Motoman NX100 Controller

Fieldbus (XFB01) Instruction Manual

Optional Anybus Interface Board

Part Number: 147380-2
Revision: 0

MOTOMAN a YASKAWA company

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Chapter 1
Introduction

1.1 About This Document

This manual provides instructions for the optional Fieldbus (XFB01) board and contains the following sections:

SECTION 1 - INTRODUCTION
Provides general information about the structure of this manual, a list of reference documents, and customer service information.

SECTION 2 - SAFETY
This section provides information regarding the safe use and operation of Motoman products.

SECTION 3 - FIELDBUS (XFB01) USER'S MANUAL
Provides detailed instructions for Fieldbus (XFB01), including installation, specifications, and operation.

1.2 Reference to Other Documentation

For additional information refer to the following:

- NX100 Controller Manual (P/N 149201-1)
- Concurrent I/O Manual (P/N 149230-1)
- Manipulator Manual for your robot
- Operator's Manual for your application
- Vendor manuals for system components not manufactured by Motoman

1.3 Customer Service Information

If you are in need of technical assistance, contact the Motoman service staff at (937) 847-3200. Please have the following information ready before you call:

- Robot Type (EA1400N, EA1900N, etc.)
- Application Type (arcwelding, spot welding, handling)
- Robot Serial Number (located on back side of robot arm)
- Robot Sales Order Number (located on back of controller)

Chapter 2
Safety

2.1 Introduction

It is the purchaser's responsibility to ensure that all local, county, state, and national codes, regulations, rules, or laws relating to safety and safe operating conditions for each installation are met and followed.

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems. This information can be obtained from the Robotic Industries Association by requesting ANSI/RIA R15.06-1999. The address is as follows:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338
INTERNET: www.roboticsonline.com

Ultimately, the best safeguard is trained personnel. The user is responsible for providing personnel who are adequately trained to operate, program, and maintain the robot cell. **The robot must not be operated by personnel who have not been trained!**

We recommend that all personnel who intend to operate, program, repair, or use the robot system be trained in an approved Motoman training course and become familiar with the proper operation of the system.

This safety section addresses the following:

- Standard Conventions (Section 2.2)
- General Safeguarding Tips (Section 2.3)
- Mechanical Safety Devices (Section 2.4)
- Installation Safety (Section 2.5)
- Programming, Operation, and Maintenance Safety (Section 2.6)

2.2 Standard Conventions

This manual includes the following alerts – in descending order of severity – that are essential to the safety of personnel and equipment. As you read this manual, pay close attention to these alerts to insure safety when installing, operating, programming, and maintaining this equipment.

DANGER!
Information appearing in a DANGER concerns the protection of personnel from the immediate and imminent hazards that, if not avoided, will result in immediate, serious personal injury or loss of life in addition to equipment damage.

WARNING!
Information appearing in a WARNING concerns the protection of personnel and equipment from potential hazards that can result in personal injury or loss of life in addition to equipment damage.

CAUTION!
Information appearing in a CAUTION concerns the protection of personnel and equipment, software, and data from hazards that can result in minor personal injury or equipment damage.

Note: Information appearing in a Note provides additional information which is helpful in understanding the item being explained.

2.3 General Safeguarding Tips

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06-1999, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

2.4 Mechanical Safety Devices

The safe operation of the robot, positioner, auxiliary equipment, and system is ultimately the user's responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06-1999 safety standards, and other local codes that may pertain to the installation and use of industrial equipment. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety equipment is provided as standard:

- Safety fences and barriers
- Light curtains and/or safety mats
- Door interlocks
- Emergency stop palm buttons located on operator station, robot controller, and programming pendant

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.

2.5 Installation Safety

Safe installation is essential for protection of people and equipment. The following suggestions are intended to supplement, but not replace, existing federal, local, and state laws and regulations. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. Installation tips are as follows:

- Be sure that only qualified personnel familiar with national codes, local codes, and ANSI/RIA R15.06-1999 safety standards are permitted to install the equipment.
- Identify the work envelope of each robot with floor markings, signs, and barriers.
- Position all controllers outside the robot work envelope.
- Whenever possible, install safety fences to protect against unauthorized entry into the work envelope.
- Eliminate areas where personnel might get trapped between a moving robot and other equipment (pinch points).
- Provide sufficient room inside the workcell to permit safe teaching and maintenance procedures.

2.6 Programming, Operation, and Maintenance Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to program, operate, and maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the robot and work envelope to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Do not enter the robot cell while it is in automatic operation. Be sure that only the person holding the programming pendant enters the workcell.
- Check the E-STOP button on the programming pendant for proper operation before programming. The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.

- Any modifications to PART 1, System Section, of the robot controller concurrent I/O program can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1, System Section. Making any changes without the written permission of Motoman will VOID YOUR WARRANTY!
- Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. YOUR WARRANTY WILL BE VOID if you use these special passwords.
- The robot controller allows modifications of PART 2, User Section, of the concurrent I/O program and modifications to controller parameters for maximum robot performance. Great care must be taken when making these modifications. All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot and other parts of the system. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations.
- Check and test any new or modified program at low speed for at least one full cycle.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Use proper replacement parts.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).

NOTES

OPERATOR'S MANUAL

FIELDBUS INTERFACE XFB01

Upon receipt of this product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN®

Document No: MRS6010GB.0.U

Reference list

MOTOMAN NX100 Installation and wiring manual
Fieldbus appendix (AnyBus manuals form HMS

Revision

050216
First release of this document.

Fieldbus interface board XFB01

1. General

1.1 About this manual

This Instruction manual comprises information about:

- Installation
- Setup

The Fieldbus board is valid for MOTOMAN NX100 (hereafter called NX100).

Text written in **BOLD** letters means command or button.
Text written in *ITALIC* means text shown on display.

ATTENTION!
Observe precautions for handling electrostatic sensitive devices

1.2 The Fieldbus interface board (kit) comprises

- One Carrier board SARCR-XFB01
- One AnyBus® module (see table below)
- One data disk for setup (not necessary for all types)

Bus type	Fieldbus kit, Motoman Part No.		
	Master	Slave	DataTransfer
DeviceNet	347521-90	347521-84	
Profibus DP	347522-90	347522-84	
InterBus-S	347523-90	347523-84	
InterBus-FO		347523-85	
Ethernet		347524-84	
Ethernet MB/TCP FiberOpto		347524-85	
Ethernet MB/TCP +EtherNet/IP +IT		347524-86	
ControlNet		347525-84	
CANOpen		347526-84	
Modbus Plus		347527-84	347527-83
LonWorks		347528-84	347528-83
ASI	347530-90		
Remote I/O			347531-83
CC-link		347532-84	
FIPIO		347529-84	
Modbus RTU		347533-84	

1.2.1 Also needed

- Bus connection cable, Motoman P/N 347198-81, -82
- Power supply cable, Motoman P/N 347194-80, -81
- Terminator, Motoman P/N 347203

1.3 Safety

This equipment is constructed, produced and tested according to the laws of the Member States relating to the EMC-directives (89/336/EEC) and also the LVD-directives (73/23/EEC).

CE

Motoman Robotics Europe AB's responsibility does not cover errors or safety risks that may occur in equipment connected to the Motoman Robotics Europe AB machine, nor errors or safety risks that may occur in the machine caused by equipment connected to the Motoman Robotics Europe AB's machine.

External cables must be connected according to our cable connection guide, see separate document.

1.4 Manufacturer

Address	**Motoman** Robotics Europe AB Box 504 385 25 Torsås Sweden
Telephone:	+46 480 417 800
Telefax:	+46 486 414 10
Type:	SARCR-XFB01

1.5 Introduction

The purpose of this document is to provide instructions for users of the MOTOMAN Fieldbus Interface Board. This document is to provide support for configuration and usage of the fieldbus board (XFB01). For further information regarding fieldbus configuration and programming please refer to the AnyBus manuals or contact the supplier of the PLC-equipment or similar.

This document is limited to the functionality of the XFB01 and the connections to the MOTOMAN Robot Controller (hereafter referred to as NX100). It is assumed that the reader has an understanding of the functionality of the NX100 control system.

1.6 Terms

Throughout this document the term “user“ refers to the person or persons who are installing and programming the NX100 system with an XFB01 installed. The enduser of the robot equipment will be referred to as the customer.

As in all communication systems the terms “inputs“ and “outputs“ can be ambiguous, because their meaning depends on which end of the link that is being referenced. The convention in this document is that “inputs“ and “outputs“ are always being referenced from the NX100 systems end of the link.

1.7 Fieldbus systems

Instead of using traditional wiring to distribute input and output signals, the automation industry more frequently relays on computer communications. By using communication systems cost for material, installation, documentation and maintenance can be greatly reduced. The communication system can also be used for more advanced features like connecting different control systems and to distribute the control functions to intelligent sub-systems, sensors and actuators.

The communication systems used for these tasks are commonly called a fieldbus system. Fieldbus systems are used in all sectors of automation: Factory automation, manufacturing automation, assembly automation, building automation, process automation, etc.

Different systems are used because of different technical requirements of the application. Those different requirements are different levels of bus systems, bus structures, real-time behaviour, amount of data being transferred, transmission media, distribution of power on the communication media. The difference between the technical demands and the fact that no system on the market fulfils all requirements has lead to a wide variety of different fieldbus systems.

When designing a product which includes fieldbus systems it is necessary to also take the local computer network or communication system into consideration. In reality, this means that the Motoman fieldbus board (XFB01) is uniqe for every installation.

1.8 AnyBus®[1]

The AnyBus product range consists of a series of small fieldbus modules. There is one AnyBus module for each fieldbus system. All electronics, software and control for the fieldbus is integrated on the module. All AnyBus modules uses the same standardised product interface.

Since all AnyBus modules uses the same standardised interface the modules can be interchanged with other AnyBus modules without having to change the product design. This standardised interface provides a way to design a product that supports all the major fieldbus systems in one and the same product version. This means that the product does not have to handle the fieldbus characteristics, all that is handled by the AnyBus module.

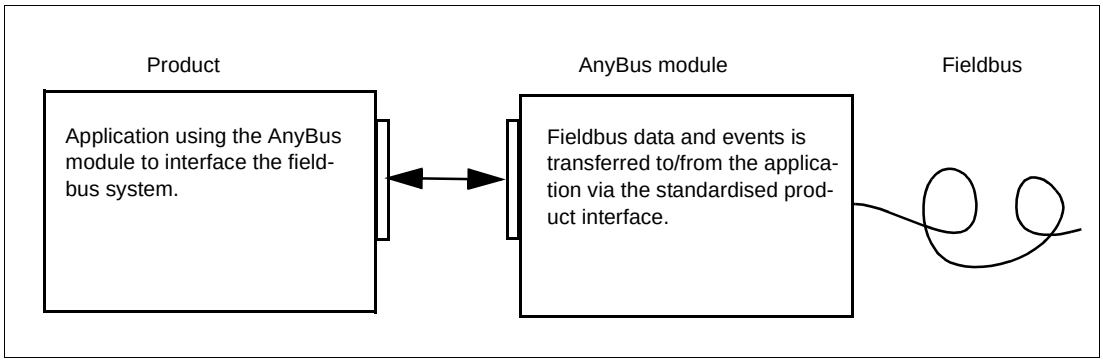

Fig.1 AnyBus system

There are several types of AnyBus modules available, it is only the amount of data to be handled which decides which module is the most appropriate. This means regardless of the complexity of the application, it will be possible to find a suitable AnyBus module.

Since there is one AnyBus available for each significant fieldbus system on the market there is no need to consider fieldbus specific information, set-ups or installation when designing the application.

1.9 Introduction to the Fieldbus Interface Board (XFB01)

The XFB01 is designed to make it possible to connect the NX100 to the most commonly used fieldbus systems on the market. It controls the exchange of data between the NX100 and the AnyBus modules witch constitutes the fieldbus interface.

1.10 Hardware comparability

The XFB01 is electrically compatible with the motherboards in all current models of NX100 cabinets. From the users point of view the fieldbus board will be used as a standard I/O board available for the NX100 system.

The AnyBus interface fulfils the requirements specified by the manufacturer of each fieldbus system.

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1. AnyBus® is a registered trademark of HMS Industrial Networks AB, Halmstad, Sweden

2. Installation

For installation guidlines refer to:
“MOTOMAN NX100 - Installation and wiring, MRS6100”.

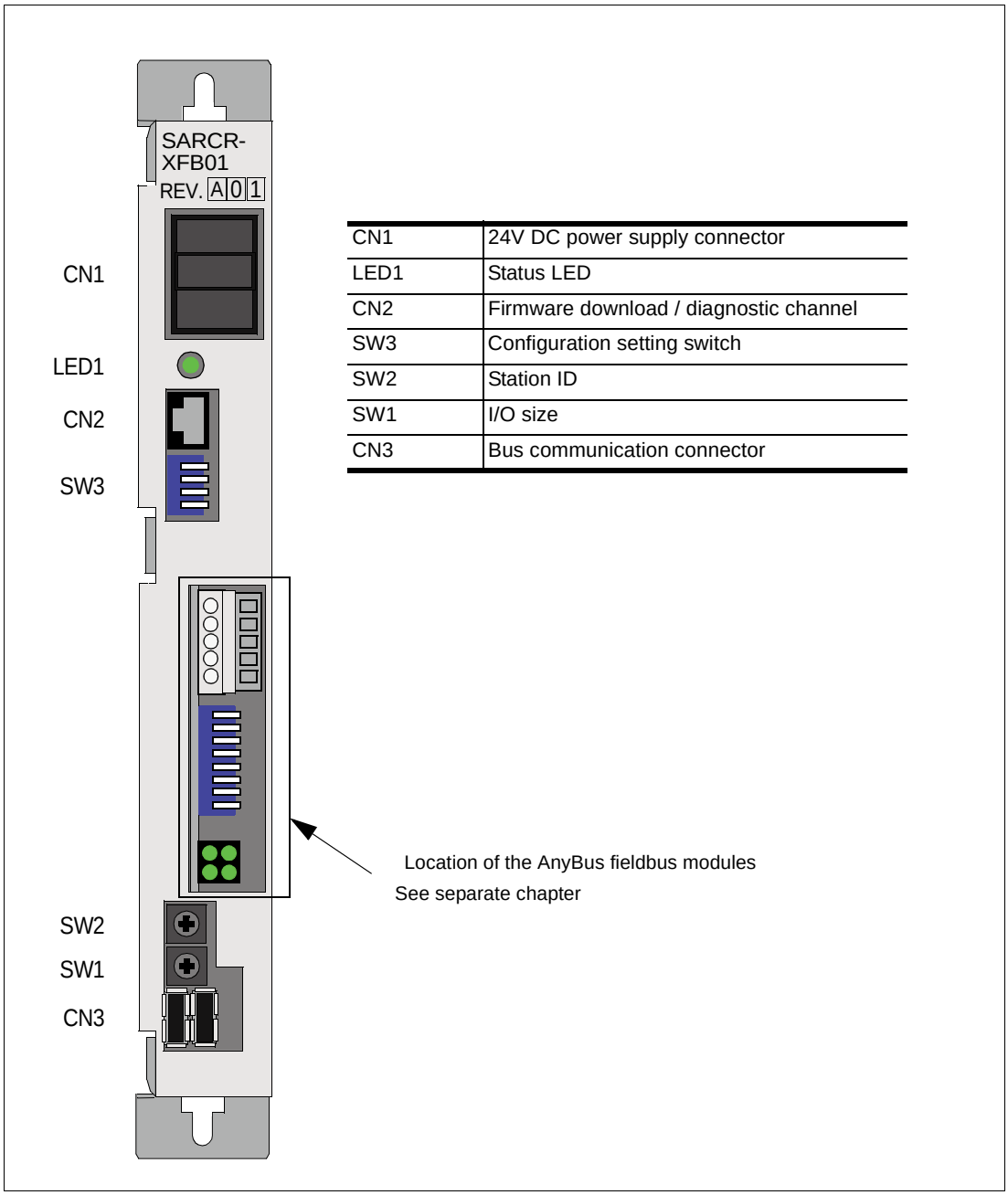
Warning!
To prevent electrical shock to personnel and to prevent equipment damage, ensure power to NX100 controller is turned OFF before beginning the installation

Caution!
Follow the proper anti-static procedures to ensure that static electricity does not damage the FBIB.

Caution!
Never change any of the settings on the FBIB while controller power is ON.

3. Configuration and indicators

3.1 SARCR-XFB01 settings



CN1	24V DC power supply connector
LED1	Status LED
CN2	Firmware download / diagnostic channel
SW3	Configuration setting switch
SW2	Station ID
SW1	I/O size
CN3	Bus communication connector

Fig.2 XFB01 carrier board

3.1.1 LED1 (status)

The status LED indicates the SARCR-XFB01 carrier board status.

