**DIN EN ISO 9001:2000
certified**

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| --- |

Preliminary version

| **Technical description**

MSX-E3011

**Intelligent analog
Ethernet input module** |
| --- |

Edition: 01.03 – 08/2007

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.
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The user is not permitted to make changes to the product beyond the intended use, or to interfere with the product in any other way.
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The software must only be used to set up the ADDI-DATA boards.
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    EmbeddedNT and MS DOS are registered trademarks of Microsoft Corporation.
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    Corp.
CompactPCI is a registered trademark of PCI Industrial Computer Manufacturers Group.
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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 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:**

i **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.

Figures

Tables

1 DEFINITION OF APPLICATION

1.1 Intended use

The Ethernet module **MSX-E3011** for analog input 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 module **MSX-E3011** must <u>not</u> to be used as safety related part for securing emergency stop functions.

The Ethernet module **MSX-E3011** must <u>not</u> be used in potentially explosive atmospheres.

1.3 General description of the board

Characteristics

The Ethernet module **MSX-E3011** can be used for the acquisition of analog signals through 16 differential inputs or for the simultaneous acquisition through four analog inputs.

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

i

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 from persons who were authorized by ADDI-DATA.

1.4.5   Connection

Please find information about cables and further accessories in a separate PDF file "Accessories".

1.4.6   Remarks

The use of the Ethernet 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 module remains in its protective pack **until it is used**.

Do not remove or alter the identification numbers of the Ethernet 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 MODULE

Fig. 3-1: Correct handling

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

4   TECHNICAL DATA

4.1   Electromagnetic compatibility (EMC)

The PC is to comply with the norm IEC61326 for measurement, control and laboratory use and with the specifications for EMC protection.

4.2   Physical set-up

Dimensions

Table 4-1: Dimensions

	Length x Width x Height (L x W x H)
MSX-E3011	215 mm x 110 mm x 50 mm

Fig. 4-1: Dimensions
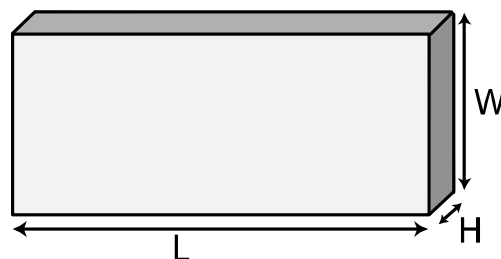
Weight

> **MSX-E3011**: .... 850 g
> 900 g (with DIN rail mounting)

Degree of protection
> Degree of protection: .... IP 65[1]

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[1] Please observe that the protection is only reached if adequate protection caps are used (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**)

Fig. 4-2: MSX-E3011-16: View from above
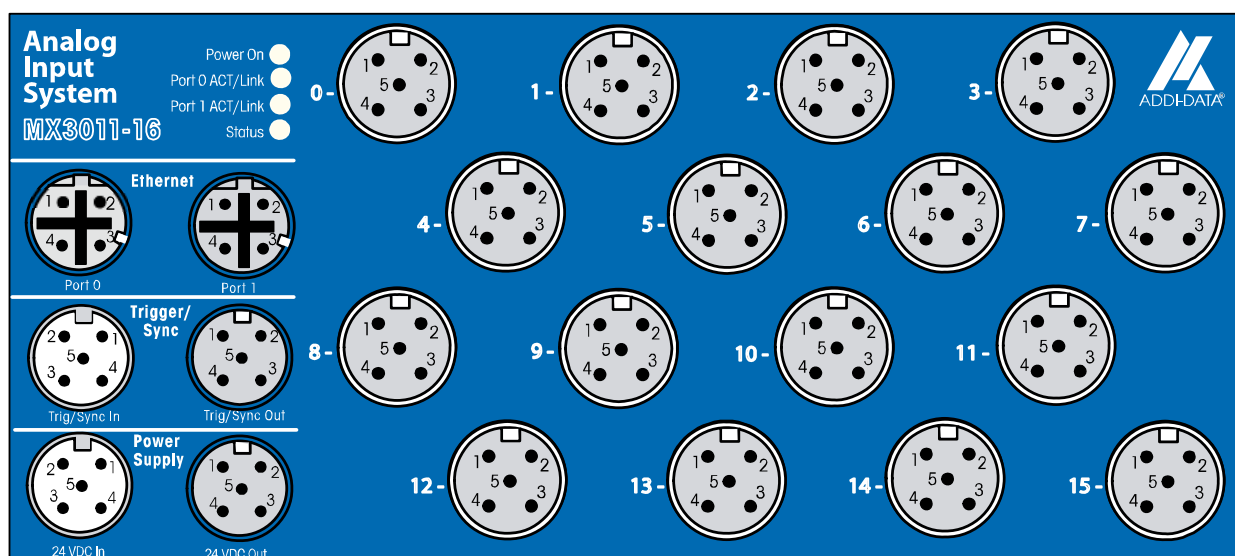
Accessories[1]:
See link in the bookmarks „Table: Accessories"

4.3　Versions

The Ethernet module is available in the following versions:

MSX-E3011-16:　　　　　　　16 analog voltage inputs

MSX-E3011-16-PC-DIFF:　16 analog current inputs (option: current input)

4.4　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: .... 160 mA (typical) (±10 %)

---

1 Not contained in the standard delivery.

4.4.1   Ethernet

Number of ports... 2
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 acc. to IEEE802.3
                                                         100 Base-TX acc. to IEEE802.3
MAC address: .... 00:0F:6C:##.##.## (unique for each device)

4.4.2   Trigger input (digital)

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

4.4.3   Synchro inputs and outputs

Number of inputs:...................................... 1
Number of outputs:.................................... 1
Cable length:... max. 20 m
Optical isolation: .... 1000 V (via opto-coupler)
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)

4.4.4   Analog inputs

Number/type:... 16 inputs (differential or single-ended)
Architecture:... 4 channels organized in 4 groups
                                                         (ADC with four simultaneous sampling
                                                         channels, with one 4-channel
                                                         multiplexer per ADC channel)
Resolution:.. 16-bit
Relative precision (INL):............................ ±3 LSB
Input ranges: .... ±5 V / ±10 V (software programmable)
Throughput rate: 100 kHz (max. per ADC)
Gain: .... x1, x2 (software programmable)
Bandwidth: .... 160 kHz (limited through TP filter)
                                                         16 Hz (version with diff. filter)

Trigger:...a) Software: software programmable
b) Digital input
c) Synchro

MSX-E3011-16-PC-DIFF (Option: current input):
Shunt resistance: ....250 Ω   (0.05 % TK 25 ppm)
Calibration:..Gain x2 (± 5 V input range)

