

Graphics Mini *Terminal*

MT/GR-A, MT/GR-B, MT/GR-C and MT/GR-S

REFERENCE MANUAL

For Firmware Ver. 990908.xxxx and newer

**RS232 serial controller for
LCD graphics modules with**

Controller ICs

- TOSHIBA T6963C,
- SEIKO-EPSON SED1330 or 1335,
- HITACHI HD61830,
- SANYO LC7981,

4-Bit LCD-Timing Interface or

Row- / Column Drivers

- HD61202 and HD61203 or
- KS0107 and KS0108

BECKMANN+EGLE
INDUSTRIELEKTRONIK GMBH

Command set

The MT/GR supports the following commands:

General commands

FIRMWARE-VERSION NUMBER

Command code

ESC ?V

Description

Displays the version number of the firmware in the form "ESC ?Vxxxxxx.xxxx;".

xxxxxx.xxxx: Firmware version number, e.g. 970506.1112

Example:

ESC ?V

SYSTEM INFORMATION

Command code

ESC ??

Description

Displays system information about the interface in plain text.

Example:

ESC ??

CURSOR MODE

Command code	Parameters
ESC !C	W;

Description

Sets the cursor mode to W. W can have the following values:

- 0: Cursor off
- 1: Cursor blinking at the text cursor position
- 2: Cursor non-blinking at the text cursor position
- 3: Cursor blinking at the current graphics position as crosshairs
- 4: Cursor non-blinking at the current graphics position as crosshairs
- 5: Cursor blinking at the current graphics position as text cursor
- 6: Cursor non-blinking at the current graphics position as text cursor
- 7: Cursor blinking at the current graphics position as proportional-text cursor *)
- 8: Cursor non-blinking at the current graphics position as proport.-text cursor *)

*) Available only if proportional fonts are installed. (See FLASH-512 commands!)

Example:

```
ESC !C1;
```

DISPLAY CURSOR MODUS**Command code**

```
ESC ?C
```

Description

Displays the current cursor mode set in the form "ESC ?C W;" where W assumes values described in "CURSOR MODE".

Example:

```
ESC ?C
```

CURSOR SIZE

Command code	Parameters
ESC !c	M,G;

Description

Sets the cursor size to size G for cursor mode M.

Caution:

- No cursor size can be entered for cursor mode 0 (cursor off).
- For crosshair cursors (cursor modes 3 and 4) G indicates the length of the four lines making up the crosshairs.
- For text cursors (cursor modes 1,2,5 and 6) G indicates if the cursor is shown as a lower line (G=0) or as a block (G=1).

Note: the cursor is always shown as a block in fonts 4 and 9.

- Cursor sizes in modes 1 and 2, 3 and 4, as well as 5 and 6 are always related, i.e. the blinking cursor always has the same size as its corresponding non-blinking cursor.

Example:

```
ESC !c1,1;  
ESC !c3,10;
```

CURSOR SIZE QUERY**Command code**

```
ESC ?c
```

Description

Displays the current cursor size set via the interface in the form "ESC ?c G1,G2,G3;".

G1: Size of the text cursor (0 = Lower line, 1 = Block)

G2: Size of crosshair cursor

G3: Size of graphics text cursor (0 = Lower line, 1 = Block)

Example:

```
ESC ?c
```

CONFIGURE DISPLAY RESOLUTION

Command code	Parameters
ESC !R	H,V;

Description

Sets the display resolution in H pixels horizontal and V pixels vertical. The settings are not immediately adopted but must first be stored with the command "EEPROM: STORE CONFIGURATION". They are then activated once the *MiniTerminal* is again switched on. Parameter D selects "Normal Display" or "Dual Screen Display". Some Displays (not many, though) require this setting .

H: Horizontal resolution

V: Vertical resolution

D: 0=Normal Display, 1=Dual Screen Display

Example:

```
ESC !R240,64,0;
```

CONFIGURE FIRST SERIAL INTERFACE (CN4)

Command code	Parameters
ESC !B	B,P,D,S,H;

Description

Sets the baud rate, parity, number of data bits and stop bits as well as the type of handshake of the first serial interface. The settings are not immediately adopted but must first be stored with the command "EEPROM: STORE CONFIGURATION".

They are then activated once the *MiniTerminal* is again switched on.

B: Baud rate

P: Parity (0 = NO, 1 = SPACE, 2 = ODD, 3 = EVEN PARITY)

D: Number of data bits (7 or 8)

S: Number of stop bits (1 or 2)

H: Type of handshake (0 = XON/XOFF, 1 = RTS/CTS)

Example:

```
ESC !B19200,0,8,1,1;
```

RECEIVE BUFFER OF FIRST SERIAL INTERFACE

Command code	Parameters
ESC !S	G;

Description

Sets the size of the receive buffer for the first serial interface to G bytes. The default and maximum value is 16K, i.e. 16384 bytes.

G: Receive buffer in bytes.

Example:

```
ESC !S1024;
```

CONFIGURE THE SECOND SERIAL INTERFACE(CN5)

Command code	Parameters
ESC !b	B,P,D,S,H;

Description

Sets the baud rate, parity, number of data and stop bits as well as the handshake of the second serial interface. After a reset the second serial interface remains disabled until this function is called.

B: Baud rate

P: Parity (0 = NO, 1 = SPACE, 2 = ODD, 3 = EVEN PARITY)

D: Number of data bits (7 or 8)

S: Number of stop bits (1 or 2)

H: Type of handshake (0 = XON/XOFF, 1 = RTS/CTS)

Example:

```
ESC !b1200,0,8,1,1;
```

RECEIVE BUFFER OF THE SECOND SERIAL INTERFACE

Command code	Parameters
ESC !s	G;

Description

Sets the size of the receive buffer for the second serial interface to G bytes. The default and maximum value is 1K, i.e. 1024 bytes.

G: Receive buffer in bytes.

Example:

```
ESC !s256;
```

RECEIVE MODE AT THE SECOND SERIAL INTERFACE

Command code	Parameters
ESC 2I	N;

Description

Switches the receive mode on or off to the second serial interface. When switched on all characters arriving at the second interface are sent to the first interface.

N = 0: Switch off receive mode.

N = 1: Switch on receive mode. Characters already in the buffer are transmitted.

N = 2: Switch on receive mode. Characters already in the buffer are deleted.

Example:

ESC 2I1;

TRANSMIT AT SECOND INTERFACE

Command code	Parameters
ESC 2O	→see Description!

Description

This sequence allows characters at the second interface to be transmitted. The text to be sent is between any two selected characters which are not found in the text itself. (the minus sign is used in this example.)

Example:

ESC 2O-Text transmitted at the 2nd interface-

SET THE OUTPUT PORT

Command code	Parameters
ESC !P	W;

Description

Sets the 8-bit port P0 (CN3 Pin1 to Pin8) to the value W. W is a binary code and can thus have any value from 0 (all pins LO) to 255 (all pins HI).

W: Binary coded value to which the pins 1-8 at CN3 should be set.

Caution: This function is only meaningful when the matrix keyboard is switched off.

Example:

ESC !P3; (*Sets P00 and P01 to HI, with all other pins to LO*)

READ INPUT PORT

Command code

ESC ?P

Description

Reads out the 8-bit port P1 (CN3 Pin9 to Pin16) and supplies the result via the serial interface in the form "ESC ?P W;".

W: Binary coded value corresponding to pins 9-16 at CN3.

Caution: This function can only be used when the matrix keyboard is switched off.

Example:

ESC ?P

ALLOCATE ADDRESS

Command code

ESC !A

Parameters

W;

Description

This command sequence allocates the address of the MT/GR in the bus mode (Pin 24 at CN3 to LO) which is activated by the following command. Only the MT/GR device, having the address W set at the port PT (CN3 Pins 17-24) evaluates the following control sequences and data. If W is set to 255, then all MT/GR devices connected are activated simultaneously.

W: Address of MT/GR to be activated (0-127) or 255 for all "MT/GRs"

Example:

ESC !A0; *(Only the MT/GR set to the address 0 is activated)*

FIXED TEXT MODE

Command code	Parameters
ESC !A	W;

Description

The command sequence switches on or off the fixed text mode (Pin 24 at CN3 to HI) which automatically displays fixed text. When the automatic fixed text display is switched on the inputs PT0 to PT6 (Pins 17-23 at CN3) are continuously checked. As soon as there is a change at the inputs, then the macro corresponding to the (binary coded) value of the inputs (0..127) is called up as a fixed text. Because the fixed texts are also implemented as macros, this function also enables simple texts as well as graphics, and even complicated masks to be displayed automatically. The function "CARRY OUT MACRO" is used to call up a fixed text using a control sequence (and not by a change at port PT),.