Note!

During power up, this led is tested for correct operation. The led turns red for 500ms, followed by green 500ms, finally orange 500ms.

LED1	Description
Turned OFF	Microprocessor turned OFF
Green	Carrier board initialisation
Flashing green (1Hz)	Normal operation
Red	Carrier board hardware error detected
Flashing red (1Hz)	Error detected in access towards JL-012C chip or AnyBus module. Additional information is available through the serial interface.
Yellow	Bootloader enable

3.1.2 CN2 (diagnostic channel)

Firmware download / Diagnostic channel (CN2).
For upgrade of carrier board internal software and trouble shooting facilities.
See separate chapter for further information.

3.1.3 SW3 (configuration DIP)

Switch No.	Position	Description
1	OFF	AnyBus Output data used in CLEAR Mode (AnyBus -> NX100 system)
	ON	AnyBus Output data used in FREEZE Mode (AnyBus -> NX100 system)
2	OFF	16 data bytes ENABLED XRC system
	ON	17 data bytes ENABLED NX100 system
3	OFF	Firmware download DISABLED in start-up, Master RUN mode in runtime. (Note #3)
	ON	Firmware download ENABLED in start-up, MASTER IDLE in runtime. (Note #3)
4	OFF	Serial channel DISABLED (Note #1)
	ON	Serial channel ENABLED (Note #2)

Note #1:

The serial channel should be disabled in normal use.

Note #2:

If bootloader enable mode is enabled at start-up, this switch should be set to OFF after the LED indicates orange, otherwise the download will be completed and a new bootload sequence is started

Note #3:
When using ABM-DEV this switch could be used as a RUN / IDLE switch

3.1.4 SW2 (station ID)

Station ID (SW2) A hexadecimal rotary switch is used for the Station ID setting.

Value	Station ID
0	Forced to 1
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15

Note!
Since 'F' in the SW2 station setting is typical used already, do not use the 'F' setting. Be sure not to set more than one board to the same station ID.

3.1.5 SW1 (I/O size)

I/O size (SW1) Set the number of I/O points to be transferred. The number of input and output points cannot be set individually.

Value	Output data bits	Input data bits	NX100 shows*
0	Only status	0	8
1	8	8	16
2	16	16	24
3	24	24	32
4	32	32	40
5	40	40	48
6	48	48	56
7	56	56	64
8	64	64	72
9	72	72	80
A	80	80	88
B	88	88	96
C	96	96	104
D	104	104	112
E	112	112	120
F	Forced to 112	Forced to 112	120

*) NX100 shows = The number of allocated IOs in the controller.
(Number of available IOs + status bit = NX100 shown).
e.g. 64 + 8 = 72

3.2 I/O map

The NX100 system has the capability of supporting 1024 input and 1024 output signals. Depending on the application of the system, the number of userdefinable I/O points will vary.

The NX100 I/O's follows a basic octal numbering system, i.e. each input or output group will occur in a grouping of eight.

3.2.1 Fieldbus input data map

The data received from the FBIB and the fieldbus appears in the NX100 memory map according the tables below. The base address in the NX100 where the data will appear depends on the installation. In the examples below the FBIB inputs are represented from address 20060.

Address	Contents								Description
	MSB							LSB	
20060	Module and network status								FBIB status information. See section 5.3 below.
20070	b7	b6	b5	b4	b3	b2	b1	b0	Fieldbus input byte 1 (b0 - b7)
20080	b15	b14	b13	b12	b11	b10	b9	b8	Fieldbus input byte 2 (b8 - b15)

Table above shows the memory map when the I/O size switch is set in position 2 i.e. total 24 input bits (16 fieldbus input bits).

Address	Contents								Description
	MSB							LSB	
20060	Module and network status								FBIB status information. See section 5.3 below.
20070	b7	b6	b5	b4	b3	b2	b1	b0	Fieldbus input byte 1 (b0 - b7)
20080	b15	b14	b13	b12	b11	b10	b9	b8	Fieldbus input byte 2 (b8 - b15)
20090	b23	b22	b21	b20	b19	b18	b17	b16	Fieldbus input byte 3 (b16 - b23)
20100	b31	b30	b29	b28	b27	b26	b25	b24	Fieldbus input byte 4 (b24 - b31)
20110	b39	b38	b37	b36	b35	b34	b33	b32	Fieldbus input byte 5 (b32 - b39)
20120	b48	b47	b46	b45	b44	b43	b41	b40	Fieldbus input byte 6 (b40 - b48)

Table above shows the memory map when the I/O size switch is set in position 6 i.e. total 56 input bits (48 fieldbus input bits).

3.2.2 Fieldbus output data map

The data transferred from the NX100 to the FBIB and the fieldbus appears in the NX100 memory map according the table below. The base address in the NX100 where the data will appear depends on the installation. In the examples below the FBIB inputs are represented from address 30060.

Address	Contents								Description
	MSB							LSB	
30060	Reserved								Not available for use
30070	b7	b6	b5	b4	b3	b2	b1	b0	Fieldbus output byte 1 (b0 - b7)
30080	b15	b14	b13	b12	b11	b10	b9	b8	Fieldbus output byte 2 (b8 - b15)

Table above shows the memory map when the I/O size switch is set in position 2 i.e. total 24 output bits (16 fieldbus output bits).

Address	Contents								Description
	MSB							LSB	
30060	Reserved								Not available for use
30070	b7	b6	b5	b4	b3	b2	b1	b0	Fieldbus output byte 1 (b0 - b7)
30080	b15	b14	b13	b12	b11	b10	b9	b8	Fieldbus output byte 2 (b8 - b15)
30090	b23	b22	b21	b20	b19	b18	b17	b16	Fieldbus output byte 3 (b16 - b23)
30100	b31	b30	b29	b28	b27	b26	b25	b24	Fieldbus output byte 4 (b24 - b31)
30110	b39	b38	b37	b36	b35	b34	b33	b32	Fieldbus output byte 5 (b32 - b39)
30120	b48	b47	b46	b45	b44	b43	b41	b40	Fieldbus output byte 6 (b40 - b48)

Table above shows the memory map when the I/O size switch is set in position 6 i.e. total 56 output bits (48 fieldbus output bits).

The first byte of output data is reserved for future use and is not accessed by the FIB. This byte should not be used by the NX100 program.

3.3 Module and network status

One byte of input status data is generated by the FBIB. The status byte contains information about the FIB and the fieldbus environment. The byte is continuously updated by the software. The information available in this byte can be used by the NX100 to monitor the FBIB and the fieldbus system.

The status byte contains the following information:

b7	b6	b5	b4	b3	b2	b1	b0
CB	FB	-	-	-		Counter	

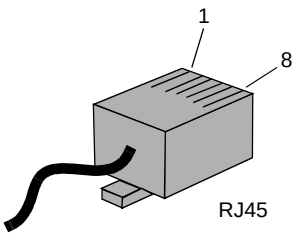
Bit no.	Name	Description
b0 b1 b2	WD	Watchdog counter. These bits are incremented each 32 ms by the FBIB. This counter is LOW priority, which means that the time may be longer if the bus is occupied by other communication. The bits are incremented in the following way 0,1,2,3,4,5,6,7,0,1,2, etc.
b3	-	Not used
b4	-	Not used
b5	-	Not used
b6	FB-status	Indicates fieldbus status. 0: Fieldbus is stopped or communication error detected 1: Fieldbus running
b7	CB-status	Indicates FBIB status 0: Internal FBIB error detected. FBIB not operating properly. 1: Normal FBIB operation. No errors detected.

3.4 Diagnostic software

Firmware download / Diagnostic channel (CN2).
For upgrade of carrier board internal software and trouble shooting facilities.
A simple textbased terminal interface is provided for diagnostic information.

Note!
The diagnostic interface affects the performance of the data throughput between the fieldbus and Robot Control and should only be used when performance is not critical. In normal use set the configuration DIP (SW3: 3 and 4) in OFF state (Serial channel DISABLED).

3.4.1 Cable configuration (CN2 <=> PC)



Signal	RJ45 pin	D-SUB pin
TX	Pin 1	Pin 2
RX	Pin 2	Pin 3
GND	Pin 6	Pin 5

3.4.2 Communication settings

The terminal
shall be set to the following settings:

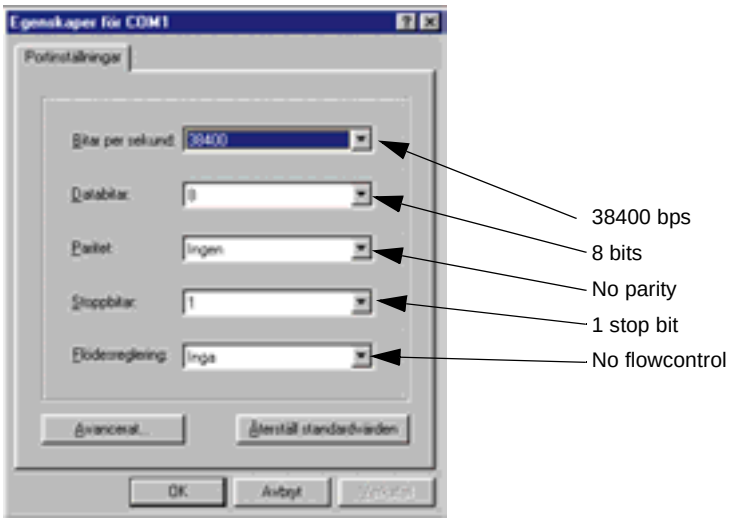


Fig.3 Communication setting

3.4.3 Terminal interface

Fieldbus board software version: CB SARCR-XFB01 Rev. 1.30

1. From the Main menu.
   Select the required function by typing commands 1 - 4.
2. From the Extended info menu
   Confirm your choice by pressing '**Y**' or cancel the operation with "**N**".

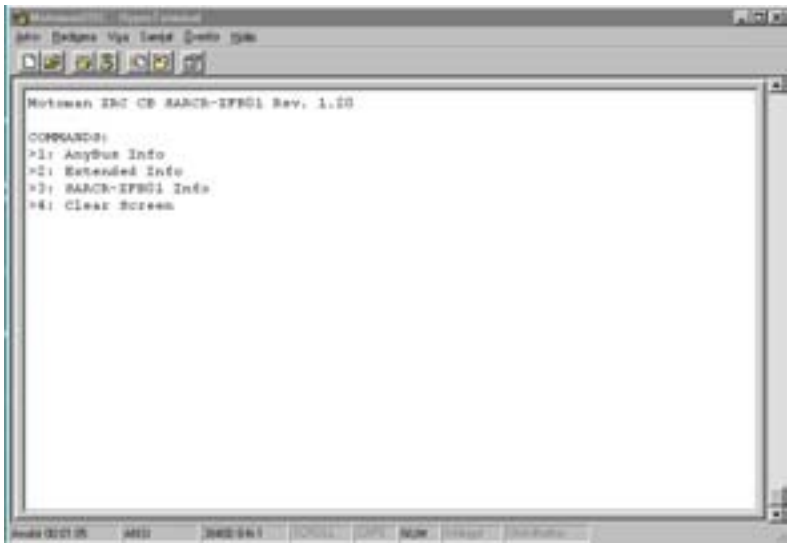


Fig.4 Main menu

Note!

A power cycle is required after a modification of the Anybus parameters for the module changes ro take affect.

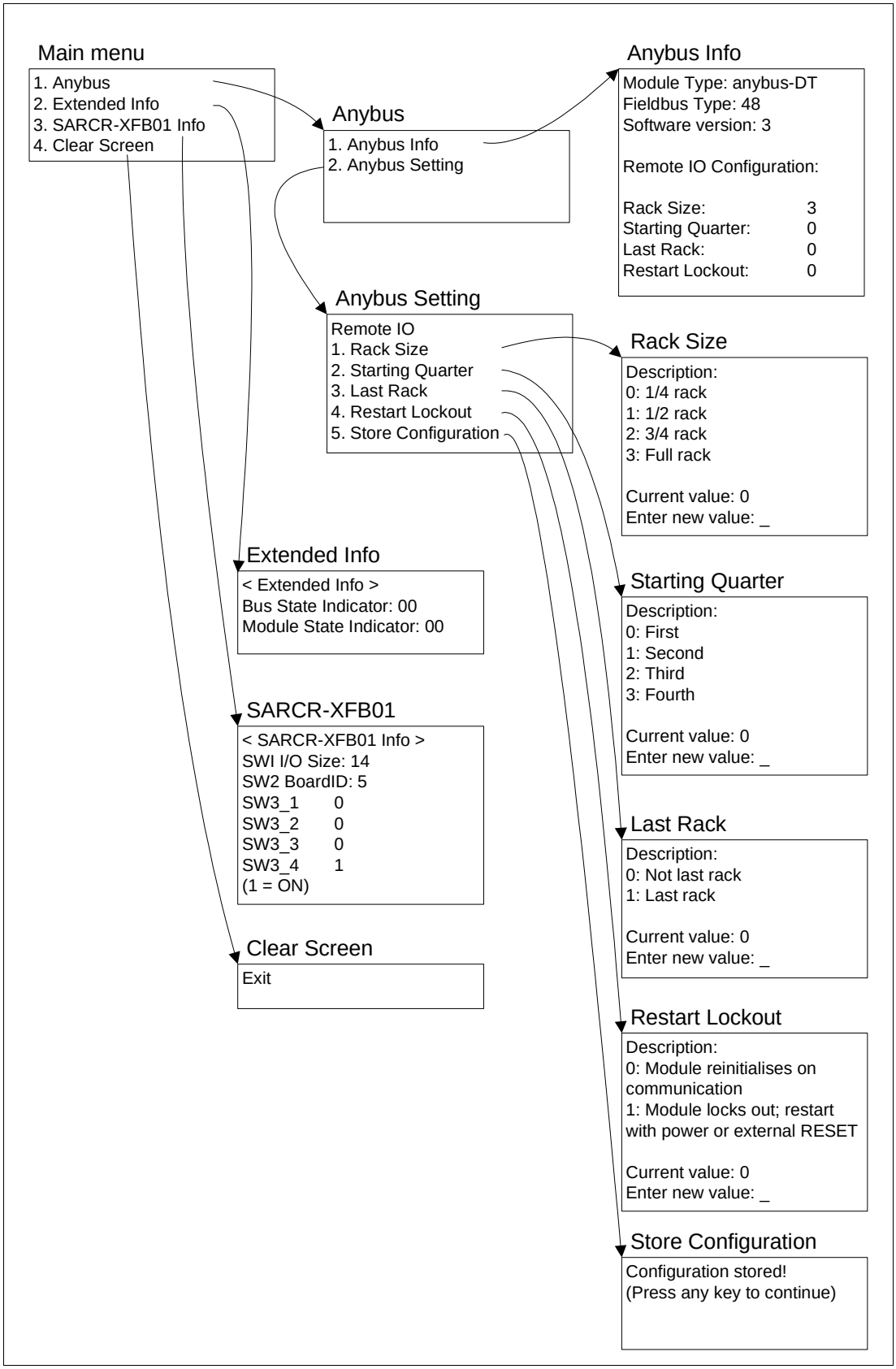
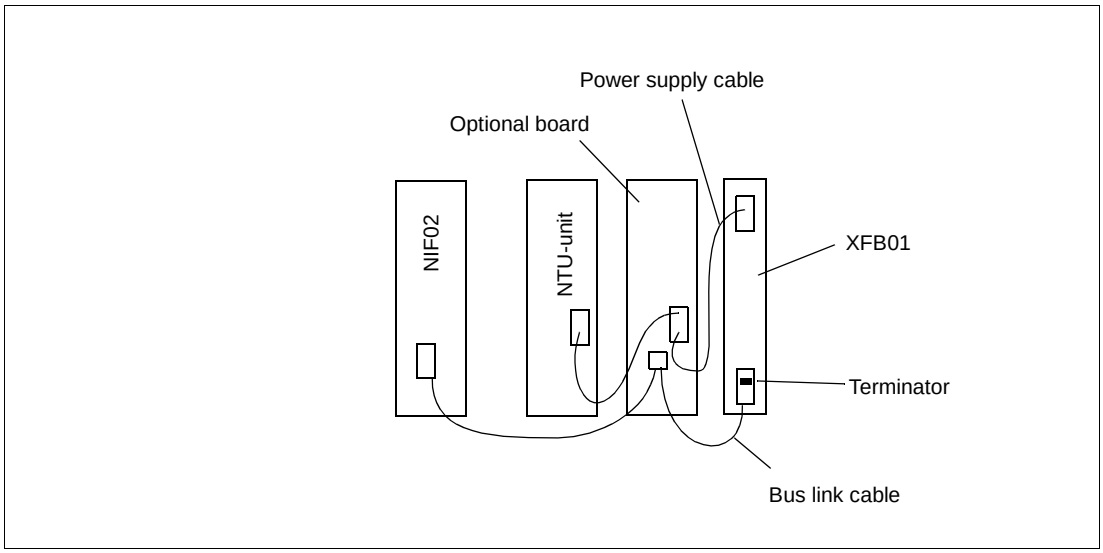


Fig.5 Command layout

3.5 Connetion of carrier board

For further information, see MOTOMAN NX100 “Installation and Wiring” manual No. MRS6100.



