

*Industrial PC*

# **BT155 / BT205 / BT250 PC-Based Control Terminal Connectivity Manual**

Edition

# 103



**BOSCH**  
Automation

*Industrial PC*

# **BT155 / BT205 / BT250 PC–Based Control Terminal Connectivity Manual**

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# 1 Safety Instructions

Before you start working with the Bosch BT155, BT205, and BT250 PC-based control terminals, we recommend that you thoroughly familiarize yourself with the contents of this manual. Keep this manual in a place where it is always accessible to all users.

## 1.1 Proper use and standard operation


The industrial-standard PCs described hereunder serve as **operating and visualization units** for Bosch proprietary application software running on Microsoft Windows 95 or Microsoft Windows NT 4.0 operating systems, either as a controller platform on standalone machines or in networked systems.

While it is possible in principle to operate other proprietary operating systems or application software on the described industrial-standard PCs, the occurrence of unexpected repercussions, even with Bosch applications, cannot be entirely ruled out. In conjunction with such nonstandard operations, Bosch shall not assume any liability for either hardware and/or software.

The products described hereunder

- were developed, manufactured, tested and documented in accordance with the relevant safety standards. In standard operation, and provided that the specifications and safety instructions relating to the project phase, installation and correct operation of the product are followed, there should arise no risk of danger to personnel or property.
- are certified to be in full compliance with the requirements of the
  - COUNCIL DIRECTIVE 89/336/EEC of May 3rd 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 93/68/EEC (amendments of Directives), and 93/44/EEC (relating to machinery)
  - COUNCIL DIRECTIVE 73/23/EEC (electrical equipment designed for use within certain voltage limits)
  - Harmonized standards EN 50081-2 and EN 50082-2
- are designed for operation in an industrial environment (Class A emissions). The following restrictions apply:
  - Direct connection to the public low-voltage power supply is prohibited.
  - Connection to the medium and/or high-voltage network must be provided via transformer.

The operation of Class A devices in private residences, in business or small-industry settings is permitted only if their operation does not produce undue interference with other devices.

 **This is a Class A device. In a residential area, this device may cause radio interference. In such case, the user may be required to introduce suitable countermeasures, and to bear the cost of the same.**

Proper transport, handling and storage, placement and installation of the product are indispensable prerequisites for its subsequent flawless service and safe operation.

## 1.2 Qualified personnel

This instruction manual is designed for specially trained personnel. The relevant requirements are based on the job specifications as outlined by the ZVEI and VDMA professional associations in Germany. Please refer to the following German-Language publication:

**Weiterbildung in der Automatisierungstechnik**  
**Publishers: ZVEI and VDMA Maschinenbau Verlag**  
**Postfach 71 08 64**  
**60498 Frankfurt/Germany**

This instruction manual is specifically designed for project designers and PC specialists. They require special knowledge and skills related to configuring and commissioning electrical system components.

Interventions in the hardware and software of our products not described in this instruction manual may be performed only by specially trained Bosch personnel.

Unqualified interventions in the hardware or software or non-compliance with the warnings listed in this instruction manual or affixed to the product may result in serious personal injury or damage to property.

Installation and maintenance of the products described hereunder is the exclusive domain of trained electricians as per IEV 826-09-01 (modified) who are familiar with the contents of this manual.

Trained electricians are persons of whom the following is true:

- They are capable, due to their professional training, skills and expertise, and based upon their knowledge of and familiarity with applicable technical standards, of assessing the work to be carried out, and of recognizing possible hazards.
- They possess, subsequent to several years' experience in a comparable field of endeavour, a level of knowledge and skills that may be deemed commensurate with that attainable in the course of a formal professional education.

With regard to the foregoing, please read the information about our comprehensive training program. Visit our Web Shop for Teachware and online seminar bookings on the Internet at <http://www.bosch.de.at/didactic>. The professional staff at our training centre will be pleased to provide detailed information. You may contact the centre by telephone at (+49) 6062 78-258.

### 1.3 Safety markings on components



DANGER! High voltage!



DANGER! Corrosive battery acid!



CAUTION! Electrostatically sensitive devices!



Lug for connecting PE conductor only!



Screened conductor only!



## 1.4 Safety instructions in this manual

---



### **DANGEROUS ELECTRICAL VOLTAGE**

This symbol warns of the presence of a **dangerous electrical voltage**. Insufficient or lacking compliance with this warning may result in **personal injury**.

---



### **DANGER**

This symbol is used wherever insufficient or lacking observance of this instruction may result in **personal injury**.


---



### **CAUTION**

This symbol is used wherever insufficient or lacking observance of instructions can result in **damage to equipment or data files**.

---

 This symbol is used to alert the user to an item of special interest.

★ This asterisk symbol indicates that the manual is describing an activity which the user will be required to perform.

## 1.5 Safety instructions for the described product

---

**DANGER**

Fatal injury hazard through ineffective Emergency-STOP devices! Emergency-STOP safety devices must remain effective and accessible during all operating modes of the system. The release of functional locks imposed by Emergency-STOP devices must never be allowed to cause an uncontrolled system restart! Before restoring power to the system, test the Emergency-STOP sequence!

---

**DANGER**

Retrofits or modifications may interfere with the safety of the products described hereunder!

The consequences may be severe personal injury or damage to equipment or the environment. Therefore, any system retrofitting or modification utilizing equipment components from other manufacturers will require express approval by Bosch.

---

**CAUTION**

Only Bosch-approved spare parts may be used!

---

**CAUTION**

**Danger to the module!**

**All ESD protection measures must be observed when using the module! Prevent electrostatic discharges!**

---

Observe the following protective measures for electrostatically sensitive devices (ESD)!


- The personnel responsible for storage, transport and handling must be trained in ESD protection.
- ESDs must be stored and transported in the dedicated protective packaging specified for this purpose.
- Out of principle, ESDs may be handled only at special ESD work stations equipped for this particular purpose.
- Personnel, work surfaces and all devices and tools that could come into contact with ESDs must be on the same potential (e.g., earthed).
- An approved earthing wrist strap must be worn. It must be connected to the work surface via a cable with integrated 1 MΩ resistor.
- ESDs may under no circumstances come into contact with objects susceptible to accumulating an electrostatic charge. Most items made of plastic belong to this category.
- When installing ESDs in or removing them from an electronic device, the power supply of the device must be switched OFF.

## 1.6 Documentation, software release and trademarks

### Documentation

The present manual contains information about specifications, configuration procedures and operation of the BT155, BT205 and BT255 PC-based control terminals.

Documentation	Order no.	
	German	English
BT155 / BT205 / BT255 PC Based Control Terminals – Connectivity Manual	1070 073 810	1070 073 820

 **In this manual the floppy disk drive always uses drive letter A:, and the hard disk drive always uses drive letter C:.**

Special keys or key combinations are shown enclosed in pointed brackets:

- Named keys: e.g., <Enter>, <PgUp>, <Del>
- Key combinations (pressed simultaneously): e.g., <Ctrl> + <PgUp>

 **The present manual makes reference to the following:**

**Software: Microsoft Windows 95B  
Microsoft Windows NT4.0**

 **Information on the software version of Windows 95 or Windows NT can be obtained as follows:**

- 1. Click the "My Computer" icon on the desktop with the right mouse button.**
- 2. Double-click the "Properties" menu option.**

### Trademarks

All trademarks referring to software that is installed on Bosch products when shipped from the factory represent the property of their respective owners.

At the time of shipment from the factory, all installed software is protected by copyright. Software may therefore be duplicated only with the prior permission of the respective manufacturer or copyright owner.

MS-DOS® and Windows™ are registered trademarks of Microsoft Corporation.

PROFIBUS® is a registered trademark of the PROFIBUS Nutzerorganisation e.V. (user organization).



## 2 System Overview

### 2.1 Components

The BT155, BT205 and BT250 PC-Based Control Terminals incorporate the following:

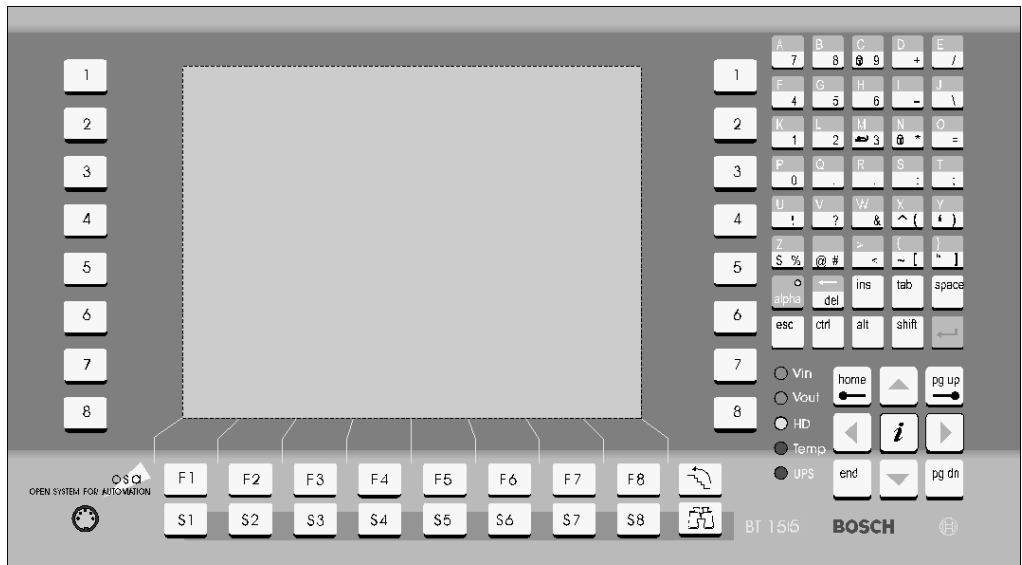
- Industrial PC, at rear of housing
- Flat-panel display, some also with touch screen
- Operator panel with keyboard and LED status displays

The compact design and service-friendly construction excels with regard to the following:

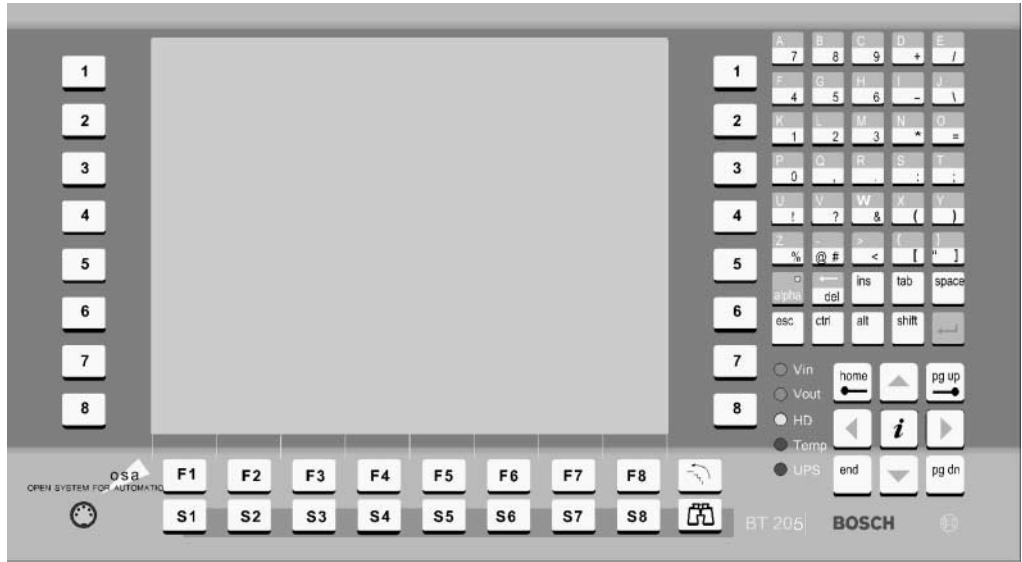
- **High degree of failure safety** (e.g., spring-cushioned, impact protected and vibration-proof hard disk suspension, UPS uninterruptible power supply)
- **Simple maintenance**

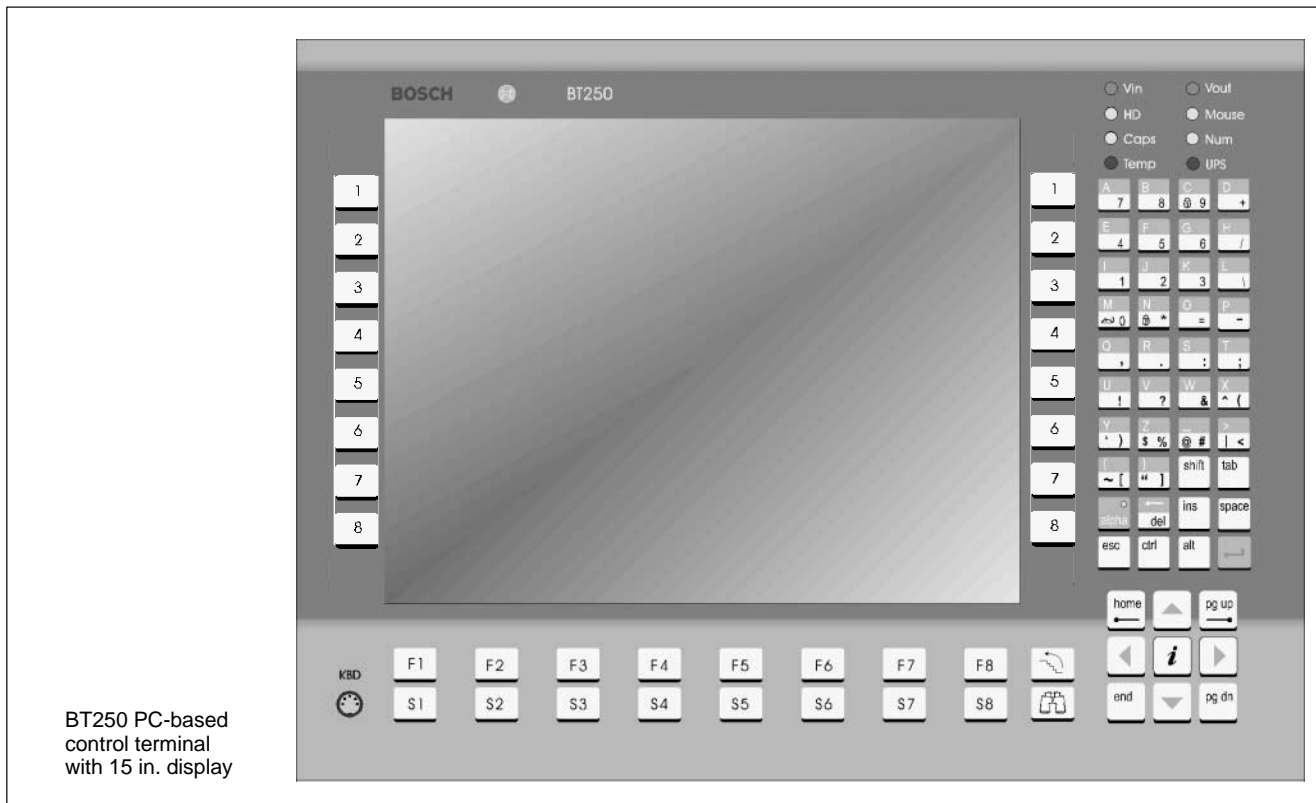
Depending on the intended application, the Microsoft Windows 95 or Microsoft Windows NT 4.0 operating system and appropriate Bosch application software are preinstalled (refer to section 9.4).

BT155 PC-based control terminal with 10.4 in. display



BT205 PC-based control terminal with 12.1 in. display






BT250 PC-based control terminal with 15 in. display

## 2.2 Device variants

The PC-Based Control Terminals are available in different model variants. Their major differentiating features are listed below:

- Display size
- Touch screen capability
- Processor
- Number of expansion slots
- Type of power supply

	<b>BT155, BT155T (Touch screen)</b>	<b>BT205</b>	<b>BT250, BT250T (Touch screen)</b>
Display	10.4 in. TFT	12.1 in. TFT	15 in. TFT
Touch Screen	Yes (BT155T)	No	Yes (BT250T)
Free expansion slots (PCI / ISA)	2 or 6	2 or 6	2
Power supply	230/115 VAC or 24 VDC	230/115 VAC or 24 VDC	230/115 VAC or 24 VDC

 **Touch screen control panels (BT155T and BT250T) provide PC control via a touch-sensitive display panel, without requiring the use of either keyboard or mouse.**


## 2.3 Specifications

Feature	Characteristics	BT155(T)	BT205	BT250(T)
Processor	Intel Pentium CPU (Socket 7) or compatible	≥ 266 MHz with MMX™ technology  optional: 400 MHz Pentium™ III		
RAM (SIMM modules)	min. 64 MB max. 256 MB	64 MB or 128 MB (DRAM or EDO)	64 MB or 128 MB (DRAM or EDO)	256 MB (SDRAM)
Hard disk	IDE	> 5 GB	> 5 GB	> 5 GB
Display	10.4 in. TFT	●	–	–
	12.1 in. TFT	–	●	–
	15 in. TFT	–	–	●
Touch Screen	Touch-sensitive TFT display surface	● optional, BT155T	–	● optional, BT250T
Available expansion slots (housing w/ 2 expansion slots)	PCI / ISA	2 / 0 or 1 / 1	2 / 0 or 1 / 1	2 / 0 or 1 / 1
Available expansion slots (housing w/ 6 expansion slots)	PCI / ISA	4 / 2 or 3 / 3	4 / 2 or 3 / 3	–
Power supply cable	230/115 VAC, 50/60Hz	(alternative to 24 VDC)		
	24 VDC	(alternative to 230/115 VAC)		
UPS (Uninterruptible Power Supply)	Built-in rechargeable battery pack	● (6-slot housing)	● (6-slot housing)	–
	External rechargeable battery pack	● (2-slot housing)	● (2-slot housing)	● (2-slot housing)
Ports, connectors, interfaces	(Refer to Chapter 6 for detailed information)	4 x serial, 1 x parallel, USB port PS/2 keyboard and mouse, Ethernet connector Key codes via PROFIBUS-DP and 24 Vout connectors		
Weight		approx. 8 kg (w/ 2 expansion cards, no rechargeable battery pack)	approx. 10 kg (w/ 6 expansion cards, including rechargeable battery pack)	approx. 10 kg (w/ 2 expansion cards, including rechargeable battery pack)
Dimensions	PC housing with 2 expansion slots	448 x 195 x 98 mm	448 x 195 x 98 mm	448 x 195 x 98 mm
	PC housing with 6 expansion slots	448 x 195 x 138 mm	448 x 195 x 138 mm	–
	Control panel (display w/ keyboard)	482.6 x 267 x 5 mm (19 in. x 6 U x 5 mm)		482.6 x 354.8 x 5 mm (19 in. x 8 U x 5 mm)
Operating system	Windows 95	●	●	–
	Windows NT 4.0	● (Standard)	● (Standard)	●

● = available

– = not available



 All specifications are subject to change as a result of technological developments. This also means that components providing higher than the specified performance (e.g., a faster processor) may be integrated in the devices without explicit reference in this documentation.

