Fieldbus Appendix
Anybus-S FL-NET

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About This Document

How To Use This Document

This document is intended to be used in conjunction with the Anybus-S Parallel Design Guide. The reader is expected to have sufficient knowledge in the FL-NET networking system to be able to understand the terms and concepts used in this document.

For general information about the Anybus-S platform, please consult the general Anybus-S/M Parallel Design Guide.

Note: This document describes the functionality offered by the latest firmware release. Some features may be missing or working somewhat differently in older releases. Contact HMS to obtain the latest firmware revision.

Important User Information

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

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

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

The examples and illustrations in this document are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular implementation, HMS 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	web
RFC 821 (Network Working Group)	www.ietf.org
RFC 1918 (Network Working Group)	www.ietf.org
Anybus-S/M Parallel Design Guide	www.anybus.com
Protocol Specification for FA control network standard (JIS) (JIS B 3521, JEMA 1479:2002-2.00)	www.jsa.or.jp
Testing Specifications for FA Control Network [FL-net (OPCN-2)] (JEM1480)	www.jema-net.or.jp
Implementation Guidelines of FA Control Network [FL-net (OPCN-2)] (JEM-TR213)	www.jema-net.or.jp
FA Control Network [FL-net (OPCN-2)] Device Profile Common Specification (JEM-TR214)	www.jema-net.or.jp

Document History

Summary of Recent Changes (1.03 - 1.04)

Change	Page(s)
Updated sales and support information	Front page, P-4
Updated wording in environmental specification and EMC (CE) pre-complicance	B-2
Added copyright notice	E-1

Revision List

Revision	Date	Author(s)	Chapter(s)	Description
1.00	2005-12-14	PeP	All	1st official release
1.02	2006-03-02	PeP	1, 2	Misc. minor updates
1.03	2006-10-19	PeP	B, C	Misc. minor updates
1.04	2010-12-03	KeL	P, B, D	Misc. minor updates

Conventions & Terminology

The following conventions are used throughout this document:

- 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 "ANYBUS_INIT" and "END_INIT" commands.
- The term 'Anybus module' is used when referring to the Anybus-S FL-NET
- The term 'application' is used when referring to the hardware that is connected to the Anybus Application Connector.
- 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.
- 16/32 bit values are written in big endian Motorola format
- Floating point values are in the IEEE Standard 754 format

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About the Anybus-S FL-NET

General

The Anybus-S FL-NET provides full FL-NET Class 1 functionality via the patented Anybus-S application interface. Any device supporting this standard can take advantage of the features offered by the module, providing seamless network integration regardless of network type.

FL-NET is a control network, primarily used for interconnection of devices such as PLCs, Robot Controllers and Numerical Control Devices. It features both cyclic and acyclic data exchange capabilities, and uses a token-based communication scheme for data transmission. The Anybus module is classified as a 'Class 1'-node, which means that it supports cyclic data exchange in both directions.

The FL-NET communication is carried out through IP/UDP broadcast messages on ports 55000 through 55003.

Features

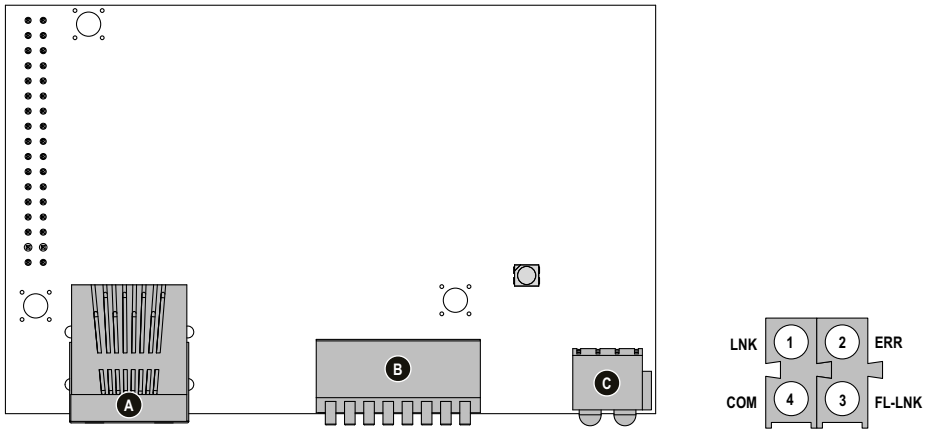
- **FL-NET Class 1 node**
- **Supports shielded (FTP) and unshielded (UTP) cables**
- **Customizable identity/profile information**
- **Up to 1024 bytes cyclical I/O in each direction**
- **Up to 2048 bytes acyclical I/O in each direction**

Fieldbus Conformance Notes

Preliminary/Pending:

This product is pre-certified for network compliance. While this is done to ensure that the final product *can* be certified, it does not necessarily mean that the final product will not require recertification. Contact HMS for further information.

External View



#	Description	Comment
A	Ethernet Connector	For more information, see C-1 “Connectors”
B	Switches	IP configuration switches, see below.
C	Status Indicators	These LEDs indicate run time status and errors to the user, see below.

