

migra MPB Ethernet/IP

Large Format, Graphics Compatible Display with Ethernet/IP Interface

User's Manual



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1 General

The large format, graphics compatible display can be used universally for displaying production data, or as an information board.

Its modular design allows for cost-effective variants of various size, as well as different character heights and numbers of digits.

Especially important information can be colour-highlighted with the multicolour model (MC).

Functions

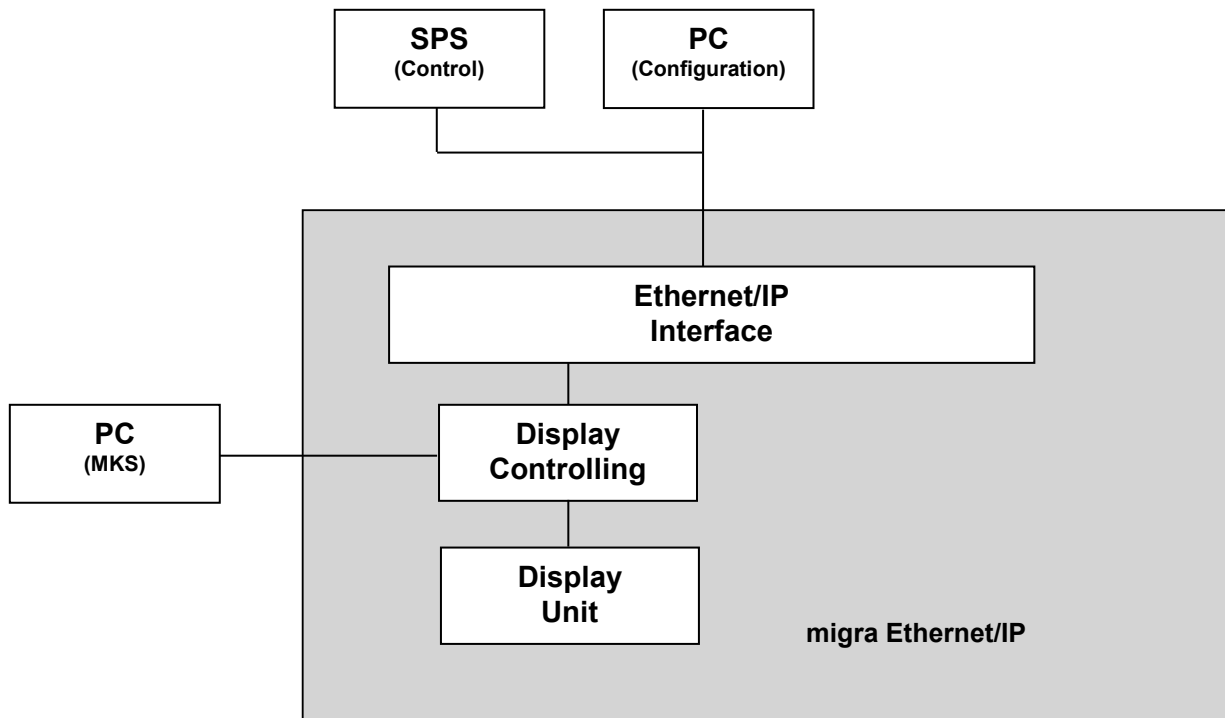
- Data transmission: Ethernet/IP interface
- Configuration with PC software
- Text (different font sizes and types) and graphics can both be displayed.
- Standard font, flashing font, moving screen text, scrolling, inverse display
- Monitor display, stored texts and graphics can be queried, variables can be displayed and macros can be executed
- Variable size thanks to modular display design.

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2 Application Example

Schematic diagram of the display unit at the interface:



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3 Technical Data

General Specifications

Display type:	LED dot matrix display (max.256x128 (HxV))
Display:	ASCII characters (Windows character set), graphics
Display colour:	type SC: single colour, type MC: multicolour
View:	single or double sided
Operating voltage:	230 V / 50 Hz, 110 V / 60 Hz or 24 VDC +/-20 %
Protocol:	Ethernet/IP
Connection:	RJ45, 10/100 MBit/s, configuration via RS232 interface
Housing:	powder coated aluminium
Housing dimensions:	see chapter "device configuration"
Mounting:	articulated arm or hanging mount bracket for wall mounting
Protection:	IP 54 or IP 65
Operating temperature:	0 to +50 °C (optionally -20 to +50 °C)
Storage temperature:	-25 to +70 °C
Graphics:	max. 1000
Texts:	max. 1000 (max. 255 moving screen texts)
Variables:	max. 1000
Macros:	max. 1000
Character sets:	max. 100

The available flash memory capacity for graphics, texts, variables, character sets and macros depends on the vertical resolution of the display:

- Vertical resolution ≤ 64 Pixel: 64 KByte
- Vertical resolution > 64 Pixel: 448 KByte

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3.1 Tips and Tricks

- When putting on the power supply, the following sequence has to be observed:
 - Connect the power supply cable to the display.
 - Connect the power supply cable to the power supply.
- When disconnecting the power supply, the following sequence has to be observed:
 - Disconnect the power supply cable from the power supply.
 - Disconnect the power supply cable from the display.
- Be sure to use a valid colour when creating texts.
Example: Green lettering may not be used with a red, single colour display (no display appears in this case).
- When selecting X and Y coordinates for the purpose of positioning, the desired position must actually exist at the display (resolution in pixels).
- Graphics, texts and variables to be displayed must be positioned such that they fit properly into the display unit.

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3.2 Device Configuration

Itemnumber : _____

Number of pixels (horizontal x vertical): _____ x _____

Type:

for inside use for outside use

Display colour:

red green yellow
 white blue

View:

single sided double sided

Operating voltage:

230 V / 50 Hz 110 V / 60 Hz 24 V DC

Protection:

IP40 IP54 IP65 IP _____

Operating temperature:

with type for inside use:	with type for outside use:	special version:
<input type="checkbox"/> 0...+50 °C (standard)	<input type="checkbox"/> -20...+50 °C (standard)	<input type="checkbox"/> _____ °C
	<input type="checkbox"/> -25...+50 °C (optional with heating)	

Housing dimensions: _____ x _____ x _____ mm

Housing Material:

Aluminum profile Stainless steel Sheet metal

Interface:

Ethernet/IP Parallel interface

Configuration:

RS232 RS485

Device address: _____ . _____ . _____ . _____

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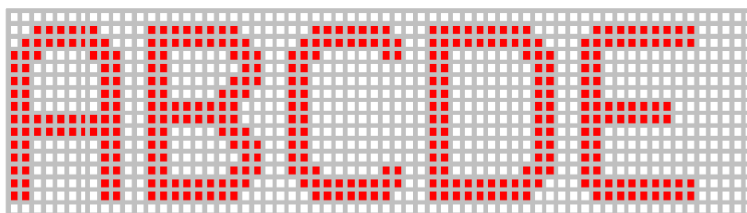
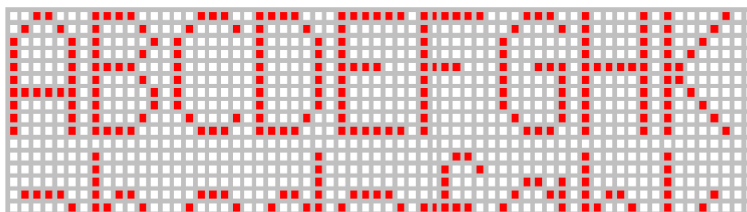
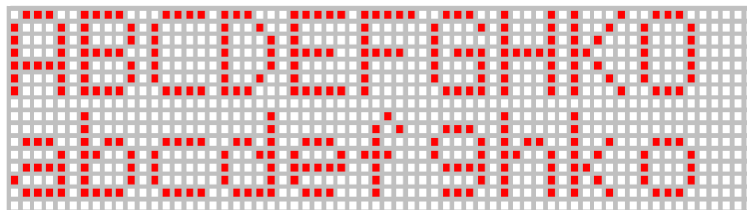
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3.3 Display Elements

Alphanumeric display modules with 16 x 16, 64 x 8 or 64 x 16 dot matrices are utilized.

Attention: As far as the software is concerned, there is no difference between modules with 16 pixel lines and modules with 8 pixel lines. The last 8 lines are simply not visible at a module with 8 pixel lines.

