

Installation and Power Wiring

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Safety Guidelines



WARNING: Providing a safe operating environment for personnel and equipment is your responsibility and should be your 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. You should use external electromechanical devices, such as relays or limit switches, that are independent of the application to provide protection for any part of the system that may cause personal injury or damage.

Every automation application is different, so there may be special requirements for your particular application. Make sure you 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. You should examine *every* aspect of the system to determine which areas are critical to operator or machine safety.

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

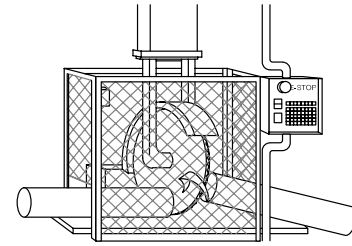
- NEMA — The National Electrical Manufacturers Association, located in Washington, D.C., publishes many different documents that discuss standards for industrial control systems. You can order these publications directly from NEMA. Some of these include:
ICS 1, General Standards for Industrial Control 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. At a minimum, you should follow these regulations. Using the techniques listed below will further help reduce the risk of safety problems.

- Orderly system shutdown sequence in the control program.
- Emergency stop switch for disconnecting system power.

Orderly System Shutdown

The first level of protection can be provided with the control program by identifying machine problems. Analyze your application and identify any shutdown sequences that must be performed. Typical problems are jammed or missing parts, empty bins, etc. that do not pose a risk of personal injury or equipment damage.



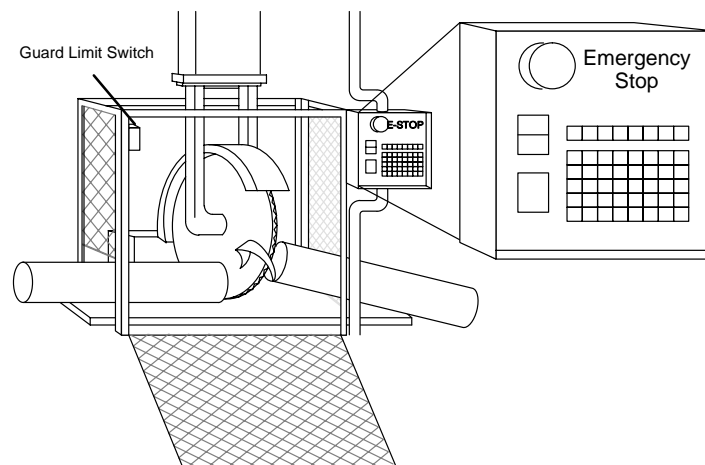
WARNING: The control program *must not* be the only form of protection for any problems that may result in a risk of personal injury or equipment damage.

System Power Disconnect

By using electromechanical 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 bypass switch to disconnect *all* system power any time the guard is opened.

The operator must also have a quick method of manually disconnecting *all* system power. This is accomplished with a mechanical device 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

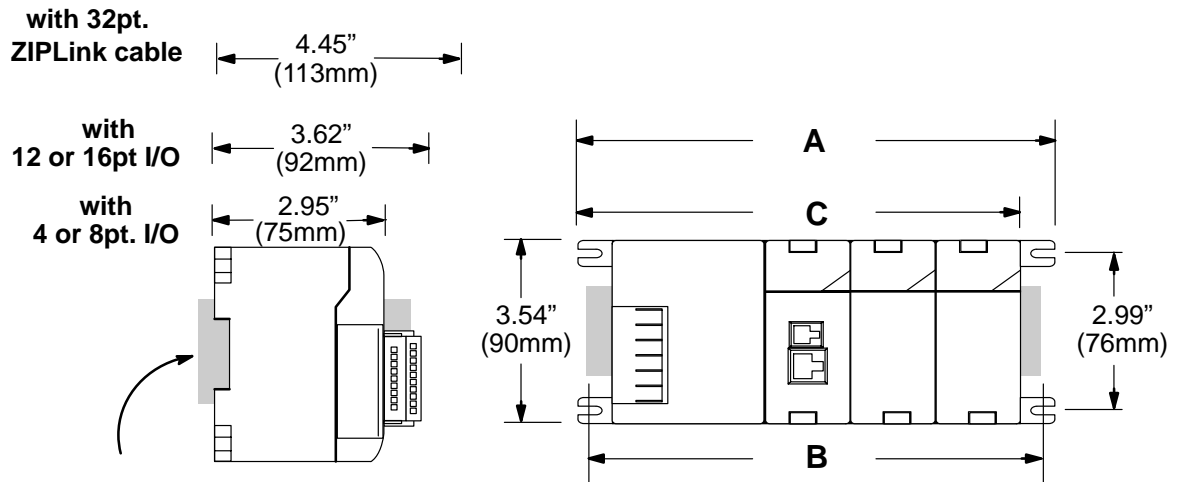
Before installing the DL205 system you will need to know the dimensions for the components. The diagrams on the following pages provide the component dimensions to use in defining your enclosure specifications. Remember to leave room for potential expansion.