Status Indicators

#	Indication	State	Description
1	LNK	Green	Link established
		Off	No link established
2	ERR	Red	Unit needs to be replaced (e.g. invalid MAC ID)... or... Anybus watchdog enabled and not updated properly
		Red, flashing	Parameter error
		Off	Normal state
3	FL-LNK	Green	Participating on FL-NET
		Off	Not participating on FL-NET
4	COM	Green	Packet received or transmitted
		Off	No activity

Switches

The on-board switches may be used to set the last byte of the IP address. Note that the switches are read once during startup, i.e. any changes require a reset in order to have effect.

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	IP
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	(invalid)
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	192.168.250.1
OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	192.168.250.2
...	...	...	...	...	...	...	...	...
ON	ON	ON	ON	ON	ON	OFF	ON	192.168.250.253
ON	ON	ON	ON	ON	ON	ON	OFF	192.168.250.254
ON	ON	ON	ON	ON	ON	ON	ON	(invalid)

See also...

- Mailbox Commands (See 9-2 “General Configuration Commands”)

Basic Operation

General

Software Requirements

No additional network support code needs to be written in order to support the Anybus-S FL-NET, however due to the nature of the FL-NET networking system, cyclic data exchange requires an additional fieldbus-specific mailbox command to be issued during initialisation.

The module supports the following settings in ANYBUS_INIT:

- **Input I/O Length**
  Up to 1024 bytes
- **Input DPRAM Length**
  Up to 512 bytes
- **Input Total Length**
  Up to 2048 bytes
- **Output I/O Length**
  Up to 1024 bytes
- **Output DPRAM Length**
  Up to 512 bytes
- **Output Total Length**
  Up to 2048 bytes

Device Identity

Generic Implementation

In a generic implementation (i.e. no network specific support is implemented) the module will appear as a generic HMS device with the following identity information:

Information	Default Value
Revision Number	0 (zero)
Revision Date Year	2005
Revision Date Month	July
Revision Date Day	1st
Device Type	'OTHER'
Vendor Name	'HMS'
Product Name	'ABS-FLN'
Device-specific Data	(none)

Advanced Implementation

By implementing the fieldbus-specific mailbox commands 'SET_PROFILE' and 'SET_PROFILE_SPEC', the module can be customized to appear as a vendor-specific implementation rather than a generic HMS device.

See also...

- 3-15 "Set Profile (SET_PROFILE)"
- 3-17 "Set Profile Device Specific (SET_PROFILE_SPEC)"

Initialisation Sequence

General

FL-NET is based on the concept of a large common memory area, which is shared between all nodes on the network. In order for the module to be able to participate on the network, the application must declare how (and where) the Anybus I/O areas shall be represented in this common memory. This is achieved by issuing the mailbox command MAP_IO_AREAS during initialisation as follows:

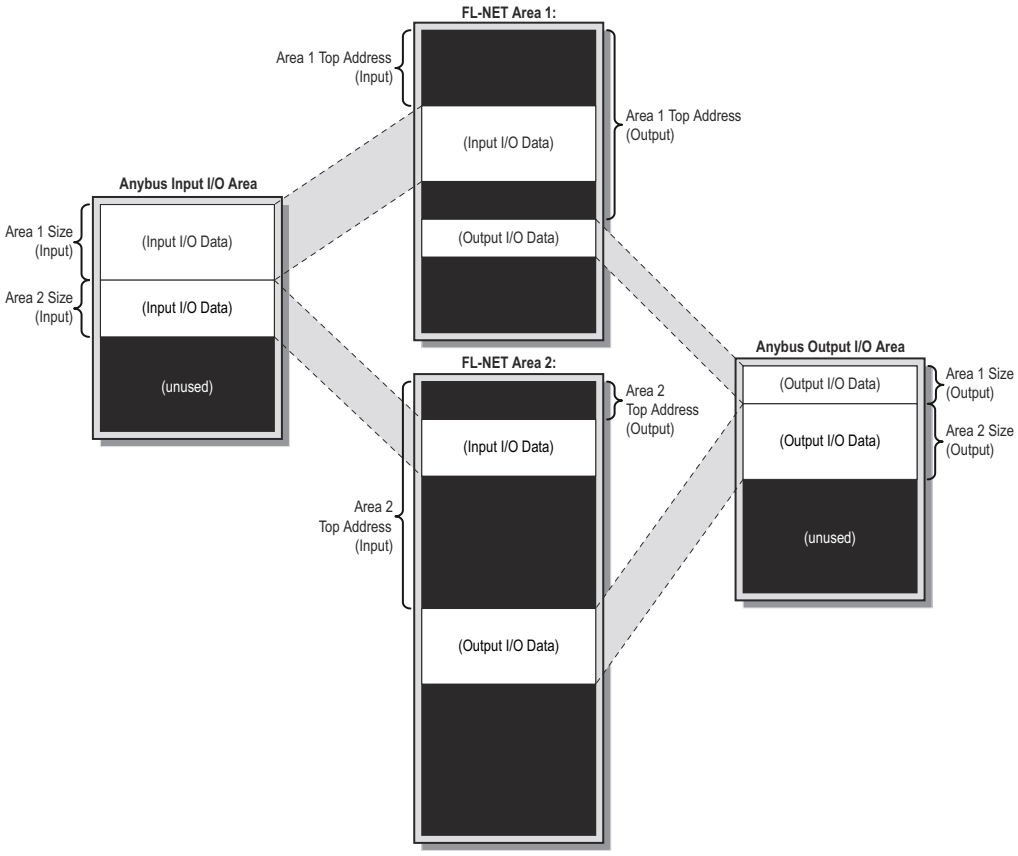
1. **START_INIT**
2. **ANYBUS_INIT**

   (See 2-1 "Software Requirements")
3. **MAP_IO_AREAS**

   This command maps a specified amount of I/O Data to Area 1 and 2 on FL-NET (see also 3-11 "Map FL-NET I/O (MAP_IO_AREAS)"). If this this step is omitted, no cyclic data exchange is possible.
4. **END_INIT**

