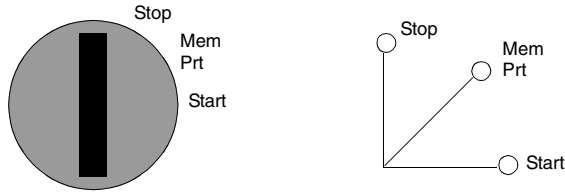
Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Key Switch

The key switch is used to protect memory from programming changes while the controller is in operation. The following figure shows the key switch.



Note: The key switch positions shown next to the switch (above) are for reference only and are marked on the module as indicated on the right.

The following table shows the key switch information.

Key Switch Description				
Key switch Position	Controller Status	Memory Protected From Programmer Changes	Will Accept Programmer Stop or Start	Key switch Transition
Stop	Controller is stopped and disables Programmer changes.	Y	N	From Start or Memory Protect: Stops controller, if running, and disables Programmer changes
Mem Prt	Controller may be either stopped or running and Programmer changes are disabled. User cannot write to unlocated variables.	Y	N	From Stop or Start: Prevents Programmer changes, controller run status is not changed

Key Switch Description				
Key switch Position	Controller Status	Memory Protected From Programmer Changes	Will Accept Programmer Stop or Start	Key switch Transition
Start	Controller may be either stopped or running. Programmer may make changes and start/stop the controller	N	Y	From Stop: Enables Programmer changes, starts controller. From Memory Protect: Enables programmer changes, starts controller if stopped.

Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that support Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

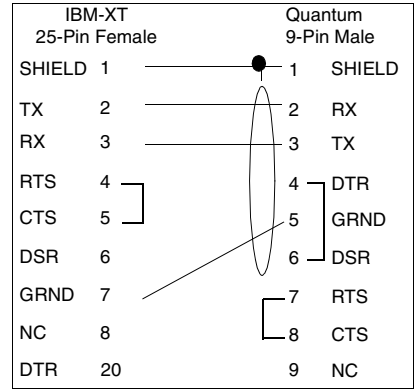
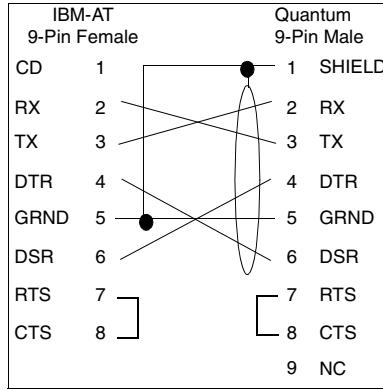
Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

Modbus Port Modem Support

Modbus Port 1 has full modem interfacing ability. Modbus Port 2 RTS/CTS connections function properly for normal non-modem communications but do not support modems.

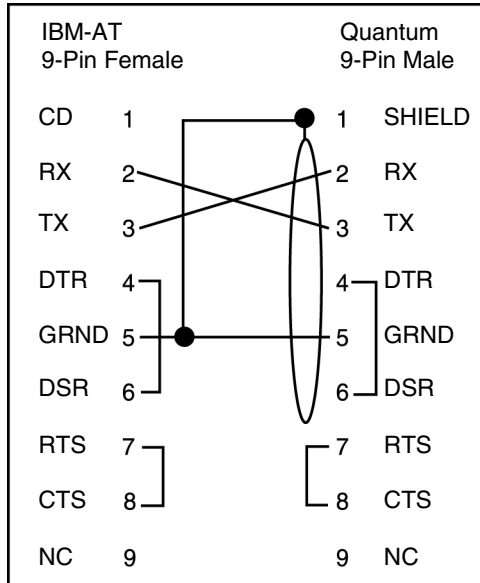
**Modbus Ports
Pinout
Connections**

The following figure shows the Modbus port pinout connections for 9-pin and 25-pin connections.



