

GFK-2506D

August 2011

The PACSystems* Control Memory Xchange (CMX) module provides deterministic sharing of data among PLCs and other computing devices on a high-speed fiber optic network, using reflective memory technology. A reflective memory network can contain up to 256 nodes. Each node in the network can be any reflective memory device that is compatible with the 5565 family. When data is written to one node, all nodes on the network are automatically updated with the new data.

Each node in the reflective memory network is connected in a daisy-chained loop using fiber optic cables. The transmitter of the first node is tied to the receiver of the second. The transmitter of the second node is tied to the receiver of the third node, and so on, until the loop is completed back at the receiver of the first node. The figure on page 6 shows an example of a reflective memory network.

A PACSystems RX3i main rack supports a maximum of six CMX modules.

Features

- PACSystems RX3i single slot form factor.
- 128 Mbytes reflective memory with parity.
- Software configuration of all node parameters (no jumper or switch settings required).
- No RX3i CPU processing required to operate the network.
- Network-compatible with VMIC 5565 family of reflective memory devices, including the ACC-5595 reflective memory hub and the RX7i CMX module.
- Connection with multimode fiber up to 300m/984.25ft.
- Dynamic packet sizes of 4 to 68 bytes, controlled by the CMX module.
- Network transfer rate of 43 Mbyte/s (4 byte packets) to 174 Mbyte/s (64 byte packets)
- Network link speed of 2.1 Gigabits/sec.
- Programmable module interrupt output.
- Four general-purpose network interrupts with 32 bits of data each.
- Network error detection.
- Up to 256 nodes per network.
- Redundant transfer mode operation. This optional mode reduces the chance of a data packet being dropped from the network.
- Configurable network memory offset allows you to assign nodes on a network to groups according to the 16MB segment in the network address space that they use.

The CMX128 module must be located in an RX3i Universal Backplane. The module can be hot-inserted and removed following the instructions in the *PACSystems RX3i System Manual*, GFK-2314.



* indicates a trademark of GE Intelligent Platforms, Inc. and/or its affiliates. All other trademarks are the property of their respective owners. All rights reserved.

GFK-2506D

Specifications

Packet size	Dynamic packet sizes of 4 to 68 bytes (firmware version 1.04 and later), automatically controlled by the CMX module
Transfer rate	Network link speed of 2.1 Gbits/sec
User memory	128MB SDRAM
Input power (from RX3i power supply)	660 mA @ +3.3 VDC 253 mA @ +5 VDC
Connectors	<ul style="list-style-type: none"> ■ Fiber optic LC type, conforms to IEC 61754-20 ■ Zirconium ceramic ferrule ■ Insertion loss: 0.35 dB (maximum) ■ Return loss: -30dB

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

Related Publications

PACSystems Memory Xchange Modules User's Manual, GFK-2300

PACSystems RX3i System Manual, GFK-2314

PACSystems CPU Reference Manual, GFK-2222

Proficy™ Machine Edition Logic Developer-PLC Getting Started, GFK-1918

Ordering Information

Description	Catalog Number
Control Memory Xchange Module for RX3i	IC695CMX128
Fiber Optic Cables	VMICBL-000-F5-0xx, where 0xx distinguishes different lengths
Reflective Memory Hub	VMIACC-5595

Release History

Release	Version	Date	Upgrade Kit	Comments
IC695CMX128-AC	1.04	Aug. 2011	82A1512-MS10-000-A2	Increases the maximum packet size that can be accepted and processed to 68 bytes. Adds the ability to detect and correct a rarely occurring condition of corruption in data read operations.
IC695CMX128-AB	1.02	Oct. 2009	82A1512-MS10-000-A1	See GFK-2506B for "Problems Resolved."
IC695CMX128-AA	1.00	Sep. 2008	N/A	Initial Release

Important Information for this Release

Upgrades

CMX128-AA modules can be updated to firmware version 1.04 using upgrade kit 82A1512-MS10-000-A1.

Upgrade kits can be downloaded from www.ge-ip.com/support.

Functional Compatibility

The CMX128 requires the following versions for configuration and operation.

Subject	Description
Programmer Version Requirements	Proficy* Machine Edition Logic Developer 5.80 (released build 4541) or later is required to use the RX3i IC695CMX128 modules.
RX3i CPU	PACSystems RX3i CPU firmware version 5.50 or later
Rack Location	The CMX128 must be located in the main RX3i rack. IC695CMX128 modules require a PCI backplane, which is not available on IC694CHSxxx expansion bases.

