VT100 emulation

This manual presents installation and handling of the driver VT100 to the terminals in the E-series.

The functionality in the E-terminals and in MAC Programmer+ are described in the E-manual.

Content

1   Introduction

This manual describes how the VT100 emulation driver works with the operator terminals in the E-series. For information about the VT100 system we refer to the manual for current system.

The VT100 driver makes it possible to emulate a VT100 terminal from the E-terminal.

The VT100 driver works with the operator terminals in the E-series (not E50, E100 and E200) with the system program version 5.00A or higher.

2   Install and update driver

When installing MAC Programmer+ the drivers available at the time of release are installed too. A new driver can be added into MAC Programmer+ either with MAC Programmer+ using an Internet connection or from diskette. A driver can be updated to a newer version in the same way.

2.1   Installation of driver using Internet

To update available drivers to the latest version or to install new drivers you can use the function Update terminal drivers, from Internet in the File menu in MAC Programmer+. All projects must be closed before this function is used and the computer must be able to make an Internet connection. You don't need a browser. When the connection is established a list is shown with all drivers that can be downloaded from Internet to the computer. The list shows the version number of available drivers and the version number of installed drivers. Mark the driver/drivers you want to install in the MAC Programmer+. The function Mark Newer will mark all drivers that are available in a newer version than the one installed and the drivers not installed. Then you select Download. Each driver is approximately 500 kb and it is ready to use when the download is ready.

2.2   Installation of driver from disk

To update available drivers to the latest versions or to install new drivers you can use the function Update terminal drivers, from Disk in the File menu in MAC Programmer+. All projects must be closed before this function is used. Select the folder with the new driver and choose to open the mpd-file. A list is shown with all drivers that can be installed showing the version number of available drivers and the version number of installed drivers. Mark the driver/drivers you want to install in the MAC Programmer+. The function Mark Newer will mark all drivers that are available in a newer version than the one installed and the drivers not installed. Then you select Install.

How to select the VT100 driver in the project and how to transfer it to the terminal are described in *chapter 3*.

3 Connecting the terminal to the Host system

3.1 Settings in the MAC Programmer+

For communication with Host system via the VT100 protocol the following settings must be made in the programming tool MAC Programmer+.

Driver selection

Choosing **New** in the **File** menu creates a new project and the dialog **Project Settings** is shown. In an existing project, the dialog is shown by selecting **Project Settings** in the **File** menu.
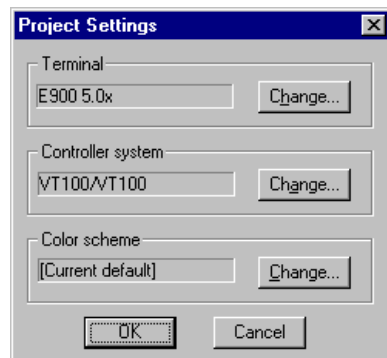
Press **Change...** under Controller system to get the choice list of available drivers. Choose Brand name, Protocol and then press OK. Press OK again to confirm the project settings.
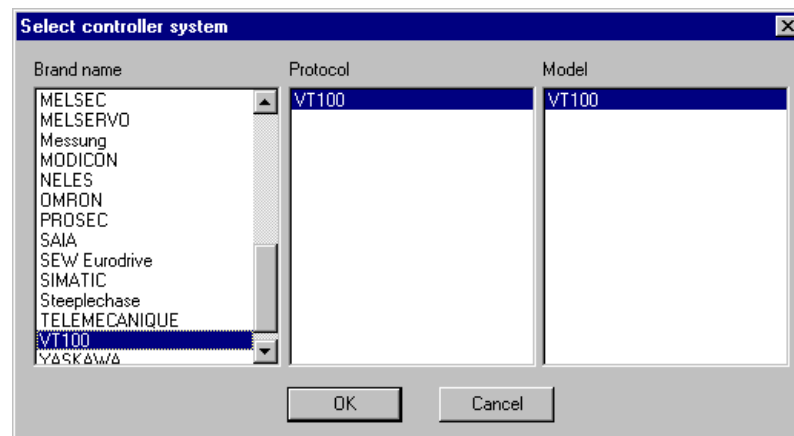
Communication setup

