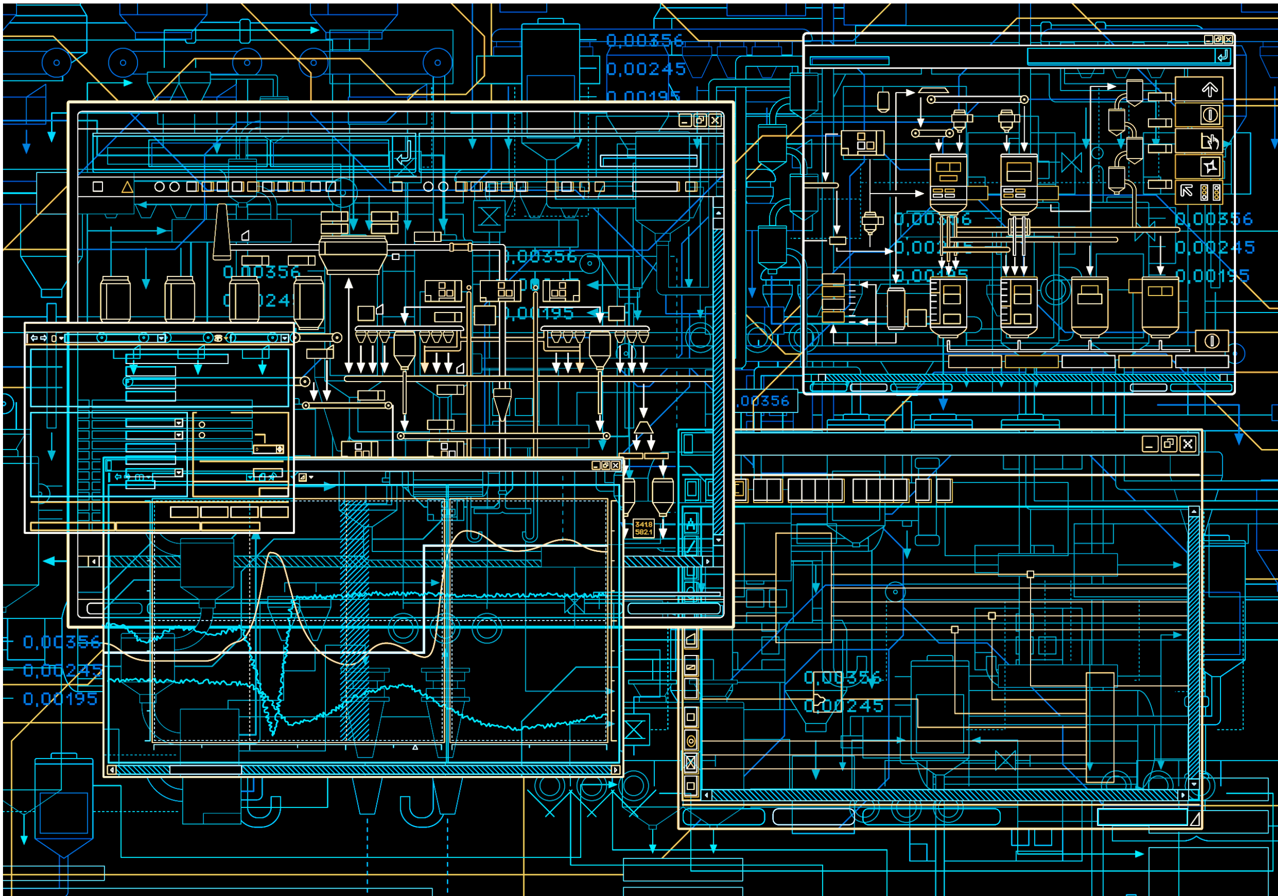

S200 I/O

Hardware

Power and productivity
for a better world™

S200 I/O

Hardware

NOTICE

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Safety Summary

E S D	**Electrostatic Sensitive Device** Devices labeled with this symbol require special handling precautions as described in the installation section.

GENERAL WARNINGS	**Equipment Environment** All components, whether in transportation, operation or storage, must be in a noncorrosive environment. **Electrical Shock Hazard During Maintenance** Disconnect power or take precautions to insure that contact with energized parts is avoided when servicing.

This section is mandatory reading for anyone planning to use the control system.

Be Careful – Prevent Accidents and Protect Valuable Equipment

A control system is a general tool which can be used in various processes. Responsibility for attaining and maintaining a reasonable level of safety must therefore rest with the people who engineer, operate and maintain the equipment. They must have intimate knowledge of the functions and inherent safety risks of the processes involved, and the imaginative power to anticipate situations in which accidents may occur.

Special attention should be paid to situations in which the mains supply is switched on or off, units are fitted or removed, cables are connected or disconnected, and units are reset or switched to manual operation. If possible, the process should be shut down before such actions are taken.

The level of safety can be improved considerably by taking steps to bring the process to a safe state when power supplies, communication links or parts of the control system fail. Such steps may, for instance, imply the installation of valves or relays which are spring-returned to a safe position.

Before Replacing I/O Units

Although it is possible to remove and insert I/O system units, except adapters and terminal base units, under system power, it is highly recommended that the process side power be disconnected before removing or inserting an I/O unit to avoid hazardous conditions.

S200L I/O units must not be removed or inserted under system power, as hazardous conditions may occur or units may be damaged.

Maintenance

In order to avoid long shutdowns, it is advisable to keep spares of components in stock.

Always make regular backup copies of the application program.

Operating Environment

Before the system is brought on-line, find out which environmental conditions are applicable. The following points are important.

- The product must not be exposed to conditions exceeding the stated values in the technical specifications.
- The product must not be used in an environment where it is exposed to strong electrical interference. Electrical machines can produce interference which exceeds the permitted levels for the equipment, e.g. during repair work.
- All products must be handled with appropriate precautions with regard to electrostatic damage.

Important Software

- Use the system's fault-monitoring facility to prevent mishaps and accidents.
- Check possible consequences before executing any changes.

Important Hardware

Do not disconnect the power supply to a system which is in operation.

Signal Noise Due to Cables

Cables which might cause electrical interference (e.g. power-line cables) must not be installed close to bus cables carrying fast digital signals. Ensure a minimum distance of 100 mm (4 inches) between them inside cabinets.

Hazardous Electrical Supplies

Operations in which personnel may come into contact with high-voltage supplies should only be performed by those trained in the maintenance of electrical equipment and who are fully aware of the risks involved.

Mandatory Installation Instructions

M

Mandatory installation instructions in this document are marked with the symbol . Such instructions must be followed to fulfil the EMC directive.

About This Book

General

This manual is intended for those involved in the configuration, installation and maintenance of the S200 I/O system.

Safety

It is mandatory for all users of the control system to read the section *Safety Summary* before taking any action.

How to Read the Manual

The section *Introduction* provides an overview of the I/O system.

The section *System Configuration* is intended for those who will configure an I/O system. Alternative configurations and the methods for calculation of power consumption are discussed.

The sections *General Installation Instructions* and *Mounting Instructions*, give a step-by-step explanation of how to mount the I/O components and connect external cables to the system.

The section *Functional Description* describes the function and connections of the I/O units.

The last section *Maintenance and Service* is intended for maintenance and service engineers.

Appendices provide technical specifications, order codes, recommended components, mounting dimensions and Standards.

Use of Warning, Caution, Information, and Tip Icons

This publication includes **Warning**, **Caution**, and **Information** where appropriate to point out safety related or other important information. It also includes **Tip** to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

Electrical warning icon indicates the presence of a hazard which could result in *electrical shock.*

Warning icon indicates the presence of a hazard which could result in *personal injury.*

Caution icon indicates important information or warning related to the concept disussed in the text. It might indicate the presence of a hazard which could result in *corruption of software or damage to equipment/property.*

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

Document Conventions

The following conventions are used for the presentation of material:

- The words in names of screen elements (for example, the title in the title bar of a window, the label for a field of a dialog box) are initially capitalized.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the ENTER key.
- Lowercase letters are used for the name of a keyboard key that is not labeled on the keyboard. For example, the **space bar**, **comma key**, and so on.
- Press CTRL+C indicates that you must hold down the CTRL key while pressing the C key (to copy a selected object in this case).
- Press **ESC E C** indicates that you press and release each key in sequence (to copy a selected object in this case).
- The names of push and toggle buttons are boldfaced. For example, click **OK**.
- The names of menus and menu items are boldfaced. For example, the **File** menu.
  - The following convention is used for menu operations: MenuName > MenuItem > CascadedMenuItem. For example: select **File** > **New** > **Type**.
  - The **Start** menu name always refers to the **Start** menu on the Windows Task Bar.
- System prompts/messages are shown in the Courier font, and user responses/input are in the boldfaced Courier font. For example, if you enter a value out of range, the following message is displayed:

  `Entered value is not valid. The value must be 0 to30.`

  You may be told to enter the string TIC132 in a field. The string is shown as follows in the procedure:

  `TIC132`

  Variables are shown using lowercase letters.

  sequence name

Applicable Specifications

European Union Directive Compliance

Units mentioned in this document for which product or packing is marked with the CE logo comply with the electromagnetic compatibility directive 89/336/EEC and the low-voltage directive 73/23/EEC. See Appendix E, Directive Considerations on page 351.

UL Listing

Units mentioned in this document are UL listed if product or packing is marked with the UL logo. indicates UL approval for the USA, and c US also for Canada. The logo c indicates UL approval for Canada only.

The applied standard is UL508, Industrial Control Equipment. Units approved for use in hazardous locations also comply with the standard UL1604. To fulfill the UL requirements for hazardous locations, the instructions in Appendix D, Standards on page 347 must be followed.

CSA Certification

Units mentioned in this document are CSA certified if product or packing is marked with the ® logo. The applied standard is C22.2, No. 142-M1987.

Units approved for use in hazardous locations also comply with the standard C22.2, No. 213-M1987. To fulfill the CSA requirements for hazardous locations, the instructions in Appendix D, Standards on page 347 must be followed.

Section 1 Introduction

Product Overview

S200 I/O is a flexible, modular I/O system for central and distributed applications. The S200 I/O units are compatible with the S200L I/O units and can be mixed in any order on the same DIN rail.

The S200 I/O system features:

- Replacement under system power
- CE approvement
- Software configurable function
- Mechanical coding for safe replacement
- Safety function on outputs in remote configuration
- Variety of termination options
- The same I/O units in central and remote configurations
- Compatible with S200L I/O

The S200 I/O system is to be used in industrial environments and meets the EMC directive 89/336/EEC and low-voltage directive LVD 73/23/EEC.

Note. This manual describes the general facilities of the S200 I/O system. The use of the I/O units and their functionality with controllers is dependent on certain system versions and configurations. The setting of filter constants can, for instance be limited in some systems. Refer to relevant manuals or data sheets.

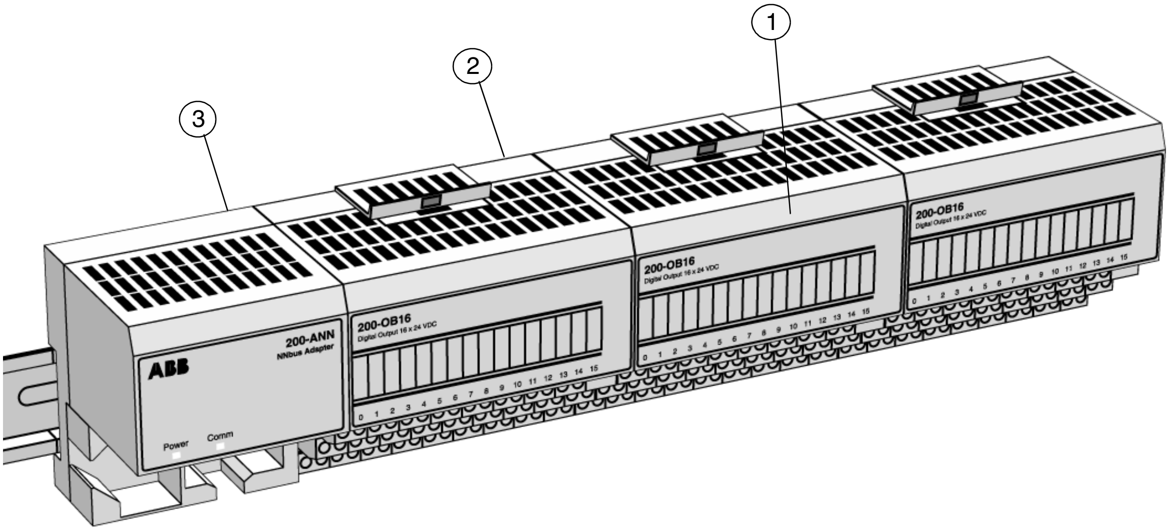
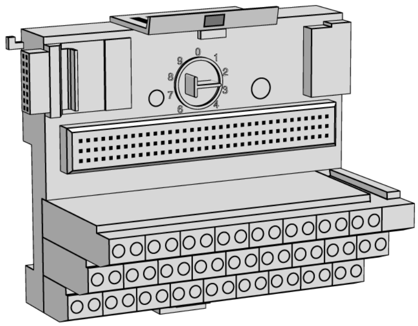


Figure 1. S200 I/O system units (1) mounted on terminal base units (2) and connected to a bus adapter (3).

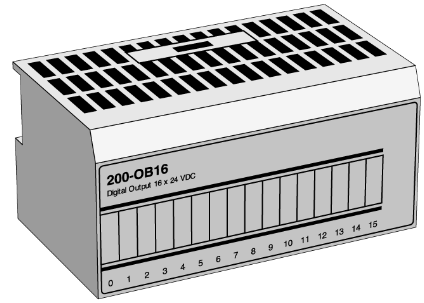
The I/O Components

The I/O system is a compact modular system built around small terminal base units which can be connected together to the desired system size. There is a variety of termination options, see Terminal Base Unit Overview on page 57.

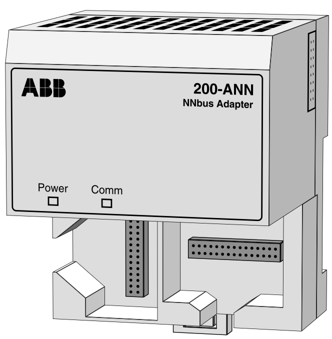
The figure below shows the basic hardware of the I/O system.



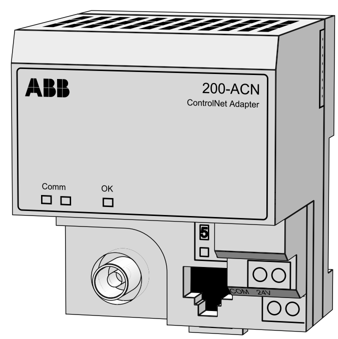
Terminal base units:
200-TB3, 200-TB2, 200-TBN etc.



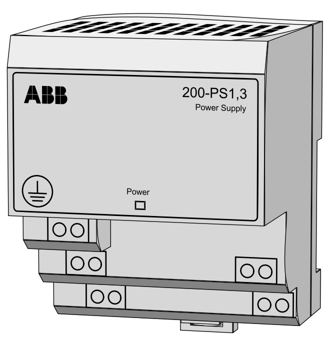
I/O units:
200-IB16, 200-OB16, 200-IE8, etc.



Adapter for central I/O:
200-ANN, 200-AIO



Adapters for remote I/O:
200-ACN, 200-APB12



Power supply:
200-PS1.3

Figure 2. The basic components of the I/O system.

Section 2 System Configuration

This section describes how the I/O units are incorporated into a control system and how the power consumption can be calculated. To obtain a total view of the I/O system configuration, also read Section 4, Mounting Instructions on page 45.

I/O System Connection

The I/O system can be locally or remotely connected to the controller using different types of adapters.

The serial I/O bus is identical for this I/O system and the S200L I/O system, they may be mounted in any order.

Refer to Section 4, Mounting Instructions on page 45.

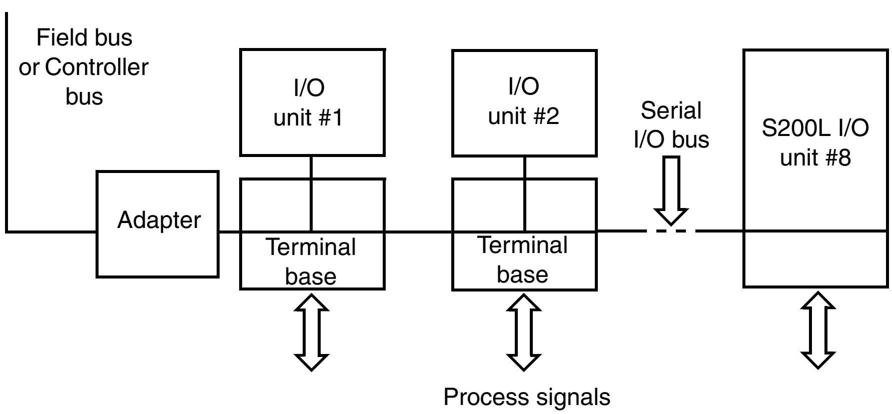


Figure 3. The I/O system can be connected to the controller via different types of adapter.

Refer to the manual *S200L Hardware and Installation* regarding S200L I/O units.

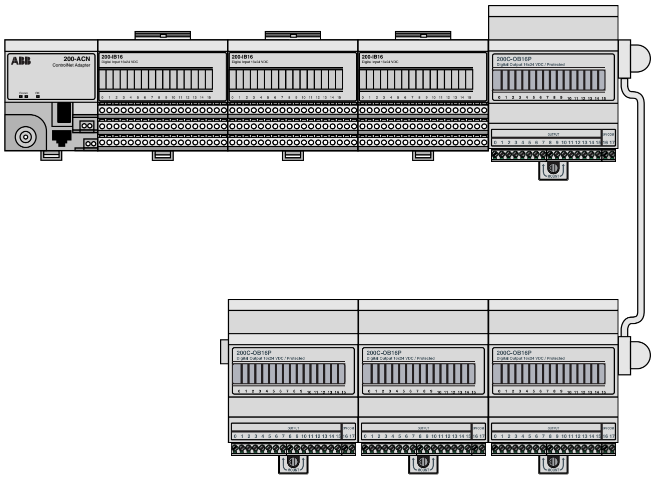


Figure 4. The I/O system with adapter and mixed I/O units in two rows.

Terminal Base and I/O Unit Configuration

The terminal base units can be mounted horizontally or vertically on a standard DIN rail or mounting profile. Maximum 8 terminal base units may be mounted and connected to the adapter. The adapter must be placed on the left side of the terminal base units, see Figure 5 below.

When configuring the I/O system there must be no empty terminal base units due to electrostatic discharge (ESD) considerations. Use the Dummy unit 200-DUTB to fill empty locations.

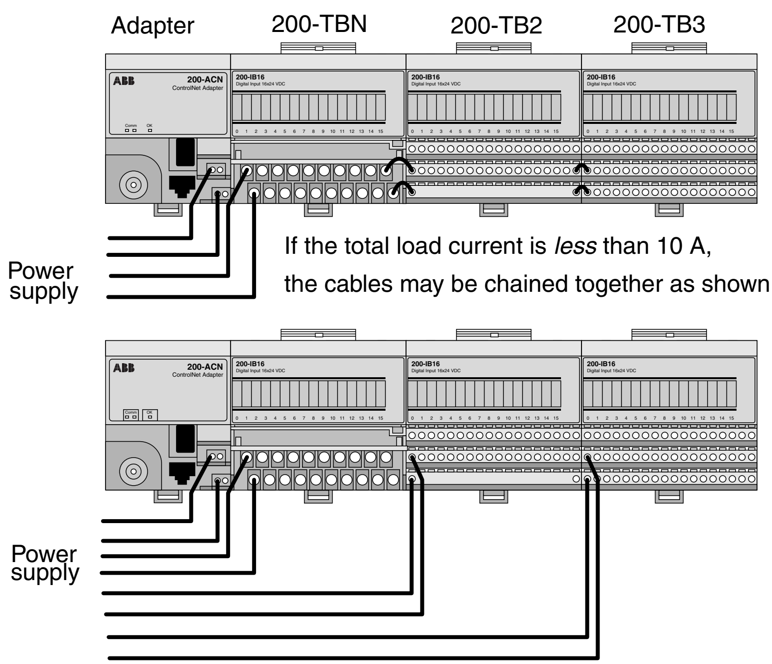
When using a DIN rail, the cable 200-CE1 (200-CE3) must be mounted before any terminal bases, adapters or I/O units are installed, see Mounting Cable 200-CE1 or 200-CE3 on page 53.

Do not use extension cables to connect an adapter to the first I/O unit in the row.

Connecting the Power Supply Cables

Connect a 24 V DC power supply to the I/O units requiring 24 V DC. Digital and analog I/O units should always be separated by a power-line filter, see Section 3, General Installation Instructions on page 35.

Separate wires can be used for each I/O unit or the wires can be chained if the total current for all I/O units does not exceed the maximum current for the cables or screw terminals. See figure.



When the total load current is greater than 10 A, the units must be powered by wiring each unit individually to the power supply.

Figure 5. Chained and individual power supply.

Using 200-PS1.3 to Supply the Remote I/O System

If 200-PS1.3 is used to supply the remote I/O system the following applies.

Connecting the power supply cables

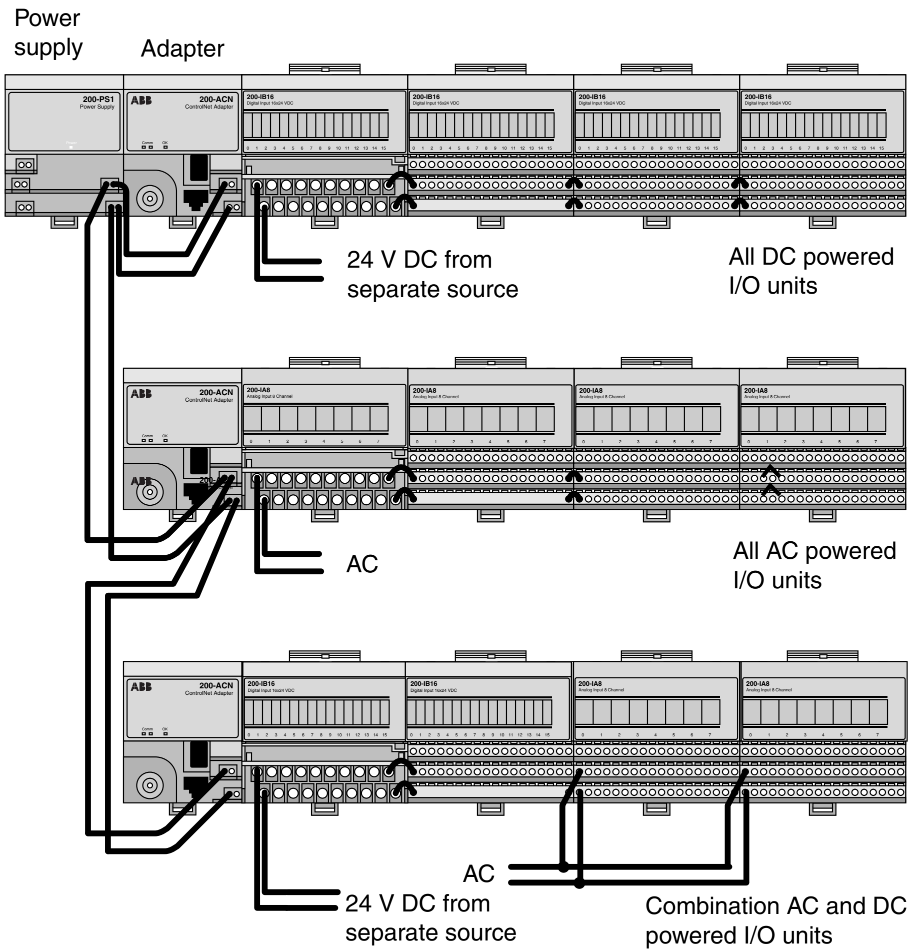


Figure 6. Example of using a 200-PS1.3 Power supply to power 3 adapters in a remote I/O system.

The 200-PS1.3 power supply provides sufficient 24 V DC power to operate up to 4 adapter units. Do not attempt to operate an entire I/O system with this power supply.

Calculating the 24 V Supply to the I/O System

To calculate the total current required from the 24 V I/O supply, both the current required by the I/O units themselves and that required by the inputs/outputs must be considered. For the digital inputs the maximum number of simultaneous on-state inputs powered from the supply must be known. For analog and digital outputs the total simultaneous output current must be known. Refer to Appendix A, Technical Specifications on page 261 for the basic data.

See Power Installation on page 36.

Example

In this example, a maximum of 32 of the 48 digital outputs can be on and the output load is 0.1 A per channel.

Number of I/O units used: 3 200-IB16, 3 200-OB16, 1 200-IE8 and 1 200-OE4
Number of adapters used: 1 200-ACN

3 200-IB16 require 3 * 16 inputs * 0.008 A =	0.38 A
3 200-OB16. 32 on-state outputs require 3 * 0.05 + 32 * 0.1 A =	3.35 A
1 200-IE8 requires 1 * 0.06 A =	0.06 A
1 200-OE4 requires 1*0.07 A =	0.07 A
1 200-ACN requires 1*0.4 A =	0.4 A
Total current required from 24 V I/O supply:	4.26 A

This means that the 24 V DC power supply should be able to deliver at least 5 A.

Section 3 General Installation Instructions

Mandatory installation instructions in this section are marked with the symbol Ⓜ. Such instructions must be followed to fulfil the requirements of the EMC directive.

General cabinet installation instructions are given in the manual *Installation Manual – Cabinet*.

Installation Precautions

A system installed according to the instructions in this document meets the company's environmental specifications for industrial equipment. These specifications concern electric, climatic and mechanical environment.

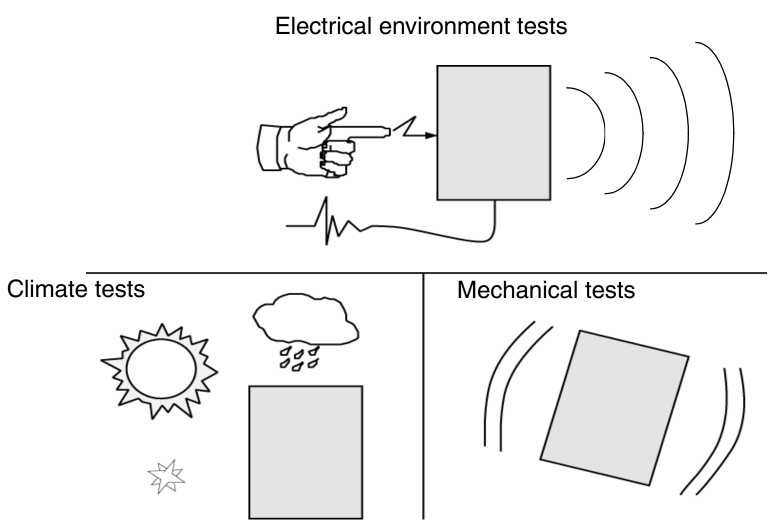


Figure 7. A system installed according to the instructions in this document is prepared to meet the ABB Automation environmental specifications for industrial equipment.

By taking the proper precautions, control systems can operate safely and reliably in normal industrial environments. Avoid locating equipment

- where the ambient temperature is outside the range specified in the Technical Specifications
- where the relative humidity exceeds the range specified in the Technical Specifications
- where condensation may occur following sudden temperature changes
- where it may be exposed to high electric or magnetic fields
- where it may be exposed to corrosive or inflammable gases
- where it may be exposed to dust, conductive particles, oil mist or organic solutions
- where it may be exposed to direct sunlight
- where it may be exposed to vibration or mechanical shock
- where it may be exposed to water
- close to powerful high-frequency sources. Possible problems may be solved by means of external filters.

Do not use communication radios and cellular phones within one meter of the control system, as there is a risk that industrial interference levels may be exceeded, which may disturb the system.

Power Installation

Overvoltage Protection

Cables running outdoors may require overvoltage protection, see Devices for Extended Noise Suppression on page 334. Be sure to use the correct device for each cable, otherwise the protection device may not work properly.

Contactors

Avoid mounting contactors and other disturbing equipment in the same cabinet as the control system. If this should be necessary, suppress interference (by snubbers, tranzorbs, diodes, varistors, etc.) and maintain the greatest possible distance between the system and the contactors.

Building and Power Distribution

- The building in which the control system is located must be sufficiently protected against lightning, taking the local conditions into consideration.
- The power distribution network must be sufficiently protected against overvoltage, taking the local conditions into consideration. In severe cases, we recommend gas discharge tubes in the main panel and varistors in the subpanel.
- If the overvoltage protectors do not have a built-in inductance, the cable between the main panel and the subpanel must be longer than 10 meters.
- The building should have a grounding busbar system to minimize common-mode currents. Alternatively, ground current loops must be broken by grounding shielded cables at only one end, or by using isolation amplifiers, fiber modems, etc.

Power Supply

For controllers and I/O systems, supplied by 24 V DC power supply units, see Power Supplies on page 339.

M The output from the power supply must be isolated from mains.

It is recommended that the power supply be mounted in the same cabinet as the supplied system. If the power supply does not have a mains fuse, this can be installed between the power-line filter and the 24 V DC power supply.

The controller and the I/O system should, if possible, have separate 24 V DC supplies. If separate supplies are not used, the common 24 V DC power supply should have a separate filter for the controller. If possible, use a separate power supply for analog units to ensure accuracy.

For UL approval of the entire installation the power supply must be UL approved as a “general purpose” power supply.

External Power, Communication and I/O Cables

If external power cables, for example 230 V AC or 24 V DC, and signal/communication/I/O cables run in parallel they should be separated by at least 30 cm. The distance between them may be 10 cm for a maximum length of 1 meter. See Recommended Cable Types on page 42.

Filtering

Filtering must be performed according to the figures below. Filters are here divided in type A and type B as follows:

Type A: Corresponds to a two-stage filter for mounting plate assembly.

Type B: Corresponds to a one-stage filter for mounting plate assembly or DIN rail assembly.

A filter of type A is required to protect the mains from emission from the control system and to protect controllers, fieldbus adapters and analog I/O units from noise from the mains. A filter of type B is used to protect controllers, fieldbus adapters and analog I/O units from disturbances from digital I/Os, since the 24 V DC process voltage for digital I/O can pick up noise from the plant. See Power-Line Filters on page 333 for recommended filters of types A and B.

Both types attenuate superimposed high-frequency noise, but they *are not* overvoltage protectors and *do not* prevent the voltage from exceeding a certain level. Note also that it is possible to use a filter of type A in place of a type B filter.

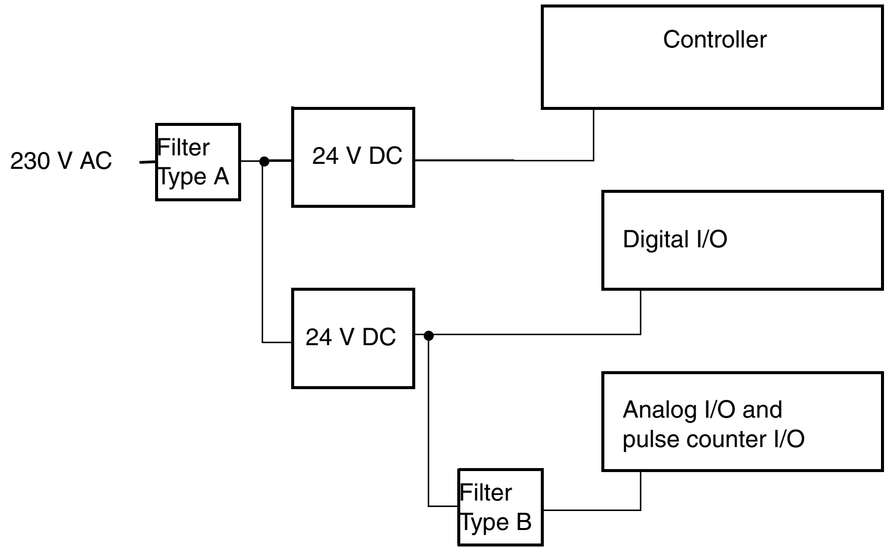


Figure 8. Filtering for a controller and I/O system mounted in the same cabinet, without a fieldbus connection. Digital and analog I/O units have separate serial buses which are supplied with power by the controller.

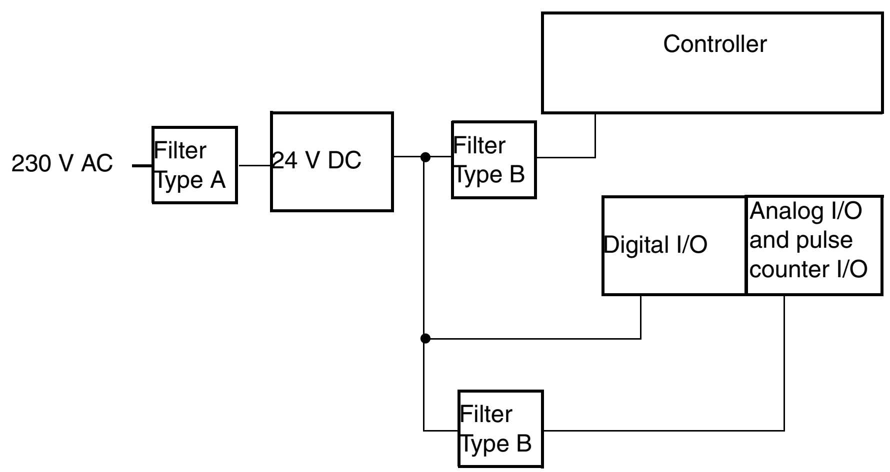


Figure 9. Filtering for a controller and I/O system mounted in the same cabinet, without a fieldbus connection. Digital and analog I/O units are combined on a common serial bus which is supplied with power by the controller.

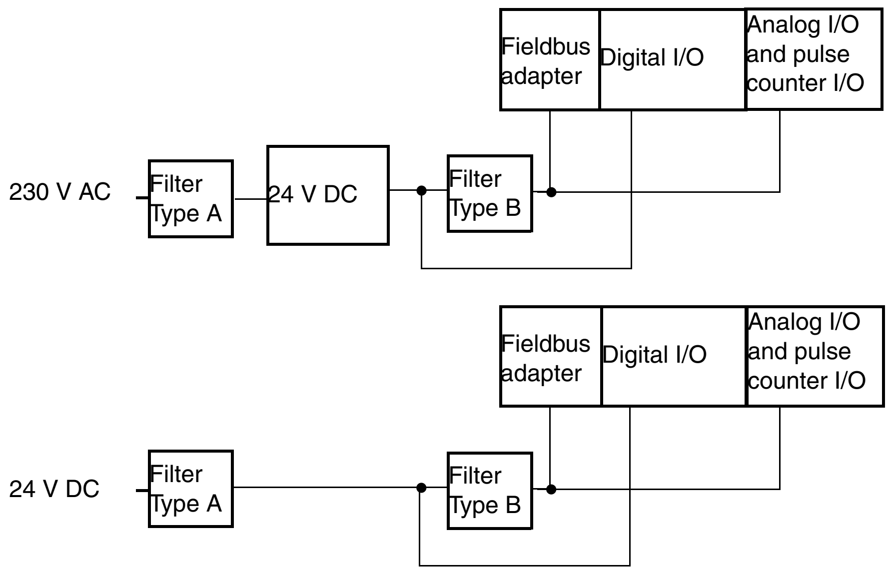


Figure 10. Filtering for I/O systems connected to the controller via a fieldbus and fieldbus adapter (for instance ControlNet or PROFIBUS-DP). Digital and analog/pulse counter I/O units are combined on a common serial bus. The power to the serial bus is supplied by the fieldbus adapter. Alternative power supplies, 230 V AC and 24 V DC, are shown.

M If filters and lightning protectors are not connected to ground via the mechanical fastening devices, the ground connection should be made with a ground wire, maximum 100 mm long and minimum 1.5 mm^2 or AWG 16.

Installation of Power-Line Filter for 24 V DC

Note the following when installing the power-line filter for 24 V DC. If the filter has two ground connections, *both* must be connected to ground via a ground terminal block, close to the power-line filter, see figure below.

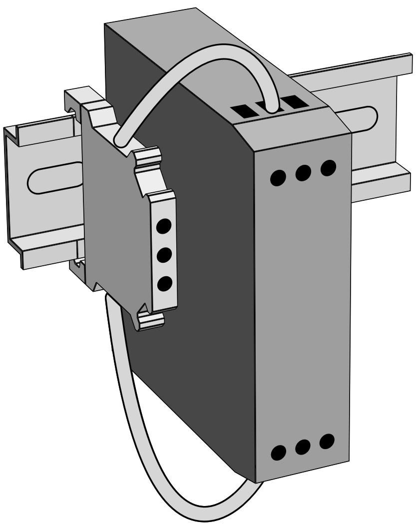


Figure 11. Both ground connections of the power-line filter must be connected to ground.

For recommended types of filters and overvoltage protectors, see Power-Line Filters on page 333.

Installation of External Cables

Recommended Cable Types

ABB Automation recommends the cable types specified in Cables for Process Signals on page 340.

Cables can be divided into the following classes:

Class	Description	Example
III	Non-sensitive signals (noisy)	230 V AC mains
II	Moderately sensitive signals (quiet)	24 V DC, digital I/O signals, RS485, PROFIBUS-DP, ControlNet and SattBus
I	Sensitive signals (very quiet)	Analog signals, RS232 and Ethernet (trunk cable and AUI cable)

In order for signals not to interfere with each other, the following minimum distances should be maintained between long, parallel cables outside cabinets.

II–III	0.3 meters
I–II	0.3 meters
I–III	1.0 meter

Connecting Power Supply Cables

- Always use shielded cables for incoming mains power inside the cabinet unless the power-line filter is mounted directly where the power cable enters the cabinet.
- Connect the mains via a power-line filter to the 24 V supplies.
- Connect the 24 V DC power supply to the I/O units requiring 24 V DC. Digital and analog I/O units should always be separated by a power-line filter. Separate wires can be used for each I/O unit, or the wires can be chained if the total current for all I/O units does not exceed the maximum current for the cables or screw terminals.

For power connection and filtering see also External Power, Communication and I/O Cables on page 38.

Connecting Cables to Screw Terminals

The wire areas for screw terminals are specified in the appendices *Technical Specifications* and *Recommended Components*.

A maximum of 2 wires is allowed in each terminal. However, three wires are allowed if ferrules are used. The wires should be crimped, not soldered.

Recommendations: Tightening torque for the screw terminals: 0.5–0.8 Nm. Use copper wires only, which are UL approved for 60/75 ºC.

Figure 12. Two wires are allowed in each terminal, unless ferrules are used.

Unshielded Cables

Unshielded cables can be used in normal industrial environments for digital I/O signals.

Shielded Cables

Shielded cables must be used for analog I/O and communication (except SattBus and Ethernet twisted pair).

The shields must be clamped to ground (normally the mounting plate) using one of the following alternatives.

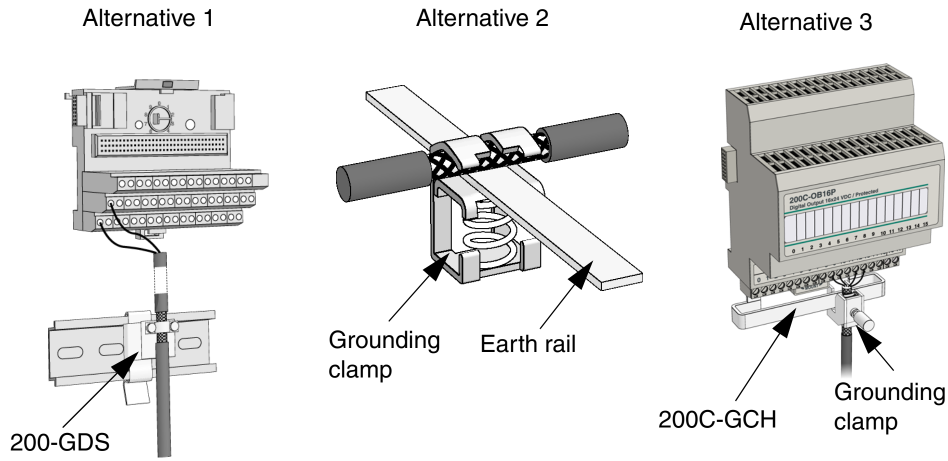


Figure 13. Different alternatives of clamping shields to ground.

Alternative 1: Grounding device 200-GDS
Mount a DIN rail where the cables enter the cabinet, snap a sufficient number of 200-GDS devices onto the DIN rail, remove 10 mm of the sheath and fasten the cables. 200-GDS is designed for cable diameters of 5–8 mm. Let the shield continue as close as possible to the inner conductor connection point.

Alternative 2: Earth rail with grounding clamp
See Grounding Devices on page 334 for a recommended grounding clamp to be mounted on an earth rail where the cables enter the cabinet. The distance between the holders must not exceed 100 mm. Use metal holders only.

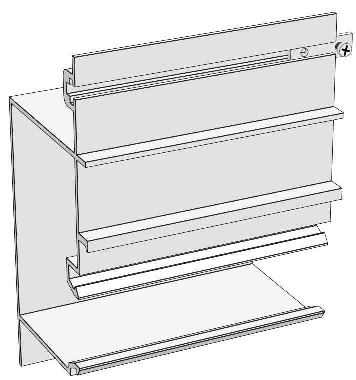
Alternative 3: Grounding clamp holder 200C-GCH
The clamp holder is screwed onto the back of AC 800C and S200L I/O units. Mount a suitable grounding clamp on the holder (see Grounding Devices on page 334) and tighten it around the exposed braided shield of the cable.

See section Cables for Process Signals on page 340 for recommended cable types.

Section 4 Mounting Instructions

This section describes how to mount the I/O units and their accessories. The corresponding information regarding 200L I/O units can be found in the manual *S200L I/O Hardware and Installation*. Refer to Appendix C, Mounting Dimensions on page 341 for scaled drawings and recommended distances between components on a mounting plate. The mounting of I/O units together with controllers is described in the corresponding controller manuals.

Rails and Profiles



I/O units are mounted on either DIN rails or mounting profiles. DIN rails should be chromium plated, for instance yellow chromium treated. Use star washers with every screw used to fasten the DIN rail to the mounting plate. The minimum screw diameter is 5 mm. Recommended DIN rails are specified at DIN rail on page 338.

Mounting profiles incorporate cable ducts. They can be delivered by ABB Automation in different lengths.

M DIN rails and mounting profiles used in a central I/O system must be mounted on the same metal mounting plate.

Mounting the Terminal Bases

The terminal base units can be mounted horizontally or vertically on a standard DIN rail or mounting profile. The terminal base should easily snap onto the DIN rail or mounting profile by hand.

Mount the terminal base unit as follows:

1. Remove the cover plug (if used) from the male connector of the unit to which this terminal base unit is to be connected. The cover plug is located on the right side of the terminal base unit.

Use the cover plug to protect the unprotected bus contact.

2. If an adjacent terminal base unit is installed, push the female I/O bus (B) connector to its rightmost position in order not to damage the connector. Also insert the hook (A) on the unit into the slot on the terminal base unit (or adapter) positioned to the left of the terminal base unit.
   Position the terminal base unit on the DIN rail.

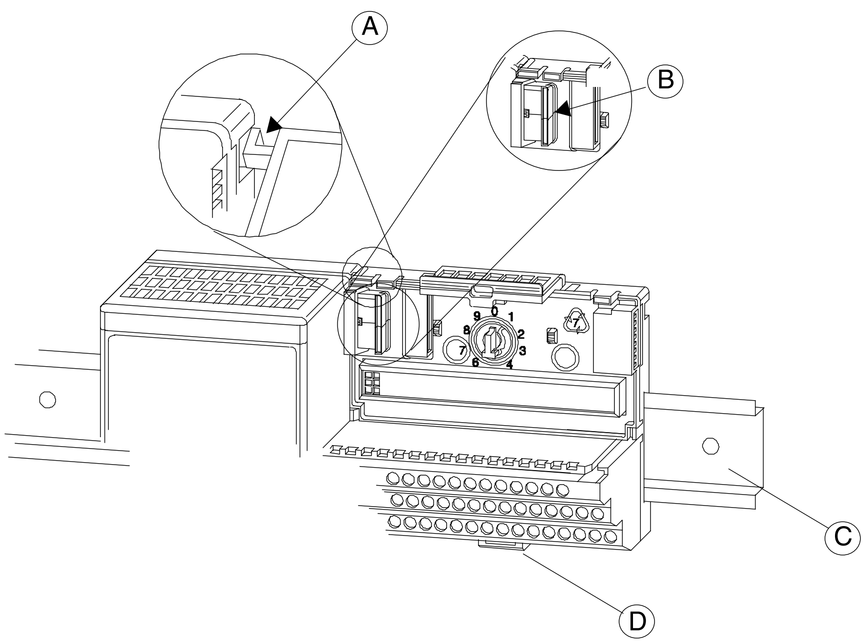


Figure 14. Mounting the terminal base unit.

3. Rotate the terminal base unit onto the DIN rail (C) to hook under the lip on the rear end of the unit.
4. Press the unit down onto the DIN rail until flush. The locking tab (D) will snap into position and lock the unit to the DIN rail.
5. If the terminal base unit does not lock in place, use a screwdriver or similar device to move the locking tab down while pressing the unit flush onto the DIN rail and release the locking tab to lock the unit in place.
6. Push the I/O bus connectors gently into the adjacent adapter (e.g. 200-ANN or 200-ACN) and/or an adjacent teminal base unit (if any).

Make sure that the connector pins and sockets are in line when the units are plugged together, otherwise there is a risk of damaging the pins. Do not use excessive force.

If the connector (B) is not fully extended (to the left), no I/O unit can be installed. Be careful not to bend the connector pins.

When configuring the central I/O system there must be no empty terminal base units due to Electrostatic Discharge (ESD) considerations.

Removing a Terminal Base Unit

To remove a terminal base unit proceed as follows:

1. If any I/O unit is fastened to the actual terminal base, remove it.
2. Gently push the bus connector (B) to its rightmost position.
3. If there is an adjacent terminal base on the right hand side, first remove the I/O units mounted on this terminal base and push that terminal base's bus connector (B) to its rightmost position.
4. Gently use a screwdriver to loosen the locking tab (C) and remove the terminal base from the DIN rail. Note the hook (A).

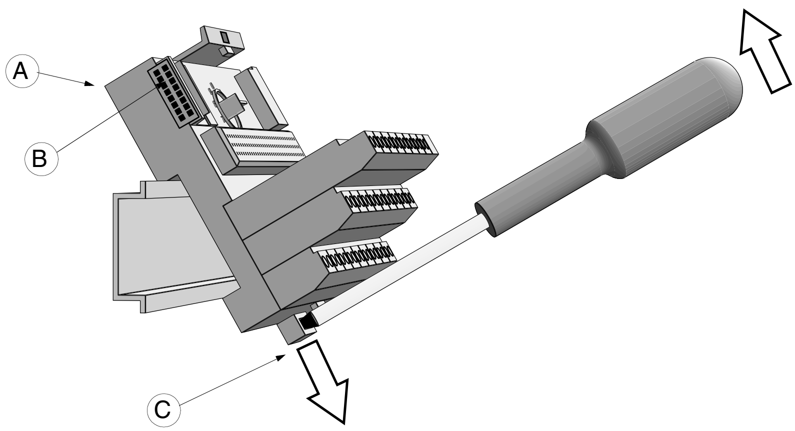


Figure 15. Removing the terminal base unit.

Mounting the Adapters

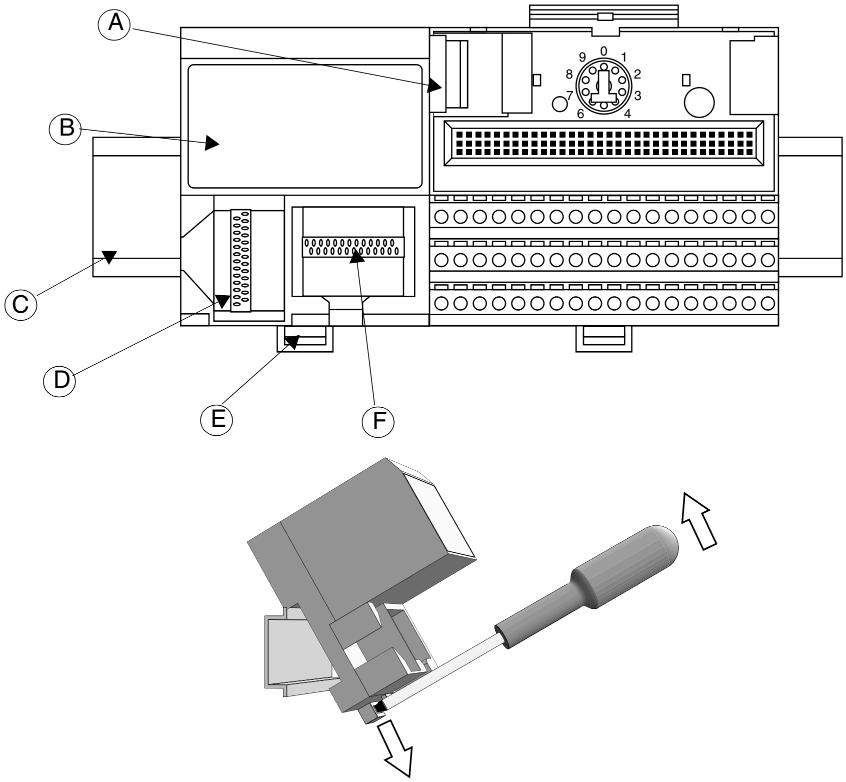


Figure 16. Mounting the adapter. Notice that only adapter 200-ANN is drawn in this figure.

Mount the adapter as follows:

1. Remove the I/O unit (if any) on the adjacent terminal base unit and push the female I/O bus connector (A) to its rightmost position.
2. Position the adapter (B) on the DIN rail (C).
3. Rotate the adapter onto the DIN rail to hook under the lip on the rear side of the adapter.

4. Press the adapter unit down onto the DIN rail until flush against the DIN rail. Locking tab (E) will snap into position and lock the adapter unit to the DIN rail.
5. If the adapter unit does not lock in place, use a screwdriver or similar device to move the locking tab down while pressing the adapter unit flush onto the DIN rail and release the locking tab to lock the adapter unit in place.
6. Push the female I/O bus connector on the terminal base unit gently into the male equivalent on the adapter and connect the adequate cables to the adapter.

Be sure to push the serial bus connector all the way in to the left. Otherwise it may cause problems when inserting an I/O unit into the terminal base unit.

Removing an adapter unit

Removing an adapter means that you also disconnect the I/O units that are connected to the adapter from the controller.

To remove an adapter proceed as follows:

1. First remove any adjacent I/O unit.
2. Gently push the bus connector (A) to its rightmost position.
3. Remove cables (D and F) or BNC connector if 200-ACN.
4. Pull the locking tab (E) on the adapter downwards and tip the adapter slightly outwards to remove the adapter from the DIN rail.

Checking the Basic (Internal) Mountings

After the DIN rails and the terminal base units have been mounted, check that the units are hooked into each other and that no metallic particles or other drilling waste has dropped into the backplanes.

Before inserting any I/O unit, check that the terminal base units and adapters are secured on the DIN rail and that the I/O bus connectors are at their leftmost positions.

Also check that connections between the controller and the I/O system are properly made and that the bus terminators are installed correctly.

Setting the Terminal Base Code Keys

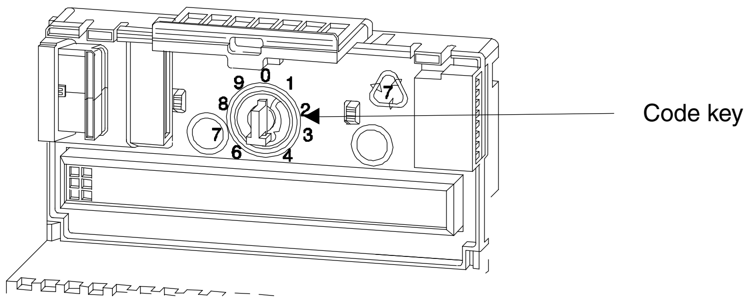


Figure 17. The code key on the terminal base unit.

Turn the code key (clockwise) to match the predefined key hole on the actual unit. The key on the I/O unit is set by the manufacturer and is not to be altered by the user.

Code key table

The code key positions for the I/O units are specified in Appendix A, Technical Specifications on page 261.

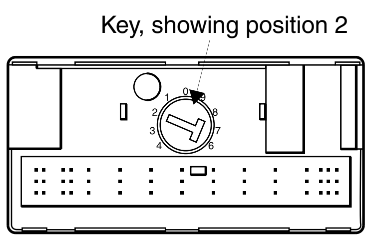


Figure 18. The key hole on the rear side of the I/O unit.

Mounting the I/O Units

To be able to install an I/O unit on the leftmost terminal base on the lower row, push the bus connector (B) to its leftmost position. Then push the I/O unit into its socket until locked by locking tab (G).

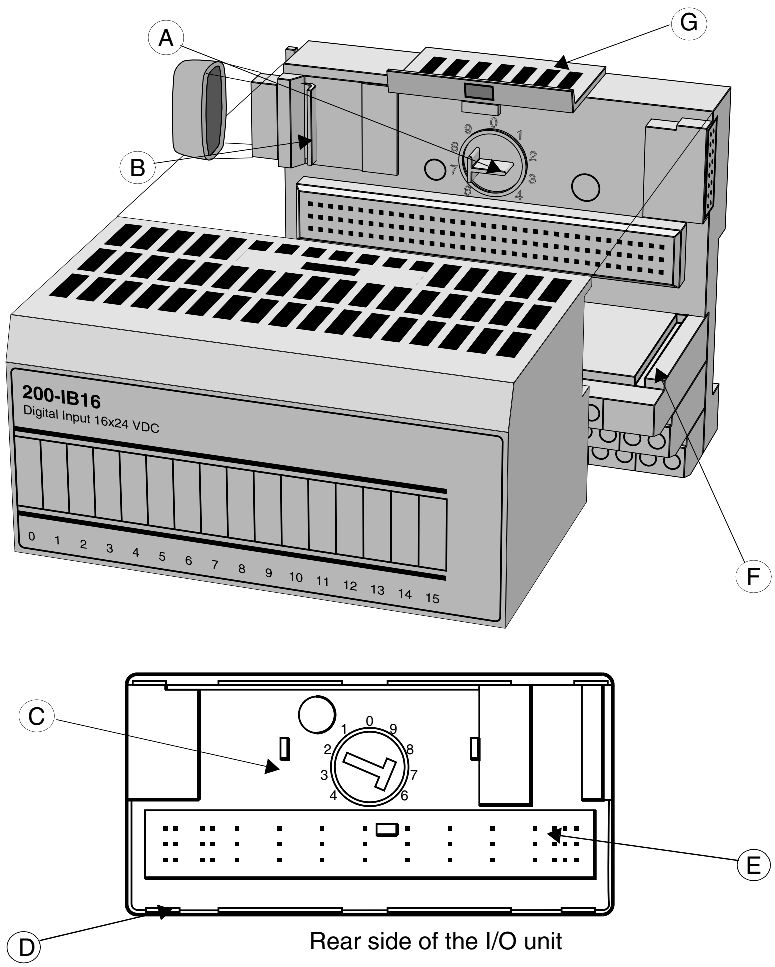


Figure 19. Inserting the I/O unit.

There is a 96-pin connector which interfaces the unit to the terminal base unit. Proceed as below when fastening the units to the terminal base unit.

1. Rotate the keyswitch, (A) on the terminal base unit (if not already done), clockwise to the position required for the actual unit.
2. Make certain that the bus connector (B) is pushed all the way to the left to connect with the adjacent terminal base/adapter. Note that you cannot properly install the unit unless the connector is fully extended.
3. Position the unit (C) with its guide rail (D) within the groove (F) on the terminal base unit.
4. Press firmly and evenly to seat the unit in the terminal base unit. The unit is seated when the latching mechanism (G) is locked.
5. Be careful not to bend the connector pins (E) on the rear of the I/O unit. Note that some pins on the rear of the I/O unit are shorter than others.

Removing an I/O unit

Release the snap locks (G) and gently pull the I/O unit straight out along the groove (F). Be careful not to wrench the I/O unit so that the connector pins on the rear side (E) of the I/O unit are bent.

Mounting Cable 200-CE1 or 200-CE3

Mounting Cables when DIN Rails are Used

The cable 200-CE1 (200-CE3) must be mounted before any terminal bases, adapters or I/O units are installed. This is because some drilling is required to attach the screws that come with the cable. Refer to Appendix C, Mounting Dimensions on page 341.

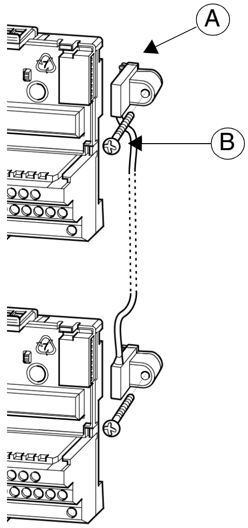


Figure 20. Mounting of the cable 200-CE1 (CE-3).

Mount a terminal base temporarily as a template to mark the positions of the cable fixing holes. Make sure you remove the I/O unit before drilling, as metallic particles may otherwise fall into the electronics causing damage or short-circuit. Mounting of terminal bases must thus commence from the right hand side of the DIN rail. If mounting is not carried out in this way, the cable connectors may not be positioned correctly to allow mating to the rightmost terminal base.

Proceed as follows:

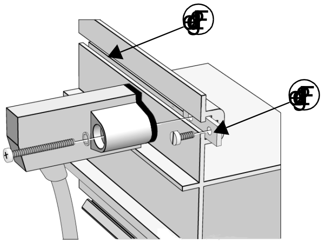
1. Insert the cable connector (A) into the mating connector on the right side of the terminal base unit. Push in firmly.
2. Mount the terminal base unit onto the DIN rail[1].
3. Use a bradawl or other pointed tool to mark the position of the hole on the mounting plate.
4. Remove the temporarily mounted terminal base with the connected cable.

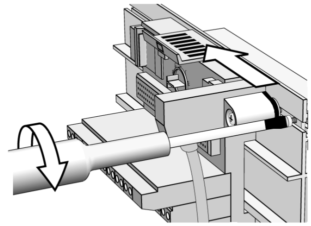
1. For details on mounting a terminal base unit, see Mounting the Terminal Bases on page 46.

5. Using the mark made in step 3, drill a hole with a diameter of 3.2 mm for the 6-32 screw[1] (B) supplied with your kit.
6. Repeat steps 1 to 5 for the row below.
7. After drilling, reinstall both terminal base units and secure with the 6-32 screw (B).

