



REOVIB

Control Equipment for the Vibratory Feeder Industry

MFS 268

Frequency Converter for Vibratory Feeders

Appendix: EtherNet-IP - Programming

Technical safety instructions for the user

This description contains the necessary information for the correct application of the product described below. It is intended for use by technically qualified personal.

Qualified personnel are persons who, because of their training, experience and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions, are authorised to be responsible for the safety of the equipment, at all times, whilst carrying out their normal duties and are therefore aware of, and can report, possible hazards (Definition of qualified employees according to IEC 364)

Safety Instructions

The following instructions are provided for the personal safety of operators and also for the protection of the described product and connected equipment.



Warning!

Hazardous Voltage

Failure to observe can kill, cause serious injury or damage

- Isolate from mains before installation or dismantling work, as well as for fuse changes or post installation modifications.
- Observe the prescribed accident prevention and safety rules for the specific application.
- Before putting into operation check if the rated voltage for the unit conforms with the local supply voltage.
- Emergency stop devices must be provided for all applications. Operation of the emergency stop must inhibit any further uncontrolled operation.
- **The electrical connecting terminals must be covered!**
- **Earth bonding must be tested for integrity after installation.**

Specified Use

The units described herein are electrical controllers for installation in industrial plant. They are designed for controlling vibratory feeders.

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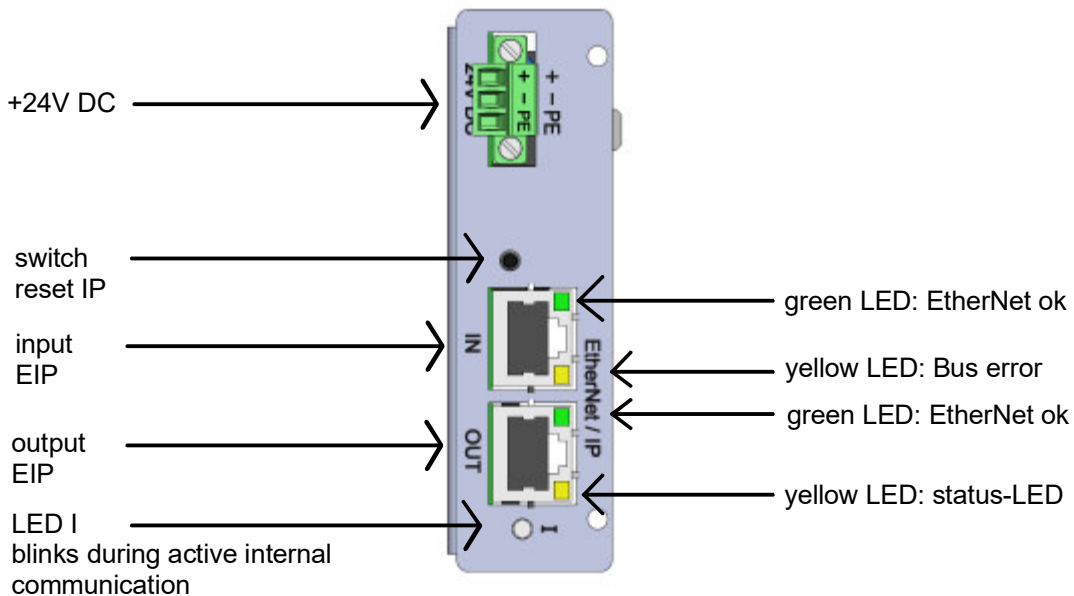
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1.0 General

The MFS 268 range of frequency converters for vibratory feeders can operate with an EtherNet-IP interface.

In normal operation the set point, for the feeder throughput, can be sent from a PLC to the controller and the unit ready/fault status signals are fed back. In an additional parameter mode the unit can be configured over the EtherNet-IP. An external power supply of 24 VDC is required for the interface.

The required EDS-File is provided at the time of delivery.



