Fieldbus Appendix
Anybus-S PROFIBUS

Rev 2.00

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About This Document

How To Use This Document

This document is intended to provide a good understanding of the functionality offered by the Anybus-S PROFIBUS. The document only describes the features that are specific to the Anybus-S PROFIBUS, i.e. for general information regarding the Anybus-S platform, consult the Anybus-S Parallel Design Guide.

The reader of this document is expected to be familiar with high level software design, and communication systems in general. The use of advanced PROFIBUS-specific functionality may require in-depth knowledge in PROFIBUS networking internals and/or information from the official PROFIBUS specification. In such cases, those responsible for the implementation of this product should either obtain the PROFIBUS specification to gain sufficient knowledge or limit their implementation is such a way that this is not necessary.

For more information, documentation etc., please visit the HMS website, 'www.anybus.com'.

Important User Information

The data and illustrations found in this document are not binding. We, HMS Industrial Networks AB, reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be considered as a commitment by HMS Industrial Networks AB. HMS Industrial Networks AB assumes no responsibility for any errors that may appear in this document.

There are many applications of this product. Those responsible for the use of this device must ensure that all the necessary steps have been taken to verify that the application meets all performance and safety requirements including any applicable laws, regulations, codes, and standards.

Anybus® is a registered trademark of HMS Industrial Networks AB. All other trademarks are the property of their respective holders.

The examples and illustrations in this document are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular implementation, HMS Industrial Networks cannot assume responsibility or liability for actual use based on these examples and illustrations.

Warning:	This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.
ESD Note:	This product contains ESD (Electrostatic Discharge) sensitive parts that may be damaged if ESD control procedures are not followed. Static control precautions are required when handling the product. Failure to observe this may cause damage to the product.

Related Documents

Document name	Author
Anybus-S Parallel Design Guide	HMS
PROFIdrive - Profile Drive Technology (v. 3)	PNO
Digital Communications IEC61158 Type 3 (PROFIBUS)	IEC
PROFIBUS Profile Guidelines Part 1: Identification and Maintenance Functions	PNO
-	-

Document History

Summary of Recent Changes (v1.00... v2.00)

Change	Page(s)

Revision List

Revision	Date	Author(s)	Chapter(s)	Description
<2.00	-	-	-	(see older revisions)
2.00	2008-05-19	PeP	-	Major update
-	-	-	-	-

Conventions & Terminology

The following conventions are used throughout this document:

- Numbered lists provide sequential steps
- Bulleted lists provide information, not procedural steps
- The term 'module' refers to the Anybus module
- The term 'application' refers to the device that hosts the Anybus module
- Hexadecimal values are written in the format NNNNh, where NNNN is the hexadecimal value.
- Commands instructs the module to perform certain task
- Functions are commands that returns data

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About the Anybus-S PROFIBUS

General Information

The Anybus-S PROFIBUS communication module provides instant PROFIBUS DP-V0 connectivity via the patented Anybus-S application interface. Any device that supports this standard can take advantage of the features offered by the module, providing seamless network integration regardless of network type.

This product conforms to all aspects of the application interface defined in the Anybus-S Parallel Design Guide, making it fully interchangeable with any other device following that specification.

Features

- PROFIBUS DP-V0 communications
- Up to 416 bytes of cyclic I/O
- Galvanically isolated bus electronics
- Automatic baudrate detection
- On-board configuration switches
- Supports User Parameterization Data
- Supports Device Diagnostics
- Customisation of Configuration Data
- Device identity customisation
- Generic GSD-file provided

Overview
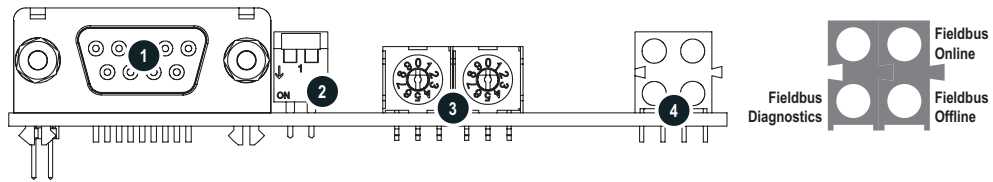
#	Description	Notes
1	PROFIBUS Connector	See C-1 "Connectors"
2	Termination Switch	See below.
3	Node Address Switches	
4	Status Indicators	

Termination Switch

Each bus segment in a PROFIBUS network must be terminated properly to ensure error-free operation. If the module is used as the first or last node in a network segment, the termination switch shall to be in ON position. Otherwise the switch has to be in OFF position.

Note: If an external termination connector is used, the switch must be in OFF position.

Node Address Switches

These rotary switches can be used to set the node address of the module in the range 1... 99. The switches are read once during start-up, i.e. if the setting is changed, a reset is required in order for the change to have effect.
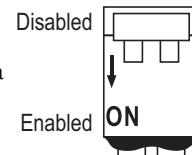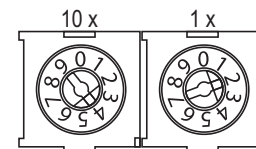

Example:

When the left switch is set to 4 and the right one is set to 2, the final value will be 42.

