PACSystems^{TM} RX3i

GENIUS COMMUNICATIONS GATEWAY
USER MANUAL

EMERSON.

Contents

Warning 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 to 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.

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

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Chapter 1:   Introduction

This manual describes the RX3i Genius Communications Gateway, which acts as a gateway between PROFINET and Genius I/O. Introductory material may be found in this chapter. Chapter 2 provides installation and set-up information. Chapter 3 provides configuration instructions. Chapter 4 describes system operation. Chapter 5 provides diagnostic information. Chapter 6 covers the use and format of ladder logic COMMREQ instructions.

1.1   Revisions in this Manual

Rev	Date	Description
G	Aug 2019	Following Emerson's acquisition of this product, changes have been made to apply appropriate branding and registration of the product with required certification agencies. No changes to material, process, form, fit or functionality.
F	Mar 2019	In Section 5.1.3, added Fault Status Data.
E	Oct 2018	Added note 3.2.2 concerning PNC001 Critical Network Ports feature with GCGs.
D	Mar 2018	Added compatibility with CPE302.
C	Dec 2017	Added support for Field Control Bus Interface Unit. Added Outputs at Startup hardware configuration parameter. Added Enable/Disable Outputs and Switch BSM COMMREQs. Documented GCG001 Units deployed in Genius Hot Standby Dual Bus Redundancy (Section 3.2.5).
B	Aug 2016	Added support for VersaMax Genius Network Interface (GNIU) Added support for IC660BSS101 isolated I/O block Added support for additional Genius baud rates
A	Mar 2015	Behavior of GCG001 with respect to input references associated with a faulted block is described in Section 1.10, with workaround in Section 4.1.4. Correction to Figure 27: Genius Hot Standby Redundancy to indicate CPU type is CRU and RMX modules are required. Clear All Faults can now be dispatched to all blocks on the bus in a single command. See Section 6.4.6.
-	Jun 2014	Initial release

1.2 Acronyms and Abbreviations

AR	PROFINET Application Relationship
CR	PROFINET Communication Relationship
DCP	PROFINET Discovery & Configuration Protocol
GBIU	Genius Bus Interface Unit
GCG	Genius Communications Gateway (specifically GCG001)
GENA	Genius Network Adaptor
GENI	Genius Network Interface
GNIU	Genius Network Interface Unit
GR7	Series 90-70 Remote I/O Scanner (IC697BEM733)
GSDML	General Station Description Markup Language
HHM	Genius Hand-Held Monitor
HWC	Hardware Configuration (in PME)
LAN	Local Area Network
LED	Light Emitting Diode
MRC	Ethernet Media Redundancy Client
MRM	Ethernet Media Redundancy Manager
MRP	Ethernet Media Redundancy Protocol
NRT	Non-Real-Time PROFINET Communication
PCIM	Personal Computer Interface Module
PME	PAC Machine Edition
PNC	PROFINET Controller
PPV	PLC Protocol Variables
RT	Real-Time PROFINET Communication
SBA	Genius Serial Bus Address
SD	Secure Digital Card Slot
STP	Shielded Twisted Pair
UTP	Unshielded Twisted Pair

1.3   PACSystems Documentation

PACSystems Manuals

PACSystems RX7i, RX3i and RSTi-EP CPU Reference Manual	GFK-2222
PACSystems RX7i, RX3i and RSTi-EP CPU Programmer's Reference Manual	GFK-2950
PACSystems RX7i, RX3i and RSTi-EP TCP/IP Ethernet Communications User Manual	GFK-2224
PACSystems TCP/IP Ethernet Communications Station Manager User Manual	GFK-2225
C Programmer's Toolkit for PACSystems	GFK-2259
PACSystems Memory Xchange Modules User's Manual	GFK-2300
PACSystems Hot Standby CPU Redundancy User Manual	GFK-2308
PACSystems Battery and Energy Pack Manual	GFK-2741
PAC Machine Edition Logic Developer Getting Started	GFK-1918
PAC Process Systems Getting Started Guide	GFK-2487
PACSystems RXi, RX3i, RX7i and RSTi-EP Controller Secure Deployment Guide	GFK-2830
PACSystems RX3i & RSTi-EP PROFINET I/O Controller Manual	GFK-2571
PACSystems RX3i Genius Communications Gateway	GFK-2928

RX3i Manuals

PACSystems RX3i System Manual	GFK-2314
PACSystems RX3i PROFINET Scanner Manual	GFK-2737
PACSystems RX3i CEP PROFINET Scanner User Manual	GFK-2883

Distributed I/O Systems Manuals

Genius I/O System and Communications User's Manual	GEK-90486-1
Genius I/O Analog and Discrete Blocks User's Manual	GEK-90486-2
Genius Hand-Held Monitor User's Guide	GFK-0121

VersaMax Systems Manuals

VersaMax System Genius Network Interface Unit User's Manual	GFK-1535

In addition to these manuals, datasheets and product update documents describe individual modules and product revisions. The most recent PACSystems documentation is available on the EMERSON support website https://www.emerson.com/Industrial-Automation-Controls/support.

1.4   Description

The RX3i Genius Communications Gateway, IC695GCG001 (or GCG001), interfaces Genius IO devices on a Simplex Genius Serial Bus to an EMERSON PROFINET IO Controller.

Figure 1: Simplex PLC System Using Genius Gateway GCG001
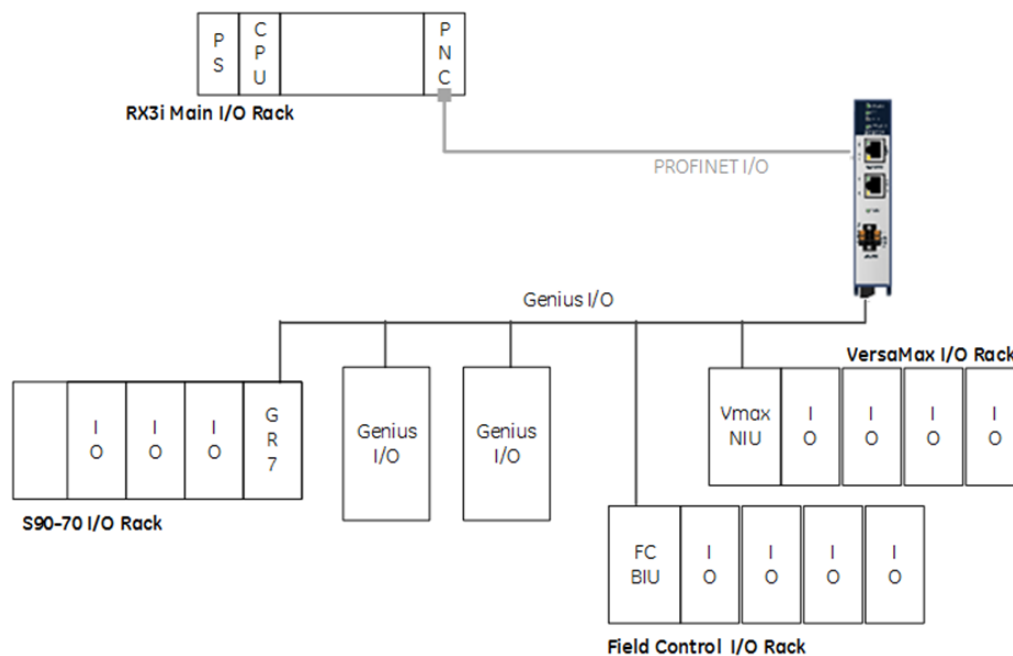
The GCG001 operates as a Genius Bus Controller on a Genius network. It scans the Genius IO devices configured to it, retrieving input data and providing output data. It then exchanges that data with its configured PROFINET IO Controller over its Ethernet interfaces at the configured production rate. The GCG001 can manage communications for up to 31 Genius IO devices on a single Genius Serial Bus.

The GCG001 also operates as an IO Device on PROFINET. It may be controlled by any of the following PROFINET IO Controllers:

- PNC001 (the RX3i rack-mounted PNC module), or by
- CPE330 LAN 2 when configured as a PROFINET LAN, or by
- CPE400 LAN 2 when configured as a PROFINET LAN.

Thus, when correctly configured, the entire Genius Bus, including the GCG001 itself, becomes visible to the controlling PLC. Note that the GCG001 operates only with EMERSON PLC PROFINET IO Controllers.

PROFINET operates on an Ethernet network. If the Ethernet network or Genius serial bus communications are lost, the GCG001 manages I/O states according to the individual module configurations.

Both PROFINET and Genius may be set up in Redundant configurations. These are discussed later in this manual.

1.5   Product Overview

Features of the GCG001 module include:

- Attachment of two RJ-45 Ethernet connections (Ports 1 & 2)

- Support for both star (switched) and linear (daisy-chained) network topologies

- Supports Ethernet Media Redundancy Protocol (MRP)

- LEDs to indicate Ethernet status (ACT & LINK)

- Genius bus terminal block attachment

- Supports Genius Redundancy consisting of a single Genius bus with two GCG001 Gateways, one at SBA #30 and the other at SBA #31.

- LED to indicate Genius Communications Status (COM)

- LEDs to indicate module status (refer to module header)

- Panel-mount (typical)

- Optional mounting in RX3i expansion slot

- Cable tie-down loop on underside of module (at front)

- 24Vdc power connector on underside of module

- 0.2A maximum current draw

- Secure Digital (SD) Card Slot, accessible at rear of module

- Firmware load pushbutton, accessible at rear of module

Figure 2: GCG001 Module

Note: Although the hardware supports the 10/100BASE TX Ethernet standard, PROFINET I/O over wired infrastructure must be 100Mbps full-duplex or faster. 10Mbps should not be used for PROFINET.

1.6 Specifications

RX3i Genius Communications Gateway Specifications

PROFINET Support	PROFINET version 2.3 Class A IO-Device
CPU Compatibility	RX3i CPE330 RX3i CPE302/CPE305/CPE310 with firmware version 8.15 or later RX3i CPU315/CPU320/CRU320 with firmware version 8.15 or later Rx3i CPE302 (any firmware version)
PNC001 Compatibility	Firmware version 2.05 or later
Embedded PROFINET Compatibility	RX3i CPE400 embedded PROFINET RX3i CPE330 embedded PROFINET with firmware version 8.90 or later
PAC* Machine Edition Compatibility	PME 8.0 or later
Power Requirements	External 24Vdc: (±10%) 0.2A
Operating Temperature Range	0 to 60°C
Number of Port Connectors	Two RJ-45
Local Area Network (LAN)	IEEE 802.2 Logical Link Control Class I IEEE 802.3 CSMA/CD Medium Access Control 10/100 Mbps
Status Data	64 (two banks of 32 bits)
Genius Bus Support	Supports One Genius Bus. Serial 1, Serial 2, Shield in and Shield Out, as marked. Up to 29 additional devices supported per Genius Bus. Selectable Baud Rate, per Genius specifications. Genius Hot Standby and Duplex Redundancy supported.
HHM Compatibility	IC660HHM501
Other Genius Compatibility	See table in Section 1.11
SD Card	2GB or smaller. Not compatible with SDHC or SDXC cards.
Configuration	GSDML file is available on the Support website for download and import into PME. The GSDML supporting a firmware release is part of the firmware upgrade kit available on the Support website.
Hot Swappable	The Genius Gateway requires an external 24Vdc power supply and does not draw power from the Rx3i backplane. Swapping out the GCG001 will therefore not impact the PLC. However, this cannot be performed without disconnecting its power supply. If configured to support Genius Hot Standby, the loss of a single GCG001 will be tolerated; otherwise not.

For system standards, general operating specifications, and installation requirements, refer to the PACSystems RX3i System Manual, GFK-2314.

1.7   Controls and Indicators

The following figure shows the front of the module and identifies the controls and indicators.

Figure 3: Genius Gateway GCG001 Front Panel View
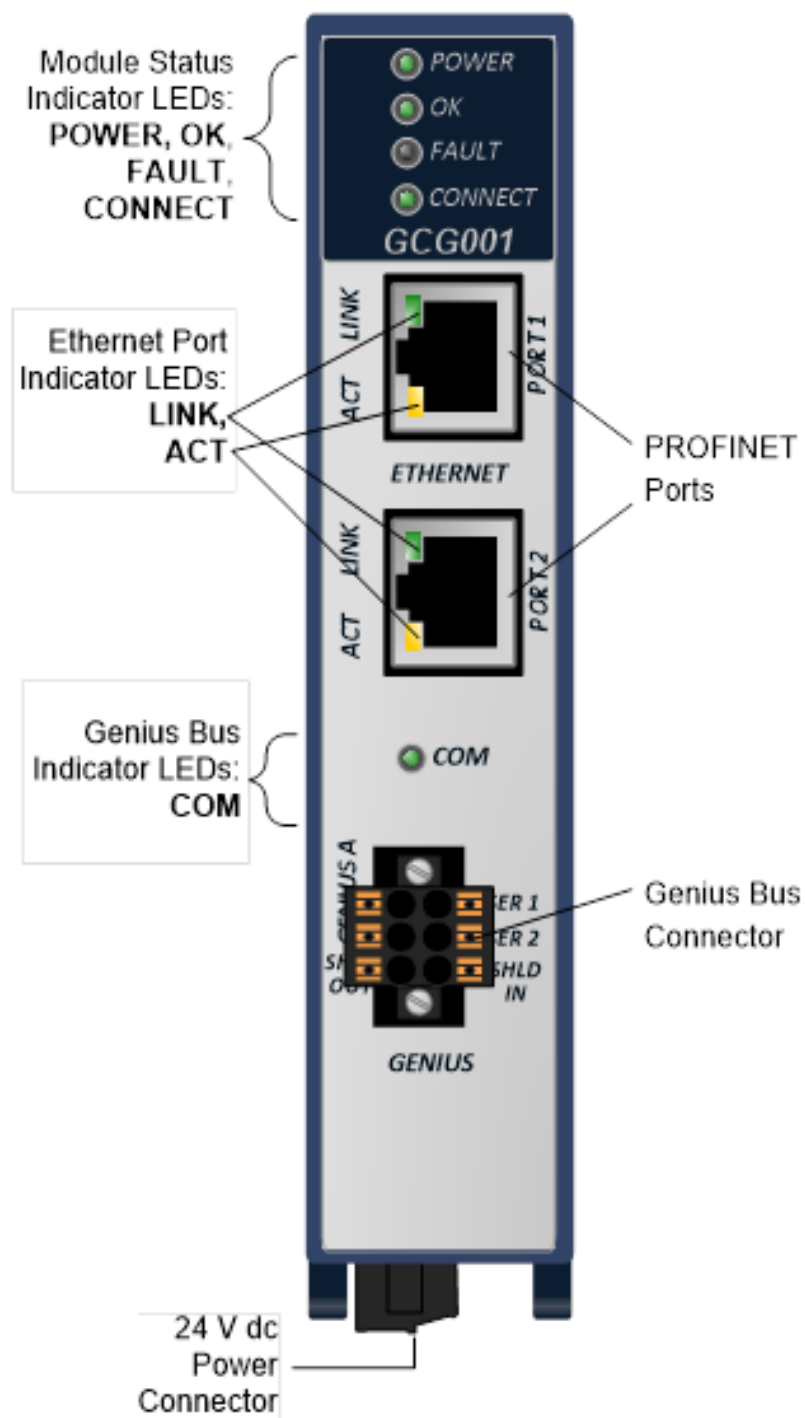
1.7.1　　　Mounting

The GCG001 may either be panel-mounted or be mounted in the rightmost slot (expansion slot) of an RX3i rack (IC695CHS012 or IC695CHS016).

Note:

1. *The SD Card supplied with the GCG001 will have been installed at the factory. See section 2.4.1 for instructions for installing the SD Card when doing a retrofit. The presence of the SD Card should be checked before mounting the module.*

2. *Clearance of 3 inches (75mm) must be provided above and below the module for proper ventilation and to permit cable access.*

3. *External power must always be supplied to the module, regardless of which mounting arrangement is chosen. When rack-mounted, the GCG001 does not draw power from the RX3i Universal Backplane.*

RX3i Backplane Mounting

The GCG001 may be mounted in the rightmost slot (expansion slot) of an RX3i Universal Backplane.

The two captive M3.5 screws at the rear of the GCG001 align with mating tapped holes on the right side of the backplane, providing a convenient mounting location. When rack-mounted, the module does not contact the backplane connector.

Panel-Mounting

Panel-mounting allows for mounting where no RX3i backplane slot is available. The two captive M3.5 machine screws on the GCG001 can be used for attaching the unit to a panel.

Note:　　*The panel must have a minimum thickness of 2.4mm (0.094in).*

1. *Drill two mounting holes using the spacing shown in the drawing (at right) and tap for M3.5 (3.5 x 0.6mm).*

2. *Align the two mounting screws of the module with the mounting holes in the panel.*

3. *Using a Philips screwdriver, tighten the two screws to a maximum torque of 0.5 Nm (4.4 in-lbs).*

Figure 4: GCG001 Panel Mount Diagram
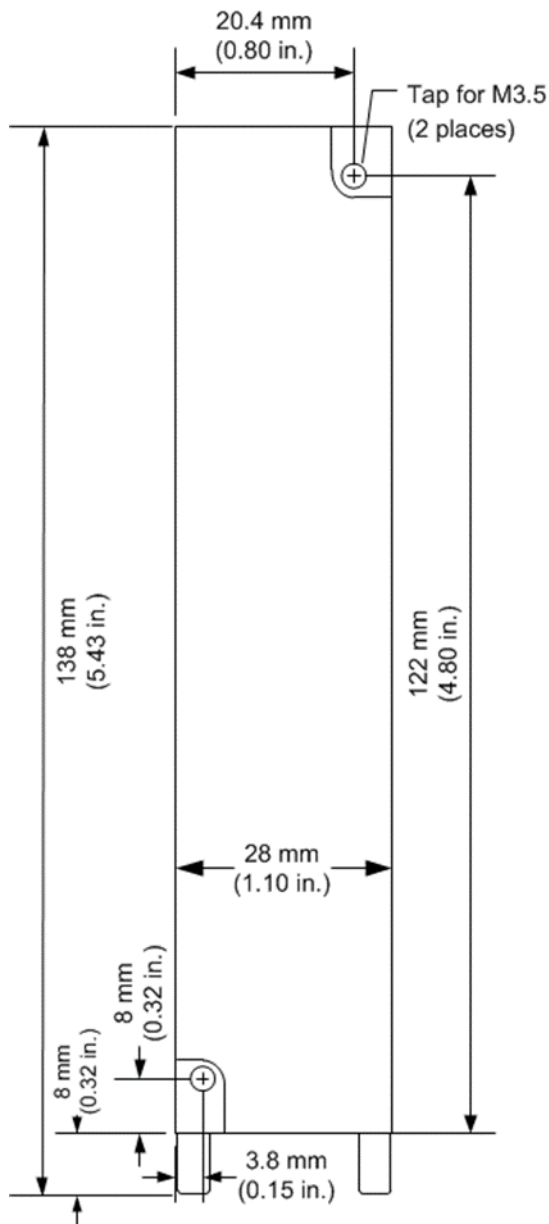
1.8 PROFINET Operation Overview

An RX3i Genius Communications Gateway (GCG001) uses PROFINET communications for data exchange with the PLC. As noted above, the data rate must be 100Mbps full-duplex or faster. The same network may be used for basic Ethernet communications, but use of a separate Ethernet network and RX3i Ethernet interface is recommended.

PROFINET Communications

Communications on an RX3i PROFINET network use the standard PROFINET communications described in this section. Note, however, that the Genius Gateway GCG001 is constrained to work only with EMERSON PROFINET PLC products.

Application Relationships

Before a PROFINET IO-Controller can exchange data with a PROFINET IO-Device such as the GCG001, an Application Relationship (connection) must be established between the devices. The PROFINET IO-Controller automatically sets up the correct number and types of Application Relationship and Communication Relationship channels (see below) based on its PME configuration. Usually, only one Application Relationship is established per IO-Device.

Communication Relationships within an Application Relationship

Within each Application Relationship, the PROFINET IO-Controller establishes the following types of Communication Relationships (CRs):

Record Data CRs – always the first to be established within an Application Relationship. Record Data Communication Relationships are used for non-real-time transfers of data records such as startup parameter data, diagnostics data, identification data, and configuration data.

IO CRs – used for the real-time, cyclic transfer of IO data

Alarm CR – used for real-time, acyclic transfer of alarms and events

The following illustration represents an Application Relationship between an RX3i PROFINET Controller and an RX3i Genius Gateway GCG001.

