

SIEMENS

SIMATIC

Y-Connection

Manual

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Edition 1

Safety Guidelines

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



Danger

indicates that death, severe personal injury or substantial property damage **will** result if proper precautions are not taken.



Warning

indicates that death, severe personal injury or substantial property damage **can** result if proper precautions are not taken.



Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken.

Note

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Qualified Personnel

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

Correct Usage

Note the following:



Warning

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

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

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Disclaimer of Liability

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

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Technical data subject to change.

Important Notes

Purpose of the Manual

The information contained in this manual will enable you to use the Y-connection.

Target Group

The manual describes the hardware of the Y-connection. It consists of instructive chapters and reference chapters (technical specifications).

The following subjects are covered:

- Configuration options
- Installing and wiring the Y-connection
- Commissioning and diagnostics of the Y-connection
- Technical specifications
- Order numbers

Scope of Validity

This manual describes the Y-connection and is valid for the following products:

- Y-connection with 200 mm rail, 2 different bus modules, 2 Y-IMs and 1 Y-coupler (installed and tested ready for operation): 6ES7 654-1YB00-0AB0
- Y-connection with 300 mm rail, 2 PS307; 2 A power supply modules, 2 different bus modules, 2 Y-IMs and 1 Y-coupler (installed and tested ready for operation): 6ES7 654-2YB00-0AB0
- Individual components:
 - Y-IM: 6ES7 654-0YS00-0AB0
 - Y-coupler: 6ES7 654-0YK00-0AB0
 - BM IM 157/IM 157 bus module: 6ES7 195-7HE80-0XA0
 - BM Y-coupler bus module: 6ES7 654-7HY00-0XA0
 - PS307; 2 A power supply module: 6ES7 307-1BA00-0AAA

It describes the components valid at the time of the manual's publication. We reserve the right to enclose a product information document containing current information with new components and new releases of components.

Position in the Information Landscape

In addition to this manual, you require the manual for the DP master used.

CD-ROM

The entire Y-connection documentation is also available on CD-ROM.

Standards, Certificates and Approvals

The Y-connection complies with EN 50170, Volume 2, PROFIBUS. The Y-connection meets the requirements and criteria of IEC 131, Part 2 and the requirements for CE marking. CSA, UL and FM certificates and approvals for the Y-connection have been granted. Please refer to Chapter 8 for further details on standards, certificates and approvals.

Recycling and Disposal

The Y-connection hardware is low in contaminants and can thus be recycled.

For further information about environment-friendly recycling and the procedure for disposing of your old equipment, please contact:

Siemens Aktiengesellschaft
Anlagenbau und Technische Dienstleistungen
ATD ERC Essen Recycling/ Remarketing
Frohnhauser Str. 69
45127 Essen

Phone: +49 201/816 1540 (hotline)

Fax: +49 201/816 1504

Aids to Finding Information

To help you find the information you require quickly, the manual offers the following aids:

- At the beginning of the manual you will find a comprehensive table of contents as well as lists of all the figures and tables that appear in the manual.
- Each chapter contains subheadings that provide you with an overview of the contents of the relevant sections.
- Following the appendices, you will find a glossary in which important technical terms used in the manual are defined.
- Finally, a comprehensive index allows quick access to information on specific subjects.

Additional Support

If you have queries of a technical nature, please get in touch with your contact at Siemens in the office or branch that you deal with. You will find the address in the manuals for the DP masters, in the appendix entitled "Siemens Worldwide" in the *S7-300 Programmable Controller, Hardware and Installation* manual, in catalogs and on CompuServe (GO AUTFORUM).

If you have any questions or suggestions concerning this manual, please fill out the form at the back and return it to the specified address.

If you require the device database file, you can download this from the **SchnittStellenCenter** Fürth via modem by dialing +49 (911) 737972 or on the Internet at http://www.ad.siemens.de/csi_e/gsd.

Constantly Updated Information

You can obtain constantly updated information on SIMATIC products on the Internet at <http://www.ad.siemens.de/>

In addition, SIMATIC Customer Support provides you with up-to-date information and downloads that can be useful to you when using SIMATIC products:

- On the Internet at http://www.ad.siemens.de/support/html_00/index.shtml
- Via the SIMATIC Customer Support mailbox at +49 (911) 895-7100

To access the mailbox, please use a modem with up to V.34 (28.8 kbps) and the following parameter settings: 8, N, 1, ANSI. Alternatively, use ISDN (x.75, 64 kbps).

You can contact SIMATIC Customer Support by phone at +49 (911) 895-7000 or by fax at +49 (911) 895-7002. You can send questions by e-mail on the Internet or to the above-mentioned mailbox.

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Product Overview

In This Appendix

The product overview tells you:

- How the Y-connection fits into the programmable controller landscape
- The components that belong to the Y-connection

Chapter Overview

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1.1	What Are Distributed I/O Devices?	1-1
1.2	What is the Y-Connection?	1-3

1.1 What Are Distributed I/O Devices?

Distributed I/O Devices – Area of Application

When a system is set up, the inputs and outputs to and from the process are often located centrally in the programmable logic controller.

If there are inputs and outputs at a considerable distance from the programmable logic controller, there may be long runs of cabling which are not easy to follow, and electromagnetic interference may impair reliability.

Distributed I/O devices are the ideal solution for such systems:

- The controller CPU is located centrally.
- The I/O devices (inputs and outputs) operate locally on a distributed basis.
- The high-performance PROFIBUS-DP bus system with its high transmission rates ensures that the controller CPU and I/O devices communicate smoothly.

What Is PROFIBUS-DP?

PROFIBUS-DP is an open bus system based on the *EN 50170, Volume 2, PROFIBUS* standard with the “DP” transmission protocol (DP being the German abbreviation for distributed I/O).

Physically, PROFIBUS-DP is either an electrical network based on a shielded two-wire line or an optical network based on a fiber-optic cable.

The “DP” transmission protocol allows rapid, cyclic exchange of data between the controller CPU and the distributed I/O devices.

What Is a Redundant PROFIBUS-DP?

Distributed I/O devices are usually connected to the PROFIBUS-DP with only one DP interface.

The redundant PROFIBUS-DP system consists two PROFIBUS-DP systems installed in duplicate. Fault-tolerant programmable logic controllers (H systems) that communicate across the redundant PROFIBUS-DP system with redundant, distributed I/Os, are connected to the two PROFIBUS-DP systems.

With the Y-connection, you can now also operate distributed I/O devices with only one PROFIBUS-DP interface on redundant fault-tolerant systems.

What Are DP Masters and DP Slaves?

The DP master links the controller CPU to the distributed I/O devices. The DP master exchanges data with the distributed I/O devices via the PROFIBUS-DP system and monitors the PROFIBUS-DP.

The distributed I/O devices (= DP slaves) prepare the data of the sensors and actuators locally so that they can be transmitted via PROFIBUS-DP to the controller CPU.

Which Devices Can Be Connected to the PROFIBUS-DP System?

An extremely wide range of devices can be connected to the PROFIBUS-DP system as DP masters or DP slaves, provided they comply with *EN 50170, Volume 2, PROFIBUS*. The devices that can be used include the following:

- SIMATIC S5
- SIMATIC S7/M7/C7
- SIMATIC programming device/PC
- SIMATIC HMI (OP, OS and TD operator interfaces)
- Devices from other manufacturers

1.2 What is the Y-Connection?

Y-Connection

With the Y-connection, you can connect distributed I/O devices with an PROFIBUS-DP interface to a redundant fault-tolerant system.

The Y-connection consists of two Y-IMs and one Y-coupler. The two Y-IMs connect the Y-connection to the redundant fault-tolerant system via the PROFIBUS-DP system. The Y-coupler connects the Y-connection to the distributed I/O devices on the Y-chain.

In redundant operation, a Y-IM (master) is through-connected to the Y-chain, while the second Y-IM (standby) is locked. If a component of the preferred channel fails (DP master, Y-connection or interconnecting cable), there is a bumpless switchover to the standby (second Y-IM).

Figure 1-1 below shows how the Y-connection is integrated in the system.

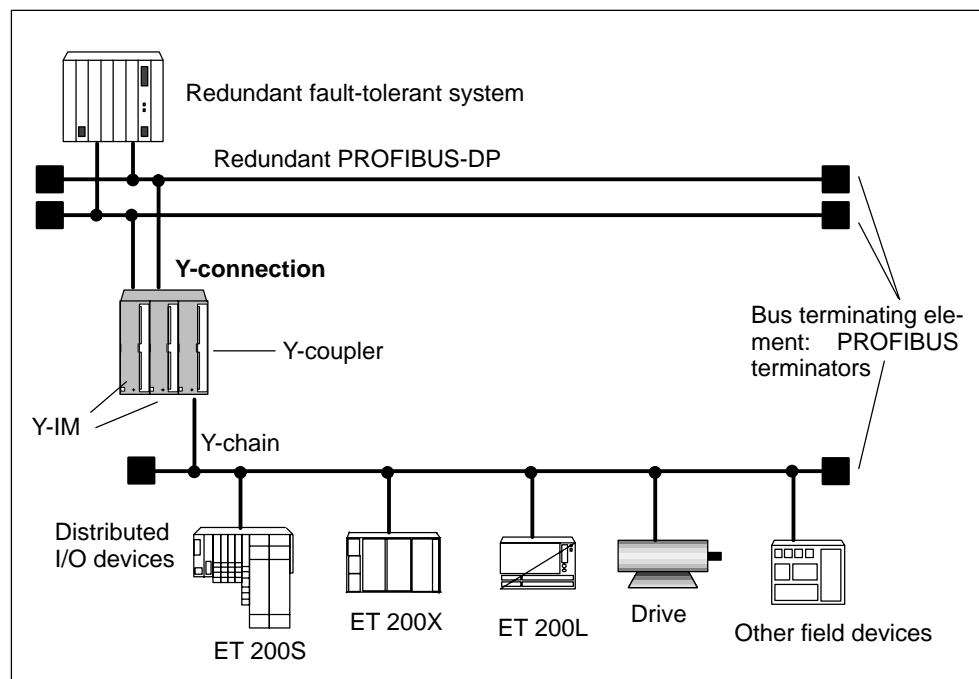


Figure 1-1 Y-Connection in the System

Areas of Application

The Y-connection can be used in redundant DP standard master systems (e.g. S5 fault-tolerant systems).

Y-Connection Features

The Y-connection has the following features:

- The Y-connection is a DP standard slave on the PROFIBUS-DP that is transparent to all the connected nodes on the redundant PROFIBUS-DP and on the Y-chain.
- Bumpless switchover between the master and standby Y-IM
- Hot swapping of one Y-IM at a time (module replacement during operation)
- Diagnosis by means of LEDs and a diagnostic frame
- The Y-connection occupies one input and output byte in the input and output area of the process image.
- Isolation between PROFIBUS-DP and supply voltage
- Isolation between PROFIBUS-DP and Y-chain
- Supports all PROFIBUS-DP transmission rates from 9.6 kbps to 12 Mbps
- Degree of protection, IP 20

Configuration

Configure the Y-connection by means of a device database file. The Y-connection is integrated in your system as a DP standard slave by means of the device database file.

Components

The table below gives you an overview of the most important components of the Y-connection:

Table 1-1 Components of the Y-Connection

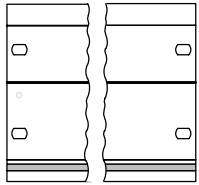
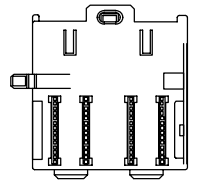


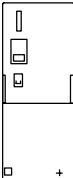

Component	Function	Drawing
Rail	... accommodates the Y-connection	
Active bus modules (BM) <ul style="list-style-type: none"> • BM IM 157/IM 157 for the Y-IM • BM Y-coupler for the Y-coupler 	... connect the two Y-IMs and the Y-coupler via the backplane bus	

Table 1-1 Components of the Y-Connection

Component	Function	Drawing
Y-IM	... connects the Y-connection to the redundant PROFIBUS-DP	
Y-coupler	... connects the Y-connection to the Y-chain	
Power supply (PS)	... converts the line voltage (120/230 V AC) to 24 V DC operating voltage to supply the Y-connection	
PROFIBUS cable with bus connector	... interconnects nodes in a PROFIBUS-DP configuration.	

