

IC695EIS001-CE RX3i Ethernet IEC 104 Server Module

The PACSystems* RX3i Ethernet IEC 104 Server Module, catalog number IC695EIS001, implements the IEC 60870-5-104 communications protocol. It permits a PACSystems RX3i controller to be connected to an Ethernet network using a standard TCP/IP connection scheme, allowing an IEC 104 Client to poll data from the Server, as well generate unsolicited communications from the Server back to the Client.

Two auto-sensing 10BaseT/100BaseTX RJ-45 shielded twisted-pair Ethernet ports permit direct connection to either a 10BaseT or 100BaseTX IEEE 802.3 network without an external transceiver. Line, Star and Daisy Chain topologies are supported.

The RX3i Ethernet IEC 104 Server Module hosts the IEC104 Server side protocol on a common RX3i ETM001 module hardware platform. Thus, many of the specifications and behaviors are shared with the ETM001 module including protocol support. IC695EIS001 is an Ethernet-connected module that fits in the RX3i backplane and permits the RX3i to behave as a Server on the IEC104 network. The data exchanges between the EIS001 module and IEC104 Client(s) are configurable, using a single COMMREQ instruction in the ladder logic or Structured Text program.

Module Features

- Supports eight client connection to the RX3i Controller data set specified in the configuration. [RBE supported only on one Client connection associated with a specified port -Refer to GFK-2949B for details]
- Supports Interrogation and RBE for Single Point and Double Point data.
- Supports Interrogation and RBE for Regulated Step.
- Supports Interrogation and Measured data sets for Scaled, normalized, and single precision Float.
- Supports 56-bit IEC 60870-5-104 time format, with the default being 56-bit time format.
- Supports *Time Set*, and query of the RX3i Controller CPU Clock in UTC time.
- *Cause of Transmission* size is two octets.

RX3i Interface specifications:

- Up to four EIS001 per RX3i, as allowed by available power and slots.
- Module can be installed in any available RX3i main rack I/O slot.
- Module supports insertion into and removal from an RX3i backplane which is under power.
- Firmware upgrade through RX3i CPU using WinLoader software utility.

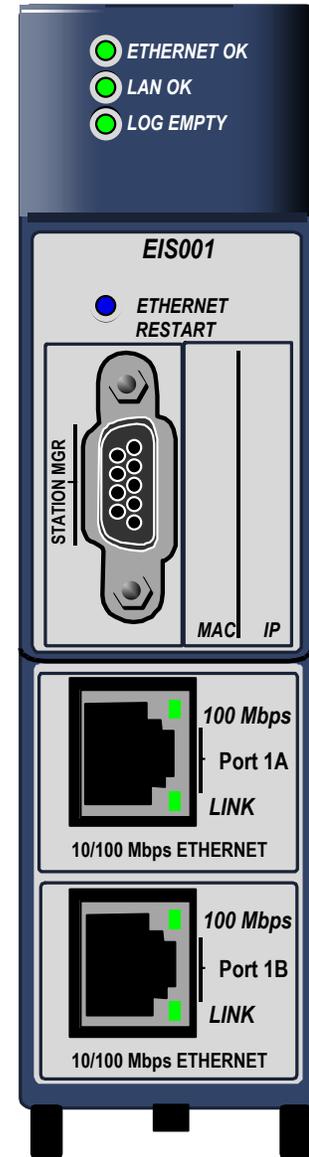


Figure 1: EIS001 Front View

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GFK-2947D

Current Release Information

Catalog Number	Firmware Version	Date	Comments
IC695EIS001-CE	6.41/1.40	Aug 2017	This firmware provides enhancement to enable Report by Exception of analog data without time stamp through ASDU13 spontaneously instead of ASDU36. It also fixes issue where IEC104 Master reads incorrect data for transient period (~100ms to 120ms) from EIS module (IEC104 server) intermittently over long duration of operation.

Upgrade Kit: 41G2076-MS10-000-A4

This combines a compatible Ethernet Firmware Upgrade Kit and IEC 104 Server Firmware Kit in one package.

