

PACSystems™ RX3i

IC695CMM002 and IC695CMM004

Serial Communications Modules

GFK-2461E
January 2010

PACSystems RX3i Serial Communications modules expand the serial communications capabilities of the RX3i system.

Serial Communications module IC695CMM002 provides two independent, isolated serial ports. Serial Communications module IC695CMM004, illustrated at right, provides four independent, isolated serial ports. Up to six Serial Communications modules can be located in the main PACSystems RX3i backplane.

Each port can be configured for MODBUS Master, MODBUS Slave, CCM Slave, DNP3 Master, DNP3 Slave, or Serial I/O protocol. If any port is configured for DNP3 Master or Slave, the other ports on the module can only be configured for DNP3 Master or Slave.

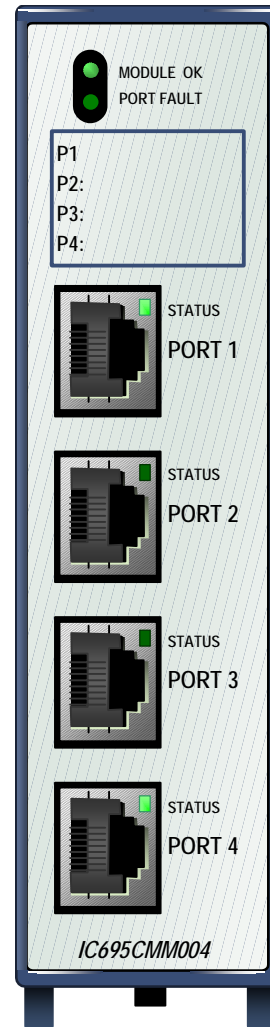
For modules with firmware version 1.32 or later, half-duplex flow control can be configured using Machine Edition *Release 5.90, SP1, SIM 6* or later. Otherwise, flow control defaults to full-duplex.

Additional module features include:

- Port-to-port isolation and port-to-backplane isolation
- RS-232, RS-485/422 communication, software-selected
- Hardware handshake: RTS/CTS, RFR/CTS for RS-232
- Selectable Baud Rates: 1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
- Module fault status reporting (Watchdog, Ram Fail, Flash Fail)
- Module identity and status reporting, including LED status indicators
- Meets CE, UL/CUL 508 and 1604, and ATEX requirements
- Flash memory for future upgrades

These modules must be located in an RX3i Universal Backplane.

RX3i Serial Communications can be hot-inserted and removed following the instructions in the *PACSystems RX3i System Manual*, GFK-2314.



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Release Information

Release History

Release	Firmware Version	Upgrade Kit	Comments
IC695CMM002-AE IC695CMM004-AE	1.32	44A753277-G04 44A753278-G04	See “New for this Release” and “Problems Resolved,” below.
IC695CMM002-AD IC695CMM004-AD	1.30	44A753277-G04 44A753278-G04	Supports Serial Protocol Language (SPL) scripting. Corrects DNP3 Slave Bit Write issue. Please refer to M050803 - IC695CMM002_004 Product Safety Bulletin for more information.
IC695CMM002-AC IC695CMM004-AC	1.20	44A753277-G03 44A753278-G03	Supports DNP3 Master and DNP3 Slave Protocol
IC695CMM002-AB IC695CMM004-AB	1.10	44A753277-G02 44A753278-G02	Supports CCM Slave Protocol
IC695CMM002-AA IC695CMM004-AA	1.00	N/A	Initial Release

Upgrades

The Serial Communications Modules can be upgraded to firmware version 1.32 using the following upgrade kits, which can be downloaded from <http://www.ge-ip.com/support>

CMM002: 44A753277-G05

CMM004: 44A753278-G05

Compatibility

Programmer Version Requirements

Proficy® Machine Edition Logic Developer 5.9 SP1 with SIM 6 is required for half duplex flow control

Proficy Machine Edition Logic Developer 5.8 with SIM 2 or newer is required to use SPL

Proficy Machine Edition Logic Developer 5.6 with SIM 10 or newer is required to use DNP3

Proficy Machine Edition Logic Developer 5.6 with SIM 6 or newer is required to use the CMM

CPU Firmware Version Requirements

PACSystems RX3i CPU Version 5.50 or newer is required for SPL

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PACSystems RX3i CPU Version 5.00 or newer is required for DNP3 Master to sync its timestamp value with the CPU.

PACSystems RX3i CPU Version 3.83 or newer is required to be able to use the CMM in the RX3i system.