If, with the MT/GR, the automatic fixed text display is automatically switched on after a reset, then the sequence "ESC !A1;" must be programmed as the autostart macro (macro No. 0).

W: 1 = Automatic fixed text display on, 0 = Automatic fixed text display off

Example:

ESC !A1; (*Switching on automatic fixed text display*)

QUERY SET ADDRESSES

Command code
ESC ?A

Description

This control sequence displays the setting of port PT (CN3 Pins 17-24) via the interface in the form "ESC ?A T,W;".

T: Type of address: 1 = W is fixed text selection, 0 = W is bus mode address

W: When T = 1: Current fixed text, when T = 0: Address of the MT/GR

T corresponds to the input port PT7 (CN3 Pin 24). PT7 determines if the MT/GR is in bus mode or fixed text mode. W corresponds to the (binary coded) value of pins PT0-PT6 (CN3 Pin 17-23).

Example:

ESC ?A

DEMO PROGRAM

Command code

ESC !D

Description

Starts a demo program which runs several functions of the graphics *MiniTerminal*.

Example:

ESC !D

ECHO MODE

Command code	Parameters
ESC !E	→ <i>see description!</i>

Description

This command sends back characters to the host. The text that is to be sent back is embraced with a character that is not contained in the text. (In the example given below it is the asterix.) The characters are sent back as soon as the terminatin character (the asterix in the example below) is received.

Caution: The Text must not be longer than 255 characters and must not contain the ASCII character No. 0 [CHR\$(0)].

Example:

```
ESC !E*Text which will be sent back!*
```

DIRECT ECHO MODE

Command code	Parameters
ESC !e	→ <i>see description!</i>

Description

This command sends back characters to the host. The text that is to be sent back is embraced with a character that is not contained in the text. (In the example given below it is the asterix.) All characters after the first emracing character are immediately sent back up until the second embracing character is received.

Example:

```
ESC !e*Text which will be sent back!*
```

MATRIX KEYBOARD SET-UP

Command code	Parameters
ESC MS	E,A;

Description

Initialises the system for using a matrix keyboard.

The command MATRIX KEYBOARD ENABLE must be called up after this sequence in order to activate the matrix keyboard (see below).

E: Number of inputs (1 to 8)

A: Number of outputs (1 to 8)

Example (Initialising a 8x4 matrix keyboard):

```
ESC MS8,4;
```

MATRIX KEYBOARD CHARACTERISTICS

Command code	Parameters
ESC MC	P1,P2,P3,P4,P5,P6;

Description

Changes the scan characteristics of the matrix keyboard.

P1: Bounce time (1 to 255, Default = 2)

P2: Repeat time (1 to 255, Default = 10)

P3: Repeat response time (1 to 255, Default = 35)

P4: Input-mask (0 to 255, Default = 0)

P5: Output mask (0 to 255, Default = 0)

P6: Scan pulse length (1 to 255, Default = 5)

Example:

```
ESC MC2,10,35,0,0,15;
```

MATRIX KEYBOARD: READ INPUT

Command code	Parameters
ESC MR	A;

Description

Reads the input bits of the matrix keyboard on activating output bits A. It can be used (with inactivated - but initialised matrix keyboard) to read keys or switches. The result is sent over the interface in the form "ESC MR A,E;".

A: Bit pattern of output bits (0 to 255).

An output is activated when the appropriate bit is set to 0.

E: Read out bit pattern of the input bits.

Example:

```
ESC MR0;
```

MATRIX KEYBOARD ENABLE

Command code
ESC ME

Description

Switches on the matrix keyboard. Key presses are scanned and assembled as a key code. The key code consists of one byte (8 bits) and is built up in a sequence as follows (MSB left, LSB right): 1AAA0EEE

AAA stands for the number of the output and EEE for the number of the input at which the key is. Bit 8 (MSB) is always set to 1 to prevent mismatching with the control characters. If the columns of the matrix keyboard are connected, e.g. to the outputs and the rows to the inputs, then the value is (binary) 11010011, (hex) D3 or (decimal) 211 in column 5 and row 3 of the key code.

The key code is sent via the interface as a single ASCII character with the appropriate number.

IMPORTANT: Before MATRIX KEYBOARD ENABLE the keyboard must first be initialised with the command MATRIX KEYBOARD SET-UP!

Example:

```
ESC ME
```

MATRIX KEYBOARD DISABLE

Command code

ESC MD

Description

Switches off the matrix keyboard. Key presses are no longer scanned. The matrix keyboard can be switched on or off at any time with the commands MATRIX KEYBOARD ENABLE and MATRIX KEYBOARD DISABLE

Example:

ESC MD

RESET TRANSMISSION CHECK-SUM

Command code

ESC C!

Note

For ver. 990908 or newer

Description

The MT/GR permanently calculates an unsigned 16-bit check sum over the received data by adding up every single byte that is received. Overflows of the check sum are ignored i.e. the check sum always represents the lower 16 bits of the actual sum. This control sequence resets the internal check sum to zero.

Example:

ESC C!

QUERY TRANSMISSION CHECK-SUM

Command code

ESC C?

Note

For ver. 990908 or newer

Description

This control sequence returns the internal check sum in the form „ESC C? ChkSum;“ thru the serial interface. The query command sequence „ESC C?“ is part of the check sum.

ChkSum: Check sum represented as a 4-digit hexadecimal value.

Also see „RESET TRANSMISSION CHECK-SUM“!

Example:

ESC C?

Text commands

All text commands begin with "ESC T".

The home position is 1,1 and is found in the upper left-hand corner.

TEXT CURSOR HOME

Command code

ESC TH

Description

Positions the text cursor at the home position.

Example:

ESC TH

TEXT CURSOR UP

Command code

ESC TU

Note

Firmware 990623 reqd.

Description

Moves the text-cursor up one line. If the cursor is in the first line already the position remains unchanged.

Example:

ESC TU

TEXT CURSOR DOWN

Command code

ESC TD

Hinweis

Firmware 990623 reqd.

Description

Moves the text-cursor down one line. If the cursor is in the last line already the position remains unchanged.

Example:

ESC TD

TEXT CURSOR LEFT

Command code

ESC TL

Hinweis

Firmware 990623 reqd.

Description

Moves the text-cursor one character to the left. If the cursor is in the first column already the position remains unchanged.

Example:

ESC TL

TEXT CURSOR RIGHT

Command code

ESC TR

Hinweis

Firmware 990623 reqd.

Description

Moves the text-cursor one character to the right. If the cursor is in the last column already the position remains unchanged.

Example:

ESC TR

TEXT WINDOW CLEAR

Command code

ESC TC

Description

Clears the current text window.

Example:

ESC TC

TEXT WINDOW

Command code	Parameters
ESC TW	S1,Z1,S2,Z2;

Description

Sets the current text windows to the stated size.

S1: Far left column of the text window

Z1: Top row of the text window

S2: Far right of the text window

Z2: Bottom row of the text window

Example:

ESC TW2,2,18,4;

QUERY TEXT WINDOW**Command code**

ESC T?W

Description

Supplies the co-ordinates of the current text window via the interface in the form "ESC T?W S1,Z1,S2,Z2;".

S1: Far left column of the text window

Z1: Top row of the text window

S2: Far right column of the text window

Z2: Bottom row of the text window

Example:

ESC T?W

TEXT CURSOR POSITION

Command code	Parameters
ESC TP	S,Z;

Description

Sets the text cursor in column S in row Z.

S: Column

Z: Row

Example:

ESC TP5,2;

QUERY TEXT CURSOR POSITION

Command code

ESC T?P

Description

Supplies the current text cursor position via the interface in the form "ESC T?P S,Z;".

S: Column

Z: Row

Example:

ESC T?P

TEXT ATTRIBUTE

Command code

ESC TA

Parameters

W;

Description

Sets the attribute for the text display to the value W.

W can have the following values:

0: Normal display

1: Underlined

2: Bold

4: Inverse

Attributes can also be combined: The values of the individual attributes are then added, e.g.. W = 6 for bold and inverse displays

Examples:

ESC TA4; Inverse text

ESC TA3; Underlined and bold

QUERY TEXT ATTRIBUTE

Command code

ESC T?A

Description

Supplies the current text attribute via the interface in the form "ESC T?A W;".

W stands for the attribute as stated in the function "TEXT ATTRIBUTE".

Example:

ESC T?A

TEXT WRITE MODE

Command code	Parameters
ESC TM	W;

Description

Sets the write mode for text display.

W can assume the following values:

- 0: Replace (the character pattern replaces the background)
- 1: Complement (the character pattern inverses the background)
- 2: Clear (1 in the character pattern deletes the background)
- 3: Set (Only 1s are written in the character pattern)

Example:

```
ESC TM0;
```

QUERY TEXT WRITE MODE

Command code
ESC T?M

Description

Supplies the current text write mode via the interface in the form "ESC T?M W;".