The following example depicts a module with 64 x 16 pixels including three different character heights:



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3.4 System and Device Initialisation

Internal memory and functions tests are performed at the large format display during power-up (duration: less than 1 second).

If the display is not illuminated (and if the integrated function LED is slowly blinking, i.e. 0,5 Hz), the device is in boot mode. This indicates that the software currently stored on the integrated flash memory is incomplete. This may have been caused by a previously interrupted upload operation. If this is the case, uploading must be repeated (with the help of included PC software MKS).

After power-up, the first macro is executed (if one exists). If the display unit is to be cleared again immediately, a corresponding macro must exist!

The display unit then waits for valid output data from the user (via the interface).

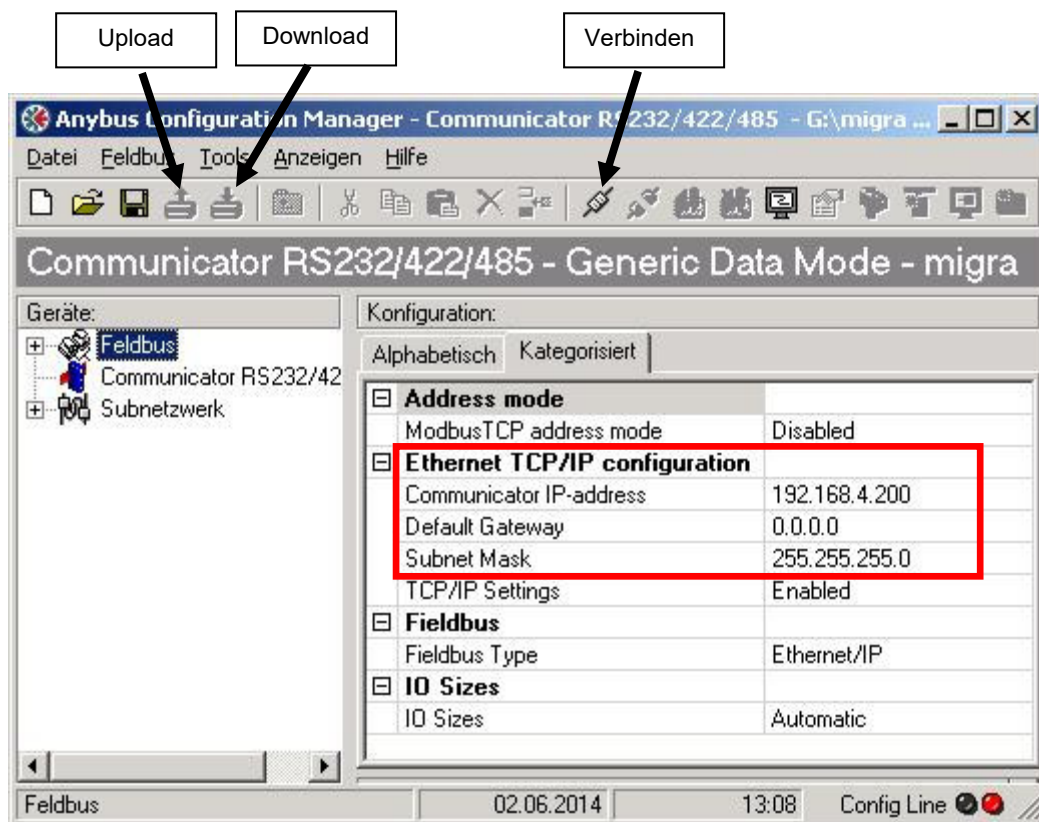
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3.5 Configuration of the Ethernet/IP Interface

The software “Anybus Configuration Manager” of the company HMS serves for the configuration of the interface. You can find this tool at the web page of the interface manufacturer www.anybus.com in the area SUPPORT -> Anybus Communicator -> Ethernet Serial Gateway.

- Connect the display with a RS232 null modem cable (pins 2<->3, 3<->2, 5<->5) to a PC / Laptop.
- Start the software.
- Close the window “Konfiguration auswählen” with the button “Cancel”.
- Press button “Verbinden” and after that button “Upload”.



- Change **only** the marked fields according to your requirements
- Click button “Download” to transmit the configuration to the interface.
- Now the interface configuration is completed.

You can find the original configuration at our home page www.microsyst.de in the area “Downloads & Support” -> “migra” -> “Ethernet IP” -> “Configuration File for HMS Interface”.

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3.6 Configuration of the migra with software “micon”

The enclosed software “*micon 5*” serves for the configuration of the display’s variables and graphics.

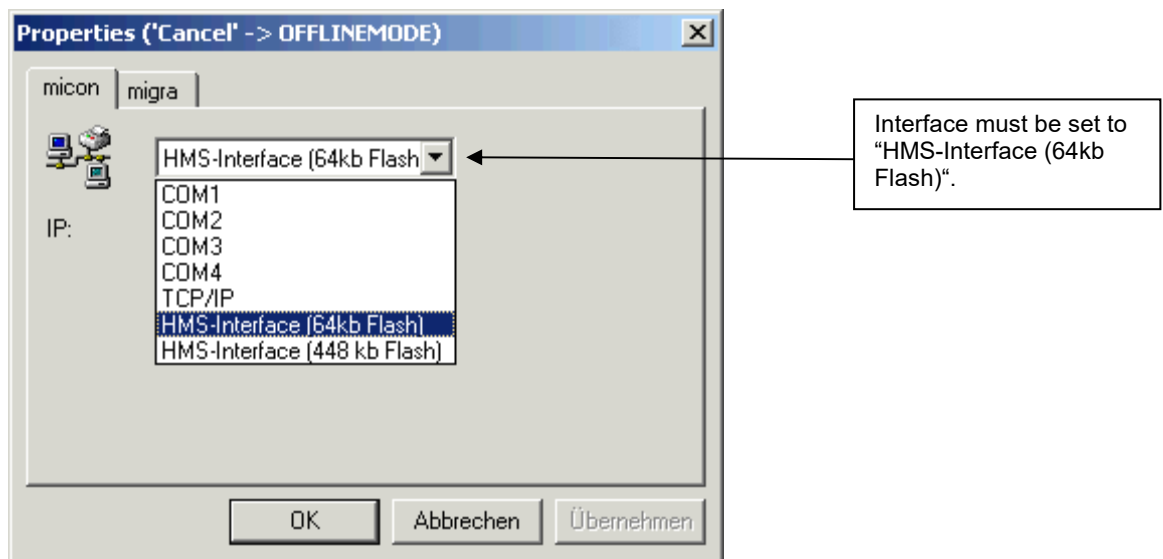
- Connect a PC / Laptop via Ethernet with the display (1 : 1 cable if using a switch/hub; crosslink cable at direct connection).

Installation

- Execute the enclosed file “*setup.exe*” in the path “*MICON*” of the enclosed CD and follow the instructions.

Start

After the start, the dialog “*Properties*” appears.

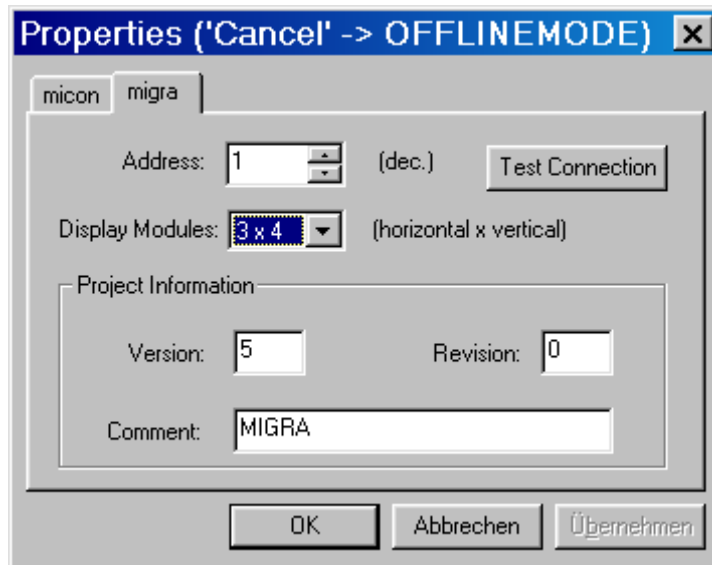


The IP address of the display must be specified by the user.

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- Select the folder “migra”.



- Adjust the display modules depending on the display type. One module (smallest unit) has 64x16 pixels resolution.
- Click at the button “OK”.

