GE Fanuc Automation

Programmable Control Products

PACSystems RX7i
User's Guide to Integration of VME Modules

GFK-2235 June 2003

Warnings, Cautions, and Notes as Used in this Publication

Warning

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

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

Caution

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

Note

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

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Chapter 1 VME Modules for PACSystems

This manual is a guide to using VME modules from other vendors in a GE Fanuc PACSystems RX7i system. It includes the following information:

Chapter 1. VME Modules for PACSystems, describes the VME features of PACSystems equipment, and gives module selection guidelines.

- VMEbus Standards
- VMEbus Features for PACSystems Products
- General Requirements for VME Modules
- Module Size Requirements
- Addressing and Data Requirements
- Module Power Requirements
- Module Functional Requirements

Chapter 2. Racks, Backplanes, and Power Supplies, provides information about racks, backplanes and power supplies.

- Types of Racks in the System
- Backplanes and Connectors
- The PACSystems RX7i Main Rack
- Expansion Racks: Series 90-70 VME Integrator Racks
- Expansion Racks: Series 90-70 Standard Racks
- Module Locations in Expansion Racks
- Additional Considerations when using Non-GE Fanuc VME Modules
- Auxiliary VME Racks

Chapter 3. PACSystems Configuration for Non-GE Fanuc VME Modules, explains how to include non-GE Fanuc VME modules in the PACSystems configuration.

- Configuring a Slot in the Rack
- Configuring VME Address Regions
- Configuring Interrupts
- Configuring Power Consumption

Chapter 4. Programming for Non-GE Fanuc VME Modules, describes programming features that allow the PACSystems CPU to communicate with VME modules.

- Swap
- Bus Read
- Bus Write
- Bus Read / Modify / Write
- Bus Test and Set
- Interrupt Handling

VMEbus Standards

VME stands for VERSAmodule Eurocard. Eurocard products are based the DIN 41612 and IEC 603-2 connector standards, the IEEE 1101 PC board standards and the DIN 41494 and IEC 297-3 rack standards.

The VMEbus specification has been refined through revisions B, C, C.1, IEC 821, IEEE 1014-1987 and ANSI/VITA 1-1994.

Copies of the VMEbus specifications are available from a variety of sources:

ANSI/VITA 1-1994 (VME64), ANSI/VITA 1.1-1997 (VME64x)

VMEbus International Trade Association (VITA)
7825 East Gelding Dr., Suite 104
Scottsdale, AZ USA 85260
TEL: (480) 951-8866; FAX: (480) 951-0720
http://www.vita.com

ANSI Approved Versions

American National Standards Institute (ANSI)
11 West 42nd Street
New York, NY USA 10036
TEL: (212) 642-4900; FAX: (212) 398-0023
http://www.ansi.org

IEEE 1014-1987 (VMEbus) and IEEE 1101.XX Mechanical Standards

IEEE Service Center
Publications Sales Department
445 Hoes Lane; P.O. Box 1331
Piscataway, NJ USA 08855-1331
TEL: 800-678-4333
http://www.ieee.org

VMEbus Features for PACSystems RX7i Products

PACSystems RX7i products provide basic VMEbus capabilities, plus many VME64 features.

- Master/slave architecture.
- Asynchronous bus (no clocks are used to coordinate data transfers).
- Variable-speed handshaking protocol.
- Non-multiplexed bus.
- Addressing range between 16 and 32-bits.
- Data path widths between 8 and 32-bits.
- Multiprocessing capability.
- Up to 3 levels of interrupts
- Bus LOCK cycles.
- Automatic daisy-chaining of Bus Grants and Interrupt Acknowledge

Non-GE Fanuc VMEbus modules that conform to the IEEE-1014-1987 are considered to be VME64-compliant, regardless of their data transfer capability.

Note that compliance with the VME Standard does not ensure the operating compatibility of VMEbus modules. Two VMEbus modules that adhere to the standard can be incompatible with each other.

Non-GE Fanuc VME modules that have been designed to the set of standards known as VME64x are generally compatible with PACSystems equipment. However, the following VME64x features are not available:

- 160 pin connectors on the backplane.
- P0/J0 connector.
- 3.3 V power supply pins.
- Rear plug-in units (transition modules).
- Live insertion / hot-swap capability.
- Injector / ejector locking handles.
- EMC (ElectroMagnetic Compatible) front panels.
- ESD (Electrostatic Discharge) features.

A module with 160-pin connectors can be plugged into 96-pin J1/J2 connectors in a PACSystems main rack or Series 90-70 expansion rack.

A module that requires +3.3 VDC power cannot be used in a PACSystems main rack or Series 90-70 expansion rack.

General Requirements for VME Modules

A non-GE Fanuc VME Module must meet these general requirements for use with PACSystems equipment:

- The module must meet the same agency approval standards as the PACSystems equipment.
- The module must comply with the VME64 specification if it will be located in the main rack.
- The module must at least comply with the VMEbus Specification Revision C.1 if it will be located in a Series 90-70 expansion rack. No earlier version of this specification may be used.
- The module must be compatible with the characteristics of the Industrialized VMEbus (VME–I) as implemented on the GE Fanuc PACSystems CPU.

Environmental Requirements

In selecting a VME module from another vendor, it is important to pay close attention to the environmental ratings of the module, because individual module ratings can limit the overall system rating. The VME module should meet the following specifications of PACSystems equipment. For more detailed information on product agency approvals, standards, and general specifications for the system, please refer to the *PACSystems RX7i Installation Manual*, GFK-2223.

Specification	***Requirement***
Operating Temperature	0° to 60° C (32° to 140° F), (inlet air at bottom of rack)
Storage Temperature	-40° to 85° C (-40° to 185° F)
Humidity	5% to 95% (non–condensing)
Vibration	1G @40–150Hz, 0.012in p–p @10–40Hz
Shock	15 g's for 11 msec

Consideration must be given to maintaining acceptable component temperature when the VME module has other modules on either side of it. The VME module itself should not exceed 22.5 Watts if this specification is to be met.

Module Size Requirements

Module Height and Connectors

Single height (3U) modules connect to the J1 connector on the rack backplane. Traditionally, 3U modules generate or accept up to 24-bit address and 16-bit data transfers. Single height modules are commonly used if space is limited. Because of their size, they are also more resilient to shock and vibration than double height boards. A 3U-size module will require a faceplate adapter to secure the module to the rack rails.

Double height (6U) modules are electrically compatible with single height modules. Most 6U modules can generate or accept up to 32-bit address and 32-bit data transfers.

Both 3U and 6U modules can be installed in any PACSystems RX7i main or Series 90-70 expansion rack. However, only the main rack has a J1 and J2 backplane. A J2 backplane can optionally be added to an expansion rack if necessary, as explained in chapter 2.

Triple height (9U) boards are not supported by the VME64 specification and cannot be used in any PACSystems main or expansion rack.

Module Width

Both single-width (0.8 inch) and double-width (1.6) inch modules can be installed in any rack in the system. However, modules having more than one board, each with a backplane connector, must be installed in the main rack or in a VME Integrator expansion rack.

See chapter 2 for more information about slot spacing, blank slots, and module location restrictions.

Addressing and Data Requirements

- Modules must have a configurable address range to prevent overlap with GE Fanuc modules' addresses.
- Modules must respond to one or more of the following address modifier (AM) codes:

AM Code	Address Width	Description
29H	A16	Non-Privileged Data
2DH	A16	Supervisory Data
39H	A24	Non-Privileged Data
3AH	A24	Non-Privileged Program (main rack only)
3DH	A24	Supervisory Data (main rack only)
3EH	A24	Supervisory Program (main rack only)
09H	A32	Non-Privileged Data (main rack only)
0AH	A32	Non-Privileged Program (main rack only)
0DH	A32	Supervisory Data (main rack only)
0EH	A32	Supervisory Program (main rack only)

- Modules must not respond to GE Fanuc-defined AM codes 10H through 1FH.
- Modules that use D16 (16 data bits) or D8 (8 data bits) data transfers can be located in the main rack or in an expansion rack. 16 bit data transfers are preferred.
- Modules in an expansion rack must be A24 (standard) or A16 (short) address compatible.
- Modules that use D32 (32 data bits) data transfers can only be used in the main rack.

Module Power Requirements

Per-connector current requirements for a VME module must not exceed 4.5A at 5 VDC and 1.5A at ±12 VDC at 25°C (77°F).

In addition, the power specifications of non-GE Fanuc VME modules must be appropriate for the rack power supply being used. See chapter 2 for more information about GE Fanuc power supplies.

Power Requirements for Modules in the Main Rack

The PACSystems main rack uses a PACSystems power supply. To be used in the main rack, a non-GE Fanuc VME module must:

- comply with VME64 power consumption specifications.
- operate at 5V backplane signaling.
- use the 5V rail for power.

The PACSystems RX7i 100W power supplies provide three output voltages:
+5 VDC output up to 20 amps
+12 VDC output up to 2 amps
-12 VDC output up to 1 amp

The PACSystems RX7i 350W power supplies provide three output voltages:
+5 VDC output up to 60 amps
+12 VDC output up to 12 amps
-12 VDC output up to 4 amp

Power Requirements for Modules in an Expansion Rack

Expansion racks use Series 90-70 PLC power supplies. The VMEbus includes both a +5 volt bus and ±12 volt busses; however, not all Series 90-70 power supplies have a ±12 volt output. Modules requiring ±12VDC must reside in a rack powered by the Series 90-70 100W AC/DC, 90W 24 VDC or 90W 48 VDC power supply.

The output current rating of the +5 volt bus depends on the power supply model, as detailed in chapter 2.

Power Requirements for Modules in Secondary Racks Powered by Cable

- PACSystems RX7i does not support secondary power cables. Only 90-70 expansion racks provide this feature.
- Only modules that use +5 volts may be used in the rack (second rack) without the power supply (the ±12 volt busses are not carried in the Two Rack Power Cable).
- Current rating of the +5 volt bus in the second rack (without power supply) is limited to 5.2 Amps or less.
- Secondary racks must be powered by a 90-70 rack that is controlled by the same PACSystems CPU main rack or a 90-70 CPU main rack. You cannot share the power between two different control racks as they share the system reset signal and could reset each other.

Module Functional Requirements

- Preference should be given to modules that provide opto-isolation between field connections and the backplane. If no isolation from backplane to field connections is provided, system noise immunity may be compromised.
- The module must not interfere with the normal operation of the PACSystems CPU or GE Fanuc modules.
- Modules that are most likely to be successful in the system are those identified by the following acronyms in the VITA catalog and the VMEbus Specification:

A16	D8
A24	D16
A32	D32
SAD016	SD8(O)
SAD024	SRMW8(O)
SD8	SD16
SBLT8	SBLT16
SRMW8	SRMW16
SALL8	SALL16

Additional Requirements

- The module must only drive VME backplane interrupts on IRQ6. The module must not use IRQ1-IRQ4.
- The module should have VMEbus clock and bus controller functions disabled.
- Any VME module that provides power sequencing signals such as ACFAIL and SYSRESET must have them disabled. If a module asserts SYSFAIL, it must do so only at power-up, and must drive SYSFAIL for no longer than one second.
- The module must be able to recover from SYSFAIL which is asserted by the PACSystems CPU during powerup and during I/O configuration.
- The module should go to a default state under failure conditions (e.g. SYSFAIL) and upon command from the CPU.
- All Bus Arb functions must be disabled at power-up.
- The module must only operate as a bus slave. Enabling bus mastership is not supported.

Chapter 2 Racks, Backplanes, and Power Supplies

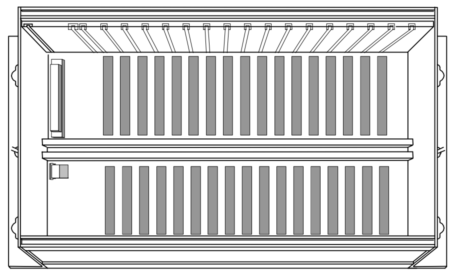
This section provides information about racks, backplanes and power supplies for systems that include non-GE Fanuc VME modules.

