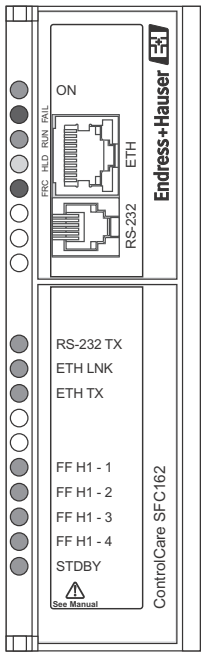
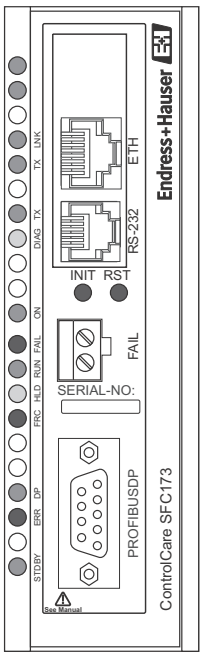
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

ControlCare Field Controllers

Hardware installation





BA 021S/04/en/06.10
Software Version 2.05.xx
Nr. 56004885

Endress+Hauser

People for Process Automation

Table of Contents

Revision History

Product version	Manual	Changes	Remarks
1.00.xx	BA021S/04/en/07.02	Original manual	
2.00.xx	BA021S/04/en/01.05	Manual revised Profibus added	■ Software installlation now in BA035S/04/en/01.01 ■ Profibus architectures added
2.01.xx	BA021S/04/en/08.05	Editorial	■ Address rules for rack mounting clarified ■ Drawings updated where necessary
2.01.xx	BA021S/04/en/03.06	No changes	Service Pack 1, no impact on this manual
2.02.xx	BA021S/04/en/07.06	Product	■ Up to 14 rack assemblies can be added to SFC910
		Editorial	■ Update version numbers, order numbers, etc. ■ Description simulation switch (Chapter 3.5.1)
2.03.xx	BA021S/04/en/06.07	Editorial	■ Wiring diagrams for I/O modules added
2.04.xx	BA021S/04/en/12.08	Editorial	■ Legend in Fig. 4-23, 4-24 corrected (MAO, AO) ■ Connections SFC445, Fig 4-22 corrected ■ Red LED to Yellow LED in I/O wiring diagrams
2.05.xx	BA021S/04/en/06.10	Editorial	■ Version, documentation table, Windows support ■ FRC LED for battery power failure (Chapter 3.5.1)

Product Version

Details of product version and the individual components of Application Designer Suite can be seen in the About ControlCare dialog:

Start=>Programs=>Endress+Hauser=>ControlCare=>Tools=>About ControlCare

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PROFIBUS®
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FOUNDATION™ Fieldbus
Trademark of the Fieldbus Foundation, Austin, TX 78759, USA

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1 Safety

1.1 Designated use

ControlCare is a field-based control system comprising hardware and software components. It can be used to visualize, monitor and control production processes. The hardware described in this manual constitutes the FOUNDATION Fieldbus or PROFIBUS Field Controller. Each comprises a number of separate units that may include power supply modules, power conditioning modules, fieldbus linking devices, controllers, interfaces, analog I/O and discrete I/O units. The approved usage of the individual units used in the system can be taken from the corresponding parts of these operating instructions.

1.2 Installation,commissioning and operation

ControlCare Field Controller modules have been designed to operate safely in accordance with current technical safety and EU directives. Essential to their use is the ControlCare Application Designer software, which allows control strategies to be created for both FOUNDATION Fieldbus and PROFIBUS applications. Field devices, links, junction boxes, cables and other hardware comprising the Fieldbus sytem must also be designed to operate safely in accordance with current technical safety and EU directives.

If devices are installed incorrectly or used for applications for which they are not intended, or if the controller is not configured correctly, it is possible that dangers may arise. For this reason, the system must be installed, connected, configured, operated and maintained according to the instructions in this and the associated manuals: personnel must be authorised and suitably qualified.

1.3 Operational safety

Location

Field Controllers must be mounted in a permanent and weather-protected location in a safe area. The environment shall be a metal cabinet or an installation frame with a well grounded mounting plane. The environment shall be protected.

Hazardous areas

The controller must be connected to networks operating in explosion hazardous areas via barriers or other safety components. When installing components in explosion hazardous areas:

- Ensure that all installion and maintenance personnel are suitably qualified
- Check that all equipment has the appropriate safety certificates
- Observe the specifications in the device certificates as well as national and local regulations.

This topic is discussed in BA013S (FF Guidelines) and BA034S (PROFIBUS Guidelines).

EMC

All modules are suitable for industrial use and conform with the following standard, see Appendix:

- EN 61326: 1997/A1: 1998
  Interference emmision: Class A apparatus
  Interference immunity: as per Annex A, industrial environment

Depending upon the environment in which the bus is operating, particular attention should be paid to the grounding of the bus cables. This topic is discussed in BA013S (FF Guidelines) and BA034S (PROFIBUS Guidelines).

Technical improvement

Endress+Hauser reserves the right to make technical improvements to its software and equipment at any time and without prior notification. Where such improvements have no effect on the operation of the equipment, they are not documentated. If the improvements effect operation, a new version of the operating instructions is normally issued.

1.4 Conventions and icons

In order to highlight safety relevant or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

Safety conventions

Icon	Meaning
	A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned
	**Caution!** Caution highlights actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument
	**Warning!** A warning highlights actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument

Explosion protection

Icon	Meaning
	**Device certified for use in explosion hazardous area** If the device has this symbol embossed on its name plate it can be installed in an explosion hazardous area in accordance with the specifications in the certificate or in a safe area
	**Explosion hazardous area** Symbol used in drawings to indicate explosion hazardous areas. Devices located in and wiring entering areas with the designation “explosion hazardous areas” must conform with the stated type of protection
	**Safe area (non-explosion hazardous area)** Symbol used in drawings to indicate, if necessary, non-explosion hazardous areas. Devices located in safe areas stiill require a certificate if their outputs run into explosion hazardous areas.

Electrical symbols

Icon	Meaning
	Direct voltage A terminal to which or from which a direct current or voltage may be applied or supplied
	Alternating voltage A terminal to which or from which an alternating (sine-wave) current or voltage may be applied or supplied
	**Grounded terminal** A grounded terminal, which as far as the operator is concerned, is already grounded by means of an earth grounding system
	**Protective grounding (earth) terminal** A terminal which must be connected to earth ground prior to making any other connection to the equipment
	**Equipotential connection (earth bonding)** A connection made to the plant grounding system which may be of type e.g. neutral star or equipotential line according to national or company practice
	**Electrostatic discharge** A terminal or location at which an electrostatic discharge might cause damage to the module circuitry

1.5 ControlCare documentation

Table 1.1 indicates the documents, planned and realized, containing safety relevant information, installation, commissioning and operating instructions for the equipment and software associated with Field Controller.

All documentation available at the time of release is included on the ControlCare CD-ROM and is installed in **Start=>Programs=>Endress+Hauser=ControlCare=Manuals** during set-up.

Component	Description	Document type	Designation	Order No.
System	ControlCare System Overview	Operating manual	BA016S/04/en	56004883
	ControlCare System Design	Operating manual	BA039S/04/en	Planned
	ControlCare System Specifications	Operating manual	BA040S/04/en	56004888
Software	Application Designer Overview	Operating manual	BA017S/04/en	70104301
	Application Designer: Local I/O Tutorial	Operating manual	BA032S/04/en	71095009
	Application Designer: FF Tutorial	Operating manual	BA019S/04/en	70101151
	Application Designer: PROFIBUS Tutorial	Operating manual	BA036S/04/en	70101152
	Application Designer: MODBUS Tutorial	Operating manual	BA037S/04/en	70101153
	Application Designer: IEC 61131-3 Ladder Logic Tutorial	Operating manual	BA038S/04/en	70101386
	Application Designer: IEC 61131-3 Structured Text Tutorial	Operating manual	BA056S/04/en	71060063
	Field Control (OPC) Servers	Operating manual	BA018S/04/en	71031428
	SFC162 Visitor	Operation manual	BA069S/04/en	71113457
Field Controller	Hardware Installation Guide	Operating manual	BA021S/04/en	56004885
	Commissioning and Configuration	Operating manual	BA035S/04/en	56004887
Function Blocks	Function Block Manual	Operating manual	BA022S/04/en	56004886
Set-Up	Getting Started	Operating manual	BA020S/04/en	56004884
General	FOUNDATION Fieldbus Guidelines	Operating manual	BA013S/04/en	70100707
	PROFIBUS Guidelines	Operating manual	BA034S/04/en	56004242

Tab. 1-1: ControlCare Documentation

2 Identification

2.1 Device designation

ControlCare Field Controller is delivered as a complete packet comprising several components. Each module can be identified from the designation on the front panel and the nameplate printed upon its side:

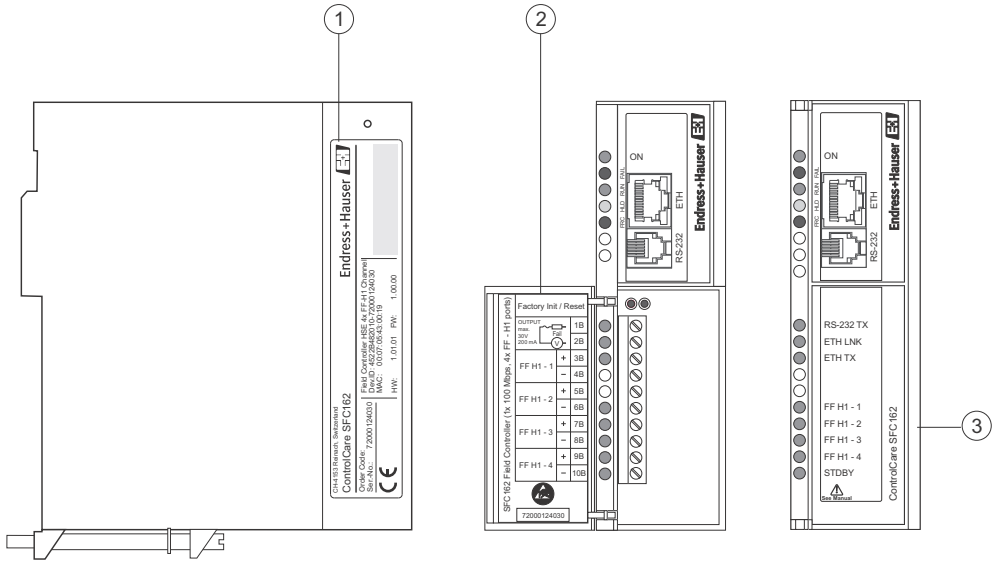


Fig. 2-1: Identification of Field Controller modules (here SFC162 FOUNDATION Fieldbus Field Controller)

1) All Modules: Module nameplate with serial number and characteristics
2) All modules with exception of SFC173: Connector designations on back of door,
SFC162 FF Field Controller: serial number inside door
SFC173 PROFIBUS Field Controller: serial number on front of door
3) Module designation on front panel

In attaching the CE Mark, Endress+Hauser confirms that the devices conform to all relevant EU directives.

Note!

- There is a second label on the right-hand side of some modules that indicates the position of the DIP-switches necessary for operation, see Chapter 3.5.1

2.2 Scope of delivery

2.2.1 System components

The number and type of components can be derived from the designation on the invoice by using the table below.

Software

Designation	Description	Order No.
SFE120	ControlCare Application Designer Suite	N/A
SFE240	ControlCare Field Control (OPC) Server	N/A

Power, CPU and Fieldbus Modules

Designation	Description	Order No.
SFC050	AC Backplane power supply	70103451
SFC056	DC Backplane power supply	70103454
SFC162	FF Field Controller, 4x FF H1 channels	70103455
SFC173	PROFIBUS Field Controller, 1x DP channel	70103456
SFC252	AC Fieldbus power supply	70103457
SFC260	DC Fieldbus power supply	70103458
SFC353	Fieldbus power conditioner	70103459

I/O modules

Designation	Description	Order No.
SFC411	Discrete Input 2x8 DI (24 VDC)	70103461
SFC415	Discrete Input 2x8 DI (24 VDC sink) Low active, False logic/OFF when 24 VDC applied	70103462
SFC420	Discrete Input 1x8 DI (On/off switches)	70103463
SFC428	Discrete Output 2x8 DO (Relay Normally Open)	70103464
SFC432	Discrete Input/Discrete Output 1x8 DI (24 VDC) + 1x4 DO (Relay Normally Open)	70103465
SFC435	Discrete Input/Discrete Output 1x8 DI (24 VDC) + 1x4 DO (Relay Normally Closed)	70103466
SFC438	Discrete Input/Discrete Output 1x8 DI (24 VDC) + 1x2+2 DO (Relay Normally Open/ Normally Closed)	70103467
SFC441	Pulse Input 2x8 DI (Impulse 100 Hz)	70103477
SFC442	Pulse Input 2x8 DI (Impulse 10 kHz)	70103478
SFC467	Pulse Input 2x DI Pulse Input (AC)	70103483
SFC444	Analog Input 1x8 AI (With shunt)	70103479
SFC445	Analog Input 1x8 AI (Temperature RTD, Thermocouple)	70103480
SFC446	Analog Output 1x4 AO	70103481
SFC457	Analog Input 1x8 AI (Differential with shunt)	70103482

Accessories

Designation	Description	Order No.
SFC900	Housing, empty slot	70103484
SFC901A	Rack with 4-slot backplane	70103485
SFC902	Rack terminator	70103486
SFC903	Connection cable, 65 mm	70103487
SFC904A	Connection cable, 651 mm	70103490
SFC905A	Connection cable, 814 mm	70103524
SFC906A	Connection cable, 977 mm	70103525
SFC907A	Connection cable, 1140 mm	70103526
SFC909	Stand-alone base for 1 module (no connector for local I/O)	70103528
SFC910	Rack with 2-slot backplane (connection of local I/O to right only)	70103529
SFC954	Ethernet cable, 100BaseT, 2m	70103530
SFC955	Ethernet cable, 100BaseT, 2m	70103531

3 Installation

Warning!
- To avoid malfunction of the system, it must be mounted and connected together as described in this chapter.