5 USE

Fig. 5-1: Use
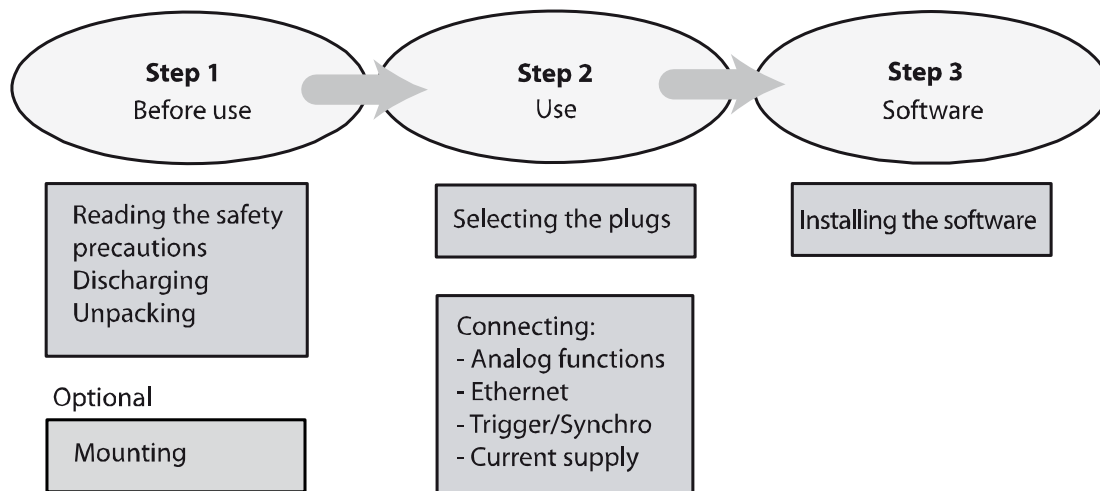
5.1 Before use

♦ **Discharge yourself by touching a conducting surface**

♦ **Remove the Ethernet module from its protective package**

5.1.1 Mounting the Ethernet module: DIN rail

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

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

♦ **Attach the clamps to the Ethernet 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 module to the DIN rail by placing the clamp with the springs under the rail**

♦ **Lift the Ethernet module until the upper part of the clamp locks on the rail**

5.1.2   Mounting the Ethernet module: Angle mounting

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

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

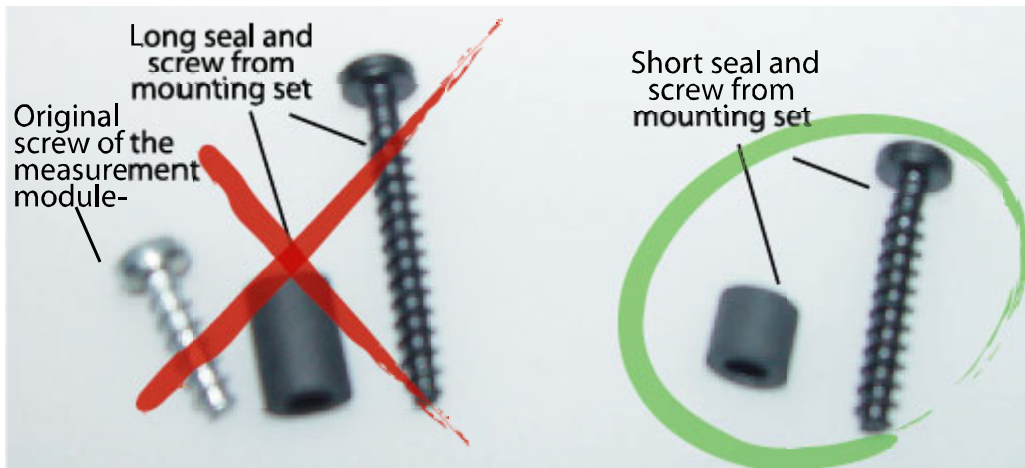**Fig. 5-3: Angles pointing to the outside**   **Fig. 5-4: Angles pointing to the inside**

For mounting please observe the following steps:

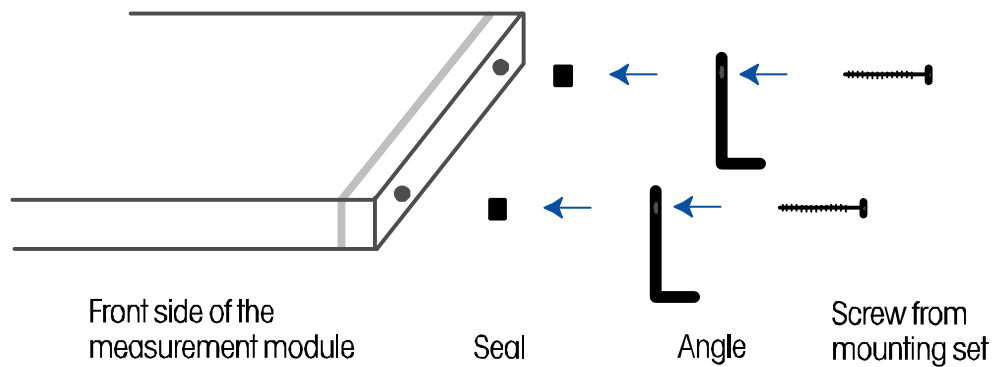♦ **Unscrew the screws from the side of the Ethernet module**

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 module, you can attach the module directly to devices and machines with further screws.

5.2   Connecting the components

♦ **Discharge yourself**

♦ **Take the Ethernet module out of its protective pack**

5.2.1   Connecting the analog inputs

♦ **Select one or more function plugs**

Fig. 5-7: Selecting an analog plug

♦ **Plug the function cable/s into the required plug/s**

5.2.2 Connecting Ethernet ports

♦ **Plug the Ethernet cable in Ethernet port 0[1]**

Fig. 5-8: Connecting Ethernet ports

5.2.3 Connecting trigger and synchro signals

♦ **Plug the cable into the plug Trig/Sync In[1]**

Fig. 5-9: Connecting trigger and synchro signals

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[1] If you want to connect several Ethernet modules, please do observe chapter 5.3.

5.2.4   Connecting to the current supply

♦ **Plug the cable into the input (24 VDC In)[1]**

Fig. 5-10: Connecting the current supply


5.3   Connecting several Ethernet modules

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

♦ **Connect the first Ethernet module as described above**

♦ **Connect the components as shown in the figure (see next page)**

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[1] If you want to connect several Ethernet modules please do observe chapter 5.3.

