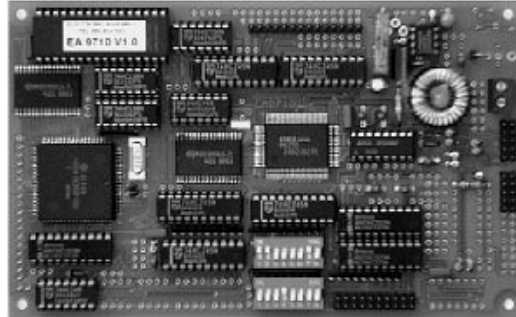


RS-232 / RS-485 / CENTRONICS CONTROLLER FOR GRAPHIC MODULES

FOR DIRECT CONNECTION TO
BELOW LISTED GRAPHIC MODULES:

EA 7160-7NEL	160	x	128	dots
EA 7240-6NEL	240	x	64	dots
EA 7240-7NEL	240	x	128	dots
EA 7320-7,9NC	320	x	240	dots
EA 7640-6N	640	x	64	dots
EA 7640-7,5N3C	640	x	200	dots
EA 7640-8,5NC	640	x	400	dots
EA 7640-8,8BWC3	640	x	480	dots
EA 7720-8,5NEL	720	x	400	dots



Dimensions 160x100x20(max) mm

FEATURES

- * SUPPORTS ALL KNOWN LCD- GRAPHIC DISPLAYS (MONOCHROME)
- * CONNECT EITHER TO RS-232 OR RS 485 OR CENTRONICS OR TO 8-BIT BUS
- * TERMINALMODE VT-52 I.E. 640x400 DISPLAY: 80/40 CHAR., 25/50 LINES
- * INTELLIGENT GRAPH COMMANDS LIKE DRAW LINE, DELETE, SET DOTS, DISPLAY WINDOWS, TEXTROTATION IN 90° STEPS
- * POWER SUPPLY: VDD= + 5V ±5%, approx. 150mA
- * DISPLAY SELECTION WITH DIP-SWITCHES B
- * KEYBOARDCONNECTION: MF-102 OR 8x8 MATRIX (RS-232 AND RS 485 ONLY)
- * INTERFACE PARAMETER SETTING WITH DIP-SWITCHES A
- * INCLUDING TEST- AND DEMO PROGRAMS FOR PC's
- * 5 INTEGRATED CHARACTER SETS (8x8, 8x16, 16x16, 16x32, 32x56)
- * BIG NUMERALS (56x80) FOR EASY DISPLAY READING, INTEGRATED
- * DOWNLOADABLE CHARACTERSETS, I.E. KYRILLIC, FRENCH, ETC.
- * ADRESSABLE: SEVERAL EA 9710's ON A SINGLE SERIAL INTERFACE
- * NEG. DISPLAY SUPPLY VOLTAGE V_{EE} INTEGRATED, DIGITAL SETABLE

OPTIONAL

- * VOLTAGE REGULATOR FOR 8-12 VOLTS INPUT: EA OPT-REGLER

ORDERING INFORMATION

RS-232- TERMINAL FOR LCD-GRAPHS, KEYB. CONNECTOR	EA 9710-V24
RS 485- TERMINAL FOR LCD-GRAPHS, KEYB. CONNECTOR	EA 9710-485
CENTRONICS- / BUS- TERMINAL FOR LCD-GRAPHMODULES	EA 9710-BUS
VOLTAGE REGULATOR FOR 8-24 VOLTS INPUT	EA OPT-REGLER
VARIOUS TEST- AND DEMOPROGRAMS ON FLOPPY DISC	EA DISK9710

RS-232 / RS485 CABLE WITH 9-PIN SUB-D CONNECTOR AND 8-PIN D-SUB CONNECTOR
ELECTRONIC ASSEMBLY GMBH Phone +49-89-8541991 · FAX +49-89-8541721 · lcd-module.de

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GENERAL

We designed our EA 9710 controller especially for simple and timesaving installation to operate all customery monochrome LCD-graphic displays. The onboard Graphcontroller MSM 6255 supplies all needed signals (LP, CP, FLM, M, UD0..3, LD0..3) for driving LCD-graphic modules. Display sizes in ranges up to 720x400 respectively 640x480 dots can be connected. The usual negative supply voltage for Graphic displays is also generated on board.

This outstanding 8-bit microcontroller system allows thanks to a 1 MBit display memory a very comfortable use of advanced programming-commands like "ASCII-characters to coordinate (X,Y)" or "Box to coordinate (X1,Y1,X2,Y2)" etc. When Terminalmode is choosed, a VT-52 terminal will be emulated. Commands like "Carriage Return" and "Line Feed" and all Cursor movements are available. Also mixed operation in both modes is allowed.

OPERATING WITH RS-232, RS 485, BUS, CENTRONICS

EA 9710 boards can be connected either to RS-232 (EA 9710-V24), RS 485 (EA 9710-485) or to CENTRONICS- Interfaces (EA 9710-BUS). Interface parameters are set with DIP- switches according to table 15. A performance increase of your processor system can be achieved by direct connecting the processor bus to the EA 9710-BUS. By doing that, the main processor is relieved from unnessesary computing work for display outputs.

Additional it is possible to connect an AT keyboard (MF-102) or a Matrix keypad (8x8 keys), for EA 9710-V24 and EA 9710-485 only. Also switched output gates may be used.

