

SIMATIC S5

S5-100U Programmable Controller

**System Manual
CPU 100/102/103**

EWA 4NEB 812 6120-02b

Edition 04

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3 Installation Guidelines

3.1 Installing S5-100U Components

Except for the I/O module, all of the S5-100U components are mounted on standard mounting rails in accordance with DIN EN 50022-35x15. Mount the rails on a metal plate to obtain the same reference potential.

Bus units with a SIGUT/screw-type, or crimp snap-in connection method have different heights.

If you install, remove, or change any parts of your S5-100U system, your system must be in the state indicated in Table 3-1.

Table 3-1. Installing, Removing, and Changing S5-100U Components

Installing, Removing, and Changing:	S5-100U Power Status	S5-100U Operating Mode	Load Voltage
I/O modules	X	STOP	OFF
Bus units Interface modules	Power OFF	X	X
CPU power supply	Power supply voltage OFF	X	X

X=not relevant

3.1.1 Assembling a Tier

You need the following components to configure the S5-100U:

- Power supply module
- Central processing unit
- Bus units
- I/O modules

If you do not have a 24 V DC power supply, you must have a power supply module.

Mount the first module on the extreme left end of the standard mounting rail. Add other modules to the right of the first module.

Mounting the PS 930 Power Supply Module

The backplane design makes it easy to attach this module to the standard mounting rail.

1. Hook the module onto the standard mounting rail.
2. Swing the module back until the slide snaps into place (see Figure 3-1).

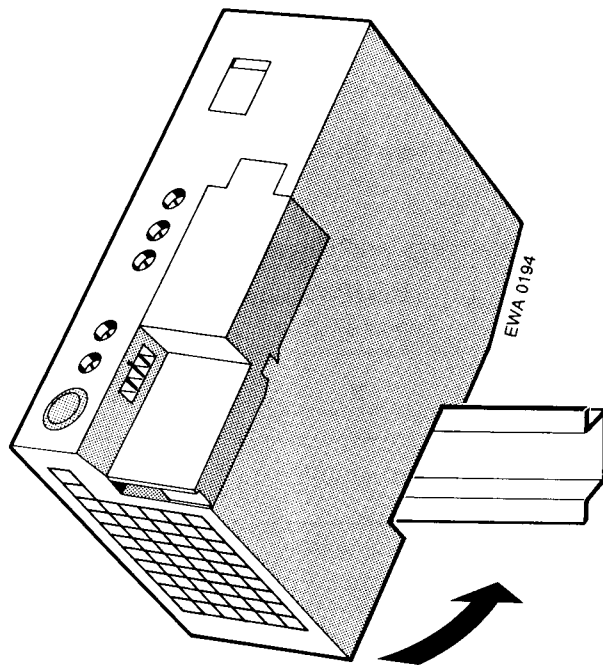


Figure 3-1. Mounting the PS 930 Power Supply Module

Removing the PS 930 Power Supply Module

1. Turn off the 115 V/230 V AC power supply.
2. Remove the connections between the CPU and the power supply module.
3. Use a screwdriver to press down on the slide on the bottom of the module.
4. Swing the module up and out of the standard mounting rail.

Mounting the Central Processing Unit

Follow the same procedure you used to mount the PS 930 power supply module (see Figure 3-1).

1. Hook the CPU onto the rail and to the right of the power supply module.
2. Swing the CPU back until the slide snaps into place.

Removing the CPU

1. Remove the I/O module located at slot "0".
2. Pull the connection (ribbon cable) between the CPU and the first bus unit.
3. Pull the connections between the CPU and the power supply module.
4. Use a screwdriver to press down on the slide on the bottom of the module.
5. Swing the module up and out of the standard mounting rail.

Mounting Bus Units

Use the same procedures to mount the bus unit that you used to mount both the power supply module and the CPU. Hooks are located on the sides of each bus unit. These hooks are used to connect bus units to each other and to connect bus units to the CPU.

Connecting Bus Units to Each Other or to the CPU

1. Pull the ribbon cable connector located on the top left of the bus unit out of its holder.
2. Plug the connector either into the receptacle located on the right side of the CPU or into the receptacle of the adjacent bus unit located on the left (see Figure 3-2).

Removing Bus Units

1. Pull the connections to the neighboring bus units or to the CPU.
2. Use a screwdriver to press down on the slide.
3. Swing the module up and out of the standard mounting rail.

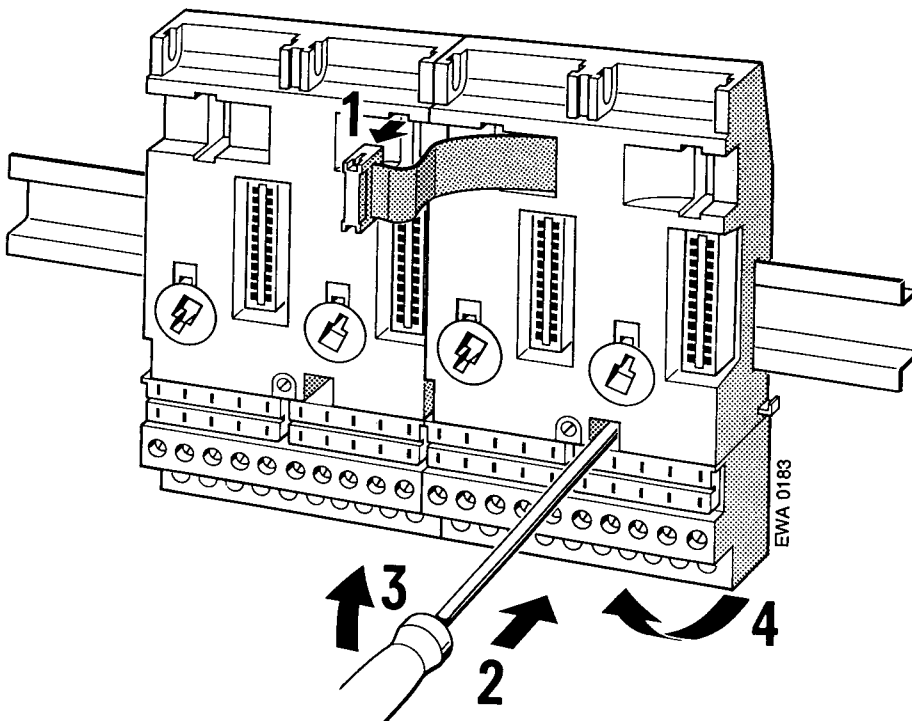


Figure 3-2. Removing Bus Units

Plugging Input and Output Modules into the Bus Units

Before you plug in an input or output module, you must set the bus unit's coding element to match the module type.

Setting the Coding Element

An identification number is printed on the front plate of every I/O module. Depending on the particular module type, the number is between two and eight. There is a white mechanical coding key located on the back of each module. The position of the coding key is determined by the module type and cannot be changed. The bus unit has a mating component for each key, a white rotating coding element or "lock" (see Figure 3-3).

Use a screwdriver to set the "lock" on the bus unit to the corresponding I/O module code number.

