SIEMENS

SIMATIC

**Distributed I/O System
DP/ASi Link**

Manual

EWA 4NEB 710 6055-02b

Edition 3

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

The device/system may only be set up and operated in conjunction with this manual.

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 description, 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.

Trademarks

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Preface

Purpose of manual

The information contained in this manual will enable you to:

- install an Actuator Sensor Interface (ASi)
- commission the DP/ASi link

Manual contents

The scope of delivery of MLFB 6ES7 156-0AA00-8AA0 consists of the manual:

Distributed I/O System
DP/ASi Link, Edition 3

- installing and wiring the distributed I/O system DP/ASi link
- configuring the DP/ASi link
- diagnostics and error handling
- technical data

Applicability

The present manual is valid for:

Order No. DP/ASi Link	Release (or Later) DP/ASi Link	Manual Edition
6ES7 156-0AA00-0XA0	03	03
6ES7 156-0AA01-0XA0	01	

The present manual contains a description of all the functions incorporated in the DP/ASi link at the time this manual was published. We reserve the right to describe modified functions in a Product Information.

**Changes from
previous edition**

Compared to the previous edition of this manual, *Distributed I/O System DP/
ASi Link* having the Order No. 6ES7 156-0AA00-8AA0, Edition 2, the fol-
lowing changes have been incorporated:

- DP/ASi link to S7

- diagnostics during operation with an S7/M7 DP master

**Standards and
approvals**

The DP/ASi link meets the requirements and criteria of the following stan-
dards and approvals:

- IEC 1131, Part 2

- EN 50170 Volume 2, PROFIBUS

- ASi: *Actuator Sensor Interface Complete Specification*

- CE mark requirements

- CSA, UL and FM approvals

You will find complete details of approvals and standards in appendix A.1.

**How this manual
fits in**

This manual, *DP/ASi Link*, describes the DP/ASi link and the installation of
the ASi.

The description of the PROFIBUS-DP and a master interface such as
IM 308-C do not form a part of this manual. You will find further information
on these subjects in the manual called *Distributed I/O System ET 200*, Order
No. 6ES5 998-3ES12.

CD-ROM

The Distributed I/O System DP/ASi Link can be acquired on a CD-ROM as
an electronic manual.

**Aids to accessing
the manual**

You can quickly access specific information in the manual using the follow-
ing access aids:

- At the beginning of the manual, you will find a complete list of manual
  contents and lists of illustrations and tables contained in the whole docu-
  ment.

- Within the chapters, you will find information in the left-hand margin
  giving you an overview of the subject that is dealt with.

- Following the appendices, there is a glossary in which technical terms
  used in the manual are defined.

- At the end of the manual, you will find a comprehensive index enabling
  rapid access to the information you require.

Further support

Should you have any technical queries, please contact your Siemens representative at the agents or branch office responsible. You will find the address in the manuals describing the DP masters – for example, in the appendix "Siemens Worldwide" to the *S7-300 Programmable Controller; Hardware and Installation* manual, in catalogs and on CompuServe (GO AUTFORUM). In addition, you can contact our hotline by calling +49 (911) 895-7000 (Fax 7001).

Should you require the type file or the GSD file, you can download them over your modem by dialing +49 (911) 737972.

In the event of queries or remarks concerning the manual itself, please complete the Remarks Form at the end of the manual and return it to the address specified. We would kindly ask you to enter your own personal assessment of the manual on the Remarks Form.

To help you get started with the distributed I/O system ET 200, we hold a "KO-ET 200" workshop. If you are interested in attending the workshop, please contact your next area training center or the principal training center in Nuremberg, Germany, by dialing +49 911 895 3154.

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Overview

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Introduction

You use the DP/ASi link to interface the Actuator Sensor Interface to the PROFIBUS-DP.

Devices and modules

The DP/ASi link operates as a DP slave and requires a DP master – for example, an IM 308-C.

In this chapter

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1.2	What is the DP/ASi Link?	1-3
1.3	View of the DP/ASi Link	1-5

1.1   Using the DP/ASi Link

Definition

The DP/ASi link connects the Actuator Sensor Interface (referred to in the following as ASi) to the PROFIBUS-DP.

PROFIBUS-DP conforms to the PROFIBUS-DP standard EN 50170 Volume 2, PROFIBUS; the term DP means "distributed I/O".

You will find an explanation of how the ASi works in Chapter 2.

ASi and PROFI-BUS-DP
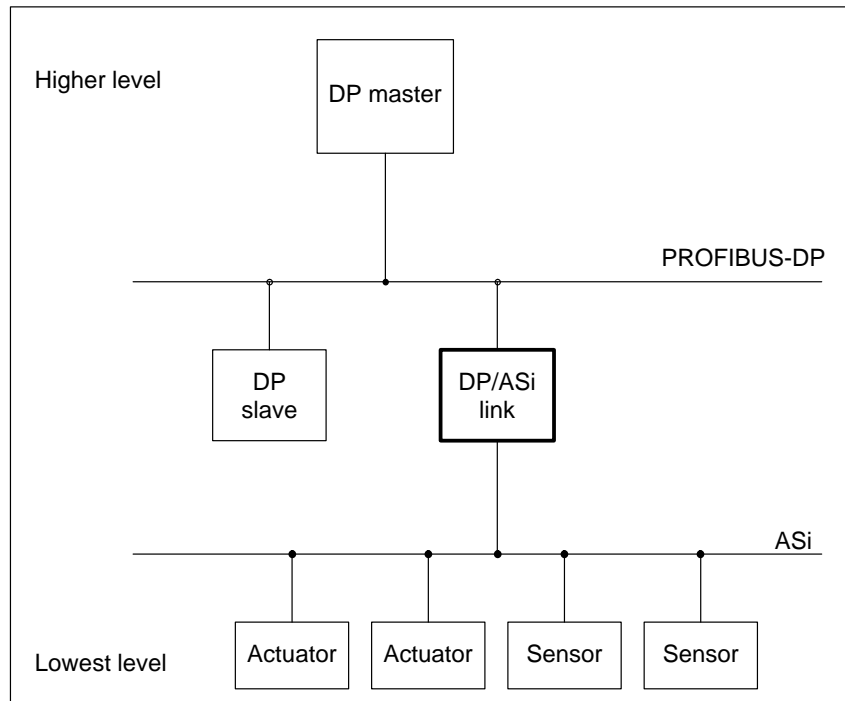
Figure 1-1   Integrating the DP/ASi link

Explanation

Up to 31 binary actuators and sensors are networked over the ASi cable. The DP/ASi link is used to interface the ASi cable to PROFIBUS-DP. You can operate up to 122 DP/ASi links to PROFIBUS-DP, should you use the IM 308-C, for example, as the DP master.

ASi master

ASi allows one ASi master. The DP/ASi link is the ASi master.

IP 66/67

The DP/ASi link meets the IP 66/IP 67 degree of protection.

Installation

Owing to the IP 66/IP 67 degree of protection, you can use the DP/ASi link in a harsh industrial environment. There is no preferred mounting location for the DP/ASi link.

1.2   What is the DP/ASi Link?

Definition

The DP/ASi link connects the actuator sensor interface (ASi) to the PROFI-BUS-DP field bus. In doing so, the protocols of the bus systems are converted.

Overview

The DP/ASi link belongs to the Distributed I/O.

The DP/ASi link is a DP slave. In addition, other components belong to the DP/ASi link. Not all components are necessarily required for operation:

Components

T connector	
Power supply connector	PS cntr
Programmer connector	PG
Bus cable	———— 2-core
Power supply cable	════ 3-core
Bus cable incl. power supply cable	▬▬▬ 5-core
Terminating resistor	■
Adapter cable	▯——▯
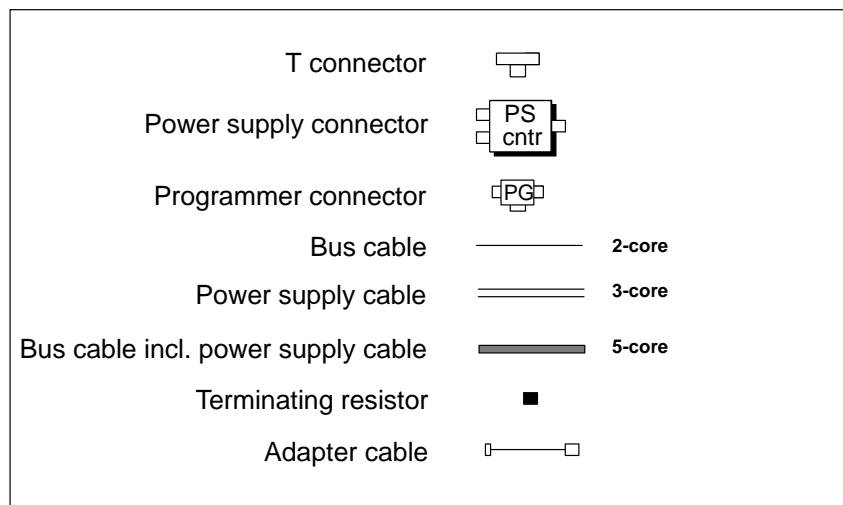
Figure 1-2   Components

Master interface

The DP/ASi link can be operated, for example, with the following master interface module and COM ET 200 version:

*   IM 308-C (version 1 or later)
*   COM ET 200 Windows (version 2.0 or later).

Characteristics

The DP/ASi link has the following characteristics:

*   IP 66/IP 67 degree of protection

    The DP/ASi link is installed in degrees of protection IP 66 and IP 67. When assembling, note that IP 66/IP 67 is insured only when you follow the rules on installation set out in section 4.1.
*   Compact design

    The DP/ASi link is suitable for applications requiring little space. Its dimensions are $205 \times 80 \times 57$ mm plus the T connector.

- Connections
    - PROFIBUS-DP
    - ASi cable
    - 24 V DC power supply
- Optical isolation between PROFIBUS-DP and ASi
- Direct ET 200 Handheld connection possible for setting the station number (using an adapter cable)
- ASi diagnostics using LEDs

    The diagnosis can also be read using the DP master.
- The DP/ASi link has LEDs with the following meanings
    - RUN
    - BF (bus error)
    - ASi POWER FAIL (ASi power supply failure)
    - CONFIG ERROR (configuration error)
    - AUTOPROG AV (automatic programming possible)
    - CONFIG MODE (configuration mode)
    - ASi-SLAVE FAIL (5 LEDs for displaying the failed ASi slave)
- The DP/ASi link can be operated on the PROFIBUS-DP with a baud rate of up to 12 000 kBd.
- Length of PROFIBUS bus cable

    The following values apply to installation of the DP/ASi link for the PROFIBUS bus cable as a function of the baud rate on the bus.

Table 1-1   Length of the PROFIBUS bus cable as a function of the baud rate on the PROFIBUS DP bus

Baud Rate	Max. Length of Bus Cable
< 187.5 kBd	1200 m per segment
187.5 kBd	1000 m per segment
500 kBd	400 m per segment
1500 kBd	200 m per segment
> 1500 kBd	100 m per segment

1.3   View of the DP/ASi Link

View   Fig. 1-3 contains an illustration of the DP/ASi link.

You will find detailed descriptions of the different areas of the DP/ASi link in Chapter 4.
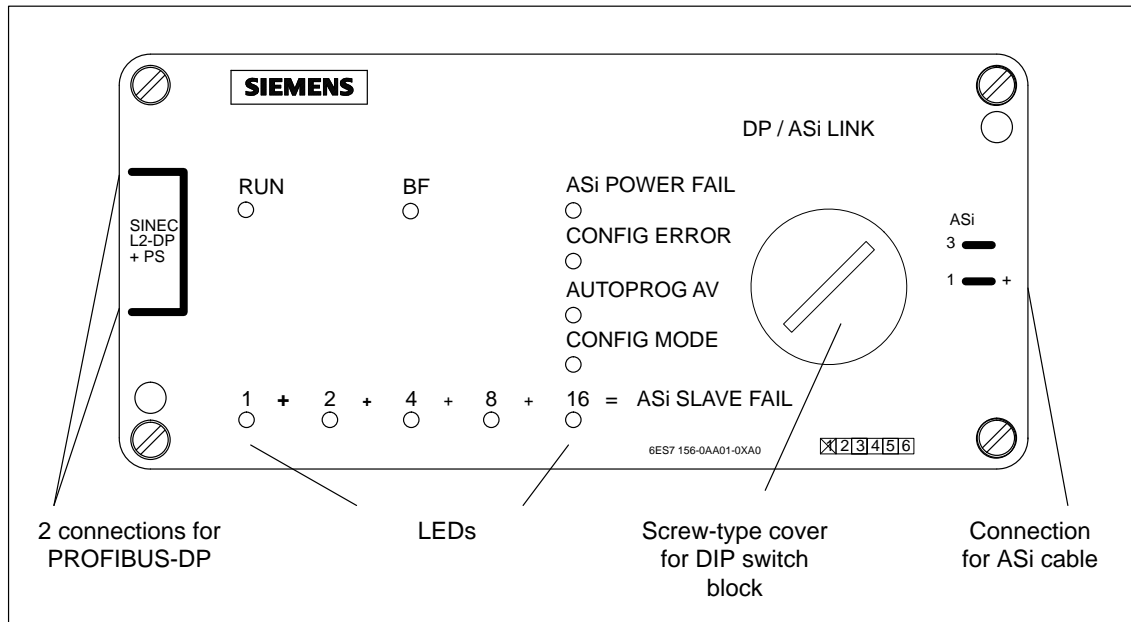
Figure 1-3   View of DP/ASi link

ASi Basics

2

Introduction

If you wish to acquire a general idea of ASi, this is the right chapter for you.

If you are already familiar with ASi, you can skip this chapter.

Definition

The Actuator Sensor Interface is a wiring system to which a master and up to 31 slaves can be connected.

The ASi master (the DP/ASi link) periodically transfers input and output data from and to all the ASi slaves within a period not exceeding 5 ms.

The slaves may be configured as modules or intelligent actuators and sensors. Intelligent sensors are BEROs, for instance.

Overview

After you have studied this chapter, you will know how the ASi is structured and how it operates.

In this chapter

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2.2	Elements of ASi	2-3
2.3	Example Configuration of a Module	2-5
2.4	Connecting Elements	2-6
2.5	Interruption or Short-Circuit of the ASi Cable	2-7

2.1   Structure of ASi

Structure   You can install the ASi as branched with a single 2-wire cable. You connect
                       the DP/ASi link, the different ASi slaves and the ASi power supply unit to
                       any point on the ASi cable.

Example installa-   Fig. 2-1 shows an example installation of an ASi.
tion
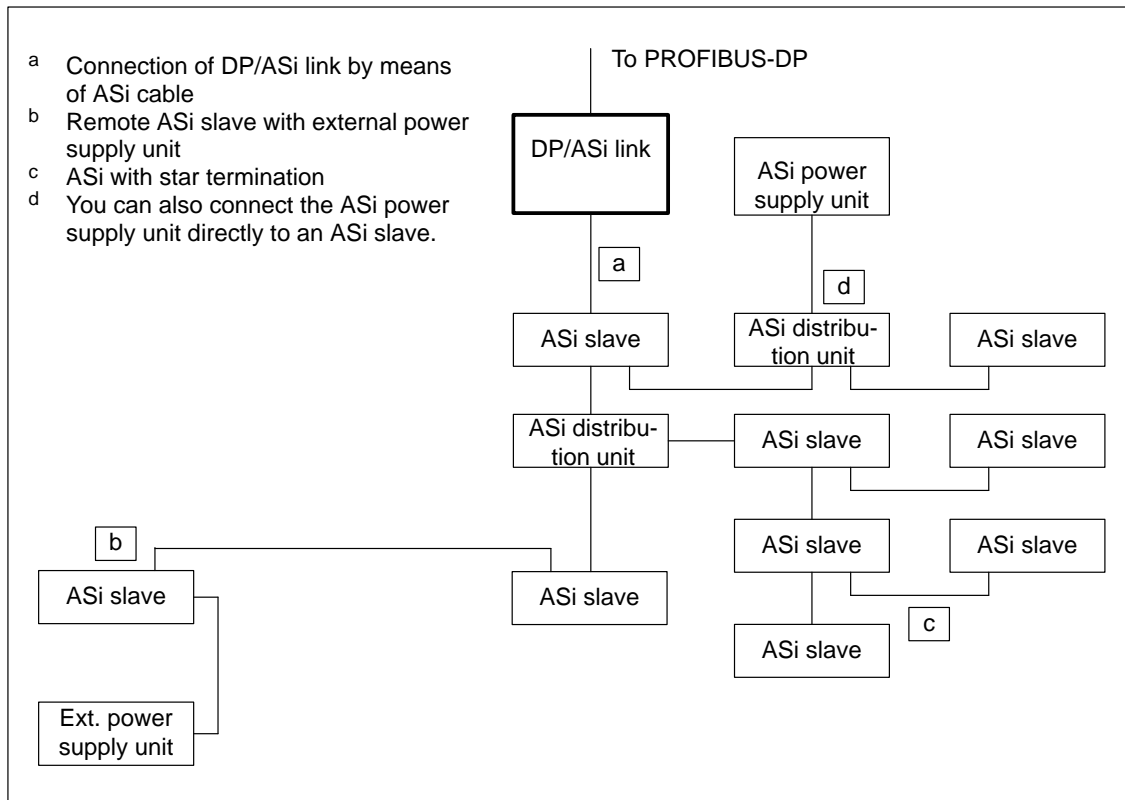
Figure 2-1   Example installation of an ASi

2.2   Elements of ASi

DP/ASi link

The DP/ASi link is the ASi master. It controls communication in the ASi. The DP/ASi link periodically exchanges data with the ASi slaves.

ASi slave

ASi slaves are the input and output channels of the ASi. ASi slaves transfer data to the DP/ASi link when requested to do so by the DP/ASi link. ASi slaves are:

- Modules

  You connect up to 4 binary actuators and sensors to a single module.

  A supply voltage of 24 VDC is available for the actuators and sensors at the output of the modules.

  You can combine different upper and lower parts to form a module, depending on the application. The configuration of a module depends on the:

  – ASi cable used

  – number of inputs and outputs (I/O code)

  – use of an external power supply unit

  You will find an example of a module in section 2.3.

- Intelligent actuators or sensors

  You connect intelligent actuators and sensors directly to the ASi cable.

You differentiate between the individual ASi slaves by means of an ASi address that you can set. You set the ASi address, for example, by using the ASi addressing unit (Order No: 3RX9 400-0AA00).

All ASi slaves are supplied ex works with an ASi address of 0. This ASi address is not enabled within the ASi for data exchange.

I/O code

The I/O code contains the definition of the distribution of the inputs and outputs of the different ASi slaves. You will find the complete I/O code in Appendix B.

You choose the ASi slave type according to the distribution of inputs and outputs. From the viewpoint of the DP/ASi link, sensors are inputs and actuators are outputs.

ID code

The ID code is an additional code that be optionally used for any ASi slave. The ID code is specified for every ASi slave. The default value for the ID code is 0.

ASi distribution unit

You use the ASi distribution unit when you

- branch the ASi cable without using an ASi slave

- reroute the ASi cable to a normal 2-wire cable.

The ASi distribution unit is designed as a module and is not assigned an ASi address.

ASi cable

You connect the different elements via an ASi cable that is protected against polarity reversal.

Within the ASi, you can branch the ASi cable over a total length of up to 100 m. You can connect your elements to the ASi cable at any points you like.

Caution

If you connect the ASi cable to a ring feeder or roll up the ASi cable, reliable data transfer is not assured.

According to the ASi standard, multiple interconnections of the ASi cable are prohibited, as is rolling it up (not even as a standby).

ASi power supply unit

For the ASi power supply, you require a separate ASi power supply unit. The ASi power supply unit is connected directly to the ASi cable. Data are superimposed on the supply voltage. The ASi power supply unit has data decoupling and supplies a voltage of approximately 30 VDC.

ASi power supply units are available in different protection classes. Apart from power supply units in IP 20, we also provide a power supply unit in IP 66/IP 67. You can acquire it by ordering 6EP1 632-1AL01.

Caution

If you overload the power supply unit, either erroneous data transfer takes place on the ASi cable or none at all.

If the supply voltage falls, it is possible that individual ASi slaves will not operate properly. Please pay attention to the data sheets for the ASi slaves you are using.

Do not load the ASi power supply unit above its rated output.

External power supply

The external power supply is optically isolated from the ASi power supply.

You use an external power supply when an ASi slave requires a higher load voltage or a higher load current.

You connect an external power supply unit directly to the module concerned.

2.3   Example Configuration of a Module

**Module configura-
tion**

Every module consists of an upper part and a lower part.

As an example, you can see an illustration in Fig. 2-2 of an upper part with
two inputs and two outputs and a lower part for the ASi cable without an in-
terface for an external power supply.

