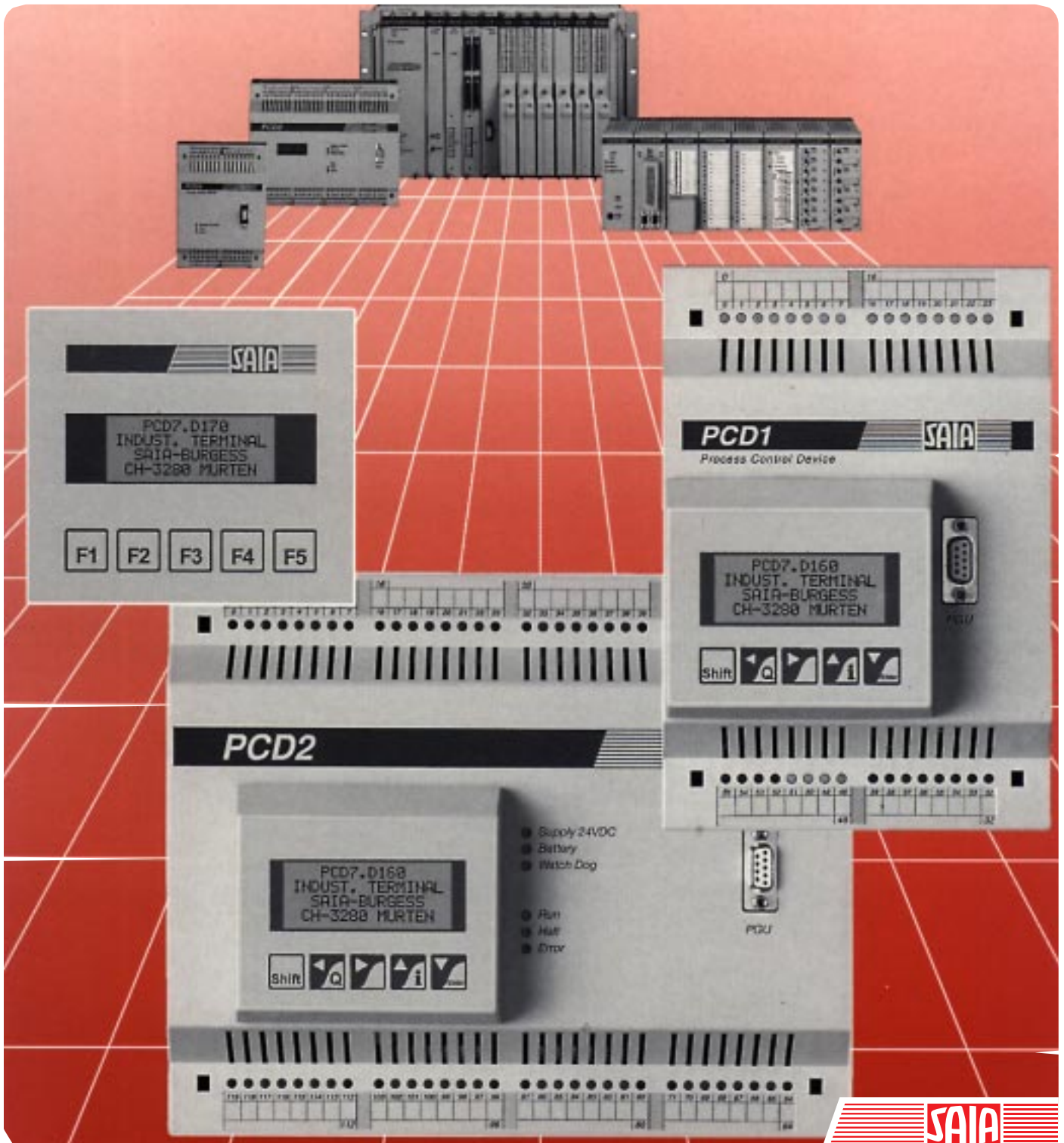


SAIA® PCD Process Control Devices

PCD7.D160 and ..D170 Small industrial terminals Manual



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SAIA® Process Control Devices

Manual

Small industrial terminals

PCD7.D160 and ..D170

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Edition 26/753 E1 - 02.1997

Subject to technical changes

Updates

Manual : Small industrial terminals PCD7.D160 and ..D170 - Edition E1

Date	Chapter	Page	Description
15.11.2000	---	---	Small updates for the "Support Homepage"
15.11.2000	2	2-1	Correction : Tolerance of the supply voltage at U_n
15.11.2000	10	10-1 / 10-2	Serial interface RS 232 only possible with ..D170

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Notes :



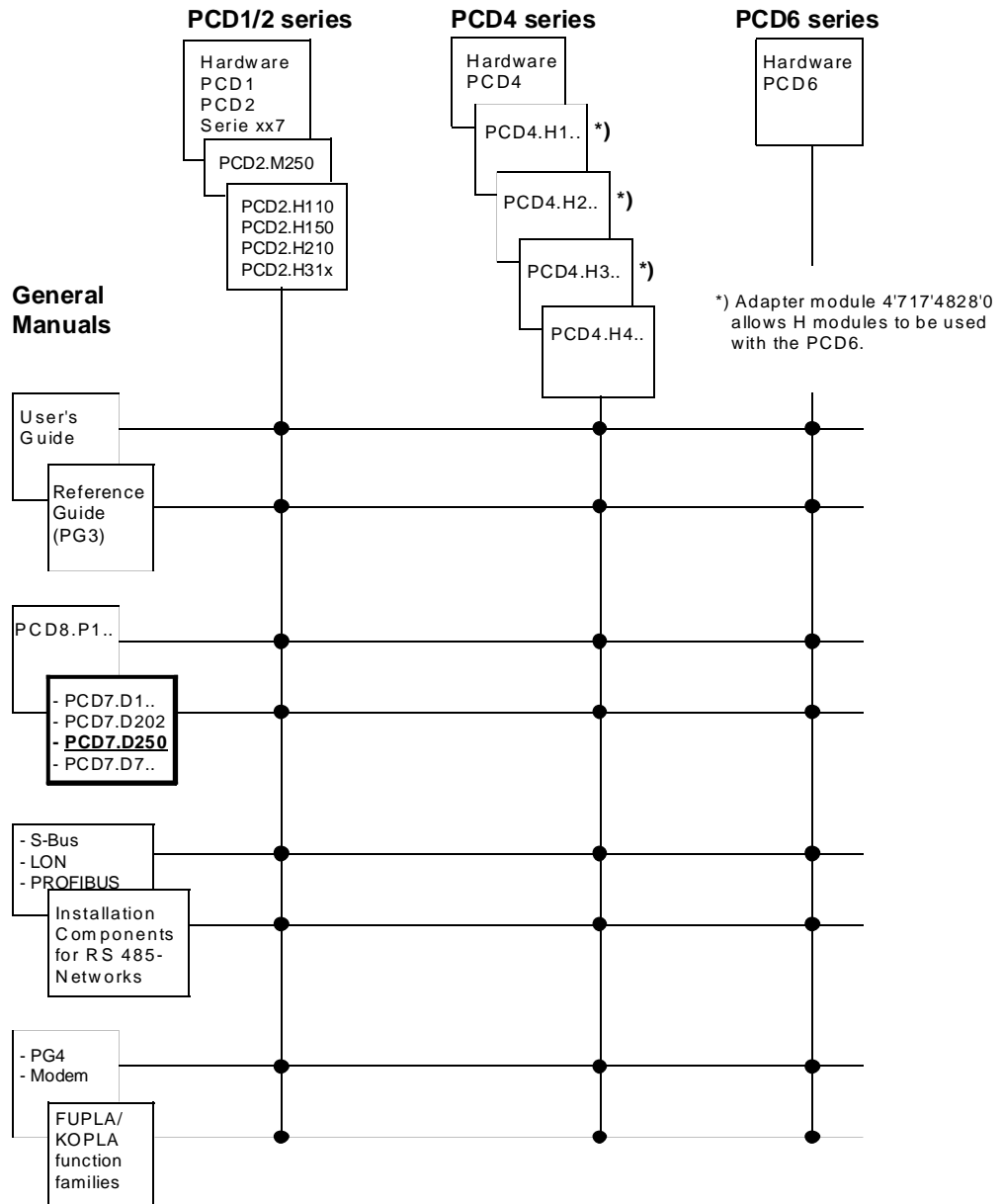
Please note :

A number of detailed manuals are available to aid installation and operation of the SAIA® PCD. These are for use by technically qualified staff, who may also have successfully completed one of our "workshops".

To obtain the best performance from your SAIA® PCD, closely follow the guidelines for assembly, wiring, programming and commissioning given in these manuals. In this way, you will also become one of the many enthusiastic SAIA® PCD users.

If you have any technical suggestions or recommendations for improvements to the manuals, please let us know. A form is provided on the last page of this manual for your comments.

Summary



Reliability and safety of electronic controllers

SAIA-Burgess Electronics Ltd. is a company which devotes the greatest care to the design, development and manufacture of its products:

- state-of-the-art technology
- compliance with standards
- ISO 9001 certification
- international approvals: e.g. Germanischer Lloyd, UL, Det Norske Veritas, CE mark ...
- choice of high-quality componentry
- quality control checks at various stages of production
- in-circuit tests

Despite every care, the excellent quality which results from this does have its limits. It is therefore necessary, for example, to reckon with the natural failure of components. For this reason SAIA-Burgess Electronics Ltd. provides a guarantee according to the “General terms and conditions of supply”.

The plant engineer must in turn also contribute his share to the reliable operation of an installation. He is therefore responsible for ensuring that controller use conforms to the technical data and that no excessive stresses are placed on it, e.g. with regard to temperature ranges, overvoltages and noise fields or mechanical stresses.

In addition, the plant engineer is also responsible for ensuring that a faulty product in no case leads to personal injury or even death, nor to the damage or destruction of property. The relevant safety regulations should always be observed. Dangerous faults must be recognized by additional measures and any consequences prevented. For example, outputs which are important for safety should lead back to inputs and be monitored from software. Consistent use should be made of the diagnostic elements of the PCD, such as the watchdog, exception organization blocks (XOB) and test or diagnostic instructions.

If all these points are taken into consideration, the SAIA[®] PCD will provide you with a modern, safe programmable controller to control, regulate and monitor your installation with reliability for many years.

1. Overview

1.1 Application

SAIA's new small terminals take advantage of the high intelligence and ample memory of SAIA®PCD controllers and can therefore be used economically and to optimal effect with industrial control systems or in building automation.

- All SAIA terminals PCD7.D1.. and D2.. have a simple text display. Apart from the display size and number of keys, they are fully mutually compatible, which makes changing to a larger version problem free (request brochure 26/311 E).
- The texts to be displayed are stored in the PCD control device. This means that the same programming tool (PG1, PG3 or PG4) can be used as for the control program. In addition, access to text and variables is possible at any time via modem.
- The intelligent text output of PCD controllers allows variables to be edited as desired and output to the display in the necessary format.
- Of course, these terminals also bear the CE mark and have been developed and manufactured under quality rules to ISO 9001.

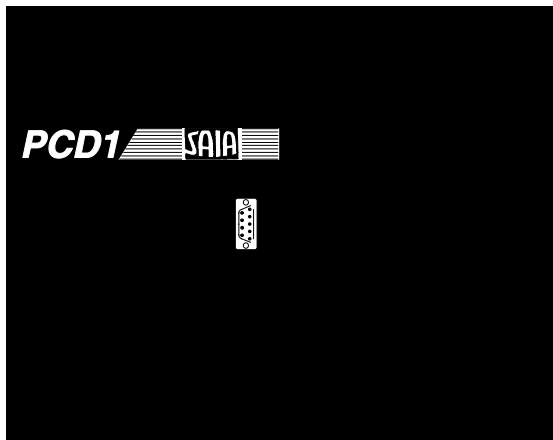
For intelligent terminals with graphics display also, please request brochure 26/325 E.

1.2 Quick guide to operating terminals PCD7.D160 and D170

The following chapters supply detailed descriptions of the broad functional possibilities provided by the D160/D170 terminal. In any practical application, probably only a small part of them will be used.

In order to give the beginner a brief guide to simple text output it is advisable, before studying all tests and instructions individually, to do one of the program examples from chapter 8 as a practical exercise. In this way it will be obvious how simple it is in practice to work with the PCD and the D160/D170 terminal.

1.3 Three types



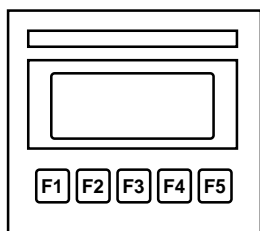
D160 on PCD1



D160 on PCD2

All types are identical regarding display (4 x 16 characters) number of keys (5) and all software functions.

Terminal sets ..D162 and ..D163 plug straight onto the cover of PCD1 or PCD2 controllers. This combination results in an intelligent controller with the capacity for direct display and entry. The type designation for the set varies according to the interface module used (see ordering details and part 4.1).



PCD7.D170

Terminal ..D170 is suitable for front-panel flush mounting with IP 65 protective system and has RS 232 interface which fits all PCD controllers.

1.4 Ordering details

Type	Description
	Small terminal set for direct mounting on PCD1 or PCD2, consisting of terminal with display of 4 x 16 characters.
PCD7.D162	... and ..F540 interface module
PCD7.D163	... and ..F550 interface module with additional RS 422/RS 485 interface and real time clock (only for PCD2)
PCD7.D170	Small terminal for external mounting (front panel flush mount) with display of 4 x 16 characters
	Interface connecting cable (shielded)
PCD7.K412	between ..D170 terminal and the PGU connector of PCD CPU's (9-pole D-type connector both ends), length 2.5 m
PCD7.K422	between ..D170 terminal (9-pole D-type connector) and the RS232 interface of the PCD1, PCD2 or PCD4 (wire ends free), length 2.5 m

Overview

Notes :

2. Technical data

Type designation	PCD7.D162/..D163 ¹⁾	PCD7.D170
Display		
Type	LCD with LED back-lighting	
Display dimensions (h x w)	4 x 16 characters 24 x 60 mm	4 x 16 characters 24 x 60 mm
Character size (h x w)	5 x 7 pixels + cursor 2.95 x 4.75 mm	5 x 7 pixels + cursor 2.95 x 4.75 mm
Contrast adjustment	software	software
Back-lighting	off/on	off/on
Character fonts	ASCII plus special characters for English, German, French and Scandinavian languages	
Keyboard		
Function keys, customizable	5	5
System / numeric keys	(5) ²⁾	(5) ²⁾
Memory		
Text and data	Entire text and data memory of PCD controller, i.e. from max. 128 Kbytes for PCD1 to max. 1 Mbytes for PCD6	
Interfaces		
to SAIA®PCD	plugged directly onto PCD1/2	RS 232 9-pole, D-type jack
Performance and programming		
Performance features	All performance features of PCD controllers are also available for terminals, such as: up to 8000 texts, data in any format, alarm handling, password protection, real time clock	
Programming software	Any SAIA®PCD programming tool (PG1, PG3 or PG4)	
General data		
Supply voltage at U_n	5 VDC from PCD1/2 bus	24 VDC, +30%/-20% 19 VAC, ±15%, full-wave rectified
Power consumption at U_n	300 mA or 100 mA ³⁾	100 mA
Interference immunity	CE mark according to EN 50 081-1 and 50 082-2	
Protective system (front)	IP 20	IP 65
Operating temperature	0...50°C	0...50°C
Storage temperature	-25...+70°C	-25...+70°C
Humidity (without condensation) DIN 40 040 class F	5...95%	5...95%

1) The ..D162 or ..D163 build-on terminals can also be ordered ready for connection, mounted on a PCD1 or PCD2

2) Software configuration on the 5 keys produces 5 function keys or, with a shift key, 8 key functions.