Status Indicators

Led	State	Description
Fieldbus Online	Green	Bus online, data exchange possible
	Off	Bus not online (or no power)
Fieldbus Offline	Red	Bus offline
	Off	Bus not offline (or no power)
Fieldbus Diagnostics	Off	No diagnostics present (or no power)
	Red, flashing (1 Hz)	Error in Configuration Data
	Red, flashing (2 Hz)	Error in Parameter Data
	Red, flashing (4 Hz)	Error in initialisation of the PROFIBUS communication ASIC
	Red, flashing (8 Hz)	Watchdog timeout (internal error)

Basic Operation

Network- and Software Requirements

As a member of the Anybus concept of interchangeable network products, the Anybus-S PROFIBUS is compatible with any product that supports the Anybus-S application interface. However, due to the nature of the PROFIBUS networking system, certain things needs to be taken into account:

- The total (Input + Output) I/O size must exceed zero.
- The Cyclic I/O size for each direction cannot exceed 244 bytes
- Acyclic I/O is not supported
- The max. theoretical total I/O size (Input + Output) is 416 bytes. This value will be less when using User Parameterization Data and Device Diagnostics (see 2-7 "PROFIBUS Buffer Sizes").
- The flexible nature of the Anybus concept allows the application to modify the behaviour on PROFIBUS in ways which contradict the generic GSD-file or in other ways voids network certification. Those responsible for the implementation of the final product should ensure that their level of implementation matches their own requirements and policies regarding network certification and interoperability.
- The use of advanced PROFIBUS-specific functionality may require in-depth knowledge in PROFIBUS networking internals and/or information from the official PROFIBUS specifications. In such cases, those responsible for the implementation of the product should either obtain the PROFIBUS specification to gain sufficient knowledge or limit their implementation is such a way that this is not necessary.

For further information about the Anybus-S software interface, consult the general Anybus-S Parallel Design Guide.

See also...

- 2-3 "Conformance Notes"

Communication Settings

Baudrate

The Anybus module detects the PROFIBUS baudrate automatically.

Supported baud rates:

- 9.6 kbps
- 19.2 kbps
- 45.45 kbps
- 93.75 kbps
- 187.5 kbps

- 500 kbps
- 1.5 Mbps
- 3 Mbps
- 6 Mbps
- 12 Mbps

Node Address

The node address can either be set using the on-board switches (range 0... 99) or through the mailbox interface (range 0... 126). Note that address 126 is reserved for commissioning purposes.

See also...

- 1-2 "Node Address Switches"
- 3-9 "FB_SET_NODE_ADDRESS"
- 3-10 "FB_GET_NODE_ADDRESS"

Data Exchange

I/O Data (Cyclic Data Exchange)

I/O Data is exchanged as Cyclical I/O on PROFIBUS. Note that the data sizes specified during initialisation must be sufficient to hold the data specified in the network configuration. If this is not the case, the Anybus module will indicate an error on the Fieldbus Diagnostics LED.

See also...

- 3-2 "FB_INIT"
- 3-8 "FB_SET_CONFIG"

Parameter Data (Acyclic Data Exchange)

Acyclic exchange of data is not supported on the Anybus-S PROFIBUS.

PROFIBUS Implementation

Conformance Notes

Products which claim PROFIBUS compliance must pass conformance tests at a certified test facility. HMS embedded products for PROFIBUS are successfully tested for pre-compliance and found to comply with PROFIBUS specifications. Test reports etc. are available and registered at the PROFIBUS Organisation (PNO).

The use of certified PROFIBUS networking technology (e.g. Anybus) does not automatically make the end product certified. To be able to state PROFIBUS compliance for the end product, the final implementation will need to pass further certification tests at a certified test facility. Due to the vast customisation possibilities found in the Anybus concept, the use of such technology alone does in itself not constitute a discount of the certification fee.

Generic implementations[1] generally only require basic knowledge in the PROFIBUS networking system and are certifiable by nature as long as basic usage procedures are followed (exceptions and instructions are stated where appropriate).

With advanced implementations[2], the topic of network certification becomes slightly more complex. A side effect of the inherent flexibility of the Anybus concept is that the application, in theory, can alter the behaviour on PROFIBUS in ways which makes it impossible to successfully pass network certification tests. HMS cannot possible foresee all possible usage scenarios for this type of implementation, which mean that those responsible for the implementation of the Anybus module into the final product should take the necessary steps to ensure that the implementation operates according to PROFIBUS specifications. This process may involve steps which require in-depth knowledge in PROFIBUS networking internals and/or information from the official PROFIBUS specifications. Those responsible for the implementation of the final product should either obtain the PROFIBUS specification to gain sufficient knowledge or limit their implementation in such a way that this is not necessary.

Due to the rapid development in the industrial communication industry, and the impact this may have on network certification procedures, always make sure to use the very latest Anybus revision when certifying the final product.

In case of uncertainties, contact your nearest HMS support department.

Contact information:

http://www.profibus.com/pb/support/

See also...

