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Display and Operating Systems

PXT 5 SER
Configuration Manual
Item No. 19 556

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This configuration manual is valid for the display system **PXT 5 SER**.

Please read through this configuration manual before installing the unit, and always ensure the safety guidelines given are observed.

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Version 1, December 1997

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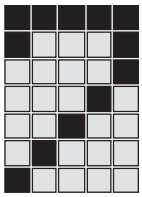
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Introduction

The PX(T) SER/PAR range comprises "Text Displays" (PX) and "Operator Terminals"(PXT).

PX(T) are display systems for application together with a PLC, using the serial drive Pilz protocol or a parallel drive I/O protocol.

This configuration manual describes the function of one of these display systems, the PXT 5 SER, and how it is programmed, plus its communication and operation in online mode. The PXT 5 SER can only use the Pilz protocol.

For hardware information such as Technical features, Interfaces and cables, Installation, Commissioning and Technical data **please refer to the "PXT 5 SER / Hardware Description"**.

This manual is intended for the person responsible for programming the display system and PLC.

Chapter 1 provides information on the contents, structure and usage of this configuration manual.

It is vital that you read **Chapter 2** as it contains information on how to apply the unit in accordance with regulations and provides important safety guidelines.

Chapter 3 describes the function of the unit in a short, simplified format.

Chapter 4 contains details of how to put the unit into commission.

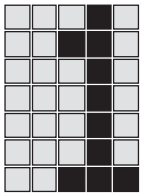
Chapter 5 describes how to configure the unit to perform to specific customer requirements (e.g. scroll mode). These settings should be made before commencing online operation.
This chapter also contains information on the editing and display of text and variables.

Chapter 6 explains the serial drive based on the Pilz protocol.

Chapter 7 is the appendix, which contains tables and overviews showing, for example, character sets, key codes and internal error messages.

For simplicity, the abbreviation "PXT" will at times be used to denote the display system, while the abbreviation "PLC" will be used for the controller.

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Application in Accordance with the Regulations and General Safety Guidelines

Application in Accordance with the Regulations

Pilz Display Systems in the PX(T) range have been specially developed for communication via the RS 232 interface of a PLC, in accordance with the Pilz protocol, or via 24 V I/O.

They can be used anywhere where quick, reliable information on machine status is required, or where current process data needs to be displayed.

Operator terminals (PXT) also enable manual control of the PLC through the operator.

All units are designed for industrial applications.

Safety Guidelines

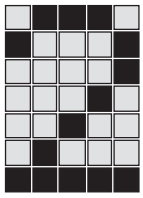
To ensure trouble-free operation, please make sure you are conversant with the safety guidelines issued in the "PXT 5 SER / Hardware Description".

Note on Operating the Unit

Important!

To ensure that key information is transmitted accurately, make sure that no more than 1 key is pressed at the same time.

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Communication Principles and General Operation

The PXT 5 SER is a text display that has been specifically developed for communication via the RS 232 interface of a PLC, using the Pilz protocol.

All data required by the display system (e.g. message numbers and variable values) are to be sent from the PLC; information, generated by the function keys or keys connected to the inputs on the rear of the unit, is sent to the PLC.

The following functions are supported by the display systems:

Function	Explanation
Display of message texts	Texts stored in the PXT memory are selected and displayed using the relevant message number.
Inserting variables (true values)	Selected by number, these variables are displayed at a specified location and are given particular attributes (e.g. right aligned). Before being displayed, the variable value sent from the PLC can be scaled, i.e. converted by multiplying it by a factor and adding an offset.
Sending key codes to the PLC	of the function keys F1 ... F5 respectively of keys connected to the Inputs E0 ... E15
Displaying information via one LED	connected to the HS-Output
Special Functions	e.g. scrolling and segment test.

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Communication Principles and General Operation

Modes of the Unit

Pilz Operator Terminals can be operated:

- in **Display Mode** or
- in **Monitor Mode**.

In **Display Mode**, texts are stored in the text memory and are selected and displayed using the relevant text number.
Texts may include variables. Variables are selected by number and are displayed with particular attributes (eg. right justification). The allocation of attributes and the positioning of variables are managed by means of control characters and flags, which are edited within the text.

In **Monitor Mode**, texts are sent from the PLC as IBM/ASCII characters (by-passing the text memory), and are displayed at the cursor position. Variables are also sent as IBM/ASCII characters, but you will need to position the cursor at the point at which the text or variable is to be displayed.

Operating Modes in Display Mode

The functions and facilities on the display system in Display Mode are called "Operating Modes".
The following table shows which Operating Modes are supported by the display system and indicates which page in the manual to refer to for details.

Operating Modes in Display Mode	see page
Text call-up	6-7
Variable call-up	6-7
Special Mode (e.g. segment test)	6-8
LED Mode	6-8
Transmit function key information	6-9

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Installation / Set-Up

IMPORTANT!
Before installing the unit, please read the safety guidelines given in the "PXT 5 SER / Hardware Description".

The PXT 5 SER must be installed in accordance with these safety guidelines.

For further details on how to install the unit, please refer to the "PXT 5 SER / Hardware Description".

Procedure after Power-Up

There is a time delay of up to several seconds between power-up and the unit being ready for operation.

The display system signals that the unit is ready for operation, either:

- By displaying the **ex-works base message**, which contains the following information:
  - Unit description
  - Version number

OR

- By displaying a **base message configured by the user** (see Chapter 5, section entitled "Unit Configuration", page 5-2).

IMPORTANT!
If you have configured your own base message, the version number can be called up using a special function (see Chapter 6, "Special Mode", page 6-8).