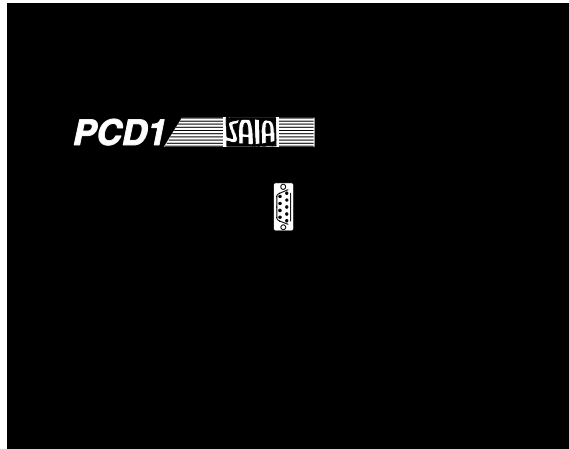
3) 100 mA with back-lighting switched off

Technical data

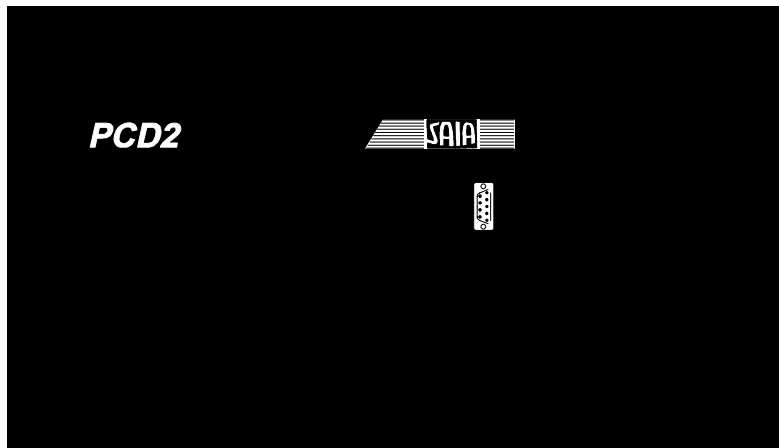
Notes :

3. Dimensions

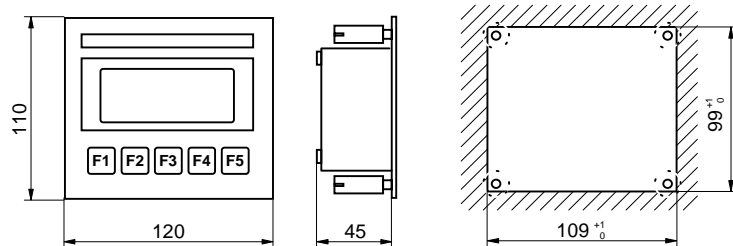
PCD7.D160
on
PCD1



PCD7.D160
on
PCD2



PCD7.D170



Dimensions

Notes :

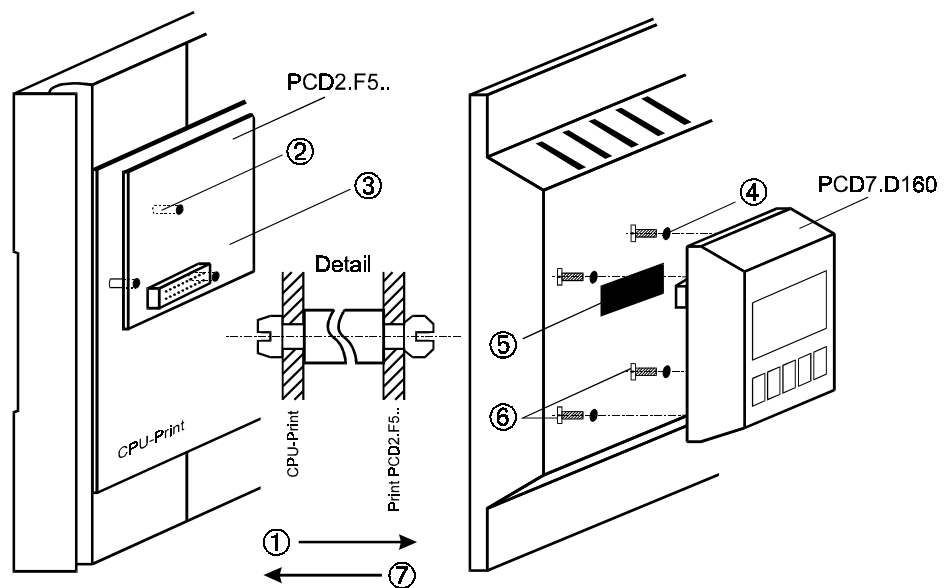
4. Hardware

Both models D160/D170 are identical as far as the display, keys and all software functions are concerned. Regarding hardware, they differ from each other in the following points:

- **Type D160** is plugged directly onto a PCD1 or PCD2 control device using an interface module
- **Type D170** (as D200/202) is designed for independent front-panel flush mounting, with its own 24V DC supply and a plug for an RS 232 connection.

4.1 The D160 build-on terminal

4.1.1 Mechanical features and assembly instructions D162 and D163



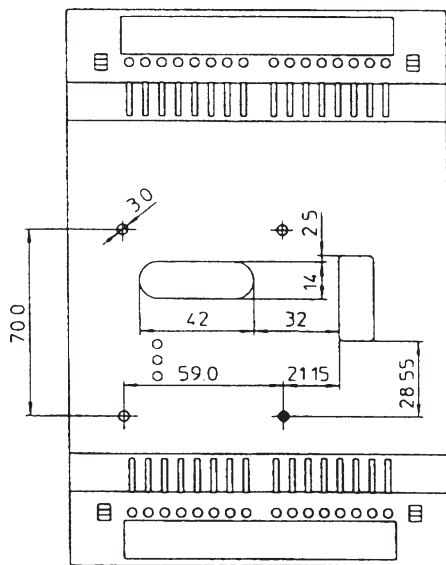
- ① Remove cover
 - ② insert supports onto main board (see "Detail"). Older modules do not have all 3 holes on the main board.
 - ③ Plug PCD7.F5.. interface module into connector and snap into supports.
 - ④ Push through or drill out ready-positioned screw holes \varnothing 3mm from back of cover.
 - ⑤ For PCD2: press red window out of cover
For PCD1: spec. cover 4'104'7338'0 can be ordered.
 - ⑥ Tighten the D160 terminal with the 4 screws.
 - ⑦ Carefully place cover on lower part.
- The cover, including the terminal, can be removed and replaced, even while the PCD1 is powered up and running.

We solve all listed problems for you when you order configured PCD1 or PCD2 systems with ready-assembled terminals (see part 4.1.2).

4.1.2 Which combinations are possible?

PCD1/2 base unit	Cover	PCD7.D162 terminal set with F540 interface module (standard without RTC and interface no.3)	PCD7.D163 terminal set with F550 interface module (with RTC and interface no.3)
PCD1.M110	Special 4'104'7338'0	√ a)	(√) but no other interface available
PCD1.M120	Special 4'104'7338'0	√ b)	(√) but no other interface available
PCD2.M110	Standard	√ c)	√ with RTC but no other interface available d)
PCD2.M120	Standard	√ e)	√ additional interface no. 3 (RS422/485) and real time clock available f)

*) From production 9701 on, blind holes are in the cover. They can be pushed or drilled through.



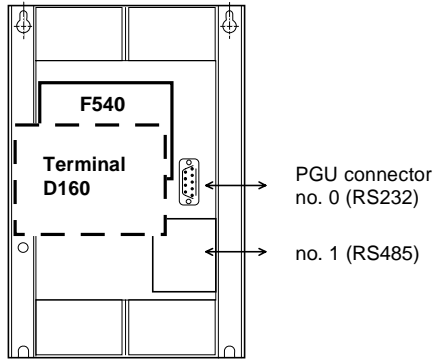
This type of PCD1 cover can be obtained by ordering item number 4'104'7338'0 .

We solve all listed assembly problems for you when you order configured PCD1 or PCD2 systems with ready-assembled terminals.

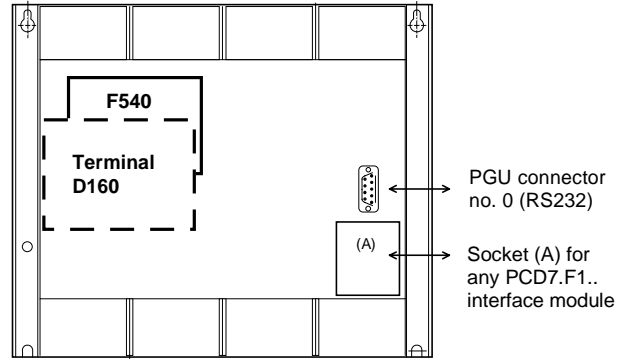
Combination	Configured type
a) PCD1.M110 with set D162	P30-5
b) PCD1.M120 with set D162	P35-5
c) PCD2.M110 with set D162	P10-5
d) PCD2.M110 with set D163	P10-6
e) PCD2.M120 with set D162	P20-5
f) PCD2.M120 with set D163	P20-6

Drawings to represent preceding table

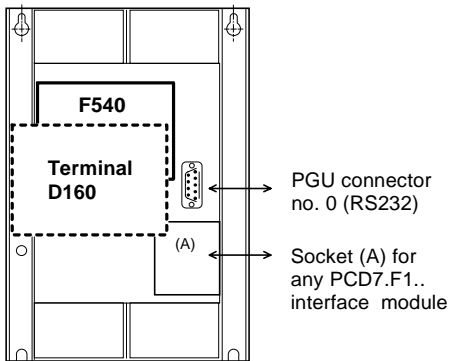
PCD1.M110
with **PCD7.D162** terminal set



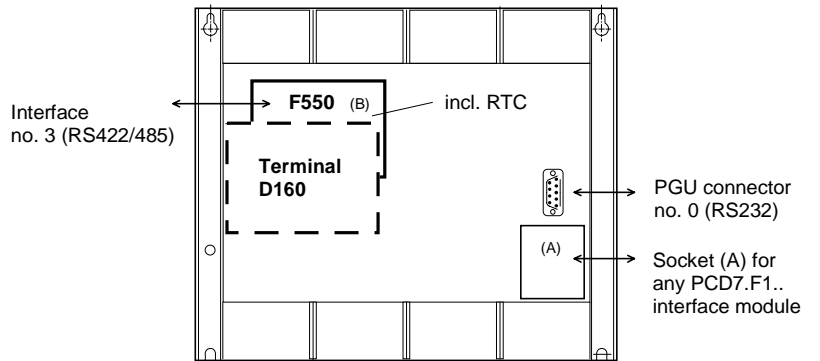
PCD2.M110
with **PCD7.D162** terminal set



PCD1.M120
with **PCD7.D162** terminal set



PCD2.M120
with **PCD7.D163** terminal set



4.1.3 Communications of terminal D160 to PCD1/PCD2

As shown in the previous section, communication takes place via the interface module with **port no. 2** of the PCD1 or PCD2 controller.

The communications parameters of both devices (D160 and PCD1/2) must match (see section 5.3.1 Setup mode). Regarding handshaking, the terminal requires "**RTS/CTS**" (which is the default setting). This corresponds to **MC1** mode in the PCD1/2 SASI text.

4.1.4 Power supply of D160

This is provided from the **internal +5V supply of the PCD1/2**. For all additional modules plugged onto the base unit, only limited power is available.

PCD1	750 mA
PCD2	1100 mA (including expansion unit)

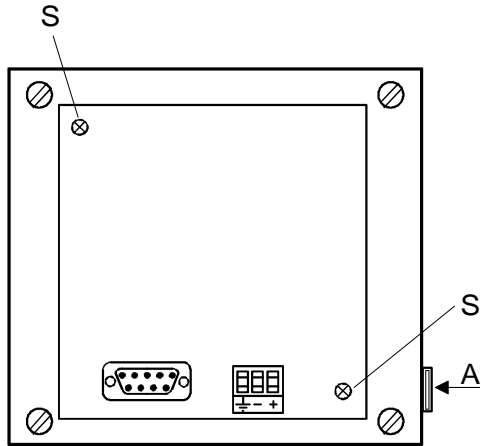
The power consumption of the D160 resp. D162/D163 with interface module F540/F550 is dependent on the back lighting of the display. From +5V it amounts to

- 300 mA with back lighting
- 100 mA without back lighting

Please note these values in connection with the rest of the equipment for the PCD1/2. Further details can be obtained from the PCD1/2 manual under the "Power supply" chapter.

4.2 D170 front-panel terminal

4.2.1 Power supply / connections



Power supply via plug-in screw terminals for wires of max. 2.5 mm² (flexible wires with ferrules max. 1.5 mm²).

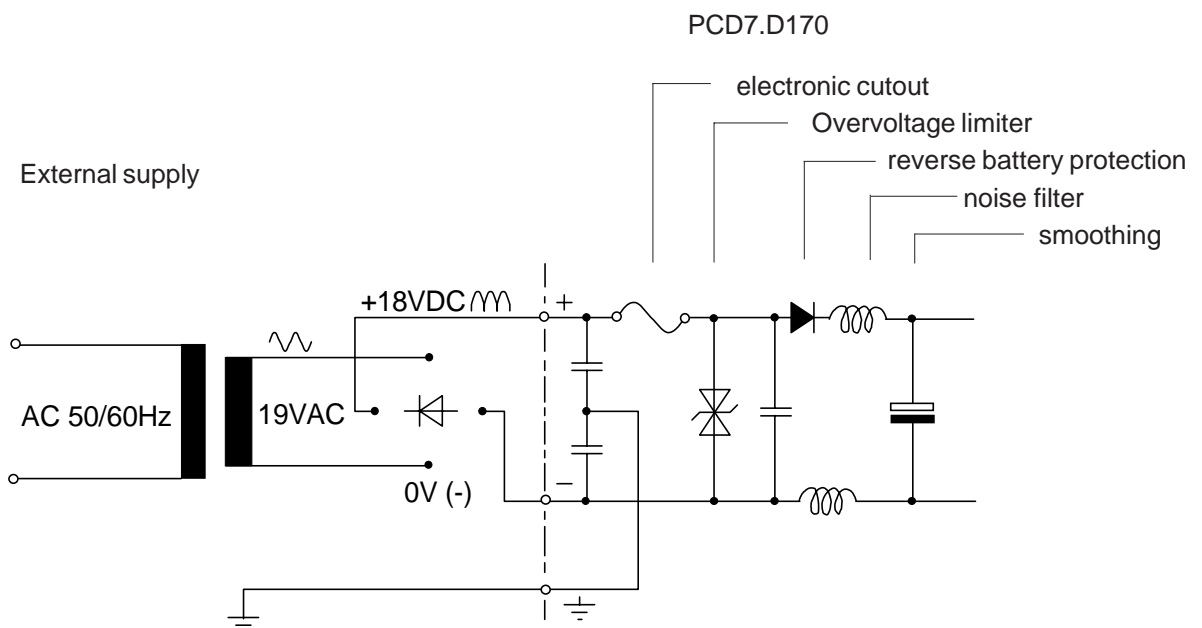
19...32 VDC smoothed or 19 VAC ± 15 % full wave rectified with reverse battery protection.



A good earth connection is imperative for perfect operation! Moreover, whenever the cover has been removed, cover screw S must be screwed back tightly to restore a good connection to frame ground.

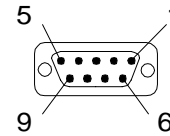
The labelling strip for the 5 keys is pushed in at position A. Depending on the setup (shift key No/Yes) the strip is selectable with F-labelling or with shift function. On the back of the strip, a user-specific label can also be applied.