- 2-4 "Electronic Data Sheet (GSD-file)"

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1. Includes generic implementations which require no changes to the generic GSD-file supplied by HMS.
2. Includes implementations which deviate from the generic GSD-file supplied by HMS.

Electronic Data Sheet (GSD-file)

On PROFIBUS, the characteristics of a device is stored in an ASCII-format data file with the suffix GSD. This file is used by the PROFIBUS configuration tool when setting up the network. HMS provides a generic GSD-file, which corresponds to the default settings in the module.

Network Conformance Notes:

- The Anybus module is certified for network compliance under the condition that the implementation is compatible with the generic GSD-file supplied by HMS. Any changes which require deviations from the generic GSD-file voids network certification, and re-certification of the end product is necessary.

See also...

- 2-3 "Conformance Notes"

Device Identity

By default, the Anybus module identifies itself as a generic HMS product as follows:

Information	Default Value
Vendor Name	'HMS Industrial Networks'
Model Name	'Anybus-S PROFIBUS (FW x.x)'
Ident Number	1003h

The device identity can be customized to allow the module to appear as a vendor specific implementation rather than a generic HMS product.

Network Conformance Notes:

- Custom device identity information requires a custom GSD-file, and thus re-certification of the end product is necessary.
- PROFIBUS Ident Numbers are assigned by the PNO (PROFIBUS User Organisation).

See also...

- 3-2 "FB_INIT"

Configuration Data Handling

General Information

The maximum amount of configuration data that can be handled by the module is determined by the size of the Configuration Data buffer, which is specified in FB_INIT.

The Anybus module is a modular slave, which means that the input/output block size is flexible and not tied to a specific block length. The input/output blocks are specified by so-called Identifier bytes, which defines the Input- and/or Output Data length as well as data consistency. The Identifier bytes are defined in the GSD-file and are automatically extracted by the configuration tool when adding modules to the configuration.

Network Conformance Notes:

- Custom Configuration Data is not supported by the generic GSD-file supplied by HMS.

See also...

- 3-2 "FB_INIT"

Validation

During network startup, the master sends its Actual Configuration to the Anybus module for validation. By default, the Anybus module adopts it's Configuration Data from the master (i.e. a mismatch is not possible, unless the configuration is bigger than the data sizes specified in ANYBUS_INIT).

Validation of the Configuration Data is optional.

- **Configuration Data not validated (Default)**

   No verification is performed. The size must however not exceed the one defined in FB_INIT.

- **Configuration Data validated (Advanced Users Only)**

   The application downloads its expected Configuration Data to the Anybus module, which in turn compares it to the Actual Configuration received from the master, and provides a suitable response.

See also...

- 3-2 "FB_INIT"
- 3-8 "FB_SET_CONFIG"

User Parameterization Data

General Information

The master identifies itself with the slaves by sending Parameterization Data, specifying how the slave shall operate (i.e. Master address, PNO-ID, Sync/Freeze capabilities etc.).

The Parameterization Data consists of three parts:

	DP Standard Parameters	DP-V1 Status Bytes	User Parameterization Data
Size	7 bytes	3 bytes	Dynamic; 1st byte reserved for Anybus
Defined by	IEC 61158-6	IEC 61158-6	1st byte defined by HMS, remainder defined by application
Supported in the Generic HMS GSD-file	Yes	N/A	>1 byte requires GSD customization, 1st byte supported by default.

As seen in the table above, support for additional (i.e. > 1 byte) User Parameterization Data can optionally be implemented by supporting the corresponding mailbox commands in the application. Note however that this invalidates the generic GSD-file supplied by HMS.

The maximum amount of User Parameterization Data that can be handled by the module is determined by the size of the User Parameterization Data buffer, which is specified in FB_INIT.

Network Conformance Notes:

- User Parameterization Data is not supported by the generic GSD-file supplied by HMS.

See also...

- 3-2 "FB_INIT"

Validation

The DP Standard Parameters are always evaluated by the Anybus module. Validation of User Parameterization Data is optional.

- **User Parameterization Data not validated (Default)**

  No verification is performed. The size must however not exceed the one defined in FB_INIT.

- **User Parameterization Data validated (Advanced Users Only)**

  The application can download its expected User Parameterization Data to the Anybus module, which in turn compares it to the actual User Parameterization Data received from the master, and provides a suitable response.

See also...

- 3-2 "FB_INIT"
- 3-5 "FB_CHECK_USER_PARAMETER_DATA"
- 3-6 "FB_GET_USER_PARAMETER"

Device Diagnostics (Advanced Users Only)

The Anybus module handles the standard PROFIBUS diagnostics automatically. Optionally, the application can implement support for device diagnostics by means of FB_WRITE_DIAGNOSTICS.

Network Conformance Notes:

- Device Diagnostics is not supported by the generic GSD-file supplied by HMS.

See also...

- 3-2 "FB_INIT"
- 3-11 "FB_WRITE_DIAGNOSTICS"

PROFIBUS Buffer Sizes

Due to technical reasons, the use of User Parameterization Data and Device Diagnostics affect the maximum amount if I/O available for data exchange. Internally, the Anybus module uses an array of buffers for various network functions. The total size of these buffers, when summed up, cannot exceed 1472 bytes.

