

Fieldbus Appendix

Anybus-S PROFINET IO

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Appendix G Copyright Notices

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 PROFINET fieldbus communication module. The document only describes the features that are specific to the Anybus-S PROFINET, 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 PROFINET-specific functionality may require in-depth knowledge in PROFINET networking internals and/or information from the official PROFINET specifications. In such cases, the people responsible for the implementation of this product should either obtain the PROFINET specification to gain sufficient knowledge or limit their implementation in such a way that this is not necessary.

Note: This document describes the functionality provided by the latest firmware release. Some features may be missing or working somewhat differently in older firmware releases.

Please contact HMS to obtain the latest version.

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.

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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 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
Open Modbus/TCP Specification	Schneider Automation
PROFINET Technology and Application	PNO
GSDML Specification for PROFINET IO	
PROFINET IO specification	
PROFINET Installation Guideline for Cabling and Assembly, order no. 8.072	
PROFIBUS Guideline, Identification & Maintenance Functions	
SIMATIC NET PROFINET IO Softwarebeschreibung	ComDec
Structure of the Diagnostic Data Records (publication: A5E00337523-01)	SIEMENS
RFC 821	Network Working Group
RFC 1918	

Document History

Summary of Recent Changes (1.51... 1.52)

Change	Page(s)
Updated contact information	Titlepage, P-4
Added Fast Start Up information	2-10
Added information on PNIO_SET_IM0_INFO, IM Supported, regarding the default value 001Eh	8-73
Added information on PNIO_IND_CFG_MISMATCH, Module State	8-78
Added value 0x0000 to the IO Controller Status table	9-3
Added information on associating a bitmap to the GSD file	B-2
Updated the appendix about recertification	F-2
Added information about storing DAPs to nonvolatile memory	F-6

Revision List

Revision	Date	Author(s)	Chapter(s)	Description
1.00	2005-02-16	PeP	All	First official release
1.10	2005-10-10	PeP	All	Misc. minor updates
1.20	2006-01-18	PeP	All	Major update
1.21	2006-04-26	PeP	8	Minor update
1.25	2006-05-04	PeP	-	Corrected misc. errors, added new info
1.26	2006-10-19	PeP	C, D	Misc. minor corrections & updates
1.27	2007-06-18	PeP	2, 3, 7, 8, 9	Misc. minor corrections & updates
1.30	2008-04-28	PeP	7, 8	Minor update
1.40	2008-06-30	PeP	1, 2, 3, 8, B	Major update
1.41	2008-10-21	HeS	1, 9	Minor update
1.42	2008-10-27	HeS	9	Minor update
1.43	2009-09-23	KeL	8, 9, C	Minor update
1.44	2010-01-29	KeL	2, 8	Minor update
1.45	2010-12-23	KeL	2, 8, A, C, D, F	Misc. updates and corrections
1.50	2011-03-11	KeL	A, F	Added appendix, updated appendix
1.51	2011-04-18	KeL	F	Updated appendix
1.52	2012-04-11	KaD	P, 2, 8, 9, B, F	Misc updates and new information

Conventions & Terminology

The following conventions are used throughout this manual:

- Numbered lists provide sequential steps
- Bulleted lists provide information, not procedural steps
- Mailbox commands that “may only be issued during initialization” must be issued between the “START_INIT” and “END_INIT” commands.
- Hexadecimal values are written in the format NNNNh or 0xNNNN, where NNNN is the hexadecimal value.
- Binary values are written in the format NNNNb, where NNNN is the binary value.
- All pictures in this manual shows the standard version of this product. However, other connectors, leds and switches may be present depending on configuration.
- 16/32 bit values are written in big endian Motorola format

The following terms are used throughout this document:

Term	Meaning
Anybus	Anybus-S PROFINET IO RT module
Application	Hardware which is connected to the Anybus Application Connector.
Generic Mode	Basic modes of operation which determines how certain aspects of the communication are handled by the Anybus module
Advanced Mode	
AR	Application Relationship
DAP	Device Access Point
DCP	Discovery and basic Configuration Protocol. Used for IP configuration over PROFINET.
DHCP	De-facto standard for dynamic IP address management
GSDML	XML-based descriptive language for GSD-files
Initial Record Data	Record Data write-requests destined for a sub-module. Comparable to Profibus-DP User Parameter Data.
IOCS	IO Consumer Status
IOPS	IO Provider Status
IO Controller	Controlling device, which acts as a client for several IO devices. Usually a PLC. Comparable to a Profibus-DP Class 1 master.
IO Device	Field device assigned to an IO Controller. Comparable to a Profibus DPV1 slave.
IO Supervisor	Programming device with commissioning and diagnostic functions. Comparable to a Profibus-DP Class 2 master.
Module	Hardware or logical component of a network device.
Submodule	Hardware or logical component of a module
PNIO	Short for PROFINET IO
PROFINET IO	PROFINET IO is a communication concept for the implementation of modular, decentralized applications. Comparable to Profibus-DP, where I/O data of field devices are cyclically transmitted to the process image of a PLC. The real time capabilities of PROFINET IO are further divided into RT and IRT (see below).
PROFINET IO RT	PROFINET IO with Real Time capabilities. Optimized real time communication channel for time critical I/O data and Alarms. Implemented in software.
PROFINET IRT	PROFINET IO with Isochronous Real Time capabilities. Necessary for motion control application which require an update rate of 1ms, or less, with no jitter. Implemented in hardware.
PROFINET CBA	PROFINET Component Based Automation. Comparable to Profibus FMS.
Record Data	Comparable to Profibus DPV1 acyclic Read/Write
A 'set' bit	The bit value is 1 (one)
A 'cleared' bit	The bit value is 0 (zero)

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About the Anybus-S PROFINET IO

The Anybus-S PROFINET IO communication module provides instant integration in any ethernet based lan via SMTP, FTP, HTTP as well as PROFINET and Modbus/TCP. Additional protocols can be implemented on top of TCP/IP or UDP using the transparent socket interface.

The data exchange can be monitored via the built in web server, Modbus/TCP, or using event triggered email messages. SSI (Sever Side Include) technology enables web pages and email messages to carry dynamic content such as I/O data, configuration settings, or even application specific data passed to the Anybus module through the mailbox interface.

As a member of the Anybus concept of interchangeable network products, the Anybus-S PROFINET IO is compatible with any product that supports the Anybus-S application interface with only little or no software adjustments.

Features

General

- Supports shielded (FTP) and unshielded (UTP) cables
- Flexible file system providing both volatile and non-volatile storage areas
- Security framework
- Integrated FTP server provides easy file management using standard FTP clients.
- Server Side Include (SSI) capability
- Web server
- Email client (Messages can be triggered by data events or directly by the application)
- SNMP capabilities

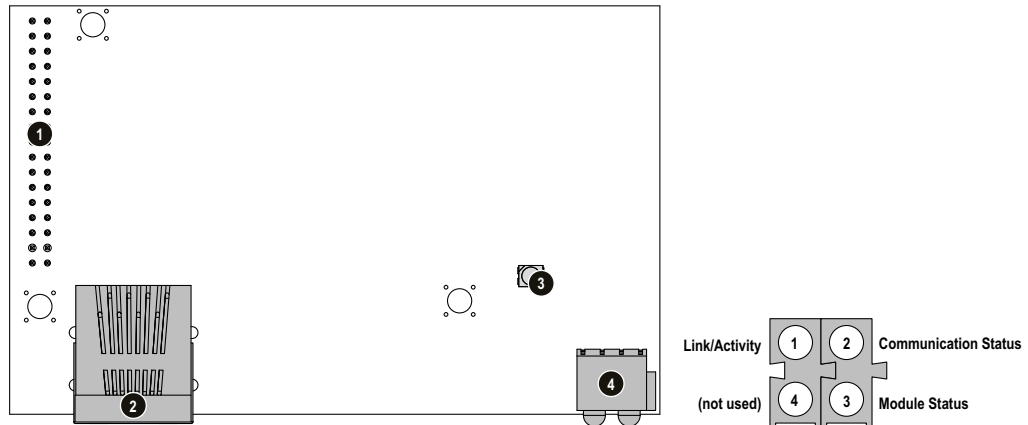
Industrial Protocols

- PROFINET IO
 - Up to 64 slots / 1 subslot
 - Up to 1024 bytes cyclical I/O (512 input & 512 output)
 - 2ms cycle time
- Modbus/TCP server
 - read-only

Conformance Notes

- On PROFINET, the characteristics of a device is stored in an XML data file. This file, referred to as the 'GSD'-file is used by the PROFINET configuration tool when setting up the network.
- HMS provides a generic GSD-file, which corresponds to the default settings in the Anybus module. However, due to the flexible nature of the Anybus-S concept, it is possible to alter the behaviour of the product in a way that invalidates this file. In such case, a custom file GSD-file must be created.
- DHCP is disabled by default. Enabling DHCP will prevent the module from successfully passing PROFINET conformance tests.

Overview



#	Description	
1	Application Connector	Consult the general Anybus-S Parallel Design Guide for further information.
2	Ethernet Connector	For more information, see Appendix D-1 "Connectors"
3	Anybus Watchdog	Consult the general Anybus-S Parallel Design Guide for further information.
4	Status Indicators	These LEDs indicate run time status and errors to the user, see below.

Status Indicators

#	Indication	State	Description
1	Link/Activity	Green	Link established
		Green, flashing	Receiving/Transmitting data
		Off	No link or power off
2	Communication Status	Green	On line, Run - Connection with IO Controller established - IO Controller is in RUN state
		Green, 1 flash	On line, STOP - Connection with IO Controller established - IO Controller in STOP state
		Off	Off line - No connection with IO Controller
3	Module Status	Green	Initialized, no error
		Green, 1 flash	Diagnostic data available
		Green, 2 flashes	Blink. Used by an engineering tool to identify the Anybus module.
		Red, 1 flash	Configuration Error - Too many modules/submodules - I/O size derived from IO Controller configuration is too large - Configuration mismatch (no module, wrong module)
		Red, 3 flashes	No Station Name or no IP address assigned
		Red, 4 flashes	Internal error
		Off	No power or not initialized
4	-	-	-

Basic Operation

Modes of Operation

General

The Anybus offers two modes of operation which mainly affects the handling of the PROFINET protocol.

- **Generic Anybus Mode**

This is the simplest mode since it requires the least interaction from the application side.

- Anybus takes care of plugging modules/submodules.
- The configuration is adopted from the IO Controller
- Record Data is mapped as Parameter Data in the Input/Output data areas
- Initial Record Data is *not* supported
- Interface and Port sub-modules will be plugged as default
- Diagnostics and Alarm functionality is *not* supported
- Supported by the generic GSD-file (see B-1 “HMS Standard GSD-file”). Device Access Point “DAP 2.0” is used as default.

- **Advanced Mode**

This mode offers tighter integration with the application, but is a bit more complex compared to Generic Anybus Mode.

- Application is responsible for adding modules/submodules.
- Application must manually plug the Interface and Port sub-modules to maintain network conformance.
- The application can optionally get information about the actual IO configuration from the IO controller
- Record Data is either mapped as Parameter Data in the Input/Output data areas, or routed to the application via the mailbox interface.
- Alarm and Diagnostic functionality is handled through the mailbox interface
- An application-specific GSD-file must be created

See also...

- 2-2 “Initialization Sequence, Generic Anybus Mode”
- 2-3 “Initialization Sequence, Advanced Mode”
- 8-45 “Advanced Mode (PNIO_ADV_MODE)” (enables Advanced Mode)
- B-1 “HMS Standard GSD-file”

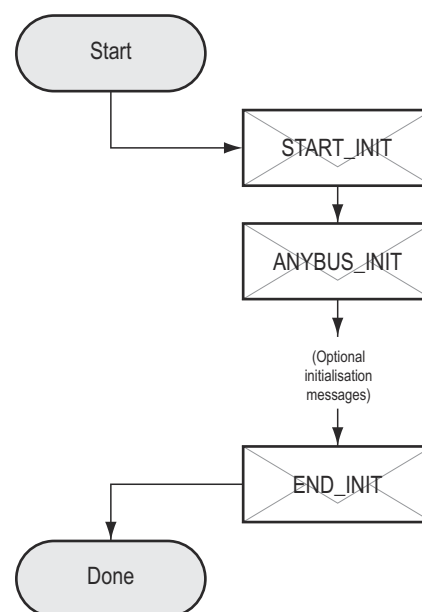
Initialization Sequence, Generic Anybus Mode

To operate in this mode, the Anybus must be initialised with the following mailbox sequence:

- **START_INIT**
(Initiates the initialization process)
- **ANYBUS_INIT**
(Specifies the total I/O sizes)
- **Other initialization messages**
(Optional)
- **END_INIT**
(Finalizes the initialization process)

The Anybus will adopt the configuration issued by the IO Controller via the Connect service.

Note that the total size of the configuration must be less or equal to the corresponding I/O lengths specified in the ANYBUS_INIT mailbox message.



See also...

- 2-1 “General”
- 2-3 “Initialization Sequence, Advanced Mode”

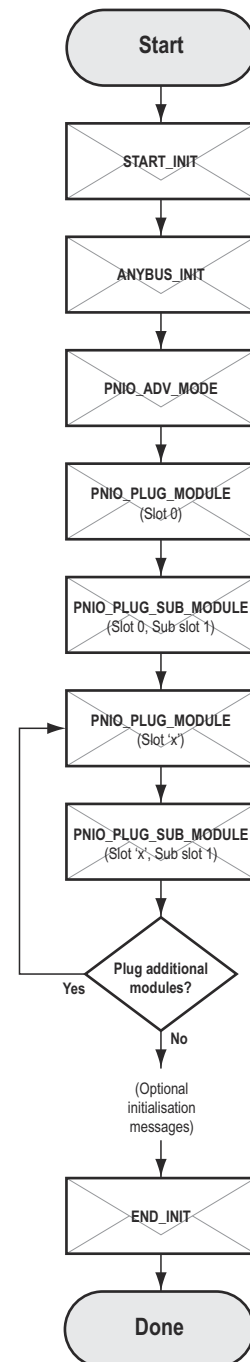
Initialization Sequence, Advanced Mode

To operate in this mode, the Anybus must be initialised with the following mailbox sequence:

- **START_INIT**
(Initiates the initialization process)
- **ANYBUS_INIT**
(Specifies the total I/O sizes)
- **PNIO_ADV_MODE**
(Instructs the Anybus to operate in Advanced Mode, and specifies advanced operational parameters)
- **PNIO_PLUG_MODULE**¹
(Slot #0, mandatory (DAP))
- **PNIO_PLUG_SUB_MODULE**¹
(Slot #0, Sub slot #1, mandatory (DAP))
- ...
- (Plug additional modules/submodules)
-
- **Other initialization messages**
(Optional)
- **END_INIT**
(Finalizes the initialization process)

See also...

- 2-1 “General”
- 2-2 “Initialization Sequence, Generic Anybus Mode”



1. A module must be plugged in slot #0 before additional modules can be plugged. Slot #0 is the device access point (DAP) and acts as a proxy for the IO device.

PROFINET Implementation

Data Exchange

IO Data

IO Data is exchanged via the I/O Data portions of the Anybus Input/Output areas.

Parameter Data (Record Data)

This is handled slightly differently depending on how the Anybus module has been initialised:

- **Generic Anybus Mode (or Advanced Mode with ‘Record Data Request’-bit cleared)**

Index Range	Mapped to...	Comments
1000h... 1XXXh	Parameter Input Area	Each index corresponds to a single byte in the Anybus module. The number of indexes used for data exchange depends on the data sizes specified in ANYBUS_INIT.
2000h... 2XXXh	Parameter Output Area	
6000h... 7FFFh	-	(reserved)
8000h... FFFFh	Diagnostics, I&M etc.	See... - 2-7 “Diagnostics & Alarms (Advanced Mode Only)” - 2-9 “Identification & Maintenance (I&M) Functionality”

- **Advanced Mode (‘Record Data Request’-bit set)**

The Anybus will act based on the settings specified in PNIO_ADV_MODE, see below.

Index Range	Mapped to...	Comments
0000h... 7fffh	Application	Routed to the application through the mailbox interface.
8000h... FFFFh	Diagnostics etc.	See... - 2-7 “Diagnostics & Alarms (Advanced Mode Only)” - 2-9 “Identification & Maintenance (I&M) Functionality”

See also...

- 2-1 “Modes of Operation”
- 2-7 “Diagnostics & Alarms (Advanced Mode Only)”
- 2-9 “Identification & Maintenance (I&M) Functionality”
- 8-45 “Advanced Mode (PNIO_ADV_MODE)”
- 8-60 “Record Data Read (PNIO_IND_RECORD_DATA_READ)”
- 8-62 “Record Data Write (PNIO_IND_RECORD_DATA_WRITE)”

Example, Generic Anybus Mode

The modules in the configuration specified by the IO Controller will be mapped to the Input/Output Data Areas in the order of their slot number. Record Data Request will be mapped to the Parameter Data Areas.

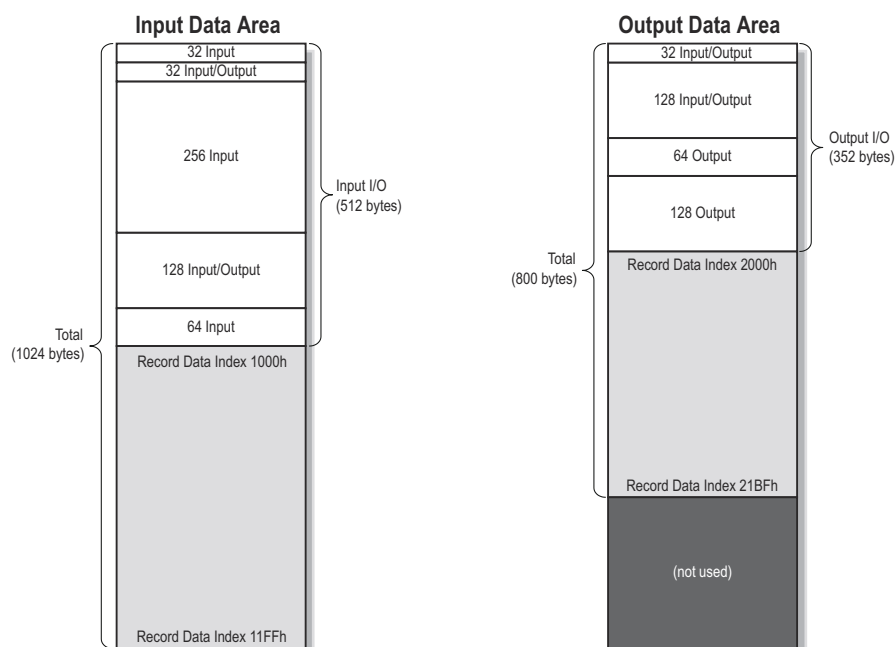
Settings in ANYBUS_INIT:

Input I/O Length	= 512 bytes
Total Input Length	= 1024 bytes
Output I/O Length	= 352 bytes
Total Output Length	= 800 bytes

The following modules are specified in the IO Controller:

Slot	Module Size (bytes)	Direction	Notes
0	0	-	(Device Access Point, DAP)
1	32	Input	-
2	32	Input/Output	-
3	256	Input	-
4	128	Input/Output	-
5	64	Input	-
6	64	Output	-
7	128	Output	-

Resulting memory layout:



See also...

- 2-1 “General”
- 2-2 “Initialization Sequence, Generic Anybus Mode”

Example, Advanced Mode

The modules/submodules are specified by the application during initialization, and are mapped to the Input/Output Data Areas in the order of their slot number. In this example, the Record Data Requests will be routed to the application via the mailbox interface.

Settings in ANYBUS_INIT:

Input I/O Length	= 384 bytes
Total Input Length	= 384 bytes
Output I/O Length	= 256 bytes
Total Input Length	= 256 bytes

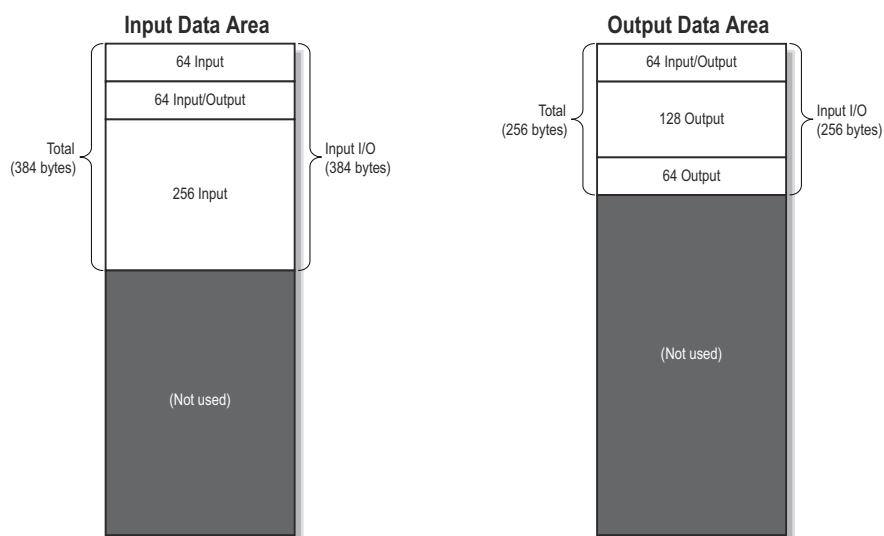
Settings in PNIO_ADV_MODE:

Max. No. Of Slots	= 10
Cfg Mismatch	= (not relevant in this example)
Record Data Request	= 1
End of Prm	= (not relevant in this example)
Alarm Acknowledge	= (not relevant in this example)
AR Information	= (not relevant in this example)
I&M Request	= (not relevant in this example)

The following modules are plugged by the application during initialization:

Slot	Module Size (bytes)	Direction	Notes
0	0	-	(Device Access Point, DAP)
1	64	Input	-
2	64	Input/Output	-
3	256	Input	-
4	128	Output	-
5	64	Output	-

Resulting memory layout:



See also...

- 2-1 "General"
- 2-3 "Initialization Sequence, Advanced Mode"

Diagnostics & Alarms (Advanced Mode Only)

In the Anybus implementation, diagnostic entries are always created in conjunction with Diagnostic Alarms. The following alarm types are supported:

- **Diagnostic Alarm**

There are two types of Diagnostic Alarms; Channel- and Generic Diagnostic Alarms. Generally, it's recommended to use Channel Diagnostic Alarms, since the semantics are fully defined by the PROFINET specification. Alternatively, vendor-specific diagnostics can be accomplished by means of Generic Diagnostic Alarms.

Each time an event is reported as a Diagnostic Alarm, a corresponding diagnostic entry is created and stored by the Anybus module. The IO Controller/Supervisor may read the diagnostic entry using Record Data requests as follows:

Index	Contents
800Ah... 800Bh	Channel diagnostic data for a specific Submodule
800Ch	Generic diagnostic data for a specific Submodule
C00Ah... C00Bh	Channel diagnostic data for a specific Module
C00Ch	Generic diagnostic data for a specific Module
E00Ah... E00Bh	Channel diagnostic data for an AR
E00Ch	Generic diagnostic data for an API
F00Ah... F00Bh	Channel diagnostic data for an API
F00Ch	Generic diagnostic data for an API

When an event has been resolved, an additional Diagnostic alarm shall be issued to inform the IO Controller that the event has been handled. As a result, the corresponding diagnostic entry is removed. Note that diagnostic data only can be obtained from configured modules/submodules. For more information about how to interpret the data, consult the PROFINET specification.

- **Process Alarm**

A Process Alarm signals the occurrence of an event related to the process, e.g. over temperature, short circuit etc.

- **Pull/Plug Alarm**

Issued each time the application pulls/plugs modules and submodules during runtime.

See also...

- 8-45 “Advanced Mode (PNIO_ADV_MODE)”
- 8-64 “Add Channel Diagnostic Alarm (PNIO_ADD_CHANNEL_DIAG_ALARM)”
- 8-67 “Add Generic Diagnostic Alarm (PNIO_ADD_GENERIC_DIAG_ALARM)”
- 8-69 “Add Process Alarm (PNIO_ADD_PROCESS_ALARM)”
- 8-76 “Alarm Acknowledge Received (PNIO_IND_ALARM_ACK_RECEIVED)”¹
- 8-66 “Remove Diagnostic Alarm (PNIO_REMOVE_DIAG_ALARM)”

1. If enabled, the Anybus module will issue this mailbox message each time the IO Controller has processed an alarm. See also 8-45 “Advanced Mode (PNIO_ADV_MODE)”.

Initial Parameters (Advanced Mode Only)

During network startup, the module may optionally be loaded with initial parameters which are defined in the GSD-file. This is carried out using Record Data requests, which means that the data will either be written to the Parameter Data areas or sent to the application depending on how the module has been initialised.

When all initial parameters have been loaded, the IO Controller signals this to the Anybus module. At this stage, the Anybus module will act on the settings specified in PNIO_ADV_MODE as follows:

- ‘End of Prm’-bit = 1
The Anybus module issues the spontaneous mailbox message PNIO_IND_END_OF_PRM. The application can then examine the initial parameters and decide whether or not to enter data exchange by providing an appropriate mailbox response.
- ‘End of Prm’-bit = 0
The Anybus module automatically enters data exchange.

See also...