Power supply with full wave rectified AC



4.2.2 Serial interface RS232 from terminal ..D170

9-pole D-type jack (female)

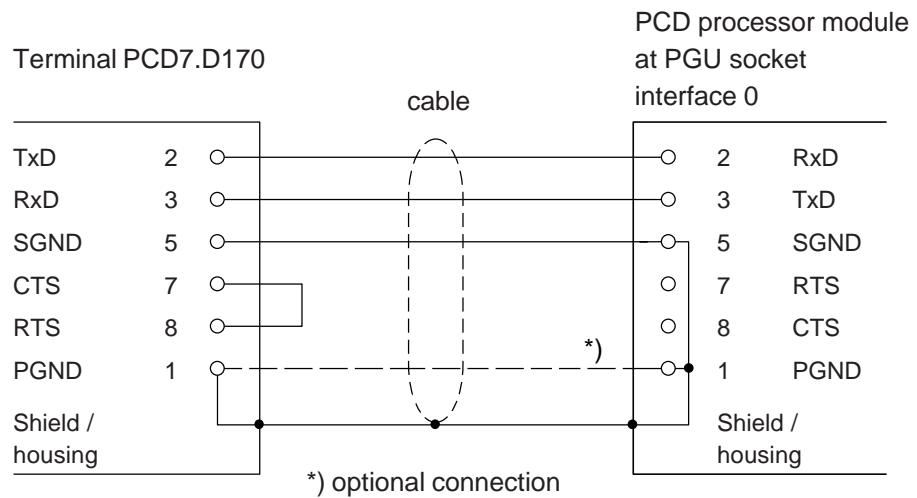


Without RTS/CTS handshaking

Instructions apply for all PCD communications channels:

- At the terminal, RTS must be connected with CTS.
- Up to 9600 Baud it is possible to work under PCD communications mode MC0.
- If communication is at 19,200 Baud, handshaking with XON/XOFF is required (PCD communications mode MC2).

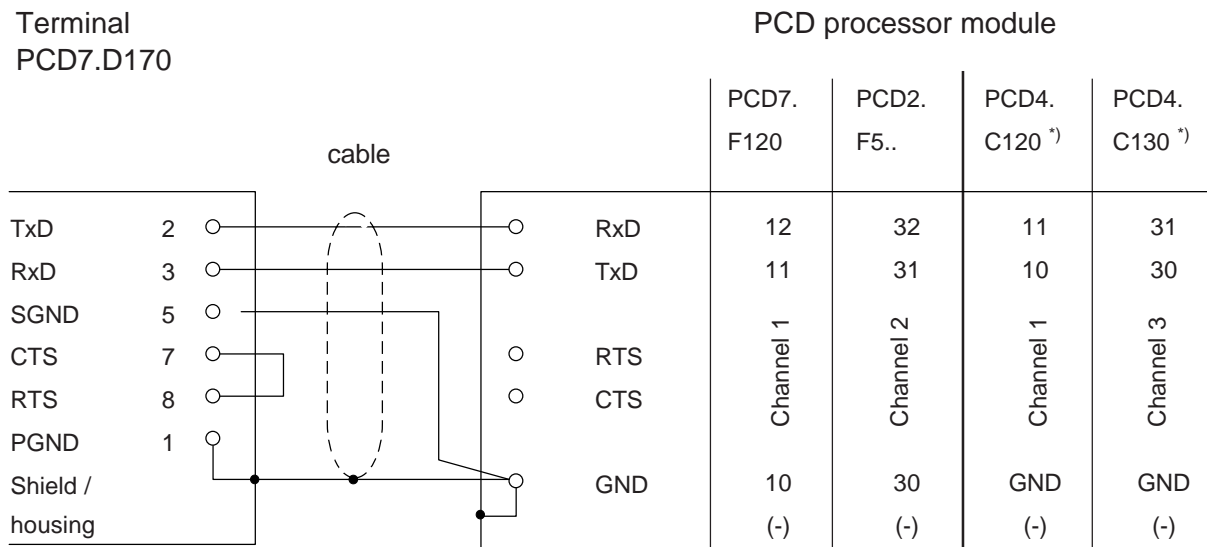
a) D170 terminal to PGU connector of PCD



For terminal D170 select in setup mode under handshaking "None" or "XON/XOFF".

PCD7.K412 cable can be used for this connection (see chapter 10).

b) D170 terminal to PCD processors, channels 1 to 3

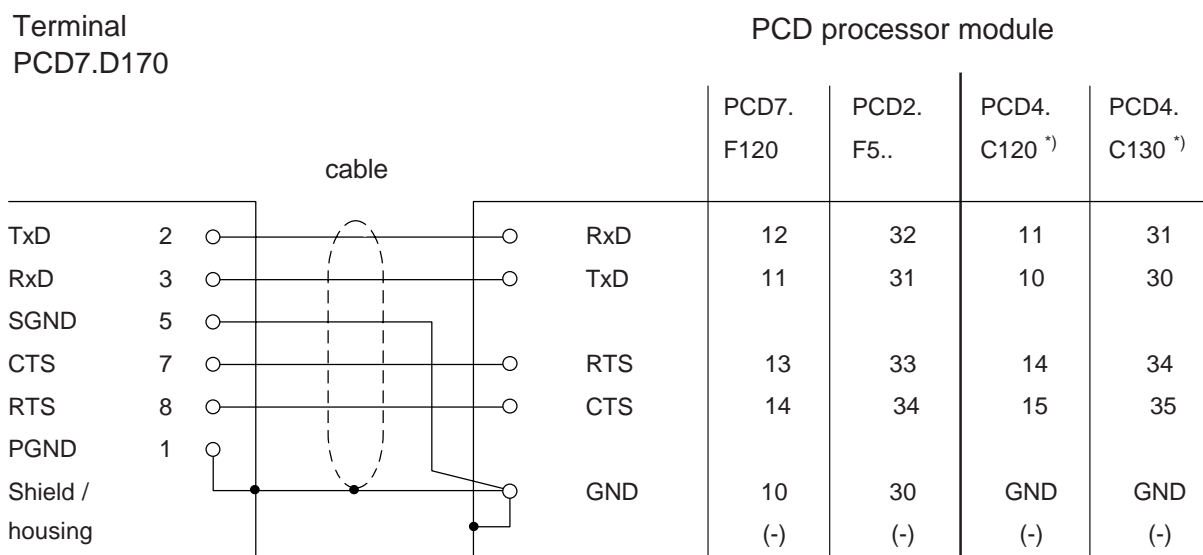


For terminal D170 select in setup mode under handshaking "None" or "XON/XOFF".

PCD7.K422 cable can be used for this connection (see chapter 10).

With RTS/CTS handshaking

The corresponding PCD communications channel must be assigned with MC1 mode. Default the terminal is already in pos. "RTS/CTS".



*) Regarding bus module PCD4.C340, please refer to PCD4 manual 26/734 part 3.4.

Notes :

5. Operation

5.1 Power-up tests

When the D160/D170 starts up, this display is shown:

```
SAIA-BURGESS  
CH-3280 MURTEN  
PCD7.D1x V001  
POWER-UP TEST
```

The power-up tests are executed, and the D160/D170 is initialized. This takes about 2 seconds. The user program should not send commands to the terminal during this period, because they will be ignored. The user program can use the "poll" command, described in section 6.4, to determine when the terminal is ready to accept commands, or can simply delay for short period.

The selftest contains 6 steps :

- CPU-Test
- LCD-Test
- RAM-Test
- EPROM-Checksum Test
- Display-Test
- EEPROM-Checksum Test

If any test fails, the D160/D170 attempts to indicate the failure on the display and the microprocessor is halted. The tests are automatically repeated after about 1.5 seconds, when the watchdog timer resets the terminal.

5.2 The keyboard

The 5 keys can operate either as straight function keys F1 to F5, or as shift-keys with dual functions (see also chapters entitled "Setup" and "Control commands").

According to the mode selected, appropriate strip labels can be inserted.

Mode without Shift-function



Key	Dec	Hex	ASCII	Notes
F1	65	41	'A'	
F2	66	42	'B'	
F3	67	43	'C'	
F4	68	44	'D'	
F5	69	45	'E'	

Mode with Shift-function



Key	Dec	Hex	ASCII	Notes
Shift	-	-	-	*)
←	8	08	BS	Left arrow
→	6	06	ACK	Right arrow
↑	11	0B	VT	Up arrow
↓	5	05	ENQ	Down arrow
Shift+← (Q)	113	71	'q'	Quit
Shift+→	112	70	'p'	User key
Shift+↑ (i)	(105)	(69)	(i)	No code output but change to "Setup/Test" mode. If "Setup/Test" mode is blocked, the character 'i' is output. *)
Shift+↓ (E)	13	0D	CR	Enter (carriage return)

*) If the shift-function mode is being used, access to "Setup/Test" mode should be blocked. This prevents any risk of the user unintentionally entering that mode. An additional key combination (total 8) is also available to the programmer. See chapter 6.4 "Disable and Enable Setup/Test mode".

5.3 Setup/Test mode

This mode is entered by pressing **F1+F4** ^{*)} resp. **Shift+i** . Setup/Test mode can be entered when the D160/D170 is on or off line, all data received from the host is ignored until the mode is exited.

Mode without Shift-function:

```

SETUP/TEST MODE
F4/5 scroll menu
F1 exec, F2 exit
Setup mode

```

Mode with Shift-function:

```

SETUP/TEST MODE
↑/↓ scroll menu
↵ exec, Q exit
Setup mode

```

Pressing the F4/F5 key or the up or down arrow key steps through the Setup/Test mode menu:

Setup mode	Configures the D160/D170
Default setup	Restores factory default setup
Demo display	Demonstration display
Hardware tests	Runs hardware tests continuously
Display test	Tests the LCD display
Keyboard test	Tests the keyboard

Once the desired menu item is selected, pressing F1 resp. ↵ executes.

To exit Setup/Test mode, press "F2" or "Q".



Note 1: If the host computer is sending data to the D160/D170 when the operator enters Setup/Test mode, characters may be lost, which can cause the display to become corrupted on return to normal operation.

^{*)} Note 2: If mode without Shift-function is selected (default), the character of the first depressed key is sent out by the serial interface.

5.3.1 Setup mode

This displays and configures the setup data by the keyboard in the non-volatile EEPROM. The first screen shows a help text:

Mode without Shift-function:

```

SETUP MODE
F4/5 scroll menu
F3  change data
F1 ok , F2 abort
    
```

Mode with Shift-function:

```

SETUP MODE
↑/↓ scroll menu
←/→ change data
↵ ok , Q abort
    
```

Pressing any key displays the first item in the menu:

```

SETUP MODE

Baudrate:
9600
    
```

Pressing the up or down arrow key resp. F4 or F5 steps through the menu of configurable items. Press the left or right arrow key resp. F3 (only one direction) to change the selected item's setting.

Baudrate	110, 150, 300, 600, 1200, 2400, 4800 [9600], 19200
Data bits	[8] (can not be modified)
Parity	[Even], Odd, None, Low, High
Stop bits	[1] (can not be modified)
Handshaking	None, [RTS/CTS], XON/XOFF
Echo key to display	[No], Yes
Page/scroll mode	[Page], Scroll
Auto line feed	[No], Yes
Key auto-repeat	[No], Yes
"2 speed"	
Character set	[D100 compatible], English, French, German, Scandinavian
Backlight	[Off], On
Contrast	0...7 [4]
Shift key	[No], Yes

[] Factory default settings are shown in square brackets. Each item is described in detail below.

Once all settings are correct, press F1 resp. ↵ to store the data to the non-volatile EEPROM memory. To abort, discarding any changes, press "F2" or "Q". All features except the baudrate, data bits, parity, stop bits and handshaking can also be controlled from the host computer by sending an escape sequence to the D160/D170. These are described in section 6.1.

Communication parameter (Baudrate, Data bits, Parity and Stop bits)

These settings define the communications protocol

- 1 Start bit
- 8 Data bits
- 1 Parity bit (or none)
- 1 Stop bit

Parity "High" can also be used as second stop bit.

Handshaking [None]

With handshaking, the data flow between communications partners can be controlled. Since the D160/D170 has a receive buffer of 256 characters, handshaking is not generally required.

At 19,200 Baud, however, handshaking should always be used (either with RTS/CTS or XON/XOFF).

The D160 always requires RTS/CTS handshaking, regardless of baud rate.

RTS/CTS : This handshaking takes place via hardware, using the appropriate control lines (PCD mode MC1).
If "None" is selected, pins 8 and 7 (RTS/CTS) on the D170 should be short-circuited (PCD mode MC0)

XON/XOFF : handshaking uses the XOFF (17 decimal, 11H) and XON (19 decimal, 13H) characters to disable (XOFF) and enable (XON) transmission. Pins 7 and 8 of the D170 plug must be connected together and SAIA° PCD is assigned in mode MC2.

Echo (Echo key to display) [No]

When a key is pressed in "Echo=Off" mode (the default), the ASCII code is transmitted directly to the host computer and is not displayed. The user program in the host computer must echo the character back to the D160/D170 for it to be displayed. When a key is pressed in "Echo=Yes" mode, the character is automatically written to the display at the current cursor position, and it is also transmitted to the host.

Page/scroll mode [Page]

Page mode : The cursor moves from the last line to the first line when the D160/D170 receives a line feed character. The display is not altered.

Scroll mode: If the cursor is on the last line when a line feed is received, then the display scrolls up one line and the cursor remains on the last line, which is now blank, in the same column. If the line feed was caused by a carriage return character, with "auto line feed" set to "Yes", then the cursor is also moved to the start of the line.

Auto line feed [No]

When the D160/D170 receives a carriage return character (13 decimal, 0DH), it moves the cursor to the start of the current line. If "auto line feed" is set to "Yes", then the cursor also moves to the next line down automatically.

Key auto-repeat [No]

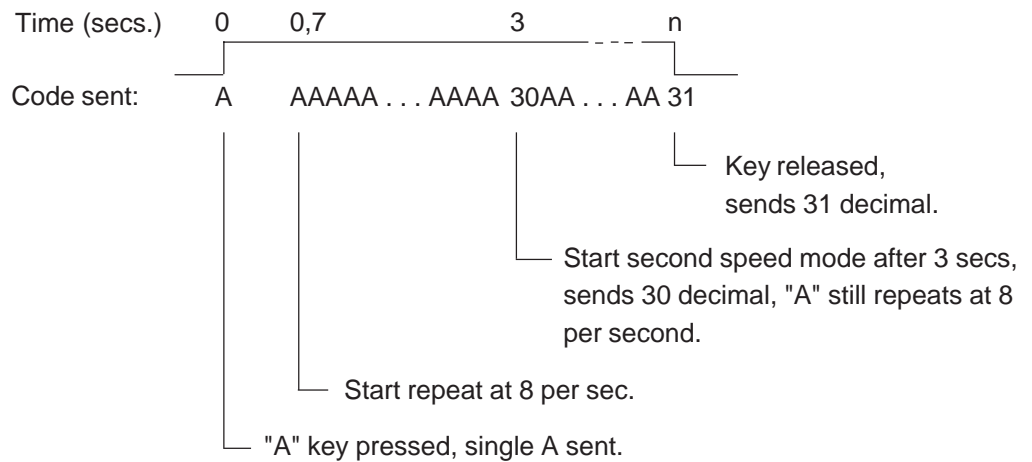
Keys can be made to repeat at a rate of 8 per second if the key is held depressed for more than 0.7 seconds. The auto-repeat feature has these settings:

No	No keys repeat (default)
Yes	All keys repeat, with 2-speed signalling, see below

"2 speed" signalling mode is for use by host programmes that have stepping up/down controls, which are stepped by pressing up/down keys. With auto-repeat on, key codes are sent at a rate of 8 per second if the key is held down for 0.7 sec. The same occurs with the 2 speed feature, but after holding the key down for 3 seconds a special "start second speed" character (30 decimal) is sent to the host to indicate 2 speed mode, followed by more repeated key codes at the same 8-per-second rate. When the key is released an "end 2 speed" character (31 decimal) is sent to indicate that the key has been released.