- Types of Racks in the System
- Backplanes and Connectors
- The PACSystems RX7i Main Rack
  - Modules in the Main Rack
  - Specifications for PACSystems RX7i Main Racks
  - PACSystems RX7i Power Supplies for the Main Rack
  - Connector Pin Assignments for the Main Rack
- Expansion Racks: Series 90-70 Standard Racks
  - Modules in a Series 90-70 Standard Rack
  - Specifications for Series 90-70 Standard Racks
- Expansion Racks: Series 90-70 VME Integrator Racks
  - Modules in a Series 90-70 VME Integrator Rack
  - Specifications for Series 90-70 VME Integrator Racks
- Series 90-70 Power Supplies for Expansion Racks
- Module Locations in Expansion Racks
- Additional Considerations when using Non-GE Fanuc VME Modules
- Auxiliary VME Racks

Types of Racks in the System

A PACSystems RX7i rack system can include a PACSystems main rack and up to seven Series 90-70 expansion racks.

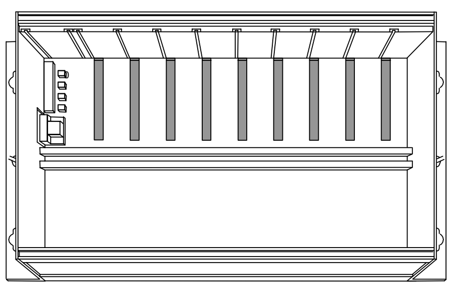
The PACSystems RX7i main rack can be used for all RX7i CPU and I/O module combinations. Backplane connectors on the RX7i rack are spaced on 0.8" (20.3mm) centers to accommodate single-width RX7i modules and non-GE Fanuc VME modules. Standard Series 90-70 modules use two slots each in the main rack. RX7i racks cannot be used as expansion racks.



Main Rack
PACSystems RX7i Rack

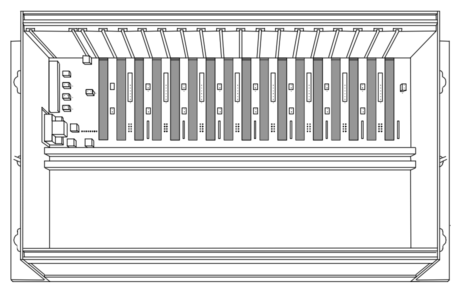
- J1 and J2 backplanes
- Slots on 0.8 Inch (cm) centers
- Single-width & double-width modules
- 3U and 6U modules

Up to 7
Series 90-70 Standard and/or
VME Integrator Racks



Series 90-70 Standard Racks

- J1 backplane
- Slots on 1.6 Inch (cm) centers
- Double-width modules
- 6U modules. 3U modules with faceplate



Series 90-70 VME Integrator Racks

- J1 backplane
- Slots on 0.8 Inch (cm) centers
- Single-width & double-width modules
- 6U modules. 3U modules with faceplate

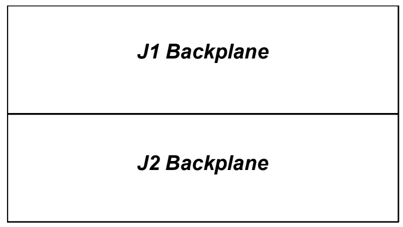
The Series 90-70 expansion racks can accommodate the same types of GE Fanuc modules as the main rack. Non-GE Fanuc VME modules can be located in expansion racks if they are mechanically and functionally compatible with the rack and with the other modules.

Expansion racks must be connected to the main rack using Expansion Transmitter and Expansion Receiver modules. Non-GE Fanuc VME modules cannot be used in a <u>remote</u> rack controlled by a Series 90-70 Remote I/O Scanner module.

Backplanes and Connectors

The PACSystems main rack and all expansion racks have a J1 (upper) backplane. The J1 backplane allows 16-bit and 24-bit addresses, and 8-bit and 16-bit data transfers.

The PACSystems main rack also has a J2 backplane, which provides lines for 32-bit addressing, 32-bit data and additional DC power.



3U-type VME modules connect only to a J1 backplane. 6U-type modules also connect to the J1 backplane. Some 6U modules also connect to the J2 backplane. 6U modules that use 32-bit addressing or data must be in a rack with a J2 backplane.

The connector on a module that plugs into the J1 backplane is referred to as P1; the connector on a module that plugs into the J2 backplane is referred to as P2.

Adding a J2 Backplane to an Expansion Rack

Series 90-70 standard racks and VME Integrator racks have only a J1 backplane. If an expansion rack needs to include modules that require the J2 backplane, an optional mounting kit (VME Option Kit #IC697ACC715) can be used to add one. J2 backplanes are available in many different lengths and with different types of power connectors. The J2 backplane must be obtained from a VME vendor.

The J2 backplane can be used in many different ways by non-GE Fanuc VME modules. It may be needed to provide parallel power paths to the module, or it may be needed for user interface connections to the module. If non-GE Fanuc modules are using 32-bit addressing, the J2 backplane is used for address bits 24 through 31 (and/or data bits 17 through 31).

Rack Standoffs for J2 Backplanes

Many commercially-available J2 backplanes have wirewrap pins that extend beyond the Series 90-70 expansion rack backplane. A panel-mounted expansion rack must be mounted on standoffs attached to the panel for clearance between the wirewrap pins and the panel. A front-mounted expansion rack can use standard rack mounting techniques.

The PACSystems RX7i Main Rack

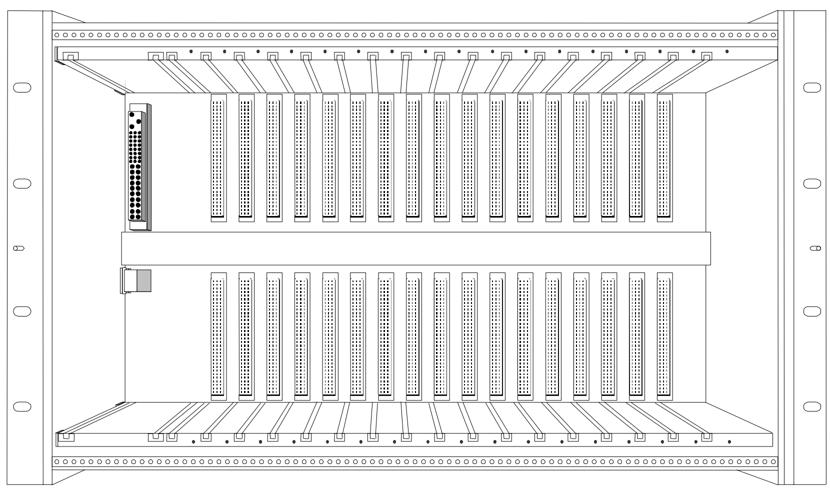
The PACSystems RX7i main rack has a power supply in slot 0 and a CPU with embedded Ethernet in slots 1 and 2. Backplane connectors in the main rack are spaced on 0.8 inch (20.3mm) centers to accommodate single-width RX7i modules and VME modules. Standard Series 90-70 double-width modules use two slots each in the main rack.

Modules in the Main Rack

The main rack can contain one of the following I/O combinations:

- up to 15 single-width modules (if no double-width modules are installed),
- up to 8 double-width modules, or
- a combination of double-width and single-width modules.

The power supply capacity may limit the number of modules in a rack. No more than 10 V-series GE Fanuc modules and/or non-GE Fanuc VME boards may be used in a single rack.



Each slot in the main rack backplane has a J1 connector for data access, with up to 24 address bits and 16 data bits. Each slot also has a J2 connector for data transfers with up to 32 address bits and 32 data bits. The 32 address bits can be multiplexed and used as data pins after the initial address strobe, resulting in 64 data bit block transfer capability.

In a PACSystems main rack, unoccupied slots between I/O modules automatically continue the daisy-chained VME signals, Bus Grant and interrupt acknowledge. Installation of VME jumpers is not required.

Specifications for PACSystems RX7i Racks

VME	VME standard 64	
Number of Slots:	17 on 0.8" centers plus power supply slot.	
Maximum 5 volt current from the power supply	20 Amps (100 watt supply)	
	60 Amps (350 watt supply)	
I/O References	Software-configurable	
Dimensions	Height	283mm (11.15 inches)
(All Series 90-70 modules extend 1.7" (43 mm) beyond front of rack.)	Width	483mm (19.00 inches)
	Depth	190mm (7.5 inches)

PACSystems RX7i Power Supplies for the Main Rack

The RX7i power supplies provide 5V, 12V, and -12V power, and logic-level signals to modules in the rack. The Power Supply Module plugs directly into the leftmost slot in the RX7i rack.

Catalog Number	Description	Current Rating (Amps)		
		+5VDC	+12VDC	-12VDC
IC698PSA100	Power Supply: 85 to 264 VAC at 47 to 63 Hz Input, 100 watt output	20 Amps	2 Amps	1 Amp
IC698PSA350	Power Supply: 85 to 264 VAC at 47 to 63 Hz Input, 350 watt output	60 Amps	12 Amps	4 Amps

Power Supply IC698PSA100 delivers up to 100W total output at ambient temperatures of 0 to 60ºC without forced air cooling.

Power Supply IC698PSA350 provides up to 350W total output. The high capacity supply requires forced air cooling, provided by a fan tray on the bottom of the rack.

The power supply output can ride through loss of up to one input line cycle without loss of output power. Protection is provided for overcurrent and overvoltage fault conditions.

VMEbus Power Monitor Interface Timing

The ACFAIL# signal is pulled down when the power supply inputs are no longer being provided, when the ON/OFF switch is OFF, or when the required DC output voltage levels are not within specifications. The ACFAIL# signal is asserted at least 5ms before outputs fall below their specified limits to provide sufficient warning to the system of power failure.

Connector Pin Assignments for the Main Rack

The J1 and J2 connectors are the standard DIN connectors recommended for use in VME applications. The tables below show the pin numbers and associated signal names for the PACSystems main rack.

VME64 J1 Pin Assignments

Pin Number	Row A	Row B	Row C
1	D00	BBSY*	D08
2	D01	BCLR*	D09
3	D02	ACFAIL*	D10
4	D03	*BG0IN**	D11
5	D04	*BG0OUT**	D12
6	D05	*BG1IN**	D13
7	D06	*BG1OUT**	D14
8	D07	*BG2IN**	D15
9	GND	*BG2OUT**	GND
10	SYSCLK	*BG3IN**	SYSFAIL*
11	GND	*BG3OUT**	BERR*
12	DS1*	BR0*	SYSRESET*
13	DS0*	BR1*	LWORD*
14	WRITE*	BR2*	AM5
15	GND	BR3*	A23
16	DTACK*	AM0	A22
17	GND	AM1	A21
18	AS*	AM2	A20
19	GND	AM3	A19
20	IACK*	GND	A18
21	*IACKIN**	SERA(SMBCLK)	A17
22	*IACKOUT**	SERB(SMBDATA_)	A16
23	AM4	GND	A15
24	A07	IRQ7*	A14
25	A06	IRQ6*	A13
26	A05	IRQ5*	A12
27	A04	IRQ4*/SLOTID3	A11
28	A03	IRQ3*/SLOTID2	A10
29	A02	IRQ2*/SLOTID1	A09
20	A01	IRQ1*/SLOTID0	A08
31	-12v	+5VSTDBY	+12v
32	+5V	+5V	+5V

Daisy Chained Signals

The daisy-chained signals are shown in italics above. Daisy chain signals originate as an output on one slot and terminate as an input on the next slot. For example, the IACKOUT signal on slot 1 goes to the IACKIN signal on slot 2 and IACKOUT on slot 2 goes to the IACKIN signal on slot 3. All other signals are bussed to all slots, and connected to the terminations in both ends

Slot ID Signals IRQ1 - IRQ4

IRQ4 to IRQ1are used as SLOTID3 to SLOTID0 for the module (non-CPU) slots.

