ACS 160

Installation and Start-up Guide

InterBus-S Adapter Module
CFB-IBS

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Safety Instructions

Overview

This chapter states the safety instructions that must be followed when installing and operating the CFB-IBS InterBus-S Adapter Module.

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

Warnings and Notes

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

Warnings

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

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

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

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

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

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

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

General Safety Instructions

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

The drive and adjoining equipment must be properly earthed.

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

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

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

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

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

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

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Chapter 4 – Programming

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Chapter 1 – Introduction to This Guide

Intended Audience

The Guide is intended for the people who are responsible for commissioning and using a CFB-IBS InterBus-S Adapter Module with the ACS 160 drive. The reader is expected to have a basic knowledge of electrical fundamentals, electrical wiring practices, the host controller software, and how to operate the drive.

Before You Start

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

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

What This Guide Contains

This manual contains information on the wiring, configuration and use of the CFB-IBS module.

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

Chapter 2 – Overview contains a short description of the InterBus-S system and the CFB-IBS InterBus-S Adapter Module, a delivery checklist, and warranty information.

Chapter 3 – Installation contains wiring instructions.

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

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

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

Appendix A explains definitions and abbreviations concerning this guide and the InterBus system.

Appendix B contains Technical Data.

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

Chapter 2 – Overview

Overview

This chapter contains a short description of the InterBus-S system and the CFB-IBS module, a delivery checklist, and warranty information.

The InterBus-S System

InterBus-S is an open serial communication standard for the sensor-actuator level. The protocol is based on DIN 19245 Part 2 and itself specified in DIN 19258. In the exchange of parameter data, InterBus-S employs the PMS (Peripherals Message Specification) user interface.

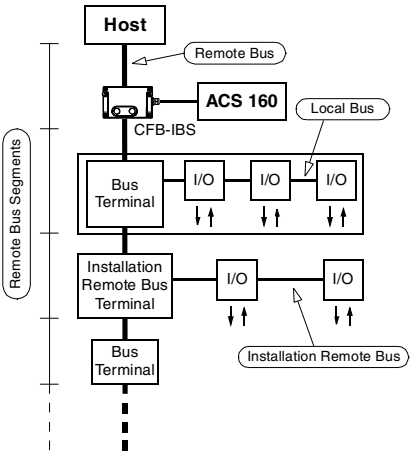
Further information is available from the host controller documentation, *www.interbusclub.com* (INTERBUS Club) and *www.phoenixcontact.com* (Phoenix Contact).

InterBus-S Message Frame

The InterBus-S system employs so-called summation frames. The host controller cyclically sends a message frame that includes the process data for every module on the bus. The frame is constructed by the host controller using the configuration data entered previously for each module.

As the message frame is relayed through the system, each device on the bus stores the information addressed to it in a buffer and responds by writing a response message into the same position in the frame. As the message frame returns to the host controller, it is checked against the original message.

Topology The physical transmission medium of InterBus-S is twisted pair cable according to the RS-485 standard. The main bus – in InterBus terminology, the *remote bus* – may contain 32 *segments,* each consisting of a cable and the device connected to it. The maximum length of one segment is 400 m. Local branches (referred to as *installation remote buses* and *local buses,* depending on branch type) can be connected to the remote bus using so-called *bus terminals.*



Data Channels The InterBus-S system provides two channels for data transfer, the *process data channel* (for fast cyclic transfer of time-critical I/O data) and the *PCP channel* (for acyclic transfer of non-time-critical, complex blocks of data, e.g. parameter data).

The CFB-IBS Module

The CFB-IBS InterBus-S Adapter Module is an optional device which enables the connection of an ACS 160 drive to an InterBus-S system. The drive is considered a remote bus device by the host. The CFB-IBS does not initiate communication to other devices; it will only respond to incoming messages.

Through the CFB-IBS, it is possible to:

- Give control commands to the drive (Start, Stop, Run enable, etc.)
- Feed a motor speed reference to the drive
- Read status information and actual values from the drive
- Change drive parameter values
- Reset a drive fault.

The InterBus-S commands and services supported by the CFB-IBS InterBus-S Adapter Module are discussed in Chapter 5.

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

Delivery Check

The option package of the CFB-IBS InterBus-S Adapter Module contains:

- InterBus-S Adapter Module, Type CFB-IBS
- 2 pcs M16×1.5 cable glands with O ring
- 2 pcs M4×12 mounting screws
- this manual, the *CFB-IBS Installation and Start-up Guide*.