W stands for a number between 0 and 3 as stated in the write mode (as described in the function "TEXT WRITE MODE").

Example:

```
ESC T?M
```

TEXT ZOOM

Command code	Parameters
ESC TZ	ZX,ZY;

Description

Sets the zoom factors for text displays.

ZX: Zoom factor in the X direction, range: 1 to 4

ZY: Zoom factor in the Y direction, range: 1 to 8

Example:

```
ESC TZ1,3;
```

QUERY TEXT ZOOM

Command code

ESC T?Z

Description

Supplies the current zoom factors set in the form "ESC T?Z ZX,ZY;".

ZX: Zoom factor in the X direction

ZY: Zoom factor in the Y direction

Example:

ESC T?Z

TEXT FONT

Command code

ESC TF

Parameters

W

Description

Sets the font for text displays.

W	Font Size (WxH)
0	8 x 8
1	8 x 10
2	8 x 14
3	8 x 16
4	4 x 6 Minidigits
5	8 x 8, bold
6	8 x 10, bold
7	8 x 14, bold
8	8 x 16, bold
9	16 x 32 Maxidigits

The standard value for W is 0.

Example:

ESC TF0;

QUERY TEXT FONT

Command code

ESC T?F

Description

Supplies the number of the current font set and the character dimensions in the form "ESC T?F W,B,H;".

W: Font number

B : Character width

H Character height

Example:

ESC T?F

Graphics commands

All graphics commands begin with "ESC G". The reference co-ordinate for all graphics commands is (0,0) in the lower left-hand corner with positive values increasing upwards and to the upper right-hand corner.

GRAPHICS CURSOR HOME

Command code

ESC GH

Description

Sets the graphics cursor to the home position (0,0).

Example:

ESC GH

GRAPHICS AREA CLEAR

Command code

ESC GC

Description

Clears the screen.

Example:

ESC GC

GRAPHICS CURSOR POSITION

Command code

ESC GP

Parameters

X,Y;

Description

Sets the graphics cursor to position X,Y.

Example:

ESC GP50,20;

QUERY GRAPHICS CURSOR POSITION

Command code

```
ESC G?P
```

Description

Supplies the current position of the graphics cursor in the form "ESC G?P X,Y;

X: X-co-ordinate

Y: Y-co-ordinate

Example:

```
ESC G?P
```

GRAPHICS PIXEL

Command code

```
ESC GX
```

Description

Sets a pixel at the current graphics cursor.

Example:

```
ESC GX
```

GRAPHICS LINE

Command code

```
ESC GL
```

Parameters

```
X,Y;
```

Description

Draws a line of the current graphics cursor position to position (X,Y) which is then the new graphics cursor position.

Example:

```
ESC GP10,10;
```

```
ESC GL40,20;
```

GRAPHICS RECTANGLE

Command code	Parameters
ESC GR	X,Y;

Description

Draws a rectangle using the current cursor position as a corner and the position (X,Y) as the diagonally opposite corner. (X,Y) then becomes the new graphics position.

Example:

```
ESC GP10,10;  
ESC GR30,20;
```

GRAPHIK RECHTECK MIT ABGERUNDETEN ECKEN

Command code	Parameters	Note
ESC GrR	X,Y,R;	<i>Firmware 990623 reqd.</i>

Description

Draws a round rectangle. R is the radius.

Beispiel:

```
ESC GP10,10;  
ESC GrR80,100,10;
```

GRAPHICS FILLED RECTANGLE

Command code	Parameters
ESC GfR	X,Y;

Description

Draws a filled rectangle using the current cursor position as a corner and the position (X,Y) as the diagonally opposite corner. (X,Y) then becomes the new current graphics position.

Example:

```
ESC GP10,10;  
ESC GfR30,20;
```


GRAPHICS CIRCLE

Command code	Parameters
ESC GK	R;

Description

Draws a circle around the current cursor position with a radius R.

Example:

```
ESC GK30;
```

GRAPHICS FILLED CIRCLE

Command code	Parameters
ESC GfK	R;

Description

Draws a filled circle around the current cursor position with a radius R.

Example:

```
ESC GfK25;
```

GRAPHICS ELLIPSE

Command code	Parameters
ESC GE	RX,RY;

Description

Draws an ellipsis around the current cursor position with radii RX and RY.

Example:

```
ESC GE8,12;
```

GRAPHICS FILLED ELLIPSE

Command code	Parameters
ESC GfE	RX,RY;

Description

Draws a filled ellipsis around the current cursor position with radii RX and RY.

Example:

```
ESC GfE10,15;
```

LOAD GRAPHICS BITMAP IN BUFFER

Command code	Parameters
ESC GbL	B, H, bitmap data;

Description

Loads a bitmap into a temporary buffer. The bitmap data is coded as a sequence of two-figure hexadecimal numbers (without separators). To show the bitmap in the temporary buffer the function "SHOW GRAPHICS BITMAP FROM BUFFER" must be called up (see below). The buffer has a maximum of 2 KB.

B: Width of bitmap in bytes (=8 pixels)

H: Height of bitmap in pixels

Example (a small square with a diagonal line):

```
ESC GbL2,8,FFFFFFB0018C01830180C18031800DFFFF;
```

SHOW GRAPHICS BITMAP FROM THE BUFFER

Command code	Parameters
ESC GbS	X, Y;

Description

Draws the bitmap in the temporary buffer at position X,Y. The bitmap data must first be loaded into the temporary buffer with the control sequence "LOAD GRAPHICS BITMAP IN BUFFER".

X: Horizontal position (must be a multiple of 8)

Y: Vertical position

Example:

```
ESC GbS0,0;
```

Examples of bitmap data (2 bytes wide, 8 rows high):

```
11111111 11111111 → FFh,FFh
10110000 00000001 → B0h,01h
10001100 00000001 → 8Ch,01h
10000011 00000001 → 83h,01h
10000000 11000001 → 80h,C1h
10000000 00110001 → 80h,31h
10000000 00001101 → 80h,0Dh
11111111 11111111 → FFh,FFh
```

GRAPHICS BITMAP

Command code	Parameters
ESC GB	X, Y, B, H, bitmap data;

Description

Draws a bitmap at position X,Y. The bitmap data is coded as a sequence of two-figure hexadecimal numbers (without separators).

X: Horizontal position (must be a multiple of 8)

Y: Vertical position

B: Width of bitmaps in bytes (= 8 pixels)

H: Height of bitmap in pixels

Example (a small square with a diagonal line):

```
ESC GB16,10,2,8,FFFFB0018C01830180C18031800DFFFF;
```

GRAPHICS MOVE BLOCK (BLOCK COPY)

Command code	Parameters
ESC Gm	X1, Y1, X2, Y2, ZX, ZY;

Description

Copies a rectangular screen section (defined by the key co-ordinates X1,Y1,X2,Y2) to the target position (ZX,ZY). The source and target area may not overlap.

X1,Y1: Lower left-hand corner of the screen section to copy

X2,Y2: Upper right corner of the screen section to copy

ZX,ZY: Position to which the screen section is to be copied

Example:

```
ESC Gm0,0,20,20,50,10;
```

GRAPHICS ATTRIBUTE

Command code	Parameters
ESC GA	W;

Description

Sets the attribute for graphics text display to the value W.

W can have the following values:

- 0: Normal display
- 1: Underlined
- 2: Bold
- 4: Inverse

Attributes can also be combined: Add the values of individual attributes, e.g.. W = 6 for bold and inverse displays

Example:

```
ESC GA4;
```

READ OUT GRAPHICS ATTRIBUTE**Command code**

```
ESC G?A
```

Description

Supplies the current graphics attribute via the interface in the form "ESC G?A W;".

W stands for the attribute as stated in the function "GRAPHICS ATTRIBUTE".

Example:

```
ESC G?A
```

GRAPHICS WRITE MODE

Command code	Parameters
ESC GM	W;

Description

Sets the write mode for graphics display.

W can assume the following values:

- 0: Replace (The pattern to be written replaces the background)
- 1: Complement (The pattern to be written inverses the background)
- 2: Clear (1 in the pattern to be written deletes the background)
- 3: Set (Only 1s are written in the pattern to be written)

Example:

```
ESC GM0 ;
```

READ OUT GRAPHICS WRITE MODE

Command code
ESC G?M

Description

Supplies the current graphics write mode via the interface in the form "ESC G?M W;". W stands for a number between 0 and 3 as stated in the write mode (as described in the function "GRAPHICS WRITE MODE").