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3.7 General Frame Description

The frames to be transmitted to the display have the following structure:

Offset	Designation	Content	Description
0	TB	0 ... 255	Toggle byte (*0)
1	LB		Length byte = frame length
2	Migra frame	2...3	See chapter "Online Frame Layout"

***0: Toggle byte:**

The toggle byte must be increased by 1, if the frame shall be processed

However the toggle byte must only be changed if the lock-byte = 0 (see chapter "General Frame Description"). Otherwise there is a lock from the configuration software MICON (because it controls the display at the moment).

The lock-byte is read from address 0x3FE of the display interface (with "explicit messaging").

The transmit-bytes are written as of the address 0x202 into the display interface.

Response Frame:

The display writes the response frame as of the address 0x160.

Offset	Designation	Content	Description
0	TB	0 ... 255	Toggle byte (*0)
1	LB		Length byte = frame length
2	Response frame	2...3	See chapter "Response Frame"

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3.8 Online Frame Layout

Each of the frames transmitted to the large format display unit consists of 3 parts:

Header	Data Unit	Trail
---------------	------------------	--------------

Frames transmitted to the MIGRA are not evaluated by the device until 3 to 240 ms after the last frame byte has been received (depending upon baud rate and HEX switch settings). The pause between the individual frame bytes may not exceed this period of time! The pause between the individual frames must exceed this period of time!

The next frame can be transmitted immediately after the response frame has been received.

If no response frame is used, the MIGRA is not ready to receive a new frame until the last received frame has been completely processed. For example, if a large graphic is displayed, a longer waiting period is required than would be the case for reading out an "online character". As a rule, a pause of „receiving timeout“ + 150 ms between frames is sufficient.

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3.8.1 Header

STX	DA	SA	FC	LEN-H (optional)	LEN-L (optional)
Start of Text	Destination Address	Source Address	Frame Control	High Nibble Number of Data Bytes	Low Nibble Number of Data Bytes
00000010 _B	1XXXXXXX _B	1XXXXXXX _B	1XXXXXXX _B	1111XXXX _B	1111XXXX _B

- STX:** Start of Text: 02_H
- DA:** Destination Address:
(normally set to 81_H when an Ethernet interface is utilised)
- SA:** Source Address:
(normally set to 80_H when an Ethernet interface is utilised)
- FC:** Frame Control: control for the communications sequence
 Bit 7: set permanently to 1
 Bits 6 - 2: reserved (0)
 Bit 1: 0 -> do not use checksum
 (do not use LEN-H/L, CHK-H/L)
 1 -> use checksum
 (use LEN-H/L, CHK-H/L)
 Bit 0: 0 -> do not send response
 1 -> send response
- LEN-H:** High nibble length: number of high nibble data bytes, bits 4 through 7 must be set
 (e.g. number of data bytes = 26_H ⇒
 high nibble = 2 ⇒ 11110010_B)
- LEN-L:** Low nibble length: number of low nibble data bytes, bits 4 through 7 must be set
 (e.g. number of data bytes = 26_H ⇒
 low nibble = 6 ⇒ 11110110_B)

LEN-H und LEN-L only need to be transmitted if a checksum is used. If bit 1 in the FC byte is not set, LEN-H and LEN-L may not be transmitted!

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3.8.2 Data Unit

Data Unit
Display Data
1B _H , 0A _H , 0D _H , 20 _H - FF _H

Data Unit: Data bytes (ASCII characters, control commands)

3.8.3 Trail

If bit 1 is not set in the FC byte (no checksum):

ETX
End of Text
00000011 _B

End of Text: 03_H.

If bit 1 is set in the FC byte (use checksum):

CHK-H	CHK-L	ETX
High nibble from sum of all previous bytes (without STX)	Low nibble from sum of all previous bytes (without STX)	End of Text
1111XXXX _B	1111XXXX _B	00000011 _B

Checksum = low byte for sum of DA, SA, FC, LEN-H, LEN-L and all data bytes

CHK-H: High nibble for checksum: bits 3 through 0, bits 4 through 7 must be set (1)

CHK-L: Low nibble for checksum: bits 3 through 0, bits 4 through 7 must be set (1)

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3.9 Description of the Data Unit for Online Frames

The display must be configured with the PC software (define character sets, graphics, texts, variables and macros). The individual elements included in the configuration which is downloaded to the display can then be used by the frames described in this chapter.

The display is delivered with a pre-programmed default configuration. However, you can create an individualised configuration for your own application and download it to the display unit with the PC software. The existing default configuration is overwritten during this process.

All indices are 0-based, i.e. "000" is transmitted in order to query the first text. The position 0 / 0 (X / Y) is the upper left-hand pixel at the display unit. All variables, graphics and texts are written to the display starting at the selected X and Y coordinates, and then proceed down and to the right. The display's physical limits may not be exceeded during this process (otherwise no display appears).

Note: Text, variable, graphic, character set and bar graph indices in the PC software and at the controlling are 0-based!

Frames which contain no online text (ASCII codes 20_h through FF_h, 10_h and 13_h), start with the escape character (1B_h) as the first data byte. A separate frame must be transmitted for each escape sequence.

If response frames are used, the next frame can be transmitted immediately after receipt of the response. However, this may lead to delays in the execution of macros, moving screen texts and scrolling if the frame sequence is too fast.

If response telegrams are not used, a pause must be inserted between the frames as described in chapter "Online Frame Layout".

Data bytes included in the data unit must be in ASCII format!

Example, Specifying Position:

... 31_h 32_h 33_h ... must be transmitted for position 123_D!
(ASCII characters "1", "2" and "3").

Refer to chapter "Displayable Characters" for a table of displayable ASCII characters!

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3.9.1 Online Texts

Online texts are transmitted without an escape sequence (ASCII codes 20_H – FF_H, 0A_H, 0D_H).

Transmitted ASCII characters are displayed with the current character set at the current cursor position in consideration of current attributes.

Line breaks are accomplished with the help of ASCII code 0A_H or 0D_H by transmitting the escape sequence for setting cursor position (ESC-“C”).

If the display limits are exceeded, read-out is continued at the next line, or at the first line of the display unit.

3.9.1.1 Selecting a Character Set

Byte 1	Byte 2	Byte 3	Byte 4
ESC	Function	Character set no. tens	Character set no. ones
1B _h	“Z”: normal character width “z”: uniform character width	“0” – “9”	“0” – “9”

Three character sets are included with the display unit upon delivery:

50 mm (1.97”) character set (character set “Z00”, “z00”)

75 mm (2.95”) character set (character set “Z01”, “z01”)

100 mm (3.94”) character set (character set “Z02”, “z02”).

Existing character sets are overwritten with the new character sets if a new configuration is downloaded to the display unit!

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3.9.1.2 Positioning the Cursor

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
ESC	Function	X Position hundreds	X Position tens	X Position ones	Y Position hundreds	Y Position tens	Y Position ones
1B _h	"C"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"

3.9.1.3 Configuring Attributes

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
ESC	Function	Foreground colour	Background colour	Blinking
1B _h	"A"	"0": black "1": green "2": red "3": yellow	"0": black "1": green "2": red "3": yellow "T": transparent	"0": static "1": blinking

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3.9.2 Texts, Graphics and Variables

3.9.2.1 Querying Text

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Text no. hundreds	Text no. tens	Text no. ones
1B _h	"T"	"+": display "-": clear	"0" – "9"	"0" – "9"	"0" – "9"

When the display is cleared, the surface at which the text is displayed is overwritten with the current online background colour (from the last "ESC-A" frame)! Black is used if the background colour has been set to transparent!

3.9.2.2 Adjusting Speed for Moving Screen Texts

Byte 1	Byte 2	Byte 3
ESC	Function	Moving Screen Speed
1B _h	"L"	"0": static "1": 1.8 seconds : "9": 0.2 seconds

All moving screen texts are set into motion at the selected speed. The default setting is "9" (0.2 seconds per step), and this setting is always activated each time the device is switched on.

3.9.2.3 Querying Graphics

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Graphic no. hundreds	Graphic no. tens	Graphic no. ones
1B _h	"G"	"+": display "-": clear	"0" – "9"	"0" – "9"	"0" – "9"

When the display is cleared, the surface at which the text is displayed is overwritten with the current online background colour (from the last "ESC-A" frame)! Black is used if the background colour has been set to transparent!

