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GE Fanuc Automation

Programmable Control Products

***Series 90™-30 PLC
Installation and Hardware Manual***

Chapter 1

Overview of the Series 90-30 PLC

The Series 90™-30 Programmable Logic Controller (PLC) is a member of the GE Fanuc Series 90 PLC family.

The Basic Parts of a Series 90-30 PLC

The Series 90-30 PLC is very versatile because (1) it is programmable, and (2) it is assembled from a wide variety of modular, plug-together components. Therefore, by choosing the correct components and developing an appropriate program, the PLC can be used for an almost unlimited variety of applications. Although there are many choices of individual hardware components to use in a system, there are just a few basic categories. Each of these component categories is covered in detail in a separate chapter in this manual. They are introduced in this chapter so you can see how they fit together:

- Baseplates
- Power Supplies
- CPUs
- I/O Modules
- Option Modules
- Cables

Baseplates

The baseplates are the foundation of the PLC system because most other components mount on them. As a basic minimum, every system has at least one baseplate, which usually contains the CPU (in which case, it is referred to as “the CPU Baseplate”). Many systems require more modules than can be mounted on one baseplate, so there are also Expansion and Remote baseplates that connect together. The three categories of baseplates, CPU, Expansion, and Remote, are available in two sizes, 5-slot and 10-slot, named according to the number of modules they can hold.

Power Supply Modules

Every baseplate must have its own power supply. The power supply always mounts in a baseplate’s left-most slot. There are several power supply models available to meet a variety of requirements.

CPUs

The CPU is the manager of the PLC. Every PLC system must have one. A CPU uses the instructions in its firmware and application program to direct the PLC's operation and to monitor the system to make sure there are no basic faults. Some Series 90-30 CPUs are built into baseplates, but most are contained in plug-in modules. In some cases, the CPU resides in a Personal Computer using a Personal Computer Interface Card that interfaces to Series 90-30 Input, Output, and Option modules.

Input and Output (I/O) Modules

These modules enable the PLC to interface with input and output field devices such as switches, sensors, relays, and solenoids. They are available in both discrete and analog types.

Option Modules

These modules extend the capability of the PLC beyond the basic functions. These provide such things as communications and networking options, motion control, high speed counting, temperature control, interfacing to operator interface stations, etc.

Cables

These connect the PLC components together or to other systems. Many standard prefabricated cables are available from GE Fanuc. They are primarily used to:

- Interconnect baseplates
- Connect a programmer to the CPU or to an option module
- Connect option modules to field devices or other systems.

Assembling a Basic Series 90-30 PLC System

Let's assemble, on paper, a basic system using the following components:

- Baseplate
- Power Supply module
- CPU module
- Some I/O modules

We'll start with the **baseplate**. To keep it simple, we'll use a 5-slot size. Note that a 5-slot baseplate actually has six slots, but the power supply slot is not numbered. Note also, that this baseplate has a CPU slot, which is slot number 1, and it has an expansion connector on the right end, which is used for connecting to another baseplate if the system has more than one baseplate.

When assembled, the system will look like this:

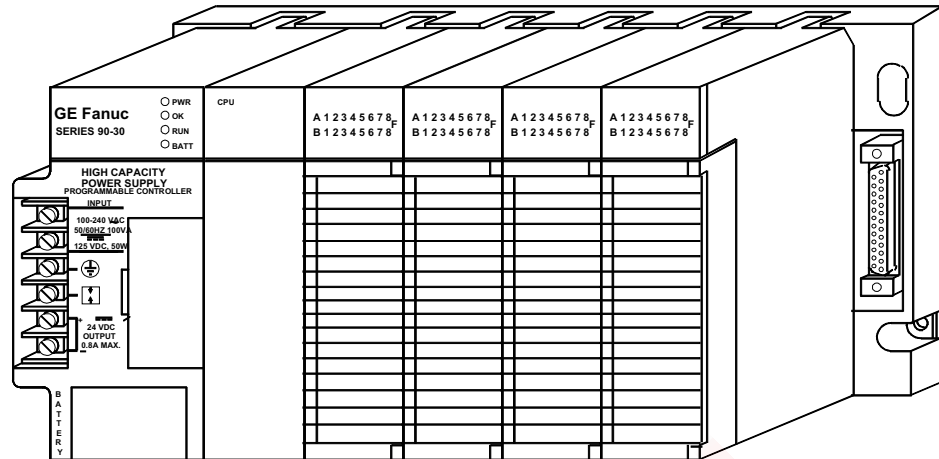


Figure 1-6. A Basic System

An assembly of baseplate and modules such as this one is called a “Rack.”

What else would be needed to make this basic system functional?

To make this basic system functional, you would need:

- **Mounting.** Safe, secure mounting for the PLC in a protective enclosure.
- **Wiring.** This includes properly installed incoming power to the power supply, as well as wiring from the I/O modules to field devices such as switches, sensors, solenoids, relays, etc.
- **Program.** An application program for the PLC to run. This is developed with GE Fanuc PLC programming software.

What if the application requires more than five modules?