Example:

```
ESC G?M
```

GRAPHICS ZOOM

Command code	Parameters
ESC GZ	ZX,ZY;

Description

Sets the zoom factors for graphics text displays.

ZX: Zoom factor in the X direction, range: 1 to 4

ZY: Zoom factor in the Y direction, range: 1 to 8

Example:

```
ESC GZ1 , 2 ;
```

DISPLAY GRAPHICS ZOOM

Command code

ESC G?Z

Description

Supplies the current zoom factors set in the form "ESC G?Z ZX,ZY;".

ZX: Zoom factor in the X direction

ZY: Zoom factor in the Y direction

Example:

ESC G?Z

GRAPHICS FONT

Command code

ESC GF

Parameters

W;

Description

Sets the font for graphics text displays.

W	Font Size (WxH)
0	8 x 8
1	8 x 10
2	8 x 14
3	8 x 16
4	4 x 6 Minidigits
5	8 x 8, bold
6	8 x 10, bold
7	8 x 14, bold
8	8 x 16, bold
9	16 x 32 Maxidigits

The standard value for W is 0.

Example:

ESC GF0;

GRAPHICS FONT READ OUT

Command code	Parameters	Remarks
--------------	------------	---------

ESC G?F

Description

Supplies the number of the current font set in the form "ESC G?F W;".

W: Font number

Example:

ESC G?F

DISPLAY GRAPHICS TEXT

Command code	Parameters
--------------	------------

ESC GT Supplied text <004>

Description

Displays the stated text as parameters to the current graphics position. The text display is terminated by the ASCII character 4 (EOT), here given as "<004>". An ESC character which introduces a new command sequence also terminates the graphics text display.

Example:

ESC GP32,17;

ESC GT Example text to Pos. 32,17 <004>

EEPROM commands

This section describes the functions which are available on the EEPROM (= non-volatile memory).

DELETE EEPROM

Command code

ESC EE

Description

Deletes the entire contents of the EEPROM. The procedure can last some seconds.

When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm.

Note:

The configuration data (display height and interface initialisation) is deleted. The command "EEPROM: STORE CONFIGURATION" (see below) should therefore be carried out immediately after the command DELETE EEPROM has been used otherwise after a restart the *MiniTerminal* operates with standard settings.

Example:

ESC EE

EEPROM: INFORMATION

Command code

ESC E??

Description

Returns information on the installed EEPROM(s) in the form

„ESC E?? E1, E2, E3, E4, E5, E6, E7, E8;“.

E1..E8: 0, if EEPROM not installed, type of EEPROM, else

Example:

ESC E??

EEPROM: FREE BYTES

Command code

ESC E?F

Description

Determines how many bytes are free (available) in the EEPROM. The result is sent via the interface in the form "ESC E?F n;".

n: Number of bytes available.

Example:

ESC E?F

EEPROM: STORE CONFIGURATION

Command code

ESC EWC

Description

Stores the current configuration data in the EEPROM. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when storing, then the ASCII character No. 21 (NAK) is sent instead of ACK.

The configuration data contains the display geometry (resolution) and the initialisation data for the first serial interface (baud rate, parity, number of data bits and stop bits as well as the type of handshake).

Note:

In order to start the MiniTerminal without evaluating the configuration data in the EEPROM, the pins 8 and 10 at CN3 must be short-circuited before switching on. This is useful if incorrect configuration data has been stored in the EEPROM by mistake.

Example:

ESC EWC

EEPROM: DELETE CONFIGURATION

Command code

ESC EDC

Description

Deletes the current configuration data in the EEPROM. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when deleting, then the ASCII character No. 21 (NAK) is sent instead of ACK.

When switched on again the *MiniTerminal* then operates again with standard settings.

Example:

ESC EDC

EEPROM: STORE STRING

Command code

ESC EWS

Parameters

N, string data <004>

Description

Stores a string in the EEPROM. The string is terminated by the ASCII character 4 (EOT), here given as "<004>". When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when storing, then the ASCII character No. 21 (NAK) is sent instead of ACK. Strings can have a maximum length of 255 bytes.

N: Number of the string (0 to 255)

Example:

ESC EWS 1,Test string <004>

EEPROM: DELETE STRING

Command code

ESC EDS

Parameters

N;

Description

Deletes a string in the EEPROM. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when deleting, then the ASCII character No. 21 (NAK) is sent instead of ACK.

N: Number of the string (0 to 255)

Example:

ESC EDS 1;

EEPROM: STORE HEX STRING

Command code	Parameters
ESC EWH	N, H1, ... , Hn;

Description

Stores a string in the EEPROM. The string is defined as a sequence of hexadecimal numbers. These are given as two-figure hexadecimal numbers in block capitals. When completed the MiniTerminal sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when storing, then the ASCII character No. 21 (NAK) is sent instead of ACK. Strings are limited to a length of 255 bytes.

N: Number of the string (0 to 255)
H1...Hn Number of the string as a hexadecimal number

This function can be used instead of "EEPROM: STORE STRING". This allows the string to contain the ASCII character 4 (EOT).

Example (Store "ABCZ" as string No. 1):

```
ESC EWH 1 , 41 , 42 , 43 , 5A ;
```

EEPROM: STORE MACRO

Command code	Parameters
ESC EWM	N, macro data <003>

Description

Stores a macro in the EEPROM. The macro is terminated by the ASCII character 3 (EOT), shown here by "<003>". When completed the MiniTerminal sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when storing, then the ASCII character No. 21 (NAK) is sent instead of ACK. Macros can have a maximum length of 1024 bytes.

The macro with the number 0 is an auto-start macro and is automatically called up when the system is switched on.

N: Number of the macro (0 to 255)

Example:

```
ESC EWM 1 , Test string <003>
```

EEPROM: DELETE MACRO

Command code	Parameters
ESC EDM	N;

Description

Deletes a macro in the EEPROM. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when deleting, then the ASCII character No. 21 (NAK) is sent instead of ACK.

N: Number of the macro (0 to 255)

Example:

```
ESC EDM 1;
```

EEPROM: START MACRO

Command code	Parameters
ESC ECM	N;

Description

Starts the macro N which is stored in the EEPROM.

N: Number of the macro (0 to 255)

Example:

```
ESC ECM 1;
```

EEPROM: START TIMED MACROS

Command code	Parameters
ESC ETM	Z,M1,M2,...,Mn;

Description

Z: Interval time (unit: 16 ms)

M1...Mn: Macros, that will be cyclically called with interval time Z.
(Up to 20 macros can be specified.)

Note:

Automatic execution of macros is stopped when new characters arrive on the serial port. This is done to avoid conflicts between automatic data and data coming from the serial line. **WARNING:** Do not specify too short interval times.

Example:

```
ESC ETM 63,5;      Macro No. 5 is automatically called in 1 sek. intervals
```

```
ESC ETM 125,3,4;    Macros 3 and 4 are automatically called in 2 sek. intervals
```

EEPROM: STORE CODE CONVERSION TABLE

Command code	Parameters
ESC EWK	T,SH,H1,H2,...,Hn;

Description

Stores a keyboard code conversion table with the number T in the EEPROM. When completed the table must be activated using the control sequence "ACTIVATE CODE CONVERSION TABLE FOR AT KEYBOARD" or "ACTIVATE CODE CONVERSION TABLE FOR MATRIX KEYBOARD". The parameters SH, H1, H2, ..., Hn must be given as two-figure hexadecimal numbers (in capitals). When completed the MiniTerminal sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when storing, then the ASCII character No. 21 (NAK) is sent instead of ACK.

T: Number of code conversion table (1 to 255).

SH: Code of first key to be converted.

H1, ..., Hn: New key codes.

Example:

A matrix keyboard with one row and 8 columns would supply the default codes (hex) 80,81,82,83,84,85,86 and 87. This example shows the coding of the keys to 'A','B','C', 'D','E','F', 'G','H':

```
ESC EWK1,80,65,66,67,68,69,70,71,72;
```

```
ESC EMK1;
```

EEPROM: DELETE CODE CONVERSION TABLE

Command code	Parameters
ESC EDK	T;

Description

Deletes the coding table stored with the number T in the EEPROM. When completed the MiniTerminal sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when deleting, then the ASCII character No. 21 (NAK) is sent instead of ACK.

T: Number of the code conversion table

Example:

```
ESC EDK17;
```

EEPROM: ACTIVATE CODE CONVERSION TABLE FOR AT KEYBOARDS

Command code	Parameters
ESC EAK	T;

Description

Activates the code conversion table T for AT keyboards. A code conversion table with the number T must first be stored in the EEPROM!