The interface enables communication with the frequency converter, using 4 data words (i.e. 16 Bits). The four 16 Bit words are transmitted and acknowledged every bus cycle.

! Important – Data consistence is required to operate with EtherNet-IP!

Note: Data consistence is defined in a Siemens S7 PLC with SFC14 and SFC15, for example

Units are factory set prior to delivery and so are configured for bus operation. If the unit is required for manual control then the parameter "CAN." in menu C 017 should be set on "0". You get back to bus operation, if you choose CAN. = „1“.

2.0 Interface operation (EtherNet-IP)

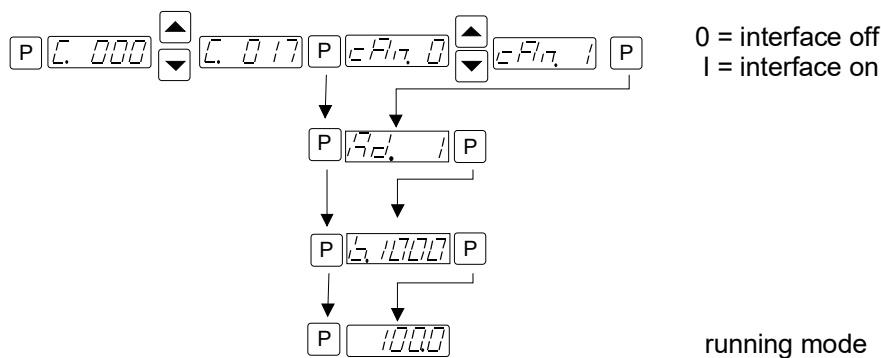
Bus Power Supply	24 V, DC, 250 mA
Bus connector	2 x RJ-45
Internal interface	CAN-Bus
Supported baud rates	1000 kBaud
Communication	Data consistency required
Protocol	EtherNet-IP

3.0 Activate interface

For the interface version parameter "CAN" is set to "1". Then communication through the interface is possible. If manual control of the unit should be required e.g. for testing, this parameter must firstly be set back to "0" again.

Important: The parameter "Ad." must be set to "1" and the baud rate must be set to "b 1000".

Code 017



4.0 EDS-File

Following EDS-File is required for the operation with the EtherNet-IP interface:

EDS File Name:	UNIGATE IC-EI 2Port.eds
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The EDS-file is supplied on a CD with each new unit or alternatively, visit www.reo.de to download the file from the website.

5.0 Bus operating modes

Two fundamental operating modes can be chosen for bus communication.

Normal Operation: Control of the frequency controller in production, in which case the Set point and ON/OFF control signals are transmitted

Parameter Operation: Adjustment of the frequency controller for the desired operation mode and limits. In a special mode the parameter and parameter addresses are transmitted and acknowledged.
In parameter operation, the unit's specific values, such as frequency, soft start time, timers and switching etc., are set.

5.1 Programming for the Bus operation

In normal operation the set point for Amplitude (throughout/feed rate) and the digital control signals, such as enable are set across the interface. The actual voltage/current values and unit status (ready or fault) are fed back. All data words are within the range 0...FFFF H.
The following communication words are given in bit form.

5.1.1 Send to Controller

H-Byte								L-Byte								Word 1
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0000 H (reserved)
H-Byte								L-Byte								Word 2
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Set point 1, 16-Bit 100 % = FFFF H
H-Byte								L-Byte								Word 3
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	reserved
H-Byte								L-Byte								Word 4
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Control - word
Mode bit														Enable		
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	All unused bits MUST be set to `0`
Control information (unit specific)																

