AMIKON TECHNICAL DOCUMENTATION

Installation Instructions

Siemens 6ES7222-1HF22-0XA8

EM 222 CN relay output

OUTPUTS	CONTACT RATING	LOGIC SUPPLY	SWITCH DELAY
8 relay contacts	**2 A maximum**	**5 V / 40 mA**	**10 ms maximum**

For qualified personnel only. Isolate the equipment and follow the complete manufacturer and site safety procedures. This reference does not replace the approved project design or the full installation manual.

01 PREPARATION AND WIRING CHECKS

- Disconnect power from the CPU and associated equipment before installation or removal; follow the original warning and installation sequence.
- Use a restricted-access enclosure and the documented clearances: 25 mm above and below and 75 mm minimum enclosure depth. Vertical installations require the specified temperature derating.
- Evaluate the complete five-volt logic and sensor-supply budget. Do not connect an external 24 V supply in parallel with a CPU sensor supply.
- Follow the original grounding and field-wiring requirements, including independent safeguards and the specified protective supply practices.
- Use the exact module connection diagram and maintain the original terminal grouping and expansion position.
- Provide the documented protection for inductive loads; preserve the warning about unintended output signals when output power is switched mechanically.

02 ORIGINAL WIRING REFERENCE

Original source PDF pages 423, 2, 30, 31, 32, 33, 34, 35, 36, 419, 421, 526, 527. The following pages retain the original Siemens drawings and printed page numbers.

Siemens original installation documentation

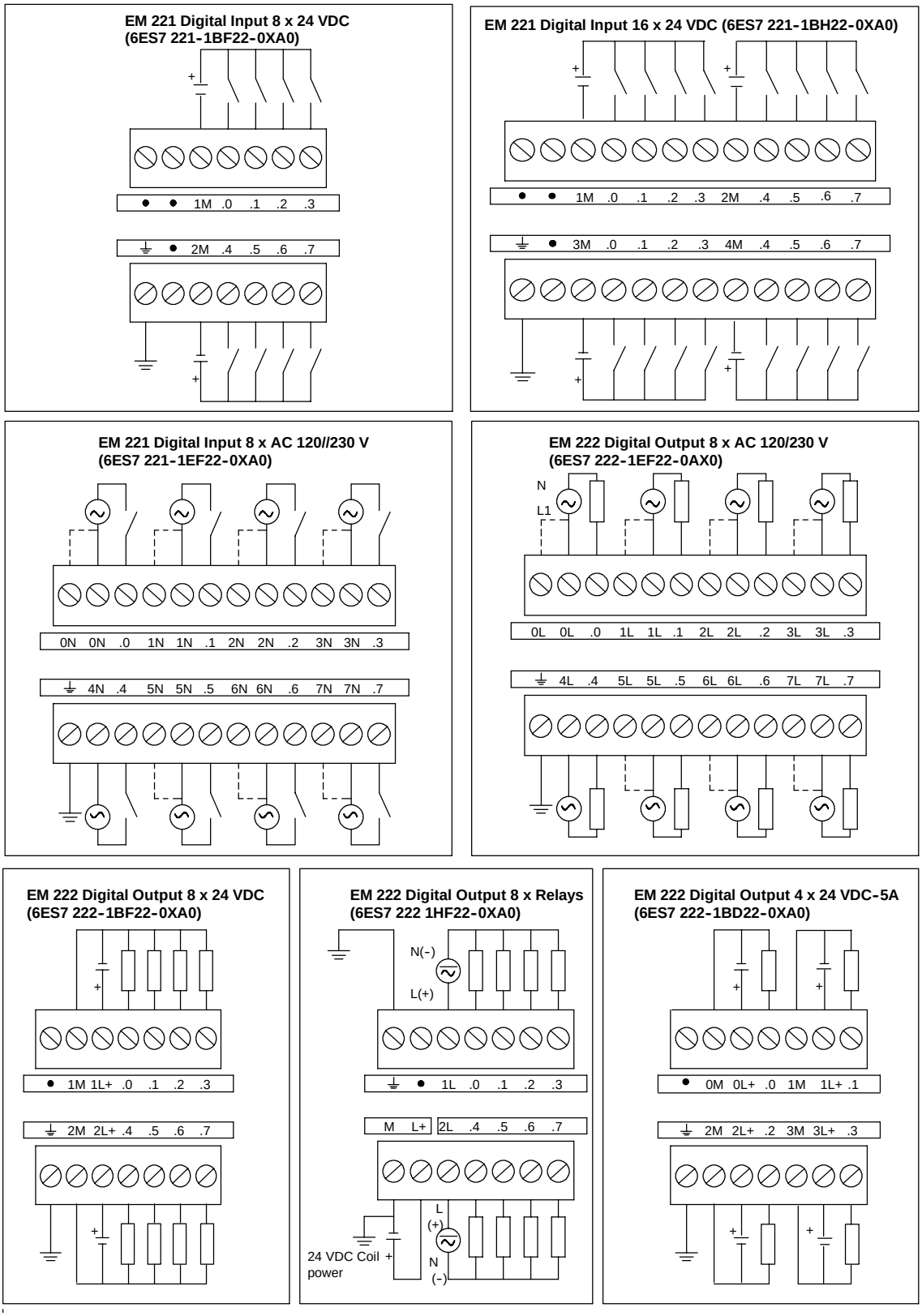


Figure A-10 Wiring Diagrams for EM 221 and EM 222 Expansion Modules

Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:



Danger

Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



Warning

Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Caution

Caution used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Caution

Caution used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Notice

Notice indicates a potential situation which, if not avoided, may result in an undesirable result or state.

