



Serie PCD7.D23x Graphic Terminals

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0.1 Document History

Date	Version	Changes	Remarks
2003-04-28	EN01	-	Published Edition
2003-06-30	EN02	-	Chap. 4.1-4.3, new, add., corr.
2003-10-15	EN03	-	Chap. 2, colours free cable ends
2004-03-31	EN04	-	Chap. 1, page 1-5, 1-12, Add. of D231 and D232
2004-05-01	EN05	-	Chap. 3, Communication
2005-02-25	EN06	-	Chap. 2 and chap. 4 corr.
2005-04-01	EN07	-	Corrections in all chapters
2009-09-28	EN08	-	Error in 2.4.2 Picture «Connection in RS-485»
2009-12-02			4.1.3 new Grammatical corrections in Ch04, Ch05 and Ch0A
2010-04-08	EN09	-	Chapter 2.3: PCD7.K413 -> D-Sub connector
2013-10-14	EN10	-	New logo and new company name

0.2 About this manual

See the section in the appendix in relation to some of the terms, abbreviations and the references used in this manual.

0.3 Brands and trademarks

Saia PCD® and Saia PG5® are registered trademarks of Saia-Burgess Controls AG.

Technical modifications are based on the current state-of-the-art technology.

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Published in Switzerland

1 Quickstart

1.1 Introduction

1

This manual covers the technical aspects of the PCD7.D23x graphic terminals.

The aim of the Quickstart chapter is to talk about the essentials regarding the use and installation aspects of PCD7.D23x components. We are talking about:

- How to use the terminals
 - as [remote displays for PCS1](#)
 - as [remote displays for the whole Saia PCD® range](#)
 - in a [special configuration with RS-485 and RS-422 Free Terminal Protocol](#)
- How to configure the terminals with the HMI-Editor
- [Power supply](#)
- [The communication connector](#)
- [Dimensions](#)

Details about the

- [Hardware](#)
- [Communication](#)
- [Software](#)
- [Handling](#) and
- [Maintenance](#)

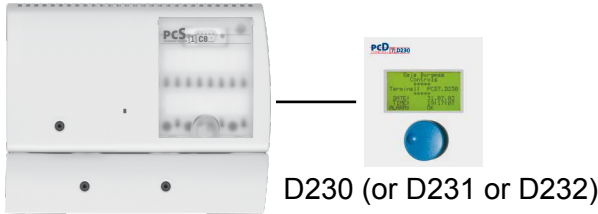
can be found in separate chapters. The [appendix](#) covers more general topics like information about the [icons](#) we used, character maps and so on.

1.2 Use of the PCD7.D230, D231 and D232 terminals as remote displays for PCS1

1.2.1 Configuration with one terminal as remote display

1

Valid for: PCS1.C822, C823, C882, C883 (without integrated display)
A - Basic equipment with RS-232 interface



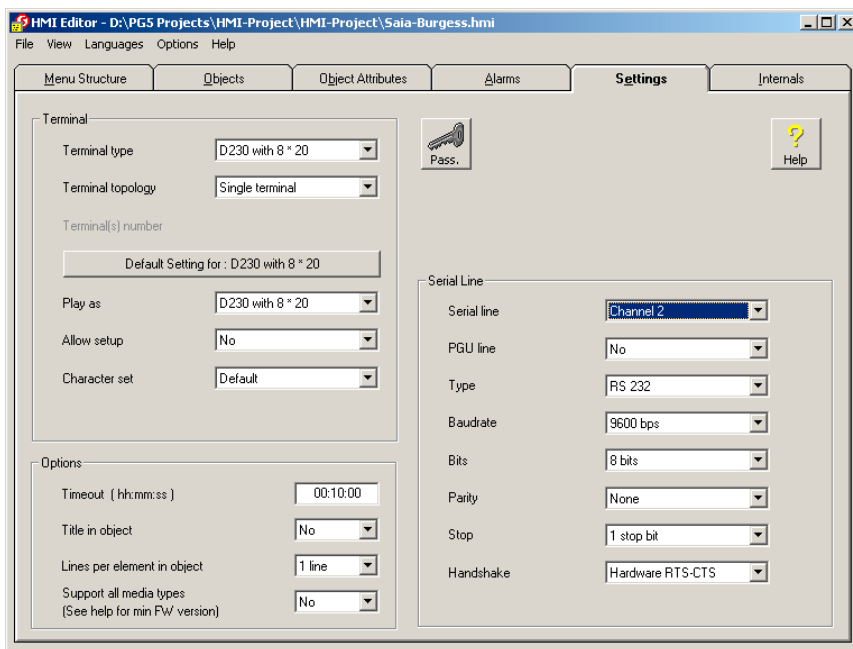
- Use the port 2 (with or without Handshake) of the terminal block X3
 OR
- use the port 1 (with or without Handshake) of the terminal block X4

PCD7.D23x setup (recommended):
 (see also chapter 3)

Baudrate: 9600 or 19200 bps
 Serial mode: RS-232 RTS/CTS

Use of HMI-Editor V 1.3 (recommended):

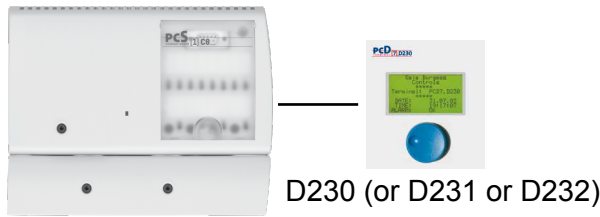
Terminal type: D230 with 8 × 20 (or D231 or D232)
 Terminal topology: single terminal
 Serial line: 2 or respectively 1
 Type of serial line: RS-232
 Baudrate: 9600 or 19200 bps
 Handshake: RTS/CTS



Hardware connection:

Connection cable (length: 2.5 m) between PCS1 and PCD7.D23x: PCD7.K423

B - Extra PCD7.F110 interface for RS-422



- RS-422: use the port 1 of the terminal block X4

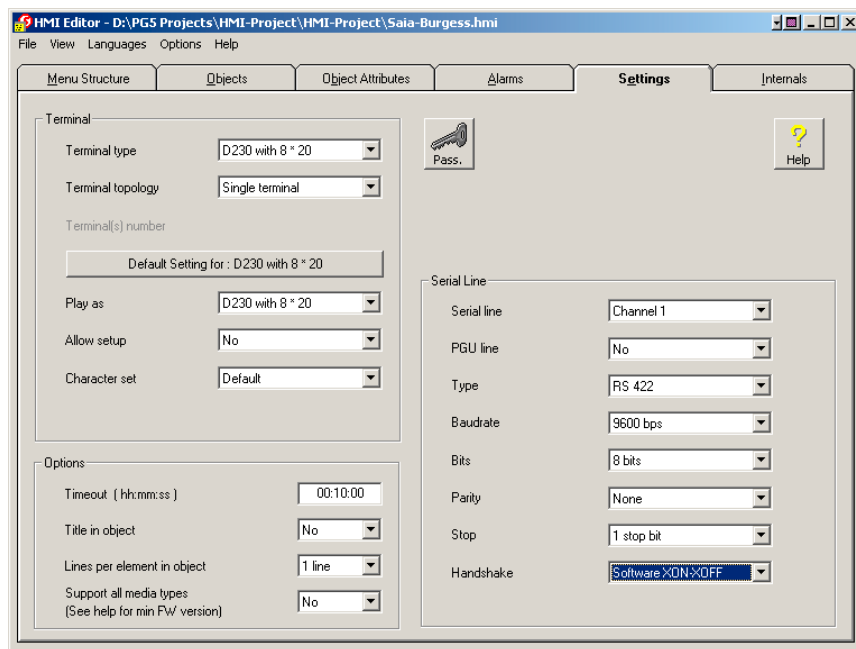
1

PCD7.D23x setup (recommended):
(see also chapter 3)

Baudrate: 9600 or 19200 bps
Serial mode: RS-422 XON/XOFF - [or XON/XOFF(R)]*

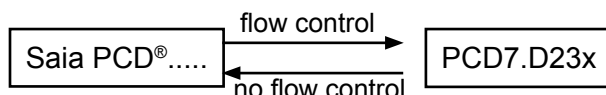
Use of HMI-Editor V 1.3 (recommended):

Terminal type: D230 with 8 × 20 (or D231 or D232)
Terminal topology: single terminal
Serial line: 1
Type of serial line: RS-422
Baudrate: 9600 or 19200 bps
Handshake: Software XON/XOFF



Connection diagram: see chapter 2.4

- * The reduced XON/XOFF mode is a save, non locking, XON/XOFF mode with the PCD7.D23x always responding. If using XON/XOFF, it is recommended to use this reduced mode, especially if you notice that after some time of use you have to switch the power off and on again to get the PCD7.D23x responding again. In this mode, the traffic from the Saia PCD® to the PCD7.D23x is supervised by flow control, in the other direction, from the PCD7.D23x to the Saia PCD®, there is no flow control

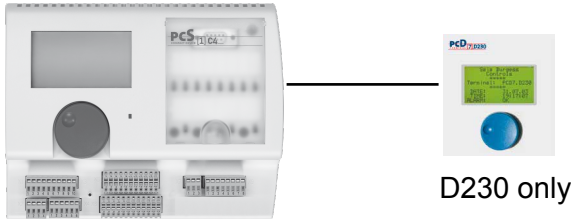


1.2.2 Configuration with one terminal as second display for PCS1

Valid for: PCS1.C820, C821, C880, C881 (with integrated display)

1

A - Extra PCD7.F120 interface for RS-232



The integrated display is connected physically on the port 2.

- Use the port 1 (with or without Handshake) of the terminal block X4.



Don't use the port 2 of the terminal X3 (reserved for internal display)4.

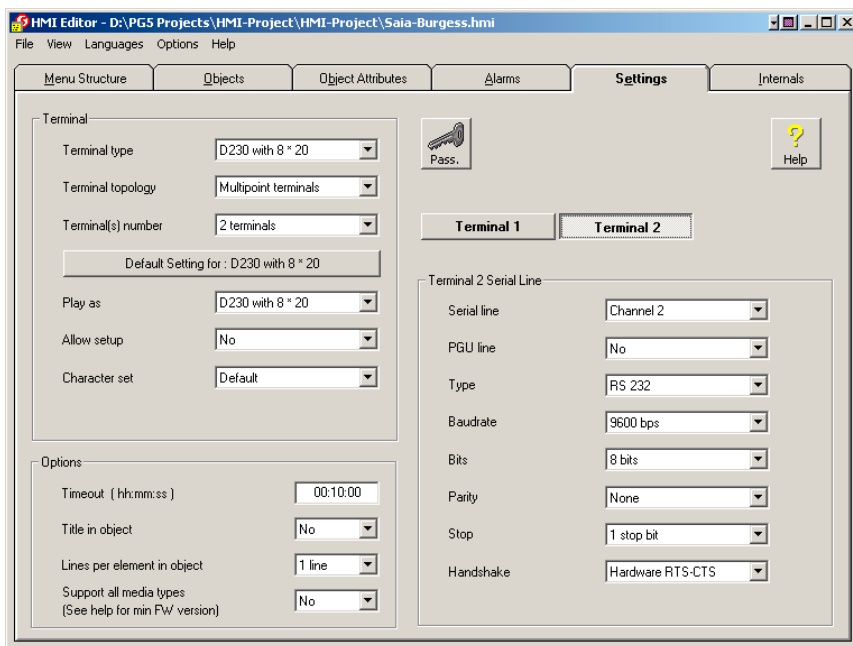
PCD7.D230 setup (recommended):

(see also chapter 3)

Baudrate: 9600 bps
 Serial mode: RS-232 RTS/CTS

Use of HMI-Editor V 1.3 (recommended):

Terminal type: D230 with 8 × 20 (only)
 Terminal topology: Multipoint terminals
 Number of channels: 2
 Serial line: 2 (internal display) and 1 (PCD7.D230)
 Type of serial line: RS-232
 Baudrate: 9600 bps
 Handshake: RTS/CTS



Hardware connection:

Connection cable (length: 2.5 m) between PCS1 and PCD7.D230: PCD7.K423

1.2.3 Configuration with two or more PCD7.D230, D231 and D232 terminals as remote displays for PCS1 (mixing not possible)

Valid for: PCS1.C822, C823, C882, C883 (without integrated display)

1

A - Basic equipment with RS-232 interface + Extra PCD7.F120 interface for RS-232



Configuration with 2 PCD7.D230 terminals (or 2 D231 or 2 D232)

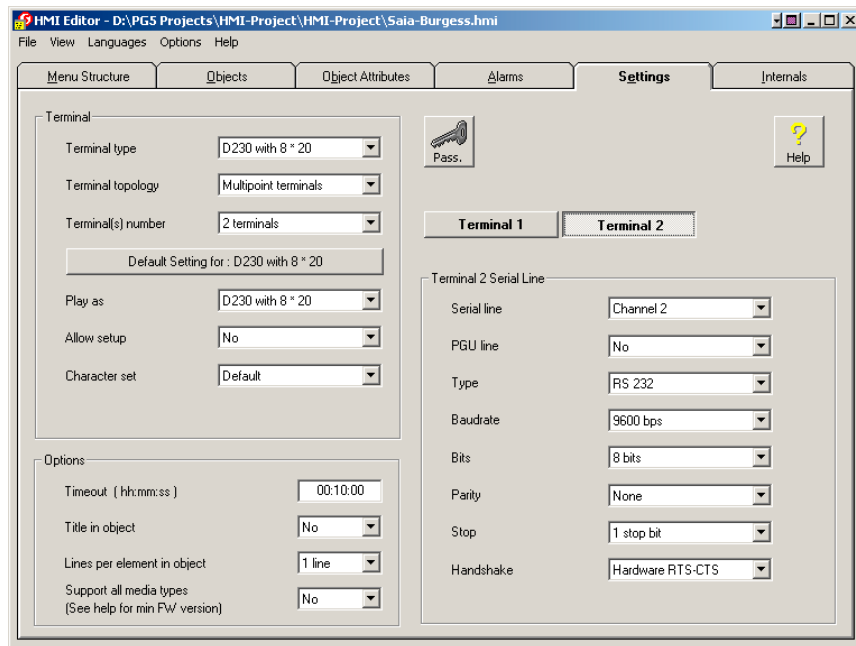
- Use the port 2 (with or without Handshake) of the terminal block X3
- Use the port 1 (with or without Handshake) of the terminal block X4