ELECTRONIC ASSEMBLY

PUTTING INTO OPERATION

- **Test mode:** After connecting the display with flat type cable to the appropriate plug, you should set DIP-B switches (1..7) into "Off" position and switch 8 to "On" (factory setting, see table 1). The Module now is in Test- mode. Various display initial screens are carried out automatically. Vertical strips should alternate with entire black- respective white displays.
- **Demo mode:** When previous test is done well, set DIP-B switch No. 8 to "On" and switches No. 1..7 to the Type number of the Display (table 1). Now you can watch a little demo program.
- **Standard mode:** If previous tests have been performed correctly, set DIP-B switch No. 8 to "Off" (Standard mode).

Type of Display	Resolution	DIP B								Connect	Remark	
		1	2	3	4	5	6	7	8			
all	-	off	off	off	off	off	off	off	off	ON	-	Test VEE, MUX
Set Type of Display on DIP 1..7	-	Set to Type of Display							ON	-	Demo Program	
EA 7128-6N	DMF697, 50051, 50202	128 x 64	ON	off	off	off	off	off	off	off	-	
	DMF50374	160 x 64	ON	ON	off	off	off	off	off	off	5	
EA 7160-7N	DMF608	160 x 128	off	off	ON	off	off	off	off	off	-	
EA 7240-6N	DMF633	240 x 64	ON	off	ON	off	off	off	off	off	-	Close solder bridge xx , add 1MOhm (Rxx)
EA 7240-7N	DMF660	240 x 128	off	ON	ON	off	off	off	off	off	-	Close solder bridge xx
	DMF50239	256 x 128	ON	ON	ON	off	off	off	off	off	-	
EA 7320-7,9NC	DMF50081, 50174	320 x 240	off	off	off	ON	off	off	off	off	5	
EA 7480-6N	DMF612	480 x 64	ON	off	off	ON	off	off	off	off	-	
EA 7480-7N2	DMF6102	480 x 128	off	ON	off	ON	off	off	off	off	5	
EA 7640-6N	DMF690	640 x 64	off	off	ON	ON	off	off	off	off	-	
EA 7640-7N2	DMF651A, 50357	640 x 200	ON	off	ON	ON	off	off	off	off	5	
EA 7640-7,5N3C	DMF50036	640 x 200	off	ON	ON	ON	off	off	off	off	5	
	DMF50380	640 x 200	off	ON	ON	ON	off	off	off	off	-	
EA 7640-8,5N	DMF666A, 50069	640 x 400	ON	ON	ON	ON	off	off	off	off	6	
	DMF665	640 x 400	ON	ON	ON	ON	off	off	off	off	-	
	DMF50262, 50263	640 x 400	ON	ON	ON	ON	off	off	off	off	7	
	DMF675	640 x 400	off	off	off	off	ON	off	off	off	6	
EA 7640-8,8BWC	DMF50147	640 x 480	ON	off	off	off	ON	off	off	off	-	
EA 7640-8,8BWC3	DMF50260, 50261, 50383	640 x 480	ON	off	off	off	ON	off	off	off	7	
EA 7640-8,8N	DMF6106	640 x 480	off	ON	off	off	ON	off	off	off	6	
	DMF50107, 50419	640 x 480	ON	ON	off	off	ON	off	off	off	-	
	DMF684N, 685NK	720 x 350	off	off	ON	off	ON	off	off	off	-	
	DMF676	720 x 400	ON	off	ON	off	ON	off	off	off	-	

Table 1
Display Selection

COMMANDS IN TERMINAL MODE

After power on the module is ready for receiving in terminal mode. All received characters are shown in ASCII format. Line carriage return is done automatically and, if display is filled, the page is scrolling to the top. The extended VT-52 terminal commands are listed in table 2.

Terminal mode (extended VT-52)				
Command	Codes			Description
Backspace (decimal: 08)	^H			Delete characters left of cursor, close up remaining line
Linefeed (decimal: 10)	^J			Cursor to next line, position of columns remain
Formfeed (decimal: 12)	^L			Clear display, cursor to left hand, top corner (position 1,1)
Carriage return (dec.: 13)	^M			Cursor to left hand border
Cursor home	ESC	H		Set cursor to left hand, top corner (position 1,1)
Cursor up	ESC	A		Move cursor to next line above
Cursor down	ESC	B		Move cursor to next line below
Cursor right	ESC	C		Move cursor one character to the right
Cursor left	ESC	D		Move cursor one character to the left
Cursor scroll to top	ESC	I		Cursor to line above, scrolling top border, than cursor to the left
Save cursor position	ESC	j		Save actual cursor position
Load cursor position	ESC	k		Set cursor to saved position
Set cursor to position	ESC	Y	s+32 z+32	Set cursor to absolute position column s and line z
Cursor on	ESC	e		Cursor on (visible)
Cursor off	ESC	f		Cursor off (invisible), conserves cursor type
Block cursor	ESC	1		Cursor type: inverted block
Block cursor, flashing	ESC	2		Cursor type: inverted block, flashing
Underline cursor	ESC	3		Cursor type: underline
Underline cursor, flashing	ESC	4		Cursor type: underline, flashing
Delete display image	ESC	E		Clear screen, cursor to top lleft hand position 1,1)
Delete line	ESC	l		Delete cursor pointed line
Delete line	ESC	M		Delete cursor pointed line, remaining image scrolls up
Delete to the end of line	ESC	K		Delete line from cursor position onward (incl.cursor position)
Delete to the end of page	ESC	J		Delete total image beyond cursor position (incl. cursor position)
Delete line up to cursor	ESC	o		Delete line up to cursor position
Delete image up to cursor position	ESC	d		Delete image up to cursor position
Delete character	ESC	P		Delete character at cursor position, move back remaining line
Insert blanks	ESC	@		Insert a blank at the place of cursor position
Insert new line	ESC	L		Insert blank line in place of actual line; cursor moves to the left
Set to inverted letter	ESC	p		Next images are shown inverted
Switch off inverted letters	ESC	q		Next images are shown standard
Display inverted	ESC	r		Inverse total display
Display standard	ESC	s		Standard display
Autom. line overflow on	ESC	v		Set cursor from right hand border automatic to the start of new line
Autom. line overflow off	ESC	w		Cursor stays at right hand border