The settings for the communication between the terminal and the Host system are done under **Peripherals** in the **Setup** menu. To change which port the Host system is connected to, mark Controller and hold left mouse button down and drag to move it to another communication port. Mark the selected communication port and press **Edit** to change the other communication settings.
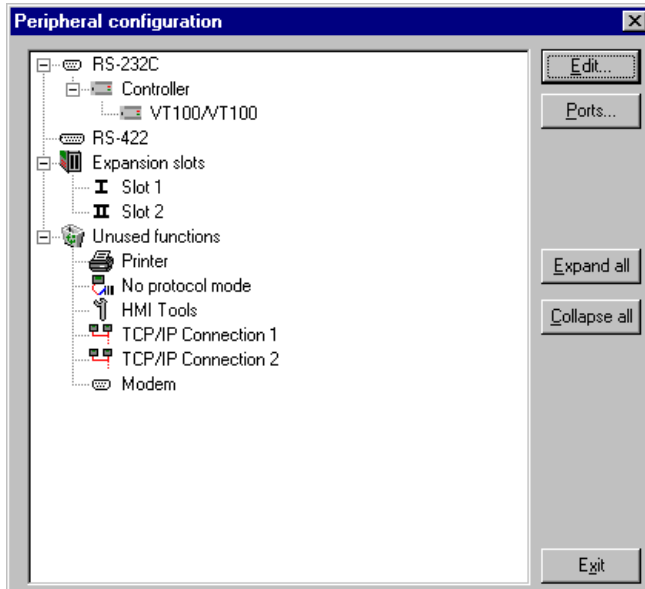
The settings should be:

Parameter	Description
Port	RS-232 or RS-422
Baudrate	300 – 57 600
Data bits	7 or 8
Stop bits	1 or 2
Parity	None, Even or Odd

The settings in the terminal (MAC Programmer+) must be according to the settings in the Host system.

To make specific settings for the selected driver mark the driver name and press **Edit**. In the following dialog you define the functions for the function keys in the E-terminal and the flow control. Xon/Xoff is default.
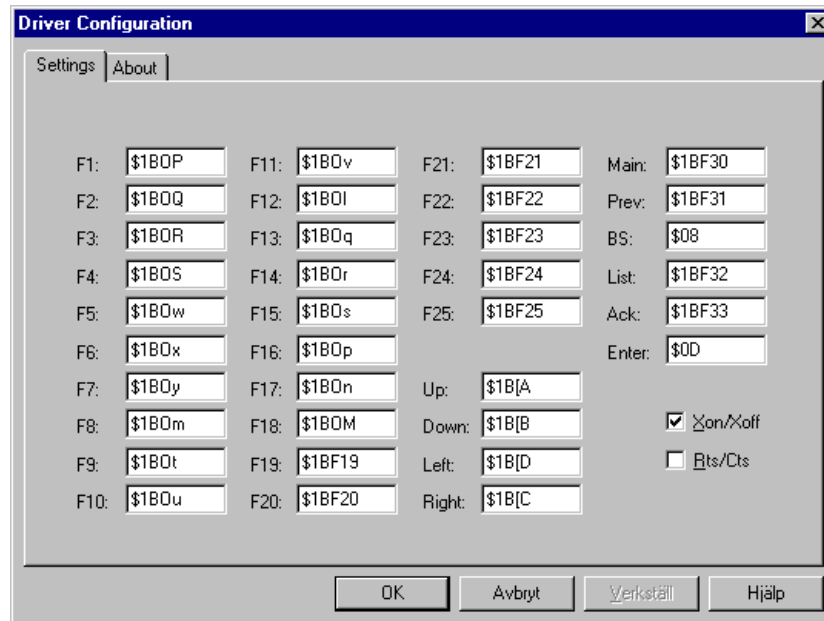
In the dialog above the dollar sign ($) can be used to enter the hexadecimal value (two characters) for the control characters.