Warning. No drilling may take place when units are mounted on the DIN rail.

Mounting Cables when Mounting Profiles are Used





Proceed as follows:

1. The mounting profile has a groove (A) into which a locking plate (B) is inserted.
2. Insert the locking plate into the groove.
3. Attach the CE1 (or CE3) cable to the locking plate by fastening the screw in the left hole on the locking plate.
4. Push the CE1 (or CE3) cable into the terminal base.
5. Lock the cable by fastening the screw in the the right hole of the locking plate.

1. This screw has a diameter of 3.7 mm and a length of 27.5 mm. The screw is self-tapping. 6-32 is a screw of type 6, which means a tap diameter of 9/62 inches, i.e. 3.7 mm. A drill-hole of 3.2 mm assumes that the material to be drilled is made from steel with a thickness of 3 mm.

Section 5 Functional Description

This section describes the function of the terminal base units, I/O units and accessories. Remember to check that your controller software allows you to use the functions described.

Terminal Base Unit Overview

The following table shows which terminal base unit meet various application needs.

Terminal base unit	Purpose
200-TB2	Primarily intended for use with input units when using 2-wire inputs/outputs.
200-TB3	Primarily intended for use with input units when using 3-wire input proximity switches – can also be used with output units.
200-TB3S	A spring clamp version of the cage clamp 200-TB3 above – provides faster, simpler wire installation.
200-TB32	Required with the 200-IB32, 200-OB32P and 200-IB16xOB16P units.
200-TB3T	Required with the 200-IT8 unit – also provides chassis ground connections for the 200-IR8 and analog units.
200-TBN	Provides screw terminals to accept larger gauge wires plus cover for I/O wiring.
200-TBNF	Provides 8 5x20 mm fuses, screw terminals, plus a cover for I/O wiring – shipped with fuses for the 200-OA8 and 200-OM8 units, can be used for the 200-OW8 unit (see 200-OW8 installation instructions).

Terminal Base Compatibility Cross Reference

The following table lists the recommended terminal base unit(s) for each I/O unit.

I/O unit	Order code	Preferred terminal base	Compatible terminal base(s)
AC			
230 V AC	200-IM8	200-TBN	-
	200-OM8	200-TBNF	200-TBN
120 V AC	200-IA8	200-TBN	200-TB3 200-TB3S
	200-OA8	200-TBNF	200-TB3 200-TB3S 200-TBN
DC			
24 V DC	200-IB16	200-TB3	200-TB2 200-TB3S
	200-OB16 200-OB16P	200-TB2	200-TB3 200-TB3S
	200-IB10xOB6	200-TB3	200-TB3S
	200-IB32 200-OB32P 200-IB16xOB16P	200-TB32	
	200-OB8EP	200-TB2	200-TB3 200-TBN 200-TBNF
Relay			
Relay unit	200-OW8	200-TBNF	200-TB3 200-TB3S 200-TBN

I/O unit	Order code	Preferred terminal base	Compatible terminal base(s)
Counters			
24 V DC	200-IP2	200-TB3	200-TB3S 200-TB2
	200-IP4	200-TB3	200-TB3S 200-TB2
Analog			
24 V DC	200-IE8	200-TB3	200-TB3S
	200-OE4	200-TB3	200-TB3S 200-TBN 200-TBNF
	200-IE4xOE2	200-TB3	200-TB3S
Isolated analog			
24 V DC	200-IF4I	200-TB3	200-TB3S 200-TB3T 200-TBN
	200-OF4I	200-TB3	200-TB3S 200-TB3T 200-TBN
Speciality			
RTD Input unit	200-IR8	200-TB3	200-TB3S 200-TB3T
	200-IR8R	200-TB3T	200-TB3T
Thermocouple/mV Input unit	200-IT8	200-TB3T(1)	

(1) You can use a 200-TB3 for mV inputs only

Terminal Base Unit 200-TB2

This terminal base unit is intended for connecting an I/O unit and a number of two wire devices to the I/O system.

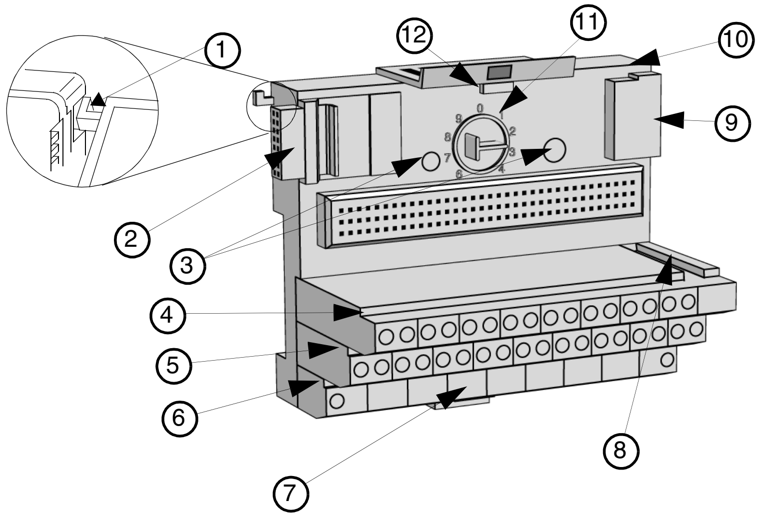


Figure 22. Terminal base unit 200-TB2

Component identification

1	Hook
2	Female I/O bus connector
3	Screw holes for panel mounting (Ø 4.5 mm), not used
4	Screw terminals for input/output connections
5	Screw terminals for input/output commons (0V DC)
6	Screw terminals for power connections (+24 V DC)
7	Locking tab for DIN rail mounting
8	Groove where the I/O unit guide rail fits
9	Male I/O bus connector
10	Slot for connection of an adjacent terminal base unit

11	Code key – set to the position required for the installed I/O unit
12	Snap lock

Functional Description

The terminal base unit transfers data between the I/O units and the controller via an adapter and the serial bus.

A key switch is provided to prevent insertion of incorrect I/O units into a preconfigured terminal base unit. See also Setting the Terminal Base Code Keys on page 51.

This unit assumes that the input devices to be connected are equipped with their own power supply unit.

Screw terminals

Terminal base unit 200-TB2, is equipped with three screw terminal rows.

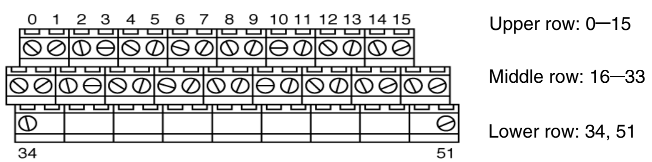


Figure 23. Screw terminal rows for 200-TB2.

The upper row has 16 terminals (0–15) for input/output signals.

The middle row consists of eighteen 0 V DC screw terminals (16–33) which are internally connected. The rightmost and leftmost screw terminals are for connection to power supply.

The lower row consists of two +24 V DC screw terminals (34, 51) which are internally connected. These terminals are for connection to power supply.

See also section Connecting Power Supply Cables on page 42.

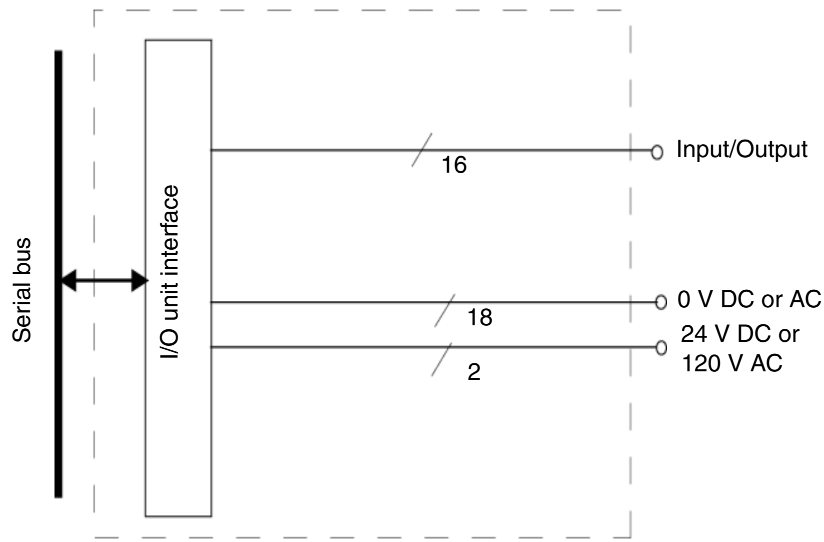


Figure 24. The 200-TB2 functional block diagram.

Terminal Base Unit 200-TB3

This terminal base unit is intended for connecting an I/O unit and a number of two or three wire devices to the I/O system.

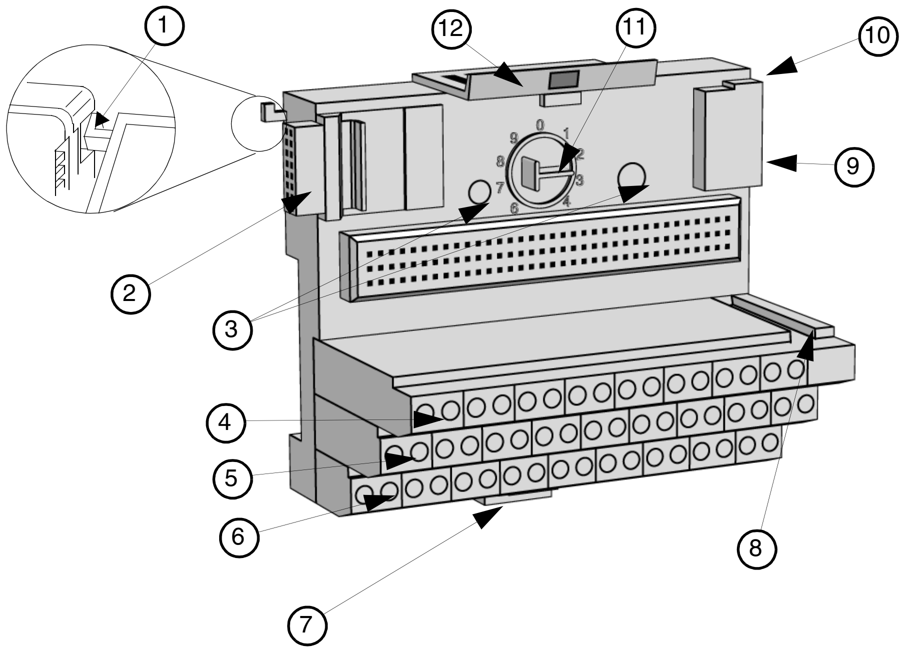


Figure 25. Terminal base unit 200-TB3

Component identification

1	Hook
2	Female I/O bus connector
3	Screw holes for panel mounting (Ø 4.5 mm), not used
4	Screw terminals for input/output connections
5	Screw terminals for input/output commons (0V DC)
6	Screw terminals for power connections (+24 V DC)
7	Locking tab for DIN rail mounting

8	Groove where the I/O unit guide rail fits
9	Male I/O bus connector
10	Slot for connection of an adjacent Terminal base unit
11	Code key – set to the position required for the installed I/O unit
12	Snap lock

Functional Description

The terminal base unit transfers data between the I/O units and the controller via an adapter and the serial bus.

A key switch is provided to prevent insertion of incorrect I/O units into a preconfigured terminal base unit. See also Setting the Terminal Base Code Keys on page 51.

Screw terminals

Terminal base unit 200-TB3, is equipped with three screw terminal rows.

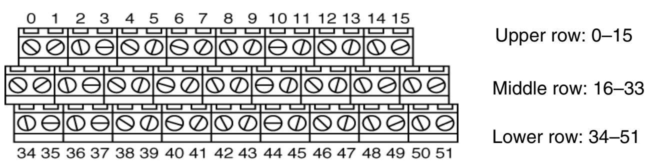


Figure 26. Screw terminals for 200-TB3.

The upper row has 16 terminals (0–15) for input/output signals.

The middle row consists of eighteen 0 V DC screw terminals (16–33) which are internally connected. The rightmost and leftmost screw terminals are for connection to power supply.

The lower row consists of eighteen +24 V DC screw terminals (34–51) which are internally connected. The leftmost and rightmost terminals are for connection to power supply.

See also Connecting Power Supply Cables on page 42.

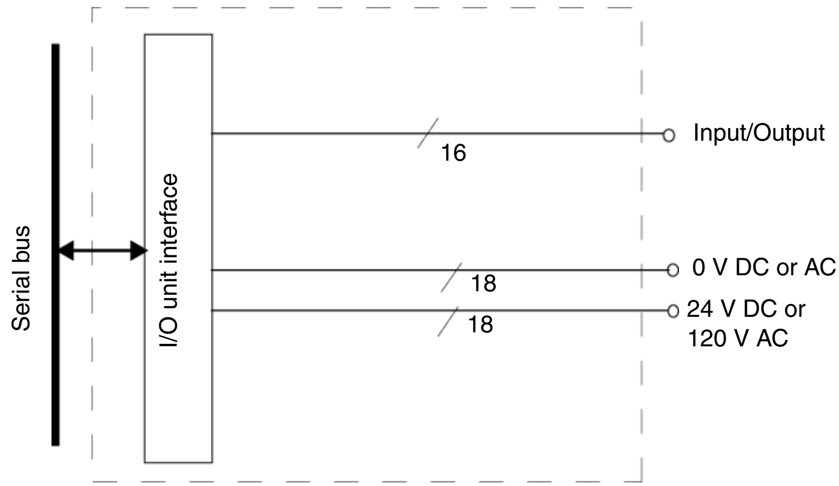


Figure 27. The 200-TB3 functional block diagram.

Terminal Base Unit 200-TB3S

This terminal base unit is intended for connecting an I/O unit and a number of two or three wire devices to the I/O system.

Note that the 200-TB3S is a spring clamp version of 200-TB3. All connections on 200-TB3S are spring clamps. Always use a screw driver when inserting the cable.

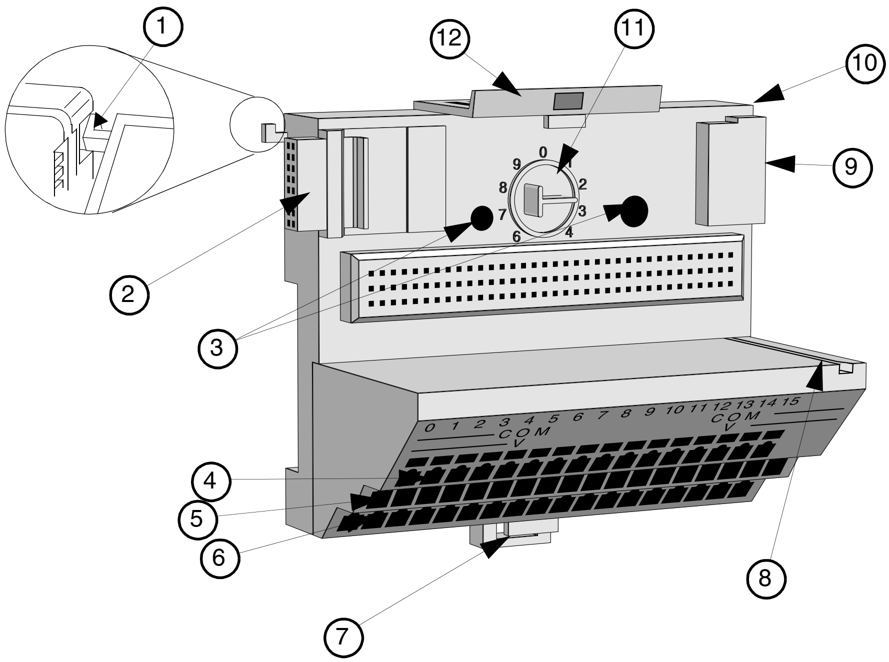


Figure 28. Terminal base unit 200-TB3S.

Component identification

1	Hook
2	Female I/O bus connector
3	Screw holes for panel mounting (Ø 4.5 mm), not used
4	Cage clamps for input/output connections
5	Cage clamps for input/output commons (0 V DC)

6	Cage clamps for power connections (+ 24 V DC)
7	Locking tab for DIN rail mounting
8	Groove where the I/O unit guide rail fits
9	Male I/O bus connector
10	Slot for connection of an adjacent Terminal base unit
11	Code key – set to the position required for the installed I/O unit
12	Snap lock

Functional Description

The terminal base unit transfers data between the I/O units and the controller via an adapter and the serial bus.

A key switch is provided to prevent insertion of incorrect I/O units into a preconfigured terminal base unit. See also Setting the Terminal Base Code Keys on page 51.

Spring clamp terminals

Terminal base unit 200-TB3S, is equipped with three rows of spring clamp terminals.

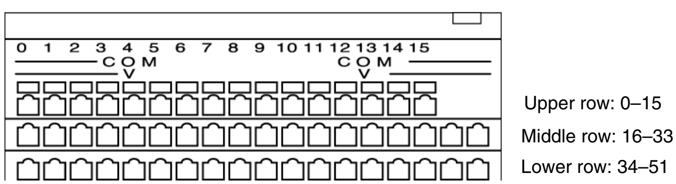


Figure 29. Spring clamp terminals for 200-TB3S.

The upper row has sixteen terminals (0–15) for input/output signals.

The middle row consists of eighteen 0 V DC spring clamp terminals (16–33) which are internally connected. The rightmost and leftmost screw terminals are for connection to a power supply.

The lower row consists of eighteen +24 V DC spring clamp terminals (34–51) which are internally connected. The leftmost and rightmost terminals are for connection to a power supply.

See also Connecting Power Supply Cables on page 42.

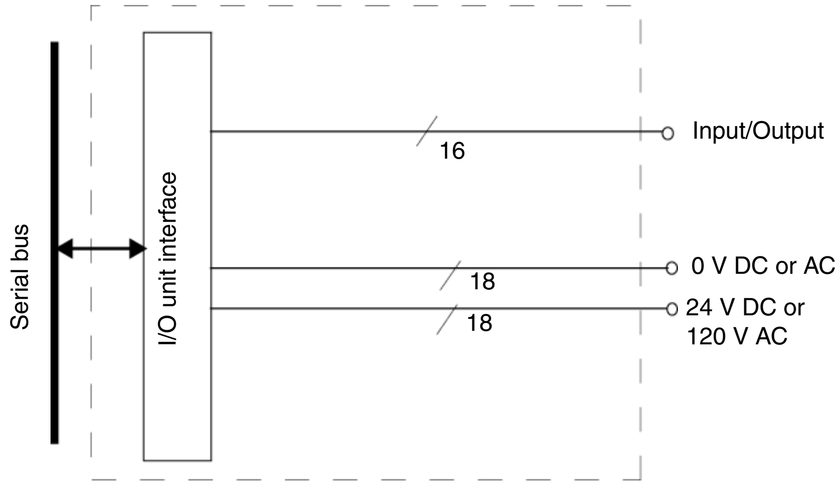


Figure 30. The 200-TB3S functional block diagram.

Terminal Base Unit 200-TB32

This terminal base unit is intended for connecting an I/O unit and a number of two- or three-wire devices to the I/O system. It is required for I/O units 200-IB32, 200-OB32P, and IB16xOB16P.

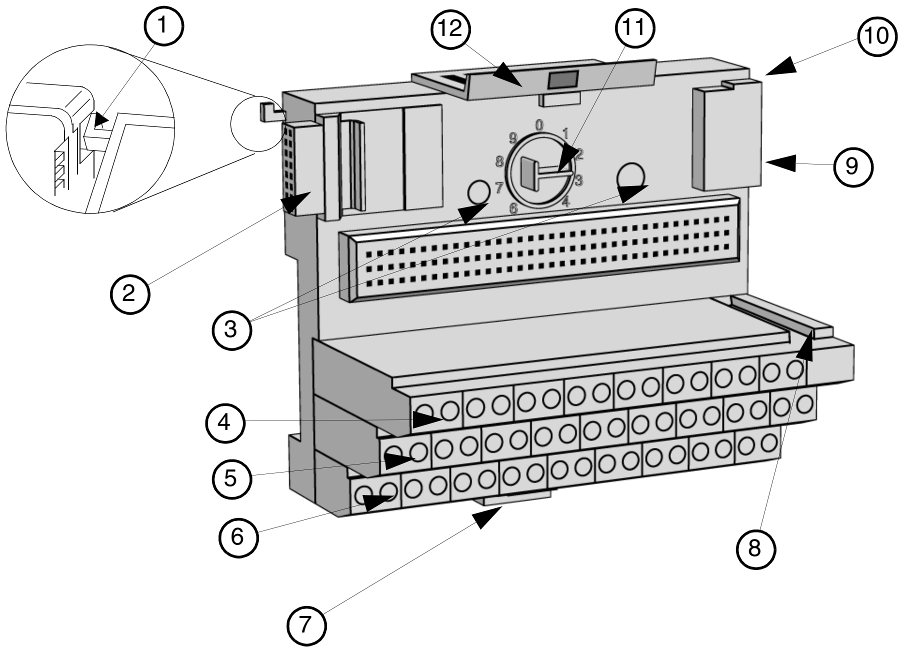


Figure 31. Terminal base unit 200-TB32.

Component identification

1	Hook
2	Female I/O bus connector
3	Screw holes for panel mounting (Ø 4.5 mm), not used
4	Screw terminals for input/output connections
5	Screw terminals for input/output connections
6	Screw terminals for power and signal ground connections (+24 V DC and 0 V DC)

7	Locking tab for DIN rail mounting
8	Groove where the I/O unit guide rail fits
9	Male I/O bus connector
10	Slot for connection of an adjacent terminal base unit
11	Code key – set to the position required for the installed I/O unit
12	Snap lock

Functional Description

The terminal base unit transfers data between the I/O units and the controller via an adapter and the serial bus.

A key switch is provided to prevent insertion of incorrect I/O units into a preconfigured terminal base unit. See also Setting the Terminal Base Code Keys on page 51.

Note that 200-TB32 can only be used with 200-IB32, 200-OB32P and 200-IB16xOB16P, though other 24 V DC units have the same backplane key code.

Screw terminals

Terminal base unit 200-TB32 is equipped with three screw terminal rows.

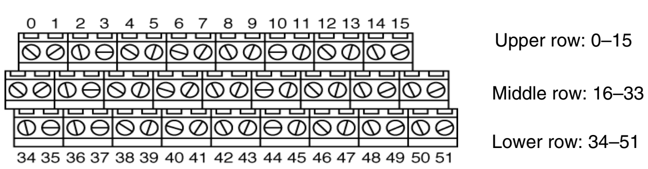


Figure 32. Screw terminal rows for 200-TB32.

The upper row has 16 terminals (0–15) for input/output signals with common signal ground.

The middle row has 16 terminals (17–32) for input/output signals with common signal ground. Terminals 16 and 33 are not connected.

The lower row consists of eighteen terminals for power and signal ground connections. Terminals 35, 37, 39 and 41 are internally connected for +24 V DC supply to the upper row, and terminals 43, 45, 47 and 49 are used for +24 V DC supply to the middle row. Terminals 36, 38, 40 and 42 are internally connected for common 0 V DC to the upper row, and terminals 44, 46, 48 and 50 provides 0 V DC connection to the middle row. Terminals 34 and 51 are not connected.

See also Connecting Power Supply Cables on page 42.

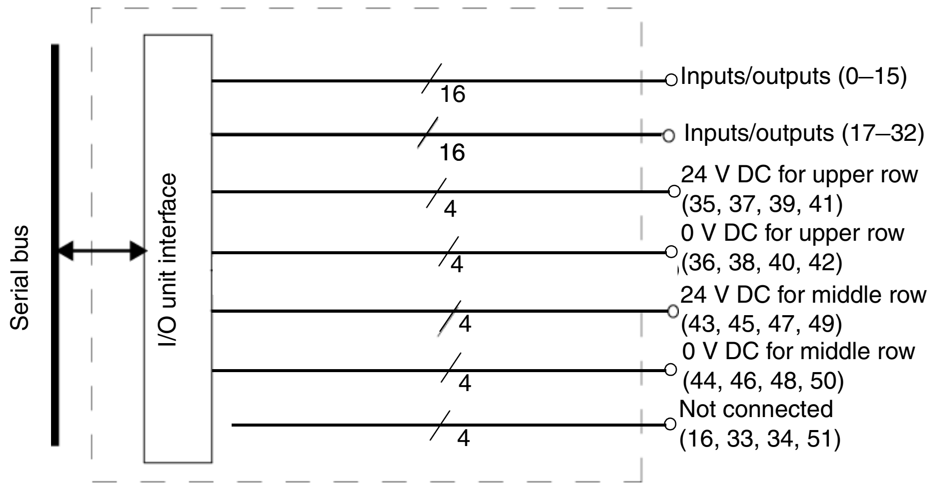


Figure 33. The 200-TB32 functional block diagram.

Numbers within parentheses in the diagram refer to terminal numbers on the terminal base unit.

Each group of four terminals for 24 V DC and 0 V supply are internally connected in the terminal base unit (for instance, terminals 35, 37, 39, and 41 are internally connected).

Terminal Base Unit 200-TB3T

This terminal base unit is intended for connecting an I/O unit and a number of 2- and 3-wire devices to the I/O system. This terminal base is mainly intended for use with 200-IT8.

Six screw terminals are intended for cold junction inputs for compensation via an external thermistor. This is a requirement when used with 200-IT8.

Eight screw terminals are intended to provide connection points to chassis ground. This intent is to provide a place to connect the shield wire when using shielded cables of analog units.

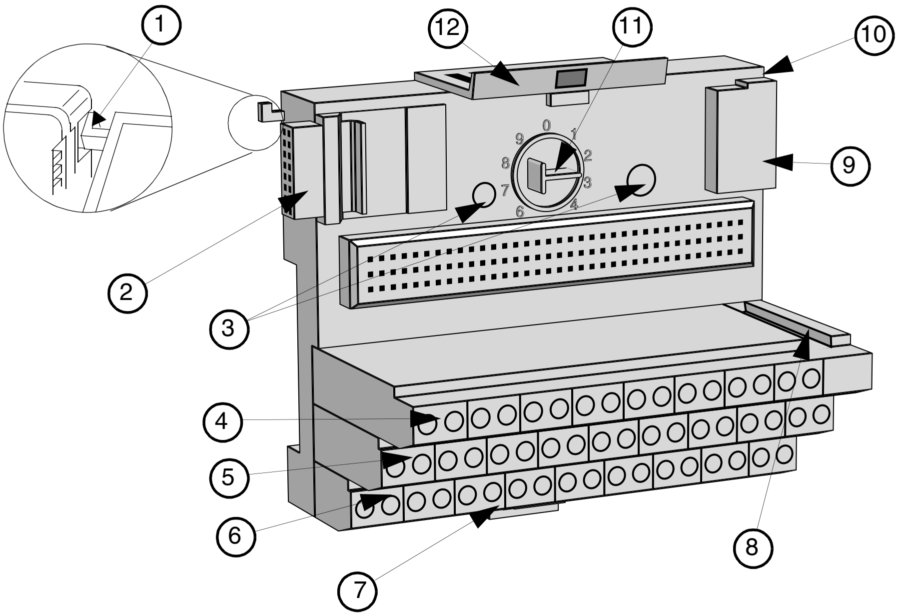


Figure 34. Terminal base unit 200-TB3T.

Component identification

1	Hook
2	Female I/O bus connector
3	Screw holes for panel mounting (Ø 4.5 mm), not used
4	See description below
5	See description below
6	See description below
7	Locking tab for DIN rail mounting
8	Groove where the I/O unit guide rail fits
9	Male I/O bus connector
10	Slot for connection of an adjacent Terminal base unit
11	Code key – set to the position required for the installed I/O unit
12	Snap lock

Functional Description

The terminal base unit transfers data between the I/O units and the controller via an adapter and the serial bus.

A key-switch is provided to prevent insertion of incorrect I/O units into a preconfigured terminal base unit. See also Setting the Terminal Base Code Keys on page 51.

Screw terminals

Terminal base unit 200-TB3T, is equipped with three screw terminal rows.

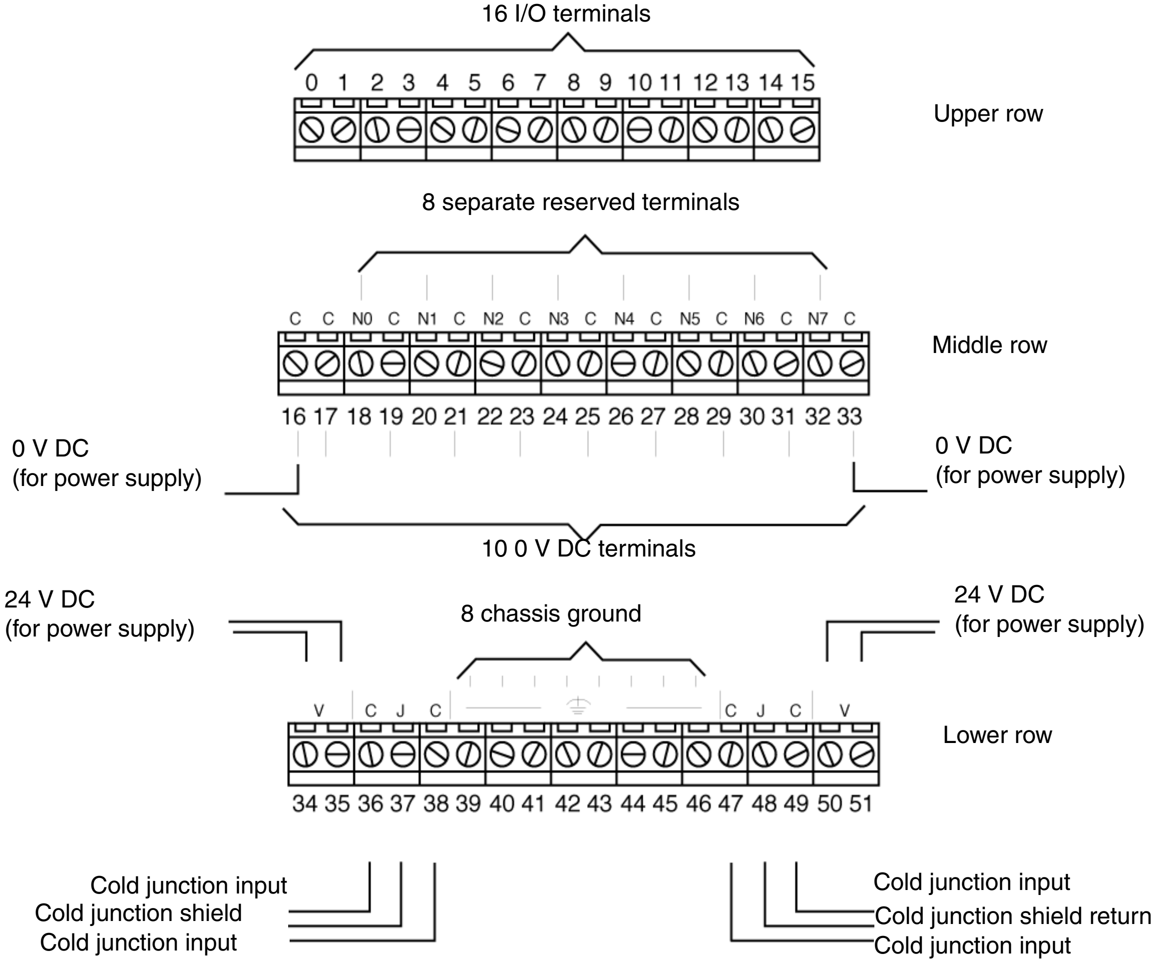


Figure 35. Screw terminals for 200-TB3T.

See also Connecting Power Supply Cables on page 42.

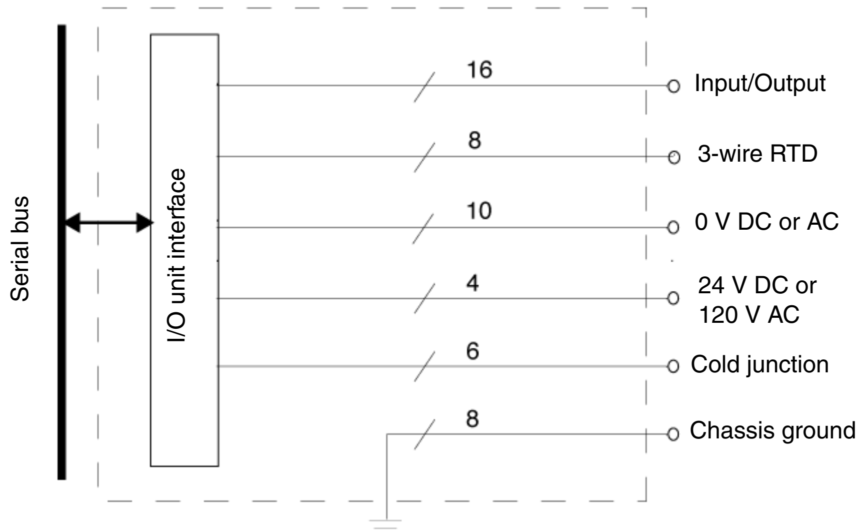


Figure 36. The 200-TB3T functional block diagram.

Terminal Base Unit 200-TBN

This terminal base unit is intended for connecting an I/O unit and a number of devices to the I/O system. Screw terminals on 200-TBN are well insulated and can be used for connection of units which allows both +24 V DC and 230 V AC connections.

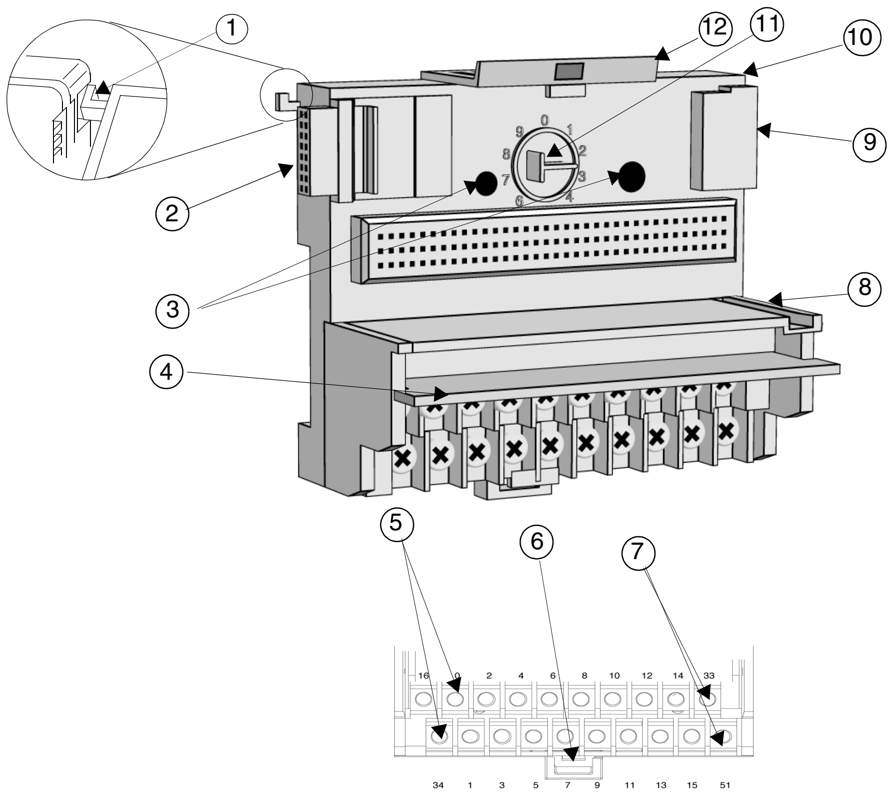


Figure 37. Terminal base unit 200-TBN.

Component identification

1	Hook
2	Female I/O bus connector
3	Screw holes for panel mounting (Ø 4.5 mm), not used
4	Protection lid
5	Screw terminals for input/output connections
6	Locking tab for DIN rail mounting
7	Screw terminals for power connections (0 V DC and +24 V DC)
8	Groove where the I/O unit guide rail fits
9	Male I/O bus connector
10	Slot for connection of an adjacent Terminal base unit
11	Code key – set to the position required for the installed I/O unit
12	Snap lock

Functional Description

The terminal base unit transfers data between the I/O units and the controller via an adapter and the serial bus.

A key switch is provided to prevent insertion of incorrect I/O units into a preconfigured terminal base unit. See also Setting the Terminal Base Code Keys on page 51.

This unit assumes that input devices to be connected are equipped with their own power supply unit.

Screw terminals

Terminal base unit 200-TBN, is equipped with two screw terminal rows.

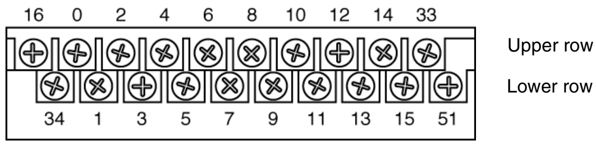


Figure 38. Screw terminals for 200-TBN.

The upper row has 10 screw terminals, where terminal 16 and 33 are dedicated for 0 V DC and even numbered terminals for input/output signals from a device.

The lower row consists of 10 screw terminals, where 34 and 51 are for +24 V DC connection and odd numbered terminals for input/output signals from a device.

Also see Connecting Power Supply Cables on page 42.

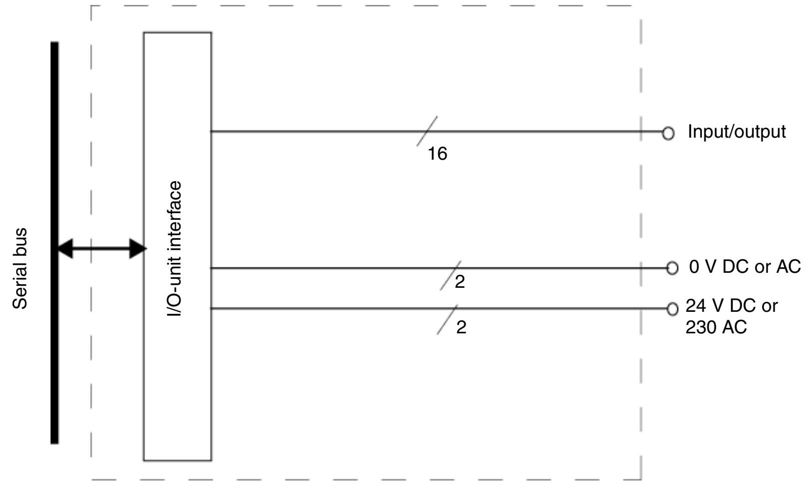


Figure 39. The 200-TBN functional block diagram.

Terminal Base Unit 200-TBNF

This terminal base unit is intended for connecting an I/O unit and a number of devices to the I/O system. Screw terminals on 200-TBNF are well insulated and can be used for connection of units which allows both +24 V DC and 230 V AC connections. 200-TBNF is equipped with holders for eight fuses connected in series with the eight channels on the top row.

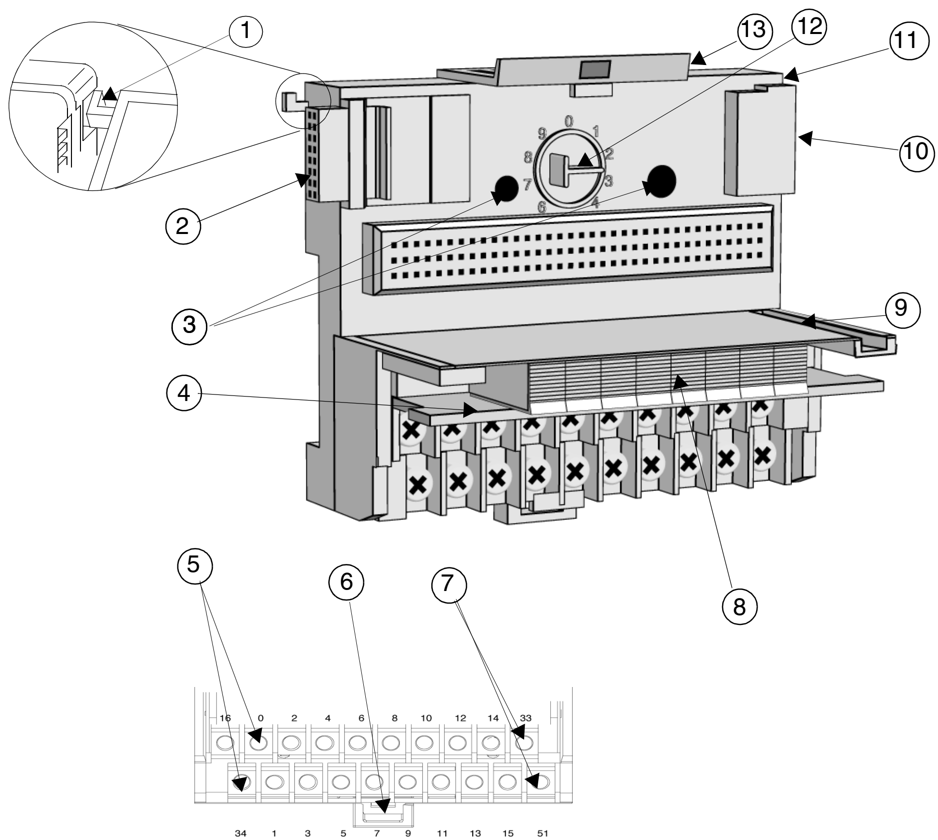


Figure 40. Terminal base unit 200-TBNF.

Component identification

1	Hook
2	Female I/O bus connector
3	Screw holes for panel mounting (Ø 4.5 mm), not used
4	Protection lid
5	Screw terminals for input/output connections
6	Locking tab for DIN rail mounting
7	Screw terminals for power connections (0 V DC and +24 V DC)
8	Fuse holders
9	Groove where the I/O unit guide rail fits
10	Male I/O bus connector
11	Slot for connection of an adjacent Terminal base unit
12	Code key – set to the position required for the installed I/O unit
13	Snap lock

Functional Description

The terminal base unit transfers data between the I/O units and the controller via an adapter and the serial bus. The upper row has holders for 8 fuses. This unit is primarily for units with 8 inputs or outputs.

A key switch is provided to prevent insertion of incorrect I/O units into a preconfigured terminal base unit. See also Setting the Terminal Base Code Keys on page 51.

It is assumed that input devices to be connected to this unit are equipped with their own power supply unit.

3 A fuses are supplied with the terminal base unit to be used with 200-OW8. Fuses for other units are described in the technical data for the actual I/O unit.

Screw terminals

Terminal base unit 200-TBNF, is equipped with two screw terminal rows.

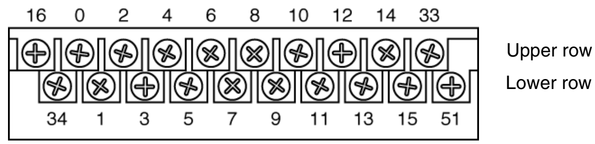


Figure 41. Screw terminals for 200-TBNF.

The upper row has 10 screw terminals, where terminal 16 and 33 are dedicated for 0 V DC and even numbered terminals for input/output signals from a device. This row is secured by fuses.

The lower row consists of 10 screw terminals, where 34 and 51 are for +24 V DC connection and odd numbered terminals for input/output signals from a device.

Also see Connecting Power Supply Cables on page 42.

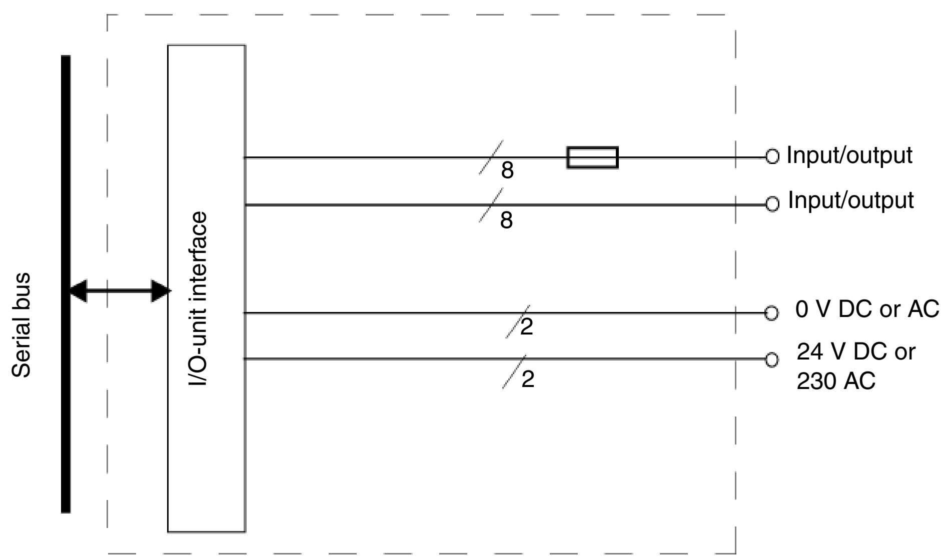
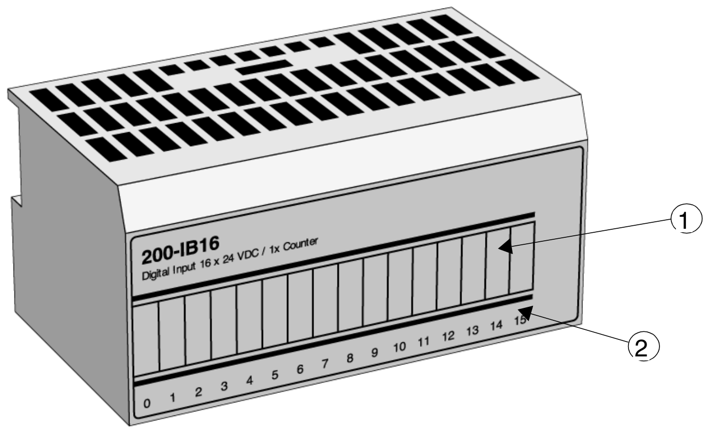


Figure 42. The 200-TBNF functional block diagram.

Digital Input Unit 200-IB16

200-IB16 is an I/O unit for 16 digital input signals. The inputs are filtered and galvanically isolated by optocouplers. The status of each signal is indicated by an LED on the front of the unit. The unit has programmable sample time.



1 = Holder for insertable label for individual input designations
2 = Status indicators - show status of individual inputs.

Figure 43. Digital input unit 200-IB16.

Front Panel

Indicators

Indication	Function
0–15	Yellow LED, lit when inputs are TRUE

Functional Description

The inputs are galvanically isolated by optocouplers and the 16 inputs shares a common ground connection. The unit is connected via the terminal base unit.

The status of each input signal is indicated by a yellow LED on the front of the unit. Each signal is isolated from the logic circuits by an optocoupler and filtered by a digital filter.The filter has one common time constant for inputs 0–11 and another for inputs 12–15. The sum of the hardware and digital filter time constants affects the shortest possible pulse length that can be detected and the highest possible frequency that can be connected to the pulse counter.[1]

Power for the internal logic is provided via the adapter for the I/O system.

The unit is equipped with a 16-bit[2] pulse counter connected to channel 15. The counter is reset when the unit is without power.

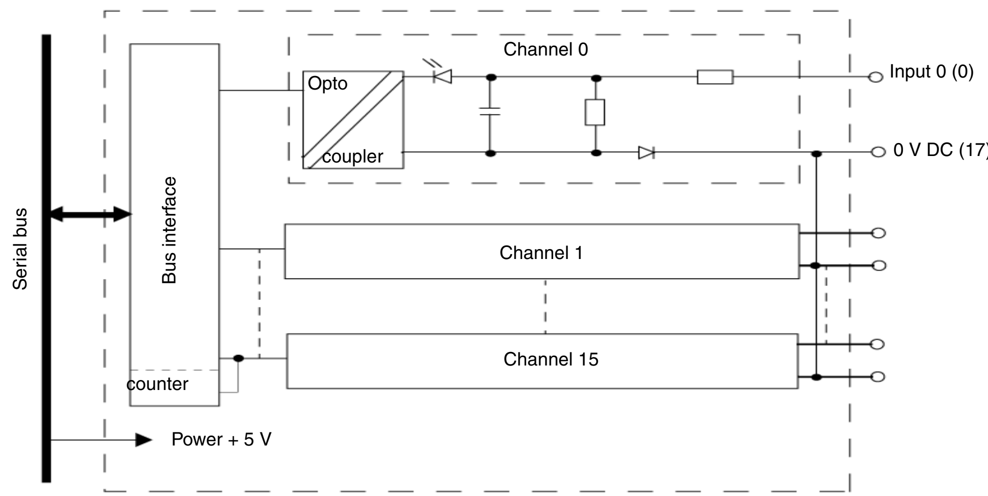


Figure 44. The 200-IB16 functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit, (e.g. 200-TB3) connected to the I/O unit. Note that screw terminals 17–32 do not exist on 200-TBN and 200-TBNF.

1. Only article No. 490-1760-59 or later. Older versions (article No. 490-1760-43 or 490-1760-05, -26) have the following function: The input signals are sampled at intervals determined by sample time. The signal status is changed only if two consecutive samples are the same. The sample time can be set by the programming software.
2. Only article No. 490-1760-59 or later. Older versions have a 5-bit counter (article No. 490-1760-43) or none (article No. 490-1760-05, -26).

200-IB16 Connections

Connect individual input wiring to numbered terminal as described in the table below.

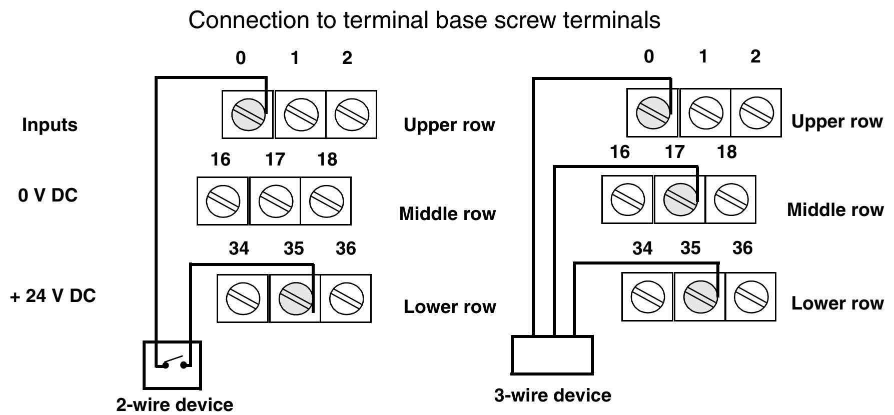


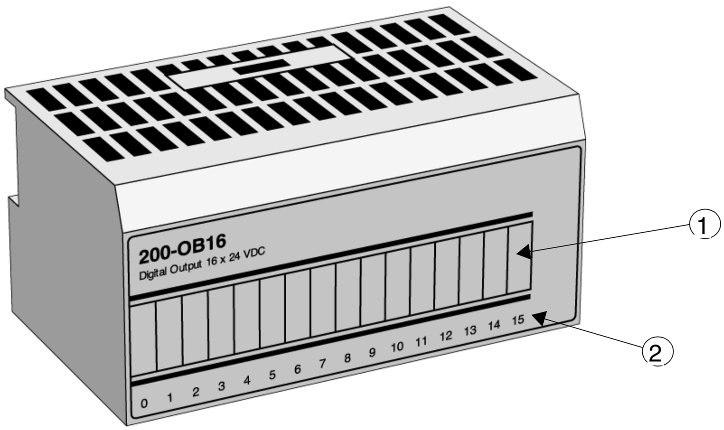
Figure 45. Two wiring examples. Note that not all terminal base units have three rows.

Screw terminal connections

Input	200-TB2 & 200-TB3			200-TBN & 200-TBNF
	Terminals to be connected			
	Signal (upper row)	0 V DC (middle row)	24 V DC (lower row)	Signal
0	0	17	35	0
1	1	18	36	1
2	2	19	37	2
3	3	20	38	3
4	4	21	39	4
5	5	22	40	5
6	6	23	41	6
7	7	24	42	7
8	8	25	43	8
9	9	26	44	9
10	10	45	45	10
11	11	28	46	11
12	12	29	47	12
13	13	30	48	13
14	14	31	49	14
15	15	32	50	15
0 V DC		16–33		16, 33
+24 V DC			34–51	34, 51

Digital Output Unit 200-OB16

200-OB16 is an I/O unit for 16 digital output signals. The outputs are galvanically isolated. The status of each signal is indicated by a LED on the front of the unit.



1 = Holder for insertable label for individual output designations
2 = Status indicators – show status of individual outputs.

Figure 46. Digital output unit 200-OB16.

Front Panel

Indicators

Indication	Function
0–15	Yellow LED, lit when outputs are TRUE

Functional Description

The outputs are galvanically isolated by optocouplers and the 16 outputs share a common ground connection. The unit is connected via the terminal base unit.

The status of each output signal is indicated by a yellow LED on the front of the unit. Output indicators do not work if +24 V DC is missing.

Power for the internal logic is provided via the adapter for the I/O system.

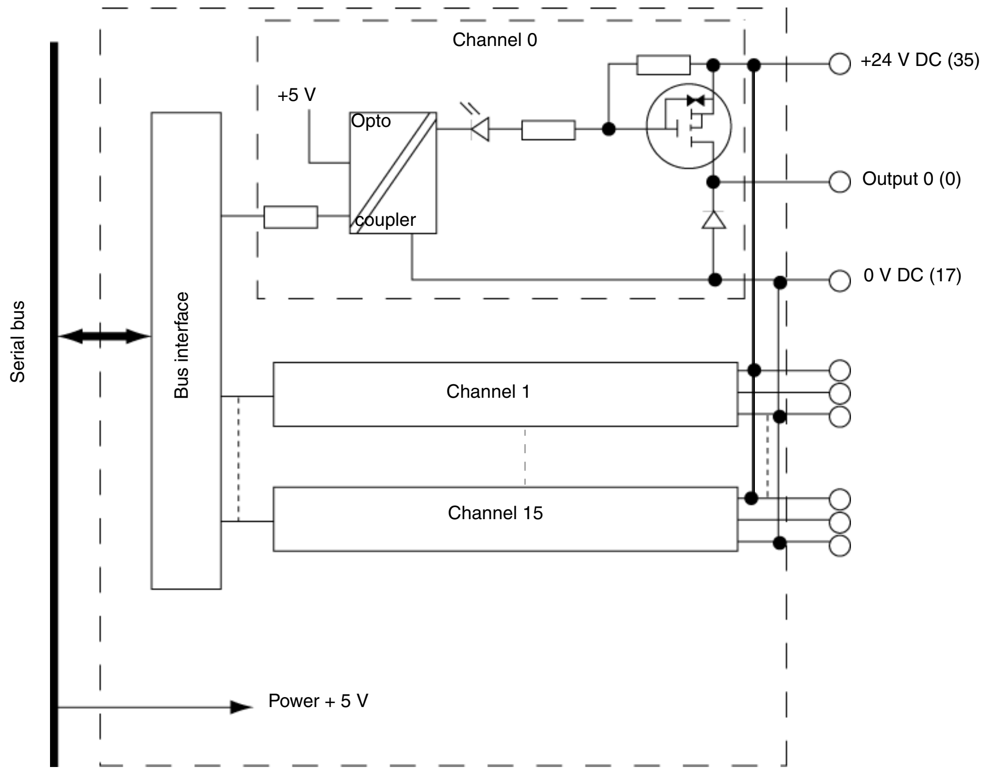


Figure 47. The 200-OB16 functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit, (e.g. 200-TB3) connected to the I/O unit. Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-OB16 Connections

Connect individual output wiring to numbered terminal as described in the table below. Up to four outputs can be connected in parallel (the total load must, however, never exceed 1.8 A).

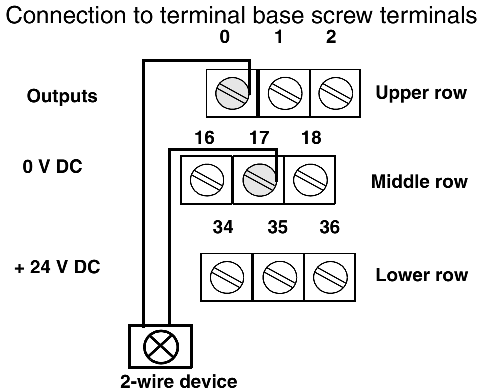


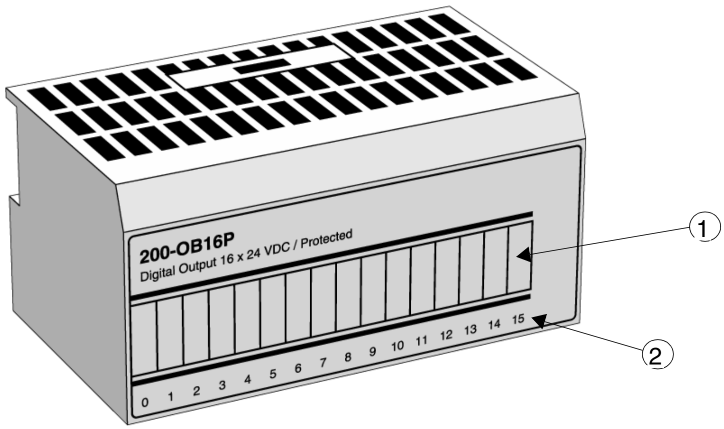
Figure 48. Wiring example. Note that not all terminal base units have three rows.

Screw terminal connections

Output	200-TB2 & 200-TB3			200-TBN & 200-TBNF
	Terminals to be connected			
	Signal (upper row)	0 V DC (middle row)	24 V DC (lower row)	Signal
0	0	17	35	0
1	1	18	36	1
2	2	19	37	2
3	3	20	38	3
4	4	21	39	4
5	5	22	40	5
6	6	23	41	6
7	7	24	42	7
8	8	25	43	8
9	9	26	44	9
10	10	45	45	10
11	11	28	46	11
12	12	29	47	12
13	13	30	48	13
14	14	31	49	14
15	15	32	50	15
0 V DC		16–33		16, 33
+24 V DC			34–51	34, 51

Digital Output Unit 200-OB16P

200-OB16P is an I/O unit for 16 digital output signals. The outputs are galvanically isolated and short-circuit proof. The status of each signal is indicated by a LED on the front of the unit.



1 = Holder for insertable label for individual output designations
2 = Status indicators – LEDs show status of individual outputs.

Figure 49. Digital output unit 200-OB16P.

200-OB16P can be used with the version B or later of Adapter 200-ANN.

Front Panel

Indicators

Indication	Function
0–15	Yellow LED, lit when outputs are TRUE

Functional Description

The outputs are galvanically isolated by optocouplers and the 16 outputs share a common ground connection. The unit is connected via the terminal base unit.