When the host's program receives the up/down key code, it should increment/decrement the associated value. If the host receives a "start second speed" character it should step the value by two (or more) and also for each additional up/down key code received and stop when the "end 2 speed" character is received (or any character which is not the same repeated up/down key code).

For example, if "A" is pressed, with "All keys, 2 speed" auto-repeat, this is the sequence of events:



Character set

[D100]

Five character sets are available. Each character set has the same characters for those with codes 32 to 127 decimal (20H to 7FH), but extended ASCII characters with codes 128 to 255 decimal (80H to FFH) are selected according to the character set. (see section 7).

Backlight

[On]

The display's LED backlight can be turned on and off if required. The backlight is normally off. The backlight can be turned off and on (blinked) to provide a visual indication of an alarm etc. using escape sequences sent by the host computer.

Contrast

[7]

The contrast of the LCD display (it's blackness) can be adjusted in 8 steps by selecting a value between 0 and 7. 0 is the lightest, 7 is the darkest.

Shift-key mode

[No]

Since this terminal only has 5 keys, operation with or without the shift function is possible, depending on requirements (see chapter 5.2, Keyboard).

5.3.2 Default setup

This restores the factory default setup, and writes it into the non-volatile EEPROM. The factory default settings are as follows:

Baudrate	9600
Data bits	8
Parity	Even
Stop bits	1
Handshaking	RTS/CTS
Echo key to display	No
Page/scroll mode	Page
Auto line feed	No
Key auto-repeat	No
Character set	D100 compatible
Backlight	Off
Contrast	4 (medium)
Shift key	No

5.3.3 Demo display

This is for use when showing the D160/D170 at an exhibition, when it is not connected to a host computer. The display shows some information about the unit. Press F1+F4 resp. Shift+i to exit.

```

<PCD7.D1x0>
INDUST. TERMINAL
SAIA-BURGESS
CH-3280 MURTEN
```

5.3.4 Hardware tests

This runs the power-up tests in a continuous loop, which can be used for detecting intermittent faults when the D160/D170 is in the field. The tests run until an error occurs, which displays a text and the D160/D170 is reset by the watchdog timer and the tests are repeated. The only way to exit the tests is to power the terminal off and on.

5.3.5 Display test

This is a comprehensive test of the LCD display, the character set and the LCD controller's internal RAM. **Press any key** to exit.

5.3.6 Keyboard test

This displays a "map" of the keyboard, with a digit for each key. If the key is not pressed, the digit will be "0", when the key is pressed the digit should be "1". It also shows the character assigned to the last key which was pressed, enclosed in square brackets.

Mode without Shift-function:

```
KEYBOARD TEST
F1+F3 to exit
Last Key:[F1]
10000
```

Mode with Shift-function:

```
KEYBOARD TEST
Shift+→ to exit
Last Key:[RA]
00100
```

Press **F1+F3** resp. **Shift+→** to exit the keyboard test.

Operation

Setup/Test mode

Notes :

6. Commands

Single control characters or two, three or four character "escape sequences" are transmitted to the D160/D170 using the PCD's STXT (send text) or STXD (transmit character) instructions.



Note: Some escape sequences use the '@' character. If using a SAIA° PCD port running in MODE C, the PCD interprets an '@' character as the start of an indirect addressing control string. So when using MODE C, enter each '@' character as '@@', so the PCD interprets it as a single '@' character.

6.1 Configuration (by the serial interface)

The configuration of the D160/D170 can be modified by sending a series of special commands. The configuration remains active until the D160/D170 is powered off and on, whereupon the configuration defined from "setup mode" is restored.

All required commands can be included in a single PCD Text and transmitted to the D160/D170 in one go.

Echo key to display

See section 5.3.1 for details.

Command	ASCII	Decimal	Hex
Echo off	ESC @ 0	27 64 48	1B 40 30
Echo on	ESC @ 1	27 64 49	1B 40 31

Page and scroll mode

See section 5.3.1 for details.

Command	ASCII	Decimal	Hex
Scroll mode	ESC @ 4	27 64 52	1B 40 34
Page mode	ESC @ 5	27 64 53	1B 40 35

Auto line feed after carriage return

See section 5.3.1 for details.

Command	ASCII	Decimal	Hex
Auto line feed on	ESC @ 2	27 64 50	1B 40 32
Auto line feed off	ESC @ 3	27 64 51	1B 40 33

Key auto-repeat

See section 5.3.1 for details.

Command	ASCII	Decimal	Hex
Auto-repeat off	ESC A	27 65	1B 41
Auto-repeat on for all keys, "2 speed"	ESC D	27 68	1B 44

Keyboard with "Shift" function

See section 5.3.1 for details.

Command	ASCII	Decimal	Hex
Shift function off	ESC G	27 71	1B 47
Shift function on	ESC F	27 70	1B 46

Character set

Five character sets are available, as described in section 7.

Command	ASCII	Decimal	Hex
D100 compatible	ESC @ F	27 64 70	1B 40 46
English	ESC @ 6	27 64 54	1B 40 36
French	ESC @ 7	27 64 55	1B 40 37
German	ESC @ 8	27 64 56	1B 40 38
Scandinavian	ESC @ E	27 64 69	1B 40 45

Backlight and contrast see part 6.3

6.2 Cursor control

Cursor up/down/left/right

The cursor can be moved one place up, down, left or right with a single-character command. If the cursor is moved off the display, it wraps around automatically.

Command	ASCII	Decimal	Hex
Cursor up	CTRL+K	11	0B
Cursor down	CTRL+E	5	05
Cursor left	CTRL+H	8	08
Cursor right	CTRL+F	6	06

Cursor positioning

Apart from the cursor address code (16 dec. or 10H), this function also requires X and Y addresses to position the cursor. Add an offset of 32 dec. or 20H to both addresses. If either of the addresses is incorrect, the cursor is not moved.

Example (sequence: 16 dec., Code X, Code Y) :

Cursor position	Decimal command	Hex command
Column 1, Line 1	16 32 32	10 20 20
Column 4, Line 2	16 35 33	10 23 21
Column 16, Line 4	16 47 35	10 2F 23

Y Code	Code X	<32>	<33>	<34>	<35>	<36>	<37>	<38>	<39>	<40>	<41>	<42>	<43>	<44>	<45>	<46>	<47>
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<32>	1	x															
<33>	2				x												
<34>	3																
<35>	4																x

Note: To place the cursor in x-pos. 36 (equal ASCII \$), please enter in each PCD text <36><36>.

Example: Text xxxx "... 16 36 36 34 ..."

X-Pos. Y-Pos.

Cursor home

This single-character command moves the cursor to the first column of the first line.

Command	ASCII	Decimal	Hex
Cursor home	CTRL+Z	26	1A

Cursor on/off

These two-character commands turn the cursor on and off.

Command	ASCII	Decimal	Hex
Cursor on	ESC W	27 87	1B 57
Cursor off	ESC T	27 84	1B 54

Line feed

Line feed moves the cursor down one line. If the cursor was on the last line, this scrolls the display if in scroll mode, or the cursor moves to the first line if in page mode. The column position is not changed.

Command	ASCII	Decimal	Hex
Line feed	LF	10	0A

Carriage return

Carriage return moves the cursor to the start of the current line. If "auto line feed after carriage return" is selected, a line feed is also done as described above.

Command	ASCII	Decimal	Hex
Carriage return	CR	13	0D

Delete character

Delete removes the character to the left of the cursor (changes it to a space), and moves the cursor left one place. If at the start of a line, the cursor is moved to the end of the preceding line. Delete stops at the home position.

Command	ASCII	Decimal	Hex
Delete (backspace)	DEL	127	7F

6.3 Display control

Clear display

Clear display sets all the characters on the display to spaces, and moves the cursor to the home position.

Command	ASCII	Decimal	Hex
Clear display	CTRL+L	12	0C

Save display/Restore display

These commands save and restore the contents of the display and the cursor position and state (visible/not visible). Ten save/restore areas are provided, numbered 0 to 9. Restoring from a display area that was not previously saved will produce unexpected results.

Command	ASCII	Decimal	Hex
Save display 'n'	ESC @ S n	27 64 83 n	1B 40 53 n
Restore display 'n'	ESC @ R n	27 64 82 n	1B 40 52 n

Where 'n' is '0'..'9' (48..57 decimal, 30H..39H)

Backlight off/on

The display's LED backlight can be turned off if required. The backlight is normally always on, and is required to make the text visible. The backlight can be turned off and on (blinked) to provide a visual indication of an alarm etc.

Command	ASCII	Decimal	Hex
Backlight off	ESC O	27 79	1B 4F
Backlight on	ESC L	27 76	1B 4C

Display contrast

The contrast of the LCD display (it's blackness) can be adjusted by sending a contrast value between 0 and 7, where 0 is lightest and 7 is darkest.

Command	ASCII	Decimal	Hex
Light	ESC @ D 0	27 64 68 48	1B 40 44 30
Medium contrast	ESC @ D 4	27 64 68 52	1B 40 44 34
Dark	ESC @ D 7	27 64 68 55	1B 40 44 37

6.4 Miscellaneous commands

Lock keyboard/Unlock keyboard

These commands enable or disable the keyboard. When locked, all key depressions are ignored.

Command	ASCII	Decimal	Hex
Lock keyboard	ESC N	27 78	1B 4E
Unlock keyboard	ESC Q	27 81	1B 51

Restart warm/Restart cold

"Restart warm" resets the D160/D170 and restores the customer setup. It is the same as a power-up reset.

"Restart cold" initializes the setup to the factory defaults listed in section 5.3.2.

Command	ASCII	Decimal	Hex
Restart warm	ESC H	27 72	1B 48
Restart cold	ESC @ G	27 64 71	1B 40 47

Disable and Enable Setup/Test mode

Once the D160/D170 has been configured, you may want to prevent unauthorized users changing the setup. This can be done with the escape sequence below, which disables or enables the Shift+i key combination. If disabled, Shift+i is also restored by powering the D160/D170 off and on, or by sending a "Restart" command.

Command	ASCII	Decimal	Hex
Disable Setup/Test	ESC @ H	27 64 72	1B 40 48
Enable Setup/Test	ESC @ I	27 64 73	1B 40 49

Note: If the shift-function mode is being used, access to "Setup/Test" mode should be blocked. This prevents any risk of the user unintentionally entering that mode. An additional key combination (total 8) is also available to the programmer. See also chapter 5.2.

Demonstration display and hardware tests

These commands execute the tests described in sections 5.3.3 to 5.3.7. The "poll" command can be used determine when test has been completed.

Command	ASCII	Decimal	Hex
Demonstration display	ESC J	27 74	1B 4A
Display test	ESC @ A	27 64 65	1B 40 41
Keyboard test	ESC @ 9	27 64 57	1B 40 39
Hardware tests	ESC @ C	27 64 67	1B 40 43

Poll

To determine if the D160/D170 is connected and is ready to receive commands, the "poll" message can be sent. If the D160/D170 is ready, it returns an "SOH" response character (1 decimal, 01H). If not ready there will be no response.

It can also be used to check that the D160/D170 is still operational. If it fails, the user program could take the necessary action to alert the operator that the D160/D170 terminal is not responding.

Command	ASCII	Decimal	Hex
Poll	ESC @ B	27 64 66	1B 40 42

6.5 Command summary

Command	ASCII	Decimal	Hex
Configuration:			
Echo off	ESC @ 0	27 64 48	1B 40 30
Echo on	ESC @ 1	27 64 49	1B 40 31
Auto line feed on	ESC @ 2	27 64 50	1B 40 32
Auto line feed off	ESC @ 3	27 64 51	1B 40 33
Scroll mode	ESC @ 4	27 64 52	1B 40 34
Page mode	ESC @ 5	27 64 53	1B 40 35
D100 character set	ESC @ F	27 64 70	1B 40 46
English	ESC @ 6	27 64 54	1B 40 36
French	ESC @ 7	27 64 55	1B 40 37
German	ESC @ 8	27 64 56	1B 40 38
Scandinavian	ESC @ E	27 64 69	1B 40 45

Note: To output the character "@", please enter in each PCD text "@@" !

Command	ASCII	Decimal	Hex
Auto-repeat off	ESC A	27 65	1B 41
Auto-repeat on, all keys, "2 speed"	ESC D	27 68	1B 44
Keyboard with shift-function on	ESC F	27 70	1B 46
Keyboard with shift-function off	ESC G	27 71	1B 47
Cursor control:			
Cursor up	CTRL+K	11	0B
Cursor down	CTRL+E	5	05
Cursor left	CTRL+H	8	08
Cursor right	CTRL+F	6	06
Cursor home	CTRL+Z	26	1A
Cursor on	ESC W	27 87	1B 57
Cursor off	ESC T	27 84	1B 54
Line feed	LF	10	0A
Carriage return	CR	13	0D
Delete (backspace)	DEL	127	7F
Cursor positioning	ASCII	CTRL+P ' '+X ' '+Y	
	Decimal	16 32+X 32+Y	
	Hex	10 20+X 20+Y	
Display control:			
Clear display	CTRL+L	12	0C
Save display 'n'	ESC @ S n	27 64 83 n	1B 40 53 n
Restore display 'n'	ESC @ R n	27 64 82 n	1B 40 52 n
Backlight off	ESC O	27 79	1B 4F
Backlight on	ESC L	27 76	1B 4C
Display light	ESC @ D 0	27 64 68 48	1B 40 44 30
Medium contrast	ESC @ D 4	27 64 68 52	1B 40 44 34
Display dark	ESC @ D 7	27 64 68 55	1B 40 44 37

Note: To output the character "@", please enter in each PCD text "@@" !

Command	ASCII	Decimal	Hex
Miscellaneous commands:			
Lock keyboard	ESC N	27 78	1B 4E
Unlock keyboard	ESC Q	27 81	1B 51
Restart warm	ESC H	27 72	1B 48
Restart cold	ESC @ G	27 64 71	1B 40 47
Disable Setup/Test	ESC @ H	27 64 72	1B 40 48
Enable Setup/Test	ESC @ I	27 64 73	1B 40 49
Demonstration display	ESC J	27 74	1B 4A
Display test	ESC @ A	27 64 65	1B 40 41
Keyboard test	ESC @ 9	27 64 57	1B 40 39
Hardware tests	ESC @ C	27 64 67	1B 40 43
Poll	ESC @ B	27 64 66	1B 40 42
(D160/D170 responds with SOH)			

Note: To output the character "@", please enter in each PCD text "@@" !

Notes :

7. Character sets

The character set determines which special characters are displayed. The D160/D170 has eight programmable characters which are programmed according to the selected character set.