4. Profibus DP

4.1 Profibus DP slave module

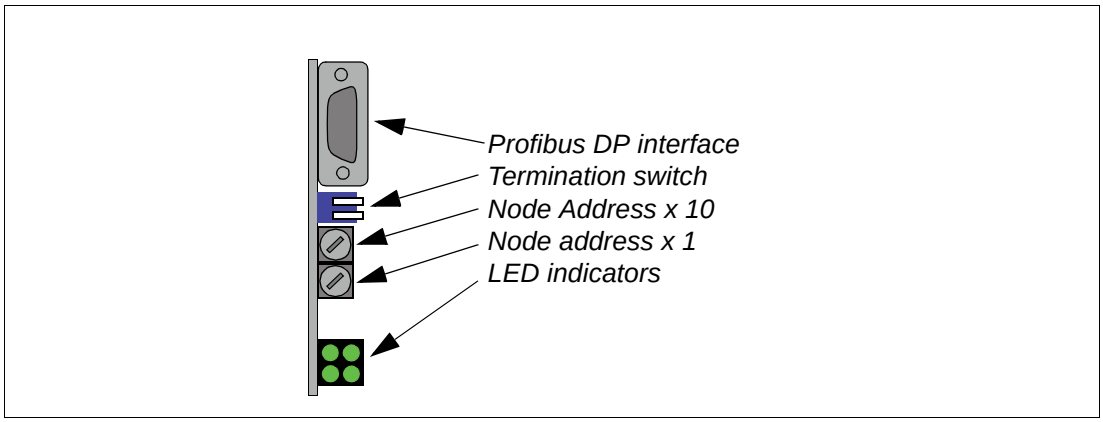


Fig.6 Profbus DP slave module

4.1.1 Profibus DP interface

Pin	Description	Function
Housing	Shield	Connected to PE
1	Not connected	-
2	Not connected	-
3	B-line	Positive RxD/TxD according to RS485 specification
4	RTS	Request To Send
5	GND BUS	BUS Isolated GND from RS485 side
6	+5V BUS	Isolated +5V from RS485 side
7	Not connected	
8	A-line	Negative RxD/TxD according to RS485 specification
9	Not connected	-

4.1.2 Termination switch

The end nodes in a Profibus-DP network must be terminated to avoid reflections on the bus line. The AnyBus-S Profibus-DP module has an on board termination switch to accomplish this in an easy way.

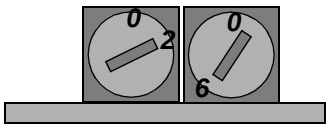
Note!

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

Switch position	Description
ON	Bus termination enabled If the module is the last or first module on the network, the bus must be terminated using the termination switch or by using an external termination connector
OFF	Bus termination disabled

4.1.3 Node address

Before configuring the AnyBus-S Profibus-DP module the node address has to be set. This is done with two rotary switches on the module, this enables address settings from 1-99 in decimal format. Looking at the front of the module, the leftmost switch is used for the ten setting and the rightmost switch is used for the setting of the integers.



Address = (Left Switch x 10) + (Right Switch x 1)

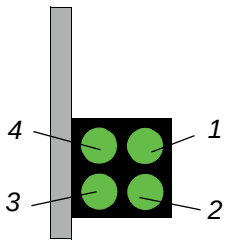
Example: 2 x 10 + 6 x 1 = 26

Note!

The node address cannot be changed during operation.

4.1.4 LED Indicators

The module is equipped with four LED's mounted at the front and one LED on the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	Not used
2	On-line
3	Off-line
4	Fieldbus diagnostics

LED	Colour	Function
Fieldbus diagnostics	Red	Indicates certain faults on the fieldbus side. **Flashing 1Hz** - Error in configuration: IN and/or OUT length set during initialisation of the module is not equal to the length set during configuration of the network. **Flashing 2Hz** - Error in User Parameter data: The length/contents of the User Parameter data set during initialisation of the module is not equal to the length/contents set during configuration of the network. **Flashing 4Hz** - Error in initialisation of the Profibus ocmmunication ASIC. **OFF** - No diagnostics present
On-line	Green	Indicates that the module is On-Line on the fieldbus network. **ON** - Module is On-Line and data exchange is possible. **OFF** - Module is not On-Line
Off-line	Red	Indicates that the module is Off-Line on the fieldbus network. **ON** - Module is Off-Line and no data exchange is possible **OFF** - Module is not Off-Line

4.1.5 The GSD-file

Each device on a Profibus-DP network is associated with a GSD-file, containing all the necessary information about the device. The configuration tool uses the GSD-file during configuration of the Profibus DP network.

The SARCR-XFB01 uses the same GSD-file as the AnyBus-S Profibus module.

Valid GSD-file for AnyBus-S Profibus module is: **hms_1003.gsd**

The latest version of this file can either be downloaded from http://www.hms.se or received by contacting HMS.

4.2 Profibus DP master module

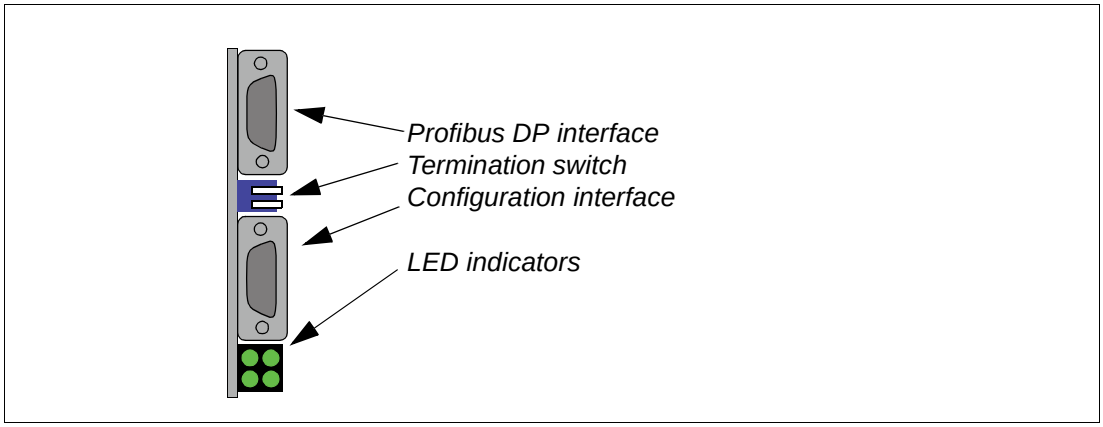


Fig.7 Profbus DP master module

■ *Profibus DP interface*

Pin	Description	Function
Housing	Shield	Connected to PE
1	Not connected	-
2	Not connected	-
3	B-line	Positive RxD/TxD according to RS485 specification
4	RTS	Request To Send
5	GND BUS	BUS Isolated GND from RS485 side
6	+5V BUS	Isolated +5V from RS485 side
7	Not connected	
8	A-line	Negative RxD/TxD according to RS485 specification
9	Not connected	-

4.2.1 Termination switch

The end nodes in a Profibus-DP network must be terminated to avoid reflections on the bus line. The AnyBus-S Profibus-DP module has an on board termination switch to accomplish this in an easy way.

Note!

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

Switch position	Description
ON	Bus termination enabled If the module is the last or first module on the network, the bus must be terminated using the termination switch or by using an external termination connector
OFF	Bus termination disabled

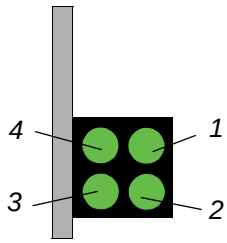
4.2.2 Configuration interface

The configuration port is a non-isolated RS232 communication port.

Pin	Description	Function
Housing	Shield	Connected to PE
1	Not connected	-
2	RxD	Receive data
3	TxD	Transmit data
4	DTR	Data terminal ready
5	Ground	Ground
6	Not connected	-
7	RTS	Request to send
8	CTS	Clear to send
9	Not connected	-

4.2.3 LED indicators

The module is equipped with four LED's mounted at the front and one LED on the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.

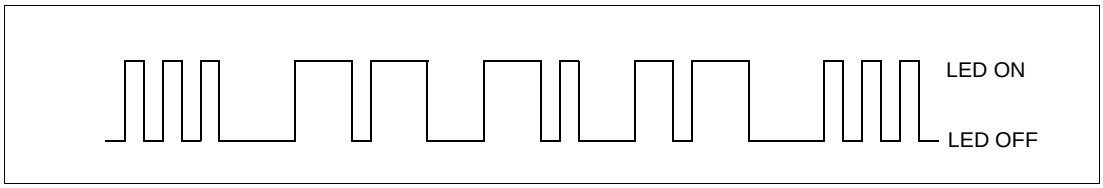


LED	Description
1	Error
2	Ready
3	Run
4	Token

LED	Colour	Function
Error	Red	This LED is lit if a bus error has occurred **ON** - Error on communication line **OFF** - No errors detected
Ready	Green	**ON** - Module OK **OFF** - Hardware error **Flashing 1Hz** - No valid firmware stored in flash **Flashing 4Hz** - Hardware/system error or firmware/configuration database download in progress
Run	Green	**ON** - Communication running **Cyclic flash (approx. 4Hz)** - Ready for communication **Acyclic flash** - Configuration error or fatal error (See figure below)
Token	Green	**ON** - Profibus Master owns Token **OFF** - Profibus Master does not own Token

Note!

The acyclic flashing indicates a configuration error or fatal error, e.g. no valid configuration loaded. The following picture is indicating the general look. The duration of the indication is approximately 10 seconds.



4.2.4 Configuration software

(Please refer to "Profibus System Configurator HMS SyCon", doc. No. HMS-SYCON-2.03)

5. DeviceNet

5.1 DeviceNet slave module

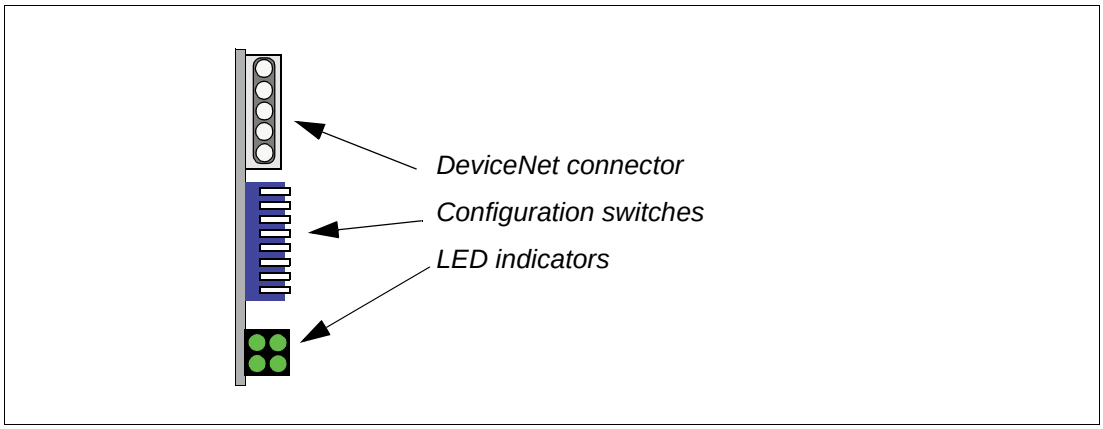


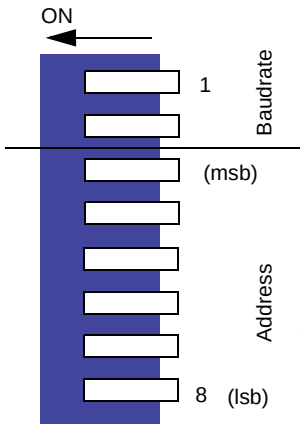
Fig.8 DeviceNet slave module

5.1.1 DeviceNet connector

Pin	Description	Function
1	V-	CAN Ground
2	CAN_L	CAN_L bus line (dominant low)
3	SHIELD	CAN Shield
4	CAN_H	CAN_H bus line (dominant high)
5	V+	CAN external power supply

5.1.2 Configuration switches

The baudrate and Mac ID must be configured before power on. The Mac ID is set in binary format. Valid settings range from 0-63. (ON=1, OFF=0).



1	2	Baudrate
ON	ON	Reserved
ON	OFF	500 kbit/sec
OFF	ON	250 kbit/sec
OFF	OFF	125 kbit/sec

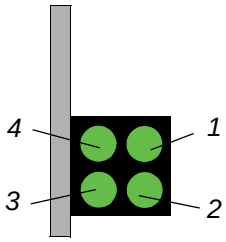
Binary value 3-8	Mac ID
000000	0
000001	1
000010	2
.....	.
.....	.
111111	63

Note!

Mac ID and baudrate cannot be changed during operation.

5.1.3 LED indicators

The module is equipped with four LED's mounted at the front and one LED on the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	Reserved
2	Network status
3	Module status
4	Reserved

LED	Colour	Function
Module status	Red, stable Red, flashing Green, stable OFF	Major fault Minor fault Device operational No power
Network status	Red, stable Red, flashing Green, stable Green, flashing OFF	Critical link failure Connection time out On line, one or more connections established On line, not connections established No power, not initialised or no connections established

5.1.4 Termination

Termination of the fieldbus requires a terminating resistor at each end of the fieldbus. These resistors should have a value of 121 ohm.

5.1.5 The EDS-file

Each device on a DeviceNet network is associated with an EDS-file, containing all the necessary information about the device. The configuration tool uses the EDS-file during configuration of the DeviceNet network. The SARCR-XFB01 uses the same GSD-file as the AnyBus-S DeviceNet module.

The latest version of this file can either be downloaded from http:// www.hms.se/fbfiles.htm or received by contacting HMS.

5.2 DeviceNet master module

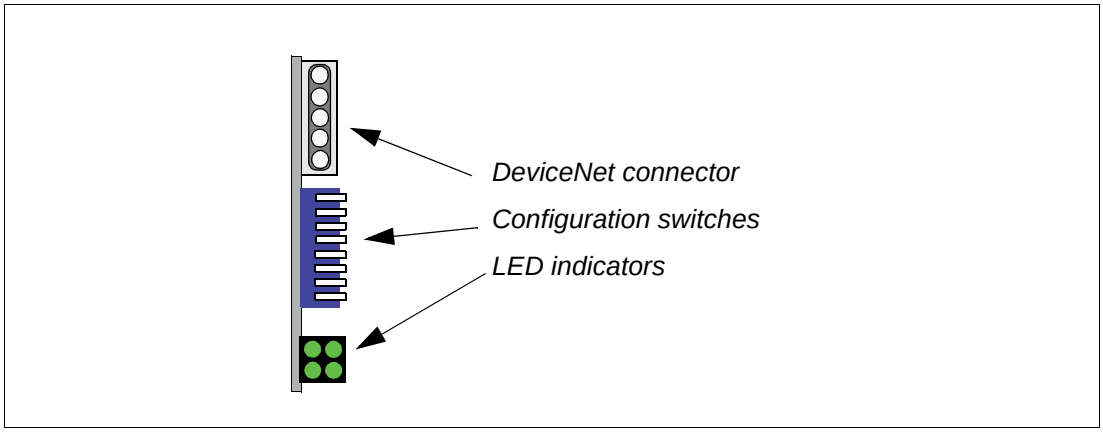


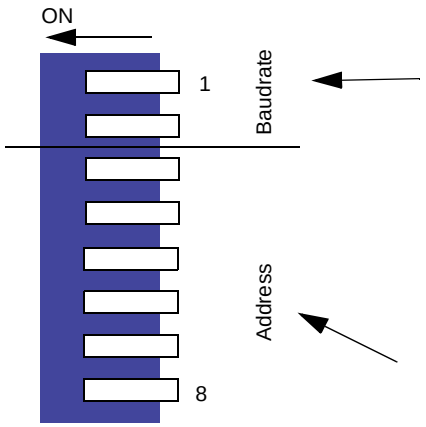
Fig.9 DeviceNet master module

5.2.1 DeviceNet connector

Pin	Description	Function
1	V-	CAN Ground
2	CAN_L	CAN_L bus line (dominant low)
3	SHIELD	CAN Shield
4	CAN_H	CAN_H bus line (dominant high)
5	V+	CAN external power supply

5.2.2 Configuration switches

The baudrate and Mac ID must be configured before power on. The Mac ID is set in binary format. Valid settings range from 0-63. (ON=1, OFF=0).