**Modbus Ports
Pinout
Connections for
Portable
Computers**

The following figure shows the Modbus port pinout connections for 9-pin portable computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

140CPU43412A CPU Module

Overview

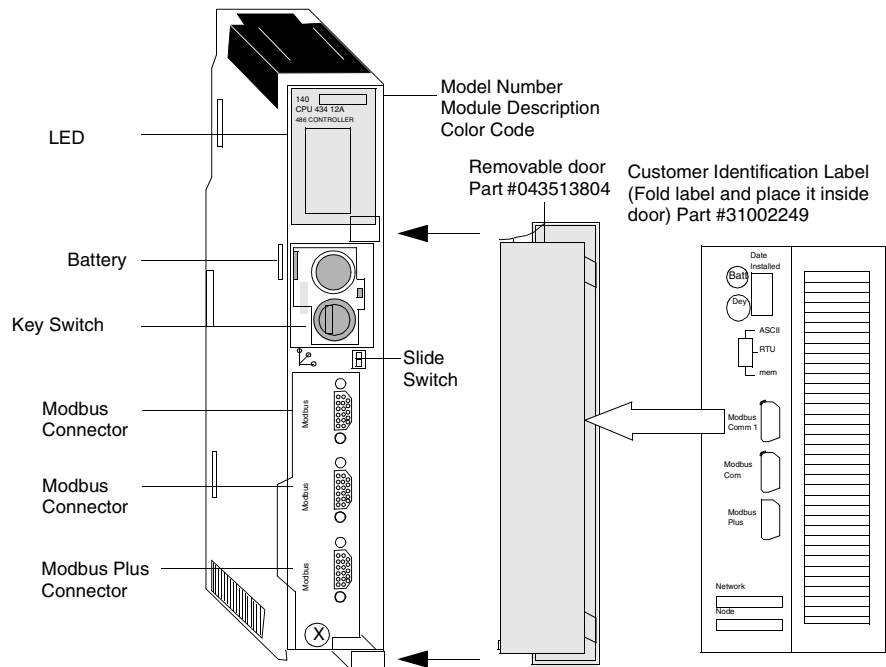
The following provides information on the specifications, LED indicators and description and error codes for the 140CPU43412A Controller Module.

This module is functionally identical to the non-"A" version, however, the following should be considered:

- If you are using the module in a Hot Standby topology, then you **must** use either two non-"A" models or two "A" models.
- The "A" version requires a new flash executive.
- The "A" version and non-"A" flash executives are **not** interchangeable.
- Schneider Automation software (Concept, ProWORX, and Modsoft) supports the "A" version. Any existing or new 140CPU43412 program configuration will load into a 140CPU43412A without any modifications.

CPU Module

The following figure shows the CPU Module and its components.



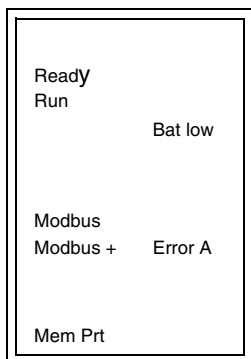
Specifications The following table shows the specifications for the CPU43412A Controller module.

Specifications					
User Logic/Reference Capacity	984 Ladder Logic	Discrete	Register	Extended Register	IEC Application
	64 k words	64 k	57 k	96 k	896 k
	57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16				
Reference Capacity					
Discrete	64 k - any mix				
Local I/O					
Maximum I/O Words	64 In and 64 Out*				
Maximum Number of I/O Racks	2 (Requires Expander)				
Remote I/O					
Maximum I/O Words per Drop	64 In and 64 Out*				
Maximum Number of Remote Drops	31				
Distributed I/O					
Maximum Number of Networks per System	3**				
Maximum Words per Network (for every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out				
Maximum Words per Node	30 In and 32 Out				
*This information can be a mix of Discrete or Register I/O. For each word of register I/O configured, one word must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured- -one word must be subtracted from the total available.					
**Requires the use of two 140NOM21X00 Option Modules.					
Maximum Number of Network Module Interfaces	6				
Watchdog Timer	250 ms (S/W adjustable)				
Logic Solve Time	0.1 ms / k to 0.5 ms / k				
Battery					
Type	3 V Lithium				
Service Life	1200 mAh				
Shelf Life	10 years with 0.5% loss of capacity per year				
Battery Load Current at Power-off					

Specifications		
Typical	7 μ A	
Maximum	210 μ A	
Communication		
Modbus (RS-232)	2 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
Programming Software Capability	Modsoft Version 2.6 minimum Concept version 2.1 with B2.1 patch Concept 2.2 with SR2 ProWORX Nxt version 2.0, minimum ProWORX Plus version 1.05, minimum ProWORX 32 version 1.0, minimum	
General		
Diagnostics	Power Up	Runtime
	RAM RAM Address Executive Checksum User Logic Check Processor	RAM RAM Address Executive Checksum User Logic Check
Bus Current Required	1.25 A	
Power Dissipation	6.25 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Operating Temperature	0 ... 60° C	

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED error codes for the 140CPU43412A module.

