



DIN EN ISO 9001:2000
certified



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Preliminary version

Technical description

MSX-E1701

**Intelligent Ethernet
counter/digital I/O module**

- Digital I/O -

Edition: 01.02 – 04/2007

Product information

This manual contains the technical installation and important instructions for correct commissioning and usage, as well as production information according to the current status before printing. The content of this manual and the technical product data may be changed without prior notice. ADDI-DATA GmbH reserves the right to make changes to the technical data and the materials included herein.

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WARNING

The following risks result from improper implementation and from use of the product contrary to the regulations:



- ◆ Personal injury



- ◆ Damage to the I/O module, PC and peripherals



- ◆ Pollution of the environment

- ◆ **Protect yourself, the others and the environment!**

- ◆ **Read carefully the safety precautions (yellow leaflet).**

If this leaflet is not with the documentation, please contact us and ask for it.

- ◆ **Observe the instructions of the manual.**

Make sure that you do not forget or skip any step. We are not liable for damages resulting from a wrong use of the product.

- ◆ **Used symbols:**



IMPORTANT!

designates hints and other useful information.



WARNING!

It designates a possibly dangerous situation.

If the instructions are ignored the module, PC and/or peripheral may be destroyed.

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1 DEFINITION OF APPLICATION

1.1 Intended use

The Ethernet I/O module **MSX-E1701** with digital and counter functions is intended for the connection to a network, which is used as electrical equipment for measurement, control and laboratory pursuant to the norm IEC 61010-1.

1.2 Usage restrictions

The Ethernet I/O module **MSX-E1701** must not be used as safety related part for securing emergency stop functions.

The Ethernet I/O module **MSX-E1701** must not be used in potentially explosive atmospheres.

1.3 General description of the board

Characteristics

The Ethernet I/O module **MSX-E1701** can be used for the acquisition of incremental counter inputs and the processing of digital signals via 16 digital inputs/outputs.

1.4 Safety precautions

1.4.1 Current sources

All connected devices must be supplied from current sources that comply with SELV according to IEC 60950 or EN 60950; or PELV according to IEC 60204-1 or EN 60204-1.

1.4.2 Degrees of protection



IMPORTANT!

The protection according to the defined degree of protection is only given if the openings are protected with adequate protection caps or connectors.

If you are not sure, please contact us:

Phone: +49 (0)7223/94 93-0

E-mail: info@addi-data.de

1.4.3 Cables

The cables must be installed safely against mechanical load.

1.4.4 Housing

The housing may not be opened. It may be opened only by persons who are authorized by ADDI-DATA.

1.4.5 Connection

Please find information about cables and further accessories in a separate PDF file “Accessories table”

1.4.6 Remarks

The use of the Ethernet I/O module according to its intended purpose includes observing all advices given in this manual and in the safety leaflet.

Uses beyond these specifications are not allowed. The manufacturer is not liable for any damages which would result from the non-observance of this clause.

Make sure that the Ethernet I/O module remains in its protective pack **until it is used**.

Do not remove or alter the identification numbers of the Ethernet I/O module. If you do, the guarantee expires.

2 USER

2.1 Qualification

Only persons trained in electronics are entitled to perform the following works:

- installation
- use
- maintenance

2.2 Personal protection

Consider the country-specific regulations about:

- the prevention of accidents
- electrical and mechanical installations
- radio interference suppression

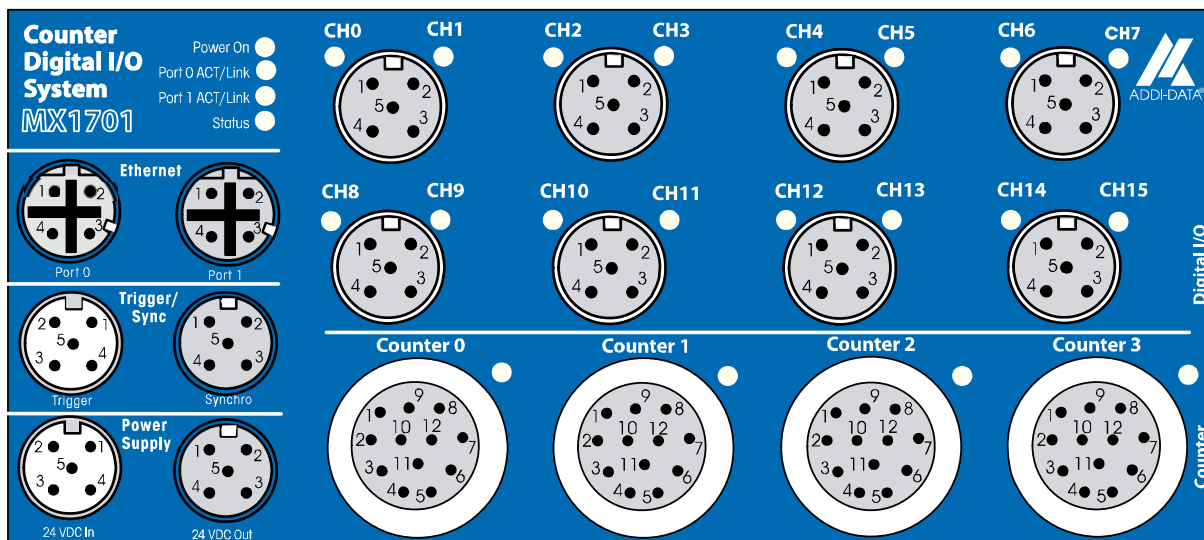
3 HANDLING OF THE ETHERNET I/O MODULE

Fig. 3-1: Correct handling



- Do not touch the connectors
- Hold the module only at the sides and at the bottom

Fig. 4-2: MSX-E1701: View from above

**Accessories³:**

See link in the bookmarks „Accessories table”

4.3 Limit values

Max altitude: 2000 m
 Operating temperature: 0 to 60°C (with forced ventilation)
 Relative humidity: 30 to 99% non condensing
 Storage temperature: -25 to + 70°C

Safety features:

Optical isolation: 1000 V
 Voltage reversal protection: max. 1 A

Current supply:

Nominal voltage: 24 V direct current
 (symbol acc. to IEC 60417 # 5031)
 Supply voltage 18-30 V
 Current consumption at 24 V: 150 mA (±10 %)

Degree of protection:
 Degree of protection: IP 65⁴

4.3.1 Ethernet

Number of ports: 2

³ Not contained in the standard delivery

⁴ Please observe that the protection can be reached only if adequate protection caps are used (see also chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**).

Optical isolation:	1000 V
Cable length:	150 m (max. at CAT5E UTP)
Bandwidth:	10 Mbps (auto-negotiation) 100 Mbps (auto-negotiation)
Protocol:	10 Base-T according to IEEE802.3 100 Base-TX according to IEEE802.3
MAC-address:	00:0F:6C:##:##:## (unique for each device)

4.3.2 Trigger input

Number of inputs:	1
Filter/protective circuitry:	Low-pass/transorb diode
Optical isolation:	1000 V (through opto-coupler)
Nominal voltage (external):	24 V
Input voltage:	0 V to 30 V
Input current:	11 mA (at 24 VDC, typical)
Input frequency (max.):	2 MHz (at 24 V)

4.3.3 Synchro inputs and outputs

Number of inputs:	1
Number of outputs:	1
Optical isolation:	1000 V
Output type:	RS485
Driver level (Master) V_{A-B} :	≤ 1.5 V (low) ≥ -1.5 V (high)
Receiver level (Slave) V_{A-B} :	≤ -200 mV (low) ≥ 200 mV (high)

4.3.4 Digital inputs

Number of inputs:	16 (2 per female connector/ common ground acc. to IEC 1131-2)
Filter/protective circuitry:	33.9 kHz low-pass, 1 st order
Overvoltage protection:	30 V
Optical isolation:	1000 V (through opto-coupler)
Interruptible inputs:	No
Interrupt compare logic:	No
Nominal voltage (external):	24 V
Input voltage:	0 V to 30 V
Input current:	at 24 V: 11 mA (typical) at 16.6 V: 6.3 mA (typical) at 30 V: 17 mA (typical)
Input frequency (max.):	5 kHz (at 24 V)
Logic input levels:	$U_{H(max.)}$: 30 V/17 mA (typical) $U_{H(min.)}$: 19 V/ 8 mA (typical) $U_{H(max.)}$: 14 V/4 mA (typical)

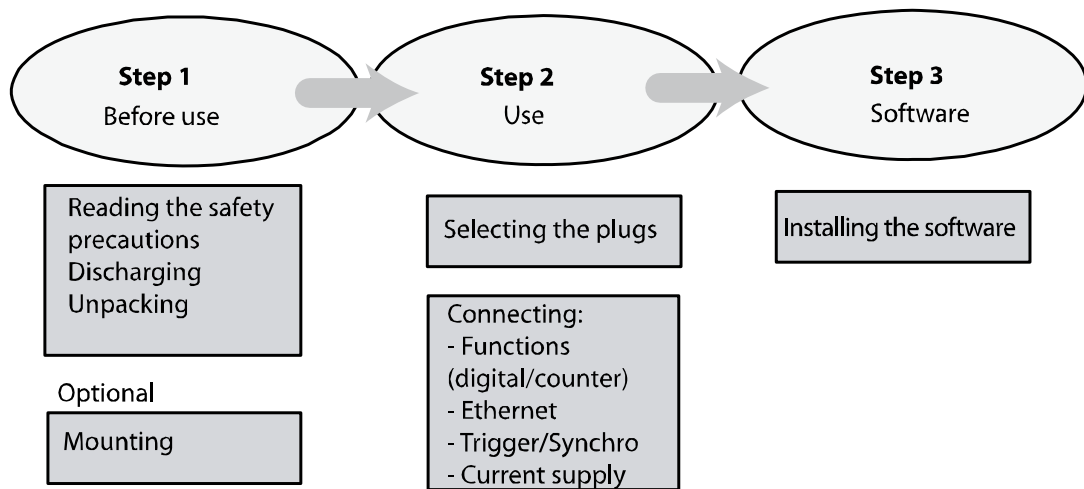
$U_{H(min.)}$: 0 V/0 mA (typical)