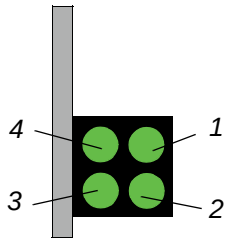
1	2	Baudrate
ON	ON	Reserved
ON	OFF	500 kbit/sec
OFF	ON	250 kbit/sec
OFF	OFF	125 kbit/sec

Binary value 3-6	Mac ID
000000	0
000001	1
000010	2
.....	.
.....	.
111111	63

Note!
Mac ID and baudrate cannot be changed during operation.

5.2.3 LED indicators

The module is equipped with four LED's mounted at the front and one LED on the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	Reserved
2	Module status
3	Network status
4	Operation mode

LED	Colour	Function
Module status	Red, stable Red, flashing Green, stable OFF	Major fault Minor fault Device operational No power
Network status	Red, stable Red, flashing Green, stable Green, flashing OFF	Critical link failure Minor fault, one or more connections have a minor fault On line, one or more connections established On line, not connections established No power, not initialised or no connections established
Operation mode	Green, stable Green, flashing OFF	Run mode Idle mode No power or not initialised

5.2.4 Operation mode

The operation modes RUN/IDLE can be set with Configuration Switch (SW3 on the XFB01 carrier board).

5.3 Configuration using RSNetWorx

One way to configure the AnyBus-M DeviceNet module is to use RSNetWorx for DeviceNet (DeviceNet configuration tool from Rockwell). See the picture below. This program is run on a PC in the Windows environment. The program needs a physical link towards the DeviceNet network where the AnyBus-M module is connected and also the modules that the AnyBus-M shall communicate with. This physical link can be a serial adapter (for example 1770-KFD), a PCI or ISA card (for example 1784 scanner), or a PCMCIA interface. When a node in a DeviceNet network shall be configured with a DeviceNet configuration tool, it is necessary to have an EDS-file that describes the node for the configuration tool. Please contact each vendor for all products that shall be configured for correct EDS files.

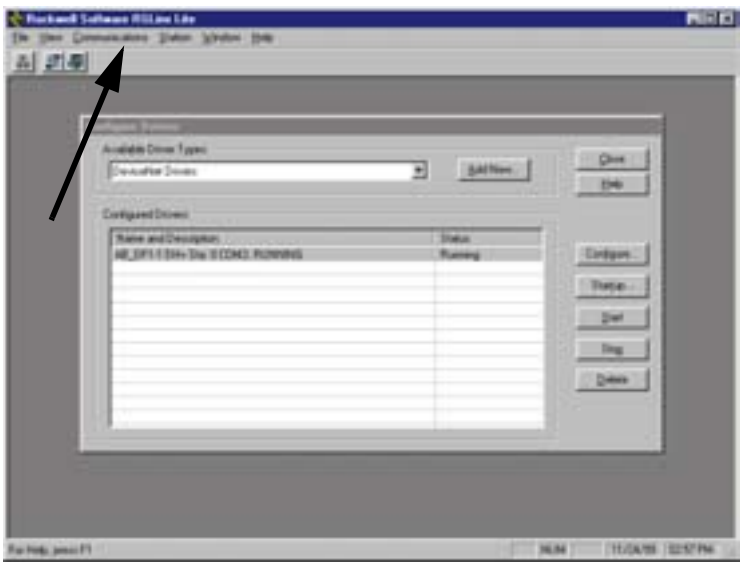
Information

Some of the buttons on the pictures in this chapter have Swedish labels, as they have been captured on a computer with a Swedish operating system. We apologise for that.

5.3.1 Getting started

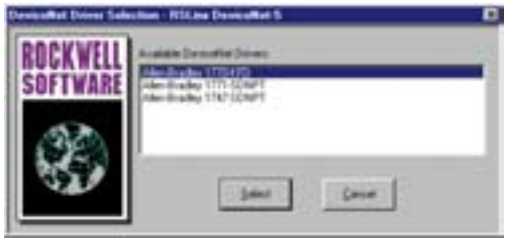
The first thing to do when the RSNetWorx shall be used for the first time is to select which driver that shall be used. RSNetWorx uses a program called RSLinx to access the DeviceNet network. To install the driver, start the RSLinx program, and then select configure drivers in the communications menu. A new window will now appear called "Configure drivers" (see below). Select DeviceNet drivers in the "Available driver types" scroll list, and press add new.

1. Click **Communications**.
2. Click **Configure Drivers**.



3. Select the driver that corresponds to the physical interface that is used (in our case 1770-KFD).

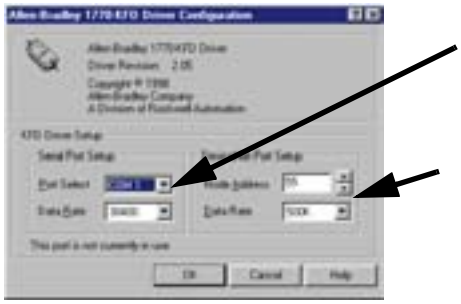
4. Click **Select** to confirm your choice.



5. Now the program wants the user to select the correct settings, that the RSNetWorx shall use on the DeviceNet network. In our case the 1770-KFD is connected to a serial COM port on the PC, so we select the COM port that it is connected to and which data rate we will use on the serial channel.

6. The node address (MAC ID) and data rate (Baudrate), which the configuration tool will use on the DeviceNet network, has to be selected. In the example below, we have chosen 55 as MAC ID and 500 kbit/sec, since the rest of the nodes are configured for that baudrate.

7. Click **OK** to confirm your selections.



8. RSLinx will now start the driver.

5.4 Installing EDS files

Before the RSNetWorx can go on-line, the correct EDS-files for all nodes in the network need to be installed. To install an EDS file, select EDS wizard in the tools menu. A new window shall now appear and guide the user on how to install the files.

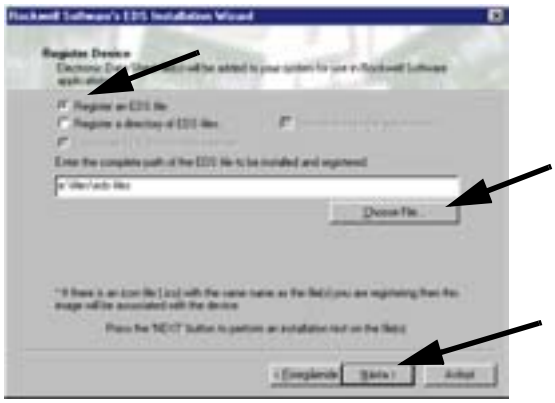
1. Click **Next** to continue.

2. Select the alternative **Register an EDS file(s)**.

3. Click Next to continue.

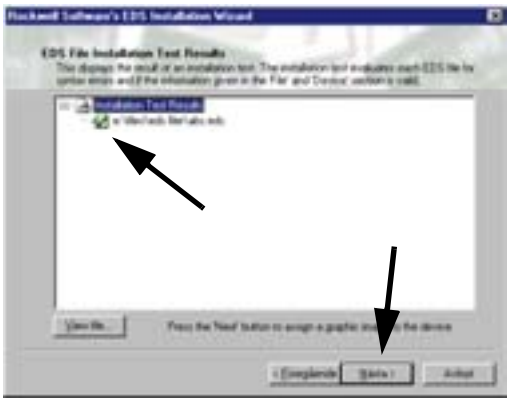
4. Select **Register an EDS file** and choose the file by pressing the **Choose file button**.

5. Click **Next** to continue.



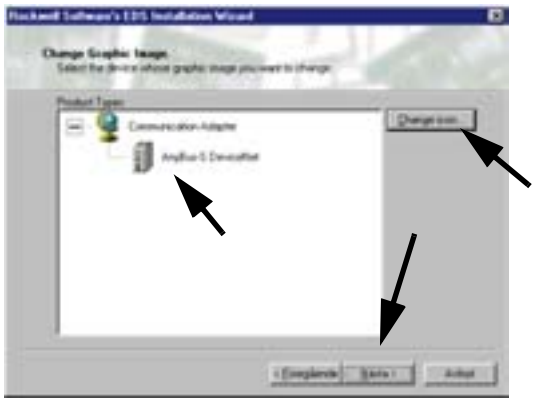
The EDS wizard will now test the EDS file, to make sure that it does not have any error. If no errors or warnings are found, the EDS file will appear with a green "checked" sign on it as seen below. If no errors are found just press next, otherwise contact the vendor for the product for a correct EDS file.

6. Click **Next** to continue.



7. Select an icon to be used when the module is displayed in the configuration tool.

8. Click **Next** to continue.



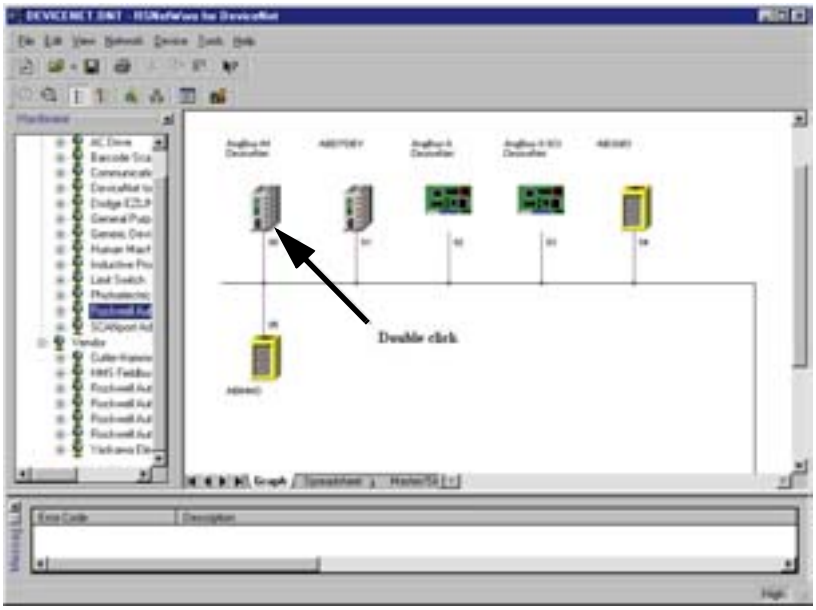
9. The EDS wizard will now install the EDS file into the RSNetWorx configuration tool.

10. Click **Finish** to finalize the installation.

5.4.1 Get On-line

When RSNetWorx has been correctly installed and connected to the DeviceNet network, the user can go on-line by selecting ONLINE in the Network menu, or by pressing F10. The user now has to select which physical interface that is used. Just double click the alternative in the pop-up window that appears (if the correct alternative do not appear in the window, the driver has not been correctly installed in RSLinx, see last chapter on how to install the RSLinx driver). The configuration tool will now browse the network, and display all nodes that are found in the network. All nodes that shall be configured need corresponding EDS files to be able to be configured.

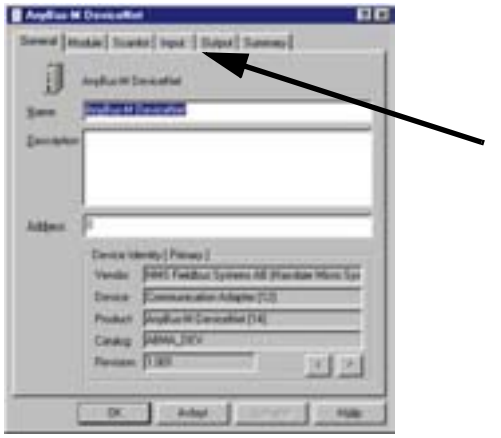
To configure thedeviceNet module, double click on its icon in the main window.



5.4.2 General information

In this window, which appears after double clicking the modules icon, all configuration of the AnyBus-M module can be done. The window contains six pages, General, Module, Scanlist, Input, and Output.

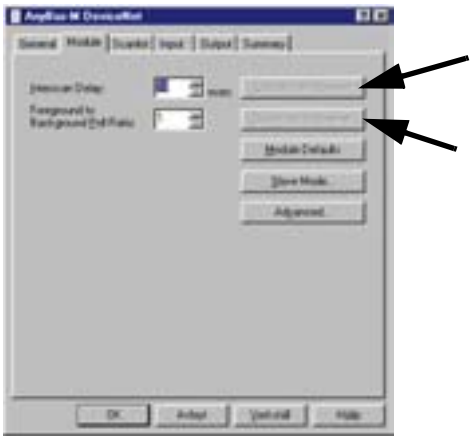
The general page contains information, which is obtaines from the EDS file, and verified with the module in the network.



5.4.3 Scanner configuration and slave mode configuration

In the configuration window, on the module page it is possible to change the "Inter scan delay" and "Foreground to background poll ratio". "Inter scan delay" is the delay between each I/O poll the master sends to the configured nodes. A node can be configured to be polled with a "background poll rate". This means that the module will poll the foreground-nodes X number of times as often as the background nodes. It is also possible to configure the slave connection in this window. There is also a button called "Advanced" which gives the user the possibility to change the maximum expected packet rate (the time the master shall wait for a I/O response) and the number of times the master shall retry to transmit if a module is not responding.

To upload the settings that are stored in the module by pressing the **Upload fron scanner** button. If the settings are changed, they need to be downloaded to the module. Pressing the **Download to scanner** button does this.



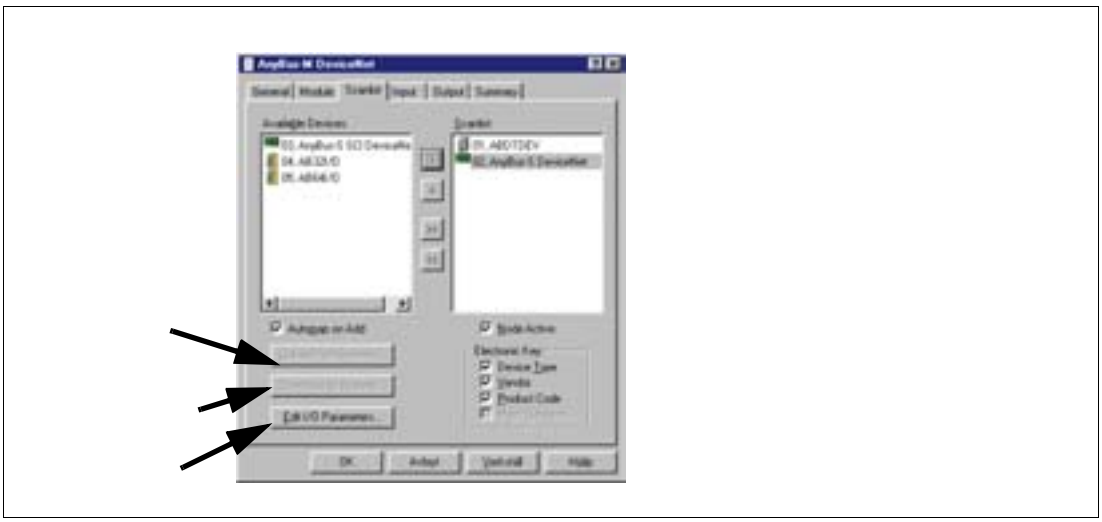
In the slave mode window, the user can enable the slave connections that shall be used and select the amount of data for each connection. This data will have to be mapped in the Input and Output areas of the DPRAM. In this example we have chosen to enable a polled slave connection, with 5 bytes as input data and 6 bytes as output data.

5.4.4 Scan list configuration with RSNetWorx

On the Scanlist page, nodes are mapped into the masters scan list. In the picture below, two modules have been mapped into the masters scan list. To add a node to the scanlist, mark the node and press the "**>**" button. The node shall now be moved into the scan list. To add all nodes into the scan list, click the "**>>**" button.

The scanlist data can be uploaded from/to the module by pressing the "**Upload to scanner**" or "**Download to scanner**" buttons.

When a node is added into the scan list, the node will automatically be mapped into the input and output areas, if the check box "**Automap on Add**" is marked. If a node does not use the default I/O size that are presented in the EDS file, it might be necessary to correct the I/O configuration for a node.
To do this, select the node and click the "**Edit I/O parameters**" button.



