

GFK-0837C  
August 1997

### 16 MHz, 32-Bit Floating Point Expandable Central Processing Unit for Hot Standby CPU Applications

## Features

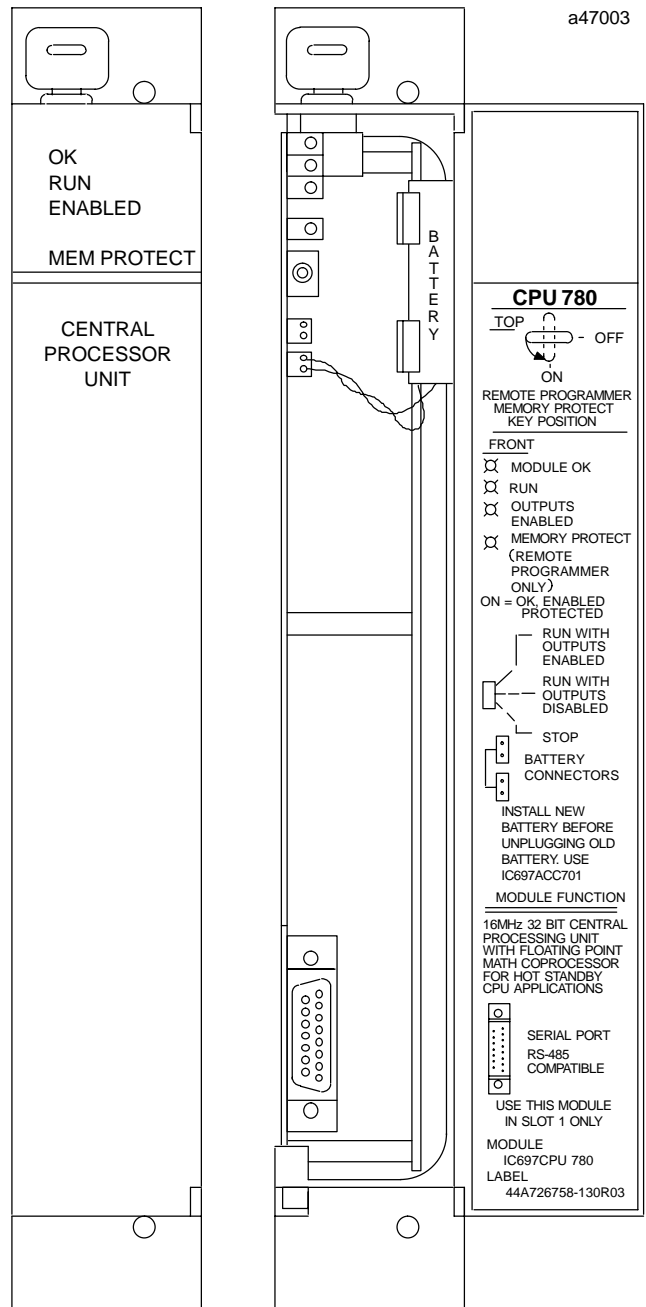
- Required for Hot Standby CPU applications
- Supports floating point calculation
- Single slot CPU
- 12K inputs and outputs (any mix)
- Up to 8K analog I/O
- 0.4 microseconds per boolean function
- 16MHz, 80386DX microprocessor
- Supports IC660/IC661 and IC697I/O products
- Programmed by MS-DOS® (IC641) based software products
- Supports up to 512 Kbytes of battery-backed expansion memory in the same slot
- Configurable data and program memory
- Battery-backed calendar clock
- Three position operation mode switch
- Password controlled access
- Keyswitch memory protection
- Four status LEDs
- Software configuration (No DIP switches or jumpers to set)
- Reference information inside front door.

## Redundancy Features

In addition to the above features, the CPU 780 supports the redundancy features listed below.