4.3.5 Digital outputs

Number of outputs:	16 (2 per female connector)
Optical isolation:	1000 V (through opto-coupler)
Output type:	High Side (load against mass acc. to IEC 1131-2)
Nominal voltage:	24 V
Supply voltage:	18 V to 30 V
Current (max.):	1.85 A (typical at 8 channels through PTC)
Output current per output:	500 mA (typical)
Short-circuit current per output:	1.7 A (max.) Shutdown-logic at 24 V, $R_{load}=10m\Omega$
R_{DS} ON resistance:	280 m Ω (max.)
Switching-on time:	100 μ s (max. $R_L=48\Omega$ of 80% V_{out})
Switching-off time:	150 μ s (max. $R_L=48\Omega$ of 10% V_{out})
Overtemperature (shutdown):	135°C max. (output driver)
Temperature hysteresis:	15°C typ. (output driver)
Diagnostics:	Common diagnostics bit for all 16 channels at overtemperature of one channel

5 USE

Fig. 5-1: Use



5.1 Before use

- ◆ Discharge yourself by touching a conducting surface
- ◆ Remove the Ethernet I/O module from its protective package

5.1.1 Mounting the Ethernet I/O module: DIN rail

With the mounting set **MX-Rail** (see PDF table „Accessories“) you can attach the Ethernet I/O module to a DIN rail.



WARNING!

Should you have already mounted the **MSX-E1701** and want to transport it in a switch cabinet or in other systems, do ensure that there is sufficient transportation lock. The **MSX-E1701** could fall e.g. from the DIN rail, which could lead to the damage of the **I/O module** and/or other objects/persons.

- ◆ Attach the clamps to the Ethernet I/O module
- ◆ Fasten the clamps in the holes with the 2 delivered screws



IMPORTANT!

The spring within the clamps points to the housing ground (see figure below).

Fig. 5-2: Clamps



- ◆ Attach the Ethernet I/O module to the DIN rail by placing the clamp with the springs under the rail
- ◆ Lift the Ethernet I/O module until the upper part of the clamp locks on the rail

5.1.2 Mounting the Ethernet I/O module: Angle mounting

With the mounting set **MX-Screw** (see PDF table “Accessories”) you can prepare the Ethernet I/O module for the direct attachment to machines and devices.

According to your requirements you can attach the four angles either pointing inside or outside.

Fig. 5-3: Angles pointing to the outside



Fig. 5-4: Angles pointing to the inside

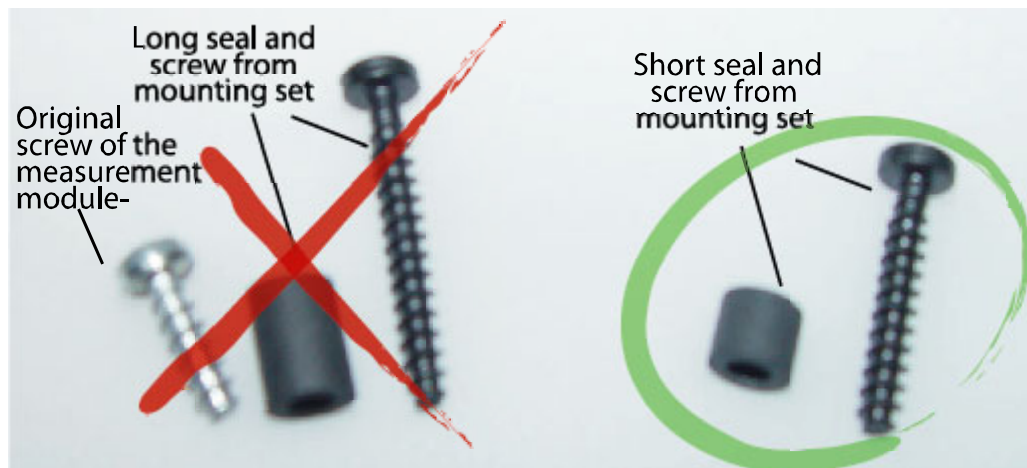


For mounting please observe the following steps:

- ◆ Unscrew the screws from the side of the Ethernet I/O module

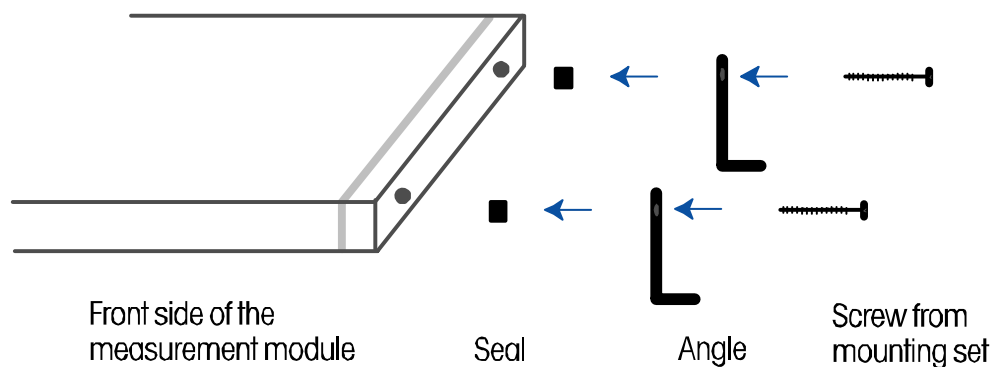
For further mounting please use only the **short** seals and screws from the mounting set.

Fig. 5-5: Screws and seals



- ◆ Put the seal into the opening
- ◆ Put the angle on the seal
- ◆ Fasten the angle with a short screw from the mounting set

Fig. 5-6: Angle mounting



After having attached the angles to the Ethernet I/O module, you can attach the module directly to devices and machines with further screws.

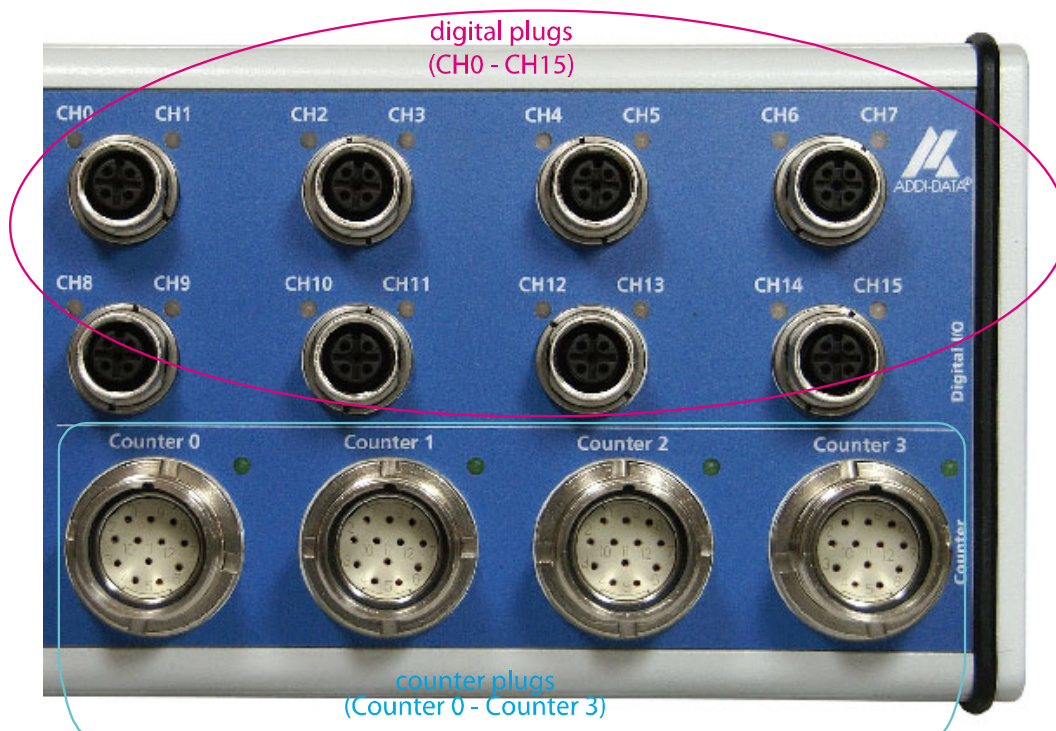
5.2 Connecting the components

- ◆ Discharge yourself
- ◆ Take the Ethernet I/O module out of its protective pack

5.2.1 Connecting the digital functions

- ◆ Select one or more plugs for digital functions
CH0 – CH15 = Digital plugs

Fig. 5-7: Selecting a digital plug



- ◆ Plug the function cable/clamp into the required plug/s

5.2.2 Connecting Ethernet ports

- ◆ Plug the Ethernet cable in Ethernet port 0⁵

Fig. 5-8: Connecting Ethernet ports



5.2.3 Connecting trigger and synchro signals

- ◆ Plug the cable into the plug Trigger/Sync In¹

Fig. 5-9: Connecting trigger and synchro signals



⁵ If you want to connect several Ethernet I/O modules, please do observe chapter 5.3.