The upper part is attached to the lower part with four attaching screws (see
remark g).

a   Contact spikes with two contacts per core
b   ASi cable aperture
c   Seals for the cable apertures that are not required
d   Actuator/sensor connection with M12 bush
e   Display LEDs for input and output
f   Drilled through-hole for attaching the module
g   Screws for attaching the upper part to the lower part
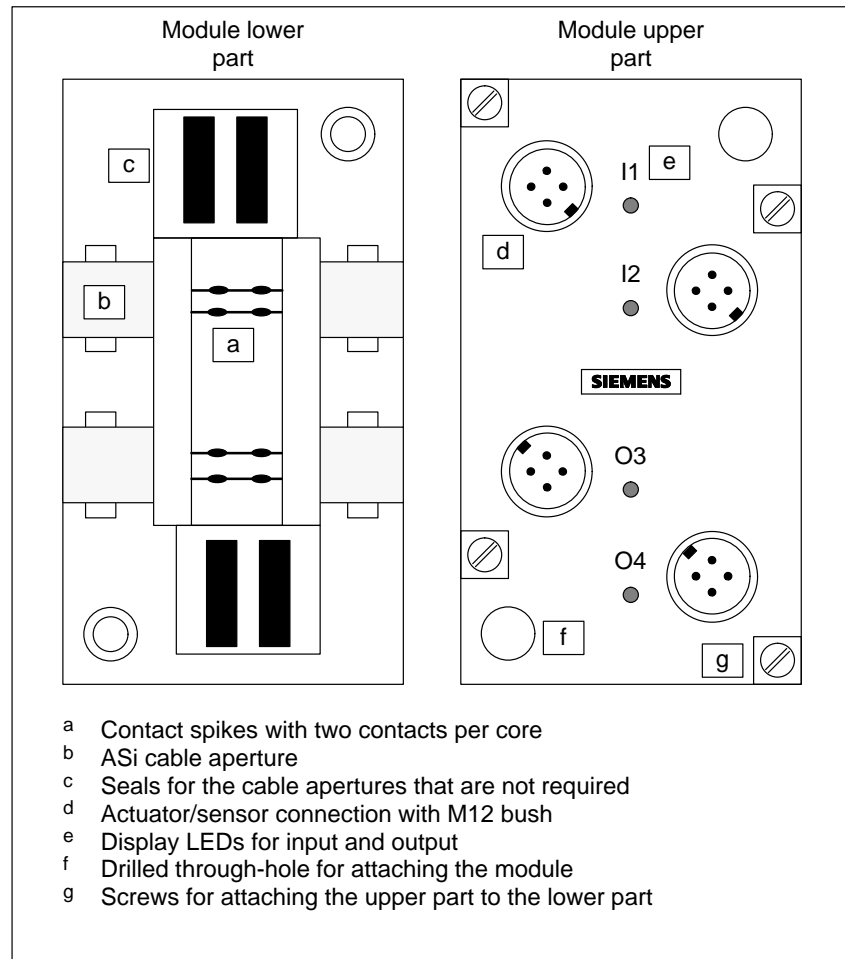
Figure 2-2   View of module, example of an upper part and a lower part

2.4   Connecting Elements

Connecting

You connect the elements of the ASi by attaching the modules to the ASi cable. You do not have to operate the ASi cable for this.

The ASi cable is connected to the DP/ASi link by means of a connector.

Penetration technique

In section 2.3, Fig. 2-2, you can see an illustration of an example of a module.

You place the ASi cable in the module lower part. By attaching the module upper part to the lower part, the two contact spikes per core penetrate the insulation of the ASi cable and establish the contact.

You will find comprehensive installation instructions in the description of the module that you wish to integrate in the ASi.

Contacts for 2-wire cable

Should you wish to use a normal 2-wire cable instead of the ASi cable, connect it to the module in accordance with the manufacturer's specifications.

2.5   Interruption or Short-Circuit of the ASi cable

ASi short-circuit   If the ASi cable is short-circuited due to pinching or fraying of the insulation, data exchange no longer takes place on the ASi cable.

ASi interruption   If the ASi cable is interrupted, you can no longer address the actuators or sensors which, as viewed from the DP/ASi link, are located downstream of the point of interruption.

The actuators and sensors upstream of the point of interruption are still able to operate.

> **Warning**
>
> If the ASi fails completely or partially, the DP/ASi link can no longer address the actuators and sensors affected by the failure.
>
> Data is no longer exchanged with the ASi slaves affected.

ASi slave reaction   If an ASi slave detects a failure of the ASi, the response depends on the ASi slave concerned.

> **Warning**
>
> There is a possibility of the ASi slave retaining its latest state after a failure – for instance, outputs that have been set remain set.
>
> Study the description of the ASi slave.

Configuration Options

3

Introduction

At this point we will show you how you integrate the DP/ASi link into the PROFIBUS-DP, and what you have to bear in mind when you do so.

The power supply (PS) described in this chapter is the 24 VDC power supply of the DP/ASi link, which is required to operate it.

Tip

If you are already familiar with the configuration options of the PROFIBUS-DP – for example, from the *Distributed I/O System ET 200C* manual, you can skip this chapter.

In this chapter we take a look at the PROFIBUS-DP side of the DP/ASi link.

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3.1 Summary of Configuration Options

Configuration options

PROFIBUS-DP presents you with different configuration options for combining the PROFIBUS-DP and the 24 V power supply of the devices. The following Table 3-1 shows the different options.

Table 3-1   Configuration options

Power Supply Connector for Device's Internal Power Consumption	Configuration	Refer to
Configuration **with** power supply connector	Configuration **without** T connector	Section 3.2
	Configuration **with** T connector	Section 3.3
	Configuration with **programmer connector**	Section 3.6
Configuration **with several** power supply connectors (the degree of expansion is limited with a PS connector)		Section 3.4
Configuration **without** power supply connector (every L2 station has a separate power supply)	Configuration without power supply connector	Section 3.5
	Configuration with **programmer connector**	Section 3.6

Legend for following sections

Configuration options are described in the following using illustrations for a possible installation. We use the following legend:

T connector	⊥
Power supply connector	PS cntr
Programmer connector	PG
Bus cable	——— **2-core**
Power supply (PS) cable	═══ **3-core (see note)**
Bus cable incl. PS cable	▬▬▬ **5-core**
Terminating resistor	■
Adapter cable	□——□
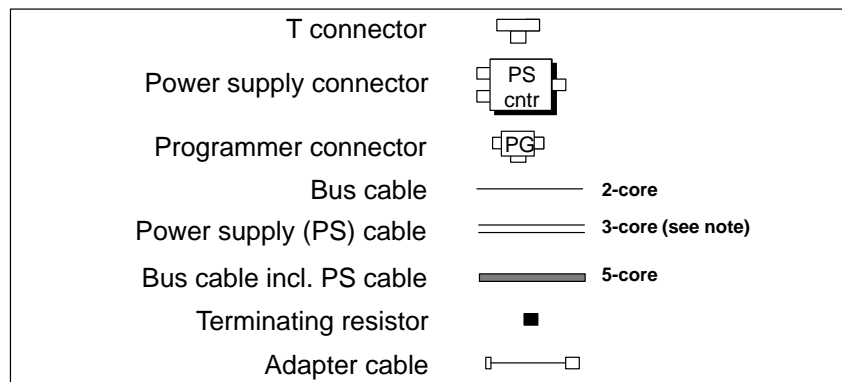
Figure 3-1   Legend

Note

The 2-core bus cable must not be incorporated between the power supply unit and a load.

If you incorporate the bus cable in the power supply cable, an inadmissible spur line occurs. Data transfer is no longer assured in the PROFIBUS-DP.

3.2 Configuration without T Connector and with Power Supply Connector

Definition

In a configuration with a looped-through field bus and a power supply, the DP/ASi link is connected directly to the PROFIBUS-DP.

The power supply is gated by means of the power supply connector with the PROFIBUS-DP in a single cable.

Advantage

You do not require a T connector.

The power supply is fed along the bus cable, i.e. an external power supply of the slave station is not required.

Constraint

If a slave station is disconnected from the bus, "bus traffic" is interrupted for the slave stations that follow it.

Bus traffic may be disrupted for the slave stations still on the bus owing to the absence of the terminating resistor.

The degree of expansion with a power supply connector is limited (refer to section 3.4).

Cables

You use cables of different design for the installation:

- If you wish to use prefabricated Siemens cables, please turn to section 4.4.4.

- If you wish to prepare your own cables, please turn to section 4.4.7.

Installation

Fig. 3-2 shows a possible installation for the configuration with a power supply connector and without a T connector:
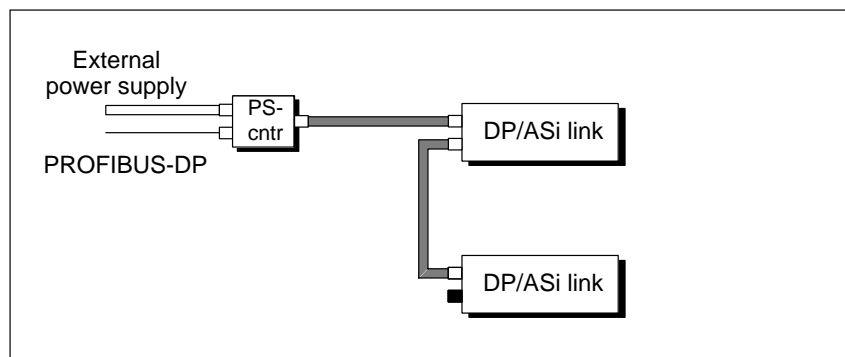
Figure 3-2   PROFIBUS-DP and power supply looped through on DP/ASi link

3.3 Configuration with T Connector and with Power Supply Connector

Definition

In a configuration with a power supply connector and a T connector, the DP/ASi link is connected by means of a T connector to the PROFIBUS-DP.

The power supply is gated by means of the power supply connector with the PROFIBUS-DP in a single cable.

Advantage

A slave station can be disconnected at any time from the bus without the "bus traffic" being interrupted for the other slave stations.

The power supply is fed along the bus cable, i.e. an external power supply of the slave station is not required.

Constraint

The degree of expansion with a PS connector is limited (refer to section 3.4).

Cables

You use cables of different design for the installation:

- If you wish to use prefabricated Siemens cables, please turn to section 4.4.4.

- If you wish to prepare your own cables, please turn to section 4.4.7.

Installation

Fig. 3-3 shows a possible installation for the configuration with a power supply connector and with a T connector:
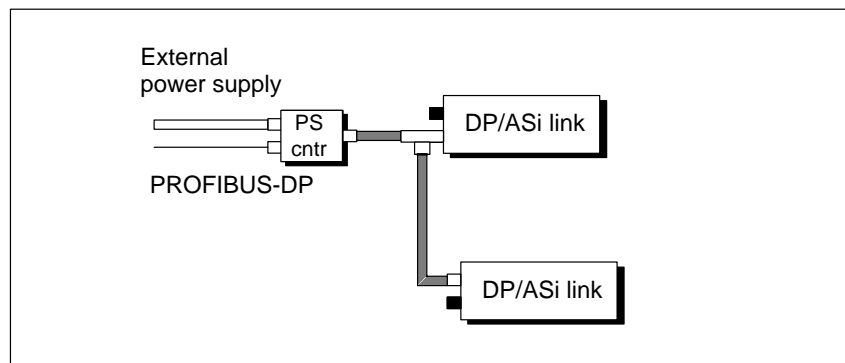
Figure 3-3   PROFIBUS-DP and power supply looped through by means of T connector

**Rules for the
T connector**

With the DP/ASi link, spur lines are not authorized except for the programmer or the ET 200 Handheld. This means that the **12-pin plug** of the T connector is always screwed directly to the bus connection of a module.

Without spur line   With spur line
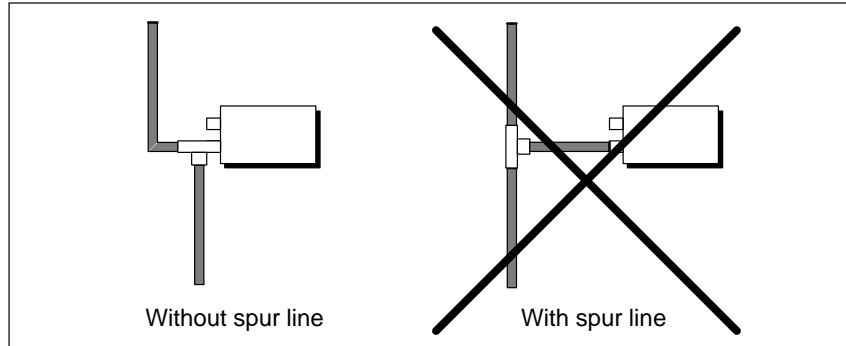
Figure 3-4   Rule for installation with a T connector

3.4 Configuration with Several Power Supply Connectors

Constraint for installation with one power supply connector

In configurations with a power supply connector (refer to sections 3.2 and 3.3), the power supply is fed along the bus cable.

This configuration is limited by the following factors:

- If the power supply and the PROFIBUS-DP field bus are fed on the same cable, the following values apply to the length of the bus cable between the power supply connector and the last slave station connected:

Table 3-2   Length of bus cable when PROFIBUS-DP and power supply are fed on the same bus cable

Current Loading	Max. Cable Length
< 1 A	80 m
< 2 A	40 m
< 4 A	20 m

- Not more than 4 A may be looped through the power supply connector. The input power of the ET 200 modules and of the DP/ASi link limits the number of modules that you can connect.

Remedy

You make allowance for several power supply connectors per segment. Fig. 3-5 shows a possible installation for the configuration with several power supply connectors.

[1]   In this case you can use a 2- or 5-core cable, because the two "left" connections for "external power supply" and "PROFIBUS-DP" are not bridged.
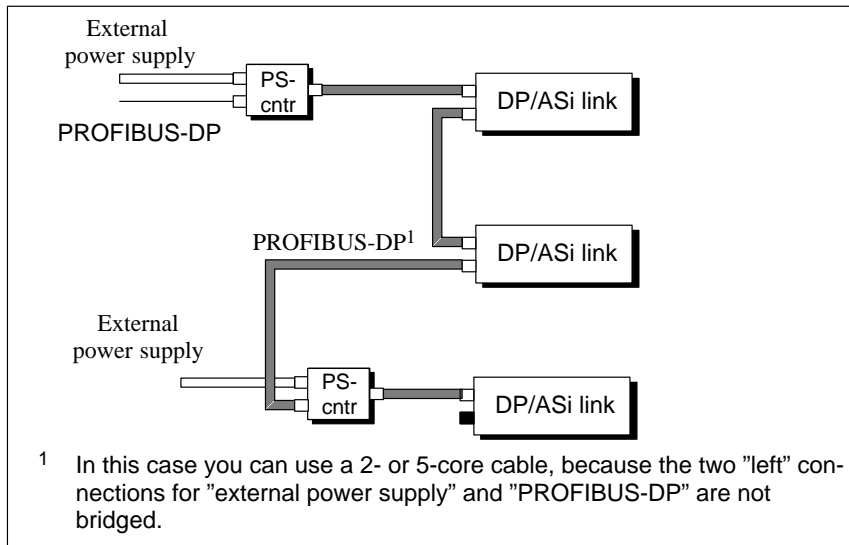
Figure 3-5   Configuration with several power supply connectors

3.5 Configuration without Power Supply Connector

Definition   In a configuration with a separate power supply, every slave station is sup-
plied with power separately. This power supply must **not** be fed on the bus
cable.

The T connector for connecting PROFIBUS-DP is imperative for continuous
looping of the PROFIBUS-DP.

Advantage   You do not feed the power supply over the bus (2-core instead of a 5-core
cable).

A slave station can be disconnected at any time from the bus without "bus
traffic" being interrupted for the slave stations beyond it, because the PROFI-
BUS-DP is looped through T connectors.

Cables   You use cables of different design for the installation:

- If you wish to use prefabricated Siemens cables, please turn to sec-
tion 4.4.4.

- If you wish to prepare your own cables, please turn to section 4.4.7.

Installation   Fig. 3-6 shows a possible installation for the configuration without a power
supply connector.
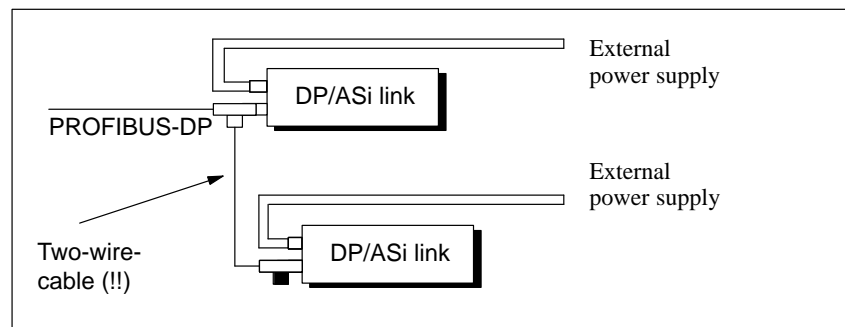
Figure 3-6   PROFIBUS-DP looped through T connectors –
external power supply fed separately to every slave station

**Rules for the
T connector**

With the DP/ASi link, spur lines are not authorized except for the programmer or the ET 200 Handheld. This means that the **12-pin plug** of the T connector is always screwed directly to the bus connection of a module.

Without spur line   With spur line
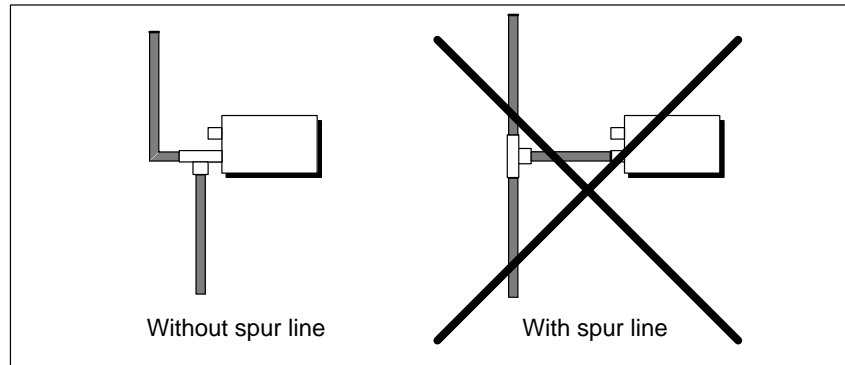
Figure 3-7   Rule for installation with a T connector

3.6   Configuration with Programmer Connector

Definition

If you wish to operate the programmer on the PROFIBUS-DP in an IP 66/IP 67 environment, you require a programmer connector.

Connecting the programmer

To connect the programmer to the programmer connector, you require two plug-in connectors:

- adapter cable

- programmer connecting cable

An ET 200 Handheld cannot be connected to the programmer connector. The ET 200 Handheld can be plugged only into the bus connection of a slave station (using the adapter cable).

Installation

Fig. 3-8 shows a possible installation for the configuration with a programmer connector.
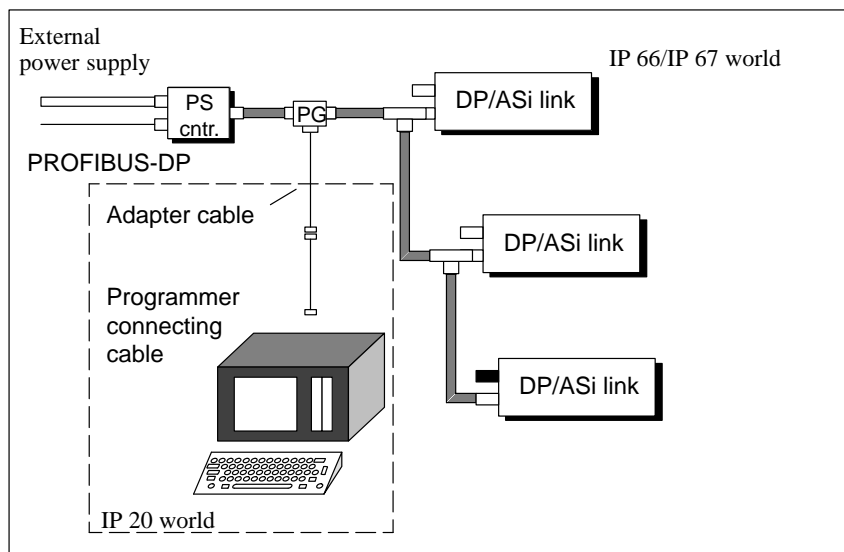
Figure 3-8   Configuration with programmer connector

Rule for connection of programmer connector

Both the 2-core cable and the 5-core cable can be connected to the programmer connector.

A programmer connector may be placed anywhere on the PROFIBUS-DP field bus. When doing so, pay attention to the following:

- Since a terminating resistor cannot be inserted, the programmer connector must not be located at the ends of the bus line.

- You may place several programmer connectors on the bus. However, you may connect only **one** programmer to one of the programmer connectors on the bus, since the programmer represents a node having the station number 0.

- For connecting a programmer, the following values apply to the length of the spur line as a function of the baud rate on the PROFIBUS-DP bus:

Table 3-3   Length of the spur line of the programmer connection as a function of the baud rate on the PROFIBUS-DP bus

Baud Rate	Max. Length of Spur Line
< 500 kBd	Max. 32 $\times$ 3 m Max. 10 $\times$ 5 m Max. 1 $\times$ 10 m
1500 kBd	Max. 5 $\times$ 2 m (3 m spacing) or PROFIBUS bus terminal
> 1500 kBd	Max. 1 $\times$ 1.5 m

Installing and Wiring the DP/ASi Link

4

Introduction

In this chapter you will learn how the DP/ASi link is installed mechanically and electrically.

Objective

When you have worked your way through this chapter, you will be in a position to install and connect the DP/ASi link. You will know what accessories you require to perform these jobs.

In this chapter

In Section	You Will Find	on Page
4.1	Installation	4-2
4.2	Electrical Wiring of DP/ASi Link	4-3
4.3	Commissioning	4-10
4.4	Additional Components for PROFIBUS-DP	4-15

4.1 Installation

Rules

The IP 66/IP 67 degree of protection can be guaranteed for the DP/ASi link only under the following conditions:

- The supporting surface for the DP/ASi link must be level (without distortions).

- You must **always** cover the unused connection with the enclosed metal cap.

  IP 66/IP 67 is **not** guaranteed with the transparent transit protective cap.

IP 66/IP 67 degree of protection

Pay attention to the following note so that the IP 66/IP 67 degree of protection can be insured.

Note

Before commissioning, check that all covers on the DP/ASi link have been tightened.

Installing

You are free to chose where you wish to install the DP/ASi link. You can install the DP/ASi Link at any inclination.

Pay attention to the minimum spacing between the DP/ASi link and the cable duct:

Table 4-1   Spacing between DP/ASi link and cable duct

Between DP/ASi Link and Cable Duct...	Spacing
... there is **no** T connector	10 cm
... there is a T connector	15 cm

Install the DP/ASi link using the drilling jig at the end of the manual with two fastening screws (M4 DIN 912) on an even surface or on supporting bars.

