MANUAL Firmware

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Operator panel

TERMEX 330
TERMEX 320
TERMEX 230
TERMEX 220
TERM 330
TERM 320
TERM 230
TERM 220

TERMEX 331
TERMEX 330
TERMEX 230
TERMEX 231

Firmware Version VR 5.21

(2007)

1 Table of Contents

2 Important Notes

This documentation describes the behavior of the firmware for the operator panels TERMEX 2xx/3xx as well as their non-hazardous counterparts TERM 2xx/3xx. It is intended for the designer of an application as well as for the operator of the machine system.
Please use the following documentation for installation and connection of the operator panel.

"Technical Manual TERMEX 2xx/3xx" [TERMEX]

References to this documentation are labeled [TERMEX].

Please use the following documentation for the generation of project designs with the design program TERMEXpro:

"Technical Manual TERMEXpro & EPCA How to start" and the online help with TERMEXpro [TERMEXpro]

References to this documentation are labeled [TERMEXpro].

The manual describes the following issues:

- setup options when using the setup feature
- protocols and commands of the serial interface(s)
- display options on the LCD display
- programming options

The chapter **"For the User"** is designed for the setup person and user of the operator panel to provide basic information on operation and functions of the operator panel.
The chapter **"For the Project Designer"** is designed for those persons who integrate the operator panel in its system environment which would for example include the setup of the user interface and the addressing of various protocols.

In case terms should occur in the documentation which are not absolutely clear, please consult the **Glossar** on page 129 or the **Index** on page 131.

For questions beyond this documentation please contact the following e-mail address:

Support_hmi@de.pepperl-fuchs.com

You get actual informations about the operator panels on the support pages of our website

http://www.pepperl-fuchs.com

How to contact Pepperl+Fuchs GmbH:

Should you encounter any problems with the device, please consult the technical manual first of all. If you are still anable to solve the problems after studying the above information carefully you can contact the following places:

If you need to contact the support hotline, please make sure you have the Technical manual handy!

Region	**Tel. / mail address**
Western Europe + South Africa France, Belgium, Netherlands, Luxemburg, South Africa	+33-1 60 92 13-13, commercial@fr.pepperl-fuchs.com
Northern Europe Great Britain, Sweden, Norway, Denmark, Ireland, Finnland	+44-161-633 6431 sales@gb.pepperl-fuchs.com +353-21-4883798 info@insteco.iol.ie +358-9-477720-0 joel.patrikka@sensonor.fi
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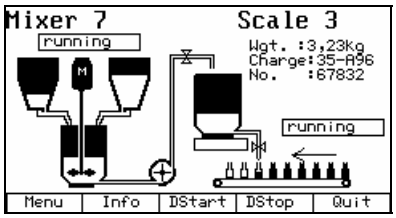
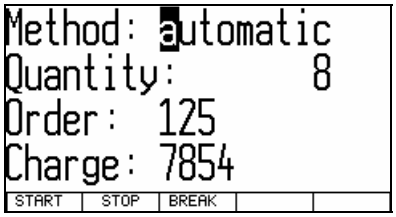
3 Introduction

Two different versions of the operator panels are available:



TERMEX 230 / 330

- graphics operator panel, display with 240 x 128 pixels
- display of text, graphics, alarms, tags, and bars
- 4 character sets in varying sizes already installed, additional can be loaded
- project with screens, alarms, and programs (EPCA programming system) in flash memory of operator panel permanently installed
- 18 keys for TERMEX 230, 37 keys for TERMEX 330
- automatic labeling of function keys in display (soft keys), changeover with Shift key
- integrated setup for configuration, accessible directly on operator panel with keyboard
- 1 user interface for connection of a control computer (PLC, PC)
- 3 serial peripheral interfaces for connection of scales for hazardous areas and barcode scanners digital I/O-connections



TERMEX 220 / 320

- text operator panel with 4 lines and 20 characters each, height of characters 12 mm
- text, alarms, and tags can be displayed
- 1 integrated character set
- project with display masks, alarms, and programs (EPCA programming system) in flash memory of operator panel permanently installed
- 18 keys for TERMEX 220, 37 keys for TERMEX 320
- automatic labeling of function keys in display (soft keys), changeover with Shift key
- integrated setup for configuration, accessible directly on operator panel with keyboard
- 1 user interface for connection of a control computer (PLC, PC)
- 3 serial peripheral interfaces for connection of scales for hazardous areas and barcode scanners
- digital I/O-connections

Typical applications:

3.1 SPS-mode

Connection to Programmable Logic Controller (PLC)

- A PLC is connected to the control interface SER1 of the operator panel via a separator with data interface (ENT-DC). The two devices communicate via a special protocol depending on the type of PLC and exchange data via a mutual data building block.
- Screens, alarms, and programs are generated with the design software TERMEXpro. They are then downloaded as one project from the design PC to the operator panel (refer to **[TERMEXpro]**). The project is stored in a flash memory as resident data.
- Screens can be retrieved for example from the PLC via previously determined data words within a data building block. Alarms can then be displayed via individual bits. The tags within the screens are used to indicate alternating values (Output tags) and maintain the current values with respect to data words in the data building block previously selected in TERMEXpro.
- Values input in the operator panel are Input/Output tags whose values are transferred to the PLC via selected data words in the data building block.
- The status of the function keys (actuated, not actuated) is displayed as a status bit in the data building block by the operator panel.

3.2 Operator panel-mode

Connection to a PC

- A PC or similar controller is connected to the control interface SER1 of the operator panel via a separator with data interface (ENT-DC). The two devices communicate via the EXTEC protocol. The PC hereby directly sends character codes of the characters to be output as well as control commands (ESC sequences) to the operator panel. The operator panel on the other hand sends the key codes of the pressed keys as well as responses to control commands back to the PC.
- Screens can be generated with the design software TERMEXpro and then downloaded to the operator panel. In this case the transmission effort for display build-up is reduced and more complex displays are possible.

Extended connection to a PC

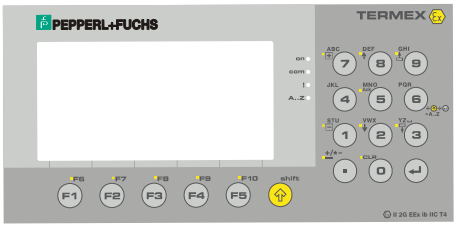
- The EXTEC protocol also allows access to the data building block. As opposed to PLC protocols communication is actively performed by the PC.
- Hence a combined operation of the two operating types described above is possible which allows numerous options.
- For example, the Input/Output tags can be used for input while at the same time the full spectrum of commands of the EXTEC protocol is available.

4 For the User

4.1 Key Assignment

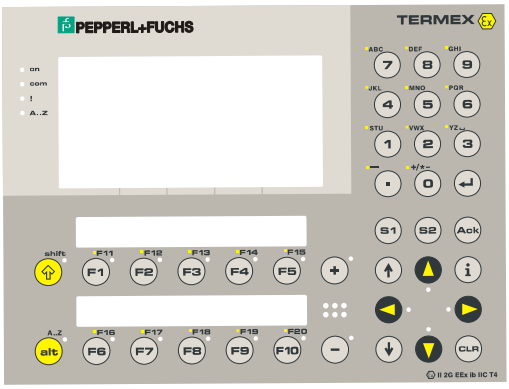
TERMEX 220 / 230 and TERMEX 320 / 330 vary in regard to the front panel. TERMEX 320 / 330 is equipped with additional keys and status LEDs. The Key codes for EXTEC Protocol can be found on page 98.

TERMEX 220 / 230



Symbol	Description	
F1...F5	*Function keys*: their function is assigned exclusively with the application; if the ⇧-key is pressed at the same time F6...F10 are accessible.	F1...F5
⇧	*Shift key*: Shift key for dual assignment. Throughout the documentation "<⇧> key" is used as an abbreviation for key combinations with the Shift key pressed.	SHT
0...9	*Number keys*: for entries with Input/Output tags, for input windows or for output of key codes. (30h=0 … 39h=9)	0...9
.	*Period / comma*: for entries of numbers for Input/Output tags, for input windows or for output of key codes.	.
←	*Delete key* (<⇧> 0): to delete the character entered last for Input/Output tags, for input windows or for output of key codes.	
−	*Minus key*: for output of minus keys for Input/Output tags, for input windows or for output of key codes.	
↵	*Enter key*: to complete an entry for Input/Output tag, for input windows or for output of key codes.	CR
+ −	*Increment-/Decrement keys* (<⇧> 7 and <⇧> 1): to increase / decrease the value of the selected Input/Output tag by one (note the possible scaling of each tag!).	
↑ ↓	*Alarm shift keys* (<⇧> 8 and <⇧> 2): to turn pages between several alarms that are to be displayed (if alarms are used).	
↑ ↓	*Shift Input/Output tag* (<⇧> 9 and <⇧> 3): Select the desired Input/Output tag. The Input/Output tags on the display are addressed in sequence from top to bottom.	
ACK	*Alarm acknowledgment key*(<⇧> 5): Acknowledgment of the alarm displayed.	
A...Z	*Alphanumeric Shift key* (<⇧> <↵> 6): This key is used to switch to alphanumeric input for the respective Input/Output tags and input windows. The characters ABC, DEF, etc. on the numeric keypad are now valid. If such a key is held down an automatic switch occurs between the 3 characters in the display. Once the desired character appears, the key is released. The alphanumeric mode can be exited with the same key combination. The mode is automatically exited if the entry was confirmed with ↵ or if a switch to a different Input/Output tag was executed.	

TERMEX 320 / 330



Symbol	Description	
F1...F10	*Function keys*: their function is assigned exclusively with the application; if the ⇧-key is pressed at the same time F11...F20 are accessible.	F1...F10
SHIFT	*Shift key:* Shift key for dual assignment. Throughout the documentation "<⇧> key" is used as an abbreviation for key combinations with the Shift key pressed.	SHT
ALT	*Alt key:* Shift key for additional key assignments (with push-button function/toggle, displayed by the LED on the key). The Alt key is used to switch to **alphanumeric input** for the respective Input/Output tags and input windows. Now the characters ABC, DEF, etc. on the numeric keys are valid. If such a key is held down, switching among the 3 characters in the display occurs. Once the desired character appears, the key is released. The alphanumeric mode is exited by pressing Alt again. The mode is automatically exited if the entry was confirmed with ↵ or if a switch to a different Input/Output tag was executed.	ALT
0...9	*Number keys*: for entries with Input/Output tags, for input windows or for output of key codes.	0...9
●	*Period / comma*: for entries of numbers for Input/Output tags, for input windows or for output of key codes.	.
CLR	*Delete key*: to delete the character entered last for Input/Output tags, for input windows or for output of key codes.	CLR
↵	*Enter key*: to complete an entry for Input/Output tags, for input windows or for output of key codes.	CR
+ -	*Increment-/Decrement keys* : to increase / decrease the value of the selected Input/Output tag by one (note the possible scaling of each tag!) The respective LED goes off as soon as the upper / lower limit of the value range of the tag has been reached.	PLS, MNS
▲▼	*Alarm shift keys*: to turn pages between several alarms that are to be displayed.	TOP, BOT
▲▼◀▶	*Shift Input/Output tag* : Select the desired Input/Output tag. The system jumps between the Input/Output tags according to the geometric assignment. The 4 cursor LEDs show the possible directions.	CUP, CDN, CLE, CRI
i	*Info key:* can be used in applications to output additional information (via EPCA programs).	INF
ACK	*Alarm acknowledgement key*	
S1 S2 S3	*Special keys:* Additional keys that can be assigned as needed.	SO1, SO2, SO3

4.2 Status LEDs

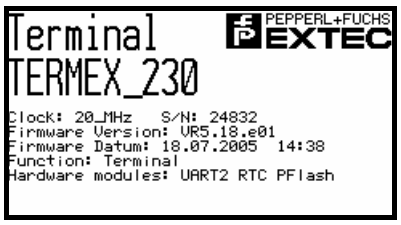
The operator panel TERMEX 320 / 330 is equipped with 4 status LEDs left to the display:

!	at least one alarm is active
ON	operator panel is supplied with voltage
COM	communication error
?	(not used)

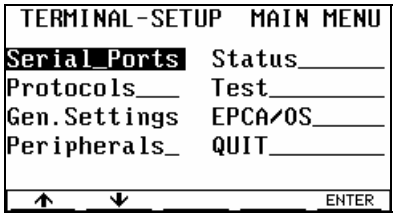
4.3 How to Perform Settings via the Setup

The operator panel is equipped with a setup menu which makes is very easy to select the appropriate settings.

During the start-up alarm



the key combination **<SHIFT⇑> F1** is pressed. Next the main menu of the setup can be accessed.



The start-up message appears a few seconds after voltage has been supplied or the operator panel has undergone a reset. The setup can be secured by a password which is entered, modified, and deleted in the menu *General Settings* (see below).
The start-up message appears for approximately 4 seconds. A reset can be performed at any time on the operator panel by pressing the key combination

<SHIFT⇑> <ENTER> 9

and can be triggered in the EXTEC protocol through the control computer with the command

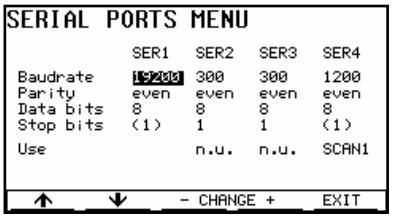
ESC "A" "2"

(refer to "overview of commands"!).

NOTE:
These key combinations and commands should only be available to instructed and authorized personnel since a large number of changes can be performed from the operator panel setup.

The **Setup is controlled** via the function keys F1...F5 whose assignment is shown in the appropriate menu (soft keys):
- the cursor keys ↑ and ↓ are used to change the active field (active: inverse display)
- a menu is exited with **EXIT**
- a currently active field is selected with **ENTER** (inverse display)
- **- CHANGE +** is used to modify the values of an active field (for fields which allow different settings)

The following menus can be accessed from the main menu:

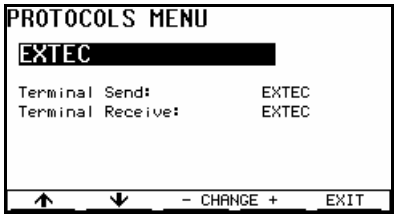


The transmission parameter of serial interfaces can be configured in the *Serial Ports Menu*
SER1 (X1): command interface (to the controller)
SER2 (X4): peripheral interface
SER3 (X3): peripheral interface
SER4 (X2): peripheral interface

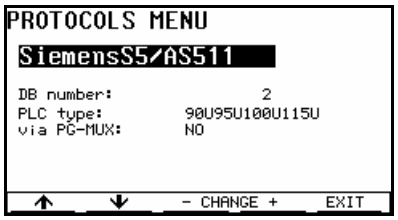
Baudrate, parity, number of data bits and the number of stop bits each can be selected. The number of stop bits is factory set to 1 on interface SER1. In addition the factory set application of SER2, SER3, and SER 4 is displayed (Use):

SER2	n.u.	Interface not used
	SCAN	Barcode scanner DRAGON-D-101
	PSER1	Test mode: character detour from and to SER1
	BAZ05	External additional keyboard BAZ-05
	2.MET	2. Mettler K-weighing platform
	WOUT	Secondary display of weight value BAZ-04
SER3	n.u.	Interface not used
	METnW	Mettler K- weighing platform (operated not for calibration)
	METWM	Mettler K- weighing platform (operated for calibration)
	BIZ	Bizerba ITE-weighing operator panel
	PSER1	Test mode: character detour from and to SER1
	ID5	Mettler ID5-weighing operator panel
	SaSBI	Sartorius scales with SBI protocol
	METPu	Mettler PUMA scale / Mettler ID3
SER4	n.u.	Interface not used
	SCAN1	Barcode scanner 1
	PSER1	Test mode: character detour from and to SER1
	SCAN2	Barcode scanner 2
	ATAST	ASCII keyboard

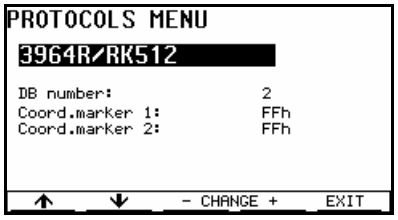
The user can choose between different interface protocols on SER1 in the Protocols Menu:



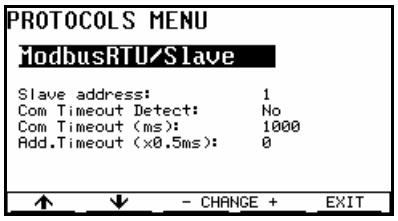
Standard protocol in operator panel mode. This protocol must be set for the loading of projects, even when a different protocol is selected for standard operation. Provided no EPCA program will use the serial interface SER1, the correct standard setting is always "EXTEC".



Protocol for communication via programming device interface (AS511) by Siemens S5. Here the number of the communication data building block used in the PLC must be selected (2...255). In addition the type of the connected PLC must be selected. If the operator panel is operated via a PG-multiplexer the selection at "via PG-Mux" must read "YES".



Protocol for communication with a communication assembly (by Siemens) according to the procedure 3964R (interpreter RK512). The number of the communication data building block used in the PLC must be selected (2...255). The two coordination flags of the protocol can be selected. The standard setting for the two bytes is **FFh**.

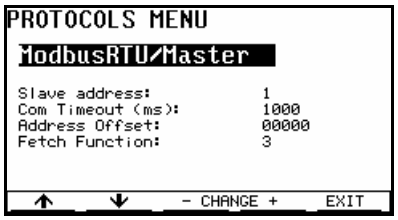


MODBUS protocol for communication with various controllers, with the **operator panel acting as slave** (in other words passive).

Slave address: The slave address of the operator panel must be set correctly (1 to 32).

Com Timeout Detect / Com Timeout: Communications can be monitored with a selectable timeout to enable failed connections to the master to be detected by the operator panel. If a failed connection is detected, the operator panel indicates the failure with an internal error message.

Add.Timeout: The end delimiter of a MODBUS telegram is a break in transmission corresponding to 3.5 characters. If a transmitting master has longer breaks when characters are transmitted in a telegram, the break length can be extended by multiples of 0.5 ms with this setting. If the break length is not extended, communications will be aborted. A value of 1 or 2 should normally be sufficient for this setting.



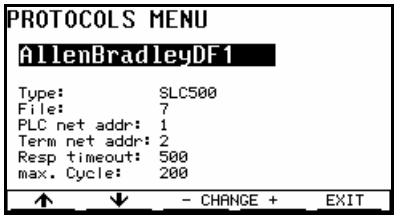
MODBUS protocol for communication with various controllers, with the **operator panel acting as master** (in other words active).

Slave address: The slave address of the master (controller) must be set correctly (1 to 32).

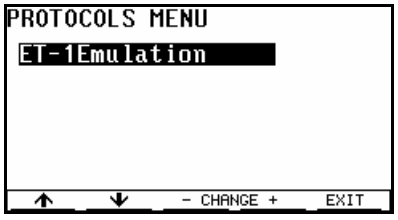
Com Timeout: The time for the communication timeout is settable. If the operator panel does not receive a response telegram to a request within the set time, error messages are displayed.

Address Offset: This setting determines the address starting at which the operator panel maps the data block in the slave.

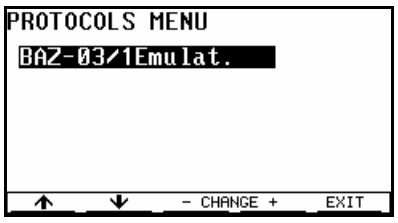
Fetch Function: MODBUS function used to retrieve data from the slave (function 3 or 4, refer also to MODBUS Protocol on page 48).



Connection to programmable logic controllers of the series SLC 500 and PLC 5 via the DF-1 interface. The following settings must be made: type (*Type*), communications file number (*File*), network address of the PLC (*PLC net addr*.), network address of the operator panel (*Term net addr*.), maximum response time of the operator panel (*Resp timeout*) in ms, and maximum PLC cycle time (*max. Cycle*) in ms.

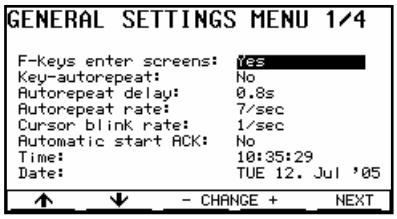


Emulation of a SAE ET-1 text operator panel. A suitable project must first be loaded for this purpose.



Emulation of a SAE ET-1 text operator panel. A suitable project must first be loaded for this purpose.

General settings for the operator panel can be selected in the menu *General Settings* :



F-keys enter screens: especially for demonstration purposes screens can be retrieved locally on the operator panel. The function keys F1...F10 retrieve screens 1...10 during normal operation.

Key-autorepeat: Switch autorepeat function on and off. A key repeat is triggered if the key remains pressed longer than the adjustable time. This effect impact the entire key processing which operates with key codes. The data building block on the other hand operates with key statuses!

Autorepeat delay: delay time after which the key autorepeat is initiated.

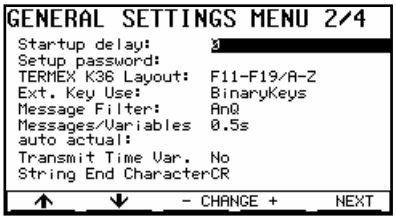
Autorepeat rate: repeat rate for autorepeat function.

Cursor blink rate: blink rate of cursor .

Automatic start ACK: If this function is activated the characters **ESC ACK** (1Bh, 06h) are output via SER1 during start-up of the unit once it has been switched on or a reset has been performed. This function only operates in the EXTEC protocol.

Time: Setting of time on operator panel. The individual numbers can be changed with + and -.

Date: Setting of date on operator panel. The individual number and the month can be changed with + and -.



Startup delay: It is possible to intentionally delay the start-up of the operator panel (0s...5s) once voltage has been provided or a reset has been performed. Following the start-up message the selected time will pass until the operator panel will assume operation in the selected protocol.

Setup password: A password (number) with a maximum of 6 digits can be assigned for access to the operator panel. The password is entered, modified, or deleted at this location. The keys - *Change* + will activate the cursor. The input is completed with ↵. If no entry has been made in this line there is no password and the access to the setup is unrestricted.

Warning: Once a password has been entered the operator panel setup can only be accessed with the appropriate password!

TERMEX K36 layout: The desired keyboard layout (key assignment) for a TERMEX K36 / TERMEX KL36 expanded keyboard can be selected.

Ext. Key Use: The use of discrete external keys can be selected here. For the control of alarms and tags "Mes/Var Control" will provide a special key assignment (refer to page 21). "Binary Keys" will simply project the key status in the data building block.

Message Filter: The applied alarm criteria for the display of alarms can be selected. Please note that this setting can be modified outside the setup by the controller using the data building block.

Messages/Variables auto actual: Alarms and tags are updated with the time pulse selected here. If the protocol is running an update is also performed once the respective telegram have been completed.

Transmit Time Var.: This selection provides the option to transmit the time to the controller of the tags TIME and DATE used. If this function is turned off, time is only displayed on the operator panel.
Note: If the clock cycle is being transmitted by the host to the TERMEX, DO NOT use Input/Output tags in a screen where a time tag is utilized.

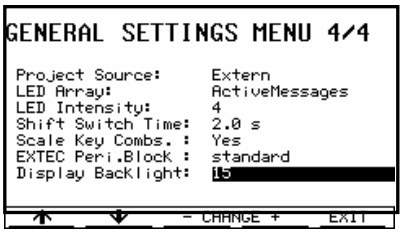
String End Character: If keyboard Handle2 is used a final character from the operator panel is added to the entered string; CR (0Dh) or LF (0Ah) (refer also to **Set** Handle2 **(Input from keyboard)** on page 85).

Concat time: The chaining time can be set separately for user defined and internal alarms. If an alarm should occur several times during this time it is considered an event.

Internal messages: The internal error alarms of the operator panel can be switched on and off.

Internal Errors/Warnings/Hints: A selection is made for each of the three internal alarm categories (error, warning, hint) whether the category should be displayed at all and if so with what priority (relative to user defined alarms).

Message Use: The structure of the alarm block in the data building block is preset.



Project Source: This setting is only relevant for the **TERMEX 200/210/300/310 family with a serial flash memory**.
The source when loading projects is selected with this item. "External" constitutes the standard setting. Projects are downloaded from the PC to the operator panel. "Internal Flash" indicates that the project from a previous external loading process from the integrated flash memory is reinitialized once (when leaving the setup). Next the setting returns to "External". An automatic initialization from the flash can be accomplished through "Auto Reload" should the integrated battery fail. An initialization at every start-up of the operator panel can be achieved using „Reload forced“.

LED Array: This function can be selected for the 6-digit LED field on the TERMEX 3xx. The LEDs will be on for "Active Messages". As soon as alarms are active at "DB Controlled", the LEDs are controlled by the control computer via the data building block.

LED Intensity: If this menu item is selected the LEDs of the TERMEX 3xx are switched on and the intensity of the LEDs for a subsequent operation can be selected.

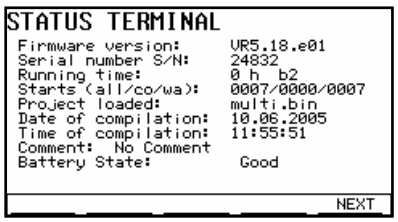
Shift Switch Time: This is the necessary holding time of the Shift key prior to switching to the alternative alarm criteria (AnQ+QA) (refer also to Alarms beginning with page 29).

Scale Key Combs.: The key combinations for the entry into the scale menus are enabled using „Yes“ or disabled using „No” (see pages 60ff).

EXTEC Peri.Block : The block format of the peripheral data output can be chosen between “standard” and “alternative”.

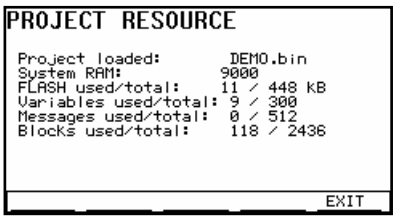
Display Backlight: This setting determines the default brightness of the display backlighting (versions with a backlit display only). There are 16 possible brightness levels. The brightness can be temporarily adjusted during operation (refer to Key Assignment on page 8).

Peripheral devices which can be connected to the serial interfaces SER2, SER3, and SER4 are configured in the Peripherals Menu. This is especially true for scales by various manufacturers which can be connected to the operator panel directly. If an item is selected a special submenu is called up which will be described in separate chapters. The retrieval of these submenus is only possible if the interfaces for the respective devices have been factory configured (refer also to *Serial Ports Menu* on page 10).

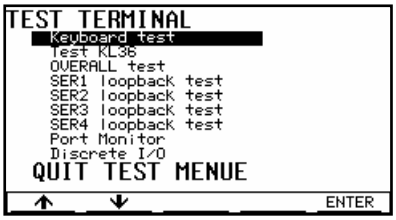


The firmware version of the operator panel, the running time of the operator panel in hours (h: hours) as well as the name and the time of generation of the loaded project are output on the status page .
The battery status is also displayed.

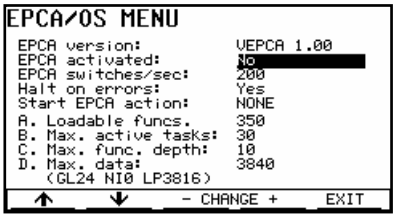
If you continue by pressing NEXT the output of project resources can be accessed.



The resources used by the loaded project are displayed.
RAM used/total: indicates how much of the available total RAM for projects is actively used (output in bytes).
FLASH used/total: indicates how many Kbytes of the total flash memory is used by the project.
Tags used/total: indicates how many tags are defined in this project.
Messages used/total: indicates how many user defined alarms are used.
Blocks used/total: indicates how many blocks are used by the project. Screens, templates, alarms, character sets, bit maps, and text (but NOT tags) are considered blocks.

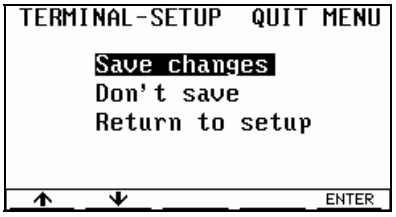


A number of tests can be accessed from this menu:
Keyboard test: tests the integrated keyboard
Test KL36: tests a supplemental keyboard
OVERALL test: overall test for continuous runs
SERx loopback test: tests the respective interface (loopback connection must be established!)
Port Monitor: received characters of peripheral interfaces SER2..4 will be displayed.
Discrete I/O: status display of binary inputs and switching options of binary outputs.



Settings for the EPCA programming system can be performed and system values can be shown in the EPCA/OS menu:
EPCA version: version number of the EPCA processor
EPCA activated: processing of EPCA tasks can be switched on or off
EPCA switches/sec: number of the desired task switches within EPCA. With higher values the processing speed rises, with lower values it sinks. The speed of the other operator panel functions changes the other way.

Halt on errors: the integrated EPCA processor has an integrated error detection for detecting program errors. Switching to „YES“ the operator panel will stop in cause of such an error with a alarm, switching to „NO“ it tries to continue with program execution. It is recommended to leave it on „YES“.
Start EPCA action: an action may be chosen, that will be done exactly once exiting the EPCA/OS menu. Using „Clear Nimem“ the resident NoInit memory will be deleted. Attention: Depending on the EPCA application important data may be lost. This function should only be used during tests or exceptional errors.
A. Loadable funcs.: the maximum number of functions (programs) that can be loaded within a project is shown (no settings can be made)
B. Max. active tasks: the maximum number of tasks that are active at the same time is shown (no settings can be made)
C. Max. func. depth: the maximum function call depth of EPCA is shown. For example: a task f1() calls a function f2() and this calls f3(), then a call depth of 3 is necessary. shown (no settings can be made)
D. Max. data: the EPCA memory is shown in words (= 16Bit). Below there are the memory categories with their size. GL is the global memory, NI is the NoInit memory that is also global and LP is the local and parameter memory. The division in these three parts is set by the loaded project and may vary.



When exiting the setup via QUIT, the operator panel tests if changes have been made from the time the setup has been accessed. If no changes occurred the setup is exited immediately. If changes occurred the user is prompted to save the changes. If "Don't save" is selected all values remain the same. The third option returns to the setup.

4.4 How to Enter Settings in the Setup Dialog

In addition to entering settings directly on the unit in the integrated setup menu, you can also configure the TERMEX remotely via the SER1 port. The operator panel must be connected to a serial port on the PC via the ENT-DC for this purpose. Start a terminal program, such as HyperTerminal, on the PC. You can then display and change the settings interactively in this program.

Procedure

1. The TERMEX must be set to the EXTEC protocol before you start. In addition, please check that the settings for the transmission parameters (baud rate, parity) are the same at both ends.
2. In order to open the dialog mode, you must send the following command to the operator panel on the PC: **ESC '1'** (the two ASCII characters 27 and 49). Most terminal programs allow you to type the ESC character using the Alt key. Hold this key pressed down while you enter the number 27 on the PC's number block. When you release the Alt key, the character corresponding to the entered code is sent off. You can now generate the '1' directly by pressing the '1' key.

The TERMEX responds by outputting the following message:

```
TERMEX 2xx/3xx Setup Dialog - type 'help' for command list
> □
```

You can then enter commands with parameters at the prompt > and confirm them by pressing the ↵ key. The operator panel responds to each command either with a confirmation or with an error alarm. You can use the "help" command to display a list of all available commands:

```
// Available commands:
//   set <item=setting>
//   showsettings
//   showsetting <item>
//   showpossibles
//   showpossible <item>
//   showlevel
//   enterlevel <level> <password>
//   reset
//   help
//   exit  (w/o save)
//   quit  (with save)
> □
```

Meanings of the commands:

set — Activate a setting

The name of the setting and the set value are transferred. The set value can be either a numerical value that is within a valid range or a predefined text.

```
e.g. set ser1BaudRate=9600              (fixed setting text)
e.g. set gnrl_KeyAutorepeatDelay=450    (numerical value)
```

showsettings — Show all settings

A list of all settings is output in the following format:
set <item>=<setting>
You can use this command, for instance, to save all the settings you have entered on the PC. Terminal programs normally allow you to save these outputs in a file (in HyperTerminal: Transfer/Capture Text). With the help of the stored file, you can later save precisely these settings back to an operator panel (HyperTerminal: Transfer/Send Text File).

showsetting — Show one (or more) specified setting(s)

You can display any setting by specifying its identifier. If you only enter part of the identifier, such as "ser1" or "gnrl", all settings that begin with this character string will be displayed.

```
e.g. showsetting ser1
```

showpossibles — Show all possible settings

You can display a list of all possible settings, for example in order to see the valid number ranges or the default setting texts.

```
e.g.
ser1BaudRate[Baud]:300,1200,2400,4800,9600,19200,38400,57600,115200
```

showpossible — Show one (or more) specified possible setting(s)

You can display any possible setting by specifying its identifier. If you only enter part of the identifier, such as "ser1" or "gnrl", all possible settings that begin with this character string will be displayed.

```
e.g. showpossible gnrl
```

showlevel — Show the current access level and the next access code

The currently active level is displayed.
The next access code is displayed in addition for levels 9 and 10 (see below)

enterlevel — Enter the setup password (level 8) or the access code for a specific access level (levels 9 and 10).