Overview of Mapping Parameters (MAP_IO_AREAS)

The following figure illustrates the function of the different parameters in the MAP_IO_AREAS command. For more information, see 3-11 "Map FL-NET I/O (MAP_IO_AREAS)".



Data Representation

I/O Data (Cyclic Transfer)

The I/O Data portions of the Input- and Output Data areas are represented in FL-NET memory through Area 1 and Area 2. The size and location of the I/O Data must be declared during initialisation using ANYBUS_INIT and MAP_IO_AREAS, or no cyclic data exchange will take place.

See also...

- 2-2 “Initialisation Sequence”
- 2-2 “Overview of Mapping Parameters (MAP_IO_AREAS)”
- 2-4 “Implemented Network Services”
- 3-11 “Map FL-NET I/O (MAP_IO_AREAS)”

Parameter Data (Acyclical Read/Write Services)

The Parameter Data areas can be accessed from FL-NET through acyclical Read/Write services.

FL-NET			Anybus	
Word Address	**Byte Address**	**Access**	**Area**	**Byte Offset**
0000 0000h	0000 0000h	RO	Parameter Data (Input)	0
	0000 0001h	RO		1
0000 0001h	0000 0002h	RO		3
	0000 0003h	RO		4
...	...	...	...	...
0000 03FEh	0000 07FCh	RO	Parameter Data (Input)	2044
	0000 07FDh	RO		2045
0000 03FFh	0000 07FEh	RO		2046
	0000 07FFh	RO		2047
0000 0400h ... 0000 07FFh	0000 0800h ... 0000 0FFFh	-	(reserved)	(reserved)
0000 0800h	0000 1000h	R/W	Parameter Data (Output)	0
	0000 1001h	R/W		1
0000 0801h	0000 1002h	R/W		3
	0000 1003h	R/W		4
...	...	...	...	...
0000 0BFEh	0000 17FCh	R/W	Parameter Data (Output)	2044
	0000 17FDh	R/W		2045
0000 0BFFh	0000 17FEh	R/W		2046
	0000 17FFh	R/W		2047
0000 0C00h ... xxxx xxxxh	0000 1800h ... xxxx xxxxh	-	(reserved)	(reserved)

See also...

- 2-4 “Implemented Network Services”

Implemented Network Services

Classification	Service	Comments
Cyclic transfer	Area 1	Used for cyclic data exchange. See also... • 2-3 “Data Representation”
	Area 2	
Message transfer	Byte block read service	Used for acyclic data exchange. See also... • 2-3 “Data Representation”
	Byte block write service	
	Word block read service	
	Word block write service	
	Network parameter read service	See also... • 3-14 “Set Network Parameters (SET_NW_PARAM)” • 3-15 “Set Profile (SET_PROFILE)”
	Network parameter write service	(not supported)
	Stop command service	These commands affects the Start/Stop information in the fieldbus specific area. See also... • 3-18 “FL-NET Services (FLNET_SERVICES)” • 4-1 “Fieldbus Specific Area”
	Start command service	
	Profile read service	See 3-15 “Set Profile (SET_PROFILE)”
	Transparent message service	(not supported)
	Log data read service	Returns the log data. All defined data fields are supported. See also... • 3-25 “Get Communication Log (GET_LOG)”
	Log data clear service	Clears all log entries. See also... • 3-25 “Get Communication Log (GET_LOG)”
	Message echo back service	Used for testing purposes only.
	Vendor specific message	(not supported)
Network control	This node control table	Implemented according to the FL-NET specification.
	Participating node table	
	Network control table	

Fieldbus Specific Mailbox Commands

Overview

Configuration Commands

Mailbox Commands	Description	Page
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Get IP Configuration (GET_IP_CONFIG)	-	3-7
Get MAC Address (GET_MAC_ADDR)	-	3-8
Set MAC Address (SET_MAC_ADDR)	-	3-9
Get DIP Switch (GET_DIP_SWITCH)	-	3-10

FL-NET-related Commands

Mailbox Commands	Description	Page
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Set Profile Device Specific (SET_PROFILE_SPEC)	-	3-17
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Get Local Node Management Table (GET_LOCAL_MNGMT)	-	3-19
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Get Network Management Table (GET_NET_MNGMT)	-	3-23
Get Communication Log (GET_LOG)	-	3-25

Fault Codes (Fault Information)

Code	Description
0001h	Invalid IP-address or Subnet mask
0002h	Mapping of data failed
0003h	Failed to allocate required memory
0004h	Invalid watchdog time
0005h	Invalid frame interval time
0006h	Command failed
0007h	Invalid Run/Stop value
0008h	Invalid ULS value
0009h	Fragmentation error
000Ah	Invalid revision date
000Bh	Invalid device type
000Ch	Invalid vendor name
000Dh	Invalid product name

Configuration Commands

Set IP Configuration (SET_IP_CONFIG)

Description

This command can be used to override the on-board switches.