Figure 5: Application Relationships between PROFINET Controller & Genius Gateway
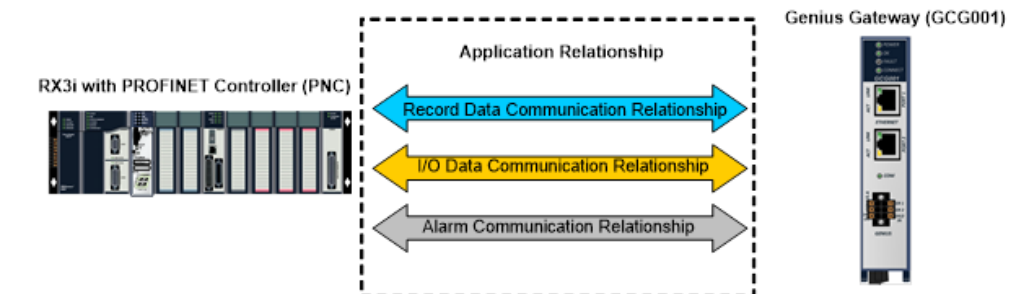
Types of PROFINET Communications

Genius Communications Gateways use two types of PROFINET communication transfers: real-time and non-real-time. The illustration below shows real-time communications as solid lines and non-real-time communications as dashed lines.

Figure 6: Real-Time & Non-Real-Time communication
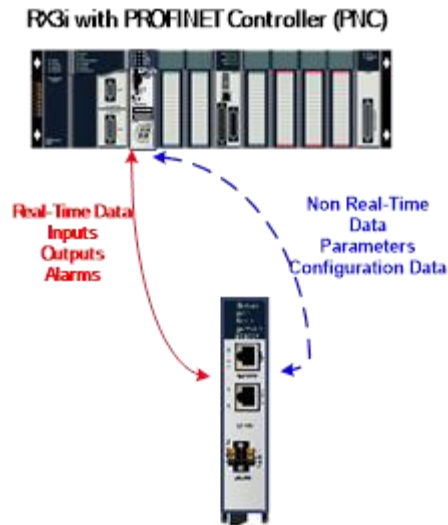
Real-Time (RT) communication: PROFINET real-time communication is used for time-sensitive data. A PROFINET IO-Controller (PROFINET Controller) and PROFINET IO-Device use two types of real-time communications to exchange data: cyclic communication and acyclic communication:

Real-time Cyclic communication is used to periodically transfer the application's input and output data. Cyclic communication occurs each PROFINET IO production cycle.

Real-time Acyclic communication is used to transfer non-periodic data such as alarms. Acyclic communication occurs only when needed.

Non-Real-Time (NRT) communication: PROFINET non-real-time communication is used for less time-sensitive data such as configuration, parameterization, diagnostics, and identification data.

Operations of the Genius Communications Gateway

The Genius Communications Gateway performs the following operations:

Consumes PROFINET IO-Device configuration from the PROFINET IO-Controller over the PROFINET network.

Scans input data from each Genius device it manages and produces that data to the PROFINET IO-Controller.

Consumes the output data that it receives from the PROFINET IO-Controller and applies it to each Genius device it manages.

Where needed, translates Genius Datagrams (background traffic) into PROFINET packages that are sent to the PROFINET Controller. This includes Datagrams that originated at the Genius Devices, such as Fault Reports.

Translates PROFINET packages that are sent by the PROFINET Controller into Genius Datagrams. This includes Datagrams that originated at the PLC through use of COMMREQ or Data_Init_Comm instructions. For example, a COMMREQ is used to generate a Clear Fault Report datagram.

IO Scanning

In the PACSystems RX3i PROFINET network, multiple IO cycles run asynchronously and independently. Figure 7 illustrates typical cycles in a system with an RX3i CPU with a PROFINET Controller module communicating with a Genius Communications Gateway. Cycles may be different for third-party devices.

Figure 7: PLC - GCG - Genius Scan Cycles
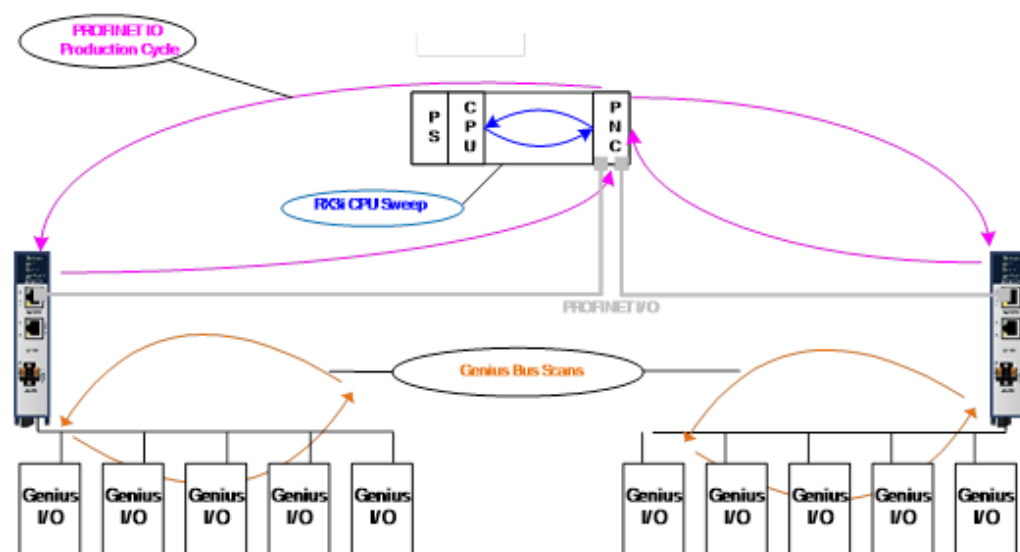
Genius IO-Device Scan: In this example, each GCG scans all its Genius devices. The GCG stores the devices' input data into its internal memory. Every time the GCG gets a turn on the Genius bus, it transmits the output data from its internal memory to each of the Genius devices.

3rd party devices: The transfer of IO data between an IO module and the PROFINET IO network is device dependent. Refer to the third-party manufacturer documentation for specifics for a device.

PROFINET IO Production Cycle: Each PROFINET Controller and IO-Device publishes data from its internal memory onto the network at its scheduled PROFINET production cycle (Note: Production cycles between IO-Controllers and IO-Devices are not synchronized; each publishes at its configured update rate independently). The PROFINET Controller publishes output data received from the RX3i CPU to each IO-Device, and the IO-Device publishes input data from its memory to the PROFINET Controller.

RX3i CPU Sweep: The RX3i CPU Sweep includes both an input scan and an output scan. The CPU input scan retrieves the current input data being stored within the PROFINET Controller module. This input data is then available for use by the application logic. After the logic solution, the CPU output scan writes the outputs to the PROFINET Controller.

Media Redundancy Protocol Support

PROFINET Media Redundancy Protocol (MRP) supports devices configured in a ring topology. MRP is specified as part of IEC62439 and has been adopted by the PROFINET specification, which provides for convenient configuration of the ring topology and necessary parameters. Like PROFINET IO data, Media Redundancy Protocol operations are not routable between different IP subnets.

Each device within an MRP ring has two physical pathways to the IO-Controller. To connect to the ring, each device requires an integrated switch with at least two external ports (ring ports) that support MRP. Devices that are not MRP-capable can be connected to a device in the ring (i.e., an MRP-capable switch in the ring), but they should not be in the ring themselves. The redundancy capability offered by the ring topology only extends to the devices on the ring that are MRP-capable and enabled.

One of the devices on the ring must be configured as the Media Redundancy Manager (MRM), and all the other devices must be configured as Media Redundancy Clients (MRCs). The GCG001 can be configured as an MRC. Configuring the GCG as an MRC alters how the Ethernet ports connect to the network. They attempt to indicate their state to the MRM before allowing traffic to flow between the ports and close the ring topology through the internal switch. They also send out notifications to the MRM when a port is lost. Operation of the GCG001 is otherwise unchanged.

The MRP configuration is stored in non-volatile storage in the GCG001 and activated immediately upon powering up. Non-volatile storage is updated as part of a connection with the IO-Controller. A PROFINET Discovery & Configuration Protocol (DCP) Reset disables MRP Client operation and updates non-volatile storage. The current state of the MRP configuration is provided as part of the GCG's Gateway Status Bits which are accessible to user application logic. Refer to the description of Gateway Status Bits in Section 5.1.1 for further details.

Fast ring-break detection is not fully functional until all MRP clients have received their MRP configuration. For a discussion of ring-break detection and bump less operation with MRP, refer to sections 6.1.1 and 6.1.2 in the PACSystems RX3i & RSTi-EP PROFINET I/O Controller Manual, GFK-2571K or later.

1.9　System Limits

IO-Controllers have limitations on the size of the system they support. One of these limits is the number of PROFINET sub-modules supported. The GCG001 uses four sub-modules: two for basic operation and two built-in port sub-modules that are always configured. Each Genius device attached to a GCG001 uses one additional sub-module.

Other limitations, such as the configuration and IO sizes are specific to the configuration options chosen. Note that not every combination of options is supported in every system. If the configuration uses all Genius bus slots with a corresponding large device count, the memory of the IO-Controller system will be a limiting resource.

Refer to the PACSystems RX3i & RSTi-EP PROFINET I/O Controller Manual, GFK-2571, for actual limits in the RX3i PROFINET Controller (PNC001) and the embedded PROFINET controllers.

Refer to the Genius I/O System and Communications User's Manual, GEK-90486-1 for information on how much I/O, and which type of I/O, need to be allocated to Genius devices.

PME (v8.0 or later) considers both system limits and I/O allocation.

1.10   Operational Differences vs. Genius Bus Controller

Persons migrating from a Genius environment where the Genius Bus Controller performs functions like those of the GCG001 will want to be aware of the following differences:

1. COMMREQ function block SYSID and Task parameters change. SYSID is now the rack & slot of the PNC connected to the GCG001. Task is now 132.

2. COMMREQ data blocks are different, mainly due to added PROFINET Device Number and expansion of memory address fields from one word to two words. See COMMREQ summary in Section 0.

3. Pulse Test and Assign Monitor COMMREQs do not support Genius bus address of 255 to send messages to all blocks.

4. COMMREQ commands: GCG001 does not support all datagrams. See section 6.3.2 for a corresponding list of supported COMMREQs.

5. GCG001 supports hot-standby, duplex, and dual-bus redundancy modes[1]. Dual-bus requires additional application code.

6. GCG001 can be assigned to bus addresses 30 and 31 only.

7. GCG001 does not support GENI, GENA, or PCIM.

8. Prior to V1.1.1, fault contact operation has changed. Whenever there is a fault on a single channel of a Genius block, all fault contacts associated with that Genius block will become active. All faults on that device must be cleared before any of the fault contacts will de-energize. Beginning with V1.1.1, when there is a fault on a single channel, none of the fault contacts will become active.

9. Genius faults routed through a GCG001 appear as PROFINET faults to the CPU. The same fault routed through a Genius Bus Controller will present a different error code.

10. Circuit Fault Behavior:

    - Prior to GCG firmware release V1.1.1, when a Genius block encounters a circuit fault on one or more points or channels, the GCG001 causes all the input references associated with that block to either hold last state or go to default values until such time as the fault is cleared. See the Alarms discussion in section 4.1.4 for a work-around to this behavior.

    - Beginning with V1.1.1, when a Genius block encounters a circuit fault on one or more points or channels, the GCG will cause only the faulted input references

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[1] For Dual Bus Redundancy, GCG001 firmware version 2.2.0 or later is required; for all other redundancy modes, version 1.1.0 (minimum) is required.

to hold the last state or go to default values. The other points or channels on the block will continue to operate normally.

11. Beginning with V2.2.2, Addition of Module and Loss of Module faults will not be logged when Genius devices change their online status with the Genius bus. The user must monitor the 32 bits of Genius Status Data to determine if Genius Devices are operational or no

12. t

13. Genius Status Data to determine if Genius devices are operational or not.

14. Beginning with V2.2.4.1 Fault Status Bits are available to monitor each device on the bus. Refer to Section 5.1.3 for additional information.

1.11 Supported Genius Devices

The following Genius devices are compatible with the GCG001 Genius Communications Gateway.

Catalog Number	Description
IC200GBI001[2]	VersaMax Genius Network Interface Unit (GNIU)
IC660BBA020	24/48Vdc 4-Input/2-Output Analog Block
IC660BBA021	24/48Vdc RTD Input Block
IC660BBA023	24/48Vdc Thermocouple Input Block
IC660BBA024	24/48Vdc Current–Source Analog Block
IC660BBA025	24/48Vdc Current–Source Output Block
IC660BBA026	24/48Vdc Current–Source Input Block
IC660BBA100	115Vac 4-Input/2-Output Analog Block
IC660BBA101	115Vac RTD Input Block
IC660BBA103	115Vac/125Vdc Thermocouple Input Block
IC660BBA104	115Vac/125Vdc Current–Source Analog Block
IC660BBA105	115Vac/125Vdc Current–Source Output Block
IC660BBA106	115Vac/125Vdc Current–Source Input Block
IC660BBD020	24/48Vdc 16-Circuit Source I/O Block
IC660BBD021	24/48Vdc 16-Circuit Sink I/O Block
IC660BBD022	24Vdc 16-Circuit Source I/O Block
IC660BBD023	24Vdc 16-Circuit Sink I/O Block
IC660BBD024	12/24Vdc 32-Circuit Source I/O Block
IC660BBD025	5/12/24Vdc 32-Circuit Sink I/O Block
IC660BBD100[3]	115Vac 8-Circuit Grouped Block
IC660BBD101	115Vac Low–Leakage 8-Circuit Grouped Block
IC660BBD110	115Vac 16-Circuit Input Block
IC660BBD120	High–Speed Counter Block
IC660BBR100	16-Circuit Relay Block, normally–Closed
IC660BBR101	16-Circuit Relay Block, Normally–Open
IC660BBS100	115Vac/125Vdc 8-Circuit Isolated I/O Block
IC660BBS101	115Vac/125Vdc 8-Circuit Isolated I/O Block Without Failed Switch Diagnostic
IC660BBS102	115Vac/125Vdc 8-Circuit Isolated I/O Block

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[2] Refer to VersaMax System Genius Network Interface Unit User's Manual, GFK-1535, Chapter 1 for a list of VersaMax modules supported by GBI001
[3] Prior to GCG version 2.2.4.2, in PME Hardware Configuration, configure the BBD100 as a BBD101.

Catalog Number	Description
IC660BBS103	115Vac/125Vdc 8-Circuit Isolated I/O Block Without Failed Switch Diagnostic
IC670GBI002 IC670GBI102	Field Control Genius Bus Interface Unit (GBIU)
IC697BEM733	Series 90-70 Remote I/O Scanner (GR7)

Chapter 2:   Installation

This chapter provides instructions for installing the module. The following topics are covered.

- Pre-Installation check
- Module installation and removal
- Port connections
- LED indications
- Firmware updates

For additional information about RX3i system installation, see the PACSystems RX3i System Manual, catalog number GFK-2314.

For additional information about PROFINET installation and configuration, refer to the PACSystems RX3i & RSTi-EP PROFINET I/O Controller Manual, GFK-2571. You will also need PAC Machine Edition (PME) configuration and programming software, version 8.0 or later.

2.1   Pre-Installation Check

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. EMERSON will cooperate fully 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.

If you need technical help, contact Technical Support. For phone numbers and email addresses, see the Contact Information page in the front of this manual.

2.2   Installation Location

This product is primarily 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. At 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 IP20 rating (IEC 60529) providing at least a pollution degree 2 environment. For details about installing RX3i rack systems, refer to the PACSystems RX3i System Manual, GFK-2314.

2.3 Installation in Hazardous Areas

The following information is for products bearing the UL marking for Hazardous Areas or ATEX marking for explosive atmospheres:

CLASS 1 DIVISION 2 GROUPS 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 nonhazardous 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.

> **⚠ WARNING**
>
> - EXPLOSION HAZARD - USB PORT IS ONLY FOR USE IN NONHAZARDOUS LOCATIONS, DO NOT USE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.

2.3.1 ATEX Zone 2

The module 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.

2.3.2 ATEX Marking

⟨Ex⟩ II 3 G   Ex nA IIC T4 X Ta: 0 - 60C

2.4 Module Installation

2.4.1 Install SD Card

The SD card slot is designed to support a Secure Digital (SD) non-volatile memory card in standard capacity format. This optional card has two distinct uses: (1) backup storage of some key PROFINET configuration data and (2) loading new GCG001 module firmware. Insert the SD Card into its slot at the rear of the GCG001 before mounting the module, as shown in Figure 8.

Figure 8: Rear View of GCG001

Firmware Load Pushbutton   SD Card Slot
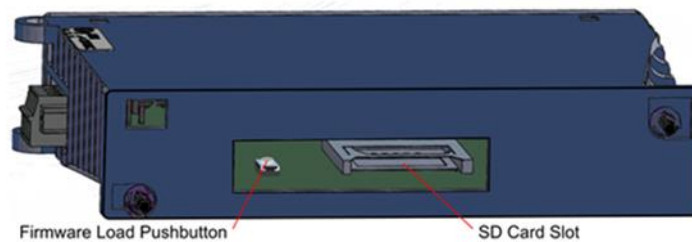
When shipped from the factory, the SD card will have been pre-installed. It will have been programmed with the then-current version of the firmware for the GCG001. In the event the firmware on the SD card needs to be updated, see section 2.7. Note that the firmware upgrade should be performed before mounting the module.

2.4.2 Mounting the GCG001

The GCG001 is designed to mounted in one of the following ways:

a.   In the expansion slot of an RX3i Universal Backplane

b.   Panel-mounted

In both cases, at least 75 mm (3 in.) must remain clear above and below the module to allow for convection cooling. See section 0 for mounting details.

Once the module has been mounted, connect 24Vdc power via the connector on the underside of the module, connect PROFINET via the RJ-45 connectors and the Genius bus via twisted pair cable. Each connection is described in the following section.

Once all connections are in place, it will be necessary to configure PROFINET. This is also discussed in the following sections

Power Connection

The module requires a user-supplied 24Vdc (±10%) power source wired to the removable screw-terminal block located on the bottom of the module. Connector pin-outs are identified on the module, as indicated at right. The module draws 0.2 A maximum current.

Figure 9: GCG001 Power Connector

(Use for cable tie-downs)

RTN
+24 VDC

24 Vdc Power Connector
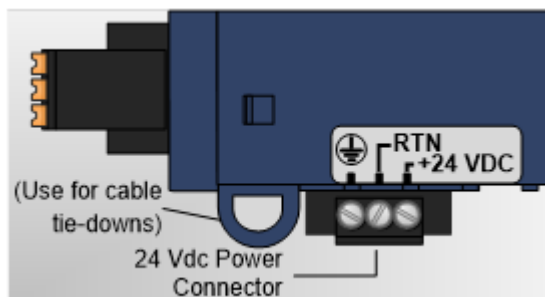
Grounding

For proper operation, always connect the GCG001 ground terminal (see Figure 9, above) to earth ground. The panel to which the GCG001 module is mounted, or the RX3i Universal Backplane to which it is mounted, must have a safety ground connection to protective earth. This ground wire must be at least 1.5 mm2 (16 AWG).

Connect the frame ground connection on the power plug to protective earth.

Terminate all ground wires at the same grounding point.

Make all ground wires as short as possible.

Where the grounding terminal contacts a painted enclosure panel, scrape the paint away down to clean, bare metal to ensure good contact.

PROFINET Connection

Attach the PROFINET via one or both RJ-45 connectors provided (Port 1 & Port 2). Various configurations are possible. Refer to the manual for the PROFINET controller used in the application (PACSystems RX3i & RSTi-EP PROFINET I/O Controller Manual, GFK-2571 for the RX3i PROFINET Controller Module).

Genius Bus Connection

The GCG module is equipped with one active six-terminal Genius Serial Bus connector.

Figure 10: Daisy Chain Genius Bus Wiring

Figure 11: Genius Bus Wiring for Bus Termination
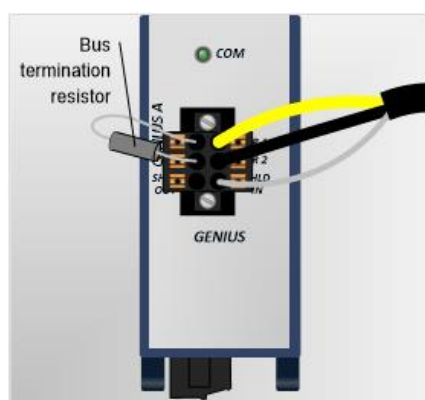
Two terminals each are provided on a removable terminal block for Serial 1, Serial 2, and Shield connections. The figure (above left) shows the Genius connection continuing through the connector block (daisy chain).