7.1 First ASCII-table (32...127 dec)

The characters 20..7F hex (32..127 decimal) are the same for all character sets:

Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC
32 20 SP	48 30 0	64 40 @	80 50 P	96 60 `	112 70 p
33 21 !	49 31 1	65 41 A	81 51 Q	97 61 a	113 71 q
34 22 "	50 32 2	66 42 B	82 52 R	98 62 b	114 72 r
35 23 #	51 33 3	67 43 C	83 53 S	99 63 c	115 73 s
36 24 \$	52 34 4	68 44 D	84 54 T	100 64 d	116 74 t
37 25 %	53 35 5	69 45 E	85 55 U	101 65 e	117 75 u
38 26 &	54 36 6	70 46 F	86 56 V	102 66 f	118 76 v
39 27 '	55 37 7	71 47 G	87 57 W	103 67 g	119 77 w
40 28 (56 38 8	72 48 H	88 58 X	104 68 h	120 78 x
41 29)	57 39 9	73 49 I	89 59 Y	105 69 i	121 79 y
42 2A *	58 3A :	74 4A J	90 5A Z	106 6A j	122 7A z
43 2B +	59 3B ;	75 4B K	91 5B [107 6B k	123 7B {
44 2C ,	60 3C <	76 4C L	92 5C \	108 6C l	124 7C
45 2D -	61 3D =	77 4D M	93 5D]	109 6D m	125 7D }
46 2E .	62 3E >	78 4E N	94 5E ^	110 6E n	126 7E →
47 2F /	63 3F ?	79 4F O	95 5F _	111 6F o	127 7F DEL

7.2 Extended ASCII-table (128...255 dec)

Extended ASCII characters 128..255 decimal (80..FF hex) are slightly different, depending on the selected character set. IBM extended ASCII character codes have been used (except for the "D100 compatible" character set). This allows the characters to be entered directly into TEXTs in the PCD's user program, using a PC-based ASCII text editor such as EDIT or IBM's Personal Editor (PE).

In the following diagrams, ASCII characters which are left blank display as a space.

Note: The displayed character shapes in the extended ASCII characters may not be exactly as shown due to differences between the D160/D170 and IBM PC character shapes.

7.2.1 D100 compatible

This is the same as the original D100 character set.

Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC
128 80	144 90	160 A0	176 B0
129 81	145 91	161 A1 □	177 B1
130 82	146 92	162 A2	178 B2
131 83	147 93	163 A3	179 B3
132 84	148 94	164 A4	180 B4
133 85	149 95	165 A5	181 B5
134 86	150 96	166 A6	182 B6
135 87	151 97	167 A7	183 B7
136 88	152 98	168 A8	184 B8
137 89	153 99	169 A9	185 B9
138 8A	154 9A	170 AA	186 BA
139 8B	155 9B	171 AB	187 BB
140 8C	156 9C	172 AC	188 BC
141 8D	157 9D	173 AD	189 BD
142 8E	158 9E	174 AE ∃	190 BE
143 8F	159 9F	175 AF	191 BF

Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC
192 C0	208 D0	224 E0 α	240 F0
193 C1	209 D1	225 E1 ä	241 F1
194 C2	210 D2	226 E2 ß	242 F2
195 C3	211 D3	227 E3	243 F3
196 C4 Ä	212 D4	228 E4 ä	244 F4 Ω
197 C5 Å	213 D5	229 E5 å	245 F5
198 C6 Æ	214 D6 Ö	230 E6 æ	246 F6 ö
199 C7	215 D7	231 E7	247 F7 π
200 C8	216 D8 Ø	232 E8	248 F8 Ø
201 C9	217 D9	233 E9	249 F9
202 CA	218 DA	234 EA	250 FA
203 CB	219 DB □	235 EB x	251 FB
204 CC	220 DC Ü	236 EC Φ	252 FC ü
205 CD	221 DD	237 ED	253 FD
206 CE	222 DE	238 EE	254 FE
207 CF	223 DF □	239 EF Ö	255 FF ■

7.2.2 English

The English character set has a '£' sign and additional box drawing characters: \ulcorner \lrcorner \llcorner \lrcorner $|$ $-$ \top \perp

Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC
128 80	144 90	160 A0	176 B0
129 81 ü	145 91	161 A1	177 B1
130 82	146 92	162 A2	178 B2
131 83	147 93	163 A3	179 B3
132 84 ä	148 94 ö	164 A4 ñ	180 B4
133 85	149 95	165 A5	181 B5
134 86	150 96	166 A6	182 B6
135 87	151 97	167 A7	183 B7
136 88	152 98	168 A8	184 B8
137 89	153 99	169 A9 ←	185 B9
138 8A	154 9A	170 AA →	186 BA
139 8B	155 9B ø	171 AB	187 BB
140 8C	156 9C £	172 AC	188 BC
141 8D	157 9D ¥	173 AD	189 BD
142 8E	158 9E	174 AE	190 BE
143 8F	159 9F	175 AF	191 BF \lrcorner

Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC
192 C0 L	208 D0	224 E0 α	240 F0
193 C1 \perp	209 D1	225 E1 β	241 F1
194 C2 \top	210 D2	226 E2 Γ	242 F2
195 C3	211 D3	227 E3 π	243 F3
196 C4 -	212 D4	228 E4 Σ	244 F4
197 C5	213 D5	229 E5 σ	245 F5
198 C6	214 D6	230 E6 μ	246 F6 ÷
199 C7	215 D7	231 E7	247 F7
200 C8	216 D8	232 E8	248 F8 °
201 C9	217 D9 \lrcorner	233 E9 θ	249 F9 •
202 CA	218 DA \ulcorner	234 EA Ω	250 FA
203 CB	219 DB ■	235 EB	251 FB √
204 CC	220 DC	236 EC ∞	252 FC
205 CD	221 DD	237 ED	253 FD
206 CE	222 DE	238 EE €	254 FE ■
207 CF	223 DF	239 EF	255 FF

7.2.3 French

The French character set includes: é â à ê ë î ô ù

Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC
128 80	144 90	160 A0	176 B0
129 81 ü	145 91	161 A1	177 B1
130 82 é	146 92	162 A2	178 B2
131 83 â	147 93 ô	163 A3	179 B3
132 84 ä	148 94 ö	164 A4 ñ	180 B4
133 85 à	149 95	165 A5	181 B5
134 86	150 96	166 A6	182 B6
135 87	151 97 ù	167 A7	183 B7
136 88 ê	152 98	168 A8	184 B8
137 89	153 99	169 A9 ←	185 B9
138 8A è	154 9A	170 AA →	186 BA
139 8B	155 9B ¢	171 AB	187 BB
140 8C î	156 9C	172 AC	188 BC
141 8D	157 9D ¥	173 AD	189 BD
142 8E	158 9E	174 AE	190 BE
143 8F	159 9F	175 AF	191 BF

Dec Hex ASC	Dec Hex ASC	Dec Hex ASC	Dec Hex ASC
192 C0	208 D0	224 E0 α	240 F0
193 C1	209 D1	225 E1 ß	241 F1
194 C2	210 D2	226 E2 Γ	242 F2
195 C3	211 D3	227 E3 π	243 F3
196 C4 –	212 D4	228 E4 Σ	244 F4
197 C5	213 D5	229 E5 σ	245 F5
198 C6	214 D6	230 E6 μ	246 F6 ÷
199 C7	215 D7	231 E7	247 F7
200 C8	216 D8	232 E8	248 F8 °
201 C9	217 D9	233 E9 θ	249 F9 •
202 CA	218 DA	234 EA Ω	250 FA
203 CB	219 DB ■	235 EB	251 FB √
204 CC	220 DC	236 EC ∞	252 FC
205 CD	221 DD	237 ED	253 FD
206 CE	222 DE	238 EE €	254 FE ■
207 CF	223 DF	239 EF	255 FF

7.2.4 German

The German character set includes: ä ö ü Ä Ö Ü "(opening) and " (closing)

Dec	Hex	ASC	Dec	Hex	ASC	Dec	Hex	ASC	Dec	Hex	ASC
128	80		144	90		160	A0		176	B0	
129	81	ü	145	91		161	A1		177	B1	
130	82		146	92		162	A2		178	B2	
131	83		147	93		163	A3		179	B3	
132	84	ä	148	94	ö	164	A4	ñ	180	B4	
133	85		149	95		165	A5		181	B5	
134	86		150	96		166	A6		182	B6	
135	87		151	97		167	A7		183	B7	
136	88		152	98		168	A8		184	B8	
137	89		153	99	Ö	169	A9	←	185	B9	
138	8A		154	9A	Ü	170	AA	→	186	BA	
139	8B		155	9B	ø	171	AB		187	BB	
140	8C		156	9C		172	AC		188	BC	
141	8D		157	9D	¥	173	AD		189	BD	
142	8E	Ä	158	9E		174	AE	"	190	BE	
143	8F		159	9F		175	AF	"	191	BF	

Dec	Hex	ASC	Dec	Hex	ASC	Dec	Hex	ASC	Dec	Hex	ASC
192	C0		208	D0		224	E0	α	240	F0	
193	C1		209	D1		225	E1	β	241	F1	
194	C2		210	D2		226	E2	Γ	242	F2	
195	C3		211	D3		227	E3	π	243	F3	
196	C4	–	212	D4		228	E4	Σ	244	F4	
197	C5		213	D5		229	E5	σ	245	F5	
198	C6		214	D6		230	E6	μ	246	F6	÷
199	C7		215	D7		231	E7		247	F7	
200	C8		216	D8		232	E8		248	F8	°
201	C9		217	D9		233	E9	θ	249	F9	•
202	CA		218	DA		234	EA	Ω	250	FA	
203	CB		219	DB	■	235	EB		251	FB	√
204	CC		220	DC		236	EC	∞	252	FC	
205	CD		221	DD		237	ED		253	FD	
206	CE		222	DE		238	EE	€	254	FE	■
207	CF		223	DF		239	EF		255	FF	

7.2.5 Scandinavian

The Scandinavian character set includes: å Ä Å æ Æ Ö Ü ç

Dec	Hex	ASC	Dec	Hex	ASC	Dec	Hex	ASC	Dec	Hex	ASC
128	80		144	90		160	A0		176	B0	
129	81	ü	145	91	æ	161	A1		177	B1	
130	82		146	92	Æ	162	A2		178	B2	
131	83		147	93		163	A3		179	B3	
132	84	ä	148	94	ö	164	A4	ñ	180	B4	
133	85		149	95		165	A5		181	B5	
134	86	å	150	96		166	A6		182	B6	
135	87		151	97		167	A7		183	B7	
136	88		152	98		168	A8		184	B8	
137	89		153	99	Ö	169	A9	←	185	B9	
138	8A		154	9A	Ü	170	AA	→	186	BA	
139	8B		155	9B	ç	171	AB		187	BB	
140	8C		156	9C		172	AC		188	BC	
141	8D		157	9D	¥	173	AD		189	BD	
142	8E	Ä	158	9E		174	AE		190	BE	
143	8F	Å	159	9F		175	AF		191	BF	

Dec	Hex	ASC	Dec	Hex	ASC	Dec	Hex	ASC	Dec	Hex	ASC
192	C0		208	D0		224	E0	α	240	F0	
193	C1		209	D1		225	E1	β	241	F1	
194	C2		210	D2		226	E2	Γ	242	F2	
195	C3		211	D3		227	E3	π	243	F3	
196	C4	—	212	D4		228	E4	Σ	244	F4	
197	C5		213	D5		229	E5	σ	245	F5	
198	C6		214	D6		230	E6	μ	246	F6	÷
199	C7		215	D7		231	E7		247	F7	
200	C8		216	D8		232	E8		248	F8	°
201	C9		217	D9		233	E9	θ	249	F9	•
202	CA		218	DA		234	EA	Ω	250	FA	
203	CB		219	DB	■	235	EB		251	FB	√
204	CC		220	DC		236	EC	∞	252	FC	
205	CD		221	DD		237	ED		253	FD	
206	CE		222	DE		238	EE	€	254	FE	■
207	CF		223	DF		239	EF		255	FF	

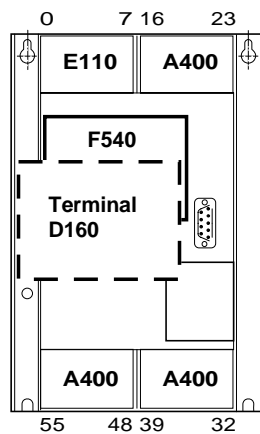
8. User program examples for PCD

8.1 Hardware configuration

All examples are based on the following hardware configuration.

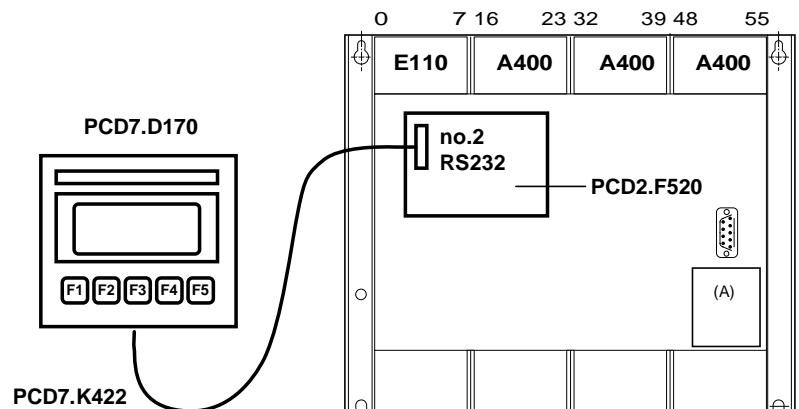
PCD1

with built on terminal set D162



PCD2

with external terminal D170



Hardware PCD1 : PCD1.M110 or M120
with built on terminal set PCD7.D162,
consisting of PCD7.D160 and PCD2.F540

Hardware PCD2 : PCD2.M120 or M130
with interface module PCD2.F520,
terminal PCD7.D170, cable PCD7.K422
(without RTS/CTS)

Serial interface : no. 2

Terminal setup

- for PCD1	:	Backlight	On
- for PCD2	:	Handshaking	None (MC0)
		Backlight	On

8.2 Single text transmission

When the switch connected to input 0 is switched on a simple text is transmitted to the terminal.

8.2.1 The user program is structured in BLOCTEC.

8.2.2 The user program is structured in GRAFTEC.

8.3 Transmission of several texts

When the switches connected to input 0, 1 and 2 are switched on the following texts are transmitted to the terminal:

Input 0 : a simple text is displayed.
Input 1 : a text containing the state of the inputs 4 and 5 is displayed.
Input 2 : a text containing the state of the inputs 6 and 7 is displayed.

8.3.1 The user program is structured in BLOCTEC.

8.3.2 The user program is structured in GRAFTEC.

8.4 Recognition of a pressed key with a following action

When one of the function keys F1, F2, F3 or F4 is pressed the following texts are transmitted.

Key F1 : a simple text is displayed
Key F2 : a text containing the state of the inputs 0 to 7 and outputs 16 to 23 is displayed.
Key F3 : a text containing the the BCD value of the switches connected to the inputs 0... 7 is displayed.
Key F4 : a text containing the date, week and time is displayed.

By pressing the key F4 the date, week and time is transmitted only once to the terminal. If a value should be displayed cyclically (for instance to refresh the time) then the following points should be noted to get a stable display:

- Switch off the cursor
- Don't send the control code "12" (clear screen) at the beginning of the text.

8.4.1 The user program contains jumps.

8.4.2 The user program is structured in BLOCTEC.

8.4.3 The user program is structured in GRAFTEC.

8.5 Modifying numerical parameters

Guided by a menu the contents of a register and counter can be modified by the terminal.

Conditions:

- The register can contain either positive or negative values using the format with a fixed decimal point.
- The counter may contain only positive values without decimal point.

To realise that function the universal function block **MODIFY** had been developed.