Table 2: Commands in Terminal Mode

ELECTRONIC ASSEMBLY

COMMANDS IN GRAPHIC MODE

Keying in: "ESC" "ESC" "G" changes to Graphic Mode. Letters x and y in table 3 are used for input of coordinates, where the origin of coordinate (0,0) is situated in the left hand, top display corner.

Graphic mode								
Command	Codes						Description	
Clear display	D	L					Delete display	
Fill display	D	F					Fill display	
Invert display	D	I					Invert display	
Set graph mode	V	n1					n1: 1=set; 2=delete; 3=exor (dots, lines)	
Line pattern	F	x					Binary 16-bit form of line patterns	
Set dot size	Q	n1	n2				Set dot size n1=width, n2=height in dots	
Dot	P	x1	y1				Set dot to coordinates x1,y1	
Straight line	G	x1	y1	x2	y2		Draw straight line with act. dot size/ line pattern	
Straight line up to	T	x1	y1				Draw line from last stop to x1,y1	
Rectangular	K	x1	y1	x2	y2		Draw rectangular with act. dot size / line pattern	
Clear range	L	x1	y1	x2	y2		Delete a defined display area	
Fill range	E	x1	y1	x2	y2		Fill a defined display area	
Invert range	I	x1	y1	x2	y2		Invert a defined display area	
Copy range	C	x1	y1	x2	y2	x3	y3	Copy a defined area to x3, y3 (multiples of 8 only)
Box	B	x1	y1	x2	y2			Draw blank box with border (actual dot size)
Box with shadow	N	x1	y1	x2	y2	n1		Box with border + shadow at x2,y2 (n1=distance)
Set text mode	M	n1						n1: 1=set; 2=delete; 3=exor; 4=replace; 5=invert
ASCII- character	A	x1	y1	n1				Set sign n1 to pos. x1,y1 setzen
Character chain	Z	x1	y1	...	<cr>			Display a character chain (...); Carriage return= end
Rescue image	S	n1						Copy visible image to buffer n1 (1 <= n1 <= max.)
Get image	R	n1						Copy image from buffer memory n1 into visible image
Divert graphic transfer	J	n1						Divert into image buffer n1 (0= visible image)
Load range of image (upload)	U	x1	y1	Datei				Load a defined image area to x1,y1 (multiples of 8)
Save range of image (download)	O	x1	y1	x2	y2			Save image range via V.24 resp. RS485 (multipl. of 8)

Table 3: Commands in Graphic Mode

PARAMETER HANDOVER IN GRAPHIC MODE

Coordinates may be handed over in two ways:

- ASCII format: If commands are given in "CAPITAL LETTERS", the terminal expects values for coordinates (x,y,n) in numerals 0..9, separated by comma. Each command has to be closed either with semikolon or with return.

i.E. set point at coordinate 258,10: **P258,10;**

- Binary format: If commands are given in "small letters", the terminal expects binary values. Coordinates (x,y) must be transmitted as 16 bit binary values (low-byte first, followed by high-byte). Other parameters (n) must be transmitted as 8 bit binary values too, (insert no separating byte between coordinates and parameters). Commands don't need any closing byte.

i.E. set point at coordinate 258,10: **\$70 \$02 \$01 \$0A \$00**

COMMON COMMANDS FOR TERMINAL- AND GRAPHIC MODE

Several special commands are applicable in Graphic Mode as well as in Terminal Mode. Parameter handover follows the same capital/small-letter rules as described under Graphic Mode.

Common commands for terminal- and graphic mode						
Command	Codes					Description
Graphic mode	ESC	ESC	G			Change to graphic-mode, image remains on display
Terminal mode	ESC	ESC	T			Change to terminal-mode, image remains on display
Select font	ESC	ESC	F	n1	n2	n1:1-10 get font from Eprom n1:11-20 get upload Font n2: 0: 0°; 1: 90°; 2: 180°; 3: 270°; rotation
Upload font	ESC	ESC	U	n1	Datei	Load individual defined font Nr. n1=11-20
Font into upload area	ESC	ESC	Y	n1		Save actual font as an upload font n1: 11-20
Increase contrast	ESC	ESC	P			Increase display voltage for one step
Decrease contrast	ESC	ESC	M			Decrease display voltage for one step
Contrast default	ESC	ESC	Z			Set display voltage to default
Auto transmit on	ESC	ESC	E			Enable auto transmit of keyboard strokes
Auto transmit off	ESC	ESC	A			Disable auto transmit of Keyboard strokes
Query matrix keypad	ESC	ESC	B			Query actual status of matrix keypad
Select	ESC	ESC	S	n1		Select EA 9710 by adress n1 (n1=255: all)
Deselect	ESC	ESC	D	n1		Deselect EA 9710 by adress n1 (n1=255: all)
Pause	ESC	ESC	H	n1		n1: 1..255 x 0,1 seconds pause

Table 4: Common Commands for Terminal- and Graphic Mode

ADDRESSING SEVERAL EA 9710's ON A SINGLE INTERFACE

Commands "Select" and "Deselect" allow to address and operate several terminals connected to a single interface bus. The individual terminal address is stored in EPROM (27C1000) at address \$00AD. EPROM value \$FF (factory setting) can be reprogrammed any time to another value.

