

# Manual



**saia-burgess**  
Control Systems and Components

## Graphic Terminal PCD7.D290

Controls Division



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## 0.1 Document history

Changed	Published	Version	Page	Remarks
2006-01-31	2006-02-10	E 1	-	First edition
2007-01-05	2007-01-04	E 2	-	Second edition
2007-01-15	2007-05-04	E 3	-	Third edition
2007-11-13	2008-02-06	E 4	1-10...1-12	Changed the pin numbers (9 & 10) of the interface RS 485 of the PCD7.D290

0

## 0.2 Trademarks

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

Technical changes are subject to the state of technology.

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# 1 Quick start

## 1.1 Introduction

This manual covers the technical aspects of the PCD7.D290 graphic terminal.

The aim of this chapter is to give the basic information about the use and the installation of the terminal PCD7.D290.

This chapter will present the following arguments:

- How to use the PCD7.D290
  - as remote display for the whole Saia® PCD range
  - configured for RS232 and RS485 Free Terminal Protocol
- How to use the PCD7.D290 with HMI-Editor
- Power supply
- Connections
- Dimensions

Details about:

- Hardware
- Communications
- Software
- Handling
- Maintenance

can be found in separate chapters.

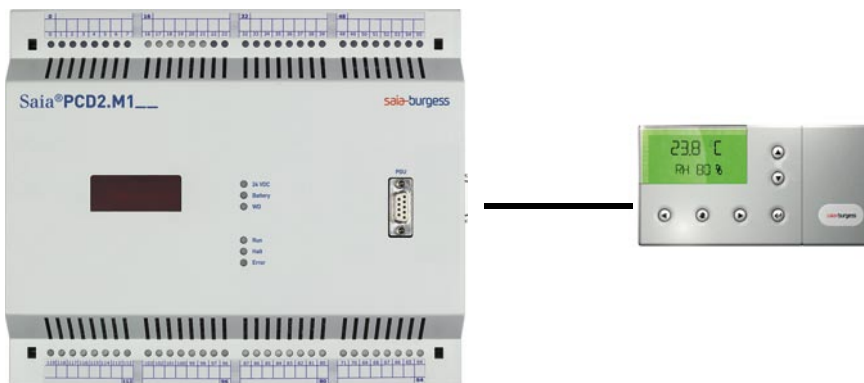
Appendix covers topics like characters maps.

## 1.2 Use of the PCD7.D290 as a remote display for the whole Saia® PCD range

### 1.2.1 Configuration for one terminal PCD7.D290

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#### A - RS 232 connection



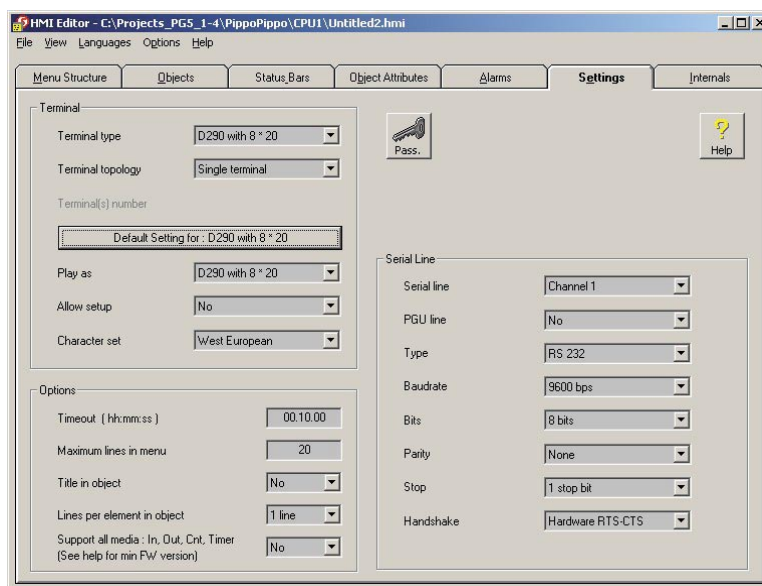
#### Raccomended setup for PCD7.D290

Baudrate 4.800, 9.600 or 19.200 Baud  
 Serial mode RS 232 with RTS/CTS handshake

#### Use with HMI-Editor

Terminal type PCD7.D290 (8 × 20)  
 Terminal topology Single terminal  
 Serial line xx (port number)\*  
 Type of serial line RS 232  
 Baudrate 4.800, 9.600 or 19.200 Baud  
 Handshake RTS/CTS

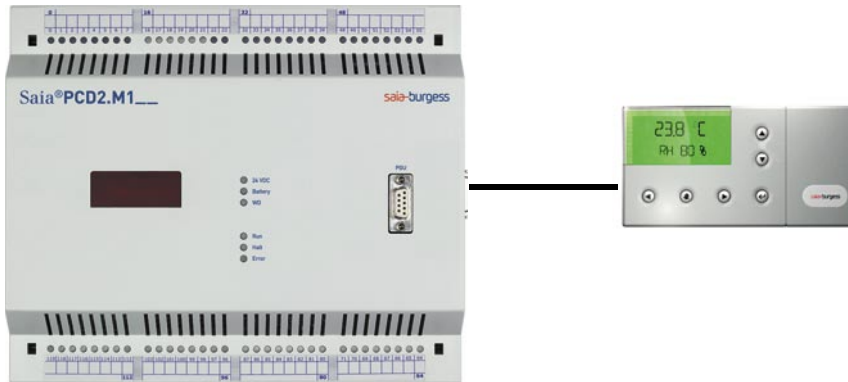
\*) It is possible to use the PGU port as RS232 serial line. In this case, select PGU line: YES



Hardware connections: see chapter 1.4



**B - RS485 connection**



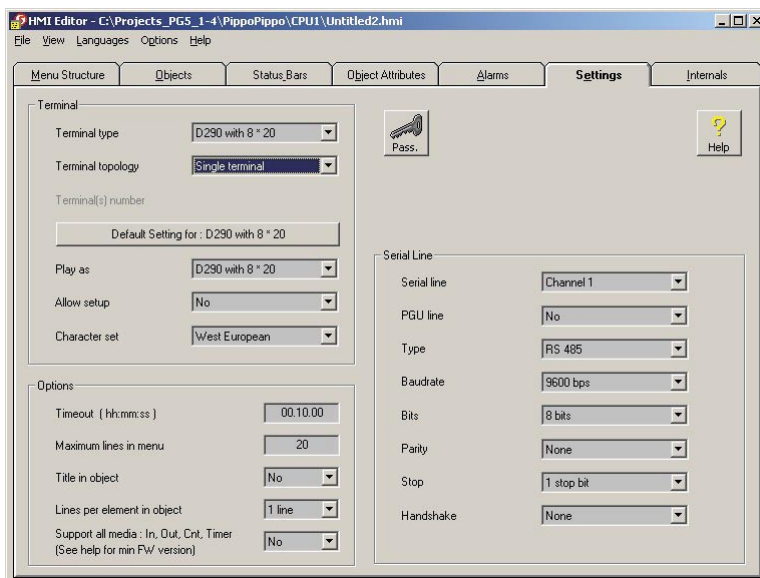
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**Raccomended setup for PCD7.D290**

Baudrate 4.800, 9.600 o 19.200 Baud  
 Serial mode RS 485

**Use with HMI-Editor**

Terminal type PCD7.D290 (8 × 20)  
 Terminal topology Single terminal  
 Serial line xx (port number)  
 Type of serial line RS 485  
 Baudrate 4.800, 9.600 or 19.200 Baud  
 Handshake None

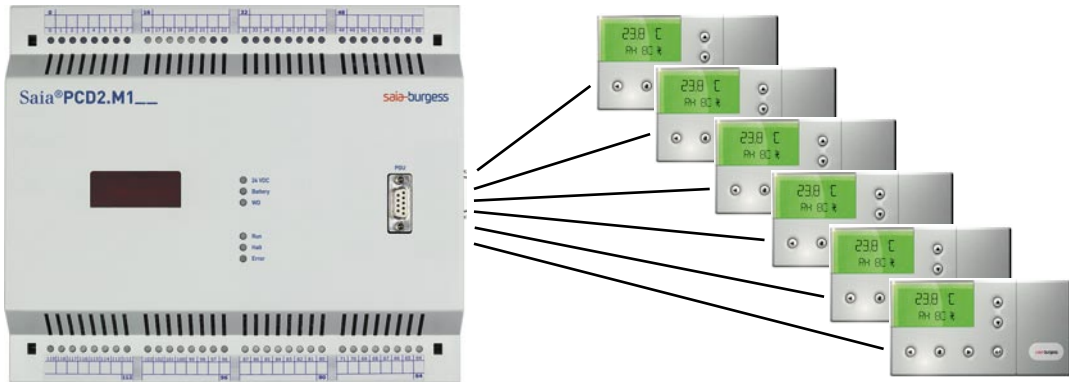


Hardware connections: see chapter 1.4

**1.2.2 Configuration for several PCD7.D290**

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

1



Configuration with 6 PCD7.D290.

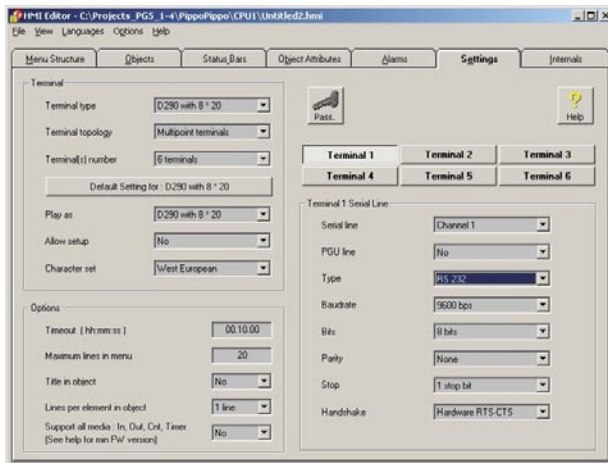
Up to 6 × RS 232 ports, accordingly to the Saia® PCD type

**Raccomended setup for PCD7.D290**

Baudrate 4.800, 9.600 o 19.200 Baud  
 Serial mode RS 232 with or without RTS/CTS handshake depending on the number of PCD interfaces used on the PCD

**Use with HMI-Editor**

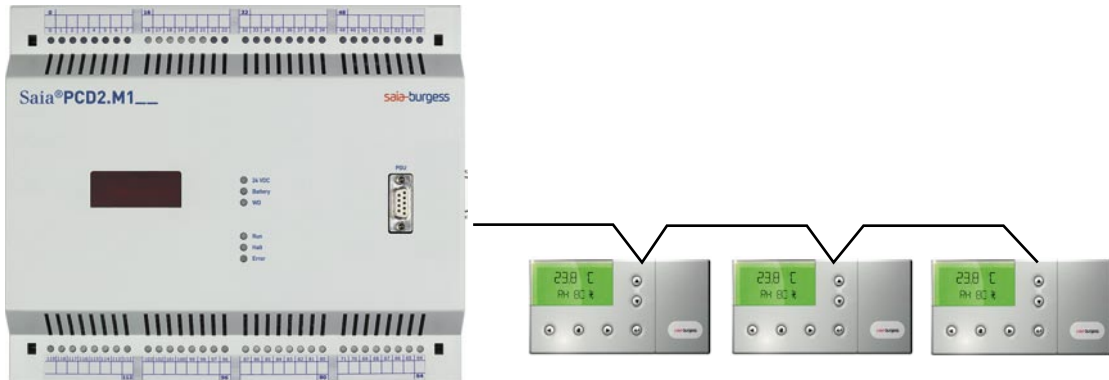
Terminal type PCD7.D290 (8 × 20)  
 Terminal topology Multipoint terminal  
 Number of channels xx (up to 6)  
 Serial line 1...6 corresponding to the number of terminals  
 Type of serial line RS 232  
 Baudrate 4.800, 9.600 or 19.200 Baud  
 Handshake RTS/CTS or None



Hardware connections: see chapter 1.4

**B - With one RS 485 port**

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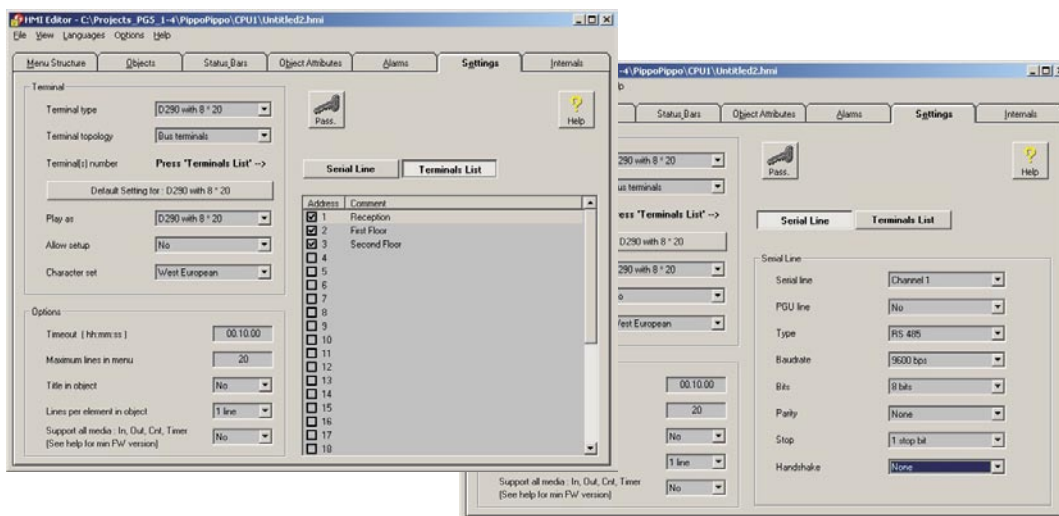
Up to 32 PCD7.D290 can be connected to one RS485 port, but HMI-Editor supports a maximum of 6 terminals on one RS485 port. This limit is implemented to allow the optimization of PCD7.D290 access time.

**Raccomended setup for PCD7.D290**

Baudrate 4.800, 9.600 or 19.200 Baud  
 Serial mode RS485 FTP

**Use with HMI-Editor**

Terminal type PCD7.D290 (8 × 20)  
 Terminal topology Bus  
 Terminal number xx (up to 6)  
 Terminal list corresponding to the identification number  
 Serial line 1  
 Type of serial line RS485  
 Baudrate 4.800, 9.600 or 19.200 Baud  
 Handshake None



Hardware connections: see chapter 1.4

### 1.3 Power supply

The power supply of the PCD7.D290 is 24 VAC or 24 VDC.

Power supply via plug-in screw connector for wires of 1.5 mm<sup>2</sup> max.

1

The couples of pins with the same connection type are short circuited in the PCB.

Connection type	Connector pin
24 VAC/24 VDC	1
24 VAC/24 VDC	2
0 V	3
0 V	4

**1.4 Communication connections**

**1.4.1 Pin assignment**

Communication connexions via plug-in screw connectors for wires of 1,5 mm<sup>2</sup> max.

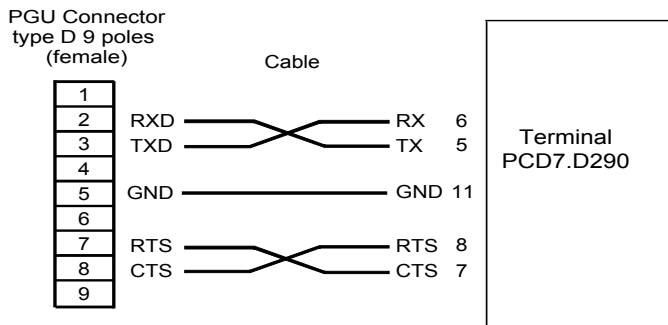
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Signal	Description	Connector pin
TXD	Transmit Data	5
RXD	Receive Data	6
RTS	Request To Send	8
CTS	Clear To Send	7
RX - TX	RX -TX	9
/RX - /TX	/RX - /TX	10
GND	Signal Ground	11

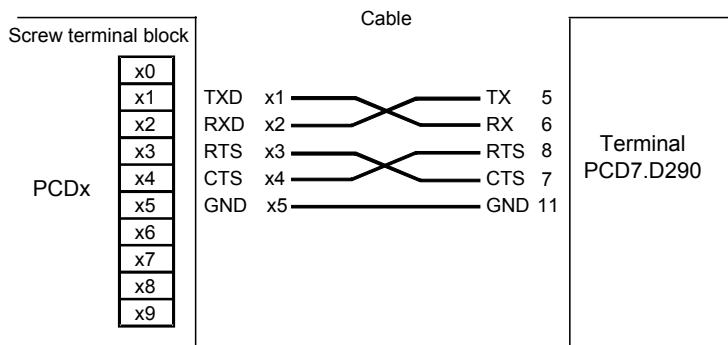
**1.4.2 RS232 connection with handshake RTS/CTS**

Connection between PCD7.D290 and CPUs PCD of the series PCD1, PCD2, PCD3, PCD4 and PCS1.

**A - Connection with port #0 (PGU) in mode MC1**



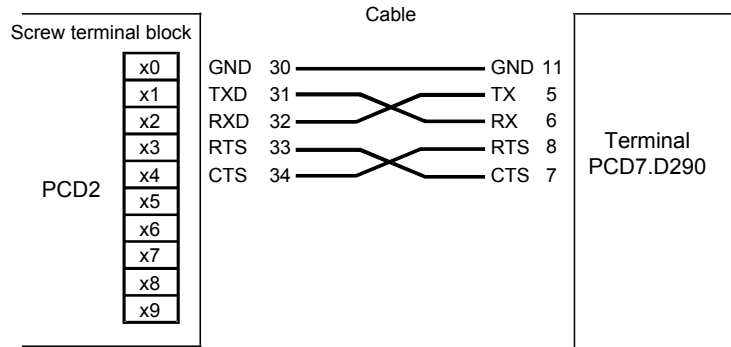
**B - Connection with PCD1, PCD2 and PCD3 on the port #1 (with PCD7.F120 or PCD3.F121) in mode MC1**



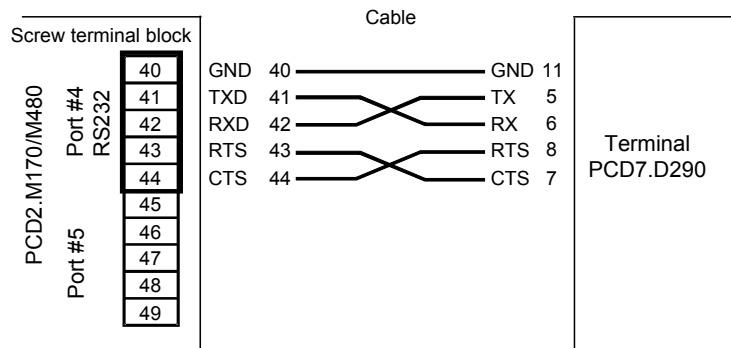
Where x means 1 for the module PCD7.F120 and 0 for the module PCD3.F121

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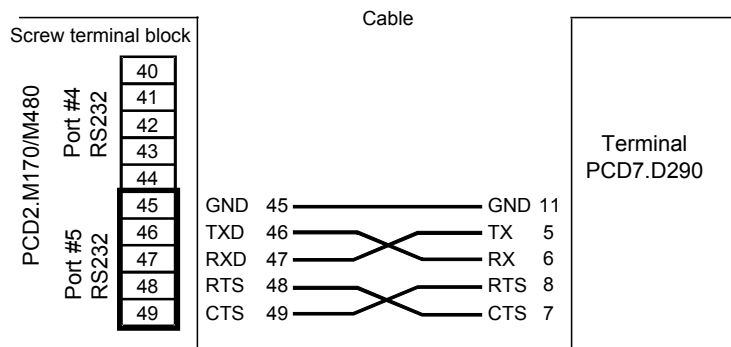
**C - Connection with PCD2 on the port #2 (with PCD2.F520) in mode MC1**



**D - Connection with PCD2 on the port #4 (PCD2.M170/M480 only) with PCD2.F520 or PCD2.F522 (in modality 2xRS 232) in mode MC1**



**E - Connection with PCD2 on the port #5 (PCD2.M170/M480 only) with PCD2.F522 in modality 2xRS 232 in mode MC1**



**Notes:**

The CPUs PCD2.M170 equipped with the interfaces PCD2.F522 give the possibility to use also the ports RS 232 on the front connectors (type D sub 9 pin):

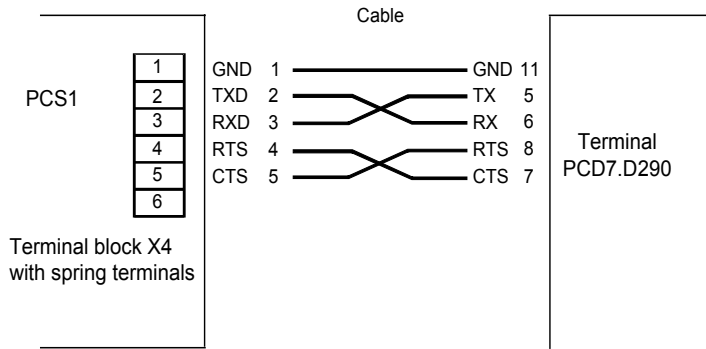
B1 (port #3) and B2 (port #5).

Le CPUs PCD2.M480 equipped with the interface PCD2.F522 give the possibility to use also the port RS 232 on the front connectors (type D sub 9 pin):

B1 (port #3)

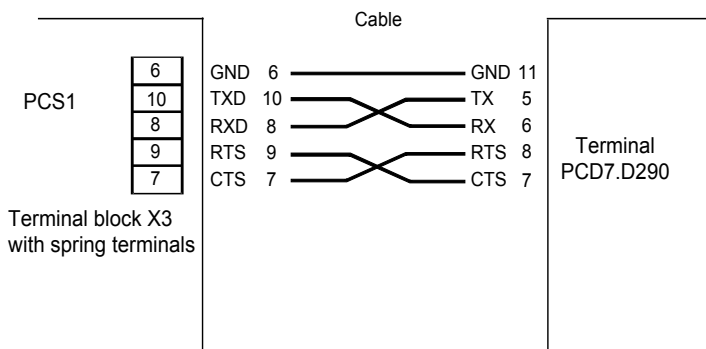
The connection diagrams can be found on the manual HW PCD1/PCD2, ed. 26/737 E13.