Select the I/O connections that shall be used, by marking the checkboxes corresponding to

the I/O connections. Then fill in the number of bytes that shall be sent and receved. Also set **Heartbeat rate** for the **COS/Cyclic** connection, and select if the TX bit shall be used for the strobed connection, if those connections shall be configured.

In our picture below we have selected 4 bytes input data and 5 bytes output data for the poll connection, and we have chosen not to use the other connections.
Press the **OK** button when the editing is finished.

5.4.5 Mapping data into the DPRAM with RSNetworx

On the input and output pages there are information about how the I/O connections are mapped into the I/O areas. If the "Automap on add" checkbox was marked, and the default I/O connections and data sizes are used, the nodes have automatically been mapped into the I/O areas. If a node has not been mapped into the I/O areas, it will say "No" in the column "Map" (the column where it says 3.0 for node 0).
Below we can see that there are three connections that have been mapped into the input area, each corresponding to different nodes. The first node that has been mapped is node 1 (the node with MAC ID 1). That node has 2 bytes of input corresponding to its polled connection, which will be sent from the node to the AnyBus-M module. The data is mapped into the input area from byte 0 to byte 1 (word 0). The next node that has been mapped is node 2. This node also uses the polled I/O connection, and it will send 4 bytes of polled I/O data to the AnyBus-M module. The data has been mapped into the bytes 2 to 5 (word 1 and 2) in the input area.

The master’s slave connection also has been configured to 5 bytes of input data for the polled connection. This data has been mapped into the bytes 6 to 10 (word 3, 4 and the low byte of word 5).

The RSNetWorx uses word addressing. This is the reason why it says 3.0 for node 0 in the map column. This means that the data is mapped from word 3, bit 0 (= byte 6, bit 0).

Below we can see information for the output data mapping. Here are also three I/O connections that are configured, 6 bytes polled output for the masters slave connection, 3 bytes of polled output data for node 1, and 5 bytes of polled output data for node 2. In this example, the AnyBus-M module's slave connection has been mapped into the first four bytes in the output data area, bytes 0 to 5 (word 0, 1, and 2). The output data corresponding to node 1 has been mapped into the bytes 6 to 8 (word 3 and the low byte of word 4).

No I/O data has yet been mapped for node 2. To map the data for that node, just mark the node by clicking it once and then press the button “**Automap**”. Now the node will be mapped directly after the last mapped node in the output data area.

It is also possible to do a more advanced mapping of the data by pressing the “**Advanced**” button. To find more information about this pleas see the manual for RSNetWorX.

5.4.6 Summary of the configuration

On the summary page, information about all I/O connections, which are configured into the scan list, is displayed. The Active column tells if each connection is active or not. The Key column tells if electronic keying will be used to verify the identity of each node, before any of the I/O connections are established and any data exchange will be done. The Rx and Tx fields display the data size that is configured for each connection, and the Rx Map and Tx Map fields tell if the connections have been mapped into the I/O areas.

When all configurations have been done, click “Apply”. Now all changes will be downloaded to the module. Note that the module needs to be in idle mode to be able to download any changes to the configuration.

5.4.7 AnyBus-M DeviceNet techninal information

Technical data for the AnyBus-M DeviceNet module:

Description	Text string	Dec	Hex
Vendor ID	HMS Fieldbus Systems AB	90	0x5A
Product Type	Communication Adapter	12	0x0C
Product Code	-	14	0x0E
Product Name	AnyBus-M DeviceNet	-	-

5.4.8 Compliance with predefined standards

The ANYBUS® M DeviceNet follows the DeviceNet standard that has been developed by ODVA. It is fully compatible with the DeviceNet specification rev. 2.0 Vol I and Vol II. The module operates according to the communication adapter profile (product type 12, see DeviceNet specification for more information). The module supports the I/O connections Bit strobe, Polled I/O, Change of state and Cyclic I/O data.

DeviceNet Features			
Device Type	**Communication Adapter**	**Master/Scanner**	**Yes**
Explicit peer-to-peer messaging	Yes	I/O slave messaging	
I/O peer-to-peer messaging	No	Bit strobe	Yes
Configuration consistency value	No	Polling	Yes
Faulted node recovery	No	Cyclic	Yes
Bauderate	125K, 250K, 500K	Change of state (COS)	

5.4.9 Extended info available through the diagnostic channel

The module reports extended information through the diagnostic channel.

Active connections: 0000	The number of connections that has been established between the AnyBus-M DeviceNet module and other DeviceNet nodes on the network.
Expected Pack Rate: 0000	Expected pack rate for the polled and bit-strobe I/O connections.
DIP Set & scan Flags: 8109	The value of the configuration DIP.

5.4.10 Active, Idle, and Faulted nodes:

Node's Active:
7- 0:00000000
15- 8:00000000
23-16:00000000
31-24:00000000
39-32:00000000
47-40:00000000
55-48:00000000
63-56:00000000

The Node Active Area is an 8 byte long bit-array containing information about which nodes that are configured in the master. If the bit is set (=1), the node is configured in the scanlist, and the master will try to establish connections to the node. If the bit is cleared (=0), the node is not configured, and the master will not communicate with the node.

Node's Idle:
7- 0:00000000
15- 8:00000000
23-16:00000000
31-24:00000000
39-32:00000000
47-40:00000000
55-48:00000000
63-56:00000000

The Node Idle Area is an 8 byte long bit-array containing information about which nodes that are in idle mode. If the bit is set (=1), the node is idle. If the bit is cleared (=0) the node is not idle, i.e. it is in run mode.

Node's Faulted:
7- 0:00000010
15- 8:00000000
23-16:00000000
31-24:00000000
39-32:00000000
47-40:00000000
55-48:00000000
63-56:00000000

The Node Faulted Area is an 8 byte long bit-array containing information about which nodes that are not running correctly. If the bit is set (=1), the corresponding node is faulted. If the bit is cleared (=0), the node is operating correctly. For more information about the fault of the node, see corresponding information in the Node Status Area. (See below)

5.4.11 Node Status

To see node status, type "p" + node + "p". Example:

To get node status print: p(0-63)p
p1p

The module replies:

Node No:1 ->Status:92

The following table describes the meaning of the values that can appear in the Node status area:

Value	Meaning
00	OK or Not in scan list
70	Duplicate MAC ID failure
71	Scanner configuration error
72	Device communication error
73	Wrong device type
74	Port over-run error
75	Network failure
76	No CAN messages detected
77	Wrong data size
78	No such device found
79	Transmit failure
80	Node in IDLE mode
81	Node in fault mode
82	Fragmentation error
83	Unable to initialise node
84	Node not yet initialised
85	Receive buffer overflow
86	Node changed to IDLE mode
87	Shared master error (not used)
88	Shared choice error (not used)
89	Keeper object failure (not used)
90	CAN port disabled (not used)
91	Bus off
92	No bus power detected
93	Updating flash (not used)
94	In test mode (not used)
95	Halted by user cmd. (not used)
96	Firmware failure (not used)
97	System failure

6. CANOpen

6.1 CANOpen slave module

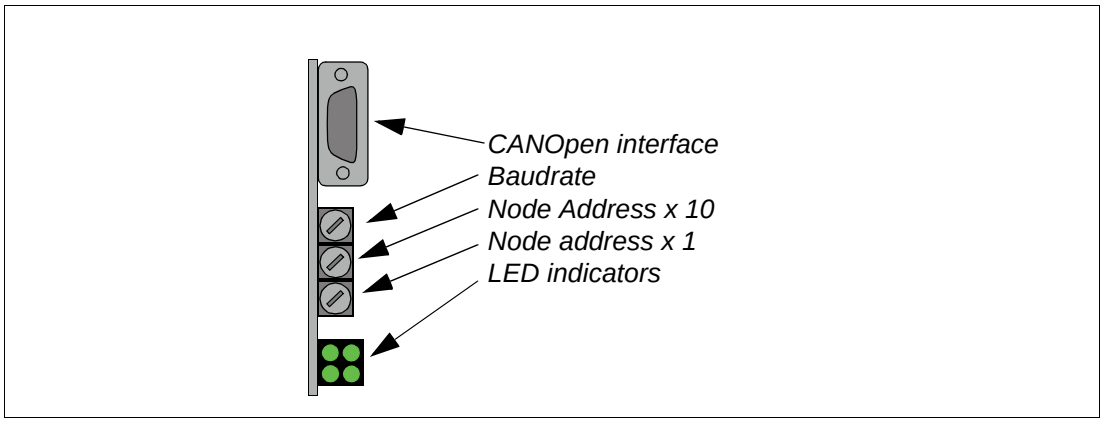


Fig.10 Profbus DP slave module

6.1.1 CANOpen interface

Pin	Description	Function
Housing		
1	Not connected	-
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	CAN Ground
4	Not connected	-
5	CAN_SHLD	Optional CAN shield
6	GND	Ground
7	CAN_H	CAN_H bus line (dominant high)
8	Not connected	
9	CAN_V+	CAN external power supply

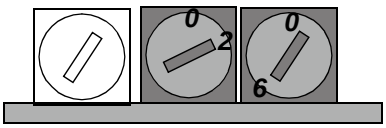
6.1.2 Baudrate

Switch setting	Baudrate
0	Not available
1	10 kbit/sec
2	20 kbit/sec
3	50 kbit/sec
4	125 kbit/sec
5	250 kbit/sec
6	500 kbit/sec
7	800 kbit/sec
8	1 Mbit/sec
9	Not available

Note!
The baudrate cannot be changed during operation.

6.1.3 Node address

Before configuring the AnyBus-S CANOpen module the node address has to be set. This is done with two rotary switches on the module. Valid settings range from 1-99. Looking at the front of the module, the leftmost switch is used for the ten setting and the rightmost switch is used for the setting of the integers.

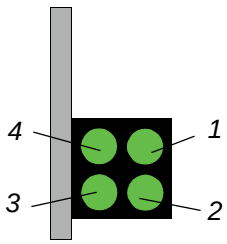


Address = (Left Switch x 10) + (Right Switch x 1)

Example: 2 x 10 + 6 x 1 = 26

6.1.4 LED Indicators

The module is equipped with four LED's mounted at the front and one LED on the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	Reserved
2	State indication
3	Bus indication
4	Power

LED	Colour	Function
State indication	Green, stable Green, flashing 1Hz Green, flashing 2Hz Red, flashing 1Hz	Module operational Module in pre-operational Module prepared Bus initialisation failed
Bus indication	Red, flashing 1Hz Green, stable Green, flashing 1Hz OFF	Other error Bus running Bus off / error passive Module power off or module not initialised
Power	Green, stable OFF	Power on Power off

6.1.5 Configuration

Default Fast Input Data to the CANopen Bus

Input data (high speed)	DPO mapping	Default COB-ID	Object index	Object subindex	Default state
Input data byte 1-8	TPD01	384 + node address	2000h	1-8	Enabled
Input data byte 9-14	TPD02	640 + node address	2000h	9-14	Enabled

Default Fast Output Data from the CANopen Bus

Output data (high speed)	DPO mapping	Default COB-ID	Object index	Object subindex	Default state
Output data byte 1-8	RPD01	512 + node address	2100h	1-8	Enabled
Output databyte 9-14	RPD02	768 + node address	2100h	9-14	Enabled

7. Ethernet

7.1 Ethernet slave module

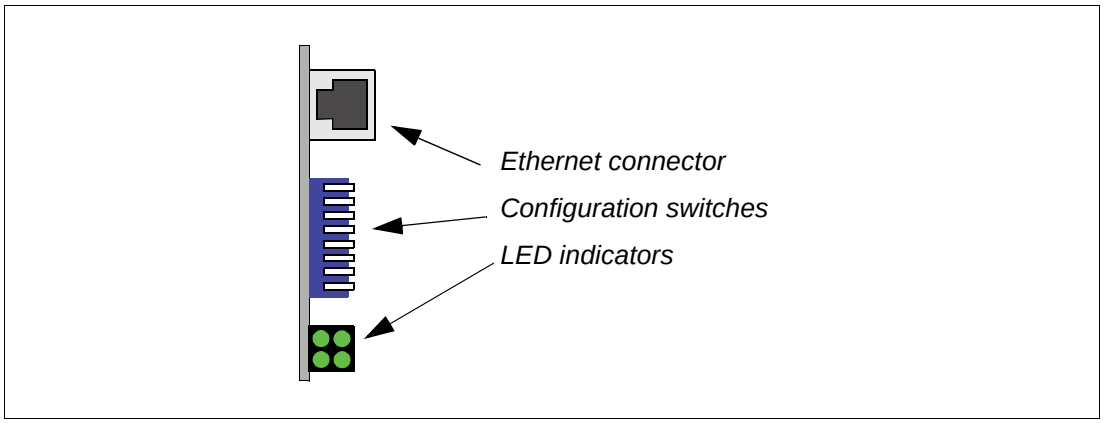


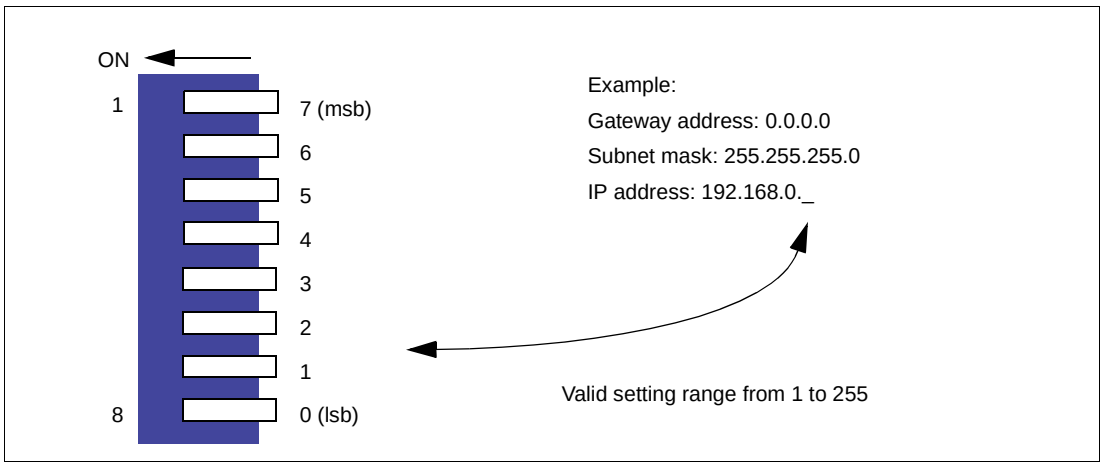
Fig.11 Ethernet slave module

7.1.1 Ethernet connector

Pin	Description	Function
1	TD+	Transmit positive
2	TD-	Transmit negative
3	RD+	Receive positive
4	NC	-
5	NC	-
6	RD-	Receive negative
7	NC	-
8	NC	-

7.1.2 Configuration switch

The switches represent the binary value of the last byte in the IP address.
(ON=1, OFF=0).



Note
This method is an easy way to configure the module for intranet use, but it cannot be used on the internet.

7.1.3 Modbus protocol

The module works as a Modbus/TCP server according to the Modbus/TCP specification 1.0. It's possible to use up to eight Modbus/TCP connections simultaneously. The module supports all the Modbus commands according to class 0 and class 1 and some of the commands in class 2. The Modbus commands supported by the module are:

function code	Function name	Class
1	Read coils	1
2	Read input discretes	1
3	Read multiple registers	0
4	Read input registers	1
5	Write coil	1
6	Write single register	1
7	Read exception status	1
15	Force multiple coils	2
16	Write multiple registers	0
22	Mask write register	2
23	Read/Write registers	2

For more information about the Modbus/TCP specification please visit the website www.modicon.com/openmbus/.