Problems Resolved by Release 1.04

Subject	Description
Memory Read Data Corruption	<p>RX3i CMX and RMX (when configured as a CMX) firmware has been modified to detect an extremely rare condition where corruption can occur during a memory read (seen by user as corrupted or swapped data). Once the module enters this state, portions of “data reads” from memory will exhibit corruption until the module is power cycled.</p> <p>Firmware version 1.04 (and later) identifies this condition by setting the local memory parity error bit (bit 13) in the LISR and, if configured to do so, generates a parity error interrupt. When firmware version 1.04 (and later) identifies the condition it will also correct the condition prior to the next memory access (a power cycle of the module is no longer required).</p> <p>It is also recommended that applications verify that bit 13 of the LISR (immediately after the read data command) is clear, even if local memory parity is not enabled in the application. Detection of this condition on bit 13 remains enabled even if local memory parity is not enabled.</p> <p>If bit 13 of the LISR is set, applications should acknowledge this error by clearing bit 13 of the LISR and re-reading the memory locations accessed prior to the detection of this condition.</p> <p>Please refer to GFK-2300 for additional details on access the LISR and configuring Memory Parity Checking.</p> <p style="text-align: center;">Section 5 – Memory Parity Checking Appendix B - Register Definitions (for information on LISR)</p>

New Features and Enhancements in Release 1.04

Subject	Description
68 Byte Packets	<p>Previous versions of the CMX128 firmware did not allow packet sizes greater than 64 bytes. However, some versions of the 5565 reflective memory products generate packet sizes up to 68 bytes. When the CMX128 module received these 68 byte packets it would generate “Bad Data” errors and discard the data.</p> <p>The CMX128 now accepts and processes packet sizes up to 68 bytes.</p>

Restrictions and Open Issues in this Release

Subject	Description
RX3i RMX and CMX modules with version A hardware require a metal enclosure to meet radiated emissions requirements.	For installation requirements, see “Government Regulations” on page 8.
RX3i CMX/RMX does not disable transmitter when the CPU goes to Stop/Halt mode.	<p>For CMX128 modules and RMX128 modules not used as redundancy links, the automatic transmitter disable feature currently does not work correctly when a controller goes to Stop/Halt mode.</p> <p>When the CPU goes to Stop/Halt mode or fails and the automatic transmitter disable feature is enabled, the fiber optic transmitter should be turned off, breaking the reflective memory link. When the feature is disabled the transmitter remains ON and the reflective memory link will not be broken.</p> <p>When enabled, the automatic transmitter disable feature does not work when the CPU goes into Stop/Halt mode (such as after a software watchdog trip or multi-bit ECC error detection), leaving the fiber optic transmitter ON. The fiber optic transmitter is properly disabled if the CPU fails or is lost (for instance the CPU hardware is removed, the CPU experiences a hardware watchdog event, or displays a blink code such as a page fault).</p> <p>This user-configurable feature is enabled by default. It may be disabled by clearing bit 12 with a BUS_WRITE to region 3, offset 0x440.</p>
The LCSR status bit is not turning ON after LISR turns ON when Interrupt (Sync Loss) is generated	<p>The LCSR bit is not latched to the ON state (indicating sync loss) and should not be used for sync loss detection.</p> <p>The LISR bit should be used for detecting sync loss.</p>
SVC_REQ 17 is not supported	SVC_REQ 17 is not supported to mask or unmask module interrupts on RX3i CPUs. There is currently no way to identify which module interrupt should be masked on RX3i. To turn off interrupts, use the normal interrupt disabling mechanism described in the IC695CMX128 user's manual. For details, see “Dynamic Masking of Interrupts” in the <i>PACSystems Memory Xchange Modules User's Manual</i> , GFK-2300.
CPU320 compatibility issue with firmware version 5.50	When using CPU320 with firmware version 5.50, occasionally, a backplane reset of the CMX128 module will cause it to become non-responsive. This problem is corrected in CPU320 firmware version 5.51.

CMX Operation

The CMX module initially powers up in an unconfigured state with its optical transmitter and receiver disabled. The module cannot operate on a network until the RX3i CPU has delivered a hardware configuration to the module.

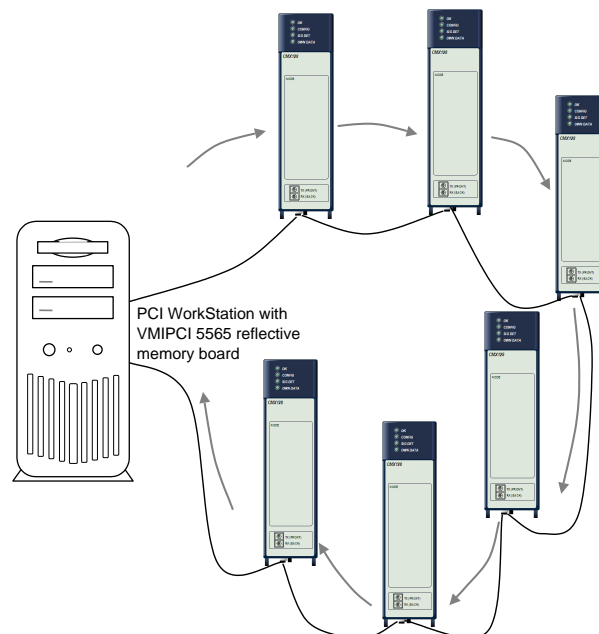
Basic operating functions are configured using Machine Edition – Logic Developer PLC. You can configure the following parameters in the hardware configuration: Node ID, Redundant Transfer Mode, Rogue Master, Network Memory Offset, and Interrupt enable.