**F - Connection with PCS1 on the port #1 (with PCD7.F120) in mode MC1 Terminal block X4**



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**G - Connection with PCS1 on the port #2 in mode MC1 - Terminal block X3**



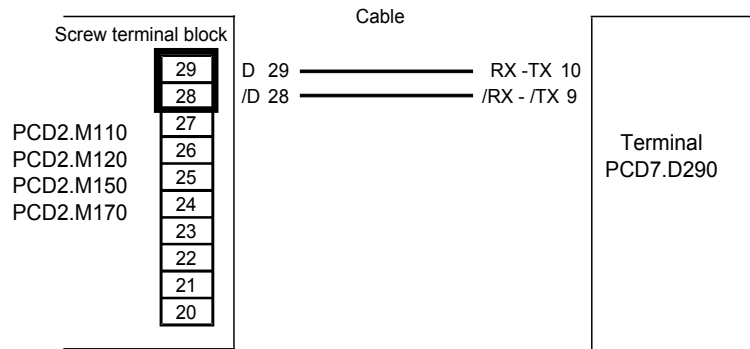
This connection is available only if the PCS1 is not equipped with the integrated HMI (PCD7.D230)

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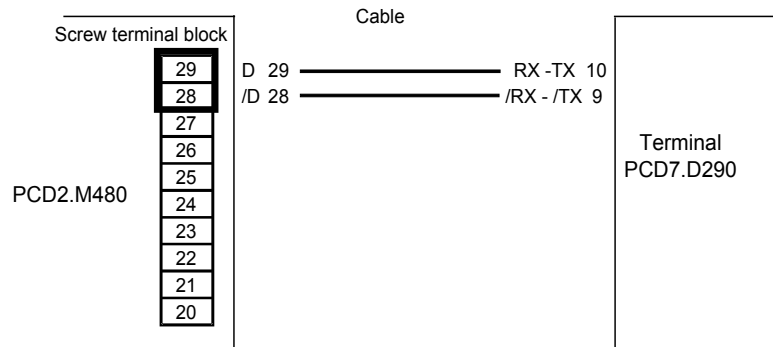
### 1.4.3 RS485 connection

The first and the last device connected in a RS485 network must provide the correct polarization of the network. If those devices are not suitable, it is suggested to install the termination boxes PCD7.T160.

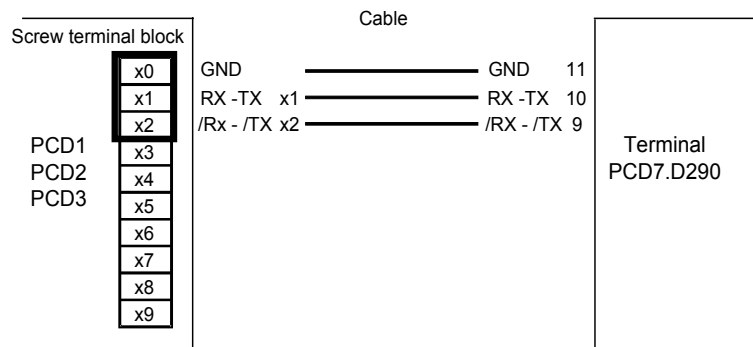
#### A - Connection with PCD2.M110, M120, M150, M170 on the port #0 (PGU) in mode MC4



#### B - Connection with PCD2.M480 on the integrated port #6 in mode MC4



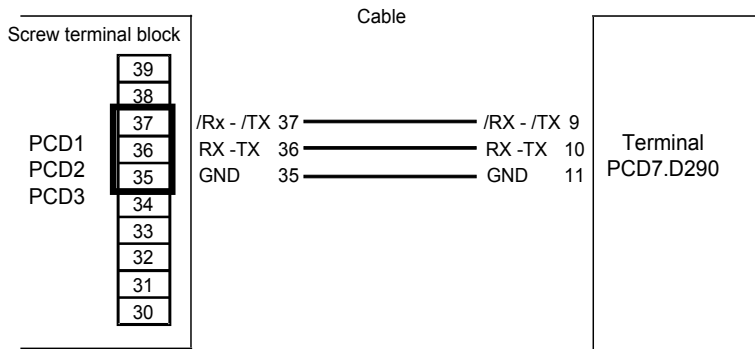
#### C - Connection with PCD1, PCD2, PCD3 on the port #1 (with PCDx.F110) in mode MC4



Where x means 1 for PCD1, PCD2 and 0 for PCD3

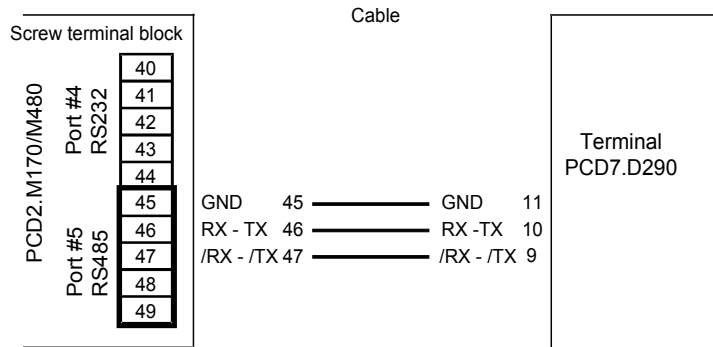


**D - Connection with PCD2 on the port #3 (with PCD2.F520) in mode MC4**



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**E - Connection with PCD2 on the port #5 with PCD2.F520 in mode MC4 (PCD2.M170/M480 only)**



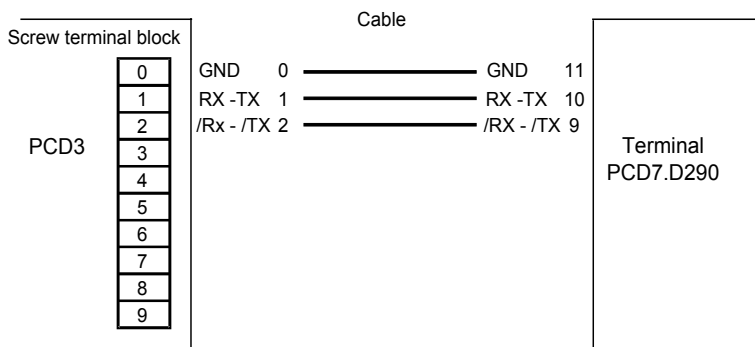
**Notes:**

The CPUs PCD2.M170 equipped with the interfaces PCD2.F520 give the possibility to use also the ports RS 485 on the front connectors (type D sub 9 pin): B1 (port #3) and B2 (port #5).

Le CPUs PCD2.M480 equipped with the interface PCD2.F520 give the possibility to use also the port RS 485 on the front connectors (type D sub 9 pin): B1 (port #3)

The connection diagrams can be found on the manual HW PCD1/PCD2, ed. 26/737 E13.

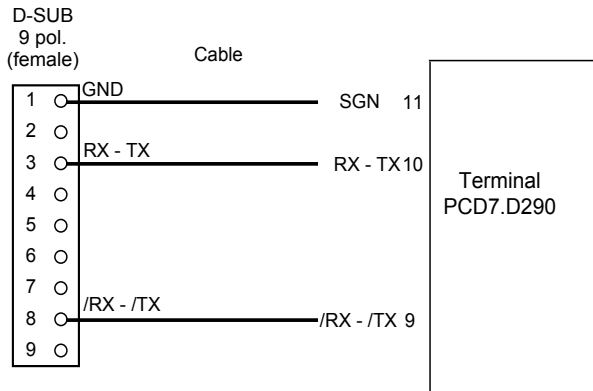
**F - Connection with PCD3 on the port #2 in mode MC4**



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**G - Connection with PCD3 on the port #10 in mode MC4**

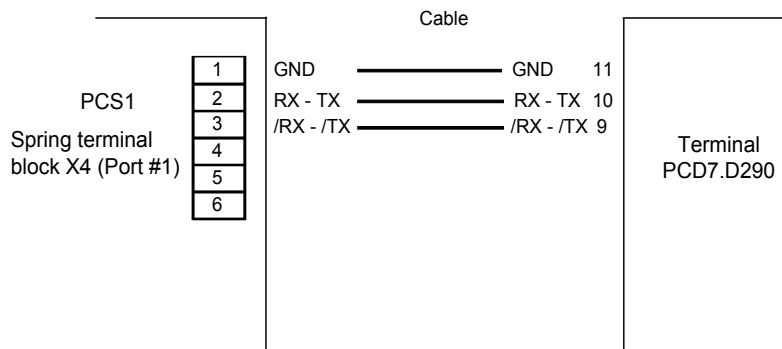
**Connector 9 pin D-Sub**



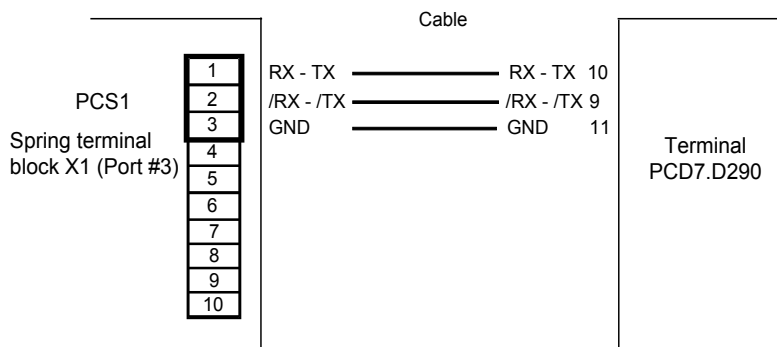
This connection is available only on CPUs PCD3.M5xx0

**H - Connection with PCS1 on the port #1 (with PCD7.F110) in mode MC4**

**Terminal block X4**



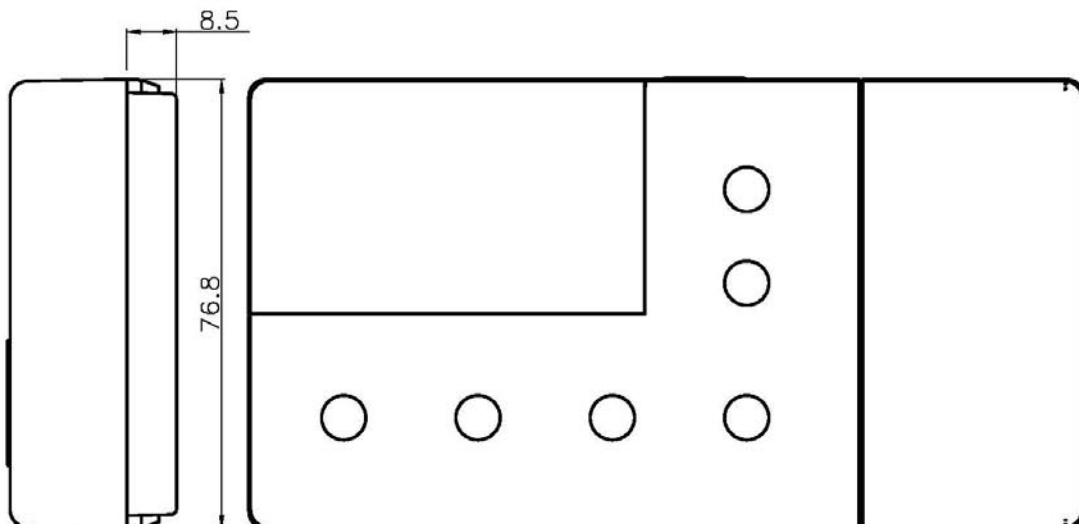
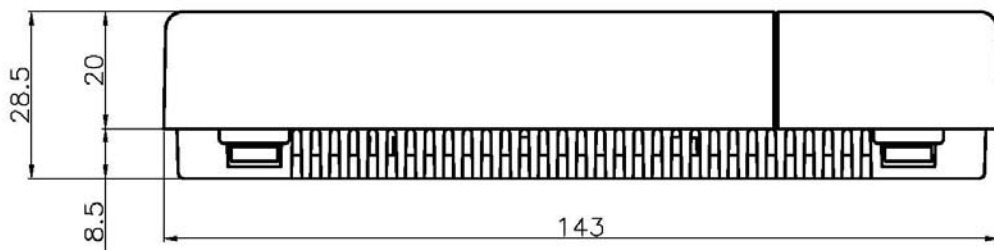
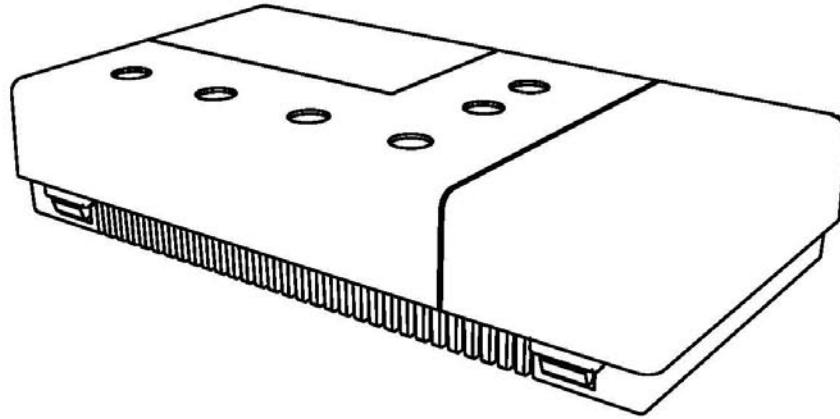
**I - Connection with PCS1 on the port #3 in mode MC4. Terminal block X1**



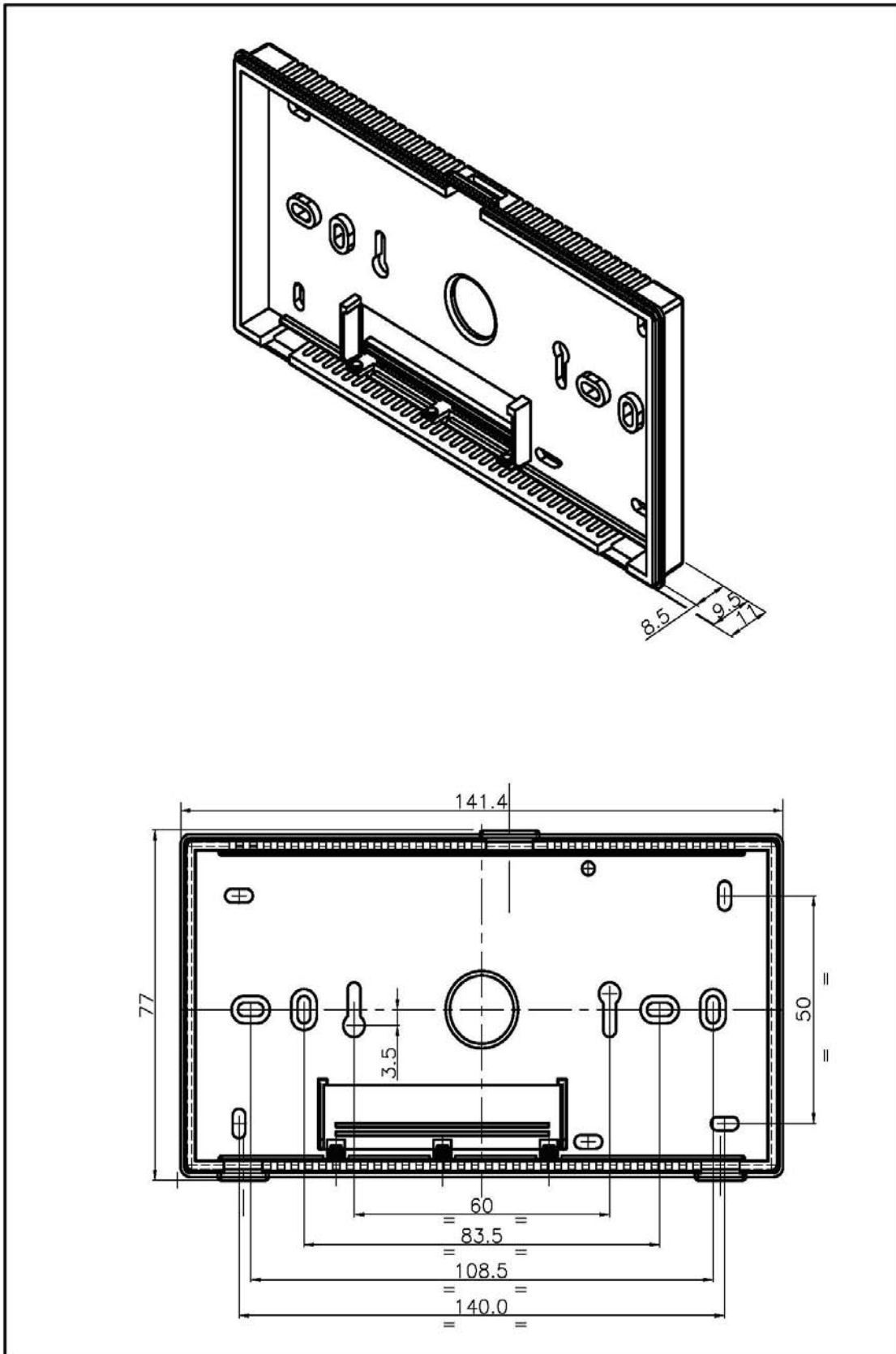
### 1.5 Dimensions

Dimension in mm

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## 3 Communication mode setting

### 3.1 Serial mode, baudrate and handshake

The selected PCD communication mode and PCD7.D290 communication settings in the setup menu must match.

The PCD communication mode is selected in the HMI-Editor in the setting screen:

- MC0: Full duplex, no handshake, RS 232
- MC1: Full duplex, RTS/CTS, RS 232
- MC4: Half duplex, RS 485
- MC5: Half duplex, Fast RS 485 (reduced turn around delay)
- Baudrate: 4.800, 9.600, 19.200 Baud
- Bit/char: 7,8
- Parity: Odd, even, no parity
- Stop bit: always 1

The PCD7.D290 communication mode is set in the set-up menu:

- Serial interface: RS 232 with RTS/CTS, RS 232 without RTS/CTS, RS 485
- Type of connection: Point – to – point, multidrop
- Address
- Baudrate: 4.800, 9.600, 19.200 Baud
- Bit/char: 7,8
- Parity: Odd, even, no parity

### 3.2 Standard modes

Interface	Baudrate	Type	Handshake	Control	Graphic support (HMI)
RS 232	4.800/9.600/19.200	MC0	No	None	No
RS 232	4.800/9.600/19.200	MC1	Si	RTS/CTS	Yes
RS 485 Point-Point	4.800/9.600/19.200	MC4	No	None	Yes
RS 485 Multidrop	4.800/9.600/19.200	MC4	No	None	No



## 2 Hardware description

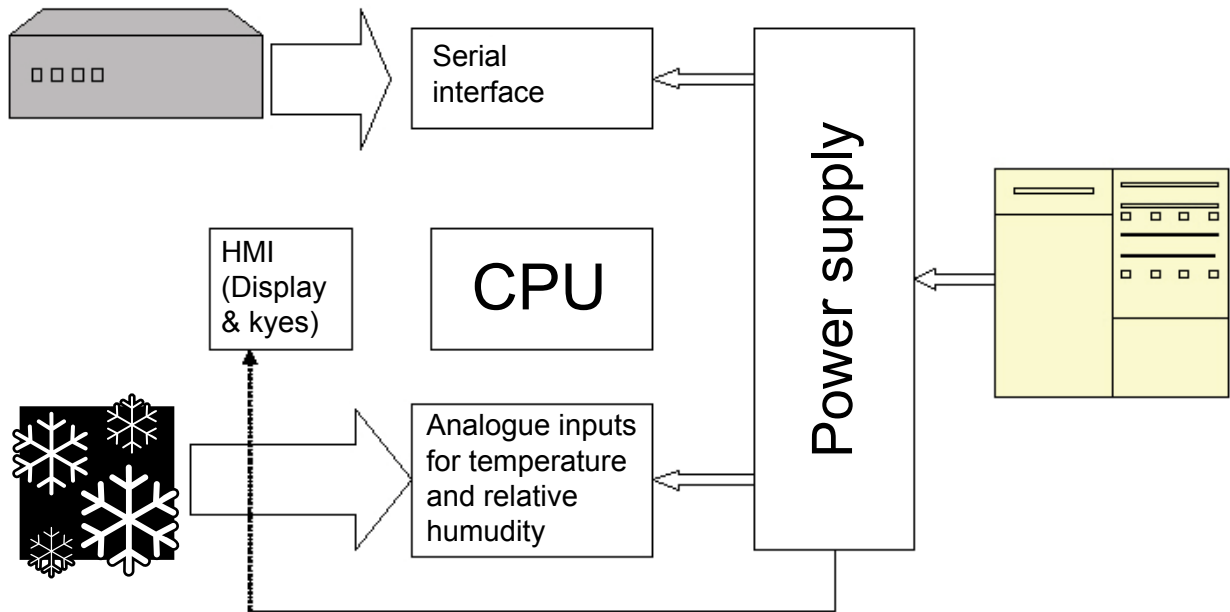
### 2.1 Technical data

2

<b>Type designation</b>	<b>PCD7.D290</b>
<b>Display</b>	
Type	Graphic display
Display dimension (lxh)	8 lines × 20 characters (128 × 64 pixel)
Character size	5 × 7 pixel (6 × 8)
Contrast adjustment	Via software or setup
LED backlight	ON/OFF via software
Character set	ASCII (English, French, German)
<b>Keyboard</b>	
Number of keys	6
Key backlight	ON/OFF via software
Autorepeat	Yes
<b>Memory</b>	
Capacity	Permanent storage of communication and contrast settings. Non permanent storage of 20 icons (6 characters/icon)
<b>Interfaces, Programming</b>	
Serial interfaces	RS 232, RS 485 on a screw connector. Only one is active
Programming software	HMI-Editor, from version V1.4
Field inputs	Temperature, range 15...45 °C 10 bits resolution. Humidity, range 5...95 % equivalent to 16 bits resolution.
<b>General data</b>	
Supply voltage	19...30 VAC/VDC
Interference immunity	CE mark according to EN 50 081 and EN 50 082-2
Power consumption	200 mA
Working temperature	0...+ 50 °C
Storage temperature	-25...+ 70 °C
Humidity	5...95 % without condensation, according to DIN 40 040 class F
Protection (Front)	IP40
Mounting	Wall mounting

### 2.2 Block diagram

2





## 4 Software

The PCD7.D290 can be in the following operating modes:

- **Set-up mode.** In this mode the terminal will process the keys entries to modify its set-up. No commands or characters coming from the serial interface are accepted.
- **Direct mode.** In this mode the terminal will display on the screen the received characters in the same sequence they are received from the serial interface. There are two possibilities:
  - **Full duplex operation.** The active interface is RS232. In this mode the terminal is active, and can send to the master, without any delay, the characters corresponding to the key pressed by the user.
  - **Half duplex operation.** The active interface is RS485. In this mode the terminal is passive, and will send to the master the code of the pressed keys only upon a polling command from the master. The terminal has a key buffer 8 characters long.