Buffer space is calculated using the following formula:

$$1472 \geq (3 \times IN) + (3 \times OUT) + (2 \times DIAG) + PRM + CFG + (2 * AUX)$$

Variable	Meaning	Source
IN	Input I/O Size	ANYBUS_INIT (FB_INIT)
OUT	Output I/O Size	
DIAG	Diagnostic length	FB_INIT
PRM	Parameterization data length	
CFG	Configuration data size	
AUX	Equals PRM or CFG (whichever is largest)	

See also...

- 3-2 "FB_INIT"

Mailbox Interface

General Information

This chapter describes the fieldbus specific mailbox commands in the module. Consult the Anybus-S Design Guide for more information regarding the mailbox functionality.

Command	Page
FB_INIT	3-2
FB_CHECK_USER_PARAMETER_DATA	3-5
FB_GET_USER_PARAMETER	3-6
FB_SET_CONFIG	3-8
FB_SET_NODE_ADDRESS	3-9
FB_GET_NODE_ADDRESS	3-10
FB_WRITE_DIAGNOSTICS	3-11

See also...

- 2-3 "Conformance Notes"

Fault Information

When a mailbox command cannot be processed, the Message Information register in the header of the response will indicate that an error occurred (consult the Anybus-S Parallel Design Guide for more information). If the error code is 'Invalid Other' (Fh), extended error information is available in the Fault Information register (Extended Word 7 or 8, depending on the command).

When applicable, the structure of the Fault Information register is specified separately for each message.

FB_INIT

This command is used to specify PROFIBUS-specific operational parameters.

Note: This command replaces ANYBUS_INIT and may only be issued during initialisation.

Command initiator	Application
Command number	0001h
Extended Header data	Fault information
Command data	PROFIBUS-specific initialisation settings.
Response data	The response holds a copy of the command data.

Command and Response Layout

	Command	Expected Response
Message ID	(ID)	(ID)
Message information	4002h	0002h
Command	0001h	0001h
Data size	001Ah	001Ah
Frame count	0001h	0001h
Frame number	0001h	0001h
Offset high	0000h	0000h
Offset low	0000h	0000h
Extended Word 1	-	-
Extended Word 2	-	-
Extended Word 3	-	-
Extended Word 4	-	-
Extended Word 5	-	-
Extended Word 6	-	Extended Fault Information
Extended Word 7	-	Extended Fault Information
Extended Word 8	-	Fault Information
Message Data Word 1	Input I/O Length	Input I/O Length
Message Data Word 2	Input DPRAM Length	Input DPRAM Length
Message Data Word 3	Input Total Length	Input Total Length
Message Data Word 4	Output I/O Length	Output I/O Length
Message Data Word 5	Output DPRAM Length	Output DPRAM Length
Message Data Word 6	Output Total Length	Output Total Length
Message Data Word 7	Operation Mode	Operation Mode
Message Data Word 8	Event Notification Config.	Event Notification Config.
Message Data Word 9	Watchdog Timeout Value	Watchdog Timeout Value
Message Data Word 10	Ident Number	Ident Number
Message Data Word 11	User Param. Data length	User Param. Data length
Message Data Word 12	Device Diagnostic length	Device Diagnostic length
Message Data Word 13	DP-features	DP-features

- **Input I/O Length, Input DPRAM Length, Input Total Length**

  (Consult specification for ANYBUS_INIT for further information)

- **Output I/O Length, Output DPRAM Length, Output Total Length**

  (Consult specification for ANYBUS_INIT for further information)

- **Operation Mode, Event Notification Config, Watchdog Timeout Value**

  (Consult specification for ANYBUS_INIT for further information)

- **Ident Number**

  Identification number unique to the implementation. Note that this value is assigned by the PNO (PROFIBUS User Organisation) and must not be chosen arbitrarily.

- **User Param. Data Length**

  Size of the User Parameterization Data buffer in bytes.

  Range 0-237.

  Note: This value will only be used if bit 1 in the 'DP-features'-word (below) is set (1).

- **Device Diagnostic Length**

  Size of the Device Diagnostics buffer in bytes (Diagnostic Control Byte excluded).

  Range 0-237.

  Note: This value will only be used if bit 0 in the 'DP-features'-word (below) is set (1).

- **DP-features**

  This word specifies various operational parameters:

Bit(s)	Contents	Comments

0	Device Diagnostics Enable
	
	Value: Meaning:
	  0 Disabled (standard diagnostics only).
	  1 Enabled
		See also...
		  - 3-11 "FB_WRITE_DIAGNOSTICS"

1	User Parameterization Data
	
	Value: Meaning:
	  0 Disabled (standard Parameterization Data only)
	  1 Enabled
		See also...
		  - 3-5 "FB_CHECK_USER_PARAMETER _DATA"
		  - 3-6 "FB_GET_USER_PARAMETER"

2	Verification of User Parameterization Data
	
	Value: Meaning:
	  0 User Parameterization Data always accepted.
	  1 User Parameterization Data will be compared to Initial User Parameterization Data specified by the application.	