## 2.4 Expansion slots

Depending on the size of the housing, 2 or 6 expansion slots are provided:

- Small housing:
  - 1 PCI bus card
  - 1 PCI or ISA bus card (combination slot)
- Large housing
  - 3 PCI bus cards
  - 2 ISA bus cards
  - 1 PCI or ISA bus card (combination slot)



### CAUTION

Risk of damage to the PC, or corruption of application software due to the installation of non-approved expansion cards.  
Only approved expansion cards may be installed, and only by authorized specialists.

---

For information about installing expansion cards, refer to section 8.5

## 2.5 Rechargeable battery pack

The rechargeable battery pack facilitates a controlled shutdown of the PC operating system in the case of a power failure, as described in Section 3.2 (**UPS functions**). In this way, a loss of data held in the PC RAM is prevented.

The rechargeable battery pack is integrated in the **large** housing. For the **small** housing it must be ordered separately:

- Rechargeable battery pack with short cable (20 cm), for rear-panel installation on the operator terminal,  
Order no.: 1070 081 653
- Rechargeable battery pack with long cable (200 cm), for installation in control cabinet,  
Order no.: 1070 081 652

The rechargeable battery pack has a service life of 3000 charging cycles, and must be replaced if it fails to hold a full charge. In this context, refer to section 8.4.

## 2.6 Mass storage devices

The BT155 and BT205 PC-Based Control Terminals may be equipped with an optional CD-ROM drive and an LS120 drive.

In terms of mass storage devices, the BT250 accommodates the simultaneous connection of an external CD-ROM drive and an external floppy disk drive.

### Internal CD-ROM and LS120 drive


The internal CD-ROM drive and LS120 drive are located at the rear of the control terminal. When installing the BT155 and BT205 equipped with CD-ROM and LS120 drive, accessibility of the drive bays must be ensured.

### CD-ROM drive for parallel port

 **To load software, a CD-ROM drive is required.**

An external CD-ROM drive is connected via the LPT1 parallel port. For connector pin assignments, refer to section 6.3.

Ensure that the CD-ROM drive is installed in accordance with the installation instructions provided by the respective manufacturer. This may also necessitate changes to the existing BIOS or operating system settings.

 **The simultaneous use of several devices on a single parallel port is not possible because the drivers cause mutual interference. In the event that a software protection device ("dongle") is inserted in LPT1, this port will reject the use of any other devices.**

### Floppy disk drive

 **To back up data to a floppy disk, a floppy disk drive will be required.**

The integrated floppy disk adapter supports the following types of drives:

- 3.5 in. Double Density (720 kB)
- 3.5 in. High Density (1.44 MB) **(factory setting)**
- 3.5 in. Enhanced Floppy Mode (2.88 MB)

For information about connecting the optional floppy disk drive, refer to section 8.2.

## 2.7 Operating conditions

The PC-Based Control Terminals are designed for continuous, 24-hour/day operation. The display backlight can be switched off. The following specifications apply unless otherwise indicated in the individual sections:

### Temperature

#### Storage temperature:

- BT155(T), BT205, BT250(T):  $-20\text{ °C}$  to  $+60\text{ °C}$

#### Ambient temperature:

- BT155, BT205, BT250(T):  $+5\text{ °C}$  to  $+45\text{ °C}$

Ambient temperatures apply to installation described in Section .  
Temporary temperature fluctuations of up to  $3\text{ °C}$  per minute are permitted.



#### CAUTION

##### Excessive operating temperature!

**Do not expose the PC-based control terminal to direct sunlight or any other source of heat radiation!**

### Relative humidity

Climate class 3K3, as per EN 60529; moisture condensation not permitted.

### Atmospheric pressure

Operating up to 2000 m above sea level in accordance with DIN 60 204.

### Protection category

Front panel: IP 65, otherwise IP 00

Control cabinets and installation compartments must conform to IP 54 rating (dust filters upstream of air intake and exhaust):



#### CAUTION

##### Conditions hazardous to the product!

**The ambient air must be free of electrically conductive pollutants (e.g., acids, alkali, corrosives, salts, metallic vapours, etc.).**

### Vibration resistance, operating

Frequency range: 10...150 Hz

Amplitude: 0,075 mm at 10...57 Hz

Acceleration: 1 g at 57...150 Hz

as per EN 60 068-2-6


### Impact resistance

15 g, as per DIN IEC 68-2-27, no functional detriment

## 2.8 Governing standards

The BT155(T), BT205 and BT250(T) system components conform to the following standards:

- EN 60 204-1 Electrical systems on machines
- EN 50 081-2 Basic specification for interference emission (industrial environment)
- EN 50 082-2 Basic technical standard, interference resistance (industrial environment)
- EN 60 742 Transformer for 24 V power supply, safe isolation
- EN 60 950 Overvoltage category II
- EN 61 131 24 V output requirements
- EN 61 131-2 24 V power supply requirements
- EN 418 Machine safety, Emergency-STOP devices
- EN 60 529 Protection categories (incl. housings and installation compartments)
- EN 60 068-2-6 Vibration test
- EN 60 068-2-27 Impact test
- .IS.114 "X-ray Radiation" Directive, as per Official Federal Gazette

 **As shipped from the factory, PC-Based Control Terminals conform to the requirements of the CE mark of certification. However, a new CE conformity verification will be required when new expansion cards have been installed.**

## 3 Security Functions

### 3.1 Temperature monitoring function

The ambient air temperature of the control terminal must not exceed +45 °C (see section 2.7). In the interest of equipment protection, the device features a temperature monitoring function which keeps track of the internal housing temperature.

At internal housing **temperatures exceeding 50 °C**, an overtemperature warning occurs, manifesting itself as follows:

- via the flashing **Temp** LED at the front panel.
- via a message window displayed by the operating system.  
This message must also be interpreted by all PC application programs, and particularly by I/O processes. The Bosch application software meets this requirement.

The above described temperature monitoring function can be disabled by means of the following program:

- UPS<sub>plus</sub> for Windows 95
- UPS<sub>NT</sub> for Windows NT 4.0

See also section 3.3.

If internal housing **temperatures exceed 65 °C**, the PC will be subject to a **controlled shutdown** via the UPS logic circuit (see section 3.2).



#### **DANGER**

**Inadvertent machine movements.**

**Always ensure that temperatures remain within the noncritical range. In the case of application-sensitive procedures, ensure that machine movements are terminated in a controlled fashion before the temperature monitoring function disables the operator terminal.**

---

## 3.2 UPS Uninterruptible Power Supply

In the event of a power failure or an internal housing temperature in excess of 65 °C (see section 3.1), the UPS logic integrated in the power supply of the control terminal is activated, initiating a safe operating system shutdown procedure backed by the internal rechargeable battery pack.

Contingent upon a fully charged and functioning rechargeable battery pack, the detection of a **power dropout in excess of 20 ms** triggers the switch-over to battery-backed operation.

☞ **The purpose of the UPS logic function integrated in the power supply of the control terminal is to provide a safe shutdown for application programs and operating system. It is not designed to maintain operation in the case of a prolonged power failure!**



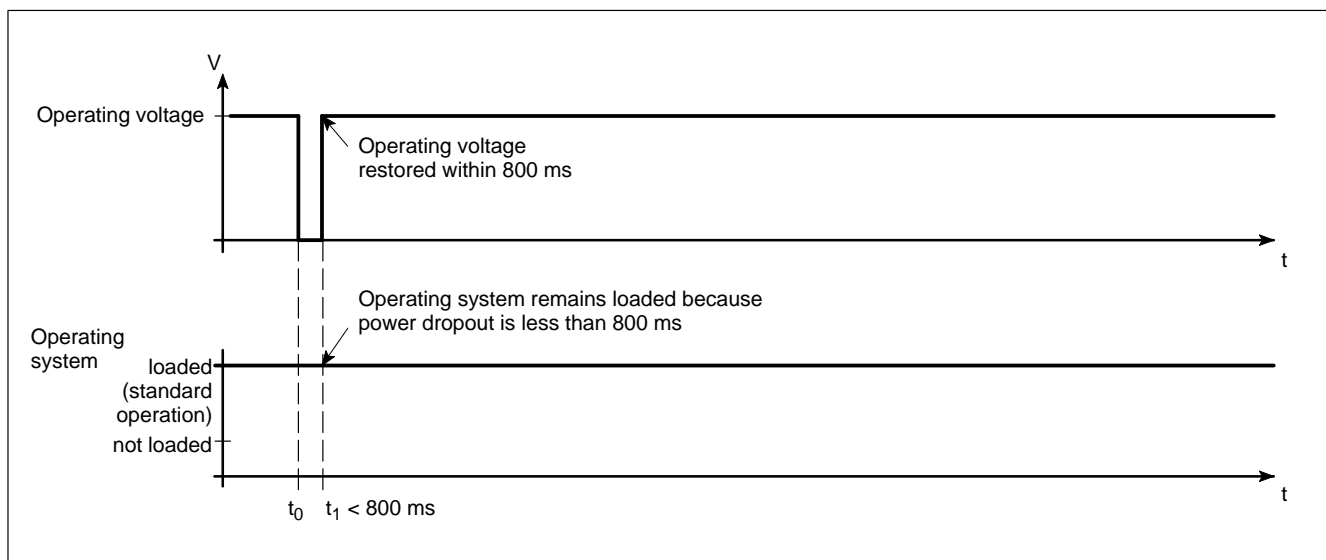
### DANGER

If there are no batteries in the unit, or if the batteries are defective or discharged, the IPC will RESET without warning after a voltage dip in excess of 20 ms! Possible consequences are uncontrolled machine movements or loss of data.

Observe UPS program messages warning of a discharged battery pack. This test is run during each PC boot phase.

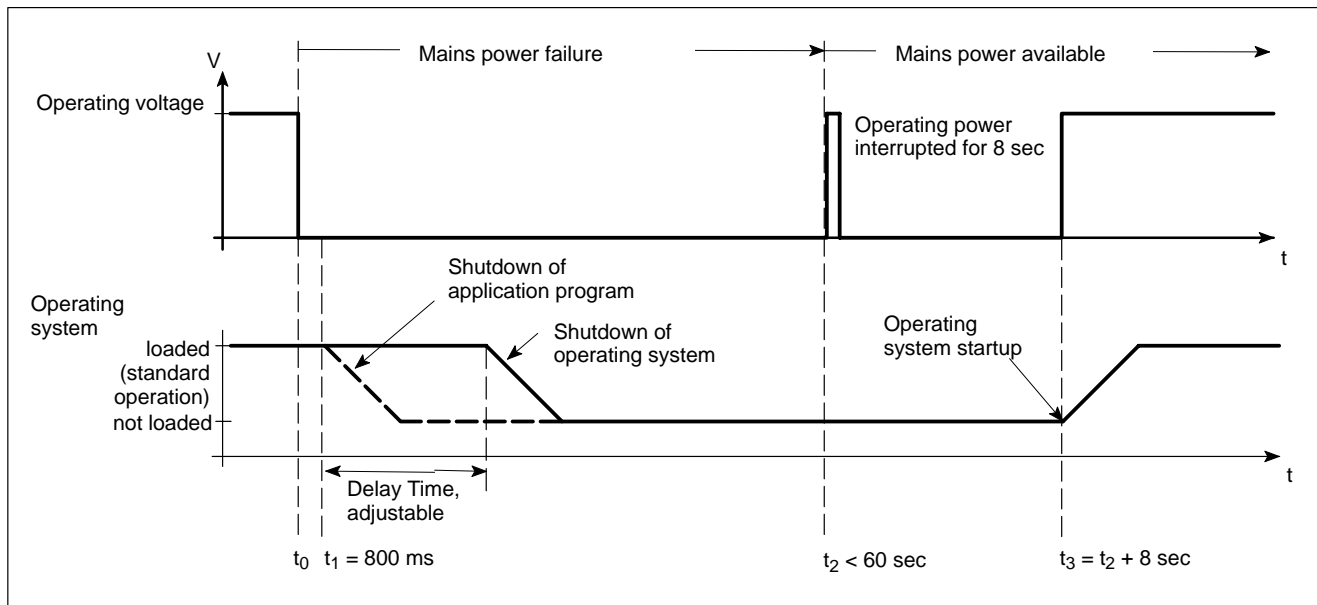
### Power dropouts below 800 ms duration

If the mains voltage is restored within the delay time of 800 ms, the power supply switches back to normal mode.



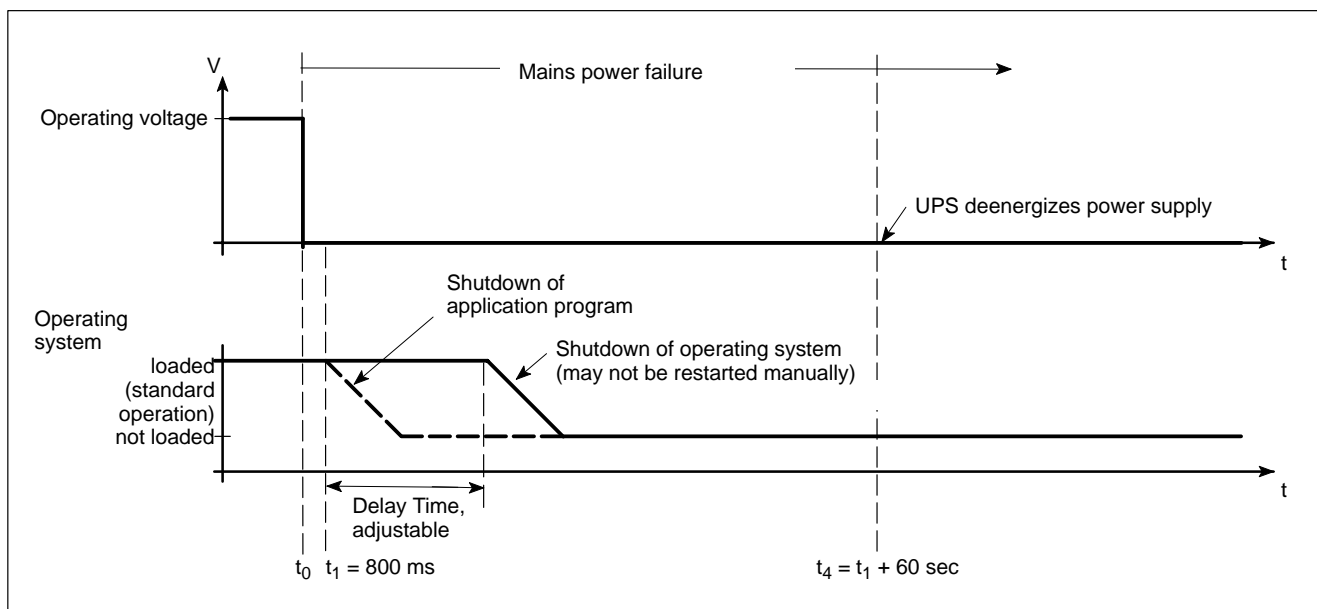
**Power losses between 800 ms and 60 sec**

In the event of a power loss in excess of 800 ms, the operating system will initiate a safe shutdown of the operating system **once a preselected interval (Delay Time) has elapsed**. If the mains voltage returns within 60 seconds, the UPS will interrupt the operating voltage for an additional 8 sec. When point t3 has been reached, the operating system is again started up.



**Power losses > 60 s**

After approx. 60 sec., internal UPS functions deenergize the power supply.



☞ Refer to the following sections for the procedure required to adjust the Delay Time: For the UPS<sub>plus</sub> supplementary software, see section 3.3.2; for the UPS<sub>NT</sub> control program see section 3.3.3.

### 3.3 UPS program

#### 3.3.1 Functionality

The “UPS<sub>plus</sub>” or “UPS<sub>NT</sub>” uninterruptible power supply program controls and monitors the integrated uninterruptible power supply (UPS). The program also checks the function of the rechargeable battery pack, and controls the system temperature monitoring function.

Depending on the operating system, one of the following is installed:

- **UPS<sub>plus</sub>** for Windows 95
- **UPS<sub>NT</sub>** for Windows NT

Communications between program and UPS are handled via the COM4 serial port.

The task of the UPS program is to respond as follows in the event of a power loss, and within a predefined Delay Time (max. 60 sec):

- By sending a message to all active applications, facilitating their safe shutdown via special application routines.
- By shutting down the operating system after the delay time has elapsed. Once the UPS power monitoring function has been triggered, aborting the system shutdown routine is no longer possible.

Closing all active applications prevents data loss in the event of a sudden voltage interruption.

In the event that the mains power has not been restored, the UPS will switch off the PC power supply after a maximum of 60 seconds (refer to disconnect conditions in section 3.2).



#### CAUTION

**Loss of data through manual restart!**

**Note that the UPS will switch off the operator terminal in any case. For this reason, once the operating system has been shut down, the “Restart” dialog button must not be selected.**

**In the case of power outages lasting less than 60 seconds, the operating system is restarted automatically.**

---

During standard operation, the user is unable to access or influence the UPS<sub>plus</sub> or UPS<sub>NT</sub> control program. Program operation and parameter modification require special access privileges, and can be effected only after a restart of the operating system.



**Parameter values set in the UPS<sub>plus</sub> or UPS<sub>NT</sub> software may not be changed without prior consultation with Bosch.**



### 3.3.2 Configuring and operating UPS<sub>plus</sub> for Windows 95



☞ All of the operating steps described below will be available only at the time of initial installation, or in the event that the program was started with special access rights.

#### Start / Stop commands

In the main window, click **UPS**, followed by double-clicking **Start**.



