

CPU Module

November 1999

GFK-1536F

Product Information

Revision:	CPU001-CD CPU002-AA														
Firmware:	Version 1.50														
Compatibility:	CPU001-CD is fully compatible with CPU001-BC. VersaPro software version 1.1 or later is required for CPU002 and to configure expansion I/O. All types of I/O and communications modules can be used in expansion racks. Some analog modules require specific module revisions in expansion racks, as listed below: <table><thead><tr><th>Module</th><th>Module Revision</th></tr></thead><tbody><tr><td>*ALG320</td><td>B or later</td></tr><tr><td>*ALG321</td><td>B or later</td></tr><tr><td>*ALG322</td><td>B or later</td></tr><tr><td>*ALG430</td><td>C or later</td></tr><tr><td>*ALG431</td><td>C or later</td></tr><tr><td>*ALG432</td><td>B or later</td></tr></tbody></table>	Module	Module Revision	*ALG320	B or later	*ALG321	B or later	*ALG322	B or later	*ALG430	C or later	*ALG431	C or later	*ALG432	B or later
Module	Module Revision														
*ALG320	B or later														
*ALG321	B or later														
*ALG322	B or later														
*ALG430	C or later														
*ALG431	C or later														
*ALG432	B or later														

New Features

- This version of CPU001/2 provides support for expansion I/O modules.
- CPU002 provides 20K of program memory.

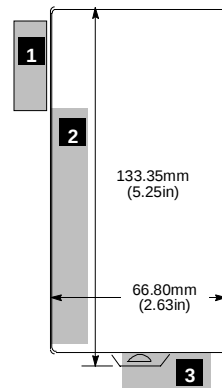
Specifications

Size	2.63" (66.8mm) x 5.04" (128mm)
I/O Discrete Points	2048 In, 2048 Out
I/O Analog Words	128 In, 128 Out
Registers	2048 words
Discrete Internal Bits	1024 points
Discrete Temporary Bits	256 points
Global Discrete Bits	1280 points
Program Memory	CPU001: 12288 bytes CPU002: 20480 bytes
Boolean execution speed	1.8ms/K (typical)
Floating Point	Yes
Override	Yes
Built-in ports	RS-232, RS-485
Built-in communications	SNP Slave, RTU Slave, Serial I/O
Type of memory storage	System flash, battery-backed RAM
Battery-Backed Real-time Clock	Yes
Realtime clock accuracy (used for timers or timer contacts)	100ppm (0.01%) or +/- 9sec/day
Time-of-day clock accuracy	23ppm (.0023%) or +/- 2sec/day @ 30C; 100 ppm ((0.01%) or +/- 9sec/day @ full temperature range.

Preinstallation Check

Carefully inspect all shipping containers for damage. If any equipment is damaged, notify the delivery service immediately. Save the damaged shipping container for inspection by the delivery service. After unpacking the equipment, record all serial numbers. Save the shipping containers and packing material in case it is necessary to transport or ship any part of the system.

Module Installation



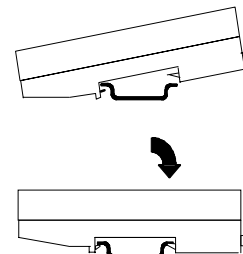
Modules must be mounted on a horizontal DIN rail.

- Allow sufficient finger clearance for opening CPU door.
- Allow adequate clearance for serial port cables.
- Allow adequate space for power wiring.

The CPU with power supply attached fits into a 70mm deep enclosure.

Rated thermal specifications for the CPU module is based on a clearance of 2" above and below the equipment and 1" to the left of the CPU module.

Installing the CPU on the DIN Rail



The CPU and connecting carriers must be installed on the same section of 35mm x 7.5mm DIN rail. The rail must have a conductive (unpainted) finish for proper grounding. For best stability, the DIN rail should be installed on a panel using screws spaced approximately 6 inches (5.24cm) apart.

The CPU snaps easily onto the DIN rail. No tools are required for mounting or grounding to the DIN rail.

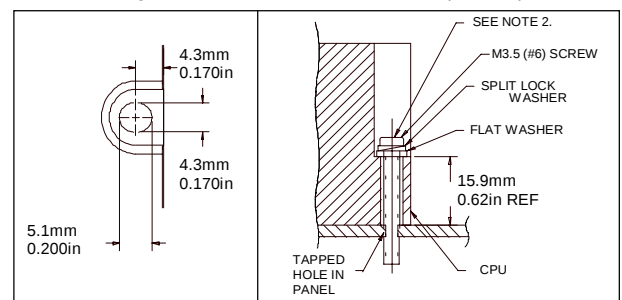
Before joining module carriers to the CPU, remove the connector cover on the righthand side of the CPU. Do not discard this cover, you will need to install it on the last carrier, to protect the connector pins from contamination and damage during use.