Qualified Personnel

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct Usage

Note the following:



Warning

This device and its components may only be used for the applications described in the catalog or the technical descriptions, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Siemens AG
Bereich Automation and Drives
Geschaeftsgebiet Industrial Automation Systems
Postfach 4848, D- 90327 Nuernberg

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Guidelines for Installing S7-200 Devices

You can install an S7-200 either on a panel or on a standard rail, and you can orient the S7-200 either horizontally or vertically.

Warning

The SIMATIC S7-200 PLCs are Open Type Controllers. It is required that you install the S7-200 in a housing, cabinet, or electric control room. Entry to the housing, cabinet, or electric control room should be limited to authorized personnel.

Failure to follow these installation requirements could result in death or serious injury to personnel, and/or damage to equipment.

Always follow these requirements when installing S7-200 PLCs.

Separate the S7-200 Devices from Heat, High Voltage, and Electrical Noise

As a general rule for laying out the devices of your system, always separate the devices that generate high voltage and high electrical noise from the low-voltage, logic-type devices such as the S7-200.

When configuring the layout of the S7-200 inside your panel, consider the heat-generating devices and locate the electronic-type devices in the cooler areas of your cabinet. Operating any electronic device in a high-temperature environment will reduce the time to failure.

Consider also the routing of the wiring for the devices in the panel. Avoid placing low voltage signal wires and communications cables in the same tray with AC power wiring and high-energy, rapidly-switched DC wiring.

Provide Adequate Clearance for Cooling and Wiring

S7-200 devices are designed for natural convection cooling. For proper cooling, you must provide a clearance of at least 25 mm above and below the devices. Also, allow at least 75 mm of depth.

Caution

For vertical mounting, the maximum allowable ambient temperature is reduced by 10 degrees C. Mount the S7-200 CPU below any expansion modules.

When planning your layout for the S7-200 system, allow enough clearance for the wiring and communications cable connections. For additional flexibility in configuring the layout of the S7-200 system, use the I/O expansion cable.

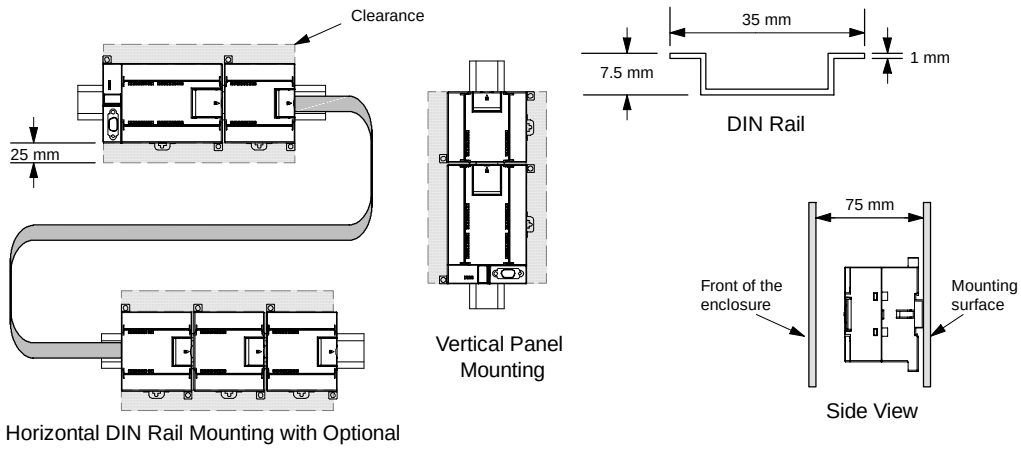


Figure 3-1 Mounting Methods, Orientation, and Clearance

Power Budget

All S7-200 CPUs have an internal power supply that provides power for the CPU, the expansion modules, and other 24 VDC user power requirements.

The S7-200 CPU provides the 5 VDC logic power needed for any expansion in your system. Pay careful attention to your system configuration to ensure that your CPU can supply the 5V power required by your selected expansion modules. If your configuration requires more power than the CPU can supply, you must remove a module or select a CPU with more power capability. Refer to Appendix A for information about the 5 VDC logic budget supplied by your S7-200 CPU and the 5 VDC power requirements of the expansion modules. Use Appendix B as a guide for determining how much power (or current) the CPU can provide for your configuration.

All S7-200 CPUs also provide a 24 VDC sensor supply that can supply 24 VDC for input points, for relay coil power on the expansion modules, or for other requirements. If your power requirements exceed the budget of the sensor supply, then you must add an external 24 VDC power supply to your system. Refer to Appendix A for the 24 VDC sensor supply power budget for your particular S7-200 CPU.

If you require an external 24 VDC power supply, ensure that the power supply is not connected in parallel with the sensor supply of the S7-200 CPU. For improved electrical noise protection, it is recommended that the commons (M) of the different power supplies be connected.



Warning

Connecting an external 24 VDC power supply in parallel with the S7-200 24 VDC sensor supply can result in a conflict between the two supplies as each seeks to establish its own preferred output voltage level.