VME64 J2 Pin Assignments

Pin Number	Row A	Row B	Row C
1	User Defined	+5V	User Defined
2	User Defined	GND	User Defined
3	User Defined	RETRY*	User Defined
4	User Defined	A24	User Defined
5	User Defined	A25	User Defined
6	User Defined	A26	User Defined
7	User Defined	A27	User Defined
8	User Defined	A28	User Defined
9	User Defined	A29	User Defined
10	User Defined	A30	User Defined
11	User Defined	A31	User Defined
12	User Defined	GND	User Defined
13	User Defined	+5V	User Defined
14	User Defined	D16	User Defined
15	User Defined	D17	User Defined
16	User Defined	D18	User Defined
17	User Defined	D19	User Defined
18	User Defined	D20	User Defined
19	User Defined	D21	User Defined
20	User Defined	D22	User Defined
21	User Defined	D23	User Defined
22	User Defined	GND	User Defined
23	User Defined	D24	User Defined
24	User Defined	D25	User Defined
25	User Defined	D26	User Defined
26	User Defined	D27	User Defined
27	User Defined	D28	User Defined
28	User Defined	D29	User Defined
29	User Defined	D30	User Defined
20	User Defined	D31	User Defined
31	User Defined	GND	User Defined
32	User Defined	+5V	User Defined

User Defined Signals

The user-defined pins on the J2 half of the main rack backplane are not bussed together. These pins are not formally defined in the VME bus specification. On the PACSystems main rack backplane, these pins are not accessible for user wiring because there are no wire-wrap posts on the back of the board.

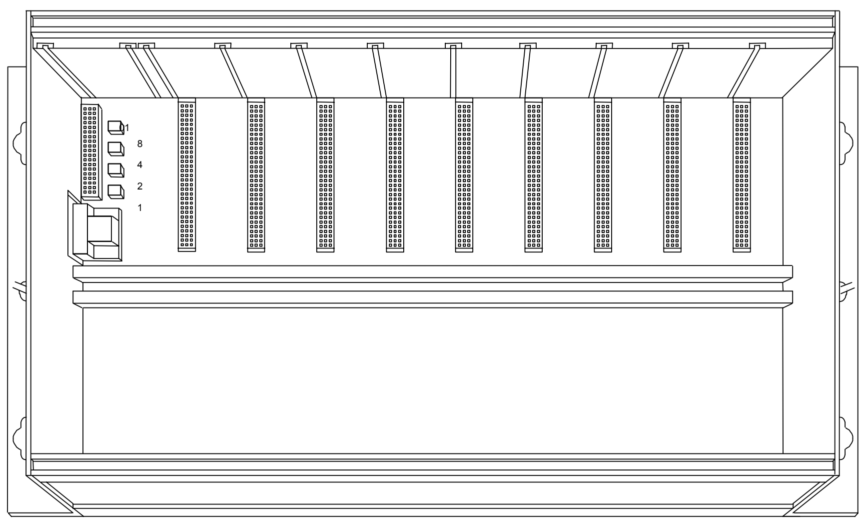
Expansion Racks: Series 90-70 Standard Racks

Series 90-70 Standard Racks (IC697CHS750/790/791) have 5 or 9 slots with backplane connectors spaced on 1.6 inch centers. A Series 90-70 Standard Rack accommodates 6U modules without adaptation. 3U modules can be installed using adapter hardware or a 6U faceplate to support the smaller 3U module.

Modules in a Series 90-70 Standard Rack

A Series 90-70 Standard Rack can accommodate double-width modules such as standard Series 90-70 I/O modules. These racks accept double-high (6U) VME modules. Single-high(3U) VME modules can be used if a commercially available 6U faceplate adapter is attached to the 3U module to allow securing it to the rack rails.

The power supply capacity may limit the number of modules in a rack. No more than 10 V-series GE Fanuc modules and/or non-GE Fanuc VME boards may be used in a single rack.



All non-GE Fanuc VME modules must be installed to the right of the GE Fanuc modules.

There must not be any unused slots between GE Fanuc modules in the rack. There also must not be any unused slots to the left of any VME module that generates VME interrupts. If any slot is not used (for example, because of an over-wide module), that slot must be covered using a connector that daisy-chains the interrupt signals.

A Series 90-70 Standard Rack has a J1 backplane. Each slot provides a single 96 pin, J1 connector to allow data accesses with up to 24 address bits and 16 data bits.

To use modules with both P1 and P2 connectors, an optional J2 backplane can be added as described on page 2-3. Power connections must also be provided.

Multiple-slot VME modules and modules with daughterboards cannot plug into these racks without modification. Multiple-board sets that have 0.8-inch centers do not fit in a standard Series 90-70 rack, which has backplane connectors and card guides on 1.6

inch centers. Multiple-board modules must be placed in the main rack or in a VME Integrator rack.

Single-width modules require a cover plate for the unused half of the slot opening to keep out foreign objects. A cover plate made of non-conductive material is available from GE Fanuc. DO NOT use metal cover plates since they can short to the back of GE Fanuc I/O modules as they are removed from or inserted into the rack.

Specifications for Series 90-70 Standard Racks

VME	VME standard C.1		
Number of Slots:	5 or 9, plus power supply slot		
Maximum 5 Volt Current	20 amps (100 watt 120/240 VAC or 125 VDC power supply) 11 amps (55 watt 120/240 VAC or 125 VDC power supply) 18 amps (90 watt 24 VDC power supply) 18 amps (90 watt 48 VDC power supply)		
Current from I/O Bus	0.5 amps		
I/O References: Rack Identification:	Software-configurable Four jumpers (JP1 – JP4) behind rack power supply.		
Dimensions –	*Height*	*Width*	*Depth*
9–Slot Rack:	11.15 inches 283mm	19.00 inches 483mm	7.5 inches 190mm
5–Slot Rack:	11.15 inches 283mm	12.6 inches 320mm	7.5 inches 190mm
	Note: Series 90-70 modules extend 1.7 inch (43mm) beyond the front of the rack; non-GE Fanuc VME modules may fit flush with or extend from front of rack.		

Expansion Racks: Series 90-70 VME Integrator Racks

Series 90-70 VME Integrator Racks provide easy integration of non-GE Fanuc VME modules into the system. Backplane connectors are spaced on 0.8 inch (20.3mm) centers to accommodate single-width VME modules. Standard Series 90-70 double-width modules use two slots each.

Two types of Series 90-70 PLC VME Integrator racks can be used as expansion racks with a PACSystems RX7i main rack:

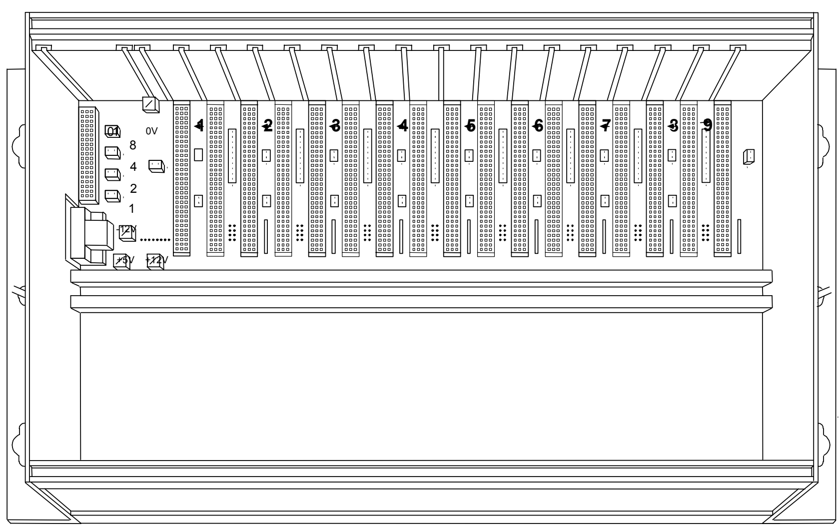
17–Slot, Rear Mount – IC697CHS782
17–Slot, Front Mount – IC697CHS783

Modules in a Series 90-70 VME Integrator Rack

A VME Integrator Rack can contain the following I/O combinations:

- up to 17 single-width modules (if no double-width modules are installed)
- up to 9 double-width modules, or
- a combination of double-width and single-width modules.

The power supply capacity may limit the number of modules in a rack. No more than 10 V-series GE Fanuc modules and/or non-GE Fanuc VME boards may be used in a single rack. The rack can also contain all non-GE Fanuc VME modules. A Series 90-70 Bus Receiver module must be located in slot 1.



All non-GE Fanuc VME modules should be installed to the right of the GE Fanuc modules.

There must not be any unused slots between GE Fanuc modules in the rack. There also must not be any unused slots to the left of any VME module that generates VME interrupts. If any slot is not used (for example, because of an over-wide module), that slot must be covered using a connector that daisy-chains the interrupt signals.

A Series 90-70 VME Integrator Rack has a J1 backplane. Each slot provides a single 96 pin, J1 connector to allow data accesses with up to 24 address bits and 16 data bits. To use modules with both P1 and P2 connectors, an optional J2 backplane can be added as described on page 2-3. Power connections must also be provided.

The VME Integrator Rack is factory-configured for standard GE Fanuc modules. Integration of non-GE Fanuc VME modules is done by moving the backplane jumpers to different positions. Jumper settings are described in the *PACSystems Installation Manual*. Configurable functions and signals are:

- *select rack ID* for multiple rack systems (Series 90–70 feature)
- configure *SYSFAIL* signal to be enabled or disabled (per slot)
- *LWORD* signal in slot 1 configurable to be inactive
- configure *IRQ1/ – IRQ4/* signals for VME slots 12PL to 19PL
- configure *Bus Grant* signals for VME slots 12PL to 19PL

Two racks can be interconnected to share a single power supply for applications having extended I/O requirements. A Power Supply Extension Cable kit (IC697CBL700) is available for such applications. There are also four *power cube* screw connections (+5V, +12V, -12V, 0V) on the backplane for use with a Series 90-70 power supply when used to supply power to an optional J2 backplane. *These connections should not be used for direct connection to a non-GE Fanuc power supply.*

Specifications for Series 90-70 VME Integrator Racks

VME	VME standard C.1	
Number of Slots:	17 on 0.8 inch centers plus power supply slot (2.4 inches)	
Maximum 5 Volt Current (from standard Series 90–70 power supplies)	20 amps (100 watt 120/240 VAC or 125 VDC power supply) 11 amps (55 watt 120/240 VAC or 125 VDC power supply) 18 amps (90 watt 24 VDC power supply) 18 amps (90 watt 48 VDC power supply)	
Maximum current from user supplied (not Series 90–70) Power Supply, slot J1 only:	3.3 amps (+5 VDC) 1.1 amps (+/-12 VDC)	
I/O References: Rack Identification: VME/Series 90–70 slot configuration:	Software-configurable Four jumpers (JP1 – JP4) behind rack power supply. Via jumpers on backplane.	
Dimensions *(All Series 90-70 modules extend 1.7" (43 mm) beyond front of rack.)*	Height	283mm (11.15 inches)
	Width	483mm (19.00 inches)
	Depth	184mm (7.25 inches)

Series 90-70 Power Supplies for Expansion Racks

The VMEbus includes both a +5 volt bus and ±12 volt busses; however, not all Series 90-70 power supplies have a ±12 volt output, and the output current rating of the +5 volt bus depends on the power supply model, as shown below.

Catalog Number	Description	Current Rating (Amps)		
		+5 VDC	+12 VDC	-12 VDC
IC697PWR710	Power Supply, 120/240 VAC or 125 VDC, 55W	11	-	-
IC697PWR711	Power Supply, 120/240 VAC or 125 VDC, 100W	20	2.0	1.0
IC697PWR724	Power Supply, 24 VDC, 90W	18	1.5	1.0
IC697PWR748	Power Supply, 48 VDC, 90W	18	1.5	1.0

For multiple-output power supplies, the current ratings are individual bus maximums. The total power of all three must not exceed the wattage rating of the power supply.