You must specify both the desired level number and the corresponding password.

```
e.g. enterlevel 8 passw
```

Level 1 means normal read access; this is the active level after powering up if a setup password was defined.
Level 8 means write access; this is the active level after powering up if a setup password was NOT defined.
A special code derived from the access code is required for **levels 9 and 10** (refer to showlevel). Not all users are allowed to access levels 9 and 10.

reset — Reset to factory settings

You can use this command to restore the factory settings. Please be very careful with it because your custom settings may be lost. The factory settings are not saved until you enter the "quit" command. If you close the setup dialog with "exit", in other words, your old settings will still be valid the next time you start up the unit.
The reset command only applies to those settings you are actually allowed to access with the active level.

help — Show command list

A list of all available commands is displayed (see above).

exit — Close dialog without saving
The dialog is closed, but your new settings are not saved in the flash memory. If you are unsure about the changes you have made, you can exit the dialog in this way without losing anything.
The new settings remain valid, however, until you restart the operator panel and the system reloads your old settings from the flash memory.

quit — Close dialog and save changes
Your new settings are saved in the flash memory. The old settings are now lost and cannot be restored!

You can find a list and short description of all possible settings in the Reference section on page 70.

4.5 Start-up Error Alarms

Start-up error alarms
These errors will be displayed at the end of the start-up message. Reasons are normally hardware problems. (look at chap.6.7)

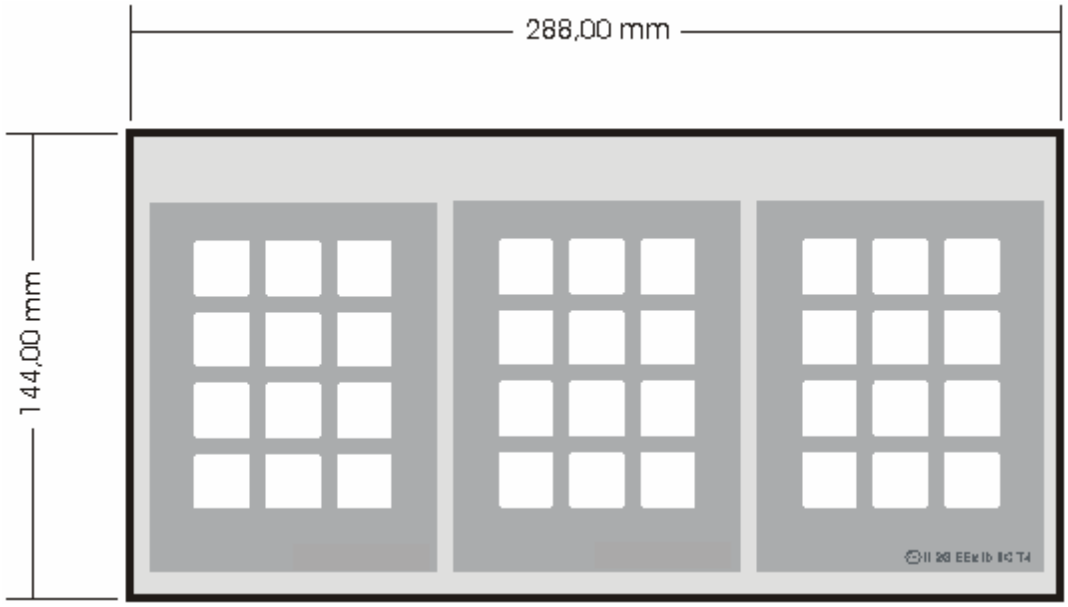
4.6 Runtime errors

Runtime errors
Runtime errors occur during normal processing of the operator panel. Reasons are errors in EPCA programs. Such errors are fatal, because of that the processing cannot be continued after the alarm was shown. (see chap. 6.7)

4.7 Key Assignment for Extended Keyboard TERMEX K36/KL36

Extended keyboards are available for TERMEX 2xx/3xx. The keyboard has 36 keys and up to 64 LEDs. The operator panel must be factory preset to be used with an extended keyboard TERMEX-K36/TERMEX-KL36. The key assignment can be chosen in the operator panel setup under *GENERAL SETTINGS / TERMEX K36 layout*. The different key assignments are listed on the following pages as they appear in the setup.

TERMEX K36/KL36 (view from front)



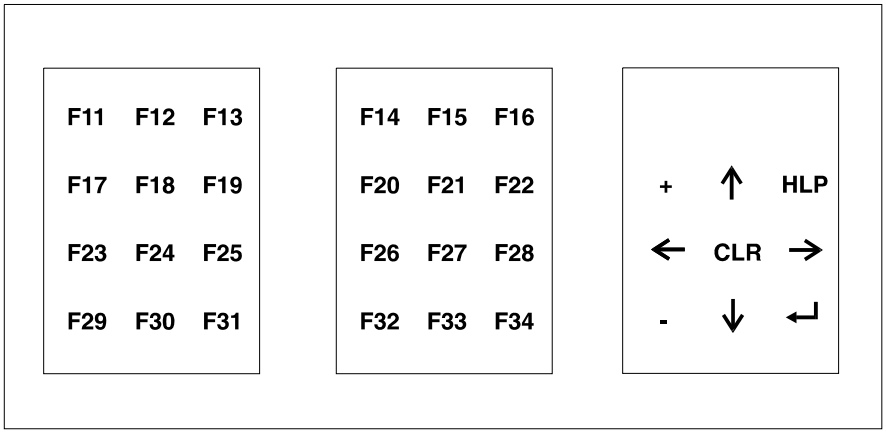
Standard module strip:

F11	F12	F13	F14	F15	F16	F17	F18	F19
F20	F21	F22	F23	F24	F25	F26	F27	F28
F29	F30	F31	F32	F33	F34	F35	F36	F37
F38	F39	F40	F41	F42	F43	F44	F45	F46

F11-F19, A-Z

F11	F12	F13	F14	F15	F16	F17	F18	F19
A	B	C	D	E	F	G	H	I
J	K	L	M	N	O	P	Q	R
S	T	U	V	W	X	Y	Z	CR

CU-Extension



4.8 Key Assignment for External Keys

Up to seven external nonlocking keys can be connected to a operator panel for the assignment of special functions. The required setting in the menu *General Settings* under item *Ext. Key Use* is **Mes/Var Control.** (refer to page 14).
The following assignment of external keys is available:

External keys	equivalent key combinations	Function in operator panel
IN 0	<Shift> 2	Alarm switch to lower priority
IN 1	<Shift> 5	Confirm alarm
IN 2	<Shift> 8	Alarm switch to higher priority
IN 3	<Shift> (after holding time)	Switch to alternative alarm display for criteria AnQ+QA
IN 4	-	-
IN 5	<Shift> 3	Move Input/Output tag window down
IN 6	<Shift> 9	Move Input/Output tag window up

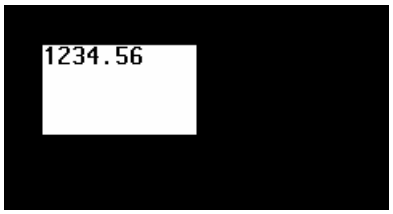
5 For the Project Designer

5.1 Output of Text

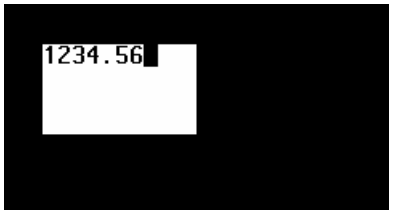
TERMEX 230 / 330

A window must always be opened before output of text can be performed on these systems. Size and position of the window are irrevocable. Certain characteristics on the other hand can always be changed. The procedure is explained in the following example:

A window is opened on the top left. The light area is now reserved for the output of text. The background was intentionally kept dark so that the window area can be displayed in this example. If the background has no color (light) the opening of a window is normally not noticeable!
(refer to **Open** text window on page 80)



The so called output handle is placed onto this window.
Since several windows in which characters can be entered can be open at the same time, a type of handle must be used to determine which window is used for the output of text.
(refer to **Set** Handle1 **(Text from SER1)** on page 84)
Next text can be output to this window.
(refer to **Character** Sets / Character Codes / Control Characters on page 100)



The cursor that is the position where the next output of characters would occur was not visible until now. This characteristic can be set with the menu item window style.
(refer to **Set text window style** on page 82)
Other window styles for example are ‘window frame’ or ‘inverse display’.

The cursor is positioned on the next line with the control character **LF** (Line Feed, 0Ah). The output of additional characters into the next line can be continued.
(refer to **Line** feed on page 88).

If the open window is no longer needed it can be closed. The background superimposed when opening a window can be restored.
(refer to **Close text window** on page 81)

In addition to LF mentioned above, there are additional control characters for the movement of the cursor:

- **BS** (backspace) is used to move the cursor back (refer to page 88).
- **CR** (carriage return) moves the cursor to the beginning of the line (refer to page 88).
- The **cursor commands** as described on page 88 allow movement in all 4 directions as well as absolute movement.

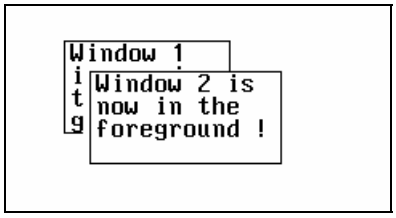
In addition to the described output of text into text windows, text may also be output via a free text output . The text characters are set up like small graphs on the previously indicated pixel position.

Procedure:

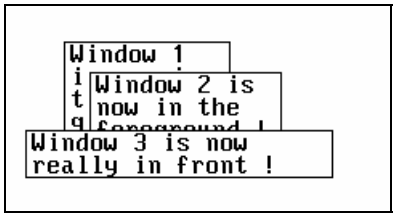
- Determine coordinates for output of text (refer to **Set Cursor for free text output** on page 80).
- Select character set (refer to **Select character set for free text output** on page 80).
- Set output handle to 0 (refer to **Set Handle1 (Text from SER1)** on page 84).
- Now the characters can be output. The (invisible) cursor moves depending on the character output by one character width to the right. There is no line break at the end of the line.

Display of foreground and background for TERMEX 230/330

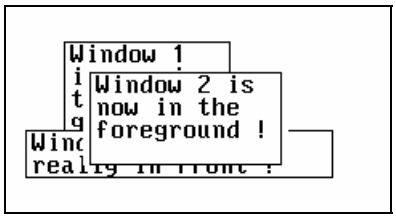
In addition to the options described above the window system of the operator panels offers other special features which will be described in the following example.



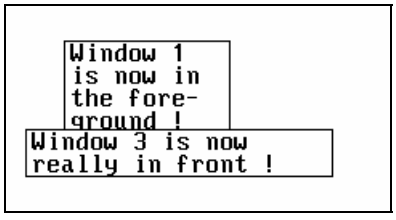
The first window is opened but the second window is not opened immediately next to it but overlaps the first window. In doing so the first window becomes **inactive** with the result that characters can no longer be output to this window and the window cannot be modified. Inactive windows can be closed though.



An additional window is opened overlapping window 1 and window 2. Since it overlaps window 1 and 2 both windows have become inactive. Characters can only be output from window 3. The example shows that windows can be set up in several layers.

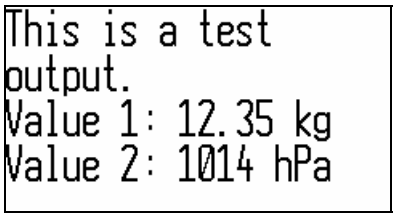


A special activation command (refer to page 86) makes it possible to move certain windows to the foreground. Window 2 is now active, windows 1 and 3 are inactive.



A special command is used to make window 2 invisible (refer to page 86). The window has not been deleted even though it may appear that way. The just displayed activation command will bring it back into the foreground. Window 3 is now active again.

TERMEX 220 / 320



An output window with 4 lines is automatically opened on these devices. Characters can only be output to this window. The same cursor control characters as for TERMEX 230 / 330 can be used (see above). Line break and page break are available.
In addition soft key bars can be displayed on screens to label function keys.

Cursors blinks in windows

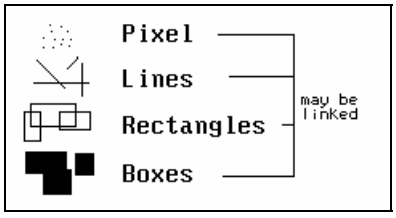
Only one cursor can blink on the entire display of the operator panel. The blinking frequency can be selected in the operator panel setup under the menu **GENERAL SETTINGS** (refer to page 14). If necessary the blinking of the cursor can be switched off. Which cursor is truly blinking depends on the status of the operator panel:

1. If a **Input/Output tag** is active in the PLC mode (ready for input) the cursor of this tag blinks, that is independently whether the cursor has been switched on under 'style' in the respective window or not.

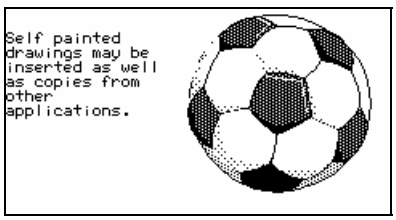
2. If no Input/Output tag is active the cursor of the window in which input from the user via the **keyboard input handle** (Handle2 on one window, refer to page 85) is expected, blinks. This is only true if the cursor of the respective window has been switched on under 'style' (Handle2 ≠ 0).

3. If keys are entered freely (Handle2 = 0) the cursor of the window blinks in which the output of characters has been generated by the control computer via **output handle** (Handle1). This is only true if the cursor of the respective window has been switched on under 'style'. This setting is especially interesting for applications in which the key codes first must be filtered by the controlling computer. The control computer receives the key codes and converts them into character codes which are then returned to the operator panel.

5.2 Graphic Display on TERMEX 230 / 330



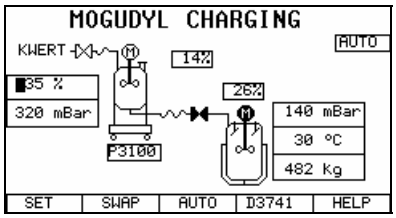
Pixels, lines, rectangulars, and boxes are available for setup with individual elements. These can be combined freely, that is, they can also be drawn into already existing windows. Hence an entire drawing can be deleted by closing a window.
These graphic elements can be applied in TERMEXpro projects (refer to **[TERMEXpro]**) and output directly to the operator panel via the EXTEC protocol (refer to page 90).



Bit maps are suitable for complex drawings of varying sizes. These graphic objects are square and are output directly to windows like characters. Bit maps can only be generated in TERMEXpro projects (refer to **[TERMEXpro]**).
In the example on the left, the bit map fills almost the entire display. The text was added in a separate window.

5.3 Tags

Tags are used for input and output of current values within a screen. Values that are to be output are written to a previously selected data word position in the data building block by the connected control computer (refer to page 33). The operator panel transfers entered values to positions where they can be read by the controlling computer. Tags can only be used with TERMEXpro and within projects.



The example on the left shows a machine setup in which several values are shown as tags. A number of tags are Input/Outpus tags whose values can be modified with the keyboard. The shift keys for Input/Output tags (refer to Key Assignment on page 8) are used to switch between the Input/output tags on a screen. The blinking cursor indicates the current Input/Output tags as shown on the left.
Output tags on the other hand only represent values of a connected control. They cannot be modified with the keyboard.
Tags must not necessarily represent numerical values. They also may consist of text ("AUTO", "P3100") and even of graphic symbols (valves, symbols for motors "M"). The above graph shows a total of 13 tags.

Output tags

- In TERMEXpro tags are defined through indication of the tag type and their respective parameters. These tags can than be inserted in various screens but only once per screen. Tags are only available if TERMEXpro is available.

- The updating of tags is normally connected to the selected protocol. In protocols where the operator panel performs active communication (e.g. Siemens S5 PGSS) the tags are automatically updated when the respective data word range has been read. For other protocols (EXTEC and MODBUS) the update occurs after each write access in the tag range of the data building block. In addition, a feature can be selected so that updates are performed at certain intervals (refer to Setup on page 14).

- Each tag requires a certain area within the data building block which may consist of several data words or only individual bits. Normally these areas are organized without overlapping so that values can be assigned to each tag independently. There are exceptions where an intended overlapping may be helpful, for example, if a certain value should be output simultaneously in different formats. In this case two tags have the same data words. It is the responsibility of the project designer to make sure that tags are correctly assigned in the data building block.

- As soon as the window in which the tag is output becomes inactive (e.g. due to an overlapping of alarm windows) the tag can no longer be updated. This fact must be taken into consideration since a tag may not be fully visible in such a case. Such issues should be avoided to not confuse the user.
  If the window with the tag becomes active again (e.g. if the alarm disappears) the update is assumed immediately.

- Tags can be scrolled in windows just like normal text. As long as the tags remain visible in the window they will be continuously updated in a correct manner. Should the user scroll past the window the tag will disappear.

Input/Output tags

- Input/Output tags generally behave like Output tags but in addition permit the input of values at the operator panel and transfer to the control computer.

- The user can switch between the Input/Output tags of a screen (refer to Key Assignment on page 8) .

- A cursor will blink at the beginning of a tag field of the current Input/Output tag.

- As long as the input cursor remains at the beginning of the tag field the update of a field is performed in the same manner as for Output tags. If the user begins to enter values via the numerical keypad the updating process will pause until the entry of values has been completed.

- Entries will be interpreted and written to the data building block if they have been confirmed with ENTER. This can occur only once. Next the data direction reverses and the Input/Output tag behaves like an Output tag.
  The PLC may reject the entered SET values by immediately overwriting data words in the data building block. In this case, the user will see how his entered value is immediately overwritten.

- Instead of entering numbers the values of tags may also be modified by using the Increment and Decrement key (refer to Key Assignment on page 8).

tag type	Effect
BCD1 BCD01 BCD2 BCD02	The current value is increased or decreased by 1.
BINA VBINA	The system jumps to the next larger or smaller value that can be displayed (depending on scaling).
BINB VBINB	The system jumps to the next larger or smaller value that can be displayed.
TEXT	Use *Increment* to switch the bit from 0 to 1 and *Decrement* to switch from 1 to 0.
TEXT16	The system jumps to the next larger or smaller form value.

- If a Input/Output tag becomes inactive due to an overlapping window, the operator panel will attempt to find another Input/Output tag which may be activated and displays the cursor.

Overview of the available tag types (Output and Input/Output tags)

tag type	Description	Details on page
BCD1	BCD number (max. 4 digits without leading zeros)	103
BCD01	BCD number (max. 4 digits with leading zeros)	103
BCD2	BCD number (max. 8 digits without leading zeros)	103
BCD02	BCD number (max. 8 digits with leading zeros)	103
BINA	Binary number (no sign, scaleable, "unsigned integer")	104
VBINA	Binary number (positive or negative, scaleable, "signed integer")	104
BINB	Binary number (no sign, not scaleable, "long unsigned integer")	105
VBINB	Binary number (positive or negative, not scaleable, "long signed integer")	105
TEXT	2 text forms, depending on bit status	106
TEXT16	up to 65535 text forms, depending on DW value	106
ASCII	character chain (tag length)	107

Periphery tags

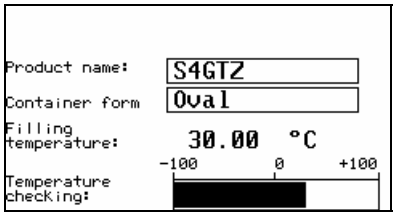
- There are Periphery tags in addition to Input/Output tags and Output tags. They are designed to output values to the data building block whose data origin can be found in the operator panel or connected peripherals.

- Overview of the available Periphery tags:

tag type	Description	Details on page
NWEIGHT	Net output of weight Mettler scale	108
SCAN	Scancode output 1. scanner	110
SCAN2	Scancode output 2. scanner	110
DATE	Output of date	111
TIME	Output of time	112
MSGFILTER	Output of a current alarm criteria	112
PLUGID	Output of connection ID (for mobile units)	113

5.4 Bars

A bar is used for the graphic display of current values of tags. The bar is automatically updated by the operator panel. The control computer does not have to consistently redraw the bar.



In the example, the bar shows the temperature as a bar within a scale. At the same time the exact value is output as a VBINA tag.
Since the limits of display for the bar can be chosen at random very detailed or rough overviews can be provided.

- Exactly one bar is generated for each defined tag. Reliable tag types are BINA, VBINA, BINB, VBINB.
- If several bars have to output a tag value an additional tag must be defined for each additional bar. Normally the tag will have the same parameters.
- The bar is opened in the foreground **like a window**. Therefore the bar snaps like a window to the known 8-pixel grid (first on the left, then, if necessary, on the right). The size of the bar is never reduced in this process, rather enlarged.
- The indicated **tag name** must reference to the previously defined tag.
- **Orientation** (up, down, right, or left) is used to determine the growth direction of the bar for increasing values.
- The indicated **limits of display** always refer to previously scaled display values of the respective binary tags.

Example:
Tag:

Tag type:	BINA
Leading comma positions:	4
End comma positions:	2
MIN (operator panel):	0
MAX (term.):	100000
(MIN (PLC):	0)
(MAX (PLC):	65000)

Property window bar:

MIN:	25000
MAX:	75000
Orientation:	UP

In this case the tag is output within the limits 0.00 through 1000.00. The binary reference range in the data building block is 0 to 65000 (a decimal point is not indicated).
The generated bar will display values between 250.00 and 750.00. If the current tag value lies below 250.00 the bar is drawn with 0 expanse. If the tag value exceeds 750.00 the bar is drawn with maximum expanse.

- Bars behave like windows when closed. The background previously covered is regenerated. Now a new bar can be opened for the same tag.
- Desired scale lines can be drawn around the bar via line commands. It must be noted, however, that this scale is not an integral part of the bar. Hence the background is not regenerated when the window is closed.
- Bars are only updated if the respective tag is output to the same screen. It is not sufficient to just define a tag.

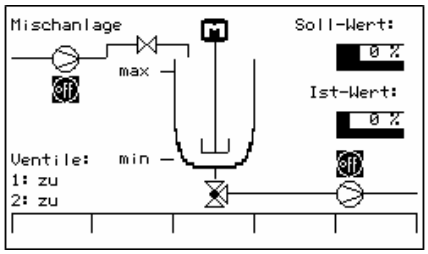
5.5 Screens and Language Selection

The objects described above, for instance

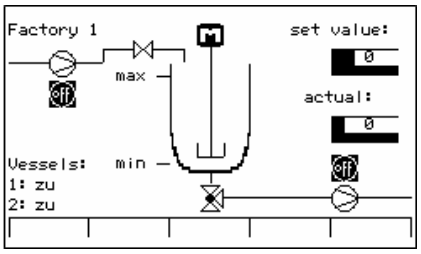
- Texts in fields
- Tags
- Graphics
- Bars
- Bitmaps

are typically combined in screens that are built using a single command. These screens are pieced together from the above-mentioned objects in the TERMEXpro project design software and loaded in the operator panel as a resident project after they have been translated.
Many modern applications are required to be multilingual with an easy way to change from one language to another. It is often practically impossible to accommodate text in different languages on one and the same screen. On the other hand, very little effort is needed to switch between similar screens containing the same text in different languages.
TERMEX provides a simple solution here in conjunction with TERMEXpro. Up to 32 languages can be defined as sets of screens and alarms. The required language can then be easily selected in various ways.

Example: German



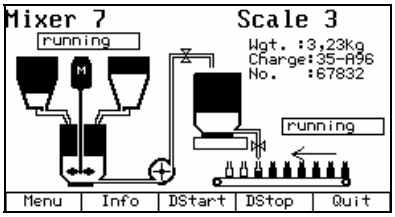
English

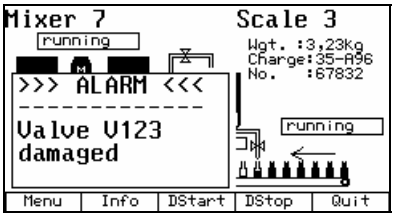


Note:
Monolingual projects run on any firmware.
Multilingual projects will only run on firmware VR5.13 or higher with the new TERMEX 220/230/320/330 generation of operator panels. If a multilingual project is created in firmware < VR5.13, it will not be displayed correctly! The same applies if you attempt to run a multilingual project created in firmware >= VR5.13 on the older TERMEX 200/210/300/310 operator panel generation.

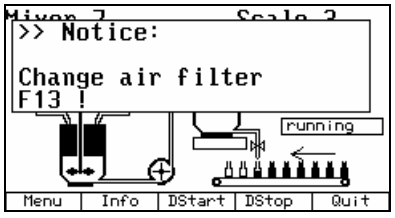
5.6 Alarms

Alarms are used for the display of current information, malfunctioning, and error alarms in an existing image:





In this example the display of a so-called MULTI alarm can be viewed (only **TERMEX 230/330**). This alarm is very versatile. The user has numerous options for design. A alarm can consist of up to ten windows of any size and position and any content.



If the project design should not be too complex it is best to use MONO alarms. MONO alarms only require text. Position, size, and character set of the MONO alarm window are already preset. Available are 4 lines with 24 characters each.

TERMEX 220 and **TERMEX 320** provide MONO alarms. Their size corresponds to the output area of the operator panel (4 lines with 20 characters each).

Alarms are activated by setting a bit in reference to the alarm in the data building block. As soon as the bit is deleted the alarm is deactivated (refer to Data Building Block under **DW46** beginning with page 40).

Alarm acknowledgment

Alarms on the operator panel can be acknowledged by pressing the key for alarm acknowledgment (refer to **Key** Assignment on page 8). The option for a remote acknowledgment by the control computer also exists (refer to Data Building Block under **DW46** on page 40).
The number of acknowledged alarms can be read on the data building block (refer to **DW2** on page 35).

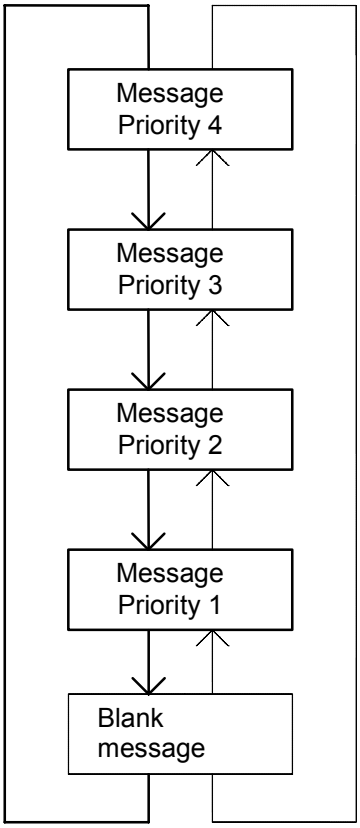
Alarm criteria

The alarm system of the operator panel knows several alarm criteria which govern the alarms to be displayed.

The desired alarm criteria can be selected in the setup (refer to page 14 under "Alarm Filter") or to **DW23** (on page 38) of the data building block.
The following selection is available:

Number selected	Short description of criterion	Description of the alarm criterion
0	AnQ	Alarms are active and have not been acknowledged yet. Alarms whose alarm bit has been set and that have not been acknowledged yet will be displayed. Inactive alarms, no longer active alarms, and acknowledged alarms will not be displayed.
1	nQ	Alarms are not acknowledged („original value alarms“). Alarms which have been active or still are, and have not been acknowledged will be displayed. Any active alarm will never disappear prior to acknowledgment.
2	QA	Alarms have already been acknowledged but they are still active („upcoming alarms“) This criterion is mainly used for control purposes in order to find out which alarms have already been acknowledged.
3	NONE	No alarms will be displayed.
4	A	Active alarms. Active alarms will be displayed whether they have been acknowledged or not. Acknowledged or not acknowledged alarms cannot be differentiated. If an active alarm has already been acknowledged alarm windows are displayed as inverted windows.
5	AnQ+QA	*Standard display (AnQ)* The active alarm which occurred the earliest and has not been acknowledged yet will be displayed. One cannot switch between waiting alarms. *Alternative display (QA)* If the Shift key is held down the system switches to this display. The active alarm which has been acknowledged last appears. The alarm shift keys are used to look through all active and acknowledged alarms in their chronological order. Refer to additional information regarding this alarm criterion on page 31.

The operator panel creates a group of alarms which meet the selected criteria. The system will display the alarm with the highest priority from this group (exception AnQ+QA, see above). The priority is determined during the definition of the alarm in TERMEXpro and remains unchanged during the run time of the operator panel. If the priority level is the same the alarm with the higher alarm number is ranked higher.



Remarks

- The alarm shift keys (refer to Key Assignment on page 8) are used to look through the entire list of waiting alarms in the order of their priority.
- Pressing the down arrow ☐ displays the alarm with the next lower priority; pressing the up arrow ☐ displays the alarm with the next higher priority.
- A “blank alarm” is added to the list of alarms which does not display any of the waiting alarms. This will allow the user to continue working with the previous screen if the cause for displayed alarms is not remedied immediately.
- New alarms with a higher priority than the one displayed will continue to immediately be displayed. If the user has reached the alarm with priority 1 as shown in the example and a new alarm with priority 3 is added, the entry is added to the list and the system switches to that location.
- If a displayed alarm becomes inactive the alarm with the highest priority and which has not appeared yet will be displayed. For example if the user has leafed through all waiting alarms and the current alarm disappears no other alarm will be displayed. An alarm with a lower priority than the previous one that has been added in the interim will not be displayed since it has not been acknowledged by the user.

- Due to the numerous options with respect to the alarm system as well as the varying processes relationships can be very complex. Testing of the equipment is recommended to verify whether the chosen setting will trigger the desired actions.

- The alarm status LED (refer to
- Status LEDs on page 10) will light up on the TERMEX 3xx if at least one alarm is active in the operator panel. This display is independent of the type of displayed alarms and the minimum alarm priority respectively. The same functionality can be chosen for the LED array under Setup (GENERAL SETTINGS MENU on page 14).

- To not be disturbed by “unimportant” alarms during critical procedures an option has been integrated that alarms are only displayed if they have a certain priority level. Alarms whose priority is smaller than the selected value will not be released for display (refer to **DW23** on page 38).

Remarks regarding criterion AnQ+QA

- All other alarm display features have one feature in common. The order of the displayed alarms depends on their priority.
- Priority is of no importance for the criterion **AnQ+QA**. The deciding factor is the order in which the alarms occur (the time the alarm will become active).
- Alarms with lower priorities can still be blocked by selecting a minimal display priority in **DW23** (refer to page 38)!

- If this criterion is used a maximum of 254 alarms can be active at the same time. This limit must be adhered to otherwise malfunctioning may occur.
- For practical applications, this criterion means that alarms must be acknowledged in the order they have occurred. All acknowledged alarms that are still active will then appear in the list of the alternative display. There the user can always check if these alarms are still active. If alarms have become inactive they will no longer appear in the alternative display.
- The necessary holding time for the Shift key can be selected in the menu *General Settings* under "Shift Switch Time" in a range from 0.5 seconds to 4 seconds. The default setting is 2.0 seconds.
- If the Shift key is needed for different functions as for example alarm acknowledgment with <Shift> 5, the user should make certain that the Shift key does not remain pressed for too long. The time is reduced by pressing the second key (in this case "5"). It is also possible to continuously acknowledge several alarms by keeping <Shift> pressed down and hitting "5" several times.

5.7 Internal Alarms

Internal alarms

Internal alarms can occur during normal processing. Their reasons (e.g. protocol problems) can be cleared normally. These alarms behave like user-defined alarm, therefore they may be acknowledged or they may be switched between.
Internal alarms separate in hints, warnings and errors. (see chap. 6.7)

5.8 Alarm Event Management (Alarm History)

All operator panels are equipped with buffers to generate protocols of alarm events.

The following data will be saved:
1. Alarm number.
2. Priority of the alarm
3. Information whether it is a primary value alarm. (These are alarms with the priority 250 which designate a special operational status).
4. Time of alarm start with month, day, hour, minute, and second.
5. Time of alarm stop with month, day, hour, minute, and second.
6. Time of alarm acknowledgment month, day, hour, minute, and second.
7. Frequency of a alarm between the first occurrence and the last disappearance. Alarms can be connected to an event to accomplish data concentration for intermittent alarms.

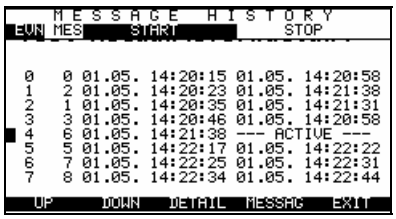
Memory depth is restricted to 50 events. The memory is laid out as a ring buffer which means that when memory capacity has been exceeded the oldest event is always overwritten by a new event. The event memory is resident. Hence its memory will not be deleted by loss of voltage or a reset.

The key combination

<Shift> <↵> 8.

is always used to view alarm events regardless of the current protocol.
As long as the display for alarm events is displayed the MED-bit is set in the data building block. Communication is continued in the selected protocol but commands are not processed.
As long as the operator panel displays the list and detail view of alarm events, alarms are not displayed directly.

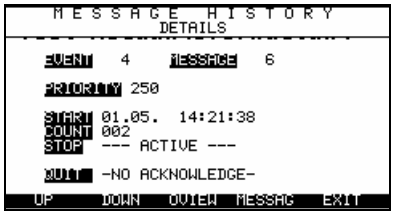
List view



Displayed information:
EVN: Continuous event number; the more recent the event the higher the number. Once the highest number has been assigned the counting will start again at 0. Primary value alarms are marked with an asterisk (*) following EVN.
MES: Alarm number in the displayed alarm.
START: Time when alarm starts.
STOP: Time when alarm stops. If alarm is still displayed --- *ACTIVE* --- will appear.