3.1 Basic information

Location

ControlCare Field Controller is intended for use in a permanent and weather-protected location. The environment shall be a metal cabinet or an installation frame with a well grounded mounting plane. The environment shall be protected.

Mounting

Field Controller comprises several modules that are installed on an expandable, DIN-rail mounted backplane. The modules are plugged-in using industrial grade connectors and secured by a robust metal screw.

A conventional I/O-subsystem with modules for analogue and discrete inputs and outputs can be connected to the basic controller.

All modules must be mounted vertically.

Power supply

The Field Controller power supply module is plugged directly into the backplane forming an integral unit, no separate bulk power supplies are required to power the rack. The power supply has built in diagnostics and dedicated LEDs indicating normal operation and failure which make troubleshooting easier. An externally accessible fuse located on the incoming line side can be replaced without removal of the power supply module or disconnecting any wiring. If one power supply is not sufficient to meet the supply demands in the system, or if power supply redundancy is required, others can be added as required.

A power calculation sheet for the rack is included in the System Specifications, BA040S/04/en.

The SFC050 power supply is also designed for redundant operation, see Chapter 3.5.2.

Note!
- ControlCare power modules are suitable for powering the rack only.
- 24 VDC power supplies must be used to power devices connected to and the external circuits of the local I/O modules.

3.2 Components

3.2.1 Rack assembly SFC901A

Fig 3-1 shows the principle features and components of the standard SFC901A rack assembly with four slots.

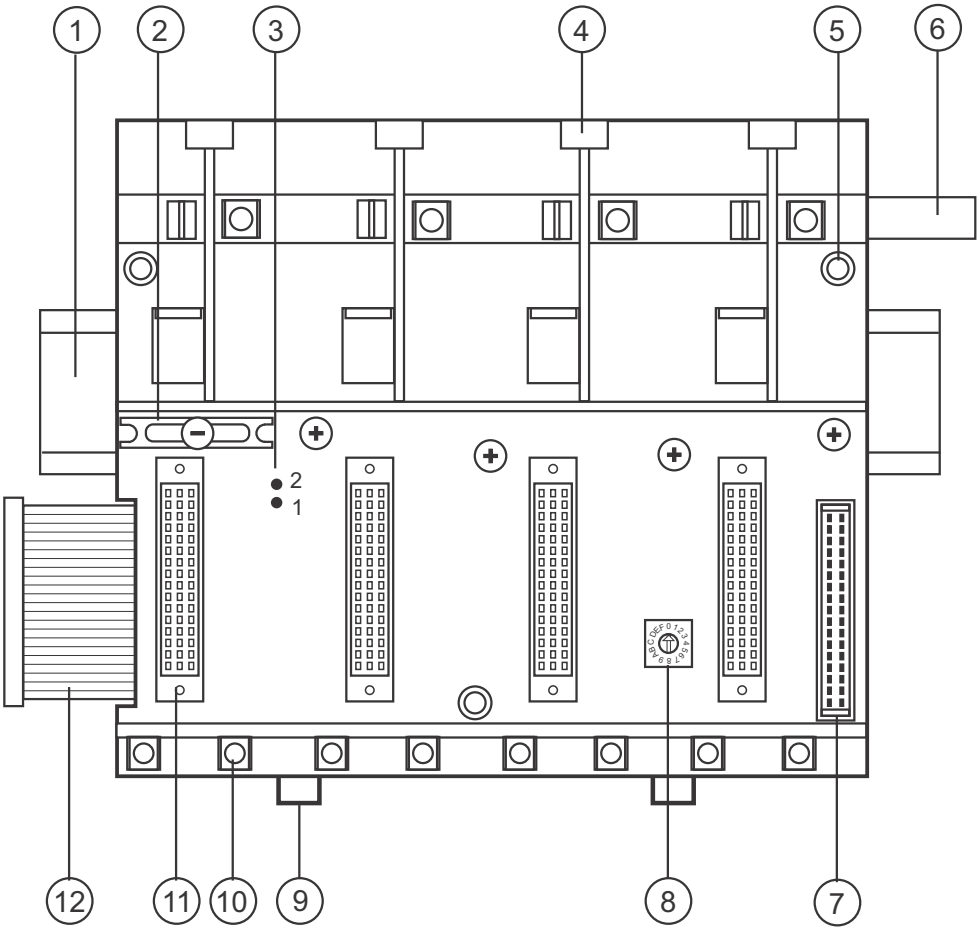


Fig. 3-1 Front view of standard SFC901A rack with four slots
1) DIN mounting rail
2) Digital ground bar: the bar is used to connect together adjacent racks on the same rail
3) Wire link W1: must be cut if a backplane power supply is present on the rack.
4) Module support lug: the module is slotted over this before being pushed home
5) Screw hole for wall mounting of the rack (3x)
6) Metal bar: required to strengthen the assembly when two racks are positioned together
7) Socket for rack connection cable or terminator block
8) Rack address switch: the leftmost rack has the address "0", the next to the right typically "1" etc.
9) Release clip for fixing rack to DIN rail
10) Counternut for securing module
11) Module connector
12) Rack connection cable: the second socket is at the back of the rack

3.2.2 Rack assembly SFC910

Fig 3-2 shows the principle features and components of the standard SFC910 rack assembly with two slots. It is specifically designed to accomodate the SFC173 PROFIBUS Field Controller and a SFC050 or SFC056 Power Supply Module.

- The assembly is for DIN rail mounting only
- It cannot be used for mounting local I/O modules
- It is only possible to connect additional rack assemblies at the right-hand side
- It is not possible to connect two SFC910 rack assemblies together

Older hardware versions of the rack could support an additional two rack assemblies only, but from Hardware Version 1.00.03 onwards, 14 additional rack assemblies can be supported.

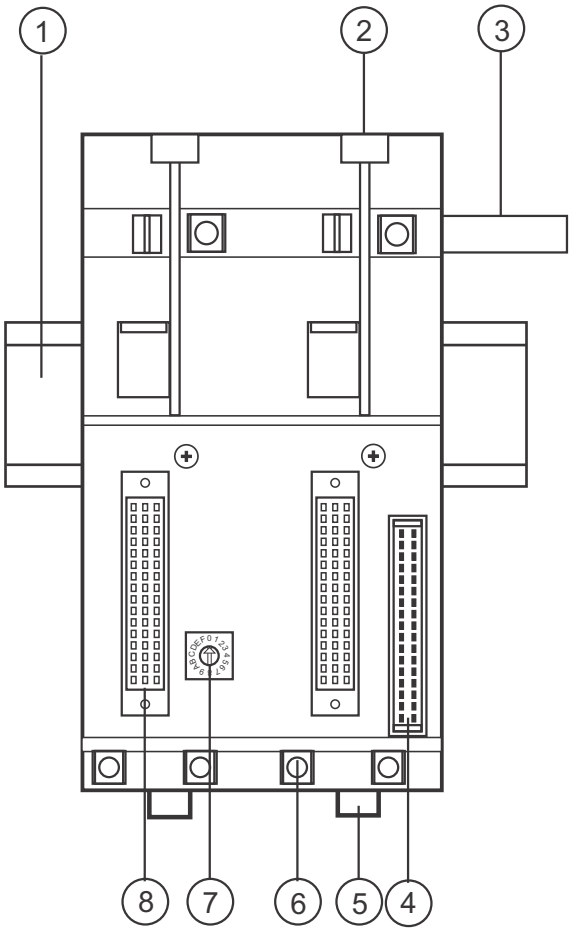


Fig. 3-2 Front view of standard SFC910 rack with two slots
1) DIN mounting rail
2) Module support lug: the module is slotted over this before being pushed home
3) Metal bar: required to strengthen the assembly when two racks are positioned together
4) Socket for rack connection cable or terminator block
5) Release clip for fixing rack to DIN rail
6) Counternut for securing module
7) Rack address switch
8) Module connector

3.2.3 Modules

Fig. 3-3 shows the front and rear view of a typical module. Power supply modules have, in addition, a grounding screw, located at the front of the module below the door. It is not shown here for clarity.

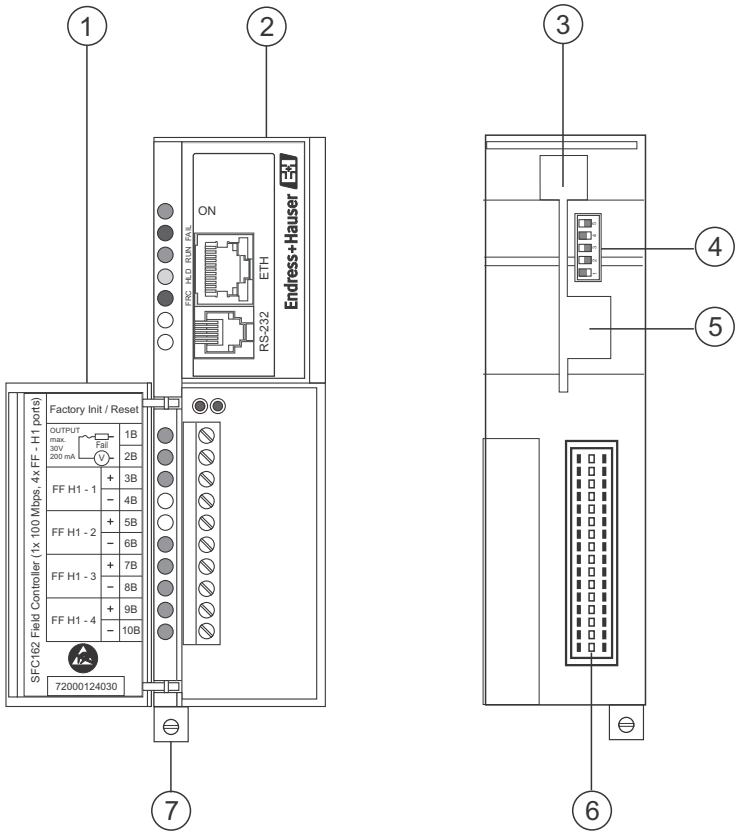


Fig. 3-3 Front and rear view of a typical Field Controller module, door open
1) Where appropriate, terminal and connector designations
2) Where appropriate, terminals and connectors
3) Slot for module locating lug on rack
4) DIP switch to set battery and watchdog, Chapter 3.5.1
5) Where appropriate, grounding spring
6) Module connector socket
7) Fixing screw for rack

The front panel contains the name of the module plus its LEDs. Any terminal blocks are accessed by opening the front door of the module: a terminal designation diagram is to be found inside the door, see above.

For the Field Controllers SFC162 and SFC173, connector sockets are integrated in the front panel. The SFC173 has no front door.

Location

Field Controller is intended for use in a permanent and weather-protected location. The environment shall be a metal cabinet or an installation frame with a well grounded mounting plane. The environment shall be protected. Maintenance and operation shall be by authorised personel only.

3.3 System dimensions

Note!

- When mounting in a cabinet allow 50 mm (2") clearance all round to ensure adequate ventilation.

3.3.1 Single rack assembly

Fig. 3.4 shows the dimensions of the SFC901A rack assembly with mounted ControlCare modules. All modules are of uniform size and design.

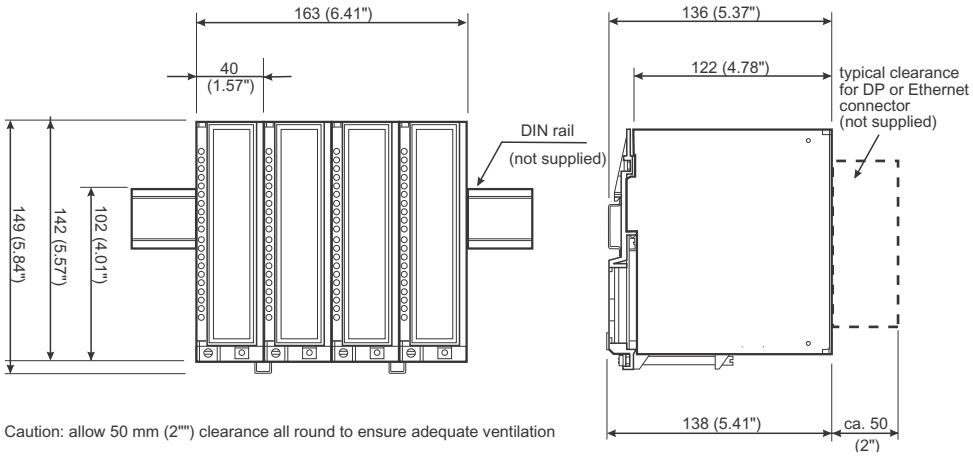


Fig. 3-4: Dimensions of SFC901A rack assembly with mounted modules

3.3.2 Combined rack assemblies

Fig. 3-5 shows how to calculate the dimensions of a rack assembly comprising several SFC901A units.

Caution!

- You may want to split a large rack assembly and mount it on several DIN rails. In this case, no more than three connecting cables (SFC904A, SFC905A, SFC906A, SFC907A) are to be used.