Subsequent to the initial installation or subsequent to **Stop**, the program is again started with this command. When the program has started successfully, the main window is closed after approx. 2 seconds, and a symbol appears in the Windows task bar.

The USP program is exited by selecting the **Stop** menu command.

#### Hide command

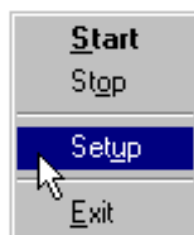
Hides the program main window, and places a symbol in the Windows task bar. The command is not available while the program is stopped.

#### Exit command

Exits the entire program, and terminates an ongoing monitoring event.

#### Simple operating menu

Clicking the **right** mouse button displays a simple operating menu containing the major program functions.

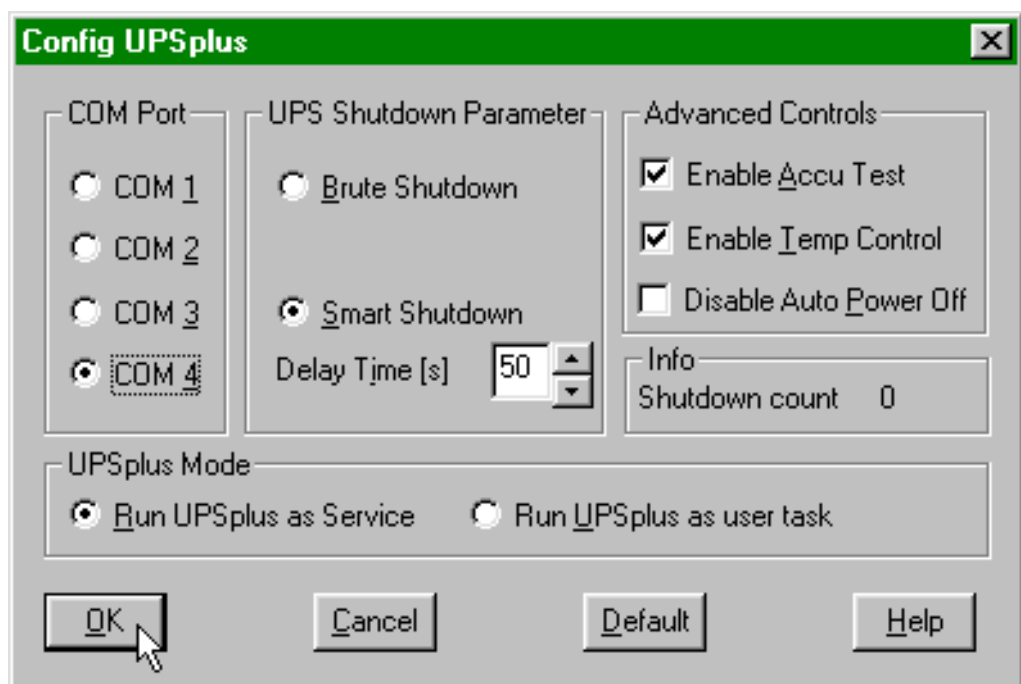


## Configuration



This dialog is used to define the starting and run-time behaviour of the UPS Control program.

The parameter settings can be changed at any time. To allow modifications to take effect, the UPS program must be exited and restarted.



### COM Port

The UPS program is always connected to the UPS via the COM4 serial port.

### UPS Shutdown Parameters

#### Brute Shutdown

Upon receipt of the shutdown signal from the UPS, the shutdown command for the Windows operating system is issued without delay. This causes the immediate termination of all active applications, followed by the shutdown of Windows.

#### Smart Shutdown

Upon receipt of the shutdown signal from the UPS, the preset Delay Time interval starts to elapse.

## (Shutdown) Delay Time

This parameter defines the interval (0 to 60 seconds) by which the **shutdown is delayed** (Delay Time). The intervening period is used to dispatch a Request To Close message to all active windows. The user can avail himself of this time for the purpose of saving his data. Upon expiry of the Delay Time, all application programs will be terminated without prior security query!

When defining the Delay Time value, it is important to ensure that enough time remains for a safe operating system shutdown (i.e., closing and backing up Windows system files, etc.) in the intervening period between the expiry of the Delay Time interval and the expiry of the 60-second interval after receiving the shutdown signal. If the selected interval is too short, the shutdown process will be aborted because the UPS deenergizes the power supply of the control terminal. Given the right set of circumstances, this may well lead to loss of data.



### CAUTION

**Upon expiry of the Delay Time interval, the operating system is shut down without prior security query. Unsecured data belonging to open applications will be lost.**

---

## Advanced Controls field

### Enable Accu Test

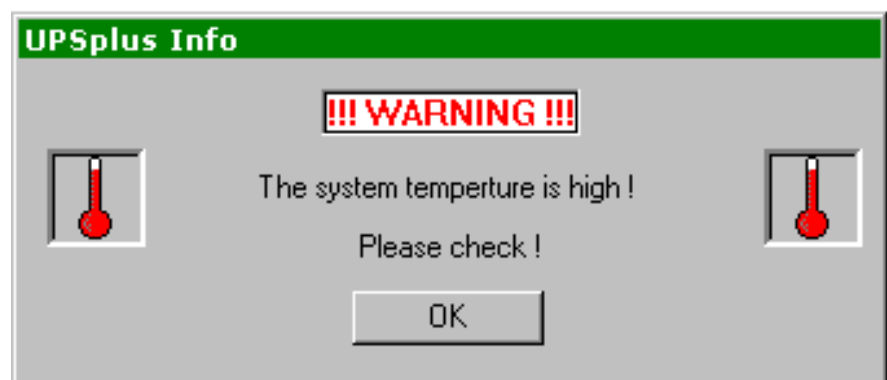
When this checkbox is checked, the system performs a test of the battery pack during each restart.

In the case of a faulty battery pack (e.g., defective battery pack, cable break, plug not connected), battery monitoring is disabled. The UPS program continues only with its temperature monitoring function.

If temperature monitoring has not been enabled, the UPS program will be terminated.

### Enable Temp Control

Enabling this check box causes the ambient temperature to be monitored on a permanent basis. Excessive temperatures will produce the following warning message:



Subsequent to a temperature warning, the UPS control program is again started. During the reactivation interval of approx. 2 seconds, no power monitoring takes place although the battery pack is fully functional.

**Disable Auto Power Off**

The Disable Auto Power Off" function should only be used when starting up the system or installing software. For standard operation, this checkbox must be unchecked **without exception!**

**CAUTION****Loss of data!**

**When this checkbox is activated, a safe shutdown of the operating system will no longer be possible in the event of a power failure. The control terminal will shut off instantly!**

**Info field****Shutdown Count**

The value displayed here indicates the number of times the UPS has already shut down the system. After more than 3,000 forced shutdown cycles by the UPS, replacement of the rechargeable battery pack is recommended.

**UPS<sub>plus</sub> Mode field**

There are two operating modes for the **UPS<sub>plus</sub>** control program:

**Run UPS<sub>plus</sub> as Service**

The program is started as part of the Windows 95 startup, and remains active until Windows 95 is again terminated. This behaviour is not influenced by changing the logged-in user. The user is unable to stop the program or terminate monitoring. Although he would be able to access the active program via the Setup dialog and change parameter values, these changes would not take effect until Windows 95 has been restarted.

**Run UPS<sub>plus</sub> as User Task**

The program is started as part of a user login routine, and is terminated upon logout. The user has full control over all UPS program functions.

**Default button – UPS<sub>plus</sub>**

Selecting this button returns all settings to their **default values**.

These are:

- COM-Port: COM4
- Smart Shutdown/Delay Time: 50 sec
- Accu Test (battery test): enabled
- Temp Control: enabled
- Run UPS<sub>plus</sub> as Service: enabled
- Disable Auto Power Off: disabled

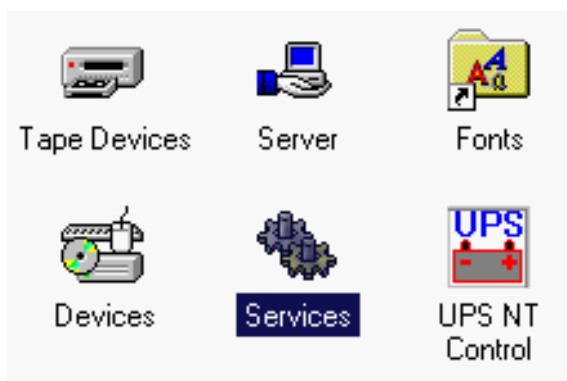
### 3.3.3 Configuring and operating UPS<sub>NT</sub> for Windows NT

☞ Access to program functions requires Administrator privileges!

#### Start / Stop

The UPS<sub>NT</sub> program is started **automatically** as part of the Windows startup routine.

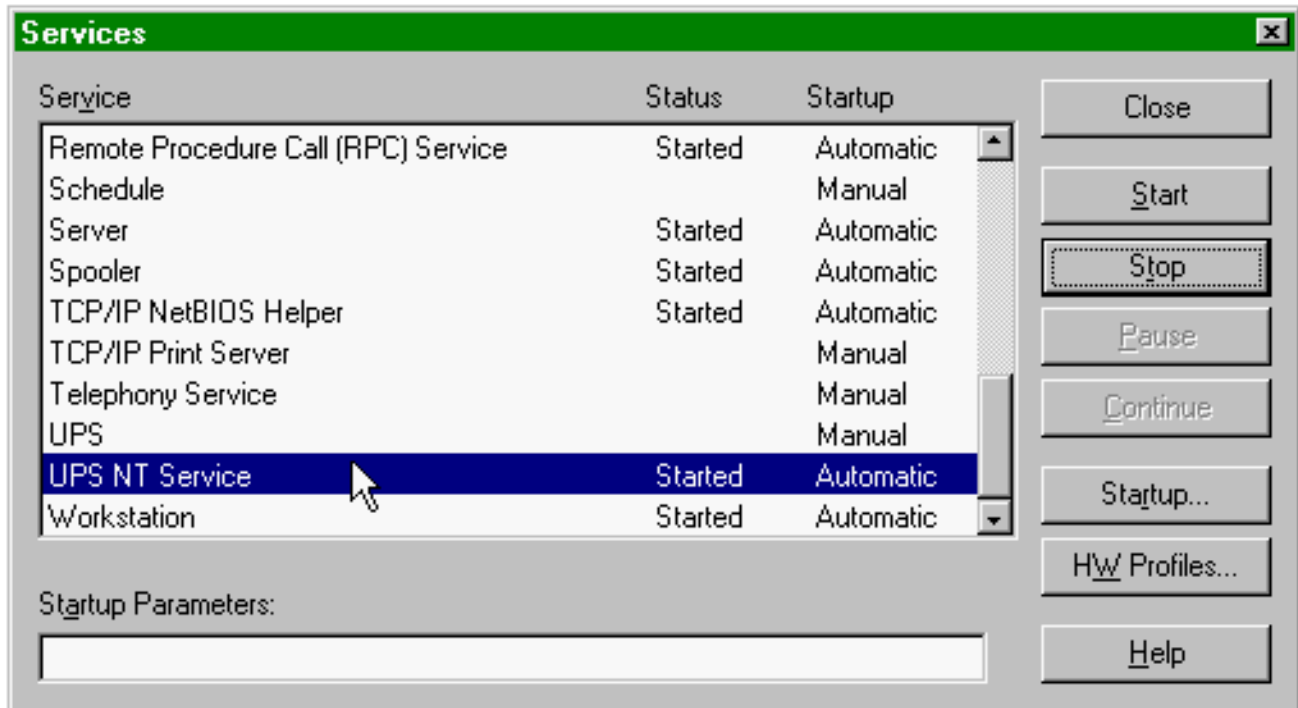
To halt, terminate or restart the service (e.g., in the course of a new software installation or update), select **Services** (at left of **UPS<sub>NT</sub> Control** symbol, see illustration below).



The Services manager of Windows NT indicates the status of the UPS<sub>NT</sub> service:

- UPS<sub>NT</sub> stopped: No entry in Status column
- UPS<sub>NT</sub> started: **Started** entry in status column

When the **UPS<sub>NT</sub> Service** entry is highlighted, it can be started and stopped with the use of the **Start** and **Stop** buttons, respectively.

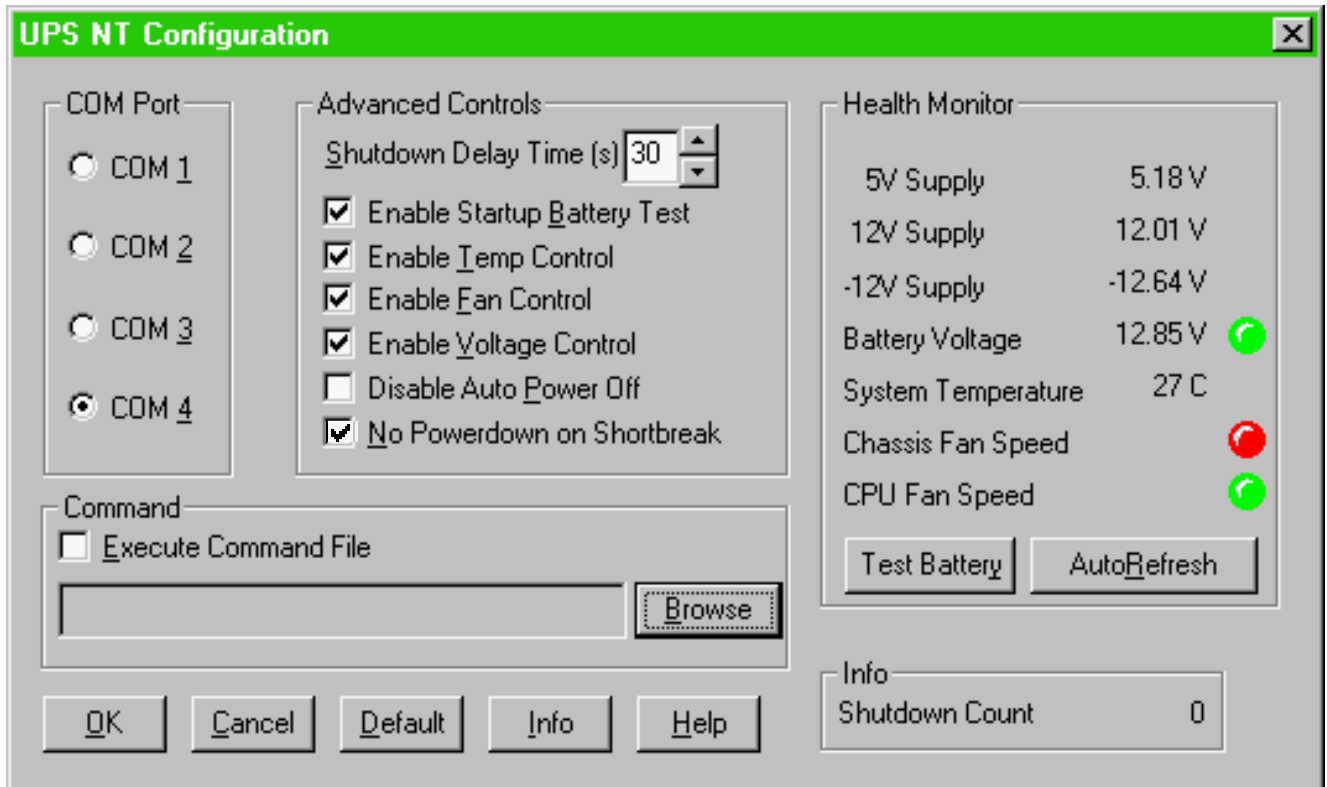


### Configuration

To configure the UPS<sub>NT</sub> control program, click **UPS NT Control** in the Control Panel (see illustration below).

- ☞ **The UPS<sub>NT</sub> control program always runs as a Windows NT service. This behaviour is not affected by changing the logged-in user. Unless a user possesses Administrator privileges, he will be unable to terminate the program or stop the monitoring function.**





- ☞ To allow modifications of parameter values to take effect, the UPS program is stopped and restarted automatically. During this interval of approx. 5 to 10 s, no monitoring takes place.

## COM Port

The UPS program is always connected to the UPS via the COM4 serial port.

## Advanced Controls

### Shutdown Delay Time

This parameter defines the interval (0 to 45 seconds) by which the **shutdown is delayed** (Delay Time). The intervening period is used to dispatch a Request To Close message to all active windows. The user can avail himself of this time for the purpose of saving his data. Upon expiry of the Delay Time, all application programs will be terminated without prior security query!

When defining the Delay Time value, it is important to ensure that enough time remains for a safe operating system shutdown (i.e., closing and backing up Windows system files, etc.) in the intervening period between the expiry of the Delay Time interval and the expiry of the 60-second interval after receiving the shutdown signal. If the interval is too short, the shutdown process will be interrupted because the UPS disrupts the mains power. This may cause loss of data in some circumstances.



### CAUTION

Upon expiry of the Delay Time, the operating system is shut down without prior security query. Unsecured data belonging to open applications will be lost.

### Enable Startup Battery Test

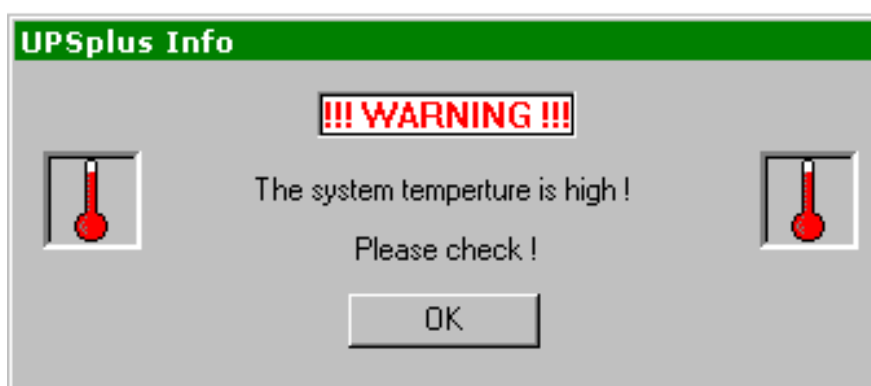
When this check box is checked, the system performs a test of the battery pack during each restart. Upon detection of an error, an error dialog is generated, and a message is distributed throughout the system. The UPS program continues to operate.