Configuration Options

Chapter Overview

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2.1 Y-Connection in a Redundant S5 Fault-Tolerant System

Sample Configuration

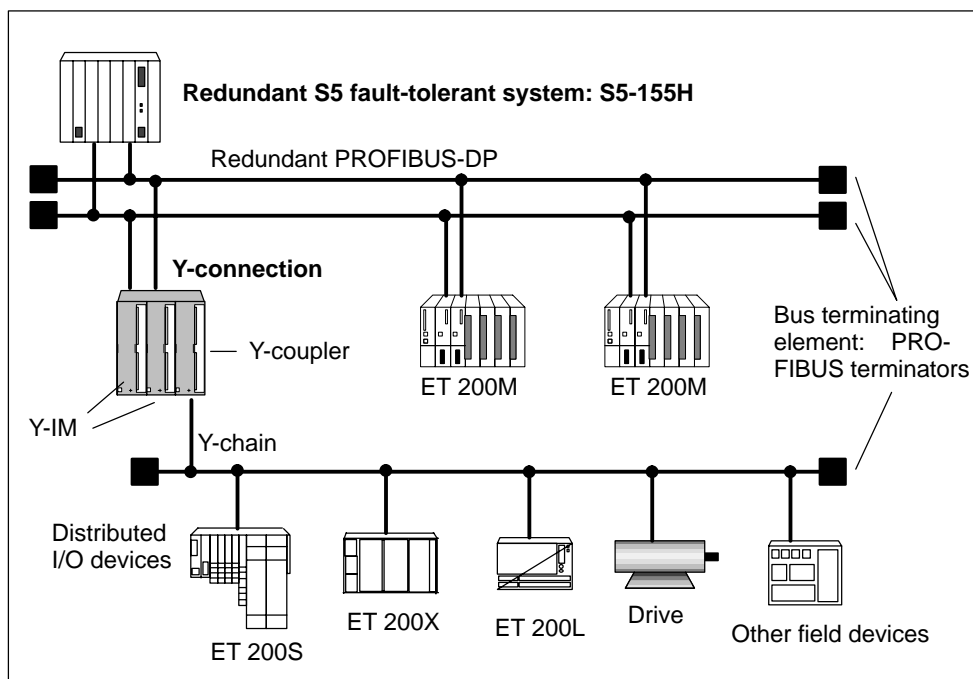


Figure 2-1 Y-Connection in a Redundant S5 Fault-Tolerant System

2.2 Y-Connection in a Redundant DP Standard Master System

Sample Configuration

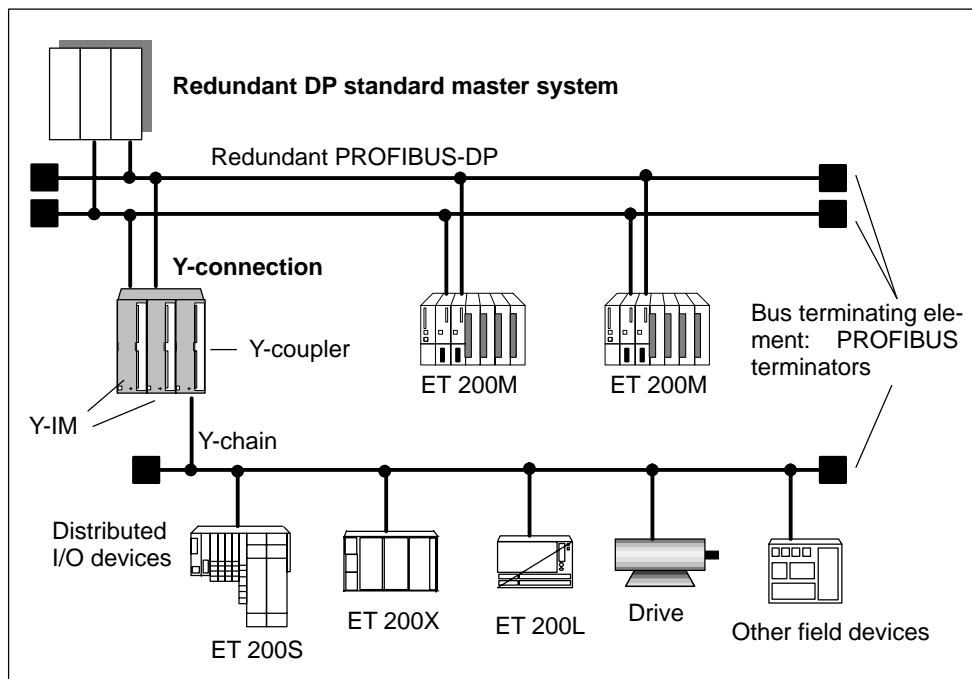


Figure 2-2 Y-Connection in a Redundant DP Standard Master System

2.3 General Rules for Using the Y-Connection

Comply with the Following Rules.

This ensures trouble-free operation of the Y-connection:

PROFIBUS Addresses

The following nodes must have the same PROFIBUS address:

- The same PROFIBUS address must be set on the two DP masters (e.g. IM 308-C) of the fault-tolerant system.
- You must assign two identical PROFIBUS addresses for each Y-connection. Set the PROFIBUS addresses using the DIP switches on the Y-IMs.

No Cascading

Cascading the Y-connection is **not** permissible:

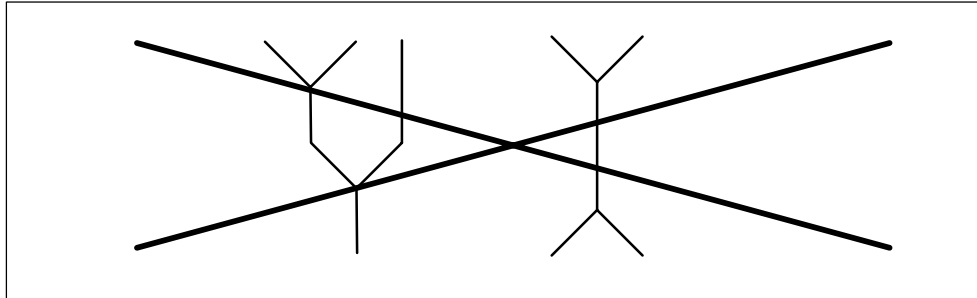


Figure 2-3 Cascading

Number of Y-Connections

The number of Y-connections on a redundant PROFIBUS-DP is only limited by the maximum number of bus nodes (126).

Connection to the Redundant PROFIBUS-DP

You can connect the Y-connections at any point on the redundant PROFIBUS-DP (e.g. at the beginning, in the middle or at the end).

Terminating the Redundant PROFIBUS-DP and the Y-Chain

You must terminate the redundant PROFIBUS-DP and the Y-chain either with PROFIBUS terminators or the integrated bus connector resistors of the bus connector.

Number of Fault-Tolerant Systems

The Y-connection can only be connected to one fault-tolerant system with 2 redundantly connected DP masters via the redundant PROFIBUS-DP chains.

Number of Distributed I/O Devices

You should connect a maximum of 30 distributed I/O devices to each Y-chain – even if you extend the cable lengths using RS 485 repeaters or optical link modules (OLM).

The number of distributed I/O devices that can be directly connected to the Y-connection decreases with each RS 485 repeater and OLM on the Y-chain.

Connecting OPs

Operator panels (OPs) must not be connected to the Y-chain.

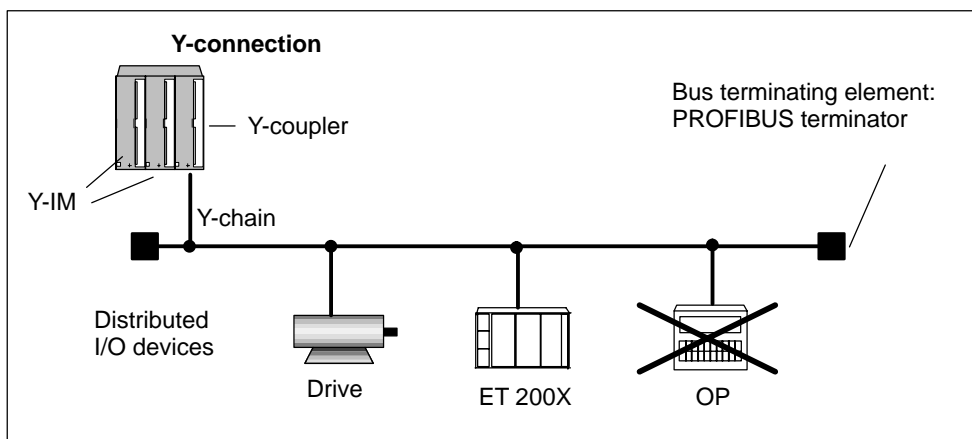


Figure 2-4 Connecting OPs

Direct Communication and Equidistance

Direct communication via the Y-connection and equidistance are not supported.

Cable Length of the Y-Chain

The cable length of the Y-chain corresponds to the standard length of PROFIBUS-DP:

- 9.6 to 187.5 kbps: 1000 m
- 500 kbps: 400 m
- 1.5 kbps: 200 m
- 3 to 12 Mbps: 100 m

You can increase the cable lengths using RS 485 repeaters or OLMs/OBTs. You can find the permissible cable lengths in the associated manuals (see the ST 70 catalog).

2.4 Rules for Using the Y-Connection in DP Standard Master Mode

Comply with the Following Rules

This ensures trouble-free operation of the Y-connection in DP standard master mode:

DP Standard Slaves in Accordance with EN 50170 on the Y-Chain

On the Y-chain of the Y-connection you can operate all passive DP standard slaves without expansion for records (cyclic data transfer only) that comply with EN 50170, Volume 2. This includes, for example:

- The distributed I/O devices ET 200X, ET 200S, ET 200L etc.

Response Monitoring Time for a Redundant PROFIBUS-DP System with One-Sided DP Slaves

After the fault-tolerant system has been configured with one-sided DP slaves, you will receive two different response monitoring times for the redundant PROFIBUS-DP. Set the longer response monitoring time in both DP masters in the fault-tolerant system.

Installation

Chapter Overview

Section	Topic	Page
3.1	Installation Position and Clearances	3-2
3.2	Installing the Rail	3-3
3.3	Installing the Y-IM and Y-Coupler	3-5
3.4	Installing the PS307; 2 A Power Supply Module	3-7

Delivery Formats

The Y-connection is available in various formats. There may be some information contained in this chapter that you don't need, depending on which delivery format you choose. The table below is intended to help you find out which information you require (for the order numbers, see Appendix A):

- Delivery format **1**: Y-connection as a bundle (ready for operation and tested) consisting of 2 Y-IMs, 1 Y-coupler, 2 different bus modules, 2 PS307; 2 A power supply modules and a 300 mm DIN rail.
- Delivery format **2**: Y-connection as a bundle (ready for operation and tested) consisting of 2 Y-IMs, 1 Y-coupler, 2 different bus modules and a 200 mm DIN rail.
- Delivery format **3**: Y-connection as a bundle (ready for operation and tested) consisting of individual components.

Table 3-1 Installation Information

Section	Topic	Delivery Format		
		1	2	3
3.1	Installation Position and Clearances	X	X	X
3.2	Installing the Rail	X	X	X
3.3	Installing the Y-IM and Y-Coupler			X
3.4	Installing the PS307 2A Power Supply Module			X

3.1 Installation Position and Clearances

Installation Position

The installation position of the Y-connection is horizontal or vertical.

Clearances

Complying with minimum clearances ensures the following:

- You will ensure that the Y-connection does not get too hot.
- You will have adequate space for inserting and removing the modules.
- You will have sufficient space for running cables.

Figure 3-1 shows you the clearances to nearby cable ducts, apparatus, cabinet walls etc. for the Y-connection.