None of the Series 90-70 power supplies fully supports the +5 volt standby bus. The 55 Watt supply has no connection between the +5 volt standby backplane line and the +5 volt power bus. If +5 volt standby power is required by a VME module, a method must be supplied to route power to that backplane line if the 55 watt power supply is being used. The other supplies connect the +5 volt standby power to the +5 volt bus during operation, but are electrically isolated from it following power-down.

Series 90-70 AC power supplies will ride through a 1 cycle loss of AC input power without system interruption. If the loss exceeds 1 cycle, the ACFAIL signal is asserted and a shutdown procedure will begin after a 5 millisecond holdup time of backplane power busses.

Note: The maximum current required for any single VME module is restricted to 4.5 Amps or less (worst case) on the +5 volt bus (3 Amps is the recommended maximum) due to the J1 backplane connector capacity. If additional capacity is required, some modules allow a J2 connector to carry additional current to the module.

Powering Two Racks from the Same Power Supply

A Two-Rack Power Cable (IC697CBL700) is available that allows two racks to be operated from a single power supply.

- Only modules that use +5 volts can be used in the second rack without the power supply, because the ±12 volt busses are not carried in the Two-Rack Power Cable.
- The current rating of the +5 volt bus in the second rack (without power supply) is limited to 5.2 Amps or less.

Power for an Optional J2 Backplane in a Series 90-70 Standard Rack

Standard Series 90-70 PLC Power Supplies do not make direct connection to an optional J2 backplane. Series 90-70 VME Integrator Racks provide for a power connection for a J2 backplane.

Power for the J2 backplane can be provided using a modified Two-Rack Power cable, IC697CBL700. This cable allows +5 VDC power from a connector at the left end of the J1 backplane to be routed to the J2 backplane. However, when this is done, it is no longer possible to power a second rack from the same power supply as described above. The connector at one end of the cable must be removed and adapted for the selected J2 backplane. The +5 volts and common are each carried on several wires in this cable. It is necessary to maintain the parallel connection of these conductors to achieve the required current carrying capacity of the cable. Two wires in this cable, which carry the ACFAIL and SYSRESET signals, must be disconnected at the power supply end of the cable.

Module Locations

All non-GE Fanuc VME modules installed in an expansion rack should be physically located with consideration for empty slots. In addition, the width of a module may determine its slot location.

Propagating Daisy-Chain Signals

A daisy-chain bus signal propagates down the backplane starting from slot one by entering the connector on an input pin and exiting the connector on a separate output pin. The VMEbus uses daisy-chain signals for bus arbitration and interrupt handling. PACSystems main racks provide automatic daisy-chain jumpering as shown previously. Empty slots in the main rack are automatically jumpered within the connector, so daisy-chain signals are passed if a slot is empty. However, Series 90-70 expansion racks do not have automatic daisy-chain jumpering.

Locations for Non-GE Fanuc VME Modules in All Expansion Racks

Because expansion racks do not provide automatic daisy-chain jumpering:

- There should not be any unused slots to the left of GE Fanuc modules in the rack.
- There should not be any unused slots to the left of VME modules that generate VME interrupts.

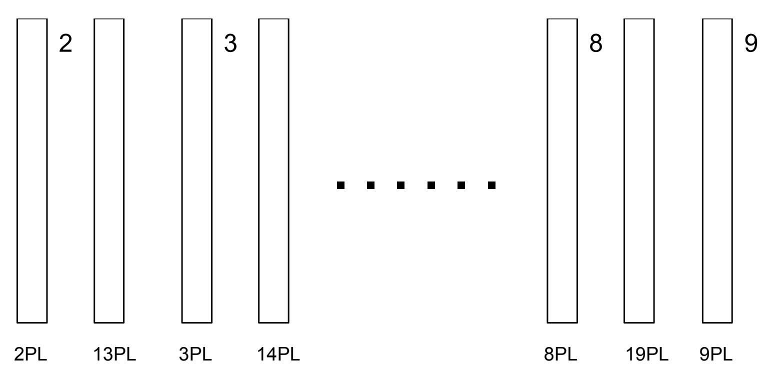
If an unused slot between modules is required (for example, to accommodate an over-wide module) a connector that daisy-chains the interrupt signals must be used.

Locations for Modules that Do Not Pass Daisy-chain Signals

If any non-GE Fanuc VME modules do not pass the VME daisy chain signals, all GE Fanuc modules should occupy lower-numbered (leftmost) slots in the rack. Non-GE Fanuc VME modules must be installed to the right.

Module Locations in VME Integrator Racks

VME Integrator Racks have slots on 0.8 inch centers. Single-width modules can be installed in any module slot (connectors 2PL – 9PL and 12PL – 19PL). Double-width modules in a VME Integrator Rack must be installed in connectors 2PL – 9PL.



Additional Considerations When Using Non-GE Fanuc VME Modules

Cooling Requirements

The GE Fanuc Industrialized VMEbus (VME–I) uses low-power technology to achieve the full temperature rating for system modules without the use of fans. However, some modules require fans to achieve the specified VME module temperature rating in a PACSystems installation. If any selected VME modules require forced air for cooling, Rack Fan Assemblies are available from GE Fanuc .

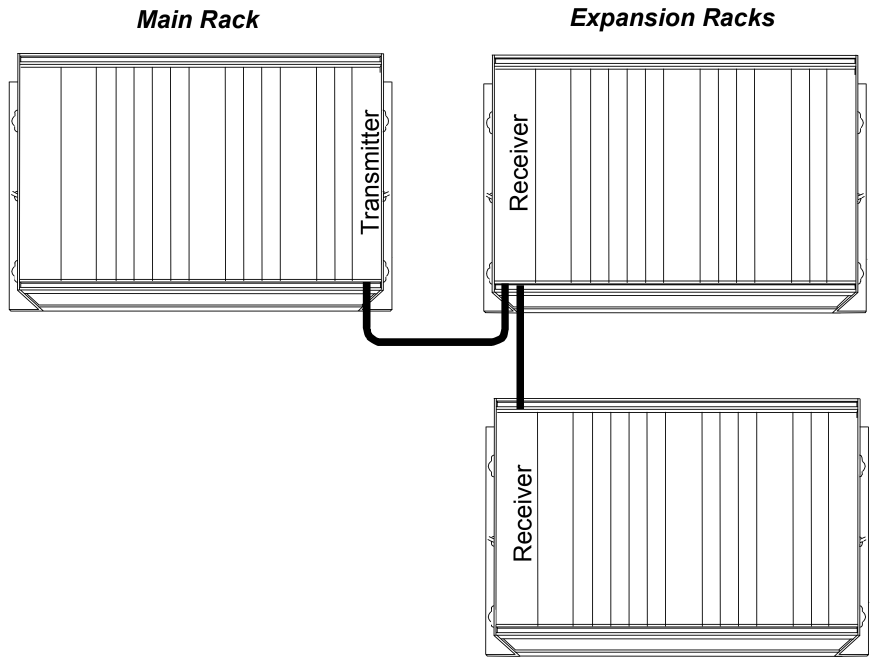
Additionally, certain industrial applications may require the presence of loss-of-fan detection.

Grounding Requirements

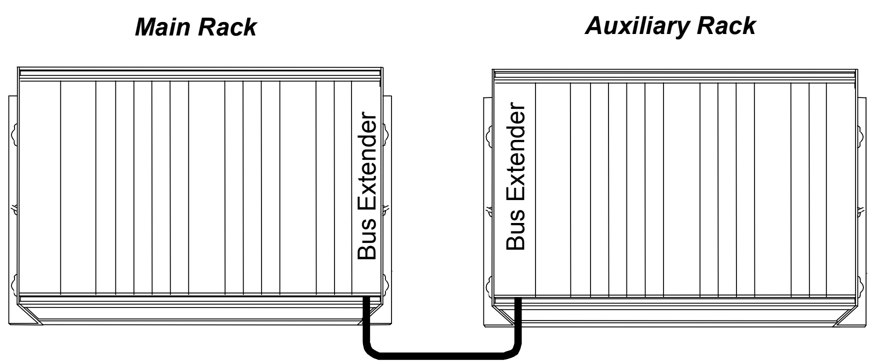
VME modules used in an expansion rack must use proper grounding practices. VME modules often use the module front as the ground point with the top and bottom screws which secure the module to the rack as the ground connection. The mounting screws must be securely attached, and the module should not be removed from the rack unless external connections to the module are first removed. If the external connections are not removed first, potentially hazardous voltages may exist on the module. Additionally, no grounding point exists after the mounting screws have been disconnected.

Auxiliary VME Racks

Expansion racks in the system are linked to the main rack and CPU via Bus Transmitter and Bus Receiver modules as shown below.



However, the Bus Receiver Module does not arbitrate or respect arbitration for bus mastership. That functionality requires the use of a commercially-available VMEbus extender or Reflective Memory module to connect the main rack to a second, auxiliary VME rack. Such VMEbus extenders have boards in both the PACSystems rack and the auxiliary VME rack, connected through a cable.



Bus extenders must be set up to allow the two racks to communicate via a shared RAM interface on one of the boards (NOT as an electrical extension of the VMEbus). This shared RAM technique makes it possible to use features such as bus masters or interrupts in the auxiliary rack without affecting the PACSystems equipment operation.

Chapter 3 PACSystems Configuration for Non-GE Fanuc VME Modules

This section explains how to incorporate Non-GE Fanuc VME modules in the PACSystems hardware configuration.

- Configuring a Slot in the Rack
- Configuring VME Address Regions
    - Region
    - VME Address Modifier Code
    - VME Base Address
    - Region Size
    - Interface Type
    - VME Block Transfers
- Configuring Interrupts
    - Interrupt Enable / Disable
    - Interrupt ID
- Configuring Power Consumption

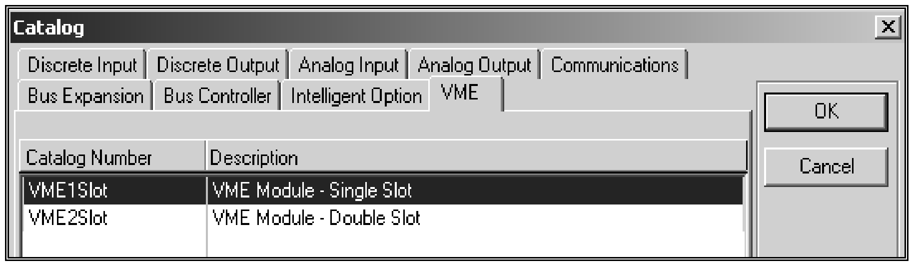
Configuring Modules

A non-GE Fanuc module must be included in the PACSystems configuration to set up the parameters of its interaction with the system CPU via application program. Programming features for communicating with non-GE Fanuc VME modules are described in chapter 4.

Most of the PACSystems configuration parameters have defaults that can be used as-is for many applications. However, it is important to check the manufacturer's specifications for the module and set the PACSystems parameters appropriately. It is also important to be sure that the module's own configuration (for example, its jumper settings) matches its PACSystems configuration parameters.

Configuring a Slot in the Rack

To configure a VME module or pair of VME modules (as explained below) in a slot, select Add or Replace Module, then select VME from the catalog.

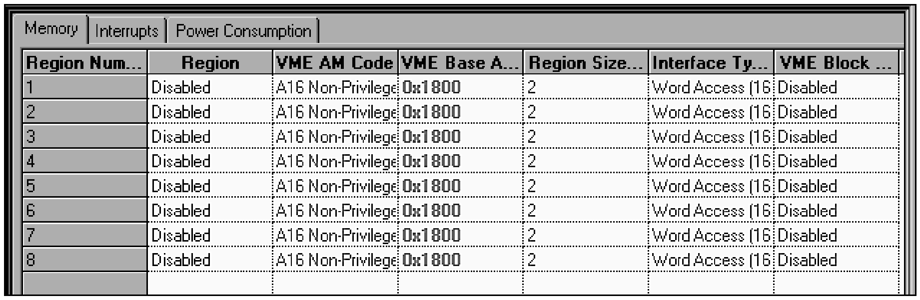


Then select Single Slot or Double Slot to configure the slot:

- for a PACSystems main rack:
  - to configure a single-width module, select VME 1 Slot.
  - to configure a double-width module, select VME 2 Slot.
- for a Series 90-70 VME Integrator expansion rack:
  - to configure a single-width module in one slot of a slot pair (for example, slot 7a) with the other slot of the pair empty, select VME 1 Slot.
  - to configure single-width modules in both slots of a pair (for example, 7a and 7b), select VME 2 Slot.
  - to configure a double-width module, select VME 2 Slot.
- for a Series 90-70 standard expansion rack:
  - to configure a single-width module, select VME 1 Slot.
  - to configure a double-width module, select VME 1 Slot.