New for Release 1.32

Enhanced Configuration for Serial Port Flow Control

Releases 1.32 and later support half duplex flow control and full duplex control. Flow control is configurable with Proficy Machine Edition Logic Developer 5.9 SP1 with SIM 6. Full duplex flow control is the default flow control. Releases 1.30 and earlier support full duplex flow control only.

Problems Resolved in Release 1.32

SPL - ASCTOVAL function would not accept negative sign

Releases 1.32 and later will allow leading negative sign in char arrays passed into ASCTOVAL

SPL - ASCTOVAL function would over write trailing byte in SRC array

ASCTOVAL writes null to source array byte that follows last converted byte by command

DNP3- Multiple Block Writes were not allowed in single request

In Release 1.30 (only) multiple Control Relay Output Block (CROB) and multiple Analog Output Block (AOB) writes were not allowed in a single request. Release 1.32 allows multiple Control Relay Output Block (CROB) and multiple Analog Output Block (AOB) writes.

SPL - 'dot' notation for integer values did not work

The 'dot' notation (variable subscript reference GFK-2460C pg 9-11) allows each byte in an integer to be addressed. This ability was not working correctly from the command line interface (CLI) to the module.

A script, such as this following example, would correctly reference the byte.

```
DIM iMyInt INTEGER
iMyInt = 256
PRINT "iMyInt.1 = " & iMyInt.1
```

The command line would not.

```
1>RUN
iMyInt.1 = 1
1> print iMyInt.1
256
```

This value of 256 should be 1.

This functionality now behaves as expected from the command line interface.

SPL - Serial.clear command did not work

SPL SERIAL.clear commands did not work. This has been corrected in Firmware revision 1.32.

SPL displayed error -3 when PUTB buffer overflowed.

SPL displayed error -3 when PUTB buffer overflowed.

In firmware version 1.32 the correct error is displayed when PUTB buffer is overflowed as follows:

```
Reason: code[53] serial transmit buffer overflow
```

Restrictions and Open Issues in this Release

1. The module will reject a SPL program file containing a literal string of length greater than 127. The SPL port will return a status in the status byte of 61.
2. The static file checker can miss paired NEXT and FOR statements. If a NEXT statement is missing from the program, execution will continue without looping back to the FOR statement. Users should check their FOR/NEXT statements before downloading. A missing NEXT statement can also be detected by debugging using the CLI debug interface.
3. Each port can be configured for DNP3 Master or DNP3 Slave protocol. If any port is configured for DNP3 Master or Slave, the other ports on the module can **only** be configured for DNP3 Master or Slave.
4. These modules do not support GE special MODBUS commands for use with a Daniels Flow Computer.
5. PLC Reference Address Parameters will only allow bit based memory values that are aligned to a byte boundary.

For example, for a port using MODBUS Slave with coils mapped to %Q memory, the %Q memory address must start on a byte boundary in %Q. (Target Address 1 can be mapped to %Q00001 or %Q00009, but it can not be mapped to %Q00007.)

6. When a port is configured for CCM Slave protocol, and:
 - a new configuration is stored to the PLC using Machine Edition, or
 - the system is power-cycled, or
 - the module is hot-inserted

If the first query received from the CCM Master is a Read Scratchpad request, the module will reject that request. All subsequent Read Scratchpad requests will be successful unless one of the above conditions occurs again.

7. When multiple group objects (i.e. %I and %AI memory) are read in a single request, the DNP3 port will ignore all but the first object. Operations of multiple group objects should be split into multiple successive exchanges (i.e. exchange 1 - %I, exchange 2 - %AI).
8. The DNP3 slave port has problems using the link layer to validate frame receipt. The DNP3 organization encourages users not to do this.

Operating Notes

SPL

1. In the error message, brackets [] are printed only around the key failing token. When looking at the error message the entire line should be interpreted.

Example:

```
--- Script file ---
```

```
i = 128 )
```

```
--- Error output---
```

```
Error [3184]: line 1
```

```
i = [128] )
```

2. An SPL wrong error is reported when a "(" is in an IF statement. IF statements only support comparisons of variables and constants. Using () to enclose operations (like arithmetic operations or comparisons) will result in a syntax error. The module will report this error as an unknown identifier for the () symbols rather than a syntax error.
3. If the SPL program writes to memory that is invalid in the PLC the write will fail and the SPL program will halt.

Other

The maximum resolution for the MODBUS drop delay is 420µs, so the minimum time for a drop delay is 420µs.

Installation in Hazardous Locations

- EQUIPMENT LABELED WITH REFERENCE TO CLASS I, GROUPS A, B, C & D, DIV. 2 HAZARDOUS LOCATIONS IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY
- WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2;
- WARNING - EXPLOSION HAZARD - WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES; AND
- WARNING - EXPLOSION HAZARD - DO NOT CONNECT OR DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.