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3.9.2.4 Querying Variables

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Variable no. hundreds	Variable no. tens	Variable no. ones
1B _h	"V"	"+": display "-": clear	"0" – "9"	"0" – "9"	"0" – "9"

When the display is cleared, the surface at which the variable is displayed is overwritten with the current online background colour (from the last "ESC-A" frame)! Black is used if the background colour has been set to transparent!

3.9.2.5 Setting Variables

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5.	Byte 6	Byte 7...133
ESC	Function	Set	Variable no. hundreds	Variable no. tens	Variable no. ones	Variable values
1B _h	"V"	"=": set	"0" – "9"	"0" – "9"	"0" – "9"	20 _h ...FF _h

Variables may include up to 127 characters (the length of the variables is set during configuration).

The same number of characters is overwritten in the variable as is transmitted with the frame.

In order to avoid flickering, the old display is not cleared until after the new display is read out!

The background colour used with the variables may not be transparent, and a character set with uniform character width should be used in order to assure correct display. Otherwise, the variable must be cleared prior to changing, and then displayed once again!

Variable content is stored to RAM only. After the device has been switched off and back on again, the variables are returned to their pre-configured values.

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3.9.2.6 Increasing and Decreasing Variables

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Increase / Decrease	Variable no. hundreds	Variable no. tens	Variable no. ones
1B _h	„V“	“I”: increase or “D”: decrease	“0” – “9”	“0” – “9”	“0” – “9”

Only numeric characters are changed. Letters, commas etc. are skipped. Numeric characters are interpreted as an single decimal number. This decimal number is increased or decreased by 1.

In order to avoid flickering, the old display is not cleared until after the new display is read out!

The background colour used with the variables may not be transparent, and a character set with uniform character width should be used in order to assure correct display. Otherwise, the variable must be cleared prior to changing, and then displayed once again!

Variable content is stored to RAM only. After the device has been switched off and back on again, the variables are returned to their pre-configured values.

3.9.2.7 Positioning Variables

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5.	Byte 6
ESC	Function	Set	Variable no. hundreds	Variable no. tens	Variable no. ones
1B _h	“V”	“P”: set position	“0” – “9”	“0” – “9”	“0” – “9”

Byte 7	Byte 8	Byte 9	Byte 10	Byte 11	Byte 12
X position hundreds	X position tens	X position ones	Y position hundreds	Y position tens	Y position ones
“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”	“0” – “9”

Variable positioning is stored to RAM only. After the device has been switched off and back on again, the variables are returned to their pre-configured positions.

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3.9.2.8 Querying Bar Graphs

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Display / Clear	Bar graph no. hundreds	Bar graph no. tens	Bar graph no. ones
1B _h	"W"	"+": display "-": clear	"0" – "9"	"0" – "9"	"0" – "9"

When a bar graph is displayed, the last bar graph value transmitted to the display is used (or the reference value after a reset). If a variable is linked to the bar graph, it is also displayed accordingly.

When the display is cleared, the surface at which the bar graph is displayed is overwritten with the current online background colour (from the last "ESC-A" frame)! Black is used if the background colour has been set to transparent! If a variable is linked to the bar graph, it is cleared from the display as well.

Up to 255 bar graphs are possible (numbers 0 through 254).

The maximum variable length for linked variables is 127 characters.

3.9.2.9 Setting Bar Graph Values

3.9.2.9.1 ASCII Coded Decimal Values

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
ESC	Function	Set	Bar graph no. hundreds	Bar graph no. tens	Bar graph no. ones	Type of transmitted data
1B _h	"W"	"=": set	"0" – "9"	"0" – "9"	"0" – "9"	"A": ASCII coded decimal value

Byte 8	Byte 9	Byte 10	Byte 11	Byte 12	Byte 13
Plus or minus sign	Decimal value ten thousands	Decimal value thousands	Decimal value hundreds	Decimal value tens	Decimal value ones
"+", "-"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"

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3.9.2.9.2 Signed Integer Coded Values

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Set	Bar graph no. hundreds	Bar graph no. tens	Bar graph no. ones
1Bh	"W"	"=": set	"0" – "9"	"0" – "9"	"0" – "9"



Byte 7	Byte 8	Byte 9
Type of transmitted data	High byte of the transmitted value	Low byte of the transmitted value
"I": signed integer coded value	00h ... FFh	00h ... FFh

If the bar graph is not yet displayed, it is refreshed automatically.

The bar graph is displayed according to its positioning between the minimum and maximum limits selected in the configuration. The start position of the bar graph is always positioned at the reference value selected in the configuration. The end of the bar graph is determined by the transmitted value.

The bar graph is displayed in the selected colour at the reference value position.

If the bar graph exceeds any of the colour limits (measured from the reference point), it is displayed in the colour selected for the respective colour limit as of this point.

Four colour limits can be defined. Each colour limit must lie within the minimum to maximum limit range:

MIN limit ≤ colour limit 1 ≤ colour limit 2 ≤ colour limit 3 ≤ colour limit 4 ≤ MAX limit

Observance of this sequence is assured by the included PC software!

In addition to standard multicolour bar graphs, display is also possible as a single colour bar graph or a single colour marker (depending upon configuration data – see PC software). In this case, the colour of the bar graph or the marker is the same as the colour of the end of the bar graph for the standard bar graph display.

If the minimum limit is fallen short of or the maximum limit is exceeded, a blinking marker appears at the respective limit.

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If a variable is linked to the bar graph, it is changed accordingly as well:

All digits occupied with the characters “#” and “*” are overwritten with the new value starting at the right.

If a variable is preset to “#”, preceding zeros are suppressed (i.e. replaced with blanks).

If a variable is preset to “*”, preceding zeros are displayed.

If a digit is occupied by the dollar sign (\$), it is overwritten with the new preceding plus or minus sign.

Example:	Variable preset	= “\$ #*,* m/s”
	Value	= -9 = “-00009”
	=> Display	= “- 0,9 m/s”

If minimum or maximum values are violated, the current values blinks at the display.

The background colour used for variables may not be transparent, and a character set with uniform character width should be used in order to assure correct display.

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3.9.3 Direct Graphic Control

3.9.3.1 Clear Display and Fill

Byte 1	Byte 2	Byte 3
ESC	Function	Colour
1B _h	"F"	"0": black "1": green "2": red "3": yellow

3.9.3.2 Setting the Decimal Point

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ESC	Function	Colour	X pos. hundreds	X pos. tens	X pos. ones	Y pos. hundreds	Y pos. tens	Y pos. ones
1B _h	"P"	"0": black "1": green "2": red "3": yellow	"0" - "9"	"0" - "9"	"0" - "9"	"0" - "9"	"0" - "9"	"0" - "9"

3.9.3.3 Reading Out the Decimal Point from the Display

Query:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ESC	Function	Query code	X pos. hundreds	X pos. tens	X pos. ones	Y pos. hundreds	Y pos. tens	Y pos. ones
1B _h	"P"	"?"	"0" - "9"	"0" - "9"	"0" - "9"	"0" - "9"	"0" - "9"	"0" - "9"

Response:

Colour Information (with header and trail)

Byte 1	Byte 2	Byte 3
ESC	Function	Colour
1B _h	"P"	"0": black "1": green "2": red "3": yellow

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3.9.3.4 Drawing a Rectangle

Byte 1	Byte 2	Byte 3	Byte 4
ESC	Function	Foreground colour (perimeter)	Background colour (filling)
1B _h	"R"	"0": black "1": green "2": red "3": yellow	"0": black "1": green "2": red "3": yellow "T": transparent

Upper Left-Hand Corner Position:

Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
X position hundreds	X position tens	X position ones	Y position hundreds	Y position tens	Y position ones
"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"

Lower Right-Hand Corner Position:

Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
X position hundreds	X position tens	X position ones	Y position hundreds	Y position tens	Y position ones
"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"	"0" – "9"

The perimeter of the rectangle is drawn with the foreground colour.
The rectangle is filled with the background colour.

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3.9.3.5 Scrolling

3.9.3.5.1 Displays with vertical Resolution < 64 Pixels

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
ESC	Function	Direction	Speed	Increment	Start line tens	Start line ones	End line tens	End line ones
1B _h	"S"	"0": off "1": up "2": down	"0": static "1": 1.8 sec "9": 0.2 sec	"1": 1 pixel "9": 9 pixels "0": no scrolling	"0"- "9"	"0"- "9"	"0"- "9"	"0"- "9"

Scrolls once through a portion of the screen from the start line to the end line (speed = "static") or cyclically in steps with a value ranging from 1 to 9 pixels.