Warranty and Liability Information

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

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

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

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

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

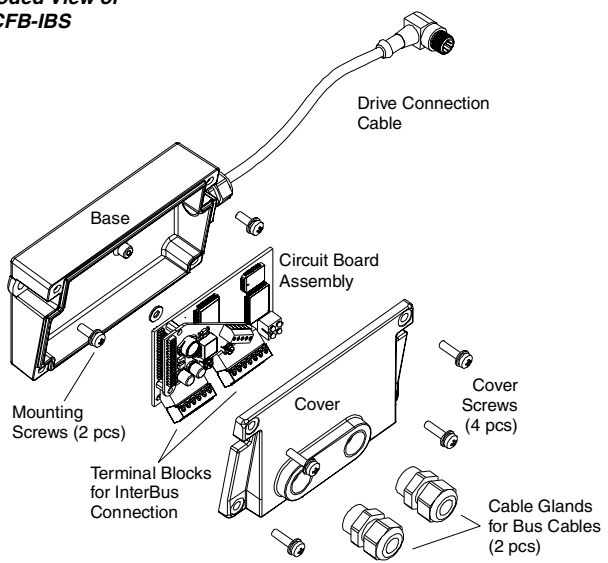
The technical data and specifications are valid at the time of printing. ABB reserves the right to subsequent alterations.

Chapter 3 – Installation

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

WARNING! The CFB-IBS contains components sensitive to electrostatic discharge (ESD). Wear an earthing wrist band when handling the circuit board assembly. Do not touch the boards unnecessarily.

Exploded View of the CFB-IBS



Mounting

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

Drive Connection

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

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

InterBus-S Connection

The CFB-IBS provides two cable entries for the incoming and outgoing InterBus cables. The cables are connected to detachable terminal headers.

Note: If the CFB-IBS module is the last station on the remote bus, the output terminals are to be left unconnected.

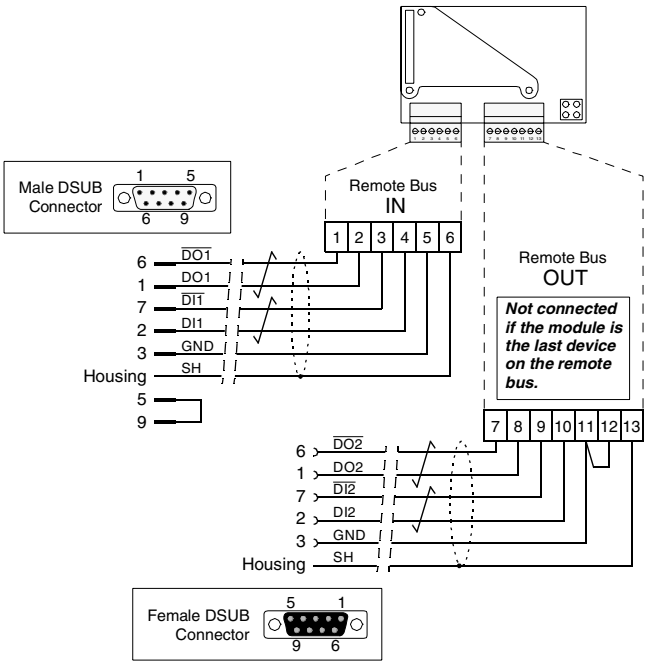
Bus Cable Specification

Ready-made remote bus cables in various lengths are available from Phoenix Contact. If these are not used, the cable should fulfil the following specification:

Parameter	Value	Test Method
No. of Conductors	3 × 2 (twisted pairs), common shield	–
Conductor Cross-section	Min. 0.2 mm^2	–
Conductor Resistance (DC)	Max. 9.6 Ω/m	VDE 0472-501, IEC 189-1 cl. 5-1
Characteristic Impedance	120 Ω ± 20% at f = 0.064 MHz, 100 Ω ± 15% at f > 1 MHz	IEC 1156-1 cl. 3.3.6
Dielectric Strength, Conductor/ Conductor, Conductor/Shield	1000 V RMS, 1 min	VDE 0472-509 Test type C or IEC 189-1 cl. 5.2
Insulation Resistance (after Dielectric Strength test)	Min. 150 MΩ/1000 metres of cable	VDE 0472-509 Test type B or IEC 189-1 cl. 5.3
Maximum Transfer Impedance at 30 MHz	250 mΩ/m	IEC 96-1
Operating Capacity at 800 Hz	Max. 60 nF/1000 metres of cable	VDE 0472-504 Test type A, IEC 189-1 cl. 5-4
Minimum Near-end Crosstalk Attenuation (NEXT) for 100 metres of cable at		VDE 0472-517 or IEC 1156-1 cl. 3.3.4
0.722 MHz	61 dB	
1 MHz	59 dB	
2 MHz	55 dB	
4 MHz	50 dB	
8 MHz	46 dB	
10 MHz	44 dB	
16 MHz	41 dB	
20 MHz	40 dB	

Procedure To connect the InterBus cables, follow this procedure:

1. Lead the bus cables to the space where the ACS 160 and the CFB-IBS are installed in. Arrange the bus cables as far away from any power cables as possible. Avoid parallel runs. Use grommets or cable glands at all cable lead-throughs for protection.
2. Remove the cover of the CFB-IBS module. Fasten the cable glands to the cover (if not done already).
3. Lead the bus cables through the cable glands and the cover. Loosen the clamping nuts of the cable glands if necessary. If only one bus cable is used, block the unused lead-through with a suitable plug.
4. Detach the terminal headers from their receptacles on the circuit board assembly and make the connections. See wiring diagram and terminal designations below.


