IMPORTANT PRODUCT INFORMATION

READ THIS INFORMATION FIRST

Product: PACSystems™ RX3i CPU

IC695CPU310-CC with Firmware Version 2.90

Note: This document contains information that is not available in any other publication; therefore, we recommend that you read and save it for future reference.

This is an update to the CPU firmware. Support for the following modules has been added:

- The new RX3I PROFIBUS Master module (IC695PBM300)

- Genius Bus Controller Modules: IC694BEM331 and IC693BEM331

- Serial IO Processor Modules: IC694APU305 and IC693APU305C

This update also resolves the problems described in "Problems Resolved by this Version" on page 3.

Version Identification

Hardware Identification		Firmware Identification	
Catalog Number	**Circuit Board ID**	**Firmware ID**	**Version**
IC695CPU310-CC	CP4A1	CPU Primary	2.90 Build 50A4 BOC Build 28A1
		CPU Boot	2.50 Build 25A3

CPU Programmable Parts	
Part ID	**Revision**
BIOS	f4_r05
MCU	r07/6/04
FPGA	X05
SDRAM CPLD	C
HW rev EPROM	f4_r05
MAC EPROM	f4_r05

Updates

IC695CPU310-AA is field-upgradeable to firmware version 2.90 by ordering the upgrade kit below or downloading from the services web site. The hardware is not field upgradeable.

Upgrade Kit: 44A752290-G03

Product Documentation

PACSystems CPU Reference Manual, GFK-2222

PACSystems RX3i Hardware and Installation Manual, GFK-2314

TCP/IP Ethernet Communications for the PACSystems, GFK-2224

C Toolkit for PACSystems User's Manual, GFK-2259

Proficy™ Machine Edition Getting Started, GFK-1868

Proficy Logic Developer – PLC Programming Software Getting Started, GFK-1918

Datasheet, PACSystems RX3i CPU, GFK-2316

IPI, PACSystems RX3i CPU, GFK-2329D (this document)

CPU Functional Compatibility

Subject	Description
Programmer Version Requirements	Machine Edition Logic Developer 5.0 or later must be used to configure and program the RX3i. Service Pack 2 is required to support the new features in release 2.90.
C Toolkit Compatibility	The C Toolkit for PACSystems is distributed with Machine Edition Logic Developer 5.0 or greater. Toolkit build 50A1 or later is required for use with the RX3i. Please note: The Series 90 Toolkit (IC641SWP709/719) is not compatible with PACSystems.
Series 90-30 Module Compatibility	The PACSystems RX3i supports the following Series 90-30 modules: Discrete Input Modules: IC693ACC300, IC693MDL230/231/240/241/632/634/645/646/648/654/655 Discrete Output Modules: IC693MDL310/330/340/390/730/731/732/733/734/740/741/742/748/752/753/760/930/931/940 Discrete Combinational: IC693MAR590, IC693MDR390 Analog I/O Modules: IC693ALG220/221/222/223/390/391/392/442 High Speed Counter: IC693APU300 FANUC I/O Link: IC693BEM320, IC693BEM321 Motion Control: IC693DSM314, IC693DSM324 Genius Bus Controller Module: IC693BEM331 Serial IO Processor: IC693APU305 All other Series 90-30 modules are not currently supported.
IC694 Module Compatibility	The PACSystems RX3i supports the following IC694 modules: IC694ACC300, IC694MDL230/231/240/241/632/634/645/646/654/655 Discrete Output Modules: IC694MDL310/330/340/390/732/734/740/741/742/752/753/930/931/940 Analog I/O Modules: IC694ALG220/221/222/223/390/391/392/442 High Speed Counter: IC694APU300 Fanuc I/O Link Modules: IC694BEM320, IC694BEM321 Motion Control: IC694DSM314, IC694DSM324 Genius Bus Controller Module: IC694BEM331 Serial IO Processor: IC694APU305 Expansion Backplanes: IC694CHS392/398 Expansion Power Supplies: IC694PWR321/330/331
IC695 (PCI) Module Compatibility	Ethernet Interface: IC695ETM001 Universal Analog Input Module: IC695ALG600 Profibus Master Module: IC695PBM300
Series 90-30 Expansion Rack Compatibility	The PACSystems RX3i supports local and remote Series 90-30 expansion racks. PACSystems RX3i CPUs do not operate in a Series 90-30 Rack.