Hardware ID	Catalog Number	Board ID	Board Revision
IC695EIS001 Ethernet IEC 104	IC695EIS001-CE	EX4B1	41G1299-BA10-000-D2
Ethernet TCP Firmware ID	Version: 6.41 Build 09A1		
Ethernet Boot Firmware ID	Version: 3.71 Build 43A1		
Ethernet Toolkit Plugin3 - IEC 104 Server License	N/A		
Ethernet Toolkit Plugin2 - IEC 104 Server Application	Version: 140 (0xC142)		
Ethernet Programmable Parts	Part ID	Revision	
	PLD	44I725580-1401B	
	Flash Memory - U3	41G2040-FW10-000-A4	
	Flash Memory - U4	41G2040-FW10-001-A4	
	Microcontroller 405GPR -U66	41G1911-FW10-000-A0	

Release History

Catalog Number	Firmware Version	Date	Comments
IC695EIS001-CE	Firmware 6.41/1.40	Aug 2017	This firmware provides enhancement to enable Report by Exception of analog data without time stamp through ASDU13 spontaneously instead of ASDU36. It also fixes issue where IEC104 Master reads incorrect data for transient period (~100ms to 120ms) from EIS module (IEC104 server) intermittently over long duration of operation.
IC695EIS001-CD	Firmware 6.41/1.30	April 2016	This firmware enables multiple IEC 104 Clients connections to the IEC 104 Server module (Max 8 Connections). It also provides a mechanism to shift RBE (Report By Exception) data during runtime, on one specific Client connection associated with a specified Port Number using COMMREQ (Communication request) in the Controller logic.
IC695EIS001-CC	Firmware 6.40 /1.20 Boot 3.71	Feb 2016	This Firmware fixes issue with module going unexpectedly in firmware update mode, as part of the Web upgrade kit. An enhancement was made to prevent the module from becoming unresponsive and requiring a power cycle if it was subjected to heavy network storm traffic.
IC695EIS001-BB	1.10	Apr 2015	The Memory Address Translation feature added in this release supports Unambiguous (Unique) Object Addressing as required by some legacy SCADA clients (like CPELE/SAGE). Refer to PACSystems RX3i Ethernet IEC 104 Server Module IC695EIS001 User Manual, GFK-2949A or later for details.
IC695EIS001-AA	1.00	Dec 2014	Initial release.

Functional Compatibility

Subject	Minimum Version Required
Programmer Version Requirements	Proficy* Machine Edition Logic Developer Release 8.5 SIM 9 or later.
Ethernet Firmware Version Requirements	Ethernet (ETM001) Primary Firmware Release 6.30 (Build: 41A1) Ethernet (ETM001) Boot Firmware Release 3.60 (Build: 45A1)
Module Hardware Requirements	The newly released EIS001 firmware is compatible with original hardware (IC695EIS001-AA) and with new hardware (IC695EIS001-BB). Note: It is not compatible with IC695ETM001 hardware.
RX3i CPU version Requirements	CPU320/CPU315 Primary Firmware Release 8.05 CPE310/CPE305 Primary Firmware Release 8.05 CRU320 Primary Firmware Release 8.05 CPE330 Primary Firmware Release 8.45 (Other RX3i CPU/CPE models are not supported)

Problems Resolved by this Revision

Subject	ID code	Description
IEC104 Master reads incorrect data for transient period (~100ms to 120ms) from EIS module	DE4193	It was observed that after long runs intermittently some of the binary inputs data read by the IEC 104 Master are changing their state to zero for a transient period (~100-120ms). This firmware fixes this issue of the IEC104 Master reading incorrect data intermittently for transient period (~ 100ms to 120ms) during long runs of operation from EIS module (IEC 104 server).

New Features and Enhancements

Subject	Description
Report by Exception (RBE) of analog data without Time Stamp through ADSU13	<p>The IEC-104 communication module IC695EIS001 firmware Release 1.40 provides enhancement to enable Report by Exception of analog data without time stamp through ADSU13 spontaneously instead of ADSU36, this enhancement makes use of unused bit 10 of Option parameter [67] as described below.</p> <ol style="list-style-type: none"> Bit 10 – When set to 1, M_ME_NC_1 (ADSU Type 13) - Measured value, scaled value (Short Float) (without Time Tag) is sent as “Spontaneous” or “RBE” response instead of M_ME_TF_1 (ADSU Type 36) - Measured value, scaled value with time tag CP56Time2a. Bit 10 – Default is set to 0, In such case, M_ME_TF_1 (ADSU Type 36) - Measured value, scaled value with time tag CP56Time2a is sent as “Spontaneous” or “RBE” response and M_ME_NC_1 (ADSU Type 13) - Measured value, scaled value (Short Float) (without Time Tag) is only sent as response to “General Interrogation” or “Polling” command from Client.