Male DSUB
Connector
1
5
6
9
Remote Bus
IN
1
2
3
4
5
6
Remote Bus
OUT
Not connected if the module is the last device on the remote bus.
7
8
9
10
11
12
13
6
DO1
1
DO1
7
DI1
2
DI1
3
GND
Housing
SH
5
9
6
DO2
1
DO2
7
DI2
2
DI2
3
GND
Housing
SH
Female DSUB
Connector
5
1
9
6

Bus Connector Terminal Designations

	Terminal		Description
BUS IN	1	$\overline{DO1}$	Data out 1 (inverted)
	2	DO1	Data out 1
	3	$\overline{DI1}$	Data in 1 (inverted)
	4	DI1	Data in 1
	5	GND	Ground
	6	SH	Earth terminal for bus cable shield
BUS OUT (Not connected if the module is the last device on the remote bus)	7	$\overline{DO2}$	Data out 2 (inverted)
	8	DO2	Data out 2
	9	$\overline{DI2}$	Data in 2 (inverted)
	10	DI2	Data in 2
	11	GND	Ground
	12	RBST	Remote Bus Connector. When this terminal is connected to GND, internal bus termination is disabled.
	13	SH	Earth terminal for bus cable shield

5. Re-insert the terminal headers into their receptacles.
6. Replace the cover of the CFB-IBS.
7. Tighten the clamping nuts of the cable glands.

Chapter 4 – Programming

Overview

This chapter gives information on configuring the InterBus-S system and the drive for communication through the CFB-IBS InterBus-S Adapter Module.

Configuring the System

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

Drive Configuration

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

The parameters that configure the CFB-IBS are listed in Table 4-1 below. The alternative selections for these parameters are discussed in more detail below the table. See also Chapter 5.

The default settings are recommended for the CFB-IBS to act as a standard DRIVECOM Profile 21 device.

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

Table 4-1 The CFB-IBS configuration parameters.

No.	Parameter Name	Alternative Settings	Default Setting
5101	Module Type	**0** None; …; **3** CFB-IBS; …; **9** Other	**3** (CFB-IBS)
***5102**	Process Data In, Word 0	**0** DRIVECOM Status Word; **0101…9999** (Drive Parameter No.)	**0 (**DRIVECOM Status Word)
***5103**	Process Data In, Word 1	**0** DRIVECOM Speed Actual; **0101…9999** (Drive Parameter No.)	**0** (DRIVECOM Speed Actual)
***5104**	Process Data In, Word 2	**0** Not used; **0101…9999** (Drive Parameter No.)	**0** (Not used)
***5105**	Process Data In, Word 3	**0** Not used; **0101…9999** (Drive Parameter No.)	**0** (Not used)
***5106**	Process Data Out, Word 0	**0** DRIVECOM Control Word; **0101…9999** (Drive Parameter No.)	**0** (DRIVECOM Control Word)
***5107**	Process Data Out, Word 1	**0** DRIVECOM Speed Reference (Setpoint); **0101…9999** (Drive Parameter No.)	**0** (DRIVECOM Speed Ref.)
***5108**	Process Data Out, Word 2	**0** Not used; **0101…9999** (Drive Parameter No.)	**0** (Not used)
***5109**	Process Data Out, Word 3	**0** Not used; **0101…9999** (Drive Parameter No.)	**0** (Not used)
5110	PCP Words	**0, 1, 3, 5…65535** 1 word **2** 2 words*; **4** 4 words* *Generation 4 host required	**1** (1 PCP word)
5111	Process Data Words	**0** 0 words (PCP available only); **1** 1 word; **2** 2 words; **3** 3 words; **4…65535** 4 words	**2** (2 Process Data words)

*Process data can also be set up using the Process Data Description objects (6000 and 6001). See Chapter 5.