The result of this conflict can be shortened lifetime or immediate failure of one or both power supplies, with consequent unpredictable operation of the PLC system. Unpredictable operation could result in death or serious injury to personnel, and/or damage to equipment.

The S7-200 DC sensor supply and any external power supply should provide power to different points.

Installing and Removing the S7-200 Modules

The S7-200 can be easily installed on a standard DIN rail or on a panel.

Prerequisites

Before you install or remove any electrical device, ensure that the power to that equipment has been turned off. Also, ensure that the power to any related equipment has been turned off.



Warning

Attempts to install or remove S7-200 or related equipment with the power applied could cause electric shock or faulty operation of equipment.

Failure to disable all power to the S7-200 and related equipment during installation or removal procedures could result in death or serious injury to personnel, and/or damage to equipment.

Always follow appropriate safety precautions and ensure that power to the S7-200 is disabled before attempting to install or remove S7-200 CPUs or related equipment.

Always ensure that whenever you replace or install an S7-200 device you use the correct module or equivalent device.



Warning

If you install an incorrect module, the program in the S7-200 could function unpredictably.

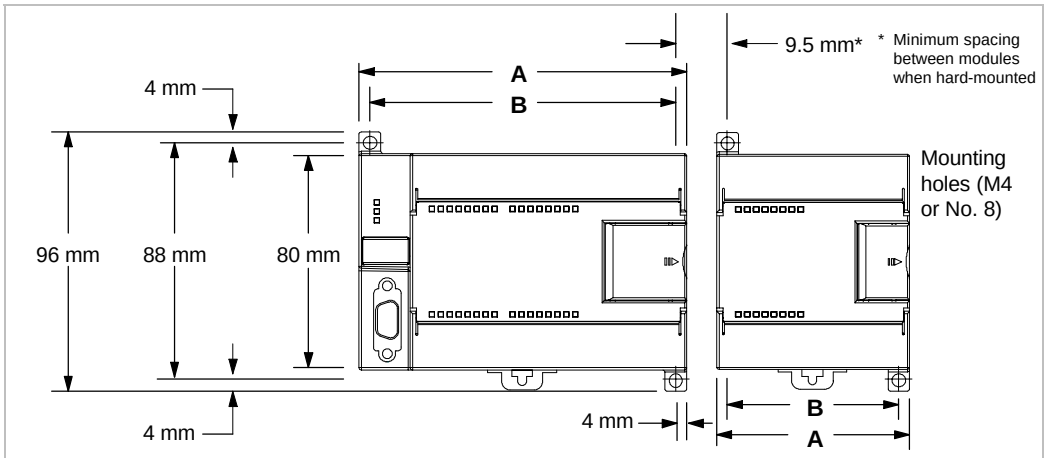
Failure to replace an S7-200 device with the same model, orientation, or order could result in death or serious injury to personnel, and/or damage to equipment.

Replace an S7-200 device with the same model, and be sure to orient and position it correctly.

Mounting Dimensions

The S7-200 CPUs and expansion modules include mounting holes to facilitate installation on panels. Refer to Table 3-1 for the mounting dimensions.

Table 3-1 Mounting Dimensions



S7-200 Module		Width A	Width B
CPU 221 and CPU 222		90 mm	82 mm
CPU 224		120.5 mm	112.5 mm
CPU 224XP, CPU 224XPsi		140 mm	132 mm
CPU 226		196 mm	188 mm
Expansion modules:	4- and 8-point DC and Relay I/O (8I, 4Q, 8Q, 4I/4Q) and Analog Out (2 AQ)	46 mm	38 mm
Expansion modules: Modem	16-point digital I/O (16I, 8I/8Q), Analog I/O (4AI, 8AI, 4AQ, 4AI/1AQ), RTD, Thermocouple, PROFIBUS, Ethernet, Internet, AS-Interface, 8-point AC (8I and 8Q), Position, and	71.2 mm	63.2 mm
Expansion modules:	32-point digital I/O (16I/16Q)	137.3 mm	129.3 mm
Expansion modules:	64-point digital I/O (32I/32Q)	196 mm	188 mm

Installing a CPU or Expansion Module

Installing the S7-200 is easy! Just follow these steps.

Panel Mounting

1. Locate, drill, and tap the mounting holes (M4 or American Standard number 8), using the dimensions in Table 3-1.
2. Secure the module(s) to the panel, using the appropriate screws.
3. If you are using an expansion module, connect the expansion module ribbon cable into the expansion port connector under the access door.

DIN Rail Mounting

1. Secure the rail to the mounting panel every 75 mm.
2. Snap open the DIN clip (located on the bottom of the module) and hook the back of the module onto the DIN rail.
3. If you are using an expansion module, connect the expansion module ribbon cable into the expansion port connector under the access door.
4. Rotate the module down to the DIN rail and snap the clip closed. Carefully check that the clip has fastened the module securely onto the rail. To avoid damage to the module, press on the tab of the mounting hole instead of pressing directly on the front of the module.

Tip

Using DIN rail stops could be helpful if your S7-200 is in an environment with high vibration potential or if the S7-200 has been installed vertically.

If your system is in a high-vibration environment, then panel-mounting the S7-200 will provide a greater level of vibration protection.