NOTE: If you are using other components in your system, refer to the appropriate manual to determine how those units can affect mounting dimensions.

Base Dimensions

The following information shows the proper mounting dimensions. The height dimension is the same for all bases. The depth varies depending on your choice of I/O module. The length varies as the number of slots increase. Make sure you have followed the installation guidelines for proper spacing.

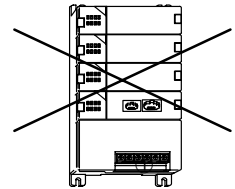
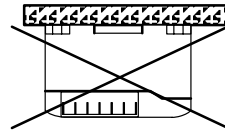
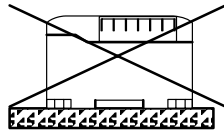
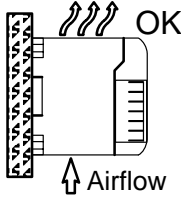


DIN Rail slot. Use rail conforming to DIN EN 50022.

Base	A (Total Width)		B (Mounting Hole)		C (Component Width)	
	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
3-slot	6.77"	172mm	6.41"	163mm	5.8"	148mm
4-slot	7.99"	203mm	7.63"	194mm	7.04"	179mm
6-slot	10.43"	265mm	10.07"	256mm	9.48"	241mm
9-slot	14.09"	358mm	13.74"	349mm	13.14"	334mm