5101 Module Type	This parameter must be set to 3.
5102 Process Data In, Word 0	Selects the source of data word 0 from the drive. (Usually this is the DRIVECOM Status Word.)
5103 Process Data In, Word 1	Selects the source of data word 1 from the drive. (Usually this is the actual speed value in rpm.)
5104 Process Data In, Word 2	Selects the source of data word 2 from the drive.
5105 Process Data In, Word 3	Selects the source of data word 3 from the drive.
5106 Process Data Out, Word 0	Selects the source of data word 0 to the drive. (Usually this is the DRIVECOM Control Word.)
5107 Process Data Out, Word 1	Selects the source of data word 1 to the drive. (Usually this is the speed reference in rpm.)
5108 Process Data Out, Word 2	Selects the source of data word 2 to the drive.
5109 Process Data Out, Word 3	Selects the source of data word 3 to the drive.
5110 PCP Words	Selects how many PCP (parameter data) words are transferred on the InterBus network. The value can also be set by the host controller (object index 5F9C). Independent of the changing method, the power of the CFB-IBS must be cycled for the new parameter value to take effect. The settings **2** and **4** require a Generation 4 host. Note that the CFB-IBS requires 200 bytes in the PDU buffers, and the host has to be set up for that amount for communication with the CFB-IBS.
5111 Process Data Words	Selects how many process data words are transferred on the InterBus network. The value can also be set by the host controller (object index 5F9B). Independent of the changing method, the power of the CFB-IBS must be cycled for the new parameter value to take effect.

Other Drive Parameters

Fieldbus Communication

Parameters 5204 COMM FAULT TIME and 5205 COMM FAULT FUNC define the action taken in the event of a communication error between the CFB-IBS module and the drive.

Control Locations and Actual Signal Selections

The ACS 160 drive can receive control signals from multiple sources (such as the digital and analogue inputs, the control panel, and a fieldbus adapter). The user can separately determine the source for each type of control information, and select which operating data is output as actual signals by the drive. Especially refer to parameter groups 10, 11, 15 and 16 in the *ACS 160 User's Manual* for information on the selection parameters.

Host Configuration The devices on the remote bus are automatically detected by the host controller software, and then assigned input and output memory addresses. The need for further configuration depends on the host controller software and the application. The configuration data below is valid for the CFB-IBS.

Communication Parameter	Value
Device Name/Type	CFB-IBS
ID Code	Default: 227 (E3h) Other possible settings: 224 (E0h); 225 (E1h); 56 (38h)
Length Code	Default: 6 bytes
No. of Process Data Bytes In/Out	Default: 4 bytes
No. of Parameter Data Bytes In/Out	Default: 2 bytes
Register Length (bytes)	Default: 6
Profile No.	21 (DRIVECOM)
Services Supported	All Mandatory Services Get OV, Read, Write
Maximum PDU Length	200 bytes
COMMUNICATION REFERENCE LIST ENTRIES	
Max-PDU Sending-High-Prio	0
Max-PDU Sending-Low-Prio	200 bytes
Max-PDU Receiving-High-Prio	0
Max-PDU Receiving-Low-Prio	200 bytes
PMS-Services-Supported	80 30 00 / 00 00 00 Client / Server

Calculating the Optimal Cycle (Scan) Time

For fast data transfer, the host controller should send the message frame as frequently as possible. However, the slave stations on the bus may not be able to follow if the cycle time (scan time) is too short. The cycle time can be calculated using the following formula:

$$t_{cycle} = (13 \times (6 + n) + 1.5 \times m) \times t_{Bit} + t_{SW} + t_{PH}$$

where

t_{cycle}	Cycle time in milliseconds
n	Number of user data bytes
m	Number of remote bus modules installed
t_{Bit}	Bit duration (0.002 ms for 500 kbit/s)
t_{SW}	Software runtime (0.2 ms)
t_{PH}	Runtime on the transmission medium (for copper, 0.016 ms • l/km, where l = remote bus cable length in kilometres)

Note: The minimum bus cycle time with the CFB-IBS is 1 ms. Also note that data transfer through the module may be slower.

Chapter 5 – Communication

Overview

This chapter describes the communication between the CFB-IBS and the InterBus-S host controller.

PCP Protocol

The interface structure of the CFB-IBS is based on an object-oriented model. All communication objects can be accessed via the PCP (Peripherals Communication Protocol) channel. The PCP services allow acknowledged access to the communication objects, ie. the intended access is confirmed by the drive.

PCP Services Supported by CFB-IBS

The CFB-IBS supports the following PCP services:

- Abort
- Get-OD (Short and Long)
- Identify
- Initiate
- Read
- Reject
- Status
- Write.

PDU Buffers

Note that the CFB-IBS requires 200 bytes in the PDU buffers, and the host has to be set up for that amount for communication with the CFB-IBS.

Comm. Objects on Process Data Channel

It is possible to map certain communication objects to the process data channel. Through the process data channel, data is transferred without acknowledgement.

Because the process data channel is significantly faster than the PCP channel, it is often used for transferring time-critical cyclic data such as the Control/Status Word, references and actual values.

The default values of Parameters 5102, 5103, 5106 and 5107 (see Table 4-1) define the Control Word, Status Word, Speed Reference, and Actual Speed to be transferred through the process data channel.

