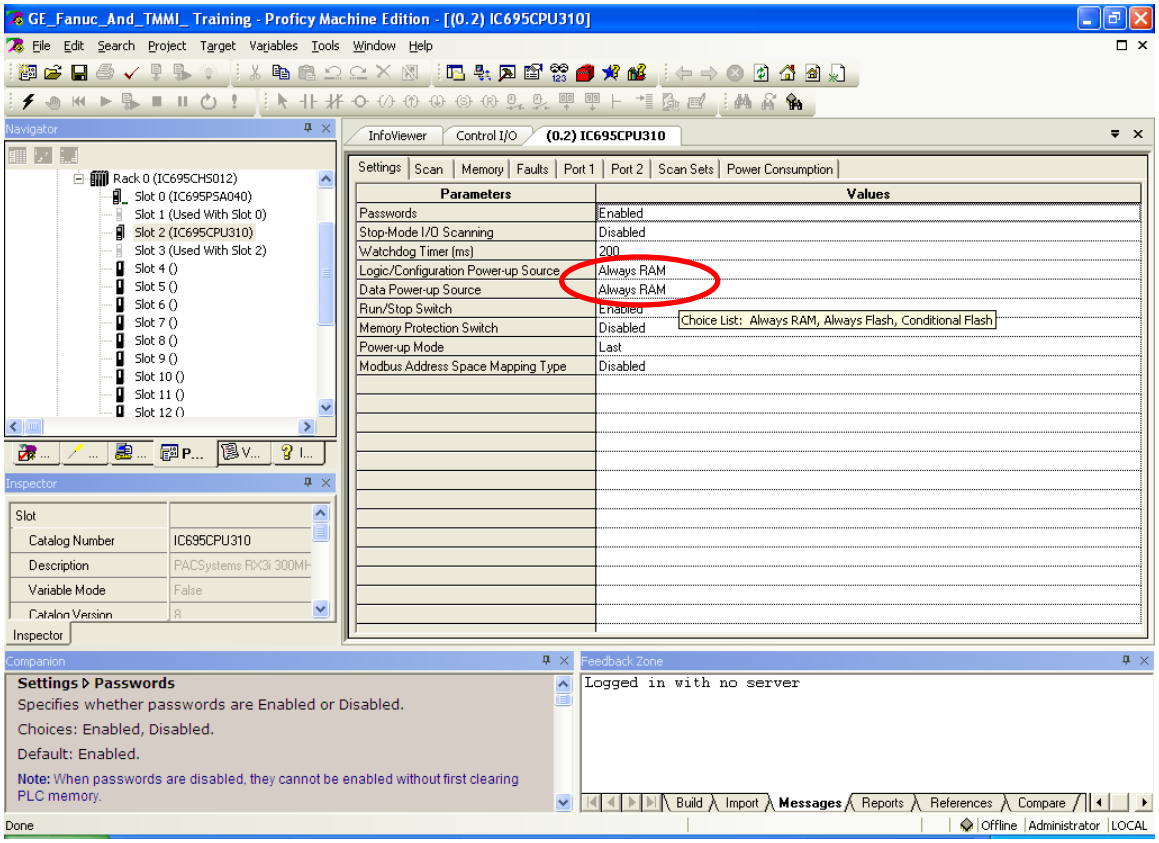
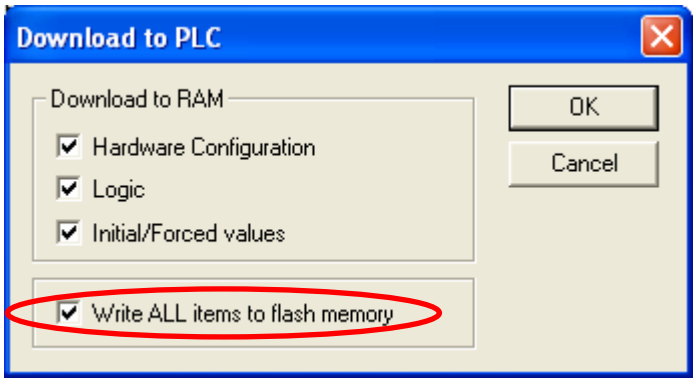
Saving to Flash Memory

If you decide to operate without battery backed memory please follow these two steps to ensure that the program is loaded from Flash Memory.

1. Select 'Always from Flash' or 'Flash' (VersaMax Micro and Nano PLC's) for the 'Logic/Configuration Power-up Source' and 'Data Power-up Source'. The default setting is 'Always RAM' or 'RAM' (VersaMax Micro and Nano PLC's).



2. Select 'Write ALL items to flash memory' when downloading to the PLC.



Battery Replacement/Memory Protection Factors

Since there are differences in each PLC application, each user will have to determine on an individual basis what strategy to use. There are several factors to consider when planning a battery replacement/memory protection strategy:

- How critical is the application? Will considerable loss be sustained if the PLC goes down? If so, frequent replacement of the battery would be a wise choice. For critical applications, the cost of a battery would be quite low in comparison to the cost of a PLC shut-down.
- How readily can a backup program be loaded? Are there technicians on-site who know how to load a backup program? Is the backup program accessible at all times to those responsible for maintaining the equipment? Is a personal computer or equivalent equipped with GE Fanuc programming software available at all times for use in loading the backup program?
- Do you have a preventive maintenance program? A formal program would help ensure that the battery is replaced on time. Some users replace the backup battery each year during their annual shut-down period.
- How accessible is the PLC? In some applications, the PLC may be mounted in a remote location that is not easily accessed.
- Safety codes. Some users may have safety rules that would not allow replacing the battery with power applied.
- How is the PLC used? Is power left on all the time, or is it shut down every day? See the heading "Factors Affecting Battery Life."
- Some users run without a backup battery by using one of the PROM options. See the section below called "Operating Without a Memory Backup Battery" to determine if this strategy is suitable for your application.