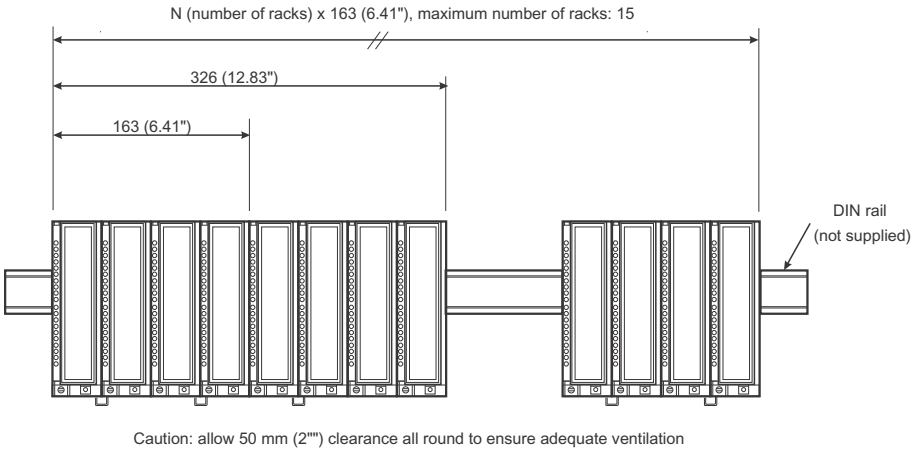


Fig. 3-5: Calculation of the dimensions of combined SFC910A rack assemblies

3.4 Installing the rack assembly

3.4.1 General rules

When installing in the cabinet observe the following rules:

- Where possible, mount the Field Controller as a single unit.
- Mount it vertically (i.e. 90° to the horizontal)
- Allow 50 mm (2 ") clearance at the top, bottom and either side of the unit for ventilation.
- Mount switching units or frequency converters well away from the controller.
- Where possible, separate the power and Ethernet cables from the Fieldbus cables.
- Screw the earth connectors on the connecting cable and power modules to the cabinet ground.

3.4.2 Installing on the DIN rail

- The rack must be mounted on standard 35 mm DIN rail in a metal cabinet or installation frame
- You will need a small electrical screwdriver with a 3 mm blade.

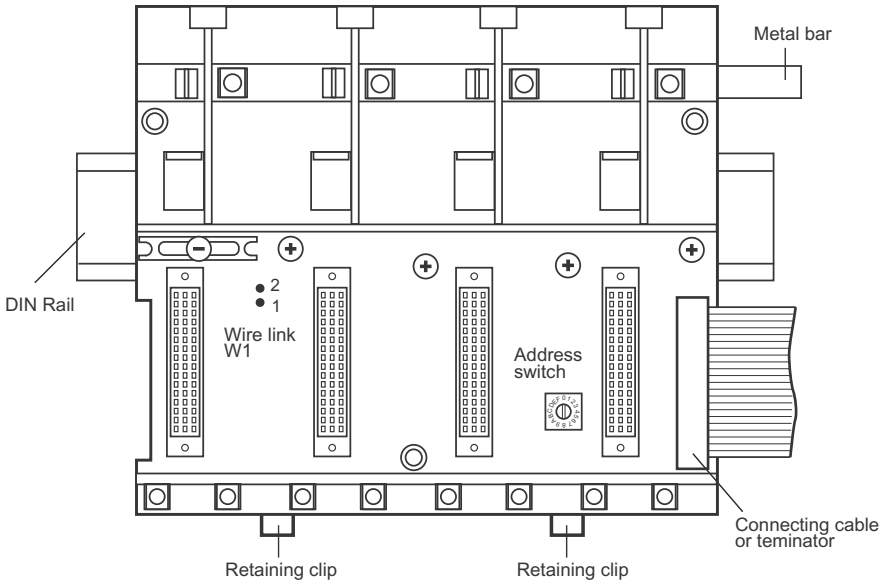


Fig. 3-6: SFC901A rack assembly

Procedure

1 Check that the DIN rail has been correctly mounted.

2 Using a screw-driver blade, pull down the two retaining clips at the bottom of the rack until you hear a click.

3 Locate the lugs at the back of the rack on the top edge of the DIN rail. Push the rack against the rail and push the clips up again. You will hear a click sound when they lock properly: check that the rack is fixed firmly.

4 If only one rack is in use, plug the rack terminator into the socket for the rack connection cable.

Note:
The SFC910 rack assembly does not require a rack terminator.

3.4.3 Adding racks (local I/O expansion)

Local I/O expansion is the process of adding more SFC901A rack assemblies and connecting them together. It is recommended that the splitting of racks is avoided where possible.

Note!

- The SFC910 rack assembly cannot be used for mounting local I/O modules

Procedure

1 The wire link W1, see Item 3, Fig. 3-1, connects to the backplane power supply line of the rack to its left:

- If the rack extension is to be powered by a power supply module positioned to its left, check that W1 is connected.
- If additional power supply modules are required in the rack, remove the wire link of the rack extensions on which they are to be mounted.

2 Plug the rack extension cable, e.g. SFC903, into the socket at the rear of the new rack.
- Check that the correct connector is being used

3 If the racks are to be mounted adjacent to each other, insert the metal rack strengthing bar into the slot provided for it, see Fig. 3-1, Item 2.

4 Mount the whole rack assembly as described in Section 3.4.2, Steps 2 to 3.

5 Plug the rack extension cable, e.g. SFC903, into the socket on the front of the rack to the left.

6 On the last rack, plug the rack terminator into the socket for the rack connection cable.

7 Loosen the screws holding the digital ground bar, push it to the left until it is positioned under the fixing screw of the adjacent rack, then tighten both fixing screws.

8 Screw the ground connection on the rack connecting cables to the cabinet ground.

3.4.4 Setting the rack address

The factory setting of the rack address switch is "0".

1 Using the rotary switch on the rack, set a unique address for each rack assembly unit

Position	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Address	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	–

2 It is recommended that the racks be numbered consecutively from left to right

- The arrow head indicates the position of the switch
- The addresses associated with the switch positions are shown above: do not use "F"
- **Rack assemblies with I/O modules must have an address greater than "0"** (i.e. if you have I/O units on the first rack, start numbering from "1"

3.5 Installing the modules

3.5.1 Hardware configuration

The SFC162 and SFC173 Field Controllers, the SFC444 and SFC457 Current/Voltage Input modules, and the SFC446 Current/Voltage Output module must be configured before they are mounted on the rack assembly.

SFC162/SFC173 Field Controller

The Field Controllers have a DIP switch located at the rear of the module that can be accessed with a small screwdriver blade, see Fig.3-3, Chapter 3.2.3. Before mounting the Field Controllers SFC162 and SFC173 in the rack:

- Set Switch 1 "BATTERY" to "ON"– this will ensure that the configuration is safe in the event of power shutdown.
- Set Switch 4 "WATCHDOG" to "ON"
- Switch 3 activates simulation for local I/O blocks, see Chap. 7.1, BA035S/04/en
- Switches 2 and 5 are required for service only and must be set to "OFF"

Note!

- If the battery is not switched on when the controller is powered up, the FRC LED flashes.
- If the FRC LED flashes after the controller has been operating for some time, the battery is flat.

SFC444/SFC457 Current/ Voltage Input Module

The SFC444 and SFC457 modules have eight channels that can be configured individually to read voltage or current analog signals by a jumper on the card. The factory setting is for current. The input range is configured in Application Designer, see Operating Instructions BA035/047en, Field Controller: Commissioning and Configuration.

- Open the module as described in Chapter 3.5.2
- Set the jumpers as required

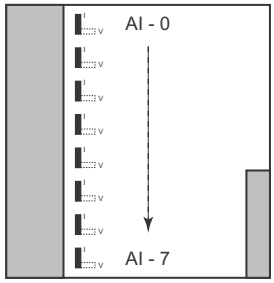
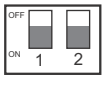


Fig. 3-7: Position of jumpers on card

SFC446 Current/Voltage Output Module

The SFC446 module has 4 analog outputs that can be used as current or voltage signals. When used in voltage mode, the range-end value (5V or 10V) must be configured at the DIP-switches located within the casing at the top and bottom of the module. Default setting is 5V (OFF).



The switches can be accessed externally with a small screwdriver blade or other pointed object. The output mode (standard or differential) is configured in Application Designer, see Operating Instructions BA035/047en, Field Controller: Commissioning and Configuration.

Location	DIP-**Switch**	**Use**	**OFF**	**ON**
Top side	Switch 1	Configures the range end value of Channel AO-0	max. 5V	max. 10V
Top side	Switch 2	Configures the range end value of Channel AO-1	max. 5V	max. 10V
Bottom side	Switch 1	Configures the range end value of Channel AO-2	max. 5V	max. 10V
Bottom side	Switch 2	Configures the range end value of Channel AO-3	max. 5V	max. 10V

3.5.2 Redundant SFC050, SFC056 power supply

The SFC050 AC power supply can be used in one of four modes, controlled by two jumpers W1 and CH1 on the module board:

- Non-redundant, power supply limited to 3A
- Non-redundant, power supply greater than 3A
- Redundant, split power concept
- Redundant, stand-by concept

The SFC056 DC power supply does not support the standby concept for redundancy.

For non-redundant operation, the power supply should always be placed in the first slot of the rack and the racks prepared as described in Chapters 3.4.2 and 3.4.3. The jumpers are set for non-redundant operation by default.

Redundancy with power splitting

In this case the two power supplies are mounted on the first and third slots of the rack assembly. Rack preparation as per Chapters 3.4.2 and 3.4.3 applies. Before mounting open both modules and:

- Set Jumper W1 to "open" (no adjustment is required for the SFC056 module)
- Set Jumper CH1 to "R".

Jumper Positions
Redundancy
Split power concept

Redundancy with standby (SFC050 only)

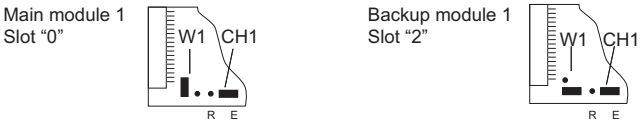
In this case the two power supplies are mounted on the first (main modules) and third slots (backup module) of the rack assembly. Rack preparation as per Chapters 3.4.2 and 3.4.3 applies. Before mounting open both modules. For the main module:

- Set Jumper W1 to "open"
- Set Jumper CH1 to "R".

For the standby module:

- Set Jumper W1 to "closed"
- Set Jumper CH1 to "R".

Jumper Positions
Redundancy
Standby concept



3.5.3 Opening modules

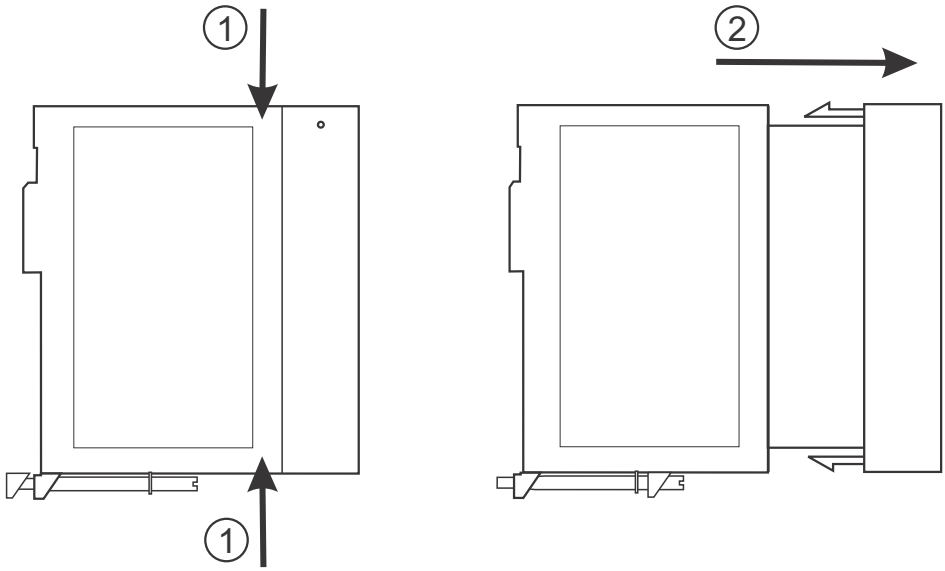


Fig. 3-8: Opening the module to access jumpers on the printed circuit board

For some applications, jumpers on the printed circuit board control the module properties. The module must be opened to access them.

1 Using e.g. a screwdriver blade, gently press down on the top catch to release the board assembly and ease forward a little. Repeat with the bottom catch.

2 When both catches have been released, carefully work the board forward until it can be pulled out – it will not pull out immediately! If necessary, a screwdriver can be used to carefully prise the front of the module from the rear assembly.

3 When reassembling, check that the board is the right way up, push the board assembly home and check that the catches have latched.

Note!

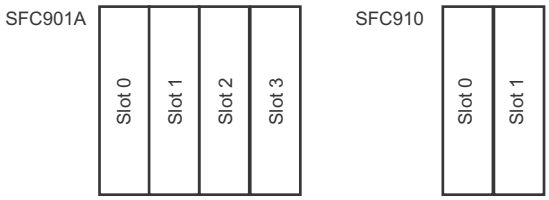
- Avoid frequent disassembly of the modules since this can damage sensitive parts.

3.5.4 Installing the modules

After the rack assembly has been mounted, connected up and the addresses have been set, the modules can be mounted.

Order

Each SFC901A rack has four slots and the SFC910 rack has two slots: for slot numbered see below:



- One Field Controller only is allowed per complete rack assembly (set of I/O modules)
- It is recommended that the Field Controller modules be mounted in the first rack (Use the rack address "0" unless local I/O is also in the same rack, in which case "1")
- Power supply modules SFC050 and SFC056 are usually mounted in Slot 0, but can also be mounted in Slot 2 when it is used for redundant power, see Chapter 3.5.2.
- Field Controllers SFC162 and SFC173 are usually mounted in Slot 1, but can also be mounted in Slot 0
- FOUNDATION Fieldbus power supplies SFC252 and SFC260 are usually mounted in Slot 2
- FOUNDATION Fieldbus power conditioner SFC353 is usually mounted in Slot 3.
- I/O modules can be mounted anywhere except in the rack with address "0"
- Dummy modules SFC900 should be mounted in empty slots to prevent damage through electrical discharge.

Document the order of the modules, see Chapter 3.5.4, since this is required for the configuration of the Field Controller Hardware Configuration block, see Operating Instructions BA035S/04/en, Field Controller: Commissioning and Conguration.

