IMPORTANT PRODUCT INFORMATION

GFK-2332BD

Mar 2021

PACSystems™ RX3i

ETHERNET INTERFACE MODULE

(IC695ETM001-LAAA)

Version 7.06



EMERSON

Warnings and Caution Notes as Used in this Publication

⚠ WARNING

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

⚠ CAUTION

Caution notices are used where equipment might be damaged if care is not taken.

Note: *Notes merely call attention to information that is especially significant to understanding and operating the equipment.*

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met during installation, operation, and maintenance. The information is supplied for informational purposes only, and Emerson makes no warranty as to the accuracy of the information included herein. Changes, modifications, and/or improvements to equipment and specifications are made periodically and these changes may or may not be reflected herein. It is understood that Emerson may make changes, modifications, or improvements to the equipment referenced herein or to the document itself at any time. This document is intended for trained personnel familiar with the Emerson products referenced herein.

Emerson may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not provide any license whatsoever to any of these patents.

Emerson provides the following document and the information included therein as-is and without warranty of any kind, expressed or implied, including but not limited to any implied statutory warranty of merchantability or fitness for particular purpose.

Introduction

The Ethernet Interface Module, IC695ETM001, connects a PACSystems RX3i controller to an Ethernet network. It enables the RX3i controller to communicate with other PACSystems equipment and with Series 90 and VersaMax controllers. The Ethernet Interface provides Transmission Control Protocol and Internet Protocol (TCP/IP) communications with other control systems, host computers running programming software, and computers running the TCP/IP version of the programming software. These communications use the Service Request Transport Protocol (SRTP), Modbus TCP, and Ethernet Global Data (EGD) protocols over a four-layer TCP/IP (Internet) stack.

Features of the RX3i Ethernet Interface include:

- Programming and configuration services. Firmware upgrades from the RX3i CPU using the Web/HTTP method if the CPU supports that method, or by using the WinLoader software utility, which is supplied with updates to the Ethernet Interface software
- Periodic data exchange using Ethernet Global Data (EGD)
- EGD Commands to read and write controller and EGD exchange memory over the network
- TCP/IP communication services using SRTP
- Support for SRTP Channels, Modbus/TCP Server, and Modbus/TCP Client.
- Ethernet port on the faceplate of model for a direct connection to the module
- Three auto-sensing 10BaseT/100BaseTX/1000BaseTX RJ45 shielded twisted-pair Ethernet ports for direct connection to either a 10BaseT or 100BaseTX or 1000T IEEE 802.3 network without an external transceiver. There is one interface to the network for Communications protocols and Station Manager (two ports) and one separate interface (one port) for Station Manager access only
- Internal network switch with Auto-negotiate, Sense, Speed, and Crossover detection
- Ethernet Restart pushbutton permits manually restarting the Ethernet firmware without power cycling the system
- LEDs: OK, STATUS, LAN OK, LOG EMPTY, individual port activity and speed LEDs
- Configurable stand-alone Redundant IP Addressing, which allows a single IP Address to be assigned to corresponding Ethernet modules in two different controllers. The Redundant IP Address is configured in addition to the normal unique IP Address of each Ethernet module. Under application logic control, only the Ethernet module in the active unit can use the Redundant IP Address
- Time synchronization to SNTP Time Server on Ethernet network (when used with Release 5.00 or later CPU module)

Current Release Information

Catalog Number	Date	Firmware Version (Build Number)				Hardware
		Ethernet Firmware ID	Ethernet Boot Loader Firmware ID	MCU	FPGA	
IC695ETM001-LAAA	Mar 2021	Version 7.06 (EG67)	Version 1.06 (EB5G)	Version 1.3 Boot 1.0	Version 0.162 (23A9)	Version 10.00

Field Upgrades

IC695ETM001-Kxxx or later revision modules are field-upgradeable to firmware version 7.06 using the Web/HTTP method or WinLoader firmware upgrade utility. To upgrade an ETM001-Kxxx or later revision module to firmware version 7.06, you will need the upgrade kit which can be downloaded from the support link provided at the end of this document.