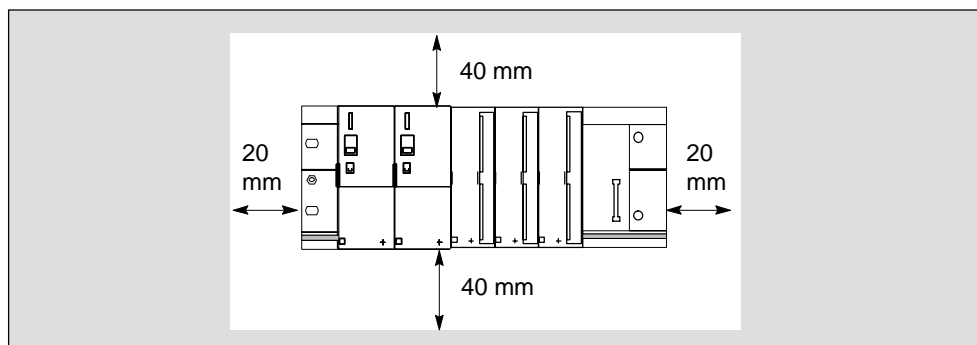


Figure 3-1 Clearances for the Y-Connection on a Mounting Rack

3.2 Installing the Rail

Length of the Rail

The length of the required rail depends on the structure of the Y-connection:

- 200 mm rail: Y-connection consists of two Y-IMs and one Y-coupler
- 300 mm rail: Y-connection consists of two Y-IMs, one Y-coupler and two PS307; 2 A power supply modules

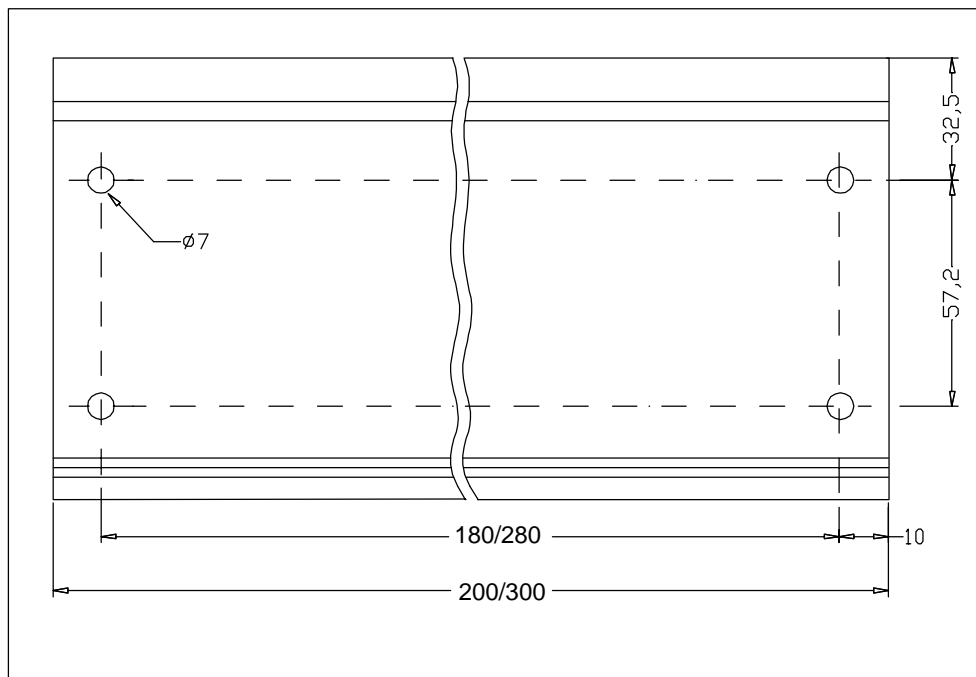


Figure 3-2 Dimensioned Drawing for Fixing Holes

Note

The rails are only available in the lengths specified (200 mm and 300 mm) in the Y-connection bundle.

The rails can be ordered in standard lengths. You can find the order numbers in the *ST 70 catalog*.

Fixing Screws

You have a choice of the following screw types for fixing the rail.

For	Type of Screw	Description
External fixing screws	M6 cheese-head screw M6 to ISO 1207/ ISO 1580 (DIN 84/DIN 85)	Choose a suitable screw length for your configuration. You will also require 6,4 washers to ISO 7092 (DIN 433)
	M6 hexagon-head screw to ISO 4017 (DIN 4017)	

Installing the Rail

To install rails, proceed as follows:

1. Choose a position for the rail that leaves enough room to install it properly and enough space to cope with the temperature rise of the modules (leave at least 40 mm /1.56 in. free above and below the rail; see Figure 3-1 on page 3-2)
2. Screw the rail to its base (size: M6). Is this base a metallic plate or a grounded supporting plate?

If so: Make sure there is a low-impedance connection between the rail and the base. In the case of painted or anodized metals, for instance, use a suitable contacting agent or contact washers.

If not: No particular steps are required.

3. Connect the rail to the protective conductor. The protective conductor must be clamped with a cable lug (for an M6 screw) on one of the 4 fixing screws. To ensure contact, insert a contact disk between the rail and the cable lug.

Minimum cross-section from the conductor to the protective conductor: 10 mm².

Note

Ensure that your connection to the protective conductor is low-impedance (see Figure 3-3). If the Y-connection is mounted on a hinged rail, you must use a flexible cable to establish the connection to the protective conductor.

Protective Conductor Connection

Figure 3-3 shows you the protective conductor on the rail (200 mm and 300 mm).

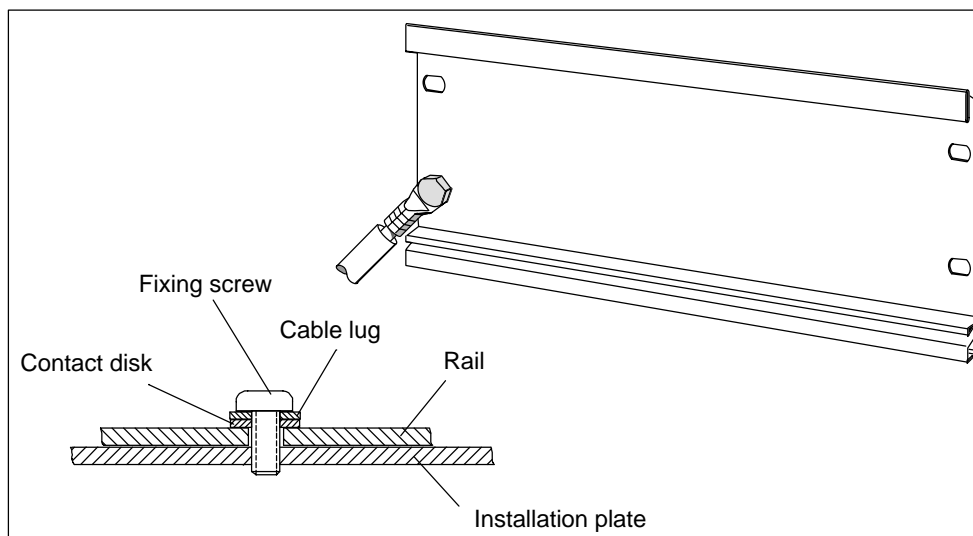


Figure 3-3 The Protective Conductor on the Rail

3.3 Installing the Y-IM and Y-Coupler

Prerequisites

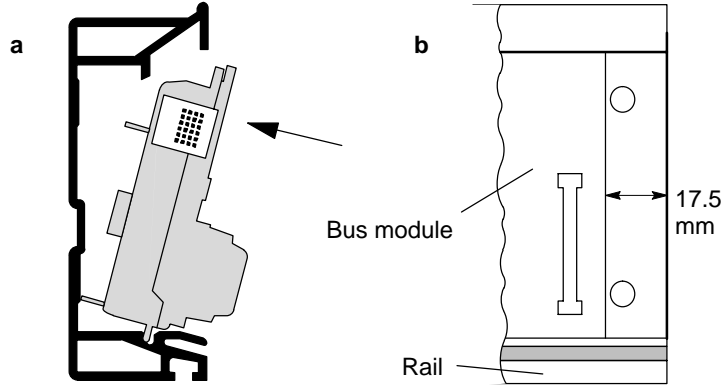
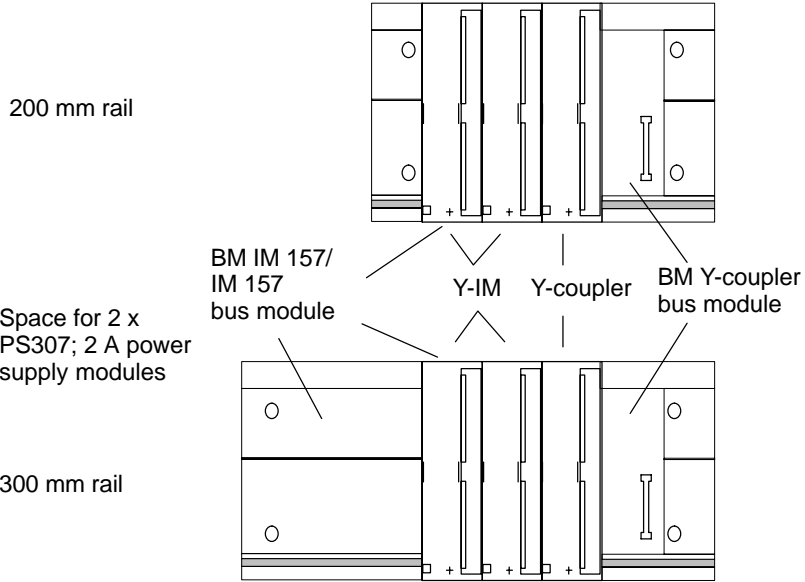
You require

- 200 mm or 300 mm rails or a standard length that can be ordered (see Catalog ST 70)
- 2 Y-IMs (6ES7 654-0YS00-0AB0)
- 1 Y-coupler (6ES7 654-0YK00-0AB0)
- 1 BM IM 157/IM 157 bus module (6ES7 195-7HE80-0XA0)
- 1 BM Y-coupler bus module (6ES7 654-7HY00-0XA0)

Installing Bus Modules and Modules

Install the bus modules **from right to left!**

Only install bus modules if they are deenergized.

Step	Activity
1	<p>Hook the lower edge of the BM Y-coupler bus module onto the rail, press it into the rail (a), and push it to the right, 17.5 mm away from the right edge of the rail (b).</p> 
2	<p>Hook the BM IM 157/IM 157 bus module onto the rail and push it into the rail. Push it towards the first bus module, so that the module connectors have contact and engage.</p> <p>Are you using the 300 mm rail? There is still space to the left of the BM IM 157/IM 157 bus module for 2 x PS307; 2A.</p>
3	<p>Plug the modules into the bus modules. Use the side guides of the bus modules to do this. When you screw in the modules, fix the bus module to the rail at the same time. The figure below shows you the order in which to insert the modules:</p> 
4	<p>Insert the bus module cover on the right bus module (included with the IM 157/IM 157 bus module).</p>

Removing the Bus Modules

Only remove bus modules if they are deenergized.

Note

During operation of the Y-connection you can remove and insert one of the two Y-IMs. Remember that the Y-IM must only be removed or inserted in a deenergized state (switch off the 24 V DC supply voltage). See Chapter 6.

3.4 Installing the PS307; 2 A Power Supply Modules

Prerequisites

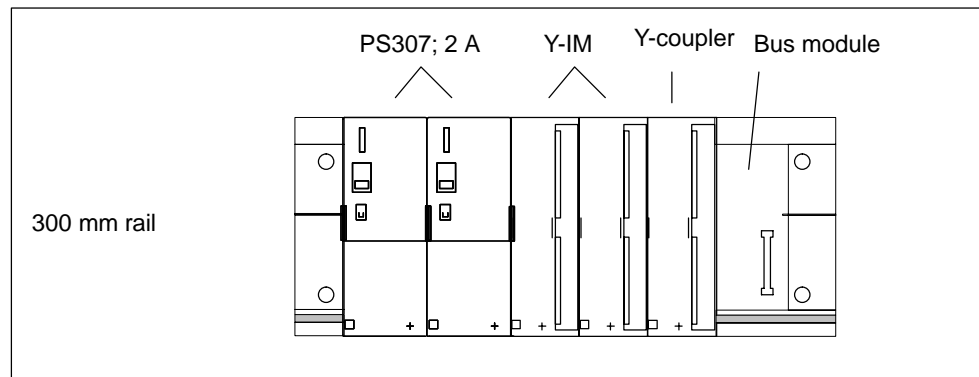
You require

- 2 x PS307; 2 A power supply modules (6ES7 307-1BA00-0AA0)
- A rail 300 mm or longer with an installed Y-connection

Installing the PS307; 2 A Power Supply Modules

Install the power supply module to the left of the Y-IM on the rail as follows:

1. Hook the first power supply module onto the rail to the left of the Y-IM, and swing it downwards.
2. Screw the power supply module on securely.
3. Hook the second power supply module onto the rail to the left of the first PS307; 2 A and swing it downwards.
4. Screw the second power supply module on securely.



Wiring

4

Chapter Overview

Section	Topic	Page
4.1	General Rules and Guidelines for the Operation of a Y-Connection	4-2
4.2	Operating the Y-Connection with a Grounded Supply	4-4
4.3	Operating the Y-Connection with Ungrounded Reference Potential	4-5
4.4	Wiring Rules	4-6
4.5	Connections of the Y-Connection	4-7
4.6	Connecting the Line and Supply Voltage	4-7
4.7	Connecting PROFIBUS-DP	4-9
4.8	Setting the PROFIBUS Address	4-10

Delivery Formats

The Y-connection is available in various formats. There may be some information contained in this chapter that you don't need, depending on which delivery format you choose. The table below is intended to help you find out which information you require (order numbers – see Appendix A):

- Delivery format **1**: Y-connection as a bundle (ready for operation and tested) consisting of 2 Y-IMs, 1 Y-coupler, 2 different bus modules, 2 PS307; 2 A power supply modules and a 300 mm DIN rail.
- Delivery format **2**: Y-connection as a bundle (ready for operation and tested) consisting of 2 Y-IMs, 1 Y-coupler, 2 different bus modules and a 200 mm DIN rail.
- Delivery format **3**: Y-connection as a bundle (ready for operation and tested) consisting of individual components.

