ACS 160

Installation and Start-up Guide

PROFIBUS-DP Adapter Module
CFB-PDP

ABB

PROFIBUS-DP Adapter Module
CFB-PDP

**Installation and
Start-up Guide**

Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing and operating the CFB-PDP PROFIBUS Adapter Module.

The material in this chapter must be studied before attempting any work on, or with, the unit.

Warnings and Notes

This manual distinguishes two sorts of safety instructions. Warnings are used to inform of conditions which can, if proper steps are not taken, lead to a serious fault condition, physical injury and death. Notes are used when the reader is required to pay special attention or when there is additional information available on the subject. Notes are less crucial than Warnings, but should not be disregarded.

Warnings

Readers are informed of situations that can result in serious physical injury and/or serious damage to equipment with the following symbols:

Dangerous Voltage Warning: warns of situations in which a high voltage can cause physical injury and/or damage equipment. The text next to this symbol describes ways to avoid the danger.

General Warning: warns of situations which can cause physical injury and/or damage equipment by means other than electrical. The text next to this symbol describes ways to avoid the danger.

Electrostatic Discharge Warning: warns of situations in which an electrostatic discharge can damage equipment. The text next to this symbol describes ways to avoid the danger.

Notes Readers are notified of the need for special attention or additional information available on the subject with the following symbols:

CAUTION! **Caution** aims to draw special attention to a particular issue.

Note: **Note** gives additional information or points out more information available on the subject.

General Safety Instructions

WARNING! All electrical installation and maintenance work on the drive should be carried out by qualified electricians.

The drive and adjoining equipment must be properly earthed.

Do not attempt any work on a powered drive. After switching off the mains, always allow the intermediate circuit capacitors 5 minutes to discharge before working on the frequency converter, the motor or the motor cable. It is good practice to check (with a voltage indicating instrument) that the drive is in fact discharged before beginning work.

The motor cable terminals of the drive are at a dangerously high voltage when mains power is applied, regardless of motor operation.

There can be dangerous voltages inside the drive from external control circuits even when the drive mains power is shut off. Exercise appropriate care when

working with the unit. Neglecting these instructions can cause physical injury and death.

⚠ **WARNING!** There are several automatic reset functions in the drive. If selected, they reset the unit and resume operation after a fault. These functions should not be selected if other equipment is not compatible with this kind of operation, or dangerous situations can be caused by such action.

More Warnings and Notes are printed at appropriate instances along the text.

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Chapter 1 – Introduction to This Guide

Intended Audience The Guide is intended for the people who are responsible for commissioning and using a CFB-PDP PROFIBUS-DP Adapter Module with the ACS 160 drive. The reader is expected to have a basic knowledge of electrical fundamentals, electrical wiring practices, how to operate the drive, and the PROFIBUS protocol family.

Compatibility This manual is compatible with ACS 160 software version **1.0.0.0** or later, and CFB-PDP module version **A** or later.

Before You Start It is assumed that the drive is installed and ready to operate before starting the installation of the adapter module.

In addition to conventional installation tools, have the drive manuals available during the installation as they contain important information not included in this guide. The drive manuals are referred to at various points of this guide.

What This Guide Contains   This manual contains information on the wiring, configuration and use of the CFB-PDP module.

Safety Instructions are featured in the first few pages of this Guide. Safety Instructions describe the formats for various warnings and notations used within this Guide.

Chapter 2 – Overview contains a short description of the PROFIBUS-DP protocol and the CFB-PDP PROFIBUS-DP Adapter Module, a delivery checklist, and warranty information.

Chapter 3 – Installation contains wiring instructions.

Chapter 4 – Programming explains how to program the PROFIBUS controller and the drive before the communication through the adapter module can be started.

Chapter 5 – Communication contains a description of how data is transmitted through the CFB-PDP module.

Chapter 6 – Status LEDs explains the status LED indications of the CFB-PDP module.

Appendix A lists the PROFIBUS Profile-specific parameters.

Appendix B explains definitions and abbreviations concerning this guide and the PROFIBUS protocol family.

Appendix C contains Technical Data.

Appendix D contains a specification of the ambient conditions allowed during transportation, storage and use of the CFB-PDP module.

Chapter 2 – Overview

Overview

This chapter contains a short description of the PROFIBUS standard and the CFB-PDP module, a delivery checklist, and warranty information.

PROFIBUS

PROFIBUS is an open serial communication standard that enables data exchange between all kinds of automation components. There are three main variations of PROFIBUS: PROFIBUS-FMS *(Fieldbus Message Specification)*, PROFIBUS-DP *(Decentralised Periphery)* and PROFIBUS-PA *(Process Automation)*. The CFB-PDP module is compatible with the PROFIBUS-DP protocol.

The physical transmission medium of the bus is a twisted pair cable (according to the RS 485 standard). The maximum length of the bus cable is 100 to 1200 metres, depending on the selected transmission rate (see Appendix C). Up to 31 stations can be connected to the same PROFIBUS system without the use of repeaters. With repeaters, it is possible to connect 127 stations (including the repeaters, and the master station) to the system.

In PROFIBUS communication, the master station – usually a programmable logic controller (PLC) – polls the slaves which respond and take the actions requested by the master. It is also possible to send a command to several slaves at the same time; in this case the slaves send no response message to the master. Communication between the slaves is not possible on a PROFIBUS link.

The PROFIBUS protocol family is specified in the EN 50170 Standard. The communication with a drive is discussed in *PROFIDRIVE-PROFILE – The PROFIBUS Profile for Adjustable Speed Drives.* For further information on PROFIBUS, refer to the above-mentioned standards.

The CFB-PDP Module

The CFB-PDP PROFIBUS-DP Adapter Module is an optional device which enables the connection of an ACS 160 drive to a PROFIBUS system. The drive is considered a slave in the PROFIBUS network.
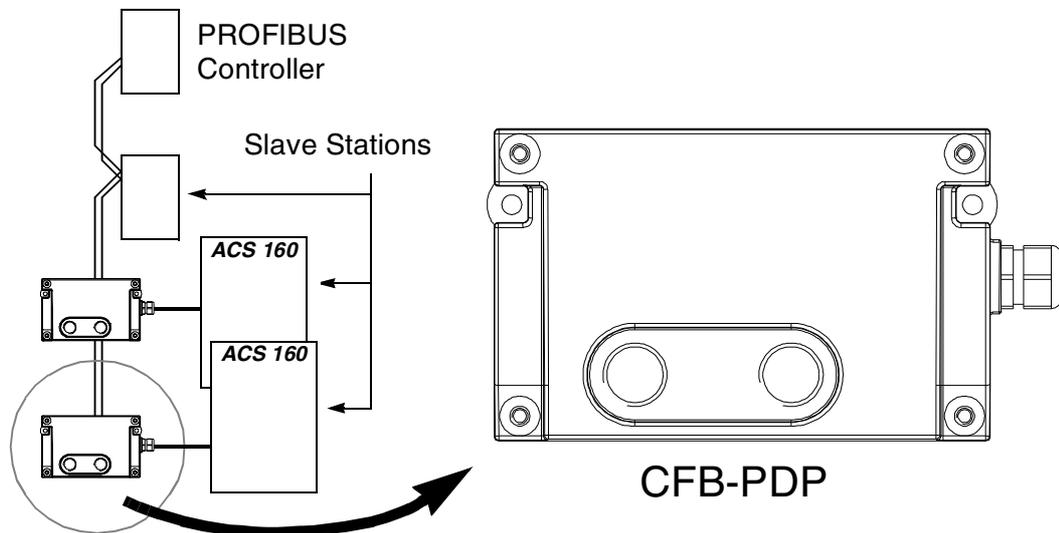
Figure 2-1 The construction of a PROFIBUS network.

Through the CFB-PDP, it is possible to:

• Give control commands to the drive
  (Start, Stop, Run enable, etc.)

• Feed a motor speed reference to the drive

• Read status information and actual values from the drive

• Change drive parameter values

• Reset a drive fault.

The PROFIBUS commands and services supported by the CFB-PDP PROFIBUS-DP Adapter Module are discussed in Chapter 5.

The adapter module is mounted onto the side of the ACS 160 drive. See the *ACS 160 User's Manual* for more information.

Delivery Check   The option package of the CFB-PDP PROFIBUS-DP Adapter Module contains:

• PROFIBUS-DP Adapter Module, Type CFB-PDP

• 2 pcs M16×1.5 cable glands with O ring

• 2 pcs M4×12 mounting screws

• this manual, the *CFB-PDP Installation and Start-up Guide*.

Warranty and Liability Information

The warranty for your ABB drive and options covers manufacturing defects. The manufacturer carries no responsibility for damage due to transport or unpacking.

In no event and under no circumstances shall the manufacturer be liable for damages and failures due to misuse, abuse, improper installation, or abnormal conditions of temperature, dust, or corrosives, or failures due to operation above rated capacities. Nor shall the manufacturer ever be liable for consequential and incidental damages.

The period of manufacturer's warranty is 12 months, and not more than 18 months, from the date of delivery. Extended warranty may be available with certified start-up. Contact your local distributor for details.

Your local ABB Drives company or distributor may have a different warranty period, which is specified in their sales terms, conditions, and warranty terms.

If you have any questions concerning your ABB drive, contact your local distributor or ABB Drives office.

The technical data and specifications are valid at the time of printing. ABB reserves the right to subsequent alterations.

Chapter 3 – Installation

![warning icon] **WARNING!** Follow the safety instructions given in this Guide and in the *ACS 160 User's Manual.*

Exploded View of the CFB-PDP

Drive Connection Cable

Base

Circuit Board Assembly

Mounting Screws (2 pcs)

Terminal Block for PROFIBUS Connection

Cover

Cover Screws (4 pcs)

Cable Glands for Bus Cables (2 pcs)
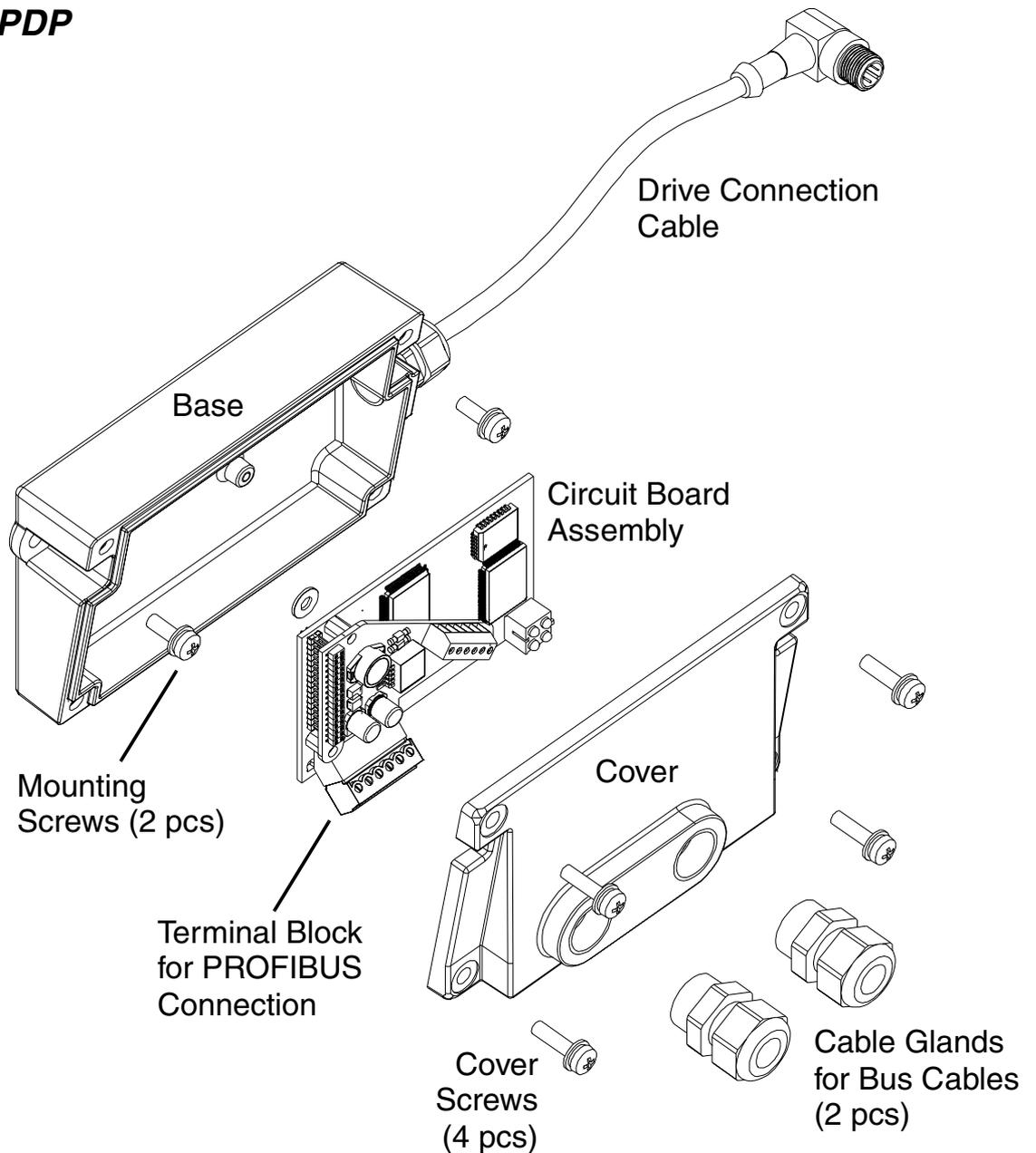
Mounting

The CFB-PDP is mounted onto the ACS 160 drive with two screws as shown in the *ACS 160 User's Manual.* This also provides the earthing of the module housing.

Drive Connection

The CFB-PDP uses the control panel connector of the drive. (However, leave the CFB-PDP disconnected at this point since the control panel is needed later for setting up the communication parameters.)

The CFB-PDP is powered through the drive control panel connector.

PROFIBUS Connection

The CFB-PDP provides two cable entries for the incoming and outgoing PROFIBUS cables. The cables are connected to a detachable terminal header, which enables the disconnection of the CFB-PDP without interrupting the data transfer to other devices.

If only one bus cable is connected, the unused cable entry should be plugged.

To connect the PROFIBUS cables, follow this procedure:

1. Lead the bus cables to the space where the ACS 160 and the CFB-PDP are installed in. Arrange the bus cables as far away from any power cables as possible. Avoid parallel runs. Use grommets or cable glands at all cable lead-throughs for protection.

2. Remove the cover of the CFB-PDP module. Fasten the cable glands to the cover (if not done already).

3. Lead the bus cables through the cable glands and the cover. Loosen the clamping nuts of the cable glands if necessary.

4. Detach the terminal header from its receptacle on the circuit board assembly and make the connections.
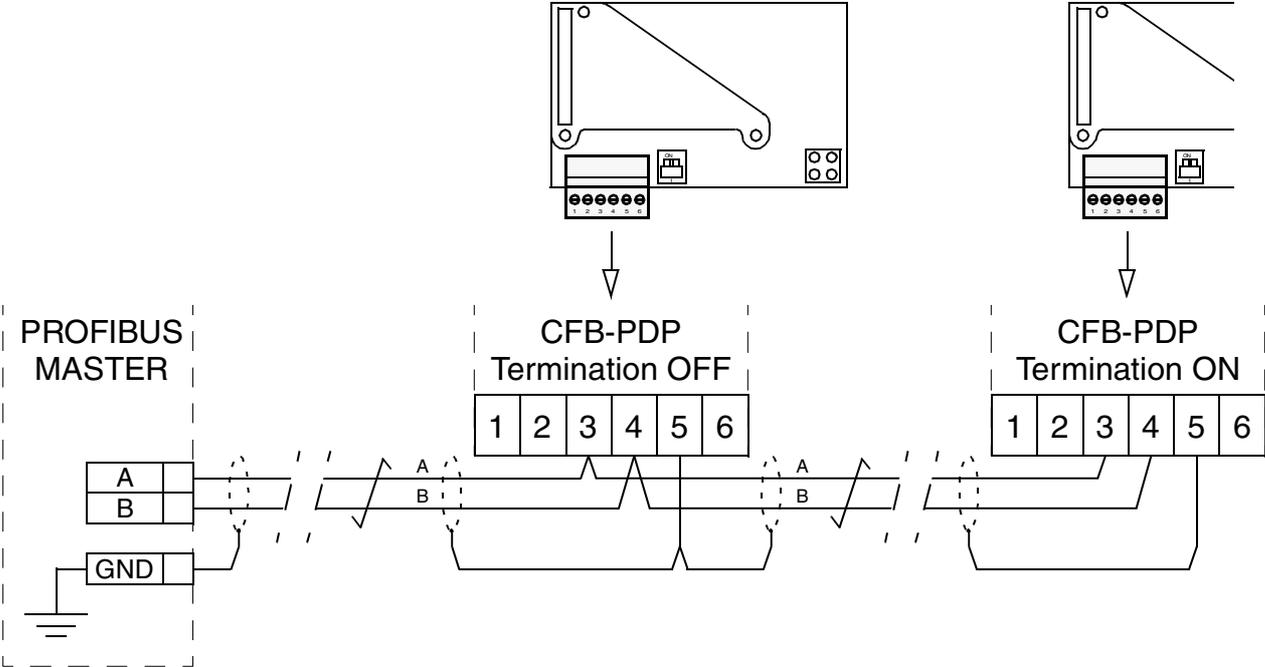
Bus Connector Terminal Designations

Terminal		Description
1	+5V BUS	+5V output (isolated from drive side)
2	GND BUS	GND (isolated from drive side)
3	A	Data Negative (Conductor 2)
4	B	Data Positive (Conductor 1)
5	SHIELD	Bus cable screen
6	RTS	Request To Send*

*Used by some equipment to determine direction of transmission.

5. Re-insert the terminal header into its receptacle.

6. Set the termination switch to the appropriate position. Termination should be ON if the module is located at the end of the bus. On intermediate modules, termination should be OFF.

Termination Switch
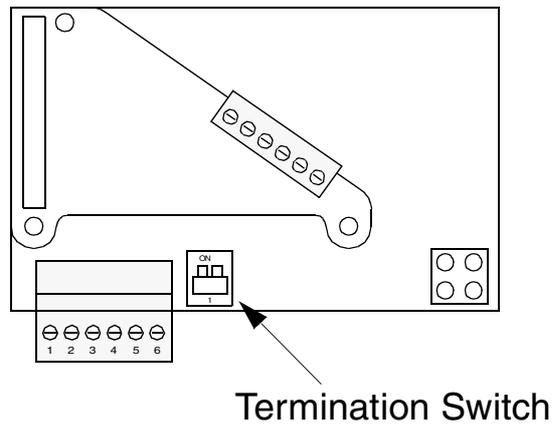
7. Replace the cover of the CFB-PDP.

8. Tighten the clamping nuts of the cable glands.

Chapter 4 – Programming

Overview

This chapter gives information on configuring the PROFIBUS master station and the drive for communication through the CFB-PDP PROFIBUS-DP Adapter Module.

Configuring the System

After the CFB-PDP module has been mechanically and electrically installed, the master station and the drive must be prepared for communication with the module.

The type definition (GSD) file required for configuration of the master station is available from *www.profibus.com* or your local ABB representative. The filename is **ABB_1612.GSD**.

Please refer to the master station documentation for more information.

PROFIBUS Connection Configuration

The communication between the drive and the CFB-PDP module is configured through drive parameters. As the control panel of the drive and the CFB-PDP share the same connector, the parameters must be set before detaching the panel and connecting the CFB-PDP.

The parameters that configure the CFB-PDP are listed in Table 4-1 below. The alternative selections for these parameters are discussed in more detail below the table.

Note: After making the necessary parameter adjustments, power down the drive, disconnect the control panel, connect the CFB-PDP, and power up the drive.

Table 4-1 The CFB-PDP configuration parameters.

Parameter No.	Parameter Name	Alternative Settings	Default Setting
5101	Module Type	**0** None; **1** CFB-PDP; …; **9** Other	**1** CFB-PDP
5102	PROFIBUS Mode	**0, 1, 6…65536** DP-PPO 1; **2** DP-PPO 2; **3** DP-PPO 3; **4** DP-PPO 4; **5** DP-PPO 5	**1** DP-PPO 1
5103	Station Number	**2** to **126**	**2**
5104	Cut-off Timeout	**0** to **255**	**30**
5105	Control Zero Mode	**0** Stop; **1** Freeze	**0** Stop

5101 Module Type   This parameter must be set to 1.

5102 PROFIBUS Mode   This parameter selects the PPO message type (see Chapter 6 for PPO message types). This setting must correspond to the setting in the PROFIBUS controller configuration frame.

Note that run-time changing of the PPO type is not possible.

5103 Station Number   Each device on the PROFIBUS link must have a unique station number. This parameter is used to define a station number for the drive it is connected to. Allowable values are 2 to 126 inclusive. If a value outside of this range is selected, node address 2 will be active.

5104 Cut-off Timeout This parameter defines the behaviour of the CFB-PDP module in the event that no messages are received from the PROFIBUS controller.

0
The CFB-PDP cyclically sends the last valid Control Word and References to the drive until new values are received from the controller.

1 … 255
The CFB-PDP sends a "fieldbus lost" message to the drive after a timeout, the actual length of which equals the setting multiplied by 20 milliseconds. Normal operation is resumed after valid messages are again received from the controller.

5105 Control Zero Mode This parameter defines the operation of the CFB-PDP module in the event that only messages consisting of zeros are received from the PROFIBUS controller. This is the case e.g. when the controller is switched from RUN to STOP mode.

0 (Stop)
The drive is stopped.

1 (Freeze)
The last-received valid Control Word and References are sent to the drive until new values are received from the PROFIBUS controller.

Communication Speed The CFB-PDP supports the following communication speeds: 9.6 kbit/s, 19.2 kbit/s, 45.45 kbit/s, 93.75 kbit/s, 187.5 kbit/s, 500 kbit/s, 1.5 Mbit/s, 3 Mbit/s, 6 Mbit/s, and 12 Mbit/s.

The speed is automatically detected.

Other Parameters

Fieldbus Communication	Parameters 5204 COMM FAULT TIME and 5205 COMM FAULT FUNC define the action taken in the event of a communication error between the CFB-PDP module and the drive.
Control Locations and Actual Signal Selections	The ACS 160 drive can receive control signals from multiple sources (such as the digital and analogue inputs, the control panel, and a fieldbus adapter). The user can separately determine the source for each type of control information, and select which operating data is output as actual signals by the drive. Especially refer to parameter groups 10, 11, 15 and 16 in the *ACS 160 User's Manual* for information on the selection parameters.

Chapter 5 – Communication

Overview

This chapter describes the messaging between the PROFIBUS controller and the drive.

General

The CFB-PDP module supports the PROFIBUS-DP protocol. PROFIBUS-DP is a distributed I/O system which enables the master to use a large number of peripheral modules and field devices. The data transfer is mainly cyclic: the master reads the input information from the slaves and sends the output information back to the slaves.

For further information on Service Access Points, refer to the manual of the PROFIBUS master, *PROFIDRIVE – The PROFIBUS Profile for Adjustable Speed Drives,* or the EN 50170 standard.

PPO Messages

The PROFIBUS-DP protocol uses so-called PPOs *(Parameter/Process Data Objects)* in cyclic communication. See Figure 5-1 for the different PPO types and their composition.

Service Access Points

The services of the PROFIBUS Data Link Layer (Layer 2) are used by PROFIBUS-DP through Service Access Points (SAPs). PROFIBUS-DP uses an individual subset of the services, with precisely defined functions assigned to individual SAPs.

DP Communication Start-up   The following Service Access Points (SAPs) are used to initiate DP communication:

SAP No.	Short	Name
61	Set_Prm	Send Parameter Data
62	Chk_Cfg	Check Configuration Data
60	Slave_Diag	Read Slave Diagnostic Information
128 (Default)	Data_Exch	Transfer Input and Output Data

SAP 61 (Set_Prm)   This SAP is used in the parameterisation of the drive.

Prm_Data (Parameter Data) Type: Octet String - Length: 7		
Byte	**Hex**	**Description**
1	B0	**Station_Status**
2 to 3	00	**Watchdog Factors 1 and 2** (unavailable for the CFB-PDP)
4	0A	**Minimum Station Delay Respond Time** (the time after which a slave station is allowed to send response frames to the master). Calculated by multiplying the Hex value with t_{Bit} (the time required for transmitting one bit)
5 to 6	1612	**Identification Number** (for the CFB-PDP: **1612h**)
7	00	Group Identification

SAP 62 (Chk_Cfg) SAP 62 selects the PPO type to be used. (The same type must be selected with both SAP 62 and CFB-PDP Configuration Parameter 5102 PROFIBUS MODE.) The table below gives the Hex frame that must be sent to the drive to select the PPO type.

Cfg_Data (Configuration Data) Type: Octet String - Length: 1 to 32	
PPO Type	**Hex Frame**
1	F3 F1
2	F3 F5
3	F1
4	F5
5	F3 F9

SAP 60   This SAP gives diagnostic information on the slave
(Slave_Diag)   station.

Diag_Data (Diagnostic Data) Type: Octet String - Length: 6 (Standard) + 2 (Extended Diagnosis)	
Byte	**Description**
1	**Station_Status_1** x x x x x x x x Diag.Station_Non_Existent (Set by Master, reset by Slave) Slave not found Diag.Station_Not_Ready (Set by Slave) Slave not ready for data exchange Diag.Cfg_Fault (Set by Slave) Received config. data does not match original config. data Diag.Ext_Diag (Set by Slave) Diagnostic entry present in slave-specific diagnostic area Diag.Not_Supported (Set by Slave) Service not supported by slave Diag.Invalid_Slave_Response (Set by Master, reset by Slave) Invalid response by slave Diag.Prm_Fault (Set by Slave) Invalid parameter or parameter value Diag.Master_Lock (Set by Master, reset by Slave) Slave parameterised by another master
2	**Station_Status_2** x 0 x x x 1 x x Diag.Prm_Req (Set by Slave) Slave requires re-configuration and re-parameterisation Diag.Stat_Diag (Set by Slave) Static diagnosis. Slave (temporarily) unable to provide valid data Always set to 1 by Slave Diag.WD_On (Set by Slave) Watchdog on Diag.Freeze_Mode (Set by Slave) Freeze command received by slave Diag.Sync_Mode (Set by Slave) Sync command received by slave Reserved Diag.Deactivated (Set by Master, reset by Slave) Slave is inactive

Diag_Data (Diagnostic Data)	
Type: Octet String - Length: 6 (Standard) + 2 (Extended Diagnosis)	
Byte	**Description**
3	**Station_Status_3** x 0 0 0 0 0 0 0 ─ Reserved ─ Diag.Ext_Diag_Overflow (Set by Slave)
4	**Diag.Master_Add** The address of the master that parameterised this slave
5 to 6	**Ident_Number** (for CFB-PDP: **1612h**)
7	Ext_Diag_Data The number of bytes reserved for Extended Diagnosis (including this byte) Fixed to 2
8	Ext_Diag_Data 0 = OK 4 = Actual value channel is not updated (last value retained)

SAP 128 (Data_Exchange) Allows the master to send output data to a slave station and to simultaneously request input data from the same station.

Outp_Data (Output Data)
Type: Octet String - Length: 0 to 32 (depending on the selected PPO Type)
Inp_Data (Input Data)
Type: Octet String - Length: 0 to 32 (depending on the selected PPO Type)

PPO Message Types

Parameter Identification			Process Data									
ID	IND	VALUE	CW SW	REF ACT	PD1 PD1	PD2 PD2	PD3 PD3	PD4 PD4	PD5 PD5	PD6 PD6	PD7 PD7	PD8 PD8

PPO1

PPO2

PPO3

PPO4

PPO5

Assignable using PROFIBUS Parameters 915 and 916
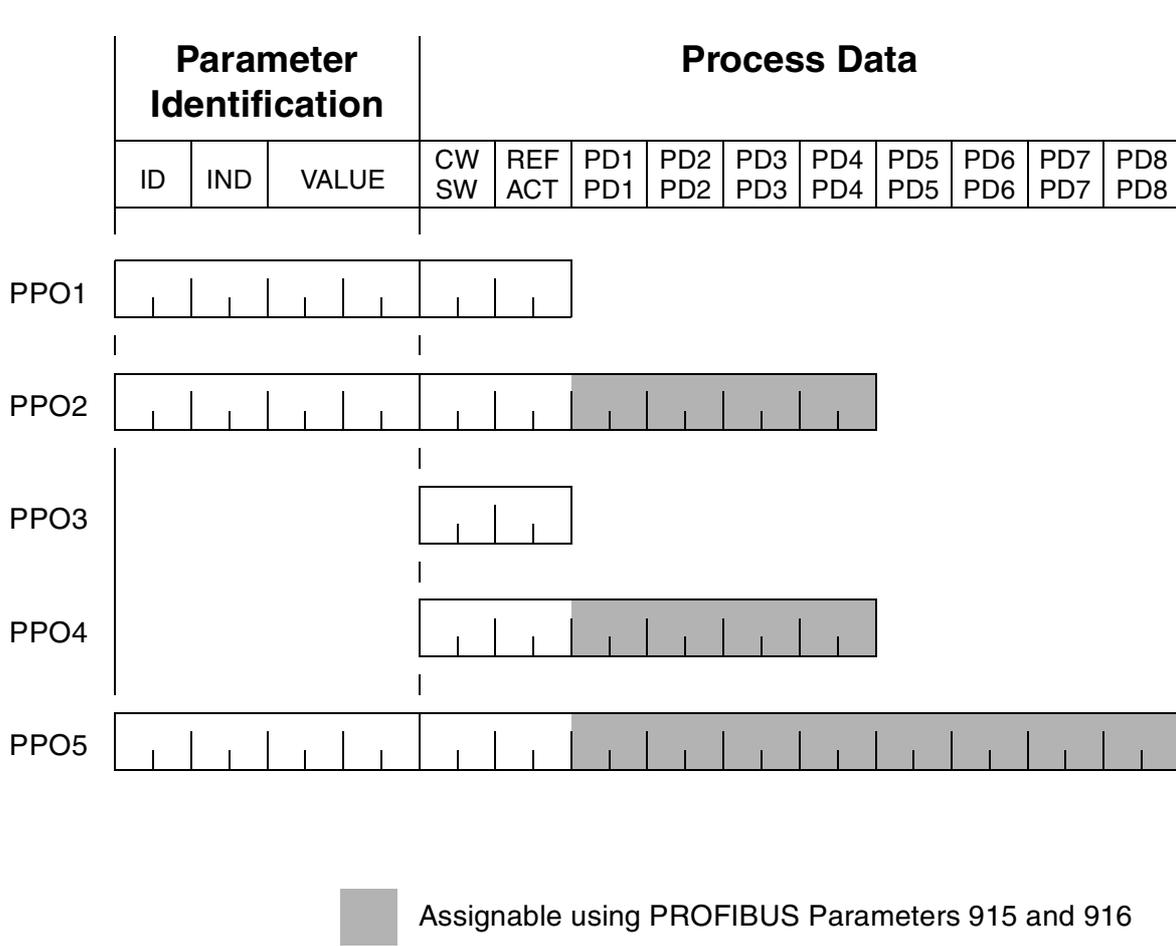
Parameter Identification:
ID – Parameter Identification
IND – Subindex for Arrays (2nd byte reserved)
VALUE – Parameter Value (max. 4 bytes)

Process Data:
CW – Control Word (from Master to Slave)
SW – Status Word (from Slave to Master)
REF – Reference (from Master to Slave)
ACT – Actual Value (from Slave to Master)
PD – Process Data (application-specific)

Figure 5-1 PPO Message Types.

The Control Word and the Status Word

The Control Word (PROFIBUS Parameter 967) is the principal means for controlling the drive from a fieldbus system. The drive switches between its states according to the bit-coded instructions on the Control Word, and returns status information to the master in the Status Word (PROFIBUS Parameter 968).

The contents of the Control Word and the Status Word are detailed in Table 5-1 and Table 5-2 respectively. The drive states are presented in the PROFIBUS State Machine (Figure 5-2).

Reference

The fieldbus reference is a 16-bit word comprising a sign bit and a 15-bit integer. A negative reference (indicating reversed direction of rotation) is formed by calculating the two's complement from the corresponding positive reference value.

	Bit							
	8	7	6	5	4	3	2	1
Byte 1	sign	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}
Byte 2	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}

The reference is scaled so that
0h = 0%
4000h = 100%
of the max. frequency set with drive parameter 1105.

For the drive to use the reference from the fieldbus controller, the communication module must be defined as the source. See the *ACS 160 User's Manual*, parameter group 11.

Actual Value

Actual Value is a 16-bit word containing information on the operation of the drive. The functions to be monitored are selected with a drive parameter.

The scaling is similar to that of the reference (see above).

Table 5-1 The Control Word (PROFIBUS Parameter 967). The upper case boldface text refers to the states shown in Figure 5-2.

Control Word (PROFIBUS Parameter 967)		
Bit	**Value**	Proceed to **STATE/Description**
0	1	ON1: Proceed to **READY TO OPERATE**
	0	OFF1: Emergency OFF, stop by the selected deceleration ramp. Proceed to **OFF1 ACTIVE**, then to **READY TO SWITCH ON** unless other interlocks (OFF2, OFF3) are active
1	1	ON2: Continue operation (OFF2 inactive)
	0	OFF2: Emergency OFF, coast to stop. Proceed to **OFF2 ACTIVE**, then to **SWITCH-ON INHIBITED**
2	1	ON3: Continue operation (OFF3 inactive)
	0	OFF3: Emergency stop, stop according to fastest possible deceleration mode. Proceed to **OFF3 ACTIVE**, then to **SWITCH-ON INHIBITED. Warning:** Ensure motor and driven machine can be stopped using this stop mode.
3	1	Proceed to **OPERATION ENABLED**
	0	Coast to stop. Proceed to **READY TO OPERATE**
4	1	Normal operation. Proceed to **RAMP FUNCTION GENERATOR: OUTPUT ENABLED**
	0	Output frequency set to 0
5	1	Normal operation. Proceed to **RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED**
	0	Halt ramping (Ramp Function Generator output held)
6	1	Normal operation. Proceed to **OPERATING**
	0	Stop within set deceleration time (Par. 2203)
7	0 $\Rightarrow$ 1	Fault reset if an active fault exists. Proceed to **SWITCH-ON INHIBITED**
	0	(Continue normal operation)

(Continued)

Control Word (PROFIBUS Parameter 967)		
Bit	**Value**	Proceed to **STATE/Description**
8…9		Reserved
10	1	Enable fieldbus control
	0	Control Word <> 0 or Reference <> 0: Retain last Control Word and Reference Control Word = 0 and Reference = 0: Enable fieldbus control
11	1	Select EXT2 as reference
	0	Select EXT1 as reference
12…15		Reserved

Table 5-2 The Status Word (PROFIBUS Parameter 968). The upper case boldface text refers to the states shown in Figure 5-2.

Status Word (PROFIBUS Parameter 968)		
Bit	**Value**	**STATE/Description**
0	1	**READY TO SWITCH ON**
	0	**NOT READY TO SWITCH ON**
1	1	**READY TO OPERATE**
	0	**OFF1 ACTIVE**
2	1	**OPERATION ENABLED**
	0	
3	1	**FAULT**
	0	No fault
4	1	ON2 (OFF2 inactive)
	0	**OFF2 ACTIVE**

(Continued)

Status Word (PROFIBUS Parameter 968)		
Bit	**Value**	**STATE/Description**
5	1	ON3 (OFF3 inactive)
	0	**OFF3 ACTIVE**
6	1	**SWITCH-ON INHIBITED**
	0	**NOT READY TO SWITCH ON**
7	Reserved	
8	1	**OPERATING.** Actual value equals reference (= is within tolerance limits)
	0	Actual value differs from reference (= is outside tolerance limits)
9	1	Remote control (Fieldbus control enabled)
	0	Local control (Fieldbus control disabled)
10	1	Actual frequency or speed equals or is greater than supervision limit
	0	Actual frequency or speed value is within supervision limit
11	1	EXT2 selected
	0	EXT1 selected
12…14	Reserved	
15	1	Communication error between CFB-PDP and ACS 160
	0	Communication OK between CFB-PDP and ACS 160
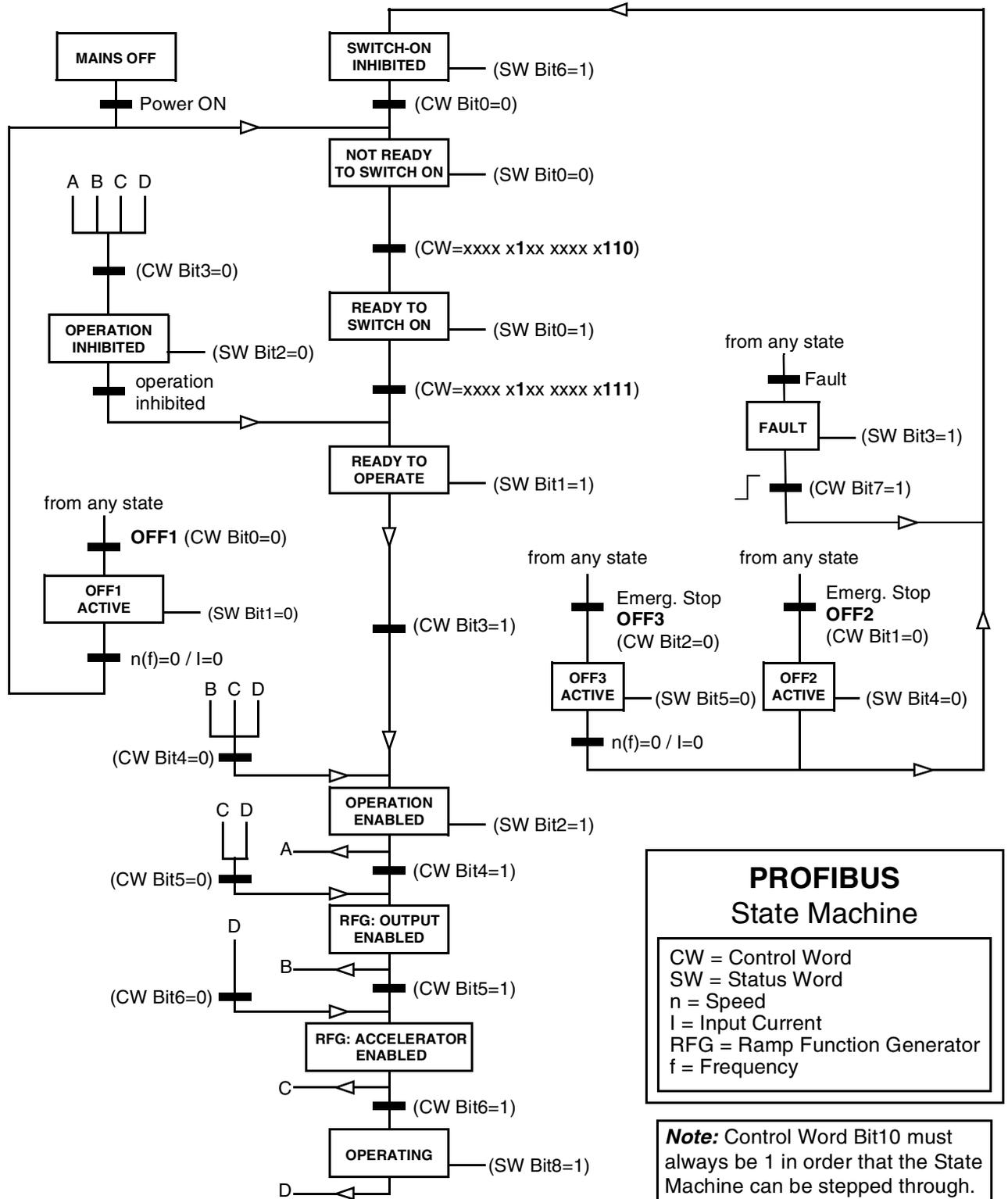
Figure 5-2 The PROFIBUS State Machine.

Parameters in Cyclic Communication

In cyclic communication parameters are transferred by PPO message types 1, 2 and 5 (see Figure 5-1). The Parameter Identification part consists of eight bytes (see below).
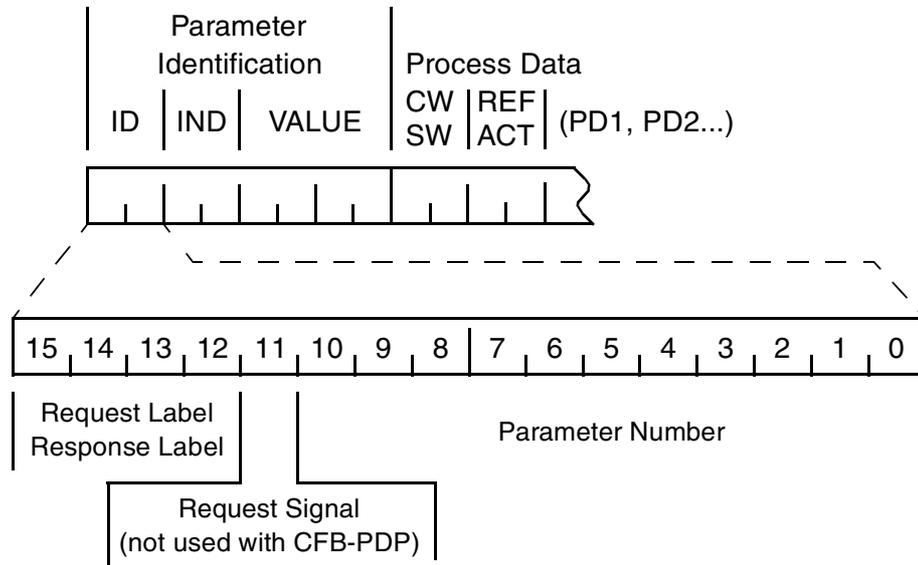
The Request Label is used by the master when transmitting data to the slave, while the Response Label is used by the slave as a positive or negative acknowledgement. The tables below show the Request/Response functions.

Request Labels (from Master to Slave)				
Request	**Function**	**Response Labels**		
		Ackn. (+)	**Ackn. (-)**	
0	No request	0	–	
1	Request parameter value	1	7	
2	Change parameter value (word)	1	7	
3 to 5	Reserved			
6	Request parameter value (array)	4	7	
7	Change parameter value (array)	4	7	
8	Reserved			
9	Request number of array elements	6	7	
10 to 15	Reserved			

Response Label (Acknowledgement from Slave to Master)	
Ackn.	Function
0	No response
1	Transfer parameter value (word)
4	Transfer parameter value (array)
6	Transfer number of array elements
7	Request rejected, followed by Fault Code 0 = Illegal parameter 17 = Task cannot be executed 1 = Parameter is read-only because of operating status 2 = Value is outside limits 103 = Request not supported 3 = Invalid subindex 107 = PD value cannot be set 4 = Not an array 108 = PD set parameter non- 5 = Invalid data type existing 9 = Description data not defined 301 = Internal comm. fault 11 = No parameter change rights 18 = Other
8	No parameter change rights by the request/response interface

Note: PROFIBUS equivalents for ACS 160 parameter numbers are given in the *ACS 160 User's Manual.*

Example 1:
Changing a Drive
Parameter

In this example, drive parameter 1202 CONST SPEED 2 is changed to the value of 200 Hz. The corresponding PROFIBUS parameter number is 152 (98h). As the resolution of the parameter is 0.1 Hz, the value to be written into the parameter is 2000 (7D0h).

Note that the drive always observes the Control Word (CW) and Reference (REF) bytes. The values shown below are examples.

Request (Change parameter value)

Param. Number (152 Dec)

		IND		Param. Value				CW		REF	
Request	20	98	00	00	00	00	07	D0	04	7F	34	15
Response	10	98	00	00	00	00	07	D0	03	37	34	15

IND   Param. Value   SW   ACT

Param. Number (152 Dec)

Response (Transfer parameter value)
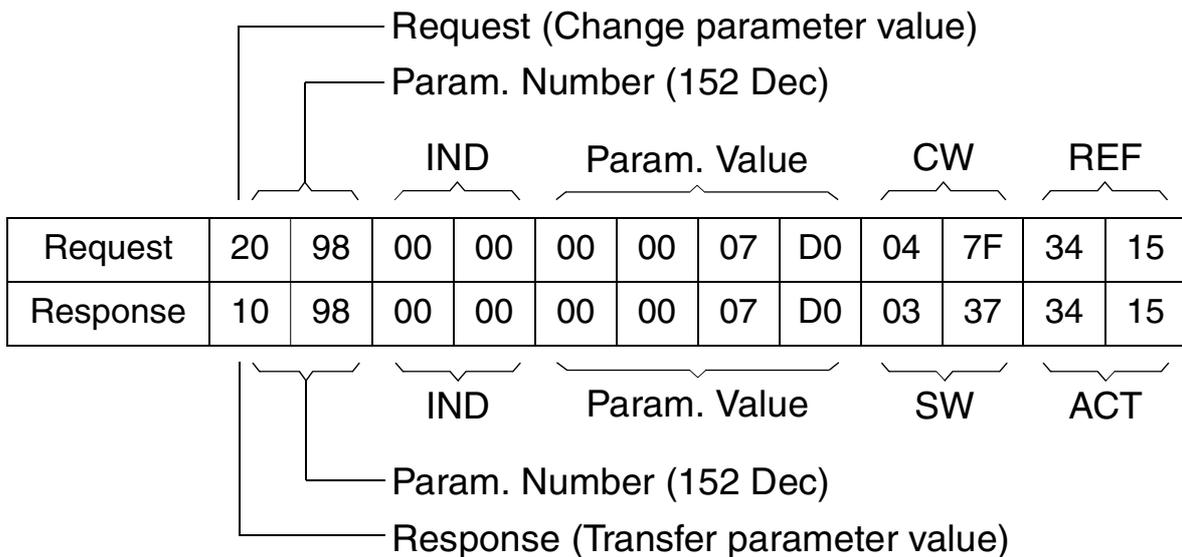
Example 2: Reading a PROFIBUS Parameter

In this example, PROFIBUS Parameter No. 918 is used to read the station number of the slave.

Request (Request parameter value)

Param. Number (918 Dec)

			IND		Param. Value				CW		REF	
Request	13	96	00	00	00	00	00	00	04	7F	34	15
Response	13	96	00	00	00	00	00	02	03	37	34	15

IND   Param. Value   SW   ACT

Param. Number (918 Dec)

Response (Transfer parameter value)
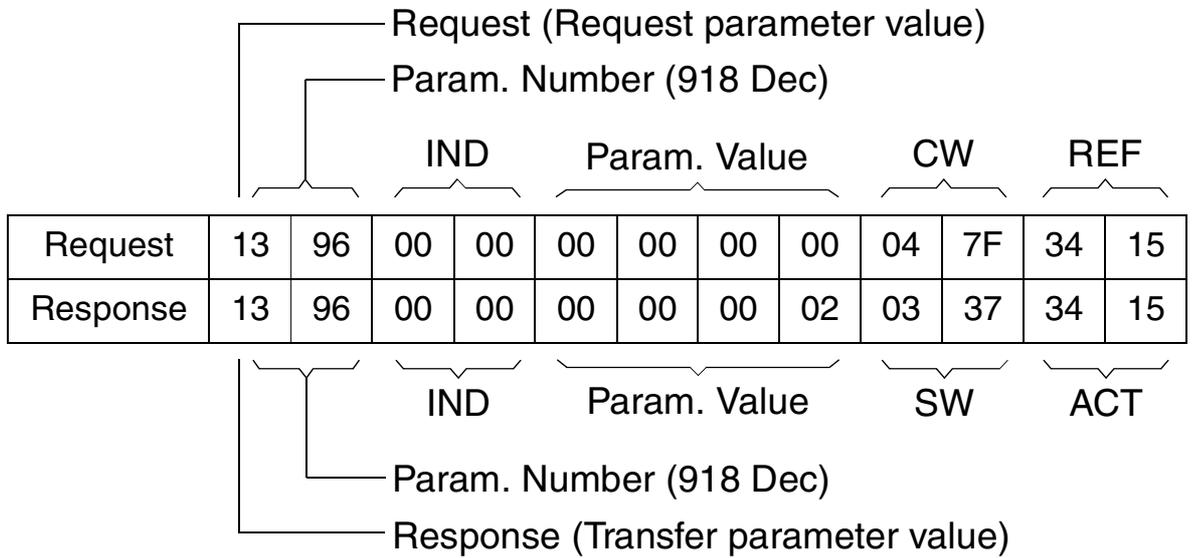
The slave returns its station number (2).

Example 3:   In this example, PROFIBUS Parameter No. 947 is used
Reading an Array-   to read the code of the latest acknowledged fault. As
type Parameter   shown in Table A-1, Parameter 947 is of the array type
with subindexes 1, 9, 17 and 25.

Request (Request parameter value [array])

Param. Number (947 Dec)

Subindex (Latest Acknowledged Fault)*

			Param. Value				CW		REF	
Request	63	B3	09	00	00	00	00	00	04	7F	34	15
Response	43	B3	09	00	00	00	23	00	03	37	34	15

Param. Value   SW   ACT

Subindex (Latest Acknowledged Fault)*

Param. Number (947 Dec)

Response (Transfer parameter value [array])

*2nd byte reserved
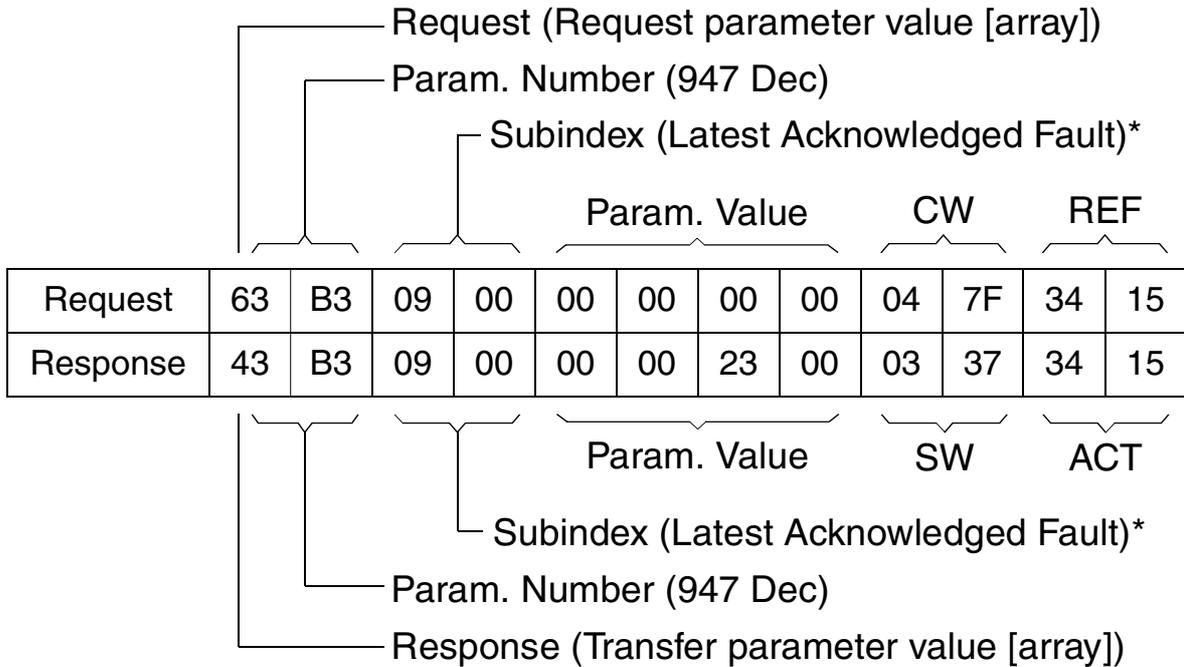
The slave returns the code of the latest acknowledged
fault (2300h). According to Table A-2, this corresponds
to ACS 160 fault code 1, which in turn indicates an
OVERCURRENT fault as detailed by the *ACS 160
User's Manual.*

Example 4:
Reading Process
Data from the Drive

PROFIBUS Parameter No. 916 can be used to define which data is read cyclically from the drive as application-specific process data (marked PDx in Figure 5-1).

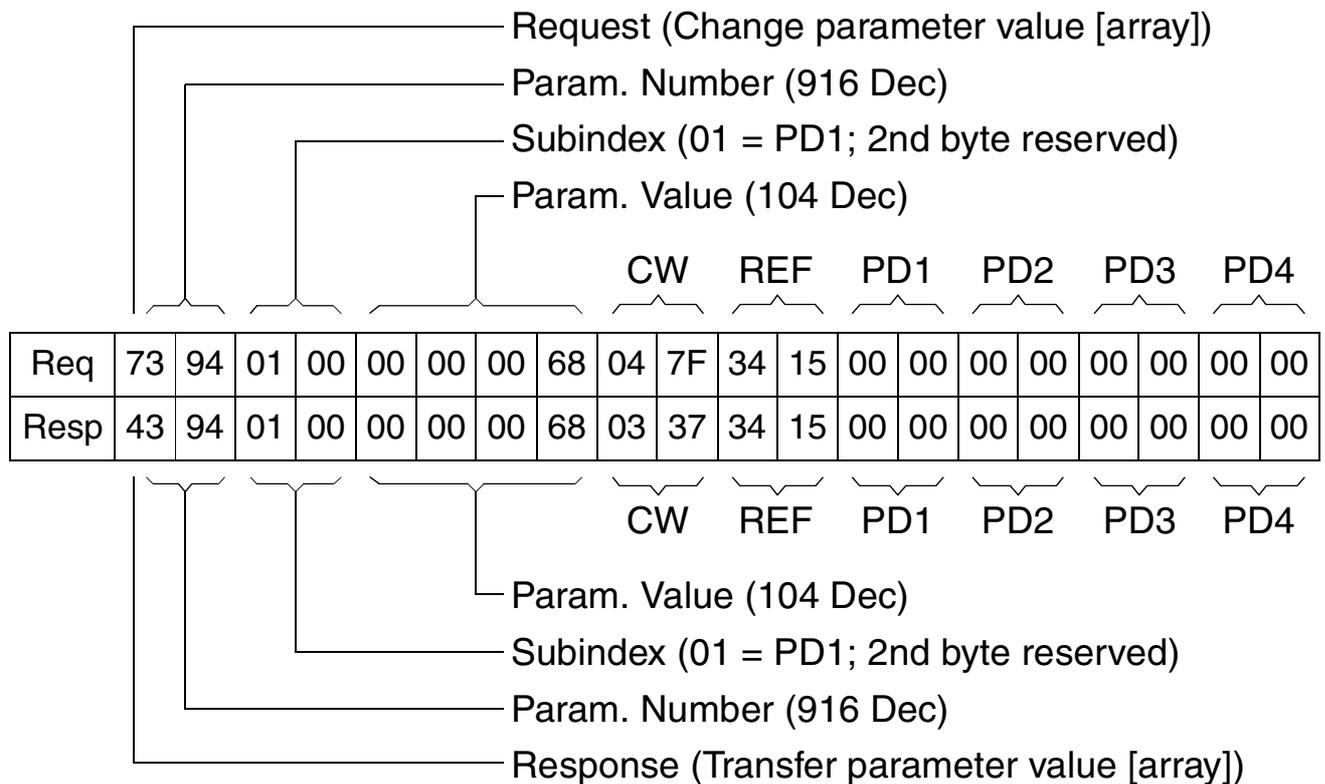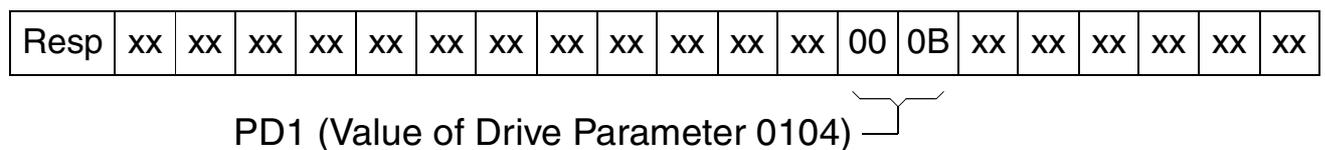In the example below, ACS 160 parameter 0104 CURRENT (68h) is selected to be transmitted by the drive as PD1. The selection is in force until it is superseded by another selection.

Subindex (IND) defines which process data word the required data is transmitted in, and *Parameter Value* defines which drive parameter is mapped to that word.

Request (Change parameter value [array])
Param. Number (916 Dec)
Subindex (01 = PD1; 2nd byte reserved)
Param. Value (104 Dec)

									CW	REF	PD1	PD2	PD3	PD4	
Req	73	94	01	00	00	00	00	68	04	7F	34	15	00	00	00	00	00	00	00	00
Resp	43	94	01	00	00	00	00	68	03	37	34	15	00	00	00	00	00	00	00	00

CW   REF   PD1   PD2   PD3   PD4

Param. Value (104 Dec)
Subindex (01 = PD1; 2nd byte reserved)
Param. Number (916 Dec)
Response (Transfer parameter value [array])

Subsequent Response Frames:

Resp	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	0B	xx	xx	xx	xx	xx	xx

PD1 (Value of Drive Parameter 0104)
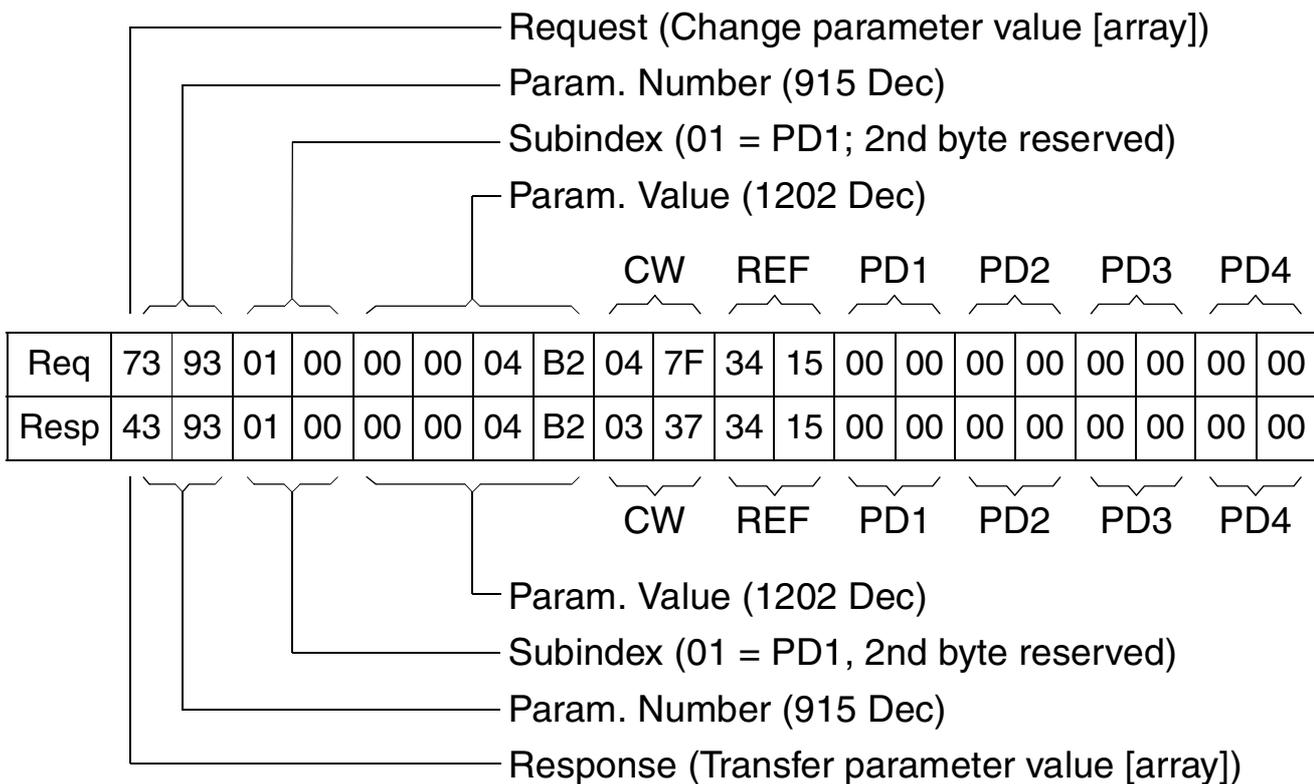
Example 5:
Writing Process
Data to the Drive

PROFIBUS Parameter No. 915 can be used to define which data is written cyclically to a drive parameter as application-specific process data (marked PDx in Figure 5-1).

In the example below, the value of ACS 160 parameter 1202 CONSTANT SPEED 1 (4B2h) is selected to be taken from PD1. The parameter will continue to be updated with the contents of PD1 in each Request frame until a different selection is made.

Subindex (IND) defines which process data word the required data is taken from. *Parameter Value* selects the drive parameter to which that word is mapped.

Request (Change parameter value [array])
Param. Number (915 Dec)
Subindex (01 = PD1; 2nd byte reserved)
Param. Value (1202 Dec)

									CW		REF		PD1		PD2		PD3		PD4	
Req	73	93	01	00	00	00	04	B2	04	7F	34	15	00	00	00	00	00	00	00	00
Resp	43	93	01	00	00	00	04	B2	03	37	34	15	00	00	00	00	00	00	00	00

CW REF PD1 PD2 PD3 PD4

Param. Value (1202 Dec)
Subindex (01 = PD1, 2nd byte reserved)
Param. Number (915 Dec)
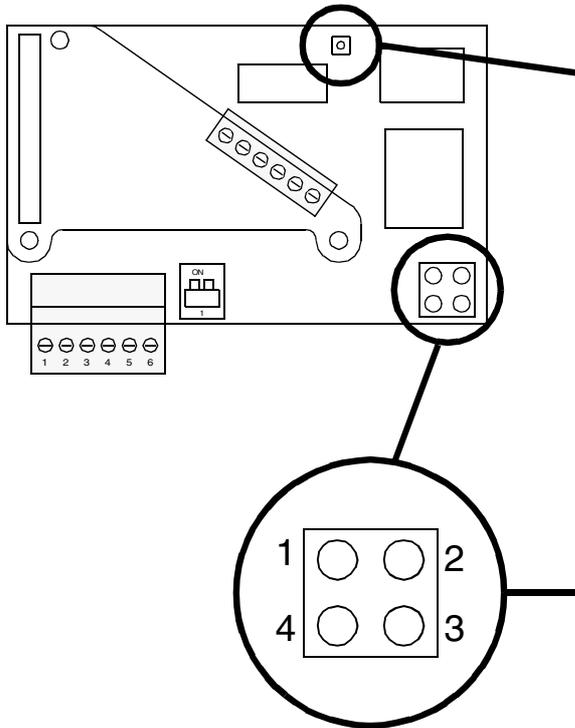Response (Transfer parameter value [array])

Subsequently, the contents of PD1 in each Request frame are written to ACS 160 Parameter 1202 CONSTANT SPEED 1 until a different selection is made.

Chapter 6 – Status LEDs

Status LEDs   There are five – one watchdog and four fieldbus – status LEDs on the printed board assembly of the CFB-PDP module.

Watchdog LED Indication	Description
FLASHING GREEN (1 Hz)	Module initialised and running OK.
FLASHING GREEN (2 Hz)	Module not initialised.
FLASHING RED (1 Hz)	RAM check fault.
FLASHING RED (2 Hz)	Program FLASH check fault.
FLASHING RED (4 Hz)	Drive initialisation failed.
ORANGE	Firmware download enabled.

LED No.	Indication/Description
1	Not used.
2	GREEN: On-line
3	RED: Off-line FLASHING RED: Off-line, waiting for the cut-off timeout (parameter 5104) to expire.
4	FLASHING RED: Configuration or initialisation error.

Appendix A – PROFIBUS Parameters

Table A-1 below shows the PROFIBUS Profile-specific parameters. Table A-2 lists the error codes for parameter 947.

Table A-1 PROFIBUS Profile-specific parameters.

No.	R/W	Data Type	Description
915	R/W	Unsigned 16 Array [8]	Assignment Process Data (PDx) in PPO Write. (See example in Chapter 5.) Subindex 1: PD1 Subindex 2: PD2 … Subindex 8: PD8
916	R/W	Unsigned 16 Array [8]	Assignment Process Data (PDx) in PPO Read. (See example in Chapter 5.) Subindex 1: PD1 Subindex 2: PD2 … Subindex 8: PD8
918	R	Unsigned 16	Node address.
927	R/W	Unsigned 16	Operator control rights (parameter identification). 1 = Parameters can be accessed without restrictions 0 = Parameters are read-only
928	R/W	Unsigned 16	Control rights (process data). 1 = No action: process data is handled in a normal way 0 = Process data not updated (Control Word and Reference frozen)
947	R	Unsigned 16 Array [64]	Fault (see codes in Table A-2). Subindex 1: Not acknowledged fault. Subindex 9: Latest acknowledged fault. Subindex 17: 2nd latest acknowledged fault. Subindex 25: 3rd latest acknowledged fault.

No.	R/W	Data Type	Description
963	R	Unsigned 16	Current baudrate. 0 = 12 Mbit/s 1 = 6 Mbit/s 2 = 3 Mbit/s 3 = 1.5 Mbit/s 4 = 500 kbit/s 5 = 187.5 kbit/s 6 = 93.75 kbit/s 7 = 45.45 kbit/s 8 = 19.2 kbit/s 9 = 9.6 kbit/s 255 = Invalid baudrate
964	R	Unsigned 16	Device identification (for CFB-PDP: **1612h**).
965	R	Unsigned 16	Profile number (for CFB-PDP: **0302h**).
967	R	Unsigned 16	16-bit word for controlling the drive.
968	R	Unsigned 16	Status word.
970	R/W	Unsigned 16	Load parameter record (indicates application macro). 0 = FACTORY 1 = ABB STANDARD 2 = 3-WIRE 3 = ALTERNATE 4 = MOTOR POT 5 = HAND/AUTO 6 = PID CONTROL 7 = PREMAGN
999	R/W	Unsigned 16	CFB-PDP module reset. Only effective with PPO Type 1, 2 or 5. 0 → 1 = Reset

Table A-2 Listing of error codes for Parameter 947. See the ACS 160 User's Manual *for information on the ACS 160 faults.*

PROFIBUS Fault Code	Corresponding ACS 160 Fault Code
0x0000	No fault
0x1000	20
0x2120	15
0x2300	1
0x2310	5
0x2340	4
0x3100	16
0x3120	6
0x3210	2
0x4210	9
0x4310	3
0x5081 to 0x5089	21 to 29
0x5300	10
0x6320	11
0x7081	7
0x7082	8
0x7110	30
0x7120	12 or 17
0x7510	13
0x9000	14

Appendix B – Definitions and Abbreviations

Definitions

Acyclic Communication	Communication in which messages are sent only once on request
Array	Parameter consisting of data fields of equal data type
Broadcast	Non-acknowledged message from master to all bus participants (compare Multicast)
Command Word	See Control Word
Communication Module	Parameter (selection) name for a device (eg. fieldbus adapter) through which the drive is connected to an external serial communication network (eg. fieldbus)
Communication Object	Any object of a real device that can be communicated with (variable, program, data range, etc.). Stored locally in the Object Dictionary
Control Word	16-bit word from master to slave with bit-coded control signals. (Also known as the Command Word)
Cyclic Communication	Communication in which Parameter-/Process Data-Objects are sent cyclically at pre-defined intervals
Device Class	Classification according to the number of profile functions included in the device
Drivecast	Broad- and Multicast, a special message frame for drives
Fault	Event that leads to tripping of the device

GSD File ASCII-format device description file in a specified form. Each device (active & passive stations) on PROFIBUS has to have its own GSD File. GSD Files for various master stations are available from your local ABB representative.

Index Access reference for Objects in PROFIBUS

Information Report Non-acknowledged message from master to one or all groups of bus participants

Master Control system with bus initiative. In PROFIBUS terminology, master stations are also called active stations

Multicast Non-acknowledged message from master to one group of bus participants (compare Broadcast)

Name Symbolic name of a parameter

Nibble Set of 4 bits

Object Dictionary Local storage of all Communication Objects recognised by a device

Object List List of all accessible objects

Parameter (1) Value that can be accessed as Object, e.g. variable, constant, signal
(2) Operating instruction for drive. Can be read and programmed with the drive control panel, or through the CFB-PDP module

Parameter Description Specification of a parameter

Parameter Number Parameter address

Parameter/Process Data Object   Special object that contains Parameter and Process Data

Process Data   Data that contains Control Word and Reference value or Status Word and Actual value. May also contain other (user-definable) control information

Profile   Adaptation of the protocol for certain application field, e.g. drives

Request Label   Coded information specifying the required service for the parameter part sent from master to slave

Response Label   Coded information specifying the required service for the parameter part sent from slave to master

Slave   Passive bus participant. In PROFIBUS terminology, slave stations (or slaves) are also called passive stations

Status Word   16-bit word from slave to master with bit-coded status messages

Warning   Signal caused by an existing alarm which does not lead to tripping of the device

PROFIBUS Abbreviations

The text in *italics* is the original German term.

.con	Confirmation
.ind	Indication
.req	Request
.res	Response
ACT	Actual Value *Istwert*
AK	Request Label/Response Label *Auftragskennung/Antwortkennung*
ALI	Application Layer Interface
CR	Communication Reference *Kommunikationsreferenz (Kommunikationsbeziehung)*
DP	Decentralised Periphery *Dezentrale Peripherie*
DP-ALI	Application Layer Interface for DP
FDL	Fieldbus Data Link
FMS	Fieldbus Message Specification
FSU	Manufacturer Specific Interface *Firmenspezifischer Umsetzer*
HIW	Main Actual Value *Hauptistwert*
HSW	Main Reference *Hauptsollwert*
ISW	see ACT
KR (KB)	see CR

PD	Process Data	
	Prozessdaten	
PKE	Parameter Identification	
	Parameter-Kennung	
PKW	Parameter Identification Value	
	Parameter-Kennung-Wert	
PNU	Parameter Number	
	Parameternummer	
PPO	Parameter/Process Data Object	
	Parameter-/Prozessdaten-Objekt	
PWE	Parameter Value	
	Parameter-Wert	
PZD	see PD	
PZDO	Process Data Object	
	Prozessdatenobjekt	
SAP	Service Access Point	
SOW	Reference	
	Sollwert	
SPM	Request Signal	
	Spontanmeldung	
STW	Control Word	
	Steuerwort	
ZSW	Status Word	
	Zustandswort	

Appendix C – Technical Data

PROFIBUS Link

Compatible Devices: All devices compatible with the PROFIBUS-DP protocol

Size of the Link: 127 stations including repeaters (31 stations and 1 repeater per segment)

Medium: Shielded, twisted pair RS-485 cable

- Termination: built in the CFB-PDP Module

- Specifications:

Parameter	Line A PROFIBUS-DP	Line B DIN 19245 Part 1	Unit
Impedance	135 to 165 (3 to 20 MHz)	100 to 130 (f > 100 kHz)	Ω
Capacitance	< 30	< 60	pF/m
Resistance	< 110	–	Ω/km
Wire gauge	> 0.64	> 0.53	mm
Conductor area	> 0.34	> 0.22	mm^2

- Maximum Bus Length (m):

	Transfer rate (kbit/s)						
	$\leq$ 93.75	187.5	500	1500	3000	6000	12000
Line A	1200	1000	400	200	100	100	100
Line B	1200	600	200	–	–	–	–

Topology: Multi-drop

Serial Communication Type: Asynchronous, half Duplex

Transfer Rate: 9.6 kbit/s, 19.2 kbit/s, 45.45 kbit/s, 93.75 kbit/s, 187.5 kbit/s, 500 kbit/s, 1.5 Mbit/s, 3 Mbit/s, 6 Mbit/s, or 12 Mbit/s (automatically detected by CFB-PDP)

Protocol: PROFIBUS-DP

CFB-PDP

Enclosure: Cast aluminium, dimensions 124 × 79 × 42 mm (without cable glands)

Degree of Protection: IP65

Mounting: Onto ACS 160 drive

Settings: Via drive interface (control panel)

Current Consumption: 280 mA

Connectors:

- One Phoenix Contact MC1,5/6-ST-3,81 (6-pole, cross-section 1.5 mm^2 max.) screw terminal block for fieldbus connection:

	Terminal	Description
1	+5V BUS	+5V output (isolated from drive side)
2	GND BUS	GND (isolated from drive side)
3	A	Data Negative (Conductor 2)
4	B	Data Positive (Conductor 1)
5	SHIELD	Bus cable screen
6	RTS	Request To Send*

*Used by some equipment to determine direction of transmission.

General:

- Complies with EMC Standards EN 50081-1 and EN 50082-2

Appendix D – Ambient Conditions

Operation

The following conditions apply to stationary use of the module.

Installation Site Altitude: 0 to 2000 m above sea level. If the installation site is higher than 2000 m above sea level, please contact your local ABB representative for further information.

Temperature: -10 to +50 °C

Contamination Levels (IEC 721-3-3):
Chemical gases: Class 3C3
Solid particles: Class 3S3

Sinusoidal Vibration
(IEC 721-3-3, 2nd Edition 1994-12):
Max 3 mm (2 to 9 Hz)
Max 10 m/s^2 (9 to 200 Hz)

Shock (IEC 721-3-3, 2nd Edition 1994-12):
Max 250 m/s^2, 6 ms

Storage and Transportation

The following conditions apply to storage and transportation of the module in the protective package.

Temperature: -40 to +70 °C

Contamination Levels (IEC 721-3-3):

Storage: Chemical gases: Class 1C2
                               Solid particles: Class 1S3

Transportation: Chemical gases: Class 2C2
                               Solid particles: Class 2S2

Shock (IEC 721-3-3, 2nd Edition 1994-12):
Max 300 m/s^2, 18 ms

ABB

CFB-PDP/EN
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EFFECTIVE: 1.2.2001

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