SIEMENS

Product Information on

Y-Link Bus Coupler, Version 2

Introduction

This product information document contains all the information you need to commission the Y-link bus coupler.

The information contained in the *DP/PA Bus Coupler* manual, edition 04 (02/2000), with the order number 6ES7 157-0AA00-8XA0, does not apply to the Y-link bus coupler.

Contents

Scope of Validity

This product information document is valid for the following products:

- IM 157: 6ES7 157-0AA81-0XA0 (as of release 3 or FW V3.5.0)
- Y-Coupler: 6ES7 197-1LB00-0XA0
- BM IM 157 bus module: 6ES7 195-7HE80-0XA0
- BM Y-coupler bus module: 6ES7 654-7HY00-0XA0
- Complete package of the above components: 6ES7 197-1LA01-0XA0

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1 Product Overview of the Y-Link/Y-Coupler

Definition

The Y-link bus coupler consists of two IM 157 an a Y-coupler.

Area of Application

The Y-link bus coupler creates a gateway from the redundant DP master system of an S7-400H to a one-sided DP master system. This enables devices with only one PROFIBUS DP interface to be connected to a redundant DP master system as switched I/O devices.

The Y-link is a DP slave to the programmable logic controller (”above”) and a DP master in relation to systems below it in the hierarchy. The figure below shows how the Y-link is integrated in the system.

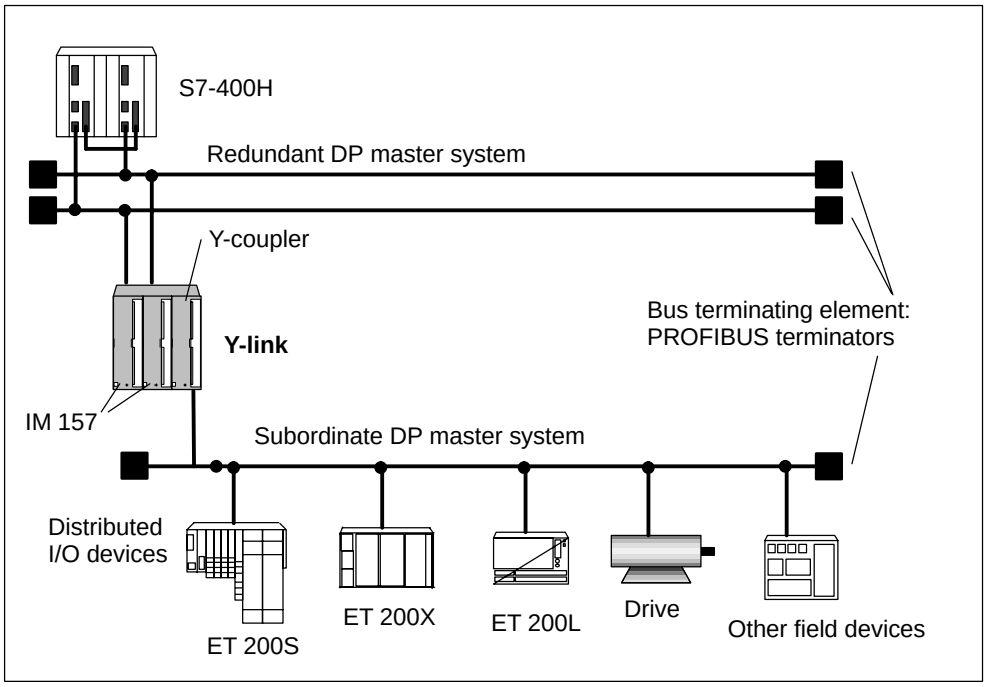


Figure 1 Integration of the Y-Link in the System

Features of the Y-Link

The Y-link has the following features:

- Modular design on S7-300 rail with active backplane bus
- All transmission rates from 9.6 kbps to 12 Mbps for the redundant DP master system
- Bumpless switching of the active channel of the redundant DP master system
- Supports system changes during operation on an S7-400H
- Diagnosis by means of LEDs and the user program

Features of the Y-Coupler

The Y-coupler has the following features:

- Transmission rates from 187.5 kbps to 1.5 Mbps for the subordinate DP master system (regardless of the redundant DP master system)
- Isolation between the subordinate DP master system and power supply
- IP 20 degree of protection

Operating Principle

- The Y-link maps the subordinate DP master system to the redundant DP master system as a switched DP slave.
- The Y-coupler and the subordinate DP master system form their own bus system and work separately from the redundant bus system.
- The Y-link as DP slave on the redundant DP master system functions, as far as the data are concerned, as a substitute for the nodes on the subordinate DP master system.

Configuration

The Y-link can be configured with STEP 7 as of version 5.1 SP1. It is not necessary to configure the Y-coupler.

To calculate the bus parameters using STEP 7, the connected nodes on the subordinate DP master system and the Y-link itself must be taken into account.

Parameter Assignment of the DP Slaves

The parameter of the DP slaves in the subordinate DP master system are assigned from the redundant DP master system via the Y-link.

Configuration Options and Restrictions

A redundant DP master system can be expanded with Y-links as follows:

- The number of Y-links on a redundant DP master system is only limited by the maximum number of bus nodes (126).
- Only **one** Y-coupler can be operated in each Y-link. DP/PA couplers cannot be operated in the Y-link.
- The number of nodes in each subordinate DP master system is limited to 31. The total number of slots is limited to 223.
- The configuration frame and the user data frames of the Y-link each consist of the frame contents of the subordinate slaves. The maximum length of the configuration frame and the maximum frame length for I/O data for each Y-link is 244 bytes.
- The ET 200M should not be connected to the redundant DP master system via the Y-link; it should be connected via the IM 153.
- It is **not** permissible to cascade Y-links.
- Direct communication and equidistance are not possible in the subordinate DP master system.

2 Y-Coupler

Features

The Y-coupler is intended to connect the subordinate PROFIBUS DP to the DP master in the IM 157. This DP master system offers the following possibilities:

- The connection of passive DP standard slaves without expansion for records
- The configuration of DP slaves with STEP 7
- A transmission rate of 187.5 kbps to 1.5 Mbps (at 1.5 Mbps the maximum consistency length is 1 word)
- No isolation between the DP master interfaces of the IM 157

It is not possible to operate the Y-coupler without the IM 157.

Connections of the Y-Coupler

The Y-coupler has a PROFIBUS DP interface for connection to the subordinate DP master system.

The power supply of the Y-coupler is connected via the bus module.

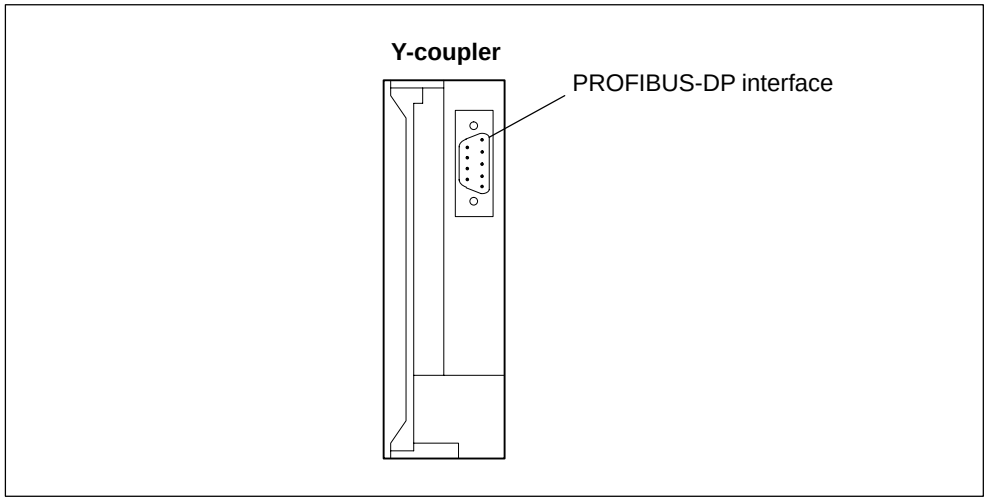


Figure 2 PROFIBUS DP Interface of the Y-Coupler

3 Y-Link

This chapter describes the Y-link. The Y-link consists of two IM 157 devices and a Y-coupler, which are connected to each other via bus modules.

Typical Application Specification of the Y-Link

The Y-link can be used in redundancy mode on the S7-400H.

Table 1 Typical Application Specification of the Subordinate DP Master System

Features	Value
Connectable DP slaves	Max. 31
Available slots	223 (one DP slave can occupy several slots)
Frame length for parameter assignment:	Max. 244 bytes
Communication links from the PG/PC to the DP slaves (routing) via the Y-link.	Max. 10 connections

Table 2 Features of the Y-Link on the Redundant DP Master System

Features	Value
Frame length for diagnosis	168 bytes (188 bytes for interrupt)
Frame length for parameter assignment:	Byte 18
Frame length for configuration:	Max. 244 bytes
Frame length for user data	Max. 244 bytes outputs and max. 244 bytes inputs
Communication connections from the programming device/PC to the Y-link	Max. 5 connections

User Data of the Y-Link

The DP user data frame of the Y-link is dependent on the number of configured DP slaves. It consists of the data blocks of the configured DP slaves arranged next to each other. The data blocks are sorted in ascending order by DP address.

In the event of the failure of a DP slave, the associated input data in the user data frame of the Y-link is reset first. The corresponding information is then entered in the diagnostic frame.

When the DP slave returns, information is first entered in the diagnostic frame. Several DP cycles later the valid input data of the DP slave is again available in the user data frame of the Y-link.

Diagnostic Data of the DP Slaves

Diagnostic frames of the DP slaves are not forwarded to the redundant DP master system. If the external diagnostic bit (group error bit) is set in the diagnostic frame of a slave, this bit is also set in the diagnostic frame of the Y-link (see Section 5.5.2). Diagnostic data without a group error bit (such as process interrupts) are not reported on.

The diagnostic frames of the lower-level DP slaves can be displayed in the online view of the hardware configuration with STEP 7 as of V5.1 SP3.

Communication Connections from the Programming Device/PC to DP Slaves

Up to 10 communication connections can be set up simultaneously to DP slaves from a programming device/PC via the Y-link.

C2 connections cannot be forwarded from the subordinate DP master system to the redundant DP master system and vice versa. If this type of connection is necessary, the programming device/PC must be connected to the corresponding DP master system.

When the active channel is switched from one IM 157 to another, all the communication connections from the programming device/PC to the DP slaves are automatically cleared.

4 Installation and Wiring

Chapter Overview

4.1 Installing/Removing the Y-Link

Introduction

The Y-link can only be installed on the associated bus modules.

Installation Location

The Y-link can only be installed outside of potentially explosive areas.

The modules of the Y-link are open resources. That means you can only install the Y-link in housings, cabinets, or electrical operating areas that can be accessed only with a key or a special tool. Only trained or authorized personnel should have access to the housings, cabinets, or electrical operating areas.

Installation Position

The Y-link can be installed horizontally or vertically.

Components

- Rail for the configuration with active bus modules (rail for the replacement of modules during operation)
- BM IM 157 bus module
- BM Y-coupler bus module
- 2 x IM 157 (both IM 157 devices must have the same version)
- Y-coupler

You can find the order numbers for these components in Chapter 7.

Note

The bus modules intended for use in the ET 200M distributed I/O device cannot be used for the Y-link.

The use of these bus modules can result in damage to the modules.

Removing and Inserting Modules

You can remove and insert modules in redundancy mode on the S7-400H during operation. The following points should be noted when doing this:

- You can only remove and insert one IM 157 in a deenergized state. To do this, switch off the 24 VDC supply to the IM 157. To prevent the subordinate DP master system failing, the Y-link should be set up with independently switchable power supplies for both IM 157 (by using, for example, two power supply modules).
- You can remove and insert the Y-coupler without restrictions; it does, however, result in the failure of the subordinate DP master system.

Design of the Y-Link

The following figure illustrates the typical setup of the Y-link with two power supply modules and open front doors.