T: Number of the code conversion table

Example:

```
ESC EAK7 ;
```

EEPROM: ACTIVATE CODE CONVERSION TABLE FOR MATRIX KEYBOARDS

Command code	Parameters
ESC EMK	T;

Description

Activates the code conversion table T for MATRIX keyboards. A code conversion table with the number T must first be stored in the EEPROM!

T: Number of the code conversion table

Example:

```
ESC EMK5 ;
```

EEPROM: STORE BITMAP

Command code	Parameters
ESC EWB	N, B, H, bitmap data;

Description

Stores a bitmap in the EEPROM with the number N. The width of the bitmap is always a multiple of 8 pixels and is given in bytes (=8 pixels). The bitmap data itself is coded as two figure hexadecimal numbers (without separators). The maximum length of the bitmap data is 1024 bytes. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when storing, then the ASCII character No. 21 (NAK) is sent instead of ACK.

N: Number of the bitmap (0 to 255)
B: Width of bitmap in bytes(1 to 255)
H: Height of bitmap in pixels (1 to 255)

Example (a small square with a point in the centre):
ESC EWB0,2,6,FFFF8001818181818001FFFF;

EEPROM: DELETE BITMAP

Command code	Parameters
ESC EDB	N;

Description

Deletes the bitmap N in the EEPROM. . When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred when deleting, then the ASCII character No. 21 (NAK) is sent instead of ACK.

N: Number of the bitmap (0 to 255)

Example:

EEPROM: DISPLAY BITMAP

Command code	Parameters
ESC ECB	N, X, Y;

Description

Shows the bitmap N stored in the EEPROM on the display at position X,Y.

N: Number of the bitmap (0 to 255)

X: Horizontal position (must be a multiple of 8!)

Y: Vertical position

Example:

```
ESC ECB0,16,10;
```


DISPLAY FLASH INFORMATION

Command code

ESC F??

Description

Returns information on the flash memory via the interface in the form "ESC F?? N,S;".

Note: The standard MT/GR does not have a flash memory but instead has an EPROM. The sector number and size are therefore set at 0 when delivered.

N: Number of flash sectors

S: Sector size

Example:

ESC F??

PROGRAM FLASH MEMORY

Command code

ESC FP

Parameters

Data, C;

Description

If the MT/GR is equipped with a flash memory then it can be updated with the firmware of the MT/GR using this sequence. A firmware update is thus required for this. Please contact the manufacturers (BECKMANN+EGLE GmbH, D-71394 Kernen).

Note: The standard MT/GR does not have a flash memory but instead has an EPROM. This command therefore has no function.

Files: The data is coded as a sequence of two-figure hexadecimal numbers (without separators).

C: 16-bit check sum (given as a 4-figure hexadecimal number)
The check sum is formed with all bytes are added and the remainder ignored.

Example (suggested only):

ESC FP436F7079726967687420<...>,F3A5;

PROGRAM FLASH DATA

Command code	Parameters
ESC FD	Data, C;

Description

If the MT/GR is equipped with a flash memory then you can download your own fonts, bitmaps and zoom tables. You will need the optional software MTGRDATA.EXE to convert the data into a MT/GR specific format. Please contact the manufacturers (BECKMANN+EGLE GmbH, D-71394 Kernen).

Note: The standard MT/GR does not have a flash memory but instead has an EPROM. This command therefore has no function.

Files: The data is coded as a sequence of two-figure hexadecimal numbers (without separators).

C: 16-bit check sum (given as a 4-figure hexadecimal number)
The check sum is formed with all bytes are added and the remainder ignored.

Example (suggested only):

```
ESC FD436F7079726967687420<...> ,F3A5 ;
```

FLASH: DISPLAY BITMAP

Command code	Parameters
ESC FCB	N, X, Y;

Description

Shows the bitmap N stored in the FLASH on the display at position X,Y.

N: Number of the bitmap (0 to 255)

X: Horizontal position (must be a multiple of 8!)

Y: Vertical position

Example:

```
ESC FCB0 ,16 ,10 ;
```

The following commands are valid only for firmware versions 990901.0000 and newer for the following systems if the MT/GR is equipped with a 512kB sized flash memory of type Am29F040.

- MT/GR-S
- MT/GR-B, if a display with T6963C or SED1330 or SED1335 is used
- MT/GR-C, if a display with T6963C or SED1330 or SED1335 is used

In the above cases there is additional flash memory space of 320kB available which can be used to store downloaded proportional fonts and additional bitmaps.

FLASH-512: QUERY AVAILABLE MEMORY

Command code

ESC S ?F

Description

Returns the number of available bytes in the additional flash memory space in the form “ESC S?F cnt ;”.

cnt: Number of available bytes.

Example:

ESC S?F

FLASH-512: ERASE MEMORY

Command code

ESC SE

Description

Erases the complete additional flash memory space. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred during erasing, then the ASCII character No. 21 (NAK) is sent instead of ACK.

Example:

ESC SE

FLASH-512: STORE BITMAP

Command code	Parameters
ESC SWB	id,dx,dy,data;

Description

Stores a bitmap in the additional flash memory space. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred during storing, then the ASCII character No. 21 (NAK) is sent instead of ACK.

id: Identification number of the bitmap (0 to 255)
dx: Width of the bitmap (in pixels)
dy: Height of the bitmap (in pixels)
data: Bitmap data

Example (box with a diagonal line):

```
ESC SWB 1,16,8,FFFFB0018C01830180C18031800DFFFF;
```

FLASH-512: ERASE BITMAP

Command code	Parameters
ESC SEB	id;

Description

Erases bitmap number id in the additional flash memory space. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred during erasing, then the ASCII character No. 21 (NAK) is sent instead of ACK.

Note:

The bitmap is only marked as deleted. The memory space that is occupied by this bitmap will not be freed. To free the memory you must erase the complete additional flash memory space (FLASH-512 ERASE MEMORY)!

Example:

```
ESC SEB1;
```

FLASH-512: DISPLAY BITMAP

Command code	Parameters
ESC SCB	id,x,y;

Description

Shows bitmap number id that was previously stored in the additional flash memory space on screen at position x,y.

Example:

```
ESC SCB1,0,0;
```

FLASH-512: STORE PROPORTIONAL FONT

Command code	Parameters
ESC SWP	id,len,data;

Description

Stores a proportional font in the additional flash memory space. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred during storing, then the ASCII character No. 21 (NAK) is sent instead of ACK.

id: Number of the proportional font (0 to 255)

len: length of following font data (in bytes)

data: font data converted to hex data stream

Example (incomplete):

```
ESC SWP0,8370,<fontdata>;
```

FLASH-512: ERASE PROPORTIONAL FONT

Command code	Parameters
ESC SEP	id;

Description

Erases proportional font number *id* in the additional flash memory space. When completed the *MiniTerminal* sends via the interface the ASCII character No. 6 (ACK) to confirm. If an error has occurred during erasing, then the ASCII character No. 21 (NAK) is sent instead of ACK.

Note:

The proportional font is only marked as deleted. The memory space that is occupied by this proportional font will not be freed. To free the memory you must erase the complete additional flash memory space (FLASH-512 ERASE MEMORY)!

Example:

```
ESC SEP0;
```

FLASH-512: SELECT PROPORTIONAL FONT

Command code	Parameters
ESC PF	id;

Description

Selects the proportional font with number *id*. This font will be used for subsequent text output using the “DISPLAY PROPORTIONAL TEXT” command. The font must have been stored in the additional flash memory space.

Example:

```
ESC SEP0;
```

FLASH-512: QUERY PROPORTIONAL FONT

Command code

`ESC P?F`

Description

Returns the currently selected proportional font in the form “ESC P?F id;”

id: Number of currently selected proportional font or –1 if there is currently no font selected.

Example:

`ESC P?F`**FLASH-512: DISPLAY PROPORTIONAL TEXT**

Command code

`ESC PT`

Parameters

Supplied text <004>


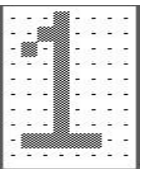
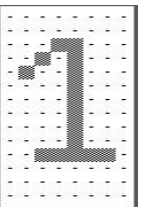
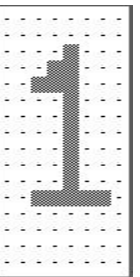
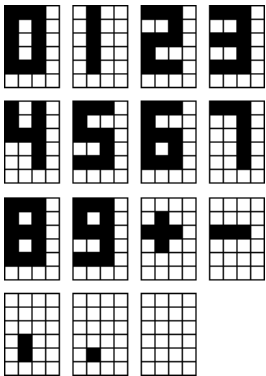
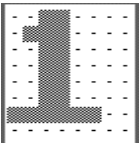
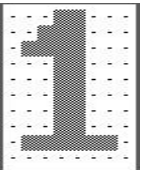
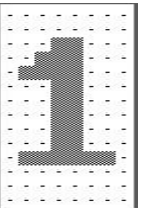
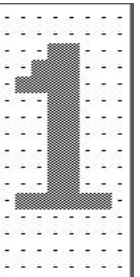
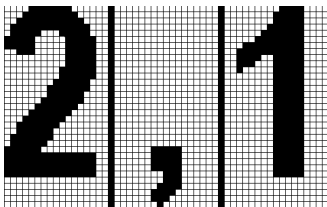
Description

Displays the stated text as parameters to the current graphics position using the currently selected proportional font. The text display is terminated by the ASCII character 4 (EOT), here given as "<004>". An ESC character which introduces a new command sequence also terminates the graphics text display. All graphics write modes as well as the graphics text attributes “normal” and “inverse” are supported.