### 4.1 Communication protocol

There are two possible connections: point-to-point and multidrop. The first one will apply when a master unit (typically a PCD system) is connected to one terminal with the RS 232 (typical) or RS 485 interface. The second connection will apply when a master is connected via RS 485 to several terminals.

The choice between point-to-point and multidrop connection is done by a configuration menu and by connections

#### 4.1.1 Point to point connection

In a point-to-point connection the terminal is always able to send characters corresponding to the pressed keys, but it is also possible to use poll telegrams (read temperature and read humidity).

When using the RS 232 interface the connection is full duplex. When using the RS 485 interface the connection is half duplex: the terminal will send the code of a pressed key only upon reception of the poll command from the PCD.

When the terminal address is "00" (set in the configuration menu), the connection is point to point, regardless of the used interface.

The master sends no address: all the characters will be displayed as the terminal receives them.

#### 4.1.2 Multidrop connection

The maximum number of terminals connected is 32 with addresses 1...32. HMI-Editor allows the connection of a maximum of 6 terminals.

The master selects the destination terminal with the following command:

```
<ESC>I<y><y><EOT>
01Bhex 053Hex <y><y>04Hex
```

Where the values <y> are the two Hex digit of the selected address with BCD coding (e.g. address 01 will be sent as 30Hex 31Hex).

A new destination will be chosen simply by sending a new address.

When it is chosen 00Hex as address a broadcast is activated, so all terminals will display the same message.

### 4.1.3 Command table

When the terminal is active (point to point connection, or selected terminal), it will react to the master commands as mentioned in the following table:

4

Description	Code	Par. 1	Par. 2	Par. 3	Par. 4	Par. 5	Par. 6
Cursor down	05						
Cursor right	06						
Hmidity and Temperature enquiry	07	00					
Cursor left	08						
Line feed	0A						
Cursor up	0B						
Clear screen	0C						
Carriage Return	0D						
Cursor position	10	column	row				
Download icon	17	IconNo	Line	18 byte, from <C00> to <C17>			
Display dynamic icon	18	SEL	IconA	IconB	Line		
Display icon	19	IconNo	Line				
Cursore home	1A						
Restart with factory default	1B	@	C				
Decrease contrast	1B	@	D	0			
Medium contrast -6	1B	@	D	1			
Medium contrast -5	1B	@	D	2			
Medium contrast -4	1B	@	D	3			
Medium contrast -3	1B	@	D	4			
Medium contrast -2	1B	@	D	5			
Medium contrast -1	1B	@	D	6			
Medium contrast <b>Default</b>	1B	@	D	7			
Medium contrast +1	1B	@	D	8			
Medium contrast +2	1B	@	D	9			
Medium contrast +3	1B	@	D	A			
Medium contrast +4	1B	@	D	B			
Medium contrast +5	1B	@	D	C			
Medium contrast +6	1B	@	D	D			
Increase contrast	1B	@	D	F			
Buzzer OFF <b>Default</b>	1B	@	r	0			
Buzzer ON	1B	@	r	1			
Unlock set-up mode	1B	@	G	0			
Lock set-up mode	1B	@	G	1			
Delete line	1B	@	L				
Double width character	1B	@	M	1			
Normal width character <b>Default</b>	1B	@	M	2			
Double high character	1B	@	M	3			
Normal high caracter <b>Default</b>	1B	@	M	4			
Cursor OFF	1B	B	0	0	EOT		
Cursor ON <b>Default (Blinking)</b>	1B	B	1	1	EOT		

follow command table:

Description	Code	Par. 1	Par. 2	Par. 3	Par. 4	Par. 5	Par. 6
Clear key buffer	1B	E					
Active terminal selection	1B	I	x	x	EOT		
Backlight ON	1B	L					
Backlight OFF <b>Default</b>	1B	O					
Key backlight ( <b>ON Default</b> )	1B	U	Leds 1,4	Leds 5,6			
Key enquiry / Poll command	1B	@	B				
Poll icons	1B	@	B				

4

In the table above, commands are indicated as Hex values, but the parameters are indicated as ASCII characters.

The cursor position is always given with an offset of 31. This means that column 1, row 1 (home) correspond to values 32, 32 and column 20, row 8 correspond to values 51, 39.

The command Restart with factory default <ESC>@C (1B Hex, 40 Hex, 42 Hex) affects only the contrast and backlight setting, but doesn't influence the serial interface setting.

## 4.2 Return codes from PCD7.D290

### 4.2.1 Keyboard returned codes

Key	Returned Hex value RS 232 connection	Returned Hex values RS 485 connection
Down arrow	05 Hex	<xx><xx>30Hex 35Hex
Up arrow	0B Hex	<xx><xx>30Hex 42Hex
Left arrow	08 Hex	<xx><xx>30Hex 38Hex
Right arrow	06 Hex	<xx><xx>30Hex 36Hex
Bell	071 Hex	<xx><xx>30Hex 31Hex
Enter	0D Hex	<xx><xx>30Hex 44Hex

### 4.2.2 Return values and codes

When the terminal receives the humidity/temperature enquiry command, it will answer immediately (with 50 ms delay) with the following string:

**07H 00H Length Error Temperature Relative Humidity**

where:

- Length - One byte, is the number of the bytes following the length parameter, the correct value is 9.
- Error - One byte, is the error code, 0 means no error.
- Temperature – 4 bytes long, MSB first, LSB last
- Relative Humidity – 4 bytes long, MSB first, LSB last

Temperature and R.H. values are in tenths of degree and in tenths of percent R.H. respectively.

When the terminal receive the key enquiry command:

**<ESC>T<EOT> (<1B Hex><54 Hex><04 Hex>)**

it answers, with max 50 ms delay, with 4 ASCII characters "xxyy"; "xx" representing the number of characters present in the terminal buffer, and "yy" is the Hex code of the first character in the buffer.

As example, when Left Arrow key is pressed, the terminal will answer to the above telegram with:

**<30Hex> <31Hex> <30Hex> <38Hex>**

Upon reception of the Poll Icon command

**<ESC>@B (<1BHex> <40Hex><42Hex>)**

the terminal will return the following response code:

- B0 Hex if there are icons stored in the terminal memory
- B1 Hex if there are no icons stored in the terminal memory

### 4.2.3 Temperature sensor

Temperature sensor used in PCD7.D290 is active and supply as output a voltage of 10.0 mV/°C; this sensor is directly calibrated in °C. The accuracy, guaranteed by the supplier is 0,5°C at 25°C.

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### 4.2.4 R.H. sensor

R.H. sensor used in PCD7.D290 is capacitive and supply as output a capacity in the range 161.6 pF at 0% R.H. and 193.1 pF at 100% R.H. The evaluation algorithm is stored directly inside the PCD7.d290 firmware.

### 4.3 Icons

The PCD7.D290 can store 20 icons, generated as example by the Icon Editor. Each icon needs 36 bytes (icons are 3 characters wide and 2 characters high, mapping a single character by columns). The icons are mapped in two lines of three characters.

#### 4.3.1 Downloading icons

At start-up the PCD will download ALL the 20 icons.

The PCD download icons with the command:

**017Hex <IconNo> <IconLine> <Char00>...<Char17>**

IconNo is the icon number hex coded 0x01 to 0x14 (decimal 01 to 20). This command download icons one line per time. This means that a complete download of 20 icons needs 40 commands.

#### 4.3.2 Display icons

Before display an icon the user program in the PCD must select the position where the icon will appear. It is responsibility of the programmer the right choice of the cursor positioning before the display icon command.

As second step, the user program must send two times the command Display icon. There is the need of sending two command because the D290 display half icon per time (first the upper part and then the lower part of the icon). This is because the D290 stores icons in sequences of icon lines: each icon is made by two lines (line 1 and line 2). The display icon command allow the display of only one icon line at a time. This means that the D290 is able to display even half an icon.

The icon is three characters wide and two characters high.

There are two display icon commands, one is static and the other is dynamic:

- Static icons

The command display icon static is as follows:

**019Hex <IconNo> <IconLine>**

IconNo is the icon number hex coded 0x01 to 0x14 (decimal 01 to 20)

IconLine is the line number of the icon line to be displayed (01Hex or 02Hex)

The following example forces the D290 to display icon 1 in the home position:

**<16><32><32><25><1><1><16><32><33><25><1><2>**

- Dynamic icons

The command display icon dyanmic is as follows:

**018Hex <SEL> <IconA> <IconB> <IconLine>**

SEL is the icon selector with a value of 0 or 1 (30Hex or 31Hex), and it enables the display of IconA (value 30Hex) or IconB (value 31Hex).

IconA and IconB are the icon number hex coded 0x01 to 0x14 (decimal 01 to 20) that will be displayed accordingly to the value of SEL.

IconLine is the line number of the icon line to be displayed (01Hex or 02Hex)

The following example forces the D290 to display icon 1 or icon 2 in the home position depending on the value of Flag 100:

**<16><32><32><24>\$f0100<1><2><1><16><32><33><24>\$f0100<1><2><2>**

#### 4.4 Backlight

The terminal display is LED back lighted. The backlight is software controlled with the commands:

- Backlight ON: **01Bhex 04Chex (ESC L)**
- Backlight OFF: **01Bhex 04Fhex (ESC O)**

The key backlight is controlled individually for each key with a unique command: **01Bhex 055hex Led01...04 Led05...06** or: **ESC U Led01...04 Led05...06**

The third and fourth byte of this command have the same meaning: they are the bit pattern of the desired state of the Led with an offset of 020hex.

As example, the command: **01Bhex 055hex 02Bhex 020hex**, will light the Led 1 (Left arrow), 2 (Bell), 4 (Enter).





## 5 Handling

### 5.1 Setup

The setup menu is displayed:

- By pressing Left arrow and Enter keys simultaneously at switch on.
- By pressing Left arrow and Enter keys simultaneously runtime if this option is enabled by the command:  
**0x1b 0x40 0x47 0x30 o <ESC>@G0.**

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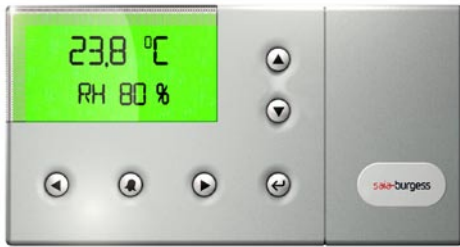
The setup menu allows the following settings:

- Baudrate (4.800, 9.600, 19.200)
- Bit/character (7, 8)
- Parity (No parity, odd, even)
- Type of connection (point to point, multidrop)
- Interface (RS232 with RTS/CTS handshaking, RS232 without handshaking, RS485)
- Address
- Contrast (the contrast is also adjustable with software commands)

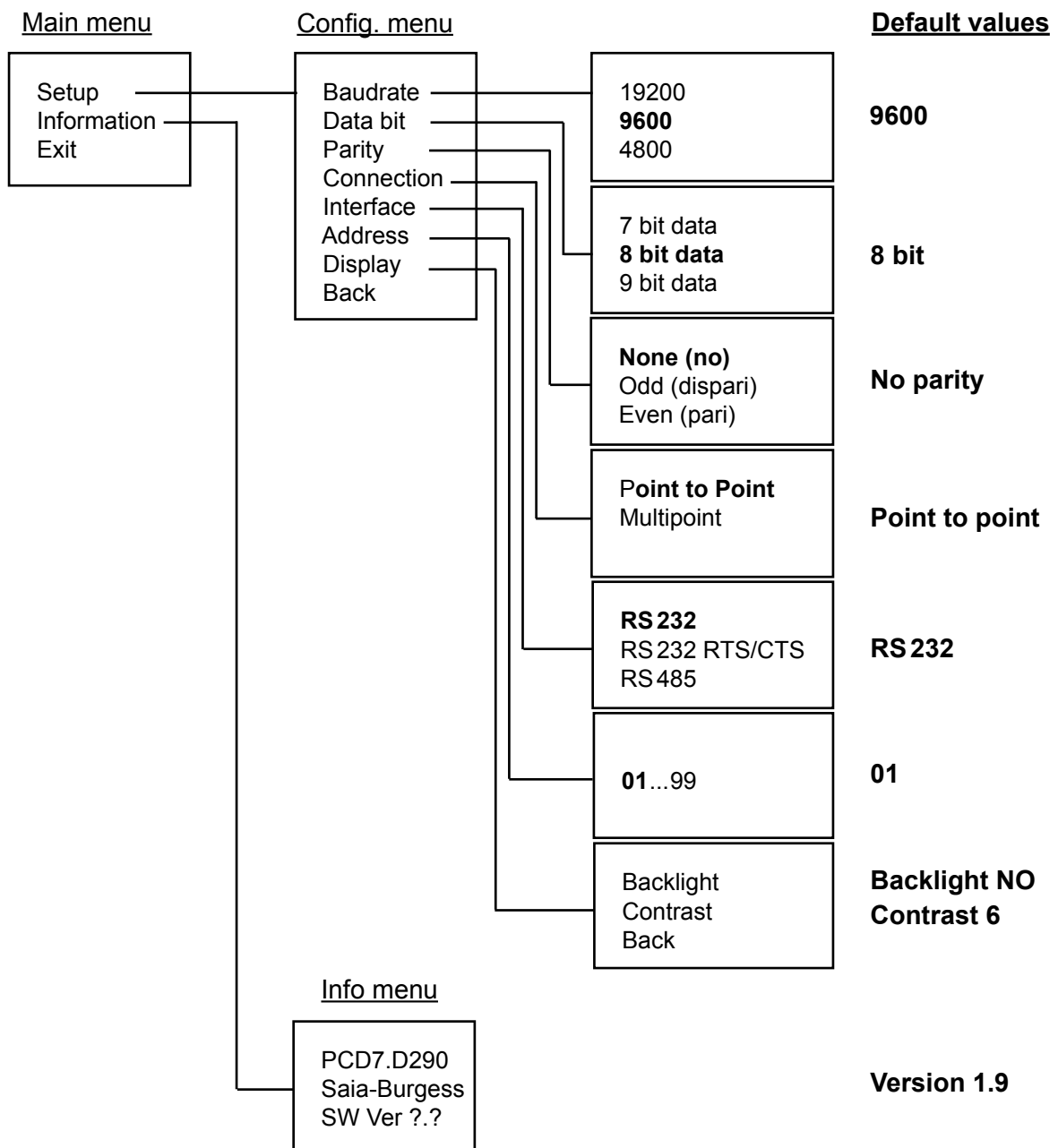
### 5.2 Setup menu structure

Bold values are the default settings.

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1. At the switch on, press simultaneously the Left arrow and Enter keys to access the Setup menu.
2. Move the cursor through the various options pushing the Up Arrow and Down Arrow keys, selecting the option with the Enter key.
3. Go out from Setup selecting Exit



### 5.3 Keys used in Setup menu

- Down arrow: move selection to the next item
- Up arrow: move selection to the previous item
- Enter : select item and, if the actual setup level has no further submenu
- Right arrow: no effect
- Left arrow: no effect
- Bell: no effect





```

NOTA : Il Registro Indice NON viene modificato
ELENCO PARAMETRI - tra parentesi si indica il tipo :
=1 Destinazione valore (R)
=2 Valore iniziale timeout (R)
=3 Fine memorizzazione (F)
=4 Massimo valore accettabile (R)
=5 Minimo valore accettabile (R)
=6 Valore temporaneo per display (R)
=7 Carattere ricevuto (R)
=8 Interfaccia seriale (W)
=9 Codice ASCII di memorizzazione (K)
=10 Codice ASCII di interruzione (K)
=11 Codice ASCII tasto incremento (K)
=12 Codice ASCII tasto decremento (K)
=13 Testo display valore temporaneo (X)
=14 Ricezione busy (F)
=15 Timer di servizio per timeout (T)
-----+-----
;
;
destin DEF = 1 serinout ;Destinazione valore da memorizzare [R]
fbtempo DEF = 2 ;Registro per valore iniziale Timeout [R]
second DEF = 3 ;Flag fine memorizzazione (a 0 in X0B 16) [F]
fbmax DEF = 4 ;Valore massimo [R]
fbmin DEF = 5 ;Valore minimo [R]
fbcopia DEF = 6 ;Copia destinazione (servizio) [R]
fbasci DEF = 7 ;Registro per carattere ASCII ricevuto [R]
fbser DEF = 8 ;Interfaccia seriale [W]
kmem DEF = 9 ;Codice ASCII conferma dato [K]
kesc DEF = 10 ;Codice ASCII interruzione procedura [K]
kinc DEF = 11 ;Codice ASCII incremento valore [K]
kdec DEF = 12 ;Codice ASCII decremento valore [K]
texref DEF = 13 ;Testo refresh valore introdotto [X]
fbbusy DEF = 14 ;Receiver busy [F]
fbtim DEF = 15 ;Timer per timeout [T]
;
;
STH second ;se ho gia inizializzato tutto
JR H uno ;evito di rifarlo
COPY destin ;copio il valore attuale della destinazione
fbcopia ;sul registro usato per il display
fbser ;primo display testo (valore corrente)
texref
COPY fbtempo ;attivo timeout
fbtim
ACC H ;inizializzazione completa
SET second
uno: STL fbbusy ;se non ricevuto carattere
ANH fbtim ;e timeout non trascorso
JR H fine ;esco
;Se sono qui ho ricevuto un carattere oppure I finito il timeout
stl fbbusy ;se non ho ricevuto caratteri
res second ;se non ho ricevuto caratteri
jr h fine ;I finito il timeout = fine procedura
acc h
ldl fbtim ;imposto timeout per tasto successivo
25 ;2,5 secondi
srxd fbser ;ricezione carattere
fbasci
;Incremento valore
cmp fbasci
kinc
acc z
jr l due ;se non era tasto incremento vado avanti
inc fbcopia
cmp fbmax ;potevo incrementare ancora ?
fbcopia
jr p tre ;se si eseguo display direttamente
copy fbmin ;altrimenti carico valore minimo
fbcopia
JR tre ;e vado a rinfrescare il valore a display
;Decremento valore
due: cmp fbasci
kdec
acc z
jr l quatt ;se non era tasto decremento vado avanti
dec fbcopia
cmp fbcopia ;potevo decrementare ancora ?
fbmin
jr p tre ;se si eseguo display direttamente
copy fbmax ;altrimenti carico valore massimo
fbcopia
;Rinfresco valore memorizzato
tre: stxt fbser
texref
jr fine
;Memorizzazione
quatt: cmp fbasci
kmem
acc z
jr l cinq ;se non era tasto decremento vado avanti
copy fbcopia ;altrimenti copio valore attuale
destin ;su destinazione
second ;segnalo fine memorizzazione
jr fine
;Interruzione
cinq: cmp fbasci
kesc
acc z
jr l fine ;se non era tasto ESC aspetto nuovo tasto
res second ;segnalo fine memorizzazione
ldl fbtim ;segnalo interruzione
0
fine: nop
efb

```

### 6.1.2 Data input from RS485 serial interface

The used FB symbol (serinoutRs485) must be declared Global in the Symbol Editor.

```

..... FB acquisizione valori da seriale per PCD7.Dxxx .....
MODULO      : serinoutRs485.src
DATA        : 05 / 03 / 1997 S. Codini
MODIFICA    : 11 / 03 / 1997 S. Codini - Introd. ciclica
              : 05 / 05 / 2006 S. Codini - Rinominato FB
              : 06 / 09 / 2006 S. Codini - Modificato D290-RS485
FUNZIONE    : Memorizzazione in un registro indirizzabile a
              : piacere di un valore decimale qualsiasi per
              : mezzo di una qualunque porta seriale definita
              : in modalità C. Viene definito un limite di
              : tempo per acquisire il valore; tale limite è
              : impostabile per mezzo di uno dei parametri.
              : L'impostazione del valore avviene per mezzo di
              : due tasti: uno provoca l'incremento e l'altro
              : il decremento del valore da modificare. Sono
              : gestiti inoltre due tasti che consentono:
              : 1) la memorizzazione del valore correntemente
              : visualizzato, oppure 2) l'interruzione della
              : procedura.
              : E' consigliabile utilizzare la modalità di
              : "Autorepeat" del terminale in modo da rendere
              : più agevole l'inserimento dei dati. I valori
              : da memorizzare devono essere compresi tra un
              : minimo ed un massimo indicati da due
              : parametri.
              : La visualizzazione del valore temporaneo
              : per mezzo di un testo da specificare come
              : parametro, attraverso tale testo è possibile
              : controllare la posizione dell'eco ed il
              : formato di tale eco (numero decimali...).
              : Per l'uso con il D290 in RS485, il testo DEVE
              : contenere il comando di richiesta tasto:
              : <ESC>T<EOT> (<1BH><54H><04H>)
              : Per la visualizzazione del valore temporaneo
              : occorre utilizzare nel testo il parametro 4.

              :
              : Il programma è ciclico, quindi va richiamato
              : continuamente (quando deve essere attivata la
              : funzione).

              :
              : La procedura viene conclusa in due modi:
              : 1) Pressione del tasto di memorizzazione;
              : 2) Pressione del tasto di interruzione;

              :
              : La destinazione del valore è indicata dal
              : parametro 1.
              : Il timeout è definito dal parametro 2.
              : La conclusione della procedura è indicata dal
              : passaggio a "Low" del parametro 3 (questo flag
              : deve essere portato a "Low" nell'XOB 16).
              : La modalità con cui avviene la conclusione
              : della procedura è indicata dalle condizioni
              : seguenti: 1) Parametro 3 = 0 AND Parametro 15
              : diverso da 0 --> memorizzazione completata
              : correttamente; 2) Parametro 3 AND Parametro
              : 15 ENTRAMBI = 0 --> errore di timeout oppure
              : interruzione della memorizzazione.

              :
              : NOTA : Il Registro Indice NON viene modificato
              : Il Parametro 2, Valore iniziale timeout
              : VIENE modificato.
  