The following tables shows the supported control characters and the response of the VT100 driver when they are received. Control characters not supported are ignored by the terminal.

Control characters

	Short	Hex	Description
Bell	bel	07	A beep is emitted from the terminal.
Backspace	bs	08	The cursor is moved left one column. If the cursor is in column 1, the character is ignored.
Tab	ht	09	The cursor is moved right to next tab stop. If no more tab stops are found, the cursor moves to the last column of current row.
Line feed	lf	0A	The cursor is moved down one row, and optionally to the first column (depending on current New Line Mode, that is default Off). If the cursor already is at the bottom of the scroll region, the region will be scrolled one row up instead.
Vertical tab	vt	0B	
Form feed	ff	0C	
Carriage return	cr	0D	The cursor is moved to the first column (left margin) of current row.
Shift Out	so	0E	Selects G1 to be current character set.
Shift In	si	0F	Selects G0 to be current character set.
XON	dc1	11	Software flow control; Continue transmission.

	Short	Hex	Description
XOFF	dc2	13	Software flow control; Pause transmission. The terminal will pause transmissions to the host after reception of this character, until an XON character is received (see above). However, the terminal may transmit XON/XOFF characters back to the host (even if other transmission is paused). Note: It may be possible that a number of characters will be transmitted even after the arrival of the XOFF character, since both received and transmitted characters are placed in queues, before, and after processing.
Escape	esc	1B	Begins an escape sequence (e.g. a Cursor Movement command, see below).

Cursor Movement and Manipulation

	Short	Description
Cursor UP	esc [*n* A	The cursor is moved up *n* rows. Upper limit set by the scroll region. If *n* is 0 or omitted, 1 is default.
Cursor DOWN	esc [*n* B	The cursor is moved down *n* rows. Lower limit set by the scroll region. If *n* is 0 or omitted, 1 is default.
Cursor RIGHT	esc [*n* C	The cursor is moved right *n* columns. If *n* is omitted, 1 is default.
Cursor LEFT	esc [*n* D	The cursor is moved left *n* columns. If *n* is omitted, 1 is default.
Cursor POSI-TION	esc [*r* ; *c* H or esc [*r* ; *c* f	The cursor is moved to row *r*, column *c*. If *r* and/or *c* is 0 or omitted, 1 is default. The origin (1,1) is dependent on current Origin Mode (absolute or relative to the scroll region).
Cursor HOME	esc [H or esc [f	The cursor is moved to row 1, column 1. (This is simply a way to use Cursor POSITION, see above.) The origin (1,1) is dependent on current Origin Mode (absolute or relative to the scroll region).
Cursor DOWN with SCROLL	esc D	The cursor is moved down one row (same column). If the cursor already is at the bottom of the scroll region, the region will be scrolled one row up instead.
Cursor UP with SCROLL	esc M	The cursor is moved up one row (same column). If the cursor already is at the top of the scroll region, the region will be scrolled one row down instead.
Next Line with SCROLL	esc E	The cursor is moved down one row, first column. If the cursor already is at the bottom of the scroll region, the region will be scrolled one row up instead.
Save Cursor	esc 7	Saves the cursor position, current character set, and current Origin Mode.
Restore Cursor	esc 8	Restores the cursor position, current character set, and current Origin Mode from previous Save Cursor command.
Cursor ON	esc [? 25 h	Enables cursor visibility. (Default On.)
Cursor OFF	esc [? 25 l (lowercase L)	Disables (hides) cursor visibility.