Mounting procedure

1 Holding the module at about 45° to the rack, slot the module over the locating lug on the rack.

2 Gently swing it down and until it engages the connecting socket, then push it firmly home.

3 Secure the module to the rack by tightening the fixing screw.

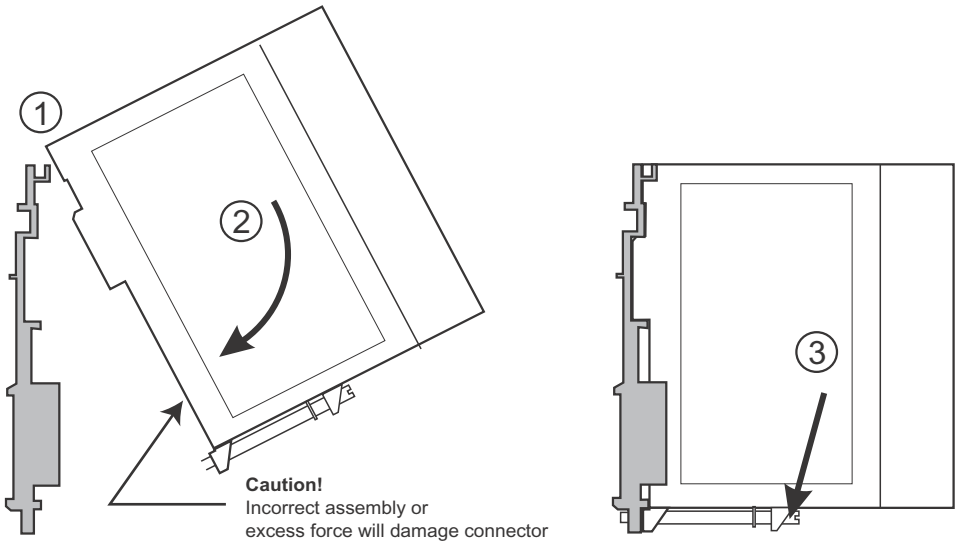


Fig. 3-9: Mounting the modules

3.5.5 Documentation

The rack addresses and order of the modules in each rack assembly is required for the configuration of the Field Controller Hardware Configuration block, see Operating Instructions BA035S/04/en, for example:

SFC162 Field Controller

Rack Address	Slot 0	Slot 1	Slot 2	Slot 3	Connector/ Terminator
0	SFC050	SFC162	SFC252	SFC353	SFC903
1	SFC444	SFC411	SFC428	SFC446	SFC902

SFC173 Field Controller in SFC910 rack

Rack Address	Slot 0	Slot 1	Slot 2	Slot 3	Connector/ Terminator
0	SFC056	SFC173	–	–	SFC903
1	SFC444	SFC411	SFC428	SFC446	SFC902

SFC173 Field Controller in SFC901A rack with I/O

Rack Address	Slot 0	Slot 1	Slot 2	Slot 3	Connector/ Terminator
1	SFC056	SFC173	SFC444	SFC411	SFC903
2	SFC432	SFC438	SFC428	SFC446	SFC902

The table below can be used to document the order of modules in your rack

Rack Address	Slot 0	Slot 1	Slot 2	Slot 3	Connector/ Terminator
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10 ("A")					
11 ("B")					
12 ("C")					
13 ("D")					
14 ("E")					

4 Wiring

Note!
- The snap-outs at the top and bottom of the modules can be removed to accommodate the cables to the terminal blocks.

4.1 Basic Information

Fieldbus segment design

Field Controller communicates with the instruments and equipment connected to it via Ethernet backbone and PROFIBUS DP/PA or FOUNDATION Fieldbus HSE/H1 networks. Instructions on how to design, validate and install such networks are to be found in the following manuals, supplied on the ControlCare CD-ROM:

- BA013S/04/en: FOUNDATION Fieldbus Guidelines
- BA034S/04/en: PROFIBUS Guidelines

Note!
- This manual describes the connections required at the Field Controller and any I/O modules only. It does not deal with the connections of the devices or any auxiliary equipment such as segment couplers. In these cases, details should be taken from the appropriate manufacturer's manual.

Module connections

Depending upon the type of module, connections are made with cable sets and standard connectors or via screw terminal blocks which can be unplugged to aid wiring up. These are keyed so that the terminal block cannot be inserted the wrong way up. The wiring itself is standard installation cable for intermodule connection and shielded twisted pairs for bus connections.

4.1.1 Cable types

Ethernet

Use shielded twisted-pairs to wire controller modules to the Ethernet backbone. The modules are equipped with RJ-45 connectors, so that commercial cable sets can be used:

- 100BaseT cable for SFC162/SFC173 and an Ethernet switch
- 100BaseT cable(crossover) for direct connection of SFC162/SFC173 to a host PC

The LEDs on the controller module will indicate active communication or failure, see also Chapters 4.2.4 or 4.3.4, Fault indication relay. The Ethernet connections can be made without having to power down. The hub/switched based star topology means that you can disconnect devices without disrupting control or communication of other nodes.

Fieldbus cabling

It is recommended that IEC 61158-2 Cable Type A (SSTP) or better is used for new installations. Depending upon application this should be chosen as to be suitable for safe or hazardous areas. To aid connection and prevent accidental short-circuits, it is recommended that max. 2mm cable ferrules are attached to all core ends.

Depending upon how the devices are equipped, connection in the field can be either by means of unprepared cables or cable sets with 7/8" standard plugs for FF or M12/PG13.5 or M20/M12 plugs for PROFIBUS. When installing the bus, attention must be paid to the grounding or the cable shielding. See above "Fieldbus segment design".

Power cabling

Standard cables can be used for all power connections. To aid connection and prevent accidental short-circuits, it is recommended that all max 2mm cable ferrules are attached to all core ends.

4.2 FOUNDATION Fieldbus Field Controller

The basic controller comprises the following modules mounted on a SFC901A rack

- SFC050 (AC) or SFC056 (DC) backplane power supply
- SFC162 FOUNDATION Fieldbus Field Controller
- SFC252 (AC) or SFC260 (DC) Fieldbus Power supply
- SFC353 4 port, fieldbus power conditioner

For fieldbuses operating in explosion hazardous areas, a barrier must be connected between the controller and each intrinsically safe segment.

4.2.1 Wiring diagrams

External AC supply: SFC050/SFC252

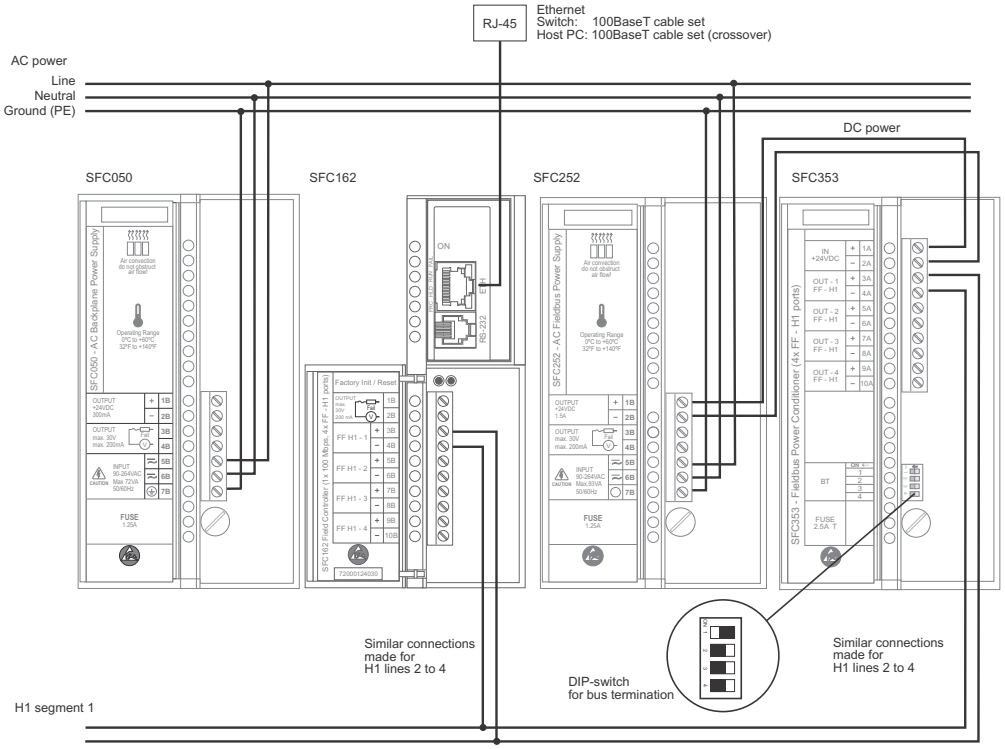


Fig. 4-1: Wiring diagram of basic controller when modules SFC 050/SFC 252 are used for the backplane and fieldbus power supply: one H1 segment

External 24 VDC supply SFC056/SFC260

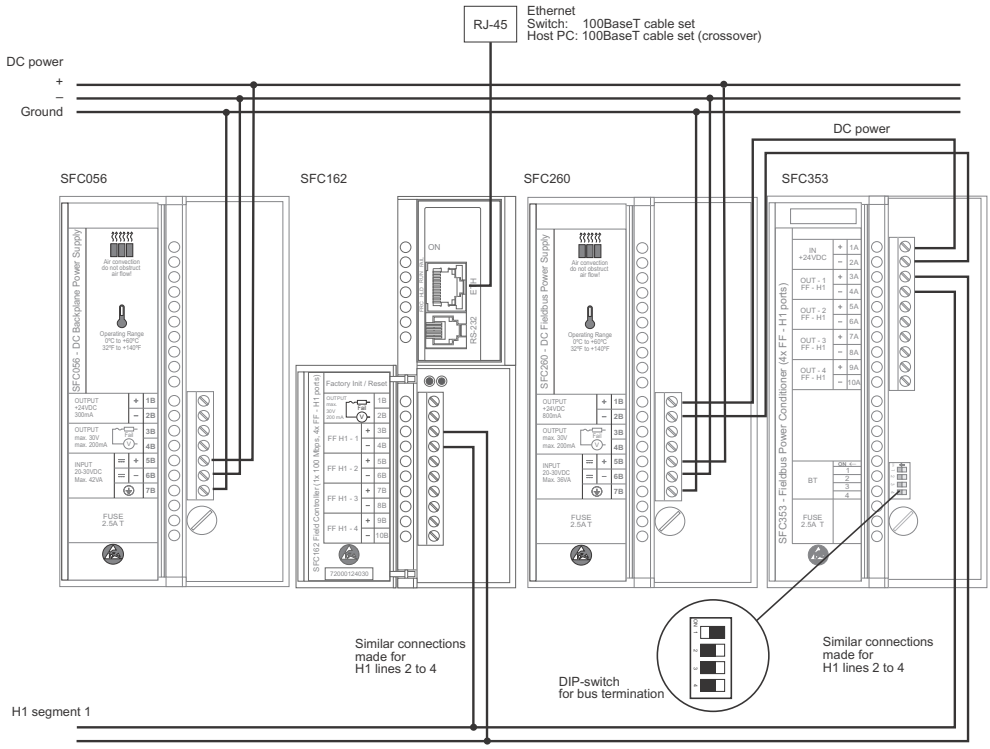


Fig. 4-2: Wiring diagram of basic FF controller when modules SFC 056/SFC 260 are used for the backplane and fieldbus power supply: one H1 segment

External 24 VDC supply Intrisically safe fieldbus

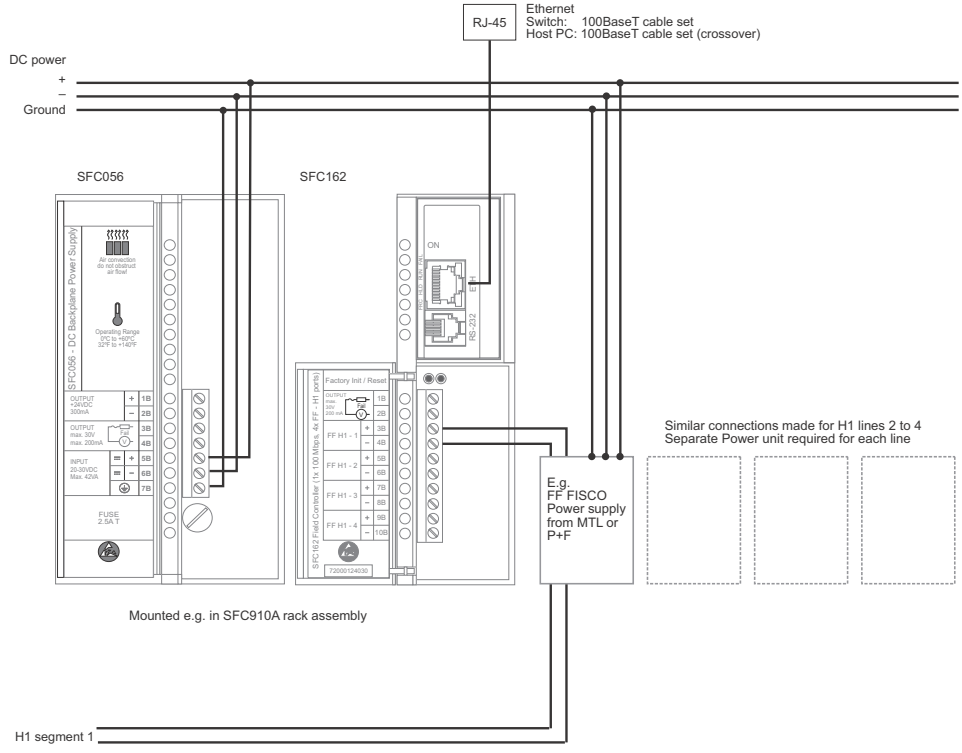


Fig. 4-3: Wiring diagram for intrinisically safe applications using a 24 VDC FF FISCO power supply for each F1 segment

4.2.2 Wiring up procedure

The following procedure applies to the basic controller shown in Fig. 4-1, but shows the principles of wiring that apply to all controller configurations. The snap-outs at the top and bottom of the modules can be removed to accommodate the cables to the terminal blocks.

Procedure

1 Connect the AC power supply to the input terminals of the SFC050 and SFC252 modules or connect the DC power supply to the input terminals of the SFC056 and SFC260 modules.

   – If necessary, provision should be made for a local on-off switch.

2 Connect the DC output (Terminals 1B and 2B) of the fieldbus power supply SFC252 or SFC260 to the SFC353 DC input (Terminals 1A and 2A).

