

Installation

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Safety Guidelines

WARNING: Providing a safe operating environment for personnel and equipment is your responsibility and should be a primary goal during system planning and installation. Automation systems can fail and may result in situations that can cause serious injury to personnel or damage to equipment. Do not rely on the automation system alone to provide a safe operating environment. Use external electromechanical devices, such as relays or limit switches, that are independent of the DL405 system to provide protection for any part of the system that may cause personal injury or damage.

Every automation application is different, therefore, there may be special requirements for your particular application. Be sure to follow all National, State, and local government requirements for the proper installation and use of your equipment.

Plan for Safety

The best way to provide a safe operating environment is to make personnel and equipment safety part of the planning process. Examine every aspect of the system to determine which areas are critical to operator or machine safety.

If you are not familiar with system installation practices, or your company does not have established installation guidelines, you should obtain additional information from the following sources.

- NEMA — The National Electrical Manufacturers Association, located in Washington, D.C., publishes many different documents that discuss standards for industrial control systems. You can order these publications directly from NEMA. Some of these include:
ICS 1, General Standards for Industrial Control and Systems
ICS 3, Industrial Systems
ICS 6, Enclosures for Industrial Control Systems
- NEC — The National Electrical Code provides regulations concerning the installation and use of various types of electrical equipment. Copies of the NEC Handbook can often be obtained from your local electrical equipment distributor or your local library.
- Local and State Agencies — many local governments and state governments have additional requirements above and beyond those described in the NEC Handbook. Check with your local Electrical Inspector or Fire Marshall office for information.

Safety Techniques

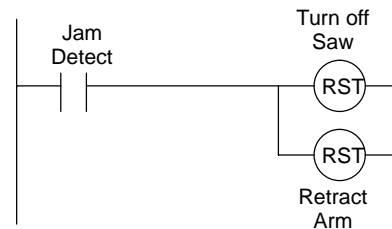
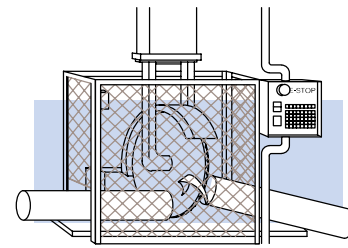
The publications mentioned provide many ideas and requirements for system safety. It is recommended to follow these regulations as a minimum. Using the techniques listed below will further help reduce the risk of safety problems.

- Orderly system shutdown sequence in the control program.
 - System power disconnects (guard limits, emergency stop switches, etc.)
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Orderly System Shutdown

The control program can provide the first level of protection when used to identify machine problems. After analyzing your application, identify any shutdown sequences that must be performed. Typical problems include part jams, empty bins, etc. that do not pose a risk of personal injury or equipment damage.

WARNING: The control program *must not* be the only form of protection for any problems that may result in a risk of personal injury or equipment damage.

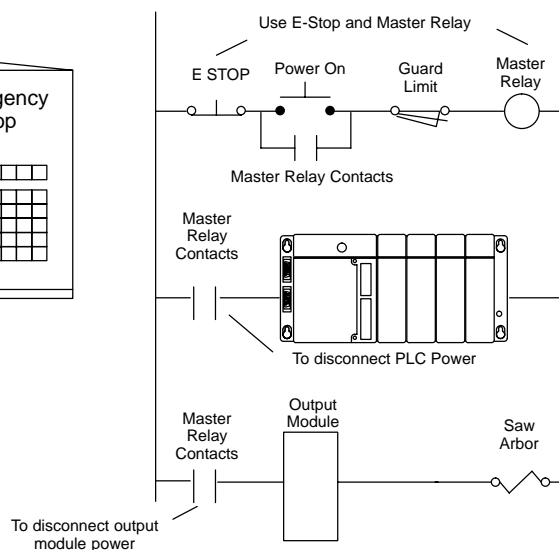
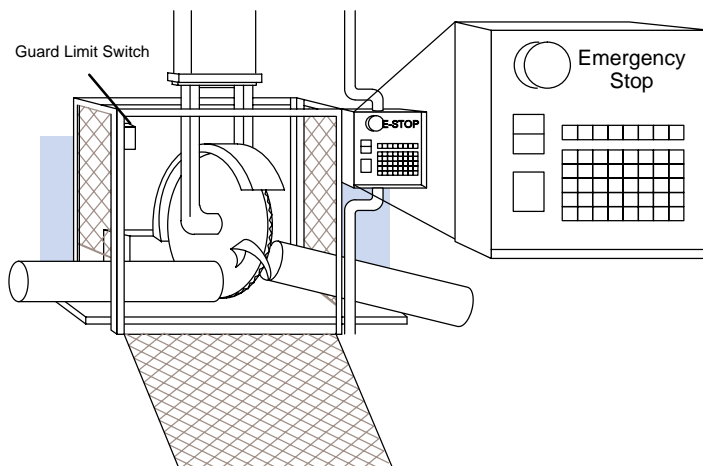


System Power Disconnect

By using electro-mechanical devices such as master control relays and/or limit switches, you can prevent accidental equipment startup. When installed properly, these devices will prevent *any* machine operations from occurring.