- Bumpless switching between redundancy PLCs
- Synchronization of CPUs
- Redundant backup communications
- 20 ms scan extension (nominal)
- One scan switching (in most cases)
- Configurable backup data size
- On-line programming
- On-line repair
- No single point of failure
- Same or different program in Primary and Secondary PLCs
- Program control switching
- Symptom status bits and fault tables
- Memory parity and checksums

- Common I/O on IC660/IC661 bus
- Manual switching with pushbutton switch on Redundancy Communications Module



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### Functions

The CPU 780 is a single slot programmable controller CPU which allows floating point calculations and is required for Hot Standby CPU applications. The CPU 780 is programmed and configured by IC641 programming software to perform real time control of machines, processes and material handling systems.

The CPU 780 communicates with I/O and smart option modules over the rack mounted backplane (IC697CHS750, 790, 791) by way of the VME C.1 Standard format.

Supported option modules include all IC697 LAN interface modules, several Coprocessor modules, Bus Controller for IC660/IC661 I/O, Communications modules, and all of the IC697 family of discrete and analog I/O modules.

Program and data memory for the CPU 780 is available by the attachment of an expansion memory board with either 128 Kbytes, 256 Kbytes or 512 Kbytes of battery-backed CMOS RAM, or 256 Kbytes with 256 Kbytes of non-volatile flash memory. These memory boards provide

error checking through a CPU checksum routine with detected parity errors being reported to the CPU as they occur.

Operation of this module may be controlled by the three position RUN/STOP switch or remotely by an attached programmer and IC641 software. Program and configuration data can be locked through software passwords or manually by the memory protect key-switch. When the key is in the *protected* position, program and configuration data can only be changed by a programmer connected through parallel communications (i.e., via the Bus Transmitter module). The status of the CPU is indicated by the four green LEDs on the front of the module.

The CPU 780 is used as the CPU in a Hot Standby CPU Redundancy system. Two CPUs are required in a Hot Standby CPU redundancy system; one in the Primary PLC and one in the Secondary PLC. Each of the CPUs must be configured separately, with one configured as the *Primary* unit and one configured as the *Secondary* unit. The location of the CPU 780 modules in a typical Hot Standby CPU Redundancy system is shown in Figure 1.