LEDS	Color	Indication when On
Ready	Green	The CPU has passed power-up diagnostics.
Run	Green	The CPU has been started and is solving logic.
Bat Low	Red	The battery needs replacing or is not present.
Modbus	Green	Communications are active on the Modbus port 1 or 2.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Indicates communications error on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).

LED Error Codes The following table shows the run LED error codes for the 140CPU43412A.

LED Error Codes		
Number of Blinks	Code	Error
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	Code	Error
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
626	bad modbus state tmr0_evt	
627	bad modbus state trn-int	
628	bad modbus state rcv-int	
631	bad interrupt	
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

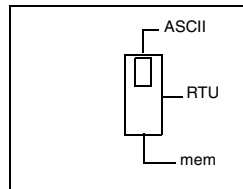
Note: Information in the Code column is visible only with the Flash download utility.

Front Panel Switch

The slide switch is used to select the comm parameter settings for the Modbus (RS232) ports. Three options are available:

1. Setting the switch to the top position assigns ASCII functionality to the port.
2. Setting the switch to the middle position assigns remote terminal unit (RTU) functionality to the port.
3. Setting the switch to the bottom position lets you assign comm parameters to the port in software.

The figure shows the three options that are available on the front panel slide switch.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

The following table shows the ASCII comm port parameters.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

The following table shows the RTU comm port parameters. The comm parameters are set and cannot be changed.

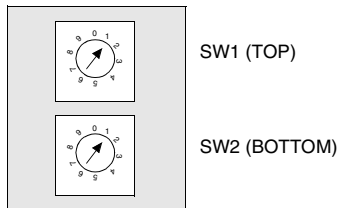
RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

The following table shows the valid comm port parameters.

Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

Rear Panel Switches

The following figure shows the SW1 and SW2 settings.



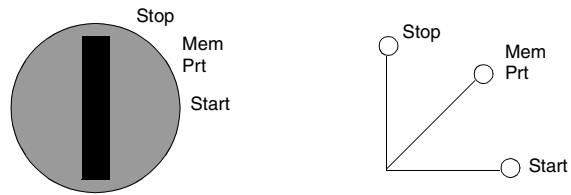
SW1 sets the upper digit (tens) of the address. SW2 sets the lower digit (ones) of the address. The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

Key Switch

The key switch protects memory from programming changes while the controller is in operation. The following figure shows the key switch.



Note: The key switch positions shown next to the switch (above) are for reference only and are marked on the module as indicated on the right.

Key Switch Description

The following table shows the key switch information.

Key Switch Description				
Key switch Position	Controller Status	Memory Protected From Programmer Changes	Will Accept Programmer Stop or Start	Key switch Transition
Stop	Controller is stopped and disables Programmer changes.	Y	N	From Start or Memory Protect: Stops controller, if running, and disables Programmer changes
Mem Prt	Controller may be either stopped or running and Programmer changes are disabled. User cannot write to unlocated variables.	Y	N	From Stop or Start: Prevents Programmer changes, controller run status is not changed
Start	Controller may be either stopped or running. Programmer may make changes and start/stop the controller.	N	Y	From Stop: Enables Programmer changes, starts controller. From Memory Protect: Enables programmer changes, starts controller if stopped.

Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that support Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

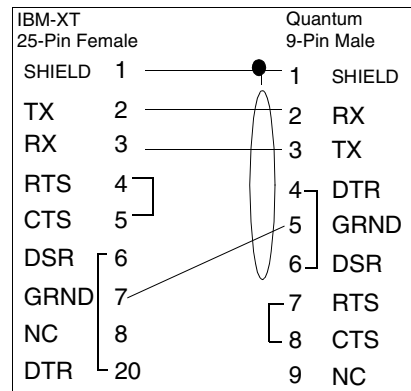
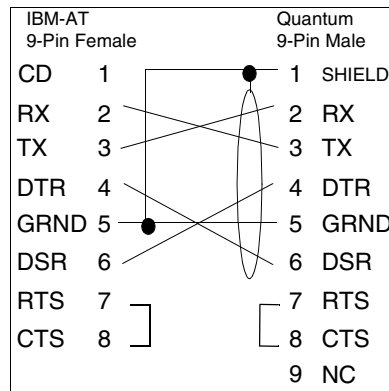
Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

Modbus Port Modem Support

Modbus Port 1 has full modem interfacing ability. Modbus Port 2 RTS/CTS connections function properly for normal non-modem communications but do not support modems.