The battery test is repeated automatically after 12 hours:

- If no error is found, automatic test repetition in 12hour intervals ensues.
- When an error occurs, an error dialog is generated, and a message is distributed systemwide. The UPS program is terminated.

### Enable Temp Control

When this checkbox is checked, the ambient temperature is monitored on a continuous basis. Excessive temperatures will produce the following warning message:



The power monitoring function is retained even after a temperature warning.

### Enable Fan Control

When this checkbox is activated, the integrated housing and processor fans are monitored. In the event of an error, a message is generated and distributed throughout the system.

### Enable Voltage Control

When this checkbox is activated, internal supply voltages are monitored. In the event of an error, a message is generated and distributed throughout the system.

### Disable Auto Power Off

This option disables both the USP monitoring function and the power-off delay for the power supply:

- A power loss will cause the PC to shut down immediately.
- After a normal shutdown, the approx. 60-second wait interval prior to the shutdown of the power supply is omitted.



Although this function reduces the wait times during startups and software installations, it must always be disabled during standard operation!



#### CAUTION

##### Loss of data!


When this checkbox is activated, a safe shutdown of the operating system will no longer be possible in the event of a power failure. The device switches off instantly!

#### No Powerdown on Shortbreak

When this checkbox has been activated, interruptions in the power supply of up to 5 seconds are permitted without affecting ongoing operations. Only in the case of power interruptions lasting in excess of 5 seconds will the UPS logic be started and the safe shutdown of the system initiated.

#### Command text box

This dialog box provides for the linking and activation of an executable program (\*.exe; \*.bat) which is to be started and executed after the initialization of the shutdown. This is helpful in situations where applications failing to respond to the systemwide messages must be backed up and terminated. To this end, appropriate housekeeping and termination programs can be entered and activated in this dialog. If there are several programs, or if the programs require transfer parameters, they must be combined in a batch file and then entered.

 **The entry itself may not contain any invocation parameters, and the declared program itself must not initiate a shutdown!**

#### Default settings

Selecting this button returns all settings to their **default values**.

These are:

- COM-Port: COM4
- Shutdown Delay Time: 30 sec
- Enable Startup Battery Test: enabled
- Enable Temp Control: enabled
- Enable Fan Control: enabled
- Enable Voltage Control: enabled
- Disable Auto Power Off: disabled
- No Powerdown on Shortbreak: enabled
- Execute Command File: disabled

#### Health Monitor

This dialog section indicates the current readings for internal voltages, battery voltage, system temperature and fan functions.

The **Battery Voltage** reading is updated only after a battery test. The battery test occurs automatically after a system start, and in 12-hour intervals thereafter; it can also be initiated by pressing the **Test Battery** button.

- The LED illuminates red when the voltage reading of the battery voltage measured under load is low.

- The LED illuminates green when the battery pack is fully functional.

 **Excessive repetitions of the battery test will discharge the battery pack. Never perform more than 5 battery tests within a 24-hour period.**

The following applies to **Fan Speed monitoring**:

- Red LED: Fan at standstill, or fan speed is too low or too high.
- Green LED: Fan is working properly.

Pressing the **StopAutoRefresh** button disables the automatic updating of measured readings, and the legend on the button changes to **AutoRefresh**. Pressing the **AutoRefresh** button again enables automatic measurement updating, again changing the legend on the button to **StopAutoRefresh**.

## Info field

### Shutdown Count

The value displayed here indicates the number of times the UPS has already shut down the system. After more than 3,000 forced shutdown cycles by the UPS, replacement of the rechargeable battery pack is recommended.

 **Windows NT stores all important events. The relevant records can be accessed with the use of the following menu sequence:  
ADMINISTRATIVE TOOLS ► EVENT VIEWER ► LOG ► APPLICATION**

## 4 Installation

Before you start working with the Bosch BT155, BT205, and BT250 PC-based control terminals, refer to the information on standards compatibility and operating conditions in sections 2.8 and 2.7.



### CAUTION

**Conditions hazardous to the product!**

The ambient air must be free of elevated concentrations of acids, alkali, corrosives, salts, metallic vapours, or other electrically conductive pollutants.

---



### CAUTION

The operational reliability of components designed to be installed in housings or control cabinets will be severely impeded if they are used or operated without having first been installed.

Therefore, operate and manipulate the BT155 / BT205 / BT255 PC-based Control Terminal only while properly installed.

---

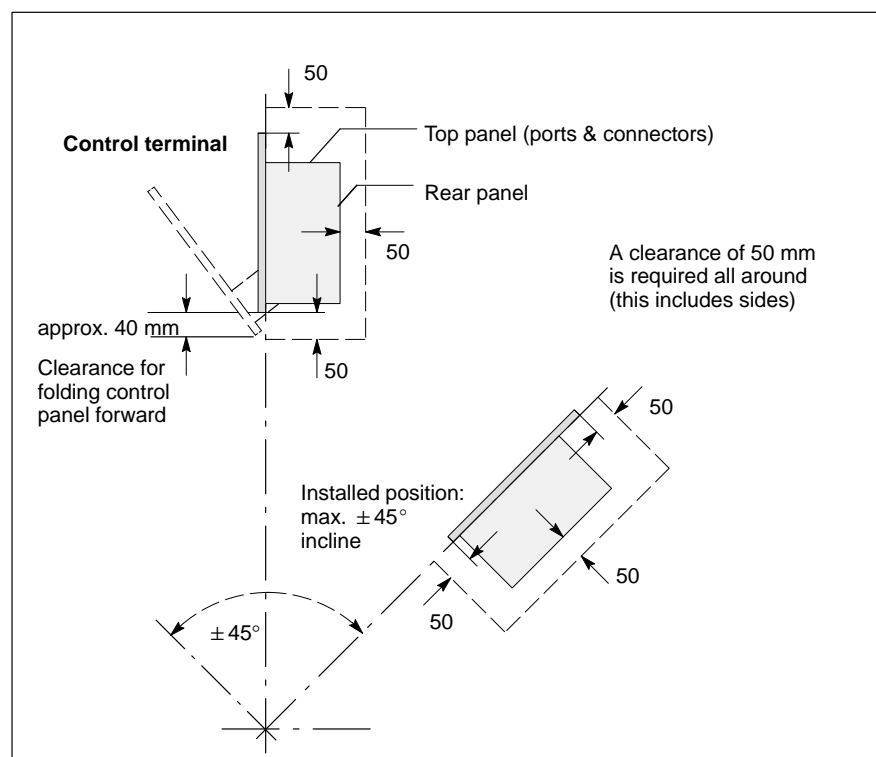
### Note

- The use of silicon-based sealing compounds, adhesives and insulating agents is prohibited.
- Ensure that the installation is maintenance-friendly, i.e., that it provides unrestricted access to connections, cables and fuses.
- Precede all installation procedures by writing down the information on equipment rating plates. In the event that rating plates are hidden from view as a result of the installation, you will still have quick access to this information whenever required.

## 4.1 Installed positions and clearances

Housing:	19 in. EISA rackmount front panel, protection category IP 65; PC housing, protection category IP 00
Weight:	Small housing, without rechargeable battery: approx. 8 kg. Large housing, including rechargeable battery: approx. 10 kg.
Installed pos.:	0° through max. $\pm 45^\circ$ incline
Installation	In console frame or hinged frame, sealed to conform to IP 54 type:

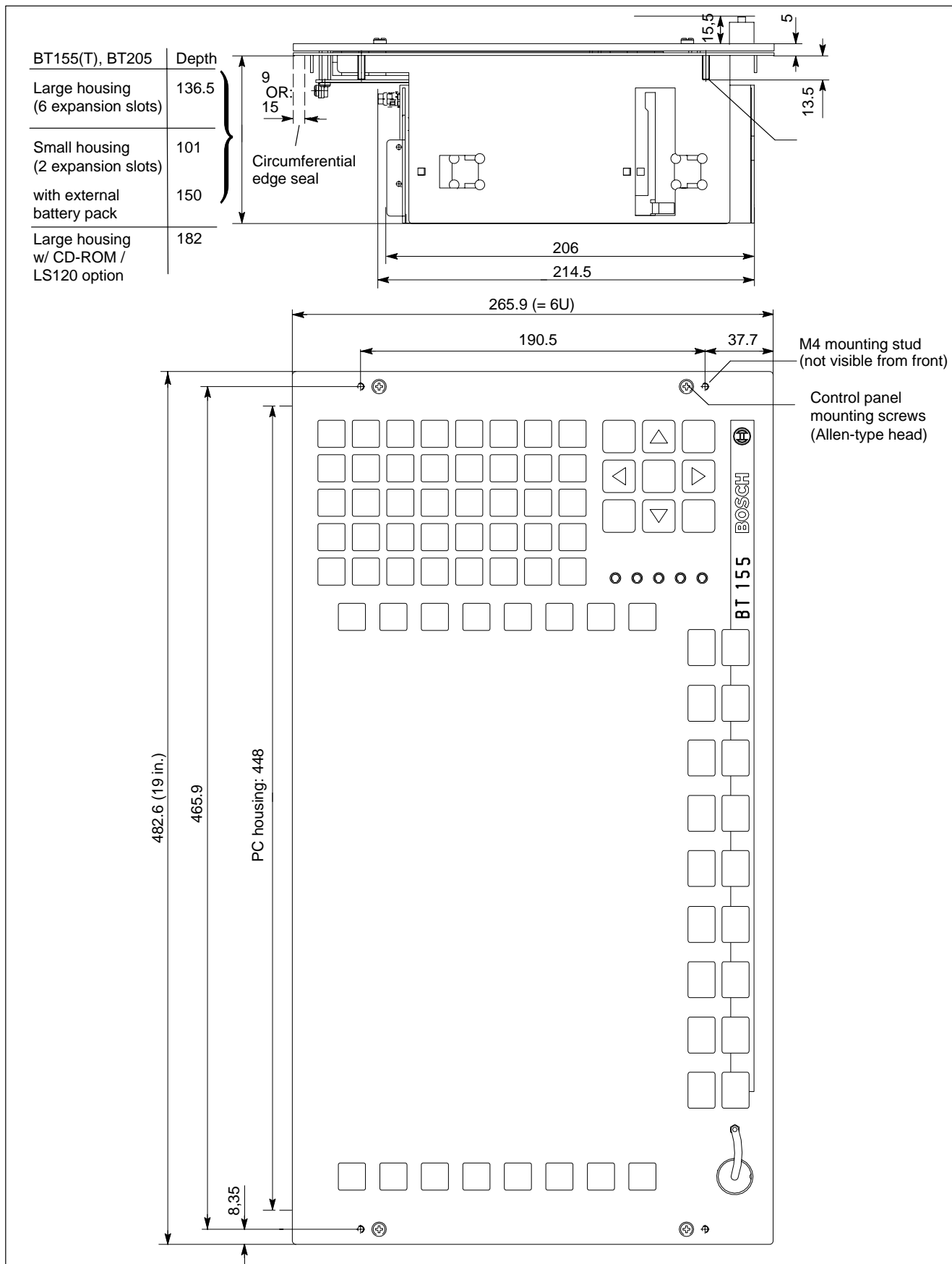
 **Please consider that the front panel of the PC-based Control Terminal may become fouled more readily when installed at an angle.**



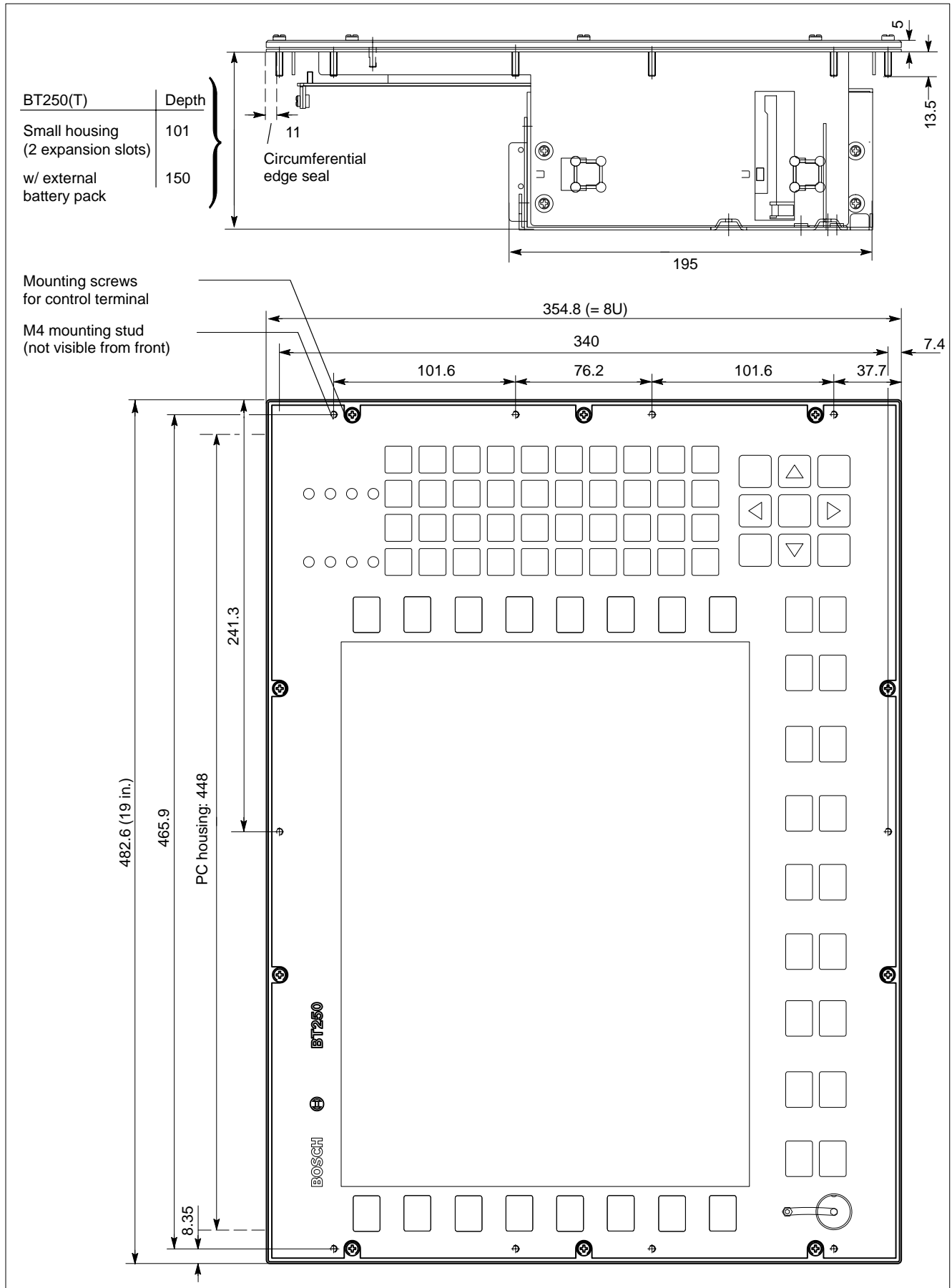
- Install the Control Panel in such a way that ergonomically compatible operation is ensured. In addition, the operator must be provided with a permanent and unobstructed line of sight on moving machine components!
- To prevent reduced screen readability and additional thermal load, avoid installation locations exposed to direct sunlight.
- Install the Control Panel in a manner ensuring easy access to the connector panel at the top.
- The LED display on the front panel must not be concealed.
- To provide adequate ventilation and sufficient cable routing space, allow an all-round minimum clearance of 50 mm (refer to diagram).
- Allow for connecting loops in all cable routings; provide strain relief for all cables.
- Maintain a suitably large distance from sources of interference.

### 4.1.1 Dimensioned drawings

#### BT155(T), BT205



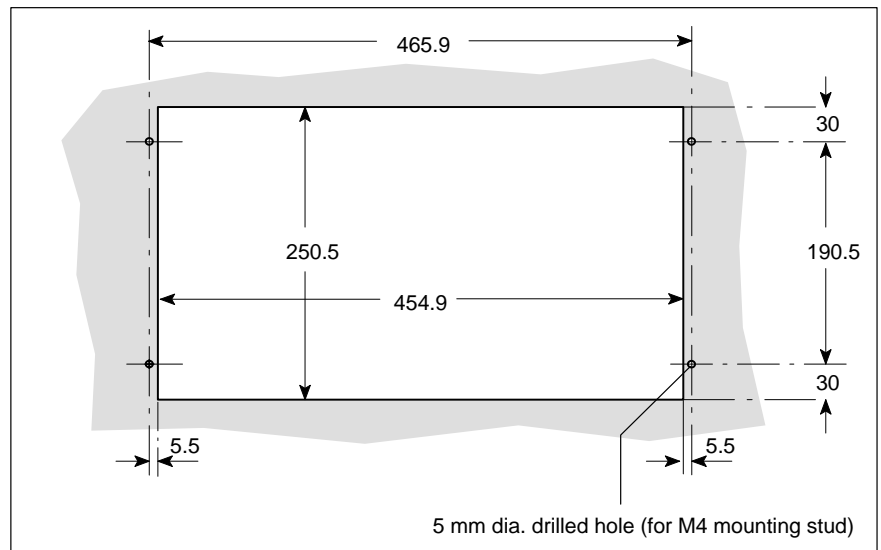
**BT250(T)**



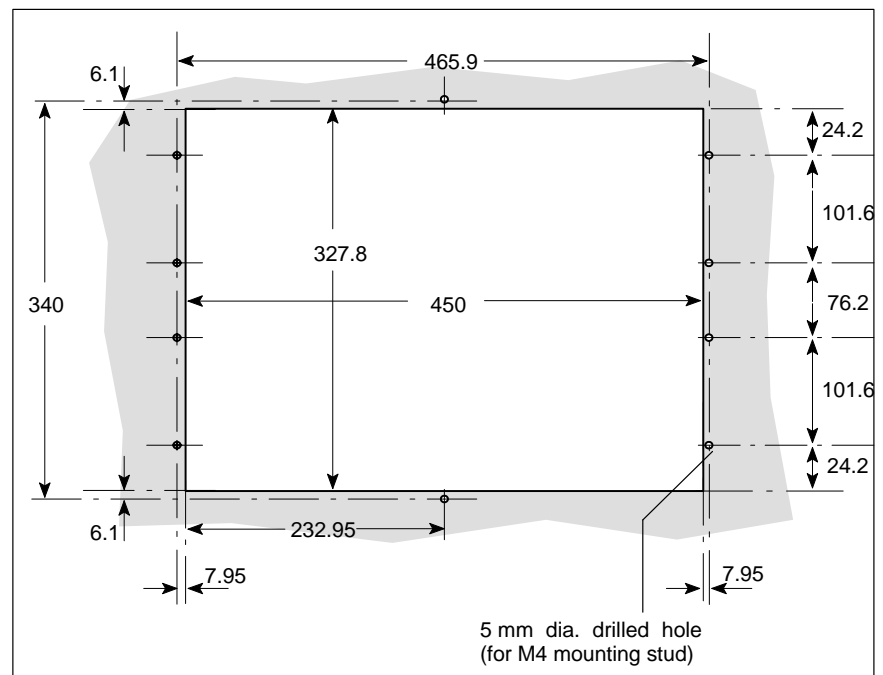
### 4.1.2 Installation cutout templates

- ★ Using the dimensions provided in the template diagrams below, prepare an installation cutout with 4 drilled holes (BT155, BT205) or 10 drilled holes (BT250) of 5mm dia.
- ★ Insert the control panel into the cutout from the front while inserting the M4 machine screws into the drilled holes.
- ★ Fasten the control panel by starting and tightening M4 nuts on the mounting studs protruding at the rear of the control panel.