Assignment of function keys:
F1 (UP): Move cursor to the next older event in the list.
F2 (DOWN): Move cursor to the next newer event in the list.
F3 (DETAIL): Switch to detail view of the event at the cursor position.
F4 (MESSAG): Display alarm at cursor position as long as key remains pressed.
F5 (EXIT): Exit event view to access user screen.

Detail view



Displayed Information:
EVENT: event number
MESSAGE: alarm number
PRIORITY: alarm priority
MAJOR FAULT: This entry characterizes a primary value alarm and will only appear if the alarm belongs into that category.
START: Time when alarm starts
COUNT: Frequency alarm occurs (chaining)
STOP: Time when alarm stops. If alarm is still waiting the following text appears:
--- ACTIVE ---.
ACKNO: Time when alarm is acknowledged. If alarm was not acknowledged the following text appears:
-- NO ACKNOWLEDGE ---.

Assignment of function keys:
F1 (UP): Switch to next older event
F2 (DOWN): Switch to next newer event
F3 (OVIEW): Switch to list view (the previously viewed event will be displayed in the lowest line)
F4 (MESSAG): Alarm displayed as long as key is held down.
F5 (EXIT): Exit alarm view to user screen.

→Note:
The displayed data in the list and detail view are not continuously updated. Once the display is changed current data will be synthesized.

5.9 Data Building Block

A data building block (DB) is a range of data with a length of 256 data words (DW). The data building block is used for data exchange between operator panel and connected controller. The DB is part of the operator panel as well as control computer.
The next page shows an overview over the functions of the data words and their data bits. Next the individual data word or data word areas will be discussed individually.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Direction TERM PLC	Description
DW0	MED	- r e s e r v e d -							D i s p l a y e d s c r e e n								→ •	Feedback
DW1	MES	- r e s e r v e d -					D i s p l a y e d m e s s a g e										→ •	Feedback
DW2	MQI	NQM	- r e s e r v e d -				A c k n o w l e d g e d m e s s a g e										→ •	Feedback
DW3																	→ •	
DW4	F4	F3	F2	F1	.	1	4	7	BOT	MNS	SHT	F5	0	2	5	8	→ •	Key status
DW5	TOP	PLS			CR	3	6	9									→ •	T: supp. keybrd.
DW6	T29	T28	T20	T19	T11	T10	T2	T1	T31	T30	T22	T21	T13	T12	T4	T3	→ •	dT: ext. keys
DW7	T33	T32	T24	T23	T15	T14	T6	T5	T35	T34	T26	T25	T17	T16	T8	T7	→ •	dE: ext. keys
DW8	dT4	dT3	dT2	dT1	T36	T27	T18	T9			**E3**	**D3**	**E2**	**D2**	**E1**	**D1**	→ •	(w/o supp. k.)
DW9	CLE	CRI	INF	SO3	CLR	CDN	SO2		F10	F9	ALT	F6	F8	F7	SO1	CUP	→ •	
DW10																	→ •	reserved
DW11																	→ •	reserved
DW12																LIVE	→ •	Status
DW13															SAK	STA	→ •	
DW14																	→ •	reserved
DW15	G29	G28	G20	G19	G11	G10	G2	G1	G31	G30	G22	G21	G13	G12	G4	G3	• ←	LEDs
DW16	G33	G32	G24	G23	G15	G14	G6	G5	G35	G34	G26	G25	G17	G16	G8	G7	• ←	(supp. keybrd.)
DW17	R1	R10	R11	R12	G36	G27	G18	G9	R13	R14	R15	R16	R17	R18	R19	R20	• ←	R: red
DW18	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	• ←	G: green
DW19	- r e s e r v e d -								S c r e e n n u m b e r								• ←	Screen call-up
DW20	AL						F10	F9	F8	F7	F6	F5	F4	F3	F2	F1	• ←	LED keys
DW21									Language number								• ←	Language change
DW22																	• ←	
DW23	MF	SDM	DSE	preselection DS					lowest display priority								• ←	
DW24	QSB										BPS	BPE	KSN	KSE	QSN	QSE	• ←	Control bits
DW25																	• ←	
DW26									ANZS (Number of characters to be sent)								• ↔ •	
DW27	Z 1								Z 2								• ←	
DW28	Z 3								Z 4								• ←	
DW29	Z 5								Z 6								• ←	general
DW30	Z 7								Z 8								• ←	data
DW31	Z 9								Z 10								• ←	exchange
DW32	Z 11								Z 12								• ←	TERM ← PLC
DW33	Z 13								Z 14								• ←	
DW34	Z 15								Z 16								• ←	
DW35	Z 17								Z 18								• ←	
DW36									ANZE (Number of characters to be received)								• ↔ •	
DW37	Z 1								Z 2								→ •	
DW38	Z 3								Z 4								→ •	
DW39	Z 5								Z 6								→ •	general
DW40	Z 7								Z 8								→ •	data
DW41	Z 9								Z 10								→ •	exchange
DW42	Z 11								Z 12								→ •	TERM → PLC
DW43	Z 13								Z 14								→ •	(not
DW44	Z 15								Z 16								→ •	implemented)
DW45	Z 17								Z 18								→ •	
DW46	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	• ←	Alarm block
-DW53	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112		
DW54	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128		
-DW61	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240		
DW62	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256		
-DW69	383	382	381	380	379	378	377	376	375	374	373	372	371	370	369	368		
DW70	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384		
-DW77	511	510	509	508	507	506	505	504	503	502	501	500	499	498	497	496		
DW78																	• ↔ •	
...																	• ↔ •	Tag
-DW255																	• ↔ •	range

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW0	MED	-reserved-							Displayed screen								→ •	Feedback

In the low byte of the data word 0 the operator panel reports the number of the selected screen. The data words DW0 and DW1 as well as the key status are synchronized. The user can read in DW0 and DW1 in which screen the key has been pressed and whether an alarm has just been displayed. Hence even though delays may occur in communication it is always possible to assign a key status to information shown on the display.

Once the system has started to generate a new screen it switches to data word 0. If the selected screen is entered into DW19 the same number will appear in data word 0 with a short delay. Even when the function keys are directly switched at the operator panel the displayed screen is entered there.
MED: If a bit is set the operator panel has the status alarm event display.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW1	MES	-reserved-					Displayed message										→ •	Feedback

If the MES-bit is set the number of the currently visible alarm is waiting in the bits 9-0. If the MES-bit is not set the displayed number is invalid and there is no alarm in the display.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW2	MQI	NQM	-reserved-				Acknowledged message										→ •	Feedback

The number of the alarm last acknowledged by the user is upcoming in the bits 0-9 of DW2. Only if the MQI-flag is set the number is valid. Automatic acknowledgment (e.g. following a primary value alarm or acknowledgment bits by the control computer) will not be entered. The number as well as the MQI-flag remain unchanged until a manual acknowledgment is executed. If on the other hand the previously active alarm becomes active again, then the number is reset and the MQI-flag will be deleted. The NQM-flag indicates that alarms have not been acknowledged in the operator panel. The flag reads 1 if at least one alarm has not been acknowledged yet. If all alarms have been acknowledged the NQM-flag reads 0.

A return of the numbers for the acknowledged alarms occurs automatically during connections in which the operator panel actively controls communication (one number per cycle). If alarms are acknowledged in quick succession the alarm numbers will be buffered internally. In all other connections (EXTEC protocol, MODBUS) a new number is provided (if available) with each read access to DW2. This procedure may cause problems if the protocol drivers of the control read this data word asynchronous to the following data word processing. It is possible that not all data words are processed in the control.
For this purpose numbers can now also be read safely via a type of handshake:

- The QSE-bit must be set for this type of transmission. For standard transmission the QSE-bit is not set. (Default: QSE-bit not set).
- With every setting of the QSN-bit the next number is entered into DW2. Hence it is not necessary to reset the QSN-bit. This task will automatically be performed by the operator panel.

(refer also to **DW24** on page 38)

In addition a fully buffered version of the acknowledgment number return is available. If the QSB-bit is set each new status with respect to the acknowledgment number and the MQI-flags is returned to DW2 buffered (refer also to **DW24** on page 38).
The difference to a normal status (QSB=0) is that the resetting of the number of the alarm acknowledged last is now also buffered (alarm becomes inactive and then active again).

With each rising edge of the QSN-bit the next status of the MQI-flag and the acknowledgment number are written into DW2. An automatic reset of the QSN-flag does not occur. The flag must be reset through a reset by the control computer itself.
If at the time of a rising edge of the QSN-bit the status has not changed the edge will be discarded. Up to this point the edge has been saved. The next status will be output immediately after a status has changed.
In this mode the NQM-flag is externally updated without being controlled. Hence it immediately follows the alarm bits and the local or remote controlled acknowledgment.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW4	F4	F3	F2	F1	.	1	4	7	BOT	MNS	SHT	F5	0	2	5	8	→ •	Key status
DW5	TOP	PLS			CR	3	6	9									→ •	T: supp. keybrd.
DW6	T29	T28	T20	T19	T11	T10	T2	T1	T31	T30	T22	T21	T13	T12	T4	T3	→ •	dT: ext. keys
DW7	T33	T32	T24	T23	T15	T14	T6	T5	T35	T34	T26	T25	T17	T16	T8	T7	→ •	Dx,Ex: DIGIO
DW8	dT4	dT3	dT2	dT1	T36	T27	T18	T9			**E3**	**D3**	**E2**	**D2**	**E1**	**D1**	→ •	(w/o.supp. keyb.)
DW9	CLE	CRI	INF	SO3	CLR	CDN	SO2		F10	F9	ALT	F6	F8	F7	SO1	CUP	→ •	
DW10											**E6**	**D6**	**E5**	**D5**	**E4**	**D4**	→ •	Dx,Ex: DIGIO

The key bits equal 1 as long as the respective key is pressed (multiple key strokes are possible). The above chart of the data building block shows the internal keys following a standard key assignment. An explanation for the abbreviations used on the integrated keys (e.g. PLS) can be found under **Key** Assignment on page 8.

T: Keys on the supplemental keyboard TERMEX-K36 / TERMEX-KL36

T1	T2	T3
T10	T11	T12
T19	T20	T21
T28	T29	T30

T4	T5	T6
T13	T14	T15
T22	T23	T24
T31	T32	T33

T7	T8	T9
T16	T17	T18
T25	T26	T27
T34	T35	T36

dT: external keys on the supplemental keyboard TERMEX-K36 / TERMEX-KL36
Dx,Ex: Digitale Eingänge (NAMUR) über DIGIO-Karten

Unassigned bit positions are designed for system expansions and should not be used for any other purpose.

Flags for DIGIO inputs according to NAMUR

State	Ex	Dx	Description
Off	0	0	R = 12 kΩ
On	0	1	R = 2 kΩ
Interruption	1	0	R = ∞
Short-circuit	1	1	R = 0

Ex: Error flag (E1, E2, and E3)
Dx: Data flag (D1, D2, and D3)

Plus, if a second module is mounted:

Ex : Error flag (E4, E5, and E6)
Dx: Data flag (D4, D5, and D6)

Assignment of DIGIO inputs

Terminal	Input	Flags	
X5' (1,2)	IN1	E1, D1	
X5' (3,4)	IN2	E2, D2	
X5' (5,6)	IN3	E3, D3	
X4 (1,2)	IN4	E4, D4	With 2nd module
X4 (3,4)	IN5	E5, D5	With 2nd module
X4 (5,6)	IN6	E6, D6	With 2nd module

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW12																LIVE	→ •	Status
DW13															SAK	STA	→ •	

Meaning of the individual bits:

STA: Start operator panel; following start-up or reset the operator panel will set this bit to 1 exactly once. The PLC can evaluate this bit and trigger a restart of the PLC software. Next the bit must be deleted by the PLC!

SAK: SET value update; is set to 1 by operator panel after each entry of a SET value by the user. The PLC can evaluate the bit and perform a check-up of the SET values with respect to their plausibility. For this purpose the bit must be reset to 0 by the PLC program (in the PLC) once 1 has been detected.

LIVE: Operator panel is switched on and communication is possible. Bit is set to 0 by operator panel during operation. The PLC can evaluate the bit and perform a check-up to see whether communication is possible and whether the operator panel is switched on. For this purpose the bit must be reset to 1 by the PLC program once 0 has been detected.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW15	G29	G28	G20	G19	G11	G10	G2	G1	G31	G30	G22	G21	G13	G12	G4	G3	• ←	LEDs
DW16	G33	G32	G24	G23	G15	G14	G6	G5	G35	G34	G26	G25	G17	G16	G8	G7	• ←	(supp. keyboard)
DW17	R1	R10	R11	R12	G36	G27	G18	G9	R13	R14	R15	R16	R17	R18	R19	R20	• ←	R: red
DW18	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	• ←	G: green

These bits are used to directly control the status of the LEDs integrated in the supplemental keyboard (R: red LEDs, G: green LEDs). The numbering corresponds to that of the keys (refer to on page 36).

Status-bit	Effect
0	LED off
1	LED on

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW19	- r e s e r v e d -								S c r e e n n u m b e r								• ←	Screen display

By entering the desired screen numbers into the lower byte of DW19 screens can be displayed. (Example: If xx17h is entered into DW19 screen 23 will be displayed).

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW20	AL						F10	F9	F8	F7	F6	F5	F4	F3	F2	F1	• ←	LED keys

The bits F1-F10 are used to control the status of the LEDs in the function keys (TERMEX 3xx).
The bit AL is used to control the status of the LEDs in the LED array. For this purpose “DB controlled” must be selected in the menu General Setting under the menu item LED array.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM SPS	Description
DW21									Language number								• ←	Language change

By entering the required language number in the low byte of DW21, you change all screens and alarms to the corresponding language set (example: by entering xx02h in DW21, you change all screens and alarms to language 2).
You can choose from up to 32 different languages.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW23	MF	SDM	DSE	preselected DS				lowest display priority									• ←	control bits
DW24	QSB										BPS	BPE	KSN	KSE	QSN	QSE	• ←	
DW25																	• ←	

The smallest priority of the displayed alarms can be displayed with bit 0-8 of DW23. If 0 is entered all alarms will be displayed. If a number > 255 is entered no alarms will be displayed since the highest possible priority of a alarm is 255.

MF: Clearing of primary value alarms (major fault) with MF=1
SDM: (select display mode) acceptance of preselected value DS for the alarm criterion in an edge 0→1
DSE: (display select enable) SDM opens an additional selection menu for DSE=1 with rising edges (see below).
DS: (display select) preselected value for the alarm criterion, acceptance with SDM flag
QSB: QSB=1 switches the fully buffered acknowledgment number return on (see below).
BPS: Control of integrated beeper. Setting BPS to 1, the beeper is switched on, clearing BPS to 0, the beeper is switched off. To control the beeper, it is necessary to set BPE to 1 before. Otherwise BPS has no effect.
BPE: That’s the enable bit to control the integrated beeper. Only for BPE=1 the beeper can be controlled via BPS.
KSN: The next status is entered into the key status bits with a rising edge (0→1) provided KSE=1. KSN must be reset to 0 by the control computer.
KSE: The updating of the key status bits is switched on with KSE=1 through KSN (only EXTEC and MODBUS protocol).
If KSE=0 an update will occur with each read access of the key status bits.
QSN: The next acknowledgment number is entered in DW2 with a rising edge (0→1) provided QSE=1. QSN must be reset to 0 by the control computer.
QSE: The controlled return of the acknowledgment numbers via QSN is switched on when QSE=1 (only EXTEC and MODBUS protocol). The new acknowledgment number is entered into DW2 with each read access when QSE=0.

Example 1:

DW23	High byte								Low byte							
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	MF	SDM	DSE	preselected DS				lowest display priority								
	x	x	x	x	x	x	x	0	0	0	0	0	0	1	0	1

Only alarms with a priority greater than or equal to 5 will be displayed. Alarms with a priority lower than 5 are not permitted for display.

Example 2:

DW23	High byte								Low byte							
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	MF	SDM	DSE	preselected DS				lowest display priority								
	x	x	x	x	x	x	x	1	0	0	0	0	0	0	0	0

Only alarms with a priority greater than or equal to 5 will be displayed. Alarms with a priority lower than 5 are not permitted for display. Since alarms have a priority of at least 255 no alarms will be displayed at all. Bit 8 in DW23 has the effect of a locking bit for the alarm display.

Primary value alarms (major fault) can be released with bit 15. Hence all new alarms with priority 250 will be labeled as primary value alarms in the alarm history. Depending on the use of the alarm block (refer to use of the alarm block in a data building block) all successive alarms are automatically acknowledged. As soon as the MF-bit is deleted this mode will be exited.

If the system recognizes that the edge of the SDM-bit is rising (select display mode, bit 14) a new default value for the display criterion of alarms (message filter) will be read from bit 9-12 (possible types of alarms refer to page 29 and following).

If the DSE-bit (display select enable, bit 13) is set a menu will be opened in which the user can select the display criteria himself. If the DSE-bit is not set the default from bits 9-12 is used without any additional display.

Example:

DW23	High byte								Low byte							
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	MF	SDM	DSE	preselected DS				lowest display priority								
	x	0	1	0	0	1	0	x	x	x	x	x	x	x	x	x

A 2 has been entered in bit 9-12 as a default value for the display criterion of the alarms, that is during the start of the selection menu criterion no. 2 will be output as default value (alarm is acknowledged but still active). The DSE-bit is set, that is the default value in the menu can be changed and hence a different criterion can be selected. The selection menu is started when the edge of the SDM-bit (0→1) begins to rise.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW26									ANZS (Number of characters to be sent)								• ↔ •	
DW27	Z 1								Z 2								• ←	
DW28	Z 3								Z 4								• ←	
DW29	Z 5								Z 6								• ←	general
DW30	Z 7								Z 8								• ←	data
DW31	Z 9								Z 10								• ←	exchange
DW32	Z 11								Z 12								• ←	TERM ← PLC
DW33	Z 13								Z 14								• ←	
DW34	Z 15								Z 16								• ←	
DW35	Z 17								Z 18								• ←	

This block must be used if commands or character sets of the operator panel mode should be transferred from the PLC to the operator panel via the data building block.
Procedure in the PLC when transferring a chain of characters:

1. Verify if ANZS (DW 26 right) equals 0. If this is not the case, a previous transfer from the operator panel has not been processed yet. The verification must be repeated.

2. Beginning with DW27 enter the characters to be transferred.
3. Enter the number for ANZS (DW 26 right).

Screens can also be displayed using this method:

DW26									3h
DW27	ESC								'G'
DW28	Screen number								

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	TERM PLC	Description
DW46	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	• ←	Alarm block
-DW53	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112		
DW54	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128		
-DW61	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240		
DW62	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256		
-DW69	383	382	381	380	379	378	377	376	375	374	373	372	371	370	369	368		
DW70	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384		
-DW77	511	510	509	508	507	506	505	504	503	502	501	500	499	498	497	496		

Three different assignments can be made on the alarm block in the data building block. The selection how a alarm block is used is made in the setup under “General Settings - Message Use” (refer to page 14). Three settings are possible: 512 messages or 256 alarms/256 quit or alarms/256 quit.

In the operating mode “**512 Messages**“ an alarm is assigned to each of the 512 bits in the alarm block (default setting). An alarm is active if the respective bit has been set.

DW46	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	• ←	Alarm bits
-DW53	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112		
DW54	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128		
-DW61	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240		
DW62	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256		
-DW69	383	382	381	380	379	378	377	376	375	374	373	372	371	370	369	368		
DW70	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384		
-DW77	511	510	509	508	507	506	505	504	503	502	501	500	499	498	497	496		

In the operation type "**256 Messages/256 Quit**" only 256 alarms are supported. The PLC can actively switch these alarms and also acknowledge them. Alarms are assigned to the first 256 bits in the alarm block. The remaining 256 bits are used to acknowledge alarms controlled by the PLC. If primary value alarms are active in this mode successive alarms are not automatically acknowledged. During project design with TERMEXpro the user must make sure that alarm numbers greater than 255 are never assigned in this mode, since the operator panel will not support these alarms (the switching of some alarms to active causes other alarms to be acknowledged).

DW46	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	• ←	Alarm bits
-DW53	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112		
DW54	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128		
-DW61	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240		
DW62	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	• ←	Acknowledge bits
-DW69	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112		
DW70	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128		
-DW77	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240		

In the operating mode "**512 Messages/512 Quit**" the two operating modes previously described will be combined. All 512 alarms can be acknowledged by the PLC through remote control.

Important note! The range beginning with DW78 previously reserved for tags is now used for acknowledgment bits up to DW109. It is important to consider this fact when placing tags in TERMEXpro. Tags may only be placed in the data building block beginning with DW110. The protocol drivers in the operator panel automatically acknowledge this setting.

DW46	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	• ←	Alarm bits
-DW53	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112		
DW54	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128		
-DW61	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240		
DW62	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256		
-DW69	383	382	381	380	379	378	377	376	375	374	373	372	371	370	369	368		
DW70	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384		
-DW77	511	510	509	508	507	506	505	504	503	502	501	500	499	498	497	496		
DW78	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	• ←	Acknowledge bits
-DW87	127	126	125	124	123	122	121	120	119	118	117	116	115	114	113	112		
DW86	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128		
-DW93	255	254	253	252	251	250	249	248	247	246	245	244	243	242	241	240		
DW94	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256		
-DW101	383	382	381	380	379	378	377	376	375	374	373	372	371	370	369	368		
DW102	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384		
-DW109	511	510	509	508	507	506	505	504	503	502	501	500	499	498	497	496		

Bit-no.	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**TERM PLC**	**Description**
DW78																	• ↔ •	
...																	• ↔ •	Range of
-DW255																	• ↔ •	tags

The entire **range of tags** can be used for the definition of tags in TERMEXpro. To achieve the shortest data transmission time it makes sense to assign the tags without leaving positions open in between.
It would be ideal to also group Input/Output tags together. Periphery tags which submit data to the PLC (e.g. TIME, DATE, MSGFILTER) will be treated as Input/Output tags.

5.10 Comparison of the Different Protocols

All protocols which can be applied on operator panels will be described in the following chapters. The following table will help you find the right protocol.

Protocol	Description	Page
EXTEC protocol	Standard protocol • used also to load projects • the protocol is actively operated by the control computer via command sequences • data exchange also possible via data building block • easily implemented • high speed, low protocol overhead • no bus capability	43
Siemens S5 PGSS	Communication with Siemens S5 interface for programming devices • data exchange only via data building block • little effort necessary for implementation of protocol; only configuration required • protocol is actively operated by terminal • secured protocol • no bus capability	46
Siemens S5 3964R	Communication with Siemens S5 communication assembly • data exchange only via data building block • little effort necessary for implementation of protocol; only configuration required • protocol is actively operated by terminal • secured protocol • no bus capability	47
MODBUS protocol (operator panel is slave)	Universal protocol for communication with controllers • data exchange only via data block • protocol is actively operated by control computer (master) • relatively high speed, low protocol overhead, still very secure due to CRC checksum • if a protocol driver is not already available, implementation is relatively complex (critical timing) • bus capability via RS485 using slave addresses	48
MODBUS protocol (operator panel is master)	Universal protocol for communication with controllers • data exchange only via data block • protocol is actively operated by operator panel (master) • relatively high speed, low protocol overhead, still very secure due to CRC checksum • point-to-point connection between exactly one operator panel and one controller	
Allen Bradley DF1	Protocol for communication with Allen Bradley controls • data exchange only via data building block • little effort necessary for implementation of protocol; only configuration required • protocol is actively operated by terminal • secured protocol • no bus capability	54

Siemens S7 via Profibus DP	Communication with Siemens S7 PLC via Profibus DP • the protocol 3964R is used by the terminal for the link • data exchange only via data building block • little effort necessary for implementation of protocol; only configuration required • protocol is actively operated by terminal • secured protocol • bus capability	56

5.11 EXTEC Protocol

The EXTEC protocol is the standard protocol for all operator panels. It is also used for the loading of projects, even when a different protocol is used to connect to the control computer. The protocol is selected under Setup (refer to page 14). A detailed description of the protocol commands is provided on page 72.

Data direction Control -> Operator panel

The control will either send the direct ASCII codes of the characters to be displayed or command sequences which are all triggered with ESC (hexadecimal: 1Bh). The length of the sequence varies with the command.

ASCII:	"1"	"2"	"3"	ESC	"["	";"	"H"	"4"	"5"	"6"	LF
HEX:	31h	32h	33h	1Bh	5Bh	3Bh	48h	34h	35h	36h	0Ah
	character codes			command sequence (Cursor Home)				character codes			control character (Line Feed)

In the example above 3 characters are displayed first ("123"). Then the cursor is positioned top left in a window and 3 more characters are displayed ("456"). Finally the cursor is placed at the beginning of the next line with the control character LF.
Some commands provide an answer as feedback. In addition the buffer overflow control must be observed when sending characters to the operator panel (see below).

Data direction Operator panel -> Control

The operator panel will either send codes of the pressed keys or answers to command sequences previously sent to the operator panel. The answers will always start with the control character STX (hexadecimal: 02h) and end with the control character ETX (hexadecimal: 03h). The only exception is the answer ACK (hexadecimal: 06h) which is sent individually as an answer to the command "vital sign". In addition the control characters XON (hex.: 11h) and XOFF (hex.: 13h) can be sent when the buffer threatens to overflow.

ASCII:	F1	"9"	"5"	"3"	"."	"1"	LF
HEX:	80h	39h	35h	33h	2Eh	31h	0Ah

In the above example a user pressed the function key F1 on the operator panel, then entered the number "953.1" and confirmed with ENTER which would normally trigger the control character LF. An overview over the key codes can be found under **Key codes for EXTEC Protocol** on page 98.

The answer frame for command sequences is set up as follows:

STX	Identifier	Number of bytes	Data bytes				ETX
02h							03h

The identifier byte determines the type of answer. The byte with the number determines how many answer bytes are sent until the final character ETX is sent.

Identifier	Description	Refer to page
B	Scanner 1	59; 85
C	Scanner 2	59; 86
D	Answer to data building block access	76
M	Mettler scale	91
S	Sartorius scale	96
Z	Bizerba scale	94

General information regarding the EXTEC protocol

- A portion of the commands is directly compatible with the ANSI / VT100 standard.
- The operator panel is equipped with a receiving buffer of 1 Kbyte. Hence the control computer can send even longer command sequences in direct order to the operator panel even though the operator panel may not be capable to process the commands with the same speed.
- The operator panel will send a warning prior to buffer overflow by sending the control character XOFF to the control computer. If the control computer receives this character it should no longer send additional characters until the operator panel will give a release by sending XON.
  It should be noticed that the control characters XON/XOFF can occur only outside of an answer block. Inside of a block there may be any binary data (e.g. number of characters). Those characters mustn't be treated as control characters.
- By switching to the alternative peripheral block output format the value of 128 will be added to the number of bytes (the highest bit is set). Thus it can be guaranteed that this byte never can take the value of a control character. The decoding of control characters like XON/XOFF can be easier then.
- Since the commands are processed in the sequence of their input the respond times for commands may become longer if the buffer is full.
- Commands to the operator panel are not subject to character timeout; the operator panel will wait until the number of bytes has been received as directed by the command.

Special issues for operation with 7 data bits

- All possible settings can be selected for the parity of the interface SER1 including **even, odd, mark, space,** and **none**. Since the device must output a minimum of 8 bits (including parity bit) a logical 1 is sent in the setting **none** for the parity bit. Consequently the opposite position may not be operated with 7 data bits without parity since errors would occur if the characters are in a direct order.
- If the operator panel has to send codes higher than 7Fh (127), e.g. the codes for the **function keys**, these codes will be reduced by 20h. Some keys with key codes ≥ A0h will still not be processed correctly. Therefore the manufacturer does not encourage an operation with 7 data bits (refer also to page 98).
- It must be noted that the operator panel when **loading projects** via SER1 **must have 8 data bits**. Prior to loading the user must switch to 8 data bits in the SERIAL PORTS MENU.

5.12 EPCA Programming System

The EPCA programming system allows the user to freely program "operator panels". This sentence is contradictory in itself since per definition a operator panel should only be an interface between the user, controller and possibly a peripheral unit but never a stand-alone unit with functions the project designer can determine himself.

But in practical applications it has become obvious that frequently it would be very useful to freely program the units:

- the user could assign any function to keys or key combinations to relieve the connected controlling computer and to obtain shorter response times respectively.
- the user could calculate with tag values and immediately output results without having to make a detour through the controlling computer.
- the user would have a stand-alone “intelligent” unit which for example is often needed for movable systems or simple dosing computers.
- the user could expand and customize functions since even the broadest spectrum of functions will never meet all customer needs.
- the user could design safer systems by integrating emergency intercepts or output of warnings at the operator panel even if communication is interrupted.

All of the issues listed above can be accomplished with the EPCA programming system on TERMEX 2xx/3xx operator panels.
EPCA can:

- react to keyboard entries
- calculate with varying data types
- react to preset limits
- control outputs
- use various timer functions (measure times, react to completed time periods)
- use the control interface SER1 (the user could implement his own protocol)
- generate any output to the display (open windows, output text, output graphics)

Most attention was paid to two principles during the development of EPCA: **Simplicity** and **Safety**. The system must be easy to handle and be mastered quickly by the user so that objective advantages are not ruined during the project design phase due to increased cost. Also a very safe processing of programs is mandatory for the industrial sector.

Measures for simplicity:

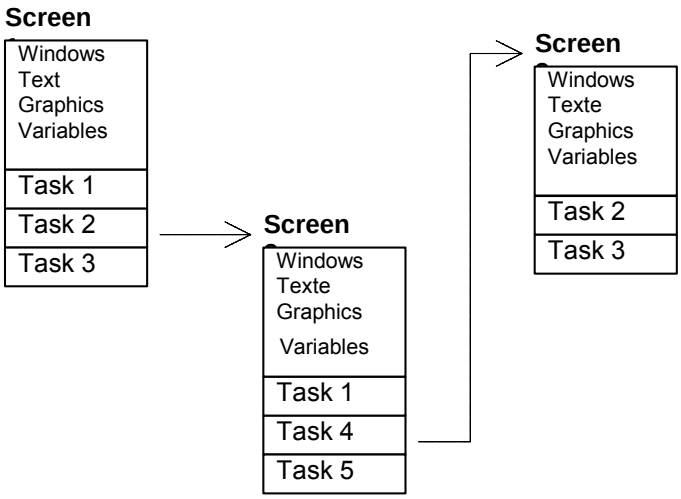
- The most common programming language used is: C
- Several functions can be processed parallel due to multitasking which constitutes a significant advantage with respect to quick program generation and easy maintenance. The system is kept intentionally simple. It is not necessary to first learn an abundance of system commands to carry out the various tasks.
- All required data for the EPCA programs has been preprocessed. It is then displayed in a special data area. In addition the user is able to access the data building block.
- The programming environment is fully integrated into the design software TERMEXpro.
- An increasing number of functions is already integrated into TERMEXpro. Only certain information must be entered and TERMEXpro will generate the tasks automatically.
- The time required for programming is significantly reduced by a number of library functions included in the program.
- Separate functions can be assigned to each screen. Each screen has its own list of tasks that are currently processed. Individual tasks are easily added or deleted. The remaining tasks must not be modified for this purpose.

Safety measures:

- The EPCA programming system is subordinate to the firmware of the operator panel. Hence the firmware data cannot be influenced by EPCA tasks at all.
- The tasks themselves are completely separated. Even a task that has been programmed incorrectly cannot sabotage a correctly working task. Local data areas are strictly local; a function cannot access data areas from different functions.
- There are no interrupts on the EPCA level.
- Memory management has been integrated into the system which will release memory that is no longer needed.

Procedure for the generation of programs:

1. The first step is to determine the functionality of a screen. All tasks which are to be executed within a screen are retrieved by a screen, not vice versa. Once a new screen has been retrieved (through a task or a control from the outside) all current tasks are terminated and the new tasks are started with the generation of the new screen. Hence a very clear order can be established which facilitates the description of the behavior of a screen.



2. The next step is to determine how the functions of a screen are distributed to the individual tasks. Since up to 20 tasks can be processed simultaneously, a separation into many small tasks becomes obvious. This option should be used since such a separation will often facilitate the generation of the entire program immensely. Key inquiries for example can be easily realized with one task per key. If the same key inquiry is needed in a different screen in conjunction with other keys the task can be used again and combined with different key inquiries.

Detailed information on programming with EPCA can be found in the appropriate documentation.

5.13 Siemens S5 Programming Device Interface / AS511

When the operating mode **Siemens S5 PGSS** is selected in the **OPERATOR PANEL SETUP** under the menu item **Protocols** the operator panel operates in the PLC mode. The user can use the parameter **DB-Number:** to select the desired communication data building block or **PLC type:** to set the used Siemens automation device (AD).
In this operating mode the operator panel will directly access the data building block in the PLC indicated on the **DB-Number:** via the programming devices interface of the AD, hence is the active participant of the communication. The operator panel will store the respective changes (e.g. keystrokes) in this data building block at the specified locations (refer to Data Building Block beginning

page 33) and retrieves the data (e.g. a character chain beginning with DW26 of the data building block or a tag value beginning with DW78) provided in the PLC in this data building block by the user program. This process is repeated several times per second.
The selected communications data building block with a size of 256 data words (L KF +256, E DB XY) must be generated in the PLC in (OB20), OB21, and OB22. In addition the EXTEC function building block **FB 215 INITPGSS** must be integrated into these start-up OBs and parameterized with the desired communication data building block XY. The selected communication data building block XY is filled with 00h in this building block for initialization. A reset command is then sent to the operator panel.
Example OB21:

```
          :
          :L    KF    +256
          :E    DB    87      (generate DB87 with a length of 256 data words)
          :
          :SPA  FB    215     (initialize DB87 with 00h and trigger a reset at the operator panel)
NAME      :INITPGSS
DB#A      :     KF    +87
          :
```

The operator panel now communicates with the PLC via the serial interface SER1 and the EXTEC power supply (with ENT type data interface). Normally the 20 mA power circuit is used as a bi-directional connection to the PLC.
Refer to [TERMEX] for setup of the necessary connecting cable.