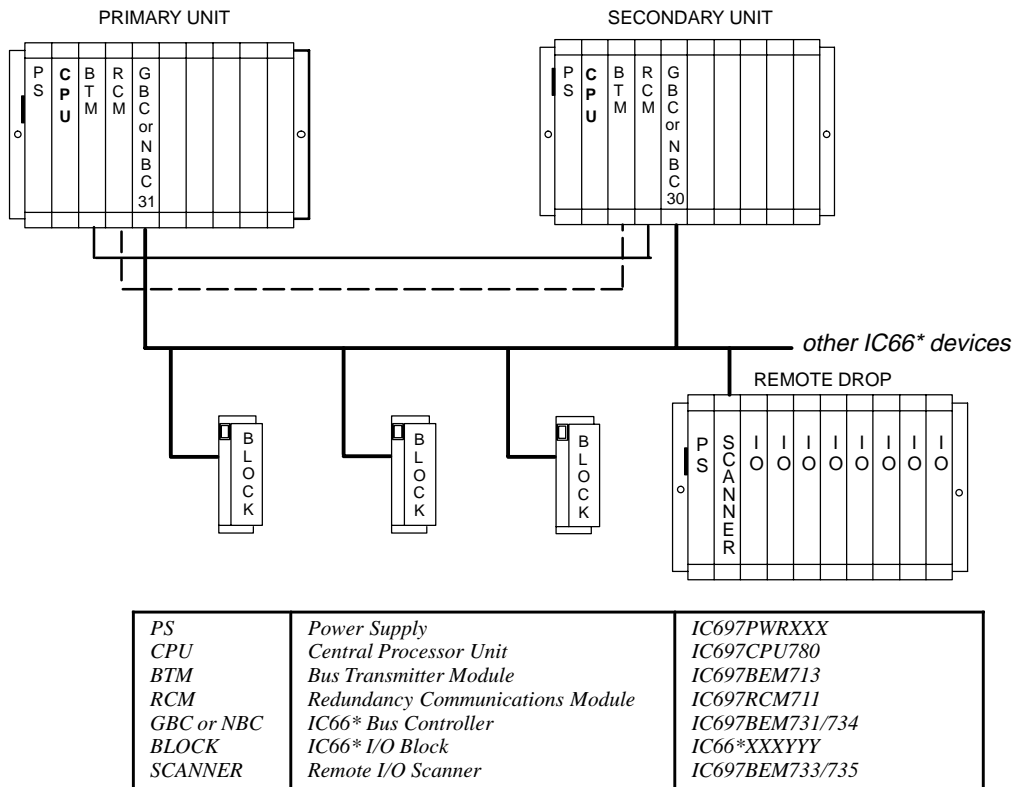


Figure 1. Hot Standby CPU Redundancy System Configuration

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**Installation**

It is the responsibility of the OEM, system integrator, or end user to properly install the PLC equipment for safe and reliable operation. Product manuals provide detailed information about installation, startup, and proper use of the PLC equipment. The installation manual, shipped with your PLC programming software, describes how to properly install the equipment. If the PLC installation must comply with supported standards, such as FCC or CE Directives, please refer to the *Installation Requirements for Conformance to Standards*, shipped with the PLC programming software, for additional guidelines.

Installation should not be attempted without referring to the applicable *Programmable Controller Installation Manual* and the *Hot Standby CPU Redundancy Manual*.

- Align the expansion memory and CPU connectors.
- Align the captive screws on the memory board with the standoffs already installed on the CPU.
- Push the memory board onto the CPU connector ensuring that the mating screws remain aligned with their respective standoff.
- Screw each memory board screw into the standoffs with a #1 Phillips screwdriver, and tighten.
- Connect the battery to either of the battery connectors on the module.
- Put toggle switch in the STOP position.
- Put keyswitch in Memory Protection OFF position.
- Make sure rack power is off.
- Install in slot 1 of rack 0. (See Figure 1)
- Turn on power.

The module should power up and blink the top LED. When the diagnostics have completed successfully, the top LED stays on and the second and third LEDs are off.

The fourth LED is off if the keyswitch is in the OFF position. The CPU is now ready to be programmed. After the program has been verified the toggle switch may be moved to the appropriate operation mode position. The LEDs indicate the position of the toggle switch, memory protection status, and the state of the program.

**Expansion Memory**

The CPU 780 must have a CMOS RAM expansion memory board. The CMOS expansion memory board provides CMOS RAM memory of 128K, 256K, 256K

with 256K of non-volatile flash memory, or 512 Kbytes. These memory boards provide error checking through a CPU checksum routine. Memory parity errors are reported to the CPU when they occur. The battery which supports this memory is located on the main CPU board. (See Figure 2).