PCD7.D23x setup (recommended):
(see also chapter 3)

Baudrate: 9600 bps
Serial mode: RS-232 RTS/CTS

Use of HMI-Editor V 1.3 (recommended):

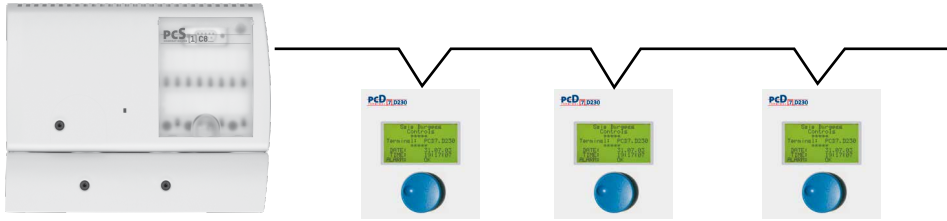
Terminal type: D230 with 8 × 20 (or D231 or D232)
Terminal topology: Multipoints terminal
Number of channels: 2
Serial line: 2 and 1 corresponding to the terminal 1 and 2
Type of serial line: RS-232
Baudrate: 9600 bps
Handshake: RTS/CTS



Hardware connection:

Connection cable (length: 2.5 m) between PCS1 and PCD7.D23x: PCD7.K423

B - Extra PCD7.F110 interface for RS-485



1

Configuration with 3 PCD7.D230 or 3 D231 or 3 D232

- Use the port 1 of the terminal block X4

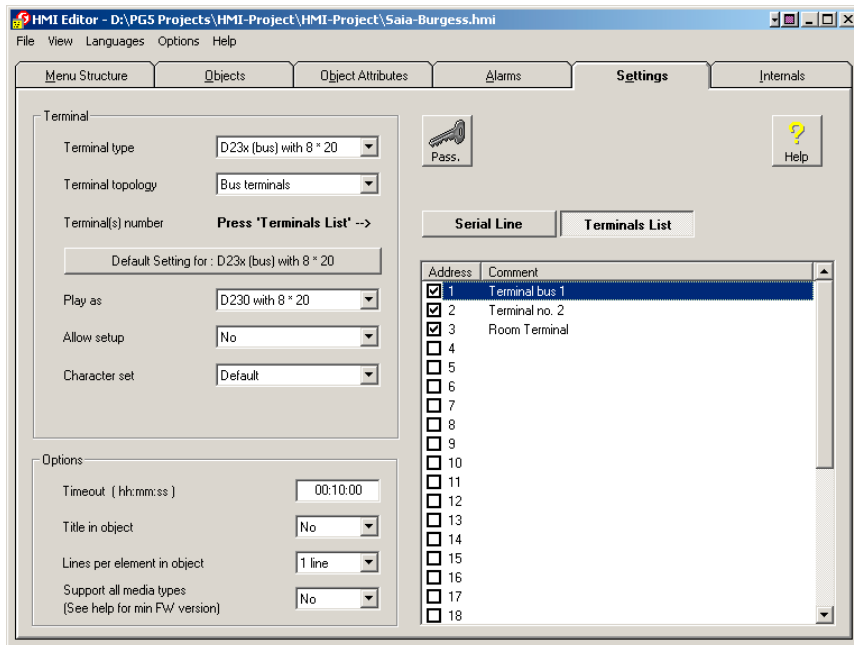
PCD7.D23x setup (recommended):

(see also chapter 3)

Baudrate: 9600 or 19200 bps
 Serial mode: RS-485 FTP
 Addresses: same number of different addresses as number of terminals: from 01 to 31

Use of HMI-Editor V 1.3 (recommended):

Select the terminal: D230 with 8 × 20 (or D231 or D232)
 Terminal topology: terminal bus
 Terminal number: xx terminals
 Terminal list: number 1, 2, 3,...31 corresponding to the identification number (address) of each terminals.
 Serial line: 1
 Type of serial line: RS-485
 Baudrate: 9600 or 19200 bps
 Handshake: None



Connection diagram: see chapter 2.4

For further details see the manual “HMI-Editor” 26/768.



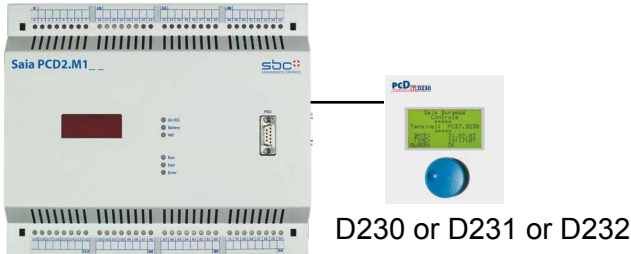
General restriction: Don't use the PGU port of the PCS1 as RS-232 serial port because it is reserved for Modem!!!

1.3 Use of the PCD7.D230, D231 or D232 as remote displays for the Saia PCD® range

1.3.1 Configuration for one terminal

1

A - with RS-232



- Use one port RS-232 (with Handshake)

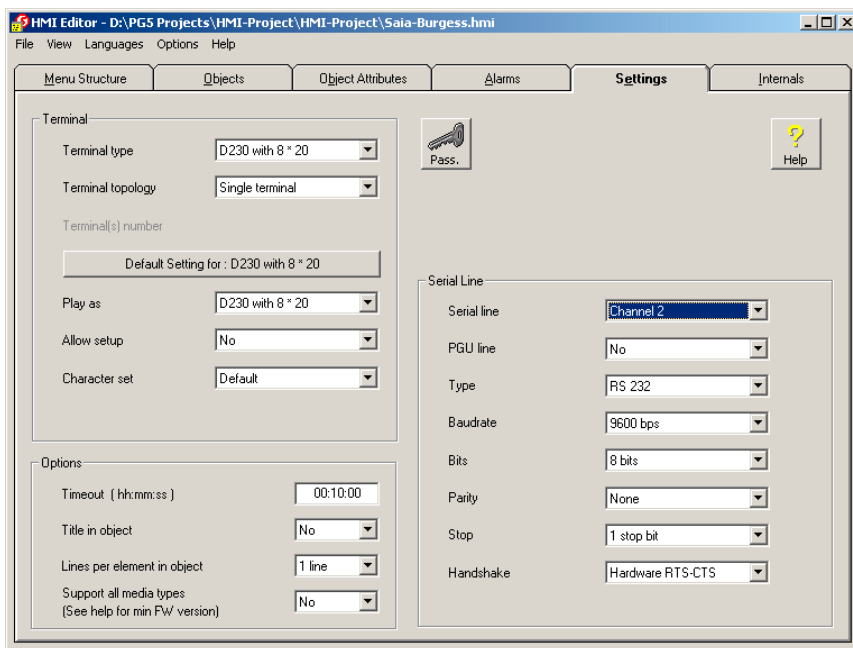
PCD7.D23x setup (recommended):
(see also chapter 3)

Baudrate: 9600 or 19200 bps
Serial mode: RS-232 RTS/CTS

Use of HMI-Editor V 1.3 (recommended):

Terminal type: D230 with 8 × 20 (or D231 or D232)
Terminal topology: single terminal
Serial line: xx (port number)*
Type of serial line: RS-232
Baudrate: 9600 or 19200 bps
Handshake: RTS/CTS

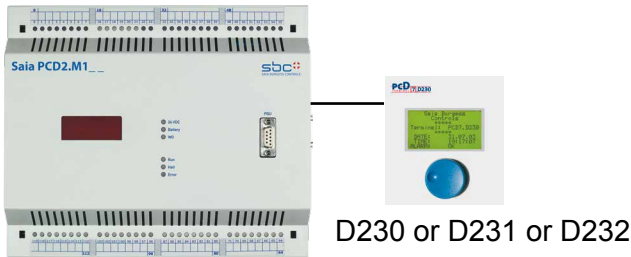
*You can use the PGU port as RS-232 serial line. In this case, select PGU line: Yes.



Hardware connection:

Connection cable length: 2.5 m, between Saia PCD® and PCD7.D23x: PCD7.K423

B - with RS-422



1

- Use one port RS-422

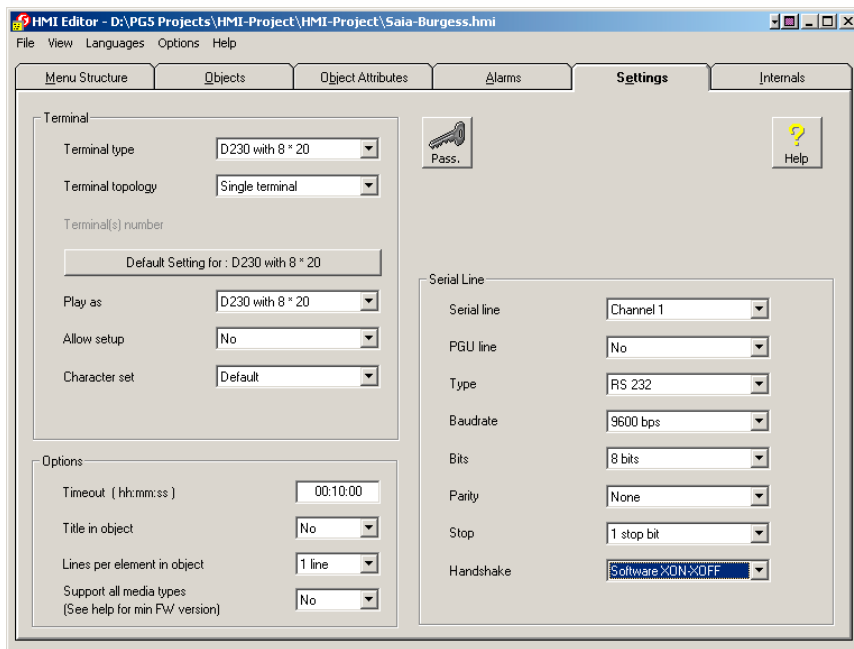
PCD7.D23x setup (recommended):

(see also chapter 3)

Baudrate: 9600 or 19200 bps
 Serial mode: RS-422 XON/XOFF-[or XON/XOFF(R)]*

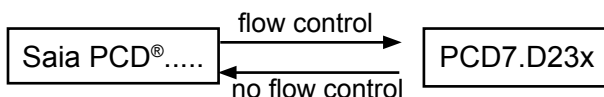
Use of HMI-Editor V 1.3 (recommended):

Terminal type: D230 with 8 × 20 (or D231 or D232)
 Terminal topology: single terminal
 Serial line: xx (port number)
 Type of serial line: RS-422
 Baudrate: 9600 or 19200 bps
 Handshake: XON/XOFF



Connection diagram: see chapter 2.4

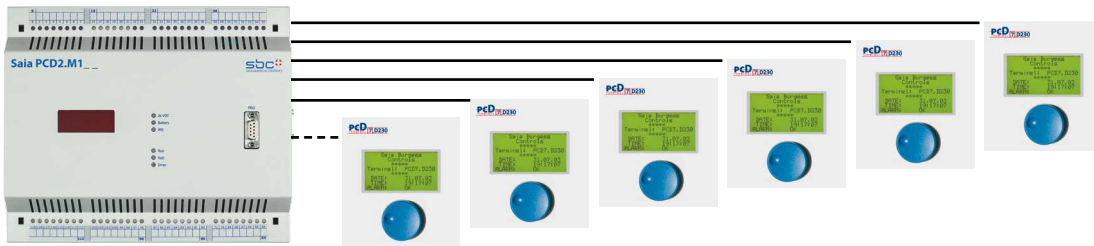
- * The reduced XON/XOFF mode is a save, non locking, XON/XOFF mode with the PCD7.D23x always responding. If using XON/XOFF, it is recommended to use this reduced mode, especially if you notice that after some time of use you have to switch the power off and on again to get the PCD7.D23x responding again. In this mode, the traffic from the Saia PCD® to the PCD7.D23x is supervised by flow control, in the other direction, from the PCD7.D23x to the Saia PCD®, there is no flow control



1.3.2 Configuration for several terminals (mixing is not possible)

A - with several RS-232 ports (with or without RTS/CTS)

1



Configuration with 6 PCD7.D230 or 6 D231 or 6D232

- Up to 6 × RS-232 ports according to the types of Saia PCD®.

PCD7.D23x setup (recommended):

(see also chapter 3)

Same Baudrate and serial mode for all terminals

Baudrate: 9600 or 19200 bps

Serial mode: RS-232 with RTS/CTS or without RTS/CTS depending of the number of RS-232 interfaces with full control that you can connect to your Saia PCD®.