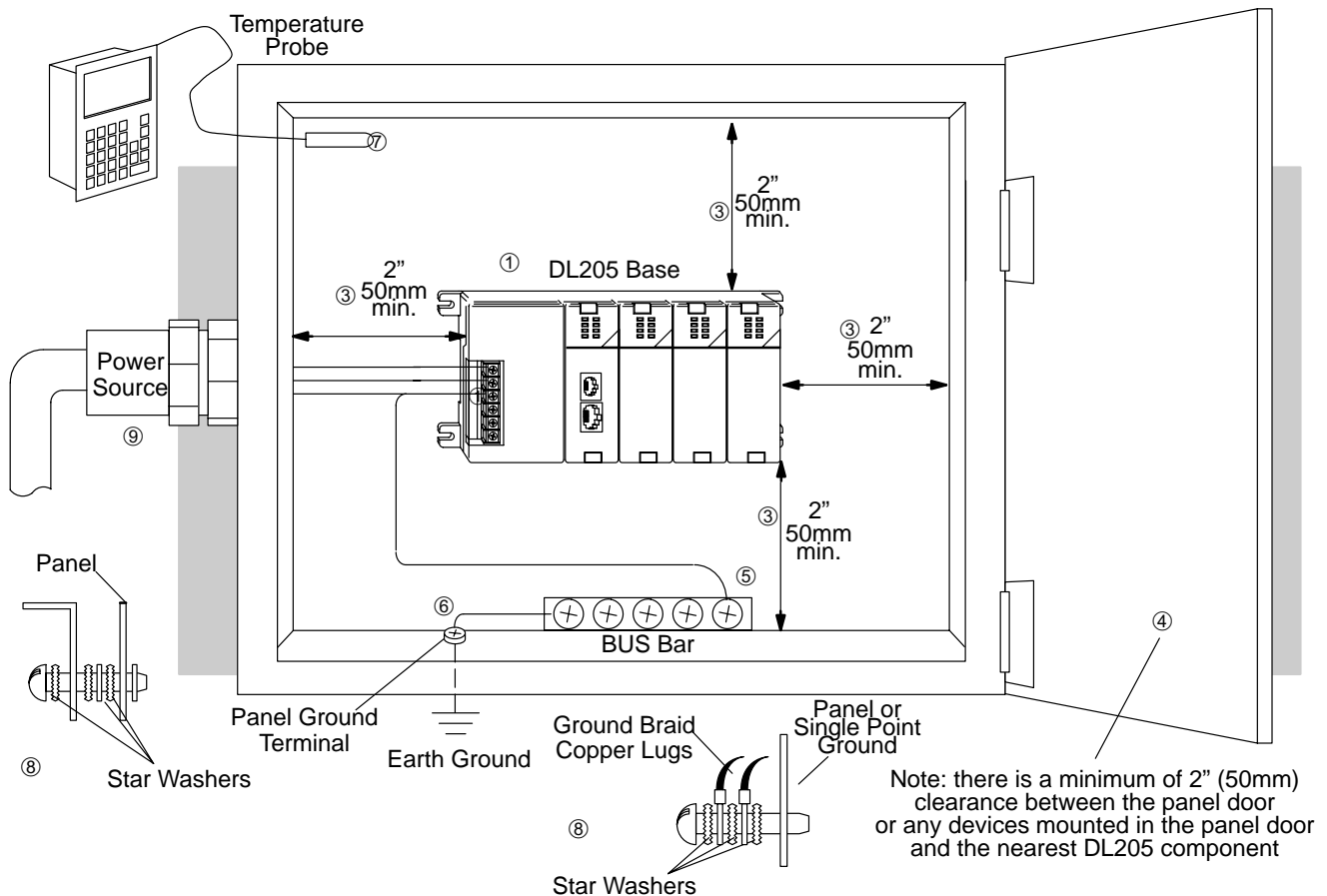
Panel Mounting and Layout

It is important to design your panel properly to help ensure the DL205 products operate within their environmental and electrical limits. The system installation should comply with all appropriate electrical codes and standards. It is important the system also conforms to the operating standards for the application to insure proper performance. The diagrams below reference the items in the following list.



1. Mount the bases horizontally to provide proper ventilation.
2. If you place more than one base in a cabinet, there should be a minimum of 7.2" (183mm) between bases.
3. Provide a minimum clearance of 2" (50mm) between the base and all sides of the cabinet. There should also be at least 1.2" (30mm) of clearance between the base and any wiring ducts.
4. There must be a minimum of 2" (50mm) clearance between the panel door and the nearest DL205 component.

Note: The cabinet configuration below is not suitable for EU installations. Refer to Appendix A European Union Directives.



Installation and Wiring

5. The ground terminal on the DL205 base must be connected 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 general rule is to achieve a 0.1 ohm of DC resistance between the DL205 base and the single point ground.
6. 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 region.

A good common ground reference (Earth ground) is essential for proper operation of the DL205. There are several methods of providing an adequate common ground reference, including:

- a) Installing a ground rod as close to the panel as possible.
- b) Connection to incoming power system ground.

7. Properly evaluate any installations where the ambient temperature may approach the lower or upper limits of the specifications. 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 DL205 system, measures such as installing a cooling/heating source must be taken to get the ambient temperature within the DL205 operating specifications.
8. 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.
9. The DL205 system is designed to be powered by 110/220 VAC, 24 VDC, or 125 VDC 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 DL205 system. Applications of DL205 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 and maintenance of equipment

Environmental Specifications

The following table lists the environmental specifications that generally apply to the DL205 bases and I/O modules (Be sure to check the specifications of the CPU-slot controller you are using). 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 131° F (0° C to 55° C)
Ambient humidity*	30% – 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

*Equipment will operate below 30% humidity. However, static electricity problems occur much more frequently at lower humidity levels. Make sure you take adequate precautions when you touch the equipment. Consider using ground straps, anti-static floor coverings, etc. if you use the equipment in low humidity environments.