#### BT155, BT205



#### BT250



Notes:



## 5 Electrical Connection

As regards the electrical connection, the terminal connection plans and work instructions provided by the machine manufacturer shall always be binding!

The system planner is also charged with providing and planning for required components, such as Emergency-STOP circuits, mains switches, etc., in accordance with the current state of the art, and at the highest level of safety attainable.



### CAUTION

**Risk of damage to system components caused by inserting or removing plug connectors on energized circuits! Connections must be made only while the system is switched off.**

---

To prevent malfunctions, observe the following:

- Ensure isolated installation of the 24 VDC and 0 V terminal strips inside the control cabinet. When routing cables, maintain a minimum distance of 100 mm from power cables.
- Design the system control circuits in such a way the operating terminals and other industrial-service components, such as CNC and PLC, are always powered up together.

## 5.1 Protective Earth (PE) conductor & screening information

---



### **DANGER**

**Dangerous conditions, functional failures and equipment damage on machine plant caused by substandard potential equalization or screening properties between system components!**

**Potential equalization currents must not be allowed to flow across the screening of connecting cables.**

---

- ★ The protective earthing conductors (PE conductors) of the system must be arranged in a tightly meshed grid. All components, control cabinet housings and doors, including the mounting plate, must be earthed.
  - ★ The equipotential bonding conductors of all system components shall be kept as short as possible, resulting in low-resistance connections.
  - ★ Observe the preferred mode of installation of PE terminal bars, i.e., electrically conductive on the mounting plate inside the control cabinet. Both ends of PE terminal bars shall be connected to the mounting plate by means of braided copper straps of a length not exceeding 200 mm. Arrange the PE terminal bars so that the length of individual PE conductors connecting to components in the control cabinet will not exceed 1 m.
  - ★ When specifying the PE wiring, ensure sufficiently dimensioned cross-sections. In this regard, also observe EN 60204, Part 1 (max. electrical resistance and testing PE wiring installations).
  - ★ If at all possible, apply screening connections at both ends of a cable.
  - ★ Ensure that equipotential equalization currents do not flow across the interface signal lines via the shielded conductors. Therefore, even before taking a system into operation for the first time (commissioning), ensure that there is proper potential equalization between devices to be connected. Do not forget those interfaces and cables that interconnect devices at different locations (irrespective of distance or power supply).
- 



### **DANGER**

**Dangerous shock currents due to poor PE connections!  
The effectiveness of PE connections must not be impeded by mechanical, chemical or electrochemical influences. Connections must be permanent and tight.**

---

## 5.2 Interference suppression information

When designing the machine plant, observe and comply with governing regulations and statutory law with regard to interference suppression on individual components. This will increase the operational safety of the entire system.



### DANGER

**Dangerous conditions, functional failures and equipment damage on the machine plant caused by substandard EMC measures or line transient interference!**

**Install signal voltage cables only at a sufficient distance from high-voltage cables (e.g., motor power cables). If this is not possible, separate metallic cable channels must be used.**

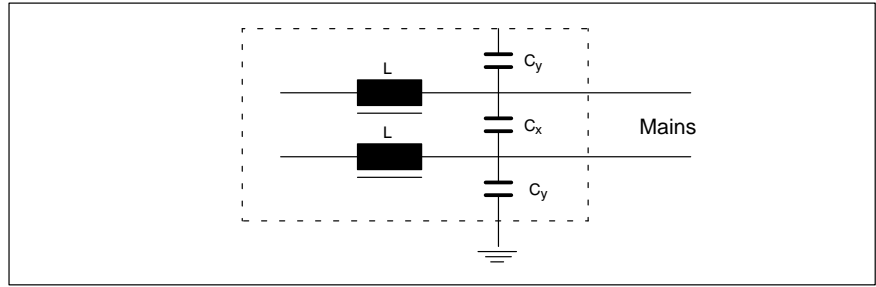
The following sections are designed to provide you with a brief overview of possible interference suppression measures in the control cabinet. Among these are, for example:

- Filter
- Spark quenching circuits
- Damping of inductive switching peaks
- Limitation of switching voltage of high-speed semiconductors
- Screening

To ensure optimum suppress interference, the deployment of **all of the above components** should be considered because they are most effective when working in combination. In principle, interference suppression should be implemented as follows:

- Apply suppression measures as close to the source of interference as possible.
- Use only components that are identified as interference suppressors.
- Limit leakage currents in accordance with safety regulations.
- Provide touch guards.
- Prevent vibration fatigue breakage by providing secure mechanical support for interference suppressors.

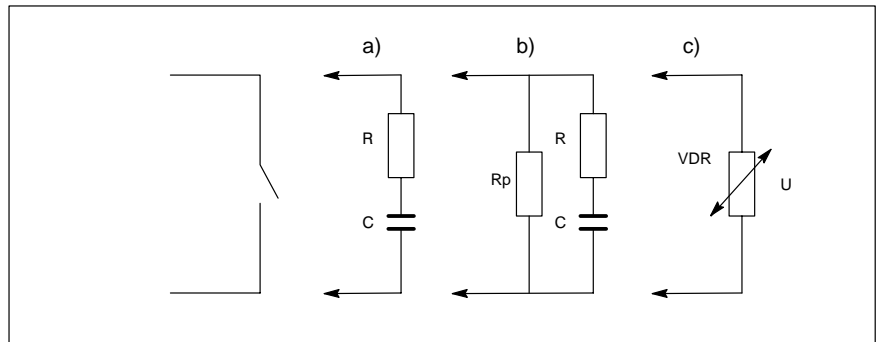
To ensure that interference suppression measures are successful, electrical symmetry or asymmetry must also be taken into consideration. Besides symmetrical parasitic voltage interference between the mains connection cables, asymmetrical voltages are also of concern. These are caused by capacitive coupling between interference source and mains network. The diagram below shows a standard interference suppression circuit. Here the asymmetrical interference voltages are discharged to the housing via  $C_y$ , whereas  $C_x$  serves to dampen the symmetrical interference component.



**Interference suppression examples**

**Suppression example – contacts:**

(Alternating current, direct current, offset DC current)

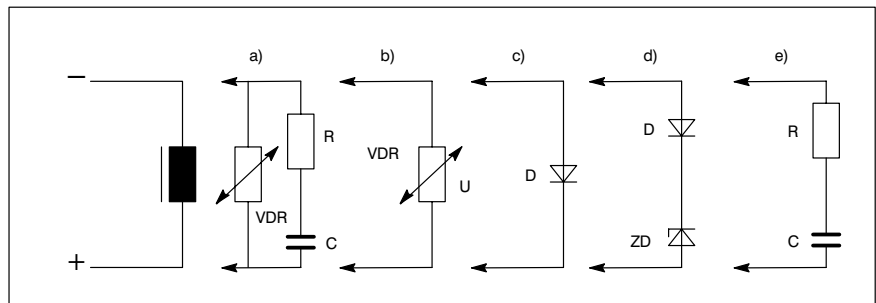


to b) For sensitive contacts, residual current when contact open!

to c) Voltage-dependent resistance, residual current when contact open!

**Suppression example – inductive load:**

(Motors, solenoid, relay and contactor coils)

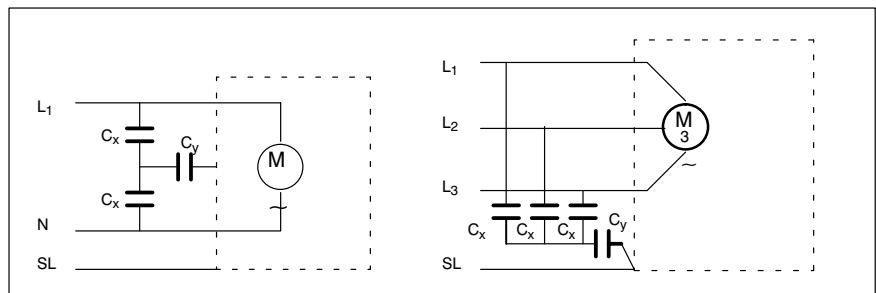


to c) For relay, dropoff delay.

to d) For relay, defined dropoff delay

to e) Must be optimized for inductance!

**Suppression example – mains input:**



**5.3 Operating power**

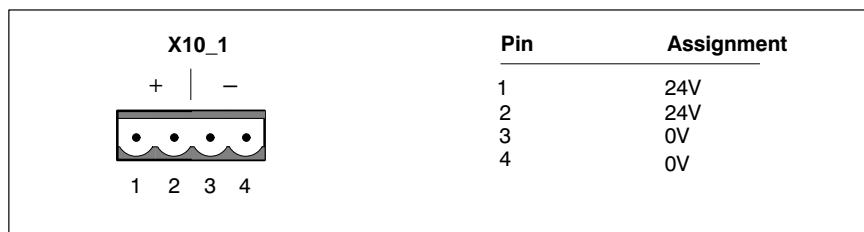
**5.3.1 24 VDC power connection**

**X10\_1 24 VDC power connection (when equipped w/ 24 V power supply)**

Alternate to 230/115 VAC power connection. All internally required voltages are provided by a DC/DC converter, and are electrically isolated.

Weidmüller push-lock terminal, MSTB 1.5, 4-pin

Max. conductor crosssection: 1.5 mm<sup>2</sup> (see following page)

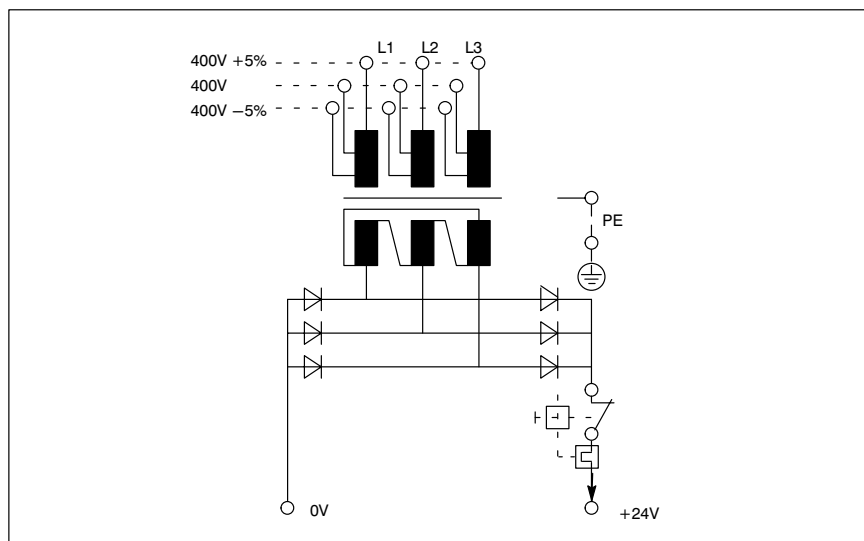


- Rated voltage  $U_N$ : 24 VDC ; +20%, -15%
- Residual ripple at  $U_N$ : See diagram below
- Interference / surge immunity:  $U_{max} = 35$  V (at  $t < 100$  ms)
- Current draw at  $U_N$ : max. 5 A
- Input fuse: M6.3A (5x20) medium time-lag
- Reverse polarity protection: Via decoupling diode. Polarity reversal will blow input fuse.



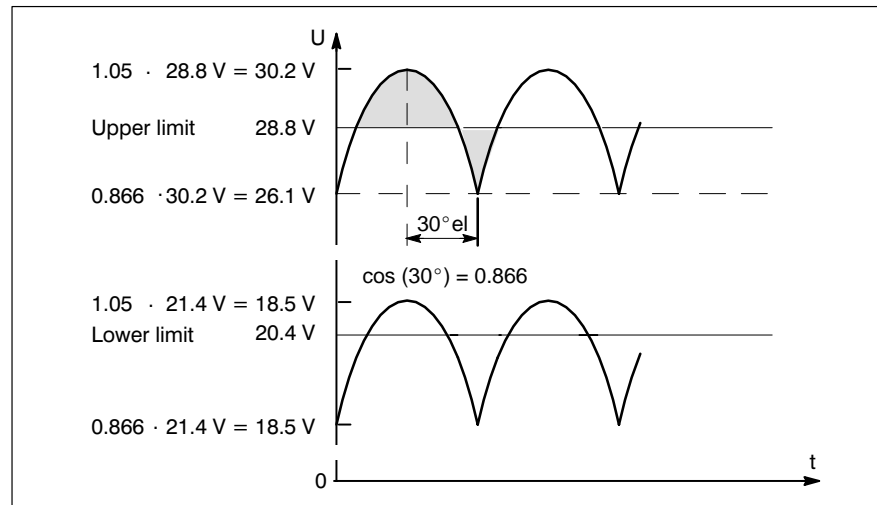
**DANGEROUS ELECTRICAL VOLTAGE**  
**The 24 VDC input voltage must comply with the requirements of “protective separation”!**

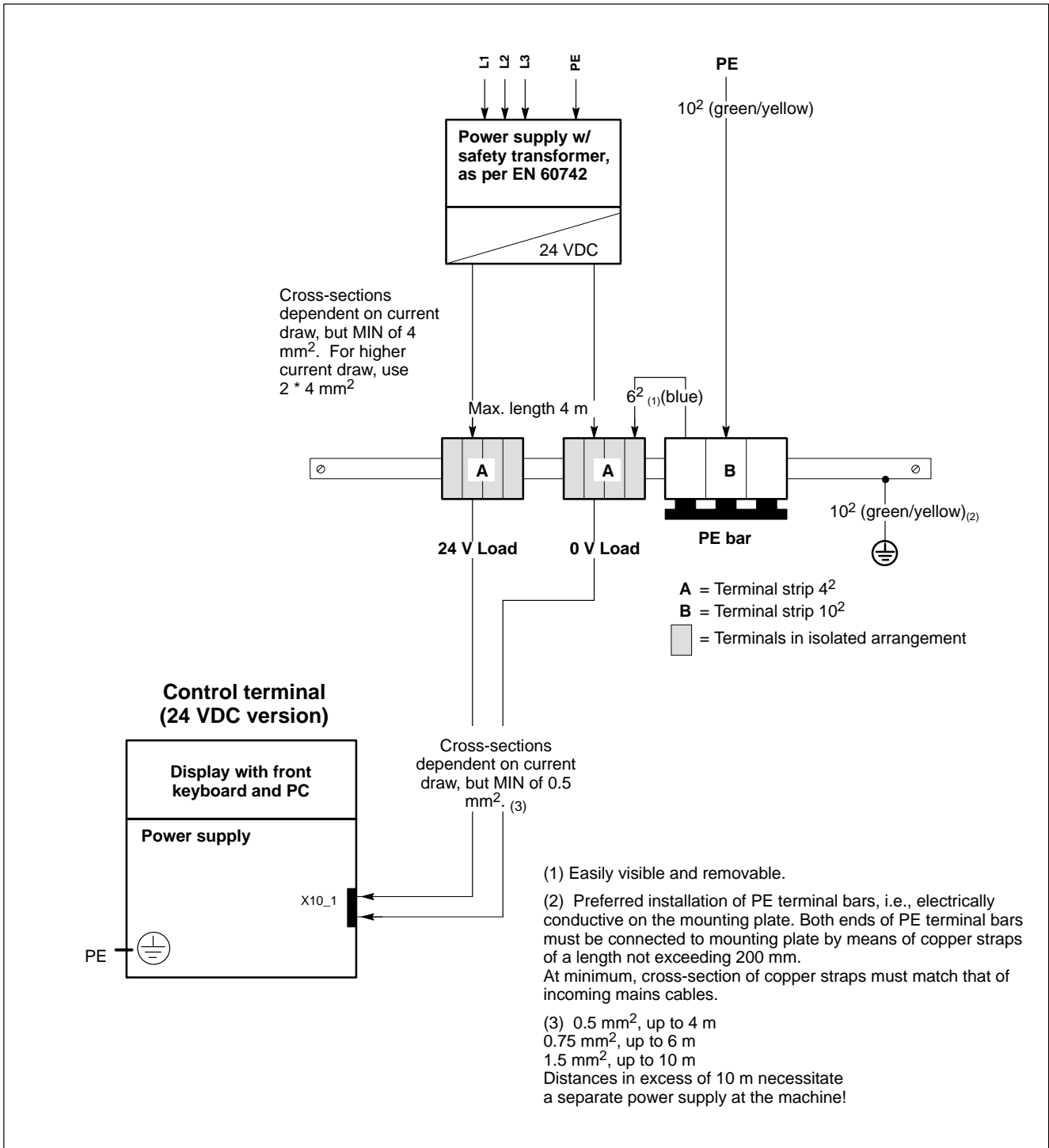
Safety transformer, as per EN 60742:



Offset AC components of the type produced by an unregulated rotary current bridge circuit without smoothing, with a ripple factor of 5% (refer to DIN 40110/10.75, section 1.2), are permissible.

As an upper voltage limit, this produces a maximum absolute value of 30.2 V and, as a minimum voltage limit, the minimum absolute value of 18.5 V.