Whenever the Genius bus is terminated at the GCG001, a bus termination resistor should connect Serial 1 to Serial 2, with SHLD IN unterminated, (as shown above right). The value of the termination resistor must match the impedance of the Genius Bus cable.

> *Note:*   *Whenever the GCG001 Genius terminal blocks are removed from the faceplate, the continuity of the Genius Bus is disrupted.*

PROFINET Configuration

Once all connections are in place, it will be necessary to set up the PROFINET configuration. This requires use of the PC-based PROFINET Discovery tool. Be sure your PC is connected to the same PROFINET network and interrogate the network to discover what is connected, as shown in the following screen-shot.

Figure 12: PROFINET Discovery Screenshot
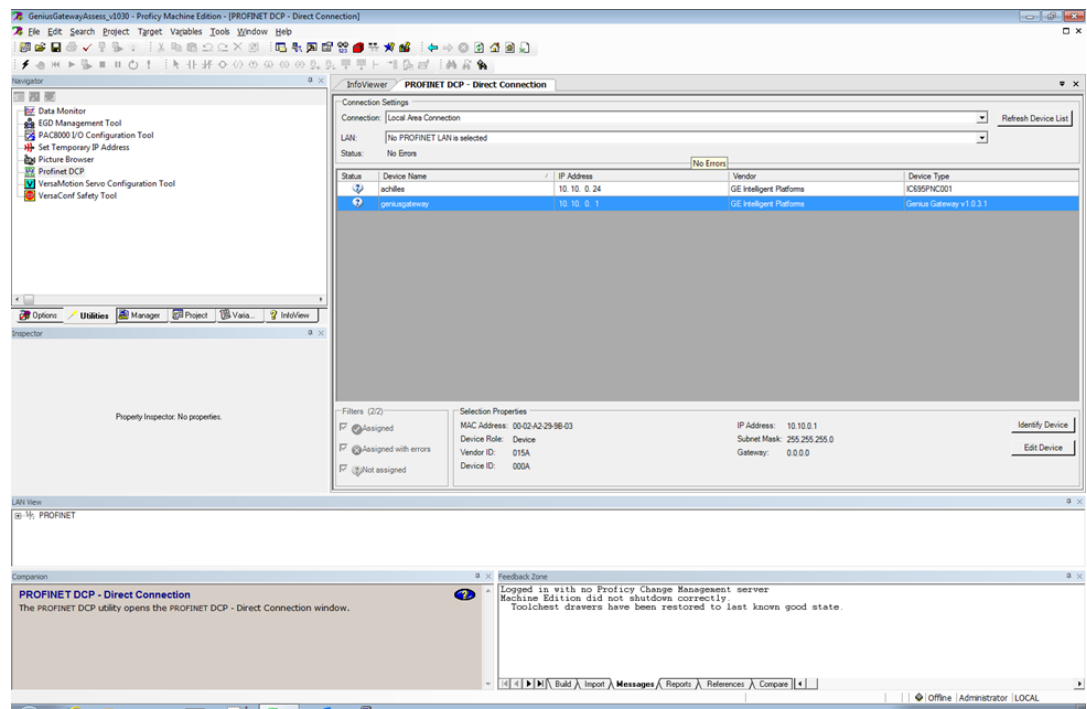
Initially, the out-of-the box GCG001 will not have a name assigned. Select the row containing the GCG001, then click on the Edit Device button in order to assign a unique name.

Configuration tools and procedures are discussed in detail in Chapter 3:.

2.4.3   GCG001 Module Removal

- Power down the external 24Vdc source

- Remove the Power connector from the underside of the GCG001 module

- Disconnect the RJ-45 PROFNET connector(s)

- Remove the Genius terminal block

- While holding the GCG001, loosen the two captive M3.5 screws that hold the module in place, then pull away from the mounting surface. Note that, if mounted to an RX3i rack, there is no pivot attachment or backplane connection to the rack.

- The SD Card may be transferred from the removed GCG001 to another (successor) GCG001. This permits the PROFINET configuration of the removed module to be transferred to the successor module.

- Once the successor module has been mounted, the original Power, PROFINET and Genius connections may be restored to it.

2.4.4 Light-Emitting Diode (LED) Indications

The four LEDs in the module header provide a visual indication of the GCG001 module status.

POWER — indicates the presence of power to the module.

	Green, ON steady	Power supply is good.
	OFF	Power supply is off or not good.

OK — indicates GCG001 readiness to perform normal module operations.

	Green, ON steady	Module able to perform normal operations.
	Green/Amber, blinking	Module loading main operating system
	Amber, ON steady	Module loading boot-loader operating system
	OFF	Module has an unrecoverable fault or power is not applied.

FAULT — indicates the detection of faults by the module.

	OFF	No faults present.
	Red, blinking 2Hz	DCP Device Identification Signal received on PROFINET.
	Red, ON	A fault or other PROFINET diagnostic data exists on the Gateway

CONNECT — indicates status of the connection to a PROFINET controller.

	OFF	One or more connections with EMERSON PROFINET Controllers have been established to this device.
	Red, blinking	Device trying to connect to a controller. Continuous if device has not been assigned a valid station name.
	Red, ON	No PROFINET Controller connection

The two LEDs associated with each Ethernet port (used here as PROFINET ports) are labelled ACT and LINK. These LEDs provide information about activity on that port.

PORT 1, PORT 2 LINK — indicates connection status on Ethernet ports.

	Green, ON steady	Ethernet connection established
	OFF	No Ethernet connection

PORT 1, PORT 2 ACT — indicates activity on PROFINET ports.

	Amber, blinking	Communications occurring on port
	OFF	No communication

The LED located directly above the Genius connector provides information about the Genius bus.

COM — indicates the status of Genius Bus communications.

	Green, ON steady	The Genius Bus is configured and operating properly.

	Green, blinking	A Genius Bus error has been detected.
	OFF	The Genius Bus has failed or no Genius Bus configuration has been received.

2.4.5 Fault Notifications

Powering up or down or connecting/disconnecting the GCG001 from the controlling PROFINET device will have effects specific to the controlling device. The discussion below relates to using the RX3i PROFINET Controller as the controlling device.

Removing a GCG001 from the PROFINET network causes a Loss of Device fault for the GCG001 itself and all Genius devices connected via that GCG001.

Adding a GCG001 to the PROFINET network causes an Addition of Device fault for the GCG001 itself and all Genius devices connected via that GCG001.

Note that when a GCG001 is replaced by a successor GCG001, it is important to ensure that the successor is configured for PROFINET in the same manner as its predecessor. The quickest way to ensure this is to remove the SD Card from the original and insert it into the successor GCG001.

2.5 Configuring the Genius Gateway to Operate with the RX3i CPU

1. Start the PME application, then open or create the project which contains the GCG001 module.

2. Configuring the rack, power supply, CPU and PROFINET Controller in the Project tab of the Navigator

3. Follow the instructions in the PACSystems RX3i & RSTi-EP PROFINET I/O Controller Manual GFK-2571, for adding devices to the PROFINET IO Network. The GCG001 will be one of those devices.

4. Note that each IO Device connected to the GCG001 will be mapped per the RX3i PROFINET Controller configuration.

2.6 Ethernet Port Connections

As noted earlier, PROFINET IO operates at 100Mbps or higher (full duplex). The GCG001 Genius Gateway cannot operate at a data rate greater than 100Mbps. Thus, for normal operation, at least one port must be operated at 100Mbps. Other devices operating at 10Mbps may co-exist on that network, though this would not be typical.

Each Ethernet port on the GCG001 module (see Figure 3) operates independently, so devices that operate at different speeds and/or duplex modes may be attached to the ports. Each port automatically detects the attached cable and functions properly with either straight-through or crossover cables.

Note: *The module operates only in auto-negotiate mode. All PROFINET devices and switches that are connected to the module should be configured to use auto-negotiation.*

2.6.1 RJ-45 Port Connections

The two RJ-45 ports on the GCG001 Genius Gateway can be used for PROFINET network connections or for general Ethernet communications on a 10BaseT or 100BaseTX IEEE 802.3 network; 1000BaseTX is not supported. If the port is connected to an external switch, hub, or repeater, up to 12 PROFINET nodes may be connected in a star wiring topology. Cables may be up to 100 meters in length. Cables for 100BaseTX must be data grade Category 5 or better unshielded twisted pair (UTP) or shielded twisted pair (STP). 10BaseT may be used for the general Ethernet traffic, but not for PROFINET communications.

2.7 Firmware Updates

Refer to the rear view of the GCG001 module shown in Figure 8 (above). Whenever the GCG001 firmware needs to be updated, remove the SD card from its slot at the rear of the module, then install the SD Card in your PC and copy the new firmware to the SD Card. The ZIP file containing the GCG001 firmware upgrade may be found on the EMERSON Product Support web-site https://www.emerson.com/Industrial-Automation-Controls/support Unzip the file as shown in the following figure.

Figure 13: GCG001 Firmware Upgrade ZIP File Unzipped to SD Card
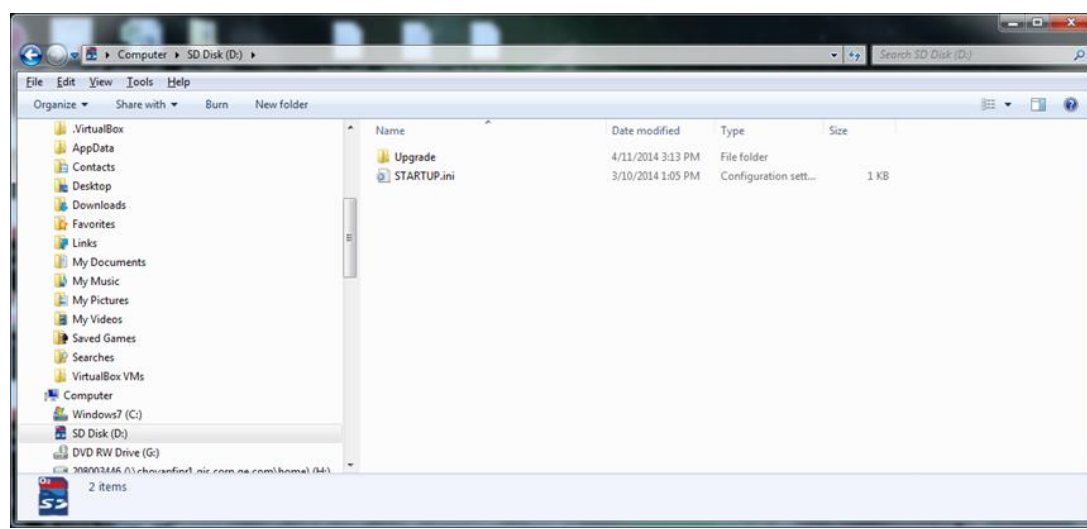
After the SD card has received an update of the GCG001 firmware, install the SD card in its slot (see Figure 8). Note that the GCG001 must not be powered up while installing the SD Card. Next, while holding down the Firmware Load Pushbutton (see Figure 8), apply power to the module. This action causes the firmware to be copied from the SD Card to the GCG001 module itself. Continue holding the pushbutton until the OK LED turns amber, then release the pushbutton. When the OK LED turns green, the firmware has been loaded. Cycle power on the module and wait for the OK LED to turn green and steady. The module is then ready to be properly mounted (see section 0).

2.8 Spare Parts

The following spare parts may be obtained directly from the indicated vendors:

GCG001 Usage	Manufacturer	Manufacturer P/N	Description	Contact Information
Power	Phoenix Contact	1763180	Conn TB Plug 1x3 3.81mm Tin Scw Lcks Blk	www.phoenixcontact.com
Genius Terminal Block	Weidmueller	127787000	Con,3x2 Plug, w/Screws, Spring Conn, Term Block	www.wiedmueller.com
Config Backup	Verbatim	44015	SD Card, 2GB	www.verbatim.com

Chapter 3:   Configuration

The RX3i GCG001 Genius Gateway receives its configuration via its connected PROFINET I/O Controller (PROFINET Controller). The PROFINET Controller, in turn, is configured by a PROFINET I/O configuration tool. This tool will require a GSDML file for the GCG001 Genius Gateway. The RX3i GCG001 GSDML can be obtained from Emerson support website, https://www.emerson.com/Industrial-Automation-Controls/support using GCG001 as your search term. For subsequent use, import the RX3i GCG001 GSDML file into the Tool Chest of PAC Machine Edition.

3.1   Configuration Tools

- PACSystems RX3i CPU Firmware 8.00 or later.

- PAC Machine Edition (PME) configuration and programming software, version 8.0 or later.

- Serial or Ethernet cable for connecting the computer hosting PME to the RX3i CPU.

- General Station Description Markup Language (GSDML) file for the GCG001, available from Emerson support website, https://www.emerson.com/Industrial-Automation-Controls/support .

3.2   Configuration Overview

3.2.1   GCG001 in Simplex Genius Bus Configuration

The steps involved in configuring a GCG001 Genius Gateway are as follows:

1. If you haven't already done so, use PME to add a PROFINET IO-Controller (IC695PNC001) to the Hardware Configuration (HWC) of the target control system.

2. Select the PNC001 in the Navigator window, then browse the module and the Local Area Network (LAN) configuration in the Inspector window, changing parameters as necessary for your system. Note that the GCG001 will operate at 100Mbps and will cause the Network Speed to be auto-negotiated to this speed.

3. Right-click the PNC001, then select Add IO-Device to add the GCG001 as a connected device on the PROFINET LAN. In the PROFINET Device Catalog dialog that subsequently appears, select Have GSDML..., then browse to the location on your computer where the file is located, select it, and Open. As mentioned above, the GSDML can be conveniently stored in the PME Tool Chest.

4. Use PROFINET/DCP tool in PME to assign a name to the GCG001 Gateway so that the PROFINET Controller can connect to it and send its configuration. To do this, right-click the PNC001, then select Launch Discovery Tool GCG001.The tool will appear in a new Info Viewer tab entitled PROFINET DCP – Direct Connection (see Figure 12).

Note: *This tool can also be activated from the Utilities tab in the Navigation pane by selecting PROFINET DCP.*

5. With the GCG001 connected to the PNC001 via Ethernet cables, and both the RX3i rack and the GCG001 powered up, select Refresh Device List. Find the GCG001 in the list. If its Device Name does not match the Device Name configured on the PNC001, select the GCG001, then select Edit Device, change the Device Name, then Exit.

6. GeniusGateway… appears in the Device Catalog tree. Select GeniusGateway, then OK.

7. Geniusgateway now appears (Figure 14) as an IO device in the Hardware Configuration tree under the PNC001.

8. Within the GeniusGateway branch, two daughter devices are displayed by default: the GCG (shown in Figure 16 at slot 0 with its connected PNC) and the Gateway module itself at slot 31. You may drag the gateway to slot 30, if desired. Note that slot 0, normally used by the Genius HHM, is not really consumed by the GCG001. The slot 0 indication for the GCG001 in the PME display should be ignored: no, I/O module may be dragged into the slot.

Figure 14: Hardware Configuration Expanded Tree
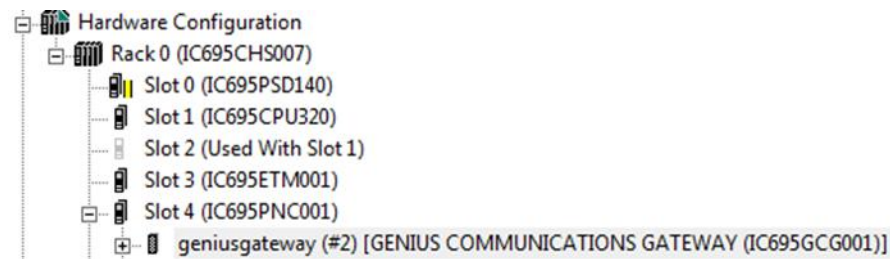
Note: *Genius gateway… is the default PROFINET Device Name that PME gives to a GCG001 in the Hardware Configuration under a PNC001. This Device Name must match that given to the module itself using the PROFINET/DCP (Discovery and Configuration Protocol) tool (*

Figure 12*). If there are multiple GCG001s on a PROFINET bus, each of the modules' Device Names must be unique. You can change it by selecting the device in the Navigator, then typing in a new name in the Inspector.*

Example: GCG_inside and GCG_outside is acceptable Device Names.

9. Enter the reference addresses for Genius Status Data, Fault Status Data, and Gateway Status Data.

Figure 15 - GCG Data Reference Addresses

10. If desired, change the GCG001 configuration parameters for Genius Bus Baud Rate and Output at Startup (Figure 16). Select the GENIUS Gateway Module in slot 31 (or

slot 30) and double-click it. You can now use the pull-down menus to select the appropriate Baud Rate and Output at Startup value. When Output at Startup is set to Disabled, no output data is sent to the Genius devices when the PLC transitions from STOP to RUN. In this case, the Enable/Disable Outputs COMMREQ must be used to enable outputs on the Genius bus.

Figure 16: Genius Gateway Parameters

11. Add Genius I/O devices to the Genius Bus by right-clicking genius gateway… and selecting Change Module List…. (see Figure 17). If the application is a retrofit of an existing Genius solution, be sure to set all I/O reference addresses to match those of the Genius configuration being incorporated. To ease confusion, it is also recommended that the Genius Devices be assigned the same serial bus addresses (Location column) as had been assigned in the system under retrofit.

Figure 17: Change Module List for Genius Gateway GCG001

12. Select individual Genius I/O devices from the right-hand panel of Figure 17 and then drag/drop them into the appropriate location row on the left-hand side, resulting in Figure 18.

Figure 18: Populating the Genius IO Devices to be Controlled by the Genius Gateway
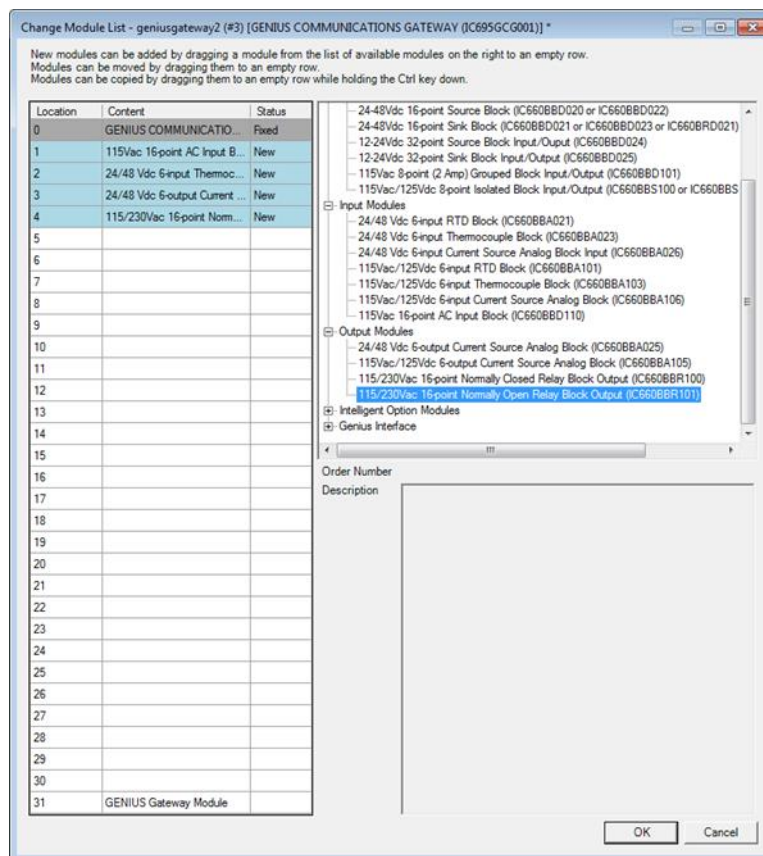
13. Special consideration needs to be given to the configuration of a Series 90-70 Remote I/O Scanner (BEM733) device on the Genius Bus, since this device can control a rack filled with I/O modules, each of which needs to be suitably configured.

   a. Add the BEM733 to the Genius Bus configuration as described above.

   b. Drill down into the BEM733. A display of rack I/O will be presented (Figure 19).

   c. For each slot in the BEM733-controlled rack, select a generic I/O device (such as a 16-point discrete input module or a 4-channel analog output module) and attach that to its corresponding slot in the I/O rack. Note that actual part numbers have not been assigned for this procedure. If in doubt, check the data sheet related to each product number to determine the type of I/O it consumes (Analog or Discrete / Input or Output) and the number of I/O points it requires.

   d. Once all BEM733-controlled rack slots have been suitably populated, save that portion of the configuration.