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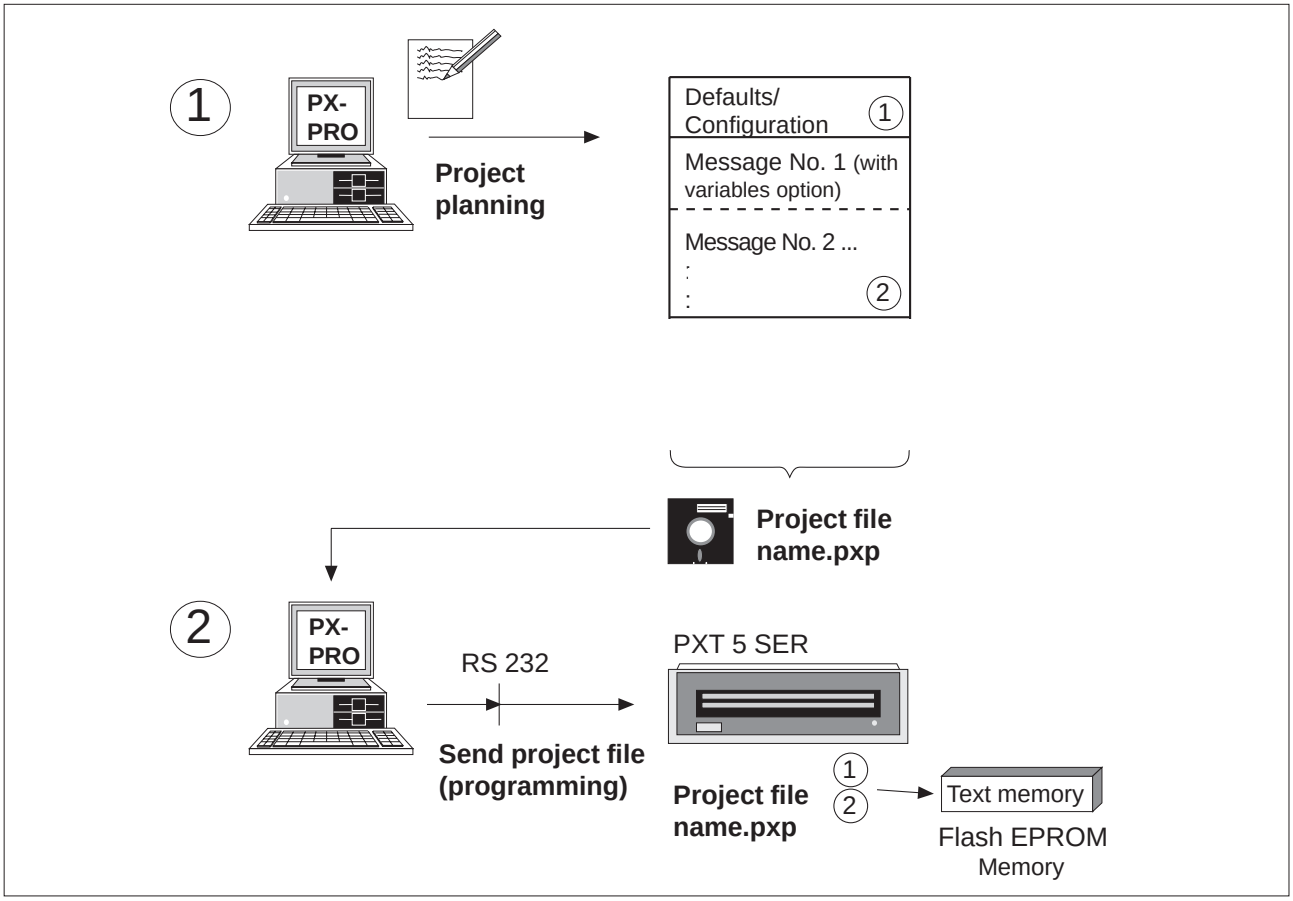
Basic Procedure

To operate a PX(T) in online mode with a PLC, a project file must first be available within the PX(T) text memory. Among other things, this file must contain the messages with the variables to be serviced, plus PX(T) configuration details.

Files are created and edited using a PC together with **PX-PRO software**, which runs under Windows®.

When a file has been edited, **PX-PRO** is also used to send the file from the PC to the PXT text memory.

Please note: PX-PRO software has been specially developed for Pilz display systems and is described in a separate manual (Item No. 19 178).



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Programming and Unit Configuration

PXT Programming Sequence

1. Set the defaults for (configure) the unit, create messages, edit variables and set parameters using PX-PRO on a PC.
   The result is project file: name.pxp
2. Establishing a connection between the RS 232 interfaces on the PC and the PXT (for the layout of the RS 232 programming cable, please refer to the "PXT 5 SER / Hardware description")
3. Switch on the PXT (connect 24 V supply)
5. Program the text memory using PX-PRO:
   Send the project file name.pxp from the PC to the PX(T): this contains the unit's configuration plus messages, including variables.
6. Switch-off the PXT.
7. Disconnect the RS 232 link between the PC and the PXT

Programming Cable (RS 232 Connection to PC)

Details of the layout of the RS 232 programming cable can be found in the "PXT 5 SER / Hardware Description".
This cable is also available as an accessory (description: AKSET, order reference: 307 426).

Unit Configuration (PX-PRO Defaults)

This section describes the settings which should be made in PX-PRO (under “Default Settings”) for PXT online mode.
These settings are made in an index card, within a dialogue box.

You will be prompted to enter the following information:

- Character set
- Base message on power-up
- Scroll mode
- Message number at which text error messages on the PXT are to start (NB. These are the messages which explain the internal error codes).
- Scroll speed for auto-scroll special function
- Loadable special character set

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The settings made in the **PX-PRO defaults** are automatically stored with the project file (name.pxp) and will be effective each time the unit is powered up.

Character set

Explanation	Index card / Setting in PX-PRO	Default setting
Select between the IBM character set or the Cyrillic character set on the display system.	"Options" → "Character set"/ (options list)	IBM character set

Base Message

Explanation	Index card/ Setting in PX-PRO	Default Setting
The ex-works base message when the PX(T) is powered up can be replaced with a text defined by the user.	“Options” : “Base Text Number”/ (Message No.)	(Base message: Unit description, version number)

Scroll Mode

Explanation	Index card/ Setting in PX-PRO	Default Setting
Various modes may be set for scrolling messages on the display: a) All lines scrolled b) 2nd line scrolled	“Settings” : “Scroll” (options list)	All lines are scrolled

The scrolling of background text is explained in detail in the section entitled “Displaying Texts”, from page 5-6 onwards.