	Short	Description
Autowrap ON	esc [? 7 h	Enables cursor wrapping. (Default On.) Text exceeding right margin will be continued on the next line. Scroll region will be scrolled up if last line's right margin was exceeded.
Autowrap OFF	esc [? 7 l (lowercase L)	Disables cursor wrapping. Text exceeding right margin will be lost.
Origin Mode ON	esc [? 6 h	Enables origin mode. (Default Off.) In origin mode, the cursor is positioned relative to the scrolling region instead of the absolute position.
Origin Mode OFF	esc [? 6 l (lowercase L)	Disables origin mode.
Insert Mode ON	esc [4 h	Enables insert mode. (Default Off.) Characters will be inserted at the cursor position, and remaining characters on cursor row are moved to the right. Text moved outside right margin will be lost. Please note that this mode may be quite slow on some terminals.
Insert Mode OFF	esc [4 l (lowercase L)	Disables insert mode. (Default Off.)
New Line Mode ON	esc [2 0 h	Enables new line mode. (Default Off.) In this mode, line feeds (lf) will be interpreted as new lines; Line feed will move cursor to beginning of next row.
New Line Mode OFF	esc [2 0 l (lowercase L)	Disables newline mode. (Default Off.)
SET Tab Stop	esc H	Sets a Tab stop at current cursor column.
REMOVE Tab Stop	esc [g	Removes Tab stop from current cursor column.
REMOVE All Tab Stops	esc [3 g	Removes all Tab stops.

Scrolling

	Short	Description
Scroll UP	esc [*n* S	The scroll region is scrolled up *n* rows. If *n* is omitted, 1 is default. See also Cursor Movement, Cursor Down with Scroll. This is a non-standard extension.
Scroll DOWN	esc [*n* T	The scroll region is scrolled down *n* rows. If *n* is omitted, 1 is default. See also Cursor Movement, Cursor Up with Scroll. This is a non-standard extension.
Set Scroll Region	esc [*r1* ; *r2* r	Sets scrolling region to start at row *r1* and end with *r2*. If *r1* and/or *r2* is 0 or omitted, default values will be row 1 and bottom row of screen, respectively (the latter depends on terminal model). the cursor will always be positioned at 1,1 (relative).
Set Full Scroll Region	esc [r	Sets scrolling region to full screen. (This is simply a way to use Set Scroll Region, see above.) This is default scrolling region.

Character Attributes

	Short	Description
Set Double Height Line (top half)	esc # 3	Sets double character size on current line (both width and height). Lines in this mode will fit only half the number of characters compared to normal. The behaviour of this driver differs slightly from the VT100 standard. However, if the standard escape sequences are sent to the terminal, the result should be the same. The difference in this driver is that when text are placed on a line with Double Height, top half, both the top half, and the bottom half are drawn on screen. It is not necessary to set next line to Double Height, bottom half, and send same text to it. The driver will instead "ignore" the text written to the bottom half row, since the text on the top half row is already drawn there.
Set Double Height Line (bottom half)	esc # 4	Sets double character size on current line (both width and height). Lines in this mode will fit only half the number of characters compared to normal. Also see Set Double Height Line (top half) above.
Set Single Height Line	esc # 5	Sets single character size on current line (both width and height). This is the default mode.
Set Font G0	esc (*c*	Sets font for G0. The charcter *c* can be one of the following: A B (default, standard ASCII), an A for UK, or a 0 (zero) for some graphic characters.
Set Font G1	esc) *c*	Sets font for G1. The charcter *c* can be one of the following: A B (default, standard ASCII), an A for UK, or a 0 (zero) for some graphic characters.