```

```

.....
ELENCO PARAMETRI - tra parentesi si indica il tipo :
.....
=1 Destinazione valore (R)
=2 Valore iniziale timeout (R)
=3 Fine memorizzazione (F)
=4 Massimo valore accettabile (R)
=5 Minimo valore accettabile (R)
=6 Valore temporaneo per display (R)
=7 Carattere ricevuto (R)
=8 Interfaccia seriale (W)
=9 Codice ASCII di memorizzazione (K)
=10 Codice ASCII di interruzione (K)
=11 Codice ASCII tasto incremento (K)
=12 Codice ASCII tasto decremento (K)
=13 Testo display valore temporaneo (X)
=14 Ricezione busy (F)
=15 Timer di servizio per timeout (T)
.....

FB serinoutRs485
destin DEF = 1 ;Destinazione valore da memorizzare [R]
fbtempo DEF = 2 ;Registro per valore iniziale Timeout [R]
second DEF = 3 ;Flag fine memorizzazione (a 0 in XOB 16) [F]
fbmax DEF = 4 ;Valore massimo [R]
fbmin DEF = 5 ;Valore minimo [R]
fbcopia DEF = 6 ;Copia destinazione (servizio) [R]
fbasci DEF = 7 ;Registro per carattere ASCII ricevuto [R]
fbser DEF = 8 ;Interfaccia seriale [W]
kmem DEF = 9 ;Codice ASCII conferma dato [K]
kesc DEF = 10 ;Codice ASCII interruzione procedura [K]
kinc DEF = 11 ;Codice ASCII incremento valore [K]
kdec DEF = 12 ;Codice ASCII decremento valore [K]
texref DEF = 13 ;Testo refresh valore introdotto [X]
fbusy DEF = 14 ;Receiver busy [F]
fbtim DEF = 15 ;Timer per timeout [T]
;

STH second ;se ho gia inizializzato tutto
JR H uno ;evito di rifarlo
COPY destin ;copio il valore attuale della destinazione
fbcopia ;sul registro usato per il display
fbtempo ;attivo timeout
fbtim
ACC H ;inizializzazione completa
SET second
uno: STL fbusy ;se non ricevuto carattere
ANH fbtin ;e timeout non trascorso
JR H tre ;esco dopo aver rinfrescato il display
;Se sono qui ho ricevuto un carattere oppure T finito il timeout
STL fbusy ;se non ho ricevuto caratteri
RES second ;T finito il timeout = fine procedura
JR H fine
ACC H
LDL fbtin ;imposto timeout per tasto successivo
25 ;2,5 secondi
;in RS485 la risposta del terminale è costituita da 4 digit Hex,
;dei quali è importante solo l'ultimo.
;Quindi svuoto il buffer tenendo conto del solo ultimo carattere ricevuto
;se non ricevo abbastanza caratteri abortisco la procedura.
;Primo carattere
STL fbusy ;se non ho il buffer carico
RES second ;dichiaro finita la procedura
JR H fine ;ed esco, altrimenti leggo il carattere
SRXD fbser ;ricezione carattere
fbasci
;
;Secondo carattere
STL fbusy ;se non ho il buffer carico
RES second ;dichiaro finita la procedura
JR H fine ;ed esco, altrimenti leggo il carattere
SRXD fbser ;ricezione carattere
fbasci
;
;Terzo carattere
STL fbusy ;se non ho il buffer carico
RES second ;dichiaro finita la procedura
JR H fine ;ed esco, altrimenti leggo il carattere
SRXD fbser ;ricezione carattere
fbasci
;
;Quarto carattere
STL fbusy ;se non ho il buffer carico
RES second ;dichiaro finita la procedura
JR H fine ;ed esco, altrimenti leggo il carattere
SRXD fbser ;ricezione carattere
fbasci

```



```

;
;Incremento valore
    CMP    fbasci
           kinc
    ACC    Z
    JR     L due           ;se non era tasto incremento vado avanti
    INC    fbcopia
    CMP    fbmax           ;potevo incrementare ancora ?
           fbcopia
    JR     P tre           ;se si eseguo display direttamente
    COPY   fbmin           ;altrimenti carico valore minimo
           fbcopia
    JR     tre             ;e vado a rinfrescare il valore a display
;Decremento valore
due:    CMP    fbasci
           kdec
    ACC    Z
    JR     L quatt        ;se non era tasto decremento vado avanti
    DEC    fbcopia
    CMP    fbcopia
           fbmin
    JR     P tre           ;se si eseguo display direttamente
    COPY   fbmax           ;altrimenti carico valore massimo
           fbcopia

;Rinfresco valore memorizzato
;Attesa di circa 70 ms.
tre:    LDL    fbtempo
           3000
tre_1:  DEC    fbtempo
    CMP    fbtempo
           K 0
    ACC    Z
    JR     L tre_1
    STXT   fbser
           texref
    JR     fine
;Memorizzazione
quatt:  CMP    fbasci
           kmem
    ACC    Z
    JR     L cinq        ;se non era tasto memorizzazione vado avanti
    COPY   fbcopia
           destin        ;altrimenti copio valore attuale
           second       ;su destinazione
    RES    second        ;segnalo fine memorizzazione
    JR     fine
;Interruzione
cinq:   CMP    fbasci
           kesc
    ACC    Z
    JR     L fine        ;se non era tasto ESC aspetto nuovo tasto
    RES    second       ;segnalo fine memorizzazione
    LDL    fbtim        ;segnalo interruzione
           0
fine:   NOP
    EFB
;

```

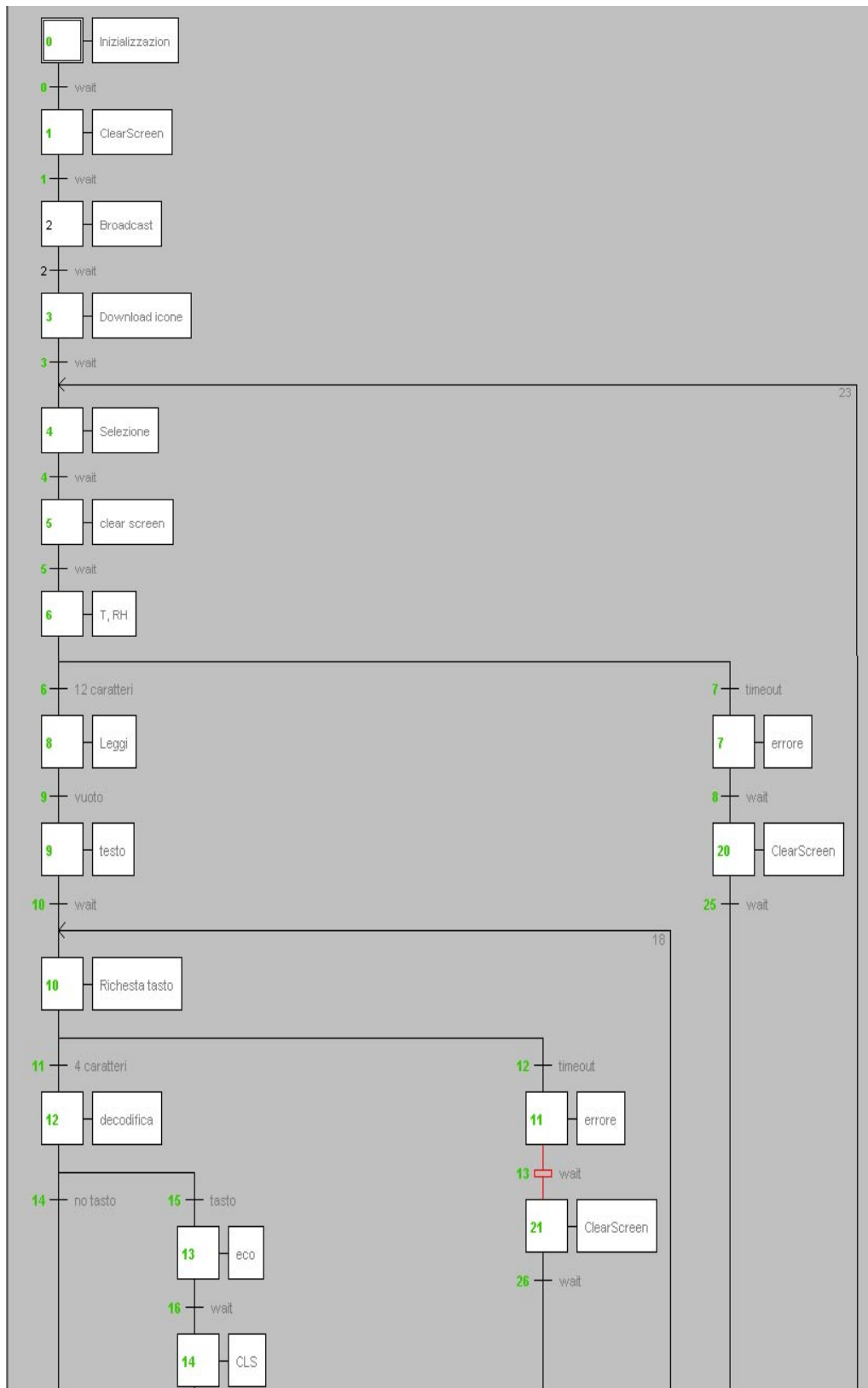
### 6.1.3 Main Program

This file include only the SB call.

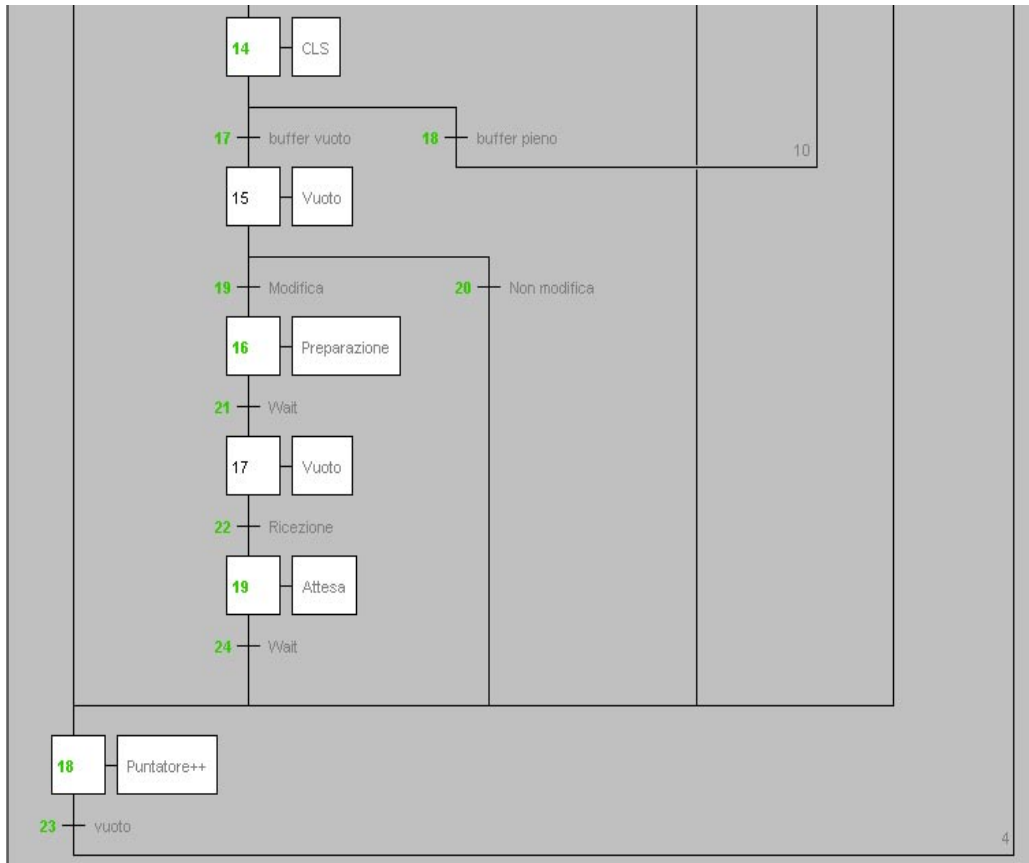
6

```
;Programma principale associato a TestSFC01.sfc  
;  
;contiene la sola chiamata dell'SB  
      COB      0  
      CSB      0  
      ECOB     0
```

**6.1.4 Sequential program - Structure**



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### 6.1.5 Sequential program - Code

The program code is completely included in this manual, but it is not fully discussed.

In the Symbol Editor there are some symbol defined to allow a quick modification in the connection structure.

In particular:

- Multipoint, this symbol can have the following values:
  - 0 that defines a point to point connection
  - 1 that defines a multipoint connection
- RS485, this symbol can have the following values:
  - 0 that defines a RS232 connection
  - 1 that defines a RS485 connection
- portad290, this symbol defines which PCD interface is used for the connection to the terminal PCD7.D290
- ND290, is a constant that define the number of D290 connected in a RS485 network. The terminal must have a progressive addressing starting from 1.

Program description:

- Initial Step IST 0. Definition of the used serial interface. This definition must match with the one defined in the D290 setup menu. Moreover, are initialized all the variables used in the program.
- ST1 - The PCD send to terminal(s) a clear screen command. A waiting time is started (2 seconds).
- ST2 - empty
- ST3 - Initialization of Icons registers and download to terminal(s).
- ST4 - Selection of the active terminal. If the D290 is connected in PTP this command is meaningless.
- ST5 - Clear screen following a previous error message.
- ST6 - Temperature and Humidity enquiry. An error message is displayed if the D290 answer is not correct.
- ST8 - Decoding received values.
- ST9 - Transmission of the main text page with the following information:
  - Date/Time
  - Terminal Address
  - Temperature
  - Relative Humidity
  - No. of program cycles per minute, No. of program cycle per second
  - Value for data input
  - 6 dynamic icons (controlled by Flag 100 – Flag 105)
- ST10 - Key enquiry for RS485 connection. An error message is displayed if the D290 answer is not correct.
- ST12 - Decoding received message.

## IST 0

```

;serial interface definition
      SASI      portad290
              txt290

;
$IF RS485
$SASI
TEXT txt290      "uart:19200,8,n,1;mode:mc4;diag:",fdia.04T,",",rdia.04T,""
$ENDSASI
$ELSE
$SASI
TEXT txt290      "uart:19200,8,n,1;mode:mc0;diag:",fdia.04T,",",rdia.04T,""
$ENDSASI
$ENDIF
;Mi lascio la possibilità di uno sblocco manuale (da debug) del setup
TEXT 80 "<ESC>@@G@"
;load timer
      LDL      tim0
              30
      RES      Second          ;reset iniziale fine introduzione dati
;
      SET      cls
      SEI      K 0
      STI      pointer          ;preparo puntatore sul terminale 1
      INC      pointer
      LDL      broadcast        ;broadcast
              0
      LDL      T1
              200
      LDL      T2
              200
      LDL      T3
              200
      LDL      RH1
              300
      LDL      RH2
              300
      LDL      RH3
              300
      ADD      pointer
              K 9
      ADD      pointerT
              K 19
      LDL      pointerRH
      LDL      cicli
              0
      LDL      ccicli
              100
      LDL      unminuto
              600

```

## TR 0

```

;wait
STL tim0

```

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## ST 1

```

;Selezione Broadcast più clear screen
STXT portad290
      initscreen
TEXT initscreen "<ESC>I00<EOT><12>"
      LDL tim0 ;breve attesa
      2

```

## TR 1

```

;wait
STL tim0

```

ST 2 and TR 2 empty

## ST 3

```

;init registers for icons download, registers 100 - 117
;Icona 1
      LDL Valore
      0FFH
      LDL R 101
      07DH
      LDL R 102
      03CH
      LDL R 103
      018H
      LDL R 104
      018H
      LDL R 105
      03CH
      LDL R 106
      07DH
      LDL R 107
      0FFH
      LDL R 108
      0D7H
      LDL R 109
      0C3H
      LDL R 110
      081H
      LDL R 111
      0
      LDL R 112
      081H
      LDL R 113
      0C3H
      LDL R 114
      0D7H
      LDL R 115
      0D7H
      LDL R 116
      0FFH
      LDL R 117
      0
;

```

```
;Icona 2
LDL R 120
    0FFH
LDL R 121
    0H
LDL R 122
    0FFH
LDL R 123
    0H
LDL R 124
    0FFH
LDL R 125
    0H
LDL R 126
    0FFH
LDL R 127
    0H
LDL R 128
    0FFH
LDL R 129
    0H
LDL R 130
    0FFH
LDL R 131
    0H
LDL R 132
    0FFH
LDL R 133
    0H
LDL R 134
    0FFH
LDL R 135
    0H
LDL R 136
    0FFH
LDL R 137
    0H
;
;
;Icona 3
LDL R 140
    0FEH
LDL R 141
    07CH
LDL R 142
    03BH
LDL R 143
    017H
LDL R 144
    017H
LDL R 145
    03BH
LDL R 146
    07CH
LDL R 147
    0FEH
LDL R 148
    0D6H
LDL R 149
    0C2H
LDL R 150
    080H
LDL R 151
    0FFH
LDL R 152
    080H
LDL R 153
    0C2H
LDL R 154
    0D6H
LDL R 155
    0D6H
LDL R 156
    0FEH
LDL R 157
    0FFH
```



```
;Icona 4
LDL R 160
    0EFH
LDL R 161
    06DH
LDL R 162
    02CH
LDL R 163
    08H
LDL R 164
    08H
LDL R 165
    02CH
LDL R 166
    06DH
LDL R 167
    0EFH
LDL R 168
    0C7H
LDL R 169
    0B3H
LDL R 170
    071H
LDL R 171
    0FFH
LDL R 172
    071H
LDL R 173
    0B3H
LDL R 174
    0C7H
LDL R 175
    0C7H
LDL R 176
    0EFH
LDL R 177
    0FFH
    -----
;
;
;Icona 5
LDL R 180
    0H
LDL R 181
    07EH
LDL R 182
    03DH
LDL R 183
    019H
LDL R 184
    019H
LDL R 185
    03DH
LDL R 186
    07EH
LDL R 187
    0H
LDL R 188
    0D6H
LDL R 189
    0C2H
LDL R 190
    080H
LDL R 191
    01H
LDL R 192
    080H
LDL R 193
    0C4H
LDL R 194
    0D8H
LDL R 195
    0D8H
LDL R 196
    0H
LDL R 197
    01H
;
```

```

;Icona 6
LDL R 200
011H
LDL R 201
08EH
LDL R 202
040H
LDL R 203
029H
LDL R 204
029H
LDL R 205
040H
LDL R 206
08EH
LDL R 207
011H
LDL R 208
0E8H
LDL R 209
0D4H
LDL R 210
09AH
LDL R 211
011H
LDL R 212
09AH
LDL R 213
0D4H
LDL R 214
0E8H
LDL R 215
0E8H
LDL R 216
011H
LDL R 217
011H
;
;
;download icone
;Icona 1
LDL DnIcoNo
1
LDL DnIcoLn
1
LDL DnldIco
017H
;
;
SEI K 0
;
;
STH fdia+3
ORH fdia+6
JR H -2
STXD portad290 ;Download icon command 017H
DnldIco
STH fdia+3
JR H -1
STXD portad290 ;Icon No
DnIcoNo
STH fdia+3
JR H -1
STXD portad290 ;Icon line
DnIcoLn
loop1:
NOP
STH fdia+3
JR H -1
STXDX portad290 ;Icon characters
Ualore
INI K 17
JR H loop1
;
LDL DnIcoNo
1
LDL DnIcoLn
2
LDL DnldIco
017H
;

```

```

;
;
SEI    K 0
;
;
STH    fdia+3
ORH    fdia+6
JR     H -2
STXD   portad290      ;Download icon command 017H
      DnldIco
STH    fdia+3
JR     H -1
STXD   portad290      ;Icon No
      DnIcoNo
STH    fdia+3
JR     H -1
STXD   portad290      ;Icon line
      DnIcoLn
loop1a: NOP
      STH    fdia+3
      JR     H -1
      STXDX  portad290      ;Icon characters
      Ualore
      INI    K 17
      JR     H loop1a
;
;
;Icona 2
LDL    DnIcoNo
      2
LDL    DnIcoLn
      1
LDL    DnldIco
      017H
;
;
SEI    K 0
;
;
STH    fdia+3
ORH    fdia+6
JR     H -2
STXD   portad290      ;Download icon command 017H
      DnldIco
STH    fdia+3
JR     H -1
STXD   portad290      ;Icon No
      DnIcoNo
STH    fdia+3
JR     H -1
STXD   portad290      ;Icon line
      DnIcoLn
loop2: NOP
      STH    fdia+3
      JR     H -1
      STXDX  portad290      ;Icon characters
      R 120
      INI    K 17
      JR     H loop2
;
;
LDL    DnIcoNo
      2
LDL    DnIcoLn
      2
LDL    DnldIco
      017H
;
;
SEI    K 0
;
;

```

6

```

;
      STH    fdia+3
      ORH    fdia+6
      JR     H -2
      STXD   portad290      ;Download icon command 017H
                        DnldIco
      STH    fdia+3
      JR     H -1
      STXD   portad290      ;Icon No
                        DnIcoNo
      STH    fdia+3
      JR     H -1
      STXD   portad290      ;Icon line
                        DnIcoLn
loop2a:  NOP
      STH    fdia+3
      JR     H -1
      STXDX  portad290      ;Icon characters
                        R 120
      INI    K 17
      JR     H loop2a
;
;
;Icona 3
      LDL    DnIcoNo
                        3
      LDL    DnIcoLn
                        1
      LDL    DnldIco
                        017H
;
;
      SEI    K 0
;
;
      STH    fdia+3
      ORH    fdia+6
      JR     H -2
      STXD   portad290      ;Download icon command 017H
                        DnldIco
      STH    fdia+3
      JR     H -1
      STXD   portad290      ;Icon No
                        DnIcoNo
      STH    fdia+3
      JR     H -1
      STXD   portad290      ;Icon line
                        DnIcoLn
loop3:  NOP
      STH    fdia+3
      JR     H -1
      STXDX  portad290      ;Icon characters
                        R 140
      INI    K 17
      JR     H loop3
;
;
      LDL    DnIcoNo
                        3
      LDL    DnIcoLn
                        2
      LDL    DnldIco
                        017H
;
;
      SEI    K 0
;

```

```

;
    STH    fdia+3
    ORH    fdia+6
    JR     H -2
    STXD   portad290      ;Download icon command 017H
    DnldIco

    STH    fdia+3
    JR     H -1
    STXD   portad290      ;Icon No
    DnIcoNo

    STH    fdia+3
    JR     H -1
    STXD   portad290      ;Icon line
    DnIcoLn

loop3a:
    NOP
    STH    fdia+3
    JR     H -1
    STXDX  portad290      ;Icon characters
    R 140
    INI    K 17
    JR     H loop3a
;
;Icona 4
    LDL    DnIcoNo
    4
    LDL    DnIcoLn
    1
    LDL    DnldIco
    017H
;
    SEI    K 0
;
    STH    fdia+3
    ORH    fdia+6
    JR     H -2
    STXD   portad290      ;Download icon command 017H
    DnldIco

    STH    fdia+3
    JR     H -1
    STXD   portad290      ;Icon No
    DnIcoNo

    STH    fdia+3
    JR     H -1
    STXD   portad290      ;Icon line
    DnIcoLn

loop4:
    NOP
    STH    fdia+3
    JR     H -1
    STXDX  portad290      ;Icon characters
    R 160
    INI    K 17
    JR     H loop4
;
    LDL    DnIcoNo
    4
    LDL    DnIcoLn
    2
    LDL    DnldIco
    017H
;
    SEI    K 0