For example, if the machine has a jammed part the control program can turn off the saw blade and retract the arbor. However, since the operator must open the guard to remove the part, you must include a disconnect switch that removes *all* system power any time the guard is opened.

The machine operator must also have a quick and easy method of manually disconnecting *all* system power. This is accomplished with a mechanical device that is clearly labeled as an **Emergency Stop** switch.



After an Emergency shutdown or any other type of power interruption, there may be requirements that must be met before the control program can be restarted. For example, there may be specific register values that must be established (or maintained from the state prior to the shutdown) before operations can resume. In this case, you may want to use retentive memory locations, or include constants in the control program to ensure a known starting point.

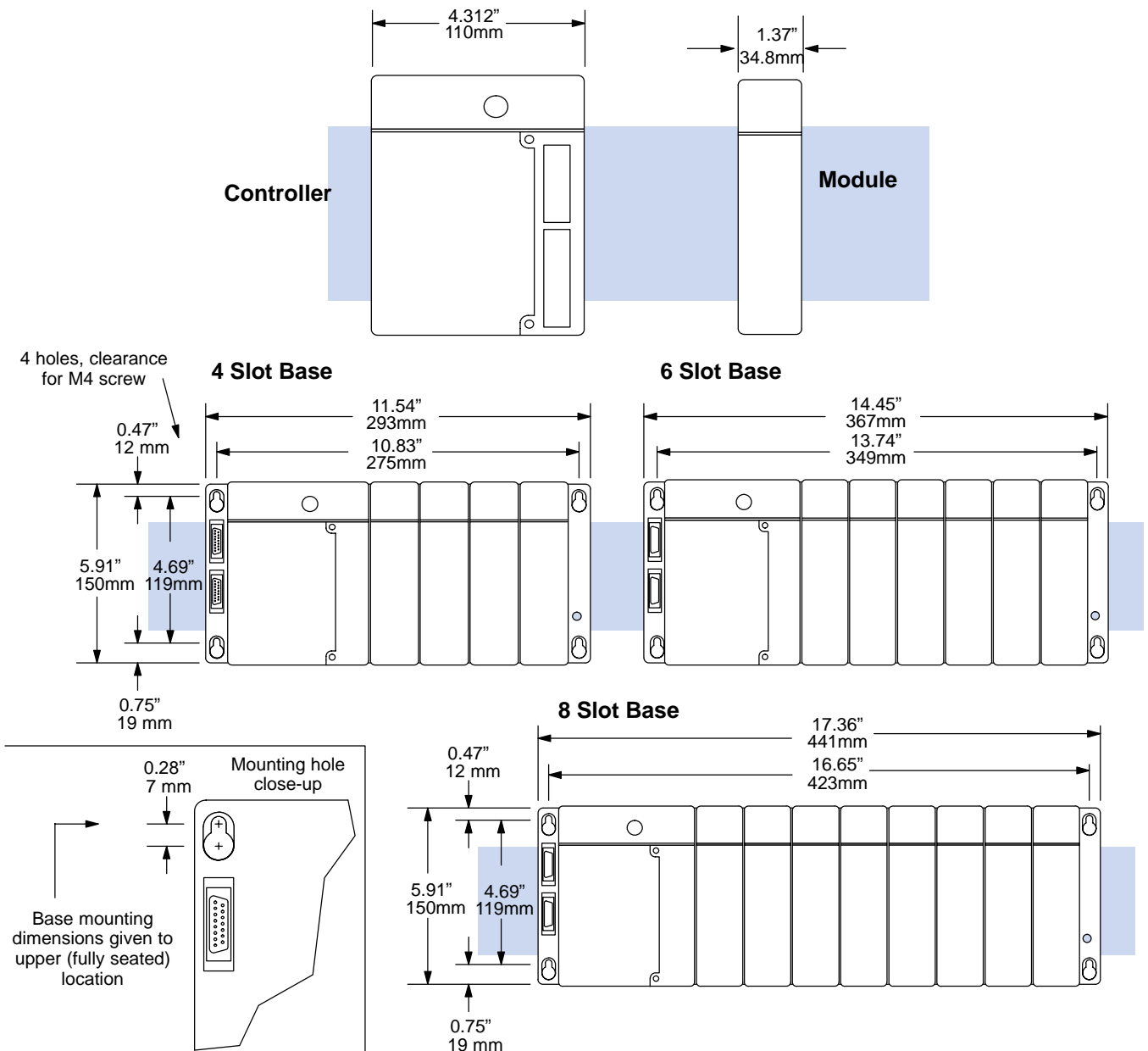
Mounting Guidelines

In addition to the panel layout guidelines, other specifications can affect the installation of a DL405 system. Always consider the following:

- Environmental specifications
- Power supply specifications
- Regulatory Agency Approvals
- Enclosure Selection and Component Dimensions

Base Dimensions

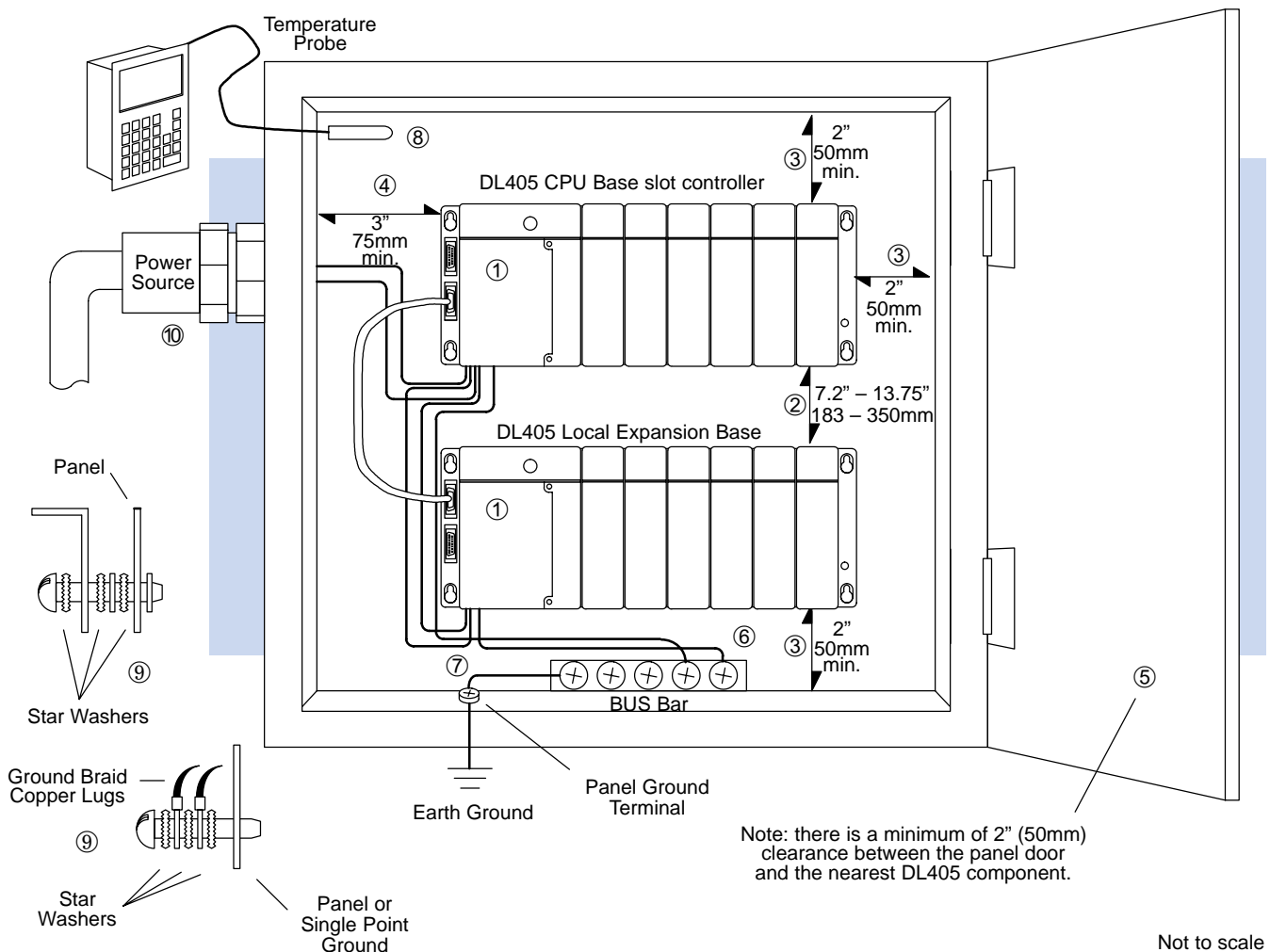
The following diagram shows the outside dimensions and mounting hole locations for the 4-slot, 6-slot, and 8-slot bases. Make sure you follow the installation guidelines to allow proper spacing from other components.