3 Plug the Ethernet cable into the "ETH" socket of the SFC162 module:

   – SFC162: use 100BaseT cable set for a connection to an Ethernet hub or switch or use 100BaseT crossover cable set for a connection to a host PC

4 Connect the FF H1 bus to the SFC162 ports (Terminals 3B, 4B etc.) and to the SFC353 FF H1 ports (Terminals 3A, 4A etc.) and from there to the field devices.

   – Depending upon the grounding scheme you have adopted, the cable shielding should be connected to the cabinet or installation frame ground.

4.2.3 Bus termination

The four pole DIP-switch in the SFC353 module enables the internal bus terminators on FF H1 fieldbus ports. The switch number corresponds to the port number, e.g. Switch 1 for Port 1 etc..

- Check that for all connected ports, the corresponding switch is set to ON
- Check that the end of the bus is also terminated – see BA013S/04/en, FF Guidelines

If several intrinisically safe power supplies are being used, the terminator must be switched on at each unit.

4.2.4 Fault indication relay

A NC (Normally Closed) relay is connected to terminals of the following modules:

- SFC162 FF Field Controller, Terminals 1B and 2B
- SFC050 AC Backplane Power Supply, Terminals 3B and 4B
- SFC056 DC Backplane Power Supply, Terminals 3B and 4B
- SFC252 AC Fieldbus Power Supply, Terminals 3B and 4B
- SFC260 DC Fieldbus Power Supply, Terminals 3B and 4B

The rating is as follows: max 200mA and max. 30 VDC, supplied by and external power source.

In normal operation, the Field Controller SFC162 forces this relay to remain open. If any bad condition causes the processor to crash or the power is switched off or lost, the relay is closed. This status may be used:

- in redundancy situation where the back-up processor reads this contact and knows about the fault.
- to turn on an alarm.

4.3 PROFIBUS Field Controller

The basic controller comprises the following modules mounted on a SFC901A or SFC910 rack

- SFC050 AC backplane power supply or SFC056 DC backplane power supply
- SFC173 PROFIBUS Field Controller

The controller outputs a PROFIBUS DP signal at the front port. Connection to a PROFIBUS PA segment is via a segment coupler or link, e.g. from Pepperl+Fuchs or Siemens. This provides provides power to the PA segment and, depending upon type, acts as an intrinsically safe barrier.

4.3.1 Wiring diagrams

External 24V DC supply SFC056

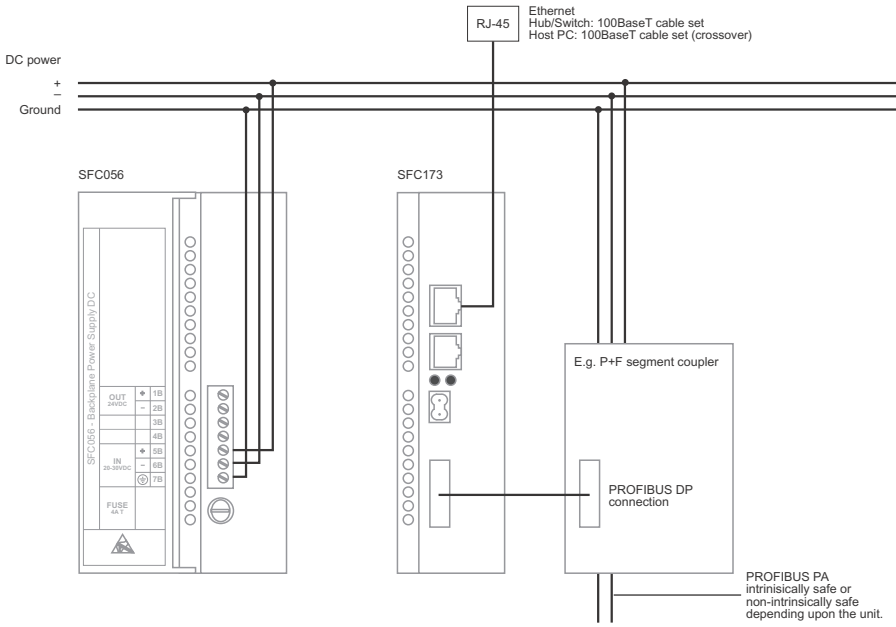


Fig. 4-4: DC wiring diagram of PROFIBUS Field Controller using segment coupler or link.

External AC supply SFC050

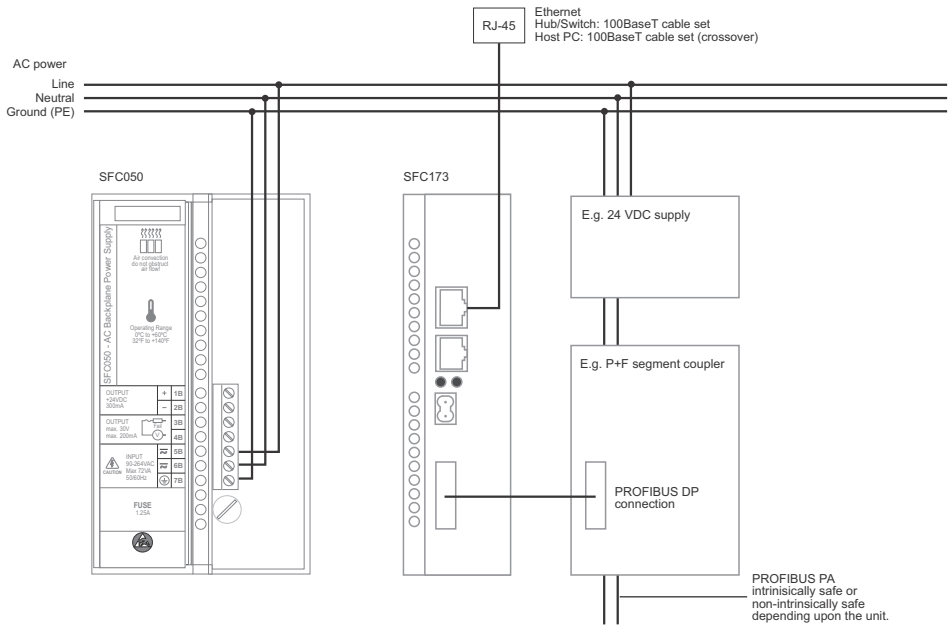


Fig. 4-5: AC wiring diagram for PROFIBUS Field Controller using segment coupler or link

4.3.2 Wiring up procedure

The following procedure applies to the basic controller shown in Fig. 4-4, but shows the principles of wiring that apply to all controller configurations. The snap-outs at the top and bottom of the modules can be removed to accommodate the cables to the terminal blocks.

Procedure

1 Connect the DC power supply to the input terminals of the SFC056 module and to the segment coupler or link.

   – If necessary, provision should be made for local on-off switches.
   – If you are using the SFC050 AC power supply, see Fig. 4.5 for connections
   Depending on coupler/link, it may be necessary to provide a 24 VDC power supply

2 Connect the PROFIBUS DP output of the SFC173 to the PROFIBUS DP intput of the segment coupler or link.

   – Depending on coupler or link type, this may be a plugged or screw terminal connection.

3 Plug the Ethernet cable into the "ETH" socket of the SFC173 module:

   – Use 100BaseT cable set for a connection to an Ethernet hub or switch
   – Use 100BaseT crossover cable set for a connection to a host PC

4 Connect the PROFIBUS PA segment to the segment coupler or link output and from there to the field devices.

   – Depending upon the grounding scheme you have adopted, the cable shielding should be connected to the cabinet or installation frame ground.
   – For bus termination etc. consult the operating instructions of the coupler/link

4.3.3 Bus termination

The segment must be terminated at the coupler or link and at the end of the segment. Check in the manufacturer's manual how this is done for the coupler or link. See also BA034S/04/en, PROFIBUS Guidelines.

4.3.4 Fault indication relay

A NC (Normally Closed) relay is connected to terminals of the following modules:

- SFC173 PROFIBUS Field Controller, 2-pin socket
- SFC050 AC Backplane Power Supply, Terminals 3B and 4B
- SFC056 DC Backplane Power Supply, Terminals 3B and 4B

The rating is as follows: max. 200mA and max. 30 VDC, supplied by and external power source.

In normal operation, the Field Controller SFC173 forces this relay to remain open. If any bad condition causes the processor to crash or the power is switched off or lost, the relay is closed. This status may be used::

- in redundancy situation where the back-up processor reads this contact and knows about the fault.
- to turn on an alarm.

4.4 Modbus

The Field Controller can act as a Modbus master or as a slave: for further information see the manuals:

- BA016S, ControlCare System Overview
- BA037S/04/en, ControlCare Application Designer, Modbus Tutorial.

The Field Controllers SFC162 and SFC173 make provision for the connection of Modbus, working as a Modbus gateway, either as:

- Modbus TCP via the Ethernet port or
- Modbus RTU via the RS-232 port

In order to make connections to the system, additional interfaces may be required for Modbus RTU:

- For applications in which the SFC162 or SFC173 module is connected to a Modbus RTU and more than one Modbus device needs to be connected to the same Modbus network, a RS232/RS485 converter must be used to provide a multi-point communication capability.
- For cases where only one Modbus device is used but the distance between both devices is more than 15 meters, a RS232/RS485 converter is also required.

Chapter 5.2 contains wiring examples of Modbus serial cable. Fig 4.6, below shows a possibility for connecting a Field Controller to a Modbus device with a two-wire RS-485 interface such as the Promass 83 flowmeter.

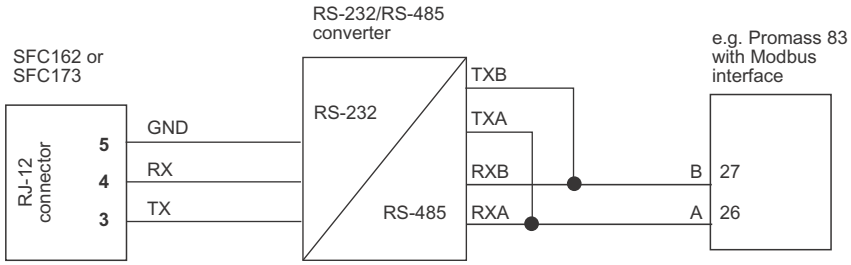


Fig. 4-6: Use of a RS-232/RS-485 converter to produce a Modbus connection between a Field Controller and a Modbus device with a two-wire RS-485 interface

4.5 I/O modules

The Field Controllers SFC162 and SFC173 are designed to operate with FOUNDATION Fieldbus and PROFIBUS instruments respectively. Many applications, however, require connection of devices that do not have Fieldbus communication.

Local I/O modules

Conventional discrete and analogue local I/O can be added on an extended backplane.

- Each Field Controller can be fitted with an I/O subsystem
- A maximum of 14 rack extensions are allowed per Field Controller (Nos. 1 – 14)
- Each rack has four slots, whereby as a rule of thumb, a rack power supply is required on every third rack, i.e. a maximum of 52 modules can be used
- The number of points is calculated from the number of I/Os per module, irrespective of whether they are actually used. For example, if all modules have 16 points, the maximum system size is 52 x 16 for the SFC162 = 832 points
- Depending upon configuration, up to 256 points can be used without significant influence on system performance.

The wiring diagrams of the I/O modules are to be found on the inside of the module door and in the following pages. Detailed specifications of the input and output modules are to be found in BA040S/04/en, System Specifications. Their commissioning with Application Designer is described in BA035S/04/en, Field Controller: Installation and Commissioning.

Table 4-1 shows the I/O modules currently available for the Field Controller.

Designation	Description	I/O Type
SFC411	Discrete Input 2x8 DI (24 VDC)	16 discrete inputs
SFC415	Discrete Input 2x8 DI (24 VDC sink)	16 discrete inputs
SFC420	Discrete Input 1x8 DI (on/off switches)	8 discrete inputs
SFC428	Discrete Output 2x8 DO (Relay NO)	16 discrete outputs
SFC432	Discrete Input/Discrete Output 1x8 DI (24 VDC) + 1x4 DO (Relay NO)	8 discrete inputs 4 discrete outputs
SFC435	Discrete Input/Discrete Output 1x8 DI (24 VDC) + 1x4 DO (Relay NC)	8 discrete inputs 4 discrete outputs
SFC438	Discrete Input/Discrete Output 1x8 DI (24 VDC) + 1x2+2 DO (Relay NO/NC)	8 discrete inputs 4 discrete outputs
SFC441	Pulse Input 2x8 DI (Impulse 100 Hz)	16 pulse inputs
SFC442	Pulse Input 2x8 DI (Impulse 10 kHz)	16 pulse inputs
SFC467	Pulse Input 2x DI Pulse Input(AC)	16 pulse inputs
SFC444	Analog Input 1x8 AI (with shunt)	8 analog inputs
SFC445	Analog Input 1x8 AI (Temperature RTD, Thermocouple)	8 temperature inputs
SFC446	Analog Output 1x4 AO	4 analog outputs
SFC457	Analog Input 1x8 AI (differential with shunt)	8 analog inputs

Tab. 4-1: Overview of local I/O modules

4.5.1 SFC411 Discrete Input module

The SFC411 Discrete Input module with 16x 24 VDC inputs can be powered by a single 24 VDC power supply or two separate power supplies connected to each group of inputs. Fig. 4-7 shows the wiring for a single power supply together with the input channel numbers for the associated Multiple Digital Input block or Digital Input block.