5.14 Siemens S5 Via Protocol 3964R / RK512

When the operating mode **Siemens S5 3964R** is selected in the **OPERATOR PANEL SETUP** under the menu item **Protocols** the operator panel is operated in the PLC mode. The user can use the parameter **DB-Number:** to select the desired communication data building block.
In this operating mode the operator panel will directly access the data building block in the PLC indicated on the **DB-Number:** via a communication assembly (e.g. CP524, CP525, CP544) or the second serial interface of a CPU (e.g. CPU 928), hence is the active participant of the communication. The operator panel will store the respective changes (e.g. keystrokes) in this data building block at the specified locations (refer to *Data* Building Block beginning page 33) and retrieves the data (e.g. a character chain beginning with DW26 of the data building block or a tag value beginning with DW 78) provided in the PLC in this data building block by the user program. This process is repeated several times per second.
The selected communications data building block with a size of 256 data words (L KF +256, E DB XY) must be generated in the PLC in (OB20), OB21, and OB22. In addition the EXTEC function building block **FB 215 INIT3964** must be integrated into these start-up OBs and parameterized with the desired transfer data building block (DB#A), a flag byte for the output of an error status of the communication assembly and the assembly address (BADR). The selected communication data building block XY is filled with 00h in this building block for initialization. A reset command is then sent to the operator panel.
Example OB21:

```
          :
          :L    KF    +256
          :E    DB    65          (generate DB65 with a length of 256 data words)
          :
          :SPA  FB    215     (initialize DB65 with 00h and trigger a reset at the operator panel)
NAME      :INIT3964
BADR      :     KF    +0
ERR       :     MB    200
DB#A      :     KF    +65
          :
```

The also required EXTEC function building block **FB 214 CTRL3964** should be integrated into OB 1 and should be processed at least once per PLC cycle. If the PLC user programs are large and the cycle times lie within the range of 100 ms or more the FB 214 CTRL3964 should be accessed several times per PLC cycle. The FB 214 CTRL3964 includes a SEND ALL command as well as a RECEIVE ALL command and secures communication between operator panel and PLC via the communication assembly. A possible error status of the communication assembly will be output in ANZW.

```
Example OB1:        :
                    :SPA    FB      214
                NAME:CTRL3964
                ANZW:       MW      80
                    :
```

A memory module (EPROM) is necessary for operation of the interface on CP524/525.
The following parameters must be selected for the respective assembly with the parameterization software by Siemens:

Procedure:	3964R
Interpreter:	RK512
Procedure parameter:	9600 baud, character length 8, 1 stop bit, even parity, lower priority
Order block:	order number 1
Order type:	SEND
Source- / destination address:	arbitrary
DB number:	arbitrary
Coordination flag:	arbitrary

Note: For this connection type the distance between the lowest and highest data word used in the tag range of the data building block may be 127DW. If the lowest tag is placed in DW78, the highest would be found in DW205.

5.15 MODBUS Protocol (Operator panel Slave)

Compared to the other PLC protocols in this situation the operator panel is passive. The control computer independently accesses the data building block of the PLC mode in the operator panel via the MODBUS protocol. The operator panel operates as slave; the slave address can be selected in the **PROTOCOLS MENU** (refer to page 13).
The control computer sends a command (*Message*) with a certain function code to the operator panel which will in return send an answer (*Response*) to the control computer.

Framing:	8 Bit (RTU)
Slave address:	1...32 (can be selected in setup)

Applicable MODBUS functions:

Function code	Name	Description
1	Read Coils	individual bits or bit chains of tag length will be read beginning with a certain bit address
3	Read Output Registers	individual or multiple data words will be read beginning with a certain data word address
4	Read Input Registers	individual or multiple data words will be read beginning with a certain data word address
6	Load Register	exactly one data word will be written
8	Loopback Test	test function for the communication system
15	Force Multiple Coils	individual bits or bit chains of tag length will be written beginning with a certain bit address
16	Load Multiple Registers	individual or multiple data words will be written beginning with a certain data word address

Supported MODBUS error messages:

Exception Code	Name	Description
1	Illegal Function	The command (message) received includes a function code which is not supported by the operator panel
2	Illegal Data Address	The system attempted to access a bit or data word address which lies outside the data building block

The response sent by the operator panel in case of an error has the following format:

Slave address	80h + Function Code	Exception Code	Check-sum HI	Check-sum LO

The function code of the request with the highest bit set is sent which corresponds to an addition of 80h. The exception code of the error message is located in the third byte.

MODBUS functions in detail

Message:

Slave address	1	Coil address HI	Coil address LO	Coil number HI	Coil number LO	Checksum HI	Checksum LO

Response:

Slave address	1	Byte number	Coils 7...0	Coils 15...8	...	Checksum HI	Checksum LO

Coil address (HI * 256 + LO)
Bit address the system starts to read. The bit address is as follows:

DW0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW1	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
DW2	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
...																

Coil number (HI * 256 + LO)
Number of bits to be read

Byte number
Number of following bytes which include coils.

Coils
Bits read from the data building block. As many bytes are transmitted as necessary for the desired number of bits. If for example 14 bits should be transmitted beginning with bit address 13 the setup of the transmitted bytes looks as follows:

Bit-no.	7	6	5	4	3	2	1	0
1. byte	20	19	18	17	16	15	14	13
2. byte	-	-	26	25	24	23	22	21

Permitted value range: Coil address + Coil number ≤ 4096

Message:

Slave address	3/4	Reg address HI	Reg address LO	Reg number HI	Reg number LO	Checksum HI	Checksum LO

Response:

Slave address	3/4	Byte number	Reg 0 HI	Reg 0 LO	...	Checksum HI	Checksum LO

Reg address (HI * 256 + LO)
Data word address the system starts to read.

Reg number (HI * 256 + LO)
Number of data words to be read.

Byte number
Number of the following bytes which include data words.

Reg
Data words (high byte and low byte) read from the data building block.

Permitted value range: Reg address + Reg number ≤ 256

Message:

Slave address	6	Reg address HI	Reg address LO	Reg data HI	Reg data LO	Checksum HI	Checksum LO

Response:

Slave address	6	Reg address HI	Reg address LO	Reg data HI	Reg data LO	Checksum HI	Checksum LO

Reg address (HI * 256 + LO)
Data word address that is to be written.

Reg data
Value of data word that is to be written (high byte and low byte).

Permitted value range: Reg address ≤ 256

Message:

Slave address	8	Data Diag Code HI 0x00	Data Diag Code LO 0x00	Test Data	Test Data	Checksum HI	Checksum LO

Response:

Slave address	8	Data Diag Code Hi	Data Diag Code LO	Test Data	Test Data	Checksum HI	Checksum LO

Data Diag Code Hi, Data Diag Code Low
Diagnostic Code (subfunction of function 8) for testing purposes of the communication system. The diagnostics code “Return Query Data” (0x00 0x00) will be supported.

Test Data
If the diagnostic code 0x00 0x00 is used the data sent will be sent back to the master unchanged. The data length with the MODBUS limits is arbitrary.

Message:

Slave address	15	Coil addr HI	Coil addr LO	Coil num HI	Coil num LO	Byte number	Coils 7...0	...	Check-sum HI	Check-sum LO

Response:

Slave address	15	Coil addr HI	Coil addr LO	Coil num HI	Coil num LO	Check-sum HI	Check-sum LO

Coil address (HI * 256 + LO)
Bit address the system starts writing. The bit address is as follows:

DW0	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW1	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
DW2	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
...																

Coil number (HI * 256 + LO)
Number of bits to be written.

Byte number
Number of following bytes which include coils.

Coils
Bits written to the data building block. As many bytes are transmitted as necessary for the desired number of bits. If for example 14 bits should be transmitted beginning with bit address 13 the setup of the transmitted bytes looks as follows:

Bit-no.	7	6	5	4	3	2	1	0
1. byte	20	19	18	17	16	15	14	13
2. byte	-	-	26	25	24	23	22	21

Permitted value range: Coil address + Coil number ≤ 4096

Message:

Slave address	16	Reg addr HI	Reg addr LO	Reg num HI	Reg num LO	Byte number	Reg 0 HI	Reg 0 LO	...	Check-sum HI	Check-sum LO

Response:

Slave address	16	Reg addr HI	Reg addr LO	Reg num HI	Reg num LO	Check-sum HI	Check-sum LO

Reg address (HI * 256 + LO)
Data word address the system starts writing.

Reg number (HI * 256 + LO)
Number of data words to be written.

Byte number
Number of following bytes which include data words.

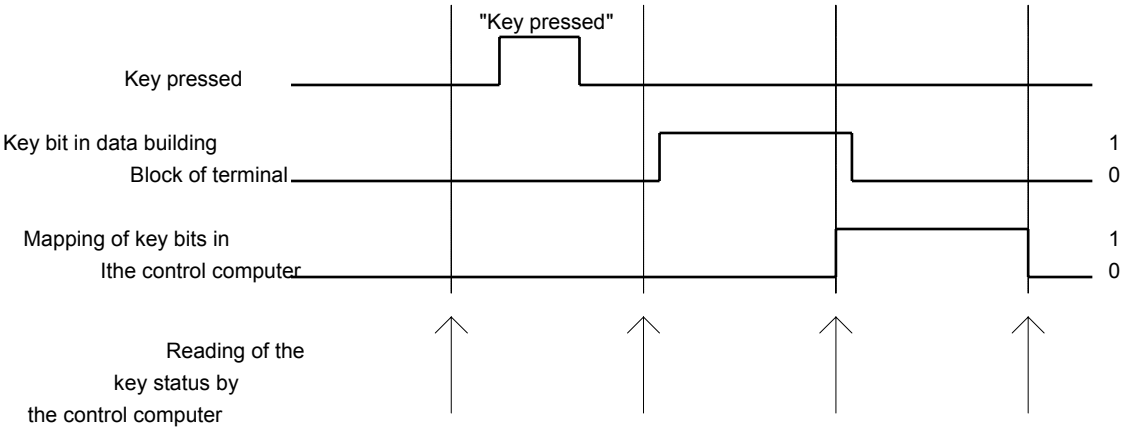
Reg
Data words to be written into the data building block (high byte and low byte).

Permitted value range: Reg address + Reg number ≤ 256

Key status

The data word with key bits must be read at regular intervals (app. 1....2 times per second) to determine the key status on the control computer (functions 1, 3 or 4). After each read access to these

data words, the key status is updated which means that a possible change in the key status is mapped in the key bits. A number of keyboard status changes can be buffered in the operator panel. The following example explains the process:



You can see that even a short key stroke which occurs in between two queries is still captured and extended to a cycle time of the query.
It is absolutely mandatory that all data words with data bits will be read at the same time since even during partial readings the key status is updated. If this is not taken into consideration a loss of information may occur!

LED-Status

LEDs are updated with each read access to one of the respective data words.

Alarm blocks

The alarm display is updated with each write access of the respective data word. It is recommended to get the alarm blocks with a single access.

Tags

In general Output tags and inactive Input/Output tags are updated with each write access. In addition an update with a constant time pulse according to the setting in the setup will occur (refer to *Alarms/Tags auto actual* on page 14). Input/Output tags are immediately updated at the operator panel once they have been entered and can be retrieved at any time. Input/Output tags can be overwritten by the control computer at any time.
It is recommended to group the tags without any empty spaces in the tag range so that an update can be carried out with only one access.

MODBUS error messages

The operator panel functions as slave in the Modbus connection, that is, the master controls it with cyclic Modbus telegrams. In case of a severe malfunctioning of the connection or interruption of the line, the master will acknowledge the problem due to the missing response telegram. Since the frequency of telegrams fluctuates greatly depending on the application it is not always possible for the slave to recognize the problem. In many cases it is extremely important that also the user at the operator panel recognizes that a connection to the master exits.
A communication timeout monitoring can be activated in the Protocols Menu of the Operator panel setup ("Com Timeout Detect" to "on", refer to page 13). In addition the timeout can be set to broader limits (100 ms ... 10 s) ("Com Timeout (ms)"). If the operator panel does not receive a valid Modbus telegram designated for the operator panel, the internal error message.

Modbus Communication Lost Timeout

will be generated. Refer also to "internal alarms" on page 32.

5.16 MODBUS Protocol (Operator Panel is Master)

The operator panel acts as master and accesses a slave with the functions mentioned below. It maps its own data block in the slave. This slave must be a controller!
The operator panel cannot perform controller functions itself, nor can it process or output the data of a peripheral device!

The slave address can be set in the **PROTOCOLS MENU** (refer to page 13).
The operator panel sends a command (*alarm*) with a defined function code to the slave, which sends an answer (*response*) back to the control computer.

Framing: 8 bits (RTU)
Slave address: 1 to 32 (selected in the setup)

MODBUS functions used by the operator panel:

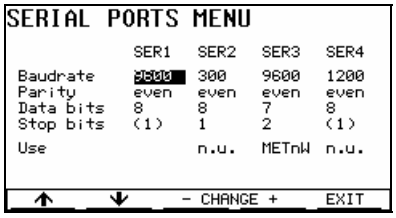
Function code	Designation	Description
3	Read Output Registers	The operator panel reads the data words in the slave using one of these two functions (settable in the setup)
or 4	Read Input Registers	
16	Load Multiple Registers	The operator panel writes the data words in the slave using this function

5.17 Allen Bradley Protocol

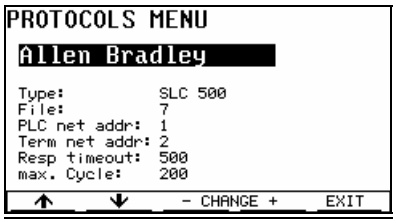
Available PLC types

The system operates in the DF1 protocol using all controls of the SLC-500 group as well as controls of the PLC-5 group. The only exception is PLC-5/250. The group of SLC-500 controls includes SLC-500 fixed controls and the module controls SLC-5/01, SLC-5/02, SLC-5/03, and SLC-5/04. Prerequisite is a free interface RS232 which can be used to process the DF1 protocol.

Selections in the setup



Baudrate: recommended value: 9600
Parity: recommended value: even
Data bits: 8
Stop bits: 1



Type: PLC group which the operator panel is connected to. So far the types SLC-500 and PLC-5 (except for PLC-5/250) are available.

File: Data file which is used for data exchange between PLC and operator panel. This data file must be an integer type. It must be initialized in the PLC with a length of 256 data words! (Default value: File = 7 ⇒ first integer data file)

PLC net addr: Network address which is used by TERMEX 330 to address the PLC. This address must also be entered in the configuration of the communication channel in the PLC! (Default value: PLC net addr = 1).

Term net addr: Operator panel network address. This address can be selected at random. The only condition that must be met is that *Operator panel net addr* is not the same as *PLC net addr*.

Resp timeout: Response timeout is the time period (in ms) during which the PLC must have responded to a command request by the operator panel. This time period must be greater than the cycle time of the PLC. The default setting is 500 ms. This value should only be modified if the cycle time of the PLC is very large (> 500 ms). The default value should remain unchanged for "standard" cycle times of the PLC.

max. Cycle: Maximum value of the PLC cycle time (in ms). This value must always be larger than the cycle time possible in the PLC. But it should not be unnecessarily large, otherwise the data transmission is too slow. This setting warrants that a data building block is only transmitted once in a PLC cycle. The procedure is necessary to make sure that the transmitted data from the PLC have been already evaluated prior to being overwritten. Controls without their own communication processor (SLC-series) do not require this type of monitoring. The value "Not Used" should be selected in the setup for fast communication. The default value is 200 ms.

Preselected communication parameters

NAK retries: 3
ENQ retries: 3
ENQ timeout: 500 ms

Settings on the Allen-Bradley PLC

Communication data file:
Communication between the PLC and TERMEX 330 is carried out via a data file in the PLC. The number of this data file is selected in the operator panel. The data file (integer type with 256 data words) must be set up in the PLC.

Settings on the menu Channel Config:

Channel0 Configuration:

Current Communication Mode:	SYSTEM
System Mode Driver:	DF1 Full Duplex

Channel0 Sys Config:

Baudrate:	Setting as in TERMEX 330 (recommended value: 9600)
Duplicate Detect:	Enable
ACK Timeout [X 20 ms]:	100
Source ID:	Setting corresponding to value of *PLC net addr* in TERMEX 330
Control Line:	NO HANDSHAKING
Parity:	Setting as in TERMEX 330 (recommended value: EVEN)
Error Detect:	BCC
NAK Retries:	recommended value: 3
ENQ Retries:	recommended value: 3
Embedded Responses:	ENABLED

Connection of controllers in the Logix family

All controllers in the Logix family have an RS232 port and can be connected to the TERMEX using the DF1 protocol. This applies to the following controllers:

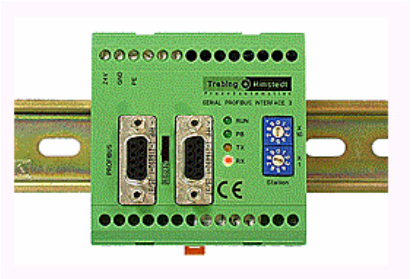
-MicroLogix
-ControlLogix
-CompactLogix
-FlexLogix
-SoftLogix

We recommend using the above-mentioned default values for all communications on the TERMEX side in conjunction with the DF1 protocol.

Note (optional): Allen Bradley also offers special converters from DF1 to DH485 and from DF1 to DH+. Please request these converters direct from AB because they have not been tested by us.

5.18 Siemens S7 PLC via Profibus

Refer to "Startup Manual SK-PROFIBUS SPI3 Profibus-DP Interface



5.19 Siemens S7 via MPI – Interface

Refer to "MPI Adapter Parameterization Manual"

5.20 ET-1 Emulation

Introduction

TERMEX 230 / 330 is equipped with an option for emulation of a ET-1 text operator panel. The text display of the ET-1 is shown in a operator panel window. The window and the respective character set are generated in a project on TERMEXpro and loaded on the operator panel. Only after the project has been loaded the operator panel can emulate SAE ET-1. A suitable project is included.

Installation

A project must have the following characteristics to be used with TERMEXpro:

1. Screen 1 including an emulation window with 4 lines and 32 characters / line and an arbitrary window number.
2. Two switches must be set for the window style ("***Line Feed Mode***", "***D'ont clear at page break***") otherwise emulation will not work correctly.
3. If additional windows are opened in screen 1 for static text the user must make sure that the emulation window described above is located in the foreground.
4. The character set used is arbitrary provided the emulation window can be opened with this character set in the size described. It is important that the character set includes all characters that are necessary for output.

The project must be loaded on the operator panel. Next the user must switch to **ET-1 Emulation** in the *Protocols Menu* and set the desired baudrate in the *Serial Ports Menu*.
The operator panel will display the loaded screen 1 after restarting or resetting the operator panel. Next the ET-1 emulation starts.

Commands

The following commands will be emulated in TERMEX 230/330:

Command	ASCII	Hexadecimal
Set cursor	ESC = X Y	1Bh 3Dh (20h+xx) (20h+yy)
Clear display	ESC *	1Bh 2Ah
Delete entire line	ESC T	1Bh 54h
Delete entire page	ESC Y	1Bh 59h
Enable keyboard	ESC "	1Bh 22h
Disable keyboard	ESC #	1Bh 23h
Inverse ON	ESC G 4	1Bh 47h 34h
Standard setting (Inverse OFF)	ESC G 0	1Bh 47h 30h
Cursor ON	ESC . 1	1Bh 2Eh 31h
Cursor OFF	ESC . 0	1Bh 2Eh 30h
Standard Text	x ... x	

The following commands will not be emulated in TERMEX 230 / 330:

- Standard font size on (only one standard font size is available)
- All caps ON

Remarks:

- A line break is automatically executed at the end of each line
- At the end of the emulation window the cursor returns to Home Position (top left)
- The ET-1-keys 'F11' and 'F12' are assigned to different keys (see below)
- A key switch is not supported
- XON / XOFF is not output in ET-1 emulation

Additional commands

The following commands have been added since the original firmware version.

Command	ASCII	Hexadecimal
Alternative font	ESC Z 1	1Bh 5Ah 31h
Back to main font	ESC Z 0	1Bh 5Ah 30h

The ID for the alternative font must always be 1 higher than for the main font, in other words main = 6 and alternative = 7, for instance. This is necessary to enable international special characters to be used in the ET-1 emulation as well.

Key assignment

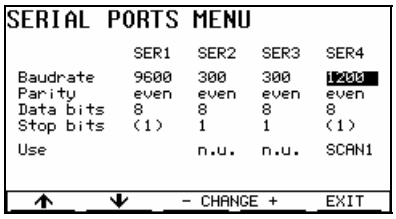
The following key codes are output during ET-1 emulation:

Key	Key code
0...9	30h...39h
.	2Eh
CLEAR (CLR)	1Bh
ENTER (↵)	0Dh
Cursor left (<Shift> 4)	08h
Cursor right (<Shift> 6)	09h
Cursor down (<Shift> 2)	0Ah
Cursor up (<Shift> 8)	0Bh
F1 ... F10	41h...4Ah
F11 (<Shift> 7)	4Bh
F12 (<Shift> 9)	4Ch
'K1', 'K2'	not supported

5.21 BAZ-03/1 Emulation

TERMEX 230/330 allows you to emulate a BAZ-03/1 text operator panel.
It supports the ASCII protocol of the BAZ-03/1. Protocols and special applications other than these cannot be used.

5.22 Barcode Reading



EXTEC - barcode reader (scanner) can be connected to the interfaces SER2 and SER4. For this purpose the connection as well as operator panel configuration must be factory prepared for barcode reader use. If a unit has been set up for barcode reader use the entry "**SCAN1"** or "**SCAN2"** will show under the item *Use* at SER2 or SER4 in the menu *Serial Ports.*

The transmission parameter at the operator panel and scanner must agree to warrant a proper communication. The parameters at the operator panel are selected in the *Serial Ports Menu*, the parameters of the scanner are selected from a barcode list included in the delivery (refer to RS232 INTERFACE, OPERATOR'S MANUAL SUPPLEMENT).

Standard factory settings of the serial interface:

1200 baud
even parity
8 data bits
1 stop bit

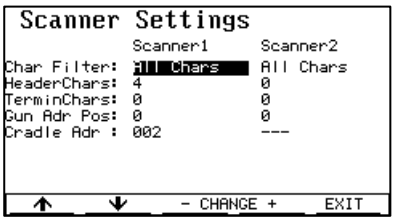
Processing

The barcode read by a barcode reader can be processed in two ways:

- via a **Handle** assigned to the barcode reader which is used to output the character set of the barcode in a selected window or only via the interface in the EXTEC protocol.
- via an **periphery tag** assigned to the barcode reader which outputs the character set at the tag position in the display as well as to the data word position in the data building block.

Scanner	Handle	ID	Page	Tag	Page
Scanner 1	3	"B" (42h)	85	SCAN	110
Scanner 2	5	"C" (43h)	86	SCAN2	110

Settings



The scanner settings submenu of the PERIPHERALS MENU contains various settings for the scanner connection.

Char Filter : The characters with the codes 0...31 may be filtered out of the received sequence („No Chars 0...31“). To pass any characters set to “All Chars”.

HeaderChars : The number of header characters at the beginning of the sequence. These characters were hidden for the output of the barcode via the scanner handle or the SCAN tag. Depending on the scanner configuration start codes or scanner addresses may be filtered. At the output of the scanner sequence via the serial connect and the data area all characters are visible however.

TerminChars : The number of terminator characters at the end of the sequence. These characters were hidden for the output of the barcode via the scanner handle or the SCAN tag. Depending on the scanner configuration CR LF or end codes may be filtered. At the output of the scanner sequence via the serial connect and the data area all characters are visible however.

Gun Adr Pos : The gun address position when a radio scanner is connected to the operator panel. The address can be output through SCANADR or SCANADR2 tags.

Cradle Adr : The cradle address of a connected radio scanner EX-DRAGON-M101. All cradles used in the same area must have different addresses. The operator panel sends the configuration string with the cradle address upon leaving the menu. If the cradle address is set to “---“ no configuration string is sent, this setting should be used for all other scanners than the radio scanner.

Example for a character sequence of a radio scanner:

0	0	3	-	A	B	C	D	E	<CR>	<LF>
Header (here gun address, 4 characters)				Barcode (output in the display)					Terminator (2 characters)	

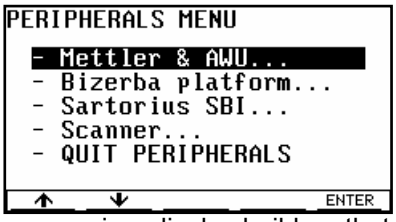
5.23 Mettler Scale

Numerous Mettler scale types can be connected to the interface **SER3**. Connection and operator panel configuration must be factory preset for application of Mettler scales. Whether the operator panel is configured for a particular scale can be checked in the **SERIAL PORTS MENU** under SER3 / Use:

- **Mettler KB...x** - Scales above GD130x (Use: METWM or METnW)
- **Mettler-AWU** (Use: METWM or METnW)
- **Mettler ID5** - Scale operator panel (Use: ID5)
- **Mettler PM....** - Scales (Use: ID5)
- **Mettler PUMA** - Waagen / Mettler ID3 with SICS Level 0 protocol (Use: METPu)
  With this scale there are only limited possiblities available. The Mettler scale operator panel has to be configured to SICS Level 0 und the interface setting must be the same.

A special version of the operator panel allows the user to connect a Mettler K-weighing platform to SER3 and SER2. (SER2-Use: 2.MET).

The scale interface EXTEC AWU also uses the protocol of Mettler scales and hence can be set up and controlled with the menus for Mettler scales.



Scales can be operated in two ways:

Manual scale: the scale is operated as a stand-alone unit without any communication to the control computer. The operator panel supplies a completed display build-up which cannot be modified by the user.

Automatic operation: the scale works during normal operator panel operation (communication with the control computer) in a display build-up that can be arbitrarily defined and provides the control computer with a weight value. The control computer must intercept if scale functions such as “tarring” are to be activated.

Scale setup

The scale can be fully configured through the setup:

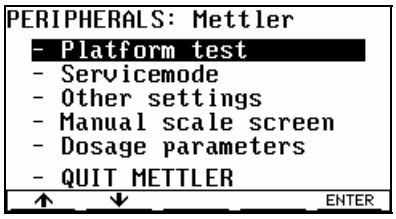
The menu item "Mettler & AWU...” must be selected in the Peripherals menu. The operator panel will then attempt to establish a connection to the scale:

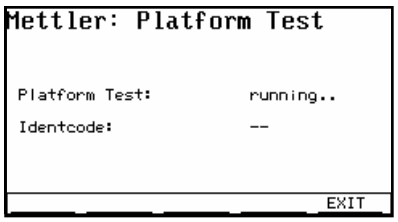
- If no communication can be established the Peripherals menu will appear again after a few seconds.
- If the connection was successfully established the following menu can be accessed.

Reasons for failure may be as follows:

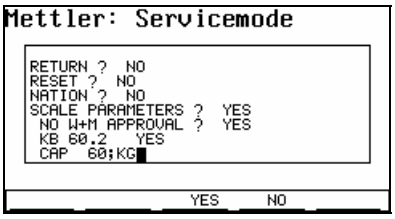
- Weighing platform interface (GD 130x or AWU) not or incorrectly connected to operator panel
- Weighing platform not or incorrectly connected to weighing platform interface (GD 130x or AWU)
- Scale has no power
- Interface SER3 incorrectly configured: The setting on SER3 in the **SERIAL PORTS MENU** must be set as follows: **9600 baud**
  even parity
  7 data bits
  2 stop bits (1 Stopbit with PUMA)

The following items for Mettler scales can be found in the main menu:

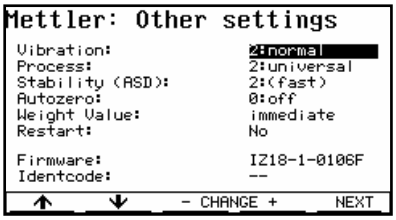




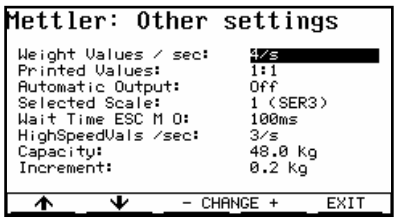
Platform test (only for KB..x - scales and AWU): The weighing platform and its measuring electronics are tested with respect to function and accuracy. The display "laeuft..." (running) will appear during the test procedure. Next "OK !" is displayed provided the test was successful. Should an error occur the system will display "FEHLER !" (error).
The test can be canceled with "EXIT" at any time.
The platform test can be accessed at any time from the operator panel mode with the key combination
<SHIFT ENTER> 4.
The same key combination is used to return to the operator panel mode.



Service mode (only for KB..x - scales and AWU): The service mode permits numerous settings on the scale. A dialog with questions is displayed which must be answered with (YES) or (NO) (Soft keys F3 and F4). The mode can either be exited with the response YES to “SAVE PARAMETERS ?” if changes should be saved, or with YES in response to “RETURN ?” if changes should not be saved.
Additional information with respect to the possible settings can be found in the respective documentation for Mettler scales or EXTEC MVS1.1.
Setting changes in the service mode should only be performed by trained personnel since the number of options is very large and a wrong selection may be made very easily!

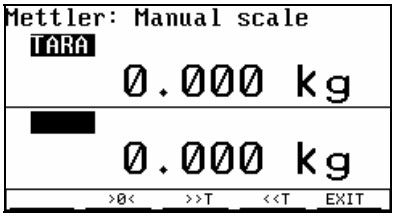


Other settings (only for KB..x - scales and AWU):
Vibration: for adaptation of the scale to vibrations in its environment (1: quiet environment; 2: normal environment; 3: unstable environment)
Process: for adaptation of the weighing process to weighing goods (1: fine dosing for liquid or trickling weighing goods; 2: universal weighing; 3: absolute weighing for solid goods; 4: dynamic weighing)
Stability <ASD> : for selection of weighing speed and accuracy of weighing platform.
Autozero: for correction of zero position. If the autocorrection is switched on the zero position of the scale is automatically readjusted.
Weight Value: immediate output of the current weight value ("immediate") or output of the stationary weight value ("still").
Restart: YES allows an automatic restart of the scale. After power has failed on the scale and/or operator panel, the last zero and tara value are automatically used after the units have been turned on again. Since values are stored in a buffered memory section of the operator panel this function is also warranted if power fails entirely.
Identcode: Output of the identcode (important for calibration). The identcode is increased by one (service mode) after each calibration. If the scale is operated without calibration capabilities, the place holder "--" will appear instead of the identcodes. The identcode cannot be reset or manipulated in any other way.



Weight Values / sec.: (0, **1**, 2, 3, 4, 5, 6, max., High speed) The number of weight values per second the operator panel receives from the scale and then sends to the control computer. If *max.* has been selected 6.4 values/sec., if *high speed* has been selected 12.4 values/sec. are sent. A special Mettler scale which supports this fast weighing mode must be connected for *high speed*. The output mode *AWU Speed* is available for connected AWUs. In this mode the exact rate must be set under AWU Gew.werte/Sek (weight value/sec.). The output of the weight value is pulse controlled, hence the output frequency is very consistent.

Printed Values: (**1:1**, 1:2, 1:3, 1:4, 1:5, 1:6) Dividers for the display rate of the weight values in the window 251 of the operator panel mode. For example 1:3 means that every third incoming weight value is output in the window. Especially for higher weight value rates we recommend the selection of a divider since otherwise the use of the processor may slow down the display build-up and the intended weight value rate cannot be reached respectively.
Automatic Output: (**off**, on) Selection of the automatic weight value output to the control computer.
Selected scale: (**1 (X4)**, 2 (X3)) Selection of scale 1 or 2.
Wait Time ESC M O: A waiting time is determined for the feed-through of Mettler scale commands during which the scale must respond in order to be transferred to the control computer by the operator panel.
HighSpeedVals / sec..: The output rate is determined for the setting *AWU Speed* under *Gew.werte / Sek.*
Capacity: Control display for the maximum load selected for the scale (via service mode).
Increment: Control output of division selected for the scale (via service mode).



Manual scale screen: Display of the weight value providing options for zero setting, tarring, and dosing. This page can be used to operate the scale without the control computer ("stand-alone"). For this reason this page can be directly accessed during normal operation of the operator panel (from outside the setup) by using the key combination **<SHIFT ENTER> 7**. In this case the user can only exit the page by using the same key combination to return to standard operation. A direct transfer into the setup is not possible.

Displays
TARA: Display of the tara value (after tarring or zero setting).
NET: Display of the net weight value when NET is displayed. Otherwise the gross weight value is displayed. If the communication with the scale does not operate properly the message "-----.--- kg" will appear instead of the weight value. If the scale does not offer a valid weight value (excess load, underload) "-----.--- kg" also appears.