Configuring VME Address Regions

Use the Memory tab to configure up to eight VME address regions for the slot.



Region Num...	Region	VME AM Code	VME Base A...	Region Size...	Interface Ty...	VME Block ...
1	Disabled	A16 Non-Privilege	0x1800	2	Word Access (16	Disabled
2	Disabled	A16 Non-Privilege	0x1800	2	Word Access (16	Disabled
3	Disabled	A16 Non-Privilege	0x1800	2	Word Access (16	Disabled
4	Disabled	A16 Non-Privilege	0x1800	2	Word Access (16	Disabled
5	Disabled	A16 Non-Privilege	0x1800	2	Word Access (16	Disabled
6	Disabled	A16 Non-Privilege	0x1800	2	Word Access (16	Disabled
7	Disabled	A16 Non-Privilege	0x1800	2	Word Access (16	Disabled
8	Disabled	A16 Non-Privilege	0x1800	2	Word Access (16	Disabled

Each configured region has a VME Address Modifier code, base address, and size, as summarized below and described on the following pages.

<table>
<tr><th>Name</th><th>Default</th><th>Choices</th></tr>
<tr><td>Region 1 to 8</td><td>Disabled</td><td>Enabled / Disabled</td></tr>
<tr><td>VME Address Modifier Code (hex)</td><td>A16 Non-Privileged Data (29h)</td><td>
<table>
<tr><th>AM Code</th><th>Number of address bits</th><th>Description</th></tr>
<tr><td>29h</td><td>A16</td><td>Non-Privileged Data</td></tr>
<tr><td>2Dh</td><td>A16</td><td>Supervisory Data</td></tr>
<tr><td>39h</td><td>A24</td><td>Non-Privileged Data</td></tr>
<tr><td>3Ah</td><td>A24</td><td>Non-Privileged Program (main rack only)</td></tr>
<tr><td>3Dh</td><td>A24</td><td>Supervisory Data (main rack only)</td></tr>
<tr><td>3Eh</td><td>A24</td><td>Supervisory Program (main rack only)</td></tr>
<tr><td>09h</td><td>A32</td><td>Non-Privileged Data (main rack only)</td></tr>
<tr><td>0Ah</td><td>A32</td><td>Non-Privileged Program (main rack only)</td></tr>
<tr><td>0Dh</td><td>A32</td><td>Supervisory Data (main rack only)</td></tr>
<tr><td>0Eh</td><td>A32</td><td>Supervisory Program (main rack only)</td></tr>
</table>
</td></tr>
<tr><td>VME Base Address (hex)</td><td>Default depends on rack and slot</td><td>
<table>
<tr><th>For these AM Code:</th><th>Valid Base Address Range Is:</th></tr>
<tr><td>29h, 2Dh</td><td>00000000 to 0000FFFF</td></tr>
<tr><td>39h, 3Ah, 3Dh, 3Eh</td><td>00000000 to 00FFFFFF</td></tr>
<tr><td>09h, 0Ah, 0Dh, 0Eh</td><td>00000000 to FFFFFFFF</td></tr>
</table>
</td></tr>
<tr><td>Region Size</td><td>2048 bytes (2k)</td><td>1 to 16777216 (16 Megabytes)</td></tr>
<tr><td>Interface Type</td><td>Word Access (16-bit)</td><td>Qword Access (64-bit), (main rack only)
Dword Access (32-bit), (main rack only)
Word Access (16-bit),
Byte Access (8-bit),
Odd Byte Only,
Single Word Address,
Single Byte Address</td></tr>
<tr><td>VME Block Transfers</td><td>Disabled</td><td>Enabled / Disabled. VME block transfers can only be enabled in the main rack.</td></tr>
</table>

Region Number

There are eight regions available to each slot. Enable a region to define the rest of the parameters. If you are configuring two single-width modules in a slot pair (such as 7a and 7b) of a VME Integrator expansion rack, enable at least one region for each module of the pair. The software configuration for a region must match the module's own configured settings (for example, its onboard jumper settings).

VME Address Modifier Code

An address on a VMEbus consists of two parts: an address modifier (AM) code and address bits A0 through A31. All modules in a VME system must be configured to respond to one or more AM codes and an address range. Check the manufacturer's module specifications to determine which Address Modifiers it uses.

Select the Address Modifier code to be associated with the region. The choice of an appropriate Address Modifier code depends on the module type and its location in the system. Some Address Modifier Codes can only be used in the main rack, as shown in the table below.

AM Codes		Address Size in Bits	Description
Main Rack	Expansion Racks		
29h	29h	16	A16 Non-Privileged Data
2Dh	2Dh	16	A16 Supervisory Data
39h	39h	24	A24 Non-Privileged Data
3Ah	n/a	24	A24 Non-Privileged Program
3Dh	n/a	24	A24 Supervisory Data
3Eh	n/a	24	A24 Supervisory Program
09h	n/a	32	A32 Non-Privileged Data
0Ah	n/a	32	A32 Non-Privileged Program
0Dh	n/a	32	A32 Supervisory Data
0Eh	n/a	32	A32 Supervisory Program

Simpler modules such as discrete I/O modules, often use A16 addressing. More complex modules often use A24 or A32 addressing.

In addition, single height (3U) modules use only the P1/J1 connector, and can only monitor address lines A01-A23. This limits these modules to the A16 and A24 Address Modifier codes. Double height (6U) modules that have a P2/J2 connector can monitor an additional eight address lines on the P2/J2 connector, so 6U modules in the main rack can use the A32 Address Modifiers.

VME Base Address

The valid range for the VME Base Address depends on the Address Modifier (AM) code that has been entered.

AM Code	*Valid Base Address Range*
29h, 2Dh	00000000 to 0000FFFF
39h, 3Ah, 3Dh, 3Eh	00000000 to 00FFFFFF
09h, 0Ah, 0Dh, 0Eh	00000000 to FFFFFFFF

The Base Address plus the region size must lie within the ranges shown above.

It is important to select VME Memory ranges that do not conflict with any GE Fanuc modules in the system. GE Fanuc module addresses are listed in the tables in this section. A module can usually be configured to use the same address that would be used by a GE Fanuc module in the same rack/slot location. If the default Base Address value is used with the default Address Modifier Code of 29h and the default Window Size of 2k, there will not be a conflict with GE Fanuc modules.

For non-GE Fanuc modules with more data, or modules that require the use of other AM codes, it is important to configure addresses that will not overlap the addresses used by GE Fanuc modules, as shown in the tables. If a non-GE Fanuc module's address range extends beyond the address space shown in the tables, no GE Fanuc modules may reside in slots that the non GE-Fanuc module’s address covers. To avoid overlap, the non-GE Fanuc module can be assigned to the user-defined address area shown in the tables.

VME Addresses for GE Fanuc Modules in the Main Rack

The VME address assignments for GE Fanuc modules in the PACSystems main rack are shown below. The Slot ID column represents the binary value of IRQ4-IRQ1 in that slot.

Slot Number	Slot ID	A16 AM Codes 29h, 2Dh		A24 AM Codes: 39h, 3Dh		A32 AM Code: 09h	
		VME Address	Length	VME Address	Length	VME Address	Length
0 (PS)		None		None		None	
1 (System)		None		None		None	
2	0	0000h – 07FFh	2K	000000h – 00FFFFh	64K	00000000h – 00FFFFFFh	16 Meg.
3	1	0800h – 0FFFh	2K	010000h – 01FFFFh	64K	01000000h – 01FFFFFFh	16 Meg.
4	2	1000h – 17FFh	2K	020000h – 02FFFFh	64K	02000000h – 02FFFFFFh	16 Meg.
5	3	1800h – 1FFFh	2K	030000h – 03FFFFh	64K	03000000h – 03FFFFFFh	16 Meg.
6	4	2000h – 27FFh	2K	040000h – 04FFFFh	64K	04000000h – 04FFFFFFh	16 Meg.
7	5	2800h – 2FFFh	2K	050000h – 05FFFFh	64K	05000000h – 05FFFFFFh	16 Meg.
8	6	3000h – 37FFh	2K	060000h – 06FFFFh	64K	06000000h – 06FFFFFFh	16 Meg.
9	7	3800h – 3FFFh	2K	070000h – 07FFFFh	64K	07000000h – 07FFFFFFh	16 Meg.
10	8	4000h – 47FFh	2K	080000h – 08FFFFh	64K	08000000h – 08FFFFFFh	16 Meg.
11	9	4800h – 4FFFh	2K	090000h – 09FFFFh	64K	09000000h – 09FFFFFFh	16 Meg.
12	A	5000h – 57FFh	2K	0A0000h – 0AFFFFh	64K	0A000000h – 0AFFFFFFh	16 Meg.
13	B	5800h – 5FFFh	2K	0B0000h – 0BFFFFh	64K	0B000000h – 0BFFFFFFh	16 Meg.
14	C	6000h – 67FFh	2K	0C0000h – 0CFFFFh	64K	0C000000h – 0CFFFFFFh	16 Meg.
15	D	6800h – 6FFFh	2K	0D0000h – 0DFFFFh	64K	0D000000h – 0DFFFFFFh	16 Meg.
16	E	7000h – 77FFh	2K	0E0000h – 0EFFFFh	64K	0E000000h – 0EFFFFFFh	16 Meg.
17	F	7800h – 7FFFh	2K	0F0000h – 0FFFFFh	64K	0F000000h – 0FFFFFFFh	16 Meg.
User Defined		8000h – FFFFh	32K	100000h – 7FFFFFh	7 Meg.	10000000h – 1FFFFFFFh	256 Meg.

The user-defined address 100000H through 7FFFFFH for A24 is restricted to rack 0. This is due to the fact that the Bus Transmitter Module will not pass rack 0 allocated addresses to expansion racks. If a Bus Transmitter Module is not present, address 100000h through 0EFFFFFh is unused address space and can be allocated to non-GE Fanuc VME modules in the main rack.

When a Bus Transmitter Module is present, unused address space allocated to expansion racks cannot be assigned to non-GE Fanuc modules in the main rack. The Bus Transmitter Module will always drive the backplane when an address allocated to an expansion rack is used, with or without the expansion rack present.

VME Addresses for GE Fanuc Modules in Expansion Racks

The VME address assignments for GE Fanuc modules in expansion racks are shown below. The Slot ID represents the binary value of IRQ4 - IRQ1 in that slot.

VME Addresses for AM Code 29h and 2DH

For Address Modifier code 29h, address range 5000h through FFFFh is user-definable for each expansion rack. For Address Modifier code 2Dh, address ranges 5000h through 7FFFh and 8800h through FFFFh are user-definable for each expansion rack. Two VME modules responding to AM code 29h or 2Dh and the same address will not conflict if they reside in different racks.

Slot Number	***Slot ID***	***VME Addresses for AM Code 29h***	***VME Addresses for AM Code 2Dh***	***Length***
PS		none	none	
1		none	none	
2	2	1000h – 17FFh	1000h – 17FFh	2K
3	3	1800h – 1FFFh	1800h – 1FFFh	2K
4	4	2000h – 27FFh	2000h – 27FFh	2K
5	5	2800h – 2FFFh	2800h – 2FFFh	2K
6	6	3000h – 37FFh	3000h – 37FFh	2K
7	7	3800h – 3FFFh	3800h – 3FFFh	2K
8	8	4000h – 47FFh	4000h – 47FFh	2K
9	9	4800h – 4FFFh	4800h – 4FFFh	2K
User-defined		5000h – FFFFh	5000h – 7FFFh and 8800 – FFFFh	2K

VME Addresses for AM Code 29h and 2DH

For Address Modifier 39h, the address space allocated to one rack cannot be used for a non-GE Fanuc module in another rack.