- 2-1 “Modes of Operation”
- 8-45 “Advanced Mode (PNIO_ADV_MODE)”
- 8-58 “End of Parameterization (PNIO_IND_END_OF_PRM)”
- 8-59 “Application State Ready (PNIO_APPL_STATE_READY)”
- 8-60 “Record Data Read (PNIO_IND_RECORD_DATA_READ)”
- 8-62 “Record Data Write (PNIO_IND_RECORD_DATA_WRITE)”

Configuration Data

During network startup, the IO Controller sends its expected configuration to the Anybus module for validation. The Anybus module handles this slightly differently depending on how it has been initialised:

- **Generic Anybus Mode**
A configuration mismatch is not possible since the Anybus module will adopt its configuration from the IO Controller.
- **Advanced Mode**
In the event of a mismatch, the Anybus will act based on the settings in the PNIO_ADV_MODE, see below.
 - ‘Cfg Mismatch’-bit = 1
In the event of a mismatch, the Anybus issues PNIO_IND_CFG_MISMATCH. The application can then decide whether to reject the configuration or to adopt the expected configuration sent by the IO Controller.
 - ‘Cfg Mismatch’-bit = 0
In the event of a mismatch, the Anybus will reject the IO Controller configuration.

See also...

- 2-1 “Modes of Operation”
- 8-45 “Advanced Mode (PNIO_ADV_MODE)”
- 8-77 “Configuration Mismatch (PNIO_IND_CFG_MISMATCH)”

Identification & Maintenance (I&M) Functionality

Identification & Maintenance (from now on referred to as I&M) provides a standardized way of gathering information about an IO device.

The I&M data is accessed using Record Data requests as follows:

Index	Contents	Comments
AFF0h	IM0	read-only
AFF1h	IM1	read/write
AFF2h	IM2	read/write
AFF3h	IM3	read/write
AFF4h	IM4	read/write

These requests are handled differently depending on how the Anybus module has been initialised:

- **Generic Mode (or Advanced Mode with 'I&O Request'-bit = 0)**

By default, the Anybus module identifies itself as a generic HMS product. This can be customized by implementing PNIO_SET_IM0_INFO, see 8-72 "Set IM0 Information (PNIO_SET_IM0_INFO)".

Note however that all slots/sub-slots will return the same information.

- **Advanced Mode ('I&M Request'-bit = 1)**

I&M-related Record Data requests are routed to the application, allowing each slot and subslot to carry it's own I&M information.

See also...

- 2-1 "Modes of Operation"
- 2-4 "Data Exchange"
- 8-45 "Advanced Mode (PNIO_ADV_MODE)"
- 8-60 "Record Data Read (PNIO_IND_RECORD_DATA_READ)"
- 8-62 "Record Data Write (PNIO_IND_RECORD_DATA_WRITE)"
- 8-72 "Set IM0 Information (PNIO_SET_IM0_INFO)"

Fast Start Up

The Fast Start Up (FSU) function enables PROFINET IO devices, connected to the network, to power up quickly. This is useful in for example robot applications, where rapid retooling is necessary. This function has to be activated when configuring the Anybus-S-PROFINET IO module.

In the GSD-file a few keywords for this functionality are used. The FSU time is defined as the number of milliseconds from hardware reset (or power-on) until establishment of PROFINET IO Communication. If the FSU-time is measured to be larger than approximately 1500 ms it is recommended that this functionality is disabled.

The following keywords are used for this functionality (listed for the Device Access Point(s)):

- **PowerOnToCommReady**
FSU time, in milliseconds (ms). Default value is 0 ms.
- **DCP_HelloSupported**
Keyword stating whether or not the device will transfer “Hello” messages at power on. Default value: true.

To disable FSU, set the keywords to the following values:

- **PowerOnToCommReady**
Remove this keyword from the GSD-file.
- **DCP_HelloSupported**
Value: false.

Modbus/TCP Read-only Server

General

The Modbus/TCP protocol is an implementation of the standard Modbus protocol running on top of TCP/IP. The built in Modbus/TCP server provides read-only access to the Input- and Output Data Areas via a subset of the functions defined in the Modbus/TCP specification.

All Modbus/TCP messages are received/transmitted on TCP port no. 502. For detailed information regarding the Modbus/TCP protocol, consult the Open Modbus Specification.

The Modbus/TCP server can be disabled, see 8-88 “Disable Modbus/TCP server (DISABLE_MB_TCP)”.

Supported Exception codes

Code	Name	Description
01h	Illegal function	The function code in the query is not supported
02h	Illegal data address	The data address received in the query is outside the initialized memory area
03h	Illegal data value	The data in the request is illegal

Supported Function Codes

The following function codes are implemented:

Modbus Function	Function Code	Associated with Area
Read Input Registers	4	Input Data Area
Read Multiple Registers	3	Output Data Area

Register Map

Register Type	Modbus Register	Mapped To...	
		Area	Offset
Input Registers (3xxxx)	0000h	Input Data Area	000h...001h
	0001h		002h...003h
	0002h		004h...005h
	0003h		006h...007h

	03FFh		7FEh...7FFh
Output Registers (4xxxx)	0000h	Output Data Area	000h...001h
	0001h		002h...003h
	0002h		004h...005h
	0003h		006h...007h

	03FFh		7FEh...7FFh

Filesystem

General

The Anybus module features a built in filesystem, which is used to store information such as web files, network communication settings, email messages etc.

The filesystem can be accessed using FTP, HTTP, and by the application via the mailbox interface.

Storage Areas

The filesystem consists of the different storage areas:

- **Non-volatile area (approx. 2 Mb)**
This section is intended for static files such as web files, configuration files etc.
- **Volatile area (approx. 1 Mb)**
This area is intended for temporary storage; data placed here will be lost in case of power loss or reset. Note that this area is not available by default, and must be mounted by the application during initialization (see 8-41 “Create RAM disc (CREATE_RAM_DISC)”)

Conventions

- ‘\’ (backslash) is used as a path separator
- A ‘path’ originates from the system root and as such must begin with a ‘\’
- A ‘path’ must not end with a ‘\’
- Names may contain spaces (‘ ’) but must not begin or end with one.
- Names must not contain one of the following characters: ‘\ / : * ? “ < > | ’
- Names cannot be longer than 48 characters (plus null termination)
- A path cannot be longer than 256 characters (filename included)
- The maximum number of simultaneously open files is 40
- The maximum number of simultaneously open directories is 40

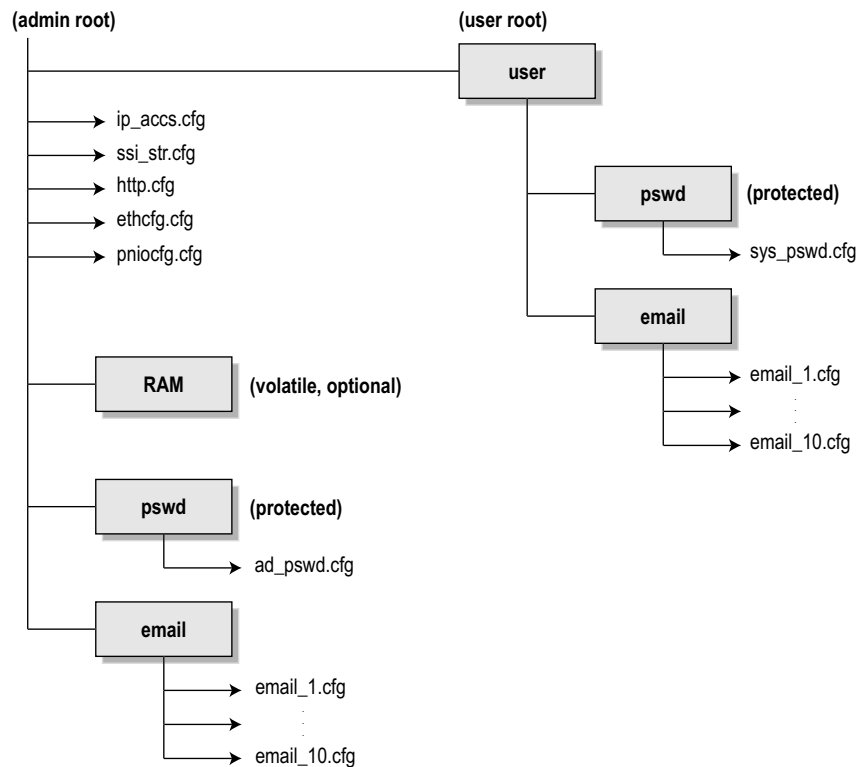
Important Note:

The non-volatile storage is located in FLASH memory. Each FLASH segment can only be erased approximately 100000 times due to the nature of this type of memory.

The following operations will erase one or more FLASH segments:

- Deleting, moving or renaming a file or directory
- Writing or appending data to an existing file
- Formatting the filesystem

Filesystem Overview



System Files

The filesystem contains a set of files used for system configuration. These files, known as “system files”, are regular ASCII files which can be altered using a standard text editor (such as the Notepad in Microsoft Windows™). Note that some of these files may also be altered by the Anybus module itself, e.g. when using SSI (see 7-1 “Server Side Include (SSI)”).

The format of the system files are based on the concept of ‘keys’, where each ‘key’ can be assigned a value, see example below.

Example:

```
[Key1]
value of key1

[Key2]
value of key2
```

The exact format of each system file is described in detail later in this document.

The contents of the above files can be redirected:

Example:

In this example, the contents will be loaded from the file ‘here.cfg’.

```
[File path]
\i\put\it\over\here.cfg
```

Note: Any directory in the file system can be protected from web access by placing the file `web_accs.cfg` in the directory, see 5-2 “Authorization”.

Network Configuration

TCP/IP Settings

General

To be able to participate on the network, the module needs a valid TCP/IP configuration. These settings are stored in the system file ‘\ethcfg.cfg’.

File Format:

[IP address] xxx.xxx.xxx.xxx	•	IP address
[Subnet mask] xxx.xxx.xxx.xxx		
[Gateway address] xxx.xxx.xxx.xxx	•	Subnet mask
[DHCP/BOOTP] ON or OFF	•	Gateway address
		DHCP/BootP
		ON - Enabled OFF - Disabled (default)
[SMTP address] xxx.xxx.xxx.xxx		SMTP server/login settings
[SMTP username] username		
[SMTP password] password		
		Username and Password is only necessary if required by the server.
[DNS1 address] xxx.xxx.xxx.xxx	•	Primary and Secondary DNS
[DNS2 address] xxx.xxx.xxx.xxx		
		Needed to be able to resolve host names
[Domain name] domain	•	Default domain name for not fully qualified host names
[Host name] anybus	•	Host name of the module
[HICP password] password	•	HICP password

The settings in this file may also be affected by...

- Mailbox Commands (See 8-4 “General Configuration Commands”)
- Using DCP (See 3-2 “DCP (Discovery and Basic Configuration)”)
- DHCP/BootP (See 3-2 “DHCP/BootP”)
- HICP (See 3-2 “HICP (Anybus IPconfig)”)
- SSI (See 7-1 “Server Side Include (SSI)”)

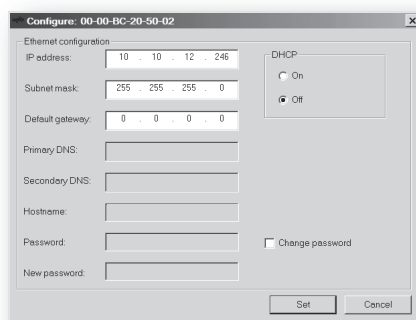
DCP (Discovery and Basic Configuration)

The Anybus module fully supports the DCP protocol, which allows an IO Controller/Supervisor to change the IP settings of the module during runtime.

HICP (Anybus IPconfig)

The module supports the HICP protocol used by the Anybus IPconfig utility, which can be downloaded free of charge from the HMS website. This utility may be used to access the network settings of any Anybus product connected to the network via UDP port 3250.

Upon starting the program, the network is scanned for Anybus products. The network can be rescanned at any time by clicking 'Scan'. In the list of detected devices, the module will appear as 'ABS-PRT'.



To alter the network settings of the module, double-click on its entry in the list. A window will appear, containing the settings for the module.

Validate the new settings by clicking 'Set'. The new IP configuration will be stored in '\ethcfg.cfg'.

Optionally, the configuration can be protected from unauthorized access by a password. To enter a password, click on the 'Change password' checkbox, and enter the password under 'New password'. The password is stored in the system file '\ethcfg.cfg'.

Note: This feature cannot be used if SET_ETN_CONFIG has been issued (see 8-5 "Set Ethernet Configuration (SET_ETN_CONFIG)").

DHCP/BootP

DHCP, if enabled, allows the module to retrieve the TCP/IP settings from a DHCP server. If no DHCP server is found, the module will fall back on its current settings (i.e. the settings currently stored in '\ethcfg.cfg').

If no current settings are available (i.e. set to 0), the module will halt and indicate an error on the on-board status LEDs (the network configuration may however still be accessed via HICP, see 3-2 "HICP (Anybus IPconfig)").

Note: DHCP is disabled by default.

IP Access Control

It is possible to specify which IP addresses that are permitted to connect to the module. This information is stored in the system file ‘\ip_accs.cfg’.

File Format:

[Web] xxx.xxx.xxx.xxx	• Nodes listed here may access the web server
[FTP] xxx.xxx.xxx.xxx	• Nodes listed here may access the FTP server
[Modbus/TCP] xxx.xxx.xxx.xxx	• Nodes listed here may connect to the module via Modbus/TCP
[All] xxx.xxx.xxx.xxx	• Fallback setting, used by the module when one or several of the keys above are omitted

Note: ‘*’ may be used as a wildcard to select IP series.

PROFINET Settings

The file ‘\pniocfg.cfg’ holds various PROFINET-related settings. The file is read once during startup, i.e. the Anybus module must be restarted in order for any changes to have effect (Unless it’s contents has been changed by an IO Controller/Supervisor via the DCP protocol. In such case, the settings will have effect immediately).

Example:

[Station Name] Nice Device	• Station Name Station name as ASCII string, maximum 64 characters.
[Station Type] ABS-PRT	• Station Type Station type as ASCII string, maximum 64 characters.
[Vendor ID] 0x010C	• Vendor ID 16 bit hexadecimal value, with the prefix 0x. Assigned by the PNO.
[Device ID] 0x0001	• Device ID 16 bit hexadecimal value, with the prefix 0x. Assigned by vendor.
[System Description] "HMS Industrial Networks Anybus-S"	• System Description SNMP parameter
[System Interface] "PROFINET IO interface"	• System Interface SNMP parameter.

SNMP Functionality

General Information

The Simple Network Management Protocol (SNMP) forms part of the internet protocol suite as defined by the Internet Engineering Task Force (IETF). SNMP is used in network management systems to monitor network devices for conditions that warrant administrative attention.

SNMP exposes management data in the form of variables on the managed systems, which describe the system configuration. These variables can be queried (and sometimes set) by managing applications.

SNMP itself does not specify which variables a device should offer, but rather uses an extensible design where information is defined by Management Information Bases (MIBs). MIBs define the structure of the management data in a device. All MIB requests use the standard UDP port 161.

Note: At the time of writing, the Anybus-S PROFINET IO does not implement MIB2.

Implemented SNMP Variables

The Anybus-S PROFINET IO implements the following SNMP variables:

- **System Name**

This variable is mapped to the PROFINET Station Name.

See also...

- 3-2 “DCP (Discovery and Basic Configuration)”
- 3-3 “PROFINET Settings”
- 8-49 “Set Station Name (PNIO_SET_STATION_NAME)”

- **System Description**

This variable is set to ‘HMS Industrial Networks Anybus-S’ by default.

See also...

- 3-3 “PROFINET Settings”
- 8-90 “Set System Description (SET_SYSTEM_DESCRIPTION)”

- **System Interface**

This variable is set to ‘PROFINET IO interface’ by default.

See also...

- 3-3 “PROFINET Settings”
- 8-91 “Set System Interface (SET_SYSTEM_INTERFACE)”

FTP Server

General

The built in FTP server provides a way to access the file system using a standard FTP client.

The following port numbers are used for FTP communication:

- TCP, port 20 (FTP data port)
- TCP, port 21 (FTP command port)

Security Levels

The FTP-server features two security levels; admin and normal.

- **Normal-level users**

The root directory will be ‘\user’.

- **Admin-level users**

The root directory will be ‘\’, i.e. the user has unrestricted access to the file system.

If the mailbox command GLOBAL_ADMIN_MODE (see 8-23 “Global Admin Mode (GLOBAL_ADMIN_MODE)”) is issued during startup, the Anybus will grant Admin-level access to all users. In such case, the FTP server accepts any username/password combination, and the root directory will be ‘\’.

User Accounts

The user accounts are stored in two files, which are protected from web access:

- ‘\user\pswd\sys_pswd.cfg’

This file holds the user accounts for normal-level users.

- ‘\pswd\ad_pswd.cfg’

This file holds the user accounts for admin-level users.

File Format:

The format of these files are as follows:

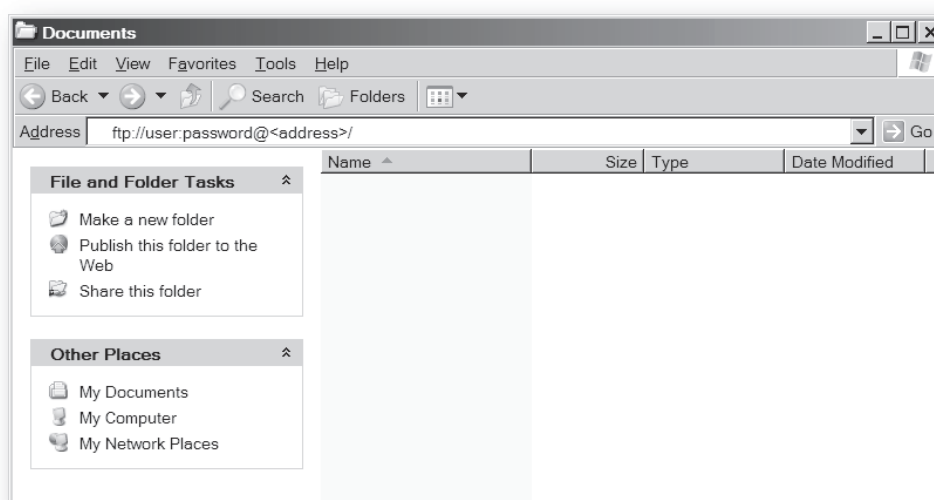
```
Username1:Password1
Username2:Password2
Username3:Password3
```

Note: If no valid user accounts have been defined, the Anybus will grant Admin-level access to all users. In such case, the FTP server accepts any username/password combination, and the root directory will be ‘\’.

FTP Connection Example (Windows Explorer)

The built in FTP client in Windows Explorer can easily be used to access the filesystem as follows:

1. Open the Windows Explorer by right-clicking on the 'Start' button and selecting 'Explore'.
2. In the address field, type FTP://<user>:<password>@<address>
 - Substitute <address> with the IP address of the Anybus module
 - Substitute <user> with the username
 - Substitute <password> with the password
3. Press enter. The Explorer will now attempt to connect to the Anybus module using the specified settings. If successful, the filesystem of the module is displayed in the Explorer window.



Web Server

General

The Anybus module features a flexible web server with SSI capabilities. The built in web pages can be customized to fit a particular application and allow access to I/O data and configuration settings.

The web server communicates through port 80 and can handle a maximum of 48 simultaneous connections.

See also...

- 8-20 “Disable Web Server (DISABLE_WEB_SERVER)”
- 8-21 “Enable Web Server (ENABLE_WEB_SERVER)”

Protected Files

For security reasons, the following files are protected from web access:

- Files located in ‘\user\pswd’
- Files located in ‘\pswd’
- Files located in a directory which contains a file named ‘web_accs.cfg’

Default Web Pages

The Anybus module contains a set of virtual files that can be used when building a web page for configuration of network parameters. These virtual files can be overwritten (not erased) by placing files with the same name in the root of disc 0.

This makes it possible to, for example, replace the HMS logo by uploading a new logo named ‘\logo.jpg’. It is also possible to make links from a web page to the virtual configuration page. In that case the link shall point to ‘\config.htm’.

These virtual files are:

\index.htm	- Points to the contents of config.htm
\config.htm	- Configuration frame page
\configform.htm	- Configuration form page
\configform2.htm	- Configuration form page
\store.htm	- Configuration store page
\logo.jpg	- HMS logo
\configuration.gif	- Configuration picture
\boarder.bg.gif	- picture
\boarder_m_bg.gif	- picture

Authorization

Directories can be protected from web access by placing a file called 'web_accs.cfg' in the directory to protect. This file shall contain a list of users that are allowed to access the directory and its subdirectories.

File Format:

```
Username1:Password1
Username2:Password2
...
UsernameN:PasswordN
```

• List of approved users.


```
[AuthName]
(message goes here)
```

• Optionally, a login message can be specified by including the key [AuthName]. This message will be displayed by the web browser upon accessing the protected directory.

The list of approved users can optionally be redirected to one or several other files.

Example:

In this example, the list of approved users will be loaded from the files 'here.cfg' and 'too.cfg'.

```
[File path]
\i\put\it\over\here.cfg
\i\actually\put\some\of\it\over\here\too.cfg

[AuthName]
Yeah. Whatsda passwoid?
```

Note that when using this feature, make sure to put the user/password files in a directory that is protected from web access, see 5-1 "Protected Files".

Content Types

By default, the following content types are recognized by their file extension:

Content Type	File Extension
text/html	*.htm, *.html, *.shtm
image/gif	*.gif
image/jpeg	*.jpeg, *.jpg, *.jpe
image/x-png	*.png
application/x-javascript	*.js
text/plain	*.bat, *.txt, *.c, *.h, *.cpp, *.hpp
application/x-zip-compressed	*.zip
application/octet-stream	*.exe, *.com
text/vnd.wap.wml	*.wml
application/vnd.wap.wmlc	*.wmlc
image/vnd.wap.wbmp	*.wbmp
text/vnd.wap.wmlscript	*.wmls
application/vnd.wap.wmlscriptc	*.wmlsc
text/xml	*.xml
application/pdf	*.pdf

It is possible to configure/reconfigure the reported content types, and which files that shall be scanned for SSI. This is done in the system file ‘\http.cfg’.

File Format:

```
[FileTypes]
FileType1:ContentType1
FileType2:ContentType2
...
FileTypeN:ContentTypeN

[SSIFileTypes]
FileType1
FileType2
...
FileTypeN
```

Note: Up to 50 content types and 50 SSI file types may be specified in this file.

SMTP Client

General

The built in email client can send predefined email messages based on trigger-events in the dual port memory (DPRAM). The application can also use the client directly via the mailbox interface.

The client supports SSI, however note that some SSI functions cannot be used in email messages (specified separately for each SSI function).

See also...

- 7-1 “Server Side Include (SSI)”
- 8-116 “Send Email (SEND_EMAIL)”

Server Settings

The module needs a valid SMTP server configuration in order to be able to send email messages. These settings are stored in the system file ‘\ethcfg.cfg’. This file is read once during startup, i.e. any changes requires that the module is restarted in order to have effect. See also...

- 8-17 “Set SMTP Server (SET_SMTP_SERVER)”
- 8-116 “Send Email (SEND_EMAIL)”

Event-Triggered Messages

As mentioned previously, the email client can send predefined message based on events in the DPRAM. In operation, this works as follows:

1. The trigger source is fetched from the dual port memory
2. A logical AND is performed between the trigger source and a mask value
3. The result is compared to a reference value according to a specified operand
4. If the end result is true, the email is sent to the specified recipient(s).

Which events that shall cause a particular message to be sent, is specified separately for each message. For more information, see 6-2 “Email Definitions”.

Note that the DPRAM is scanned once every 0.5 second, i.e. a trigger-event must be present longer than 0.5 seconds to ensure that it is detected by the Anybus module.

Email Definitions

The email definitions are stored in the following two directories:

- **'\user\email'**
This directory holds up to 10 messages which can be altered by normal-level FTP-users.
- **'\email'**
This directory holds up to 10 messages which can be altered by admin-level FTP-users.

Email definition files must be named 'email_1.cfg', 'email_2.cfg'... 'email_10.cfg' in order to be properly recognized by the module.

File Format:

```
[Register]
Area, Offset, Type

[Register Match]
Value, Mask, Operand

[To]
recipient

[From]
sender

[Subject]
subject line

[Headers]
Optional extra headers

[Message]
message body
```

Key	Value	Scanned for SSI
Area	Source area in DPRAM. Possible values are 'IN' or 'OUT'	No
Offset	Source offset, written in decimal or hexadecimal.	
Type	Source data type. Possible values are 'byte', 'word', and 'long'	
Value	Used as a reference value for comparison.	
Mask	Mask value, applied on the trigger source prior to comparison (logical AND).	
Operand	Possible values are '<', '=', or '>'	
To	Email recipient	Yes
From	Sender email address	
Subject	Email subject. One line only.	
Headers	Optional; may be used to provide additional headers.	
Message	The actual message.	

Note: Hexadecimal values must be written with the prefix '0x' in order to be recognized by the module.

Server Side Include (SSI)

General

Server Side Include (from now on referred to as SSI) functionality enables dynamic content to be used on web pages and in email messages.

SSI are special commands embedded in the source document. When the Anybus module encounters such a command, it will execute it, and replace it with the result (when applicable).

Syntax

The 'X's below represents a command opcode and parameters associated with the command.