Note: This command may only be issued during initialisation.

Command initiator	Application
Command number	0001h
Extended Header data	Fault information
Message data	Network settings.
Response message	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	0001h	0001h	*SET_IP_CONFIG*
Data size	0004h	0004h	*4 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	-	Fault information	
Message dataword 1	IP address (high)	IP address (high)	
Message dataword 2	IP address (low)	IP address (low)	

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **IP address**

  FL-NET normally uses the address range 192.168.250.xxx.

Get IP Configuration (GET_IP_CONFIG)

Description

This command returns the currently used IP address.

Note: This command may only be issued during runtime.

Command initiator	Application
Command number	0002h
Extended Header data	-
Message data	-
Response message	Currently used IP address.

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	*Fieldbus Specific Message*
Command	0002h	0002h	*GET_IP_CONFIG*
Data size	0000h	0004h	*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	-	-	
		IP address (high)	**Response dataword 1**
		IP address (low)	**Response dataword 2**

- **IP address**

  Currently used IP address.

Get MAC Address (GET_MAC_ADDR)

Description

This command returns the MAC address of the module.

Command initiator	Application
Command number	0004h
Extended Header data	-
Message data	-
Response message	MAC Address, 6 bytes

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	*Fieldbus Specific Message*
Command	0004h	0004h	*GET_MAC_ADDR*
Data size	0000h	0006h	*6 bytes of data (3 words)*
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	-	-	
		MAC Address (high)	**Response dataword 1**
		MAC Address (mid)	**Response dataword 2**
		MAC Address (low)	**Response dataword 3**

- **MAC Address**

  Currently used MAC address.

Set MAC Address (SET_MAC_ADDR)

Description

This command temporarily changes the MAC address of the module.

Note: This command may only be issued during initialization.

Command initiator	Application
Command number	0005h
Extended Header data	-
Message data	MAC Address, 6 bytes
Response message	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	0005h	0005h	*SET_MAC_ADDR*
Data size	0006h	0006h	*6 bytes of data (3 words)*
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 dataword 1	MAC Address (high)	MAC Address (high)	
Message dataword 2	MAC Address (mid)	MAC Address (mid)	
Message dataword 3	MAC Address (low)	MAC Address (low)	

- **MAC Address**
  Desired MAC Address.

Get DIP Switch (GET_DIP_SWITCH)

Description

This command returns the binary value of the on-board DIP-switches.

Command initiator	Application
Command number	0003h
Extended Header data	-
Message data	-
Response message	Value of switches

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	*Fieldbus Specific Message*
Command	0003h	0003h	*GET_DIP_SWITCH*
Data size	0000h	0001h	*1 data byte*
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	-	-	
		Switch value	**Response byte 1**

- **Switch value**

  Current value of onboard switches.

FL-NET-related Commands

Map FL-NET I/O (MAP_IO_AREAS)

Description

This command maps two blocks from the Input I/O area, and two blocks from the Output I/O area, to FL-NET shared memory, Area 1 and 2.

See also...

- 2-2 "Initialisation Sequence"
- 2-2 "Overview of Mapping Parameters (MAP_IO_AREAS)"

Command initiator	Application
Command number	0020h
Extended Header data	Fault information
Message data	Top address and sizes for Area 1 and 2.
Response message	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	0020h	0020h	*MAP_IO_AREAS*
Data size	0010h	0010h	*16 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	-	Fault information	
Message dataword 1	Area 1 Top Address (Input)	Area 1 Top Address (Input)	
Message dataword 2	Area 1 Size (Input)	Area 1 Size (Input)	
Message dataword 3	Area 2 Top Address (Input)	Area 2 Top Address (Input)	
Message dataword 4	Area 2 Size (Input)	Area 2 Size (Input)	
Message dataword 5	Area 1 Top Address (Output)	Area 1 Top Address (Output)	
Message dataword 6	Area 1 Size (Output)	Area 1 Size (Output)	
Message dataword 7	Area 2 Top Address (Output)	Area 2 Top Address (Output)	
Message dataword 8	Area 2 Size (Output)	Area 2 Size (Output)	

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Area 1 Top Address (Input)**[1]

  Target location in Area 1 for Input I/O data block #1.

- **Area 1 Size (Input)**[1]

  Total size (Area 1+2) must be less or equal to the Input I/O length specified in ANYBUS_INIT.

- **Area 2 Top Address (Input)**[1]

  Target location in Area 1 for Input I/O data block #2.

- **Area 2 Size (Input)**[1]

  Total size (Area 1+2) must be less or equal to the Input I/O length specified in ANYBUS_INIT.

- **Area 1 Top Address (Output)**[1]

  Target location in Area 1 for Output I/O data block #1.

- **Area 1 Size (Output)**[1]

  Total size (Area 1+2) must be less or equal to the Output I/O length specified in ANYBUS_INIT.