Series 90-30 Main Rack Compatibility	Series 90-30 Main Racks cannot be used in a PACSystems RX3i system. Series 90-30 CPUs do not operate in PACSystemsRX3i Racks.
Isolated 24V power	In applications that use the IC69xALG220/221/222, consult *PACSystems RX3i Hardware and Installation Manual*, GFK-2314 for details of wiring the 24V power.

Problems Resolved by this Version

Subject	Description
Ref Address field of I/O Fault Table for Universal Analog Module	The I/O Fault Table Ref Address field now always displays the correct value for the Universal Analog Input module and circuit faults. (This problem was reported in the IPI for the Universal Analog Module IC695ALG600, GFK-2348.)
Error with a Flash Write or Clear	The CPU firmware no longer reports faults for large flash writes or clears.
Faults with Hot Swap and DO_IO	Previously, hot-inserting a module that does not support DO_IO into a slot configured for DO_IO, or vice versa, caused the CPU to record faults. This has now been fixed.
Hot insertion of Series 90-30 smart module to ETM slot	If a Series 90-30 smart module is hot-inserted into a slot that has been configured for an RX3i Ethernet module (ETM001), the fault table does not list multiple Extra Module faults and the module is not repeatedly reset.
CPU goes to STOP-HALT with Unsupported Module Fault	If an unsupported module is hot-inserted into the RX3i system, an Unsupported Module fault is generated, and the CPU goes to STOP-HALT mode.
"Lost" or late interrupt handling for the Universal Analog Module	This CPU pulls all interrupts from a Universal Analog Input module (IC695ALG600) when the module sends many interrupts in a short period of time. It will not appear to have lost interrupts or interrupts that execute late.
Unsupported Module fault for DSM module	After a power cycle, a DSM 314 or DSM324 module will not generate an Unsupported Module fault.

New CPU Features and Enhancements

Subject	Description
Feature Description	This version of the RX3i CPU supports: ▪ The new RX3i PROFIBUS Master module (IC695PBM300) ▪ Genius Bus Controller Modules: IC694BEM331 and IC693BEM331 ▪ Serial IO Processor Modules: IC694APU305 and IC693APU305C

CPU Restrictions and Open Issues

Subject	Description
Ethernet Disconnect During Word for Word Change	If the Ethernet connection is broken during a word-for-word change, the programmer may not allow a subsequent word-for-word change after reconnecting due to the fact that it thinks another programmer is currently attached. If this occurs, you should go offline and then back online again.
Simultaneous Clears, Loads and Stores Not Supported	Currently, PACSystems CPUs do not support multiple programmers changing CPU contents at the same time. The programming software may generate an error during the operation.
Power Cycle During Online Edit	If the user stores a folder to flash that is configured to power up from flash and then subsequently power is cycled in the middle of a Online Edit session, the programmer will still indicate that the Online Edit session is in progress after the power cycle. The user should cancel the Online Edit session to continue.