Power

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

Specification	AC Powered Bases	24 VDC Powered Bases	125 VDC Powered Bases
Part Numbers	D2-03B-1, D2-04B-1, D2-06B-1, D2-09B-1	D2-03BDC1-1, D2-04BDC1-1, D2-06BDC1-1, D2-09BDC1-1	D2-06BDC2-1, D2-09BDC2-1
Input Voltage Range	100-240 VAC +10% -15%	10.2 – 28.8VDC (24VDC) with less than 10% ripple	104-240 VDC +10% -15%
Maximum Inrush Current	30 A	10A	20A
Maximum Power	80 VA	25W	30W
Voltage Withstand (dielectric)	1 minute @ 1500 VAC between primary, secondary, field ground, and run relay		
Insulation Resistance	> 10 M Ω at 500 VDC		
Auxiliary 24 VDC Output	20-28 VDC, less than 1V p-p 300 mA max.	None	20-28 VDC, less than 1V p-p 300 mA max.
Fusing (internal to base power supply)	non-replaceable 2A @ 250V slow blow fuse; external fus- ing recommended	non-replaceable 3.15A @ 250V slow blow fuse; exter- nal fusing recommended	non-replaceable 2A @ 250V slow blow fuse; external fus- ing recommended

Agency Approvals

Some applications require agency approvals. Typical agency approvals which your application may require are:

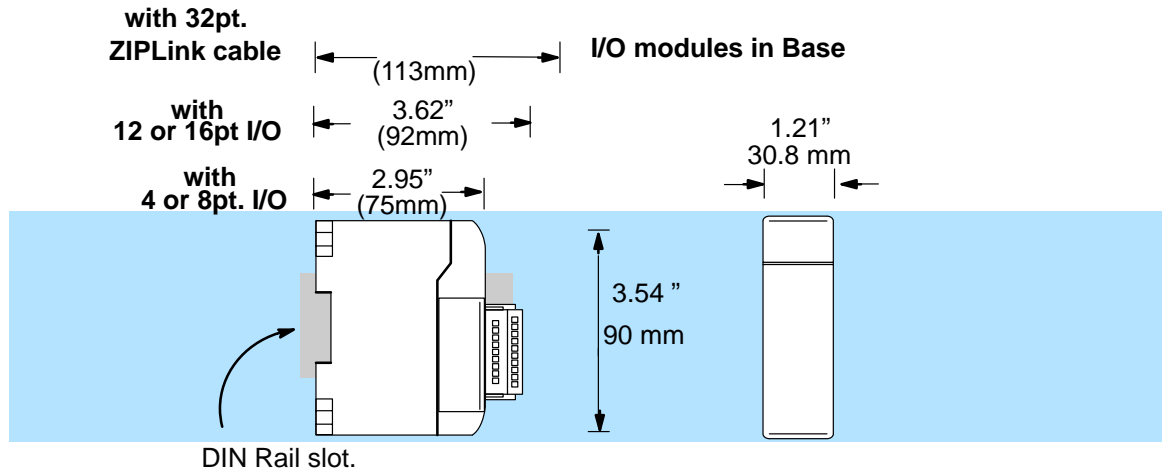
- UL (Underwriters' Laboratories, Inc.)
- CSA (Canadian Standards Association)
- FM (Factory Mutual Research Corporation)
- CUL (Canadian Underwriters' Laboratories, Inc.)

Component Dimensions



Before installing your DL205 system you will need to know the dimensions for the components in your system. The diagrams on the following pages provide the component dimensions and should be used to define your enclosure specifications. Remember to leave room for potential expansion.

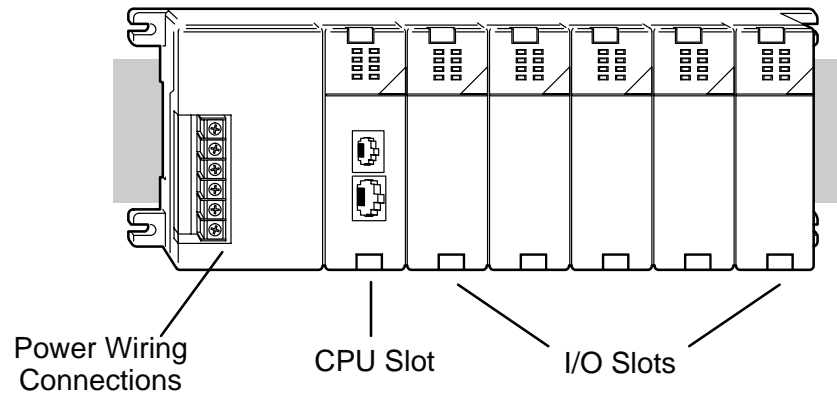
NOTE: If you are using other components in your system, make sure you refer to the appropriate manual to determine how those units can affect mounting dimensions.



Installing DL205 Bases

Choosing the Base Type The DL205 system offers four different sizes of bases and three different power supply options.