The complete description of that function block can be found attached to the listing of the demonstration program.

```

;
;
; User program example 8.2.1 for the industrial terminal PCD7.D160/170
; =====
; The program is structured in BLOCTEC
;
; File : NDEMO21.SRC
;
; Creation: 16.01.97 U.Jäggi / Th. Hofer
;
;

```

```

TEXT 1      "<12>"          ; Clear display
          "<27><84>"        ; Cursor off
          * INDUSTRIAL "
          "CONTROL-TERMINAL"
          " PCD7.D160/170 "
          "#####"

```

```

TEXT 100    "UART:9600,8,E,1;MODE:MC1;DIAG:O16,R100" 1)

```

```

;-----
; Coldstart
;-----
XOB          16
SASI         2          ; Assignment interface no. 2
              100       ; Text 100
EXOB
;-----
; Mainprogram
;-----
COB          0
              0
STH          I          0
DYN          F          0
ANL          O          22      ; Text busy flag
CPB          H          0          ; Send text
ECOB

PB           0          ; Send text
STXT        2          ; Interface 2
              1          ; Text 1
EPB

```

1) MC0 for D170 with cable K422 !

```

;
;
; User program example 8.2.2 for the industrial terminal PCD7.D160/170
; =====
; The program is structured in GRAFTEC
;
; File : NDEMO22.SRC
;
; Creation: 16.01.97 U.Jäggi / Th. Hofer
;
;
;

```

```

TEXT 1          "<12>"          ; Clear display
          "<27><84>"          ; Cursor off
          " INDUSTRIAL "
          "CONTROL-TERMINAL"
          " PCD7.D160/170 "
          "#####"

```

```

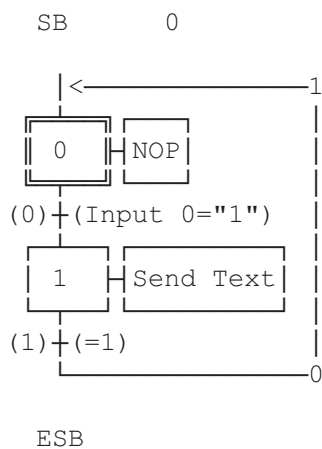
TEXT 100       "UART:9600,8,E,1;MODE:MC1;DIAG:016,R100"

```

```

;-----
; Coldstart
;-----
XOB          16
SASI         2          ; Assignment interface no. 2
              100       ; Text 100
EXOB
;-----
; Mainprogram
;-----
COB          0
              0
CSB          0
ECOB
;-----

```



```
SB      0
;-----
IST      0      ;NOP
EST
;-----
ST       1      ;Send Text
STXT      2
          1
EST
;-----
TR       0      ;Input 0="1"
STH      I      0
DYN      F      0
ANL      O      22      ; Text busy
ETR
;-----
TR       1      ;=1
ETR
;-----
ESB
```



```

;
;
; User program example 8.3.1 for the industrial terminal PCD7.D160/170
; =====
; The program is structured in BLOCTEC
;
; File : NDEMO31.SRC
;
; Creation: 16.01.97 U.Jäggi / Th. Hofer
;
;

```

```

TEXT 1      "<12>"          ; Clear display
            "<27><84>"      ; cursor off
            "Main menu : I0<10><13>"
            "Display status "
            "Input 4,5 : I1"
            "Input 6,7 : I2"

TEXT 2      "<12>"
            "Status <10><13>"
            "Input 4 :$i0004<10><13>"
            "Input 5 :$i0005<10><13>"
            "Main menu I0"

TEXT 3      "<12>"
            "Status <10><13>"
            "Input 6 :$i0006<10><13>"
            "Input 7 :$i0007<10><13>"
            "Main menu I0"

TEXT 100    "UART:9600,8,E,1;MODE:MC1;DIAG:O16,R100"

```

```

;-----
; Coldstart
;-----
XOB          16
SASI         2          ; Assignment interface no. 2
                100      ; Text 100
EXOB
;-----
; Mainprogram
;-----
COB          0
                0
;-----
STH          I          0
DYN          F          0
ANL          O          22      ; Text busy flag
CFB          H          0      ; Send text
                1          ; Text 1
;-----
STH          I          1
DYN          F          1
ANL          O          22      ; Text busy flag
CFB          H          0      ; Send text
                2          ; Text 2
;-----
STH          I          2
DYN          F          2
ANL          O          22      ; Text busy flag
CFB          H          0      ; Send text
                3          ; Text 3
ECOB

FB           0          ; Send text
STXT         2          ; Interface 2
            =          1          ; Textnumber
EFB

```

```

;
;
; User program example 8.3.2 for the industrial terminal PCD7.D160/170
; =====
; The program is structured in GRAFTEC
;
; File   :   NDEMO32.SRC
;
; Creation:  16.01.97           U.Jäggi / Th. Hofer
;
;
;

```

```

TEXT    1      "<12>"                ; Clear display
          "<27><84>"                ; Cursor off
          "Main menu   : I0<10><13>"
          "Display status  "
          "Input 4,5   : I1"
          "Input 6,7   : I2"

TEXT    2      "<12>"
          "Status <10><13>"
          "Input 4  :$i0004<10><13>"
          "Input 5  :$i0005<10><13>"
          "Main menu I0"

TEXT    3      "<12>"
          "Status <10><13>"
          "Input 6  :$i0006<10><13>"
          "Input 7  :$i0007<10><13>"
          "Main menu I0"

TEXT    100    "UART:9600,8,E,1;MODE:MC1;DIAG:O16,R100"

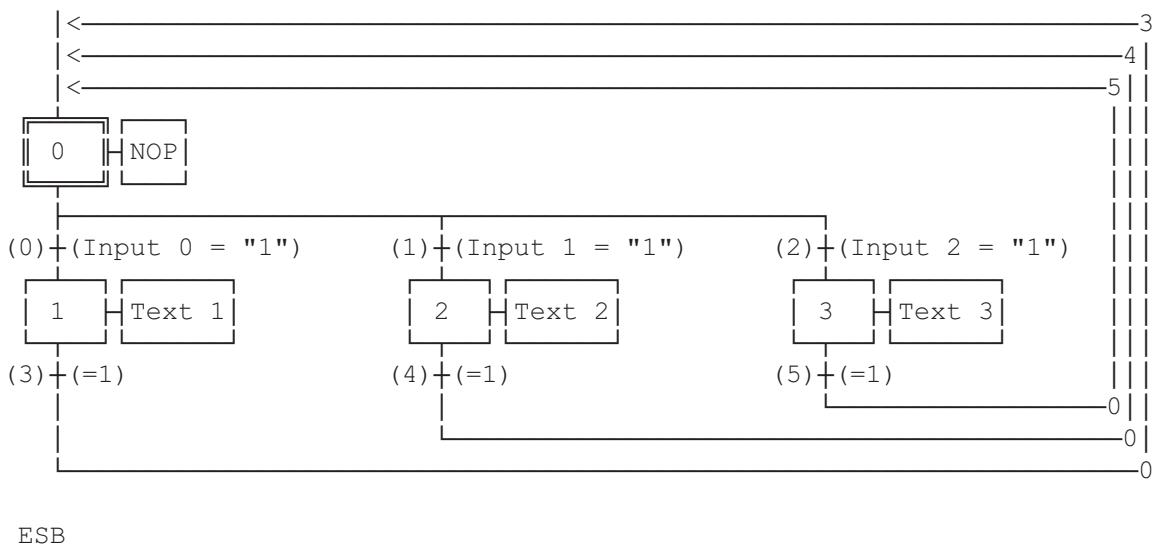
```

```

;-----
; Coldstart
;-----
XOB          16
SASI         2           ; Assigination interface no. 2
                100      ; Text 100

EXOB
;-----
; Mainprogram
;-----
COB          0
                0
CSB          0
ECOB

SB           0
    
```



```

SB      0
;-----
IST      0          ;NOP
EST
;-----
ST       1          ;Text 1
STXT      2
          1
EST
;-----
ST       2          ;Text 2
STXT      2
          2
EST
;-----
ST       3          ;Text 3
STXT      2
          3
EST
;-----
TR       0          ;Input 0 = "1"
STH      I         0
DYN      F         0
ANL      O         22
ETR
;-----
TR       1          ;Input 1 = "1"
STH      I         1
DYN      F         1
ANL      O         22
ETR
;-----
TR       2          ;Input 2 = "1"
STH      I         2
DYN      F         2
ANL      O         22
ETR
;-----
TR       3          ;=1
ETR
;-----
TR       4          ;=1
ETR
;-----
TR       5          ;=1
ETR
;-----
ESB

```

```

;
;
; User program example 8.4.1 for the industrial terminal PCD7.D160/170
; =====
; The program contains jumps
;
; File : NDEMO41.SRC
;
; Creation: 16.01.97 U.Jäggi / Th. Hofer
;
;

```

```

TEXT 1      "<12>"                ; Clear display
           "<27><84>"            ; Cursor off
           "Main menu   F1<10><13>"
           "I/O 0..23   F2<10><13>"
           "BCD-Value   F3<10><13>"
           "Date/Time   F4"

TEXT 2      "<12>"                ; Clear display
           "Input Status      "
           "I0..7   : $I0000<10><13>"
           "O16..23 : $O0016<10><13>"
           "Main menu  F1"

TEXT 3      "<12>"                ; Clear display
           "BCD-Value I0..7"
           "-----"
           "Value   : $R0010<10><13>"
           "Main menu  F1"

TEXT 4      "<12>"                ; Clear display
           "Date : $D<10><13>"
           "Week : $W<10><13>"
           "Time : $H<10><13>"
           "Main menu  F1"

TEXT 100    "UART:9600,8,E,1;MODE:MC1;DIAG:O16,R100"

; Symboldefinitions
; =====
; Diagnostic outputs serial interface
; -----
RBSY  EQU    0    16            ; Receiver Busy
RFUL  EQU    0    RBSY+1       ; Receive Buffer Full
RDIA  EQU    0    RBSY+2       ; Receiver Diagnostic
TBSY  EQU    0    RBSY+3       ; Transmitter Busy
TFUL  EQU    0    RBSY+4       ; Transmit Buffer Full
TDIA  EQU    0    RBSY+5       ; Transmitter Diagnostic
XBSY  EQU    0    RBSY+6       ; Text Busy
NEXE  EQU    0    RBSY+7       ; Not Executed
; -----
; Function/Program blocks
; -----
READ  EQU    FB    0            ; Read character
SEND  EQU    FB    1            ; Send text
COMPARE EQU    PB    0          ; Compare received character
; -----
; Register
; -----
RBUF_R EQU    R    1000

```

```

;-----
; Coldstart
;-----
XOB          16
SASI         2          ; Assignment interface no. 2
              100       ; Text 100
LDL   T     10          ; Wait on D160
              25
STL   T     10
JR    L     -1
STXT          2          ; Interface 2
              1          ; Text 1
SOCL         1          ; nötig weil Kabel für MCl-Mode
              0

EXOB
;-----
; Main program
;-----
COB          0
              0
STH   O     RBSY        ; Receiver busy
ANL   O     XBSY        ; Text busy
JR    L     END         ; If RBSY = low then do nothing
SRXD  R     RBUF_R      ; Receive buffer register
;-----          ; Compare received character
CMP   R     RBUF_R
      K     65          ; F1
ACC   Z
JR    L     F2
STXT          2          ; Interface 2
              1          ; Text 1
JR    END

;-----
F2:   CMP   R     RBUF_R
      K     66          ; F2
ACC   Z
JR    L     F3
STXT          2          ; Interface 2
              2          ; Text 2
JR    END

;-----
F3:   CMP   R     RBUF_R
      K     67          ; F3
ACC   Z
JR    L     F4
STXT          2          ; Interface 2
              3          ; Text 3
JR    END

;-----
F4:   CMP   R     RBUF_R
      K     68          ; F4
ACC   Z
JR    L     END
STXT          2          ; Interface 2
              4          ; Text 4
JR    END
;-----          ; Read BCD-Value
END:  DIGI          4
      I     0
      R     10
;-----
ECOB

```

```

;
;
; User program example 8.4.2 for the industrial terminal PCD7.D160/170
; =====
; The program is structured in BLOC TEC
;
; File : NDEMO42.SRC
;
; Creation: 16.01.97 U.Jäggi / Th. Hofer
;
;

```

```

TEXT 1      "<12>"                ; Clear display
           "<27><84>"            ; Cursor off
           "Main menu      F1<10><13>"
           "I/O 0..23      F2<10><13>"
           "BCD-Value      F3<10><13>"
           "Date/Time      F4"

```

```

TEXT 2      "<12>"                ; Clear display
           "Input Status      "
           "I0..7 : $I0000<10><13>"
           "O16..23 : $O0016<10><13>"
           "Main menu  F1"

```

```

TEXT 3      "<12>"                ; Clear display
           "BCD-Value I0..7"
           "-----"
           "Value : $R0010<10><13>"
           "Main menu  F1"

```

```

TEXT 4      "<12>"                ; Clear display
           "Date : $D<10><13>"
           "Week : $W<10><13>"
           "Time : $H<10><13>"
           "Main menu  F1"

```

```

TEXT 100    "UART:9600,8,E,1;MODE:MC1;DIAG:O16,R100"

```

```

; Symboldefinitions
; =====
; Diagnostic outputs serial interface
; -----
RBSY EQU 0 16 ; Receiver Busy
RFUL EQU 0 RBSY+1 ; Receive Buffer Full
RDIA EQU 0 RBSY+2 ; Receiver Diagnostic
TBSY EQU 0 RBSY+3 ; Transmitter Busy
TFUL EQU 0 RBSY+4 ; Transmit Buffer Full
TDIA EQU 0 RBSY+5 ; Transmitter Diagnostic
XBSY EQU 0 RBSY+6 ; Text Busy
NEXE EQU 0 RBSY+7 ; Not Executed
; -----

```

```

; Function/Program blocks
; -----
READ EQU FB 0 ; Read character
SEND EQU FB 1 ; Send text
COMPARE EQU PB 0 ; Compare received character
; -----

```

```

; Register
; -----
RBUF_R EQU R 1000

```



```

;-----
; Coldstart
;-----
XOB          16
SASI         2          ; Assignment interface no. 2
              100       ; Text 100
LDL   T      10        ; Wait on D160
              25
STL   T      10
JR    L      -1
CFB          SEND
              1
EXOB
;-----
; Main program
;-----
COB          0
              0
STH   O      RBSY      ; Receiver busy
ANL   O      XBSY      ; Text busy
CFB   H      READ      ; Read character
              R      RBUF_R  ; Receive buffer register
CPB   H      COMPARE   ; Compare received character
;-----; Read BCD-Value
DIGI          4
              I      0
              R      10
;-----
ECOB

```

```

PB          COMPARE          ; Compare received character
;-----; Key = F1 ?
CMP        R          RBUF_R
          K          65          ; F1
ACC        Z
CFB        H          SEND          ; Send text
          1          ; Text 1
;-----; Key = F2 ?
CMP        R          RBUF_R
          K          66          ; F2
ACC        Z
CFB        H          SEND          ; Send text
          2          ; Text 2
;-----; Key = F3 ?
CMP        R          RBUF_R
          K          67          ; F3
ACC        Z
CFB        H          SEND          ; Send text
          3          ; Text 3
;-----; Key = F4 ?
CMP        R          RBUF_R
          K          68          ; F4
ACC        Z
CFB        H          SEND          ; Send text
          4          ; Text 4
;-----
EPB

;=====
FB          READ          ; Read character
SRXD       2          ; Interface 2
          =          1
EFB

;-----
FB          SEND          ; Send text
STXT       2          ; Interface 2
          =          1          ; Textnumber
EFB

```

```

;
;
; User program example 8.4.3 for the industrial terminal PCD7.D160/170
;
; =====
; The program is structured in GRAFTEC.
;
; File   :   NDEMO43.SRC
;
; Creation:  16.01.97      U.Jäggi
;
;
;