IC695ETM001-Jx and earlier revision modules cannot be updated to R7.00 or later firmware.

Upgrade Kit No.: 41G2749-MS10-000-A2

Upgrade File Name: ETM001-Kxxx_FW7_06_41G2749-MS10-000-A2.zip

IC695ETM001-KAAA or Later[1] Specifications

Specification	Description
Connectors	Three 10BaseT/100BaseTX/1000BaseT Ports: 8-pin female shielded RJ45
LAN	IEEE 802.2 Logical Link Control Class I IEEE 802.3 CSMA/CD Medium Access Control 10/100/1000 Mbps
Number of IP Addresses	Two (One for Front Panel port and One for LAN1 switched ports)
Number of Ethernet Port Connectors	Three. All are 10BaseT / 100BaseTX / 1000T with auto-sensing RJ45 connection.
Embedded Ethernet Switch	Yes – Allows daisy-chaining of Ethernet nodes.

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

[1] For IC695ETM001-Jx or earlier, please consult GFK-2332AA or earlier. This document is specific to the -KAAA and later hardware platform.

Ethernet Interface Status Bits

Note: *Unless **LAN Interface OK** (Status Bit 16) is set, the other status bits are invalid. Bit 1 is lsb.*

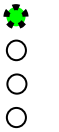
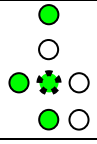
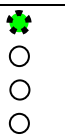
LAN Interface Status Bits

1	Port 1 full-duplex
2	Port 1 100Mbps
3	Port 2 full-duplex
4	Port 2 100 Mbps
5	Network Time Locked
6	Redundant IP Address is active
7	Port 1 1000 Mbps (-Kxxx or later)
8	Port 2 1000 Mbps (-Kxxx or later)
9	Any Channel Error (error on any channel)
10–12	Reserved
13	LAN OK
14	Resource problem
15	Module Overtemperature
16	LAN Interface OK

Channel Status Bits (two for each channel)

17	Channel 1 Status (SRTP: Data Transfer)
18	Channel 1 Status (SRTP: Channel Error)
…	…
79	Channel 32 Status (SRTP: Data Transfer)
80	Channel 32 Status (SRTP: Channel Error)

Indicator Light Emitting Diodes (LEDs)

LED	State		Indicates
OK STATUS LAN OK LOG EMPTY		Slow Blink Off Off Off	Waiting for Ethernet configuration from CPU
OK STATUS LAN OK LOG EMPTY		On Off On/Traffic/Off On/Off	Operational
OK STATUS LAN OK LOG EMPTY		Blink error code Off Off Off	Hardware failure. See Section 12 of GFK-2224 for blink code definitions.
OK STATUS LAN OK LOG EMPTY		Slow Blink Off Slow Blink Slow Blink	(*All LEDs blink in unison; pattern same while awaiting or performing load*)	Firmware Update

Hardware Installation

Initial Checks

Upon receiving your RX3i equipment, carefully inspect all shipping containers for damage. If any part of the system is damaged, notify the carrier immediately. The damaged shipping container should be saved as evidence for inspection by the carrier.

As the consignee, it is your responsibility to register a claim with the carrier for damage incurred during shipment. Intelligent Platforms LLC will fully cooperate with you, however, should such action be necessary.

After unpacking the RX3i equipment, record all serial numbers. Serial numbers are required if you should need to contact Customer Care during the warranty period. All shipping containers and all packing material should be saved should it be necessary to transport or ship any part of the system.

Verify that all components of the system have been received and that they agree with your order. If the system received does not agree with your order, contact Customer Care.

Installation Location

This product is intended for use with the RX3i system. Its components are considered open equipment (having live electrical parts that may be accessible to users) and must be installed in an ultimate enclosure that is manufactured to provide safety. As a minimum, the enclosure shall provide a degree of protection against solid objects as small as 12mm (e.g. fingers). This equates to a NEMA/UL Type 1 enclosure or an IEC60529 IP20 rating providing at least a pollution degree 2 environment. For details about installing RX3i rack systems, refer to GFK 2314.