Table 4-1 Installation Information

Section	Topic	Delivery Format		
		1	2	3
4.1	General Rules and Guidelines for the Operation of a Y-Connection	X	X	X
4.2	Operating the Y-Connection with a Grounded Supply	X	X	X

Table 4-1 Installation Information, continued

Section	Topic	Delivery Format		
		1	2	3
4.3	Operating the Y-Connection with Ungrounded Reference Potential	X	X	X
4.3	Wiring Rules		X	X
4.5	Connections of the Y-Connection			X
4.6	Connecting the Line and Supply Voltage	X	X	X
4.7	Connecting PROFIBUS-DP	X	X	X
4.8	Setting the PROFIBUS Address	X	X	X

4.1 General Rules and Guidelines for the Operation of a Y-Connection

Introduction

As part of a plant or system, and depending on its particular area of application, a number of specific rules and guidelines have to be observed for the Y-connection.

This chapter provides an overview of the most important rules that must be followed in order to integrate the Y-connection safely in a system.

Specific Applications

Please comply with the safety and accident prevention regulations (e.g. machine protection guidelines) that are valid for specific applications.

Emergency Stop Devices

Emergency stop functions in accordance with IEC 204 (which corresponds to DIN VDE 113) must remain effective in all the system's operating modes.

Start-Up of the System Again Following Specific Events

The following table shows what you have to look out for when the system starts up after certain events.

When ...	Then ...
The system starts up after a voltage dip or power failure Startup of the Y-connection after an interruption of bus communication	No dangerous operating states must occur. If necessary, force an emergency stop!
The system starts up after the emergency stop system is reset The Y-connection starts up, but the DP master does not address the Y-connection	There must not be an uncontrolled or undefined start-up.

24V DC Power Supply

The following table shows what you have to look out for in the case of the 24 V supply.

In the Case of ...	You Must Remember ...	
Buildings	External lightning protection	Install lightning protection (e.g. lightning conductors).
24 V DC supply lines, signal lines	Internal lightning protection	
24 V supply	Safe electrical isolation of safety extra-low voltage	

Protection From External Electrical Influences

The following table shows what you have to look out for to ensure protection against electrical influences or faults.

In the Case of ...	You Must Ensure that ...
All plants and systems in which the Y-connection is installed	... The system is connected to the protective conductor so that electromagnetic interference can be discharged.
Connecting, signal and bus lines	... The cable has been routed and installed correctly.
Signal and bus lines	... Line or conductor strand breaks do not lead to undefined system states.


4.2 Operating the Y-Connection with a Grounded Supply

Definition: Grounded Supply

With grounded supplies, the neutral conductor is grounded. A simple short-circuit to ground between a voltage-carrying conductor and ground or a grounded part of the system leads to the protective devices being used.

Components and Protective Measures

Various components and protective measures are required for an overall system. The type of components used and the degree to which the protective measures are mandatory depend on which regulations (e.g. DIN VDE in Germany) are valid for your system configuration.

- Main switch (in Figure 4-1, 

The Y-Connection with a Grounded Supply

Figure 4-1 shows the position of the Y-connection in the overall configuration with supply from a TN-S system. When the Y-connection is configured with grounded reference potential, any interference current is discharged to the protective conductor.

Note: The illustration of the power supply connections does not reflect the actual physical arrangement; this has been done to improve clarity.

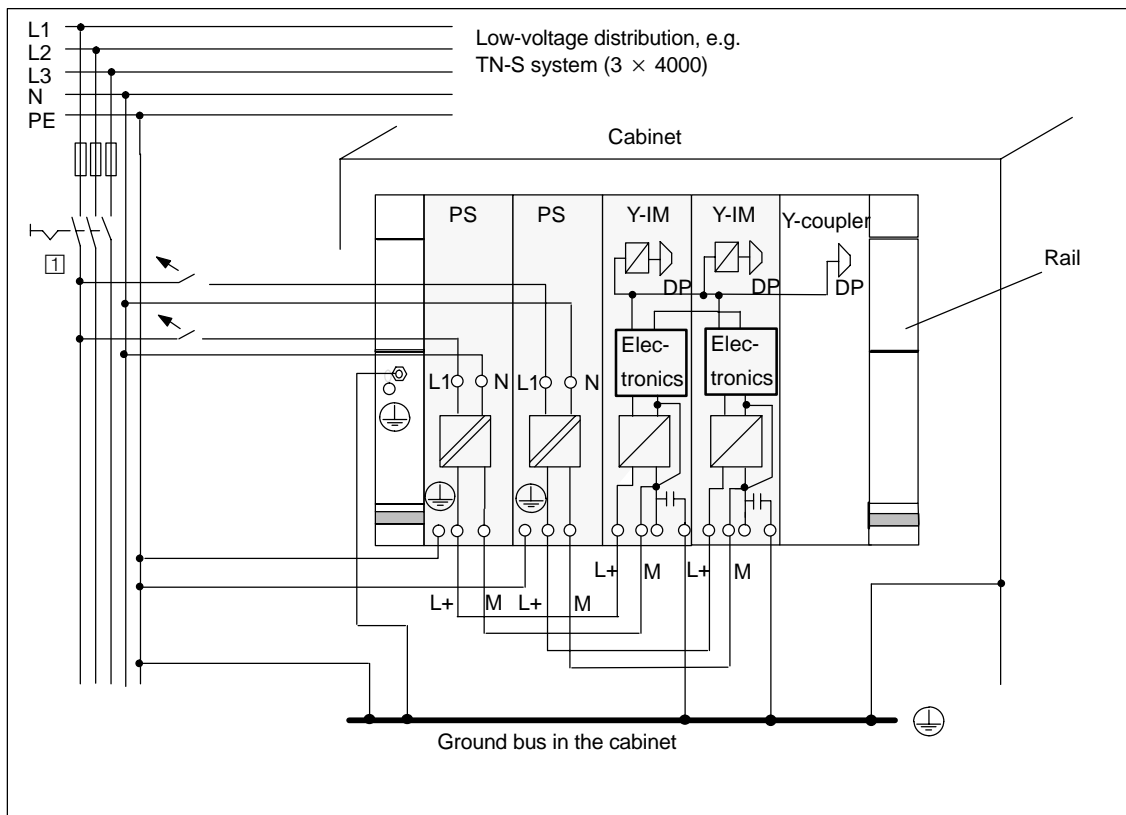


Figure 4-1 Operating the Y-Connection with a Grounded Supply

4.3 Operating the Y-Connection with Ungrounded Reference Potential

Application

In plants covering large areas, it may be necessary to configure the Y-connection with ungrounded reference potential for ground fault monitoring purposes, for example. This is the case in the chemical engineering industry or in power stations.

Diverting Interference Current

When the Y-connection is configured with ungrounded reference potential, any interference current is discharged to the protective conductor via an integrated capacitor in the Y-connection (see Figure 4-2).

Terminal Connection Model

Figure 4-2 shows the Y-IM configured with ungrounded reference potential. If you do not want to ground the reference potential of the 24 V supply, you must **remove the bridge between the M terminals and functional ground on each Y-IM**. If the bridges are not inserted, the reference potential of the two Y-IMs is connected with the rail and the protective conductor internally via a capacitor.

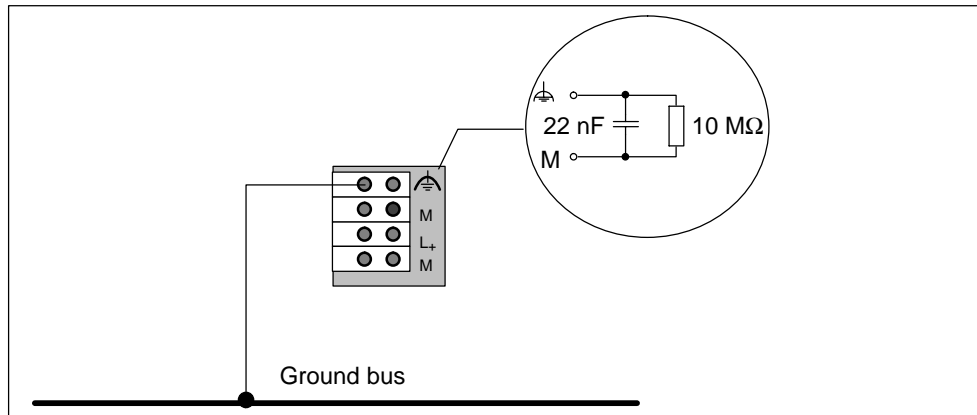


Figure 4-2 Configuration of the Y-IM with Ungrounded Reference Potential

4.4 Wiring Rules

Wiring Rules for ...		Power Supply and Y-IM
Connectable wire cross-sections for rigid lines		No
Connectable wire cross-sections for flexible lines	Without wire end ferrule	0.25 to 2.5 mm ²
	With wire end ferrule	0.25 to 1.5 mm ²
Number of wires per connection		1 or a combination of 2 wires up to 1.5 mm ² (sum) in a common wire end ferrule
Maximum external diameter of the wire's insulation		3.8 mm
Stripping length of the wires	Without insulating collar	11 mm
	With insulating collar	11 mm
Wire end ferrules to DIN 46228	Without insulating collar	Form A, 10 to 12 mm long
Wire end ferrules to DIN 46228	With insulating collar	Form E, up to 12 mm long

4.5 Connections of the Y-Connection

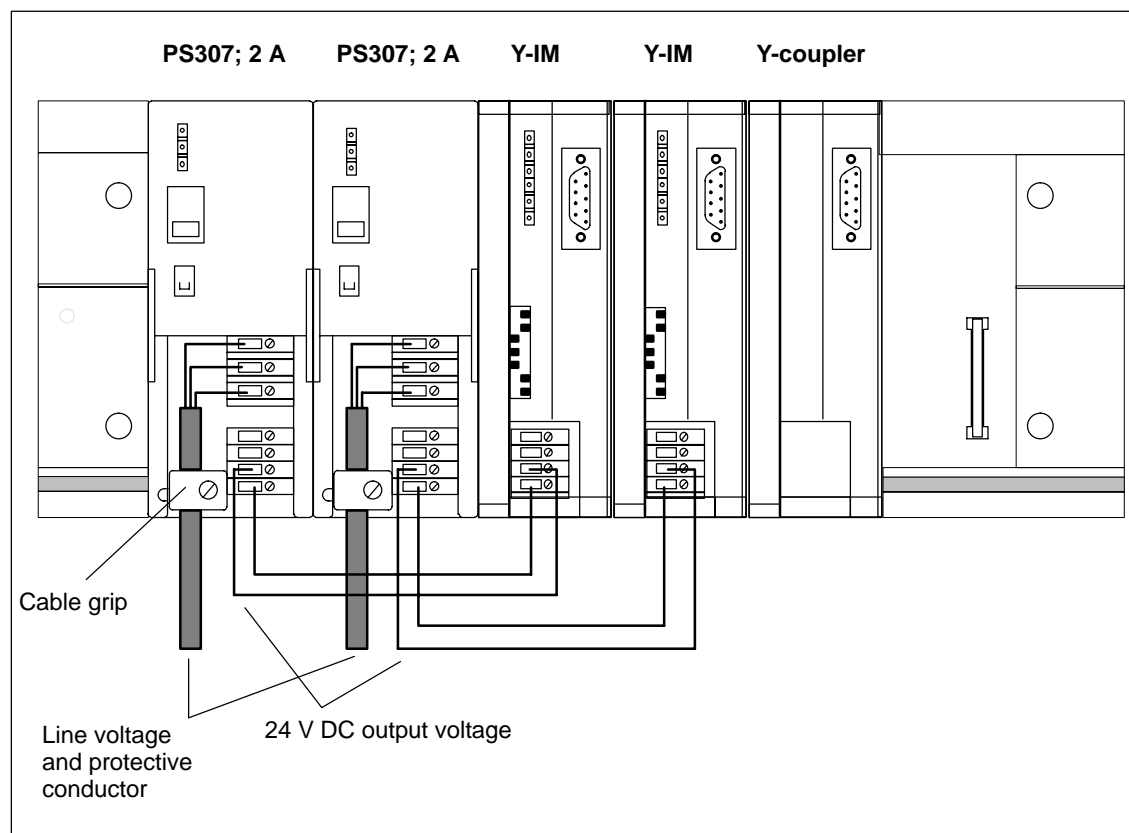


Figure 4-3 Connections of the Y-Connection

4.6 Connecting the Line and Supply Voltage

Tool Required

To connect the line and supply voltage, you need a 3 mm screwdriver.