Removing a CPU or Expansion Module

To remove an S7-200 CPU or expansion module, follow these steps:

1. Remove power from the S7-200.
2. Disconnect all the wiring and cabling that is attached to the module. Most S7-200 CPU and expansion modules have removable connectors to make this job easier.
3. If you have expansion modules connected to the unit that you are removing, open the access cover door and disconnect the expansion module ribbon cable from the adjacent modules.
4. Unscrew the mounting screws or snap open the DIN clip.
5. Remove the module.

Removing and Reinstalling the Terminal Block Connector

Most S7-200 modules have removable connectors to make installing and replacing the module easy. Refer to Appendix A to determine whether your S7-200 module has removable connectors. You can order an optional fan-out connector for modules that do not have removable connectors. See Appendix E for order numbers.

To Remove the Connector

1. Open the connector door to gain access to the connector.
2. Insert a small screwdriver in the notch in the middle of the connector.
3. Remove the terminal connector by prying the screwdriver away from the S7-200 housing. See Figure 3-2.

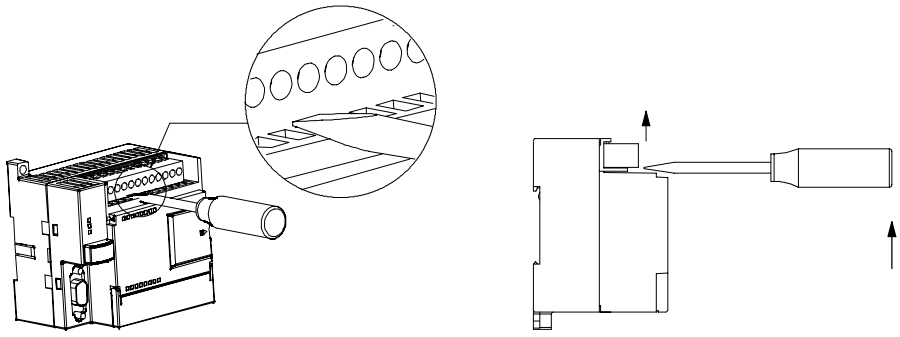


Figure 3-2 Removing the Connector

To Reinstall the Connector

1. Open the connector door.
2. Align the connector with the pins on the unit and align the wiring edge of the connector inside the rim of the connector base.
3. Press down firmly to rotate the connector until it snaps into place. Check carefully to ensure that the connector is properly aligned and fully engaged.

Guidelines for Grounding and Wiring

Proper grounding and wiring of all electrical equipment is important to help ensure the optimum operation of your system and to provide additional electrical noise protection for your application and the S7-200.

Prerequisites

Before you ground or install wiring to any electrical device, ensure that the power to that equipment has been turned off. Also, ensure that the power to any related equipment has been turned off.

Ensure that you follow all applicable electrical codes when wiring the S7-200 and related equipment. Install and operate all equipment according to all applicable national and local standards. Contact your local authorities to determine which codes and standards apply to your specific case.



Warning

Attempts to install or wire the S7-200 or related equipment with power applied could cause electric shock or faulty operation of equipment. Failure to disable all power to the S7-200 and related equipment during installation or removal procedures could result in death or serious injury to personnel, and/or damage to equipment.

Always follow appropriate safety precautions and ensure that power to the S7-200 is disabled before attempting to install or remove the S7-200 or related equipment.

Always take safety into consideration as you design the grounding and wiring of your S7-200 system. Electronic control devices, such as the S7-200, can fail and can cause unexpected operation of the equipment that is being controlled or monitored. For this reason, you should implement safeguards that are independent of the S7-200 to protect against possible personal injury or equipment damage.



Warning

Control devices can fail in an unsafe condition, resulting in unexpected operation of controlled equipment. Such unexpected operations could result in death or serious injury to personnel, and/or damage to equipment.

Use an emergency stop function, electromechanical overrides, or other redundant safeguards that are independent of the S7-200.

Guidelines for Isolation

S7-200 AC power supply boundaries and I/O boundaries to AC circuits have been designed and approved to provide safe separation between AC line voltages and low voltage circuits. These boundaries include double or reinforced insulation, or basic plus supplementary insulation, according to various standards. Components which cross these boundaries such as optical couplers, capacitors, transformers, and relays have been approved as providing safe separation. Isolation boundaries which meet these requirements have been identified in S7-200 product data sheets as having 1500VAC or greater isolation. This designation is based on a routine factory test of (2Ue + 1000VAC) or equivalent according to approved methods. S7-200 safe separation boundaries have been type tested to 4242 VDC.

The sensor supply output, communications circuits, and internal logic circuits of an S7-200 with included AC power supply are sourced as SELV (safety extra-low voltage) according to EN 61131-2. These circuits become PELV (protective extra-low voltage) if the sensor supply M, or any other non-isolated M connection to the S7-200 is connected to ground. Other S7-200 M connections which may ground reference the low voltage are designated as not isolated to logic on specific product data sheets. Examples are RS485 communications port M, analog I/O M, and relay coil power M.

To maintain the SELV / PELV character of the S7-200 low voltage circuits, external connections to communications ports, analog circuits, and all 24V nominal power supply and I/O circuits must be powered from approved sources that meet the requirements of SELV, PELV, Class 2, Limited Voltage, or Limited Power according to various standards.