```

6

```

;
      STH    fdia+3
      ORH    fdia+6
      JR     H -2
      STXD   portad290      ;Download icon command 017H
                        DnldIco
      STH    fdia+3
      JR     H -1
      STXD   portad290      ;Icon No
                        DnIcoNo
      STH    fdia+3
      JR     H -1
      STXD   portad290      ;Icon line
                        DnIcoLn
loop4a: NOP
      STH    fdia+3
      JR     H -1
      STXDX  portad290      ;Icon characters
                        R 160
      INI    K 17
      JR     H loop4a
;
;
;Icona 5
      LDL    DnIcoNo
                        5
      LDL    DnIcoLn
                        1
      LDL    DnldIco
                        017H
;
;
      SEI    K 0
;
      STH    fdia+3
      ORH    fdia+6
      JR     H -2
      STXD   portad290      ;Download icon command 017H
                        DnldIco
      STH    fdia+3
      JR     H -1
      STXD   portad290      ;Icon No
                        DnIcoNo
      STH    fdia+3
      JR     H -1
      STXD   portad290      ;Icon line
                        DnIcoLn
loop5:  NOP
      STH    fdia+3
      JR     H -1
      STXDX  portad290      ;Icon characters
                        R 180
      INI    K 17
      JR     H loop5
;
      LDL    DnIcoNo
                        5
      LDL    DnIcoLn
                        2
      LDL    DnldIco
                        017H

```

```

;
SEI      K 0
;
STH      fdia+3
ORH      fdia+6
JR        H -2
STXD     portad290      ;Download icon command 017H
          DnldIco
;
STH      fdia+3
JR        H -1
STXD     portad290      ;Icon No
          DnIcoNo
;
STH      fdia+3
JR        H -1
STXD     portad290      ;Icon line
          DnIcoLn
loop5a:  NOP
          STH      fdia+3
          JR        H -1
          STXDX    portad290      ;Icon characters
          R 180
          INI      K 17
          JR        H loop5a
;
;
;Icona 6
LDL      DnIcoNo
          6
LDL      DnIcoLn
          1
LDL      DnldIco
          017H
;
;
SEI      K 0
;
STH      fdia+3
ORH      fdia+6
JR        H -2
STXD     portad290      ;Download icon command 017H
          DnldIco
;
STH      fdia+3
JR        H -1
STXD     portad290      ;Icon No
          DnIcoNo
;
STH      fdia+3
JR        H -1
STXD     portad290      ;Icon line
          DnIcoLn
loop6:  NOP
          STH      fdia+3
          JR        H -1
          STXDX    portad290      ;Icon characters
          R 200
          INI      K 17
          JR        H loop6
;
LDL      DnIcoNo
          6
LDL      DnIcoLn
          2
LDL      DnldIco
          017H
;
SEI      K 0

```

6

```

;
;          SEI      K 0
;
;          STH      fdia+3
;          ORH      fdia+6
;          JR       H -2
;          STXD     portad290      ;Download icon command 017H
;          DnldIco
;          STH      fdia+3
;          JR       H -1
;          STXD     portad290      ;Icon No
;          DnIcoNo
;          STH      fdia+3
;          JR       H -1
;          STXD     portad290      ;Icon line
;          DnIcoLn
loop6a:   NOP
;          STH      fdia+3
;          JR       H -1
;          STXD     portad290      ;Icon characters
;          R 200
;          INI      K 17
;          JR       H loop6a
;
;          ACC      H
;          LDL      tim0
;          50

```

## TR 3

```

;attesa
;          STL      tim0

```

## ST 4

```

;Selezione terminale attivo
;L'indirizzo è contenuto nel registro Pointer
;
;          STXT     portad290
;          select
;Il testo è definito nel symbol editor
;          LDL      tim0
;          0

```

## TR 4

```

;Attesa busy
;          STL      fdia+6      ;Cross busy
;          ANL      fdia+3      ;TBSY
;          ANL      tim0

```



## ST 5

```

;Selezione Broadcast più clear screen
      STH   cls
      RES   cls
      JR    L fine
      LDL   car0
           12
      STXD  portad290
           car0
fine:   NOP

```

6

## TR 5

```

;Attesa busy
      STL   fdia+6           ;Cross busy
      ANL   fdia+3           ;TBSY

```

## ST 6

```

;
      LD    car0
           0
      STXT  portad290
           EnqTRH
TEXT EnqTRH "<07>$A",car0.04,""
loop:   SEI    K 0
          LDLX   car0
           0
          INI    K 11
          JR     H loop
          ACC    H
          LDL    tim0           ;timeout lettura T, RH
           10                 ;1 secondo
          RSI    pointer
          DEI    K 0
          RESX   erroreTRH1
          RESX   erroreTRHtout1
          LDL    ricar           ;preparo indice per lettura
           0

```

## TR 6

```

;lettura risposta: 12 caratteri
      RSI    ricar
      STH    fdia           ;carattere ricevuto ?
      JR     L ava0         ;se no resta in attesa sulla transizione
      SRXDX  portad290     ;leggi carattere
           car0
      INI    K 11
      STI    ricar
      JR     H ava01       ;leggo tutti i caratteri
      RSI    pointer       ;preparo eventuale segnalazione di errore
      DEI    K 0
      STL    fdia           ;se non ho più caratteri nel buffer
      JR     H ava0         ;ho finito ed esco con ACCU = H
      ACC    H             ;altrimenti ho un errore
loop1:  SETX   erroreTRH1  ;e lo segnalo
          STH    fdia       ;controllo presenza caratteri per svuotare buffer
          JR     L ava0     ;se sono finiti aspetto timeout
          SRXD   portad290  ;svuoto buffer
           car0
          JR     loop1
;-----
ava01:  ACC    L           ;non ho ancora finito di leggere 12 caratteri, aspetto
ava0:   NOP

```

## TR 7

```

;timeout trascorso
      STL    tim0

```

## ST 7

```

;segnalazione errore lettura
      RSI    pointer
      DEI    K 0
      SETX   erroreTRHtout1      ;segnalazione timeout
      STHX   erroreTRH1          ;se ho ricevuto troppi caratteri
      OUT    toomany              ;lo indico nel display
      STXT   portad290
      Dsperrore
      ACC    H
      SET    cls
      LDL    tim0                 ;tempo permanenza messaggio
      10                          ;1 secondo

```

## ST 20

```

;Selezione Broadcast più clear screen
      STXT   portad290
      initscreen
      TEXT   initscreen          "<ESC>I00<E0T><12>"
      LDL    tim0                 ;breve attesa
      2

```

## TR 25

```

;wait
      STL    tim0

```

## TR 8

```

;tempo permanenza messaggio errore
loop:   STH    fdia
        JR     L ava00
        SRXD   portad290
        car0
        JR     loop
ava00:  NOP
        STL    tim0

```

## ST 8

```

LDL    Rserv
      0
MOV    car0+4
      B 0
      Rserv
      B 3
MOV    car0+5
      B 0
      Rserv
      B 2
MOV    car0+6
      B 0
      Rserv
      B 1
MOV    car0+7
      B 0
      Rserv
      B 0
PUTX   Rserv           ;copia temperatura
      T1
;Umidità
LDL    Rserv
      0
MOV    car0+8
      B 0
      Rserv
      B 3
MOV    car0+9
      B 0
      Rserv
      B 2
MOV    car0+10
      B 0
      Rserv
      B 1
MOV    car0+11
      B 0
      Rserv
      B 0
PUTX   Rserv           ;copia umidità
      RH1
fine:  NOP

```

6

## TR 9 empty

## ST 9

```

;display messaggio principale
COPY   ccicli
      rcicli
DIU    rcicli
      K 6
      rcicli
      rcicli1
STXT   portad290
      display

$SKIP
TEXT display ""$%00d<16><32><32>$d $H<13>"
      "Sono il terminale $",pointer.04T,"<13><10>"
      "$%04.1dTemperatura @",pointerT.04T,"<167><C<13><10>"
      "RH @",pointerRH.04T," %<13><10>"
      "$%00d$",ccicli.04T," cicli / minuto<13><10>"
      "$%03.1d$",rcicli.04T," cicli / secondo$%00d<13><10>"
;
$ENDSKIP
;
TEXT display ""$%00d $d $H <27>L"
      " Terminal D290 N. $%01d$",pointer.04T," "
      "$%04.1dTemperature @",pointerT.04T,"<167><C "
      "RHHumidity @",pointerRH.04T," % "
      "$%03d$",ccicli.04T," c/min - $%03.1d$",rcicli.04T," c/s "
      "$%04dValore attuale $",Ualore.04T," $%00d"
      "<24>$F0100<01><02><01><24>$F0101<02><03><01>"
      "<24>$F0102<03><04><01><24>$F0103<04><05><01>"
      "<24>$F0104<05><06><01><24>$F0105<06><01><01>"
      "<24>$F0100<01><02><02><24>$F0101<02><03><02>"
      "<24>$F0102<03><04><02><24>$F0103<04><05><02>"
      "<24>$F0104<05><06><02><24>$F0105<06><01><02>"
ACC    H
LDL    tim0
      0

```

## TR 10

```

;wait
      STL   fdia+6           ;esco quando il testo è stato trasmesso
      ANL   fdia+3
      ANL   tim0

```

## ST 10

```

;polling tastiera
$IF RS485
      STXT   portad290
      polltasti
TEXT polltasti "<ESC>T<EOT>"
      LDL   tim0           ;impostazione timeout
                        10   ;1 secondo
      LDL   ricar         ;preparo contatore tasti
                        0
$ENDIF

```

## TR 11

```

;lettura risposta: 4 caratteri
$IF RS485
      RSI   ricar
      STH   fdia           ;carattere ricevuto ?
      JR    L ava0        ;se no resta in attesa sulla transizione
      SRXD  portad290     ;leggi carattere
      car0
      INI   K 3
      STI   ricar
      JR    H ava01       ;leggo tutti i caratteri
      STL   fdia         ;se sono qui e non ho più caratteri nel buffer
      JR    H ava0        ;ho finito ed esco con ACCU = H
                        ;altrimenti ho un errore
loop1:  STH   fdia         ;controllo presenza caratteri per svuotare buffer
      JR    L ava0        ;se sono finiti aspetto timeout
      SRXD  portad290     ;svuoto buffer
      car0
      JR    loop1
;-----
ava01:  ACC   L           ;non ho ancora finito di leggere 12 caratteri, aspetto
ava0:   NOP
$ENDIF

```

## TR 12

```

;timeout trascorso
$IF RS485
      STL   tim0
$ELSE
      ACC   L
$ENDIF

```

## ST 11

```

;segnalazione errore lettura
RSI    pointer
DEI    K 0
SETX   errore1           ;segnalazione timeout
STXT   portad290
       Dsperrore1
ACC    H
SET    cls
LDL    tim0              ;tempo permanenza messaggio
       10                ;1 secondo

```

6

## TR 13

```

;tempo permanenza messaggio errore
loop:   STH    fdia
        JR     L ava00
        SRXD   portad290
        car0
ava00:  JR     loop
        NOP
        STL    tim0

```

## ST 21

```

;Seleziona Broadcast più clear screen
STXT   portad290
       initscreen
TEXT   initscreen    "<ESC>I00<EOT><12>"
LDL    tim0          ;breve attesa
       2

```

## TR 26

```

;wait
STL    tim0

```

6

## ST 12

```

;Calcolo numero caratteri presenti nel buffer del terminale
$IF RS485
    LDL    Buffer
           0
    SUB    car0
           K 48
           car0
    MOV    car0
           N 0
           Buffer
           N 1
    SUB    car0+1
           K 48
           car0+1
    MOV    car0+1
           N 0
           Buffer
           N 0
    CMP    Buffer
           K 0
    ACC    Z
    OUT    BufferVuoto
$ELSE
    STL    fdia
    OUT    BufferVuoto
    JR     H ava
    SRXD   portad290
           car0+3
ava:     NOP
$ENDIF

```

## TR 14

```

;Esco di qui se il buffer del D290 è vuoto
    STH    BufferVuoto

```

## TR 15

```

;Esco di qui se il buffer del D290 è carico
    STL    BufferVuoto

```

## ST 13

```
;Eco tasto ricevuto
;Preparazione valori display
$IF RS485
  DEC Buffer ;ora in Buffer ho il numero di caratteri restanti nel D290
  LD Tasto ;preparo tasto freccia sinistra
  ' SX '
  CMP car0+3 ;se ho ricevuto freccia sx
  K 56
  JR Z ava0 ;esco
;
  LD Tasto ;preparo tasto freccia destra
  ' DX '
  CMP car0+3 ;se ho ricevuto freccia dx
  K 54
  JR Z ava0 ;esco
;
  LD Tasto ;preparo tasto BELL
  'BELL'
  CMP car0+3 ;se ho ricevuto BELL
  K 49
  JR Z ava0 ;esco
;
  LD Tasto ;preparo tasto Enter
  'Conf'
  CMP car0+3 ;se ho ricevuto Enter
  K 68
  JR Z ava0 ;esco
;
  LD Tasto ;preparo tasto freccia su
  ' UP '
  CMP car0+3 ;se ho ricevuto freccia su
  K 66
  JR Z ava0 ;esco
;
  LD Tasto ;preparo tasto freccia giu
  'DOWN'
  CMP car0+3 ;se ho ricevuto freccia giu
  K 53
  JR Z ava0 ;esco
$ELSE
```

6

```

;Preparazione valori display
DEC Buffer ;ora in Buffer ho il numero di caratteri restanti nel D290
LD Tasto ;preparo tasto freccia sinistra
' SX '
CMP car0+3 ;se ho ricevuto freccia sx
K 8
JR Z ava0 ;esco
;
LD Tasto ;preparo tasto freccia destra
' DX '
CMP car0+3 ;se ho ricevuto freccia dx
K 6
JR Z ava0 ;esco
;
LD Tasto ;preparo tasto BELL
'BELL'
CMP car0+3 ;se ho ricevuto BELL
K 113
JR Z ava0 ;esco
;
LD Tasto ;preparo tasto Enter
'Conf'
CMP car0+3 ;se ho ricevuto Enter
K 13
JR Z ava0 ;esco
;
LD Tasto ;preparo tasto freccia su
' UP '
CMP car0+3 ;se ho ricevuto freccia su
K 11
JR Z ava0 ;esco
;
LD Tasto ;preparo tasto freccia giu
'DOWN'
CMP car0+3 ;se ho ricevuto freccia giu
K 5
JR Z ava0 ;esco
$ENDIF
;
;se sono qui sa Dio cosa ho ho ricevuto e lo dico apertamente
ACC H
STXT portad290
ErrKeyb
LDL tim0 ;permanenza messaggio errore sul display
50 ;5 secondi
loop: SET cls
STH fdia
JR L ava00
SRXD portad290
car0
JR loop
ava00: NOP
JR fine
;
ava0: NOP
$IF RS485
STXT portad290 ;eco tasto
KeybEco
$ELSE
STXT portad290 ;eco tasto
KeybEco1
$ENDIF
LDL tim0 ;permanenza messaggio
10 ;1 secondo
fine: NOP

```

TR 16

```

;tempo permanenza messaggio
STL tim0

```



ST 14 vuoto

TR 17

```

;Esco di qui se il buffer del D290 è vuoto
$IF RS485
    CMP    Buffer
           K 0
    ACC    Z
$ENDIF

```

6

TR 18

```

;
;se sono qui sa Dio cosa ho ho ricevuto e lo dico
    ACC    H
    STXT   portad290
           ErrKeyb
    LDL    tim0           ;permanen
           50           ;5 second
    SET    cls
loop:    STH    fdia

```

ST 15 vuoto

TR 19

```

;L'ultimo carattere ricevuto era un <CR> ?
$IF RS485
    CMP    car0+3
           K 68
    ACC    Z
$ELSE
    CMP    car0+3
           K 13
    ACC    Z
$ENDIF

```

TR 20

```

;L'ultimo carattere ricevuto NON era un <CR> ?
    CMP    car0+3
           K 68
    ACC    Z
    ACC    C

```

## ST 16

```

LDL Rtimeout      ;tempo massimo di attesa routine
    150           ;15 secondi
LDL Massimo       ;Massimo valore consentito
    999
LD Minimo         ;Minimo valore consentito
    -999
STXT portad290
    display

```

## TR 21

```

;wait
STL Fdia+6        ;esco quando il testo è stato trasmesso
ANL Fdia+3
ANL tim0

```

## ST 17 vuoto

## TR 22

```

;Memorizzazione dati
$IF RS485
CFB serinoutRs485
  Valore           ;Registro destinazione
  Rtimeout        ;Valore iniziale timeout
  Second          ;Fine procedura
  Massimo         ;Valore Massimo
  Minimo          ;Valore minimo
  Rserv           ;Servizio per display
  car0            ;Carattere ricevuto
  portad290       ;Interfaccia seriale
  K 68            ;Enter ("D")
  K 56            ;Escape ("8")
  K 66            ;Aumenta ("B" = Freccia Su)
  K 53            ;Diminuisce ("5" = Freccia Giu)
  EcoIntro        ;Eco modifica valore
  fdia            ;Diagnostica
  tim0            ;Timer attesa
  STL Fdia+6      ;esco quando il testo è stato trasmesso
  ANL Fdia+3
  JR L -2
;
TEXT EcoIntro "<16><32><38>"
              "$%04dNuovo Valore $",Rserv.04T," <ESC>T<E0T>"
$ELSE
CFB serinout
  Valore           ;Registro destinazione
  Rtimeout        ;Valore iniziale timeout
  Second          ;Fine procedura
  Massimo         ;Valore Massimo
  Minimo          ;Valore minimo
  Rserv           ;Servizio per display
  car0            ;Carattere ricevuto
  portad290       ;Interfaccia seriale
  K 13            ;Enter ("D")
  K 8             ;Escape ("8")
  K 11            ;Aumenta ("B" = Freccia Su)
  K 5             ;Diminuisce ("5" = Freccia Giu)
  EcoIntro        ;Eco modifica valore
  fdia            ;Diagnostica
  tim0            ;Timer attesa
TEXT EcoIntro "<16><32><38>"
              "$%04dNuovo Valore $",Rserv.04T," "
$ENDIF
STL Second       ;Attesa fine procedura

```

## ST 19

```

;Impostazione tempo di attesa
      LDL    tim0           ;0,2 secondi
      2

```

6

## TR 24

```

;Attesa
      STL    tim0

```

## ST 18

```

;incremento puntatore
$IF RS485 & Multipoint
      INC    pointer
      CMP    ND290         ;verifica se ho già lavorato sull'ultimo terminale
      pointer
      JR     P avanti      ;se non avevo lavorato sul questo terminale OK
      LDL    pointer       ;altrimenti riparto da 1
avanti:  NOP
      ADD    pointer
      K 9
      pointerT
      ADD    pointer
      K 19
      pointerRH
      ACC    H
$ENDIF
      INC    cicli
      STL    unminuto
      JR     L fine
      ACC    H
      COPY   cicli
      ccicli
      LDL    unminuto
      600
      LDL    cicli
      0
fine:    NOP

```

## TR 23

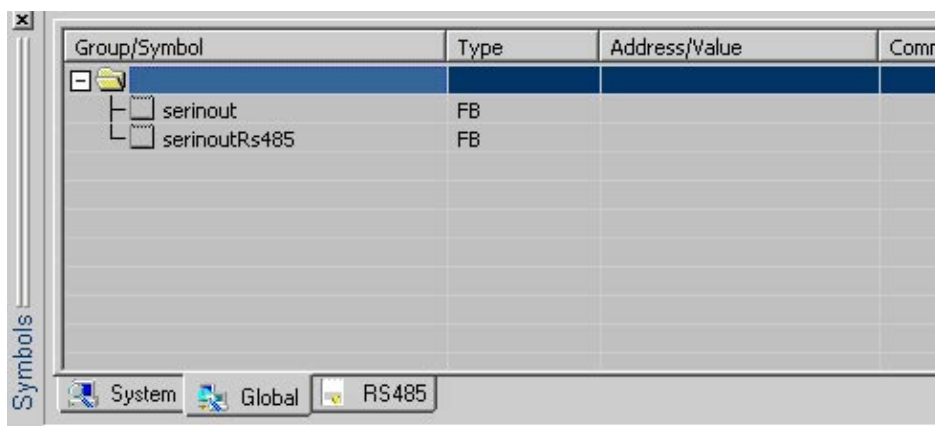
```

;emptying buffer
loop:   STH    fdia
      JR     L ava00
      SRXD   portad290
      car0
      JR     loop
ava00:  ACC    H

```

### 6.1.6 Resources

- Global symbols:

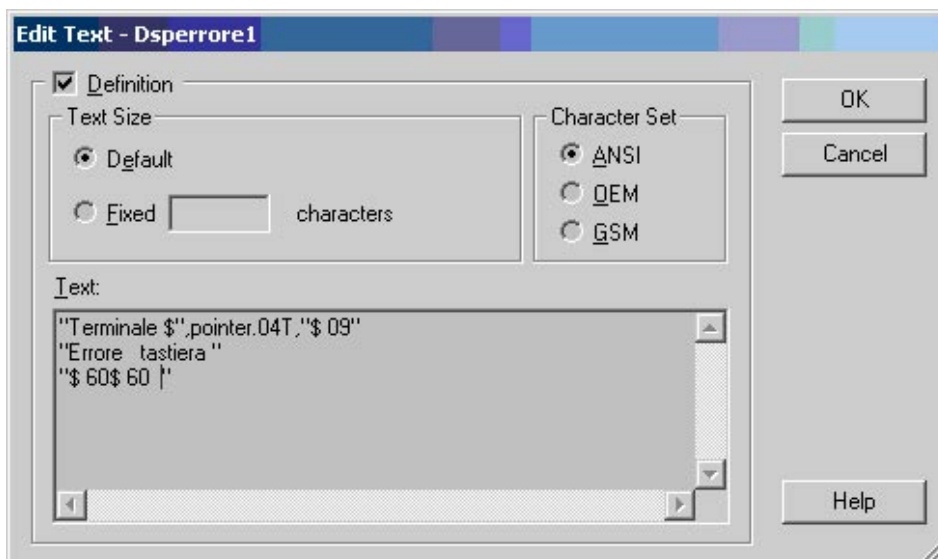
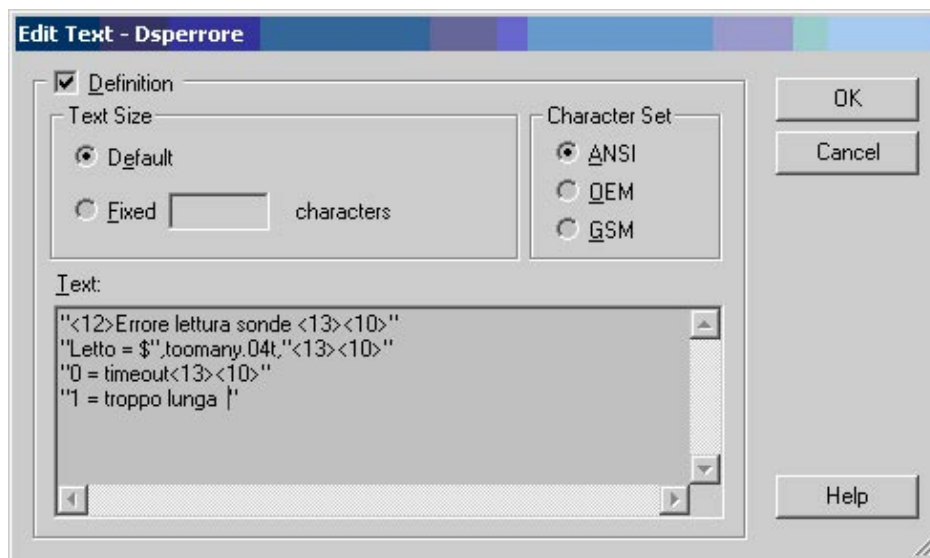


- Local symbols:

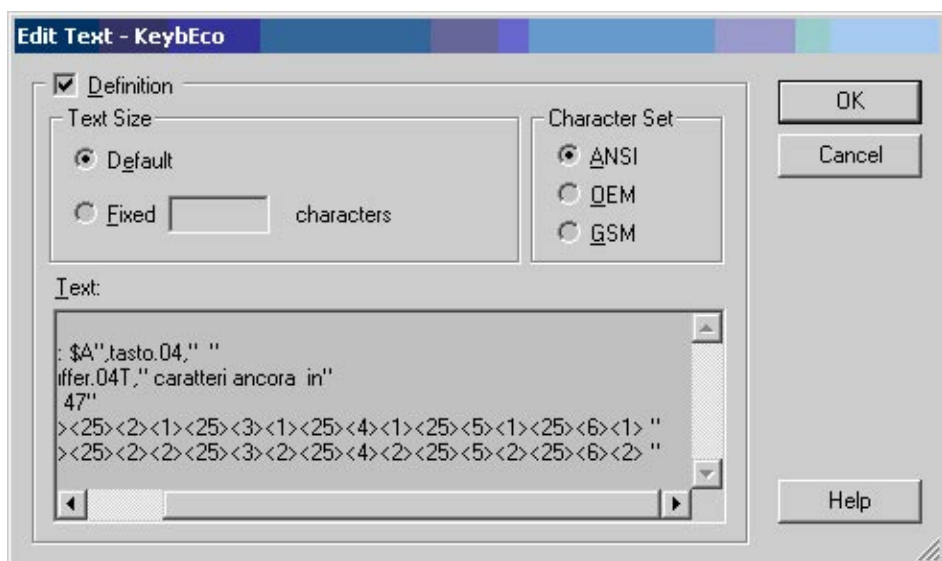
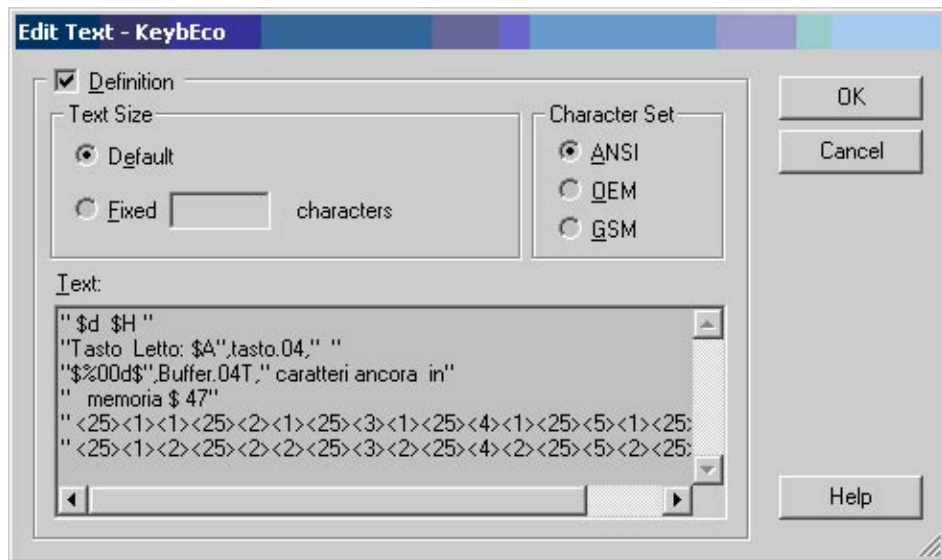
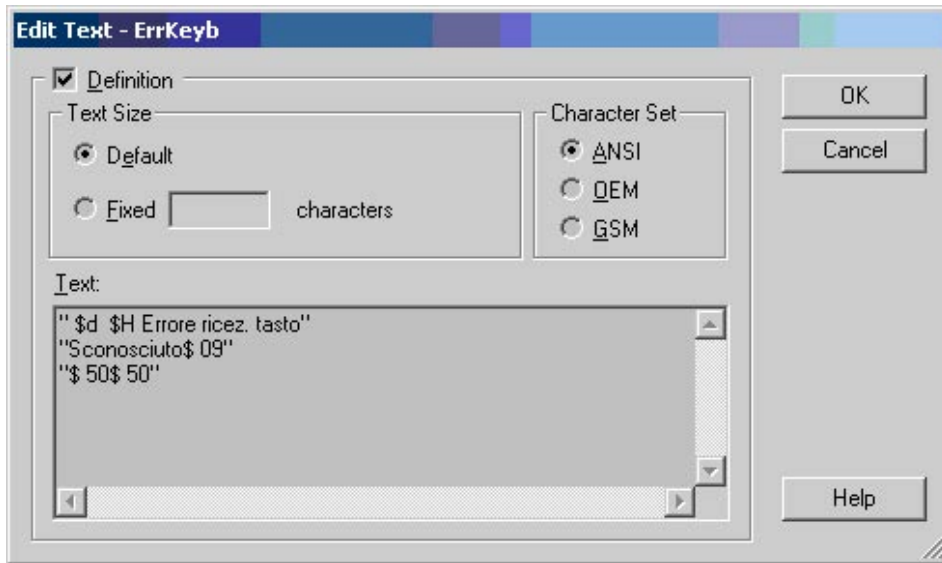
Group/Symbol	Type	Address/Value	Comment
Multipoint		1	Switch per gestione R5485 multipoint (1) o point to point (0)
R5485		1	Switch per gestione R5485 (1) oppure RS232 (0)
portad290		2	
ccicli	Counter		contatore cicli programma al minuto
cicli	Counter		contatore cicli di programma
BufferVuoto	F		flag segnalazione buffer D290 vuoto
cls	F		
incar	F		
toomany	F		
Second	F	10	Evito reinizializzazione in inserimento dati
errore1	F	11	Errore terminale 1 (primo di tre Flag indicizzati)
erroreTRH1	F	20	errore sonda terminale 1
erroreTRH2	F	21	errore sonda terminale 2
erroreTRH3	F	22	errore sonda terminale 3
erroreTRHtout1	F	30	timeout lettura sonda terminale 1
erroreTRHtout2	F	31	timeout lettura sonda terminale 2
erroreTRHtout3	F	32	timeout lettura sonda terminale 3
fdia	F	1000	Diagnostica seriale
ND290	K Constant	4	Numero terminali
broadcast	R		Registro per broadcast
DnIcoLn	R		
DnIcoNo	R		
DnIdIco	R		
eco	R		
Massimo	R		
Minimo	R		
pointer	R		Puntatore al terminale
pointerRH	R		Puntatore alle umidità
pointerT	R		Puntatore alle temperature
rcicli	R		display cicli al secondo
rcicli1	R		
ricar	R		contatore caratteri
Rserv	R		
Rtimeout	R		
T1	R	10	Temperatura terminale 1
T2	R	11	Temperatura terminale 2
T3	R	12	Temperatura terminale 3
RH1	R	20	Umidità terminale 1
RH2	R	21	Umidità terminale 2
RH3	R	22	Umidità terminale 3
car0	R	40	Carattere ricevuto / trasmesso (primo di max 12)
Buffer	R	60	Numero caratteri nel buffer del D290
Tasto	R	61	Servizio per codice tasto
Valore	R	100	Valore impostato da terminale
rdia	R	1000	Diagnostica seriale

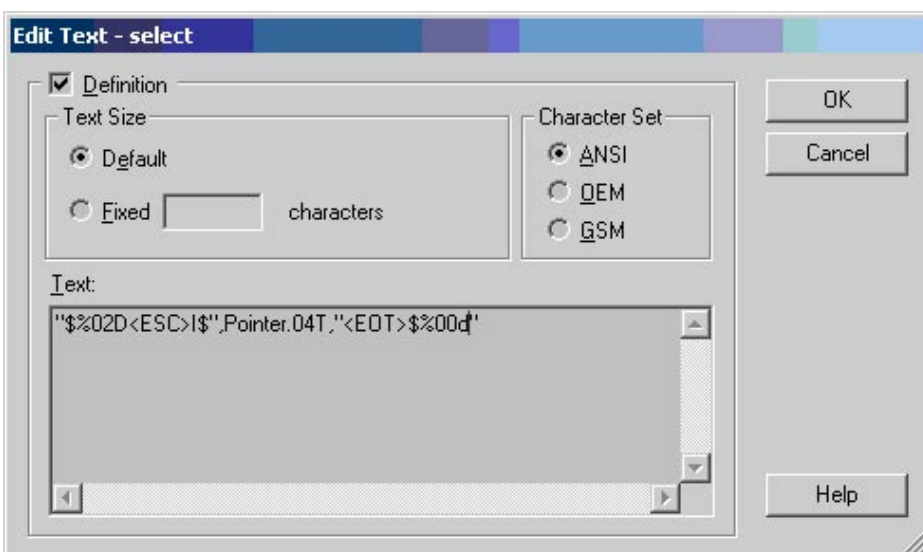
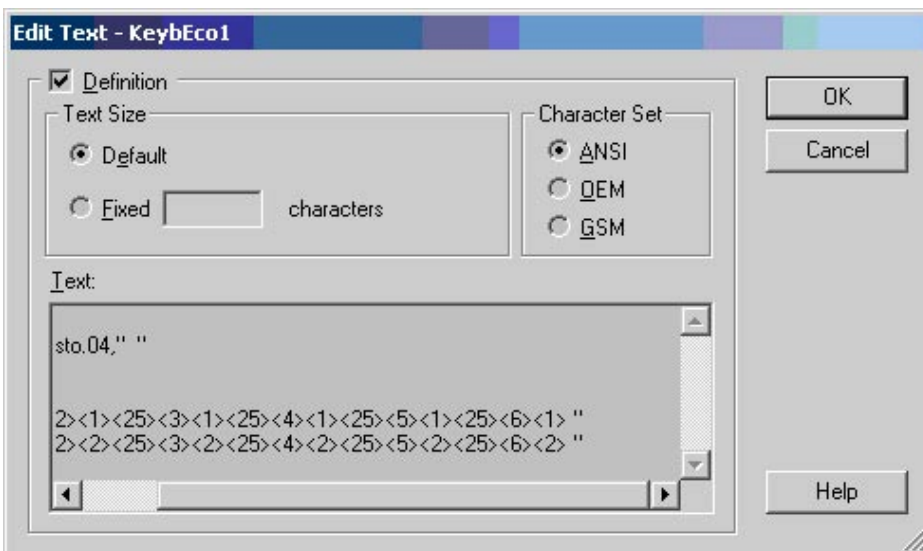
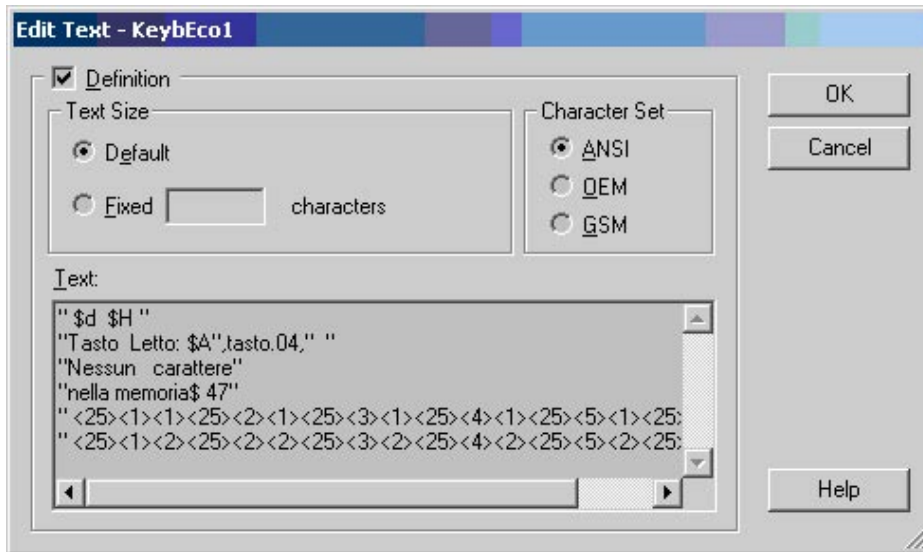
display	Text		
Dsperrorre	Text		
Dsperrorre1	Text		
EcoIntro	Text		
EnqTRH	Text		
ErrKeyb	Text		Segnalazione errore ricezione tasto
initscreen	Text		Inizializzazione di tutti i terminali
KeybEco	Text		eco tasto
KeybEco1	Text		
polling	Text		
select	Text		Selezione terminale attivo
txteco	Text		
txtd290_buf12	Text	2	definizione seriale
txtd290_buf4	Text	3	definizione seriale buffer 4 caratteri
modeoff	Text	4	Disattivazione seriale
polltasti	Text	5	Richiesta tasti
txtd290	Text	6	Definizione seriale senza buffer
unminuto	Timer		timer per contatore cicli di programma
tim0	Timer	0	Timer generico
	TR	0	wait

The above enclosed resource list doesn't include the Graftec structure related symbols. Some texts are defined within the source code, and they can be found there; other texts are defined in the Symbol editor. These texts are listed here below



6





## 6.2 HMI and Fupla programming

In the project two files are present:

- **Display.hmi** that controls the terminal handling with a RS 232 connection without handshake.
- **Fupla.fup** that controls:
  - The copy of the variables read from D290 (temperature and humidity) to PCD registers
  - Copy to flag of 7 digital inputs to handle
    - Key LEDs
    - Buzzer
  - Blinker started or stopped by the D290

### 6.2.1 Resources

The only local resources used are the digital inputs above mentioned.

Here below are listed the global resources:

The screenshot shows the Saia Project Manager interface for a project named 'TestD290 [HMI\_RS232]'. The left pane displays a project tree with the following structure:

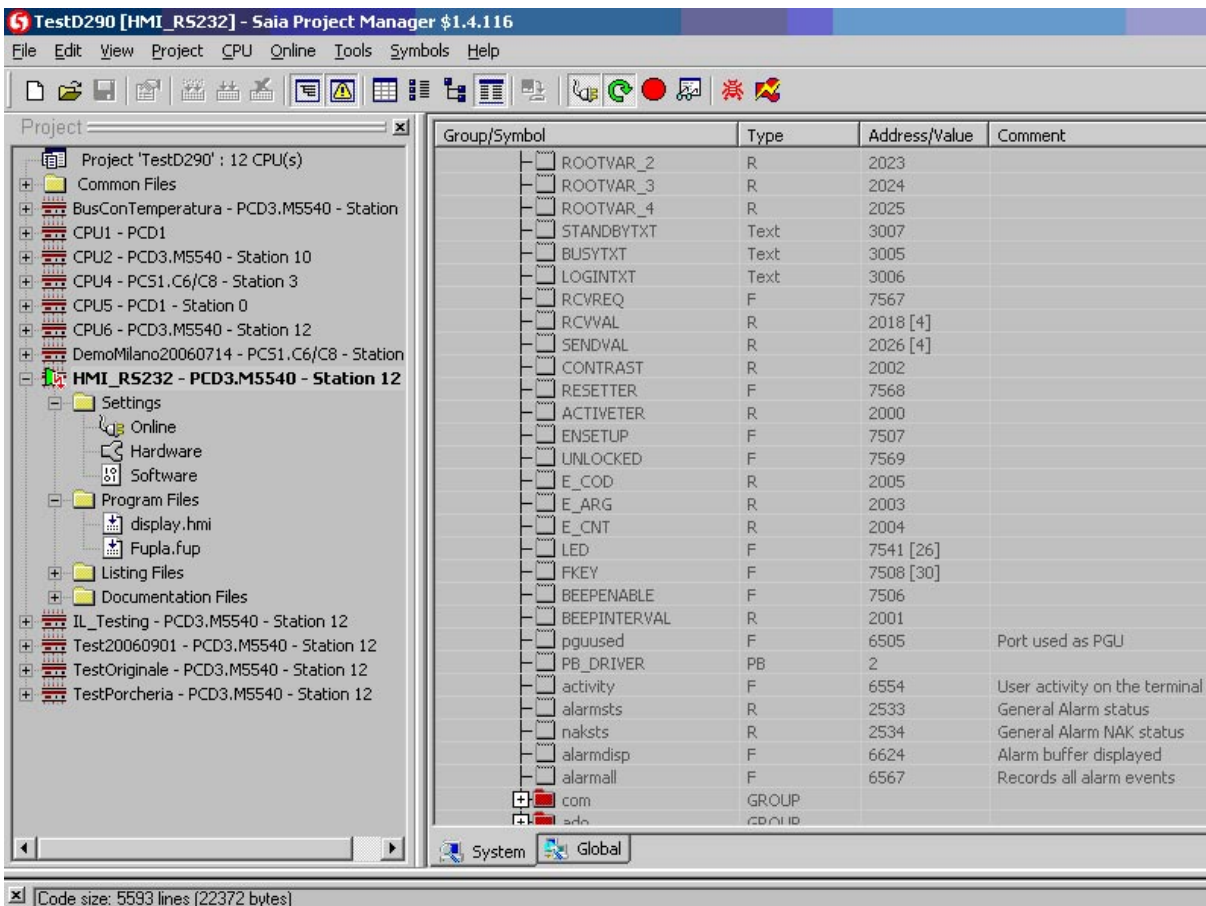
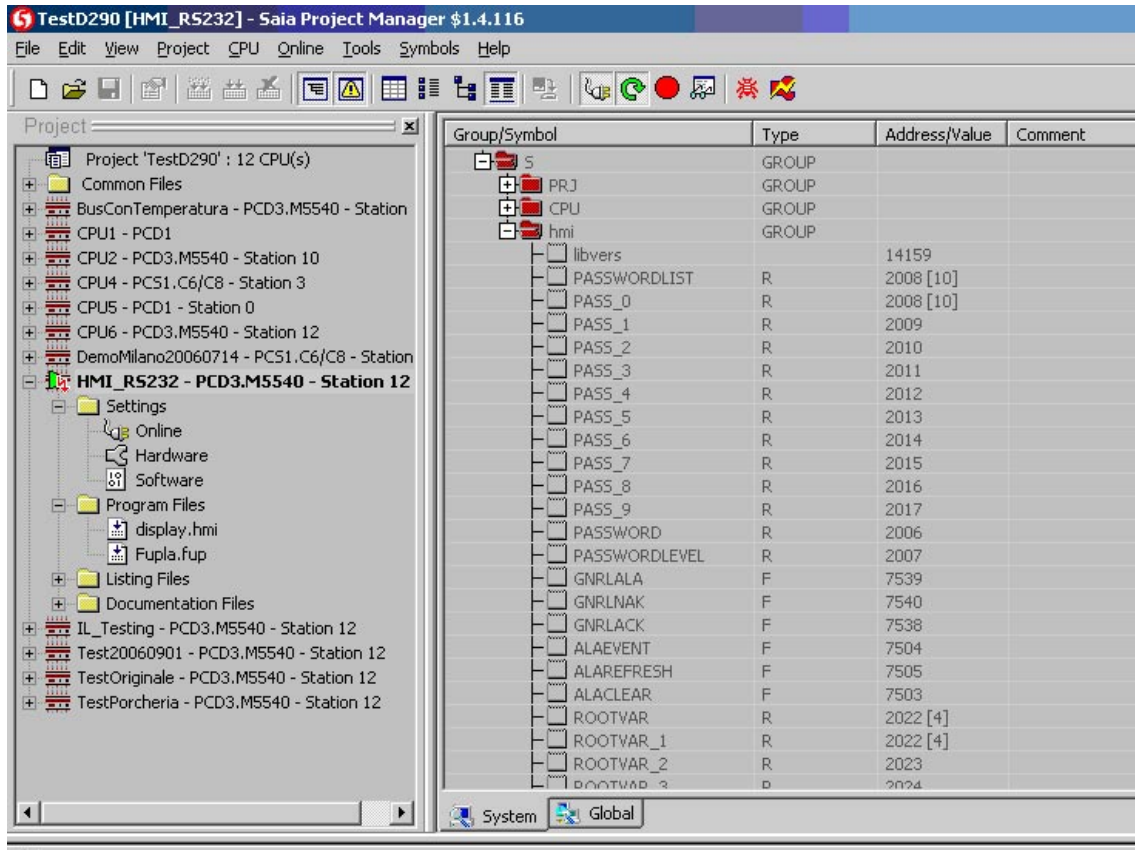
- Project 'TestD290' : 12 CPU(s)
  - Common Files
  - BusConTemperatura - PCD3.M5540 - Station
  - CPU1 - PCD1
  - CPU2 - PCD3.M5540 - Station 10
  - CPU4 - PCS1.C6/C8 - Station 3
  - CPU5 - PCD1 - Station 0
  - CPU6 - PCD3.M5540 - Station 12
  - DemoMilano20060714 - PCS1.C6/C8 - Station
  - HMI\_RS232 - PCD3.M5540 - Station 12**
    - Settings
      - Online
      - Hardware
      - Software
    - Program Files
      - display.hmi
      - Fupla.fup
    - Listing Files
    - Documentation Files
  - IL\_Testing - PCD3.M5540 - Station 12
  - Test20060901 - PCD3.M5540 - Station 12
  - TestOriginale - PCD3.M5540 - Station 12
  - TestPorcheria - PCD3.M5540 - Station 12