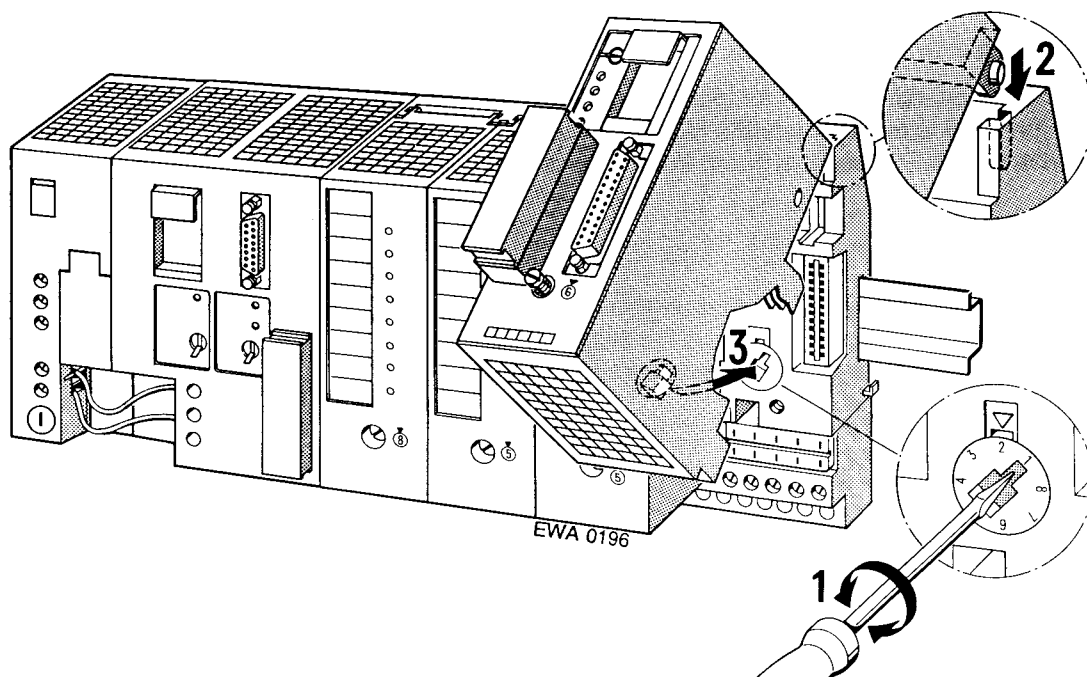


Figure 3-3. Coding System to Prevent an Inadvertent Interchange of Modules

The 6ES5 788-8MA11 simulator module does not have a coding key. You can plug in this simulator module in place of any module.

Attaching I/O Modules

1. Hook the module onto the top of the bus unit.
2. Swing the module down onto the bus unit.
3. Press the module down firmly.
4. Tighten the hold-down screw on the front of the module to attach the module to the bus unit.

Removing I/O Modules

Remove the hold-down screw and swing the module up and out of the bus unit.

3.1.2 Multi-Tier Expansion

If it is not possible to have all of the modules located on one tier, you can expand the configuration up to four tiers. You may use a maximum of 16 bus units. It does not matter how many bus units are mounted on a tier. You need one interface module per tier to interconnect the tiers.

Install an interface module as you would install a bus unit. You must connect each interface module to the last bus unit via the ribbon cable.

Use the IM 315 interface module for two-tier configurations. The IM 315 consists of two modules permanently connected to each other via a 0.5-m (20-in.) cable.

Use the IM 316 interface modules for multi-tier configurations. Use the 712-8 connecting cable to connect the IM 316 interface modules (Order No. 6ES5 712-8...).

The standard mounting rails must have a common reference potential if they are mounted in different cabinets.

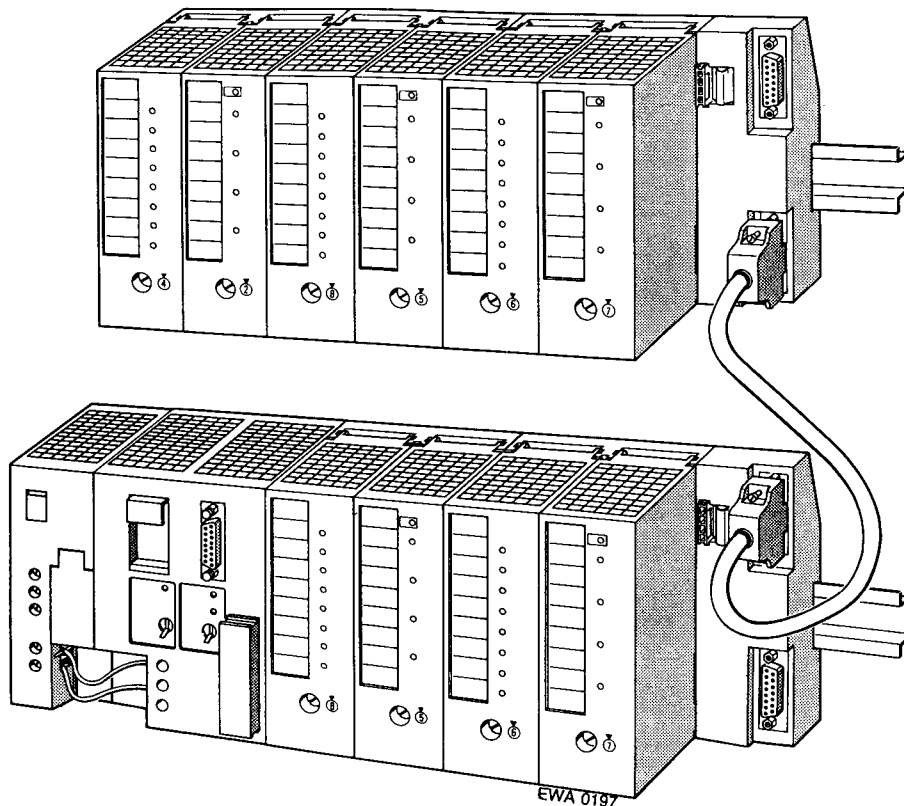


Figure 3-4. Interconnecting Tiers with Interface Modules (6ES5 316-8MA12)

Installing an Interface Module

1. Hook the interface module to the standard mounting rail.
2. Swing the interface module back until the slide on the bottom snaps into place on the rail.
3. Use the ribbon cable to connect the module to the last bus unit.
4. Use connecting cable 712-8 to join the two interface modules.
5. Connect the cable to the “out” socket on the programmable controller tier and to the “in” socket on the expansion tier.
6. Securely screw the connecting cable plugs in place. Use two screws for each connecting cable plug.

Removing an Interface Module

1. Only for the IM 316: Remove the hold-down screws from the plugs and remove the connecting cable.
2. Remove the connecting ribbon cable from the adjacent bus unit.
3. Use a screwdriver to press down on the slide located on the bottom of the interface module.
4. Swing the module up and out of the standard mounting rail.

3.1.3 Cabinet Mounting

Make sure that the S5-100U, the power supply, and all modules are well grounded. Mount the S5-100U on a metal plate to help prevent noise. There should be electrical continuity between the grounded enclosure and the mounting rails. Make sure that the system is bonded to earth.

You can use the 8LW system or the 8LX system mounting plates (see Catalog NV 21).

Adequate ventilation and heat dissipation are important to the proper operation of the system. You must have at least 210 mm (8.3 in.) between each mounting rail (see Figures in Appendix B) for proper ventilation.

Always locate the power supply and the CPU on the lowest tier to ensure better heat dissipation. To measure cabinet ventilation, define the total heat loss by calculating the sum of all typical heat losses (see Catalog ST 52.1).

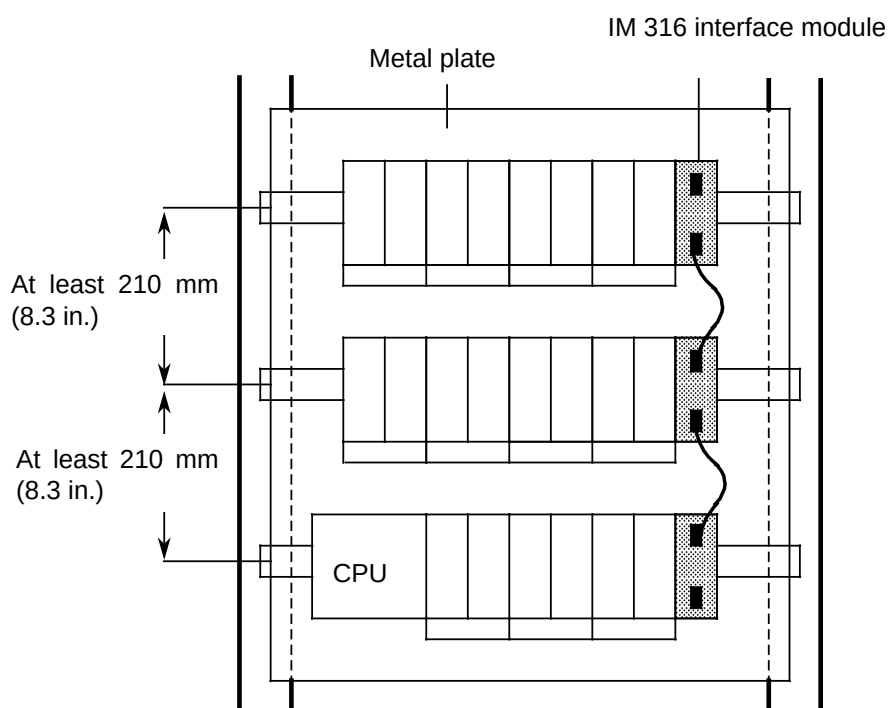


Figure 3-5. Multi-Tier Configuration in a Cabinet with the IM 316 Interface Module (6ES5 316-8MA12)