Bit(s)	Contents	Comments
3	Verification of Configuration Data Value: Meaning: 0 Configuration Data received from master is accepted as long as the I/O sizes does not exceed the configured sizes in the module. 1 Perfect match required; Configuration Data received from the master must match the Expected Configuration (a mismatch generates a configuration error)	See also... - 3-8 "FB_SET_CONFIG"
4	Expected Configuration Value: Meaning: 0 Generate Expected Configuration based on the configured I/O sizes 1 Expected Configuration specified by application using FB_SET_CONFIG	
5... 15	(reserved)	-

- **Fault Information**

  If the error code in the Message Information registers is 'Undefined ERROR' (Fh), this field holds additional error information.

  Consult the specification for ANYBUS_INIT for further information.

- **Extended Fault Information**

  Extended Word 7 contains error codes related to Message Data words 10... 13. Extended Word 6 holds additional error-specific information.

Extended Word 7	Meaning	Extended Word 6 Contents
1	Maximum buffer size exceeded (see 2-7 "PROFIBUS Buffer Sizes")	Maximum Input + Output size in bytes, given the supplied settings
3	Input/Output I/O Sizes too large	-
4	Device Diagnostic Length too large	Max. Device Diagnostic length in bytes, given the supplied settings
5	User Param. Data Length too large	Max. User Param. Data length in bytes, given the supplied settings

FB_CHECK_USER_PARAMETER_DATA

This command specifies the Initial User Parameterization Data. This data may or may not be compared to data received from the master during parameterization depending on the settings in FB_INIT (DP-features, bit 2).

Note 1: This command may only be issued during initialisation.

Note 2: This command will only be accepted if enabled in FB_INIT (DP-features, bit 1)

See also...

- 3-2 "FB_INIT" (DP-features)
- 3-6 "FB_GET_USER_PARAMETER"

Command initiator	Application
Command number	0005h
Extended Header data	Fault information
Command data	User Parameterization data
Response data	(the response holds a copy of the command data)

Command and Response Layout

	Command	Expected Response
Message ID	(ID)	(ID)
Message information	4002h	0002h
Command	0005h	0005h
Data size	(size)	(size)
Frame count	0001h	0001h
Frame number	0001h	0001h
Offset high	0000h	0000h
Offset low	0000h	0000h
Extended Word 1	-	-
Extended Word 2	-	-
Extended Word 3	-	-
Extended Word 4	-	-
Extended Word 5	-	-
Extended Word 6	-	-
Extended Word 7	-	-
Extended Word 8	-	Fault Information
Message Data	Data	Data

- **Data**

  Initial User Parameterization Data.

- **Fault Information**

  If the error code in the Message Information registers is 'Undefined ERROR' (Fh) the fault information in Extended Word 8 can be interpreted using the following table:

Value	Meaning
1	First byte of Initial User Parameterization Data not set to 0 (zero).
2	User Parameterization Data disabled in FB_INIT (DP-features, bit 1)
(other)	(reserved for future use)

FB_GET_USER_PARAMETER

This command retrieves data from the User Parameterization Data buffer. Note that if used, this process must be repeated each time the module goes on-line, since the User Parameterization Data may have changed.

Note: This command may only be issued during runtime (i.e. after END_INIT)

See also...

- 3-5 "FB_CHECK_USER_PARAMETER_DATA"

Command initiator	Application
Command number	0002h
Extended Header data	Offset, Size, Fault Information
Command data	-
Response data	User Parameterization Data

Command and Response Layout

	Command	Expected Response
Message ID	(ID)	(ID)
Message information	4002h	0002h
Command	0002h	0002h
Data size	0000h	(size)
Frame count	0001h	0001h
Frame number	0001h	0001h
Offset high	0000h	0000h
Offset low	0000h	0000h
Extended Word 1	Offset	Offset
Extended Word 2	Size	Size
Extended Word 3	-	-
Extended Word 4	-	-
Extended Word 5	-	-
Extended Word 6	-	-
Extended Word 7	-	-
Extended Word 8	-	Fault Information
		Data

- **Offset**

  This value specifies the byte offset into the User Parameterization Data buffer from which the data shall be read.

- **Size**

  This value specifies how many bytes to read from the User Parameterization Data buffer.

- **Data**

  Block of User Parameterization Data.

- **Fault Information**

  If the error code in the Message Information registers is 'Undefined ERROR' (Fh) the fault information in Extended Word 8 can be interpreted using the following table:

Value	Meaning
1	Block Offset and/or Block Size out of range.
2	User Parameterization Data disabled in FB_INIT (DP-features, bit 1)
(other)	(reserved for future use)

FB_SET_CONFIG

This command can be used to specify the Expected Configuration Data. This data may or may not be compared to the configuration received from the master depending on the settings in FB_INIT (DP-features, bit 3).

See also...

- 3-2 "FB_INIT" (DP-Features)

Note 1: This command may only be issued during initialisation.