Fig. 5-11: Connecting several Ethernet modules
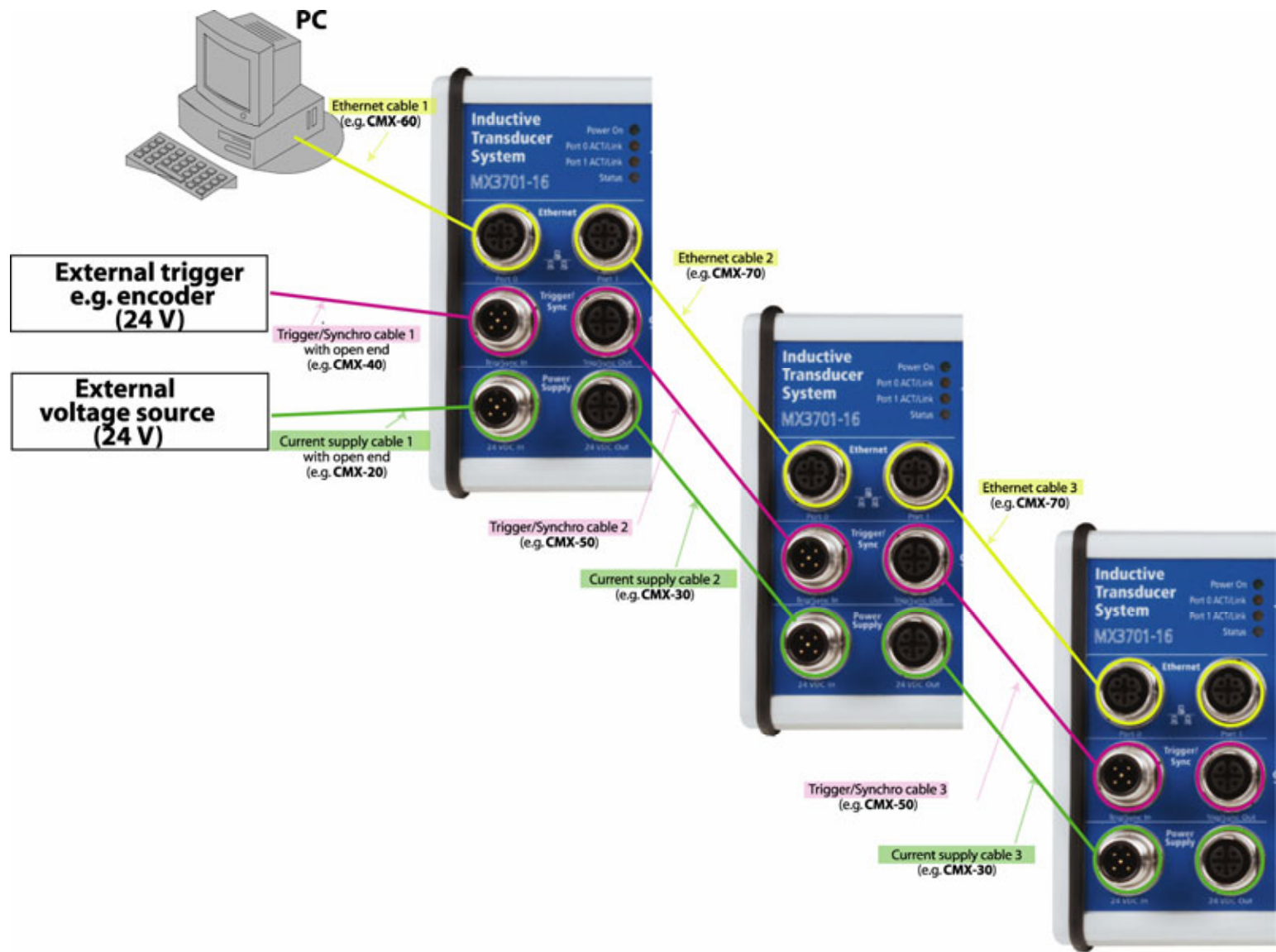
5.4　LED display

5.4.1　Overview

The LEDs show the following information:

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

Status:　　　　See following table

As soon as the Status LED lights green, the module is ready for work

If the Status-LED lights yellow, the network cables are possibly not connected

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 ambiance conditions	Internal temperature is outside the working range (< -40 ºC or > 85 ºC)	- 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

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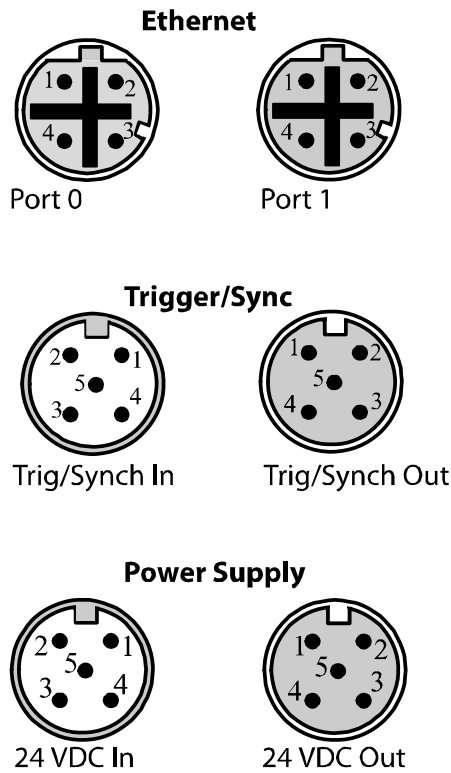| Display	Meaning	Possible cause	Tip
Blinks yellow/green	Data acquisition is possible but some parts are not working correctly.	- The Flash memory is not working correctly - It was tried to configure the module with a wrong IP address	- Check your IP address - Contact us for reparation or exchange
Blinks green	System is working	- Firmware update - Data acquisition is running	
Lights green grün	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 MSX-E3011

Fig. 6-1: Control signals MSX-E3011

Ethernet

Port 0   Port 1

Trigger/Sync

Trig/Synch In   Trig/Synch Out

Power Supply

24 VDC In   24 VDC Out

6.1.1   Ethernet Ports

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

Pin No.	Ethernet Port 0 Ethernet female connector D-coded, M12	Ethernet Port 1 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
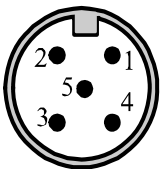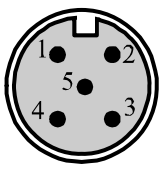
Pin No.	Trigger/Sync In Male connector, 5-pin, M12	Trigger/Sync Out Female connector, 5-pin, M12	Cable color
1	Dig. trigger input -	Dig. trigger input -	Brown
2	Dig. trigger input +	Dig. trigger input +	White
3	Synchro trigger +	Synchro trigger +	Blue
4	Synchro trigger -	Synchro trigger -	Black
5	Ground	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
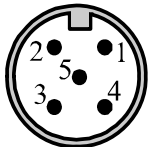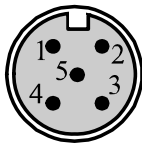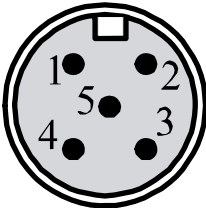
Pin No.	Power Input Male connector, 5-pin, M12	Power Output Female connector, 5-pin, M12	Kabelfarbe
1	24 V	24 V	Brown
2	24 V	24 V	White
3	Ground	Ground	Blue
4	Ground	Ground	Black
5	Shield	Shield	Gray
	Power Input	**Power Output**	

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

6.2   Signals of the analog inputs

Table 6-4: Pin assignment: Analog input signals

Pin No.	Female connector, 5-pin, M12	Cable color
1	24 V	Brown
2	Differential input -	White
3	Ground	Blue
4	Differential input +	Black
5	Shield	Gray

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 module:

Option 1:   With direct access (all functionalities of the module can be used)
Option 2:   With ADDIPACK (for compatibility with PCI board)

7.1   Option 1: Direct access

7.1.1   Interface to the module

The module is accessed via a TCP/IP socket:

The Ethernet 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-E3011 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 used 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	…

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 "Public SOAP function description" (Currently available as html-version on customer specific CD or on request)

7.1.4 Data socket format

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

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

Data protocol:

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

time stamp low	time stamp high	source counter	source type	data

Auto refresh mode data protocol

Time stamp low (if the data format is with time stamp)	Tme stamp high (if the data format is with time stamp)	Auto refresh counter	data 0	data 1	...(the number of data depends from the auto refresh mask)

Sequence mode data protocol

Time stamp low (if the data format is with time stamp)	Time stamp high (if the data format is with time stamp)	Sequence counter (if data format with sequence counter)	data 0	data 1	...(the number of data depends from the sequence channel list)

In both modes

If data format = without converting value

Data x	32-bit digital value

If data format = with converting value

Data x	32-bit float analog value (in V)

7.2   Option 2: Access with ADDIPACK

i   **IMPORTANT!**
The software functions that support the Ethernet module
MSX-E3011 are listed in chapter 7.2.3.

The Ethernet module is supplied with a driver-CD-ROM (CD 1) containing the
ADDIPACK software package for Windows XP.

ADDIPACK is composed of following programs:
ADDIREG: The ADDIREG registration program is a 32-bit program for
Windows XP. The user can register all hardware information necessary to
operate the ADDI-DATA Ethernet modules.