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Error Messages

(See Appendix, under “Error Messages” on page 7-8).

Scroll Speed

The scroll speed during auto-scroll is preset to 2 seconds. However, this can be changed via the index card “Settings” : “Scroll Speed (Sec.)”. For further details on auto-scroll, please refer to page 5-5).

Loadable Special Character Set

A special character set may be loaded, either one available within the display or one created by the user. For further details please refer to the Appendix, under “Loadable Special Character Set”, from page 7-4.

Displaying Text

This section contains vital information for displaying text on a PXT. This must be taken into account when editing texts in PX-PRO.

Text Memory/Creating Messages

The PXT text memory is a Flash-EPROM-chip (for details of memory capacity, please refer to the “PXT 5 SER/Hardware Description”/Technical Details).
The address range for the text memory consists of message numbers 1 ... 9 999.
For further details on how to edit messages, please refer to the “PX-PRO” manual.

Character Sets

The following character sets are available:

- IBM character set no. 437 (see page 7-1)
- Cyrillic character set (see page 7-3).

The desired character set is selected when making the presettings in PX-PRO (see under "Character set" on page 5-3).

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Representable Characters	Characters from 20 to FE_H (32 to 254_D) **Exception:** 23_H (35_D); this character ("#") is used as a variable marker and is not displayed. It is only visible in the PX-PRO Editor.
Control Characters	Some of the characters which cannot be represented (< 20_H/32_D) are used as text and variable-related control characters in the PX(T). In the PX-PRO Editor, these control characters are automatically entered in the message text.

Control Characters

The following control characters are supported by the PXT 5 SER:

Relates to	Control chars.	Explanation
Text	Clear Display	Displayed text is cleared. Attributes attached to the message (e.g. variables) are also lost.
	Auto-Scroll	The displayed message is scrolled automatically at a rate of every 2 seconds. You can determine which lines scroll and which lines remain static when setting the defaults in PX-PRO (see page 5-3).
	Flash ON	From this point on, text will flash.
	Flash OFF	From this point on, text will no longer flash.
Variable	Variable No. 0 to Variable No. 7	
	Right Justification [1)]	See under "displaying variables" on page 5-11
	Left Justification	
	Show leading zeros	See under "displaying variables" on page 5-11
	Suppress leading zeros [1)]	

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[1] Default setting: This function has priority. Even if the relevant control character is not present, this function will remain in effect until the opposite function is set.

Displaying Texts

When a text is called up, control characters contained in the text are evaluated and then converted into the corresponding text and variable layout (see page 5-5 for details of characters which cannot be represented).

Clear Display

If a text contains the control character “Clear Display”, the previous text and all the corresponding variable positions will be cleared when a new text is displayed.

If the “Clear Display” control character has been deleted in a text in the PX-PRO Editor, this text can be “stored” in a type of “background file”, on top of the previously displayed text:

- All the characters edited in the “new” text **(including spaces)** will overwrite the characters they replace in the “old” text.
- All “.”-characters in the “new” text which are passed over using the arrow keys, will be retained from the “old” text.
- Variable positions are retained and may also be addressed.
- If the “old” text was scrolled, the “new” text (also scrolled) will be placed on top.

Scroll Background Text

It is possible to display messages containing more lines than those visible on the display unit.
A message may contain a maximum of 320 characters (without control characters).
On display systems with 20 characters per line, 16 lines of text are possible per message. On displays with 40 characters per line, 8 lines of text are possible per message.

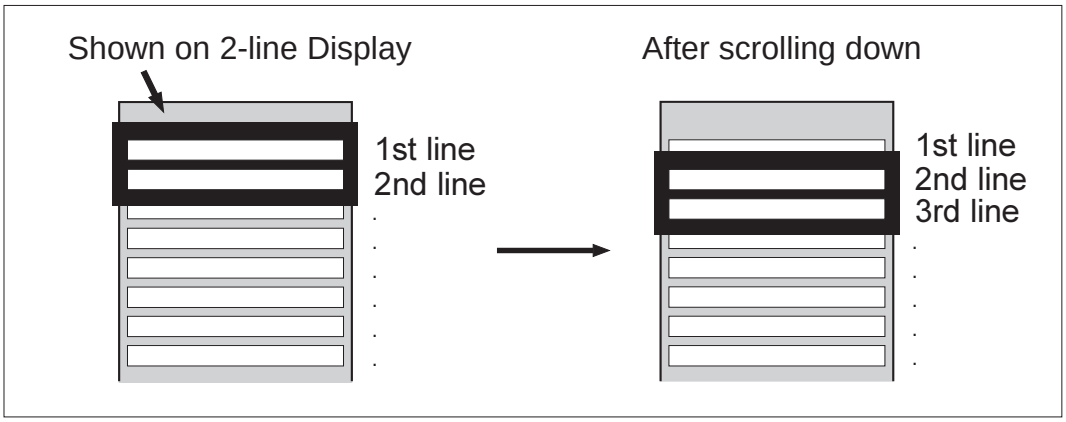
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When a message is displayed, the first two lines of the text are shown.

Messages can be scrolled in the following ways:

- Via special function codes in special utilities:
  - 08_H (scroll down)
  - 09_H (scroll up)
  - $0A_H$ (scroll to start of text)
- Automatically, by entering the control character for auto-scroll in the message text (when editing in PX-PRO).

Additional lines (background text) can be displayed, for example, by sending special function codes. Each time a special function code is sent, the text is scrolled on one line (i.e. when scrolling downwards on a 2-line display, for example, the 2nd line will become the 1st line on the display and the 3rd line will become the second).