Slot	VME Addresses for AM Code: 39h (A24)							
	Length	Rack 1	Rack 2	Rack 3	Rack 4	Rack 5	Rack 6	Rack 7
PS		none	none	none	none	none	none	none
1		none	none	none	none	none	none	none
2	64K	E00000h – E0FFFFh	D00000h – D0FFFFh	C00000h – C0FFFFh	B00000h – B0FFFFh	A00000h – A0FFFFh	900000h – 90FFFFh	800000h – 80FFFFh
3	64K	E10000h – E1FFFFh	D10000h – D1FFFFh	C10000h – C1FFFFh	B10000h – B1FFFFh	A10000h – A1FFFFh	910000h – 91FFFFh	810000h – 81FFFFh
4	64K	E20000h – E2FFFFh	D20000h – D2FFFFh	C20000h – C2FFFFh	B20000h – B2FFFFh	A20000h – A2FFFFh	920000h – 92FFFFh	820000h – 82FFFFh
5	64K	E30000h – E3FFFFh	D30000h – D3FFFFh	C30000h – C3FFFFh	B30000h – B3FFFFh	A30000h – A3FFFFh	930000h – 93FFFFh	830000h – 83FFFFh
6	64K	E40000h – E4FFFFh	D40000h – D4FFFFh	C40000h – C4FFFFh	B40000h – B4FFFFh	A40000h – A4FFFFh	940000h – 94FFFFh	840000h – 84FFFFh
7	64K	E50000h – E5FFFFh	D50000h – D5FFFFh	C50000h – C5FFFFh	B50000h – B5FFFFh	A50000h – A5FFFFh	950000h – 95FFFFh	850000h – 85FFFFh
8	64K	E60000h – E6FFFFh	D60000h – D6FFFFh	C60000h – C6FFFFh	B60000h – B6FFFFh	A60000h – A6FFFFh	960000h – 96FFFFh	860000h – 86FFFFh
9	64K	E70000h – E7FFFFh	D70000h – D7FFFFh	C70000h – C7FFFFh	B70000h – B7FFFFh	A70000h – A7FFFFh	970000h – 97FFFFh	870000h – 87FFFFh
User-defined	512K	E80000h – EFFFFFh	D80000h – DFFFFFh	C80000h – CFFFFFh	B80000h – BFFFFFh	A80000h – AFFFFFh	980000h – 9FFFFFh	880000h – 8FFFFFh

Unused address space in expansion racks must only be assigned to non-GE Fanuc modules located in that rack. The Bus Receiver Module only responds to addresses allocated to the rack it resides in.

Reqion Size

Enter the size for the memory region, from 1 byte to 16 Megabytes. The default is 2048 bytes (2K).

Interface Type

Specify how data is to be read/written to the VME module. Choose one of the following based on the hardware capabilities of the VME module:

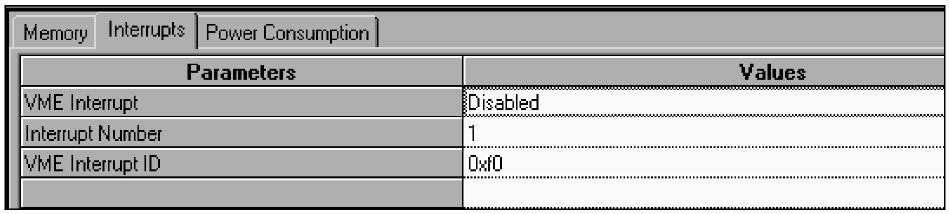
- **QWORD ACCESS:** Read/write up to 64 bits at a time (MBLT) to consecutive addresses. MBLTs are not used if the AM code is A16 or the module is in an expansion rack.
- **DWORD ACCESS:** Read/write up to 32 bits at a time to consecutive addresses (main rack only).
- **WORD ACCESS:** Read/write up to 16 bits at a time to consecutive addresses. (default)
- **BYTE ACCESS:** Read/write only 8 bits at a time to consecutive addresses.
- **ODD BYTE ONLY:** Read/write data only to odd bytes because the hardware cannot support even addresses.
- **SINGLE WORD ADDRESS:** Data is to be read up to 16 bits at a time from the same address on the VME bus into CPU memory, and written up to 16 bits at a time to the same VME address.
- **SINGLE BYTE ADDRESS:** Read only 8 bits at a time from the same address on the VME bus into CPU memory. Write only 8 bits at a time to the same VME address.

VME Block Transfers

Enables block transfers to the module (BLT). Block transfers can be enabled if the VME module hardware supports VME block transter (BLT) cycles. Selecting Enabled tells the RX7i CPU that it may use VME block transfer cycles when performing reads and writes to this VME region. VME block transfers are not used if the AM code is A16 or the module is in an expansion rack.

Configuring Interrupts

If a non-GE Fanuc VME module should issue an interrupt for the CPU application program, enable the interrupt and configure its parameters on the Interrupts tab:



If the interrupt is enabled, the module must also be assigned an Interrupt ID and number.

Name	***Default***	***Choices***
VME Interrupt	Disabled	Enabled, Disabled
Interrupt Number	1	Must be set to 1
VME Interrupt ID		Any byte value between 1 and FEh

VME Interrupt

If the interrupt from the module is enabled, the CPU processes the interrupt from the module and schedules the associated program logic for execution. If the interrupt is set to disabled, the CPU will not expect an interrupt from this module.

An interrupt that has been enabled can be dynamically masked or unmasked from the application program during system operation. However, an interrupt that has been configured as disabled cannot be unmasked during operation. See chapter 4 for information about masking interrupts.

Interrupt Number

This must be set to 1.

VME Interrupt ID

Each VME module in the system that can generate a VME interrupt to the CPU must have a unique VME Interrupt ID.

The Interrupt ID is a byte hexadecimal value that identifies the module driving the VME interrupt line. The Interrupt ID must be a value between 1 and FEh that is not used by any other module (including GE Fanuc modules).

For example, the module could use the value FBh as long as no other module in the system will use that value. Only one Interrupt ID is allowed for each module.

Interrupt IDs Used by GE Fanuc Modules

The PACSystems CPU assigns VME Interrupt IDs to GE Fanuc modules based on the module rack and slot numbers.

Module Slot Number	Interrupt ID (hex)							
	Rack 0	Rack 1	Rack 2	Rack 3	Rack 4	Rack 5	Rack 6	Rack 7
0 (PS)	None	None	None	None	None	None	None	None
1 (System)	None	None	None	None	None	None	None	None
2	00	20	40	60	80	A0	C0	E0
3	02	22	42	62	82	A2	C2	E2
4	04	24	44	64	84	A4	C4	E4
5	06	26	46	66	86	A6	C6	E6
6	08	28	48	68	88	A8	C8	E8
7	0A	2A	4A	6A	8A	AA	CA	EA
8	0C	2C	4C	6C	8C	AC	CC	EC
9	0E	2E	4E	6E	8E	AE	CE	EE
10	10							
11	12							
12	14							
13	16							
14	18							
15	1A							
16	1C							
17	1E							

Interrupt IDs for Non-GE Fanuc Modules

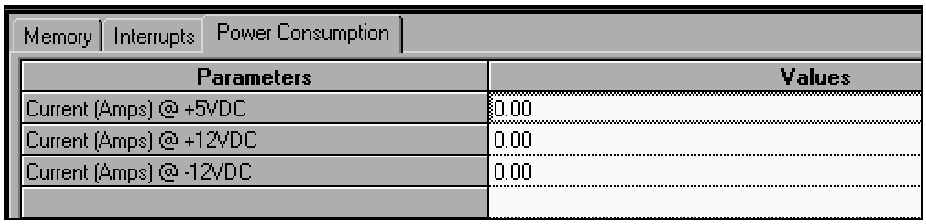
The Interrupt ID selected for a non-GE Fanuc VME module must not conflict with any other modules in the system that generate VME interrupts. All odd numbers and IDs within the range F0h – FEh are available for use by non-GE Fanuc modules.

The Interrupt ID set for the module must match its configured Interrupt ID.

Configuring Power Consumption

Power consumption for GE Fanuc modules in the system is automatically supplied by the configuration software.

Power consumption for non-GE Fanuc modules must be configured on the Power Consumption tab:



Enter the module's power usage at each voltage in Amps, according to the module specifications. This information is required to accurately estimate power supply loading.

Chapter 4 Programming for Non-GE Fanuc VME Modules

This chapter describes programming features that allow a PACSystems CPU to communicate with non-GE Fanuc VME modules.

- Programming Bus ___ Functions for VME Modules
- Bus Read
- Bus Write
- Bus Read / Modify / Write
- Bus Test and Set
- Swap
- Interrupts
    - Using Interrupts to Trigger Program Logic
    - Dynamic Masking of Interrupts

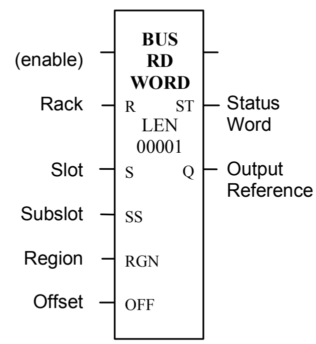
For additional information on PACSystems program features, refer to the *PACSystems Reference Manual*, GFK-2222. Instructions for using the programmer software are provided in the software's online help.

Programming BUS____ Functions for VME Modules

Four program functions allow the PACSystems CPU to communicate with non-GE Fanuc VME modules in the system

- BUS READ (BUSRD)
- BUS WRITE (BUSWRT)
- BUS READ/MODIFY/WRITE (BUSRMW)
- BUS TEST AND SET (BUSTST)

These functions all use the same parameters to specify which module in the system will exchange data with the CPU. The Bus Read function block shown below illustrates these parameters:



The Rack, Slot, Subslot, Region, and Offset Parameters

The rack and slot parameters refer to a module in the hardware configuration. The region parameter refers to a memory region configured for that module. Configuration of parameters is described in chapter 3. The subslot is ordinarily set to 0. The offset is a 0-based number that the function block adds the offset to the VME base address (which is part of the region configuration) to compute the VME address to be read or written.

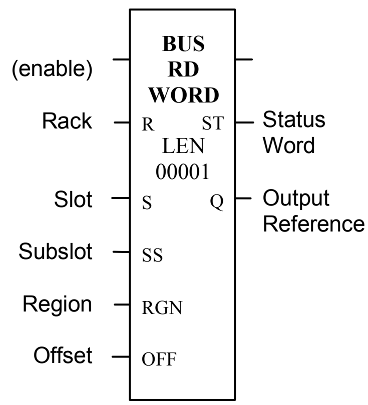
As mentioned in chapter 3, each slot can have up to 8 regions configured. These regions can overlap within the module. At least one region must have been configured for the logic to communicate with the module.

Parameters for Two Single-Width Modules in a VME Integrator Expansion Rack

In a Series 90-70 VME Integrator expansion rack, pairs of slots share a single slot number, as described in chapter 2. When two single-width VME modules are located in such a pair of slots, they have the same rack, slot, and subslot parameters. (The subslot for both is 0). However, the two modules of the pair must be set up to use different region numbers. For example, the first module in slot 7 might use region number 1 and the second module in slot 7 might use region number 2. This is established by the PACSystems configuration, by entering multiple regions for the slot pair. In addition, each of the modules is itself set up (for example, using jumpers on the module) to respond to different VME addresses.

Bus Read (BUSRD)

The BUSRD function reads data from the VME bus. This function should be executed before the data is needed in the program. If the amount of data to be read is greater than 32767 bytes, words, or dwords, use multiple instructions to read the data.



When the BUSRD function receives power flow through its enable input, it accesses the VME module at the specified rack (R), slot (S), subslot (SS), address region (RGN) and offset (OFF). BUSRD copies the specified number (LEN) of data units (DWORDS, WORDs or BYTEs) from the module to the CPU, beginning at output reference (Q).