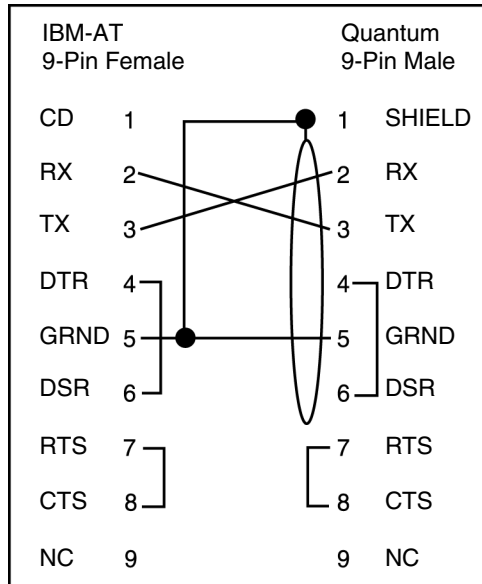
Modbus Ports Pinout Connections Figure

The following figure shows the Modbus port pinout connections for 9-pin and 25-pin connections.



Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for portable (laptop) computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

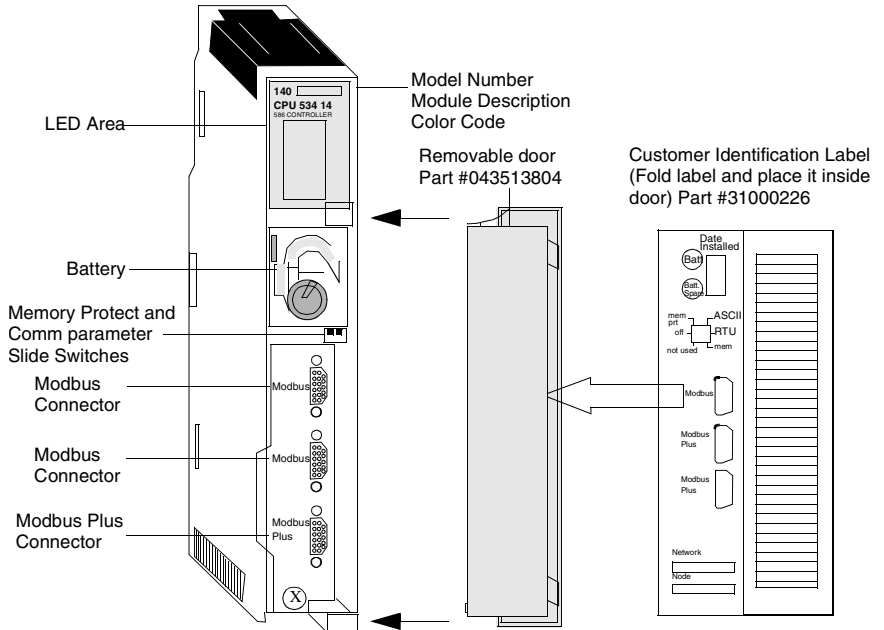
140CPU53414 CPU Module

Overview

The following provides information on the 140CPU53414 Controller module – CPU 4M, 1xModbus Plus, Max IEC Program – 2.5 M.

CPU Module

The following figure shows the CPU Module and its components.



Specifications

The following table shows the specification for the 140CPU53414 CONTROLLER module.

Specifications				
User Logic/Reference Capacity	984 Ladder Logic	Discrete	Register	Extended Register
	64 k words	64 k	57 k	96 k
57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16				
Reference Capacity				
Discrete	64 k - any mix			
Local I/O (Main Backplane)				
Maximum I/O Words	64 In and 64 Out*			
Maximum Number of I/O Racks	2 (Requires Expander)			
Remote I/O				
Maximum I/O Words per Drop	64 In and 64 Out*			
Maximum Number of Remote Drops	31			
Distributed I/O				
Maximum Number of Networks per System	3**			
Maximum Words per Network. (For every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out			
Maximum Words per Node	30 In and 32 Out			
Maximum Number of Option Module Interfaces	Supports up to six network modules (i.e., Modbus Plus, Ethernet and Multi-Axis Motion option modules) using the option module interface technique. Note: Only two Modbus Plus modules can have full functionality, including Quantum DIO support.			
Watchdog Timer	250 ms (S/W adjustable)			
Logic Solve Time	0.09 ms / k to 0.45 ms / k			
Battery	3 V Lithium			
Service Life	1200 mAh			
Shelf Life	10 years with 0.5% loss of capacity per year			
Battery Load Current @ Power-off				
Typical	14 μ A			