The fastening screws on the housing are captive screws. You require an Allan key 3.0 DIN 911 for installation.

4.2 Electrical Wiring of DP/ASi Link

Introduction

You can wire the 24 V supply to the DP/ASi link either as a grounded or an ungrounded installation, depending on the requirements of your system installation.

Characteristics

The DP/ASi link exhibits the following characteristics:

- PROFIBUS-DP and the ASi cable are floating with reference to the 24 V supply of the DP/ASi link

- PROFIBUS-DP and the ASi cable are optically isolated with reference to the 24 V supply and to each other

- PROFIBUS-DP and the ASi cable are optically isolated from the DP/ASi link

In this section

In Section	You Will Find	on Page
4.2.1	Grounded Installation	4-4
4.2.2	Ungrounded Installation	4-6
4.2.3	Connecting the DP/ASi Link to ASi and PROFIBUS-DP	4-8

4.2.1   Grounded Installation

Introduction

With grounded installation of the DP/ASi link, you have to connect the reference potential of the electronics section to the protective conductor.

Note that in this case only the power supply for the electronics (M24V) is grounded. The PROFIBUS-DP bus and the AS interface are not grounded by this action.

Rules

For grounded installation you must pay attention to the following points:

- You have to provide a master switch (1) conforming to VDE 0100 for the DP/ASi link.

- For the connection of the external power supply (24 VDC) to the supply system, you require a fuse (2).

- For the power supply, use a Siemens Series 6EV1 external power supply (refer to catalog ET 1).

   If you connect other external power supplies (24 VDC), make sure that the voltage is between 20 and 30 V (including ripple). The external power supply must generate a functional extra-low voltage with safe electrical isolation in accordance with VDE 0106, Part 101. For non-stabilized external power supplies, you require a backup capacitor (200 µF per 1 A load current, (3)).

- Provide a separable connection (4) to the protective conductor on the external power supply (terminal M) in the secondary circuit.

- The 24 VDC supply should be fused separately (5).

- With both grounded and ungrounded installation,connect the PI connection of the DP/ASi link in a low-resistance manner to the protective conductor (6).

   On the right side of the DP/ASi link and of the power supply connector there is a screw for connecting the conductor conducter.

   The protective conductor terminal of the DP/ASi link is connected internally to a pin 9 of the circular connector (refer to Table 4-3).

- All machine parts have to be grounded.

- Use a minimum diameter of 10 mm^2 for equipotential bonding and ground connections.

Installation   Grounded installation of the DP/ASi link is shown in the diagram below.
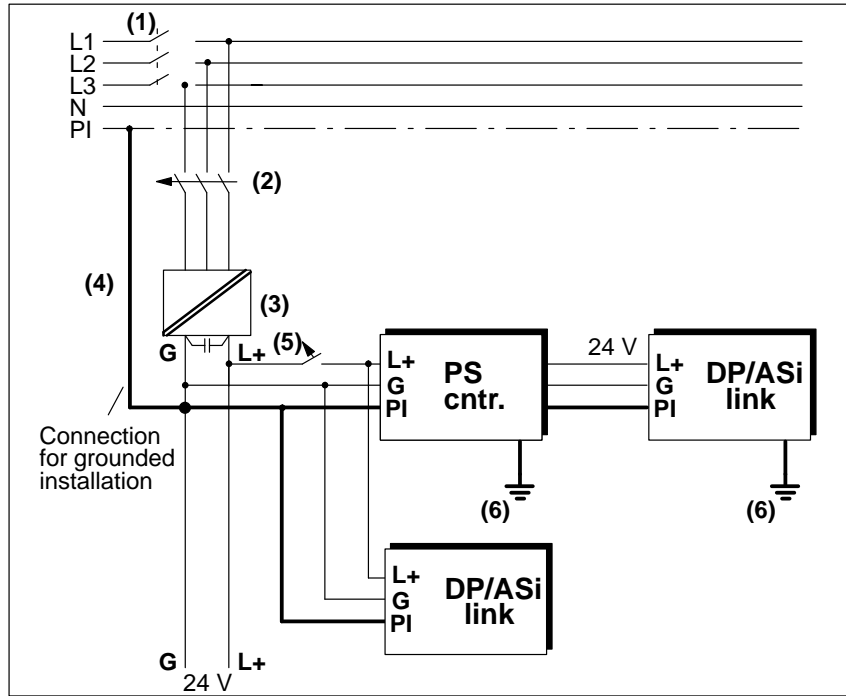
Figure 4-1   Grounded installation of DP/ASi link

4.2.2   Ungrounded Installation

Definition

With ungrounded installation of the 24V supply to the DP/ASi link, there is no link between the external power supply (terminal G) and PI, thus resulting in the protective conductor loosing its protective function.

Due to the internal design of the DP/ASi link, the supply voltage is connected capacitively to the protective conductor. This results in high-frequency interference being diverted.

Rules

For ungrounded installation you must pay attention to the following points:

- You have to provide a master switch (1) conforming to VDE 0100 for the DP/ASi link.

- For the connection of the external power supply (24 VDC) to the supply system, you require a fuse (2).

- For the power supply use a Siemens Series 6EV1 external power supply (refer to catalog ET 1).

  If you connect other external power supplies (24 VDC), make sure that the voltage is between 20 and 30 V (including ripple). The external power supply must generate a functional extra-low voltage with safe electrical isolation in accordance with VDE 0106, Part 101. For non-stabilized external power supplies, you require a backup capacitor (200 µF per 1 A load current, (3)).

- The 24 VDC supply should be fused separately (5).

- With both grounded and ungrounded installation,connect the PI connection of the DP/ASi link in a low-resistance manner to the protective conductor (6).

  On the right side of the DP/ASi link and of the power supply connector there is a screw for connecting the protective conductor.

  The protective conductor terminal of the DP/ASi link is connected internally to a pin 9 of the circular connector (refer to Table 4-3).

- Provide isolation monitoring to earth with voltage clamping (7).

⚠ **Warning**

Ungrounded installation may be canceled by grounded machine parts or grounded electrical apparatus.

Example: A grounded sensor or a grounded signal control element connects the PI to the chassis ground potential of the PLC.

Installation   Ungrounded installation of the DP/ASi link is shown in the diagram below.
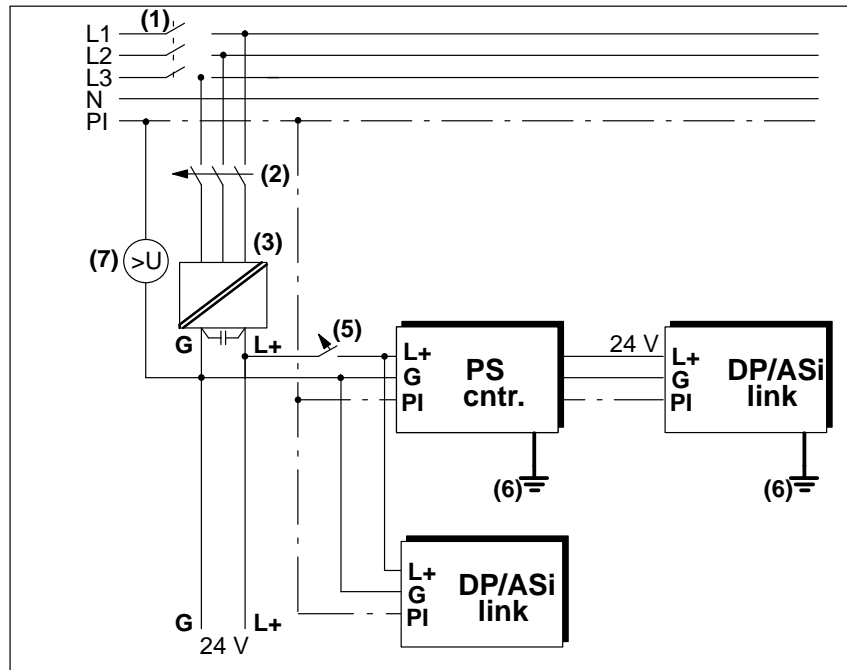
Figure 4-2   Ungrounded installation of DP/ASi link

4.2.3   Connecting the DP/ASi Link to ASi and PROFIBUS-DP
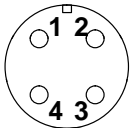
Pinout

The location of the three sockets of the DP/ASi link is described in Fig. A-1. You will find the pinout of the DP/ASi link sockets in Table 4-2 and Table 4-3.

Connecting the ASi

Connect the ASi cable with the special terminal. Secure the connector with the union nut.

You obtain the special terminal for the ASi cable by quoting Order Number 6ES7 194-5AA00-0XA0. The assignment of the ASi socket can be seen in Table 4-2.

You can also connect the ASi by using a 2-wire round cable.

Table 4-2   Pin assignment of ASi terminal connection

Pin	Assignment	View
1	ASi cable + [1]	
2	Unused	
3	ASi cable − [2]	
4	Unused	View: mating side
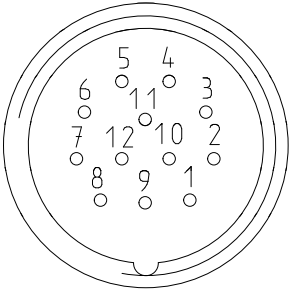
[1]   Brown on Siemens sourced cable
[2]   Blue on Siemens sourced cable

Connecting the PROFIBUS-DP

Connect the PROFIBUS-DP using one of the two 12-pin device connectors with a tee unit to the DP/ASi link. You will find the assignment of the 12-pin connector in Table 4-3.

Device connector assignment

You can connect either the PROFIBUS-DP or the power supply to the device connector. The two 12-pin connectors are interconnected internally. Table 4-3 shows the assignment of the 12-pin device connector.

Table 4-3   Pin assignment of 12-pin device connector

Pin	Assign-ment	Meaning	View
1	–	Reserved	
2	A[1]	Data line P	
3	–	Reserved	
4	B[2]	Data line N	
5	–	Reserved	
6	–	Reserved	
7	P24V	24 V input voltage	
8	M24V	24 V reference poten-tial	
9	PI	Protective conductor	
10	–	Reserved	View: mating side
11	–	Reserved	
12	–	Reserved	

[1]   Green on Siemens sourced cable
[2]   Red on Siemens sourced cable

Power supply

You connect the power supply to the DP/ASi link using the second device connector. Make sure that the power supply cable is deenergized at the time of connection.

⚠ Warning

The DP/ASi link may be destroyed by voltage glitches that may occur while the connector is being slipped on.

The DP/ASi link starts up automatically when the operating voltage is turned on.

Unused device connector

If you run the supply voltage over the PROFIBUS-DP and do not loop the PROFIBUS-DP through the DP/ASi link, you must seal the second device connector with the metal cap or, if necessary, screw on the terminating resistor. Only then is IP 66/IP 67 assured.

4.3 Commissioning

In this section In this section you will learn what you have to take into consideration to commission the DP/ASi link.

Sequence You commission the DP/ASi link in several steps.

Step	Action	Note
1	Install and wire the ASi completely. Connect the ASi power supply to the ASi cable.	Refer to the instructions for the different ASi slaves and modules concerned to learn how to install them. The following assignment applies to the Siemens ASi cable: • ASi cable + = brown • ASi cable – = blue
2	Install the DP/ASi link.	Refer to section 4.1
3	Select the station number you are using.	You can choose between EEPROM and DIP switch block (refer to section 4.3.1). EEPROM: refer to section 4.3.3 DIP switch block: refer to section 4.3.2
4	Connect the ASi cable to the DP/ASi link M12 connector provided for it.	Refer to section 4.2
5	Connect the PROFIBUS-DP with a tee unit to the DP/ASi link.	Refer to section 4.2
6	Connect the 24 V power supply for the DP/ASi link to the remaining device connector.	Refer to section 4.2
7	Turn on the power supply.	–

Automatic start-up After you have connected the DP/ASi link in the specified order and have turned on the power supply of the DP/ASi link, the DP/ASi link starts up automatically (refer to section 7.1).

4.3.1   Selecting the Station Number for PROFIBUS-DP

Definition

With the station number, you identify every station of the PROFIBUS-DP. The station number represents the name used by the DP master to address individual stations.

Selecting station numbers

With switch 8 of the DIP switch block (refer to Fig. 4-3), you define whether the station number in the EEPROM or the station number on the DIP switch block is valid.

Table 4-4   Station number selection on DIP switch block

Switch 8	Meaning	Refer to
OFF	Station number on DIP switch block is valid. The station number in the EEPROM is reset to station number 126	Section 4.3.2
ON	Station number in the EEPROM is valid	Section 4.3.3

Range of values

You can set the station number within the range between 0 and 125. Station numbers 126 and 127 are not authorized.

Address 126 is used to identify new DP slaves. Address 127 is reserved for sending messages to a group of stations (multicasting, a sub-form of broad-casting).

Note that you cannot use station numbers 124 and 125 with IM 308-C. IM 308-C does not support diagnostics for these two station numbers.

Modifying station numbers

If you use the station number stored in the EEPROM, you can modify it during operation, as described in section 4.3.3.

You cannot modify the station number set with the DIP switch block during operation. If you alter the station number on the DIP switch block, the new station number is only taken into account after a cold restart.

4.3.2 Setting a Station Number on the DIP Switch Block

Station number
If you wish to use the station number of the DIP switch block, you must set the configured station number of the DP/ASi link on the DIP switch block before initial startup.

DIP switch block
You will find the DIP switch block under the screw-type cover on top of the DP/ASi link (refer to Fig. 4-3). Open the screw-type cover using a suitable coin.

Using switch 8, you set whether the station number in the EEPROM or that on the DIP switch block is used.

With switches 1 through 7, you set the station number.

Example: Switches 1, 5 and 6 at ON

$2^0 + 2^4 + 2^5 = 1 + 16 + 32 = 49$
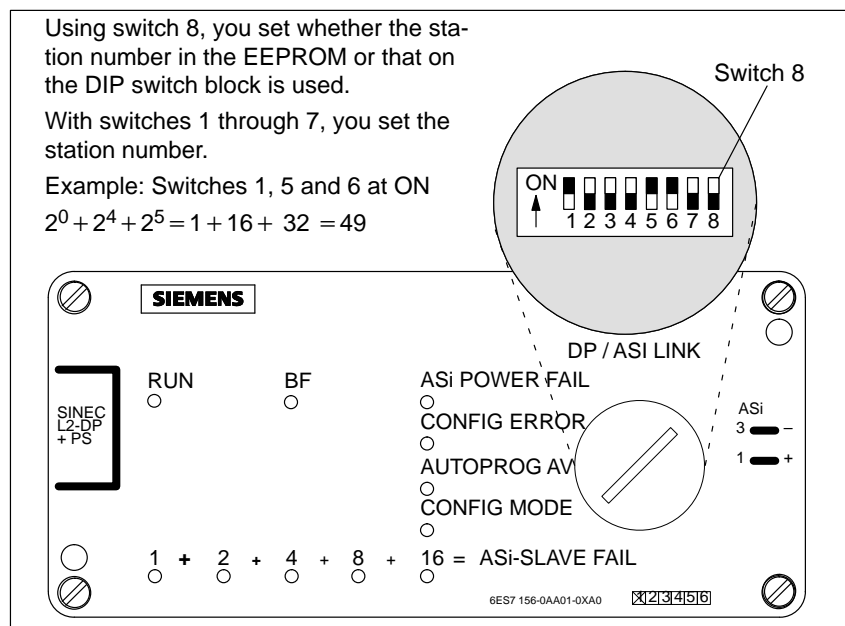
Figure 4-3   Location of DIP switch block

Converting station numbers
You have to convert the station number into binary. When doing so, bear in mind that switch 1 corresponds to bit 0, switch 2 corresponds to bit 1, etc.

Replace cover
Carefully close the DP/ASi link after setting the station number (torque 100 Ncm).

⚠

Caution

If you operate the DP/ASi link without the screw type cover for the DIP switch block, moisture and dirt may penetrate into the DP/ASi link, possibly resulting in destruction of the DP/ASi link.

IP 66/IP 67 degree of protection is not met when the screw-type cover is open.

4.3.3   Station Number in EEPROM

Default station number

The DP/ASi link is supplied to you with the default station number,126, in the EEPROM. The DIP switch block is set ex works so that the station number in the EEPROM is valid. You have to modify this station number either by using the ET 200 Handheld or by means of the DP master.

Modifying station numbers

If you use the station number set in the EEPROM, you have to modify the default station number, since one DP slave at most may exhibit this number.

You can modify this station number either on your SIMATIC with FB IM308C (FKT = CS) or the ET 200 Handheld. The procedure is described in the *Distributed I/O System ET 200* manual. Note that any modification of the address can be saved only if the ASi power supply is turned on.

Note that any modification of the address can be saved only if the ASi power supply is turned on.

Note

If you modify the station number with FB IM308C, you must have configured the new station number and notified it to the IM 308-C via the memory card.

Should you attempt to assign to the DP/ASi link a station number that is unknown to the IM 308-C, an error message is issued in FB IM308C. Assign only defined station numbers.

Deleting station numbers

In special cases you have to set the address of the DP/ASi link to the default address of 126.

Proceed as follows at this stage:

- Set switch 8 to "Off" and perform a cold start.

Resetting station numbers

In certain cases the station number in the EEPROM of the DP/ASi link has to be reset. Proceed in the following order:

Step	Action
1	Turn off the power supply for the DP/ASi link.
2	Turn switch 8 on the DIP switch block to OFF.
3	Turn on the power supply for the DP/ASi link and then turn it off after automatic start-up of the DP/ASi link. Start-up is aborted with an error message. The station number is reset to 126.
4	Turn switch 8 on the DIP switch block to ON.
5	Turn on the power supply for the DP/ASi link.
6	Set the correct station number again with the ET 200 Handheld or by means of the DP master.

4.4 Additional Components for PROFIBUS-DP

Introduction

You require additional components to operate the DP/ASi link on the PROFIBUS-DP. You will learn what components are involved, and their characteristics, in this section.

In this section

In Section	You Will Find	on Page
4.4.1	T Connector (6ES5 762-2CT11)	4-16
4.4.2	Power Supply Connector (6ES5 2CS11)	4-17
4.4.3	Programmer Connector (6ES5 762-2CA12)	4-18
4.4.4	Cables	4-19
4.4.5	Terminating Resistor (6ES5 755-2CA11)	4-21
4.4.6	Adapter Cable (6ES5 755-8CA11)	4-22
4.4.7	Wiring of PROFIBUS-DP	4-23

4.4.1   T Connector (6ES5 762-2CT11)

Usage

You require a T connector for the following configurations:

- Configuration with power supply connector and T connectors (refer to section 3.3)

- Configuration with external power supply (refer to section 3.5)

This means that the PROFIBUS-DP can continue to run even when a slave station is uncoupled via a T connector.

Characteristics

The T connector has the following characteristics:

- Degree of protection: IP 66/IP 67 (refer to installation rules, section 4.1)

- Can be operated with the following baud rates:
9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000 kBd

  The 3000, 6000 and 12000 kBd baud rates are possible only in the case of operation with a suitable DP master – for example, the IM 308-C.

Connections

A T connector has three bus connections:

- two 12-pin sockets

- one 12-pin connector.

The T connector is screwed with the 12-pin connector onto the bus connection of a DP/ASi link. Both bus connections of the DP/ASi link can be used in all cases.
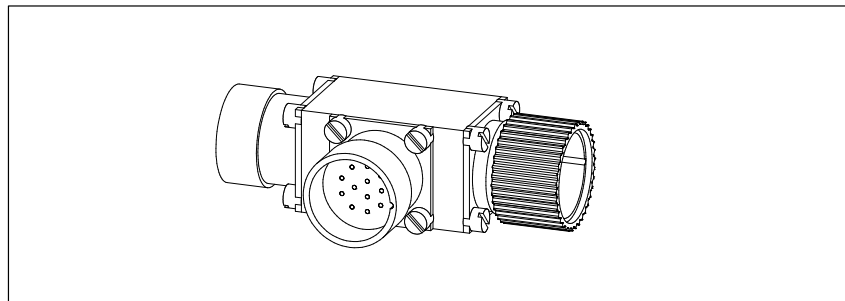
Figure 4-4   T connector

4.4.2   Power Supply Connector (6ES5 762-2CS11)

Usage

The power supply connector is used to link the PROFIBUS-DP and the 24 VDC external power supply for the DP/ASi link.

Characteristics

The power supply connector has the following characteristics:

- Degree of protection: IP 66/IP 67 (refer to installation rules, section 4.1)

- Can be operated at the following baud rates
  9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000 kBd

  The 3000, 6000 and 12000 kBd baud rates are possible only in the case of operation with a suitable DP master – for example, the IM 308-C.

- Can be loaded with up to 4 A input power. This limits the number of modules that can be connected (refer to section 3.4)

- Is not a bus station having a station number.

- Is secured without opening the cover.

Connections

The power supply connector has the following connections:

- Connection for an "incoming" PROFIBUS-DP (12-pin socket)

- Connection for an "incoming" external power supply
   (6-pin connector)

- Connection for an "outgoing" PROFIBUS-DP with power supply (12-pin socket)

- Grounding screw for connecting PI

4.4.3 Programmer Connector (6ES5 762-2CA12)

Usage

A programmer connector is used to connect the programmer within the IP 66/IP 67 environment to the PROFIBUS-DP.

Characteristics

The programmer connector has the following characteristics:

- Degree of protection: IP 66/IP 67 (refer to installation rules, section 4.1)

- Can be operated at the following baud rates:
  9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000 kBd

  The 3000, 6000 and 12000 kBd baud rates are possible only in the case of operation with a suitable DP master – for example, the IM 308-C.

- Can be located anywhere on the bus (exception: the programmer connector must not be located at the extremities of the bus cable, since the terminating resistor must not be inserted).

- Is not a bus station having a station number.

- Is secured without opening the cover.

Connections

A programmer connector has three bus connections:

- Connection for an "incoming" PROFIBUS-DP (possibly with power supply, 12-pin socket).