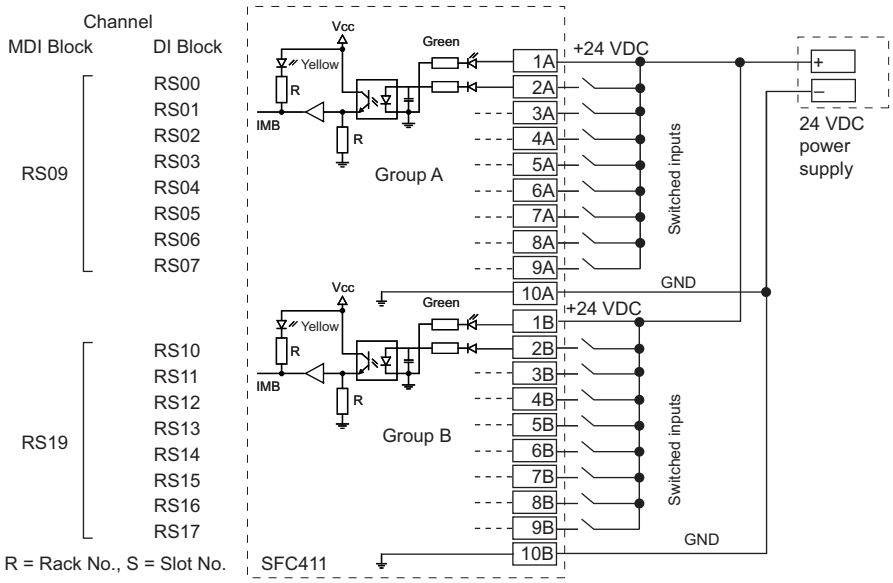


Fig. 4-7: Wiring of SFC411 Discrete Input module

4.5.2 SFC415 Discrete Input module

The SFC415 Discrete Input module (sink) with 16x 24 VDC inputs can be powered by a single 24 VDC power supply or two separate power supplies connected to each group of inputs. Fig. 4-7 shows the wiring for a single power supply together with the input channel numbers for the associated Multiple Digital Input block or Digital Input block.

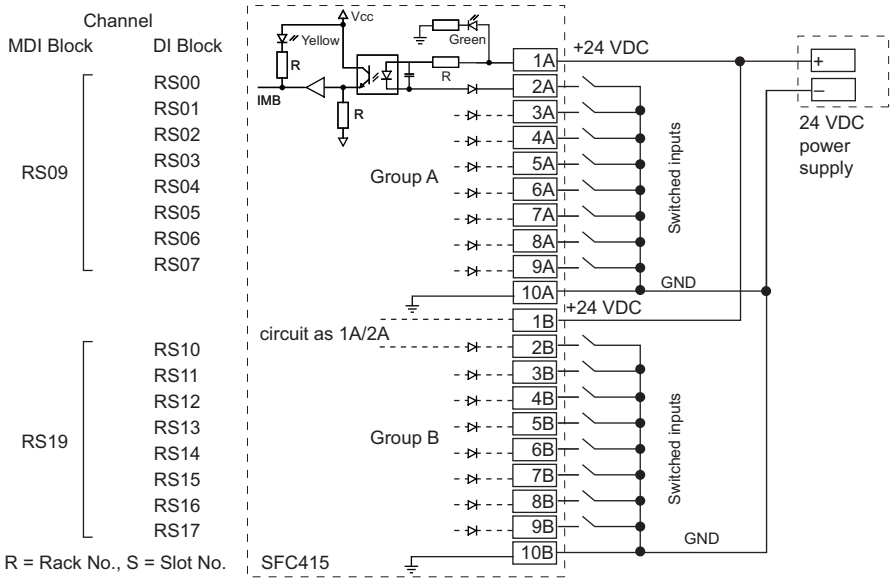


Fig. 4-8: Wiring of SFC415 Discrete Input module (sink)

4.5.3 SFC420 Discrete Input module

The SFC420 Discrete Input module provides 8 latched pushbuttons which can be used to set TRUE (pushbutton depressed) or FALSE (pushbutton normal) signals within the system. It requires no external power source. Fig. 4-9 shows the relationship between pushbutton and output channel number in the associated Digital Input block.

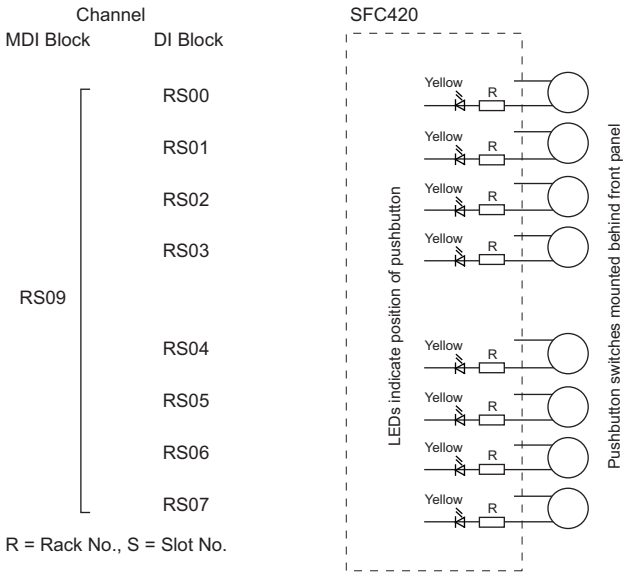


Fig. 4-9: Channel numbers of SFC420 Discrete Input Module

4.5.4 SFC428 Discrete Output

The SFC428 Discrete Ouput module with 16x NO relays can be wired in two ways: either as a common ground or common power circuit. The user has the choice of wiring each relay group to a single or two separate 24 VDC supplies. Fig. 4-10 shows the common ground wiring together with the output channel numbers of the associated Multiple Digital Output or Digital Output Block.

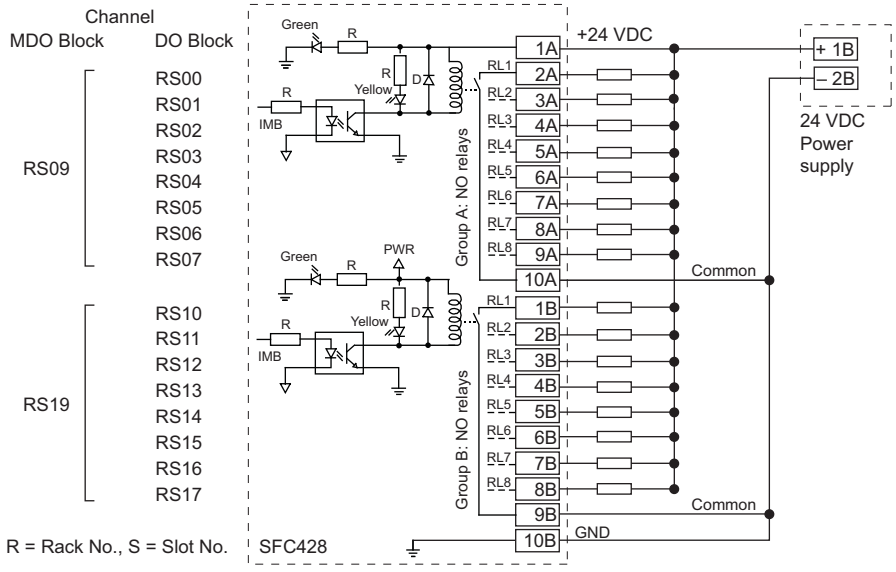


Fig. 4-10: Common ground wiring of SFC428 discrete output module (NO relay)

Fig. 4-11 shows the common power wiring together with the output channel numbers of the associated Multiple Digital Output or Digital Output Block.

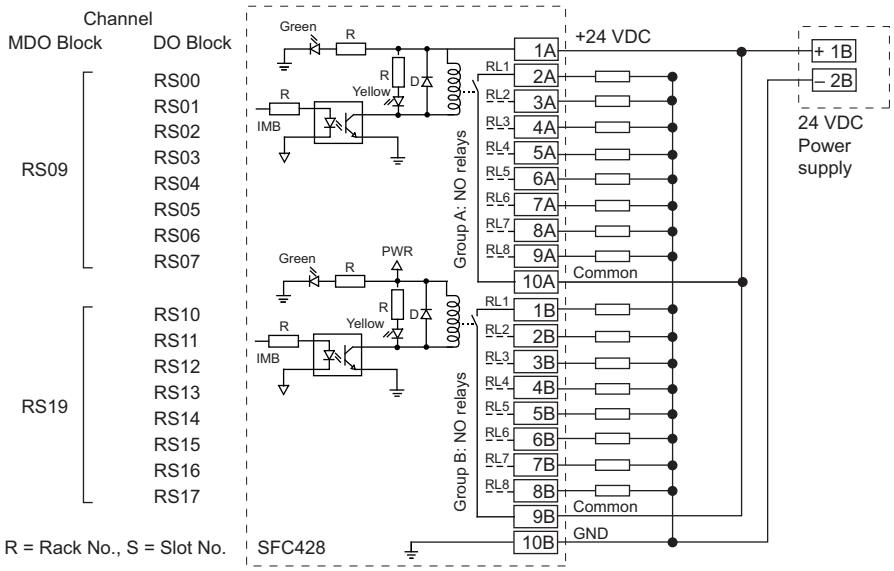


Fig. 4-11: Common power wiring of SFC428 discrete input module (NO relay)

4.5.5 SFC432 Discrete Input/Output

The Discrete Input/Output modules SFC432 with 8 switched inputs and 4 NO relays may be wired in several different ways. Fig 4-12 shows the wiring from a single 24 VDC power supply together with the input and output channel numbers of the associated Multiple Digital Input /Digital Input and Multiple Digital Output/Digital Output Block

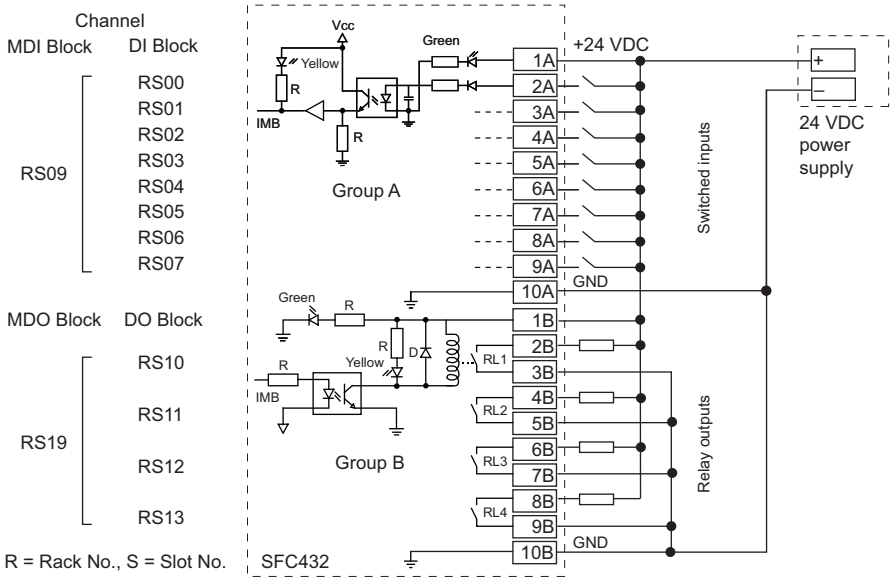


Fig. 4-12: Wiring of SFC432 Discrete I/O module using a single power source

Fig 4-13 shows the wiring from a separate 24 VDC power and relay power supplies together with the input and output channel numbers of the associated Multiple Digital Input /Digital Input and Multiple Digital Output/Digital Output Block

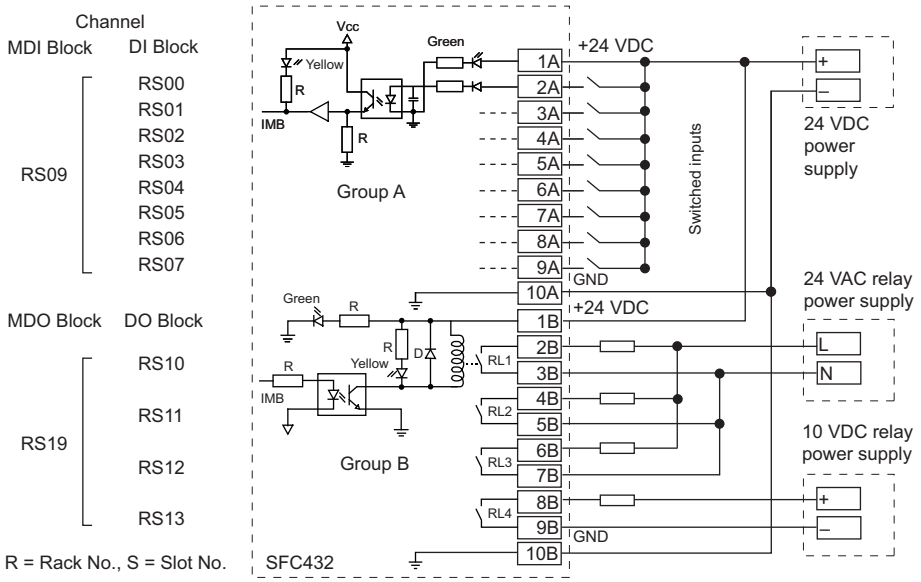


Fig. 4-13: Wiring of SFC432 Discrete I/O module using separate power supplies

4.5.6 SFC435 Discrete Input/Discrete Output

The Discrete Input/Output modules SFC435 with 8 switched inputs and 4 NC relays may be wired in several different ways. Fig 4-14 shows the wiring from a separate 24 VDC power and relay power supplies together with the input and output channel numbers of the associated Multiple Digital Input /Digital Input and Multiple Digital Output/Digital Output Block. The wiring for a single power supply is identical to that in Fig. 4-12.