5.2.4 Connecting to the current supply

- ◆ Plug the cable into the input (24 VDC In)⁶

Fig. 5-10: Connecting the current supply



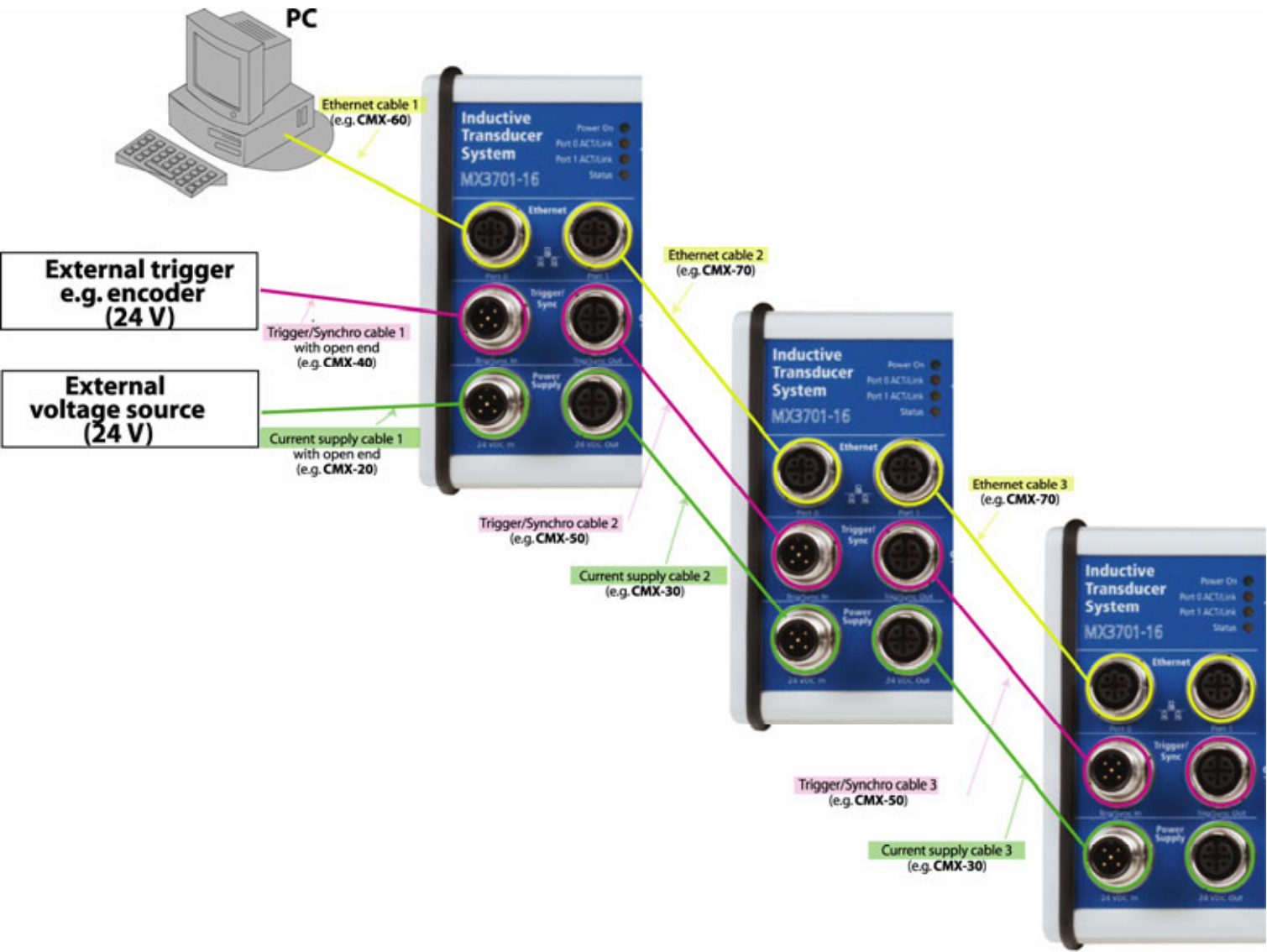
5.3 Connecting several Ethernet I/O modules

You can connect several Ethernet I/O modules. Hereto please observe the following steps:

- ◆ Connect the first Ethernet I/O module as described above
- ◆ Connect the components as shown in the figure (see next page)

⁶ If you want to connect several Ethernet I/O modules please do observe chapter 5.3.

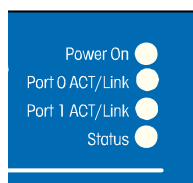
Fig. 5-11: Connecting several Ethernet I/O modules



5.4 LED display

5.4.1 Overview

Fig. 5-12: LEDs: Current supply, Ethernet and Status








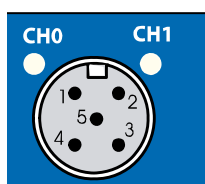




	LED	Description
Power On	Lights green 	Current supply OK
Port 0 ACT/Link	Blinks yellow 	Ethernet cable connected to Port 0
Port 1 ACT/Link	Blinks yellow 	Ethernet cable connected to Port 1 verbunden
Status	Lights green 	As soon as the Status LED lights <u>green</u>, the module is ready for work.
	Lights yellow 	If the Status-LED lights <u>yellow</u>, the network cables are possibly not connected
	Detailed description of the Status LED: See table next page	

Fig. 5-13: LEDs: Digital I/O



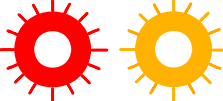








Direction	State	LED	Description
Output	inactive	black 	No output is active, there is no voltage.
Output	active	red 	Output is active, there is voltage. Caution, short-circuit danger!
Input	inactive	green 	Input is ready for work, signals can be received.
Input	active	yellow 	Input is active, signal is received.

5.4.2 LED "Status"

The table below contains further information about the LED "Status".

Table 5-1: LED "Status"

Display	Meaning	Possible cause	Tip
Lights red 	Error during booting	Hardware error (e.g. RAM)	- Contact us for reparation or exchange
Blinks red 	Damaging ambient conditions	Internal temperature is outside the working range (< -40 C° or > 85 C°)	- The module should be handled quickly appropriately - Under such conditions the measurement values are inexact and the whole functions are limited - Such conditions can damage the internal components and thus make the whole system useless
Blinks red/yellow 	The system cannot be accessed via a network connection and dangers are possible to arrive	Internal temperature is low (LOW) or high (HIGH) and network cables are not connected.	- The module should be handled appropriately - Check the Ethernetlinks (see LEDs Port 0 ACT/LINK and Port 1 ACT 1/LINK) - Please observe that in the meantime also further errors can occur that prevent data acquisition (e.g. a short-circuit)
Blinks red/yellow 	System still works and communicates correctly, but dangers are possible to arrive	Internal temperature is low (LOW) or high (HIGH)	The module should be handled appropriately
Lights yellow 	System is serviceable, but cannot be accessed via a network connection	- System is booting - Network cables are not connected	- Wait until the system initialization is finished (approx. 40 s) - Check Ethernet connection (see LEDs Port 0 ACT/Link or Port 1 ACT/Link)
Blinks yellow 	Data acquisition is not possible, but the system can be accessed via a network connection	- After an update with a defect firmware - Essential part works not correctly - Short-circuit at the primary side of one or several sensors	- Check the diagnostics on the website of the system - Check the cables and sensors that are connected to the module - Use an updated firmware for your system - Contact us for reparation or exchange

Display	Meaning	Possible cause	Tip
Blinks yellow/green 	Data acquisition is possible but some parts are not working correctly.	- The Flash memory is not working correctly - A wrong IP address has been configured	- Check your IP address - Contact us for reparation or exchange
Blinks green 	System is working	- Firmware update - Data acquisition is running	
Lights green 	System is ready for work		



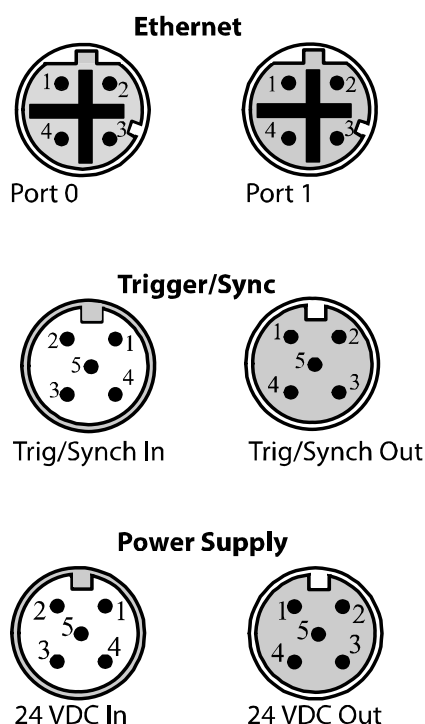
Note: During booting, the LED “Status” is yellow

6 CONNECTING THE PERIPHERAL

This chapter contains the connector pin assignment of the control signals (see chapter 6.1) and of the function signals (see chapter 6.2).

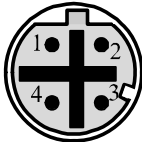
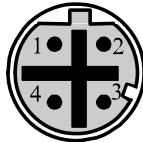
6.1 Pin assignment control signals

Fig. 6-1: Control signals MSX-E1701



6.1.1 Ethernet Ports

Table 6-1: Pin assignment: Ethernet Port 0 and Port 1

	Ethernet Port 0	Ethernet Port 1
Pin No.	Ethernet female connector D-coded, M12	Ethernet female connector D-coded, M12
1	TD0+	TD1+
2	RD0+	RD1+
3	TD0-	TD1-
4	RD0-	RD1-
	Ethernet Port 0 	Ethernet Port 1 

6.1.2 Trigger/sync

Table 6-2: Pin assignment: Trigger/Sync

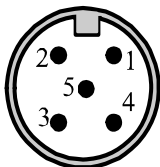
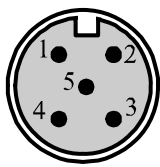
	Trigger/Sync In	Trigger/Sync Out	Cable color
Pin No.	Male connector, 5-pin., M12	Female connector, 5-pin, M12	
1	Dig. trigger input -	Dig. trigger input -	Brown
2	Dig. trigger input +	Dig. trigger input +	White
3	Synchro trigger input +	Synchro trigger output +	Blue
4	Synchro trigger input -	Synchro trigger output -	Black
5	Ground	Ground	Gray
	Trigger/Sync In 	Trigger/Sync Out 	

Photo: Connecting the trigger/synchro signals (see Fig. 5-9)

6.1.3 Current supply

Table 6-3: Pin assignment: Current supply

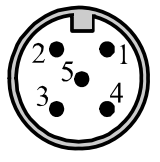
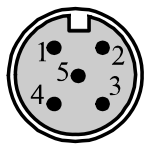

	Power Input	Power Output	Cable color
Pin No.	Male connector, 5-pin, M12	Female connector, 5-pin, M12	
1	24 V	24 V	Brown
2	24 V	24 V	Whiter
3	Ground	Ground	Blue
4	Ground	Ground	Black
5	Shield	Shield	Gray
	Power Input 	Power Output 	

Photo: Connecting the current supply (see Fig. 5-10)

6.2 Signals of the counter and digital functions

Table 6-4: Pin assignment of the digital I/O

Pin No.	Female connector, 5-pin, M12	Cable color
1	24 V	Brown
2	Digital I/O (2n+1)*	White
3	Ground	Blue
4	Digital I/O (2n)*	Black
5	Shield	Gray
		

Digital I/O (2n) and (2n+1) on female connector (n)

* Please observe that the connector is assigned double and that the assignment of the digital I/O is determined on the female connector (n) via (2n) and (2n+1).