- Connection for an "outgoing" PROFIBUS-DP (possibly with power supply, 12-pin socket).

- Connection for adapter cable (refer to section 4.4.6) to the programmer (12-pin socket)

4.4.4   Cables

Types of cables   The PROFIBUS-DP features different installation options, for which you need the correct cables. There are the following types of cables.

Table 4-5   PROFIBUS-DP cables

No. of Cores	Usage
2	PROFIBUS-DP field bus, power supply is not incorporated
5	• For PROFIBUS-DP field bus and power supply in one cable • For power supply feed line to the power supply connector

Designs   SIEMENS supplies cables for the PROFIBUS-DP in different designs.

All cables are precut with connectors at both ends, at one end or not at all with a 12-pin connector for connection to the PROFIBUS-DP bus and/or power supply.

You can cut the cables and fit connectors yourself. You will find the necessary information in section 4.4.7.

Note

All precut cables fitted with connectors are designed with a core cross-section of 0.75 mm^2 for a current loading not exceeding 4 A.

You have to precut the cable for the power supply feed line for a separate power supply and fit the connectors yourself.

Order Numbers   The following table shows the Order Numbers for the standard lengths:

Table 4-6   Order Numbers for cables in standard lengths
(core cross-section 0.75 mm^2, maximum current loading 4 A)

Preparation	Cable (Standard Sheath)	Cable (Non-welding Sheath)
5-core cable (unprepared)	6ES5 717-1□□□1	6ES5 718-1□□□1
5-core cable, terminated at one end (6-pin circular socket)	6ES5 717-2□□□1	6ES5 718-2□□□1
5-core cable, terminated at both ends (6-pin circular socket/6-pin circular connector)	6ES5 717-3□□□1	6ES5 718-3□□□1
5-core cable, terminated at one end (12-pin circular connector)1	6ES5 717-6□□□1	6ES5 718-6□□□1
5-core cable, terminated at both ends (12-pin circular connector)	6ES5 717-7□□□1 ↑ ↑ ↑	6ES5 718-7□□□1 ↑ ↑ ↑
Length 0.5 m 1 m 2 m 5 m 10 m	A B 4 B B 0 B C 0 B F 0 C B 0	A B 4 B B 0 B C 0 B F 0 C B 0

[1]   Do not use for separate power supply feed line (as bus cable connected → bus disturbances are possible).

If you require other lengths, you can order the cables having a Z number. When you order, quote the Order Number and the length you require – for example, 6ES5 717-1AA01-Z 3.50 m.

Table 4-7   Order Numbers for cables having a Z number
(core cross-section 0.75 mm^2, maximum current loading 4 A)

Preparation	Cable (Standard Sheath)	Cable (Non-welding Sheath)
5-core cable (unprepared)	6ES5 717-1AA01-Z	6ES5 718-1AA01-Z
5-core cable, terminated at one end (6-pin circular socket)	6ES5 717-2AA01-Z	6ES5 718-2AA01-Z
5-core cable, terminated at both ends (6-pin circular socket/6-pin circular connector)	6ES5 717-3AA01-Z	6ES5 718-3AA01-Z
5-core cable, terminated at one end (12-pin circular connector)[1]	6ES5 717-6AA01-Z	6ES5 718-6AA01-Z
5-core cable, terminated at both ends (12-pin circular connector)	6ES5 717-7AA01-Z	6ES5 718-7AA01-Z

[1]   Do not use for separate power supply feed line (as bus cable connected → bus disturbances possible).

4.4.5 Terminating Resistor (6ES5 755-2CA11)

Usage

A bus cable must always be terminated at both ends with a terminating resistor.

Screw the terminating resistor on a 12-pin socket or on the bus connector of the:

- DP/ASi link or
- T connector

Characteristics

The terminating resistor has the

- IP 66/IP 67 degree of protection (refer to installation rules, section 4.1)
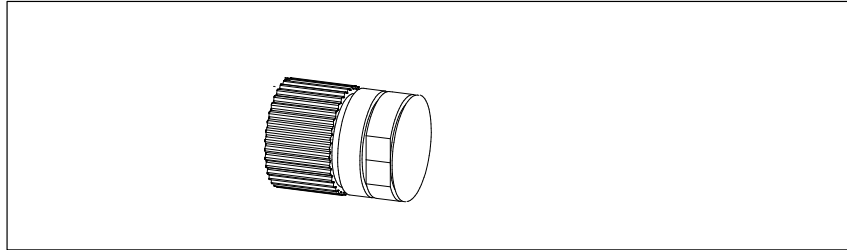
Figure 4-5   Terminating resistor

4.4.6   Adapter Cable (6ES5 755-8CA11)

Usage The adapter cable is required to connect the programmers (with programmer interface module CP 5410-S5 DOS/ST) or the ET 200 Handheld to the PROFIBUS-DP.

The programmer or the ET 200 Handheld are required for

- Setting the station number
- Test and commissioning (not ET 200 Handheld)
- Diagnostic functions (not ET 200 Handheld)

Characteristics The adapter cable has the following characteristics:

- Degree of protection: IP 66/IP 67 (refer to installation rules, section 4.1) only at extremity with IP 66/IP 67 bus connector
- can be operated at the following baud rates
  9.6; 19.2; 93.75; 187.5; 500; 1500; 3000; 6000 and 12000 kBd

  The 3000, 6000 and 12000 kBd baud rates are possible only in the case of operation with a suitable DP master – for example, the IM 308-C.

Connections The adapter cable has the following connections:

- Bus connector in IP 20 (9-pin connector)
- Bus connector in IP 66/IP 67 (12-pin connector)

To connect the programmer, you also require the programmer connecting cable.
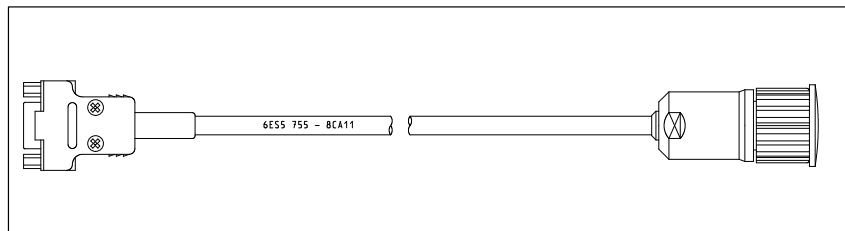
Figure 4-6   Adapter cable

4.4.7   Wiring of PROFIBUS-DP

Introduction

This section describes the points you have to take into account when you wish to prepare the bus cables yourself.

We can provide you with ready cut and terminated cables for the bus connection and the power supply (refer to section 4.4.3).

Circular connectors

For the bus connection and connection of the power supply, you require 12-pin circular connectors.

Table 4-8 shows the Order Number for the 12-pin circular connector:

Table 4-8   Order Number for circular connector

Circular Connector	Order Number
12-pin connector with pin insert (unprepared)	6ES5 760-2CB11

Rules: circular connectors

The following applies to all connections to circular connectors:

- Strip sufficient insulation from the cable so that the screen is firmly enclosed by the clamping ring in the circular connector.

- Always use the same color of the cores for the same signal; the following applies to the green/red PROFIBUS cable:

   – always connect terminal A to the green wire

   – connect terminal B to the red wire

Power supply cable

Use only a 3-core cable for the power supply.

Caution

If you use a 5-core cable for the power supply, the PROFIBUS-DP can no longer operate.

Since the two DP connections on the DP/ASi link are connected internally, a 5-core power supply cable represents a prohibited spur line.

Configuring the DP/ASi Link

5

Introduction

To operate the DP/ASi link to the PROFIBUS-DP, you must configure and assign parameters to it.

Method

There are two ways in which you can configure a DP/ASi link:

1. You can use the STEP 7 application (version 2.1 or higher) or COM ET 200 Windows (version 2.0 or higher).

2. You can use any external master that is not covered by COM ET 200 Windows.

The simplest method is to configure the DP/ASi link using STEP 7 (version 2.1 or higher).

STEP 7

With STEP 7 (version 2.1 or higher) the DP/ASi link is easy to configure, as is also the assignment of parameters to it. The approach is described in the Standart *STEP 7 Standard Software for S7 and M7* user's guide. STEP 7 contains a detailed online Help for support when you are configuring and assigning parameters.

COM ET 200 Windows

If you are already familiar with the COM ET 200 Windows package, you will not learn anything new here.

Should you not be certain about how to handle the COM ET 200 Windows package, you will receive instructions on how to integrate a DP/ASi link in the PROFIBUS-DP.

COM ET 200 Windows contains an integrated Help.

External master

If you wish to operate the DP/ASi link on an external master, section 5.3 is relevant for you.

Parameterization data

Of special importance in configuration is the assignment of parameters to ASi slaves. A detailed description of how parameterization data are stored in the parameterization message will be found in appendix C.

The re-assignment of parameters to the DP/ASi link in the S5 (IM308C as the S5 master) is described in detail in the *Distributed I/O System ET 200* manual, Order No. 6ES5 998-3ES12.

In this chapter

5.1 Configuring – for Example with COM ET 200 Windows (Version 2.0 or Later)

Method

In the following you will find a description of the method by which you can integrate the DP/ASi link into the PROFIBUS-DP using COM ET 200 Windows (version 2.0 or later). You will find additional information about the different steps in the integrated online Help of COM ET 200 Windows.

1. Open the worksheet with the DP master to which you wish to connect the DP/ASi link.

2. Click in the **Slaves** window on **ASi** . As soon as you exit from the **Slaves** window, the mouse pointer changes its appearance.

3. Click the mouse on the point of the user interface at which you wish to insert the DP/ASi link.

4. Select the slave station number from the list box.

5. Click **OK** to confirm your selection.

   You can configure or assign parameters to the DP/ASi link even at this stage by clicking once on **Configure...** or **Parameterize...**.

6. To insert further DP slaves, repeat steps 3 to 5 above.

Configuring

Once you have inserted the DP/ASi link in the PROFIBUS-DP, you have to configure it. Proceed in the following order:

1. Click on **Configure...**

2. Select an ASi slave number. Double-click in the I/O field of the slave number to go to a new input window.

3. Select the I/O code of your ASi slave from the list.

4. You can now edit the ID code and the parameter value of the ASi slave you selected, the default values both being 15. If the ID code of your ASi slave is not 15, you have to enter the corresponding value here.
   In the case of a DP standard master of limited configuration – for example, S5-95U – step 4 cannot be performed.

5. Set the **base address** of the SIMATIC address assignment. You have to set the base address separately for inputs and outputs only once for every DP/ASi link.

6. Assign the corresponding address assignment to the ASi slave using **Auto addr.**
   You do not obtain the final address assignment until you have configured all the ASi slaves.

7. For all the other ASi slaves you wish to connect to the DP/ASi link, repeat steps 2 to 6 above with the exception of step 5.

Parameterize
By choosing **Parameterize...**, you can influence the start-up characteristics of the DP/ASi link. You can differentiate between "actual is equal to setpoint configuration" and "actual is less than or equal to setpoint configuration".

Actual configuration
By actual configuration we mean the actual configuration of the ASi as detected by the DP/ASi link.

Setpoint configuration
By setpoint configuration we mean the configured configuration of the ASi as stored in the DP master.

Actual equal to setpoint configuration
"Actual is equal to setpoint configuration" means that the DP/ASi link starts up only when the actual configuration is identical with the setpoint configuration. If there is a discrepancy between the actual and setpoint configurations, the DP/ASi link requests a new parameterization message.

Actual less than or equal to setpoint configuration
"Actual is less than or equal to setpoint configuration" means that the DP/ASi link compares the actual configuration with the setpoint configuration. If the DP/ASi link establishes a discrepancy, it reacts in two different ways:

- If the DP/ASi link detects unconfigured ASi slaves, it behaves as for "actual is equal to setpoint configuration", that is, the DP/ASi link does not start up.

- If a comparison of the actual and setpoint configurations determines that configured ASi slaves are missing, the non-existent ASi slaves are reported to have failed in the diagnosis. Data exchange is initiated, however.

If the setpoint and actual configurations are identical, the DP/ASi link starts without issuing an error message. If the actual and setpoint configurations are not identical, a diagnosis is generated (refer to Chapter 8).

Hex...
By pressing the **Hex...** button, you can view the parameterization table of the DP/ASi link. The structure of this table is described in Appendix C.

Re-configuring
You can later add more ASi slaves to the DP/ASi link or remove them later. To do this, select the corresponding DP/ASi link from the master system concerned.

5.2   Example Using COM ET 200 Windows (Version 2.0 or Later)

Model structure

You wish to connect an ASi with an ASi slave over the DP/ASi link to the PROFIBUS-DP. The ASi slave has the following assignment:

* one ASi slave with 4 inputs

Assign the ASi slave to the ASi address as shown in Table 5-1.

Set the ASi address according to your requirements. The I/O code (refer to Appendix B) results from the input/output assignment.

Table 5-1   Assigning the slave to the ASi address, an example

ASi Address	Input/Output Assignment	I/O Code
1	4 inputs	0

Method

Proceed in the following order:

* Integrate the DP/ASi link into the PROFIBUS-DP (refer to section 5.1).

* In the window, select **Slave parameters ▸ Configure...**

* Double-click on the line containing ASi address 1 in the "I/O Code" field to open a new input window.

* Select the ASi slave with 4 inputs. Enter I/O code 0 in the field you selected.

* Position the mouse pointer in the field for the input address.

* With **base address**, set this address for the address assignment of the SIMATIC, for example, P54.

* Select **Auto addr.** Start address P54.0 is assigned to the ASi slave.

Confirming inputs

Confirm your inputs and write the data to the memory card. Insert the memory card in your DP master. You can now commission the DP/ASi link.

5.3   Operating the DP/ASi Link with an External Master

Introduction   If you do not use an application having an easy-to-use user interface for the DP/ASi link – for example, COM ET 200 Windows (version 2.0 or later) or a comparable application, you must pay attention to the following points.

In Section	You Will Find	on Page
5.3.1	Configuring with Address Space Optimization	5-7
5.3.2	Simple Configuration	5-8
5.3.3	Default Start-Up	5-9

5.3.1   Configuring with Address Space Optimization

Requirement   You can operate the DP/ASi link with any DP master that conforms with the DP standard and supports a parameterization message containing 140 bytes (full assignment of parameters).

Basics   We will confine ourselves here to showing you how to address the DP/ASi link on the PROFIBUS-DP side.

Configuring   Configure the DP/ASi link in the following order:

Step	Action	Meaning
1	Define the installation of the ASi.	From the installation, you learn the total number of inputs and outputs that you will assign.
2	Optimize the address assignment of the input and output data of the DP/ASi link (refer to appendix C.3).	In this way you make optimum use of the limited address area.
3	Create the parameterization data from the address assignment received.	You require the parameterization data of the ASi slaves for the parameterization message.
4	Create the parameterization message (refer to appendix C.1).	The DP/ASi link requires the data contained in the parameterization message upon power up.
5	Create the configuration message (refer to appendix D.2).	In the configuration message, define the number of bytes for the input and output data.

Commissioning   You commission the DP/ASi link as described in section 4.3. The DP/ASi link performs as described in chapter 7.

DP standard slave   The DP/ASi link behaves like a DP standard slave.

5.3.2   Simple Configuration

Requirement The DP/ASi link, version 3 or later, can also be operated on DP standard masters having a reduced message length of 32 bytes (reduced parameter assignment). A DP standard master of this type is the S5-95U with its integrated DP master interface, for example.

Configuring Configure the DP/ASi link in the following order:

Step	Action	Meaning
1	Define the ASi installation.	From the installation, you learn the total number of inputs and outputs that you will assign.
2	Create the parameterization message (refer to appendix C.4).	The DP/ASi link requires the data contained in the parameterization message during power up.
3	Create the configuration message (refer to appendix D.3).	In the configuration message, define the number of bytes for the input and output data.

Commissioning You commission the DP/ASi link as described in section 4.3. The DP/ASi link performs as described in chapter 7.

DP standard slave The DP/ASi link behaves like a DP standard slave.

5.3.3   Default Start-Up

Introduction

You can also configure and assign parameters to the DP/ASi link from the DP standard master by means of a "default start-up". In a default start-up, the DP/ASi link operates with preset parameters, which are described in detail on the next few pages. The information is important if you wish to operate the DP/ASi link on the DP standard master of a manufacturer who does not provide an easy-to-use configuring tool.

Requirements for DP standard master

The DP standard master must be able to process the following messages:

- 20-byte configuration messages
- 7-byte parameterization messages
- 32-byte diagnostic messages

Characteristics

The following characteristics apply to a default start-up:

- The I/O area assigns 16 input bytes and 16 output bytes.
- The location of the ASi slave in the I/O area is uniquely defined by its address. The distribution of ASi slave inputs and outputs is determined by their I/O codes.
- Upon start-up, the DP/ASi link automatically sends the parameter F_H to all the ASi slaves connected.
- The ASi slaves present during start-up are detected as the actual configuration and accepted as the setpoint configuration at the same time.

Note

The current ASi configuration is always applied as the setpoint configuration every time the DP/ASi link starts up. This means that ASi slaves which have failed are no longer detected or reported after a re-start.

If you wish to monitor the ASi configuration, you must compare the actual configurations (bytes 16 to 31 of the diagnostic message) in the user program.

Input and output area

The table below describes the location of ASi data in the input and output area. A specific address is permanently assigned to every ASi slave:

- even-numbered ASi slaves: bits 4 to 7
- odd-numbered ASi slaves: bits 0 to 3

Table 5-2   I/O area assignment

Input and Output								
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
n					Slave 1			
n + 1	Slave 2				Slave 3			
n + 2	Slave 4				Slave 5			
n + 3	Slave 6				Slave 7			
n + 4	Slave 8				Slave 9			
n + 5	Slave 10				Slave 11			
n + 6	Slave 12				Slave 13			
n + 7	Slave 14				Slave 15			
n + 8	Slave 16				Slave 17			
n + 9	Slave 18				Slave 19			
n + 10	Slave 20				Slave 21			
n + 11	Slave 22				Slave 23			
n + 12	Slave 24				Slave 25			
n + 13	Slave 26				Slave 27			
n + 14	Slave 28				Slave 29			
n + 15	Slave 30				Slave 31			

Subsequent modification of ASi configuration

Should you wish to modify the ASi configuration, you must keep to the following procedure:

1. Add or remove ASi slaves.

2. Perform a new default start-up.

As soon as the DP/ASi link receives the parameterization message from the DP master, ASi slaves that are added or removed after this point of time are ignored. ASi slaves that have been removed are reported as having failed in the diagnosis.

Parameterization and configuration messages

Following power up, the DP/ASi link determines the configuration of the AS interface and expects a parameterization message and a configuration message from the DP master.

The parameterization message is identical to the first seven bytes of the DP standard part (bytes 0 to 6). You will find a detailed account of the DP standard part in appendix C.1.

The length of the configuration message for default start-up is exactly 20 bytes and is described in appendix D.1.

DP/ASi Link to S7

6

Introduction   If you operate the DP/ASi link to an S7 (6ES7 156-0AA01-0XA0 or later, version 1), you can re-assign the parameters of the ASi slaves connected to the DP/ASi link during operation. This is done on the S7 by SFCs 59 "RD_REC" and 58 "WR_REC", which permit data records to be read and written.

- Read data records with SFC 59 "RD_REC"

    – Data record 140: Read lists and flags of ASi slaves

    – Data record 141: Read parameter echo of ASi slaves

    – Data record 2: Read response

- Write data records with SFC 58 "WR_REC"

    – Data record 142: Write parameters to ASi slaves

    – Data record 143: Modify operating address of an ASi slave

    – Data record 144: Set DP/ASi link to "Offline" mode

SFC 59 "RD_REC"   You use SFC 59 to read a data record from the DP/ASi link. The parameters are described in the table below:

Table 6-1   Parameters for SFC 59 "RD_REC"

Parameter	Declaration	Data Type	Memory Area	Description
REC	INPUT	BOOL	I, O, M, D, L, Const.	REQ = 1: Request to read
IOID	INPUT	BYTE	I, O, M, D, L, Const.	Area: DP/ASi link is a hybrid module IOID = B#16#54
LADDR	INPUT	WORD	I, O, M, D, L, Const.	Logical address of the DP/ASi link. Example: Logical address = 336 (decimal), LADDR = W#16#150 (hexadecimal)
RECNUM	INPUT	BYTE	I, O, M, D, L, Const.	Data record number Example: Data record 140, RECNUM = B#16#8C
RET_VAL	OUTPUT	INT	I, O, M, D, L	If an error occurs while a function is being processed, the return value contains an error code.

Table 6-1   Parameters for SFC 59 "RD_REC", continued

Parameter	Declaration	Data Type	Memory Area	Description
BUSY	OUTPUT	BOOL	I, O, M, D, L	BUSY = 1: Read operation still being processed
RECORD	OUTPUT	ANY	I, O, M, D, L	Destination area for data record read Example: Data record 140 (22 bytes long) is to be stored in bit memory address area from MB 50 onward, RECORD = P#M50.0 BYTE22

SFC 58 "WR_REC"   You use the SFC 58 to transfer a data record to the DP/ASi link. The parameters are described in the table below:

Table 6-2   Parameters for SFC 58 "WR_REC"

Parameter	Declaration	Data Type	Memory Area	Description
REC	INPUT	BOOL	I, O, M, D, L, Const.	REQ = 1: Request to write
IOID	INPUT	BYTE	I, O, M, D, L, Const.	Area: The DP/ASi link is a hybrid module IOID = B#16#54
LADDR	INPUT	WORD	I, O, M, D, L, Const.	Logical address of the DP/ASi link. Example: Logical address = 336 (decimal), LADDR = W#16#150 (hexadecimal)
RECNUM	INPUT	BYTE	I, O, M, D, L, Const.	Data record number Example: Data record 143, RECNUM = B#16#8F
RECORD	INPUT	ANY	I, O, M, D, L	Data record Example: Data record 142 (2 bytes long) is to be read in the bit memory address area from MB 50 onward, RE CORD = P#M50.0 BYTE2
RET_VAL	OUTPUT	INT	I, O, M, D, L	If an error occurs while a function is being processed, the return value contains an error code.
BUSY	OUTPUT	BOOL	I, O, M, D, L	BUSY = 1: Write operation still being processed

Further reading   You will find a detailed description of SFC 58 and SFC 59 in the *System and Standard Functions* reference manual.