Use of HMI-Editor V 1.3 (recommended):

Terminal type: D230 with 8 × 20 (or D231 or D232)

Terminal topology: Multipoint terminal

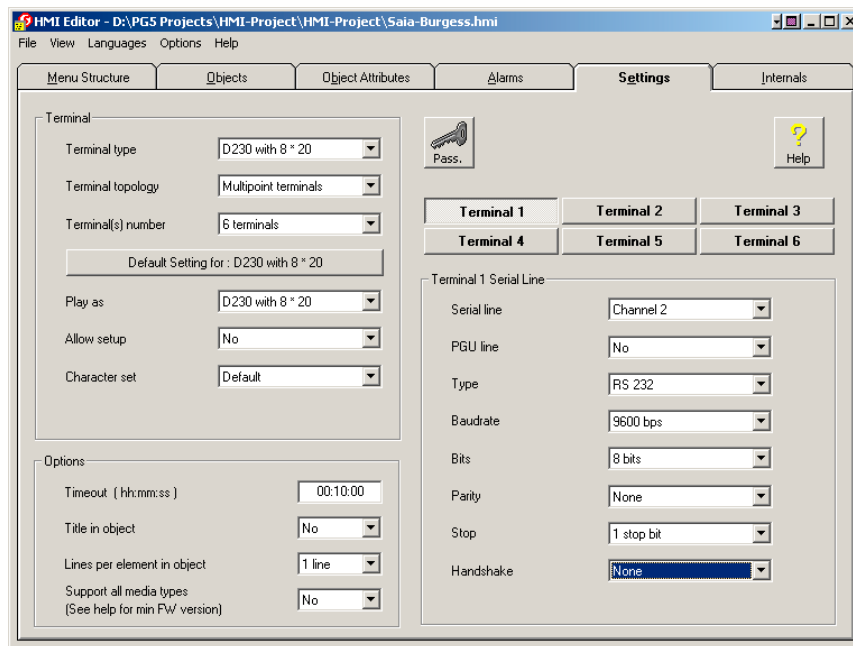
Number of channels: xx (up to 6)

Serial line: 1 to 6 corresponding to the number of terminals.

Type of serial line: RS-232

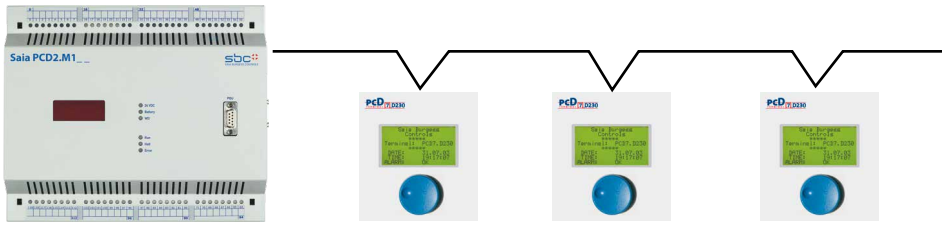
Baudrate: 9600 or 19200 bps

Handshake: RTS/CTS or None



Hardware connection (recommended): Connection cable (length: 2.5 m) between Saia PCD® and PCD7.D23x: PCD7.K423 (with RTS/CTS)
 Connection cable (length: 2.5 m) between Saia PCD® and PCD7.D23x: PCD7.K422 (without RTS/CTS)

B - with one RS-485 port



1

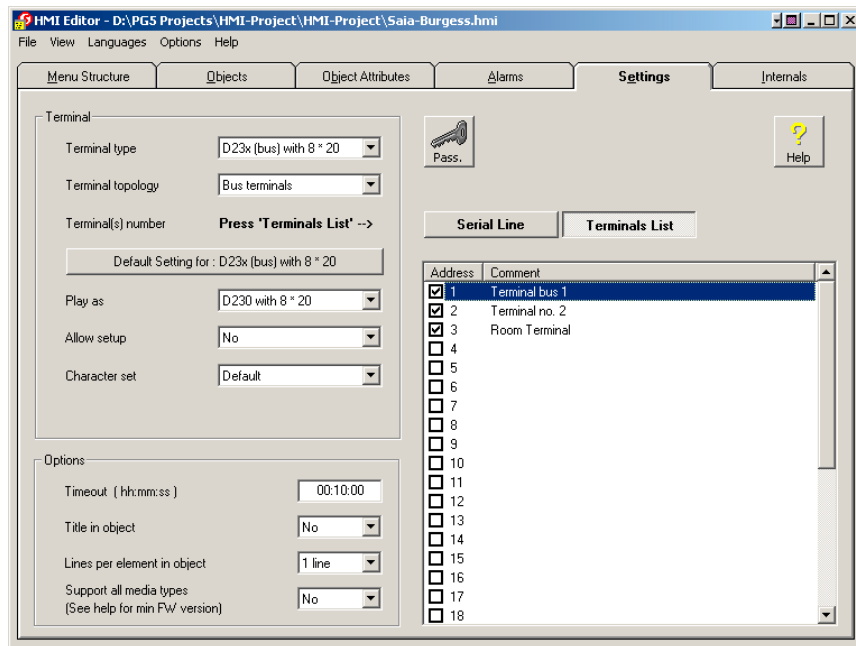
Up to 31 PCD7.D230 or D231 or D232 terminals can be connected to one RS-485 port.

PCD7.D23x setup (recommended):
(see also chapter 3)

Baudrate: 9600 bps
 Serial mode: RS-485 FTP
 Addresses: same number of different addresses
 as number of terminals: from 01 to 31

Use of HMI-Editor V 1.3 (recommended):

Select the terminal: D230 with 8 × 20 (or D231 or D232)
 Terminal topology: bus
 Terminal number: xx terminals
 Terminal list: number 1, 2, 3...31 corresponding to the identification
 number (address) of each terminal.
 Serial line: 1
 Type of serial line: RS-485
 Baudrate: 9600 bps
 Handshake: None



Connection diagram: see chapter 2.4

For further detail see the manual “HMI-Editor” 26/768.

1.4 Special configuration with several terminals with RS-422 Free Terminal Protocol (Multi Drop) (mixing is not possible)

1

Available for PCS1 without display and all the range of Saia PCD®.

This mode allows the connection of several terminals on one RS-422 port. In this case, only one terminal is active (sender and receiver) and the other are passive (Read only).

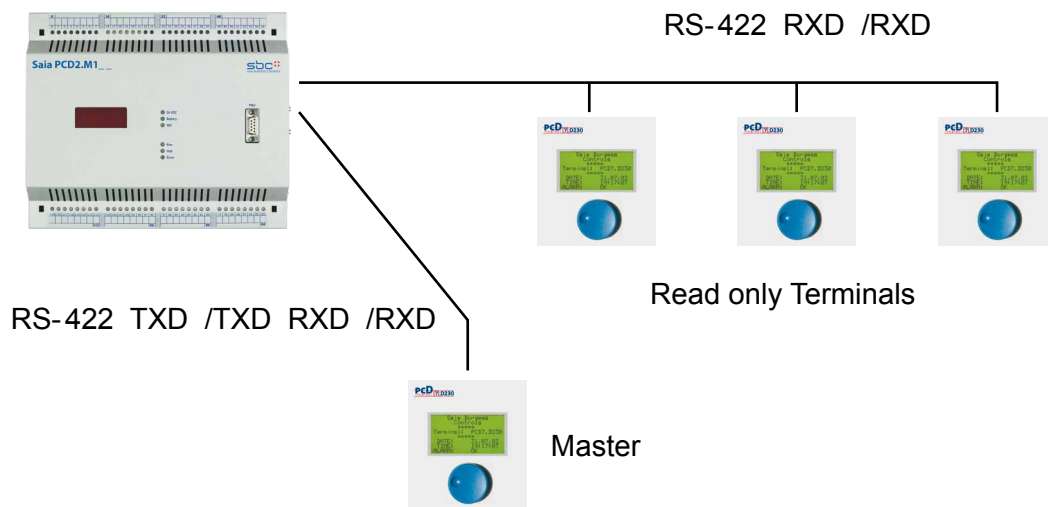
PCD7.D23x setup:

Baudrate: up to 19200 bps
 Serial mode: RS-422 Free Terminal Protocol (Multi Drop)
 Addresses: Same address for all terminals

Only the terminal with the full connections TXD /TXD and RXD /RXD is full active (single knob and display). The other terminals with the connections RXD /RXD work only as displays.

Advantages:

- just one terminal is full master.
- Other terminals have a short refresh time.



Use of HMI-Editor V 1.3 (recommended):

Select the terminal: D230 with 8 × 20 (or D231 or D232)
 Terminal topology: bus
 Terminal number: xx terminals
 Terminal list: just one address (the same as the terminals address)
 Serial line: 1
 Type of serial line: RS-422
 Baudrate: up to 19200 bps
 Handshake: None

Connection diagram: see chapter 2.4

1.5 Power supply

Connection type	Connector J2 pin no.
24 VDC	1
GND	2
PGND	3

24 VDC +30% /-20%
 or
 19 VAC ±15% full-wave rectified
 Power consumption: 200 mA on 24 VDC



Power supply via plug-in spring connector for wires of max 1,5 mm².

1.6 Communication connector, D-Sub 9 pole

Standard D-Sub 9 pole:

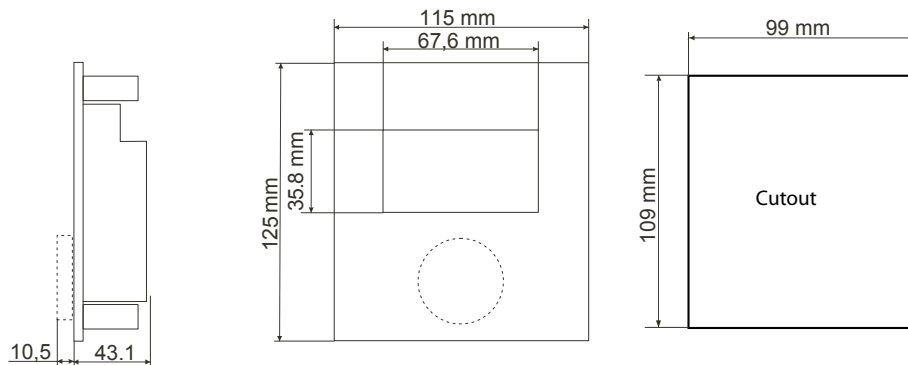
- | | |
|----------------------------|--|
| Pin 1: RXD_422 | Pin 6: /RXD_422 |
| Pin 2: TxD_232 | Pin 7: CTS_232 |
| Pin 3: RxD_232 | Pin 8: RTS_232 |
| Pin 4: TXD_422 / TX-RX_485 | Pin 9: /TXD_422 / /TX-/RX_485 |
| Pin 5: SGND | <i>Metal support connected to PGND</i> |

5 4 3 2 1



9 8 7 6

1.7 Dimensions



2 Hardware-System Overview

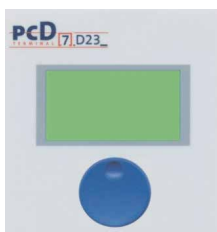
2.1 Function

The new range of PCD7.D230, D231 and D232 terminals are remote graphic displays for the Saia PCS1 and the whole Saia PCD® range.

They have been developed for building automation and industrial applications. In combination with the HMI-Editor, an add-on tool of the Saia PG5® programming package, they provide a simple way of implementing menu-driven user interface.

This new range consists of three different graphic displays:

PCD7.D230 easy to use! like a mouse.



The single-knob control has “turn” and “press” functions which can be used to select submenu structures and different process parameters.

PCD7.D231 with large keys



10 function keys allow to control a lot of processes, the auto-repeat function with 2 speeds allows to increment and decrement a value easily.

PCD7.D232 with numeric keyboard and LED indication



8 function keys, 1 numeric keyboard, 8 LEDs allow to control, enter values and control a process.

All terminals, with backlighting, have a resolution of 128 × 64 pixel and can therefore be used for high quality representation too:

- in plain text (8 lines × 20 characters) such as temperature, pressure, unit numbers, date, time, etc., and messages about operating states and alarms
- in graphic mode (with the HMI-Editor only) to display graphic symbols, bargraphs...

In the basic equipment, the terminal offers RS-232, RS-422 and RS-485 interfaces, which allows a broad range of configurations.

Customising

A polyester foil with the type and the Saia Burgess Controls logo covers the whole front side.

Upon request:

- Special labelling is available on request
- Special design (own logo) can be realized and placed on the front-panel.

Both solutions are available for small quantities (minimum order 100 pieces and minimum delivery 25 pieces) by extra charges.