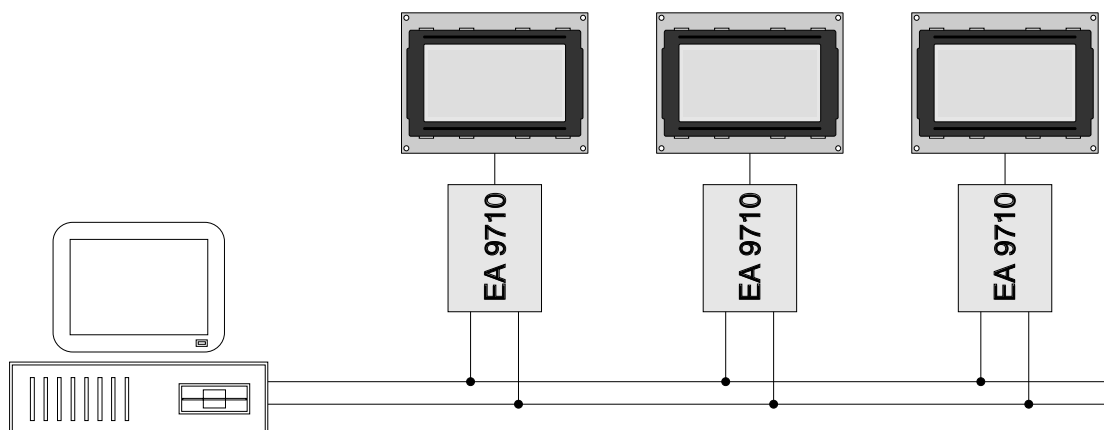


Figure 1

ELECTRONIC ASSEMBLY

BUILT IN CHARACTER SETS

Terminal is delivered with 6 different character sets, already installed. Up to 10 more character sets may be added by download.

Because of the fact, that character sets does not always content all characters from 0 to 255, table 5 shows the available characters. For instance the built in font No. 6, "BIG DIGITS", contents only numerals 0..9 and signs "-", "/", ".", ":".

All characters are available in Text- and in Graphic Mode. Listed graphmode coordinates references to the left hand top corner of the character.

Font	Size in pixels	ASCII- Range	Description
1	8 x 8	0..255	Extended ASCII-code
2	8 x 16	0..255	Extended ASCII-code
3	16 x 16	0..255	Extended ASCII-code
4	16 x 32	32..127	ASCII-code
5	32 x 56	32..63	Numbers, punctuation, ...
6	32 x 56	64..95	Capital letters
7	32 x 56	96..127	Small letters
8	56 x 80	45..58	Big numbers
9		n/a	
10		n/a	

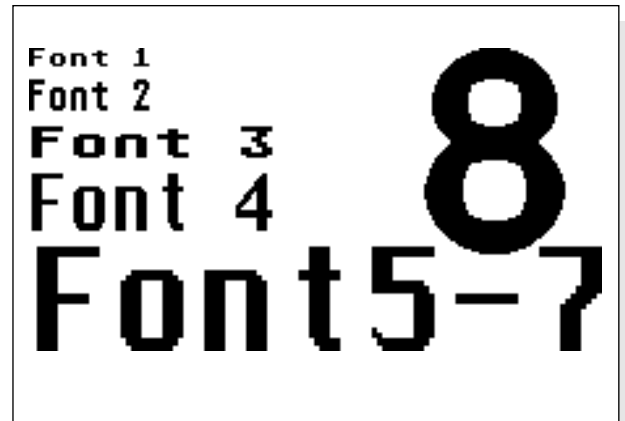


Table 5

Figure 2

EXAMPLE FOR DISPLAY CONTROL

To demonstrate, how a complete display readout is "programmed" with a few commands, an example is printed below. Figure 3 shows the result of this demoprogram. Applied for that was a ¼-VGA display with 320x240 dots resolution.