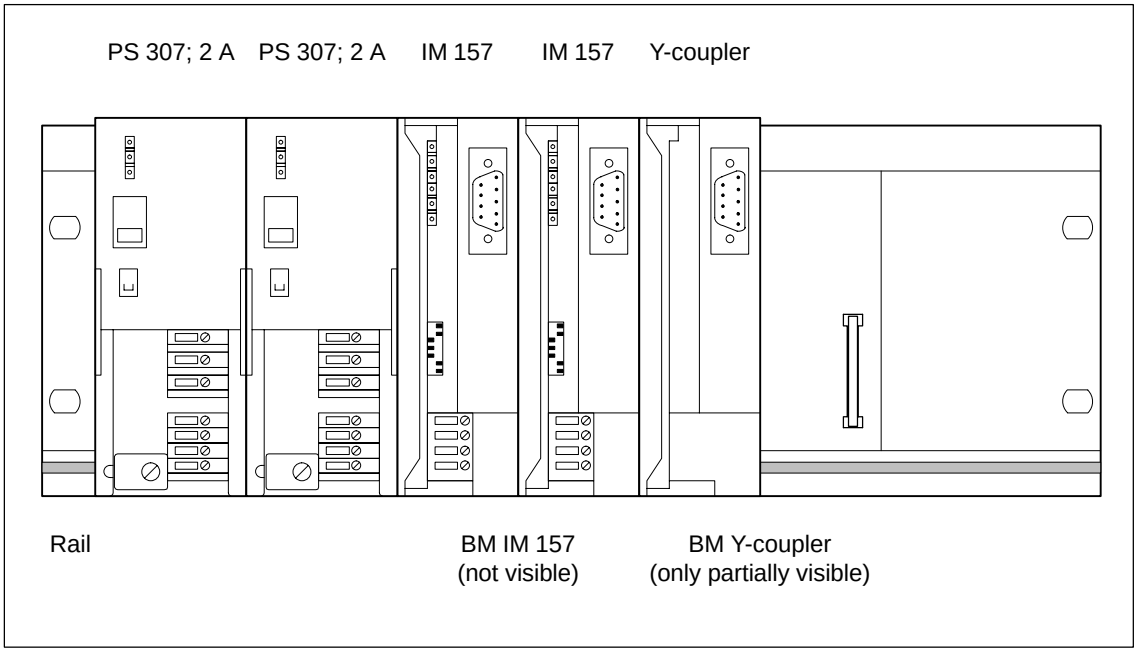
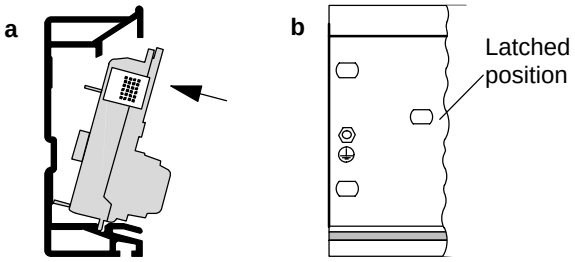


Figure 3 Setup of the Y-Link

A clearance of 40 mm must be maintained above and below the Y-link for problem-free installation.

Installing Bus Modules and Modules

You can install and deinstall the bus modules in a deenergized state as follows:

Step	Activity
1	Hook the lower edge of the BM IM 157 bus module onto the rail, press it into the rail (**a**) and push it to the left until it engages (**b**). If you are using the 530 mm rail and position the BM IM 157 in the right-hand latched position, you can install two additional PS 307; 2A or one PS 307; 5A to the left of the bus module. 
2	Hook the BM Y-coupler bus module onto the rail and press it on. Push the bus modules together so that the module connectors have contact.
3	Insert the two IM 157 in the BM IM 157 bus module and the Y-coupler in the BM Y-coupler bus module. Use the side guides of the bus modules to do this.
4	Screw the modules in securely. This secures the bus modules to the rail at the same time.

Deinstalling Bus Modules and Modules

To remove the Y-link, proceed as above but in reverse.

4.2 Isolation and Grounding

Chapter Overview

Introduction

You can wire the 24 V power supply to the IM 157 as a grounded or ungrounded configuration, depending on the requirements of your system configuration.

Features

The IM 157 has the following features:

- The IM 157 (S7 backplane bus) and 24 V power supply are galvanically linked
- The IM 157 (DP interface) is galvanically isolated from the 24V power supply and the IM 157 (S7 backplane bus)

4.2.1 General Rules and Regulations for Operating the Y-Link

Introduction

As part of a plant or system, depending on the area of application, the Y-link requires that you observe a number of specific rules and guidelines.

This section outlines the most important rules you must observe to integrate the Y-link safely into an existing plant or system.

Specific Application

Note the safety and accident prevention regulations that apply to specific applications (e.g. machine protection guidelines).

Emergency Stop Devices

Emergency stop devices complying with IEC 204 (which corresponds to DIN VDE 113) must remain effective in all the operating modes of the plant or system.

Start-Up of the System Again Following Specific Events

The following table indicates what you should do when the system starts up after the occurrence of specific events.

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

24 VDC Power Supply

The following table tells you what you have to do in the case of the 24 VDC supply.

In the Case of ...	You Must Remember ...	
Buildings	External lightning protection	Lightning protection measures (e.g. lightning conductors)
24 VDC power supply cables, signal cables	Internal lightning protection	
24 V supply	Safety extra-low voltage with safe electrical isolation (SELV)	

Protection Against 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 or systems in which the Y-link is integrated	... The system is connected to the protective conductor so that electromagnetic interference can be discharged.
Connecting, signal and bus cables	... The cable has been routed and installed correctly.
Signal and bus lines	... Line or conductor strand breaks do not lead to undefined system states.

4.2.2 Operation with a Grounded Supply

Definition: Grounded Supply

In a grounded supply, the neutral conductor of the system is grounded. A simple short-circuit to ground between a voltage-carrying conductor and ground or a grounded part of the system causes the protective devices to respond.

Components and Protective Measures

Various different components and protective measures are prescribed when setting up an entire plant. 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): DIN VDE 0100 Part 460
- Isolator (in Figure 4, 1): DIN VDE 0113 Part 1

Y-Link on a Grounded Supply

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

Note: The arrangement of the power connections shown does not correspond to the actual arrangement; it was selected in the interests of clarity.

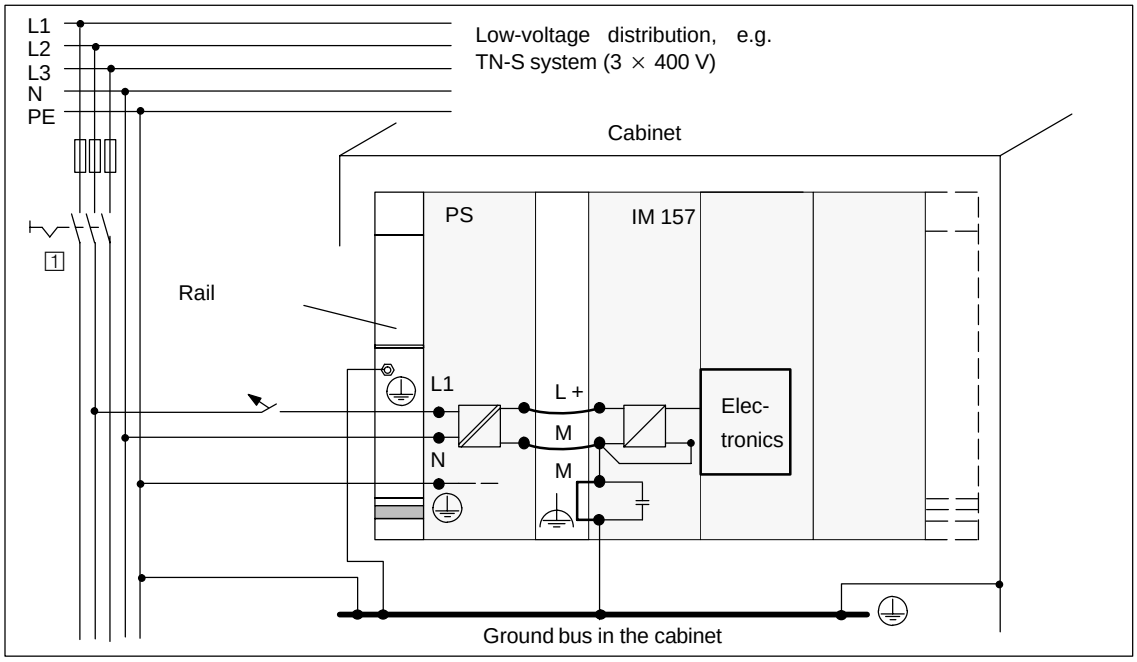


Figure 4 Operating the Y-Link on a Grounded Supply

4.2.3 Operation with Ungrounded Reference Potential

Application

In plants covering large areas, it may be necessary to configure the Y-link 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 configuring the Y-link with ungrounded reference potential, any interference currents that may occur are diverted to the protective conductor via the RC networks integrated in the IM 157 (see Figure 5).

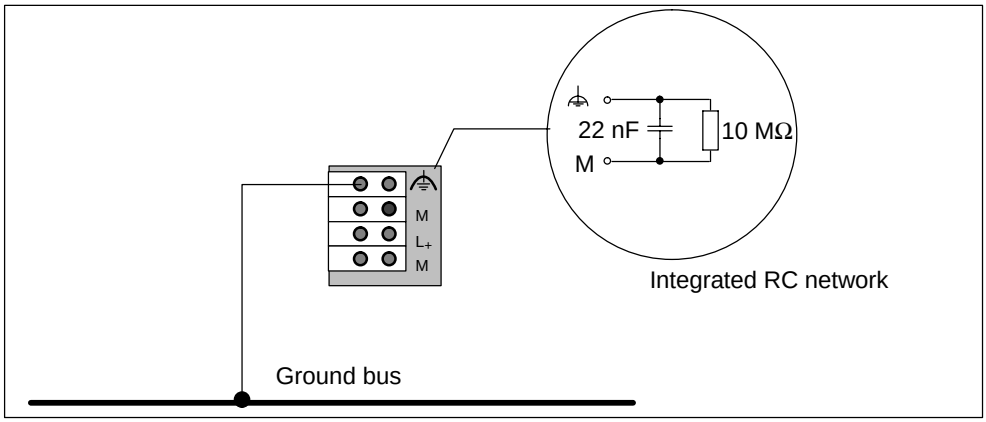


Figure 5 IM 157 Configuration with Ungrounded Reference Potential

4.3 Wiring the Y-Link

Chapter Overview

Section	Topic	Page
4.3.1	Connections of the Y-Link	15
4.3.2	Connecting the Power Supply	16
4.3.3	Connecting PROFIBUS-DP	17

4.3.1 Connections of the Y-Link

The following figure illustrates all the connections that have to be set up to and from the Y-link:

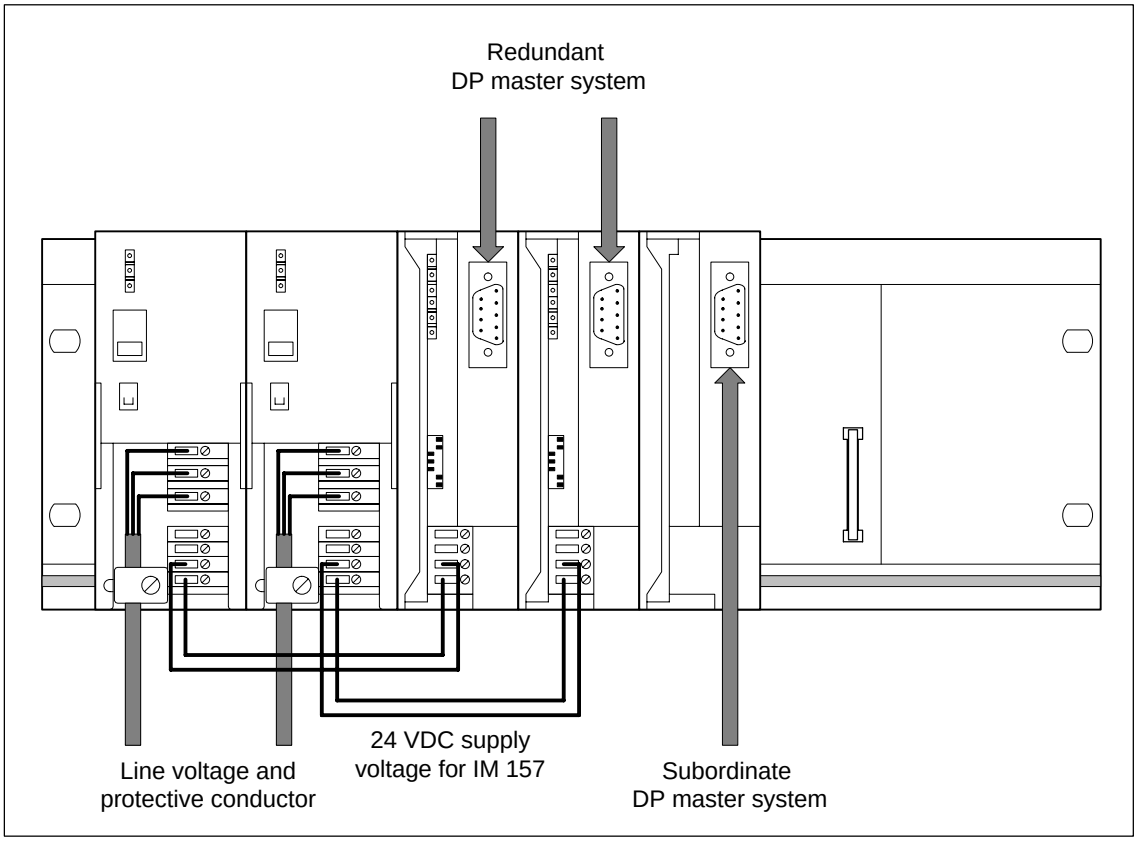


Figure 6 Connections of the Y-Link

Redundant DP master system

You can operate the Y-link on all DP masters that are suitable for redundant DP master systems on the S7-400H. You can find the transmission rates supported on PROFIBUS-DP in Section 6.1.