Panel-Mounting

If excessive vibration is a factor the CPU should also be screwed down to the mounting panel.

Note 1. Tolerances are +/- 0.13mm (0.005in) non-cumulative.

Note 2. 1.1-1.4Nm (10-12 in/lbs) of torque should be applied to M3.5 (#6-32) steel screw threaded into material containing internal threads and having a minimum thickness of 2.4mm (0.093in).



Removing the CPU from the DIN Rail

- Turn off power to the power supply.
- (If the CPU is attached to the panel with a screw) remove the power supply module. Remove the panel-mount screw.
- Slide the CPU away from the other modules until the connector on the right side disengages from the next carrier.
- With a small flathead screwdriver, pull the DIN rail latch outward while tilting the other end of the module down to disengage it from the DIN rail.

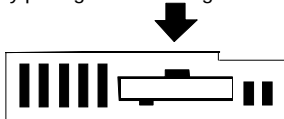
CPU Module

November 1999

GFK-1536F

Activating or Replacing the Backup Battery

The CPU is shipped with a battery already installed. The battery holder is located in the top side of the CPU module. Before the first use, activate the battery by pulling and removing the insulator tab.



To replace the battery, use a small screwdriver to gently pry open the battery holder. Replace battery only with *ACC001 from your PLC supplier, or with Panasonic battery: BR2032. Use of another battery may present a risk of fire or explosion.

Caution

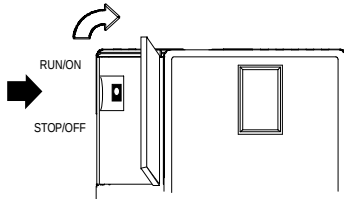
Battery may explode if mistreated.

Do not recharge, disassemble, heat above 100 deg.C (212 deg.F) or incinerate.

Autoconfiguration

At powerup, the CPU by default automatically generates a configuration that includes all of the modules that are physically present in the system, starting at slot 1. Autoconfiguration stops at the first empty slot or faulted module.

Switching the PLC Operating Mode



The CPU Run/Stop mode switch is located behind the module door. This switch can be used to place the CPU in Stop or Run mode. By default, Run/Stop mode operation is enabled. The same switch can also be configured to prevent writing to program or configuration memory and forcing or overriding discrete data. It defaults to disabled memory protection.

Run/Stop Mode Operation

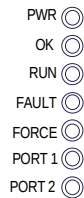
If Run/Stop mode switch operation is enabled, the switch can be used to place the CPU in Run mode.

If the CPU has non-fatal faults and is not in Stop/Fault mode, placing the switch in Run position causes the CPU to go to Run mode. Faults are NOT cleared.

If the CPU has fatal faults and is in Stop/Fault mode, placing the switch in Run position causes the Run LED to blink for 5 seconds. While the Run LED is blinking, the CPU switch can be used to clear the fault table and put the CPU in Run mode. After the switch has been in Run position for at least ½ second, move it to Stop position for at least ½ second. Then move it back to Run position. The faults are cleared and the CPU goes to Run mode. The LED stops blinking and stays on. This can be repeated if necessary.

If the switch is not toggled, after 5 seconds the Run LED goes off and the CPU remains in Stop/Fault mode. Faults stay in the fault table.

Observing the Module LEDs



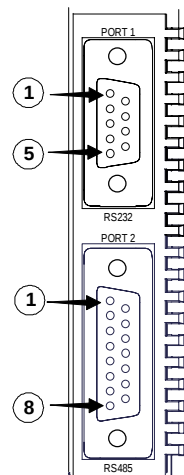
The LEDs indicate the presence of power and show the operating mode and status of the CPU.

- POWER** ON when the CPU is receiving 5V power from the power supply. Does not indicate the status of the 3.3V power output.
- OK** ON indicates the CPU has passed its powerup diagnostics and is functioning properly. OFF indicates a CPU problem. Fast blinking indicates the CPU is running its powerup diagnostics. Slow blinking indicates the CPU is configuring I/O modules. Simultaneous blinking of this LED and the green Run LED indicates the CPU is in boot mode and is waiting for a firmware download through port 1.
- RUN** Green when the CPU is in Run mode. Amber indicates the CPU is in Stop/I/O Scan mode. If this LED is OFF but OK is ON, the CPU is in Stop/No I/O Scan mode.
- If RUN is flashing green and the Fault LED is ON, the Run/Stop switch was moved to Run position while a fatal fault existed.
- FAULT** ON if the CPU is in Stop/Faulted mode because a fatal fault has occurred. To turn off the Fault LED, clear both the I/O Fault Table and the PLC Fault Table. If this LED is blinking and the OK LED is OFF, a fatal fault has occurred during self-diagnostics. Please contact PLC Field Service.
- FORCE** ON if an override is active on a bit reference.
- PORT 1 & 2** Blinking indicates activity on that port.