- **Area 2 Top Address (Output)**[1]

  Target location in Area 1 for Output I/O data block #2.

- **Area 2 Size (Output)**[1]

  Total size (Area 1+2) must be less or equal to the Output I/O length specified in ANYBUS_INIT.

See also...

- 2-2 "Overview of Mapping Parameters (MAP_IO_AREAS)"

1. Sizes and addresses are specified in words.

Set Upper Layer Status (SET_UL_STATUS)

Description

This command can be used to specify the upper layer status information.

Command initiator	Application
Command number	0021h
Extended Header data	Fault information
Message data	Upper layer status information.
Response message	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	0021h	0021h	*SET_UL_STATUS*
Data size	0004h	0004h	*4 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	-	Fault information	
Message data byte 1	Operation Information	Operation Information	
Message data byte 2	Error Information	Error Information	
Message data byte 3	U_ERR_CODE (bits 11... 8)	U_ERR_CODE (bits 11... 8)	
Message data byte 4	U_ERR_CODE (bits 7... 0)	U_ERR_CODE (bits 7... 0)	

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Operation Information**

  0: Run (default)
  1: Stop

- **Error Information**

  0: Normal (default)
  1: Warning
  2: Alarm

- **U_ERR_CODE**

  Contents of error in upper layer.

Set Network Parameters (SET_NW_PARAM)

Description

This command is used to set the FL-NET network parameters.

Note: This command may only be issued during initialisation.

Command initiator	Application
Command number	0022h
Extended Header data	Fault information
Message data	Network settings.
Response message	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	0022h	0022h	*SET_NW_PARAM*
Data size	000Ch	000Ch	*12 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	-	Fault information	
Message data byte 1	TW	TW	
Message data byte 2	MFT	MFT	
Message data byte 3... 12	Node Name	Node Name	

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **TW (Token Watchdog Time)**

  Valid range: 2... 255 (in units of 1ms). Default is 50.

- **MFT (Minimum Frame Interval Time)**

  Valid range: 0... 50 (in units of 100µs). Default is 5.

- **Node Name**

  Node name in ASCII, padded with spaces (20h). Default is NULL.

Set Profile (SET_PROFILE)

Description

This command is used to specify the common part of the FL-NET profile.

Note: This command may only be issued during initialisation.

Command initiator	Application
Command number	0023h
Extended Header data	Fault information
Message data	Profile data, common part.
Response message	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	0023h	0023h	*SET_PROFILE*
Data size	(size)	(size)	*(size of data)*
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	-	-	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
Message data byte 1	Revision Number	Revision Number	
Message data byte 2	Revision Date Year (high)	Revision Date Year (high)	
Message data byte 3	Revision Date Year (low)	Revision Date Year (low)	
Message data byte 4	Revision Date Month	Revision Date Month	
Message data byte 5	Revision Date Day	Revision Date Day	
Message data...	Device Type (string, null terminated)	Device Type (string, null terminated)	
	Vendor Name (string, null terminated)	Vendor Name (string, null terminated)	
	Product Name (string, null terminated)	Product Name (string, null terminated)	

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Revision Number**

  Revision number of product. Default is 0 (zero).

- **Revision Date Year**

  Year of revision. Default is 2005.

- **Revision Date Month**

  Month of revision. Default is 07h (July).

- **Revision Date Day**

  Day of revision. Default is 01h (1st).

- **Device Type**

  ASCII string, null terminated. Default is 'OTHER'.

- **Vendor Name**

  ASCII string, null terminated. Default is 'HMS'.

- **Product Name**

  ASCII string, null terminated. Default is 'ABS-FLN'.

Set Profile Device Specific (SET_PROFILE_SPEC)

Description

This command is used to specify the device-specific part of the FL-NET profile. If this command hasn't been issued, no device-specific data will be returned in response to a 'Profile Read'-request.

Note: This command may only be issued during initialisation.

Command initiator	Application
Command number	0024h
Extended Header data	Fault information
Message data	Profile data, device-specific part (ASN.1 coded)
Response message	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	0024h	0024h	*SET_PROFILE_SPEC*
Data size	(size)	(size)	*(size of data)*
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...	Profile Data	Profile Data	

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Profile Data**

  Device-specific profile data, ASN.1 coded.

FL-NET Services (FLNET_SERVICES)

Description

This command enables/disables optional services on FL-NET.

Note: This command may only be issued during initialisation.

Command initiator	Application
Command number	0025h
Extended Header data	Fault information
Message data	Network settings.
Response message	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	0025h	0025h	*FLNET_SERVICES*
Data size	0002h	0002h	*2 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	-	Fault information	
Message data byte 1	Block read/write services	Block read/write services	
Message data byte 2	Start/Stop Services	Start/Stop Services	

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Block read/write services**

  0: Disabled
  1: Enabled (default)

- **Start/Stop Services**

  0: Disabled (default)
  1: Enabled

Get Local Node Management Table (GET_LOCAL_MNGMT)

Description

This command retrieves the local node management table.