- Neutral versions (Z11) without SBC logo and type is also available

Hardware improvement between current PCD7.D230 and the new ones

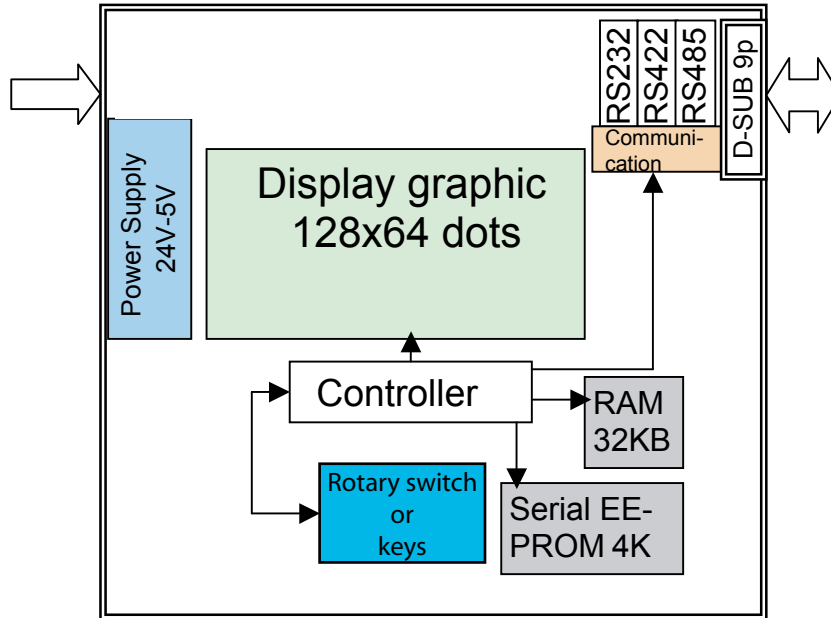
- Better visibility (transparent plastic instead of plastic film on front)
- Frame around the front side (front dimensions 115 mm × 125 mm)
- Logo and SBC reference more discreet on front
- Buzzer

2.2 Technical Data PCD7.D230, D231 and D232

Type designation	PCD7.D230	PCD7.D231	PCD7.D232
Display			
Type	Graphic Display		
Display dimensions (w × h)	8 lines × 20 characters/128 × 64 Pixel (70 × 40 mm)		
Character size (w × h)	5 × 7 (5 × 8) Pixel+cursor (2.52 × 3.54 mm)		
Contrast adjustment	via software or setup		
LED backlighting	on/off		
Character sets	ASCII (basic set: 95 character), with as default the standard Western-European character set (DOS graphical 437, 128 characters). An added alternative enhanced Western und Central European character set (128 characters) is selectable by software		
Controls, LEDs			
Single-knob control/keys	yes/-	-/10 (large)	-/25
Function keys	-	10	8
Numeric keypad	-	-	yes (12 keys)
LEDs	-	-	8 (6 red, 1 orange, 1 green)
Auto-repeat keys	-	yes	yes
Memory			
Terminal storage capacity	Volatile storage for 100 symbols (18 × 16 pixels). Permanent storage of communication and contrast settings. With advanced commands (for other than HMI users):16 volatile background screens (120 × 64 pixels). Free to define character sets with up to 128 redefined character pixel maps (with up to 18 × 24 pixels for each character code) Redefined use of character codes over redefinition tables.		
Interfaces			
to the PCS1 and Saia PCD®	RS-232/RS-422/RS-485, 9-pole, D-type		
Switch for line termination res.	yes		
Performance and programming			
Performance features	All performance features of Saia PCD® controllers are also available if with them the terminals are used, such as: up to 8000 texts, data in any format, alarm handling, password protection, real time clock		
Programming software	HMI-Editor (integrated within Saia PG5® as add-on tool)		
General data			
Supply voltage U _n	24 VDC, +30%/-20% or 19 VAC, ±15%, full-wave rectified		
Power consumption on U _n	200 mA		
Interference immunity	CE mark according to EN 50 081-1 and 50 082-2		
Operating temperature	0...50°C		
Storage temperature	-25...+70°C		
Permissible humidity	5...95% r. H. w/o condensation (DIN 40 040 class F)		

Protection system (front)	IP 54	IP 65	IP 65
---------------------------	-------	-------	-------

2.2.1 Block diagram



2.3 Standard interface connection cables

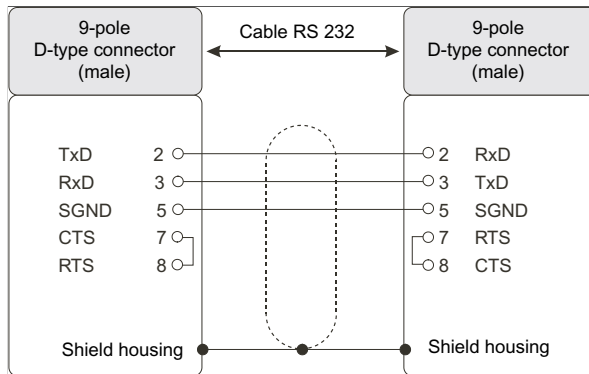
2.3.1 PCD7.K412: for interface RS-232 (without handshake RTS/CTS)

Recommended is to use PCD7.K413

Connection between terminal PCD7.D23x and PGU socket of all Saia PCD®s.

Connection cable, 2.5 m in length with 2 × D-Sub 9 pole.

Terminal PCD7.D23x **“PGU”**
 at PCD1, PCD2, PCD3 and PCD4



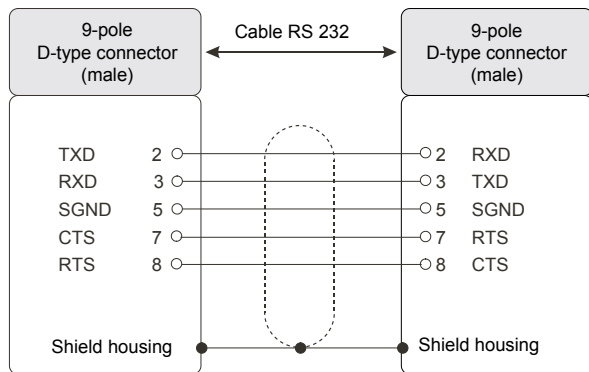
2.3.2 PCD7.K413: for interface RS-232

Recommended

Connection between terminal PCD7.D23x and PGU socket of all Saia PCD®s.

Connection cable, 2.5 m in length with 2 × D-Sub 9 pole.

Terminal PCD7.D23x **“PGU”**
 at PCD1, PCD2, PCD3,
 PCS1 and PCD4

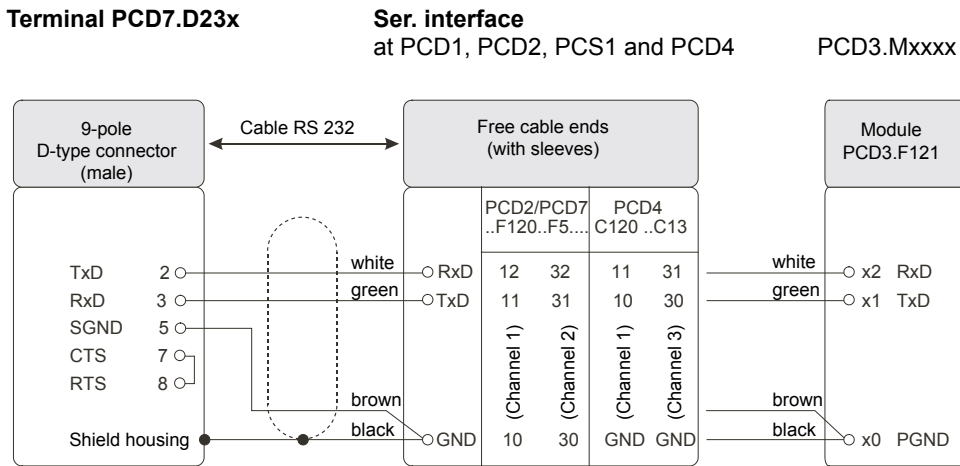


2.3.3 PCD7.K422: for interface RS-232 (without handshake RTS/CTS)

Recommended is to use PCD7.K423

Connection between terminal PCD7.D23x and CPU's of the series PCD1, PCD2, PCD3, PCS1 or PCD4.

Free cable ends (with sleeves) in 2.5 m lengths.



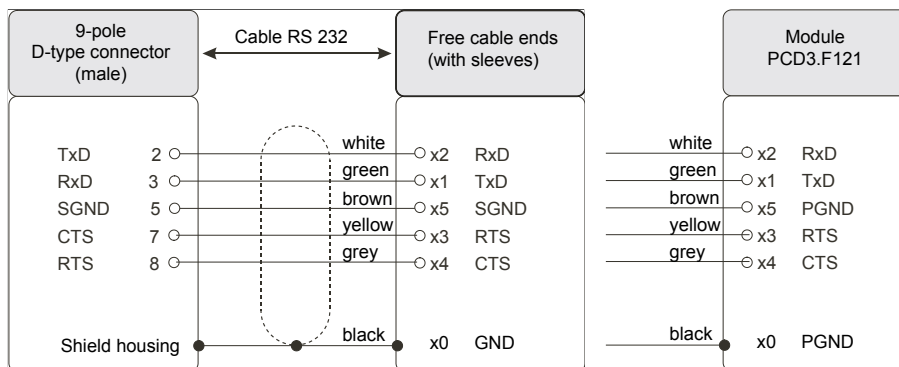
2.3.4 PCD7.K423: for interface RS-232 (with handshake RTS/CTS)

Recommended

Connection between terminal PCD7.D23x and CPUs of the series PCD1, PCD2, PCD3, PCS1 or PCD4.

Free cable ends (with sleeves) in 2.5 m lengths.

Terminal PCD7.D23x **Ser. interface** at PCD1, PCD2,
 PCS1, PCD4 and PCD3.Mxxxx



2.3.5 PCD7.K456: for interface RS-485

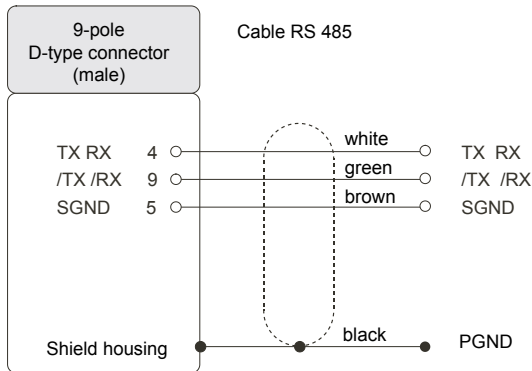
Connection between terminal PCD7.D23x and CPUs of the series PCD1, PCD2, PCD3, PCS1 or PCD4.

Free cable ends (with sleeves) in 5 m lengths.

2

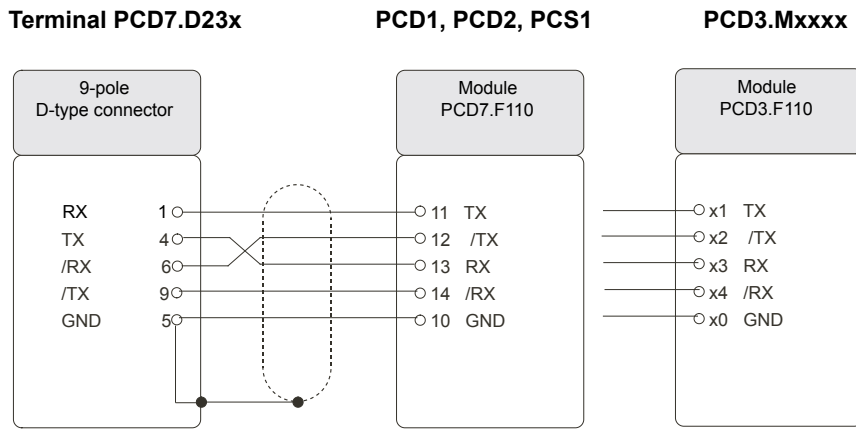
Terminal PCD7.D23x

“PGU” or ser. interface
at PCD1, PCD2, PCD3, PCS1 and PCD4

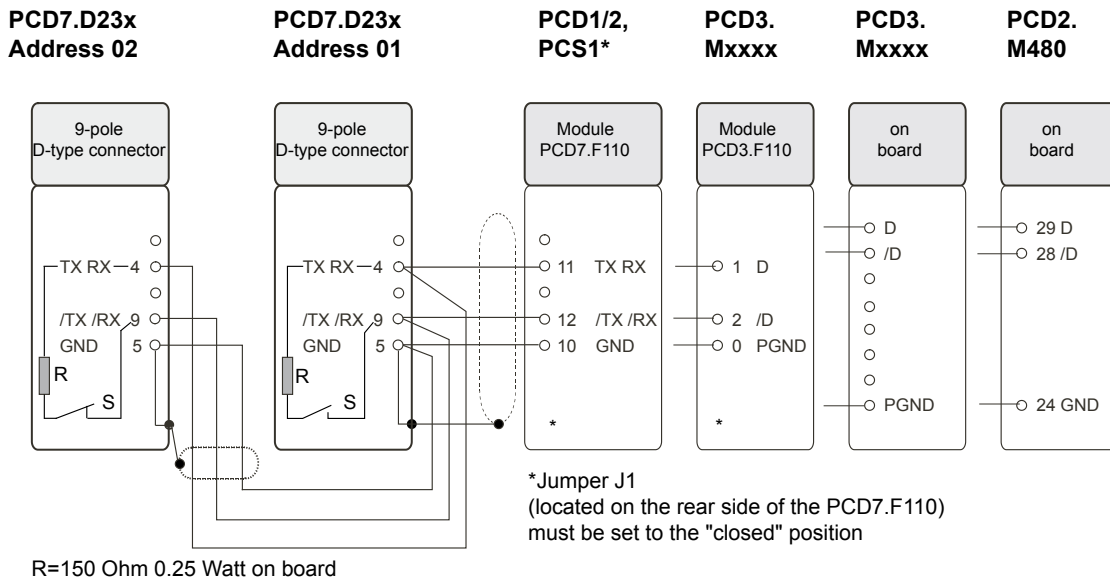


2.4 User created interface connection cables

2.4.1 Connection in RS-422 mode (single terminal)



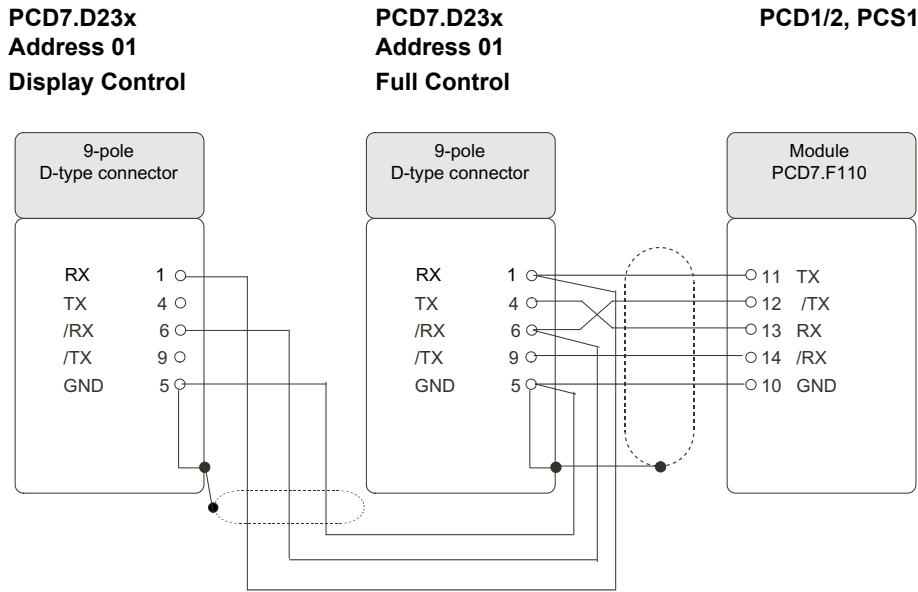
2.4.2 Connection in RS-485



The PCD7.D23x terminals have a switch for a termination resistor R on the rear side of the housing, available in RS-485 & RS-422. At the last station, the switch S has to be moved to the “CLOSED” position. For all other stations, switches S have to be moved in the “OPEN” position

*If a PCD1 or a PCS1 is used as an end station, a terminal box (PCD7.T160) has to be used.