0 = Normal operation
1 = Parameter operation

Enable - bit

5.1.2 Reply from Controller

H-Byte								L-Byte								Word 1
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	xxxx H (undefined)
H-Byte								L-Byte								Word 2 (only in regulation mode)
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Feed back actual acceleration 16 Bit 100% = 8000H
H-Byte								L-Byte								Word 3
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Feed back actual output current, 16 Bit 100% = 8000H (in % von I-nom)
H-Byte								L-Byte								Word 4
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Status - Word
Status - Code																
ERROR - Code																
								X	X	X	OFF	X	X	X	X	Bit = „1“ = Function ON
Status information Unit specific																

- 00 Unit not responding
- A5 (H) Unit ready
- 57 (H) ERROR Peak
- 58 (H) ERROR OC
- 02 (H) ERROR OL
- 0C (H) ERROR ACC
- 05 (H) ERROR OU
- C0 (H) Acknowledge
Parameter mode

OFF – Bit
Acknowledge

Status, actual acceleration and actual output current are received.

5.2 Parameter Operation

In parameter operation, the specific unit parameters can be monitored and adjusted.

A `write` enable must be transmitted before parameters can be altered. On closing, the `write` enable must be cancelled.

A `read` request must be sent before data can be read.

Word 3 in the acknowledge is always `CODE H`. This indicates that the controller is in parameter mode.

5.2.1 Creating parameter addresses and values

In parameter operation the most significant bit (msb) in Word 1 is defined as a read or write bit (R/W), where 1 = write and 0 = read, this should be accompanied by the corresponding parameter address.

The mode bit (msb in Word 3) is used to select normal or parameter operation, 0 = Normal or 1 = parameter operation.

Word 1:	reserved	0000 H
Word 2:	R / W – Bit + Address	e.g. 8000 H + 1009 H => 9009 H
Word 3:	Value of the parameters	e.g. 7FFF H
Word 4:	Mode bit = 1 + Control bit's	e.g. 8000 H + 0004 H => 9004 H

5.2.2 Send Write Enable

H-Byte								L-Byte								Word 1
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0000 H (reserved)
H-Byte								L-Byte								Word 2
C0								DE								Write Enable Address = CODE H
H-Byte								L-Byte								Word 3
B5								E7								Write Enable = B5E7 H
H-Byte								L-Byte								Word 4
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Control - Word + 8000 H
1 Mode bit																Mode Bit must be set to `1` !!
	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	All unused bits must be set to `0` Bit = `1` = Function ON
Control Information unit specific																

5.2.3 Receive, Acknowledge Write Enable

H-Byte	L-Byte	Word 1
00	0E	xxxx H (undefined)
H-Byte	L-Byte	Word 2
C0	DE	C0DE H
H-Byte	L-Byte	Word 3
B5	E7	B5E7 H
H-Byte	L-Byte	Word 4
C0	DE	C0DE H

The parameters can be sent after receipt of the acknowledge

5.2.4 Send Parameter

H-Byte								L-Byte								Word 1
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0000 H (reserve)
H-Byte								L-Byte								Word 2
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Parameter address + R / W – Bit (16-Bit) = 0...FFFF H
R / W	<i>Parameter address</i>															
H-Byte								L-Byte								Word 3
XX								XX								Parameter value (16-Bit) = 0...FFFF H
H-Byte								L-Byte								Word 4
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Control - Word + 8000H Mode must be set to `1`!! All unused bits must be set to `0` Bit = `1` = Function ON
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Control Information (unit specific)																

Received acknowledge

H-Byte								L-Byte								Word 1
00								00								xxxx H
H-Byte								L-Byte								Word 2
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Acknowledge the sent address + R / W - Bit
R / W	<i>Parameter address</i>															
H-Byte								L-Byte								Word 3
xx								xx								Acknowledge the Parameter value
H-Byte								L-Byte								Word 4
C0								DE								Acknowledge the Parameter mode (always „C0DE“ H)