Example:

`ESC GP32,17;``ESC PT Proportional text to Pos. 32,17 <004>`

Fonts

<p>0:</p>  <p>8x8</p>	<p>1:</p>  <p>8x10</p>	<p>2:</p>  <p>8x14</p>	<p>3:</p>  <p>8x16</p>	 <p>Minidigits (4x6)</p>
<p>5:</p>  <p>8x8, bold</p>	<p>6:</p>  <p>8x10, bold</p>	<p>7:</p>  <p>8x14, bold</p>	<p>8:</p>  <p>8x16, bold</p>	 <p>Maxidigits (16x32)</p>

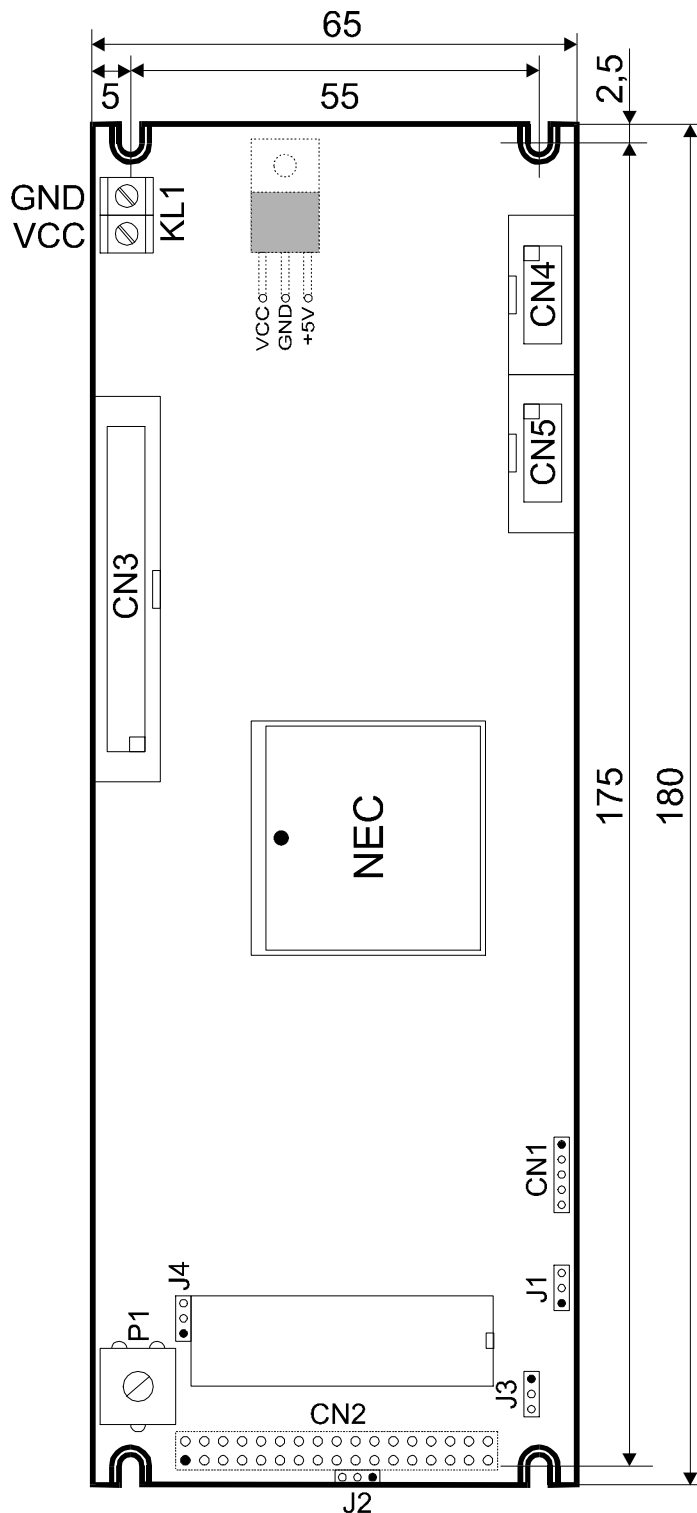
Note:

- The fonts 0,1,2,3,5,6,7,8 contain the complete IBM 8-bit character set.
- Fonts 4 and 9 define only the numbers '0'-'9' as well as '+', '-', ',', '.' and the space. All other characters are shown as blanks.

Further limitations of font 4 and font 9:

- Only the attributes "underlined" and "inverse" are available.
- Only the write modes "replace" and "complement" are available.
- The zoom function for font 9 is only in the Y-direction.
- No zoom function is available for font 4.

Dimensions and assigning the plug connectors for 9717-A -???-T Types (CNx), jumpers (Jx) and potentiometer (Px)



KL1: Power supply

CN1: PC/AT keyboard conn.
CN2: Display connection (on underside of board!)

CN3: Matrix keyboard conn.
CN4: Serial interface
CN5: Optional (second) serial interface

J1: SRAM Type
J2: T6963C FS
J3: FLASH R/W
J4: EPROM Type

P1: LCD contrast setting

All dimensions in millimeters (mm).

Pin Assignments for 9717-A -???-T Types**CN1**

Pin	Assignment
1	KEYBOARD CLOCK
2	GND
3	KEYBOARD DATA
4	+5V
5	reserved

CN2

Pin	Assignment
1	GND
2	GND
3	+5V
4	V ₀
5	/WR
6	/RD
7	/CE
8	C/D
9	N.C. (not connected)
10	/RESET
11	DB0
12	DB1
13	DB2
14	DB3
15	DB4
16	DB5
17	DB6
18	DB7
19	FS
20	A1
21	RESET
22	A2
23	N.C. (not connected)
24	A3
25	N.C. (not connected)
26	/RESET
27	N.C. (not connected)
28	N.C. (not connected)
29	N.C. (not connected)
30	N.C. (not connected)
31	N.C. (not connected)
32	N.C. (not connected)
33	N.C. (not connected)
34	N.C. (not connected)

CN3

Pin	Assignment
1	P00 (matrix output 7)
2	P01 (matrix output 6)
3	P02 (matrix output 5)
4	P03 (matrix output 4)
5	P04 (matrix output 3)
6	P05 (matrix output 2)
7	P06 (matrix output 1)
8	P07 (matrix output 0)
9	P10 (matrix input 0)
10	P11 (matrix input 1)
11	P12 (matrix input 2)
12	P13 (matrix input 3)
13	P14 (matrix input 4)
14	P15 (matrix input 5)
15	P16 (matrix input 6)
16	P17 (matrix input 7)
17	PT0
18	PT1
19	PT2
20	PT3
21	PT4
22	PT5
23	PT6
24	PT7
25	GND
26	GND
27	GND
28	/RESET
29	+5V
30	+5V
31	N.C. (not connected)
32	N.C. (not connected)
33	VCC (inputs voltage from terminal KL1)
34	VCC (input voltage from terminal KL1)

CN4

Pin	Assignment
1	N.C. (not connected)
2	N.C. (not connected)
3	TX DATA
4	CTS
5	RX DATA
6	RTS
7	N.C. (not connected)
8	N.C. (not connected)
9	GND
10	N.C. (not connected)

CN5 (optional)