Figure 19: Populating Slots in S90-70 Rack Controlled by Remote I/O Scanner (BEM733)
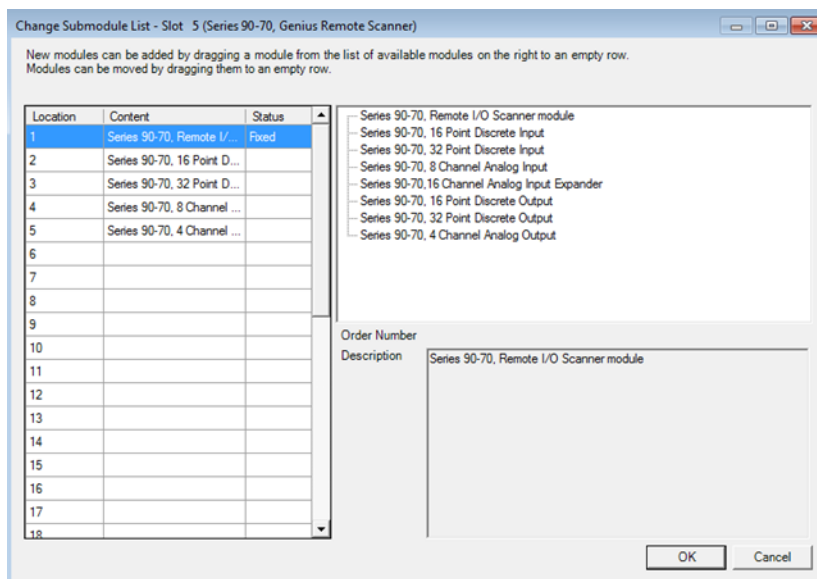
14. Configuration of a VersaMax Genius Network Interface Unit (GNIU) is like the process described for the Series 90-70 Remote I/O Scanner, above.

    a. Add a GBI001[4] to the Genius Bus configuration as described above.

    b. Drill down into the GBI001. A display of VersaMax I/O will be presented.

    c. For each rack and slot controlled by the GBI001, select the VersaMax I/O device that corresponds with the actual VersaMax device that is in use.

15. Configuration of a Field Control Genius Bus Interface Unit (FBIU) is very much like the process described for the VersaMax GNIU, above.

    a. Add a Field Control I/O Station to the Genius Bus configuration as described above.

    b. Select the Field Control I/O Unit, then right-click it to Change the Submodule List.

    c. For each location controlled by the FBIU, select the Field Control I/O device that corresponds with the actual Field Control device that is in use.

16. Once all the Genius Devices have been populated onto the Genius Bus topology as shown in Figure 18, click the OK button to save that portion of the configuration.

17. Note that the I/O addresses associated with each Genius Device will have been provided with default assignments by PME. Double-click on each Genius device to examine its properties and change the I/O assignments where needed. In retrofits, for example, it will likely be crucial to keep the same I/O assignments from the earlier implementation so that the controller logic can operate with the same I/O allocations as before. For each location on the Genius Bus, keep a note of the assigned I/O addresses.

---

[4] GCG001 firmware version 2.0.0 is required to support GNIU; GCG001 firmware version 2.2.0 is required for FBIU.

18. In PME, store the Hardware Configuration to the RX3i CPU. This act also stores the GCG001 configuration data to the PNC001.

The following screenshot shows a completed configuration.

Figure 20: PME Display of Complete Genius Gateway Configuration
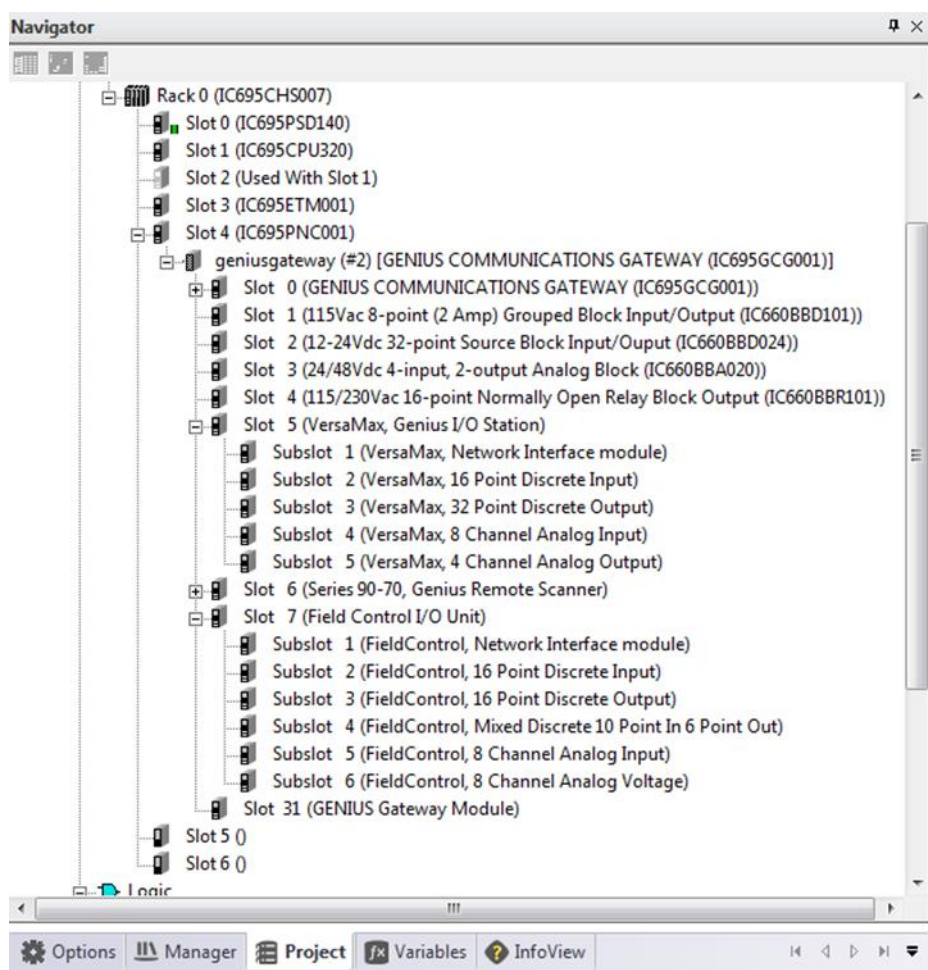
3.2.2   Genius Hot-Standby Redundancy Configuration

As shown in Figure 27 below, a Hot Standby system will contain two GCG001 modules. One uses SBA #31, the other uses SBA#30. Set the SBA as described in step 7 above. Do not select any SBA other than #30 and #31 for GCG001 in Hot Standby.

Next, be sure to configure each device on the Genius Bus (i.e. those at SBA #1-29) with the parameter that corresponds to Hot Standby. Use the Genius Hand-Held Monitor (HHM) to set this parameter.

Figure 21:

```
CPU REDUNDANCY
REF
NO CTRL REDUND
    tgl entr nxt
```
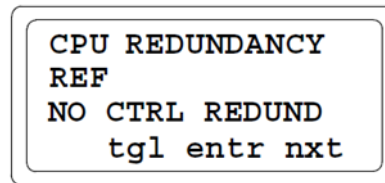
1. To change the current selection, press F2 (tgl).

2. Press F3 (entr) to save the new selection.

3. Press F4 (next) to advance to the next configuration display.

Blocks can be configured for No CPU Redundancy, Hot Standby or Duplex redundancy. For new blocks, it is set to No Redundancy. It must be changed if the block should be able to receive output data from two CPUs.

In Hot Standby mode, a block receives output data from both CPUs but uses the data from only one of them to drive its outputs. The block prefers outputs sent by the GCG with SBA#31. If those outputs are not available, the block uses outputs from the GCG with SBA#30. If no outputs from either GCG are available, outputs either Hold Last State or default (as configured).

3.2.3   Genius Duplex Configuration

In Duplex redundancy mode, a block compares outputs received from two CPUs and sets any outputs for which there is disagreement to their Duplex Default state.

All other devices on the Genius Bus (at SBA #1-29) that control discrete outputs need to be properly configured in order to handle the two sets of output data they will be receiving from SBA#30 and SBA#31. This parameter is called Duplex Default State. For Genius blocks and Field Control, use the Genius Hand-Held Monitor (HHM) to set this parameter.

Figure 22:

```
DUPLEX DEFAULT
REF
OFF
    tgl entr nxt
```
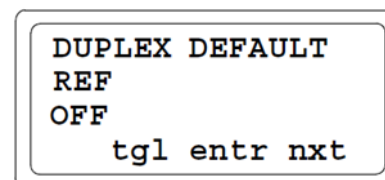
1. To change the Duplex Default state, press F2 (tgl).

2. Press F3 (entr) to save the new selection.

3. Press F4 (next) to advance to the next configuration display.

Duplex Default State is configured for each output point on each active I/O device on the Genius bus. The options are:

*   Default ON

*   Default OFF

*   Hold Last State.

Duplex Default State is employed whenever the output point data received in real time from SBA#30 and SBA#31 disagree.

> *Note:* *PNC Critical Network Ports feature does not cause a fatal fail-over in GCG-only PROFINET systems because GCGs are Simplex devices. Users must monitor in logic both for a Loss of all Critical Ports (either by monitoring the Controller port bits or watching for the Critical Network Ports diagnostic message) and cause a logic-initiated roll-over, as well as watching in logic for any GCGs to fail to then also cause a logic-initiated rollover.*

3.2.4 Genius Dual Bus Configuration

In Genius Dual Bus, two Bus Controllers are active on separate Genius busses. Both are typically configured to use SBA#31. Each I/O device controls which bus it is connected to via a Bus Switching Module (BSM). Thus, if the Bus Controller on the active bus ceases to transmit, or the bus is physically broken, the I/O device controlling the BSM senses that condition and switches to the alternate bus. The Genius devices connected in this fashion must be configured for BSM Present. For Genius blocks and Field Control this is accomplished using the Handheld Monitor. For VersaMax and 90-70 I/O Scanner Racks, this is accomplished by configuring a target in the project folder.

Note that the Genius Bus Controller on the inactive bus will not be able to detect traffic from the I/O devices. Following a bus switch, the newly active Bus Controller then needs to log in all the I/O devices and begin servicing their I/O and alarms.

When GCG001 is used as the Bus Controller in this manner, application logic is required to overcome the inherent delays resulting from Genius devices logging into the new bus connections after a bus-switching event. The application must hold the last state of all inputs (analog and discrete) until all devices have logged in and are broadcasting their input data to the PLCs.

Each I/O device on the bus that does control a BSM needs to be configured as a BSM Controller. Each such device will then be able to support the Switch BSM datagram (refer to Section 6.4.9), which is typically used to test the behavior of the bus following a bus switch. Devices configured as a BSM Controller will automatically switch away from a defective bus, expecting that the alternate bus is intact and can function properly.

For Genius and Field Control devices, use the Genius Hand-Held Monitor (HHM) to set or verify these parameters.

Figure 23:

```
BSM PRESENT ?
REF
STATUS =  YES
     tgl entr nxt
```
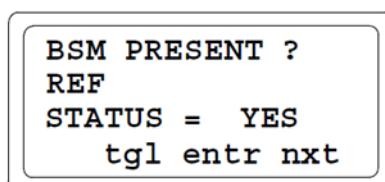
1. To change the BSM Present configuration, press F2 (tgl).

2. To save the new selection, press F3 (entr).

3. Press F4 (next) to advance to the next configuration display.

Figure 24:
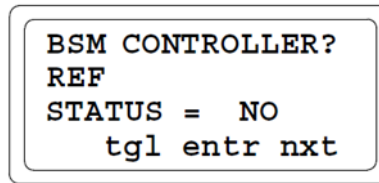
```
BSM CONTROLLER?
REF
STATUS =  NO
     tgl entr nxt
```

1. To change the configuration, press F2 (tgl).

2. To save the new selection, press F3 (entr).

3. Press F4 (next) to advance to the next configuration display.

Figure 25:

```
OUTPUT DEF.TIME
REF
TIME = 2.5 SECS
     tgl entr nxt
```
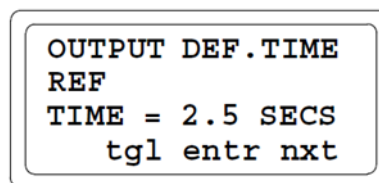
1. To change the configuration, press F2 (tgl).

2. To save the new selection, press F3 (entr).

3. Press F4 (next) to advance to the next configuration display.

GCG001 offers an optional enhancement to Genius Dual Bus. It is PROFINET Media Redundancy, shown in Figure 26. PROFINET Media Redundancy (MRP) offers a solution where the PROFINET network is more likely to be compromised. Genius Dual Bus offers a solution where the Genius Bus is more likely to be compromised.

3.2.5   Genius Hot Standby Dual Bus Configuration

Genius Hot Standby Dual Bus Configuration combines the two architectures discussed in Section 3.2.2 and 3.2.4. The result is diagrammed in Figure 26. There is a total of four Genius Bus Controllers involved, here shown as GCG001 units.

- The Primary CPU hosts two GCG001 units, each using SBA#31. One of these is resident on Bus A; the other is resident on Bus B.

- The Secondary CPU hosts two GCG001 units, each using SBA#30. One of these is resident on Bus A; the other is resident on Bus B.

- Each I/O drop connects to Genius Bus A and to Genius Bus B via a Bus Switching Module (BSM). Some devices have built-in BSMs, while others, such as the Genius blocks, employ an external BSM. In the event the active bus becomes disconnected, the BSM is commanded by its host I/O device to switch to the alternate bus. In this way, the application is protected against failure of either bus and/or a Bus Controller (here GCG001).

- It is permitted to have non-redundant I/O devices (i.e. I/O connected to just one Genius Bus – none are diagrammed below. Such devices would not employ a BSM.

- The two CPUs are synchronized to accomplish Hot Standby. In Figure 26, a dual RMX link is diagrammed. For a CPE400, the synchronization would be performed over LAN3.

Figure 26: GCG001 Units Deployed in Genius Hot Standby Dual Bus Redundancy
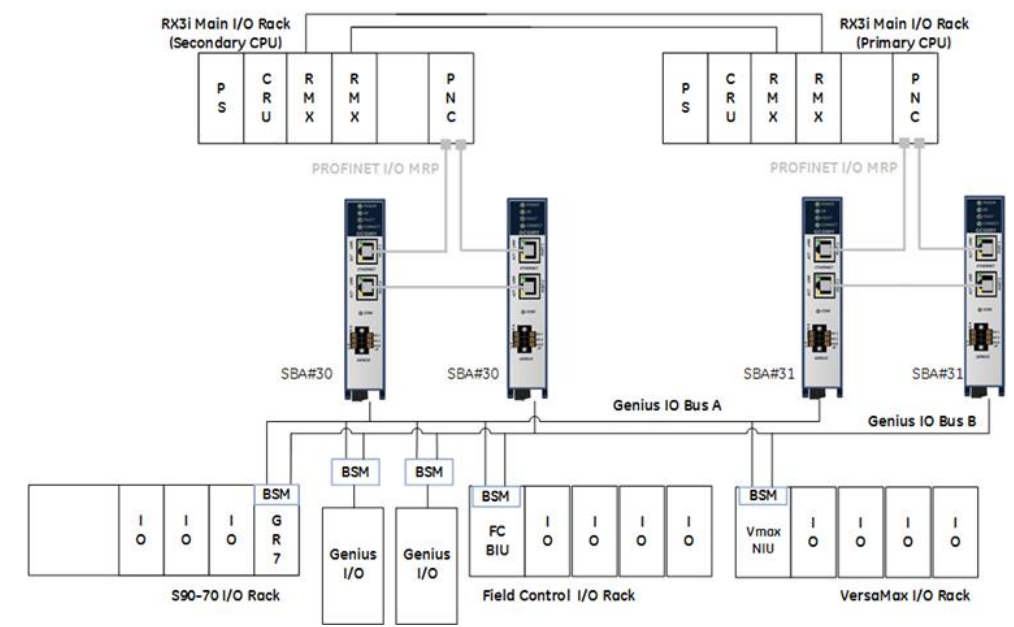
Chapter 4:   System Operation

This chapter provides a System Overview and describes:

- Communications
- Redundancy
- I/O Scans
- Alarms

4.1   System Overview

4.1.1   Communications

As shown in Figure 7, the Genius Gateway (GCG001) sits on a PROFINET network which is connected to a PROFINET Controller (PNC001, for instance). The PROFINET Controller is mounted in an RX3i rack. This aspect of the architecture allows the RX3i to interact with the GCG001.

The PROFINET network to which the GCG001 is connected operates at 100Mbps only. The Network Speed will be set through auto-negotiation if necessary. Details of PROFINET communications may be found in the PACSystems RX3i & RSTi-EP PROFINET I/O Controller Manual GFK-2571.

The GCG001 is also connected to a Genius Bus. It takes the place of a traditional Genius Bus Controller, meaning it can communicate with up to 31 other Genius Devices.

The Genius Bus operates as a Local Area Network (LAN) using twisted pair wiring. The wiring is daisy-chained via the terminal strips on each device, as shown in Figure-10.

The Genius LAN will not be disrupted if power is lost on one its networked devices, since the wiring passes through each device without requiring any active electronics to be present. The LAN cabling must be terminated at both ends of the cable run, using resistors, the value of which matches the impedance of the cable used in the application. See Figure 11 for terminating the bus at the GCG001.

The Genius Bus can operate at several different baud rates. All devices on the bus must operate at the same agreed baud rate. For further details, refer to the Genius I/O System and Communications User's Manual, GEK-90486-1. The default baud rate of the GCG001, when shipped from the factory is 153.6 kBaud. This may be changed via the PME configuration software.

In the event the baud rate needs to be changed, the following sequence is recommended:

1. Disconnect the GCG001 module from the Genius bus.

2. Change the baud rate to the new value on all Genius devices connected to that bus.

3. Cycle power to all Genius devices on which the baud rate has just been changed.

4. Use the HHM to verify the baud rate was successfully changed on each device.

5. Retry the above steps on any devices that failed to switch over to the new baud rate.

6. Using PME, configure the GCG001 module to operate at the new baud rate.

7. Reconnect the GCG001 to the Genius bus.

8. Note that the HHM will not work reliably on a mixed baud rate bus. Connect the HHM directly to any device under these circumstances and disconnect that device from the Genius bus temporarily. The baud rate of the HHM can be altered (via the HHM keyboard) to match the configured baud rate of the device (which may be unknown). Once both the HHM and target device are set to the same baud rate, the HHM can command the target device to change to a new baud rate, which will take effect upon power cycling the device. Remember to then change the baud rate of the HHM to the new baud rate.

4.1.2　　Redundancy

Genius Hot Standby and Duplex Redundancy

Genius supports several different forms of redundancy, as described in the Genius I/O System and Communications User's Manual, GEK-90486-1

Figure 27: Genius Hot Standby Redundancy
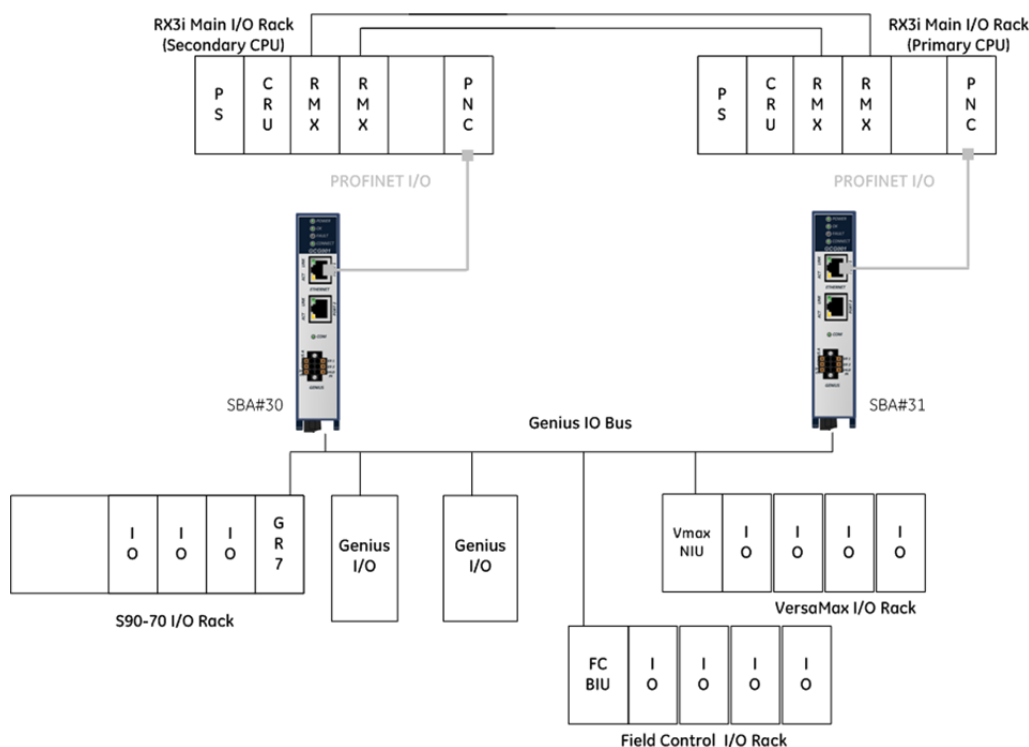
To support either Genius Hot Standby or Duplex type redundancy, two GCG001 modules are present on the same physical Genius Bus, one at SBA #31 and the other at SBA #30, as shown Figure 27. This architecture is designed to withstand the loss of one GCG001 and/or the loss of the PLC to which it is attached. The two GCG001 modules involved should therefore be powered via independent 24Vdc power supplies. Alternately, a Genius Bus Controller may be used at SBA #30 or #31.