5.2.5 Close write enable

H-Byte								L-Byte								Word d	
00								00								0000 H	
H-Byte								L-Byte								Word 2	
C0								DE								Write Enable Address = C0DE H	
H-Byte								L-Byte								Word 3	
00								00								Enable Value 0000	
H-Byte								L-Byte								Word 4	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Control - Word + 8000 H Mode bit must be set to `1`! All unused bits must be set to `0` Bit = `1` = Function ON	
Mode bit																	
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Control Information (unit specific)																

5.2.6 Parameter read (send)

H-Byte								L-Byte								Word d	
00								00								xxxx H (undefined)	
H-Byte								L-Byte								Word 2	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Parameter address + R / W - Bit	
R / W	<i>Parameter address</i>																
H-Byte								L-Byte								Word 3	
00								00								Read Enable Value = 0000	
H-Byte								L-Byte								Word 4	
80								00								Mode bit = 1 + Control bits	

Received parameter

H-Byte								L-Byte								Word 1	
00								00								xxxx H (undefined)	
H-Byte								L-Byte								Word 2	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Acknowledge Parameter address + R / W - Bit	
R / W	<i>Parameter address</i>																
H-Byte								L-Byte								Word 3	
XX								XX								Parameter value	
H-Byte								L-Byte								Word 4	
C0								DE								Acknowledge Parameter mode	

6.0 Parameter Table

Non listed addresses cannot be altered!

Parameter:	Adjustment	Display-Code	Factory Setting:	Entry code	Parameter address HEX (.bit)	Value HEX
Vibratory feeder						
• Amplitude (throughput)	0...100 %	A.	0 %	000, 002, 008, 096	100C	0x0000...0xFFFF
• Second set point / coarse - fine	0...100 %	2.	0	002	0x1006	0x0000...0xFFFF
• Maximum control limit (U_{max})	5...100 %	P.	90 %	096, 008	1009	0CCC...FFFF H
• Vibrating frequency	5...300 Hz	F.	100 Hz	096, 008 040	1005	01F4...7530 H 500...30000 dec. (FL)...(FH.)
• Soft start ramp up	0...60 sec.	/.	0,1 sec.	096	1013	0x0000...0xFFFF
• Soft stop ramp down	0...60 sec.	\.	0,1 sec.	096	1012	0x0000...0xFFFF
• Switch to external set point	0 / 1	E.S.P.	0	003	0x5800	0x0000 / 0x FFFF
• Set point 0(4)...20 mA	0 / 1	4.20	0	003	0x5801	0x0000 / 0x FFFF
• Potentiometer set point (for 3 / 6 / 8 A units)	0 / 1	POT.	0	003	0x5805	0x0000 / 0x FFFF
• Coarse / Fine control	0 / 1	S.P.2.	0	003	0x580C	0x0000 / 0x FFFF
• Switch to second set point (delayed)	0 / 1	S.2.d	0	003		0x0000 / 0x FFFF
• Invert enable	0 / 1	-En.	0	003	0x5811	0x0000 / 0x FFFF
• Switch status/ ready relay	0 / 1	r.b.	0	003	0x583D	0x0000 / 0x FFFF
Regulation (with sensor)						
• Switch to regulation	0 / 1	ACC.	0	008	0x5808	0x0000 / 0x FFFF
• P characteristic	0...100	P.A.	40	008	0x100F	0x0000...0xFFFF
• I characteristic	0...100	I.A.	100	008	0x1014	0x0000...0xFFFF
• Automatic frequency control	0 / 1	A.F.C.	0	008	0x5809	0x0000 / 0x FFFF
• Start automatic frequency search	start	A.F.S.		008	0x1400	0x0AF5
Track control						
• Switch on time delay	0...60 sec.	I.	1 sec.	007, 167	0x1003	0x0000...0xFFFF
• Switch off time delay	0...60 sec.	O.	1 sec.	007, 167	0x1002	0x0000...0xFFFF
• Invert sensor	PNP / PNP inverse	-SE.	0	007, 167	0x580A	0x0000 / 0x FFFF
Sensor control						
• Sensor Time-out	0 / 1	E.En	0	015, 167	0x580B	0x0000 / 0x FFFF
• Sense time delay (Sensor Time-out)	30...240 sec.	E.	180 sec.	015, 167	0x1004	0x0000...0xFFFF
• lead time valve output ¹⁾	0...60 sec.	A.r.	0,0	015		0x0000...0xFFFF
• follow-up time valve output ¹⁾	0...60 sec.	Ai.	4,0	015	0x102C	0x0000...0xFFFF
Interface (option)						
• Interface OFF / ON	0 / 1	cAn.	I	017	0x5818	0x0000 / 0x FFFF
Service						
• ERROR Reset	Reset	CLr.Er.		009	1400	C009 H
• Hide programming menus	0 / 1	Hd.C.		117	0x5804	0x0000 / 0x FFFF
• Choose user parameter menu Nr. 0...3	0...3	U.S.I.	0	143		
• Save user settings		PUSH.		143		
• Recall factory settings		FAC.		210		
• Choose user parameter menu Nr. 0...3	0...3	U.S.I.	0	210		
• Recall user parameter		US.PA.		210		