You could use a 10-slot baseplate, shown in the next picture:

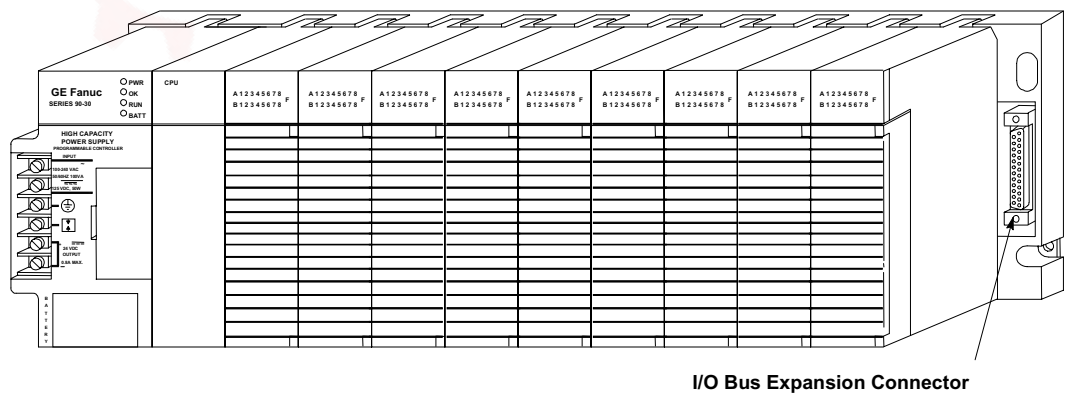


Figure 1-7. Ten-Slot Rack

Chapter 2

Installation

This chapter discusses installation details only. Other information about the products such as hardware descriptions and specifications, is covered in the applicable chapters.

Important Note

Series 90-30 PLCs must be mounted in a protective enclosure.

*The installation instructions described in this chapter apply to PLC installations that do not require special procedures for noisy or hazardous environments. For installations that must conform to more stringent requirements (such as CE Mark), see **GFK-1179, Installation Requirements for Conformance to Standards**. Also see **GFK-0867, GE Fanuc Product Agency Approvals, Standards, General Specifications**.*

Receiving your Products - Visual Inspection

When you receive your Series 90-30 PLC system, carefully inspect all shipping containers for damage that may have occurred during shipping. If any part of the system is damaged, notify the carrier immediately. The damaged shipping container should be saved as evidence for inspection by the carrier.

As the consignee, it is your responsibility to register a claim with the carrier for damage incurred during shipment. However, GE Fanuc will fully cooperate with you if such action is necessary.

Pre-installation Check

After unpacking Series 90-30 PLC racks, cables, modules, etc., **record all serial numbers**. Serial numbers are printed on the module packaging. Serial numbers are required to make a claim during the warranty period of the equipment. All software product registration cards should be completed and returned to GE Fanuc. See “Module Features” in this chapter for location of module serial numbers. See “Common Baseplate Features” in chapter 3 for location of baseplate serial numbers.

You should verify that all components of the system have been received and that they agree with your order. If the parts received do not agree with your order, call Programmable Control Customer Service at 1-800-432-7521. A Customer Service representative will provide further instructions.

If you require assistance with your installation, GE Fanuc’s Technical Support department offers expert help. Call the support number for your area from the list in Chapter 13, “Maintenance and Troubleshooting.” The GE Fanuc web site support address is www.gefanuc.com/support/plc.

Warranty Claims

Record the serial number of the defective item and contact your distributor for instructions.