ADDIDRIVER contains API functions to operate the ADDI-DATA modules in
32-bit.

ADDevice Manager configures the resources of the ADDI-DATA virtual module
(see below).

ADDI-DATA virtual module:
ADDI-DATA software is based on the principle of a **virtual module:** it
transposes the different functions (e.g. digital inputs, analog outputs, timer, ...)
of all inserted ADDI-DATA modules as the functions of a single (virtual)
module. The virtual module features a pool of functions, the functionality of
which can be called up without calling a specific module.

ADDEVICE MAPPER was specifically developed for the ADDIPACK module
to facilitate the management of the virtual module. With this program you can
optimally adapt the virtual module to your application requirements.

IMPORTANT!
For some functions of the **ADDEVICE MAPPER** program the browser
Internet Explorer 6 or higher has to be installed on your PC.

7.2.1   Module registration

a) Assigning the IP address

♦ **Install and start SETMSXExxxx (is on delivered CD)**

Change the IP address of the Ethernet module (more information see chapter
Fehler! Verweisquelle konnte nicht gefunden werden.   software tool
SETMSXExxxx)

b) Module registration

♦ **Install ADDIPACK (is on CD1 "standard drivers")**

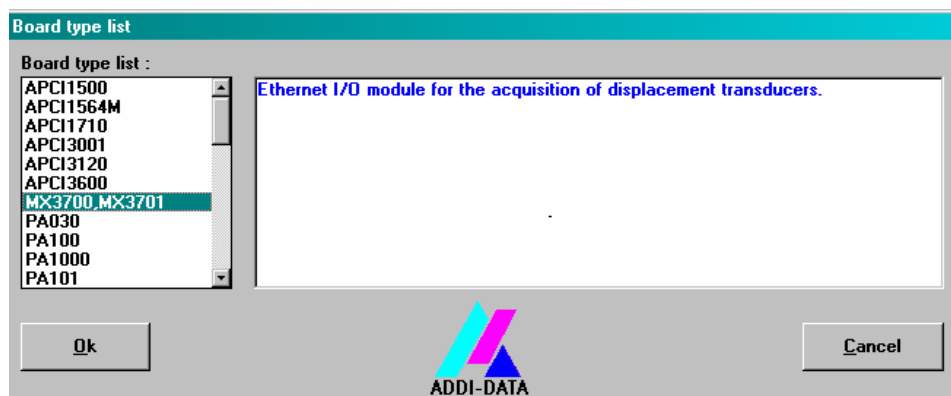After this, continue with the module registration as follows:

Inserting the module

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

♦ **Select „MSX-E301x" when clicking on „Insert" in the ADDIREG-main
window (see Fig. 7-6)**

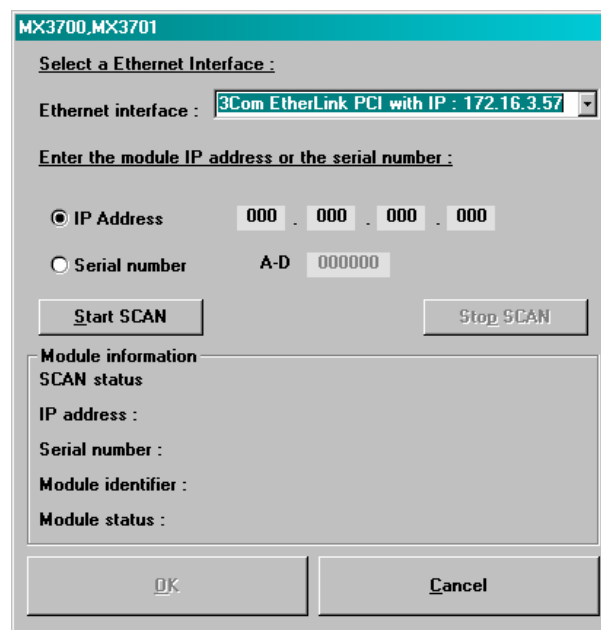After this the following window will be displayed:

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 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   **Fig. 7-5: Settings not OK**
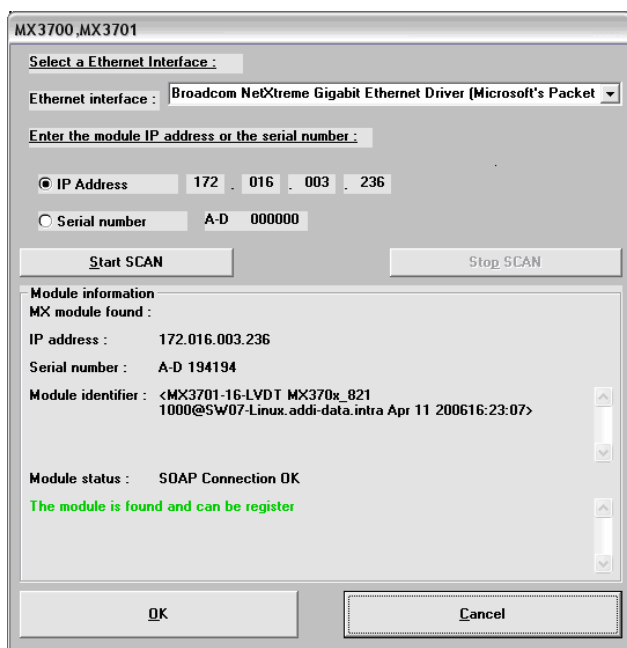
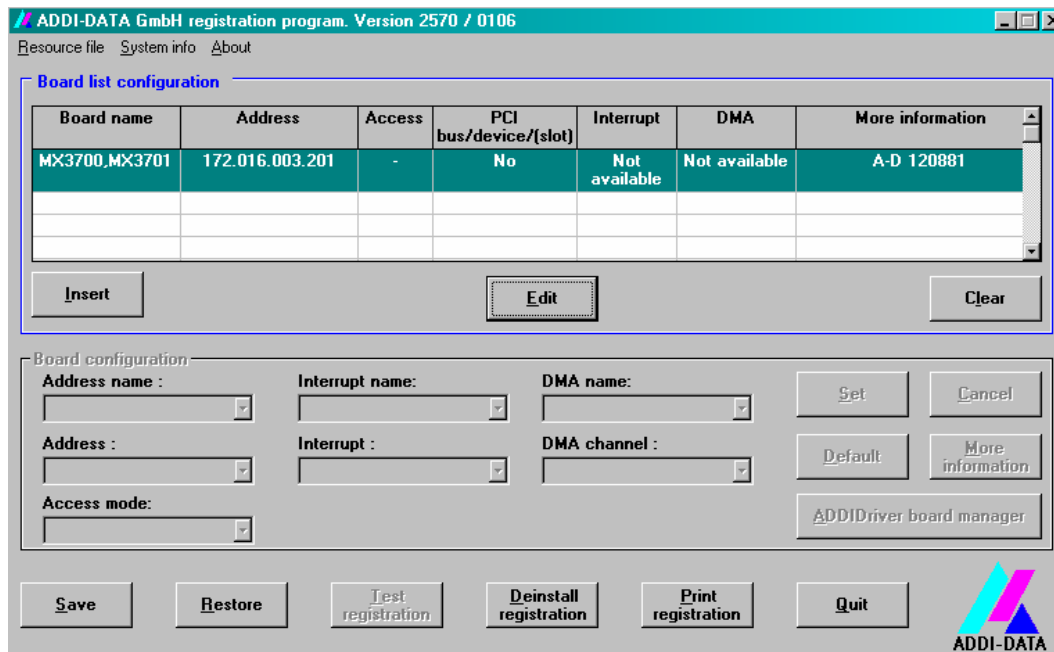This window is displayed if your settings are OK. You can continue as described below.
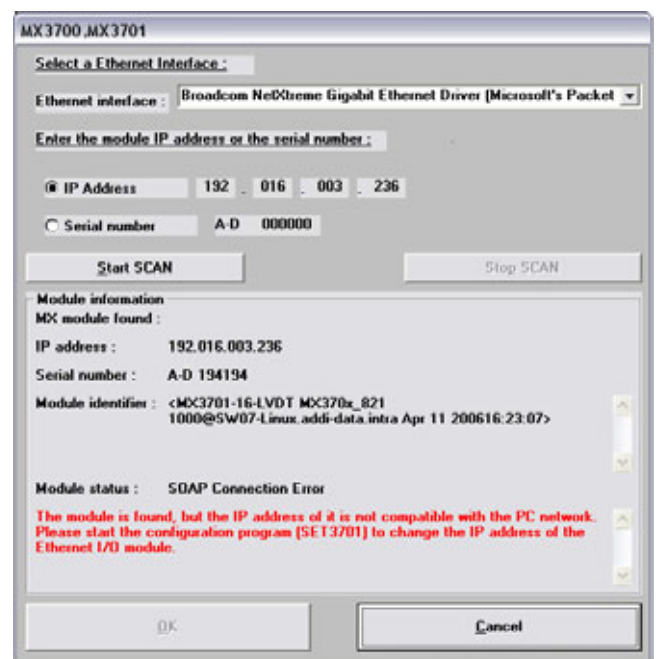
This window is displayed if your settings are not OK. Follow the advice shown in the window.