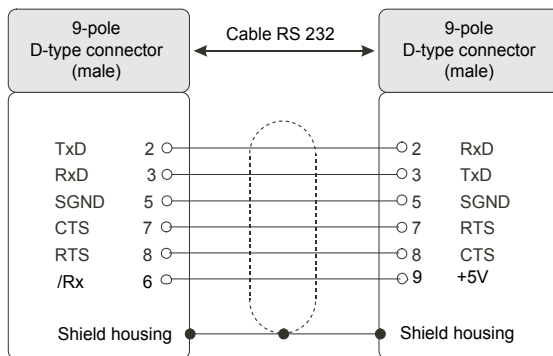
2.4.3 Connection in RS-422 Multi Drop (example with PCD7.F110 module)



2.4.4 Connection in RS-232 (with Handshake RTS/CTS) for an autonomous version without 24 VDC power supply

Connection between terminal PCD7.D23x and PGU socket

PCD7.D23x PGU: PCD1, PCD2, PCD3 or PCD4



- + 5 V of the PGU is mapped on Pin 6 (/RX) of the D-sub 9 of the terminal
- Power consumption (5 V / max 500 mA)



- Cable maximum one meter length is recommended
- No external supply 24 VDC (in parallel) must be present
- Increase the contrast of the graphics-display in the setup menu of the terminal
- EMV test is not yet released

3 Communication mode setting

3.1 Serial mode – Baudrate and Controls

The selected Saia PCD® communication mode and PCD7.D23x communication settings in the setup menu must match.

The Saia PCD® communication mode (MC0/1/2/4/5) is selected in the HMI using the HMI set-up screen:

- MC0: Duplex, No handshake, with optional manual RTS/CTS use on RS-232
- MC1: Duplex, Automatic Hardware (RTS/CTS) Handshake, RS-232 only
- MC2: Duplex, Software Handshake (XON / XOFF)
- MC4: Half duplex for RS-485 / 422, and for RS-232 with RTS transmit direction control
- MC5: MC4 mode for devices with reduced turn-around delay (Fast RS-485).

The PCD7.D2xx communication modes are set in the set-up menu:

- RS-232 RTS/CTS: Duplex, Full Hardware Handshake (RS-232 only)
- RS-232 None: Duplex RS-232 with RTS only, no Handshake on RS-422
- RS-422/232 XON/XOFF: Duplex full handshake
- RS-422/232 XON/XOFF(R): Duplex XON/XOFF Reduced
- RS-485 FTP: Half duplex Free Terminal Protocol
- RS-422 FTP Multi-drop: Half duplex Free Terminal Protocol

In the reduced handshake modes the PCD7.D23x receive buffer is protected for receive buffer overflow by the RTS detection on the CTS input of the Saia PCD®, or XON/XOFF reception control on the Saia PCD®, but the Saia PCD® receive buffer goes unprotected.

In the XON/XOFF full protocol the XON/XOFF reception requires special escape parsing (XON: ESC-[, XOFF : ESC-], ESC: ESC-ESC) in the Saia PCD® transmission and reception.

3.1.1 Standard modes (available with D23x, FW 25)

RS-232 (with or without handshake)

Baudrate	Type	Handshake	Control	Graphic support (HMI)
4800/9600 bps	MC0	without	None	No
4800/9600/19200 bps	MC1	with	RTS/CTS *	Yes
4800/9600 bps	MC2	with	XON/XOFF	No

*Recommended in the most applications RS-232 (with handshake)

RS-422 (with handshake)

Baudrate	Type	Handshake	Control	Graphic support (HMI)
4800/9600 bps	MC2	with	XON/XOFF	No

RS-485 Free Terminal Protocol (without handshake)

Baudrate	Type	Handshake	Control	Graphic support (HMI)
4800/9600 bps	MC4(5)	without	-	No

3.1.2 Special modes (available with D23x, FW 25)

RS-232/RS-422 with XON/XOFF (R) reduced

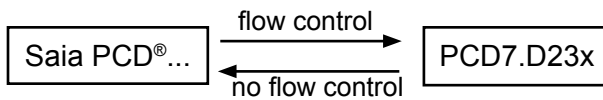
Baudrate	Type	Handshake	Control	Graphic support (HMI)
4800 bps	MC2	with	XON/XOFF (R)	Yes

RS-422 with Free Terminal Protocol (Multi-Drop)

Baudrate	Type	Handshake	Control	Graphic support (HMI)
4800/9600 bps	MC0	without	-	No

3

- * The reduced XON/XOFF mode is a save, non locking, XON/XOFF mode with the PCD7.D23x always responding. If using XON/XOFF, it is recommended to use this reduced mode, especially if you notice that after some time of use you have to switch the power off and on again to get the PCD7.D23x responding again. In this mode, the traffic from the Saia PCD® to the PCD7.D23x is supervised by flow control, in the other direction, from the PCD7.D23x to the Saia PCD®, there is no flow control



4 Software

The terminal interface can be in different operation modes:

- Direct mode:**
 The direct mode is the default full duplex mode with key code directly sent if the buttons on the PCD7.D231 or PCD7.D232 are pushed or the rotary wheel assembly on the PCD7.D230 is used.
 Commands go unconfirmed (no handshake).
- Setup menu mode:**
 If at power-up an arbitrary key (except the switch key) is kept pushed the display enters in the setup menu mode with built-in menu browser.
 No key code is sent. No commands are received.
 This mode is used to set the communication and contrast settings.
 At the PCD7.D231 and PCD7.D232 this mode can also be entered using the Info key at run time.
- Free Terminal Protocol FTP mode:**
 The Free Terminal Protocol FTP mode is an alternative half duplex mode with key codes buffered. The last entered push buttons or turns / pushes on the rotary wheel assembly are returned at request (poll) if the terminal is set to active before. This is used for half duplex RS- 485.
 Selection goes over the setup menu.
- Serial Data/Setup protocol:**
 The serial data/setup mode is an alternative full duplex mode with confirmed command sending (handshake). In this mode, key code sending is inhibited. Switching from the direct mode (no handshake, keys active) to the serial data/setup mode (handshake, no keys sent) and vice-versa is done by serial commands.

The PCD7.D23x may also be in a special alarm indicating mode if internal testing did not pass. In this case contact SBC.

4.1 Basic commands

4.1.1 The PCD7.D23x return codes in direct mode

PCD7.						Compatibility		
D232	D231	D230	dec.	hex.	Meaning	D1x0 stand.	D1x0 Fkeys	D202
down arrow	down arrow		5	5	down	x		x
right arrow	right arrow	Turn right	6	6	right	x		x
left arrow	left arrow	Turn left	8	8	left	x		x
up arrow	up arrow		11	B	up	x		x
		2nd long	12	C	2nd escape			
Enter		Push short	13	D	enter	x		x
esc		Push long	27	1B	escape			x
Autorepeat started	Autorepeat started	Long turn on	30	1E	Repeat on	x		x

PCD7.						Compatibility		
						D1x0	D1x0	D202
D232	D231	D230	dec.	hex.	Meaning	stand.	Fkeys	
Autorepeat finished	Autorepeat finished	Long turn off	31	1F	Repeat off	x		x
plus			43	2B	+ (plus)			x
shift-dot			44	2C	, (comma)			x
shift-plus			45	2D	- (minus)			x
dot			46	2E	. (point)			x
0			48	30	0			x
1			49	31	1			x
2			50	32	2			x
3			51	33	3			x
4			52	34	4			x
5			53	35	5			x
6			54	36	6			x
7			55	37	7			x
8			56	38	8			x
9			57	39	9			x
F1	F1		65	41	A, F1 code		x	x
F2	F2		66	42	B, F2 Code		x	x
F3	F3		67	43	C, F3 code		x	x
F4	F4		68	44	D, F4 code		x	x
	F5		69	45	E, F5 code		x	
shift-0			97	61	a			x
shift-1			98	62	b			x
shift-2			99	63	c			x
shift-3			100	64	d			x
shift-4			101	65	e			x
shift-5			102	66	f			x
shift-6			103	67	g			x
shift-7			104	68	h			x
shift-8			105	69	i			x
info	l (shift-up arrow)		105	69	i (info)	x		x
shift-9			106	6A	j			x
	shift-right arrow		112	70	p (free)	x		
quit	Quit (shift-left arrow)		113	71	quit	x		x
F5 (Shift-F1)	F6 (Shift-F1)		119	77	w Fx code			x
F6 (Shift-F2)	F7 (Shift-F2)		120	78	x Fx code			x
F7 (Shift-F3)	F8 (Shift-F3)		121	79	y Fx code			x
F8 (Shift-F4)	F9 (Shift-F4)		122	7A	z Fx code			x
	F10 (Shift-F5)		123	7B	{ Fx code			
shift	shift		shift function - no code sent			shift	shift	shift

						Compatibility		
PCD7.						D1x0	D1x0	D202
D232	D231	D230	dec.	hex.	Meaning	stand.	Fkeys	
Enter Key at power-up only	Down arrow / Enter key at power-up only	Push dial at power-up only	starts set up - no code sent					

If on the PCD7.D231 and PCD7.D232 key repetition is enabled the key code transmission can be repeated holding the key for a longer time.

The first repetition occurs after 0.7 Sec.

The following repetitions occur at 8 repetitions / second rate.

Above this a secondary auto-repeat started indication (0x30) may be sent.

If enabled this is sent after App. 3 Sec.

The joining auto-repeat indication off (0x31) is sent at button release.

The same indication is sent by the PCD7.D230 if the rotary wheel is turned continuously in one direction (turn long).

This indication is used by the HMI to switch the decimal entry position of data for faster entry.

This second indication and the auto-repeat can be switched on and off independent of each other, and the auto-repeat can be set on all keys or on cursor keys only by advanced commands.

For more information see Chap.4.6.2.

4

4.1.2 The PCD7.D23x display return set

Display Response Direct mode	Definition	Further information
0xb0	Display Ready	Confirmation after restart or reset from Saia PCD® Power-Up indication (autonomous) At a poll command: OK
0xb1	Run time error indication: Unexpected command / range error. Command will be ignored.	Supervisory signal: send as response on erroneous commands. Otherwise direct mode commands go unacknowledged. Note: In no RAM mode this also will be send as response to commands that are normally supported but in the no RAM case not.
0xb2	Run time error indication: HW LCD access error	Supervisory signal: one time generated (first error only) or continuously using the repeat error off /on command. This error may flood the serial interface at startup so repetition is de-active by default.
0xb3	Run time error indication: HW serial send overflow	Supervisory signal: may be generated at multiple error reporting if one of the error messages is lost or indicates preceding CTS blocking. Check the CTS setting if this happens at normal use.
0xb4	Run time error indication: HW serial receive overflow	Supervisory signal: If the RTS is ignored the buffer may overflow with the arriving data and then this signal is sent. Correct display working is not guaranteed in this case.
Display Response Direct mode	Definition	Further information

0xb5	Run time error indication: HW Error	Supervisory signal: Optional indication for special test cases (No normal operating case)
0xb6	Start up error indication: Display access error at startup	Supervisory signal: Display missing or defect at startup. If the display is accessed again <0xb2> is sent.
0xb7	Manual beeper off indication	The beeper can be switched off manually by pushing the enter key on the keyboard of the PCD7.D231 and PCD7.D232 and with the pushbutton on the PCD7.D230.

At a poll the last sent indication is sent back again as response as long as in between no other error occurred.

The use of synchronisation at start-up is not only essential to get the display showing the sent characters at the right position without swallowing the first entry commands. It is also essential at the restarts of programs as used in the Saia PCD® IL restart cold command. In this case the display may be at another baud rate setting or in the setup mode, which only can be reset using appropriate control commands after proper detection of the PCD7.D23x start-up.

If it is not sure that the PCD7.D23x is not in the data/setup mode always a set back to direct mode (<ESC>D) has to be send before the restart cold (<ESC>@G) or restart cold with default (<ESC>@C) command is called.

4

4.1.3 Serial lock command to acces in the setup mode

While the PCD7.D23x is running, the access to the setup mode may be switched off (locked) using the serial lock command (ESC@g1/ESC@o1). The serial locking setting is permanently stored so this locking can have been done any time before.

The serial lock mode can be reset by the serial unlock command (ESC@g0/ESC@o0), the serial command restart cold with defaults (ESC@C) or by a renewed power-up, and calling the 'Set to default' option in the setup menu.