The Y positions of the first and last pixel lines within the scrolling range define the start and end lines (end line > start line!). Only the last selected scrolling range is used!

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3.9.3.5.2 Displays with vertical Resolution > 64 Pixels

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10	Byte 11
ESC	Function	Direction	Speed	Increment	Start line hundreds	Start line tens	Start line ones	End line hundreds	End line tens	End line ones
1B _h	„S“	“0”: off “1”: up “2”: down	“0”: static “1”: 1.8 sec “9”: 0.2 sec	“1”: 1 pixel “9”: 9 pixels “0”: no scrolling	“0”-“9”	“0”-“9”	“0”-“9”	“0”-“9”	“0”-“9”	“0”-“9”

Scrolls once through a portion of the screen from the start line to the end line (speed = “static”) or cyclically in steps with a value ranging from 1 to 9 pixels. The y position of the first and last pixel lines within the scrolling range define the start and end lines (end line > start line!). Only the last selected scrolling range is used!

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3.9.4 General Functions

3.9.4.1 Selecting Blinking Period Duration

Byte 1	Byte 2	Byte 3
ESC	Function	Blinking period duration
1B _h	"B"	"0": 2 seconds : "9": 0.2 seconds

The selected blinking period duration applies to all blinking texts.
The default value ("9") is activated each time the device is switched on.

3.9.4.2 Adjusting Brightness

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Colour	Brightness hundreds	Brightness tens	Brightness ones
1B _h	"H"	"1" – "2"	"0" – "9"	"0" – "9"	"0" – "9"

Within a range of 0 to 100% for each of the following colours:
"1" = green
"2" = red

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3.9.5 Digital Inputs and Outputs

Large format display with a vertical resolution of up to 64 pixels can optionally be equipped with up to 16 digital inputs and 16 digital outputs. Large format display with a vertical resolution of more than 64 pixels can optionally be equipped with up to 16 digital inputs.

Request Frame

Byte 1	Byte 2	Byte 3	Byte 2+n	Byte 18
ESC	Function	Output bit 1	Output bit n	Output bit 16
1Bh	"D"	"0" or "1"	"0" or "1"	"0" or "1"

"0" -> clear output
 "1" -> set output
 else -> retain previous output status

Response: (FC byte, bit 0 = 1)

Byte 1	Byte 2	Byte 3	Byte 2+n	Byte 18
ESC	Function	Input bit 1	Input bit n	Input bit 16
1Bh	"D"	"0" or "1"	"0" or "1"	"0" or "1"

"0" -> input cleared
 "1" -> input set

The output bits are used to switch the digital outputs (if included).

After switching the device on, all outputs are cleared (0).

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3.9.6 Macros

Macros are predefined command sequences included in the device configuration.

They are analogous to the data units in the online frames.

The first macro is executed after the device is switched on (if one exists). Subsequent macros are executed every 100 ms. Macro execution is stopped after the last macro has been executed.

3.9.6.1 Start Macro Execution

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
ESC	Function	Macro no. hundreds	Macro no. tens	Macro no. ones
1B _h	"M"	"0" – "9"	"0" – "9"	"0" – "9"

Execution starts with the indicated macro.

Skipping is also possible during macro execution through the use of this command within a macro sequence.

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3.9.6.2 Input-dependent Macro Jump

Option A:

The macro execution is continued at the digit „Macro no.“ („000“-„999“), if the indicated input („0“-„F“) is equal to „0“ or „1“.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Macro no. hundreds	Macro no. tens	Macro no. ones	„E“ (fixed)
1B _h	„M“	„0“-„9“	„0“-„9“	„0“-„9“	„E“

→

Byte 7	Byte 8	Byte 9
No. of queried Input (0-15)	„=“ (fixed)	queried status (0/1)
„0“-„F“	„=“	„0“ or „1“

Option B:

The macro execution is continued at the digit „Macro no.“ („000“-„999“), if the indicated input was read in at least once with the status „0“ or „1“ since the last query (with exactly this command).

The digital inputs are usually read in every 100 ms.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6
ESC	Function	Macro no. hundreds	Macro no. tens	Macro no. ones	„E“ (fixed)
1B _h	„M“	„0“-„9“	„0“-„9“	„0“-„9“	„E“

→

Byte 7	Byte 8	Byte 9
No. of queried Input (0-15)	„#“ (fixed)	queried status (0/1)
„0“-„F“	„#“	„0“ or „1“

Note:

If one of these commands (option A oder B) was called from within the macro list, the next macro is executed immediately (without waiting 100 ms and without reading the digital inputs again).

After 30 of these macros („ESC-MXXXE...“) have been executed in sequence from within the macro list, a break of 100 ms happens and the digital inputs are read in again.

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Example:

	Macro no.	Macro command
1	000	ESC-M005E0=1
2	001	ESC-M007E1#1
3	002	ESC-M009E2=1
4	003	ESC-w010
5	004	ESC-M000
6	005	ESC-T+000
7	006	ESC-M000
8	007	ESC-T+001
9	008	ESC-M000
10	009	ESC-F0
11	010	ESC-M000

- The Inputs 0 to 2 are queried every 1 second.
- If Input 0 is set, text „000“ is displayed.
- If Input 1 is set, text „001“ is displayed.
This also happens, if the input was set only for a short time (at least 100 ms), for example during the delay time (1 second).
- If Input 2 is set, the display is cleared.

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3.9.6.3 Pause during Macro Execution

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
ESC	Function	Pause duration hundreds	Pause duration tens	Pause duration ones
1B _h	"w"	"0" – "9"	"0" – "9"	"0" – "9"

Sets the time which elapses until the next macro is executed (in steps of 100 ms).

A macro is normally executed every 100 ms until the last macro has been completed.

After the ESC + "w..." sequence, macro execution is stopped for the specified pause duration.

This sequence can be used as part of a macro, as well as part of a receive frame.

3.9.6.4 Stop Macro Execution

Byte 1	Byte 2
ESC	Function
1B _h	"E"

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3.10 Response Frames

A response frame is only transmitted if the corresponding bit (bit 0) has been set in the FC byte, and if the broadcast address (127) has not been used as the destination address.

Example: display unit address = 1
 master address = 0

Response frame from the display unit to the master:

STX	DA	SA	FC	Data-Unit	ETX
Start of text	Destination address	Source address	Frame control	Error code	End of text
00000010 _B	10000000 _B	10000001 _B	10000000 _B		00000011 _B
2	128	129	128	"0" – "5"	3

Error Codes and their Meanings:

Value (ASCII character)	Meaning
"0"	No error
"1"	Incorrect checksum
"2"	Reserved
"3"	Incorrect number of data bytes (LEN-H/L), invalid escape sequence
"4"	Element (text, variable, graphic, character set or macro) is missing, invalid parameter
"5"	Invalid flash

The queried information is returned instead of error code "0" for frames which require a response ("reading out decimal point from the display", "digital inputs and outputs").

The error code in the response frame always relates to the last partition frame.

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3.11 Multiple ESC-Sequences

It is possible to combine several partition frames in one complete frame. This applies to the standard controlling and to the macro list.

The partition frames can be a ESC-sequence or a online text each.

If a online text shall follow after the ESC-sequence, it must be separated with the "separator sign" $31_D = 1F_H$ from the ESC-sequence. The separator itself is not evaluated.

The maximum length of the data unit of a complete frame is 230 characters.

Example:

Data unit = $1B_H$ „Z01“ $1B_H$ „C002003“ $1B_H$ „A301“ $1F_H$ „online text“

=> An "online text" with character set 1, on cursor position x=2, y=3 with foreground colour „yellow“ and background colour „black“ is displayed (blinking).