♦ **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 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
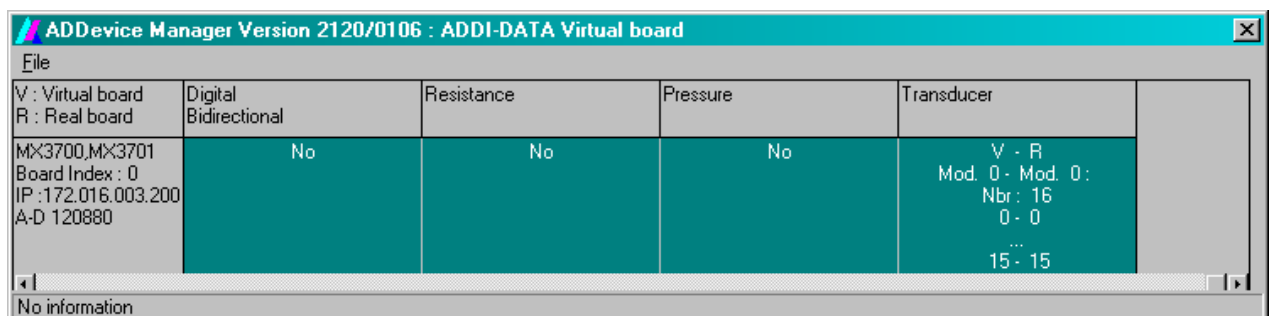
The ADDevice Manager shows the following information:

First column:
Modul name
Board Index: Number allocated to the Ethernet module when registered in
    ADDIREG
IP address
Serial number

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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.

i

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

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

Fig. 7-8: Board clear/insert

If you need more information about the operation of the Ethernet 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.
per 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 module **MSX-E3011**:

http://www.addi-data.com

IMPORTANT!
Before using the product or in case of malfunction during operation, check if there is an update of the technical description or the 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 module
MSX-E3011.

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
Analog inputs[1]	b_ADDIDATA_GetNumberOfAnalogInputs
	b_ADDIDATA_GetNumberOfAnalogInputModules
	b_ADDIDATA_GetNumberOfAnalogInputsForTheModule
	b_ADDIDATA_GetAnalogInputModuleNumber
	b_ADDIDATA_GetAnalogInputModuleGeneralInformation
	b_ADDIDATA_GetAnalogInputModuleSingleAcquisitionInformation
	b_ADDIDATA_GetAnalogInputModuleAutoRefreshInformation
	b_ADDIDATA_GetAnalogInputModuleSequenceInformation
	b_ADDIDATA_InitAnalogInput
	b_ADDIDATA_ReleaseAnalogInput
	b_ADDIDATA_Read1AnalogInput without interrupt
	b_ADDIDATA_ConvertDigitalToRealAnalogValue
	b_ADDIDATA_ReadMoreAnalogInputs without interrupt

---

[1] Please observe that the interrupt is not generated via PC. The interrupt is generated by the driver.

Functionality	Function name
	b_ADDIDATA_ConvertMoreDigitalToRealAnalogValues
	b_ADDIDATA_GetAnalogInputAutoRefreshChannelPointer
	b_ADDIDATA_GetAnalogInputAutoRefreshModulePointer
	b_ADDIDATA_GetAnalogInputAutoRefreshModuleCounterPointer
	b_ADDIDATA_StartAnalogInputAutoRefresh
	b_ADDIDATA_StopAnalogInputAutoRefresh
	b_ADDIDATA_Read1AnalogInputAutoRefreshValue
	b_ADDIDATA_ReadAnalogInputAutoRefreshCounterValue
	b_ADDIDATA_InitAnalogInputSequenceAcquisition
	b_ADDIDATA_StartAnalogInputSequenceAcquisition
	b_ADDIDATA_StopAnalogInputSequenceAcquisition
	b_ADDIDATA_ReleaseAnalogInputSequenceAcquisition
	b_ADDIDATA_ConvertDigitalToRealAnalogValueSequence
	b_ADDIDATA_GetAnalogInputHardwareTriggerInformation
	b_ADDIDATA_EnableDisableAnalogInputHardwareTrigger
	b_ADDIDATA_GetAnalogInputHardwareTriggerStatus
Digital inputs	b_ADDIDATA_GetNumberOfDigitalInputs
	b_ADDIDATA_GetDigitalInputInformation
	b_ADDIDATA_Read1DigitalInput
	b_ADDIDATA_InitDigitalInputModuleFilter (…)
	b_ADDIDATA_EnableDisableDigitalInputModuleFilter (…)

b) Software samples

Table 7-2: Supported software samples for the Ethernet module

Functionality	Sample number	Description
Analog inputs[1]	SAMPLE00	Displays 1 analog input information.
	SAMPLE01	Reads 1 analog input channel without interrupt. The user defines the channel he wants to use.
	SAMPLE03	Reads more analog input channels without interrupt.
	SAMPLE05	Tests the sequence acquisition with interrupt.

---

[1] Please observe that the interrupt is not generated via PC. The interrupt is generated by the driver.

		The user defines the channel he wants to use.
		The user defines the interrupt mode (synchronous, asynchronous).
		The user defines the external trigger mode, if available.
		The user defines if he wants to use a delay and enters its value.
	SAMPLE06	Tests the auto refresh sequence acquisition.
		The user defines the channel he wants to use.
		The user defines the external trigger mode, if available.
Digital inputs	SAMPLE00	Gets the selected digital input channel information.
	SAMPLE01	Reads 1 digital input.

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 <u>and</u> as password**

After this the window „Module information" appears.

Fig. 7-9: Webserver: Module information

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"). Enter your new password twice. Encryption of the webserver data is possible (TLS).
Autostart	Module configuration for automatic data acquisition during booting.