$0 \leq n \leq 7$

Examples:

n = 0 =>	Digital I/O 2x0=0 and (2x0+1)	= 1 on female connector 0
n = 3 =>	Digital I/O 2x3=6 and (2x3+1)	= 7 on female connector 3
n = 7 =>	Digital I/O 2x7=14 and (2x7+1)	= 15 on female connector 7

7 SOFTWARE

In this chapter you will find a description of the delivered software and its possible applications. The detailed software descriptions of the several functions can be found in separate PDF files.

You can choose the following options for using your Ethernet I/O module:

Option 1: With direct access (all functionalities of the module can be used)

Option 2: With ADDIPACK (for compatibility with PCI board)⁷

7.1 Option 1: Direct access

7.1.1 Interface to the module

The module is accessed via a TCP/IP socket:

The Ethernet I/O module has the following two servers:

Command server (SOAP) > to send commands (acquisition initialisation, etc.)

Data server (TCP socket) > to obtain the values of the acquisition

MSX-E1701 server access information:

SOAP server: Port number 5555

Data server: Port number 8989

7.1.2 SOAP: General definition

What is SOAP?

SOAP (originally *Simple Object Access Protocol*) is a protocol with which data can be exchanged between systems, and Remote Procedure Calls can be executed. SOAP is based on services of other standards, XML for representing the data and internet protocols of the transport and user layer (see TCP/IP reference model) for transmitting the messages. The most usual combination is SOAP via HTTP and TCP. The abbreviation SOAP is not used anymore since version 1.2 because it is (subjective) not „simple“ and it serves not only for accessing to objects (Object Access).

Fig. 7-1: SOAP in the TCP/IP protocol staple

Application	SOAP				
	HTTP	HTTPS	...		
Transport	TCP				
Network	IP				
Net access	Ethernet	Token Ring	FDDI	...	

⁷ At the moment **no** access with ADDIPACK is possible. Therefore please use option 1 “Direct access”

What is a socket?

A **socket** is a bidirectional software interface to interprocess (*IPC*) or network *communication*.

Sockets are a standardized interface (API) between the network-protocol-implementation of the operating system and the actual application software.

7.1.3 SOAP functions

For further information: See “SOAP function description” (link on PDF file in the bookmarks).

7.1.4 Data server and data protocol**What is a data server?**

A data server is a network component that reads data from the module and sends it to all clients.

Characteristics:

- Multiclients
- Optimized for high throughput and fast servicing of available data.

Data protocol:

A data package consists of five fields (field format: 32-bit little-indian)

time stamp low	time stamp high	source counter	source type	data
----------------	-----------------	----------------	-------------	------

Time stamp

timestamp low	micro second
timestamp high	second

Source counter

Source counter: 0 to 3

Source type

0	compare logic
1	Frequence
2	latch register digital trigger
3	latch register synchro trigger
4	index

Data

The width of all data is 32-bit (0 to 0xFFFFFFFF)

Source type	Definition
Compare logic	Counter value when the compare-condition becomes true.
Frequence	Number of pulses during a given interval.
Latch register digital trigger	Counter value when the digital trigger occurs.
Latch register synchro trigger	Counter value when the synchro trigger occurs.
Index	Counter value when the index comes.

7.2 Option 2: Access with ADDIPACK

7.2.1 Module registration

a) Assigning the IP address

- ◆ **Install and start SETMSXExxxx (is on the delivered CD)**

Change the IP address of the Ethernet I/O module (more information see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** software tool SETMSXExxx)

b) Module registration

- ◆ **Install ADDIPACK (is on CD1 “standard drivers”)**

After this, continue with the module registration as follows:

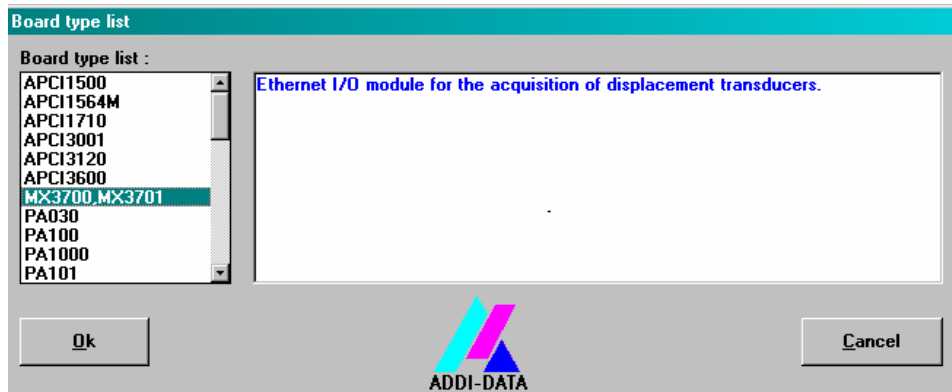
Inserting the module

To use a module you should insert it firstly in ADDIREG.

- ◆ **Select „MSX-E1701” when clicking on „Insert“ in the ADDIREG-main window (see Fig. 7-6)**

After this the following window will be displayed:

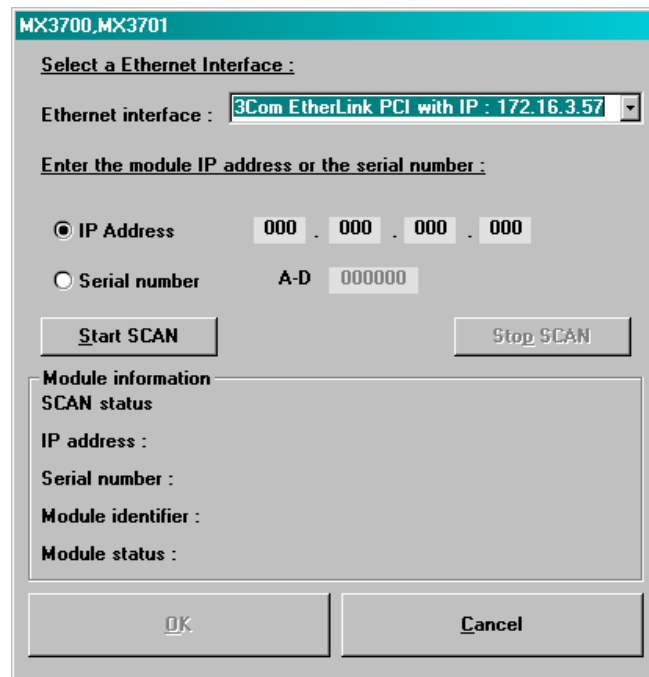
Fig. 7-2: Board type list



◆ Click on OK.

After this the following window appears:

Fig. 7-3: Settings



◆ Select the network card under „Ethernet interface“

Make sure that you have selected the network card to which the Ethernet I/O module is connected.

◆ Enter the IP address

or:

◆ Enter the serial number of the module

◆ Click on „Start Scan“

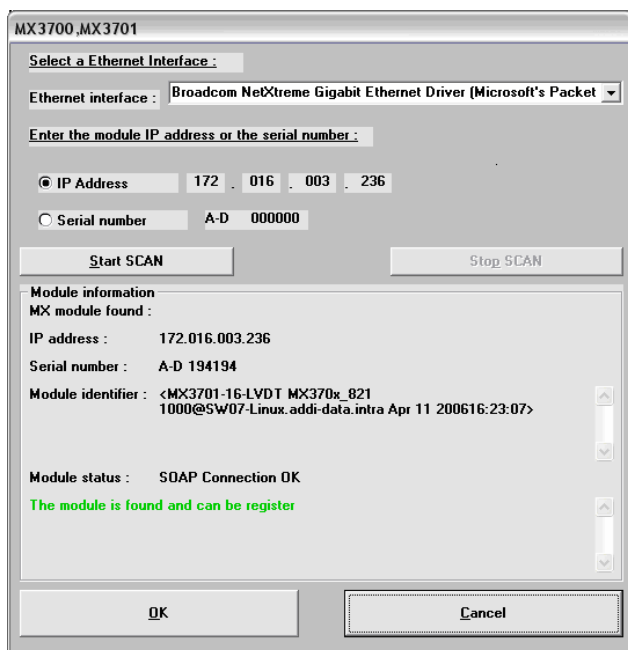
Depending on the firewall-settings of your PC, it is possible that a Windows-warning will be displayed.

◆ Click on “Nicht mehr blocken” (don’t block) to start also in this case the scan

Now the scan will be started. After the module has been recognized, the SOAP connections will be checked.