PCD7.		Commands		dec	hex	1	2	3	4	5	6	7	new	Compatibility				
D232	D231	D230	Commands										cds.	D100	D1x0	D202	D250	D79x
Default	Default	Default	auto if on	27	1b	@	2								x	x	x	
Default	Default	Default	page mode	27	1b	@	5								x	x	x	
Default	Default	Default	english	27	1b	@	6								x	x		
Default	Default	Default	french	27	1b	@	7								x	x		
Default	Default	Default	german	27	1b	@	8								x	x		
D/F dummy	D/F dummy	D/F dummy	key test	27	1b	@	9								x	x	x	
D/F	No	No	LED A off	27	1b	@	a	0								x	x	
D/F	No	No	LED A on	27	1b	@	a	1								x	x	
D/F default	No	No	LED B off	27	1b	@	b	0								x	x	
D/F	No	No	LED B on	27	1b	@	b	1								x	x	
D/S	D/S	D/S	poll	27	1b	@	B								x	x	x	
D/F default	No	No	LED C off	27	1b	@	c	0								x	x	
D/F	No	No	LED C on	27	1b	@	c	1								x	x	
D/F	D/F	D/F	restart cold with default setting	27	1b	@	C											
D/F default	No	No	LED D off	27	1b	@	d	0								x	x	
D/F	No	No	LED D on	27	1b	@	d	1								x	x	
D/F	D/F	D/F	contrast down	27	1b	@	D	0					x					
D/F	D/F	D/F	contrast medium -6	27	1b	@	D	1					x					
D/F	D/F	D/F	contrast medium -5	28	1b	@	D	2					x					
D/F	D/F	D/F	contrast medium -4	29	1b	@	D	3					x					
D/F	D/F	D/F	contrast medium -3	30	1b	@	D	4					x					
D/F	D/F	D/F	contrast medium -2	31	1b	@	D	5					x					
D/F	D/F	D/F	contrast medium -1	32	1b	@	D	6					x					
D/F default	D/F default	D/F default	contrast medium	27	1b	@	D	7					x					
D/F	D/F	D/F	contrast medium +1	28	1b	@	D	8					x					
D/F	D/F	D/F	contrast medium +2	29	1b	@	D	9					x					
D/F	D/F	D/F	contrast medium +3	30	1b	@	D	A					x					
D/F	D/F	D/F	contrast medium +4	31	1b	@	D	B					x					
D/F	D/F	D/F	contrast medium +5	32	1b	@	D	C					x					

PCD7.			Parameters										Compatibility					
D232	D231	D230	Commands	dec	hex	1	2	3	4	5	6	7	new cds.	D100	D1x0	D202	D250	D79x
D/F	D/F	No	autorepeat without auto-repeat on/off indication on cursor keys only	27	1b	@	p	0										
D/F	D/F	No	autorepeat without auto-repeat on/off indication on all keys	27	1b	@	p	1										
D/F	D/F	No	both autorepeat and auto-repeat on/off indication on cursor keys only	27	1b	@	q	0										
D/F	D/F	No	both autorepeat and auto-repeat on/off indication on all keys	27	1b	@	q	1										
D/F	D/F	D/F	Buzzer off	27	1b	@	r	0										
D/F	D/F	D/F	Buzzer on	27	1b	@	r	1										
D/F	D/F	D/F	clear line	27	1b	@	L						x					
Default	Default	Default	select mode 8 x 40	27	1b	@	M	0									x	
D/F	D/F	D/F	invert entry off	27	1b	@	N	0										
D/F	D/F	D/F	invert entry on	27	1b	@	N	1										
D/F	D/F	D/F	Symbol line 2 mode off	27	1b	@	s	0										
D/F	D/F	D/F	Symbol line 2 mode on	27	1b	@	s	1										
F	F	F	FTP move cursor absolute	27	1b	A	d ⁸⁾	d ⁸⁾	x ⁸⁾			<EOT>						x
No	No	No	Auto repeat off	27	1b	A								x		x		
F	F	F	FTP Switch cursor on/off	27	1b	B	s ⁸⁾	s ⁸⁾	<EOT>									x
No	No	No	autorepeat without on/off indication on all keys	27	1b	B										x		
F	F	F	FTP clear screen	27	1b	C	<EOT>											x
No	No	No	autorepeat without on/off indication on cursor keys only	27	1b	C										x		
F / dummy	F / dummy	F / dummy	FTP Set Key Buffer mode	27	1b	D	k ⁸⁾	k ⁸⁾	m ⁸⁾			<EOT>						x
No	No	No	autorepeat with on/off indication on all keys	27	1b	D								x		x		

10) Upper page character. The default code page setting is DOS-437 which is compatible with the earlier SBC terminals for all languages (French, German, Scandinavian). Beside that alternative code pages can be selected. The terminal can write the symbol in negative and not negative mode (default) and moves one position further with next line / home switch after writing.

- F FTP command
- D Direct command
- D/F Direct & FTP command
- D/S Direct and Setup command

4.3 Advanced Commands

The terminals switch in the serial data/setup mode with the data/setup mode command (ESC S). In this mode handshake is used with code 0x16 0x30 (DLE-0) as OK indication. Key detection is not active. At a poll command in direct mode code 0xb0 is returned. At a poll command in data/setup mode code 0x16 0x30 is returned. This can be used for mode synchronisation. The commands are not used with the HMI. For more details on these commands contact SBC for the full programming reference.

PCD7.		Parameters										Compatibility						
D232	D231	D230	Commands	dec.	hex.	1	2	3	4	5	6	7	new cds.	D100	D1x0	D202	D250	D79x
S	S	S	start automatic entry mode ¹⁾	16	10	C	key mode	character code low	character code high	character code start			x					
S	S	S	download screen line ²⁾	16	10	D	Screen number	line number	data (120 bytes)				x					
S	S	S	deactivate a loaded character pixel map overload ³⁾	16	10	E	code ID						x					
S	S	S	start automatic cursor mode ⁶⁾	16	10	I	key mode	delta y	delta x				x					
S	S	S	load character pixel map first ³⁾	16	10	L	code ID	data (5 bytes)					x					
S	S	S	load character pixel map next ³⁾	16	10	N	code ID	data (5 bytes)					x					
S	S	S	read parameter ⁴⁾	16	10	R	parameter ID						x					
S	S	S	set parameter ⁴⁾	16	10	S	parameter ID	data (1 byte)					x					

PCD7.		Commands					Parameters										Compatibility				
D232	D231	D230	Commands	dec.	hex.	1	2	3	4	5	6	7	new	D100	D1x0	D202	D250	D79x			
S	S	S	upload screen line ³⁾	16	10	U	Screen number	line number					cds.								
D/S	D/S	D/S	Xon	17	11										X						
D/S	D/S	D/S	Xoff	19	13										X				X		
No	No	D (de-fault)	error message repeat off	27	1b	@	a	0					X		X				X		
No	No	D	error message repeat on	27	1b	@	a	1					X								
No	No	D/F (de-fault)	cursor underline ⁵⁾	27	1b	@	b	0					X								
No	No	D/F	cursor full ⁵⁾	27	1b	@	b	1					X								
No	No	D/F (de-fault)	cursor blinking ⁵⁾	27	1b	@	c	0					X								
No	No	D/F	cursor permanent ⁵⁾	27	1b	@	c	1					X								
No	No	D/F	key filter off	27	1b	@	d	0					X								
No	No	D/F (de-fault)	key filter on	27	1b	@	d	1					X								
No	No	D/F	key long turn on/off off	27	1b	@	e	0					X								
No	No	D/F (de-fault)	key long turn on/off on	27	1b	@	e	1					X								
No	No	D/F	key second long off	27	1b	@	f	0					X								
No	No	D/F (de-fault)	key second long on	27	1b	@	f	1					X								
D/F	D/F	D/F	set codemap 1 ⁷⁾	27	1b	@	F	1					X								
D/F	D/F	D/F	set codemap 2 ⁷⁾	27	1b	@	F	2					X								
D/F	D/F	D/F	set codemap 3 ⁷⁾	27	1b	@	F	3					X								
D/F	D/F	D/F	set codemap 4 ⁷⁾	27	1b	@	F	4					X								
D default	D default	No	error message repeat off	27	1b	@	i	0					X								
D default	D default	No	error message repeat on	27	1b	@	i	1					X								

PCD7.		Parameters										Compatibility						
D232	D231	D230	Commands	dec.	hex.	1	2	3	4	5	6	7	new	D100	D1x0	D202	D250	D79x
D/F (de-fault)	D/F (de-fault)	No	cursor underline ⁵⁾	27	1b	@	j	0					x					
D/F default	D/F default	No	cursor full ⁵⁾	27	1b	@	j	1					x					
D/F default	D/F default	No	cursor blinking ⁵⁾	27	1b	@	k	0					x					
D/F	D/F	No	cursor permanent ⁵⁾	27	1b	@	k	1					x					
D/F	D/F	No	key filter off	27	1b	@	l	0					x					
D/F default	D/F default	No	key filter on	27	1b	@	l	1					x					
D/F	D/F	D/F	set screen replay full ³⁾	27	1b	@	M	4									x	
D/F	D/F	D/F	set screen replay transparent ³⁾	27	1b	@	M	5									x	
D/F	D/F	D/F	replay screen from background ³⁾	27	1b	@	R	screen number						x	x			
D/F	D/F	D/F	save screen in background ³⁾	27	1b	@	S	screen number						x	x			
D/S	D/S	D/S	switch into direct mode	27	1b	D							x					

- 1) In the automatic entry mode the character symbols in the range from character code low to character code high can be selected without any serial line communication going on. This is done using the rotary wheel (PCD7.D230) or cursor up / down keys (PCD7.D231 / PCD7.D232). No values are returned during selection. Pushing the enter key the character code of the chosen character is sent over the serial line as response. Typical use is the setting of start value '0', end value 'g' which yields an automatic decimal selection. Keypcode 0x30 ('0') and 0x31 ('1') allow the selection of the up/down direction. This mini data entry function is also used in the setup menu and can be verified there for it's working.
- 2) The terminals have a storage option for 16 full sized background memory screens (each 120 x 64 Pixel). The command makes a 'snapshot' into memory of the currently shown screen. The stored screen can be replayed in transparent or non transparent mode. In transparent mode its content is only rewritten over empty character fields. This can be used for menu masks. The download / upload screen line commands are used to upload / download one line (120 x 8 Pixel) of one of the 16 background screens. The command can also directly download into the symbol storage for symbol display. This goes in background without touching the displayed screen.
- 3) The pixel map that is displayed at a specific character code is free to define. The pixel map can be downloaded for each individual upper page character code (code 128 .. 255) with for each character code storage from 1 character field (6 x 8 pixel) to 9 character fields (18 x 24 pixel) using the load next command. This can be used to load free to define symbols for alternative alphabets, and display of larger characters that can be shown easily sending merely the joint 1 byte character code.
- 4) Read / Set Parameter allow the change of serial mode and timing parameters. Baudrate changes get active at a warm restart.
- 5) The actual access position is shown by a cursor that inverts the actual displayed pixel. This cursor can be set to blinking, permanent or off. The cursor type can be underline (2 pixels vertical, 1 character field wide) or full (all 8 pixels). The default is underline, blinking.
- 6) In the auto cursor mode the cursor moves without serial communications going on using the rotary wheel or cursor up / down / left /right keys. The cursor display mode is such as set before. A box (x-delta, y-delta) is defined in which the cursor moves. The box can be a vertical bar or horizontal bar or a combination. Pushing the entry the actual position is returned. This built-in mini browser function can be used for a selection of a menu entry/Keypcode 0x30 ('0') and 0x31 ('1') allow the selection of the up/down direction. This mini browser function is also used in the setup menu and can be verified there for its working.
- 7) The upper page character code can point directly into the default code page or alternative code pages or point into a combination of them using redirection tables. The selection of this direct of redirected access is done over the serial commands for code map selection. For more information see Chap.7.2.3. If for a specific character a pixel map is downloaded the code maps are not used. In this case the loaded pixel map of the character symbol is shown.

- D/F Direct & FTP command
- D/S Direct & Setup command
- S Setup command

4.4 Free Terminal Protocol Mode

To be able to use the RS- 485 as half duplex interface, the PCD7.D23x have to be used in a “Free Terminal Protocol” Mode (PCD7.D79x compatible).

In this serial command mode: **by default no responses will be sent.**

- Key responses are buffered
- The other responses as found in the PCD7.D23x direct mode protocol are thrown away and not sent.

After a special activation code has been received the buffered responses can be requested using a serial poll command. The PCD7.D23x will never send something at it's own initiative.

Note that with this free terminal protocol direct control of PLC-controlled processes by the key assembly is not possible as (due to necessary polling) considerable delays in the response may be found.

The interface is compatible with the PCD7.D790 and PCD7.D795 text terminals for “protocol free” use. Additionally, in this “Free Terminal Protocol” Mode a limited set of commands out of the direct mode command set is included.

Graphical use over the data / setup mode commands is not possible in this mode: The Free Terminal Protocol Mode is a text only mode, the graphical access is not supported.

In the Free Terminal Protocol Mode normally the PCD7.D23x terminal is always active if the terminal address is set to “0”. If the terminal address is not set to “0” it is only active after reception of the activation command. The related commands are:

D23x Command Free Terminal Protocol Mode	Description	Details
0x1b 0x49<y><y>0x04 <ESC>I<y><y><EOT>	Select the terminal with address <y><y>. yy BCD ASCII coded '01'...'31'*	Select the terminal and deselect all other connected terminals
0x1b 0x59 0x04 <ESC>Y<EOT>	Call terminal confirmation display	Shows the welcome screen as shown with startup with activation indication at the bottom line.

* Example: Value 1 is coded as 0x30 0x31 (,01')

The activation address of the PCD7.D23x is set in the setup menu.

If the activation address is set to '00' the terminal will be always active.

The selection / de-selection command will be ignored.

This can be used on a point-to-point configuration, or at a **multi-drop configuration** with a number of passive displays showing the same information in parallel.

An inactive terminal will ignore all other commands and only react on the select command. In inactive state also all key entries are lost. In active state the terminal will react on all commands.

Key entries are queued and can be requested using the Free Terminal Protocol poll command.

Free Terminal Protocol Mode display commands

4

If the PCD7.D23x is set active most direct mode text display commands are supported.