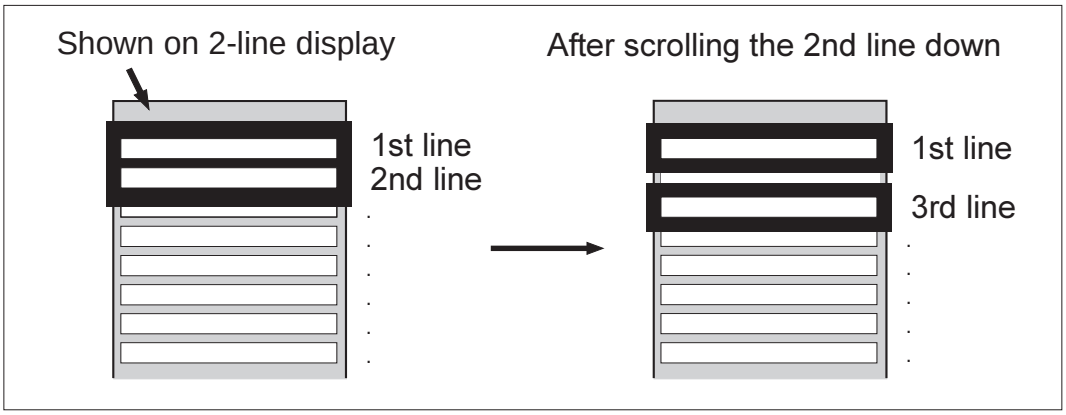


It is only possible to scroll up as far as the first line of text and down as far as the last line of text.

The default settings in PX-PRO can be used to change the scroll function so that the 1st line of the display remains static and only the 2nd line is scrolled with the background text (see section entitled "Unit Configuration" on page 5-2).

(Continued overleaf)

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The display will return to the start of the text if special function code $0A_H$ is set. The display will return to the first two lines of text.

Scroll Limiter in Background Text

When scrolling background text, it is possible to conceal text after a specified line. To do this, enter the Scroll End command **@SE** in the corresponding line when editing the message in the PX-PRO Editor. The text on this line, and on all subsequent lines, will not be displayed.

Please note: The Scroll End command is only effective from the first line of background text (i.e. from line 3).

Displaying Variables

This section contains important information on how to edit and display variables.

Guidelines for Editing Variables

- Variables are generated while editing in PX-PRO (when generating the message texts).
- When editing variables there is a distinction made between true value and set value variables **(PXT 5 SER supports only true value variables)**.
- 8 variables (numbered 0 ... 7) are available per message.

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- PX-PRO automatically generates text masks for variables (#) within the message text. These format the variable output.
- A variable can be a maximum of 10 characters in length.
- The negative sign “-” may be placed in front of the variable as an 11th character.
  Please note: If a variable is composed of numeric values with decimal places, right justfication should be selected, otherwise the variable value could be falsified.
- If the transmitted variable is larger than the variable length edited (number of text masks), only the higher value or lower value part will be displayed, depending on the justification.
- The PXT 5 SER is line-oriented.
  This means that a variable cannot extend over the start or end of a line. For this reason it is not possible to insert one and the same variable over several lines.

Valid Value Ranges for Variables

Coding	Value Range
ASCII	10 characters, permissible characters 20_H to FE_H (IBM)
BCD	0 ... +9 999 999 999
Integer8	-128 ... +127
Integer16	-32 768 ... +32 767
Integer32	-2 147 483 648 ... +2 147 483 647

True and Set Value Variables

True value variables are those whose values are read from the PLC and are displayed in the text at the place reserved by the marker.

Set value variables are not supported by the PXT 5 SER.

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Variable Layout

The following options for variable layout are available in PX-PRO:

- Formatting with the aid of variable masks (ASCII: 23_H, #)
- Left or right justification **(set value variables are generally right-justified!)**
- Display or suppress leading zeros.

Please note: The variable marker # is only visible in the PX-PRO Editor.

In the paragraphs which follow, the variable control character will be shown as “#”. In PX-PRO, this character is displayed in green.

Text Characters within Variables

The variable only appears in the text at the places marked "#". All other text characters are placed within the variable number.

Examples:

Edited Text	Variable Value	Display
#-#-#-#	1234	1-2-3-4
#,##	156	1,56
####/#	00105	0010/5

Overlapping Variables

Variables must not overlap.
For reasons of operational security, it is not possible to edit two or more variables at the same position.
In the following example, variable b is restricted by variable a:

Edited Text	Variable Value	Display
####,##### a b	a 987654 b 111111	9876,54111

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Left / Right Justification (True Value Variables)

If no control character is present, the variable will be displayed with right justification.

Example

Edited Text	Variable Value	Display
####,##	12345678	Right justified: 3456,78
		Left justified: 1234,56

Leading Zeros

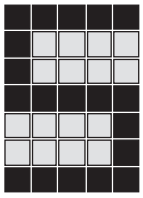
If no control character is present, the variable will be displayed with leading zeros suppressed. When leading zeros are suppressed, “superfluous” zeros are replaced by spaces and any negative prefix is moved along accordingly. Examples:

Edited Text	Variable Value	Control Character	Display
#####,## (right justified)	-34	Show leading zeros	-0000,34
		Suppress zeros	-0,34
#####,## (left justified)	-34	Show leading zeros	-34 ,
		Suppress zeros	-34 ,
#### (left justified)	0	Suppress zeros	0
##,## (right justified)	1	Suppress zeros	0,01
#### (left justified)	34	Suppress zeros	34
###,## (right justified)	-1	Suppress zeros	-0,01
###.## (right justified)	-1	Suppress zeros	-0.01
###-## (right justified)	-1	Suppress zeros	--1

Variables in Background Text

Variables can also be inserted into background text, becoming visible when you scroll to the corresponding line.

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Serial Drive

IMPORTANT!
If you are using the Pilz function blocks “PSS Drivers for PX and PXT” (order number 301 250) you will not need to read through this chapter.

The operator terminal can only be driven through the RS 232 interface. The distinction is made between monitor and display mode.

Serial Interface: Communication Parameters

The standard settings on the RS 232 interface are:

- Full duplex
- 9600 baud
- 8 data bits
- 1 stop bit on receive
- No parity

Monitor Mode

Please note: Display mode is active when the unit is switched on.

To activate monitor mode you will need to send the following telegram:

Start byte	02_H
Data length, low byte	01_H
Data length, high byte	00_H
Data (1)	**90_H**
End byte	03_H

Communication Protocol

1-byte data pieces are processed in monitor mode. These are either:

- Representable characters from the IBM character set, which will be displayed at the current cursor position OR
- Characters with control functions (control codes).

The control codes are listed on page 7-4.