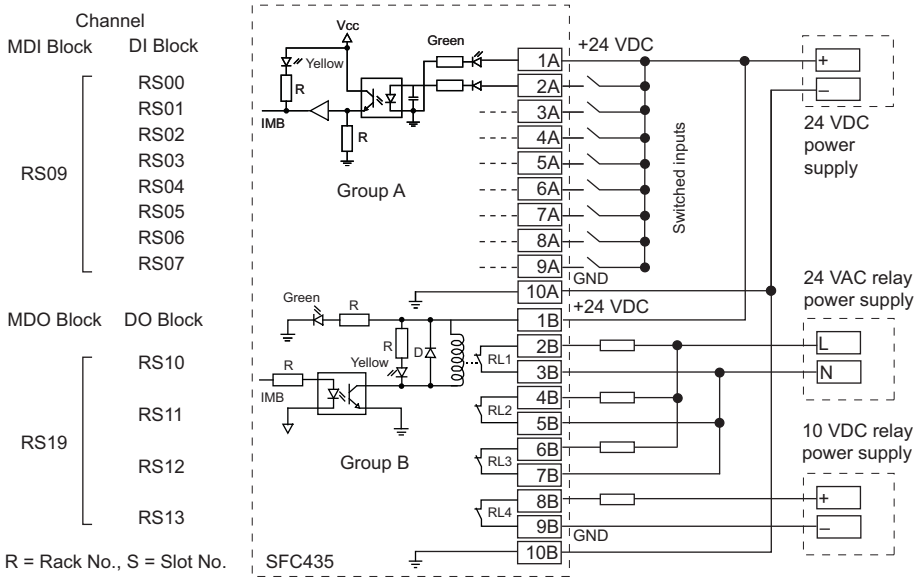


Fig. 4-14: Wiring of SFC435 Discrete I/O module using separate power supplies

4.5.7 SFC438 Discrete Input/Discrete Output

The Discrete Input/Output modules SFC438 with 8 switched inputs and 2 NO and 2 NC relays may be wired in several different ways. Fig 4-15 shows the wiring from a separate 24 VDC power and relay power supplies together with the input and output channel numbers of the associated Multiple Digital Input /Digital Input and Multiple Digital Output/Digital Output Block. The wiring for a single power supply is identical to that in Fig. 4-12.

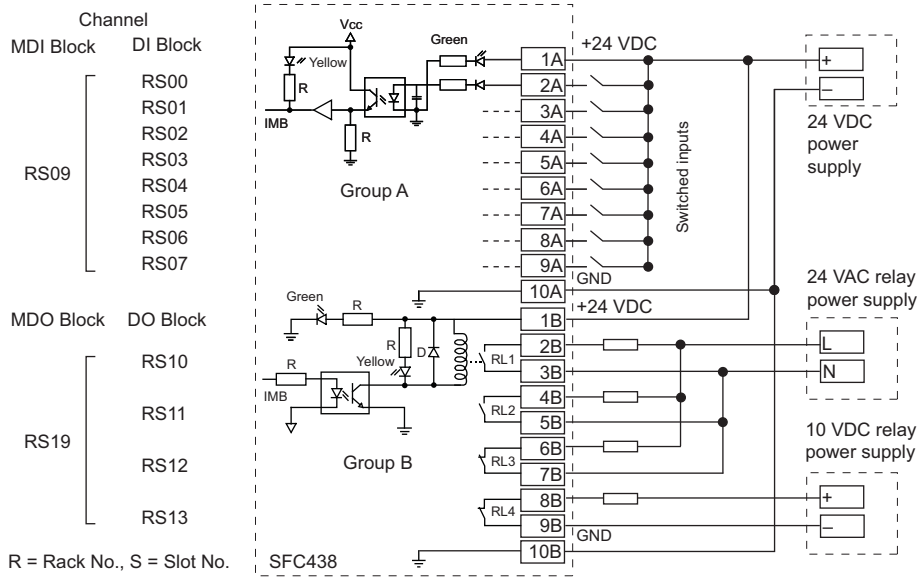


Fig. 4-15: Wiring of SFC435 Discrete I/O module using separate power supplies

4.5.8 SFC441, SFC442 Pulse Input

The Pulse Input modules SFC441 and SFC 442 with 16 pulse inputs may be wired with a common or separate power supply for each group of inputs. Fig 4-16 shows the wiring from a single 24 VDC power together with the input channel numbers of the associated Pulse Input block.

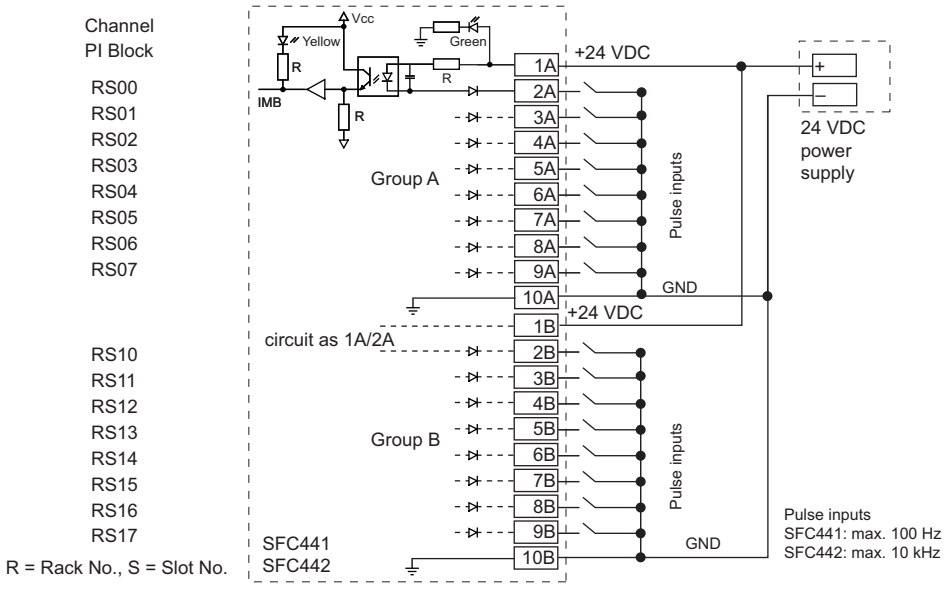


Fig. 4-16: Wiring of SFC441 and SFC442 Pulse Input module with single power supply

4.5.9 SFC467 Pulse Input

The Pulse Input moduls SFC467 with 16 AC inputs may be wired with a common or separate power supply for each group of inputs. Fig 4-17 shows the wiring from a single 24 VDC power together with the input channel numbers of the associated Pulse Input block.

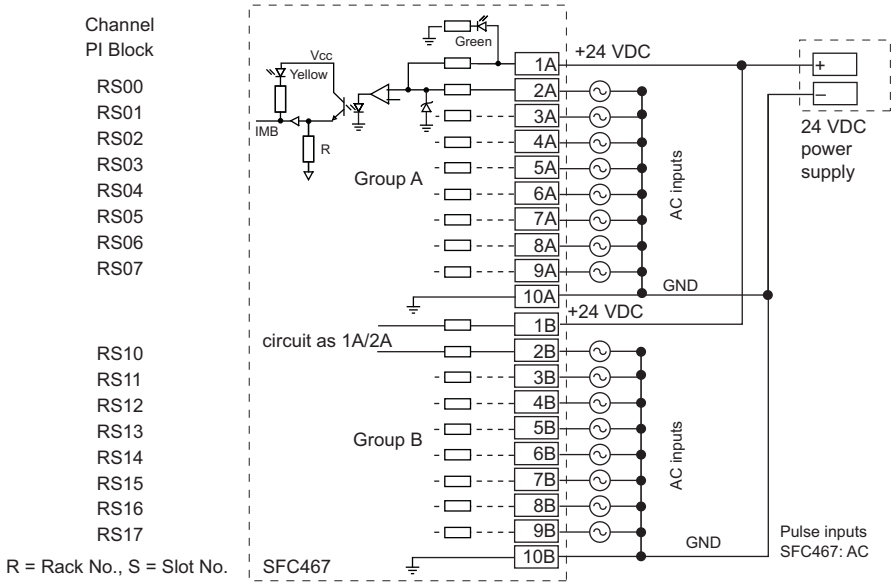


Fig. 4-17: Wiring of SFC467 Pulse Input module with single power supply

4.5.10 SFC444, SFC457 Analog Input

Loop-powered 4–20 mA/ HART devices

Loop-powered 4–20 mA/HART devices can be connected via e.g. the RN221N active barrier which is available in both non-Ex and Ex versions. Fig. 4-18 shows the wiring for the SFC444 analog input module with a loop-powered device operating in an explosion hazardous area together with the input channel numbers of the associated Multiple Analog Input and Analog Input block.

When used in Ex-applications, the RN221N must be mounted in a safe area and the device connected to it must have the appropriate Ex-certification.

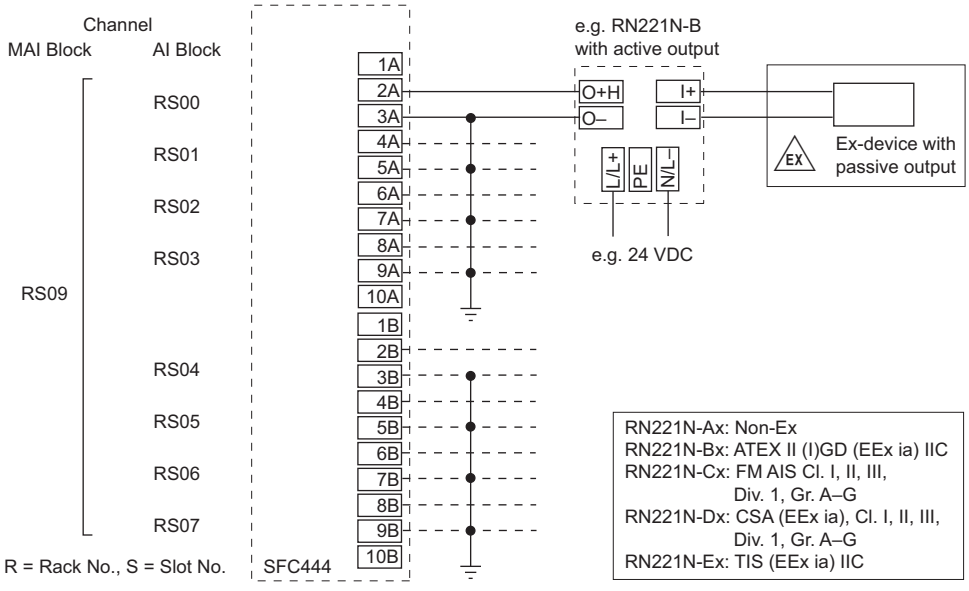


Fig. 4-18: Wiring of loop powered devices to SFC444 Analog Input module

Fig 4-19 shows the same for the SFC457 analog input module. When wired in this way it is possible to configure HART devices by connecting a Laptop with FieldCare to the two communication sockets in the front panel of the RN221N module.

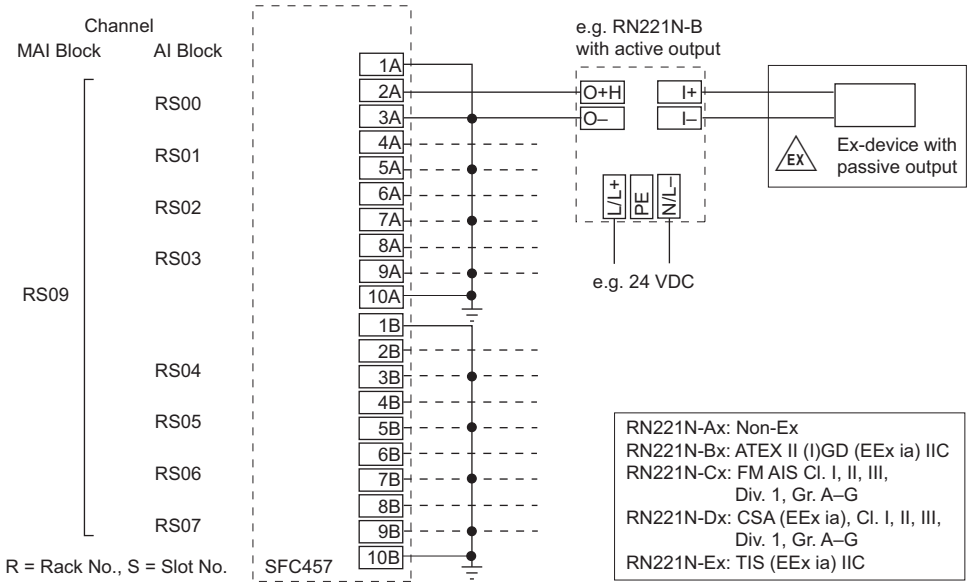


Fig. 4-19: Wiring of loop powered devices to SFC457 Analog Input module

Externally powered 4–20 mA/HART devices

In addition to power for the input loop, externally powered 4–20 mA/HART devices must also have a separate power supply. The signal line can be connected via the RN221N active barrier which is available in both non-Ex and Ex versions. When used in Ex-applications, the RN221N and Ex-certified power supply must be mounted in a safe area and the device connected to it must have the appropriate Ex-certification.

Fig. 4-20 shows the wiring for the SFC444 analog input module with a externally powered (4-wire) device operating in an explosion hazardous together with the input channel numbers of the associated Multiple Analog Input and Digital Analog block.

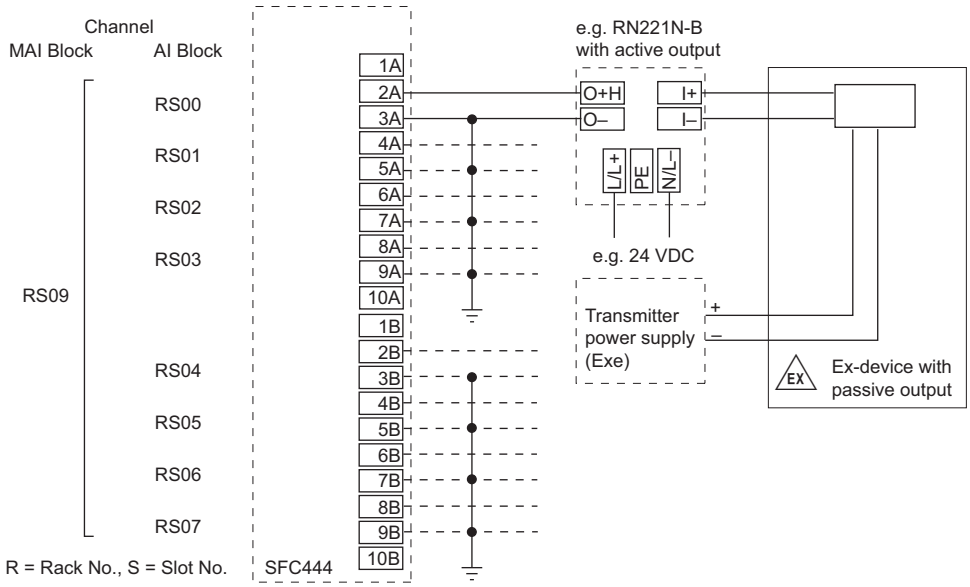


Fig. 4-20: Wiring of externally powered devices to SFC444 Analog Input module

Fig 4-21 shows the same for the SFC457 analog input module. When wired in this way it is possible to configure HART devices by connecting a Laptop with FieldCare to the two communication

sockets in the front panel of the RN221N module.