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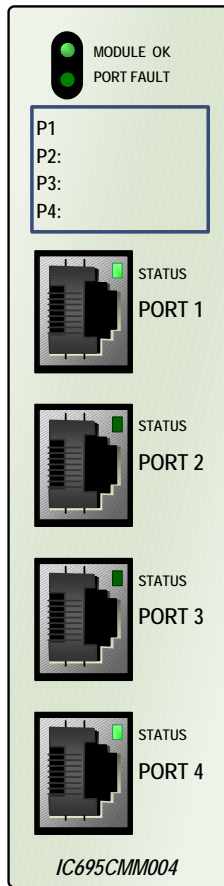
Specifications: IC695CMM002 and IC695CMM004

Refer to the *PACSystems RX3i System Manual*, GFK-2314, for product standards and general specifications.

Number of Serial Ports	IC695CMM002: two independent serial ports IC695CMM004: four independent serial ports	
Connectors	RJ-45	
Number of Serial Communications Modules per CPU	Six in the main CPU backplane	
Backplane power requirements	IC695CMM002	0.7 Amps maximum @ 3.3 VDC 0.115 Amps maximum @ 5.0 VDC
	IC695CMM004	0.7 Amps maximum @ 3.3 VDC 0.150 Amps maximum @ 5.0 VDC
LEDs	Module OK, Port Fault, Port Status (2 or 4)	
Port Type	RS-232 or RS-485/22. 4-wire (full duplex) or 2-wire (half-duplex) operation for RS-485/422	
Flow Control for RS-232	Selectable: Hardware (RTS/CTS, RFR/CTS) or none	
Baud rates	1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2k	
Parity	Even, odd, none	
Data bits	7, 8	
Stop bits	1, 2	
Operating Temperature	0°C to + 60°C	
Input Impedance	Zin > 96 kOhm for RS-485/422 3 kOhm < Zin < 7 kOhm for RS-232	
Max Overvoltage	+/- 25V	
Channel-Channel Crosstalk	-55dB minimum	
Isolation	Port to Backplane and to frame ground: 250 VAC continuous; 1500 VAC for 1 minute, 2550VDC for one second. Port to port: 500VDC continuous, 710VDC for one minute.	

In order to meet emission and immunity requirements for the EMC directive (CE mark), shielded cable must be used with this module.

LEDs



The Module OK LED indicates the status of the module. Solid green indicates that the module has been configured. The Module OK LED is off, if the module is not receiving power from the R3i backplane, or if a serious module fault exists.

At powerup, the Module OK LED flashes green/off while the module is executing powerup diagnostics. It then flashes more slowly as the module receives its configuration from the CPU.

If a problem occurs, the Module OK LED flashes amber. The blink code (see below) indicates the cause of the error.

- 1 = watchdog expired
- 2 = RAM error
- 6 = Invalid CPU Master Interface version
- 7 = CPU heartbeat failure
- 8 = Failed to get semaphore

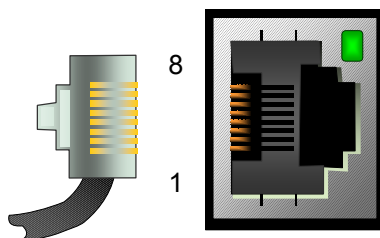
The Port Fault LED indicates the status of all ports. The Port Fault LED is green when there are no faults present on any enabled port. If this LED turns amber, there is a fault on at least one port.

A port's Status LED flashes green when there is activity on the port.

The area below the module LEDs can be used to record identifying information about each port.

Serial Ports

Each port is a standard RJ-45 female connector with the following pin assignments. For MODBUS applications, note that these pin assignments are different than the standard MODBUS pin assignments. If the port is configured for MODBUS master or slave operation, custom cables are needed.