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The 1-byte data pieces can be sent from the host to the operator terminal either individually or in a package.
The operator terminal will respond to each of these send telegrams with a positive or negative acknowledgement.

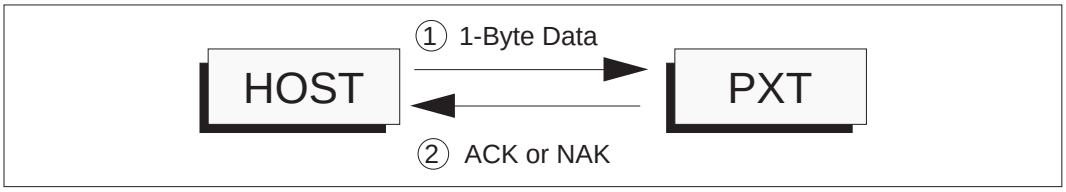
Communication Protocol for Individual Data

Host:

1-byte Data (IBM / ASCII)

Operator terminal (PXT):

positive acknowledgement:	06_H (ASCII: ACK)
negative acknowledgement:	15_H (ASCII: NAK)



Communication Protocol for Packaged Data

Data can also be transmitted in a package, speeding up data communication between the host and the operator terminal. Confirmation will only be given for one data package.

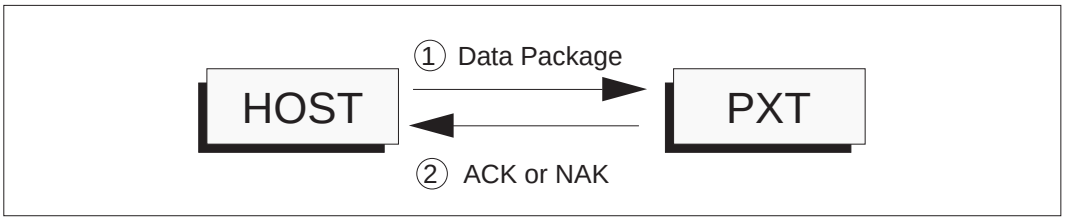
Host:

Start byte:	02_H
Data (1):	IBM / ASCII-characters: representable characters and control codes
.	
.	
.	
Data (n):	
End byte:	03_H

Operator Terminal (PXT):

positive acknowledgement:	06_H (ASCII: ACK)
negative acknowledegment:	15_H (ASCII: NAK)

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LED Drive in Monitor Mode

Serial LED-drive is activated by transmitting a LED control code.

LED control code	Function
15_H	Start byte for the specific control of **one** LED

LED control code 15_H: Specific control of one LED

Data sequence

	7						0	← Bit
1st data byte	0	0	0	1	0	1	0	1	15_H
2nd data byte	e	b	0	0	0	0	0	0	

e On/off: 1 = switch on; 0 = switch off
b Flash attribute: 1 = on; 0 = off

Response from Operator Terminal

The operator terminal responds to the host's send telegram with:

positive acknowledgement:	06_H (ASCII: ACK)
negative acknowledgement:	15_H (ASCII: NAK)

Driving the LEDs in Monitor Mode and PLC Start-Up

If the PLC is started up when the text monitor (= display unit in monitor mode) is in the middle of an LED-drive operation, "normal" text monitor data could be wrongly interpreted as LED-status information.

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In order to avoid this, take the following steps once the PLC has completed its run-up time:

- **Send the value "0" to the operator terminal**

A) If you receive the acknowledgement 06_H (ACK), the display is in monitor mode.

B) If you receive no response to the first zero, display mode is active. In this case, you will need to transmit the telegram **02_H - 01_H - 00_H - 90_H - 03_H** in order to switch back to monitor mode.

Display Mode

Please note: Display mode is active when the unit is switched on.

Information from the PLC is transmitted to the operator terminal in send telegrams. Each send telegram is followed by a receive telegram, in which the operator terminal responds with a positive or negative acknowledgement.

Communication Protocol

The following data communication protocol must be adhered to in display mode:

Host:

Start byte:	02_H
Data length, low byte	Data length (DL)
Data length, high byte	
Data (1)	
Data (2)	
.	
.	
Data (DL)	
End byte:	03_H

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In the bytes **Data length, low byte** and **Data length, high byte**, the amount of data from **Data (1)** to **Data (DL)** must be contained in byte form.

The operating mode should be coded in **Data (1)**.

Depending on which mode is selected, additional information should be given in the following bytes **(Data (2) to Data (DL)**). For further information please refer to the section entitled "Operating Modes" on this page.

Response from Operator Terminal

The operator terminal responds to the host's send telegram with:

positive acknowledgement:	06_H (ASCII: ACK)
negative acknowledgement:	15_H (ASCII: NAK)

Operating Modes

Following operating modes and special functions are available. Data communication must be carried out in accordance with the protocol described earlier in the chapter.

The operating modes available are:

Operating Mode	Hex. Code in **Data (1)**	Binary Code in **Data (1)**
Text Mode	50	01010000
Variable Mode	60	01100000
Special Mode	70	01110000
LED Mode	80	10000000
Activating Monitor Mode	90	10010000

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In "text" and "variable" modes, the ID-Byte in **Data (2)** should be transmitted in the following format:

7	6	5	4	3	2	1	0	← Bit
A	?	_	N	C	n	n	n	Data (2)

A = 1 A = 0	Display ASCII-coded variables Display binary or BCD-coded variables
? = 1 ? = 0	Inserts "?"; flashes alternately with the lowest value digit of the variable value "?" not inserted
_ = 1 _ = 0	Inserts "_"; flashes alternately with the lowest value digit of the variable value "_" not inserted
If ? = 1 **and** _ = 1, "?" will be inserted. "?" or "_" can still be flashed at the point of the lowest value digit even when the variable value is not transmitted (Data (2) as Data (DL)).	
N = 1 N = 0	A negative prefix ("-") is placed before the value of the variables Display without negative prefix
C = 1 C = 0	BCD-coded transmission Binary coded transmission
nnn	In variable mode, variable numbers (0 ... 7) should be transmitted in Bits 2 ... 0.

The following table shows the connection between operating mode, coding and the contents of the data field from **Data (1) to Data (DL)**.

