

C9302-YE

Control computer for XC-Boards[®]
with EtherNet/IP interface

Operating instructions

1 Contact

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2 Legal note

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3 Safety precautions

Important information

Read these operating instructions before starting the unit. They provide you with important information on the use, safety and maintenance of the units. This helps you to protect yourself and prevent damage to the unit.



Information intended to help you to avoid death, bodily harm or considerable damage to property is highlighted by the warning triangle shown here; it is imperative that this information be properly heeded.

The operating instructions are intended for trained professional electricians familiar with the safety standards of electrical technology and industrial electronics.

Store these operating instructions in an appropriate place.

The manufacturer is not liable if the information in these operating instructions is not complied with.

Safety



Components inside the units are energized with electricity during operation. For this reason, mounting and maintenance work may only be performed by professionally-trained personnel while observing the corresponding safety regulations.

The repair and replacement of components and modules may only be carried out by the manufacturer for safety reasons and due to the required compliance with the documented unit properties.

The units do not have a power switch. They are operative as soon as the operating voltage is applied.

Intended use

The units are intended for use in industrial environments. They may only be operated within the limit values stipulated by the technical data.

When configuring, installing, maintaining and testing the units, the safety and accident-prevention regulations relevant to use in each individual case must be complied with.

Trouble-free, safe operation of the units requires proper transport, storage, installation, mounting and careful operation and maintenance of the units.

Mounting and installation

The attachment options for the units were conceived in such a way as to ensure safe, reliable mounting.



The user must ensure that the attachment hardware, the unit carrier and the anchoring at the unit carrier are sufficient to securely support the unit under the given surrounding conditions.

The units are to be mounted in such a way that they can be opened up while mounted. Sufficient space for the cables must be available in the unit near the cable entries.

Sufficient space is to be kept clear around the units to ensure air circulation and to prevent the build-up of heat resulting from use. The relevant information must be heeded in the case of units ventilated by other means.



When the housing fasteners are opened, the front frame of the housing hinges out upward or downward (depending on the unit version) automatically.

Grounding

All devices are equipped with a metal housing. They comply with safety class I and require a protective earth connection. The connecting cable for the operating voltage must contain a protective earth wire of a sufficient cross section (DIN VDE 0106 part 1, DIN VDE 0411 part 1).

EMC measures

The devices comply with the current EU Directive (EMC Directive) and provide the required interference immunity. Observe the following when connecting the operating voltage and data cables:

Use shielded data cables.

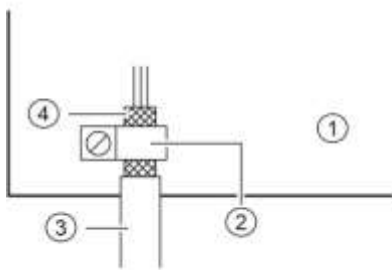
The data and operating voltage cables must be laid separately. They may not be laid together with heavy-current cables or other interference-producing cables.

The cable thickness must be properly assessed (DIN VDE 0100 Part 540).

The cable lengths inside the units are to be kept as short as possible to prevent interference. This applies especially to unshielded operating voltage cables. Shielded cables are also to be kept short due to any interference which might be emitted by the shielding.

Neither excessively long cables nor cable loops may be placed inside the units.

The connection of the cable shielding to the functional ground (PE) must be as short and low-impedance as possible. It should be made directly to the mounting plate over a large area with a conductive clip:



- | | |
|------------------|--------------------|
| ① mounting plate | ② conductive clamp |
| ③ data lines | ④ cable shielding |

The cable shielding is to be connected at both cable ends. If equipotential bonding currents are expected due to the cable arrangement, electrical isolation is to be performed on one side. In this case, capacitive connection (approx. $0.1\mu\text{F}/600\text{ V AC}$) of the shielding on the isolated side must occur.

Disposal

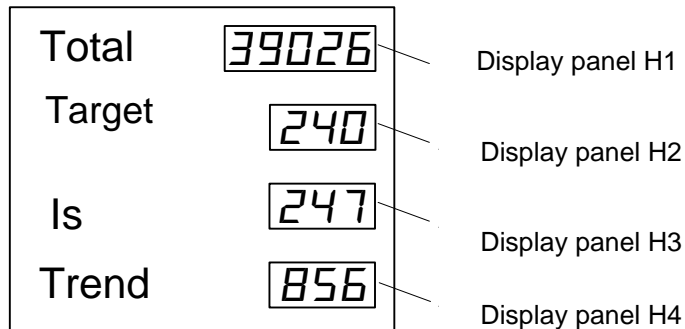
Units or unit parts which are no longer needed are to be disposed of in accordance with the regulations in effect in your country.