Keys

>0<:	Zero setting of a scale: weight value and tara value are reset to zero. If the weight value is not steady the zero setting may take some time.
>>T:	Tarring: the weight value is reset to 0 and the current tara value is displayed. If the weight value is not steady the tarring process may take some time.
<<T:	Delete tara memory: the tara value is reset to 0; the previous tara value will be displayed as weight value.
EXIT:	Exit manual scale and return to the menu: **PERIPHERALS: Mettler**.
F6:	Switch scale to higher resolution.
F7:	Return from higher resolution to standard resolution.

Typical applications :

Application: Simple scale

- The integrated setup-page for operation of the scale is used. The generation of a project is not necessary.
- The page **Mettler: Manual scale** is switched on during operator panel operation either via the setup or the key combination **<SHIFT ENTER> 7**. Weight and tara value will be displayed. The scale can be set to zero, tarred and back-tarred (refer to scale setup).
- A communication with the control computer does not occur. Automatic dosing is not possible.

Application: User defined scale (EXTEC protocol)

- The weight value is displayed in a new screen that has been created by the user.
- This is accomplished by either opening window 251 via the EXTEC protocol or through generation of a screen in TERMEXpro which includes a window with the attribute scale (refer to **[TERMEXpro]**).

- The operator panel will display the current weight value according to the weight and/or display rate selected in the scale setup in this window. The screen around the window can be custom designed using EXTEC commands or TERMEXpro.
- Once a key is pressed the operator panel will output the key code to a connected control computer which will create the respective command sequences for zero setting or tarring (refer to page 91). This method is used to control the scale. As an alternative the key assignment can also be performed through EPCA-programs. In this situation a control computer is not necessary.

Application: Dosing scale (EXTEC protocol)

- The procedure is similar to the *user defined scale*.
- In addition the connected control computer will retrieve weight values from the operator panel if requested (refer to page 91), process these values, and control the dosing via the appropriate actors.
- A better quality of the dosing process can be accomplished through automatic sending of the weight values (refer to scale setup and page 93) since the intervals between the weight values can be kept constant.
- If the actors (e.g. control valves) are directly connected to the operator panel these outputs are controlled with the respective EXTEC command (refer to page 77).
- As an alternative the controlling of the dosing can also be processed on the operator panel itself via EPCA programs. The control computer is not needed in this stand-alone application.

Application: Scale connected to a PLC

- A project must be generated in TERMEXpro in which the tag NWEIGHT will be defined and output to the respective screens.
- The update of the weight values in the data building block is processed by the operator panel along with the clock for general update of tags. The system uses a currently available weight value in the operator panel which is retrieved from the operator panel according to the clock selected in the setup. Hence it is possible that a weight value is picked up 4 times per second from the operator panel but is only output to the display according to the clock of the tag update which is once per second.
- The PLC can continue to process the weight value by reading the weight value from the data building block. Regarding the format of the NWEIGHT tag refer to page .
- It must be pointed out that dosing through the PLC is normally impossible due to speed reasons since an update of the NWEIGHT tag can only be performed once per second (S5 protocols and Allen Bradley). It may only be possible in very slow dosing runs.
- A better result can be accomplished through a dosing control using EPCA programs.

Additional information

- Window 251 should have only one line and a minimum width of 13 characters. Otherwise the weight value cannot be displayed correctly. Different displays are not possible in this window since commands for the setting of the handle on window 251 are always ignored. If the weight value should be supplemented with other labels either preceding or following the value, additional windows must be opened.
- If the communication with the scale does no operate properly in window 251 and for the NWEIGHT tag the message "-----.--- kg" will appear instead. Refer to the section "Setup" for additional troubleshooting. If the scale does not provide a valid weight value (excess load, underload), "-----.--- kg" also appears.
- Due to communication with the scale short delays may occur during the processing of commands, reception of keystrokes, or scanner codes. During a malfunctioning of the communication the operator panel continuously attempts to establish a connection to the scale. Hence more significant delays may occur during such time period.

- Certain special key combinations are recognized by the operator panel mode:
  <SHIFT ENTER> 4: to access the scale test
  <SHIFT ENTER> 7: to access the manual scale
  These key combinations can be switched off in the operator panel setup.

Special issues regarding versions for calibration

The operator panel can be delivered in a version that can be calibrated. Certain issues must be taken into consideration:
A version for calibration is labeled METWM under SER3 Use in the Serial Ports Menu in the setup. A version that cannot be calibrated would read METnW.
Only displays through the window 251 can be calibrated, not displays through the NWEIGHT tag.

- The display window for weight values (window 251) is protected. It is not possible to open additional windows if these windows would overlap the output window. In addition, the display of characters via free text output is not possible.
- The output of the weight value to the controlling computer via ESC "M" "S" is only possible if window 251 is truly open and active. Is this not the case, an error code is returned instead of the weight value (refer to page 91).
- When opening window 251 the operator panel will automatically open an additional designator window 252 which is also protected in a similar fashion to window 251. Depending on the character set used, an increased need for space must be considered for the output of coordinates.
- Window 252 is then opened at the position of the transferred data. Window 251 will be to the right of window 252.

Character set 1, 2, and 4:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		
N	**E**	**T**		**_**	**_**	**_**	**1**	**2**	**.**	**3**	**4**	**5**	**_**	**k**	**g**		
Window 252				Window 251													

Character set 3:

1	2	3	4	5	6	7	8	9	10	11	12	13
N E T	**_**	**_**	**_**	**1**	**2**	**.**	**3**	**4**	**5**	**_**	**k**	**g**
Win-dow 252	Window 251											

- The name "NET" is displayed if the tara value of the scale does not equal 0.
- To open a weight value window with character set 3 the window in the far left must be opened.
- As soon as the weight value window is closed the designator window is also automatically closed.

Special issues for versions with 2 scales

- In principle two Mettler scales can be connected to TERMEX 2xx / 3xx at the same time. In this case the operator panel must be setup and configured differently in the factory. The option for connection of two scales is displayed in the operator panel setup in the menu *Serial Ports* under *Use*:
  1. Scale (SER3, connection X4): METnW or METWM
  2. Scale (SER2, connection X3): 2.MET
- Only one scale can be active at one time. The changeover can be either performed in the setup or via a control command in the EXTEC protocol (refer to page 93).
- After the operator panel has been switched on or a reset has been performed, scale 1 is always active.

5.24 Bizerba Scale

The Bizerba operator panel ITE can be connected to interface SER3 via the PC/EDV interface. The connection as well as the operator panel configuration must be prepared in the factory for this type of scale. Whether the operator panel has been configured or not can be determined from the **SERIAL PORTS MENU** at SER3 / Use:

- **Bizerba ITE** - Operator panel via GD130x (Use: Biz)

The scale can be operated in two ways:

Manual scale: The scale is operated without communication to the control computer (stand-alone). The operator panel provides a complete display build-up which cannot be modified by the user.

Automatic operation: The scale functions during standard operator panel operation (communication with the control computer) with an arbitrarily definable display build-up and provides the control computer with the weight value. The control computer must intercept if scale functions such as “tarring” are to be activated.

Selection of ITE

Certain steps must be performed in the parameter menu of the ITE service menu so that communication with the operator panel can be accomplished. The settings can only be performed on the ITE itself.

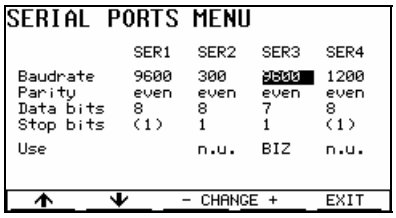
The parameter menu can be accessed as follows:

90 → MOD → Service password → MOD → MOD

Necessary settings:

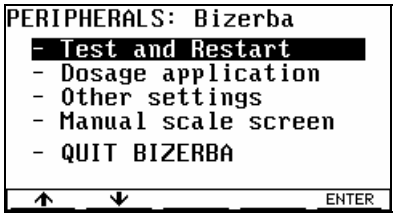
Step no.	Value	Remarks
70	23	Channel 1: PC/EDV interface
71	62	Channel 2: Dosing, 8 x E/A
72	0	Channel 3: not used
80	9600E7	9600 baud, even parity, 7 data bits
81	0	Receiving prompt switched off
82	0	Positive acknowledgment switched off
83	15	Negative acknowledgment 15h (NAK)
84	0	Start character switched off
85	0	Separator switched off
86	D	1. end character 0Dh (CR)
87	A	2. end character 0Ah (LF)
88	0	Border of the receiving prompt switched off
89	100	Timeout 100 x 0.01s
90	2	Min. waiting time 2 x 0.01s
91	1	Comma switched on
92	0	Block check character switched off
93	0	Repeat counter switched off
94	3	Number of repeats
95	1	Logic acknowledgment switched on
96	0	Header in data record switched off
97	1	Preceding zero suppression switched on

Setup



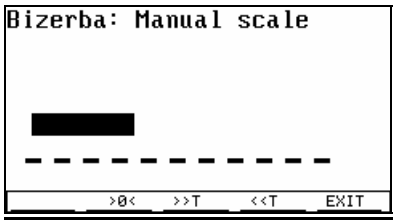
Baudrate: 9600
Parity: even
Data bits: 7
Stop bits: 1

Select the menu item Bizerba platform from the menu.
You can now access the main menu for the Bizerba scale.



The following items are available:
Test and Restart: Automatic function test of the ITE electronics and display. The same result can be achieved by pressing the key ∇ directly at the ITE.
Dosage Application: not yet supported
Other settings: not yet supported
Manual scale screen: refer to following section

-



Manual scale screen: Display of the weight value with the option of zero setting, tarring and dosing. This page can be used to operate the scale without the control computer ("stand-alone"). For this reason this page can be directly accessed during normal operation of the operator panel (from outside the setup) by using the key combination **<SHIFT ENTER> 7**. In this case the user can only exit the page by using the same key combination to return to standard operation. A direct transfer into the setup is not possible.

Display

WEIGHT:	Display of gross weight value
NET:	Display of net weight value (displayed after tarring has been completed)

Keys

>0<:	Zero setting of scale: the weight value is reset to 0
>>T:	Tarring: Instead of the gross weight the net weight (0) is displayed.
<<T:	Delete tara memory: Instead of the net weight the gross weight is displayed. The tara is added to the net weight.
EXIT:	Exit manual scale and return to PERIPHERALS: Bizerba menu.

The following weight values can be displayed instead of error messages:

----------	Communication to scale interrupted
nnnnnnnnnn	Excess load
uuuuuuuuuu	Underload

Automatic scale operation

- The weight value always appears in **Window 251** in the operator panel mode. The window must first be opened by the user. Window 251 should have only one line and a minimum width of 13 characters per line, otherwise the weight value cannot be displayed correctly. Different displays are not possible in this window since commands for the setting of the handle on window 251 are always ignored. If the weight value should be supplemented with other labels either preceding or following the value, additional windows must be opened.
- In case of malfunctioning the same error message as for the output of weight values through manual scales appears on the screen.
- Due to communication with the scale short delays may occur during the processing of commands, reception of keystrokes, or scanner codes. During a malfunctioning of the communication the operator panel continuously attempts to establish a connection to the scale. Hence more significant delays may occur during such time period.

5.25 Sartorius Scale

Settings in the operator panel setup:

- Extended menu:
  The use of SER2 or SER3 must be selected to Sartorius with the SBI protocol. A connection to SER2 and SER3 at the same time is not recommended.

- Serial ports menu:
  The interface used by the Sartorius scale must be configured in the serial ports menu according to the settings selected for the scale. This configuration concerns the values baudrate, parity, and stop bits; the number of data bits must be set to 7.

We recommend the following settings:

Baudrate:	9600
Parity:	even
Data bits:	7 (mandatory!)
Stop bits:	1

- Peripherals menu:
  Selection: Sartorius SBI

Communication	Basic settings for communication with scale
Settings	Possible settings on scale
Calibrate	“Service functions“ of scale
Manual scale screen	Standard weighing operation

Selection: Communication

MaxRespTime:	Interval (in ms) during which the scale must receive a new value for display, otherwise the display will be switched off.
Output length:	Output format of scale: SBI protocol with 16 or 22 characters. Note: Scales with keypad have a data output format with labels (22 characters), scales without keypad have a data output format without labels (16 characters).
Print mode	Print mode in which data from the scale is output to the interface. Possible values are Single (on print command) or Auto (synchronous to display). This setting must be selected according to the operating program of the scale. On this scale it can be differentiated whether the output occurred after a complete stop or not. For output without complete stop the user can follow how the displayed value levels out. For output after a complete stop a timeout may occur between two weight values and the display will be deleted. The display will reappear as soon as a display value has become available.

Selection: Settings

Keyboard	Provides the option to block the keyboard on the scale. The ON/OFF remains accessible. After the scale has been restarted the keyboard is accessible again according to the selections made in the operating program of the scale.
Ambient condition	very quiet - very unquiet
Weight unit	Unit of the displayed weight value.
Values/sec.	Displays how often the displayed value must be updated in one second.

Selection: Calibrate

Selftest/Reconfig.	Performs a selftest and reconfiguration according to the setting in the operating program of the scale.
Tare	Tarring process is started.
Calibrate	Calibration process is started.

Selection: Manual scale screen

Displays the weight value of the scale as well as a tarring function.

Automatic scale operation:

During automatic operation the weight value always appears in **Window 253** which first must be opened by the user. The window should have only one line and a minimum width of 14 characters per line, otherwise the weight value cannot be displayed correctly. During a malfunctioning of communication to the scale „----------“ is displayed instead of the display value of the scale. During

this time the operator panel continuously attempts to establish a connection to the scale. Hence more significant delays may occur during such a time period.
Refer to page 95 for available commands.

Connection of two scales:

You can connect two Sartorius scales to the operator panel simultaneously. The two scales work parallel to and independently of one another. Their values are displayed in different fields in automatic mode. The two weight values can be processed concurrently in EPCA, and the scales separately controlled and queried using the EXTEC protocol. They are assigned as shown in the table below:

	Scale 1	**Scale 2**
Settings	SartorSBI1	SartorSBI2
Interface	SER3	SER2
Field	251	253
EPCA scale	1	2
EXTEC commands ESC S ...	S,T,Z,A	s,t,z,A

Troubleshooting

Error:	Possible cause:
The scale does not receive a display value. The display is dark.	⇒ Scale is not switched on ⇒ Scale is not connected to operator panel ⇒ Settings of used interface and scale not identical (baudrate, parity, stop bits, data bits = 7!) ⇒ 2 interfaces selected on operator panel for Sartorius scale ⇒ Data output length of scale incorrectly selected in operator panel ⇒ Position of scale very unstable, hence does not provide final weight values
It is not possible to access the Sartorius menu from the setup	⇒ Communication to scale not possible ⇒ Scale not connected ⇒ Scale is switched off
For a moment the screen turns dark between the display of two weight values	⇒ The print mode (Auto/Single) of the scale is selected incorrectly on the operator panel ⇒ Communication to scale is malfunctioning

5.26 Load Errors

Load errors

Load errors appear immediately after loading a project. Reasons are errors in the project or when the project demands too much of the operator panel (see chap. 6.7).

5.27 Firmware Update

A firmware update is available for firmware VR5.00 and higher in combination with the TERMEX 220/230/320/330 generation. This update gives you access to new functionalities and avoids problems occasionally encountered with older firmware versions.
The latest firmware version can be downloaded free of charge from our website www.pepperl-fuchs.com.

Procedure:

1. Connect TERMEX to the serial port (ENT-DC to PC).
2. Set TERMEX to the EXTEC protocol in the setup, then close the setup.
3. Start TERMEX PRO's EXTEC Loader (exloader.exe, Version > 3.0).
4. Set the COM interface and the baud rate for the TERMEX ("Settings").
5. Open a file called t330_xxx.bin ("Project"). A file called t330_xxx.key should be contained in the same folder.
6. Download the firmware ("Download").
7. When the TERMEX trips a reset, the display goes blank and shows "BOOT".
8. When the download has finished (after approx. 8 minutes), the new firmware is started automatically. Any projects that are already loaded are still open and all valid settings remain stored.

Note:

If the download is interrupted, you must switch off the TERMEX briefly and then switch it back on again. The display remains blank because at this moment in time no valid version of the firmware is installed. You can then attempt to load it again straight away (starting with step 5). However, the word "BOOT" is not displayed.

6 Reference

6.1 EXTEC protocol commands

Displayed below is the syntax used for commands to the operator panel:

ESC: Control character escape (Code: 1Bh)
"X": Code of ASCII character X (here: 58h)
x: Tag (1 byte, 0...255)
aah: Hexadecimal aa
... : additional characters must follow

ASCII: ASCII codes
HEX: HEX codes

Only the commands listed in this chapter may be sent to the operator panel. Different command sequences may lead to errors! Certain commands are not valid for TERMEX 220 / 320 (refer to quick overview of commands).

Quick overview (in logical order)

Description	Terminal command	TERMEX 230/330	TERMEX 220/320	ANSI/VT100 compatible	Page
Clear display	ESC "*"	•	•		**75**
Enable internal keyboard	ESC """	•	•		**75**
Disable internal keyboard	ESC "#"	•	•		**75**
Hardware reset	ESC "A" "2"	•	•		**75**
Query ready for operation	ESC "A" "5"	•	•		**75**
Display screen n	ESC "G" n	•	•		**75**
Display version no. of firmware	ESC "?"	•	•		**76**
Write data words in DB	ESC "y" ...	•	•		**76**
Read data words in DB	ESC "z" ...	•	•		**77**
Control switching outputs SAV-4	ESC "s" sz ko	•	•		**77**
Control beeper	ESC "r" vhigh vlow	•	•		**78**
Character output via SER1…SER4	ESC "o" port num $z_1 \ldots z_{num}$	•	•		**78**
Set date and time	ESC "T" yh y mo d dw h mi s	•	•		**79**
Disable keys	ESC ESC "#" num $km_0 \ldots km_{11}$	•	•		**79**
Set cursor for free text output	ESC "C" x y	•	•		**80**
Select character set for free text output	ESC ESC "y" n	•			**80**
Open text window	ESC ESC "W" x y xmz ymz n c h	•			**80**
Close text window	ESC ESC "w" h	•			**81**
Set text window style	ESC ESC "Q" q1 q2 h	•			**82**
Set style bits	ESC ESC "C" q1 q2	•	•		**84**
Delete style bits	ESC ESC "c" q1 q2	•	•		**84**
Set Handle1 (text from SER1)	ESC ESC "H" "1" h	•			**84**
Set Handle2 (input from keyboard)	ESC ESC "H" "2" h	•			**85**
Set Handle3 (input from SCAN1)	ESC ESC "H" "3" h	•			**85**
Set Handle5 (input from SCAN2)	ESC ESC "H" "5" h	•			**86**
Activate text window	ESC ESC "A" h	•			**86**
Text window invisible	ESC ESC "a" h	•			**86**
Generate soft key bar	ESC ESC "K" num $txtf_1 \ldots txtf_{num}$	•	•		**86**
Delete characters, BS	8h	•	•	•	**88**
Line feed, LF	Ah	•	•	•	**88**
Carriage return, CR	Dh	•	•	•	**88**
Cursor up	ESC "[" (nn) "A"	•	•	•	**88**
Cursor down	ESC "[" (nn) "B"	•	•	•	**88**
Cursor forward	ESC "[" (nn) "C"	•	•	•	**89**
Cursor backwards	ESC "[" (nn) "D"	•	•	•	**89**
Cursor absolute	ESC "[" (yy) ";" (xx) "H"	•	•	•	**89**
Delete current line	ESC "Y"	•	•		**89**
Set pixel	ESC ESC "P" x y	•			**90**
Delete pixel	ESC ESC "p" x y	•			**90**
Draw line	ESC ESC "L" x1 y1 x2 y2	•			**90**
Delete line	ESC ESC "l" x1 y1 x2 y2	•			**90**
Draw rectangle	ESC ESC "S" x1 y1 x2 y2	•			**90**
Delete rectangle	ESC ESC "s" x1 y1 x2 y2	•			**91**

Description	Terminal command	TERMEX 230/330	TERMEX 220/320	ANSI/VT100 compatible	Page
Draw bar	ESC ESC "B" x1 y2 x2 y2	•			**91**
Delete bar	ESC ESC "b" x1 y1 x2 y2	•			**91**
Reset Mettler scale to zero	ESC "M" "Z"	•	•		**91**
Tare Mettler scale	ESC "M" "T"	•	•		**91**
Mettler scale, send weight value	ESC "M" "S"	•	•		**91**
Mettler scale, number of weight value / sec	ESC "M" "A" n	•	•		**92**
Mettler scale, divider for weight value display	ESC "M" "D" n	•	•		**93**
Mettler scale, switch automatic output of weight value ON / OFF	ESC "M" "R" n	•	•		**93**
Mettler scale, select scale 1 / 2	ESC "M" "C" n	•	•		**93**
Mettler scale, commands for feed-through operation	ESC "M" "O" ... CR LF	•	•		**94**
Bizerba scale, commands	ESC "B" "O" ... CR LF	•	•		**94**
Sartorius scale, zero setting	ESC "S" "Z" ESC “S“ “z“	•	•		**95**
Sartorius scale, tarring	ESC "S" "T" ESC “S“ “t“	•	•		**95**
Sartorius scale, send weight value	ESC "S" "S" ESC “S“ “s“	•	•		**96**
Sartorius scale, number of weight values / sec	ESC "S" "A" n	•	•		**97**

Individual description of commands

Clear display	ASCII: **ESC "*"** HEX: 1Bh 2Ah

- Each pixel of the display will be deleted.
- All text windows open at this time will automatically be closed.
- The existing soft key bar is also deleted.
- All tags displayed will be deleted in a logical order.
- Any alarm waiting during the delete process is regenerated afterwards.

Enable internal keyboard	ASCII: **ESC """** HEX: 1Bh 22h

- Enables the internal keyboard after disabling through ESC "#"

Disable internal keyboard	ASCII: **ESC "#"** HEX: 1Bh 23h

- Any subsequent keys used after this command will be completely ignored, not buffered or possibly output later.

Hardware reset	ASCII: **ESC "A" "2"** HEX: 1Bh 41h 32h

- Triggers a hardware reset which equals a start-up of the operator panel. This command can be used to access the operator panel setup without interrupting the power supply.
- The execution of a reset requires a few seconds. The start-up message will be displayed for an additional 4 seconds.
- If the user wants to make sure that the unit is ready for operation after a reset has been performed the command **Query "Ready for Operation"** on page 75 can be used.

Query "Ready for Operation"	ASCII: **ESC "A" "5"** HEX: 1Bh 41h 35h

- Will be answered with ACK (Code: 06h) via SER1 when ready.
- If no response should be received after several tries a hardware problem with respect to connection of the operator panel may exist.

Display screen n	ASCII: **ESC "G" n** HEX: 1Bh 47h ...

Parameter: n: Screen number (1...255)

- Screen *n* is displayed.
- If a screen with the number *n* does has not been loaded the query will be ignored.

Change language	ASCII: **ESC "L" n** HEX: 1Bh 4Ch ...

Parameter: n: Language number (1 to 32)

- The language changes to language number *n*.
- The display is switched between screens and alarms.
- If a language with the number *n* does not exist, the screen continues to be displayed in the old language but the alarm is not rebuilt.
- You can also select the language using the data block or in EPCA (refer to the relevant sections).

Display version no. of firmware	ASCII: **ESC "?"** HEX: 1Bh 3Fh

- The operator panel sends the operator panel name, the version number as well as the serial number to the serial interface SER1 in a formatted form followed by a carriage return (e.g.: "TERMEX_330_VR5.18.e01" LF for version VR5.18 with serial number 29443).

Write data words (in data building block)	ASCII: **ESC "y" .....** HEX: 1Bh 79h ....

- The data building block which is otherwise used by PLC protocols can be accessed via the EXTEC protocol. Hence tags, bars, and alarms can be applied in such connections.
- The difference to other PLC protocols is that the control computer must actively read and write data.

Write data words

In the following example 4 data words are written beginning with address 80h (decimal 128).

Command header		DW start address		Number of DWs		Data words to be written							
		High byte	Low byte	High byte	Low byte	H	L	H	L	H	L	H	L
ESC	**'y'**	**0h**	**80h**	**0h**	**4h**	**0h**	**1h**	**0h**	**2h**	**0h**	**3h**	**0h**	**4h**
1Bh	79h	0...255		1...256		DW 128		DW 129		DW 130		DW 131	

Response from operator panel to writing of data words

Beginning of block		Length	Command desc.	DW start address		Number of DWs		End of block
				High byte	Low byte	High byte	Low byte	
STX	**'D'**	**num**	**'y'**	**0h**	**80h**	**0h**	**4h**	**ETX**
2h	44h	5h	79h					3h

Result in data building block for above example

DW	Contents
...	
80h	0001h
81h	0002h
82h	0003h
83h	0004h
...	

Read data words (from data building block)	ASCII: **ESC "z" .....** HEX: 1Bh 7Ah ....

Read data words

In the following example 4 data words are read beginning with address 80h (decimal 128).

Command header		DW start address		Number of DWs	
		High byte	Low byte	High byte	Low byte
ESC	**'z'**	**0h**	**80h**	**0h**	**4h**
1Bh	7Ah	0...255		1...256	

Response from operator panel to reading of data words

Beginning of block		Length	Command desc.	DW start address		Number of DWs		Data words read								End of block
				High	Low	High	Low	H	L	H	L	H	L	H	L	
STX	**'D'**	**num**	**'z'**	**0h**	**80h**	**0h**	**4h**	**0h**	**1h**	**0h**	**2h**	**0h**	**3h**	**0h**	**4h**	**ETX**
2h	44h		7Ah					DW128		DW129		DW130		DW131		3h

Control switching outputs DIGIO	ASCII: **ESC "s" sz ko** HEX: 1Bh 73h ....

- The three switching outputs on a DIGIO33 card can be controlled directly with a command. Hence dosage applications are possible in which the controlling computer controls the dosage process based on the received weight values.

Example:

Command header		Switching status sz	Control ko
ESC	**'s'**	**0x01**	**0xFE**
1Bh	73h	0x00...0xFF	Complement of switching status (ko=255-sz)

Bit no.	Output
0	1
1	2
2	3
3	4
4	
5	
6	
7	

- A set bit means the switching output is on, in other words the contacts are closed.
- The control byte must also be transferred. The control byte must be the complement of the switching status to achieve valid transmission (the sum of both bytes results in 0xFF = 255). If this condition is not met the operator panel will switch off all outputs.
- In the above example output 1 is switched on; all other outputs (2, 3, 4) are switched off.

Control beeper	ASCII: **ESC "r" vhigh vlow** HEX: 1Bh 72h ....

- The integrated beeper (only optional) can be controlled with this command.

The possible commands:

vhigh	vlow	effect
0h	0h	switch off beeper
FFh	FFh	switch on beeper
xxh	yyh	switch on beeper for a limited time, after that time it will be switched off automatically. The number xxyyh is a multiplier of 10 ms (Time = (256*xx + yy) *10ms).

Examples

ESC "r" 0h 64h	the beeper is switched on for 1 s. (64h = 100d, 100*10ms = 1s)
ESC "r" 3h E8h	the beeper is switched on for 10 s. (3E8h = 1000d, 1000*10ms = 10s)

- The commands for switching off and on overwrite a preceding command for limited switching on. That means for the switch-off command that the beeper will be switched off immediately, although the time isn't over. And that means for the switch-on command that the beeper remains on, although the time has been over.
- The beeper is switched on for a short time during the start-up message to test correct function.

Character output via SER1...SER4	ASCII: **ESC "o" port num Z_1...Z_{num}** HEX: 1Bh 6Fh ....

Parameter:
- port: port number of the serial interface (SER1: 0x01 …. SER4: 0x04).
- num: number of the following charcters that have to be output.
- z_x: auszugebende Zeichen

- This command can be used to send characters to the serial interface determined in *port*. The number of the characters that have to be output must be given in *num*.
- For port=0x01 the characters will be echoed by the operator panel.
- For port=0x02…0x04 the charcters are sent to connected peripheral devices.
- This command should only be used with care. It may cause communication errors at such devices, where the operator panel uses own software drivers (e.g. scales).

It may be useful for the control of barcode scanners. For example it is possible to control the display of the radio scanner EX-DRAGON-M101.

Set date and time	ASCII: **ESC "T" yh y mo d dw h mi s**
	HEX: 1Bh 54h ....

Parameter:

- yh: millennium in the upper 4 data bits, century in the lower 4 data bits (BCD format).
- y: decade in the upper 4 data bits, digit for single numbers of the year in lower 4 data bits (BCD format).
- mo: first decimal for month in upper 4 data bits, second decimal for month in lower 4 data bits (BCD format).
- d: first decimal for day in upper 4 data bits, second decimal for day in lower 4 data bits(BCD format).
- dw: describes the day of the week (sun - sat) with the numbers 0-6.
- h: first decimal for hour in upper 4 data bits, second decimal for hour in lower 4 data bits (BCD format). The hour selected is output in the 24 h clock.
- mi: first digit for minutes in upper 4 data bits, second digit for minutes in lower 4 data bits (BCD format).
- s: second digit for seconds in upper 4 data bits, seconds digit for seconds in lower 4 data bits (BCD format).

Example:
Set time and date to Tuesday, May 21, 1996, 22.00 hours, 15 minutes, 27 seconds.

Start of command	Command code	Date century	Date year	Date month	Date day	Date weekday	Time hour	Time minutes	Time seconds
ESC	T	0x19	0x96	0x05	0x21	0x02	0x22	0x15	0x37

Disable keys (key status bits)	ASCII: **ESC ESC "#" num km_0...km_{11}**
	HEX: 1Bh 1Bh 23h ....

Parameter:

- num: number of following mask bytes (must be 12)
- km_x: mask bytes (bit=1 key enabled; bit=0 key disabled)

Assignment:

km0	F4	F3	F2	F1	.	1	4	7	BOT	MNS	SHT	F5	0	2	5	8	**km1**	(DW 4)
km2	TOP	PLS			CR	3	6	9									**km3**	(DW 5)
km4	T29	T28	T20	T19	T11	T10	T2	T1	T31	T30	T22	T21	T13	T12	T4	T3	**km5**	(DW 6)
km6	T33	T32	T24	T23	T15	T14	T6	T5	T35	T34	T26	T25	T17	T16	T8	T7	**km7**	(DW 7)
km8	dT4	dT3	dT2	dT1	T36	T27	T18	T9	dE8	dE7	dE6	dE5	dE4	dE3	dE2	dE1	**km9**	(DW 8)
km10	CLE	CRI	INF	SO3	CLR	CDN	SO2		F10	F9	ALT	F6	F8	F7	SO1	CUP	**km11**	(DW 9)

This command is used to disable status bits of keys which are mapped in the data building block. If one key is disabled by a "0" in the mask not the true key status is mapped in the data building block but a "0".
Using this method user options for certain screens can be restricted. Hence the key processing of the controlling computer can be simplified.
Another application is the shielding of certain number keys which are normally used for input of tags. Since through the masking of keys the key status itself is not modified many transmission telegrams to the PLC are not used. This factor may accelerate communication and reduce the response time of key especially for slower protocols.

Set Cursor for free text output	ASCII: **ESC "C" x y** HEX: 1Bh 43h ....

Parameter:
- x: Column (1...240)
- y: Line (1...128)

- The (imaginary) cursor for the free output of text is set to the given coordinates.
- The coordinates indicate the left lower corner of the first character.
- The text output to windows will not be influenced.
- The cursor remains at the set position until it is set in a new position or a character is entered.
- The cursor moves to the right by one position after a character has been displayed.
- If the cursor is set to coordinates outside the screen limit the following characters are not displayed.
- If a displayed character only partially fits on the screen the visible part will be displayed.
- It is possible to set the cursor above the window.
- For text variations of operator panels this command can also be used to set the cursor for text output.

Select character set for free text output	ASCII: **ESC ESC "y" n** HEX: 1Bh 1Bh 79h ...

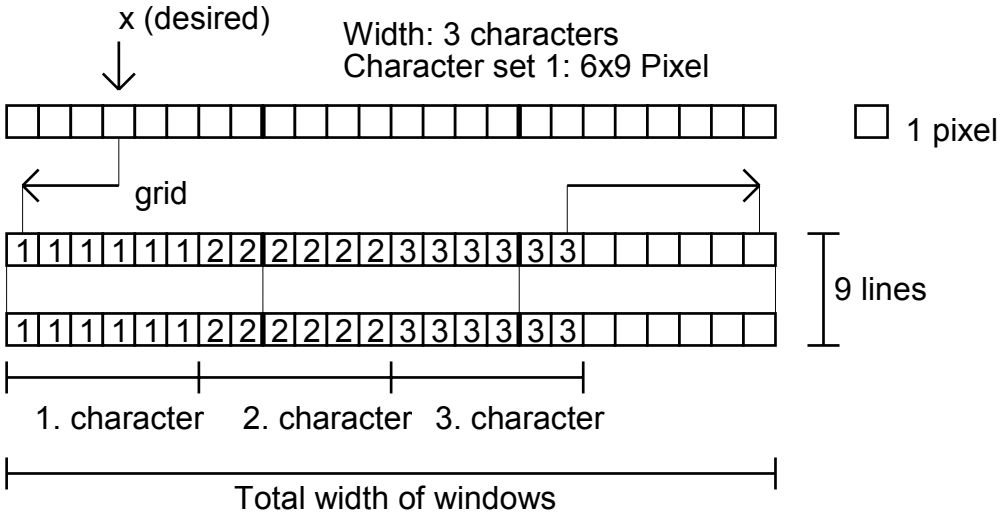
Parameter:
- n: character set no. (1...4)

- A character set for the free text output in the display is determined.
- The selected character set remains valid for free output until this command appears again.
- This command does not effect the character set defined in a window.