Warning

Use of non-isolated or single insulation supplies to supply low voltage circuits from an AC line can result in hazardous voltages appearing on circuits that are expected to be touch safe, such as communications circuits and low voltage sensor wiring.

Such unexpected high voltages could result in death or serious injury to personnel, and/or damage to equipment.

Only use high voltage to low voltage power converters that are approved as sources of touch safe, limited voltage circuits.

Guidelines for Grounding the S7-200

The best way to ground your application is to ensure that all the common and ground connections of your S7-200 and related equipment are grounded to a single point. This single point should be connected directly to the earth ground for your system.

For improved electrical noise protection, it is recommended that all DC common returns be connected to the same single-point earth ground. Connect the 24 VDC sensor supply common (M) to earth ground.

All ground wires should be as short as possible and should use a large wire size, such as 2 mm^2 (14 AWG).

When locating grounds, remember to consider safety grounding requirements and the proper operation of protective interrupting devices.

Guidelines for Wiring the S7-200

When designing the wiring for your S7-200, provide a single disconnect switch that simultaneously removes power from the S7-200 CPU power supply, from all input circuits, and from all output circuits. Provide overcurrent protection, such as a fuse or circuit breaker, to limit fault currents on supply wiring. You might want to provide additional protection by placing a fuse or other current limit in each output circuit.

Install appropriate surge suppression devices for any wiring that could be subject to lightning surges.

Avoid placing low-voltage signal wires and communications cables in the same wire tray with AC wires and high-energy, rapidly switched DC wires. Always route wires in pairs, with the neutral or common wire paired with the hot or signal-carrying wire.

Use the shortest wire possible and ensure that the wire is sized properly to carry the required current. The connector accepts wire sizes from 2 mm^2 to 0.3 mm^2 (14 AWG to 22 AWG). Use shielded wires for optimum protection against electrical noise. Typically, grounding the shield at the S7-200 gives the best results.

When wiring input circuits that are powered by an external power supply, include an overcurrent protection device in that circuit. External protection is not necessary for circuits that are powered by the 24 VDC sensor supply from the S7-200 because the sensor supply is already current-limited.

Most S7-200 modules have removable connectors for user wiring. (Refer to Appendix A to determine if your module has removable connectors.) To prevent loose connections, ensure that the connector is seated securely and that the wire is installed securely into the connector. To avoid damaging the connector, be careful that you do not over-tighten the screws. The maximum torque for the connector screw is 0.56 N-m (5 inch-pounds).

To help prevent unwanted current flows in your installation, the S7-200 provides isolation boundaries at certain points. When you plan the wiring for your system, you should consider these isolation boundaries. Refer to Appendix A for the amount of isolation provided and the location of the isolation boundaries. Isolation boundaries rated less than 1500 VAC must not be depended on as safety boundaries.



Tip

For a communications network, the maximum length of the communications cable is 50 m without using a repeater. The communications port on the S7-200 is non-isolated. Refer to Chapter 7 for more information.

Guidelines for Inductive Loads

You should equip inductive loads with suppression circuits to limit voltage rise when the control output turns off. Suppression circuits protect your outputs from premature failure due to high inductive switching currents. In addition, suppression circuits limit the electrical noise generated when switching inductive loads.

Tip

The effectiveness of a given suppression circuit depends on the application, and you must verify it for your particular use. Always ensure that all components used in your suppression circuit are rated for use in the application.

DC Outputs and Relays That Control DC Loads

The DC outputs have internal protection that is adequate for most applications. Since the relays can be used for either a DC or an AC load, internal protection is not provided.

Figure 3-3 shows a sample suppression circuit for a DC load. In most applications, the addition of a diode (A) across the inductive load is suitable, but if your application requires faster turn-off times, then the addition of a Zener diode (B) is recommended. Be sure to size your Zener diode properly for the amount of current in your output circuit.

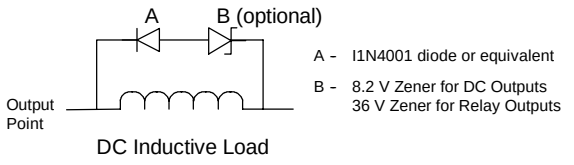


Figure 3-3 Suppression Circuit for a DC Load

AC Outputs and Relays That Control AC Loads

The AC outputs have internal protection that is adequate for most applications. Since the relays can be used for either a DC or an AC load, internal protection is not provided.

Figure 3-4 shows a sample suppression circuit for an AC load. When you use a relay or AC output to switch 115 V/230 VAC loads, place resistor/capacitor networks across the AC load as shown in this figure. You can also use a metal oxide varistor (MOV) to limit peak voltage. Ensure that the working voltage of the MOV is at least 20% greater than the nominal line voltage.

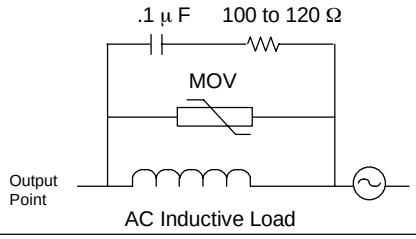


Figure 3-4 Suppression Circuit for an AC Load

Warning

When relay expansion modules are used to switch AC inductive loads, the external resistor/capacitor noise suppression circuit must be placed across the AC load to prevent unexpected machine or process operation. See Figure 3-4.