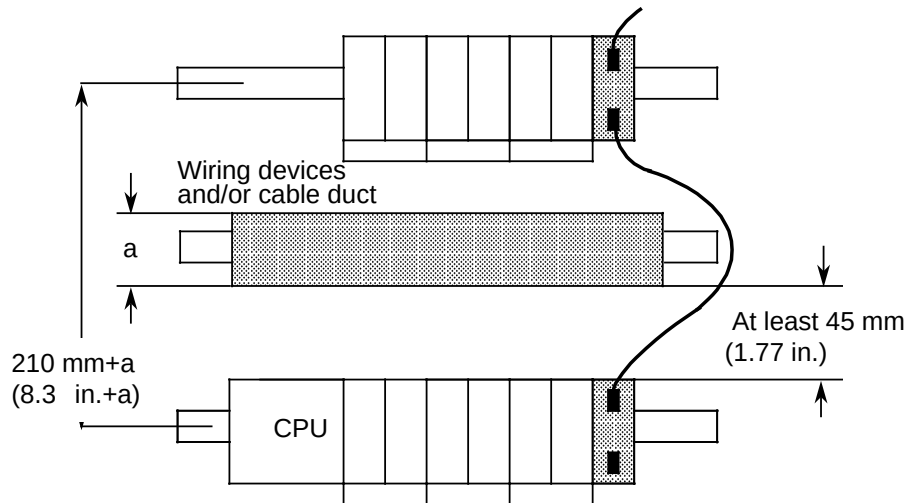


Figure 3-6. Cabinet Mounting with a Series of Devices

3.1.4 Vertical Mounting

You can also mount the standard mounting rails vertically and then attach the modules one over the other. Because heat dissipation by convection is less effective in this case, the maximum ambient temperature allowed is 40 °C (104 °F).

Use the same minimum clearances for a vertical configuration as for a horizontal configuration.

You must install a clamp (see Catalog SA 2) on the lower end of the programmable controller tier to hold the modules mechanically in position.

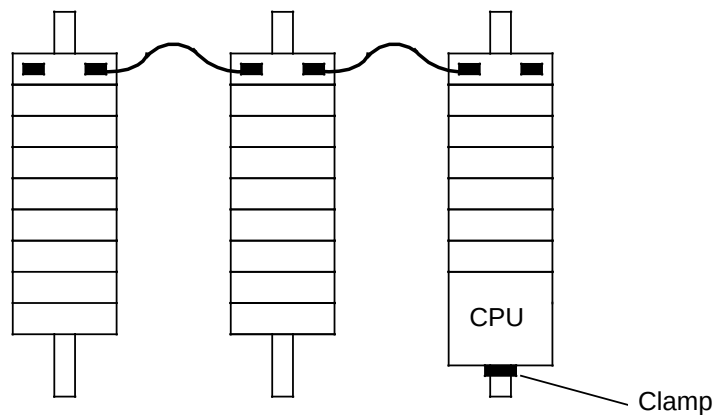


Figure 3-7. Vertically Mounting a Programmable Controller

3.2 Wiring

3.2.1 Connection Methods: Screw-Type Terminals and Crimp Snap-in

SIGUT Screw-Type Terminal

When using screw-type terminals, you can clamp two cables per terminal. It is best to use a 3.5-mm screwdriver to tighten the screws.

Permissible cable cross-sections are:

- A stranded conductor with a core end sleeve: 2 x 0.5 to 1.5 mm²
- A solid conductor: 2 x 0.5 to 2.5 mm²

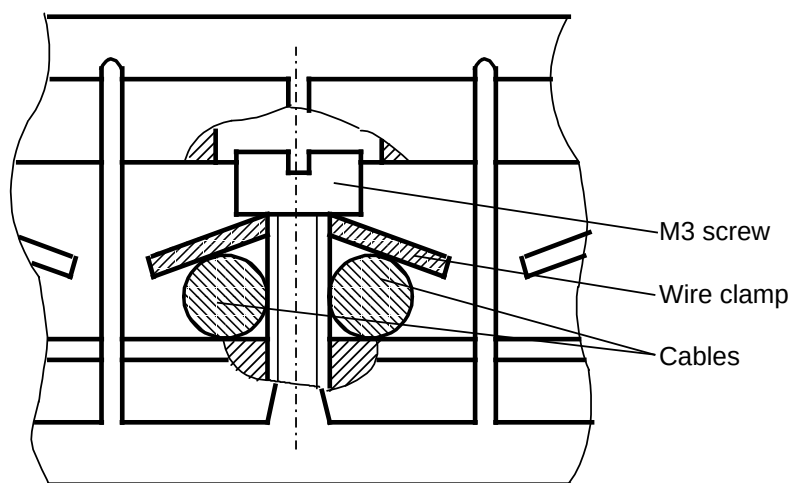


Figure 3-8. SIGUT/Screw-Type Connection Method

Crimp Snap-in Terminals

Bus units using the crimp snap-in connection method have the same height as the CPU.

You can connect stranded conductors with a cross-section of 0.5 to 1.5-mm² to these terminals.

Connecting the Contact to the Terminal Block

Refer to Figure 3-9 and perform the following steps to connect the contact to the terminal block.

1. Remove the module that is plugged into the bus unit.
2. Use a screwdriver to press down on the terminal block (1).
3. Swing the terminal block up. The rear side is now visible (2).
4. Push the contact into the desired opening until the locating spring engages.
- Caution: The spring must point into the slot.
5. Pull lightly on the cable to make certain that the contact is properly engaged.
6. Swing the terminal block back into its original position.
7. Press up on the terminal block until it snaps into position.

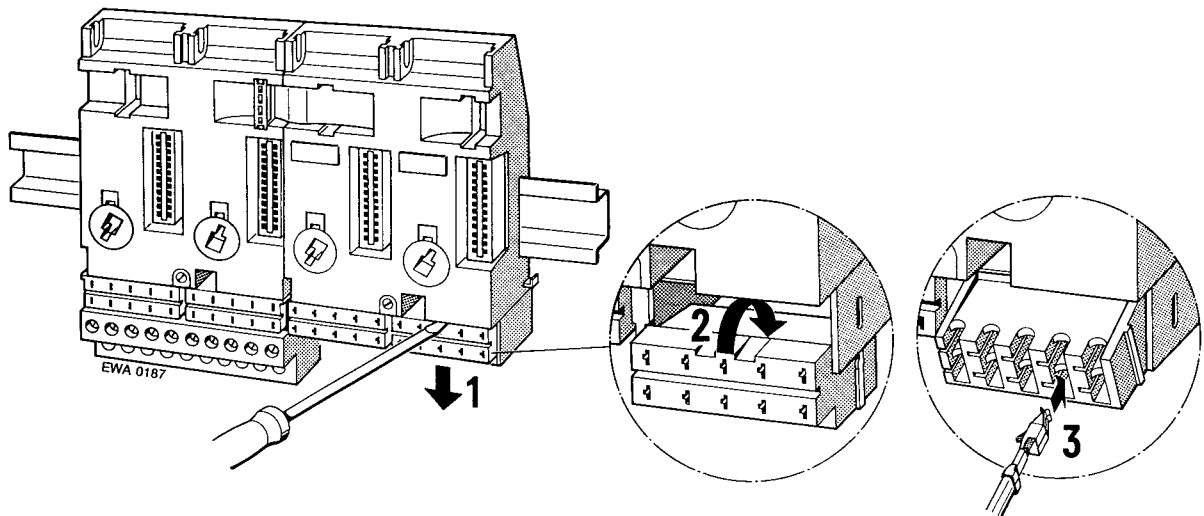


Figure 3-9. Mounting the Crimp Snap-In Terminal

Disconnecting a Terminal

1. Position the terminal block as is shown in Figure 3-10.
2. Insert the extraction tool into the slot beside the terminal so that you can compress the barb.
3. Position the cable in the groove on the extraction tool and pull out both the tool and the cable.
4. Realign the deformed barb so that you can use the terminal again.