Parameter:	Adjustment	Display-Code	Factory Setting:	Entry code	Parameter address HEX (.bit)	Value HEX
------------	------------	--------------	------------------	------------	------------------------------	-----------

Service limits						
• Enable service menu	0 / 1	En.S.	0	127	0x5834	0x0000 / 0x FFFF
• Show output current (0... 100 %)		i.		040	0x200A	0x0000...0x8000 H
• Show active vibration frequency		F.		040	0x1005	0x01F4...0x7530 H
• Current limit	0...100 %	l.	100	040	0x1016	0x0000...0x8000 H
• Stop at current limit	0 / 1	E.F.u.	0	040	0x5850	0x0000 / 0x FFFF
• Current regulator P-part	1...100	I.P.	20	040	0x100D	0x0000...0xFFFF
• Current regulator I-part	1...100	I.I	40	040	0x1032	0x0000...0xFFFF
• Min frequency limit	5...150 Hz	F.L:	35	040	0x1020	01F4...7530 H 500...30000 dec.
• Max frequency limit	5...150 Hz	F.H.	140	040	0x1021	01F4...7530 H 500...30000 dec.
• Start level AFC	0...100	A.S.	25	040	0x1033	0x0000...0xFFFF
• Output voltage limited	0...100	P.L.	100	040	0x1018	0x0000...0xFFFF

- 1) Not available IP20 Version
- 2) Not for fieldbus operation

7.0 Example of bus communication with Frequency controller

Variable values are shown in *italics*.

7.1 Normal mode

(Set point to 70 %)

Send Set point	Word	Code	send	Code	Received
	1		0000 H		0000 H
2		B332 H	Set point = 70 %	---	---
3					
4		<i>0004 H</i>	Enable On	<i>A5xx H</i>	Ready

Enable ON, Stop controller (with enable)

Send Set point	Word	Code	send	Code	Received
	1		0000 H		0000 H
2		B332 H	Set point = 70 %	---	---
3					
4		<i>0000 H</i>	Enable OFF	<i>A5xx H</i>	Ready

7.2 Parameter mode

(e.g. set frequency to 50 Hz and soft start to 2 second)

Open write enable	Word	Code	send	Code	Received
	1		0000 H		0000 H
2		C0DE H	Write enable Address	C0DE H	Acknowledge
3		B5E7 H	Write enable value	B5E7 H	Acknowledge
4		8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge

Write parameter	Word	Code	send	Code	Received
	1		0000 H		0000 H
2		<i>9005 H</i>	Parameter address Vibrating frequency + R / W - Bit	<i>9005 H</i>	Acknowledge
3		<i>1388H</i>	Frequency 50 Hz	<i>1388 H</i>	Acknowledge 50 Hz
4		8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge

Write parameter	Word	Code	send	Code	Received
	1		0000 H		0000 H
2		<i>9013 H</i>	Parameter address Soft start + R / W - Bit	<i>9013 H</i>	Acknowledge
3		<i>3333 H</i>	Soft start 2 Sec.	<i>3333 H</i>	Acknowledge 2 seconds
4		8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge

Close Write enable	Word	Code	send	Code	Received
	1		0000 H		0000 H
2		C0DE H	Write enable address	C0DE H	Acknowledge
3		0000 H	Write enable Value	0000 H	Acknowledge
4		8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge

Example of switch parameter change

Enable invert

Open Write enable	Word	Code	send	Code	Received
	1	0000 H		0000 H	
	2	C0DE H	Write Enable Address	C0DE H	Acknowledge
	3	B5E7 H	Write Enable Value	B5E7 H	Acknowledge
	4	8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge

Write Parameter	1	0000 H		0000 H	
	2	<i>D811 H</i>	Parameter address	<i>D811 H</i>	Acknowledge
	3	<i>FFFF H</i>	new Parameter	<i>FFFF H</i>	Acknowledge
	4	8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge

Close Write enable	Word	Code	send	Code	Received
	1	0000 H		0000 H	
	2	C0DE H	Write Enable Address	C0DE H	Acknowledge
	3	0000 H	Write Enable Value	0000 H	Acknowledge
	4	8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge

Read only the parameter)

Read	Word	Code	send	Code	Received
	1	0000 H		0000 H	
	2	<i>1013 H</i>	Parameter address Soft start	<i>1013 H</i>	Acknowledge
	3	0000 H	Read parameter	<i>8000 H</i>	Parameter value (=> 5 seconds)
	4	8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge Parameter mode

7.3 RESET Controller

	Word	Code	send	Code	received
Open Write enable	1	0000 H		0000 H	
	2	C0DE H	Write Enable Address	C0DE H	Acknowledge
	3	B5C9 H	Write Enable Value	B5C9 H	Acknowledge
	4	8000 H + Control bits	Set mode bit = 1	C0DE H	Acknowledge

Write Parameter	1	0000 H		0000 H	
	2	9400 H	Parameter address Reset + R / W - Bit	0000 H	Acknowledge
	3	C009 H	RESET.	0000 H	
	4	8000 H + Control bits	Set mode bit = 1	C0DE H	

Allow approximately 0.5 sec. for RESET

8.0 Methods for adjusting the IP-address

1. Web server (Preferably)
2. DHCP Server Utility

If you don't have a browser, you can push a switch on the front of our device.

If you push this switch shorter than five seconds, the device gets the IP-address 192.168.11.182.

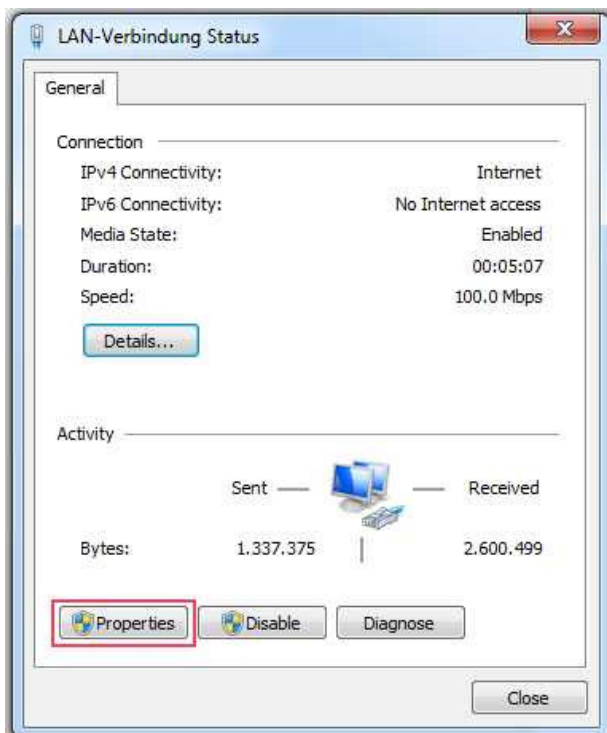
If you push this switch longer than five seconds, the device is set into the original state (IP-address 0.0.0.0) and DHCP is set on.