The status of each output signal is indicated by a yellow LED on the front of the unit. The output status indicators do not work if the +24 V DC is missing.

Power for the internal logic is provided via the adapter for the I/O system.

An output shuts down and limits the current to about 200 mA when a short-circuit or an over-current (500 mA) is detected. The output returns to its normal state as soon as the short-circuit is removed and the temperature of the circuit is low enough.

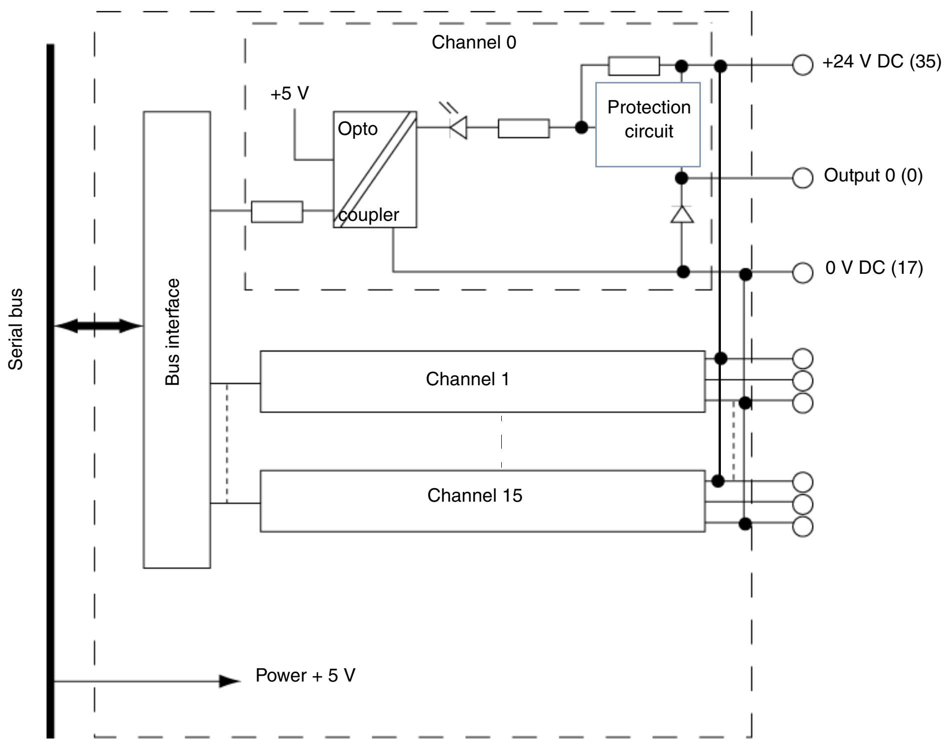


Figure 50. The 200-OB16P functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit, (e.g. 200-TB3) connected to the I/O unit. Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-OB16P Connections

Connect individual output wiring to numbered terminal as described in the table below. Up to four outputs can be connected in parallel.

Connection to terminal base screw terminals

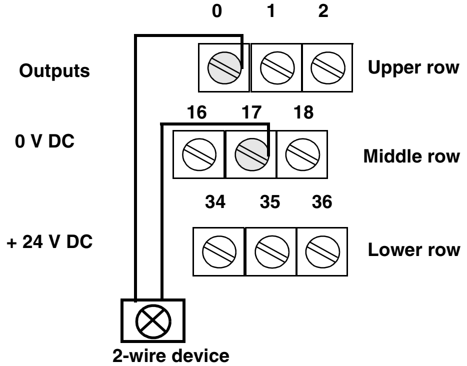


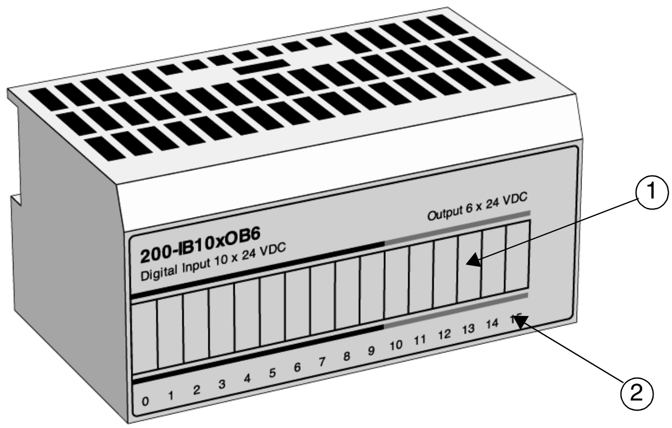
Figure 51. Wiring example. Note: not all terminal base units have three rows.

Screw terminal connections

Output	200-TB2 & 200-TB3			200-TBN & 200-TBNF
	Terminals to be connected			
	Signal (upper row)	0 V DC (middle row)	24 V DC (lower row)	Signal
0	0	17	35	0
1	1	18	36	1
2	2	19	37	2
3	3	20	38	3
4	4	21	39	4
5	5	22	40	5
6	6	23	41	6
7	7	24	42	7
8	8	25	43	8
9	9	26	44	9
10	10	45	45	10
11	11	28	46	11
12	12	29	47	12
13	13	30	48	13
14	14	31	49	14
15	15	32	50	15
0 V DC		16–33		16, 33
+24 V DC			34–51	34, 51

Digital Input/Output Combo Unit 200-IB10xOB6

200-IB10xOB6 is an I/O unit for 10 digital input and 6 digital output signals. The inputs are filtered and the unit is galvanically isolated. The inputs have programmable filter time. The status of each signal is indicated by a LED on the front of the unit.



1 = Holder for insertable label for individual input designations
2 = Status indicators - show status of individual inputs and outputs.

Figure 52. Digital input/output combo unit 200-IB10xOB6.

Front Panel

Indicators

Indication	Function
0–15	Yellow LED, lit when inputs/outputs are TRUE

Functional Description

The 10 digital input and the 6 digital output signals are connected to the unit via the screw terminals on the terminal base unit.

The status of each input/output signal is indicated by a yellow LED on the front of the unit. The inputs and outputs are galvanically isolated by optocouplers and shares a common ground connection. The inputs have a digital filter.

Filter time can be set by the programming software.

The outputs can deliver up to 2 A. Power for the internal logic is provided via the adapter.

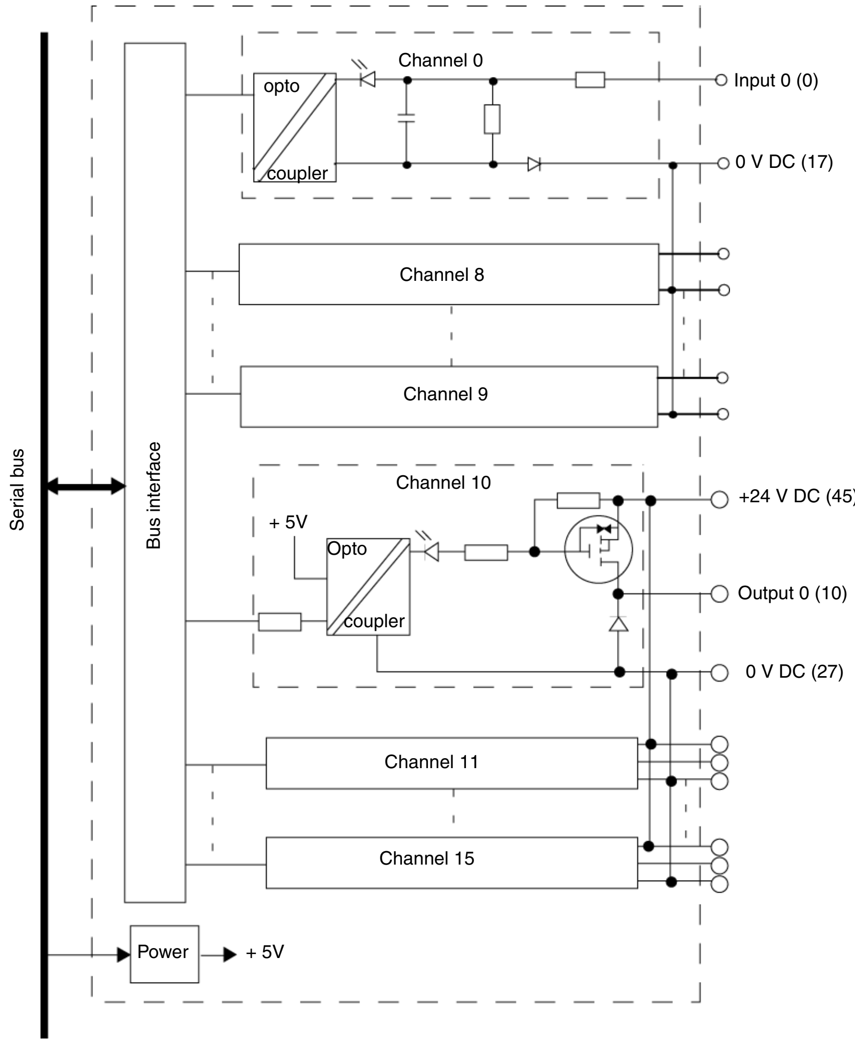


Figure 53. The 200-IB10xOB6 functional block diagram.

Numbers within parentheses in the diagram, refer to signal terminals on the terminal base unit (e.g. 200-TB3). Note that screw terminals 35–50 only exist on 200-TB3.

200-IB10xOB6 Connections

Connect individual input or output wiring to numbered terminal as described in the table below. Up to four outputs can be connected in parallel (the total load must, however, never exceed 1.8 A).

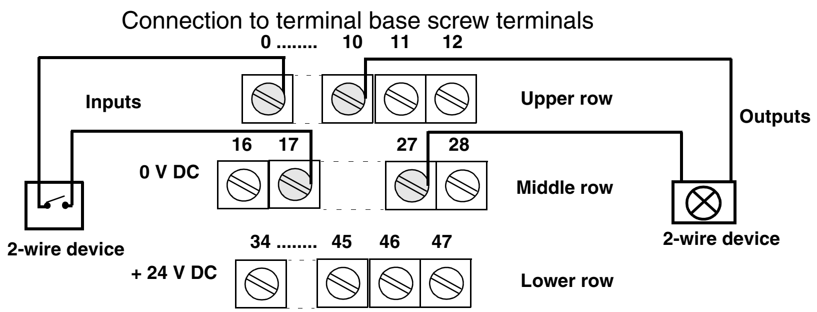


Figure 54. Two wiring examples.

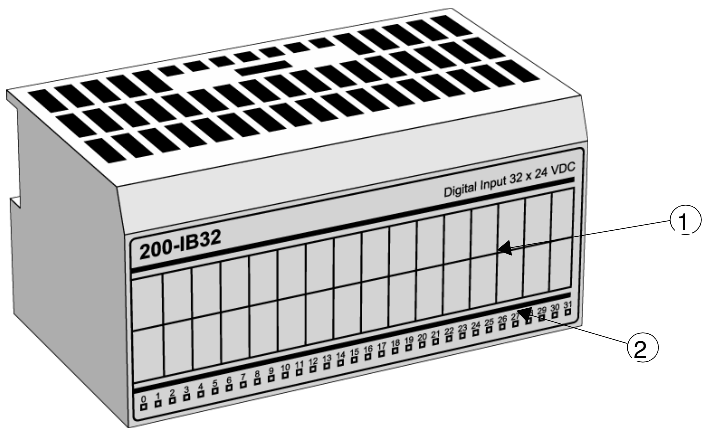
Not all terminal base units have three rows. See also examples in 200-IB16 Connections on page 84 and 200-OB16 Connections on page 88.

Screw terminal connections

	200-TB2 & 200-TB3			200-TBN & 200-TBNF
	Terminals to be connected			
	Signal (upper row)	0 V DC (middle row)	24 V DC (lower row)	Signal
Input 0	0	17	35	0
Input 1	1	18	36	1
Input 2	2	19	37	2
Input 3	3	20	38	3
Input 4	4	21	39	4
Input 5	5	22	40	5
Input 6	6	23	41	6
Input 7	7	24	42	7
Input 8	8	25	43	8
Input 9	9	26	44	9
Output 10	10	27	45	10
Output 11	11	28	46	11
Output 12	12	29	47	12
Output 13	13	30	48	13
Output 14	14	31	49	14
Output 15	15	32	50	15
0 V DC		16–33		16, 33
+24 V DC			34–51	34, 51

Digital Input Unit 200-IB32

200-IB32 is an I/O unit for 32 digital input signals. The status of each signal is indicated by a LED on the front of the unit.



1 = Holder for insertable label for individual input designations
2 = Status indicators - show status of individual inputs.

Figure 55. Digital input unit 200-IB32.

200-OB32P must be used with a 200-TB32 terminal base unit.

If you remove or insert the module while the backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Front Panel

Indicators

Indication	Function
0–31	Yellow LED, lit when inputs are TRUE

Functional Description

The inputs are isolated from the logic circuits in two groups by optocouplers. Each of the two input groups share common power and ground connections. The unit is connected via the terminal base unit.

The signals are filtered by a digital filter with a filter time common for all 31 input signals, set with the programming software.

Power for the internal logic is provided via the adapter for the I/O system.

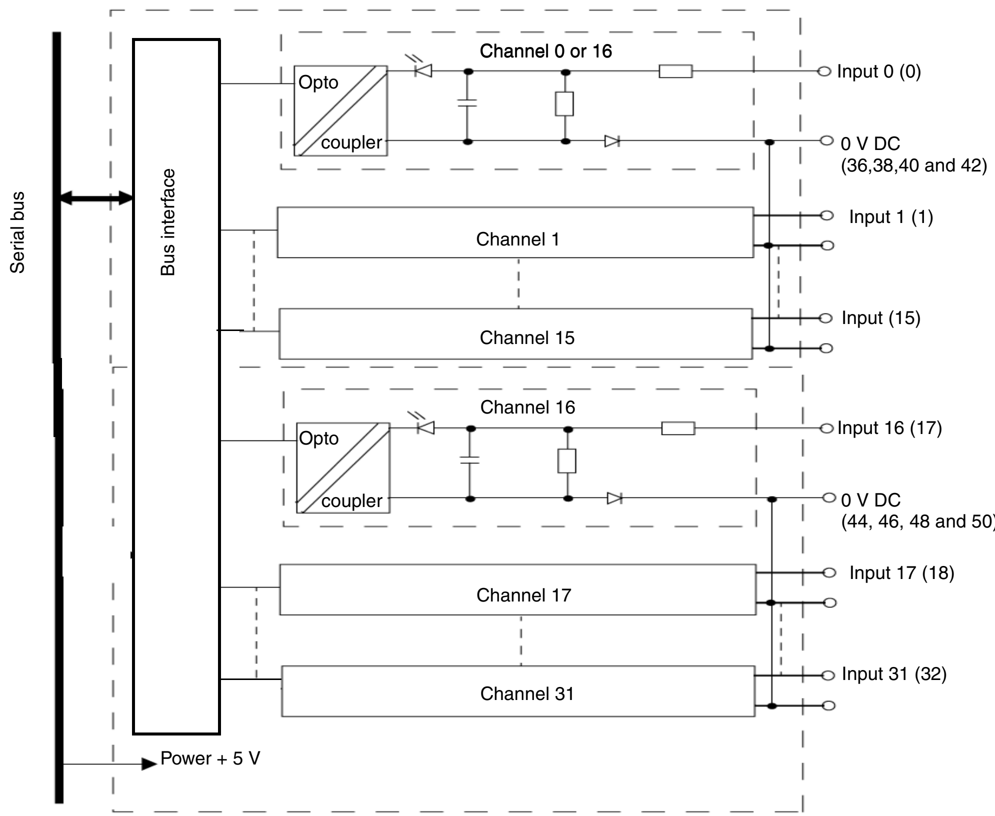


Figure 56. The 200-IB32 functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit (i.e. 200-TB32), connected to the I/O unit.

200-IB32 Connections

Connect individual input wirings to the numbered terminals as described in the table below.

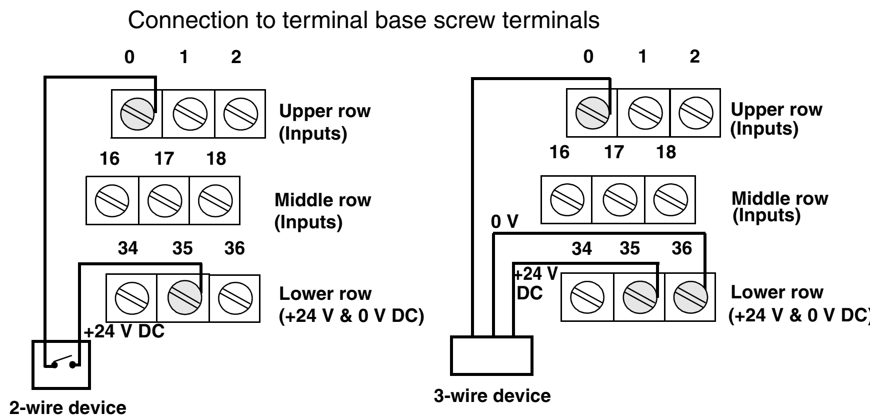


Figure 57. Two wiring examples.

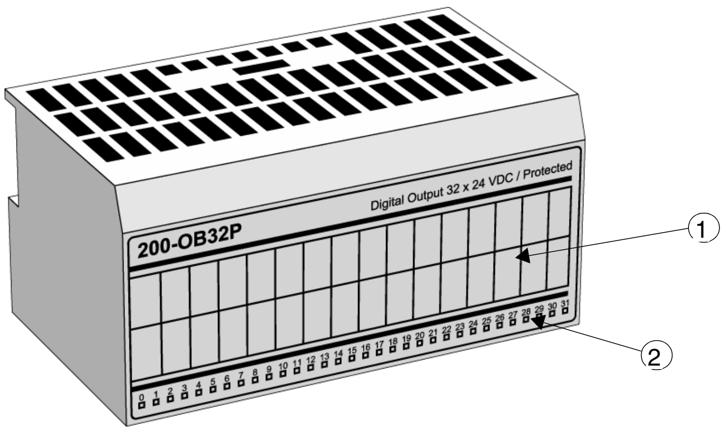
Screw terminal connections

Input	200-TB32 Terminals to be connected		
	Signal	0 V DC	24 V DC
0	0	36, 38, 40, 42	35, 37, 39, 41
1	1		
2	2		
3	3		
4	4		
5	5		
6	6		
7	7		
8	8		
9	9		

Input	200-TB32 Terminals to be connected		
	Signal	0 V DC	24 V DC
10	10	36, 38, 40, 42	35, 37, 39, 41
11	11		
12	12		
13	13		
14	14		
15	15		
16	17	44, 46, 48, 50	43, 45, 47, 49
17	18		
18	19		
19	20		
20	21		
21	22		
22	23		
23	24		
24	25		
25	26		
26	27		
27	28		
28	29		
29	30		
30	31		
31	32		

Digital Output Unit 200-OB32P

200-OB32P is an I/O unit for 32 digital output signals. The status of each signal is indicated by a LED on the front of the unit.



1 = Holder for insertable label for individual output designations
2 = Status indicators – LEDs show status of individual outputs.

Figure 58. Digital output unit 200-OB32P.

200-OB32P must be used with a 200-TB32 terminal base unit.

If you remove or insert the module while the backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

Indicators

Indication	Function
0–31	Yellow LED, lit when outputs are TRUE

Functional Description

The outputs are short-circuit proof and are isolated from the logic circuits in two groups by optocouplers. Each of the two output groups share common power and ground connections. The unit is connected via the terminal base unit.

The status of each output signal is indicated by a yellow LED on the front of the unit. The output status indicators do not work if the +24 V DC is missing.

Power for the internal logic is provided via the adapter for the I/O system.

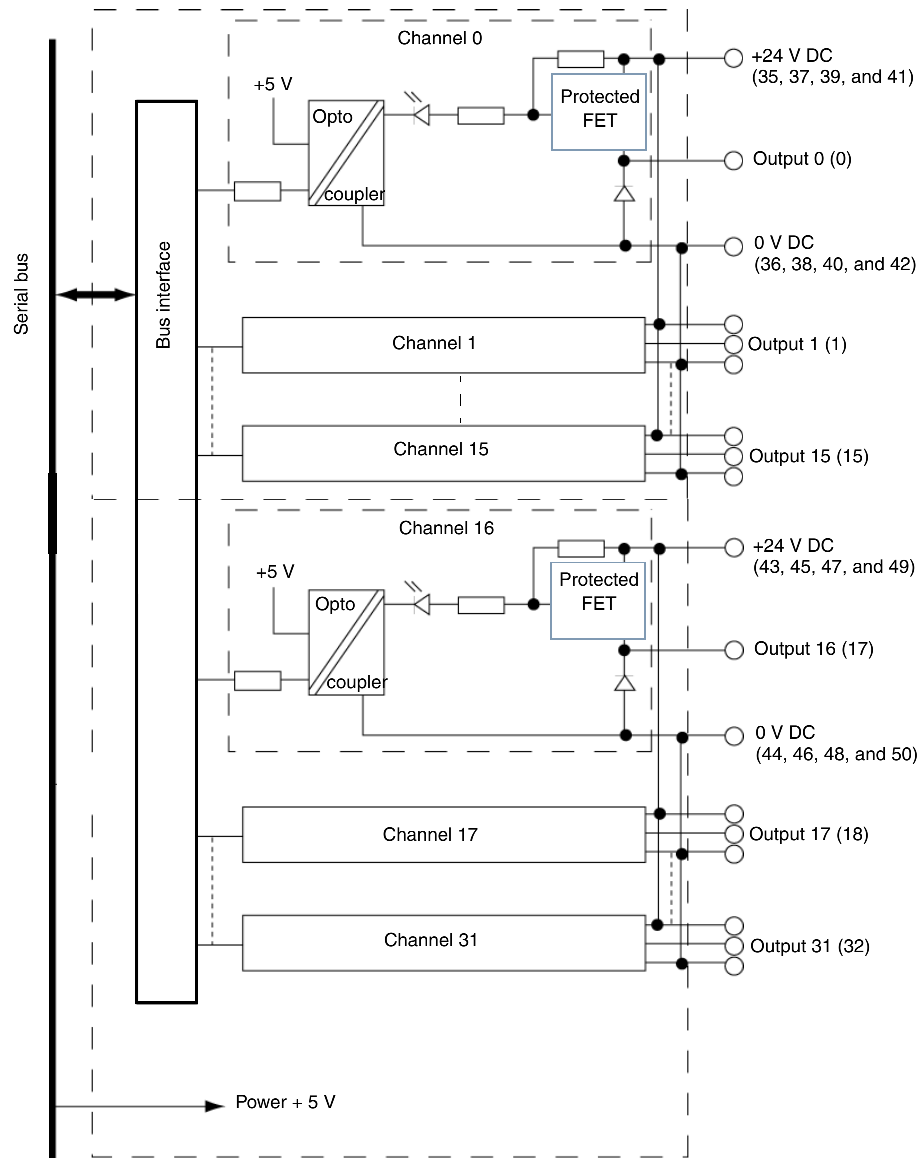


Figure 59. The 200-OB32P functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit (i.e. 200-TB32), connected to the I/O unit.

200-OB32P Connections

Connect individual output wirings to the numbered terminals as described in the table below.

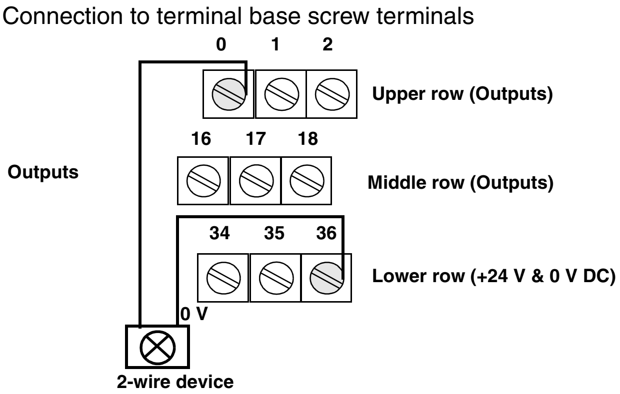


Figure 60. Wiring example.

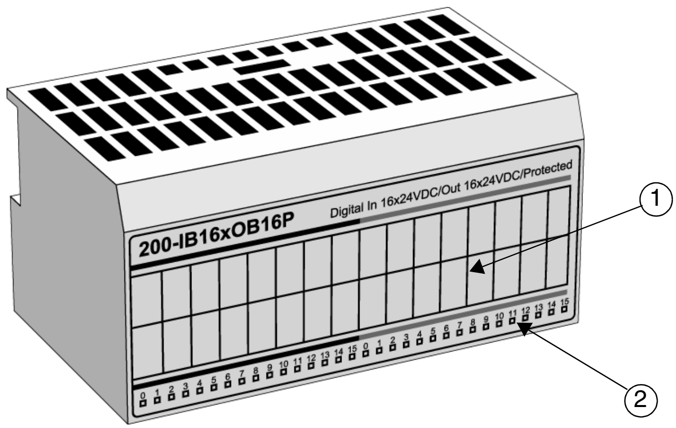
Screw terminal connections

Output Signal	200-TB32 Terminals to be connected		
	Signal	0 V DC	24 V DC
0	0	36, 38, 40, 42	35, 37, 39, 41
1	1		
2	2		
3	3		
4	4		
5	5		
6	6		
7	7		
8	8		
9	9		

Output Signal	200-TB32 Terminals to be connected		
	Signal	0 V DC	24 V DC
10	10	36, 38, 40, 42	35, 37, 39, 41
11	11		
12	12		
13	13		
14	14		
15	15		
16	17	44, 46, 48, 50	43, 45, 47, 49
17	18		
18	19		
19	20		
20	21		
21	22		
22	23		
23	24		
24	25		
25	26		
26	27		
27	28		
28	29		
29	30		
30	31		
31	32		

Digital Input/Output Combo Unit 200-IB16xOB16P

200-IB16xOB16 is an I/O unit for 16 digital input and 16 digital output signals. The status of each signal is indicated by a LED on the front of the unit.



1 = Holder for insertable label for individual input designations
2 = Status indicators - show status of individual inputs and outputs.

Figure 61. Digital input/output combo unit 200-IB16xOB16P.

200-OB32P must be used with a 200-TB32 terminal base unit.

Remove field-side power before removing or inserting this module. It is designed so that you can *remove and insert it under backplane power,* but if you remove or insert it with *field-side power* applied, an electrical arc may occur. This can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices causing unintended machine motion

- causing an explosion in a hazardous environment

Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

Front Panel

Indicators

Indication	Function
0–31	Yellow LED, lit when inputs/outputs are TRUE

Functional Description

The 16 digital input and the 16 digital output signals are connected to the unit via the screw terminals on the terminal base unit. Power for the internal logic is provided via the adapter.

Input channels are isolated from output channels. There is no isolation between individual channels. The inputs have a digital filter with the filter time set by the programming software.

The outputs are short-circuit proof and can deliver up to 0.5 A each.

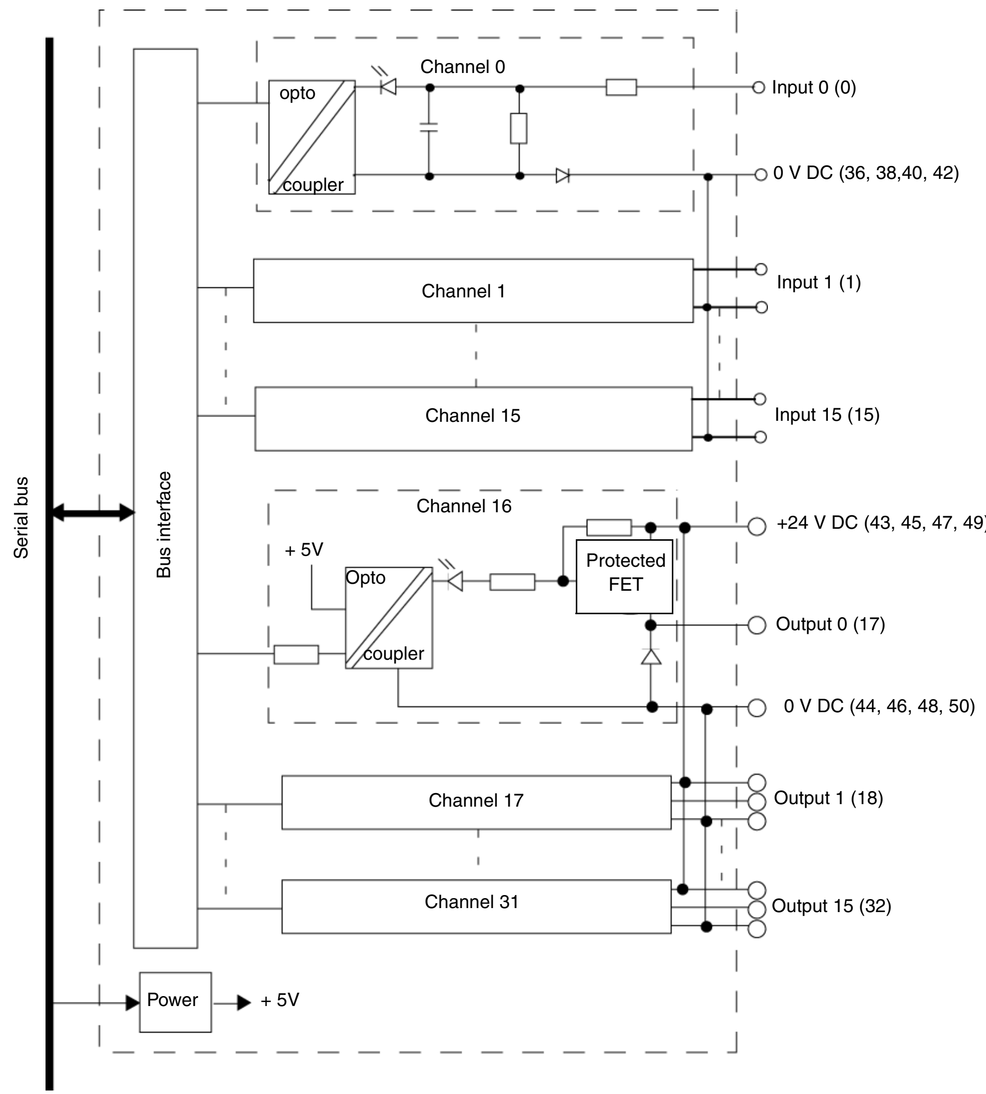


Figure 62. The 200-IB16xOB16P functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit (i.e. 200-TB32), connected to the I/O unit.

200-IB16xOB16P Connections

Connect individual input or output wirings to the numbered terminals as described in the table below.

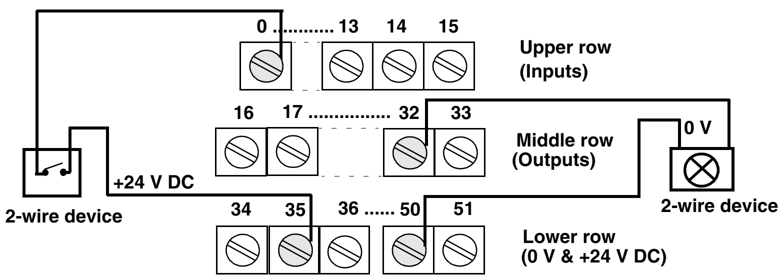


Figure 63. Two wiring examples.

See also examples in 200-IB32 Connections on page 101 and 200-OB32P Connections on page 106.

Screw terminal connections

In-/output signal	200-TB32 Terminals to be connected		
	Signal	0 V DC	24 V DC
Input 0	0	36, 38, 40, 42	35, 37, 39, 41
Input 1	1		
Input 2	2		
Input 3	3		
Input 4	4		
Input 5	5		
Input 6	6		
Input 7	7		
Input 8	8		
Input 9	9		

In-/output signal	200-TB32 Terminals to be connected		
	Signal	0 V DC	24 V DC
Input 10	10	36, 38, 40, 42	35, 37, 39, 41
Input 11	11		
Input 12	12		
Input 13	13		
Input 14	14		
Input 15	15		
Output 0	17	44, 46, 48, 50	43, 45, 47, 49
Output 1	18		
Output 2	19		
Output 3	20		
Output 4	21		
Output 5	22		
Output 6	23		
Output 7	24		
Output 8	25		
Output 9	26		
Output 10	27		
Output 11	28		
Output 12	29		
Output 13	30		
Output 14	31		
Output 15	32		

Pulse Counter Unit 200-IP2

The Pulse Counter Unit, 200-IP2, is an I/O unit with 2 pulse transmitter interfaces, each with 4 optocoupled inputs. The maximum pulse frequency is 100 kHz. The I/O unit is configured using the control system program.

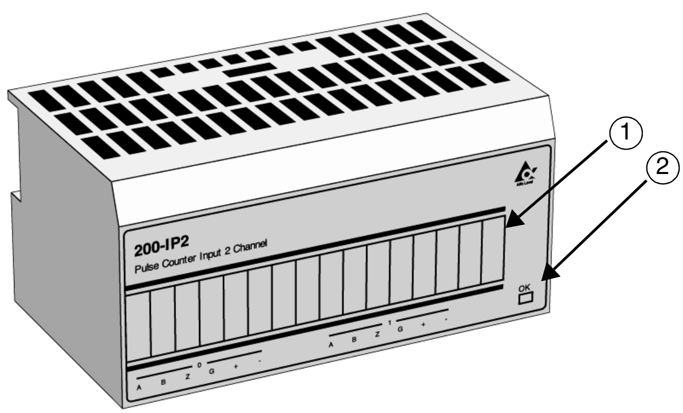
200-IP2 can be adapted for a wide range of applications, for example, for counting pulses from pulse transmitters or incremental encoders with 1 pulse train or with 2 pulse trains. Quantity counting, positioning and speed calculation are examples of other applications.

200-IP2 has two 16-bit up/down counters, which are individually programmable. The number of edges to be counted in a pulse train can be specified to x1, x2 or x4.

Complementary or non-complementary pulse transmitters can be connected.

200-IP2 can be used with the version B or later of Adapter 200-ANN.

Front Panel



1 = Insertable label for labelling individual input designations
2 = Status indicators

Figure 64. Pulse counter unit 200-IP2.

Indicators

The table below shows the LEDs for one of the two identical pulse transmitter interfaces.

Indication	Function
A	Yellow LED, lit when input A is active
B	Yellow LED, lit when input B is active
Z	Yellow LED, lit when input Z is active
G	Yellow LED, lit when input G is active
+	Yellow LED, lit when a positive count pulse is detected. It is turned off by a negative pulse.
–	Yellow LED, lit when a negative count pulse is detected. It is turned off by a positive pulse.
OK	Red LED, lit during the initialization phase, after the power has been switched on.
	Green LED, lit when the initialization of the 200-IP2 internal logic is complete.

Functional Description

200-IP2 has 2 identical pulse transmitter interfaces (12–24 V DC), each with four inputs (A, B, Z and G). Each input has +/– inputs for connection to pulse transmitters with complementary or non-complementary signals. The counter can count one or two pulse trains.

200-IP2 handles up/down counting and detection of a selectable number of edges (x1, x2 or x4) for incremental encoders with two pulse trains, nominal 90 degrees out of phase (minimum stable signal condition: 2 µs). Each of the two counters has a 16-bit counter register, a preset register and a latch register.

Built-in programmable low-pass filters can be connected to the A inputs. The selected filter constant is common for both A inputs.

The unit can be configured for a number of applications. This is done via parameters accessible from the control system program.

The power to 200-IP2 is supplied from an external power supply (12–24 V DC), connected to the screw terminals of the I/O unit.

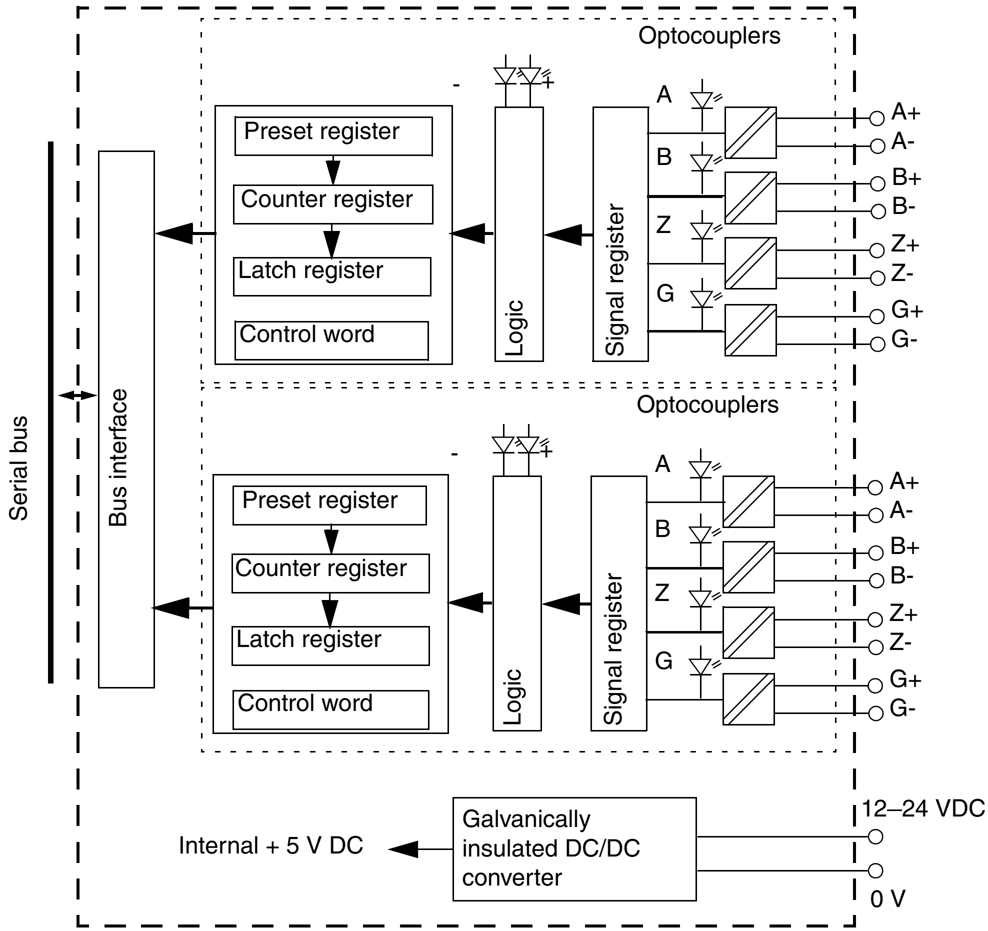


Figure 65. The 200-IP2 functional block diagram.

Variables

Communication between the unit and the control system takes place via variables accessible in the control system program. Such variables are, for example, the counter register (*Counter*), the preset register (*PresetValue*) and the latch register

(*LatchValue*). Signal registers and control words are also used to set parameters for the counter configuration. The control word, which is sent to the pulse counter unit, can be read back to the control system, to allow verification that (at least) one I/O scan has been performed since the PLC cycle which initiated the 200-IP2 command.

Control word variables are written in italics, making it easier to recognize them. Example: *Latched, CalDirection, GateControl,* etc.

Only one of the two identical pulse counter interfaces is described in this section. This means that the counter number of the variables is omitted, for example, *CounterEnable0* and *CounterEnable1* are named *CounterEnable*.

Start Counting

The control bit *CounterEnable* enables counting. It must be set (1), to enable counting and all other functions described in this section.

All registers, including the *CounterEnable* control bits, are reset (=0) after a power-up sequence.

Select Type of Pulse Transmitter and Up/Down Counting

Depending on the type of pulse transmitter, the pulse counter unit can be set in different counter modes, *CounterMode*.

CounterMode	Function
0	Count on the positive edge of input signal A. Up/down counting is determined by the signal at input B (see Up/Down Counting Controlled by Input B on page 117).
1	The transmitter pulse frequency x1 (see Count Pulses from Incremental Encoders on page 118).
2	The transmitter pulse frequency x2 (see Count Pulses from Incremental Encoders on page 118).
3	The transmitter pulse frequency x4 (see Count Pulses from Incremental Encoders on page 118).

CounterMode	Function
4	Count up on the positive edge of input signal A and down on the positive edge of input signal B. (see Up/down Counting using Pulses at the Inputs A and B on page 118)
5	Not used
6	Not used
7	Not used

Up/Down Counting Controlled by Input B

If *CounterMode* = 0, then the counter will count on the positive edge of input A. If input B = 0, the counter will count up, and if B = 1, it will count down.

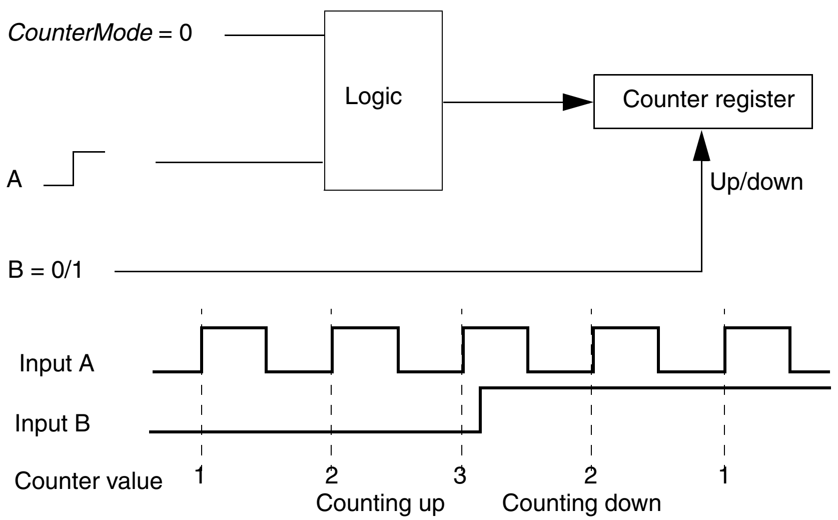


Figure 66. Up/down counting example.

Up/down Counting using Pulses at the Inputs A and B

If *CounterMode* = 4, then the counter will count up on the positive edge of input signal A, and down on the positive edge of input signal B.

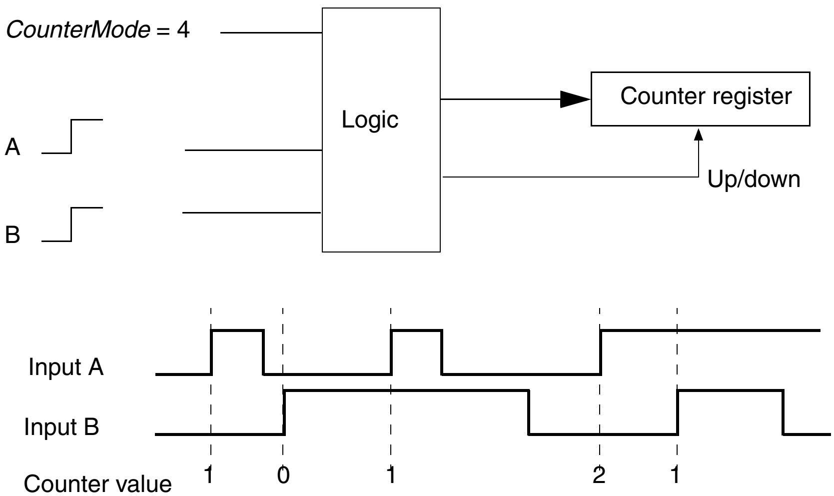


Figure 67. Up/down counting example.

A flag *CountDirection* is indicating if the counter is counting up (+) or down (–) (this direction is also visually indicated by the front LEDs + and -).

CountDirection	Function
0	Last pulse decreased (–) the counter value
1	Last pulse increased (+) the counter value

Count Pulses from Incremental Encoders

If *CounterMode* = 1, 2 or 3, then 1, 2 or 4 edges of the pulse train will be counted. The counter direction (up/down) is determined by the phase difference of the input signals of A and B, see example below.

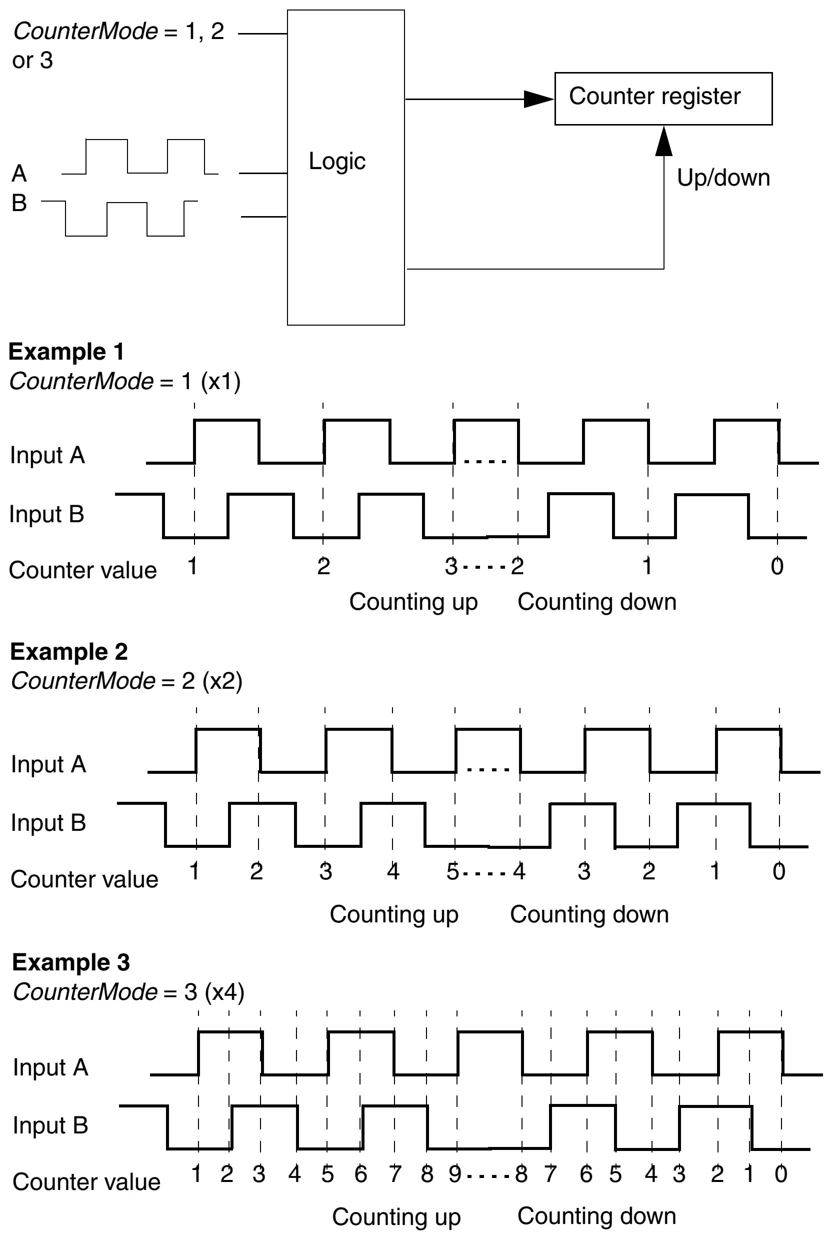


Figure 68. Pulse counting examples.

Preset Function

The preset function is used to copy a value from the preset register to the counter register. Two alternatives are described in the figure below, but there are more alternatives, see the sections Limitation Function on page 122 and Process Calibration on page 124.

The flag *PresetReached* is set when the counter register and the preset register are equal (if the counter preset value has been reached, or if the counter has been loaded with the preset value). The flag is reset on a positive edge of *PresetReset* after the operation and can only be set after at least one additional counting pulse.

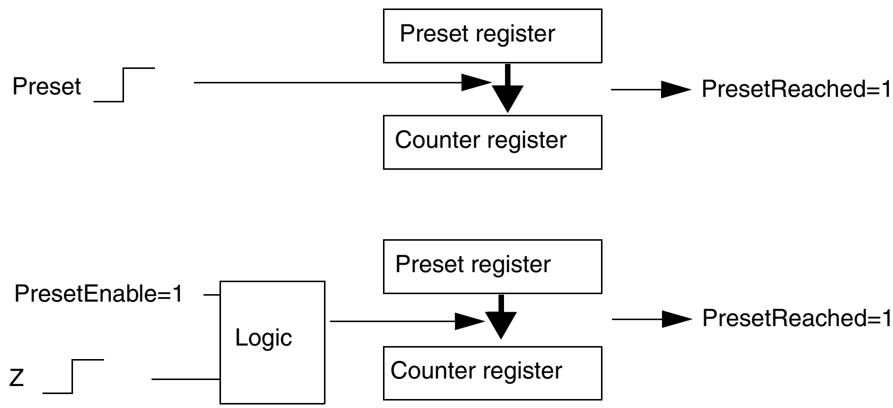


Figure 69. Two methods of copying the preset register to the counter register.

Gate Function

The gate function is used to determine when counting should start and stop. This is used, for example, when measuring distances.

The parameter *GateControl* determines the gate function. The gate signal is connected to input G.

GateControl	Function
0	Counting is independent of G
1	Counting takes place only if G = 1
2	Counting takes place only if G = 0
3	Calibration if G = 1 and all other conditions are fulfilled, see Process Calibration on page 124

Example

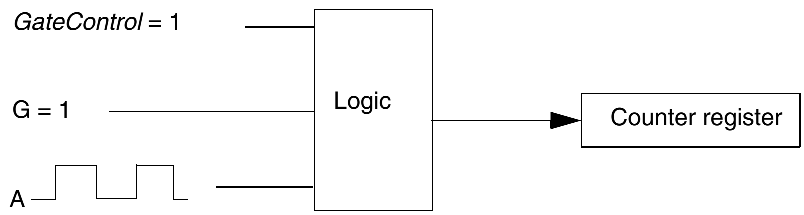


Figure 70. The counter is counting if G = 1. There are two other alternatives, see the table above.

Latch Function

The latch function is used to copy the value in the counter register (*Counter*) to the latch register (*LatchValue*).

The parameter *LatchControl* determines the latch function. The operation is executed on the positive and/or the negative edge (see table below) of input signals G and Z, respectively.

The parameter *Latched* must be = 0 (Reset).

Latched is set when the operation is completed. It must be reset after the operation by *LatchedReset*.

See also Process Calibration on page 124.

LatchControl	Function
0	Save the counter value on the positive edge of input signal Z. For its use, see Process Calibration on page 124
1	Save the counter value on the positive edge of input signal G
2	Save the counter value on the negative edge of input signal G
3	Save the counter value on both the positive and negative edges of input signal G

Example

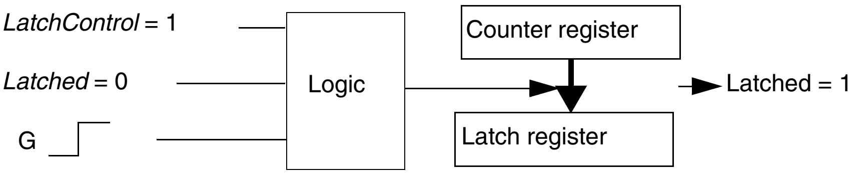


Figure 71. The counter value is copied to the latch register on the positive edge of input signal G. There are 3 other alternatives, see table above.

Limitation Function

If the control bit *RangeLimited* = 1, then the counter is counting up to the preset value and will then restart from 0. Counting down results in the counter attaining the preset value on the next pulse, if the current counter value = 0.

RangeLimited = 0 corresponds to *RangeLimited* = 1 if the preset value = FFFF(hex) = 65535(dec).

The flag *PresetReached* is set when the counter value is equal to the preset value. This flag must be reset by *PresetReset* after the operation.

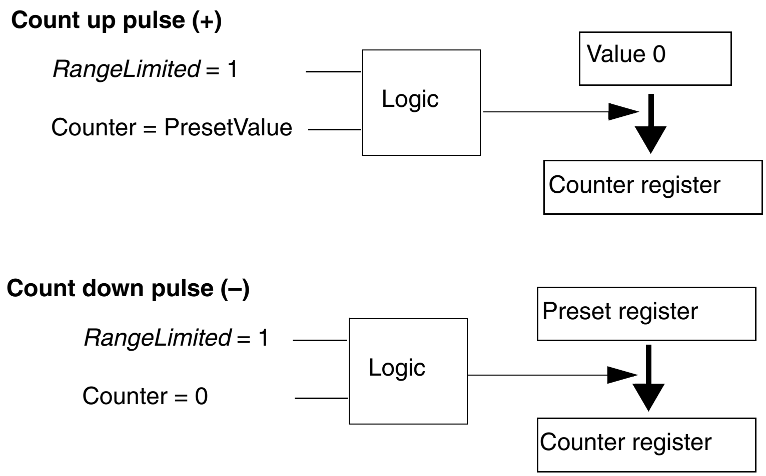


Figure 72. Limitation function example.

If the preset register value = 0, then the counter retains the value 0.

Digital Low-pass Filter Function

Programmable digital low-pass filters can be connected to the A inputs. The selected filter constant is common for the two A inputs.

The filter function is only available if *CounterMode* = 0 (pulse counting).

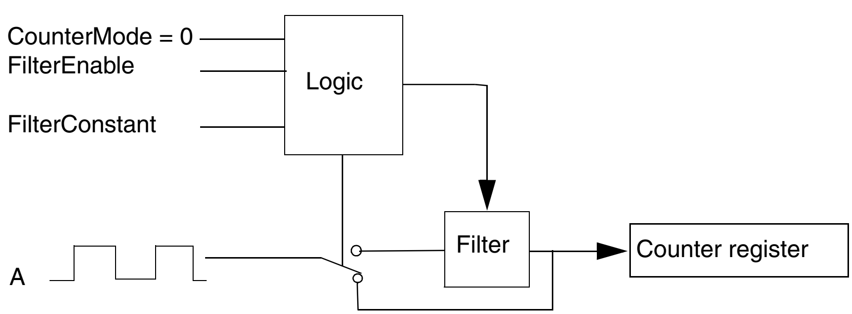


Figure 73. A filter can be connected between the A input and the counter register.

The control bit *FilterEnable* enables the filter function for each counter individually. The filter will be connected to the input A if the bit is set. The parameter *FilterConstant* is used to select the filter constant value, see table below. Note that there are two filters but the constant value is common for the two filters.

FilterConstant	Function
0	73.5 kHz or minimum 0.007 ms pulse width
1	37.8 kHz or minimum 0.013 ms pulse width
2	12.8 kHz or minimum 0.04 ms pulse width
3	1.2 kHz or minimum 0.4 ms pulse width

Process Calibration

Process calibration of the counter is performed in order to synchronize the control system with the machinery where the pulse transmitter is mounted. This means, that the counter is set to a preset value when a reference pulse is received. Input Z is used to activate calibration. The input signal to Z can, for example, be a zero pulse integrated with an incremental encoder. Alternatively, the calibration signal may come from another transmitter which is independent of the pulse transmitter. Calibration is performed at the first positive edge of the input signal Z and is therefore independent of the signal duration at Z. It does not matter if it corresponds to several pulses in the A and B signals, or if several Z pulses are given during the allowed calibration time. Calibration may be initiated by the control system or by an external signal.

Calibration is enabled if *CalEnable* = 1 or if *GateControl* = 3 and G input = 1. The counter direction must also coincide with *CalDirection,* and *Calibrated* must be = 0 (acknowledged by a positive edge on *CalReset)*. When calibration is activated, the counter is given the value in *PresetValue* and *Calibrated* will be set. The counter value before loading, can be saved in *LatchValue* if *LatchControl* = 0 and *Latched* = 0 (see below). Note, that the condition for the latch function is not dependent on the direction and therefore does not automatically occur on that edge of Z, which activates calibration.

The example below illustrates the use of the signals involved in the calibration.

Process calibration, alternative 1

Calibration is enabled by the flag *CalEnable*, which should be enabled by the control system. The preset value is copied to the counter register at a positive edge on input signal Z. The old counter register value is saved in the latch register for evaluation.

The calibration direction is determined by *CalDirection* (0 = positive direction, 1 = negative direction).

Calibrated, *Latched* and *PresetReached* should be reset after calibration (with *CalReset*, *LatchedReset* and *PresetReset*).

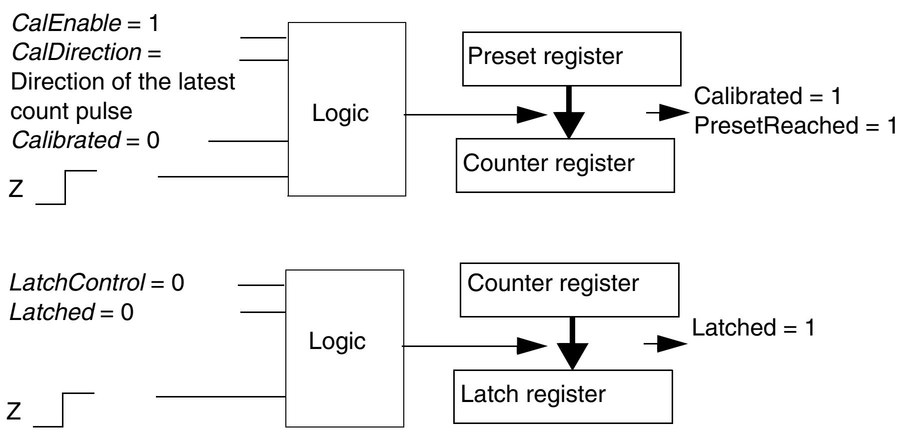


Figure 74. Process calibration example 1.

Process calibration, alternative 2

Calibration is enabled by input G if *GateControl* = 3 and *Calibrated* = 0. The preset value is copied to the counter register at a positive edge on input signal Z. The old counter register value in the latch register is saved for evaluation.

The calibration direction is determined by *CalDirection* (0 = positive direction, 1 = negative direction).

Calibrated, *Latched* and *PresetReached* should be reset after calibration (with *CalReset*, *LatchedReset* and *PresetReset*).

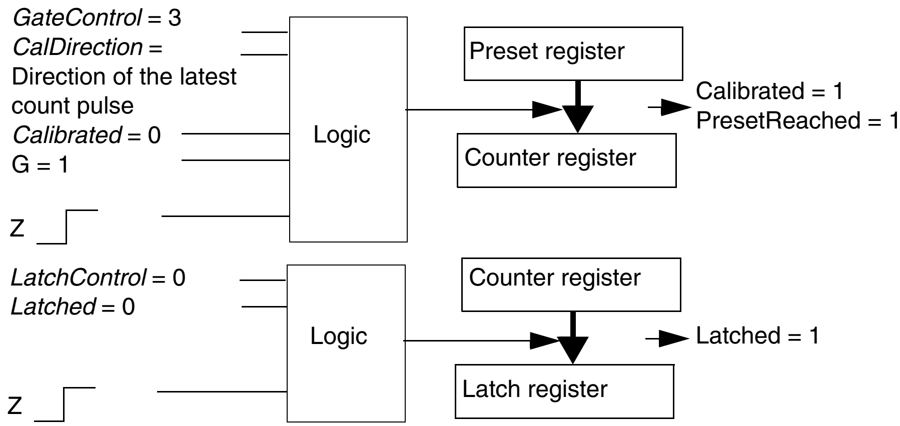


Figure 75. Process calibration example 2.