Panel Layout & Clearances

There are many things to consider when designing the panel layout. The following items correspond to the diagram shown. Note: there may be additional requirements, depending on your application and use of other components in the cabinet.

1. The bases must be mounted horizontally to provide proper ventilation.
2. There should be a minimum of 7.2" (183mm) and a maximum of 13.75" (350mm) between bases.
3. A minimum clearance of 2" (50mm) between the base and the top, bottom and right side of the cabinet should be provided.
4. A minimum clearance of 3" (75mm) between the base and the left side of the cabinet should be provided.
5. There must be a minimum of 2" clearance between the panel door and the nearest DL405 component.



6. Connect the ground terminal on the DL405 base to a single point ground. Use copper stranded wire to achieve a low impedance. Copper eye lugs should be crimped and soldered to the ends of the stranded wire to ensure good surface contact. Remove anodized finishes and use copper lugs and star washers at termination points. A rule of thumb is to achieve 0.1 ohm of DC resistance between the DL405 base and the single point ground.

7. There must be a single point ground (i.e. copper bus bar) for all devices in the panel requiring an earth ground return. The single point of ground must be connected to the panel ground termination.

The panel ground termination must be connected to earth ground. For this connection you should use #12 AWG stranded copper wire as a minimum. Minimum wire sizes, color coding, and general safety practices should comply with appropriate electrical codes and standards for your area.

A good common ground reference (Earth ground) is essential for proper operation of the DL405, which include:

- a) Installing a ground rod as close to the panel as possible.
 - b) Connection to incoming power system ground.
8. Installations where the ambient temperature may approach the lower or upper limits of the specifications should be evaluated properly. To do this place a temperature probe in the panel, close the door and operate the system until the ambient temperature has stabilized. If the ambient temperature is not within the operating specification for the DL405 system, measures such as installing a cooling/heating source must be taken to get the ambient temperature within the DL405 operating specifications.
 9. Device mounting bolts and ground braid termination bolts should be #10 copper bolts or equivalent. Tapped holes instead of nut-bolt arrangements should be used whenever possible. To assure good contact on termination areas impediments such as paint, coating or corrosion should be removed in the area of contact.
 10. The DL405 system is designed to be powered by 110/220 VAC normally available throughout an industrial environment. Isolation transformers and noise suppression devices are not normally necessary, but may be helpful in eliminating/reducing suspect power problems.

Enclosures

Your selection of a proper enclosure is important to ensure safe and proper operation of your DL405 system. Applications of DL405 systems vary and may require additional features. The minimum considerations for enclosures include:

- Conformance to electrical standards
- Protection from the elements in an industrial environment
- Common ground reference
- Maintenance of specified ambient temperature
- Access to equipment
- Security or restricted access
- Sufficient space for proper installation, cooling, and maintenance

Agency Approvals Some applications require agency approvals. The DL405 agency approvals for which DL405 products are submitted are;

- UL (Underwriters' Laboratories, Inc.)
- CE EMC (Electromagnetic Compatibility)
- CUL (Canadian Underwriters' Laboratories)

A complete listing of agency approvals for each product in the DL405 family is available in the sales catalog, or you may call 1-770-844-4200.

Environmental Specifications

The following table lists the environmental specifications that generally apply to the DL405 system (Slot Controller, Expansion Unit, Bases, I/O Modules). I/O module operation may fluctuate depending on the ambient temperature and your application. Please refer to the appropriate I/O module specifications for the temperature derating curves applying to specific modules.

Specification	Rating
Storage temperature	-4° F to 158° F (-20° C to 70° C)
Ambient operating temperature	32° F to 140° F (0° C to 60° C)
Ambient humidity	5% – 95% relative humidity (non-condensing)
Vibration resistance	MIL STD 810C, Method 514.2
Shock resistance	MIL STD 810C, Method 516.2
Noise immunity	NEMA (ICS3-304)
Atmosphere	No corrosive gases

Power

The external power source must be capable of supplying voltage and current complying with the power supply specifications.