Command initiator	Application
Command number	0026h
Extended Header data	Fault information
Message data	-
Response message	Local node management table

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	*Fieldbus Specific Message*
Command	0026h	0026h	*GET_LOCAL_MNGMT*
Data size	0000h	002Eh	*46 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	-	Fault information	
		Node number	**Response data byte 1**
		Area 1 top address (high)	**Response data byte 2**
		Area 1 top address (low)	**Response data byte 3**
		Area 1 size (high)	**Response data byte 4**
		Area 1 size (low)	**Response data byte 5**
		Area 2 top address (high)	**Response data byte 6**
		Area 2 top address (low)	**Response data byte 7**
		Area 2 size (high)	**Response data byte 8**
		Area 2 size (low)	**Response data byte 9**
		ULS (high)	**Response data byte 10**
		ULS (low)	**Response data byte 11**
		TW	**Response data byte 12**
		Allowable MFT	**Response data byte 13**
		Vendor Code [1... 10]	**Response data byte 14-23**
		Manufacturer Name [1... 10]	**Response data byte 24-33**
		Node Name [1... 10]	**Response data byte 34-43**
		Protocol Type	**Response data byte 44**
		LKS	**Response data byte 45**
		Own-node Status	**Response data byte 46**

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Node Number**

  Our node number (low byte of IP address).

- **Area 1 Top Address**

  Corresponds to the 'Area 1 Top Address (Input)'-value specified during initialisation, see 3-11 "Map FL-NET I/O (MAP_IO_AREAS)".

- **Area 1 Size**

  Corresponds to the 'Area 1 Size (Input)'-value specified during initialisation, see 3-11 "Map FL-NET I/O (MAP_IO_AREAS)".

- **Area 2 Top Address**

  Corresponds to the 'Area 2 Top Address (Input)'-value specified during initialisation, see 3-11 "Map FL-NET I/O (MAP_IO_AREAS)".

- **Area 2 Size**

  Corresponds to the 'Area 2 Size (Input)'-value specified during initialisation, see 3-11 "Map FL-NET I/O (MAP_IO_AREAS)".

- **ULS (Upper Layer Status)**

  See 4-2 "ULS (Upper Layer Status)".

- **TW (Token Watchdog Time)**

  See 3-14 "Set Network Parameters (SET_NW_PARAM)".

- **MFT (Allowable Minimum Frame Interval)**

  See 3-14 "Set Network Parameters (SET_NW_PARAM)".

- **Vendor Code**

  ASCII string, 10 characters, padded with space (20h).

- **Manufacturer Name**

  ASCII string, 10 characters, padded with space (20h).

- **Node Name**

  ASCII string, 10 characters, padded with space (20h).

- **Protocol Type**

  Fixed value: 80h.

- **LKS (FA Link Status)**

  See 4-1 "LKS (FA Link Status)".

- **Own-node Status**

  See 4-2 "Own Node Status".

Get Participating Node Management Table (GET_PART_MNGMT)

Description

This command retrieves the management table of a participating node.

Command initiator	Application
Command number	0027h
Extended Header data	Node number + Fault information
Message data	-
Response message	Participant node's management table

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	*Fieldbus Specific Message*
Command	0027h	0027h	*GET_PART_MNGMT*
Data size	0000h	000Fh	*15 bytes*
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Node Number	Node Number	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
		ULS (high)	**Response data byte 1**
		ULS (low)	**Response data byte 2**
		Area 1 top address (high)	**Response data byte 3**
		Area 1 top address (low)	**Response data byte 4**
		Area 1 size (high)	**Response data byte 5**
		Area 1 size (low)	**Response data byte 6**
		Area 2 top address (high)	**Response data byte 7**
		Area 2 top address (low)	**Response data byte 8**
		Area 2 size (high)	**Response data byte 9**
		Area 2 size (low)	**Response data byte 10**
		RCT (high)	**Response data byte 11**
		RCT (low)	**Response data byte 12**
		TW	**Response data byte 13**
		MFT	**Response data byte 14**
		LKS	**Response data byte 15**

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Node Number**

  Number of the participating node of which information shall be returned.

- **ULS (Upper Layer Status)**

  ULS for the participating node (node number specified by 'Node Number')

- **Area 1 Top Address**

  Area 1 Top Address for the participating node (node number specified by 'Node Number')

- **Area 1 Size**

  Area 1 Size for the participating node (node number specified by 'Node Number')

- **Area 2 Top Address**

  Area 2 Top Address for the participating node (node number specified by 'Node Number')

- **Area 2 Size**

  Area 2 Size for the participating node (node number specified by 'Node Number')

- **RCT (Allowable Refresh Cyclic Time)**

  RTC for the participating node (node number specified by 'Node Number')

- **TW (Token Watchdog Time)**

  TW for the participating node (node number specified by 'Node Number')

- **MFT (Allowable Minimum Frame Interval)**

  MFT for the participating node (node number specified by 'Node Number')

- **LKS (FA Link Status)**

  LKS for the participating node (node number specified by 'Node Number')

Get Network Management Table (GET_NET_MNGMT)

Description

This command returns the network management table.