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3.12 Examples

Read out online text to the large format display unit at address 1:

1. Without checksum, with response

STX	DA	SA	FC	Data-Unit	ETX
Start of text	Display unit address	Source address	Frame control	"Hello world"	End of text
00000010 _B	10000001 _B	10000000 _B	10000001 _B		00000011 _B
2	129	128	129	...	3

Response from large format display unit if no errors occur:

STX	DA	SA	FC	Data-Unit	ETX
Start of text	Destination address	Source address	Frame control	Error code	End of text
00000010 _B	10000000 _B	10000001 _B	10000000 _B		00000011 _B
2	128	129	128	„0“	3

2. With checksum and response (in short form)

The character “**A**” is to be displayed at the large format display unit at address 1:

Master : 02 81 80 83 F0 F1 **41** FA F6 03
 Display unit: 02 80 81 80 30 03

The frame to be transmitted including TB and LB:

Master : 01 0A 02 81 80 83 F0 F1 **41** FA F6 03

Response from the display including TB and LB:

Display unit: 02 06 02 80 81 80 30 03

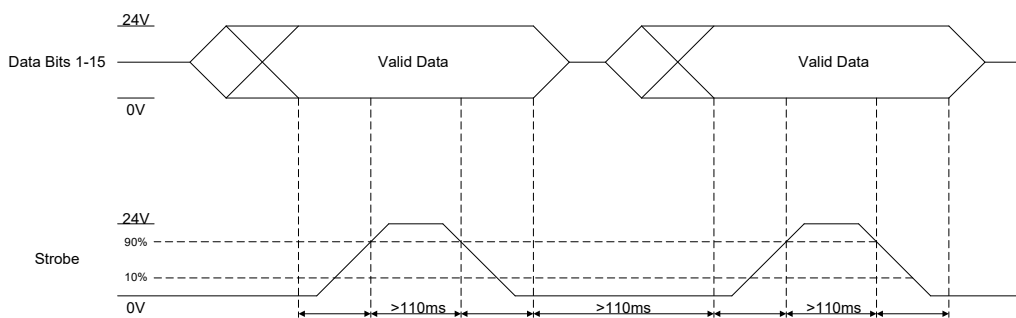
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3.13 Parallel Interface

Functions can be initialised via the 16 digital inputs, which are analogous to the online frames used for the serial interface.

3.13.1 Timing at the Parallels Inputs



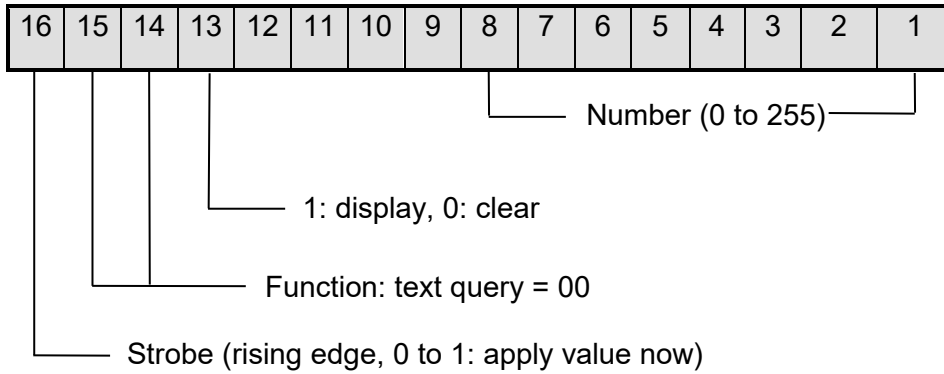
3.13.2 Input Level at the Parallel Inputs

Level	Voltage Range
U (low)	+ 0 to 1.6 V DC
U (high)	+ 18 to 30 V DC

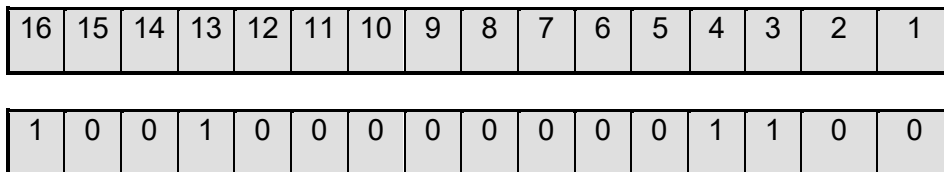
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3.13.3 Querying Text



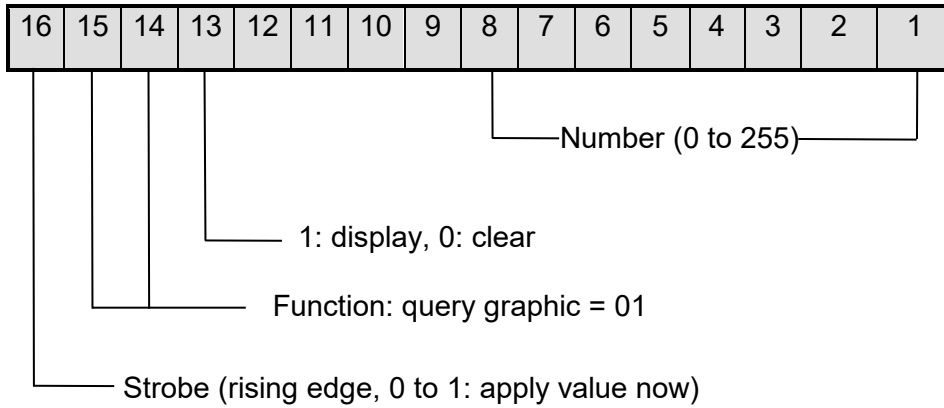
For example, the following assignments are used to display text 12:



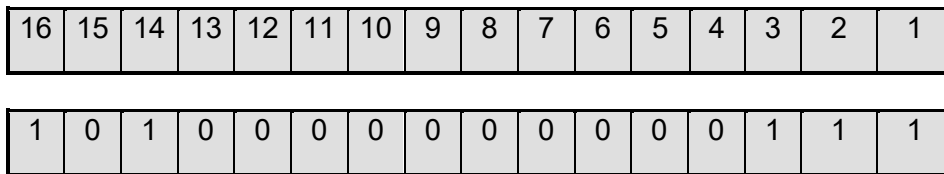
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3.13.4 Querying Graphics



For example, the following assignments are used to clear graphic 7:

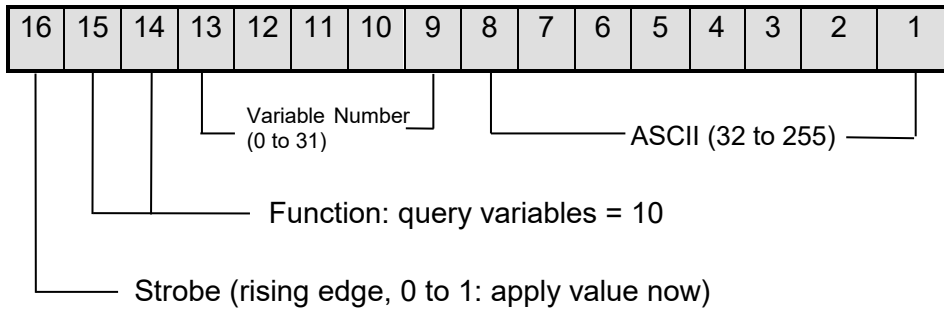


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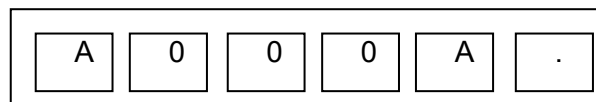
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3.13.5 Setting Variables

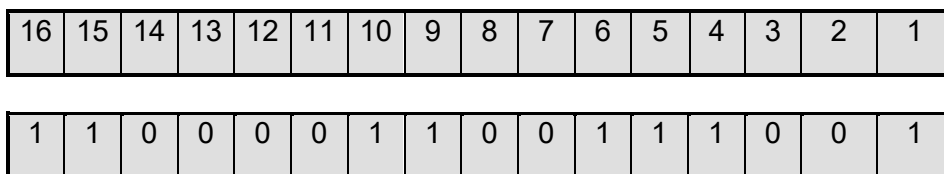
Variables with a single character can be set directly:



Example: The variable at the fourth digit is to be changed at a display with 6 variables.