7.1.4 IN area

The IN area which is maximum 14 bytes can be read by Modbus command 1, 2, 3, 4 and 23.It is not possible to write data to the IN area from the bus. Command 1 and 2 uses a bit oriented address information and command 3, 4 and 23 uses word oriented address information. The possible bit and word addresses are described below:

Word address	Bit address							
000h	0000h	0001h	0002h	0003h	0004h	0005h	0006h	0007h
000h	0008h	0009h	000Ah	000Bh	000Ch	000Dh	000Eh	000Fh
001h	0010h	0011h	0012h	0013h	0014h	0015h	0016h	0017h
001h	0018h	0019h	001Ah	001Bh	001Ch	001Dh	001Eh	001Fh
...	...0h	...1h	...2h	...3h	...4h	...5h	...6h	...7h
...	...8h	...9h	...Ah	...Bh	...Ch	...Dh	...Eh	...Fh
00Dh	00D0h	00D1h	00D2h	00D3h	00D4h	00D5h	00D6h	00D7h
00Dh	00D8h	00D9h	00DAh	00DBh	00DCh	00DDh	00DEh	00DFh

7.1.5 OUT area

The OUT area which is maximum 14 bytes can be written to by Modbus commands 5, 6, 15, 16, 22 and 23. The OUT area can be read by the Modbus commands 1, 2, 3, 4, and 23. Command 1, 2, 5 and 15 uses a bit oriented address information and command 3, 4, 6, 16, 22 and 23 uses word oriented address information. The possible bit and word addresses are described below

Word address	Bit address							
400h	4000h	4001h	4002h	4003h	4004h	4005h	4006h	4007h
400h	4008h	4009h	400Ah	400Bh	400Ch	400Dh	400Eh	400Fh
401h	4010h	4011h	4012h	4013h	4014h	4015h	4016h	4017h
401h	4018h	4019h	401Ah	401Bh	401Ch	401Dh	401Eh	401Fh
...	...0h	...1h	...2h	...3h	...4h	...5h	...6h	...7h
...	...8h	...9h	...Ah	...Bh	...Ch	...Dh	...Eh	...Fh
40Dh	40D0h	40D1h	40D2h	40D3h	40D4h	40D5h	40D6h	40D7h
40Dh	40D8h	40D9h	40DAh	40DBh	40DCh	40DDh	40DEh	40DFh

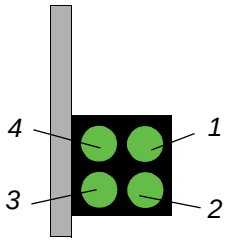
7.1.6 Exception codes

The supported exception codes are:

Exception code	Name	Description
01	Illegal function	The module does not support the function code in the query
02	Illegal data address	The data address received in the query is outside the initialised memory area in the module
03	Illegal data value	The data in the request is illegal

7.1.7 LED indicators

The module is equipped with four LED's mounted at the front and one LED on the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	Link LED
2	Status LED
3	Modbus/TCP connection LED
4	Activity LED

Description	Colour	Function
Link LED	GREEN	Indicates that the module is connected to an Ethernet network
Status LED	GREEN, flashing 1Hz RED, flashing 1Hz RED, flashing 2Hz RED, flashing 4Hz	The IP address is not set using the dipswitch The Ethernet MAC address is incorrect The module failed to load Ethernet configuration from the flash Internal error
Modbus/TCP Connection LED	GREEN, flashing	The number of flashes indicate the number of Modbus/TCP connections that is established to the module
Activity LED	GREEN OFF	No activity Flashes from green to off when a packet is received or transmitted

8. ControlNet

8.1 ControlNet slave module

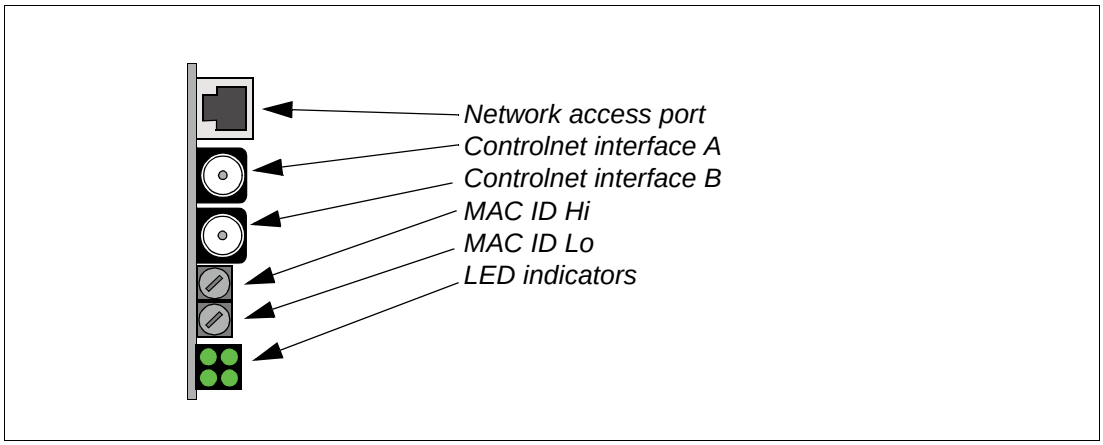


Fig.12 ControlNet slave module

8.1.1 Network access port (NAP)

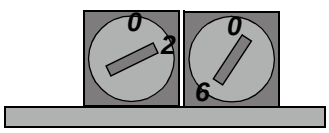
The module is also equipped with a NAP (Network access port) for temporary connection of configuration tools, e.g. a PC card. The minimum Network Update Time, (NUT), of the module is 5ms.

8.1.2 Network access port (BNC)

The module is equipped with two ControlnNet BNC connectors. If redundant operation is desired, both connectors are used, otherwise connector A or B is used.

8.1.3 MAC ID

Before configuring the module the Mac ID has to be set. This is done with two rotary switches on the module. Valid settings range from 1-99. Looking at the front of the module, the leftmost switch is used for the ten setting and the rightmost switch is used for the setting of the integers.



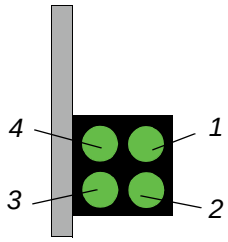
Address = (Left Switch x 10) + (Right Switch x 1)

Example: 2 x 10 + 6 x 1 = 26

Note!
MAC ID cannot be changed during operation.

8.1.4 LED indicators

The module is equipped with four LED's mounted at the front and one LED on the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	Module status
2	Channel A
3	Channel B
4	Module owned

Description	Colour	Function
Module status	GREEN, stable GREEN, flashing RED, stable RED, flashing	Module is initialised Waiting for initialisation Major fault Minor fault
Channel A and B	RED, stable RED, flashing RED/GREEN, flashing OFF	Faulted unit, must be restarted or repaired Incorrect node configuration, duplicate MacID etc Selftest of bus controller Module power off of module not initialised
Channel A / B	GREEN, stable GREEN, flashing RED, flashing RED/GREEN, flashing OFF	Normal operation of channel Temporary errors (node will selfcorrect) or node is not configured to go online Media fault or no other nodes on the network Incorrect network configuration Channel is disabled, depending on network configuration
Module owned	GREEN, stable OFF	A connection is opened against the AnyBus-S module No connection is opened

9. InterBus-S

9.1 InterBus-S slave module

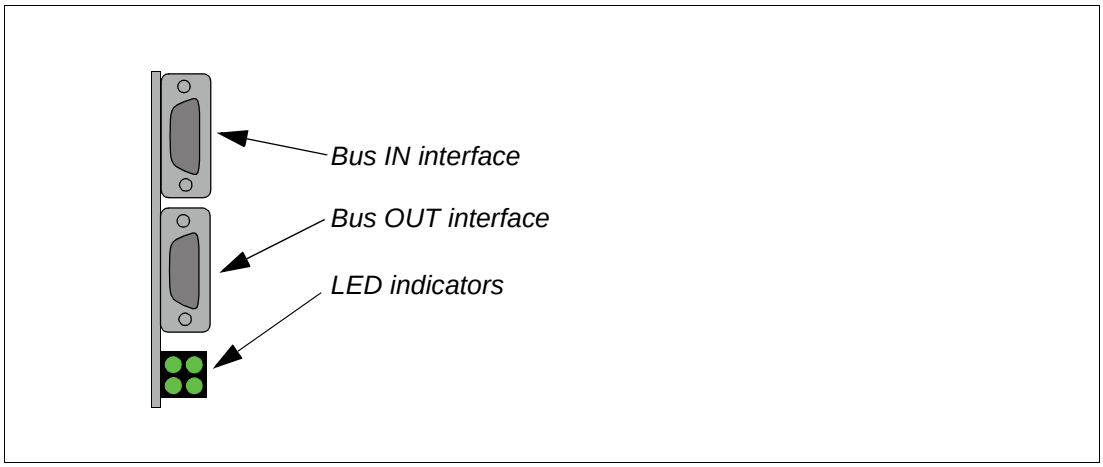


Fig.13 InterBus-S slave module

9.1.1 Device ID

The AnyBus S InterBus module will have the device ID = 3, only process data is used in this device.

9.1.2 Bus-IN interface

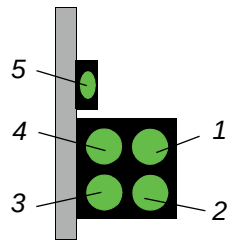
Pin	Description	Function
Housing	PE	PE
1	DO1	DO1
2	DI1	DI1
3	GND	GND
4	Not connected	-
5	Not connected	-
6	/DO1	/DO1
7	/DI1	/DI1
8	Not connected	-
9	Not connected	-

9.1.3 Bus-OUT interface

Pin	Description	Function
Housing	PE	PE
1	DO2	DO2
2	DI2	DI2
3	GND	GND
4	Not connected	-
5	GND	GND
6	/DO2	/DO2
7	/DI2	/DI2
8	Not connected	-
9	RBST	RBST

9.1.4 LED indicators

The module is equipped with four LED's mounted at the front and one LED on the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	RBDA
2	TR
3	CC
4	BA
5	UL

Description	Colour	Function
RDBA	Red	Active when outgoing remote bus is switched off
TR	Green	Active when PCP communication is carried out over the InterBus
CC	Green	Active if the cable connection is good and the InterBus Master is not in reset
BA	Green	Bus Active
UL	Green	Voltage OK at bus interface

10. Modbus Plus

10.1 Modbus Plus slave module

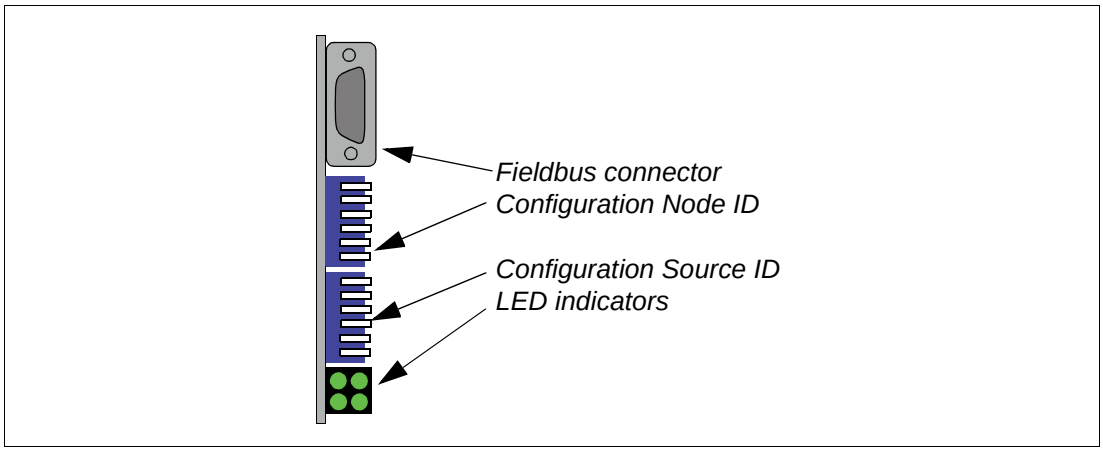


Fig.14 AnyBus-S module

10.1.1 Fieldbus connector

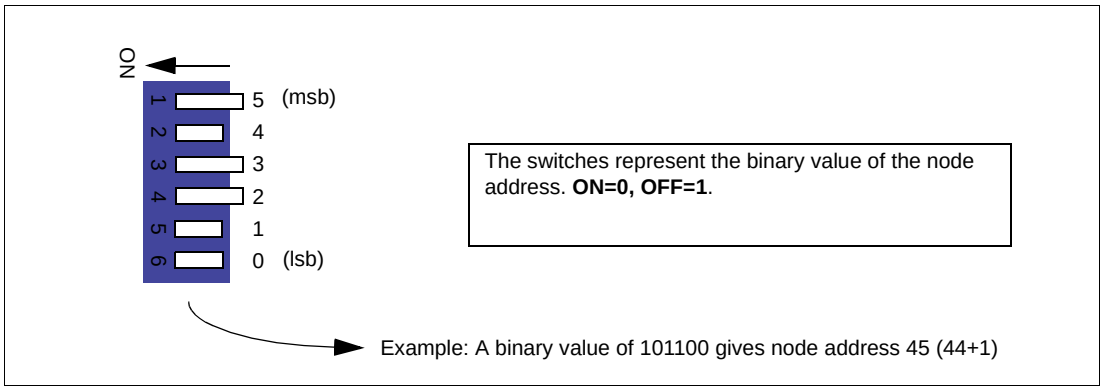
Pin	Description	Function
Housing	PE	PE
1	Cable shielding	Cable shielding
2	MBP Line B	MBP Line B
3	MBP Line A	MBP Line A
4	Not connected	-
5	Not connected	-
6	Not connected	-
7	Not connected	-
8	Not connected	-
9	Not connected	-

10.1.2 Modbus Plus data transfer services

The AnyBus S Modbus Plus module is using global data for data transfer. Point-to-point command such as Read Holding Registers can be used for reading the data out from the module, but no point-to-point writing commands is valid in this I/O area.

10.1.3 Configuration node ID

The Node ID on the Modbus Plus node is set before power on. Any change of Node ID during power on is not valid until next power cycle. The address is set in binary format. Settings range from 1-64. (Add 1 to binary value of the switches).

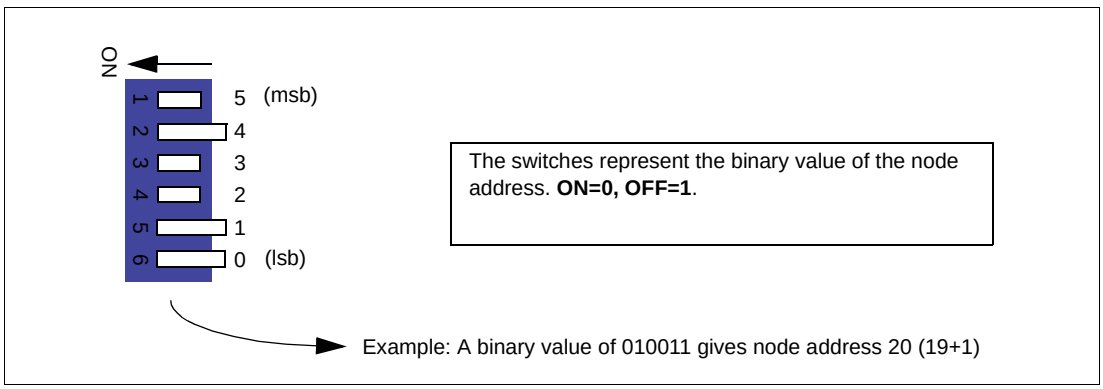


Note!

The node address cannot be changed during operation.

10.1.4 Configuration source ID

The module uses a node address from 1 - 64 to configure what node it will extract the global data from, sent during the token pass. The address is set in binary format. Settings range from 1-64. (Add 1 to binary value of the switches).

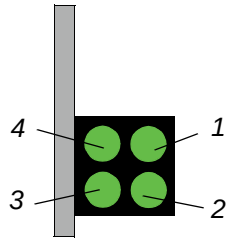


Note!

The source address cannot be changed during operation.

10.1.5 LED indicators

The module is equipped with four LED's mounted at the front of the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	Not used
2	Error
3	MBP Active
4	MBP Init

Description	Colour	Function
Error	Red	Communication error
MBP Active	Green, flashing 6 Hz Green, flashing 1Hz Green, 2 flashes, off 2 sec Green, 3 flashes, off 1.7 sec Green, 4 flashes, off 1.4 sec	Normal operation The node is in MONITOR_OFFLINE state The node is in MAC_IDLE never-getting-token state The node is not hearing any other nodes The node has detected a duplicate node ID
MBP Init	Green	Indicates that the peer interface is initialised

10.2 Modbus Plus DT module

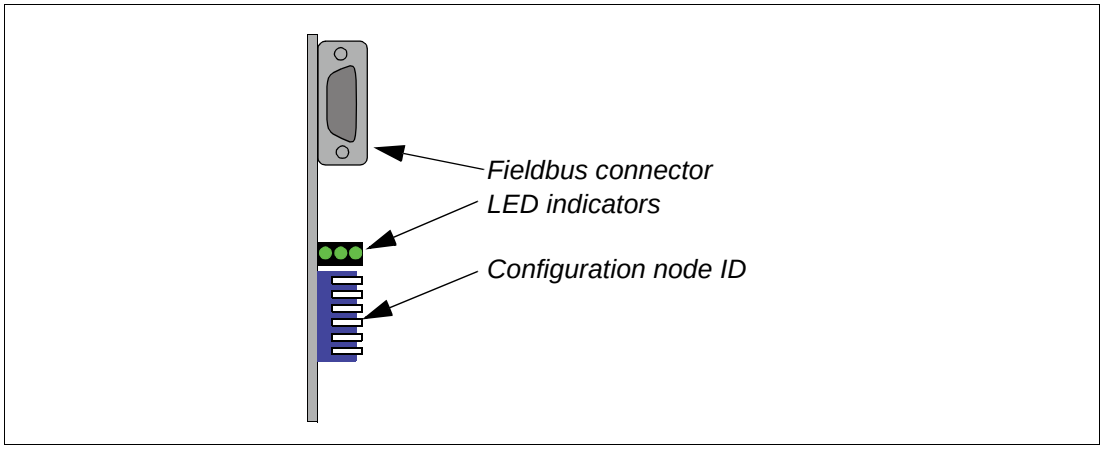


Fig.15 AnyBus-DT module

10.2.1 Modbus Plus data transfer services

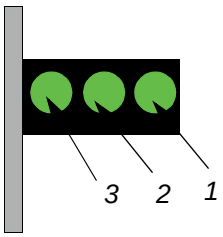
The AnyBus DT Modbus Plus is only using point-to-point modbus commands for data transfer. Commands supporter are: Preset Multiple Registers and Read Holding Registers.