200-IP2 Connections

The unit is used for pulse transmitters with a nominal voltage of 12–24 V DC. An external power supply must be connected via a power line filter to the screw terminals (note that there are general demands on all connected units for CE marking with respect to the EMC and LVD approval). The type of filter is specified in Appendix B, Recommended Components on page 333. If galvanic insulation is not required for the connected pulse transmitters, then the power supply can be connected to the individual pulse transmitter via terminals on the baseplate of the pulse counter. Separate power supplies can be used for the pulse transmitters and the pulse counter unit, as the signal inputs are optocoupled and galvanically insulated. This also applies for transmitters using different voltages.

Connect the different inputs to the corresponding numbered connections as shown in the figure below.

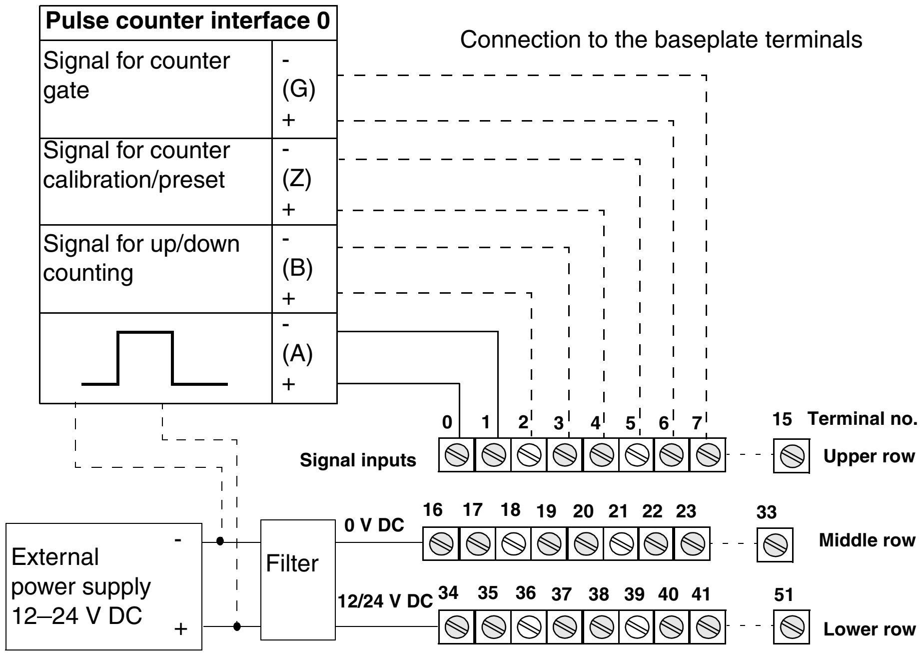


Figure 76. Example of wiring with a pulse transmitter with one pulse train. For connection of a second pulse transmitter to the baseplate, see the table below. The dotted lines indicate signals which are not always used. Note, that not all baseplates have three rows.

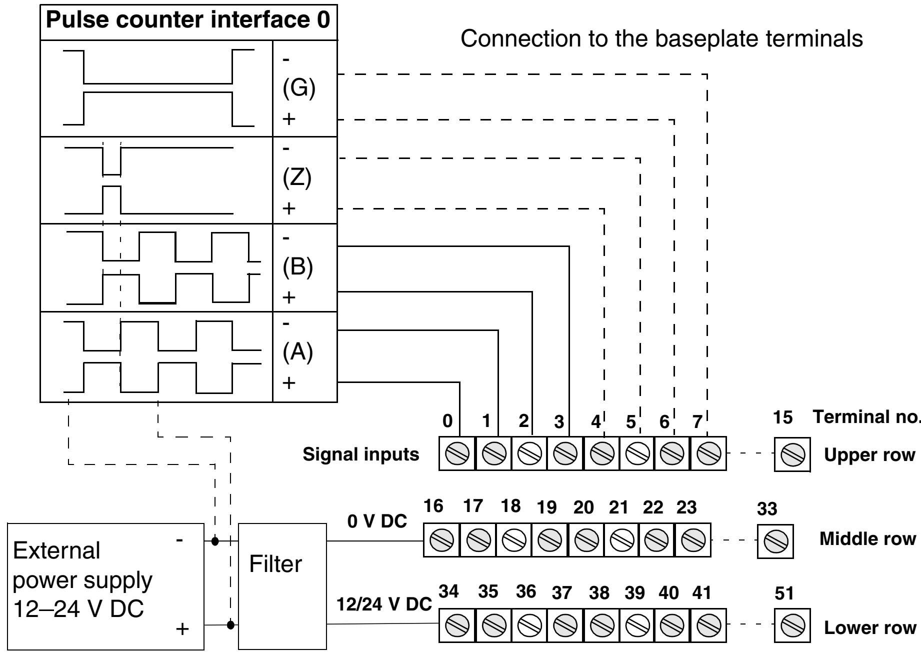


Figure 77. Example of wiring with an incremental encoder with 2 pulse trains, with or without zero reference, and/or gate function. For connection of a second incremental encoder to the baseplate, see the table below. The dotted lines indicate signals which are not always used. Note, that not all baseplates have three rows.

Screw Terminal connections

	200-TB2 & 200-TB3 (TB3 is the recommended type)			200-TBN & 200-TBNF
	Terminals to be connected			
	Signal (upper row)	**0 V DC (middle row)**	**12/24 V DC (lower row)**	**Signal**
Pulse counter interface 0				
A+	0	17	35	0
A-	1	18	36	1
B+	2	19	37	2
B-	3	20	38	3
Z+	4	21	39	4
Z-	5	22	40	5
G+	6	23	41	6
G-	7	24	42	7
Pulse counter interface 1				
A+	8	25	43	8
A-	9	26	44	9
B+	10	27	45	10
B-	11	28	46	11
Z+	12	29	47	12
Z-	13	30	48	13
G+	14	31	49	14
G-	15	32	50	15
0 V DC		16–33		16, 33
12/24 V DC			34–51	34, 51

Power can be supplied to the encoders from the middle and lower row (marked COM and V, respectively) of the baseplate, or from a separate power supply.

If a non-complementary transmitter is used, its 0 V reference is connected to the minus terminal (–), and the signal to the plus terminal (+). Both complementary and non-complementary transmitters can be used in the same counter, as all the inputs are individually galvanically insulated. Complementary electronic transmitters should be used if long wires are used, and maximum noise immunity is required. They should also be used to avoid contact bounce problems. Complementary signals give better noise suppression.

200-IP2 can be used with transmitters giving a maximum pulse frequency of 100 kHz, which means that mechanical transmitters should not be used. Such transmitters generate contact bounces, which may be counted by this high-speed counter. Use electronic pulse transmitters instead.

Not connected signal inputs are detected as “Input OFF” (inactive).

To fulfil EMC demands, the connection cable to the transmitter must be shielded using a twisted-pair cable, one for each complementary input signal. The shield must be connected close to the pulse counter unit, using a ground clamp.

Temperature Precautions

Certain environmental temperature precautions should be considered if the absolute maximum allowed input voltage specified for 200-IP2 is supplied to many inputs simultaneously. This may occur if the inputs are connected to digital switches for 24V DC.

To minimize temperature rise and thus extend the unit life, it is recommended not to connect maximum input voltage simultaneously to all inputs for extended periods of time at maximum allowed environmental temperature (+55 ºC momentarily or +50 ºC average for over 24 hours).

If the ambient temperature is expected to exceed 40 ºC, input signal voltage exceeding 20 V can easily be limited to a lower voltage using a series resistor which could be mounted on the input signal terminal block. Recommended resistor value is 1 kΩ Typically a 1 kΩ series resistor limits a 24 V sensor signal to approximately 15 V at the 200-IP2 input, which still safely meets the minimum level for an active input.

Background

The wide signal input voltage range for the 200-IP2 unit is designed specifically to meet the complementary signal output voltage from incremental encoders intended to be connected to 200-IP2.

The incremental encoder differential output voltage is typically 8–10 V for a 12 V DC powered unit and 18–20 V for a 24 V DC device. To allow connection of both 12 and 24 V DC encoders to 200-IP2, the input range has been designed to meet 6–26.4 V (24 V DC +10%). Power dissipation in the input resistors depends on the input current which is typically 3 mA at 6 V DC and 15 mA at 24 V DC. Total power dissipation in the input circuits is approximately 3.5 W at maximum input voltage on all 8 inputs, which is added to the logic power supply of 1.5 W. The total power dissipation is within the recommendations of maximum 6 W per module.

Frequency Counter Unit 200-IP4

The Frequency Counter Unit, 200-IP4, is an I/O unit with 4 pulse transmitter interfaces, each with 2 optocoupled inputs. The maximum pulse frequency is 100 kHz. The I/O unit is configured using the control system program.

200-IP4 can be adapted for a wide range of applications, for example, for counting pulses from flow meters and density meters. Quantity counting and speed calculation are examples of other applications.

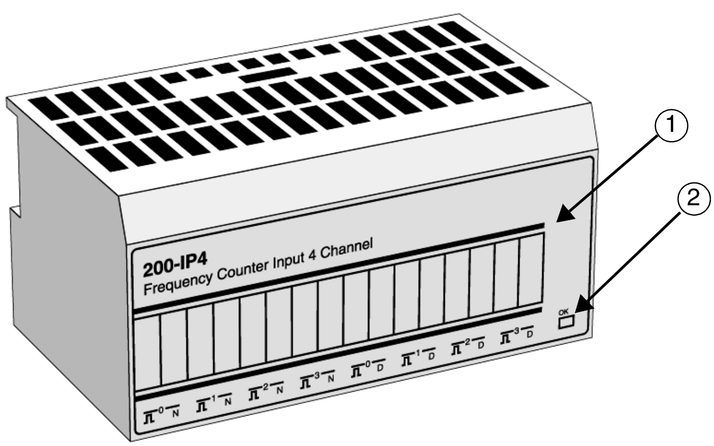
200-IP4 has two 16-bit counters per channel. Each of the four interfaces can be individually configured for:

- time period measurement using one 16-bit counter and accumulating pulse counting using the other 16-bit counter.
- time period measurement using a 32-bit counter.

An internal clock (1 or 10 MHz) is used for the time period measurement.

200-IP4 can be used with the version B or later of Adapter 200-ANN.

Front Panel



1 = Insertable label for labelling individual input designations
2 = Status indicators

Figure 78. Frequency counter unit 200-IP4.

Indicators

Only the LEDs for one of the four interfaces are shown in the table below.

Indication	Function
⎍	Yellow LED, lit when the input is active.
N	Yellow LED, lit when the input is configured for 16-bit time period measurement and a 16-bit accumulating pulse counter function.
D	Yellow LED, lit when input is configured for 32-bit time period measurement.
OK	Red LED, lit during the initialization phase, after the power has been switched on.
	Green LED, lit when initialization of the 200-IP4 internal logic is complete.

Functional Description

200-IP4 has 4 identical pulse transmitter interfaces (12–24 V DC), each with two signal inputs (N and D). Each input has +/– inputs for connection to pulse transmitters.

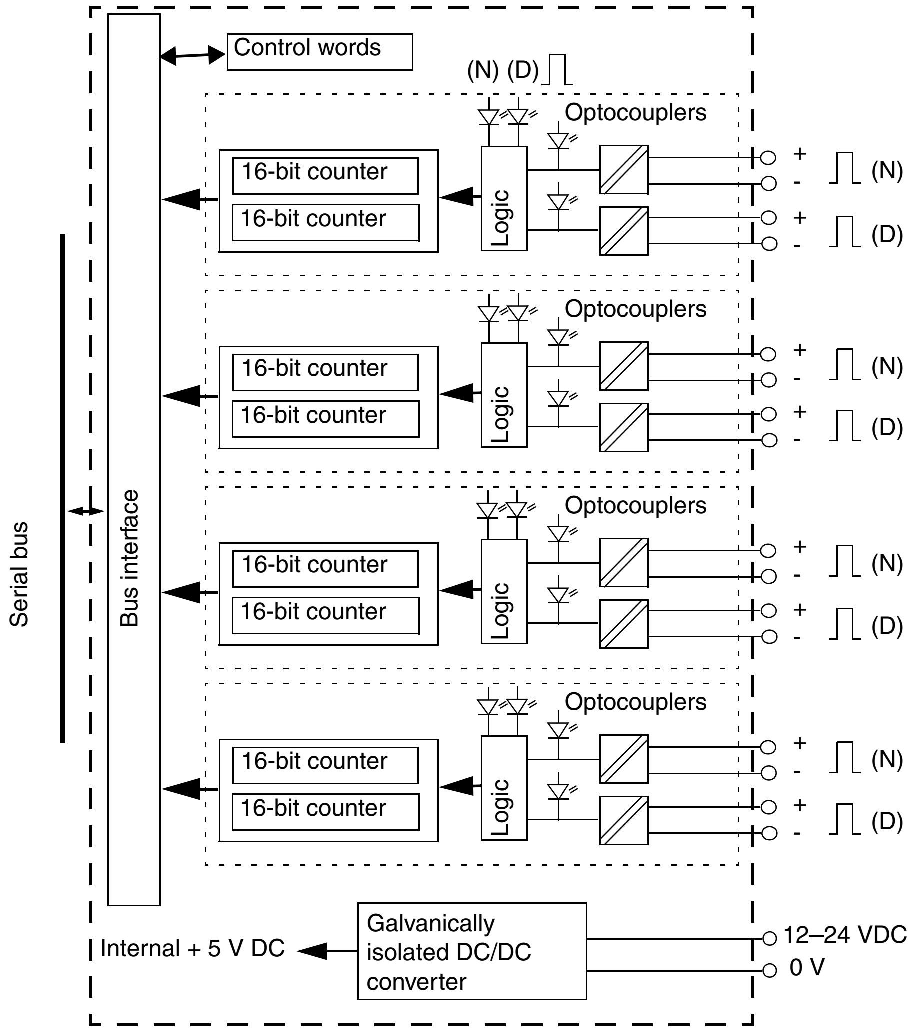


Figure 79. The 200-IP4 functional block diagram.

Each of the four interfaces can be individually configured for:

- time period measurement using one 16-bit counter and accumulating pulse counting using the other 16-bit counter (the N-input is to be used).
- time period measurement using a 32-bit counter (the D-input is to be used).

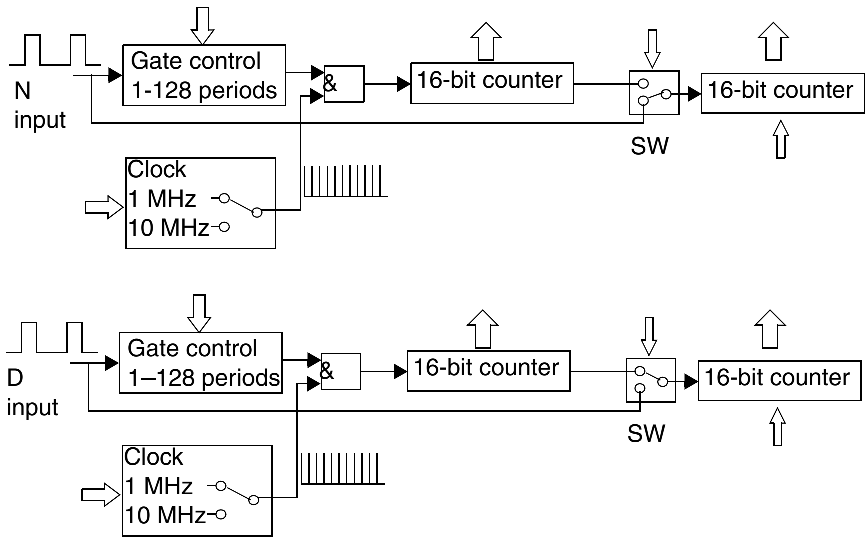


Figure 80. Individual configuration of interfaces.

The configuration is selected by setting “SW” in the appropriate position (variable *SelectMeasureType*). The arrows show signals (control words and registers) controlled by the control system.

The internal clock (1 or 10 MHz) is used for the time period measurement.

The number of periods for which the input signal is to be measured is selectable (1, 2, 4, 8, 16, 32, 64 or 128 periods). See *Gate control* in the figure above.

The unit can be configured for a number of applications. This is done via parameters accessible from the control system program.

The power to the 200-IP4 is supplied by an external power supply (12–24 V DC), connected to the screw terminal of the I/O unit.

Variables

Communication between the 200-IP4 unit and the control system takes place via variables accessible in the control system program. Such variables are, for example, selection of clock frequency (*ClockFrequency*) and the selection of measurement type (*SelectMeasureType*). Control words are used to set parameters for the unit configuration. The control words which are sent to the frequency counter unit, can be read back to the control system to allow verification that (at least) one I/O scan has been performed since the control system cycle which initiated the 200-IP4 command.

Control word variables are written in italics, making it easier to recognize them. Example: *SelectMeasureType, ClockFrequency,* etc.

Only one of the four identical frequency counter interfaces is described in this section. This means that the interface number of the variables has been omitted, for example, *SelectMeasureType0* and *SelectMeasureType1* are the parameters *SelectMeasureType* for interfaces 0 and 1, respectively.

Select type of measurement

200-IP4 can be configured for two alternative functions using the variable *SelectMeasureType*. Each of the four input channels can be configured individually.

SelectMeasureType	Function
0	Time period measurement using a 16-bit counter register and the function of a 16-bit accumulating counter
1	Time period measurement using a 32-bit counter register

Start time period measurement

The control bit *StartMeasurement* starts one measurement of the time period.

StartMeasurement	Function
0	Time period measurement stopped (not enabled)
1	Time period measurement starts on the positive edge of the variable

Check if the time period measurement is complete

After a complete measurement the flag *MeasurementReady* is set.

MeasurementReady	Function
0	The measurement is not complete
1	The positive edge of the flag indicates that the measurement is complete

MeasurementReady is reset by the 200-IP4 unit when a positive edge of *StartMeasurement* is received.

Select clock frequency

The clock frequency (for the time period measurement resolution selection) can be set to 1 or 10 MHz using the variable *ClockFrequency*.

ClockFrequency	Function
0	Clock frequency = 10 MHz
1	Clock frequency = 1 MHz

Select number of time periods

The number of time periods to be measured can be selected using the variable *NumberOfPeriods*.

NumberOfPeriods	Function
0	Measure for 1 period
1	Measure for 2 periods
2	Measure for 4 periods
3	Measure for 8 periods
4	Measure for 16 periods
5	Measure for 32 periods
6	Measure for 64 periods
7	Measure for 128 periods

Time period measurement

The time period measurement described below is valid for a 16-bit or 32 bit measurement (*SelectMeasureType* 0 or 1).

For *SelectMeasureType* 0 (16-bit measurement) the minimum input frequency from a pulse transmitter is 15.3 Hz. At lower frequencies the counter will overflow every 65 ms. To measure frequencies below 15.3 Hz, the overflow must be detected and counted by the software. The counter value is always available via the Serial Bus, which means that an overflow can be detected by reading the counter every 30 ms. This means, there is in practice, no lower limit for the input frequency.

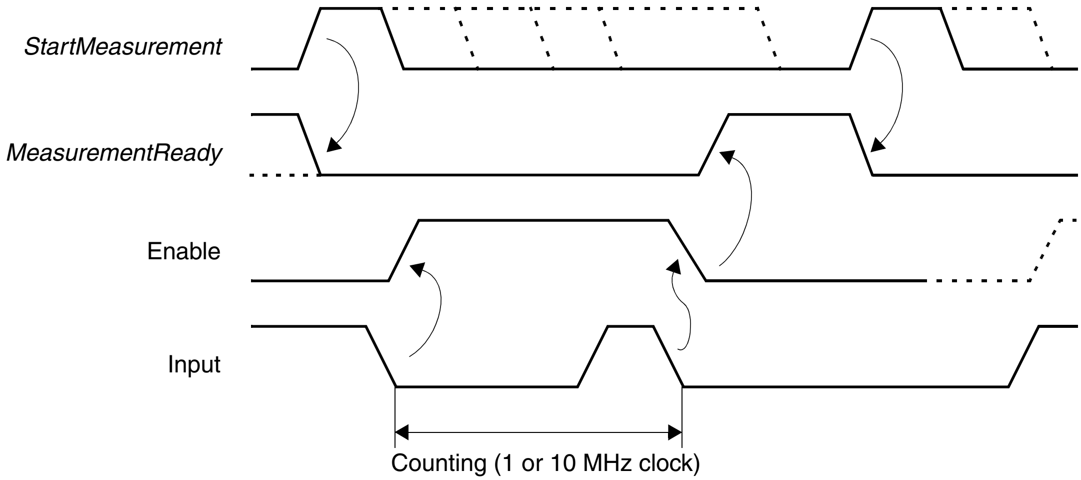


Figure 81. Time period measurement.

Signal	Function
StartMeasurement	The raising edge of *StartMeasurement* will start a new measuring sequence. The measuring function is independent of the length of *StartMeasurement*. ***Note.*** *StartMeasurement* must not be set to 1 and then reset to 0 during the same Serial Bus scan.
MeasurementReady	*MeasurementReady* will be set to 1 on the falling edge of "Enable", i.e. when the counter is stopped and a new stable value is available. *MeasurementReady* will be reset to 0 on the raising edge of *StartMeasurement*.
Enable	"Enable" is an internal signal of 200-IP4, which is generated from the input pulses and *StartMeasurement*. The length of "Enable" is selected by *NumberOfPeriods,* to be 1, 2, 4, ... up to 128 periods of the input signal.
Input	Input signal to an 200-IP4 channel, which is coming from a pulse transmitter.

Reset of Counter

The accumulating pulse counter, which is available if *SelectMeasureType* = 0 (see Select type of measurement on page 136), can be reset by the control bit *ResetCounter*. The counter is reset on the positive edge of *ResetCounter* and goes on counting (from 0) after this edge.The positive edge of the flag *ResetDone* is an acknowledgement that the counter has been reset. Use this flag in the control system to set bit *ResetCounter* to 0. *ResetDone* is automatically reset on the negative edge of *ResetCounter*.

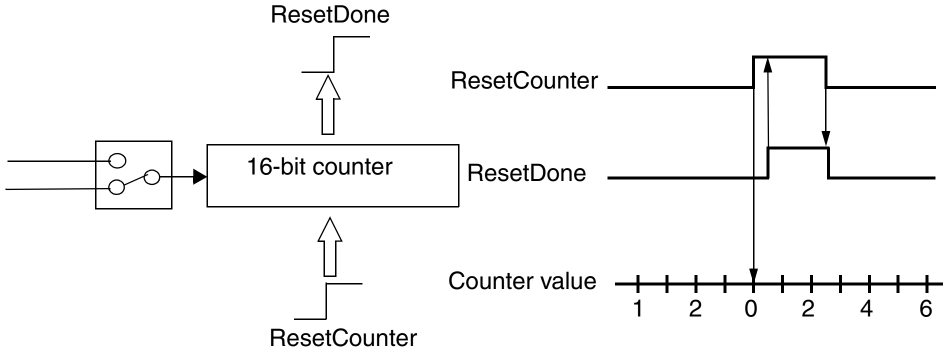


Figure 82. The 16-bit accumulating counter can be reset if *SelectMeasureType* = 0.

200-IP4 Connections

The unit is used for pulse transmitters with a nominal voltage of 12–24 V DC. An external power supply must be connected via a power-line filter to the screw terminals (note that there is a general demand for CE marking with respect to EMC and LVD approval for all units). The type of filter is specified in Appendix B, Recommended Components on page 333. If galvanic insulation is not required for the connected pulse transmitters, then the power supply can be connected to the individual pulse transmitter via terminals on the base plate of the frequency counter. Separate power supplies can be used for the pulse transmitters and the frequency counter unit, as the signal inputs are optocoupled and galvanically insulated. This also applies for transmitters using different voltages.

Connect the different inputs to the corresponding numbered connections as shown in the figure below.

Connections used for 16-bit time period measurement

The following connections are to be used if the configuration for 16-bit time period measurement and a 16 bit accumulating counter is selected.

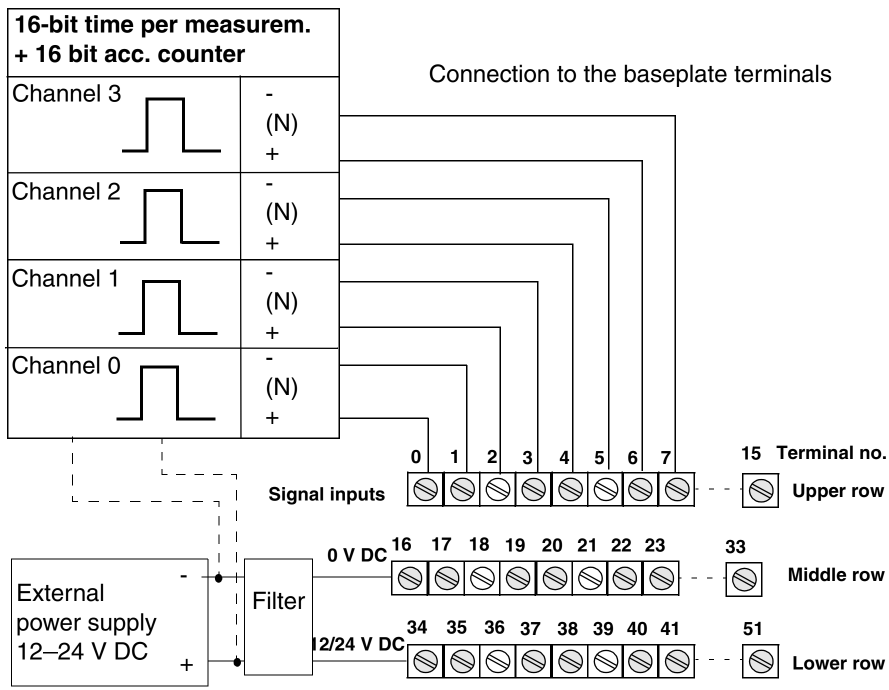


Figure 83. Connections for 16-bit time period measurement and a 16-bit accumulating pulse counter in all 4 channels.

Connections used for 32-bit time period measurement

The following connections are used if the configuration for 32-bit time period measurement is selected.

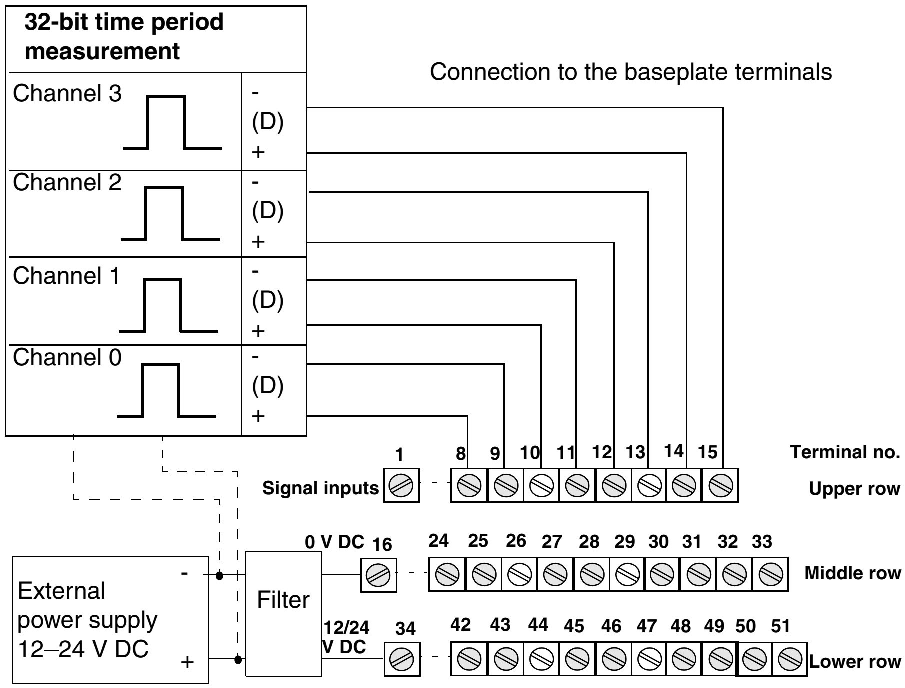


Figure 84. Connections for 32-bit time period measurement in all 4 channels.

Screw terminal connections

Channel	Input	200-TB2 & 200-TB3 (TB3 is the recommended type)			200-TBN & 200-TBNF
		Connections to be connected			
		Signal (upper row)	0 V DC (middle row)	12/24 V DC (lower row)	Signal
0	N+	0	17	35	0
0	N-	1	18	36	1
1	N+	2	19	37	2
1	N-	3	20	38	3
2	N+	4	21	39	4
2	N-	5	22	40	5
3	N+	6	23	41	6
3	N-	7	24	42	7
0	D+	8	25	43	8
0	D-	9	26	44	9
1	D+	10	27	45	10
1	D-	11	28	46	11
2	D+	12	29	47	12
2	D-	13	30	48	13
3	D+	14	31	49	14
3	D-	15	32	50	15
0 V DC			16–33		16, 33
12/24 V DC				34–51	34, 51

Power can be supplied to the transmitters from the middle and lower row (marked COM and V, respectively) of the baseplate, or from a separate power supply.

200-IP4 can be used with transmitters giving a maximum pulse frequency of 100 kHz, which means that mechanical transmitters should not be used. Such transmitters generate contact bounces, which may be counted by this high-speed counter. Use electronic pulse transmitters instead.

Not connected signal inputs are detected as “Input OFF” (inactive).

To fulfil EMC demands, the connection cable to the transmitter must be shielded using a twisted-pair cable, one for each input signal. The shield must be connected close to the frequency counter unit, using a ground clamp.

Temperature Precautions

Certain environmental temperature precautions should be considered if the absolute maximum allowed input voltage specified for 200-IP4 is supplied to many inputs simultaneously. This may occur if the inputs are connected to digital switches for 24 V DC.

To minimize temperature rise and thus extend the unit life, it is recommended not to connect maximum input voltage simultaneously to all inputs for extended periods of time at maximum allowed environmental temperature (+55 ºC momentarily or +50 ºC average for over 24 hours).

If the ambient temperature is expected to exceed 40 ºC, input signal voltage exceeding 20 V can easily be limited to a lower voltage using a series resistor which could be mounted on the input signal terminal block. Recommended resistor value is 1 kΩ Typically a 1 kΩ series resistor limits a 24 V sensor signal to approximately 15 V at the 200-IP4 input, which still safely meets the minimum level for an active input.

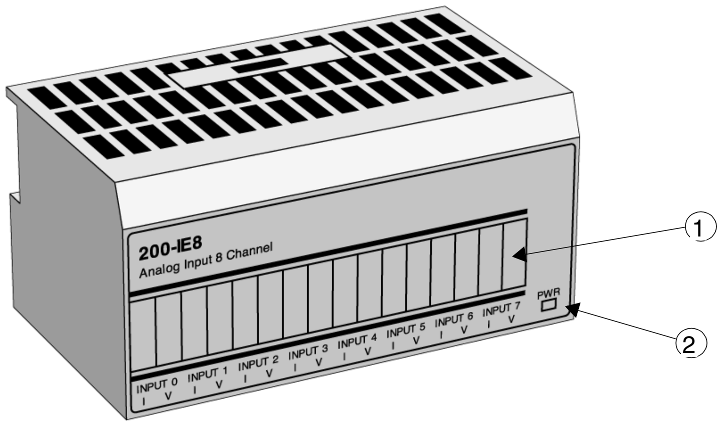
Background

The wide signal input voltage range for the 200-IP4 unit is designed specifically to meet the complementary signal output voltage from incremental encoders intended to be connected to 200-IP4.

The incremental encoder differential output voltage is typically 8–10 V for a 12 V DC powered unit and 18–20 V for a 24 V DC device. To allow connection of both 12 and 24 V DC encoders to 200-IP4, the input range has been designed to meet 6–26.4 V (24 V DC +10%). Power dissipation in the input resistors depends on the input current which is typically 3 mA at 6 V DC and 15 mA at 24 V DC. Total power dissipation in the input circuits is approximately 3.5 W at maximum input voltage on all 8 inputs, which is added to the logic power supply of 1.5 W. The total power dissipation is within the recommendations of maximum 6 W per module.

Analog Input Unit 200-IE8

200-IE8 is an I/O unit for 8 analog input signals. The inputs are filtered and the unit is galvanically insulated. The unit has 12 bit resolution. Each of the inputs can be either a voltage (0–10 V DC, ± 10 V DC) or a current (0–20 mA, 4–20 mA) input.



1 = Holder for insertable label for individual input designations
2 = Power ON indicator

Figure 85. Analog input unit 200-IE8.

Front Panel

Indicators

Indication	Function
PWR	Green LED, lit when 24 V DC power is ON

Functional Description

The 8 analog input signals are connected to the unit via the screw terminals on the terminal base unit.

The inputs are as a group of eight galvanically isolated from the serial bus by optocouplers and the 8 inputs are single ended.

Selection of voltage or current is made on the terminal base unit for each input. It is possible to connect either voltage or current to the input but not both simultaneously. Selection must also be set by the programming software.

Power for the internal logic is provided via an external power supply.

Since 200-IE8 does not receive power from the terminal base unit, 24 V DC must be applied to the unit before operation. If power is not applied, the unit position will appear to the adapter as an empty terminal base.

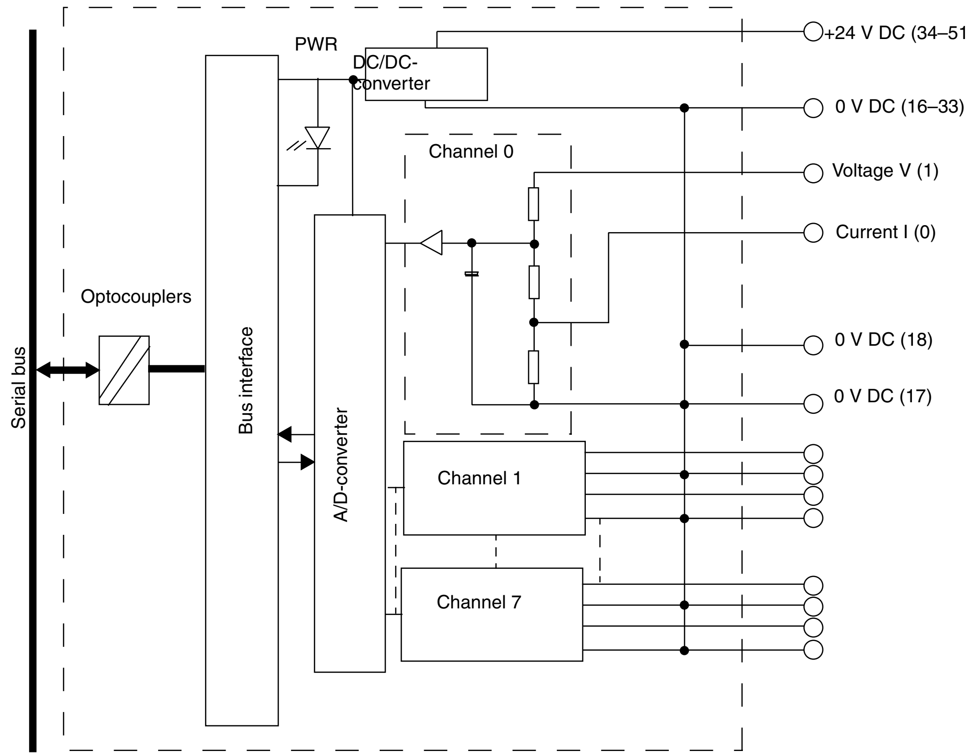


Figure 86. The 200-IE8 functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit, (e.g. 200-TB3) connected to the I/O unit. Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-IE8 Connections

Connect individual input wiring to numbered terminals as described in the table below. Always use shielded twisted-pair cables.

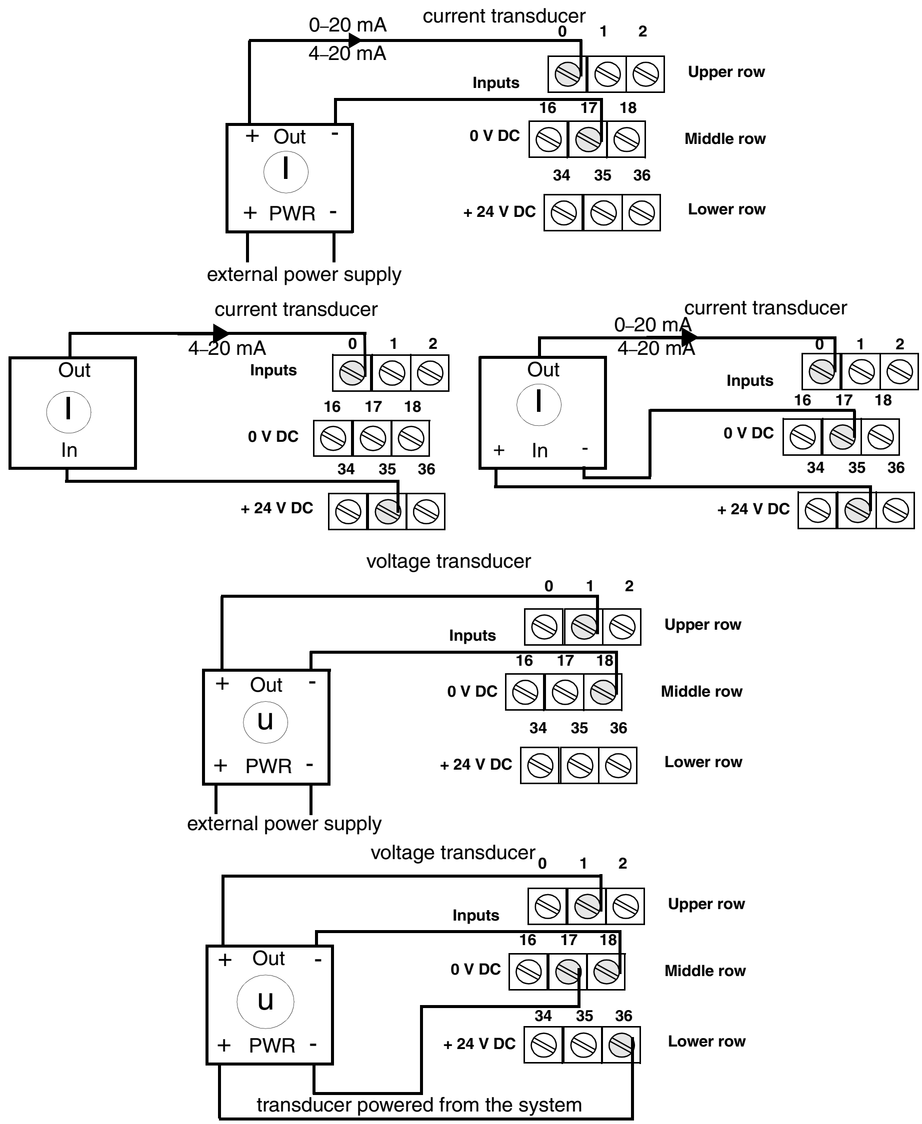


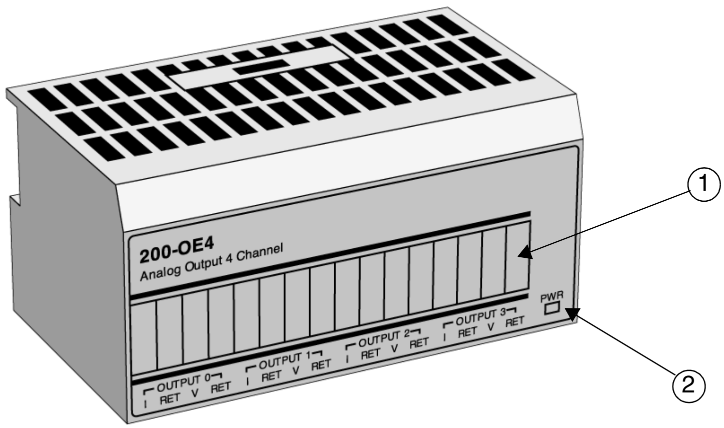
Figure 87. Wiring examples. Note that not all terminal base units have three rows.

Screw terminal connections

Input	200-TB2 & 200-TB3			200-TBN & 200-TBNF
	Terminals to be connected			
	Signal (upper row)	0 V DC (middle row)	24 V DC (lower row)	Signal
Current 0	0	17	35	0
Voltage 0	1	18	36	1
Current 1	2	19	37	2
Voltage 1	3	20	38	3
Current 2	4	21	39	4
Voltage 2	5	22	40	5
Current 3	6	23	41	6
Voltage 3	7	24	42	7
Current 4	8	25	43	8
Voltage 4	9	26	44	9
Current 5	10	27	45	10
Voltage 5	11	28	46	11
Current 6	12	29	47	12
Voltage 6	13	30	48	13
Current 7	14	31	49	14
Voltage 7	15	32	50	15
0 V DC		16–33		16, 33
+24 V DC			34–51	34, 51

Analog Output Unit 200-OE4

200-OE4 is an I/O unit for 4 analog output signals. The unit is galvanically isolated. The unit has 12 bit resolution. Each of the outputs can be either a voltage (0–10 V DC, ± 10 V DC) or a current (0–20 mA, 4–20 mA) output.



1 = Holder for insertable label for individual output designations
2 = Power ON indicator.

Figure 88. Analog output unit 200-OE4.

Front Panel

Indicators

Indication	Function
PWR	Green LED, lit when 24 V DC power is ON

Functional Description

The 4 analog output signals are connected to the unit via the screw terminal on the terminal base unit.

The outputs are arranged in a group of four, galvanically isolated from the serial bus by optocouplers.

Selection of voltage or current is made on the terminal base unit for each output. This means that one output can be selected for current and another for voltage output. It is possible to connect either voltage or current to the input but not both simultaneously. Selection must also be set in the programming software.

Power for the internal logic is provided via an external power supply.

Since 200-OE4 does not receive power from the terminal base unit, 24 V DC must be applied to the unit before operation. If power is not applied, the unit position will appear to the adapter as an empty terminal base. Minimum resistive load on mA output is 15 Ω

A-versions only. Select range 0–20 mA for *not* connected outputs (to avoid voltage or current on the output pins).

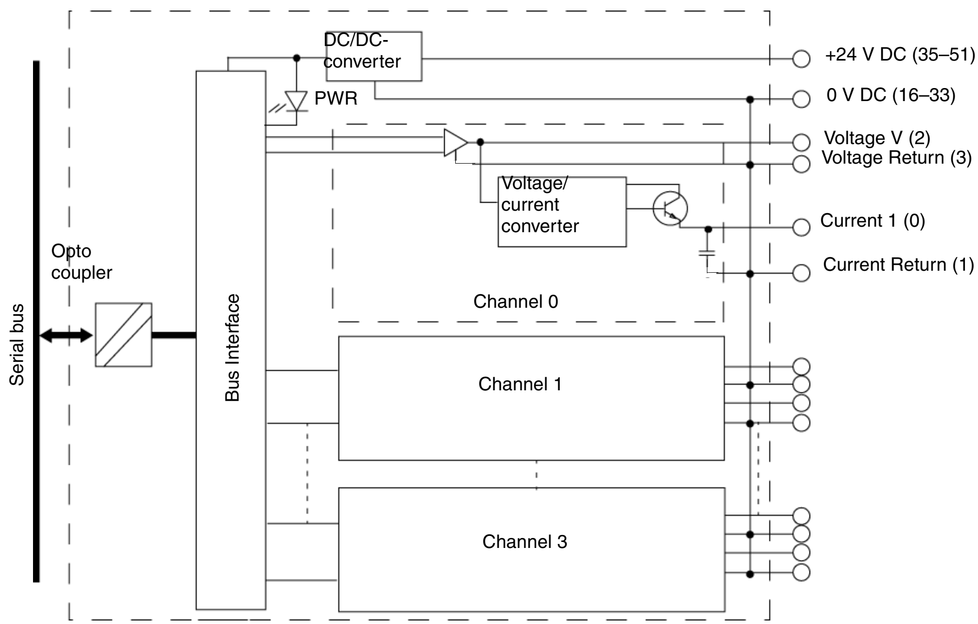


Figure 89. The 200-OE4 functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit, (e.g. 200-TB3) connected to the I/O unit. Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-OE4 Connections

Connect individual output wiring to numbered terminals as described in the table below. Always use shielded twisted-pair cables.

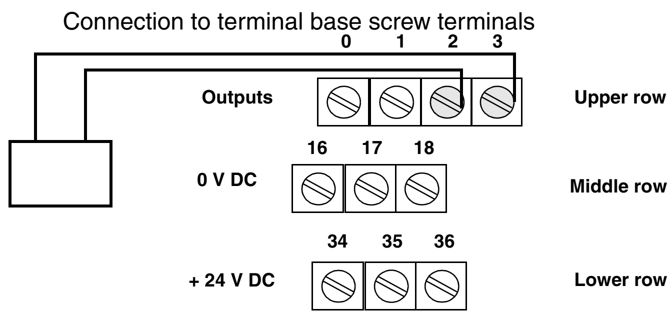


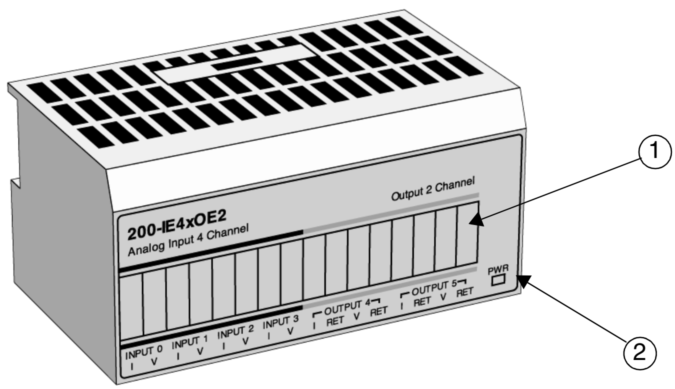
Figure 90. Wiring example. Notice that not all terminal base units have three rows.

Screw terminal connections

Output	200-TB2 & 200-TB3	200-TBN & 200-TBNF
	Terminals to be connected	
	Signal (upper row)	Signal
Current Signal 0	0	0
Current Return 0	1	1
Voltage Signal 0	2	2
Voltage Return 0	3	3
Current Signal 1	4	4
Current Return 1	5	5
Voltage Signal 1	6	6
Voltage Return 1	7	7
Current Signal 2	8	8
Current Return 2	9	9
Voltage Signal 2	10	10
Voltage Return 2	11	11
Current Signal 3	12	12
Current Return 3	13	13
Voltage Signal 3	14	14
Voltage Return 3	15	15
0 V DC	16–33 (middle row)	16, 33
+24 V DC	34–51 (lower row)	34, 51

Input/Output Analog Combo Unit 200-IE4xOE2

200-IE4xOE2 is an I/O unit for 4 analog input and 2 analog output signals. The inputs and outputs are filtered and the unit is galvanically isolated.



1 = Holder for insertable label for individual output designations
2 = Power ON indicator.

Figure 91. Input/output analog combo unit 200-IE4xOE2.

Front Panel

Indicators

Indication	Function
PWR	Green LED, lit when 24 V DC power is ON

Functional Description

The 4 analog input and 2 analog output signals are connected to the unit via the screw terminal on the terminal base unit.

Selection of voltage or current is made on the terminal base unit for each input. It is possible to connect either voltage or current to the input but not both simultaneously. Selection must also be set in the programming software.

The inputs and the outputs are as a group galvanically isolated from the serial bus by optocouplers.

Power for the internal logic is provided via an external power supply.

Since 200-IE4xOE2 does not receive power from the terminal base unit, 24 V DC must be applied to the unit before operation. If power is not applied, the unit position will appear to the adapter as an empty terminal base.

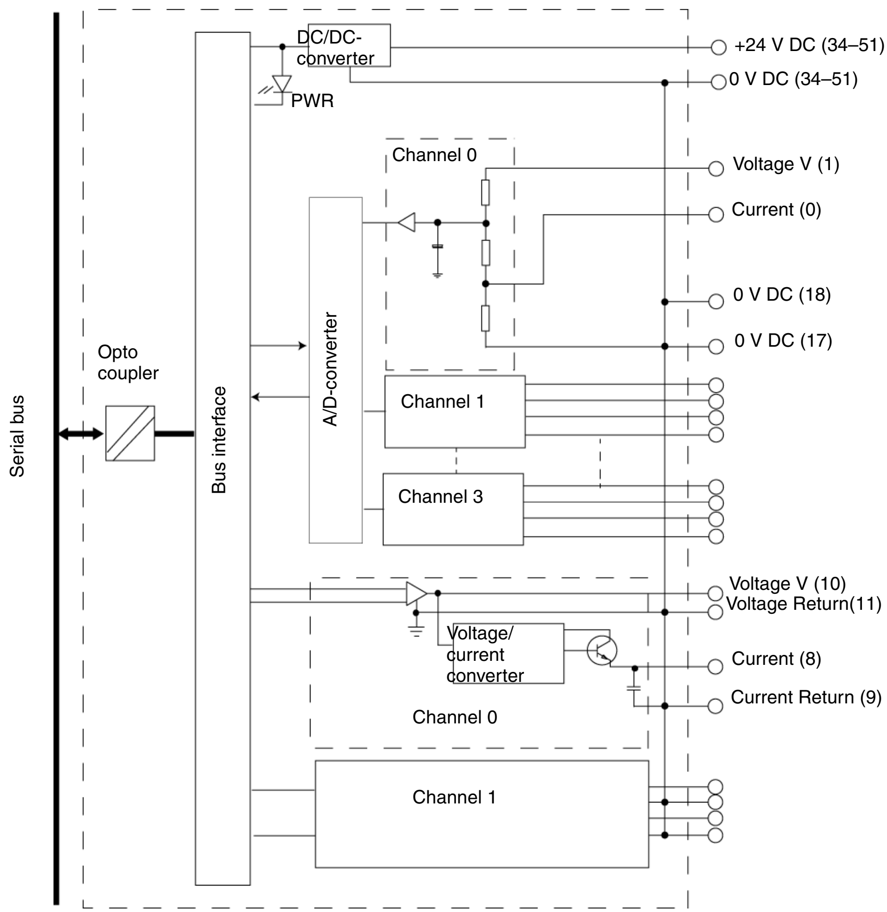


Figure 92. The 200-IE4xOE2 functional block diagrams.

Numbers in parentheses in the diagram, refer to signal terminals on the terminal base unit, (e.g. 200-TB3) to which the unit is connected. Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-IE4xOE2 Connections

Connect individual input/output wiring to numbered terminals as described in the table below. Always use shielded twisted-pair cables.

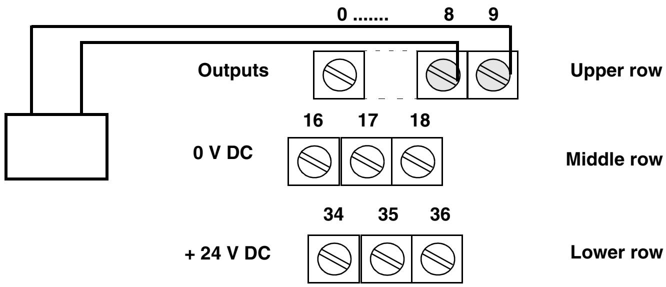


Figure 93. Wiring example.

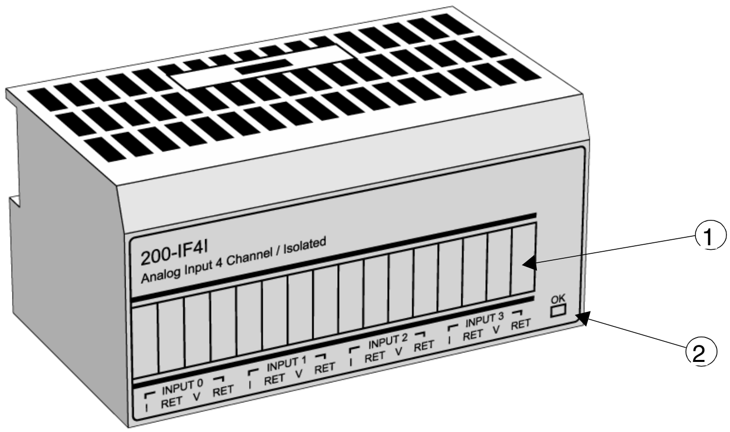
Not all terminal base units have three rows. See also examples in 200-IE8 Connections on page 147.

Screw terminal connections

Input/Output	200-TB2 & 200-TB3			200-TBN & 200-TBNF
	Terminals to be connected			
	Signal (upper row)	0 V DC (middle row)	24 V DC (lower row)	Signal
Input Current 0	0	17	35	0
Input Voltage 0	1	18	36	1
Input Current 1	2	19	37	2
Input Voltage 1	3	20	38	3
Input Current 2	4	21	39	4
Input Voltage 2	5	22	40	5
Input Current 3	6	23	41	6
Input Voltage 3	7	24	42	7
Output Current Signal 4	8			8
Output Current Return 4	9			9
Output Voltage Signal 4	10			10
Output Voltage Return 4	11			11
Output Current Signal 5	12			12
Output Current Return 5	13			13
Output Voltage Signal 5	14			14
Output Voltage Return 5	15			15
0 V DC		16–33		16, 33
+24 V DC			34–51	34, 51

Analog Input Unit 200-IF4I

200-IF4I is an I/O unit for 4 analog input signals. The inputs are filtered and individually galvanically isolated. The unit has up to 16-bit resolution. Each of the inputs can be either a voltage (0–5 V DC, ± 5 V DC, 0–10 V DC, ± 10 V DC) or a current (0–20 mA, 4–20 mA) input.



1 = Holder for insertable label for individual input designations
2 = Power ON indicator

Figure 94. Analog input unit 200-IF4I.

Front Panel

Indicators

Indication	Function
OK	Green LED, 1. Solid green when 24 V DC power is ON 2. Flashing green if the unit is not configured or there is a field-power fault 3. Solid red if there is no contact with the controller or there is a critical fault

Functional Description

The 4 analog input signals are connected to the unit via the screw terminals on the terminal base unit.

The inputs are individually galvanically isolated from the serial bus by optocouplers.

Selection of voltage or current is made on the terminal base unit for each input. It is possible to connect either voltage or current to the input but not both simultaneously. Selection must also be set in the programming software.

Maximum 50 Hz supression of the input signal is obtained if the filter frequency is set to 300 Hz, and maximum 60 Hz supression is obtained if the filter frequency is set to 150 Hz (set from the programming software).

Power to the internal logic is provided via the Serial I/O bus, but to the analog parts external 24 V DC must be supplied.

If the 24 V DC supply fails, the current input will open.

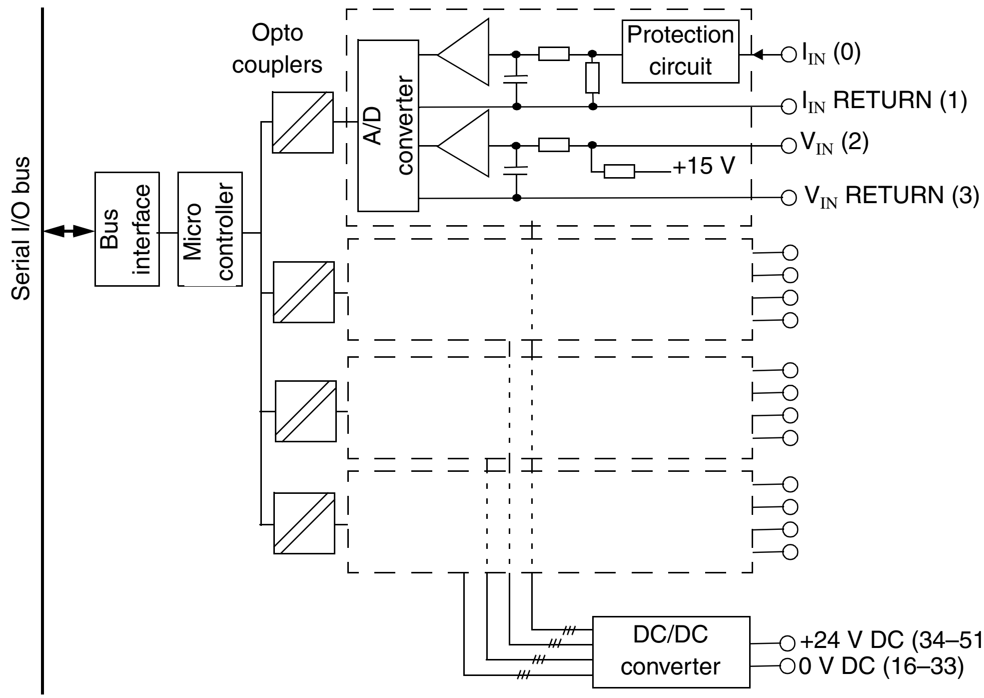


Figure 95. The 200-IF4I functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit, (e.g. 200-TB3) connected to the I/O unit. Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN or 200-TBNF.

200-IF4I Connections

Connect individual input wiring to numbered terminals as described in the table below. Always use shielded twisted-pair cables.