Subject	Description
Power Cycle During Write to Flash	If the CPU is power cycled during the process of writing to flash, and is configured to power up from flash, a fault will be generated on power up.
Hardware Configuration Not Equal After Changing Target Name	If the user stores a hardware configuration to flash which indicates that "Logic/Config Power up Source" is set to "Always Flash" or "Conditional Flash" and then subsequently changes the name of the target in the programming software, the hardware configuration will go Not Equal and will not Verify as equal.
PLC and IO Fault Tables May Need to be Cleared Twice to Clear Faulted State	Both PLC and IO fault tables may need to be cleared to take the CPU out of Stop/Fault mode. If one of the tables contains a recurring fault, the order in which the tables is cleared may be significant. If the CPU is still in Stop/Fault mode after both tables are cleared, try clearing the fault tables again.
Setting Force On/Off by Storing Initial Value	Once a force on or force off has been stored to the PLC, the user cannot switch from force on to force off or vice-versa directly by downloading initial values. The user can turn off the force by doing a download, and then change the force on or off by another download.
Storing Large Numbers of Blocks to Flash	Currently, storing logic with approximately 200 blocks or more to flash may fail, due to the programmer timing out.
Number of Active Programs Returned as Zero	The SNP request Return Controller Type and ID currently returns the number of active programs as zero.
Serial I/O Failure at 115K During Heavy Interrupt Load	Rare data corruption errors have been seen on serial communications when running at 115K under heavy interrupt load on the PLC. Under heavy load applications, users should restrict serial communications to 57K or lower.
RAND_MAX and rand() function incompatible	In the C Toolkit, the RAND_MAX system variable is defined as a 32-bit integer. However, the rand() function returns a 16-bit integer. By definition, rand() should return an integer between 0 and RAND_MAX.
Incorrect Commreq Status For Invalid Program Name	The program name for PACSystems is always "LDPROG1". When another program name is used in a CommReq accessing %L memory, an Invalid Block Name (05D5) error is generated.
SNP ID not always provided	Unlike the Series 90-30, the RX3i CPU's SNP ID will not appear in the Machine Edition programmer Show Status display. Service Request 11 will always return zeros.
Second programmer can change logic while in Test & Edit mode	While currently active in a Test and Edit session using Machine Edition on one PC, Machine Edition running on another PC is not prevented from storing new logic to the PLC.
FANUC I/O Master and Slave operation	Scan sets on the master do not work properly for the first operation of the scan set after entering RUN mode. They do work properly for subsequent scans. After downloading a new hardware configuration and logic, a power cycle may be required to resume FANUC I/O operation. Use PLCs of similar performance in FANUC I/O networks. If a master or slave is located in an RX3i system, the other PLCs should be RX3is or Series 90-30 CPU374s.
Must Have Logic If Powering-Up From Flash	If the application will configure the CPU to retrieve the contents of flash memory at power-up, be sure to include logic along with hardware configuration when saving to flash memory.
Avoid Ethernet module resets	Resetting the Ethernet module, either by Service Request 24 or by the restart pushbutton, will cause some of the CPU's internal memory to be consumed if EGD is configured. The problem becomes more pronounced with larger EGD configurations. Power-cycling the system will recover the internal memory.
Configuration mismatch with unsupported module causes PLC sequence store failure	If you attempt to store a hardware configuration to the CPU that has a module configured for a slot that physically contains an unsupported module, the store will fail with a sequence store failure.
Two loss of modul faults for Universal Analog mocule	Occasionally the hot removal of the Universal Analog Input Module (IC695ALG600) results in two "Loss of I/O Module" faults instead of one.
CPU logs incorrect fault for Overtemp	When the CPU detects an overtemp condition, the overtemp fault causes the CPU to go to STOP/HALT instead of STOP/FAULT.

Subject	*Description*
Powerup of High-speed Counter may take up to 20 seconds	As power is applied to a Series 90-30 High-Speed Counter module, the "module ready" bit in the status bits returned each sweep may not be set for as long as 20 seconds after the first PLC sweep, even though there is no "loss of module" indication. I/O data exchanged with the module is not meaningful until this bit is set by the module. c.f., pages 4-3 to 4-5 of GFK-0293C
Lost count at powerup for Serial IO Processor	A Serial IO Processor module will lose the first count after every powerup or every time the module receives a configuration.
Info fault at power up	Intermittently during powerup, an Informational non-critical CPU software fault may be generated with fault extra data of 01 91 01 D6. This fault will have no effect on the normal operation of the PLC. But, if the hardware watchdog timer expires after this fault and before power has been cycled again, the outputs of I/O modules may hold their last state, rather than defaulting to zero.
Serial Port Lock-up after Bad Modbus Message	If a badly-formed Modbus RTU message is sent ot the PLC, the serial port will lock up. Power must be cycled to recover proper port operation.