### 5.3.2 230/115 VAC power connection

#### X20 230/115 VAC power connection (when equipped w/ AC power supply)

Alternate to 24 VDC power connection.

To provide power to the 24 Vout connector, 24 VDC must be applied to the X10\_1 connection. All of the other internally required voltages are generated via the 230/115 VAC power supply.



#### CAUTION

The supply voltage must satisfy the requirements of Overvoltage Category II. Otherwise, the integrated power supply may be destroyed.

Use an isolating transformer to generate the 230/115 VAC (refer to next page).

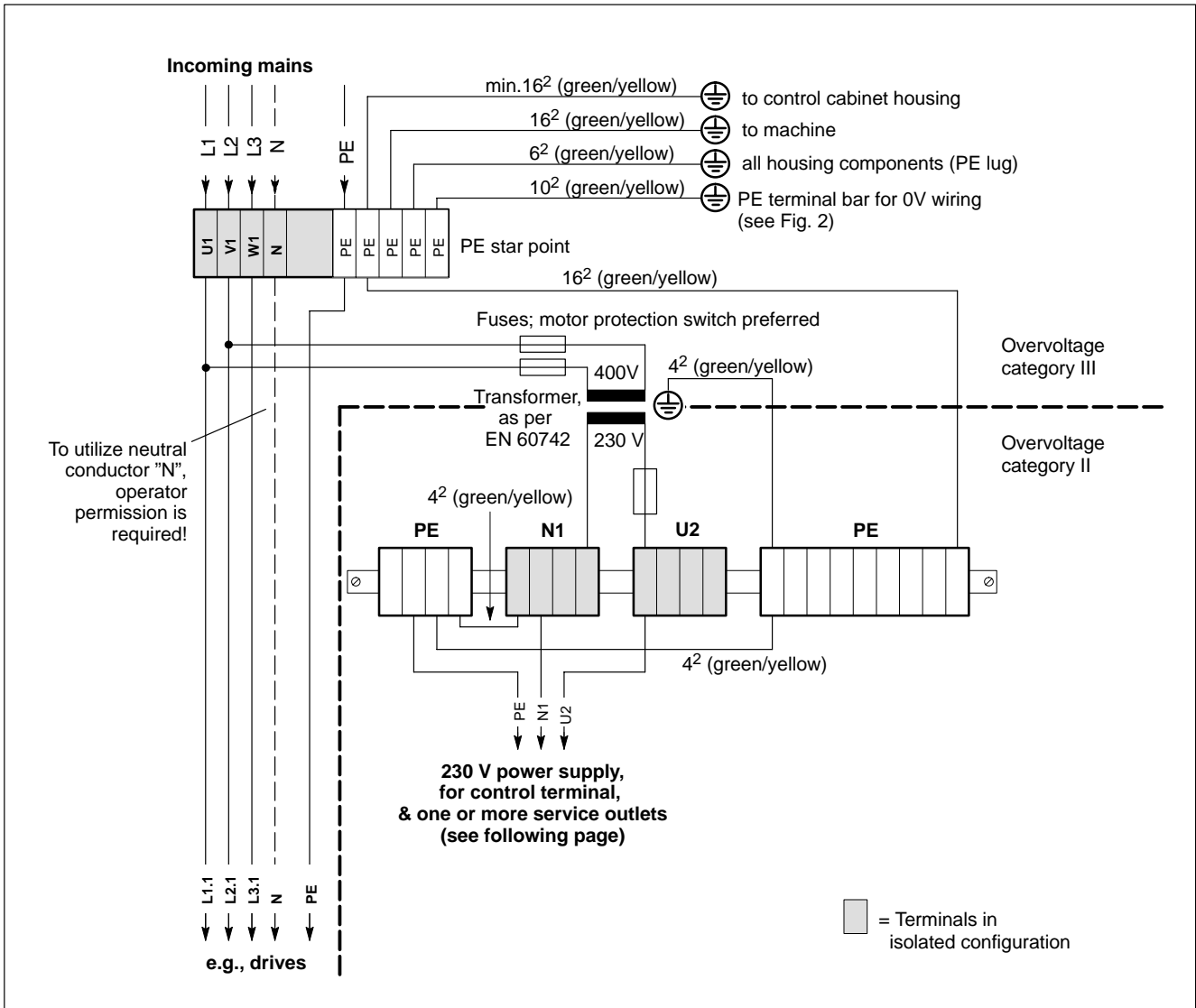
Coupler for non-heating apparatus, 3pin

Max. conductor cross-section: 1.5 mm<sup>2</sup>

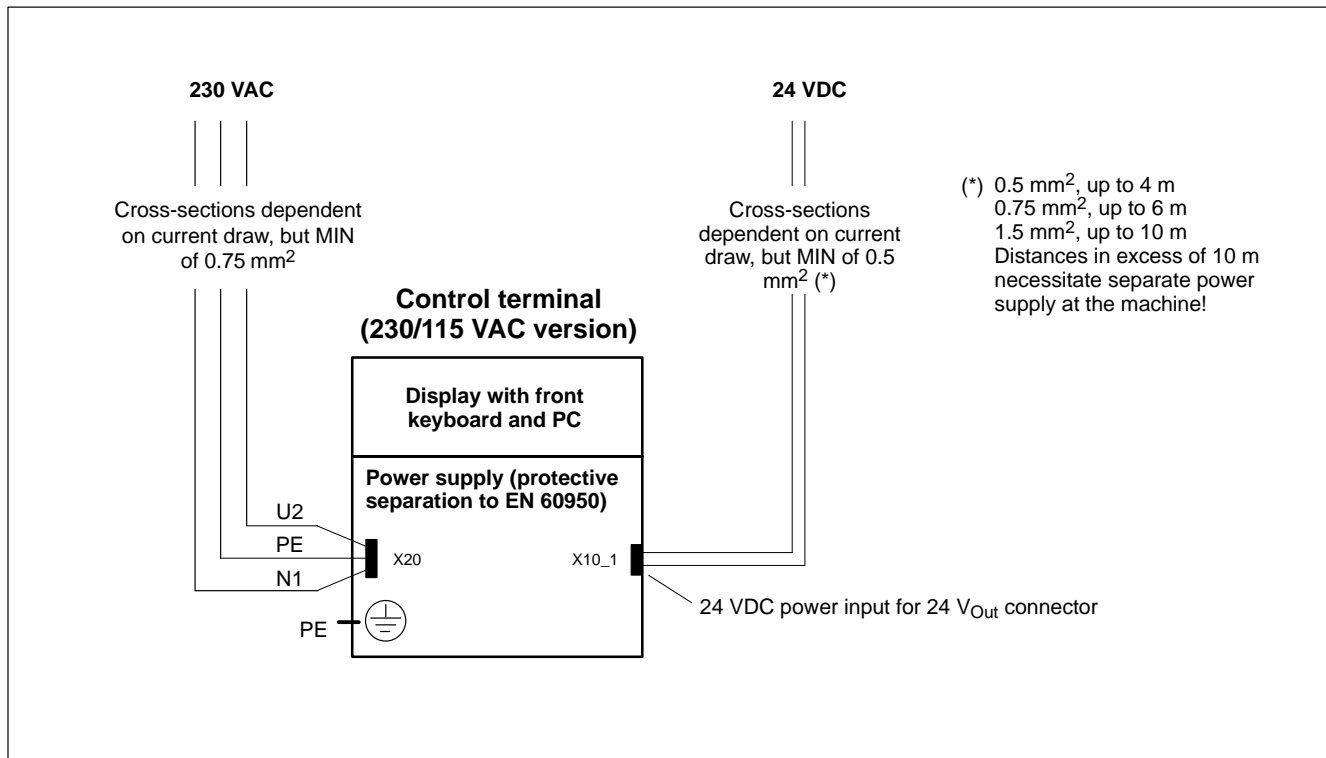


Rated voltage:	85 VAC ... 264 VAC; Extended-range input
Current draw at $U_N$ $U_N = 230$ VAC:	0.7 A
Current draw at $U_N$ $U_N = 115$ VAC:	1.4 A
Inrush current at 230 VAC:	30 A, cold start, 25 °C
at 115 VAC:	15 A, cold start, 25 °C
Input fuse:	1.25 A (5x20)





230 VAC power connection via isolating transformer



## 6 Interfaces, Ports & Connectors

### 6.1 Overview

The table below describes the connector types integrated in the BT155(T), BT205 and BT250(T) control terminals and the required mating connectors.

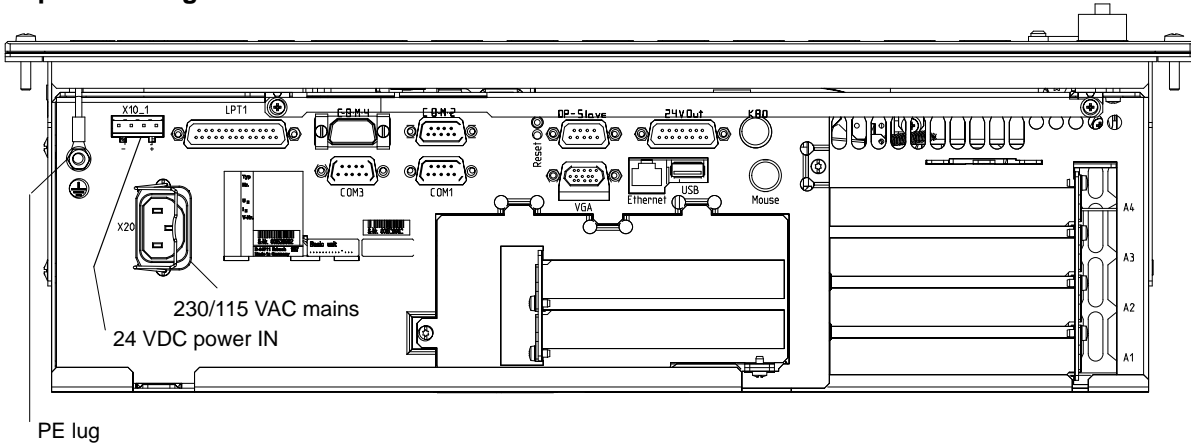
	Label on housing	Signal type / Interface service	Connector type (integrated)	Mating connector or cable (external)
T	Mouse	PS/2 mini-DIN mouse	Female mini-DIN PS/2, 6-pin	Male mini-DIN PS/2, 6-pin
T	KBD	PS/2 mini-DIN keyboard	Female mini-DIN PS/2, 6-pin	Keyboard cable with male mini-DIN PS/2, 6-pin
T	24 Vout	Keyboard code output	Female DB-15	Male DB-15
T	Ethernet	Network connection: Ethernet 10BaseT / 100BaseX	Female RJ45, 8-pin	Male RJ45 (twisted-pair, 8-conductor)
T	VGA	VGA connector for external CRT monitor	Female VGA, DB-15	Monitor cable w/ male VGA, DB-15
T	DP Slave	PROFIBUS-DP keyboard code output (Slave)	Female DB-9	Male DB-9 (IP20 bus connector, 9-pin) (Comnet DP bus system)
T	COM1; X59	Serial port: RS-232 (UART 16550), unused; alternate option (RS-485/422)	Male DB-9	Female DB-9
T	COM2	Serial port: RS-232 (UART 16550) for touch screen or unused	Male DB-9	Female DB-9
T	COM3	Serial port: RS-232 (UART 16550) kbd download or unused	Male DB-9	Female DB-9
T	COM4	Serial port: RS-232 (UART 16550); reserved fro UPS logic	Male DB-9	Female DB-9
T	LPT1	Parallel port: supports SPP, EPP, ECP modes	Female DB-25	Male DB-25 (e.g., printer cable)
T	USB	USB port	USB socket, 4-pin	USB plug, 4-pin
T	X20	PC power connector: 230/115 VAC (at 50/60Hz)	Non-heating appliance coupler	Power cord w/ non-heating appliance coupler
T	X10_1	PC power connector: 24 VDC (alternate to X20)	Weidmüller push-lock terminal, MSTB 1.5, 4-pin	Weidmüller push-lock terminal, MSTB 1.5, 4-pin
B	X76	Floppy disk power supply, +5 VDC	Female FDD power connector, 4-pin	Male FDD power connector, 4-pin
B	X75	Data connection for 3 <sup>1</sup> / <sub>2</sub> -in. or 5 <sup>1</sup> / <sub>4</sub> -in. drive (SD, HD, ED)	Male inline connector, 34-pin (IDC)	Female inline connector, 34-pin (IDC) (data cable, floppy disk drive)
B	X53	Keyboard to PS/2 mini DIN connector	Female mini-DIN PS/2, 6-pin	Keyboard cable with male mini-DIN PS/2, 6-pin
B	–	LC display connection	Male connector, multipolar	Female plug connector, (multipolar cable for front panel, LCD)
B	–	Front keyboard	Male plug connector, 50-pin	Female plug connector, 50-pin (cable for front keyboard card)
B	X19	Battery pack	Male 2-pin connector	Female 2pin connector (cable for internal/external battery pack)
M	–	IDE hard disk	Male 44-pin connector (on carrier board)	Female 44-pin connector (IDE data cable for hard disk)
F	KBD	Keyboard (Front of BT LCD)	Female MF2 DIN, 5-pin	Male MF2 DIN keyboard, 5-pin

Connector location:  
T = Top of housing,  
F = Front of control terminal  
E = External cable connection

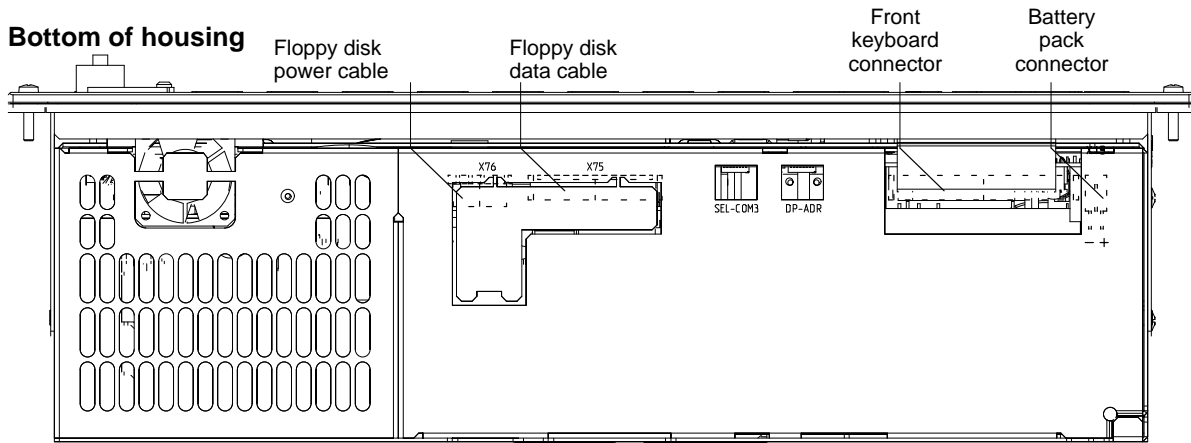
B = Bottom of housing (on carrier board),  
M = Main board,