Command initiator	Application
Command number	0028h
Extended Header data	Fault information
Message data	-
Response message	Network management table

Command and response layout

	Command	Expected response	
Message ID	(ID)	(ID)	
Message information	4002h	0002h	*Fieldbus Specific Message*
Command	0028h	0028h	*GET_NET_MNGMT*
Data size	0000h	000Ah	*10 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	-	Fault information	
		Token latch node number	**Response data byte 1**
		MFT	**Response data byte 2**
		RCT (high)	**Response data byte 3**
		RCT (low)	**Response data byte 4**
		RMT - current value (high)	**Response data byte 5**
		RMT - current value (low)	**Response data byte 6**
		RMT - maximum value (high)	**Response data byte 7**
		RMT - maximum value (low)	**Response data byte 8**
		RMT - minimum value (high)	**Response data byte 9**
		RMT - minimum value (low)	**Response data byte 10**

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Token latch node number**

  Current token owner; range: 1... 254.

- **MFT (Min. separation of frames)**

  In units of 100µs.

- **RCT (Allowable Refresh Cycle Time)**

  In units of 1ms.

- **RMT (Refresh Cycle Measurement Time) - Current value**

  Current value in units of 1ms.

- **RMT (Refresh Cycle Measurement Time) - Maximum value**

  Maximum value in units of 1ms.

- **RMT (Refresh Cycle Measurement Time) - Minimum value**

  Minimum value in units of 1ms.

Get Communication Log (GET_LOG)

Description

This command returns the FL-NET communication log.

Command initiator	Application
Command number	0029h
Extended Header data	Fragmentation Control, Fragmentation Info, Fault information
Message data	-
Response message	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	0029h	0029h	*GET_LOG*
Data size	0000h	(size)	*(size of data)*
Frame count	0001h	0001h	
Frame number	0001h	0001h	
Offset high	0000h	0000h	
Offset low	0000h	0000h	
Extended word 1	Fragmentation Control	Fragmentation Info	
Extended word 2	-	-	
Extended word 3	-	-	
Extended word 4	-	-	
Extended word 5	-	-	
Extended word 6	-	-	
Extended word 7	-	-	
Extended word 8	-	Fault information	
		Log Data	**Response data...**

- **Fault Information**

  If the Message Information word in the header of the response indicates 'Invalid Other', this register holds additional fault information. See also 3-5 "Fault Codes (Fault Information)".

- **Fragmentation Control**

  0: Get 1st fragment
  1: Get next fragment

- **Fragmentation Info**

  0: The response holds the 1st fragment
  1: The response holds a subsequent fragment
  2: The response holds the last fragment

- **Log Data**

  This data is fragmented, which means that the command must be issued repeatedly until the 'Fragmentation Info'-word indicates that all data has been returned (i.e. until it equals 2 (last fragment)).

Fieldbus Specific Area

Location	Contents	Access
640h	Run/Stop Received	RO
641h	LKS	RO
642h... 643h	ULS	RO
644h	Own Node Status	RO
645h	MFT	RO
646h... 665h	Participating Node Table	RO
666h... 7BFh	(reserved)	-

- **Run/Stop Received**

  Contains the last Run/Stop received from FL-NET (if enabled).

  00h: Default value
  01h: Stop
  02h: Run

  See also...

  - 2-4 “Implemented Network Services”
  - 3-13 “Set Upper Layer Status (SET_UL_STATUS)”
  - 3-18 “FL-NET Services (FLNET_SERVICES)”

- **LKS (FA Link Status)**

Bit	Contents	Clear (0)	Set (1)
0	Node status	Out-ring	In-ring
1	Invalid communication	Not detected	Detected
2	(reserved)	(ignore)	(ignore)
3			
4	Upper layer operation signal error	No error	Error
5	Common memory data validity flag	Not valid	Valid
6	Common memory (top address/size) setting completion	Not complete	Complete
7	Address duplication	No error	Error

- **ULS (Upper Layer Status)**

Bit	Contents	Clear (0)	Set (1)
15	RUN/STOP	STOP	RUN
14	ALARM	-	ALARM
13	(reserved)	(ignore)	(ignore)
12	WARNING	-	WARNING
11	U_ERR_CODE	-	-
10			
...			
1			
0			

See also...
- 3-13 “Set Upper Layer Status (SET_UL_STATUS)”

- **Own Node Status**

Bit	Contents	Clear (0)	Set (1)
7	Reception waiting	Normal	Waiting
6	Duplicated node number	No error	Error
5	Initialisation error	No error	Error
4	Token watchdog error	No error	Error
3	(reserved)	(ignore)	(ignore)
2			
1			
0			

- **MFT (Allowable Minimum Frame Interval)**

See also...
- 3-14 “Set Network Parameters (SET_NW_PARAM)”

- **Participating Node Table**

Location	b7	b6	b5	b4	b3	b2	b1	b0
646h	node 7	node 6	node 5	node 4	node 3	node 2	node 1	node 0
647h	node 15	node 14	node 13	node 12	node 11	node 10	node 9	node 8
648h	node 23	node 22	node 21	node 20	node 19	node 18	node 17	node 16
649h	node 31	node 30	node 29	node 28	node 27	node 26	node 25	node 24
...	...	...	...	...	...	...	...	...
663h	node 239	node 238	node 237	node 236	node 235	node 234	node 233	node 232
664h	node 247	node 246	node 245	node 244	node 243	node 242	node 241	node 240
665h	node 255	node 254	node 253	node 252	node 251	node 250	node 249	node 248

0: Not participating
1: Participating

Implementation Details

Control Register Area

Fieldbus Type Value

The fieldbus type value for this product is 0086h.