Connections

In the case of the PS307; 2 A and the Y-IM, the screw-type terminals are under the front door. The connections have the following functions:

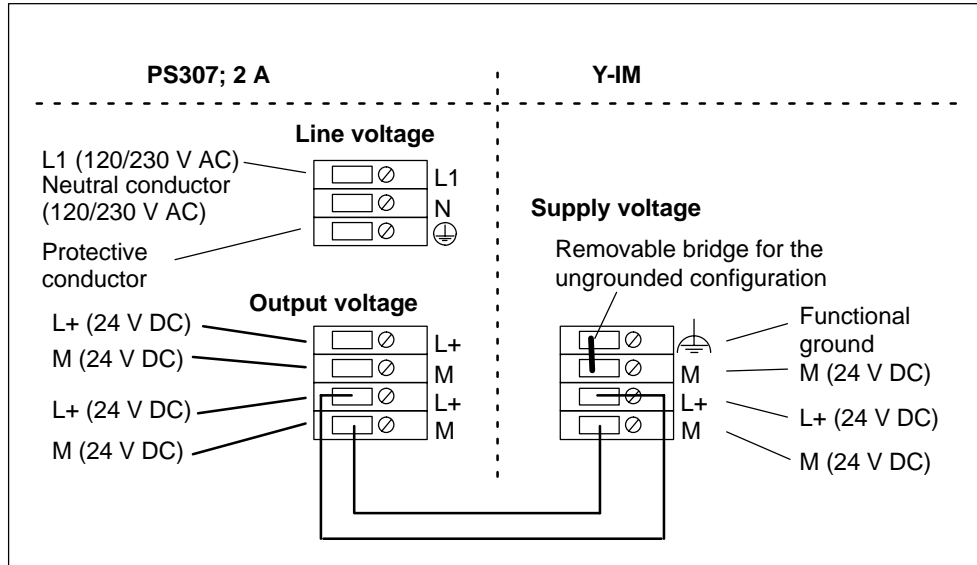


Figure 4-4 Connections for the Power Supply

Note

You can also connect the two Y-IMs to a PS307; 2 A. Remember that the redundancy quality of the Y-connection is then reduced.

Procedure

To connect the power supply to the screw-type terminals, proceed as follows:

- Strip the insulation from the cable or the conductors for the power supply.
Note: The maximum conductor cross-section is 2.5 mm².
- Secure the conductors in the screw-type terminal.
Note: There is only a cable grip on the PS307; 2 A.
- Repeat steps 1 and 2 for the second PS307; 2 A and Y-IM.

4.7 Connecting PROFIBUS-DP

Tool Required

To attach the bus connector to the Y-connection, you need a 3 mm screwdriver.

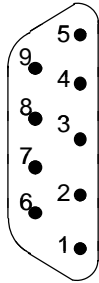
Bus Cable

Use the interconnecting cables specified in Appendix A for PROFIBUS-DP.

PROFIBUS-DP Connection

The 9-pin PROFIBUS-DP connection on the Y-IMs and the Y-coupler is under the front door. The connections have the following functions:

Table 4-2 Pin Assignment of the PROFIBUS-DP Connection

View	Pin No.	Signal Name	Designation
	1	–	–
	2	–	–
	3	RxD/TxD-P	Data line B
	4	RTS	Request to send
	5	M5V	Data reference potential (of station)
	6	P5V	Supply plus (of station)
	7	–	–
	8	RxD/TxD-N	Data line A
	9	–	–

Procedure

Connect the PROFIBUS-DP as follows:

1. Insert the bus connector (from bus 1 of the redundant PROFIBUS-DP) on the PROFIBUS-DP connection of the first Y-IM.
2. Tighten the screws on the bus connector.
3. Insert the bus connector (from bus 2 of the redundant PROFIBUS-DP) on the PROFIBUS-DP connection of the second Y-IM.
4. Tighten the screws on the bus connector.
5. Insert the bus connector (of the Y-chain) on the PROFIBUS-DP connection of the Y-coupler.
6. Tighten the screws on the bus connector.

4.8 Setting the PROFIBUS Address

Tool Required

To set the PROFIBUS address you require a 3 mm screwdriver.

Definition

Each bus node must receive a PROFIBUS address so that it can be uniquely identified on PROFIBUS-DP.

Rules

Observe the following rules for the PROFIBUS address of the Y-connection:

- The permitted PROFIBUS addresses are: 1 to 125.
- The PROFIBUS address can only be assigned once on PROFIBUS-DP.
- A shared PROFIBUS address must be assigned for the Y-connection: You must set the same PROFIBUS address on the two Y-IMs.

Setting the PROFIBUS Address

Set the same PROFIBUS addresses **on the two Y-IMs** with the front door open using a screwdriver. The PROFIBUS address is the addition of the switches that are on the right ("ON" position).

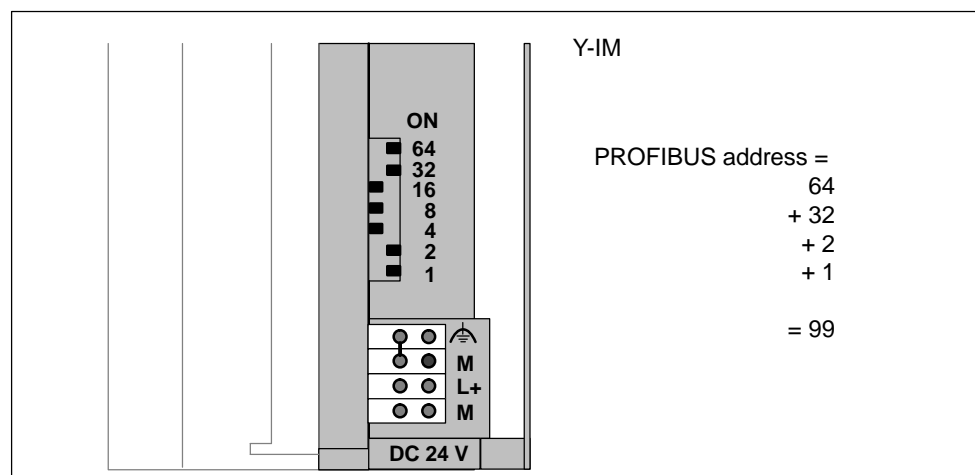


Figure 4-5 Setting the PROFIBUS Address (Example)

Changing the PROFIBUS Address

You can change the set PROFIBUS address at any time. The Y-connection will accept the changed PROFIBUS address once the 24 V DC power supply has been turned off and on again.

PROFIBUS Address = 126

You can display the firmware version on the Y-IM if the PROFIBUS address 126 is set.

Table 4-3 Display of the Firmware Version

Phase	Display
1	Display of the current version (in BCD code)
2	Brief pause
3	Display of the current release (in BCD code)
4	Long pause

Commissioning and Diagnostics

In This Chapter

Section	Topic	Page
5.1	Software Prerequisites and Rules	5-1
5.2	Configuration Example with COM PROFIBUS, STEP 5 and COM 155H	5-3
5.3	Commissioning and Startup	5-5
5.4	Diagnostics Using LEDs	5-6
5.5	Diagnostics with <i>STEP 5</i>	5-7

5.1 Software Prerequisites and Rules

Table 5-1 Software Prerequisites for Commissioning

Configuration Software Used	Version	Notes
<i>COM PROFIBUS</i>	≥ Version 5.0	The following files of the Y-connection are integrated in <i>COM PROFIBUS</i> : <ul style="list-style-type: none"> • SIEM8096.GSD (device database file) • SIEM8096.DIB (bitmap file)
FB 192 “IM308C-Y”		Shipped with the Y-connection on floppy disk
Configuration software for the other DP master used		You require the device database file SIEM8096.GSD.

Note

Currently it is not permissible to use the Y-connection as a DP standard slave in the S7-400H and the CP443-5 Extended because redundant operation of the Y-connection is not possible in the S7-400H. Undefined module states can occur with Y-slaves.

Rules for Configuration

You must remember the following points when using *COM PROFIBUS* for configuration:

- If you use the Y-connection in an S5-H system (e.g. S5-155H as DP master), you must configure two DP master systems in *COM PROFIBUS*.
- The configuration of the Y-chain must be identical in the two DP master systems.
- Select "None" as the error reporting mode. The Y-connection is always addressed by a DP master. The standby DP master would passivate the outputs in "QVZ" (timeout) error reporting mode and always report QVZ when passivation has been discontinued.
- You must set the correction factor of the response monitoring time to "2".

Note the following when working with STEP 5:

- The DP slaves can only be addressed via the FB 192 "IM308C-Y". Direct I/O accesses or accesses via the process image are not permissible. The FB 192 "IM308C-Y" is delivered together with the Y-connection on floppy disk.

5.2 Example of a Configuration with COM PROFIBUS, STEP 5 and COM 155H

Configuring the Y-Connection

With **COM PROFIBUS V 5.0**:

1. Add a new DP master in the window for the bus configuration, e.g. IM 308-C in an S5-155H/CPU 948.
2. Add a Y-IM in the window for the bus configuration.
3. Set the PROFIBUS addresses on the DP master and the Y-IM.
4. Add the DP slaves to the Y-chain.

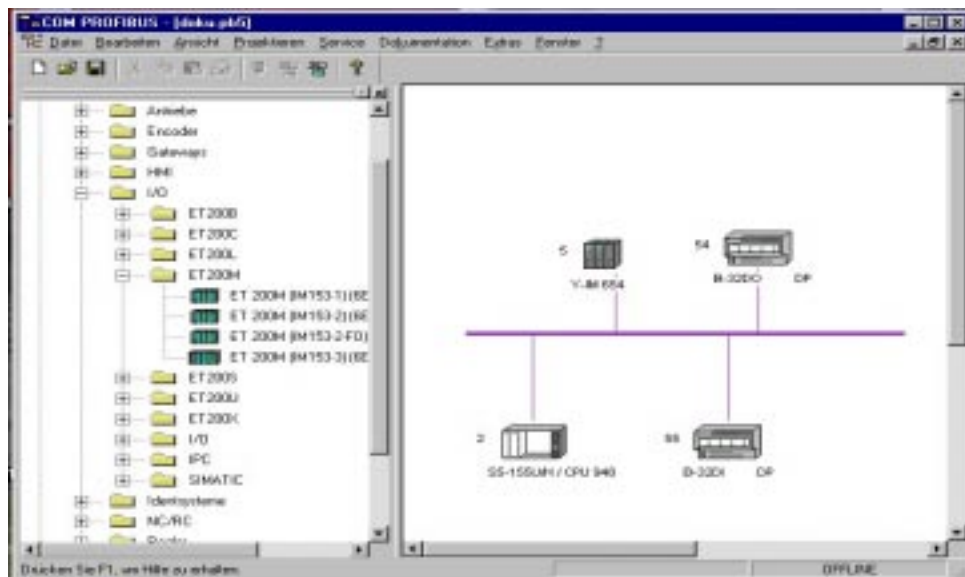


Figure 5-1 View in COM PROFIBUS

5. Select the properties of the IM 308-C and set the following in the “Master parameters” dialog box:
 - Error reporting mode: None
 - Response monitoring for slaves: Selected
6. Transfer the configuration to **both** DP masters.
 - Via memory card or
 - Download via PROFIBUS-DP

Note: You must reset the memories of the two CPUs at initial commissioning.

With **FB192 “IM308C-Y”**:

To find out whether Y-slaves have failed, you must evaluate the **ERR** parameter.

STL	Description
:A DB 30	
:SPA FB 192	
Name :IM308C-Y	
DPAD : KH F800	Default address area of the IM 308-C
IMST : KY 0, 3	IM No. = 0, PROFIBUS address of the DP slave = 3
FCT : KC RI	Function: RI to read inputs or WO to write to outputs
T-AG : KC A	Not relevant for reading and writing data
TYP : KY 0, 20	S5 data area: DB 20
STAD : KF +0	User data as of data word 0
LENG : KF +8	Data length = 8 bytes
ERR : DW 0	Error code stored in DW 0 of DB 30

Switching On

1. Carry out a startup on the CPU (without memory).
2. Switch on the standby CPU: First put it into STOP mode and then start it up (without memory).

5.3 Commissioning and Startup

Prerequisites for Commissioning

Table 5-2 Prerequisites for Commissioning the Y-Connection

Required Activity	See
1. The Y-connection is installed.	Chapter 3
4. The Y-connection is wired.	Chapter 4
2. PROFIBUS addresses are set on the Y-connection.	Section 4.8
5. The Y-connection is configured.	Configuration software manual
6. The supply voltage for the DP master (fault-tolerant system) is switched on.	DP master (fault-tolerant system) manual
7. The DP master (fault-tolerant system) is switched to RUN.	DP master (fault-tolerant system) manual

Commissioning the Y-Connection

Table 5-3 Steps Required to Commissioning the Y-Connection

Step	Procedure
1.	Switch on the power supplies for the Y-connection (PS307; 2 A power supply modules).
2.	Switch on the power supply for the distributed I/O devices on the Y-chain.