The subslot parameter is intended for future expansion where a rack/slot address may contain more than one board.

Region configuration is described on page 3-3.

The function passes power to the right when its operation is successful. The status of the operation is reported in the status location (ST).

BUSRD Parameters

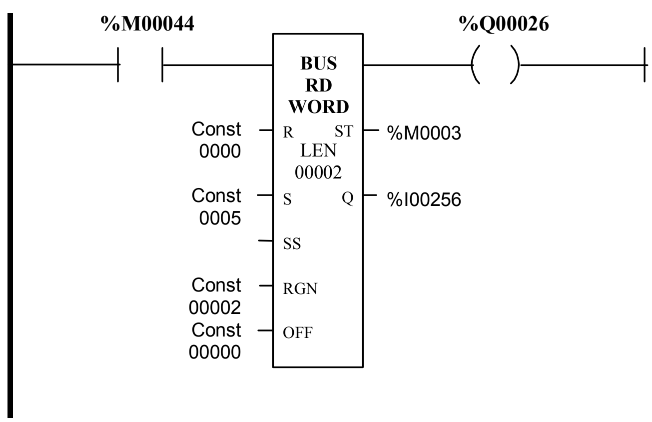
Parameter	Description	Data Types	Valid Memory Types
LEN	Length. The number of BYTEs, DWORDs, or WORDs. 1 to 32,767.	UINT	Constant
R	Rack number	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant
S	Slot number	UINT	
SS	Subslot number (optional, defaults to 0)	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant, none
RGN	Region. (Optional, defaults to 1)	UINT	
OFF	The offset in bytes	DWORD	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant
ST	(Optional.) The status of the operation.	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, none
Q	Reference for data read from the VME module	BYTE, DWORD, or WORD	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic

BUSRD Status in the ST Output

The BUSRD function returns one of the following values to the ST output:

0	Operation successful.
1	Bus error
2	Module does not exist at rack/slot location.
3	Module at rack/slot location is an invalid type.
4	Start address outside the configured range.
5	End address outside the configured address range.
6	Absolute address even but interface configured as odd byte only
8	Region not enabled
10	Function parameter invalid.

BUSRD Example 1

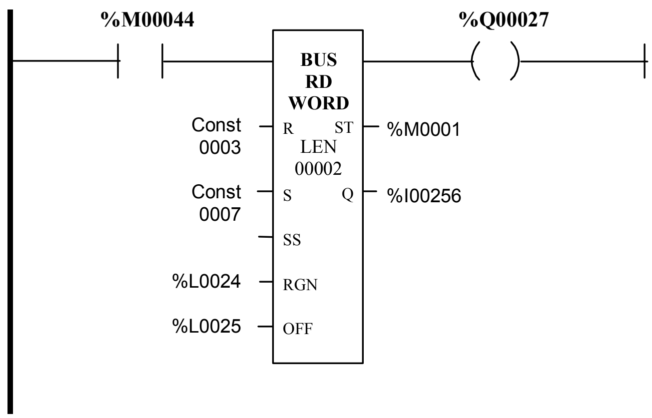


In this example, when enabling input %M00044 is on, the CPU reads 2 words (LEN) of data from a module in rack 0, slot 5. Data is read from the module's configured region (RGN) 2, starting at offset 0.

This function stores the data to 2 words beginning at %I256.

The function indicates successful completion by placing the value 0 into status reference %M0003.

BUSRD Example 2



In this example, when enabling input %M00044 is on, the CPU reads 2 words (LEN) of data from a module in rack 3, slot 7 and stores it to 2 words beginning at %I256.

In this case, rack 3 is a VME Integrator expansion rack, and slot 7 contains a pair of non-GE Fanuc VME modules.

In the configuration for the pair of modules, multiple regions have been assigned. In the example function block, the RGN parameter is a reference, %L0024. The offset is specified using reference %L0025. By changing the region number in %L024, the application program can use the same function block on successive logic sweeps to read data from either module of the pair.

Alternatively, multiple BUSRD functions could be used in the same sweep, with the region in each specified as different constant values.

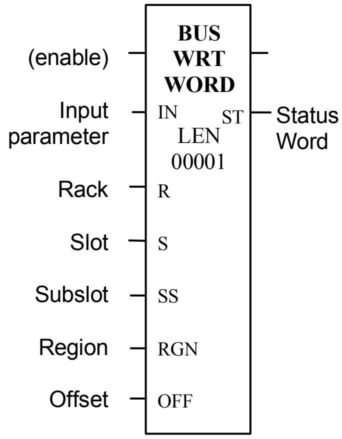
In this example, %L025 and %L026 are set to 0, so the function block always reads 2 words of data from the beginning of the memory region specified in %L024.

After reading the data, the function block places it in CPU memory starting at (bit reference) %I00256. Unless an error has occurred, output coil %Q00027 is turned on.

The function indicates successful completion by placing the value 0 into status reference %M0001.

Bus Write (BUSWRT)

The BUSWRT function writes data to the VME bus. Locate the function at a place in the program where the output data will be ready to send. If the amount of data to be written is greater than 32767 bytes, words, or dwords, use multiple instructions to write the data.



When the BUSWRT function receives power flow through its enable input, it writes the data located at reference (IN) to the VME module at the specified rack (R), slot (S), subslot (SS) and optional address region (RGN) and offset (OFF). BUSWRT writes the specified length (LEN) of data units (DWORDS, WORDs or BYTEs).

The BUSWRT function passes power to the right when its operation is successful. The status of the operation is reported in the status location (ST).

BUSWRT Parameters

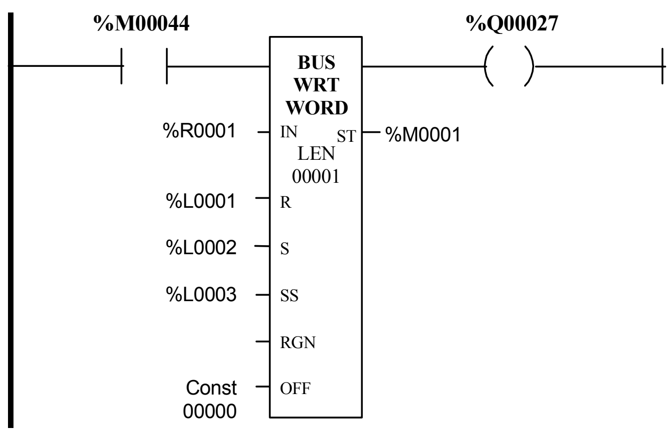
Parameter	Description	Data Types	Valid Memory Types
LEN	Length. The number of BYTEs, DWORDs, or WORDs. 1 to 32,767.	UINT	Constant
IN	Reference for data to be written to the VME module	BYTE, DWORD, or WORD	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant
R	Rack number	UINT	
S	Slot number	UINT	
SS	Subslot number (optional, defaults to 0)	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant, none
RGN	Region. (Optional, defaults to 1)	UINT	
OFF	The offset in bytes	DWORD	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant
ST	(Optional.) The status of the operation.	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, none

BUSWRT Status in the ST Output

The BUSWRT function returns one of the following values to the ST output:

0	Operation successful.
1	Bus error
2	Module does not exist at rack/slot location.
3	Module at rack/slot location is an invalid type.
4	Start address outside the configured range.
5	End address outside the configured address range.
6	Absolute address even but interface configured as odd byte only
8	Region not enabled
10	Function parameter invalid.

BUSWRT Example



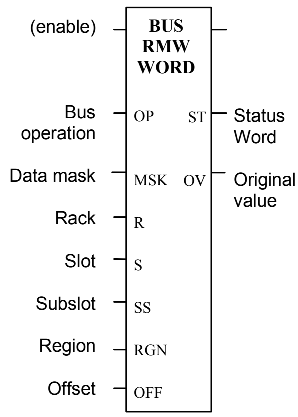
In this example, every sweep that enabling input %M00044 is true, the BUSWRT function writes a word of data from %R0001 to a module on the bus. Because the module's rack, slot, and subslot location are contained in references %L0001 through %L0003, rather than being explicitly entered in the function block, the same function block can be used to update different modules on subsequent logic sweeps by first changing the values in those references.

Because the example function block does not include an entry for the RGN parameter, this function block will always write to region 1. Because the Offset parameter is 0, it will always start at the beginning of the module's configured memory address. Other function blocks in the program might write to other regions.

Unless an error occurs while writing the data, output coil %Q0027 is set to true. The BUSWRT function indicates successful completeion with a 0 in status reference %M0001.

Bus Read / Modify / Write (BUSRMW)

The BUSRMW function updates one byte, word, or double word of data on the VME bus. This function locks the VME bus while performing the read-modify-write operation.



When the BUSRMW function receives power flow through its enable input, the function reads a dword, word or byte of data from the module at the specified rack (R), slot (S), subslot (SS) and optional address region (RGN) and offset (OFF). The original value is stored in parameter (OV).

The function combines the data with the data mask (MSK). The operation performed (AND / OR) is selected with the OP parameter. The mask value is dword data. When operating on a word of data, only the lower 16 bits are used. When operating on a byte of data, only the lower 8 bits of the mask data are used. The result is then written back to the same VME address from which it was read.

The BUSRMW function passes power to the right when its operation is successful, and returns a status value to the ST output.

BUSRMW Parameters

For BUSRMW_WORD, the absolute VME address must be a multiple of 2. For BUSRMW_DWORD, it must be a multiple of 4.

The absolute VME address is equal to the base address plus the offset value.

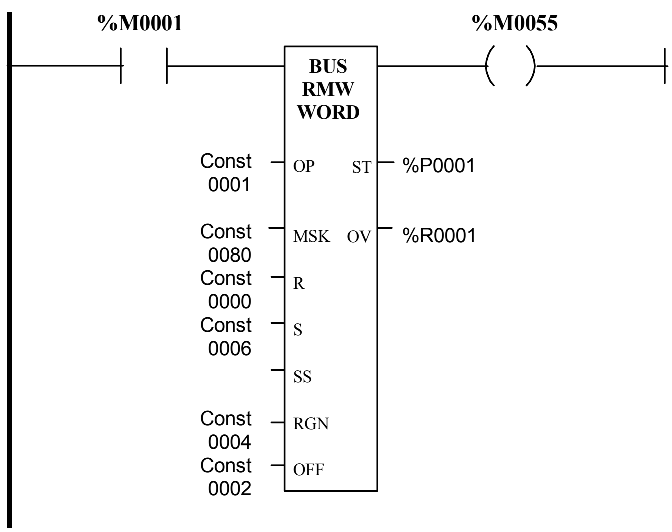
Parameter	***Description***	***Data Types***	***Valid Memory Types***
OP	Type of operation: 0 = AND 1 = OR	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant
MSK	The data mask	DWORD	
R	Rack number	UINT	
S	Slot number	UINT	
SS	Subslot number (optional, defaults to 0)	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant, none
RGN	Region. (Optional, defaults to 1)	UINT	
OFF	The offset in bytes	DWORD	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant
ST	(Optional.) The status of the operation.	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, none
OV	(Optional) Original value	BYTE, DWORD, or WORD	

BUSRMW Status in the ST Output

The BUSRMW function returns one of the following values to the ST output:

0	Operation successful.
1	Bus error
2	Module does not exist at rack/slot location.
3	Module at rack/slot location is an invalid type.
4	Start address outside the configured range.
5	End address outside the configured address range.
6	Absolute address even but interface configured as odd byte only
7	For WORD type, absolute VME address is not a multiple of 2. For DWORD type, absolute VME address is not a multiple of 4.
8	Region not enabled
9	Function type too large for configured access type.
10	Function parameter invalid.

BUSRMW Example



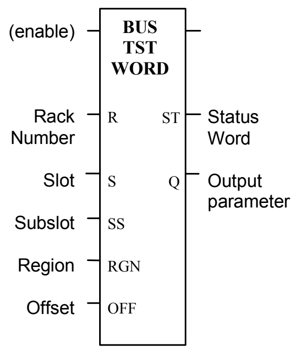
In this example, when enabling input %M0001 is energized, the hexadecimal MSK value 80H is ORed (OP = 1) with a word of data read from the module in slot 6 of the main rack.