The right pane shows a table of global resources:

Group/Symbol	Type	Address/Value	Comment
FlagIco0	F		Comando icone
FlagIco1	F		Comando icone
FlagIco2	F		Comando icone
FlagIco3	F		Comando icone
FlagIco4	F		Comando icone
FlagIco5	F		Comando icone
StartBlink	F		Avvio Lampeggio
LedBlink	F		Uscita Lampeggio
TempoBlink	R	:= 10	Tempo Lampeggio
T1	R		Temperatura letta
RH1	R		Umidità relativa



Fupla and HMI program also use System symbols as below listed:

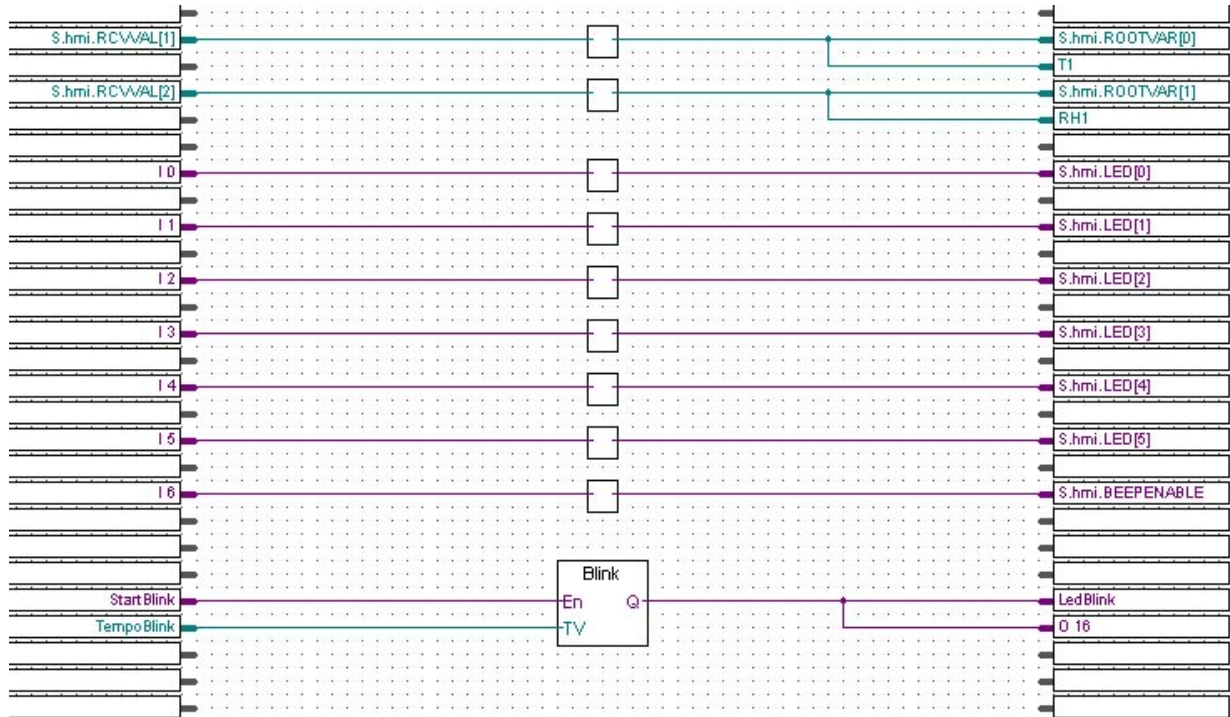


### 6.2.2 Fupla program

The local resources are formed by the inputs above indicated.

the global resources are listed on end:

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### 6.2.3 HMI program - General

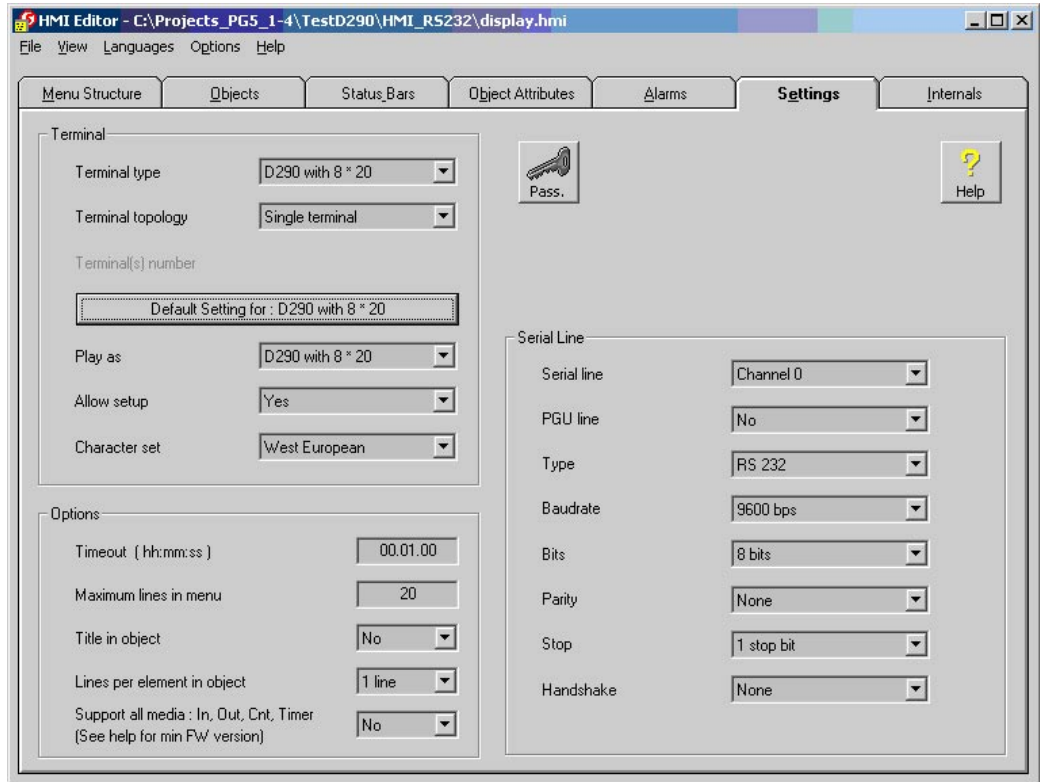
There is no alarm handling.

The following folders are not modified:

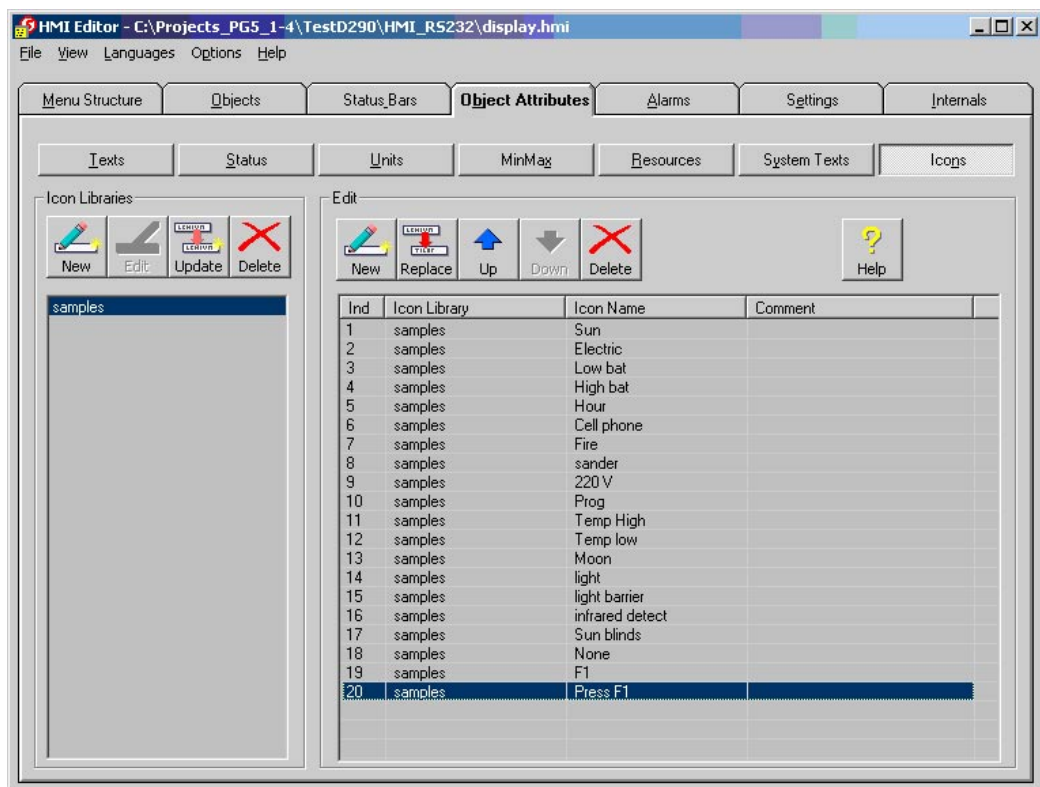
- Object attributes - Status
- Object attributes - Units
- Object attributes - MinMax
- Object attributes - System Texts
- Root Menu - Alarm
- Internals

With the associated program "Icon Editor" 20 icons are defined and included in the HMI project and loaded in the terminal memory.

### 6.2.4 HMI program - Setting



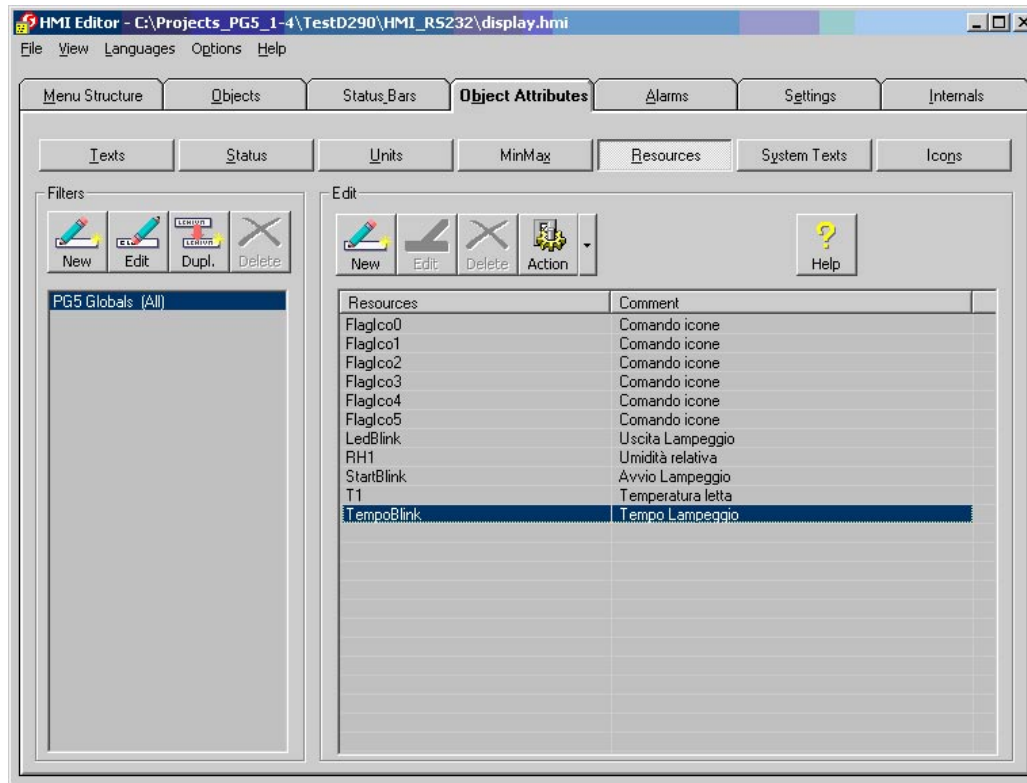
### 6.2.5 HMI program – Object attributes, Icons



### 6.2.6 HMI program – Object attributes, Resources

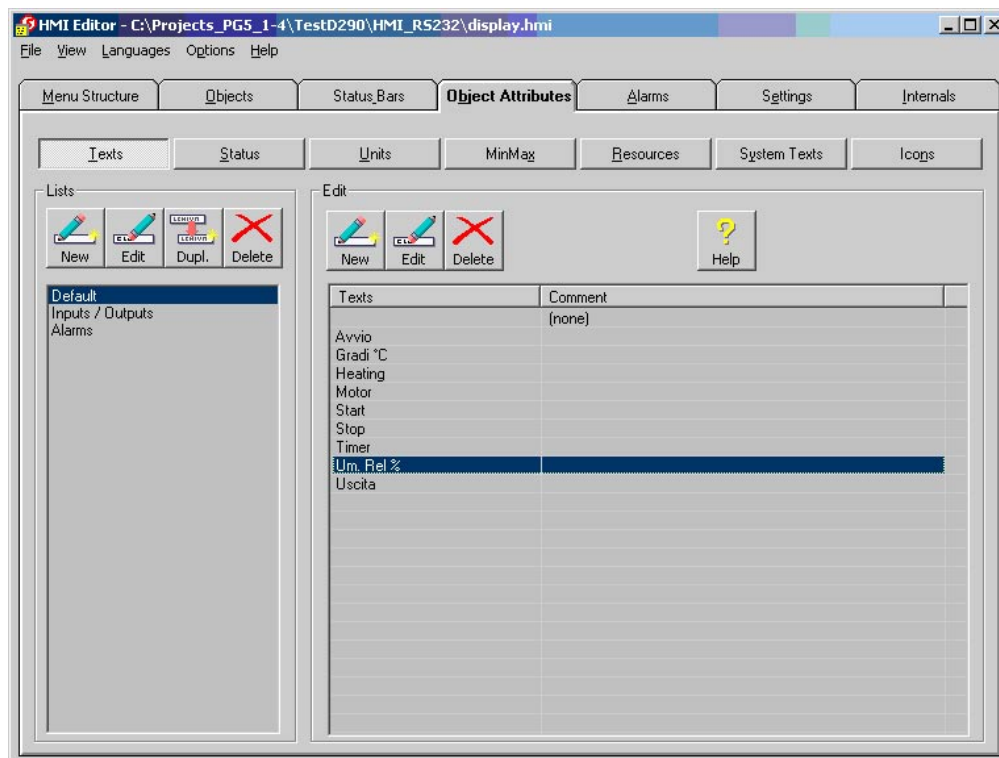
This folder allows resource import from Fupla files.

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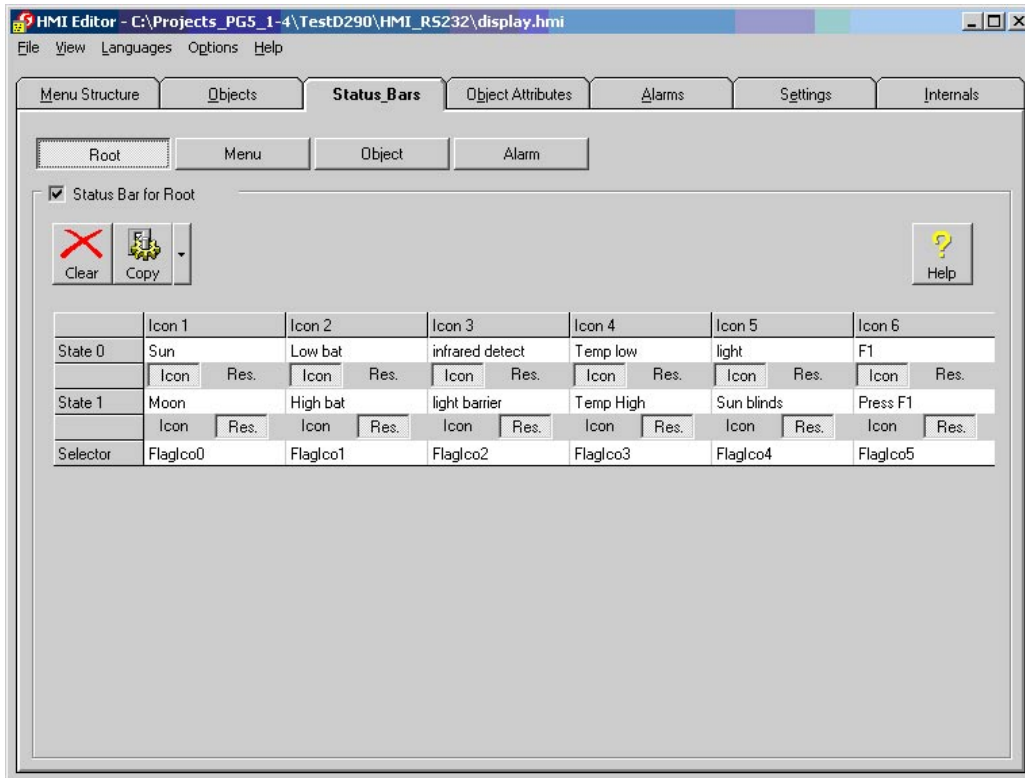
### 6.2.7 HMI programming – Object attributes, Texts

The following 5 texts are added to the default list: Celsius, OutBlink, RelHum, StartBlink, Timer



### 6.2.8 HMI program – Status\_Bars

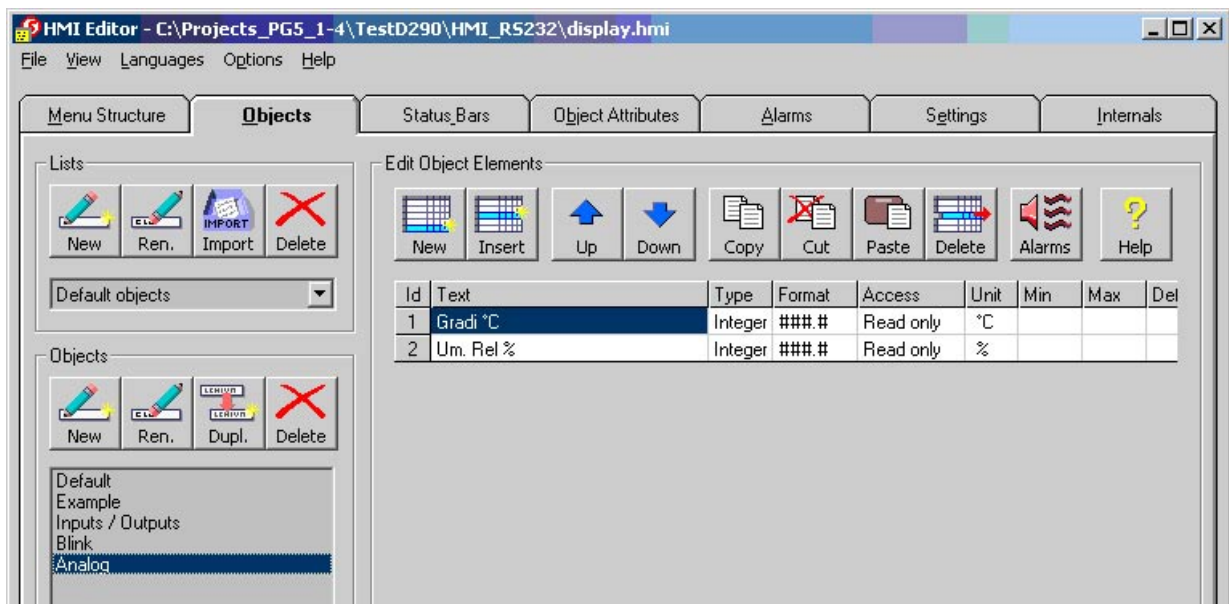
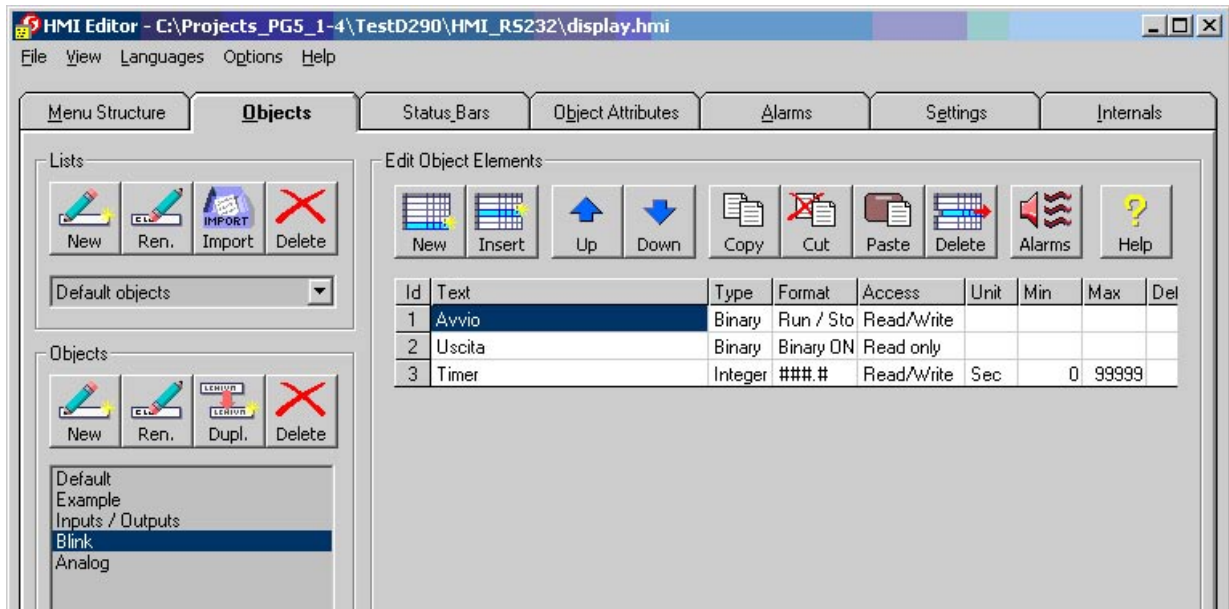
Two groups of dynamic icons are added to Root and Menu folders. These icons are controlled by the Flags: Flaglco0, Flaglco1, Flaglco2, Flaglco3, Flaglco4, and Flaglco5. These Flags can be easily accessed by the Watch Window program.



### 6.2.9 HMI program - Objects

In the family Default two objects are now defined: Blink and Analog.