Command	Description	Result (Display)
ESC ESC F4,0 Z0,0, Temperatur	Font No. 4, Text on Coordinate 0,0	Temperatur
N4,120,300,220,8	Box with gray shadow on Coordinate (120,300)	
ESC ESC F8,0 Z40,130,25.4	Font No. 8, Text on Coordinate (40,130)	25.4
ESC ESC F4,1 Z8,198,Innen	Font No. 4, Text on Coordinate (8,198)	Innen
ESC ESC F3,0 Z264,130,°C	Font No. 3, Text on Coordinate (264,130)	°C
G160,40,160,105 G155,100,300,100	Line from (160,40) to (160,105)...	
G160,50,190,95 T220,45 T300,70	Line from (160,50) to (300,70)	
F255 G160,80,230,70 T250,30 T300,90	Line Pattern No. 255, Line from (160,80) to (300,90)	

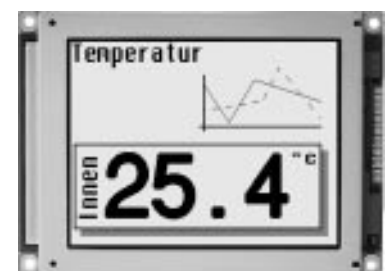


Figure 3

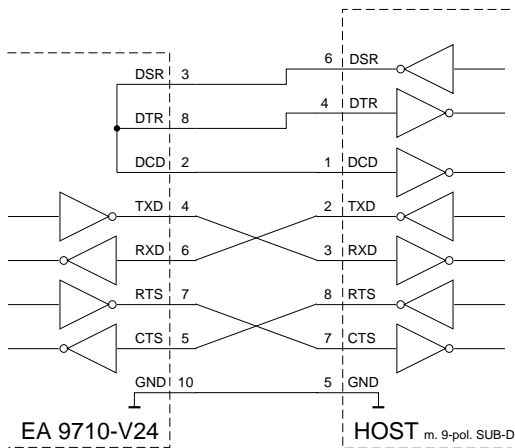
Table 6

CONNECTING EA 9710-V24

On board RS-232- drivers generate true RS-232 level with voltage amplitudes of approx. $\pm 10V$. This guarantees safe transmissions up to 57600 Baud, even on long lines (up to 15 meters). Communication parameters are set on DIP-switch A according to table 15 (see page 11)

Input Datas takes connector J2 on EA 9710-V24. Pinout can be seen in aside table. Connecting i.E. to a PC is particularly simple with cable EA KV24-9, which is available as an option. Using this cable enables direct (1:1) plug in of EA 9710-V24 into serial PC- ports (i.E. COM1, 9-pin SUB-D connector).

RS-232 connector J2			
Pin	Symbol	In/Out	Function
1	NC	-	n/c
2	DCD	-	Connected with pin 3 and pin 8
3	DSR	-	Connected with pin 2 and pin 8
4	TxD	Out	Transmit Data
5	CTS	In	Clear To Send
6	RxD	In	Receive Data
7	RTS	Out	Request To Send
8	DTR	-	Connected with pin 2 and pin 3
9	NC	-	n/c
10	GND	-	Ground



If cable EA KV24-9 is not used, proceed according to figure 4. In case, that wires for handshakes are not available, pins RTS and CTS must be bridged on EA 9710-V24. In this way EA 9710-V24 supports a special mode for software handshakes XON / XOFF.

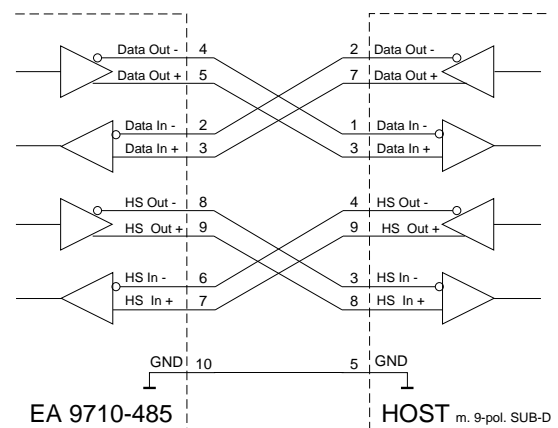
Figure 4

CONNECTING EA 9710-485

RS422 / RS485 connector J2		
Pin	Symbol	Function
1	NC	n/c
2	Data In -	Receive Data
3	Data In +	Receive Data
4	Data Out -	Transmit Data
5	Data Out +	Transmit Data
6	HS In -	Handshake
7	HS In +	Handshake
8	HS Out -	Handshake
9	HS Out +	Handshake
10	GND	0V, Ground

On board RS422 / 485- drivers are generating differential voltages with approx. $\pm 5V$ amplitudes. This guarantees an extremely safe transmission up to 57.600 Baud, even on very long lines (up to 1.200 meters). Communication parameters are set on DIP- switch A according to table 15.

Input Datas takes connector J2 on EA 9710-485. Pinout can be seen in aside table. Connecting i.E. to a PC is particularly simple with cable EA KV24-9, which is available as an option. Using this cable enables direct (1:1) plug in of EA 9710-V24 into serial PC- ports (i.E. COM1, 9-pin. SUB-D connector).



If cable EA KV24-9 is not used, proceed according to figure 5. In case, that wires for handshakes are not available, pins RTS and CTS must be bridged on EA 9710-485. In this case, EA 9710-485 supports a special mode for software handshakes XON / XOFF.

Figure 5

ELECTRONIC ASSEMBLY

CONNECTING EA 9710-BUS, CENTRONICS

Connector J3 is assigned for connection to Centronics interface. A 25-pin Centronics connector (male) can be crimped direct onto a flat type cable, and allows in this combination i.E. direct operation with PC.

It's also possible to operate the terminal directly via Centronics interface on a processor system bus. Hereby the input "Strobe" takes over the function of a low active "Enable". Data takeover happens at the L-H edge. On fast processor systems should be waited until pin "Busy" is on low level, before transfer new datas.