4.3.2 Connecting the Power Supply

Power supplies are required for both IM 157 modules in the Y-link.

Tool Required

To connect the power supply you will require a 3 mm screwdriver.

Power Supply Unit

You can only use power supply units of the SELV type with safe, electrically isolated functional extra-low voltage ($\leq$ 60 VDC).

Secure the 24 V supply of each IM 157 with, at most, a 5 A fuse (for example, a non-replaceable T5 A fuse).

Power Supply for the IM 157

The 4-pin screw-type terminal for the 24 V power supply on the IM 157 at the bottom behind the front door. The connections have the following functions:

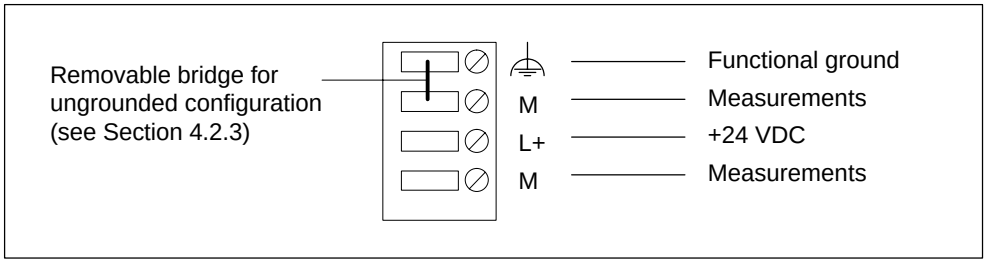


Figure 7 Power Supply for the IM 157

The maximum connection cross-section is 2.5 mm^2. There is no cable grip.

Procedure

To connect the 24 V power supply to the 4-pin screw-type terminal of the IM 157, proceed as follows:

1. Strip the insulation from the cable and the individual conductors for the 24 V power supply.
2. Secure the conductors in the screw-type terminal.

4.3.3 Connecting PROFIBUS-DP

The following PROFIBUS DP inputs/outputs are required for the Y-link:

- Redundant DP master system on both IM 157 devices
- Subordinate DP master system on the Y-coupler

Tool Required

To attach the bus connector to the IM 157, you need a 3 mm screwdriver.

Bus Cable and Connector

Only use the PROFIBUS DP accessories listed in Chapter 7.

You can find all the information you require on the use of bus cables and connectors in the *ET 200 Distributed I/O System* manual.

The Y-coupler does not have any integrated bus terminating resistors. If the Y-coupler is placed at the beginning or end of a bus segment, the bus terminating resistors must be connected at the bus connector.

5 Commissioning and Diagnostics

Requirements for Commissioning

Before you commission the IM 157:

- You must have set up and wired the Y-link as described in Chapter 4.
- You must have set up the fault-tolerant system and the redundant DP master system in their entirety. The PROFIBUS DP bus system must be ready for operation.
- You must have completed the setup of the subordinate DP master system and connected it to the Y-coupler. The PROFIBUS DP bus system must be ready for operation.

Chapter Overview

5.1 Configuration with STEP 7

The Y-link and the subordinate DP slaves are configured in STEP 7.

Step	Activity
1	Start STEP 7 and open a SIMATIC H station in HWCONFIG.
2	If the desired DP slaves cannot be configured directly (see Chapter 8), import the associated DDB (GSD) files by choosing **Options > Install New GSD**. Result: The DP slaves are displayed in the hardware catalog in the **PROFIBUS DP\Additional Field Devices** directory.
3	Drag a redundant IM 157 (MLFB: 6ES7 157-0AA81-0XA0) from the **PROFIBUS-DP\DP/PA-Link** directory of the hardware catalog to a redundant DP master system (see Figure 8 in the example below). Result: The properties dialog box for the PROFIBUS interface of the IM 157 is displayed.
4	Change the suggested address of the IM 157 in the redundant DP master system, if necessary. Result: After this dialog box has been closed, a dialog box appears in which you can select the subordinate bus system.

Step	Activity
5	Select PROFIBUS DP and confirm with OK. Result: The Y-link is inserted in the redundant DP master system. The transmission rate of the subordinate DP master system is preset to 500 kbps.
6	If you want to change the transmission rate of the subordinate DP master system, double-click it. Result: The dialog box with the properties for the subordinate bus system is displayed. Click the **Properties...** button. Result: The **PROFIBUS Properties** dialog box is displayed. On the **Network Settings** tab, select a transmission rate of 187.5 kbps to 1.5 Mbps*) and confirm with OK.
7	From the **PROFIBUS DP** subdirectory in the hardware catalog, drag the desired DP slaves to the subordinate DP master system.
8	Configure the DP slaves with STEP 7.

*) *At 1.5 Mbps, the maximum consistency length is 1 word.*

HWCONFIG checks that the configuration of the subordinate DP slave adheres to the typical application specification (see Chapter 3) and displays a corresponding error message if there has been a violation.

Processing the DP Slaves in the User Program

The process data of the DP slave should only be accessed in the user program via the process images.

An Example for the Configuration of a Y-Link

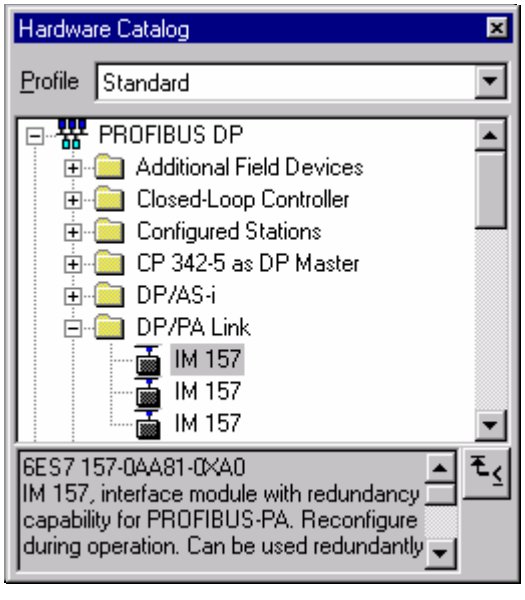


Figure 8 Y-Link in the Hardware Catalog

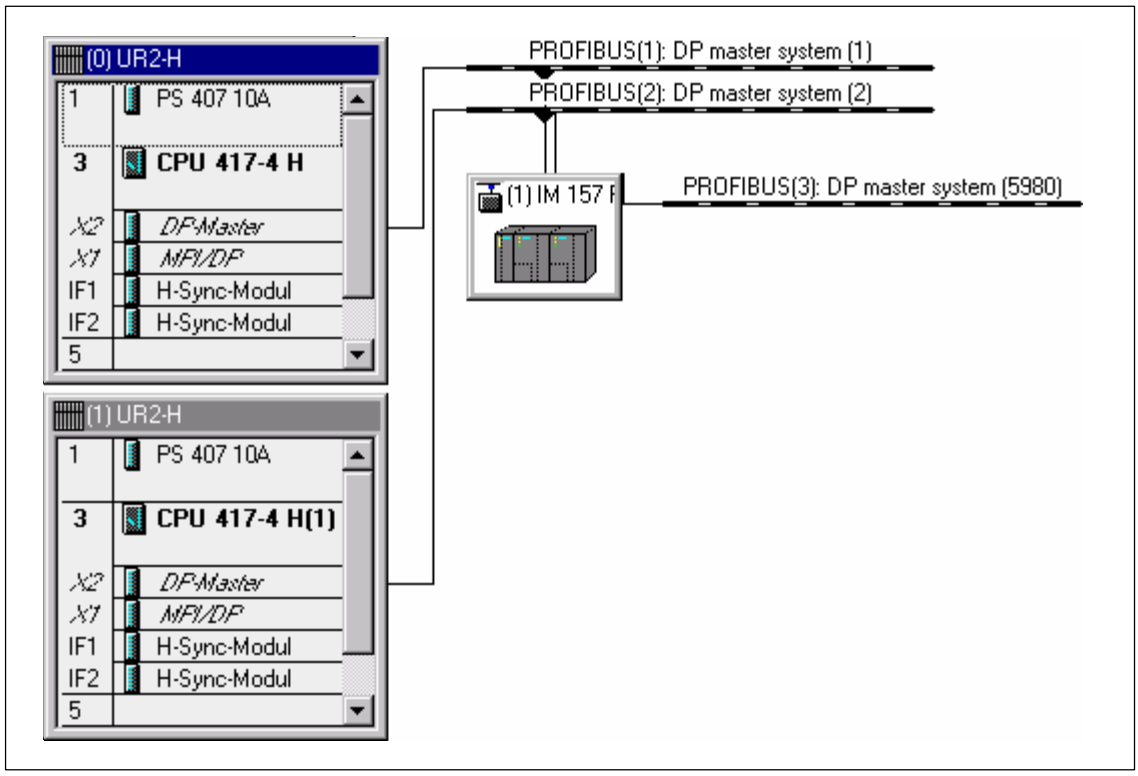


Figure 9 Minimum Configuration of an S7-400H with Y-Link

5.2 Setting the PROFIBUS Address

Definition

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

Rules

In the redundant DP master system, the following rules apply to the PROFIBUS address of the IM 157:

- The permitted PROFIBUS addresses are: 1 to 125.
- The same PROFIBUS address must be set for both IM 157.
- The PROFIBUS address can only be assigned once in each PROFIBUS-DP.

The two IM 157 use addresses 1 and 2 in the subordinate DP master system. The first possible address for a subordinate DP slave is 3.

Tool Required

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

Procedure

1. Open the front doors of the IM 157.
2. Set the PROFIBUS addresses using a screwdriver.
   The PROFIBUS address is the sum of the values of all the switches that are in the “ON” position (right switch position).

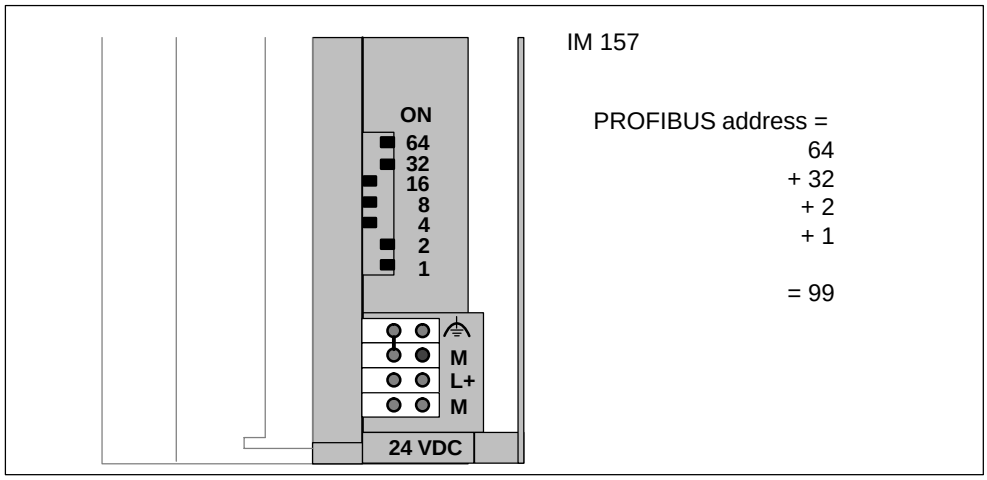


Figure 10 An Example of Setting the PROFIBUS Address

Changing the PROFIBUS Address

You can change the set PROFIBUS address at any time. The IM 157 will accept the changed PROFIBUS address once the 24V DC power supply has been turned off and on again.

PROFIBUS Address = 126

You can display the firmware version on the IM 157 when the PROFIBUS address 126 is set.

Table 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

5.3 Start-up of the Y-Link

LED Displays

During power-up all the LEDs of the IM 157 light up for approximately one second.

Power-Up Delay

At power-up the Y-link accepts the DP slaves of the subordinate DP master system in the data cycle. The DP slaves are parameterized and configured and the inputs of the DP slaves are read in.

To ensure a reproducible start-up, the Y-link outputs CLEAR frames during this phase on the PROFIBUS-DP. In other words, the outputs of the DP slaves are put into a safe state.

The power-up behavior depends on the configured start-up characteristics of the system configuration (see Table 4).

Table 4 Configured Start-Up Characteristics

Configured Start-Up Characteristics	Output Data Is Output by the Y-Link When...
Start-up when the actual layout does not correspond to the desired layout	• All the DP slaves are parameterized and configured or • The start-up delay has elapsed and fewer DP slaves were parameterized/configured than planned.
Start-up when the actual layout corresponds to the desired layout	• All the DP slaves are parameterized and configured. Note: If not all the DP slaves are configured/parameterized within the power-up delay time, the Y-link automatically repeats start-up.