Working with Series 90-30 Modules

Module Features

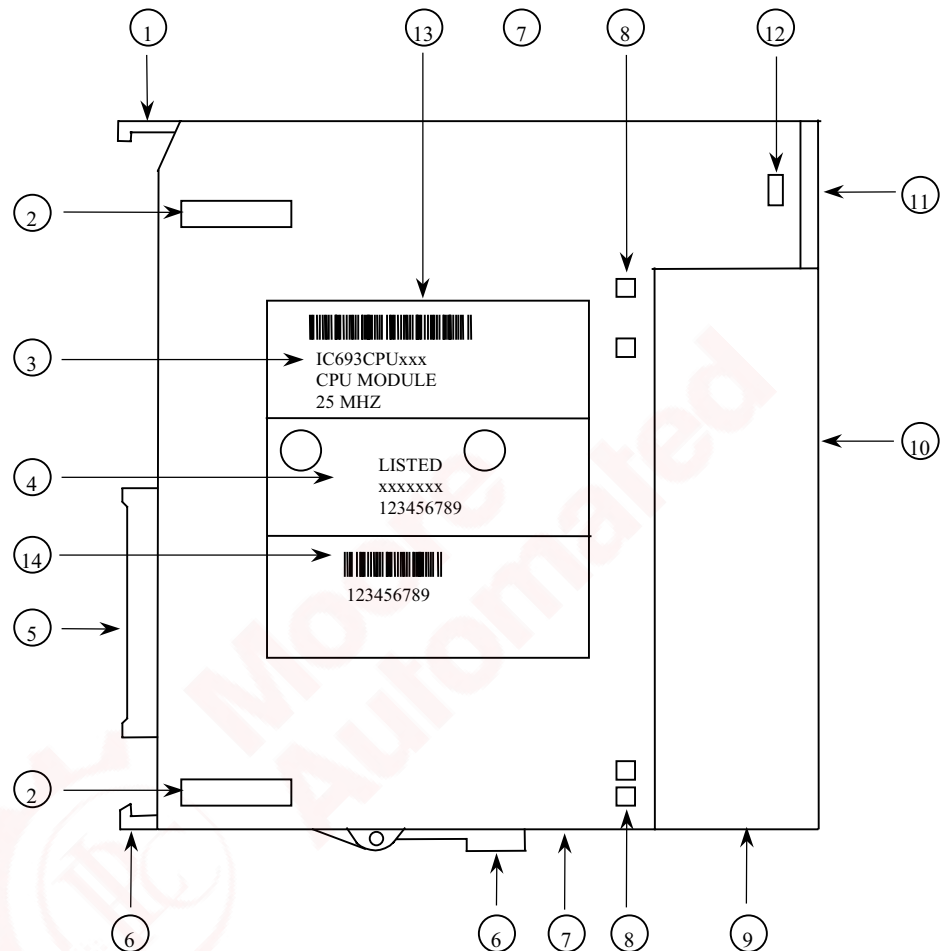


Figure 2-1. Features of Series 90-30 Module

1. Pivot hook
2. Circuit board holding tabs (two on each side of module)
3. Catalog number and description section of label (Includes MAC address for CPU374.)
4. Certification (UL, CE, etc.) section of label
5. Module connector - plugs into baseplate backplane connector
6. Release lever - spring loaded
7. Ventilation openings in module case (top and bottom)
8. Front cover holding tabs (two on each side of module)
9. Front cover (shown) or terminal board (for I/O modules).
10. Front cover faceplate or hinged cover for terminal board.
11. Lens cap (some modules do not have).
12. Lens cap holding tabs (one on each side of module)
13. Module label
14. Serial Number - used to determine module warranty status. (On some modules, the Serial Number may be on a small tag on the back of the module.)

Installing a Module

Warning

Do not insert or remove modules with power applied. This could cause the PLC to stop or malfunction. Injury to personnel and damage to the module or baseplate may result. Also, attempts to force a module into an improper slot type will result in damage to the module and/or the baseplate. Modules will mount in the correct slot type easily, with a minimum of force.

Use the following instructions as a guide when inserting a module into a baseplate slot.

- Check that module catalog number matches slot configuration. Each slot is, or will be, assigned a particular module type during configuration. A Power Supply module must be installed in the left end unnumbered slot only, and a CPU module and some special Option modules can only be installed in Slot 1 of a CPU baseplate. I/O Modules and most Option modules install in slots numbered 2 and higher.
- Grasp the module firmly with terminal board toward you and with rear pivot hook facing away from you.
- Align the module with the desired baseplate slot and connector. Tilt the module upwards so that top rear pivot hook of the module engages the baseplate's top module retainer.
- Swing the module downward until the module's connector engages the baseplate's backplane connector, and the release lever on the bottom of the module snaps into place in the baseplate's bottom module retainer.
- Visually inspect the module to be sure that it properly seated.

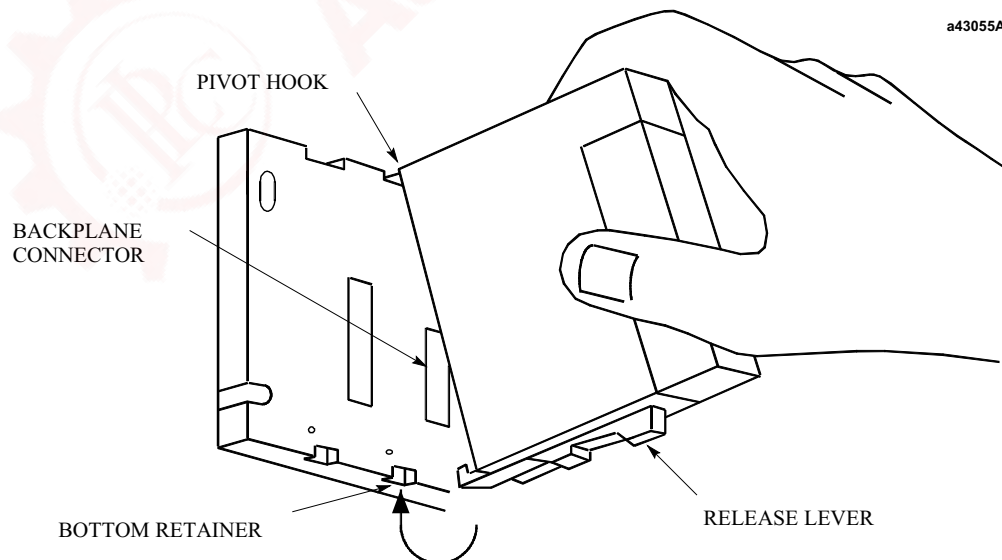


Figure 2-2. Installing a Module

Removing a Module

Warning

Do not insert or remove modules with power applied. This could cause the PLC to stop or malfunction. Injury to personnel and damage to the module or baseplate may result. Also potentially dangerous voltages from user devices may be present on a module's screw terminals even though power to the rack is turned off. Care must be taken any time that you are handling the module's removable terminal board or any wires connected to it.

- If the module has wiring, remove the module's terminal board (NOTE: You do not have to unwire the terminal board) or cables. The procedure for removing a terminal board is described later in this section.
- Locate the release lever at the bottom of the module and firmly press it up, towards the module.
- While holding the module firmly at its top and fully depressing release lever, swing (pivot) the module upward (release lever must be free of its retaining slot).
- Disengage pivot hook at the top rear of the module by moving the module up and away from the baseplate.