Using the CPU Serial Ports

The CPU's two serial ports are software-configurable for SNP slave, RTU slave, or Serial I/O operation. If a port is being used for RTU, it automatically switches to SNP slave mode if necessary. Both ports' default configuration is SNP slave mode. If configured for Serial I/O, a port automatically reverts to SNP slave when the CPU is in Stop mode.

Either port can be software-configured to set up communications between the CPU and various serial devices. An external device can obtain power from Port 2 if it requires 100mA or less at 5VDC.



Port 1 is an RS-232 port with a 9-pin female D-sub connector. It is used as the boot loader port for upgrading the CPU firmware. The pinout of port 1 allows a simple, straight-through cable to connect with a standard AT-style RS-232 port. Cable shielding attaches to the shell. Port 1 screw locks are threaded #4-40.

Port 2 is an RS-485 port with a 15-pin female D-sub connector. This can be attached directly to an RS-485 to RS-232 adapter (IC690ACC901). Port 2 screw locks are threaded (metric) M3x0.5).

Cable Lengths and Baud Rates

Maximum cable lengths (the total number of feet from the CPU to the last device) are:

Port 1 (RS-232) = 15 meters (50 ft.)

Port 2 (RS-485) = 1200 meters (4000 ft.)

Both ports support configurable baud rates from 4800 to 38.4k bps.

CPU Module

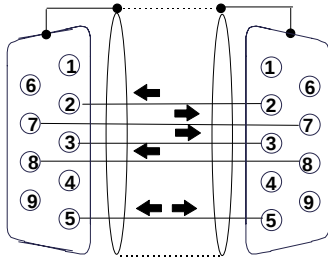
November 1999

GFK-1536F

Pin Assignments for Port 1

Pin	Signal	Direction	Function
1	n/c		--
2	TXD	Output	Transmit Data output
3	RXD	Input	Receive Data input
4	n/c		--
5	GND	--	0V/GND signal reference
6	n/c		--
7	CTS	Input	Clear to Send input
8	RTS	Output	Request to Send output
9	n/c		--
Shell	SHLD	--	Cable Shield wire connection / 100% (Continuous) shielding cable shield connection

Cable Diagram for Attachment to a PC



PC 9-Pin Serial Port	CPU Port 1
9-pin female	9-pin male
(2) RXD	(2) TXD
(3) TXD	(3) RXD
(5) GND	(5) GND
(7) RTS	(7) CTS
(8) CTS	(8) RTS

The shield must attach to shell of connectors on both ends of the cable.

Connector and Cable Specifications for Port 1

Vendor Part numbers below are provided for reference only. Any part that meets the same specification can be used.

Cable: Belden 9610	Computer cable, overall braid over foil shield 5 conductor † 30 Volt / 80°C (176°F) 24 AWG tinned copper, 7x32 stranding			
9 Pin Male Connector:	Type: Crimp	Vendor: ITT/Cannon AMP	Plug: DEA9PK87F0 205204-1	Pin: 030-2487-017 66506-9
	Solder	ITT/Cannon AMP	ZDE9P 747904-2	--
Connector Shell:	Kit* – ITT Cannon DE121073-54 [9-pin size backshell kit]: Metal-Plated Plastic (Plastic with Nickel over Copper) † Cable Grounding Clamp (included) 40° cable exit design to maintain low-profile installation Plus – ITT Cannon 250-8501-010 [Extended Jackscrew]: Threaded with #4-40 for secure attachment to port † Order Qty 2 for each cable shell ordered			

† Critical Information – any other part selected should meet or exceed this criteria.

* Use of this kit maintains the 70mm installed depth.

Pin Assignments for Port 2

Pin	Signal	Direction	Function
1	SHLD	--	Cable Shield Drain wire connection
2, 3, 4	n/c		--
5	P5V	Output	+5.1VDC to power external level converters (100mA max.)
6	RTSA	Output	Request to Send (A) output
7	GND	--	0V/GND reference signal
8	CTSB'	Input	Clear to Send (B) input
9	RT	--	Resistor Termination (120 ohm) for RDA'
10	RDA'	Input	Receive Data (A) input
11	RDB'	Input	Receive Data (B) input
12	SDA	Output	Transmit Data (A) output
13	SDB	Output	Transmit Data (B) output
14	RTSB	Output	Request to Send (B) output
15	CTSA'	Input	Clear to Send (A) input
Shell	SHLD	--	Cable Shield wire connection / 100% (Continuous) shielding cable shield connection

See the PLC User's Manual for cable diagrams.

Connector and Cable Specifications for Port 2

Vendor Part numbers below are provided for reference only. Any part that meets the same specification can be used.