Editing

	Short	Description
Erase to End of Line	esc [0 K or esc [K	Erases all characters from, and including, cursor position to end of line.
Erase to Beginning of Line	esc [1 K	Erases all characters from beginning of line to, and including, cursor position.
Erase Line	esc [2 K	Erases all characters on current line.
Erase to End of Screen	esc [0 J or esc [J	Erases all characters from, and including, cursor position to end of screen.
Erase to Beginning of Screen	esc [1 J	Erases all characters from beginning of screen to, and including, cursor position.
Erase Screen	esc [2 J	Erases all characters from screen. (Cursor is not repositioned.)
Screen Alignment (fill screen with 'E')	esc # 8	Fills all character positions on screen with character E.

LED Control

	Short	Description
Set LEDs On	esc [*n1* ; *n2* ; .. q	Turns On (green color) LEDs number *n1*, *n2*, ... A value of 0 turn all LEDs Off. Several (max 32) LEDs can be set to on by separating their numbers with semicolon.
Set LED Off	esc [*n* x	Turns Off LED number *n*. A value of 0 turn all LEDs Off. It's only possible to turn off one LED at a time (except by using number 0, that turns off all). This is a short form of Set LED Color (see below). This is a non-standard extension.
Set LED Color	esc [*n* ; *c* x	Set LED number *n* to color *c*. If *n* is 0, all LEDs are turned Off, independant of the *c* value. If *c* is omitted, 0 (off) will be default. Possible color values: 0 (off), 1 (green) and 2 (red). Also see Set LED Color and Blink (below). This is a non-standard extension.
Set LED Color and Blink	esc [*n* ; *c* ; *b* x	Set LED number *n* to color *c*, and optionally a blink time *b*. If *n* is 0, all LEDs are turned Off, independant of the *c* and *b* values. The default values for *c* and *b* is 0 (off and no blink). Possible Blink times: 0 (no blink), 1 (0.2s), 2 (0.4s), 3 (0.8s), and 4 (1.6s). Also see Set LED Color (above). This is a non-standard extension.

Reports

	Short	Description
Report Device Status	esc [5 n	The terminal sends a status sequence back to the host, indicating the functionality. The normal response is esc [0 n. If esc [3 n is returned, something is wrong with the terminal.
Report Cursor Position	esc [6 n	The terminal sends a sequence back to the host, indicating the cursor position. The response is esc [*r* ; *c* R. That is row and column respectively (*r* and *c*). The reported cursor position is always the absolute position.
Report Device Identification	esc Z or esc [c	The terminal sends a sequence back to the host, indicating the type of device the terminal is. The response is esc [? 1 ; 0 c. This is interpreted as a "Base VT100, no options" terminal.

Miscellaneous

	Short	Description
Reset Terminal To Default Settings	esc c	The terminal is reset to power-up status.

Transfer the driver to the terminal

The selected driver is downloaded into the terminal when the project is transferred to the terminal. Choose Project in the Transfer menu.
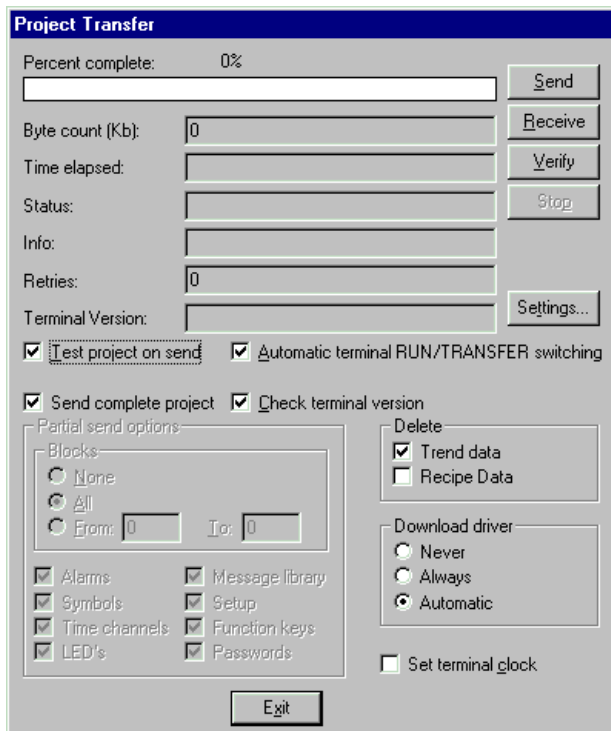
There are three alternatives when the driver is downloaded into the terminal:

Function	Description
Never	The driver is not down-loaded and the existing driver in the terminal is used.
Always	The driver is down-loaded every time the project is transferred.
Automatic	The driver is down-loaded if the driver in the terminal is not the same as the selected driver in the project. If it is the same the driver is not down-loaded.

3.2 Settings in the Host system

For information about settings in the Host system we refer to the manual for current system.

3.3 Connecting the terminal to the Host system

Point-to-point connection

CAB5 or CAB6   RS-232 or RS-422
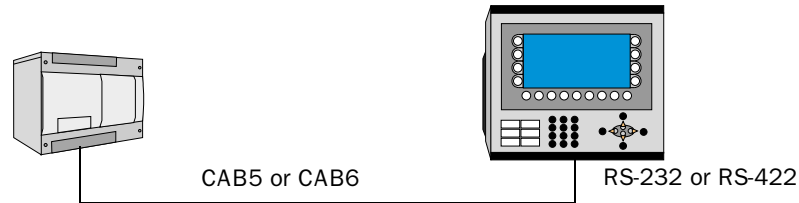
The point-to-point connection can be done either via the RS-422 port or via the RS-232C port on the terminal. Cables such as CAB5 or CAB6 may be used for point-to-point connection. See the chapter Drawings for cable drawings.

CAB5 and CAB6 are standard cables that can be ordered from Beijer Electronics. For further information about settings in the Host system, cable specifications and information about connecting the Host system to the terminal we refer to the manual for the current system.

Please make sure to choose a cable suitable for the desired flow control. If Rts/Cts is used, the cable must connect these signals to the host system. If Xon/Xoff is used, no special cabling is required.

4 Efficient communication

To make the communication between the terminal and the Host system quick and efficient the following should be noted about the VT100 functions and what can be done to optimize the communication.

Some VT100 functions will require a relative long time to process by the terminal. Two "slow" functions are Scrolling of the display, and Writing characters on screen with Insert Mode on. Some terminal models will avoid updating of the actual display when the terminal is busy (several unprocessed bytes in the receive queue). These models will instead update the screen as soon as the queue is processed. This is to make the terminal processing faster.

To optimize the communication with the user, try to avoid extensive use of the two functions mentioned above.

4.1   Trouble shooting schedule

The following trouble shooting schedule can help you to remember to check some settings, for example, if communication problems occures.

```
                    ┌─────────────────────┐
                    │ The communication will │
                    │      not start       │
                    └─────────────────────┘
                              │
                              ▼
                         ╱╲
                        ╱  ╲
           ╱ Is the correct cable used ╲    NO    ┌──────────────────────┐
           ╲  and is it connected?    ╱──────────▶│ Check and connect the │
                        ╲  ╱                       │        cable         │
                         ╲╱                        └──────────────────────┘
                         │ YES
                         ▼
                         ╱╲
                        ╱  ╲
           ╱   Is the baudrate    ╲       NO    ┌──────────────────────────┐
           ╲ setting correct in the ╱──────────▶│ Correct the settings in the │
           ╱ terminal and the Host ╲            │  MP+ and in the controller  │
           ╲      system?         ╱            │         system           │
                        ╲  ╱                    └──────────────────────────┘
                         ╲╱
                         │ YES
                         ▼
                         ╱╲
                        ╱  ╲
           ╱ Are the driver config- ╲   NO    ┌────────────────────┐
           ╲ uration settings correct ╱──────▶│ Correct the settings in │
           ╱ according to chapter   ╲         │         MP+          │
           ╲        3.1?           ╱          └────────────────────┘
                        ╲  ╱
                         ╲╱
                         │ YES
                         ▼
                         ╱╲
                        ╱  ╲
           ╱ Is the terminal set to ╲   NO    ┌────────────────────┐
           ╲ use the correct port   ╱──────▶│ Correct the settings in │
           ╱ (RS-232C/RS-422)?    ╲         │       the MP+        │
                        ╲  ╱                  └────────────────────┘
                         ╲╱
                         │ YES            ┌────────────────────┐
                         └───────────────▶│ Contact Your support │
                                          │      service        │
                                          └────────────────────┘
```