5.4 Diagnostics via LEDs

Y-Connection

Table 5-4 Status and Error Messages of the Y-IM

LEDs				Meaning	What to Do
SF	BF	ACT	ON		
Off	Off	*	Off	There is no voltage applied to the Y-IM, or the Y-IM has a hardware defect.	Switch on the power supply module, or change the Y-IM.
*	*	*	On	There is voltage applied to the Y-IM. The Y-IM is ready for operation.	–
*	Flashing	*	On	The Y-IM is incorrectly parameterized – there is no data transfer between the DP master and the Y-IM. Cause: The PROFIBUS address is incorrect.	<ul style="list-style-type: none"> • Check the Y-IM. • Check the configuration and parameter assignment. • Check the PROFIBUS address.
*	On	*	On	The Y-IM has no connection to the DP master (transmission rate detection) Causes: <ul style="list-style-type: none"> • The bus communication via PROFIBUS-DP to the Y-IM has been interrupted. 	Check the bus configuration. <ul style="list-style-type: none"> • Check whether the Y-IM or the bus connector is correctly inserted. • Check if the interconnecting cable to the DP master has been interrupted. • Switch the 24 V DC on/off switch on the power supply module off and then on again.
On	Off	*	On	Impermissible PROFIBUS address The Y-IM is defective.	Set a valid PROFIBUS address (1 to 125) on the Y-IM. Replace the Y-IM, or get in touch with your Siemens partner.
Off	Off	On	On	The Y-IM is active , and data transfer is taking place with the DP master.	–
Off	Off	Off	On	The Y-IM is passive and ready for switchover. Data transfer is taking place with the DP master.	–
Flashing	Off	Off	On	The passive Y-IM is not ready for switchover .	Check whether the CPU or the DP master is in RUN mode

* Not applicable

“DP2 ACT” LED

The “DP2 ACT” LED is “on” if data transfer is taking place between the active Y-IM and the distributed I/O devices on the Y-chain. The LED flickers at low transmission rates and comes on continuously at high transmission rates.

5.5 Diagnostics with *STEP 5*

Section	Topic	Page
5.5.1	Reading Out the Diagnosis	5-7
5.5.2	Structure of the Slave Diagnosis	5-9
5.5.3	Station Statuses 1 to 3	5-10
5.5.4	Master PROFIBUS Address	5-12
5.5.5	Manufacturer ID	5-12
5.5.6	H Status	5-13

Slave Diagnosis

The slave diagnosis complies with the EN 50170, Volume 2, PROFIBUS standard. Depending on the DP master, it can be displayed with *STEP 5* for all DP slaves complying with the standard.

Reading out the slave diagnosis and its structure for the Y-connection are described in the following sections.

5.5.1 Reading Out the Diagnosis

Options for Reading Out the Diagnosis

Table 5-5 Reading Out the Diagnosis with *STEP 5*

Programmable Logic Controller with DP Master	Block	Application	See
SIMATIC S5 with the IM 308-C as DP master	FB 192 “IM308C-Y”	Read out slave diagnosis (store in data area of the user program)	Slave diagnosis, see Section 5.5.2; FBs, see the documentation for the <i>COM 155H</i>

Example of Reading Out the Slave Diagnosis with FB 192 “IM308C-Y”

Here you will find an example of how to use FB 192 to read out the slave diagnosis for a DP slave in the *STEP 5* user program.

Assumptions

The following assumptions apply to this *STEP 5* user program:

- As the DP master, the IM 308-C takes up pages 0 to 15 (number 0 of the IM 308-C).
- The Y-connection has the PROFIBUS address 3.
- The slave diagnosis is to be stored in DB 20.
- The slave diagnosis consists of 13 bytes.

STEP 5 User Program

STL	Description
:A DB 30	
:SPA FB 192	
Name :IM308C-Y	
DPAD : KH F800	Default address area of the IM 308-C
IMST : KY 0, 3	IM No. = 0, PROFIBUS address of the DP slave = 3
FCT : KC SD	Function: to read the slave diagnosis
T-AG : KC A	Diagnostic data from subunit A
TYP : KY 0, 20	S5 data area: DB 20
STAD : KF +1	Diagnostic data as of data word 1
LENG : KF 13	Diagnosis length =13 bytes
ERR : DW 0	Error code stored in DW 0 of DB 30

5.5.2 Structure of the Slave Diagnosis

Structure of the Slave Diagnosis

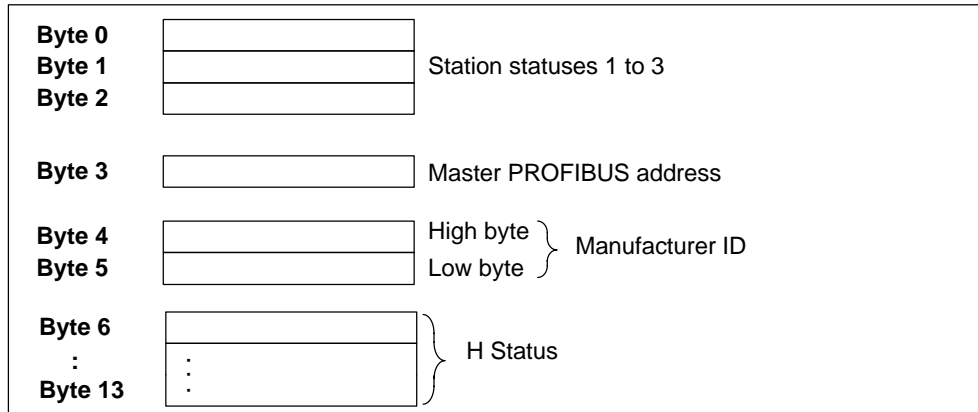


Figure 5-2 Structure of the Slave Diagnosis

5.5.3 Station Statuses 1 to 3

Definition

Station status 1 to 3 provides an overview of the status of the Y-connection.

Station Status 1

Table 5-6 Structure of Station Status 1 (Byte 0)

Bit	Meaning	Cause/Remedy
0	1: The DP slave cannot be addressed by the DP master.	<ul style="list-style-type: none"> • Correct PROFIBUS address set on the DP slave? • Is the bus connector connected? • Voltage at DP slave? • Is the RS 485 repeater set correctly? • Reset on the DP slave executed (switch on/off)?
1	1: The DP slave is not yet ready or data transfer.	<ul style="list-style-type: none"> • Wait while the DP slave starts up.
2	1: The configuration data sent by the DP master to the DP slave does not correspond to the configuration of the DP slave.	<ul style="list-style-type: none"> • Is the correct station type or correct configuration of the DP slave entered in the configuration software?
3	0: The bit is always set to "0".	
4	1: The function requested is not supported by the DP slave (e.g. changing the PROFIBUS address by means of software).	<ul style="list-style-type: none"> • Check the configuration.
5	1: The DP master cannot interpret the response of the DP slave.	<ul style="list-style-type: none"> • Check the bus configuration.
6	1: The DP slave type does not correspond to the software configuration.	<ul style="list-style-type: none"> • Compare the desired configuration with the actual configuration.
7	1: Parameters have been assigned to the DP slave by a different DP master (not the DP master that currently has access to the DP slave).	<ul style="list-style-type: none"> • The bit is always set to 1 if, for instance, you are accessing the DP slave using the programming device or another DP master. The PROFIBUS address of the DP master that parameterized the DP slave is located in the "master PROFIBUS address" diagnostic byte.

Station Status 2

Table 5-7 Structure of Station Status 2 (Byte 1)

Bit	Meaning
0	1: Parameters have to be reassigned to the DP slave.
1	1: The bit is always set to "0".
2	1: The bit is always set to "1" if the DP slave with this PROFIBUS address is present.
3	1: Response monitoring has been enabled for this DP slave.
4	1: The bit is always set to "0".
5	1: The bit is always set to "0".
6	0: The bit is always set to "0".
7	1: The DP slave is disabled, i.e. it has been removed from current processing.

Station Status 3

Table 5-8 Structure of Station Status 3 (Byte 2)

Bit	Meaning
0 to 7	0: The bits are always set to "0".

5.5.4 Master PROFIBUS Address

Definition

The master PROFIBUS address diagnostic byte contains the PROFIBUS address of the DP master that:

- Assigned parameters to the Y-connection and
- Has read and write access to the Y-connection

The master PROFIBUS address is in byte 3 of the slave diagnosis.

FF_H in Byte 3

If the value FF_H is defined as the master PROFIBUS address in byte 3, the Y-connection has not been parameterized by the DP master.

5.5.5 Manufacturer ID

Definition

The manufacturer ID contains a code that describes the type of the Y-connection.

Manufacturer ID Connection

Table 5-9 Structure of the Manufacturer ID (Bytes 4 and 5)

Byte 4	Byte 5	Manufacturer ID for
80 _H	96 _H	Y-IM

5.5.6 H Status

The H status provides information on the state of active and passive Y-IMs. The H status consists of 8 bytes (bytes 6 to 13) and is structured as follows:

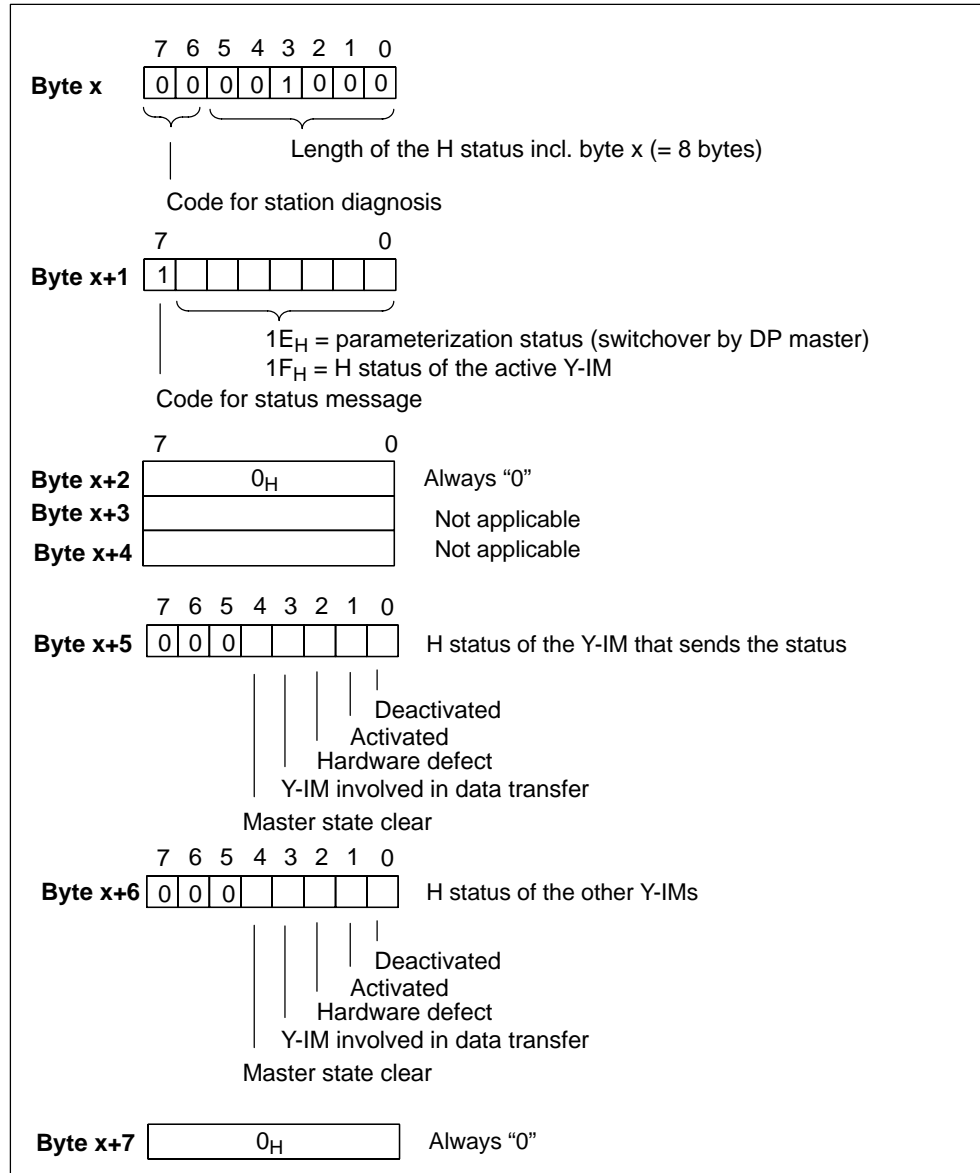


Figure 5-3 Structure of the H Status of the Y-Connection

Maintenance

Replacing the Y-IM During Operation

You can replace a Y-IM during operation.

Initial Situation

The Y-connection is installed, wired and in operation. Data transfer to the associated DP master takes place via at least one of the two Y-IMs.

What to Look Out for Beforehand:

Are you replacing a defective Y-IM? If so, then data transfer will continue via the active Y-IM.

Are you replacing an active Y-IM, and the passive Y-IM is OK? There is then an automatic and bumpless switchover from the active to the passive Y-IM.

Are you replacing the active Y-IM, and the passive Y-IM is defective? If so, you must interrupt data transfer between the DP master and the Y slaves. The Y slaves go into safe state and switch off their outputs.

You can tell whether the Y-IM is active or passive by looking at the status indicators of the Y-IM (see Chapter 6).