Communication Object Listing

PCP Index	Name	Access	Type
5F9B	PD Words	R/W	UNSIGNED8
5F9C	PCP Words	R/W	UNSIGNED8
5F9D…5FFF	Vendor-Specific	R/W or RO	RECORD_OBJECT
6000	PI Desc	R/W	RECORD_OBJECT
6001	PO Desc	R/W	RECORD_OBJECT
6002	PO Enable	R/W	BOOLEAN
6012	Write Control	R/W	BOOLEAN
603F	Error Code	RO	OCTET_STRING
6040	Control Word	R/W	OCTET_STRING
6041	Status Word	RO	OCTET_STRING
6042	Speed Set	R/W	INTEGER16
6043	Speed Cmnd	RO	INTEGER16
6044	Speed Actual	RO	INTEGER16
6046	Speed Min Max	R/W	UNSIGNED32
6048	Speed Acc	R/W	RECORD_OBJECT
6049	Speed Dec	R/W	RECORD_OBJECT
604A	Speed Quick	R/W	RECORD_OBJECT
605A	Quick Opt	R/W	INTEGER16
605B	Shutdown Opt	R/W	INTEGER16
605C	Disable Opt	R/W	INTEGER16

Indexing of Drive Parameters (5F9D…5FFF)

Drive parameters are mapped into 16-bit record-type objects in the range 5F9D…5FFF.

The first ACS 160 parameter is *0102,* where *01* denotes parameter group; *02* is the parameter index. The PCP Object Index for each parameter group is calculated by adding 24476 to the group number, then converting to hexadecimal, eg.

01 + 24476 = 24477d = 5F9D

99 + 24476 = 24575d = 5FFF

The resultant PCP object will be named according to the source parameter group, eg. Group 10 becomes *PaGr 10*. Nonexisting parameter groups will be declared as null objects and will not be visible at the InterBus-S host. Individual parameters inside parameter groups become accessible through object subindexes. For example, drive parameter group 10 is mapped as follows:

Drive Parameter				Object		
Group	**Index**	**Name**		**Index**	**Subindex**	**Contents**
01	01	–	⇒	5F9D	01	0x00
	02	SPEED	⇒		02	value
	03	OUTPUT FREQ	⇒		03	value
	04	CURRENT	⇒		04	value
	05	TORQUE	⇒		05	value
	06	POWER	⇒		06	value
	07	DC BUS VOLTAGE	⇒		07	value
	08	–	⇒		08	0x00
	09	OUTPUT VOLTAGE	⇒		09	value
	•••	•••	⇒		•••	•••
	37	MWh COUNTER	⇒		37	value

An attempt to access a nonexisting subindex returns a negative response. A Read request for the whole object (subindex 0) will return a response with the data, with the exception of nonexisting parameters inside the group. These will be returned as zero.

A Write request for the whole object (subindex 0) will return a negative response if any of the nonexistent subindexes are set to other than zero.

Process Input Data Description (6000)

This object contains a description of how parameters are transferred through the process input data channel. The direction is given as seen from the host controller, thus process input data is transmitted by the CFB-IBS to the host. This object, when accessing a single element, is controlled by the Write Control parameter (see further below).

With the CFB-IBS, it is only possible to map whole words on the InterBus network. This means it is only allowed to map objects to even bytes. Some of the indexes are simple variables, so the subindex should be set to 0. For drive parameters, subindexes must be used as described above.

The process input data can also be configured using drive parameters 5102 to 5105 (see Chapter 4).

On the InterBus network, a record object represents the process data descriptions as follows:

Subindex	Meaning	Example
1	Bytes of process data available	4
2	Index to use for byte 0	6041
3	Subindex to use for byte 0	0
4	Index to use for byte 1	0
5	Subindex to use for byte 1	0
6	Index to use for byte 2	6044
7	Subindex to use for byte 2	0
8	Index to use for byte 3	0
9	Subindex to use for byte 3	0
•••	•••	•••
•••	•••	•••
•••	Index to use for byte n	–
•••	Subindex to use for byte n	–

The above example describes a case where two words of process data are used. Objects 6041 (DRIVECOM Status Word) and 6044 (DRIVECOM Speed Actual) are mapped to the 1st and 2nd words respectively, which corresponds to the default parameter settings of the CFB-IBS.

With the CFB-IBS, the index mappings available for Object 6000 are as follows:

Word No.	Indexes Possible to Map
0	Readable indexes in the range 5F9D…5FFF, and index 6041
1	Readable indexes in the range 5F9D…5FFF, and index 6044
2	Readable indexes in the range 5F9D…5FFF
3	Readable indexes in the range 5F9D…5FFF

Process Output Data Description (6001)

This object contains a description of how parameters are transferred through the process output data channel. The direction is given as seen from the host controller, thus process output data is transmitted by the host to the CFB-IBS. This object, when accessing a single element, is controlled by the Write Control parameter (see further below).

With the CFB-IBS, it is only possible to map whole words on the InterBus network. This means it is only allowed to map objects to even bytes. Some of the indexes are simple variables, so the subindex should be set to 0. For drive parameters, subindexes must be used as described above.