In this chapter

In Section	You Will Find	on Page
6.1	Reading Data Records with SFC 59 "RD_REC"	6-3
6.2	Writing Data Records with SFC 58 "WR_REC"	6-5
6.3	Example of Re-assigning Parameters to the DP/ASi Link with S7	6-6

6.1 Reading Data Records with SFC 59 "RD_REC"

Data record 140   You use data record 140 to read lists and flags of the ASi slaves. In the case of lists, the ASi slaves present, enabled and configured are displayed. This data record also displays the version and release date of the DP/ASi link.

Table 6-3   Structure of data record 140: Read lists and flags

Description		Byte	Contents							
Read lists			Bit (corresponds to ASi address)							
			7	6	**5**	4	3	2	1	0
	ASi slaves present	0	7	6	5	4	3	2	1	——
		1	15	14	13	12	11	10	9	8
Bits:		2	23	22	21	20	19	18	17	16
"1" ASi slave present		3	31	30	29	28	27	26	25	24
	ASi slaves enabled	4	7	6	5	4	3	2	1	——
"0" ASi slave not present		5	15	14	13	12	11	10	9	8
		6	23	22	21	20	19	18	17	16
		7	31	30	29	28	27	26	25	24
	ASi slaves configured	8	7	6	5	4	3	2	1	——
		9	15	14	13	12	11	10	9	8
		10	23	22	21	20	19	18	17	16
		11	31	30	29	28	27	26	25	24
Read flags		12.0	Config_OK flag							
		12.1	Null slave present							
Bits:		12.2	Automatic programming enabled							
"1" applicable		12.3	Automatic programming possible							
		12.4	Normal mode enabled							
"0" not applicable		12.5	"Offline" mode enabled							
		12.6	ASi power supply missing							
Version and re- lease date of DP/ ASi link	Version	13	$5A_H$=Z (version **Z**01 dated 12.15.96)							
		14	30_H=0 (version Z**0**1 dated 12.15.96)							
		15	31_H=1 (version Z0**1** dated 12.15.96)							
	Date	16	31_H=1 (version Z01 dated 12.**1**5.96)							
		17	35_H=5 (version Z01 dated 12.1**5**.96)							
		18	31_H=1 (version Z01 dated 12.15.**96**)							
		19	32_H=2 (version Z01 dated 1**2**.15.96)							
		20	39_H=9 (version Z01 dated 12.15.96)							
		21	36_H=6 (version Z01 dated 12.15.9**6**)							

Data record 141   Data record 141 reads outs the parameter echoes of the different ASi slaves. You can evaluate the reactions of the different ASi slaves in a parameter echo following a "WR_REC" write job in the user program. You thus obtain a current image of the state of the ASi slaves. A nibble is assigned to every ASi slave.

Table 6-4   Structure of data record 141: Read parameter echoes of ASi slaves

Byte	Parameter Echoes of ASi Slaves (4 Bits in All Cases)	
	Bits 4 to 7	Bits 0 to 3
0	——	Slave 1
1	Slave 2	Slave 3
2	Slave 4	Slave 5
3	Slave 6	Slave 7
4	Slave 8	Slave 9
5	Slave 10	Slave 11
6	Slave 12	Slave 13
7	Slave 14	Slave 15
8	Slave 16	Slave 17
9	Slave 18	Slave 19
10	Slave 20	Slave 21
11	Slave 22	Slave 23
12	Slave 24	Slave 25
13	Slave 26	Slave 27
14	Slave 28	Slave 29
15	Slave 30	Slave 31

Data record 2   Data record 2 reads the response of the last "WR_REC" write job.

You have to call a "RD_REC" read job by means of data record 2 after every "WR_REC" write job for the response of the last "WR_REC" write job to be read.

Table 6-5   Structure of data record 2: Read response

Byte	Contents
0	Data record number of last "WR_REC" job
1	Response of last "WR_REC" job

Error codes in data record 2   You can read out in byte 1 of data record 2 any error code that has been issued.

If you read data record 2 **without** executing a write job beforehand, undefined responses of the error codes may occur.

Table 6-6   Error codes in byte 1 of data record 2

Byte 1		Meaning	Action
Hex.	Dec.		
00$_H$	000	No error	———
01$_H$	001	ASi slave not enabled	———
02$_H$	002	Source slave not present	Input error; enter correct value
03$_H$	003	ASi slave with address 0 present	———
04$_H$	004	Destination slave already present	———
05$_H$	005	Source address cannot be deleted	———
06$_H$	006	Source address could not be programmed with new address	———
07$_H$	007		
08$_H$	008	Could not write new parameters	Input error; enter correct value
09$_H$	009	No meaning	———
0A$_H$	010	No meaning	———
0B$_H$	011	Unknown job number	Input error; enter correct value
0C$_H$	012	Unknown data record	Input error; enter correct value
0D$_H$	013	Unknown ASi Manager OP code	Input error; enter correct value
0E$_H$	014	Message too long or too short	Correct number of bytes
0F$_H$	015	Automatic programming enabled	Repeat job
10$_H$	016	Argument too large; source address = destination address	Input error; enter correct argument
11$_H$	017	ASi master is in Offline mode, job is not possible	Wait until the DP master is in Operating mode
12$_H$	018	Configuration in DP/ASi Link erroneous	Check configuration

6.2   Writing Data Records with SFC 58 "WR_REC"

Data record 142

Data record 142 writes parameters to ASi slaves.

Table 6-7   Structure of data record 142: Write parameters to ASi slaves

Byte	Contents
0	01 to 1F$_H$: Slave address
1	00 to 0F$_H$: Parameters for the ASi slave

Data record 143

Data record 143 modifies the operating address of an ASi slave

Table 6-8   Structure of data record 143: Modify operating address of ASi slave

Byte	Contents
0	00 to 1F$_H$: Source address (old) of the ASi slave
1	00 to 1F$_H$: Destination address (new) of the ASi slave

Data record 144

Data record 144 sets the DP/ASi link to "Offline" mode. In "Of fline" mode, all the ASi slaves are reset and there is no periodic data exchange with the DP/ASi link.

Table 6-9   Srtructure of data record 144: Set DP/ASi link to "Offline" mode

Byte	Contents
0	"1": Set "Offline" mode
	"0": Reset "Offline" mode

6.3   Example of Re-assigning Parameters to an ASi Slave with S7

Introduction   Below you will find an example program for assigning parameters to the DP/ASi link using an S7. It shows you how you can read out lists and flags of the ASi slave.

Cyclic program   You use data record 140 to read the lists and flags of the ASi slaves. To do this, call SFC 59 "RD_REC" using data record 140, for example in the cyclic program (OB1):

```
STL                                          Description

CALL "RD_REC"  SFC59 --Read Data Record      Call SFC 59
        REC      :=M0.0                       Read data record enabled via M0.0
        IOID     :=B#16#54                    DP/ASi link is a hybrid module
        LADDR    :=W#16#0                      Logical module address
        RECNUM   :=B#16#8C                     Data record No. DR140
        RET_VAL  :=MW100                       Error code while executing SFC59
        BUSY     :=M102.0                      Read status (1:Read operation still being
                                               processed)
        RECORD   :=P#DB59.DBX 0.0 BYTE 22      Destination area of DR140 (in DB59, from byte
                                               0 onward)
```

Destination area of DR140

The destination area of data record 140 is located in data block DB 59, for example. The following table describes the contents of DB59:

Address	Name	Type	Initial Value	Comment
0.0		STRUCT		
+0.0	Vorh_Slaves	ARRAY[0..3]		Slaves present
*1.0		BYTE		
+4.0	Akt_Slaves	ARRAY[0..3]		Slaves enabled
*1.0		BYTE		
+8.0	Proj_Slaves	ARRAY[0..3]		Slaves configured
*1.0		BYTE		
+12.0	Konf_Flag	BOOL	FALSE	Config_OK flag
+12.1	Nullslave	BOOL	FALSE	Null slave present
+12.2	AutoProg_Frei	BOOL	FALSE	Automatic programming enabled
+12.3	AutoProg_Moegl	BOOL	FALSE	Automatic programming possible
+12.4	Nrmbetr_akt	BOOL	FALSE	Normal mode enabled
+12.5	Offl_akt	BOOL	FALSE	Offline mode enabled
+12.6	Spgvers_flt	BOOL	FALSE	ASi power supply missing
+13.0	Version_1	BYTE	B#16#0	Version_Part 1
+14.0	Version_2	BYTE	B#16#0	Version_Part 2
+15.0	Version_3	BYTE	B#16#0	Version_Part 3
+16.0	Datum_1	BYTE	B#16#0	Date_Part 1
+17.0	Datum_2	BYTE	B#16#0	Date_Part 2
+18.0	Datum_3	BYTE	B#16#0	Date_Part 3
+19.0	Datum_4	BYTE	B#16#0	Date_Part 4
+20.0	Datum_5	BYTE	B#16#0	Date_Part 5
+21.0	Datum_6	BYTE	B#16#0	Date_Part 6
=22.0		END_STRUCT		

Operating Modes

7

Introduction

The DP/ASi link goes through various operating modes during operation, ranging from automatic start-up to normal mode and automatic programming.

We will briefly describe these operating modes for you.

CONFIG MODE

The configuration mode, which is assigned to the CONFIG MODE LED, is provided for extensions of the SIMATIC S7.
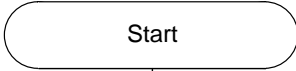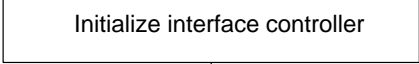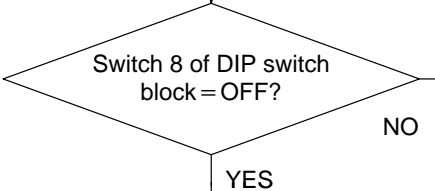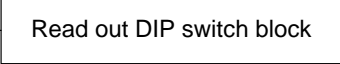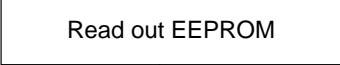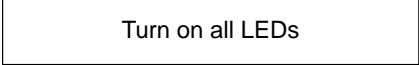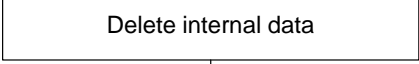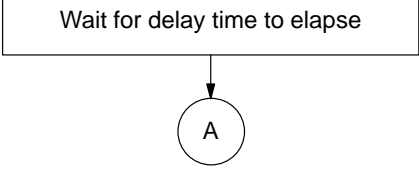
In this chapter
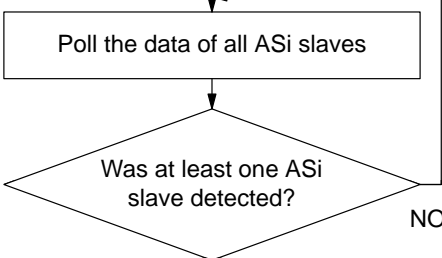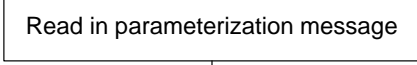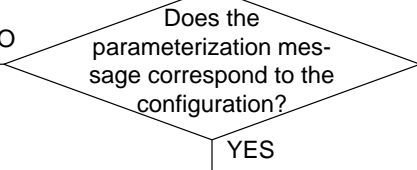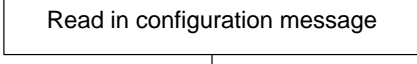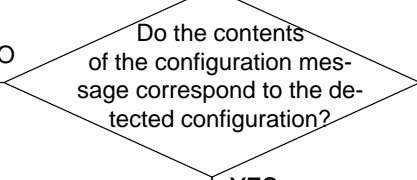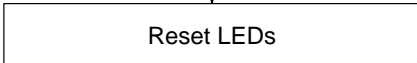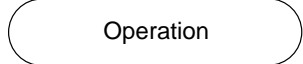
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7.1	Automatic Start-up of DP/ASi Link	7-2
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7.1   Automatic Start-up of DP/ASi Link

Start-up behavior   There are not any switches on the DP/ASi link. The DP/ASi link commences work as soon as it is connected to the power supply.

The following flowchart shows the sequence of automatic startup.

Step	Flowchart	Meaning
1	Start	The power supply of the DP/ASi link is turned on.
2	Initialize interface controller	The two interface controllers for the ASi and the PROFIBUS-DP are initialized. The DP/ASi link enters a defined basic state.
3	Switch 8 of DIP switch block = OFF? NO / YES	The DP/ASi link checks for the valid station address. YES = DIP switch block: proceed to step 4, NO = EEPROM: proceed to step 5.
4	Read out DIP switch block	The DP/ASi link applies the station address set on the DIP switch block. Proceed to step 6.
5	Read out EEPROM	The DP/ASi link applies the station address stored in the EEPROM. The EEPROM is checked simultaneously.
6	Turn on all LEDs	The DP/ASi link turns on all eleven LEDs for test purposes. You can thus detect on site whether a LED has failed.
7	Delete internal data	All internal lists with the ASi slave data are deleted. This means that the DP/ASi link insures that old data are no longer present.
8	Wait for delay time to elapse A	The DP/ASi link waits for a delay time to expire before resuming automatic start-up. This behavior insures that the DP/ASi link does not enter an undefined state caused by a short-term voltage drop during start-up.

Step	Flowchart	Meaning
9	A	The DP/ASi link, as the ASi master, periodically polls the I/O code and the ID code of all the ASi slaves possible.
10	Poll the data of all ASi slaves	During the polling cycle, the DP/ASi link must detect at least one ASi slave.
	Was at least one ASi slave detected? NO	If no ASi slave is present, the DP/ASi link does not resume start-up. The five ASi SLAVE FAIL LEDs flash. This is followed by a return to step 9.
11		The DP/ASi link waits for the parameterization message from the DP master.
12	YES Read in parameterization message NO Does the parameterization message correspond to the configuration? YES	Once the parameterization message has been received, the DP/ASi link compares the setpoint and actual configurations. If you selected the "actual is equal to setpoint configuration", start-up is resumed only if the setpoint and actual configurations are identical. In the event of an error, you return to step 7. If you selected "actual is less than or equal to setpoint configuration", you return to step 7 only if unconfigured ASi slaves are present.
13	Read in configuration message	The DP/ASi link waits for the configuration message.
14	NO Do the contents of the configuration message correspond to the detected configuration? YES	Once the configuration message has been received, the DP/ASi link compares the specified structure of the data message with the self-detected structure. If the DP/ASi detects an error, you return to step 7.
15	Reset LEDs Operation	The DP/ASi link resets the LEDs. If no errors have been detected, only the green "RUN" LED is on. In the case of "actual is less than or equal to setpoint configuration" and if there are no configured ASi slaves, the corresponding error LEDs are on. The missing slave having the lowest address is displayed.

Error detection   If an error occurs during start-up, it is detected and evaluated internally. Depending on the error, either the whole start-up process or a part thereof is repeated.

7.2   Normal Operation

Method of operation

In normal operation, the DP master exchanges data with the DP/ASi link in exactly the same manner as with any other DP slave.

You do not have take any specific action.

Tasks

In normal operation, there is a continuous exchange of data with the ASi and the PROFIBUS-DP. The activities of the DP/ASi link can be divided into two tasks:

1. Monitor the ASi

2. Monitor the PROFIBUS-DP

Monitoring the ASi

The task of the ASi monitor is to monitor and control communication within the ASi. The input data from the ASi slaves are read and the output data are written to the ASi slaves. The data are stored in the internal work memory.

The DP/ASi link simultaneously senses the actual configuration and compares it with the setpoint configuration. If it is found to be different, a diagnosis is prepared.

Monitoring the PROFIBUS-DP

If the DP/ASi link is addressed by the DP master, the DP/ASi link transmits the input data to the DP master and receives the output data for the ASi slaves.

Error detection

If an error is detected, the DP/ASi link generates a diagnosis, which is fetched by the DP master (refer to Chapter 8).

ASi power failure

If the ASi power supply fails during routine operation, the outputs of the ASi slaves are reset. The input data are reset in the DP/ASi link and are not updated until the power is restored.

Note

In the event of an ASi power failure, the data sent to the DP master by the DP/ASi link are no longer valid.

Check, therefore, the data for validity by evaluating the slave diagnosis (byte 12.4) and do not read them into your PLC until you have checked the data.

ASi slave failure   If the connection to an ASi slave or an ASi slave fails during routine operation, undefined states may occur at the outputs. Behavior depends on the slaves concerned and the causes of failure. The input data are reset in the DP/ASi link.

The input data are not updated until a cause of failure has been remedied.

Note

If an ASi slave fails, the data sent by the DP/ASi link to the DP master are no longer valid for to that ASi slave.

Check, therefore, the validity of the data by evaluating the slave diagnosis (bytes 22 to 25) and do not read the data into your PLC until you have checked the data.

7.3   Automatic Programming

Definition   "Automatic programming" is an operating mode that occurs only when **one** ASi slave fails.

Display   The DP/ASi link shows you the "automatic programming" mode using the "AUTOPROG AV" LED.

Byte 20.4 is set simultaneously in the diagnostic message.

Meaning   If "automatic programming" mode is displayed, then precisely **one** ASi slave has failed.

Furthermore, there is no ASi slave with ASi address 0 in the ASi. ASi address 0 is the default address for automatic programming.

Constraint   Automatic programming is not possible if an ASi slave that has been connected to the ASi has not been configured.

The constraint of automatic programming is defined in this manner in the ASi standard.

**Replacing
ASi slaves**   As long as "automatic programming" mode is displayed, you can replace the failed ASi slave with a suitable ASi slave having ASi address 0. The DP/ASi link assigns the correct ASi address to the new ASi slave.

Note

The replacement slave must have the same I/O code and ID code as the ASi slave it replaced.

If this is not the case and if this ASi slave is operated only for a short time on the ASi, automatic programming is no longer authorized, according to the draft ASi Standard.

Automatic programming is not possible again until after power OFF/ON of the DP/ASi link.

Diagnostics and Error Handling

8

Introduction

You use the chapter entitled "Diagnostics and Error Handling" to evaluate the diagnosis of the DP/ASi link and to take the necessary action.

Diagnostic options

You have two diagnostic options which refer you to the location at which the diagnostic information is stored.

- Diagnosis by means of LEDs gives you the opportunity to evaluate messages and to remedy any errors which have occurred.

- The diagnostic message gives you the opportunity to react to fail-state characteristics of the DP/ASi link by means of the user program of the DP master or the higher level PLC.

Online Help

The COM ET 200 Windows configuration software has an integrated online Help which enables you to activate context-sensitive Help. A description of the error messages is therefore not necessary at this stage.

Diagnosing with IM308C

You can read the DP/ASi link diagnosis into your PLC using the IM308C module with function block IM308C (FB 192, FKT = SD).

You will find an in-depth description of FB IM308C and the diagnostic options in respect of the PROFIBUS-DP in the *Distributed I/O System ET 200* manual.

Diagnosing with a S7/M7 DP master

If you wish to operate the DP/ASi link as a DP slave with a **SIMATIC S7/M7** DP master, the DP/ASi link behaves like a central S7-300 module.

You read out the diagnosis (data records 0 and 1) using the SFC 13 "DPNRM_DG". You will find information on requesting diagnostic data in the *STEP 7 Standard and System Functions* manual.

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8.2	Diagnostics by Means of User Program	8-6

8.1 Diagnostics by Means of LEDs of DP/ASi Link

Diagnostics   For on-site diagnostics, the operating modes of the DP/ASi link are displayed by six LEDs. Five other LEDs indicate the address of the failed ASi slave (refer to Fig. 8-1).
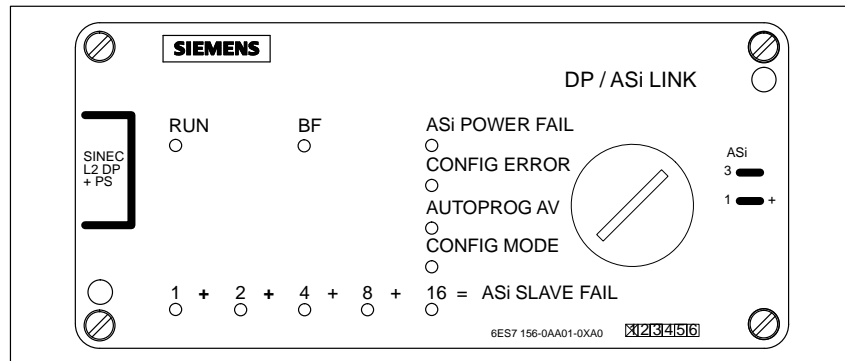
Figure 8-1   Location of LEDs of DP/ASi link

Display elements   The meanings of the different LEDs is shown in Table 8-1.

Table 8-1   Meanings of display LEDs

Name	Color	State	Function
RUN	Green	On	24 V power supply is in order.
		Off	24 V power supply is either not present or below permitted limit value.
BF	Red	On	Response monitoring has terminated or parameters have not been as signed yet to DP/ASi link for the PROFIBUS-DP and the DP/ASi link has not been configured.
		Off	PROFIBUS-DP is in data cycle.
ASi POWER FAIL	Red	On	ASi power supply is either not present or below the permitted limit value.
		Off	ASi power supply is in order.
CONFIG ERROR	Yellow	On	Configuration error on ASi
		Off	Configuration is in order
AUTPROG AV	Green	On	Automatic programming is possible.
		Off	Automatic programming is not possible.
CONFIG MODE	No function		
ASi SLAVE FAIL	Red		These five LEDs are used to indicate the failed ASi slave with the lowest ASi address.

ASi slave address So that the DP/ASi link display is not cluttered, failed ASi slaves (ASi-SLAVE FAIL) are displayed in binary code by five LEDs.