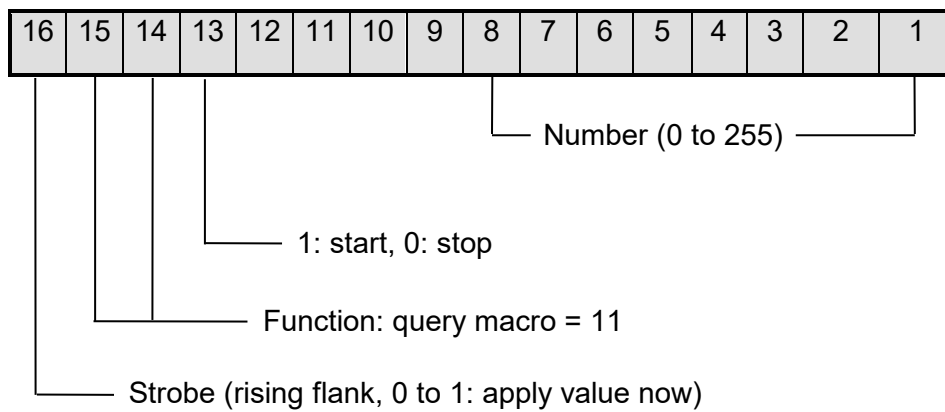
Each digit is implemented by means of a variable (numbers 0 through 5). In order to display a “9” at the fourth digit, ASCII value 39_H must be assigned to variable 3 (fourth digit). The inputs must be set up as follows to this end:



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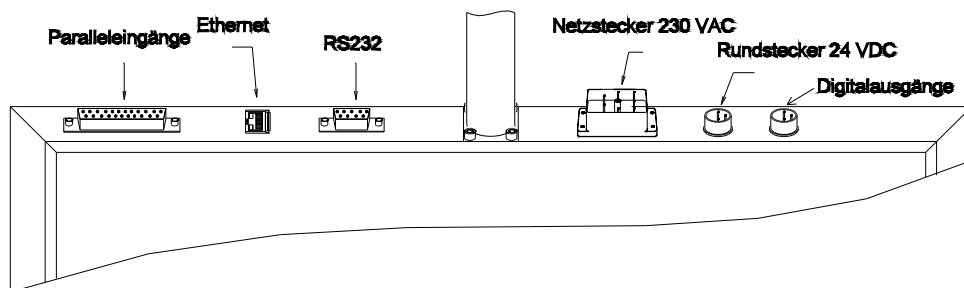
3.13.6 Querying Macros



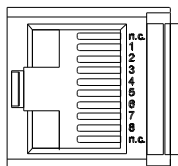
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4 Connector Pin Assignments



Ethernet Socket (interface)



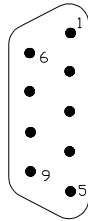
PIN	Assignment
1	Tx +
2	Tx -
3	Rx +
4	n.c.
5	n.c.
6	Rx -
7	n.c.
8	n.c.

Note: The two outer pins at the Ethernet socket are not used (see above drawing for identification of pin 1).

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Large Format, Graphics Compatible Display with Ethernet/IP Interface

9-Pin. Sub-Miniature Plug Connector (RS232)



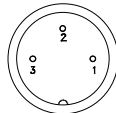
PIN	RS232
1	n.c.
2	RxD
3	TxD
4	n.c.
5	GND
6	n.c.
7	n.c.
8	n.c.
9	n.c.

7-Pole Mains Plug (230 V AC)



PIN	Assignment
1	L1
2	N
(PE)	PE

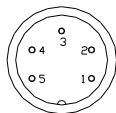
3-Pin Circular Plug (24 V DC) **



PIN	Assignment
1	GND
2	+ 24 V DC
3	PE

** Only with 24 V DC power supply

5-Pin Circular Plug (only at displays with a maximum size of 4x4 display modules and optional digital outputs)



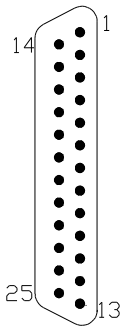
PIN	Assignment
1	Relay 1, normally open, a
2	Relay 1, normally open, b
3	Relay 2, normally open, a
4	Relay 2, normally open, b
5	n.c.

Relay 1 / 2 is controlled by digital output 1 / 2 (frame: ESC+“D”).

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25-Pin Sub-Miniature Plug Connector (only with optional parallel inputs)



Pin 1	Binary data 2^0	
Pin 2	Binary data 2^1	
Pin 3	Binary data 2^2	
Pin 4	Binary data 2^3	
Pin 5	Binary data 2^4	
Pin 6	Binary data 2^5	
Pin 7	Binary data 2^6	
Pin 8	Binary data 2^7	
Pin 9		Variable no. 2^0
Pin 10		Variable no. 2^1
Pin 11		Variable no. 2^2
Pin 12		Variable no. 2^3
Pin 13	Display / clear (1: display, 0: clear)	Variable no. 2^4
Pin 14	Function selection 2^0	
Pin 15	Function selection 2^1	
Pin 16	Strobe (1: apply value now)	
Pin 17-24	n.c.	
Pin 25	GND	

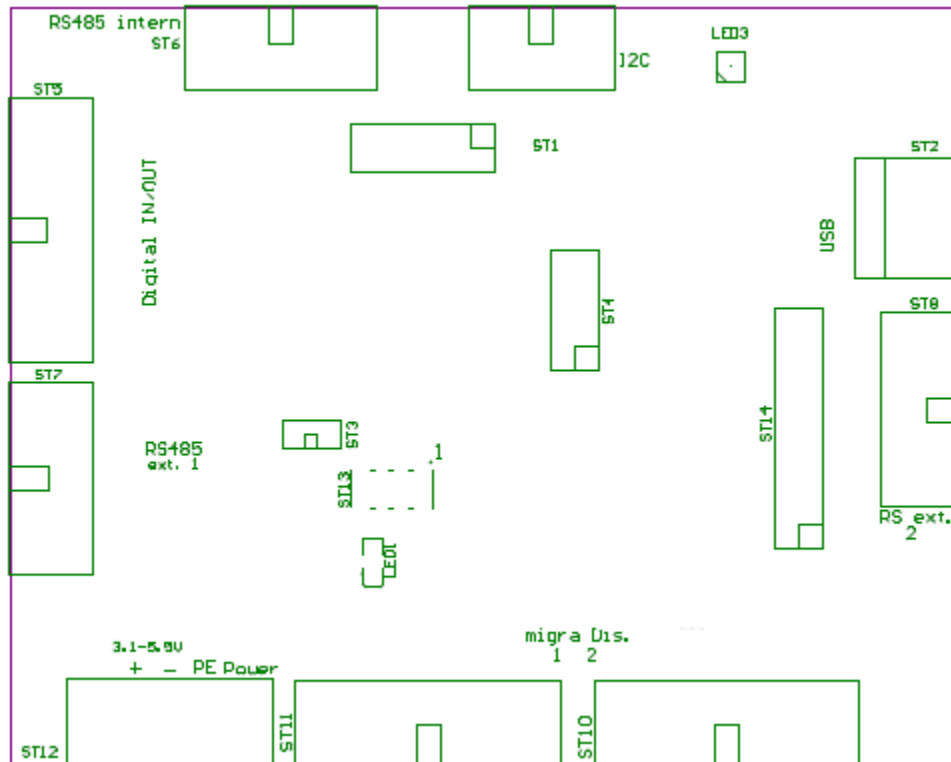
- Binary data:** Data with a value ranging from 0 to 255 as the number of a text, a graphic or a macro, or as the ASCII character of a variable to be displayed.
- Display / clear:** Displays or clears the selected object.
- Query text:** Displays or clears the selected text.
- Query graphic:** Displays or clears the selected graphic.
- Query variable:** Displays the ASCII character defined by means of binary data at the position of the selected variable.
- Query macro:** Starts / stops macro execution at the selected macro.
- Strobe:** If high level is applied to pin 16 (> 110 ms), the selected data are applied (command is executed no later than 100 ms after occurrence of the rising edge, except when the display unit has not yet completed processing of a previous command).

Please refer to chapter "Parallel Interface" for details concerning the parallel inputs!

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4.1 Control Board (intern)



The display unit is delivered with the following default settings:

- * Baud rate: 19200 baud
- * Data bits: 8
- * Parity: even
- * Stop bits: 1.

For setting the serial interfaces the PC software MKS is mandatory.