Note 2: This command will only be accepted if enabled in FB_INIT (DP-features, bit 4)

Command initiator	Application
Command number	0009h
Extended Header data	Fault information
Command data	Expected Configuration Data
Response data	The response holds a copy of the command data.

Command and Response Layout

	Command	Expected Response
Message ID	(ID)	(ID)
Message information	4002h	0002h
Command	0009h	0009h
Data size	(size)	(size)
Frame count	0001h	0001h
Frame number	0001h	0001h
Offset high	0000h	0000h
Offset low	0000h	0000h
Extended Word 1	-	-
Extended Word 2	-	-
Extended Word 3	-	-
Extended Word 4	-	-
Extended Word 5	-	-
Extended Word 6	-	-
Extended Word 7	-	-
Extended Word 8	-	-
Message Data	Data	Data

- **Data**

  Expected Configuration Data.

FB_SET_NODE_ADDRESS

This command specifies the PROFIBUS node address for the Anybus module.

Note: This command may only be issued during initialisation.

Command initiator	Application
Command number	0004h
Extended Header data	Fault information
Command data	Node address
Response data	The response holds a copy of the command data

Command and Response Layout

	Command	Expected Response
	Command	**Expected Response**
Message ID	(ID)	(ID)
Message information	4002h	0002h
Command	0004h	0004h
Data size	0001h	0001h
Frame count	0001h	0001h
Frame number	0001h	0001h
Offset high	0000h	0000h
Offset low	0000h	0000h
Extended Word 1	-	-
Extended Word 2	-	-
Extended Word 3	-	-
Extended Word 4	-	-
Extended Word 5	-	-
Extended Word 6	-	-
Extended Word 7	-	-
Extended Word 8	-	Fault information
Message Data Byte 1	Node address	Node address

- **Node address**

  PROFIBUS node address; range 0... 126. Note that address 126 is reserved for commissioning purposes and must not be used for data exchange.

- **Fault Information**

  If the error code in the Message Information registers is 'Undefined ERROR' (Fh) the fault information in Extended Word 8 can be interpreted using the following table:

Register value	Description
0001h	The node address is not in the range 0 - 126.
(all other)	Reserved.

FB_GET_NODE_ADDRESS

This command returns the currently used PROFIBUS node address.

Command initiator	Application
Command number	0006h
Extended Header data	-
Command data	-
Response data	Node Address

Command and Response Layout

	Command	Expected Response
Message ID	(ID)	(ID)
Message information	4002h	0002h
Command	0006h	0006h
Data size	0000h	0001h
Frame count	0001h	0001h
Frame number	0001h	0001h
Offset high	0000h	0000h
Offset low	0000h	0000h
Extended Word 1	-	-
Extended Word 2	-	-
Extended Word 3	-	-
Extended Word 4	-	-
Extended Word 5	-	-
Extended Word 6	-	-
Extended Word 7	-	-
Extended Word 8	-	-
		Node address — **Response Data Byte 1**

- **Node address**

  PROFIBUS node address.

FB_WRITE_DIAGNOSTICS

This command reports Device Diagnostics to the master.

Note 1: This command may only be issued during runtime (i.e. after END_INIT)

Note 2: This command will only be accepted if enabled in FB_INIT (DP-features, bit 0)

Command initiator	Application
Command number	0003h
Extended Header data	Service code, Fault information
Command data	Extended Diagnostic Data
Response data	The response holds a copy of the command data.

Command and Response Layout

	Command	Expected Response
Message ID	(ID)	(ID)
Message information	4002h	0002h
Command	0003h	0003h
Data size	(size)	(size)
Frame count	0001h	0001h
Frame number	0001h	0001h
Offset high	0000h	0000h
Offset low	0000h	0000h
Extended Word 1	-	-
Extended Word 2	-	-
Extended Word 3	-	-
Extended Word 4	-	-
Extended Word 5	-	-
Extended Word 6	-	-
Extended Word 7	-	-
Extended Word 8	-	Fault Information
Message Data Byte 1	Diagnostic Control Byte	Diagnostic Control Byte
Message Data Bytes 2... N	Device Diagnostic Block	Device Diagnostic Block

- **Diagnostic Control Byte**

  Bit field, containing the following settings:

Bit(s)	Contents	Comments
0	High/Low priority diagnostics Value: Meaning: 0 Low Priority 1 High Priority	This bit specifies the priority of the diagnostics. The end-user will be notified of high-priority diagnostics in the diagnostic overview on the master side. The PLC/host program can then, for example, call a special routine. Low Priority diagnostics are not included in the diagnostic overview, but the PLC/host program can still evaluate the status information.
1	Static Diagnostics Value: Meaning: 0 Non-static diagnostics 1 Static diagnostics	This bit specifies the nature of the diagnostics. Static Diagnostics means that the master will stop exchanging data with the slave, until the state in the application that caused the problem has been taken care of (e.g. if the slave for some reason cannot provide valid data to the master).
2... 7	(reserved, set to zero)	-

- **Device Diagnostic Block**

  The user can manipulate the bits in each of these bytes. The number of bytes used (max. 237), and what the bits in these bytes means, is application specific. The number of bytes to be used, is configured in FB_INIT (Device Diagnostic Length)

  For more information about the structure of this data, consult the PROFIBUS specification.