You have to add the numbers shown on the lit LEDs to determine the address of the failed ASi slave.

If several ASi slaves have failed, the failed ASi slave having the lowest address is indicated. In this case the "AUTOPROG AV" LED is off.

Example LEDs showing the numbers "1", "+2" and "+4" are on.

Add up the numbers: $1 + 2 + 4 = 7$.

The ASi slave with ASi address 7 has failed.

Normal operation In normal operation, the only LED to be on is the "RUN" LED, which indicates to you that the DP/ASi link is running properly.

Start-up During automatic start-up, all eleven LEDs are turned on briefly. This behavior allows you to check that all LEDs are in order.

LED display The display of the DP/ASi link can be divided into two arrays:

- Operation and PROFIBUS-DP faults
- ASi array with indication of failed slaves

Mode display and PROFIBUS-DP The mode display with the "RUN" LED is turned on as soon as the power supply is established. If the DP/ASi link detects a fault on the PROFIBUS-DP, the "BF" (Bus Fault) LED goes on.

In Table 8-2 you will find the reaction of the DP/ASi link and troubleshooting information.

Table 8-2   LED display for modes and bus faults on PROFIBUS-DP

LED	Reason	Meaning	Remedy
RUN LED off	24 V power supply	This LED goes on as soon as the 24 V power supply is established.	Check the 24 V power supply.
BF LED on	PROFIBUS-DP failed	The DP/ASi link is restarting. Input and output data are set to 0 by the DP/ASi link.	Check the PROFIBUS-DP for interrupt. Check the DP master for availability.

ASi diagnostics　　　　Table 8-3 shows the meanings of the LEDs for ASi diagnostics and describes the action required to be taken for troubleshooting.

For ASi diagnostics, the DP/ASi link has four LEDs. In the event of a failure, one or several LEDs are turned on.

Table 8-3　　　　LED display for faults on ASi side

LED on	Reason	Meaning	Remedy
ASi POWER FAIL	The ASi power supply has failed.	Data exchange between the DP/ASi link and the ASi slave is no longer possible.	Check the ASi power supply. Check ASi connections.
CONFIG ERROR	Actual and setpoint configurations are not identifical.	During power up: • "Actual is equal to setpoint configuration": no data exchange • "Actual is less than setpoint configuration": data exchange possible (refer to section 5.1) The data exchange continues in operation. The fault is caused by: • one ASi slave has been added • one ASi slave has failed • ASi slave 0 has been added The lowest address of the failed ASi slaves is indicated by five ASi-SLAVE FAIL LEDs.	Check the ASi slave having the address indicated. Check whether a slave type different from that specified in the parameterization message (different I/O or ID code) is being used.
AUTOPROG AV	Precisely one ASi slave has failed. The DP/ASi link is in automatic programming mode.	The DP/ASi link enables one ASi slave having ASi address 0 automatically to be allocated the ASi address of the failed ASi slave. The ASi address of the failed ASi slave is indicated by the five ASi-SLAVE FAIL LEDs.	Replace the failed ASi slave with a new ASi slave having the same I/O code and ID code (refer to section 7.3).
CONFIG MODE	No meaning		

Combinations   In addition to the different displays described in Table 8-2 and Table 8-3, combinations of several LEDs are also possible. Table 8-4 shows you the meanings of the displays.

Table 8-4   Combination of several LEDs

LEDs	Meaning	Remedy
All on	DP/ASi link starting up.	–
All on except ASi POWER FAIL	A fault has occurred in the PROFIBUS-DP during start-up.	Check the PROFIBUS-DP, the DP master and the bus connection.
ASi SLAVE FAIL flashing	DP/ASi link has not detected an ASi slave. DP/ASi link not starting.	Check the ASi cable and the cable termination.
BF flashing	Station number 126 or 127 is set on the DIP switch block or switch 8 is in OFF position.	Set the correct station number on the DIP switch block. Set switch 8 on the DIP switch block to ON and set a valid station number in the EE-PROM.
CONFIG ERROR and all ASi SLAVE FAIL light	Normal mode: ASi slave 31 has failed S7 start-up: data record 128 missing	Check your configuration. Possibly no ASi slaves have been configured.

ASi slave failure   If several ASi slaves have failed, the failed ASi slave having the lowest ASi address is indicated with the "ASi-SLAVE FAIL" LEDs. You recognize the failure of several ASi slaves by the "AUTOPROG AV" LED not being on.

Check, therefore, the ASi cable for damage in all cases as well.

DP/ASi link reaction   If the DP/ASi link detects that an ASi slave has failed or that there is no longer a connection to it, it takes the following action:

- The input data to the DP master are reset to 0 for the failed ASi slave.

- A diagnostic message is generated (refer to section 8.2)

All data, including the reset data of the failed ASi slave, are still transmitted to the DP master.

Check   If you have remedied the reason for the failure, you can establish immediately whether the DP/ASi link is working properly again. If everything is in order, the DP/ASi link enters normal operation. Only the "RUN" LED is on.

8.2　Diagnostics by Means of User Program

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8.2.9	Diagnostics for a Default Start-Up with the IM308C (MLFB 6ES7 156 0AA00-8AA0 or Later)	8-21

8.2.1   Diagnostic Fundamentals in Operations with an IM308C

FB IM308C

You can read the DP/ASi link diagnosis, as the "slave diagnosis", using function block IM308C (FB192) into your PLC – for example, SIMATIC S5 with IM 308 C.

FB IM308C is described in detail in the *Distributed I/O System ET 200* manual.

Exchanging diagnostic data

The DP/ASi link informs the DP master, by means of a high-priority transmission of user data, that a diagnosis is available. The DP master then requests the diagnostic message from the DP/ASi link.

Selecting a diagnosis

You have two options for requesting a diagnosis:

1. Master diagnostics as overview diagnosis and

2. Slave diagnostics as secondary diagnosis.

Master diagnosis

The master diagnosis includes an overview diagnosis in the first 16 bytes. From the overview diagnosis, you can determine the DP slaves which have reported a diagnosis or which cannot be addressed by that DP master.

The overview diagnosis is recommended especially when you are using several DP slaves. By using the master diagnosis, you do not have to request the slave diagnosis from every DP slave you are using.

Slave diagnosis

The slave diagnosis includes all the diagnostic information of a specific DP slave.

The structure of the slave diagnosis is explained in section 8.2.3.

Method

The method for reading the diagnosis into your PLC is described in detail in the Distributed I/O System ET 200 manual.

Example   At this point you will find a brief example of how to read the slave diagnosis into your PLC using FB IM308C.

The following assumptions apply to this STEP 5 program:

- The IM 308-C is assigned, as a PROFIBUS-DP master, pages 0 to 15 (number 0 of IM 308-C).

- The station number of the DP/ASi link is 3.

- The slave diagnosis is to be stored in DB 30. You may also use any other data block to store it in.

- The slave diagnosis consists of 26 bytes.

```
AWL                                        Explanation

      :A      DB 30
      :SPA    FB 192
Name  :IM308C
DPAD  :       KH F800                       Default address area of the IM 308-C
IMST  :       KY 0, 3                       IM No. = 0, DP/ASi link No. = 3
FCT   :       KC SD                         Function: Read slave diagnosis
GCGR  :       KM 0                          Not evaluated
TYP   :       KY 0, 20                      S5 data area: DB 20
STAD  :       KF +1                         Diagnostic data, from data word 1 on-
LENG  :       KF 26                         ward
ERR   :       DW 0                          Length of diagnosis = 26 bytes
                                            Error code stored in DW 0 of DB 30
```

Diagnostic status   The DP/ASi link can send two different diagnostic messages:

- Dynamic diagnostics

  If a new fault occurs on the DP/ASi link, the diagnosis is fetched automatically by the DP master.

  This procedure is repeated every time the diagnosis is modified.

- Static diagnostics

  The DP/ASi link uses static diagnostics when the ASi power fails. While static diagnosis is enabled, the DP master requests diagnostic messages from the DP/ASi link.

  Neither input nor output data are exchanged between the DP master and the DP/ASi link during this period.

  Static diagnostics is retained until you have remedied the reason for the failure for the diagnostic message.

Fault remedied   If there is no longer a reason for a diagnosis, the DP/ASi link sends a final diagnostic message without any further error messages.

8.2.2 Diagnostic Fundamentals in Operations with an S7/M7 DP Master (STEP 7) or with Another PROFIBUS-DP Master

Diagnosis with S7/M7 DP Master

If you are operating the DP/ASi link as a DP slave with a **SIMATIC S7/M7** DP master, the DP/ASi link behaves like a central S7-300 I/O module.

SFC 13 "DPNRM_DG"

You read out the diagnosis (data records 0 and 1) using SFC 13 "DPNRM_DG". You will find information on requesting diagnostic data in the *STEP 7 Standard and System Functions* manual.

Table 8-5   Parameters for SFC 13 "DPNRM_DG"

Parameter	Declaration	Data Type	Memory Area	Description
REC	INPUT	BOOL	I, O, M, D, L, Const.	REQ = 1: Read request
LADDR	INPUT	WORD	I, O, M, D, L, Const.	Configured diagnostic address from I area of DP/ASi link.
RET_VAL	OUTPUT	INT	I, O, M, D, L	If an error occurs while the function is being processed, the return value contains an error code. If an error does not occur, the length of the data actually transferred is located in RET_VAL.
RECORD	OUTPUT	ANY	I, O, M, D, L	Destination area for diagnostic data after being read. Only data type BYTE is allowed.
BUSY	OUTPUT	BOOL	I, O, M, D, L	BUSY = 1: Read process continuing.

Diagnosing with other PROFIBUS-DP masters

If you operate the DP/ASi link as a DP slave with a DP master from Siemens that is not part of the SIMATIC S5/S7/M7 PLCs or with a DP master from another manufacturer, please refer to the documentation for the DP master concerned for the way in which the slave diagnosis is requested.

Diagnostic interrupts

The DP/ASi link supports diagnostic interrupts.

You can evaluate these interrupts using an S7/M7 DP master. Should an interrupt occur, interrupt OBs are processed automatically by the CPU (refer to the *System Software for S7-300 and S7-400, Program Design* programming manual).

8.2.3 Structure of Diagnosis

Introduction

The structure of the diagnostic message conforms with the PROFIBUS-DP standard.

Note

The structure of the diagnostic message described below does not apply to a default start-up (refer to section 8.2.9).

Structure for IM 308C

The diagnostic message for the IM308C contains 26 bytes of data. The structure of the complete diagnosis is shown in Table 8-6.

Table 8-6   Structure of diagnostic message

Byte(s)	Contents
0	Station status 1
1	Station status 2
2	Station status 3
3	Station number, DP master
4	Manufacturer ID ($801B_H$)
5	
6	Header and length of module diagnosis
7	Module diagnosis
8	Header and length of first station diagnosis
9	Length of S7 area
10	Reserved
11	Reserved
12 – 15	Part 1 of diagnostic data
16	Length of second station diagnosis (ASi-specific part)
17	Length of S7 area
18	Reserved
19	Reserved
20 – 25	Part 2 of diagnostic data.

**Structure for
S7/M7 DP master**

The diagnostic message for the S7/M7 DP master contains 24 bytes of data.
The structure of the entire diagnosis is shown in Table 8-7.

Table 8-7   Diagnostic message structure for the S7/M7 DP master

Byte(s)	S7/M7 DP Master
0	Stations status 1
1	Stations status 2
2	Stations status 3
3	Station number, DP Master
4	Manufacturer ID ($801B_H$)
5	
6	Header and length of module diagnosis
7	Module diagnosis
8	Module diagnosis
9	Header and length of station diagnosis
10	S7 diagnostic interrupt ID
11	S7 slot
12	Reserved
13 – 16	Part 1 of station diagnostic data (DS 0)
17 – 23	Part 2 of station diagnostic data (DS 1)

8.2.4   Contents of DP Standard Part

DP standard part   The first six bytes of the diagnostic message (byte 0 to byte 5) are termed the DP standard part. They are independent of the DP slave used.

Station status 1   You will find a description of the structure of station status 1 in Table 8-8. The default setting is 02_H.

Table 8-8   Structure of station status 1

Bit	Value	Contents
0	1	DP/ASi link cannot be addressed.
1	1	DP/ASi link not yet ready for data exchange.
2	1	The configuration data sent by the DP master do not correspond to the configuration of the ASi.
3	1	Slave diagnosis available.
4	1	Requested function not supported by DP/ASi link.
5	1	Implausible response received from DP/ASi link.
6	1	Erroneous parameterization message present.
7	1	DP/ASi link assigned parameters by a DP master other than the DP master that is just attempting to access the DP/ASi link.

Station status 2   You will find a description of the structure of station status 2 in Table 8-9. The default setting is 05_H.

Table 8-9   Structure of station status 2

Bit	Value	Contents
0	1	New parameters have to be assigned to DP/ASi link.
1	1	Static diagnostics available.
2	1	Reserved
3	1	Response monitoring activated.
4	1	FREEZE mode enabled.
5	1	SYNC mode enabled.
6	0	Reserved
7	0	DP/ASi link de-activated.

Station status 3

Station status 3 is reserved for later applications. Its value is always 00_H.

Station number of DP master

This byte contains the station number of the DP master which assigned parameters to the DP slave. Only this DP master has read and write access to this DP slave.

The default value of the station number during startup is FF_H. This means that the DP/ASi link has so far not been assigned parameters by any DP master.

Manufacturer ID

The manufacturer ID enables you to precisely identify the DP slave. The manufacturer ID is specific to a product.

The manufacturer ID for the DP/ASi link has a value of 32795 ($801B_H$).

8.2.5   Module and First Station Diagnoses with the IM308C

Area   Module and first station diagnoses are contained in bytes 6 to 15.

Contents   The contents of bytes 6 to 11 are shown in Table 8-10.

Table 8-10   Structure of bytes 6 to 11 of diagnostic message

Byte	Contents	Contents
6	42_H	Header of module diagnosis including length specification in accordance with DP standard. This diagnosis is not used by the DP/ASi link.
7	00_H	Module diagnosis This diagnosis is not used by the DP/ASi link.
8	08_H	First station diagnosis with 8 bytes including header The first station diagnosis comprises bytes 8 to 15.
9	XX_H	This area is prepared for an extended diagnosis by your S7.
10	04_H	Reserved
11	00_H	Reserved

**Diagnostic data
Part 1**

The first part of the station diagnostic data of the DP/ASi link as a DP slave is structured as shown in Table 8-11. A message is indicated by a "1".

Table 8-11   Structure of diagnosis, bytes 12 to 15

Byte[1]	Meaning	Reason/Reaction	Remedy
12.0	Group error message for module	An error is present.	Evaluate the other error messages.
12.1	Internal DP/ASi link fault; group error message	Either there are no parameterization data or a serious software error has occurred on the DP/ASi link.	Check whether the parameterization and configuration messages are present in your DP master.
12.2	ASi error; external DP/ASi link error	Either there is a configuration error of the ASi or an ASi slave has failed.	Compare the data of your configuration with the actual set-up.
12.4	ASi power supply	There is no ASi power supply.	Check the ASi power supply. Check the connections of ASi.
12.7	ID code or I/O code of an ASi slave erroneous (occurs during start-up only)	The ID code or the I/O code of an existing ASi slave does not correspond to the data in the parameterization message.	Check whether a different slave type (different I/O or ID code) from that specified in the parameterization message is being used.
13.0 to 4	CPU class		–
15.2	EEPROM of DP/ASi link defective	An internal self-test has determined that the EEPROM is defective.	Consult your point of contact at Siemens.

[1]   Unnamed bits are without significance

8.2.6 Module and First Station Diagnoses with the S7/M7 DP Master

Area   Module and first station diagnoses are contained in bytes 6 to 16.

Contents   The contents of bytes 6 to 12 is shown in Table 8-12.

Table 8-12   Structure of bytes 6 to 12 of diagnostic message for operations with IM308C

Byte	Contents	Contents
6	43_H	Header and length of module diagnosis including length specification (3 bytes) in accordance with DP standard. This diagnosis is not used by the DP/ASi link.
7	XX_H	Module diagnosis This diagnosis is not used by the DP/ASi link.
8	00_H	Module diagnosis This diagnosis is not used by the DP/ASi link.
9	$0F_H$	Header and length of station diagnostics (15 bytes).
10	01_H	S7 diagnostic interrupt ID
11	04_H	S7 slot
12	00_H	Reserved

Diagnostic data
Part 1   The first part of the station diagnostic data of the DP/ASi link as a DP slave
is structured as shown in Table 8-13. A message is indicated by a "1".

Table 8-13   Structure of diagnosis, bytes 13 to 16

Byte[1]	Meaning	Reason/Reaction	Remedy
13.0	Module malfunction	Group error 0 – Interrupt going 1 – Interrupt coming	Refer to other diagnostic data
13.2	External fault	Slave failed	Check and, if necessary, replace slave
13.3	Channel error present	Difference from setpoint configuration	Compare setpoint and actual configurations
13.4	No external standby supply	No ASi power supply.	Check ASi power supply. Check ASi connections.
14.0 to 3	Module class: 0110 (Misc. module)	–	–
15.0	User module wrong/missing	Configuration error: incorrect I/O code, incorrect ID code (start-up only)	Check I/O and ID codes
15.2	RUN/STOP mode	Modes: 0 – Normal mode 1 – Offline	–
16	No meaning		

[1]   Unnamed bits are without significance

8.2.7   Second Station Diagnosis with the IM308C

Area   The second part of the station diagnostics is contained in bytes 16 to 25.

Contents   The contents of bytes 16 to 19 are shown in Table 8-14.

Table 8-14   Structure of bytes 16 to 19 in diagnostic message

Byte	Con tents	Contents
16	0A$_H$	Second station diagnostics with 10 bytes including header. The second station diagnostics covers bytes 16 to 25.
17	xx$_H$	This area has been prepared for an extended diagnosis from your S7.
18	04$_H$	Reserved
19	00$_H$	Reserved

Diagnostic data   The second part of the station diagnostic data of the DP/ASi link, which refer
Part 2   to the ASi, are spread over two areas. In the first area, as shown in
                      Table 8-15, you will find ASi-related data. A message is indicated by a "1".

Table 8-15   Structure of diagnostic data, bytes 20 and 21

Byte[1]	Meaning	Reason/Reaction	Remedy
20.1	ASi power supply	ASi power supply has failed.	Check the ASi power supply. Check the connections of the ASi.
20.4	Automatic programming is possible.	Precisely one ASi slave has failed (refer to sec tion 7.3). The address of the failed ASi slave is indicated by five ASi SLAVE FAIL LEDs.	Replace the failed ASi slave with a new ASi slave having identical I/O and ID codes.
21.0	Configuration error: Unconfigured ASi slaves pre-sent	On start-up: Data exchange cannot take place on PROFIBUS-DP side. In operation: Data exchange is possible.	Remove unconfigured ASi slaves.

[1]   Unnamed bits are without significance.

Table 8-15   Structure of diagnostic data, bytes 20 and 21, continued

Byte[1]	Meaning	Reason/Reaction	Remedy
21.1	Configuration error: configured ASi slaves not present	"Actual is equal to setpoint configuration": data exchange cannot take place on PROFIBUS-DP side. "Actual is less than setpoint configuration" and operation: data exchange is possible	Add the missing ASi slaves.
21.2	ID code or I/O code of an ASi slave erroneous (occurs only during start-up)	The ID code or the I/O code of an existing ASi slave does not correspond to the data in the parameterization message.	Check whether a different slave (different ID or I/O code) from that specified in the parameterization message is being used.
21.3	Internal DP/ASi error	Parameterization data not present.	Check whether the parameterization and configuration messages are present in your DP master.
21.4	ASi slave present with address "0"	You have included an ASi slave having an address of "0" in the ASi.	Modify the ASi address on the ASi slave. If byte 20.4 is set simultaneously, the correct ASi address is set automatically.
21.5	EEPROM of DP/ASi link defective	An internal self-test has determined that the EEPROM is defective.	Consult your point of contact at Siemens.

[1]   Unnamed bits are without significance.

ASi slave diagnosis   The failure of an ASi slave is indicated by diagnostic bytes 22 to 25. Byte 22.0 is not assigned. In Table 8-16 you can see the assignment of the different bits to the ASi address.

Defective ASi slaves are marked with a "1".

Table 8-16   Assignment of ASi address to bit positions, bytes 22 to 25

Byte	Bit (Corresponds to ASi Address)							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
22	7	6	5	4	3	2	1	–[1]
23	15	14	13	12	11	10	9	8
24	23	22	21	20	19	18	17	16
25	31	30	29	28	27	26	25	24

[1]   This position is not assigned. An ASi slave with ASi address 0 is indicated by byte 21.4.

8.2.8   Second Station Diagnosis with the S7/ M7 DP Master

Area   The second part of the station diagnosis is contained in bytes 17 to 23.

Contents   The contents of bytes 17 to 19 are shown in Table 8-17.

Table 8-17   Structure of bytes 17 to 19 in diagnostic message

Byte	Con-tents	Contents
17	60$_H$	Channel type (channel module)
18	00$_H$	Length of overall diagnostic information per channel
19	20$_H$	Number of channel modules

ASi slave diagnosis   Diagnostic bytes 20 to 23 indicate an ASi slave failure. In Table 8-18, you will see the assignment of the different bits to the ASi address.

Erroneous ASi slaves are marked "1".

Table 8-18   Assignment of the ASi address to bit positions, bytes 20 to 23

Byte	Bit (Corresponds to ASi Address)							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
20	7	6	5	4	3	2	1	[1]
21	15	14	13	12	11	10	9	8
22	23	22	21	20	19	18	17	16
23	31	30	29	28	27	26	25	24

[1]   This position is not assigned.

8.2.9 Diagnostics for a Default Start-Up with the IM308C (6ES7 156 0AA00-0XA0 or Later, Issue 3)

Structure

For the default start-up, the diagnostic message contains 32 bytes of data and complies with the PROFIBUS DP standard. The table below describes the basic structure of the diagnostic message.