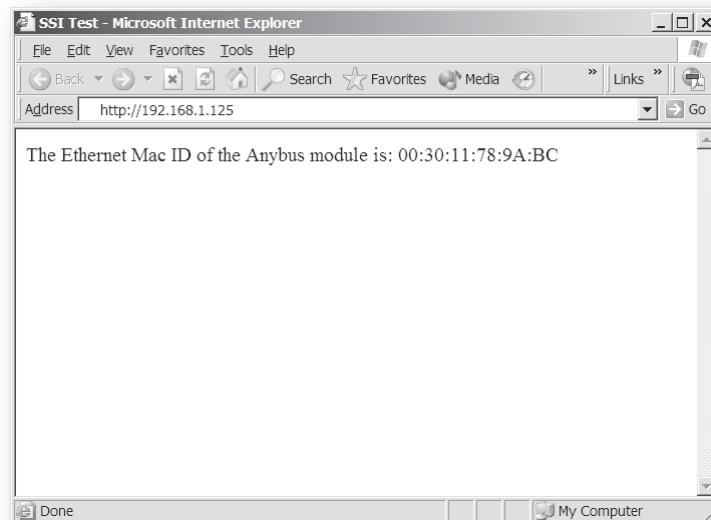
```
<?--#exec cmd_argument='XXXXXXXXXXXXXXXXXXXXX' -->
```

Example

The following example causes a web page to display the Ethernet Mac ID of the module:

```
<HTML>
<HEAD><TITLE>SSI Test</TITLE></HEAD>
<BODY>
The Ethernet Mac ID of the Anybus module is:
<?--#exec cmd_argument='DisplayMacID' -->
</BODY>
</HTML>
```

Resulting webpage:



Functions

DisplayMacID

This function returns the MAC ID in format xx:xx:xx:xx:xx:xx.

Syntax:

```
<?--#exec cmd_argument='DisplayMacId'-->
```

DisplaySerial

This function returns the serial number of the Anybus module.

Syntax:

```
<?--#exec cmd_argument='DisplaySerial'-->
```

DisplayFWVersion

This function returns the main firmware revision of the Anybus module.

Syntax:

```
<?--#exec cmd_argument='DisplayFWVersion'-->
```

DisplayBLVersion

This function returns the bootloader firmware revision of the Anybus module.

Syntax:

```
<?--#exec cmd_argument='DisplayBLVersion'-->
```

DisplayIP

This function returns the currently used IP address.

Syntax:

```
<?--#exec cmd_argument='DisplayIP'-->
```

DisplaySubnet

This function returns the currently used Subnet mask.

Syntax:

```
<?--#exec cmd_argument='DisplaySubnet'-->
```

DisplayGateway

This function returns the currently used Gateway address.

Syntax:

```
<?--#exec cmd_argument='DisplayGateway'-->
```

DisplayDNS1

This function returns the address of the primary DNS server.

Syntax:

```
<?--#exec cmd_argument='DisplayDNS1'-->
```

DisplayDNS2

This function returns the address of the secondary DNS server.

Syntax:

```
<?--#exec cmd_argument='DisplayDNS2'-->
```

DisplayHostName

This function returns the hostname.

Syntax:

```
<?--#exec cmd_argument='DisplayHostName'-->
```

DisplayDomainName

This function returns the default domain name.

Syntax:

```
<?--#exec cmd_argument='DisplayDomainName'-->
```

DisplayDhcpState

This function returns whether DHCP/BootP is enabled or disabled.

Syntax:

```
<?--#exec cmd_argument='DisplayDhcpState( "Output when ON", "Output when OFF" )'-->
```

DisplayDhcpSupport

DHCP support can be disabled using the mailbox command `DISABLE_DHCP`, see 8-13 “Disable DHCP (`DISABLE_DHCP`)”. This function returns ‘Arg1’ if it’s enabled and ‘Arg2’ if it’s disabled.

Syntax:

```
<?--#exec cmd_argument='DisplayDhcpSupport( "Arg1", "Arg2" )'-->
```

DisplayEmailServer

This function returns the currently used SMTP server address.

Syntax:

```
<?--#exec cmd_argument='DisplayEmailServer'-->
```

DisplaySMTPUser

This function returns the username used for SMTP authentication.

Syntax:

```
<?--#exec cmd_argument='DisplaySMTPUser'-->
```

DisplaySMTPPwd

This function returns the password used for SMTP authentication.

Syntax:

```
<?--#exec cmd_argument='DisplaySMTPPwd'-->
```

DisplayStationName

This function returns the PROFINET Station Name.

Syntax:

```
<?--#exec cmd_argument='DisplayStationName'-->
```

DisplayStationType

This function returns the PROFINET Station Type.

Syntax:

```
<?--#exec cmd_argument='DisplayStationType'-->
```

DisplayVendorID

This function returns the PROFINET Vendor ID.

Syntax:

```
<?--#exec cmd_argument='DisplayVendorId'-->
```

DisplayDeviceID

This function returns the PROFINET DeviceID.

Syntax:

```
<?--#exec cmd_argument='DisplayDeviceId'-->
```

StoreEtnConfig

Note: This function cannot be used in email messages.

This SSI function stores a passed IP configuration in the configuration file 'ethcfg.cfg'.

Syntax:

```
<?--#exec cmd_argument='StoreEtnConfig'-->
```

Include this line in a HTML page and pass a form with new IP settings to it.

Accepted fields in form:

```
SetIp
SetSubnet
SetGateway
SetEmailServer
SetDhcpState - value "on" or "off"
SetDNS1
SetDNS2
SetHostName
SetDomainName
SetSMTPUser
SetSMTPPwd
```

Default output:

```
Invalid IP address!
Invalid Subnet mask!
Invalid Gateway address!
Invalid IP address or Subnet mask!
Invalid Email Server IP address!
Invalid DHCP state!
Invalid DNS1!
Invalid DNS2!
Configuration stored correctly.
Failed to store configuration.
```

GetText

Note: This function cannot be used in email messages.

This SSI function gets the text from an object and stores it in the OUT area.

Syntax:

```
<?--#exec cmd_argument='GetText( "ObjName", OutWriteString ( offset ), n )'-->
```

```
ObjName    - Name of object.
offset      - Specifies the offset from the beginning of the OUT area.
n          - Specifies maximum number of characters to read (Optional)
```

Default output:

```
Success      - Write succeeded
Failure      - Write failed
```

printf

This SSI function includes a formatted string, which may contain data from the Anybus IN/OUT area, on a web page. The formatting of the string is equal to the standard C function printf().

Syntax:

```
<?--#exec cmd_argument='printf("String to write", Arg1, Arg2, ..., ArgN) '-->
```

Like the standard C function printf() the "String to write" for this SSI function contains two types of objects: Ordinary characters, which are copied to the output stream, and conversion specifications, each of which causes conversion and printing of the next successive argument to printf. Each conversion specification begins with the character % and ends with a conversion character. Between the % and the conversion character there may be, in order:

- Flags (in any order), which modify the specification:
 - which specifies left adjustment of the converted argument in its field.
 - + which specifies that the number will always be printed with a sign
 - (space) if the first character is not a sign, a space will be prefixed.
 - 0 for numeric conversions, specifies padding to the field with leading zeroes.
 - # which specifies an alternate output form. For o, the first digit will be zero. For x or X, 0x or 0X will be prefixed to a non-zero result. For e, E, f, g and G, the output will always have a decimal point; for g and G, trailing zeros will not be removed.
- A number specifying a minimum field width. The converted argument will be printed in a field at least this wide, and wider if necessary. If the converted argument has fewer characters than the field width it will be padded on the left (or right, if left adjustment has been requested) to make up the field width. The padding character is normally space, but can be 0 if the zero padding flag is present.
- A period, which separates the field width from the precision.
- A number, the precision, that specifies the maximum number of characters to be printed from a string, or the number of digits to be printed after the decimal point for e, E, or F conversions, or the number of significant digits for g or G conversion, or the minimum number of digits to be printed for an integer (leading 0s will be added to make up the necessary width)
- A length modifier h, l (letter ell), or L. "h" Indicates that the corresponding argument is to be printed as a short or unsigned short; "l" indicates that the argument is along or unsigned long.

The conversion characters and their meanings are shown below. If the character after the % is not a conversion character, the behaviour is undefined.

Character	Argument type, Converted to
d, i	byte, short; decimal notation (For signed representation. Use signed argument)
o	byte, short; octal notation (without a leading zero).
x, X	byte, short; hexadecimal notation (without a leading 0x or 0X), using abcdef for 0x or ABCDEF for 0X.
u	byte, short; decimal notation.
c	byte, short; single character, after conversion to unsigned char.
s	char*; characters from the string are printed until a "\0" is reached or until the number of characters indicated by the precision have been printed
f	float; decimal notation of the form [-]mmm.ddd, where the number of d's is specified by the precision. The default precision is 6; a precision of 0 suppresses the decimal point.
e, E	float; decimal notation of the form [-]m.ddddd e+-xx or [-]m.dddddE+-xx, where the number of d's specified by the precision. The default precision is 6; a precision of 0 suppresses the decimal point.
g, G	float; %e or %E is used if the exponent is less than -4 or greater than or equal to the precision; otherwise %f is used. Trailing zeros and trailing decimal point are not printed.
%	no argument is converted; print a %

The arguments that can be passed to the SSI function *printf* are:

Argument	Description
InReadSByte(<i>offset</i>)	Read a signed byte from position <i>offset</i> in the IN area
InReadUByte(<i>offset</i>)	Read an unsigned byte from position <i>offset</i> in the IN area
InReadSWord(<i>offset</i>)	Read a signed word from position <i>offset</i> in the IN area
InReadUWord(<i>offset</i>)	Read an unsigned word from position <i>offset</i> in the IN area
InReadSLong(<i>offset</i>)	Read a signed longword from position <i>offset</i> in the IN area
InReadULong(<i>offset</i>)	Read an unsigned longword from position <i>offset</i> in the IN area
InReadString(<i>offset</i>)	Read a string (char*) from position <i>offset</i> in the IN area
InReadFloat(<i>offset</i>)	Read a floating point (float) value from position <i>offset</i> in the IN area
OutReadSByte(<i>offset</i>)	Read a signed byte from position <i>offset</i> in the OUT area
OutReadUByte(<i>offset</i>)	Read an unsigned byte from position <i>offset</i> in the OUT area
OutReadSWord(<i>offset</i>)	Read a signed word (short) from position <i>offset</i> in the OUT area
OutReadUWord(<i>offset</i>)	Read an unsigned word (short) from position <i>offset</i> in the OUT area
OutReadSLong(<i>offset</i>)	Read a signed longword (long) from position <i>offset</i> in the OUT area
OutReadULong(<i>offset</i>)	Read an unsigned longword (long) from position <i>offset</i> in the OUT area
OutReadString(<i>offset</i>)	Read a null-terminated string from position <i>offset</i> in the OUT area
OutReadFloat(<i>offset</i>)	Read a floating point (float) value from position <i>offset</i> in the OUT area
MbReadSByte(<i>id</i>)	Read a signed byte (short) from the application via the mailbox interface
MbReadUByte(<i>id</i>)	Read an unsigned byte (short) from the application via the mailbox interface
MbReadSWord(<i>id</i>)	Read a signed word from the application via the mailbox interface
MbReadUWord(<i>id</i>)	Read an unsigned word from the application via the mailbox interface
MbReadSLong(<i>id</i>)	Read a signed longword from the application via the mailbox interface
MbReadULong(<i>id</i>)	Read an unsigned longword from the application via the mailbox interface
MbReadString(<i>id</i>)	Read a null-terminated string from the application via the mailbox interface
MbReadFloat(<i>id</i>)	Read a floating point (float) value from the application via the mailbox interface

scanf

Note: This function cannot be used in email messages.

This SSI function reads a string passed from an object in a HTML form, interprets the string according to the specification in format, and stores the result in the OUT area according to the passed arguments. The formatting of the string is equal to the standard C function call scanf()

Syntax:

```
<?--#exec cmd_argument='scanf( "ObjName", "format", Arg1, ..., ArgN), ErrVal1, ..., ErrValN'-->
```

ObjName - The name of the object with the passed data string
format - Specifies how the passed string shall be formatted
Arg1 - ArgN - Specifies where to write the data
ErrVal1 -ErrValN - Optional; specifies the value/string to write in case of an error.

Character	Input, Argument Type
d	Decimal number; byte, short
i	Number, byte, short. The number may be in octal (leading 0(zero)) or hexadecimal (leading 0x or 0X)
o	Octal number (with or without leading zero); byte, short
u	Unsigned decimal number; unsigned byte, unsigned short
x	Hexadecimal number (with or without leading 0x or 0X); byte, short
c	Characters; char*. The next input characters (default 1) are placed at the indicated spot. The normal skip over white space is suppressed; to read the next non-white space character, use %1s.
s	Character string (not quoted); char*, pointing to an array of characters large enough for the string and a terminating "\0" that will be added.
e, f, g	Floating-point number with optional sign, optional decimal point and optional exponent; float*
%	Literal %; no assignment is made.

The conversion characters d, i, o, u and x may be preceded by l (letter ell) to indicate that a pointer to 'long' appears in the argument list rather than a 'byte' or a 'short'

The arguments that can be passed to the SSI function scanf are:

Argument	Description
OutWriteByte(<i>offset</i>)	Write a byte to position <i>offset</i> in the OUT area
OutWriteWord(<i>offset</i>)	Write a word to position <i>offset</i> in the OUT area
OutWriteLong(<i>offset</i>)	Write a long to position <i>offset</i> in the OUT area
OutWriteString(<i>offset</i>)	Write a string to position <i>offset</i> in the OUT area
OutWriteFloat(<i>offset</i>)	Write a floating point value to position <i>offset</i> in the OUT area
MbWriteByte(<i>id</i>)	Write a byte to the application via the mailbox interface
MbWriteWord(<i>id</i>)	Write a word to the application via the mailbox interface
MbWriteLong(<i>id</i>)	Write a longword to the application via the mailbox interface
MbWriteString(<i>id</i>)	Write a string to the application via the mailbox interface
MbWriteFloat(<i>id</i>)	Write a floating point value to the application via the mailbox interface

Default output:

```
Write succeeded
Write failed
```

IncludeFile

This SSI function includes the contents of a file on a web page.

Syntax:

```
<?--#exec cmd_argument='IncludeFile( "File name" )'-->
```

Default output:

Success	- <File content>
Failure	- Failed to open <filename>

SaveToFile

Note: This function cannot be used in email messages.

This SSI function saves the contents of a passed form to a file. The passed name/value pair will be written to the file "File name" separated by the "Separator" string. The [Append|Overwrite] parameter determines if the specified file shall be overwritten, or if the data in the file shall be appended.

Syntax:

```
<?--#exec cmd_argument='SaveToFile( "File name",  
"Separator", [Append|Overwrite] )'-->
```

Default output:

Success	- Form saved to file
Failure	- Failed to save form

SaveDataToFile

Note: This function cannot be used in email messages.

This SSI function saves the data of a passed form to a file. The “Object name” parameter is optional, if specified, only the data from that object will be stored. If not, the data from all objects in the form will be stored.

The [Append|Overwrite] parameter determines if the specified file shall be overwritten, or if the data in the file shall be appended.

Syntax:

```
<?--#exec cmd_argument='SaveDataToFile( "File name", "Object  
name", [Append|Overwrite] )'-->
```

Default output:

Success	- Form saved to file
Failure	- Failed to save form

DisplayRemoteUser

Note: This function cannot be used in email messages.

This SSI function returns the user name on an authentication session.

Syntax:

```
<?--#exec cmd_argument='DisplayRemoteUser'-->
```

Changing SSI output

There is two methods of changing the output strings from SSI functions:

1. Changing SSI output defaults by creating a file called "\ssi_str.cfg" containing the output strings for all SSI functions in the system
2. Temporary changing the SSI output by calling the SSI function "SsiOutput()".

SSI Output String File

If the file "\ssi_str.cfg" is found in the file system and the file is correctly according to the specification below, the SSI functions will use the output strings specified in this file instead of the default strings.

The files shall have the following format:

```
[StoreEtnConfig]
Success: "String to use on success"
Invalid IP: "String to use when the IP address is invalid"
Invalid Subnet: "String to use when the Subnet mask is invalid"
Invalid Gateway: "String to use when the Gateway address is invalid"
Invalid Email server: "String to use when the SMTP address is invalid"
Invalid IP or Subnet: "String to use when the IP address and Subnet mask does
not match"
Invalid DNS1: "String to use when the primary DNS cannot be found"
Invalid DNS2: "String to use when the secondary DNS cannot be found"
Save Error: "String to use when storage fails"
Invalid DHCP state: "String to use when the DHCP state is invalid"

[scanf]
Success: "String to use on success"
Failure: "String to use on failure"

[IncludeFile]
Failure: "String to use when failure"1

[SaveToFile]
Success: "String to use on success"
Failure: "String to use on failure"1

[SaveDataToFile]
Success: "String to use on success"
Failure: "String to use on failure"1

[GetText]
Success: "String to use on success"
Failure: "String to use on failure"
```

The contents of this file can be redirected by placing the line '[File path]' on the first row, and a file path on the second.

Example:

```
[File path]
\user\ssi_strings.cfg
```

In this example, the settings described above will be loaded from the file 'user\ssi_strings.cfg'.

1. '%s' includes the filename in the string

Temporary SSI Output change

The SSI output for the next called SSI function can be changed with the SSI function “SsiOutput()” The next called SSI function will use the output according to this call. Thereafter the SSI functions will use the default outputs or the outputs defined in the file ‘\ssi_str.cfg’. The maximum size of a string is 128 bytes.

Syntax:

```
<?--#exec cmd_argument='SsiOutput( "Success string", "Failure string" )'-->
```

Example:

This example shows how to change the output strings for a scanf SSI call.

```
<?--#exec cmd_argument='SsiOutput ( "Parameter1 updated", "Error" )'-->  
<?--#exec cmd_argument="scanf( "Parameter1", "%d", OutWriteByte(0) )'-->
```


Fieldbus Specific Mailbox Commands

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 8).

The fault codes in the Fault Information register are:

Register Value	Description
0001h	Invalid IP-address or Subnet mask
0002h	Invalid socket type
0003h	No free socket
0004h	Invalid socket
0005h	Not connected
0006h	Command failed
0007h	Invalid data size
0008h	Invalid fragment type
0009h	Fragment error
000Ah	Invalid timeout time
000Bh	Can't send more
000Ch	Failed to open file or file not found
000Dh	Invalid file descriptor
000Eh	Invalid open method
000Fh	No email server configured
0010h	Command aborted
0011h	Too many registered objects
0012h	Object already registered
0013h	Deregistering invalid object
0015h	Unsupported Command
0016h	Failed to send UCMM command
0017h	No timeout
0018h	Invalid port number
0019h	Duplicate port number
001Ah	EPATH too big
001Bh	Mapping Failed
001Ch	Reset notification unsupported
001Dh	Too many open files
001Eh	Failed to create directory
001Fh	Failed to delete directory
0020h	Failed to rename file
0021h	Failed to move file
0022h	Failed to copy file
0023h	Too many open directories
0024h	Failed to open directory or directory not found
0025h	Failed to resolve hostname with DNS
0026h	Timed out resolving hostname with DNS
0027h	Mailbox command not allowed in this state
0028h	Reserved value not set to zero

Register Value	Description
0029h	Value out-of-range
002Ah	Slot number out-of-range
002Bh	Subslot number out-of-range
002Ch	Channel number out-of-range
002Eh	Channel error type out-of-range
002Fh	Channel type out-of-range
0030h	Channel spec out-of-range
0031h	Channel dir out-of-range
0032h	User structure identifier out-of-range
0033h	Slot occupied
0034h	Subslot occupied
0035h	No module
0036h	No submodule
0037h	Memory overlap
0038h	Memory out-of-range
0039h	Extended fault information available (See 8-2 “Extended Fault Information”)
003Ah	Slot 0 is not plugged
003Bh	Invalid application handle
003Ch	Module/submodule cannot be pulled/plugged
003Dh	Failed to set operation state
003Eh	Failed to send alarm
003Fh	Failed to add/remove diagnostic entry
0040h	I&M X not supported
0041h	AR handle not valid
0042h	Failed to abort the AR

Extended Fault Information

When ‘fault information’ indicates ‘Extended Fault Information available’, additional information from the PROFINET stack is available in Extended Word 7.

The fault codes are:

Register Value	Description
1000h	No resources available
1002h	System adaptation error
1003h	Sequence error
1004h	Parameter error
1005h	Incorrect opcode
1006h	Memory allocation error
1007h	Error in lower layer of the PNIO stack
1008h	Buffer cannot be locked
1009h	Operation aborted
100Ah	Request belongs to an old session
100Bh	RPC timeout error
100Ch	RPC communication error
100Dh	RPC peer signalled busy (try again later)
100Eh	Function call-up not possible at the moment
1100h	Attempted pull from an empty slot
1101h	Attempted pull from an empty subslot

Register Value	Description
1102h	Attempted plug into an occupied slot
1103h	Attempted plug into an occupied subslot
1104h	Invalid parameter
1105h	Function cannot be called since no valid Application Relation (AR) is available

General Configuration Commands

Commands in this category:

Mailbox Commands	Description	Page
Set Ethernet Configuration (SET_ETN_CONFIG)	Set network settings	8-5
Read Ethernet Configuration (READ_ETN_CONFIG)	Retrieve the currently used network settings	8-6
Get MAC Address (GET_MAC_ADDR)	Retrieve the ethernet MAC address from the module	8-7
Connection Timeout (CONNECT_TIMEOUT)	Set the connection timeout value	8-8
Set Host and Domain (SET_HOST_DOMAIN)	Set host and default domain names	8-9
Get Host and Domain (GET_HOST_DOMAIN)	Returns the currently used host and domain	8-10
Set MAC address (SET_MAC_ADDR)	Set the MAC address of the module	8-11
Disable / Enable HICP (HICP_CFG_CONTROL)	Disable/enable HICP support	8-12
Disable DHCP (DISABLE_DHCP)	Disable DHCP support	8-13
Enable DHCP (ENABLE_DHCP)	Enable DHCP support	8-14
Set DNS Server Settings (SET_DNS_SERVERS)	Configures the DNS server settings	8-15
Get DNS Server Settings (GET_DNS_SERVERS)	Returns the currently used DNS server settings	8-16
Set SMTP Server (SET_SMTP_SERVER)	Configures the SMTP server IP address	8-17
Set SMTP Server by Name (SET_SMTP_SERVER_NAME)	Configures the SMTP server address	8-18
Get SMTP Server (GET_SMTP_SERVER)	Returns the currently used SMTP server IP address	8-19
Disable Web Server (DISABLE_WEB_SERVER)	This command disables the built in web server	8-20
Enable Web Server (ENABLE_WEB_SERVER)	This command enables the built in web server	8-21
Disable FTP server (DISABLE_FTP_SERVER)	This command disables the built in FTP server	8-22
Global Admin Mode (GLOBAL_ADMIN_MODE)	This command instruct the module to run in global admin mode	8-23
Disable Virtual File System (DISABLE_VFS)	Disable the virtual file system	8-24

Set Ethernet Configuration (SET_ETN_CONFIG)

Description

This command can be used to set the IP address, Gateway address, and Subnet mask. The settings in this command overrides the settings in 'ethcfg.cfg'.

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	0001h
Extended Header	Fault information
Message data	Network 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	<i>Fieldbus Specific Message</i> SET_ETN_CONFIG 12 bytes of data (6 words)
Command	0001h	0001h	
Data size	000Ch	000Ch	
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 dataword 1	IP address (high)	IP address (high)	
Message dataword 2	IP address (low)	IP address (low)	
Message dataword 3	Subnet mask (high)	Subnet mask (high)	
Message dataword 4	Subnet mask (low)	Subnet mask (low)	
Message dataword 5	Gateway address (high)	Gateway address (high)	
Message dataword 6	Gateway address (low)	Gateway address (low)	

Read Ethernet Configuration (READ_ETN_CONFIG)

Description

This command returns the currently used network settings.

Note: This command may only be issued during runtime.

Initiated by	Application
Command no.	0002h
Extended Header	-
Message data	-
Response data	Currently used network settings.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> READ_ETN_CONFIG 12 bytes of data (6 words)
Command	0002h	0002h	
Data size	0000h	000Ch	
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	-	-	
		IP address (high)	Response dataword 1
		IP address (low)	Response dataword 2
		Subnet mask (high)	Response dataword 3
		Subnet mask (low)	Response dataword 4
		Gateway address (high)	Response dataword 5
		Gateway address (low)	Response dataword 6

Get MAC Address (GET_MAC_ADDR)

Description

This command returns MAC addresses associated with the module.

See also...

- 8-25 “Set Port MAC Address (SET_PORT_MAC_ADDR)”

Initiated by	Application
Command no.	0010h
Extended Header	MAC Selection
Message data	-
Response data	MAC Data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>GET_MAC_ADDR</i>
Command	0010h	0010h	
Data size	0000h	(size)	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	MAC Selection	-	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	-	
		MAC Data	Response data word 1 ... Response data word N

- MAC Selection & MAC Data**

MAC Data holds 6... 18 bytes of data depending on the value of MAC Selection.

MAC Selection	MAC Data[0...5]	MAC Data[6...11]	MAC Data[12...17]
0	Module MAC Address	-	-
1	Port 1 MAC Address	-	-
2	Port 2 MAC Address	-	-
FFFFh	Module MAC Address	Port 1 MAC Address	Port 2 MAC Address

Note: MAC Selection 2 (Port 2 MAC Address) is only available on two-port versions of the product. Also note that for one-port versions, MAC Selection FFFFh will only return 12 bytes (Module MAC Address + Port 1 MAC Address)

Connection Timeout (CONNECT_TIMEOUT)

Description

This mailbox command configures the timeout value used when trying to establish a connection to a host.