Cable: Belden 8105	Low Capacitance Computer cable, overall braid over foil shield 5 Twisted-pairs † Shield Drain Wire † 30 Volt / 80°C (176°F) 24 AWG tinned copper, 7x32 stranding Velocity of Propagation = 78% Nominal Impedance = 100Ω †			
15 Pin Male Connector:	Type: Crimp	Vendor: ITT/Cannon AMP	Plug: DAA15PK87F0 205206-1	Pin: 030-2487-017 66506-9
	Solder	ITT/Cannon AMP	ZDA15P 747908-2	--
Connector Shell:	Kit* – ITT Cannon DA121073-50 [15-pin size backshell kit]: Metal-Plated Plastic (Plastic with Nickel over Copper) † Cable Grounding Clamp (included) 40° cable exit design to maintain low-profile installation Plus – ITT Cannon 250-8501-009 [Extended Jackscrew]: Threaded with (metric) M3x0.5 for secure attachment † Order Qty 2 for each cable shell ordered			

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GFK-1536F

Firmware Upgrades

CPU001/2 firmware resides in FLASH memory. This firmware may be upgraded via serial download from an appropriate personal computer to CPU serial port 1 (RS-232). Firmware upgrades through port 2 (RS-485) are not supported.

To determine the current version of firmware on an existing CPU, connect a programmer to the CPU and look in the Status/Memory Information.

Upgrading CPU001-AA: Any version with a date code of 903 or greater may be upgraded to CPU001-AD without updating the hardware. (Date code is a 3-digit code found just below the Bar Code marking on the CPU module). CPU001-AA models with date codes prior to 903 require a hardware modification; these units are not field upgradable to CPU001-AD.

CPU001-BA, BB or BC: Any CPU001-BA, BB or BC may be upgraded to CPU001-BD.

CPU001-CC: Any CPU001-CC may be upgraded to CPU001-CD.

Operating Notes/Restrictions

1. If an overridden reference bit is used on a positive transition coil and the override is removed during the same sweep as an enclosing MCR becomes inactive, the transition coil is not set ON as expected.
2. Using an older revision non-intelligent analog module in an expansion rack will cause a System Configuration Mismatch error to be logged. The faulted module must be replaced with a newer revision before it will be scanned. The allowed revisions are detailed under Compatibility, in the Product Information section, above.
3. The PID Integral Contribution is not calculated correctly with an integral rate of one or zero.
4. Occasionally, a "Backplane Communication Failure" fault may be logged on an intelligent I/O module after a power-cycle of main or expansion rack. This is a non-fatal diagnostic fault that can be cleared by the user.
5. If an invalid reference address is used for the status word of a COMMREQ, the failure output does not pass power.
6. If the receiver in a local single rack is powered off while the CPU is powered on, erroneous "Addition of rack" faults may be logged by the CPU. It is recommended that both the CPU and the receiver be powered by a single source.
7. When the BIT_SEQ function block is called with a length of one, the output is set to zero instead of one.
8. In very rare instances, when field power is lost on one module, other non-intelligent analog output modules in the same rack may also report field faults.
9. Point faults may reappear once after being cleared by the user, even though the fault is no longer present. Clear the fault table again to clear the fault.

Problems Fixed (F/W version 1.50)

1. As the input to a trigonometric function becomes larger ($\geq 10^4$), the output result maintains its accuracy.
2. Overflow and underflow conditions with the Real Exponential function block are now handled correctly.
3. If a load of program logic occurs simultaneously with a program store, all subroutines are loaded successfully.
4. If the upgrade file for an intelligent module has become corrupt and an attempt to upgrade the intelligent module is made, appropriate error codes are shown in the error message displayed by the Firmware Upgrade Utility when it fails.
5. An END function may be used within a subblock (subroutine).
6. If, while disabled, the Run/Stop keyswitch is turned to ON and then enabled (with a store or clear of the hardware configuration), the PLC stays in stop mode.
7. The Radian to Degree function block no longer returns real numbers when +/- infinity is expected.
8. Retentive negative transition coils are not set in the first sweep after a clear of memory even if the coil was receiving power flow immediately prior to the clear.
9. When attempting to store a hardware configuration with passwords disabled, the user will no longer occasionally receive the following error: "Store Error, 0x05C7-Passwords have been set to inactive and cannot be enabled or disabled."

Product Revision History

Rev	FW version	Description/ / Features
CPU001-AA	1.00	Initial Product Release
CPU001-BA	1.00	Updated hardware to support Intelligent I/O modules
CPU001-BB	1.10	Added function blocks to scale input data. Added Drum Sequencer function block.
CPU001-BC	1.20	Added support for ALG240, 331, 620, and 630 intelligent analog modules.
CPU001-CC	1.20	Hardware-only upgrade to support future functionality. No customer/user impact for changes made from -BC version.
CPU001-CD CPU002-AA	1.50	Support for CPU002 and expansion I/O.