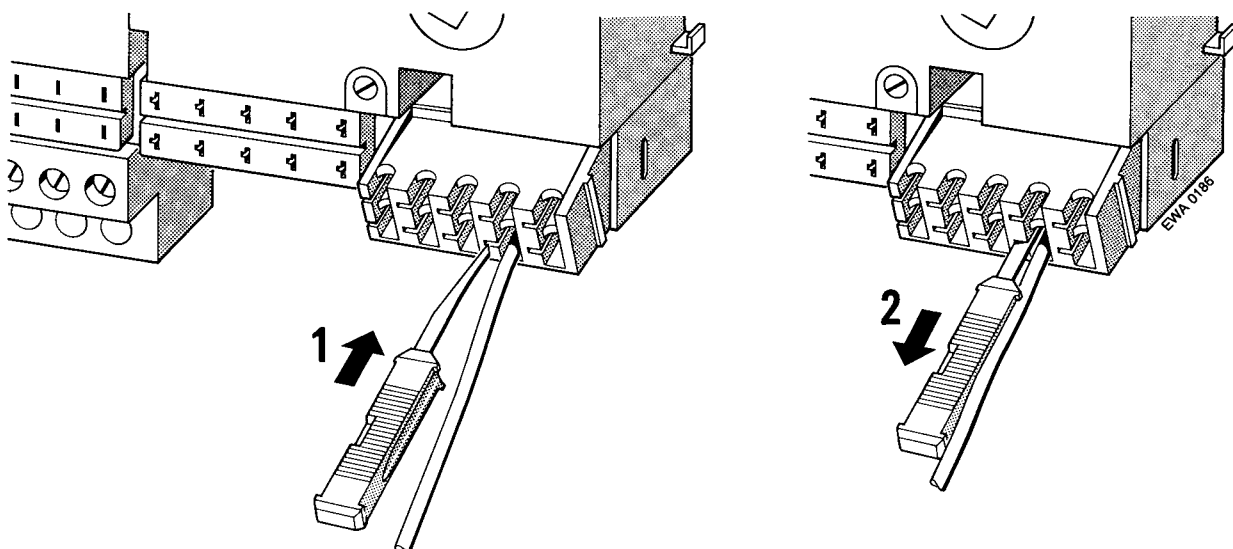


Figure 3-10. Disconnecting a Terminal

3.2.2 Connecting the Power Supply to the S5-100U

Power Supply Module

1. Set the voltage selector to the supply voltage you are using.
2. Swing up the protective cover.
3. Connect the supply cable to terminals L1, N and $\perp$ (see Figure 3-11).
4. Close the protective cover.

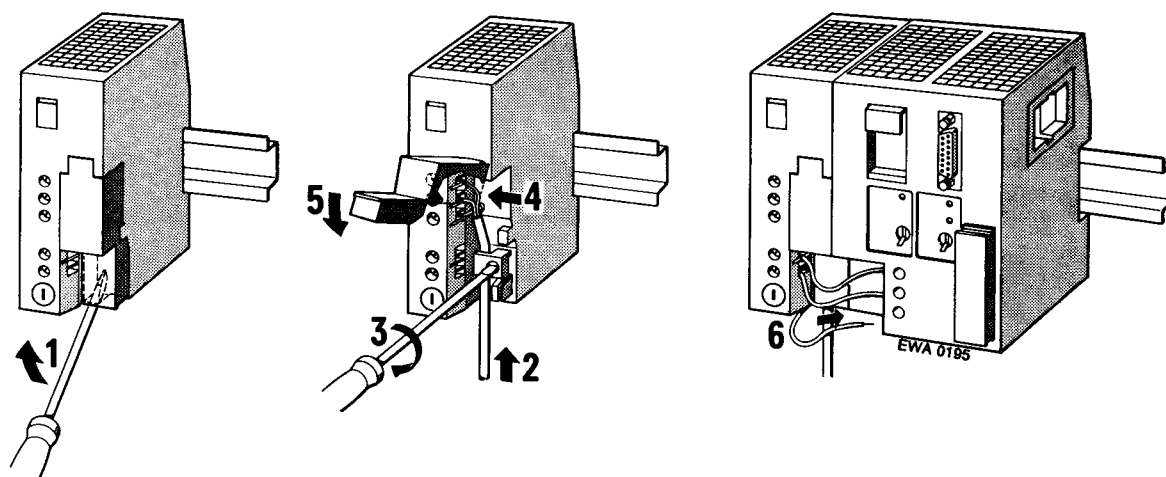


Figure 3-11. Connecting a Power Supply Module and a CPU

115/230 V AC power supply modules can be operated with a load voltage of 120/230 V AC.

CPU

1. Connect the L+ and M terminals of the PS 931 power supply module to the corresponding terminals on the CPU (see Figure 3-23).
2. Connect the $\perp$ terminal of the CPU to the standard mounting rail.

3.3 Electrical Configuration

3.3.1 Electrical Configuration for the S5-100U

Power Supply

The entire control for the S5-100U consists of the following separate electrical circuits:

- Control circuit for the S5-100U (24 V DC)
- Control circuit for the sensors (24 V DC)
- Load circuit for the actuators (24 V DC or 115/230 V AC)

Control Circuit

The power source for the control circuit supplies the CPU, the bus units, the programmer interface, and the internal control circuits for the I/O modules. When the incoming supply is 24 V DC/1 A, the PS 931 power supply module provides an internal supply of +9 V up to a total of 1 A current input to the I/O modules. The grounding spring on the CPU forces the control circuit to be connected to the standard mounting rail. The grounding spring must also be protected from interference. The grounding spring must be grounded.

Load Circuit

The power source for the load circuit supplies the actuators of the process peripherals.

It is suggested that you use one of the following for a 24 V DC power supply:

- The PS 931 power supply module (see Chapter 14)
- A Siemens load power supply from the 6EV1 series (see Appendix D)

If you use load power supplies other than the recommended ones, make certain that the load voltage is in the range of 20 to 30 V (including ripple).

Note

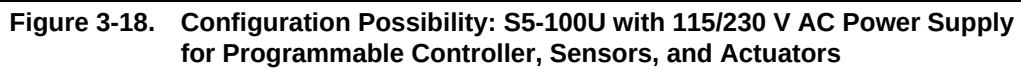
If you use a switched-mode power supply unit to supply floating analog modules and BEROs, then this supply must be filtered through a network.

You can connect several mutually independent load circuits adjacent to each other on a single programmable controller. These connections can either be non-floating or floating (see section 3.3.3).

3.3.2 Electrical Configuration with External I/Os

Figures 3-18, 3-19, and 3-20 display different configuration possibilities. Pay attention to the following points when you design your configuration. The numbers appearing in parentheses in the following points refer to the numbers in Figures 3-18 to 3-20.

- You must have a main switch **(1)** in accordance with VDE 0100 for your S5-100U, the sensors, and the actuators.
- You do not need an additional fuse **(2)** to connect your S5-100U and the load circuit to power if your radial lines are a maximum of 3 meters (9.84 feet) long and are inherently earth-fault proof and short-circuit proof.
- You need a load power supply **(3)** for 24 V DC load circuits.
 - You need a back-up capacitor (rating: 200 μ F per 1 A of load current) if you have non-stabilized load power supplies.
- If you have AC load circuits, galvanic isolation via a transformer **(4)** is recommended.
- You should ground the load circuit at one end. Provide a removable connection **(5)** to the ground conductor on the load power supply (terminal M) or on the isolating transformer.
 - You must provide earth-fault monitoring for any non-grounded load circuits.
- You must separately fuse **(6 and 7)** the load voltage for sensor circuits and for actuator circuits.
- You must connect the standard mounting rail of the S5-100U to the ground conductor through a capacitor **(8)**, to suppress high-frequency noise) for a non-grounded configuration.
- You must have a low-resistance connection between the standard mounting rail and the cabinet's chassis ground **(10)** for a grounded configuration.
- You need a power fuse **(9)** to protect against a short-circuit occurring in the power supply.