Open text window	ASCII: **ESC ESC "W" x y xmz ymz n c h** HEX: 1Bh 1Bh 57h ....

Parameter:
- x, y: Screen coordinates of the left upper window corner.
- xmz: Line length (in characters) in the text window.
- ymz: Number of lines in the text window.
- n: Character set within the text window (1...4 for integrated character sets).
- c: Character color (always 1).
- h: Handle number (individual window ID, 1...255)
  - 1...239: free usable window numbers
  - 240...249: recommended windows for MULTI alarms
  - 250...255: reserved windows (e.g. for output of weights)

- At the given coordinates (*x,y*) a window is opened with *xmz* characters/line and *ymz* lines. The size of the window then automatically depends on the selected character set *n* which must principally only be used within the window.
- If coordinates (*x,y*) are outside the display the command to open the window is ignored.
- If *xmz* or *ymz* are selected so large that they exceed the right or the bottom edge of the window (cross coordinates) the line length *xmz* or the line set *ymz* are reduced until the whole window fits into the display.
- The window is opened in the foreground and therefore active. If the new window overlaps windows which have been previously opened they become inactive, i.e. no characters can be displayed.
- The cursor is placed at the beginning of the window (outer left column, top line).
- The window snaps to an 8 pixel grid in the x-direction when opened so that the left edge of the window can be moved by up to 7 pixels to the left. The right edge of the window moves to the right over the actual required width on to the next grid (see illustration below).



- When the window is opened, the field which is used is not overwritten, but only **superimposed by the window**. As the window is opened other windows become inactive as they are overlapped by new windows. When the window is closed, the superimposed background reappears.
- **Additional settings** in the window are carried out after opening with the **command "Text Window Style"** (refer to page 82). Until the window style is set, a default setting applies (see command "text window style") where the window has no frame or cursor. Therefore, under normal circumstances, the opening of a window is only noticeable by a window background which disappears.
- Settings in a window which have already been determined when the window is opened (e.g. character set) cannot be changed later when the window is opened. In this case the old window must be closed in order to open a new window with the new settings.
- The individual **Handle-no.** must be allocated by the user for the new window so it can be accessed again later. The attempt to open a window with a Handle-no. that has already been allocated will result in the command being ignored.

Close text window	ASCII: **ESC ESC "w" h**
	HEX: 1Bh 1Bh 77h ...

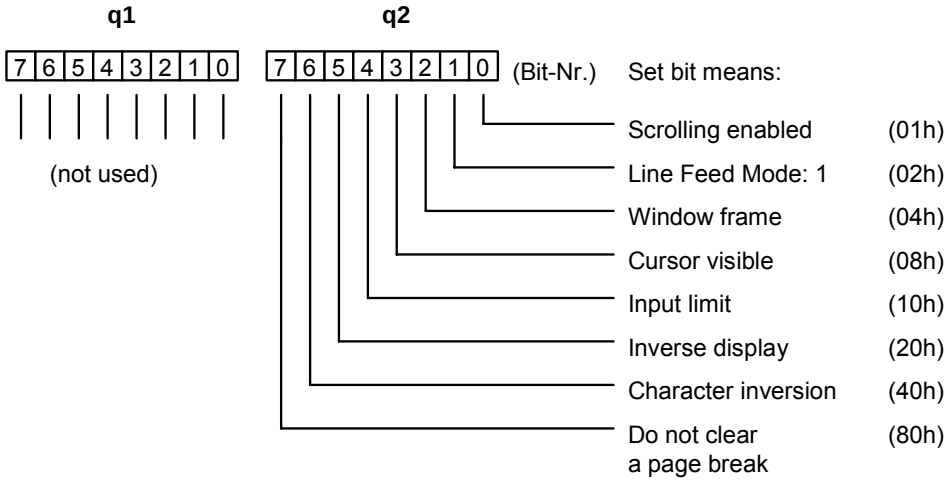
Parameter: h: Handle-no. (individual window indicator, 1...255)

- The window which was previously opened with the handle-no. *h* is closed with this command.
- If an opened window does not exist with handle-no. *h* this command remains ineffective.
- The background which was previously superimposed is built up again. Further access to this handle-no. is not possible. The number for windows which are subsequently opened is cleared again. The text window style previously set is also overwritten.
- Other windows which were previously overlapped by the window which is being closed are now active again as long as these are not overlapped by a third window.
- In order to close a window it does not necessarily have to be active. Windows which are overlapped by others or completely invisible can be closed. This does, however, require a reorganization of the windows where all respective windows are built up again.
- If Handle2 (keyboard input) points to handle-no. *h* then this is set back to 0 (free input). Handle1 and handle 3 are not affected by this.

Set text window style	ASCII: **ESC ESC "Q" q1 q2 h** HEX: 1Bh 1Bh 51h ....

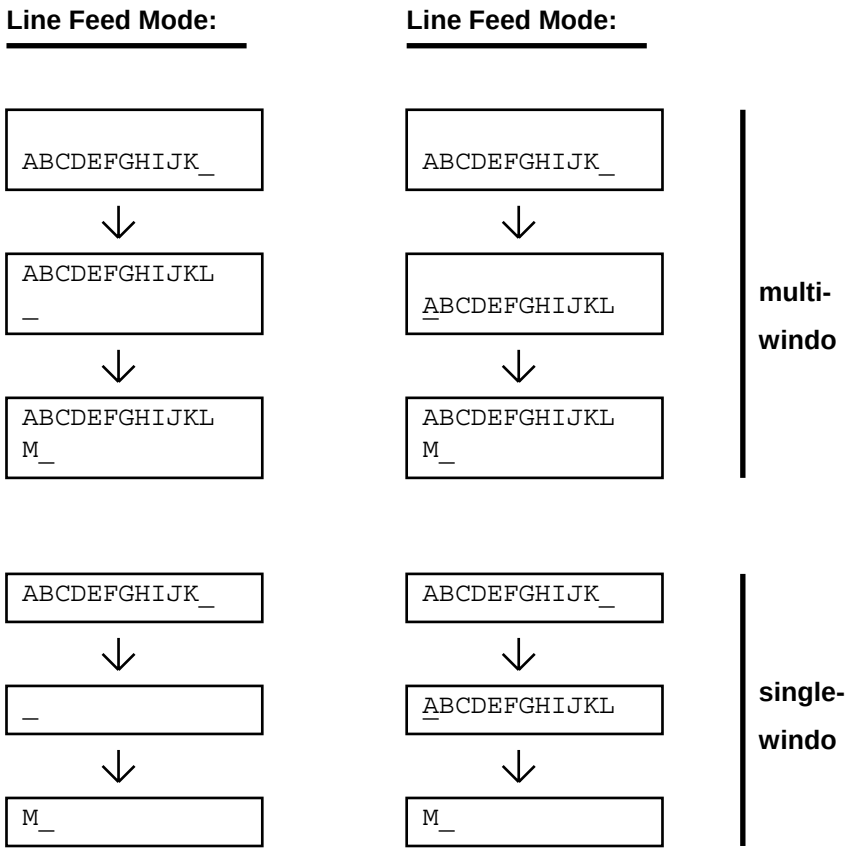
Parameter:
q1: Bit sample 1
q2: Bit sample 2
h: Handle-no. (individual window indicator, 1...255)

- A style is set for text windows which have already been opened with handle-no. *h*.
- This command can be used in an opened text window as often as required to repeatedly change characteristics of the window.
- The window must, however, be active which means it must be in the foreground. Changes in style in an inactive window will be ignored and will not be carried out even if the window subsequently becomes active.
- Using this command the changes in a window will be carried out immediately.
- Each individual bit in the bit samples q1 and q2 corresponds to an option which regardless of other options influences the style (see illustration below).
- Prior to setting the style with this command **default** values q1=0 and q2=0 apply for each window.



Scrolling enabled:
With the bit set the window scrolls and a carriage return causes the text to move up one line. Otherwise the cursor is set again at the start of the window at the top left position. Another flag determines whether the window is to be deleted in this case or whether the window contents should remain. (Flag: “do not clear at page break”).

Line Feed Mode:
If this bit is set the carriage return is carried out after a character has been set in the last column of a line (normal operator panel operation). Otherwise the carriage return is made before a character is set in the first column.
The following illustration shows how characters are printed in both modes of operation. The arrow symbolizes the sending of characters to the window in each case. The underscore represents the cursor.



Operational mode 0 is mainly intended for single window input so that after a line feed (which has the same function as the character "L" for line feed in the above example) the characters which have been entered do not immediately disappear but remain visible until the next character is entered.

Window frame:
If the bit is set a frame is drawn around the window in the color of the window. The frame requires a field consisting of 8 pixels each left and right, a line of pixels at the top and at the bottom. If additional space is required a neighboring window is overlapped. Overlapped windows automatically become inactive.

Cursor visible:
If the bit is set the cursor appears at the bottom line at the next character input position. The request by the control computer that an input is anticipated via the internal keyboard can be indicated here.

Input limit :
If the bit is set the input of characters via the internal keyboard (line length - 1) is limited. All subsequent input characters will be ignored. The function keys, however, remain active and continue to send the corresponding codes to the control computer via SER1.

Inverted display:
If the bit is set the whole window is displayed inverted (background, frame, cursor, character).

Character inversion:
For inversion of individual characters within a window. Provided the bit is set, the characters are output as inverted. In case the bit is deleted, the following characters are output as normal.

Do not delete at page break:
If the scrolling is switched off and a page break occurs at the end of the page, the cursor is positioned in the left upper corner. Provided this flag is set, the window contents remains, otherwise the window content will be deleted.

Set text window style attribute	ASCII: **ESC ESC "C" q1 q2** HEX: 1Bh 1Bh 43h ....

Parameter: q1: Bit pattern 1
q2: Bit pattern 2

Delete text window style attribute	ASCII: **ESC ESC "c" q1 q2** HEX: 1Bh 1Bh 63h ....

Parameter: q1: Bit pattern 1
q2: Bit pattern 2

These two commands allow the user to activate and deactivate individual attributes of the window style. The previous status of the window style must not be known for this purpose.
The commands are always in reference to the current window, that is the window that handle 1 points to.

Example:
ESC ESC "C" 0 40h : switches character inversion on
ESC ESC "c" 0 40h : switches character inversion off

ESC ESC "C" 0 8h : switches cursor to visible
ESC ESC "c" 0 8h : switches cursor to invisible

It must be noted that for command ESC ESC "c" ... those bits must be set whose style attribute should be switched off.
If style attributes are set / deleted which were already set / deleted, nothing will change.

Set Handle1 (Text from SER1)	ASCII: **ESC ESC "H" "1" h** HEX: 1Bh 1Bh 48h 31h ...

Parameter: h: Handle-no. (0...255)

Determines the target of characters in the text channel for characters that are to be output.
h=0: Free output to the cursor positions in display which have previously been determined.
h=1...255: Output to the window determined in handle-no. *h*.

- Even if a window does not exist with the given handle-no., the handle is reset. However, if characters are sent via this handle they will be ignored.

Set Handle2 (Input from keyboard)

ASCII: **ESC ESC "H" "2" h**
HEX: 1Bh 1Bh 48h 32h ...

Parameter: h: Handle-no. (0...255)

This command determines the target of characters in the text channel which are received from the internal keyboard.
h=0: Direct output via SER1 to the control computer (without output to the display).
h=1...255: Output to the window determined in Handle-no. *h* with output of characters via SER1 to the control computer after completing the entries with carriage return.
The final character of the character chain normally is the control character CR.
However, the user can switch to LF in the setup (refer to page **Fehler! Textmarke nicht definiert.**).

- Even if a window does not exist with the given handle-no., the handle is reset. If, however, characters are sent via this handle they will be ignored.
- If a window to which handle2 is pointing is overwritten, handle2 is automatically reset to 0.
- The cursor of the window to which the keyboard handle is pointing blinks at the selected rate. In this case the cursor for the text window style must be switched on.

Set handle3 (Scanner 1)

ASCII: **ESC ESC "H" "3" h**
HEX: 1Bh 1Bh 48h 33h ...

Parameter: h: Handle-no. (0...255)

This determines the target of characters in the text channel which are received via scanner 1.
h=0: Free output via SER1 to the control computer.
h=1...255: Output to the windows determined in handle-no. *h* will output the characters via SER1 to the control computer.

- Even if a window does not exist with the given handle-no., the handle is reset. If, however, characters are sent via this handle they will be ignored.

Output format via SER1:

STX	"B"	num	"0"	"2"	"-"	"A"	"B"	"C"	"-"	"D"	"L"	ETX
02h	42h		Barcode (character chain) from reader									03h

num: number of following characters of barcode (in this case 9).
Output to the window is performed as follows:
1. The system tests whether the cursor is located in column 0 in the window (at the beginning of the line) or not. If not, a carriage return is sent prior to character output.
2. The character of the respective barcodes are sent to the window.
3. Next, output is checked one more time. If the cursor is not located in column 0 another carriage return is sent.

Set Handle5 (Scanner 2)	ASCII: **ESC ESC "H" "5" h** HEX: 1Bh 1Bh 48h 35h ...

Parameter: h: Handle-no. (0...255)

This command determines the target of characters in the text channel which are received via scanner 2.

h=0: Free output via SER1 to the control computer.

h=1...255: Output to the windows determined in handle-no. *h* will output the characters via SER1 to the control computer

- Even if a window does not exist with the given handle-no., the handle is reset. If, however, characters are sent via this handle they will be ignored.

Output format via SER1:

STX	"C"	num
02h	43h	

"0"	"2"	"-"	"A"	"B"	"C"	"-"	"D"	"L"
Barcode (character chain) from reader								

ETX
03h

num: number of following characters of barcode (in this case 9).

Activate text window	ASCII: **ESC ESC "A" h** HEX: 1Bh 1Bh 41h ...

Parameter: h: Handle-no. (individual window indicator, 1...255)

- The (inactive) window h is activated, i.e. brought into the foreground. Other windows which are now overlapped automatically become de-activated
- If the window was not previously visible (see below), then the other windows involved need to be built-up again. The required time depends on the number, size, and position of the opened windows.

Text window invisible	ASCII: **ESC ESC "a" h** HEX: 1Bh 1Bh 61h ...

Parameter: h: Handle-no. (individual window identification, 1...255)

- The window h (active or inactive) is moved to the background, and becomes completely invisible, regardless of other objects which are being displayed.
- Windows which were previously only overlapped by this window are automatically activated.
- If the window was inactive then the respective windows need to be built-up again.
- This command is very useful for example for the application of warning windows. Such windows can already be built-up at the start of the system. Next the window is made invisible in order to display it very quickly in case of an alarm.

Generate soft key bar	ASCII: **ESC ESC "K" num $txtf_1$ ... $txtf_{num}$** HEX: 1Bh 1Bh 4Bh ....

Parameter: num: Number of transmitted soft key texts

$txtf_n$: Text for function key F_n (each terminated with a binary 0)
(Length: max. 6 character per text)

This command is very handy for a quick and easy soft key bar generation. The transferred texts for F1 through F5 are centered above the function keys. They are then built up in the display with separating lines. A special characteristic is the automatic switching to texts for F6 through F10 while the Shift key (⇑) is held down. Hence the use of the function keys F6 through F10 operated with shift is now much safer.

Example:

Character	Comment
ESC	Command header
ESC	
'K'	
7h	Number of texts
'N'	F1-text
'u'	
'l'	
'l'	
'e'	
'n'	
0h	**Separator**
'T'	F2-text
'a'	
'r'	
'i'	
'e'	
'r'	
0h	**Separator**
'T'	F3-text
'e'	
's'	
't'	
0h	**Separator**
'S'	F4-text
't'	
'a'	
'r'	
't'	
0h	**Separator**
'S'	F5-text
't'	
'o'	
'p'	
0h	**Separator**
'H'	F6-text
'i'	
'l'	
'f'	
'e'	
0h	**Separator**
'W'	F7-text
'e'	
'i'	
't'	
'e'	
'r'	
0h	**Separator**

In the example above the function key texts for F1 through F7 are transferred. Nothing is transferred for the keys F8 through F10, hence nothing is displayed.

- When transferring texts, the user must always start with F1.
- In case a key should be skipped, only the separator is transferred instead of the text (with separator).
- If keys remain unassigned in the end, no additional separators must be transferred provided the indicated number of texts is correct.

- The soft key bar is also deleted with the command "Delete display".
- By transferring new texts older texts are automatically deleted.
- For a build up of a screen the soft key texts should be transferred at the end. Reason for that is that otherwise other windows could overlap the texts.

Delete character , Backspace	ASCII: **BS** HEX: 08h

- The cursor moves one position to the left and deletes the character at that position.
- If the cursor is already located on the left margin the command will be ignored. The cursor will not move up one line.

Line feed	ASCII: **LF** HEX: 0Ah

- The cursor moves to the beginning of the next line.
- If the cursor is already located at the bottom line the system will either scroll by one line or the cursor is placed at the top position of the window, depending on the selected window style (Details refer to **Set text window style** on page 82).

Carriage return	ASCII: **CR** HEX: 0Dh

- The cursor will move to the beginning of the current line.

Cursor up	ASCII: **ESC "[" (nn) "A"** HEX: 1Bh 5Bh 41h

Parameter: (nn): number of lines

- The cursor will be moved up by nn lines.
- The parameter (nn) is expected in a formatted format, i.e. as character chain composed of numbers.
  (e.g. 12 lines: ASCII "1" "2" ; HEX 31h 32h). The character chain may consist of one or two numbers.
- The command is compatible with ANSI/VT100.
- The cursor only moves to the upper edge of the window, other commands for movement in this direction will be ignored.

Cursor down	ASCII: **ESC "[" (nn) "B"** HEX: 1Bh 5Bh 42h

Parameter: (nn): number of lines

- The cursor will be moved down by nn lines.
- The parameter (nn) is expected in a formatted format, i.e. as character chain composed of numbers.
  (e.g. 8 lines: ASCII "8" ; HEX 38h). The character chain may consist of one or two numbers.
- The command is compatible with ANSI/VT100.

- The cursor only moves to the bottom edge of the window, other commands for movement in this direction will be ignored.

Cursor forward	ASCII: **ESC "[" (nn) "C"**
	HEX: 1Bh 5Bh 44h

Parameter: (nn): number of lines

- The cursor will be moved to the right by nn lines.
- The parameter (nn) is expected in a formatted format, i.e. as character chain composed of numbers.
- (e.g. 17 lines: ASCII "1" "7" ; HEX 31h 37h). The character chain may consist of one or two numbers.
- The command is compatible with ANSI/VT100.
- The cursor only moves to the right edge of the window, other commands for movement in this direction will be ignored.

Cursor backwards	ASCII: **ESC "[" (nn) "D"**
	HEX: 1Bh 5Bh 43h

Parameter: (nn): number of lines

- The cursor will be moved to the left by nn lines.
- The parameter (nn) is expected in a formatted format, i.e. as character chain composed of numbers.
  (e.g. 23 lines: ASCII "2" "3" ; HEX 32h 33h). The character chain may consist of one or two numbers.
- The command is compatible with ANSI/VT100.
- The cursor only moves to the left edge of the window, other commands for movement in this direction will be ignored.

Cursor absolute	ASCII: **ESC "[" (yy) ";" (xx) "H"**
	HEX: 1Bh 5Bh .... 3Bh 48h

Parameter: (yy): line position
(xx): column position

- The cursor is moved to position (xx | yy). The origin of the coordinates (1 | 1) is located in the top left corner of the window.
- The parameters (yy) and (xx) are expected in a formatted form, i.e. as character chain composed of numbers.
  (e.g. position (3 | 4): ASCII: ESC "[" "4" ";" "3" "H"; HEX: 1Bh 5Bh 34h 3Bh 33h 48h). The character chain may consist of one or two numbers or may not be needed at all. In the latter case the value will be assumed 1. Hence positioning to the origin is possible with ESC "[" ";" "H".
- The command is compatible with ANSI/VT100.
- If the coordinate is chosen too large so that it is not part of the window (e.g. line 5 in a window with 3 lines) the cursor will move to the edge (i.e. line 3).

Delete current line	ASCII: **ESC "Y"**
	HEX: 1Bh 59h

- The line in which the cursor is currently positioned will be deleted.
- Next the cursor is positioned at the beginning of the same line.

Set pixel	ASCII: **ESC ESC "P" x y**
	HEX: 1Bh 1Bh 50h ....

Parameter:
x: x-coordinate (column) (1...240)
y: y-coordinate (line) (1...128)

- The pixel with the coordinates (x, y) is set in the display.
- If the coordinates are outside the permissible area this command is ignored.

Delete pixel	ASCII: **ESC ESC "p" x y**
	HEX: 1Bh 1Bh 70h ....

Parameter:
x: x-coordinate (Column) (1...240)
y: y-coordinate (Line) (1...128)

- The pixel with the coordinates (x, y) is canceled in the display.
- If the coordinates are outside the permissible area this command is canceled.

Draw line	ASCII: **ESC ESC "L" x1 y1 x2 y2**
	HEX: 1Bh 1Bh 4Ch ....

Parameter:
x1, y1: coordinates of line start position
x2, y2: coordinates of line end position

- A line (1 pixel thickness) at any angle is drawn between the start position and the end position.
- If a coordinate is outside the screen area only the part of the line which is still visible is drawn.
- The definition start and end position does not mean that the coordinates of the start position have to be smaller than those of the end position.

Delete line	ASCII: **ESC ESC "l" x1 y1 x2 y2**
	HEX: 1Bh 1Bh 6Ch ....

Parameter:
x1, y1: coordinates of line start position
x2, y2: coordinates of line end position

- A line (1 pixel thickness) at any angle is canceled between the start position and the end position.
- If a coordinate is outside the screen area only the part of the line which is visible is canceled.

Draw rectangle	ASCII: **ESC ESC "S" x1 y1 x2 y2**
	HEX: 1Bh 1Bh 53h ....

Parameter:
x1, y1: coordinates of corner position 1
x2, y2: coordinates of corner position 2

- An orthogonal rectangle which spreads out diagonally from positions 1 to position 2 (1 pixel line thickness) is drawn.
- If a coordinate is outside the screen area only the part of the rectangle which is still visible is drawn.

Delete rectangle	ASCII: **ESC ESC "s" x1 y1 x2 y2**
	HEX: 1Bh 1Bh 73h ....

Parameter: x1, y1: coordinates of corner position 1
x2, y2: coordinates of corner position 2

- An orthogonal rectangle which spreads out diagonally from position 1 to position 2 (1 pixel line thickness) is canceled.
- If a coordinate is outside the screen area only the part of the rectangle which is visible is canceled.

Draw bar	ASCII: **ESC ESC "B" x1 y1 x2 y2**
	HEX: 1Bh 1Bh 42h ....

Parameter: x1, y1: coordinates of corner position 1
x2, y2: coordinates of corner position 2

- An orthogonally filled rectangle (bar) which is spread out diagonally from position 1 to position 2 is drawn (pixel set).
- If a coordinate is outside the screen area, then only the part of the box which is still visible is drawn.

Delete bar	ASCII: **ESC ESC "b" x1 y1 x2 y2**
	HEX: 1Bh 1Bh 62h ....

Parameter: x1, y1: coordinates of corner position 1
x2, y2: coordinates of corner position 2

- An orthogonally filled rectangle (bar) which is spread out diagonally from position 1 to position 2 is deleted (pixel set).
- If a coordinate is outside the screen area, then only the part of the box which is still visible is deleted.

Reset Mettler scale to zero	ASCII: **ESC "M" "Z"**
	HEX: 1Bh 4Dh 5Ah

Scale is set to zero. There is no feedback from the interface.

Tare Mettler scale	ASCII: **ESC "M" "T"**
	HEX: 1Bh 4Dh 54h

Scale is tarred. There is no feedback to the control computer.

Mettler scale, send weight value	ASCII: **ESC "M" "S"**
	HEX: 1Bh 4Dh 53h

Weight values currently available in the operator panel are output via SER1. The identification in the transfer block is "M" (Ident. = 4Dh).
Since the operator panel independently of this command always attempts to get the most current weight value, no query is started at the Mettler scale with this command. Only values will be displayed that are stored in the operator panel. Hence a response will be provided very quickly (<200ms).
The weight value or an error alarm are output as response.

STX	"M"	num
02h	4Dh	

"S"	typ	" "	" "	" "	"1"	"2"	"."	"3"	"8"	"5"	" "	"k"	"g"
53h													
	"D": stationary value												
	" ": dynamic value												

ETX
03h

STX	"M"	2
02h	4Dh	02h

"E"	code
45h	

ETX
03h

code: 01h: Error during reception / scale does not respond
02h: Signal from scale: invalid weight value
03h: Weighing platform in underload range
04h: Weighing platform in excess load range
0Ah: Scale (calibrated): Weight value may not be sent.
(refer to "Special issues regarding scales for calibration").

num: Number of following bytes (without ETX)
typ: stationary and dynamic weight value
STX: 02h
ETX: 03h

The transfer is performed in a frame (refer to "output of peripheral devices" in the protocol description).

Mettler scale, set weight value rate	ASCII: **ESC "M" "A" n [n_{AWU}]**
	HEX: 1Bh 4Dh 41h ....

Parameter: n: 0...6 (weight value rate / sec)
7 (max.)
8 (high speed)
9 (AWU speed, additional parameter n_{AWU})
n_{AWU}: 1...15 (weight value rate / sec for AWU)

- This command is used to set the number of weight values per second which the operator panel will retrieve from the Mettler scale.
- The setting **max**. causes the weight values to be automatically transmitted to the operator panel from the scale at a maximum rate.
- If **High speed** has been selected the scale will independently send weight values to the operator panel in quick succession.
- If **AWU Speed** has been selected the number of weight values from a AWU with the parameter n_{AWU} will be set in the range from 1 / sec through 15 / sec.
- The command will trigger no feedback.

Mettler scale, divider for weight value display	ASCII: **ESC "M" "D" n** HEX: 1Bh 4Dh 44h ...

Parameter: n: display divider
0 (1:1)
1 (1:2)
2 (1:3)
3 (1:4)
4 (1:5)
5 (1:6)

- This command is used to select the divider for the display rate of weight values in window 251 on Mettler scales. (e.g. 1:3 means that every third incoming weight value is displayed in window 251.
- The output rate can be selected together with the setting of the command **Mettler scale, set weight value rate** on page 92; (e.g. 6 values / sec with a divider of 1:3 results in a display rate of 2 values / sec).
- The command will trigger no feedback.

Mettler scale, automatic output	ASCII: **ESC "M" "R" n** HEX: 1Bh 4Dh 52h ...

Parameter: n: switch
0 (off)
1 (on)

- This command controls the output mode of weight values from the operator panel to the control computer. If the automatic output is switched off the control computer must retrieve every value individually from the operator panel using the command **Mettler scale, send weight value** on page 91. If automatic output is switched on the operator panel will immediately forward each incoming value from the scale to the control computer.
- Automatic output provides significant advantages for dosage control of the control computer since weight values will be incoming at the control computer at consistent rates.
- If automatic output is switched on a very high weight value rate will lead to a high usage of the operator panel and the transmission route.
- The command will trigger no feedback.

Mettler scale, select scale	ASCII: **ESC "M" "C" n** HEX: 1Bh 4Dh 43h ...

Parameter: n: switch
0 (scale 1, SER3, X4)
1 (scale 2, SER2, X3)

- If two Mettler scales are connected to the operator panel this command is used to select the appropriate scale. The selected scale can be accessed with other Mettler commands.

- For confirmation feedback is sent by the operator panel as follows:

STX	"M"	2	"C"	code	ETX
02h	4Dh	02h	43h		03h

code: 00h: scale 1 selected
01h: scale 2 selected

Mettler scale, command sequence	ASCII: **ESC "M" "O" (sequence) CR LF**
	HEX: 1Bh 4Dh 4Fh (sequence) 0Dh 0Ah

- This command permits the user to feed a Mettler scale command sequence through the operator panel directly to the scale. For this purpose the Mettler command is packaged into a frame which is suitable for the EXTEC protocol.
- The response received by the scale is also sent back to the control computer in a frame.

Example:
Command to immediately send a weight value.

ESC	"M"	"O"	"S"	"I"	CR	LF
1Bh	4Dh	4Fh	53h	49h	0Dh	0Ah

Response from Mettler scale via operator panel:

STX	"M"	14	"S"	"D"	" "	" "	" "	"1"	"2"	"."	"3"	"8"	"5"	" "	"k"	"g"	ETX
02h	4Dh	0Eh	53h	44h													03h

or: Response from operator panel if communication to scale is interrupted.

STX	"M"	2	"E"	1	ETX
02h	4Dh	02h	45h	01h	03h

- An answer by Mettler scales is only sent to the control computer from the operator panel provided the answer is generated within a selected time frame. The respective time is selected in the operator panel setup:
  Peripherals / Mettler platform / other settings / waiting time ESC M O.
  The time can be set in steps of 100 msec to 3 sec.
- The length of the entire instruction, beginning with ESC "M" "O", may not exceed 130 characters.
- The length of the answer from the Mettler scale may not exceed 130 characters.
- This instruction is ignored by the operator panel if the number of the weight values in the setup is set to "max." or "0/sec".

Bizerba scale, commands	ASCII: **ESC "B" "O" (sequence) CR LF**
	HEX: 1Bh 42h 4Fh (sequence) 0Dh 0Ah

- This command permits the user to feed a Bizerba scale command sequence through the operator panel directly to the scale. For this purpose the Bizerba command is packaged into a frame which is suitable for the EXTEC protocol.
- The response received by the scale is also sent back to the control computer in a frame.

Example:
Command for data output according to parameter memory:

ESC	"B"	"O"
1Bh	42h	4Fh

"q"	"%"
71h	25h

CR	LF
0Dh	0Ah

Response from Bizerba - scale via operator panel:

STX	"Z"	15
02h	5Ah	0Eh

"+"	")"	" "	" "	" "	" "	"1"	"9"	","	"5"	"5"	"k"	"g"	CR	LF
2Bh	29h													

ETX
03h

or: Response from operator panel if communication to scale is interrupted.

STX	"Z"	2
02h	5Ah	02h

"E"	1
45h	01h

ETX
03h

The operator panel is able to process complete data records which are sent by ITE in response to the command "q%". Normally only the net value is sent. The output of net, tara, and gross weight may be selected in the parameter memory (51, 52, and 53). The order should be as follows:

1: 53
2: 52
3: 51

In the programmed sequence it is necessary to transfer the net value prior to the tare value, otherwise the tarred weight value will no longer be displayed correctly.

Sartorius-scale, adjusting	ASCII: **ESC "S" "Z"**	**(scale 1)**
	HEX: 1Bh 53h 5Ah	
	ASCII: **ESC "S" "z"**	**(scale 2)**
	HEX: 1Bh 53h 7Ah	

- The scale is adjusted. There is no feedback to the control computer except for the displayed status information which may be requested explicitly.

Sartorius-scale, tarring	ASCII: **ESC "S" "T"**	**(scale 1)**
	HEX: 1Bh 53h 54h	
	ASCII: **ESC "S" "t"**	**(scale 2)**
	HEX: 1Bh 53h 74h	

- The scale is tarred. There is no feedback to the control computer.

Sartorius-scale, zero setting	ASCII: **ESC "S" "N"**	**(scale 1)**
	HEX: 1Bh 53h 4Eh	
	ASCII: **ESC "S" "n"**	**(scale 2)**
	HEX: 1Bh 53h 6Eh	

- The scale is set to zero. There is no feedback to the control computer except for the displayed status information which may be requested explicitly.

Sartorius scale, send displayed value	ASCII: **ESC "S" "S"** HEX: 1Bh 53h 53h

- The current value from the scale displayed in the operator panel is output via SER1. The identification in the transfer block is “S“ (Ident. = 53h). A displayed value, a status comment, or an error alarm are output as response:

STX	"S"	num	"S"	code				"1"	"2"	"."	"3"	"8"	"5"	"_"	"k"	"g"	ETX

STX	"S"	2	"H"	code	ETX

STX	"S"	2	"E"	code	ETX

Displayed value “S”

code: 01h: the displayed value constitutes a weight value when output format has 16 characters
02h: the displayed value does not constitute a weight value when output format has 16 characters
03h: the displayed value constitutes the net weight value when output format has 22 characters
04h: the displayed value constitutes the net weight value when occupied applied tara memory 1 and output format has 22 characters
05h: the displayed value constitutes the net weight value when occupied applied tara memory 2 and output format has 22 characters
06h: the displayed value constitutes series number when output format has 22 characters
07h: the displayed constitutes status information when output format has 22 characters

Status information “H”

code: 01h: scale is being tarred
02h: scale is being calibrated
03h: calibration completed
04h: error during calibration
05h: weighing process
06h: excess load
07h: underload

Error output "E"
code: 01h: Timeout occurred during reception of display value
02h: Communication with scale not possible

num: Number of following data bytes (without ETX)
STX: 02h
ETX: 03h

Sartorius scale, number of weight values / sec	ASCII: **ESC "S" "A" n**
	HEX: 1Bh 53h 51h ...