(Continued overleaf)

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<table>
<tr><th>Operating Mode</th><th>Data (n)</th><th colspan="4">Contents</th></tr>
<tr><td rowspan="4">Binary coded
text call-up</td><td>Data (1)</td><td colspan="4">50_H</td></tr>
<tr><td>Data (2)</td><td colspan="4">ID-Byte:
binary xxxx0xxx (eg. 00_H)
(x ... Bit is insignificant)</td></tr>
<tr><td>Data (3)</td><td colspan="4">low Byte text number</td></tr>
<tr><td>Data (4)</td><td colspan="4">high Byte text number</td></tr>
<tr><td rowspan="4">BCD-coded
text call-up</td><td>Data (1)</td><td colspan="4">50_H</td></tr>
<tr><td>Data (2)</td><td colspan="4">ID-Byte:
binary xxxx1xxx (eg. 08_H)
(x ... Bit is insignificant)</td></tr>
<tr><td>Data (3)</td><td colspan="4">BCD-digit 10^1, 10^0 of the text number</td></tr>
<tr><td>Data (4)</td><td colspan="4">BCD-digit 10^3, 10^2 of the text number
(Data (4) is omitted for text numbers 1 ... 99)</td></tr>
<tr><td rowspan="7">Binary coded
variable call-up</td><td>Data (1)</td><td colspan="4">60_H</td></tr>
<tr><td>Data (2)</td><td colspan="4">ID-Byte:
binary 0(?)(_)x0nnn
(nnn ... variable number binary coded,
x ... Bit is insignificant)</td></tr>
<tr><td>Data (3)</td><td>8-Bit-binary value</td><td rowspan="3">16-bit binary value</td><td rowspan="3">24-bit binary value</td><td rowspan="3">32-bit binary value</td></tr>
<tr><td>Data (4)</td><td></td></tr>
<tr><td>Data (5)</td><td></td></tr>
<tr><td>Data (6)</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="4">Data (4) to Data (6) may be omitted</td></tr>
<tr><td rowspan="8">BCD-coded
variable call-up</td><td>Data (1)</td><td colspan="4">60_H</td></tr>
<tr><td>Data (2)</td><td colspan="4">ID-Byte:
binary 0(?)(_)(N)1nnn
(nnn ... variable number binary coded)</td></tr>
<tr><td>Data (3)</td><td colspan="4">BCD-value 10^1, 10^0</td></tr>
<tr><td>Data (4)</td><td colspan="4">BCD-value 10^3, 10^2</td></tr>
<tr><td>Data (5)</td><td colspan="4">BCD-value 10^5, 10^4</td></tr>
<tr><td>Data (6)</td><td colspan="4">BCD-value 10^7, 10^6</td></tr>
<tr><td>Data (7)</td><td colspan="4">BCD-value 10^9, 10^8</td></tr>
<tr><td></td><td colspan="4">Data (4) ... Data (7) may be omitted.</td></tr>
</table>

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Operating Mode	Data (n)	Contents
ASCII-coded variable call-up	Data (1)	60_H
	Data (2)	ID-Byte: binary **1**(?)(_)(N)xnnn (nnn ... variable number binary coded; x ... Bit is insignificant)
	Data (3)	1st ASCII-character (positioned furthest **right**)
	•	•
	•	•
	•	•
	Data (12)	10th ASCII-character (positioned furthest **left**)
		Data (4) ... Data (12) may be omitted.
Special Mode	Data (1)	70_H
	Data (2)	binary xx**yyyyyy** x ... Bit is insignificant yyyyyy Special function code, binary coded 000001 Segment test on 000010 Segment test off 000011 Output version number 000110 Clear display 001000 Scroll down 001001 Scroll up 001010 Go to start of text
LED Mode *	Data (1)	80_H
	Data (2)	xxxx xxxe e = 1 LED on; e = 0 LED off
	Data (3)	xxxx xxxb b = 1 flash on; b = 0 flash off
Activating Monitor Mode	Data (1)	90_H

* Only one LED can be connected to the HS-Output (24 Volts).

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Serial Keyboard Operation

When a key on the operator terminal is pressed, the corresponding key code is sent to the host as 1-byte-data via the RS 232 interface.

Please refer to the Appendix (page 7-5) for further information on the allocation of key codes to the operator terminal keys.