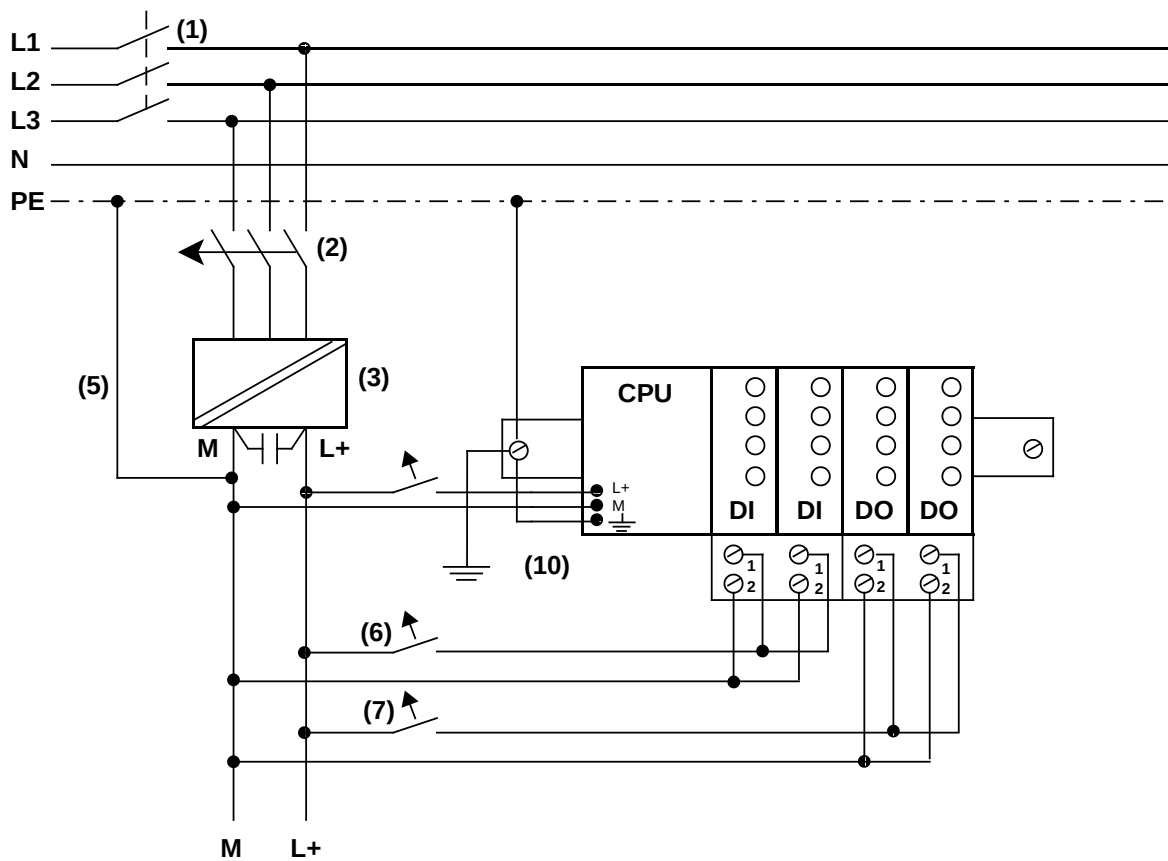


**Figure 3.19 Configuration Possibility: S5-100U with 24 V DC Power Supply
(with Safe Electrical Isolation According to DIN VDE 0160)
for Programmable Controller, Sensors, and Actuators**

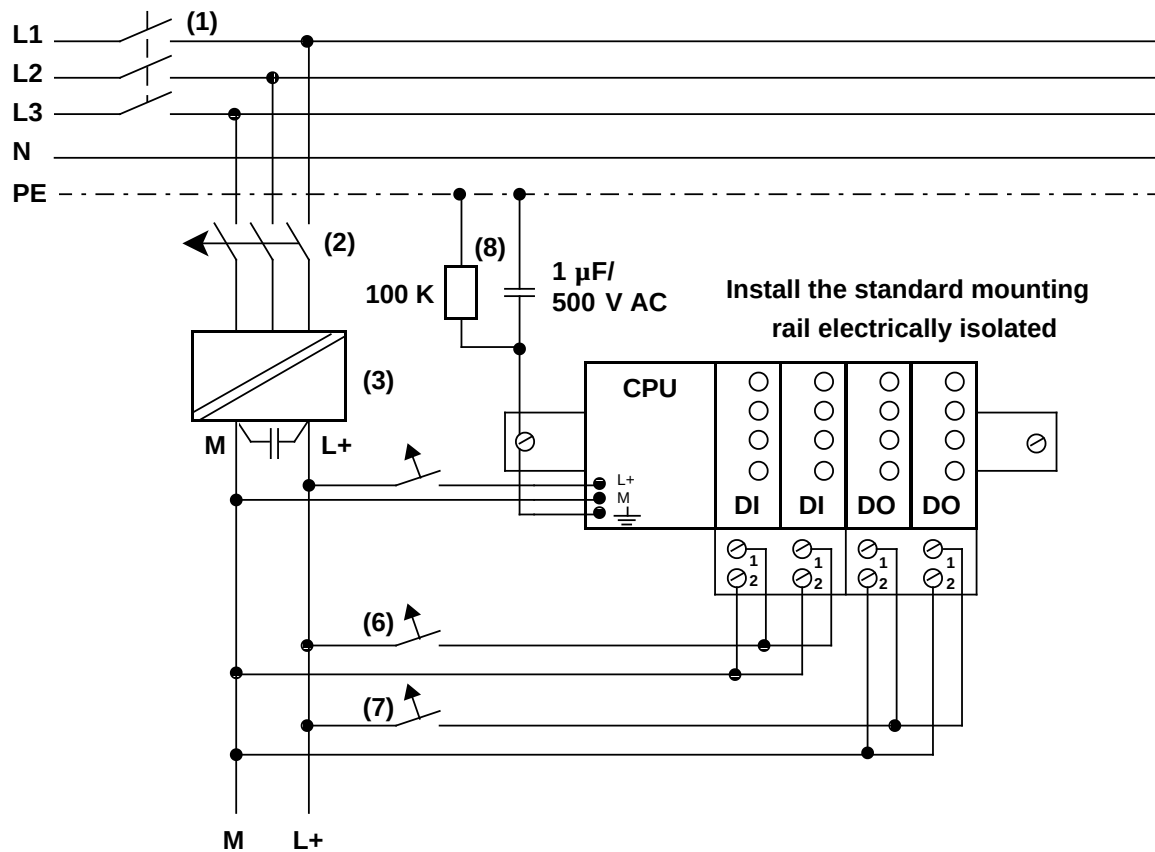


**Figure 3-20. Non-Grounded Operation; 24 V DC Power Supply
(with Safe Electrical Isolation According to DIN VDE 0160)
for Programmable Controller and I/Os**

Interference voltages are discharged to the ground conductor (PE) via a capacitor. You can prevent static charges by connecting a high-ohmic resistor (approx. 100 k / W) parallel to the capacitor.

3.3.3 Non-Floating and Floating Configurations

The S5-100U is powered by its own control circuit. The I/Os are powered by the load circuit.

The circuits can either be connected to the same grounding point (non-floating) or galvanically isolated (floating).

Example of a Non-Floating Connection of Digital Modules

A 24 V DC load circuit has the same chassis grounding as the control circuit of the CPU.

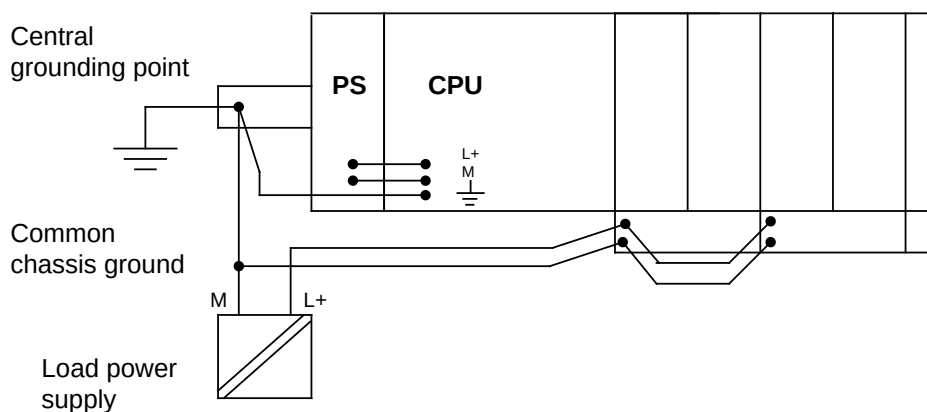


Figure 3-21. Example: Non-Floating Connection of I/Os to the S5-100U

The common chassis grounding connection makes it possible for you to use reasonably priced non-floating I/Os. These modules function according to the following principles.