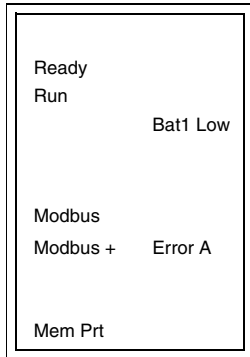
Specifications		
Maximum	420 μ A	
Communication		
Modbus (RS-232)	2 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
General		
Diagnostics	Power Up	Runtime
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	1.8 A	
Power dissipation	9 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60 °C	
Operating Temperature	0 ... 45 °C	

*This information can be a mix of Discrete or Register I/Os. For each word of Register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured – one word of Register I/O must be subtracted from the total available.

**Requires the use of two 140NOM21x00 Option Modules.

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED descriptions.

LED Descriptions		
LEDS	Color	Indication when On
Ready	Green	The CPU has passed power-up diagnostics.
Run	Green	The CPU has been started and is solving logic.
Bat Low	Red	The battery needs replacing or is not present.
Modbus	Green	Communications are active on the Modbus port 1 or 2.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Indicates communications error on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).

LED Error Codes The following table shows the run LED error codes for the 140CPU53414 module.

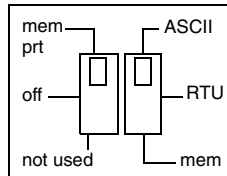
LED Error Codes		
Number of Blinks	Code	Error
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	Code	Error
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
626	bad modbus state tmr0_evt	
627	bad modbus state trn-int	
628	bad modbus state rcv-int	
631	bad interrupt	
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the communication parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available for the 140CPU53414 module.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following communication parameters are set and cannot be changed.

ASCII Communication Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following communication parameters are set and cannot be changed.

RTU Communication Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign communication parameters to the port in software; the following parameters are valid.

Valid Communication Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

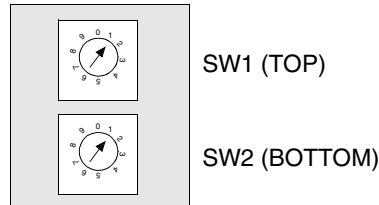
Rear Panel Switches

Two rotary switches (refer to the illustration and table below) are located on the rear panel of the CPU. They are used for setting Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.

The following figure shows SW1 and SW2.



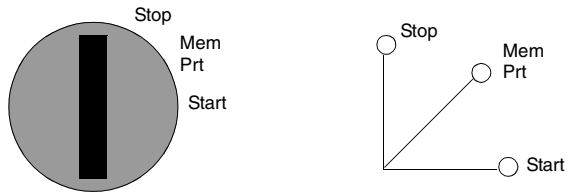
The following table shows the SW1 and SW2 address settings.

Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

Key Switch

The key switch is used to protect memory from programming changes while the controller is in operation. The following figure shows the key switch.



Note: The key switch positions shown next to the switch (above) are for reference only and are marked on the module as indicated on the right.

Key Switch Description

The following table provides descriptions of the key switch information.

Key Swich Description				
Key switch Position	Controller Status	Memory Protected From Programmer Changes	Will Accept Programmer Stop or Start	Key switch Transition
Stop	Controller is stopped and disables Programmer changes.	Y	N	From Start or Memory Protect: Stops controller, if running, and disables Programmer changes
Mem Prt	Controller may be either stopped or running and Programmer changes are disabled. The user cannot write to unlocated variables.	Y	N	From Stop or Start: Prevents Programmer changes, controller run status is not changed
Start	Controller may be either stopped or running. Programmer may make changes and start/stop the controller	N	Y	From Stop: Enables Programmer changes, starts controller. From Memory Protect: Enables programmer changes, starts controller if stopped.

Modbus Port Modem Support

Modbus Port 1 has full modem interfacing ability. Modbus Port 2 RTS/CTS connections function properly for normal non-modem communications but do not support modems.