8.1 Web server

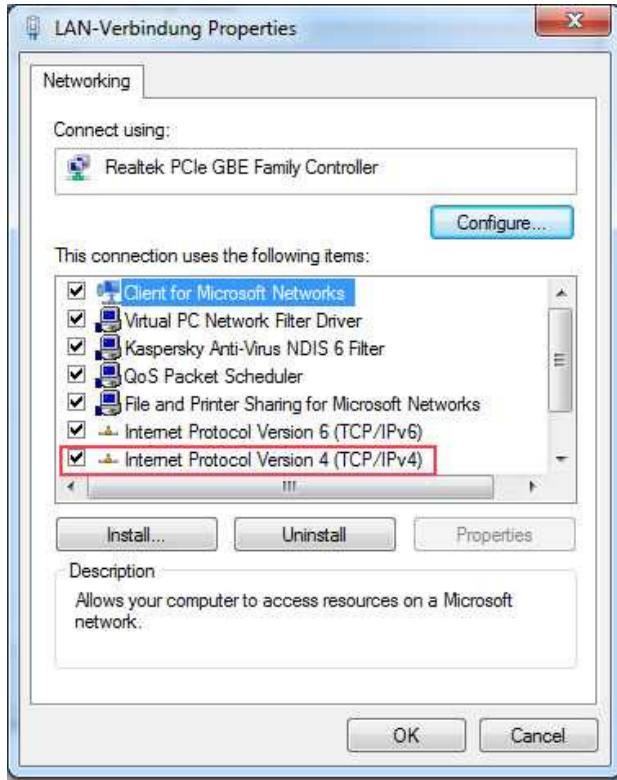
You can call up an HTML-page with the help of our web server. There are shown system parameters of the device on this page.

If the subnet mask of your PC doesn't correspond with the subnet mask of the device, you proceed in the following way.

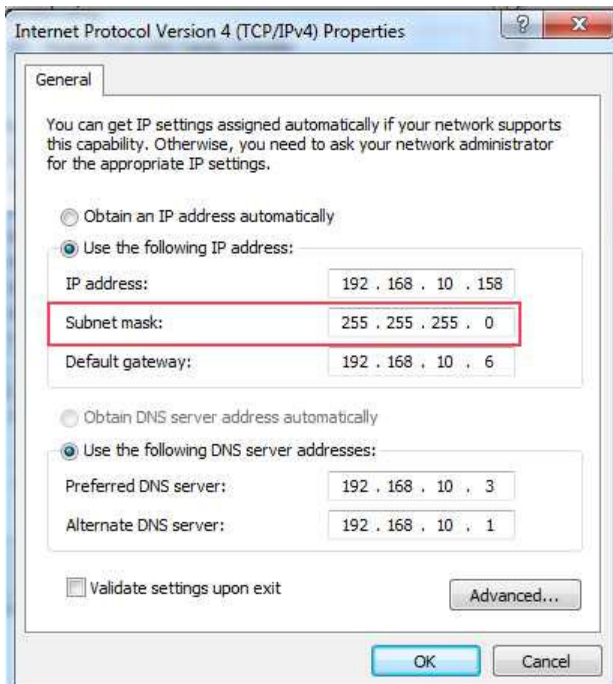
1. You open the control panel.
2. There you open the "Network and Sharing Center".
3. There you click on "LAN-Verbindung" respectively „LAN-connections“.
4. There you choose "Properties".