Centronics bus connector J3							
Pin	Symbol	Level	Function	Pin	Symbol	Level	Function
1	Strobe	L	Data transfer	2	NC	-	n/c
3	Data 0	H / L	Bit 0 LSB	4	VDD	H	+ 5V
5	Data 1	H / L	Bit 1	6	NC	-	n/c
7	Data 2	H / L	Bit 2	8	NC	-	n/c
9	Data 3	H / L	Bit 3	10	GND	L	0V Ground
11	Data 4	H / L	Bit 4	12	GND	L	0V Ground
13	Data 5	H / L	Bit 5	14	GND	L	0V Ground
15	Data 6	H / L	Bit 6	16	GND	L	0V Ground
17	Data 7	H / L	Bit 7 MSB	18	GND	L	0V Ground
19	Ack	L	Acknowledge	20	GND	L	0V Ground
21	Busy	H	In progress	22	GND	L	0V Ground
23	GND	L	0V Ground	24	GND	L	0V Ground
25	VDD	H	+ 5V	26	NC	-	n/c

Table 9

DISPLAY CONNECTION

On board are four rows solder terminals for direct connection (1:1 link) to most customary LCD-Graphic Modules.

Display connector J5			
Pin	Symbol	Level	Function
1	FLM	H/L	Frame Signal
2	LP	H/L	Data Latch Signal
3	CP	H/L	Data Shift Clock
4	M	H/L	Alternate Signal
5	VADJ	-	Contrast adjustment
6	VDD	H	Positive supply for electronic
7	VSS	L	Negative supply for electronic
8	VEE	-	Display voltage
9	D0	H/L	Display Data 0
10	D1	H/L	Display Data 1
11	D2	H/L	Display Data 2
12	D3	H/L	Display Data 3

Table 10

Display connector J6			
Pin	Symbol	Level	Function
1	FLM	H/L	Frame Signal
2	LP	H/L	Data Latch Signal
3	CP	H/L	Data Shift Clock
4	M	H/L	Alternate Signal
5	VADJ	-	Contrast adjustment
6	VDD	H	Positive supply for electronic
7	VSS	L	Negative supply for electronic
8	VEE	-	Display voltage
9	DU0	H/L	Display Data 0 (Upper)
10	DU1	H/L	Display Data 1 (Upper)
11	DU2	H/L	Display Data 2 (Upper)
12	DU3	H/L	Display Data 3 (Upper)
13	DL0	H/L	Display Data 0 (Lower)
14	DL1	H/L	Display Data 1 (Lower)
15	DL2	H/L	Display Data 2 (Lower)
16	DL3	H/L	Display Data 3 (Lower)

Table 11

Display connector J7 and J7-2			
Pin	Symbol	Level	Function
1	FLM	H/L	Frame Signal
2	LP	H/L	Data Latch Signal
3	CP	H/L	Data Shift Clock
4	DOFF	H	H: Display on (L:OFF)
5	VDD	H	Positive supply for electronic
6	VSS	L	Negative supply for electronic
7	VEE	-	Display voltage
8	DU0	H/L	Display Data 0 (Upper)
9	DU1	H/L	Display Data 1 (Upper)
10	DU2	H/L	Display Data 2 (Upper)
11	DU3	H/L	Display Data 3 (Upper)
12	DL0	H/L	Display Data 0 (Lower)
13	DL1	H/L	Display Data 1 (Lower)
14	DL2	H/L	Display Data 2 (Lower)
15	DL3	H/L	Display Data 3 (Lower)

Table 12

CONNECTING (MATRIX-) KEYPAD

Connector J4 allows connection to single keys or to Matrix- keypads with up to 8x8 keys. The contact bouncing is eliminated by software. Please take into consideration, that this keypad functions are supported by version RS-232 and version RS 485 only.

Keys are connected to input- and output gates, where each input gate is shunted by a 100kΩ pullup resistor. Up to 8 keys may be connected to a single output gate.

In order to recognize fast double keystrokes, the output gates have to be decoupled. Best way to achieve that is using Schottky- Diodes (i.E. BAT 43).

On multiple keystrokes (>2) each individual key must be decoupled by separate diode.

Matrix - Keypad connector J4					
Pin	Symbol	Function	Pin	Symbol	Function
1	GND	0V Ground	2	VDD	+ 5V
3	OUT 1	output line 1	4	OUT 2	output line 2
5	OUT 3	output line 3	6	OUT 4	output line 4
7	OUT 5	output line 5	8	OUT 6	output line 6
9	OUT 7	output line 6	10	OUT 8	output line 8
11	IN 1	input column 1	12	IN 2	input column 2
13	IN 3	input column 3	14	IN 4	input column 4
15	IN 5	input column 5	16	IN 6	input column 6
17	IN 7	input column 7	18	IN 8	input column 8
19	GND	0V Ground	20	VDD	+ 5V

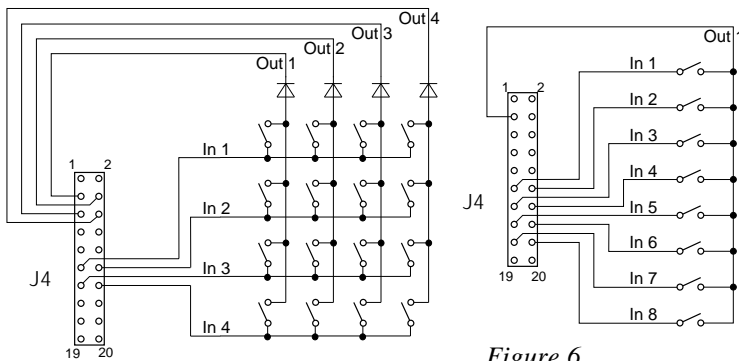


Figure 6

Transmitting keystrokes

After the terminal is switched on, all keystrokes will be stored. For automatic transmitting of each change on input gates, the command "automatic transmission on" (ESC ESC E) must be given. It's also possible, to query the actual status of keystrokes by commands: ESC ESC B. This makes sense, especially when several terminals operate on one line, it prevents a datacrash when single terminals are transmitting arbitrary.