The status of the start-up delay can be evaluated in byte 141 of the diagnostic frame.

Start-Up Diagram of the IM 157

During start-up, the two IM 157 modules are addressed independently of one another:

- Each DP master configures and parameterizes its IM 157 (independently of the other DP master) and sends the corresponding configuration.
- During error-free operation, the IM 157 that is connected to the subsystem master CPU is activated.
- As soon as the other DP master has also configured and parameterized its IM 157 without errors and sent the entire configuration, the IM 157 with redundant data storage is made available on standby (the IM 157 is passive). If the active IM 157 fails, it is still able to continue processing the DP slaves.

Figure 11 shows a simplified layout of the mutually independent behavior of the two IM 157 devices.

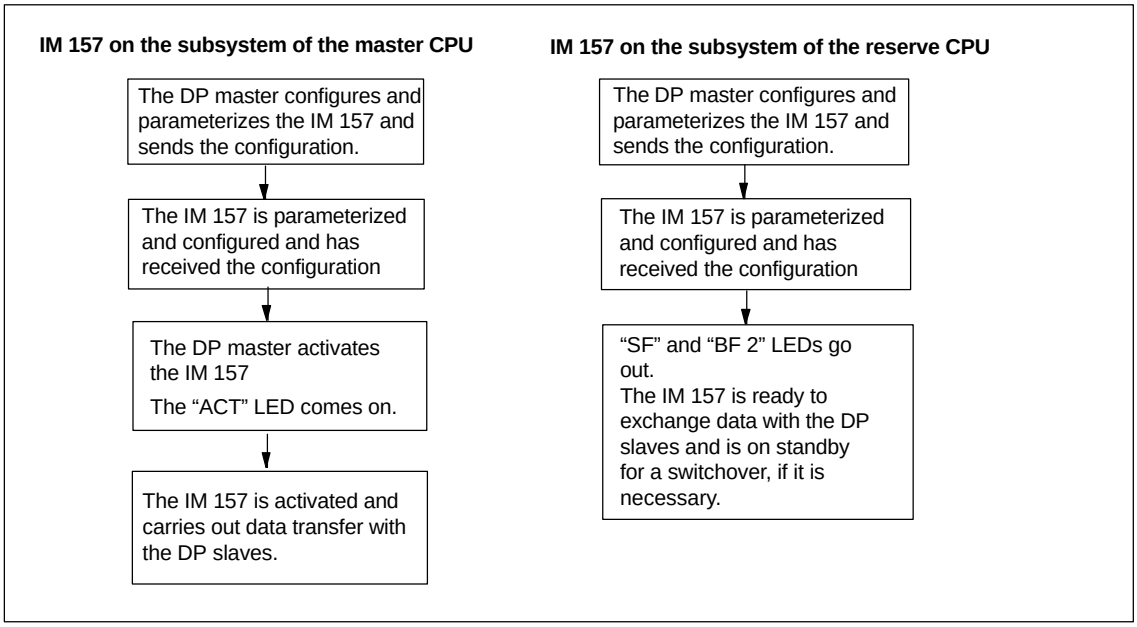
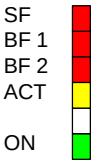


Figure 11 Behavior of the Two IM 157 Modules Given Redundancy

5.4 Diagnostics Using LEDs

5.4.1 LED Displays of the IM 157

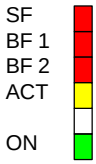
Table 5 Status and Error Messages of the IM 157



SF: Group error (red)
BF 1: Bus fault of the redundant PROFIBUS DP (red)
BF 2: Bus fault of the subordinate PROFIBUS DP (red)
ACT: IM 157 has the active channel (yellow)
ON: 24 V power supply Y-link (green)

LEDs					Meaning	What to Do
SF	**BF 1**	**BF 2**	**ACT**	**ON**		
Off	Off	Off	Off	Off	There is no voltage applied to the IM 157.	Switch the power supply module on.
Off	Off	Off	Off	On	There is voltage applied to the IM 157. The IM 157 is operational and ready to be switched over.	–
On	On	On	On	On	All the LEDs come on for approximately 1 second. The IM 157 is starting up.	–
Flash. (quickly)	Flash. (quickly)	Flash. (quickly)	Flash. (quickly)	Flash. (quickly)	Error in the IM 157. Read bytes 102 to 111 from the diagnostic frame and get in touch with your Siemens partner.	–
Off	On	On	Off	On	No connection to the DP master (transmission rate detection) Causes: • Bus communication to the IM 157 has been interrupted. • The DP master is not in operation.	• Check that the bus connector is correctly inserted. • Check if the interconnecting cable to the DP master has been interrupted. • Switch the 24V DC switch on the power supply module off and then on again.
Off	Flash.	On	Off	On	There is no data transfer between the DP master and the IM 157.	• Check the configuration. • Check the PROFIBUS address.
Off	Off	Flash. (quickly)	On	On	Power-up delay is active on the active IM 157.	If the IM 157 doesn't complete start-up within 20 sec., check in the configuration whether start-up is enabled when desired layout <> actual layout.

Table 5 Status and Error Messages of the IM 157

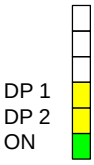


SF: Group error (red)
BF 1: Bus fault of the redundant PROFIBUS DP (red)
BF 2: Bus fault of the subordinate PROFIBUS DP (red)
ACT: IM 157 has the active channel (yellow)
ON: 24 V power supply Y-link (green)

LEDs					Meaning	What to Do
SF	**BF 1**	**BF 2**	**ACT**	**ON**		
Off	Off	Off	On	On	The IM 157 is active. It is involved in data transfer with the DP master and the subordinate DP slaves.	–
On	Off	Flash.	On	On	The active IM 157 has no cyclical data transfer to at least one DP slave.	Evaluate the diagnosis of the IM 157, and check the reported DP slaves (connection, DP address, parameter assignment, configuration).
On	Off	Off	On	On	The IM 157 is active. All the DP slaves are involved in data transfer. At least one DP slave has reported an error.	Evaluate the diagnosis of the IM 157, and check the reported DP slaves (status byte in the slave user data; reading out of the DP slave device status with a configuration tool such as SIMATIC PDM).
Flash.	Off	On	Off	On	IM 157 configuration missing.	Check whether the CPU or the DP master are in RUN.
Flash.	Off	Flash. or is off	Off	On	The passive IM 157 is not yet ready to be switched over.	–
On	Off	Off	Off	On	The IM 157 is passive and ready to be switched over. There is an error on the active IM 157. Or Invalid PROFIBUS address	Evaluate the LED on the active IM 157. Set a valid PROFIBUS address (1 to 125) on the IM 157.

5.4.2 LED Displays of the Y-Coupler

Table 6 Status Messages of the Y-Coupler



DP 1: Internal PROFIBUS DP bus monitoring (yellow)
DP 2: Subordinate PROFIBUS DP bus monitoring (yellow)
ON: 24 V power supply Y-coupler (green)

LEDs			Meaning	What to Do
BF 1	**BF 2**	**ON**		
Off	Off	Off	There is no voltage applied to the Y-coupler.	Switch on the power supply of the IM 157. If the **ON** LED does not come on when the power supply of the IM 157 is switched on: Replace the IM 157 because its internal power supply is defective.
Off	Off	On	There is voltage applied to the Y-coupler. The Y-coupler is ready for operation. There is no data transfer between the internal and subordinate PROFIBUS DP.	• Check that the bus connector is correctly inserted. • Check if the interconnecting cable to the subordinate PROFIBUS DP has been disconnected.
On	Off	On	Frames are not being received from the subordinate PROFIBUS DP, e.g.: • The connection to the subordinate PROFIBUS DP is interrupted. • DP slaves do not respond.	• Check that the subordinate PROFIBUS DP is connected correctly (the bus connector and the two bus terminating resistors are connected). • Check the connected DP slaves.
On	On	On	There is data transfer between the internal and subordinate PROFIBUS DP (at a high transmission speed).	–
Flash.	Flash.	On	There is data transfer between the internal and subordinate PROFIBUS DP (at a low transmission speed).	–

5.5 Diagnostics Using the User Program

Diagnostics with the S7 DP Master

The IM 157 sends the diagnostic data on the PROFIBUS-DP in accordance with EN 50170, Volume 2. The IM 157 behaves like a DP slave with a **SIMATIC S7** DP master.

SFC 13 “DPNRM_DG”

Read the diagnosis out in a SIMATIC S7 with SFC 13 ”DPNRM_DG”. You can find information on requesting diagnostic data in the *STEP 7 Standard and System Functions* manual.

Chapter Overview

5.5.1 Structure of the Slave Diagnosis

The slave diagnosis consists of a maximum of 188 bytes (bytes 0 to 187) and is subdivided as follows:

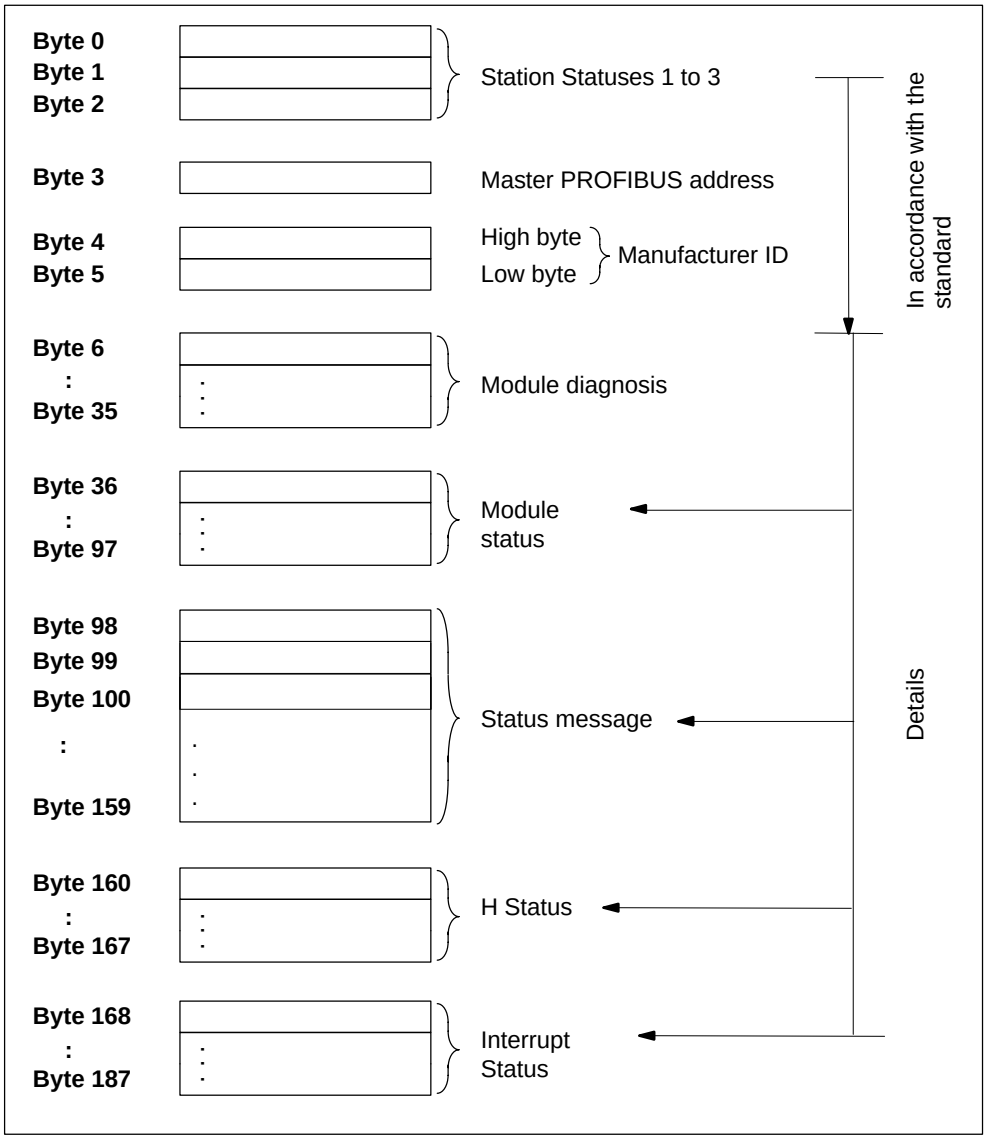


Figure 12 Structure of the Slave Diagnosis in Redundant Operation

5.5.2 Station Statuses 1 to 3

Definition

Station statuses 1 to 3 provide an overview of the status of a DP slave (IM 157).