Additional functions beyond the basic read and write operations, including enabling interrupts, reading interrupt status, enabling parity, and reading parity errors, can be performed by user logic. For details on accessing these advanced functions, refer to the *PACSystems Memory Xchange Modules User's Manual*, GFK-2300.

Once the CMX has been configured, a transfer of data over the network can be initiated by writing to the reflective memory region through the backplane. The CMX forms the data into variable length packets sized from 4 to 68 bytes, which it transmits over the fiber-optic network to the receiver of the next node. Whenever a packet is received, the CMX evaluates the packet. If the packet is valid and did not originate on this node, it is accepted. If, however, the data packet is invalid or if it originated at this node, it is discarded. The receiving node writes the data into the local reflective memory and simultaneously transmits the data to the next node on the network. The process is repeated until the data returns to the originating node, where it is removed from the network.

Sample Reflective Memory Network

The seven-node network in the following illustration consists of six RX3i CMX modules and a PCI WorkStation with a VMIPCI 5565 reflective memory board.



Optical Transceiver

The optical transceiver, which is located on the bottom of the module, has two “LC” type fiber optic ports. The port labeled “TX” is the transmitter and the port labeled “RX” is the receiver.

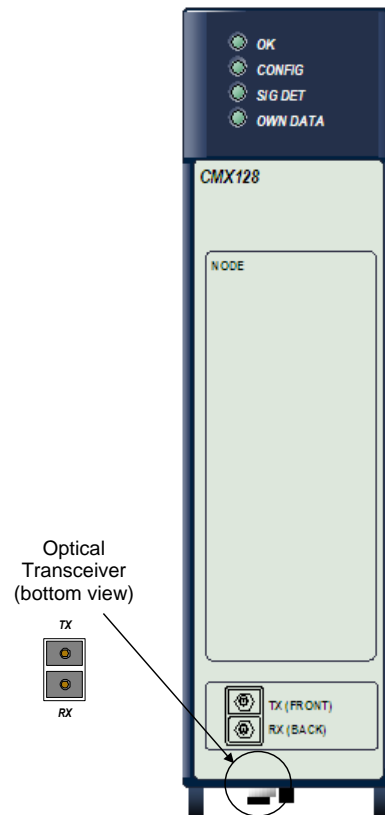
CMX modules are networked together using either simplex (single fiber) or duplex (dual fiber) multimode fiber optic cables. The specific cable construction depends on your operating environment. For details on cables, refer to the *PACSystems Memory Xchange Modules User’s Manual*, GFK-2300.

LEDs

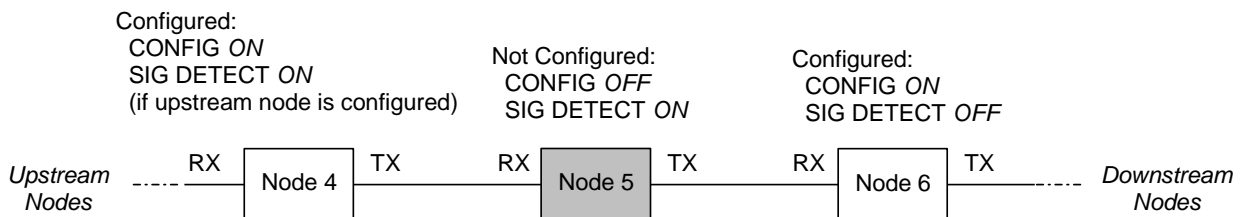
All front panel LED indicators are green.

LED Label	Description
OK	ON indicates the CMX module and the CPU are functioning properly.
CONFIG*	ON indicates the module is configured.
SIG DETECT	ON indicates the receiver is detecting a fiber optic signal.
OWN DATA	ON indicates the module has received its own data packet from the network at least once.

* A reflective memory hub can be used to bypass a node that is not configured.



Example of SIG DETECT Operation -- Node 5 Not Configured



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.

Government Regulations

U.S., European, Canadian, and Australian radio-frequency emission regulations are intended to prevent equipment from interfering with approved transmissions or with the operation of other equipment. In order to meet the emissions limits for Class A digital devices as specified in 47 CFR 15, EN 55011, ICES-003, and AS/NZ 3548, the Control system in which the IC695RMX128-Ax and IC695CMX128-Ax modules are used shall be installed as follows:

- The Control system must be mounted in a minimum IP54 rated metal enclosure or the equivalent. All surfaces of the enclosure must be adequately grounded to adjacent surfaces to provide electrical conductivity. Wiring external to the enclosure must be routed in metal conduit or the equivalent.
- The conduit must be mounted to the enclosure using standard procedures and hardware to ensure electrical conductivity between the enclosure and conduit. Equivalent termination for the shielded cable alternative to conduit may also be used.
- Applications using these modules outside a grounded metal enclosure may experience RF interference at 956.24MHz, 3.08GHz, or 3.29GHz.