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Appendix

Character Sets

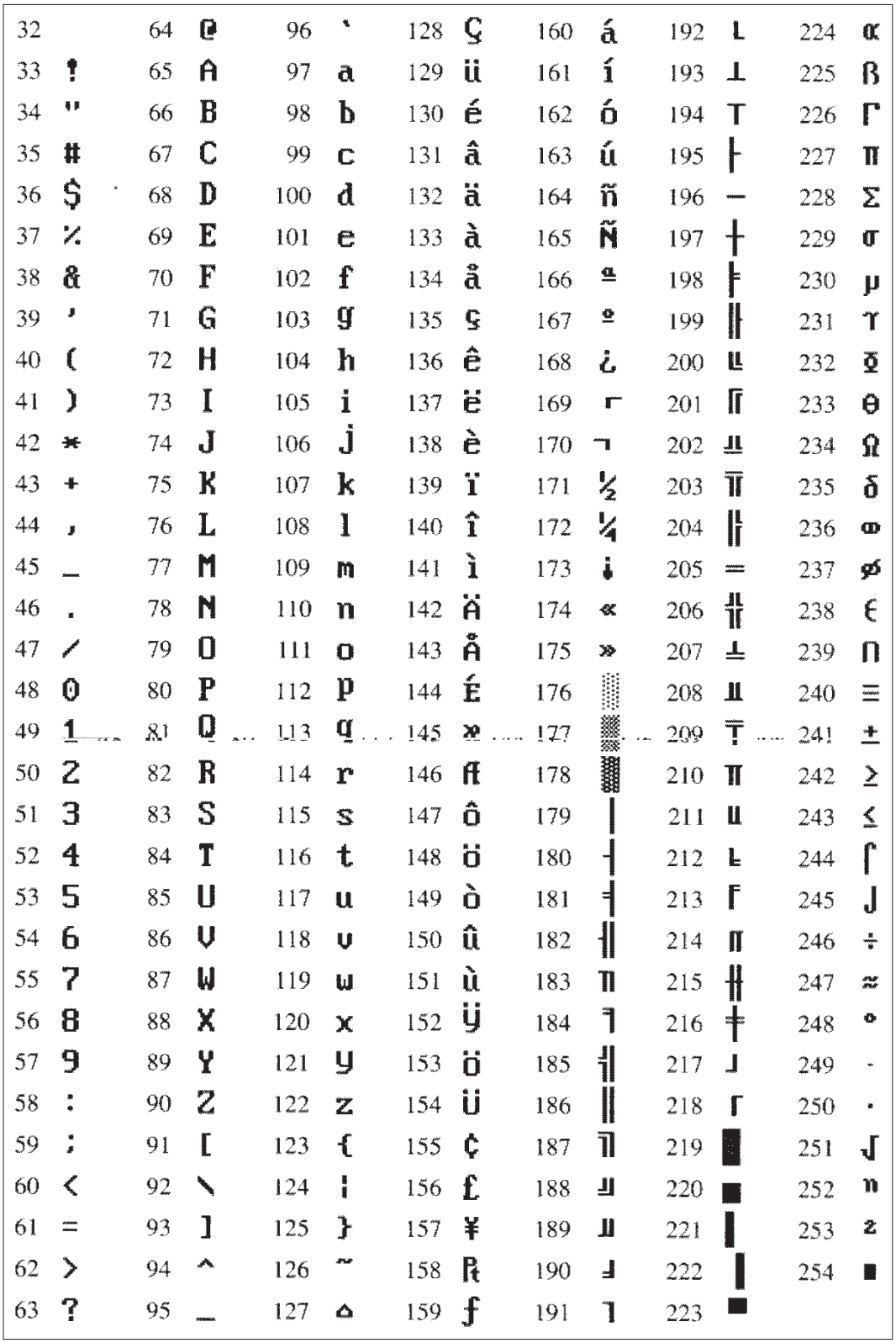
IBM Character Set

The displays' character set corresponds to IBM character set number 437. The character 255_D (FF_H) is used to identify an empty text memory chip. Characters which can be represented are 32 to 254_D (20 to FE_H); one exception is the character 35_D (#), which is reserved as a variable marker.

(See overleaf)

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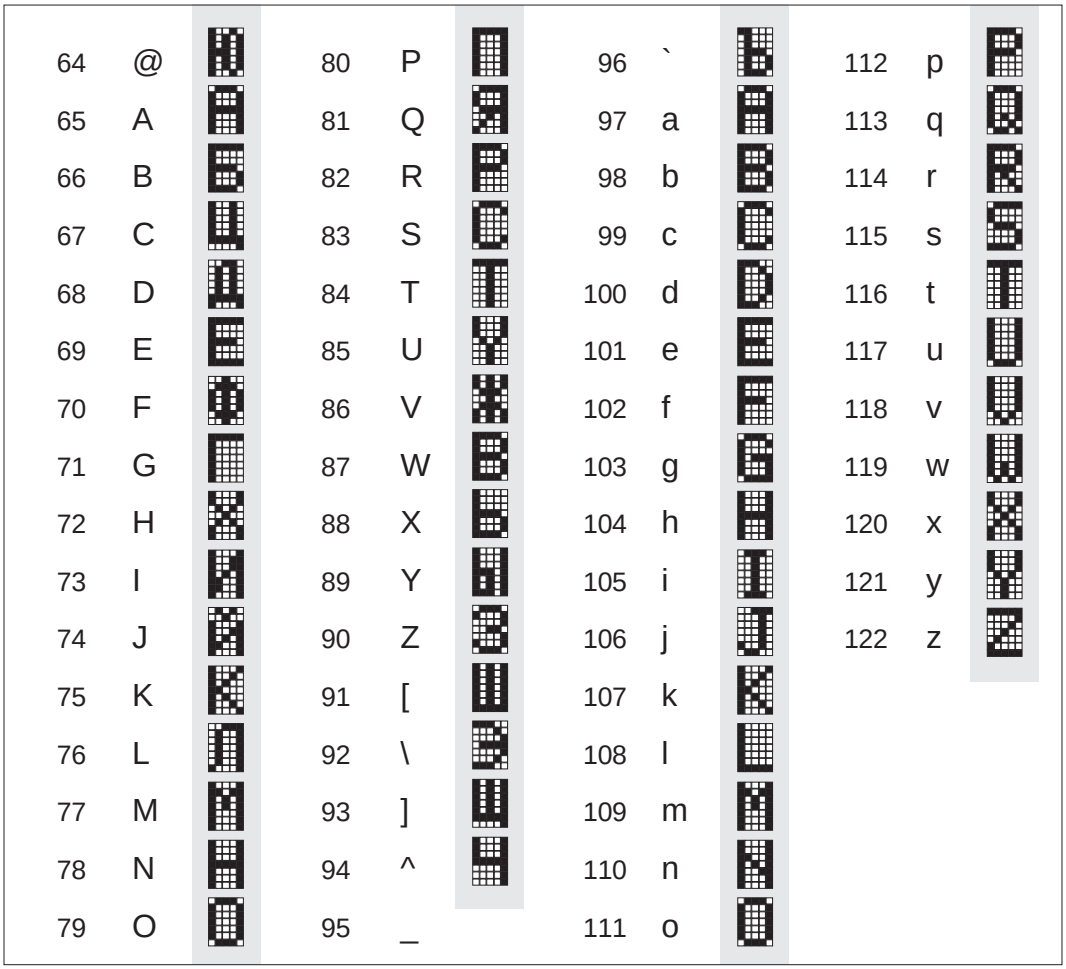
Appendix



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Cyrillic Character Set

When the Cyrillic character set is used, the IBM characters in the range 64 to 122_D (40 to $7A_H$) are replaced by the shaded characters in the diagram below.