In addition to that, compatible to the PCD7.D795, the following special commands are added:

D23x Command Free Terminal Protocol Mode	Description	Details
0x1b 0x41 <y><y><x><x>0x04 <ESC>A<y><y><x><x><EOT>	Move the access position to position yy=00...07: line position xx=00...19: column position	The position is ASCII coded BCD code. Position 0 corresponds to the left hand upper line home position. It's code is 0x30 0x30 (,00'). Note: In the PCD7.D23x protocol (and on earlier PCD7) the x position is the vertical, and the y position the horizontal position with the x parameter as first parameter
0x1b 0x46 <d><d><x><x>0x04 <ESC>F<d><d><x><x><EOT>	Move the access position relative dd=00: up dd=01: right dd=02: down dd=03: left Repetition count horizontal xx=01...19 vertical xx=01...07	The parameters are ASCII coded BCD Handling is as with the PCD7.D23x direct mode with wrap to the start of the line at cursor right and equivalent wrap to the end of the line at cursor left. For cursor right, up and down the equivalent direct mode command can also be used. The direct mode cursor left command 0x08 is replaced by PCD7.D795 compatible backspace handling.
0x08	Backspace	As direct mode backspace command 0x7f
0x1b 0x43 0x04 <ESC>C<EOT>	Clear screen	As direct mode clear screen command 0x0c
0x1b 0x5A 0x04 <ESC>Z<EOT>	Clear screen	As direct mode clear screen command 0x0c
0x1b 0x42 <s><s>0x04 <ESC>B<s><s><EOT>	Cursor control ss='00': cursor hide ss='11': cursor visible in the currently selected cursor mode	The cursor is by default in the blinking underline mode. The cursor display mode can be set to full or underline mode, and also set to blinking or continuous mode using the PCD7.D23x direct mode commands

Free Terminal Protocol Mode compatibility aspect

The Free Terminal Protocol Mode is compatible with the command set of the SBC

PCD7.D79x series, the so called protocol free terminals series, with some exceptions:

- Another key assembly is used with adjusted code setting
- The <ESC>Dkkmm<EOT> key buffering modification command of the PCD7.D79x is parsed but ignored.
- The <ESC>Pbbpp<EOT> communication parameters modification command of the PCD7.D79x is parsed but ignored.
- At the <ESC>T<EOT> poll command a protective turn around delay is used which makes it useable on all driving equipment.
- A RS- 422 / RS- 485 multidrop mode is supported for parallel display on pas sive and active terminals (usually using address 0 setting, but essentially free to chose).
- Point to point is also on RS-232 possible, even with RTS half duplex RTS transmission control if wanted.
- A large extension of the command set using shared PCD7.D23x direct mode commands can be used. This includes background menu screen use, enlarged cursor visualization control, and the use of different code maps for alternative language and standard DOS graphical symbol display.

4

The PCD7.D23x has been designed for serial line handshake use and must be driven with proper timing in the non-handshake free terminal protocol mode.

Free Terminal Protocol Mode key polling handler

The key handler is compatible to the PCD7.D23x with the same events detected and forwarded.

As long as the terminal is active, all key events are stored in a buffer. They are never sent on the terminal's initiative.

The values are returned on a poll request only, on a first in first out base.

The used command is

D23x Command Active on request mode	Description	Details
0x1b 0x54 0x04 <ESC>T<EOT>	Poll the buffer of the actual active terminal (if any is connected and set to active)	This returns the 4 digit ASCII code 'xxyy'. 'xx': Number of queued / stored key codes incl. the requested ('00'...'15') 'yy': Modified key code (hex)

The terminal returns the the answer with a delay that can be reconfigured with advanced commands only. For advanced command programming and use other than with the HMI contact SBC for the programming details.

With the 20 ms default setting the timing is:

Before start of transmission:

- Minimal turnaround time: 10 ms
- Maximal turnaround time: 20 ms

After finishing transmission:

- Maximal hold time: < 5 μ sc (start of last hold Bit triggered)

The number of stored event is limited to 4. In the PCD7.D795 it's 63, but that would lead to an unworkable lock up. If the count "00" is returned it means that no key event has been entered in between. If the count "4" is returned it means that key events may have been lost.

The modified key code is as follows:

Key code "yy"	Rotator / Push key assembly function	D230 direct mode	
"09"	push long	0x1b	escape
"04"	rotate left	0x08	left
"02"	rotate right	0x06	right
"0D"	push short	0x0d	enter

A ring buffer is used, at queue overflow the last recent entries are lost.

4.5 Return codes in FTP mode

PCD7.						
D232	D231	D230	dec.	hex.	FTP Code	Meaning
up arrow	up arrow		11	B	01	up
right arrow	right arrow	Turn right	6	6	02	right
down arrow	down arrow		5	5	03	down
left arrow	left arrow	Turn left	8	8	04	left
esc		Push long	27	1B	09	escape
enter	enter (shift-down)	Push short	13	D	0D	return / enter
		2nd long	12	C	10	2nd escape
info	I (shift-up)		105	5F	10	i (info)
quit	quit (shift-left)		113	67	12	quit
shift-quit			113	67	12	quit
F1	F1		65	41	14	A, F1 code
F2	F2		66	42	15	B, F2 Code
F3	F3		67	43	16	C, F3 code
F4	F4		68	44	17	D, F4 code
	F5		69	45	18	E, F5 code
Autorepeat started	Autorepeat started	Long turn on	30	1E	1E	Repeat on
Autorepeat finished	Autorepeat finished	Long turn off	31	1F	1F	Repeat off
plus			43	2B	2B	+ (plus)
shift-dot			44	2C	2C	, (comma)
shift-plus			45	2D	2D	- (minus)
dot			46	2E	2E	. (point)
0			48	30	30	0
1			49	31	31	1
2			50	32	32	2
3			51	33	33	3
4			52	34	34	4
5			53	35	35	5
6			54	36	36	6
7			55	37	37	7
8			56	38	38	8
9			57	39	39	9
shift-0			97	61	61	a
shift-1			98	62	62	b
shift-2			99	63	63	c
shift-3			100	64	64	d
shift-4			101	65	65	e
shift-5			102	66	66	f
shift-6			103	67	67	g
shift-7			104	68	68	h
shift-8			105	69	69	i
shift-9			106	6A	6A	j
	shift-right		112	70	66	p (free to define)
F5 (Shift-F1)	F6 (Shift-F1)		119	77	77	w Fx code
F6 (Shift-F2)	F7 (Shift-F2)		120	78	78	x Fx code
F7 (Shift-F3)	F8 (Shift-F3)		121	79	79	y Fx code
F8 (Shift-F4)	F9 (Shift-F4)		122	7A	7A	z Fx code
	F10 (Shift-F5)		123	7B	71	{ Fx code

PCD7.						
D232	D231	D230	dec.	hex.	FTP Code	Meaning
shift	shift		shift function - no code sent			
Enter Key at power-up only	Down / Enter key at power-up only	Push Key at power-up only	starts setup - no code sent			

4.6 Compatibility between PCD7.D202, D160/170 commands and PCD7.D232, D231 commands

4.6.1 PCD7.D202, D160/170 (and D250) commands no longer used with the PCD7.D232/D231 terminals

These commands are mainly test commands as “display test“, “hardware test“, “demonstration display“, “LED test”... which are not basic commands.

PCD7.			Commands	dec.	hex.	Parameters							Compatibility				
D232	D231	D230				1	2	3	4	5	6	7	D100	D1x0	D202	D250	D79x
No	No	No	echo on	27	1b	@	1						x	x	x		
No	No	No	auto lf off	27	1b	@	3						x	x	x	D*	
No	No	No	scroll mode	27	1b	@	4						x	x	x		
No	No	No	display test	27	1b	@	A						x	x	x		
No	No	No	hardware test	27	1b	@	C						x	x	x		
No	No	No	D100 map	27	1b	@	F						x	x	x		
No	No	No	setup disable	27	1b	@	H						x	x	x		
No	No	No	LED test	27	1b	@	L							x			
No	No	No	select mode 4 × 20	27	1b	@	M	1							x		
No	No	No	Shift key inhibit	27	1b	G							x				
No	No	No	Restart cold with self test	27	1b	H						x					
No	No	No	display test screen	27	1b	I						x					
No	No	No	Demonstrate display	27	1b	J						x	x	x	x		

*D = Default

4.6.2 Auto-repetition upgrade commands

The PCD7.D202 knows 5 key repetition mode commands (<ESC>A...<ESC>E), see manual 26/746. The PCD7.D169/170 knows 2 key repetition mode commands (<ESC>A and <ESC>D) see manual 26/753.

These command codes are used in the D23x for other purposes and reserved for simultaneous use in the FTP mode.

With an added general command for convenience a total of 8 repetition-control commands are implemented. The used codes are:

PCD7.D202 and D160/170	PCD7.D231/232	Description
ESC A	ESC@m0	Key auto-repeat off (current setting kept in background)
ESC B	ESC@p1	Key auto-repeat without 2nd repeat on all keys
ESC C	ESC@p0	Key auto-repeat without 2nd repeat on cursor keys
ESC D	ESC@q1	Key auto-repeat with 2nd repeat on all keys
ESC E	ESC@q0	Key auto-repeat with 2nd repeat on cursor keys
New function	ESC@n1	Key without key auto-repeat with 2nd repeat sent on all keys
New function	ESC@n0	Key without key auto-repeat with 2nd repeat sent on cursor keys
New function	ESC@m1	Key auto-repeat on with the current setting

5 Handling

5.1 Setup Menu

How to enter into the “Setup menu”?

- D230: Press the single knob at the display of the version indication to power-up
- D231 and D232: Press any key (excepted Shift key) at the display of the version indication to power-up
- D231 and D232: Press (Shift info) at running display

PCD7.D230, D231 and D232

By default the terminal is delivered with full access to the setup menu. That means that each parameter can be changed. In the HMI-Editor it's possible to activate and deactivate a command which allows the access or not to the setup menu.

5

Setup locked: No access to the setup menu at run time. Calling power-up the serial mode settings are locked.

Setup unlocked: Access to the setup menu at run time with full possibilities to change the serial mode with it

How to unlock the setup menu in the setup?

Select the line “back to defaults” and press the single knob or enter key

How to navigate into the “Setup menu”?

PCD7.D230

Turn the single knob to the left or right to select a line and confirm with short pressing.

“Enter” command: short pressing = saving

“Escape” command: longer pressing = quit without saving

PCD7.D231 and D232

Press up and down arrow-keys to select a line and press “enter” key

“Enter” command: (shift + ▼) or (▶) = saving

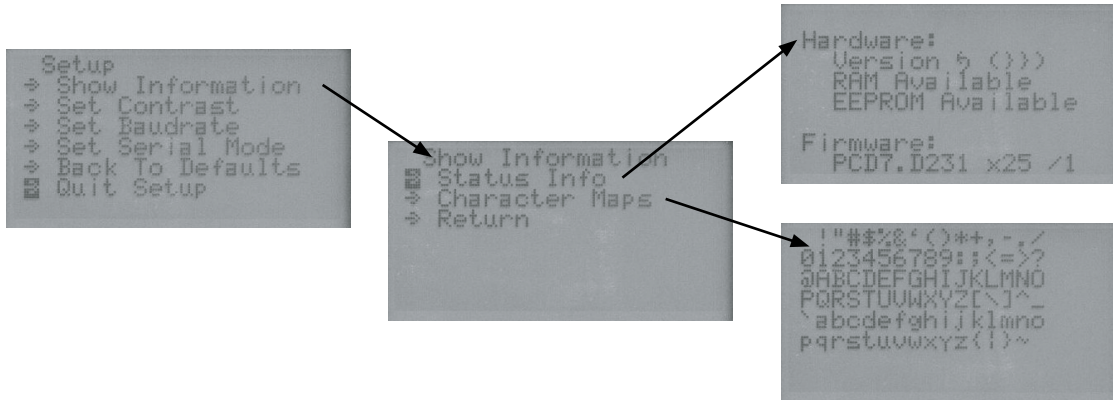
“Escape” command: (ESC) or (◀) = quit without saving

The selection of the “baudrate” and the selection of the “mode” have to be confirmed by a second pressing of the single knob or on the “enter” key.

PCD7.D230

Turn on single-knob to select “**Show Information**” and press the single knob.

“Show Information” (read only)



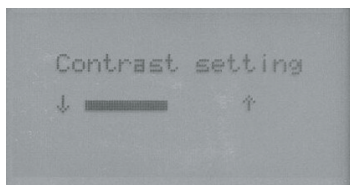
“Status Info” allows to show the hardware and firmware version* and check RAM and EEPROM.

*If a problem occurs and in order to help you better, the “Technical Customer Service” needs to know the hardware- and firmware-version of the terminal as well as other information on the label sticks on the backside of the housing.

“Character Maps” allows visualising 6 windows of character maps that you can use with this terminal. (the 6 windows flash automatically)

“Return” allows to quit the window “show Information”

“Contrast setting” (Read and Write)



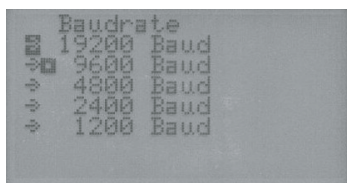
PCD7.D230

“Contrast setting” adjusts the contrast by turning the single knob to the left or right. Press the single knob to save the setting.

PCD7.D231 and D232

“Contrast setting” adjusts the contrast by pressing the up and down arrow keys. Press “enter” key to save the setting.

“Baudrate” (Read and Write)

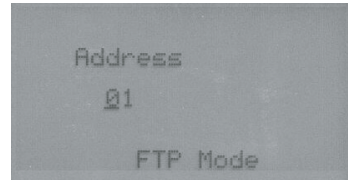
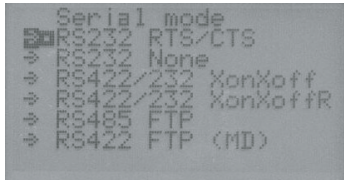


Set the baudrate according to the communications mode (see also chapter 4) to match baudrate of the Saia PCD® or PCS. (The baudrate is also set in the HMI-Editor.)