Table 8-19   Basic structure of diagnostic message

Byte(s)	Contents	Meaning
0	02_H	Station status 1
1	05_H	Station status 2
2	00_H	Station status 3
3	FF_H	Station number, DP Master
4	80_H	Manufacturer ID ($801B_H$)
5	$1B_H$	
6	$1A_H$	Header and length of module diagnosis
7	01_H	Module diagnosis
8	04_H	Header and length of first station diagnosis
9	00_H	Length of S7 area
10	22_H	Part 2 of diagnostic data
11	00_H	
12 to 15	See Table 8-20	Part 1 of diagnostic data
16 to 31	See Table 8-21	Actual configuration of ASi installation

Diagnostic data (bytes 12 to 15)

Diagnostic bytes 12 to 15 indicate an ASi slave failure. Table 8-16 shows the assignment of the ASi addresses.

Failed ASi slaves are marked "1".

Table 8-20   Indication of failed ASi slaves

Byte	Bit (Corresponds to ASi Address)							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
12	7	6	5	4	3	2	1	*
13	15	14	13	12	11	10	9	8
14	23	22	21	20	19	18	17	16
15	31	30	29	28	27	26	25	24

*   Byte 12.0 is not assigned.

**Actual ASi confi-
guration (bytes 16
to 31)**

Bytes 16 to 31 of the diagnostic message indicate the ASi configuration at
the time of the parameterization message. An ASi slave is permanently assi-
gned to every nibble. If an ASi slave is present in the configuration, its hexa-
decimal I/O code is entered at this point; missing ASi slaves are marked F_H.

Table 8-21   Actual ASi configuration

Byte	Bits 7 to 4	Bits 3 to 0
16	Not applicable	I/O code for slave 1
17	I/O code for slave 2	I/O code for slave 3
18	I/O code for slave 4	I/O code for slave 5
19	I/O code for slave 6	I/O code for slave 7
20	I/O code for slave 8	I/O code for slave 9
21	I/O code for slave 10	I/O code for slave 11
22	I/O code for slave 12	I/O code for slave 13
23	I/O code for slave 14	I/O code for slave 15
24	I/O code for slave 16	I/O code for slave 17
25	I/O code for slave 18	I/O code for slave 19
26	I/O code for slave 20	I/O code for slave 21
27	I/O code for slave 22	I/O code for slave 23
28	I/O code for slave 24	I/O code for slave 25
29	I/O code for slave 26	I/O code for slave 27
30	I/O code for slave 28	I/O code for slave 29
31	I/O code for slave 30	I/O code for slave 31

Note

If you require a comparison between the setpoint and actual configurations,
you must do this in the user program.

Technical Data

A

Standards and approvals

The DP/ASi link meets the requirements of the Profibus-DP standard, the ASi standard and UL, CSA and FM approvals.

What are general technical data?

The general technical data contain the standards and test values maintained and met by the S7-300 and the test criteria by which the S7-300 was tested.

Heed installation guidelines

SIMATIC products meet the requirements if you observe, during installation and operation, to the installation guidelines described in the manuals.

In Section	You Will Find	on Page
A.1	Standards and Approvals	A-2
A.2	General Technical Data	A-4

A.1   Standards and Approvals

Introduction

This chapter contains for the distributed I/O system DP/ASi link data concerning

- the most important standards whose criteria are met by the DP/ASi link and

- approvals for the DP/ASi link.

IEC 1131

The distributed I/O system DP/ASi link meets the requirements and criteria of IEC Standard 1131, Part 2.

PROFIBUS DP

The distributed I/O system DP/ASi link meets the requirements and criteria of EN Standard 50170 Volume 2, PROFIBUS.

ASi standard

The distributed I/O system DP/ASi link meets the requirements and criteria of the ASi standard.

CE mark

Our products meet the requirements and protective goals of the following EC Directives and conform to the harmonized European standards (EN) published for programmable logic controllers in the official journals of the European Community:

- 89/336/EEC "Electromagnetic Compatibility" (EMC Directive)

- 73/23/EEC "Electromagnetic Equipment for Use within Specific Voltage Limits" (Low-Voltage Directive)

The EC conformity declarations are made available for the cognizant authorities at:

> Siemens Aktiengesellschaft
> Bereich Automatisierungstechnik
> AUT E 14
> Postfach 1963
> D-92209 Amberg

EMC Directive   SIMATIC products are designed to operate in an industrial environment.

With a one-shot approval, SIMATIC products may also be used for domestic purposes (domestic, business and industry, small enterprises). The one-shot approval has to be obtained from an authority or test center. In Germany, one-shot approvals are issued by the Federal Office for Posts and Telecommunications (Bundesamt für Post und Telekommunikation) and its branch offices.

Application	Requirement for	
	Radio Interference	**Noise Immunity**
Industry	EN 50081-2 : 1993	EN 50082-2 : 1995
Domestic	One-shot approval	EN 50082-1 : 1992

PNO   The DP/ASi link meets the requirements of the PNO (PROFIBUS Users' Organization).

UL approval   UL Recognition Mark
Underwriters Laboratories (UL) in accordance with
Standard UL 508, File No. 116536

CSA approval   CSA Certification Mark
Canadian Standard Association (CSA) in accordance with
Standard C22.2 No. 142, File No. LR 48323

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

Warning

Persons and equipment may come to harm.

In hazardous areas persons and equipment may come to harm if you disconnect connectors during routine operation.

De-energize the distributed I/O system in hazardous areas before disconnecting connectors.

A.2 General Technical Data

Technical data   The following table presents the technical data of the distributed I/O system
                          DP/ASi link.

Technical Data	
Baud rates on PROFIBUS-DP	9.6; 19.2; 93.75; 187.5; 500; 3000; 6000 and 12000 kBd
Power down backup	Typically 20 ms
Insulation rating	In acc. with VDE 0160
Nominal insulation voltage (L+ to PI)	60 V AC
Test voltage	500 V AC
Optical isolation to	
• PROFIBUS-DP	500 V
• ASi	500 V
Power loss	3.0 W
Weight	800 g
Dimensions (B × H × D)	205 × 80 × 57

Power Supply	
Nennwert (L+)	24 V DC
Permissible range	20 to 30 V incl. ripple of max. 3.6 V
Value when t < 0.5 s	35 V
Protected against polarity	Yes
Input power	
• DP part (24 V DC)	100 mA
• ASi part	70 mA

Diagnostic Functions	
Voltage Monitoring	Green RUN LED
Monitoring	
• PROFIBUS-DP	• Red BF LED
• ASi	• Red ASi POWER FAIL LED • Yellow CONFIG ERROR LED • Green AUTOPROG AV LED • Yellow CONFIG MODE LED
• ASi slaves	5 red ASi-SLAVE FAIL LEDs

Climatic Environmental Conditions to IEC 1131-2	
Temperature	
• Operation with MLFB 6ES7 156-0AA01-0XA0 or later	0 to + 60 °C –25 to + 60 °C
• Storage/shipping	– 40 to + 70 °C
Temperature variation	
• Operation	Max. 10 °C/h
• Storage/shipping	Max. 20 °C/h
Relative humidity	10 to 100 %
Atmospheric pressure	
• Operation	860 to 1060 hPa
• Storage/shipping	660 to 1060 hPa
IP protection type to IEC 529	IP 66/IP 67
Operating conditions with chemically active pollutants to IEC 654-4	Class 2

Mechanical Environmental Conditions	
Operating conditions to IEC 654-3	
• 10 Hz ≤ f < 57 Hz	Const. amplitude 0.35 mm
• 57 Hz ≤ f < 150 Hz	Const. acceleration 5 g
• Oscillation type	Frequency sweeps with variation rate of 1 octave/min.
• Oscillation period	10 frequency sweeps per axis in all of the three per pendicular axes
• Operating conditions	V.T.1 (corresponds to 100 % frequency)
Schock tested to IEC 68-2-27	
• Type of shock	Half sine
• Force of shock	30 g peak value, 18 ms duration
• Direction of shock	6 shocks in all of the three perpendicular axes
Repetitive shock tested to IEC 68-2-29	
• Type of shock	Half sine
• Force of shock	25 g peak value; 6 ms duration
• Direction of shock	1000 shocks in all of the three perpendicular axes
Drop and topple to IEC 68-2-31	
• Tested with	Height of fall of 100 mm

Electromagnetic Compatibility (EMC)/ Noise Immunity	
Discharge of static electricity to IEC 801-2	
• Discharge of static electricity	8 kV air discharge Discharge to all parts ac cessible to the operator in normal operation.
• Test voltage	4 kV relay discharge (relative humidity 30 to 95 %)
Electromagnetic fields to IEC 801-3	
• Field strength	10 V/m
Rapid transient (burst) voltages to IEC 801-4	
• DC power supply	2 kV
• Communication inter face	2 kV

Safety Aspects	
Insulation rating	
• Between electrically independent circuits and circuits connected to a central grounding point	To DIN VDE 0160 (05.1988)
• Between all circuits and central grounding point	To DIN VDE 0160 (05.1988)
Radio interference	To EN 50081-2: 1994, use in industrial environment

Dimension drawing   Fig. A-1 shows you the dimension drawing for the DP/ASi link.
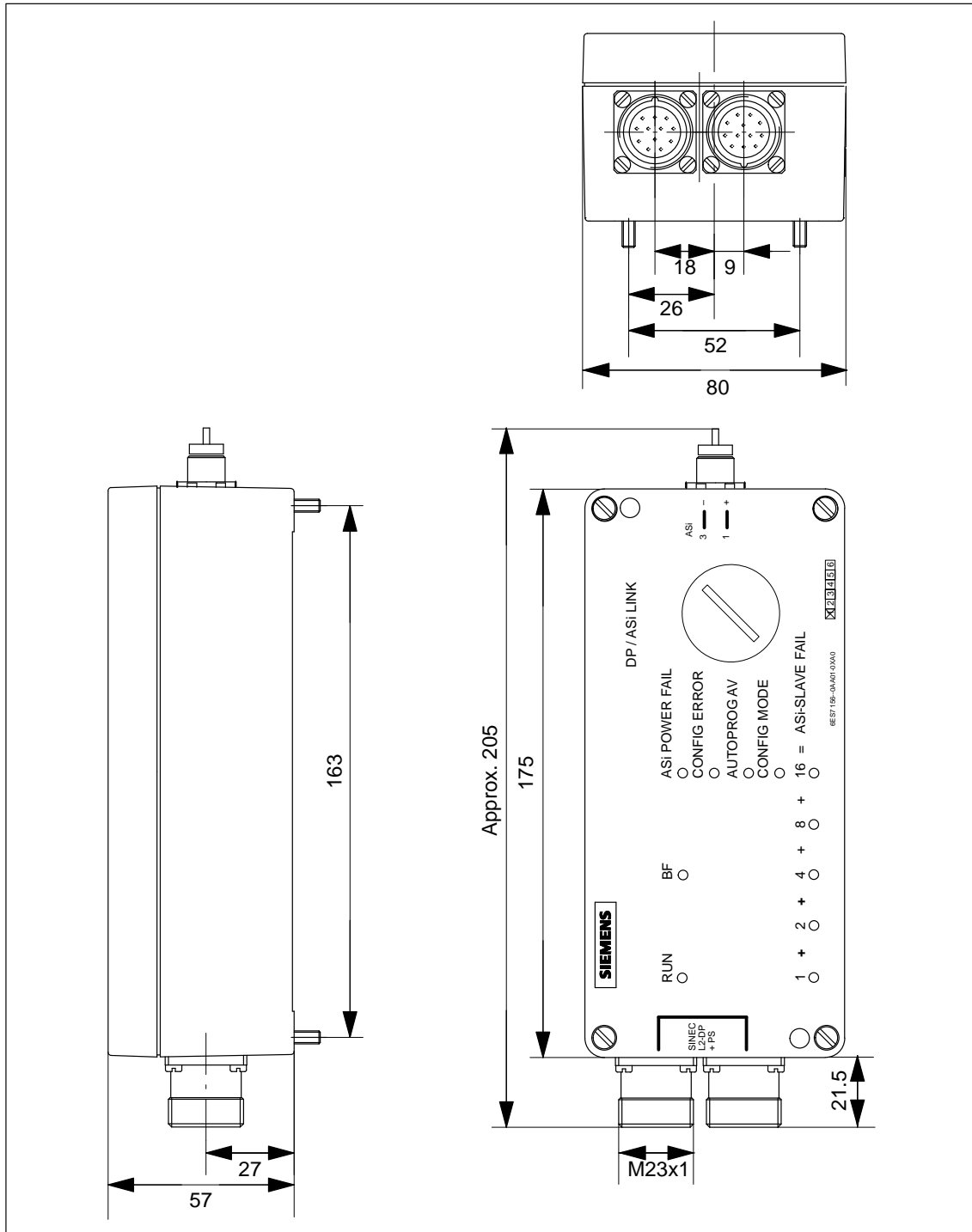
Figure A-1   DP/ASi link; dimension drawing

I/O Code

B

In this chapter   In this chapter you will find the I/O code of the ASi slaves as defined in the ASi standard.

I/O code   The I/O code characterizes every ASi slave in respect of its inputs and outputs. Table B-1 shows the interrelationship between the assignment of the four connections of an ASi slave and the I/O code.

Table B-1   I/O code of ASi slaves

D0	D1	D2	D3	I/O Code	
				Decimal	Hex.
ON	ON	ON	ON	0	0
ON	ON	ON	OFF	1	1
ON	ON	ON	ON/OFF	2	2
ON	ON	OFF	OFF	3	3
ON	ON	ON/OFF	ON/OFF	4	4
ON	OFF	OFF	OFF	5	5
ON	ON/OFF	ON/OFF	ON/OFF	6	6
ON/OFF	ON/OFF	ON/OFF	ON/OFF	7	7
OFF	OFF	OFF	OFF	8	8
OFF	OFF	OFF	ON	9	9
OFF	OFF	OFF	ON/OFF	10	A
OFF	OFF	ON	ON	11	B
OFF	OFF	ON/OFF	ON/OFF	12	C
OFF	ON	ON	ON	13	D
OFF	ON/OFF	ON/OFF	ON/OFF	14	E
TRI	TRI	TRI	TRI	15	F

Parameterization Message

C

Tip   You require this chapter only if you are not using an application such as COM ET 200 Windows (version 2.0 or later).

Introduction   The DP/ASi link requires the parameterization message during start-up. This appendix describes the structure of the parameterization message for the DP/ASi link when used as a DP standard slave.

When you have studied this chapter, you can manually create the parameterization message on your own.

In this chapter

In Section	You Will Find	on Page
C.1	Structure of the Parameterization Message in Configuring with Address Optimization	C-2
C.2	Parameterization Data for ASi Slaves	C-6
C.3	Optimizing Address Assignment	C-8
C.4	Structure of the Parameterization Message in Simple Configuration	C-10

C.1 Structure of the Parameterization Message in Configuring with Address Optimization

Structure

The parameterization message contains 140 bytes of data, bytes 0 to 139. These 140 bytes comprise:

- 7 bytes in accordance with the DP standard, bytes 0 to 6, refer to Table C-1

- 8 bytes for initialization of the DP/ASi link, bytes 7 to 14, refer to Table C-4

- a control byte, byte 15, refer to Table C-5

- 4 bytes in each case for a possible ASi slave, bytes 16 to 139, refer to Table C-6

DP standard part

You will find the structure of the seven bytes conforming to the DP standard in Table C-1.

Table C-1   Structure of the DP standard part in parameterization message

Byte(s)	Value	Meaning
0		Station status, refer to Table C-2
1	0 to 255	Watchdog factor These two bytes represent two factors for response monitoring. If the DP master fails, the DP slave is reset at the end of the response time (T_{WD}). All the outputs are set to 0 by the DP/ASi link.
2	0 to 255	You calculate the response time from the formula: $T_{WD} =$ watchdog time base[1] $\times$ factor $1_{(byte\ 1)}$ $\times$ factor $2_{(byte\ 2)}$
3	0 to 255	Response delay The response delay specifies the length of time the DP slave has to wait until it can send its response message to the DP master. The response time depends on the baud rate.
4, 5	$32795 = 801B_H$	Manufacturer ID The manufacturer ID is a product-specific ID. The DP/ASi link accepts in the parameterization message only that manufacturer ID which corresponds to its own. If the ID in the parameterization message is not identical with that of the DP/ASi link, an error message is issued.

Table C-1   Structure of the DP standard part in parameterization message, continued

Byte(s)	Value	Meaning
6		Group ID You can place several DP slaves in one group with the group ID.

[1]   Refer to Table C-3 for the watchdog time base

Station status   The station status defines the operating behavior of the DP/ASi link as a DP slave. Its behavior towards other DP masters is determined; other aspects to be determined are whether the SYNC and FREEZE modes and the watchdog are being used.

Table C-2   Structure of station status in parameterization message

Bit(s)	Value	Meaning
0 to 2	000	Reserved
3	1	The watchdog for the PROFIBUS-DP is enabled in the DP/ASi link.
4	1	The DP/ASi link can be operated in FREEZE mode.
5	1	The DP/ASi link can be operated in SYNC mode.
6, 7	00	The slave response time (T_{SDR}) is modified. All other parameters remain as they are.
	01	The DP/ASi link is enabled for other PROFIBUS masters.
	10	The DP/ASi link is disabled for other PROFIBUS masters. All parameters are applied; (exception: $T_{SDR} = 0$).
	11	The DP/ASi link is enabled for other PROFIBUS masters.

Initialization bytes

Bytes 7 to 14 are referred to as the initialization bytes.

You can modify byte 7 (refer to Table C-3), the first byte of the eight initialization bytes, as follows:

Table C-3   Structure of byte 7 for initialization

Bit(s)	Meaning	Value	
0	Start bit monitoring	0	Monitoring is enabled
		1	Monitoring is disabled
1	Stop bit monitoring	0	Monitoring is enabled
		1	Monitoring is disabled
2	Watchdog time base	0	Time base = 10 ms
		1	Time base = 1 ms[1]
3 to 5		0	In all cases
6		0	In all cases
7		0	In all cases

[1]   The time base = 1 ms may be used only for transmission rates > 1.5 MBd.

The remaining bytes (byte 8 to byte 14) are pre-defined and cannot be modified. The values of these bytes are defined in Table C-4. If you modify these values, the DP/ASi link cannot be operated.

Table C-4   Default values of bytes 8 to 14 for initialization

Byte	8	9	10	11	12	13	14
Value	00_H	00_H	82_H	51_H	04_H	$8A_H$	$7D_H$

Control byte

The control byte (byte 15) contains the other interface parameters. The control byte has the value shown in Table C-5.

Table C-5   Value of control byte (byte 15)

Value	Meaning
00_H	Actual is equal to setpoint configuration
01_H	Actual is less than or equal to setpoint configuration

Actual equal to setpoint configuration

"Actual is equal to setpoint configuration" means that the DP/ASi link starts up only when the actual configuration is the same as the setpoint configuration. If there are any differences between the actual and setpoint configurations, the DP/ASi link requests a new parameterization message.

Actual less than or equal to setpoint configuration

"Actual is less than or equal to setpoint configuration" means that the DP/ASi link compares the actual configuration with the setpoint configuration. If the DP/ASi link detects any differences, it reacts in two different ways:

- If the DP/ASi link detects unconfigured ASi slaves, it behaves in the same way as for "actual is equal to setpoint configuration".

- If ASi slaves are missing from the actual configuration compared to the setpoint configuration – without unconfigured ASi slaves being present – the DP/ASi link reports a configuration error. Data exchange is initiated, however.

If no difference is detected between actual and setpoint configurations, the DP/ASi link starts up normally.

Parameterization data for ASi slaves

Bytes 16 to 139 contain the parameterization data for the ASi slaves. The method of determining the parameterization data is described in section C.2.

Precisely four bytes are assigned to every ASi slave.

C.2 Parameterization Data for ASi Slaves

Structure

You have to define four bytes for every ASi slave when you assign parameters. These four bytes contain all the data required for an ASi slave and data exchange with it. You will find the structure of these four bytes for every ASi slave in Table C-6.

Table C-6　　Parameterization data for an ASi slave

Byte A		Byte B		Byte C [1]	Byte D [2]
Bits 7 to 4	**Bits 3 to 0**	**Bits 7 to 4**	**Bits 3 to 0**	**Bits 7 to 0**	**Bits 7 to 0**
Configuration status	Parameters of ASi slave	ID code of ASi slave	I/O code of ASi slave	Codification of input area	Codification of output area

[1]　If you do not assign any inputs, you must assign FF_H to byte C.
[2]　FIf you do not assign any outputs, you must assign FF_H to byte D.

Byte A – bits 7 to 4 Configuration status

With the configuration status, you specify whether the ASi slave is contained in the ASi. The following two values are possible:

- 8_H for configured ASi slaves (bits 7 to 4)

- 0_H for unconfigured ASi slaves (bits 7 to 4)

Byte A – bits 3 to 0 Parameters of ASi slave

Refer to the data sheet of the ASi slaves for the range of values of the parameters of the ASi slaves and their significance. The default parameter setting is 0 and applies to all ASi slaves.

Byte B – bits 7 to 4 ID code

The ID code specifies the manufacturer of the ASi slave modules. The standard ID code is 0 and can be used by all manufacturers. If the ASi slave expects a different ID code, you can take it from the data sheet for the ASi slave.

Byte B – bits 3 to 0 I/O code

The I/O code characterizes the ASi slave with reference to its inputs and outputs. You will find the I/O code in the data sheet for the ASi slave. If you know the input and output assignment, you can read the I/O code from Table B-1 in Appendix B.

Bytes C and D – input and output areas

After performing optimization of the address assignment (refer to Appendix C.3), you can take both the byte number and the number for every ASi slave from the address space template.

The position of the first input or output bit in the address space template (refer to Fig. C-1) characterizes every ASi slave. The specifications are important for the address assignment.