In Genius Hot Standby, the I/O Blocks (both Analog and Digital) report all inputs to both SBA#30 and #31 but use output data from SBA#30 only whenever SBA#31 becomes unavailable. I/O controlled by the GR7, GBIU, and GNIU also behave in this way.

In Genius Duplex Redundancy, Discrete Output Blocks vote on the output data received from both SBA #30 and #31. A configuration parameter Duplex Default State must be configured for each output point. This parameter determines how the output will behave in the event the commanded output states received from SBA#30 and SBA#31 disagree. Refer to Genius I/O System and Communications User's Manual, GEK-90486-1, Chapter 8 for details. Whenever one of the controlling devices at SBA#30 or SBA#31 becomes unavailable, the output will be controlled by the remaining device. Discrete outputs in the I/O controlled by the GR7 and GNIU also behave in this way.

The GCG001 can be used to achieve Genius Dual Bus Redundancy when used in conjunction with application code provided by EMERSON. Please contact Customer Support for assistance.

Ethernet Media Redundancy Protocol

PROFINET also supports redundancy in the form of Ethernet Media Redundancy Protocol (MRP). As shown in Figure 28, this form of redundancy is designed to permit all devices on the network to continue to communicate even though the network cable has been compromised at one point. For details, refer to the PACSystems RX3i & RSTi-EP PROFINET I/O Controller Manual, GFK-2571.

Figure 28: PROFINET Media Redundancy
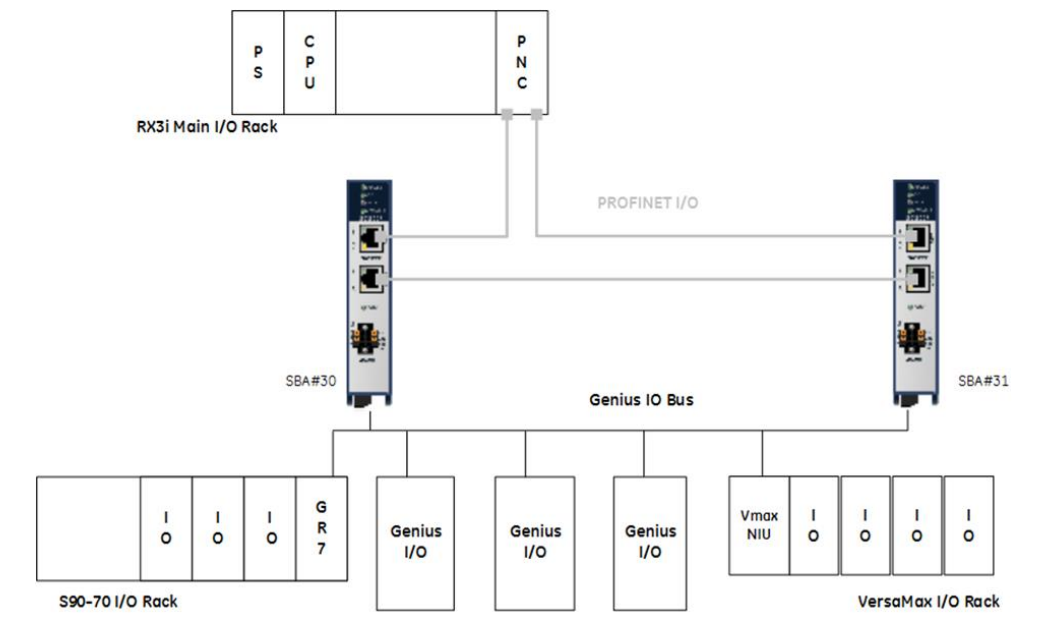
4.1.3   I/O Scans

As shown in Figure 7, there are several I/O Scans that effect how the input and output devices on the Genius bus exchange data with the RSX3i PLC.

The RX3i scan reads input data from all the devices connected to it and active in its configuration. It uses this input data to solve the control logic supplied for the application. At the conclusion of the logic execution, the output data is ready for distribution and the output portion of the RX3i scan takes place.

The PNC001 PROFINET Controller operates on its own cycle, receiving input data for all devices connected to it, including the GCG001 Genius Gateway. It passes the input data to the RX3i during the RX3i input scan. When the RX3i performs its output scan, the output data configured to the PNC001 is transmitted by the PNC001 to the output devices on its network, including the GCG001 Genius Gateway.

The GCG001 also operates on its own scan cycle. As the Genius bus token passes from one SBA to the next, each device on the Genius Bus takes its turn to transmit its input data to the GCG001, which then makes that input data available to the PNC001. The GCG001 also consumes all the output data produced by the PNC001 and broadcasts that data to all the output devices on the Genius bus whenever it receives the Genius Bus token.

All the I/O scans described above are asynchronous and may vary depending on the path through the RX3i logic, traffic on the PROFINET and traffic on the Genius Bus. Should I/O update rates be a concern for the application, it would be prudent to perform a worst-case analysis of the interacting scan cycles.

4.1.4   Alarms

Whenever an alarm condition occurs on a Genius Device, a background message (datagram) is transmitted from the device to the GCG001. This transmission occurs while the alarmed device has the Genius Bus token. Upon reception, the GCG001 formulates an Alarm message to be passed to the PNC001, which in turn passes it to the RX3i CPU. The RX3i takes appropriate action and notifies the operator per the logic in the application.

Alarms may be cleared programmatically using either the Clear Circuit Fault COMMREQ (see Figure 35) or the Clear All Circuit Fault COMMREQ, or via the Genius Hand-Held Monitor (HHM). Note that whenever the HHM is used to clear a circuit fault, the GCG001 will not be aware of this condition, thus will not have cleared the corresponding fault. Under these conditions, the Diagnosis Disappears Fault will not have been logged and any subsequent fault from the same point will not be reported to the I/O Fault Table. Be sure to follow up any HHM clearing of faults with a COMMREQ to clear the same fault(s) in order to eliminate the discrepancy described here.

Typically, the field problem needs to be investigated and resolved before the alarm can be successfully cleared. For the alarm to be cleared, the alarm condition must no longer be present and the Genius device must receive a suitable background message instructing it to clear the alarm notification. If the alarm condition is absent, the Genius device will cease to exhibit the alarm indication (LEDs will operate normally again). If the alarm condition is still present, a new alarm cycle will be initiated. See Sections 0, 6.4.6 and 6.4.4 for related COMMREQ or Data_Init_Comm instructions. Refer to Genius I/O System and Communications User's Manual, GEK-90486-1, for further details.

Note: *For GCG Firmware prior to V1.1.1*

As mentioned in Section 1.10, the behavior of the input references associated with a Genius Device that has indicated a fault, and which is interfaced to the CPU via the GCG001, is to cause all inputs to either hold last state or to default to a known state (per GCG001 configuration parameters). If this behavior is problematic for your application, you can disable fault reporting at the block, using the Genius Hand-Held Monitor (HHM) – see Report Faults in the Genius I/O Analog and Discrete Blocks User's Manual, GEK-90486-2. The downside is that your application will no longer be able to automatically sense faults at the corresponding Genius Device. The LEDs on the Genius Device will continue to indicate Fault conditions; however, no datagram will be issued for each fault occurrence. An intermediate solution is to periodically query each such device with a Read Diagnostics datagram (Section 6.4.4) and parse the response in order to detect faulted circuits.

Chapter 5:   Diagnostics

This chapter describes:

- Status Bits

  - Genius Status Bits for GCG

  - Fault Status Bits for GCG

  - Gateway Status Bits for GCG

- Module LED Indicators

- Power-up

  - Module Restart

  - Problems During Power-up and Reset

  - Transitioning from Firmware Update Mode to Normal Operating Mode

5.1   Status Data

The GGC001 produces a total of 96 bits (12 bytes) to supply status information to the controlling PROFINET Controller. When ultimately controlled by an RX3i PLC, these reference bits consume a total of 96 reference address bits in %I memory. The 96 bits consist of

- 32 bits related to the operation of the GCG001 itself - referred to in PME as Gateway Status Data, and

- 32 bits related to the online status of the Genius bus which it controls – referred to as Genius Status Data in PME, and

- 32 bits related to any faults that are associated with a device – referred to as Fault Status Data in PME.

Each bank of 32 bits must be assigned a different set of Input reference addresses in RX3i memory.

For each bank of 32 status bits, a default beginning reference (the next available %I) for the status bits is automatically assigned by PME. These assignments may be changed by clicking on the GCG001 and keying in different %I reference.

5.1.1   Gateway Status Data

For the Genius Gateway GCG001, the thirty-two bits in the Gateway Status Data are organized as follows, beginning at the first %I status reference assigned to this bank of 32:

Figure 29: Gateway Status Data
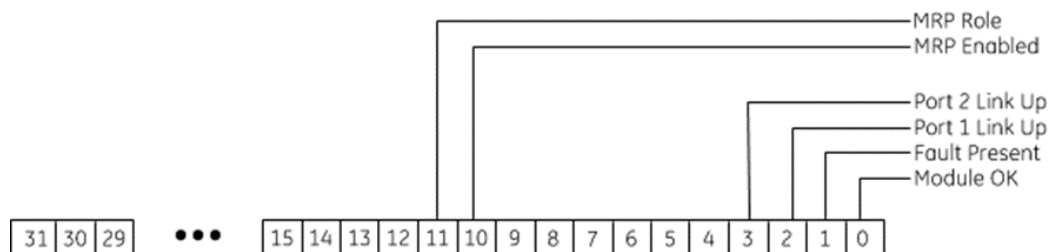
Bit#	Name	Bit Condition	Meaning of Status Bit
0	Module OK	OFF	The GCG001 module is powering up or has failed.
		ON	Indicates the GCG001 module is functioning properly.
1	Fault Present	OFF	No GCG001 diagnosis data available; FAULT LED is Off.
		ON	GCG001 diagnosis data is available; FAULT LED is On.
2	Port1 Link Up	OFF	Port is not connected to a properly configured device, or port is experiencing communications errors.
		ON	Port is connected to another device and is communicating.
3	Port2 Link Up	OFF	Port is not connected to a properly configured device, or port is experiencing communications errors.
		ON	Port is connected to another device and is communicating.
4-9	Reserved	OFF	Always off
		ON	N/A
10	MRP Enabled	OFF	MRP is not enabled
		ON	MRP is enabled
11	MRP Role	OFF	Indicates that the GCG001 is an MRP Client (if MRP is enabled), or that MRP is not enabled.
		ON	Indicates role is that of an MRP Manager – this is not a possible role for the GCG001.
12-31	Reserved	OFF	Always off
		ON	N/A

5.1.2 Genius Status Data

For the Genius Status Data, status bits are arranged in ascending order of the Genius Serial Bus Addresses (SBAs), beginning at the first %I status reference assigned to this bank of 32.

Figure 30: Genius Status Data

Bit Condition	Meaning of Genius Status Bit
OFF	• No device has logged onto the Genius Bus at this SBA, or • a device has not been configured for this SBA, or • there is a mismatch between the PME hardware configuration and the device that is installed, or • the device is not able to communicate.
ON	Device is configured, has logged-in and is communicating at the corresponding SBA.

5.1.3 Fault Status Data

For the Fault Status Data, the bits are arranged in ascending order of the Genius Serial Bus Addresses (SBAs), beginning at the first %I status reference assigned to this bank of 32.

Figure 31: Fault Status Data

Bit Condition	Meaning of Fault Status Bit
OFF	No fault is present on this device
ON	No device is configured at this SBA, or the device at this SBA is configured but is offline, or the device at this SBA is configured and online but has one or more diagnostic faults present.
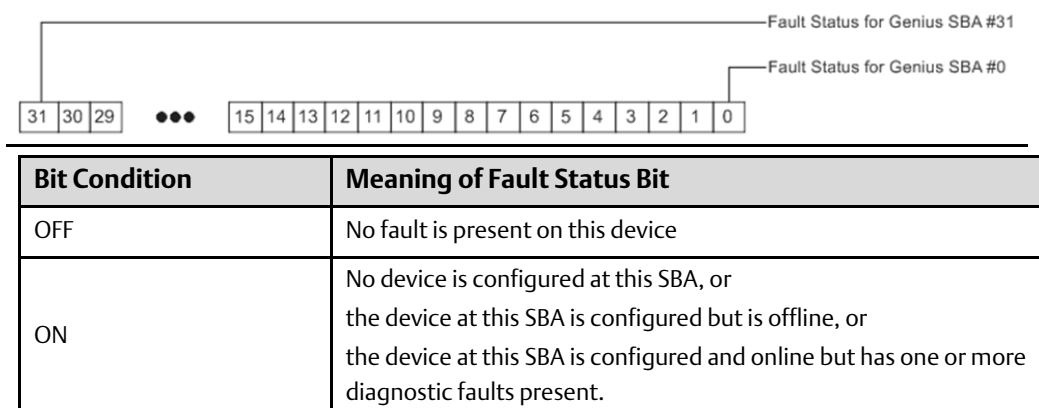
5.2 Module LED Indicators

Refer to Section □ above for a description of LED indications.

5.3　Power-Up

The GCG001 powers up whenever 24Vdc power is properly applied via the connector shown in Figure 9. During the power-up sequence, the GCG001 module runs diagnostics and initializes its hardware components. When the necessary hardware components have been initialized and tested, the module transitions to either normal operation or, if the firmware load pushbutton is being depressed (see Figure 8), to the firmware update mode.

The firmware update mode is described in Section 2.7.

As the GCG001 transitions to normal operation, it attempts to establish communications with the PROFINET Controller. Until communications have been established, normal operation cannot begin.

Once the PROFINET Controller matches the configured PROFINET Device Name that of the GCG001, PROFINET communications will begin. Any faults detected by the GCG001 prior to this event will then be uploaded to the PROFINET Controller.

Normal system operation will begin once the RX3i is in RUN mode, PROFINET communications are up and running and Genius Bus operations are also up and running.

5.3.1　Problems during Power-up

Certain conditions can prevent the module from powering up and becoming operational or entering firmware update mode:

Problem	Indication	Action
Hardware failure	All Indicator LEDs off. Module unresponsive.	Contact Technical Support to arrange for repair and replacement
Invalid boot image		
Invalid firmware image	Power LED is ON but OK LED is off or Power LED alternates Green & Amber	Perform firmware update

5.3.2　Transitioning from Firmware Update Mode to Operational Mode

As described in Section 2.7, the firmware load pushbutton (see Figure 8) must be depressed during power-up in order to invoke the GCG001 firmware load mode. Whenever the GCG001 is powered up without this button being depressed, normal operating mode will commence following power-up testing and initialization. Cycling power will transition the module from one mode to the other, depending on the condition of the pushbutton.

5.4　Module Faults in the RX3i I/O Fault Tables

Module faults from the Genius Devices downstream from the GCG001 Genius Gateway are passed to the PROFINET Controller and then to the PLC, where they are visible in the PLC's I/O Fault Table. For details on the operation of the RX3i Fault Table, refer to the PACSystems RX7i, RX3i and RSTi-EP CPU Reference Manual, GFK-2222 Chapter 14.

The I/O fault table displays I/O faults such as circuit faults, address conflicts, forced circuits, I/O module addition/loss faults and I/O bus faults. The contents of the I/O Fault Table entry are as follows:

Entry	Description
Location	Identifies the location of the fault by bus and serial bus address (SBA).
CIRC No.	When applicable, identifies the specific faulted I/O point on the module (enumerated 1-8 for an 8-point I/O block, for instance).
Variable Name	If the fault is associated with a point that is mapped to an I/O variable, and the variable is set to publish (either internal or external), the I/O fault table displays the variable name. Unpublished I/O variables will not be displayed in this field.
Ref. Address	If the fault is on a point that is mapped to a reference address, this field identifies the I/O memory type and location (offset) that corresponds to the point experiencing the fault. When a Genius device fault or local analog module fault occurs, the reference address refers to the first point on the block where the fault occurred.
Fault Category	Specifies a general classification of the fault.
Fault Type	Consists of subcategories under certain fault categories. Set to zero when not applicable to the category. See Section 5.4.1 below.
Date/Time	The date and time the fault was recorded by the CPU based on the RX3i CPU clock.
Details	To view detailed information, click the fault entry.

Note: *The Reference Address field displays numbers that are expressed in the range 0.65535 (16-bits.) Addresses in %W are displayed correctly for offsets in the 16-bit range (≤65,535). For %W offsets greater than 16-bits, the I/O Fault Table displays a blank reference address.*

As mentioned in Section 5.1, the GCG001 consumes three banks of 32 bits in %I as status bits

    a. for the GCG001 itself and

    b. for the Genius bus devices, it controls and

    c. for Fault status related to devices on the bus.

These are not to be confused with the entries in the I/O Fault Table.

5.4.1   Fault Types Reported to the RX3i Controller I/O Fault Table

When imported into the Rx3i I/O Fault Table, the following Error Codes are displayed without explanation. The following table is provided to assist in decoding the displayed error codes.

I/O Fault Table Message Identifiers

Fault Type	Description
257	Internal Circuit fault
258	Shared RAM fault
259	Electronics Assembly EEPROM fault
260	Communication interface fault
261	Terminal Strip EEPROM fault or NVRAM fault
262	EEPROM fault
263	Private RAM fault
264	Processor fault
273	Failed Switch
274	Open Input / Over-Temperature
275	No Load Present
276	Overload
277	Short Circuit
278	Loss of I/O Power
289	Feedback Error
290	Output channel over-range
291	Output channel under-range
292	Input channel open wire
293	Input channel over-range
294	Input channel under-range
295	Input channel high alarm
296	Input channel low alarm
305	Input channel shorted
306	Internal channel fault
307	Input channel wiring error
308	Input channel open wire
309	Input channel over-range
310	Input channel under-range
311	Input channel high alarm
312	Input channel low alarm
400	unknown Error-Type
513	Field Control, VersaMax or S90-70 Remote Scanner I/O fault
769	S90-70 Remote Scanner I/O fault
1026	Invalid Genius Gateway module configuration
1027	Invalid Genius Gateway module configuration
1028	Extra Genius device

Fault Type	Description
1029	Configuration mismatch in S90-70 Remote Scanner Rack
1030	Configuration mismatch in VersaMax I/O Station
1031	Configuration mismatch in Field Control I/O Station
1032	Mismatch between configured Genius device and actual device present.
1033	Genius device is present on the bus but is not in the configuration.

Figure 32: Genius Discrete Block Failed Switch Fault Display (Example)

Table Entry	Explanation	Value	Interpretation
Loc	Location of Fault	0.6.D1.r0.s15.ss1	Rack 0 Slot 6 = location of PNC D1 = Device Number of GCG s15 = SBA of faulted Genius device ss1 (Not used for Genius blocks. VersaMax, 90-70 Scanner rack, and Field Control devices specify the location of module in fault.)
Circ No.	Genius Device Circuit #	5	Fifth point on the Genius device is faulted
Variable Name	Alternate to Ref Address		Will display if variable name has been assigned
Ref. Address	PLC Reference Address	%QI 00145	Point 145 in %QI table is referenced
Fault Category	Coded Fault Category	Channel Diagnosis Appears/Disappears"	Appears when fault first detected at PLC. Disappears when fault has been resolved.
Fault Type	Coded Fault Type	Manufacturer specific (273)	See table of Fault Types (page47). Failed Switch in this case
Date/Time	Date/Time		Date/Time fault is registered by PLC.