Module Type Value

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 module will cease all network participation and indicate an error by turning the ERROR-led red.

Event Notification Cause/Source Registers

- **ON/OFF Line Indication (FBON/FBOF)**
  The module is considered on-line when Node Status equals 'in-ring'.
  See also...
  - 4-1 "LKS (FA Link Status)" (641h)
- **Network Reset Functionality (RST)**
  Not supported, since FL-NET does not implement such features.

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.

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

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

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

Humidity

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

Tests 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 FL-NET at www.anybus.com.

Connectors

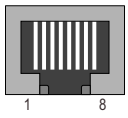
Application Connector

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

Ethernet

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	-	

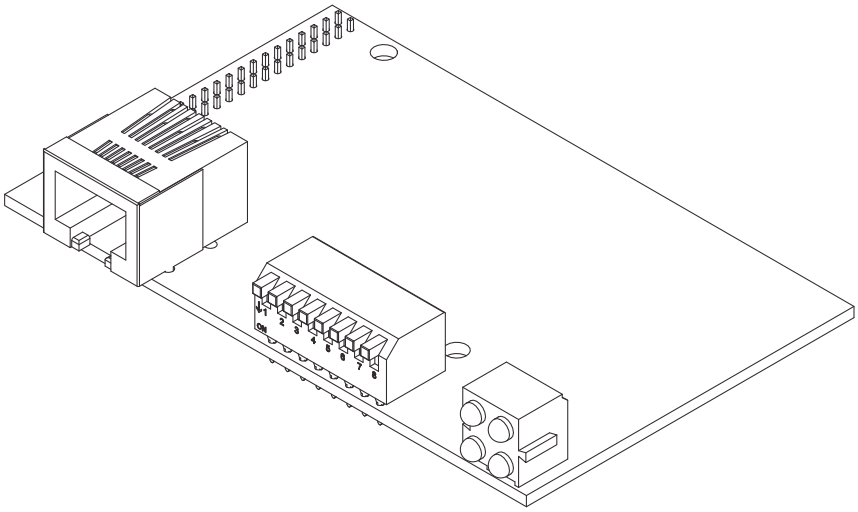


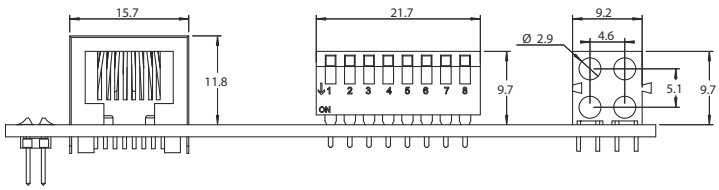
Board to Board

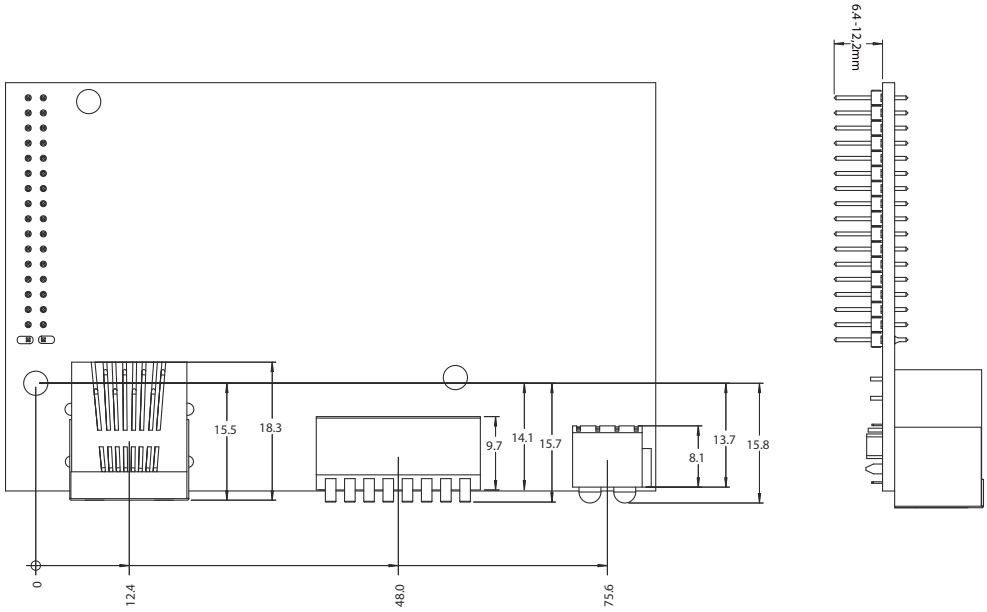
Pin	Signal	Connect to RJ45 pin...	Notes
1	Shield	Housing	-
2	-	4	(See notes for pins 4 and 5 in RJ45 connector)
3	-	5	
4	-	-	(not used)
5	TD+	1	-
6	TD-	2	-
7	RD+	3	-
8	-	7	(See notes for pins 7 and 8 in RJ45 connector)
9	RD-	6	-
10	-	8	(See notes for pins 7 and 8 in RJ45 connector)

Mechanical Specification

Measurements, Connectors & LEDs







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