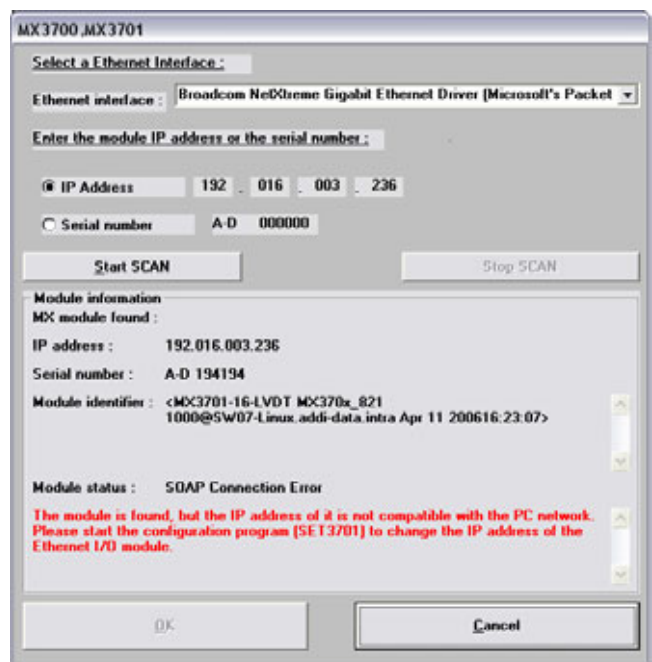
After the scan has been completed successfully and no errors have been detected during the check of the SOAP connections, the **OK** button will be activated and your settings will be listed under “Module information”.

Fig. 7-4: Settings OK



This window is displayed if your settings are OK. You can continue as described below.

Fig. 7-5: Settings not OK

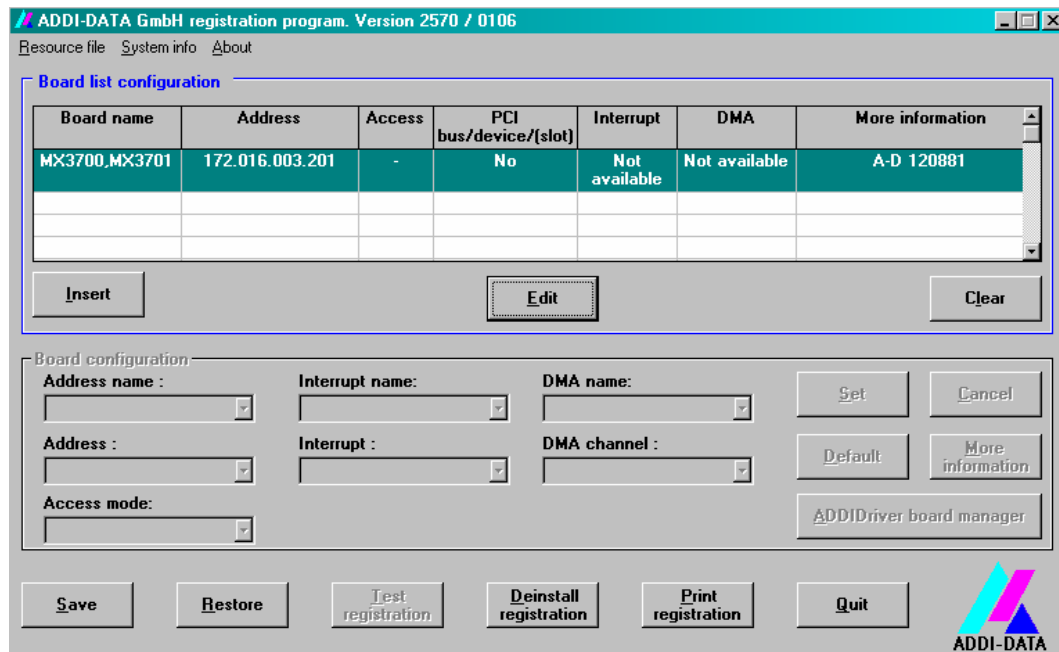


This window is displayed if your settings are not OK. Follow the advice shown in the window.

◆ Click on OK

Now the module is shown in the ADDIREG window:

Fig. 7-6: ADDIREG main window (example)



- ◆ Click on „Set“ and then on „Save“

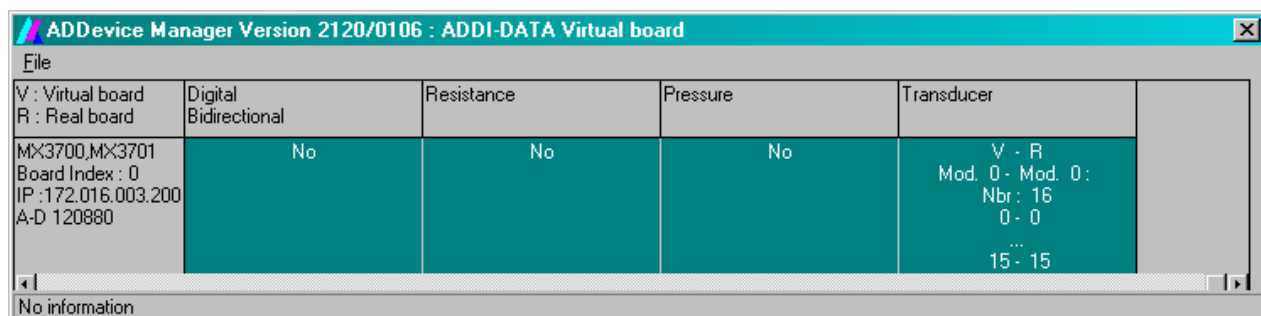
Now the Ethernet I/O module will be integrated in ADDIPACK.

Starting the ADDevice Managers

- ◆ Click on „Edit“ and then on „ADDIDriver board manager“

After this the ADDevice Manager opens:

Fig. 7-7: ADDevice Manager



The ADDevice Manager shows the following information:

First column:

Module name

Board Index: Number allocated to the Ethernet I/O module when registered in ADDIREG

IP address

Serial number

Further columns:

The program distinguishes between the resources (Digital/Resistance/Pressure/Transducer, ...) of the virtual module (**V**, software) and the real module (**R**, module).

The following parameters are listed

Module number,

Number of resources

Index: The first index line represents the number of the first resource (left: virtual resource - right: real board) The second index line represents the number of the last resource (left: virtual resource - right: real board).

Type (24 V/5 V, voltage/current, HS/OC - High-Side/Open collector).

IRQ: if the input channels are interruptible, the program displays the number of the first and of the last input channel

By clicking twice within a column, the connection principle and the technical data of the resource are displayed. This function is only possible if a question mark appears with the cursor.

You can export the set configuration as a text file. Click on "file" and save the configuration as a .txt file with "Export information to file...". Then you can print the configuration or use it for other boards.

Once you have controlled the registration, you can quit the window of ADDevice Manager. The module is ready to operate.

Description of the ADDIREG program

The program is automatically installed with ADDIPACK.

Start ADDIREG under Start/Programme/ADDIPACK/ADDIREG.

**IMPORTANT!**

First quit all the applications (programs) which use the module before starting the ADDIREG program.

When you start ADDIREG and the Ethernet I/O module is not available anymore you will find it in the "Clear board list".

Fig. 7-8: Board clear/insert

ADDIDriver board clear/insert list (automatic detection)

Clear board list

Board name	Base address	PCI bus/device/{slot}	Interrupt

Number of board : 0

Insert board list

Board name	Base address	PCI bus/device/{slot}	Interrupt
APCI3200	DC80,D800,DC78,DC70	2/ 10/ 4	11

Number of board : 1

[More information](#)

OK

If you need more information about the operation of the Ethernet I/O module click on “More information”. The ADDevice Manager will be started.

7.2.2 Questions and software downloads on the web

Do not hesitate to e-mail us your questions. We will be pleased to support you.
e-mail: info@addi-data.de or hotline@addi-data.de

Free downloads of standard software

You can download the latest version of the software for the Ethernet I/O module **MSX-E1701**:

<http://www.addi-data.com>

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IMPORTANT!

Before using the product or in case of malfunction during operation, check if there is an update of the technical description or driver. The current version can be found on our web site (download). You also can phone us directly (Phone: +49 7223 9493-0) or send us an e-mail.

7.2.3 Standard software

a) Software functions

ADDIPACK supports the following functions for the Ethernet I/O module
MSX-E1701.

Table 7-1: Supported software functions

Functionality	Function name
Common functions	i_ADDIDATA_OpenWin32Driver
	i_ADDIDATA_GetCurrentDriverHandle
	i_ADDIDATA_GetDriverVersion
	b_ADDIDATA_CloseWin32Driver
Interrupt	b_ADDIDATA_SetFunctionalityIntRoutineWin32
	b_ADDIDATA_TestInterrupt
	b_ADDIDATA_ResetFunctionalityIntRoutine
Error	i_ADDIDATA_GetLastError
	i_ADDIDATA_GetLastErrorAndSource
	b_ADDIDATA_EnableErrorMessage
	b_ADDIDATA_DisableErrorMessage
	b_ADDIDATA_FormatErrorMessage
Digital inputs	b_ADDIDATA_GetNumberOfDigitalInputs
	b_ADDIDATA_GetDigitalInputInformation
	b_ADDIDATA_GetDigitalInputInformationEx
	b_ADDIDATA_Read1DigitalInput
	b_ADDIDATA_Read2DigitalInputs
	b_ADDIDATA_Read4DigitalInputs
	b_ADDIDATA_Read8DigitalInputs
	b_ADDIDATA_Read16DigitalInputs
	b_ADDIDATA_Read32DigitalInputs
Digital outputs	b_ADDIDATA_GetNumberOfDigitalOutputs
	b_ADDIDATA_GetDigitalOutputInformation
	b_ADDIDATA_SetDigitalOutputMemoryOn
	b_ADDIDATA_SetDigitalOutputMemoryOff
	b_ADDIDATA_Set1DigitalOutputOn
	b_ADDIDATA_Set1DigitalOutputOff