10.2.2 Fieldbus connector

Pin	Description	Function
Housing	PE	PE
1	Cable shielding	Cable shielding
2	MBP Line B	MBP Line B
3	MBP Line A	MBP Line A
4	Not connected	-
5	Not connected	-
6	Not connected	-
7	Not connected	-
8	Not connected	-
9	Not connected	-

10.2.3 LED indicators

The module is equipped with three LED's mounted at the front of the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



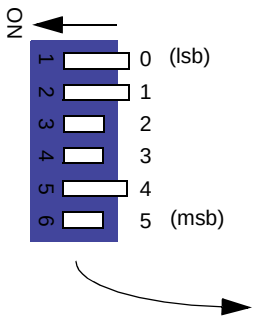
LED	Description
1	Error
2	Modbus Plus Diagnostics
3	Power

Description	Colour	Function
Error	Red	Communication error
Modbus Plus Diagnostics	Green, flashing 6 Hz Green, flashing 1Hz Green, 2 flashes, off 2 sec Green, 3 flashes, off 1.7 sec Green, 4 flashes, off 1.4 sec	Normal operation The node is in MONITOR_OFFLINE state The node is in MAC_IDLE never-getting-token state The node is not hearing any other nodes The node has detected a duplicate node ID
Power	Green	Indicates the power is on

10.2.4 Configuration node ID

The Node ID of the module is set before power on. Any change of Node ID during power on is invalid until next power cycle. The address is set in binary format. Settings range from 1-64. (Add 1 to the binary value of the switches).

(Note that the bit order is reversed compared to the AnyBus-S version.)



The switches represent the binary value of the node address. **ON=0, OFF=1**.

Example: A binary value of 110010 gives node address 20 (19+1)

Note!

The node address cannot be changed during operation.

11. Remote I/O

11.1 Remote I/O slave module

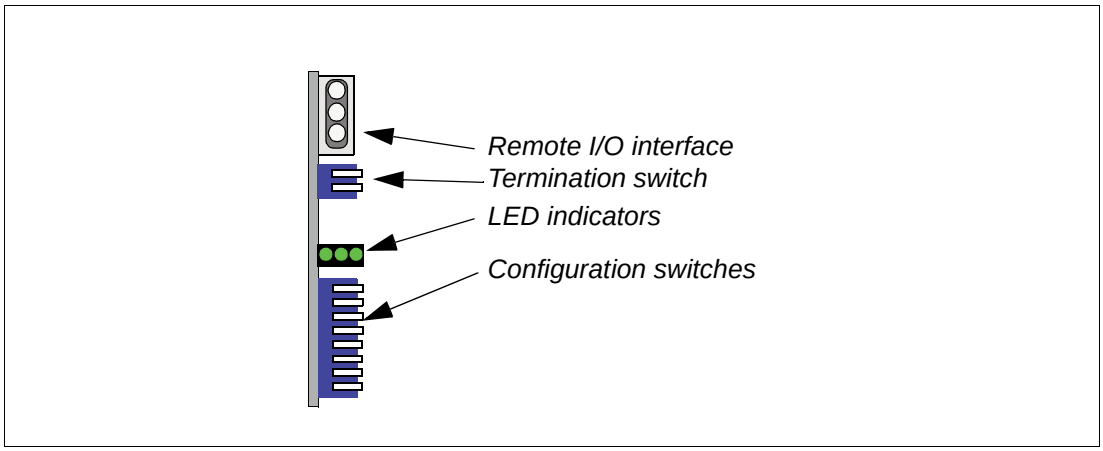


Fig.16 AnyBus-S module

11.1.1 Fieldbus connector

Pin	Description	Function
1	Blue	Blue
2	Shield	Shield
3	Clear	Clear

11.1.2 Termination switch

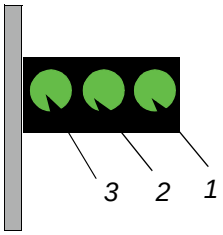
The end nodes in a Remote I/O network have to be terminated to avoid reflections on the bus line. The module has an on board termination switch to accomplish this in an easy way.

Switch position	Description
ON	Bus termination enabled
OFF	Bus termination disabled

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

11.1.3 LED indicators

The module is equipped with three LED's mounted at the front of the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.

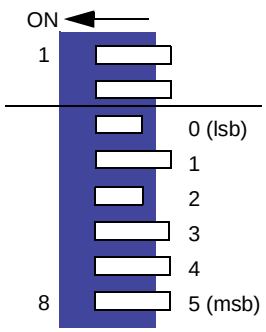


LED	Description
1	Error
2	Active
3	Power

Description	Colour	Function
Error	Red	Communication error
Active	Green	Normal operation Communication is active
Power	Green	Indicates the power is on

11.1.4 Configuration switch

The node address must be configurated before power on. Any change during power on is invalid until next power on cycle. The node address is set in binary format. Valid setting range from 0-59.



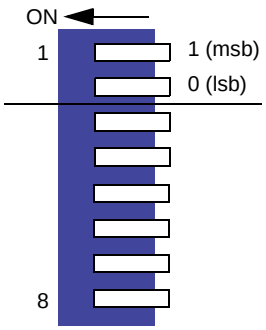
The switches represent the binary value of the node address ON=1, OFF=0

Example:

A binary value of 000101 gives node address 5

The baudrate address must be configurated before power on. Any change during power on is invalid until next power on cycle.

Observe the order of the switches!



The switches represent the binary value of the baudrate **ON=1, OFF=0**

1 (msb)	**0 (lsb)**	**Baudrate**
OFF	OFF	57.6 kbit/sec
ON	OFF	115 kbit/sec
OFF	ON	230 kbit/sec
ON	ON	“230 k/sec”

Note!
The node address and the baudrate cannot be changed during operation.

12. InterBus-FO

12.1 InterBus-FO slave module

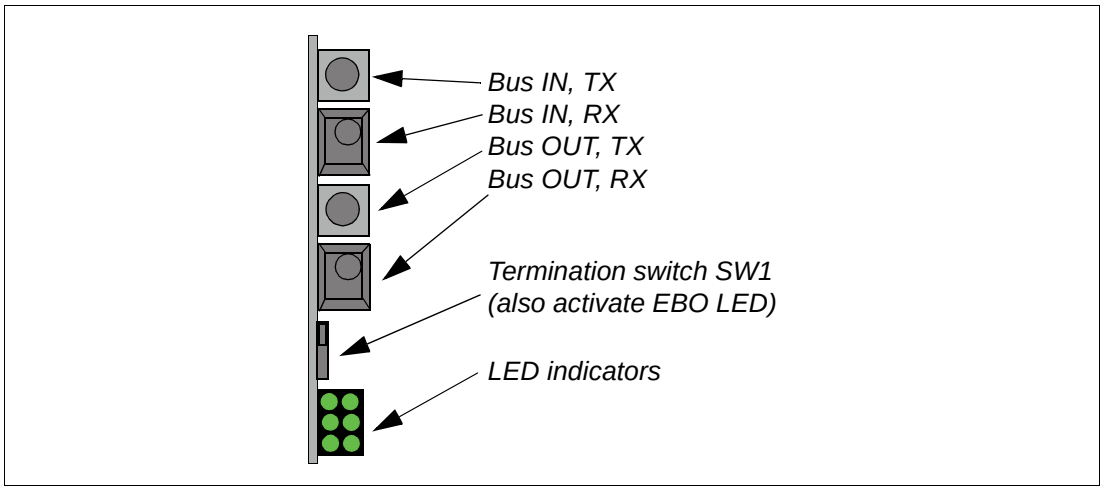


Fig.17 Interbus-FO module

12.1.1 Device ID

The AnyBus InterBus-FO module will have the device ID = 3, only process data is used in this device.

12.1.2 Bus interface IN/OUT

- Transmission media, Optical fibre
  Plastic fibre with a core of 980 µm and a clad of 1000 µm.
  HCS (glass) fibre with a core of 200 µm and a clad of 230 µm.

- Fieldbus connectors
  The specified optical connector is the F-SMA and is a standard connector according to IEC874-2 and DIN 47258.

- Fibre optical conversion
  The standard OPTOSUB can be used along with the OPTOSUB-PLUS to convert to RS485 - level.

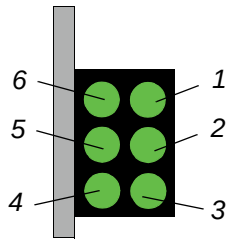
12.1.3 Termination switch

Switch to activate/deactivate the Bus-out Next/End

Always turn the switch SW1 to position marked END if it is the last module on the bus. This will cause the AnyBus InterBus-FO module to terminate the outgoing bus.

12.1.4 LED indicators

The module is equipped with six LED's mounted at the front of the board, used for debugging purposes. The function of the LED:s are described in the table and figure below



LED	Description
1	EBO
2	RBDA
3	TR
4	CC
5	BA
6	UL

Description	Colour	Function
EBO	Green	Active when BUS-OUT is enabled
RBDA	Red	Active when outgoing remote bus is switched off
TR	Green	Active when PCP communication is carried out over the InterBus
CC	Green	Active if the cable connection is good and the Inter-Bus Master is not in reset
BA	Green	Bus active
UL	Green	Voltage OK at bus interface

13. ASI

13.1 ASI master module

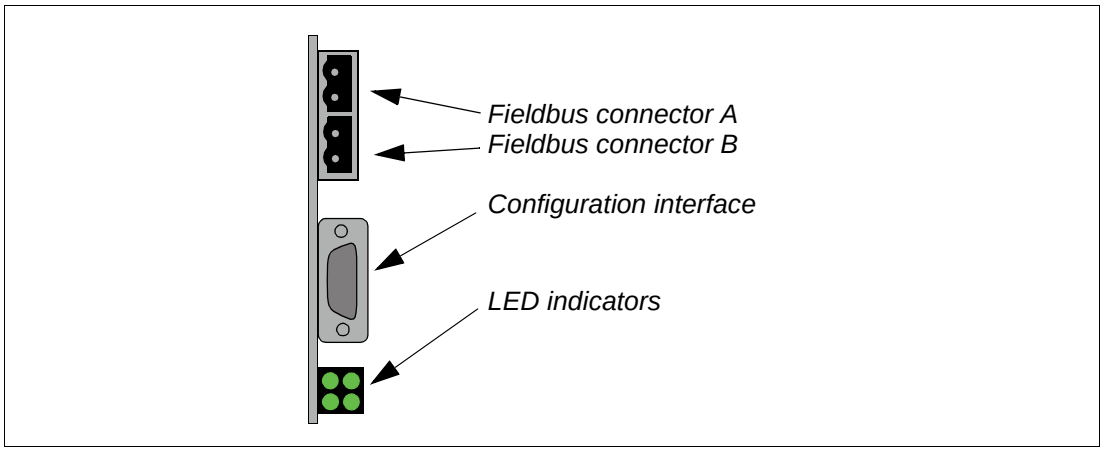


Fig.18 ASI-M module

13.1.1 Fieldbus connector A

Pin	Description	Function
1	ASI +	ASI + power and data (std cable is colour coded: Brown)
2	ASI -	ASI + power and data (std cable is colour coded: Blue)

13.1.2 Fieldbus connector B

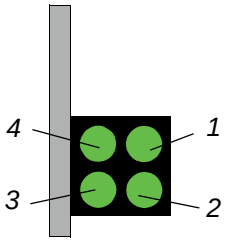
Pin	Description	Function
1	ASI +	ASI + power and data (std cable is colour coded: Brown)
2	ASI -	ASI + power and data (std cable is colour coded: Blue)

13.1.3 Configuration interface

Pin	Description	Function
Housing	PE	PE
1	Not connected	-
2	RX	Receive data
3	TX	Transmit data
4	Not connected	-
5	GND	GND
6	Not connected	-
7	Not connected	-
8	Not connected	-
9	Not connected	-

13.1.4 LED indicators

The module is equipped with four LED's mounted at the front of the board, used for debugging purposes. The function of the LED:s are described in the table and figure below.



LED	Description
1	Not used
2	Network status
3	Moduule status
4	Node status

Description	Colour	Function
Not used	-	-
Network status	Off Green, flashing Green	No power, not initialised or no connection established. On line according to configuration On line, no matching configuration
Modul status	Off Green, flashing Green Red	No power or not initialised Protected mode Configuration mode Power fail
Node status	Green	Auto configuration possible

13.1.5 IN area data mapping

The IN area. Possible ASI slave addresses are described below.

Byte address	Slave address	
1	Slave No 1	Slave No 0 (Reserved)
2	Slave No 3	Slave No 2
3	Slave No 5	Slave No 4
4	Slave No 7	Slave No 6
5	Slave No 9	Slave No 8
6	Slave No 11	Slave No 10
7	Slave No 13	Slave No 12
8	Slave No 15	Slave No 14
9	Slave No 17	Slave No 16
10	Slave No 19	Slave No 18
11	Slave No 21	Slave No 20
12	Slave No 23	Slave No 22
13	Slave No 25	Slave No 24
14	Slave No 27	Slave No 26

13.1.6 OUT area data mapping

The OUT area. Possible ASI slave addresses are described below.

Byte address	Slave address	
1	Slave No 1	Slave No 0 (Reserved)
2	Slave No 3	Slave No 2
3	Slave No 5	Slave No 4
4	Slave No 7	Slave No 6
5	Slave No 9	Slave No 8
6	Slave No 11	Slave No 10
7	Slave No 13	Slave No 12
8	Slave No 15	Slave No 14
9	Slave No 17	Slave No 16
10	Slave No 19	Slave No 18
11	Slave No 21	Slave No 20
12	Slave No 23	Slave No 22
13	Slave No 25	Slave No 24
14	Slave No 27	Slave No 26

13.2 Terminal interface

A simple text based terminal interface is used for diagnostic information.
Use the Windows “Hyper Terminal” function.
Windows Start > Program > Utilities > Communication > Hyper Terminal

13.2.1 Settings

The communication parameters in the PC shall be set as follows.