Procedure

1. Remove the bus connector from the Y-IM.
2. Switch off the power supply to the Y-IM.
3. Disconnect the power supply from the Y-IM.
4. Undo the fixing screw of the Y-IM and tilt the Y-IM upwards out of the rail.
5. Hook the new Y-IM onto the rail from above, and tighten the fixing screw.
6. Reconnect the power supply.
7. Switch on the power supply to the Y-IM again.
8. Plug the bus connector into the Y-IM again.

Response of the Y-Connection After Replacement of a Y-IM

After a Y-IM is replaced, the associated DP master resumes data transfer. The Y-chain continues to be addressed via the other Y-IMs.

If there is an error, you can evaluate the error displays of the Y-IM (see Chapter 5).

Y-Connection in DP Standard Master Mode

7

Chapter Overview

Section	Topic	Page
7.1	Parameters	7-1
7.2	Address Area in the Process Image	7-2
7.3	Power Up of the Y-Connection	7-2
7.4	Master-Standby Switchover	7-3

7.1 Parameters

Device Database File

The Y-connection is integrated in the system via the device database file SIEM8096.GSD. To do this, you require COM PROFIBUS or the configuration software of the DP master used.

Switchover Monitoring Time

In the case of a master-standby switchover, or failure of the active Y-IM, the Y-chain is processed via the standby Y-IM. The switchover is bumpless within the response monitoring time for the connected DP slaves.

The switchover monitoring time of the Y-connection is preset via the device database file. This parameter is defined as a fixed value and cannot be changed. The switchover monitoring time is equal to:

$$\text{Switchover monitoring time} = 0.5 \times \text{response monitoring time}$$

7.2 Address Area in the Process Image

Inputs and Outputs

The Y-connection occupies one input and output byte in the input and output area of the process image. The input byte and the output byte are unassigned and must not be used.

7.3 Power Up of the Y-Connection

Startup Diagram

During startup the two Y-IMs are addressed independently of one another:

- Each DP master configures and parameterizes its Y-IM (independently of the other DP master).
- The first DP master to configure and parameterize its Y-IM without errors starts data transfer with the distributed I/Os on the Y-chain. The Y-IM is through-connected and all the distributed I/O devices on the Y-chain can be reached from the DP master.
- As soon as the other DP master has also configured and parameterized its Y-IM without errors, the Y-IM on standby is made available (the Y-IM is passive). In the event of a failure of the active Y-IM, there is a bumpless switchover to the other Y-IM.

Figure 7-1 shows a simplified layout of the mutually independent behavior of the two Y-IMs. In the example we are assuming that the second Y-IM has been fully configured and parameterized first.

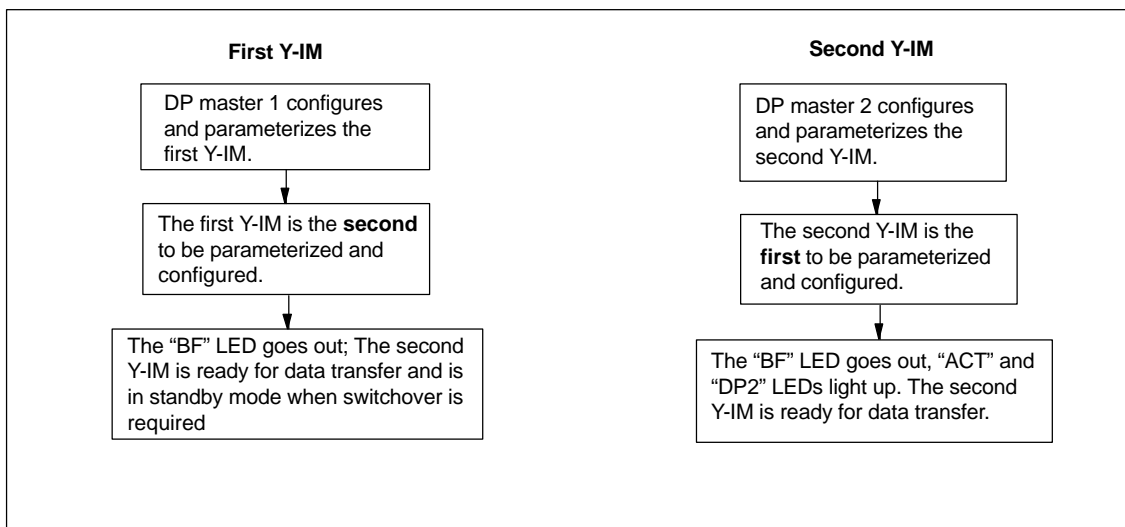


Figure 7-1 Startup of the Two Y-IMs

7.4 Master-standby switchover

Events

The following events result in a bumpless switchover of the Y-connection:

Table 7-1 Events Leading to a Bumpless Switchover

	Events	Switchover Time
Y-connection	The active Y-IM is defective (prerequisite: Switchover only occurs if the fault is detected by the passive Y-IM).	Approx. 4 ms
	Power supply failure to the active Y-IM.	Approx. 4 ms
DP Master	The active DP master forces a switchover from the active to the passive Y-IM (e.g. with CPU STOP).	Approx. 4 ms
	The active Y-IM is not addressed by the DP master within the switchover monitoring time.	Parameterized switchover monitoring time (see Section 7.1)
	The active DP master changes the status from OPERATE to CLEAR.	Approx. 4 ms
	The active PROFIBUS-DP has failed or been interrupted	Parameterized switchover monitoring time (see Section 7.1)

Technical Specifications

8

Chapter Overview

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8.2	Technical Specifications of the Y-IM (6ES7 654-0YS00-0AB0)	8-9
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8.1 Standards, Certificates and Approvals

Chapter Overview

Section	Topic	Page
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8.1.2	Transportation and Storage Conditions	8-5
8.1.3	Mechanical and Climatic Ambient Conditions for the Operation of the Y-Connection	8-5
8.1.4	Rated Voltages, Insulation Tests, Protection Class and Degree of Protection	8-8

IEC 1131

The Y-Connection meets the requirements and criteria of IEC 1131, Part 2.

PROFIBUS-DP/ PNO

The Y-connection complies with the requirements and criteria of EN 50170 Volume 2, PROFIBUS and the PNO (PROFIBUS User Organisation).

CE Marking

Our products fulfill the requirements and safety objectives of the following EC Directives and comply with the harmonized European standards (EN) published for stored-program controllers in the official journals of the European Communities:

- 89/336/EEC Electromagnetic Compatibility Directive (EMC Directive)
- 73/23/EEC Low Voltage Directive (for electrical equipment)

The EC Declarations of Conformity for the relevant authorities are available at the following address:

Siemens Aktiengesellschaft
Bereich Automatisierungstechnik
A&D AS E 14
Postfach 1963
D-92209 Amberg
Germany

EMC Directive

SIMATIC products are designed for use in industrial environments.

Area of Application	Requirements	
	Emitted Interference	Noise Immunity
Industry	EN 50081-2 : 1993	EN 50082-2 : 1995

UL Recognition

UL Recognition Mark
Underwriters Laboratories (UL) in accordance with the
UL 508 standard, file no. 116536

CSA Certification

CSA Certification Mark
Canadian Standard Association (CSA) in accordance with the
C22.2 standard no. 142, file no. LR 48323

FM Approval

Factory Mutual Approval Standard Class Number 3611, Class I, Division 2,
Group A, B, C, D.



Warning

There is a risk of injury and damage to property.

In areas where there is a risk of explosion, injuries and damage may be caused if you remove connectors during operation.

In areas where there is a risk of explosion, always deenergize the distributed I/O devices in order to remove the connectors.

Reliability

The following applies to each individual component of the Y-connection (Y-IM, Y-coupler, basic module): MTBF > 5 years at 40 °C ambient temperature, 50 % partial load and round-the-clock operation.

8.1.1 Electromagnetic Compatibility of the Y-Connection

Definition

Electromagnetic compatibility is the capacity of a piece of electrical equipment to function in a satisfactory manner in its electromagnetic environment without affecting this environment.

The modules of the Y-connection meet the requirements of the EMC legislation for the European single market.

In the following you will find information on noise immunity and radio interference suppression.

Pulse-Type Interference

The following table shows the electromagnetic compatibility of the Y-connection for pulse-type interference. The prerequisite for this is that the system meets and complies with the relevant requirements and guidelines relating to electrical equipment.

Pulse-Type Interference	Tested at	Corresponds to Severity of
Electrostatic discharge To IEC 61000-4-2 (DIN VDE 0843 Part 2)	8 kV 4 kV	3 (air discharge) 2 (contact discharge)
Burst pulses (rapid transient interference) in accordance with IEC 61000-4-4 (DIN VDE 0843 Part 4)	2 kV (supply line) 2 kV (signal line)	3

Pulse-Type Interference	Tested at	Corresponds to Severity of
Powerful single pulse (surge) To IEC 61000-4-5 (DIN VDE 0839 Part 10) With protective elements only		
Asymmetrical coupling	2 kV (supply line) 2 kV (signal line/ data line)	3
Symmetrical coupling	1 kV (supply line) 1 kV (signal line/ data line)	

Sinusoidal Interference

RF radiation on the device in accordance with IEC 61000-4-3:

- Electromagnetic RF field, amplitude-modulated
 - From 80 to 1000 MHz
 - 10 V/m
 - 80 % AM (1 kHz)
- Electromagnetic RF field, pulse-modulated
 - 900 ± 5 MHz
 - 10 V/m
 - 50 % ED
 - 200 Hz repetition frequency
- RF interference on signal and data lines etc. in accordance with IEC 61000-4-6, radio frequency, asymmetrical, amplitude-modulated
 - From 0.15 to 80 MHz
 - 10 V effective value, unmodulated
 - 80 % AM (1 kHz)
 - 150 Ω source impedance

Emission of Radio Interference

Emitted interference from electromagnetic fields in accordance with EN 55011: limit value class A, group 1

From 20 to 230 MHz	< 30 dB ($\mu\text{V}/\text{m}$)Q
From 230 to 1000 MHz	< 37 dB ($\mu\text{V}/\text{m}$)Q
Measured at 30 m distance	

Emitted interference via a.c. supply in accordance with EN 55011: limit value class A, group 1

From 0.15 to 0.5 MHz	< 79 dB (μV)Q, < 66 dB (μV)M
From 0.5 to 5 MHz	< 73 dB (μV)Q, < 60 dB (μV)M
From 5 to 30 MHz	< 73 dB (μV)Q, < 60 dB (μV)M

8.1.2 Transportation and Storage Conditions

Y-Connection

The modules of the Y-connection exceed the transportation and storage requirements stipulated in IEC 1131, Part 2. The following values apply to modules of the Y-connection that are transported or stored in the original packaging.

Type of Condition	Permissible Range
Free Fall	$\leq 1\text{m}$
Temperature	From $-40\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$
Air pressure	From 1080 to 660 hPa (corresponds to a height of -1000 to 3500 m)
Relative air humidity	From 5 to 95 %, without condensation

8.1.3 Mechanical and Climatic Ambient Conditions for the Operation of the Y-Connection

Operating Conditions

The Y-connection is designed for use in a fixed, sheltered location. The operating conditions exceed the requirements of IEC 1131-2.

The Y-connection fulfills the operating conditions of class 3C3 to DIN EN 60721 3-3 (operating locations with high traffic density and in the immediate vicinity of industrial plants with chemical emissions).

Restrictions

The Y-connection **cannot** be used without additional measures being taken:

- In locations with a high proportion of ionizing radiation
- In locations with operating conditions that are severe on account of the following, for example:
 - Dust
 - Corrosive vapors or gases
- In systems that require special monitoring, such as:
 - Lift systems
 - Electrical systems in rooms that are subject to particular dangers

One possible additional measure is to install the Y-connection in a cabinet.

Climatic Environmental Conditions

The Y-connection can be used under the following climatic ambient conditions:

Ambient Conditions	Operating Ranges	Comments
Temperature: Horizontal installation: Vertical installation:	From 0 to 60°C From 0 to 40°C	–
Relative air humidity	From 5 to 95 %	Without condensation, corresponds to relative humidity (RH) of 2 in accordance with IEC 1131-2
Air pressure	From 1080 to 795 hPa	Corresponds to a height of -1000 to 2000 m
Contaminant concentration	SO ₂ : < 0.5 ppm; Relative humidity < 60 %, no moisture condensation H ₂ S: < 0.1 ppm; Relative humidity < 60 %, no moisture condensation	Test: 10 ppm; 4 days 1 ppm; 4 days

Mechanical Ambient Conditions

The mechanical ambient conditions for Y-connection modules are specified in the following table in the form of sinusoidal oscillations.

Frequency Range (Hz)	Continuous	Occasional
$10 \leq f \leq 58$	0.0375 mm amplitude	0.075 mm amplitude
$58 \leq f \leq 150$	0.5 g constant acceleration	1 g constant acceleration

Vibration Reduction

When the Y-connection is subjected to major impacts or vibrations, you must take suitable action to reduce the acceleration or amplitude.