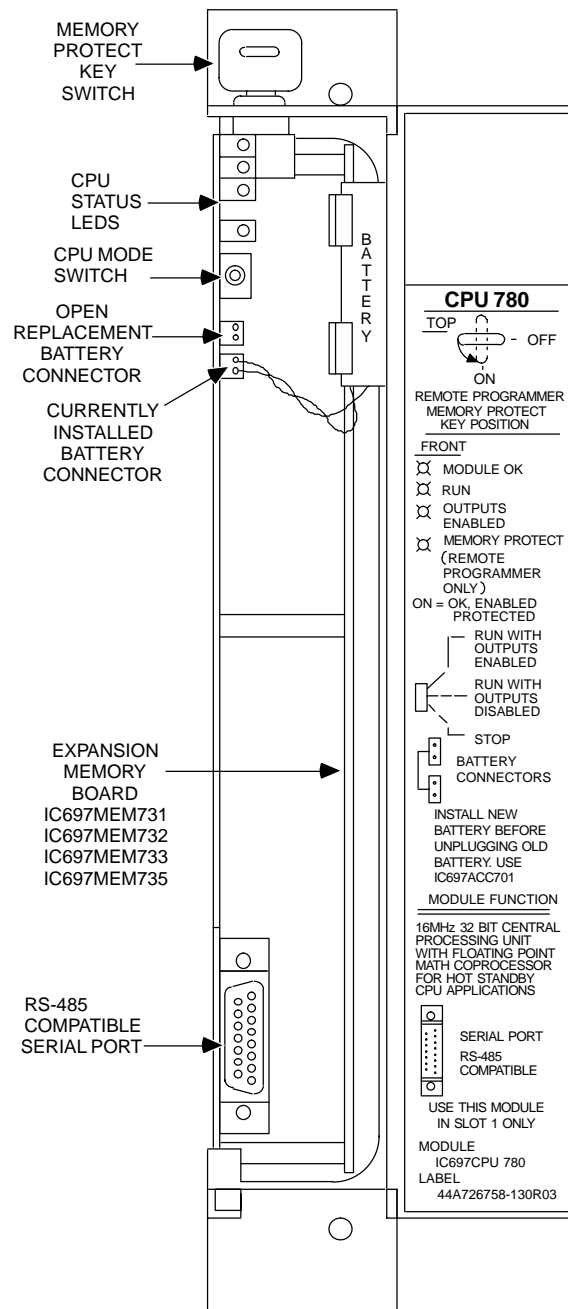


Figure 2. CPU 780 - Location of Major Features

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Installation of a CMOS expansion memory board on the CPU will require initialization of the CPU with the programmer (See Reference 2).

### Programmer Connection, Parallel

The programmer connects to the top port on the Bus Transmitter Module (IC697BEM713) system interface module for a parallel interface (as shown in Figure 1). Consult Reference 2 for a description of programming functions.

### Serial Port

The 15-pin D-connector provides the connection to an

RS-485 compatible serial port on the CPU as shown in Figures 2 and 3. This port provides a serial connection to the programming computer.

The serial connection is made from the Standard Serial COM port on the CPU to the serial port on the programming computer, or other serial device, through the RS-422/RS-485 to RS-232 Converter (IC690ACC900) or RS-232 to RS-422 Miniconverter (IC690ACC901). This connection can be made with available cables or you may build cables to fit the needs of your particular application. For more information on serial communications, see Reference 3.

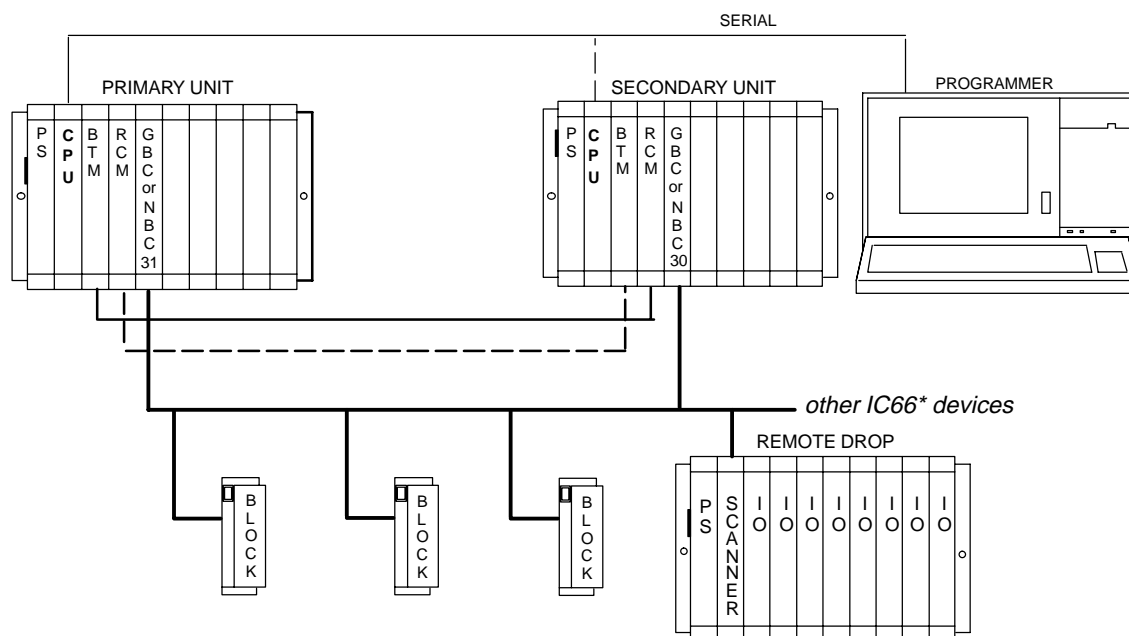


Figure 3. Hot Standby CPU Redundancy System Configuration with Serial Connection to Programmer

