ACS 600

Installation and Start-up Guide

PROFIBUS Adapter Module NPBA-01

ABB

PROFIBUS Adapter Module
NPBA-01

**Installation and
Start-up Guide**

Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing and operating the NPBA-01 PROFIBUS Adapter Module. If neglected, physical injury and death may follow, or damage may occur to the frequency converter, the motor and driven equipment. 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 ACS 600 should be carried out by qualified electricians.

The ACS 600 and adjoining equipment must be properly earthed.

Do not attempt any work on a powered ACS 600. 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 frequency converter is in fact discharged before beginning work.

The ACS 600 motor cable terminals are at a dangerously high voltage when mains power is applied, regardless of motor operation.

There can be dangerous voltages inside the ACS 600 from external control circuits when the ACS 600 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 ACS 600. 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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Appendix A – Parameter Listings

Appendix B – Definitions and Abbreviations

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Chapter 1 – Introduction to This Guide

Overview This chapter contains a description of the Start-up and Installation Guide and a list of related publications.

Intended Audience The Guide is intended for the people who are responsible for installing, commissioning and using a PROFIBUS Adapter Module with the ACS 600 frequency converter. The reader is expected to have a basic knowledge of electrical fundamentals, electrical wiring practices, ACS 600 frequency converters, the use of the CDP 311 Control Panel and the PROFIBUS protocol family.

What This Guide Contains The installation and start-up of the NPBA-01 PROFIBUS Adapter Module are introduced in this guide.

It is assumed that the ACS 600 is installed and ready to operate before starting the installation of the adapter module. For more information on the installation and start-up procedures of the ACS 600, please refer to the *ACS 601* or *ACS 602/603/604 Installation and Start-up Manual.*

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. This chapter also states the safety instructions which apply to the installation and operation of the NPBA-01 Module.

Chapter 1 – Introduction to This Guide contains a short description of the Guide and a list of related publications.

Chapter 2 – Overview contains a short description of the PROFIBUS protocol and the NPBA-01 PROFIBUS Adapter Module, option package delivery checklist and information on the manufacturer's warranty.

Chapter 3 – Mechanical Installation contains the module placing and mounting instructions.

Chapter 4 – Electrical Installation contains cabling instructions, bus termination and earthing instructions and the PROFIBUS Adapter Module connection instructions.

Chapter 5 – Programming explains how to program the ACS 600 before the communication through the adapter module can be started.

Chapter 6 – Communication contains a description of the control data sent by the PROFIBUS master to the drive and the feedback data sent from the drive back to the master.

Chapter 7 – Fault Tracing explains how to trace faults with the Status LEDs on the NPBA-01 Module.

Appendix A presents the ACS 600 Actual signals, ACS 600 parameters with the corresponding PROFIBUS parameter numbers, profile-specific parameters, the alternative settings and the scaling factors for PROFIBUS communication.

Appendix B explains definitions and abbreviations concerning 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 ACS 600's option device.

Appendix E includes assembly drawings that assist in placing the option module.

Appendix F contains the listing for a definition program required by Siemens masters to configure the system for communication with the NPBA-01 PROFIBUS Adapter Module.

Conventions Used in This Guide

CDP 311	CDP 311 is a control panel used for supervising, programming and controlling the ACS 600 frequency converter. For further information, see the *ACS 600 Programming Manual.*
Communication Module	Communication Module is the parameter name/parameter selection name for a device through which the ACS 600 is connected to an external serial communication network, e.g. to an open fieldbus. The NPBA-01 Adapter Module is one of the fieldbus adapter modules available for the ACS 600. The communication with the fieldbus adapter is activated with Parameter 98.2 COMM.MODULE.
NPBA-01 PROFIBUS Adapter Module	The NPBA-01 Adapter Module is one of the optional fieldbus adapter modules available for the ACS 600. The NPBA-01 is a device through which the ACS 600 is connected to a PROFIBUS serial communication bus.
Parameter	A parameter is an operating instruction for the ACS 600 frequency converter. Parameters can be read and programmed with the CDP 311 Control Panel, or through the NPBA-01 Module.

Related Publications

ACS 601 Installation & Start-up Manual or
ACS 602/603/ 604 Installation & Start-up Manual

ACS 600 Programming Manual.

Chapter 2 – Overview

Overview

This chapter contains a short description of the PROFIBUS standard and the NPBA-01 Adapter Module, an option package 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, PROFIBUS-DP and PROFIBUS-ISP. The NPBA-01 PROFIBUS Adapter Module is compatible with the PROFIBUS-FMS and PROFIBUS-DP protocols.

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 200 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 PLC) 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 DIN 19245 Standard, Parts 1 to 3. The communication with a drive is discussed in *PROFIDRIVE – The PROFIBUS Profile for Adjustable Speed Drives.* For further information on PROFIBUS, refer to the above-mentioned standards.

The NPBA-01 PROFIBUS Adapter Module

The NPBA-01 PROFIBUS Adapter Module is an optional device for ACS 600 frequency converters which enables the connection of the ACS 600 to a PROFIBUS system. The ACS 600 frequency converter is considered as a slave in the PROFIBUS system. Through the NPBA-01 PROFIBUS Adapter Module it is possible to:

- Give control commands to the drive
  (Start, Stop, Direction, Run enable)

- Feed a motor speed or torque reference to the drive

- Give a process actual value or a process reference to the PID controller of the drive

- Read status information and actual values from the drive

- Change drive parameter values

- Reset a drive fault.

The PROFIBUS commands supported by the ACS 600 and the NPBA-01 PROFIBUS Adapter Module are discussed in Chapter 6.

The adapter module is mounted onto a standard mounting rail inside or outside the converter unit, depending on converter type and configuration.
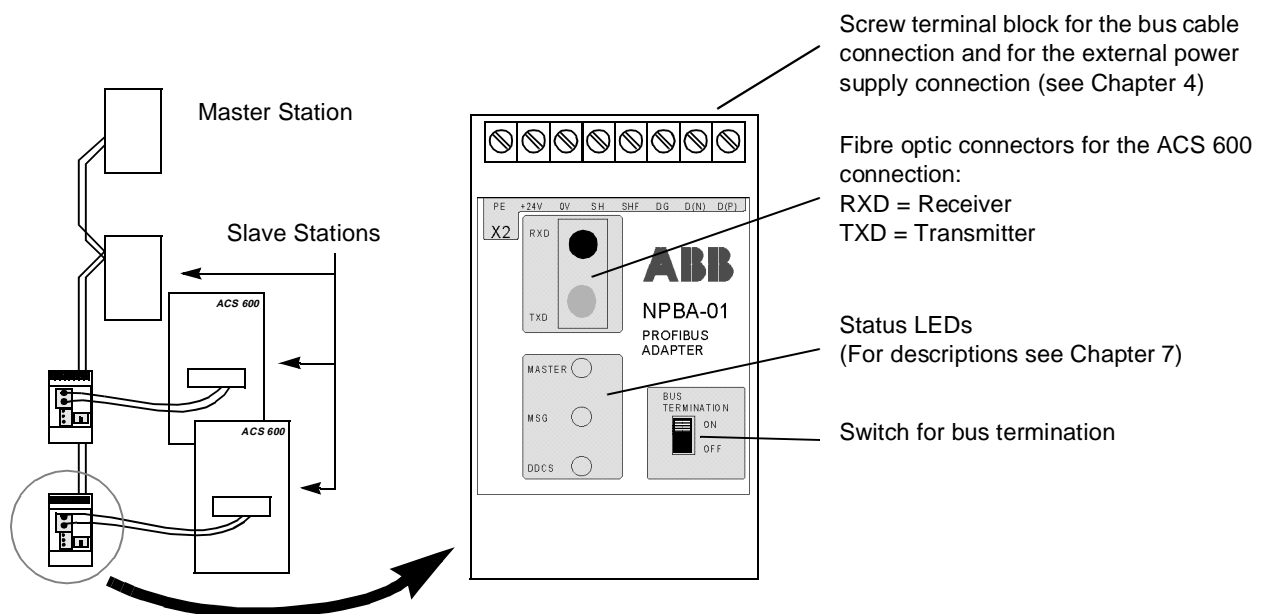
Figure 2-1 The construction of the PROFIBUS link and the NPBA-01 Adapter Module.

Compatibility   The NPBA-01 is compatible with ACS 600 DTC software version 2.7 and higher. The DTC software version can be checked by reading Parameter 33.1.

The NPBA-01 is compatible with all master stations that support the PROFIBUS-FMS and PROFIBUS-DP protocols.

Delivery Check   The option package for the PROFIBUS Adapter Module contains:

• PROFIBUS Adapter Module, Type NPBA-01

• Three pairs (six pieces) of fibre optic cables for connecting the adapter to the ACS 600

• Mounting rail

• NGND-01 Grounding Card

• *Installation and Start-up Guide for NPBA-01*.

Warranty   See the *ACS 600 Installation & Start-up Manual* for information on the warranty.

Chapter 3 – Mechanical Installation

Overview   This chapter contains the option module mounting instructions.

ACS 601   For *ACS 601-0005-3/0006-5* to *ACS 601-0016-3/0020-5,* the option modules are to be mounted outside the ACS 601 housing. See page 3-2 for mounting instructions.

For *ACS 601-0020-3/0025-5* to ACS *601-0120-3/0140-5,* one option module can be mounted inside the ACS 601 housing (see page 3-3 for mounting instructions). The additional modules are to be mounted outside the ACS 601 housing; see page 3-2 for instructions.

ACS 602   The option modules are to be mounted outside the ACS 602 unit. See next page for mounting instructions.

ACS 603   For *ACS 603-0100-3/0120-5 and ACS 603-0120-3/0140-5,* one option module can be mounted inside the frequency converter unit installed inside the ACS 603 cabinet (see page 3-4 for mounting instructions). Seven option modules can be mounted inside the ACS 603 cabinet (see page 3-4 for instructions). The additional modules are to be mounted outside the ACS 603 cabinet; see page 3-2 for instructions.

ACS 604   The option modules are to be mounted outside the ACS 604 unit. See page 3-2 for mounting instructions.

Mounting Outside the ACS 600

Choose the location for the module. Note the following:

- Note the free space requirements for the ACS 600. See the *ACS 601 (602/603/604) Installation and Start-up Manual*.

- The cabling instructions must be followed (see Chapter 4, starting page 4-1). Also, the length of the fibre optic cables included in the option package restrict the distance between the module and the ACS 600.

- The ambient conditions should be taken into account (see Appendix D). The enclosure class of the module is IP 20.

- The mounting rail onto which the option module is to be mounted must be earthed to a noiseless earth. If the rail is not mounted on a properly earthed base, a separate earthing conductor must be used. The conductor must be as short as possible and the cross-sectional area must be 6 mm^2 at least. ***Note:*** No solid copper conductor may be used (stranded wire allowed only).

Mounting instructions:

1. Switch off all dangerous voltages in the cabinet that the module is to be mounted in.

2. Fasten the rail and ensure the proper earthing (see instructions above).

3. Push the module onto the rail. The module can be released by pulling the locking spring with a screwdriver (see Figure 3-1).
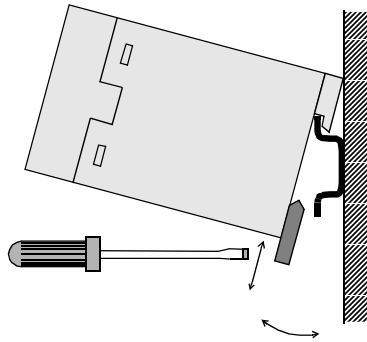
Figure 3-2 Mounting and removing the module.

Mounting Inside the ACS 601

The work inside the frequency converter should be carried out by a qualified electrician only.

WARNING! Pay attention to the slowly discharging voltage of the capacitor bank and the voltages that are connected from external control circuits to the digital inputs and to the relay outputs.

WARNING! Do not touch the printed circuit boards. The integrated circuits are extremely sensitive to electrostatic discharge.

Mounting instructions:

1. Stop the drive.

2. Switch off the power supply of the drive and all dangerous voltages connected to the digital inputs and relay outputs.

3. Wait for five minutes to ensure that the capacitors in the intermediate circuit have discharged.

4. Remove the front cover of the converter.

5. Ensure that the mains cable, motor cable and capacitor bank (UDC+ and UDC-) are not powered.

6. Locate the position for the module (see *Appendix E - Assembly Drawings*). Remove the two screws from the assembly plate. Fasten the mounting rail to its place using the two screws.

7. Push the module onto the rail. The module can be released by pulling the locking spring with a screwdriver (see Figure 3-1).

***Mounting Inside
the ACS 603***

The work inside the frequency converter should be carried out by a
qualified electrician only.

WARNING! Pay attention to the slowly discharging voltage of the
capacitor bank and the voltages that are connected from external
control circuits to the digital inputs and to the relay outputs.

WARNING! Do not touch the printed circuit boards. The integrated
circuits are extremely sensitive to electrostatic discharge.

Mounting instructions:

1. Stop the drive.

2. Switch off the power supply of the drive and all dangerous
   voltages connected to the digital inputs and relay outputs. Lock the
   fuse switch to the open position.

3. Wait for five minutes to ensure that the capacitors in the
   intermediate circuit have discharged.

4. Open the front door of the cabinet.

5. Locate the position for the module (see *Appendix E - Assembly
   Drawings*).

6. If the module can be mounted inside the converter unit
   (in ACS-603-0100-3/0120-5 and ACS 603-0120-3/0140-5,
   there is room for one option module):

   • Remove the front cover of the converter unit.

   • Ensure that the mains cable, motor cable and capacitor bank
     (UDC+ and UDC-) are not powered.

   • Remove the two screws from the assembly plate.

   • Fasten the mounting rail to its place using the two screws.

7. Push the module onto the rail. The module can be released by
   pulling the locking spring with a screwdriver (see Figure 3-1).

Chapter 4 – Electrical Installation

Overview

This chapter contains:

• Cabling instructions

• Instructions for bus termination

• Connection and earthing instructions for the NPBA-01 module and earthing instructions for the bus cable.

WARNING! Before installation, switch off the ACS 600 power supply. Wait for five minutes to ensure that the intermediate circuit is discharged. Switch off all dangerous voltages connected from external control circuits to the digital inputs or relay outputs of the ACS 600.

Cabling

Arrange the bus cables as far away from the motor cables as possible. Avoid parallel runs. Use bushings at cable entries.

Handle the fibre optic cables with care. The maximum long term tensile load is 1 N and the minimum short term bend radius is 25 mm. Do not touch the ends of the fibres with bare hands as the fibre is extremely sensitive to dirt.

Bus Termination

The built-in terminating resistors must be switched on if the NPBA-01 module is installed at the end of the bus. Otherwise the resistors must be switched off. Terminating resistors prevent signal reflections from the bus cable ends.
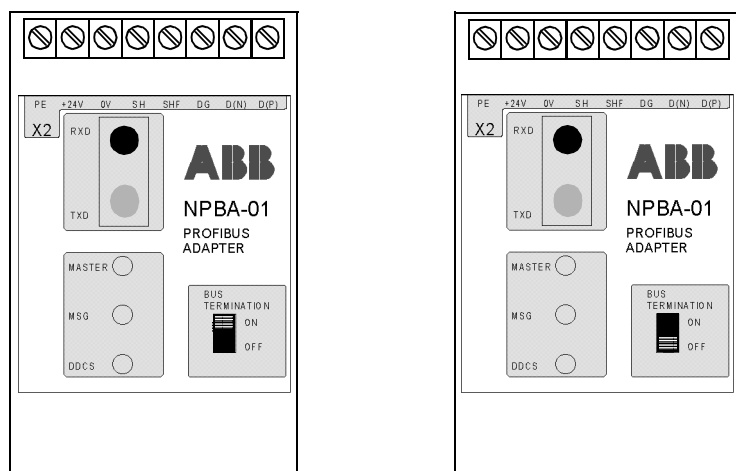
Figure 4-1 Terminating resistors on (left) and off (right).

NPBA-01 Connections
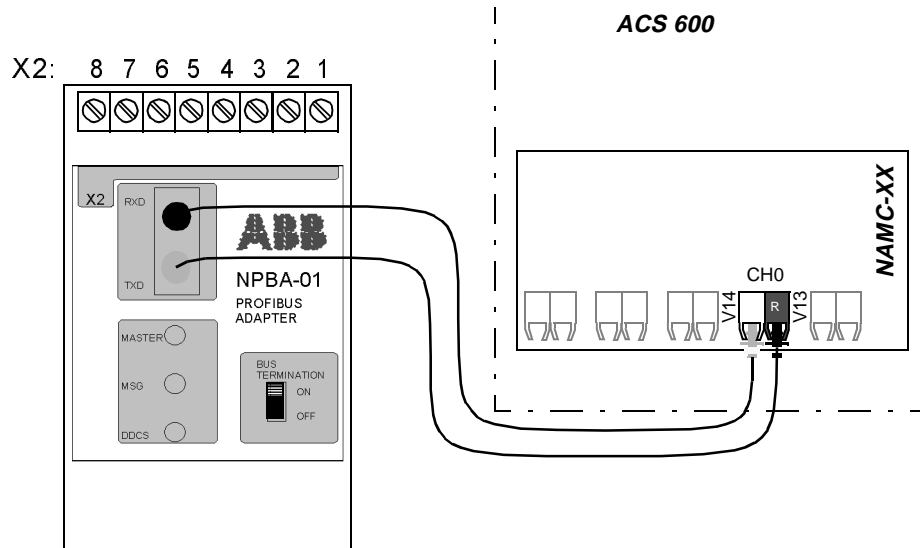
*Figure 4-2 Fibre optic link connecting the NPBA-01 adapter
to the ACS 600.*

The NPBA-01 module is connected to the frequency converter using a
fibre optic cable link. The module is designed for use with Simplex fibre
optic cables and connectors.

The bus cable and the external power supply are connected to terminal
block X2.

Table 4-1 Description of terminal block X2.

	X2	Description
1	D(P)	D(P) = Data Positive (Conductor 1 in twisted pair)
2	D(N)	D(N) = Data Negative (Conductor 2 in twisted pair) DG = Data Ground
3	DG	
4	SHF	Filtered Shield (Earthed via an RC filter)
5	SH	Shield (Earthed)
6	0V	Power supply for the module (3 W)
7	+24 V	From the NIOC card of the ACS 600 (Terminals: X23.1 = +24 V, X23.2 = Earth/0 V) or from other stable 24 V d.c. supply.
8	PE	Earth

Earthing

The NPBA-01 module earth is internally connected to the rail onto which the module is mounted. If the rail is fastened to an earthed metallic assembly plate, the module is automatically earthed, and no external earthing wire is needed. If the rail is fastened to a base that is not earthed, the rail must be connected to the nearest earthing terminal. However, the earthing wire should not be connected to the same terminal as the power cable screens. (See Chapter 3, page 3-2.)

In the NPBA-01 module there are several built-in earthing terminals (see Figure 4-3 below):

- The **PE** terminal is internally connected to the NPBA-01 module earth. Normally, no external wires need to be connected to this terminal.
- The **SH** terminal is internally connected to the NPBA-01 module earth. The SH terminal is normally used for earthing the PROFIBUS cable shield if there is no other station at which the cable shield is connected directly to earth.
- The **SHF** terminal is internally connected to the NPBA-01 module earth via an RC filter. The SHF terminal is typically used for earthing the PROFIBUS cable shield.
- The **DG** terminal is isolated from the NPBA-01 module earth. This terminal is used for connecting the third conductor of the bus cable. The third conductor - Data Ground - offers a common reference or comparison potential to all modules on the bus. The use of Data Ground is highly recommended as it improves noise immunity.

Earthing the PROFIBUS Cable Shields

The PROFIBUS cable shield may be connected straight to earth only at one station. At other stations the cable shield should be earthed via an RC filter (See Figure 4-3 below).
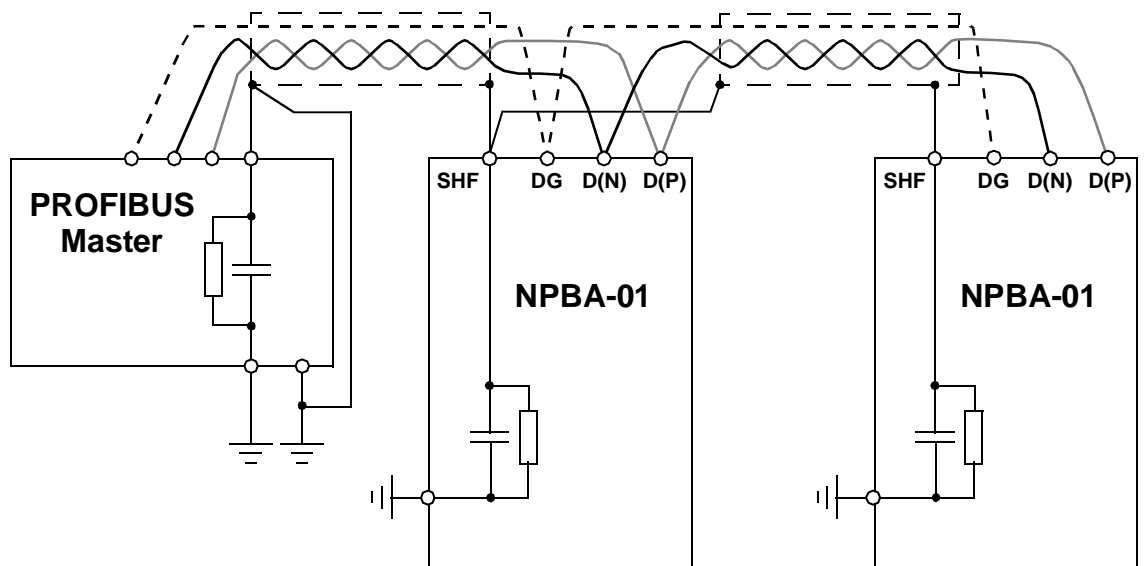
Figure 4-3 PROFIBUS bus cable connections.

Chapter 5 – Programming

Overview

This chapter explains how to program the ACS 600 parameters to prepare the drive for PROFIBUS communication.

For information on setting the ACS 600 parameters, read **General** below. For details, see the *ACS 600 Programming Manual.*

The sections **NPBA-01 Module Activation** and **PROFIBUS Connection Configuration** (page 5-3) describe how the communication between the ACS 600 and the NPBA-01 PROFIBUS Adapter Module is started.

Control Locations (starting page 5-4) deals with selecting the NPBA-01 module as the source of Start, Stop, Direction and Reference signals. For information on how to select the actual signal from the ACS 600 to be read through the PROFIBUS link, refer to **Analogue Outputs**, page 5-7. The selection of the NPBA-01 module as the source of the Run enable signal and fault reset is described in **System Control Inputs,** page 5-7. For information on how to define the operation of the drive upon a NPBA-01 Module fault condition, see **Fault Functions,** page 5-8.

General

The operation of the ACS 600 standard software can be changed by adjusting the drive operating instructions called Parameters. Parameter values can be modified with the CDP 311 Control Panel. For information on the use of the control panel, see the *ACS 600 Programming Manual.*

Before programming, the NPBA-01 PROFIBUS Adapter Module should be installed according to the instructions given in Chapters 3 and 4.

Table 5-1 (next page) presents the Parameters that should be set after the NPBA-01 PROFIBUS Adapter Module has been mechanically and electrically installed. The Parameters are discussed in more detail later in this chapter. The default values refer to the Factory macro, and may differ from the default values of other macros.

Note: The proper control of the ACS 600 by the PROFIBUS Control Word requires that the parameters are set according to the values in the Recommended Settings column.

Appendix F contains the listing for a type definition program, required by Siemens master stations to configure the system for communication with the NPBA-01 PROFIBUS Adapter Module.

Table 5-1 The ACS 600 parameters to be set on NPBA-01 installation.

Parameter	Alternative Settings	Default Setting	Recommended Setting
98.2 COMM.MODULE	YES; NO	NO	YES
51.1 MODULE TYPE		NPBA SW1.0	
51.2 PROFIBUS MODE	FMS; DP-PPO1; DP-PPO2; DP-PPO3; DP-PPO4; DP-PPO5	DP-PPO1	
51.3 STATION NUMBER	2 to 126	2	
51.4 BIT RATE SELECT	9.6KBIT; 19.2KBIT; 93.75KBIT; 187.5KBIT; 500KBIT; 1.5MBIT; AUTO	AUTO	
51.5 WRITE PPO DATA SET SEL	0 to 255	0	
51.6 READ PPO DATA SET SEL	0 to 255	0	
10.1 EXT1 STRT/STP/DIR	NOT SEL; DI1; ...; DI6,5; KEYPAD; COMM.MODULE	DI1,2	COMM.MODULE
10.2 EXT2 STRT/STP/DIR	NOT SEL; D1; ...; DI6,5; KEYPAD; COMM.MODULE	NOT SEL	COMM.MODULE
10.3 DIRECTION	FORWARD; REVERSE; REQUEST	FORWARD	REQUEST
11.2 EXT1/EXT2 SELECT	DI1; ...; DI6; EXT1; EXT2; COMM.MODULE	EXT1	COMM.MODULE
11.3 EXT REF1 SELECT	KEYPAD; AI1; ...; MAX(AI2,AI3); DI3U,4D(R); ...; DI5U,6D; COMM.MODULE	AI1	COMM.MODULE
11.6 EXT REF2 SELECT	KEYPAD; AI1; ...; MAX(AI2,AI3); DI3U,4D(R); ...; DI5U,6D; COMM.MODULE	KEYPAD	COMM.MODULE
12.1 CONST SPEED SEL	NOT SEL; D1 (SPEED1); DI2 (SPEED2); DI3 (SPEED3); DI4 (SPEED4); DI5 (SPEED5); DI6 (SPEED6); DI1,2; DI3,4; DI5,6; DI1,2,3; DI3,4,5; DI4,5,6; DI3,4,5,6	DI5,6	NOT SEL
15.1 ANALOGUE OUTPUT1	NOT USED; P SPEED; ...; CONTROL DEV	SPEED	
15.6 ANALOGUE OUTPUT2	NOT USED; P SPEED; ...; CONTROL DEV	CURRENT	
16.1 RUN ENABLE	YES; DI1; ...; DI6; COMM.MODULE	YES	COMM.MODULE
16.4 FAULT RESET SEL	NOT SEL; DI1; ...; DI6; COMM.MODULE	NOT SEL	COMM.MODULE
21.3 STOP FUNCTION	COAST; RAMP	COAST	RAMP
30.18 COMM FAULT FUNC	NO; FAULT; CONST SP 15; LAST SPEED	FAULT	
30.19 COMM FLT TIME-OUT	0.1 to 60 s	1.00	

NPBA-01 Module Activation

The NPBA-01 Adapter Module must be activated to establish the communication between the ACS 600 and the module.

98.2 COMM.MODULE

The connection with the NPBA-01 PROFIBUS Adapter Module and the ACS 600 is activated with this parameter.

YES
The connection between the NPBA-01 and the ACS 600 is active.

NO
The connection between the NPBA-01 and the ACS 600 is inactive.

After the module is activated, the configuration parameters of the NPBA-01 are automatically copied from the adapter module to the configuration table of the ACS 600.

PROFIBUS Connection Configuration

Parameter Group 51 includes the parameters for module address and mode. The user needs to adjust the parameters only if the default values have to be changed.

Note: The new parameter settings take effect only after the module power supply is switched off and then on again.

Table 5-2 Parameter Group 51 COMMUNICATION MODULE.

Parameter	Alternative Settings	Default Setting
51.1 MODULE TYPE		NPBA SW1.0
51.2 PROFIBUS MODE	FMS; DP-PPO1; DP-PPO2; DP-PPO3; DP-PPO4; DP-PPO5	DP-PPO1
51.3 STATION NUMBER	2 to 126	2
51.4 BIT RATE SELECT	9.6KBIT; 19.2KBIT; 93.75KBIT; 187.5KBIT; 500KBIT; 1.5MBIT; AUTO	AUTO
51.5 WRITE PPO DATA SET SEL	0 to 255	0
51.6 READ PPO DATA SET SEL	0 to 255	0

51.1 MODULE TYPE This parameter shows the module type as detected by the ACS 600. The value cannot be adjusted by the user.

51.2 PROFIBUS MODE This parameter defines the operating mode of the PROFIBUS connection.

FMS
The NPBA-01 module uses the PROFIBUS-FMS protocol.

DP-PPO1, ..., DP-PPO5
The NPBA-01 module uses the PROFIBUS-DP protocol. This parameter also selects the PPO message type (see Chapter 6 for PPO message types).

51.3 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 ACS 600 unit it is connected to. Allowable values are 2 to 126 inclusive.

51.4 BIT RATE SELECT This parameter shows the transfer rate used in the PROFIBUS link. The default value is AUTO. With AUTO selected, the transfer rate is detected automatically.

51.5 WRITE PPO DATA SET SEL This parameter defines the number of the data set the PPO message process information is written to. This data set is transmitted in PPO message parts PD1 to PD3 (see Table 6-2, page 6-7). This parameter is effective only when PPO Type 2, 4 or 5 is used.

51.6 READ PPO DATA SET SEL This parameter defines the number of the data set the PPO message process information is read from. This data set is transmitted in PPO message parts PD1 to PD3 (see Table 6-2, page 6-7). This parameter is effective only when PPO Type 2, 4 or 5 is used.

Note: PPO Type 5 is available in PROFIBUS-DP mode only.

Control Locations The ACS 600 drive can receive control information from multiple sources including digital inputs, analogue inputs, the CDP 311 Control Panel and a communication module (e.g. NPBA-01). The control signal sources for the drive are selected with the parameters in Parameter Group 10 START/STOP/DIR and in Parameter Group 11 REFERENCE SELECT. The parameters can be altered only with the drive stopped.

10.1 EXT1 STRT/STP/DIR This parameter defines the source of the Start, Stop and Direction commands for External control location 1 (see Parameter 11.2).

NOT SEL
No source is selected for the Start, Stop and Direction commands.

D1, ..., D6,5
The drive receives the Start, Stop and Direction commands through the digital inputs. For details on the use of the digital inputs, see the *ACS 600 Programming Manual*.

COMM.MODULE *(Recommended Setting)*
The drive receives the Start, Stop and Direction commands through the communication (fieldbus adapter) module. The rotation direction of the motor is determined by the selected reference.

10.2 EXT2 STRT/STP/DIR This parameter defines the source of the for the Start, Stop and Direction commands for External control location 2 (see Parameter 11.2).

NOT SEL
No source is selected for the Start, Stop and Direction commands.

D1, ..., D6,5
The drive receives the Start, Stop and Direction commands through the digital inputs. For details on the use of the digital inputs, see the *ACS 600 Programming Manual*.

COMM.MODULE *(Recommended Setting)*
The drive receives the Start, Stop and Direction commands through the communication (fieldbus adapter) module. The rotation direction of the motor is determined by the selected reference.

10.3 DIRECTION **FORWARD, REVERSE**
The rotation direction of the motor is fixed to FORWARD or REVERSE.

REQUEST *(Recommended Setting)*
The rotation direction is defined with Parameter 10.1 EXT1 STR/STP/DIR and Parameter 10.2 EXT2 STR/STP/DIR, or by keypad push-buttons. The selection is overridden if Parameter 11.3 EXT REF1 SELECT or Parameter 11.6 EXT REF2 SELECT is set to AI1/JOYST or AI2/JOYST or to COMM.MODULE.

11.2 EXT1/EXT2 SELECT This parameter defines the active External control location for the Start, Stop and Direction commands and for the reference. The parameter sets one of the digital inputs or the communication module to select between EXT1 and EXT2. Alternatively, the parameter fixes either EXT1 or EXT2 as the active External control location.

EXT1
External control location 1 is selected as the active External control location. Parameter 10.1 defines the source of the Start, Stop and Direction Commands. Parameter 11.3 defines the source of the reference.

EXT2
External control location 2 is selected as the active External control location. Parameter 10.2 defines the source of the Start, Stop and Direction Commands. Parameter 11.6 defines the source of the reference.

D1, ... D6
The External control location to be used is determined by the state of the specified digital input. 0V DC on the selected digital input = EXT1; 24V DC on the selected digital input = EXT2.

COMM.MODULE *(Recommended Setting)*
The selection between EXT 1 and EXT 2 is done through the communication module (Control Word bit 11).

11.3 EXT REF1 SELECT   This parameter defines the source of the reference for External control location 1 (see Parameter 11.2).

KEYPAD
The control panel is the source of the reference.

AI1, ... , MAX (AI2, AI3)
The analogue inputs (one or more) specified by the parameter value are the source of the reference. For details on the use of the analogue inputs, see the *ACS 600 Programming Manual*.

DI3U,4D(R), ... ,DI5U,6D
The digital inputs (one or more) specified by the parameter value are source of the reference. For details on the digital inputs, see the *ACS 600 Programming Manual*.

COMM.MODULE *(Recommended Setting)*
The communication module is the source of the reference.

11.6 EXT REF2 SELECT   This parameter defines the source of the reference for External control location 2 (see Parameter 11.2).

KEYPAD
The control panel is the source of the reference.

AI1, ... , MAX (AI2, AI3)
The analogue inputs (one or more) specified by the parameter value are source of the reference. For details on the use of the analogue inputs, see the *ACS 600 Programming Manual*.

DI3U,4D(R), ... ,DI5U,6D
The digital inputs (one or more) specified by the parameter value are the source of the reference. For details on the use of the digital inputs, see the *ACS 600 Programming Manual*.

COMM.MODULE *(Recommended Setting)*
The communication module is the source of the reference.

12.1 CONST SPEED SEL   This parameter defines which digital inputs are used to select Constant Speeds.

NOT SEL *(Recommended Setting)*
Constant speed function disabled. This setting is recommended as this parameter overrides external reference selections.

D1 (SPEED1), ..., DI3,4,5,6
Constant speeds selected with digital inputs. For details, see the *ACS 600 Programming Manual*.

Analogue Outputs	The PROFIBUS master can read one actual signal from the drive at a time. Two actual signals can be preset, and the selection between the two signals is done with bit 11 of the Control Word (see Chapter 6, Table 6-3). These parameters can only be set when the drive is stopped.
15.1 ANALOGUE OUTPUT1	This parameter selects Analogue output 1 of the ACS 600 and Actual signal 1 available through the communication (fieldbus adapter) module.
	NOT USED, P SPEED, ..., CONTROL DEV All the available alternatives are presented in Appendix A, Table A-1.
15.6 ANALOGUE OUTPUT2	This parameter selects Analogue output 2 of the ACS 600 and Actual signal 2 available through the communication (fieldbus adapter) module.
	NOT USED, P SPEED, ..., CONTROL DEV All the available alternatives are presented in Appendix A, Table A-1.

System Control Inputs   The ACS 600 drive can receive the system control inputs from the digital inputs and from the communication (fieldbus adapter) module.

16.1 RUN ENABLE   This parameter defines the source of the Run enable signal.

YES
The Run enable signal is set active. The ACS 600 is ready to start without an external Run enable signal.

DI1,...,DI6
The Run enable signal is received through a digital input. See the *ACS 600 Programming Manual* for more information.

COMM.MODULE *(Recommended Setting)*
The Run enable signal is received through the communication (fieldbus adapter) module.

16.4 FAULT RESET SEL   This parameter defines where faults are reset from.
(See also the *ACS 600 Programming Manual.*)

NOT SEL
Fault reset is executed from the Control Panel.

DI1, ..., DI6
Fault reset is executed from an external switch or from the Control Panel.

COMM.MODULE *(Recommended Setting)*
Fault reset is executed via the communication (fieldbus adapter) module or from the Control Panel.

21.3 STOP FUNCTION

COAST
The ACS 600 stops supplying voltage immediately after a Stop command is received and the motor coasts to stop.

RAMP *(Recommended Setting)*
Ramp deceleration as defined by the active deceleration time, Parameter 22.3 or Parameter 22.5.

Fault Functions

These parameters define the operation of the drive upon a fault condition.

30.18 COMM
FAULT FUNC

This parameter defines the operation of the drive and the fault indication type in a communication module fault condition. The parameter is available only after the communication module has been activated (see page 5-2).

NO
No indication is given of the communication module failure. The speed reverts to the last level the ACS 600 was operating at. This value is determined by the average speed over the last 15 seconds.

FAULT
A fault indication is shown on the control panel display and included in the Status Word sent to the communication module. The ACS 600 coasts to stop.

CONST SP 15
A warning indication is shown on the control panel display and included in the Status Word sent to the communication module. The speed reverts to the level set with Parameter 12.16 CONST SPEED 15.

LAST SPEED
Warning indication is given on the control panel display and in the Status Word sent to the communication (fieldbus adapter) module. The speed reverts to the last value the ACS 600 was operating at. This value is determined by the average speed over the last 15 seconds.

WARNING: If CONST SP 15 or LAST SPEED is selected, ensure it is safe to continue operation in case communication with the adapter module fails.

30.19 COMM
FAULT TIMEOUT

This parameter sets the delay after which the operation defined with Parameter 30.18 is performed upon communication module fault condition. The parameter is available only after the communication module has been activated (see page 5-2).

0.1 s - 60 s
Delay time. The default value is 1 second.

Chapter 6 – Communication

Overview

This chapter describes the contents of the PROFIBUS messages used for the communication with the ACS 600.

General

The NPBA-01 PROFIBUS Adapter Module supports the PROFIBUS-FMS and PROFIBUS-DP protocols. PROFIBUS-FMS has a slower transfer rate than PROFIBUS-DP, but it enables acyclic services not available with PROFIBUS-DP. The PROFIBUS-DP is ideal for high-speed cyclic I/O data transfer.

PPO Messages

Both the PROFIBUS-FMS and PROFIBUS-DP protocols use so-called PPOs *(Parameter/Process Data Objects)* in cyclic communication. See Table 6-2, page 6-7 for the different PPO types and their composition.

Service Access Points

The services of the PROFIBUS Data Link Layer (Layer 2) are used by both PROFIBUS-FMS and PROFIBUS-DP through Service Access Points (SAPs). Both protocols use an individual subset of the services: in FMS, SAPs are used for addressing the logical communication relationships. In DP, precisely defined functions are assigned to individual SAPs.

PROFIBUS-FMS   The PROFIBUS-FMS protocol supports cyclic and acyclic data transfer. In cyclic communication, one variable is read or written over a connection. This is done with the *Read* and *Write* services. (For available services, see **FMS Services Supported** below). In acyclic communication, the application program accesses various *communication objects* over a connection.

FMS Services Supported   These services are supported by the NPBA-01 PROFIBUS Adapter Module in PROFIBUS-FMS mode.

Initiate   With this command the master can initiate any *communication reference* (CR). The CRs supported by NPBA-01 are listed in Table 6-1 opposite.

Abort   Aborts the selected communication reference.

Reject   Rejects an invalid command that has been sent to the ACS 600, e.g. when the master attempts to use services that are not supported by the selected communication reference.

FMA 1/2 Ident   Returns the identification data for PROFIBUS protocol layers 1 and 2. With the NPBA-01, this service will return the following information:

Vendor: ABB INDUSTRY OY
Controller: NPBA-01
HW Release: HW1.00
SW Release: SW1.00

Status   Displays the status of the ACS 600.

Identify   Returns a general description of the slave. This command gives the same result as reading PROFIBUS Parameter 964.

GetOD   Reads the *object dictionary* from the drive in short form. The returned three words are the requested index, object code, and data type and length.

Read   With these command the master can read and write parameter values,
Write   descriptions and PPOs.

Communication
References   The Initiate command (see ***FMS Services Supported*** above) defines which communication reference (CR) is used in FMS communication. The CRs supported by the NPBA-01 PROFIBUS Adapter are presented in Table 6-1 below.

Table 6-1 Communication References.

CR Number	2	3	4	5
Type*	BRCT (8)	MSCY (3)	MSCY (3)	MSCY_SI (7)
Local LSAP	63	46	47	44
Remote Address	All (255)	All	All	All
Remote LSAP	All	All	All	All
Attribute	D (=0)	O	O	O
MaxSCC	0	0	0	0
MaxRCC	0	0	1	0
MaxSAC	0	0	0	1
MaxRAC	0	0	0	0
MaxPDUSendHiPrio	0	0	0	50
MaxPDUSendLoPrio	0	50	50	50
MaxPDURecHiPrio	245	0	0	0
MaxPDURecLoPrio	0	50	50	50
Features Supported	00 00 00 00 00 80	00 00 00 00 20 00	00 00 00 00 10 00	00 00 10 00 20 00

CR Number	6	7	8	9
Type*	MSCY (3)	MSAC (1)	MSAC (1)	MSAC (1)
Local LSAP	45	43	42	41
Remote Address	All	All	All	All
Remote LSAP	All	All	All	All
Attribute	O	O	O	O
MaxSCC	0	0	0	0
MaxRCC	0	1	1	1
MaxSAC	0	0	0	0
MaxRAC	0	0	0	0
MaxPDUSendHiPrio	0	0	0	0
MaxPDUSendLoPrio	50	241	241	241
MaxPDURecHiPrio	0	0	0	0
MaxPDURecLoPrio	50	244	244	244
Features Supported	00 00 00 00 20 00	00 00 00 00 30 06	00 00 00 00 33 20	00 00 00 00 33 20

*The types are abbreviated as follows:
BRCT = Broadcast
MSCY = Master–Slave Cyclic
MSCY_SI = Master–Slave Cyclic with Slave Initiative
MSAC = Master–Slave Acyclic

The communication references presented in Table 6-1 can be divided into two groups - those used for process control (Master 1), and those used for supervision and diagnostics (Master 2). CRs 5, 6 and 7 are reserved for diagnostics. However, any master can activate any CR, but multiple masters cannot have the same CR initialised at the same time.

CR 2 is used in Broadcast (the message is read by all stations, including masters) and Multicast communication. This message type is also called the Information Report. It is possible to send the same PPO message to every station or a certain group of stations, or specify a different message for each station. The format is as follows:

Station No.	Offset	PPO Type	PPO1	. . .	PPOn

Station No. defines the station or stations that the information is intended for. Station No. 127 is a universal station number comprehending all stations on the link. *Offset* (PROFIBUS Parameter No. 914) indicates the location of the PPO for the particular station, while *PPO Type* (PROFIBUS Parameter No. 904) specifies the type of PPO message used (see Table 6-2, page 6-7 for PPO types and their composition).

CR 3 is used in cyclic read operations of parameters and process data. This CR uses PPOs.

CR 4 is a cyclic write service for parameters and process data. This CR uses PPOs.

CR 5 allows Master 2 to read parameters and events.

CR 6 allows Master 2 to read cyclically from a PPO message without the Parameter Identification part.

CR 7 is an acyclic CR for Master 2. This CR supports read, write and events services.

CR 8 and higher have been reserved for acyclic communication.

Note: CRs 3 to 7 are profile-specific – for the use of these CRs, a *profile number* is required. For drives it is 3.

PROFIBUS-DP

The PROFIBUS-DP protocol 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 the Service Access Points, refer to the manual of the PROFIBUS master, *PROFIDRIVE – The PROFIBUS Profile for Adjustable Speed Drives,* or the DIN 19245 standard, Parts 1 and 3.

DP Communication Start-up

The following Service Access Points (SAPs) are used to initiate DP communication:

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

SAP 61 (Set_Prm)

This SAP is used in the parametrisation of the ACS 600.

Prm_Data (Parameter Data) Type: Octet String - Length: 7		
Byte	**Hex Value**	**Description**
1		Station_Status (Lock_Req; Unlock_Req; Sync_Req; Freeze_Req; WD_On)
2 to 3	00	Watchdog Factors 1 and 2 (unavailable for the NPBA-01)
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	0815	Identification Number (for the NPBA-01: **Hex 0815**)
7		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 Parameter 51.2 PROFIBUS MODE.) The table below gives the Hex frame that must be sent to the ACS 600 to select the PPO type.

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

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

Byte	Description
Diag_Data (Diagnostic Data) Type: Octet String - Length: 6	
1	Station Status 1 (Diag.Master_Lock; Diag.Prm_Fault; Diag.Invalid_Slave_Response; Diag.Not_Supported; Diag.Ext_Diag; Diag.Cfg_Fault; Diag.Station_Not_Ready; Diag.Station_Non_Existent)
2	Station Status 2 (Diag.Deactivated; Diag.Sync_Mode; Diag.Freeze_Mode; Diag.WD_On; Diag.Stat_Diag; Diag.Prm_Req)
3	Station Status 3 (Diag.Ext_Diag_Overflow)
4	Diag.Master_Add
5 to 6	Ident_Number (for NPBA-01: Hex 0815)

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 Type: Octet String - Length: 0 to 32 (depending on the selected PPO Type)

PPO Messages

Table 6-2 PPO Message Types.

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

Type 1

Type 2

Type 3

Type 4

Type 5*
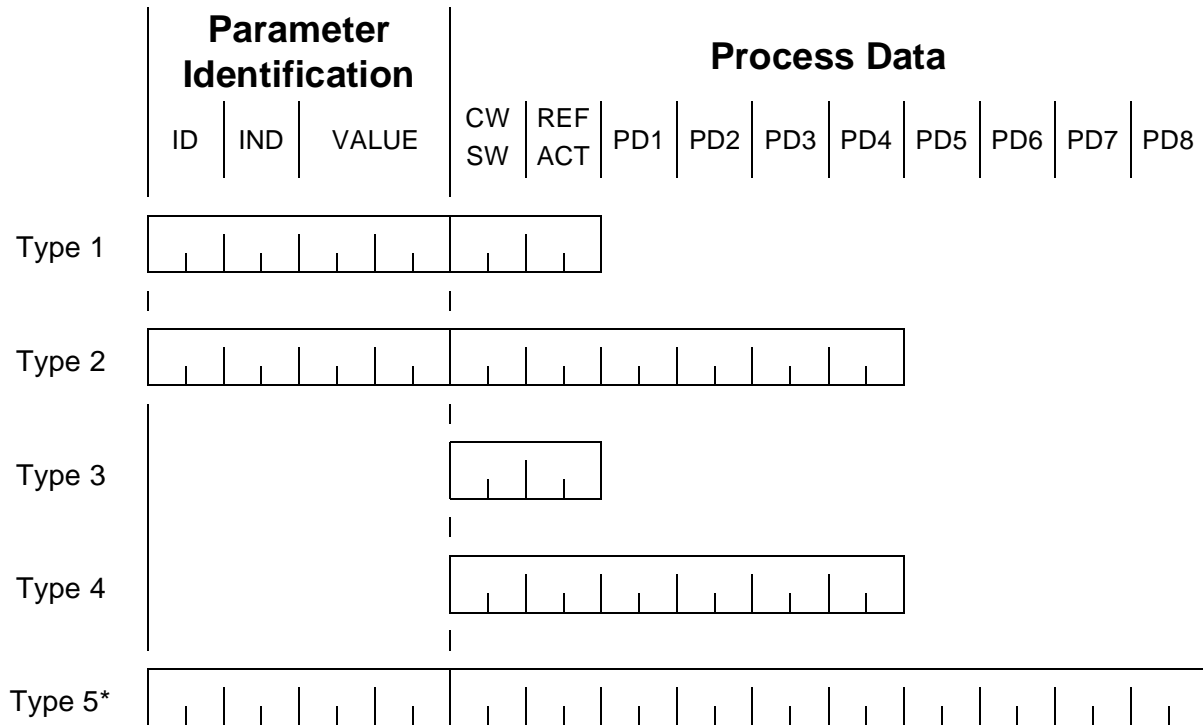
*PROFIBUS-DP Only

Parameter Identification:
ID – Parameter Identification
IND - Index for Arrays
VALUE - Parameter Value (Max. 4 bytes)

Process Data:
CW - Control Word from Master to Slave (see Table 6-3)
SW - Status Word from Slave to Master (see Table 6-4)
REF - Reference Value (from Master to Slave; see page 6-11)
ACT - Actual Value (from Slave to Master; see page 6-13)
PD - Process Data (Data sets)

Parameters in Cyclic Communication

In cyclic communication parameters are transferred by PPO message types 1, 2 and 5 (see Table 6-2 on previous page). The Parameter Identification part consists of eight bytes (see below).

*Not used by ACS600
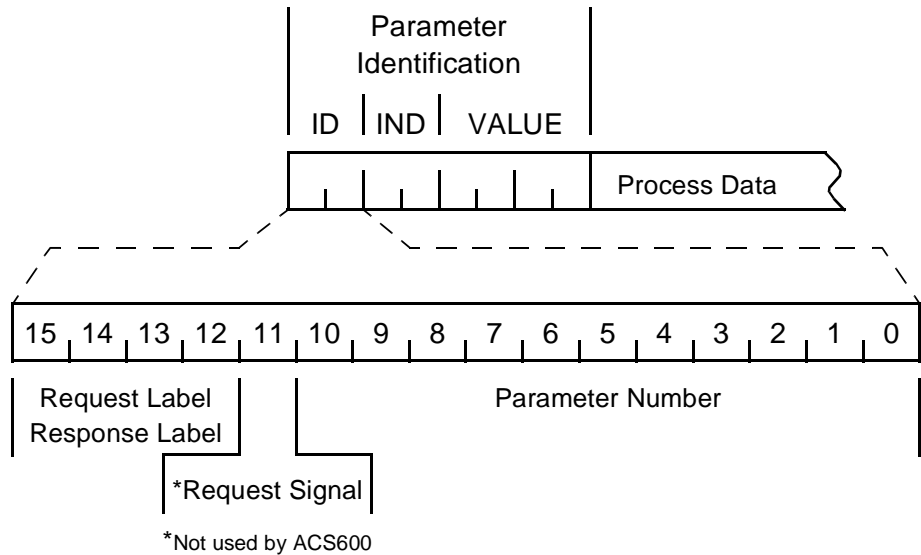
The Request Label is used by the master when transmitting data to the slave, while the Response Label is used by the slave. The tables below show the Request/Response functions.

Request Label (Master to Slave)			
Request	**Function**	**Ack (+)**	**Ack (-)**
0	No task	0	-
1	Parameter value read	1	7
2	Parameter value write (word)	1	7
3	Reserved		
4	One element of description read	3	7
5	One element of description write (name)	3	7
6	Parameter value read (array)	4	7
7 to 15	Reserved		

Response Label (Slave to Master)	
Response	**Function**
0	No response
1	Parameter value updated (word)
2	Parameter value updated (long)
3	Description updated
4	Parameter value updated (array)
7	Task not executable (+ Fault Code; see below)
9	Request signal

Response Label Fault Codes	
0	Illegal parameter
1	Parameter is read-only
2	Value is outside limits
3	Invalid subindex
4	Not an array
5	Invalid data type
9	Description data not defined
103	Request not supported
301	Fault in internal (DDCS) communication
18	Other

Example   In this example, cyclic Read and Write commands are used to set
ACS 600 Parameter 22.2 ACCELER TIME 1 (= PROFIBUS Parameter
402) to 3.0 seconds. Also, a Start command and a reference (1000
rpm) are given.

Write:

Request	21	92	00	00	00	00	00	1E	04	7F	34	15
Response	11	92	00	00	00	00	00	00	03	37	34	15

In the request message, the first two bytes are used for parameter
identification. The first digit (**2**) denotes the function PARAMETER
VALUE WRITE (see the table on previous page). The second digit
along with the second byte (**1** and **92**) indicate PROFIBUS Parameter
No. 402 (Hex 192). Bytes 7 and 8 (**00 1E** = Dec 30) is the parameter
value (30 meaning 3.0 seconds). The last four bytes are the Control
Word and a Reference value (see pages 6-10 and 6-11). Control Word
value 04 7F starts the motor, while 34 15 (Dec 13333) signifies
1000 rpm, providing that Parameter 11.5 is set to 1500 rpm (the default
value).

In the response message, the first digit (**1**) indicates the function
PARAMETER VALUE UPDATED (see previous page). The last
four bytes are the Status Word and an Actual value (see pages 6-12
and 6-13).

Read:

Request	11	92	00	00	00	00	00	00	04	7F	34	15
Response	11	92	00	00	00	00	00	1E	03	37	34	15

The first digit (**1**) in the request message denotes the function
PARAMETER VALUE READ. The Control Word and the Reference
value are in the Write command above.

The response message bytes 7 and 8 indicate the parameter value, set
with the Write command as described above.

The Control Word   The Control Word is PROFIBUS Parameter No. 967. The contents of
the Control Word is presented in the following table. The text in *italics*
refers to the states in Figure 6-1, page 6-14 *(ACS 600/PROFIBUS
State Machine).*

Table 6-3 The Control Word.

Bit	Value	Description
0	1	Enter *READY TO START*
	0	Stop according to ramp (*STOP 1*)
1	1	Ready
	0	Coast to stop *(STOP 2)*
2	1	Ready
	0	Stop according to stop type selected with Parameter 21.3 *(STOP 3)*
3	0 $\Rightarrow$ 1	Start if bits 0 to 2 are ON (1).
	0	Coast to stop *(RUN DISABLE)*
4 to 6	1	Normal operation
	0	Stop according to stop type selected with Parameter 21.3
7	0 $\Rightarrow$ 1	Fault reset (enter *DRIVE DISABLE*)
	0	No reset performed
8 and 9		Unused
10	1	The Control Word and the frequency reference (from PROFIBUS) are activated
	0	The Control Word and the frequency reference (from PROFIBUS) are not activated. Old values are retained
11	1	External reference 2 selected
	0	External reference 1 selected
12 to 15		Unused

References

Reference 1   Reference 1 is a 16-bit word containing a sign bit and a 15-bit integer. Reference 1 is used as the speed reference REF1 for the ACS 600.

The signal source of REF1 must be set to COMM.MODULE, and External control location 1 must be activated to use Reference 1 as a speed reference (see Parameters 11.3 and 11.2, pages 5-6 and 5-5 respectively).

The integer received from the master is scaled so that integer 20000 corresponds to the value set with Parameter 11.5 EXT REF1 MAXIMUM (by default, 1500 rpm).

Reference 2   Reference 2 is a 16-bit word containing a sign bit and 15-bit integer. Reference 2 can be used as reference REF2 of the ACS 600.

The signal source of REF2 must be set to COMM.MODULE and External control location 2 must be activated to use Reference 2 as the reference from the master (see Parameters 11.6 and 11.2, pages 5-6 and 5-5 respectively).

The internal use of REF2 depends on the selected ACS 600 motor control mode and the selected Application Macro of the ACS 600 (See the *ACS 600 Programming Manual,* Parameters 99.4 and 99.2):

- If the **DTC** (Direct Torque Control) mode and either the **Factory, Hand/Auto** or **Sequential Control Macro** are selected, REF2 is a speed reference. The integer 20000 corresponds to the value set with Parameter 11.8 EXT REF2 MAXIMUM (by default, 100 %).

- If the **DTC** control mode and the **Torque Control Macro** are selected, REF2 is a torque reference. The integer 10000 corresponds to the value set with Parameter 11.8 EXT REF2 MAXIMUM (by default, 100 %).

- If the **DTC** control mode and the **PID Control Macro** are selected, REF2 is the PID controller reference. The integer 10000 corresponds to the value set with Parameter 11.8 EXT REF2 MAXIMUM (by default, 100 %).

- If the **SCALAR** control mode is selected, REF2 is a frequency reference. The integer 20000 corresponds to the value set with Parameter 11.8 (by default, 100 Hz).

The Status Word   The Status Word is PROFIBUS Parameter No. 968. The contents of
the Status Word is presented in the following table. The text in *italics*
refers to the states in Figure 6-1, page 6-14 *(ACS 600/PROFIBUS
State Machine).*

Table 6-4 The Status Word.

Bit	Value	Description
0	1	Ready (initialisation OK, *DRIVE READY*)
	0	Initialisation not ready or not OK *(DRIVE NOT READY)*
1	1	Ready *(READY TO START)*
	0	Not ready *(STOP 1)*
2	1	Ready for reference, or running *(START)*
	0	Not ready *(RUN DISABLE)*
3	1	Fault condition *(FAULT)*
	0	No fault
4	1	"Coast to stop" *(STOP 2)* OFF
	0	"Coast to stop" *(STOP 2)* ON
5	1	"Stop according to selected stop type" *(STOP 3)* OFF
	0	"Stop according to selected stop type" *(STOP 3)* ON
6	1	*DRIVE DISABLE*
	0	*DRIVE NOT READY*
7	1	Warning condition
	0	No warning
8	1	Actual value equals reference value (= is within tolerance limits)
	0	Actual value differs from reference value (= is outside tolerance limits)
9	1	ACS 600 Control location REMOTE
	0	ACS 600 Control location LOCAL
10	1	Actual frequency value equals or is greater than supervision limit
	0	Actual frequency value is within supervision limit
11	1	External reference 2 selected
	0	External reference 1 selected
12 to 14	1,0	Unused
15	1	Error(s) in DDCS communication **NOTE: The information in the Status Word is not updated.**
	0	DDCS communication (ACS 600 – NPBA-01) OK

Actual Values

Actual Value 1   Actual Value 1 is a 16-bit word containing a sign bit and a 15-bit integer. Actual Value 1 is one of the actual signals read from the drive.

Actual Value 1 is selected with the same parameter (Parameter 15.1) that defines Analogue output 1 of the ACS 600 (see page 5-7). All available actual signals and scaling factors for the integers corresponding to the real actual signal values are introduced in Appendix A, Table A-1.

Actual Value 2   Actual Value 2 is a 16-bit word containing a sign bit and a 15-bit integer. Actual Value 2 is one of the actual signals read from the drive.

Actual Value 2 is selected with the same parameter (Parameter 15.6) that defines Analogue output 2 of the ACS 600 (see page 5-7). All available actual signals and scaling factors for the integers corresponding to the real actual signal values are introduced in Appendix A, Table A-1.

Figure 6-1 The ACS 600/PROFIBUS State Machine.

From all states

State

Control Word

Status Word
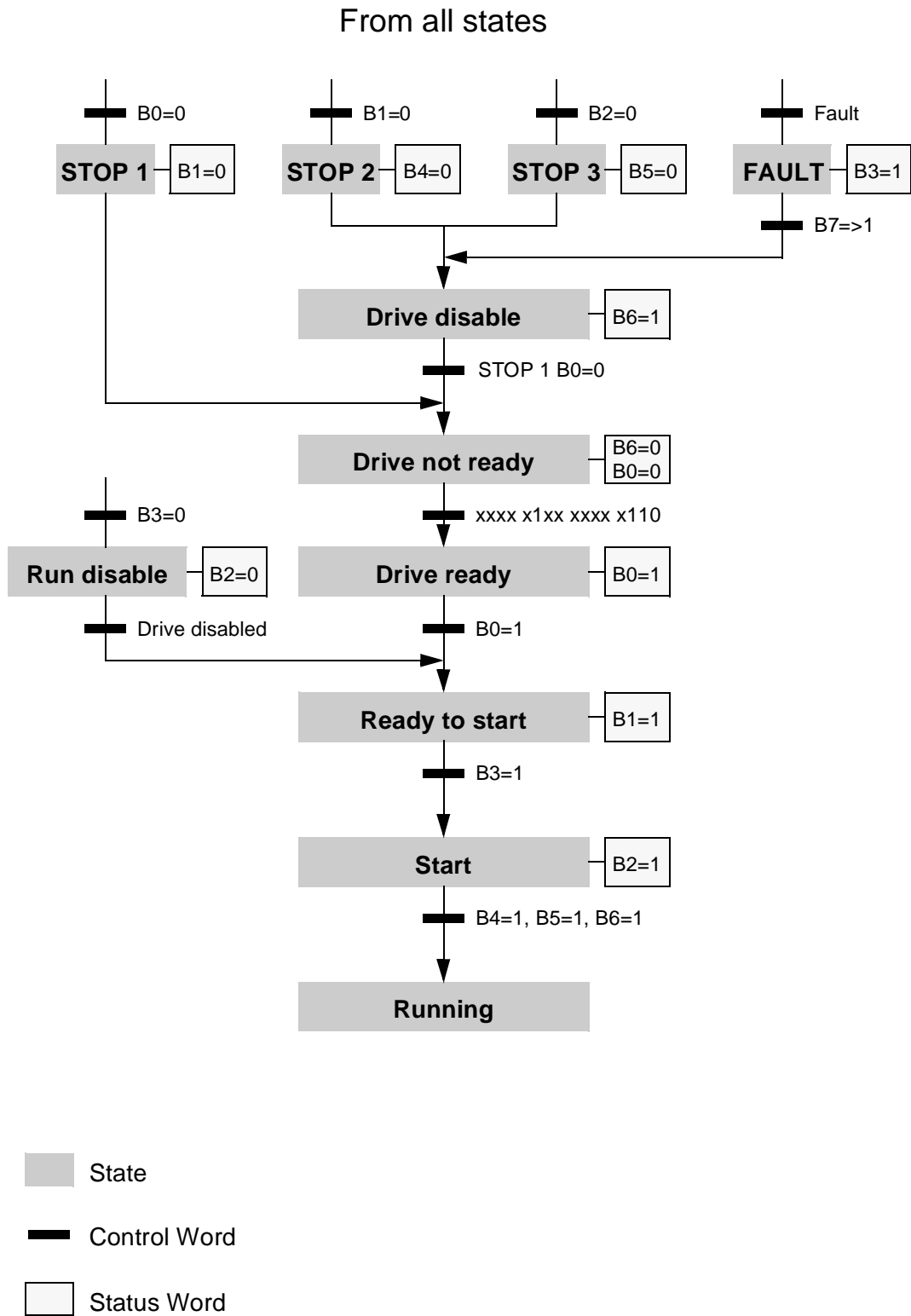
Chapter 7 – Fault Tracing

Overview   This chapter describes the functions and indications of the Status LEDs on the NPBA-01 PROFIBUS Adapter Module to help solving problems that may arise.

Status LEDs   There are three status LEDs on the NPBA-01 module, labelled *MASTER*, *MSG* and *DDCS*.

The normal power-up procedure is as follows:

- All LEDs are turned on for the duration of the RAM/ROM test. If the test is passed, all LEDs will be turned off.

- The *DDCS* LED will light as the DDCS link between the NPBA-01 and the ACS 600 is initialised. After initialisation, the *DDCS* LED will remain on.

- If Parameter 51.4 BIT RATE SELECT is set to AUTO, the *MASTER* LED will flash until the module has found the correct data transfer rate and established the PROFIBUS connection, after which the LED will remain on. If the transfer rate is set manually, the LED will light even if the rate is not correct.

- All LEDs are lit: PROFIBUS communication and DDCS communication OK.

If the *MASTER* LED flashes after the RAM/ROM test, the test has failed. Try resetting the module. If the error persists, contact an ABB service representative.

If the *DDCS* LED flashes or goes out during operation, there are errors on the DDCS link between the module and the ACS 600. All errors in the link are reported by the module to the PROFIBUS master (bit 15 of the Status Word is turned on.) If errors occur, check the fibre cables visually for dirt or flaws. Ensure that all connectors are properly inserted. If these measures do not rectify the problem, try new cables. If errors still occur, contact an ABB service representative.

As parameters are copied from the NPBA-01 to the ACS 600 during the activation of the module, you can generally observe the functioning of the link by checking the parameters in Parameter Group 51 COMMUNICATION MODULE.

If the *MSG* LED is off, there is either no data transferred on the bus or the bus communication has failed. The loss of bus communication also ceases the DDCS communication.

Appendix A – Parameter Listings

The tables in this Appendix list all the available ACS 600 Actual signals, PROFIBUS/ACS 600 Parameters and their alternative settings, and profile-specific Parameters.

Table A-1 ACS 600 Actual Signals available. (See also PROFIBUS Parameters 1 to 26.)

Analogue Output/ Actual Signal	Short name	Description	Scaling
PROCESS SPEED	P SPEED	Process speed	-20000 △ -100 % 20000 △ 100 % **of the value defined with Parameter 20.2 (DTC Control Mode) or Parameter 20.8 (SCALAR Control Mode)**
SPEED	SPEED	Motor speed	-20000 △ -100 % 20000 △ 100 %
FREQUENCY	FREQ	Inverter output frequency	-100 △ -1 Hz 100 △ 1 Hz
CURRENT	CURRENT	Motor current	0 △ 0 % 10000 △ 100 % **of motor nominal current**
TORQUE	TORQUE	Motor torque	-10000 △ -100 % 10000 △ 100 % **of motor nominal torque**
POWER	POWER	Motor power	0 △ 0 % 10000 △ 100 % **of motor nominal power**
DC BUS VOLTAGE V	DC BUS V	DC bus voltage of ACS 600	0 △ 0 % 10000 △ 100 % **of nominal DC bus voltage**
OUTPUT VOLTAGE	OUT VOLT	Calculated motor voltage	0 △ 0 % 10000 △ 100 % **of motor nominal voltage**
EXTERNAL REF 2	EXT REF2	External reference 2	0 △ 0 % 10000 △ 100 % **of motor max. speed / nominal torque / max. process reference (defined with Parameter 11.6)**
APPL BLOCK OUTPUT	APPL OUT	The reference given as an output from the application (PID controller output, etc.)	0 △ 0 % 10000 △ 100 %
ACTUAL VALUE 1	ACT VAL1	PID controller Actual value 1 Available only if the PID Macro is selected	0 △ 0 % 10000 △ 100 %
ACTUAL VALUE 2	ACT VAL2	PID controller Actual value 2 Available only if the PID Macro is selected	0 △ 0 % 10000 △ 100 %
CONTROL DEVIATION	CONT DEV	The difference between the reference given by the user and the actual reference the ACS 600 is following	0 △ 0 % 10000 △ 100 %

Table A-2 PROFIBUS/ACS 600 Parameters.

PROFIBUS Par. No. (Add 4000 in FMS Mode)	Name	Short name	Description	Scaling
1	PROCESS SPEED	P SPEED	Process speed	-100 △ -100 % 100 △ 100 % **of the value defined with Parameter 20.2 (DTC Control Mode) or Parameter 20.8 (SCALAR Control Mode)**
2	SPEED	SPEED	Motor speed	-20000 △ -100 % 20000 △ 100 %
3	FREQUENCY	FREQ	Inverter output frequency	-100 △ -1 Hz 100 △ 1 Hz
4	CURRENT	CURRENT	Motor current	10 △ 1 A
5	TORQUE	TORQUE	Motor torque	-10000 △ -100 % 10000 △ 100 % **of motor nominal torque**
6	POWER	POWER	Motor power	0 △ 0 % 10000 △ 100 % **of motor nominal power**
7	DC BUS VOLTAGE V	DC BUS V	DC bus voltage of ACS 600	1 △ 1 V
8	MAINS VOLTAGE	MAINS V	Calculated supply voltage	1 △ 1 V
9	OUTPUT VOLTAGE	OUT VOLT	Calculated motor voltage	1 △ 1 V
10	ACS 600 TEMP	ACS TEMP	Temperature of the heatsink	1 △ 1 °C
11	EXTERNAL REF 1	EXT REF1	External reference 1	1 △ 1 rpm
12	EXTERNAL REF 2	EXT REF2	External reference 2	0 △ 0 % 10000 △ 100 % **of motor max. speed / nominal torque / max. process reference (depending on the ACS 600 macro selected)**
13	CTRL LOCATION	CTRL LOC	Active control location	**1** = EXT2; **2** = LOCAL; **3** = EXT1
14	OP HOUR COUNTER	OP HOURS	Elapsed time counter	1 △ 1 h
15	KILOWATT HOURS	KW HOURS	kWh meter	1 △ 1 kWh
16	APPL BLOCK OUTPUT	APPL OUT	The reference given as an output from the application (PID controller output, etc.)	0 △ 0 % 10000 △ 100 %
17	DI6-1 STATUS	DI6-1	Status of digital inputs	
18	AI1 (V)	AI1 (V)	Value of Analogue input 1	1 △ 0.01 V
19	AI2 (mA)	AI2 (mA)	Value of Analogue input 2	1 △ 1 mA
20	AI3 (mA)	AI3 (mA)	Value of Analogue input 3	1 △ 1 mA
21	RO3-1 STATUS	RO3-1	Status of relay outputs	
22	AO1 (mA)	AO1 (mA)	Value of Analogue output 1	1 △ 1 mA
23	AO2 (mA)	AO2 (mA)	Value of Analogue output 2	1 △ 1 mA

PROFIBUS Par. No. (Add 4000 in FMS Mode)	Name	Short name	Description	Scaling
24	ACTUAL VALUE 1	ACT VAL1	PID controller Actual value 1 Available only if the PID Macro is selected	0 △ 0 % 10000 △ 100 %
25	ACTUAL VALUE 2	ACT VAL2	PID controller Actual value 2 Available only if the PID Macro is selected	0 △ 0 % 10000 △ 100 %
26	CONTROL DEVIATION	CONT DEV	The difference between the reference given by the user and the actual reference the ACS 600 is following	-10000 △ -100 % 10000 △ 100 %

PROFIBUS Par. No. (Add 4000 in FMS Mode)	ACS 600 Parameter	Alternative Settings	Scaling
	10 START/STOP/DIR		
101	10.1 EXT1 STRT/STP/DIR	**1** = NOT SEL; **2** = DI1; **3** = DI1,2; **4** = DI1P,2P; **5** = DI1P,2P,3; **6** = DI1P,2P,3P; **7** = DI6; **8** = DI6,5; **9** = KEYPAD; **10** = COMM.MODULE	
102	10.2 EXT2 STRT/STP/DIR		
103	10.3 DIRECTION	**1** = FORWARD; **2** = REVERSE; **3** = REQUEST	
	11 REFERENCE SELECT		
126	11.1 KEYPAD REF SEL	**1** = REF1(rpm); **2** = REF2(%)	
127	11.2 EXT1/EXT2 SELECT	**1** = EXT1; **2** = EXT2; **3 ... 8** = DI1 ... DI6; **9** = COMM.MODULE	
128	11.3 EXT REF1 SELECT	**1** = KEYPAD; **2 ... 4** = AI1 ...AI3; **5** = AI1/JOYST; **6** = AI2/JOYST; **7** = AI1+AI3; **8** = AI2+AI3; **9** = AI1-AI3; **10** = AI2-AI3; **11** = AI1*AI3; **12** = AI2*AI3; **13** = MIN(AI1,AI3); **14** = MIN(AI2,AI3); **15** = MAX(AI1,AI3); **16** = MAX(AI2,AI3); **17** = DI3U,4D(R); **18** = DI3U,4D; **19** = DI5U,6D; **20** = COMM.MODULE	
129	11.4 EXT REF1 MINIMUM	0 ... 18000 rpm	1 △ 1 rpm
130	11.5 EXT REF1 MAXIMUM		
131	11.6 EXT REF2 SELECT	**1** = KEYPAD; **2 ... 4** = AI1 ...AI3; **5** = AI1/JOYST; **6** = AI2/JOYST; **7** = AI1+AI3; **8** = AI2+AI3; **9** = AI1-AI3; **10** = AI2-AI3; **11** = AI1*AI3; **12** = AI2*AI3; **13** = MIN(AI1,AI3); **14** = MIN(AI2,AI3); **15** = MAX(AI1,AI3); **16** = MAX(AI2,AI3); **17** = DI3U,4D(R); **18** = DI3U,4D; **19** = DI5U,6D; **20** = COMM.MODULE	
132	11.7 EXT REF2 MINIMUM	0 % ... 100 %	0 △ 0 % 10000 △ 100 %
133	11.8 EXT REF2 MAXIMUM	0 % ... 500 %	0 △ 0 % 5000 △ 500 %

PROFIBUS Par. No. (Add 4000 in FMS Mode)	ACS 600 Parameter	Alternative Settings	Scaling
	12 CONSTANT SPEEDS		
151	12.1 CONST SPEED SEL	**1** = NOT SEL; **2** = DI1 (SPEED1); **3** = DI2 (SPEED2); **4** = DI3 (SPEED3); **5** = DI4 (SPEED4); **6** = DI5 (SPEED5); **7** = DI6 (SPEED6); **8** = DI1,2; **9** = DI3,4; **10** = DI5, 6; **11** = DI1,2,3; **12** = DI3,4,5; **13** = DI4,5,6; **14** = DI3,4,5,6	
152	12.2 CONST SPEED 1		
153	12.3 CONST SPEED 2		
154	12.4 CONST SPEED 3		
155	12.5 CONST SPEED 4		
156	12.6 CONST SPEED 5		
157	12.7 CONST SPEED 6		
158	12.8 CONST SPEED 7		
159	12.9 CONST SPEED 8	0 ... 18000 rpm	1 ≙ 1 rpm
160	12.10 CONST SPEED 9		
161	12.11 CONST SPEED 10		
162	12.12 CONST SPEED 11		
163	12.13 CONST SPEED 12		
164	12.14 CONST SPEED 13		
165	12.15 CONST SPEED 14		
166	12.16 CONST SPEED 15		
	13 ANALOGUE INPUTS		
176	13.1 MINIMUM AI1	**1** = 0 mA; **2** = 2 V; **3** = TUNED VALUE; **4** = TUNE	
177	13.2 MAXIMUM AI1	**1** = 10 V; **2** = TUNED VALUE; **3** = TUNE	
178	13.3 SCALE AI1	0 ... 100 %	0 ≙ 0 % 10000 ≙ 100 %
179	13.4 FILTER AI1	0 s ... 10 s	0 ≙ 0 s 1000 ≙ 10 s
180	13.5 INVERT AI1	**0** = NO; **Hex FFFF** = YES	
181	13.6 MINIMUM AI2	**1** = 0 mA; **2** = 4 mA; **3** = TUNED VALUE; **4** = TUNE	
182	13.7 MAXIMUM AI2	**1** = 20 mA; **2** = TUNED VALUE; **3** = TUNE	
183	13.8 SCALE AI2	0 ... 100 %	0 ≙ 0 % 10000 ≙ 100 %
184	13.9 FILTER AI2	0 s ... 10 s	0 ≙ 0 s 1000 ≙ 10 s
185	13.10 INVERT AI2	**0** = NO; **Hex FFFF** = YES	
186	13.11 MINIMUM AI3	**1** = 0 mA; **2** = 4 mA; **3** = TUNED VALUE; **4** = TUNE	
187	13.12 MAXIMUM AI3	**1** = 20 mA; **2** = TUNED VALUE; **3** = TUNE	
188	13.13 SCALE AI3	0 ... 100 %	0 ≙ 0 % 10000 ≙ 100 %
189	13.14 FILTER AI3	0 s ... 10 s	0 ≙ 0 s 1000 ≙ 10 s
190	13.15 INVERT AI3	**0** = NO; **Hex FFFF** = YES	

PROFIBUS Par. No. (Add 4000 in FMS Mode)	ACS 600 Parameter	Alternative Settings	Scaling
	14 RELAY OUTPUTS		
201	14.1 RELAY RO1 OUTPUT	**1** = NOT USED; **2** = READY; **3** = RUNNING; **4** = FAULT; **5** = FAULT(-1); **6** = FAULT(RST); **7** = STALL WARN; **8** = STALL FLT; **9** = MOT TEMP WRN; **10** = MOT TEMP FLT; **11** = ACS TEMP WRN; **12** = ACS TEMP FLT; **13** = FAULT/WARN; **14** = WARNING; **15** = REVERSED; **16** = EXT CTRL; **17** = REF 2 SEL; **18** = CONST SPEED; **19** = DC OVERVOLT; **20** = DC UNDERVOL; **21** = SPEED 1 LIM; **22** = SPEED 2 LIM; **23** = CURRENT LIM; **24** = REF 1 LIM; **25** = REF 2 LIM; **26** = TORQUE 1 LIM; **27** = TORQUE 2 LIM; **28** = STARTED; **29** = LOSS OF REF; **30** = AT SPEED; **31** = ACT 1 LIM; **32** = ACT 2 LIM	
202	14.2 RELAY RO2 OUTPUT		
203	14.3 RELAY RO3 OUTPUT		
	15 ANALOGUE OUTPUTS		
226	15.1 ANALOGUE OUTPUT1	**1** = NOT USED; **2** = P SPEED; **3** = SPEED; **4** = FREQUENCY; **5** = CURRENT; **6** = TORQUE; **7** = POWER; **8** = DC BUS VOLT; **9** = OUTPUT VOLT; **10** = APPL OUTPUT; **11** = REFERENCE; **12** = CONTROL DEV; **13** = ACTUAL 1; **14** = ACTUAL 2	
227	15.2 INVERT AO1	**0** = NO; **Hex FFFF** = YES	
228	15.3 MINIMUM AO1	**1** = 0 mA; **2** = 4 mA	
229	15.4 FILTER AO1	0 s ... 10 s	0 △ 0 s 1000 △ 10 s
230	15.5 SCALE AO1	10 % ... 1000 %	100 △ 10 % 10000 △ 1000 %
231	15.6 ANALOGUE OUTPUT2	**1** = NOT USED; **2** = P SPEED; **3** = SPEED; **4** = FREQUENCY; **5** = CURRENT; **6** = TORQUE; **7** = POWER; **8** = DC BUS VOLT; **9** = OUTPUT VOLT; **10** = APPL OUTPUT; **11** = REFERENCE; **12** = CONTROL DEV; **13** = ACTUAL 1; **14** = ACTUAL 2	
232	15.7 INVERT AO2	**0** = NO; **Hex FFFF** = YES	
233	15.8 MINIMUM AO2	**1** = 0 mA; **2** = 4 mA	
234	15.9 FILTER AO2	0 s ... 10 s	0 △ 0 s 1000 △ 10 s
235	15.10 SCALE AO2	10 % ... 1000 %	100 △ 10 % 10000 △ 1000 %
	16 SYSTEM CTR INPUTS		
251	16.1 RUN ENABLE	**1** = YES; **2 ... 7** = DI1 ... DI6; **8** = COMM.MODULE	
252	16.2 PARAMETER LOCK	**0** = OPEN; **Hex FFFF** = LOCKED	
253	16.3 PASS CODE	0 ... 8 388 607	
254	16.4 FAULT RESET SEL	**1** = NOT SEL; **2 ... 7** = DI1 ... DI6; **8** = COMM.MODULE	
255	16.5 USER MACRO IO CHG	**1** = NOT SEL; **2 ... 7** = DI1 ... DI6	
	20 LIMITS		
351	20.1 MINIMUM SPEED	-18000/(number of pole pairs) rpm ... 18000/(number of pole pairs) rpm	1 △ 1 rpm
352	20.2 MAXIMUM SPEED		
353	20.3 MAXIMUM CURRENT	0 % I_{hd} ... 200 % I_{hd}	0 △ 0 % 20000 △ 200 %
354	20.4 MAXIMUM TORQUE	0 % ... 300 %	1 △ 1 %
355	20.5 OVERVOLTAGE CTRL	**0** = OFF; **Hex FFFF** = ON	
356	20.6 UNDERVOLTAGE CTRL		
357	20.7 MINIMUM FREQ	- 300 Hz ... 300 Hz (effective only when the SCALAR control mode is selected)	-30000 △ -300 Hz 30000 △ 300 Hz
358	20.8 MAXIMUM FREQ		

PROFIBUS Par. No. (Add 4000 in FMS Mode)	ACS 600 Parameter	Alternative Settings	Scaling
	21 START/STOP		
376	21.1 START FUNCTION	**1** = AUTO; **2** = DC MAGN; **3** = CNST DC MAGN	
377	21.2 CONST MAGN TIME	30 ms ... 10000 ms	1 △ 1 ms
378	21.3 STOP FUNCTION	**1** = COAST; **2** = RAMP	
379	21.4 DC HOLD	**0** = OFF; **Hex FFFF** = ON	
380	21.5 DC HOLD SPEED	0 rpm ... 3000 rpm	1 △ 1 rpm
381	21.6 DC HOLD CURR	0 % ... 100 %	1 △ 1 %
	22 ACCEL/DECEL		
401	22.1 ACC/DEC 1/2 SEL	**1** = ACC/DEC 1; **2** = ACC/DEC 2; **3 ... 8** = DI1 ... DI6	
402	22.2 ACCELER TIME 1		
403	22.3 DECELER TIME 1	0 s ... 1800 s	0 △ 0 s 18000 △ 1800 s
404	22.4 ACCELER TIME 2		
405	22.5 DECELER TIME 2		
406	22.6 ACC/DEC RAMP SHPE	**1** = LINEAR; **2** = S1; **3** = S2; **4** = S3	
	23 SPEED CTRL		
426	23.1 GAIN	0.0 ... 100	0 △ 0 10000 △ 100
427	23.2 INTEGRATION TIME	0 s ... 320 s	0 △ 0 s 3200 △ 320 s
428	23.3 DERIVATION TIME	0 s ... 10 s	0 △ 0 s 10000 △ 10 s
429	23.4 ACC COMPENSATION	0.00 s ... 100.00 s	0 △ 0 s 1000 △ 100 s
430	23.5 SLIP GAIN	0.0 % ... 400.0 %	1 △ 1 %
431	23.6 AUTOTUNE RUN ?	**0** = NO; **Hex FFFF** = YES	
	24 TORQUE CTRL	(EFFECTIVE ONLY WHEN THE TORQUE CONTROL MACRO IS SELECTED)	
451	24.1 TORQ RAMP UP	0.00 s ... 10.00 s	0 △ 0 s 100 △ 10 s
452	24.2 TORQ RAMP DOWN	0.00 s ... 10.00 s	
	25 CRITICAL SPEEDS		
476	25.1 CRIT SPEED SELECT	**0** = OFF; **Hex FFFF** = ON	
477	25.2 CRIT SPEED 1 LOW		
478	25.3 CRIT SPEED 1 HIGH		
479	25.4 CRIT SPEED 2 LOW		
480	25.5 CRIT SPEED 2 HIGH		
481	25.6 CRIT SPEED 3 LOW		
482	25.7 CRIT SPEED 3 HIGH	0 rpm ... 18000 rpm	1 △ 1 rpm
483	25.8 CRIT SPEED 4 LOW		
484	25.9 CRIT SPEED 4 HIGH		
485	25.10 CRIT SPEED 5 LOW		
486	25.11 CRIT SPEED 5 HIGH		

PROFIBUS Par. No. (Add 4000 in FMS Mode)	ACS 600 Parameter	Alternative Settings	Scaling
	26 MOTOR CONTROL		
501	26.1 FLUX OPTIMIZATION	**0** = NO; **Hex FFFF** = YES	
502	26.2 FLUX BRAKING		
503	26.3 IR COMPENSATION	0 % ... 30 % (effective only when the SCALAR motor control mode is selected)	1 △ 1 %
	30 FAULT FUNCTIONS		
601	30.1 AI<MIN FUNCTION	**1** = FAULT; **2** = NO; **3** = CONST SP 15; **4** = LAST SPEED	
602	30.2 PANEL LOSS	**1** = FAULT; **2** = CONST SP 15; **3** = LAST SPEED	
603	30.3 EXTERNAL FAULT	**1** = NOT SEL; **2 ... 7** = DI1 ... DI6	
604	30.4 MOTOR THERM PROT	**1** = FAULT; **2** = WARNING; **3** = NO	
605	30.5 MOT THERM P MODE	**1** = DTC; **2** = USER MODE; **3** = THERMISTOR	
606	30.6 MOTOR THERM TIME	256 s ... 10 000 s	1 △ 1 s
607	30.7 MOTOR LOAD CURVE	50 % ... 150 %	1 △ 1 %
608	30.8 ZERO SPEED LOAD	25 % ... 150 %	
609	30.9 BREAK POINT	1 Hz ... 300 Hz	100 △ 1 Hz 30000 △ 300 Hz
610	30.10 STALL FUNCTION	**1** = FAULT; **2** = WARNING; **3** = NO	
611	30.11 STALL FREQ HI	0.5 Hz ... 50 Hz	50 △ 0.5 Hz 5000 △ 50 Hz
612	30.12 STALL TIME	10 s ... 400 s	1 △ 1 s
613	30.13 UNDERLOAD FUNC	**1** = NO; **2** = WARNING; **3** = FAULT	
614	30.14 UNDERLOAD TIME	0 s ... 600 s	1 △ 1 s
615	30.15 UNDERLOAD CURVE	**1**; **2**; **3**; **4**; **5**	
616	30.16 MOTOR PHASE LOSS	**0** = NO; **Hex FFFF** = FAULT	
617	30.17 EARTH FAULT		
618	30.18 COMM FAULT FUNC	**1** = FAULT; **2** = NO; **3** = CONST SP 15; **4** = LAST SPEED	
619	30.19 COMM FAULT TIMEOUT	0.1 s ... 60 s	10 △ 0.1 s 6000 △ 60 s
	31 AUTOMATIC RESET		
626	31.1 NUMBER OF TRIALS	**1**; **2**; **3**; **4**; **5**	
627	31.2 TRIAL TIME	1.0 s ... 180.0 s	100 △ 1 s 18000 △ 180 s
628	31.3 DELAY TIME	0.0 s ... 60.0 s	100 △ 1 s 6000 △ 60 s
629	31.4 OVERCURRENT	**0** = NO; **Hex FFFF** = YES	
630	31.5 OVERVOLTAGE		
631	31.6 UNDERVOLTAGE		
632	31.7 AI SIGNAL<MIN		

PROFIBUS Par. No. (Add 4000 in FMS Mode)	ACS 600 Parameter	Alternative Settings	Scaling
	32 SUPERVISION		
651	32.1 SPEED1 FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
652	32.2 SPEED1 LIMIT	-18000 rpm ... 18000 rpm	1 △ 1 rpm
653	32.3 SPEED2 FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
654	32.4 SPEED2 LIMIT	-18000 rpm ... 18000 rpm	1 △ 1 rpm
655	32.5 CURRENT FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
656	32.6 CURRENT LIMIT	0 ... 1000 A	1 △ 1 A
657	32.7 TORQUE 1 FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
658	32.8 TORQUE 1 LIMIT	0 % ... 400 %	1 △ 1 %
659	32.9 TORQUE 2 FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
660	32.10 TORQUE 2 LIMIT	0 % ... 400 %	1 △ 1 %
661	32.11 REF1 FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
662	32.12 REF1 LIMIT	0 rpm ... 18000 rpm	1 △ 1 rpm
663	32.13 REF2 FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
664	32.14 REF2 LIMIT	0 % ... 500 %	1 △ 1 %
665	32.15 ACT1 FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
666	32.16 ACT1 LIMIT	0 % ... 200 %	0 △ 0 % 20000 △ 200 %
667	32.17 ACT2 FUNCTION	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
668	32.18 ACT2 LIMIT	0 % ... 200 %	0 △ 0 % 20000 △ 200 %
	33 INFORMATION		
676	33.1 DTC SW VERSION	(Version of the ACS 600 software)	
677	33.2 APPL SW VERSION	(Version of the ACS 600 software)	
678	33.3 TEST DATE	(Date Tested)	
679	33.4 SERIAL NUMBER	(Serial number of the ACS 600)	
	34 PROCESS SPEED	(EFFECTIVE ONLY WITH APPLICATION SOFTWARE VERSION ≥ 2.5)	
701	34.1 SCALE	1 ... 30000	1 △ 1
702	34.2 UNIT	**1** = NO; **2** = rpm; **3** = %; **4** = m/s	

PROFIBUS Par. No. (Add 4000 in FMS Mode)	ACS 600 Parameter	Alternative Settings	Scaling
	40 PID CONTROL	(EFFECTIVE ONLY WHEN THE PID CONTROL MACRO IS SELECTED)	
851	40.1 PID GAIN	0.1 ... 100	10 ≙ 0.1 10000 ≙ 100
852	40.2 PID INTEG TIME	0.02 s ... 320.00 s	2 ≙ 0.02 s 32000 ≙ 320 s
853	40.3 PID DERIV TIME	0.00 s ... 10.00 s	100 ≙ 1 s 1000 ≙ 10 s
854	40.4 PID DERIV FILTER		
855	40.5 ERROR VALUE INV	**0** = NO; **Hex FFFF** = YES	
856	40.6 ACTUAL VALUE SEL	**1** = ACT1; **2** = ACT1-ACT2; **3** = ACT1+ACT2; **4** = ACT1*ACT2; **5** = ACT1/ACT2; **6** = MIN(A1,A2); **7** = MAX(A1,A2); **8** = sqrt(A1-A2); **9** = sqA1+sqA2	
857	40.7 ACTUAL1 INPUT SEL	**1** = AI1; **2** = AI2; **3** = AI3	
858	40.8 ACTUAL2 INPUT SEL		
859	40.9 ACT1 MINIMUM	-1000 % ... 1000 %	-10000 ≙ -1000 % 10000 ≙ 1000 %
860	40.10 ACT1 MAXIMUM		
861	40.11 ACT2 MINIMUM		
862	40.12 ACT2 MAXIMUM		
	50 ENCODER MODULE		
1001	50.1 PULSE NR	0 ... 2999	
1002	50.2 SPEED MEAS MODE	**0** = A ˍˉ B DIR; **1** = A ˍˊ; **2** = A ˍˊ B DIR; **3** = A ˍˊ B ˍˊ	
1003	50.3 ENCODER FAULT	**0** = WARNING; **Hex FFFF** = FAULT	
	51 COMMUNICATION MODULE		
1026	51.1 MODULE TYPE	(NPBA-01 SW1.0)	
1027	51.2 PROFIBUS MODE	**0** = FMS; **1** = DP-PPO1; **2** = DP-PPO2; **3** = DP-PPO3; **4** = DP-PPO4; **5** = DP-PPO5	
1028	51.3 STATION NUMBER	**2**, ..., **126**	
1029	51.4 BIT RATE SELECT	**0** = 9.6KBIT; **1** = 19.2KBIT; **2** = 93.75KBIT; **3** = 187.5KBIT; **4** = 500KBIT; **5** = 1.5MBIT; **6** = AUTO	
1030	51.5 WRITE PPO DATA SET SEL	**0**, ..., **255**	
1031	51.6 READ PPO DATA SET SEL	**0**, ..., **255**	
	98 OPTION MODULES		
1901	98.1 ENCODER MODULE	**0** = NO; **Hex FFFF** = YES	
1902	98.2 COMM. MODULE		
1903	98.3 DI/O EXT MODULE 1		
1904	98.4 DI/O EXT MODULE 2		
1905	98.5 DI/O EXT MODULE 3		
1906	98.6 AI/O EXT MODULE		

PROFIBUS Par. No. (Add 4000 in FMS Mode)	ACS 600 Parameter	Alternative Settings	Scaling
	99 START-UP DATA		
1926	99.1 LANGUAGE	**0** = ENGLISH; **1** = ENGLISH(AM); **2** = DEUTSCH; **3** = ITALIANO; **4** = ESPANOL; **5** = PORTUGESE; **6** = NEDERLANDS; **7** = FRANCAIS; **8** = DANSK; **9 =**	
1927	99.2 APPLICATION MACRO	**1** = FACTORY; **2** = HAND/AUTO; **3** = PID CTRL; **4** = T CTRL; **5** = SEQ CTRL; **6** = USER 1 LOAD; **7** = USER 1 SAVE; **8** = USER 2 LOAD; **9** = USER 2 SAVE	
1928	99.3 APPLIC RESTORE	**1** = NO; **2** = YES	
1929	99.4 MOTOR CTRL MODE	**0** = DTC; **Hex FFFF** = SCALAR	
1930	99.5 MOTOR NOM VOLTAGE	0 * U_N of ACS 600 ... 2 * U_N of ACS 600 (printed on the motor nameplate)	
1931	99.6 MOTOR NOM CURRENT	0 * I_{hd} of ACS 600 ... 3 * I_{hd} of ACS 600 (printed on the motor nameplate)	
1932	99.7 MOTOR NOM FREQ	8 Hz ... 300 Hz (printed on the motor nameplate)	
1933	99.8 MOTOR NOM SPEED	1 rpm ... 20 000 rpm (printed on the motor nameplate)	
1934	99.9 MOTOR NOM POWER	0 kW ... 9000 1 kW (printed on the motor nameplate)	
1935	99.10 MOTOR ID RUN	**1** = NO; **2** = STANDARD; **3** = REDUCED	

Table A-3 Profile-specific Parameters.

PROFIBUS Par. No. (Add 4000 in FMS Mode)	Parameter Name	Description
900 ... 904	PPO WRITE	Message type for cyclic write operation (W). See Chapter 6
907 ... 910	PPO READ	Message type for cyclic read operation (R). See Chapter 6
913	PPO BROADCAST OBJECT NUMBER	The object number for Broadcast messages.
914	PPO OFFSET	The location of the PPO message for a certain slave station
918	STATION NUMBER	Station number (address) (R) Allowable values: **2, ..., 126**
927	SERVICE PRIORITY (PARAMETER IDENTIFICATION)	(R) **1** = PROFIBUS Control
928	SERVICE PRIORITY (PROCESS DATA)	(R) **1** = PROFIBUS Control
947	FAULT	The last fault occurred in the drive (unsigned16) (R)
964	DEVICE IDENTIFICATION	Drive identification (R)
965	PROFILE NUMBER	Profile number for drives (R)
966	FMA SERVICES	FMA services supported by drive (R)
967	CONTROL WORD	16-bit word for controlling the drive (R/W)
968	STATUS WORD	16-bit word indicating drive status (R)
970	MACRO NUMBER	Drive macro (R)
971	STORE	Saves drive parameters to drive memory as User Macro 2 (R/W)
1999	REQUEST SIGNAL INFORMATION	**2** = Request signals lost **4** = Actual values not updated (due to software/hardware error)

Appendix B – Definitions and Abbreviations

PROFIBUS 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)
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	Word from master to slave with bit-coded control signals
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
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	Value that can be accessed as Object, e.g. variable, constant, signal
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
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	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(e)*
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 Value *Hauptsollwert*
IM318	ET200 Slave Station
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 Value
Sollwert(e)

SPM   Request Signal
Spontanmeldung

STW   Control Word
Steuerwort

ZSW   Status Word
Zustandswort

Appendix C – Technical Data

Slave Link   **Compatible Devices:** All ACS 600 Fieldbus Adapter modules, ACS 600 Frequency Converters

Size of the Link: 2 stations

Topology: Point-to-point

Serial Communication Type: Synchronous, full Duplex

Transmission Rate: 4 Mbit/s

Protocol: Distributed Drives Communication System (DDCS)

Cable: Fibre optic cable

- Construction: Plastic core, diameter 1 mm, sheathed with plastic jacket

- Attenuation: 0.31 dB/m

- Maximum Length between Stations: 10 m

- Specifications:

Parameter	Minimum	Maximum	Unit
Storage Temperature	-55	+85	°C
Installation Temperature	-20	+70	°C
Short Term Tensile Force		50	N
Short Term Bend Radius	25		mm
Long Term Bend Radius	35		mm
Long Term Tensile Load		1	N
Flexing		1000	cycles

Connectors: Blue - receiver; grey - transmitter

Fieldbus Link

Compatible Devices: All devices compatible with the PROFIBUS-DP and PROFIBUS-FMS protocols

Size of the Link: 127 stations with repeaters (32 stations per segment)

Topology: Linear bus

Serial Communication Type: Asynchronous, half Duplex

Transmission Rate: 9.6, 19.2, 93.75, 187.5, 300 or 1500 kbit/s

Protocol: PROFIBUS-DP or PROFIBUS-FMS

Cable: Shielded, twisted pair RS485 cable

- Termination: built in the NPBA-01 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):

	Transmission rate (kbit/s)			
	$\leq$ **93.75**	**187.5**	**500**	**1500**
Line A	1200	1000	400	200
Line B	1200	600	200	–

NPBA-01

Enclosure: Plastic, dimensions 45 × 75 × 105 mm, Class IP 20

Mounting: Onto a standard mounting rail

Settings: Parameter Group 51 (set with the CDP 311 Control Panel)

Connectors:

- Light transmitter (grey) and receiver (blue) for ACS 600 connection

- One Combicon MVSTBW 2,5/8-ST-5,08 (8-pole, cross-section 2.5 mm^2 max.) screw terminal block for the fieldbus and power supply:

	X2	Description
1	D(P)	D(P) = Data Positive (Conductor 1 in twisted pair)
2	D(N)	D(N) = Data Negative (Conductor 2 in twisted pair) DG = Data Ground
3	DG	
4	SHF	Filtered Shield (Earthed via an RC filter)
5	SH	Shield (Earthed)
6	0V	Power supply for the module (3 W). From the NIOC card of the ACS 600 (Terminal: X23.1 = +24 V, X23.2 = Earth/0 V) or from another stable 24 V d.c. supply.
7	+24 V	
8	PE	Earth

General:

- All materials are UL/CSA approved

- Fast transient burst immunity: According to standard IEC 801-4: 4 kV 5/50 ns

- Noise emissions: According to standard EN 55022 B

Appendix D – Ambient Conditions

Ambient Conditions, Operation

Ambient operating conditions refer to the conditions the option module is subjected to when installed for stationary use.

Air Temperature: 0 to +50 °C

Relative Humidity: 5 to 95 %, no condensation allowed. Maximum allowed relative humidity is 60 % in the presence of corrosive gases.

Contamination Levels:
Chemical gases: IEC 721-3-3, Class 3C2
Solid particles: IEC 721-3-3, Class 3S2

Installation Site Altitude: 0 to 2000 m. If installation site is above 2000 m, contact local ABB representative.

Vibration: Max 1.5 mm (2 to 9 Hz), max 5 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 70 m/s^2, 22 ms (IEC 68-2-27)

Ambient Conditions, Storage

Ambient storage conditions refer to the conditions the option module is subjected to during storage in the protective package.

Temperature: -40 to +70 °C.

Relative Humidity: Less than 95 %, no condensation allowed

Atmospheric Pressure: 70 to 106 kPa

Vibration: Max 1.5 mm (2 to 9 Hz), max 5 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 100 m/s^2, 11 ms (IEC 68-2-27)

Ambient Conditions, Transportation

Ambient transportation conditions refer to the conditions the option module is subjected to during transportation in the protective package.

Temperature: -40 to +70 °C

Relative Humidity: Less than 95 %, no condensation allowed.

Atmospheric Pressure: 60 to 106 kPa

Vibration: Max 3.5 mm (2 to 9 Hz), max 15 m/s^2 (9 to 200 Hz) sinusoidal (IEC 68-2-6)

Shock: Max 100 m/s^2, 11 ms (IEC 68-2-27)

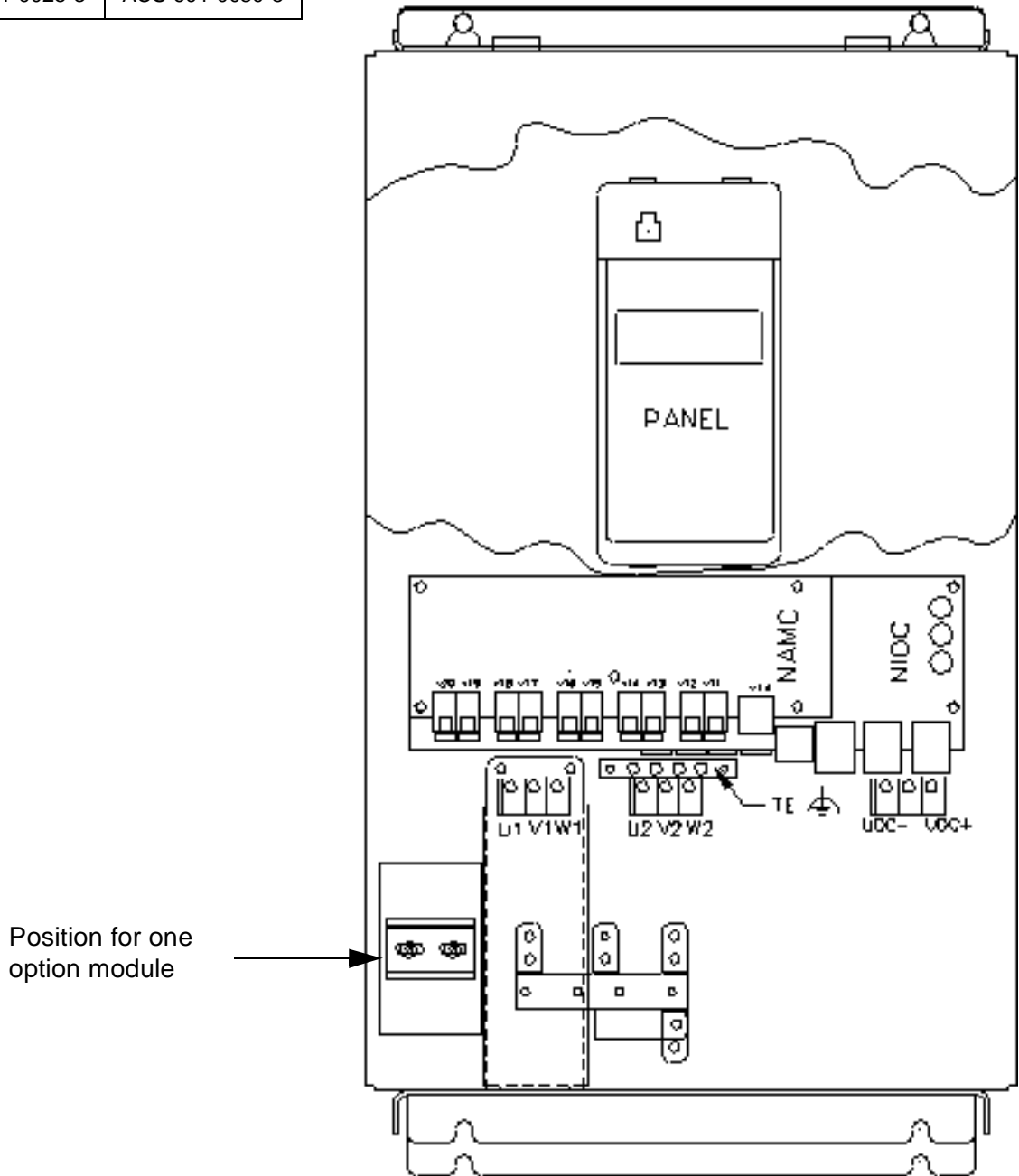**Bump:** Max 300 m/s^2, 6 ms (IEC 68-2-29)

Free Fall: 250 mm

Appendix E – Assembly Drawings

ACS 601, Frame R4

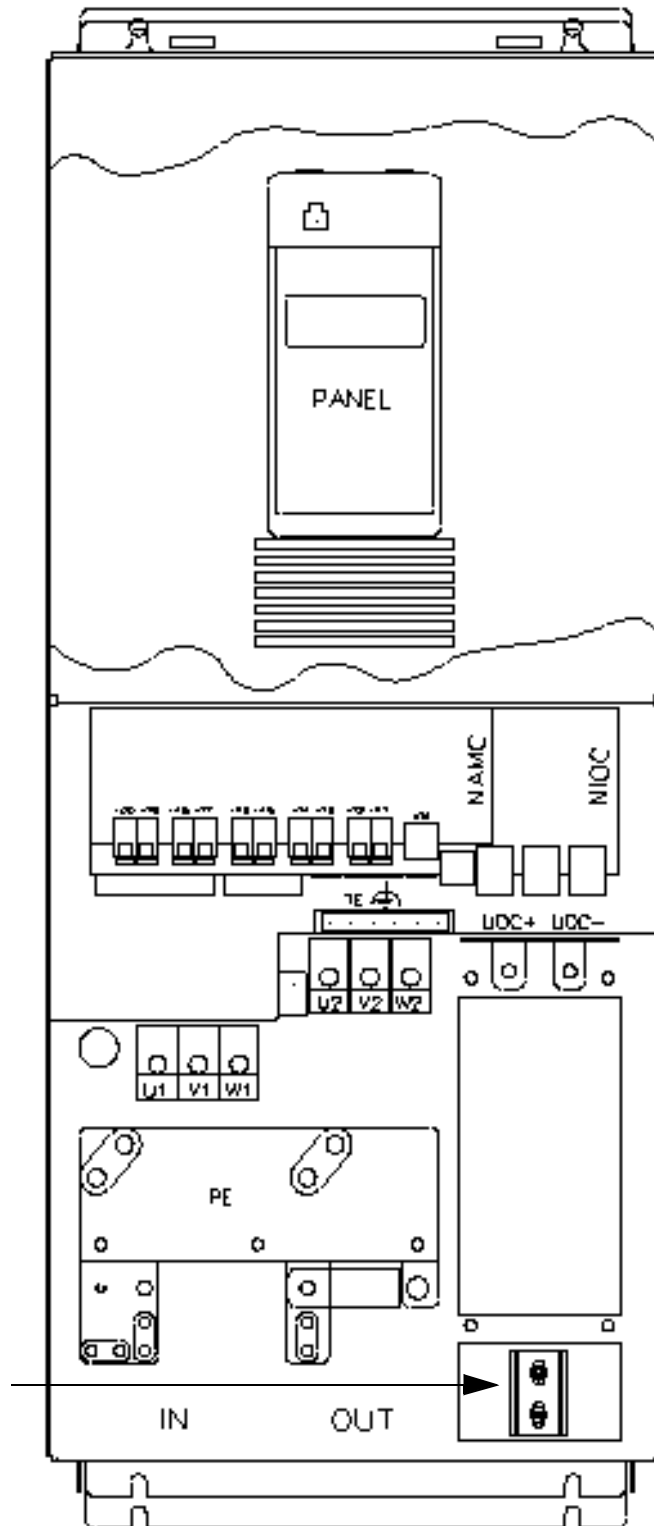|	
ACS 601-0020-3	ACS 601-0025-5
ACS 601-0025-3	ACS 601-0030-5

Front view

Position for one
option module

ACS 601, Frames R5 & R6

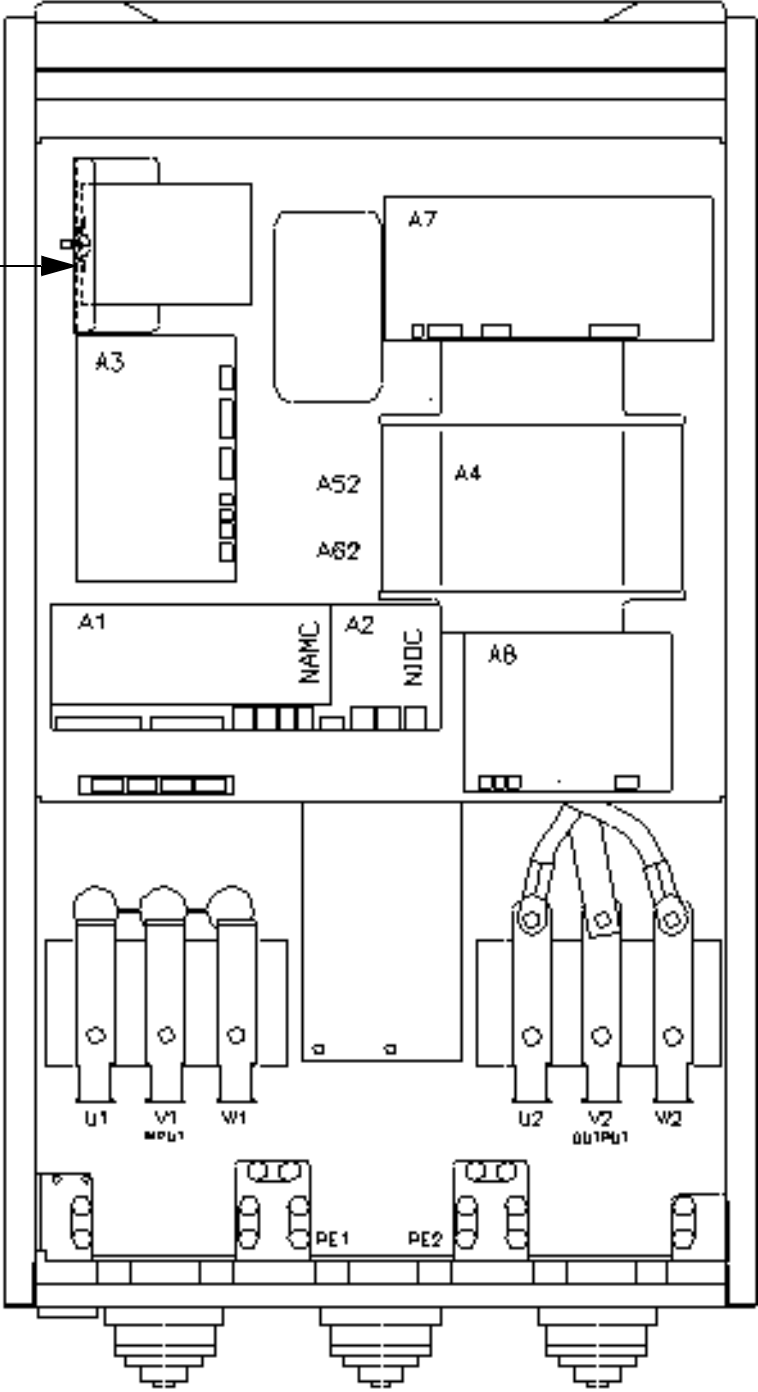| ACS 601-0030-3	ACS 601-0040-5
ACS 601-0040-3	ACS 601-0050-5
ACS 601-0050-3	ACS 601-0060-5
ACS 601-0060-3	ACS 601-0070-5
ACS 601-0070-3	ACS 601-0100-5

Front view

Position for one option module

ACS 601, Frame R7

ACS 601-0100-3	ACS 601-0120-5
ACS 601-0120-3	ACS 601-0140-5

Front view
cover removed

Position for one
option module

ACS 603, Frame R7

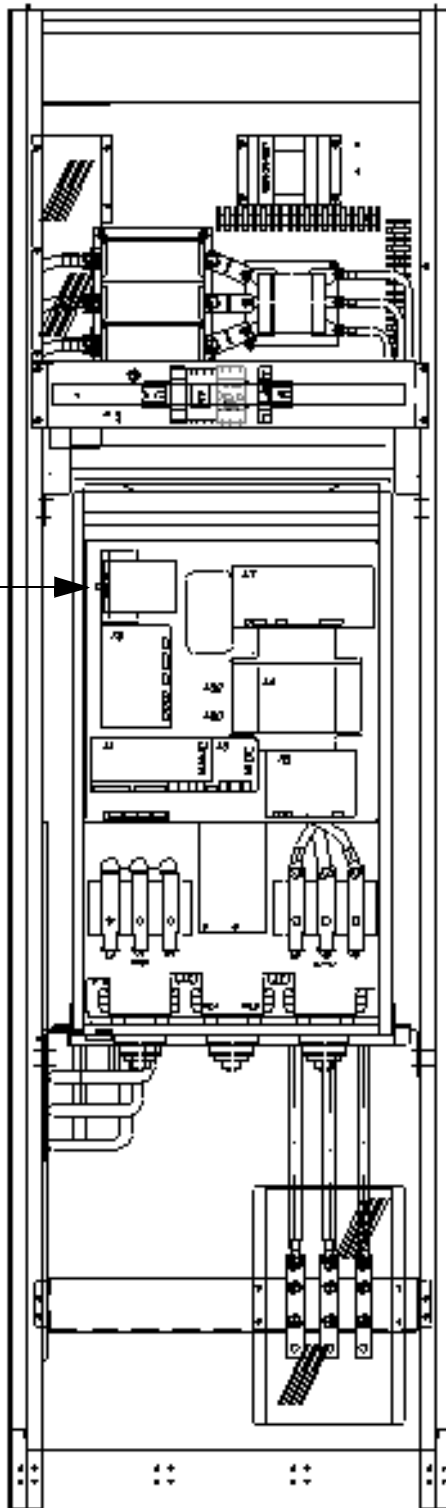|	
ACS 603-0100-3	ACS 603-0120-5
ACS 603-0120-3	ACS 603-0140-5

Front view
door open
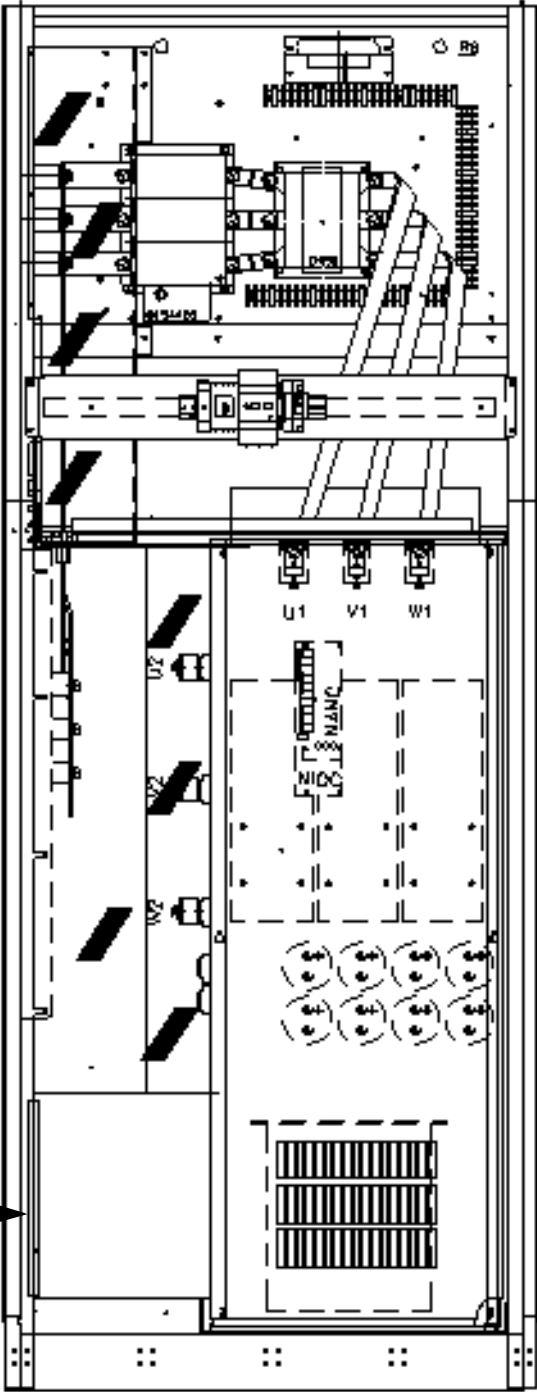converter unit cover removed

Position for one
option module

ACS 603, Frames R8 & R9

ACS 603-0140-3	ACS 603-0170-5
ACS 603-0170-3	ACS 603-0210-5
ACS 603-0210-3	ACS 603-0260-5
ACS 603-0260-3	ACS 603-0320-5
ACS 603-0320-3	ACS 603-0400-5

Front view
door open
converter unit cover removed

Mounting rail for six option modules and the power supply module

Appendix F – NPBA-01 Type Definition Program

This appendix contains information for setting up a Siemens ET 200 system for use with an ACS 600.

The program listed below should be typed in and saved to the same directory location at the PROFIBUS master as the controller programs. The file should be named **PROFI@T**X**.200** (where X is substituted with the ET 200 package language, eg. D = German, E = English, I = Italian, etc.). The program adds the ACS 600 to the ET 200 Slave Selection list. After this, the parameters of the new slave selection should be set according to Table F-1 (next page).

```
Typbeschreibungsdatei PROFIDRIVE-Slave
V4.0;
PROFIDRIVE-SLAVE ;
SIEMENS   ;
SIMATIC_S5;
ET200    ;
ET200U/DP      ;
02069;
J;
J;
N;
J;
J;
N;
N;
N;
J;
N;
N;
N;
N;
N;
00020;
0001011111;
032;
032;
032;
016;
007;
PV000;
PSL000;
KV000;
SY;
DKM000;
```

Table F-1 PROFIDRIVE-SLAVE Configuration.

	0	1	2	3	. . .
PPO1	4AX	2AX			
PPO2	4AX	4AX	2AX		
PPO3	2AX				
PPO4	4AX	2AX			
PPO5	4AX	4AX	4AX	2AX	

ABB