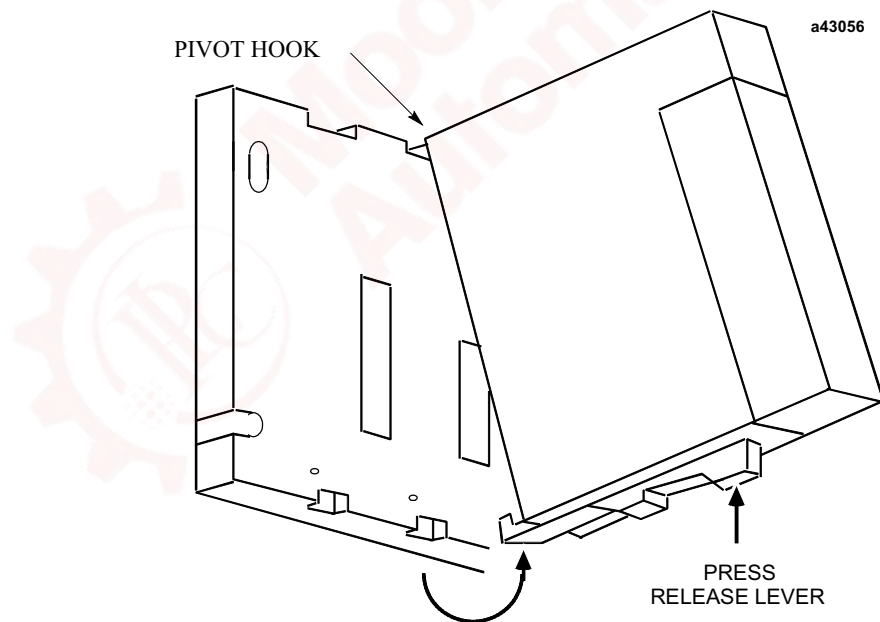


Figure 2-3. Removing a Module

Note

Modules in expansion or remote baseplates can be added, removed, or replaced while the PLC is in RUN mode if power is first removed from the expansion or remote baseplate. I/O data to/from this baseplate will not be updated while power is removed.

Installing a Module's Terminal Board

Note: Modules IC693MDL730F (and later) and IC693MDL731F (and later) have special terminal boards that are equipped with holding screws. For Installation and Removal instructions, please see the section “Installing and Removing Terminal Boards with Holding Screws” later in this chapter.

To install a terminal board (circled numbers refer to drawing below):

- Hook the pivot hook ①, located on the bottom of the terminal board, to the lower slot on the module.
- Push the terminal board toward the module ② until it snaps into place.
- Open the terminal board cover ③ and ensure that the latch on the module is securely holding the terminal board in place.

Caution

Compare the module catalog number on the label on the back of the hinged door (see Figure 2-6) and the label on the side of the module (see below) to ensure that they match. If a wired terminal board is installed on the wrong module type, damage to the module may occur when the system is powered up.

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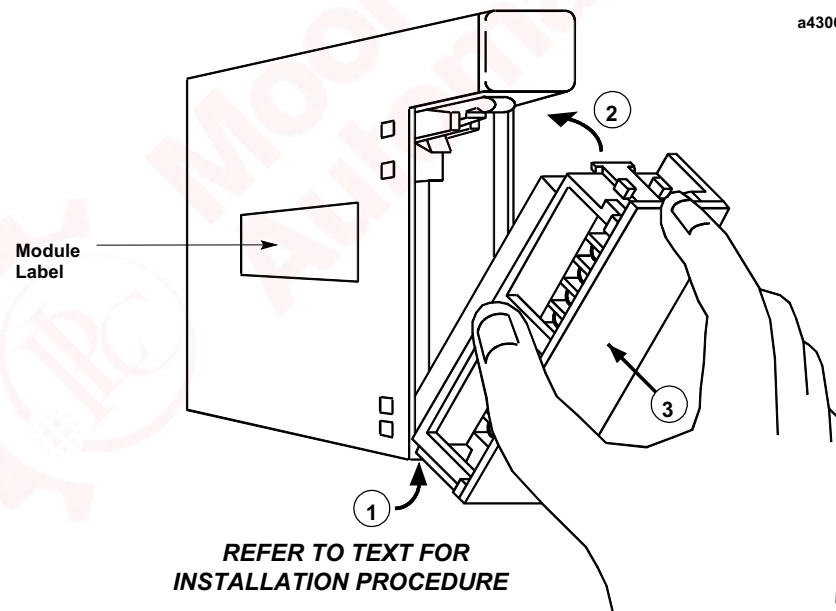
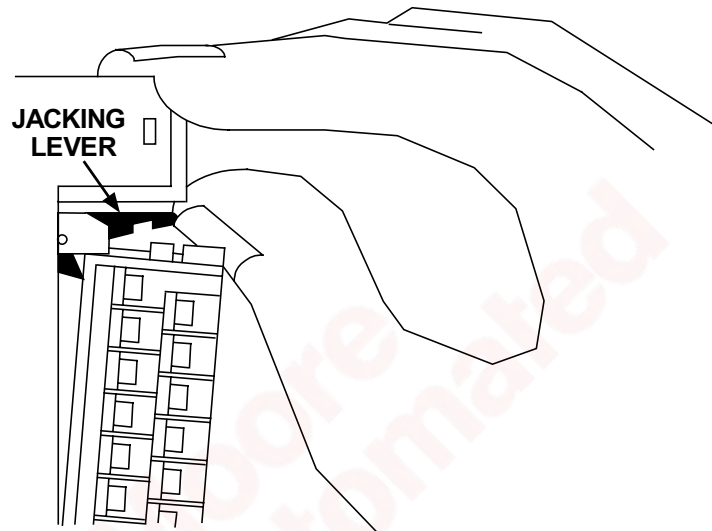


Figure 2-4. Installing an I/O Module's Terminal Board

Removing a Module's Terminal Board

To remove a terminal board:

- Open the plastic terminal board cover.
- Push up on the jacking lever to release the terminal block.



- Grasp pull-tab and pull it towards you until contacts have separated from module housing and bottom pivot hook has disengaged.