Functionality	Function name
	b_ADDIDATA_Set2DigitalOutputsOn
	b_ADDIDATA_Set2DigitalOutputsOff
	b_ADDIDATA_Set4DigitalOutputsOn
	b_ADDIDATA_Set4DigitalOutputsOff
	b_ADDIDATA_Set8DigitalOutputsOn
	b_ADDIDATA_Set8DigitalOutputsOff
	b_ADDIDATA_Set16DigitalOutputsOn
	b_ADDIDATA_Set16DigitalOutputsOff
	b_ADDIDATA_Set32DigitalOutputsOn
	b_ADDIDATA_Set32DigitalOutputsOff
	b_ADDIDATA_Get1DigitalOutputStatus
	b_ADDIDATA_Get2DigitalOutputStatus
	b_ADDIDATA_Get4DigitalOutputStatus
	b_ADDIDATA_Get8DigitalOutputStatus
	b_ADDIDATA_Get16DigitalOutputStatus
	b_ADDIDATA_Get32DigitalOutputStatus
Watchdog	b_ADDIDATA_GetNumberOfWatchdogs
	b_ADDIDATA_GetWatchdogInformation
	b_ADDIDATA_GetWatchdogInformationEx
	b_ADDIDATA_InitWatchdog
	b_ADDIDATA_ReleaseWatchdog
	b_ADDIDATA_EnableDisableWatchdogInterrupt
	b_ADDIDATA_StartWatchdog
	b_ADDIDATA_StopWatchdog
	b_ADDIDATA_ReadWatchdogStatus

b) Software samples

Table 7-2: Supported software samples for the Ethernet I/O module MSX-E1701

Functionality	Sample number	Description
Digital inputs	SAMPLE00	Get the selected digital input information
	SAMPLE01	Read 1 digital input
	SAMPLE02	Read 2 digital inputs
	SAMPLE03	Read 4 digital inputs
	SAMPLE04	Read 8 digital inputs
	SAMPLE05	Read 16 digital inputs
	SAMPLE06	Read 32 digital inputs
Digital outputs	SAMPLE01	Test 1 digital output with/without output memory option. Give the status of the digital output, if possible.
	SAMPLE02	Test 2 digital outputs with/without output memory option. Give the status of the digital outputs, if possible.
	SAMPLE03	Test 4 digital outputs with/without output memory option. Give the status of the digital outputs, if possible.
	SAMPLE04	Test 8 digital outputs with/without output memory option. Give the status of the digital outputs, if possible.
	SAMPLE05	Test 16 digital outputs with/without output memory option. Give the status of the digital outputs, if possible.
	SAMPLE06	Test 32 digital outputs with/without output memory option. Give the status of the digital outputs, if possible.
Watchdog	SAMPLE01	Initialise and enable software trigger per key press. Start 1 watchdog. Read the status as soon as the watchdog has run down. Reset the watchdog and exit the program. The user selects the watchdog he wants to test.
	SAMPLE02	Initialise and enable software trigger per key press. Start 1 watchdog with interrupt. Wait for the interrupt. Reset the watchdog and exit the program. The user selects the watchdog he wants to test.

7.3 Webserver

For a more comfortable management we offer you an additional webserver.

You access the webserver as follows:

First enter the IP address of the module in a webbrowser (e.g. Internet Explorer or Mozilla Firefox). A login window is displayed.

♦ Enter „mxadmin“ as username and as password

After this the window „Module information“ appears.

Abb. 7-1: Webserver: Module information

The screenshot shows the 'Module information' page of the webserver. The page has a blue header with the text 'Welcome to the module A-D 194759' and the ABB logo. On the left, there is a navigation menu with items: 'Module information', 'Security', 'Digital I/O', 'Watchdog', 'Counters', 'Status', 'System diagnostics', 'HTTP client', and 'Help'. The 'Module information' item is highlighted. The main content area is divided into several sections:

- General information:** A table with columns 'Item' and 'value'.

Item	value
Serial number	A-D 194759
MAC address	00:0F:6C:02:F8:C7
IP address	172.16.3.235
Module type	MSX-E1701
OS Version	MX170X(00)1909
PLD Type	EP20K
PLD Firmware version	A001.170X.00000000
- Date and time:** A text field showing '50:44:09 2007/03/06 UTC'.
- Internal temperature:** A text field showing '32° Celsius'.
- Ethernet links:** A table with columns 'link', 'state', 'speed', and 'duplex'.

link	state	speed	duplex
Port 0	link ok	100 Mbit/s	FD
Port 1	link not connected	10 Mbit/s	HD

At the bottom, there is a 'Notes' section with a bullet point: 'To refresh this page, please click on the link "Module information" on the left.'

Table 7-3: Webserver: Further points

Point	Description
Module information	General information about the Ethernet I/O module is displayed (see figure above).
Security	Change the default password („mxadmin“). Please enter your new password twice. Encryption of the webserver data possible (TLS).
Digital I/O	Configuration of digital inputs/outputs.

Watchdog	Control of the function „Watchdog“. Refresh / (Re)initialise and start / stop watchdog
Counters	Status and configuration of the additional counters (compare logic, latch register, frequency measurement and index) can be displayed.
Dataserver	Network service is a service to supply the clients acquired data via TCP/IP-socket. Here you can parameterize this service.
System diagnostics	Additional information about the Ethernet module
NTP client	Remote synchronization of the Ethernet module by saving the IP address of the server on the module. You have to set this only once.
Contact	ADDI-DATA contact information

7.4 Software tool SETMSXExxxx

The software tool SETMSXExxxx supports you in:

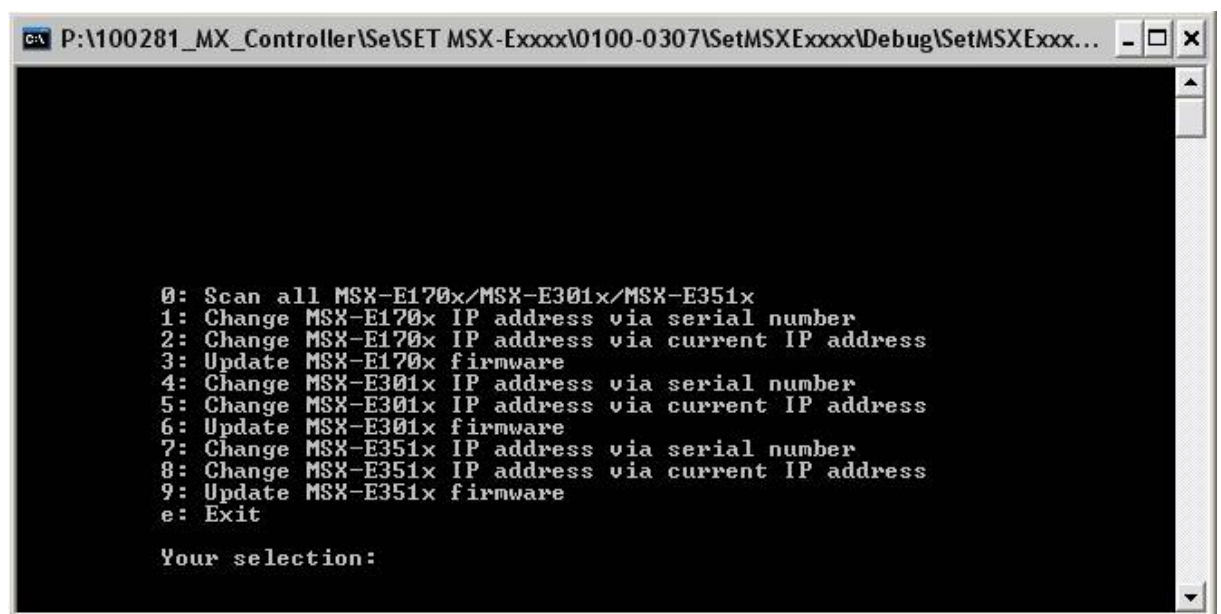
- Changing the IP address of the Ethernet I/O module (either via the current IP address or via the serial number)
- Updating the firmware
- Scanning the Ethernet I/O modules

First steps:

- ◆ **Start the software tool SETMSXExxxx via the delivered CD.**

The introduction screen of the tool appears:

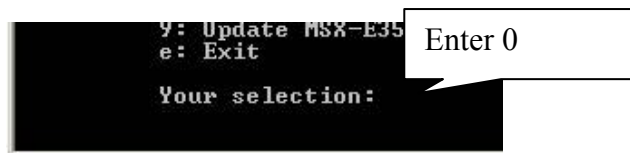
Fig. 7-9: SET MSX-Exxx: Main menu



Your selection ⁸	Meaning
0	Scanning all Ethernet I/O modules
1	Changing the IP address of the module MSX-E170x via the serial number
2	Changing the IP address of the module MSX-E170x via the current IP address
3	Updating the MSX-E170x firmware
4	Changing the IP address of the module MSX-E301x via the serial number
5	Changing the IP address of the module MSX-E301x via the current IP address
6	Updating the MSX-E301x firmware
7	Changing the IP address of the module MSX-E351x via the serial number
8	Changing the IP address of the module MSX-E351x via the current IP address
9	Updating the MSX-E351x firmware
e	Exit

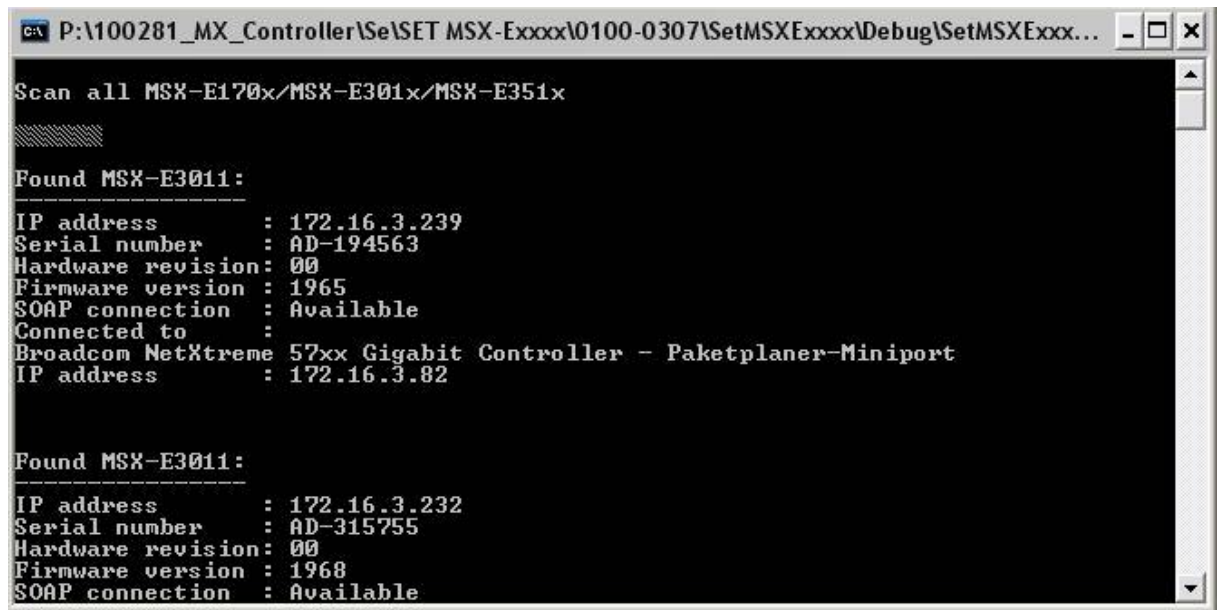
Application sample:**Changing the IP address via the serial number of the analog input module MSX-E3011:**