- **Fault Information**

  If the error code in the Message Information registers is 'Undefined ERROR' (Fh) the fault information in Extended Word 8 can be interpreted using the following table:

Register value	Description
1	No diagnostic buffer available
2	Device Diagnostics disabled in FB_INIT (DP-features, bit 0)
(all other)	(reserved for future use)

Miscellaneous

Fieldbus Specific Area

This area is reserved for future use.

Control Register Area

Fieldbus Type

The fieldbus type value for this product is 0001h (PROFIBUS DP-V0).

Module Type

The module type value for this product is 0101h (Anybus-S).

### Watchdog Counter Input (7D2h... 7D3h)

If the application has enabled the Watchdog Counter Input and doesn't update it properly, the Anybus module will go offline, and notify the end user via the Fieldbus Diagnostics LED.
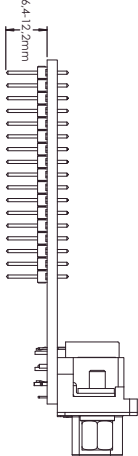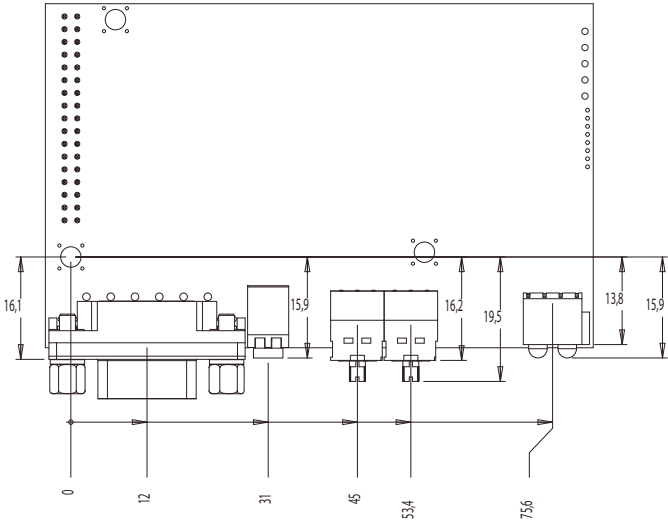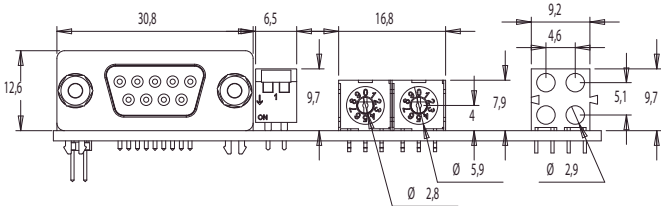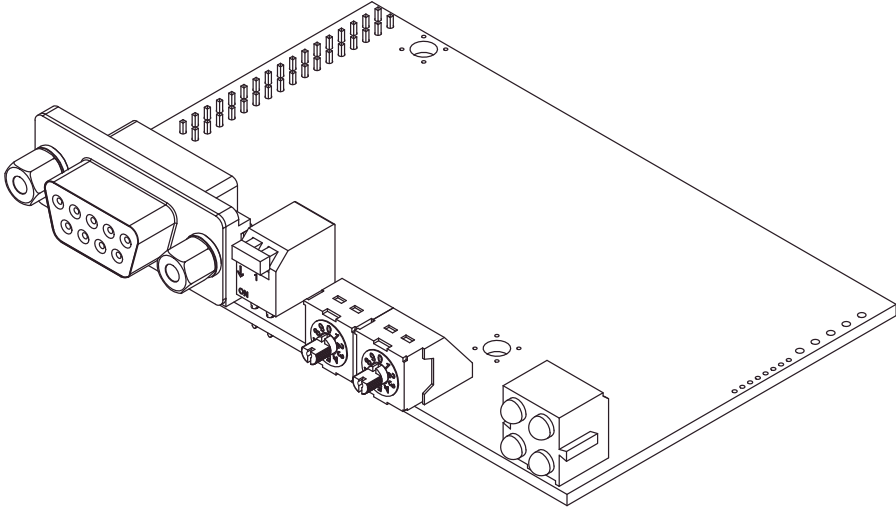
This situation is considered fatal; there is no way to recover from it besides power cycling the module.