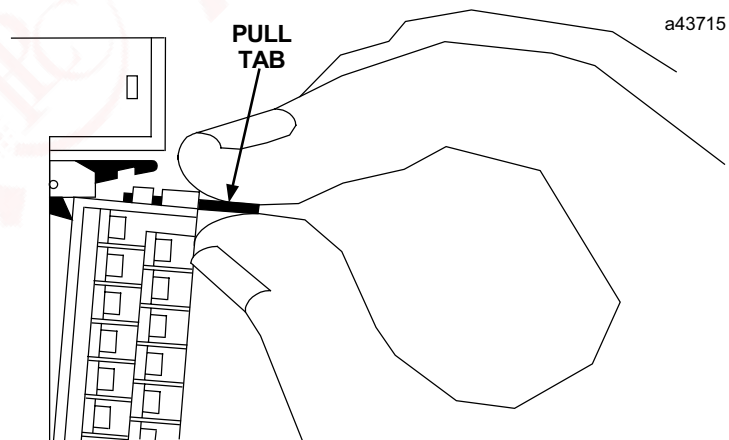


Figure 2-5. Removing a Module's Terminal Board

I/O Module Terminal Board Posts

The terminal board has three posts on the left side. The top and bottom posts hold the terminal board cover in place. The middle post keeps the terminal board wiring in place. If you do not require it to hold the wiring in place, the middle post can be easily snapped off. (Be careful that you do not inadvertently snap it off if you need it to keep your wiring in place.)

Installing and Removing Terminal Boards with Holding Screws

Discrete output modules IC693MDL730F (and later) and IC693MDL731F (and later) have a special terminal board that is equipped with holding screws, shown in the figure below. These screws prevent the terminal board-to-module connections from deteriorating in applications where the PLC is subjected to severe vibration.

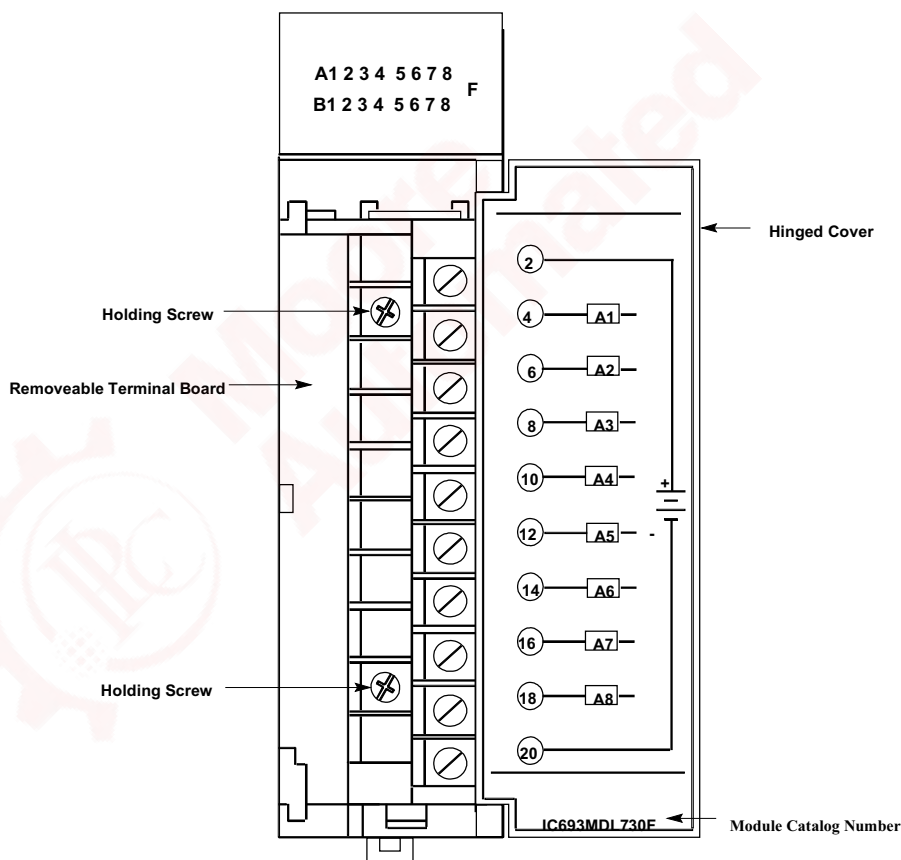


Figure 2-6. Terminal Board with Holding Screws

- **Removing:** To Remove these terminal boards, first loosen the two holding screws on the front of the terminal board, then follow the standard removal instructions in the section “Removing an I/O Module’s Terminal Board.” The holding screws are held captive in the terminal board and do not have to be completely removed.
- **Installing:** To install these terminal boards, follow the standard installation instructions in the section “Installing an I/O Module’s Terminal Board,” then tighten the two holding screws to 8 to 10 inch-pounds (1 Newton-meter) of torque.

Grounding Procedures

System Grounding Procedures

Warning

In addition to the following grounding information, we strongly urge that you follow all applicable codes that apply to your area. For example, in the United States, most areas have adopted the National Electrical Code standard and specify that all wiring conform to its requirements. In other countries, different codes will apply. For maximum safety to personnel and property you must follow these codes. Failure to do so can mean injury or death to personnel, damage to property, or both.

All components of a programmable logic control system and the devices it is controlling must be properly grounded. This is particularly important for the following reasons.

- A low resistance path from all parts of a system to earth minimizes exposure to shock in the event of short circuits or equipment malfunction.
- The Series 90-30 PLC system requires proper grounding for correct operation.

Ground Conductors

- Ground conductors should be connected in a tree fashion with branches routed to a central earth ground point, shown in the figure below. This ensures that no ground conductor carries current from any other branch. This method is shown in the following figure.
- Ground conductors should be as short and as large in size as possible. Braided straps or ground cables (typically green insulation with a yellow tracer - AWG #12 (3.3 mm²) or larger) can be used to minimize resistance. Conductors must always be large enough to carry the maximum short circuit current of the path being considered.