Running acquisition	Parameter of the configuration that is running on the module.
Monitor	Output of data that were acquired by the module.
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

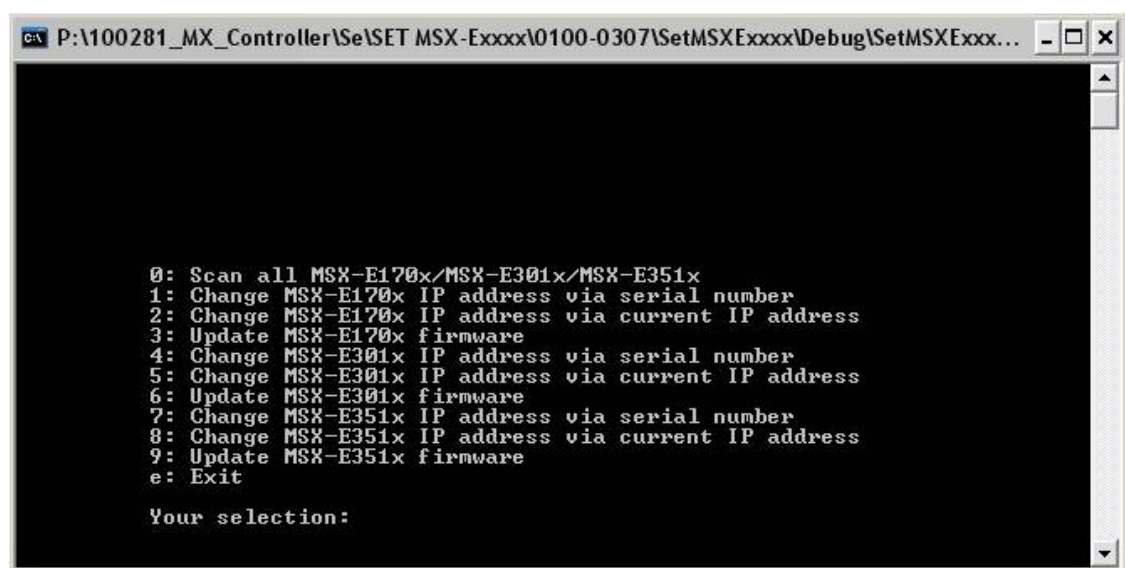**The software tool SETMSXExxxx supports you in:**
- Changing the IP address of the Ethernet I/O module (either via the current
   IP address or via the serial number)
- Updating the firmware
- Scanning the Ethernet I/O modules

First steps:

♦ **Start the software tool SETMSXExxxx via the delivered CD.**

The introduction screen of the tool appears:

Fig. 7-10: SET MSX-Exxx: Main menu

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

```
0: Scan all MSX-E170x/MSX-E301x/MSX-E351x
1: Change MSX-E170x IP address via serial number
2: Change MSX-E170x IP address via current IP address
3: Update MSX-E170x firmware
4: Change MSX-E301x IP address via serial number
5: Change MSX-E301x IP address via current IP address
6: Update MSX-E301x firmware
7: Change MSX-E351x IP address via serial number
8: Change MSX-E351x IP address via current IP address
9: Update MSX-E351x firmware
e: Exit

Your selection:
```

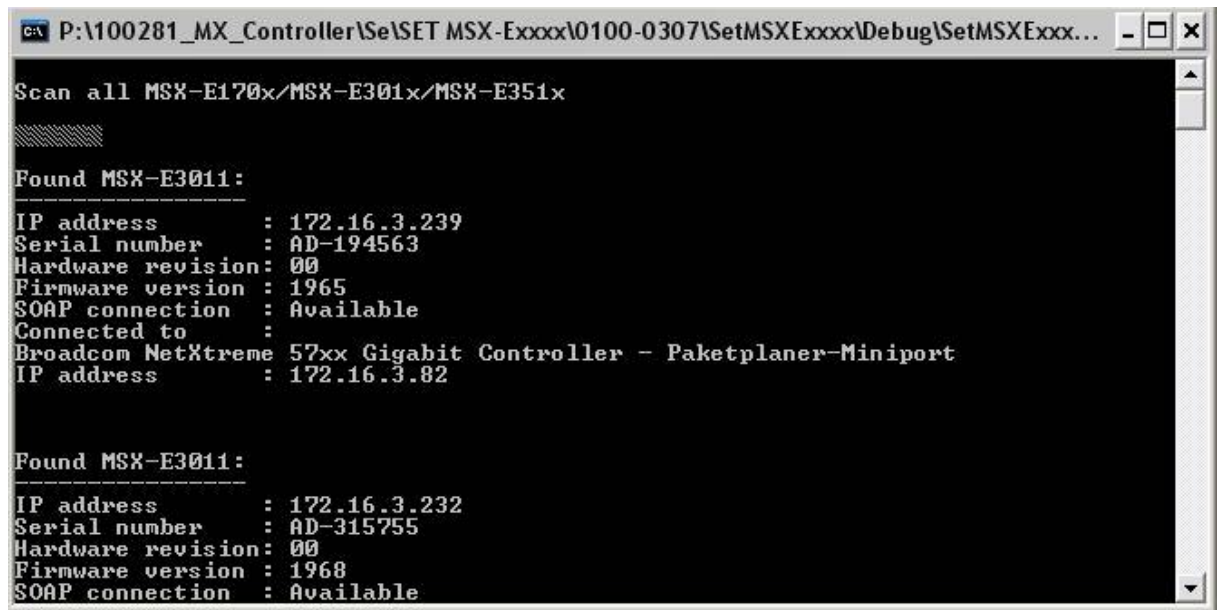| Your selection[7]	Meaning
0	Scanning all Ethernet I/O modules
1	Changing the IP address of the module MSX-E170x via the serial number
2	Changing the IP address of the module MSX-E170x via the current IP address
3	Updating the MSX-E170x firmware
4	Changing the IP address of the module MSX-E301x via 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"

---
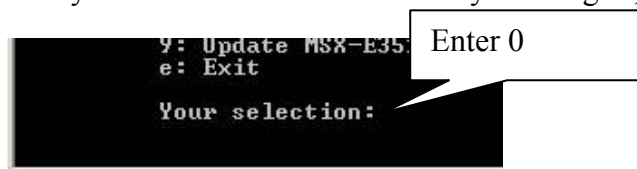
[7] The table is valid for all Ethernet I/O modules (MSX-E1701, MSX-E301x and MSX-E351x)
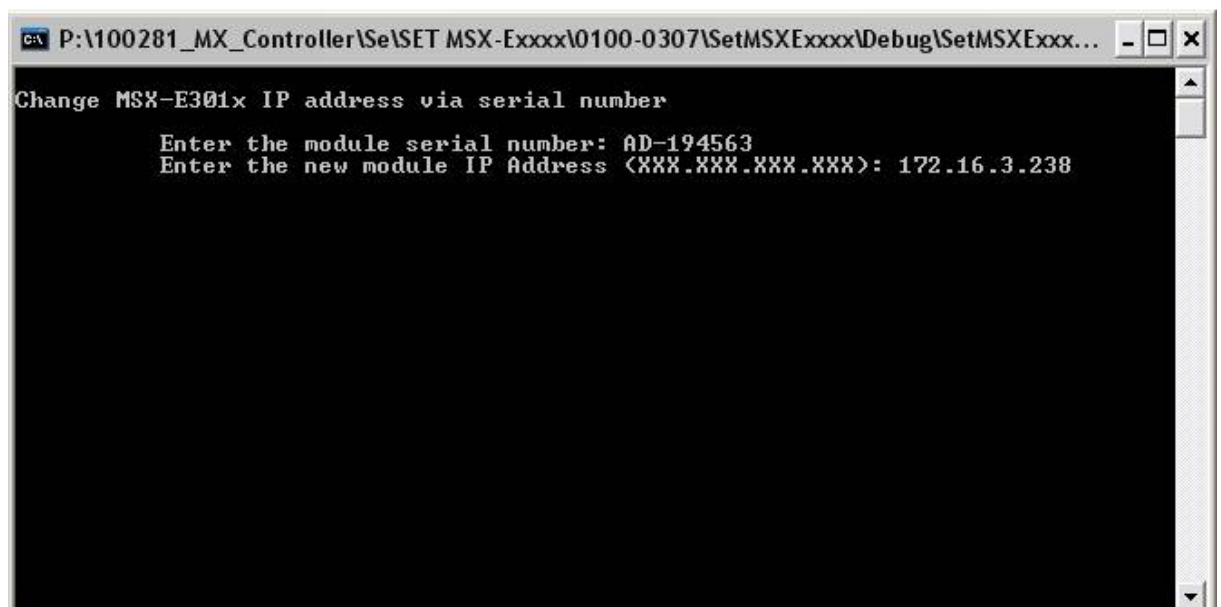
The following screen appears:

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 number[8] 1, 4 or 7**

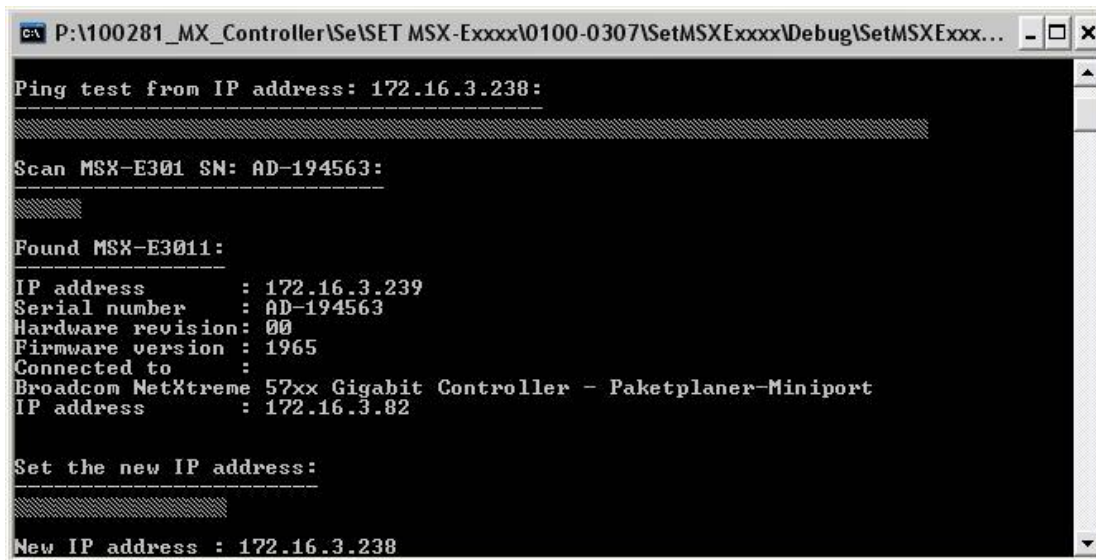The following window appears:

---

[8] 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. 7-11: 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
```
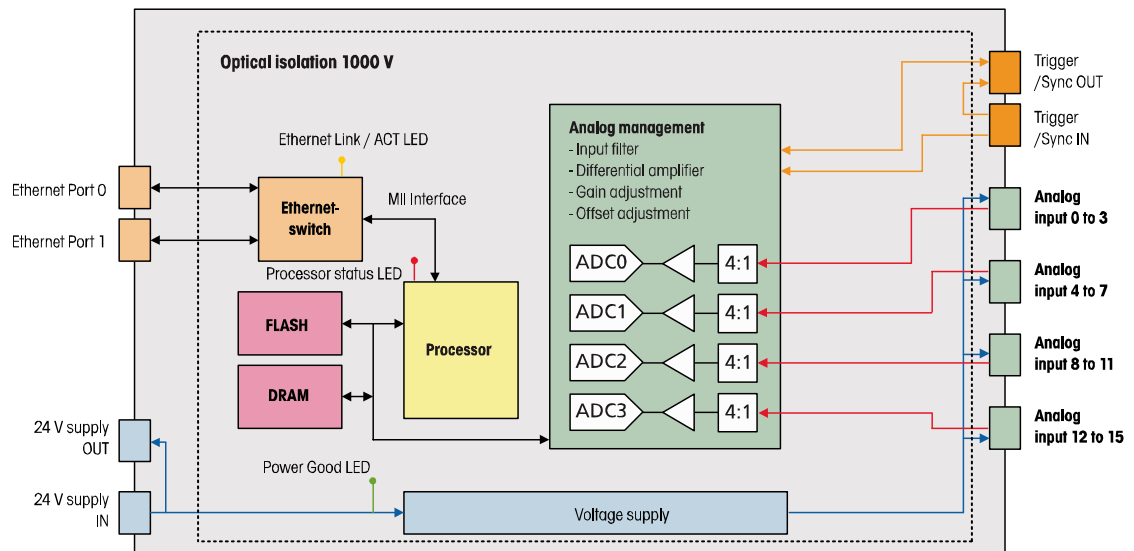
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8   FUNCTIONS OF THE MODULE

8.1   Block diagram

Fig. 8-1: Block diagram

8.2   Analog inputs

The analog inputs can be acquired either with the auto refresh mode or with the sequence mode.

8.2.1   Auto refresh mode

In the auto refresh mode the measurement value is updated automatically after each acquisition.
The analog acquisition is initialised and writes the value of the channels into a firm memory space on the Ethernet module **MSX-E3011**. The PC reads the data asynchronously to the acquisition via the data socket or a SOAP function.

When using the module with ADDIPACK, all channels should be initialised and acquired with the auto refresh mode.

When using the module with direct access, you can define a mask of all channels that should be acquired.

In the auto refresh mode you can activate the channel mean value calculation on the module:

Mean value calculation per channel	Each channel is acquired x times to calculate a channel mean value.
Averaging (calculation of the mean value) per sequence	All sequences are acquired x times to calculate a channel mean value.

8.2.2   Sequence mode

A sequence is a list of channels (max. 16) that are acquired.

It can be any order of the channels in this list.

There are different sequence modes:
- Certain number of sequences / continuous
- With/Without delay

a) Certain number of sequences:

After the acquisition of the defined number of sequences, the acquisition is stopped automatically.

 b) Continuous:

The sequences are acquired continuously until a software-stop-command occurs.

c) Without delay:

There is a waiting time between the acquisitions of 2 sequences.

d) With delay:

A delay between 2 sequences can be configured:

For this there are 2 delay types:
> Mode 1: The delay time defines the time between 2 sequence beginnings.
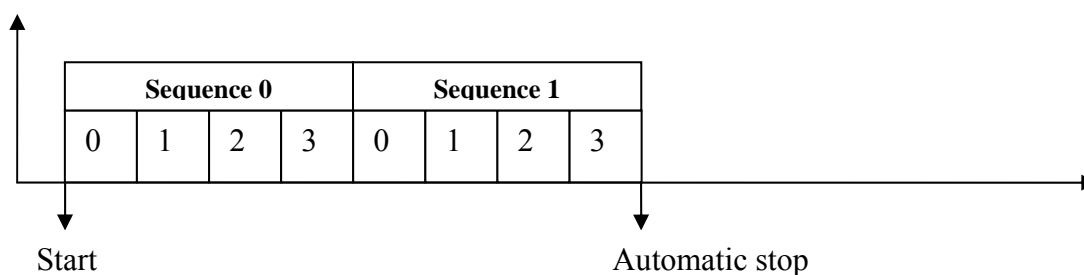
> Mode 2: The delay time defines the time between the end of a sequence until the beginning of the next sequence.

Example 1:

Sequence of the channels: 0,1,2,3

Number of sequences to be acquired: 2

Without delay

Sequence 0				Sequence 1			
0	1	2	3	0	1	2	3

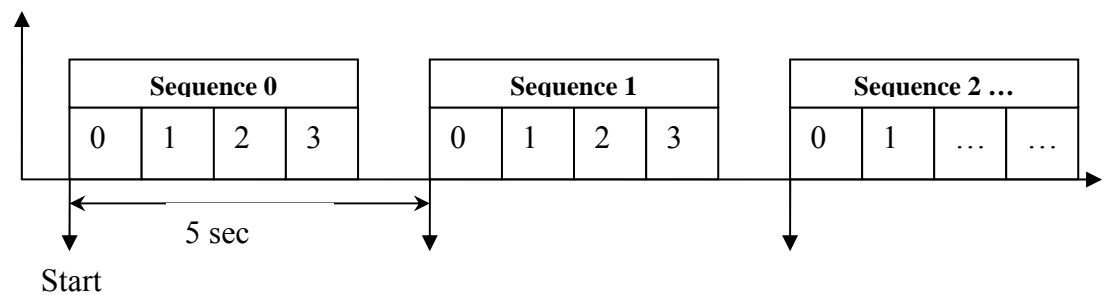Start   Automatic stop

Example 2:

Sequence of the channels: 0,1,2,3

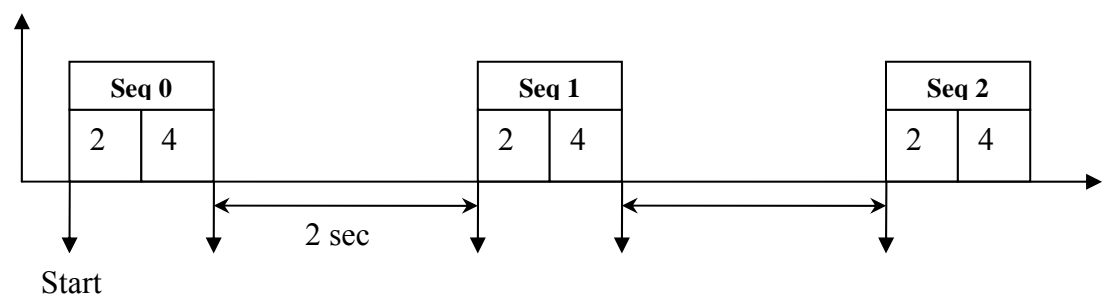Number of the sequences to be acquired: 0 (means continuous)

With Delay 1 (5 sec)

Example 3:

Sequence of the channels: 2,4

Number of the sequences to be acquired: 0 (means continuous)

With Delay 2 (2 sec)

8.2.3   Hardware trigger (for auto refresh and sequence mode)

The auto refresh and sequence mode allow you to start the acquisition by hardware trigger.

The hardware trigger can react to a rising edge, to a falling edge or to both edges.

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You can select between:
- Initialising a filter on the trigger input to avoid errors.
- Defining a number of edges before a trigger action is generated.

There are two trigger modes:
a) One shot
a) Sequence

a) One shot:

After the software start, the module is waiting for a trigger signal to start the acquisition. After this the trigger signal is ignored.

b) Sequence:

After the software start, the module is waiting for the trigger signal and acquires x sequences (that also can be set) and waits again.
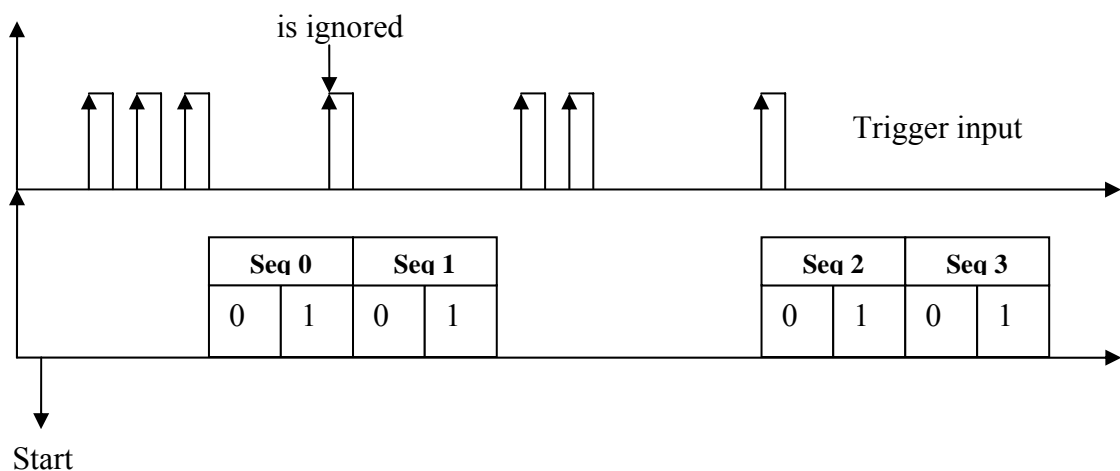
i   **IMPORTANT!**
A trigger edge during an acquisiton is ignored.

Example 1:

- Continuous sequence mode with the channels 0,1 without delay

- Trigger signal reacts to rising edge

- 3 rising edges should be available to realise a trigger action

- Each trigger action starts the acquisition of 2 sequences

is ignored

Trigger input

Seq 0		Seq 1			Seq 2		Seq 3	
0	1	0	1		0	1	0	1

Start

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8.3   Synchronisation

The synchronisation's principle is simple: Via the "Synchro"-connection, one module generates a synchronisation signal and transfers it to the next module. This transmits the signal to the next module. Herewith one module gives the clock signals for the other modules. The sinusoidal excitation signals of the transducers are synchronised and allow measuring several test pieces simultaneously. Additionally, because of the cascading of several modules, the connection of all modules to the PC becomes unnecessary.

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.
Analog	Continuous real time phenomena
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	= *Direct current voltage* 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.
Differential input (DIFF)	= DIFF An analog input with two input terminals, neither of which is grounded, whose value is the difference between the two terminals.
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	= *First In First Out* The first data into the buffer is the first data out of the buffer.
Gain	The factor by which an incoming signal is multiplied.
Half Bridge	= *HB* With the core in the central position the two signals VA and VB are equal and half the energising signal VA. As the core is displaced, VA and VB vary in a complimentary fashion. Typically the half-bridge transducer forms half of a Wheatstone Bridge circuit which enables change from null to be readily determined.
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.
LVDT	= *Linear Variable Differential Transformer* With the core in a central position the coupling from the primary to each secondary is equal, so VA = VB and the output V0 = 0. As the core is displaced, VA differs from VB in proportion to the displacement hence V0 changes in magnitude and phase in proportion to movement in either direction from null.
MUX	= *Multiplexer* 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	Internal trigger: A software generated event that starts an operation. External trigger: An analog or digital hardware event from an external source that starts an operation. 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.

9.2   Index

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Weight 12