Restrictions and Open Issues

Subject	ID code	Description
EIS Module goes in unresponsive state with 'LAN transceiver fault; OFF network until fixed' fault when subjected to EGD multicast traffic	Case 00453336	<p>The EIS module loses IEC104 communication with the IEC104 Master, logs a fault (fault "LAN transceiver fault; OFF network until fixed") and becomes unresponsive intermittently after some duration of operation (typically 4-8 hours depending on traffic load), when subjected to unintended EGD multicast traffic, thus requiring a module reset for restoring operation.</p> <p>To avoid this issue, it is recommended that IEC 104 module Ethernet interface be excluded from unintended EGD multicast traffic or other unintended traffic either through a physical Ethernet switch or through appropriate traffic routing.</p>

Operational Notes

Subject	Description
Station Manager unresponsive	Station Manager can become unresponsive when there is high polling rate, or high point load on the EIS001 module.
Use of Redundant IP with the EIS001 in a CRU application	IEC 104 is a connection oriented protocol, and during a role switch of a CRU controller the MAC Address of the Redundant IP will change, typically causing TCP/IP connections to be disrupted, then reconnected. It is likely that an IEC 104 Client with a connection to an EIS001 module in this type of configuration will experience a connection change, causing the IEC 104 data to be temporarily unavailable.
Use of SOE parameter with the EIS001 in a CRU application	It is not recommended that SOE be used in CRU applications, as, on a role switch, the EIS001 module can lose buffered events, but has no retention or RMX Sync.
IEC 104 Data During Role Switch with EIS001 Modules in a CRU Application	Whenever a role switch occurs in a redundant application, a bump in IEC 104 data will likely be observed at the connected IEC 104 Client. This depends on the client tolerance and AUP File parameters (<i>wkal_idle</i> , <i>wkal_cnt</i> , <i>wkal_intvl</i>). These parameters need to be adjusted to accommodate for the intervening network hops, in order to achieve optimized performance during role switching.
Use of Option Bit 0 in COMMREQ[74] use with Point Push	When option bits settings are configured to accept Point Push data only when a connection exists (i.e. Bit#0 of <i>mComreq_Setup[74] = 1</i>), be aware of the following latency issue. After the IEC 104 client connection is disrupted (cable removed or network otherwise disrupted), the Point Push data will continue to be accepted for approximately 100 ms and will be buffered. This is due to the inherent latency in detecting the disrupted connection state.
Binary ADSUs Spontaneous Event Generation	For Binary ADSUs (Single-Point and Double-Point), Spontaneous events are not reported back to the IEC 104 Client, when these points are changed via the connected IEC 104 Client. However, Spontaneous events are generated when these points are changed via an internal mechanism in the RX3i controller, such as via program logic.
Use of Report by Exception (RBE) with EIS001 Module in a CRU Application	It is not recommended that a Client use RBE (Report By Exception) data with CRU applications, as, on a role switch, there can be loss of data for a short duration.
Synchronizing the LSI Bits between CRU CPUs	In redundancy applications, synchronizing the LSI (LAN Status Interface) bits is not recommended, as it may cause the ST block that contains the COMMREQ setup to execute prematurely on a role switch. Independent bits, or Symbolic bits, should be used for the LSI data.

Product Documentation

PACSystems RX7i & RX3i TCP/IP Ethernet Communications User Manual	GFK-2224
PACSystems TCP/IP Ethernet Communications Station Manager Manual	GFK-2225
PACSystems RX3i Ethernet IEC 104 Server Module IC695EIS001 Quick Start Guide	GFK-2948
PACSystems RX3i Ethernet IEC 104 Server Module IC695EIS001 User Manual	GFK-2949
PACSystems RX3i Ethernet Module IC695ETM001 IPI	GFK-2332
PACSystems RX3i Ethernet IEC 104 Server Module IC695EIS001 IPI	GFK-2947

User manuals, product updates and other information sources are available on the website, <http://www.ge-ip.com/support>, under *Controllers and IO, RX3i Controllers*.



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