```

```

TEXT    1      "<12>"                ; Clear display
          "<27><84>"                ; Cursor off
          "Main menu   F1<10><13>"
          "I/O 0..23   F2<10><13>"
          "BCD-Value   F3<10><13>"
          "Date/Time   F4"

TEXT    2      "<12>"                ; Clear display
          "Input Status           "
          "I0..7   : $I0000<10><13>"
          "O16..23 : $O0016<10><13>"
          "Main menu  F1"

TEXT    3      "<12>"                ; Clear display
          "BCD-Value I0..7"
          "-----"
          "Value   : $R0010<10><13>"
          "Main menu  F1"

TEXT    4      "<12>"                ; Clear display
          "Date   : $D<10><13>"
          "Week   : $W<10><13>"
          "Time   : $H<10><13>"
          "Main menu  F1"

TEXT    100    "UART:9600,8,E,1;MODE:MC1;DIAG:O16,R100"

; Symboldefinitions
;=====
; Diagnostic outputs serial interface
;-----
RBSY    EQU    0      16      ; Receiver Busy
RFUL    EQU    0      RBSY+1  ; Receive Buffer Full
RDIA    EQU    0      RBSY+2  ; Receiver Diagnostic
TBSY    EQU    0      RBSY+3  ; Transmitter Busy
TFUL    EQU    0      RBSY+4  ; Transmit Buffer Full
TDIA    EQU    0      RBSY+5  ; Transmitter Diagnostic
XBSY    EQU    0      RBSY+6  ; Text Busy
NEXE    EQU    0      RBSY+7  ; Not Executed
;-----
; Register
;-----
RBUF_R  EQU    R      1000

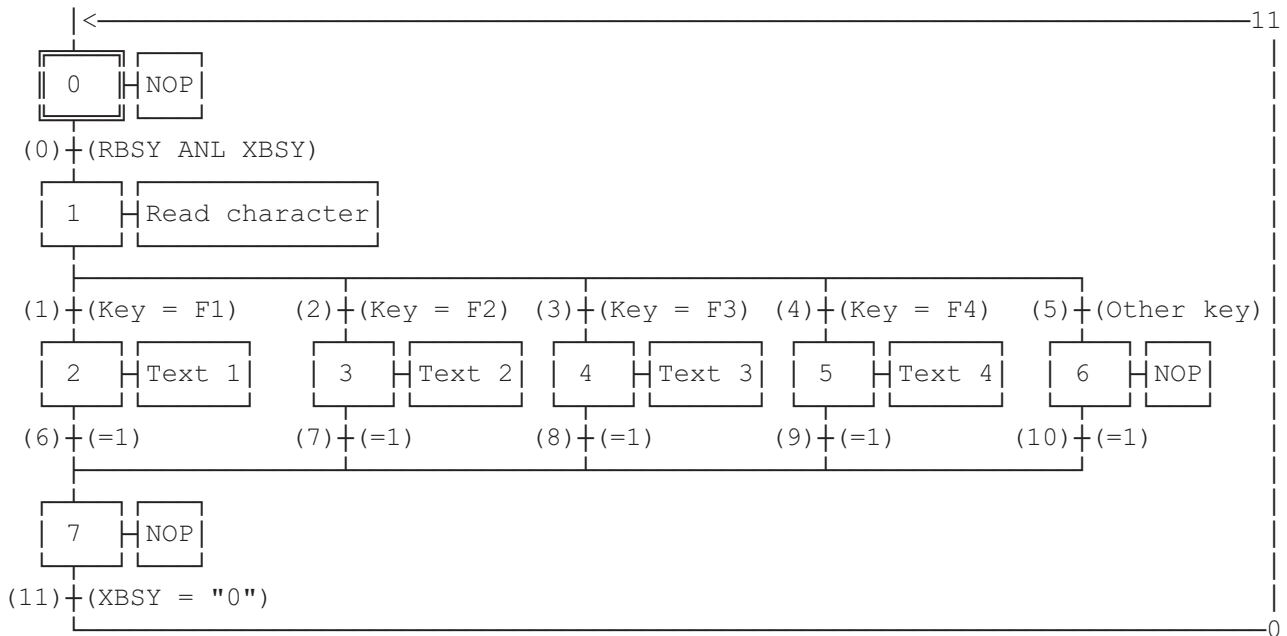
```

```

;-----
; Coldstart
;-----
XOB          16
SASI         2          ; Assigination interface no. 2
              100       ; Text 100
LDL   T     10         ; Wait on D160
              25
STL   T     10
JR    L     -1
STXT          2          ; Text 1 (menu text)
              1
EXOB
;-----
; Main program
;-----
COB          0
              0
CSB          0
;-----; Read BCD-Value
DIGI         4
              I     0
              R     10
;-----
ECOB

```

SB 0



ESB

```

SB      0
;-----
IST     0                                ;NOP
EST
;-----
ST      1                                ;Read character
SRXD   2
      R   RBUF_R
EST
;-----
ST      2                                ;Text 1
STXT   2                                ; send
      1                                ; text 1
EST
;-----
ST      3                                ;Text 2
STXT   2                                ; send
      2                                ; text 2
EST
;-----
ST      4                                ;Text 3
STXT   2                                ; send
      3                                ; text 3
EST
;-----
ST      5                                ;Text 4
STXT   2                                ; send
      4                                ; text 4
EST
;-----
ST      6                                ;NOP
EST
;-----
ST      7                                ;NOP
EST
;-----

```

```

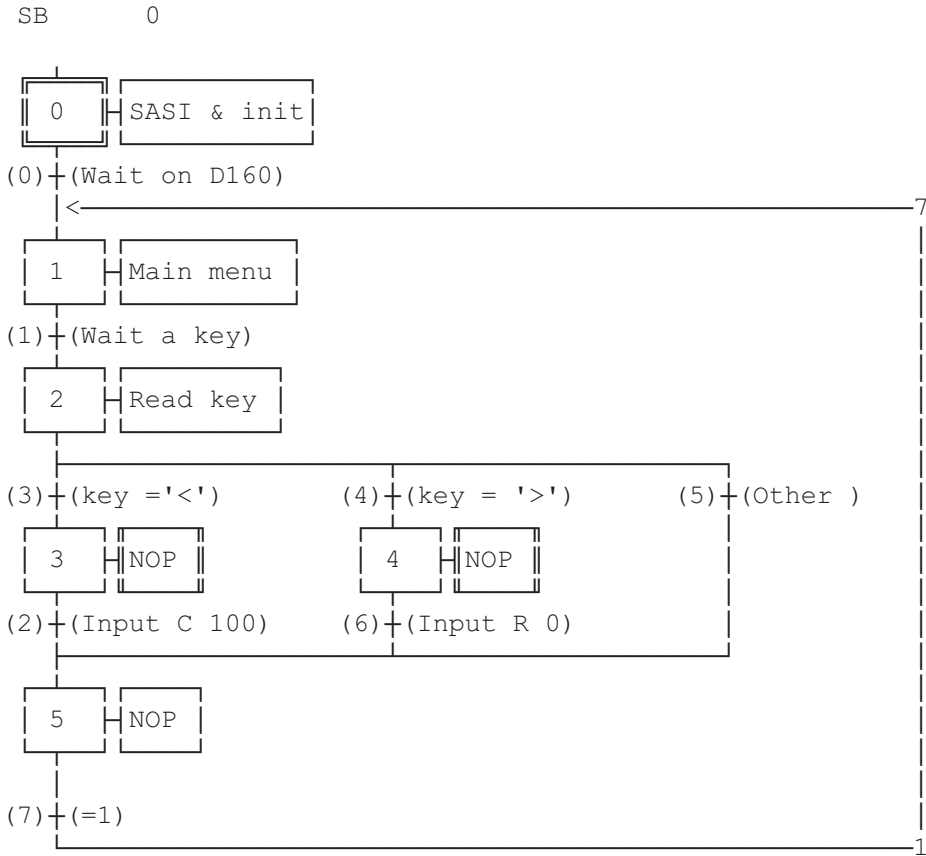
TR      0                      ;RBSY ANL XBSY
STH     O      16              ; Receiver busy
ANL     O      22              ; Text busy
ETR
;-----
TR      1                      ;Key = F1
CMP     R      RBUF_R
        K      65              ; F1
ACC     Z
ETR
;-----
TR      2                      ;Key = F2
CMP     R      RBUF_R
        K      66              ; F2
ACC     Z
ETR
;-----
TR      3                      ;Key = F3
CMP     R      RBUF_R
        K      67              ; F3
ACC     Z
ETR
;-----
TR      4                      ;Key = F4
CMP     R      RBUF_R
        K      68              ; F4
ACC     Z
ETR
;-----
TR      5                      ;Other key
ETR
;-----
TR      6                      ;=1
ETR
;-----
TR      7                      ;=1
ETR
;-----
TR      8                      ;=1
ETR
;-----
TR      9                      ;=1
ETR
;-----
TR      10                     ;=1
ETR
;-----
TR      11                     ;XBSY = "0"
STL     O      22              ; Text busy
ETR
;-----
ESB

```

```

;
;
; User program example 8.5 for the industrial terminal PCD7.D160/170
; =====
;
; Modifying numerical parameters
;
; File : DEMO160.SRC
;
; Creation: 03.02.97 N. Bovigny
;
;
;
RBSY_F EQU O 16 ; Receiver Busy
PUBL RBSY_F ; Receiver Busy
XBSY_F EQU O 22 ; Text Busy
PUBL XBSY_F ; Text Busy
IN_BUSY EQU O 32 ; Input Busy
PUBL IN_BUSY ; Input Busy
SIGN EQU O 33 ; Sign input
DOC R 0
R_X EQU R 1
R_Y EQU R 2
EDIT_R EQU R 3
KEY EQU R 10
DOC R 99
DIAG_R EQU R 3999 ; Diagnostic register
DOC T 0
DOC T 1
DOC C 0
DOC C 99
DOC C 100
K_INC2 EQU K 10
PUBL K_INC2
K_INC3 EQU K 100
PUBL K_INC3
K_INC4 EQU K 1000
PUBL K_INC4
X_INIT EQU TEXT 0
X_PR1 EQU TEXT 1 ; Prompt 1
X_PR2 EQU TEXT 2 ; Prompt 2
X_PR3 EQU TEXT 3
X_SASI EQU TEXT 3999
CHAN_N EQU 2
PUBL CHAN_N
DOC COB 0
MODIFY EQU FB 0
PUBL MODIFY

```



ESB

```

;-----
; Mainprogram
;-----
COB      0          ; Main program
         0

CSB      0          ; Call communication SB

ECOB
;=====

SB       0
;-----
IST      0          ; SASI & init
         0 0        ; Wait on D160
SASI     CHAN_N
         X_SASI

$SASI
TEXT    X_SASI    "UART:9600,8,E,1;"
          "MODE:MC1;"          ; MC0 for D170 with cable K422
          "DIAG:",RBSY_F.T,"",DIAG_R.T

$ENDSASI
    
```



```

ACC      H
SOCL     CHAN_N
         0
LDL      T 0
         25
LDL      C 100
         0
LDL      R 0
         0
EST      ;0
;-----
ST       1          ; Main menu
         I 0          ; Wait on D160
         I 7          ; =1
         O 1          ; Wait a key
STXT     CHAN_N     ; send the main
         X_INIT      ; menu

TEXT    X_INIT     "<ESC>D<ESC>@@H<FF>"
         "<<>Edit Cnt 100<CR><LF>"
         "<>> Edit Reg 0<CR><LF><LF>"
         " Press a key"

LDL      R_X        ; X_position
         32
LDL      R_Y        ; Y_position
         35
EST      ;1
;-----
ST       2          ; Read key
         I 1          ; Wait a key
         O 3          ; key = '<'
         O 4          ; key = '>'
         O 5          ; Other
SRXD     2          ; read key
         KEY
EST      ;2
;-----
ST       3          ; NOP
         I 3          ; key = '<'
         O 2          ; Input C 100
EST      ;3
;-----
ST       4          ; NOP
         I 4          ; key = '>'
         O 6          ; Input R 0
EST      ;4
;-----
ST       5          ; NOP
         I 2          ; Input C 100
         I 6          ; Input R 0
         I 5          ; Other
         O 7          ; =1
EST      ;5
;-----

```

```

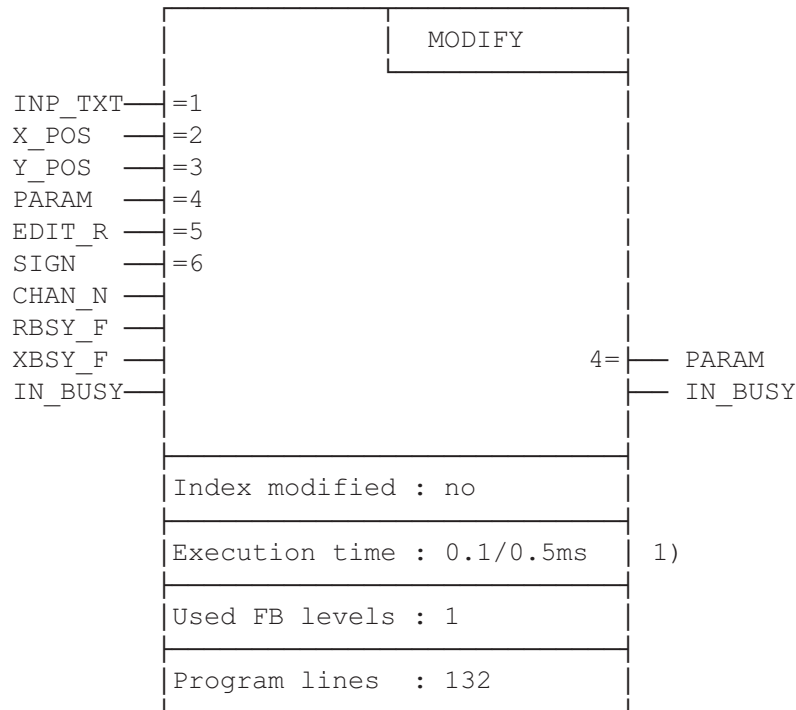
TR      0          ; Wait on D160
        I 0        ; SASI & init
        O 1        ; Main menu
STL     T 0
ETR     ;0
;-----
TR      1          ; Wait a key
        I 1        ; Main menu
        O 2        ; Read key
STH     RBSY_F     ; wait a key
ETR     ;1
;-----
TR      2          ; Input C 100
        I 3        ; NOP
        O 5        ; NOP
ACC     H
RES     SIGN       ; sign input not allowed
TEXT   X_PR1      "Cnt 100:;%07d$",edit_r.04T
CFB     MODIFY    ; Call FB Modify
        X_PR1     ; Input Text
        R_X       ; X Position
        R_Y       ; Y Position
        C 100     ; Counter to be modified
        EDIT_R    ; Editing register
        SIGN      ; Sign input
STL     IN_BUSY
ETR     ;2
;-----
TR      3          ; key = '<'
        I 2        ; Read key
        O 3        ; NOP
CMP     KEY        ; if key = '<'
        K 8
ACC     Z
ETR     ;3
;-----
TR      4          ; key = '>'
        I 2        ; Read key
        O 4        ; NOP
CMP     KEY        ; if key = '>'
        K 6
ACC     Z
ETR     ;4
;-----
TR      5          ; Other
        I 2        ; Read key
        O 5        ; NOP
ETR     ;5
;-----

```

```
TR      6          ; Input R 0
        I 4        ; NOP
        O 5        ; NOP
ACC     H
SET     SIGN       ; Sign input not allowed
TEXT   X_PR2      "Reg 0: $%06.1d$", edit_r.04T, " "
CFB     MODIFY     ; Call FB MODIFY
        X_PR2     ; Input text
        R_X       ; X position
        R_Y       ; Y position
        R 0       ; Register to be modified
        EDIT_R    ; Editing register
        SIGN      ; Sign input
STL     IN_BUSY
ETR     ;6
;-----
TR      7          ; =1
        I 5        ; NOP
        O 1        ; Main menu
ETR     ;7
ESB     ;0
```

Function block: MODIFY

for the modification of values with D160/D170 terminals.



- 1) 0.1ms : no key depressed
- 0.4ms : arrow key "left" depressed (PCD2)

Function description

This function block can be used to modify the contents of a PCD register or counter with the PCD7.D160/D170 terminal. It requires the terminal to have first been set up in "**with shift function**" mode.