Identifications

In order to distinguish transmitted datas (Matrix, MF-102) from each other, an ASCII-character 'm' will be sent first via the RS-232/RS485 interface to identify the Matrix keypad. Than, the keystroke numbers follow in binary format, finally followed by a closing byte (binary: 0). On each change, pressing and releasing a key, all key strokes will be still transmitted. The number of an individual key can be evaluated:

Number of key = (output -1) * 8 + input, output and input must be a number between 1 and 8.

CONNECTING AT-KEYBOARD (MF-102)

An AT-keyboard can be connected to connector J3. Please be aware, that keyboard functions are supported by versions RS-232 and RS 485 only.

Received MF-102 keyboard datas are buffered in terminal memory and will be transferred via RS-232/RS485 interface. The output starts only after command "Auto Transmit On" is given. When operating several terminals on one line, its advisable to give immediate after data

MF-102 Keyboard connector J3					
Pin	Symbol	Function	Pin	Symbol	Function
1	CLK	Clock line	2	-	n/a
3	DATA	Data line	4	VDD	+ 5V
5	-	n/a	6	-	n/a
7	-	n/a	8	-	n/a
9	-	n/a	10	GND	0V Ground

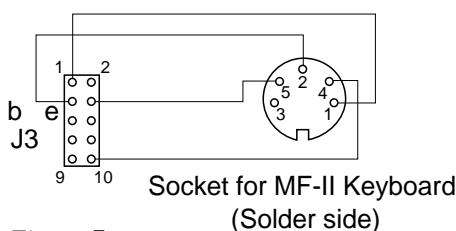


Figure 7

receiving the command "Automatisch senden aus" to prevent datacrashes when single terminals are transmitting arbitrary. No conversion (i.E.) to ASCII-characters takes place, therefore various on market available keyboards can be used. An identification string, like it's usual on matrix- keypads, won't be issued.

RS-232 / RS 485 DATA TRANSMITTING

V.24 / RS 485 Parameter									
DIP A									
1	2	3	4	5	6	7	8	Description	
On	On	On						7 data bits, 1 stop bit, no parity	
Off	On	On						7 data bits, 2 stop bits, no parity	
On		On	P					7 data bits, 1 stop bit, parity	
Off	Off	On	P					7 data bits, 2 stop bits, parity	
On	On							8 data bits, 1 stop bit, no parity	
Off	On							8 data bits, 2 stop bits, no parity	
On			P					8 data bits, 1 stop bit, parity	
Off	Off		P					8 data bits, 2 stop bits, parity	
			On	On	On	H	H	57600 Baud	
			On	On	H	H	H	28800 Baud	
			On	On	H	H	H	19200 Baud	
			On	H	H	H	H	9600 Baud	
			On	On	H	H	H	4800 Baud	
			On	H	H	H	H	2400 Baud	
			On	H	H	H	H	1200 Baud	
			Off	Off	Off	H	H	300 Baud	
			P					P= On: even parity	
			P					P= Off: odd parity	
						H	H	H= On: operation without handshake	
						H	H	H= Off: operation with handshake	

DIP-switch A allows presetting of all customary transmission parameters up to 57 600 Baud. Voltage level correspond to RS 232C Standard (approx. ±10V with EA 9710-V24), respectively RS 485 (EA 9710-485).

This Terminal is equipped with an integrated 2 kByte buffer for commands. Before the buffer is filled totally, an overflow warning is shown in time to the transmitter via RTS line. If a transmission without handshake is choosed, the overflow warning is given by XON and XOFF codes (software handshake). However, this software handshake is active only, when the command "Auto Transmit On" was given before.