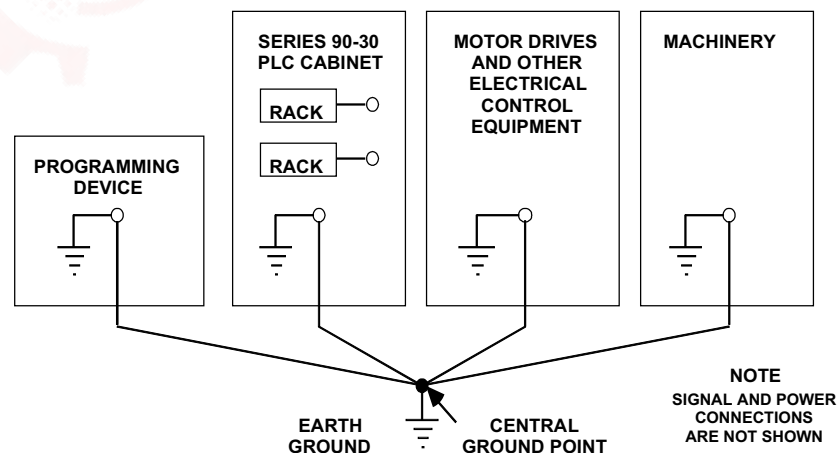


Figure 2-10. Recommended System Grounding

Series 90-30 PLC Equipment Grounding

Equipment grounding recommendations and procedures are listed below. These grounding procedures must be properly followed for safe, proper operation of your Series 90-30 PLC system.

Baseplate Safety Grounding

The following recommendations are offered, but applicable safety codes for your area or equipment type should also be consulted. The baseplate's metal back must be grounded using a separate conductor; the baseplate mounting screws are not considered to an acceptable ground connection by themselves. Use a minimum AWG #12 (3.3 mm²) wire with a ring terminal and star lock washer under the head of one of the baseplate's two lower mounting holes. These two holes have openings to the side to allow connecting a wire and ring terminal under the head of a mounting screw. Connect the other end of this ground wire to a tapped hole in the panel that the baseplate is mounted to, using a machine screw, star lock washer, and flat washer. Alternately, if your panel has a ground stud, it is recommended you use a nut and star lock washer for each wire on the ground stud to ensure adequate grounding. Where connections are made to a painted panel, the paint should be removed so clean, bare metal is exposed at the connection point. Terminals and hardware used should be rated to work with the aluminum baseplate material.

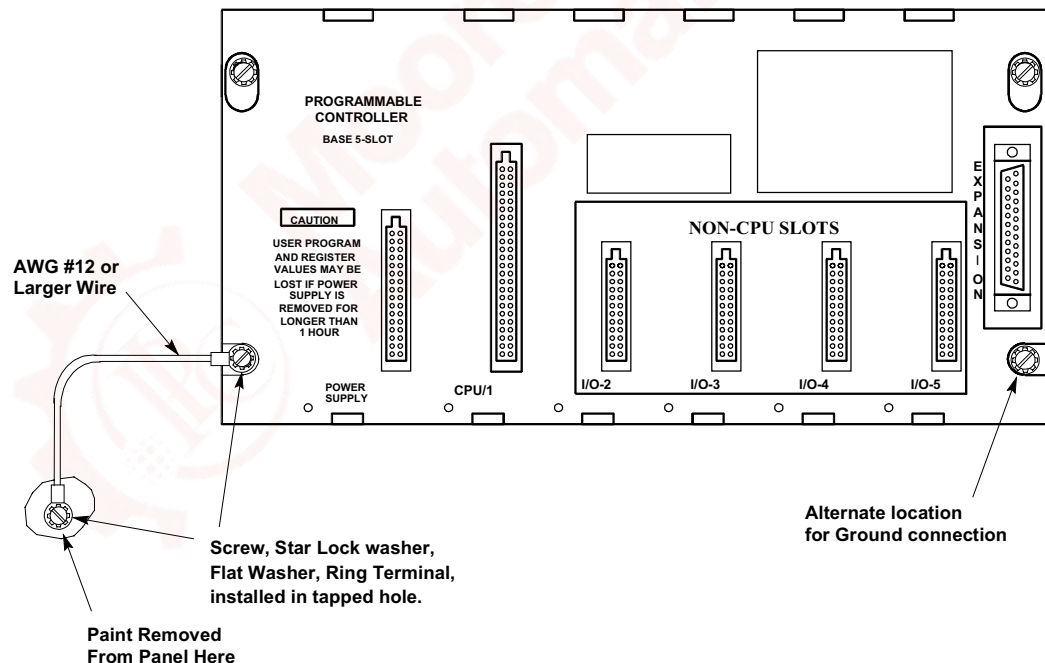


Figure 2-11. Baseplate Grounding

Warning

All baseplates must be grounded to minimize electrical shock hazard. Failure to do so can result in severe personal injury.

All baseplates grouped together in a Series 90-30 PLC system must have a common ground connection. This is especially important for baseplates that are not mounted in the same control cabinet.

Grounding 19" Rack-Mounted Baseplates

There are two Adapter Brackets used for mounting a 10-slot Series 90-30 baseplate to a 19" Rack. Regardless of which of the two Adapter Brackets is used, the 19" Rack should be grounded as per the instructions in "System Grounding Procedures," including Figure 2-10. (For details on the Adapter Brackets, see the "Mounting a Baseplate to a 19" Rack" section earlier in this chapter.)