Parameter: n: switch
0...6 (rate),
7 (max.)

- Select number of weight values per second requested by scale. The setting max. has the effect that the weight values are read in the smallest possible interval.

6.2 Key codes for EXTEC Protocol

The following table describes the key codes which are output by the operator panel via interface SER1 when keystrokes are performed while in the EXTEC protocol. The codes are valid for TERMEX 2xx as well as TERMEX 3xx. The different keyboards are described on page 8.

Key	Name	Code (dec.)	Code (hex.)
←, *CLR*	Delete key	8	08h
↵	Enter key	10	0Ah
-	Minus key	45	2Dh
	Period/comma	46	2Eh
0	Number 0	48	30h
1	Number 1	49	31h
2	Number 2	50	32h
3	Number 3	51	33h
4	Number 4	52	34h
5	Number 5	53	35h
6	Number 6	54	36h
7	Number 7	55	37h
8	Number 8	56	38h
9	Number 9	57	39h
F1	Function key 1	128	80h
F2	Function key 2	129	81h
F3	Function key 3	130	82h
F4	Function key 4	131	83h
F5	Function key 5	132	84h
F6	Function key 6	133	85h
F7	Function key 7	134	86h
F8	Function key 8	135	87h
F9	Function key 9	136	88h
F10	Function key 10	137	89h
F11	Function key 11	138	8Ah
F12	Function key 12	139	8Bh
F13	Function key 13	140	8Ch
F14	Function key 14	141	8Dh
F15	Function key 15	142	8Eh
F16	Function key 16	143	8Fh
F17	Function key 17	144	90h
F18	Function key 18	145	91h
F19	Function key 19	146	92h
F20	Function key 20	147	93h
-, ***<⇑> 1***	Increment	144	90h
↓, ***<⇑> 2***	Shift alarm (down)	145	91h
⇓, ***<⇑> 3***	Shift Input/Output tags (down, one dimension)	146	92h
<⇑> 4		147	93h
ACK, ***<⇑> 5***	Acknowledge alarm key	148	94h
<⇑> 6		149	95h

, <⇧> 7	Decrement	150	96h
, <⇧> 8	Shift alarm (up)	151	97h
, <⇧> 9	Shift Input/Output tags (up, one dimension)	152	98h
+	Increment key	194	C2h
-	Decrement key	195	C3h
S1	Special key 1	196	C4h
S2	Special key 2	197	C5h
S3	Special key 3	198	C6h
	Shift alarm (up)	199	C7h
	Shift alarm (down)	200	C8h
	Shift Input/Output tags (up, 2D)	201	C9h
	Shift Input/Output tags (down, 2D)	202	CAh
	Shift Input/Output tags (left, 2D)	203	CBh
	Shift Input/Output tags (right, 2D)	204	CCh
	Info key	205	CDh

Notes

- For certain keys internal functions have priority over the output of key codes. If an internal function is addressed output may not be generated via the interface.

Shift keys for alarms	If user defined alarms exist in the loaded project or internal alarms are switched on in the setup output of key codes will not occur.
Increment- / Decrement keys	If Input/Output tags exist in the currently visible screen output of key codes will not occur.
Shift keys for tags	If Input/Output tags exist in the currently visible screen output of key codes will not occur.
Number keys, comma/period, minus key, delete key, ENTER key	If the keyboard input handle points to a window the entries will first be displayed in this window, then stored and once input has been completed with ENTER they will be read completely (refer to page 85).

- The listed codes are valid for interface SER1 which is operated with 8 data bits. During operation with 7 data bits the codes are automatically reduced by 20h. The highest bit is cut off and the remaining bits will be sent with the result that key codes ≥ A0h will not be processed correctly. An operation with 7 data bits is therefore not recommended.
- The table above demonstrates that crossovers exist in the range from 90h - 93h provided TERMEX 3xx is used. Only these devices are equipped with the function keys F17 - F20. The respective number keys should not be used in conjunction with the Sift key on TERMEX 3xx to avoid ambiguities.

6.3 Character Sets / Character Codes / Control Characters

TERMEX 230 / 330 is equipped with 4 character sets in varying sizes. TERMEX 220 / 320 only has character set 4 available.

Character set no.	Size / Pixel	Character height/mm	Max. characters / line	Max. lines
1	6 x 9	4.5	40	14
2	9 x 14	6	26	9
3	18 x 28	10	13	4
4	12 x 28	12	20	4

Printable characters are coded in ASCII. The following characters are available:

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

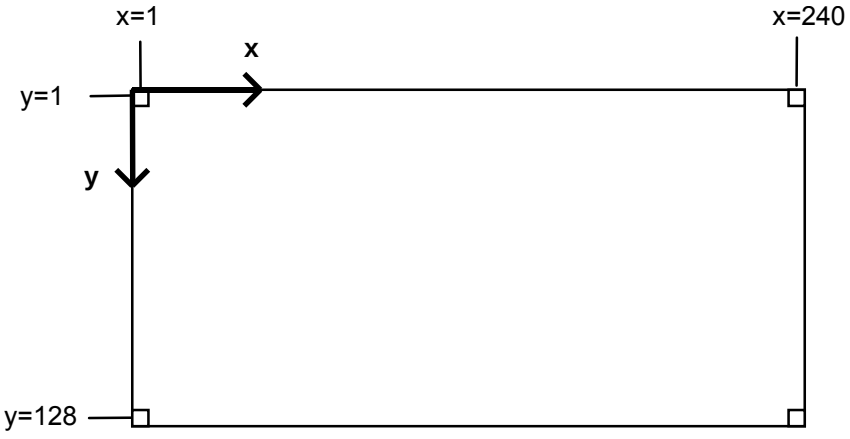
ASCII control characters

The control characters used in this manual are displayed in bold print.

Decimal	Hexa-decimal	Character
0	00 h	NUL
1	01 h	SOH
2	**02 h**	**STX**
3	**03 h**	**ETX**
4	04 h	EOT
5	05 h	ENQ
6	**06 h**	**ACK**
7	07 h	BEL
8	**08 h**	**BS**
9	09 h	HT
10	**0A h**	**LF**
11	0B h	VT
12	0C h	FF
13	**0D h**	**CR**
14	0E h	SO
15	0F h	SI
16	10 h	DLE
17	**11 h**	**DC1 (XON)**
18	12 h	DC2
19	**13 h**	**DC3 (XOFF)**
20	14 h	DC4
21	15 h	NAK
22	16 h	SYN
23	17 h	ETB
24	18 h	CAN
25	19 h	EM
26	1A h	SUB
27	**1B h**	**ESC**
28	1C h	FS
29	1D h	GS
30	1E h	RS
31	1F h	US

6.4 System of Coordinates

The following system of coordinates is valid for all information using coordinates (EXTEC protocol commands and TERMEXpro):



6.5 Characteristic and Maximum Values

Designation	Value	Remarks
Project		
Project memory (FLASH)	448 KB	Contains the .bin project file 1:1
Max. number of screens in project	255	
Max. number of alarms in project	512	
Max. number of tags in project	300	
Max. number of EPCA programs in project	350	
Max. number of blocks in project	1218	Screens, alarms, bitmaps, and fonts need one block each
Screen		
Max. number of fields per screen	50	
Max. number of tags per screen	-	Only indirectly limited
Max. number of simultaneously executable EPCA tasks	30	
Max. number of simultaneous bars	16	
System memory (RAM)	9000 bytes	Used by fields
EPCA memory (RAM)	3840 bytes	
Interfaces		
Receiving buffer SER1	1024 bytes	

6.6 Tags

BCD1	**_123**	Data building block 1 DW

BCD01	**0123**	Data building block 1 DW

A maximum of 4 numbers with BCD coding can be output using the BCD1 or BCD01 tag. Preceding zeros are only displayed for the BCD01 tag. Blank spaces will appear for BCD1 instead.
The left number corresponds to #3, the right to #0. If less than 4 numbers are used #3, #2, and #1 are not used. A tag with 2 numbers use #1 and #0.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x	BCD-number #3				BCD-number #2				BCD-number #1				BCD-number #0			

Each 4 bit value controls exactly one number:

4 bit value	0h	1h	2h	3h	4h	5h	6h	7h	8h	9h	Ah	Bh	Ch	Dh	Eh	Fh
Output	**"0"**	**"1"**	**"2"**	**"3"**	**"4"**	**"5"**	**"6"**	**"7"**	**"8"**	**"9"**	":"	";"	"<"	"="	">"	"?"

Only the number 0...9 printed on bold face are intended for output. If needed, the remaining six characters also can be used.

MIN and MAX values can be preset in TERMEXpro for application as a Input/Output tag. If the value falls outside the set range the entry will not be accepted and the previous value is displayed.

Examples:
BCD1-tag, 4 numbers, DW x = 123h, output "_123"
BCD01-tag, 3 numbers, DW x = 45h, output "045"

BCD2	**_1234567**	Data building block 2 DW

BCD02	**01234567**	Data building block 2 DW

A maximum of 8 numbers with BCD coding can be output using the BCD2 or BCD02 tag. Preceding zeros are only displayed for the BCD02 tag. Blank spaces will appear for BCD2 instead.
The left number corresponds to #7, the right to #0. If less than 8 numbers are used #7, #6, #5 etc. are not needed. A tag with 5 numbers uses #4, #3, #2, #1, and #0. Nevertheless the tag will require 2 DW in the data building block.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x	BCD-number #7				BCD-number #6				BCD-number #5				BCD-number #4			
DW x+1	BCD-number #3				BCD-number #2				BCD-number #1				BCD-number #0			

Each 4 bit value controls exactly one number:

4 bit value	0h	1h	2h	3h	4h	5h	6h	7h	8h	9h	Ah	Bh	Ch	Dh	Eh	Fh
Output	**"0"**	**"1"**	**"2"**	**"3"**	**"4"**	**"5"**	**"6"**	**"7"**	**"8"**	**"9"**	":"	";"	"<"	"="	">"	"?"

Only the numbers 0...9 printed in bold face are intended for output. If needed, the remaining six characters also can be used.

MIN and MAX values can be preset in TERMEXpro for application as Input/Output tags. If the value falls outside the set range the entry will not be accepted and the previous value is displayed.

Examples:
BCD2-tag, 8 numbers, DW x = 123h, DW x+1 = 4567h ⇒ output "_1234567"
BCD02-tag, 5 numbers, DW x = Fh, DW x+1 = 9876h ⇒ output "000?9876"

BINA	**"98765.50"**	Data building block 1 DW

VBINA	**"-98765.50"**	Data building block 1 DW

- A maximum of 10 numbers in binary coding can be output (plus sign for VBINA).
- The 16 bit binary number in the data building block is scaled up to one 32 bit value using two MIN-MAX pairs.
- The 16 bit value in the data building block is interpreted as a number without sign for BINA. The number displayed is always positive. For VBINA the 16 bit value is considered a binary number in a complement of two. Depending on the scaling, output can either be positive or negative.
- Leading or end comma positions can be preset for tags. Output is generated with fixed positions, i.e. the decimal period is output by the operator panel at the selected position. The respective value in the data building block does not change (e.g. same value for 12.34 and 1234).
- The value range in the data building block for BINA equals 0...65535; the value range in the display equals 0...4294967295.
- The value range in the data building block for VBINA equals -32768...32767; the value range in the display equals -2147483648...2147483647.

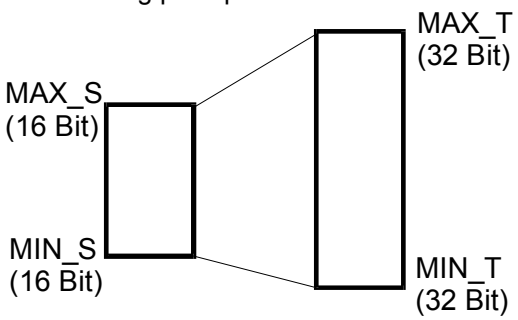
BINA

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x	16 bit binary number (unsigned integer)															

VBINA

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x	16 bit binary number (signed integer)															

The mapping of the values in the data building block to values in the display is performed according to the following principle:



The limit MIN_S is assigned to MIN_T; the limit MAX_S is assigned to MAX_T.

Example BINA:
MIN_S (MIN PLC) = 0
MAX_S (MAX PLC) = 65535
MIN_T (MIN operator panel) = 0
MAX_T (MAX operator panel) = 1500000
6 leading comma positions, 1 end comma position
If the value 0 is entered in DW x in this example, the display reads "0.0".
If the value 65535 is entered, the display reads "150000.0".

Example VBINA:
MIN_S (MIN PLC) = 0
MAX_S (MAX PLC) = 65535
MIN_T (MIN operator panel) = -20
MAX_T (MAX operator panel) = 15000
4 leading comma positions, 1 end comma position
If the value 0 is entered in DW x in this example, the display reads "-20.0".
If the value 65535 is entered, the display reads "1500.0".

Values between these points are computed according to the respective scale.

$$AKT\_T = MIN\_T + \frac{(MAX\_T - MIN\_T)}{(MAX\_S - MIN\_S)} * (AKT\_S - MIN\_S)$$

Here AKT_S constitutes the current 16 bit value in the data building block and AKT_T the 32 bit output in the display of the operator panel.

Comments:
- The range of numbers in the display must not necessarily be greater than the number range in the PLC. The user can also "scale down".
- Output is not absolute precise. It may deviate by 1 in the display (e.g. 99999 instead of 100000).
- At the same time MIN_T and MAX_T serve as limits in the application of Input/Output tags. Input values that lie outside these limits will not be accepted and the previous value is output again.

BINB "112233.44"

Data building block
2 DW

VBINB "-112233.44"

Data building block
2 DW

- The 32 bit binary number entered in the data building block in two data words is output to the display without scaling.
- The number is positive for BINB-tags. For VBINB-tags is interpreted as a complement of two, hence may also be negative.
- Output is generated with fixed positions, i.e. the decimal period is output at the selected position by the operator panel. The respective value in the data building block does not change (e.g. same value for 123.45 and 12345). Leading and end comma positions must be indicated in TERMEXpro.
- The value range for BINB-tags equals 0...4294967295,
  for VBINB-tags -2147483648...2147483647.

.
BINB

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x	32 bit binary number (long unsigned integer, upper 16 bit)															
DW x+1	32 bit binary number (long unsigned integer, lower 16 bit)															

VBINB

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x	32 bit binary number (long signed integer, upper 16 bit)															
DW x+1	32 bit binary number (long signed integer, lower 16 bit)															

Example:
BINB-tag: 6 leading comma positions, 4 end comma positions,
DW x = 1E2Ah, DW x+1 = 301Ch
⇒ Output to display "50608.1308"
VBINB-tag: 5 leading comma positions, 3 end comma positions,
DW x = FF86h, DW x+1 = 229Dh
⇒ Output to display "_7986.351"

Comments:
- Even though the user would like to work with small numbers which require only 16 bit, both data words must be kept free in the data building block. A 0 is written in DW x for BINB and positive VBINB, FFFFh for negative VBINB. The respective 16 bit value can be found in DW x+1.
- The MIN and MAX values which must be entered only function as limits when Input/Output tags are used. These values are not scaled. The transferred binary value is output without any conversion. BINA tags should be used if scaling is desired.

TEXT "OPEN"

Data building block
1 Bit

- For the tag type TEXT 2 previously defined texts can be output depending of the status of a certain bit in the data building block.
- One text is output for the status bit=0, another text is output for bit=1.
- Since any character set can be used for tags, TEXT tags can be used to generate graphic status displays. For example a character for the ON/OFF valve status can be generated with the help of a user defined character set. The two texts consist of exactly the character for the respective valve status.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x													bit			

Example:
Texts:
Text0: ID=0 "closed"
Text1: ID=1 "open"
Tag:
for bit=0:Text0
for bit=1:Text1

If bit=0 the text “closed” will appear at the insertion point of the tag, if bit=1 "open" will appear.

TEXT16 "half throttle"

Data building block
1 DW

- A maximum of 65536 previously defined texts can be output for the tag type TEXT16 depending of the status of certain bits in the data building block.

- Since any character set can be used for each tag, TEXT16-tags can be used to generate graphic status displays. For example with the help of a user defined character set a character can be generated for an open, half open, and closed valve status. The three texts consist of exactly the character for the respective valve status.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x	16 bit binary number (integer)															

1. Example:

Texts:

Text group:	TEXT2	
Text0:	ID=0	"off"
Text1:	ID=1	"half throttle"
Text2:	ID=2	"full throttle"
Text3:	ID=3	"ultimate throttle"

Tag:

Text group: TEXT2

If the binary values lie in the range from 0 to 3 the defined texts will appear. If the values are greater than 3 "----------" will appear which indicates that “forms” do not exist for such values.

2. Example:

Texts:

Text group:	TEXT3	
Text0:	ID=0	"too low "
Text10000:	ID=10000	"correct"
Text12000:	ID=12000	"too high"
Text20000:	ID=20000	"way too high"
Text40000:	ID=40000	"way too high"

Tag:

Text group: TEXT3

Forms can be defined for whole areas. If value gaps appear in form definitions, the form with the lesser value is continuously used through the value of the next larger form. In this case:

0...9999:	"too low"
10000...11999:	"correct"
12000...19999:	"too high"
20000...40000:	"way too high"
40001...65535	"----------"

The second form definition with "way too high" is necessary. If it was omitted the display "----------" would appear beginning with 20001.

ASCII "xy123A"

Data building block
x DW

- Any character chain is output in the display through the entry of ASCII-codes in the data words of the ASCII-tag.
- In this process the high- and low byte of a data word are alternatingly used by a character code.
- The length of the character chain must be indicated when defining the ASCII tag in TERMEXpro.

Bit-no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DW x	Character 1								Character 2							
DW x+1	Character 3								Character 4							
DW x+2	Character 5								Character 6							
DW x+3	Character 7								....							

Example:
6 characters, DW x = 7879h , DW x+1 = 3132h , DW x+2 = 3341h ⇒ output "xy123A"

S5FLOAT "14.321"

Data building block
2 DW

Output of a 32 bit floating point number (format Siemens S5).

NWEIGHT "__86.50 kg"

Data building block
x DW

- Net weight values which are sent by a Mettler scale connected to the operator panel can be displayed as internal tags via the data building block.
- The current weight value is entered with each update of tags and then displayed.
- Hence a weight value can be transferred to a PLC without using the EXTEC protocol.

Example:

Tag type:	NWEIGHT
Data word:	100

This definition causes the current net weight to be output to the data building block beginning with data word 100. The output rate equals approximately 1/sec. Output is performed in conjunction with the output of SET values. Therefore during each update of the weight value the SAK-flag is set in the status block of the data building block.
Output format:

Data word	High byte	Low byte
DW100	stat	num
DW101	' '	' '
DW102	' '	' '
DW103	'5'	'.'
DW104	'0'	'0'
DW105	'2'	' '
DW106	'k'	'g'
DW107	0	

The content of the above data word displays the weight value "____5.002 kg".

Comments:

- The output rate is always: high byte, low byte, high byte, ... etc.
- The length of the character chain depends on the connected scale. To facilitate readout the number *num* of the following weight values is output. In this case *num*=12. In addition a binary 0 is output following the character chain to mark the end of the chain.
- A minimum of **8 data words** must be reserved in the data building block arrangement for this tag.
- *Stat* contains the weight value status. Only if *stat*=0 the weight value is valid:

stat	Description
00h	Weight value valid
01h	Error during reception / scale does not respond
02h	Signal from scale: invalid weight value
03h	Weighing platform in underload range
04h	Weighing platform in excess load range

- In case of an error the data words and the weight value are not deleted. Prior to processing the weight value *stat* must be interpreted.

TERMEX_T "____1.50 kg" WEIGHT

Data block
x DW

- The tare value of a Mettler scale connected to the operator panel can be output via the data block as a peripheral tag.
- The actual tare value is entered and output on the display each time the tag is updated.
- The tare value can thus be transferred to a PLC, for instance, without using the EXTEC protocol.

Example:

Tag type: TERMEX_TWEIGHT
Data word: 110

This definition causes the actual tare weight to be output to the data block starting at data word 110. The output rate is approximately 1/sec. The tare weight is output in connection with the set values. The SAK flag is therefore set in the status block of the data block each time the tare value is updated. Output format:

Data word	High byte	Low byte
DW110	Stat	num
DW111	' '	' '
DW112	' '	' '
DW113	' '	' '
DW114	'1'	'.'
DW115	'5'	' '
DW116	'k'	'g'
DW117	0	

The contents of the above data word would cause a tare weight "____1.5 kg" to be displayed.

Note:

- The output order is always high byte, low byte, high byte, etc.
- The length of the character string depends on the connected scale. To make it easier to read, *num* contains the number of following weight value characters. In this case, *num*=12. In addition, the character string is followed by a binary 0 to identify the end.
- A minimum of **8 data words** must be reserved for this tag in the data block.
- *Stat* contains the weight value state. The tare value is only valid if *stat*=0:

stat	Description
00h	Valid tare value
01h	Receive error / scale does not respond
02h	Low tare range limit exceeded
03h	High tare range limit exceeded

- The data words containing the tare value are not deleted in case of an error. *stat* must therefore always be interpreted prior to processing a tare value.

SCAN SCAN2	"02-ABC- DL"	Data building block x DW

- Barcodes which were read by a barcode reader connected to the operator panel can be output as internal tags in the data building block.
- A tag exists for each of the connected scanner. SCAN for scanner 1 and SCAN2 for scanner 2.

Example:

Length: 9
Shield no

This definition causes scanned codes to be output to the data building block beginning with DW x. Output is performed in conjunction with the output of SET values. Therefore during each update of the weight value the SAK-flag is set in the status block of the data building block. Scancodes are only output to the data building block up to the selected length. If shielding is switched off the code is cut off in case of excess length. If the switch is set a code of excess length is not accepted at all.
Output format:

Data word	High byte	Low byte
DW x	count	length
DW x+1	'0'	'2'
DW x+2	'-'	'A'
DW x+3	'B'	'C'
DW x+4	'-'	'D'
DW x+5	'L'	
DW x+6		
DW x+7		

The scancode "02-ABC-DL" received from the barcode reader is output with the above data word content. The output order of the individual characters is always: high byte, low byte, high byte, ... etc.
The length of the character chain is indicated in a binary format as ***length*** (here = 9).
The ***count*** will increase by 1 every time a new scancode has been read. The first valid scancode has the count=1.
After each transfer of a Input/Output tag the high byte of the first tag word (or the entire word) should be compared to the previous value which should be stored somewhere else.
Only character positions within the indicated length are valid.

Comments:

- The maximum character length for the scanned barcodes when using the internal tags SCAN and SCAN2 is 45 characters. Longer barcodes may not be scanned. The character positions of the previous barcode are deleted (with 00h) in the data building block prior to output of a new barcode. If the barcodes vary in length no previous characters remain at the end.
- Data words can be evaluated in two ways:
  The system evaluates the transferred barcode length and processes only those characters or it will read all characters from the data building block up to a certain length and ignores all character positions with the value 00h.

SCANADR	"003"	Datenbaustein x DW

SCANADR2

- Addresses of barcode scanners can be output with these tags. Especially when there is a radio scanner EX-DRAGON-M101 connected to the operator panel, several guns can be used with one cradle. The configuration of the barcode scanner must be prepared for the output of the gun adress on the position of the address must be set correctly in the operator panel setup (refer to page 60).
- The tags are OUTPUT tags (IST) an have to be placed to same data word position than the corresponding SCAN tag.
- There is an own tag for each connectable scanner SCANADR for the first scanner and SCANADR2 for the second scanner (configuration see page 11).

DATE "20. JAN 98"

Data building block
3 DW

This tag is used to output the operator panel date in the data building block and a tag window. The following display options are available:

- Display DMY (day month year) or MDY (month day year). Option whether the day precedes or follows the month.
- Selection of separator between year, month and day.
- Selection whether weekday is output as text or number.
- Selection whether month is displayed as number or text.
- Selection whether the year is displayed with or without century.

Example:
Date: Monday, 20.05.1996

Tag type: DATE
Display: DMY (day month year)
Separator „.“
Display weekday
Display month as text
Display century

This definition causes the operator panel date to be output to the data building block in a BCD format beginning with data word 100. At the same time the date is output in the selected format in the appropriate window on the display.

Output to data building block:

Data word	High byte		Low byte	
	Millennium	Century	Decade	Year
DW x	1	9	9	6
	Month 1st digit	Month 2nd digit	Day 1st digit	Day 2nd digit
DW x+1	0	5	2	0
	weekday		not used	
DW x+2	0x01			

Output in the display: "MON 20.MAI 1996"

Comments:
- The update of the date via the data building block (PLC connected) can be switched off (refer to Setup on page 14). The date is then only output in the display. As a result the data transmission load to the control computer is reduced. (The control computer is equipped with its own real time clock.)

TIME "08:45:15"

Data building block
2 DW

This tag is used to output the operator panel time in the data building block and a tag window. The following display options are available:

- Display of hours in a 24 h format or 12 h format with AM for morning hours and PM for afternoon hours.
- Selection of separator between hour, minute, and second.
- Selection whether seconds are displayed or not.

Example:
Time: morning, 8 o' clock, 45 minutes, 15 seconds

Tag type: TIME
Display: 12 h
Separator „:"
Display seconds

This definition causes the operator panel time to be output to the data building block in a BCD format (24 h display). At the same time the time is output in the selected format in the appropriate window on the display.

Output to data building block:

Data word	High byte		Low byte	
	Hour 1st digit	Hour 2nd digit	Minute 1st digit	Minute 2nd digit
DW x	0	8	4	5
	Second 1st digit	Second 2nd digit	not used	
DW x+1	1	5		

Output in the display: "08:45:15 AM"

Comments:
- The update of the time via the data building block (PLC connected) can be switched off (refer to Setup on page 14). The time is then only output in the display. As a result the data transmission load to the control computer is reduced. (The control computer is equipped with its own real time clock.)

MSGFILTER "AnQ"

Data building block
1 DW

This tag is used to output the display criterion of the displayed alarms. The number of the selected display criterion is overlaid in the data building block. Either the number or the display criterion can be output as short text in the tag output window. Possible display criteria are listed beginning page 29 under description of alarm management.

Example:
Display criterion: Active and not acknowledged alarms (AnQ / No. 0)

Tag type: MSGFILTER
Display: Display as actual text

This definition causes the display criterion for alarms to be entered in DW x in the data building block. At the same time the display criterion of the selected type is output in the appropriate window on the display.

Output to data building block:

Data word	High byte	Low byte
DW x		0

Output in the display: "AnQ"

PLUGID "13"

Data building block
1 DW

- Tags of the type PLUGID capture the switch position of a coding connector at the digital inputs (interface X8) of the operator panel. The seven digital inputs are set to a bit pattern with a coding connector. If no connector is plugged in at the digital inputs the value is set to 0. Instead of 0 the display will read “NC” for “not connected”. If the use of a coding connector was not selected in the setup the display will show lines. To suppress intermediate positions for the connecting and disconnecting of a coding connector, the value of the digital input is only accepted by the tag once it has been constant for at least one second.

Output to data building block:

Data word	High byte	Low byte
DW x		id

6.7 Error messages

There are four types of error alarms that can be output by the operator panel:
Start-up error messages, load errors, runtime errors and internal alarms:

Start-up error messages
During start-up of the operator panel (voltage supplied or after reset) certain system tests are performed. Should errors be detected the error messages will be displayed at the end of the start-up message.

Error message	Description
E001: Battery low (press key)	An error was found during check-up of the battery buffered RAM. This alarm is also displayed after a previous firmware update (EPROM exchange). If the alarm occurs spontaneously an error must have occurred. Electromagnetic pulses the operator panel was exposed to may be reason for that. Verify proper grounding of the system. Another (more unlikely) reason may be a defect in the RAM device. A previously loaded project from the flash must be reinitialized. (refer to "Project Source").
E002: RAM Error	A more thorough check-up of the RAM is only performed during the initial start-up, during a later forced check-up or following error alarm E001. Since this error is considered fatal the alarm cannot be ignored. Please contact EXTEC for execution of the necessary repairs.
E003: Firmware has wrong checksum !	An error was found during the checksum test of the integrated software. The error is considered fatal. The operator panel will not assume operation since errors may occur during operation. Please contact EXTEC for execution of the necessary repairs.
E004: Config. Error SER2 (press key)	The configuration of the peripheral interface SER2 is not correct. The use of the serial interface has been selected in the setup but the operator panel was not able to detect the necessary interface module. The problem could be caused by a defect module or the wrong selection in the setup. This alarm may also appear if the module was removed from the unit without adjusting the setup. The alarm can be ignored by pressing any key. If the cause is not remedied the alarm will appear during every start-up.
E005: Config. Error SER3 (press key)	refer to "E004: Config. Error SER2 (press key)". This is the respective error alarm for SER3.
E006: Flash Setup invalid (press key)	An error was detected during the verification of the setup data in the flash memory device. This alarm can be displayed directly after a firmware update (EPROM exchange), if the formation of the internal setup data record among the two versions was changed. If on the other hand an error will occur spontaneously, a malfunction has occurred. Following this alarm the operator panel will directly access the setup where the necessary settings can be executed. The system will force the saving of the setup data in this instance. The error is considered fatal if it reoccurs spontaneously. Please contact EXTEC for execution of the necessary repairs.

Load errors

Load errors may appear in the display of the operator panel immediately after loading a project. The project isn't accepted in this case. A key has to be pressed and the operator panel resets.

Error message	Description
LOAD ERROR: **Too much global data !**	The loaded project needs more global memory for EPCA than the operator panel offers. You may try to reduce the needed memory by saving of global tags and smaller global arrays in the EPCA tasks.
LOAD ERROR: **Too much noinit data !**	The loaded project needs more noinit memory for EPCA than the operator panel offers. You may try to reduce the needed memory by saving of noinit tags and smaller noinit arrays in the EPCA tasks.
LOAD ERROR: **Too much alloc data !**	The loaded project needs more local and parameter memory than the operator panel offers. You may try to reduce the needed memory by saving local tags, by smaller local arrays or less function parameters in the EPCA tasks.
LOAD ERROR: **Too much programs !**	The loaded project contains more EPCA programs (functions) than the program storage capacity offered by the operator panel.
LOAD ERROR: **Too much bitmaps !**	The loaded project contains more bitmaps and character sets than the bitmap storage capacity offered by the operator panel.
LOAD ERROR: **Wrong checksum !**	The checksum of the loaded project ist wrong. It may be caused by trouble on the data line between the PC and the operator panel. After checking the cable or reducing transmission baudrate the project should be loaded again.
LOAD ERROR: **Too much blocks !**	The loaded project contains more data blocks (screens, alarms, bitmaps, programs) than the operator panel can handle.
LOAD ERROR: **Too much tasks !**	The maximum number of active EPCA tasks is too high in one screen at least. If the number of tasks in the task list of a screen exceeds the maximum number (look at the „EPCA/OS Menu"), it will be necessary to delete tasks.
LOAD ERROR: **EPCA stack depth !**	The maximum EPCA function call depth ist too high in one screen of the loaded project at least. The call depth should be reduced by combining the calling and the called function.

Runtime errors

Runtime errors occur mainly in connection with EPCA programs. The processing cannot be continued because these errors are fatal. After pressing a key the operator panel resets. The appearance of these alarms can be suppressed. Look at „EPCA / OS Menu").

Error message	Description
>>> RUNTIME ERROR <<< **Illegal Opcode**	A forbidden internal EPCA command has appeared. Possible reasons are: • Errors inside of the loaded project. Try to load the project again or to initialize it out of the flash memory. • Incompatibility between EPCA development system and firmware: the program uses code that isn't yet supported by the firmware. The settings of the version at the project properties in TERMEXpro should be checked.
>>> RUNTIME ERROR <<< **Too much tasks.**	It was tried to start more than the maximum EPCA tasks. If the number of tasks in the task list of a screen exceeds the maximum number (look at the „EPCA/OS Menu"), it will be necessary to delete tasks. Such an error should be already detected during the loading of the project, if an actual version of TERMEXpro was used.

>>> RUNTIME ERROR <<< **Too much memory allocated.**	It was tried to allocate more than the available EPCA memory. It should be tried to reduce the needed memory by saving tags and smaller arrays in the EPCA tasks. Such an error should be already detected during the loading of the project, if an actual version of TERMEXpro was used.
>>> RUNTIME ERROR <<< **Unknown program.**	It was tried to call an EPCA program that isn't available in the loaded project. This problem cannot be solved by the user, please contact Pepperl+Fuchs GmbH.
>>> RUNTIME ERROR <<< **Function stack depth exceeded.**	It was tried to exceed the maximum EPCA function call depth. The call depth should be reduced by combining the calling and the called function. Such an error should be already detected during the loading of the project, if an actual version of TERMEXpro was used.
>>> RUNTIME ERROR <<< **Multiple memory allocation.**	It was tried to allocate memory for an EPCA function more than once. This problem cannot be solved by the user, please contact Pepperl+Fuchs GmbH
>>> RUNTIME ERROR <<< **Uninterruptable loop.**	During the processing of an EPCA program there occured an uninterruptable loop. In rare error cases this alarm can occur without EPCA programs running. This problem cannot be solved by the user, please contact Pepperl+Fuchs GmbH.