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	0003h
Extended Header	Fault information
Message data	Timeout Value
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	<i>Fieldbus Specific Message CONNECT_TIMEOUT 1 data byte</i>
Command	0003h	0003h	
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 databyte 1	Timeout Value	Timeout Value	

- Timeout Value**

Valid timeout values range from 1 to 255 seconds (Default = 75).

Set Host and Domain (SET_HOST_DOMAIN)

Description

This command is used to set the host and the default domain name.

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	0032h
Extended Header	Fault information
Message data	Host and Domain 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	Fieldbus Specific Message SET_HOST_DOMAIN
Command	0032h	0032h	
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	Host name (string, null-terminated)	Host name (string, null-terminated)	
	Domain name (string, null-terminated)	Domain name (string, null-terminated)	

Get Host and Domain (GET_HOST_DOMAIN)

Description

This command returns the configured host and default domain name settings.

Initiated by	Application
Command no.	0034h
Extended Header	-
Message data	-
Response data	Currently used Host and Domain settings

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>GET_HOST_DOMAIN</i>
Command	0034h	0034h	
Data size	0000h	(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	-	-	
		Host name (string, null-terminated)	Response data
		Domain name (string, null-terminated)	

Set MAC Address (SET_MAC_ADDR)

Description

This command sets the MAC address used by the module.

This mailbox can only be issued during initialization.

Initiated by	Application
Command no.	0019h
Extended Header	-
Message data	The new MAC address
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	<i>Fieldbus Specific Message</i> <i>SET_MAC_ADDR</i> <i>6 bytes of data</i>
Command	0019h	0019h	
Data size	0006h	0006h	
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 word 1	MAC address byte 1, 2	MAC address byte 1, 2	
Message data word 2	MAC address byte 3, 4	MAC address byte 3, 4	
Message data word 3	MAC address byte 5, 6	MAC address byte 5, 6	

Disable / Enable HICP (HICP_CFG_CONTROL)

Description

This command is used to enable / disable support for HICP (Anybus IP Config).

Initiated by	Application
Command no.	0013h
Extended Header	-
Message data	HICP state
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	<i>Fieldbus Specific Message</i>
Command	0013h	0013h	<i>HICP_CFG_CONTROL</i>
Data size	0001h	0001h	<i>1 data byte</i>
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 databyte	Config Value	Config Value	

- **Config Value**

00h: Disable
01h: Enable

Disable DHCP (DISABLE_DHCP)

Description

This command disables DHCP support and overrides the corresponding setting in ‘ethcfg.cfg’. This will also hide the DHCP-checkbox in the default web page, and prevent the DHCP status to be viewed through HICP.

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

Note 2: DHCP is disabled by default.

Initiated by	Application
Command no.	0015h
Extended Header	-
Message data	-
Response data	The response indicates if the command was accepted.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message DISABLE_DHCP</i>
Command	0015h	0015h	
Data size	0000h	0000h	
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	

Enable DHCP (ENABLE_DHCP)

Description

This command enables DHCP and overrides the corresponding setting in 'ethcfg.cfg'. This will also enable the DHCP-checkbox in the default web page, and allow the DHCP status to be viewed through HICP.

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

Note 2: DHCP is disabled by default.

Initiated by	Application
Command no.	001Ah
Extended Header	-
Message data	-
Response data	The response indicates if the command was accepted.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>ENABLE_DHCP</i>
Command	001Ah	001Ah	
Data size	0000h	0000h	
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	

Set DNS Server Settings (SET_DNS_SERVERS)

Description

This command configures the DNS server settings.

Note: This command may only be issued to during initialization.

Initiated by	Application
Command no.	0031h
Extended Header	-
Message data	DNS server settings
Response data	The response indicates if the command was accepted.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message SET_DNS_SERVERS 8 bytes (4 words) of data</i>
Command	0031h	0031h	
Data size	0008h	0008h	
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 word 1	Primary DNS (msb)	Primary DNS (msb)	
Message data word 2	Primary DNS (lsb)	Primary DNS (lsb)	
Message data word 3	Secondary DNS (msb)	Secondary DNS (msb)	
Message data word 4	Secondary DNS (lsb)	Secondary DNS (lsb)	

- **Primary DNS**
IP address to primary DNS server.
- **Secondary DNS**
IP address to secondary DNS server, or 0.0.0.0 when using primary DNS only.

Get DNS Server Settings (GET_DNS_SERVERS)

Description

This command returns the currently used DNS server settings.

Initiated by	Application
Command no.	0033h
Extended Header	-
Message data	-
Response data	DNS server settings.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>GET_DNS_SERVERS</i> <i>(size of data)</i>
Command	0033h	0033h	
Data size	0000h	0008h	
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	
		Primary DNS (msb)	
		Primary DNS (lsb)	
		Secondary DNS (msb)	
		Secondary DNS (lsb)	

- **Primary DNS**

IP address to primary DNS server, or 0.0.0.0 if unused.

- **Secondary DNS**

IP address to secondary DNS server, or 0.0.0.0 if unused.

Set SMTP Server (SET_SMTP_SERVER)

Description

This mailbox command may be used to specify the IP address of the SMTP server.

Note 1: This command overrides the settings stored in the configuration file 'ethcfg.cfg'.

Note 2: This command may only be issued during initialization.

Initiated by	Application
Command no.	000Eh
Extended Header	Fault information
Message data	SMTP server address
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	<i>Fieldbus Specific Message</i> <i>SET_SMTP_SERVER</i> <i>4 bytes of data (2 words)</i>
Command	000Eh	000Eh	
Data size	0004h	0004h	
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 dataword 1	SMTP IP address (high)	SMTP IP address (high)	
Message dataword 2	SMTP IP address (low)	SMTP IP address (low)	

Set SMTP Server by Name (SET_SMTP_SERVER_NAME)

Description

This command may be used to specify the address to the SMTP server in ASCII form.

Note 1: This command overrides the settings stored in the configuration file 'ethcfg.cfg'.

Note 2: This command may only be issued during initialization.

Initiated by	Application
Command no.	0016h
Extended Header	-
Message data	SMTP server (string)
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	<i>Fieldbus Specific Message</i>
Command	0016h	0016h	
Data size	(size)	(size)	<i>SET_SMTP_SERVER_NAME</i>
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	SMTP Server (String, null-terminated)	SMTP Server (String, null-terminated)	

- **SMTP Server**

ASCII string, null terminated (e.g. "192.168.1.42" or "smtp.server.com")

Get SMTP Server (GET_SMTP_SERVER)

Description

This function returns the currently used SMTP server IP address.

Initiated by	Application
Command no.	000Fh
Extended Header	-
Message data	-
Response data	SMTP server IP address

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>GET_SMTP_SERVER</i> <i>4 bytes of data (2 words)</i>
Command	000Fh	000Fh	
Data size	0000h	0004h	
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	
		SMTP IP address (high)	Response dataword 1
		SMTP IP address (low)	Response dataword 2

Disable Web Server (DISABLE_WEB_SERVER)

Description

This command disables the onboard web server. The web server is enabled by default.

Initiated by	Application
Command no.	0004h
Extended Header	-
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>DISABLE_WEB_SERVER</i>
Command	0004h	0004h	
Data size	0000h	0000h	
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	-	-	

Enable Web Server (ENABLE_WEB_SERVER)

Description

This command enables the onboard web server. The web server is enabled by default.

Initiated by	Application
Command no.	0005h
Extended Header	-
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>ENABLE_WEB_SERVER</i>
Command	0005h	0005h	
Data size	0000h	0000h	
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	-	-	

Disable FTP server (DISABLE_FTP_SERVER)

Description

This command disables the FTP server.

Initiated by	Application
Command no.	0006h
Extended Header	-
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>DISABLE_FTP_SERVER</i>
Command	0006h	0006h	
Data size	0000h	0000h	
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	-	-	

Global Admin Mode (GLOBAL_ADMIN_MODE)

Description

This command instructs the module to run in Global Admin Mode. For more information, see 4-1 “User Accounts”.

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	000Bh
Extended Header	-
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>GLOBAL_ADMIN_MODE</i>
Command	000Bh	000Bh	
Data size	0000h	0000h	
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	-	-	

Disable Virtual File System (DISABLE_VFS)

Description

This command disables the virtual files in the file system.

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	0011h
Extended Header	-
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0011h	0011h	
Data size	0000h	0000h	<i>DISABLE_VFS</i>
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	-	-	

Set Port MAC Address (SET_PORT_MAC_ADDR)

Description

This command is used to specify a custom Port MAC Address.

See also...

- 8-7 “Get MAC Address (GET_MAC_ADDR)”

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	0123h
Extended Header	-
Message data	Port MAC Address
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	<i>Fieldbus Specific Message</i> <i>SET_PORT_MAC_ADDR</i>
Command	0123h	0123h	
Data size	0006h	0006h	
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 Word 1	Port MAC Address	Port MAC Address	
...			
Message Data Word 3			

- Port MAC Address**
Custom MAC address to use.

Mailbox File System Interface

The filesystem is available to the application through the mailbox interface. Note that the application always has unrestricted access to the filesystem, regardless of security mode.

Commands in this category:

Mailbox Command	Description	Page
Open File (FILE_OPEN)	Open a file for reading, writing, or appending.	8-27
Close File (FILE_CLOSE)	Close a file previously opened using FILE_OPEN	8-28
Read File (FILE_READ)	Read data from a file	8-29
Write File (FILE_WRITE)	Write data to a file.	8-30
Delete File (FILE_DELETE)	Delete a file	8-31
Move File (FILE_MOVE)	Moves a file	8-32
Rename File (FILE_RENAME)	Rename a file	8-33
Copy File (FILE_COPY)	Copy a file	8-34
Create Directory (DIR_CREATE)	Create a new directory	8-35
Delete Directory (DIR_DELETE)	Delete an empty directory	8-36
Open Directory (DIR_OPEN)	Open a directory	8-37
Read Directory (DIR_READ)	Read contents of a directory previously opened using DIR_OPEN	8-38
Close Directory (DIR_CLOSE)	Close a directory previously opened using DIR_OPEN	8-40
Create RAM disc (CREATE_RAM_DISC)	Mounts the RAM disc into a specified directory in the file system.	8-41
Format File System (FORMAT_FS)	Formats the file system	8-42
File System Checksum (CRC_FS)	Calculates checksums related to the file system	8-43

Open File (FILE_OPEN)

Description

This command opens a file for reading, writing, or appending.

Initiated by	Application
Command no.	0060h
Extended Header	Mode, Filesize & Fault information
Message data	Name and path to the file to open (NULL terminated)
Response data	File Handle

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message FILE_OPEN</i>
Command	0060h	0060h	
Data size	(size)	0004h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Mode	Filesize (high)	
Extended word 2	-	Filesize (low)	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
Message data	Path + filename (String, null-terminated)	File Handle (high)	Response data word 1
		File Handle (low)	Response data word 2

- Mode**

Value	Mode
0000h	Open a file in read mode
0001h	Open a file in write mode. If the specified file does not exist, it will be created. If the specified file already exists, it will be overwritten.
0002h	Open a file in append mode. If the specified file does not exist, it will be created. If the specified file exists, any data written to the file will be appended at end-of-file.

- Filesize**

Current filesize (if applicable).

- File Handle**

Unique identifier which must be used on all further operations associated with the file.

Close File (FILE_CLOSE)

Description

This command closes a file previously opened using FILE_OPEN.

Initiated by	Application
Command no.	0061h
Extended Header	File Handle, Filesize & Fault information.
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0061h	0061h	
Data size	0000h	0000h	<i>FILE_CLOSE</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	File Handle (high)	File Handle (high)	
Extended word 2	File Handle (low)	File Handle (low)	
Extended word 3	-	Filesize (high)	
Extended word 4	-	Filesize (low)	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	

- **File Handle**

Handle of the file to close. See also 8-27 “File Handle”.

- **Filesize**

Size of the file.

Read File (FILE_READ)

Description

This command reads data from a file previously opened in read mode using FILE_OPEN.

Initiated by	Application
Command no.	0062h
Extended Header	File Handle, no. of bytes to read & Fault information
Message data	-
Response data	The read data is returned in the response data field.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message
Command	0062h	0062h	FILE_READ
Data size	0000h	(size)	Bytes read
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	File Handle (high)	File Handle (high)	
Extended word 2	File Handle (low)	File Handle (low)	
Extended word 3	No. of bytes	No. of bytes	Maximum 256 bytes.
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
		Data	Response data

- **File Handle**

File handle of the file to read data from. See also 8-27 “File Handle”.

- **No. of bytes**

Number of bytes to read minus 1 (i.e. a value of 42 will read 43 bytes).

- **Data**

The actual data read from the file (if applicable).

Write File (FILE_WRITE)

Description

This mailbox command writes data to a file previously opened in write or append mode using FILE_OPEN.

Initiated by	Application
Command no.	0063h
Extended Header	File Handle & Fault information
Message data	Data to write
Response data	A 'Data size' value of 0 (zero) indicates that the command was unsuccessful, possibly due to a faulty handle, or that the module has run out of storage.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0063h	0063h	<i>FILE_WRITE</i>
Data size	(number of bytes to write)	(number of written bytes)	<i>Max. 256 bytes</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	File Handle (high)	File Handle (high)	
Extended word 2	File Handle (low)	File Handle (low)	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
Message data	Data	Data	

- File Handle**

File handle of the file to write data to. See also 8-27 "File Handle".

- No. of bytes**

Number of bytes to write minus 1 (i.e. a value of 42 will read 43 bytes).

- Data**

The actual data that shall be written.

Delete File (FILE_DELETE)

Description

This mailbox command deletes a file from the file system.

Initiated by	Application
Command no.	0064h
Extended Header	Fault information
Message data	Name and path to the file to delete (NULL terminated)
Response data	The response data is a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0064h	0064h	<i>FILE_DELETE</i>
Data size	(size)	(size)	<i>Maximum 256 bytes</i>
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	Path + filename (String, null-terminated)	Path + filename (String, null-terminated)	

Move File (FILE_MOVE)

Description

This command renames a file in the filesystem.

Note: Although the filesystem supports path lengths of up to 256 characters, the total length of the source and destination paths summed together must be less than 256 characters when using this command due to limitations in the mailbox command structure.

Initiated by	Application
Command no.	0065h
Extended Header	Fault information
Message data	Name + Path of source and destination, both NULL terminated
Response data	The response data is a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message
Command	0065h	0065h	FILE_MOVE
Data size	(size)	(size)	Size of path strings
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	Source: Path + filename (String, null-terminated)	Source: Path + filename (String, null-terminated)	
	Destination: Path + filename (String, null-terminated)	Destination: Path + filename (String, null-terminated)	

Rename File (FILE_RENAME)

Description

This command renames a file in the filesystem.

Note: Although the filesystem supports path lengths of up to 256 characters, the total length of the two pathnames summed together must be less than 256 characters when using this command due to limitations in the mailbox command structure.

Initiated by	Application
Command no.	0066h
Extended Header	Fault information
Message data	Name + Path of source and destination, both NULL terminated
Response data	The response data is a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message
Command	0066h	0066h	FILE_RENAME
Data size	(size)	(size)	Size of path strings
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	
	Old: Path + filename (String, null-terminated)	Old: Path + filename (String, null-terminated)	
Message data	New: Path + filename (String, null-terminated)	New: Path + filename (String, null-terminated)	

Copy File (FILE_COPY)

Description

This command copies a file in the filesystem to a specified location.

Note: Although the filesystem supports path lengths of up to 256 characters, the total length of the source and destination paths summed together must be less than 256 characters when using this command due to limitations in the mailbox command structure.

Initiated by	Application
Command no.	0067h
Extended Header	Fault information
Message data	Name + Path of source and destination, both NULL terminated
Response data	The response data is a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message
Command	0067h	0067h	FILE_COPY
Data size	(size)	(size)	Size of path strings
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	Source: Path + filename (String, null-terminated)	Source: Path + filename (String, null-terminated)	
	Destination: Path + filename (String, null-terminated)	Destination: Path + filename (String, null-terminated)	

Create Directory (DIR_CREATE)

Description

This command creates a directory in the file system.

Initiated by	Application
Command no.	0068h
Extended Header	Fault information
Message data	Path and name of the new directory, null terminated.
Response data	The response data is a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0068h	0068h	<i>DIR_CREATE</i>
Data size	(size)	(size)	<i>Size of path string</i>
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	Path + name (String, null-terminated)	Path + name (String, null-terminated)	

Delete Directory (DIR_DELETE)

Description

This command deletes an empty directory from the file system.

Initiated by	Application
Command no.	0069h
Extended Header	-
Message data	Path and name of the directory, null terminated.
Response data	The response data is a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0069h	0069h	<i>DIR_DELETE</i>
Data size	(size)	(size)	<i>Size of path string</i>
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	Path + name (String, null-terminated)	Path + name (String, null-terminated)	

Open Directory (DIR_OPEN)

Description

This command opens a directory and returns a descriptor that should be used on all further operations on the directory.

See also 8-39 “Reading the Contents of a Directory”.

Initiated by	Application
Command no.	006Ah
Extended Header	-
Message data	Path and name of the directory, null terminated.
Response data	Directory handle & Fault information

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message DIR_OPEN</i>
Command	006Ah	006Ah	
Data size	(size)	0004h	
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	Path + name (String, null-terminated)	Directory Handle (high)	Response data word 1
		Directory Handle (low)	Response data word 2

- **Directory Handle**

Unique identifier which must be used on all further operations associated with the directory.

Read Directory (DIR_READ)

Description

This command reads the contents of a directory previously opened using DIR_OPEN. This must be repeated until the response to the command is empty (i.e. until the response data size equals zero).

See also 8-39 “Reading the Contents of a Directory”.

Initiated by	Application
Command no.	006Bh
Extended Header	Directory Handle & Fault information
Message data	-
Response data	Details about one object in the directory.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message DIR_READ</i>
Command	006Bh	006Bh	
Data size	0000h	(size)	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Directory Handle (high)	Directory Handle (high)	<i>(See DIR_OPEN)</i>
Extended word 2	Directory Handle (low)	Directory Handle (low)	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
		Object Size (long)	Response data byte 1
			Response data byte 2
			Response data byte 3
			Response data byte 4
		Object Flags	Response data byte 5
		Object Name (string, null-terminated)	Response data...

- **Directory Handle**

Unique identifier which must be used on all further operations associated with the directory.

- **Object Size**

Size of object (i.e. filesize).

- **Object Flags**

Various flags specifying the nature of the object:

b7	b6	b5	b4	b3	b2	b1	b0
(reserved)				SYS	H	RO	DIR

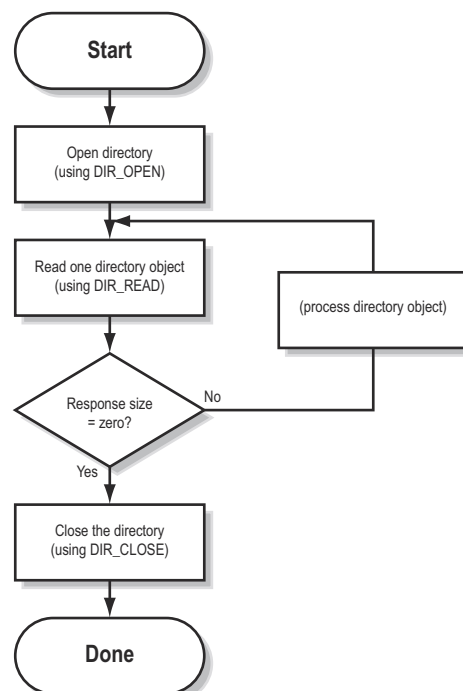
Bit	Description
DIR	Directory flag 0: Object is a file 1: Object is a directory
RO	Read only 0: Object can be read or written 1: Object is read-only
H	Hidden 0: Object is visible 1: Object is hidden
SYS	System 0: User object 1: System object

- **Object Name**

Name of object, null-terminated (e.g. filename or directory name).

Reading the Contents of a Directory

The following flowchart illustrates the process of reading the contents of a directory:



Close Directory (DIR_CLOSE)

Description

This command closes a directory previously opened using DIR_OPEN.

See also 8-39 “Reading the Contents of a Directory”.

Initiated by	Application
Command no.	006Ch
Extended Header	Directory Handle & Fault information
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message DIR_CLOSE
Command	006Ch	006Ch	
Data size	0000h	0000h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Directory Handle (high)	Directory Handle (high)	(See DIR_OPEN)
Extended word 2	Directory Handle (low)	Directory Handle (low)	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	

Create RAM disc (CREATE_RAM_DISC)

Description

This command mounts the RAM disc into a specified directory in the file system.

- The directory must be empty
- If the directory doesn't exist it will be created.

Initiated by	Application
Command no.	0018h
Extended Header	-
Message data	String containing RAM disc location, null terminated
Response data	The response data is a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message
Command	0018h	0018h	CREATE_RAM_DISC
Data size	(size)	(size)	Size of data in bytes
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	Path (String, null-terminated)	Path (String, null-terminated)	

- **Path**
RAM-disc location. Must be empty, or the command will fail.

Format File System (FORMAT_FS)

Description

This command formats the file system.

Initiated by	Application
Command no.	006Dh
Extended Header	-
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>FORMAT_FS</i>
Command	006Dh	006Dh	
Data size	0000h	0000h	
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	-	-	

File System Checksum (CRC_FS)

Description

This command calculates checksums related to the file system.

Initiated by	Application
Command no.	006Eh
Extended Header	-
Message data	-
Response data	Used Sector CRC, File System CRC

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>CRC_FS</i>
Command	006Eh	006Eh	
Data size	0000h	0004h	
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	-	-	
		Used Sector CRC	Response data word 1
		File System CRC	Response data word 2

PROFINET Specific Commands

General

Commands in this category:

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Spontaneous Messages

The following messages may be issued by the Anybus when operating in Advanced Mode.

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AR Info Indication (PNIO_IND_AR_INFO)	8-81
Abort AR Indication (PNIO_IND_AR_ABORT)	8-83
AR Offline Indication (PNIO_IND_AR_OFFLINE)	8-85

Advanced Mode (PNIO_ADV_MODE)

Description

This command instructs the Anybus module to operate in Advanced Mode, and extends the PROFI-NET specific functionality.

Note: This command may only be issued during initialization, preceded by Anybus Init.

Command initiator	Application
Command number	0100h
Extended Header data	Spontaneous Mailbox settings & Max.no. of slots
Message data	-
Response message	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message PNIO_ADV_MODE</i>
Command	0100h	0100h	
Data size	0000h	0000h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Spontaneous Mailbox	Spontaneous Mailbox	
Extended word 2	Max.no. of slots	Max.no. of slots	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault Information	

- **Spontaneous Mailbox**

This bitfield enables/disables certain PROFINET-related mailbox communication.

Bit(s)	Name	Meaning	Related Mailbox Message(s)
0	Cfg Mismatch	1: Notify the application in the event of a configuration mismatch 0: (do not notify the application)	- Configuration Mismatch (PNIO_IND_CFG_MISMATCH)
1	Record Data Request	1: Forward acyclic data through mailbox interface 0: Use the Parameter Data areas for acyclic data exchange	- Record Data Read (PNIO_IND_RECORD_DATA_READ) - Record Data Write (PNIO_IND_RECORD_DATA_WRITE)
2	End of Prm	1: Notify the application when the IO Controller has finished parameterization 0: (do not notify the application)	- End of Parameterization (PNIO_IND_END_OF_PRM)
3	Alarm Ack	1: Notify the application when the IO controller has acknowledged an alarm 0: (do not notify the application)	- Alarm Acknowledge Received (PNIO_IND_ALARM_ACK_RECEIVED)
4	AR Indication	1: Issue mailbox messages when an AR is established or disconnected 0: (do not issue these messages)	- Check AR Indication (PNIO_IND_CHECK_AR) - AR Info Indication (PNIO_IND_AR_INFO) - Abort AR Indication (PNIO_IND_AR_ABORT) - AR Offline Indication (PNIO_IND_AR_OFFLINE)
5	I&M Requests	1: Forward I&M-related requests to the application 0: Handle I&M-related requests internally	- Set IM0 Information (PNIO_SET_IM0_INFO) - Record Data Read (PNIO_IND_RECORD_DATA_READ) - Record Data Write (PNIO_IND_RECORD_DATA_WRITE)
6... 15	(reserved, set to zero)	(reserved, set to zero)	-

See also...

- 2-1 “Modes of Operation”
- 2-4 “Parameter Data (Record Data)”
- 2-7 “Diagnostics & Alarms (Advanced Mode Only)”
- 2-8 “Initial Parameters (Advanced Mode Only)”
- 2-8 “Configuration Data”
- 2-9 “Identification & Maintenance (I&M) Functionality”

- **Max.no. of slots**

Maximum number of slots that can be occupied. Range: 1...64 (Default = 64 slots)
(E.g. a value of 16 means that modules can be plugged into slots 0...15).

- **Fault Information**

(see 8-1 “Fault Information”)

Set Stop Mode Action (PNIO_SET_STOP_MODE_ACTION)

Description

This command defines what action to be taken with the Out I/O data when the IO Controller shift operation mode from RUN to STOP.