The process input data can also be configured using drive parameters 5106 to 5109 (see Chapter 4).

On the InterBus network, a record object represents the process data descriptions as follows:

Subindex	Meaning	Example
1	Bytes of process data available	4
2	Index to use for byte 0	6040
3	Subindex to use for byte 0	0
4	Index to use for byte 1	0
5	Subindex to use for byte 1	0
6	Index to use for byte 2	6042
7	Subindex to use for byte 2	0
8	Index to use for byte 3	0
9	Subindex to use for byte 3	0
•••	•••	•••
•••	•••	•••
•••	Index to use for byte n	–
•••	Subindex to use for byte n	–

The above example describes a case where two words of process data are used. Objects 6040 (DRIVECOM Control Word) and 6042 (DRIVECOM Speed Setpoint, i.e. Reference) are mapped to the 1st and 2nd words respectively, which corresponds to the default parameter settings of the CFB-IBS.

With the CFB-IBS, the index mappings available for Object 6001 are as follows:

Word No.	Indexes Possible to Map
0	Readable indexes in the range 5F9D…5FFF, and index 6040
1	Readable indexes in the range 5F9D…5FFF, and index 6042
2	Readable indexes in the range 5F9D…5FFF
3	Readable indexes in the range 5F9D…5FFF

Process Output Data Enable (6002)

This object decides whether the process output data is used by the CFB-IBS or not. This object is used for data consistency reasons when changes are made to the process output data descriptions.

Write Control (6012)

In single parameterisation mode, the contents of a parameter being written are checked for boundaries and conflict with other parameter contents. The new value is checked and becomes valid instantly providing there is a positive acknowledgement.

When parameter values are changed, dependencies between parameter contents may cause temporary incompatibilities (e.g. error message ‘collision with other values’) that require parameter changes performed in a certain order.

In situations like this, block parameterisation can be activated. In block parameterisation mode, a positive acknowledgement means that the parameter contents are accepted (after a basic test) but do not take effect yet.

Block parameterisation mode is activated by setting the object Write Control (6012) to TRUE (0xFF). (The default value of Write Control is FALSE [0x00].)

The contents are checked for consistency when Write Control is changed from TRUE back to FALSE.

If the new value is found consistent, it is accepted and write access to the Write Control object is confirmed positively.

If the new value is found inconsistent, the old value remains valid and write access to the Write Control object is confirmed negatively.

DRIVECOM Malfunction Code (603F)

Upon a fault, a malfunction code is available from object 603F. The table below lists the possible DRIVECOM malfunction codes along with their ACS 160 counterparts. See the *ACS 160 User's Manual* for information on the ACS 160 faults.

DRIVECOM Malfunction Code	Corresponding ACS 160 Fault Code	Fault Name
0000	–	(No fault)
2120	15	OUTPUT EARTH FAULT
2300	1	OVERCURRENT
2310	5	OUTPUT OVERLOAD
2340	4	SHORT CIRCUIT
3100	16	DC BUS RIPPLE
3120	6	DC UNDERVOLTAGE
3210	2	DC OVERVOLTAGE
4210	9	MOTOR OVERTEMP
4310	3	ACS160 OVERTEMP
5000	21-29	HARDWARE ERROR
5220	–	(CFB-IBS non-volatile memory fault)
5300	10	PANEL LOSS
6320	11	PARAMETERING
7000	7 or 8	ANALOGUE INPUT 1/2
7120	12 or 17	MOTOR STALL or UNDERLOAD
7510	13	SERIAL COMM LOSS
9000	14	EXTERNAL FAULT SIGNAL

The Control Word and the Status Word (6040/6041)

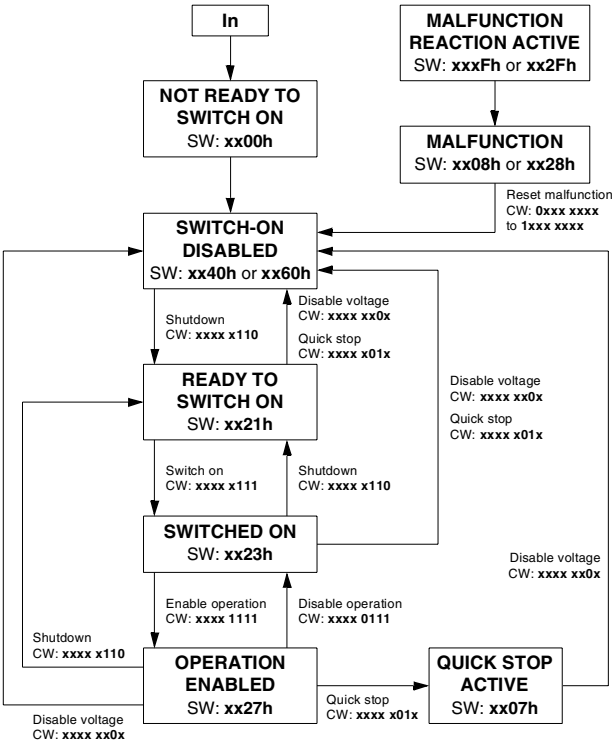
The Control Word is the principal means for controlling the drive from a fieldbus system. The drive switches between its states according to the bit-coded instructions on the Control Word, and returns status information to the host in the Status Word.