Figure 33: Genius Analog Block Over Range Fault Display (Example)

5.4.2 Clearing the RX3i Fault Tables

Clearing the RX3i CPU's I/O fault tables has no effect on the GCG001 or on the Genius Devices downstream from it. This action merely clears the I/O Fault Table temporarily. Use the Genius HHM or COMREQs in the PLC program to exercise I/O points that had previously exhibited faults, and where the underlying field fault condition has already been corrected.

Chapter 6: COMMREQ/Data_Init_Comm Programming

This chapter explains how to use Communication Requests (COMMREQs) to perform specific tasks with Genius devices that are attached to a Gateway's Genius bus.

COMMREQs are instructions in the RX3i ladder logic (see example in Figure 34). When a COMMREQ is executed in ladder logic, communications traffic is directed to the indicated PROFINET Controller module (IC695PNC001). The PROFINET Controller then communicates with the Genius Gateway over PROFINET. The Genius Gateway subsequently sends the corresponding background datagram to the Genius block Serial Bus Address (SBA) specified in the COMMREQ. Status, and optionally some data, is returned from the Genius Block via the Genius Gateway to the PROFINET Controller and then to the reference memory in the CPU module.

Data_Init_Comm is a ladder logic instruction that can be used to help set up a COMMREQ. It is a more user-friendly instruction from the programmer's perspective. It performs the same functions as are described in this Chapter. An example is shown at Figure 35.

For additional information about Genius datagrams, refer to the Genius I/O System and Communications Manual, GEK-90486–1, which describes Genius Datagrams in detail.

6.1 COMMREQs and Passwords

Level 1 and 2 controller passwords, which prevent write access, cannot be used in applications that include COMMREQs. COMMREQs require write access to return their completion status and requested data.

6.2 Programming for a COMMREQ Communication Request

In order to communicate via a COMMREQ with a Genius device attached via a Genius Gateway module, the application program should perform the following actions.

1. Supply the content of the COMMREQ communication. Ladder logic Block Moves, Data_Init_Comm, or similar program instructions can be used to place the required information into CPU memory. This content is called the Command Block.

CPU Memory   Application Program

| Command Block | ⇐ | Edit content of COMMREQ |
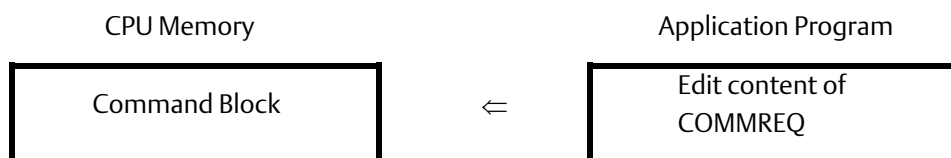
2. Clear status block. The program should set the status block to all zeroes (see programming example Figure 34). Establishing this initial condition allows the

program to differentiate between the result of an earlier command and the currently–executing COMMREQ command.

CPU Memory   Application Program

| Status Block | ⇐ | Clear status block (set value to zero) |
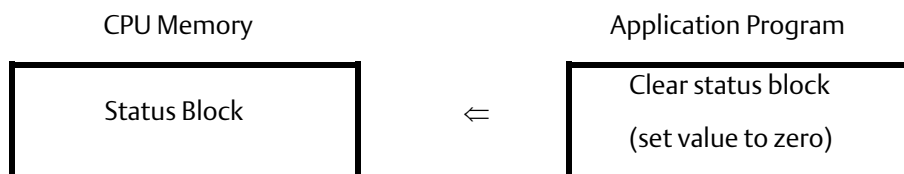
3. Use a COMMREQ instruction to perform the intended function.

Application Program   PROFINET-Genius   Genius Device

| COMMREQ instruction issued to targeted PROFINET Controller | Gateway converts COMMREQ content into Genius Datagram | I/O Module receives Genius Datagram from Gateway |
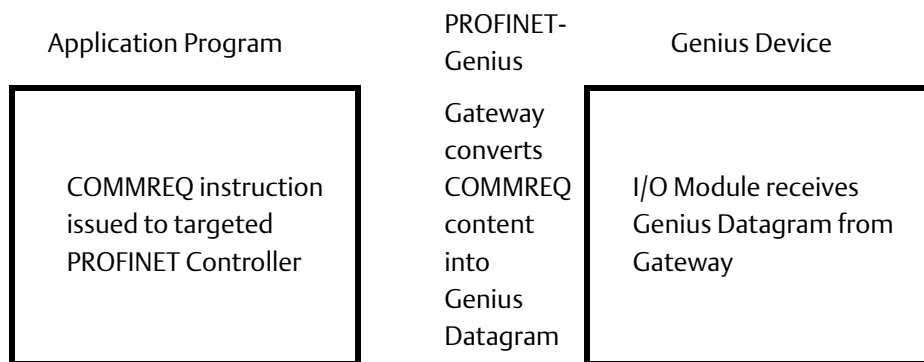
4. Check the status of the initiated COMMREQ task. COMMREQs should be executed sequentially. The application program should check that the status of the previous COMMREQ to the targeted PROFINET Controller is complete before sending it another one. Failure to do this may result in improper operation of the PROFINET Controller.

6.3   COMMREQ Command Block Format

The first step in programming communications requests is to set up the contents of the COMMREQ instruction. This can be done using Block Moves or similar program instructions, as shown later in this chapter.

CPU Memory   Application Program

| Command Block | ⇐ | Edit content of COMMREQ |
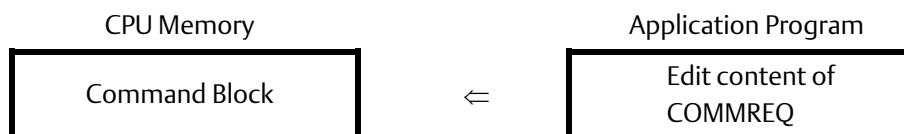
Data is placed in adjacent locations in CPU memory to form a Command Block, per the format shown below:

Location	Data Field	Value
address	Data Block Length	
address + 1	Wait/No Wait Flag	Always 0
address + 2	Status Pointer Memory Type	
address + 3	Status Pointer Offset	
address + 4	Idle Timeout Value (ms)	Always 0
address + 5	Max. Communication Time (ms)	Always 0
address + 6 to address + 78	Data Block	

The length of the Command Block depends on the type of COMMREQ being sent. Seventy words is the maximum and is used only for a COMMREQ that transfers a 128–byte datagram. Most Command Blocks are much shorter. The table in Section 0 gives an overview of the contents of each type of COMMREQ that may be sent to a PROFINET Controller for transfer to a Genius Gateway.

6.3.1   COMMREQ Command Block Contents

Data Field	Explanation
Data Block Length	This is the amount of data from [address + 6] to the end of the Command Block. Each type of COMMREQ command has a unique Data Block. See Section 6.4.
Wait/No Wait Flag	This must be set to zero, indicating No Wait.
	The Status Pointer Memory Type and Status Pointer Offset defined below combine to identify the location in CPU Memory of the Status Block associated with this COMMREQ. The Status Block is the location to which the COMMREQ will return its status. If one of the bit–oriented memories (%I or %Q) is used as the Status Block location, those bits can be monitored by the PLC program.
Status Pointer Memory Type	The Memory Type used is defined by [address + 2], as follows: | Memory Type	Description	Required Entry
---	---	---
%I	discrete input table	70
%Q	discrete output table	72
%R	register memory	8
%AI	analog input table	10
%AQ	analog output table	12
%W	Bulk Memory	196	

Status Pointer Offset	The offset into the Memory Type (above) is defined by [address + 3]. Note that the offset is 0–based. For example, if the Status Block were located at %R099, memory type would be specified as 08 (for %R memory) and the offset would be entered as 98 to point to %R099. Note that if a bit–oriented memory (%I or %Q) is specified, a byte boundary must be used for the offset.
Idle Timeout Value (ms)	This field is not used for the No Wait mode of communication.
Max. Communication Time (ms)	This field is not used for the No Wait mode of communication.
Data Block	The Data Block contains the parameters of the command. Complete descriptions of all commands appear later in this chapter (see Section 6.4).

Location	Function
address + 6	Command Number (see Section 6.3.2)
address + 7	PROFINET Device Number (1-255) of the targeted Genius Gateway.
address + 8	Targeted Genius Device Number (0-31). The serial bus address (SBA) of the Genius device connected to the targeted Genius Gateway.
thru address + 78	Parameters of the specific Command Number (see following sections in this chapter).

Each field in the Command Block is described below:

6.3.2 COMMREQ Commands Supported by the Genius Gateway (GCG001)

Command #	Function	Section
1	Pulse Test	6.4.1
2	Read Configuration	6.4.2
3	Write Configuration	6.4.3
4	Read Diagnostics	6.4.4
5	Clear Circuit Fault	0
6	Clear All Circuit Faults	6.4.6
7	Assign Monitor	6.4.7
8	Outputs Enable/Disable	0
10	Switch BSM	6.4.9
11	Read Device[5]	6.4.10
12	Write Device5	6.4.11
19	Read Identification	6.4.12
20	Write Point5	6.4.13
21	Read Block I/O	6.4.14
22	Read Map	6.4.15
23	Write Map	6.4.16
24	Read Data	6.4.17
25	Write Data	0

---

[5] Note that while the GCG001 does support the indicated COMMREQs, the devices which respond to such COMMREQs are not currently supported by the GCG001

6.3.3   COMMREQ Command Block Quick Reference

The table below summarizes all COMMREQs supported by the Genius Gateway. Beyond Address+8, please see the individual COMMREQ specification in Sections 6.4.1 thru 0.

COMMREQ	COMMREQ Content								
	Addr	Addr+1	Addr+2	Addr+3	Addr+4	Addr+5	Addr+6	Addr+7	Addr+8
	Length	Wait/ No Wait	Status Pointer Memory Type	Status Pointer Offset	Idle Timeout Value	Max. Comm Time	COMM REQ #	PROFINET Device Number	Genius Device Number
Pulse Test	3	0	see 6.3.1		0	0	1	1-255	0-31
Read Configuration	7	0	see 6.3.1		0	0	2	1-255	0-31
Write Configuration	4+n	0	see 6.3.1		0	0	3	1-255	0-31
Read Diagnostics	7	0	see 6.3.1		0	0	4	1-255	0-31
Clear Circuit Fault	4	0	see 6.3.1		0	0	5	1-255	0-31
Clear All Circuit Faults	3	0	see 6.3.1		0	0	6	1-255	0-31, 255
Assign Monitor	4	0	see 6.3.1		0	0	7	1-255	0-31
Outputs Enable /Disable	4	0	see 6.3.1		0	0	8	1-255	0-31, 255
Switch BSM	4	0	see 6.3.1		0	0	10	1-255	0-31
Read Device	18	0	see 6.3.1		0	0	11	1-255	0-31
Write Device	14-78	0	see 6.3.1		0	0	12	1-255	0-31
Read Identification	7	0	see 6.3.1		0	0	19	1-255	0-31
Write Point	8	0	see 6.3.1		0	0	20	1-255	0-31
Read Block I/O	8	0	see 6.3.1		0	0	21	1-255	0-31
Read Map	7	0	see 6.3.1		0	0	22	1-255	0-31
Write Map	12	0	see 6.3.1		0	0	23	1-255	0-31
Read Data	9	0	see 6.3.1		0	0	24	1-255	0-31
Write Data	7	0	see 6.3.1		0	0	25	1-255	0-31

6.3.4   Mechanics of the COMMREQ Instruction

Once the content of the of the COMMREQ communication has been set up (in the COMMREQ Command Block, as described above) the application program will need to activate the corresponding COMMREQ instruction in order to initiate communications with the target Genius Device (via the interconnected PROFINET Controller and Genius Gateway.

This section describes the mechanisms employed by the PLC logic to initiate and monitor the COMMREQ instruction and its aftermath.

The COMMREQ instruction has four inputs and two outputs:

COMMREQ Inputs

COMMREQ Input	Description
(enable)	Permissive logic that controls power flow to the COMMREQ function block.
IN	The memory location of the Command Block containing the specific COMMREQ command information. The Command Block may be in any word–oriented area of memory (%P, %L, %R, %AI, %AQ, or %W).
SYSID	A two-byte hex value that gives the rack and slot location of the controlling PROFINET Controller. The rack number must be zero and occupies the more significant byte; the slot number in which the PROFINET Controller is located occupies the less significant byte. Example: | Rack#	Slot#	Resulting SysID Hex Word Value
---	---	---
0	4	0004h	
TASK	The task is 16#0084 for the IC695PNC001. The task is 16#0002 0084 for the IC695CPE330 and IC695CPE400.

Thus, the input specifies the conditions under which the COMMREQ is to be activated and specifies which PROFINET Controller and which Genius Gateway are targeted in this activity.

COMMREQ Outputs

COMMREQ Output	Description
OK	Indicates correct execution of the COMMREQ.
FT	Indicates a fault condition in COMMREQ execution.

The behavior of the COMMREQ Outputs is shown in the following truth table. Note that the OK and FT outputs are never both true at the same time:

Enable	Error?	OK	FT
active	no	true	false
active	yes	false	true
not active	no execution	false	false

The COMMREQ passes power flow to its OK output unless:

- The specified module (in rack/slot) is not present.
- The specified task is not valid for the target device.
- The data length is zero.

If any fault intrinsic to the conduct of the COMMREQ occurs, power flow passes to the FT output instead.

If there are errors in the portion of the Command Block used specifically by the PROFINET Controller or Genius Gateway (for example, the Device Number entered is incorrect), these errors are reflected in the value returned in the Status Block location, not in the FT output.

COMMREQ Status Block

Once a COMMREQ command is completed, the PROFINET Controller writes any resulting data into the area designated in the COMMREQ command and then sets the status to Complete (4). However, if an error occurred during processing of the command, the status will be set to one of the possible error values. Possible status values are listed below.

Note: *Because COMMREQs require write access to return their status, level 1 and 2 Controller passwords, which prevent write access, cannot be used with COMMREQs. If an illegal memory type is specified, a fault will be generated.*

If one of the bit–oriented memories (%I or %Q) is used as the status location, the designated bits can be monitored. These bits correspond to the binary values listed below. For example, if %I048 were selected as the beginning location, reference %I050 would be set to 1 each time the COMMREQ completed successfully (corresponding to a value of 04 Hex).

Clearing the Status Block

COMMREQs to the target PROFINET Controller should be executed sequentially. Before sending a COMMREQ to the PROFINET Controller, the application program should check the status of any previous COMMREQ to that specific PROFINET Controller.

CPU Memory   Application Program

| Status Block | ⇒ | Check completion of prior COMMREQ |

When the previous COMMREQ has completed, the user's PLC program should set the Status Block to zero. Establishing this initial condition allows the program to differentiate between the result of an earlier command and the currently–executing command.

Contents of the Status Block

The Status Block consists of two words in PLC memory to which the PROFINET Controller returns the status of the COMMREQ.

The lower word is used for general information about the execution of the COMMREQ:

Table 1:

VALUE			DESCRIPTION
decimal (word)	Binary (bit)		
0	00000000	00000000	Command has not been processed.
1	00000000	00000001	Command not accepted: target PROFINET Controller busy with previous request.
2	00000000	00000010	Command currently being processed, not yet completed.
4	00000000	00000100	Command completed successfully.
8	00000000	00001000	Command terminated due to a syntax error.
16	00000000	00010000	Command terminated due to a data error.
128	00000000	10000000	Command not supported.
4096	00010000	00000000	Command failed.
32769	00100000	00000001	Unknown Task ID rejected by the PNC COMMREQ Manager.
32770	00100000	00000010	PNC COMMREQ Manager got an internal error while dispatching the request.

The upper word of the status location provides additional status information

Table 2:

VALUE decimal (word)	VALUE Hex (word)	DESCRIPTION
0	0	Command has not been processed.
1	1	Non-specific command failure.
2	2	Null or invalid command block.
3	3	Unknown Task ID detected. Task ID should be 132 for Gateway COMMREQs, or 131 for generic PROFINET acyclic requests.
4	4	Command completed successfully.
5	5	Incorrect command block length.
10	0x0A	Unknown command number.
11	0x0B	Invalid PROFINET device number. Number should be in the range 1 through MAX_PROFINET_IO_DEVICE_CONNECTIONS (model-specific definition).

VALUE decimal (word)	VALUE Hex (word)	DESCRIPTION
12	0x0C	PROFINET device is 'undeclared'. The PROFINET device specified in the command block is not known to the PNC as currently configured.
13	0x0D	PROFINET API value is out of range. The value should be 0 or 1 (always 0 for Gateway requests).
14	0x0E	PROFINET slot value is out of range. The value should be in the range 0 through 31 (Gateway requests normally use 31, except when using read index 0x0203).
15	0x0F	PROFINET subplot value is out of range. Gateway requests always use sub slot 1. Generic acyclic requests test for a sublot value in range 1 through 32784.
16	0x10	Invalid transfer length specified. Value is either too large, or zero.
17	0x11	PROFINET stack interface failure; read_req call failed at invocation site.
18	0x12	Error returned from PROFINET stack; a generic acyclic request issued a read_req call that produced a negative confirmation callback.
19	0x13	PROFINET stack interface failure; write_req call failed at invocation site.
20	0x14	Error returned from PROFINET stack; a generic acyclic request issued a write_req call that produced a negative confirmation callback.
21	0x15	Invalid Genius device number. Value should be in range 0 through 31.
22	0x16	Invalid circuit number. Value should be in range 1 through 32.
23	0x17	Error returned from PROFINET stack; a Gateway request issued a write_req call that produced a negative confirmation callback.
24	0x18	Error returned from PROFINET stack; a Gateway request issued a read_req call that produced a negative confirmation callback.
25	0x19	Last write request to the Gateway timed out or had an error. When Gateway status was checked (via read index 0x0200), the returned value was 2.
26	0x1A	Last write request to the Gateway caused a stuck busy result. Gateway status checks (via read index 0x0200) have returned a value of 1 for more than 300 msec.
27	0x1B	Gateway status check (via read index 0x0200) returned an invalid value (not 0, 1, or 2).
28	0x1C	Error returned from PROFINET stack; an attempt to retrieve a Genius Reply from the Gateway (via read index 0x0201) produced a negative confirmation callback.
29	0x1D	The message status byte associated with a Genius Reply is not 0, indicating a problem.
30	0x1E	A Genius Reply does not have the expected length.
31	0x1F	A Write Configuration COMMREQ specified a configuration data length that does not match the required configuration length for the device.
32	0x20	A Read Block I/O COMMREQ specified an invalid offset value.
33	0x21	An internal error has been detected in the PNC COMMREQ firmware.

VALUE decimal (word)	VALUE Hex (word)	DESCRIPTION
34	0x22	The COMMREQ request is not supported by the specified Genius device.
35	0x23	The data type code specified for a Read Data or Write Data COMMREQ does not have a value recognized by the High-Speed Counter.
36	0x24	The counter number specified for a Read Data or Write Data COMMREQ does not have a value recognized by the High-Speed Counter.
37	0x25	A Read Configuration or Write Configuration COMMREQ was issued for a device that does not have any configuration data.
38	0x26	A Read Diagnostics COMMREQ was issued for a device that does not have any diagnostic data.
39	0x27	A Read Device or Write Device COMMREQ specified an invalid program name when attempting to access %P or %L memory.
40	0x28	A Read Device or Write Device COMMREQ specified an invalid block name when attempting to access %L memory.
41	0x29	A Genius Reply does not have the expected sub-function code. This could indicate that the Gateway delivered a stale or out-of-sequence reply.
42	0x2A	A Read Device or Write Device COMMREQ sent to a 90-30 GBC (BEM331) attempted to access memory types (%P, %L, %W) not handled by the BEM331.

Example: Ladder Logic to Clear Circuit Fault

The ladder logic displayed in Figure 34 shows how to clear a fault on circuit #2 of the Genius Device at SBA#13 when connected via a Genius Gateway to the PROFINET Controller located at Rack 0 Slot 7. Figure 35 uses a Data_Init_Comm to set up the same COMMREQ.