Station Status 1

Table 7 Structure of Station Status 1 (Byte 0)

Bit	Meaning	Cause/Remedy
0	1: The DP slave cannot be addressed by the DP master.	• Correct PROFIBUS address set on the DP slave? • Bus connector connected? • Voltage at DP slave? • Execute reset on the DP slave
1	1: The DP slave is not yet ready to exchange data.	• 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.	• Is the correct station type or correct configuration of the DP slave entered in the configuration software?
3	1: External diagnosis available. (Group diagnosis display)	• Evaluate the module diagnosis, the module status and/or the status message. Bit 3 is reset as soon as all the faults have been rectified. The bit is reset when there is a new diagnostic message in the bytes of the above-mentioned diagnoses.
4	1: The function requested is not supported by the DP slave (e.g. changing the PROFIBUS address using software).	• Check the configuration.
5	1: The DP master cannot interpret the response of the DP slave.	• Check the bus configuration.
6	1: The DP slave type does not correspond to the software configuration.	• Is the correct station type entered in the configuration software?
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).	• 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.

Structure of Station Status 2

Table 8 Structure of Station Status 2 (Byte 2)

Bit	Meaning
0	1: Parameters have to be reassigned to the DP slave.
1	0: 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	0: The bit is always set to “0”.
5	0: 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.

Structure of Station Status 3

Table 9 Structure of Station Status 3 (Byte 2)

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

5.5.3 Structure of the Master PROFIBUS Address

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

- Assigned parameters to the DP slave
- Has read and write access to the DP slave

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

5.5.4 Manufacturer ID

The manufacturer ID contains a code that describes the type of the DP slave.

Manufacturer ID

Table 10 Structure of the Manufacturer ID (Bytes 4 and 5)

Byte 4	Byte 5	Manufacturer ID for
80_H	52_H	IM 157

5.5.5 Structure of the Module Diagnosis

The module diagnosis indicates the DP slave slot for which there is a diagnosis.

A bit is set when:

- A DP slave for the respective slot delivers a module diagnosis, or
- A configured DP slave is not engaged in data transfer with the DP master.

Note

DP slaves can consist of several modules (slots). Several bits can therefore display a module diagnosis for a DP slave.

The Terms Slot and Module

The modules of the DP slaves are virtual slots. DP slaves are mapped to slots like modular slaves. The terms module and slot are therefore used synonymously in the following description.

Structure

The module diagnosis comprises 30 bytes (byte 6 to 35).

- Each slot of a DP slave occupies one bit.
- The DP slaves are arranged continuously in ascending order by their PROFIBUS addresses.

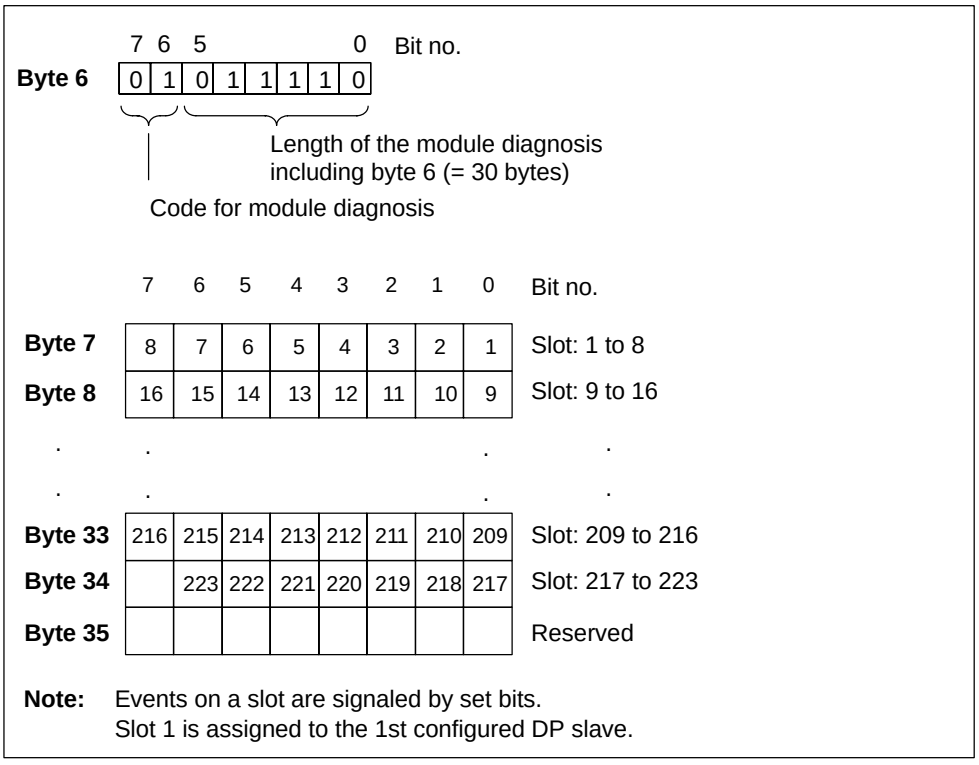


Figure 13 Structure of the Module Diagnosis for the IM 157

Example

The example below illustrates how the module diagnosis is structured:

- Bit = 1: The DP slave slot has reported a diagnosis or does not exist.
- If there is no DP slave, each slot of the DP slave is set to “1”.
- Each bit from the subordinate DP master system is forwarded from the IM 157 to the redundant DP master system without checking.

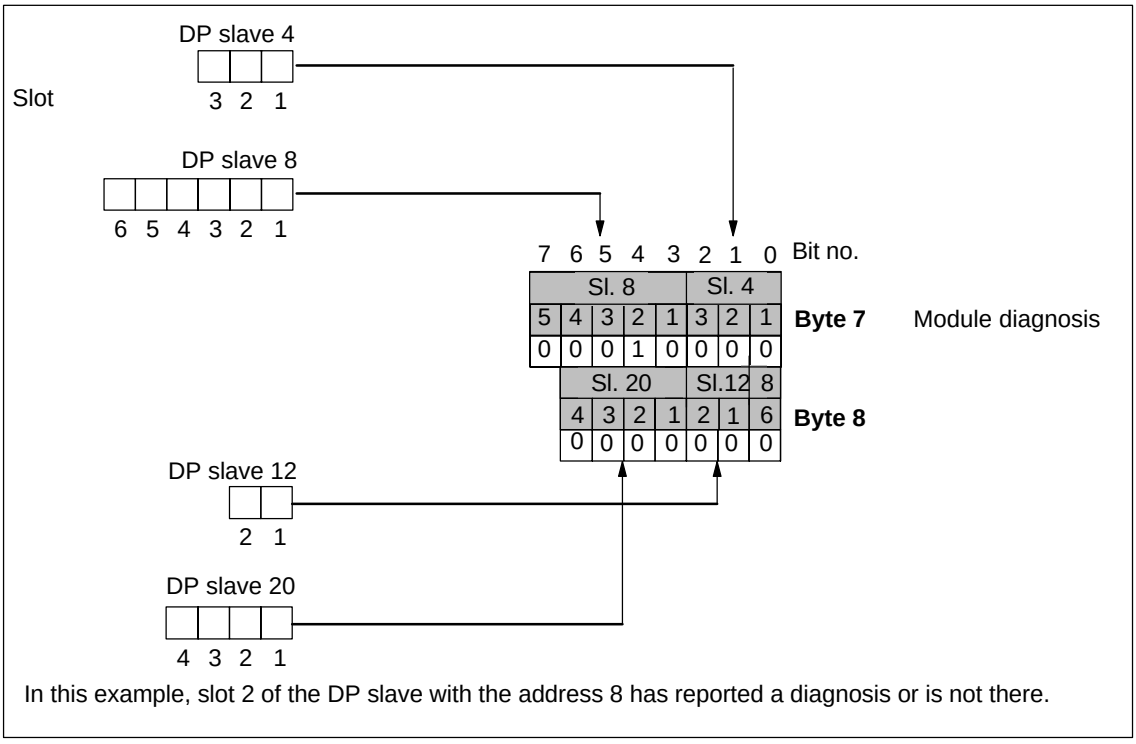


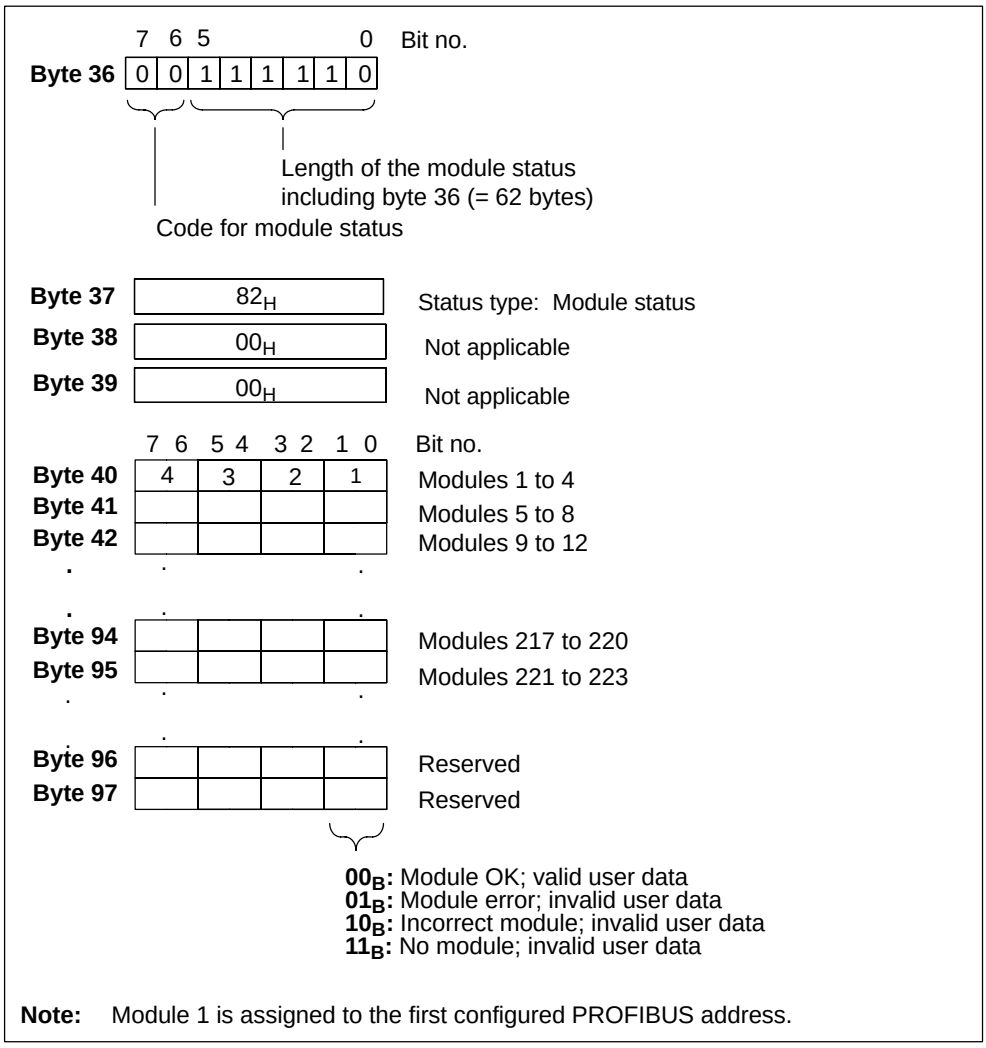
Figure 14 Module Diagnosis Example

5.5.6 Structure of the Module Status

The module status is part of the module diagnosis and indicates the status of the configured modules. The module status begins after the module diagnosis and comprises 62 bytes. The status is coded by two bits for each slot in module status. The following applies to the entry in the module status (bytes 40 to 97):

- If a DP slave delivers its own module status, the status is copied to the corresponding position.
- If the DP slave delivers a module diagnosis (but not module status), a module fault is entered for an incorrect status identifier.
- If a DP slave does not deliver either its own module status or a module diagnosis, the following is entered for the status of the DP slaves:
  - Error-free operation: 00_{B} module OK
  - Configuration error: 10_{B} incorrect module
  - DP slave not on the bus: 11_{B} No module
  - All other errors, e.g. “Prm_Fault” : 01_{B} module faulty

The module status for the IM 157 is structured as follows:



Note: Module 1 is assigned to the first configured PROFIBUS address.