Specifications	
Voltage withstand (dielectric strength)	1 min. @ 1500 VAC between primary, secondary, field ground and run relay
Insulation resistance	> 10M Ω at 500 VDC
Input voltage range H4-EBC (-F)/ D4-EX	85-132 VAC (110 range) / 170-264 VAC (220 range)
Input voltage range D4-EXDC	20-29 VDC (24VDC) less than 10% ripple
Input voltage range D4-EXDC-2	90-146 VDC (125 VDC) less than 10% ripple
Maximum inrush current H4-EBC (F) / D4-440 / D4-EX	20A
Maximum inrush current D4-EXDC	10A
Maximum inrush current D4-EXDC-2	20A
Maximum power H4-EBC (F)/D4-EX	50VA
Maximum power D4-EXDC	38W
Maximum power D4-EXDC-2	30W
24VDC Auxiliary Power Supply H4-EBC (F)/D4-EX	20-28 VDC @ 0.4A maximum, ripple > 1V p-p

Installing DL405 Bases

Three Sizes of Bases

All I/O configurations of the DL405 will use a selection of either 4, 6 or 8 slot base(s). Local and expansion bases can be 4, 6, or 8-slot in size. Local and expansion bases differ only in how they are wired in a system.

Local Base

Expansion cable input connection

Expansion cable output connection

Expansion cable

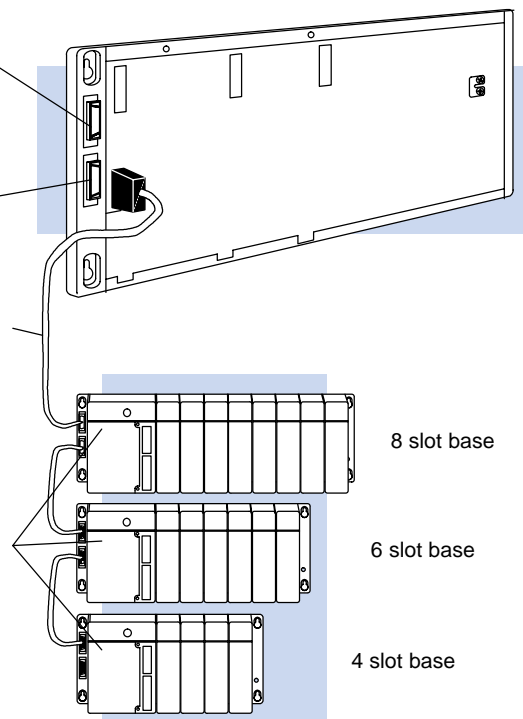
Expansion Bases

Expansion Power Supplies

8 slot base

6 slot base

4 slot base

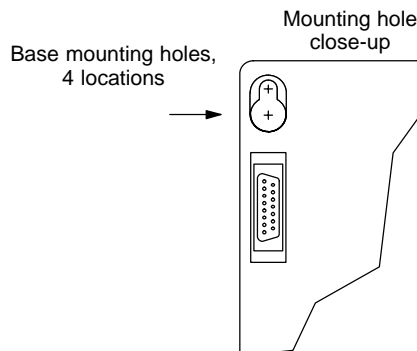


WARNING: To minimize the risk of electrical shock, personal injury, or equipment damage, always disconnect the system power before installing or removing any system component.

Mounting the Base

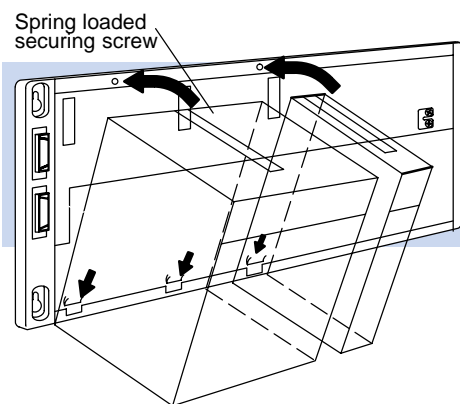
The CPU slot controller/Expansion Unit must always be installed in the left-most slot in a base. This slot is marked on the base as P/S, CPU. The I/O modules can be installed in any remaining slots. It is not necessary for all slots to be filled for your system to work correctly. You may use filler modules to fill the empty slots in the base.

The base is secured to the equipment panel or machine using four M4 screws in the corner locations shown to the right. The mounting cut-outs allow removal of the base after installation, without completely removing the mounting screws. Full mounting template dimensions are given in the previous section on Mounting Guidelines.



Installing Components in the Base

1. Note the components have plastic tabs at the bottom and a screw at the top.
2. With the device tilted slightly forward, hook the plastic tabs into the notch on the base.
3. Then gently push the top of the component back toward the base until it is firmly installed into the base.
4. Now tighten the screw at the top of the device to secure it to the base.



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Base Wiring

The main power terminal connections are under the front covers of the controllers. Please refer to the applicable User manual for the base wiring guidelines.