4 Field control

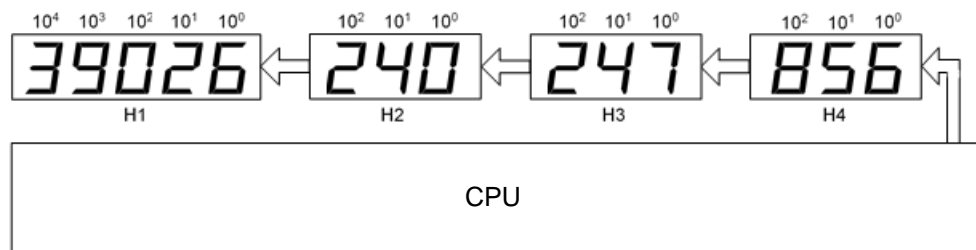
XC-Board®

The control computer C9302-YE is used for the selective control and formatting of numeric or alphanumeric display fields in XC-Boards® via an EtherNet/IP interface.

The following figure shows an example of an XC-Board® with four display panels:



The electrical design of the XC-Boards® is documented in the function chart supplied. The following figure shows the basic structure of the XC-Boards®.



Data telegrams sent to the display are valid for either a specific display field or for all display fields (see chapter 'Data format').

5 Number format

Numbers in this manual are displayed hexadecimal and decimal.

Hexadecimal numbers are always shown with the prefix '16 #' and depending on the application with leading zeros. The lowest value digit is on the right.

Example: The decimal number '10' equals '16#A' or '16#0A', the decimal number 100 equals '16#64' or '16#0064'.

Decimal numbers do not have a special marking.

6 IP settings

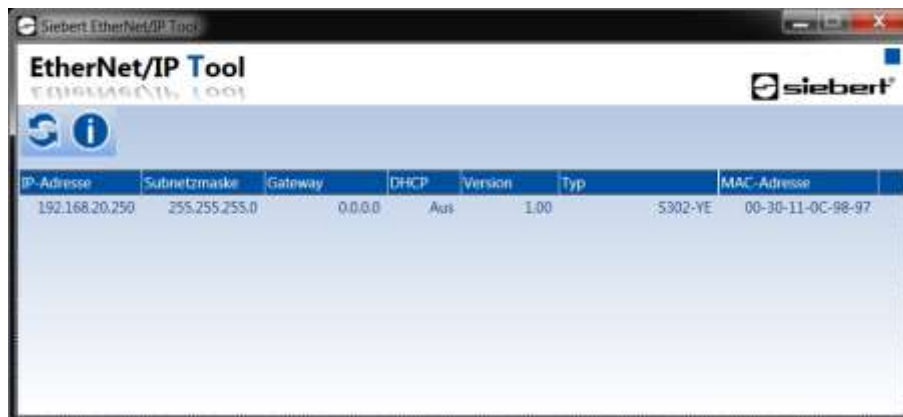
The following parameters are set in the factory setting:

IP address: 192.168.20.250
 Subnet mask: 255.255.255.0
 Gateway: 0.0.0.0
 DHCP: Off

The values can be changed in an engineering framework (for example Rockwell Studio 5000).

Alternatively, you can change the IP settings using the program 'EtherNet/IP Tool'. You find the program on the data carrier included in delivery as a ZIP archive file or on www.siebert-group.com. After unpacking this file, the program 'EthernetIPTool.exe' can be run without installation.

After the program is started the following window opens and an automatic search for EtherNet/IP-devices is started. For a new search click on the 'Refresh' button on the top left.



Double-clicking on the display whose settings you want to change opens the following window:



Enter the desired IP settings and click the 'OK' button. After successful configuration the following window opens:



After that the display carries out a restart and can be accessed via the new IP settings.

The window is closed by clicking 'OK' once and a new search for EtherNet/IP-devices starts.

7 Data format

The EDS data file is included in delivery or see on www.siebert-group.com.

The name of the display is 'S302-YE' and it uses the following settings:

Parameter	Originator to Target (O → T)	Target to Originator (T → O)
Instance ID	150	100
Data size	6 bytes	0 bytes

The display always receives 6 bytes: 4 bytes for the value and 2 bytes, which specify the meaning of the sent value. The following E/A-image is used:

Channel	Address	Description
Property	%QW0	2 bytes property identifier
Value	%QD1	4 bytes value signed

The high byte of the property corresponds to the display field number for which the data sent corresponds (e.g. '3' (16 # 03xx) corresponds to the display field H3). The possible values are describes in the chapter 'Setting the display type via Properties'.