Note: This command may only be issued during initialization.

Command initiator	Application
Command number	0101h
Extended Header data	Output Action when IO Controller is in STOP state.
Message data	-
Response message	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message
Command	0101h	0101h	
Data size	0000h	0000h	Set Stop Mode Action
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Output Action	Output Action	(see below)
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault Information	

- Output Action**

This word defines what to do when the IO Controller shifts operation state.

Value	Action
0000h	Out area cleared (0). Default setting.
0001h	Out area freeze
0002h	Out area set (1)

- Fault Information**

(see 8-1 “Fault Information”)

Set Device Identity (PNIO_SET_DEVICE_IDENTITY)

Description

This command alters the Vendor- and Device ID, and stores the new settings in the system file ‘pni-ocfg.cfg’ (see 3-3 “PROFINET Settings”).

Note: This command may only be issued during initialization.

Command initiator	Application
Command number	0102h
Extended Header data	Desired Vendor ID and Device ID
Message data	-
Response message	The response indicates if the command was accepted.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message Set I/O Device Identity</i>
Command	0102h	0102h	
Data size	0000h	0000h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Vendor ID	Vendor ID	
Extended word 2	Device ID	Device ID	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault Information	

- **Vendor ID**
Identifies the manufacturer of the device. Assigned by PNO.
- **Device ID**
Identifies the device. Assigned by the manufacturer.
- **Fault Information**
(see 8-1 “Fault Information”)

Set Station Name (PNIO_SET_STATION_NAME)

Description

This command changes the station name stored in the system file 'pniocfg.cfg' (See 3-3 "PROFINET Settings").

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

Note 2: This command shall normally not be used by the application. The station name is normally set by the end user via the network. The host application shall use this command when the end user has the possibility to edit the station name through the application, and chooses to do so.

Command initiator	Application
Command number	0103h
Extended Header data	-
Message data	Station Name, null terminated.
Response message	(The response holds a copy of the command data)

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0103h	0103h	<i>Set Station Name</i>
Data size	(data size)	(data size)	<i>Length of data</i>
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	Station Name	Station Name	

- **Station Name**
Station name as ASCII-string (NULL terminated).
- **Fault Information**
(see 8-1 "Fault Information")

Set Station Type (PNIO_SET_STATION_TYPE)

Description

This command changes the station type stored in the system file 'pniocfg.cfg' (see 3-3 "PROFINET Settings").

Note: This command may only be issued during initialization

Command initiator	Application
Command number	0104h
Extended Header data	-
Message data	Station Type, null terminated.
Response message	(The response holds a copy of the command data)

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0104h	0104h	<i>Set Station Type</i>
Data size	(data size)	(data size)	<i>Length of data</i>
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	Station Type	Station Type	

- **Station Type**
Station type as ASCII-string (NULL terminated).
- **Fault Information**
(see 8-1 "Fault Information")

Set Device Operational State (PNIO_SET_DEVICE_STATE)

Description

This command alters the operational state of the device.

Note: This command may only be issued during runtime.

Command initiator	Application
Command number	0105h
Extended Header data	Desired State
Message data	-
Response message	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message Set I/O Device Op. State</i>
Command	0105h	0105h	
Data size	0000h	0000h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	State	State	<i>(see below)</i>
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	Extended Fault Information	
Extended word 8	-	Fault Information	

- State

Value	State	Description
0001h	Operate	Anybus consumes and produces I/O data.
0002h	Clear	Anybus only consumes I/O data. No I/O data is produced.

- **Extended Fault Information**
(see 8-2 “Extended Fault Information”)
- **Fault Information**
(see 8-1 “Fault Information”)

Plug Module (PNIO_PLUG_MODULE)

Description

This command adds modules to the configuration. At least one module must be plugged during startup. Additional modules may be plugged as desired either at startup or during runtime.

If this command is issued during runtime, the Anybus will send a 'Plug Alarm' to the IO Controller. This will in turn cause the IO controller to reload 'Initial parameters' for the module and signal 'End of parameterization'.

Command initiator	Application
Command number	0107h
Extended Header data	-
Message data	Information specifying where to plug the module
Response message	(The response holds a copy of the command data)

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message PNIO_PLUG_MODULE 12 bytes of data (6 words)</i>
Command	0107h	0107h	
Data size	000Ch	000Ch	
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	-	Fault reference	
Extended word 7	-	Extended Fault Information	
Extended word 8	-	Fault Information	
Message data word 1	SlotNo (msb)	SlotNo (msb)	
Message data word 2	SlotNo (lsb)	SlotNo (lsb)	
Message data word 3	ModIdent (msb)	ModIdent (msb)	
Message data word 4	ModIdent (lsb)	ModIdent (lsb)	
Message data word 5	SubMod0Ident (msb)	SubMod0Ident (msb)	
Message data word 6	SubMod0Ident (lsb)	SubMod0Ident (lsb)	

- **SlotNo**
Number of the slot where to plug the module.
Range 0...(N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE).
- **ModIdent**
Module identifier as stated in GSD file.
- **SubMod0Ident**
Identifier for sub-module 0 as stated in GSD file.
- **Fault Information**
(see 8-1 “Fault Information”)
- **Extended Fault Information**
(see 8-2 “Extended Fault Information”)
- **Fault reference**
Indicates which Message Data word that caused the error (when applicable).

Plug Submodule (PNIO_PLUG_SUBMODULE)

Description

This command adds submodules to the configuration, and can be issued either at startup or during runtime. The application decides where in the parameter data area to locate Record Data requests destined to the submodule itself.

If this command is issued during runtime, the Anybus will automatically send a 'Plug Alarm' and a 'Return of SubModule Alarm' to the IO Controller. This will in turn cause the IO Controller to reload 'Initial parameters' for the submodule and signal 'End of parameterization'.

Note 1: Sub-modules plugged into slot #0 cannot have I/O data assigned to them.

Note 2: The Anybus module will not respond to this command until the IO Controller has acknowledged the 'Plug Alarm'. When using the CPU317-2 PN/DP, this takes approximately 8 bus cycles, which for a 512 ms bus cycle time equals 4 seconds.

Command initiator	Application
Command number	0108h
Extended Header data	-
Message data	Information specifying where to plug the submodule and how to map its record data to the parameter input/output areas
Response message	(The response holds a copy of the command data)

Command and response layout

	Command	Expected response	
Message ID	ID	ID	
Message information	4002h	0002h	<i>Fieldbus Specific Message PNIO_PLUG_SUBMODULE 20 bytes of data (10 words)</i>
Command	0108h	0108h	
Data size	0014h	0014h	
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	-	Fault reference	
Extended word 7	-	Extended Fault Information	
Extended word 8	-	Fault Information	
Message data word 1	SlotNo (msb)	SlotNo (msb)	
Message data word 2	SlotNo (lsb)	SlotNo (lsb)	
Message data word 3	SubSlotNo (msb)	SubSlotNo (msb)	
Message data word 4	SubSlotNo (lsb)	SubSlotNo (lsb)	
Message data word 5	SubModIdent (msb)	SubModIdent (msb)	
Message data word 6	SubModIdent (lsb)	SubModIdent (lsb)	
Message data word 7	SubMod Record In offset	SubMod Record In offset	
Message data word 8	SubMod Record In length	SubMod Record In length	
Message data word 9	SubMod Record Out offset	SubMod Record Out offset	
Message data word 10	SubMod Record Out length	SubMod Record Out length	

- **SlotNo**
Number of the slot where to plug the sub-module.
Range 0...(N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE)
- **SubSlotNo**
Number of the Sub-slot where to plug the sub-module.
Note: Currently only SubSlotNo = 1 is allowed. For slot #0, it is also permitted to plug the Interface (Subslot no. 32768) and Port (Subslot no. 32769) sub-modules. Note that in such case, the Offset and Length parameters (below) must be set to 0 (zero).
- **SubModIdent**
Identifier for sub-module as stated in GSD-file.
- **SubMod Record In offset**
Offset from start of Parameter Input Area where Record data associated with the sub-module is located.
Note: This parameter is not relevant when Record Data Request has been enabled in PNIO_ADV_MODE.
- **SubMod Record In length**
Max Record data length (in bytes) related to sub-module.
Note: This parameter is not relevant when Record Data Request has been enabled in PNIO_ADV_MODE.
- **SubMod Record Out offset**
Offset from start of Parameter Output Area where Record data associated with the sub-module is located.
Note: This parameter is not relevant when Record Data Request has been enabled in PNIO_ADV_MODE.
- **SubMod Record Out length**
Max Record data length (in bytes) related to sub-module.
Note: This parameter is not relevant when Record Data Request has been enabled in PNIO_ADV_MODE.
- **Fault Information**
(see 8-1 “Fault Information”)
- **Extended Fault Information**
(see 8-2 “Extended Fault Information”)
- **Fault reference**
Indicates which Message Data word that caused the error (when applicable).

Pull Module (PNIO_PULL_MODULE)

Description

This command removes a previously plugged module. When this happens, the Anybus will automatically issue a 'Pull Alarm' to the IO Controller.

Command initiator	Application
Command number	0109h
Extended Header data	-
Message data	SlotNo of the module to unplug/pull.
Response message	(The response holds a copy of the command data)

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message PNIO_PULL_MODULE 4 bytes (2 words) of data</i>
Command	0109h	0109h	
Data size	0004h	0004h	
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 Fault Information	
Extended word 8	-	Fault Information	
Message data word 1	SlotNo (msb)	SlotNo (msb)	
Message data word 2	SlotNo (lsb)	SlotNo (lsb)	

- SlotNo**
 Slot where the module to pull is located.
 Range 1...(N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE)
Note: A slot value of 0 (zero) is not allowed.
- Fault Information**
 (see 8-1 "Fault Information")
- Extended Fault Information**
 (see 8-2 "Extended Fault Information")

Pull Submodule (PNIO_PULL_SUBMODULE)

Description

This command removes a previously plugged submodule. When this happens, the Anybus will automatically issue a 'Pull Alarm' to the IO Controller.

Command initiator	Application
Command number	010Ah
Extended Header data	-
Message data	SlotNo and SubslotNo of the submodule to unplug/pull.
Response message	(The response holds a copy of the command data)

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message PNIO_PULL_SUBMODULE 8 bytes of data (4 words)</i>
Command	010Ah	010Ah	
Data size	0008h	0008h	
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 Fault Information	
Extended word 8	-	Fault Information	
Message data word 1	SlotNo (msb)	SlotNo (msb)	
Message data word 2	SlotNo (lsb)	SlotNo (lsb)	
Message data word 3	SubslotNo (msb)	SubslotNo (msb)	
Message data word 4	SubslotNo (lsb)	SubslotNo (lsb)	

- **SlotNo**

Slot where the submodule to pull is located.

Range 1...(N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE)

Note: A slot value of 0 (zero) is not allowed.

- **SubslotNo**

Subslot where the submodule to pull is located.

Note: Currently only SubSlotNo = 1 is allowed.

- **Fault Information**

(see 8-1 "Fault Information")

- **Extended Fault Information**

(see 8-2 "Extended Fault Information")

End of Parameterization (PNIO_IND_END_OF_PRM)

Description

The Anybus issues this message to indicate to the application that the parameterization phase is completed. Upon receiving this message, the application must provide a response to indicate whether it is ready for data exchange or not.

Note 1: This message may be issued during run-time when modules/submodules are re-inserted.

Note 2: This functionality must be enabled in PNIO_ADV_MODE ('End of Prm'-bit).

Command initiator	Anybus
Command number	010Bh
Extended Header data	AR Handle, Slot, Subslot, Application State (indicates to the Anybus if the application is ready)
Message data	-
Response message	-

Command and response layout

	Message	Expected response	
	Message ID (ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message PNIO_IND_END_OF_PRM (no message data)</i>
Command	010Bh	010Bh	
Data size	0000h	0000h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	AR Handle	-	
Extended word 2	Slot	-	
Extended word 3	Subslot	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Application state	

- AR Handle**

Handle for the Application Relationship.

- Slot & Subslot**

These words indicate which slots/subslots that are affected by the message:

Subslot	Slot	Meaning
0 (zero)	(don't care)	Message applies to all modules in the configuration
>0	>0	Message applies to the specified slot/subslot

- Application state**

0: Application is ready for data exchange.

1: Application is not yet ready for data exchange.
(PNIO_APPL_STATE_READY must be issued at a later stage to indicate when the application is ready.)

Application State Ready (PNIO_APPL_STATE_READY)

Description

This command indicates to the Anybus that the application is ready for data exchange, and must be issued if the application has previously responded “Not ready for data exchange yet” to the PNIO_IND_END_OF_PRM request.

Note: This functionality must be enabled in PNIO_ADV_MODE (‘End of Prm’-bit).

Command initiator	Application
Command number	0106h
Extended Header data	AR Handle
Message data	-
Response message	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0106h	0106h	
Data size	0000h	0000h	<i>Application State Ready</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	AR Handle	-	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault Information	

- **AR Handle**
Handle for the Application Relationship.
- **Fault Information**
(see 8-1 “Fault Information”)

Record Data Read (PNIO_IND_RECORD_DATA_READ)

Description

This message may be issued by the Anybus when a Record Data Read request has been received from the IO Controller. Upon receiving this message, the application must assemble the requested data and provide a response.

Note: This functionality must be enabled in PNIO_ADV_MODE ('Record Data Request'- and/or 'I&M Request'-bit).

Command initiator	Anybus
Command number	010Ch
Extended Header data	The message contains details about the issued record data request.
Message data	-
Response message	Read Data

Command and response layout

	Message	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	010C	010Ch	<i>Record Data Read</i>
Data size	0000h	(data size)	<i>Length of Read Data</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	AR Handle	-	
Extended word 2	-	-	
Extended word 3	Sequence No.	-	
Extended word 4	Slot No..	-	
Extended word 5	Subslot No..	-	
Extended word 6	Index	Error code 1 Error code 2	
Extended word 7	Length	Add data 1	
Extended word 8	-	Add data 2	
		Read Data	Message data bytes 1...n

- AR Handle**
 Handle for the Application Relationship.
- Sequence No.**
 The parameter Sequence number is used by the client (IO Controller- /supervisor) to identify the outstanding service.
- Slot No.**
 The parameter Slot number is used in the application for addressing the desired Record Data object in a specific slot (typically a module).
 Range 0...(N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE)

- **Subslot No.**

The parameter Subslot number is used in the application for addressing the desired Record Data object in a specific subslot (typically a submodule).

Range: 0–1.

- **Index**

The parameter Index is used in the application for addressing the desired Record Data object.

Range: 0000h-7FFFh (Acyclic IO), AFF0h-AFFF (I&M)

- **Length**

The parameter Length indicates the number of bytes of a Record data object that is to be read. Maximum length that can be transferred is 256 bytes (i.e. max size of a mailbox).

- **Error code 1**

(Consult the PROFINET specification).

- **Error code 2**

(User specific, consult the PROFINET specification).

- **Add data 1**

The parameter Add Data 1 is API specific (profile specific). Set to zero if no Additional data 1 is defined.

- **Add data 2**

The parameter Additional Data 2 is user specific. Set to zero if no Additional data 2 is defined.

- **Read Data**

The parameter Read data contains the value of the object which has been read and consists of the number of bytes indicated by “Data size” in the header of the response.

Record Data Write (PNIO_IND_RECORD_DATA_WRITE)

Description

This message may be issued by the Anybus when a Record Data Write request has been received from the IO Controller. Upon receiving this message, the application must interpret the request and provide a response.

Note: This functionality must be enabled in PNIO_ADV_MODE ('Record Data Request'- and/or 'I&M Request'-bit).

Command initiator	Anybus
Command number	010Dh
Extended Header data	The message contains details about the issued record data request.
Message data	Write Data
Response message	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message
Command	010Dh	010Dh	Record Data Write
Data size	(data size)	0000h	Length of Write Data
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	AR Handle	-	
Extended word 2	-	-	
Extended word 3	Sequence No.	-	
Extended word 4	Slot No..	-	
Extended word 5	Subslot No.	-	
Extended word 6	Index	Error code 1 Error code 2	
Extended word 7	-	Add data 1	
Extended word 8	-	Add data 2	
Message data bytes 1...n	Write Data		

- AR Handle**

Handle for the Application Relationship.

- Sequence No.**

The parameter Sequence number is used by the client (IO Controller- /supervisor) to identify the outstanding service.

- Slot No.**

The parameter Slot number is used in the application for addressing the desired Record Data object in a specific slot (typically a module).

Range 0...(N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE)

- **Subslot No.**

The parameter Subslot number is used in the application for addressing the desired Record Data object in a specific subslot (typically a submodule).

Range: 0–1.

- **Index**

The parameter Index is used in the application for addressing the desired Record Data object.

Range: 0000h-7FFFh (Acyclic IO), AFF0h-AFFF (I&M)

- **Write Data**

The parameter Write data contains the value of the object which shall be written and consists of the number of bytes indicated by “Data size” in the header of the command.

- **Error code 1**

(Consult the PROFINET specification).

- **Error code 2**

(User specific, consult the PROFINET specification).

- **Add data 1**

The parameter Add Data 1 is API specific (profile specific).

(Set to zero if no Add data 1 data 1 is defined).

- **Add data 2**

The parameter Additional Data 2 is user specific.

(Set to zero if no Add data 2 is defined).

Add Channel Diagnostic Alarm (PNIO_ADD_CHANNEL_DIAG_ALARM)

Description

This command reports a Channel Diagnostic Alarm to the IO Controller. Additionally, a diagnostic entry is created in the Anybus module so that the IO Controller/Supervisor can fetch the diagnostic data by accessing the corresponding Diagnostic data record.

Note: This functionality is only available in Advanced Mode (see 8-45 “Advanced Mode (PNIO_ADV_MODE)”))

Command initiator	Application
Command number	010Eh
Extended Header data	Details regarding the event, it's origin, and a unique Alarm Handle to identify it later on
Message data	-
Response message	-

Command and response layout

	Command		Expected response	
Message ID	(ID)		(ID)	
Message information	4002h		0002h	<i>Fieldbus Specific Message Add Channel Diag. Alarm (no message data)</i>
Command	010Eh		010Eh	
Data size	0000h		0000h	
Frame count	0001h		0001h	
Frame number	0001h		0001h	
Offset high	0000h		0000h	
Offset low	0000h		0000h	
Extended word 1	Alarm Handle		-	
Extended word 2	Slot No.		-	
Extended word 3	Subslot No.		-	
Extended word 4	Channel No.		-	
Extended word 5	Channel error type		-	
Extended word 6	Channel- Prop.type (high byte)	Channel- Prop.dir (low byte)	-	
Extended word 7	-		Extended Fault Information	
Extended word 8	-		Fault Information	

- **Alarm Handle**

Unique handle for the alarm, specified by the application. This handle is used on all further references to that particular alarm event.

See also 8-66 “Remove Diagnostic Alarm (PNIO_REMOVE_DIAG_ALARM)”.

- **Slot No.**

This parameter is used in the application for addressing the desired diagnostic object in a specific slot (typically a module).

Range 0...(N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE)

- **Subslot No.**

This parameter is used in the application for addressing the desired diagnostic object in a specific subslot (typically a submodule).

Note: Currently only SubSlotNo = 1 is allowed.

- **Channel No.**

The channel number for which the diagnostic data applies.

Range: 0-8000h (0-7FFFh Manufacturer specific, 8000h refers to the Submodule itself).

- **Channel error type**

The type of error that has occurred.

Value	Description
0001h	Short circuit
0002h	Under voltage
0003h	Over voltage
0004h	Overload
0005h	Over temperature
0006h	Line break
0007h	Upper limit value exceeded
0008h	Lower limit value exceeded
0009h	Error
000A...FFFFh	(Consult the PROFINET IO specification)

- **ChannelProp.type (high byte)**

Indicate channel size to which the channel diagnosis object is related.

Value	Description
00h	Shall be used if 'Channel No' equals 8000h (submodule), or if none of the types below are appropriate
01h	1 Bit.
02h	2 Bit.
03h	4 Bit.
04h	8 Bit.
05h	16 Bit.
06h	32 Bit.
07h	64 Bit.
08h-FFh	(reserved)

- **ChannelProp.dir (low byte)**

Specifies the direction of the channel.

Value	Description
00h	Manufacturer specific
01h	Input
02h	Output
03h	Input/Output
Other	(reserved)

- **Fault Information**

(see 8-1 "Fault Information")

- **Extended Fault Information**

(see 8-2 "Extended Fault Information")

Remove Diagnostic Alarm (PNIO_REMOVE_DIAG_ALARM)

Description

When a diagnostic alarm event has been resolved, this command is used to remove its diagnostic entry and report this to the IO Controller.

Note: This functionality is only available in Advanced Mode (see 8-45 “Advanced Mode (PNIO_ADV_MODE)”))

Command initiator	Application
Command number	010Fh
Extended Header data	Alarm Handle for the diagnostic alarm to remove
Message data	-
Response message	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	010Fh	010Fh	<i>Remove Diag. Alarm</i>
Data size	0000h	0000h	<i>(no message data)</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Alarm Handle	-	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	Extended Fault Information	
Extended word 8	-	Fault Information	

- **Alarm Handle**

Handle of the alarm event; must be set to match the handle specified when the alarm was issued.

See also...

- 8-64 “Add Channel Diagnostic Alarm (PNIO_ADD_CHANNEL_DIAG_ALARM)”
- 8-67 “Add Generic Diagnostic Alarm (PNIO_ADD_GENERIC_DIAG_ALARM)”

- **Fault Information**

(see 8-1 “Fault Information”)

- **Extended Fault Information**

(see 8-2 “Extended Fault Information”)

Command initiator	Application
Command number	0110h
Extended Header data	Details regarding the event, it's origin, and a unique Alarm Handle to identify it later on
Message data	Diagnostic Data (Vendor specific)
Response message	-

	Command		Expected response	
Message ID	(ID)		(ID)	
Message information	4002h		0002h	
Command	0110h		0110h	
Data size	(data size)		0000h	
Frame count	0001h		0001h	
Frame number	0001h		0001h	
Offset high	0000h		0000h	
Offset low	0000h		0000h	
Extended word 1	Alarm Handle		-	
Extended word 2	Slot No.		-	
Extended word 3	Subslot No.		-	
Extended word 4	Channel No.		-	
Extended word 5	User structure identifier		-	
Extended word 6	Channel-Prop.type (high byte)	Channel-Prop.dir (low byte)	-	
Extended word 7	-		Extended Fault Information	
Extended word 8	-		Fault Information	
Message Data Words 1...n	Diagnostic Data			

Unique handle for the alarm, specified by the applications. This handle is used on all further references to that particular alarm event. See also 8-66 “Remove Diagnostic Alarm (PNIO_REMOVE_DIAG_ALARM)”.

This parameter is used in the application for addressing the desired diagnostic object in a specific slot (typically a module).

Range 0... (N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE)

This parameter is used in the application for addressing the desired diagnostic object in a specific subslot (typically a submodule).

Note: Currently only SubSlotNo = 1 is allowed.

- **Channel No.**

Channel number for which the diagnostic data applies.

Range: 0-8000h (0-7FFFh Manufacturer specific, 8000h refers to the Submodule itself).

- **User structure identifier**

Is used to identify the structure of the diagnostic data (Message data word 1-x).

Value	Description
0000h-7FFFh	Manufacturer specific diagnostics
8000h	Channel diagnostics
8001h	Manufacturer specific multiple
9000h-9FFFh	(reserved for profiles)
Other	(reserved)

- **ChannelProp.type (high byte)**

Indicate channel size to which the channel diagnosis object is related.

Value	Description
00h	Shall be used if 'Channel No' equals 8000h (submodule), or if none of the types below are appropriate
01h	1 Bit.
02h	2 Bit.
03h	4 Bit.
04h	8 Bit.
05h	16 Bit.
06h	32 Bit.
07h	64 Bit.
08h-FFh	(reserved)

- **ChannelProp.dir (low byte)**

Specifies the direction of the channel.

Value	Description
00h	Manufacturer specific
01h	Input
02h	Output
03h	Input/Output
Other	(reserved)

- **Fault Information**

(see 8-1 "Fault Information")

- **Extended Fault Information**

(see 8-2 "Extended Fault Information")

- **Diagnostic Data**

Contains the generic diagnostic data that shall be sent. Range: 1 – 256 bytes.

Add Process Alarm (PNIO_ADD_PROCESS_ALARM)

Description

This command issues a Process Alarm to the IO Controller. Since no diagnostic entry is created for this type of alarm, no corresponding “removal” command is needed.

Note: This functionality is only available in Advanced Mode (see 8-45 “Advanced Mode (PNIO_ADV_MODE)”))

Command initiator	Application
Command number	0112h
Extended Header data	Details regarding the alarm, it's origin, and a unique Alarm Handle to identify it later on
Message data	-
Response message	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	Fieldbus Specific Message
Command	0112h	0112h	Add Process Alarm
Data size	(data size)	0000h	(Length of Alarm Data)
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Alarm Handle	-	
Extended word 2	Slot No.	-	
Extended word 3	Subslot No.	-	
Extended word 4	User structure identifier	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	Extended Fault Information	
Extended word 8	-	Fault Information	
Message Data word 1...n	Alarm Data		

- **Alarm Handle**

Unique handle for the alarm, specified by the application. This handle is used on all further references to that particular alarm event.

- **Slot No.**

The parameter Slot number is used in the application for addressing the desired diagnostic object in a specific slot (typically a module).