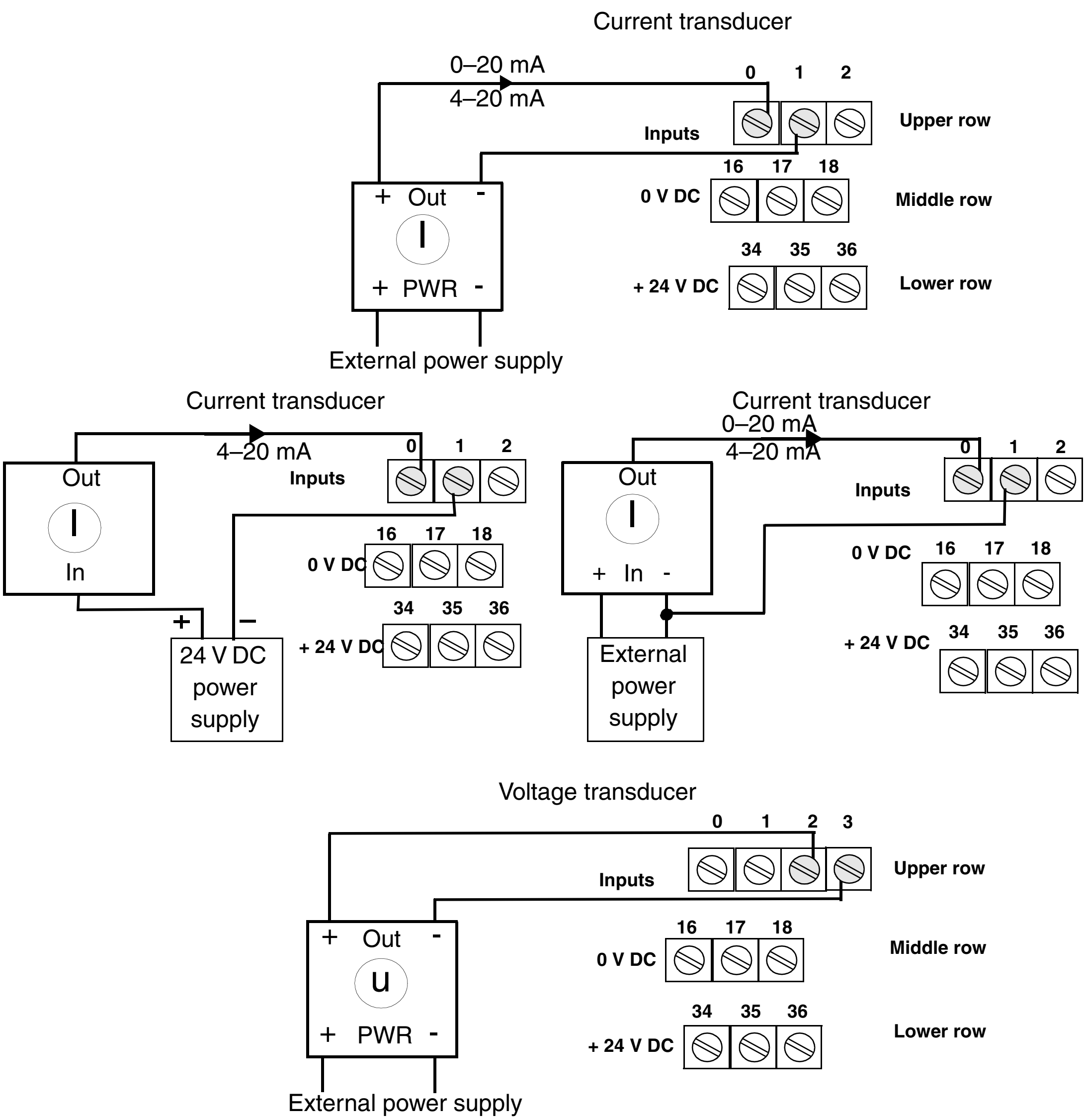


Figure 96. Wiring examples. Note that not all terminal base units have three rows.

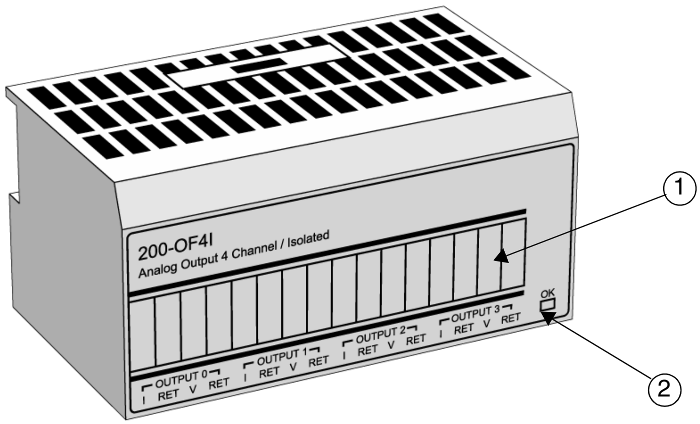
Screw terminal connections

Input	200-TB3, 200-TB3T[1], 200-TB3S, 200-TBN & 200-TBNF
	Terminals to be connected
	Signal (upper row)
Current Signal 0	0
Current Return 0	1
Voltage Signal 0	2
Voltage Return 0	3
Current Signal 1	4
Current Return 1	5
Voltage Signal 1	6
Voltage Return 1	7
Current Signal 2	8
Current Return 2	9
Voltage Signal 2	10
Voltage Return 2	11
Current Signal 3	12
Current Return 3	13
Voltage Signal 3	14
Voltage Return 3	15
0 V DC	200-TB3 – 16 thru 33[2] (middle row) 200-TB3T – 17, 18, 33 200-TBN, 200-TBNF – 16 and 33
+24 V DC	200-TB3 – 34 thru 51 (lower row) 200-TB3T – 34, 35, 50, 51 200-TBN, 200-TBNF – 34 and 51

(1) Terminals 39 through 46 are chassis grounded. Terminals 36, 37, 38 and 47, 48, 49 are used for cold junction compensation.
(2) Terminals 16 through 33 are internally connected in the terminal base unit.

Analog Output Unit 200-OF4I

200-OF4I is an I/O unit for 4 analog output signals. The outputs are individually galvanically isolated. The unit has 15 bits + sign resolution. Each of the outputs can be either a voltage (0–5 V DC, ± 5 V DC, 0–10 V DC, ± 10 V DC) or a current (0–20 mA, 4–20 mA) output.



1 = Holder for insertable label for individual output designations
2 = Power ON indicator.

Figure 97. Analog output unit 200-OF4I.

Front Panel

Indicators

Indication	Function
OK	Green LED, 1. Solid green when 24 V DC power is ON. 2. Flashing green if the unit is not configured or there is a field-power fault. 3. Solid red if there is no contact with the controller or there is a critical fault.

Functional Description

The 4 analog output signals are connected to the unit via the screw terminal on the terminal base unit.

The outputs are individually galvanically isolated from the serial bus by optocouplers.

Selection of voltage or current is made on the terminal base unit for each output. It is possible to connect either voltage or current to the output but not both simultaneously. Selection must also be set in the programming software.

Power to the internal logic is provided via the Serial I/O bus, but to the analog parts external 24 V DC must be supplied.

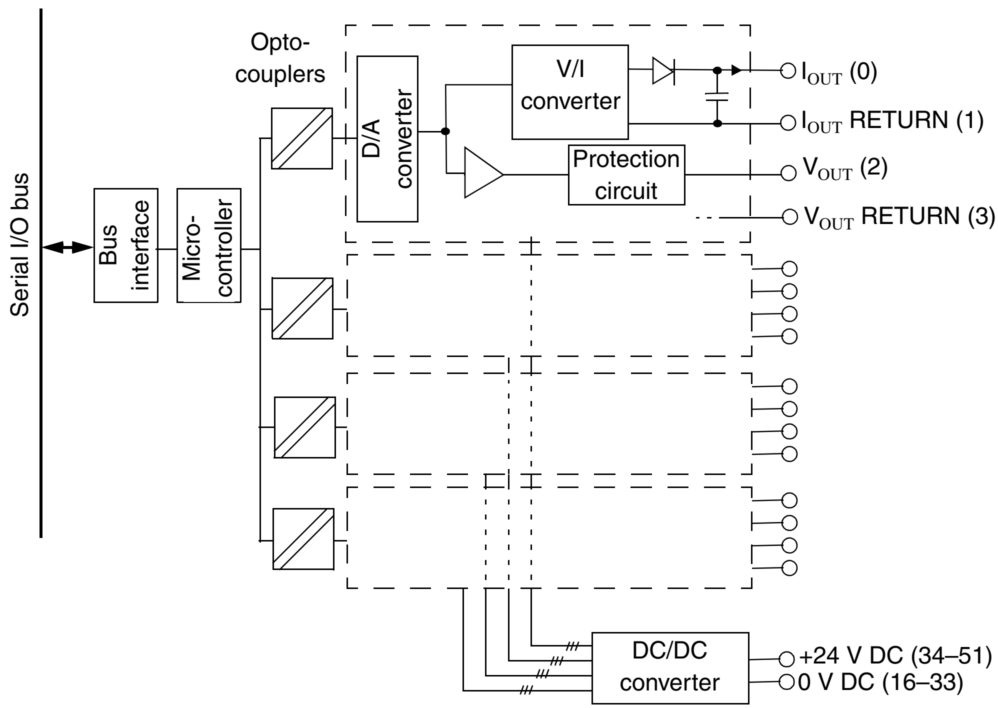


Figure 98. The 200-OF4I functional block diagram.

Numbers within parentheses in the diagram refer to signal terminals on the terminal base unit, (e.g. 200-TB3) connected to the I/O unit. Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN or 200-TBNF.

200-OF4I Connections

Connect individual output wiring to numbered terminals as described in the table below. Always use shielded twisted-pair cables.

Connection to terminal base screw terminals

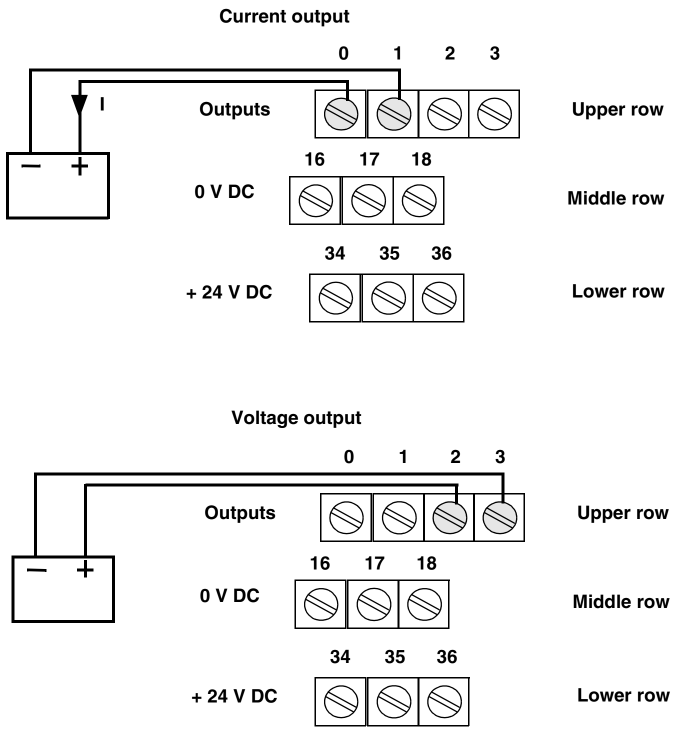


Figure 99. Wiring example. Note that not all terminal base units have three rows.

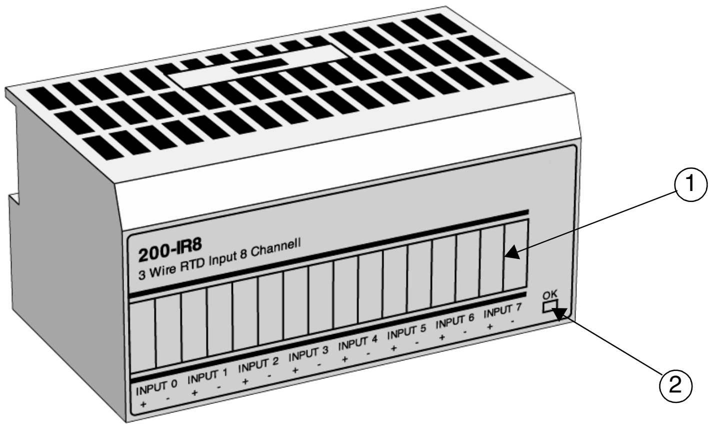
Screw terminal connections

Input	200-TB3, 200-TB3T[1], 200-TB3S, 200-TBN & 200-TBNF
	Terminals to be connected
	Signal (upper row)
Current Signal 0	0
Current Return 0	1
Voltage Signal 0	2
Voltage Return 0	3
Current Signal 1	4
Current Return 1	5
Voltage Signal 1	6
Voltage Return 1	7
Current Signal 2	8
Current Return 2	9
Voltage Signal 2	10
Voltage Return 2	11
Current Signal 3	12
Current Return 3	13
Voltage Signal 3	14
Voltage Return 3	15
0 V DC	200-TB3 – 16 thru 33[2] (middle row) 200-TB3T – 17, 18, 33 200-TBN, 200-TBNF – 16 and 33
+24 V DC	200-TB3 – 34 thru 51 (lower row) 200-TB3T – 34, 35, 50, 51 200-TBN, 200-TBNF – 34 and 51

(1) Terminals 39 through 46 are chassis grounded.
(2) Terminals 16 through 33 are internally connected in the terminal base unit.

RTD Input Unit 200-IR8

200-IR8 is an I/O unit for eight 3-wire RTD input signals. The inputs have programmable filters and the unit is galvanically isolated. The unit has 16 bit resolution. A high number of sensor types are supported.



1 = Holder for insertable label for individual output designations
2 = Power ON indicator.

Figure 100. RTD input unit 200-IR8.

Front Panel

Indicators

Indication	Function
OK	Bi-colour (green/red) LED 1. Steady red at power up. 2. Off while module performs diagnostic tests. 3. If tests are passed, flashing green as long as configuration words are zero. 4. Steady green when configured.

Sensor Types

The following sensor types can be connected to 200-IR8:

Sensor type	α	Temperature range
1–433 Ω		
500 Ω Pt Euro	0.00385	-200 to +630°C
200 Ω Pt Euro	0.00385	-200 to +630°C
100 Ω Pt Euro	0.00385	-200 to +870°C
100 Ω Pt U.S.	0.00392	-200 to +630°C
500 Ω Ni	0.00618	-60 to +250°C
200 Ω Ni	0.00618	-60 to +250°C
120 Ω Ni	0.00672	-80 to +290°C
100 Ω Ni	0.00618	-60 to +250°C
10 Ω Cu	0.00427	-200 to +260°C

Functional Description

The 8 analog input signals are connected to the unit via the screw terminal on the terminal base unit.

The inputs are as a group of 8 galvanically isolated from the serial bus by optocouplers. It is possible to deselect unused channels to improve system throughput. Periodic user calibration is supported.

Power for the internal logic is provided via an external power supply.

Since 200-IR8 does not receive power from the terminal base unit, 24 V DC must be applied to the unit before operation. If power is not applied, the unit position will appear to the adapter as an empty terminal base.

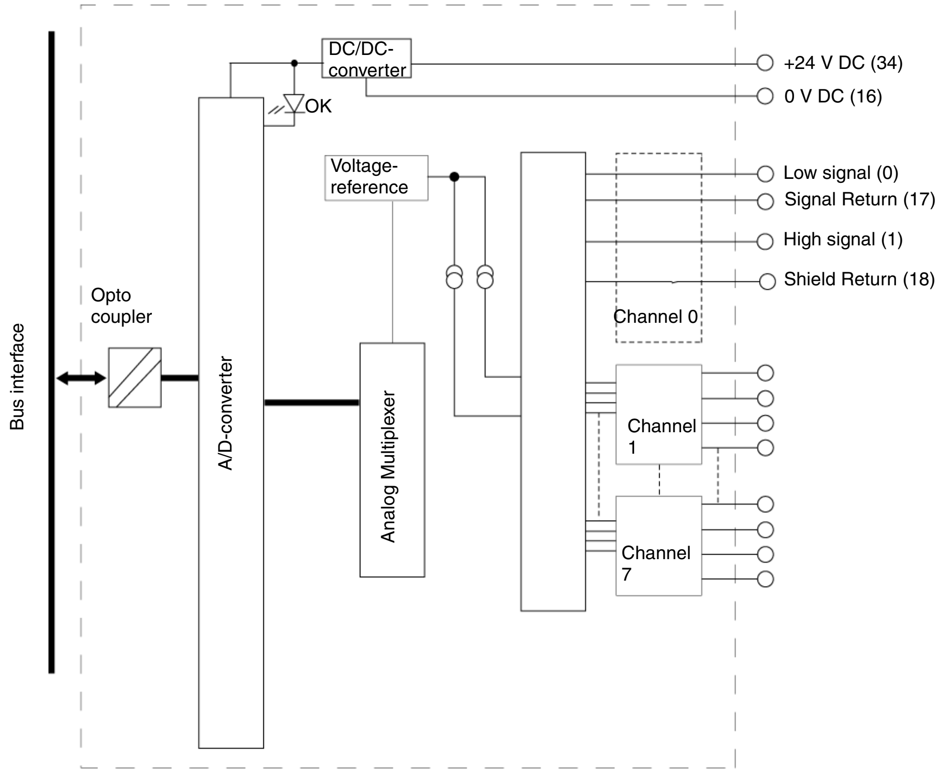


Figure 101. The 200-IR8 functional block diagram.

Numbers within parentheses in the diagram, refer to signal terminals on the terminal base unit, (e.g. 200-TB3) to which the unit is connected. Note that screw terminal numbers 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

Filter and Unit Throughput

A programmable first notch filter in the analog to digital converter lets you select a frequency for the first notch of the filter. Selection of the filter influences the analog to digital output data rate and changes the unit throughput.

First notch of filter (Hz)	-3 dB frequency (Hz)
10	2.62
25	6.55
50	13.10
60	15.72
100	26.20
250	65.50
500	131.00
1000	262.00

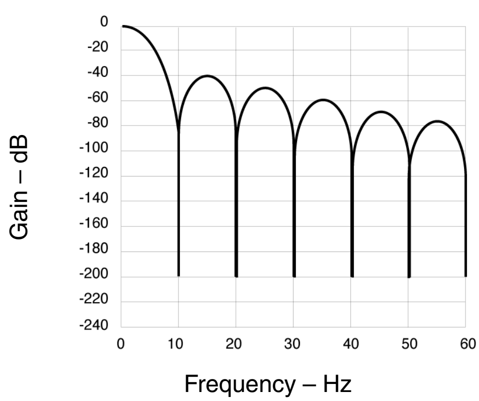


Figure 102. Filter response with first notch at 10 Hz.

Unit throughput means the time it takes for a signal at the input terminal to arrive at the serial bus. It is a function of:

- the selected programmable first notch filter frequency
- the number of channels actually configured for connection to a sensor.

Throughput in normal mode								
A/D filter first notch frequency System throughput in ms or s								
No. of channels scanned	**10 Hz (16-bits)**	**25 Hz (16-bits)**	**50 Hz (16-bits)**	**60 Hz (16-bits)**	**100 Hz (16-bits)**	**250 Hz (13-bits)**	**500 Hz (13-bits)**	**1000 Hz (9-bits)**
1	325 ms	145 ms	85 ms	75 ms	55 ms	37 ms	31 ms	28 ms
2	650 ms	290 ms	170 ms	150 ms	110 ms	74 ms	62 ms	56 ms
3	975 ms	435 ms	255 ms	225 ms	165 ms	111 ms	93 ms	84 ms
4	1.30 s	580 ms	340 ms	300 ms	220 ms	148 ms	124 ms	112 ms
5	1.625 s	725 ms	425 ms	375 ms	275 ms	185 ms	155 ms	140 ms
6	1.95 s	870 ms	510 ms	450 ms	330 ms	222 ms	186 ms	168 ms
7	2.275 s	1.015 s	595 ms	525 ms	385 ms	259 ms	217 ms	196 ms
8	2.60 s	1.16 s	680 ms	600 ms	440 ms	296 ms	248 ms	224 ms

It is possible to select an enhanced mode of operation for this unit (selected by the software).

However, since the comparison is done each program scan, the result decreases unit throughput.This results in improved unit temperature drift characteristics and accuracy.

Throughput in enhanced mode								
A/D filter first notch frequency System throughput in ms or s								
No. of channels scanned	10 Hz (16-bits)	25 Hz (16-bits)	50 Hz (16-bits)	60 Hz (16-bits)	100 Hz (16-bits)	250 Hz (13-bits)	500 Hz (13-bits)	1000 Hz (9-bits)
1	650 ms	290 ms	170 ms	150 ms	110 ms	74 ms	62 ms	56 ms
2	975 ms	435 ms	255 ms	225 ms	165 ms	111 ms	93 ms	84 ms
3	1.30 s	580 ms	340 ms	300 ms	220 ms	148 ms	124 ms	112 ms
4	1.625 s	725 ms	425 ms	375 ms	275 ms	185 ms	155 ms	140 ms
5	1.95 s	870 ms	510 ms	450 ms	330 ms	222 ms	186 ms	168 ms
6	2.275 s	1.015 s	595 ms	525 ms	385 ms	259 ms	217 ms	196 ms
7	2.60 s	1.16 s	680 ms	600 ms	440 ms	296 ms	248 ms	224 ms
8	2.925 s	1.305 s	765 ms	675 ms	495 ms	333 ms	279 ms	252 ms

Unit Calibration Overview

Unit calibration is required to either improve the initial unit accuracy or to remove unit error due to component aging.

200-IR8 is already calibrated at delivery. If a calibration is required, the unit must be in an I/O system. Input channels can be calibrated in any order, or all at once.

To allow the internal unit temperature to stabilize, apply power to the unit for at least 40 minutes before calibrating.

To calibrate the unit:

1. Apply a reference to the desired input(s).
2. Start calibration.

Perform the offset calibration procedure first and then the gain calibration procedure.

Connecting the calibration resistors

To calibrate your RTD input, you will need precision resistors or a precision decade box.

Description		
Precision resistors or Precision decade resistor box	High precision resistors: 432 Ω, 864 Ω, 1728 Ω, 0.01%, 5 ppm/°C 1 Ω, 0.1%, 5ppm/°C	Lower precision resistors: If calibration to rated accuracy is not required, lower precision resistors can be used. Add percentage of tolerance and temperature coefficient for expected accuracy.
	Accuracy: Minimum three decades; Decade one – 10 Ω decade, 1 Ω per step, better than 0.005 Ω (0.5% accuracy) Decade two – 100 Ω decade, 10 Ω per step, better than 0.005 Ω (0.05% accuracy) Decade three – 1000 Ω decade, 100 Ω per step, better than 0.01% accuracy	
	Any vendor's model that meets or exceeds the above specifications can be used. The user is responsible for assuring that the decade box maintains accuracy by periodic calibration as specified by the vendor.	

The figures below show how to connect a decade box or resistors. If using a decade box, connect all high-signal terminals together and attach to one lead from the decade box. Connect all low-signal terminals together and 0 V DC on the terminal and attach to the other lead.

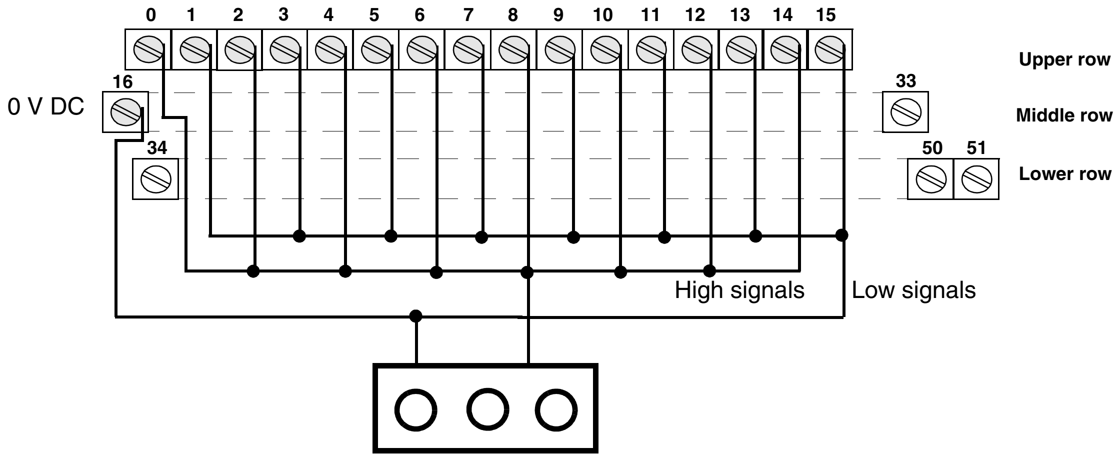


Figure 103. Connecting a decade box.

If using resistors, connect according to figure below.

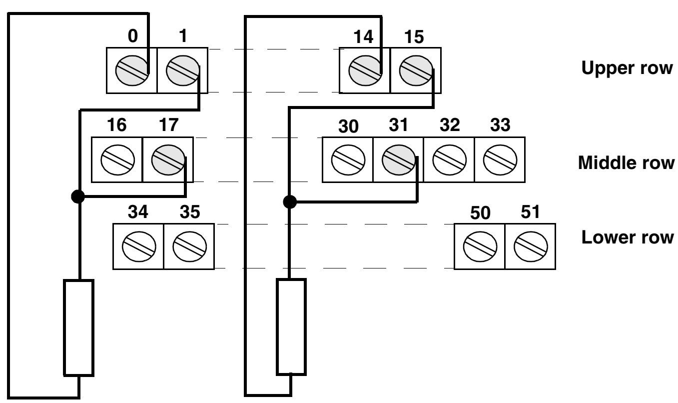


Figure 104. Connecting resistors

Calibration resistor settings

At offset calibration the resistor value should always be set to 1 Ω At gain calibration the resistor value should be according to the table below.

Type of RTD	Offset calibration value (Ideal counts)	Gain calibration
100 Ω Pt. Euro (α[1]=0.00385) 100 Ω Pt U.S. (α=0.003916) 120 Ω Ni (α=0.00672) 100 Ω Ni (α=0.00618) 10 Ω Cu (α=0.00427)	1 Ω, 0.1%, 5 ppm/°C	432 Ω, 0.01%, 5 ppm/°C
200 Ω Pt. (α=0.00385) 200 Ω Ni (α=0.00618)	1 Ω, 0.1%, 5 ppm/°C	864 Ω, 0.01%, 5 ppm/°C
500 Ω Pt. (α=0.00385)	1 Ω, 0.1%, 5 ppm/°C	1728 Ω, 0.01%, 5 ppm/°C

(1) α=Temperature coefficient

200-IR8 Connections

Connect individual input wiring to numbered terminals as described in the table below. Always use shielded cables recommended by the RTD suppliers. 2-wire RTD cables are possible to connect but not recommended.

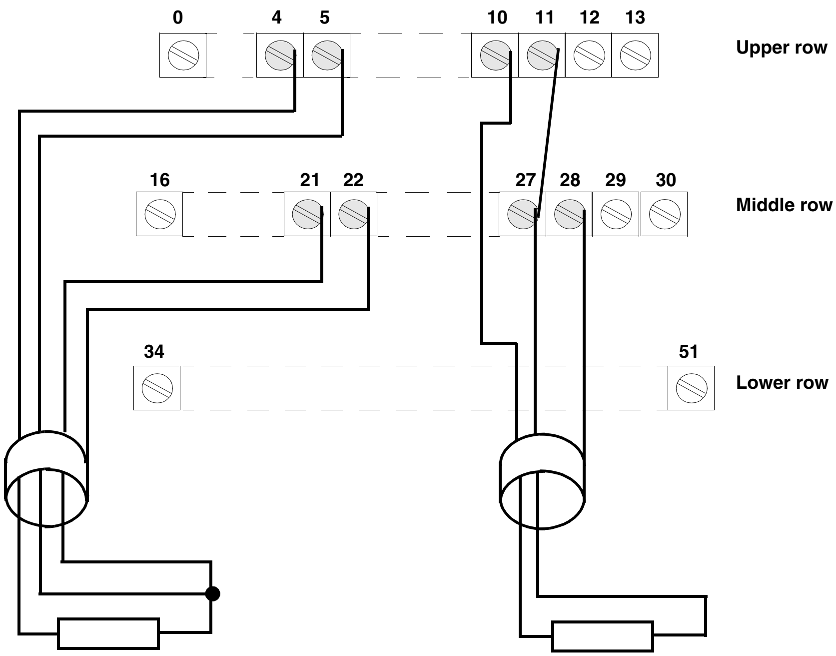


Figure 105. Wiring examples with 2- and 3-wire devices. Notice that not all terminal base units have three rows. This example shows connection to a 200-TB3.

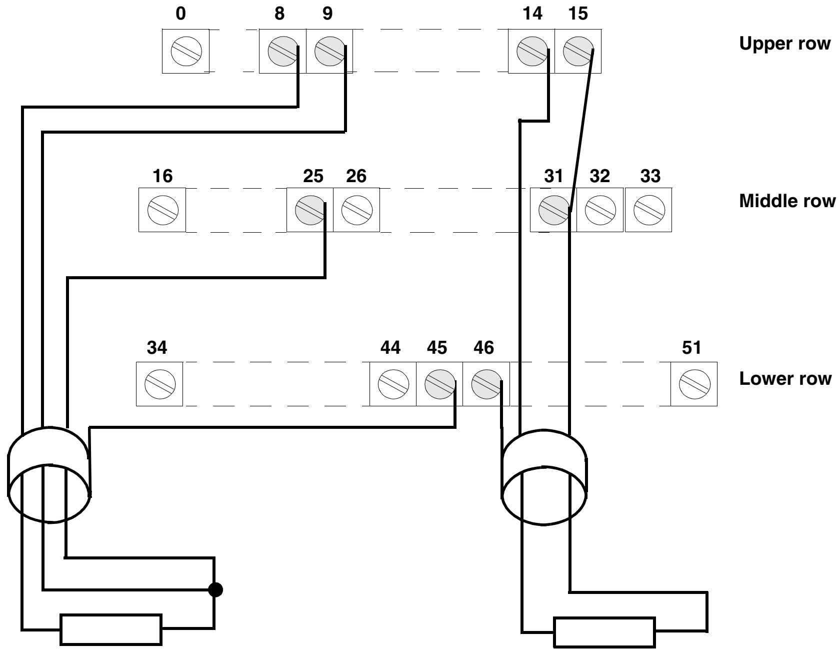


Figure 106. Wiring examples with 2- and 3-wire devices connected to a 200-TB3T.

Screw terminal connections

200-TBN and 200-TBNF connections are not listed below since screw terminals 17–31 do not exist on these base terminal units.

Note. Lower row terminals 39–46 on 200-TB3T are for chassis ground connections.

To reduce susceptibility to noise, power analog units and discrete units from separate power supplies. Do not exceed a length of 10 m for DC power cabling.

Do not daisy chain power or ground from the RTD terminal base unit *to any AC or DC discrete unit terminal base unit*.

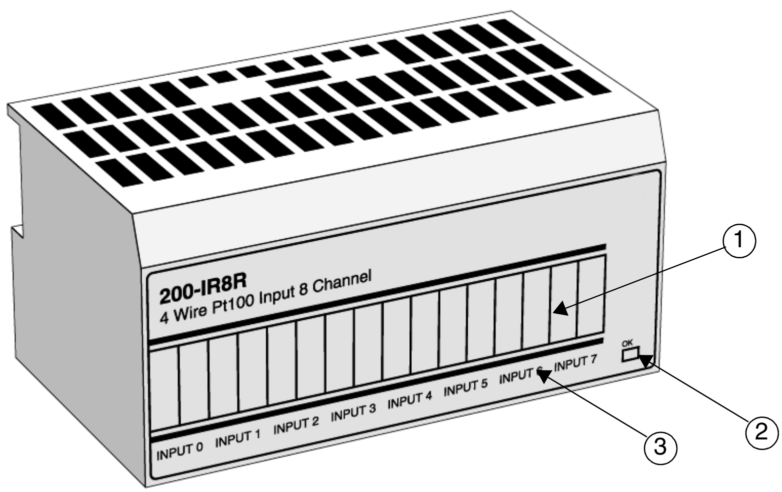
Input	200-TB2 & 200-TB3	200-TB3T
	Terminals to be connected	
Low signal 0	1	1
High signal 0	0	0
Signal Return 0	17	17
Shield Return 0	18	39
Low signal 1	3	3
High signal 1	2	2
Signal Return 1	19	19
Shield Return 1	20	40
Low signal 2	5	5
High signal 2	4	4
Signal Return 2	21	21
Shield Return 2	22	41
Low signal 3	7	7
High signal 3	6	6
Signal Return 3	23	23
Shield Return 3	24	42
Table continues on next page.		

Input	200-TB2 & 200-TB3	200-TB3T
	Terminals to be connected	
Low signal 4	9	9
High signal 4	8	8
Signal Return 4	25	25
Shield Return 4	26	43
Low signal 5	11	11
High signal 5	10	10
Signal Return 5	27	27
Shield Return 5	28	44
Low signal 6	13	13
High signal 6	12	12
Signal Return 6	29	29
Shield Return 6	30	45
Low signal 7	15	15
High signal 7	14	14
Signal Return 7	31	31
Shield Return 7	32	46
0 V DC	16, 33	16, 33
24 V DC	34, 51	34, 51

RTD Input Unit 200-IR8R

200-IR8R is an I/O unit for eight 4-wire RTD input signals. The inputs have programmable filters and the unit is galvanically isolated. The unit has 16-bit resolution. One sensor type is supported.

Front Panel



1 = Insertable label for labelling individual input designations.
2 = Power ON indicator.
3 = Status indicators

Figure 107. RTD input unit 200-IR8R

200-IR8R can be used with the version B or later of Adapter 200-ANN.

Indicators

Indication	Function
Input	Yellow LED, flashing when the input is sampled. Repetition of four flashes indicates an interrupt in the sensor connection and repetition of two flashes indicates a short-circuit in the sensor connection.
OK	Green LED with the following functions: - continuous: when the unit is fully operational - flashing: critical fault condition - not lit: unit not powered

Sensor type

The following sensor type can be connected to 200-IR8R

Sensor type	α	Temperature range
100 Ω Pt Euro	0.00385	-60 to +160°C

Functional Description

The 8 analog input signals are connected to the unit via the screw terminal on the terminal base unit.

The inputs are arranged in a group of 8, galvanically isolated from the serial bus by optocouplers. It is possible to deselect unused channels to improve system throughput.

Power for the internal logic is provided via the process power supply.

Since 200-IR8R does not receive power from the terminal base unit, 24 V DC must be applied to the unit before operation. If power is not applied, the unit position will appear to the adapter as an empty terminal base.

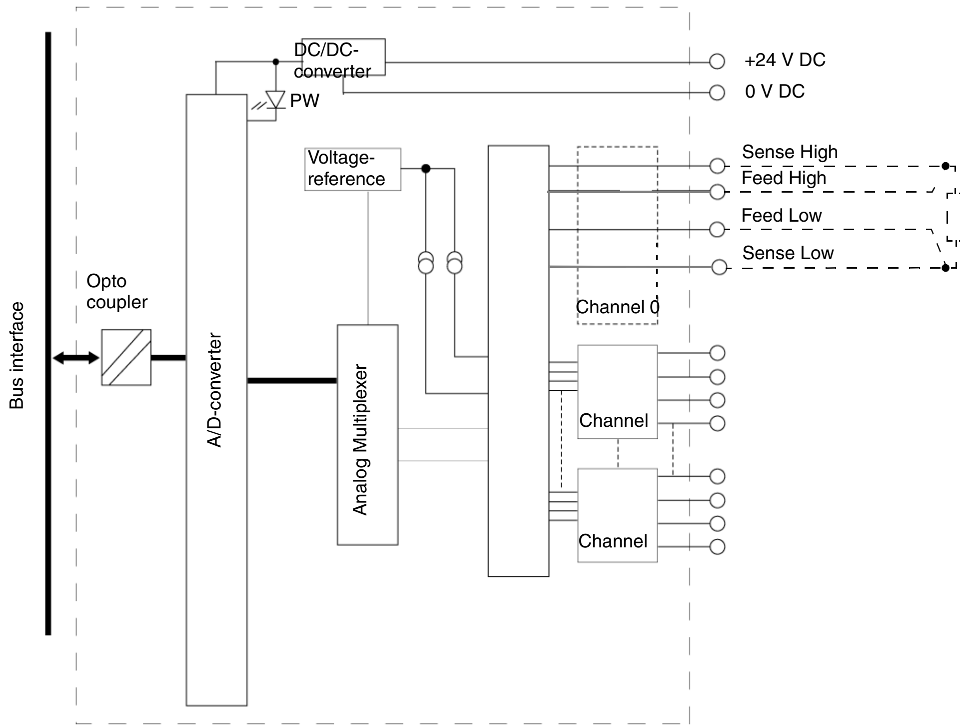


Figure 108. The 200-IR8R functional block diagram.

Filter and unit throughput

A programmable first notch filter in the analog-to-digital converter allows you to select a frequency for the first notch of the filter. Selection of the filter influences the analog-to-digital output data rate and changes the unit throughput.

First notch of filter (Hz)	-3 dB frequency (Hz)
10	2.62
50	13.10
60	15.72

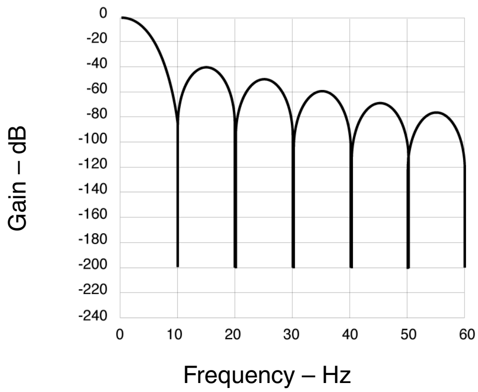


Figure 109. Filter response with first notch at 10 Hz.

Unit throughput means the time taken for a signal at the input terminal to arrive at the serial bus. It is a function of:

- the selected programmable first notch filter frequency,
- the number of channels actually configured for connection to a sensor.

A/D filter first notch frequency System throughput in ms			
No. of channels scanned	**10 Hz (16-bits)**	**50 Hz (16-bits)**	**60 Hz (16-bits)**
1	632	150	130
2	1263	300	260
3	1895	450	390
4	2526	600	520
5	3158	750	650
6	3789	900	780
7	4421	1050	910
8	5052	1200	1040

200-IR8R Connections

Connect individual input wiring to numbered terminals as described in the figure and table below. Always use shielded cables recommended by the RTD supplier. The terminal base unit 200-TB3T must be used together with 200-IR8R.

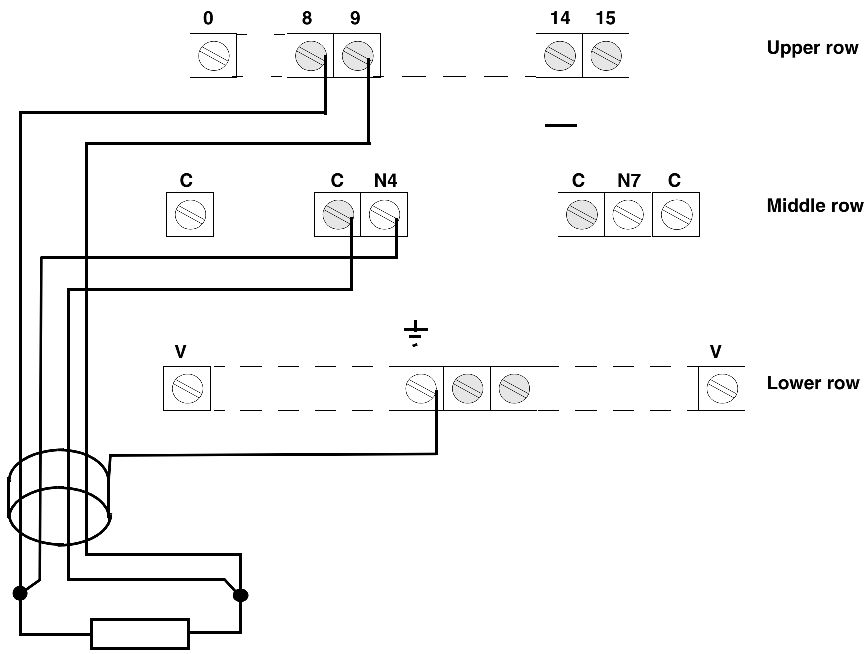


Figure 110. Wiring example with a 4-wire device connected to the terminal base unit 200-TB3T.

Input	200-TB3T Terminal	Input	200-TB3T Terminal	Input	200-TB3T Terminal	Input	200-TB3T Terminal
Sense Low 0	0	Sense Low 2	4	Sense Low 4	8	Sense Low 6	12
Sense High 0	1	Sense High 2	5	Sense High 4	9	Sense High 6	13
Feed High 0	C	Feed High 2	C	Feed High 4	C	Feed High 6	C
Feed Low 0	N0	Feed Low 2	N2	Feed Low 4	N4	Feed Low 6	N6
Sense Low 1	2	Sense Low 3	6	Sense Low 5	10	Sense Low 7	14
Sense High 1	3	Sense High 3	7	Sense High 5	11	Sense High 7	15
Feed High 1	C	Feed High 3	C	Feed High 5	C	Feed High 7	C
Feed Low 1	N1	Feed Low 3	N3	Feed Low 5	N5	Feed Low 7	N7

Screw terminal connections

Lower row terminals marked ⏚ on 200-TB3T are for the cable shields and chassis ground connections.

To reduce susceptibility to noise, supply analog units and discrete units from separate power supplies.

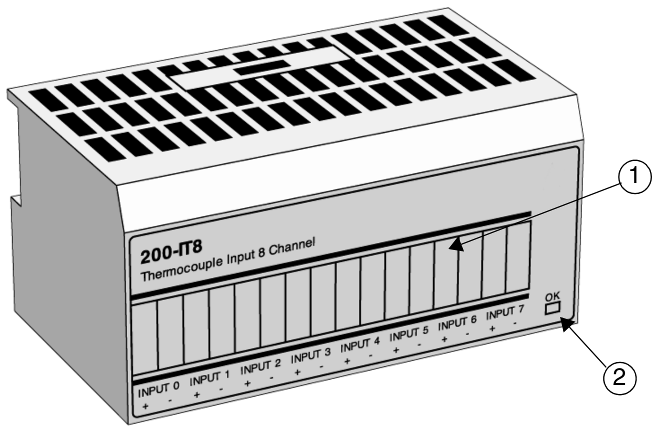
M

Do not exceed a length of 10 m for DC power cabling..

Do not chain power or ground from the RTD terminal base unit *to any discrete AC or DC unit terminal base unit.*

Thermocouple Input Unit 200-IT8

200-IT8 is an analog I/O unit for 8 thermocouple input signals. The inputs have programmable filters and the unit is galvanically isolated. The unit has 16 bit resolution. A high number of sensor types are supported. The unit comes with two Cold Junction Compensators (CJC).



1 = Holder for insertable label for individual output designations
2 = Power ON indicator

Figure 111. Thermocouple input unit 200-IT8.

Front Panel

Indicators

Indication	Function
OK	Bi-colour (green/red) LED: - Steady red at power up. - Off while module performs diagnostic tests. - If tests are passed, flashing green as long as configuration words are zero. - Steady green when configured.

Sensor Types

The following sensor types can be connected to 200-IT8:

Sensor type	Range
millivolt	±76.5 mV
B	+300 to +1800°C
E	-270 to +1000°C
J	-210 to +1200°C
K	-270 to +1372°C
R	-50 to +1768°C
S	-50 to +1768°C
T	-270 to +400°C
N	-270 to +1300°C
C	0 to +2315°C

Functional Description

The 8 input signals are connected to the unit via the screw terminal on the terminal base unit. They are galvanically isolated from the Serial bus (see function block diagram below).

It is possible to deselect unused channels to improve system throughput. Periodic user calibration is supported.

Power for the internal logic is provided via the process power supply.

Since 200-IT8 does not receive power from the terminal base unit, 24 V DC must be applied to the unit before operation. If power is not applied, the unit position will appear to the adapter as an empty terminal base.

You can use a 200-TB2 or TB3 terminal base unit if you are using the thermocouple/mV unit in the millivolt mode only. You must use a 200-TB3T terminal base unit for all thermocouple uses to be able to connect the two cold junction sensors.

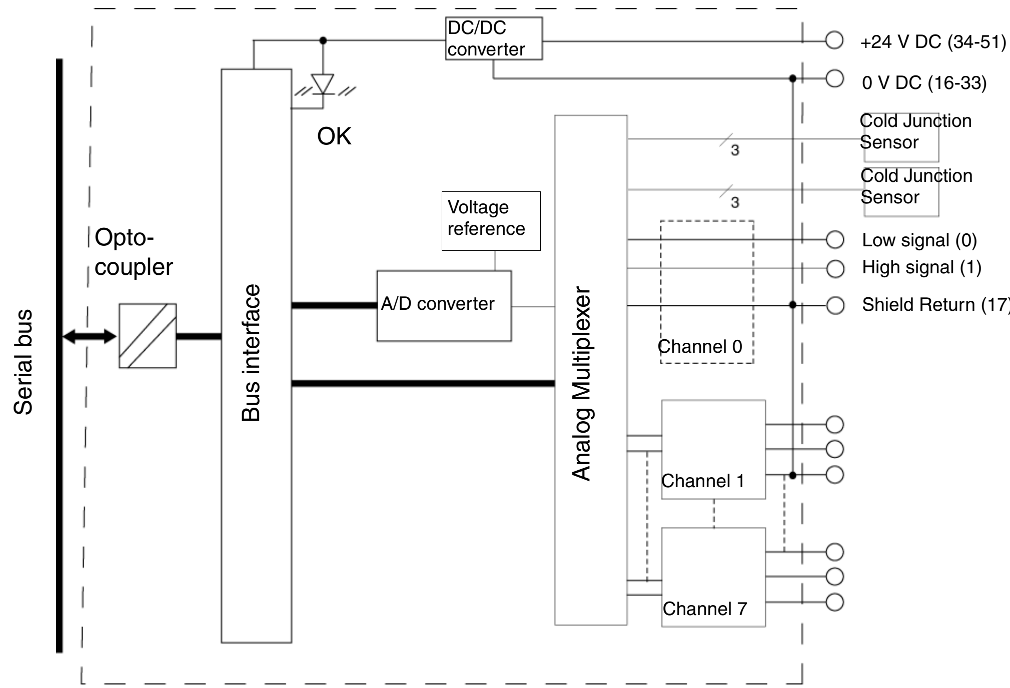


Figure 112. The 200-IT8 functional block diagram.

Numbers within parentheses in the diagram, refer to signal terminals on the terminal base unit, (e.g. 200-TB3) to which the unit is connected. Note that screw terminal numbers 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

Filter and Unit Throughput

A programmable first notch filter (low pass filter) in the analog to digital converter lets you select a (cut-off) frequency for the first notch of the filter. Selection of the filter influences the analog to digital output data rate and changes the unit throughput. See below.

A fixed digital filter may be set by programming software. This filter settles to 100% of Full Scale input in 60 times the selected first notch filter time shown on next page.

First notch of filter (Hz)	-3 dB frequency (Hz)
10	2.62
25	6.55
50	13.10
60	15.72
100	26.20
250	65.50
500	131.00
1000	262.00

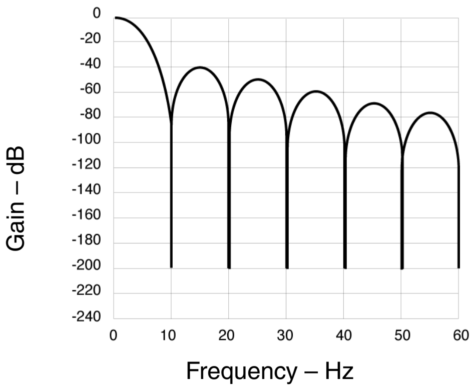


Figure 113. Filter response with first notch at 10 Hz.

Unit throughput means the time it takes for a signal at the input terminal to arrive at the serial bus. It is a function of:

- the selected programmable first notch filter (cut-off) frequency
- the number of channels actually configured for connection to a sensor
- the fixed digital filter

No. of channels scanned	Throughput A/D filter first notch frequency							
	10 Hz (16-bits)	25 Hz (16-bits)	50 Hz (16-bits)	60 Hz (16-bits)	100 Hz (16-bits)	250 Hz (13-bits)	500 Hz (13-bits)	1000 Hz (9-bits)
1	325 ms	145 ms	85 ms	75 ms	55 ms	37 ms	31 ms	28 ms
2	650 ms	290 ms	170 ms	150 ms	110 ms	74 ms	62 ms	56 ms
3	975 ms	435 ms	255 ms	225 ms	165 ms	111 ms	93 ms	84 ms
4	1.30 s	580 ms	300 ms	220 ms	148 ms	124 ms	124 ms	112 ms
5	1.625 s	725 ms	425 ms	375 ms	275 ms	185 ms	155 ms	140 ms
6	1.95 s	870 ms	510 ms	450 ms	330 ms	222 ms	186 ms	168 ms
7	2.275 s	1.015 s	595 ms	525 ms	385 ms	259 ms	217 ms	196 ms
8	2.60 s	1.16 s	680 ms	600 ms	440 ms	296 ms	248 ms	224 ms

Unit Calibration Overview

Unit calibration is required to either improve the initial unit accuracy or to remove unit error due to component aging. In addition, calibration may be required to eliminate long lead wire resistance to open-circuit detection current.

200-IT8 is already calibrated at delivery. If calibration is required, the unit must be in an I/O system. Input channels can be calibrated in any order, or all at once.

To allow the internal unit temperature to stabilize, apply power to the unit for at least 40 minutes before calibrating.

To calibrate the unit:

1. Apply a reference to the desired input(s).
2. Start calibration.

Perform the offset calibration procedure first, and then the gain calibration procedure.

Correction of the resistance error due to long lead wires is described in Removing lead wire or thermocouple extension wire resistance on page 192.

Connecting the calibration equipment

To calibrate your thermocouple input, you will need a precision voltage source or thermocouple simulator and calibration source.

Description	
Precision voltage source or thermocouple simulator and calibration source	0–100 mV, 1 µV resolution

The figures below show how to connect a precision voltage source. Connect all high signals together and attach to one lead from the precision voltage source. Connect all low signals together and 0 V DC on the terminal and attach to the other lead.

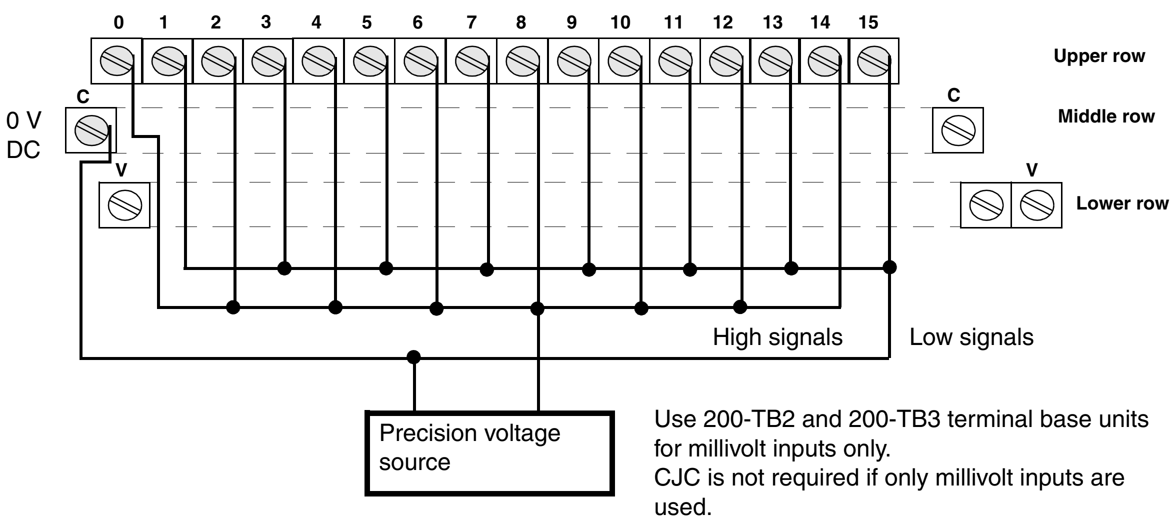


Figure 114. Connection of a precision voltage source.

For connection of Cold Junction Compensators (CJC), see figure below.

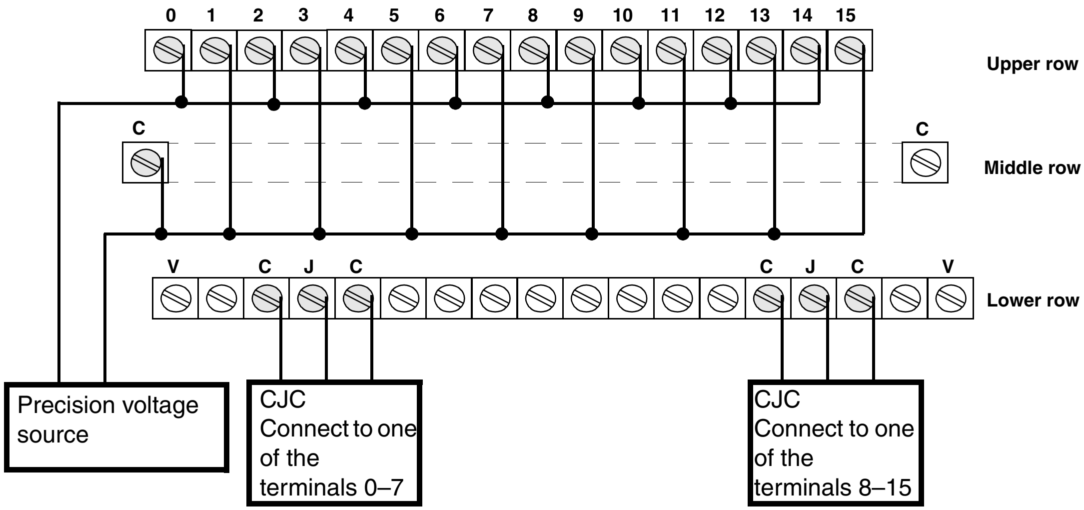


Figure 115. Connection of Cold Junction Compensators (CJC).

Removing lead wire or thermocouple extension wire resistance

The thermocouple/mV unit has open circuit detection. This is accomplished by a 1 mA current source in the unit. This current flowing, through the lead wire or thermocouple extension wire, generates an error or offset voltage in the reading.

Calibrate this error out using one of the two following methods.

Method 1, Step 1

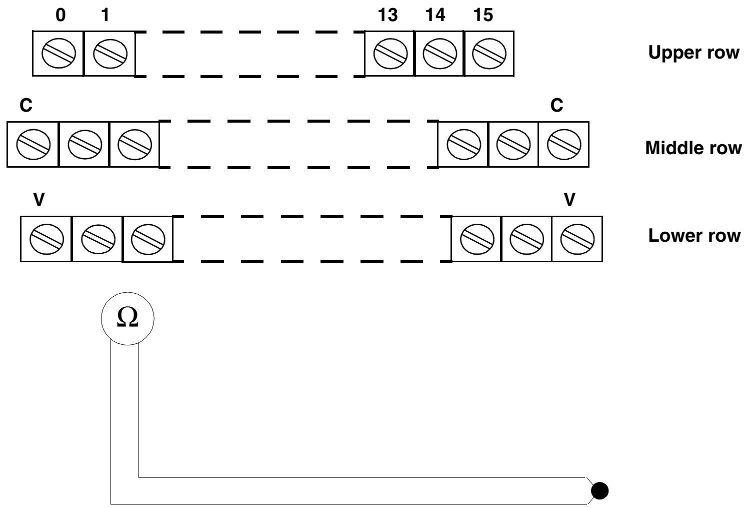


Figure 116. Calibrating error, method 1, step 1.

1. Disconnect all the lead wires at the terminal base unit.
2. Measure total loop resistance of both lead/extension wires and thermocouple.
3. If using a sensor other than a thermocouple, disconnect the lead wires at the sensor and tie together for this measurement. Reconnect after measurement.
4. After measuring, remove ohmmeter.

Method 1, step 2

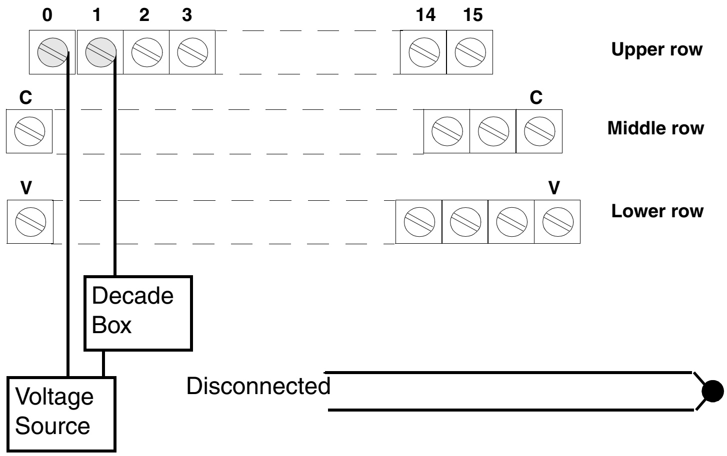


Figure 117. Calibrating error, method 1, step 2.

1. Set decade box to value determined in step 1, and connect in series with a precision voltage source.
2. Connect to the input terminals of the particular channel you are calibrating.
3. Perform an offset and gain calibration according to software instructions.
4. Remove the precision voltage source.
5. Reconnect the lead wires to the input terminals for this channel.
6. Repeat this procedure for the remaining channels.

Method 2

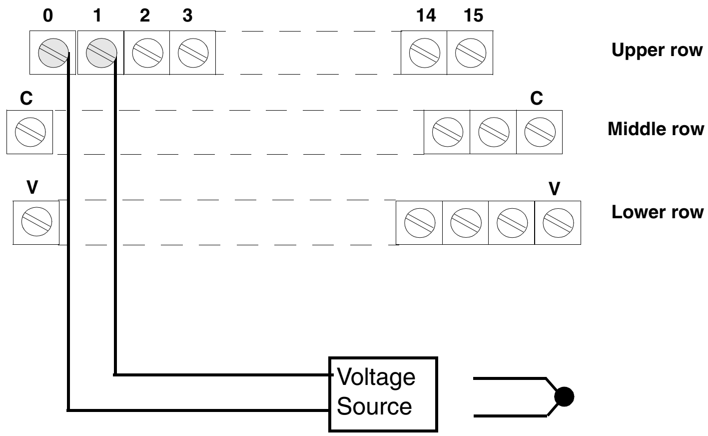


Figure 118. Calibrating error, method 2.

1. Disconnect the lead wire pair at the thermocouple or millivolt sensor.
2. Connect a precision voltage source across the lead wire pair.
3. Perform an offset and gain calibration according to software instructions.
4. Remove the precision voltage source.
5. Reconnect the lead wires to the input terminals for this channel.
6. Repeat this procedure for the remaining channels.

200-IT8 Connections

Connect individual input wiring to numbered terminals as described in the table below. Always use recommended compensation and shielded cables. The unit comes with 2 cold junction compensators (CJC) for use when using the thermocouple unit in the thermocouple mode. When using CJC the terminal base unit 200-TB3T must be used.