Figure 15 Structure of the Module Status for the IM 157

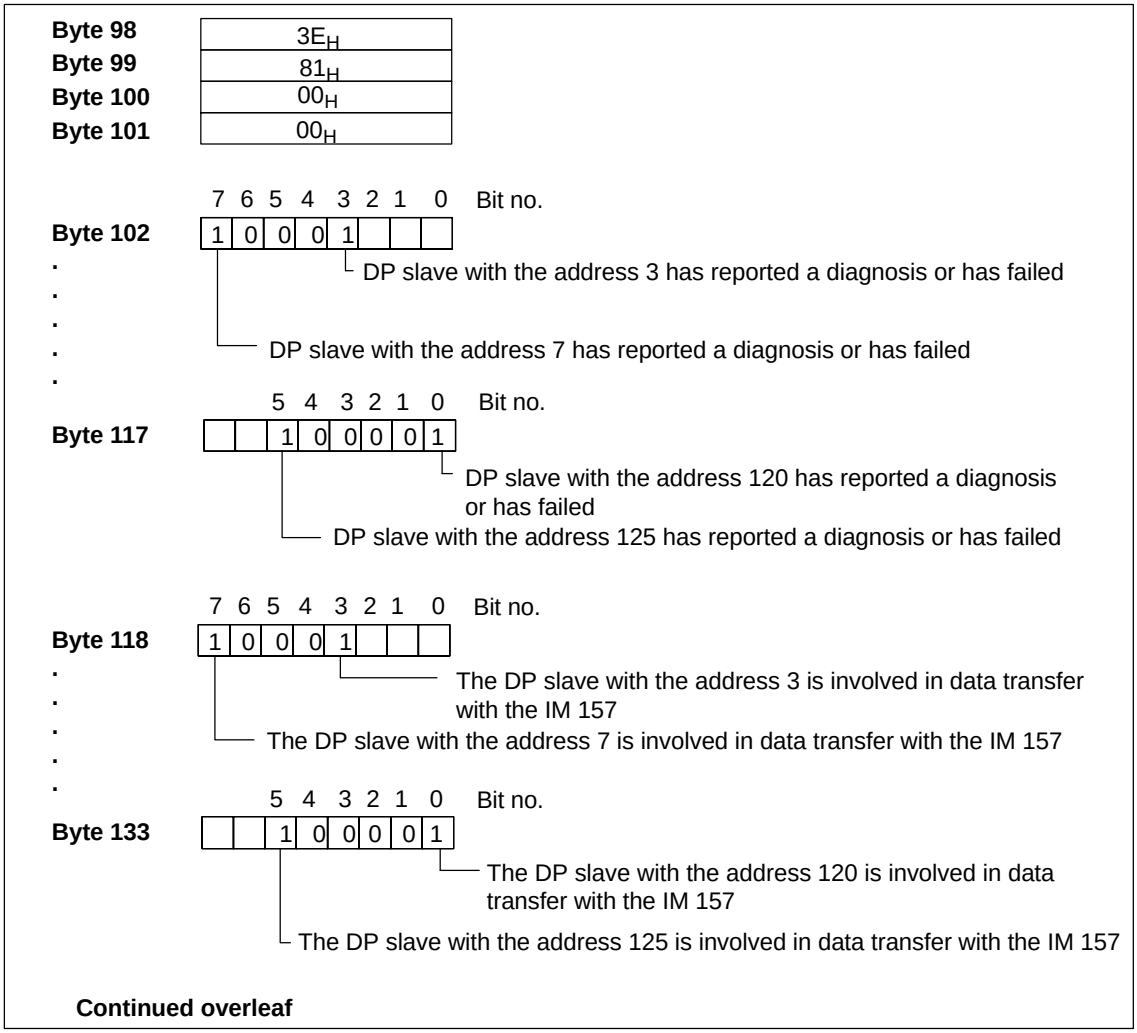
5.5.7 Structure of the Status Message

The status message is part of the module diagnosis and gives you information on the following:

- Addresses of the DP slaves with a diagnosis (bytes 102 to 117)
- Addresses of the DP slaves transferring data (= data transfer list, bytes 118 to 133).
- The status of the DP master (IM 157) (bytes 134 to 140)
- Address information on the module diagnosis of the DP slaves with a PROFIBUS address and the associated slot (bytes 142 to 159)

Structure

The status message has 62 bytes and is subdivided as follows:



Continued overleaf

Figure 16 Structure of the Status Message

Continuation from the previous page

Byte 134

00_H: OFF: There is no data transfer between the IM 157 and the DP slaves. The IM 157 can neither receive nor forward the token.

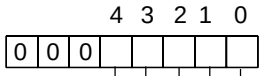
40_H: STOP: There is no data transfer between the IM 157 and the DP slaves. The IM 157 can receive and forward the token.

80_H: CLEAR: The IM 157 reads the input data cyclically. The output data is set to “0”. The IM 157 can receive and forward the token.

$C0_H$: RUN (OPERATE): The IM 157 reads the input data of the DP slaves cyclically and forwards the output data to the DP slaves. The IM 157 can receive and forward the token.

Byte 135	80_H	Manufacturer ID (high byte)
Byte 136	52_H	Manufacturer ID (low byte)
Byte 137		Reserved
Byte 138		Firmware version DDLM/user interface
Byte 139		Hardware version user
Byte 140		Firmware version user

Byte 141



1: Power up delay of the IM 157 active
(see further description)

0: At least one DP slave is not engaged in data transfer with the IM 157

1: All the DP slaves are engaged in data transfer with the IM 157
(see further description).

1: Missing or incorrect configuration

1: Impermissible bus parameter for PROFIBUS-DP

1: Number of address information items in the diagnostic bytes 142...159 >9

Byte 142

to

Byte 159

Address information of the DP slaves on the first nine module diagnoses (entries in ascending order by PROFIBUS address). 2 bytes are reserved for each set bit of the module diagnosis:

Byte 1: Address of the relevant DP slave
Byte 2: Slot of the DP slave

Example:
Slot 3 of the DP slave with the address 4 has reported a module diagnosis; bytes 142 and 143 thus have the following appearance:

Byte 142	04_H	= address
Byte 143	03_H	= slot

Figure 17 Structure of the Status Message, Continued

5.5.8 H Status

The H status delivers the IM 157 only when it is connected redundantly to a S7-400H. The H status provides information on the status of active and passive IM 157 modules. The H status consists of 8 bytes (bytes 160 to 167) and is subdivided as follows:

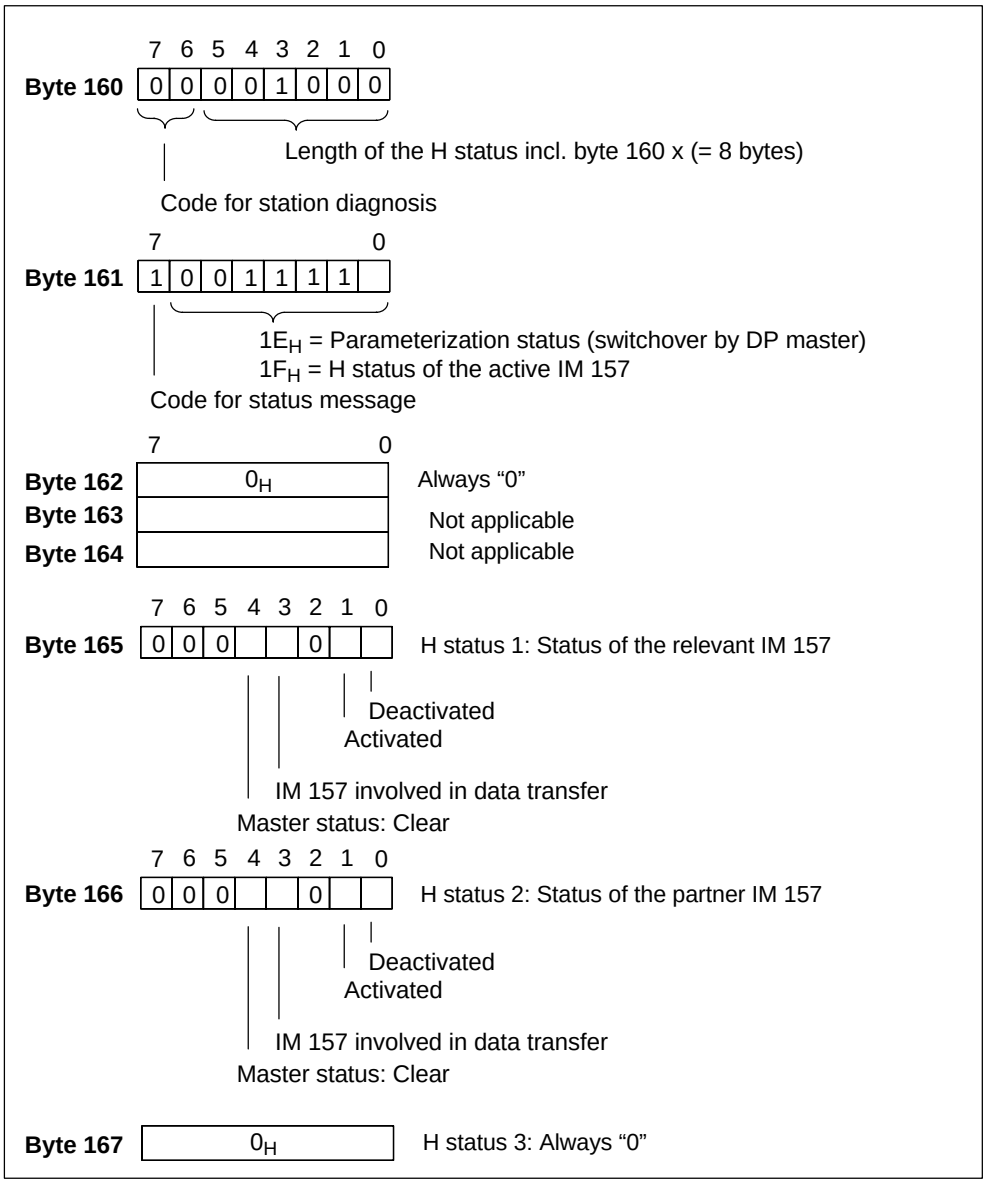


Figure 18 Structure of the H Status of the IM 157 in Redundant Operation with the S7-400H

5.5.9 Interrupt Status

The interrupt status consists of 20 bytes (bytes 168 to 187) and reports on the causes of the interrupt and the slot of the IM 157 that triggered the interrupt.

Byte 172 to byte 187 can be read or evaluated by the CPU with an SFC 59 call (corresponds to reading record 1 with 16 bytes).

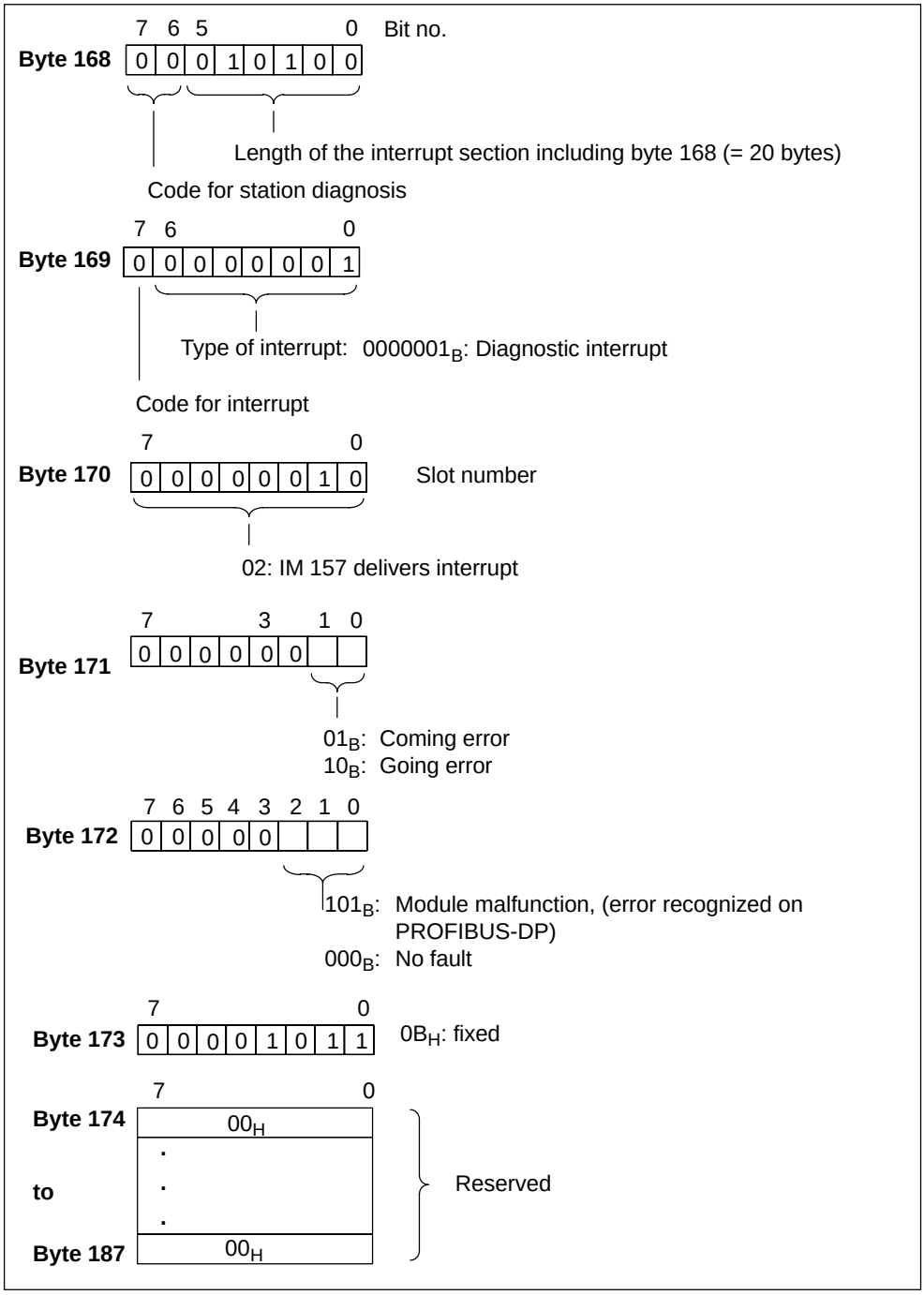


Figure 19 Structure of the Interrupt Status of the IM 157 in Redundant Operation with the S7-400H

5.5.10 Example of a Typical Diagnosis

Reading the Diagnostic Data

The example below shows the call for and appearance of a typical diagnosis of the Y-link.