Firstly scan all connected modules by entering as „Your Selection“ the number „0“



⁸ The table is valid for all Ethernet I/O modules (MSX-E1701, MSX-E301x and MSX-E351x)

The following screen appears:



```

P:\100281_MX_Controller\Se\SET MSX-Exxxx\0100-0307\SetMSXExxxx\Debug\SetMSXExxx...
Scan all MSX-E170x/MSX-E301x/MSX-E351x

Found MSX-E3011:
-----
IP address       : 172.16.3.239
Serial number    : AD-194563
Hardware revision: 00
Firmware version : 1965
SOAP connection  : Available
Connected to     :
Broadcom NetXtreme 57xx Gigabit Controller - Paketplaner-Miniport
IP address       : 172.16.3.82

Found MSX-E3011:
-----
IP address       : 172.16.3.232
Serial number    : AD-315755
Hardware revision: 00
Firmware version : 1968
SOAP connection  : Available
  
```

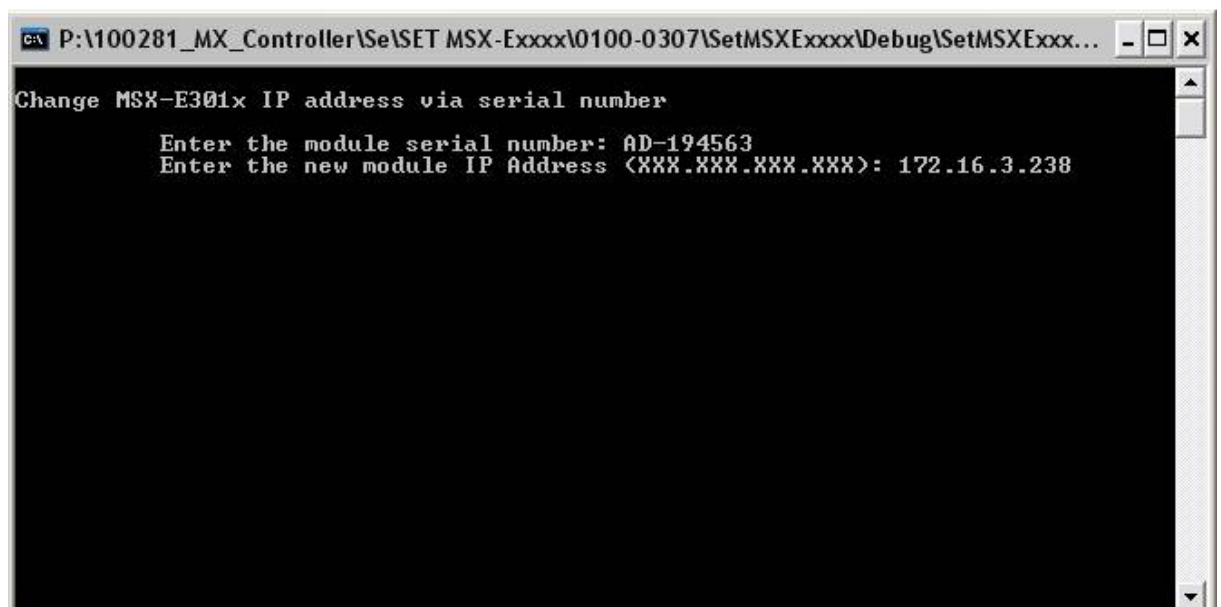
The screen shows information about all connected modules.

- ◆ **Note the serial number of the selected module (the serial number can be found on the label on the back of your module)**

You will automatically get into the main menu.

- ◆ **Enter as „Your selection“ the number⁹ 1, 4 or 7**

The following window appears:



```

P:\100281_MX_Controller\Se\SET MSX-Exxxx\0100-0307\SetMSXExxxx\Debug\SetMSXExxx...
Change MSX-E301x IP address via serial number

Enter the module serial number: AD-194563
Enter the new module IP Address (XXX.XXX.XXX.XXX): 172.16.3.238
  
```

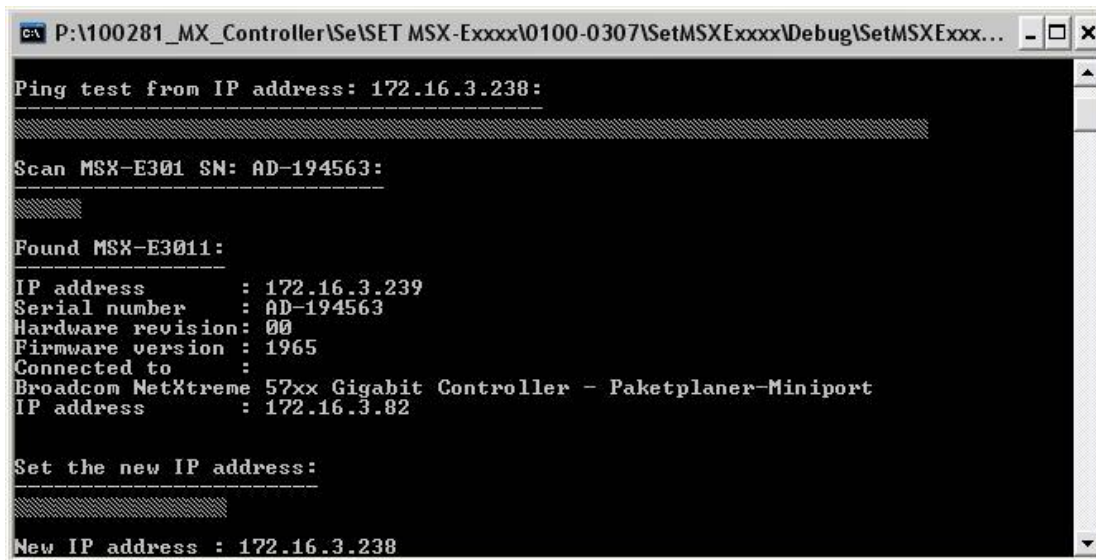
⁹ 1=MSX-E170x, 4=MSX-E301x, 7=MSX-E350x

◆ Enter the serial number and the new IP address.

Firstly a Ping test is realized on the selected IP address to test whether it is occupied or not.

Then the new IP address is set.

Fig. 7-10: New IP address changed



```
P:\100281_MX_Controller\Se\SET MSX-Exxxx\0100-0307\SetMSXExxxx\Debug\SetMSXExxx... - □ ×

Ping test from IP address: 172.16.3.238:
-----

Scan MSX-E301 SN: AD-194563:
-----

Found MSX-E3011:
-----
IP address       : 172.16.3.239
Serial number    : AD-194563
Hardware revision: 00
Firmware version : 1965
Connected to     :
Broadcom NetXtreme 57xx Gigabit Controller - Paketplaner-Miniport
IP address       : 172.16.3.82

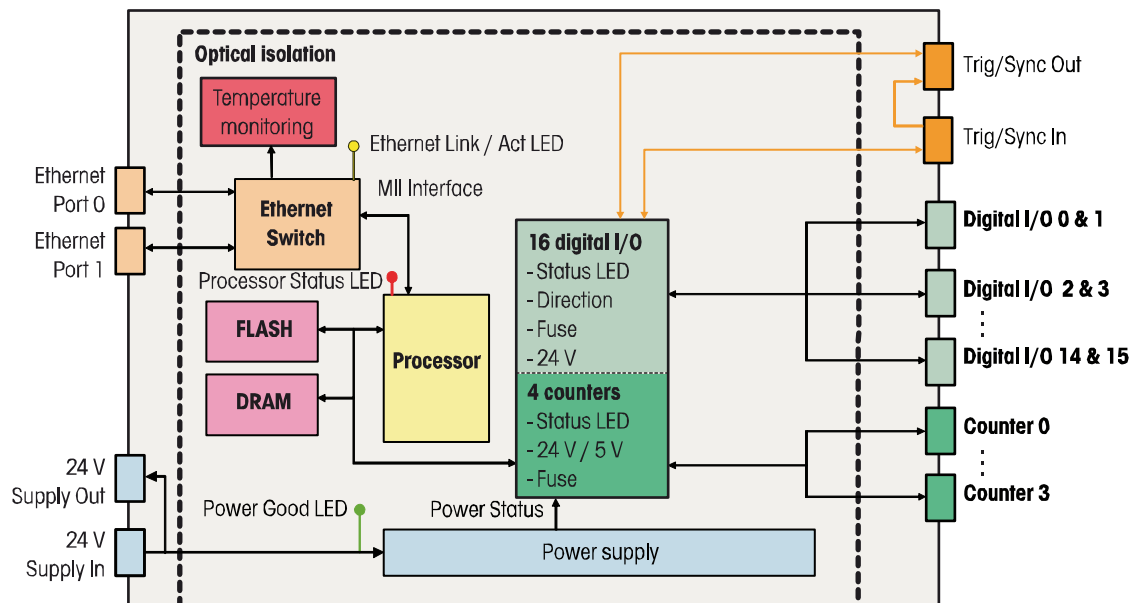
Set the new IP address:
-----

New IP address : 172.16.3.238
```