- Input modules
 - The ground line, line M (control circuit chassis) is the reference potential. A voltage drop V_1 on line affects the input signal level V_i .
- Output modules
 - Terminal 2 (M) of the terminal block is the reference potential. A voltage drop V_2 on the line raises the chassis potential of the output driver and thus reduces the resulting control voltage V_{CV} .

Figure 3-22 shows a simplified connection of the S5-100U with a non-floating external I/O.

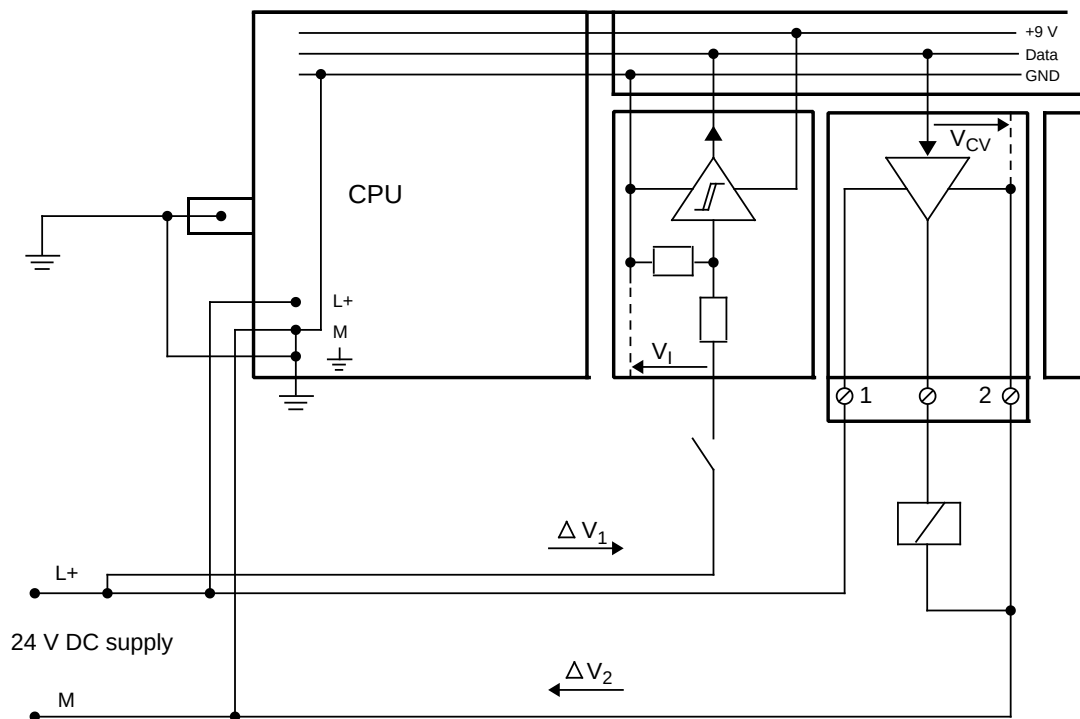


Figure 3-22. Simplified Representation of a Non-Floating I/O Connection

When you have a non-floating configuration, you must make certain that the voltage drop on cables does not exceed 1 V. If 1 V is exceeded, the reference potentials could change and the modules could malfunction.



Warning

If you use non-floating I/O modules, you must provide an external connection between the chassis ground of the non-floating I/O module and the chassis ground of the CPU.

Example of a Floating Configuration with Digital Modules

Floating configuration is required in the following situations.

- When you need to increase interference immunity in the load circuits
- When load circuits cannot be interconnected
- When you have AC load circuits

If you have a floating configuration, the PLC's control circuit and the load circuit must be galvanically isolated.

Figure 3-23 shows a simplified connection of galvanically isolated I/Os.

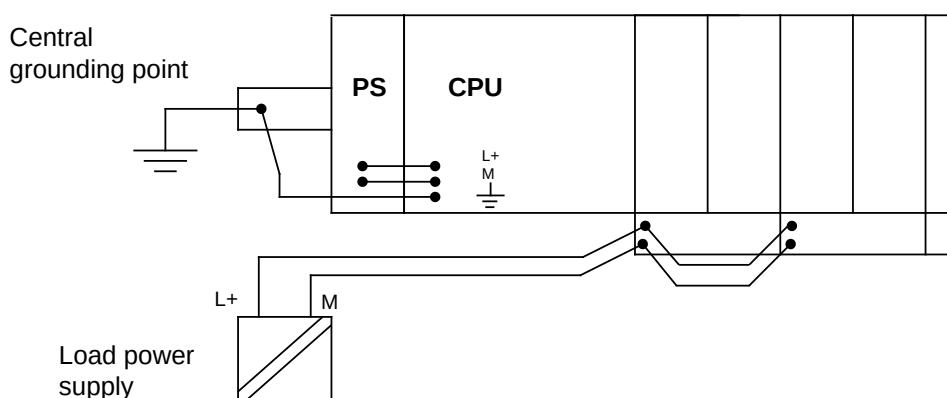


Figure 3-23. Simplified Representation of a Galvanically Isolated Connection of the I/Os to the S5-100U

Figure 3-24 shows a simplified schematic for the connection of floating I/O modules.

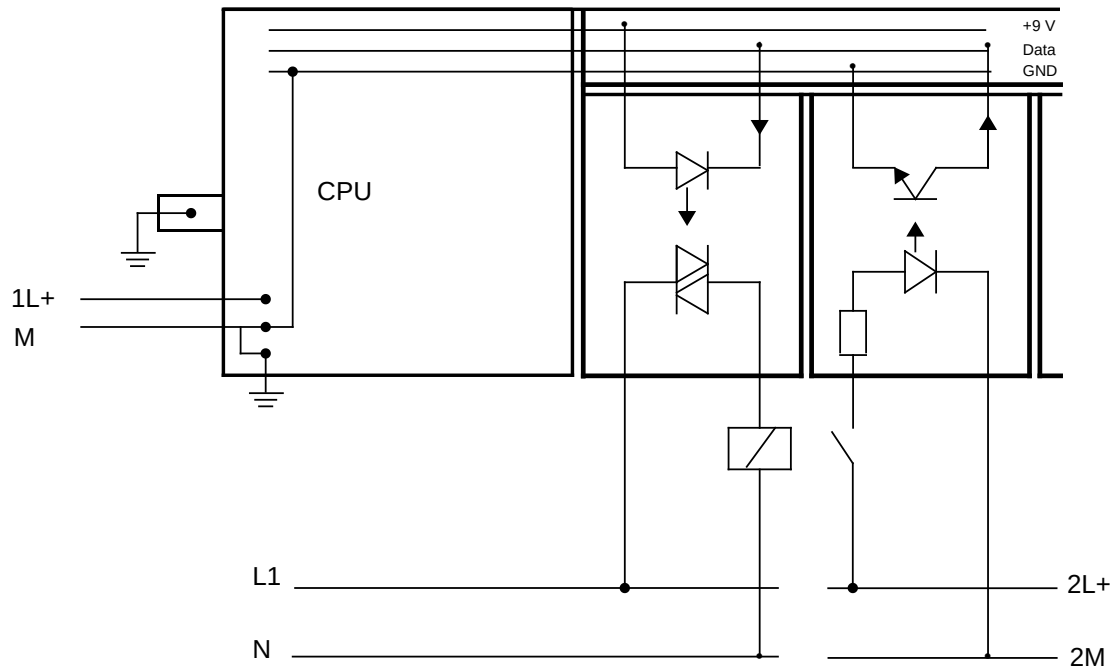


Figure 3-24. A Simplified Representation of a Floating I/O Connection

3.4 Wiring Arrangement, Shielding and Measures against Electromagnetic Interference

This section describes the wiring arrangements for bus cables, signal cables, and power supply cables that guarantee the electromagnetic compatibility (EMC) of your installation.