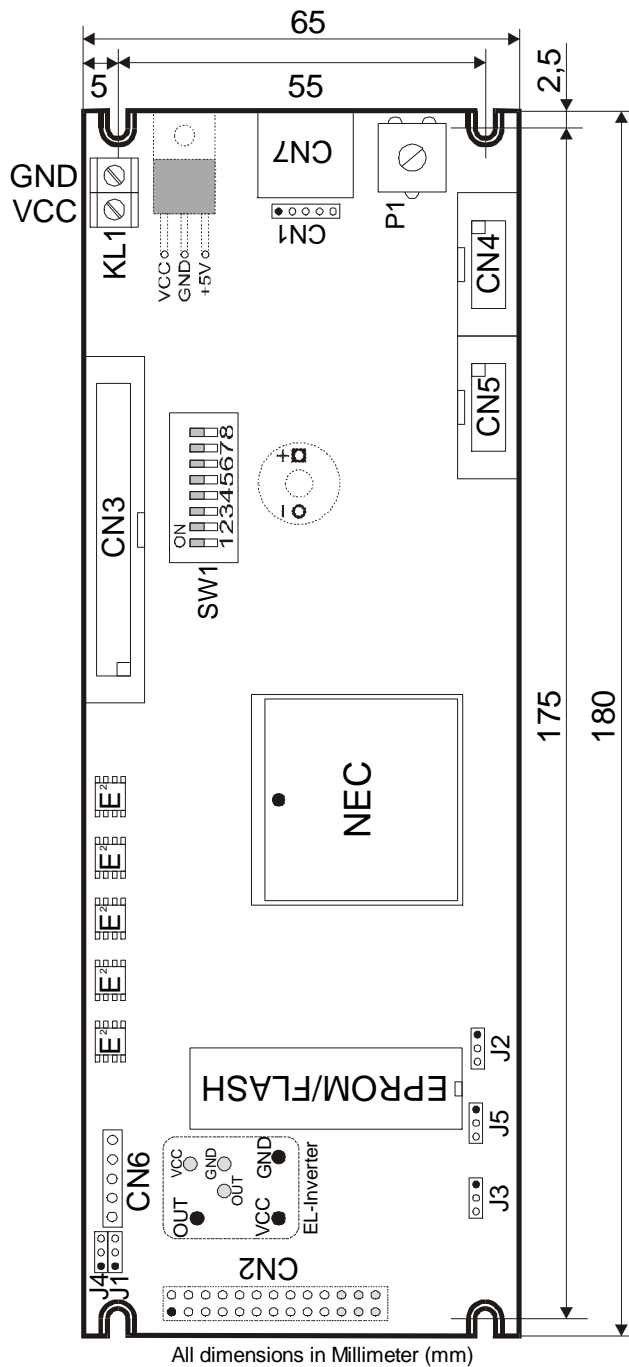
Pin	Assignment
1	N.C. (not connected)
2	N.C. (not connected)
3	TX DATA
4	CTS
5	RX DATA
6	RTS
7	N.C. (not connected)
8	N.C. (not connected)
9	GND
10	N.C. (not connected)

Key to jumpers

	Pos.	Meaning
J1	1-2	SRAM.30 = A17
	2-3	SRAM.30 = +5V
J2	1-2	CN2.19 (FS) = HIGH
	2-3	CN2.19 (FS) = LOW (must be LOW!)
J3	1-2	EPROM.31 = A18
	2-3	EPROM.31 = R/W
J4	1-2	EPROM.24 = A18
	2-3	EPROM.24 = GND

The default jumper settings are shown in thick-lined fields.

Dimensions and assigning the plug connectors for 9717-B -???-T Types (CNx), jumpers (Jx) and potentiometer (Px)



Connectors

(For pin assignment see MT/GR-C!)

- CN1: PC/AT Keyboard connector
- CN2: Display connector
- CN3: Matrix keyboard connector
- CN4: Serial interface
- CN5: Optional (second) serial interface
- CN6: Connector for EL-Backlight
- CN7: Optional connector for PS/2-Keyboard

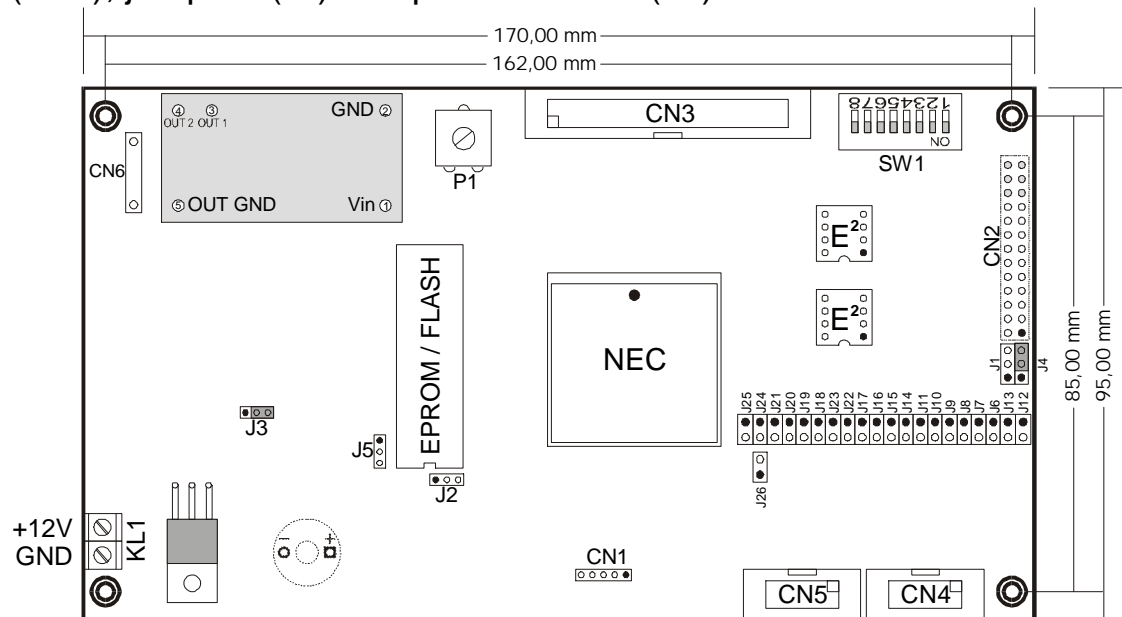
Jumper

- J1: Invers Display
- J2: 1-2: Flash Memory
2-3: Eprom Memory
- J5: 1-2: Eprom Memory
2-3: Flash Memory

Poti









- P1: LCD-Contrast

Dimensions and assigning the plug connectors for 9717-C -???-T Types (CNx), jumpers (Jx) and potentiometer (Px)



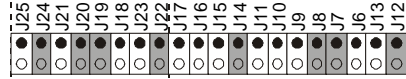
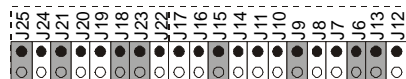

- KL1: Power supply (12V=)
- P1: LCD-contrast setting
- E²: Socket for optional EEPROMs
- SW1: Optional DIP-switch
- CN1: PC/AT keyboard connector
- CN2: Display connection
- CN3: Matrix keyboard connector
- CN4: Serial interface
- CN5: Optional (second) serial interface
- CN6: Voltage for CCFL-Illumination

Jumper Settings

NORMAL DISPLAY  J1	INVERS DISPLAY  J1	Inversion of display data
J5  EPROM J2 	J5  FLASH J2 	Type of program memory. EPROM = Standard 27C010 or 27C1001 EPROM FLASH = Am29F010 Flash
HUPE DISABLED  J26	HUPE ENABLED  J26	If a beeper is mounted it can be activated by this jumper. ATTENTION: Jumper must not be set if secondary serial interface is installed.

Jumper for the serial interfaces:

Jumper J6 to J17 refer to the first serial interface, Jumper J18 to J25 refer to the (optional) second serial interface. To make use of these jumpers the appropriate line drivers must be mounted.

 SER2: RS232 SER1: RS232	<p>Example 1:</p> <ol style="list-style-type: none"> 1. serial interface (SER1) is configured as RS232, 2. serial interface (SER2) is configured as RS232
 SER2: TTL SER1: TTL	<p>Example 2:</p> <p>Interface SER1 is configured as a serial TTL-Interface Interface SER2 is configured as a serial TTL-Interface</p>
 SER2: RS232 SER1: RS422	<p>Example 3:</p> <p>Interface SER1 is configured as a RS422-Interface Interface SER2 is configured as a RS422-Interface</p>

Pin Assignments for 9717-C -???-T Types

CN1

Pin	Function
1	KEYBOARD CLOCK
2	GND
3	KEYBOARD DATA
4	+5V
5	reserved

CN2

Pin	Function
1	GND
2	GND
3	+5V
4	V0
5	/WR
6	/RD
7	/CE
8	C/D
9	N.C. (not connected)
10	/RESET
11	DB0
12	DB1
13	DB2
14	DB3
15	DB4
16	DB5
17	DB6
18	DB7
19	FS
20	J1: GND / +5V / N.C.
21	RESET
22	A2
23	R/W
24	A3
25	E
26	A1