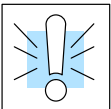
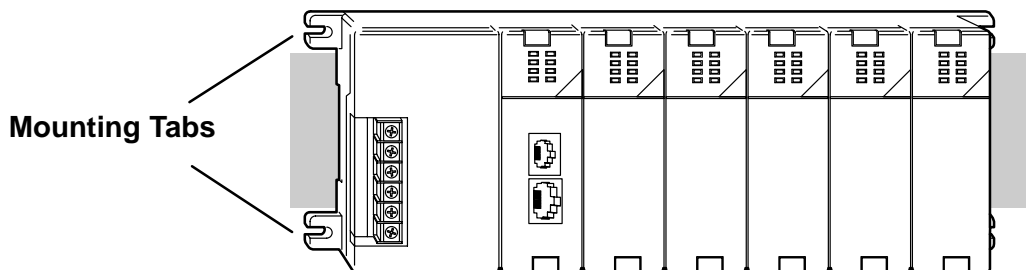
The following diagram shows an example of a 6-slot base.



Your choice of base depends on three things.

- Number of I/O modules required
- Input power requirement (AC or DC power)
- Available power budget

Mounting the Base All I/O configurations of the DL205 may use any of the base configurations. The bases are secured to the equipment panel or mounting location using four M4 screws in the corner tabs of the base. The full mounting dimensions are given in the previous section on Mounting Guidelines.



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.

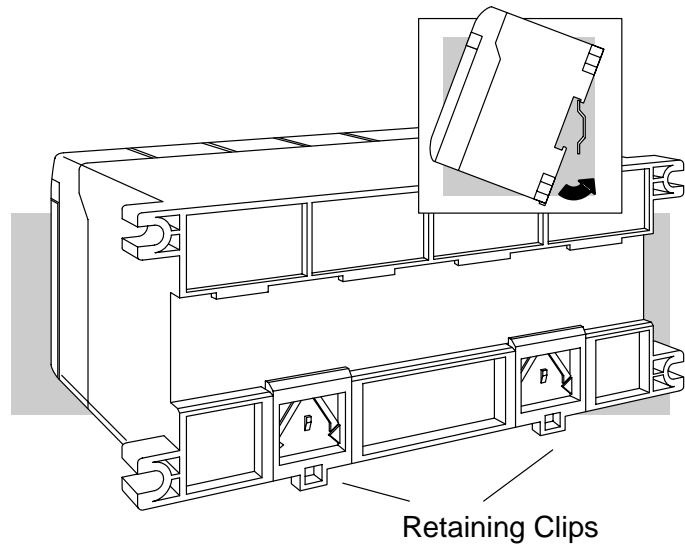
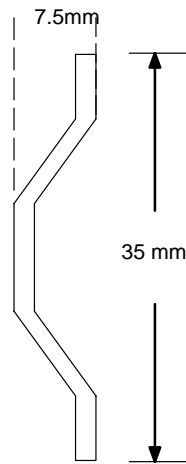
Using Mounting Rails

The DL205 bases can also be secured to the cabinet by using mounting rails. You should use rails that conform to DIN EN standard 50 022. Refer to our catalog for a complete line of DIN rail and DINnectors, DIN rail mounted apparatus. These rails are approximately 35mm high, with a depth of 7.5mm. If you mount the base on a rail, you should also consider using end brackets on each end of the rail. The end bracket helps keep the base from sliding horizontally along the rail. This helps minimize the possibility of accidentally pulling the wiring loose.

If you examine the bottom of the base, you'll notice two small retaining clips. To secure the base to a DIN rail, place the base onto the rail and gently push up on the retaining clips. The clips lock the base onto the rail.