If you need technical help, contact Technical Support. For phone numbers and email addresses, see the back cover of this Guide.

Class 1 Division 2 Group ABCD

- This equipment is an open-type device and is meant to be installed in an enclosure suitable for the environment that is only accessible with the use of a tool.
- Suitable for use in Class I, Division 2, Groups A, B, C, and D Hazardous Locations, or non-hazardous locations only.

⚠ WARNING

- EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.
- WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES; AND
- DO NOT CONNECT OR DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.
- EXPLOSION HAZARD - USB PORT IS ONLY FOR USE IN NONHAZARDOUS LOCATIONS, DO NOT USE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.

ATEX Zone 2

This product must be mounted in an enclosure certified in accordance with EN60079-15 for use in Zone 2, Group IIC, and rated IP54. The enclosure shall only be able to be opened with the use of a tool.

Module Installation

This module is compatible with all RX3i CPU models, except CPE400 and CPL410.

The ETM001 must be installed in the main (CPU) rack of an RX3i system, using a Universal Backplane such as IC695CHS007, CHS012, or CHS016.

The ETM001 supports insertion/removal while power is applied to the rack (hot-swap).

1. RX3i rack power may be off or on (“hot insertion”).
2. Holding the module firmly, align the module with the correct slot and connector, then swing the module down until the module’s connector engages the backplane’s backplane connector. Visually inspect the module to be sure it is properly seated.
3. Secure the bottom of the module to the backplane using the machine screws provided with the module.

Related Documents

For additional information about the Ethernet Interface Module, refer to the following publications:

PACSystems RX3i TCP/IP Ethernet Communications User Manual	GFK-2224
PACSystems TCP/IP Ethernet Communications Station Manager User Manual	GFK-2225
PACSystems RXi, RX3i, and RSTi-EP Controller Secure Deployment Guide	GFK-2830
PACSystems RX3i System Manual	GFK-2314

Additional Support

For support and information, visit Emerson’s support link located at the end of this document. The files for this manual and other related documentation are available there. Additional region- and language-specific websites and telephone numbers are found there as well.

Functional Compatibility

Subject	Description	
PLC CPU Firmware Version Requirements	IC695ETM001-Kxxx (or later) hardware requires the following CPU versions for full feature support: • CPE330 Release 9.90 • CPE302/CPE305/CPE310 Release 9.90 • CPU320/CPU315 Release 8.95 • CRU320 Release 8.95	
Programmer version requirements	Produce EGD on Redundant IP	PAC Machine Edition Logic Developer PLC 9.80 SIM 5 or later is required to support EGD Production with the Redundant IP address.
	IC695ETM001-Kxxx Hardware Configuration (Release 7.00 Firmware)	PAC Machine Edition Logic Developer 9.5 SIM 16 or later adds an ETM001 Kxxx module option which allows configuration of parameters previously only available through AUP files. The ETM001-Kxxx (or later) may also be configured with older versions of PME by selecting the ETM001 module option. When configured this way, the ETM001-Kxxx (or later) supports all features of the ETM001-Jx (and earlier) modules. However, any new configuration options are not available.
Rx3i Backplane Hardware Revision Compatibility	The following backplane hardware revision MUST be used: IC695CHS012-BAMP IC695CHS016-BAMP IC695CHS012CA-BAMP IC695CHS016CA-BAMP or IC695CHS012-CA (or later) IC695CHS016-CA (or later) IC695CHS012CA-CA (or later) IC695CHS016CA-CA (or later) or IC695CHS007-AA (or later)	
Ethernet Toolkit, BOOTP, FTP Server, & Set Temporary IP Address Tool Support	These features are not supported beginning with Firmware version 7.00: • Ethernet Toolkit Applications • BOOTP • FTP Server Connections • Set Temporary IP Address Tool	
Ethernet AUP File Support	The ETM001-Kxxx with Release 7.00 (and later revisions) supports Advanced User Parameter (AUP) files to maintain compatibility with ETM001-Jx with Release 6.43 (or earlier revision) applications. Some AUP parameters may generate a Station Manager log entry indicating the AUP parameter is no longer supported and was ignored.	
Ethernet Station Manager Compatibility	Ethernet Station Manager Utility Version 1.3 Build 2 or later is recommended for use with the ETM001-Kxxx. Earlier versions are compatible; however, they may not display all the ETM001-Kxxx's Ethernet parameters after issuing a parm all command. Should this issue occur, pressing enter, or issuing another command will cause the station manager to display the remaining parameters.	
Network and Memory Performance Monitor PACS Analyzer Requirements	The IC695ETM001 PACSystems RX3i Ethernet Interface with firmware revision 7.05 or later supports Network and Memory Performance Monitoring when used with PACS Analyzer version 4.3 or later.	