The values of registers and counters displayed can be modified using the arrow keys. The stepping rate has several speeds so that large changes can be made quickly. When decrementing a register value it can go below zero into the negative range.

Procedure during programming

To allow modification of displayed values, the FB must be processed cyclically (preferably in a Graftec transition or in a cyclical program) until the BUSY flag becomes 0.

The user defines a text "INP_TXT", which contains the register value to be displayed in the appropriate format. FB parameters include the following definitions:

- the text
- position on display
- serial interface
- register or counter to be displayed and modified
- an input register
- permission for negative values.

Further programming instructions:

- The terminal must be in "Shift keys: Yes" mode.
- Setup must include the selection of "Key auto-repeat: All keys, 2 speed".
- At run-time, access to setup must be blocked (ESC @ H)

Symbol	Description	Type	Format	Values	Definition
INP_TXT	Input text	X	Text		Parameter
PARAM	Input parameter(R or C)	R/C	Integer	Whole range R or C	Parameter
EDIT_R	Edit register	R	Integer	Whole range R	Parameter
X_POS	Cursor X-position	R	Integer	32..47	Parameter
Y_POS	Cursor Y-position	R	Integer	32..35	Parameter
SIGN	Negative values accepted	F/I/O	Binary	1 = yes / 0 = no	Parameter
CHAN_N	Serial channel number	K	Integer	0..3	Extern
RBSY_F	Receive busy flag	F/O	Binary	0/1	Extern
XBSY_F	Text busy flag	F/O	Binary	0/1	Extern
IN_BUSY	Input busy flag	F/O	Binary	0/1	Extern
K_INC2	Value for modification speed 2	K	Integer	Recommded value : 10	Extern
K_INC3	Value for modification speed 3	K	Integer	Recommded value : 100	Extern
K_INC4	Value for modification speed 4	K	Integer	Recommded value : 1000	Extern

Key: Parameters These elements are directly transmitted as parameters when the FB is called.
 External These elements are not transmitted as parameters and must be defined as public in the main program.

Explanation of FB I/OsInput text "INP_TXT":

This text is called when the FB is called for the first time and at each key depression. It must always contain the register to be modified (EDIT_R), including the appropriate output format. However, this text is not allowed to contain any control commands (strings) for the terminal. Positioning of the input text takes place automatically via the FB parameters X_POS and Y_POS.

Example:

```
TEXT          INP_TEXT      "Register:$%06.1$",REG.04T
n.b.: REG is an independent register (no FB parameters)
```

Position of cursor "X_POS and Y_POS":

It defines the position of the first character in the input text.

"SIGN":

This flag controls whether negative values are allowed.

"SIGN" = 0 Lower limit of value is 0.

"SIGN" = 1 Negative values are allowed.

n.b.: - For counters (C) "SIGN" must be = 0.

- The zero limit is only monitored during decrementing. This value can be negative if the register in the input text already contains a negative value.

Serial channel number "CHAN_N":

Defines the serial channel number. This number must be assigned in the SASI instruction before calling the FB.

Serial channel diagnostic flags "RBSY_F" and "XBSY_F":

Addresses for the RBSY_F and XBSY_F flags must agree with the diagnostic flag addresses defined by the SASI instruction.

Input busy flag "IN_BUSY":

The input busy flag IN_BUSY must initially be zero otherwise the FB will not function correctly.

Reset the IN_BUSY flag in XOB 16.

The flag is set high the first time the FB is called. The flag is reset again when a carriage return is received.

Resources used internally

The FB uses 2 registers and 2 flags internally for its work. These are defined locally as symbols and may only be used here. In each case it is only necessary to define the lower of the two addresses.

Symbol	Description	Type	Default value	Definition
WORK_R	Base address of the 2 registers	R	2000	Local
WORK_F	Base address of the 2 flags	F	2000	Local

Key assignment

Key codes can be changed for specific applications by re-assigning the symbols. The following list shows the symbols and default codes, as output by the D160 and D170 terminals

Symbol	Description	Default code	Definition
K_CR	Key 'E' (carriage return) Confirms the modification of the value	K 13	Local
K_QUIT	Key 'Q' (quit) Ends or ignores the modification	K 113	Local
K_UP	Arrow up (↑) Increments the value	K 11	Local
K_DOWN	Arrow down (↓) Decrements the value	K 5	Local
K_LEFT	Arrow left (←) Decrements with speed 3 and 4	K 8	Local
K_RIGHT	Arrow right (→) Increments with speed 3 and 4	K 6	Local
K_2ON	Speed 2 on	K 30 ¹⁾	Local
K_2OFF	Speed 3 off	K 31 ¹⁾	Local

- 1) These codes are sent by the terminal automatically when a key is depressed for longer than 3 seconds, or when it is released again.

Use of arrow keys to modify values

When the FB is called for the first time, the input text is displayed. The IN_BUSY flag is set to 1 and the contents of the PARAM register are copied to the EDIT_R register. It is now possible to modify the value displayed on the terminal with the arrow keys.

For the ↑ and ↓ keys, modification is by one unit per key depression. If the key is held down for longer than 0.7 seconds, the function repeats automatically. After 3 seconds the speed increases to steps of 10 (speed 2).

With the ← and → keys, the modification factor is 100 (speed 3). Here too the modification is repeated after 0.7 seconds, and the speed increasing to steps of 1000 after 3 seconds (speed 4).

Modification speeds 2 to 4 can be changed against the default values with symbols K_INC.

The input is terminated by depressing the "E" key (with shift). The input can be ignored by depressing the "Q" key.

The IN_BUSY flag is then set to 0. During entry, the PARAM register is not modified. It only adopts the new value when the "E" key is pressed.

9. Comparison of terminals PCD7.D202 and ..D160/..D170

Criterion	D202	D170	D160
Front panel colour	light grey	light grey	light grey
Front panel protection system	IP 65	IP 65	IP 20
Mounting position	Front panel flush mount	Front panel flush mount	Built onto PCD1/2
Supply	24 VDC	24 VDC	5 V from PCD1/2 bus
Display	4 x 20 character, LCD with LED backlight	4 x 16 character, LCD with LED backlight	4 x 16 character, LCD with LED backlight
Backlight at power-up	on	off	off
Character set	ASCII + special characters for Eng/Ger/Fr/Scand.	ASCII + special characters for Eng/Ger/Fr/Scand.	ASCII + special characters for Eng/Ger/Fr/Scand.
Keyboard	25 keys	5 keys with 5 or 8 functions	5 keys with 5 or 8 functions
Labelling strip	4 function keys only	All 5 keys	All 5 keys
LEDs	4 + 4	none	none
Serial interface	RS232, 9-pole connector	RS232, 9-pole connector	Port 2 of PCD1/2
Baud rate	110.. 19200 bps	110.. 19200 bps	110.. 19200 bps
Data bits	8 or 7	8	8
Stop bits	1 or 2	1	1
Default handshaking	None (MC0)	RTS/CTS (MC1)	RTS/CTS (MC1)
Usable cable	PCD7.K412 and K422	PCD7.K412 and K422	-
Instructions: - Display contrast - Shift mode	0...15 permanent	0...7 no/yes	0...7 no/yes

Comparison of terminals PCD7.D202 and ..D160/..D170

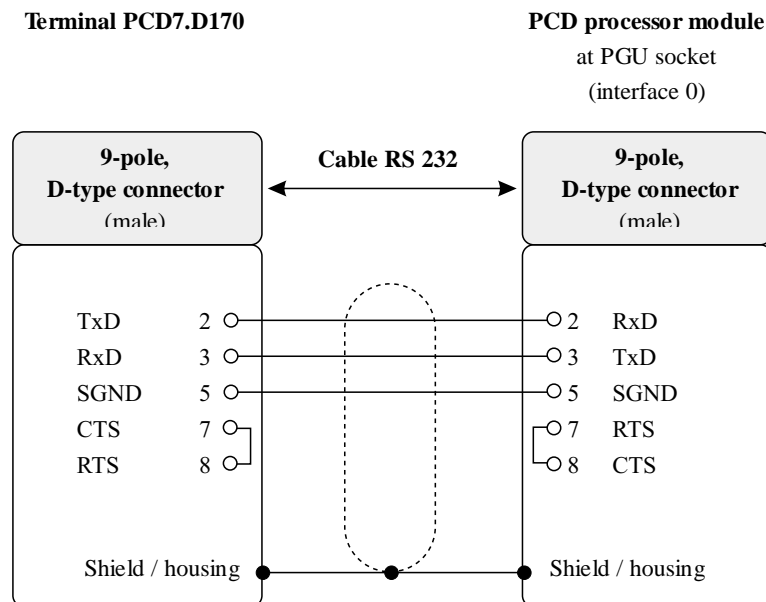
Notes :

10. Interface connection cables RS 232

The cables are double shielded with metallized connectors, in 2.5 m standard lengths.

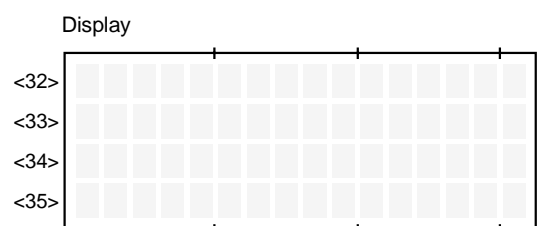
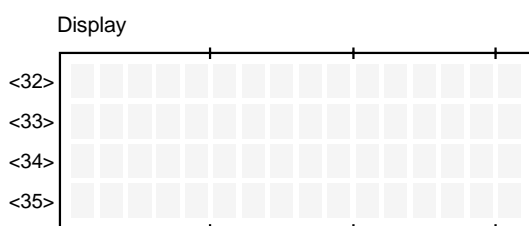
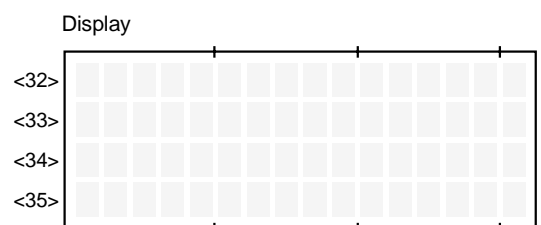
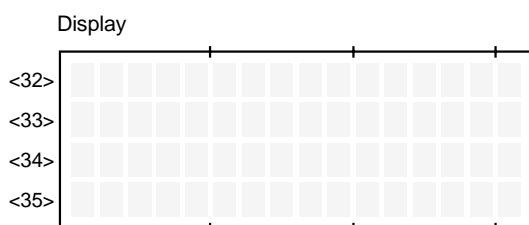
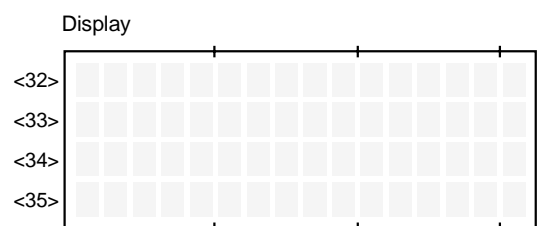
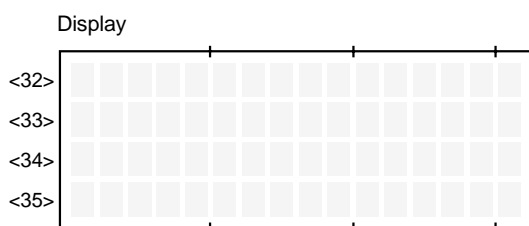
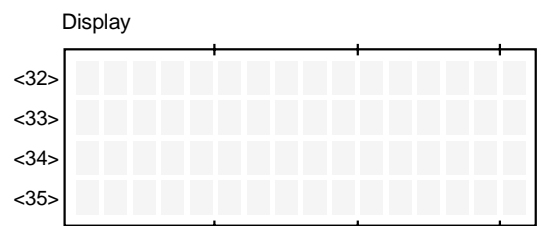
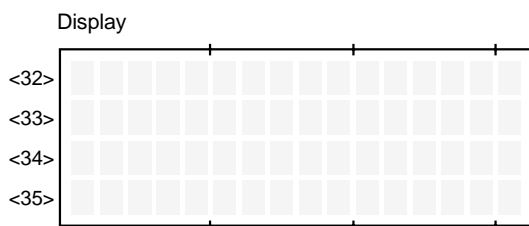
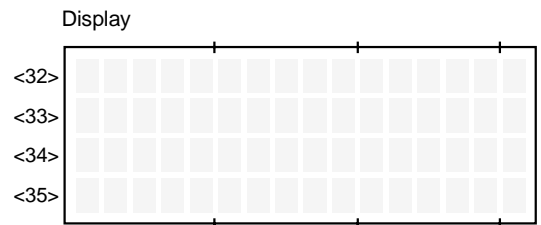
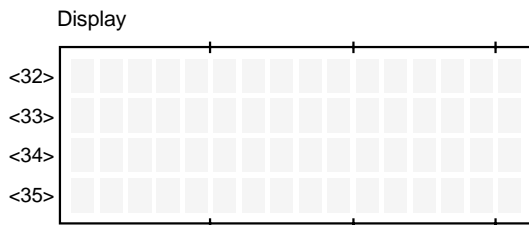
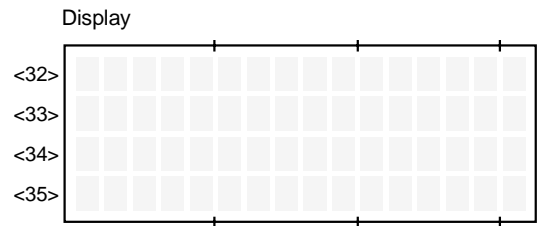
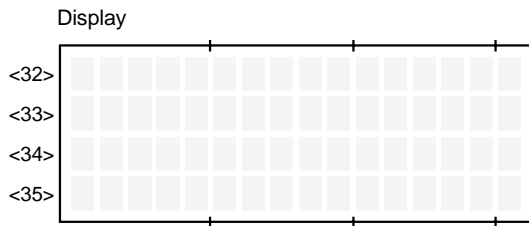
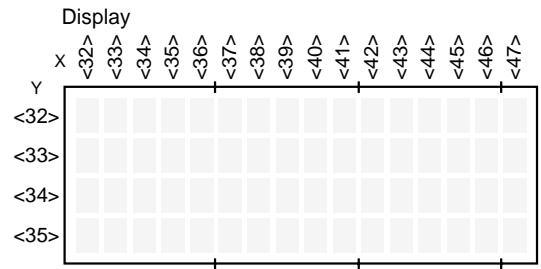
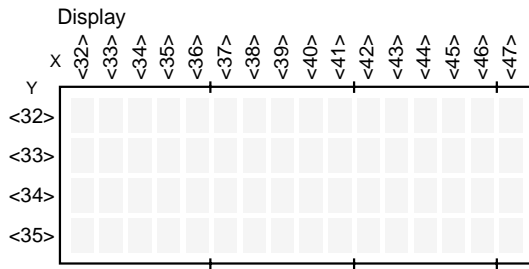
Type PCD7.K412: For interface RS 232
without handshaking RTS/CTS

Connection between terminal ..D170 and PGU socket (channel 0) of all PCD processor modules.



Displays

Pos.: <16> <X> <Y>



Displays

Notes :

From :

Company :

Department :

Name :

Address :

Tel. :

Date :

Send back to :

SAIA-Burgess Electronics Ltd.

Bahnhofstrasse 18

CH-3280 Murten (Switzerland)

<http://www.saia-burgess.com>

BA : Electronic Controllers

Small industrial terminals

PCD7.D160 and ..D170

If you have any suggestions concerning the SAIA[®] PCD, or have found any errors in this manual, brief details would be appreciated.

Your suggestions :