Faults possible when power cycling or hot-swapping smart modules in an RX3i	When power is cycled on a rack in a system containing a Series 9030 smart option module or if the module is hot-swapped in an RX3i rack, the module may intermittently fail in one of three ways:
	    1) There is a "loss of module" fault,
	    2) There is a "System Configuration Mismatch" fault, or
	    3) There is an "Unsupported hardware" fault.
	In all three cases, the module will not be scanned until power is cycled on the module. In the latter two cases, the PLC fault table must be cleared before the PLC can be placed into RUN mode. These failures are much less likely if the module is in the main RX3i rack or if the module is in an expansion rack and only the expansion rack power is cycled. If operation of the module is critical in the application, then the user logic should monitor the fault locating reference for the module, as described on pages 12-11 and 12-12 of GFK-2222.

Lost Connection to Machine Edition	On rare instances, Machine Edition may disconnect from the PLC after a download.
Possible Machine Edition disconnect when multiple Genius Bus Controllers are present in expansion/remote racks	If a system contains multiple Genius Bus Controllers in expansion/remote racks, the Machine Edition software can time out its connection to the PLC on a clear operation or a store of configuration. For each Bus Controller in an expansion/remote rack there is a 3-second delay added to the time required for a clear/store of configuration. The default connection timeout is 10 seconds and the default request timeout is 16 seconds. These values should be increased by at least 3 seconds per Genius Bus Controller in an expansion/remote rack. This is true for both Ethernet and serial programmer connections.
Timed interrupt response time increased	A Genius Bus Controller in the system may impact response time for timed interrupts. The worst case interrupt response time for a PLC system with a Genius Bus Controller and no other Genius devices is 0.5 milliseconds. The worst-case interrupt response time for a PLC system with a Bus Controller and maximum amount of Genius data is 50 milliseconds.
Extended Memory Types for IO Triggers	%R, %W and %M cannot be used as IO triggers for the Universal Analog Input module (IC695ALG600).

CPU Operational Notes

Subject	Description
Slot numbering, power supply placement, CPU placement and reference	1. The A/C Power-Supply (IC695PSA040) for the RX3i is a doublewide module whose connector is left justified as viewed when installed in a rack. It cannot be located in Slot 11 of a 12-slot rack nor Slot 15 of a 16-slot rack. No latch mechanism is provided for the last (right-most) slot in a rack, therefore it is not possible to place the power-supply in the second to last slot.

2. The RX3i CPU (IC695CPU310) is a doublewide module whose connector is right justified as viewed when installed in a rack. It is referenced for configuration and by user logic applications by the leftmost slot that it occupies. For example, if the RX3i CPU has its physical connector inserted in to slot 4, which means it occupies slots 3 and 4, the CPU is referenced as being located in slot 3. The referenced location of the CPU is not determined by what slot the physical connector is located in, but rather by the left most slot occupied by the entire module.

3. Due to item #2 above, the RX3i CPU may be located in Slot 0 of a rack (physical connector in Slot 1). In addition the CPU cannot be located in Slot 11 of a 12-slot rack nor Slot 15 of a 16-slot rack, since doing so would require the physical connector to be located in the slot reserved for an expansion module.

4. When migrating a Series 90-30 CPU system to a PACSystems RX3i CPU, be aware that to maintain the Slot 1 location of the CPU, only a singlewide power-supply may be used in Slot 0. Currently, the only available singlewide power-supply is a DC power-supply (IC695PSD040). Therefore, if the application using an existing Series 90-30 system must maintain a Slot 1 CPU and uses an AC power-supply, the RX3i system must have the RX3i AC power-supply located in a slot to the right of the RX3i CPU in Slot 1.

5. In deciding to place the CPU in slots other than Slot 1, the user should be aware of the possible application migration issues that could arise. The following lists the areas that could be affected when migrating an application from one CPU slot to another.