New Features and Enhancements in this Release

Subject	Description
Produce EGD on Redundant IP	Produced EGD exchanges may now originate from either the Redundant IP address or the Direct IP address of the Active Controller in a Hot Standby Redundancy System. The source for produced EGD exchanges may be configured using the Produce EGD on Redundant IP configuration parameter available in PAC Machine Edition 9.80 SIM 5, or later.

Problems Resolved by this Release

Subject	Description
Gateway IP Address Truncated	The LAN1 and Front Panel Ethernet port settings, which use a maximum length gateway IP address, incorrectly truncated the address by one character. For example, 192.168.120.127 was truncated to 192.168.120.12. Shorter gateway IP addresses such as 192.16.120.99 worked as expected. This issue is resolved.
EGD Exchanges Not Produced from Redundant IP	The source IP address of EGD produced from the active controller is now configurable. Using PAC Machine Edition, the source IP address of EGD produced from the active controller can be configured to be either the Direct IP address of the Ethernet interface, or the Redundant IP address configured for the system.

Release History

Catalog Number	Firmware Version	Date	Comments
IC695ETM001-LAAA	7.06 (EG67)	Mar 2021	Adds support for the Produce EGD on Redundant IP parameter and resolved Gateway IP Address Truncation issue.
IC695ETM001-LAAA	7.05 (EEJN)	Sep 2020	Manufacturing update. No change to fit, form, or function.
IC695ETM001-KAAA	7.05 (EEJN)	June 2020	IC695ETM001 PACSystems RX3i Ethernet Interface Firmware Release 7.05 adds support for the *Network and Memory Performance Monitoring Tool* and resolves the issues found in Problems Resolved by this Release.
IC695ETM001-KAAA	7.00 (EC7K)	Sept 2019	This release of the IC695ETM001 addresses obsolescence and is a new hardware and firmware release to implement the same features of the existing ETM001. Differences include: • Drop-in replacement for IC695ETM001-Jx or earlier • Support for 1000mbps connections • Achilles Level 2 certification • Replacement of serial port for Station Manager with separate Ethernet Interface • Only monitor Station Manager commands • A limited set of AUP parameters supported • New IP Setup Mode to default to known IP settings • Includes patches for VxWorks Urgent/11 vulnerabilities

Restrictions and Open Issues

Subject	ID Code	Description
No CPU fault logged when Ethernet Interface in fatal blink code	DE5720	The CPU does not log any PLC or I/O Faults when the Ethernet Interface has a fatal blink code. The user's application should monitor the LAN interface OK status bit to detect loss of module.