Connection to terminal base screw terminals

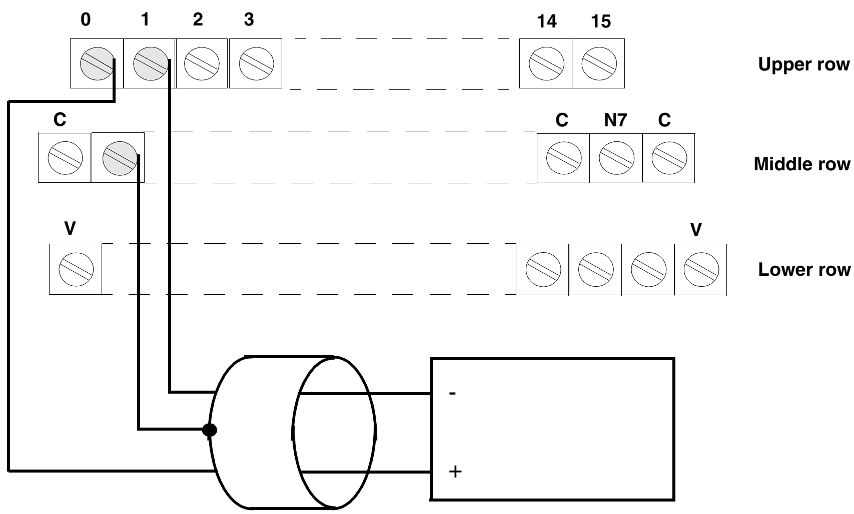


Figure 119. Example of millivolt input wiring to 200-TB3.

Connect the tail of the CJC to any of the associated thermocouple input terminals: 0–7 for CJC connected to 47, 48 and 49. The tail of the cold junction compensator shares a terminal with an input.

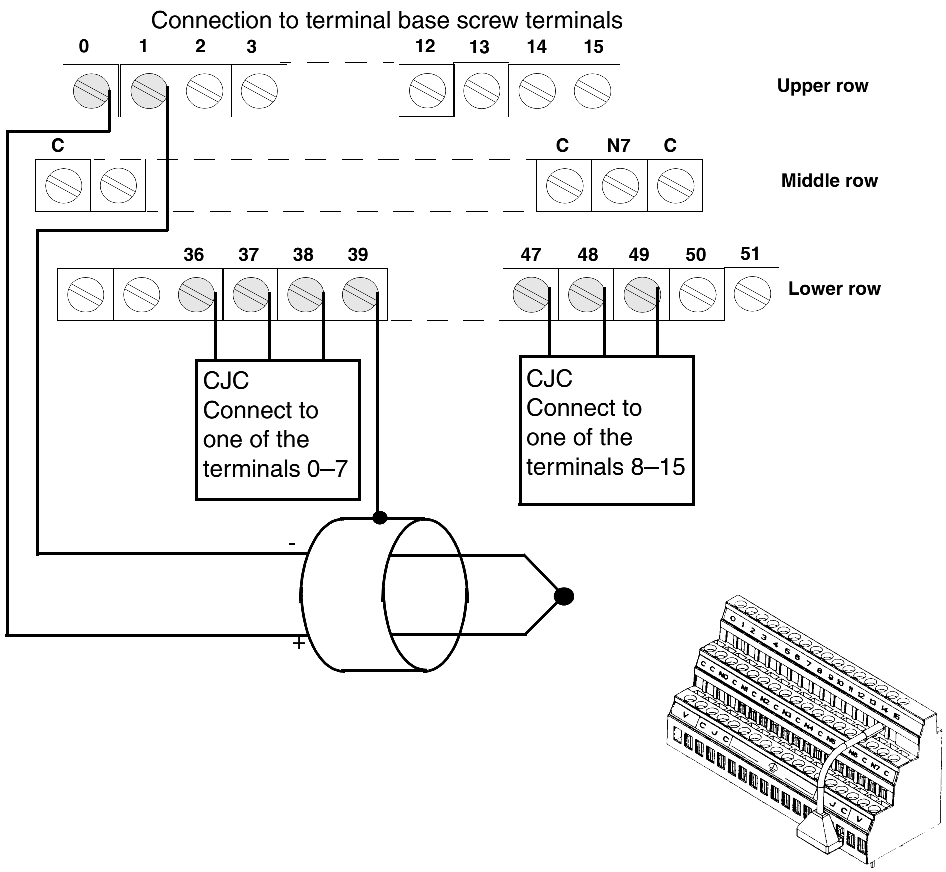


Figure 120. Example of 3-wire thermocouple wiring to 200-TB3T.

Screw terminal connections

To reduce susceptibility to noise, power analog units and discrete units from separate power supplies. Do not exceed a length of 10 m for DC power cabling.

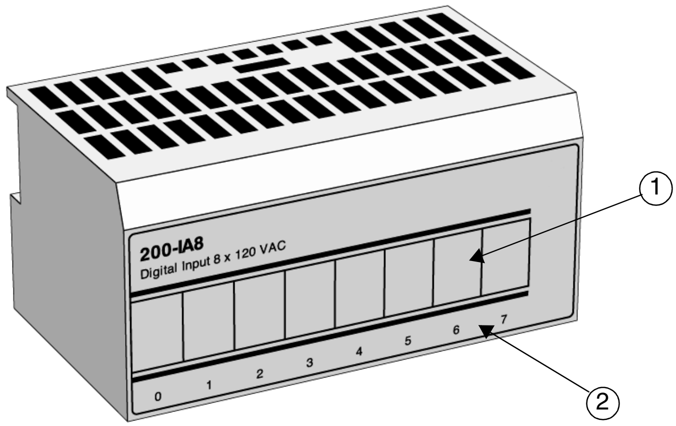
Do not daisy chain power or ground from the RTD terminal base unit *to any AC or DC discrete unit terminal base unit*.

Terminal base unit 200-TB3T is recommended with this unit.

Inputs	200-TB2 & 200-TB3	200-TB3T
	Terminals to be connected	
High signal 0	0	0
Low signal 0	1	1
Shield Return 0	17	39
High signal 1	2	2
Low signal 1	3	3
Shield Return 1	19	40
High signal 2	4	4
Low signal 2	5	5
Shield Return 2	21	41
High signal 3	6	6
Low signal 3	7	7
Shield Return 3	23	42
High signal 4	8	8
Low signal 4	9	9
Shield Return 4	25	43
High signal 5	10	10
Low signal 5	11	11
Shield Return 5	27	44
High signal 6	12	12
Low signal 6	13	13
Shield Return 6	29	45
High signal 7	14	14
Low signal 7	15	15
Shield Return 7	31	46
0 V DC	16, 33	16, 33
24 V DC	34, 51	34, 51

AC Input Unit 200-IA8

200-IA8 is a digital I/O unit for eight 120 V AC input signals. The inputs are filtered and galvanically isolated.



1 = Holder for insertable label for individual input designations
2 = Status indicators - show status of individual inputs.

Figure 121. AC input unit 200-IA8.

Front Panel

Indicators

Indication	Function
0–7	Yellow LED, lit when inputs are TRUE

Functional Description

The 8 AC input signals are connected to the unit via the screw terminals on the terminal base unit.

The inputs are galvanically isolated by optocouplers and the 8 inputs share a common AC voltage connection.

The status of each input signal is indicated by a yellow LED on the front of the unit. Each signal is filtered by a low-pass filter.

The input signals are sampled at intervals determined by sample time. The signal status is changed only if two consecutive samples are the same. The sample time can be set by the programming software.

Power for the internal logic is provided via the adapter for the I/O system.

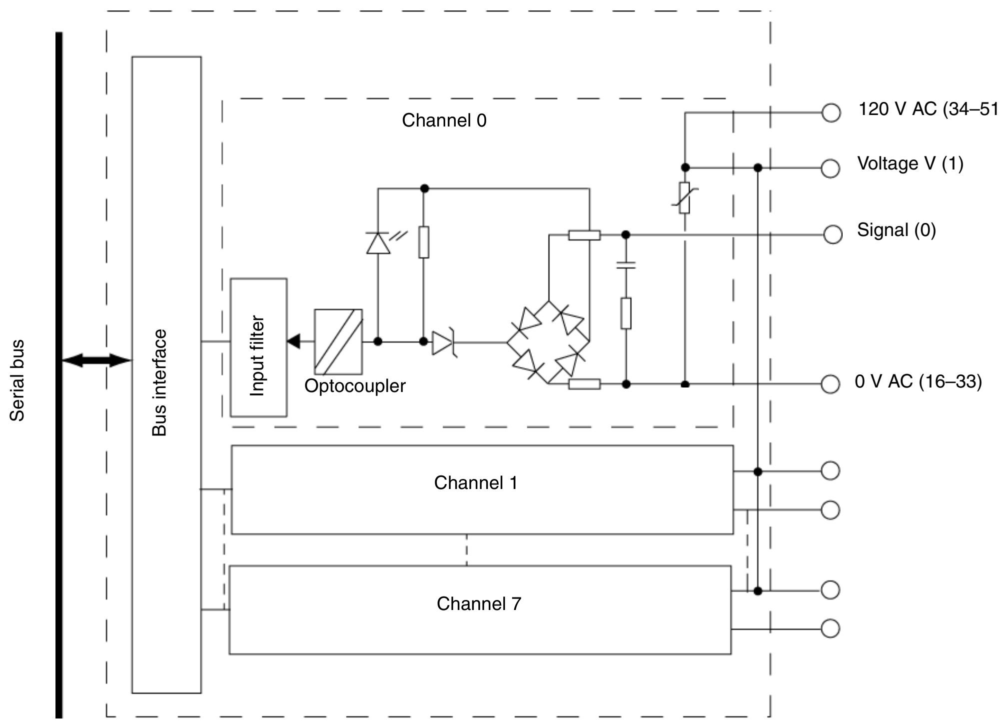


Figure 122. The 200-IA8 functional block diagram.

Numbers within parentheses in the diagram, refer to signal terminals on the terminal base unit, to which the unit is connected. (e.g. 200-TB3). Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-IA8 Connections

Connect individual input wiring to numbered terminal as described in the table below.

Remove field-side power before removing/inserting this unit or during the field-wiring installation. ***Do not*** consider this unit as galvanically isolated between the field-side power and the inputs. When you remove or insert a unit with field-side power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices causing unintended machine motion
- causing an explosion in a hazardous environment

Repeated electrical arcing causes excessive wear to contacts on both the unit and its mating connector. Worn contacts may create electrical resistance.

Connection to terminal base screw terminals

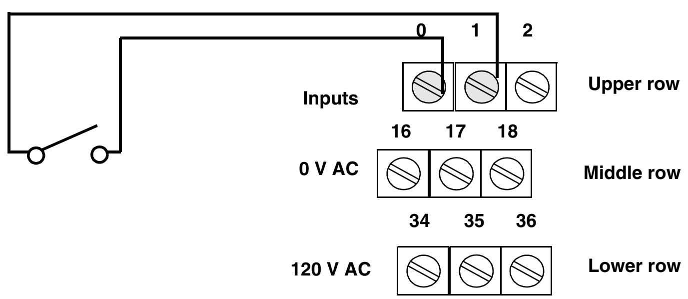


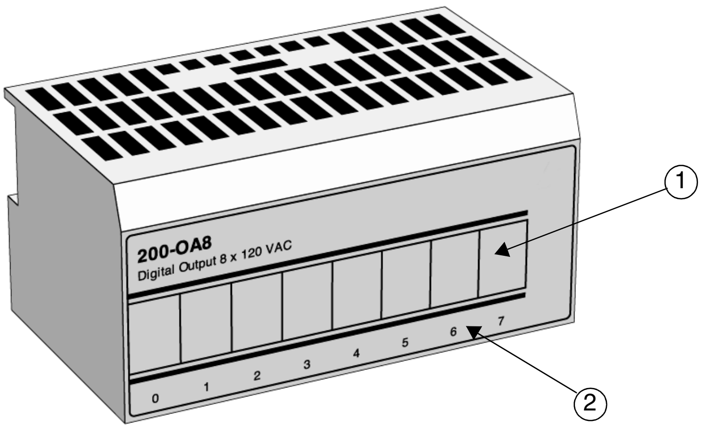
Figure 123. Wiring example. Note that not all terminal base units have three rows.

Screw terminal connections

Input	200-TB2 & 200-TB3		200-TBN & 200-TBNF	
	Terminals to be connected			
	Signal (upper row)	120 V AC (upper row)	Signal	120 V AC
0	0	1	0	1
1	2	3	2	3
2	4	5	4	5
3	6	7	6	7
4	8	9	8	9
5	10	11	10	11
6	12	13	12	13
7	14	15	14	15
0 V AC		16–33 (middle row)	16, 33	
120 V AC		34–51 (lower row)	34, 51	

AC Output Unit 200-OA8

200-OA8 is a digital I/O unit for eight 120 V AC output signals. The unit is galvanically isolated by optocouplers.



1 = Holder for insertable label for individual output designations
2 = Status indicators – show status of individual outputs.

Figure 124. AC output unit 200-OA8.

Front Panel

Indicators

Indication	Function
0–7	Yellow LED, lit when outputs are TRUE

Functional Description

The 8 AC output signals are connected to the unit via the screw terminals on the terminal base unit.

The outputs are galvanically isolated by optocouplers and the 8 outputs share a common 0 V AC connection.

The status of each output signal is indicated by a yellow LED on the front of the unit. Output indicators do not work if 120 V AC is missing.

Power for the internal logic is provided via the adapter for the I/O system.

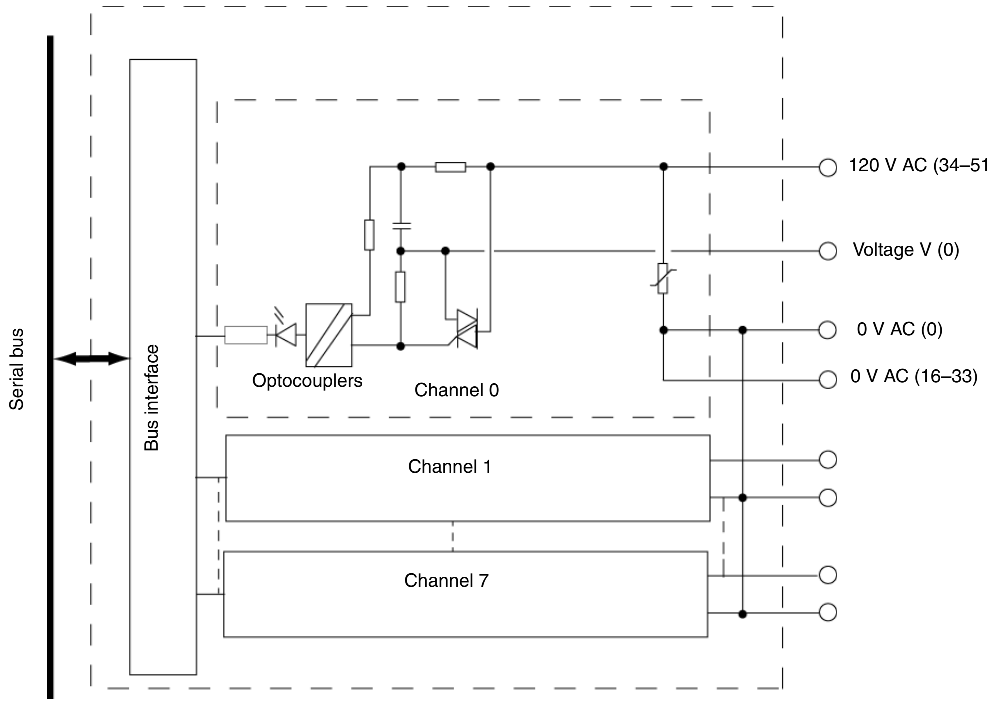


Figure 125. The 200-OA8 functional block diagram.

Numbers within parentheses in the diagram, refer to signal terminals on the terminal base unit, to which the unit is connected (e.g. 200-TB3). Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-OA8 Connections

Connect individual output wiring to numbered terminal as described in the table below.

Remove field-side power before removing/inserting this unit or during the field-wiring installation. ***Do not*** consider this unit as galvanically isolated between the field-side power and the outputs. When you remove or insert a unit with field-side power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices causing unintended machine motion
- causing an explosion in a hazardous environment

Repeated electrical arcing causes excessive wear to contacts on both the unit and its mating connector. Worn contacts may create electrical resistance.

Connection to terminal base screw terminals

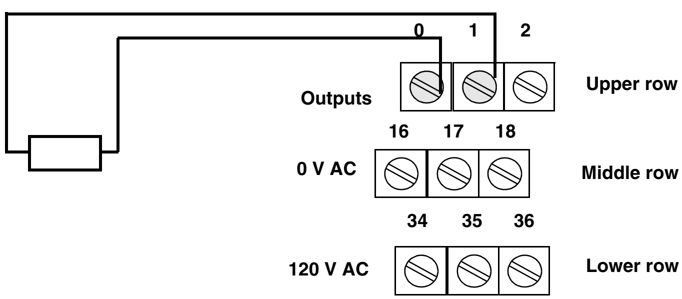


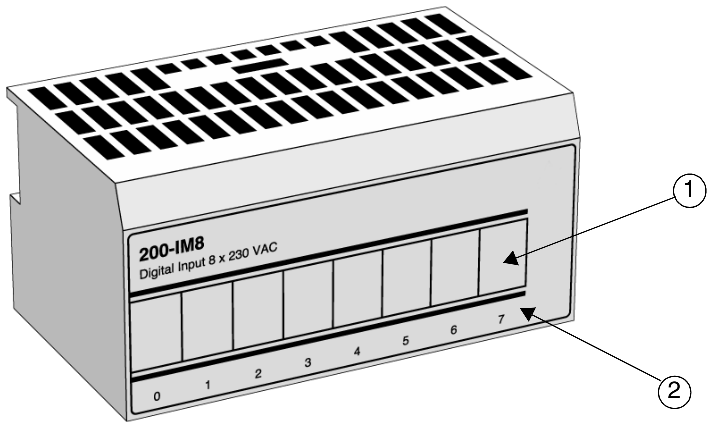
Figure 126. Wiring example. Note that not all terminal base units have three rows.

Screw terminal connections

Output	200-TB2 & 200-TB3		200-TBN & 200-TBNF	
	Terminals to be connected			
	Signal (upper row)	0 V AC (upper row)	Signal	0 V AC
0	0	1	0	1
1	2	3	2	3
2	4	5	4	5
3	6	7	6	7
4	8	9	8	9
5	10	11	10	11
6	12	13	12	13
7	14	15	14	15
0 V AC		16–33 (middle row)	16, 33	
120 V AC		34–51 (lower row)	34, 51	

AC Input Unit 200-IM8

200-IM8 is a digital I/O unit for eight 230V AC input signals. The inputs are filtered and galvanically isolated.



1 = Holder for insertable label for individual input designations
2 = Status indicators - show status of individual inputs.

Figure 127. AC input unit 200-IM8.

Front Panel

Indicators

Indication	Function
0–7	Yellow LED, lit when inputs are TRUE

Functional Description

The 8 AC input signals are connected to the unit via the screw terminals on the terminal base unit.

The inputs are galvanically isolated by optocouplers and the 8 inputs share a common AC voltage connection.

The status of each input signal is indicated by a yellow LED on the front of the unit.

Each signal is filtered by a digital low-pass filter. The filter has one common time constant for the inputs 0–7. The sum of the hardware and digital filter time constants affects the shortest possible pulse length which can be detected. The delay times are given in the table below (at 2 MHz clock frequency from the serial I/O bus). The delay time is set in the programming software.

Delay Time for Inputs 0–7	Maximum Delay Time	
	Off to ON	**On to Off**
Delay Time 0 (default)	7.5 ms	26.5 ms
Delay Time 1	8 ms	27 ms
Delay Time 2	9 ms	28 ms
Delay Time 3	10 ms	29 ms
Delay Time 4	12 ms	31 ms
Delay Time 5	16 ms	35 ms
Delay Time 6	24.5 ms	44 ms
Delay Time 7	42 ms	60.5 ms

Power for the internal logic is provided via the adapter for the I/O system.

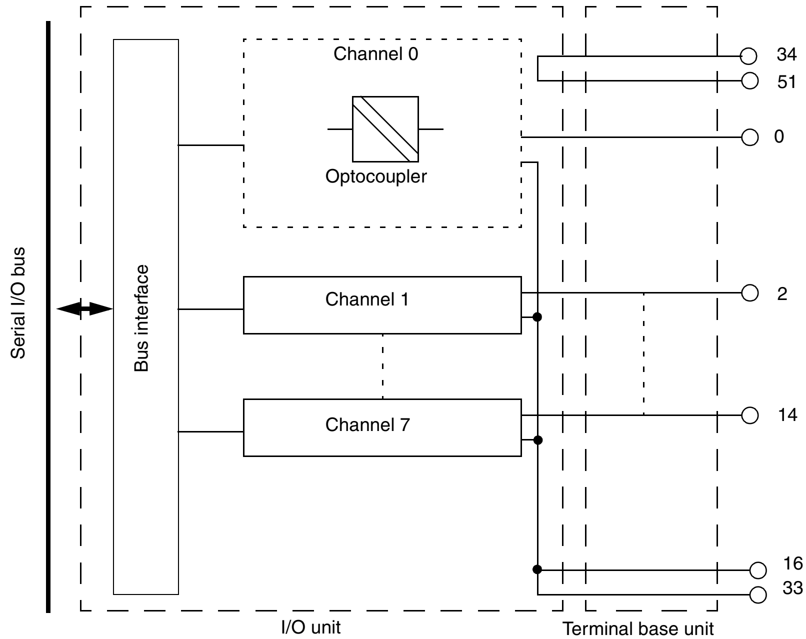


Figure 128. The 200-IM8 functional block diagram.

200-IM8 Connections

Terminal base unit 200-TBN must be used together with 200-IM8.

Connect individual input wiring to numbered terminal as described in the table below.

Remove field-side power before removing/inserting this unit or during the field-wiring installation. When you remove or insert a unit with field-side power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices causing unintended machine motion
- causing an explosion in a hazardous environment

Repeated electrical arcing causes excessive wear to contacts on both the unit and its mating connector. Worn contacts may create electrical resistance.

Total current drawn through the terminal base unit is limited to 10 A, refer to Connecting the Power Supply Cables on page 31.

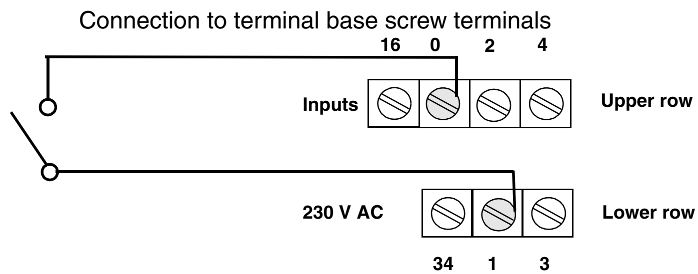


Figure 129. Wiring example.

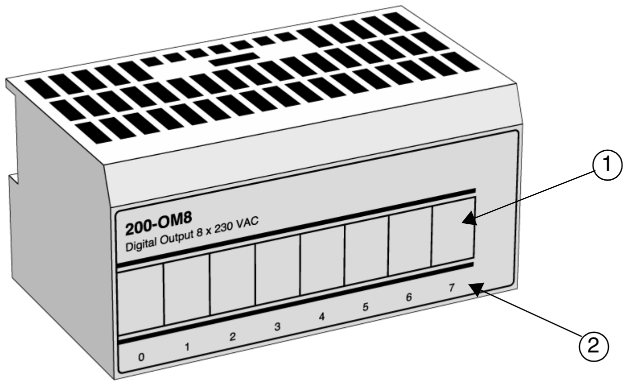
Screw terminal connections

Input	200-TBN	
	Signal	230 V AC(1)
0	0	1
1	2	3
2	4	5
3	6	7
4	8	9
5	10	11
6	12	13
7	14	15
0 V AC	16, 33	
230 V AC	34, 51	

(1) 1, 3, 5, 7, 9, 11, 13 and 15 are internally connected to 230 V AC in the I/O unit.

AC Output Unit 200-OM8

200-OM8 is a digital I/O unit for eight 230 V AC output signals. The unit is galvanically isolated by optocouplers.



1 = Holder for insertable label for individual input designations
2 = Status indicators - show status of individual outputs.

Figure 130. AC output unit 200-OM8.

Front Panel

Indicators

Indication	Function
0–7	Yellow LED, lit when outputs are TRUE

Functional Description

The 8 AC output signals are connected to the unit via the screw terminals on the terminal base unit.

The outputs are galvanically isolated by optocouplers and the 8 outputs share a common 0 V AC connection.

The status of each output signal is indicated by a yellow LED on the front of the unit. Output indicators do not work if 230 V AC is not connected.

Power for the internal logic is provided via the adapter for the I/O system.

The outputs are activated at the zero voltage crossing of the AC voltage, which causes a variable delay of 0–10 ms.

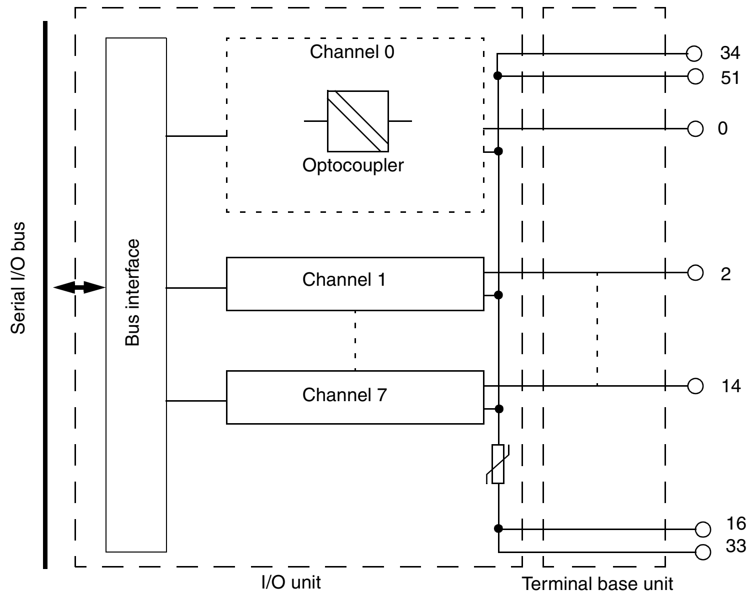


Figure 131. The 200-OM8 functional block diagram.

200-OM8 Connections

Terminal base unit 200-TBN must be used together with 200-IM8. Connect individual input wiring to numbered terminal as described in the table below.

Remove field-side power before removing/inserting this unit or during the field-wiring installation. ***Do not*** consider this unit as galvanically isolated between the field-side power and the outputs. When you remove or insert a unit with field-side power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system’s field devices causing unintended machine motion
- causing an explosion in a hazardous environment

Repeated electrical arcing causes excessive wear to contacts on both the unit and its mating connector. Worn contacts may create electrical resistance.

Total current drawn through the terminal base unit is limited to 10 A, refer to Connecting the Power Supply Cables on page 31.

It is not possible to connect the outputs in parallel.

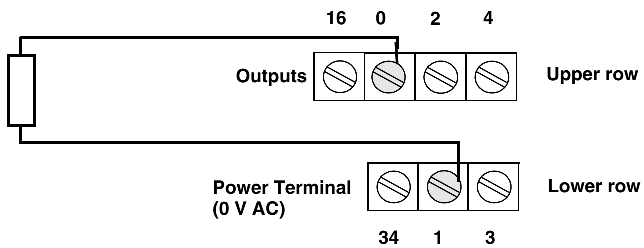


Figure 132. Wiring example. Connection to terminal base screw terminals.

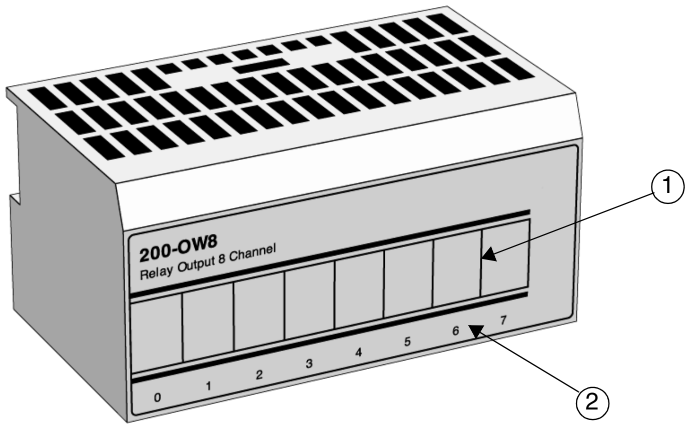
Screw terminal connections

Output	200-TBN	
	Signal	Power Terminal(1)
0	0	1
1	2	3
2	4	5
3	6	7
4	8	9
5	10	11
6	12	13
7	14	15
0 V AC	16, 33	
230 V AC	34, 51	

(1) 1, 3, 5, 7, 9, 11, 13 and 15 are internally connected to 0 V AC in the I/O unit.

Relay Output Unit 200-OW8

200-OW8 is an I/O unit for 8 relay output signals. The outputs are galvanically isolated.



1 = Holder for insertable label for individual output designations
2 = Status indicators - show status of individual outputs.

Figure 133. Relay output unit 200-OW8.

Front Panel

Indicators

Indication	Function
0–7	Yellow LED, lit when outputs are TRUE

Functional Description

The 8 relay output signals are connected to the unit via the screw terminals on the terminal base unit.

If voltage >132 V terminal base unit 200-TBN or 200-TBNF must be used.

Relay voltage is provided via an external power supply.

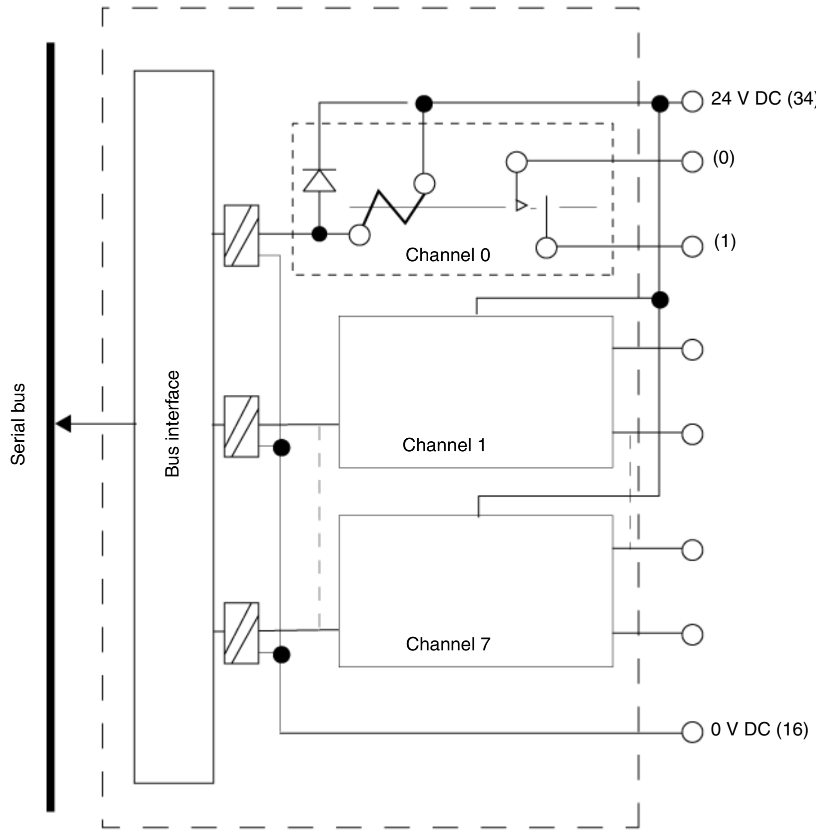


Figure 134. The 200-OW8 functional block diagram.

Representative examples of various relay load contacts. 34, 16, 1, 0, etc. in the diagram, refer to signal terminals on the terminal base unit, to which the unit is connected. (e.g. 200-TB3). Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-OW8 Connections

Connect individual output wiring to numbered terminal as described in the table below.

Do not attempt to increase load current or wattage capability load beyond the maximum rating by connecting two or more outputs in parallel. The slightest variation in relay switching time may cause one relay to momentarily switch the total load current.

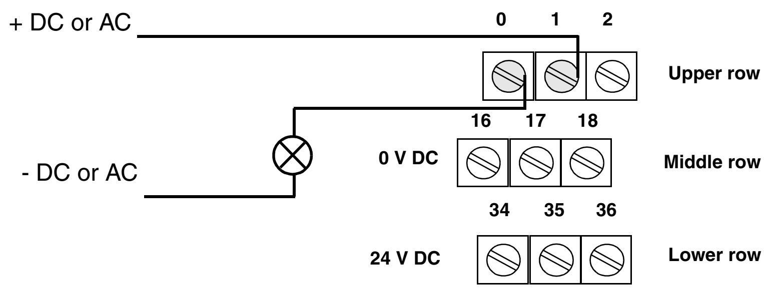


Figure 135. Two wiring examples. Connection to terminal base screw terminals. Note that not all terminal base units have three rows.

If inductive loads are connected, use a diode across each load. Do not use Zener diodes.

Do not connect a signal with tension on. The leakage current from the transient suppressions can be hazardous.

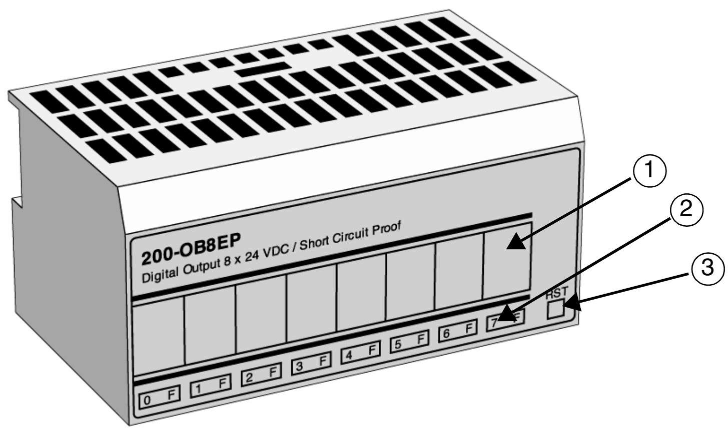
Screw terminal connections

Output	200-TB2 & 200-TB3	200-TBN & 200-TBNF
	Terminals to be connected	
	Signal	
0	0	0
	1	1
1	2	2
	3	3
2	4	4
	5	5
3	6	6
	7	7
4	8	8
	9	9
5	10	10
	11	11
6	12	12
	13	13
7	14	14
	15	15
0 V DC	16–33	16, 33
24 V DC	34–51	34, 51

Short-circuit Proof Output Unit 200-OB8EP

200-OB8EP is a short circuit proof output unit for eight signals. The unit is intended for detection of short circuit condition in its output circuit or low impedance loads causing excessive current draw. Each of the eight output channels has a current sensing circuit. The unit is designed to allow up to 2.0 A current per channel.

This unit requires a great current consumption and must be properly powered.



1 = Holder for insertable label for individual output designation
2 = Status indicators
3 = Reset button

Figure 136. Short-circuit proof output unit 200-OB8EP.

Front Panel

Indicators

Indication	Function
Output 0–7	Yellow LED, lit when outputs are TRUE
Fault 0–7	Red LED, when lit indicating fault

Functional Description

The outputs are galvanically isolated by optocouplers and the 8 outputs share a common ground connection. The unit is connected via the terminal base unit.

Process side load levels are detected by 200-OB8EP. The unit is designed to source a surge current of approximately 4.0 A for 10 ms without indicating a fault. The unit does not distinguish between an overcurrent condition and a short circuit condition.

Resetting a unit fault

Faults can be reset in three ways:

- Press the fault reset button.
- Toggle the reset bit associated with the output.[1]
- Cycle the 24 V DC supply to the unit.

The reset function resets all output fault bits simultaneously.

Using the fault reset button

When pressing the manual reset button:

1. the fault indicator for the faulted output turns off for about 500 ms (the faulted output will not attempt to turn on during this delay).
2. after the 500 ms delay, the faulted output attempts to turn on.
3. if the external condition causing the fault is corrected, the output will remain on, the fault indicator is off, and the status indicator is on.

1. A 3 second delay is recommended in the reset program.

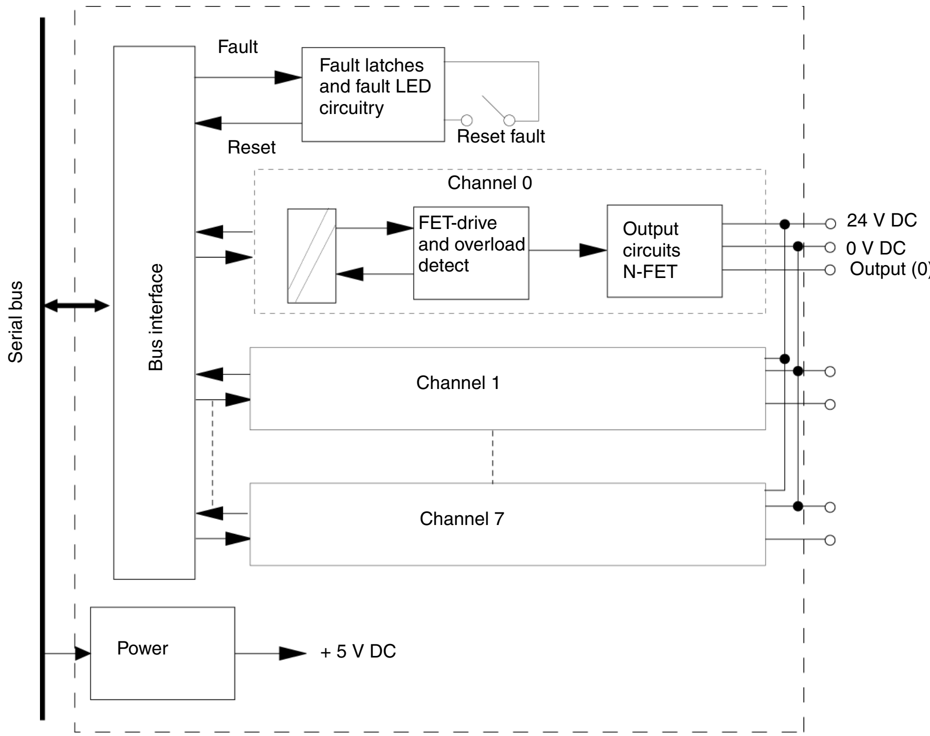


Figure 137. The 200-OB8EP functional block diagram.

Numbers within parentheses in the diagram, refer to signal terminals on the terminal base unit, to which the unit is connected (e.g. 200-TB3). Note that screw terminals 35–50 only exist on 200-TB3. Terminals 17–32 do not exist on 200-TBN and 200-TBNF.

200-OB8EP Connections

Connect individual output wiring to numbered terminals as described in the table below.

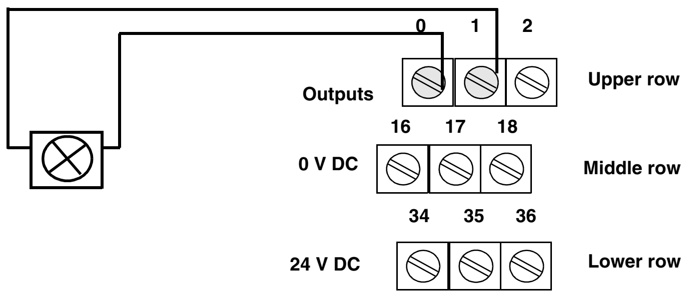


Figure 138. Wiring example. Connection to terminal base screw terminals. Note that not all terminal base units have three rows.

Screw terminal connections

Output channel	200-TB2 & 200-TB3			200-TBN & 200-TBNF	
	Terminals to be connected				
	Output terminal (upper row)	0 V DC (upper row)	0 V DC (middle row)	Output terminal	0 V DC
0	0	1	17	0	1
1	2	3	19	2	3
2	4	5	21	4	5
3	6	7	23	6	7
4	8	9	25	8	9
5	10	11	27	10	11
6	12	13	29	12	13
7	14	15	31	14	15
0 V DC		16–33 (middle row)		16, 33	
24 V DC		34–51 (lower row)		34, 51	

Dummy Unit 200-DUTB

200-DUTB is a dummy unit used to occupy empty locations on terminal base units of the I/O system. It protects the I/O system from external mechanical and electrical damage.

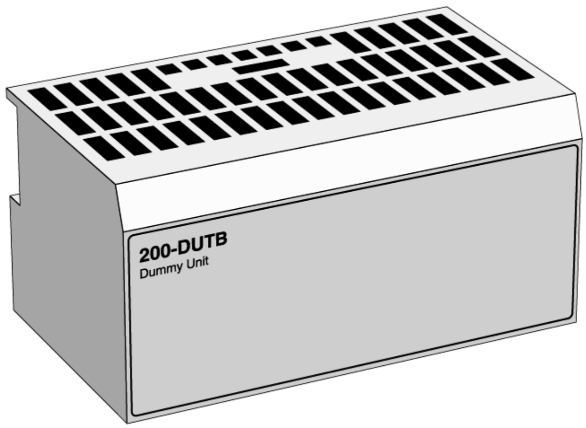


Figure 139. Dummy unit 200-DUTB.

Adapter for Central I/O System 200-ANN

This unit is a central I/O adapter unit, intended for connection of up to eight terminal base units equipped with I/O units. 200-ANN connects the Advant Controller 250 or the SoftController to the central I/O system.

Unit 200-ANN version A must not be connected to the Advant Controller 250 or the SoftController.

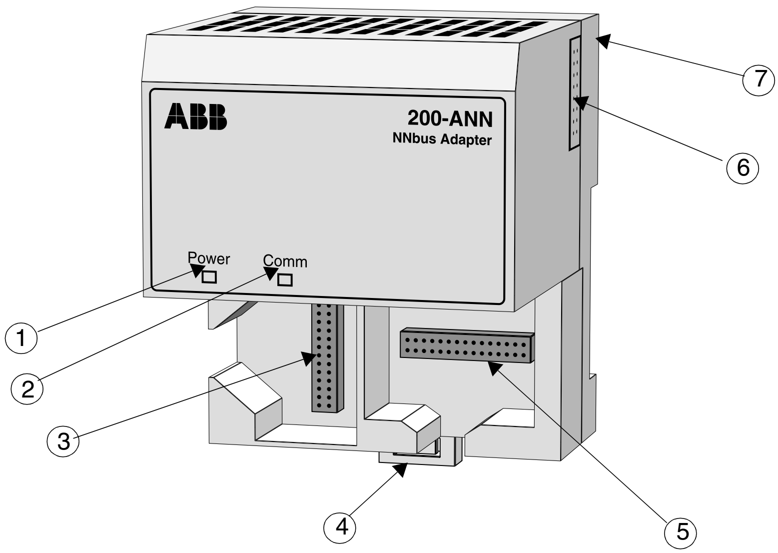


Figure 140. Adapter for central I/O system 200-ANN.

Front Panel

Indicator and component identification

1	Green LED (Power indicator), lit when internal 5 V DC is present.
2	Green LED (Comm indicator), lit when 200-ANN is initiated by the Controller unit.
3	Connection to previous adapter or BPN via the controller bus.
4	Locking tab for DIN rail mounting.

5	Connection to next adapter or BPT start.
6	Male I/O bus connector
7	Slot for connection to an adjacent terminal base unit

Functional Description

The central I/O Adapter unit passes on data from the Controller unit to the I/O system and vice versa. It also connects adjacent adapters in a central I/O system.

The power for this unit is taken from the system bus and is indicated on the left hand Power LED on the front panel. This unit supplies all I/O units internally with power supply.

The status of the adapter is indicated by the right hand Comm LED on the front panel. It is lit when 200-ANN is initiated by the Controller unit.

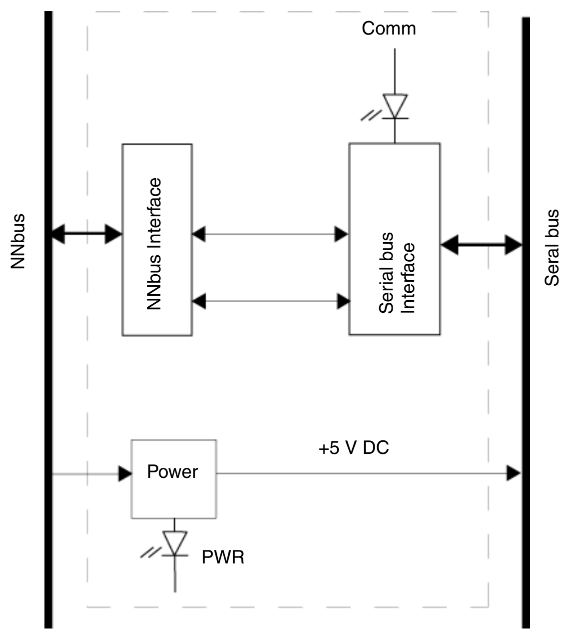


Figure 141. The 200-ANN functional block diagram

Adapter for Remote I/O System 200-ACN

This unit is a remote I/O adapter unit, intended for connection of up to eight terminal base units equipped with I/O units. 200-ACN is connected to a 200-CICN in the Advant Controller 250 via ControlNet.

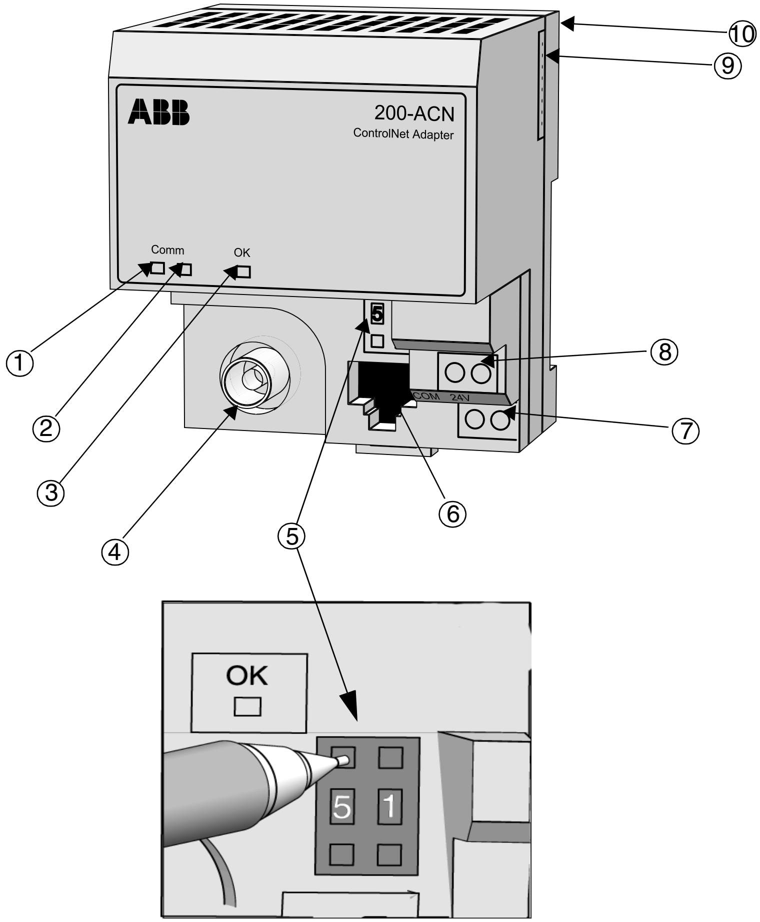


Figure 142. Adapter for remote I/O system 200-ACN.

Front Panel

Indicators and component identification

1	Red/Green LED, Communication indicator A
2	Red/Green LED, Communication indicator B
3	Red/Green LED, Adapter status indicator
4	ControlNet cable BNC connector
5	ControlNet node selection push button switches
6	ControlNet programming terminal connector (for future use)
7	+24 V DC connection terminals
8	0 V DC connection terminals
9	Male I/O bus connector
10	Slot for connection to an adjacent terminal base unit

Functional Description

The remote I/O Adapter unit pass on data from the controller to the remote I/O system and vice versa. 200-ACN is connected to the ControlNet.

The power for this unit is taken from a 24 V DC supply. The status of the adapter is indicated by the LEDs on the front panel. The unit also supports the I/O units with internal current.

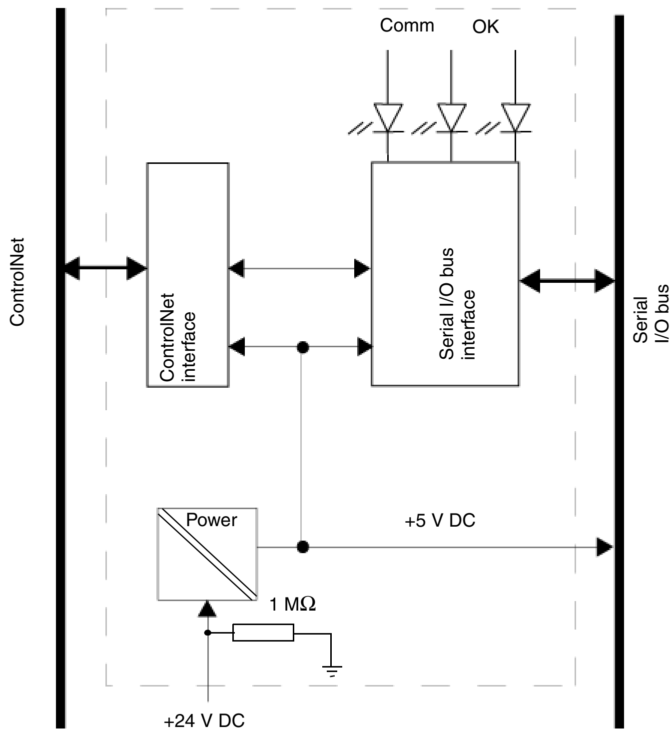


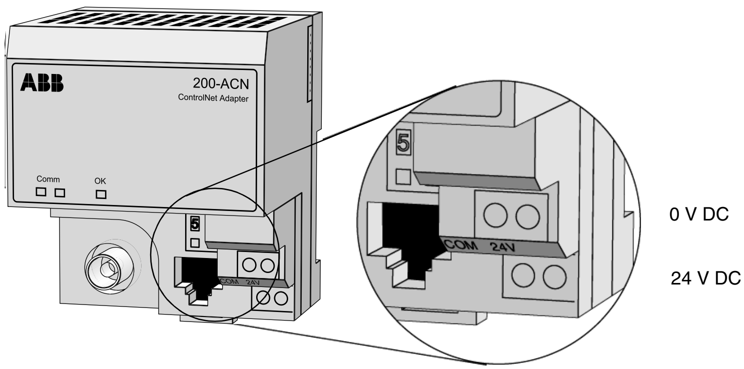
Figure 143. The 200-ACN functional block diagram

LED Indications

LEDs A and B (Comm) simultaneously	
LEDs A & B	Indication
Off	No power or reset
Red	Adapter inoperative
Red-Green (flashing alternately)	Adapter self test
Red-Off (flashing alternately)	Bad node configuration (i.e. duplicate node addresses)
LED A (Comm) individually (B is OFF)	
Off	Channel disabled
Green	Channel operational
Flashing Green-Off	Temporary network errors
Flashing Red-Off	Cable fault or lonely node. Broken cable, redundancy warning, etc.
Flashing Red-Green	Bad network configuration
OK indicator	
Off	Channel disabled
Flashing Green	On-line but not connected
Green	On-line, link okay, connected
Flashing Red	Recoverable fault
Red	Critical, adapter failure

Node Address Selection

A node address in the range 2–99 should be selected for the 200-ACNs. It is highly recommended to select addresses in a consecutive manner to minimize network load.



Screw terminals

The screw terminals are located on the lower right part of the front. The two terminals located on the upper row are for 0 V DC and the two on the lower row are for 24 V DC.

Adapter for PROFIBUS 200-APB12

This unit is intended for connection of up to eight I/O units to a PROFIBUS-DP network.

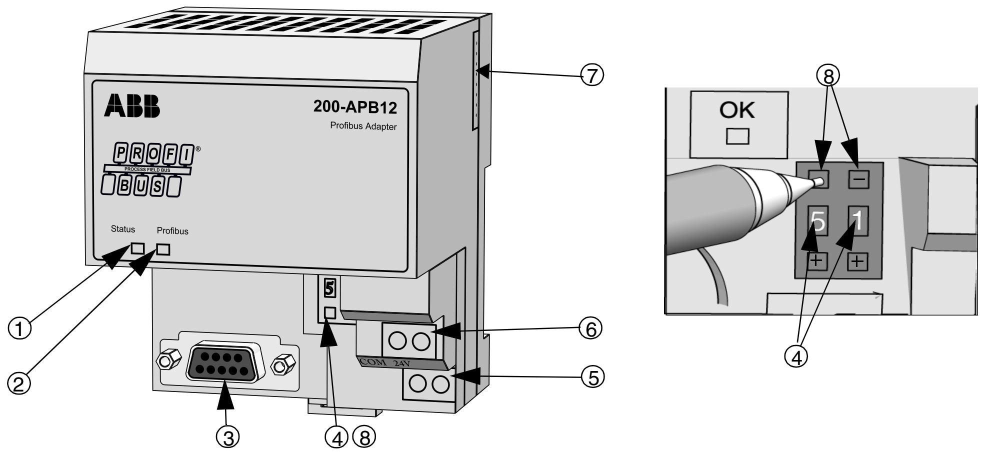


Figure 144. Adapter for PROFIBUS 200-APB12.

Front Panel

Indicators and component identification

1	Red/Green LED, adapter status indicator
2	Red/Green LED, PROFIBUS communication link indicator
3	PROFIBUS-DP network 9-pin D-type female connector
4	Node address indicator
5	+24 V DC connection terminals
6	0 V DC connection terminals
7	Serial I/O bus connector
8	Push-button switches for node address setting

Functional Description

The 200-APB12 adapter acts as a slave device to a DP master controller on the PROFIBUS network and transfers data between the controller and the I/O units. For information on PROFIBUS-DP installation, see “Installation Guidelines for PROFIBUS-DP/FMS” (available from ABB Automation, order code PB-IGE).

The power is taken from a 24 V DC supply. The status of the adapter is indicated by the LEDs on the front panel. The unit also supports I/O units with internal current via the serial I/O bus.

LED Indications

Adapter Status Indicator	
Off	No power
Steady green	Normal operation
Flashing red/off	Recoverable fault - Faulty I/O unit - Incorrect I/O unit installed - Node address changed since power-up
Steady red	Unrecoverable fault
PROFIBUS Communication Link Indicator	
Off	No power or no communication
Steady green	Data are being transmitted and received
Flashing red/off	Recoverable fault - Invalid Send parameter data - Invalid Check configuration data
Steady red	Unrecoverable fault, unable to communicate

Node Address Selection

A node address in the range 1–99 should be selected for the 200-APB12. A GSD file for the configuration can be ordered from ABB Automation.

Screw Terminals

The screw terminals are located on the lower right side of the front of the unit. The two terminals located on the upper row are for 0 V DC and the two on the lower row are for +24 V DC.

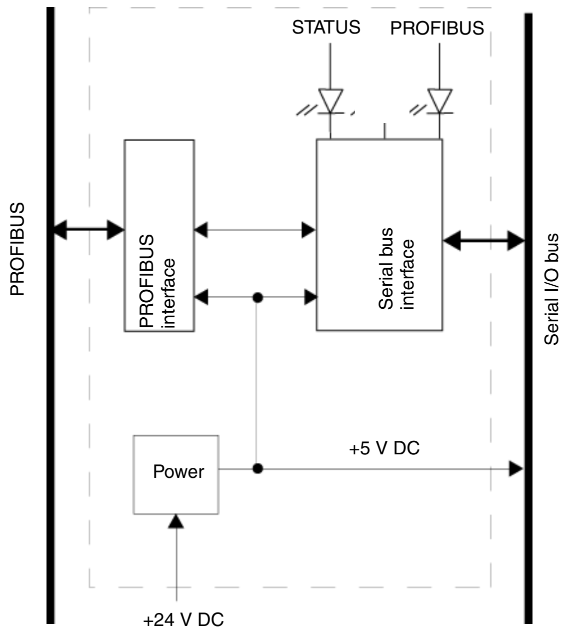


Figure 145. The 200-APB12 functional block diagram

Adapter for Serial I/O Bus 200-AIO

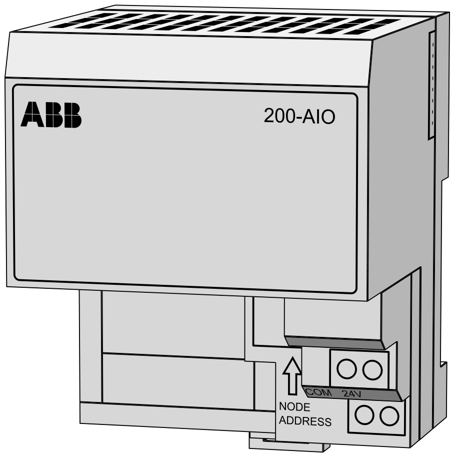


Figure 146. Adapter for Serial I/O bus 200-AIO.

The adapter is used to connect up to 8 I/O units of type S200 I/O or S200L I/O to AC 800C or SoftController via a serial I/O bus cable available in three different lengths, see TK210V005, TK210V010 and TK210V025 on page 235. The adapter has a female connector for the cable and a male connector for the serial I/O bus of the attached I/O unit.

The adapter has no indications, and the screw terminals are not used.

Power Supply for the Remote I/O System 200-PS1.3

Power supply 200-PS1.3 supplies the remote I/O system with power.

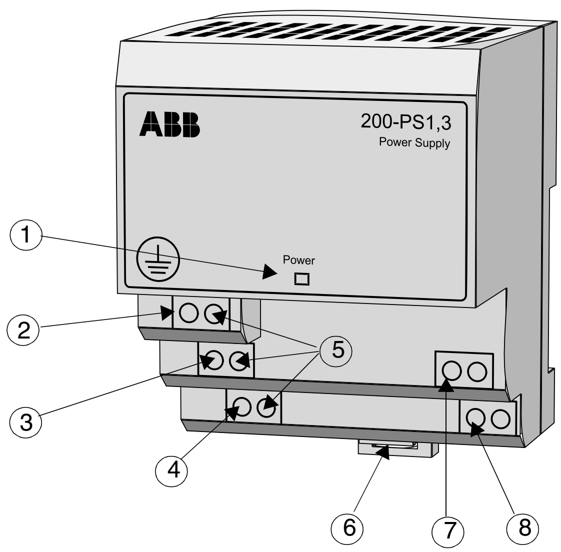


Figure 147. Power supply for the remote I/O system 200-PS1.3.