3.4.1 Running Cables Inside and Outside a Cabinet

Dividing the lines into the following groups and running the groups separately will help you to achieve electromagnetic compatibility (EMC).

Group A: Shielded bus and data lines (for programmer, OP, printer, SINEC L1, Profibus, Industrial Ethernet, etc.)
 Shielded analog lines
 Unshielded lines for DC voltage 60 V
 Unshielded lines for AC voltage 25 V
 Coaxial lines for monitors

Group B: Unshielded lines for DC voltage > 60 V and 400 V
 Unshielded lines for AC voltage > 25 V and 400 V

Group C: Unshielded lines for AC voltage > 400 V

You can use the following table to see the conditions which apply to the running of the various combinations of line groups.

Table 3-3. Rules for Common Running of Lines

	Group A	Group B	Group C
Group A			
Group B			
Group C			

Legend for table:

Lines can be run in common bundles or cable ducts

Lines must be run in separate bundles or cable ducts (without minimum distance)

Inside cabinets, lines must be run in separate bundles or cable ducts and outside cabinets but inside buildings, lines must be run on separate cable trays with a gap of at least of 10 cm between lines.

3.4.2 Running Cables Outside Buildings

Run lines outside buildings where possible in metal cable supports. Connect the abutting surfaces of the cable supports galvanically with each other and ground the cable supports.

When you run cables outdoors, you must observe the regulations governing lightning protection and grounding. Note the general guidelines:

Lightning Protection

If cables and lines for SIMATIC S5 devices are to be run outside buildings, you must take measures to ensure internal and external lightning protection.

Outside buildings run your cables either

- In metal conduits grounded at both ends
or
- In steel-reinforced concrete cable channels

Protect signal lines from overvoltage by using:

- Varistors
or
- Lightning arresters filled with inert gas

Install these protective elements at the point where the cable enters the building.

Note

Lightning protection measures always require an individual assessment of the entire system. If you have any questions, please consult your local Siemens office or any company specializing in lightning protection.

Grounding

Make certain that you have sufficient equipotential bonding between the devices.

3.4.3 Equipotential Bonding

Potential differences may occur between separate sections of the system if

- Programmable controllers and I/Os are connected via non-floating interface modules or
- Cables are shielded at both ends but grounded via different sections of the system.

Potential differences may be caused, for instance, by differences in the system input voltage. These differences must be reduced by means of equipotential bonding conductors to ensure proper functioning of the electronic components installed.

Note the following for equipotential bonding:

- A low impedance of the equipotential bonding conductor makes equipotential bonding more efficient.
- If any shielded signal cables connected to earth/protective earth at both ends are laid between the system sections concerned, the impedance of the additional equipotential bonding conductor must not exceed 10 % of the shield impedance.
- The cross-section of the equipotential bonding conductor must be matched to the maximum compensating currents. The following cross-sections are recommendable:
 - 16 mm² copper wire for equipotential bonding line up to 200 m (656.2 ft).
 - 25 mm² copper wire for equipotential bonding line over 200 m (656.2 ft).
- Use equipotential bonding conductors made of copper or zinc-plated steel. Equipotential bonding conductors are to be connected to earth/protective earth via a large contact area and to be protected against corrosion.
- The equipotential bonding conductor should be laid in such a way as to achieve a relatively small contact area between equipotential bonding conductor and signal cables (see Figure 3-25).

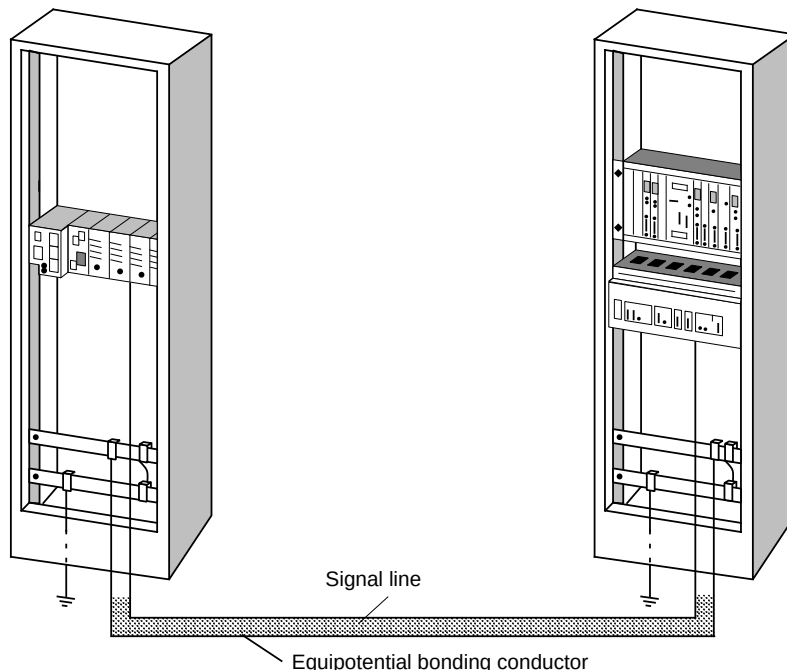


Figure 3-25. Laying Equipotential Bonding Conductor and Signal Cable

3.4.4 Shielding Cables

Shielding is a measure to weaken (attenuate) magnetic, electric or electromagnetic interference fields.

Interference currents on cable shields are discharged to ground over the shield bar which has a conductive connection to the housing. So that these interference currents do not become a source of noise in themselves, a low-resistance connection to the protective conductor is of special importance.

Use only cables with shield braiding if possible. The effectiveness of the shield should be more than 80%. Avoid cables with foil shielding since the foil can easily be damaged by tension and pressure; this leads to a reduction in the shielding effect.

As a rule, you should always shield cables at both ends. Only shielding at both ends provides good suppression in the high frequency range.

As an exception only, you can connect the shielding at one end. However, this attenuates only the lower frequencies. Shielding at one end can be of advantage in the following cases:

- If you cannot run an equipotential bonding conductor
- If you are transmitting analog signals (e.g. a few microvolts or microamps)
- If you are using foil shields (static shields).

Always use metallic or metalized connectors for data lines for serial connections. Secure the shield of the data line at the connector housing. Do **not** connect the shield to the PIN1 of the connector strip!

In the case of stationary operation, you are recommended to insulate the shielded cable without interrupt and to connect it to the shield/protective ground bar.

Note

If there are potential differences between the earthing points, a compensating current can flow over the shielding that is connected at both ends. For this reason, connect an additional equipotential bonding conductor.

Note the following when connecting the cable shield:

- Use metal cable clamps for fixing the braided shield. The clamps have to enclose the shield over a large area and make good contact (see Figure 3-26).
- Connect the shield to a shield bar immediately at the point where the cable enters the cabinet. Route the shield to the module; do **not** connect it to the module.

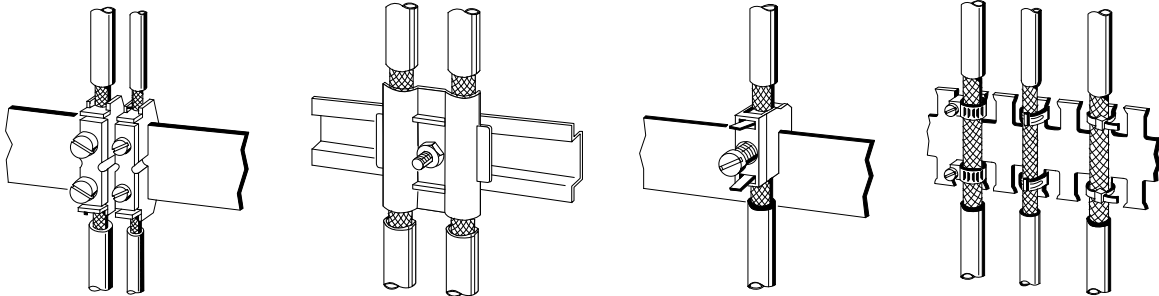


Figure 3-26. Fixing Shielded Cables with Various Types of Cable Clamps

3.4.5 Special Measures for Interference-Free Operation

Arc Suppression Elements For Inductive Circuits

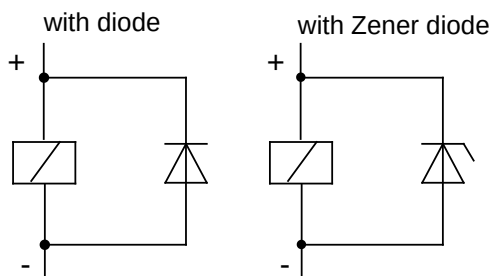
Normally, inductive circuits (e.g. contactor or relay coils) energized by SIMATIC S5 do not require to be provided with external arc suppressing elements since the necessary suppressing elements are already integrated on the modules.