Ethernet Operational Notes

Subject	Description
Setup IP Mode	The ETM001-Kxxx supports Setup IP Mode which temporarily sets the Ethernet ports to known IP addresses to allow initial connectivity and configuration. Press and hold the RESET button for at least 5 seconds while the CPU is in STOP mode to place the Ethernet module in Setup IP Mode. This is indicated with all the network speed LEDs blinking in unison. During this mode, the port settings are: Front Panel IP Address: 10.10.0.100, Subnet Mask: 255.255.255.0, Gateway IP Address: 0.0.0.0 LAN1 IP Address: 192.168.0.100, Subnet Mask: 255.255.255.0, Gateway IP Address: 0.0.0.0 IP Setup mode is terminated by pressing the RESET button again for less than 5 seconds, or power-cycling.
Multiple zero period EGD exchanges may not produce similar numbers of samples	If more than one EGD-produced exchange is configured for a production period of zero, the exchanges may not produce similar numbers of samples. (A production period of zero configures the exchange to transfer as fast as possible.) Due to the way that scheduling occurs when multiple exchanges are scheduled “as fast as possible”, some zero period exchanges may produce significantly more samples than others. For more consistent EGD production, configure the produced EGD exchanges with non-zero production periods.
Idle Modbus/TCP connection between a Series 90 and a PACSystems may be prematurely terminated	An idle Modbus/TCP connection between a Series 90 Ethernet Interface and the PACSystems Ethernet Interface may be prematurely terminated. There is an incompatibility between the TCP "Keep-Alive" timer values on the PACSystems Ethernet Interfaces and Series 90 Ethernet Interfaces. The default value of the keep-alive timer for the Series 90 modules is set to a much higher value than for the PACSystems. To keep TCP connections open between a Series 90 Ethernet Interface and a PACSystems Ethernet Interface, the Series 90 Interface Advanced User Parameter *wkal_time* should be set to the value 750 to match that of PACSystems. With this change, TCP connections remain open indefinitely. This also applies to SRTP Client Channels that have infrequent traffic and can be resolved by using the same technique.
ENIU Stale Data during Run Mode Store of EGD	In a large PPS system running 20 ENIUs, when a Run Mode Store is performed that deletes the EGD exchanges for 10 of the ENIUs, the other ENIUs will see the status on their exchanges indicate consumption timeouts during the RMS. After the RMS, the exchanges operate normally.
Limited buffering in Embedded Switches	Changing speeds from 1000mbps to 100mbps/10mbps or 100mbps to 10mbps with any switch may drop packets as network loading increases. Embedded switches typically have less memory than dedicated switch hardware. ETM001-Kxxx Version 7.00 and later adds two ‘tally I’ counts, TxDrop and TxEDrop to indicate packets that are dropped leaving a specific port. These can help identify that the embedded switch is dropping packets before they leave a specific port. This is generally due to the port running at a slower data rate than the source of the data.
Unexpected LOG EMPTY LED Operation Associated with Redundant IP Address Communications	The IC695ETM001-Kxxx’s LOG EMPTY LED operation may differ from the IC695ETM001-Jx’s LOG EMPTY LED operation when configured in a redundant system. During a role switch scenario, the ETM001 loses communications (SRTP, Modbus, etc.) directed to its Redundant IP address. This communications loss is expected and when it occurs, a corresponding event is logged in the event log. However, when the event is logged, the IC695ETM001-Kxxx’s LOG EMPTY LED turns off, whereas the IC695ETM001-Jx’s LOG EMPTY LED remains on.
Winloader update not supported in Slot 1	Winloader updates of the IC695ETM001 are not supported in Slot 1. Serial updates are supported from slot 2 onward. Updates via the Web interface are supported in Slot 1.