8 FUNCTIONS OF THE MODULE

8.1 Block diagram

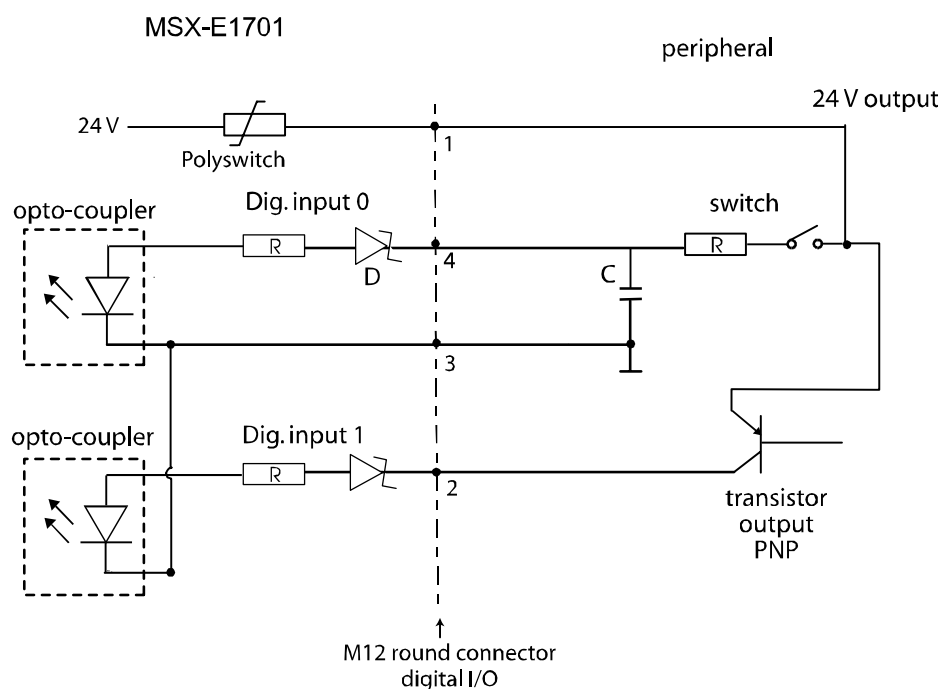
Fig. 8-1: Block diagram



8.2 Connection examples: Digital I/O

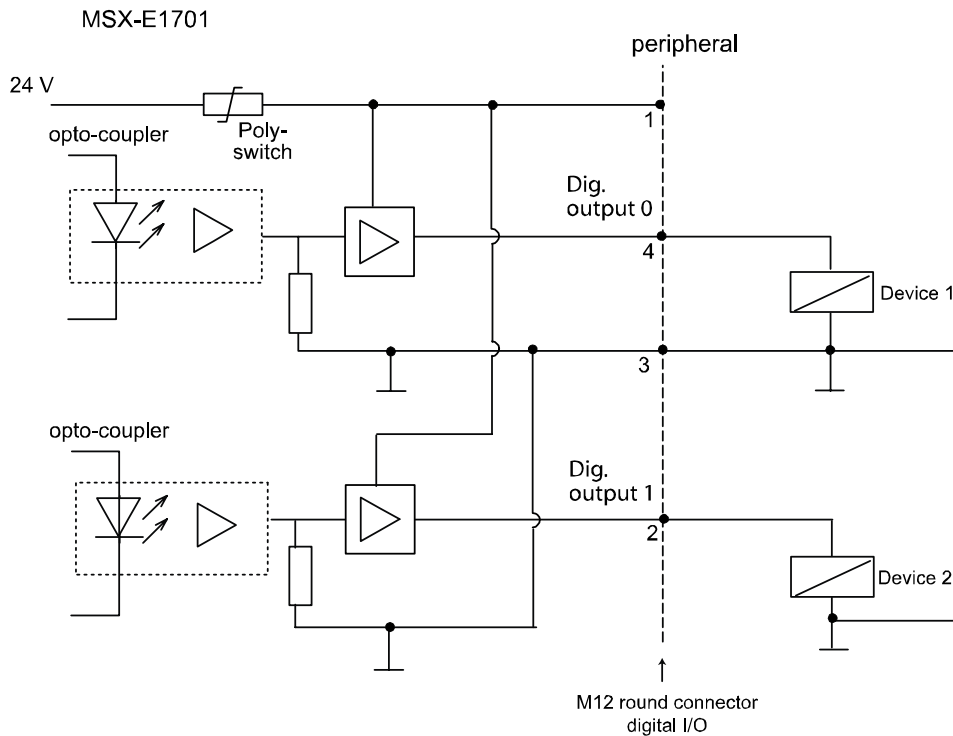
8.2.1 Connection example: Digital inputs (24 V)

Fig. 8-2: Connection example: Digital inputs (24 V)



8.2.2 Connection example: Digital outputs (24 V)

Fig. 8-3: Connection example: Digital outputs (24 V)



8.3 Function description: Digital outputs and diagnostics

The Ethernet I/O module **MSX-E1701** has 16 digital inputs and 16 outputs. The outputs work as follows:

1. You can configure a port as outputs by setting the corresponding bits on 1 in the I/O configuration register. The outputs that are configured as ports are highly ohmic now.

i

IMPORTANT!

Per connector only both ports can be configured as input or output.

2. Now put +24 V on the output by setting the corresponding bits on 1 in the digital output register.
3. To control it you can read the set ports back in the digital input register.
4. If there is a short-circuit at the switched output, the corresponding output is deactivated. If the interrupt enable bit is set, an interrupt is generated. In the diagnostics register you can read back which ports have generated a

short-circuit. Every further write access to this port is ignored.

5. The output port firstly does its old function as soon as the short-circuit is removed and a rearm (diagnostics control register) is realized.

The digital inputs are not concerned by this function.

8.4 Watchdog

The Ethernet I/O module **MSX-E1701** has a 16-bit watchdog that can be programmed in three time bases (μ s, ms, s). The watchdog is for resetting the digital outputs on 0 V after a certain time (Reload Value).

Function¹⁰:

1. Firstly the watchdog is activated.
2. The watchdog-counter is started with the „Reload-Value“ at each write access to the outputs.
At each write access to the outputs it is counted down newly with the „reload value“.
3. If there is a watchdog underrun:
 - all digital outputs are set on 0 V
 - an interrupt is generated
 - the underrun bit is set (the enable bit remains set)
4. As long as the watchdog is in the „underrun“, each write access to the outputs is ignored.
5. In order to delete the „underrun bit“ and to enable the write access again, the watchdog must be disabled (Enable=0).
6. In order to reactivate the watchdog, the enable bit must be set again on 1.

¹⁰ See also software functions and samples for the „Watchdog“ chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**

9 APPENDIX

9.1 Glossary

Term	Description
A/D converter	=ADC An electronic device that produces a digital output directly proportional to an analog signal output.
Baud rate	Serial communications data transmission rate expressed in bits per second (b/s).
D/A converter	= DAC A device that converts digital information into a corresponding analog voltage or current.
Data acquisition	Gathering information from sources such as sensors and transducers in an accurate, timely and organized manner. Modern systems convert this information to digital data which can be stored and processed by a computer.
DC voltage	= <i>Direct current voltage</i> DC voltage means that the voltage is constant respecting the time. It will always fluctuate slightly. Especially at switching on and switching off the transition behaviour is of high significance.
Digital signal	A signal which has distinct states. Digital computers process data as binary information having either 1 or 0 states.
Driver	A part of the software that is used to control a specific hardware device such as a data acquisition board or a printer.
FIFO	= <i>First In First Out</i> The first data into the buffer is the first data out of the buffer.
Gain	The factor by which an incoming signal is multiplied.
Input impedance	The measured resistance and capacitance between the high and low inputs of a circuit.
Input level	The input level is the logarithmic relation of two electric units of the same type (voltage, current or power) at the signal input of any receive device. The receive device is often a logic level that refers to the input of the switch. The input voltage that corresponds with logic "0" is here between 0 and 15 V, and the one that corresponds with logic "1" is between 17 and 30 V.
Limit value	Exceeding the limit values, even for just a short time, can lead to the destruction or to a loss of functionality.
MUX	= <i>Multiplexer</i> An array of semiconductor or electromechanical switches with a common output used for selecting one of a number of input signals.
Operating voltage	The operating voltage is the voltage that occurs during the continuous operation of the device. It may not exceed the continuous limit voltage. Furthermore, any negative operation situations, such as net overvoltages over one minute at switching on the device must be taken in consideration.
Optical isolation	The technique of using an optoelectric transmitter and receiver to

	transfer data without electrical continuity, to eliminate high-potential differences and transients.
Output voltage	The nominal voltage output reading when shaft is rotated to full range, expressed in volts DC /Vo DC).
Parameter	The parameters of a control comprise all for the control process required numeric values, e.g. for limit values and technological number.
Reference voltage	Reference voltages are stable voltages that are used as reference unit. From them voltages can be derived that are required for example in current supplies and in other electronic circuitries.
Resolution	The smallest significant number to which a measurement can be determined. For example a converter with 12-bit resolution can resolve 1 part in 4096.
Sensor	A device that responds to physical stimuli (heat, light, sound, pressure, motion, etc.) and produces a corresponding electrical output.
Throughput rate	The maximum repetitive rate at which data conversion system can operate with a specified accuracy. It is determined by summing the various times required for each part of the system and then by taking the inverse of this time.
Trigger	<p>Internal trigger: A software generated event that starts an operation.</p> <p>External trigger: An analog or digital hardware event from an external source that starts an operation.</p> <p>Digital trigger: An event that occurs at a user-selected point on a digital input signal. The polarity and sensitivity of the digital trigger can often be programmed.</p>

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