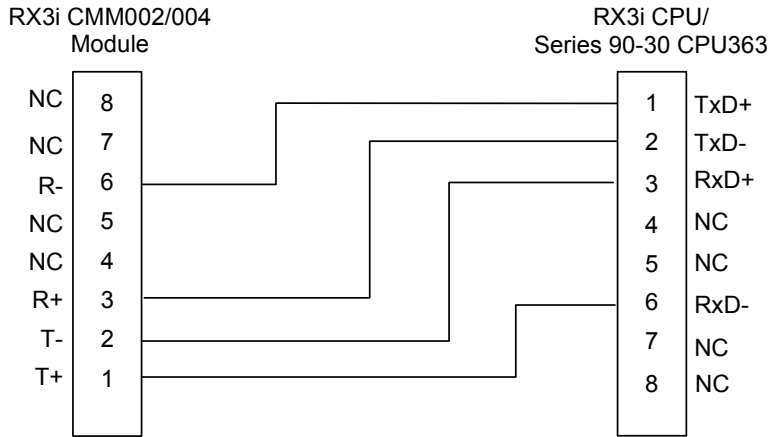


RJ-45 Pin	Pinouts		
	RS-232 DTE	RS-485/422 Half Duplex	RS-485/422 Full Duplex
8	COM	GND	GND
7			Termination 2
6	CTS		R- (RxD0)
5	COM	GND	GND
4		Termination 1	
3	RxD		R+ (RxD1)
2	TxD	T- / R- (D0)	T- (TxD0)
1	RTS/RFR	T+ / R+ (D1)	T+ (TxD1)

Note: There is no shield or frame ground pin on the port connector.

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Connecting a Serial Communications Module to a Series 90-30 CPU363 or external RX3i CPU

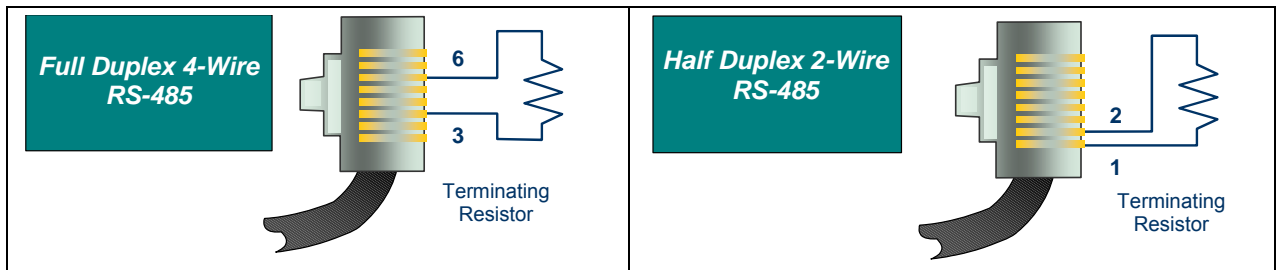


Signal Name		Description	Direction
T+	TxD+	Transmitted Data +	Output
T-	TxD-	Transmitted Data -	Output
R+	RxD+	Received Data +	Input
R-	RxD-	Received Data -	Input

Termination

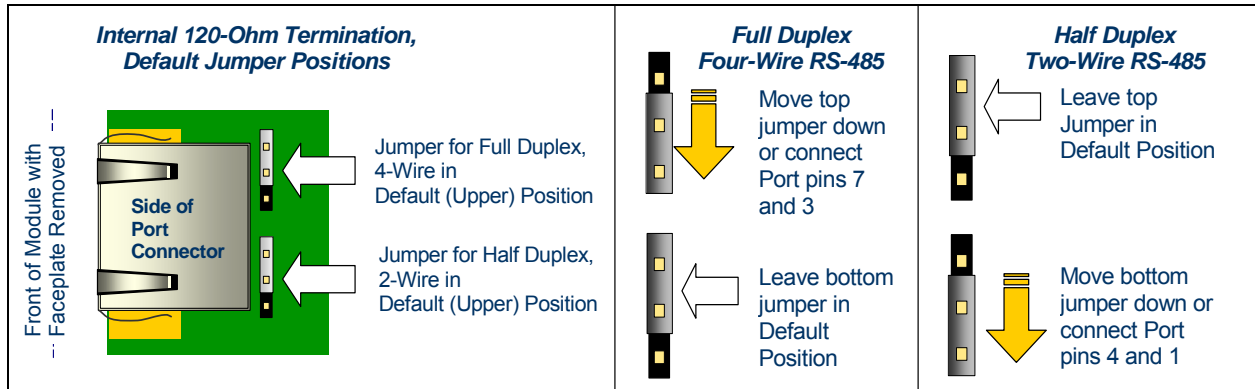
By default, each port is set for no termination. Termination is needed if the module is the first or last device on an RS-485 network, even if there is only one other device on the network. Termination can be provided using either an external resistor as shown below or the port's built-in 120-Ohm termination. If line termination other than 120 Ohms is required, an appropriate external resistor must be supplied.

User-Supplied Termination for RS-485



Built-in Termination for RS-485

Termination using the built-in 120-Ohm resistor can be provided by either setting the appropriate RS-485 termination jumper OR by installing shorting jumpers on the RS-485 cable connector that attaches to the serial port.



To set 120-Ohm termination internally:

1. Remove the module's faceplate by pressing in on the side tabs and pulling the faceplate away from the module.
2. With the module oriented as shown, move *either* the upper or lower jumper.