**BT155, BT205 ports and connectors**

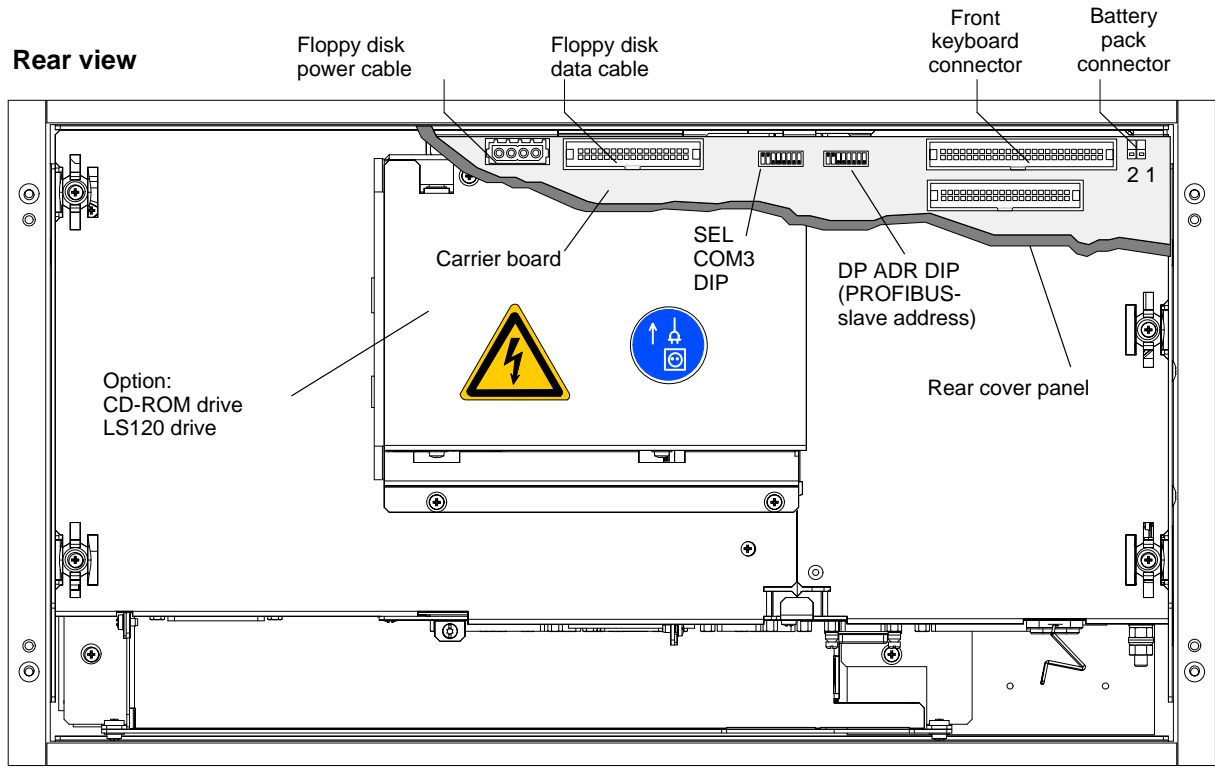
**Top of housing**



**Bottom of housing**

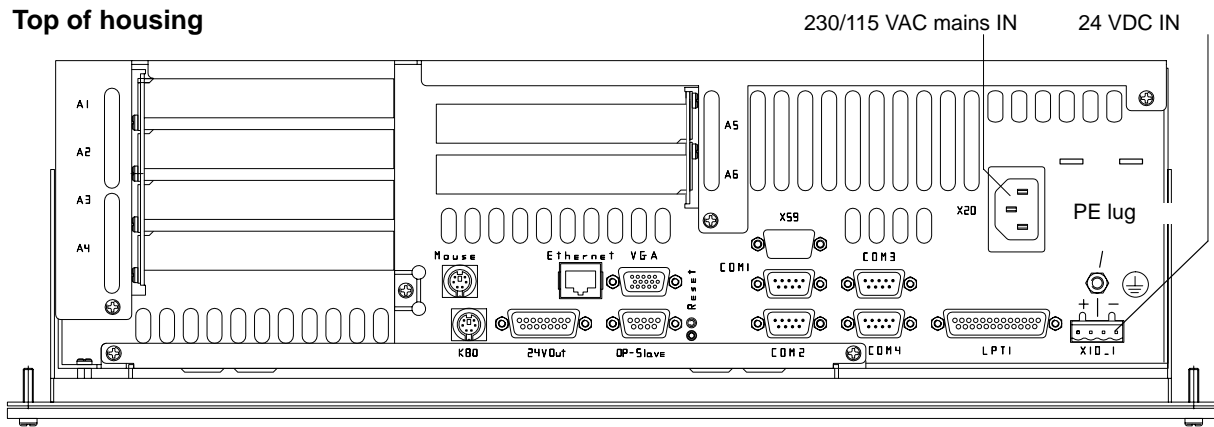


**Rear view**

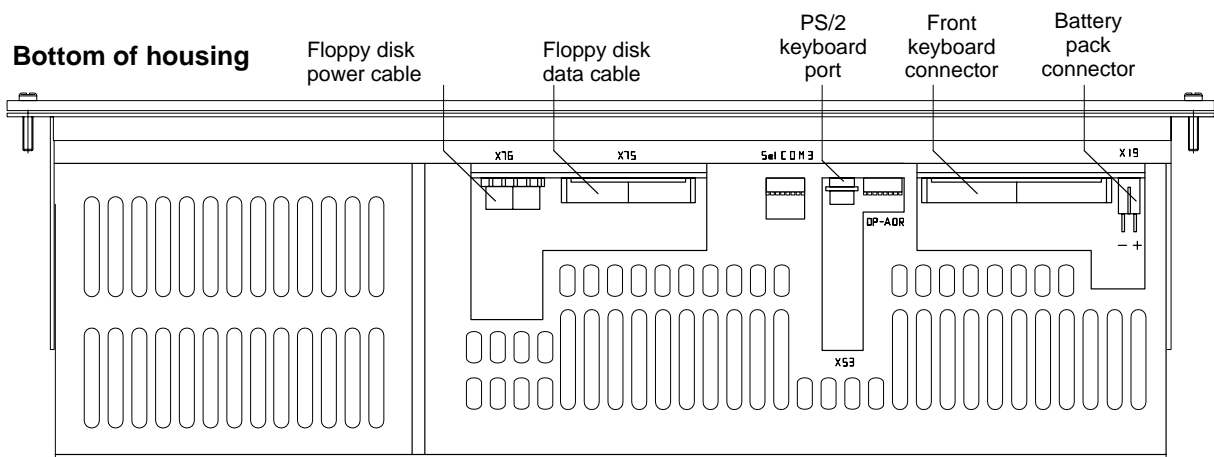


**BT250 ports and connectors**

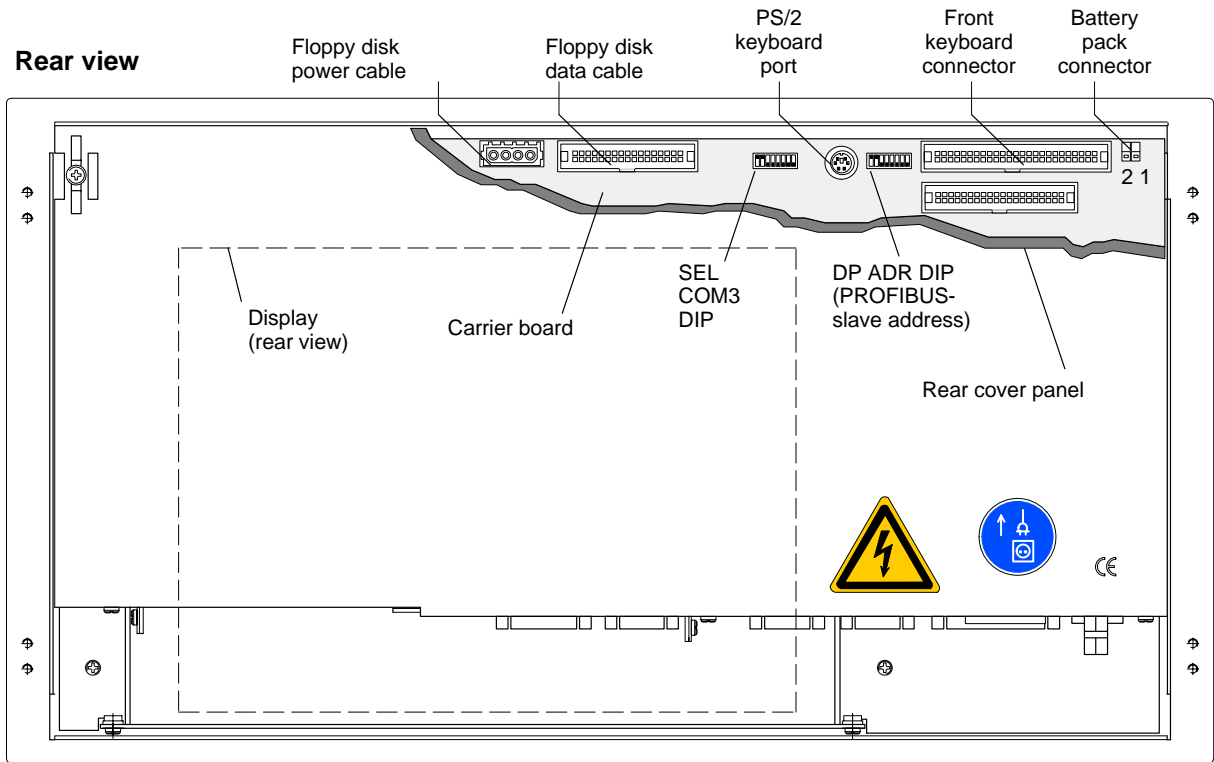
**Top of housing**



**Bottom of housing**



**Rear view**



## 6.2 COM1 through COM4 serial ports

### 6.2.1 Pin assignment



#### CAUTION

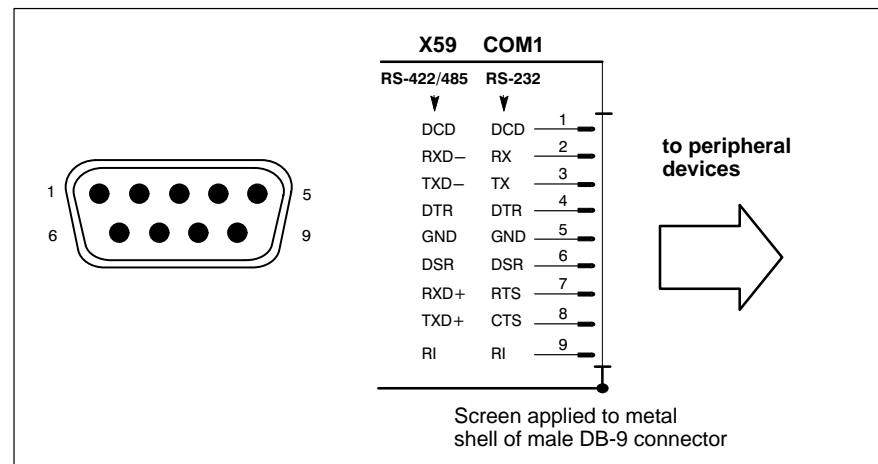
Functional failures caused by poor screening!

Use only metallic or conductive connector/coupling shells providing large-area screen contact.

#### COM1 Serial port, freely assignable

Male DB-9 connector

Type:	RS-232 (option: RS-422/485 service on X59)
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	Max. 115200 bps
Handshake:	Hardware and software handshake (XON, XOFF)
Interrupt (IRQ):	4
I/O-Address:	3F8H or AUTO (recommended)
BIOS preset:	BT150/BT200: COM1: <b>Enabled</b> BT250: Serial Port A: <b>Enabled</b>




#### Assignment as an RS-232 serial port

DCD	Data Carrier Detect. RCV channel used, for example, by a connected modem to inform the PC that it is receiving a carrier signal (active connection).
RX	Receive data; data RCV channel
TX	Transmit data; data XMIT channel to peripheral device
DTR	Data Terminal Ready; XMIT channel used by the PC to signal to a connected peripheral device that its interface is switched on and initialized.
DSR	Data Set Ready; RCV channel used by the connected peripheral device to signal to the PC that it is switched on and initialized.
GND	Signal Ground
RTS	Request To Send; RCV channel used by the connected peripheral device to signal to the PC that it wishes to transmit data.

CTS	Clear To Send; XMIT channel used by the PC to signal to the connected peripheral device that it is permitted to transmit data.
RI	Ring Indicator; RCV channel on which a connected modem informs the PC of the presence of an active call.
Screen	Contacts device chassis via metal shell of DB-type connector.

#### **Configured for RS-422/485 service (on X59 port)**

DCD	similar to RS-232
RXD-, RXD+	Receive Data channel
TXD-, TXD+	Transmit Data channel to peripheral device
DTR	similar to RS-232
DSR	similar to RS-232
GND	similar to RS-232
RI	similar to RS-232
Screen	similar to RS-232

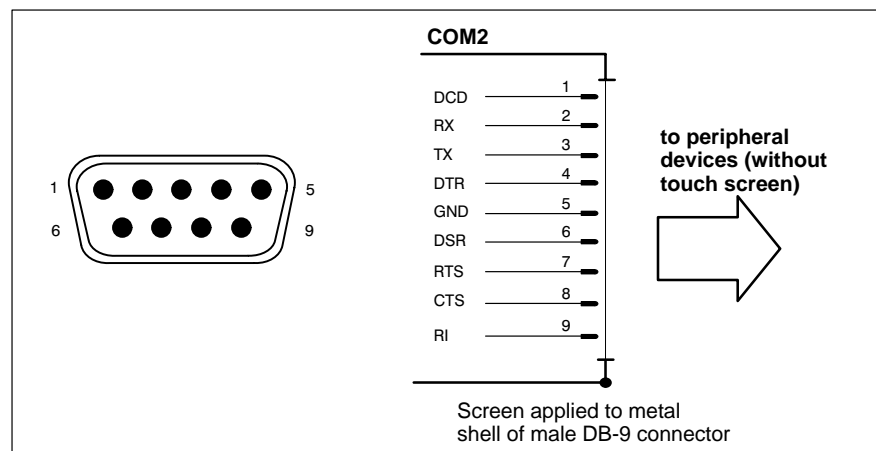
 **The COM1 pin assignment for RS-422/RS-485 service requires via special hardware configuration available only by special order. The connection will then utilize the X59 port, with RS-232 operation no longer possible.**

**COM2 Serial port, configured as touch screen input for BT155T and BT250T**

The COM2 port is reserved for the touch screen controller connection. For control terminals not equipped with touch screen, the COM2 port can also be factory configured to make it freely assignable.

Male DB-9 connector

Type:	RS-232
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	Max. 115200 bps
Handshake:	Hardware and software (XON, XOFF)
Interrupt (IRQ):	3
I/O address:	2F8H or AUTO (recommended)
BIOS preset:	BT155/BT205: COM2: <b>Enabled</b>
	BT250: Serial Port B: <b>Enabled</b>



Refer to page 6-4 for explanations of pin assignments.



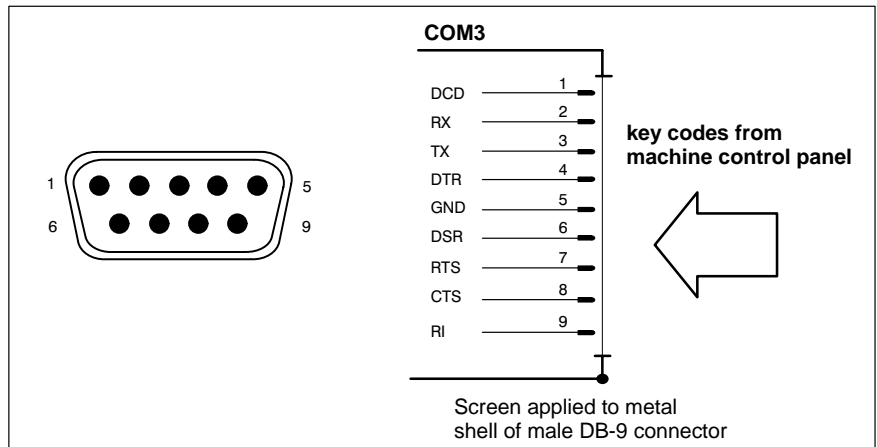
**COM3 Serial port**

- If required, input for key codes from machine control panel
- If required, software download of new key codes (refer to section 7.5.3)

For applications not requiring machine control panel or software download connections, the port can be factory-equipped to make it freely assignable.

Male DB-9 connector

Type:	RS-232
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	Max. 115200 bps
Handshake:	Hardware and software (XON, XOFF)
Interrupt (IRQ):	10
I/O address:	3E8H
BIOS preset:	BT155/BT205: COM3: <b>Enabled</b> BT250: Serial Port C: <b>Enabled</b>



Refer to page 6-4 for explanations of pin assignments.

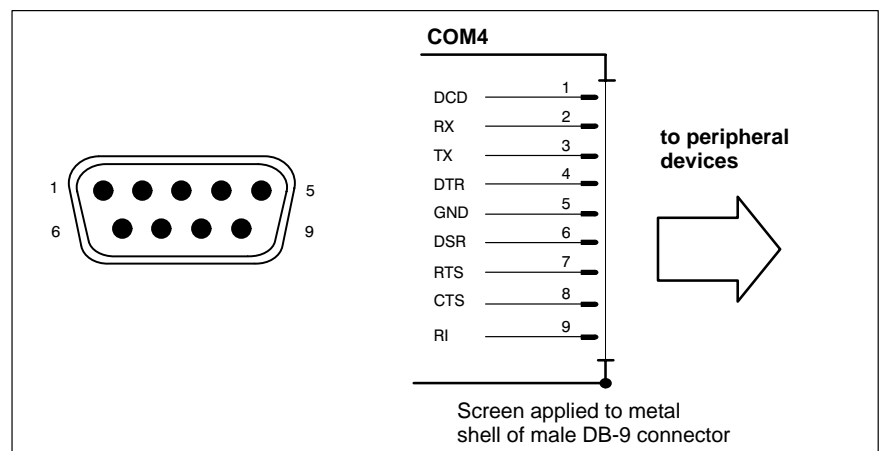
**COM4 Serial port, connected w/ internal UPS logic**

(see section 3.2)

COM4 is assigned internally to the Uninterruptible Power Supply (UPS). It can therefore be used for external connections only as long as UPS service is not required.

Male DB-9 connector

Type:	RS-232
Cable length:	Max. 15 m
Cable type:	Screened, min. cross-section 0.14 mm <sup>2</sup>
Transmission rate:	Max. 115200 bps
Handshake:	Hardware and software (XON, XOFF)
Interrupt (IRQ):	11
I/O address:	2E8H (if equipped for free assignment)
BIOS preset:	BT155/BT205: COM4: <b>Enabled</b> BT250: Serial Port D: <b>Enabled</b>



Refer to page 6-4 for explanation of pin assignments.

## 6.2.2 Communication parameter settings

### Windows Control Panel

For information about setting the communication parameters for serial interfaces, refer to the manual supplied with the installed operating system. Windows 95/NT: Go to **Start** → **Settings** → **Control Panel**, etc.

### BIOS

The factory-shipped standard BIOS settings for COM1 (Serial Port A) and COM2 (Serial Port B) have been set to **AUTO** (automatic parameter assignment). In the event that direct parameter assignment is desired, the following settings should be made by the user:

- COM1 = 3F8H
- COM2 = 2F8H

COM3 and COM4 (Serial Ports C and D) are set to **Enabled** at the factory.



#### CAUTION

Interrupt (IRQ) and I/O address must correspond to BIOS settings.

If address conflicts in conjunction with COM3 or COM4 are noted, this may indicate that IRQ 10 or 11 are already in use by other PC expansion cards. If this is the case, the use of alternate IRQs is advised.