It only becomes necessary to provide arc suppressing elements for inductive circuits in the following cases:

- If SIMATIC S5 output circuits can be switched off by additionally inserted contactors (e.g. relay contactors for EMERGENCY OFF). In such a case, the integral suppressing elements on the modules become ineffective.
- If the inductive circuits are **not** energized by SIMATIC S5.

You can use free-wheeling diodes, varistors or RC elements for wiring inductive circuits.

Wiring coils activated by direct current



Wiring coils activated by alternating current

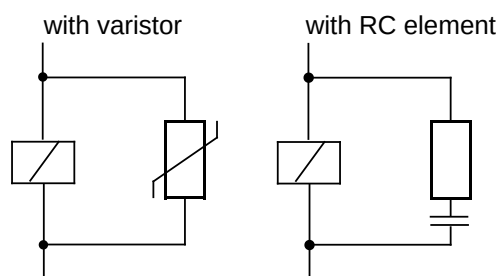


Figure 3-27. Wiring Coils

Mains Connection for Programmers

Provide a power connection for a programmer in each cabinet. The plug must be supplied from the distribution line to which the protective ground for the cabinet is connected.

Cabinet Lighting

Use, for example, LINESTRA® lamps for cabinet lighting. Avoid the use of fluorescent lamps since these generate interference fields. If you cannot do without fluorescent lamps, you must take the measures shown in Figure 3.28.

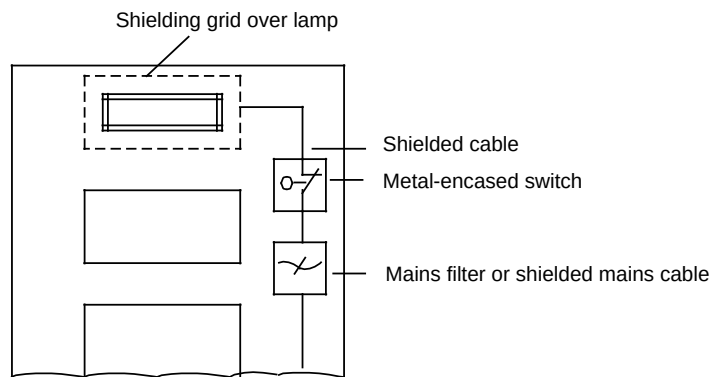
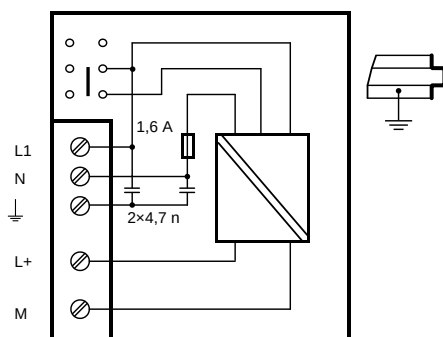
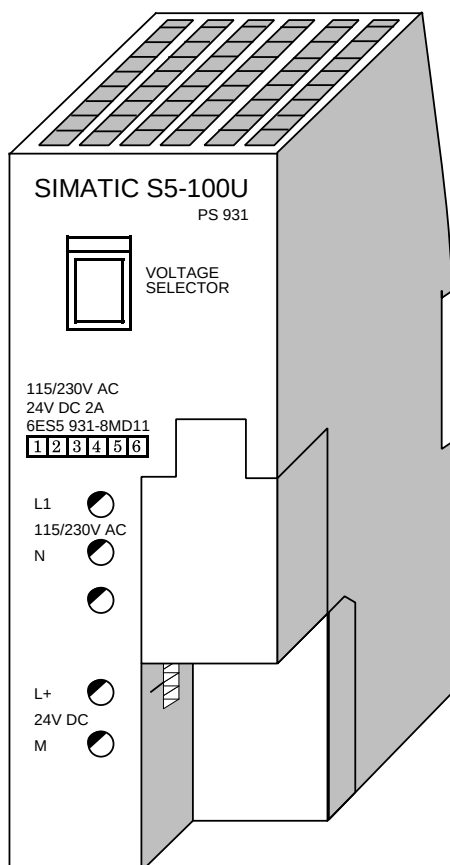


Figure 3-28. Measures for Suppressing Interference from Fluorescent Lamps in the Cabinet

Power Supply Module PS 931 115/230 V AC; 24 V DC/2 A

(6ES5 931-8MD11)



Technical specifications

Input voltage		115/230 V AC
- rated value		92 to 132 V/
- permiss. range		187 to 264 V
Line frequency		50/60 Hz
- rated value		47 to 63 Hz
- permiss. range		
Input current at 115/230 V		
- rated value		0.9/0.6 A
Efficiency	approx.	85%
Power consumption	approx.	60 W
Output voltage		24 V DC
- rated value		22.8 to 25.2 V
- permiss. range		yes
- open-circuit voltage		
Output current		2 A
- rated value		
Permiss. ambient temperature of PLC		0 to 60 °C
- horizontal arrangement		(32 to 140 °F)
- vertical arrangement		0 to 40 °C
		(32 to 104 °F)
Buffering of line voltage dips		20 ms at 187 V/2 A
- duration of voltage dips		1 s
- repetition rate		
Short-circuit protection		power limiting, electronic cutoff, non-latching
Fault LED		no
Protection class		class 1
Galvanic isolation		yes
Conductor cross-sectional area		
- stranded *		2×0.5 to 1.5 mm ²
- solid		2×0.5 to 2.5 mm ²
Insulation rating		VDE 0160 and VDE 0805 (transformer)
Rated insulation voltage (+24 V to L1)		250 V AC
- insulation group		2×B
- tested with		2830 V AC
Dimensions		
W×H×D in mm		45.4×135×120
in.		1.8 x 5.3 x 4.7
Power loss of the module	typ.	8.5 W
Weight	approx.	500 g (1.1 lbs.)

* with core end sleeves

D Information for Ordering Accessories

	Order Numbers
Standard 35 mm Mounting Rail	
for 19-in. cabinets, length 483 mm	6ES5 710-8MA11
for 600 mm cabinets, length 530 mm	6ES5 710-8MA21
for 900 mm cabinets, length 830 mm	6ES5 710-8MA31
Length 2000 mm, without holes	6ES5 710-8MA41
Power Supply Modules	
Power supply module PS 930	
115/230 V AC; 1 A	6ES5 930-8MD11
Replacement fuse (3A extra-fast)	6ES5 980-3BC61
Power supply module PS 931	
115/230 V AC; 24 V DC; 2 A	6ES5 931-8MD11
(with electronic circuit protection)	
Power supply module PS 935	
24 V DC; 9 V DC, 2.5 A	6ES5 935-8ME11
Load power supply 6EW1	
115/230 V AC; 24 V DC; 4 A	6EW1 380-1AB
115/230 V AC; 24 V DC; 10 A	6EW1 380-4AB01
Bus Units	
Bus unit with SIGUT screw-type terminals	6ES5 700-8MA11
Bus unit with crimp snap-in terminals	6ES5 700-8MA22
Interrupt bus unit, with SIGUT screw-type terminals	6ES5 700-8MB11
Interrupt bus unit with crimp snap-in terminals	6ES5 700-8MB21
Accessories	
Extracting tool	
for crimp snap-in connections	6ES5 497-8MA11
Crimp snap-in contacts, 250 pieces	6XX3 070
Crimping tool	
for attaching the crimp contacts	6XX3 071
Interface Modules	
IM 315 interface module	6ES5 315-8MA11
IM 316 interface module	6ES5 316-8MA12
- Cable connectors (0.5 m/1.6 ft.)	6ES5 712-8AF00
- Cable connectors (2.5 m/8.2 ft.)	6ES5 712-8BC50
- Cable connectors (5.0 m/16.5 ft.)	6ES5 712-8BF00
- Cable connectors (10 m/33 ft.)	6ES5 712-8CB00