We recommend that you mount it on cushioning material (e.g. rubber-metal anti-vibration mounting).

Tests for Mechanical Ambient Conditions

The following table provides information on the type and scope of the tests for mechanical ambient conditions.

Test for ...	Test Standard	Comments
Vibrations	Vibration test in accordance with IEC 68 Part 2-6 (sinusoidal)	Vibration type: frequency sweeps with a rate of change of 1 octave per minute. $10 \text{ Hz} \leq f \leq 58 \text{ Hz}$, const. amplitude 0.075 mm $58 \text{ Hz} \leq f \leq 150 \text{ Hz}$, const. acceleration 1 g Vibration duration: 10 frequency sweeps per axis in each of the 3 vertically arranged axes
Impact	Impact test in accordance with IEC 68 Part 2-27	Type of impact: half-sine Strength of impact: 15 g peak value, 11 ms duration Impact direction: 3 impacts in both + and – direction in each of the 3 vertically arranged axes

8.1.4 Rated Voltages, Insulation Tests, Protection Class and Degree of Protection

Rated Voltages for Operation

The modules of the Y-connection work with a rated voltage of DC 24 V. The tolerance range is 20.4 to 28.8 V DC.

Test Voltages

The insulating properties are verified with the following test voltages in accordance with IEC 1131 Part 2:

Circuits with a Rated Voltage of U_e Against Other Circuits or Ground	Test Voltage
$0 \text{ V} < U_e \leq 50 \text{ V}$	500 V DC

Safety Class

Protection class I in accordance with IEC 536 (VDE 0106, part 1); i.e., protective conductor connection on rail required.

Protection Against Solid Bodies and Water

Protection type IP 20 in accordance with IEC 529; i.e., protection against contact with standard probes.

In addition: protected against solid bodies greater than 12.5 mm.

No special protection against water.

8.2 Technical Specifications of the Y-IM (6ES7 654-0YS00-0AB0)

Dimensions and Weight		Power input of the Y-IM (24 V DC)	Max. 200 mA
Dimensions W × H × D (mm)	40 × 125 × 130	Power loss of the module	Typically 4 W
Weight	Approx. 350 g	Status, Interrupts, Diagnostics	
Module-Specific Data		Status display	No
Transmission rate on PROFIBUS-DP	9.6; 19.2; 45.45 93.75; 187.5; 500 kbps 1.5; 3, 6, 12 Mbps	Interrupts	None
Bus protocol	PROFIBUS-DP	Diagnostic function	Yes
Voltages, Currents, Potentials		• Group error	Red LED "SF"
Rated supply voltage of the DP/PA link	DC 24 V	• PROFIBUS-DP bus error	Red "BF" LED
• Polarity reversal protection	Yes	• Master	Yellow "ACT" LED
• Power failure bridging	5 ms	• Bus activity on the Y-chain	Yellow "DP2" LED
Isolation		• 24 V supply monitoring	Green "ON" LED
• To PROFIBUS-DP	Yes		
• To the Y-chain	Yes		
Insulation tested at	DC 500 V		

8.3 Technical Specifications of the Y-Coupler (6ES7 654-0YK00-0AB0)

Dimensions and Weight		Y-Chain Properties	
Dimensions W × H × D (mm)	40 × 125 × 130	Permissible cable length of the Y-chain	
Weight	Approx. 350 g	• 9.6 to 187.5 kbps	1000 m
Module-Specific Data		• 500 kbps	400 m
Transmission rate on the PROFIBUS-DP (Y-chain)	9.6; 19.2; 45.45 93.75; 187.5; 500 kbps 1.5; 3, 6, 12 Mbps	• 1.5 Mbps	200 m
Bus protocol	PROFIBUS-DP	• 3 to 12 Mbps	100 m
Status, Interrupts, Diagnostics		Maximum number of DP slaves	30
Status display	No	Termination of the Y-chain	Active terminating resistor (bus terminator)
Interrupts	None	Use of the RS 485 repeaters	No
Diagnostic function	No	Use of OLM/OBTs	Yes

8.4 Technical Specifications of the PS307; 2 A Power Supply Module

You can find further information on the PS307; 2 A power supply module in the *S7-300, M7-300 Programmable Controllers Module Specifications* manual.

Dimensions, Weight		Characteristic Variables	
Dimensions W × H × D (mm)	50 × 125 × 120	Protection class in accordance with IEC 536 (DIN VDE 0106, Part 1)	I, with protective conductor
Weight	Approx. 420g	Insulation rating	
Input Variables		• Rated insulation voltage (24 V against L1)	250 V AC
Input voltage		• Tested at	2800 V DC
• Rated value	120 V AC/230 V	Safe electrical isolation	In accordance with DIN VDE 0106, Part 101
Line frequency		Bridging of system failures (at 93 V and 187 V)	Min. 20 ms
• Rated value	50 Hz or 60 Hz	• Repetition rate	Min 1 s
• Permissible range	From 47 Hz to 63 Hz	Efficiency	83 %
Input current rated value		Power input	58 W
• At 230 V	0.5 A	Power losses	Typically 10 W
• At 120 V	0.8 A	Diagnostics	
Inrush current (at 25 °C)	20 A	Is there an output voltage display?	Yes (green LED)
I ² t (at inrush current)	2.2 A ² s		
Output Variables			
Output voltage			
• Rated value	DC 24 V		
• Permissible range	24 V ± 5 %, no-load operation test		
• Power up time	Max. 2.5 s		
Output current			
• Rated value	2 A, Cannot be switched in parallel		
Short-circuit protection	Electronic, non-retentive from 1.1 to 1.3 × I _N		
Residual ripple	Max. 150 mV _{SS}		

Order Numbers

Y-Connection

The order numbers of the Y-connection are as follows:

Table A-1 Order Numbers of the Y-Connection

Y-Connection	Order Number
Y-connection as a bundle (ready for operation and tested) consisting of 2 Y-IMs, 1 Y-coupler, 2 different bus modules and a 200 mm DIN rail	6ES7 654-1YB00-0AB0
Y-connection as a bundle (ready for operation and tested) consisting of 2 Y-IMs, 1 Y-coupler, 2 different bus modules, 2 PS307 2A power supply units and a 300 mm DIN rail	6ES7 654-2YB00-0AB0
Y-IM	6ES7 654-0YS00-0AB0
Y-coupler	6ES7 654-0YK00-0AB0
BM IM 157/IM 157 bus module	6ES7 195-7HE80-0XA0
Y-coupler bus module	6ES7 654-7HY00-0XA0
PS307; 2 A power supply module	6ES7 307-1BA00-0AA0

Accessories

The order numbers for accessories are as follows (for additional accessories see the ST 70 catalog):

Table A-2 Accessories Order Numbers

Accessories	Order Number
PROFIBUS-DP bus connector (12 Mbps)	
• Without programming port	6ES7 972-0BA11-0XA0
• With programming port	6ES7 972-0BB11-0XA0
PROFIBUS-DP bus cable	
• Normal (flexible)	6XV1 830-0AH10
• Drum cable (rigid)	6XV1 830-3BH10

Table A-2 Accessories Order Numbers

Accessories	Order Number
Active terminating resistor for PROFIBUS (PROFIBUS terminator)	6ES7 972-0DA00-0AA0
Covers for open interfaces on the bus modules	6ES7 195-1JA00-0XA0

You can also find the order numbers for additional documentation in the ST 70 catalog.

Glossary

Bumpless

The Y-chain is switched over between the master and standby Y-IM within the response monitoring time. The signal statuses of the I/Os on the Y-chain are not affected during switchover.

Device Database File

All slave-specific characteristics are stored in a device database file (GSD file). The format of the device database file is defined in EN 50170, Volume 2, PROFIBUS.

Diagnostics

Diagnostics is the detection, localization, classification, display and evaluation of errors, faults and messages. Diagnostics provides monitoring functions that run automatically while the system is in operation. This increases the availability of systems by reducing commissioning times and downtimes.

Direct Communication

Direct communication is characterized by the fact that the PROFIBUS-DP nodes listen in to find out which data a DP slave is sending back to its DP master. Using this function the eavesdropper (receiver) can directly access changes in the input data of other DP slaves.

DP Master

A → master that behaves in accordance with EN 50170, Volume 2, PROFIBUS is described as a DP master.

DP Slave

A → slave run on the PROFIBUS bus system with the PROFIBUS-DP protocol on the basis of EN 50170, Volume 2, PROFIBUS is referred to as a DP slave.

DP Standard

The DP standard is the bus protocol of the ET 200 distributed I/O system on the basis of EN 50170, Volume 2, PROFIBUS.

Electromagnetic Compatibility

Electromagnetic compatibility is the capacity of electrical equipment to function without problems in a defined environment without affecting the environment in an impermissible manner.

Equidistance

Equidistance is a property of PROFIBUS-DP, which ensures bus cycles of equal length. When bus cycles have exactly the same length, the DP master starts the DP bus cycle after exactly the same time interval. For the connected DP slaves this means that they also receive their data from the DP master at equal intervals.

Ground

The conductive mass of earth, the electrical potential of which can be set to zero at any point.

H System

A fault-tolerant (high-availability) system consisting of at least two central processing units or two separate devices, e.g. PCs (master/standby). The user program is processed identically in the master and standby PCs.

Passivation

When redundantly operated input/output modules fail – after successful error localization – they are switched off (= passivated) by the system program.

PROFIBUS

PROcess Field BUS is a process and field bus standard laid down in the PROFIBUS standard (EN 50170 Volume 2, PROFIBUS). It defines functional, electrical and mechanical properties for a bit-serial field bus system. PROFIBUS is available with the following protocols: DP (German abbreviation standing for distributed I/O), FMS (= Fieldbus Message Specification) or PA (= Process Automation).

PROFIBUS Address

Each bus node must have a PROFIBUS address to uniquely identify it on the PROFIBUS-DP bus system.

The PC/programming device or the hand-held ET 200 have the PROFIBUS address "0".

DP master and DP slaves have a PROFIBUS address from 1 to 125.

PROFIBUS-DP

This is the PROFIBUS bus system with the DP protocol. DP stands for distributed I/O in German. The ET 200 distributed I/O device is based on the EN 50 170, Volume 2, PROFIBUS standard.

Redundant Systems

Redundant systems are characterized by the fact that important automation components are duplicated (redundant). If a redundant component fails, there is no interruption in the program processing.

Segment

A segment or bus segment is a self-contained part of a serial bus system.

Terminating Resistor

A terminating resistor is a resistor that terminates the data transfer line to avoid reflections.

TN-S System

In a TN-S system the neutral conductor (N) and protective conductor (PE) are separated. The neutral conductor is connected to the grounded protective conductor at a central point, and only there. The conductor can be grounded any number of times.

Ungrounded

Without a conductive connection to ground.

Y-Chain

See Figure 1-1

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Siemens AG
A&D AS E82
Postfach 1963
D-92209 Amberg
Federal Republic of Germany

From:

Your Name:

Your Title:

Company Name:

Street:

City, Zip Code:

Country:

Phone:

Please check any industry that applies to you:

- | | |
|--|---|
| <input type="checkbox"/> Automotive | <input type="checkbox"/> Pharmaceutical |
| <input type="checkbox"/> Chemical | <input type="checkbox"/> Plastic |
| <input type="checkbox"/> Electrical Machinery | <input type="checkbox"/> Pulp and Paper |
| <input type="checkbox"/> Food | <input type="checkbox"/> Textiles |
| <input type="checkbox"/> Instrument and Control | <input type="checkbox"/> Transportation |
| <input type="checkbox"/> Nonelectrical Machinery | <input type="checkbox"/> Other |
| <input type="checkbox"/> Petrochemical | |



Remarks Form

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- 2. Is the information you need easy to find?
- 3. Is the text easy to understand?
- 4. Does the level of technical detail meet your requirements?
- 5. Please rate the quality of the graphics/tables:

Additional comments:

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Siemens AG
A&D AS E82
Postfach 1963
D-92209 Amberg
Federal Republic of Germany

From:

Your Name:

Your Title:

Company Name:

Street:

City, Zip Code:

Country:

Phone:

Please check any industry that applies to you:

- | | |
|--|---|
| <input type="checkbox"/> Automotive | <input type="checkbox"/> Pharmaceutical |
| <input type="checkbox"/> Chemical | <input type="checkbox"/> Plastic |
| <input type="checkbox"/> Electrical Machinery | <input type="checkbox"/> Pulp and Paper |
| <input type="checkbox"/> Food | <input type="checkbox"/> Textiles |
| <input type="checkbox"/> Instrument and Control | <input type="checkbox"/> Transportation |
| <input type="checkbox"/> Nonelectrical Machinery | <input type="checkbox"/> Other |
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Additional comments:

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