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Appendix

Loadable Special Character Set

A message number can be entered in the PX-PRO default settings, marking the spot from which pixel codes for a special character set are stored. This could be for a character set available within the display or for one created by yourself (index card “Options”, under “Loadable Character Set from...”; for the special character sets supplied by Pilz, enter **8032**). The first message will contain the pixel code for the special character at the ASCII-position 32_D; the next message will be assigned ASCII character 33_D etc. Pixel codes for all special characters up to ASCII 255_D must then be stored in consecutive messages.

IMPORTANT!

- **The special character set will only be loaded if the Cyrillic character set has not been configured in the PX-PRO defaults.**
- **Details on how to edit a special character set can be requested from your local Pilz Support.**
- **The ASCII character 35_D (#) is reserved as a variable marker. If a special character is edited in this position it will not be visible on the display!**

Control Codes

Some of the IBM characters which cannot be represented (0 to 31_D) are used as control codes for control commands in PXT monitor mode.

Hex	Dec	CTRL-Sequence	Function in Monitor Mode
00	0	^ @	Reserved
01	1	^ A	Mask
02	2	^ B	Start byte for data package
03	3	^ C	End byte for data package
04	4	^ D	Switch on display mode (serial mode)
05	5	^ E	Reserved
06	6	^ F	Reserved
07	7	^ G	Move cursor one place to the left
08	8	^ H	Reserved

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Hex	Dec	CTRL-Sequence	Function in Monitor Mode
09	9	^ I	Move cursor one place to the right
0A	10	^ J	Move cursor down one line
0B	11	^ K	Move cursor up one line
0C	12	^ L	Move cursor to start of first line
0D	13	^ M	Move cursor to start of line
0E	14	^ N	Cursor invisible (default)
0F	15	^ O	Cursor visible
10	16	^ P	Reserved
11	17	^ Q	Clear display, cursor invisible
12	18	^ R	Scroll to line n+1
13	19	^ S	Scroll to start of text
14	20	^ T	Scroll to line n-1
15	21	^ U	Start byte for targetted control of one LED
16	22	^ V	Reserved
17	23	^ W	Reserved
18	24	^ X	Reserved
19	25	^ Y	Reserved
1A	26	^ Z	Set IBM character set
1B	27	^ [	Set Cyrillic character set
1C	28	^ \	Flash ON
1D	29	^]	Flash OFF
1E	30	^ ^	Reserved
1F	31	^ _	Reserved

Key Codes

The 24 V Inputs (E0 ... E15) can be used for additional Function keys.

Key	F1	F2	F3	F4	F5			
Code	41_H	42_H	43_H	44_H	45_H			
Input	E0	E1	E2	E3	E4	E5	E6	E7
Code	80_H	81_H	82_H	83_H	84_H	85_H	86_H	87_H
Input	E8	E9	E10	E11	E12	E13	E14	E15
Code	88_H	89_H	$8A_H$	$8B_H$	$8C_H$	$8D_H$	$8E_H$	$8F_H$

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Appendix

Internal Error Messages

Error Codes

Error Code (decimal)	Key
010	Syntax error in configuration instruction
030	No message available; record is not occupied
031	No message available; message number is outside the edited message number range
035	Message number outsdie the text memory address range (> 9 999)
040	Too many BCD-digits; max. permitted number of transmission cycles has been exceeded **OR** syntax error when entering MIN/MAX/MUL/OFF
041	BCD-digit(s) > 9 were found in the message selection
042	Binary value too large
044	Negative message number selected
050	Variable marker edited, but no variable (control character)
051	Variable (control character) edited, but no marker
052	Too many variable markers # (>11)
080	Special function code invalid
081	No variable values in the telegram (with RS 232 communication)
082	No message number in the telegram (with RS 232 communication)
100	Invalid monitor command
101	Unknown manufacturer's PD-Index
102	PD-Index 21: Invalid number
103	PD-Index 21: Invalid group number
104	Unknown MMI-COM-compatible PD-Index
120	PLC addresses missing
121	PLC data for invalid utility
122	PLC data records duplicated
123	Invalid PLC address

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Error Code (decimal)	Key
124	No PLC address
125	PLC data contains invalid message number (>9 999)
126	Invalid variable coding
127	Invalid variable length
128	Invalid variable number
129	Too much PLC data in text memory
130	Invalid LED number or number of LEDs
131	Invalid LED offset
132	Invalid function key number or number of function keys
140	PLC in STOP-mode
141	Error in set value addressing
142	Philips P8: Function unsup. in basic mode
143	Philips P8: Function unsup. in ext. mode
144	Philips P8: I/O error/Hardware error
145	Philips P8: Length/checksum/protocol error
146	Philips P8: Sequence violation
147	Philips P8: Illegal Parameter
148	Philips P8: No message available
149	Philips P8: Message not accepted
150	Philips P8: PLC internal access error
151	Philips P8: Undefined/unexpected input
152	Philips P8: Keyswitch error (C121)
153	Philips P8: Illegal int. reg. setting
154	Philips P8: Block access denied
155	Philips P8: Mismatch error
156	Philips P8: Timeout error 1
157	Philips P8: Timeout error 2
160	First message number for the pixel code on the special character set has not been found
161	Incomplete pixel code for the special character set

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Error Code (decimal)	Key
170	Timeout on the RS 232-interface
200	Clearing error (when programming Flash-EPROMs)
201	ID-code error (when programming Flash-EPROMs)
202	Write error (when programming Flash-EPROMs)
203	Text memory too small (when programming Flash-EPROMs)

Error Messages

A message number can be entered in PX-PRO, indicating the start of the text memory range for error messages.

A file containing the error messages listed above is supplied with the PX-PRO software. This file starts at message number 9000. If you wish to use these messages, enter message number 9000 in the PX-PRO default settings under the “Options” index card, under “Text Error Messages from...”.

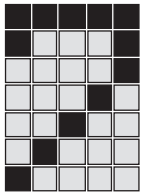
System Messages

- On power-up:
  - Unit description, version number
  or
  - any message configured by the user
- When programming the Flash EPROM:
  "Flash EPROM" flashes
  This message disappears when the next action is taken (e.g. message called up or error message)
- When errors occur:
  - "ERROR xxx" flashes (xxx ... error code)
  or
  - the configured error message

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