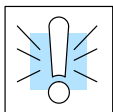
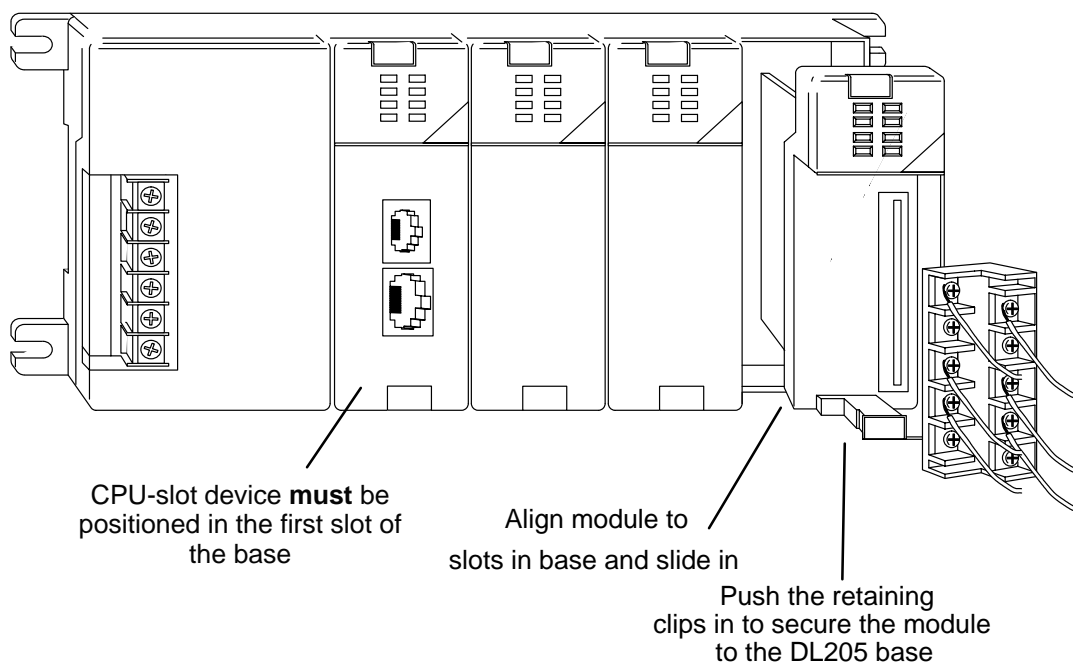
To remove the base, pull down on the retaining clips, lift up on the base slightly, and pull it away from the rail.

DIN Rail Dimensions



Installing Components in the Base

When inserting components into the base, align the PC board(s) of the module with the grooves on the top and bottom of the base. Push the module straight into the base until it is firmly seated in the backplane connector. Once the module is inserted into the base, push in the retaining clips (located at the top and bottom of the module) to firmly secure the module to the base.



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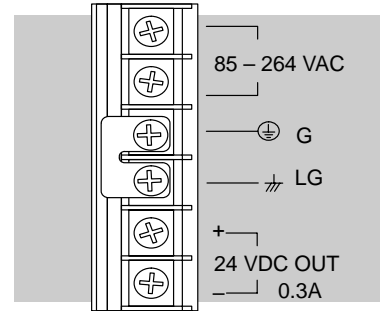
Base Wiring Guidelines

Base Wiring

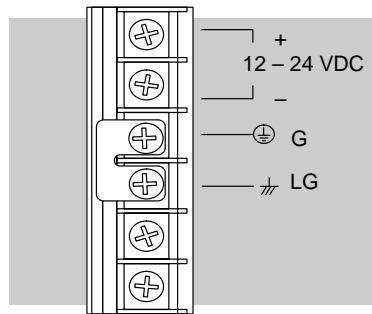
The diagrams show the terminal connections located on the power supply of the DL205 bases. The base terminals can accept up to 16 AWG. You may be able to use larger wiring depending on the type of wire used, but 16 AWG is the recommended size. Do not overtighten the connector screws; recommended torque value is 7.81 pound-inches (0.882 N•m).

NOTE: You can connect either a 115 VAC or 220 VAC supply to the AC terminals. Special wiring or jumpers are not required as with some of the other *DirectLOGIC™* products.

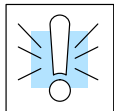
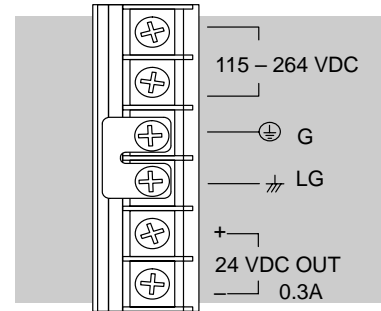
110/220 VAC Base Terminal Strip



12/24 VDC Base Terminal Strip



125 VDC Base Terminal Strip



WARNING: Once the power wiring is connected, install the plastic protective cover. When the cover is removed there is a risk of electrical shock if you accidentally touch the wiring or wiring terminals.