PCD7.D230: Select the line by turning the single knob to the left or right. Press the single knob to select the baudrate and press the single knob once again to save the baudrate.

PCD7.D231 and D232: Select the line by pressing the up and down arrow keys. Press enter to select the baudrate and press enter once again to save the baudrate.

“**Serial mode**” (Read and Write)



5

Select the serial mode

RS-232 RTS/CTS	= RS-232 with handshake RTS/CTS (recommended in most of the cases)
RS-232 None	= RS-232 without handshake (not recommended)
RS-422/232 XonXoff	= RS-422 or RS-232 with handshake Xon/Xoff
RS-422/232 XonXoffR	= RS-422 or RS-232 with reduced handshake Xon/Xoff
RS-485 FTP	= RS-485 “with free terminal protocol”
RS-422 FTP(MD)	= RS-422 “with free terminal protocol” Multi Drop.

PCD7.D230: Select the line by turning the single knob to the left or right. Press the single knob to select the mode and press the single knob once again to save the mode.

PCD7.D231 and D232: Select the line by pressing the up and down arrow keys. Press enter to select the mode and press enter once again to save the mode. (The same mode and baud rate also must be selected in the HMI-Editor)
 FTP mode: With the “Free Terminal Protocol” you have to enter an identification number (one number per station) In the HMI-Editor, select the terminal: D23x (bus) and the number of stations on the terminal list.

Back to default

```
Set. Back All
- Default Contrast
- Default Timing
- RS232 RTS/CTS
- 9600 Baud
- Unlocked
```

PCD7.D230: By pressing the single knob, all parameters are restored.

PCD7.D231 and D232: By pressing the “Enter” key, all parameters are restored.
(Default parameters: set contrast: middle / set baudrate: 9600 / serial mode RS-232 RTS/CTS)

5

“Enabled or disabled setup access”

The HMI-Editor allows to enable or disable the “setup access” to a terminal.
(allow setup “yes” or “no” in the settings Tab).
Setup is disabled (allow setup = no , in the settings Tab of the HMI-Editor)

Quit the setup and enter into the user program

There are 2 possibilities:

```
Setup
⇒ Show Information
⇒ Set Contrast
⇒ Set Baudrate
⇒ Set Serial Mode
⇒ Back To Defaults
☐ Quit Setup
```

- 1) Select “**Quit setup**” on the “**Setup**” menu and press the single knob or press the “enter key”
- 2) Switch the power off and on (without pressing the dial or any keys)

5.2 Use of the function "Play as" of PCD7.D230 with the HMI-Editor

The single-knob control is not active with the "Play as" function, it is replaced by keys.

To turn up (clockwise), click on the upward arrow button

To turn down (anticlockwise), click on the downward arrow button

To simulate a short push (enter). Click on the Enter button

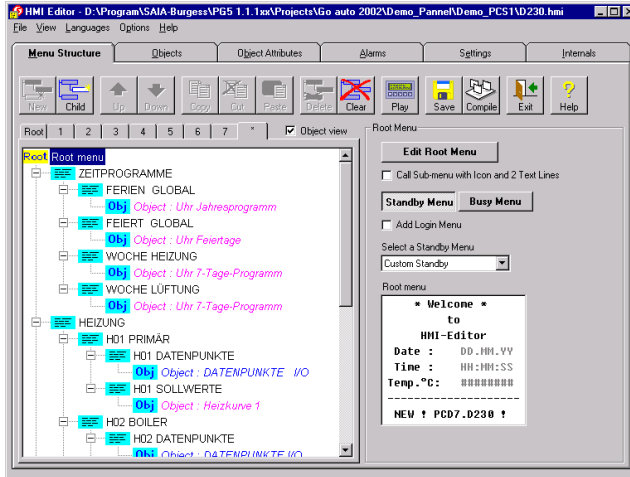
To simulate a long push (escape) . Click on the Esc button



5.3 Creation of user dialogue with the HMI-Editor

The HMI-Editor

The HMI-Editor has a tree structure, similar to that of Windows-Explorer. The root-menu (standby and login) is the first menu window displayed on the terminal, and may contain text, the date, time of day and Saia PCD® variables.

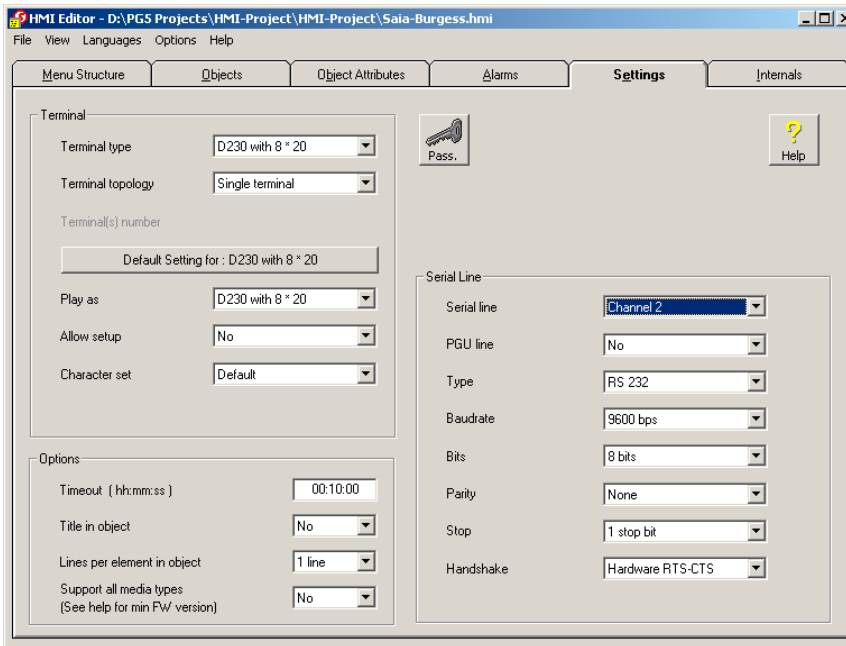


The “New” button is used whenever a new submenu window is opened. Up to 20 sub-menus, each up to 8 levels, are available for the construction of complex menu structures. A very wide variety of objects can then be inserted into this menu structure.

5

“Settings”

The fundamental settings for the terminal used are specified here



- Terminal type, settings and identification no. (1...31), by use of multiple terminals
- Type of terminal for display test (Play)
- Serial port parameters
- Password list with up to 10 levels of hierarchy
- Number of terminals for connection in a star structure

New functionalities with Saia PG5® 1.2 or later

The internal variables can be accessed by the predefined System symbols (For further details see manual “HMI-Editor” 26/768)

New functionalities with HMI-Editor V1.2

1 System texts

A list of system texts has been implemented. The list is in the Object Attribute tab. The HMI compiler will cut or extend the text to the correct length.

2 Password visibility

A new option 'Visibility' has been added in the Password settings (Settings tab) Visible /edit visible and Hidden.

3 Add login menu

The option 'Add login menu' is available also with point to point topology. When a key is pressed, the login menu is displayed to enter the password.

4 Hide menu positions

In the menu, the access to menu can be restricted by the password level.

5 Enable flag on menu position

In a similar way as with the password level, an Enable flag can be specified on each menu position.

6 Call first menu

A new call type 'Call first menu' is implemented.

7 Modem string and Phone number

New format are implemented to edit a modem string.

8 Status

The Status is now also organized in a list.

9 Language Manager

The Language manager is one of the biggest improvement of the version 1.2 of the HMI-Editor. The Language manager allows to enter all texts in up to 5 languages in the HMI file. The selection of the displayed language on the terminal is made before compilation. In this way, it's possible to create a new application in another language (or variants) just by recompiling the same HMI file.

10 Import

The Import command allows to import part of an existing HMI file into the current file. The user can choose to clear the current file or not before the importation. The import command manages also the 5 languages.

11 New terminal

Supports PCD7.D230 terminal

New fonctionnalités with HMI-Editor V1.3

1 New terminals

Support new PCD7.D231, D232 terminals (with Version \$1.3.010 or later)

2 Graphic functions

Using the graphics-display to show Icons and trends

3 Buzzer management

6 Maintenance






6.1 Care

These display terminals have been designed for maintenance-free continuous operation.

Clean the front of the display terminal if necessary. Use a damp, lint-free cloth for cleaning. Do not use a dry cloth, cleaning agents or chemical substances. Strong cleaning agents or solvents are not suitable as they may damage the surface of the display. When cleaning, make sure that no liquids of any kind get inside the terminal.

A Appendix

A.1 Icons

	<p>In manuals, this symbol refers the reader to further information in this manual or other manuals or technical information documents. As a rule there is no direct link to such documents.</p>
	<p>This symbol warns the reader of the risk to components from electrostatic discharges caused by touch. Recommendation: Before coming into contact with electrical components, you should at least touch the Minus of the system (cabinet or PGU connector). It is better to use a grounding wrist strap with its cable permanently attached to the Minus of the system.</p>
	<p>This sign accompanies instructions that must always be followed.</p>
	<p>Explanations beside this sign are valid only for the Saia PCD® Classic series.</p>
	<p>Explanations beside this sign are valid only for the Saia PCD® xx7 series.</p>

A.2 Code maps

The terminal support a basic ANSI code map (code 0x20 to 0x7e) and a default and alternative code map for upper page code 0x80 to 0xff.

ANSII code map

Position (hex)	0 / 8	1 / 9	2 / A	3 / B	4 / C	5 / D	6 / E	7 / F
20	Space	!	“	#	\$	%	&	‘
28	()	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7
38	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G
48	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W
58	X	Y	Z	[\]	^	_
60	`	a	b	c	d	e	f	g
68	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w
78	x	y	z	{		}	~	␣

Code 7F is used for backspace

Default code map (command ESC@J)

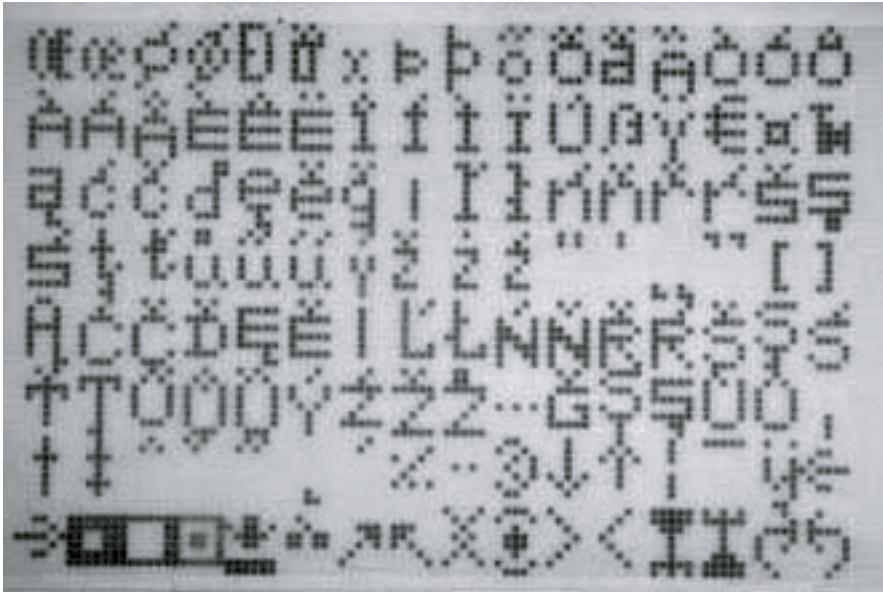
Position (hex)	8..	9..	A..	B..	C..	D..	E..	F..
.0	Ç	É	á	█	L	⌌	α	≡
.1	ü	æ	í	█	⊥	≡	β	±
.2	é	Æ	ó	█	⊥	≡	Γ	≥
.3	â	ô	ú		⊥	≡	π	≤
.4	ä	ö	ñ		—	⊥	Σ	∫
.5	à	ò	Ñ		⊥	⊥	σ	∫
.6	â	û	ª		⊥	⊥	μ	÷
.7	ç	ù	º		⊥	⊥	τ	≈
.8	ê	ÿ	¿		⊥	⊥	Φ	°
.9	ë	ÿ	←		⊥	⊥	Θ	·
.A	è	ÿ	→		⊥	⊥	Ω	•
.B	ï	ç	½		⊥	█	δ	√
.C	î	£	¼		⊥	█	∞	∞
.D	ï	¥	¡		⊥	█	φ	²
.E	Ä	Þ	«		⊥	█	ε	■
.F	Å	ƒ	»		⊥	█	∩	

Default upper page code map

The DOS graphical character (code 0xb0 to 0xdf) use the full 6 × 8 character field and allow a seamless drawing of lines and boxes.

The alternative code map adds missing Western- and Central- European ANSI symbols with some own symbols. It is selected using code map selection 4 (ESC@F4)





This character set contains the characters available in the code maps Windows 1250 and Windows 1252 (Mapping is different).

Pixel map inversion:

At a negative entry setting (ESC@N) all 6 × 8 pixel are inverted before entry. At a background screen store the pixels are stored as such. The cursor indication inverts all 6 × 8 pixel in full mode and 6 × 2 bottom line pixels in underline mode. If a negative (inverted) entry is shown (by background screen replay or direct) it is re-inverted to normal.

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Advanced command options (Use other than with HMI):

With the advanced commands (Chap.4.3) also code map redirection with combined use of the default and alternative code map is possible using the ESC@F1 through ESC@F3 commands.

Also in this case the negative entry option can be used.

Also, for each character code a free to define pixel map can be loaded.

The displayed symbols can be 6 × 8 pixel up to 18 × 24 pixel (w × h).

In this case there is no negative entry option.

For the programming details contact SBC.

A.3 Contact**Saia-Burgess Controls AG**

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