Guidelines for Lamp Loads

Lamp loads are damaging to relay contacts because of the high turn-on surge current. This surge current will nominally be 10 to 15 times the steady state current for a Tungsten lamp. A replaceable interposing relay or surge limiter is recommended for lamp loads that will be switched a large number of times during the lifetime of the application.

Digital Expansion Modules Specifications

Table A-11 Digital Expansion Modules Order Numbers

Order Number	Expansion Model	Digital Inputs	Digital Outputs	Removable Connector
6ES7 221-1BF22-0XA0	EM 221 Digital Input 8 x 24 VDC	8 x 24 VDC	-	Yes
6ES7 221-1EF22-0XA0	EM 221 Digital Input 8 x 120/230 VAC	8 x 120/230 VAC	-	Yes
6ES7 221-1BH22-0XA0	EM 221 Digital Input 16 x 24 VDC	16 x 24 VDC	-	Yes
6ES7 222-1BD22-0XA0	EM 222 Digital Output 4 x 24 VDC-5A	-	4 x 24 VDC-5A	Yes
6ES7 222-1HD22-0XA0	EM 222 Digital Output 4 x Relays-10A	-	4 x Relay-10A	Yes
6ES7 222-1BF22-0XA0	EM 222 Digital Output 8 x 24 VDC	-	8 x 24 VDC-0.75A	Yes
6ES7 222-1HF22-0XA0	EM 222 Digital Output 8 x Relays	-	8 x Relay-2A	Yes
6ES7 222-1EF22-0XA0	EM 222 Digital Output 8 x 120/230 VAC	-	8 x 120/230 VAC	Yes
6ES7 223-1BF22-0XA0	EM 223 24 VDC Digital Comb 4 Inputs/4 Outputs	4 x 24 VDC	4 x 24 VDC-0.75A	Yes
6ES7 223-1HF22-0XA0	EM 223 24 VDC Digital Comb 4 Inputs/4 Relay Outputs	4 x 24 VDC	4 x Relay-2A	Yes
6ES7 223-1BH22-0XA0	EM 223 24 VDC Digital Comb 8 Inputs/8 Outputs	8 x 24 VDC	8 x 24 VDC-0.75A	Yes
6ES7 223-1PH22-0XA0	EM 223 24 VDC Digital Comb 8 Inputs/8 Relay Outputs	8 x 24 VDC	8 x Relay-2A	Yes
6ES7 223-1BL22-0XA0	EM 223 24 VDC Digital Comb 16 Inputs/16 Outputs	16 x 24 VDC	16 x 24 VDC-0.75A	Yes
6ES7 223-1PL22-0XA0	EM 223 24 VDC Digital Comb 16 Inputs/16 Relay Outputs	16 x 24 VDC	16 x Relay-2A	Yes
6ES7 223-1BM22-0XA0	EM 223 24 VDC Digital Comb 32 Inputs/32 Outputs	32 x 24 VDC	32 x 24 VDC-0.75 A	Yes
6ES7 223-1PM22-0XA0	EM 223 24 VDC Digital Comb 32 Inputs/32 Relay Outputs	32 x 24 VDC	32 x Relay-2 A	Yes

Table A-12 Digital Expansion Modules General Specifications

Order Number	Module Name and Description	Dimensions (mm) (W x H x D)	Weight	Dissipation	VDC Requirements	
					+5 VDC	+24 VDC
6ES7 221-1BF22-0XA0	EM 221 DI 8 x 24 VDC	46 x 80 x 62	150 g	2 W	30 mA	ON: 4 mA/input
6ES7 221-1EF22-0XA0	EM 221 DI 8 x 120/230 VAC	71.2 x 80 x 62	160 g	3 W	30 mA	-
6ES7 221-1BH22-0XA0	EM 221 DI 16 x 24 VDC	71.2 x 80 x 62	160 g	3 W	70 mA	ON: 4 mA/input
6ES7 222-1BD22-0XA0	EM 222 DO 4 x 24 VDC-5A	46 x 80 x 62	120 g	3 W	40 mA	-
6ES7 222-1HD22-0XA0	EM 222 DO 4 x Relays-10A	46 x 80 x 62	150 g	4 W	30 mA	ON: 20 mA/output
6ES7 222-1BF22-0XA0	EM 222 DO 8 x 24 VDC	46 x 80 x 62	150 g	2 W	50 mA	-
6ES7 222-1HF22-0XA0	EM 222 DO 8 x Relays	46 x 80 x 62	170 g	2 W	40 mA	ON: 9 mA/output
6ES7 222-1EF22-0XA0	EM 222 DO 8 x 120/230 VAC	71.2 x 80 x 62	165 g	4 W	110 mA	-
6ES7 223-1BF22-0XA0	EM 223 24 VDC 4 In/4 Out	46 x 80 x 62	160 g	2 W	40 mA	ON: 4 mA/input
6ES7 223-1HF22-0XA0	EM 223 24 VDC 4 In/4 Relays	46 x 80 x 62	170 g	2 W	40 mA	ON: 9 mA/output, 4 mA/input
6ES7 223-1BH22-0AX0	EM 223 24 VDC 8 In/8 Out	71.2 x 80 x 62	200 g	3 W	80 mA	ON: 4 mA/input
6ES7 223-1PH22-0XA0	EM 223 24 VDC 8 In/8 Relays	71.2 x 80 x 62	300 g	3 W	80 mA	ON: 9 mA/output, 4 mA/input
6ES7 223-1BL22-0XA0	EM 223 24 VDC 16 In/16 Out	137.3 x 80 x 62	360 g	6 W	160 mA	ON: 4 mA/input
6ES7 223-1PL22-0XA0	EM 223 24 VDC 16 In/16 Relays	137.3 x 80 x 62	400 g	6 W	150 mA	ON: 9 mA/output, 4 mA/input
6ES7 223-1BM22-0XA0	EM 223 24 VDC 32 In/32 Out	196 x 80 x 62	500 g	9 W	240 mA	ON: 4 mA/input
6ES7 223-1PM22-0XA0	EM 223 24 VDC 32 In/32 Relay	196 x 80 x 62	580 g	13 W	205 mA	ON: 9 mA/output 4 mA/input