The contents of the Control Word and the Status Word are detailed below. (Unlisted bits are not used.) The drive states are presented in the DRIVECOM State Machine further below.

DRIVECOM Control Word (6040)	
Bit	**Name**
0	Switch on
1	Disable voltage
2	Quick stop
3	Enable operation
7	Reset malfunction

DRIVECOM Status Word (6041)	
Bit	**Name**
0	Ready to switch on
1	Switched on
2	Operation enabled
3	Malfunction
4	Voltage disabled
5	Quick stop
6	Switch-on disabled
9	Remote
10	Face value reached
11	Limit value
15	Comm. error between CFB-IBS and ACS 160

DRIVECOM State Machine



SW: Status Word CW: Control Word (bits 7…0 shown)

Speed Setpoint (Reference) (6042)

This object represents the specified speed reference for the drive in rpm.

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

Speed Command Variable (6043)

This is the final speed fed to the motor after the calculation of the ramp functions.

Speed Actual Value (6044)

This is the actual motor speed as detected by the drive. Depending on the drive system, speed deviations between the Speed Setpoint and this object may occur.

Speed Min/Max Amount (6046)

This object consists of the subparameters Speed Min Amount and Speed Max Amount. It should be noted that changing Speed Max Amount will cause other objects – e.g. the ramp times – to change since they use this object as the basis. It is therefore recommended that this object be set first prior to other parameters.

The Speed Min/Max Amount object also sets the limits that the Limit bit in the Status Word is compared with. For example, if Speed Setpoint is greater than Speed Max Amount, the Limit bit will be set to 1.

Speed Acceleration (6048)

This object consists of two subparameters that define the acceleration of the motor as a ramp. The subparameters are deltaspeed and deltatime. With the CFB-IBS module, the deltatime subparameter is fixed to 1 second.

Speed Deceleration (6049)

This object consists of two subparameters that define the deceleration of the motor as a ramp. The subparameters are deltaspeed and deltatime. With the CFB-IBS module, the deltatime subparameter is fixed to 1 second.

Speed Quick Stop (604A)

This object consists of two subparameters that define the Quick Stop function for the motor as a ramp. The subparameters are deltaspeed and deltatime. With the CFB-IBS module, the deltatime subparameter is fixed to 1 second.

Quick Stop Option Code (605A)

This object selects in which way the drive should be stopped when a transition from the OPERATION ENABLED state to the QUICK STOP ACTIVE state is made.

Option Code	Meaning
0	Disable drive function
1	Stop by slow down ramp
2	Stop by quick stop ramp

Shutdown Option Code (605B)

This object selects in which way the drive should be stopped when a transition from the OPERATION ENABLED state to the READY TO SWITCH ON state is made.

Option Code	Meaning
0	Disable drive function
1	Stop by slow down ramp

Disable Operation Option Code (605C)

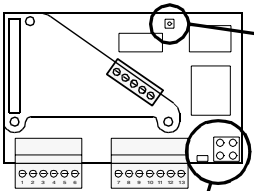
This object selects in which way the drive should be stopped when a transition from the OPERATION ENABLED state to the SWITCHED ON state is made.

Option Code	Meaning
0	Disable drive function
1	Stop by slow down ramp

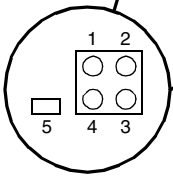
Chapter 6 – Status LEDs

Status LEDs

The status LEDs on the printed board assembly of the CFB-IBS module are described below.



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



LED No.	Indication/Description
1	RED: Outgoing remote bus disabled
2	GREEN: PCP communication active
3	GREEN: Cable connection OK and host is not in RESET state
4	GREEN: Bus (Layer 2) active
5	GREEN: Power OK

Appendix A – Definitions and Abbreviations

Abort	Service to abort the communication connection
Abort Detail	Application-specific, detailed designation for the abort
Access Groups	Identification about the allocation of group access
Acyclic Communication	Communication in which messages are sent only once on request
Add. Code	Application-specific, detailed designation of the error
Client	Service requester; the communication partner who requests an order
Communication Object	Data, programs or variables which may be processed or executed
Communication Reference	Module number of a station
Communication Relationship List	Contains definitions (permitted services, read and write memory sizes) regarding the communication channels
Confirmation	Order confirmation which the service provider sends to the service requester (client)
Control Word	16-bit word from master to slave with bit-coded control signals. (Sometimes called the Command Word)
Cyclic Communication	Communication in which Parameter/Process Data Objects are sent cyclically at pre-defined intervals
Error Class/Error Code	Classification number of an error
Error Code	Error number of the service
Fault	Event that leads to tripping of the device