The basic brightness of all display fields can be set with the value '0' (16 # 00xx) as high byte of the property (see chapter 'Setting of the basic brightness').

Example 1: The decimal number '15' has to be shown on the display field H1.

As Property '16#0100' and as Value '16#0000_000F' has to be send.

Because EtherNet/IP uses the byte order little-endian the bytes are sent as follows:

16 bit Property		32 bit signed number			
%QW0 = 16#0100		%QD1 = 16#0000_000F (equals with the decimal number '+15')			
%QB0	%QB1	%QB2	%QB3	%QB4	%QB5
16#00	16#01	16#0F	16#00	16#00	16#00

Example 2: The decimal number '-15' has to be shown on the display field H1.

As Property '16#0100' and as Value '16#FFFF_FFF1' has to be send.

Because EtherNet/IP uses the byte order little-endian the bytes are sent as follows

16 bit Property		32 bit signed number			
%QW0 = 16#0100		%QD1 = 16#FFFF_FFF1 (equals with the decimal number '-15')			
%QB0	%QB1	%QB2	%QB3	%QB4	%QB5
16#00	16#01	16#F1	16#FF	16#FF	16#FF

8 Messages on the display

The status of the EtherNet/IP connection is indicated by the status LEDs on the right side and on the left side of the two RJ45 sockets.

LED NS (on the left side of the RJ45 socket of Port P1)

LED	Status	Meaning
off	offline	no IP address assigned
on (green)	online	one or several connections established
blinking (green)	online	no connection established
on (red)	fatal error	duplicate IP address
blinking (red)	timeout	timeout for one or more connections

LED MS (on the right side of the RJ45socket of Port P2):

LED	Status	Meaning
Off	offline	no power supply
on (green)	configuration	scanner in Run-Mode
blinking (green)	configuration	module not configured or scanner in idle state
on (red)	error	restart required
blinking (red)	error	restart required

If connection fails or problems occur during operation, the display shows error 'ERR'. Possible causes are IP problems caused by wrong network parameters, multiple assigned device names, commanding of not defined properties or other fieldbus faults.

Once the connection has been established, the following messages can be displayed:

Example on a 4-digit display	
[] [] [] []	Until the first time user data is received, the display shows a frame on its display alternating with the above status messages.
UUUU	Underflow: The value sent to the display cannot be displayed on the display. For example, the value '-1500' cannot be displayed on a four-digit device.
0000	Overflow: The value sent to the display cannot be displayed on the display. For example, the value '-26550' cannot be displayed on a four-digit device.

9 Setting the display type via Properties

Each number, which is sent to the display via EtherNet/IP, is sent together with a Property value. This value defines how the transmitted number is interpreted by the display.

In this case the Property value has the structure '%QW0' = '16#hhnn'. The high byte 'hh' corresponds to the display field number for which the data sent are valid (p.e. '3' (16#03xx) corresponds to display field H3). The low byte is set according to the desired function.

Note: Invalid or undefined values for the high byte of the 'hh' Property are ignored.

The following values are allowed for 'nn'.

Note: After a restart all settings of the settings of the display type via Properties are reset to their default values.

Number to be displayed

Raw Value (property number 0 (16#00))

A number marked by this property is interpreted as a numerical value, which is displayed on the display according to the set parameters.

Decimal points

Decimal Dots (property number 1 (16#01))

The number and position of the decimal points can be defined with the help of a bit mask. For example, multiple decimal points can be used to display a date or codes.

A set bit corresponds with a set decimal point.

The least significant bit corresponds to the decimal point of the least significant digit. If, for example, the number '1234' is to be displayed with a decimal point between the 100th and the 10th digit, the bit mask must be set to the value '0x04' and '12 .34' appears on the display.

Offset, scale factor (multiplier), and divisor (property numbers 2 (16#02), 3 (16#03) and 12 (16#0C))

The formula that can be stored in the display allows you to display values in other units, such as degrees Fahrenheit in degrees Celsius, kilograms in tons, miles in kilometers, or adding an offset.

This initialization parameter consists of the values offset, scale factor (multiplier) and divisor.