Table A-14 Digital Expansion Modules Output Specifications

General	24 VDC Output		Relay Output		120/230 VAC Output
	0.75 A	5 A	2 A	10 A	
Type	Solid state-MOSFET (Sourcing)		Dry contact		Triac, zero-cross turn-on
Rated voltage	24 VDC		24 VDC or 250 VAC		120/230 VAC
Voltage range	20.4 to 28.8 VDC		5 to 30 VDC or 5 to 250 VAC	12 to 30 VDC or 12 to 250 VAC	40 to 264 VAC (47 to 63 Hz)
24 VDC coil power voltage range	–		20.4 to 28.8 VDC		–
Surge current (max.)	8 A for 100 ms	30 A	5 A for 4 s @ 10% duty cycle	15 A for 4 s @ 10% duty cycle	5 A rms for 2 AC cycles
Logic 1 (min.)	20 VDC		–		L1 (–0.9 V rms)
Logic 0 (max.)	0.1 VDC with 10 K Ω Load	0.2 VDC with 5 K Ω Load	–		–
Rated current per point (max.)	0.75 A	5 A	2.00 A	10 A resistive; 2 A DC inductive; 3 A AC inductive	0.5 A AC[1]
Rated current per common (max.)	10 A	5 A	10 A	10 A	0.5 A AC
Leakage current (max.)	10 μA	30 μA	–		1.1 mA rms at 132 VAC and 1.8 mA rrms at 264 VAC
Lamp load (max.)	5 W	50 W	30 W DC/ 200 W AC[4,5]	100 W DC/ 1000 W AC	60 W
Inductive clamp voltage	L+ minus 48 V	L+ minus 47 V[2]	–		–
On state resistance (contact)	0.3 Ω typical (0.6 Ω max.)	0.05 Ω max.	0.2 Ω max. when new	0.1 Ω max. when new	410 Ω max. when load current is less than 0.05A
Isolation					
Optical (galvanic, field to logic)	500 VAC for 1 minute		–		1500 VAC for 1minute
Coil to logic	–		None		–
Coil to contact	–		1500 VAC for 1 minute		–
Resistance (coil to contact)	–		100 M Ω min. when new		–
Isolation groups	See wiring diagram		See wiring diagram		1 point
Delay Off to On/On to Off (max.)	50 μs / 200 μs	500 μs	–	–	0.2 ms + 1/2 AC cycle
Switching (max.)	–	–	10 ms	15 ms	–
Switching frequency (max.)	–		1 Hz		10 Hz
Lifetime mechanical cycles	–		10,000,000 (no load)	30,000,000 (no load)	–
Lifetime contacts	–		100,000 (rated load)	30,000 (rated load)	–
Output on simultaneously	All at 55° C (horizontal), All at 45° C (vertical)			All at 55 °C (horizontal) with 20A max. module current. All at 45°C (vertical) with 20A max. module current[5]. All at 40 °C (horizontal) with 10A per point	All at 55° C (horizontal), All at 45° C (vertical)
Connecting two outputs in parallel	Yes, only outputs in same group		No		No
Cable length (max.)					
Shielded	500 m		500 m		500 m
Unshielded	150 m		150 m		150 m

1 Load current must be full wave AC and must not be half-wave because of the zero-cross circuitry. Minimum load current is 0.05 A AC. With a load current between 5 mA and 50 mA AC, the current can be controlled, but there is an additional voltage drop due to series resistance of 410 Ohms.

2 If the output overheats due to excessive inductive switching or abnormal conditions, the output point may turn off or be damaged. The output could overheat or be damaged if the output is subjected to more than 0.7 J of energy switching an inductive load off. To eliminate the need for this limitation, a suppression circuit as described in Chapter 3 can be added in parallel with the load. These components need to be sized properly for the given application.

3 The EM 222 DO 4 x Relay has a different FM rating than the rest of the S7-200. This module has a T4 rating, instead of T4A for FM Class I, Division Groups A, B, C, and D Hazardous Locations.

4 Relay lifetime with a lamp load will be reduced by 75% unless steps are taken to reduce the turn-on surge below the surge current rating of the output.

5 Lamp load wattage rating is for rated voltage. Reduce the wattage rating proportionally for voltage being switched (for example 120 VAC – 100 W).



Warning

When a mechanical contact turns on output power to the S7-200 CPU, or any digital expansion module, it sends a “1” signal to the digital outputs for approximately 50 microseconds.