Figure 34: Ladder Logic to Clear Circuit Fault
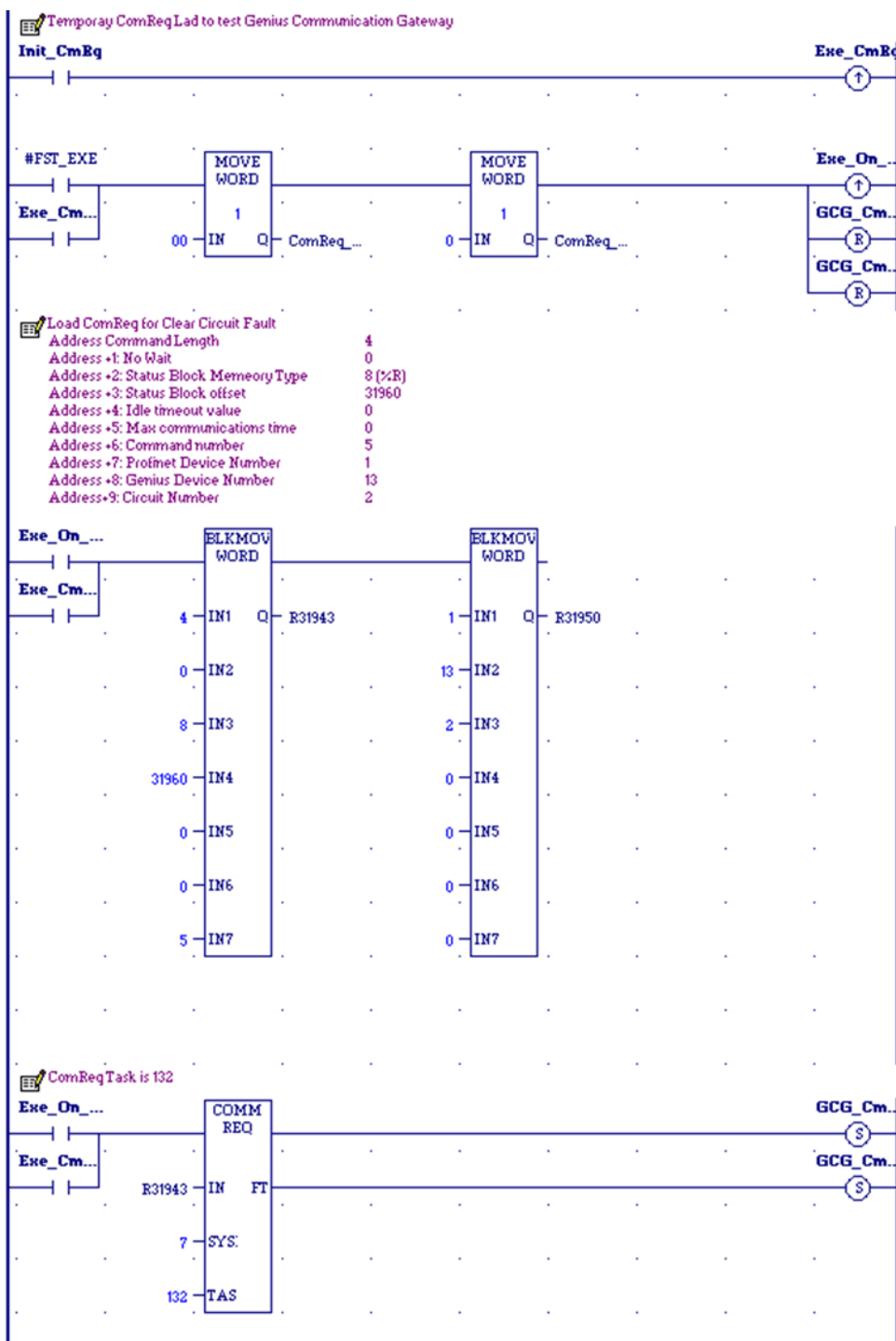
Figure 35: Data_Init_Comm to Clear Circuit Fault
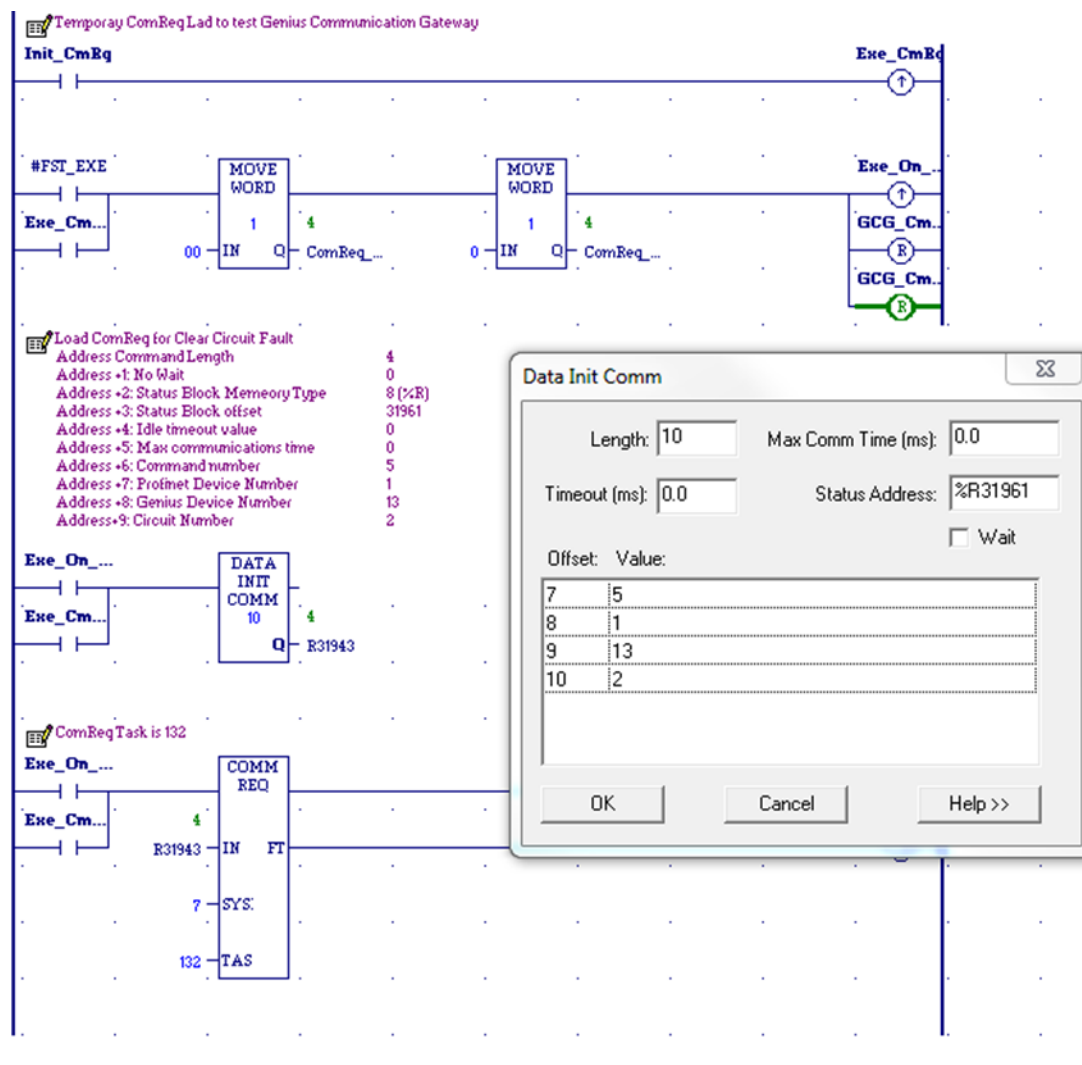
6.3.5 Comparison: COMMREQ vs Data_Init_Comm

Data_Init_Comm is an instruction designed to help programmers set up COMMREQs.

Note that when programming a COMMREQ (Figure 34), the entry for Address+3 is one less than the intended beginning address for the Status Block. When programming a Data_Init_Comm (Figure 35), the entry for Address+3 is the actual intended memory location for the beginning address for the Status Block.

This difference applies to all command blocks detailed in the following sections 6.4.1 - 0. If the COMMREQ requires "n" for the Status Block location, the equivalent Data_Init_Comm will require "n+1" in its Address+3.

Also note that the pop-up window presented in Data_Init_Comm (as shown in Figure 35), allows the user to scroll through the parameters of the command. This is especially useful where the command has multiple parameters.

6.3.6 COMMREQ Differences: Genius Bus Controllers and Genius Gateway

COMMREQs supported by the Genius Gateway (GCG) are intended to perform the same functions as their Genius Bus Controller (GBC) counterparts. However, there are four significant differences that break compatibility with the GBC COMMREQ Command Blocks:

1. GCG COMMREQs require a PROFINET Device Number at Address +7. This value is required to identify which PROFINET /GCG combination is expected to process the COMMREQ.

2. As a result of (1) above, any COMMREQ command parameters above Address +7 are shifted with respect to the comparable GBC COMMREQ.

3. SYSID consists of the Rack/Slot location of the PROFINET Controller networked to the targeted GCG rather than the Rack/Slot location of the GBC.

4. For COMMREQs that return data to CPU memory, e.g., Read Configuration, the Memory Offset field has been expanded from one to two words. This allows the use of bulk memory (%W) addresses greater than 65,535. When using offsets less than or equal to 65,535, the more significant offset word must be zero.

The following table shows all Genius COMMREQs and where they are supported.

Table 3:

COMMREQ#	Function	GCG	GBC 30	GBC 70
1	Pulse Test	✓		✓
2	Read Configuration	✓		✓
3	Write Configuration	✓		✓
4	Read Diagnostics	✓		✓
5	Clear Circuit Fault	✓		✓
6	Clear All Circuit Faults	✓		✓
7	Assign Monitor	✓		✓
8	Outputs Enable/Disable	✓	✓	✓
9	Global Data Enable/Disable			✓
10	Switch BSM	✓		✓
11	Read Device	✓		✓
12	Write Device	✓		✓
13	De-Queue Datagram		✓	✓
14	Send Datagram		✓	✓
15	Request Datagram Reply		✓	✓
16	I/O Faults Enable/Disable			✓
17	Do Output			✓
18	Read Bus Address of Bus Controller			✓

COMMREQ#	Function	GCG	GBC 30	GBC 70
19	Read Identification	✓		
20	Write Point	✓		
21	Read Block I/O	✓		
22	Read Map	✓		
23	Write Map	✓		
24	Read Data	✓		
25	Write Data	✓		

6.4 COMMREQ Descriptions and Formats

6.4.1 COMMREQ #1: Pulse Test Command

The Pulse Test command causes the Genius Gateway to send a Pulse Test datagram.

Pulse testing is used to verify the operation of outputs on discrete Genius I/O blocks. It checks whether the outputs will change state, and whether output circuits (wires, power sources, loads) will start or stop current flow. Any circuit faults generated by pulse tests are reported through the normal Report Fault message. Pulse testing is recommended for blocks that seldom change state. It is typically done once per hour, or once per shift; it should not be done more often than once per minute. Pulse testing provides assurance that when needed, an output will operate correctly. Blocks that control outputs that change state frequently do not need to be pulse tested. Pulse testing does not provide enough energy to activate mechanical devices such as motor starters, replays, or solenoid valves, but may change the state of a very small load. If appropriate, blocks can be configured (with the Hand-Held Monitor or via a Write Configuration command) to ignore a Pulse Test datagram. Pulse testing can also be done using a Hand-Held Monitor.

Command Block for the Pulse Test Command

Table 4:

Address	Command Length	3
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	1
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device.

6.4.2 COMMREQ #2: Read Configuration Command

The Read Configuration command is used to request configuration data from device on the Genius bus. It causes the Gateway to send a Read Configuration datagram to the indicated device. After receiving the request, the block returns its configuration data to the Gateway in 16-byte increments. When the Gateway has received all the configuration data, it transfers that complete data image to the PNC, which then transfers the data to the deposit memory location specified in the Command Block. Because configuration data consists of both bit-type and byte-type portions, it is best to place it in word memory, then move the bit-oriented data to bit memory. Contents of Read Configuration Reply messages for I/O blocks are shown in the Genius I/O System and Communications User's Manual, GEK-90486-1.

The VersaMax I/O Station (GNIU) does not support this COMMREQ. Use PME to read the GNIU's configuration data.

Command Block for the Read Configuration Command

Table 5:

Address	Command Length	7
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	2
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device.
Address +9	Maximum data memory length. May represent either bits or words (depends on the memory type selected below).	18 words (288 bits): any discrete block 13 words (208 bits): 16-Circuit AC Input block 42 words (672 bits): Analog blocks (4-in/2-out) 42 words (672 bits): RTD or Thermocouple block 44 words (704 bits): 6-Input Analog blocks 42 words (672 bits): 6-Output Analog blocks 35 words (560 bits): High-Speed Counter If the length of data returned by the device exceeds the length specified here, the GCG writes as much data as possible to the PLC CPU Memory and returns a data error to the COMMREQ Status Block. The GCG will not write past the computed end-point. If the same COMMREQ will be used to read configuration data from more than one type of block (for example, in a subroutine), be sure to allow enough length to accommodate the largest amount of data that might be returned.

Address	Command Length	7
Address +10	Deposit Memory type	Enter the code representing the CPU Memory Type where the GCG will deposit the data obtained from the target Genius Device. Use the same codes as in Address+2.
Address +11 Address +12	Memory offset bytes 1, 2 bytes 3 ,4	Starting address within the Deposit Memory type. (Byte 4 is MSB, Byte 1 is LSB)

6.4.3　COMMREQ #3: Write Configuration Command

The Write Configuration command is used to send configuration data from the CPU to a device on the Genius bus. The Gateway cannot write configuration data to another Genius Gateway, to a Bus Interface module, or to a Hand-Held Monitor.

The PLC sends the intended configuration data from CPU memory to the PNC which then transfers it to the Gateway. The Gateway schedules background Write Configuration datagrams to the target Genius device. Once message transmission begins, the Gateway sends the configuration data to the target Genius device, up to 16 bytes per bus scan. The block does not use any of the new configuration data until it has all been received. No new datagrams can be sent to the Genius device until the operation has been completed. When all the data has been sent, the Gateway changes the status to 4 (Done), and this is replicated by the PNC.

The length of the data sent with this command must exactly match the length specified for the target Genius device. If the lengths are not equal, the Gateway returns a Syntax Error to the COMMREQ Status Block.

GNIU does not support this COMMREQ. Use PME to download configuration data to a GNIU.

Command Block for the Write Configuration Command

Address	Command Length	This number equals the sum of the amount of configuration data to be sent to the target Genius device, plus 4. For example, for an RTD block, which has 42 words of configuration data, you would enter 46 here. Refer to Section 6.4.2, COMMREQ #2: Read Configuration Command for data lengths associated with other Genius devices.
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	3
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device.

Address	Command Length	This number equals the sum of the amount of configuration data to be sent to the target Genius device, plus 4. For example, for an RTD block, which has 42 words of configuration data, you would enter 46 here. Refer to Section 6.4.2, COMMREQ #2: Read Configuration Command for data lengths associated with other Genius devices.
Address +9	Length of configuration data (in bytes)	Up to 248 bytes (128 words) of configuration data may be written to the target Genius device. Refer to Section 6.4.2, COMMREQ #2: Read Configuration Command for data lengths associated with other Genius devices.
Address +10 to Address +n	Configuration Data	Configuration data for transfer to the target Genius device. Formats are given in the Genius I/O System and Communications User's Manual, GEK-90486-1.

6.4.4 COMMREQ #4: Read Diagnostics Command

Use this command to request diagnostic information from a Genius device or a bus interface module. Diagnostics can be requested from any Genius device, even those configured not to issue Report Fault messages. The diagnostic data returned by a block will indicate faults that have occurred since power-up or since the last Clear Faults datagram. Current diagnostic state can be found by issuing a Clear Faults command to the circuit(s) or channel(s) to clear the fault history, then issuing a Read Diagnostics command.

This command causes the Genius Gateway to send a Read Diagnostics datagram to the specified device. When the device receives this datagram, it returns a Read Diagnostics Reply datagram. I/O blocks return data in message segments of up to 16 bytes per bus scan. The content of the Read Diagnostics Reply message depends on the device being queried. The first word of the reply will contain the length of the data that follows. Data is packed two bytes per word. Message formats are shown in the Genius I/O System and Communications User's Manual, GEK-90486-1. When all the data has been received, the Gateway transfers it to the PNC, which then transfers it to the CPU.

Command Block for the Read Diagnostics Command

Address	Command Length	7
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	4
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device.
Address +9	Maximum data memory length. May represent either bits or words (depends on the memory type selected below).	This entry tells the CPU how much memory is being allocated to store the diagnostic data returned by the Genius device. The number of bits or words needed depends on the number of circuits on the block and the block type: 10 words (160 bits): Discrete blocks, 8-ckt. 18 words (288 bits): Discrete blocks, 16-ckt. 34 words (544 bits): Discrete blocks, 32-ckt. 8 words (128 bits): Analog, 4-in/2-out blocks. 8 words (128 bits): RTD Input blocks. 8 words (128 bits): Thermocouple Input blocks. 6 words (96 bits): High-Speed Counter block. If the length of data returned by the device exceeds the length specified here, the GCG writes as much data as possible to the PLC CPU Memory and returns a data error to the COMMREQ Status Block. The GCG will not write past the computed end-point.
Address +10	Deposit Memory type	Enter the code representing the CPU Memory Type where the GCG will deposit the data obtained from the target Genius Device. Use the same codes as in Address+2.
Address +11 Address +12	Memory offset bytes 1, 2 bytes 3, 4	Starting address within the Deposit Memory type. (Byte 4 is MSB, Byte 1 is LSB)

6.4.5 COMMREQ #5: Clear Circuit Fault Command

This command is used to clear any faults on a specified circuit of a targeted Genius I/O device

Command Block for the Clear Circuit Fault Command

Address	Command Length	4
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	5
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device.
Address +9	Relative Circuit Number	This is the relative number of the circuit within the Genius device. It is not its reference number assigned in CPU Memory. The first circuit on the Genius device is number 1. For example, to clear faults on discrete I/O block circuit #5, enter 5 here. For a 4-Input/2-Output analog block, circuit numbers 1 to 4 are for input channels, 5 and 6 are for output channels.

6.4.6 COMMREQ #6: Clear All

Circuit Faults Command

The Clear All Circuit Faults command is used to clear all faults on a targeted Genius I/O device.

Command Block for the Clear All Circuit Faults Command

Address	Command Length	3
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	6
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29 or 255: the SBA of the targeted Genius Device. Enter 255 to send this command to all blocks on the bus.[6]

6.4.7 COMMREQ #7: Assign Monitor Command

An Assigned Monitor is an additional bus interface module (usually in another PLC) that monitors Genius I/O devices on the bus. Remote I/O Scanners and I/O blocks broadcast their inputs to all devices on the bus. Therefore, any interface module on the bus will receive all inputs sent by the blocks. However, blocks direct fault reports and configuration change messages only to the bus interface module that sends them outputs. Blocks configured for CPU Redundancy will automatically transmit two copies of any fault report or configuration change message, directing them to Device Numbers 30 and 31.

The Assign Monitor command can be used to have Genius I/O devices send extra fault report and configuration change messages to a monitoring bus interface module. Blocks would send two copies of each fault report or configuration message in a non-redundant system. Blocks in a redundant system would send three (two to the redundant bus interface modules, and the third to the Assigned Monitor).

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[6] This enhancement (use of 255 as Genius Device Number) requires that the supervising PNC001 firmware be version 2.11 or later; otherwise the COMMREQ command will fail. If CPE330 is used, firmware version 8.80 is required. If CPE400 is used, all firmware versions support this functionality.

Command Block for the Assign Monitor Command

Address	Command Length	4
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	7
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number of the I/O device(s) that should send extra fault reports.	1-29: the SBA of a sending Genius Device. In the event only selected blocks should report their faults to the assigned monitor, program separate Assign Monitor commands for each, entering a different SBA in this field each time.
Address +9	Genius Device Number of the bus interface device that will RECEIVE the extra fault reports.	0-31: the SBA of the receiving Genius Device (i.e. the Assigned Monitor).

6.4.8   COMMREQ #8: Enable/Disable Outputs Command

The Enable/Disable Outputs command can be sent to the Genius Gateway to disable sending outputs to any blocks whose outputs are currently enabled. Conversely, it can also be used to enable sending outputs to any blocks whose outputs are currently disabled. The effect of disabling outputs is the same as running the control in Run/Disable mode.

Command Block for the Enable/Disable Outputs Command

Address	Command Length	4
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	8
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	Enter 1-29 to enable or disable outputs to one block. Or enter 255 to enable or disable outputs to ALL devices on the bus.
Address +9	Enable/Disable Command	To disable outputs, enter 0. To enable outputs, enter 1.

6.4.9   COMMREQ #10: Switch BSM Command

In a dual bus system, the Switch BSM command can be used to cause a Bus Switching Module to select a bus. This command causes the Genius Gateway to issue a normal-priority Switch BSM datagram.

The program must already know which bus is currently selected. The controller may issue the Switch BSM command at intervals to ensure continued proper bus switching capability. If the BSM position is currently forced by the Hand-held Monitor, the command will have no effect. A data error is returned to the status reference if the block does not control a BSM.