Structure

The following assumptions are made in the example:

- The subordinate DP master system consists of 4 configured DP slaves
- The DP slaves have the DP addresses: 4, 8, 12 and 20
- Structure of the DP slaves:
  - DP slave 4 consists of 3 slots
  - DP slave 8 consists of 6 slots
  - DP slave 12 consists of 2 slots
  - DP slave 20 consists of 4 slots
- All the configured DP slaves are engaged in data interchange with the DP master.
- DP slave 8 reports a diagnosis:
  - Slots 1 and 3 of the 6 slots report diagnoses
  - Slot 1 reports a limit violation
  - Slot 3 reports incorrect configuration

Call of SFC 13

You begin by reading out the diagnostic data by calling SFC 13 (DPNRM_DG) in OB 1:

Table 11 Call of SFC 13 (DPNRM_DG) in OB 1

```
STL                                          Explanation
CALL SFC 13
       REQ     :=TRUE                        //Request to read the diagnostic data
       LADDR   :=W#16#3FE                    //Diagnostic address of the IM 157
       RET_VAL :=MW0                         //RET_VAL of SFC 13
       RECORD  :=P#DB10.DBX 0.0 BYTE 188     //Data mailbox for the diagnosis in DB10
       BUSY    :=M2.0                        //Read operation runs through several OB1
                                             cycles
```

Appearance of DB 10

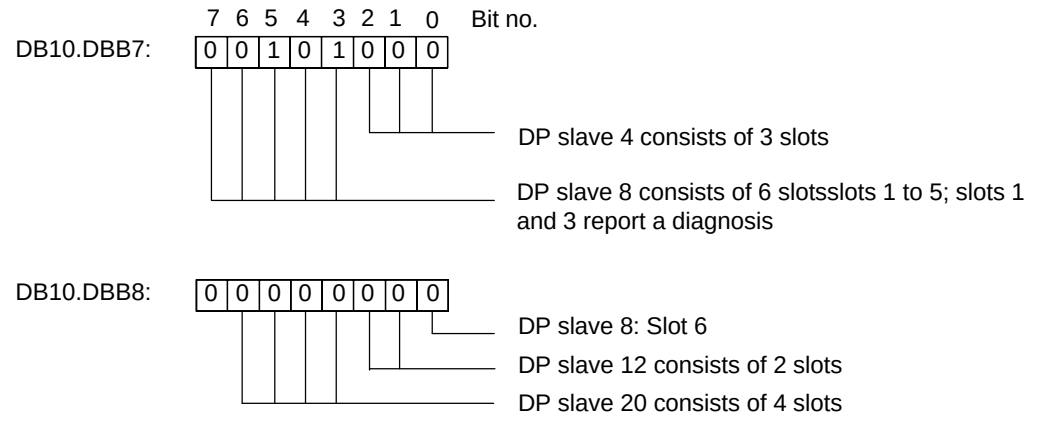
You store the diagnostic data in the data block DB 10, for example. DB 10 is as follows:

Address	Name	Type	Init. Value	Comment
0.0		STRUCT		
+0.0	NORM_DIAG	ARRAY [1..6]		Standard diagnostic data
*1.0		BYTE		
+6.0	KENN_DIAG	ARRAY [1..30]		Module diagnosis
*1.0		BYTE		
+36.0	MODUL_STATUS	ARRAY [1..62]		Module status
*1.0		BYTE		
+98.0	STATUS_MESSAGE	ARRAY [1..62]		Status message
*1.0		BYTE		
=160.0	H_STATUS	ARRAY [1..8]		H status
*1.0		BYTE		
=168.0	ALARM_STATUS	ARRAY [1..20]		Interrupt status
*1.0		BYTE		
=188.0		END_STRUCT		

Contents of DB 10

Data block DB 10 consists of a total of 188 bytes. The following list shows the relevant bytes and explains their significance:

Module diagnosis (overview of the slots of the DP slaves with a diagnosis)



What status do the configured slots (modules) have?

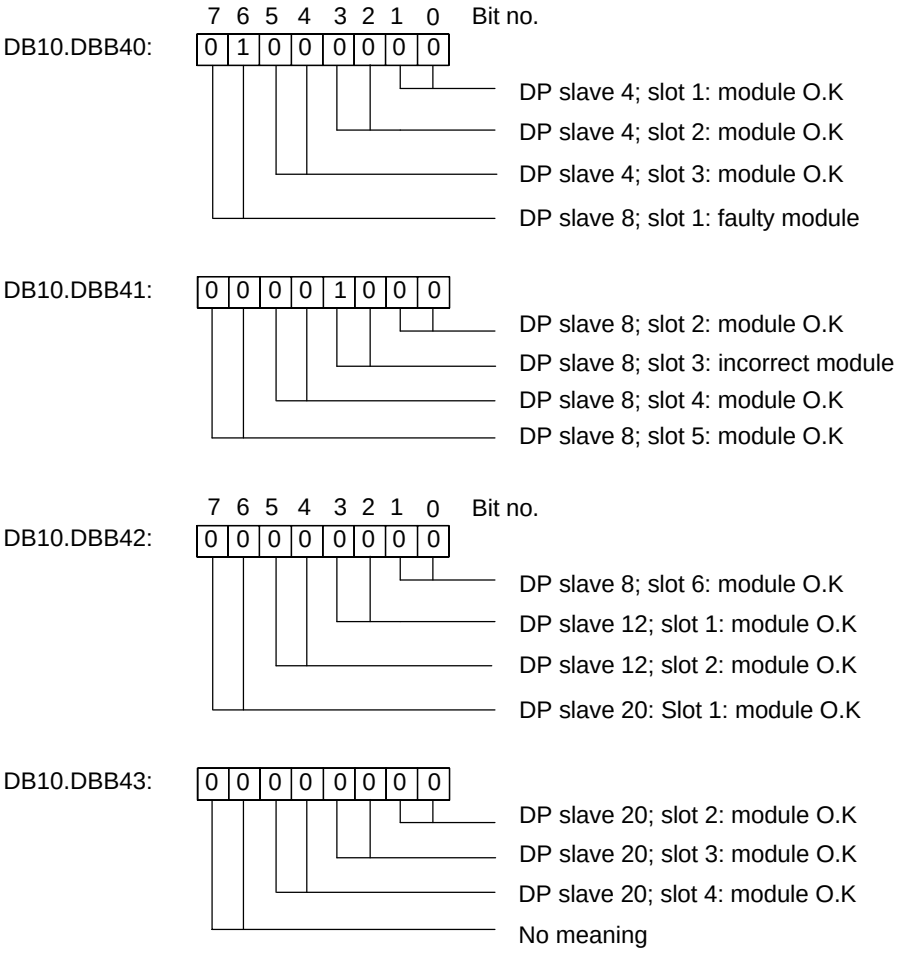


Figure 20 Module Diagnosis Example

Which DP slaves are reporting a diagnosis?

	7	6	5	4	3	2	1	0	Bit no.
DB10.DBB103:	0	0	0	0	0	0	0	1	

DP slave 8 has reported a diagnosis

Which configured DP slaves are involved in data transfer with the DP master?

DB10.DBB118:	0	0	0	1	0	0	0	0	DP slave 4 is engaged in data interchange with the IM 157
DB10.DBB119:	0	0	0	1	0	0	0	1	DP slave 8 is engaged in data interchange with the IM 157
									DP slave 12 is engaged in data interchange with the IM 157
DB10.DBB120:	0	0	0	1	0	0	0	0	DP slave 20 is engaged in data interchange with the IM 157

What status does the DP master have?

DB10.DBB134:	1	1	0	0	0	0	0	0	The IM 157 (DP master) is in RUN (OPERATE) mode
DB10.DBB135:	1	0	0	0	0	0	0	0	Manufacturer ID 8052_H
DB10.DBB136:	0	1	0	1	0	0	1	0	
DB10.DBB137:	0	0	0	0	0	0	0	0	Reserved
DB10.DBB138:	1	1	0	1	0	0	1	1	Firmware version DDLM/user interface: V 2.11
DB10.DBB139:	0	0	1	0	0	0	0	0	Hardware version user: V 2.0
DB10.DBB140:	0	0	1	0	0	0	0	0	Firmware version user: V 2.0

What status does the subordinate DP master system have?

DB82.DBB141:	0	0	0	0	0	0	1	0	

Start-up of PROFIBUS-DP is completed

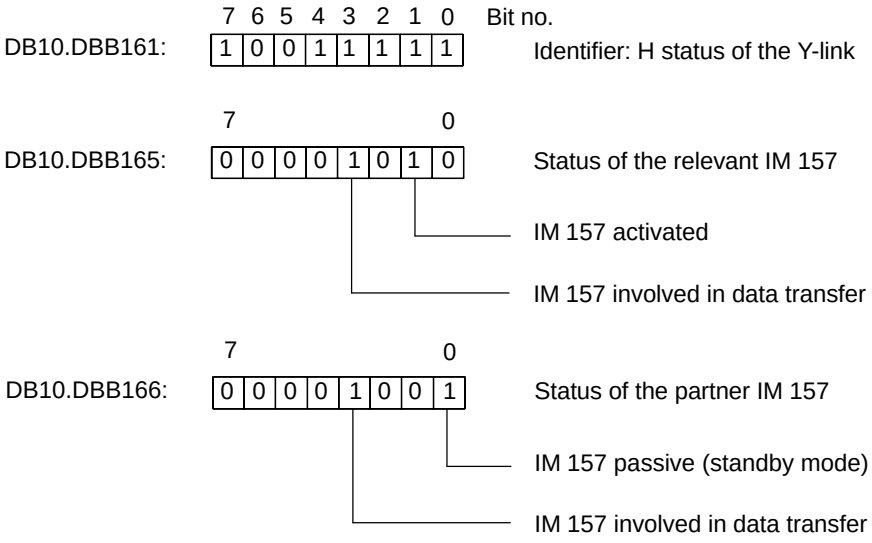
All the DP slaves are engaged in data transfer with the IM 157

Address information on the DP slaves and slots with a diagnosis

DB10.DBB142:	0	0	0	0	1	0	0	0	DP slave 8
DB10.DBB143:	0	0	0	0	0	0	0	1	Slot 1
DB10.DBB144:	0	0	0	0	1	0	0	0	DP slave 8
DB10.DBB145:	0	0	0	0	0	0	1	1	Slot 1

Figure 21 Module Diagnosis Example

What status do the two IM 157 modules have?



5.6 The Behavior of the Y-Link After Certain Events

The following table shows you the behavior of the Y-link after certain events.

Table 12 Behavior of the Y-Link After Certain Events

Event	Response
Master-reserve switchover with a modified configuration	The Y-link is switched without bumps from the active channel to the channel that has up until now been passive.
CPU failure	As long as this also results in the active channel of the redundant DP master system failing: see failure of the active channel. Otherwise: see failure of the passive channel.
Failure of the active channel	The Y-link is switched without bumps from the active channel to the channel that has up until now been passive. The failed channel is displayed on the associated IM 157 by the “BF 1” LED.
Failure of the passive channel	No effect on the Y-link. The failed channel is displayed on the associated IM 157 by the “BF 1” LED.
Failure of an IM 157 of the Y-link	A diagnostic message is generated in the system. If the active IM 157 fails, there is a bumpless switch to the channel that has up until now been passive.

5.6.1 Replacement of a Defective Module

The following table shows you the necessary steps to take to replace a defective IM 157 or a defective Y-coupler.

Step	Activity
1	Disconnect the power supply of the defective module.
2	Remove the bus connector from the PROFIBUS DP interface of the defective module.
3	Replace the defective module on the rack.
4	Insert the bus connector on the PROFIBUS DP interface of the new module.
5	Connect the power supply of the new module.

5.6.2 Expanding the System During Operation

The following table shows you the steps you need to take to add a new Y-link and the subordinate DP master system to an existing system during operation.