Address assignment

In Table C-7 you will find the assignment of the ASi addresses to the byte numbers within the parameterization message.

Table C-7   Assignment of parameterization data of ASi slaves to byte numbers of parameterization message

Parameterization Data for ASi Slave with ASi Address	... Assigned to Bytes
1	16 to 19
2	20 to 23
3	24 to 27
4	28 to 31
5	32 to 35
31	136 to 139

Example

The way in which you determine the value of an input or output byte is shown in the table below. ASi slave No. 4, as defined in Fig. C-1, is used in the example.

Step	Action	Explanation
1	Byte number: 1 Bit number: 0	Take the byte number (1) and the bit number (0) from the address space template (refer to Fig. C-1).
2	0 0 0 0 1 0 0 0 Bit No. 4 0 2 0	Convert the byte number into a 5-digit binary number and the bit number into a 3-digit binary number. You will obtain the byte number 00001_B and the bit number 000_B.
3	0 0 0 0 1 0 0 0 Bit No. 7 3 2 0	Merge the two binary numbers. The bit number is sorted into the position of bits 0 to 2 and the byte number into the position of bits 3 to 7.
4	0 0 0 0 1 0 0 0	Divide the eight bits you obtain at the center into two groups of four bits.
5	0_H 8_H	Convert both of the two groups into a hexadecimal number.
6	08_H	Unite the two hexadecimal numbers.

C.3 Optimizing Address Assignment

Purpose

For you to be able to address the ASi slaves, you have to allocate the address assignment within the SIMATIC to every ASi slave.

To make proper use of the limited address space on the SIMATIC, you must optimize the address assignment of the different slaves.

Method

Optimize the input address area first and then the output address area.

Optimization

It has proved sensible to create an address space template for each of the in puts and each of the outputs. Up to 16 bytes of address space can be assigned to every address space template. Fig. C-1 shows an example of an address space template.

Rule

Please observe the following rules, which have proved to be sensible, when you are tackling address assignment:

• Sort the ASi slaves used according to their address requirement.

• Start in byte 0 at bit 0 with an ASi slave having 4 inputs or outputs (data bits).

• Insert all the ASi slaves with 4 data bits first. Then insert all the ASi slaves with 3 data bits, then 2 data bits and, finally, all ASi slaves having a single data bit.

• In assigning addresses, you must not go beyond byte limits with an ASi slave. Note that the data must be byte-consistent.

• Always try to fill a data byte completely.

Example   Fig. C-1 illustrates the process for optimizing address assignment using the address space template.

The four AS slaves used have the following input/output assignment:

ASi Address	Inputs	Outputs
1	4	0
4	2	2
5	3	1
7	0	4
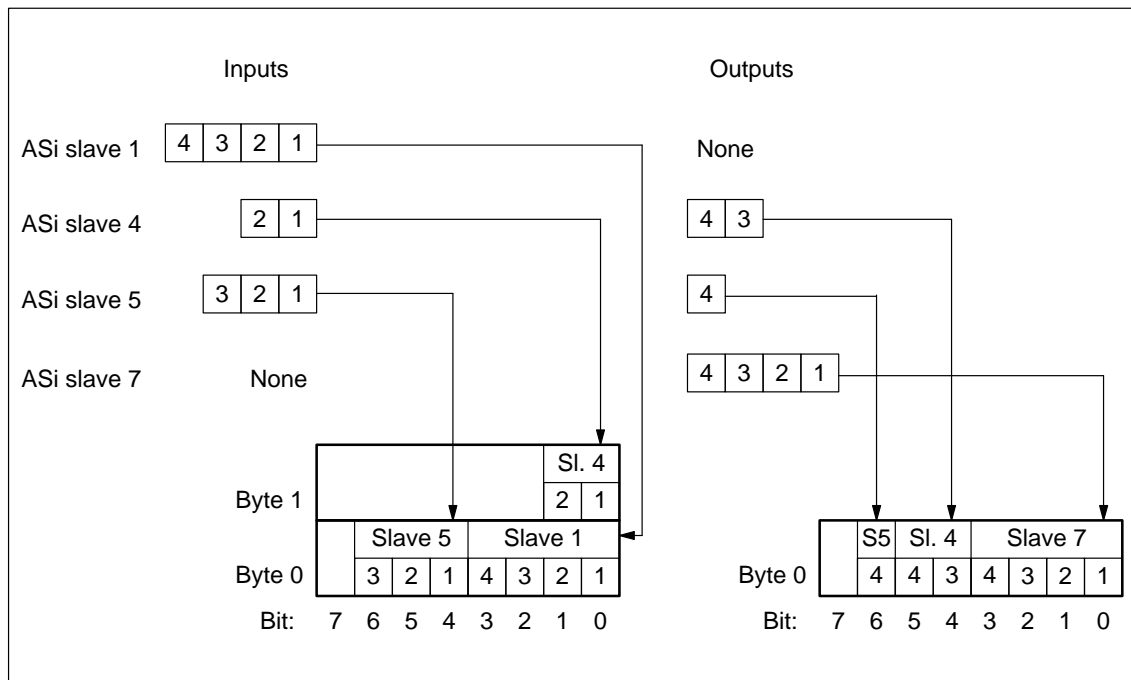
Figure C-1   Sorting ASi slaves into address space template

C.4   Structure of the Parameterization Message in Simple Configuration

Parameterization message structure

The parameterization message has a fixed length of exactly 32 bytes.

DP standard part

Bytes 0 to 6 contain the parameters of the DP standard part.

Table C-8   Assigning the DP standard part

Byte	0	1	2	3	4	5	6
Value	Refer to Table C-1						

Initialization bytes

Bytes 7 to 14 are referred to as the initialization bytes.

The structure of the first initialization byte, byte 7, is described in Table C-3.

Bytes 8 to 14 contain fixed default values for initialization of the DP/ASi link, which must not be modified.

Table C-9   Default values of bytes 8 to 14 for initialization

Byte	8	9	10	11	12	13	14
Value	00_H	00_H	16_H	51_H	04_H	$8A_H$	11_H

Control byte

Byte 15 defines the response when the actual configuration read by the DP/ASi link does not agree with the setpoint configuration.

Table C-10   Definition of response when setpoint and actual configurations differ

Byte	15
Value	Refer to Table C-5

Setpoint configuration

Bytes 16 to 31 reflect the setpoint configuration of the DP/ASi link. An ASi slave is permanently assigned to every nibble. If an ASi slave has been configured, its hexadecimal I/O code has to be entered at this stage; unconfigured ASi slaves have to be identified by F$_H$.

Table C-11   I/O code of configured ASi slaves

Byte	Bits 7 to 4	Bits 3 to 0
16	Not applicable	I/O code for slave 1
17	I/O code for slave 2	I/O code for slave 3
18	I/O code for slave 4	I/O code for slave 5
19	I/O code for slave 6	I/O code for slave 7
20	I/O code for slave 8	I/O code for slave 9
21	I/O code for slave 10	I/O code for slave 11
22	I/O code for slave 12	I/O code for slave 13
23	I/O code for slave 14	I/O code for slave 15
24	I/O code for slave 16	I/O code for slave 17
25	I/O code for slave 18	I/O code for slave 19
26	I/O code for slave 20	I/O code for slave 21
27	I/O code for slave 22	I/O code for slave 23
28	I/O code for slave 24	I/O code for slave 25
29	I/O code for slave 26	I/O code for slave 27
30	I/O code for slave 28	I/O code for slave 29
31	I/O code for slave 30	I/O code for slave 31

Configuration Message

D

Tip You require this section only if you are not using an application such as COM ET 200 Windows.

Introduction The DP/ASi link requires the configuration message during start-up. This chapter describes the structure of the configuration message for the DP/ASi link used as a DP standard slave.

Meaning The configuration message defines the length of input and output data. They are compared with the data contained in the parameterization message.

In this appendix

In Section	You Will Find	on Page
D.1	Structure of the Configuration Message with a Default Start-Up	D-2
D.2	Structure of the Configuration Message in Configuration with Address Optimization	D-3
D.3	Structure of the Configuration Message in Simple Configuration	D-7

D.1 Structure of the Configuration Message with a Default Start-Up

Structure

The configuration message consists of precisely 20 bytes. With a default start-up, it must have the structure shown in Table 8.

Table D-1   Configuration message structure for a default start-up

Byte	0	1	2	3	4	5	6	7	8	9
Value	04_H	00_H	00_H	AD_H	$C0_H$	04_H	00_H	00_H	BB_H	40_H

Byte	10	11	12	13	14	15	16	17	18	19
Value	04_H	00_H	00_H	$8F_H$	$C0_H$	$C2_H$	$0F_H$	$0F_H$	$3C_H$	40_H

D.2 Structure of the Configuration Message in Configuration with Address Optimization

Structure

The configuration message contains 20 bytes. The first 15 bytes are permanently assigned, as shown in Table D-2. All values are hexadecimal numbers.

Table D-2   Default assignment of bytes 0 to 14 of the configuration message, shown in hexadecimal numbers

Byte	0	1	2	3	4	5	6	7	8	9
Value	04	00	00	AD	C0	04	00	00	BB	40

Byte	10	11	12	13	14	15	16	17	18	19
Value	04	00	00	8F	C0	variable			3C	40

Variable bytes

Byte 15 to byte 17 are comprised as follows:

- Byte 15:

  Identification byte with specific identification format (refer to Table D-3)

- Byte 16 (possibly byte 17)

  1 or 2 length bytes for input and output data

- Byte 18 and byte 19 (possibly byte 17)

  2 or 3 bytes of manufacturer-specific data; bytes 18 and 19 are permanently assigned with values from Table D-2.

Identification byte   With the identification byte, you define the structure of the configuration message. You will find a description of the value of the identification byte in Table D-3.

Table D-3   Value of identification byte in configuration message

Value	Meaning
43_H	Input data only • in byte 16, the length byte stands for the input data • there follow three bytes of manufacturer-specific data: 00_H $3C_H$ 40_H, (bytes 17 to 19).
83_H	Output data only • in byte 16, the length byte stands for the output data • there follow three bytes of manufacturer-specific data: 00_H $3C_H$ 40_H, (bytes 17 to 19).
$C2_H$	Input and output data • in byte 16, the length byte stands for output data • in byte 17, the length byte stands for input data • there follow two bytes of manufacturer-specific data: $3C_H$ 40_H, (bytes 18 and 19).

I/O length byte   If you use inputs and outputs on the ASi, you require a separate length byte for both input data and output data. If you use only inputs or only outputs, you require only an input length byte or only an output length byte.

You will find the value of the I/O length byte in Table D-4.

Table D-4   Value of the I/O length byte in configuration message

Value	Meaning
00H	1 byte of data with byte consistency
⋮	⋮
$0F_H$[1]	16 bytes of data with byte consistency

[1]   If you specify an input length byte or an output length byte, you define automatically in doing so that at least one data byte is present. You can therefore set bytes in the range from 1 to 16 for inputs and outputs.

Manufacturer-specific data   The manufacturer-specific data are intended for later use of the DP/ASi link with extended functionality within SIMATIC S7.

Example 1 The following example presents the structure of the five bytes of data (bytes 15 to 19) for a DP/ASi link with inputs and outputs.

Byte	Value	Meaning
15	C2$_H$	Specific identification format: • there follows one length byte for output data • there follows one length byte for input data • there follow two bytes of manufacturer-specific data
16	00$_H$	Length byte for output data: • data format: byte • byte consistency • output length: 1 byte
17	01$_H$	Length byte for input data: • data format: byte • byte consistency • input length: 2 bytes
18	3C$_H$	Manufacturer-specific data
19	40$_H$	

Example 2 The following example shows the structure of the five bytes of data (bytes 15 to 19) for a DP/ASi link having only inputs.

Byte	Value	Meaning
15	43$_H$	Specific identification format: • there follows one length byte for input data • no output data are present • there follow three bytes of manufacturer-specific iden-tification
16	02$_H$	Length byte for input data: • data format: byte • byte consistency • input length: 3 bytes
17	00$_H$	Manufacturer-specific data
18	3C$_H$	
19	40$_H$	

Example 3   The following example shows the structure of the five bytes of data (bytes 15 to 19) for a DP/ASi link having only outputs.

Byte	Value	Meaning
15	83$_H$	Specific identification format: • there follows a length byte for output data • no input data are present • there follow three bytes of manufacturer-specific identification
16	04$_H$	Length byte for output data: • dats format: byte • byte consistency • output length: 5 bytes
17	00$_H$	Manufacturer-specific data
18	3C$_H$	
19	40$_H$	

D.3 Structure of the Configuration Message in Simple Configuration

Structure

The configuration message consists of 20 bytes and must have the structure shown in Table D-5. The type and length of the I/O area used are encoded in bytes 15 to 17.

Table D-5   Configuration message for masters with reduced parameter assignment

Byte	0	1	2	3	4	5	6	7	8	9
Value	04_H	00_H	00_H	AD_H	$C0_H$	04_H	00_H	00_H	BB_H	40_H

Byte	10	11	12	13	14	15	16	17	18	19
Value	04_H	00_H	00_H	$8F_H$	$C0_H$	variable			$3C_H$	40_H

Variable bytes

In byte 15, specify an ID for the type of I/O being used (inputs only, outputs only or inputs and outputs connected).

In bytes 16 and 17, specify the length ID for the input and output areas being used. The length IDs are determined by the slaves having the highest ASi addresses. Make sure that precisely one nibble is assigned to every ASi slave (refer to summary in Table D-6).

Table D-6   IDs for the variable part of the configuration message

Connected to the DP/ASi Link Are ...	The Configuration Message Must Contain:
Inputs and outputs	• in byte 15, the ID $C2_H$ • in byte 16, the length ID for the outputs • in byte 17, the length ID for the inputs
Inputs only	• in byte 15, the ID 43_H • in byte 16, the length ID for the inputs • in byte 17, the ID 00_H
Outputs only	• in byte 15, the ID 83_H • in byte 16, the length ID for the outputs • in byte 17, the ID 00_H

The length ID is calculated from the following formula:

Length ID = Length of I/O area being used in byte – 1

Example of determining length IDs

You have an DP/ASi link on which the ASi slave with the highest address to which outputs are connected is slave 7; the ASi slave with the highest address to which inputs are connected is slave 12.

Accordingly, the output area has a length of 4 bytes, for slave 7 is located in the fourth byte. The length ID for the outputs is 03_H.
The input area has a length of 6 bytes, for slave 12 is located in the sixth byte. The length ID for the inputs is 05_H.

Glossary

A

Active nodes Active nodes may send data to other nodes, if they are token holding nodes, and request data from other nodes (synonymous with master).

Actual configuration By actual configuration we mean the true configuration of the ASi as detected by the DP/ASi link.

ASi **A**ctuator**S**ensor **I**nterface. The Actuator Sensor Interface is a networking system for the lowest range of automation levels It is suitable for networking binary actuators and sensors.

ASi address The ASi address uniquely identifies every ASi slave within the ASi. The ASi master addresses an ASi slave by means of its ASi address.

ASi address 0 ASi address 0 has a special meaning in the ASi:

- It is the default address with which every ASi slave is supplied ex works.

- It is required to assign a new address to an ASi slave.

ASi cable The ASi cable is a specially shaped two-wire cable incorporating reverse polarity protection and connecting → ASi slaves and the → ASi master for transmitting information and auxiliary power.

ASi configuration data ASi configuration data contain the → I/O code and the → ID code of an ASi slave. They characterize the characteristics of the ASi slave.

ASi master → Master. The ASi master is the control and monitoring unit that monitors and coordinates data transmission from and to the ASi slaves.

ASi slave → Slave. ASi slaves are the interfaces between the higher-level ASi master and the connected actuators and sensors. ASi slaves transmit data to the ASi master only upon the latter's specific request.

Assign parameters   To assign parameters is to pass slave parameters from the master to the slave.

B

Baud rate   Rate at which data are transmitted; specifies the number of bits transmitted per second (baud rate = bit rate).

Bit time   The bit time (T_{Bit}) is the time required to transmit one bit. It is the reciprocal value of the baud rate: $T_{Bit} = 1/\text{baud rate}$

C

Configure   Configure means performing the different settings for individual modules in a Distributed I/O System.

Consistent data   Data which have related contents and must not be separated are known as consistent data.

The data of an ASi slave must always be treated consistently, the data must not be corrupted by being read out at different times.

Control command   A DP master can send commands simultaneously to a DP slave, a group of DP slaves or to all DP slaves to synchronize the DP slave stations.

By means of the → FREEZE and → SYNC control commands, it is possible to synchronize DP slave stations by event driving.

D

Diagnostics   Diagnostics comprises detection, isolation, classification, display and the ongoing evaluation of errors, malfunctions and messages.

Diagnostics features monitoring functions which run automatically during system operation. In this way higher availability of the system is achieved as a result of shorter commissioning times and down times.

Within the distributed I/O, there are various diagnostic possibilities – ranging from the overview as to which DP Slave has reported a diagnosis to the monitoring of individual inputs and outputs.

Distributed I/O devices

Distributed I/O devices are I/O units that are not used in the base unit but are set up on a distributed basis; for example:

- ET 200 family
- S5-95U with PROFIBUS-DP interface
- DP/ASi link
- other DP slaves from Siemens or external devices.

Distributed I/O devices are connected to the DP master over the PROFIBUS-DP bus.

DP

DP stands for "distributed I/O".

DP master

The DP master is an → active node which communicates with the DP slave stations according to a defined algorithm and makes data available to the user. Its behavior conforms to standard EN 50170 Volume 2, PROFIBUS.

DP slave

→ DP standard slave

DP standard

Abbreviation for standard EN 50170 Volume 2, PROFIBUS.

DP standard slave

A DP standard slave is a → passive node which behaves in accordance with standard EN 50170 Volume 2, PROFIBUS.

F

FREEZE

FREEZE is a control command of the DP master to a group of DP slaves.

Upon receiving the FREEZE control command, the DP slave freezes the current state of the inputs and transmits the frozen data periodically to the DP master.

After every FREEZE control command thereafter, the DP slave freezes the current state of the inputs again.

The input data are not sent periodically to the DP master by the DP slave again until the DP master sends an UNFREEZE control command.

I

I/O code

The I/O code specifies the assignment of inputs and outputs to the data bits. The I/O code defines sixteen different input/output combinations.

ID code   The ID code is an additional identification, its use being optional for each ASi slave. The ID code is specified for every ASi slave. The default value of the ID code is 0.

IM 308-C   The IM 308-C is a DP master for the Distributed I/O System.

IP 66   Degree of protection in accordance with DIN 40050: complete protection against contact, protection against the ingress of dust and protection against the detrimental ingress of heavy seas or high-pressure hose-water.

IP 67   Degree of protection in accordance with DIN 40050: complete protection against contact, protection against the ingress of dust and protection against the detrimental ingress of water of a certain pressure upon submersion.

M

Master   Masters, if they are token holding nodes, may send data to other nodes and request data from other nodes.

                     Examples of DP masters are IM 308-C or the programmer. One ASi master is the DP/ASi link, for example.

Master diagnosis The master diagnosis shows the diagnostic data of the DP master – for example, what slave has a diagnostic message.

Master/slave   The master/slave method is a bus access procedure in which only one node is
method $\rightarrow$ active at any time and all the others are $\rightarrow$ passive.

P

Passive nodes   Passive nodes may exchange data with an active node only when requested to do so by the latter (synonymous with slave).

PROFIBUS   **Pro**cess **Fi**eld **Bus**, German process and field bus standard defined in the PROFIBUS standard (EN 50170 Volume 2, PROFIBUS).

                     It specifies functional, electrical and mechanical characteristics for a bit-serial field bus system.

PROFIBUS-DP   Draft PROFIBUS-DP standard (EN 50170 Volume 2, PROFIBUS), on which the Distributed I/O System is based.

PROFIBUS-DP is high-speed data exchange between the central DP master and the I/O devices.

PROFIBUS-DP is a bus system networking PROFIBUS-compatible programmable logic controllers and field devices at field and cell levels. PROFIBUS-DP is available with DP (= Distributed I/O), FMS (= Field Bus Message Specification) or TF (= Technological Functions) protocols.

R

Response monitoring time   You set the length of the response monitoring time with the configuration software of the DP master.

If a DP slave is not addressed within the response monitoring time, it enters the safe state, i.e. all outputs are set to "0".

S

Setpoint configuration   By setpoint configuration we mean the configured set-up of the ASi as stored in the DP master.

Slave   A slave may exchange data with a → master only when requested to do so by the latter.

Station   A station is a device which can send, receive or amplify data over the bus – for example, a master, slave, repeater or coupler.

Station diagnostics   Station diagnostics is the highest level of slave-specific diagnostics. It refers to the whole slave.

Station number   Every PROFIBUS-DP node must be given a station number. The programmer and the ET 200 Handheld are addressed with the station number "0"; DP masters and DP slaves have a station number in the range from 1 to 125.

SYNC SYNC is a → control command of the DP master to a group of DP slaves.

With the SYNC control command, the DP master causes the DP slave to freeze the outputs at their instantaneous values. In the messages that follow, the output data from the DP slave are stored but the states across the outputs remain unchanged.

After every new SYNC control command, the DP slave sets the outputs with the data which it has stored as output data.

The outputs are not periodically updated again until the DP master sends the UNSYNC control command.

T

Type file A file which the COM ET 200 Windows configuration software requires for configuring a DP slave. The type file defines slave-specific characteristics such as the number of inputs and outputs, number of diagnostic bytes, FREEZE and SYNC compatibility, etc.

For every Siemens station type there is a type file which is compiled by Siemens and is a component part of COM ET 200 Windows.

U

UNFREEZE → FREEZE

UNSYNC → SYNC

Index

Siemens AG

AUT E 148

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D–92209 Amberg

Federal Republic of Germany

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Your Name: _

Your Title: _

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Please check any industry that applies to you:

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❐   Electrical Machinery   ❐   Pulp and Paper

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DP/ASI link
Drill holes: thread M4

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