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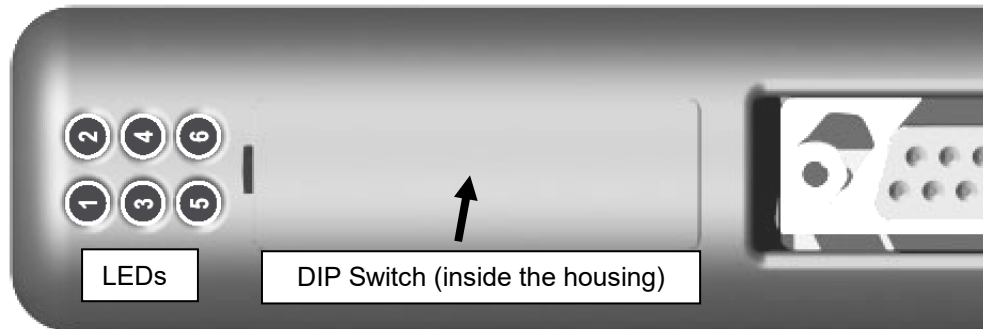
LEDs

LED	Function / Description	
LED 1 (green)	Power-up:	Blinks at a frequency of approx. 2,5 Hz
	Normal operation:	Blinks at a frequency of approx. 5 Hz
	Boot mode:	Blinks at a frequency of approx. 0,5 Hz
	Software upload:	Flickers during the upload
	Configuration:	
	Defective MKS:	Blinks with an Error Code: 1x
LED 3 (blue)	Defective Micon:	Blinks with an Error Code: 2x
	Video-signal:	On
	No Video-signal:	Off

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4.2 HMS-Interface



LED 1 - Module Status

State	Description
steady off	no supply power
steady green	device operational
flashing green	module has not been configured
flashing red	recoverable fault
steady red	internal error
flashing green/red	self-test

LED 2 - Network Status

State	Description
steady off	no power or no IP address
steady green	connection to SPS
flashing green	no connection to SPS
flashing red	connection timeout
steady red	duplicate IP address
flashing green/red	self-test

LED 3 - Link

State	Description
steady green	module has a link
steady off	module does not sense a link

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LED 4 - Activity

State	Description
flashing green	frame is received or transmitted

LED 5 - Subnet Status (RS485)

State	Description
steady off	power off
flashing green	initializing and not running
steady green	running
steady red	stopped, subnet error or timeout

LED 6 - Device Status

State	Description
steady off	power off
flashing red/green	invalid or missing configuration
steady green	initializing
flashing green	running
flashing red	error code

DIP Switch (inside the housing of the module)

All DIP switches must be switched off.

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5 Appendix

5.1 Displayable Characters

Data bytes are ASCII coded.

Character set: all ASCII characters within a range of 20H to FFH.

Sample character set:

Higher Lower	bin hex	0000 0	0001 1	0010 2	0011 3	0100 4	0101 5	0110 6	0111 7	1000 8	1001 9	1010 A	1011 B	1100 C	1101 D	1110 E	1111 F
bin xxxx0000	hex 0	X	X		0	@	P	`	p	X	X	X	X	X	X	X	X
xxxx0001	1	X	X	!	1	A	Q	a	q	ü	X	X	X	X	X	X	X
xxxx0010	2	X	X	"	2	B	R	b	r	ß	X	X	X	X	X	X	X
xxxx0011	3	X	X	#	3	C	S	c	s	X	X	X	X	X	X	X	X
xxxx0100	4	X	X	\$	4	D	T	d	t	ä	ö	X	X	Ä	X	a	X
xxxx0101	5	X	X	%	5	E	U	e	u	X	X	X	X	X	X	X	X
xxxx0110	6	X	X	&	6	F	V	f	v	X	X	X	X	X	Ö	X	ö
xxxx0111	7	X	X	'	7	G	W	g	w	X	X	X	X	X	X	X	X
xxxx1000	8	X	X	(	8	H	X	h	x	X	X	X	X	X	X	X	X
xxxx1001	9	X	X	)	9	I	Y	i	y	X	Ü	X	X	X	X	X	X
xxxx1010	A	<CR>*	X	*	:	J	Z	j	z	X	Û	X	X	X	X	X	X
xxxx1011	B	X	X	+	;	K	[	k	{	X	X	X	X	X	X	X	X
xxxx1100	C	X	X	,	<	L	\	l	|	X	X	X	X	X	Ü	X	ü
xxxx1101	D	<CR>*	X	-	=	M	]	m	}	X	X	X	X	X	X	X	X
xxxx1110	E	X	X	.	>	N	^	n	~	Ä	X	X	X	X	X	X	X
xxxx1111	F	X	X	/	?	O	_	o	■	X	X	X	X	X	ß	X	X

X means not available

*Carriage Return: The cursor jumps to the beginning of the next line.

Any Windows character set, as well as any user defined character set can be used.

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5.2 Maintenance and Care

Observe the following instructions in order to assure best possible performance of the display:

- Make sure that the housing can be opened for adjustment and maintenance even after the display has been installed. Allow for adequate clearance at the back, front and top of the display unit in order to assure sufficient ventilation (if vent slots are included).
- Display quality is impaired by direct illumination with bright light sources and/or direct sunlight.
- The display must be switched off before cleaning.
- Protect the display from excessive humidity, extreme vibration, direct sunlight and extreme temperatures. Non-observance may lead to malfunctioning or destruction of the device. Under certain circumstances electrical shock, fire and explosion may occur as well. Information concerning allowable ambient conditions, in particular recommended temperature ranges, can be found in the chapter entitled "Technical Data".
- The display may not be placed into service if the device and/or the power cable are known to be damaged.
- Do not attempt to repair the device yourself. The guarantee is rendered null and void if the device is tampered with by unauthorised persons.
- Observe all notes and instructions included in this user's manual.

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5.3 Declaration of Conformity

EU-Konformitätserklärung

EU Declaration of Conformity

Produktbezeichnung: migra
Product name:

Typenreihe: migra Ethernet/IP
Type code:

Hersteller: microSYST Systemelectronic GmbH
Manufacturer: Am Gewerbepark 11
 92670 Windischeschenbach

Das bezeichnete Produkt stimmt mit der folgenden Europäischen Richtlinie überein: <i>We herewith confirm that the above mentioned product meets the requirements of the following standard:</i>		Die Übereinstimmung des bezeichneten Produktes mit den Vorschriften der angewandten Richtlinie(n) wird nachgewiesen durch die Einhaltung folgender Normen / Vorschriften: <i>The conformity of the product described above with the provisions of the applied Directive(s) is demonstrated by compliance with the following standards / regulations:</i>
Richtlinien / Directives		Europäische Norm / Standard
EMV Richtlinie <i>EMC Directive</i>	2014/30/EU	EN61000-6-2:2005
		EN61000-6-4:2007 +A1:2011
Niederspannungs-Richtlinie <i>Low Voltage Directive</i>	2014/35/EU	EN IEC 62368-1:2021-05
RoHS Richtlinie <i>RoHS Directive</i>	2011/65/EU	EN50581:2012

Windischeschenbach, 05.05.2021



Manuel Raß

Geschäftsführer / General Manager

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5.4 Guarantee

The display is guaranteed for the duration specified in the “General Terms and Conditions” regarding manufactured products and services rendered for the electrical industry against defects which existed at the time the device was delivered to the buyer.

The device is subject to technical change without notice. Errors and omissions are excepted. No claims can be honoured for the shipment of a new product. The buyer is required to make notification of defects within 2 weeks after identification of such. Non-observance of notification requirements is equated with acceptance of the defect.

Defects and their symptoms must be described as accurately as possible in order to allow for reproducibility and elimination. The buyer must provide for access to all required and/or useful information regarding defects at no charge, as well as to the affected devices, and must make all of the required data and machine time available free of charge.

The guarantee does not cover defects which result from non-observance of the specified conditions of use, or from improper handling.

If the device has been placed at the disposal of the buyer for test purposes and has been purchased subsequent to such testing, both parties agree that the product is to be considered “used” and that it has been purchased “as is”. No guarantee claims may be made in such cases.

The “General Terms and Conditions” regarding manufactured products and services rendered for the electrical industry apply as well.

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5.5 Versions Overview

Version	Date	Remark, Description
1.00	6/9/2005	Kreuzer: Document created
1.10	11/27/2005	Kreuzer: Several ESC sequences in a row are possible
1.20	8/16/2010	Technical data updated
1.30	6/2/2014	Chapter "Configuration of the Ethernet/IP Interface" changed
1.40	3/13/2015	SC/MC removed, description of controller board
1.50	4/29/2016	Declaration of conformity
2.00	11/24/2016	migan → migra MPB
2.10	11/13/2017	Change of address and title MPB
2.20	5/5/2021	Declaration of conformity

Certified per **DIN EN ISO 9001**.