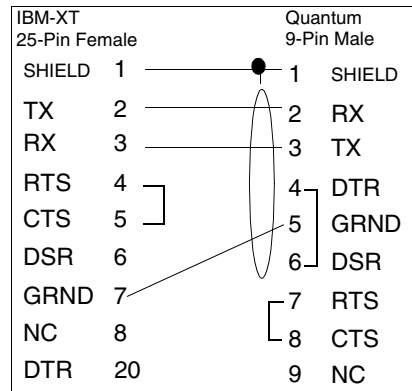
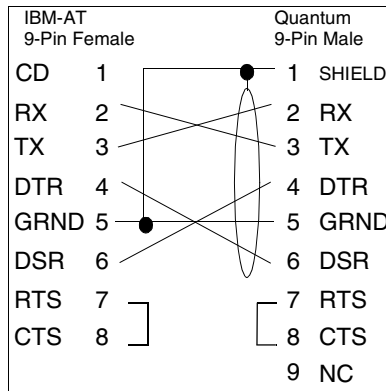
Modbus Connector Pinouts

All Quantum CPUs are equipped with a 9-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for 9-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

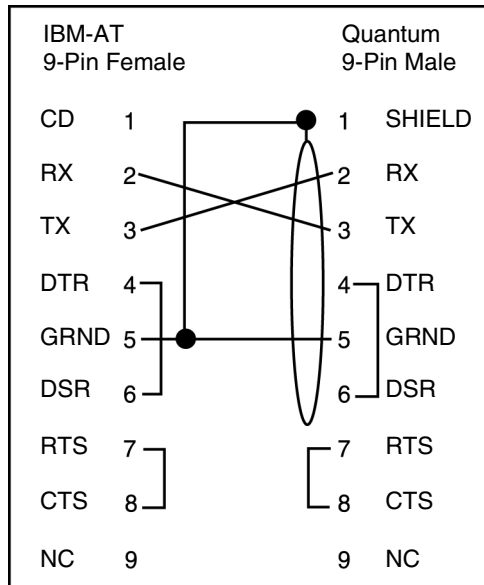
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for 9-pin and 25-pin connections.



Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for 9-pin portable (laptop) computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

140CPU53414A CPU Module

Overview

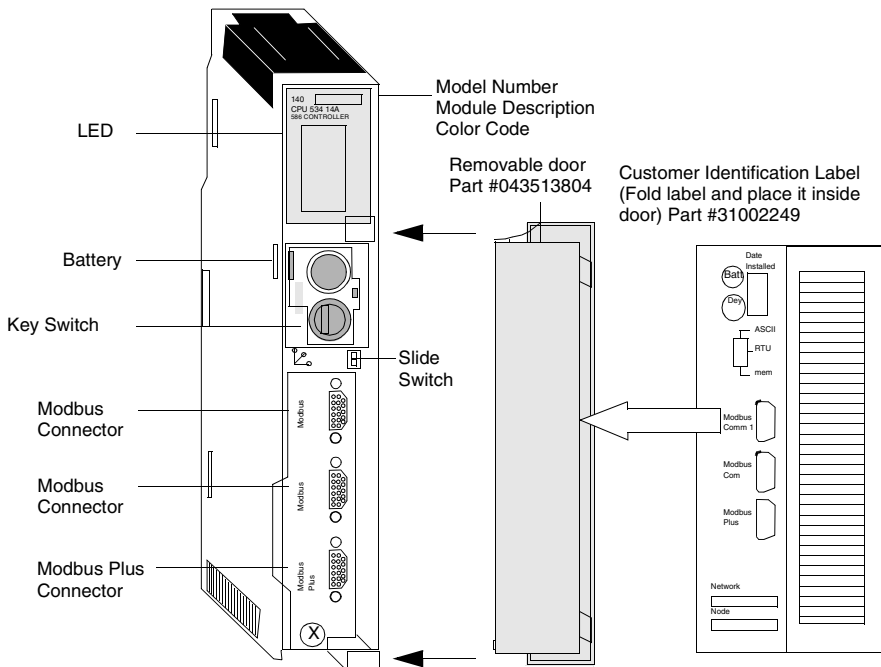
This map provides information on the specifications, LED indicators and description and error codes for the 140CPU53414A Controller Module.