GE Fanuc Battery Listing

GE Fanuc CPU	GE Fanuc Battery Part Number
VersaMax Micro PLC's	IC200ACC403
VersaMax CPU module	IC200ACC001
Series 90-30	IC693ACC301 or IC693ACC302
Series 90-70	IC693ACC701 or IC693ACC302
PACSystem Rx3i	IC693ACC302
PACSystem Rx7i	IC698ACC701 or IC693ACC302

** Note: IC693ACC302 is an external battery module

** On the 14-point Micro, the SuperCap is assumed to have maintained the RAM. The SuperCap should maintain the RAM for at least 3 days on this unit. If the SuperCap hold-time is exceeded, all data will be lost from RAM and the unit will power up in the stop mode.

*** The Nano PLC can only operate from Flash memory as it does not have a battery or supercap. The user must perform a write to flash for proper operation. Failure to write the application into flash will result in all data being lost and the PLC will power up in the stop mode

The Importance of Backing up Your Program

Regardless of what strategy you use to maintain PLC memory, you should always keep an up-to-date backup copy of your application program. Other suggestions to help minimize down time:

- Make sure the backup copy is readily accessible to those who may need to use it.
- Train more than one person to load the backup program in case that one person is not available when needed. Information on creating a backup can be found in GE Fanuc 's software user's manuals. This procedure is also covered in applicable GE Fanuc programming software training courses.
- Ensure that a suitable computer is equipped with GE Fanuc PLC programming software and will be readily available to load the backup program to the PLC.
- Create a written backup procedure. Fortunately, restoring your program from the backup copy is probably not something you will do very often. As a result, however, some of the steps could easily be forgotten.

Factors Affecting Battery Life

Replacing your battery once per year is a good rule of thumb. However, no one can predict precisely how long a backup battery will last because this depends upon what CPU is used, what temperature it is subjected to, and how it used. Considering the following list of factors that affect battery life will help you decide how frequently to replace the battery in your application:

- A battery that is not in use has an estimated life (called its "shelf life") of 5 years at "room temperature" (25 degrees C, or 77 degrees F).
- A battery that is used continuously (supplying current to memory circuits with PLC power off) if used at room temperature has an estimated average life as follows:

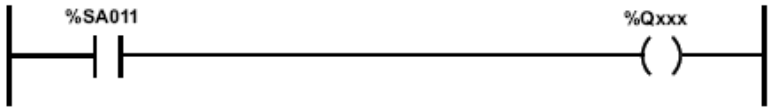
Model	Estimated Average Life at Room Temperature
CPU models 311, 313 and 323	2 years
CPU models 331—364	1 year
CPU374	1.2 months

- As long as a PLC is powered up, its battery is not being used; so how often you power down your PLC has a direct affect on battery life. Some users keep their PLC powered up all of the time while others turn theirs off every night.
- Temperature has a relatively large affect on battery life. Temperatures considerably above room temperature (25 degrees C, or 77 degrees F), or below freezing (0 degrees C, or 32 degrees F) will appreciably shorten battery life.
- The type of CPU has a small affect on battery life. Some CPUs have more memory than others. Some memory types require more power. Also, some CPUs have a clock and some do not. More memory requires more battery current to maintain its contents; and a clock requires battery current to maintain its operation.

Low Battery Warning Methods

There are three basic ways that the PLC warns of a low battery:

- The red "BATT" LED on the Power Supply module lights when the battery is low. The disadvantage of this method is that the PLC is often mounted in an enclosure, so this LED might not be easily seen.
- The PLC Fault Table is updated with a battery low message. Viewing the PLC Fault Table requires that a programmer be connected to the PLC.
- Certain System Reference bits are set to logic 1 when the battery is low. These are %SA011 (LOW_BAT), %SC009 (ANY_FLT), %S010 (SY_FLT), and %SC012 (SY_PRES). The most specific is %SA011 (LOW_BAT). This bit could be used as a contact in your ladder logic program to turn on an output that controls a warning light on an operator panel (as in the example rung below), or to send a warning to an operator interface terminal.



Operating Without a Memory Backup Battery

Whether it would be to your advantage to use a battery-less scheme depends on your application. There are various advantages and disadvantages to consider in making your decision.

Possible Advantage

The obvious advantage of operating without a memory backup battery is that you are freed from the need to maintain the battery. To be able to run without a battery, you need to have a PROM device - either an EPROM, EEPROM, or Flash PROM - installed in your system. These devices can store program logic, configuration, and register values without the need for a backup battery, and you can configure your CPU to read the contents of PROM into RAM memory each time the PLC is powered up.

Possible Disadvantages

Information is not stored to your PROM device automatically. To store information, you must stop the PLC, then use a programming device to tell the CPU to write the current PLC (RAM) memory contents to the PROM device. This requirement may make battery-less operation undesirable for many users. For example, in many applications, important data is gathered and stored in RAM register memory, data such as the current level of material in a tank that is being filled, or a running count of parts produced, etc. This constantly changing data is ***not being copied*** automatically to the PROM device. It only exists in RAM memory. Therefore, if power is lost and there is no RAM memory backup battery, this data will be lost.

However, one way to preserve data in a battery-less system is to send it over a network to a computer that can store the data on its hard drive. Also, static data (data that doesn't change) contained in RAM memory, such as mathematical constants or look-up table type information, can be stored initially in PROM and automatically written back to RAM each time the PLC powers up.

Another consideration is that if you change your program (or configuration), someone will have to remember to write the changed information to the PROM device. If that step is forgotten, the change only exists in RAM memory, and in a battery-less system, it will be lost the next time power is removed from the PLC.