### Note

When configuring a Hot Standby CPU Redundancy system the programmer must be connected to the CPU in the Primary unit to configure the Primary PLC and then moved to the CPU in the Secondary PLC to configure the Secondary PLC.

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**Configuration**

The IC697 CPU and I/O system is configured with MS-DOS based programming software. There are no DIP switches or jumpers used to configure the system. The CPU verifies the actual module and rack configuration at power-up and periodically during operation. The actual configuration must be the same as the programmed configuration. Deviations are reported to the CPU alarm processor function for configured fault response. Consult Reference 1 for a description of configuration functions.

**Batteries**

A lithium battery (IC697ACC701) is installed as shown in Figure 2. This battery maintains program and data memory when power is removed and operates the calendar clock. Be sure to install the new battery before removing the old battery. If during power-up diagnostics a low battery is detected the Module OK LED (top) will not stay on. Specific indication of a low battery state is detailed in Reference 2.

**Removing a Module**

The following instructions should be followed when removing a CPU 780 module from its slot in a rack. If a fault in the CPU hardware is detected that is logged as FATAL, the CPU will go to STOP mode and control will be switched from the active unit (with the failed CPU) to the backup unit. Power can then be removed from the rack containing the failed CPU and the CPU replaced. If a failure is detected in the backup unit, you can simply remove power from the CPU rack and replace the module.

- Grasp the board firmly at the top and bottom of the board cover with your thumbs on the front of the cover and your fingers on the plastic clips on the back of the cover.
- Squeeze the rack clips on the back of the cover with your fingers to disengage the clip from the rack rail and pull the board firmly to remove it from the backplane connector.
- Slide the board along the card guide and remove it from the rack.

**Table 1. Specifications for IC697CPU780 †**

<b>Battery Shelf Life</b>	10 years at 20° C (68° F)
<b>Memory Retention</b>	6 months nominal without applied power
<b>Current required from 5V Bus</b>	1.6 Amps (includes expansion memory)
<b>Time of Day Clock (internal timing) Accuracy</b>	±3.5 seconds per day
<b>Elapsed Time Clock</b>	±.01% maximum
<b>Serial Port</b>	RS422/485 compatible, Programmer Serial Attachment
<b>VME</b>	System designed to support the VME standard C.1

† Refer to GFK-0867B, or later for product standards and general specifications.

**Table 2. References**

<b>Reference</b>	<b>Title</b>
1	Programming Software User's Manual
2	Programmable Controller Reference Manual
3	Programmable Controller Installation Manual
4	Hot Standby CPU Redundancy User's Guide

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## 16 MHz, 32-Bit Floating Point Expandable Central Processing Unit for Hot Standby CPU Applications

Table 3. Ordering Information

Description	Catalog Number
CPU 780, 32-Bit, 16 MHz, Expandable, Floating Point for Hot Standby CPU Redundancy applications	IC697CPU780
Redundancy Communications Module	IC697RCM711
Bus Transmitter Module	IC697BEM713
128 Kbyte, 32-Bit CMOS Expansion Memory	IC697MEM731
256 Kbyte, with 256 KBytes non-volatile flash memory, 32-Bit CMOS Expansion Memory	IC697MEM732
256 Kbyte, 32-Bit CMOS Expansion Memory	IC697MEM733
512 Kbyte, 32-Bit CMOS Expansion Memory	IC697MEM735
Lithium Battery	IC697ACC701

Note: For Conformal Coat option, or Low Temperature Testing option please consult the factory for price and availability.