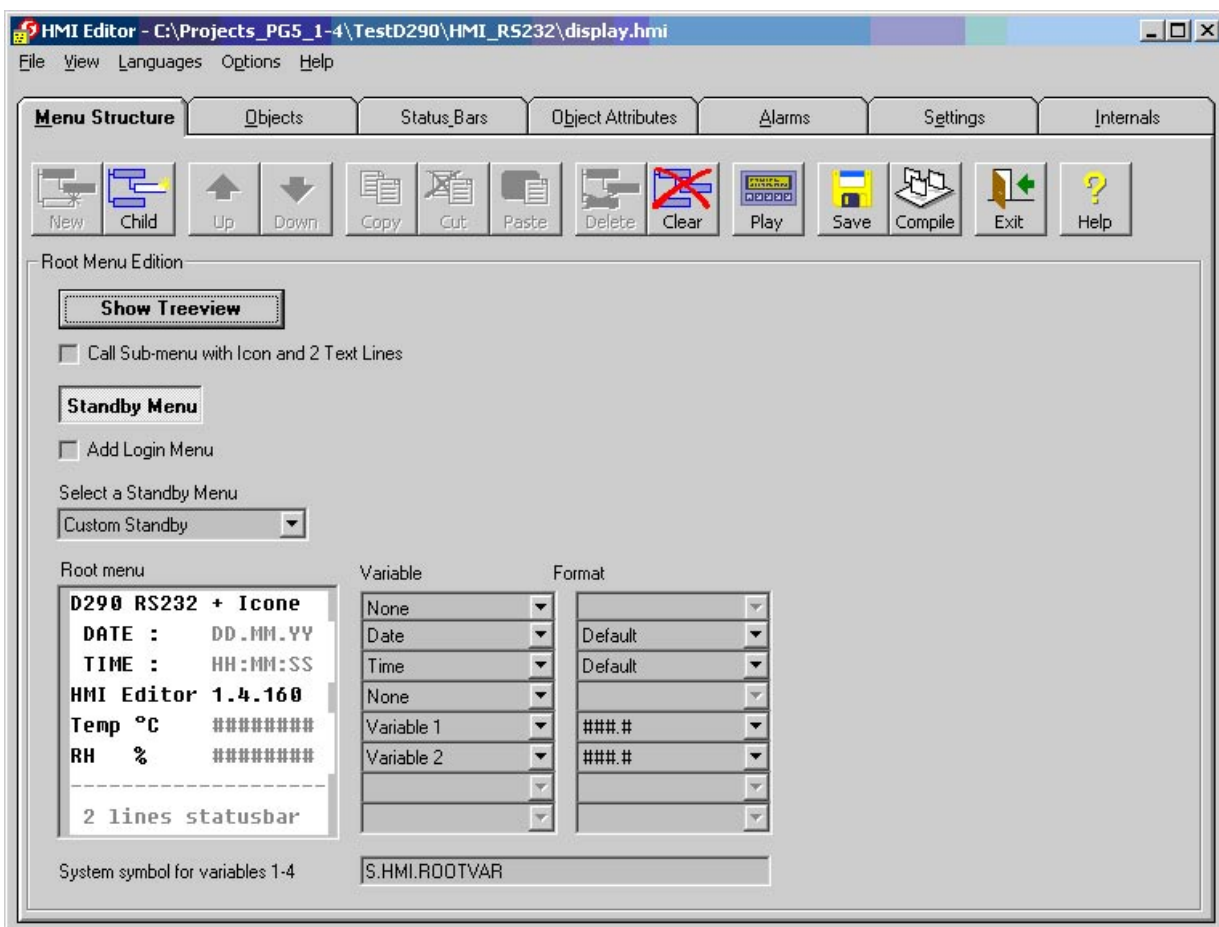
6



### 6.2.10 HMI program - Root Menu

The root menu is configured to display the following information:

- Title: D290 + Icons
- Date
- Time
- HMI Version (plain text)
- Temperature
- Relative Humidity
- 6 dynamics icons



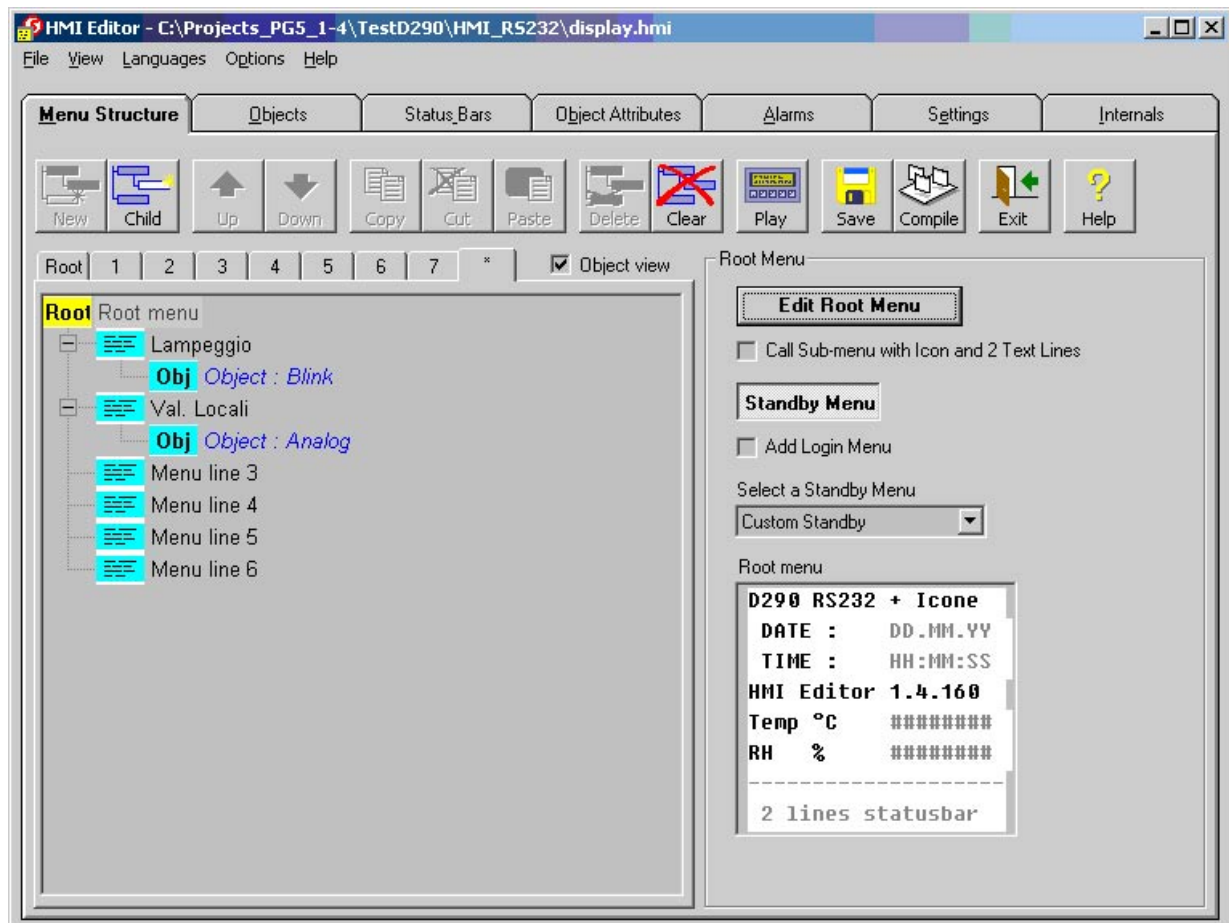
### 6.2.11 HMI program – Menu structure

The structure is made by 6 lines and 6 dynamic icons.

The first two lines allow access to the objects:

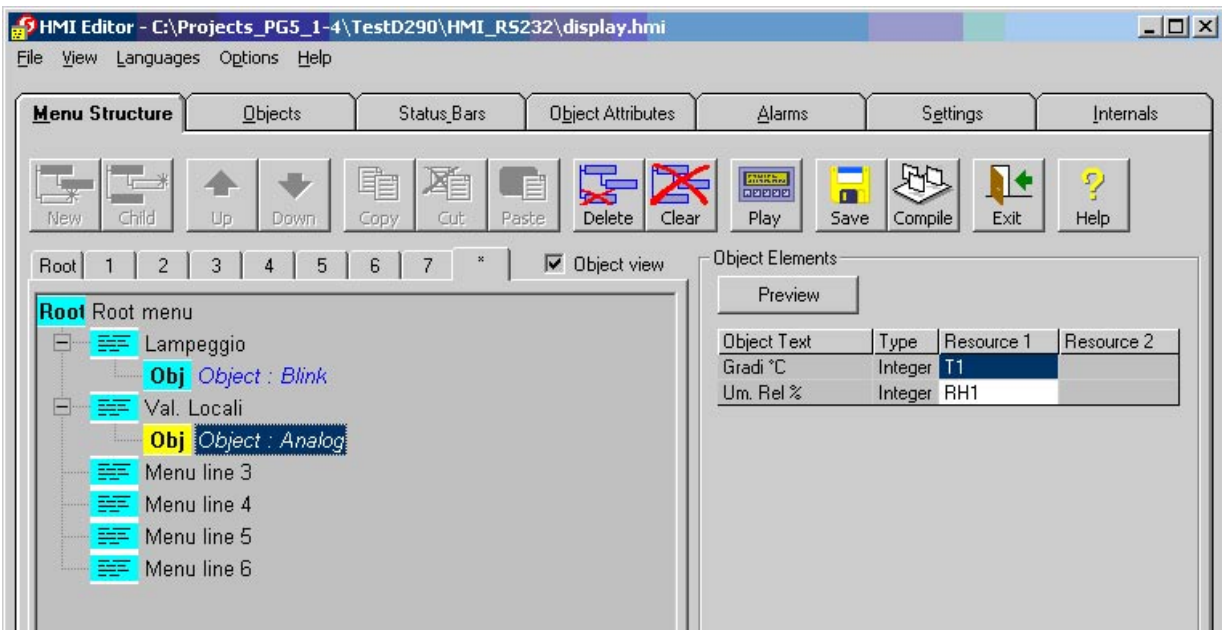
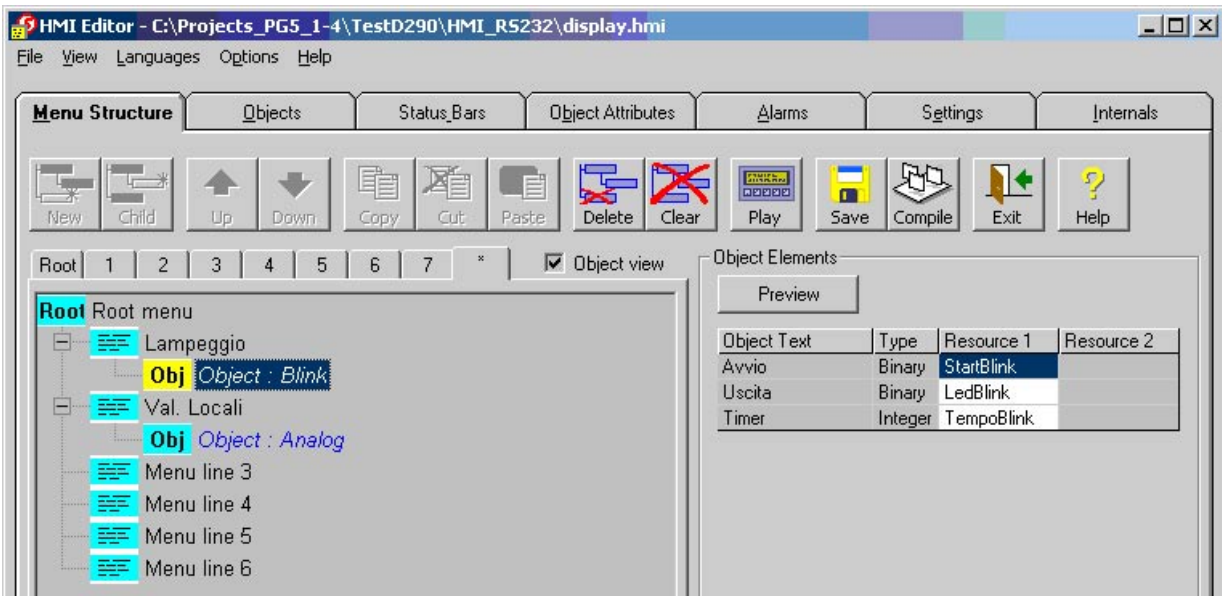
- Blink that has two variables with read/write access and one variable read only
- Analog that has two variables read only

6





### 6.2.12 HMI program – Menu structure, display objects





## **7 Maintenance**

### **7.1 Maintenance**

The PCD7.D290 has been designed for maintenance-free continuous operation.

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



# 8 Appendix

## 8.1 Code page

The code page used for the characters is shown below:

- Code table for lower page (Basic ANSI code).

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.

- Code table for upper page (Basic ANSI code).

Position (Hex)	8..	9..	A..	B..	C..	D..	E..	F..
.0	Ç	É	á	☐	Ł	⌌	α	≡
.1	Ü	æ	í	☐	⊥	⌌	β	±
.2	È	Æ	ó	☐	τ	π	Γ	≥
.3	À	ô	ú		⊥	⌌	π	≤
.4	Ä	ö	ñ	⊥	—	⌌	Σ	∫
.5	Á	ò	Ñ	⊥	⊥	⌌	σ	∫
.6	Å	û	ª	⊥	⊥	⌌	μ	÷
.7	Ç	ù	º	π	⊥	⊥	τ	≈
.8	È	ÿ	¿	⊥	⌌	⊥	Φ	°
.9	Ë	Ö	←	⊥	⌌	⊥	Θ	‘
.A	È	Ü	→	⊥	⌌	⊥	Ω	’
.B	Ï	ø	½	⊥	⌌	■	δ	√
.C	Î	£	¼	⊥	⌌	■	∞	ⁿ
.D	Ì	¥	¡	⌌	=	■	φ	²
.E	Ä	Ps	«	⊥	⌌	■	ε	▪
.F	Å	f	»	⊥	⌌	■	∩	

The graphical symbols (0xB0 to 0xDF) use the entire 6\*8 pixel map (6\*8 bits), while others characters use 5\*7 pixel matrix.

## 8.2 Mounting instructions

### 8.2.1 Installation

The installation and the connection of the terminal must be done by professionals, according to the wiring diagrams.

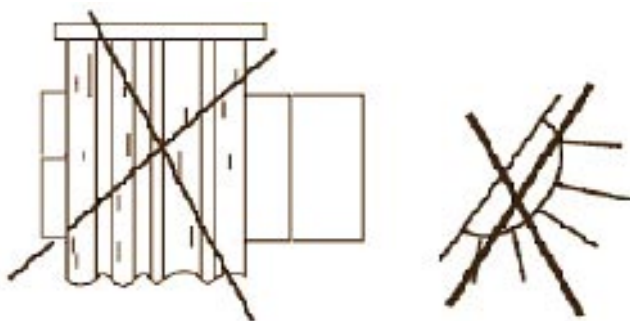
The PCD7.D290 terminal must be installed only in dry and close rooms. The maximum value allowed for the relative humidity is 95%, without condensate.

The mounting must be directly on the wall. Verify the following conditions:

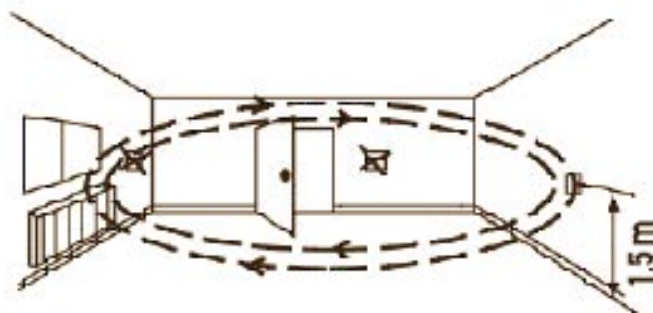
- The upper and lower fissures for the ventilation of the terminal must be free (this ensure the right measurements of the temperature and relative humidity ).
- The mounting must be vertical

Other recommendations:

- Avoid the direct exposure to the sun light



- Install away from doors and windows to avoid air streams that can false the measurements.

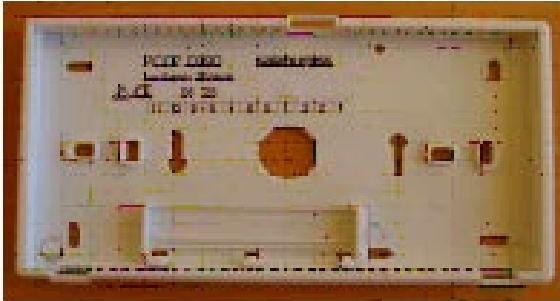


- Install away from heat sources (radiators, high intensity lamps...).



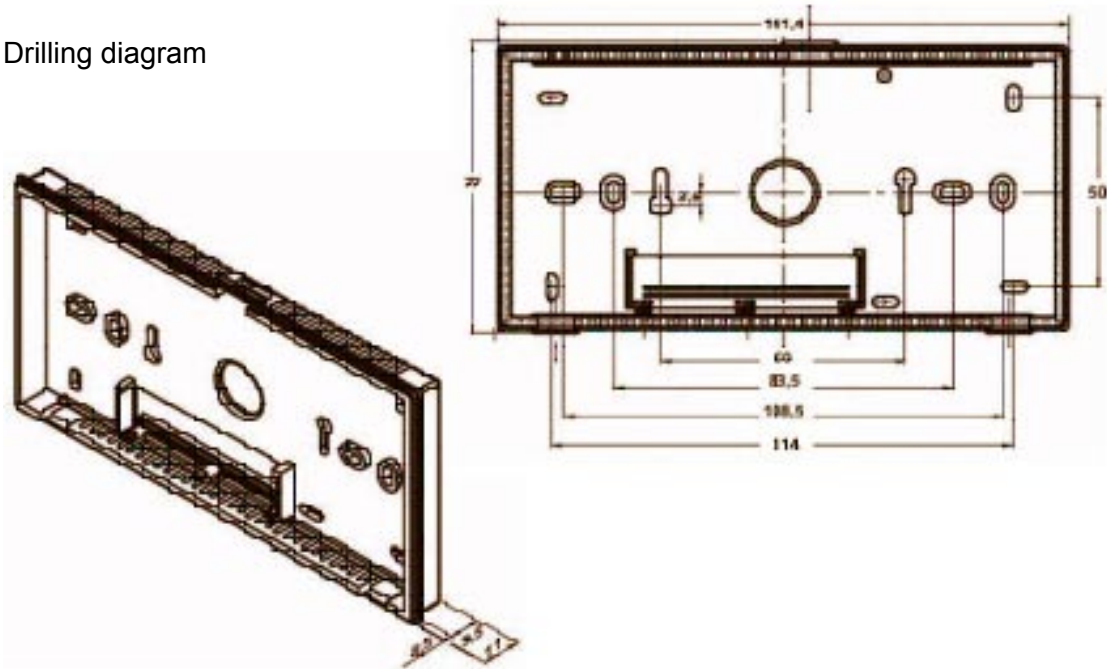
### 8.2.2 Fixing

Wall installation. Screw fixing according to the drilling diagram.



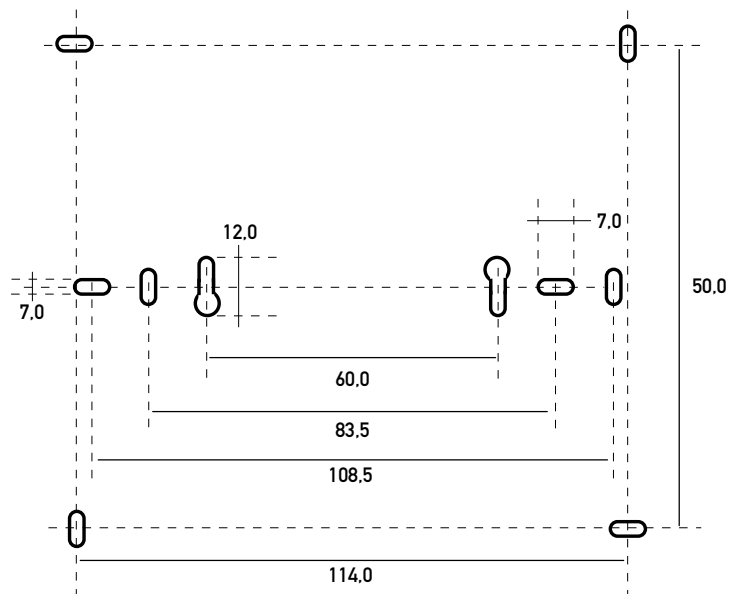
Fix the bottom to the wall

Drilling diagram



Fixing template

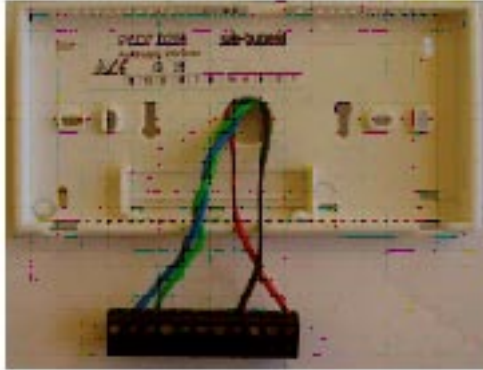
The measures are in mm



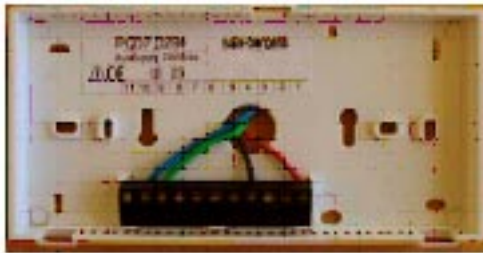
### 8.2.3 Connection

Connect the wires to the terminal block, according to the required diagram (maximum section 1,5 mm<sup>2</sup>).

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Insert the terminal block in the proper seat, pressing with the fingers.



Use the upper joint as a lever to close the frontal part.



Do not remove the frontal part when the unit is switched on !







### 8.3 Addresses

#### **Saia-Burgess** Milano Srl

Via Cadamosto, 3

I-20094 Corsico MI

T. 02 486921

F. 02 48 600 692

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#### **Saia-Burgess** Controls Ltd

Bahnhofstrasse, 18

Ch-3280 Murten CH

T. +41 26 672 72 72

F. +41 26 672 74 99

Homepage: [www.saia-burgess.com](http://www.saia-burgess.com)

Support: [www.sbc-support.ch](http://www.sbc-support.ch)

Other addresses: [www.saia-burgess.com/controls\\_it](http://www.saia-burgess.com/controls_it)