CN3

Pin	Function
1	P00 (matrix - output 7)
2	P01 (matrix - output 6)
3	P02 (matrix - output 5)
4	P03 (matrix - output 4)
5	P04 (matrix - output 3)
6	P05 (matrix - output 2)
7	P06 (matrix - output 1)
8	P07 (matrix - output 0)
9	P10 (matrix - input 0)
10	P11 (matrix - input 1)
11	P12 (matrix - input 2)
12	P13 (matrix - input 3)
13	P14 (matrix - input 4)
14	P15 (matrix - input 5)
15	P16 (matrix - input 6)
16	P17 (matrix - input 7)
17	PT0
18	PT1
19	PT2
20	PT3
21	PT4
22	PT5
23	PT6
24	PT7
25	GND
26	GND
27	GND
28	/RESET
29	+5V
30	+5V
31	Beeper
32	N.C. (not connected)
33	VCC (input voltage from KL1)
34	VCC (input voltage from KL1)

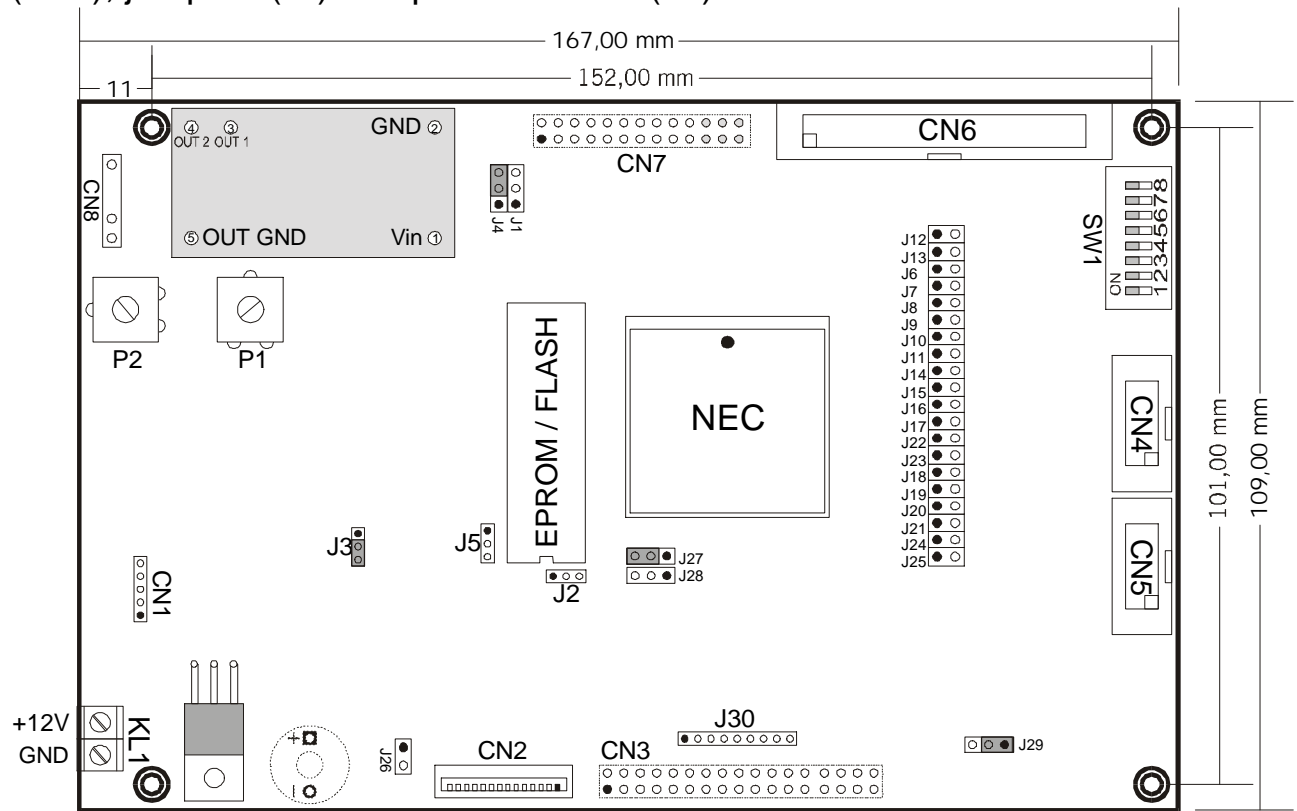
CN4

Pin	Function
1	TX DATA' (nur bei RS422)
2	N.C. (not connected)
3	TX DATA
4	CTS
5	RX DATA
6	RTS
7	RX DATA' (nur bei RS422)
8	N.C. (not connected)
9	GND
10	N.C. (not connected)

CN5 (optional)

Pin	Function
1	N.C. (not connected)
2	N.C. (not connected)
3	TX DATA
4	CTS
5	RX DATA
6	RTS
7	N.C. (not connected)
8	N.C. (not connected)
9	GND
10	N.C. (not connected)

Dimensions and assigning the plug connectors for 9717-S -???-T Types (CNx), jumpers (Jx) and potentiometer (Px)



- | | |
|---------------------------------|---|
| KL1: Power supply (12V DC) | J30: Optional display signals |
| P1: LCD-Contrast (V0) | CN4: Serial interface |
| P2: LCD-Voltage (VEE) | CN5: Optional (second) serial interface |
| SW1: Optional DIP-switch | CN6: Matrix-keyboard connector |
| CN1: PC/AT keyboard connector | CN7: Optional display connector 2 |
| CN2: Display connector | CN8: Connector for CCFL-Backlight |
| CN3: Optional display connector | |

Jumper settings

NORMAL DISPLAY <input type="checkbox"/> J1	INVERS DISPLAY <input type="checkbox"/> J1	Inverted display (for T6963C displays only)
J5 <input type="checkbox"/> EPROM	J5 <input type="checkbox"/> FLASH	Selection of program memory. EPROM = Standard 27C010 or 27C1001 EPROM FLASH = Am29F010 Flash
HUPE DISABLED <input type="checkbox"/> J26	HUPE ENABLED <input type="checkbox"/> J26	If a buzzer is on board it can be enabled via J26 CAUTION: Jumper must not be set if second serial interface is in use.

Jumper for the serial interfaces:

Jumper J6 to J17 refer to the first serial interface, Jumper J18 to J25 refer to the (optional) second serial interface. To make use of these jumpers the appropriate line drivers must be mounted.

	<p>Example 1:</p> <ol style="list-style-type: none"> 1. serial interface (SER1) is configured as RS232, 2. serial interface (SER2) is configured as RS232
	<p>Example 2:</p> <p>Interface SER1 is configured as a serial TTL-Interface Interface SER2 is configured as a serial TTL-Interface</p>
	<p>Example 3:</p> <p>Interface SER1 is configured as a RS422-Interface Interface SER2 is configured as a RS422-Interface</p>

Pin Assignments for 9717-S -???-T Types**CN1**

Pin	Function
1	KEYBOARD CLOCK
2	GND
3	KEYBOARD DATA
4	+5V
5	reserved

CN2

Pin	Function
1	D0
2	D1
3	D2
4	D3
5	/DISPOFF (+5V)
6	FRAME (YD)
7	N.C.
8	LOAD (LP)
9	SCLK (CP)
10	+5V
11	GND
12	VEE
13	V0
14	GND

CN7 Refer to CN2 of
MT/GR-C.

CN6

Pin	Function
1	P00 (Matrix-output 7)
2	P01 (Matrix-output 6)
3	P02 (Matrix-output 5)
4	P03 (Matrix-output 4)
5	P04 (Matrix-output 3)
6	P05 (Matrix-output 2)
7	P06 (Matrix-output 1)
8	P07 (Matrix-output 0)
9	P10 (Matrix-input 0)
10	P11 (Matrix- input 1)
11	P12 (Matrix- input 2)
12	P13 (Matrix- input 3)
13	P14 (Matrix- input 4)
14	P15 (Matrix- input 5)
15	P16 (Matrix- input 6)
16	P17 (Matrix- input 7)
17	PT0
18	PT1
19	PT2
20	PT3
21	PT4
22	PT5
23	PT6
24	PT7
25	GND
26	GND
27	GND
28	/RESET
29	+5V
30	+5V
31	Buzzer
32	N.C. (not connected)
33	VCC (Voltage as supplied to KL1)
34	VCC (Voltage as supplied to KL1)

CN4

Pin	Function
1	TX DATA' (nur bei RS422)
2	N.C. (not connected)
3	TX DATA
4	CTS
5	RX DATA
6	RTS
7	RX DATA' (nur bei RS422)
8	N.C. (not connected)
9	GND
10	N.C. (not connected)

CN5 (optional)

Pin	Function
1	N.C. (not connected)
2	N.C. (not connected)
3	TX DATA
4	CTS
5	RX DATA
6	RTS
7	N.C. (not connected)
8	N.C. (not connected)
9	GND
10	N.C. (not connected)