Subject	Description
Station Manager Commands	The ETM001-Kxxx supports a subset of Station Manager Commands. (monitor only commands) Refer to TCP/IP Ethernet Communications for PACSystems Station Manager Manual, GFK-2225, for details.
Avoid COMMREQ Commands During First Scan	COMMREQ commands should be sent to the ETM001 after the first logic scan completes. COMMREQs sent during the first scan may be aborted.
SRTP Communication Delays	The average latency of communications on SRTP channels may vary considerably due to TCP retransmissions. SRTP client applications should be designed to take this variance into account. In particular, SRTP client applications migrating from Series 90 SRTP servers to PACSystems may need to lengthen SRTP timeout parameters.
SRTP Server Errors Can Cause Timeouts at Channels Client	The SRTP Server in the PACSystems Ethernet Interface can encounter various errors when the remote Series 90 PLC client takes down an SRTP connection and then establishes a new connection. This can cause unexpected channel timeout errors 0190H or 0290H at the client. The SRTP server errors in the Ethernet exception log are identified as Event = 2; Entry 2 may be 001cH, or 0021H
Modbus/TCP Channel Aborted During Power-cycle	After powering up a PLC running Modbus/TCP client channels, the established connection occasionally fails because the server occasionally rejects the "open" from the client. The connection will then succeed if the application retries the open when it sees a 0x9690, 0xAA90, 0xA990, 0x9790, or b490H response to an open request or the first write request.
Avoid Overlapping Remote IP Networks when Configuring IP Address and Subnet Mask	The ETM001-Kxxx (and later) contains two LAN interfaces, each one supporting a unique IP address. Care must be taken when assigning IP Addresses and subnet masks to each LAN so that each network does not overlap any remote subnets in the network infrastructure. Intermittent or no Ethernet communication may result if the local networks on the ETM001 overlap a remote subnet.
SRTP & Modbus TCP Channel COMMREQ Error Response with Gateway	SRTP & Modbus TCP Channel commands provide different COMMREQ error codes when a request is sent to an unreachable server. When an Ethernet gateway is configured, the COMMREQ returns error code 0290H; when a gateway is not configured, the COMMREQ returns error code AA90H.
Changing IP Address of Ethernet Interface While Connected	Storing a hardware configuration with a new IP address to the ETM001 while connected to PAC Machine Edition (PME) will succeed, then immediately disconnect because the ETM001 is now using a different IP address than PME expects. You must enter a new IP address in the Target Properties in the PME Property Inspector window before reconnecting.
Modbus/TCP Client Channels require at least a 10-millisecond delay between bulk channel close and bulk channel open processing	A delay of at least 10 milliseconds must occur between logic-driven attempts to close sixteen Modbus/TCP Channels simultaneously and then re-open 16 Modbus/TCP Channels. This delay is necessary to provide external Modbus/TCP Servers sufficient time to close all channels before the Client issues channel open requests.
LAN System Software Fault After Redundant Unit Role Switch when Using Redundant IP	In a redundant system, when Redundant IP is configured on either the CPU's Embedded Ethernet interface or an ETM001, a LAN System Software Fault; Resuming message may be logged in the fault table when a role switch occurs between the Active and Backup units. This fault indicates that SRTP connections on the previously active Ethernet interface were terminated due to the role switch. This fault does not impact the normal operation and no additional action is necessary should this occur.

Support Links

Home link: http://www.Emerson.com/Industrial-Automation-Controls

Knowledge Base: https://www.Emerson.com/Industrial-Automation-Controls/Support

Customer Support and Contact Information

Americas

Phone:	1-888-565-4155 1-434-214-8532 (If toll free option is unavailable)
Customer Care (Quotes/Orders/Returns):	customercare.mas@emerson.com
Technical Support:	support.mas@emerson.com

Europe

Phone:	+800-4444-8001 +420-225-379-328 (If toll free option is unavailable)
Customer Care (Quotes/Orders/Returns):	customercare.emea.mas@emerson.com
Technical Support:	support.mas.emea@emerson.com

Asia

Phone:	+86-400-842-8599 +65-6955-9413 (All other countries)
Customer Care (Quotes/Orders/Returns):	customercare.cn.mas@emerson.com
Technical Support:	support.mas.apac@emerson.com

Any escalation request should be sent to: mas.sfdcescalation@emerson.com

Note: If the product is purchased through an Authorized Channel Partner, please contact the seller directly for any support.

Emerson reserves the right to modify or improve the designs or specifications of the products mentioned in this manual at any time without notice. Emerson does not assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use and maintenance of any Emerson product remains solely with the purchaser.

© 2021 Emerson. All rights reserved.
Emerson Terms and Conditions of Sale are available upon request. The Emerson logo is a trademark and service mark of Emerson Electric Co. All other marks are the property of their respective owners.

EMERSON