This could cause unexpected machine or process operation which could result in death or serious injury to personnel, and/or damage to equipment.

You must plan for this, especially if you are using devices which respond to short duration pulses.

Certifications and Approvals for S7-200CN Products

CE Labeling of S7-200CN Products

The S7-200CN products fulfill the requirements and protection guidelines of the following EU directives.

- EC Directive 73/23/EEC “Low–voltage directive”
- EC Directive 89/336/EEC “EMC directive”

After July 2009 the following applies:

- EC Directive 2004/108/EC (EMC Directive) “Electromagnetic Compatibility”

Standards of S7-200CN Products

The S7-200CN products fulfill the requirement and criteria of IEC 61131–2, Programmable controllers – Equipment requirements. Check the markings on the actual S7-200CN product for the specific Agency approvals and Certifications.

S7-200CN Products

A cross-reference of SIMATIC S7-200 products to S7-200CN products is shown in the following table. For wiring and performance specifications, refer to the cross-referenced SIMATIC S7-200 product in Appendix A. Check the markings on the actual S7-200CN product for the specific Agency approvals and Certifications.

Table H-1 Cross Reference for SIMATIC S7-200 Products to S7-200CN Products

Model Name and Description	S7-200 SIMATIC Product	S7-200CN Product
CPU 222 DC/DC/DC, 8 Inputs/6 Outputs	6ES7 212-1AB23-0XB0	6ES7 212-1AB23-0XB8
CPU 222 AC/DC/Relay 8 Inputs/ 6 Relays	6ES7 212-1BB23-0XB0	6ES7 212-1BB23-0XB8
CPU 224 DC/DC/DC 14 Inputs/ 10 Outputs	6ES7 214-1AD23-0XB0	6ES7 214-1AD23-0XB8
CPU 224 AC/DC/Relay14 Inputs/ 10 Relays	6ES7 214-1BD23-0XB0	6ES7 214-1BD23-0XB8
CPU 224XP DC/DC/DC 14 Inputs/10 Outputs	6ES7 214-2AD23-0XB0	6ES7 214-2AD23-0XB8
CPU 224XPsi DC/DC/DC 14 Inputs/10 Outputs	6ES7 214-2AS23-0XB0	6ES7 214-2AS23-0XB8
CPU 224XP AC/DC/Relay 14 Inputs/10 Relays	6ES7 214-2BD23-0XB0	6ES7 214-2BD23-0XB8
CPU 226 DC/DC/DC 24 Inputs/16 Outputs	6ES7 216-2AD23-0XB0	6ES7 216-2AD23-0XB8
CPU 226 AC/DC/Relay 24 Inputs/16 Relays	6ES7 216-2BD23-0XB0	6ES7 216-2BD23-0XB8
EM 221 Digital Input 8 x 24 VDC	6ES7 221-1BF22-0XA0	6ES7 221-1BF22-0XA8
EM 221 Digital Input 16 x 24 VDC	6ES7 221-1BH22-0XA0	6ES7 221-1BH22-0XA8
EM 222 Digital Output 8 x 24 VDC	6ES7 222-1BF22-0XA0	6ES7 222-1BF22-0XA8
EM 222 Digital Output 8 x Relays	6ES7 222-1HF22-0XA0	6ES7 222-1HF22-0XA8
EM 223 24 VDC Digital Comb 4 Inputs/4 Outputs	6ES7 223-1BF22-0XA0	6ES7 223-1BF22-0XA8
EM 223 24 VDC Digital Comb 4 Inputs/4 Relay Outputs	6ES7 223-1HF22-0XA0	6ES7 223-1HF22-0XA8
EM 223 24 VDC Digital Comb 8 Inputs/8 Outputs	6ES7 223-1BH22-0XA0	6ES7 223-1BH22-0XA8
EM 223 24 VDC Digital Comb 8 Inputs/8 Relay Outputs	6ES7 223-1PH22-0XA0	6ES7 223-1PH22-0XA8
EM 223 24 VDC Digital Comb 16 Inputs/16 Outputs	6ES7 223-1BL22-0XA0	6ES7 223-1BL22-0XA8
EM 223 24 VDC Digital Comb 16 Inputs/16 Relay Outputs	6ES7 223-1PL22-0XA0	6ES7 223-1PL22-0XA8
EM 223 24 VDC Digital Comb 32 Inputs/32 Outputs	6ES7 223-1BM22-0XA0	6ES7 223-1BM22-0XA8
EM 223 24 VDC Digital Comb 32 Inputs/32 Relay Outputs	6ES7 223-1PM22-0XA0	6ES7 223-1PM22-0XA8
EM 231 Analog Input, 4 Inputs	6ES7 231-0HC22-0XA0	6ES7 231-0HC22-0XA8
EM 235 Analog Combination 4 Inputs/1 Output	6ES7 235-0KD22-0XA0	6ES7 235-0KD22-0XA8
EM 232 Analog Output, 2 Outputs	6ES7 232-0HB22-0XA0	6ES7 232-0HB22-0XA8
EM 231 Analog Input RTD, 2 Inputs	6ES7 231-7PB22-0XA0	6ES7 231-7PB22-0XA8
EM 231 Analog Input Thermocouple, 4 Inputs	6ES7 231-7PD22-0XA0	6ES7 231-7PD22-0XA8