Table 15

EA 9710

DIMENSIONS, POSITION OF CONNECTORS AND DIP- SWITCHES

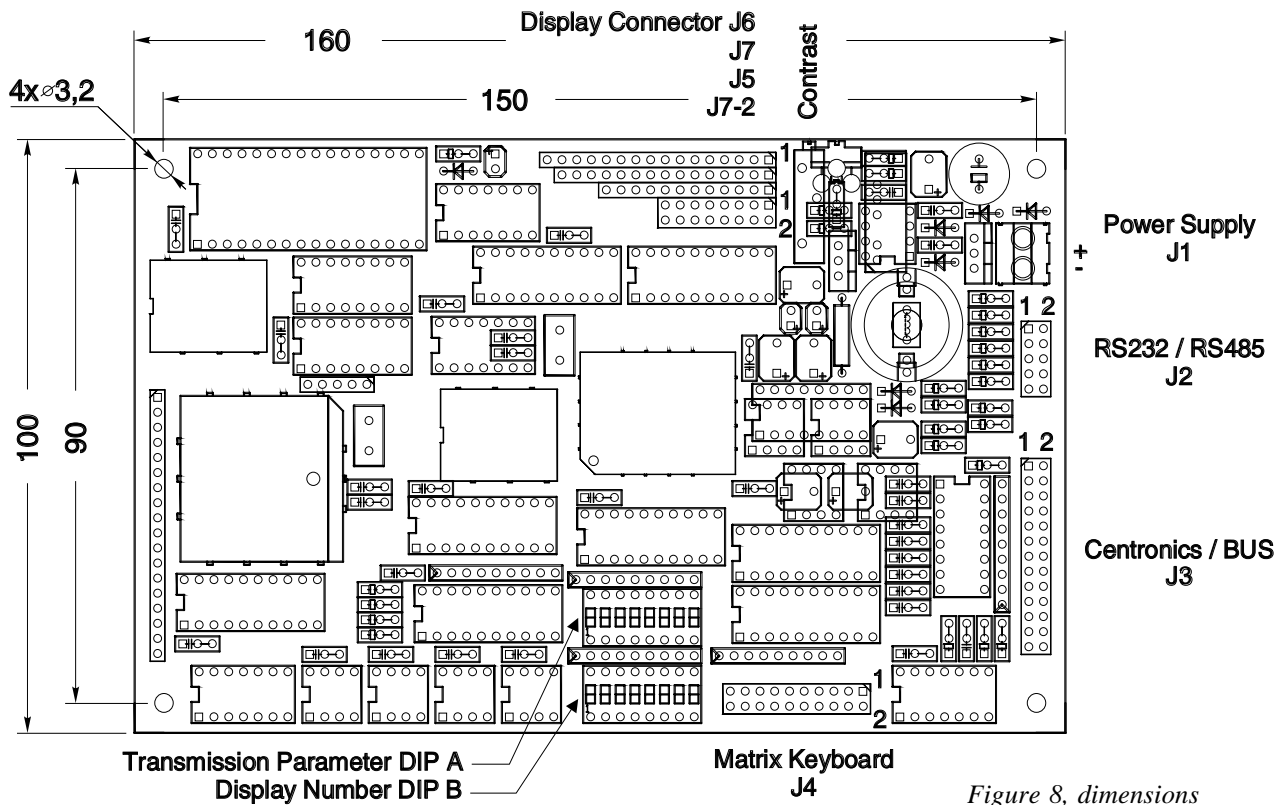


Figure 8, dimensions

SOLDER BRIDGES

In order to adapt EA 9710 to various hardware configurations, several bridging strips are placed at the solder surface of the board. This solder bridges are presetted by factory. Therefore no change should be made normally. In case, that that bridges must be altered for special purposes, we ask you to contact us.

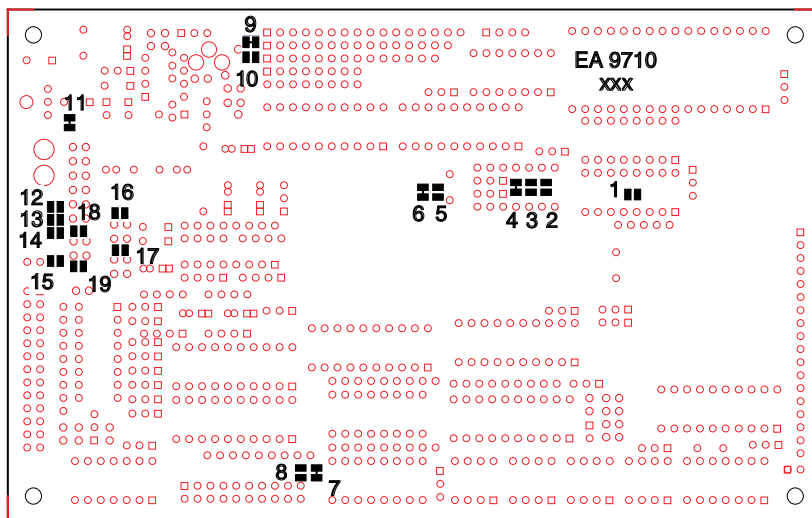


Figure 9 view of solder surface

Bridge	Function	Description
1	MF102	Closed bridge for an AT-Keyboard on modules EA 9710- V24 , EA 9710-485. Open bridge for EA 9710-BUS !!
2	4,6 MHz	Generates an external pixel clock frequency for graphic controller.
3	9,2 MHz	Must be set individually according to display model.
4	2,3 MHz	Only one closed solder bridge is allowed.
5	ext. / 2 (int.)	Driving the graphic controller with an external pixel frequency: clock rate may be divided, respectively a board owned oscillator can be added onto graphic controller board.
6	ext.	
7	Pullup	All inputs for a matrix keypad are on 100 kOhm pullup resistors. They may be reconnected for pulldown operation, but have no software support.
8	Pulldown	
9	Vadj = Vee	A separate input (Vadj) for contrast adjustment is available at some displays. Standard connection on controller board EA 9710 is to Vee. When necessary, Vadj may be connected to +5V.
10	Vadj = +5V	
11	opt. Regler	For an onboard 5V-voltage regulator: this bridge must be open.
12	+5V an J2	+5V may be applied to pin 1 of connector J2.
13	DCD - DSR	Often needed connections on V.24 / RS 232 interfaces (see figure 4, connecting EA 9710-V24) are easy to make with this solder bridges.
14	DCD - DTR	
15	RTS - CTS	
16 - 19	RV für V.24	Protection resistors in V.24/ RS232 lines can be bridged here.

Table 16