Host (Controller)	Control system with bus initiative. Also called Master
Index	Access reference for communication objects; pointer to a variable/field
Initiate	Service to establish a communication relationship
Invoke ID	Order identification, request no. of the service to a station
KBL	See Communication Relationship List
KR	See Communication Reference
Length	Quantity of the following user data in bytes
Locally Generated	Error location. (Local station: 00; Remote station: FF)
Log. Status	Status of the module program
Object Dictionary (OD)	Local storage of all Communication Objects recognised by a device
Original Invoke ID	Invoke ID of the service which caused a reject
OV	See Object Dictionary
Password	Password for the access control
PCP	Peripherals Communication Protocol
Phys. Status	Status of the module hardware
Primitive	Basic operation of a service
Process Data	Data that contains Control Word and Reference value or Status Word and Actual value. May also contain other control information
Profile	Adaptation of the protocol for certain application field, e.g. drives
Protection	The value of the access check. (00: Protection off; FF: Protection on)
Reason Code	Error code for the connection release

Receive High	High-priority send buffer size. (Always 00)
Receive Low	Low-priority send buffer size (in bytes)
Reject	Service, designation of the service type which indicates a non-allowable access to a station
Reject Code	Designation of the error cause which initiated the reject
Request	Service request by the client
Response	Sending of the order confirmation by the server after the order has been executed
Result	Acknowledgement result of a service (positive: 00; negative: 01 to FF)
Send High	High-priority send buffer size. (Always 00)
Send Low	Low-priority send buffer size (in bytes)
Server	Service provider
Slave	Passive bus participant
Status Word	16-bit word from slave to master with bit-coded status messages
String of Module	Module type designation as a data string, the length of which is specified with Length
String of Profile	Module profile as a data string, the length of which is specified with Length
String of Revision	Module revision as a data string, the length of which is specified with Length
String of Vendor	Manufacturer name as a data string, the length of which is specified with Length
Subindex	Pointer to a location in a variable/field
Supported Services	6-word code of the supported services

Appendix B – Technical Data

CFB-IBS

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

Degree of Protection: IP65

Mounting: Onto ACS 160 drive

Settings: Via drive interface (control panel)

General:

- All materials are UL/CSA approved
- Complies with EMC Standards EN 50081-2 and EN 50082-2

Connectors:

- One Phoenix Contact MC1,5/6-ST-3,81 (6-pole, cross-section 1.5 mm^2 max.) screw terminal block for fieldbus IN connection;
- One Phoenix Contact MC1,5/7-ST-3,81 (7-pole, cross-section 1.5 mm^2 max.) screw terminal block for fieldbus OUT connection.
- Terminal Designations:

Bus Connector Terminal Designations

	Terminal		Description
BUS IN	1	$\overline{DO1}$	Data out 1 (inverted)
	2	DO1	Data out 1
	3	$\overline{DI1}$	Data in 1 (inverted)
	4	DI1	Data in 1
	5	GND	Ground
	6	SH	Earth terminal for bus cable shield

Bus Connector Terminal Designations

	Terminal		Description
BUS OUT (Not connected if the module is the last device on the remote bus)	7	$\overline{DO2}$	Data out 2 (inverted)
	8	DO2	Data out 2
	9	$\overline{DI2}$	Data in 2 (inverted)
	10	DI2	Data in 2
	11	GND	Ground
	12	RBST	Remote Bus Connector. When this terminal is connected to GND, internal bus termination is disabled.
	13	SH	Earth terminal for bus cable shield

InterBus-S

Topology: Ring

Protocol: Defined in DIN E 19258

Maximum Remote Bus Length: 12.8 km

Maximum Remote Bus Segment Length: 400 m

Maximum No. of Remote Bus Segments: 32

Maximum No. of Remote I/O Stations: 256

Medium: RS-485 cable, 3×2 (twisted pairs), common shield. Specification presented in Chapter 3.

Serial Communication Type: Asynchronous, full duplex

Transfer Rate: 500 kbit/s

Minimum Bus Cycle (Scan) Time: 1 ms

Appendix C – Ambient Conditions

Operation

The following conditions apply to stationary use of the module.

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

Temperature: -10 to +50 °C

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

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

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

Storage and Transportation

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

Temperature: -40 to +70 °C

Contamination Levels (IEC 721-3-3):

Storage:	Chemical gases: Class 1C2 Solid particles: Class 1S3
Transportation:	Chemical gases: Class 2C2 Solid particles: Class 2S2

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

CFB-IBS/EN
3BFE 64400606 R0125
EFFECTIVE: 1.4.2000

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