Nineteen-Inch Rack-mounted PLC baseplates should be grounded according to the guidelines in the "Baseplate Safety Grounding" section, using a separate ground wire from the PLC baseplate as shown in the previous figure (Fig. 2-11).

- If using the **Recessed Mount Adapter Bracket (IC693ACC313)**, the ground wire can be installed as shown in Figure 2-11 with the ground attached to the Recessed Mount Adapter Bracket. An additional ground wire connecting the Adapter Bracket to a solid chassis ground on the 19" Rack should be installed. Use the same or equivalent hardware and paint removal scheme as shown in Figure 2-11.
- If using the **Surface Mount Adapter Bracket (IC693ACC308)**, the ground wire should be run from the baseplate as shown in Figure 2-11, to a solid chassis ground on the 19" Rack. Use the same or equivalent hardware and paint removal scheme as shown in Figure 2-11.

Programmer Grounding

For proper operation, the computer (programmer) running the PLC software must have a ground connection in common with the CPU baseplate. Normally, this common ground connection is provided by ensuring that the programmer's power cord is connected to the same power source (with the same ground reference point) as the baseplate. If it is not possible to ensure this common ground scheme, use a port isolator (IC690ACC903) between the programmer and PLC serial connection. If the programmer ground is at a different potential than the PLC ground, a shock hazard could exist. Also, damage to the ports or converter (if used) could occur when the programmer serial cable is connected between the two.

Warning

Failure to follow programmer grounding recommendations could result in personal injury, equipment damage, or both.

Module Shield Grounding

In general, the aluminum PLC baseplate is used for module shield grounding. On some Series 90-30 modules, shield connections to the user terminal connector on the module are routed to the baseplate through the module's backplane connector. Other modules, such as CPUs 351, 352, 363, 364, and 374 require a separate shield ground. These are discussed in the next several sections.

Shield Grounding Information for CPUs with External Port Connections

CPUs with external port connections, the 351, 352, 363, 364, and 374 must have a separate shield ground connection to provide shielding for these ports. Because the design of the ground connection for the CPU351 and 352 is different from that of the CPU363, 364, and 374, each grounding method is discussed in a separate section.

CPU351 and 352 Shield Grounding

The CPU 351 or 352 module must be connected to frame ground at the slot where it is installed. Two methods are provided for making this ground connection. Each CPU comes with an EMC Grounding Kit (44A737591-G01) that contains a ground wire, grounding bracket, and screws.

1. The connection from the CPU to frame ground can be made using the ground wire (part number 44A735970-001R01) that comes with the module in the EMC Grounding Kit. This wire has a stab-on connector on one end for connection to a mating terminal on the bottom of the CPU, and a ring terminal on the other end for connection to a grounded enclosure. Where the ring terminal contacts a painted enclosure panel, either a star lock washer can be installed between the terminal and the panel to cut through the paint, or the paint can be scraped away down to clean, bare metal to ensure a good contact. **Note: The star lock washer method is suitable for a shield ground, but not suitable for a safety ground.**

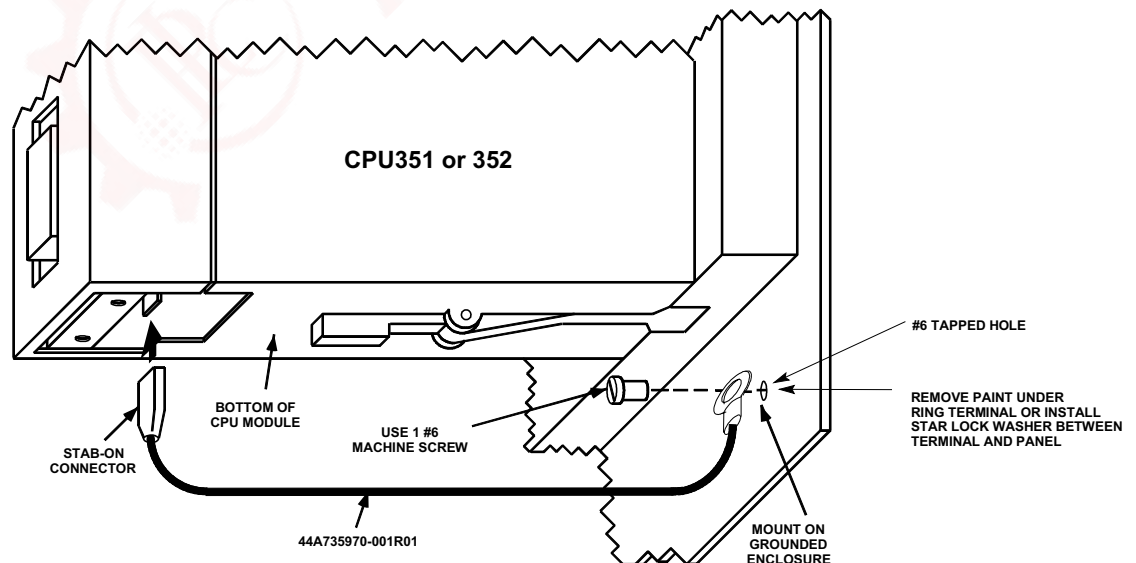


Figure 2-12. CPU 351 or 352 - Attaching Shield Ground Wire

2. The second method, which can be used for systems in noisy environments consists of installing the green ground wire **and** the optional grounding bracket (part number 44C715646-001R01). This bracket attaches to the CPU using two #4 thread-rolling screws (part number N666P9004B6) and to the grounded enclosure using two #6 thread-rolling screws (part number N666P13006B6). Two holes must be drilled in the enclosure for mounting this bracket. Also, if the bracket will be attached to a painted surface, the paint should be removed down to bare metal under the bracket to ensure good contact between the bracket and the surface. See the next figure.