Internal alarms

Errors recognized by the operator panel will be displayed as internal alarms. These internal alarms are treated as user defined alarms in the alarm display and alarm history. There are three types of internal alarms:

- **Internal errors**
  Internal errors become active if the operator panel reaches a state that standard operation will fail and cannot be assumed again immediately (e.g. no memory available).
- **Internal warnings**
  Internal warnings become active if operation of the operator panel has been impacted but operation can be assumed again (e.g. no communication possible / cable broken).
- **Internal hints**
  Internal hints become active if errors should occur temporarily (e.g. checksum errors during communication).

Internal errors, warnings, and hints can be released independently in the setup for display.
If an alarm type is not released for display the respective alarms will not appear in the display but will be stored in the alarm history. In addition each type of internal alarm can be assigned its own alarm. A chaining time may also be determined for internal alarms just as it can for user defined alarms. The chaining time will make sure that a alarm which has become active several times during a period will be assigned to only one result in the history. The use of the chaining time for internal alarms can be especially useful for internal hints since checksum error for example may occur more often and the memory capacity of the alarm history may be exceeded quickly. The display of internal alarms can be completely switched off in the setup if so desired.

Implemented internal alarms:

Type of internal alarm:	**Alarm:**	**Description:**
internal error		
	Out of Memory	No memory for screens, bit maps, windows etc. available in operator panel
	Backup Battery Low	The buffer battery of the operator panel is weak

		and should be replaced
internal warnings		
	Allen-Bradley-SLC Communication down	No connection with Allen-Bradley-PLC
	Allen-Bradley-PLC Communication down	No connection with Allen-Bradley-PLC
	PGSS Communication lost	No connection with the PLC in the PGSS protocol
	3964R Protocol communication lost	No connection with the PLC in the 3964R protocol
	Modbus Communication lost timeout	No Modbus telegrams have been received in a certain time period (selectable in the Protocols menu under "Com Timeout (ms)", refer to page 13)
internal hints		
	Allen-Bradley-SLC Checksum error	An error occurred during the communication with the Allen-Bradley-PLC.
	Allen-Bradley-PLC Checksum error	An error occurred during the communication with the Allen-Bradley-PLC.
	Modbus alarm Not complete	An incomplete message has been received while communicating in the Modbus protocol.
	Modbus Checksum error	Checksum error during communication in Modbus protocol
	Modbus Illegal opcode	An unknown command was received while communicating in the Modbus protocol.
	Modbus Illegal register address	The system tried to access an invalid register address while communicating in the Modbus protocol.
	PGSS Unexpected character	An unexpected character was received while communicating in the Modbus protocol.
	PGSS Communication timeout	Timeout during communication in the PGSS protocol.
	3964R Protocol communication error	Error during communication in the 3964R protocol

6.8 Possible Settings in the Setup Dialog

The following list shows all possible settings that can be entered in the setup dialog in the form in which they are displayed by the "showpossibles" command, together with a short description of their meanings.
For a detailed explanation, please read the section on the integrated setup menu starting on page 10, as well as other relevant chapters and the cross-references specified below.

ser1_Baudrate[]:1200,2400,4800,9600,19200,38400,125K
ser2_Baudrate[]:300,1200,2400,9600
ser3_Baudrate[]:300,1200,2400,960
ser4_Baudrate[]:1200,2400,4800,9600
Baud rates for the 4 serial ports
ser1_parity[]:even,odd,mark,space,none
ser2_parity[]:even,odd,mark,space,none
ser3_parity[]:even,odd,mark,space,none
ser4_parity[]:even,odd,mark,space,none
Parity settings for the 4 serial ports
ser1_Bits[]:7,8
ser2_Bits[]:7,8

ser3_Bits[]:7,8
ser4_Bits[]:7,8
Data bits for the 4 serial ports
ser2_Stops[]:1,2
ser3_Stops[]:1,2
Stop bits for the 4 serial ports
gnrl_FKeyScreenEnable[]:No,Yes
F1 to F10 must open screens 1 to 10
gnrl_KeyrepeatEnable[]:No,Yes
Key repeat OFF/ON
gnrl_KeyrepeatDelay[]:0.4s,0.6s,0.8s,1.0s,1.2s
Key repeat delay
gnrl_KeyrepeatRate[]:4/sec,5/sec,6/sec,7/sec,8/sec,10/sec,17/sec
Key repeat rate
gnrl_BlinkRate[]:off,1/sec,1.5/sec,2/sec
Cursor blink rate
prot_PlcType[]:90U95U100U115U,135U,155U,CPU945
Type of Siemens S5 PLC for AS511 protocol
prot_PgmuxEnable[]:NO,YES
Multiplexer between operator panel and PLC for AS511 protocol
ser2_Use[]:NotUsed,Scanner1,PassSER1,---,2.Met,---,SartorSBI2,Scanner2
ser3_Use[]:NotUsed,Met(NoWM),Met(WM),Bizerba,PassSER1,MetID5,SartorSBI1,MetPumaSICS
ser4_Use[]:NotUsed,Scanner1,PassSER1,ASCIITast,Scanner2
Use of peripheral ports for scanners, scales, keyboards
gnrl_Keylock[]:Off,On
Device with key lock YES/NO
gnrl_ExtKeyboard[]:none,BAZ-06/1,TERMEX_KL36
External keyboard connected?
gnrl_K36Layout[]:F11-F19/A-Z,F11-F46,CU-Extension,Termex300
Layout of connected K36 or KL36 keyboard
gnrl_ExtKeyFunction[]:BinaryKeys,Mes/VarControl
Function stored for connected, discrete keys
hwar_ModuleUse[]:NotUsed,DIGIO33
Use of module slot
hwar_ModuleUse2[]:NotUsed,DIGIO30
Use of second module slot
gnrl_ScaleWmapp[]:No,Yes
Calibration capable scale NO/YES
gnrl_StartAckEnable[]:No,Yes
TERMEX sends sign of life (ACK) after starting
prot_DbAddr[]:2...255
Data block number
prot_3964rCoord1[]:0...255
prot_3964rCoord2[]:0...255
3964R coordination flag
prot_ABPlcType[]:SLC500,PLC5
Allen Bradley PLC type
prot_ABDatfileNr[]:7...255
prot_ABPlcNetAdr[]:0...255
prot_ABTermNetAdr[]:0...255
prot_ABRespTimeout[]:50...2500
prot_ABCycletimeMax[]:40...2500
Allen Bradley protocol settings (see page 54)
gnrl_StartupDelay[]:0...5000
Startup delays in ms
mess_IntMessagesEnable[]:Off,On
All internal messages OFF/ON
mess_ErrorDispEnable[]:No,Yes

Internal error messages OFF/ON

mess_ErrorDispPri[]:1...255

Priority of internal error messages

mess_WarningDispEnable[]:No,Yes

Internal warnings OFF/ON

mess_WarningDispPri[]:1...255

Priority of internal warnings

mess_HintDispEnable[]:No,Yes

Internal hints OFF/ON

mess_HintDispPri[]:1...255

Priority of internal hints

mess_DispMode[]:AnQ,nQ,QA,NONE,A

Alarm display mode (see page 29)

mess_DbUse[]:512Messages,256Mess./256Quit,512Mess./512Quit

Configuration of alarm bit block in data block

gnrl_LedArrayUse[]:ActiveMessages,DBControlled

Use of LED array on TERMEX 320/330

gnrl_LedIntensity[]:1...8

LED brightness on TERMEX 320/330

gnrl_DebugEnable[]:No,Yes

Debug mode OFF/ON

gnrl_VarMesAktTime[]:off,0.5s,1s,1.5s,2s

Update rate for tags and alarms (without external trigger)

gnrl_TransTimeVar[]:No,Yes

Transfer TIME and DATE tags to PLC OFF/ON

gnrl_InputStrTerm[]:CR,LF

Line terminating character for input string

epca_Active[]:No,Yes

EPCA activated NO/YES

epca_Speed[]:10...500

EPCA processing speed

epca_HaltOnErrors[]:No,Yes

EPCA halts operator panel at processing errors NO/YES

prot_ExtecSend[]:EXTEC,EPCA,EXTEC/EPCA

Access to send cable for SER1 in EXTEC protocol

prot_ExtecReceive[]:EXTEC,EPCA

Access to receive cable for SER1 in EXTEC protocol

scal_MetVibAdapt[]:NotAvail,1:calm,2:normal,3:instable

scal_MetProAdapt[]:NotAvail,1:fine,2:universal,3:absolute,4:dynamic

scal_MetAsd[]:NotAvail,0:off,1:fast,2:(fast),3:(slow),4:slow

scal_MetAutozero[]:NotAvail,0:off,1:on

Mettler scale settings (see page 15 ff.)

scal_MetWeightDType[]:immediate,still

Operator panel fetches immediate or stationary weight values from Mettler scale

scal_MetRestartEnable[]:No,Yes

Restart function active for Mettler scales

scal_MetWeightFetch[]:0/s,1/s,2/s,3/s,4/s,5/s,6/s,max.,HighSpeed,AWUSpeed

Rate at which operator panel fetches weight values from Mettler scale

scal_AwuWeightFetch[]:0...20

Rate at which operator panel fetches weight values from connected AWU

scal_MetDispRate[]:1:1,1:2,1:3,1:4,1:5,1:6

Divisor of fetched weight values to weight values displayed on Mettler scale

scal_MetAutosend[]:Off,On

Operator panel sends weight values automatically in EXTEC protocol

scal_MetOrdWait[]:100ms,200ms,300ms,400ms,500ms,600ms,700ms,800ms,900ms,1.0s,1.2s,1.5s,2.0s,3.0s

Wait time for response to ESC M O command when Mettler scale connected

scal_MetPumaFetch[]:1/s,2/s,3/s,4/s

Rate at which operator panel fetches weight values from Mettler-PUMA scale

scal_MetWmhaUnit[]:g,kg,t,mg
scal_MetWmhaReadability[]:0...9
scal_MetWmhaWmode[]:WeightCtrl,Dispens,Invariant,User
scal_MetWmhaCutoff[]:10...999
scal_MetWmhaTolW[]:3...10000
scal_MetWmhaTolT[]:3...10000
scal_MetWmhaTolZ[]:3...10000
scal_MetWmhaTimeW[]:1...30
scal_MetWmhaTimeT[]:1...30
scal_MetWmhaTimeZ[]:1...30

Possible settings for Mettler WMH scales

scal_SbiMaxRespTime[]:1500...4000
scal_SbiOutputLen[]:16,22
scal_SbiPrintMode[]:Single,Auto
scal_SbiKeyboard[]:Release,Block
scal_SbiPlace[]:VeryStable,Stable,Unstable,VeryUnstable
scal_SbiUnit[]:g,kg,ct,lb,oz,ozt,tlh,tls,tlt,gr,dwt,mom,mg,kt,kt
scal_SbiValuesSec[]:1,2,3,4,5,6,max

Possible settings for Sartorius scales with SBI protocol (see page 15)

prot_ModbusTermAddr[]:1...32

MODBUS address of operator panel

prot_ModbusPeriAddr[]:1...32

MODBUS address of connected device

prot_ModbusTimeout[]:100...10000

Timeout within which operator panel expects a response

prot_ModbusTOEnable[]:No,Yes

Timeout monitoring NO/YES

prot_ModbusExtraTO[]:0...100

Extra time ticks (x 0.5 ms) allowed by operator panel for monitoring end of telegram

scal_KeyCombEnable[]:No,Yes

Shortcut for direct access to scale screens NO/YES

prot_ExtecPeriFormat[]:standard,alternative

Standard or alternative output format for peripheral data in EXTEC protocol

prot_ModbusAddrOffs[]:-500...32000

Address offset in MODBUS protocol

prot_ModbusFetchFunc[]:3...4

MODBUS function used by operator panel to fetch data words

pass_SetupEntry[]:@@@@@@@@

Setup password

prot_Protocol[]:EXTEC,SiemensS5/AS511,3964R/RK512,ModbusRTU/Slave,ModbusRTU/Master,AllenBradleyDF1,ET-1Emulation,BAZ-03/1Emulat.

Host interface protocol SER1

7 History

7.1 Bediengerätegenerationen

Bediengerät	Bauzeitraum	Projekt-speicher	Programm-speicher	Lauffähige Firmware
BAZ-03G1	05/1993 - 1995	Ca. 12 K RAM	32 K EPROM	VR1.02 - VR1.07
BAZ-03G/T2	02/1994 - 1998	ca. 42..50K RAM	64K – 512K EPROM	VR1.10 - VR4.39
TERMEX 200/210/300/310 TERMEX 205/215/305/315	03/1997 - 05/2003	508 K SFLASH	512 K EPROM	VR4.00 -
TERMEX 220/230/320/330	03/2003 -	448 K PFLASH	512 K FLASH	VR5.00 -

Note:

- The hardware of the BAZ-03G/T2 devices can differ, in other words "new" firmware does not run on "old" hardware.
- TERMEX 205/215/305/315 are FM approved devices for the American market; in all other respects, they are identical to TERMEX 200/210/300/310.
- RAM refers to battery backed RAM.
- SFLASH refers to serial flash memory.
- PFLASH refers to parallel flash memory.

7.2 Versionschronologie der Firmware

VR3.31 (04/97)

- Option in the General Settings Menu of the Setup whether LF or CR are output as closing ID for entries via the keyboard (only EXTEC protocol).
- New criterion for alarm display: A. Active alarms are displayed.
- Fast output of weight values for Mettler AWU was implemented. EXTEC command was designed to set the desired rate. The menu ‘Other Settings’ of the Mettler menu was expanded.

VR3.32 (04/97)

- The driver for the connection of Mettler scales has been made faster. If high speed scales with 12.4 values/sec are used a higher consistency of the time intervals during output of weight values via the interface in the EXTEC protocol is accomplished. In addition the internal lag phases were reduced.

VR3.33 (06/97)

- Expansion of the number of tags from 200 to **250**
- The General Settings Menu in the Setup provides an option to select whether the tags of the type TIME and DATE next to the display on the screen should also be transmitted to the PLC.

VR3.34 (06/97)

- Minor adjustments

VR3.35 (07/97)

- The maximum number of windows open at the same time was increased from 40 to **50**.
- Handshake possible when numbers of acknowledged alarms for EXTEC- and MODBUS-protocol are returned.
- New criterion for alarm display **AnQ+QA** with chronological sorting order.
- New operating type "**512 Alarms/512 Quit**" for the application of alarm blocks in the data building block. A maximum of 512 alarms can be confirmed from a remote location.
- New MODBUS error alarm: A timeout that can be set allows the operator panel to recognize an interruption of communication when operating as slave. An internal error alarm is generated.
- Key status bits can be selectively blocked. Masks can be preset via an EXTEC command. Different keyboard filters can be assigned to screens in TERMEXpro.
- The brightness of the keyboard LEDs on Termex 300/310 can be selected in the menu General Settings.

VR3.36 (08/97)

- Both coordination flags for the Siemens protocol 3964R / RK512 can be selected in the protocol setup. The standard setting for both bytes is **FFh**. Should the setting be different problems may occur during communication build-up!
- The assignment of **discrete external keys** in the setting "Mes/Var Control" for "Ext. Key Use" (General Settings Menu) has been changed. An alarm shift key has been made available for the alarm criterion **AnQ+QA**. The keys for tag increment and decrement have been deleted.

VR3.40 (09/97)

- A preliminary version of the EPCA programming system was implemented (VEPCA 0.90). A new menu "EPCA/OS" was added to the main menu. As a standard EPCA is switched off. This setting should not be modified unless EXTEC has been contacted regarding this issue.
- The menu items Status and Test are now integrated separately in the main menu of the setup.
- A baudrate of 38400 can now be selected in the "Serial Ports Menu" for SER1. The baudrate is exclusively used for test purposes and has not been released for standard operator panel operation!
- Switching capabilities of the cursor keys on TERMEX 300/310 with respect to Input/Output tags have been expanded. The user can move in all four directions between the Input/Output tags of a screen according to the geometric setup. Hereby the cursor will jump to the closest tag.
- The maximum length of characters for scanned barcodes for use of the periphery tags SCAN and SCAN2 has been extended from 20 to 45 characters. Character positions of the previous barcode are deleted in the data building block prior to output of new barcodes.
- The output of a key bit status can now be controlled externally via a handshake (compare to numbers of acknowledged alarms) (Bits KSN and KSE in DW24).

VR3.41 (10/97)

- The output of the acknowledgment alarm numbers in DW2 was extended by a fully buffered mode (QSB=1).
- The control bits QSN and KSN are no longer reset automatically. The next status is reached by first writing 1 then 0.

VR3.44 (12/97)

- A new preliminary version of the programming system EPCA was implemented (VEPCA 0.91).
- If characters are received on SER1 errors are detected more easily. In case of errors the operator panel will ignore characters.
- Tags are processed significantly faster. Before every tag was displayed again following an update. Now only tags whose value has changed are displayed. If no or very few changes occur an update is completed in significantly less time. Hence cycle times for PGSS-, 3964R- and Allen-Bradley protocols are much shorter as well as response times for MODBUS- and EXTEC-protocols.

- Less time is needed to close a window which positively impacts complex screens with many windows. Hence less time is required to built up overlapping windows again once a large window was closed.
- The time for an automatic alarm and tag update can be set to 0.5 seconds (General Settings menu 2/4, Messages/Tags auto actual). The standard setting is 1 sec.
- Two settings have been added to the protocol menu for the EXTEC protocol. Both data directions can be reserved separately for EPCA applications. In the standard setting "EXTEC / EXTEC" the operator panel operates as before.

VR3.45 (01/98)
- Minor adjustments

VR4.00 (04/98)
- Setup data is now stored in the flash memory. When leaving the setup the user can select whether the performed changes should be saved or not. The setup data is protected against battery failure. In addition the data is secured via a CRC checksum.
- The protocoll SICS Level 0 for Mettler Puma and ID3 scale operator panels is implemented.
- EPCA support for Sartorius SBI scales is implemented.

VR4.12 (07/98)
- EPCA was developed to version VEPCA 0.94.
- The chapter about the link to Siemens S7 PLC via Profibus was added.

VR4.14 (09/98)
- EPCA was developed to version VEPCA 0.96.

VR4.16 (01/99)
- EPCA was developed to version VEPCA 0.97.
- The memory for EPCA was increased to 3840 words.
- There is another setting for „Project Source“ in the „General Settings Menu“. Using „Reload forced“ the initialization of a loaded project out of the flash memory is done at every start-up of the operator panel.
- An attached barcode scanner may be used for the ET-1 emulation mode too.
- The scale calculation of BINA and VBINA tags was improved. Inaccuracies are reduced significantly. With 1:1 scales there aren’t any differences between input and output.
- The allowed data word distance of tags at the 3964R protocol was increased from 63 to 127.
- The internal format of text lists for TEXT and TEXT16 tags was changed. Projects with heavy use of those tags can be handled much better.
  Very old projects who are compiled using the XCO compiler instead of TERMEXpro may have problems with this firmware. Please contact us to solve the problems.
- The project memory (RAM) was reduced from 25000 Byte to 20000 Byte. If this firmware is used on operator panels of the BAZ series (without flash memory), the maximum project size will be reduced.
- The serial number of every operator panel (production number on the type label) is shown during the start-up message and in the „Status“ menu. The identification of the operator panels is easier.

VR4.17 (01/99)
- minor corrections and extensions for EPCA (version VEPCA 0.98).

VR4.18 (03/99)
- Control of the optional built-in beeper via data building block or via EXTEC command (pages 34 and 78)

VR4.22 (09/99)

- Updating of tags improved at text operator panels TERMEX 200/300
- Corrections for the Allen-Bradley driver
- AS511 driver extended for S5 CPU945
- Corrections for the first update of TEXT tags
- SER2 and SER3 now usable from EPCA

VR4.25 (09/2000)

- The timeout for the MODBUS driver may be extended in the operator panel setup. This helps devices that have problems to keep the time conditions concerning the elapsed time between the characters. If three and one-half character times elapse without a new character (e.g. 3.5 ms at 9600 Baud), then the operator panel assumes the frame to be terminated. This time may be extended in 0.5 ms steps. An extension will slow down the bus speed !
- minor corrections
- The project memory (RAM) was reduced from 20000 Byte to 14000 Byte. If this firmware is used on operator panels of the BAZ series (without flash memory), the maximum project size will be reduced.
- Number of project blocks increased: from 1836 to 2436.
- Number of loadable EPCA tasks increased: from 200 to 350.
- Maximum number of running EPCA tasks increased: from 20 to 30.
- Number of loadable tags increased: from 250 to 300.
- New tag format S7FLOAT integrated. It is for floating point numbers in IEEE 32 Bit format.

VR4.30 (12/2000)

- New Option in the GENERAL SETTINGS MENU of the setup for the block format of the peripheral data output (page 14).
- Problem with the remote acknowledgement of alarms solved. In the case of setting acknowledgement bits before setting any alarm bit the operator panel behaved incorrect.
- Problem with the tag update solved. Tags with a length of 2 data words didn't show the change of the value from different of zero to zero.
- Now it is possible to use loaded characters also for the free text output. Until now for the output of such characters windows had to be used.
- Extensions for the connection of the radio scanner EXDLL-6110R to the operator panels. In the PERIPHERALS / SCANNER setup menu the number of header and terminator characters may be set. The header and the terminator won't be output in the display via the scanner handle or the SCAN or SCAN2 tag. For example it is possible to hide the preceding gun address or the following CR LF.
  There are two new tags SCANADR and SCANADR2 that can be used for the output of the gun address of the radio scanner.
  In the setup menu SCANNER the address for the radio scanner's cradle may be set. Upon leaving the menu the configuration command with the cradle address is sent to the scanner (see page 59).
  A new command is implemented in the EXTEC protocol to enable the character output via serial connects SER1…SER4.

VR4.31 (03/2001)

- Driver for BAZ-05 supplemental keyboard removed.
- Driver for BAZ-04 additional display removed.
- Teleperm interface removed.
- All firmware based special programs removed.
- Sartorius driver enhanced. Two Sartorius scales can now be connected to one operator panel and simultaneously operated.
- Device start counters in status menu. all/co/wa count the total starts (firmware starts), cold starts (starts after powering up), and warm starts (e.g. after pressing reset keys).

VR4.32 (05/2001)
- Protocol driver implemented for emulating the EXTEC BAZ-03/1 operator panel. The ASCII protocol of the BAZ-03/1 is supported.

VR4.33 (09/2001)
- New 125 kbaud setting added for the SER1 serial port. IMPORTANT! This setting is only intended for test purposes and is therefore not released for general use!
- Bugfix for problem with text variants when more than 255 tags are used.

R4.35 (01/2002)
- Expansion implemented to help handle very large projects with a large number of text variants. The commands required for this purpose are only optionally used by TERMEXpro because they are not compatible with older firmware versions. The format can be selected as a "new text list format" in the compiler/linker settings.

R4.36 (05/2002)
- New MODBUS MASTER protocol implemented. The operator panel actively communicates as a slave with exactly one controller. Data is exchanged via the data block in the same way as with all other protocols that are actively used by the operator panel.
- Bugfix for problem with key bit masking. The lock function for keys on the BAZ-06/2, BAZ-07/2, K36, and KL36 supplemental keyboards as well as for discrete buttons did not work in older versions.

VR4.37 (07/2002)
- Minor patches concerning the Sartorius scale driver.

VR4.38 (09/2002)
- Various modifications to the MODBUS MASTER driver. Function 3 is used to read data instead of function 4. The slave address can now be set correctly. Address transformation implemented.

VR4.39 (11/2002)
- Internal modifications to barcode handling. However, the behavior of the operator panel is not affected.

VR5.00 (02/2003)
- First firmware version for the new TERMEX 220/230/320/330 generation.
- Firmware versions ≥VR5.00 still work with the TERMEX 200/210/300/310 generation but are NOT supported by BAZ-03G/T devices.
- The firmware automatically detects the equipment generation on which it is run.
- If the firmware is running on the TERMEX 220/230/320/330 generation, it can be updated on the PC with the help of the TERMEX Loader program (see page 70).
- The setup data is now stored in the flash memory as formatted text. This is especially useful if setup data needs to be copied after updating the firmware. The binary storage method used in the past caused the complete data set to be lost in the event of a major upgrade. The existing settings can now be reused. In addition, the possible settings can now be externally entered via the interface in the setup dialog and it is possible to use the TERMEX Setup tool.
- The use of parallel flash memory for TERMEX 220/230/320/330 projects speeds up access to project data. This is a particular advantage when bitmaps or fonts are output.
- DIGIO33 card with 3 digital inputs (NAMUR) and 3 digital outputs now supported.
- BAZ-03/1 emulation no longer available.

VR5.01 (03/2003)
- Bugfix for problem with the internal keyboard test for TERMEX 320/330.
- Minor patches concerning the possible settings.

VR5.02 (04/2003)
- Patches to allow the firmware to be used on the older TERMEX 200/210/300/320 generation.
- Inclusion of new settings that not available in older firmware versions.
- Bugfix for problem with the prot_Protocol setting in the setup. The display in the internal setup was not correct.

- Project resource page extended in the setup.
- New address offset setting included for the MODBUS interface.

VR5.03 (05/2003)
- Bugfix for problem with LED control on TERMEX 320/330.

VR5.04 (09/2003)
- Internal system memory increased in size from 8000 to 9000 bytes. Comparatively complex screens can now be displayed with several overlapping fields.
- Bugfix for the problem when loaded characters are output. Very occasionally, loaded characters were output incorrectly (e.g. moved to another position) in VR5.00 and higher versions.

VR5.05 (10/2003)
- Alarm acknowledgment mode 256/256 now also works in the 3964R protocol.

VR5.06 (10/2003)
- Bugfix for problem when empty strings in TERMEX_BOOL_TEXT and TERMEX_WORD_TEXT tags are output in combination with TERMEXpro 3.0.

VR5.07 (10/2003)
- Internal memory management improved when alarm fields are opened in the alarm history. There was sometimes a shortage of memory due to long MULTI alarms.
- Key bits can no longer be masked in the alarm history. The F4 key for overlaying the alarm in the history was sometimes locked if these bits were masked by the user. In addition, changes to the states of other keys were no longer detected.

VR5.08 (11/2003)
- Inclusion of a new function that allows alarms to be acknowledged in EPCA.
- Enhanced interpretation of stored setup data. The system occasionally crashed if the power supply was interrupted while data was being stored.

VR5.09 (12/2003)
- The COM error LED flashed briefly in the MODBUS slave protocol if telegrams were received for other bus devices. This problem has now been fixed.
- Alarm acknowledgment now also works with the ACK key for TERMEX 320/330.
- The A-Z LED on the TERMEX 220/230 did not work in the past. This problem has been fixed in the new version.

VR5.10 (04/2004)
- MODBUS master address transformation (see also VR4.38) now also available for the new firmware generation.
- ET-1 emulation enhanced. A command for changing to a second, alternative font now also exists.
- The MODBUS function used by the operator panel to fetch data from the slave (3 or 4) can now be selected in the MODBUS master protocol.

VR5.11 (05/2004)
- BAZ-03/1 emulation available again.
- Bugfix for problem with the MODBUS master address setting. The address set in the MODBUS slave menu was used instead of that set with the MASTER.
- Internal processing of scancodes modified.

VR5.12 (06/2004)
- Software enhancement for Mettler PUMA scale driver. Internal or external calibration can now be selected in the "Calibration" menu in the setup. A separate calibration weight must be connected by the user for external calibration.

VR5.13 (08/2004)
- Software adapted to new Mettler scale types (T-Brick, Point-Ex).
- New language selection options implemented. It is now possible to choose between up to 32 different languages on the operator panel. The system switches between displayed screens and alarms.
  Important! This option is only supported by the new TERMEX 220/230/320/330 generation of operator operator panels!
- Project download function optimized. Project downloads were occasionally aborted with the error alarm "Uninterruptible Loop". The length of the monitored timeout has now been increased.
- Second DIGIO module with 3 digital inputs supported. 6 inputs and 3 outputs are thus possible in the maximum configuration (DIGIO33+DIGIO30).
- New high-speed mode supported for Mettler scales. The MF command is supported, and the send rate for the weight values can be set in the Mettler menu under "HighSpeedVals".

VR5.14 (03/2005)
- More possible settings for WMH scales.

VR5.15 (05/2005)
- Bugfix for problem with the possible settings for the Sartorius scale. These settings were not stored in devices belonging to the new generation.

VR5.16 (05/2005)
- Bugfix for problem when Mettler scales are initialized. Mettler scales are logged in with a new scale number after updating their firmware. This new number was not supported by the operator panel if the scale was not being initialized for the first time. The operator panel now always searches all possible scale numbers.
- Bugfix for the problem with the possible settings in VR5.15.

VR5.17 (06/2005)
- New, internal TERMEX_TWEIGHT tag when the tare weight is output to the data block (i.e. to a connected controller) or on the display.

VR5.18 (08/2005)
- Integrated setup now standardized in English.
- New power-up alarm.
- EPCA processing now active as standard in the delivery condition.

VR5.19 (04/2006)
- Bugfix for problem when the language setting is queried in EPCA.
- Extended data output if a runtime error leads to an abort (memory dump)
- Problem with cursor control fixed when input/output tags are entered and then interrupted with the increment or decrement key.
- Problem with cursor control fixed when user defined fonts are used and characters are deleted.
- Enhanced driver for barcode scanner. The operator panel can now no longer be blocked by continuously transmitted characters.
- Enhanced drivers for expansion modules (UART, DIGIO). Hybrid configurations now work without any problems.

VR5.20 (07/2006)

- Enhanced driver for barcode scanner.
- Backlit displays supported. The brightness can be adjusted and saved in the setup. It can also be temporarily adjusted with the shortcut <Shift> <Enter> 3.
- Serial numbers with up to 10 digits supported.

VR5.21 (11/2007)

- Enhanced automatic identification of inserted hardware modules (RCT, UART, DIGIO)
- In order for input levels to be umdated at a screen change, there has been an error correction of the second DIGIO-card when reading these inputs in EPCA
- Now projects can be uploaded at all baut rates without receiving an uninterruptible-loop error. This was once an issue when using lower baud rates (<9600 baud)
- Long transmission telegram (tag range > 125 DW) will no longer cause a communication error or incorrect telegram when using a coupled Modbus master.

8 Glossary

Bar
Bars are used for the graphic output of tag values. A bar is always associated with just one tag. A bar with tag length is generated according to the scaling selected for the project. Bars are displayed in their own windows.

Bit map
A bit map is a graphic object consisting of individual pixels. Height and width of the bit map are set. Any graphic can be generated. Bit maps are output to windows.

Character sets
Character sets are needed to display text. TERMEX 230/330 is equipped with 4 character sets of varying size, TERMEX 220/320 has one character set. Additional character sets can be generated for TERMEX 230/330 by using TERMEXpro and loaded on the operator panel during project generation. Each character is represented by a (small) bit map. The appearance of characters is modified through the setting of pixels.

Graphic elements
These objects have their own characteristics such as pixel, line, rectangular, or bar and can be inserted at any position in the display of the TERMEX 230/330. Complete pictures can be generated through grouping of several graphic elements. If such an image is drawn in a window, the entire image can be deleted by closing the window. Otherwise the pixel of an element can be deleted by redrawing with the reverse command.

Handle
An output handle which indicates the destination of a certain data path. The handle always includes the number of the window where the data should be output. If a value = 0 there is no output. Handles are mostly used in the EXTEC protocol.
The system provides handles for the output of characters (Handle1), key codes (Handle2), and barcodes (Handle 3 and 5).

Periphery
Additional devices which can be connected to the operator panel are called peripherals such as for example barcode readers, scales, and auxiliary keyboards. Peripherals may be from different manufacturers.

Program
Process control via the EPCA programming system which occurs in the operator panel. Programs can be used for support of a connected control computer or for stand-alone applications.

Project
A project contains screens, alarms, tag definitions, character sets, and programs. Projects are generated in TERMEXpro, then loaded onto the operator panel via interface SER1, and stored as residents. The project includes all definitions that are known prior to running time and will not be modified.

Screen
Screens can be switched with numbers. Projects are normally categorized in screens to separate the individual steps. For example there could be an overview screen, numerous detail screens, one screen for parameter input.
A screen can include windows, text, tags, bars, and graphic elements.

Soft keys
Soft keys are text labels for the 5 function keys below the display of the operator panel. Soft keys can be labeled with the appropriate text output. If the integrated soft key generation is used the user does not need to consider the correct positioning of the text above the function keys. Integrated soft keys will also permit an automatic changeover to the second level by pressing the Shift key on the operator panel.

Task
The EPCA programming system offers multitasking features so that several programs can run at the same time. Each of these program sections which together may constitute an actual “program” are called tasks. Hence the system can be designed in such a way that one task is responsible for each key action.

Text
Text is composed of character chains that are output on the display. The appearance of text depends of the character set used as well as the position, size, and style of the text window. With TERMEX 220/320 text is output to a standard size window.

Tags
Tags are used for output of varying sizes and states. Tags are defined and placed in the course of project generation. The operator panel will receive the value of a tag during runtime from a connected control computer (Output tags) or through input at the operator panel by the user (Input/Output tags). Tags appear as integral parts of text or are directly output into their own window.

Window
Windows are special display areas which are used to output text, tags, bit maps, graphic objects, and bars. Positioning and size of a window are preset. Additional attributes such as inversion can be modified. If windows are closed the existing background is built up again once they are reopened. This characteristic is particularly important for alarms.

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