Item Affected		How Affected
User Logic	Service Request #15 (Read Last-Logged Fault Table Entry)	Location of CPU faults will not be the standard 0.1 location, but will reflect the slot the CPU is located in. User logic that decodes fault table entries retrieved by these service requests may need updating.
	Service Request #20 (Read Fault Tables)	
	Communications Request (Commreq)	Commreqs directed to the CPU (e.g. those directed to the serial ports of the CPU) will need to be updated with the correct CPU slot reference.
H/W Configuration	CPU Slot location	Slot location of the CPU must be updated in the HW Configuration to reflect the CPU's true location.
Fault Tables	Faults logged for the CPU	The location of faults logged for the CPU in the fault table will not be the standard 0.1 (rack.slot) location, but will reflect the CPU's actual slot.
External Devices	*Series 90 PLCs*	
	Remote Series 90 PLCs that use SRTP Channels COMMREQs expect the CPU to be in slot 1. In order to support communications with Series 90 SRTP clients such as Series 90 PLCs using SRTP Channels, the RX3i internally redirects incoming SRTP requests destined for {rack 0, slot 1} to {rack 0, slot 2}, provided that the CPU is located in rack 0 slot 2 (and the remote client has not issued an SRTP Destination service on the connection to discover the rack and slot of the CPU). This special redirection permits Series 90-30 applications that expect the power supply to be located leftmost and the CPU to be located to the right of the power supply to function. Attempts to establish channels with CPUs in slots other than 1 or 2 will fail if initiated from Series 90 PLCs.	
	HMI and External Communication Devices	
	All external communication devices that interact with the CPU should be checked for compatibility with CPU slot locations other than slot 1. Problems may arise with, but are not limited to, initial connection sequences and fault reporting. Machine Edition View customers should select "GE SRTP" as their communications driver – it can communicate with a CPU in any slot.	
	Host Communications Toolkit (HCT)	
	Applications that utilize the Host Communications Toolkit may require updated drivers.	

Subject	Description
Important Installation Instructions for Battery	A battery is shipped with the CPU unit behind the battery door on the faceplate but it is not connected. Do not connect the battery until the CPU is installed in the rack and the rack powered on. The battery may then be attached to either of the two terminals in the battery compartment. Once that is done, the CPU may be powered down and normal battery back up operation will begin. To save battery life, do not connect the battery for the first time until the CPU is powered up.
LD-PLC operations	Machine Edition LD-PLC no longer supports a function that connects to the PLC, downloads, then disconnects from the PLC. The connect and download functions are now separate. To perform a download to the PLC, you must first connect to the PLC.
Logic Executed in Row Major Instead of Column Major	Logic execution in PACSystems RX3i is performed in row major order (similar to the Series 90-30). This is different from the Series 90-70, that executes in column major order. This means that some complicated rungs may execute slightly differently on PACSystems RX3i and Series 90-70. For specific examples, see the programming software on-line help.
NaN Handled Differently Than in 90-30	The PACSystems RX3i CPU may return slightly different values for Not A Number as compared to Series 90-30 CPUs. In these exception cases (e.g., 0.0/0.0), power flow out of the function block is identical to Series 90-30 operation and the computed value is still Not A Number.
PID Algorithm Improved	The PID algorithm used in PACSystems has been improved and therefore PID will function slightly differently on PACSystems RX3i than on the Series 90-30. The differences are that the elapsed time is computed in 100 µS instead of 10 mS units. This smooths the output characteristic, eliminating periodic adjustments that occurred when the remainder accumulated to 10mS. Also, previous non-linear behavior when the integral gain is changed from some value to 1 repeat/second was eliminated.
Some Service Requests different from Series 90-30 or no longer supported	▪ Service Requests 6, 15, and 23 have slightly different parameters. Refer to GFK-2222. ▪ PACSystems PLCs support Service Request 26/30 functionality via fault locating references. ▪ Service Request 13 requires a valid value in the input parameter block (Refer to GFK-2222 for details). On the Series 90-30 and Series 90-70 the parameter block value was ignored. ▪ Service Requests 48 and 49 are no longer supported (there is no auto-restart) because most faults can be configured to be not fatal.
IL and SFC	IL and SFC are not available.
DO I/O Instruction	The Series 90-30 Enhanced DO I/O instruction is converted to a standard DO I/O instruction (the ALT parameter is discarded and ignored.)
END Instruction	The Series 90-30 END instruction is not supported. Alternate programming techniques should be used.
Non-nested JUMP, LABEL, MCR, & ENDMCR Instructions	Non-nested JUMPs, LABELs, MCRs, & ENDMCRs are translated to the corresponding nested JUMPs, LABELs, MCRs, & ENDMCRs when converting from Series 90-30 to PACSystems RX3i.
Changing IP Address of Ethernet Interface While Connected	Storing a hardware configuration with a new IP address to the RX3i while connected via Ethernet will succeed, then immediately disconnect because the RX3i is now using a different IP address than the Programmer. You must enter a new IP address in the Target Properties in the Machine Edition Inspector window before reconnecting.
Duplicate Station Address for Modbus Will Conflict with Other Nodes	The default serial protocol for the RX3i is Modbus RTU. The default Station Address is 1. If the PLC is added to a multi-drop network, care must be taken that the PLC is configured with a unique Station Address. Nodes with duplicate Station Addresses on the same network will not work correctly.