Range 0...(N-1) (N = max number of slots allowed, specified in PNIO_ADV_MODE)

- **Subslot No.**

The parameter Subslot number is used in the application for addressing the desired diagnostic object in a specific subslot (typically a submodule).

Note: Currently only SubSlotNo = 1 is allowed.

- **User structure identifier**

Is used to identify the structure of the process alarm data (Message data word 1-x).

Value	Description
0000h-7FFFh	Manufacturer specific diagnostics
Other	Reserved

- **Alarm Data**

Contains the process alarm data that shall be sent.

- **Fault Information**

(see 8-1 “Fault Information”)

- **Extended Fault Information**

(see 8-2 “Extended Fault Information”)

Abort AR (PNIO_AR_ABORT)

Description

This command aborts a previously established AR.

Command initiator	Application
Command number	011Ah
Extended Header data	AR Handle
Message data	-
Response message	-

Command and response layout

	Command	Expected response	
	(ID)	(ID)	
Message ID			
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	011Ah	011Ah	<i>PNIO_AR_ABORT</i>
Data size	0000h	0000h	<i>(No message data)</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	AR Handle	AR Handle	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault Information	

- **AR Handle**
Handle for the Application Relationship.
- **Fault Information**
(see 8-1 “Fault Information”)

Set IM0 Information (PNIO_SET_IM0_INFO)

Description

This command alters the information in the I&M (IM0) structure.

Please note that this command can be issued at any time to update the I&M information. To ensure that the I&M information is up to date when starting up the network communication, it must be issued once during initialization.

Command initiator	Application
Command number	0115h
Extended Header data	Fault Information
Message data	Manufacturer ID, Order ID, Serial Number, Hardware Revision, Software Revision, Revision Counter, Profile ID, Profile-Specific Type, IM Supported
Response message	The response holds a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>PNIO_SET_IM0_INFO</i> <i>52 bytes of data</i>
Command	0115h	0115h	
Data size	0034h	0034h	
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 bytes 1... 2	Manufacturer ID	Manufacturer ID	
Message Data bytes 3... 22	Order ID [1... 20]	Order ID [1... 20]	
Message Data bytes 23... 38	Serial Number [1... 16]	Serial Number [1... 16]	
Message Data bytes 39... 40	Hardware Revision	Hardware Revision	
Message Data bytes 41... 44	Software Revision [1... 4]	Software Revision [1... 4]	
Message Data bytes 45... 46	Revision Counter	Revision Counter	
Message Data bytes 47... 48	Profile ID	Profile ID	
Message Data bytes 49... 50	Profile-Specific Type	Profile-Specific Type	
Message Data bytes 51... 52	IM Supported	IM Supported	

Fault Information

(see 8-1 “Fault Information”).

- **Manufacturer ID**

The Manufacturer ID (a.k.a. the ‘Vendor ID’) is administered by the PNO.

Default: 010Ch (HMS).

- **Serial Number**

Serial number. If the Serial Number is shorter than 16 characters, the unused characters shall be filled with blanks (i.e. 20h). For example, the string “ABCD1234 ” corresponds to the serial number ABCD1234h.

If the Serial number is set to all zeroes, the default serial number of the Anybus module will be used.

Default: (set at production).

- **Order ID**

Order ID of the product. If the Order ID is shorter than 20 characters, the unused characters shall be filled with blanks (i.e. 20h).

Default: “ABS-PRT”.

If the Order ID is set to all zeroes, the default Order ID of the Anybus module will be used.

- **Hardware Revision**

Consult the I&M specification for details.

Default: 0001h.

- **Software Revision**

Consult the I&M specification for details.

Default: “V”, XXh, YYh, ZZh (revision of the Anybus module).

If the software revision is set to all zeroes, the default software revision of the Anybus module will be used.

- **Revision Counter**

Consult the I&M specification for details.

Default: 0000h.

- **Profile ID**

Consult the I&M specification for details.

Default: F600h (Generic Device).

- **Profile-Specific Type**

Consult the I&M specification for details.

Default: 0004h.

- **IM Supported**

By setting/clearing bits in this word it’s possible to enable/disable support for specific I&M records. Please note that only I&M # 1...4 can be enabled/disabled. I&M #0 is always enabled.

Consult the I&M specification for details.

Default: 001Eh (support I&M 0-4).

Note: As of version 2.3 of the PROFINET specification, it is mandatory to support I&M 0-4. Therefore, it is not recommended to change the default value of 001Eh.

Get IM0 Information (PNIO_GET_IM0_INFO)

Description

This command reads the information in the I&M (IM0) structure.

Please note that this command can be issued at any time to read the I&M information.

Command initiator	Application
Command number	0127h
Extended Header data	-
Message data	-
Response message	Manufacturer ID, Order ID, Serial Number, Hardware Revision, Software Revision, Revision Counter, Profile ID, Profile-Specific Type, IM Supported

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>PNIO_GET_IM0_INFO</i> <i>52 bytes of data</i>
Command	0127h	0127h	
Data size	0000h	0034h	
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 bytes 1... 2	-	Manufacturer ID	
Message Data bytes 3... 22	-	Order ID [1... 20]	
Message Data bytes 23... 38	-	Serial Number [1... 16]	
Message Data bytes 39... 40	-	Hardware Revision	
Message Data bytes 41... 44	-	Software Revision [1... 4]	
Message Data bytes 45... 46	-	Revision Counter	
Message Data bytes 47... 48	-	Profile ID	
Message Data bytes 49... 50	-	Profile-Specific Type	
Message Data bytes 51... 52	-	IM Supported	

- **Fault Information**

(see 8-1 “Fault Information”)

- **Manufacturer ID**

The Manufacturer ID (a.k.a. the ‘Vendor ID’) is administered by the PNO.

Default: 010Ch (HMS)

- **Serial Number**

Serial number. If the Serial Number is shorter than 16 characters, the unused characters shall be filled with blanks (i.e. 20h). For example, the string “ABCD1234 ” corresponds to the serial number ABCD1234h

Default: (set at production)

- **Order ID**

Order ID of the product. If the Order ID is shorter than 20 characters, the unused characters shall be filled with blanks (i.e. 20h).

Default: “ABS-PRT”

- **Hardware Revision**

Consult the I&M specification for details.

Default: 0001h

- **Software Revision**

Consult the I&M specification for details.

Default: “V”, XXh, YYh, ZZh (revision of the Anybus module).

- **Revision Counter**

Consult the I&M specification for details.

Default: 0000h

- **Profile ID**

Consult the I&M specification for details.

Default: F600h (Generic Device)

- **Profile-Specific Type**

Consult the I&M specification for details.

Default: 0004h

- **IM Supported**

Consult the I&M specification for details.

Default: 001Eh (support I&M0...4)

Alarm Acknowledge Received (PNIO_IND_ALARM_ACK_RECEIVED)

Description

This message is issued by the Anybus to inform the application that the IO Controller has acknowledged a previously reported alarm.

Note: This functionality must be enabled in PNIO_ADV_MODE ('Alarm Acknowledge'-bit)

Command initiator	Anybus
Command number	0113h
Extended Header data	Alarm Handle of the acknowledge event.
Message data	-
Response message	The application must not respond to this message.

Command and response layout

	Message	
Message ID	(ID)	
Message information	4002h	<i>Fieldbus Specific Message</i> <i>Alarm Acknowledge Received</i>
Command	0113h	
Data size	0000h	
Frame count	0001h	
Frame number	0001h	
Offset high	0000h	
Offset low	0000h	
Extended word 1	Alarm Handle	
Extended word 2	-	
Extended word 3	-	
Extended word 4	-	
Extended word 5	-	
Extended word 6	-	
Extended word 7	-	
Extended word 8	-	

- **Alarm Handle**

Handle of the alarm event; specified by the application when the alarm was issued.

Configuration Mismatch (PNIO_IND_CFG_MISMATCH)

Description

This message is issued by the Anybus to inform the application that the configuration in the IO Controller does not match the application configuration (i.e. the configuration created during initialization). The application must decide whether to adopt or reject the IO Controller configuration.

Please note that the Record Data Lengths specified when the sub-module was plugged is not updated if a module/submodule is substituted.

Note: This functionality must be enabled in PNIO_ADV_MODE ('Cfg Mismatch'-bit)

Command initiator	Anybus
Command number	0114h
Extended Header data	Slot no, Subslot no, Desired Mod. Identifier, Desired Sub. Identifier, Actual Module Identifier, Actual Sub. Identifier, Module State, Submodule State, Perfect Adaptation, AR Handle
Message data	-
Response message	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message Configuration Mismatch</i>
Command	0114h	0114h	
Data size	0000h	0000h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	AR Handle	-	
Extended word 2	Slot No.	Module state	
Extended word 3	Subslot No.	Submodule state	
Extended word 4	Desired Mod. identifier (msb)	Actual Module identifier(msb)	
Extended word 5	Desired Mod. identifier (lsb)	Actual Module identifier(lsb)	
Extended word 6	Desired Sub. identifier (msb)	Actual Sub. identifier (msb)	
Extended word 7	Desired Sub. identifier (lsb)	Actual Sub. identifier (lsb)	
Extended word 8	-	Perfect Adaptation	

- **AR Handle**

Handle for the Application Relationship.

- **Slot No.**

The parameter Slot number is used in the application for addressing the desired diagnostic object in a specific slot (typically a module).

- **Subslot No.**

The parameter Subslot number is used in the application for addressing the desired diagnostic object in a specific subslot (typically a submodule).

- **Desired Mod. identifier**
Module identifier (derived from the IO Controller configuration) as stated in GSD file.
- **Desired Sub. identifier**
Submodule identifier (derived from the IO Controller configuration) as stated in GSD file.
- **Actual Module identifier**
Module identifier as stated in GSD file.
- **Actual Sub. identifier**
Submodule identifier as stated in GSD file.
- **Module state**
Here the application must decide how the mismatching slot shall be handled.

Value	State	Description
0	NO_MODULE	There is no module in the specified slot.
1	WRONG_MODULE	Wrong module in the specified slot. Specify correct module in 'Actual Module identifier'. Note: This value should be avoided. Instead, set Module state to SUBSTITUTED_MODULE and set Submodule state for each submodule to WRONG_SUBMODULE.
2	PROPER_MODULE	Correct module specified in slot.
3	SUBSTITUTED_MODULE	A replacement module is used in the slot. Specify module in 'Actual Module identifier'.
Other	-	(reserved).

- **Submodule state**
Here the application must decide how the mismatching subslot shall be handled.

Value	State	Description
0	NO_SUBMODULE	There is no module in the specified slot.
1	WRONG_SUBMODULE	Wrong module in the specified slot. Specify correct submodule in 'Actual Sub. identifier'.
7	SUBSTITUTED_SUBMODULE	A replacement module is used in the slot. Specify submodule in 'Actual Sub. identifier'.
FFFFh	PROPER_SUBMODULE	Correct submodule specified in slot.
Other	-	(reserved).

- **Perfect Adaptation**

Value	Description
0	Use data specified in extended words 2...7 of the response
1	Make a perfect adaptation of the module; the module will automatically plug the current module and insert the module/submodule specified by the IO Controller. Extended words 2... 7 are not used.
other	undefined

Check AR Indication (PNIO_IND_CHECK_AR)

Description

This message is issued by the Anybus module each time a new AR has been established.

Note: This functionality must be enabled in PNIO_ADV_MODE ('AR Information'-bit)

Command initiator	Anybus
Command number	0116h
Extended Header data	AR Type, AR Properties, AR Handle
Message data	-
Response message	The application must not respond to this message.

Command and response layout

	Command	
Message ID	(ID)	
Message information	4002h	<i>Fieldbus Specific Message</i> <i>Check AR Indication</i>
Command	0116h	
Data size	0000h	
Frame count	0001h	
Frame number	0001h	
Offset high	0000h	
Offset low	0000h	
Extended word 1	AR Type	
Extended word 2	AR Properties (high)	
Extended word 3	AR Properties (low)	
Extended word 4	AR Handle	
Extended word 5	-	
Extended word 6	-	
Extended word 7	-	
Extended word 8	-	

- **AR Type**

Value indicates the type of Application Relationship (AR) as follows:

Value	Type
0001h	CM_AR_TYPE_SINGLE
0003h	CM_AR_TYPE_CIR
0004h	CM_AR_TYPE_IOC_REDUNDANT
0005h	CM_AR_TYPE_IOD_REDUNDANT
0006h	CM_AR_TYPE_SUPERVISOR

- **AR Properties**

Bitfield indicating the properties of the AR as follows:

Bits	Contents	Interpretation
0... 2	State	0: CM_AR_PROP_STATE_BACKUP 1: CM_AR_PROP_STATE_PRIMARY
3	Supervisor takeover allowed	0: CM_AR_SUPERVISOR_TAKEOVER_NOT_ALLOWED 1: CM_AR_SUPERVISOR_TAKEOVER_ALLOWED
4	Parameterization server	0: CM_AR_PROP_PRM_SERVER_EXTERNAL 1: CM_AR_PROP_PRM_SERVER_CMI
5... 6	Data rate	0: CM_AR_PROP_DATARATE_100MBPS_OR_MORE 1: CM_AR_PROP_DATARATE_100MBPS 2: CM_AR_PROP_DATARATE_1GBPS 3: CM_AR_DATARATE_10GBPS
7	-	-
8	Device access	0: CM_AR_PROP_DEVICE_ACCESS_NO 1: CM_AR_PROP_DEVICE_ACCESS_YES
9... 10	Companion AR	0: CM_AR_PROP_COMPANION_AR_SINGLE 1: CM_AR_PROP_COMPANION_AR_FIRST 2: CM_AR_PROP_COMPANION_AR_COMPANION
11... 31	-	-

- **AR Handle**

Handle for the Application Relationship.

AR Info Indication (PNIO_IND_AR_INFO)

Description

This command reports the current IO configuration, allowing the application to see exactly how the data is mapped in the DPRAM. Note that this information may be fragmented, which means that this command may be issued multiple times by the module, each time containing different parts of the configuration.

Note: This functionality must be enabled in PNIO_ADV_MODE ('AR Information'-bit)

Command initiator	Anybus
Command number	0117h
Extended Header data	AR Handle, Current Fragment, Total Fragments
Message data	-
Response message	The application must not respond to this message.

Command and response layout

	Command	
Message ID	(ID)	
Message information	4002h	<i>Fieldbus Specific Message</i>
Command	0117h	<i>AR Info Indication</i>
Data size	(data size)	
Frame count	0001h	
Frame number	0001h	
Offset high	0000h	
Offset low	0000h	
Extended word 1	Current Fragment	
Extended word 2	Total Fragments	
Extended word 3	AR Handle	
Extended word 4	-	
Extended word 5	-	
Extended word 6	-	
Extended word 7	-	
Extended word 8	-	
Message Data	Data	

- **Current Fragment**
Current fragment number; when this word equals the value of 'Total Fragments' (see below), all data has been received.
- **Total Fragments**
The number of fragments needed for the data.
- **AR Handle**
Handle for the Application Relationship.

- **Data**

As mentioned previously, the data is fragmented. The Anybus will issue this mailbox message repeatedly, each time with a new block of data, until all configuration details has been transferred to the application. The application should wait until all data has been transferred before interpreting it.

The data consists of 3 types of information blocks:

Block Type	Size	Contents	Comments
Initial Block	2 bytes	No. of Modules (1 word)	Total number of modules
Module Block	8 bytes	Slot no. (1 word)	Module slot number
		No. of Sub-modules (1 word)	No. of sub-modules in the module
		Module ID (2 words)	Module ID
Submodule Block	10 bytes	Subslot no. (1 word)	Submodule subslot number
		Submodule ID (2 words)	Submodule ID
		Input Data Length (1 word)	I/O data sizes associated with the module in bytes
		Output Data Length (1 word)	

The first 2 bytes in the data indicates the number of modules in the configuration. Each module is then represented by a Module Block, followed by a number of Submodule Blocks (provided that the module in question contains submodules).

Example

In this example, the configuration contains two modules with the following properties:

- Module #1 contains three submodules¹
- Module #2 contains one submodule

Initial Block	No. of Modules	0002h
Module Block (Module #1)	Slot no.	0001h
	No. of Submodules	0002h
	Module ID	4A 6F 48 62h
Submodule Block (Module #1)	Subslot no.	0001h
	Submodule ID	65 6C 69 65h
	Input Data Length	0004h
	Output Data Length	0010h
Submodule Block (Module #1)	Subslot no.	0002h
	Submodule ID	76 65 73 69h
	Input Data Length	0008h
	Output Data Length	0002h
Submodule Block (Module #1)	Subslot no.	0003h
	Submodule ID	6E 53 61 6Eh
	Input Data Length	0008h
	Output Data Length	0002h
Module Block (Module #2)	Slot no.	0002h
	No. of Submodules	0001h
	Module ID	74 61 43 6Ch
Submodule Fragment (Module #2)	Subslot no.	0001h
	Submodule ID	61 75 73 21h
	Input Data Length	0010h
	Output Data Length	0001h

1. At the time of writing, the Anybus module only supports 1 submodule per slot.

Abort AR Indication (PNIO_IND_AR_ABORT)

Description

This message signals that an Application Relationship (AR) has been aborted.

Note: This functionality must be enabled in PNIO_ADV_MODE ('AR Information'-bit)

Command initiator	Anybus
Command number	0118h
Extended Header data	AR Handle, Reason Code
Message data	-
Response message	The application must not respond to this message.

Command and response layout

	Command	
Message ID	(ID)	
Message information	4002h	<i>Fieldbus Specific Message Abort AR Indication</i>
Command	0118h	
Data size	0000h	
Frame count	0001h	
Frame number	0001h	
Offset high	0000h	
Offset low	0000h	
Extended word 1	AR Handle	
Extended word 2	Reason Code	
Extended word 3	-	
Extended word 4	-	
Extended word 5	-	
Extended word 6	-	
Extended word 7	-	
Extended word 8	-	

- **AR Handle**

Handle for the Application Relationship.

- **Reason Code**

Reason for aborting the connection.

Value	Reason
3	Out of mem
4	Add provider or consumer failed
5	Miss (consumer)
6	Cmi timeout
7	Alarm-open failed
8	Alarm-send.cnf(-)
9	Alarm-ack-send.cnf(-)
10	Alarm-data too long
11	Alarm.ind(err)
12	Rpc-client call.cnf(-)
13	Ar-abort.req
14	Re-run aborts existing
15	Got release.ind
16	Device passivated
17	Device / AR removed
18	Protocol violation
19	NARE error
20	RPC-Bind error
21	RPC-Connect error
22	RPC-Read error
23	RPC-Write error
24	RPC-Control error
25	Forbidden pull or plug after check.rsp and before in-data.ind
26	AP removed
27	Link "down"
28	Could not register multicast-mac
29	Not synchronized (cannot start companion-ar)
30	Wrong topology (cannot start companion-ar)
31	Dcp, station-name changed
32	Dcp, reset to factory-settings

AR Offline Indication (PNIO_IND_AR_OFFLINE)

Description

This message signals that an Application Relationship (AR) has gone off-line.

Note: This functionality must be enabled in PNIO_ADV_MODE ('AR Information'-bit)

Command initiator	Anybus
Command number	0119h
Extended Header data	AR Handle, Reason Code
Message data	-
Response message	The application must not respond to this message.

Command and response layout

	Command	
Message ID	(ID)	
Message information	4002h	<i>Fieldbus Specific Message</i> <i>AR Offline Indication</i>
Command	0119h	
Data size	0000h	
Frame count	0001h	
Frame number	0001h	
Offset high	0000h	
Offset low	0000h	
Extended word 1	AR Handle	
Extended word 2	Reason Code	
Extended word 3	-	
Extended word 4	-	
Extended word 5	-	
Extended word 6	-	
Extended word 7	-	
Extended word 8	-	

- **AR Handle**
Handle for the Application Relationship.
- **Reason Code**
(see 8-84 "Reason Code")

Modbus/TCP-related Commands

Commands in this category:

Mailbox Commands	Description	Page
Modbus Connection Timeout (MB_CONN_TIMEOUT)	Set the timeout value for Modbus/TCP connections	8-87
Disable Modbus/TCP server (DISABLE_MB_TCP)	Disables the Modbus/TCP server	8-88

Modbus Connection Timeout (MB_CONN_TIMEOUT)

Description

This mailbox command configures the timeout value used for Modbus/TCP connections. If an established Modbus/TCP connection does not receive a request within the specified time, the connection will be shut down by the Modbus/TCP server.

Valid timeout values are:

- 0 - No timeout is used for Modbus connections
- 10 - 65535 - Timeout value in seconds.

The default value is 60 seconds.

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	0020h
Extended Header	-
Message data	Timeout value
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	<i>Fieldbus Specific Message</i> <i>MB_CONN_TIMEOUT</i> <i>2 bytes (1 word)</i>
Command	0020h	0020h	
Data size	0002h	0002h	
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 word 1	Timeout value	Timeout value	

Disable Modbus/TCP server (DISABLE_MB_TCP)

Description

This mailbox command disables the Modbus/TCP server.

Note: This may only be issued during initialization.

Initiated by	Application
Command no.	0021h
Extended Header	-
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0021h	0021h	
Data size	0000h	0000h	<i>DISABLE_MB_TCP</i>
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	-	-	

SNMP-related Commands

Commands in this category:

Mailbox Commands	Description	Page
Set System Description (SET_SYSTEM_DESCRIPTION)	-	8-90
Set System Interface (SET_SYSTEM_INTERFACE)	-	8-91

Set System Description (SET_SYSTEM_DESCRIPTION)

Description

This command specifies the SNMP variable ‘System Description’. The value will be stored in the system file ‘/pniocfg.cfg’.

See also...

- 3-4 “SNMP Functionality”
- 3-3 “PROFINET Settings”

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	0120h
Extended Header	-
Message data	System Description String
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	0120h	0120h
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	System Description	System Description

- **System Description**
ASCII-string, null terminated.

Set System Interface (SET_SYSTEM_INTERFACE)

Description

This command specifies the SNMP variable 'System Interface'. The value will be stored in the system file '/pniocfg.cfg'.

See also...

- 3-4 "SNMP Functionality"
- 3-3 "PROFINET Settings"

Note: This command may only be issued during initialization.

Initiated by	Application
Command no.	0121h
Extended Header	-
Message data	System Interface String
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	0120h	0120h
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	System Interface String	System Interface String

- **System Interface String**
ASCII-string, null terminated.

Mailbox Socket Interface

The Anybus module features a transparent socket interface, allowing the application to send and receive transparent data via TCP/IP or UDP/IP. The mailbox socket interface can be used in two modes:

- **Non-blocking**

All mailbox operations on these sockets will respond directly - not block until the command is performed. Up to 16 simultaneous non-blocking sockets are supported.

Note: Status information for all non-blocking sockets are available in the fieldbus specific area, see 9-1 “Fieldbus Specific Area”.

- **Blocking**

Blocking sockets means that the Anybus will not respond to further socket commands until the previous one has been completed (However, non-socket related commands can still be processed as normal). Up to 32 simultaneous blocking sockets are supported.

Note: Blocking sockets do *not* have any status information in the fieldbus specific area.

Commands in this category:

Mailbox Command	Description	Page
Socket non-blocking (SOCKET_NB)	Creates a socket in non-blocking mode.	8-93
Socket blocking (SOCKET_B)	Creates a socket in blocking mode.	8-94
Listen (LISTEN)	Starts listen on a socket for incoming connections.	8-95
Accept (ACCEPT)	Accepts connections for sockets in blocking mode.	8-96
Connect (CONNECT)	Tries to connect a socket to a client.	8-97
Send (SEND)	Sends a message to a connected socket.	8-99
Receive (RECV)	Receives a message form a connected socket.	8-100
Send To (SEND_TO)	Sends a message to an unconnected UDP socket to a specified host.	8-101
Receive From (RECV_FROM)	Receives a message from an unconnected UDP socket.	8-102
Close (CLOSE)	Closes a socket (and connection).	8-103
Send Fragment (SEND_FRAG)	Sends a fragment of a message with a maximum total size of 4096 bytes.	8-104
Receive Fragment (RECV_FRAG)	Receives a fragment of a message with a total maximum size of 4096 bytes.	8-105
Send Fragment To (SEND_FRAG_TO)	Sends a fragment of a message with a total maximum size of 4096 bytes to an unconnected UDP socket.	8-107
Receive Fragment From (RECV_FRAG_FROM)	Receives a fragment of a message with a total maximum size of 4096 bytes from an unconnected UDP socket.	8-108
Get Socket Option (GET_SOCKET_OPTION)	Read options from a socket.	8-110
Set Socket Option (SET_SOCKET_OPTION)	Sets options to a socket	8-111

Socket Non-Blocking (SOCKET_NB)

Description

This mailbox command creates a socket in non-blocking mode and associates it to a specific port number. If the specified port number is 0, the Anybus module selects a free port.

The response message contains a socket descriptor and the port number. The socket descriptor shall be used on all following operations on the socket.

Initiated by	Application
Command no.	0040h
Extended Header	-
Message data	The socket type (TCP or UDP) and the port number to bind the socket to.
Response data	The response indicates if the command was accepted. The response indicates which socket descriptor that is used and the port number the socket is associated to.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message SOCKET_NB 4 bytes of data (2 words)</i>
Command	0040h	0040h	
Data size	0004h	0004h	
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 dataword 1	Socket type	Socket descriptor	
Message dataword 2	Port number	Port number	

- **Socket Type**

Value	Socket type
0001h	TCP socket
0002h	UDP socket

Socket Blocking (SOCKET_B)

Description

This mailbox command creates a socket in blocking mode and associates it to a specific port number. If the specified port number is 0, the Anybus module selects a free port.