Command Block for the Switch BSM Command

Address	Command Length	4
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	10
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the Genius block to which the Bus Switching Module is attached.
Address +9	Desired bus position	Enter 0 for Bus A or 1 for Bus B. All other values are invalid.

6.4.10   COMMREQ #11: Read Device Command

To read up to 128 bytes of data from another CPU and place it in the host PLC CPU memory, use the Read Device command. This causes the Genius Gateway to issue a Read Device datagram. When the requested data is received, it will automatically be placed in the CPU memory location specified in the Command Block.

Note that while the GCG001 does support this COMMREQ, the Genius devices which respond to such a COMMREQ are not currently supported by the GCG001.

Command Block for the Read Device Command

Address	Command Length	18
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	11
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	0-31: the SBA of the targeted Genius Device from which data is to be retrieved.

Address +9 Address +10	Source Memory Address, bytes 1, 2 bytes 3, 4	Specify the location FROM which the requested data will be read. (It is not necessary to specify a source memory address when sending a Read Device COMREQ to a computer).
Address +11 Address +12 Address +13 Address +14	Program name, characters 1, 2 characters 3, 4 characters 5, 6 characters 7, 8	Required to read %P or %L memory in another PLC, otherwise zero. If the target of the command is NOT a PLC, address +11 through Address +18 are ignored; they may contain any value. Program names are limited to 7 characters. Character 8 and all other trailing characters MUST be entered as nulls (00h).
Address +15 Address +16 Address +17 Address +18	Block name, characters 1, 2 characters 3, 4 characters 5, 6 characters 7, 8	Required to read %L memory in a PLC, otherwise zero. For %P, Address+15 through Address +18 are ignored. Block names are limited to 7 characters. Character 8 and all other trailing characters MUST be entered as nulls (00h).
Address +19	Source Data length, (in words, bytes, or bits).	This is the amount of data to be read from the targeted device. When reading a PLC, data length is defined in bits or words, depending on the memory type being read. For other types of devices, the length entered here is as expected by the target device. The maximum length is equal to 128 bytes.
Address +20	Maximum Deposit memory length	Memory length needed for the returned data. Value in bits or words (depends on memory type selected in Address+21 below).
Address +21	Deposit Memory type	Enter the code representing the CPU Memory Type where the GCG will deposit the data obtained from the target Genius Device. Use the same codes as in Address+2.
Address +22 Address +23	Memory offset bytes 1, 2 bytes 3, 4	Starting address within the Deposit Memory type. (Byte 4 is MSB, Byte 1 is LSB)

Device Memory Addressing

For Series 90 and PACSystems PLCs, Address+9 contains the segment selector value for the memory type being read. Address+10 contains the zero-based offset into the memory being read.

For legacy devices, use an absolute address, where Address+9 is the least-significant word of the address and Address+10 is the most-significant word of the address field.

6.4.11 COMMREQ #12: Write Device Command

To send up to 128 bytes of data to another CPU on the bus, use the Write Device command. Any type of data that can be addressed by its memory type and offset can be sent. This command causes the Gateway to issue a Write Device datagram to the specified device.

Note that while the GCG001 does support this COMMREQ, the Genius devices which respond to such a COMMREQ are not currently supported by the GCG001.

Using Write Device Messages Instead of Global Data

Write Device datagrams can replace Global Data when the target device is a PLC that is using a Genius Bus Controller to connect to the Genius bus. However, Write Device will not work in this manner when the target PLC is using a Genius Gateway to connect to the Genius bus.

Command Block for the Write Device Command

Address	Command Length	14 – 78 depending on length of data specified in Address +19.
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	12
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	0-31: the SBA of the targeted Genius Device to which data is to be transmitted.
Address +9 Address +10	Target Memory Address, bytes 1, 2 bytes 3, 4	Specify the location TO which the supplied data will be transmitted. (It is not necessary to specify a source memory address when sending a Write Device COMREQ to a computer).
Address +11 Address +12 Address +13 Address +14	Program name, characters 1, 2 characters 3, 4 characters 5, 6 characters 7, 8	Required to write to %P or %L memory in another PLC, otherwise zero. If the target of the command is NOT a PLC, Address +11 through Address +18 are ignored; they may contain any value. Program names are limited to 7 characters. Character 8 and all other trailing characters MUST be entered as nulls (00h).

Address +15 Address +16 Address +17 Address +18	Block name, characters 1, 2 characters 3, 4 characters 5, 6 characters 7, 8	Required to write to %L memory in a PLC, otherwise zero. For %P, Address+15 through Address +18 are ignored. Block names are limited to 7 characters. Character 8 and all other trailing characters MUST be entered as nulls (00h).
Address +19	Target Data length, (in words, bytes, or bits).	This is the amount of data to be written to the targeted device. When reading a PLC, data length is defined in bits or words, depending on the memory type being written. For other types of devices, the length entered here is as expected by the target device. The maximum length is equal to 128 bytes.
Address +20 to Address +n	Data	Data to be transmitted, then written into the specified memory of the target device.

6.4.12 COMMREQ #19: Read Identification

To read the identification data from a Genius device and place it in PLC CPU memory, use the Read Identification command. This causes the Gateway to issue a Read Identification datagram. When the data is received from the target Genius device, via a Read Identification Reply Datagram, it will automatically be placed in the CPU memory location specified in the Command Block.

Command Block for the Read Identification Command

Address	Command Length	7
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	19
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	0-31: the SBA of the targeted Genius Device.
Address +9	Deposit Memory length. (either bits or words)	This entry tells the CPU how much memory is being allocated to store the identification data returned by the Genius device. Enter 6 for word memory types or 96 for bit memory types (depends on the memory type selected as the Deposit Memory type below).

Address +10	Deposit Memory type		Enter the code representing the CPU Memory Type where the GCG will deposit the data obtained from the target Genius Device. Use the same codes as in Address+2.
Address +11 Address +12	Memory offset	bytes 1, 2 bytes 3, 4	Starting address within the Deposit Memory type. (Byte 4 is MSB, Byte 1 is LSB)

Read Identification Reply Data

The datagram returned by the target Genius Device has the following data content:

Word #	Description	
	MSB	LSB
0	Output data length (bytes)	Input data length (bytes)
1	Number of diagnostic data bytes	Number of configuration data bytes
2	Device Status Table Address (LSB)	Device Status Bits | Bit	Description
---	---
0	Device Forced if set to 1
1,2	01 = inputs only 10 = outputs only 11 = combination
3	HHM Present if set to 1
4	BSM Present if set to 1
5	BSM Controller if set to 1
6	BSM Actual State
7	BSM Forced if set to 1	
3	Device Model Number OR GENA application ID if a GENA	Device Status Table Address (MSB)
4	Assigned controller bus address OR S6 GBC DIP switch, if S6 GBC OR GENA application rev #, if GENA	Device Software Revision Number
5	Baud Rate Code | Bits	Baud Rate
---	---
0 0 0 0 x x x x	153.6 K baud, extended
0 0 0 1 x x x x	153.6 K baud, standard
0 0 1 0 x x x x	76.8 K baud
0 0 1 1 x x x x	38.4 K baud		Device Model Number

6.4.13 COMMREQ #20: Write Point Command

This command is intended for use with legacy devices that use absolute memory addressing, such as the Series Six. For Series 90 and PACSystems PLCs, use the Write Device command.

Note that while the GCG001 does support this COMMREQ, the Genius devices which respond to such a COMMREQ are not currently supported by the GCG001.

Command Block for the Write Point Command

Address	Command Length	7
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	20
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	0-31: the SBA of the targeted Genius Device to which data is to be transmitted.
Address +9 Address +10	Target Device Address bytes 1, 2 bytes 3, 4	Address within target device to be modified per the AND & OR masks supplied below. Byte 1 is LSB of this address, Byte 4 is MSB.
Address +11	AND & OR Masks for byte 1	AND mask is in the LSB; OR mask is in the MSB
Address +12	AND & OR Masks for byte 2	AND mask is in the LSB; OR mask is in the MSB

6.4.14 COMMREQ #21: Read Block I/O Command

This command is used to read input and output data from the following Genius blocks:

- 4-Input/2-Output Analog Blocks
- Current-source Analog Blocks
- Thermocouple Input Blocks

The data available to this command includes the I/O data that is part of the block's periodic I/O update as well as other related data, such as the raw counts.

Command Block for the Read Block I/O Command

Address	Command Length	8
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	21
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device from which data is to be retrieved.
Address +9	Length	Length of data to be returned by the target Genius device. Value in bits or words, depending on memory type selected below
Address +10	Deposit Memory type	Enter the code representing the CPU Memory Type where the GCG will deposit the data obtained from the target Genius Device. Use the same codes as in Address+2.
Address +11 Address +12	Memory offset, bytes 1, 2 bytes 3, 4	Starting address within the Deposit Memory type. (Byte 4 is MSB, Byte 1 is LSB)
Address +13	I/O Offset	Byte offset from the beginning of the device's I/O data (zero-based).

I/O Data Format Returned by 4-In/2-Out Analog and Strain Gauge/mV Blocks

Byte #	Description
0	Block Model Number
1	Block Software Revision Number
2	A/D value for Input Channel 1 (LSB)
3	A/D value for Input Channel 1 (MSB)
4-5	A/D value for Input Channel 2
6-7	A/D value for Input Channel 3
8-9	A/D value for Input Channel 4
10	D/A value for Output Channel 1 (LSB) *
11	D/A value for Output Channel 1 (MSB) *
12-13	D/A value for Output Channel 2 *
14	Engineering Units value for input channel 1 (LSB)
15	Engineering Units value for input channel 1 (MSB)
16-17	Engineering Units value for input channel 2
18-19	Engineering Units value for input channel 3
20-21	Engineering Units value for input channel 4
22	Engineering Units value for output channel 1 (LSB) *
23	Engineering Units value for output channel 1 (MSB) *
24-25	Engineering Units value for output channel 2 *

I/O Data Format Returned by Current Source Analog (CSA) Blocks

Byte #	Description
0	Block Model Number
1	Block Software Revision Number
2	μA value for Input Channel 1 (LSB)
3	μA value for Input Channel 1 (MSB)
4-5	μA value for Input Channel 2
6-7	μA value for Input Channel 3
8-9	μA value for Input Channel 4
10-11	μA commanded value for output channel 1
12-13	μA commanded value for output channel 2
14	Engineering Units value for input channel 1 (LSB)
15	Engineering Units value for input channel 1 (MSB)
16-17	Engineering Units value for input channel 2
18-19	Engineering Units value for input channel 3
20-21	Engineering Units value for input channel 4
22-23	Engineering Units value for output channel 1
24-25	Engineering Units value for output channel 2
26	μA Feedback value for output channel 1 (LSB)
27	μA Feedback value for output channel 1 (MSB)
28-29	μA Feedback value for output channel 2
30	Engineering Units feedback value for output channel 1 (LSB)
31	Engineering Units feedback value for output channel 1 (MSB)
32-33	Engineering Units feedback value for output channel 2

I/O Data Format Returned by Current Source Output (CSO) Blocks

Byte #	Description
0	Block Model Number
1	Block Software Revision Number
2	μA commanded value for output channel 1 (LSB)
3	μA commanded value for output channel 1 (MSB)
4-5	μA commanded value for output channel 2
6-7	μA commanded value for output channel 3
8-9	μA commanded value for output channel 4
10-11	μA commanded value for output channel 5
12-13	μA commanded value for output channel 6
14	Engineering Units value for output channel 1 (LSB)
15	Engineering Units value for output channel 1 (MSB)
16-17	Engineering Units value for output channel 2
18-19	Engineering Units value for output channel 3
20-21	Engineering Units value for output channel 4
22-23	Engineering Units value for output channel 5
24-25	Engineering Units value for output channel 6

I/O Data Format Returned by Current Source Input (CSI) Blocks

Byte #	Description
0	Block Model Number
1	Block Software Revision Number
2	μA value for input channel 1 (LSB)
3	μA value for input channel 1 (MSB)
4-5	μA value for input channel 2
6-7	μA value for input channel 3
8-9	μA value for input channel 4
10-11	μA value for input channel 5
12-13	μA value for input channel 6
14	Engineering Units value for input channel 1 (LSB)
15	Engineering Units value for input channel 1 (MSB)
16-17	Engineering Units value for input channel 2
18-19	Engineering Units value for input channel 3
20-21	Engineering Units value for input channel 4
22-23	Engineering Units value for input channel 5
24-25	Engineering Units value for input channel 6

I/O Data Format Returned by Thermocouple Input Block

Byte #	Description
0	Block Model Number
1	Block Software Revision Number
2	Channel 1 T/C input voltage (hundredths of mV) (LSB)
3	Channel 1 T/C input voltage (hundredths of mV) (MSB)
4-5	Channel 2 T/C input voltage (hundredths of mV)
6-7	Channel 3 T/C input voltage (hundredths of mV)
8-9	Channel 4 T/C input voltage (hundredths of mV)
10-11	Channel 5 T/C input voltage (hundredths of mV)
12-13	Channel 6 T/C input voltage (hundredths of mV)
14	Channel 1 Engineering Units value (LSB)
15	Channel 1 Engineering Units value (MSB)
16-17	Channel 2 Engineering Units value
18-19	Channel 3 Engineering Units value
20-21	Channel 4 Engineering Units value
22-23	Channel 5 Engineering Units value

Byte #	Description
24-25	Channel 6 Engineering Units value
26	Channel 1/2 XJV voltage (hundredths of mV) (LSB)
27	Channel 1/2 XJV voltage (hundredths of mV) (MSB)
28-29	Channel 3/4 XJV voltage (hundredths of mV)
30-31	Channel 5/6 XJV voltage (hundredths of mV)
32	Channel 1/2 XJV temperature (tenths of degrees C) (LSB)
33	Channel 1/2 XJV temperature (tenths of degrees C) (MSB)
34-35	Channel 3/4 XJV temperature (tenths of degrees C)
36-37	Channel 5/6 XJV temperature (tenths of degrees C)
38	Channel 1/2 XJI current (tenths of μA) (LSB)
39	Channel 1/2 XJI current (tenths of μA) (MSB)
40-41	Channel 3/4 XJI current (tenths of μA)
42-43	Channel 5/6 XJI current (tenths of μA)
44	Channel 1/2 XJI temperature (tenths of degrees C) (LSB)
45	Channel 1/2 XJI temperature (tenths of degrees C) (MSB)
46-47	Channel 3/4 XJI temperature (tenths of degrees C)
48-49	Channel 5/6 XJI temperature (tenths of degrees C)
50	Channel 1/2 internal CJS current (tenths of μA) (LSB)
51	Channel 1/2 internal CJS current (tenths of μA) (MSB)
52-53	Channel 3/4 internal CJS current (tenths of μA)
54-55	Channel 5/6 internal CJS current (tenths of μA)
56	Channel 1/2 internal CJS temperature (tenths of degrees C) (LSB)
57	Channel 1/2 internal CJS temperature (tenths of degrees C) (MSB)
58-59	Channel 3/4 internal CJS temperature (tenths of degrees C)
60-61	Channel 5/6 internal CJS temperature (tenths of degrees C)
62-73	Reserved

6.4.15 COMMREQ #22: Read Map Command

To read the I/O mapping configuration from a 90-70 Remote Scanner, use the Read Map Command. When the data is received, it will automatically be placed in the CPU memory location specified in the Command Block.

Command Block for the Read Map Command

Address	Command Length	7
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	22
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device.
Address +9	Deposit Memory Length (either bits or words)	This entry tells the CPU how much memory is being allocated to store the data returned by the Genius device. Value specified in bits or words, depending on memory type selected below. (8 words or 128 bits)
Address +10	Deposit Memory type	Enter the code representing the CPU Memory Type where the GCG will deposit the data obtained from the target Genius Device. Use the same codes as in Address+2.
Address +11 Address +12	Memory offset, bytes 1, 2 bytes 3, 4	Starting address within the Deposit Memory type. (Byte 4 is MSB, Byte 1 is LSB)

Read Map Returned Data

Byte #	Description
0	Remote Rack ID
1-2	%I Starting Reference
3	Length of %I data (bytes)
4-5	%AI Starting Reference
6	Length of %AI data (bytes)
7-8	%Q Starting Reference
9	Length of %Q data (bytes)
10-11	%AQ Starting Reference
12	Length of %AQ data (bytes)
13	8-bit additive checksum
14-15	16-bit LRC checksum

6.4.16   COMMREQ #23: Write Map Command

To set the reference table mapping of a 90-70 Remote Scanner on the Genius bus, use the Write Map command.

Command Block for the Write Map Command

Address	Command Length	11
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	23
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device to which data is to be transmitted.
Address +9 to Address +16	Data to be written to the target device.	Same format as Read Map Returned Data described above. The checksums will be ignored.

6.4.17   COMMREQ #24: Read Data Command

This command is used to read data from a Genius High-Speed Counter. When the data is received, it will be placed in the CPU memory location specified in the Command Block.

Command Block for the Read Data Command

Address	Command Length	9
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	24
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius HSC Device from which data is to be retrieved.
Address +9	Deposit Memory Length	This entry tells the CPU how much memory is being allocated to store the data returned by the Genius device. The value (in bytes or bits) depends on the memory type selected as the Deposit Memory type in Address +10 below. When an HSC block is configured as a Type A counter, enter 2 for word memory types or 32 for bit memory types. However, when configured as a Type B or Type C counter, enter 3 for word memory types or 48 for bit memory types. Note that the Read Data Reply Datagram always responds with six bytes of data. The most significant bytes (Byte 4 & Byte 5) are null. Bytes 0 thru Byte 3 contain the HSC Data requested.
Address +10	Deposit Memory type	Enter the code representing the CPU Memory Type where the GCG will deposit the data obtained from the target Genius Device. Use the same codes as in Address+2.
Address +11 Address +12	Memory offset, bytes 1, 2 bytes 3, 4	Starting address within the Deposit Memory type. (Byte 4 is MSB, Byte 1 is LSB)
Address +13	Command Code	See Read/Write Data Command Code Table below.
Address +14	Counter Number	1 – 4

Read Data Reply

Byte	Command Code	See Read/Write Data Command Code Table below.
Byte +1	Counter Number	1 – 4
Bytes 2 -5	Value returned by Command Code	

6.4.18   COMMREQ #25: Write Data Command

This command is used to set data values in a Genius High-speed Counter.

Command Block for the Write Data Command

Address	Command Length	7
Address +1	No Wait	0
Address +2	Status Block memory type	70 (%I), 72 (%Q), 8 (%R), 10 (%AI), 12 (%AQ) or 196 (%W)
Address +3	Status Block offset	Beginning address for the COMMREQ Status Block.
Address +4	Idle timeout value	0
Address +5	Max. communications time	0
Address +6	Command number	25
Address +7	PROFINET Device number	1-255: The device number of the targeted GCG Genius Gateway.
Address +8	Genius Device Number	1-29: the SBA of the targeted Genius Device to which data is to be transmitted.
Address +9	Command Code	See Read/Write Data Command Code Table below.
Address +10	Counter Number	1-4
Address +11 Address +12	Data to be written bytes 1, 2 bytes 3, 4	Four bytes of data to be written to the target Genius HSC (Byte 4 is MSB, Byte 1 is LSB)

Read/Write Data Command Codes for COMMREQs #24 & #25

These commands are used with the Read Data and Write Data COMMREQs to read or write data to a Genius High-speed Counter block. The Load and Set command codes are used in conjunction with the Write Data COMMREQ and the Read command codes are used by the Read Data COMMREQ. In the following descriptions, 'n' represents the counter number.

Command (Decimal)	Command (Hex)	Command Description
0	0000	Null command
1	0001	Load/Read Accumulator n
2	0002	Load/Read Hi Limit n
3	0003	Load/Read Lo Limit n
4	0004	Load Accumulator n Increment
5	0005	Set/Read Counter Direction (Type A counter n only)
6	0006	Load/Read Time Base n
8	0008	Load/Read Home Position n
11	000B	Load/Read ON Preset n.1
12	000C	Load/Read ON Preset n.2
13	000D	Load/Read ON Preset n.3
14	000E	Load/Read ON Preset n.4
21	0015	Load/Read OFF Preset n.1
22	0016	Load/Read OFF Preset n.2
23	0017	Load/Read OFF Preset n.3
24	0018	Load/Read OFF Preset n.4
31	001F	Load/Read PRELOAD n.1
32	0020	Load/Read PRELOAD n.2
50	0032	Load/Read Oscillator Divisor

Technical Support & Contact Information

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

Knowledge Base: https://www.emerson.com/Industrial-Automation-Controls/support

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

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