The function block references address region 4, using an offset that is 2 bytes from the start of that region.

The original value is output to reference %R0001. The new OR'd value is written back to the module.   Unless an error occurs while accessing the data, coil %M0055 is turned on. The status of the operation is placed in ST reference %P0001.

Bus Test and Set (BUSTST)

The BUSTST function handles semaphores located on the VME bus. The BUSTST function exchanges a boolean TRUE (1) for the value currently at the semaphore location. If that value was already a 1, then the BUSTST function does not acquire the semaphore. If the existing value was 0, the semaphore is set and the BUSTST function has the semaphore and the use of the memory area it controls. The semaphore is cleared and ownership relinquished by using the BUSWRT function to write a 0 to the semaphore location. This function locks the VME bus while performing the operation.



When the BUSTST function receives power flow through its enable input, the function exchanges a booean TRUE (1) with the address specified by the RACK, SLOT, SUBSLOT, RGN, and OFF parameters. The function sets the Q output on if the semaphore was available (0) and was acquired. It passes power flow to the right whenever power is received and no errors occur during execution.

BUSTST Parameters

BUSTST can be programmed as BUSTS_BYTE or BUSTS_WORD. For BUSTST_WORD, the absolute address of the module must be a multiple of 2. The absolute address is equal to the base address plus the offset value.

Parameter	Description	Data Types	Valid Memory Types
R	Rack number	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant
S	Slot number	UINT	
SS	Subslot number (optional, defaults to 0)	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant, none
RGN	Region. (Optional, defaults to 1)	UINT	
OFF	The offset in bytes	DWORD	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, constant
ST	(Optional.) The status of the VME operation.	UINT	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic, none
Q	Output set on if the semaphore was available (0). Otherwise, Q is set off.		power flow, none

BUSTST Status in the ST Output

The BUSTST function returns one of the following values to the ST output:

0	VME Operation successful.
1	Bus error
2	Module does not exist at rack/slot location.
3	Module at rack/slot location is an invalid type.
4	Start address outside the configured range.
5	End address outside the configured address range.
6	Absolute address even but interface configured as odd byte only
7	For WORD type, absolute VME address is not a multiple of 2.
8	Region not enabled
9	Function type too large for configured access type.
10	Function parameter invalid.

A status of 0 only means that the VME operation was successful. It does not mean that the semaphore was acquired.

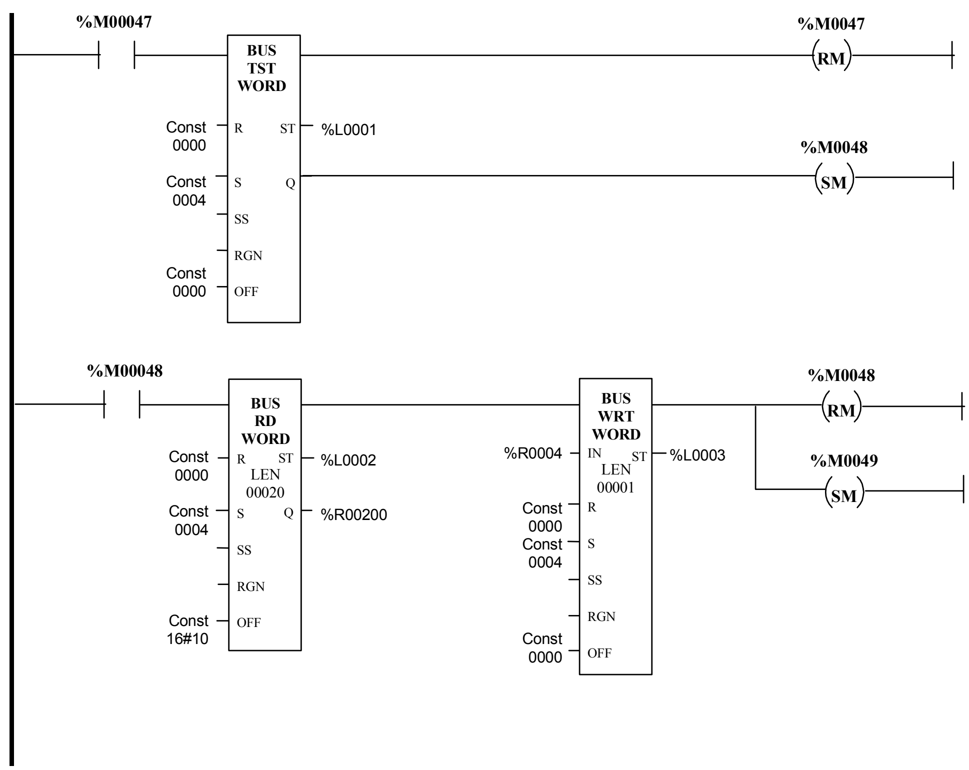
BUSTST Example

In this example, the BUSRD, BUSWRT, and BUSTST functions are used to read data protected by a semaphore into the PLC.

When enabling input %M00047 is set true, the BUSTST function is executed to acquire the semaphore of the module located in rack 0 slot 4. If the VME operation is successful, then coil %M0047 is reset and %L001 is set to 0. If the semaphore was available, output coil %M00048 is set.

When %M00048 is set, the BUSRD function reads 20 words of data from the module and stores it into CPU memory, beginning at %R0200. If the read is successful, the BUSWRT function relinquishes the semaphore. Coil %M00048 is reset when the BUSWRT is successful. %M00049 is set to indicate to later logic that fresh data is now available.

If the semaphore was not available, BUSRD and BUSWRT are not executed. The net effect is that setting %M00047 causes the CPU to check the semaphore each sweep until the semaphore is available. When it becomes available, the semaphore is acquired, the data is read and the semaphore is relinquished. No further action is taken until %M00047 is set again.

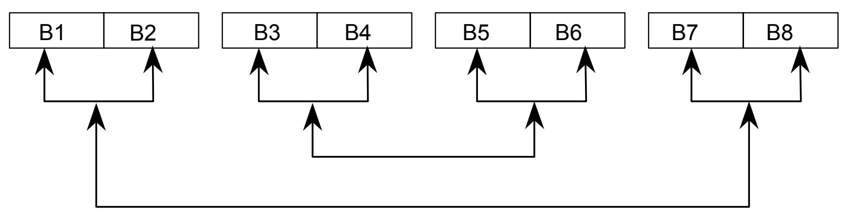


SWAP

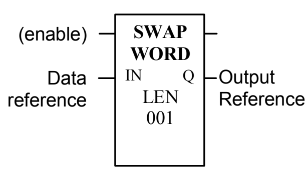
The SWAP function is used to swap two bytes within a word (SWAP WORD) or two words within a double word (SWAP DWORD). The SWAP can be performed over a wide range of memory by specifying a length greater than 1. If that is done, each word or double word of data within the specified length is appropriately swapped.

PACSystems CPUs use the Intel convention for storing word data in bytes. They store the least significant byte of a word in address n and the most signifacant byte is stored in address n+1. Many VME modules follow the Motorola convention of storing the most significant byte in address n and the least significant byte in address n+1.

The VMEbus access circuitry of the PACSystems CPU automatically assigns byte address 1 to the same storage location regardless of the byte convention used by the other device. However, because of the difference in byte significance, word and multiword data, for example, 16 bit integers (INT, UINT), 32 bit integers (DINT) or floating point (REAL) numbers, must be adjusted when being transferred to or from Motorola-convention modules. In these cases, the two bytes in each word must be swapped, either before or after the transfer. In addition, for multiword data items, the words must be swapped end-for-end on a word basis. For example, a 64-bit real number transferred to the PACSystems CPU from a Motorola-convention module must be byte-swapped and word-reversed, either before or after reading, as shown below:



Character (ASCII) strings or BCD data require no adjustment since the Intel and Motorola conventions for storage of character strings are identical.



When the SWAP function receives power flow through its enable input, it swaps the data in reference IN and places the swapped data onto output reference Q.

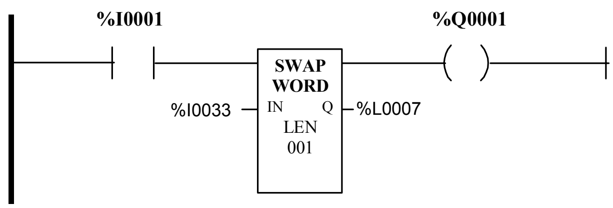
The function passes power to the right whenever it receives power.

SWAP Parameters

The two parameters, IN and Q, must both be the same type, WORD or DWORD.

Parameter	Description	Data Types	Valid Memory Types
IN	Reference for data to be swapped	DWORD, WORD	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic
Q	Reference for swapped data.	DWORD, WORD	data flow, I, Q, M, T, G, R, W, P, L, AI, AQ, symbolic

SWAP Example



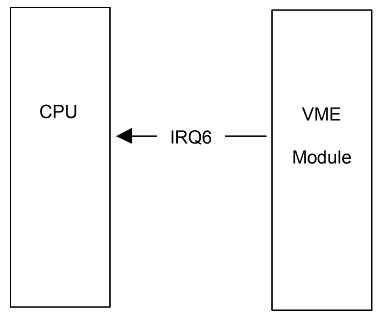
In this example, when enabling input %I00001 goes true, two bytes located in word %I0033 through %I0048 are swapped. The result of the swap is stored in %L0007. Whenever the SWAP function receives power flow, output coil %Q0001 is set to true.

Interrupts

Using Interrupts to Trigger Program Logic

The PACSystems CPU handles VME interrupts IRQ5, IRQ6, and IRQ7. Non-GE Fanuc VME modules *must not* service these interrupts.

Non-GE Fanuc VME modules may interrupt the CPU on IRQ6 to trigger the execution of logic in the application program. Each interrupt can trigger one LD interrupt block.



If a non-GE Fanuc VME module is placed to the left of a module that can generate interrupts, the non-GE Fanuc VME module must pass the VME interrupt acknowledge daisy chain signal to the slot on the right. If a non-GE Fanuc module does not pass the VME interrupt acknowledge daisy chain, it must be placed to the right of all modules that can generate VME interrupts.

Releasing IRQ6

It is important for the VME module to release IRQ6 as soon as the CPU completes the VME interrupt acknowledge cycle. Otherwise, the CPU interprets it as a subsequent interrupt request and services the VME interrupt again. This could eventually cause the system watchdog timer to expire and put the CPU in STOP/HALT mode.

Associating Interrupts with Logic

When using interrupts from a VME module to trigger logic execution, an association between the interrupt and the program logic to be executed needs to be specified. With Cimplicity Machine Edition on the properties of the interrupt logic block, select the Scheduling row. Expand the scheduling dialog, and select Module Interrupt for the Type. Put the Rack, Slot, and Interrupt Number into the Trigger field. . A single interrupt source can only trigger one logic interrupt block.

Frequency and Queuing

The system allows VME interrupts from discrete, analog, and non-GE Fanuc modules to trigger program logic in the PLC. The queuing and frequency of the non-GE Fanuc module interrupts are subject to the same rules that apply to the discrete and analog interrupts.

Dynamic Masking of Interrupts

During module configuration, interrupts from a module can be enabled or disabled. If a module's interrupt is disabled, it cannot be used to trigger logic execution in the application program and it cannot be unmasked. However, if an interrupt is enabled in the configuration, it can be dynamically masked or unmasked by the application program during system operation.

The application program can mask and unmask interrupts that are enabled using Service Request Function Block #17. To mask or unmask an interrupt from a non-GE Fanuc VME module, the application logic will pass VME_INT_ID (17 decimal, 11H) as the memory type and the VME interrupt id as the offset to SVC_REQ #17.

When the interrupt is not masked, the CPU processes the interrupt and schedules the associated program logic for execution. When the interrupt is masked, the CPU processes the interrupt but does not schedule the associated program logic for execution.

When the CPU transitions from Stop to Run, the interrupt is automatically unmasked.

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