Meaning	Property number	Data type	Default value
Offset	2 (16#02)	SINT32	0 (16#00)
Scale Factor	3 (16#03)	SINT16	1 (16#01)
Divisor	12 (16#0C)	UINT16 (unsigned)	1 (16#01)

The calculation is based on the following linear function:

Displayed value = offset + scale factor (multiplier) / divisor x sent value

As a scale factor, integers are possible. Other factors can be formed by a combination of 'ScaleFactor' and 'Divisor'. For example, a multiplication with '13, 42' can be generated by the scale factor '1342 (16#053E)' and divisor '100' (16#64).

Threshold values

Range (property numbers 4 (16#04) und 5 (16#05))

This initialization value defines the upper and lower thresholds at which the display automatically changes its display attribute.

Meaning	Property number	Data type	Default values
Upper bound	4 (16#04)	SINT32	-2147483648 (16#80000000)
Lower bound	5 (16#05)	SINT32	-2147483648 (16#80000000)

No threshold values are defined in the delivery state. The default value commands this.

If a value is received outside the defined thresholds, the display automatically changes from 'standard' to 'out of range'. As soon as a value is received within the defined limits, the display returns to standard.

Example: For a temperature value display, the display should change its display mode, both when the temperature falls below 0 degrees Celsius and when it exceeds 100 degrees Celsius. For this, the values Upper bound = 100 (16#00000064) and Lower bound = 0 (16#00000000) must be entered.

Flags (property number 6 (16#06))

In this initialization value (type INT16) display properties are set.

See chapter flags.

Attributes for flashing and blinking modes (property numbers 7 (16#07) and 9 (16#09))

This initialization values define the blinking modes for the standard display (property number 7 (16#07)) and the 'Out of range' display (property number 9 (16#09)).

See chapter flashing modes.

Format (property numbers 10 (16#0A) and 11 (16#0B))

These two initialization parameters define the alignment of the displayed values and the number of leading zeros.

Meaning	Property number	Data type	Default value
Minimum number of digits	10 (16#0A)	Unsigned	1 (16#01)
Minimum width	11 (16#0B)	Unsigned	30 (16#1E)

The minimum number of digits displayed is defined with 'Minimum number of digits'. If the value to be displayed has fewer digits than 'Minimum number of digits', the display is filled with zeros on the left side.

Example: for a six-digit display, 'Minimum number of digits' is set to 6. If the number '1234 (16 # 04D2)' is sent to the display, '001234' appears in the display.

The 'Minimum Width' defines the minimum number of digits used for display. If the number representation contains fewer characters (including the sign), the space is filled with spaces on the left side.

Example: to display a number on the left-hand side, set the parameter 'Minimum Width' to '1'.

10 Flashing modes and display attributes

The display can show the values to be displayed in a plurality of brightness and blinking patterns, which are referred to as 'display attribute'.

For the initialization parameters, two blocks are defined: a block for 'standard attributes' (property number 7 (16#07)), the other for 'out of range attributes' (property number 9 (16#09)).

The least significant byte is used for displays with monochrome LEDs, all other bytes are set to 1. So for example, the following typical display effects can be defined:

Effect	Attribute value
25% of the basic brightness	85 (16#0000_0055)
50% of the basic brightness	170 (16#0000_00AA)
100% of the basic brightness	255 (16#0000_00FF)
Pulsation	0 (16#0000_0000)
Brief flashing	3 (16#0000_0003)
Fast flashing	51 (16#0000_0033)
Slow flashing	15 (16#0000_000F)
Short darkening	63 (16#0000_003F)
Low beaming	27 (16#0000_001B)
High beaming	228 (16#0000_00E4)

In the case of displays with multicolor LEDs (red and green), the attribute for the red color is set with the least significant byte and the attribute for the green color with the next higher byte. The meaning of the bytes for red and green is identical.

With the same attributes for red and green the display shines orange. Diverse mixed colors, flashing effects and color changing effects can be defined by different attributes, for example:

25% of the basic brightness, orange	21845 (16#0000_5555)
50% of the basic brightness, orange	43690 (16#0000_AAAA)
100% of the basic brightness, orange	65535 (16#0000_FFFF)
Slow flashing (off – on), red	15 (16#0000_000F)
Slow inverse flashing (on – off), green	61440 (16#0000_F000)
Flashing red/green alternately	61455 (16#0000_F00F)

The dark switching is possible by the global 'property 4' (16#04). Here the decimal point of the least significant decade flashes.