Front Panel

Indicator and component identification

1	Green LED (Power indicator), lit when internal 24V DC is present.
2	Screw terminal for AC protective earth (GR)
3	Screw terminal for connection to 0 V AC (L2/N)
4	Screw terminal for connection to 120/230 V AC (L1)
5	Screw terminals used to pass 120/230 V AC power to adjacent 200-PS1.3 supplies
6	Locking tab for DIN rail mounting.
7	Screw terminal for connection to 0 V DC (COM)
8	Screw terminal for connection to 24 V DC (24 V)

Functional Description

Power supply 200-PS1.3 supplies the remote I/O system with power.

The power for this unit is taken from a main voltage outlet and the status of the output voltage is indicated on the Power LED on the front panel. This unit provides sufficient 24 V DC power to supply 4 adapter units.

If the output current exceeds 1.5 A, then the power supply will be switched off. The output voltage is restored by removing the overload and then switching off and on the power supply.

LED indication (Power)

The LED is not lit	No power applied to power supply or output voltage exceeds 35 V DC and overvoltage protection has shut the unit down or output current is below 0.1 A or output current is above 1.0 A

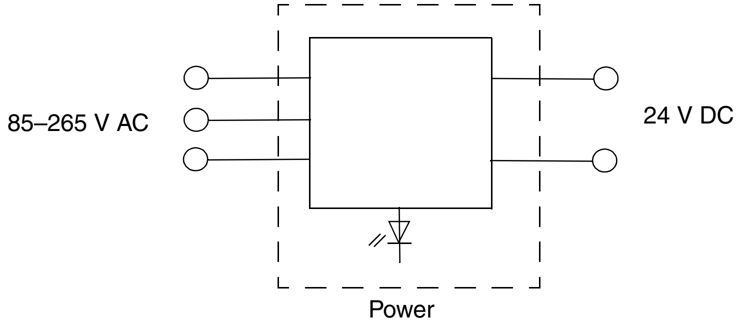


Figure 148. The 200-PS1.3 functional block diagram

The 200-PS1.3 power supply provides sufficient 24 V DC power to operate up to 4 adapter units. Do not attempt to operate an entire I/O system with this power supply.

I/O System Accessories

Cables

200-CE1 and 200-CE3

Extension cables for the I/O system. These cables are used when one I/O system is split into two adjacent I/O rows. 200-CE1 connects two I/O rows. Cable length for 200-CE1 is 300 mm and for 200-CE3 900 mm.

TK210V005, TK210V010 and TK210V025

Serial I/O bus cable for connecting I/O units of type S200 I/O or S200L I/O to AC 800C or SoftController. The bus cable is available in three different lengths. Cable length for TK210V005 is 0.5 m, for TK201V010 is 1 m and for TK210V025 is 2.5 m.

Mounting Profiles

Profile for vertical or horizontal mounting of the I/O system and when using the CE1 cable. A locking plate and a screw are included with the mounting profiles.

MP990

Profile length 990 mm.

MP890

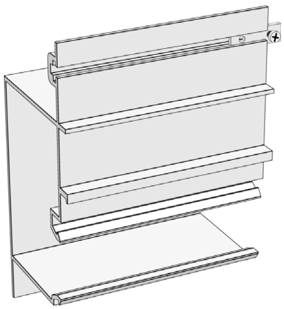
Profile length 890 mm.

MP590

Profile length 590 mm.

Clips

Clips for cables used in mounting profiles.



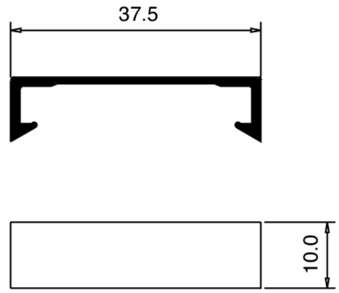


Figure 149. Profile and Clips.

Section 6 Maintenance and Service

This section describes the maintenance required by the I/O system and how to troubleshoot it.

Read the Safety Summary on page 17, before performing operations which may be dangerous to personnel or cause damage to equipment.

Replacing I/O System Units

You can remove and insert I/O system units *except adapters and terminal base units* under system power, however to avoid hazardous conditions we recommend to switch off the process side power before removing or inserting an I/O unit. When you remove or insert a unit under power, you may cause an electric arc. An electric arc is hazardous because it may:

- send an erroneous signal to your process devices causing unintended machine motion.
- cause an explosion of e.g. due to the nature of the surrounding gases.

Repeated electric arcing causes excessive wear to the contacts on both the unit and its mating connector in the terminal base. Worn contacts may create electrical resistance.

Each unit has a mechanical code key which matches a corresponding key on the terminal base unit. This prevents units of different types from being interchanged in such a manner that electrical damage occurs. For information on how to replace units, see Removing a Terminal Base Unit on page 48.

Changing Fuses

When changing fuses, please do not use metal objects inside the units. This could cause damage and electrostatic discharge. We also highly recommend that you wear an ESD bracelet.

Changing fuses in 200-TBNF

There are eight fuses located above the upper row of screw terminals, which protects even numbered inputs 0-14. Press the fuse holder down toward the terminal strip. Remove the faulty fuse from the fuse holder. Replace the fuse holder by rotating the fuse holder back to vertical until it snaps into the locked position.

Before changing fuses, turn process side power off.

The type of fuse is described in Terminal Base Unit 200-TBNF on page 268.

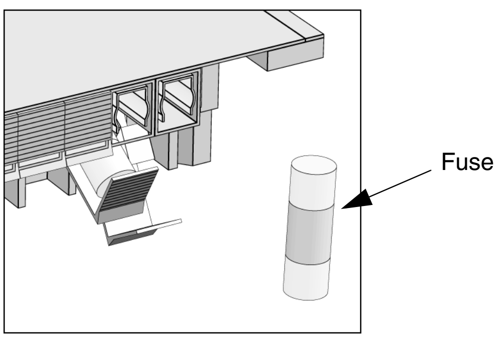


Figure 150. Changing fuses in 200-TBNF.

Troubleshooting the I/O System

General

Input levels are in accordance with to the IEC 1131-2 standard. In the transition region the LED indicators and status read by the system are not defined.

Troubleshooting 200-PS1.3

Symptom	Measure
Power LED is OFF	1. Check input power. 2. Cycle power to the unit. 3. Check for output short-circuit. 4. Replace the unit.

Troubleshooting 200-IB16

System is running and the adapter active.

Symptom	Measure
LED status on an input is ON and the control system is in status OFF or if the LED status on an input is OFF and the control system's status is on	1. Check that the input is not forced. 2. Check that the input voltage is not within the transition region. 3. Replace the unit.
LED OFF despite +24 V DC on the input screw terminal	Replace unit and/or terminal base unit.

Troubleshooting 200-OB16 or 200-OB16P

System is running and the adapter is active. The output is activated.

Symptom	Measure
LED status on the output is ON. No +24 V DC on the output screw terminal	1. Check if the output has been short-circuited to 0 V DC. - No short-circuit/overcurrent: Replace the unit and/or the terminal base unit. OK. - Short-circuit. Go to step 2. 2. Release the cable from the screw terminal and check if the cable is short-circuited to 0 V DC. - Short-circuit: check the cabling. Correct failures. OK. - No short-circuit. Go to step 3. 3. Release the unit and check if the output screw terminal is short-circuited to 0 V DC. - Short-circuit: replace the terminal base unit. - No short-circuit: replace the output unit.
LED status on the output is OFF and +24 V DC on the output screw terminal	Replace the unit.
LED status on the output is OFF and +24 V DC is NOT measured on the output screw terminal	1. Check that the output is not forced to OFF. 2. Check that +24 V DC is fed to the terminal base unit. +24 V DC: replace the unit and/or the terminal base unit. 0 V DC: check the cabling.

System is running and the adapter is active. The output is not activated.

Symptom	Measure
LED status on the output is ON and +24 V DC on the output screw terminal	1. Check that the output is not forced to ON status. 2. Replace the unit.
LED Status on the output is OFF and +24 V DC on the output screw terminal	Loosen the cable attached to the output screw terminal and check the voltage level. +24 V DC: Replace unit and/or the terminal base unit. 0 V DC: Check the cables.

Troubleshooting 200-IB10xOB6

See Troubleshooting 200-IB16 on page 239 for inputs and Troubleshooting 200-OB16 or 200-OB16P on page 240 for outputs.

Troubleshooting 200-IB32

System is running and the adapter active.

Symptom	Measure
LED status on an input is ON and the control system is in status OFF or LED status on an input is OFF and the control system's status is on	1. Check that the input is not forced. 2. Check that the input voltage is not within the transition region. 3. Replace the unit.
LED OFF despite +24 V DC on the input screw terminal	Replace unit and/or terminal base unit.

Troubleshooting 200-OB32P

System is running and the adapter is active. The output is activated.

Symptom	Measure
LED status on the output is ON. No +24 V DC on the output screw terminal	1. Check if the output has been short-circuited to 0 V DC. - No short-circuit/overcurrent: Replace the unit and/or the terminal base unit. OK. - Short-circuit. Go to step 2. 2. Release the cable from the screw terminal and check if the cable is short-circuited to 0 V DC. - Short-circuit: check the cabling. Correct failures. OK. - No short-circuit. Go to step 3. 3. Release the unit and check if the output screw terminal is short-circuited to 0 V DC. - Short-circuit: replace the terminal base unit. - No short-circuit: replace the output unit.
LED status on the output is OFF and +24 V DC on the output screw terminal	Replace the unit.
LED status on the output is OFF and +24 V DC is NOT measured on the output screw terminal	1. Check that the output is not forced to OFF. 2. Check that +24 V DC is fed to the terminal base unit. +24 V DC: replace the unit and/or the terminal base unit. 0 V DC: check the cabling.

System is running and the adapter is active. The output is not activated.

Symptom	Measure
LED status on the output is ON and +24 V DC on the output screw terminal	1. Check that the output is not forced to ON status. 2. Replace the unit.
LED Status on the output is OFF and +24 V DC on the output screw terminal	Loosen the cable attached to the output screw terminal and check the voltage level. +24 V DC: Replace unit and/or the terminal base unit. 0 V DC: Check the cables.

Troubleshooting 200-IB16xOB16P

See Troubleshooting 200-IB32 on page 241 for inputs and Troubleshooting 200-OB32P on page 242 for outputs.

Troubleshooting 200-IP2

The system is in operation.

Symptom	Action
All the LEDs are off	1. Check the power supply (12–24 V DC ±10%) 2. Replace 200-IP2
The red LED remains on longer than 2 seconds	Initialization error, replace 200-IP2
The yellow LED on inputs A, B, Z or G is not lit	1. Check the polarity of the input signal +/- 2. Check the input signal voltage (6–26.4 V DC) 3. Replace 200-IP2

Troubleshooting 200-IP4

The system is in operation.

Symptom	Action
All the LEDs are off	1. Check the power supply (12–24 V DC ±10%) 2. Replace 200-IP4
The red LED remains on longer than 2 seconds	Initialization error, replace 200-IP4
The yellow LED on inputs N or D is not lit	1. Check the polarity of the input signal +/- 2. Check the input signal voltage (6–26.4 V DC) 3. Replace 200-IP4

Troubleshooting 200-IE8

System is running and the adapter active.

Symptom	Measure
PWR LED is not lit	1. Check 24 V DC 2. Check wiring for 24 V DC 3. Replace the unit.
A break in a 4–20 mA loop is detected by the system	1. Check cabling and connections. 2. Check the sensor. 3. Check the value at the terminal base unit.(1) 4. Check that the correct type of input is selected in the hardware configuration editor. 5. Replace the unit.
An erroneous analog value has been detected by the system	1. Check if a power-line filter for the power supply is has been fitted. 2. Check if shielded twisted-pair cables are connected for the I/O signals. 3. Check the value at the terminal base unit with a voltmeter that has ≥ 10 MOhm input resistance(1). 4. Check that the correct type of input is selected in the hardware configuration program. 5. Replace the unit.
There is no signal at the terminal base unit	1. Check cabling and connections. 2. Check that input is within range. 3. Check the sensor. 4. Replace terminal base unit.

(1) Use a voltmeter that has ≥ 10 MΩinput resistance to measure the voltage where you have a known high-precision resistance. The current can be measured in series with the current loop. It is recommended that a Zener diode be placed in series with the loop. Note that the current input for a 200-IE8 has a resistance (which can be considered as a precision resistance) of 238 Ω(I=U/238).

Troubleshooting 200-OE4

The output is activated.

Symptom	Measure
PWR LED is not lit	1. Check +24 V DC. 2. Check the wiring to +24 V DC.
A break in a 4–20 mA loop has been detected by the system	1. Check cabling and connections. 2. Check if a power-line filter for the power supply has been fitted. 3. Check if shielded twisted-pair cables have been connected for the I/O signals. 4. Check the actuator. 5. Check the value at the terminal base unit.(1) 6. Check that the correct type of output is selected in the hardware configuration program. 7. Replace the unit.
An erroneous analog value has occurred at the actuator	1. Check value at the terminal base unit(1). 2. Check that the correct type of output is selected in the hardware configuration program. 3. Replace the unit.
There is no signal at the terminal base unit.	1. Check cabling and connections. 2. Check the actuator. 3. Replace the terminal base unit.

(1) Use a voltmeterwith $\geq$ 10 MΩinput resistance to measure the voltage where you have a known high-precision resistance. The current can be measured in series with the current loop. It is recommended that a Zener diode be placed in series with the loop. Note that the minimum load of the current outputs is 15 Ω

Troubleshooting 200-IE4xOE2

See Troubleshooting 200-IE8 on page 245 for inputs and Troubleshooting 200-OE4 on page 246 for outputs.

Troubleshooting 200-IF4I

System is running and the adapter active.

Symptom	Measure
OK LED is not lit	Replace the unit.
OK LED is solid red	1. Check communication with the system. 2. Replace the unit.
OK LED is flashing green	1. Check the 24 V DC. 2. Check the wiring for 24 V DC. 3. Check that the I/O unit has been configured.
A break in a 4–20 mA loop is detected by the system	1. Check cabling and connections. 2. Check the sensor. 3. Check the value at the terminal base unit.(1) 4. Check that the correct type of input is selected in the hardware configuration editor. 5. Replace the unit.
An erroneous analog value has been detected by the system	1. Check if a power-line filter for the power supply has been fitted. 2. Check if shielded twisted-pair cables have been used for the I/O signals. 3. Check the value at the terminal base unit with a voltmeter with ≥ 10 MOhm input resistance(1). 4. Check that the correct type of input is selected in the hardware configuration program. 5. Replace the unit.
There is no signal at the terminal base unit	1. Check cabling and connections. 2. Check that input is within range. 3. Check the sensor. 4. Replace terminal base unit.

(1) Use a voltmeter with ≥ 10 MΩ input resistance to measure the voltage where you have a known high-precision resistance. The current can be measured in series with the current loop. It is recommended that a Zener diode be placed in series with the loop. The current input for a 200-IF4I has a resistance of approximately 100 Ω (the input resistance will increase to 10 kΩ if the 24 V DC is removed).

Troubleshooting 200-OF4I

The output is activated.

Symptom	Measure
PWR LED is not lit	1. Check +24 V DC. 2. Check the wiring to +24 V DC.
OK LED is not lit	1. Check 24 V DC. 2. Check wiring for 24 V DC. 3. Replace the unit.
OK LED is solid red	1. Indicating a critical failure. 2. No contact with the controller or the controller is not running (watchdog time-out). 3. Replace the unit.
OK LED is flashing green	1. The unit is not configured or a field power fault. 2. Configure the unit or check the field power.
A break in a 4–20 mA loop has been detected by the system	1. Check cabling and connections. 2. Check if a power-line filter for the power supply has been fitted. 3. Check if shielded twisted-pair cables have been connected for the I/O signals. 4. Check the actuator. 5. Check the value at the terminal base unit.(1) 6. Check that the correct type of output is selected in the hardware configuration program. 7. Replace the unit.
An erroneous analog value has occurred at the actuator	1. Check value at the terminal base unit(1). 2. Check that the correct type of output is selected in the hardware configuration program. 3. Replace the unit.

Symptom	Measure
There is no signal at the terminal base unit.	1. Check cabling and connections. 2. Check the actuator. 3. Replace the terminal base unit.

(1) Use a voltmeter that has $\geq$ 10 MΩ input resistance to measure the voltage where you have a known high-precision resistance. The current can be measured in series with the current loop. It is recommended that a Zener diode be placed in series with the loop.

Troubleshooting 200-IR8

System is running and the adapter active.

The LED OK indicates the general status of 200-IR8 and the status in relation to communication with the application in the controller.

Symptom	Measure
Steady red: Indicating a critical fault	Replace the unit.
Flashing red: Indicating a noncritical fault (such as open sensor, input out of range, etc.)	1. Check cabling and connectors. 2. Check that correct type is selected in the hardware configuration. 3. Replace the unit.
Flashing green: Indicating that the unit is functional but not configured	1. Start the program to configure the unit. 2. Check the program. 3. Replace the unit.

Troubleshooting 200-IR8R

System is running and the adapter active.

The LED OK indicates the general status of 200-IR8R and the status in relation to communication with the application in the controller.

Symptom	Measure
OK LED is **flashing green** (indicating a critical failure)	Replace the unit.
OK LED is **steady green** but all input LEDs are not lit (indicating that no input is configured)	1. Check the program. 2. Replace the unit.
An input LED is flashing repeatedly 4 times (indicating an interrupt in the sensor connection)	1. Check cabling and connectors 2. Replace the unit.
An input LED is flashing repeatedly twice (indicating a short-circuit in the sensor connection)	1. Check cabling and connectors 2. Replace the unit.

Troubleshooting 200-IT8

System is running and the adapter active.

The LED OK indicates the general status of 200-IT8 and the status in relation to communication with the application in the controller.

Symptom	Measure
Steady red: Indicating a critical fault	Replace the unit.
Flashing red: Indicating a noncritical fault (such as open sensor, input out of range etc)	1. Check cabling and connectors. 2. Check that correct type is selected in the hardware configuration. 3. Replace the unit.
Flashing green: Indicating that the unit is functional but not configured	1. Start the program to configure the unit. 2. Check the program. 3. Replace the unit.

Troubleshooting 200-IM8

This I/O unit is using a high-voltage supply for the inputs.

System is running and the adapter active.

Symptom	Measure
LED status on an input is ON and the control system is in status OFF or if the LED status on an input is OFF and the control system's status is on.	1. Check that the input is not forced. 2. Check that the input voltage is not within the transition region. 3. Replace the unit.
LED OFF despite 230 V AC on the input screw terminal.	Replace unit and/or terminal base unit.

Troubleshooting 200-OM8

This I/O unit is using a high-voltage supply for the inputs.

System is running and the adapter active. The output is activated.

Symptom	Measure
LED status on the output is ON and there is no 230 V AC on the output screw terminal	1. Check 230 V AC supply: 230 V AC: replace the unit. 0 V AC: check the cables. 2. Replace the unit.
LED status on the output is OFF and there is 230 V AC on the output screw terminal or LED status on an output is OFF and there is no 230 V AC on the output screw terminal	1. Check that the output is not forced to OFF 2. Check 230 V AC supply: 230 V AC: replace the unit. 0 V AC: check the cables.
LED OFF despite 230 V AC on the output screw terminal.	Replace unit and/or terminal base unit.

Troubleshooting 200-IA8

This I/O unit is using a high-voltage supply for the inputs.

System is running and the adapter active.

Symptom	Measure
LED status on an input is ON and the control system is in status OFF or if the LED status on an input is OFF and the control system's status is ON	1. Check that the input is not forced. 2. Check that the input voltage is not within the transition region. 3. Replace the unit.
LED OFF despite 120 V AC on the input screw terminal	Replace unit and/or terminal base unit.

Troubleshooting 200-OA8

This I/O unit is using a high-voltage supply for the inputs.

System is running and the adapter active. The output is activated

Symptom	Measure
LED status on the output is ON and there is no 120 V AC on the output screw terminal	1. If TBNF terminal base is used, then check the fuse (it is recommended to analyse the reason to the blown fuse before it is replaced). The fuse is not a foolproof protection for the I/O unit. It may be necessary to replace the unit. 2. Check 120 V AC supply. If the supply is not OK, analyse the reason. 3. Replace the unit and/or the terminal base unit.
LED status on the output is OFF and there is no 120 V AC on the output screw terminals	1. Check that the output is not forced to OFF. 2. Replace the unit.
LED status on the output is OFF but there is 120 V AC on the output screw terminal	Replace unit and/or terminal base unit.

System is running and the adapter is active. The output is not activated.

Symptom	Measure
LED status on the output is ON and there is 120 V AC on the output screw terminal	1. Check that the output is not forced to ON. 2. Replace the unit.
LED Status on the output is OFF and there is 120 V AC on the output screw terminal.	1. Check for erroneous current path that holds the output to a high potential (120 V AC). 2. Replace the unit and/or the terminal base unit.

Troubleshooting 200-OW8

System is running and the adapter is active. The output is activated.

Symptom	Measure
LED status on the output is ON and the output relay is not active	Check +24 V DC supply to the terminal base unit. +24V DC: Replace the I/O unit and/or the terminal base unit 0 V DC: Check the cables
LED status on the output is OFF and the output relay is not active	1. Check that the output is not forced to OFF 2. Check +24 V DC supply to the terminal base unit +24V DC: replace the I/O unit and/or the terminal base unit 0 V DC: check the cables
LED status on the output is OFF and the output relay is active	Replace the unit.

System is running and the adapter is active. The output is not activated.

Symptom	Measure
LED status on the output is ON and the output relay is active	1. Check that the output is not forced to ON 2. Replace the unit
LED status on the output is OFF and the output relay is active	Replace the unit

Troubleshooting 200-OB8EP

System is running and the adapter is active. The output is activated.

Symptom	Measure
LED status on the output is ON. No +24 V DC on the output screw terminal	Replace the output unit.
LED status on the output is OFF and +24 V DC on the output screw terminal	Replace the unit.
LED status on the output is OFF and no +24 V DC on the output screw terminal	1. Check that the output is not forced to OFF. 2. Check that +24 V DC is fed to the terminal base unit. +24 V DC: replace the unit and/or the terminal base unit. 0 V DC: check the cabling.

System is running and the adapter is active. The output is not activated.

Symptom	Measure
LED status on the output is ON and +24 V DC on the output screw terminal	1. Check that the output is not forced to ON status. 2. Replace the unit.
LED Status on the output is OFF and +24 V DC on the output screw terminal	Loosen the cable attached to the output screw terminal. Check the voltage level on the output screw terminal. +24 VDC: replace unit and/or the terminal base unit. 0 V DC: check the cables.
The fault indicator does not turn off when pressing the manual reset button	Replace the unit.

Troubleshooting 200-ANN

In order to determine if an error is present in the central I/O system, start checking the connected adapter(s), 200-ANN (in table below only called ANN).

1. First check that all connectors are properly inserted. If so, the ANN ”Power” LED is immediately lit at power up.
2. The ANN ”Comm” LED is lit a few seconds after power up (flashing a few times during power up).

If you are going to replace a cable or unit, always switch off the power before replacement.

Symptom	Measure
The ”Power” LEDs of all connected ANNs are not lit but the Controller unit ”Power” LED is lit	1. Check the cable CBA. 2. Replace the ANN no. 0.
The ”Power” LEDs are lit on one or more ANNs closest to the controller and the remaining ANNs ”Power” LEDs are not lit	1. Check the cable CAA leading to the first unit with its ”Power” LED not lit. 2. Replace the first unit with its ”Power” LED not lit. If this action is not successful replace the ANN with the original unit. 3. Replace the last ANN with its ”Power” LED lit.
The ”Power” LED on one ANN is not lit and this ANN is followed by another with its ”Power” LED lit	Replace the unit.
The ”Comm” LEDs of all connected ANNs are not lit and the Controller unit indicates ”STOP”	See “Troubleshooting of the controller”.
The ”Comm” LEDs of all connected ANNs are not lit and the Controller unit does not indicate ”STOP”	1. Check the cable CBA. 2. Replace the ANN no. 0.

Symptom	Measure
The ”Comm” LEDs are lit on one or more ANNs closest to the controller and the remaining ANN ”Comm” LEDs are not lit	1. Check the cable CAA leading to the first adapter with its ”Comm” LED not lit. 2. Replace the first ANN with its ”Comm” LED not lit. If this action is not successful replace ANN with the original unit. 2. Replace the last ANN with its ”Comm” LED lit.
The ”Comm” LED on one ANN is not lit and this adapter is followed by an ANN with its ”Comm” LED lit	Replace the adapter.

Troubleshooting 200-ACN

OK status LED – indicates general ACN and I/O unit status.

Symptom	Measure
Off: No power or ACN in ”reset” state	1. Check 24 V DC power to ACN 2. Replace ACN
Flashing green: ACN is active, but there is no exchange of I/O-data between the controller and the ACN	1. Check controller: Is it switched on? Are there any control program running? Is the CICN unit operating and connected to the cable system? 2. Check ACN node address – set correctly according to the hardware configuration in the control program. 3. Check application program – is the hardware configuration correct (the ACN-address)?
Steady green: The ACN unit is active and communicates with the controller	

Symptom	Measure
Flashing red: Erroneous configuration	1. Check the I/O units–are they installed according to the configuration that was defined in the application program? 2. Check the ACN node address–has it been changed without resetting (power down, power-up) the unit?
Steady red: Unit failure	Replace ACN.

LEDs Comm A and B simultaneously – indicate status related to start-up of the ACN unit, or serious network errors.

Symptom	Measure
Off: No power or ACN in ”reset” state	1. Check 24 V DC power to ACN 2. Replace ACN
Flashing red-green: ACN self test is running	Wait for a couple of seconds until self-test is terminated
Flashing red: There are other node(s) that uses the same node address as this ACN Nodes on the network do not have the same network parameters	Check node address (the node address must be unique on this network). Network parameter error; will be corrected automatically by the CICN node.
Steady red: Unit failure	Replace ACN.

LED Com A (B disabled) – indicates status related to the network

Symptom	Measure
Off: Channel disabled	1. Check 24 V DC power to ACN 2. Replace ACN
Steady green: Channel operates normally	
Flashing green-off: Temporary network error (some messages are lost) The network functions are not configured	1. Check node addresses. Note that there must be a CICN with node address 1[1]. 2. Check the cable system. (trunk cable, taps, terminators, connectors etc.)
Flashing red-off: ACN is lonely node. Possible reasons: - Cable system fault - No other nodes active on the network	1. Check ACN is connected to network. 2. If this ACN is the only node on the network then switch on other nodes. Also make sure that there is a CICN with node address 1 connected. 3. Check that the cable system is OK. Look for broken cable, faulty connectors or taps etc. 4. Replace ACN.
Steady red: Unit failure	Replace ACN.

(1) The CICN configures the network parameters in all nodes on the network.

Troubleshooting 200-APB12

STATUS LED – indicates APB12 and I/O unit status.

Symptom	Measure
Off: No power	1. Check 24 V DC power to APB12. 2. Replace APB12.
Flashing red/off: Recoverable fault. APB12 is active, but there is no exchange of I/O-data between the DP master controller and the APB12	1. Check APB12 node address – has it changed since power-up? 2. Check application program – is the hardware configuration correct (the correct I/O units installed)? 3. Are any of the attached I/O units faulty?

Symptom	Measure
Steady red: Unit failure	Replace APB12.
Steady green: Normal operation	

PROFIBUS LED – indicates communication link status.

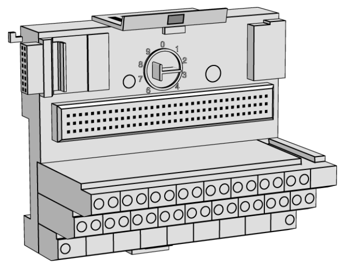
Symptom	Measure
Off: No power or no communication	1. Check 24 V DC power to APB12. 2. Check that APB12 is connected to the network, that there is no broken cable, faulty connectors or taps. 3. Check that there is a DP master controller switched on, connected to the network, and with the control program running. 4. Replace APB12.
Steady green: Data are being transmitted or received	
Flashing red/off: Recoverable fault - Invalid Send parameter message received - Invalid Check configuration message received	1. Check the network for intermittent disturbances. 2. Check node address (the node address must be unique on the network). 3. Check the DP master slave configuration.
Steady red: Unrecoverable fault, unable to communicate	Replace APB12.

Appendix A Technical Specifications

General Specifications

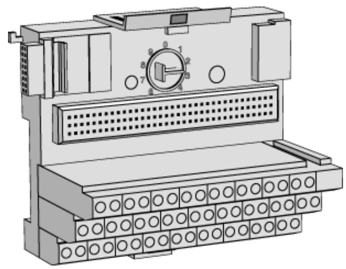
Technical Data	
Power supply	24 V DC (19.2–30 V DC) incl. 5% ripple according to EN 61131-2 standard i.e. +20%, –15% and max 5% ripple
Environmental conditions	Industrial
Protection rating	IP20
Vibration	0.15 mm/2g to 150 Hz, 3*30 min, type test according to IEC 68-2-6
Packaged volume for the I/O system units	1 unit:W 133 x H 133 x D 93 mm (1.65 dm^3) ≤10 units:W 470 x H 278x D 150 mm (19.60 dm^3)
Approvals (when product or packaging is marked)	CE marked and meets EMC directive 89/336/EEC according to EN 50081-2 and EN 50082-2 Low-Voltage Directive 73/23/EEC with supplement 93/68/EEC according to the following standard: EN 61131-2 (only applicable for units connected to 50–1000 V AC and/or 75–1500 V DC) UL listed according to UL 508 as open equipment The technical data for *hazardous locations* is described individually for each unit

Terminal Base Unit 200-TB2



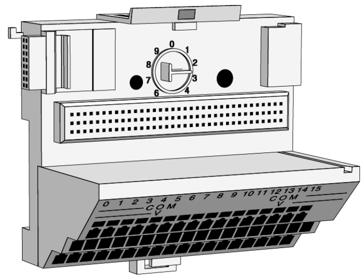
Technical Data	
Number of terminals	1 row of 16 1 row of 18 1 row of 2
Current capacity	10 A max.
Voltage rating	132 V AC max (rms).
Isolation voltage	Channel-to-channel isolation determined by inserted unit
Temperature	Operating: 0 °C to + 55 °C Non-operating: -40 °C to + 85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C
Backplane key code	Determined by inserted unit
Wire size	Solid or stranded copper wire 0.5–2.5 mm^2 or AWG 20–AWG 12
Weight	0.225 kg excl. package 0.320 kg incl. package
Dimensions	W 94 x H 94 x D 58 mm (with an I/O unit inserted: 72 mm)
Order code	200-TB2

Terminal Base Unit 200-TB3



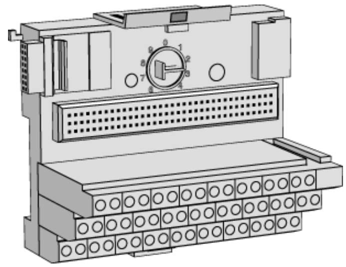
Technical Data	
Number of terminals	1 row of 16 2 rows of 18
Current capacity	10 A max.
Voltage rating	132 V AC max (rms).
Isolation voltage	Channel-to-channel isolation determined by inserted unit
Temperature	Operating: 0 °C to + 55 °C Non-operating: -40 °C to + 85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C
Backplane key code	Determined by inserted unit
Wire size	Solid or stranded copper wire 0.5–2.5 mm^2 or AWG 20–AWG 12
Weight	0.225 kg excl. package 0.320 kg incl. package
Dimensions	W 94 x H 94 x D 58 mm (with an I/O unit inserted: 72 mm)
Order code	200-TB3

Terminal Base Unit 200-TB3S



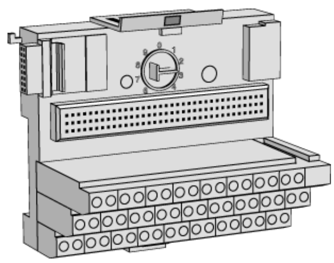
Technical Data	
Number of terminals	1 row of 16 2 rows of 18
Current capacity	10 A max.
Voltage rating	132 V AC max (rms).
Isolation voltage	Channel-to-channel isolation determined by inserted unit
Temperature	Operating: 0 °C to + 55 °C Non-operating: -40 °C to + 85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C
Backplane key code	Determined by inserted unit
Wire size	Solid or stranded copper wire 0.5–2.5 mm^2 or AWG 20–AWG 12
Weight	0.225 kg excl. package 0.320 kg incl. package
Dimensions	W 94 x H 94 x D 58 mm (with an I/O unit inserted: 72 mm)
Order code	200-TB3S

Terminal Base Unit 200-TB32



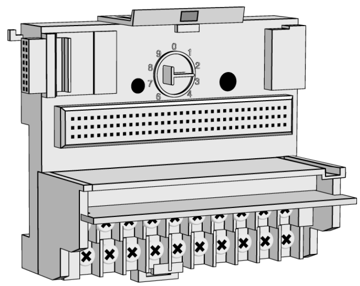
Technical Data	
Number of terminals	1 row of 16 2 rows of 18
Current capacity	10 A max.
Voltage rating	31.2 V DC max.
Isolation voltage	Channel-to-channel isolation determined by inserted unit
Temperature	Operating: 0 °C to + 55 °C Non-operating: -40 °C to + 85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	C-UL Listed UL Class I, Division 2, Groups A, B, C, D certified C-UL Class I, Division 2, Groups A, B, C, D certified
Backplane key code	Determined by inserted unit
Wire size	Solid or stranded copper wire 0.5–2.5 mm^2 or AWG 20–AWG 12
Weight	0.698 kg excl. package 0.793 kg incl. package
Dimensions	W 94 x H 94 x D 69 mm
Order code	200-TB32

Terminal Base Unit 200-TB3T



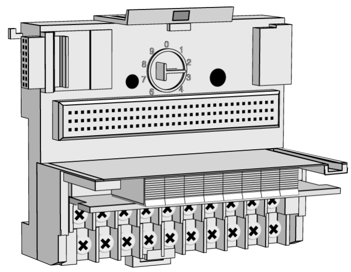
Technical Data	
Number of terminals	1 row of 16 2 rows of 18
Current capacity	10 A max.
Voltage rating	132 V AC max (rms).
Isolation voltage	Channel-to-channel isolation determined by inserted unit
Temperature	Operating: 0 °C to + 55 °C Non-operating: -40 °C to + 85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C
Backplane key code	Determined by inserted unit
Wire size	Solid or stranded copper wire 0.5–2.5 mm^2 or AWG 20–AWG 12
Weight	0.225 kg excl. package 0.320 kg incl. package
Dimensions	W 94 x H 94 x D 58 mm (with an I/O unit inserted: 72 mm)
Order code	200-TB3T

Terminal Base Unit 200-TBN



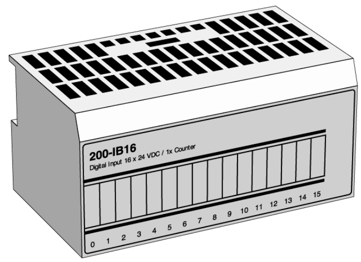
Technical Data	
Number of terminals	2 rows of 10
Current capacity	10 A max.
Voltage rating	264 V AC max. (rms)
Isolation voltage	Channel-to-channel isolation determined by inserted unit
Temperature	Operating: 0 °C to + 55 °C Non-operating: -40 °C to + 85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C
Backplane key code	Determined by inserted unit
Wire size	Solid or stranded copper wire 0.5–2.5 mm^2 or AWG 20–AWG 12
Weight	0.175 kg excl. package 0.270 kg incl. package
Dimensions	W 94 x H 94 x D 48 mm (with an I/O unit inserted: 72 mm)
Order code	200-TBN

Terminal Base Unit 200-TBNF



Technical Data	
Number of terminals	2 rows of 10
Current capacity	10 A max.
Voltage rating	264 V AC max. (rms)
Fuses	8 (5x20 mm)
Isolation voltage	Channel-to-channel isolation determined by inserted unit
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified.
Backplane key code	Determined by inserted unit
Wire size	Solid or stranded copper wire 0.5–2.5 mm^2 or AWG 20–AWG 12
Weight	0.175 kg excl. package 0.270 kg incl. package
Dimensions	W 97 x H 94 x D 48 mm (with an I/O unit inserted: 72 mm)
Order code	200-TBNF

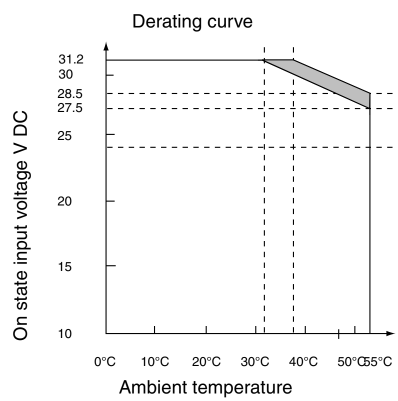
Digital Input Unit 200-IB16



Technical Data	
Number of inputs	16 positive logic
Counter input	16-bit[(1)] on channel 15, 500 Hz max. Min. pulse width 1 ms
Galvanic isolation	Yes (via optocouplers)
Status indicators	16 yellow LEDs for input indications
ON-state input voltage	10.0 V DC min., 24 V DC nominal, 31.2 V DC max.
ON-state input current	2.0 mA min., 8.0 mA nominal at 24V DC, 12.0 mA max.
OFF-state input voltage	5.0 V DC max.
OFF-state input current	Current must be ≤1.5 mA to be defined as being in OFF state.
Filter time	Software programmable
Filter	First order low-pass filter with time constant 5μs
Input impedance	4.6 kOhms max.
Isolation voltage	100% tested at 850 V DC for 1 s between user and system. No isolation between individual channels
Internal current consumption (from the serial bus)	30 mA max.
Power dissipation	6.1 W at 31.2 V DC max.
Temperature (see derating curve below)	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85 °C

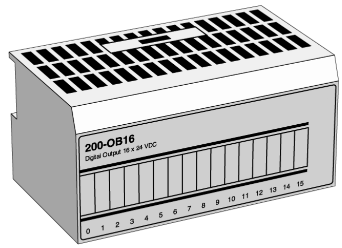
Technical Data	
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T3C European Ex certified, class I, zone 2, group II C
Unit identity	0281 (hex)
Backplane key code	2
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IB16

(1) Only article No. 490-1760-59 or later. Older versions have a 5-bit counter (article No. 490-1760-43) or none (article No. 490-1760-05, -26)



The area within the curve represents the safe operating range for the unit under various conditions of 24 V DC input voltage and ambient temperatures.
The filled part in the upper right corner is included in the safe operating range if normal mounting, but not valid if the units are mounted vertically.

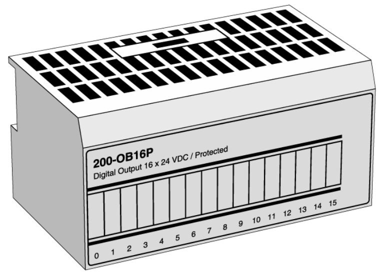
Digital Output Unit 200-OB16



Technical Data	
Number of Outputs	16 positive logic
Galvanic isolation	Yes (via optocouplers)
Status indicators	16 yellow LEDs for output indications
ON-state voltage range	10 V DC min. 24 V DC nominal 31.2 V DC max.
Output current rating	8 A (16 outputs at 0.5 A)
ON-state current	1.0 mA min. per channel 450 mA max. per channel when in parallel 500 mA max. per channel
OFF-state voltage	5 V DC max. (if load resistance max. 10 kΩ) 31.2 V DC max. (if no load connected)
Surge current	2 A for 50 ms, repeatable every 2 seconds
OFF-state leakage current	0.5 mA max.
ON-state voltage drop	0.5 V DC max.
Isolation voltage	100% tested at 850V DC for 1s between plant and system. No isolation between individual channels
Output Signal Delay OFF to ON ON to OFF	 0.5 ms max. 1.0 ms max.

Technical Data	
Internal current consumption (from the serial bus)	80 mA max.
Power dissipation	5.3 W at 31.2 V DC max.
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A European Ex certified, class I, zone 2, group II C
Unit identity	0191 (hex)
Backplane key code	2
External DC power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 49 mA at 24 V DC (38 mA–65 mA)
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Fuse	800 mA (when used in TBNF)
Order code	200-OB16

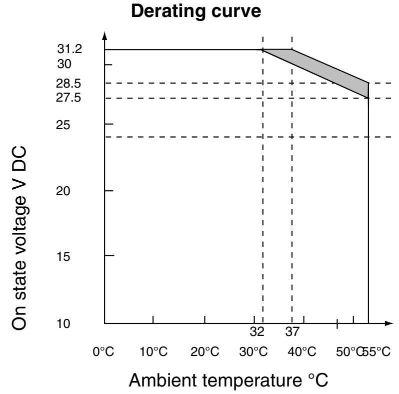
Digital Output Unit 200-OB16P



Technical Data	
Number of Outputs	16 positive logic
Galvanic isolation	Yes (via optocouplers). 1 group of 16
Status indicators	16 yellow LEDs for output indications
ON-state voltage range	10 V DC min., 24 V DC nominal, 31.2 V DC max.
ON-state current	1.0 mA min. per channel 450 mA max. per channel when in parallel 500 mA max. per channel
OFF-state voltage	5 V DC max. (if load resistance max. 10 kΩ) 31.2 V DC max. (if no load connected)
OFF-state leakage current	0.5 mA max.
ON-state voltage drop	0.5 V DC max.
Isolation voltage	100% tested at 2121 V DC for 1s between plant and system. No isolation between individual channels
Output Signal Delay OFF to ON ON to OFF	 0.5 ms max. 1.0 ms max.
Output current rating	8 A (16 outputs at 0.5 A)
Surge current	1.5 A for 50 ms, repeatable every 2 seconds
Power dissipation	5.0 W at 31.2 V DC max.
Internal current consumpt. (from the serial bus)	60 mA max.

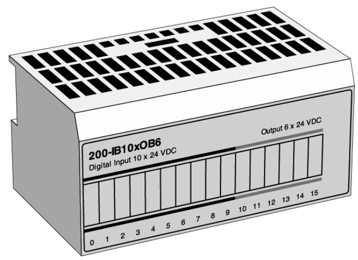
Technical Data	
Temperature (see derating curve on next page)	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A European Ex certified, class I, zone 2, group II C
Unit identity	0108 (hex)
Backplane key code	2
External DC power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 60 mA at 24 V DC (25 mA–75 mA)
Weight	0.085 kg excl. package, 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Fuse	Outputs are electronically protected
Order code	200-OB16P

Derating curve



The area within the curve represents the safe operating range for the unit under various conditions of user suplied 24 V DC supply voltages and ambient temperatures.
The filled part in the upper right corner is included in the safe operating range if normal mounting, but not valid if the units are mounted vertically.

Digital Input/Output Combo Unit 200-IB10xOB6



General specifications

Technical Data	
Galvanic isolation	Yes (via optocouplers)
Status indicators	16 yellow LEDs for input/output indications
Isolation Voltage	100% tested at 2100 V DC for 1 sec between plant and system
Internal current consumpt. (from serial bus)	35 mA max.
Power dissipation	4.0 W at 31.2 V DC max.
Unit identity	0100 (hex)
Backplane key code	2
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 70 mA at 24 V DC (not including outputs)
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T3C. European Ex certified, class I, zone 2, group II C
Weight	0.085 kg excl. package, 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IB10xOB6

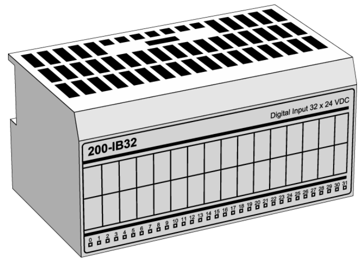
Input specifications

Technical Data	
Number of inputs	10 positive logic
ON-state input voltage	10 V DC min. 24 V DC nominal 31.2 V DC max.
ON-state input current	2.0 mA min. 8.0 mA nominal 11.0 mA max.
OFF-state input voltage	5 V DC max.
OFF-state input current	Current must be ≤1.5 mA to be defined as being in OFF state.
Input impedance	4.8 kΩ max.
Filter time	Software programmable
Filter	First order low-pass filter with time constant 100 μs (i.e. time to 63% of FS)

Output specifications

Technical Data	
Number of outputs	6 positive logic
ON-state voltage range	10 V DC min. 24 V DC nominal 31.2 V DC max.
ON-state current	1.0 mA per output min. 2.0 A per output max. 10 A max per unit
OFF-state voltage	31.2 V DC max.
Output current rating	2 A per output, 10 A per unit
Surge current	4 A for 50 ms each, repeatable every 2 seconds
OFF-stage leakage	0.5 mA max
ON-state voltage drop	1 V DC at 2 A, 0.5 V DC at 1 A

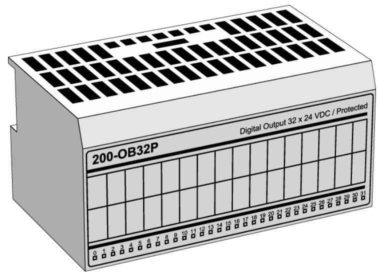
Digital Input Unit 200-IB32



Technical Data	
Number of inputs	32 positive logic
Galvanic isolation	Yes, in two groups via optocouplers
Status indicators	32 yellow LEDs for input indications
ON-state input voltage	19.2 V DC min. 24 V DC nominal 31.2 V DC max.
ON-state input current	2.0 mA min. 4.1 mA nominal at 24V DC 6.0 mA max.
OFF-state input voltage	5.0 V DC max.
OFF-state input current	Current must be ≤1.5 mA to be defined as being in OFF state.
Filter time	0.25 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, software programmable
Input impedance	6.0 kΩ max.
Isolation voltage	1250 V AC for inputs to backplane; 100% tested at 2121V DC for 1 s between user and system, no isolation between individual channels
Internal current consumption (from the serial bus)	35 mA max.
Power dissipation	6.0 W max. at 31.2 V DC

Technical Data	
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	C-UL Listed UL Class I, Division 2, Groups A, B, C, D certified C-UL Class I, Division 2, Groups A, B, C, D certified
Unit identity	0211 (hex)
Backplane key code	2
Weight	0.249 kg excl. package 0.344 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IB32

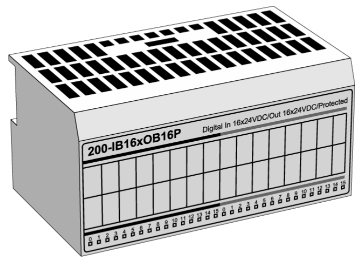
Digital Output Unit 200-OB32P



Technical Data	
Number of Outputs	32 positive logic
Galvanic isolation	Yes, in two groups via optocouplers)
Status indicators	32 yellow LEDs for output indications
ON-state voltage range	10 V DC min. 24 V DC nominal 31.2 V DC max.
ON-state current	1.0 mA min. per channel 500 mA max. per channel 14 A max. per unit (6 A total for channels 0-15; 8 A total for channels 16-31
OFF-state voltage	31.2 V DC max.
OFF-state leakage current	0.5 mA max.
ON-state voltage drop	0.5 V DC max.
Isolation voltage	1250 V AC for outputs to backplane; 100% tested at 2121 V DC for 1 s between user and system, no isolation between individual channels
Output Signal Delay OFF to ON ON to OFF	 0.5 ms max. 1.0 ms max.
Surge current	2 A for 50 ms, repeatable every 2 seconds
Power dissipation	5.3 W max. at 31.2 V DC

Technical Data	
Internal current consumption (from the serial bus)	80 mA max.
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	C-UL Listed UL Class I, Division 2, Groups A, B, C, D certified C-UL Class I, Division 2, Groups A, B, C, D certified
Unit identity	0001 (hex)
Backplane key code	2
External DC power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 49 mA at 24 V DC (38 mA–65 mA)
Weight	0.267 kg excl. package 0.362 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Fuse	Outputs are electronically protected
Order code	200-OB32P

Digital Input/Output Combo Unit 200-IB16xOB16P



General specifications

Technical Data	
Galvanic isolation	Input channels are isolated from output channels.
Status indicators	16 yellow LEDs for input indications, and 16 for output indications
Isolation Voltage	1250 V AC for inputs or outputs to backplane and between input and output channels; 100% tested at 2121 V DC for 1 sec between user and system, no isolation between individual channels
Internal current consumption (from serial bus)	100 mA max.
Power dissipation	7.0 W max. at 31.2 V DC
Unit identity	011C (hex)
Backplane key code	2
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 28 mA at 24 V DC (not including outputs)
Temperature (refer to the derating curve on page 283)	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing

Approvals (when product or packaging is marked)	C-UL Listed UL Class I, Division 2, Groups A, B, C, D certified C-UL Class I, Division 2, Groups A, B, C, D certified
Weight	0.300 kg excl. package, 0.395 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IB16xOB16P

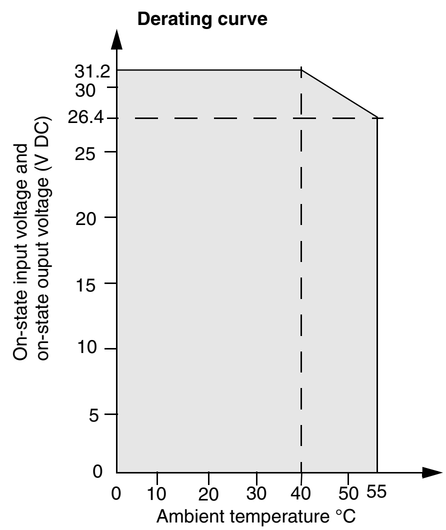
Input specifications

Technical Data	
Number of inputs	16 positive logic, non-isolated
ON-state input voltage (refer to the derating curve on page 283)	10 V DC min. 24 V DC nominal 31.2 V DC max.
ON-state input current	2.0 mA min. 8.8 mA nominal 12.1 mA max.
OFF-state input voltage	5 V DC max.
OFF-state input current	Current must be ≤1.5 mA to be defined as being in OFF state.
Input impedance	2.5 kΩ max.
Filter time	0.25 ms, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, software programmable

Output specifications

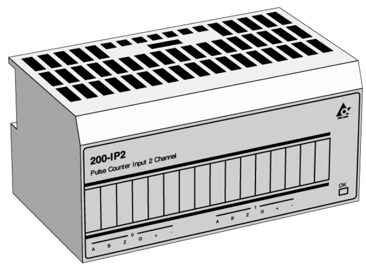
Technical Data	
Number of outputs	16 positive logic, non-isolated
ON-state voltage range (refer to the derating curve on page 283)	10 V DC min. 24 V DC nominal 31.2 V DC max.

ON-state current	1.0 mA min. and 0.5 A max. per output 8 A max. per unit
OFF-state voltage	31.2 V DC max.
Output current rating	0.5 A per output, 8 A per unit
Surge current	1.5 A for 50 ms, repeatable every 2 seconds
OFF-stage leakage	0.5 mA max.
ON-state voltage drop	Max. 0.5 V DC at 1 A
Output signal delay	OFF to ON max. 0.5 ms ON to OFF max. 1.0 ms



The area within the curve represents the safe operating range for the unit in all mounting positions, under various conditions of user supplied DC voltages and ambient temperatures.

Pulse Counter Unit 200-IP2

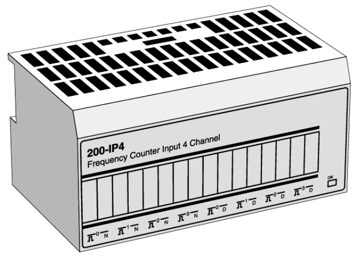


Technical data	
Number of inputs	2 pulse counter interfaces, each with 4 inputs
Counting frequency	Max. 100 kHz. Each signal condition must be stable for at least 2 µs to be recognized by the counter logic.
Galvanic isolation	Yes (via optocouplers)
Status indicators	2x6 yellow LEDs for I/O status indications and 1 red/green LED for OK status indication
Input range (2x4 input signals) Terminal ”+” and ”-” for each input	
Input ON (active)	Max. +26.4 V DC (24 V DC +10%) Min. +6 V DC
Input OFF (inactive)	Max. +3.0 V DC Min. –26.4 V DC
Input current	Typically 3 mA at 6 V DC Typically 8 mA at 12 V DC Typically 15 mA at 24 V DC
Voltage range – external power supply	12–24 V DC ±10%
Current consumption - external power supply	150 mA at 12 V DC 75 mA at 24 V DC
Isolation voltage	Type test voltage 500 V AC (corresponding to 700 V DC) for 1 minute, according to UL508

Technical data	
Internal current consumption (from the serial bus)	5 mA
Power dissipation	Max. 5 W (at 24 V input voltage at all inputs)
Temperature	Operating: +5°C to +55 °C(1) Non-operating: –25°C to +70°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	UL listed class I div. 2 hazardous locations, according to UL 1604, group A, B, C, D, temperature code T4.
Unit identity	1800 (hex)
Backplane key code	1
Weight	0.12 kg excl. package 0.20 kgincl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IP2

(1) See Temperature Precautions on page 130.

Frequency Counter Unit 200-IP4

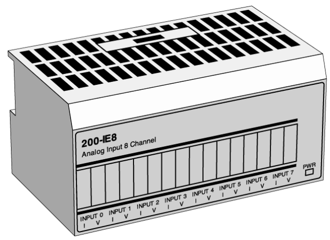


Technical data	
Number of inputs	4 frequency counter interfaces, each with 2 inputs
Counting frequency	Max. 100 kHz. Each signal condition must be stable for at least 2 µs to be recognized by the counter logic. Min. 15.3 Hz for a 16-bit time period measurement and internal clock = 1 MHz. Only one period can be measured. For lower frequencies, refer to Time period measurement on page 138. Min. 153 Hz for internal clock = 10 MHz
Galvanic isolation	Yes (via optocouplers)
Status indicators	4x2 yellow LEDs for I/O status indication, 4x2 yellow LEDs for selected measurement function indication and 1 red/green LED for OK status indication
Input range (4x2 input signals) Terminal ”+” and ”–” for each input	
Input ON (active)	Max. +26.4 V DC (24 V DC +10%) Min. +6 V DC
Input OFF (inactive)	Max. +3.0 V DC Min. –26.4 V DC
Input current	Typically 3 mA at 6 V DC Typically 8 mA at 12 V DC Typically 15 mA at 24 V DC

Technical data	
Voltage range – external power supply	12–24 V DC ±10%
Current consumption - external power supply	150 mA at 12 V DC 75 mA at 24 V DC
Isolation voltage	Type test voltage 500 V AC (corresponding to 700 V DC) for 1 minute, according to UL508
Internal current consumption (from the serial bus)	5 mA
Power dissipation	Max. 5 W (at 24 V input voltage at all inputs)
Temperature	Operating: +5°C to +55 °C(1) Non-operating: –25°C to +70°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	UL listed class I div. 2 hazardous locations, according to UL 1604, group A, B, C, D, temperature code T4.
Unit identity	1A00 (hex)
Backplane key code	1
Weight	0.12 kg excl. package 0.20 kgincl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IP4

(1) See Temperature Precautions on page 144.

Analog Input Unit 200-IE8

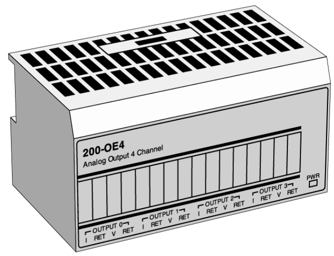


Technical Data	
Number of inputs	8 single-ended
Galvanic isolation	Yes (via optocouplers)
Status indicators	One green LED for PWR
Resolution	12-bit
Input current range	4–20 mA 0–20 mA
Input voltage range	2-10 V DC ±10 V DC 0-10 V DC
Input resistance Voltage Current	 200 kOhm 238 Ohm
Filter	First order low-pass filter with time constant 100 ms (i.e. time to 63% of FS)
Non-linearity Current Voltage	 0.10% max. 0.05% max.
Accuracy Voltage terminal Current terminal	 ± 0.2% FS at 25°C ± 0.2% FS at 25°C

Technical Data	
Accuracy drift with temperature Voltage terminal Current terminal	 ± 0.0043% FS/°C ± 0.0041% FS/°C
Repeatability	± 0.05% of FS
Overload[1]Voltage Current	30 V DC continuously 32 mA continuously, one channel at a time max.
Isolation Voltage	Type test voltage: 850 V DC for 1 s between plant and system. No isolation between individual channels.
Internal current consumption (from serial bus)	20 mA max.
Power dissipation	3 W at 31.2V DC max.
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	Operating: 5–95%, non-condensing Non-operating:5–80%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C
Unit identity	1924 (hex)
Backplane key code	3
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 60 mA at 24 V DC (typ.)
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IE8

(1) Without damage.

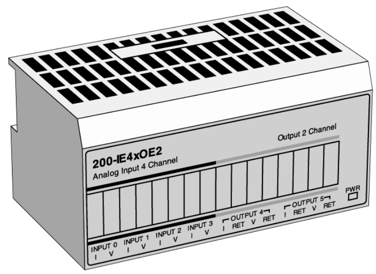
Analog Output Unit 200-OE4



Technical Data	
Number of outputs	4
Galvanic isolation	Yes (via optocouplers)
Status indicators	One green LED for PWR
Resolution	12-bit plus sign
Output current range	4–20 mA 0–20 mA
Output voltage range	2–10 V DC, ±10 V DC, 0–10 V DC
Filter	First order low-pass filter with time constant 24 ms (i.e. time to 63% of FS)
Current load on voltage output	3 mA max.
Resistive load on mA output	15–750 Ohms
Non-linearity Current Voltage	 0.1% 0.1%
Accuracy Voltage terminal Current terminal	 ± 0.13% FS at 25°C ± 0.43% FS at 25°C

Technical Data	
Accuracy drift with temperature Voltage terminal Current terminal	 ± 0.005% FS/°C ± 0.007% FS/°C
Isolation Voltage	Type test voltage: 850 V DC for 1 s between plant and system. No isolation between individual channels.
Internal current consumption (from serial bus)	20 mA max.
Power dissipation	4.5 W at 31.2 V DC max.
Unit identity	1125 (hex)
Backplane key code	4
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 70 mA at 24V DC (not including outputs)
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	Operating: 5–95%, non-condensing Non-operating:5–80%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-OE4

Input/Output Analog Combo Unit 200-IE4xOE2

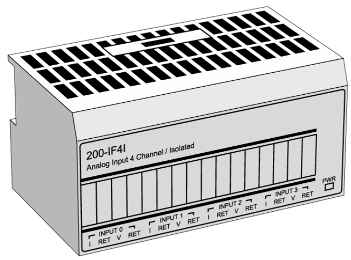


Technical Data	
Number of inputs	4 single-ended
Numberr of outputs	2 single-ended
Galvanic isolation	Yes (via optocouplers)
Status indicators	One green LED for PWR
Resolution	12-bit
Isolation Voltage	Type test voltage: 850 V DC for 1 s between plant and system. No isolation between individual channels.
Internal current consumption (from serial bus)	20 mA max.
Power dissipation	4.0 W at 31.2 V DC max.
Unit identity	1526 (hex)
Backplane key code	5
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2 to 31.2 V DC) 70 mA at 24V DC (not including outputs)
Temperature	Operating: +0°C to +55 °C Non-operating: –40°C to +85°C
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C

Humidity	Operating: 5–95%, non-condensing Non-operating:5–80%, non-condensing
Weight	0.085 kg excl. package, 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IE4xOE2

For input specifications see 200-IE8 and for output specifications see 200-OE4.