This module is functionally identical to the non-"A" version, however, the following should be considered:

- If you are using the module in a hot standby topology, then you **must** use either two non-"A" models or two "A" models.
- The "A" version requires a new flash executive.
- The "A" version and non-"A" flash executives are **not** interchangeable.
- Schneider Automation software (Concept, ProWORX, and Modsoft) supports the "A" version. Any existing or new 140CPU53414 program configuration will load into a 140CPU53414A without any modifications.

CPU Module

The following figure shows the CPU Module and its components.



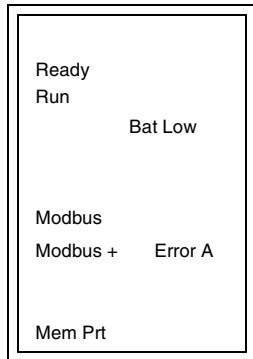
Specifications The following table shows the specifications for the CPU53414A Controller module.

Specifications					
User Logic/Reference Capacity	984 Ladder Logic	Discrete	Register	Extended Register	IEC Application Memory
	64 k words	64 k	57 k	96 k	2.5M
	57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16				
Reference Capacity					
Discrete	64 k - any mix				
Local I/O)					
Maximum I/O Words	64 In and 64 Out*				
Maximum Number of I/O Racks	2 (Requires Expander)				
Remote I/O					
Maximum I/O Words per Drop	64 In and 64 Out*				
Maximum Number of Remote Drops	31				
Distributed I/O					
Maximum Number of Networks per System	3**				
Maximum Words per Network (for every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out				
Maximum Words per Node	30 In and 32 Out				
*This information can be a mix if Discrete or Register I/O. For each word of register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured---one word Register I/O must be subtracted from the total available.					
**Requires the use of two 140NOM21X00 Option Modules.					
Maximum Number of Network Option Module Interfaces	Supports up to six network modules (i.e., Modbus Plus, Ethernet and Multi-Axis Motion option modules) using the option module interface technique (see <i>Quantum Network Interface Techniques</i> , p. 45). Note: Only two Modbus Plus modules can have full functionality, including Quantum DIO support.				
Watchdog timer	250 ms (S/W adjustable)				
Logic Solve Time	0.1 ms / k to 0.5 ms / k				
Battery					
Type	3 V Lithium				

Specifications		
Service Life	1200 mAh	
Shelf Life	10 years with 0.5% loss of capacity per year	
Battery Load Current at Power-off		
Typical	14 μ A	
Maximum	420 μ A	
Communication		
Modbus (RS-232)	2 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
Programming Software Capability	Modsoft Version 2.6 Concept version 2.1 with B2.1 patch exec Concept 2.2 with SR2 ProWorx Nxt version 2.0 ProWorx Plus version 1.05	
General		
Diagnostics	Power Up	Runtime
	RAM RAM Address Executive Checksum User Logic Check Processor	RAM RAM Address Executive Checksum User Logic Check
Bus Current Required	1.25 A	
Power dissipation	6.25 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Operating Temperature	0 ... 50° C	

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED error codes for the 140CPU53414A module.

LED Descriptions		
LEDS	Color	Indication when On
Ready	Green	The CPU has passed power-up diagnostics.
Run	Green	The CPU has been started and is solving logic.
Bat Low	Red	The battery needs replacing or is not present.
Modbus	Green	Communications are active on the Modbus port 1 or 2.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Indicates communications error on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).

LED Error Codes The following table shows the run LED error codes for the 140CPU53414A.

LED Error Codes		
Number of Blinks	Code	Error
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	Code	Error
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
626	bad modbus state tmr0_evt	
627	bad modbus state trn-int	
628	bad modbus state rcv-int	
631	bad interrupt	
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

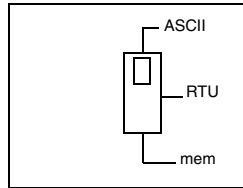
Note: Information in the Code column is visible only with the Flash download utility.

Front Panel Switch

The slide switch is used to select the comm parameter settings for the Modbus (RS232) ports. Three options are available.

1. Setting the switch to the top position assigns ASCII functionality to the port.
2. Setting the switch to the middle position assigns remote terminal unit (RTU) functionality to the port.
3. Setting the switch to the bottom position lets you assign comm parameters to the port in software.