5 Drawings

RS-422
MAC 40+/Exxx, MTA-100/Exxx
MAC 10/CM, CM10

Pin no	Name	Signal direction MAC <→ XXX
2	+TxD	↑
15	−TxD	
3	+RxD	↓
16	−RxD	
4	+RTS	↑
17	−RTS	
5	+CTS	↓
18	−CTS	
20	1)	
21	1)	
7,8	0V	
14	+5V <50mA 2)	↑
12,13 24,25	+5V >200mA 3)	↓

D−sub
25−pol Hona
25−pin Female

1) Stift 20 är anslutet till stift 21 internt i MAC'en.
Pin no 20 connected to pin no 21 internal in MAC/MTA.
2) Endast i E−serien och med serie nr 9901 eller senare
Only for E−series and with serial no 9901 or later
3) Endast E100/MAC40+/MTA−100
Only for E100/MAC40+/MTA−100

RS-232
MAC 50/90/Exxx, MTA-250/G1/Exxx
MAC 10/CM, CM10

Pin no	Name	Signal direction MAC <→ XXX
2	TxD	↑
3	RxD	↓
5	0V	
7	CTS	↓
8	RTS	↑
9*	+5V <5mA	↑

* Ej i E−serien
Not in E−series

D−sub
9−pol Hane
9−pin Male

RS-422
MAC 50/90, MTA-250/G1

Pin no	Name	Signal direction MAC <→ XXX
2	+TxD	↑
1	−TxD	
4	+RxD	↓
3	−RxD	
6	+RTS	↑
5	−RTS	
10	+CTS	↓
9	−CTS	
8,15	0V	
13,14	+5V <20mA	↑

D−sub
15−pol Hona
15−pin Female

BEIJERS
BEIJER ELECTRONICS

MAC/MTA RS−232/RS−422

Drawn BLE | Date 1993−09−07 | Revision − | Revision date 1998−12−01 | Page 1 | Next page 1 | Drawing No. S−00724

Operator terminal

PC-computer

RXD +
RXD −
CTS +
CTS −
TXD +
TXD −
RTS +
RTS −
+5V
0V

VCC

Skärmen ansluten till kabelkåpan
Shield connected to D-sub cover

2
15
4
17
3
16
5
18
14
8
7

120 ohm

P1 Brun
P2 Svart
P3 Röd
P4 Gul
P5 Orange

Brown
Black
Red
Yellow
Orange

Skärmen ansluten till kabelkåpan
Shield connected to D-sub cover

2 − (TXD)
8 − (RTS)
3 − (RXD)
7 − (CTS)
5 − 0V

CAB6

25-pol HANE
25-pos MALE

4-40

4-40

Grå
Gray

Grå
Gray

Metalliserad plastkåpa
Metalized plastic cover

Kabel: LIYCY 5x0,25kvmm (24AWG) eller motsvarande

Kabellängd 3m

9-pol HONA
9-pos FEMALE

4-40

4-40

Drawn to
scale 1:1

Scale

0 10 20 30 40 50 60 70 80 90 100 mm
0 1 2 3 4 inch

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BEIJER ELECTRONICS

Drawn	Date	App.			
EAN	1999-02-03		Principschema	CAB6	

	Revision	Revision date	Page	Next page	Drawing No.
	−	1999-03-30	1	−	S−03307