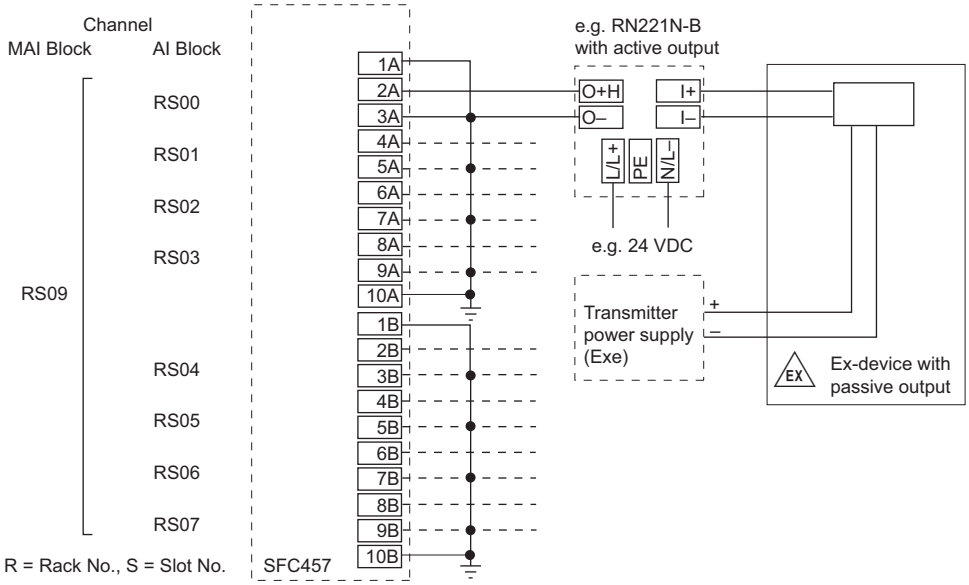


Fig. 4-21: Wiring of externally powered devices to SFC457 Analog Input module

Other voltage and current ranges

The SFC444 and SFC457 Analog Input modules can also be used to connect voltage inputs in the range ±10V and current inputs in the ±40 mA to the system. For more information on setup and configuration see Chapter 3.5.1, BA040S/04/en, System Specifications and BA035S/04/en, Field Controller: Installation and Commissioning.

4.5.11 SFC445 Analog Input (Temperature)

The SFC445 Analog Input module is designed for the connection of temperature measuring devices and low level electrical signals. Fig. 4-22 shows the wiring of 2-wire, 3-wire and differential circuits for the various input types together with the input channel numbers of the associated Multiple Analog Input and Analog Input block.

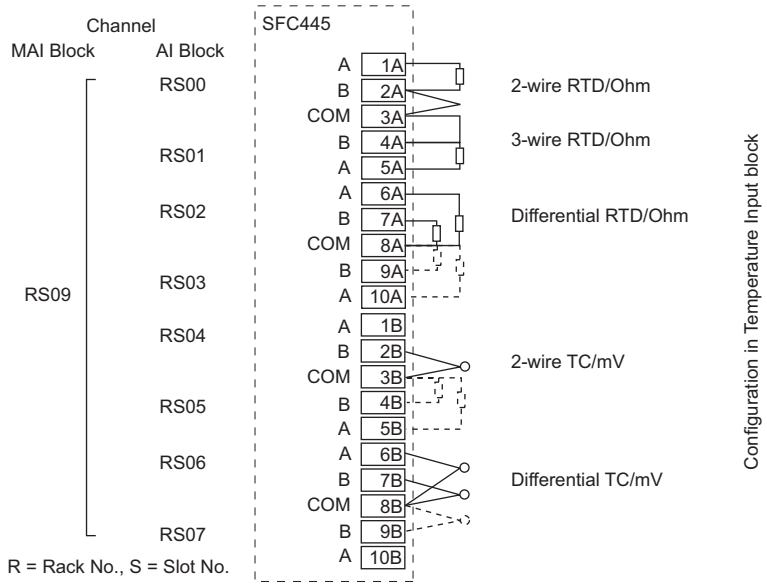


Fig. 4-22: Wiring of the SFC445 Temperature Analog Input module

4.5.12 SFC446 Analog Output

The SFC446 Analog Output module is designed for the connection of analog actuators and provides 4 outputs. The voltage range end value can be individually configured by means of DIP switches as 5V or 10V, see Section 3.5.1. If the connected device supports the HART protocol, the signal can be read by connecting e.g. a handheld via a communication resistor into to the 4–20 mA circuit.

Loop-powered 4–20 mA/ HART devices

Fig. 4-23 shows the wiring of the SFC446 for a loop-powered device together with the output channel numbers of the associated Multiple Analog Output and Analog Output block.

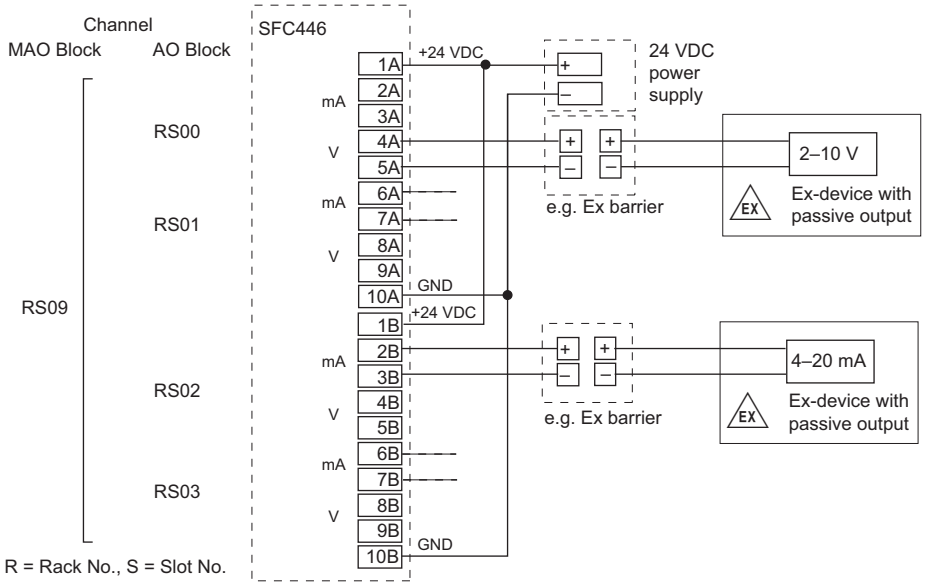


Fig. 4-23: Wiring of SFC446 Analog Output module for loop-powered devices

Externally powered 4–20 mA/HART devices

Fig. 4-24 shows the wiring of the SFC446 for an externally powered device together with the output channel numbers of the associated Multiple Analog Output and Analog Output block.

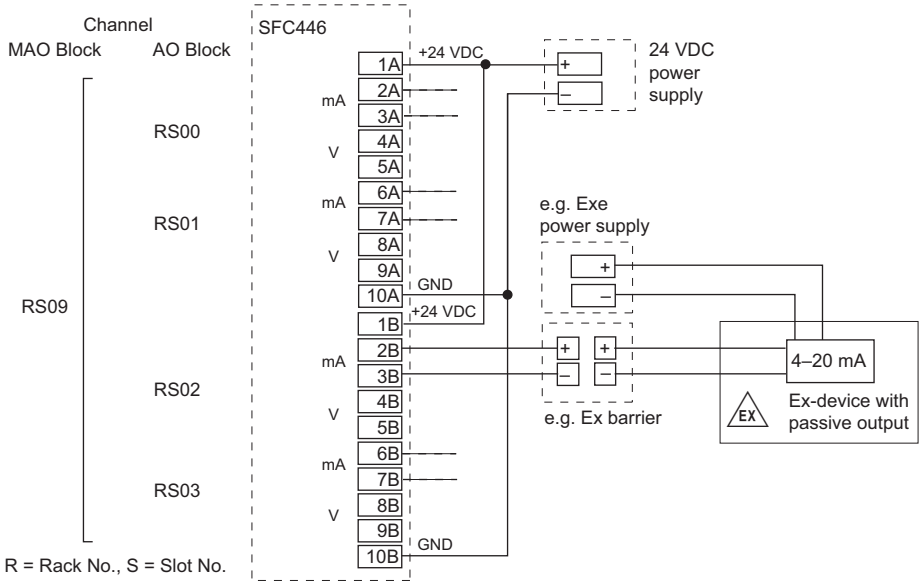


Fig. 4-24: Wiring of SFC446 Analog Output module for externally powered devices

5 Cable Specifications

5.1 Ethernet cable

Ethernet cables can be bought off the shelf or purchased from Endress+Hauser:

- SFC954, 2m standard cable
- SFC955, 2m crossover cable

To assemble an Ethernet cable, follow the specifications below.

- Standard cable is required between the Field Controller and the Ethernet Switch/HUB.
- Crossed cable, required between a PC and the Field Controller.
- Check that the cable is suitable for the transmission rate being used.

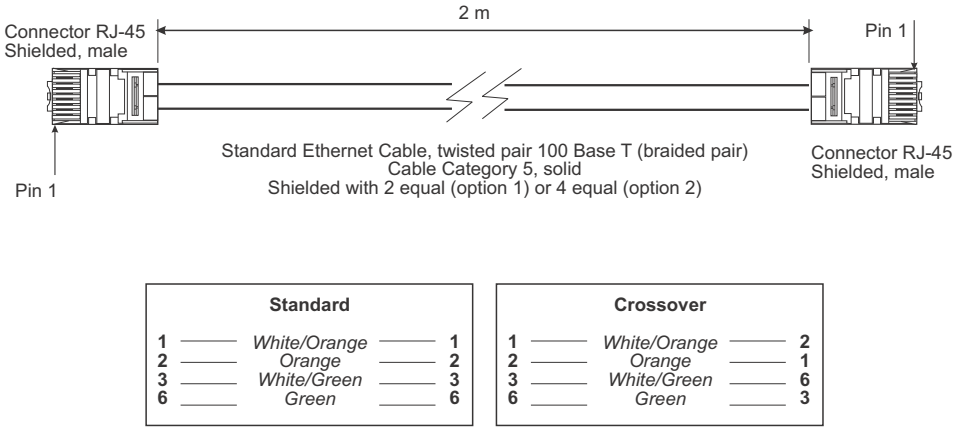


Fig. 5-1: Pin assignment for Ethernet 100 Base T cable with RJ-45 connector

Note!

- The colours are recommendations to EIA 586-B.

5.2 Serial cable (Modbus)

With RJ-12 connectors

To assemble a serial cable with 2 RJ-12 connectors, follow the instructions below.

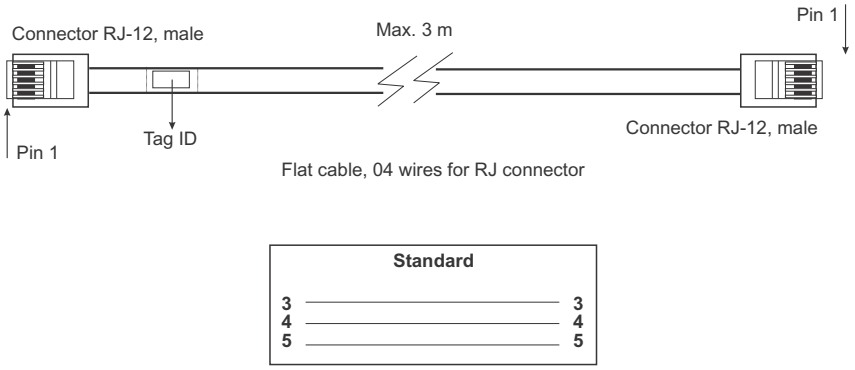


Fig. 5-2: Pin assignment for RS-232 cable with RJ-12 connectors

With RJ-12 and 9-pin Sub-DIN connector

To assemble a serial cable for use between the Field Controller and a Personal Computer, follow the instructions below. The serial connection is made to the COM port of the computer, which has usually has a 9-pin Sub-DIN male connector. You must make a cable with a RJ12 connector at one end and a 9-pin Sub-DIN female connector at the other.

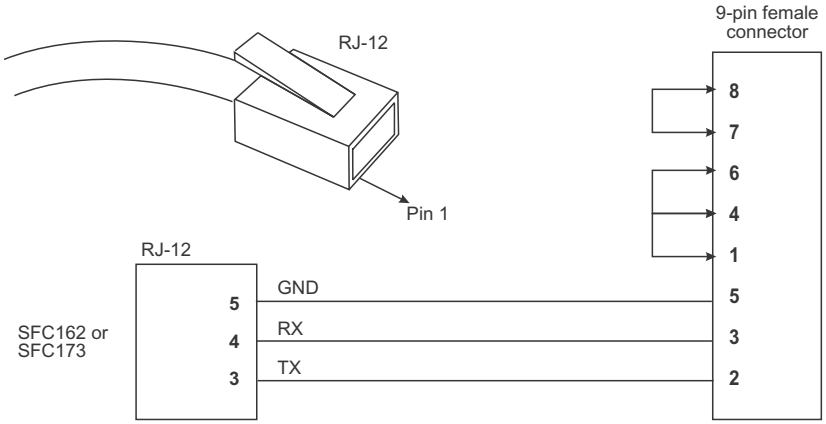


Fig. 5-3: Pin assignment for RS-232 cable with RJ-12 and DB9 female connector

Note!

- The jumpers on the 9-pin Sub-DIN side are recommended but not necessary. It depends on the application that is running in the PC.

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