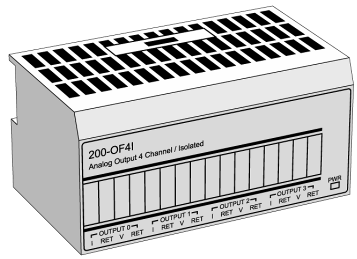
Analog Input Unit 200-IF4I



Technical Data	
Number of inputs	4 isolated
Status indicators	One bi-polar (green/red) LED for OK
Resolution	16-bit unipolar, 15 bits plus sign bipolar
Input current range	4–20 mA 0–20 mA
Input voltage range	± 5 V DC, 0–5 V DC ± 10 V DC, 0–10 V DC
Input resistance Voltage Current	 > 10 Mohm < 100 ohm
Filter	First order low-pass filter with time constant 100 ms, 500 ms or 1000 ms (i.e. time to 63% of FS), or no low-pass
Accuracy Voltage terminal Current terminal	 ± 0.1% FS at 25°C. ± 0.1% FS at 25°C Both include offset, gain, non-linearity and repeatability errors
Accuracy drift with temperature Voltage terminal Current terminal	 ± 0.0028% FS/°C ± 0.0038% FS/°C

Technical Data	
Overload (without damage) Voltage Current	 30 V DC continuously 32 mA continuously, one channel at a time max.
Isolation Voltage	Factory test voltage: 2550 V DC for 1 s between channel to channel, channel to user power, channel to system or user power to system
Internal current consumption (from serial bus)	50 mA max.
Power dissipation	2 W at 31.2V DC max.
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	Operating: 5–95%, non-condensing Non-operating:5–80%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A European Ex certified, class I, zone 2, group II C
Unit identity	1720 (hex)
Backplane key code	3
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 80 mA at 24 V DC (typ.)
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IF4I

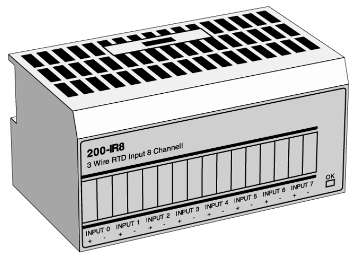
Analog Output Unit 200-OF4I



Technical Data	
Number of outputs	4 isolated
Status indicators	One bi-polar (green/red) LED for OK
Resolution	15-bit plus sign
Output current range	4–20 mA 0–20 mA
Output voltage range	± 5 V DC, ± 10 V DC 0–5 V DC, 0–10 V DC
Filter	Step response to 63% of FS < 25µs
Current load on voltage output	3 mA max.
Resistive load on mA output	0–750 Ohms
Accuracy Voltage terminal Current terminal	 ± 0.1 % FS at 25°C ± 0.1 % FS at 25°C Both include offset, gain, non-linearity and repeatability errors
Accuracy drift with temperature Voltage terminal Current terminal	 ± 0.0012% FS/°C ± 0.0025% FS/°C

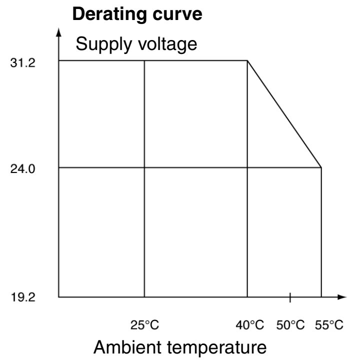
Technical Data	
Isolation Voltage	Factory test voltage: 2550 V DC for 1 s between channel to channel, channel to user power, channel to system or user power to system
Internal current consumption (from serial bus)	50 mA max.
Power dissipation	4.7 W at 31.2 V DC max.
Unit identity	1621 (hex)
Backplane key code	4
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2 to 31.2 V DC) 210 mA at 24V DC
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	Operating: 5–95%, non-condensing Non-operating:5–80%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A European Ex certified, class I, zone 2, group II C
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-OF4I

RTD Input Unit 200-IR8



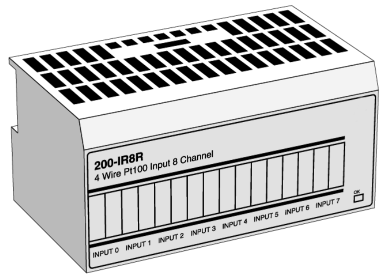
Technical Data	
Number of inputs	8
Galvanic isolation	Yes
Status indicators	Bi-colour (green/red) LED for OK
Resolution	16-bit
Input range	1–433 Ω
Overvoltage capability	±35 V DC, 25 V AC continuous at 25 °C, 250 V peak transient
Accuracy without calibration and at low humidity levels	0.05% of FSR max. in normal mode (0.01% of FSR typ. in enhanced mode) at 25 °C
Internal current consumption (from serial bus)	20 mA max.
Filter	Programmable
Normal mode noise rejection	60 dB at 60 Hz for A/D filter cut-off at 15 Hz
Calibration	Programmable
Common mode rejection	120 dB at 60 Hz; 100 dB at 50 Hz for A/D filter cut-off at 10 Hz
System throughput	Normal mode, programmable 28 ms–325 ms/channel Enhanced mode, programmable 56 ms–650 ms/channel
Open-wire detection	Out of range reading (upscale)

Technical Data	
Open-wire detection time	1 s typ.
RTD exitation current	718 µA
Input offset drift with temp.	1.5 mΩ/°C max.
Gain drift with temperature Normal mode Enhanced mode	 20 ppm/°C 10 ppm/°C
Temperature (see derating curve on next page)	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	Operating: 5–95%, non-condensing Non-operating: 5–80%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T5 European Ex certified, class I, zone 2, group II C
Supported sensors (resistance)	1–433 Ω 500 Ω Pt Euro -200 to +630 °C (α=0.00385) 200 Ω Pt Euro -200 to +630 °C(α=0.00385) 100 Ω Pt Euro -200 to +870 °C (α=0.00385) 100 Ω Pt U.S. -200 to +630 °C (α=0.00392) 500 Ω Ni -60 to +250 °C (α=0.00618) 200 Ω Ni -60 to +250 °C (α=0.00618) 120 Ω Ni -60 to +250 °C (α=0.00672) 100 Ω Ni -60 to +250 °C (α=0.00618) 10 Ω Cu -200 to +260 °C (α=0.00427)
Unit identity	1B01 (hex)
Backplane key code	3
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 60 mA at 24V DC
Power dissipation	3 W at 31.2 V DC max.
Weight	0.085 kg excl. package, 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IR8



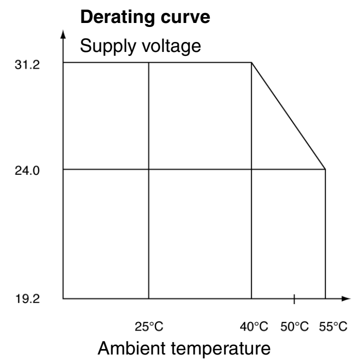
The area within the curve represents the safe operating range for the unit under various conditions of 24 V DC input voltage and ambient temperatures.

RTD Input Unit 200-IR8R



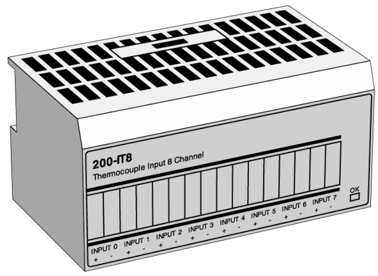
Technical Data	
Number of inputs	8
Galvanic isolation	Yes
Status indicators	8 yellow LEDs for I/O status indication and 1 green LED for OK status indication
Resolution	16-bit
Input range	-60 °C to +160 °C
Overvoltage capability	±35 V DC, 25 V AC continuous at 25 °C, 250 V peak transient
Accuracy	±0.1°C in the range –5 to +100 °C
Long term stability	1 year: ±0.006 °C 3 years: ±0.013 °C
Internal current consumption (from serial bus)	20 mA max.
Filter	Programmable
Normal mode noise rejection	60 dB at 50 Hz for A/D filter cut-off at 10 Hz
Calibration	Factory calibrated
Common mode rejection	120 dB at 60 Hz; 100 dB at 50 Hz for A/D filter cut-off at 10 Hz
System throughput	150 ms/channel at 50 Hz
Open or short-circuit RTD detection	Out of range reading and individual fault indication

Technical Data	
Open-wire detection or short-circuit detection time	< 1 s
RTD excitation current	≈ 1.8 mA, alternating direction
RTD algorithm	ITS 90
Temperature (see derating curve on next page	Operating: +5 °C to +55 °C Non-operating: –25 °C to +70°C
Humidity	Operating: 5–95%, non-condensing Non-operating:5–80%, non-condensing
Approvals (when product or packaging is marked)	UL listed class I div. 2 hazardous locations, according to UL 1604, group A, B, C, D, temperature code T4. European Ex certified, class I, zone 2, group II C
Supported sensors (resistance)	100 Ω Pt Euro -60 to +160°C (α=0.00385) IEC 751
Unit identity	1900 (hex)
Backplane key code	3
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2–30.0 V DC) 100 mA at 24V DC
Power dissipation	3 W at 30.0 V DC max.
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IR8R



The area within the curve curve represents the safe operation range for the unit under various conditions of 24 V DC supply voltage and ambient temperatures.

Thermocouple Input Unit 200-IT8

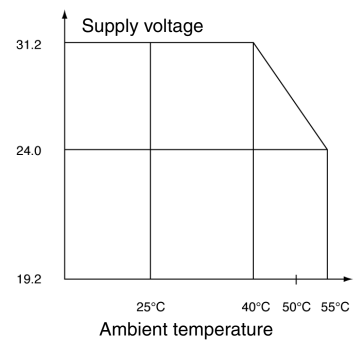


Technical Data	
Number of inputs	8
Galvanic isolation	Yes
Status indicators	Bi-colour (green/red) LED for OK
Resolution	16-bit
Input voltage range	± 76.5 mV DC
Overvoltage capability	35 V DC, 25 V AC continuous at 25 °C, 250 V peak transient
Accuracy with filter	0.025% of FSR ± 0.5 °C max.
Accuracy without filter	0.05% of FSR ± 0.5 °C max.
Internal current consumption (from serial bus)	20 mA max.
Filter	Programmable
Normal mode noise rejection	-60 dB at 60 Hz
Common mode rejection	-115 dB at 60 Hz; -100 dB at 50 Hz
System throughput	Programmable 28–325 ms for 1 channel; 2.6 s for 8 channels
Open thermocouple detection	Out of range reading (upscale)

Technical Data	
Open thermocouple detection time	1 s typ.
Input offset drift with temperature	±6 μV/°C max.
Gain drift with temperature	10 ppm/°C
Overall drift with temperature	50 ppm 1°C of span max.
Temperature (see derating curve on next page	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	Operating: 5–95%, non-condensing Non-operating:5–80%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T5 European Ex certified, class I, zone 2, group II C
Supported thermocouple types	millivolt ± 76.5 mV Type B: 300–1800 °C C: 0–2315 °C E: -270–1000 °C J: -210–1200 °C K:-270–1372 °C N:-270–1300 °C R:-50–1768 °C S:-50–1768 °C T:-270–400 °C
Unit identity	1B00 (hex)
Backplane key code	3
External DC Power Supply voltage Supply current	 24 V DC nominal (19.2–31.2 V DC) 60 mA at 24V DC
Power dissipation	3 W at 31.2 V DC max.

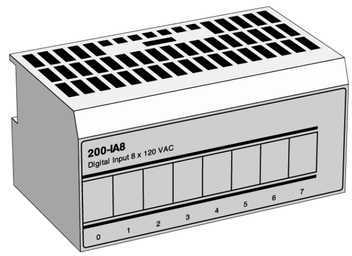
Technical Data	
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IT8

Derating curve



The area within the curve represents the safe operating range for the unit under various conditions of 24 V DC input voltage and ambient temperatures.

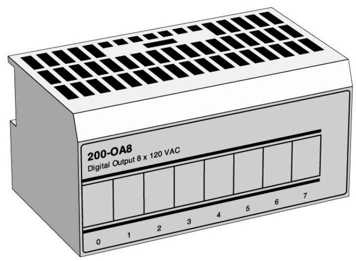
AC Input Unit 200-IA8



Technical Data	
Number of inputs	8 (1 group of 8)
Galvanic isolation	Yes (via optocouplers)
Status indicators	8 yellow (field side indication)
ON-state voltage	65 V AC min.
OFF-state voltage	43 V AC max.
ON-state current	7.1 mA min.
OFF-state current	2.9 mA max.
Filter time	Software programmable
Filter	First order low-pass filter with time constant 8 ms
Isolation voltage	100% tested at 2150 V AC for 1 s between user and system. No isolation between individual channels
Input impedance	10.6 kΩ nominal
Internal current consumption (from serial bus)	30 mA max.
Power dissipation	4.5 W at 132 V AC max.
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing

Technical Data	
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A. European Ex certified, class I, zone 2, group II C
Unit identity	0285 (hex)
Backplane key code	8
External AC Power Supply voltage Input frequency Voltage range	 120 V AC nominal 47–63 Hz 85–132 V AC
Weight	0.085 kg excl. package, 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IA8

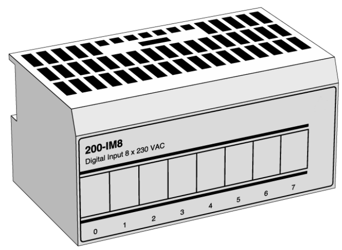
AC Output Unit 200-OA8



Technical Data	
Number of outputs	8 (1 group of 8)
Galvanic isolation	Yes (via optocouplers)
Status indicators	8 yellow LEDs
Output voltage range	85–132 V AC , 47–63 Hz
Output current range	4.0 A (8 outputs at 500 mA)
ON-state voltage drop	1.0 V AC at 0.5 A min.
Inrush current	7 A for 45 ms, repetable every 8 seconds
OFF-state leakage	2.25 mA max.
Isolation voltage	100% tested at 1250 V AC for 1 s between user and system. No isolation between individual channels
Output signal delay OFF to ON ON to OFF	 1/2 cycle max. 1/2 cycle max.
Internal current consumption (from serial bus)	80 mA max.
Power dissipation	5.2 W at 132 V AC.
Unit identity	0195 (hex)
Backplane key code	8

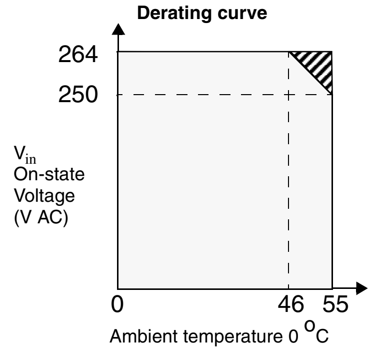
Technical Data	
External AC Power	
Supply voltage	120 V AC nominal
Input frequency	47–63 Hz
Voltage range	85–132 V AC
Supply current	150 mA min.
Surge current capability	50 A for 1/2 cycle at power-up max.
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A European Ex certified, class I, zone 2, group II C
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Fuse	1.6 A, slow (when used in TBNF)
Order code	200-OA8

AC Input Unit 200-IM8



Technical Data	
Number of inputs	8 (1 group of 8)
Unit location	On terminal base 200-TBN
Unit mounting	See derating curve below
Galvanic isolation	Yes (via optocouplers)
Status indicators	8 yellow (field side indication)
ON-state voltage	159 V AC min.
OFF-state voltage	40 V AC max.
ON-state current	11 mA min. at 230 V AC
OFF-state current	2.6 mA max.
Input delay time	Software programmable
Input delay time (max.) **OFF to ON** (time from valid input signal to recognition by the logic).	 7.5 ms, 8 ms, 9 ms, 10 ms, 12 ms, 16 ms, 24.5 ms, 42 ms (default: 7.5 ms)
ON to OFF (time from input dropping below valid level to recognition by the logic)	26.5 ms, 27 ms, 28 ms, 29 ms, 31 ms, 35 ms, 44 ms, 60.5 ms (default: 26.5 ms)

Technical Data	
Isolation voltage	100% tested at 2600 V DC for 1 s between user and system. No isolation between individual channels and no isolation between customer power to input channels.
Input impedance	22.3 kΩ nominal
Internal current consumption (from serial bus)	30 mA max. at 5 V DC
Power dissipation	4.7 W at 264 V AC max.
Temperature (see derating curve on next page	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85 °C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4 European Ex certified, class I, zone 2, group II C
Unit identity	0205 (hex)
Backplane key code	8
External AC Power Supply voltage Input frequency Voltage range	 230 V AC nominal 47–63 Hz 159–264 V AC
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-IM8

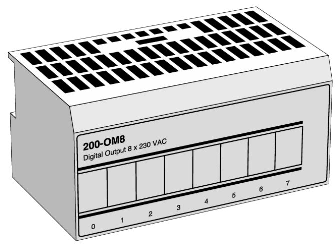


The area within the curve represents the safe operating range for the unit under various conditions of 230 V DC input voltage and ambient temperatures.

+ = Normal mounting safe operating range.

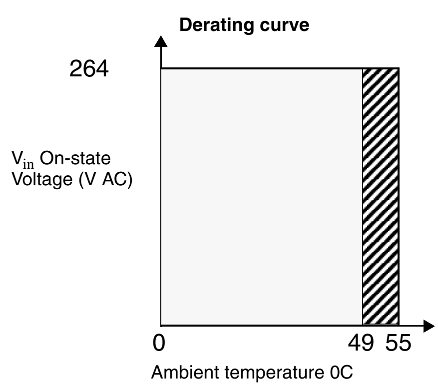
= Other mounting positions (including inverted horizontal, vertical) safe operating range.

AC Output Unit 200-OM8



Technical Data	
Number of outputs	8 (1 group of 8), non-isolated
Unit location	On terminal base 200-TBN or 200-TBNF
Unit mounting	See derating curve below
Galvanic isolation	Yes (via optocouplers)
Status indicators	8 yellow LEDs
Output voltage range	159–264 V AC , 47–63 Hz
ON-state voltage drop	1.5 V AC at 0.5 A
ON-state current	50 mA per output minimum 500 mA per output maximum at +55 ^{o}C
Inrush current	7 A for 40 ms, repetable every 8 seconds
OFF-state leakage	2.5 mA
Isolation voltage	100% tested at 2600 V AC for 1 s between user and system. No isolation between individual channels, and no isolation between user power and output channels
Output signal delay OFF to ON ON to OFF	 1/2 cycle max. 1/2 cycle max.
Internal current consump-tion (from serial bus)	60 mA max.
Power dissipation	5 W at 0.5 A
Unit identity	0105 (hex)

Technical Data	
Backplane key code	8
External AC Power Supply voltage Input frequency Voltage range	 230 V AC nominal 47–63 Hz 159–264 V AC
Temperature (see derating curve below)	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A European Ex certified, class I, zone 2, group II C
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Fuse	0.8 A (when used in 200-TBNF)
Order code	200-OM8

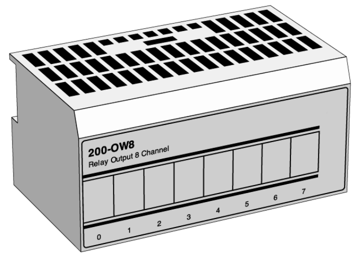


The area within the curve represents the safe operating range for the unit under various conditions of 230 V DC input voltage and ambient temperatures.

+ = Normal mounting safe operating range.

= Other mounting positions (including inverted horizontal, vertical) safe operating range.

Relay Output Unit 200-OW8

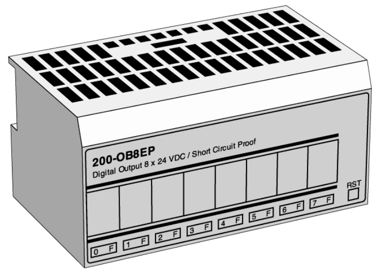


Technical Data	
Number of outputs	8 (1 group of 8), normally open electromechanical relays
Galvanic isolation	Yes (via optocouplers and relays)
Status indicators	8 yellow LEDs
Output voltage range (load dependent)	5–30 V DC at 2.0 A resistive 48 V DC at 0.5 A resistive 125 V AC at 2.0 A resistive 125 V DC at 0.25 A resistive 240 V AC at 2.0 A resistive
Output current rating (at rated power)	
Resistive	2 A at 5–30 V DC 0.5 A at 48 V DC 0.25 A at 125 V DC 2 A at 125 V AC 2 A at 240 V AC
Inductive	2.0 A steady state at 5-30 V DC, L/R=7 ms 0.5 A steady state at 48 V DC, L/R=7 ms 0.25 A steady state at 125 V DC, L/R=7 ms 2.0 A steady state, 15 A make at 125 V AC, cos φ = 0.4 2.0 A steady state, 15 A make at 240 V AC, cos φ = 0.4

Technical Data	
Power rating (steady state)	
Resistive	480 W max. for 240 V AC 250 W max. for 125 V AC 60 W max. for 30 V DC 24 W max. for 48 V DC 31 W max. for 125 V DC
Inductive	480 VA max. for 240 V AC 250 VA max. for 125 V AC 60 VA max. for 30 V DC 24 VA max. for 48 V DC 31 VA max. for 125 V DC
Initial contact resistance	30 mΩ
Switching frequency	1 operation/3s (0.3 Hz at rated load) max.
Operate/Release time	10 ms max.
Bounce time	1.2 ms mean
Contact load	100 µA at 100 mV DC min.
Expected life of electrical contacts	100,000 operations min. at rated loads
OFF-state leakage current	1 mA max. at 240 V AC thru snubber circuit
Isolation voltage between any 2 sets of contacts	2550 V DC for 1 s
customer load to logic	2550 V DC for 1 s
customer load to 24 V DC supply	2550 V DC for 1 s
customer 24 V DC supply to logic	850 V DC for 1 s

Technical Data	
Output signal delay OFF to ON	8 ms max. (time from a valid output on signal to relay energization by the module)
ON to OFF	26 ms max.(time from a valid output on signal to relay deenergization by the module)
Internal current consumption (from serial bus)	69 mA max.
Power dissipation	5.5 W max.
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85 °C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	Meets URLR150 and C300; Meets IEC 1131 AC-15 Utilization Category CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T5 European Ex certified, class I, zone 2, group II C
Unit identity	0199 (hex)
Backplane key code	9
External AC Power Supply voltage	24 V DC
Voltage range	19.2–31.2 V DC (includes 5% ripple)
Supply current	125 mA max.
Fuse	Max 3 A (when used in TBNF)
Weight	0.085 kg excl. package, 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-OW8

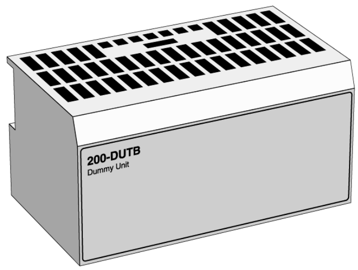
Short-Circuit-Proof Output Unit 200-OB8EP



Technical Data	
Number of outputs	8 (1 group of 8)
Galvanic isolation	Yes (via optocouplers)
Status indicators	8 yellow LEDs for status indication and 8 red LEDs for diagnostic fault indication
Output current rating	10 A (e.g. 8 outputs at 1.25 A, 5 outputs at 2.0 A or similar output/ampere combinations totaling 10 A or less). Max. 2.0 A per output.
ON-state voltage range	19.2 V DC min 24 V DC nomina 31.2 V DC max.
ON-state voltage drop	0.2 V DC max.
Surge current	4 A for 10 ms, repeatable every 3 seconds
OFF-state voltage	31.2 V DC max.
OFF-state leakage	0.5 mA max.
ON-state current	1.0 A min. per channel 2.0 A max. per channel
Isolation voltage	100% tested at 850 V AC for 1 s between user and system. No isolation between individual channels
Output signal delay	
OFF to ON ON to OFF	0.4 ms max. 0.2 ms max.

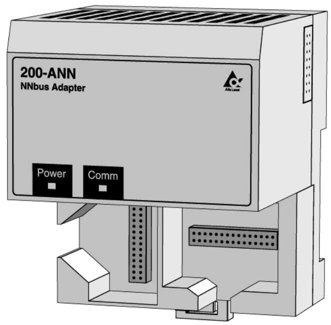
Technical Data	
Internal current consumption (from serial bus)	73 mA max.
Power dissipation	5.5 W at 31.2 V DC max.
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85 °C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A European Ex certified, class I, zone 2, group II C
Unit identity	019D (hex)
Backplane key code	2
External DC power	
Supply voltage: Voltage Range: Supply current:	24 V DC 19.2–31.2 V DC 80 mA at 24 V DC
Weight	0.085 kg excl. package 0.180 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-OB8EP

Dummy Unit 200-DUTB



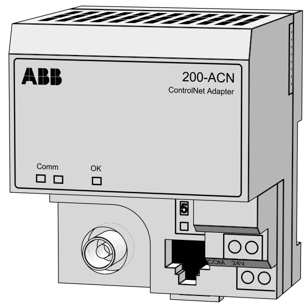
Technical Data	
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85 °C
Humidity	Operating: 5–95%, non-condensing
Backplane key code	None
Weight	0.05 kg excl. package 0.12 kg incl. package
Dimensions	W 94 x H 46 x D 53 mm
Order code	200-DUTB

Adapter for Central I/O System 200-ANN



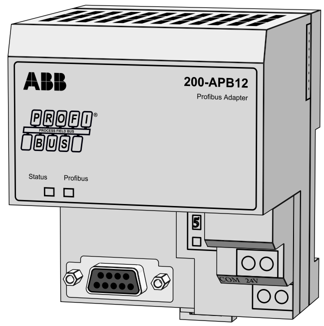
Technical Data	
I/O capacity	8 Terminal base units max.
Status indicators	2 green LEDs for Power and Comm
Internal current consumption (from serial bus)	120 mA
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85 °C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T6 European Ex certified, class I, zone 2, group II C
Weight	0.090 kg excl. package 0.185 kg incl. package
Dimensions	W 68 x H 88 x D 69 mm
Order code	200-ANN

Adapter for Remote I/O System 200-ACN



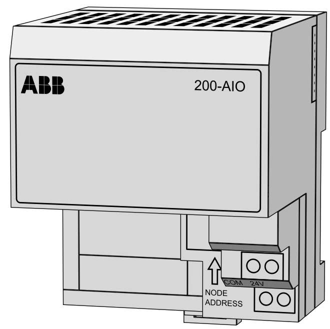
Technical Data	
Input voltage range	24 V DC nominal, 19.2–1.2 V DC
I/O capacity	8 terminal base units max. with I/ O units
Status indicators	Two communication status LEDs and one OK unit status LED
Communication rate	5 Mbits/s
ControlNet connector	75 Ω BNC
Current consumption	400 mA max. from external 24 V DC supply (includes internal current to I/O units)
Power dissipation	7.6 W max. at 19.2 V DC
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85 °C
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	CSA certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T4A European Ex certified, class I, zone 2, group II C
Weight	0.180 kg excl. package 0.275 kg incl. package
Dimensions	W 68 x H 88 x D 69 mm
Order code	200-ACN

Adapter for ProfiBus 200-APB12



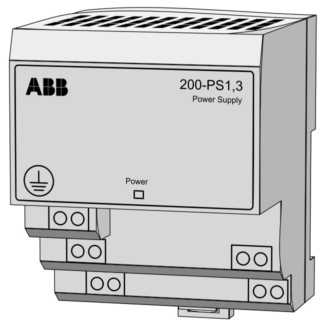
Technical Data	
Input voltage range	+24 V DC nominal, 19.2–31.2 V DC
I/O capacity	8 I/O units
Status indicators	2 red/green LEDs for unit status and communication status
Communication rate	Up to 12 Mbit/s
Current consumption	400 mA max. from external 24 V DC supply (includes internal current to I/O units)
Power dissipation	7.68 W max. at 19.2 V DC
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85°C
Humidity	5–95%, non-condensing
Weight	0.18 kg excl. package 0.27 kg incl. package
Dimensions	W 68 x H 88 x D 69 mm
Agency certification	PNO (PROFIBUS Nutzerorganisation, PROFIBUS User Organization) UL listed for US and Canada according to UL 508 as open equipment, and for hazardous locations according to UL 1604
Order code	200-APB12

Adapter for Serial I/O bus 200-AIO



Technical Data	
I/O capacity	8 S200 I/O or S200L I/O units (can be mixed)
Max. current from internal 5 V DC	0.64 A
Status indicators	None
Connectors	One 15-pole female high-density D-type connector One male serial I/O bus connector The screw terminals are not used
Approvals (when product or packaging is marked)	UL listed for US and Canada according to UL 508 as open equipment, and for hazardous locations according to UL 1604
Weight	0.100 kg excl. package 0.195 kg incl. package
Dimensions	W 68 × H 88 × D 69 mm
Order code	200-AIO

Power Supply Unit 200-PS1.3

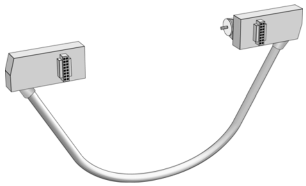


Technical Data	
Input Voltage Range	85–265 V AC
Nominal Supply Voltage	120 V AC, 47–63 Hz, 0.6 A maximum 230 V AC, 47–63 Hz, 0.42 A maximum
Inrush Current	40 A typical for 1 AC cycle at Vin 265 V AC, 55 °C
Interruption	Output voltage will stay within specification when input drops out for 1/2 cycle at 47 Hz, 85 V AC with maximum load
Nominal Output	24 V DC
Voltage Range	20.4–27.6 V DC (includes noise and 5% ripple)
Output Current	1.3 A max.
Load	0 mA min.
Output Surge	Sufficient to drive 4 adapters (surge of 23 A for 2 ms each)
Overvoltage Protection	Output internally limited to 35 V DC. Cycle power to reenergize.
Connectors	Screw terminals
Isolation Voltage	2500 V DC for 1 second
Temperature	Operating: 0 °C to +55 °C Non-operating: –40 °C to +85 °C

Technical Data	
Humidity	5–95%, non-condensing
Approvals (when product or packaging is marked)	cULus certified; class I div. 2 hazardous locations, group A, B, C, D, temperature code T3C.
Weight	0.233 kg excl. inner package 0.327 kg incl. inner package
Dimensions	W 68 x H 87 x D 69 mm
Order Code	200-PS1.3

I/O Accessories

Cable 200-CE1

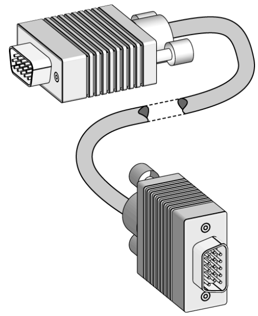


Technical Data	
Weight	0.06 kg
Length	300 mm
Order code	200-CE1

Cable 200-CE3

Technical Data	
Weight	0.1 kg
Length	900 mm
Order code	200-CE3

Cable TK210V005



Technical Data	
Connectors	Two 15-pole male high-density D-type connectors
Weight	0.13 kg
Length	0.5 m
Order code	200-CCA005

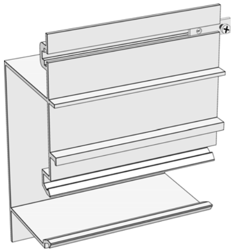
Cable TK210V010

Technical Data	
Connectors	Two 15-pole male high-density D-type connectors
Weight	0.18 kg
Length	1.0 m
Order code	200-CCA010

Cable TK210V025

Technical Data	
Connectors	Two 15-pole male high-density D-type connectors
Weight	0.32 kg
Length	2.5 m
Order code	200-CCA025

Mounting Profile MP990



Technical Data	
Weight	1.9 kg
Dimensions	W 990 x H 144.5 x D 67.8 mm
Order code	MP990

Mounting Profile MP890

Technical Data	
Weight	1.7 kg
Dimensions	W 890 x H 144.5 x D 67.8 mm
Order code	MP890

Mounting Profile MP590

Technical Data	
Weight	1.2 kg
Dimensions	W 590 x H 144.5 x D 67.8 mm
Order code	MP590

Clips[1]

Technical Data	
Weight	0.001 kg/pcs
Dimensions	W 375 x H 9 x D 10 mm
Order code	MP-CLIPS

1. Clips are delivered in a plastic bag concisting of 10 pcs.

Appendix B Recommended Components

This appendix lists recommended cables and components available on the market to be used when installing the Central system/Controllers/I/O system.

Power-Line Filters

Power-line filters for 230 V AC and external 24 V DC (Filter type A)[1]

Recommended type:	Schaffner: FN 660, Schaffner FN 2060 or a corresponding two-stage filter for mounting plate assembly.

Power-line filters for analog signals and pulse counter signals 24 V DC (Filter type B)[1]

Recommended type (1):	Schaffner FN 610, Schaffner FN 2010 or a corresponding one-stage filter for mounting plate assembly.
Recommended type (2):	Phoenix NEF 1 or a corresponding one-stage filter for DIN rail assembly.

1. See Filtering on page 38.

Grounding Devices

Universal ground terminal blocks

Recommended type (1):	Phoenix: USLKG4 (green/yellow)
Recommended type (2):	Weidmüller: WPE 2,5 (green/yellow)

Earth rail

Recommended type:	Weidmüller: Ssch 10x3 Cu

Grounding clamp for shielded cables

Recommended type:	Weidmüller: KLBÜ4-13.5
Comments:	Earth rail (10x3 mm) mounted. Used to connect a cable shield to the ground (0 V)

Grounding clamp for holder 200C-GCH

Recommended type:	Phoenix shield connection terminal blocks, type SK
Comments:	Used for AC 800C, I/O 200C and S200L I/O units

Devices for Extended Noise Suppression

To obtain extra reliability, in harsh industrial environments or environments where there is a risk of direct lightning strikes, offices where large electrostatic charges occur, etc., the following accessories are suitable. They are to be mounted on a separate DIN rail (unless otherwise stated) and in the same cabinet as the control system.

Surge voltage suppression for 230 V AC input

Recommended type (1):	Phoenix: MAINS-MODUTRAB MT 2PE-230 AC
Complement:	Phoenix: VAL-BE
Comments:	Base element with universal foot for mounting on rails
Recommended type (2):	Weidmüller: RSU, 240 V, 6 A
Description:	This unit must be grounded to universal ground terminal blocks, listed in Grounding Devices on page 334. Ground cable length max. 10 cm.
Comments:	Both modules are to be used if the plant is likely to be exposed to direct lightning strikes, if the power supply cables are extremely long or are at risk from other noise sources.

Surge voltage suppression for 24 V DC inputt

Recommended type (1):	Phoenix: TERMITRAB-SLKK 5/24 DC
Description:	Built-in earth connector is attached to the DIN rail
Recommended type (2):	Weidmüller: EGU 4, 24 V
Description:	Max. 1.5 A, to be connected to earth via adjacent ground terminal block
Comments:	Used if the plant is likely to be exposed to direct lightning strikes, if the power supply cables are extremely long or are at risk from other noise sources

Coarse surge arrester for main panel 230 V AC

Recommended types	POWERTRAB FM (3-phase) or Phoenix: POWERTRAB FM/2 (1-phase)
Comments:	The building must always be protected against overvoltage.

Medium surge arrester for sub-panel 230 V AC

Recommended types	Phoenix: VALVETRAB VAL-ST 230
Comments:	This plug-in medium-surge arrester is to be used as a complement to the surge arresters for main panels described above. Minimum 10 m cable between main and sub-panel

Protection modules for RS 232 data interfaces

Recommended type (1):	Phoenix: DATA-MODUTRAB MT V24
Description:	Two data line pins and one ground connection
Recommended type (2):	Phoenix: DATA-MODUTRAB MT V24/8
Description:	Seven data line pins and one ground connection
Recommended type (3):	Phoenix: DATATRAB D-UFB-V24/BS-B-U
Description:	25-pin D-SUB with two data lines and one signal ground
Comments:	All listed RS232 protection modules are recommended for long cables which are exposed to noise. Also recommended for “service outputs” where the equipment might be electrostatically charged

Protection module for RS 485 data interfaces

Recommended type:	Phoenix: MT RS485/S
Description:	One 12 V DC line, two data line pairs and one signal ground
Comment:	Recommended for long cables which are at risk from noise sources. Must be grounded to universal ground terminal blocks listed among Grounding Devices on page 334.

Surge arrester for SattBus

Recommended type:	Phoenix: +DATA-PLUGTRAB UFBK 2-PE5DC-HB-ST
Description:	Plug-in module
Complement:	Phoenix: DATA-PLUGTRAB UFBK 2-PE-5DC-HB-BE
Description:	Signal circuit protection that protects data interfaces operating at high transmission rates. Base element with grounding foot for mounting rails. Used together with the plug-in module above
Comments:	Used if SattBus runs between buildings

Surge voltage protection for telephone line

Recommended type (1):	Phoenix: LINETRAB UFB 2-PE-220 DC
Description:	Complete for DIN rail. Is to be connected via adjacent ground terminal block
Recommended type (2):	Phoenix: MCR-PLUGTRAB-UFBK 2 PE-220DC-ST
Description:	Plug-in module needed together with base element below
Complement:	Phoenix: MCR-PLUGTRAB-UFBK 2 PE-220DC-BE
Description:	Base element with universal foot for mounting on rails
Comments:	Is used for surge voltage protection of telephone lines. It is to be interconnected between the modem and the telephone line if there is a risk of overvoltage caused by direct lightning strikes. Fuse protected from the telephone line

Miscellaneous

DIN rail

Recommended type:	Phoenix: TS 35/7,5. Steel, yellow chromated with holes DIN 46 277 EN 50 022

DIN rail accessories

Recommended type (1):	Phoenix: UK 4-TG + ST-BE
Description:	Component adapter
Recommended type (2):	Phoenix: E/UK
Description:	DIN rail end support device
Recommended type (3):	Weidmüller: WEW 35/2
Description:	DIN rail end support device
Recommended type (4):	Phoenix: EN/MP-45 (width 45 mm)
Description:	Mounting plate for example Ethernet transceivers

Screw terminal blocks for S200L units

Recommended type:	Phoenix MSTB 2,5/x-ST, where x is the number of screw terminals (2, 6, 8 or 10)

Modems

Recommended type:	Westermo MA42, MA44 MA42 generates no handshaking signals MA44 generates DTR, DSR, CTS and RTS
Description:	Short haul modem, RS232/RS485, 220 V AC

Modems (fiber)

Recommended type:	Hirschmann, OZD 485 G2 BFOC, OZD PROFI
Description:	PROFIBUS Modem for fiber optic conductors

Power Supplies

Power supply output 24 V DC

Recommended type (1):	Phoenix[1]: CM90-PS-230 AC/24 DC/2
Description:	Input: 230 V AC Output: 24 V DC/2A
Recommended type (2):	Phoenix[1]: CM125-PS-230 AC/24 DC/5
Description:	Input: 230 V AC Output: 24 V DC/5A
Recommended type (3):	Omron: S82K-05024
Description:	2 A, switchable 115/230 V
Recommended type (4):	MEAN WELL: S-60-24 DIN
Description:	2.5 A, input range 90-260 V

(1) Note manufacturer's derating.

Cables for Process Signals

The process cables below are recommended for use with products in this manual.

Type of signals	Type of cables	Manufacturer
Mains	RKFK 3x1.5 mm^2	Various
Digital I/O signals	Solid or stranded copper wire 0.5–2.5 mm^2	Various
Analog and Pulse/Frequency counter I/O signals	FKAR-PG LiYCY(TP)	Various Unitronic
SattBus	AWM Style 2868 20 AWG/2 VW-1SC E42933 RKKB, 2 * 0.5 mm^2 Belden 8442, 2 * 0.76 mm^2 Radox 125, 2 * 0.75mm^2	Shinagawa Electric Various Belden Huber+Suhner, CH (-55 C° to +125 C°) Self-extinguishing, emits little smoke
RS 232	Belden 8723 2 pair (0.34mm^2) Belden 9729 2 pair (0.22 mm^2) Belden 9730 3 pair (0.34 mm^2) Unitronic CY 3x0.25 mm^2, 7x0.25 mm^2	Belden Belden Belden Unitronic
RS485	Belden 8723 2 pair (0.34mm^2) Belden 9729 2 pair (0.22 mm^2) Belden 9730 3 pair (0.34 mm^2)	Belden Belden Belden
ControlNet	See the *“ControlNet, Planning and Installation Manual”*	
PROFIBUS-DP	Twisted pair, 0.34 mm^2 Unitronic-Bus L2/F.I.P Twisted pair, 0.34 mm^2 Belden 3079A	Unitronic Belden

See cable manufacturer’s specifications for further information.

Appendix C Mounting Dimensions

This appendix provides scale drawings with of the I/O units and their accessories, and some recommendations for the distances between components on a mounting plate. Mounting of I/O units together with controllers is thoroughly dealt with in the corresponding controller manuals.

Terminal Base Unit

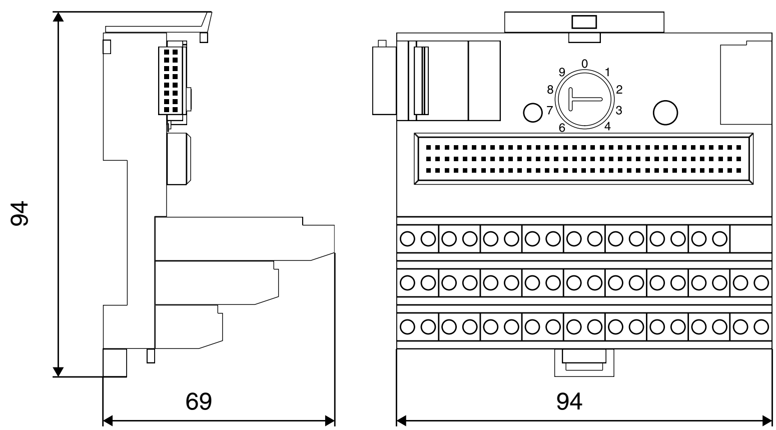


Figure 151. The dimensions (in mm) for the terminal base unit

I/O Unit

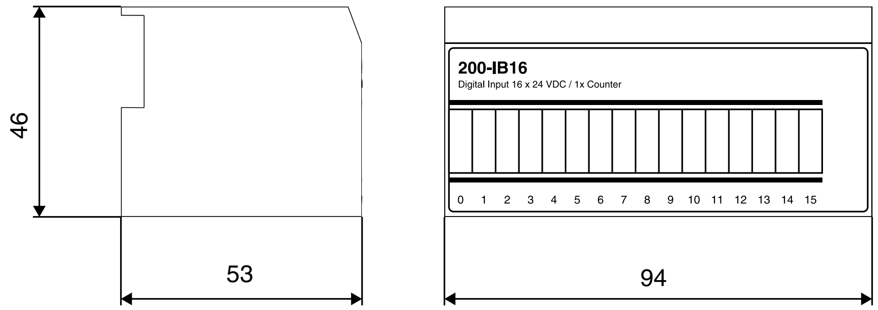


Figure 152. The dimensions in (mm) for the I/O unit

Adapter

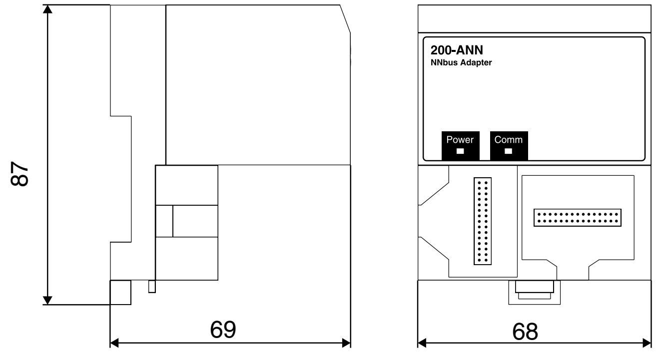


Figure 153. The dimensions (in mm) for the adapter.

Power Supply 200-PS1.3

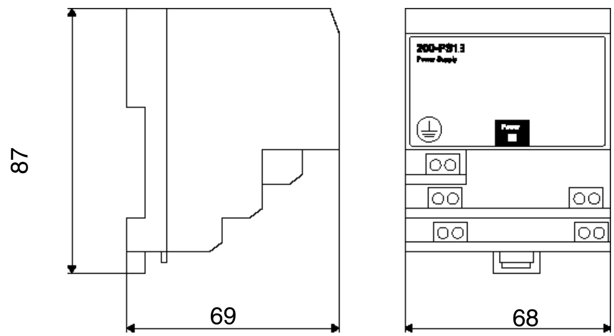


Figure 154. The dimensions (in mm) for the power supply 200-PS1.3

DIN Rail

The figure below shows the dimensions (in mm) for the DIN rail NS 35/7,5. The length is 2 meters (standard DIN EN 50 022).

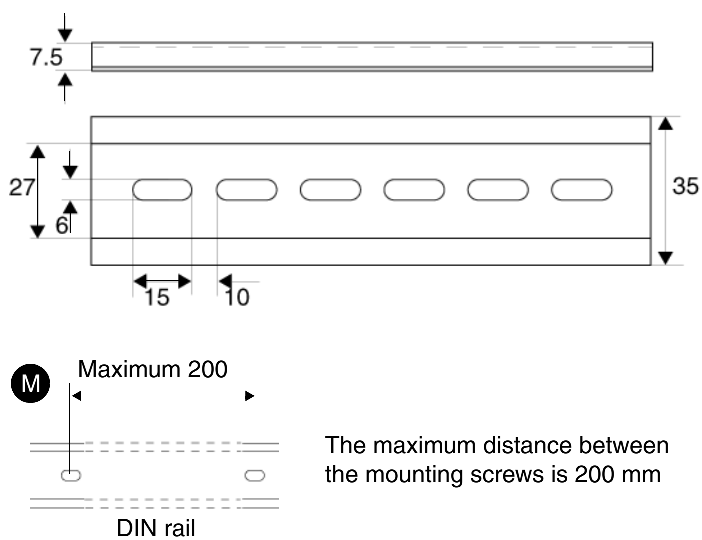


Figure 155. The dimensions (in mm) for the DIN rail

Mounting Profile

The figure below shows the dimensions of the mounting profiles MP500, MP590, MP890 and MP900, where 590, 890 and 990 are the lengths in mm, respectively.

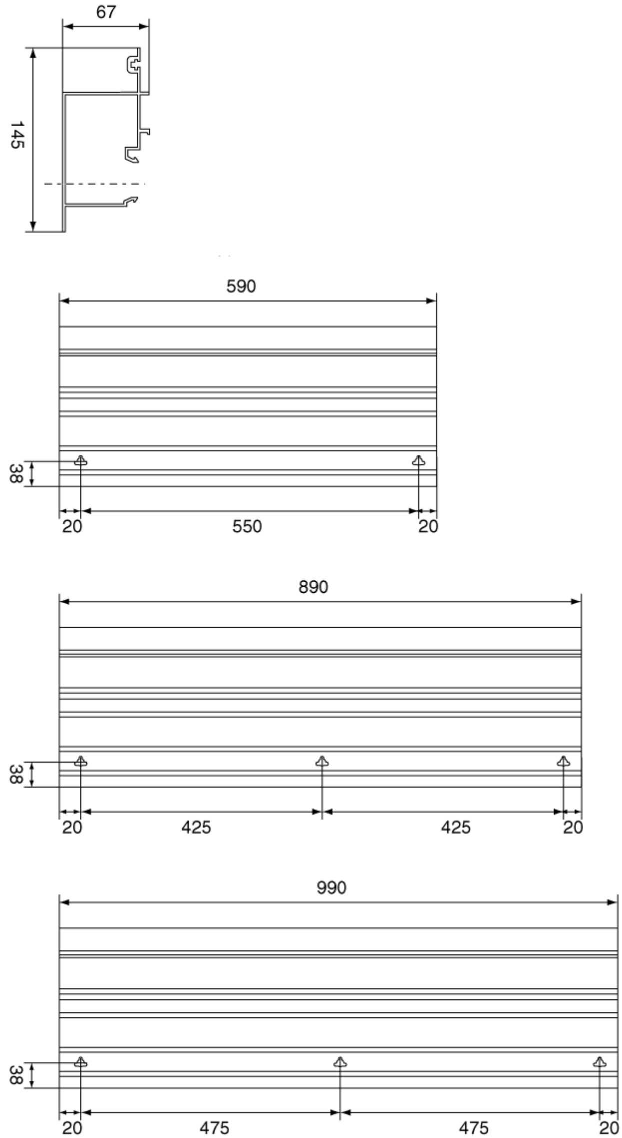


Figure 156. The dimensions (in mm) of the mounting profiles.

Clips

Cover for cables in mounting profiles.

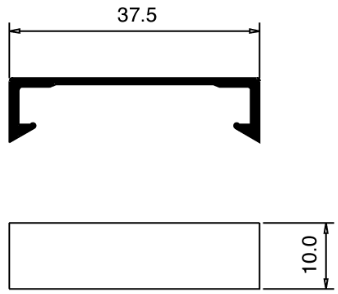


Figure 157. The dimensions (in mm) of the clips

Air Gap

The I/O system requires 25 mm free space in all directions for the air ventilation, see figure below.

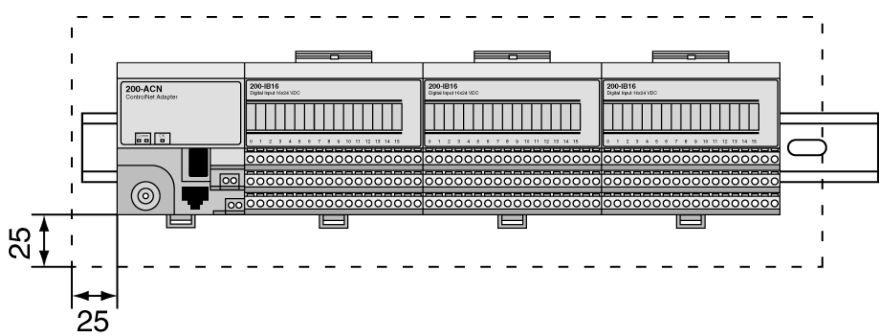


Figure 158. The airgap (in mm).

Split Rows

When dividing the I/O units into two rows connected by the CE1 cable, the recommended minimum distance between the DIN rails is 220 mm. If mounting profiles are used, the corresponding distance can be reduced to 190 mm.

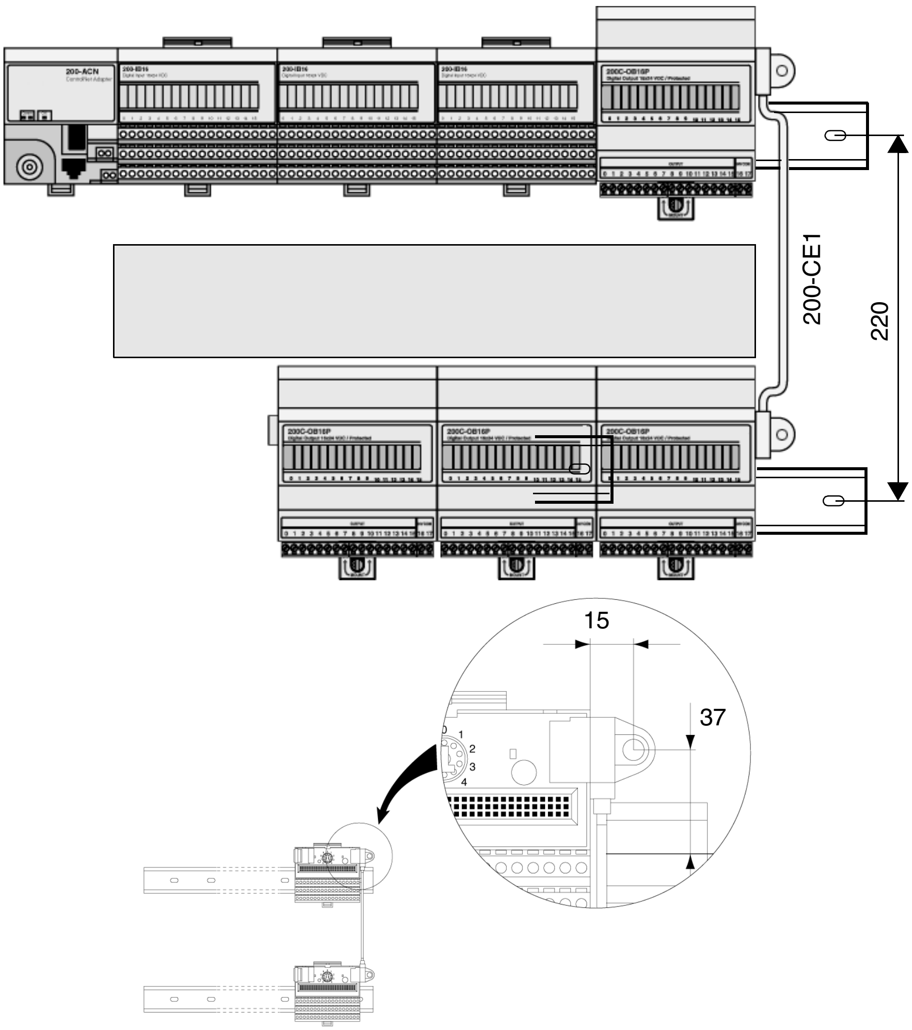


Figure 159. The dimensions (in mm) for splitted rows.

Appendix D Standards

CSA Hazardous Location Approval

CSA certifies products for general use as well as for the use in hazardous locations. **Actual CSA certification is indicated by the product label** as shown below, and not by statements in any user documentation.

Example of the CSA[1] certification product label:

CL 1 DIV 2
GP A,B,C,D
TEMP

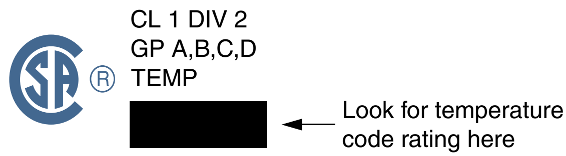
To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for this CSA-certified industrial control product.

- This equipment is suitable for use in Class 1, Division 2, Groups A, B, C, D, or non-hazardous locations only.
- The products having the appropriate CSA markings (that is, Class 1, Division 2, Groups A, B, C, D) are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction.

Important: Due to the modular nature of a programmable control system, the product with the highest temperature rating determines the overall temperature code rating of a programmable control system in a Class 1, Division 2 location. The temperature code rating is marked on the product label as shown.

1. CSA logo is a registered trademark of the Canadian Standards Association.

Temperature code rating:



The following warnings apply to products having CSA certification for use in hazardous locations.

Explosion hazard

- Substitution of components may impair suitability for Class 1, Division 2.
- Do not replace components unless power has been switched off or the area is known to be non-hazardous.
- Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on this equipment by using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 N (3.4 lb., 1.5 kg) separating force applied for a minimum of one minute.
- Batteries must be changed only in an area known to be non-hazardous.

Approbation d‘utilisation dans des emplacements dangereux par la CSA

La CSA certifie les produits d’utilisations générale aussi bien que ceaux qui s’utilisent dans des emplacements dangereux. **La certification CSA en vigueur est indiquée par l’étiquette du produit** et non par des affirmations dans la documentation à l’usage des utilisateurs.

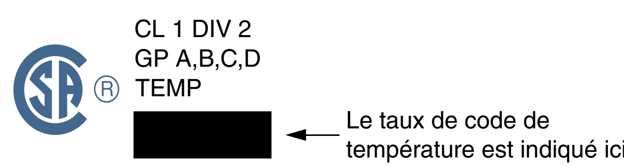
Example d’étiquette de certification d’un produit par la CSA[1]:

Pour satisfaire à la certification de la CSA dans des endroits dangereux, les informations suivantes font partie intégrante de la documentation des produits industriels de contrôle certifiés par la CSA.

- Cet équipement convient á l’utilisation dans des emplacements de Classe 1, Division 2, Groupes A, B, C, D, ou ne convient qu’á l’utilisation dans des endroits non dangereux.
- Les produits portant le marquage approprié de la CSA (c’est à dire, Classe 1, Division 2, Groupes A, B, C, D) sont certifiés à l’utilisation pour d’autres équipements où la convenance de combinaison (application ou utilisation) est déterminée par la CSA ou le bureau local d’inspection qualifié.

Important: Par suite de la nature modulaire du système de contrôle programmable, le produit ayant le taux le plus élevé de température détermine le taux d’ensemble du code de température du système de contrôle programmable dans un emplacement de Classe 1, Division 2. Le taux du code de température est indiqué sur l’étiquette du produit.

Taux du code de témperature:



1. Le sigle CSA est la marque déposée de l’Association des Standards pour le Canada.

Les avertissements suivants s’appliquent aux produits ayant la certification CSA pour leur utilisation dans des emplacements dangereux.

Risque d éxplosion

- La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe 1, Division 2.
- Couper le courant ou s’assurer que l’emplacement est désigné non dangereux avant de remplacer les composants..
- Avant de débrancher l’équipment, couper le courant ou s’assurer que l’emplacement est désigné non dangeruex.
- Avant de débrancher les connecteurs, couper le courant ou s’assurer que l’emplacement est reconnu non dangereux. Attacher tous connecteurs fournis par l’utilisateur et reliés aux circuits externes de l’appareil à l’aide de vis, loquets coulissants, connecteurs filetés ou autres moyens permettant aux connexions de résister à une force de séparation de 15 N (3,4 lb. , 1,5 kg) appliquée pendant au moins une minute.
- Afin d’éviter tout risque d’éxplosion, s’assurer que l’emplacement est designé non dangereux avant de changer la batterie.

Appendix E Directive Considerations

Electromagnetic Compatibility (EMC)

Units mentioned in this document for which product is marked with the CE logo are tested to meet Council Directive 89/336 Electromagnetic Compatibility (EMC) using a technical construction file, and meet the following EMC standards, applicable in whole or in part:

- EN 50081-2 EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

Low-Voltage Directive (LVD)

Units mentioned in this document for which product is marked with the CE logo are designed to meet Council Directive 73/23 Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 – Equipment Requirements and Tests. Units need to comply with the LVD if they are connected to 50–1000 V AC and/or 75–1500 V DC.

The units are “Open type equipment” and must be mounted in suitable cabinets.

External power supplies used to provide 24 V DC must be CE-marked. The CE low-voltage directive prescribes that a safety extra low voltage (SELV) or a protected extra low voltage (PELV) power supply be used.

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