5. Then you double-click on „Internet Protocol Version 4 (TCP/IPv4)“



6. Then you set the subnet mask at 255.255.240.0.



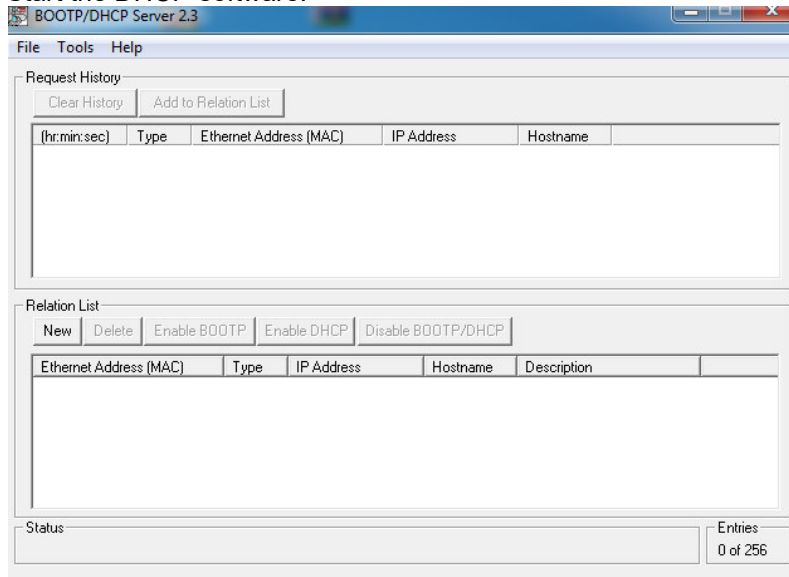
7. You click on „OK“.
8. Then you open the web browser (e.g. the Internet-Explorer).
9. You enter the following IP-address 192.168.11.182 as address.
10. Then you click on „IP-Set“.

8.2 DHCP Server Utility (Example: „BOOTP/DHCP Server“)

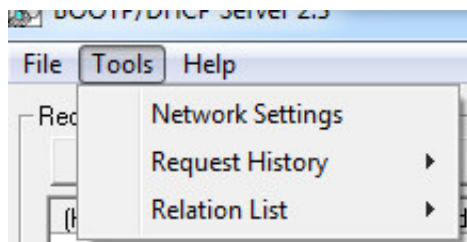
1. Please download a DHCP Server software for example: „DHCP/BOOTP Utility“.

Important: Before you start the DHCP-server, note the MAC-address which has the following form: 00-00-BC-14-55-35. The MAC-address stands on the front of the module.

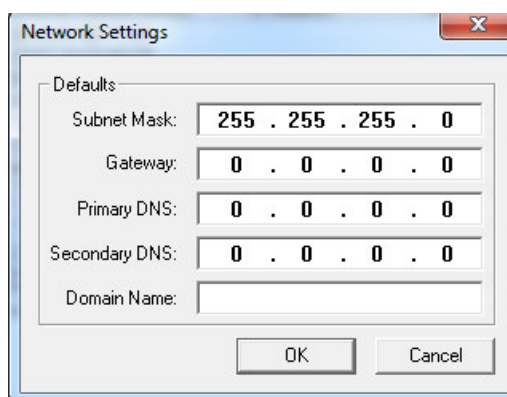
2. Start the DHCP-software.



3. You choose „Network Settings“ in the menu „Tools“.



4. You enter the subnet mask.



5. The Gateway-address, Primary and/or Secondary DNS-address and Domain Name are optional.
6. Choose the appropriate module.
7. Click on „Add to Relation List“. The „New Entry“ dialog box appears.
8. Enter an IP-address, host name and description for the module.
9. Click on „OK“.
10. You wait until the module appears in the „Relation List“. Then you choose it. The configuration is assigned permanently for the module this way.
11. Click „Disable BOOTP/DHCP“.
12. If the message „Command successful“ appears, the configuration was successful.







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