11 Flags

Bit number										Meaning	Default	
31...9	8	7	6	5	4	3	2	1	0			
:	:	:	:	:	:	:	:	:	:	0	Circumferential frame off	
:	:	:	:	:	:	:	:	:	:	1	Circumferential frame on	X
:	:	:	:	:	:	:	:	:	:	0	Underflow off	
:	:	:	:	:	:	:	:	:	:	1	Underflow on	X
:	:	:	:	:	:	:	:	:	:	0	Overflow off	
:	:	:	:	:	:	:	:	:	:	1	Overflow on	X
:	:	:	:	:	:	:	:	:	:	0	Invalid initial value off	X
:	:	:	:	:	:	:	:	:	:	1	Invalid initial value on	
:	:	:	:	:	:	:	:	:	:	0	Smart-Dot-Function off	
:	:	:	:	:	:	:	:	:	:	1	Smart-Dot-Function on	X
:	:	:	:	:	:	:	:	:	:	0 0	The decimal places are truncated.*	
:	:	:	:	:	:	:	:	:	:	0 1	The decimal places are rounded up*	
:	:	:	:	:	:	:	:	:	:	1 0	The decimal places are rounded down.*	
:	:	:	:	:	:	:	:	:	:	1 1	The decimal places are rounded commercially.*	X
:	:	:	:	:	:	:	:	:	:	0	Leading zeros off	
:	:	:	:	:	:	:	:	:	:	1	Leading zeros on	X
:	:	:	:	:	:	:	:	:	:	0	Value is displayed in decimal form	X
:	:	:	:	:	:	:	:	:	:	1	Value is displayed in hexadecimal form	
:	:	:	:	:	:	:	:	:	:	0	Without function. The bits are to be set to '0	X

* only with activated Smart-Dot-Function

Leading zeros

On the places in front of the value \square is shown automatically

Smart-Dot-Function

The display automatically moves the decimal point so that the decimal value is displayed completely when the value exceeds the maximum display capacity.

Invalid initial value

If the value sent to the display is invalid, Ξ is shown on each position.

Overflow

If the value sent to the display is that large that it cannot be displayed on the display \square is shown on each position on the upper segments.

If the overflow function is deactivated, the value that can be displayed as large as possible is displayed for a larger number than can be displayed. For example: numbers larger or equal 9999 are always displayed with '9999' on a four-digit display.

Underflow

If the value sent to the display is that small that it cannot be displayed on the display \sqcup is shown on each position of the lower segments.

If the underflow function is deactivated the value that can be displayed as small as possible is displayed for a smaller number than can be displayed. For example: numbers smaller or equal -9999 are always displayed with '-999' on a four-digit display.

Circumferential frame

Until user data is received for the first time the display alternately displays $\square \Xi \Xi \square$ or various status messages on its display.

12 Setting the basic brightness

The basic brightness can be set with the value Property = '16#000x'.
The following values are allowed for x:

Global property number	Meaning	Allowed values
1	Select luminosity value	0 (16#0) = Standard brightness (default) 1 (16#1) = Out of range brightness
2	Standard-luminosity	0 (16#0) = off ... 8 (16#8) = middle luminosity (default) ... 15 (16#F) = maximum luminosity
3	'out of range'-luminosity	0 (16#0) = off ... 8 (16#8) = middle luminosity (default) ... 15 (16#F) = maximum luminosity
4	Blanking of the display	0 (16#0) = Display is dark all others: display lights (default)

During darkness, the decimal point of the least significant decade of the display field H1 flashes.

Example1: the standard luminosity has to be changed to '10':

As Property '16#0002' and as Value '16#0000_000A' has to be send.

Because EtherNet/IP uses the byte order little-endian the bytes are sent as follows:

16 bit Property		32 bit signed number			
%QW0 = 16#0002		%QD1 = 16#0000_000A (equals with the decimal number '+10')			
%QB0	%QB1	%QB2	%QB3	%QB4	%QB5
16#02	16#00	16#0A	16#00	16#00	16#00

Example 2: switch the display to dark:

As Property '16#0004' and as Value '16#0000_0000' has to be send.

Because EtherNet/IP uses the byte order little-endian the bytes are sent as follows:

16 bit Property		32 bit signed number			
%QW0 = 16#0004		%QD1 = 16#0000_0000 (equals with the decimal number '0')			
%QB0	%QB1	%QB2	%QB3	%QB4	%QB5
16#04	16#00	16#00	16#00	16#00	16#00

13 Technical data

Fieldbus

Interface	EtherNet/IP
MAC address	The MAC address for the field bus coupling can be found on the control computer of the device.
Integrated switch	Yes