The response message contains a socket descriptor and the port number. This descriptor shall be used on all following operations on this socket.

Initiated by	Application
Command no.	003Fh
Extended Header	-
Message data	The socket type (TCP or UDP) and the port number to bind the socket to.
Response data	The response indicates if the command was accepted. The response indicates which socket descriptor that is used and the port number the socket is associated to.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message SOCKET_B 4 bytes of data (2 words)</i>
Command	003Fh	003Fh	
Data size	0004h	0004h	
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 dataword 1	Socket type	Socket descriptor	
Message dataword 2	Port number	Port number	

- **Socket Type**

Value	Socket type
0001h	TCP socket
0002h	UDP socket

Listen (LISTEN)

Description

This mailbox command makes a socket listen for new connections. If the Anybus module detects a connection request on the specified socket, a new connected socket will be created, and the current socket will continue listening for new connections. This means that multiple hosts can connect to one listening socket simultaneously.

Note: This command can only be used on a TCP socket.

- **Non-blocking sockets**

Information about active connections on this socket can be read in the fieldbus specific area, see 9-1 “Memory Map” and 9-2 “Socket Status Structure”.

- **Blocking sockets**

Socket descriptors for new connections connected to this socket can be received by the mailbox command ACCEPT, see 8-96 “Accept (ACCEPT)”.

Initiated by	Application
Command no.	0041h
Extended Header	Socket Descriptor, Fault Information
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0041h	0041h	
Data size	0000h	0000h	<i>LISTEN</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket descriptor	
Extended word 2	(reserved, set to 0000h)	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	

Accept (ACCEPT)

Description

When a connection request to a listening socket in blocking mode is received, this command receives the socket descriptor of the newly created connected socket.

This command is blocking and will not respond until a connection request is received.

Initiated by	Application
Command no.	0050h
Extended Header	Socket Descriptor, Fault Information, Local Port no, Host Port no, Host IP
Message data	-
Response data	New socket descriptor

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>ACCEPT</i>
Command	0050h	0050h	
Data size	0000h	0002h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket Descriptor	
Extended word 2	(reserved, set to 0000h)	Local Port No.	
Extended word 3	-	Host Port No.	
Extended word 4	-	Host IP-address word 1	
Extended word 5	-	Host IP-address word 2	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
		New socket descriptor	Response data word

Connect (CONNECT)

Description

This mailbox command tries to establish a connection to a specified IP address and port number.

If the socket is of UDP type this command specifies the peer with which the socket is to be associated, the address is to which datagrams are sent and the only address from which datagrams are received.

If the socket is of TCP type this command attempts to make a connection to another socket. TCP sockets may CONNECT only once, while UDP sockets may use CONNECT multiple times to change their association.

- **Non-blocking sockets**

If this command is correctly sent, it will be accepted regardless it's possible to establish a connection or not. The result of the operation is available in the fieldbus specific area, see 9-1 "Fieldbus Specific Area".

- **Blocking sockets**

This command will block until a connection is established or the connection request is cancelled due to timeout or connection error.

Initiated by	Application
Command no.	0042h
Extended Header	Socket Descriptor, Fault Information, Connection Result
Message data	IP address, Port number
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	<i>Fieldbus Specific Message</i>
Command	0042h	0042h	<i>CONNECT</i>
Data size	0006h	0006h	<i>6 bytes of data (3 words)</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	New Socket Descriptor	
Extended word 2	(reserved, set to 0000h)	Connection result	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
Message data word 1	IP address (high)	IP address (high)	
Message data word 2	IP address (low)	IP address (low)	
Message data word 3	Port number	Port number	

- **Connection Result Code (Only for blocking sockets)**

Code	Status
0003h	Connected
0004h	Connection Refused
0005h	Connection Timeout
0006h	Connection Failed

Send (SEND)

Description

This mailbox command writes data to a connected socket. A maximum of 256 bytes of data can be sent using this command.

- **Non-blocking sockets**

If there isn't enough space available for the data in the output buffers, the response will indicate that the amount of data actually sent was less than requested.

- **Blocking sockets**

If there isn't buffer space available for the data in the output buffers this command will block until there is.

Initiated by	Application
Command no.	0043h
Extended Header	Socket Descriptor, Fault Information
Message data	Data to send
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	<i>Fieldbus Specific Message SEND Max. 256 bytes</i>
Command	0043h	0043h	
Data size	(size)	(size)	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket Descriptor	
Extended word 2	(reserved, set to 0000h)	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
Message data	Data to send	Sent data	

Receive (RECV)

Description

This mailbox command receives data from a connected socket.

If the specified socket is of TCP type this command will return the requested number of bytes from the received data stream. If the available data is less than requested, all available data will be returned.

If the specified socket is of UDP type this command will return the requested amount of data from the next received datagram. If the datagram is smaller than requested, the entire datagram will be returned in the response message. If the datagram is larger than requested, the excess bytes will be discarded.

A maximum of 256 bytes of data can be received using this command.

- **Non-blocking sockets**

If no data is available on the socket the response will indicate that 0 bytes of data was received.

- **Blocking sockets**

If this command is called and no data is available the command will block until there is. If the response indicates that 0 bytes of data was received the connection has been closed by the host. The socket however is still valid and must be closed using the mailbox command CLOSE.

Initiated by	Application
Command no.	0044h
Extended Header	Socket Descriptor, Bytes to receive, Fault Information
Message data	-
Response data	Received data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0044h	0044h	<i>RECV</i>
Data size	0000h	(size)	<i>Maximum 256 bytes</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket Descriptor	
Extended word 2	Bytes to receive (in bytes)	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
		Received data	Response data

Send To (SEND_TO)

Description

This mailbox command sends a UDP datagram to a specified IP address and port number. A maximum of 256 bytes of data can be sent using this command. (Unconnected UDP sockets only)

Initiated by	Application
Command no.	0045h
Extended Header	Socket Descriptor, IP-address, Port number, Fault Information
Message data	Data to send
Response data	Sent data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0045h	0045h	<i>SEND_TO</i>
Data size	(size)	(size)	<i>Maximum 256 bytes</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket descriptor	
Extended word 2	IP-address (high)	IP-address (high)	<i>Destination IP address</i>
Extended word 3	IP-address (low)	IP-address (low)	
Extended word 4	Port number	Port number	<i>Port number</i>
Extended word 5	(reserved, set to 0000h)	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
Message data	Data to send	Sent data	

Receive From (RECV_FROM)

Description

This mailbox command reads the next received datagram from a UDP type socket. The response message contains the IP address and port number of the sender.

If the received datagram is smaller than requested, the entire datagram will be returned in the response message. If the received datagram is larger than requested, the excess bytes will be discarded.

A maximum of 256 bytes of data can be received using this command.

- **Non-blocking sockets**

If the amount of data available on the socket is less than requested, this is reflected in the data size of the response.

- **Blocking sockets**

If this command is called and no data is available the command will block until there is.

Initiated by	Application
Command no.	0045h
Extended Header	Socket Descriptor, Bytes to receive, IP-address, Port number, Fault Information
Message data	-
Response data	Received data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0046h	0046h	<i>RECV_FROM</i>
Data size	0000h	(size)	<i>Maximum 256 bytes</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket descriptor	
Extended word 2	Receive data size	IP address (high)	<i>Senders IP-address</i>
Extended word 3	(reserved, set to 0000h)	IP address (low)	
Extended word 4	-	Port number	<i>Sender port number</i>
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
		Received data	Response data

Close (CLOSE)

Description

This mailbox command causes a connected socket to shut down and release its socket descriptor.

- **Blocking sockets**

Commands still blocking on the socket when it is closed will be aborted and return indicating 0010h (Command aborted)

Note: If a host closes a TCP connection while there is still data available to read on the socket in the client, the client socket will be indicated as connected until all data is read. In this case, if the client tries to send data the mailbox response will report “Can’t send more”.

Initiated by	Application
Command no.	0047h
Extended Header	Socket Descriptor, Fault Information
Message data	-
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0047h	0047h	
Data size	0000h	0000h	<i>CLOSE</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket descriptor	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	

Send Fragment (SEND_FRAG)

Description

This mailbox command is used when sending messages larger than 256 bytes. Internally the fragments are stored in a buffer until the last fragment is received. The message is then sent to the socket. The maximum size of a fragmented message is 4096 bytes.

It is not possible to send multiple fragmented messages simultaneously. A fragmented message must be completely sent before another fragmented message can be sent on the same or another socket.

- **Non-blocking sockets**

If there isn't enough space available for the data in the output buffers, the response will indicate that the amount of data actually sent was less than requested.

- **Blocking sockets**

If there isn't buffer space available for the data in the output buffers this command will block until there is.

Initiated by	Application
Command no.	005Eh
Extended Header	Socket descriptor, Fragment Type
Message data	Data to send
Response data	Sent Data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	005Eh	005Eh	<i>SEND_FRAG</i>
Data size	(size)	(size)	<i>Max. 256 bytes/fragment</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket descriptor	
Extended word 2	Fragment type	Fragment type	<i>See below</i>
Extended word 3	(reserved, set to 0000h)	No. of sent bytes	<i>(Only in last fragment)</i>
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	-	
Message data	Data to send	Sent data	

- **Fragment Type Value**

Value	Description
0000h	First fragment of a new message
0001h	Subsequent fragment of the message
0002h	Last fragment of the message. When this fragment is sent the entire message will be sent to the socket.

Receive Fragment (RECV_FRAG)

Description

This mailbox command is used to receive fragmented messages larger than 256 bytes from a connected socket. Internally the entire message will be read from the socket to a buffer. The fragments of the message can then be read from the buffer using this command.

If the specified socket is of TCP type this command will return the requested number of bytes from the received data stream. If the available data is less than requested, all available data will be returned.

If the specified socket is of UDP type this command will return the requested amount of data from the next received datagram. If the datagram is smaller than requested, the entire datagram will be returned in the response message. If the datagram is larger than requested, the excess bytes will be discarded.

The maximum size of a fragmented message is 4096 bytes.

- **Non-blocking sockets**

If no data is available on the socket the response will indicate that 0 bytes of data was received.

- **Blocking sockets**

If no data is available the command will block until there is. If the response indicates that 0 bytes of data was received the connection has been closed by the host. The socket however is still valid and must be closed using the mailbox command CLOSE.

Initiated by	Application
Command no.	005Fh
Extended Header	Socket descriptor, Fragment Type, Receive Data Size, Bytes Remaining, Fault information
Message data	-
Response data	Received Data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	005Fh	005Fh	<i>RECV_FRAG</i>
Data size	0000h	(size)	<i>Max. 256 bytes/fragment</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket Descriptor	
Extended word 2	Fragment type	Fragment type	<i>See below</i>
Extended word 3	Receive data size ^a	Bytes remaining	
Extended word 4	(reserved, set to 0000h)	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
		Received data	Response data

a. The receive data size is only used if the Fragment type = 0000h

- Fragment Type Value**

Value	Description
0000h	Receive first fragment of a new message. This receives a new message from the network. Any unread fragments from earlier received datagrams will be overwritten.
0001h	Receive the next fragment of the message.

Send Fragment To (SEND_FRAG_TO)

Description

This mailbox command sends a UDP datagram to a specified IP address and port number. This command is used when sending a fragment of a message larger than 256 byte. Internally the fragments are stored in a buffer until the last fragment is received. The message is then sent to the socket. The maximum size of a fragmented message is 4096 bytes.

Initiated by	Application
Command no.	005Ch
Extended Header	Socket descriptor, Fragment Type, IP-address, Port number, No. of sent bytes, Fault information
Message data	Data to send
Response data	Sent data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	005Ch	005Ch	<i>SEND_FRAG_TO</i>
Data size	(size)	(size)	<i>Max. 256 bytes/fragment</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket Descriptor	
Extended word 2	Fragment type	Fragment type	<i>See below</i>
Extended word 3	IP-address (high) ^a	IP-address (high) ^a	<i>Destination IP address</i>
Extended word 4	IP-address (low) ^a	IP-address (low) ^a	
Extended word 5	Port number ^a	Port number ^a	<i>Destination Port number</i>
Extended word 6	(reserved, set to 0000h)	No. of sent bytes	<i>(Only in last fragment)</i>
Extended word 7	-	-	
Extended word 8	-	Fault information	
Message data	Data to send	Sent data	

a. IP-address and Port Number shall only be given in the first fragment.

- Fragment Type Value**

Value	Description
0000h	First fragment of a new message.
0001h	Subsequent fragment of the message
0002h	Last fragment of the message. When this fragment is sent the entire message will be sent to the socket.

Receive Fragment From (RECV_FRAG_FROM)

Description

This mailbox command reads the next received datagram from a UDP type socket. The response message contains the IP address and port number of the sender.

This command is used to receive a fragment of a message larger than 256 bytes. The maximum total size of a fragmented message is 4096 bytes. The maximal size of each fragment is 256 bytes.

If the received datagram is smaller than requested, the entire datagram will be returned in the response message. If the received datagram is larger than requested, the excess bytes will be discarded.

For blocking sockets, the first fragment will block until there is data available on the socket.

Internally the entire message is read from the socket to a buffer. The fragments can then be read from the buffer using this command.

- **Non-blocking sockets**

If no data is available on the socket the response will indicate that 0 bytes of data was received.

- **Blocking sockets**

If this command is called but there is no data available on the socket the command will block and not return until there is data available.

Initiated by	Application
Command no.	005Dh
Extended Header	Socket descriptor, Fragment Type, Received data size, Bytes remaining, IP-address, port number, Fault information
Message data	-
Response data	Received data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	005Dh	005Dh	<i>RECV_FRAG_FROM</i>
Data size	0000h	(size)	<i>Max. 256 bytes/fragment</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket descriptor	Socket Descriptor	
Extended word 2	Fragment type	Fragment type	
Extended word 3	Receive data size	Bytes remaining	
Extended word 4	(reserved, set to 0000h)	IP-address (high)	<i>The senders IP address</i>
Extended word 5	-	IP-address (low)	
Extended word 6	-	Port number	<i>The senders port number</i>
Extended word 7	-	-	
Extended word 8	-	Fault information	
		Received data	Response data

- Fragment Type Value

Value	Description
0000h	Receive first fragment of a new message. This receives a new message from the network. Any unread fragments from earlier received datagrams will be overwritten.
0001h	Receive the next fragment of the message.

Get Socket Option (GET_SOCKET_OPTION)

Description

This command reads options from a socket.

Initiated by	Application
Command no.	0051h
Extended Header	Socket descriptor, Socket Option
Message data	-
Response data	Option Data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0051h	0051h	
Data size	0000h	Option data size	<i>GET_SOCKET_OPTION</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket Descriptor	Socket Descriptor	
Extended word 2	Socket Option HI	Socket Option HI	
Extended word 3	Socket Option LO	Socket Option LO	
Extended word 4			
Extended word 5			
Extended word 6			
Extended word 7			
Extended word 8			
		Option Data	Response data

Socket Options

The following options are used to Get settings from a socket:

SO_LINGER
 SO_KEEPALIVE
 SO_REUSEADDR
 IP_MULTICAST_TTL
 IP_MULTICAST_LOOP

For more information see section Socket Options page 8-112.

Set Socket Option (SET_SOCKET_OPTION)

Description

This command changes the settings for a specified socket.

Initiated by	Application
Command no.	0052h
Extended Header	Socket descriptor, Socket Option
Message data	Option Data
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0052h	0052h	
Data size	Option data size	Option data size	<i>SET_SOCKET_OPTION</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Socket Descriptor	Socket Descriptor	
Extended word 2	Socket Option HI	Socket Option HI	
Extended word 3	Socket Option LO	Socket Option LO	
Extended word 4			
Extended word 5			
Extended word 6			
Extended word 7			
Extended word 8		Fault Information	
Message data	Option Data	Option data	

Socket Options

The following options are used to Set settings on a socket:

SO_LINGER
 SO_KEEPALIVE
 SO_REUSEADDR
 IP_MULTICAST_TTL
 IP_MULTICAST_LOOP
 IP_ADD_MEMBERSHIP
 IP_DROP_MEMBERSHIP
 TCP_NODELAY

For more information see section Socket Options page8-112.

Socket Options

Name	Option Value	Data Type	Description
SO_LINGER	0x00000080	UINT32 UINT32	<p>Controls the action taken when unsent data is queued on a socket that is being closed. This option is only valid for TCP sockets.</p> <p>l_onoff 0:Linger OFF (default) Other:Linger ON</p> <p>l_linger Normally defines the linger timeout. NOT SUPPORTED, ALWAYS SET TO 0.</p> <p>If SO_LINGER is disabled, Socket Close returns immediately and the connection is gracefully closed in the background.</p> <p>If SO_LINGER is enabled with a zero timeout, Socket Close returns immediately and the connection is reset.</p>
SO_KEEPALIVE	0x00000008	UINT32	<p>Enables/disables keep alive probes on a socket. This option is only valid for TCP sockets.</p> <p>l_keepalive 0:Keep alive OFF (default) Other:Keep alive ON</p> <p>Keep alive can be used to detect if the host is still active, and if not close down the connection.</p> <p>If keep alive is enabled a keep alive probe will be sent to the host after 2 hours with no data being sent or received on a connection. This packet is designed to provoke an ACK response from the host. If no ACK is received another 8 keep alive probes will be sent with 75 seconds interval, and if non of them is ACKed the connection will be reset.</p>
SO_REUSEADDR	0x00000004	UINT32	<p>Enables/disables reuse address option on a socket. This option is only valid for TCP sockets.</p> <p>l_reuseaddr 0:Reuse address OFF (default) Other:Reuse address ON</p> <p>When reuse address option is enabled it is possible to reuse a TCP port even if the port is busy in TIME_WAIT state. If the port is busy in other states an error will still be generated. This can be useful for a server implementation that is shut down and directly restarted while sockets are still active on its port.</p>
IP_MULTICAST_TTL	0x0000000A	UINT8	<p>Sets the TTL value for multicast packets. This option is only valid for UDP sockets.</p> <p>b_ttl 1-255 (Default 1)</p> <p>The TTL value is part of the IP packet header and specifies the number of routers a packet is allowed to pass before it shall be deleted. The default value of 1 prevents multicast packets from being forwarded beyond the local network.</p>
IP_MULTICAST_LOOP	0x0000000B	UINT8	<p>Enables/disables multicast packet loopback. This option is only valid for UDP sockets.</p> <p>l_reuseaddr 0:Multicast loopback OFF 1:Multicast loopback ON (default)</p>

IP_ADD_MEMBERSHIP	0x0000000C	UINT32 UINT32	<p>Adds membership to a multicast group. This option is only valid for UDP sockets.</p> <p>l_multiaddr IP address of multicast group to join. l_interface IP address of interface to join (own IP address)</p> <p>By joining a multicast group the local multicast router will be notified about the multicast membership (using IGMP) and the local interface network driver will enable reception of multicast datagrams destined for this multicast address.</p>
IP_DROP_MEMBERSHIP	0x0000000D	UINT32 UINT32	<p>Drops membership from a multicast group. This option is only valid for UDP sockets.</p> <p>l_multiaddr IP address of multicast group to leave. l_interface IP address of interface (own IP address)</p> <p>By leaving a multicast group the local multicast router will be notified and the local interface network driver will disable reception of multicast datagrams destined for this multicast address.</p>
TCP_NODELAY	0x00002002	UINT32	<p>Enables/disables the Nagle algorithm on a socket. This option is only valid on TCP sockets.</p> <p>l_nodelay 0:Nagle algorithm ON (default) l_nodelay Other:Nagle algorithm OFF</p> <p>For some applications, especially request/response applications, the performance over a TCP connection may be poor due to the interaction between the Nagle algorithm and the delayed acknowledgment functionality. Then the TCP_NODELAY option can be used to disable the Nagle algorithm to increase performance.</p> <p>For more information about Nagle algorithm see RFC 896.</p>

Other Commands

Commands in this category:

Mailbox Command	Description	Page
DNS Request (DNS_REQUEST)	Asks the configured DNS server for the IP address of a specified host	8-115
Send Email (SEND_EMAIL)	Sends an email message to a specified recipient	8-116
Request SSI Data (REQUEST_SSI_DATA)	Requests SSI data from the application (issued by the Anybus module)	8-118
Write SSI Data (WRITE_SSI_DATA)	Writes SSI data to the application (issued by the Anybus module)	8-119

DNS Request (DNS_REQUEST)

Description

This command sends a request to the configured DNS server for the IP address of a specified host.

Initiated by	Application
Command no.	0030h
Extended Header	-
Message data	Host (string, null-terminated)
Response data	IP address of host, or 0.0.0.0 if not found.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>DNS_REQUEST</i>
Command	0030h	0030h	
Data size	(size)	0004h	
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	Host (string, null-terminated)	IP address (high)	Response data word 1
		IP address (low)	Response data word 2

Send Email (SEND_EMAIL)

Description

This command sends an email to a specified recipient. The message data is sent as several fragments, with a total maximum size of 1024 bytes. The maximum size of each fragment is 256 bytes.

Initiated by	Application
Command no.	0070h
Extended Header	Fault information
Message data	Email message specification, fragmented.
Response data	The response data is a copy of the command data.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i>
Command	0070h	0070h	<i>SEND_EMAIL</i>
Data size	(fragment size)	(fragment size)	<i>Max. 256 bytes / fragment</i>
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Fragment Type	-	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	SMTP Error	<i>(Last fragment only)</i>
Extended word 8	-	Fault information	
Message data	Fragment Data	Fragment Data	

- **Fragment Type**

This value must match the sequence of the fragments as follows:

Value	Description
0000h	This is the first fragment
0001h	This is a subsequent fragment
0002h	This is the last fragment

- **SMTP Error**

If an SMTP error occurred, the ‘SMTP Error’ word contains the error code from the SMTP server, see RFC 821 “Simple Mail Transfer Protocol” for more information.

- **Fragment Data**

The different parts of the email message shall be sent in the following order:

Fragment no.	Fragment Type	Description
1st	0000h	Recipient(s), separated by semicolon (string, null-terminated)
2nd	0001h	Sender address (string, null-terminated)
3rd		Subject line (string, null-terminated)
4th		Message body
...		
...		
...		
...		
(last fragment)	0002h	

Request SSI Data (REQUEST_SSI_DATA)

Description

This message is issued by the Anybus module when a SSI has requested data from the application.

Example:

The following SSI...

```
<?--#exec cmd_argument='printf( "Data: %u", MbReadWord( 42 ) )'-->
```

... will cause the module to issues a REQUEST_SSI_DATA message. The value '42' will be passed to the application.

See also 7-6 “printf”.

Initiated by	Anybus
Command no.	00A0h
Extended Header	SSI Identifier
Message data	SSI Data
Response data	-

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message REQUEST_SSI_DATA (size of data)</i>
Command	00A0h	00A0h	
Data size	0000h	(data size)	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	SSI Identifier	SSI Identifier	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	-	
		SSI Data	Response Data

- **SSI Identifier**

Identifier which can be used as desired by the application to address a specific block of data.

- **SSI Data**

Data associated with the specified SSI Identifier.

Write SSI Data (WRITE_SSI_DATA)

Description

This message is issued by the Anybus module when a SSI writes data to the application.

Example:

The following SSI...

```
<?--#exec cmd_argument='scanf( "Input", "%i", MbWriteWord( 24 ) )'-->
```

... will cause the module to issues a WRITE_SSI_DATA message each time a form with an object named "Input" is sent to the web server. The value '24' will be passed to the application.

See also 7-8 "scanf".

Initiated by	Anybus
Command no.	00A0h
Extended Header	SSI Identifier
Message data	-
Response data	SSI Data

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	<i>Fieldbus Specific Message</i> <i>WRITE_SSI_DATA</i> <i>(size of data)</i>
Command	00A1h	00A1h	
Data size	(data size)	0000h	
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	SSI Identifier	SSI Identifier	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	-	
Message Data	SSI Data		

- **SSI Identifier**

Identifier which can be used as desired by the application to address a specific block of data.

- **SSI Data**

Data associated with the specified SSI Identifier.

Fieldbus Specific Area

Memory Map

The Anybus module can handle 16 non-blocking sockets simultaneously. These can be accessed using the mailbox socket interface to send and receive transparent data over the network. Information about these 16 sockets can be read in the fieldbus specific area, see memory map below.