The figure shows the three options that are available on the front panel slide switch.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

The following table shows the ASCII comm port parameters.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

The following table shows the RTU comm port parameters. The comm parameters are set and cannot be changed.

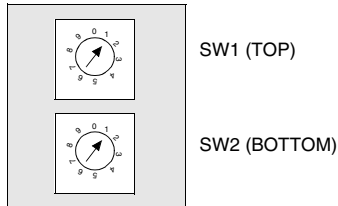
RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

The following table shows the valid comm port parameters.

Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

**Rear Panel
Switches**

The following figure shows the SW1 and SW2 settings.



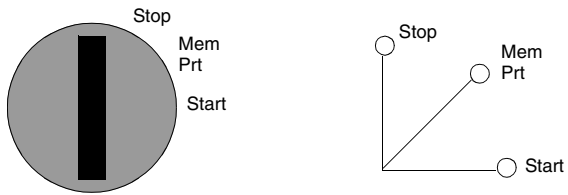
SW1 sets the upper digit (tens) of the address. SW2 sets the lower digit (ones) of the address. The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

Key Switch

The following figure shows the key switch.



Note: The key switch positions shown next to the switch (above) are for reference only and are marked on the module as indicated on the right.

Key Switch Description

The following table provides a description of the key switch information.

Key Switch Description				
Key switch Position	Controller Status	Memory Protected From Programmer Changes	Will Accept Programmer Stop or Start	Key switch Transition
Stop	Controller is stopped and disables Programmer changes.	Y	N	From Start or Memory Protect: Stops controller, if running, and disables Programmer changes
Mem Prt	Controller may be either stopped or running and Programmer changes are disabled. The user cannot write to unlocated variables.	Y	N	From Stop or Start: Prevents Programmer changes, controller run status is not changed
Start	Controller may be either stopped or running. Programmer may make changes and start/stop the controller	N	Y	From Stop: Enables Programmer changes, starts controller. From Memory Protect: Enables programmer changes, starts controller if stopped.

Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that support Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

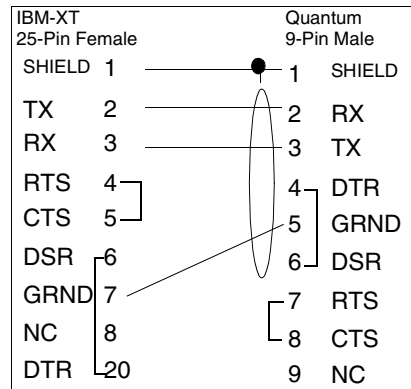
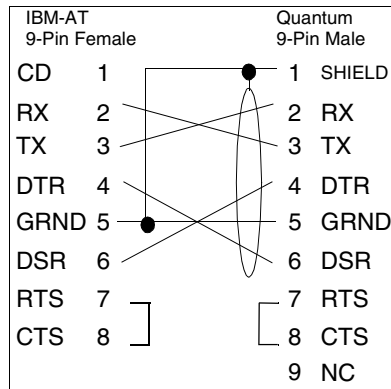
Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

Modbus Port Modem Support

Modbus Port 1 has full modem interfacing ability. Modbus Port 2 RTS/CTS connections function properly for normal non-modem communications but do not support modems.

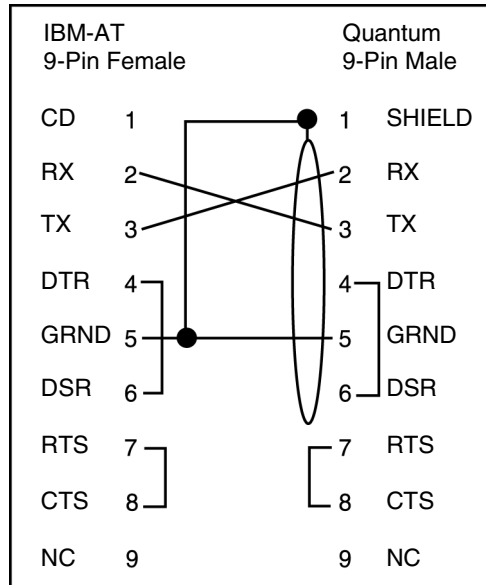
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for 9-pin and 25-pin connections.



**Modbus Ports
Pinout
Connections for
Portable
Computers**

The following figure shows the Modbus port pinout connections for 9-pin portable computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect