ACS 600

Installation and Start-up Guide

Modbus Plus Adapter Module
NMBP-01

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Installation and Start-up Guide

3AFY 58919802 R0125 REV B

EFFECTIVE: 1996-03-01
SUPERSEDES: None

Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing and operating the NMBP-01 Modbus Plus 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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Chapter 1 – Introduction

This chapter introduces the contents and divisions of this Guide.

How to Use this Guide

The purpose of this Guide is to provide the information necessary to install, commission, use, and to fault diagnose the Modbus Plus communication adapter.

Safety Instructions gives the general safety instructions which apply to ACS 600 and all of its option modules. This chapter also describes the formats and meanings for various warnings used within this guide.

Chapter 1 – Introduction, the chapter you are reading now, contains a short description of this manual and a list of related publications.

Chapter 2 – Overview contains a short description of the Modbus Plus network and of the Modbus Plus adapter module. Delivery check list for field installation, and liability of manufacturer.

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

Chapter 4 – Electrical Installation contains instructions for wiring the module to power supply, Modbus Plus network, and to the ACS 600 drive.

Chapter 5 – Programming explains how to program the ACS 600 drive for the Modbus Plus communication, and what additional parameters are available with the module.

Chapter 6 – Communication describes what drive features and parameters can be accessed through the Modbus Plus communication module. There is also information on drive control and how to read the drive actual values and status information through the Modbus Plus connection.

This chapter also discusses the performance of the Modbus Plus connection.

Chapter 7 – Fault Tracing describes how to fault diagnose the Modbus Plus connection during installation, commissioning, and normal operation.

Appendix A – Technical Data contains the technical information on the Modbus Plus module.

Appendix B – Parameter Scaling contains a complete list of all the parameters, their 4xxxx register addresses, and the scaling accessible through the Modbus Plus network.

Appendix C – Assembly Drawings contains drawings that assist in placing the option module.

Conventions Used in this Guide

This Guide uses some terms and conventions that all readers might not be familiar with. Some of these terms are described here.

Data set

Data set is a fast control and feedback value area in the ACS 600 drive. Data sets give the fastest possible control to the drive.

Global Data

The Modbus Plus network has a service called Global Data. This is a fast data transfer between devices on the Modbus Plus network. Global Data is designed for sending time-critical control or feedback values to and from devices on the network. Modicon PLCs and ACS 600 drives support the global data transfer.

4XXXX Register Area

Modicon PLCs have a signed integer data table area, which is used for Analogue output modules and for storing temporary or set-point values. These registers are in the address area starting from 40001. The last register address available on PLCs depends on the available memory, but is less than 49999.

The ACS 600 drive simulates this area by providing a read and write access to its parameters through this register address area.

Related Publications

ACS 600 Programming Manual

Modicon *Modbus Plus Network Planning and Installation Guide.*

Chapter 2 – Overview

This chapter describes the NMBP-01 Module, and gives the Warranty and Liability information of the Manufacturer.

Overview

The NMBP-01 Modbus Plus Adapter Module is for connecting the ACS 600 drive directly to the Modicon Modbus Plus network.

The NMBP-01 supports the read and write access to the drive parameters and ‘ data sets’ , as well as receiving and sending global data for critical drive control and feedback values.

Delivery Check

The field installation Modbus Plus option package include:

- NMBP-01 Adapter Module
- Three pairs of fibre optic cables
- Mounting rail
- *Installation and Start-up Guide for NMBP-01*.

Compatibility

The NMBP-01 has been tested and approved by Modicon as a part of the ModConnect program acceptance.

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 – 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). Six option modules (plus the NPSM-01 Power Supply module) 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 B). 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).

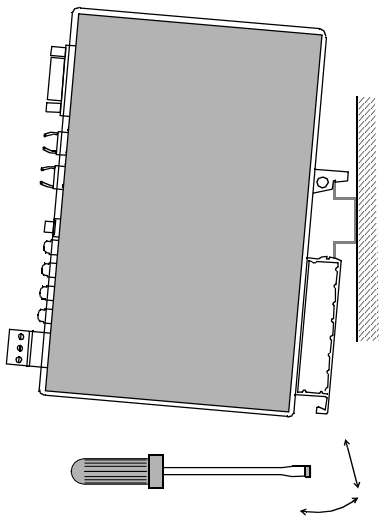

Figure 3-1 Mounting and removing the module.

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 D - 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 D - 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

This chapter gives wiring instructions for wiring the NMBP-01 Modbus Plus option module to 24 VDC power, fibre link connection to the drive, and to the Modbus Plus network.

WARNING! Verify that the ACS 600 is not powered before starting the installation.

NMBP-01 Connectors

The NMBP-01 module has multiple connectors on its front plate. These are shown in Figure 4-1 below.

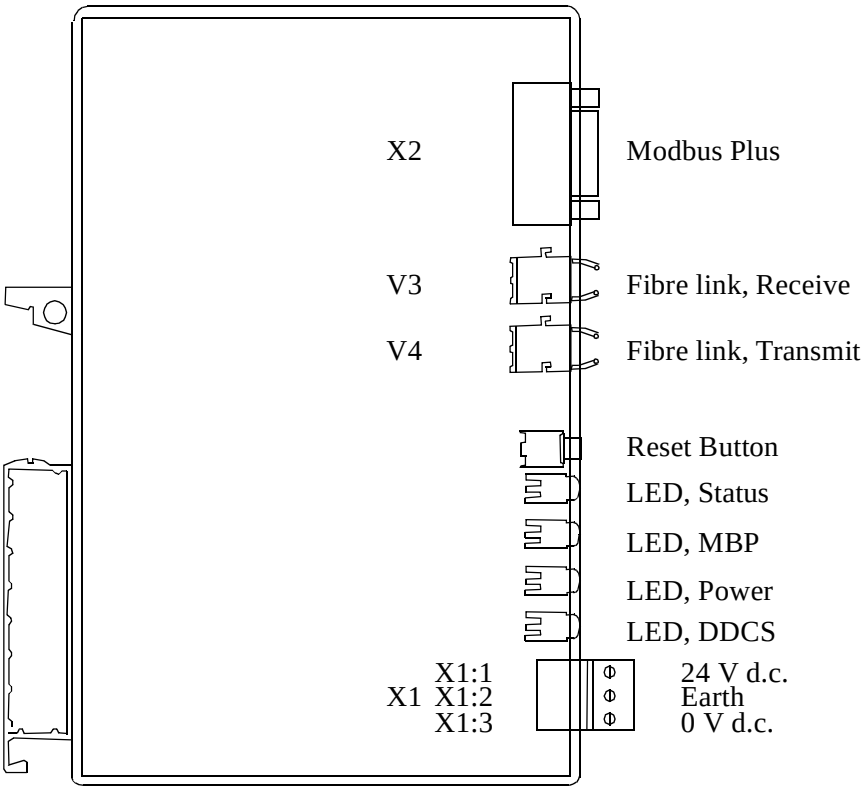

Figure 4-1 NMBP-01 Front Connections.

X1 This is the power connector for the module with the following terminals:

- X1:1 is for regulated 24 V d.c.
- X1:2 is for earthing the shield of the X2 Modbus Plus network
- X1:3 is for 0 V d.c.

X2 This is the standard Modbus Plus connector.

V3 This is the fibre link receive from the drive.

V4 This is the fibre link transmit to the drive.

Wiring

The 24 V d.c. power should be connected to the NMBP-01 using insulated wire with 16 – 20 AWG (0.5 to 1.5 mm^2).

24 V d.c. Power

The Modbus Plus module needs to be supplied from a stabilised 24 V d.c. auxiliary power supply. This power can be taken from the ACS 600 drive to a maximum of one option module per drive. If this auxiliary power is already in use, the NMBP-01 must be powered from an external power supply.

The built-in auxiliary power supply on the drive is located on the standard I/O (NIOC) card, terminal block **X23** (**1***:* +24 V d.c.; **2**: 0 V). See Figure 4-2 (next page) for details.

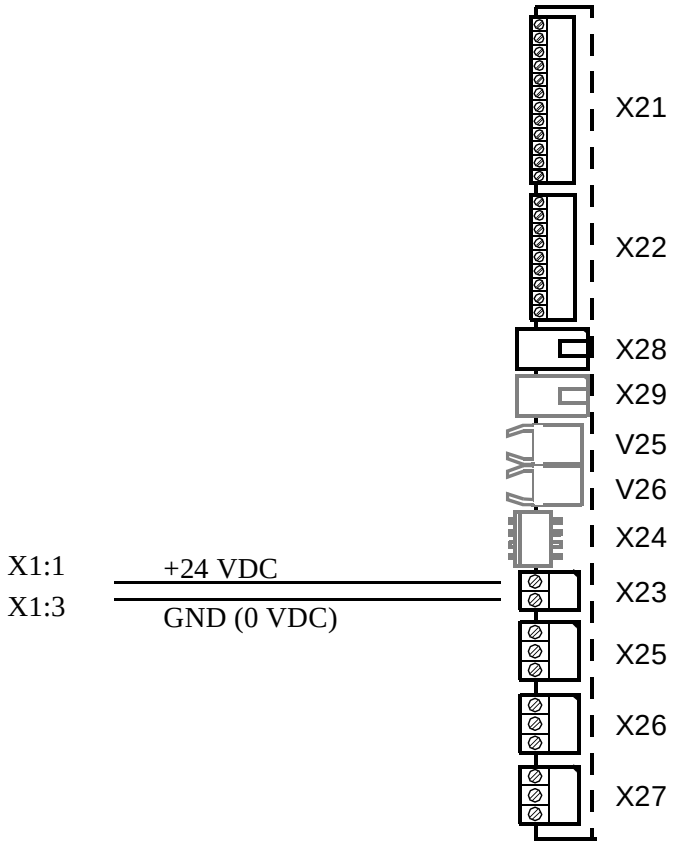

Figure 4-2 Drive Auxiliary Power Supply.

The power and earthing connector is on the bottom of the option module. The connection is shown in Figure 4-3 below.

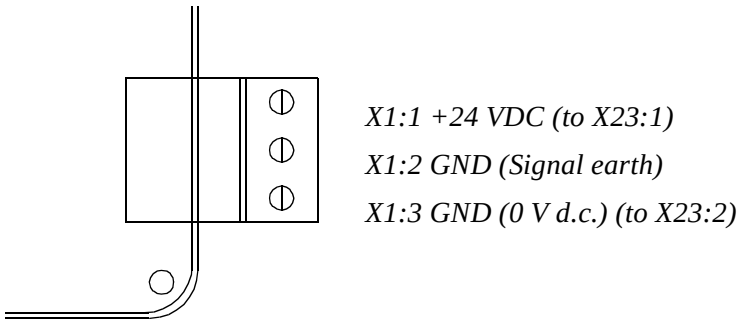

Figure 4-3 NMBP-01 Power Connector.

In this figure, the 24 V d.c. is connected to terminal 1, and the power 0 V d.c. to 3. Terminal 2 is for signal earth, which is used to terminate the shield of the Modbus Plus network. This signal earth must be connected to a noise-free earth, and not to a earth where high power devices are earthed.

Fibre Link The fibre link is used for electrically isolating the option modules from the high power components. Handle the optic cables with care. For ratings of the optic cables ABB is supplying with the drives, see Table 4-1 below.

Parameter	Minimum	Maximum	Unit
Storage Temperature	-55 (-67)	+85 (185)	° C (° F)
Installation Temperature	-20 (-4)	+70 (158)	° C (° F)
Short Term Tensile Force		50	N
Short Term Bend Radius	25 ($^{31}/_{32}$")		mm (in)
Long Term Bend Radius	35 (1 $^{3}/_{8}$")		mm (in)
Long Term Tensile Load		1	N
Flexing		1000	cycles

Table 4-1 Fibre Optic Cable Ratings.

The fibre link must be connected between the drive NAMC-01 board and the NMBP-01 Module. Two fibres are needed to connect the Modbus Plus module to the drive. See Figure 4-4 below for correct connection.

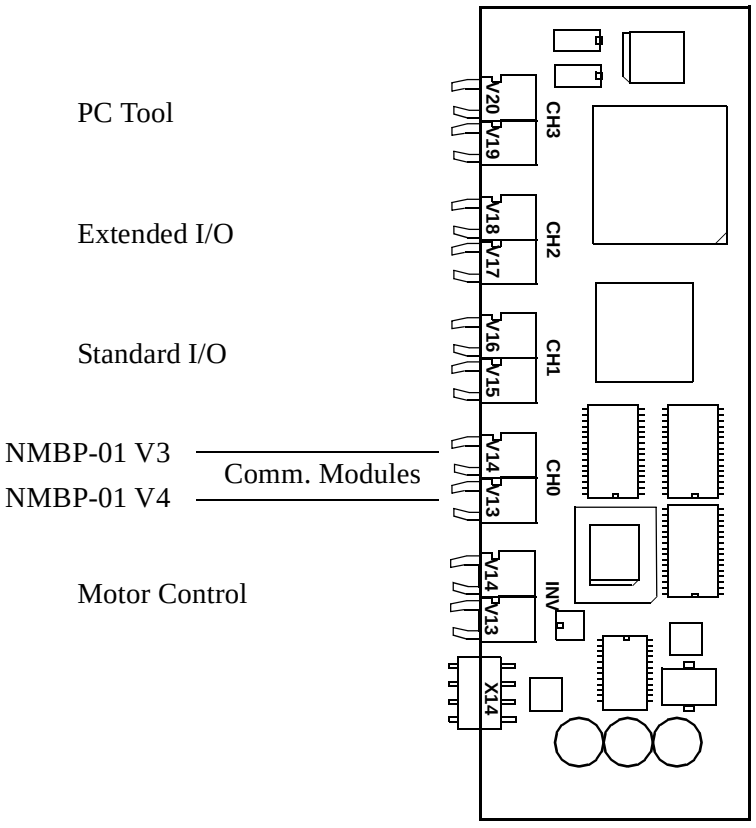

Figure 4-4 NAMC Board Fibre Connection.

Modbus Plus

The NMBP-01 option module has the standard 9-pin D-shell Modbus Plus connector on top of the front plate.

The following chapters are used by permission of Modicon. These chapters are taken from Modicon publication *" Modbus Plus Network Planning and Installation Guide"* (GM-MBPL-001 Rev. D).

Modbus Plus Cable

The cable type specified for network use is:

Manufacturer:	Belden Corporation
Telephone:	(317) 983-5200
Cable Type:	9841

Description: Twisted pair, shielded, with insulating outer jacket NEC/UL CM (communications) for use in industrial environments

This cable is available from Modicon as the following part numbers:

97-9841-100	MBPlus 100 Foot Reel
97-9841-500	MBPlus 500 Foot Reel
97-9841-01K	MBPlus 1000 Foot Reel

For ordering information, contact Modicon Customer Service at the following telephone numbers. Ask for Customer Service Order Entry.

North America:	(800) 468-5342
International:	(508) 794-0800

Your cable will run directly between the network device locations. Each cable segment must be a continuous run between the device connectors at two locations. The use of splices, taps, splitters, or any other configurations such as 'star' or 'tree' configurations, is not allowed. The only allowed media components are the network cable and network device connectors.

You will typically plan your cable runs according to the vertical rises and horizontal distances between sites. When you order cable, you will be ordering it by reels of fixed length. Order reels of sufficient length to allow continuous runs between the network devices. Provide excess length at each site for service loops, strain reliefs, and dressing.

Modbus Plus Connectors

Two types of connectors are available from Modicon for connecting devices to the network:

- Each in-line drop requires a line connector, Modicon part number AS-MBKT-085. This part number contains one connector.
- The drops at the two ends of the cable each require a terminating connector, Modicon part number AS-MBKT-185. This part number contains two connectors.

You should plan to order a sufficient quantity of connectors to allow extra ones for service access and spares.

Modbus Plus Connector Installation Tool

A special tool is available from Modicon for installing connectors on the network cable. Use of the tool will ensure positive electrical contact between the connector and cable, as well as make for a more rapid installation. Its use is highly recommended. Its part number is:

AS-MBPL-001 Modbus Plus Connector Assembly Tool

Modbus Plus Cable Impedance Termination

When the terminating connectors are installed on the two extreme ends of the cable, they furnish the proper terminating impedance for the network. The cable termination is maintained regardless of whether a node device is connected to either end of the cable. No other termination is required.

It is not necessary to provide an external matching termination to any connector. Any connector can be disconnected from its device without affecting the network impedance.

Modbus Plus Network Earthing

The entire network cable, including its shield, should remain isolated from external earth sources. No connection should be made between the cable and the plant earthing system or the panel earthing connection at any point.

Earthing systems should connect to each device's dedicated earth terminal, not to the network cable. The cable earth will be supplied by its network cable connection to the device.

The cable shield earth is connected to terminal X1:3 (see Figure 4-2, page 4-3) on the power connector on the NMBP-01 Module.

Chapter 5 – Programming

This chapter describes how to program the ACS 600 drive for the Modbus Plus communication.

The reader should be already familiar with how to program the drive parameters using the CDP-311 Control Panel, and how the parameters are arranged in groups. For details see the *ACS 600 Programming Manual.*

General

After installing and wiring the NMBP-01 Module to the ACS 600 drive, the first step is to alert the drive that there is a communication module installed. Before this communication option module is used, Parameter 98.2 COMM MODULE must be changed from NO to YES.

After this, Parameter Group 51 can be programmed for the correct configuration.

When Parameter 98.2 is set to YES, there are new selections available to Control Location parameters which are not described in the basic *ACS 600 Programming Manual.*

Modbus Plus Configuration

The NMBP-01 Modbus Plus Module is completely configured through the control panel. There are no internal DIP switches or jumpers to be set on the NMBP-01 option module.

When the NMBP-01 module is connected to the drive and it receives its power, the option module will read its setup parameters from the drive. During the initial power-up sequence, the Modbus Plus module configuration information is set to default values, which can be changed from the control panel.

The configuration information is in Group 51. The contents of this group are shown in Table 5-1 below.

Number	Parameter	Settings	Default
Group 51 – COMM MOD DATA			
51.1	FIELD BUS	NMBP-01	
51.2	PROTOCOL	MODBUS PLUS MBP FAST	MODBUS PLUS
51.3	Station	1 – 64	64
51.4	Good Msg	0 – 32767	0
51.5	Bad Msg	0 – 32767	0
51.6	GD Out 1	0 – 6	0
51.7	GD Out 2	0 – 6	0
51.8	GD Out 3	0 – 6	0
51.9	GD In1 Stn	0 – 64	0
51.10	GD In1 Wrd	0 – 31	0
51.11	GD In2 Stn	0 – 64	0
51.12	GD In2 Wrd	0 – 31	0
51.13	GD In3 Stn	0 – 64	0
51.14	GD In3 Wrd	0 – 31	0

Table 5-1 Configuration Group 51.

Note: The Default values are used when the module is connected to the drive the first time . The parameters in Group 51 must be set up for the current application. By default, no global data is being used, and the Modbus Plus module is station 64.

Group 51 Modbus Plus This group name identifies which communication hardware module is connected to the ACS 600 drive. Some option modules support multiple protocols, which can be selected with a parameter.

The setup parameters can be modified either by using the control panel, or by CMT PC software. These parameters are described below.

51.1 MODULE TYPE Shows the connected communication option module type and version. For Modbus Plus communication this is NMBP-01.

51.2 PROTOCOL Shows the logical protocol on the hardware communication option module. For Modbus Plus module, there are two selections.

MODBUS PLUS
This is the Modbus Plus protocol option, with diagnostic counter updates (Parameters 51.4 and 51.5).

MBP FAST
This is Modbus Plus protocol, without diagnostic counter updates (Parameters 51.4 and 51.5). In this mode, these diagnostic counters remain in their last value.

51.3 Station Sets the node number for the module on Modbus Plus network.

1 – 64

51.4 Good Msg This diagnostics counter increases by one every time a valid Modbus Plus message has been received by the NMBP-01 Module. This counter will roll over from 32767 back to 0. During normal operation, this counter is increasing constantly. Valid messages are message numbers 0x03, 0x06, and 0x10, with read and write addresses within groups.

0 – 32767

51.5 Bad Msg This diagnostics counter increases by one every time the NMBP-01 Module finds any kind of communication error. This counter will roll over from 32767 back to 0. During normal operation, this counter hardly ever increases. Communication errors are increased by one whenever the NMBP-01 Module receives an unsupported command, or a parameter read or write to addresses outside parameter group ranges.

0 – 32767

51.6 GD Out 1 Defines what is sent out on the first word of the global data. The selection is limited to the high-speed data set information on the ACS 600 drive.

CNTRL WORD
The Control word is used for start/stop control, and for resetting the faults on the drive. For details see Table 5-2.

REFERENCE 1
Selection sends out the current Reference 1 value.

REFERENCE 2
Selection sends out the current Reference 2 value.

STATUS
Selection sends out the current status word.

ACTUAL 1
Selection sends out the actual value corresponding to Analogue Output 1.

ACTUAL 2
Selection sends out the actual value corresponding to Analogue Output 2.

51.7 GD Out 2 Defines what is sent out on the second word of global data. The selection is limited to high-speed data set information on the ACS 600 drive. The choices are the same as Parameter 51.6 (GD Out 1).

51.8 GD Out 3 Defines what is sent out on the third word of global data. The selection is limited to high-speed data set information on the ACS 600 drive. The choices are the same as Parameter 51.6 (GD Out 1).

51.9 GD In1 Stn This parameter and Parameter 51.10 GD In1 Wrd defines what data is received for data set 1. This parameter defines the source station for Global Data which is placed to the Control Word.

0
Identifies that the control word is not received through Global Data.

1 – 64
Identifies the source station for Global Data.

51.10 GD In1 Wrd This parameter and Parameter 51.9 GD In1 Stn defines what data is received for data set 1. This parameter defines the word number on the Global Data which is placed to the Control Word.

0 – 31
The word number of the Global Data.

51.11 GD In2 Stn This parameter and Parameter 51.12 GD In2 Wrd defines what data is received for data set 2. This parameter defines the source station for Global Data which is placed to Reference 1. The choices are the same as Parameter 51.9 (GD In1 Stn).

51.12 GD In2 Wrd This parameter and Parameter 51.11 GD In2 Stn defines what data is received for data set 2. This parameter defines the word number on Global Data which is placed to Reference 1. The choices are the same as Parameter 51.10 (GD In1 Wrd).

51.13 GD In3 Stn This parameter and Parameter 51.14 GD In3 Wrd defines what data is received for data set 3. This parameter defines the source station for Global Data which is placed to Reference 2. The choices are the same as Parameter 51.9 (GD In1 Stn).

51.14 GD In3 Wrd This parameter and Parameter 51.13 GD In3 Stn defines what data is received for data set 3. This parameter defines the word number on Global Data which is placed to Reference 2. The choices are the same as Parameter 51.10 (GD In1 Wrd).

Note: The changes to the parameters in Group 51 do not take effect immediately. To change the module settings, either the reset button on the front of the module must be pressed, or the power must be disconnected from the Modbus Plus communication module.

Control Locations

The ACS 600 drive can receive control information from multiple sources, including discrete I/O, analogue I/O, keypad, and communication modules. The source for the control information must be programmed through the panel to the drive.

Configuration is done for Control Location variables. These variables are described for the Modbus Plus interface in the following paragraphs.

10.1 EXT 1 STRT / STP / DIR

Defines the source for Start and Stop Control, as well as for Direction control, when the drive uses External Reference 1.

NOT SEL
The external control source is not selected.

DI1, .., DI6,5
Start, Stop, and Direction information is received using digital inputs. For details see the *ACS 600 Programming Manual.*

KEYPAD
Start, Stop, and Direction information is received from the control panel. For details see the *ACS 600 Programming Manual.*

COMM MODULE
The Start, Stop, and Direction control is received from the communication option module. This data is received using data set number one, the Control Word.

The Control Word can be received either by using Global Data, or by doing a register write to address 40001.

10.2 EXT 2 STRT / STP / DIR

Defines the source for Start and Stop Control, as well as for Direction control, when the drive uses External Reference 2. The choices are the same as Parameter 10.1 EXT 1 STRT/STP/DIR.

11.2 EXT 1/EXT 2 REF SEL

Defines which reference (External Reference 1 or External Reference 2) is being used.

DI1, …, DI6
The selection is done with a digital input signal.

EXT 1
External Reference 1 is in use.

EXT 2
External Reference 2 is in use.

COMM MODULE
The selection is done by bit 5 of the Control Word.

11.3 EXT REF1 SELECT Defines the source for External Reference 1.

KEYPAD, …, DI5U,6D
See the *ACS 600 Programming Manual.*

COMM MODULE
External Reference 1 comes through the communication module, and is also data set 2. This Reference value can be received either by using Global Data, or by performing a register write to address 40111.

11.6 EXT REF2 SELECT Defines the source for the External Reference 2.

KEYPAD, …, DI5U,6D
See the *ACS 600 Programming Manual.*

COMM MODULE
External Reference 2 comes through the communication module, and is also data set 3. This Reference value can be received either by using Global Data, or by performing a register write to address 40112.

16.1 RUN ENABLE Defines the source for the Run enable signal to the drive.

YES
The drive is enabled all the time.

DI1, .., DI6
The Run enable signal is connected to the selected digital input.

COMM. MODULE
The Run enable signal comes through the communication module. Bit 1 is for this purpose in the drive Control Word.

16.4 FAULT RESET SEL Defines the source for resetting the drive after a fault.

NOT SEL
Faults can be cleared only from the local control panel.

DI1, …, DI6
Faults can be cleared by digital I/O signal.

COMM MODULE
Faults can be cleared using bit 8 of the Control Word. The rising edge of this bit will clear the fault. This data is received using data set number 1, the Control Word.

The Control Word can be received either by using Global Data, or by performing a register write to address 4xxxx.

Output Selections

The ACS 600 drive has two user-configurable ‘ data sets’ . These output registers are intended for transferring fast, real time data out from the drive to the controlling device.

The selection of signals is done through the analogue output selectors.

15.1 Analogue Output 1

Defines the signal on data set 5.

NOT USED, P SPEED, SPEED, …, ACTUAL 2
Analogue signal selections as in the *ACS 600 Programming Manual*.

15.6 Analogue Output 2

Defines the signal on data set 6.

Selection is the same as for Parameter 15.1 Analogue Output 1.

Data sets

Data sets on the ACS 600 drive are very fast communication data transfer areas. These are excellent for fast control, and for reading back critical actual values.

The data sets are fixed in the drive application software, and cannot be modified by the end customer. The standard software has six data sets, numbered 1 through 6.

Data set 1 - CONTROL The Control Word is used for fast drive control. This is a 16-bit word, where each of the bits have its own, defined meaning. The bits are listed in Table 5-2 below.

Bit	Name	Description
0	*reserved*	
1	RUN ENABLE	1 = Enabled 0 = Coast to stop
2	*reserved*	
3	START/STOP	0 -> 1 Start the drive 0 = Stop the drive to normal stop mode
4	*reserved*	
5	CNTRL_MODE	0 = Select Control Mode 1 1 = Select Control Mode 2
6	QUICK_STOP	1 = Stop the drive to quick stop mode 0 = Quick stop mode not selected
7	*reserved*	
8	RESET FAULT	0->1 Reset drive fault
9 – 15	*reserved*	

Table 5-2 The Control Word.

Note: The normal stop mode is defined with Parameter 21.3.

Note: The Control Word is used for communication loss detection. The use of the Control Word for communication loss detection is configured using the Parameters 30.18 and 30.19.

Data set 2 - REFERENCE 1

Used for receiving the Reference 1 value from the communication network.

This value is scaled so that a value of 20000 corresponds to the value set with Parameter 11.4 EXT REF1 MAXIMUM.

Data set 3 - REFERENCE 2

Used for receiving the Reference 2 value from the communication network.

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.

The internal use of REF2 depends on the selected ACS 600 motor control mode and the selected Application Macro of the ACS 600.

- 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%).

Data set 4 - STATUS This data set is used to read back the drive status using the communication network. This is a 16-bit word, where each of the bits have its own, defined meaning. The bits are listed in Table 5-3 below.

Bit	Name	Description
0	READY	1 = Drive Ready to Start 0 = Initialising, or Initialisation Error
1	RUN ENABLE	1 = Enabled 0 = Not Enabled
2	*reserved*	
3	RUNNING	1 = Drive Running w. Selected Reference 0 = Drive Stopped
4	QUICK_STOP	1 = Quick Stop Active 0 = No Quick Stop
5	REMOTE	1 = Drive in Remote Mode 0 = Drive in Local Mode
6	*reserved*	
7	AT_SETPOINT	1 = Drive at Reference 0 = Drive not at Reference
8	FAULTED	1 = Active Fault 0 = No Active Faults
9	WARNING	1 = Active Warning 0 = No Active Warnings
10	LIMIT	1 = Drive at Limit 0 = No Active Limits
11 – 15	*reserved*	

Table 5-3 The Status Word.

Data set 5 - ACTUAL 1 This data set contains Actual value 1. This value is selected using Parameter 15.1. The possible selections are described in Parameter 15.1 ANALOGUE OUTPUT 1.

Data set 6 - ACTUAL 2 This data set contains Actual value 2. This value is selected using Parameter 15.6. The possible selections are described in Parameter 15.6 ANALOGUE OUTPUT 2.

Communication Loss Setup

To protect equipment and personnel, the drive in application must be configured properly to handle situations where communication is lost from the controlling system. The ACS 600 drive has two parameters which will define the action to be taken if communication is lost to the drive.

30.18 COMM FLT FUNC Defines what action is taken when the communication master is lost.

FAULT
Loss of communication will generate a fault in the ACS 600 drive. The fault is recorded into the fault history, and shown on the panel. The drive stops according to the stop function set in Parameter 21.3 STOP FUNCTION.

NO
The loss of communication is ignored. No action is taken.

CONST SP 15
There is a warning on the drive control panel, and on the Status Word. The drive will run at the speed defined in Parameter 12.16 CONST SPEED 15.

LAST SPEED
There is a warning on the drive control panel, and on the Status Word. The drive will continue to operate at the last received speed. This value is the average reference over the last 15 seconds before the loss of communication.

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 FLT TIME OUT Defines the maximum time allowed between writes to data set 1 (Control Word) from the master, before a communication loss is detected.

0.1 s – 60.0 s

Chapter 6 – Communication

This chapter describes the Modbus Plus communication on ACS 600 drives.

Introduction to Modbus Plus

Modbus Plus is a 1 MBit/s, transformer-coupled network. The transformer coupling isolates all the nodes galvanically from the network.

Modbus Plus is designed for Modicon PLCs, and the services closely correspond to the PLC architecture. The ACS 600 drive ‘ looks like’ a Modicon PLC on the network.

Program Paths

Modbus Plus network always uses five address fields for addressing nodes on the network. Unused ones must be set to zero. The purpose of these fields is device-dependent.

Examples of addresses are:

- PLCs. Only one address, which is the node number on the Modbus Plus network
- Bridge/Mux. Two or three fields. First one is the node number on the Modbus Plus network. The second one is the serial port number. The third one is the slave number if in network mode.
- ACS 600. Two fields. The first field is the node number on the Modbus Plus network. The second number is internal program path number 1 – 8.

This multilevel addressing allows the user to build a large and extensive network, tying together individual segments with Bridges.

Routing for ACS 600

The ACS 600 drive requires two fields of addressing. The first field is the Modbus Plus node number, and the second field is the internal communication buffer number in the drive. Valid numbers for the communication buffer field are 1, 2, …, 8. The second field is mandatory.

Example: Routing from PLC A to the ACS 600 shown in Figure 6-1 below is 12.5.1.0.0. This example uses communication buffer 1.

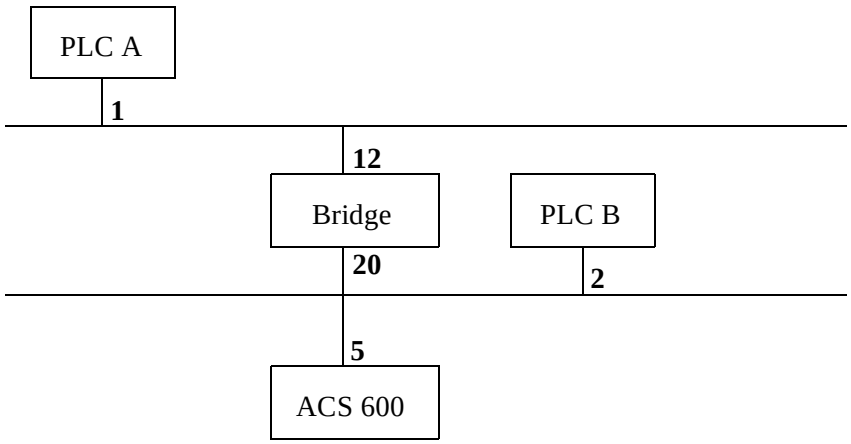

Figure 6-1 Routing Example.

In this example, the bold numbers are node numbers for devices on Modbus Plus network.

The PLC communicates to the drive through the Bridge device on node address 12. The same communication result could have been done using other communication buffers in the drive, for example routing 12.5.2.0.0 to 12.5.8.0.0.

Note: The global data can not be transferred through the Bridge. In the above example the global data from the ACS 600 is available for PLC B, but not for PLC A.

Register Read and Write

The ACS 600 has all the drive parameter and data set information mapped into a 4xxxx register area. This holding register area can be read from an external device, and an external device can modify the register values by writing to them.

There are no setup parameters for mapping the data to the 4xxxx register. The mapping is pre-defined, and corresponds directly to the drive parameter grouping which is being used by the local control panel.

All parameters are available for both reading and writing. The parameter writes are verified for correct value, and for valid register addresses. Some parameters never allow writes (including actual values), some parameters allow write only when the drive is stopped (including setup variables), and some can be modified at any time (including actual reference values).

Register Mapping

The drive parameters are mapped to the 4xxxx area so that:

- 40001 – 40099 are reserved for data sets
- 40101 – 40199 are reserved for the actual values
- 40201 – 40299 are reserved for group 2
- …
- 49901 – 49999 are reserved for the start-up data.

In this mapping, the thousands and hundreds correspond to the group number, while the tens and ones correspond to the parameter number within a group.

Register addresses 4GGPP are shown in Table 6-1 below. In this table GG is the group number, and PP is the parameter number within the group.

4GGPP	GG	PP
40001 – 40006	00 Data sets	01 Data set 1 02 Data set 2 … 06 Data set 6
40101 – 40126	01 Actual Values	01 Process Speed … 26 Control Dev.
41001 – 41003	10 Group 10	01 Param 10.1 … 03 Param 10.3
…	…	…
49801 – 49805	98 Group 98	01 Param 98.1 … 05 Param 98.5
49901 – 49909	99 Start-up Data	01 Language … 09 Motor ID Run

Table 6-1 Parameter Mapping.

The register addresses between the groups are invalid. No reads or writes are allowed for these addresses. If there is an attempt to read or write outside the parameter addresses, the Modbus Plus interface will return an exception code back to the controller.

Exception Codes The ACS 600 supports the standard Modbus Plus exception codes. These are shown in Table 6-2 below.

Code	Name	Meaning
01	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the slave. If a Poll Program Complete command was issued, this code indicates that no program function preceded it. ACS 600 : Unsupported Command.
02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the slave. ACS 600 : Address outside groups
03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for the slave. ACS 600 : Value outside min-max limits ACS 600 : Parameter is read-only

Table 6-2 Exception Codes.

Global Data The ACS 600 supports Global Data on the Modbus Plus network. Global data is a service on Modbus Plus, intended for fast control or actual value transfer.

Every node on the Modbus Plus network can ‘ broadcast’ with the token pass data to other nodes on the network. This Global Data is fixed in length (0 – 32 words), and the data contents are defined by the sending station.

ACS 600 can receive 0 – 3 words from stations on the network, and it can transmit 0 – 3 words to the network. The global data can be used for receiving or transmitting information contained in the data sets in the drive.

The Global Data is configured using the setup parameters in Group 51. See *Chapter 5 – Programming, Group 51 Modbus Plus* for details.

Data Update

The NMBP-01 module has been designed for fast and reliable data transfer between the Modbus Plus network and the ACS 600 drive. To get the maximum through put from the Modbus Plus network, the data is transferred according Table 6-3 below.

Action	Response
READ Data set	Data is read immediately from the drive
READ Parameter	Data is updated from the drive with the external read interval.
WRITE Data set	Data is written immediately to the drive. The validity of write (value range and address range) is checked, and if violation, an exception is generated.
WRITE Parameter	Data is written directly to the drive. The validity of write (value range and address range) is checked, and if violation, an exception is generated.

Table 6-3 Transfer Modes.

Note: Register writes have priority over reads. If your PLC program performs continuous writes, the read data could be obsolete.

Chapter 7 –Fault Tracing

This chapter gives step-by-step diagnostics information for determining root causes and corrections to the most usual problems with the NMBP-01 Module.

This section is divided into different sections, and every chapter lists first the symptoms, then possible causes, and remedies for them.

Installation Problems

Verify all the connections on the module:

- Modbus Plus cable is connected to the Modbus Plus terminal
- 24 V d.c. power is connected to the power terminal
- Fibre link cable is connected between the drive Channel 0 and the NMBP-01 Module
- Check that the fibre link connector colours match the drive and NMBP-01 Module connector colours.

Drive Setup

Group 51 is not shown on panel.

- Set Parameter 98.2 to YES (COMM MODULE)

The NMBP-01 is using default values.

- Verify that Parameter Group 51 is setup correctly. If so, press the configure button on the NMBP-01 which causes the module to re-read its setup parameters.

Drive values can be read, but the control (Start/Stop or Reference) does not go through.

- Check that the control location parameters are set to COMM. MODULE for the required operation.
- Check that the drive is in REMOTE control.

PLC Programming

PLC ladder program is beyond ABB Drives support.

Module Diagnostics

There is a diagnostics error LED on the NMBP-01 Modbus Plus module that indicates the current state of the module. A status code is indicated by a series of flashes at 250 ms intervals followed by 750 ms delay. Table 7-1 below shows every error code.

Flash Code	Status	Correction
No Flashes	OK	
1	NMBP is OK, no response from the drive on fibre link	Power on the drive. Check the fibre link wiring.
2	Watchdog time out	Hardware failure on NMBP module. Switch power off and on; if the problem persists, replace NMBP.
3	ROM checksum test failed	Hardware failure. Replace NMBP.
4	RAM test failed	Hardware failure. Replace NMBP.
5	Modbus Plus dual port RAM failed	Hardware failure. Replace NMBP.
6	DDCS ASIC register access test failed. DDCS Library initialisation failed.	Hardware failure. Replace NMBP. Switch power off and on; if the problem persists, replace NMBP.
7	Modbus Plus Hard Error	Hardware failure on NMBP module. Switch power off and on; if the problem persists, replace NMBP.
8	Modbus Plus Soft Error	Software failure on NMBP module. Switch power off and on; if the problem persists, replace NMBP.
9	Drive configuration write failed	Incorrect drive firmware. Change the downloaded drive application. Contact an ABB representative.

Table 7-1 Modbus Plus Module Status Codes.

Modbus Plus LED The NMBP-01 module has the standard Modbus Plus diagnostic LED. This LED has the status codes shown in Table 7-2 below.

Flash Code	Status	Correction
flash every 160ms	This node is working normally in that it is successfully receiving and passing the token. All nodes on the link should be flashing this pattern.	
flash every 1 second	This node is in the MONITOR_OFFLINE state, where it must monitor the link for 5 seconds, and it is not allowed to transmit any packets out onto the link. During this time it hears all other active nodes on the link, and builds the active station table.	NMBP-01 initialising. Wait for 5 seconds.
2 flashes, off 2 seconds	This node is permanently in the MAC_IDLE never-getting-token state, and it is hearing other nodes on the link pass the token to themselves, but the token is never passed to this node. This node may have a bad transmitter.	Switch module power off and on. If the problem persists, replace the module.
3 flashes, off 1.7 seconds	This node is not hearing any other nodes, so it is periodically claiming and winning the token, and then finding no other node to pass it to. It could be that this node is the only node on the link, or that there really are no other active nodes on the link, or this node has a bad receiver. In the latter case, this node will periodically disrupt communication on the link.	Check the Modbus Plus connection and wiring. Verify that there are other nodes on the network. If the problem is not cleared, replace the module.
4 flashes, off 1.4 seconds	This node has heard a valid packet that was duplicate-node-address sent from another node on the link that is using the same link address as this node. This node is now in the DUPLICATE_OFFLINE state where it will remain passively monitoring the link, until the duplicate node is not heard from for 5 seconds.	Check the Modbus Plus node numbering for the whole network. Renumber conflicting nodes, so that each node has a unique node number.

Table 7-2 Modbus Plus Status LED.

MSTR Block Error Codes

Modicon PLCs communicate on Modbus Plus using the MSTR block. This block is described in detail in the Modicon ladder logic programming manuals, but for reference purposes, the MSTR block error codes are listed below.

If the MSTR block detects an error, a hexadecimal error code will be displayed in the first implied register in the control block (the top node). The form of the code is Mmss, where

- M represents the major code
- m represents the minor code
- ss represents a sub-code.

Hex Error Code	Meaning
1001	User-initiated abort
2001	Invalid operation type
2002	User parameter changed
2003	Invalid length
2004	Invalid offset
2005	Invalid length and offset
2006	Invalid slave device data area
2007	Invalid slave device network area
2008	Invalid slave device network routing
2009	Route equal to your own address
200A	Attempting to obtain more global data words than available
30ss*	Modbus slave exception response
4001	Inconsistent Modbus slave response
5001	Inconsistent network response
6mss**	Routing failure

The ss subfield in error code 30ss is:

ss Hex Value	Meaning
01	Slave device does not support the requested operation
02	Nonexistent slave device registers requested
03	Invalid data value requested
04	
05	Slave has accepted long-duration program command
06	Function cannot be performed now – long-duration command in effect
07	Slave rejected long-duration program command
08 …255	

The m subfield in error code 6mss is an index into the routing information indicating where an error has been detected – a value of 0 indicates the local node, a 2 the second device on the route, etc. The ss subfield in error code 6mss is:

ss Hex Value	Meaning
01	No response received
02	Program access denied
03	Node off-line and unable to communicate
04	Exception response received
05	Router node data paths busy
06	Slave device down
07	Bad destination address
08	Invalid node type in routing path
10	Slave has rejected the command
20	Initiated transaction forgotten by slave device
40	Unexpected master output path received
80	Unexpected response received
F001	Wrong destination node specified for the MSTR operation

Hardware Failures

The NMBP-01 module has a combined power and Watchdog LED. This LED is normally on. If the built-in watchdog ‘ kicks in’ , the power LED will go dim for half a second, and the NMBP-01 module will restart itself.

This restart can be caused by:

- Module failure. In this case the NMBP-01 Status LED will flash according to error code 2. This is the only non-normal condition
- Pressing the configure button
- Loss of drive power
- Loss of fibre link connection between the NMBP-01 and the ACS 600 drive.

Appendix A – Technical Data

This chapter describes the technical information for the NMBP-01 module. The information given here is preliminary, subject to change.

Protocols

Compatible Devices: Any Modicon approved Modbus Plus device.

Communication Type: Modbus Plus

Transmission Speed: 1 MBit/s

Modbus Plus Cable: Belden 9841

Topology: Bus

Fibre Link: 4 MBit/s

Fibre Link Protocol: Distributed Drives Communication System (DDCS)

Power Supply

24 V d.c. regulated

Dimensions

171 mm (6 3/4“) height

35 mm (1 3/8”) width

140 mm (5 1/2”) depth

Mounting

Mounting onto a EN 50022 rail

Enclosure: Phoenix Contact UEG-EU.

Storage

Storage Temperature: 0 ° C – 50 ° C

Relative Humidity: 5 % – 95 %, non-condensing

Operation

Ambient Temperature: 0 ° C – 50 ° C

Relative Humidity: 5 % – 95 %, non-condensing

Noise Immunity / Emissions

The fast transient burst immunity according to standard IEC 801-4: 4 kV 5/ 50 ns.

Noise emissions according to standard EN 55022 B.

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Appendix B –Parameter Scaling

This Appendix shows all the Modbus Plus/ACS 600 Parameters with their scalings and alternative settings.

This chapter is intended for people who are using the drive data through the Modbus Plus connection, and need to know in what units the data is available for reading and writing.

Some of the values are visible only when the communication module is selected (Parameter 98.2 COMM. MODULE is set to YES).

The information is subject to change. The parameters and their scalings may change with a change of drive firmware. This table is for the standard firmware.

Table B-1 Parameter Settings and Actual Signals

DATA SETS			
Data Set	**4xxxx Register**	**Alternative Settings**	**Scaling**
1 CONTROL WORD	40001	See Table 5-2 ‘Control Word’	16-Bit Logical
2 REFERENCE 1	40002	Reference value 1 (see page 5-8)	20000 ≙ 100 %
3 REFERENCE 2	40003	Reference value 2 (see page 5-8)	20000 ≙ 100 % or 10000 ≙ 100 %
4 STATUS WORD	40004	See Table 5-3 ‘Status Word’	16-Bit Logical
5 ACTUAL 1	40005	Select by 15.1 ANALOGUE OUTPUT 1 (see below)	Variable (see below)
6 ACTUAL 2	40006	Select by 15.6 ANALOGUE OUTPUT 2 (see below)	Variable (see below)

ANALOGUE OUTPUT SELECTIONS for data sets 5 and 6			
Analogue Output	**Short name**	**Description**	**Scaling**
PROCESS SPEED	P SPEED	Process speed	-20000 ≙ -100 % 20000 ≙ 100 % **of the value defined with Parameter 20.1 or 20.2 (DTC Control Mode) or Parameter 20.7 or 20.8 (SCALAR Control Mode)**
SPEED	SPEED	Motor speed	
FREQUENCY	FREQ	ACS 600 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** (560 V d.c. for 380 to 415 V a.c. units; 675 V d.c. for 380 to 500 V a.c. units)
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 (selected with Parameter 11.6)**
APPL BLOCK OUTPUT	APPL OUT	Output of the PID controller (if the PID Macro is selected), External reference 2 (External control active), or Keypad reference 2 (Local control active)	0 ≙ 0 % 10000 ≙ 100 %
ACTUAL VALUE 1	ACT VAL1	PID controller Actual value 1 Available only if the PID Macro is selected	
ACTUAL VALUE 2	ACT VAL2	PID controller Actual value 2 Available only if the PID Macro is selected	
CONTROL DEVIATION	CONT DEV	The difference between the PID controller reference and the PID controller actual signal. Available only if the PID Macro is selected	0 ≙ -100 % 10000 ≙ 100 %

ACTUAL SIGNALS				
Parameter	**Short Name**	**4xxxx Register**	**Description**	**Scaling**
PROCESS SPEED	P SPEED	40101	Process speed	-100 ≙ -100 % 100 ≙ 100 % **of the value defined with Parameter 20.2 (DTC Control Mode) or Parameter 20.8 (SCALAR Control Mode)**
SPEED	SPEED	40102	Motor speed	-20000 ≙ -100 % 20000 ≙ 100 %
FREQUENCY	FREQ	40103	Inverter output frequency	-100 ≙ -1 Hz 100 ≙ 1 Hz
CURRENT	CURRENT	40104	Motor current	10 ≙ 1 A
TORQUE	TORQUE	40105	Motor torque	-10000 ≙ -100 % 10000 ≙ 100 % **of motor nominal torque**
POWER	POWER	40106	Motor power	0 ≙ 0 % 10000 ≙ 100 % **of motor nominal power**
DC BUS VOLTAGE V	DC BUS V	40107	DC bus voltage of ACS 600	1 ≙ 1 V
MAINS VOLTAGE	MAINS V	40108	Calculated supply voltage	1 ≙ 1 V
OUTPUT VOLTAGE	OUT VOLT	40109	Calculated motor voltage	1 ≙ 1 V
ACS 600 TEMP	ACS TEMP	40110	Temperature of the heatsink	1 ≙ 1 ℃
EXTERNAL REF 1	EXT REF1	40111	External reference 1	1 ≙ 1 rpm
EXTERNAL REF 2	EXT REF2	40112	External reference 2	0 ≙ 0 % 10000 ≙ 100 % **of motor max. speed / nominal torque / max. process reference (depending on the ACS 600 macro selected)**
CTRL LOCATION	CTRL LOC	40113	Active control location	**1** = EXT2; **2** = LOCAL; **3** = EXT1
OP HOUR COUNTER	OP HOURS	40114	Elapsed time counter	1 ≙ 1 h
KILOWATT HOURS	KW HOURS	40115	kWh meter	1 ≙ 1 kWh
APPL BLOCK OUTPUT	APPL OUT	40116	The reference given as an output from the application (PID controller output, etc.)	0 ≙ 0 % 10000 ≙ 100 %
DI6-1 STATUS	DI6-1	40117	Status of digital inputs 000000 –111111	
AI1 (V)	AI1 (V)	40118	Value of Analogue input 1	1 ≙ 0.01 V
AI2 (mA)	AI2 (mA)	40119	Value of Analogue input 2	1 ≙ 1 mA
AI3 (mA)	AI3 (mA)	40120	Value of Analogue input 3	1 ≙ 1 mA
RO3-1 STATUS	RO3-1	40121	Status of relay outputs	
AO1 (mA)	AO1 (mA)	40122	Value of Analogue output 1	1 ≙ 1 mA
AO2 (mA)	AO2 (mA)	40123	Value of Analogue output 2	1 ≙ 1 mA
ACTUAL VALUE 1	ACT VAL1	40124	PID controller Actual value 1 Available only if the PID Macro is selected	0 ≙ 0 % 10000 ≙ 100 %
ACTUAL VALUE 2	ACT VAL2	40125	PID controller Actual value 2 Available only if the PID Macro is selected	0 ≙ 0 % 10000 ≙ 100 %
CONTROL DEVIATION	CONT DEV	40126	The difference between the reference given by the user and the actual reference the ACS 600 is following	-10000 ≙ -100 % 10000 ≙ 100 %

Parameter	4xxxx Register	Alternative Settings	Scaling
10 START/STOP/DIR			
10.1 EXT1 STRT/STP/DIR	41001	**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	
10.2 EXT2 STRT/STP/DIR	41002		
10.3 DIRECTION	41003	**1** = FORWARD; **2** = REVERSE; **3** = REQUEST	
11 REFERENCE SELECT			
11.1 KEYPAD REF SEL	41101	**1** = REF1(rpm); **2** = REF2(%)	
11.2 EXT1/EXT2 SELECT	41102	**1** = EXT1; **2** = EXT2; **3 ... 8** = DI1 ... DI6; **9** = COMM.MODULE	
11.3 EXT REF1 SELECT	41103	**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	
11.4 EXT REF1 MINIMUM	41104	0 ... 18000 rpm	1 ≙ 1 rpm
11.5 EXT REF1 MAXIMUM	41105		
11.6 EXT REF2 SELECT	41106	**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	
11.7 EXT REF2 MINIMUM	41107	0 % ... 100 %	0 ≙ 0 % 10000 ≙ 100 %
11.8 EXT REF2 MAXIMUM	41108	0 % ... 500 %	0 ≙ 0 % 5000 ≙ 500 %
12 CONSTANT SPEEDS			
12.1 CONST SPEED SEL	41201	**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	
12.2 CONST SPEED 1	41202	0 ... 18000 rpm	1 ≙ 1 rpm
12.3 CONST SPEED 2	41203		
12.4 CONST SPEED 3	41204		
12.5 CONST SPEED 4	41205		
12.6 CONST SPEED 5	41206		
12.7 CONST SPEED 6	41207		
12.8 CONST SPEED 7	41208		
12.9 CONST SPEED 8	41209		
12.10 CONST SPEED 9	41210		
12.11 CONST SPEED 10	41211		
12.12 CONST SPEED 11	41212		
12.13 CONST SPEED 12	41213		
12.14 CONST SPEED 13	41214		
12.15 CONST SPEED 14	41215		
12.16 CONST SPEED 15	41216		

Parameter	4xxxx Register	Alternative Settings	Scaling
13 ANALOGUE INPUTS			
13.1 MINIMUM AI1	41301	**1** = 0 mA; **2** = 2 V; **3** = TUNED VALUE; **4** = TUNE	
13.2 MAXIMUM AI1	41302	**1** = 10 V; **2** = TUNED VALUE; **3** = TUNE	
13.3 SCALE AI1	41303	0 ... 100 %	0 ≙ 0 % 10000 ≙ 100 %
13.4 FILTER AI1	41304	0 s ... 10 s	0 ≙ 0 s 1000 ≙ 10 s
13.5 INVERT AI1	41305	**0** = NO; **Hex FFFF** = YES	
13.6 MINIMUM AI2	41306	**1** = 0 mA; **2** = 4 mA; **3** = TUNED VALUE; **4** = TUNE	
13.7 MAXIMUM AI2	41307	**1** = 20 mA; **2** = TUNED VALUE; **3** = TUNE	
13.8 SCALE AI2	41308	0 ... 100 %	0 ≙ 0 % 10000 ≙ 100 %
13.9 FILTER AI2	41309	0 s ... 10 s	0 ≙ 0 s 1000 ≙ 10 s
13.10 INVERT AI2	41310	**0** = NO; **Hex FFFF** = YES	
13.11 MINIMUM AI3	41311	**1** = 0 mA; **2** = 4 mA; **3** = TUNED VALUE; **4** = TUNE	
13.12 MAXIMUM AI3	41312	**1** = 20 mA; **2** = TUNED VALUE; **3** = TUNE	
13.13 SCALE AI3	41313	0 ... 100 %	0 ≙ 0 % 10000 ≙ 100 %
13.14 FILTER AI3	41314	0 s ... 10 s	0 ≙ 0 s 1000 ≙ 10 s
13.15 INVERT AI3	41315	**0** = NO; **Hex FFFF** = YES	
14 RELAY OUTPUTS			
14.1 RELAY RO1 OUTPUT	41401	**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	
14.2 RELAY RO2 OUTPUT	41402		
14.3 RELAY RO3 OUTPUT	41403		

Parameter	4xxxx Register	Alternative Settings	Scaling
15 ANALOGUE OUTPUTS			
15.1 ANALOGUE OUTPUT1	41501	**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	
15.2 INVERT AO1	41502	**0** = NO; **Hex FFFF** = YES	
15.3 MINIMUM AO1	41503	**1** = 0 mA; **2** = 4 mA	
15.4 FILTER AO1	41504	0 s ... 10 s	0 ≙ 0 s 1000 ≙ 10 s
15.5 SCALE AO1	41505	10 % ... 1000 %	100 ≙ 10 % 10000 ≙ 1000 %
15.6 ANALOGUE OUTPUT2	41506	**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	
15.7 INVERT AO2	41507	**0** = NO; **Hex FFFF** = YES	
15.8 MINIMUM AO2	41508	**1** = 0 mA; **2** = 4 mA	
15.9 FILTER AO2	41509	0 s ... 10 s	0 ≙ 0 s 1000 ≙ 10 s
15.10 SCALE AO2	41510	10 % ... 1000 %	100 ≙ 10 % 10000 ≙ 1000 %
16 SYSTEM CTR INPUTS			
16.1 RUN ENABLE	41601	**1** = YES; **2 ... 7** = DI1 ... DI6; **8** = COMM.MODULE	
16.2 PARAMETER LOCK	41602	**0** = OPEN; **Hex FFFF** = LOCKED	
16.3 PASS CODE	41603	0 ... 8 388 607	
16.4 FAULT RESET SEL	41604	**1** = NOT SEL; **2 ... 7** = DI1 ... DI6; **8** = COMM.MODULE	
16.5 USER MACRO IO CHG	41605	**1** = NOT SEL; **2 ... 7** = DI1 ... DI6	
20 LIMITS			
20.1 MINIMUM SPEED	42001	-18000/(number of pole pairs) rpm ... 18000/(number of pole pairs) rpm	1 ≙ 1 rpm
20.2 MAXIMUM SPEED	42002		
20.3 MAXIMUM CURRENT	42003	0 % I_{hd} ... 200 % I_{hd}	0 ≙ 0 % 20000 ≙ 200 %
20.4 MAXIMUM TORQUE	42004	0 % ... 300 %	1 ≙ 1 %
20.5 OVERVOLTAGE CTRL	42005	**0** = OFF; **Hex FFFF** = ON	
20.6 UNDERVOLTAGE CTRL	42006		
20.7 MINIMUM FREQ	42007	- 300 Hz ... 300 Hz (effective only when the SCALAR control mode is selected)	-30000 ≙ -300 Hz 30000 ≙ 300 Hz
20.8 MAXIMUM FREQ	42008		
21 START/STOP			
21.1 START FUNCTION	42101	**1** = AUTO; **2** = DC MAGN; **3** = CNST DC MAGN	
21.2 CONST MAGN TIME	42102	30 ms ... 10000 ms	1 ≙ 1 ms
21.3 STOP FUNCTION	42103	**1** = COAST; **2** = RAMP	
21.4 DC HOLD	42104	**0** = OFF; **Hex FFFF** = ON	
21.5 DC HOLD SPEED	42105	0 rpm ... 3000 rpm	1 ≙ 1 rpm
21.6 DC HOLD CURR	42106	0 % ... 100 %	1 ≙ 1 %

Parameter	4xxxx Register	Alternative Settings	Scaling
22 ACCEL/DECEL			
22.1 ACC/DEC 1/2 SEL	42201	**1** = ACC/DEC 1; **2** = ACC/DEC 2; **3 ... 8** = DI1 ... DI6	
22.2 ACCELER TIME 1	42202	0 s ... 1800 s	0 ≙ 0 s 18000 ≙ 1800 s
22.3 DECELER TIME 1	42203		
22.4 ACCELER TIME 2	42204		
22.5 DECELER TIME 2	42205		
22.6 ACC/DEC RAMP SHPE	42206	**1** = LINEAR; **2** = S1; **3** = S2; **4** = S3	
23 SPEED CTRL			
23.1 GAIN	42301	0.0 ... 100	0 ≙ 0 10000 ≙ 100
23.2 INTEGRATION TIME	42302	0 s ... 320 s	0 ≙ 0 s 3200 ≙ 320 s
23.3 DERIVATION TIME	42303	0 s ... 10 s	0 ≙ 0 s 10000 ≙ 10 s
23.4 ACC COMPENSATION	42304	0.00 s ... 100.00 s	0 ≙ 0 s 1000 ≙ 100 s
23.5 SLIP GAIN	42305	0.0 % ... 400.0 %	1 ≙ 1 %
23.6 AUTOTUNE RUN ?	42306	**0** = NO; **Hex FFFF** = YES	
24 TORQUE CTRL		(EFFECTIVE ONLY WHEN THE TORQUE CONTROL MACRO IS SELECTED)	
24.1 TORQ RAMP UP	42401	0.00 s ... 10.00 s	0 ≙ 0 s 100 ≙ 10 s
24.2 TORQ RAMP DOWN	42402	0.00 s ... 10.00 s	
25 CRITICAL SPEEDS			
25.1 CRIT SPEED SELECT	42501	**0** = OFF; **Hex FFFF** = ON	
25.2 CRIT SPEED 1 LOW	42502	0 rpm ... 18000 rpm	1 ≙ 1 rpm
25.3 CRIT SPEED 1 HIGH	42503		
25.4 CRIT SPEED 2 LOW	42504		
25.5 CRIT SPEED 2 HIGH	42505		
25.6 CRIT SPEED 3 LOW	42506		
25.7 CRIT SPEED 3 HIGH	42507		
25.8 CRIT SPEED 4 LOW	42508		
25.9 CRIT SPEED 4 HIGH	42509		
25.10 CRIT SPEED 5 LOW	42510		
25.11 CRIT SPEED 5 HIGH	42511		
26 MOTOR CONTROL			
26.1 FLUX OPTIMIZATION	42601	**0** = NO; **Hex FFFF** = YES	
26.2 FLUX BRAKING	42602		
26.3 IR COMPENSATION	42603	0 % ... 30 % (effective only when the SCALAR motor control mode is selected)	1 ≙ 1 %

Parameter	4xxxx Register	Alternative Settings	Scaling
30 FAULT FUNCTIONS			
30.1 AI<MIN FUNCTION	43001	**1** = FAULT; **2** = NO; **3** = CONST SP 15; **4** = LAST SPEED	
30.2 PANEL LOSS	43002	**1** = FAULT; **2** = CONST SP 15; **3** = LAST SPEED	
30.3 EXTERNAL FAULT	43003	**1** = NOT SEL; **2 ... 7** = DI1 ... DI6	
30.4 MOTOR THERM PROT	43004	**1** = FAULT; **2** = WARNING; **3** = NO	
30.5 MOT THERM P MODE	43005	**1** = DTC; **2** = USER MODE; **3** = THERMISTOR	
30.6 MOTOR THERM TIME	43006	256 s ... 10 000 s	1 ≙ 1 s
30.7 MOTOR LOAD CURVE	43007	50 % ... 150 %	1 ≙ 1 %
30.8 ZERO SPEED LOAD	43008	25 % ... 150 %	
30.9 BREAK POINT	43009	1 Hz ... 300 Hz	100 ≙ 1 Hz 30000 ≙ 300 Hz
30.10 STALL FUNCTION	43010	**1** = FAULT; **2** = WARNING; **3** = NO	
30.11 STALL FREQ HI	43011	0.5 Hz ... 50 Hz	50 ≙ 0.5 Hz 5000 ≙ 50 Hz
30.12 STALL TIME	43012	10 s ... 400 s	1 ≙ 1 s
30.13 UNDERLOAD FUNC	43013	**1** = NO; **2** = WARNING; **3** = FAULT	
30.14 UNDERLOAD TIME	43014	0 s ... 600 s	1 ≙ 1 s
30.15 UNDERLOAD CURVE	43015	**1**; **2**; **3**; **4**; **5**	
30.16 MOTOR PHASE LOSS	43016	**0** = NO; **Hex FFFF** = FAULT	
30.17 EARTH FAULT	43017		
30.18 COMM FAULT FUNC	43018	**1** = FAULT; **2** = NO; **3** = CONST SP 15; **4** = LAST SPEED	
30.19 COMM FAULT TIMEOUT	43019	0.1 s ... 60 s	10 ≙ 0.1 s 6000 ≙ 60 s
31 AUTOMATIC RESET			
31.1 NUMBER OF TRIALS	43101	**1**; **2**; **3**; **4**; **5**	
31.2 TRIAL TIME	43102	1.0 s ... 180.0 s	100 ≙ 1 s 18000 ≙ 180 s
31.3 DELAY TIME	43103	0.0 s ... 60.0 s	100 ≙ 1 s 6000 ≙ 60 s
31.4 OVERCURRENT	43104	**0** = NO; **Hex FFFF** = YES	
31.5 OVERVOLTAGE	43105		
31.6 UNDERVOLTAGE	43106		
31.7 AI SIGNAL<MIN	43107		

Parameter	4xxxx Register	Alternative Settings	Scaling
32 SUPERVISION			
32.1 SPEED1 FUNCTION	43201	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.2 SPEED1 LIMIT	43202	-18000 rpm ... 18000 rpm	1 ≙ 1 rpm
32.3 SPEED2 FUNCTION	43203	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.4 SPEED2 LIMIT	43204	-18000 rpm ... 18000 rpm	1 ≙ 1 rpm
32.5 CURRENT FUNCTION	43205	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.6 CURRENT LIMIT	43206	0 ... 1000 A	1 ≙ 1 A
32.7 TORQUE 1 FUNCTION	43207	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.8 TORQUE 1 LIMIT	43208	0 % ... 400 %	1 ≙ 1 %
32.9 TORQUE 2 FUNCTION	43209	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.10 TORQUE 2 LIMIT	43210	0 % ... 400 %	1 ≙ 1 %
32.11 REF1 FUNCTION	43211	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.12 REF1 LIMIT	43212	0 rpm ... 18000 rpm	1 ≙ 1 rpm
32.13 REF2 FUNCTION	43213	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.14 REF2 LIMIT	43214	0 % ... 500 %	1 ≙ 1 %
32.15 ACT1 FUNCTION	43215	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.16 ACT1 LIMIT	43216	0 % ... 200 %	0 ≙ 0 % 20000 ≙ 200 %
32.17 ACT2 FUNCTION	43217	**1** = NO; **2** = LOW LIMIT; **3** = HIGH LIMIT	
32.18 ACT2 LIMIT	43218	0 % ... 200 %	0 ≙ 0 % 20000 ≙ 200 %
33 INFORMATION			
33.1 DTC SW VERSION	43301	(Version of the ACS 600 software)	
33.2 APPL SW VERSION	43302	(Version of the ACS 600 software)	
33.3 TEST DATE	43203	(Date Tested)	
33.4 SERIAL NUMBER	43204	(Serial number of the ACS 600)	
34 PROCESS SPEED		(EFFECTIVE ONLY WITH APPLICATION SOFTWARE VERSION ≥ 2.5)	
34.1 SCALE	43401	1 ... 30000	1 ≙ 1
34.2 UNIT	43402	**1** = NO; **2** = rpm; **3** = %; **4** = m/s	
40 PID CONTROL		(EFFECTIVE ONLY WHEN THE PID CONTROL MACRO IS SELECTED)	
40.1 PID GAIN	44001	0.1 ... 100	10 ≙ 0.1 10000 ≙ 100
40.2 PID INTEG TIME	44002	0.02 s ... 320.00 s	2 ≙ 0.02 s 32000 ≙ 320 s
40.3 PID DERIV TIME	44003	0.00 s ... 10.00 s	100 ≙ 1 s 1000 ≙ 10 s
40.4 PID DERIV FILTER	44004		
40.5 ERROR VALUE INV	44005	**0** = NO; **Hex FFFF** = YES	
40.6 ACTUAL VALUE SEL	44006	**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	
40.7 ACTUAL1 INPUT SEL	44007	**1** = AI1; **2** = AI2; **3** = AI3	
40.8 ACTUAL2 INPUT SEL	44008		
40.9 ACT1 MINIMUM	44009	-1000 % ... 1000 %	-10000 ≙ -1000 % 10000 ≙ 1000 %
40.10 ACT1 MAXIMUM	44010		
40.11 ACT2 MINIMUM	44011		
40.12 ACT2 MAXIMUM	44012		

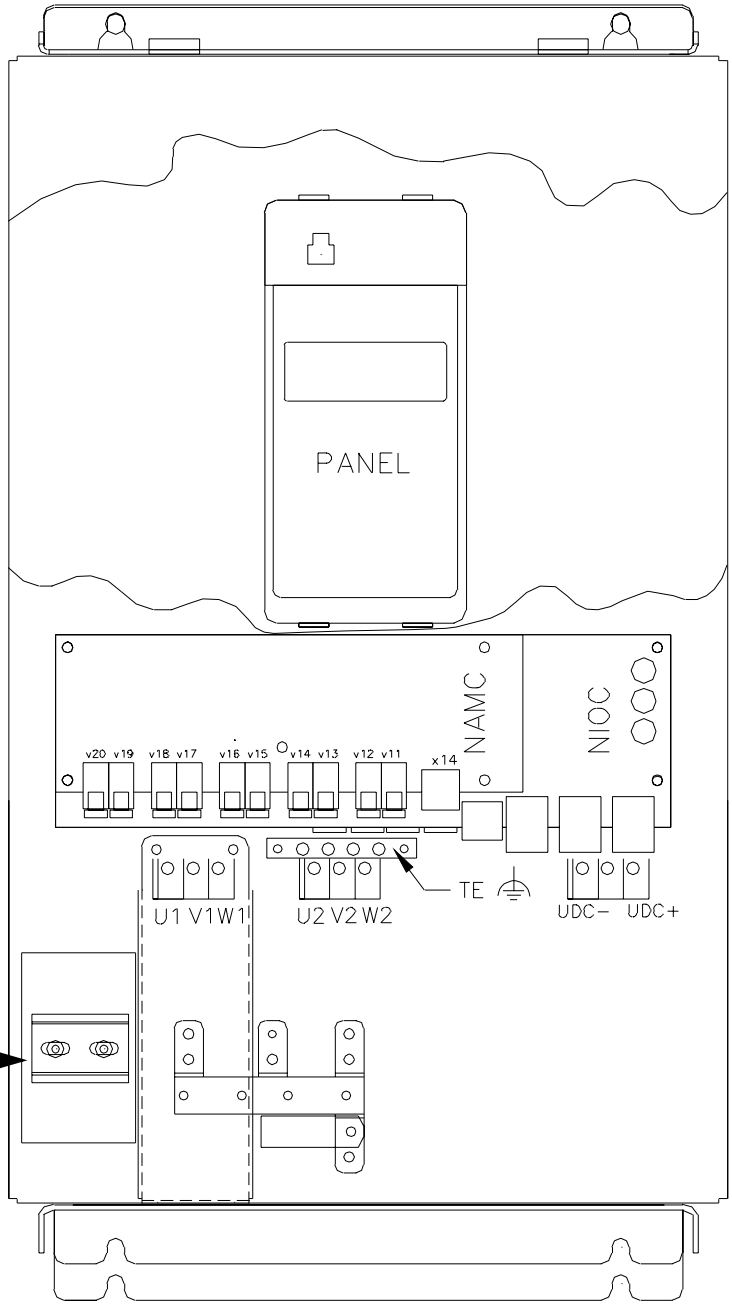
Parameter	4xxxx Register	Alternative Settings	Scaling
50 ENCODER MODULE			
50.1 PULSE NR	45001	0 ... 2999	
50.2 SPEED MEAS MODE	45002	**0** = A ¯ B DIR; **1** = A ¯¯; **2** = A ¯ B DIR; **3** = A ¯¯ B ¯¯	
50.3 ENCODER FAULT	45003	**0** = WARNING; **Hex FFFF** = FAULT	
51 COMMUNICATION MODULE			
51.1 FIELD BUS	45101	NMBP-01	
51.2 PROTOCOL	45102	MODBUS PLUS	
51.3 STATION	45103	1 ... 64	
51.4 GOOD MESSAGES	45104	0 ... 32767	
51.5 BAD MESSAGES	45105	0 ... 32767	
51.6 GD Out 1	45106	0 ... 6	
51.7 GD Out 2	45107	0 ... 6	
51.8 GD Out 3	45108	0 ... 6	
51.9 GD In1 Stn	45109	0 ... 64	
51.10 GD In1 Wrd	45110	0 ... 31	
51.11 GD In2 Stn	45111	0 ... 64	
51.12 GD In2 Wrd	45112	0 ... 31	
51.13 FD In3 Stn	45113	0 ... 64	
51.14 GD In3 Wrd	45114	0 ... 31	
98 OPTION MODULES			
98.1 ENCODER MODULE	49801	**0** = NO; **Hex FFFF** = YES	
98.2 COMM. MODULE	49802		
98.3 DI/O EXT MODULE 1	49803		
98.4 DI/O EXT MODULE 2	49804		
98.5 DI/O EXT MODULE 3	49805		
98.6 AI/O EXT MODULE	49806		
99 START-UP DATA			
99.1 LANGUAGE	49901	**0** = ENGLISH; **1** = ENGLISH(AM); **2** = DEUTSCH; **3** = ITALIANO; **4** = ESPANOL; **5** = PORTUGESE; **6** = NEDERLANDS; **7** = FRANCAIS; **8** = DANSK; **9 =** SUOMI; **10** = SVENSKA	
99.2 APPLICATION MACRO	49902	**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	
99.3 APPLIC RESTORE	49903	**1** = NO; **2** = YES	
99.4 MOTOR CTRL MODE	49904	**0** = DTC; **Hex FFFF** = SCALAR	
99.5 MOTOR NOM VOLTAGE	49905	0 * U_N of ACS 600 ... 2 * U_N of ACS 600 (printed on the motor nameplate)	
99.6 MOTOR NOM CURRENT	49906	0 * I_{hd} of ACS 600 ... 3 * I_{hd} of ACS 600 (printed on the motor nameplate)	
99.7 MOTOR NOM FREQ	49907	8 Hz ... 300 Hz (printed on the motor nameplate)	
99.8 MOTOR NOM SPEED	49908	1 rpm ... 20 000 rpm (printed on the motor nameplate)	
99.9 MOTOR NOM POWER	49909	0 kW ... 9000 kW (printed on the motor nameplate)	
99.10 MOTOR ID RUN	49910	**1** = NO; **2** = STANDARD; **3** = REDUCED	

Appendix C – Assembly Drawings

ACS 601, Frame R4

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

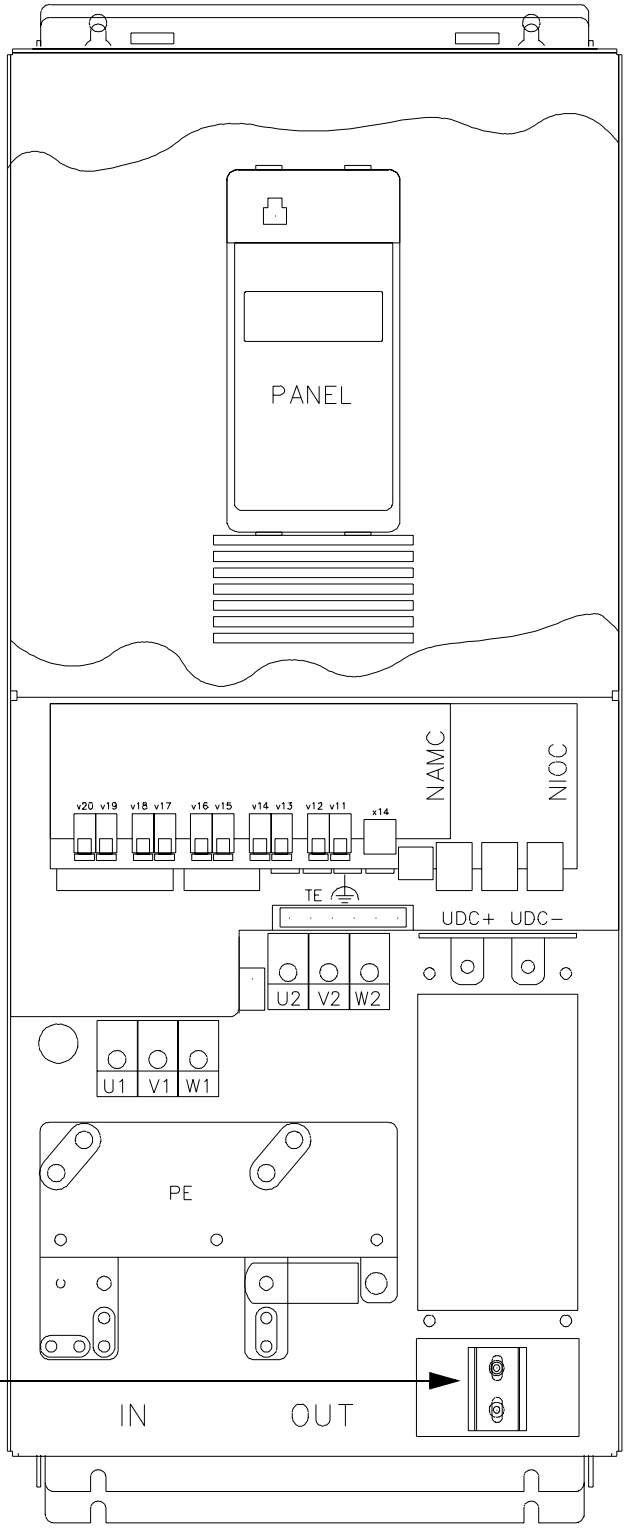
Front view



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

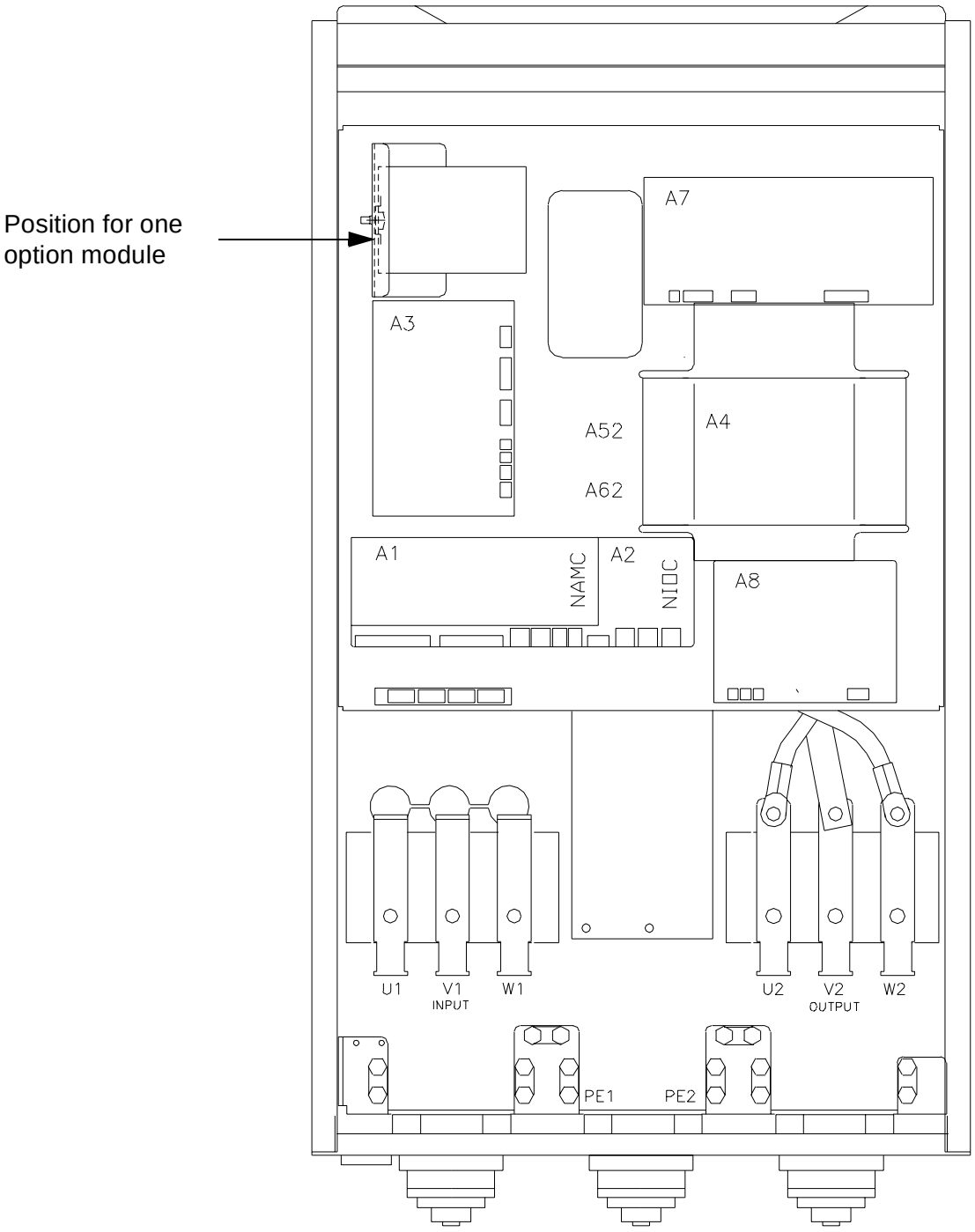


Position for one option module

ACS 601, Frame R7

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

Front view
cover removed

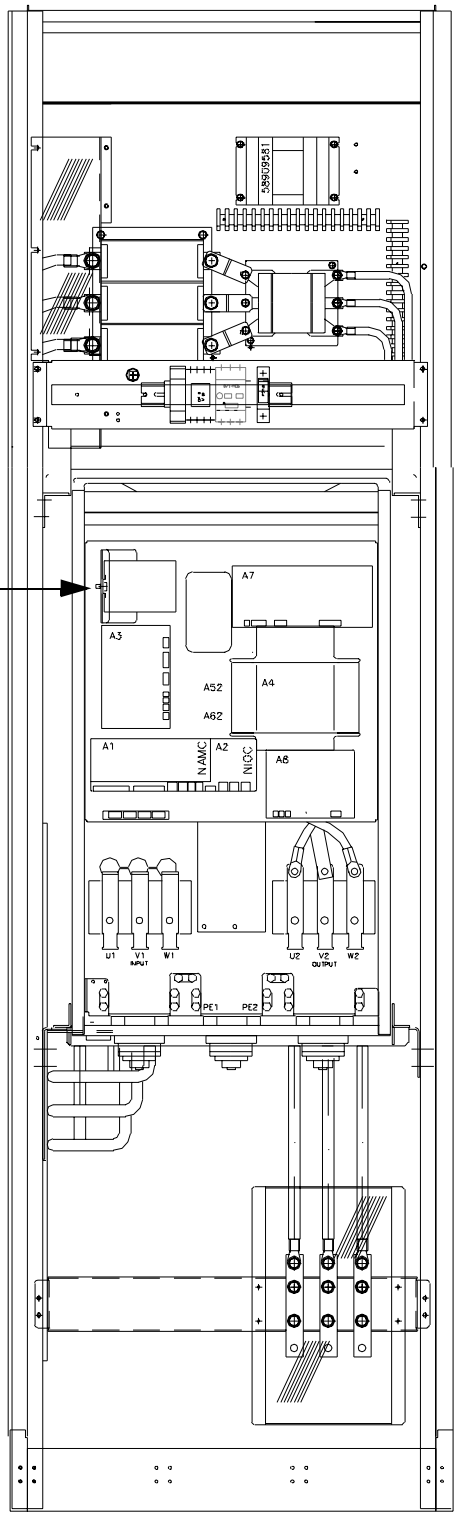


ACS 603, Frame R7

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

Front view
door open
converter unit cover removed

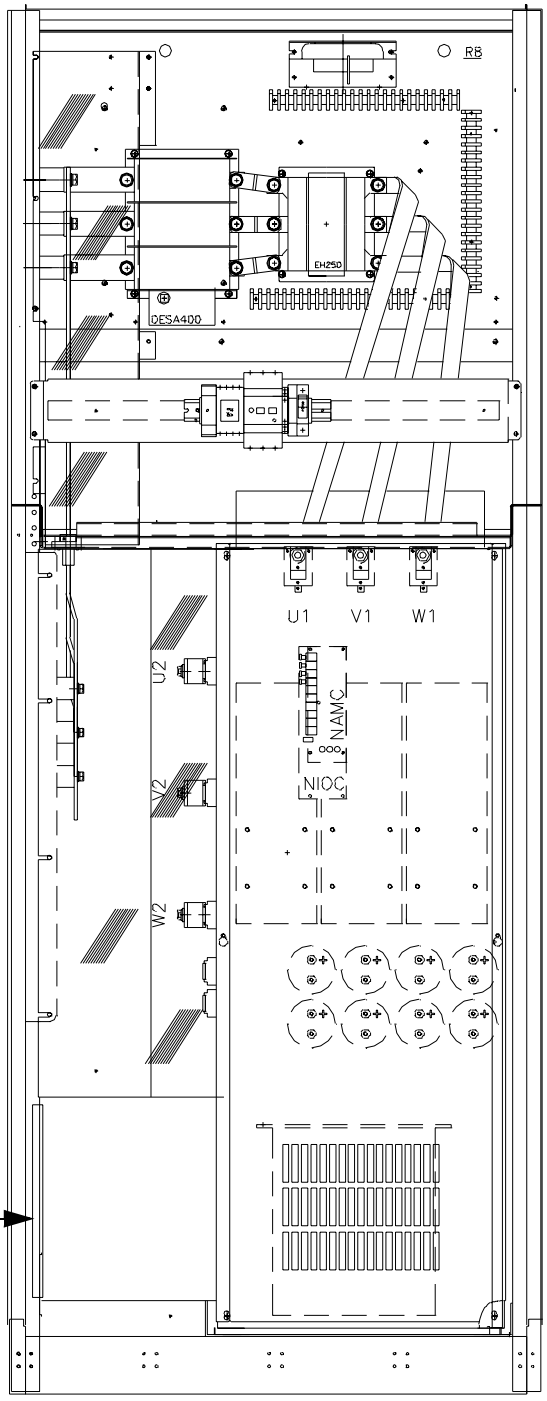
Position for one option module



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

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NMBP-01/EN
3AFY 58919802 R0125 REV B
EFFECTIVE: 1996-03-01
SUPERSEDES: None

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