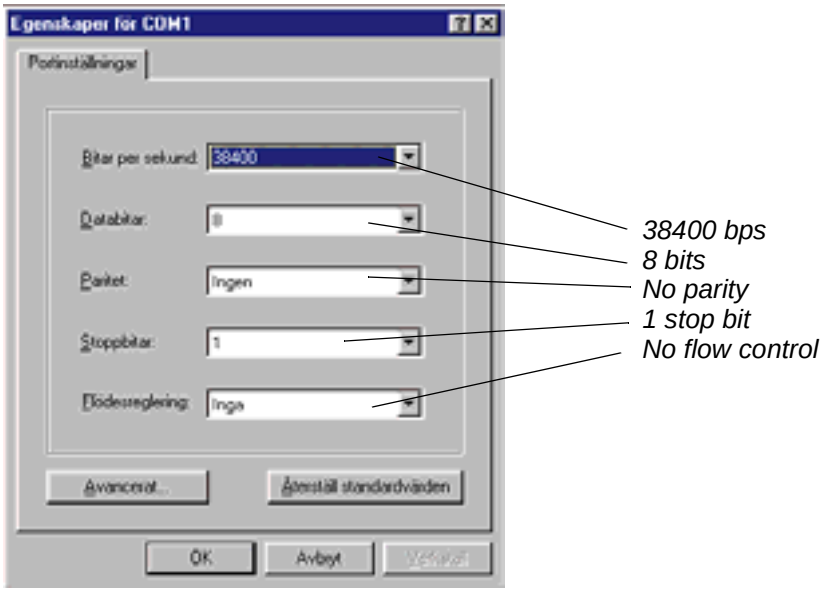
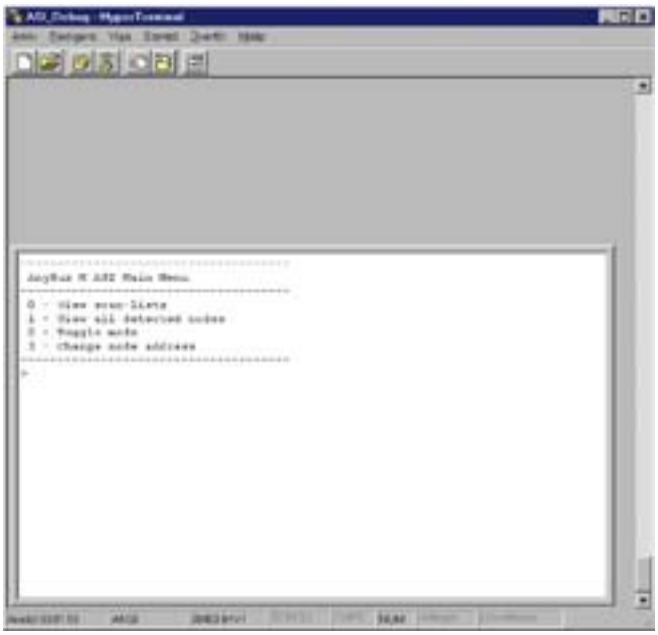


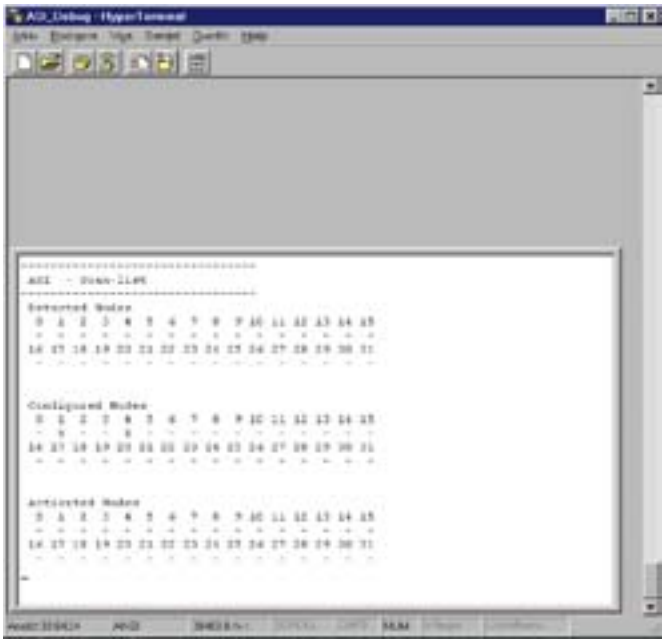
Fig.19 Communication setup

13.2.2 Configuration via terminal



Main menu

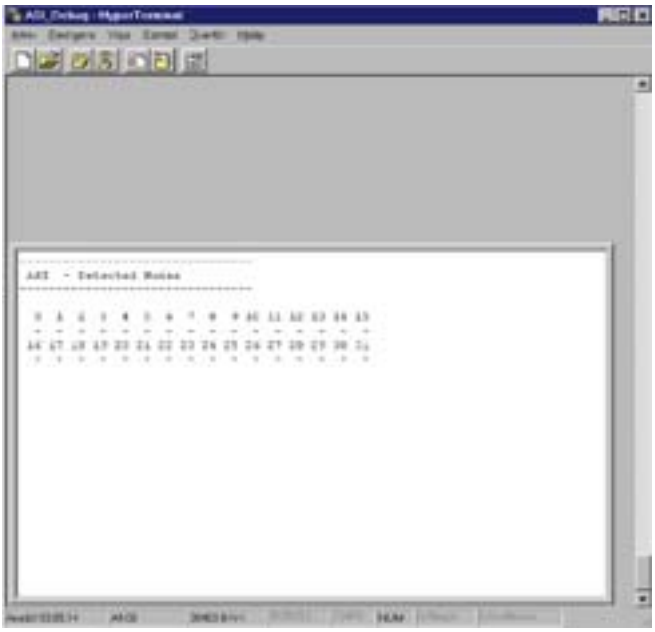
0 - View scan-lists
1 - View all detected nodes
2 - Toggle mode
3 - Change node address



0 - View scan-lists

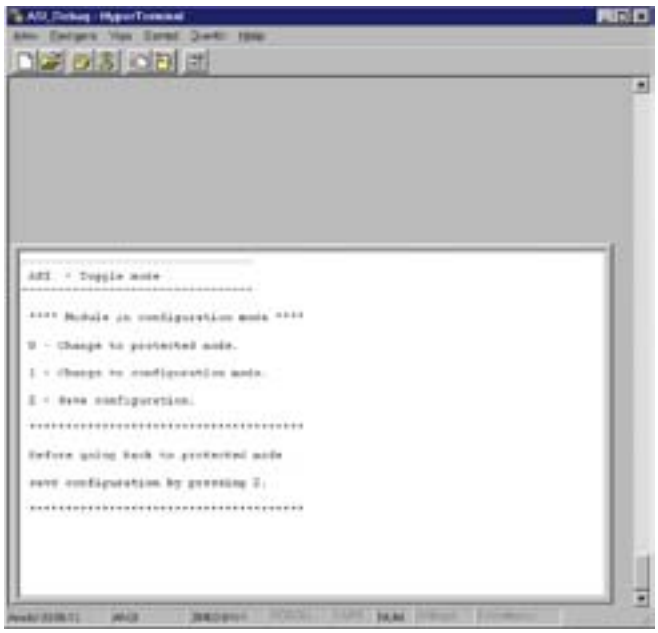
Detected nodes
Configured nodes
Activated nodes

X = Node present in list



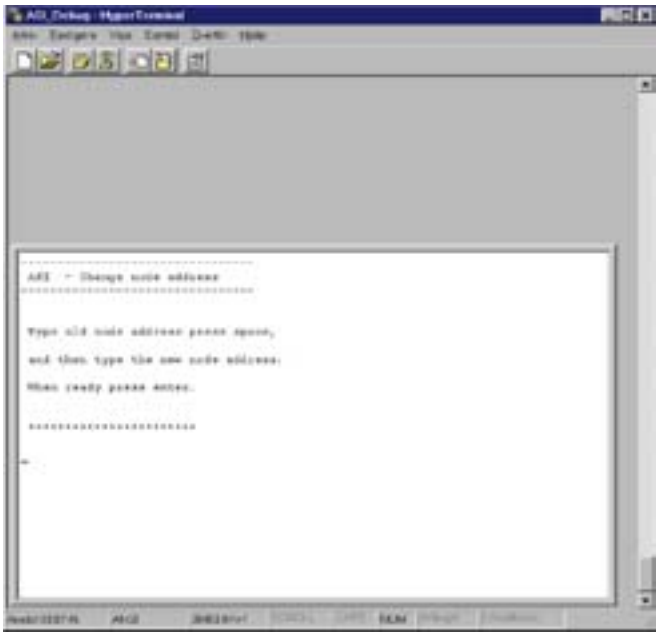
! - View all detected nodes

X = Node present in list



2 - Toggle mode

0 - Change to protected mode
1 - Change to configuration mode
2- Save configuration



3 - Change node address

Type old node address, press space bar and then type the new addresses.
When ready, press Enter.

14. FIPIO

14.1 FIPIO slave module

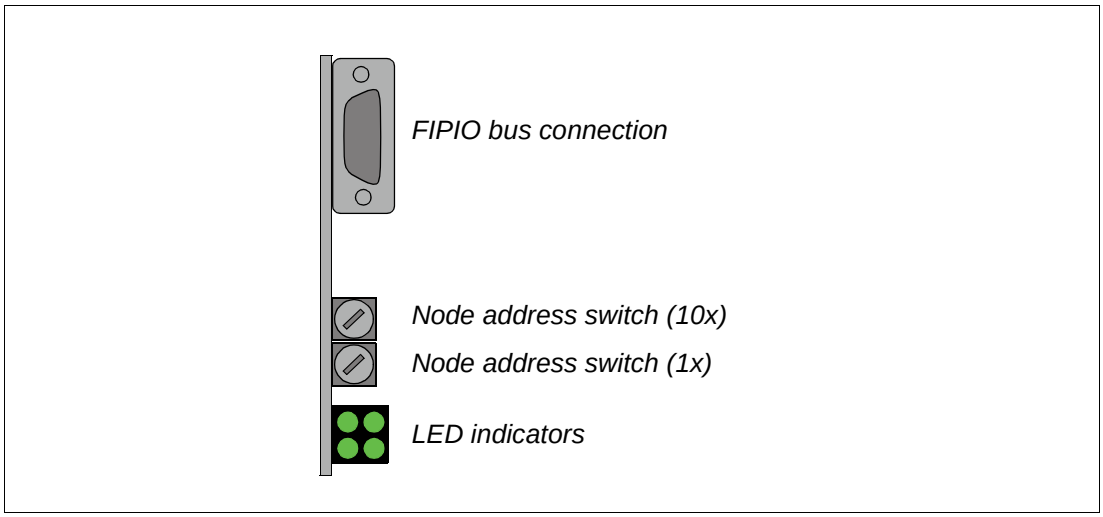


Fig.20 FIPIO slave module

14.1.1 Node address

Use the two rotating switches to set the node address from 0 to 99. The left switch is used for tens and the right switch for single digits.

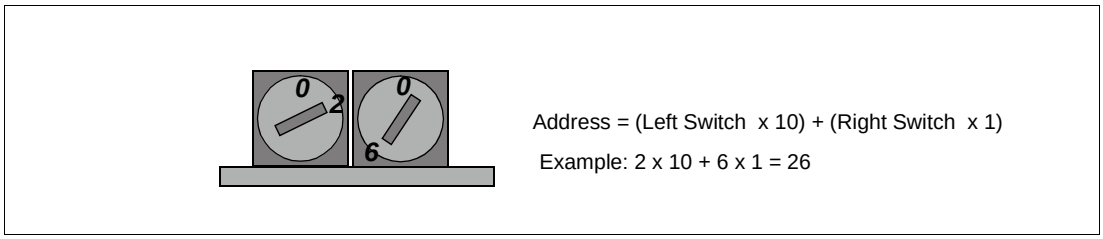
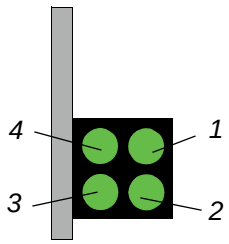


Fig.21 Changing the node address

14.1.2 LED indicators

The LED indicators indicate run time status and errors.



LED	Status	Description
1	Green OFF	Normal operation Device not powered or major failure (no communication)
2	Red Red, flashing OFF	Major unrecoverable fault Bus not connected or promptness timeout Not powered or device operating normally
3	Red OFF	External device error Device operating normally
4	Yellow, flashing OFF	Bus activity No bus activity
All	Flashing	Module not initialised

Fig.22 LED indicators

Basic operation

For more information on operation and programming please refer to the complete manual for AnyBus FIPIO “ABS-FIP-1”.

The latest version of this document can either be downloaded from www.hms.se/products/absfipio.shtml or received by contacting HMS.

15. CC-Link

15.1 CC-Link slave module

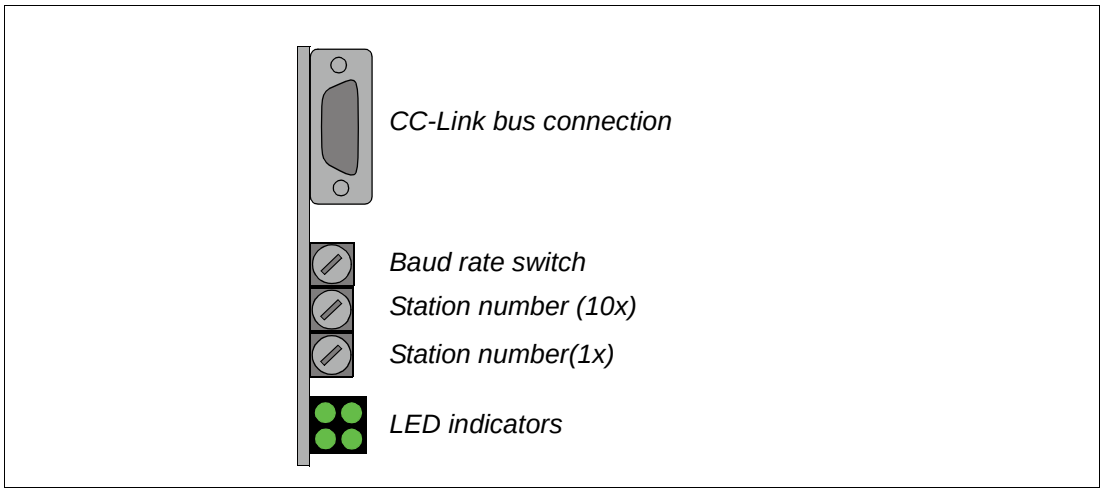


Fig.23 CC-Link slave modue

15.1.1 Baud rate

Use the rotating switch to set the baud rade.

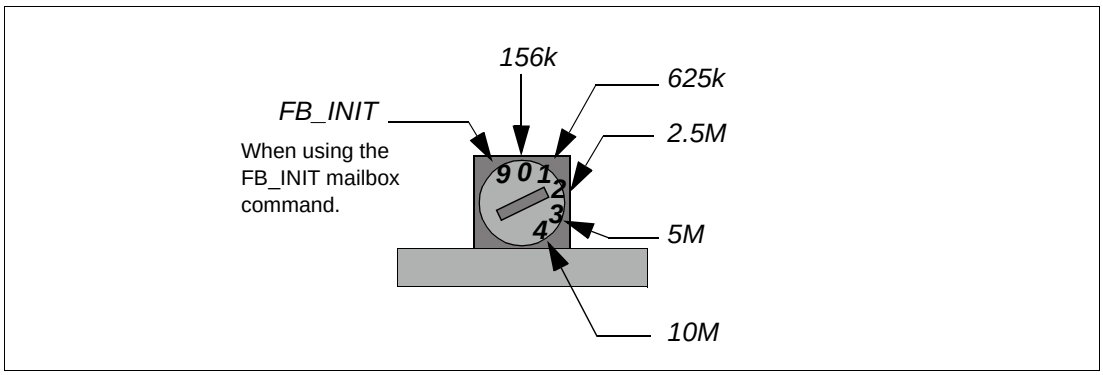


Fig.24 Baud rate settings

15.1.2 Station number

The two rotating switches are used to specify the module's station number. Valid settings range from 1 to 64.

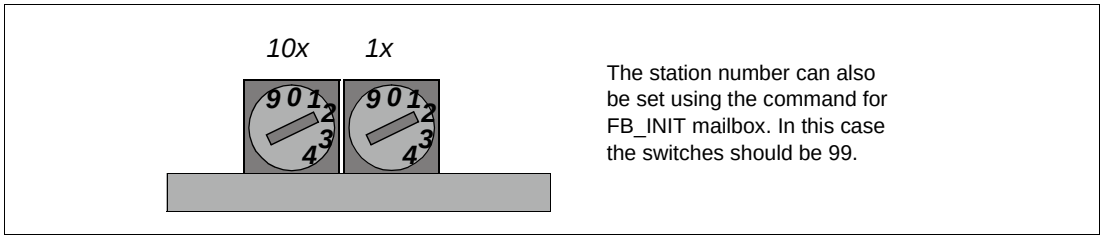
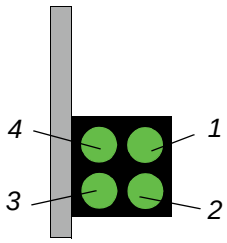


Fig.25 Specifying the module's station number

15.1.3 LED indicators

The LED indicators mounted on the front of the module indicate run time status and errors. (For the additional Watchdog LED also located on the module please refer to AnyBus-S Design Guide).



LED	Colour	Status	Description
1	Green	On	Normal operation
		OFF	Network non-participating or timeout status No power on the module
2	Red	On	CRC error detected, Illegal station number or illegal baudrate selected
		OFF	Normal operation No power on the module
3	Green	On	Data being received
		OFF	No data reception No power on the module
4	Green	On	Data being transmitted
		OFF	No data transmission No power on the module

Fig.26 LED indicators

Basic operation

For more information on operation and programming please refer to the complete manual for AnyBus CC-Link “ABS-APPENDIX-CC-LINK”.

The latest version of this document can either be downloaded from www.hms.se/products/abscclink.shtml or received by contacting HMS.

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