Step	Activity
1	Install all the modules of the Y-link.
2	Connect the power supply to all the modules.
3	Insert the bus connector of the subordinate DP master system in the PROFIBUS DP interface of the Y-coupler.
4	Insert the bus connector of the active channel of the redundant DP master system in the PROFIBUS DP interface of one of the two IM 157 devices.
5	Insert the bus connector of the passive channel in the PROFIBUS DP interface of the other IM 157.

This procedure is summarized in the *S7-400H Programmable Controller, Fault-Tolerant Systems* manual in hardware modification step in the section entitled “Modifications to the System During Operation”. You can also find a detailed description there of the overall procedure for changing a system.

6 Technical Specifications

The information on the DP/PA link and the DP/PA coupler contained in the *DP/PA Bus Coupler* manual, in Appendix A.1 on standards, certificates and approvals, also applies to the Y-link and the Y-coupler.

6.1 Technical Specifications of the IM 157 (6ES7 157-0AA81-0XA0)

Dimensions and Weight	
Dimensions W × H × D (mm)	40 × 125 × 130
Weight	Approx. 265 g
Module-Specific Data	
Transmission rate of the redundant DP master system	9,6; 19,2; 45,45; 93,75; 187,5; 500 kbps 1,5; 3, 6, 12 Mbps
Bus protocol	PROFIBUS DP
Frame length of the I/O data	Max. 244 bytes
Length of the configuration frame	Max. 244 bytes
Length of the diagnostic frame	188 bytes
Length of the parameter assignment frame	Byte 18
Voltages, Currents, Potentials	
Rated supply voltage of the Y-link	24 VDC
• Polarity reversal protection	Yes
• Power failure bridging	5 ms

Isolation	
• To the redundant DP master system	Yes
• To the Y-coupler	No
Insulation tested at	500 VDC
Current consumption (24 VDC)	Max. 250 mA
Power loss of the module	typ. 4 W
Status, Interrupts, Diagnostics	
Status display	No
Interrupts	Yes, diagnostic interrupts
Diagnostic function	Yes
• Group error	Red LED “SF”
• Bus fault on the redundant DP master system	Red ”BF 1” LED
• Bus fault on the subordinate bus system	Red ”BF 2” LED
• IM has an active channel	Yellow ”ACT” LED
• 24 V supply monitoring	Green “ON” LED

6.2 Technical Specifications of the Y-Coupler (6ES7 197-1LB00-0XA0)

Dimensions and Weight	
Dimensions W × H × D (mm)	40 × 125 × 130
Weight	Approx. 200 g
Module-Specific Data	
Transmission rate of the subordinate DP master system	187.5; 500 kbps 1.5 Mbps*)
Bus protocol	PROFIBUS DP
Length of the parameter assignment frame	Max. 244 bytes
Voltages, Currents, Potentials	
Power supply	Via the bus module
Current consumption	max. 300 mA
Power loss of the module	typ. 1 W
Isolation to the subordinate DP master system	Yes
Insulation tested at	500 VDC

Status, Interrupts, Diagnostics	
Status display	No
Interrupts	None
Diagnostic function	Yes
• Internal PROFIBUS DP bus monitoring	Yellow LED ”DP 1”
• External PROFIBUS DP bus monitoring	Yellow LED ”DP 2”
• Supply monitoring	Green “ON” LED
Features of the subordinate DP master system	
Maximum number of DP slaves	31
Terminator of the subordinate DP master system	Active terminating resistor (BUS TERMINATOR)
Use of RS 485 repeaters	max. 8
Use of OLM/OBT	Yes

*) *At 1.5 Mbps, the maximum consistency length is 1 word.*

7 Order Numbers and Accessories

Bus Coupler

The order numbers for the Y-link bus coupler are:

Table 13 Order Numbers of the Y-Link Bus Coupler

Y-Link Bus Coupler	Order Number
Y-link (complete package with 2x IM 157, Y-coupler, BM IM 157 bus modules and BM Y-coupler)	6ES7 197-1LA01-0XA0
IM 157	6ES7 157-0AA81-0XA0
Y-Coupler	6ES7 197-1LB00-0XA0
BM IM 157 bus module	6ES7 195-7HE80-0XA0
BM Y-coupler bus module	6ES7 654-7HY00-0XA0

Accessories

The order numbers for the accessories are:

Table 14 Accessories Order Numbers

Accessories	Order Number
PROFIBUS-DP bus connector (12 Mbps)	
• Without programming port	6ES7 972-0BA10-0XA0
• With programming port	6ES7 972-0BB10-0XA0
PROFIBUS-DP bus cable	
• Normal (flexible)	6XV1 830-0AH10
• Drum cable (strong)	6XV1 830-3BH10
Expansion bus for S7 rail	6ES7 390-0AA00-0AA0
Rail for the “module change during operation” function	
• 482.6 mm	6ES7 195-1GA00-0XA0
• 530 mm	6ES7 195-1GF30-0XA0
• 620 mm	6ES7 195-1GG30-0XA0
• 2000 mm	6ES7 195-1GC00-0XA0

8 DP Slaves You Can Use

The DP slaves listed in the following table can be directly configured in the subordinate DP master system of a Y-link with STEP 7 as of V5.1 SP1.

Table 15 Directly Configurable DP Slaves

Group (path[1)])	Configurable Slaves	MLFB
Stations already configured	• PC station as DP slave • S7-300 CP 342-5 DP	– All
DP/AS-i	• DP/AS-i Link	6ES7 156-0AA00-0XA0
DP/AS-i	• DP/AS-i Link 20	6GK1415-2AA00
ENCODER	SIMODRIVE sensor	6FX2001-5xPxx
ET 200B	All components except the S7 slaves ET 200B-4AI, ET 200B-4/8AI and ET 200B-4AO	**Not** 6ES7 134-0HF01-0XB0, 6ES7 134-0KH01-0XB0, 6ES7 135-0HF01-0XB0
ET 200C	All components	
ET 200L	All components except the expandable modules L-SC-...	
ET 200S	All components except the IM 151 / CPU	**Not** 6ES7 151-7AA00-0AB0
ET 200U	All components	
Function modules	IM 178-4	6ES7 178-4BH00-0AE0
IDENT	All components	
IPC	Direct key module	
NC	IM 319N (slave)	6FC5012-0CA02-0AA0
Controller	SIPART DR**	
Switchgear	• DP/RS 485 interface module • SIMOCODE-DP	3RK1000-0JC80-0BA1
SIMADYN	SIMADYN D SS52	6DD1688-0AE2
SIMATIC	All components	
SIMODRIVE	All components	
SIMOREG	All components	
SIMOVERT	All components	
SIPOS	All components	

1) *In the hardware catalog starting from “PROFIBUS DP”*

DP slaves that don’t belong to these groups can be configured using the DDB file as long as they are not affected by the following constraints.

Restrictions

The following DP slaves **cannot** be operated on a Y-link:

- Operator panels and text displays
- DPV1 slaves

S7 slaves should not be used in the subordinate DP master system.

Examples of DP Slaves that Can Be Used

The following tables show an arbitrary selection of field devices that can be defined as a DP slave by means of a DDB file and all S7 CPUs that can be used with different I/O areas as intelligent slaves.

Table 16 Examples of DP Slaves that Can Be Used

Slave Designation	Path [1]	DDB File	Input Bytes	Output Bytes	Number of Slaves [2]
Gateway 3WN6	Switchgear	Siem8032.gs*	Max. 12	Max. 12	20 [3]
ET 200X with BM147/CPU as intelligent slave with different I/O areas	I/O\ET200X	Siem804a.gs*	Max. 244	Max. 244	1 [3]
SIMOCODE-DP with basic module type 1 compact	Schaltgeräte \SIMOCODE	Siem8031.gs*	12	4	20
SIMODRIVE 611U with 1 axis, PPO type 5	Antriebe \SIMODRIVE	Siem8055.gsd	28	28	8
SIMODRIVE 611U with 2 axes, PPO type 5			56	56	4
SIMODRIVE POSMO A	Antriebe \SIMODRIVE	Siem8054.gsd	12	12	20
Heating control HS 724	Allgemein \SONSTIGE	Siem002b.gsd	32	32	7

1) *In the hardware catalog starting from “PROFIBUS DP\Weitere FELDGERÄTE”*

2) *The number of identical slaves that fulfill the I/O typical application specification of the Y-link*

3) *Applies to the maximum configuration of the slaves*

Table 17 CPUs that Can Be Used as Intelligent Slaves with Different I/O Areas

Slave Designation	Path [1]	DDB File	Input Bytes	Output Bytes	Number of Slaves [2]
S7-300 CPU 315-2DP (...-2AF01-... or ...-2AF02-...)	SPS\SIMATIC	Siem802f.gs*	Max. 122	Max. 122	1 [3]
S7-300 CPU 315-2DP (...-2AF03-...)	SPS\SIMATIC	Sie3802f.gs*	Max. 244	Max. 244	1 [3]
S7-300 CPU 316-2DP	SPS\SIMATIC	Siem806f.gs*	Max. 244	Max. 244	1 [3]
S7-300 CPU 318-2DP	SPS\SIMATIC	Siem807f.gs*	Max. 244	Max. 244	1 [3]
S7-400 CPU 412-1	SPS\SIMATIC	Siem80c5.gs*	Max. 244	Max. 244	1 [3]
S7-400 CPU 412-2	SPS\SIMATIC	Siem80c6.gs*	Max. 244	Max. 244	1 [3]
S7-400 CPU 414-2	SPS\SIMATIC	Siem80c7.gs*	Max. 244	Max. 244	1 [3]
S7-400 CPU 414-3	SPS\SIMATIC	Siem80c8.gs*	Max. 244	Max. 244	1 [3]
S7-400 CPU 416-2	SPS\SIMATIC	Siem80ca.gs*	Max. 244	Max. 244	1 [3]
S7-400 CPU 416-3	SPS\SIMATIC	Siem80cb.gs*	Max. 244	Max. 244	1 [3]
S7-400 CPU 417-4	SPS\SIMATIC	Siem80cc.gs*	Max. 244	Max. 244	1 [3]

[1] *In the hardware catalog starting from "PROFIBUS DP\Weitere FELDGERÄTE"*

[2] *The number of identical slaves that fulfill the I/O typical application specification of the Y-link*

[3] *Applies to the maximum configuration of the slaves*

Configuration Example

- An S7-300 with CPU 315-2DP as an intelligent slave with different I/O areas
- Two SIMODRIVE 611U each with two axes, PPO type 5
- Heating controller HS 724

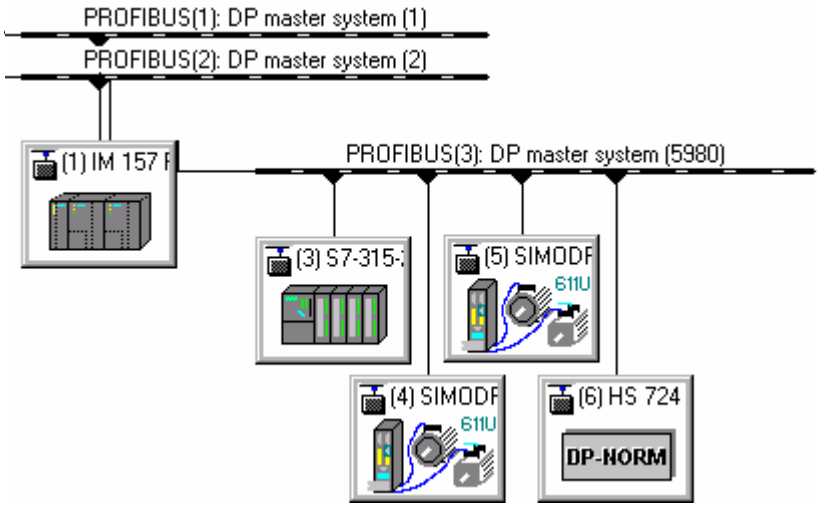


Figure 22 Section from HWCONFIG

DP Address	Slave	Input Bytes	Output Bytes
3	S7-300 with CPU 315-2DP [1)]	100	100
4	SIMODRIVE 611U with 2 axes, PPO type 5	56	56
5	SIMODRIVE 611U with 2 axes, PPO type 5	56	56
6	Heating control HS 724	32	32
	Total	244	244

1) The actual hardware configuration of this station is irrelevant here. Only the I/O areas that are transparent for the fault-tolerant system are important here.

The maximum frame length for the subordinate DP master system, for both the input and output data, is thus reached. Additional slaves cannot be operated on this DP master system.

Notes on Configuring an S7-300/S7-400 Station as an Intelligent Slave

The CPU for an S7-300 or S7-400 station cannot be take from the catalog directory of already configured stations: instead, it must be integrated by means of a DDB file.

When the S7-300/S7-400 station is configured, a dummy DP system must be generated that has the same bus settings as the subordinate DP master system of the Y-link. The station number of the S7-300/S7-400 must match the slave address on the Y-link.