Address	Contents	Access
640h - 64Bh	Socket Status (Descriptor 0)	RO
64Ch - 657h	Socket Status (Descriptor 1)	RO
658h - 663h	Socket Status (Descriptor 2)	RO
664h - 66Fh	Socket Status (Descriptor 3)	RO
670h - 67Bh	Socket Status (Descriptor 4)	RO
67Ch - 687h	Socket Status (Descriptor 5)	RO
688h - 693h	Socket Status (Descriptor 6)	RO
694h - 69Fh	Socket Status (Descriptor 7)	RO
6A0h - 6ABh	Socket Status (Descriptor 8)	RO
6ACh - 6B7h	Socket Status (Descriptor 9)	RO
6B8h - 6C3h	Socket Status (Descriptor 10)	RO
6C4h - 6CFh	Socket Status (Descriptor 11)	RO
6D0h - 6DBh	Socket Status (Descriptor 12)	RO
6DCh - 6E7h	Socket Status (Descriptor 13)	RO
6E8h - 6F3h	Socket Status (Descriptor 14)	RO
6F4h - 6FFh	Socket Status (Descriptor 15)	RO
700h - 701h	Network Status	RO
702h - 7AFh	Reserved	-
7B0h - 7B1h	IO Controller Status	RO
7B2h - 7B3h	PROFINET Layer Status	RO
7B4h - 7B5h	PROFINET Layer Fault Code	RO
7B6h - 7FFh	Reserved	-

Socket Status Structure

Offset	Register	Type
000h	Socket Type	Byte
001h	Socket Status	Byte
002h - 003h	Socket Information	Word
004h - 005h	Local Port Number	Word
006h - 007h	Host Port Number	Word
008h - 00Bh	Host IP Address	Long

Socket Type

Value	Description
00h	No active socket (free to use)
01h	TCP socket
02h	UDP socket
03h - FFh	(reserved)

Socket Status

Value	Description
00h	Not active
01h	Listening
02h	Connecting
03h	Connected
04h	Connection refused
05h	Connection timed out
06h	Connection failed
07h - FFh	(reserved)

Socket Information

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
(reserved)															DA

Bit	Description
DA	0: Data Not Available 1: Data Available

Local Port Number

This is the local port number that the socket is associated with.

Host Port Number

This is the host port number that the socket is associated with or connected to.

Host IP-address

This is the host IP-address that the socket is associated with or connected to.

Network Status

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
(reserved)														USE	LINK
Bit		Description													
LINK		0: Ethernet hardware link is not established 1: Ethernet hardware link is established													
USE		0: No IP address configured - <i>or</i> - IP address not used by the module 1: IP address configured and used by the module (passed address collision detection)													

IO Controller Status (PROFINET)

Value	Status
0000h	"No connection made"
0001h	STOP
0002h	RUN
0004h	STATION OK
0008h	STATION PROBLEM
0010h	PRIMARY
0020h	BACKUP

PROFINET Layer Status

This registers reflects the overall status of the PROFINET software layer in the Anybus module, and is primarily intended to be used as an aid during product development.

Value	Status
0000h	PROFINET layer not yet initialised
0001h	PROFINET layer successfully initialised
0002h	PROFINET layer failed to initialise (Contact HMS support).

PROFINET Layer Fault Code

In the event of a PROFINET layer initialization problem (see above), this register holds information that may be useful when contacting the HMS support department. Note that this register is primarily intended to be used as an aid during product development.

Miscellaneous

Control Register Area

Fieldbus Type

The fieldbus type value for this product is 0084h (PROFINET).

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.

Event Notification Cause/Source Registers

- **ON/OFF Line Indication (FBON/FBOF)**
This bit reflects the PROFINET online/offline status.
- **Network Reset Functionality (RST)**

Firmware Upgrade

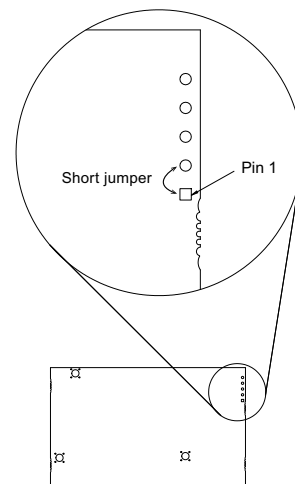
The Anybus module supports firmware updates via FTP. Follow the steps below:

1. As a precaution, make a backup copy of the filesystem contents before proceeding.
2. Upload the new firmware file(s) to the system root ("\"), or to the 'user\'-directory.
3. Reset the module and wait until the watchdog LED flashes 2Hz green (may take up to 1 minute).
4. Reset the module again. The new firmware is now operational.

Formatting the File System

In case of major file system damage, it is possible to re-initialise the file system as follows:

1. Attach a short jumper to the PCB as shown in figure.
Apply power.
2. Wait until the watchdog LED turns red.
3. Disconnect power.
4. Remove jumper.
5. Apply power.
6. Wait approx. 1 minute while the filesystem is being formatted.



HMS Standard GSD-file

On PROFINET, each IO device is associated with a unique GSD-file. The standard GSD-file provided by HMS can be used in Generic Anybus Mode and has the following properties:

- Available modules and their block size: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512 bytes.
- The modules are available as input, output and bi-directional (input/output).
- The modules are consistent over the entire block size.
- The modules have no assigned “Initial record data”.

ID of Module/ Submodule	IO Size (bytes)	Direction	Module Ident number	Submodule Ident number	Comment
DAP v1.0	0	-	A0000000h	00000000h	Represents DAP v1.0. Included for backwards compatibility only.
DAP v2.0	0	-	D0000000h	00000000h	Represents DAP v2.0. Fixed for slot 0.
0	0	-	B0000000h	00000000h	Empty slot module (No IO data). Can be located in any slot except for slot 0.
1	1	Input	00000001h	00000000h	Can be located in any slot, except for slot 0.
2	2	Input	00000002h	00000000h	
3	4	Input	00000003h	00000000h	
4	8	Input	00000004h	00000000h	
5	16	Input	00000005h	00000000h	
6	32	Input	00000006h	00000000h	
7	64	Input	00000007h	00000000h	
8	128	Input	00000008h	00000000h	
9	256	Input	00000009h	00000000h	
10	512	Input	0000000Ah	00000000h	
21	1	Output	00000010h	00000000h	
22	2	Output	00000020h	00000000h	
23	4	Output	00000030h	00000000h	
24	8	Output	00000040h	00000000h	
25	16	Output	00000050h	00000000h	
26	32	Output	00000060h	00000000h	
27	64	Output	00000070h	00000000h	
28	128	Output	00000080h	00000000h	
29	256	Output	00000090h	00000000h	
30	512	Output	000000A0h	00000000h	
41	1	Input/Output	00000100h	00000000h	
42	2	Input/Output	00000200h	00000000h	
43	4	Input/Output	00000300h	00000000h	
44	8	Input/Output	00000400h	00000000h	
45	16	Input/Output	00000500h	00000000h	
46	32	Input/Output	00000600h	00000000h	
47	64	Input/Output	00000700h	00000000h	
48	128	Input/Output	00000800h	00000000h	
49	256	Input/Output	00000900h	00000000h	
50	512	Input/Output	00000A00h	00000000h	

How to Associate a Bitmap to a Device Access Point

It is possible to associate a bitmap to a Device Access Point, using the GSD file.

For the Device Access Point, the following information needs to be added (add it right before the “</DeviceAccessPointItem>”):

```
<Graphics>  
    <GraphicItemRef Type="DeviceSymbol" GraphicItemTarget="X"/>  
</Graphics>
```

In addition to this, a list of graphics needs to be created. This list can be added directly after, for example, the “</DeviceAccessPointList>”, or “</ValueList>” keywords. Please note that the “X” above and below shall be replaced with the proper value (if only one bitmap is used, replace X with 1).

```
<GraphicsList>  
    <GraphicItem ID="X" GraphicFile="GSDML-VVVV-DDDD-N...N"/>  
</GraphicsList>
```

The format of the name of the bitmap shall be as specified above, where VVVV corresponds to the Vendor ID (for example, “010C”), DDDD corresponds to the Device ID (for example, “0009”) and “N...N” is a vendor specific extension (for example, “ABSPRTPIC1”).

Technical Specification

Electrical Specification

Protective Earth (PE) Requirements

All Anybus-S/M modules feature cable shield filters designed in accordance with 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.

Note: The shield of the RJ45 connector is not connected directly to PE. As all nodes in a PROFINET network have to share chassis ground connection, the PROFINET cable shield has to be connected to the chassis ground at each node in the network. For further information see “PROFINET Installation Guideline for Cabling and Assembly”, order no. 8.072, available for download at www.PROFINET.com.

Isolation

Isolation between the application, the network, and protective earth (PE):

Isolation Barrier	Working Voltage		Distance	
	Creepage	Clearance	External	Internal
Application to PE	200V	2500V	2.0mm	0.4mm
Application to Network	250V	2500V	2.5mm	0.4mm
Network to PE	100V	1500V	1.4mm	0.4mm

(Tests performed according to EN 60950-1)

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 power consumption is 450mA.

Environmental Specification

Temperature

Test performed according to IEC-60068-2-1, IEC-60068-2-2, and IEC 60068-2-14.

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

Humidity

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

Test performed according to EN 60068.

EMC (CE) Pre-compliance

EMC pre-compliance testing has been conducted according to the Electromagnetic Compatibility Directive 2004/108/EC. For more information please consult the EMC pre-compliance document, see [product/support](#) pages for Anybus-S PROFINET at www.anybus.com.

Connectors

Application Connector

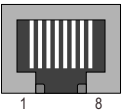
(Consult the general Anybus-S Parallel Design Guide for more information)

Ethernet

Auto-crossover is supported.

RJ45 (Standard Connector)

Pin	Signal	Notes
1	TD+	-
2	TD-	-
3	RD+	-
4	-	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit in the module.
5	-	
6	RD-	-
7	-	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit in the module.
8	-	



Board to Board

Pin	Signal	Connect to RJ45 pin...	Notes
1	Shield	Housing	-
2	-	4	(See notes for pins 4 and 5 in RJ45 connector)
3	-	5	
4	-	-	(not used)
5	TD+	1	-
6	TD-	2	-
7	RD+	3	-
8	-	7	(See notes for pins 7 and 8 in RJ45 connector)
9	RD-	6	-
10	-	8	(See notes for pins 7 and 8 in RJ45 connector)



Measurements, Connectors & LEDs



Conformance Test Guide

General

When using the default settings of all parameters, the Anybus-S PROFINET IO module is precertified for network compliance. This precertification is done to ensure that your product *can* be certified, but it does not mean that your product will not require certification.

Any change in the parameters in the GSD file, supplied by HMS, will require a certification. A vendor ID can be obtained from PNO and is compulsory for certification. This chapter provides a guide for successful conformance testing your product, containing the Anybus-S PROFINET IO module, to comply with the demands for network certification set by the PNO.

Independent of selected operation mode, the actions described in this appendix have to be accounted for in the certification process. The identity of the product needs to be changed to match your company and device.

IMPORTANT: *This appendix provides guidelines and examples of what is needed for certification. Depending on the functionality of your application, there may be additional steps to take. Please contact HMS Industrial Networks at www.anybus.com for more information.*

Reidentifying Your Product

A number of mailbox messages have to be sent during initialization to change the HMS default values to values reidentifying the product. The messages have to be sent at each power on/reset before the mailbox END_INIT signals the completion of the initialization. These mailboxes are listed in the table below.

Mailbox (See also PROFINET Specific Commands on page 8-44)	Parameter set	Explanation	Default	Customer sample	Comment
PNIO_SET_DEVICE_IDENTITY	Vendor ID Device ID	With this mailbox you set the Vendor ID and the Device ID of the product	Vendor ID: 010Ch (HMS Industrial Networks) Device ID: 0001h	Vendor ID: XXXXh Device ID: YYYYh	This information must match the keys of the "DeviceIdentity" of the GSD-file. Note that the GSD file keyword "VendorName" must correspond to the Vendor ID value.
PNIO_SET_STATION_TYPE	Station Type	With this mailbox you set the station type of the device	"ABS-PRT"	"Cust-PNIO-Dev"	This information matches, in the case of ABS-PRT, GSD keywords "DNS_CompatibleName" and "OrderNumber". The Station Type must be equal to the "DNS_CompatibleName", but it is allowed to have a completely different "OrderNumber", see also PNIO_SET_IMO_INFO below.
SET_SYSTEM_DESCRIPTION	MIB information	With this mailbox you set the description of the system	"HMS Industrial Networks Anybus-S"	"Customer HMI Interface Module"	This information can be read by means of SNMP from the network side.
SET_SYSTEM_INTERFACE	MIB information	With this mailbox you set the description of the interface	"PROFINET IO interface"	"PROFINET IO interface"	
PNIO_SET_IMO_INFO	I&M0 information, including the Manufacturer ID and Order ID. For complete list of attributes see 8-72 "Set IMO Information (PNIO_SET_IMO_INFO)".	With this mailbox you set the information that shall be returned when an Identification and Maintenance request is received from the PROFINET network	Manufacturer ID: 010Ch Order ID: "ABS-PRT"	Manufacturer ID: XXXXh Order ID: "Cust-PNIO-Dev"	The Manufacturer ID must match the Vendor ID set with PNIO_SET_DEVICE_IDENTITY and Order ID must be changed (original information can be fetched with PNIO_GET_IMO_INFO). The Order ID must match the GSD file keyword "OrderNumber". The hardware revision must match the GSD file keyword "HardwareRelease". The software revision must match the GSD file keyword "SoftwareRelease".

Additional GSD File Information

The GSD file keyword "ProductFamily" shall correspond to the vendor's name of the device.

The GSD file keyword "MainFamily" lists the kinds of devices for which the product shall be listed. As of GSD specification v2.25, the following "families" are available:

- "General"
- "Drives"
- "Switching Devices"
- "I/O"
- "Valves"
- "Controllers"
- "HMI"
- "Encoders"
- "NC/RC"
- "Gateway"
- "PLCs"
- "Ident Systems"
- "PA Profiles"
- "Network Components"
- "Sensors"

Factory Default Reset - RDR Support Recommended

When PROFINET IO modules are delivered, they are required to be in their “Factory Default” state. For PROFINET devices this means that their Station Name is empty (“”) and that the IP-suite is not assigned (IP 0.0.0.0). When a Factory Default Reset command is received from the network, the Anybus module will erase all IP and Station Name information and inform the host application that hardware or software reset of the Anybus module is required. This is done by using the RDR functionality (Fieldbus Reset Device Request Notification). For information on how to enable this functionality please refer to the Anybus-S Parallel Design Guide.

When the RDR functionality is enabled, the Anybus module will set the RDR bit in the Module Status register (when a Factory default reset command has arrived) and wait for the host application to perform a hardware or software reset of the Anybus module (i.e., the Anybus module will not reset itself) and then reinitialize the module.

Note: It is strongly recommended to enable RDR support.

IP Address

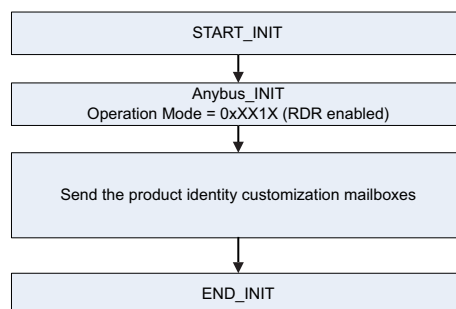
Normally the IP numbers of PROFINET IO devices are assigned via the PROFINET network via DCP (Discovery and Configuration Protocol). HMS recommends not using the mailbox SET_ETN_CONFIG during the initialization phase for PROFINET modules, unless the end user has requested the IP address to be set to a specific value (by for example using a keypad). The reason is that when a factory default reset command is received from the PROFINET network (via DCP) the node must be available after a hardware or software reset with the default IP-address (0.0.0.0).

Station Name

Normally the Station Name of a PROFINET device is assigned by the end user via the PROFINET DCP protocol. HMS recommends not using the mailbox SET_STATION_NAME during the initialization phase for PROFINET modules. If this mailbox is used, it is recommended that it is sent explicitly when the end user changes the Station Name with e.g. a keypad. The reason is that when a factory default reset command is received from the PROFINET network (via DCP), the node must be available after a hardware or software reset with the default Station Name (“”).

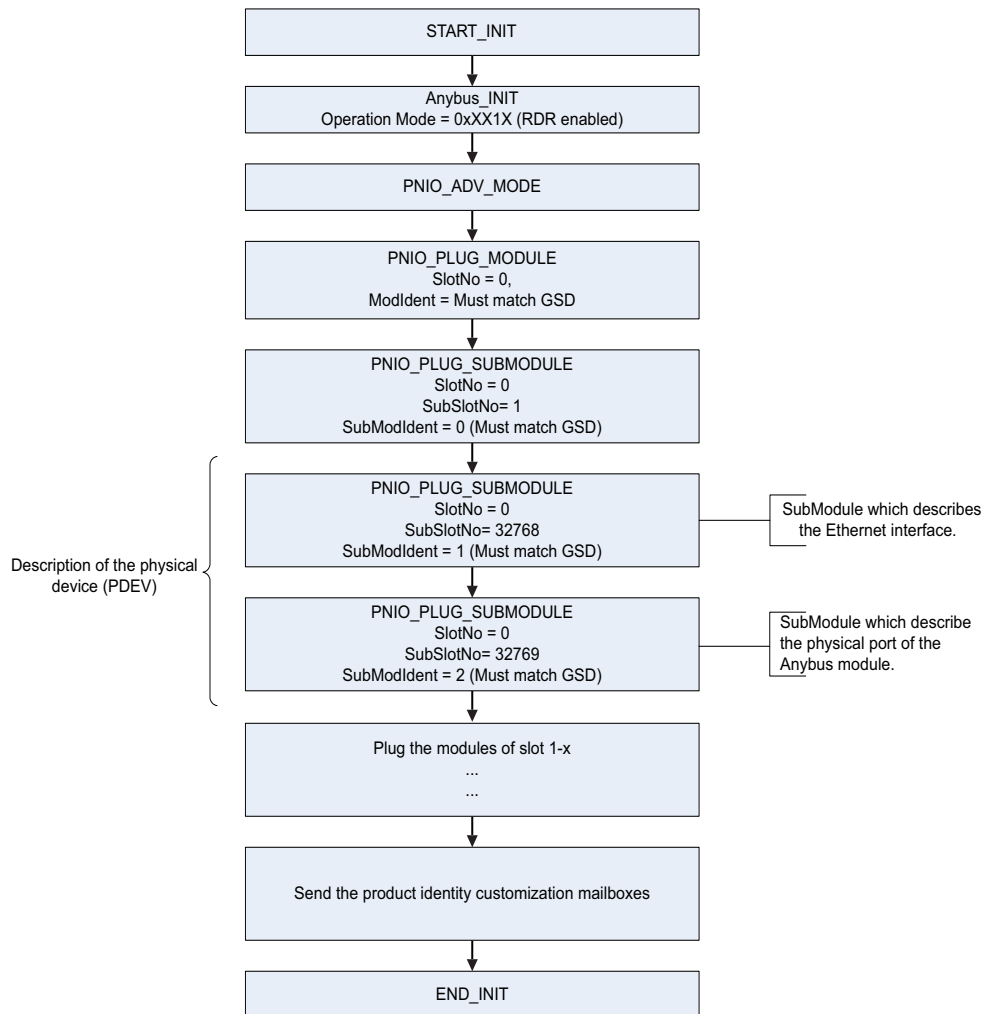
Certification in Generic Anybus Mode

In Generic Anybus Mode (when the PNIO_ADV_MODE is not used) there is normally nothing that needs to be considered apart from what is mentioned earlier in this appendix. The default HMS GSD file has to be modified with respect to the identity of the product and this requires a certification of the product.



Certification in Advanced Mode

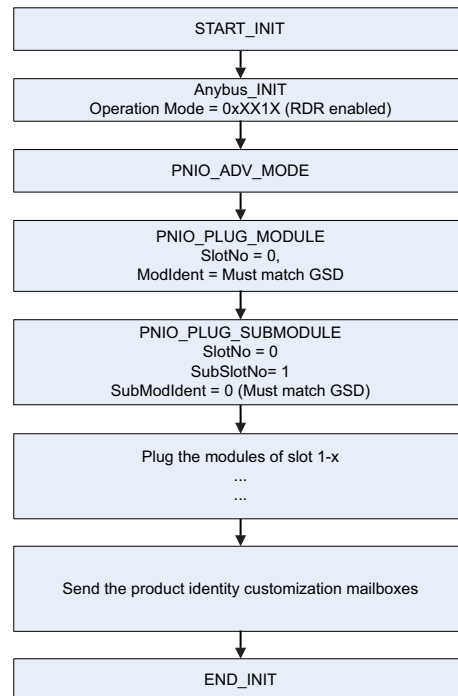
In advanced mode (mailbox PNIO_ADV_MODE is used), the most important thing is to use a Device Access Point (DAP) that conform to PROFINET IO Specification v2.0 or later (DAP2). From specification version 2.0 it is possible to describe the physical Ethernet interface and its ports (PDEV, or Physical Device) with a special mechanism. This is done with special submodules at slot 0 (the module at slot 0 is the access point for the device). HMS recommends following the flow below for setting up a DAP2.



The figure shows how to set up a PROFINET compatible DAP. Please note that for some mailboxes only the relevant parameters are shown.

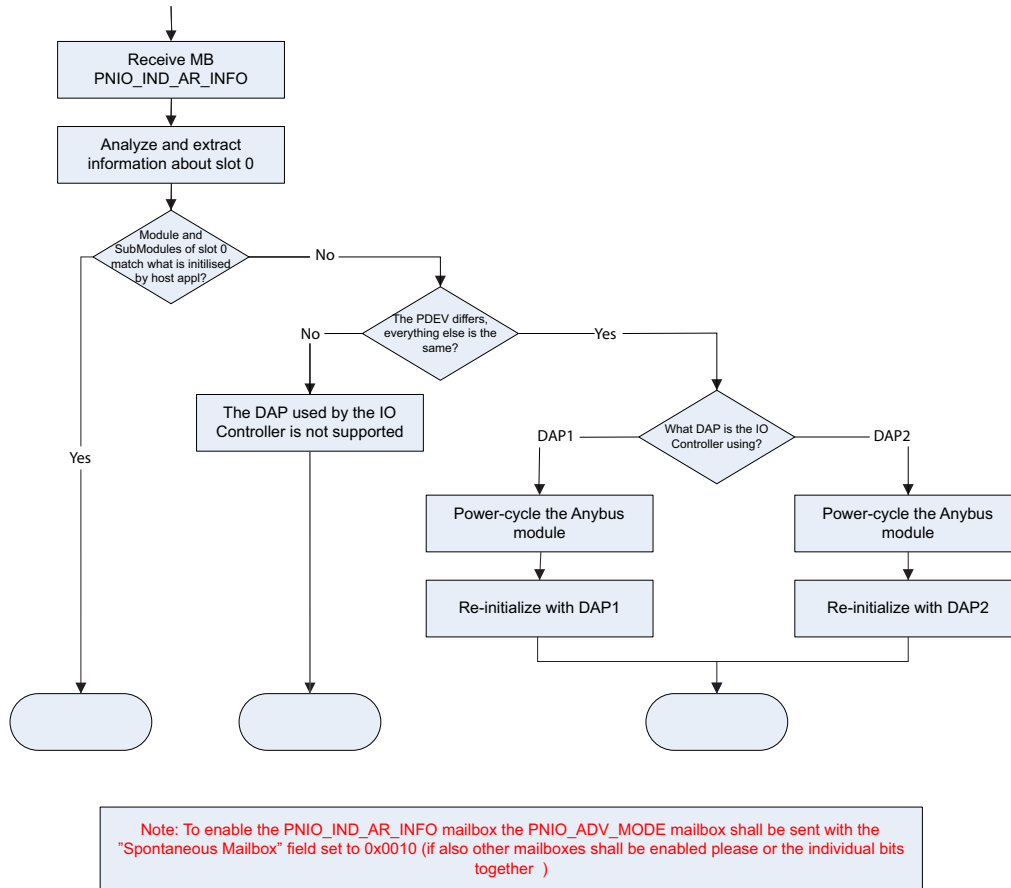
Please note that the values of “SubModIdent” in the above flowchart are the values of the default HMS GSD file. They can be changed if necessary, but there is no real need for it, the important thing is that it matches the GSD file. To be able to pass the PROFINET conformance test a “DAP2” is mandatory. On the market there still are some PROFINET IO controllers not supporting PROFINET IO specification v2.0 or later. These controllers cannot use a DAP2. These controllers cannot use a DAP2. Therefore, it might be necessary to support also a DAP containing no PDEV (i.e. the last two PNIO_PLUG_SUBMODULE mailboxes are not issued). This is called a “migration” DAP. In the default GSD file there is such functionality. In the case of advanced mode this can be implemented in either of these two ways:

1. The end user decides that reverse compatibility is necessary and selects this for example with a parameter on a hand panel. The host application performs a hardware or a software reset of the Anybus module and skips the last two PNIO_PLUG_SUBMODULE mailboxes as shown in the figure on page F-4, resulting in the flow shown in the figure below:



The figure shows a DAP without a PDEV, for reverse compatibility only (please note that for some mailboxes only the relevant parameters are shown.)

2. The host application has enabled the PNIO_IND_AR_INFO mailbox and can thus analyze the connection which is being established by the IO Controller. If the IO Controller is trying to use the DAP which has not been plugged the host application can do a hardware or software reset of the Anybus module and re-initialize the Anybus module with the correct DAP (with or without PDEV), as described in the figure below:



The figure shows a flowchart of the functionality to swap DAPs depending on what the IO Controller is using.

Once the DAP has been plugged into slot 0, the other slots can be populated. Of some importance with these other modules, is that the Module Identification Number must uniquely define the kind of module (for example, a digital input module must not have the same module identification number as a digital output module). There is one exception to this rule for the DAP. It is allowed to have a DAP with or without a PDEV, but with the same module identification number.

HMS recommends that the host application, if possible, store, in nonvolatile memory, the DAP used last time and uses that DAP after power-cycle. The reason for doing so is to reduce time for connection establishment. If no DAP is stored DAP2 shall be used. If it is not possible for the host application to store the most recently used DAP, the host application should always plug DAP2 initially.

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