Subject	Description
Timer Operation	Care should be taken when timers (ONDTR, TMR, and OFDTR) are used in program blocks that are NOT called every sweep. The timers accumulate time across calls to the sub-block unless they are reset. This means that they function like timers operating in a program with a much slower sweep than the timers in the main program block. For program blocks that are inactive for large periods of time, the timers should be programmed in such a manner as to account for this catch up feature. Related to this are timers that are skipped because of the use of the JUMP instruction. Timers that are skipped will NOT catch up and will therefore not accumulate time in the same manner as if they were executed every sweep.
Constant Sweep	Constant Sweep time, when used, should be set at least 10 milliseconds greater than the normal sweep time to avoid any over-sweep conditions when monitoring or performing on-line changes with the programmer. Window completion faults will occur if the constant sweep setting is not high enough.
Large Number of COMMREQs Sent to Module in One Sweep Causes Faults	A large number of COMMREQs (typically greater than 8) sent to a given board in the same sweep may cause Module Software faults to be logged in the PLC fault table. The fault group is MOD_OTHR_SOFTWR (16t, 10h) and the error code is COMMREQ_MB_FULL_START (2). When this occurs, the "FT" output of the function block will also be set. To prevent this situation, COMMREQs issued to a given board should be spread across multiple sweeps so that only a limited number (typically 8 or less) of COMMREQs are sent to a given board in each sweep. In addition, the FT output parameter should be checked for errors. If the FT output is set (meaning an error has been detected), the COMMREQ could be re-issued by the application logic.
C Block Standard Math Functions Do Not Set errno	In C Blocks, standard math functions (e.g. sqrt, pow, asin, acos) do not set errno to the correct value and do not return the correct value if an invalid input is provided.
Upgrading Firmware	The process of upgrading the CPU firmware with the WinLoader utility may fail when multiple IO modules are in the main rack, due to the time it takes to power cycle the rack system. If the upgrade process fails, move the CPU to a rack without IO modules and restart the upgrade process. Winloader initial connect baud rate is fixed at 19200 baud. Note that the firmware download will occur at 115.2K baud by default. Note that if you have hyperterm open on a port, and then try to use Winloader on the same port, Winloader will often say "Waiting for Target" until the hyperterm session is closed.
Hot Swap	Hot Swap of power supplies or CPUs is not supported in this release.
Single Power Supply	Use only one power supply in an RX3i main rack.
Serial Port Configuration COMMREQs	With the following combination of circumstances, it is possible to render serial communications with the CPU impossible: 1. User configuration disables the Run/Stop switch 2. User configures the power up mode to Run or Last 3. Logic is stored in FLASH and user configures CPU to load from FLASH on power up 4. User application issues COMMREQs that set the protocol on both of the serial ports to something that does not permit communications to the ME programmer.