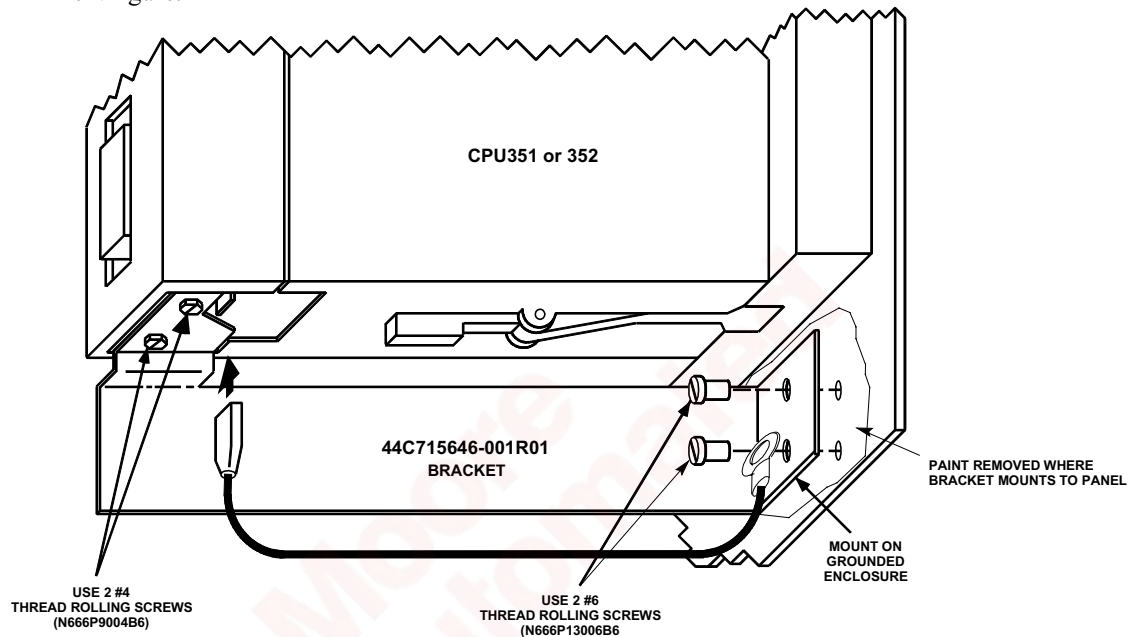


Figure 2-13. CPU 351 or 352 - Mounting the Shield Grounding Bracket and Wire

Note: When the grounding bracket is used, pin 1 of the cable connector that plugs into the Port 2 connector should not be connected. A metal connector shell must be used on the cable for this port, and the cable shield must be terminated at the metal shell instead of pin 1 of the connector.

CPU363, CPU364, and CPU374 Shield Grounding

The CPU363, CPU364, and CPU374 modules must be connected to frame ground at the slot where they are installed. Each module comes with a grounding wire for this purpose. These modules do not support or require the use of a grounding bracket. If the ring terminal on the grounding wire is to be mounted to a painted surface, remove the paint under the ring terminal to ensure good contact, or place a star lock washer between the ring terminal and the painted surface. See the next figure.

Note: The star lock washer method is suitable for a shield ground, but not suitable for a safety ground.

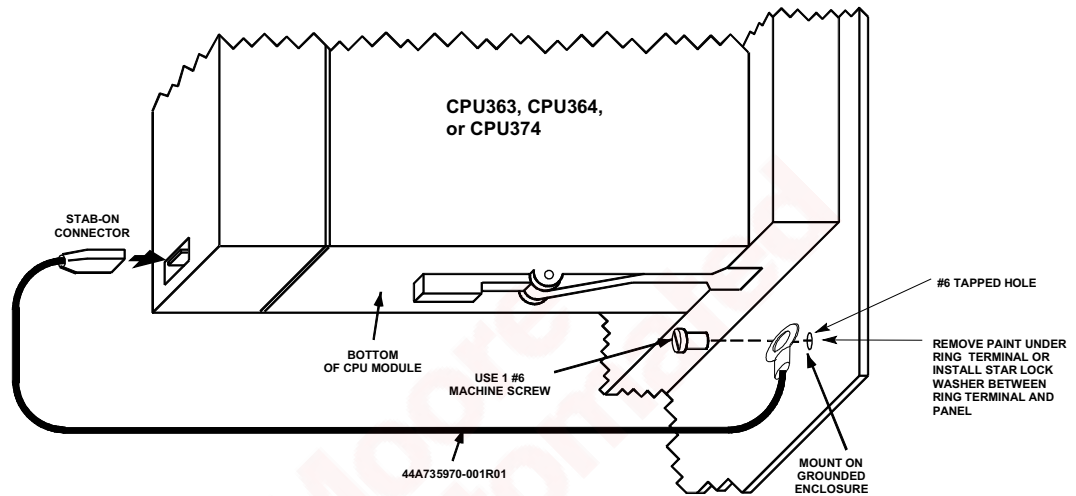


Figure 2-14. CPU 363, CPU364, or CPU374 - Attaching Ground Wire

Additional Modules with Shield Grounding Requirements

Some of the Series 90-30 Option modules, such as the FIP Remote I/O Scanner (IC693BEM330), and DSM modules (IC693DSM302 and IC693DSM314) also have shield grounding requirements. These modules come equipped with suitable grounding hardware. Please refer to each module's user's manual for grounding instructions. Appendix G contains a product to publication cross-reference to help you identify the correct manual.

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