Mechanical Specification

Straight Switches & Connectors

page 3-5
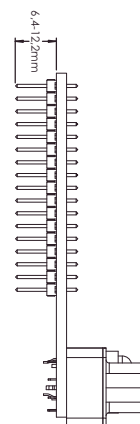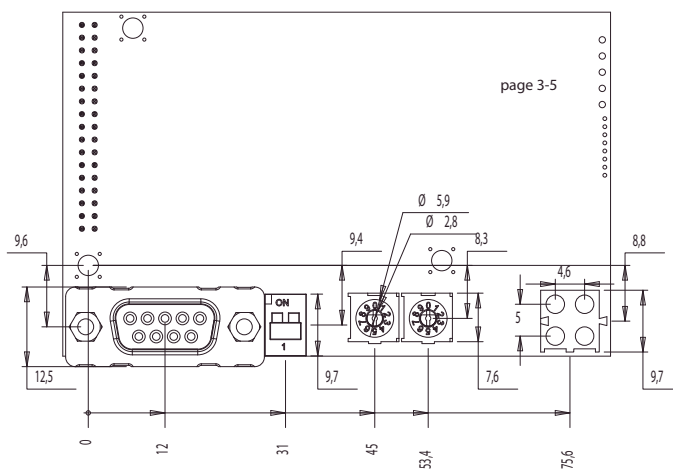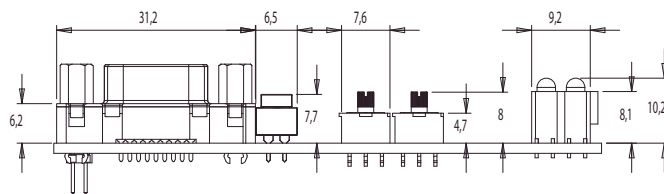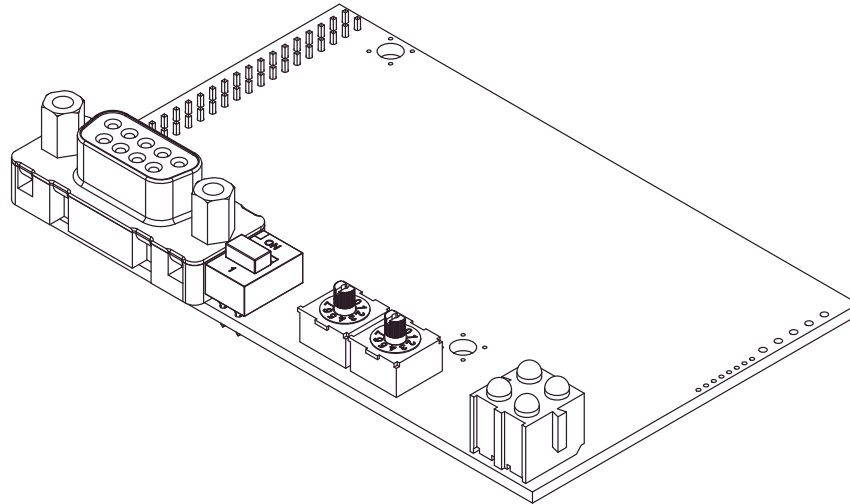
Angled Switches & Connectors

Connectors

The module supports three different types of connectors; 9-pin d-sub, screw terminal, and 2mm board-to-board. The 9-pin D--sub is the standard connector and is recommended for data transfer rates higher than 1500kbit/s. This connector is also recommended by the PROFIBUS DP standard IEC 61158.

9-pin D-sub (Standard)

Pin	Signal
Housing	Shield
1	NC
2	NC
3	B-Line
4	RTS*
5	GND BUS**
6	+5V BUS**
7	NC
8	A-Line
9	NC
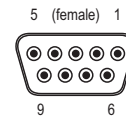
Screw Terminal

Pin	Signal
1	+5V BUS**
2	GND BUS**
3	A-Line
4	B-Line
5	Shield
6	RTS*

2mm Board to Board

Pin	Signal
1	Shield
2	GND BUS**
3	RTS*
4	NC
5	A-Line
6	B-Line
7	NC
8	+5V BUS**
9	NC
10	NC

*) RTS is used in some equipment to determine the direction of transmission. In normal applications only A-Line, B-Line and Shield are used.

**) +5V BUS and GND BUS are used for bus termination. Some devices, like optical transceivers (RS485 to fibre optics) might require external power supply from these pins. This device is not allowed to draw more than 80mA from these power pins.

Technical Specification

Electrical Specification

Protective Earth (PE) Requirements

All Anybus-S/M modules features a cable shield filter designed according to each network standard. To be able to support this, the application *must* provide a connection to PE (Protective Earth) as described in the general Anybus-S Parallel Design Guide. HMS cannot guarantee proper EMC behaviour unless this requirement is fulfilled.

Power Supply

Supply Voltage

The module requires a regulated 5V power supply as specified in the Anybus-S Parallel Design Guide.

Power Consumption

The maximum current consumption for this product is 400mA.

Environmental Specification

- **Temperature**
  Test performed according to IEC-68-2-1 and IEC 68-2-2.

Operating:	0 to 70°C	(32 to 158°F)
Storage:	-25 to +85°C	(-13 to 185°F)

- **Humidity**
  The product is designed for a relative humidity of 5 to 95% non-condensing.

  Test performed according to IEC 68-2-30.

EMC Compliance (CE)

The EMC pre-testing has been conducted according to the following standards:

- **Emission:** EN 50 081-2:1993

Tested per	EN 55011:1990, class A, radiated

- **Immunity:** EN 61000-6-2: 1999

Tested per	EN 61000-4-2:1995
	EN 61000-4-3:1996
	EN 61000-4-4:1995
	EN 61000-4-5:1995
	EN 61000-4-6:1996