---

## 6.3 LPT1 parallel port

### LPT1 Parallel port for printer, scanner, CD-ROM, etc.

Female DB-25 connector

Type:

SPP (ex factory), EPP, ECP

Cable length:

Max. 3 m

Cable type:

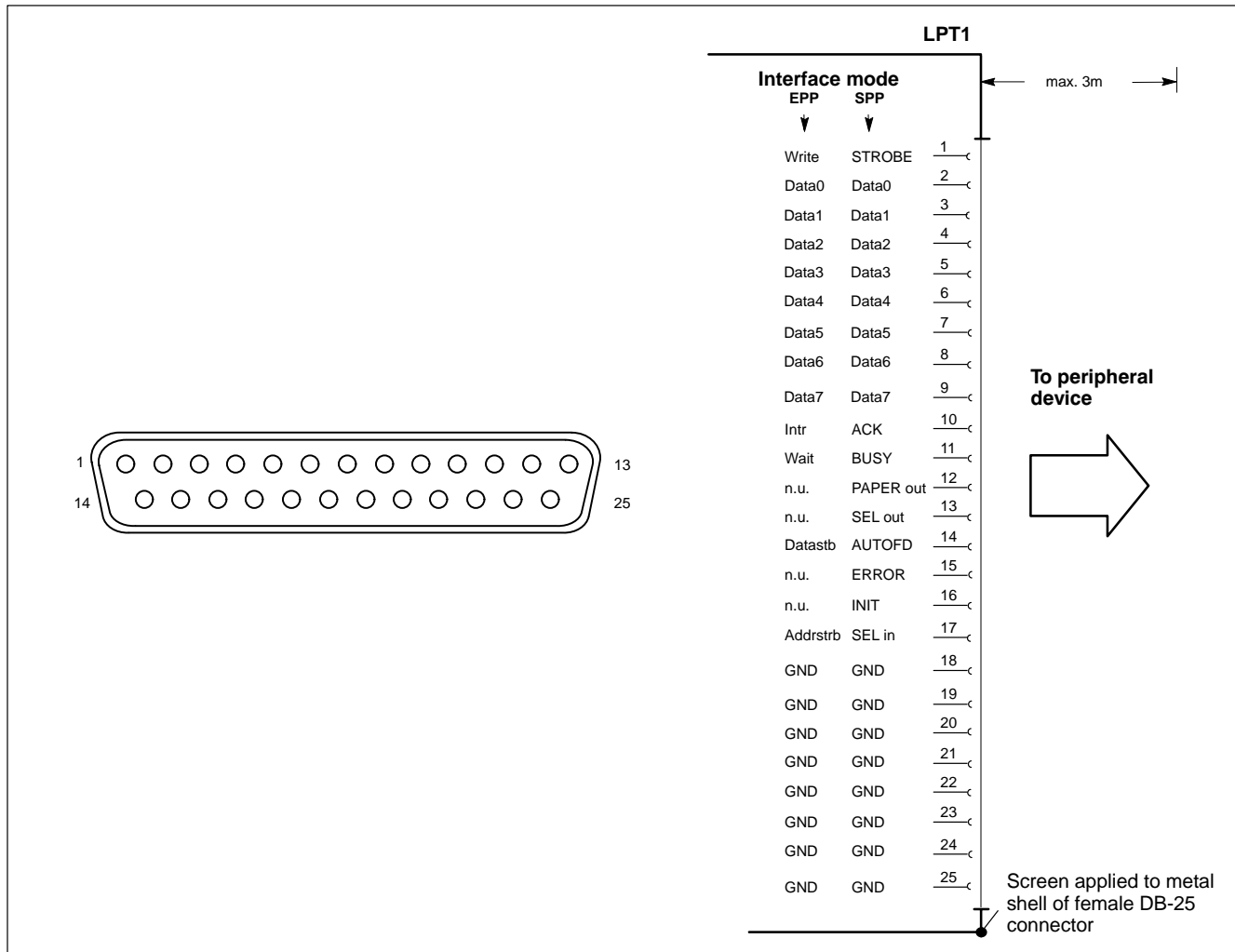
Screened, min. cross-section 0.14 mm<sup>2</sup>

Interrupt (IRQ):

7

I/O address:

AUTO or 378H (recommended)



The parallel port normally runs in the default SPP (Standard Parallel Port) mode. Provided that suitable peripheral devices are present, it can also be operated in EPP (Enhanced Parallel Port) or ECP (Extended Capabilities Port) mode. The mode is changed by means of the BIOS settings.



#### CAUTION


Functional failures caused by poor screening!

Use only metallic or conductive connector/coupling shells providing large-area screen contact.

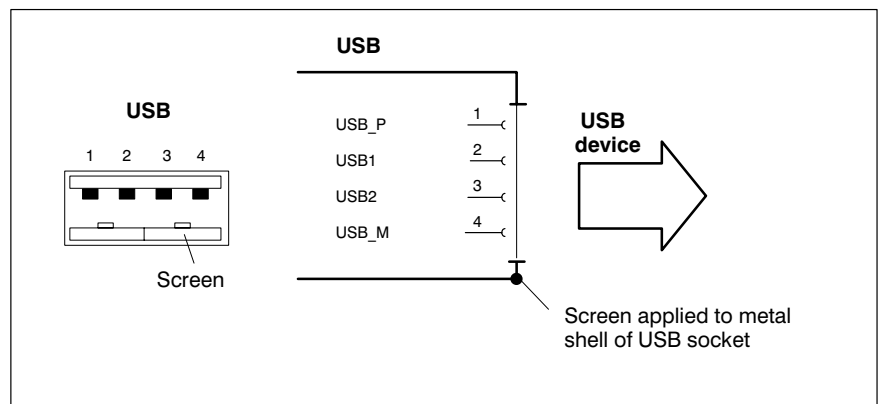
## 6.4 Universal Serial Bus (USB) port

**USB Serial interface (Universal Serial Bus), for printer, scanner, CD-ROM drive, etc.**

The USB port provides for serial connection of up to 128 USB-compatible devices.

 **The Universal Serial Bus is not supported by the Windows 95 and Windows NT 4.0 operating systems.**

USB socket, 4-pin



PIN	Signal
1	USB power supply (max. 500 mA)
2	File
3	File
4	USB Ground

## 6.5 Ethernet connection

### Ethernet Network connection

The Ethernet connection facilitates communications between control terminal and Ethernet network. To facilitate data communications, the required network protocols (e.g., TCP/IP) must be recognized by the operating system and the network application programs running on the PC.

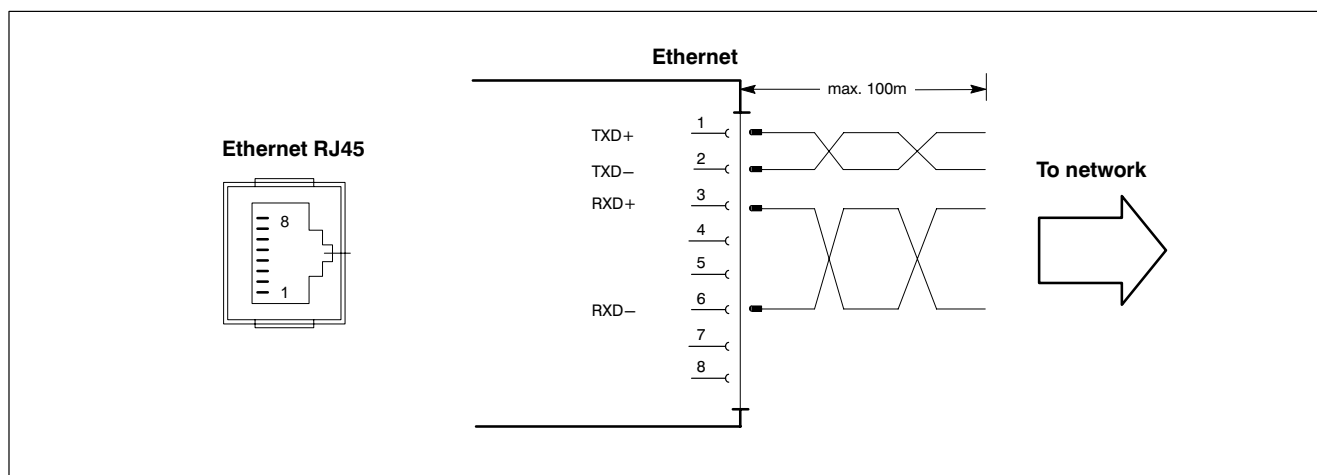
Female RJ45, 8pin

Type: Ethernet 10BaseT / 100BaseX

Cable length: Max. 100 m

Cable type: Screened, twisted-pair

Transmission rate: 10 or 100 Mbps



The driver configuration functions for the network connection can be accessed in the task bar or in the **Control Panel** under the **Network Card** symbol. A dialog box provides selections of data transmission speed, e.g., 10 Mbit/s or 100 MBit/s.

 **Note that the network card of the remote communication partner must be able to handle the same data transfer rate.**

## 6.6 VGA video port

### VGA Connector for external CRT monitor

The VGA port accepts an external monitor (CRT) for operation via the built-in video adapter. The external monitor may be operated concurrent with the integrated flat panel display.

- Video-RAM: 2 MB

**Note that the external monitor must already be connected at the time the control terminal is booted up. If this is not the case, the VGA port will not be initialized by the BIOS.**

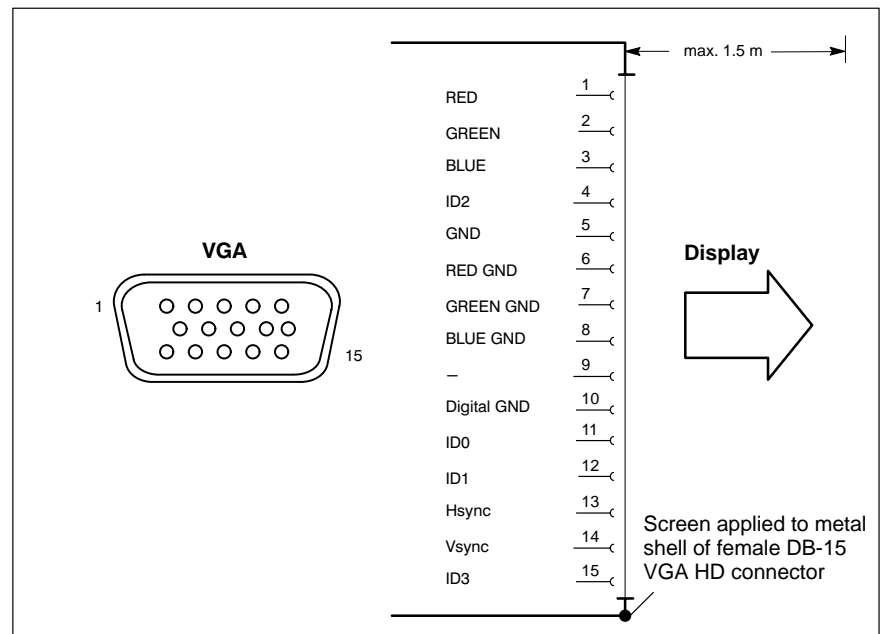
**Inserting a graphics card will disable the integrated video adapter. On the BT250, the BIOS settings must also be changed.**

Female DB-15 VGA HD

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

Max. resolution: 1280 x 1024pixels, max. 16 million colours



### CRT screen resolution

The following standard resolutions can be displayed at a refresh rate of no less than 72 Hz:

- VGA mode: 640 x 480 pixels, 24-bit colours
- SVGA mode: 800 x 600 pixels, 24-bit colours
- XVGA mode: 1024 x 768 pixels, 16-bit colours
- SXVGA mode: 1280 x 1024 pixels, 8-bit colours

Both the resolution and the number of colours are selected via the control panel of your computer's operating system.



### CAUTION

**Setting incorrect resolutions and colours can destroy your monitor! Observe the specifications applying to your CRT monitor, and adapt the operating system parameters accordingly.**

Recommended monitors for external use are low-radiation models to TCO95. In addition, you should achieve the desired display resolution at a refresh rate of no less than 72 Hz.



## 6.7 Keyboard connectors

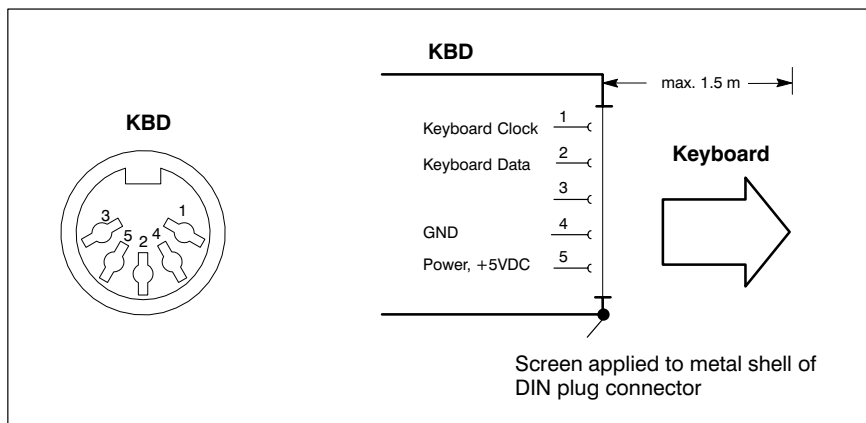
### KBD MF2 keyboard port at front panel

Female MF2 DIN, 5-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

BIOS preset: System Keyboard: **Present** (only BT155 / BT205)



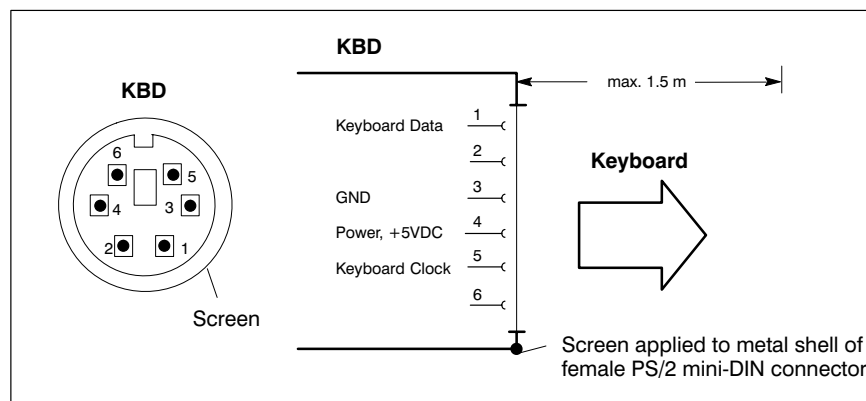
### KBD and X53 PS/2 mini DIN keyboard port

Female PS/2 mini DIN, 6-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

BIOS preset: System Keyboard: **Present** (only BT155 / BT205)

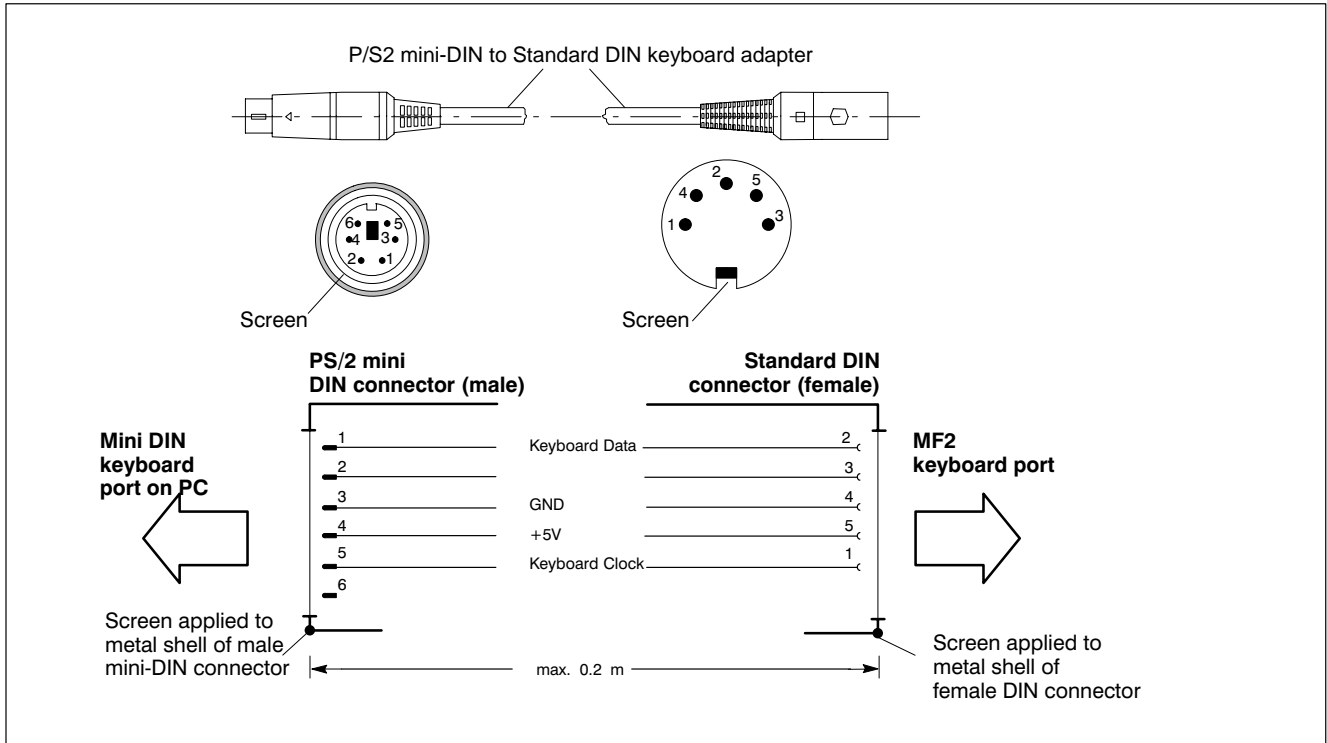


 **Only one of the two connectors may accommodate an external keyboard. Otherwise, proper functioning cannot be guaranteed.**

**Keyboard adapter**

In the event that the MF2 keyboard is equipped with a standard 5-pin DIN plug, you will require a keyboard plug adapter to a female PS/2 Mini DIN connector.

A suitable adapter is approx. 20 cm (8 in.) in length, with a DIN connector and a mini DIN coupling on the ends. Pin assignment as per diagram below. These premanufactured adapters are available from most computer stores.



## 6.8 Mouse port

### Mouse PS/2 mouse port

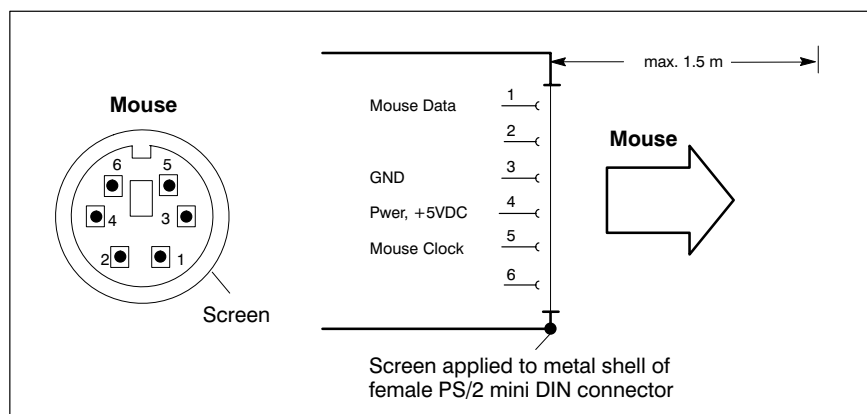
Female PS/2 mini DIN,  
6-pin

Cable length: Max. 1.5 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

Interrupt (IRQ): 12

BIOS preset: BT155/205: PS/2 Mouse Support: **Enabled**  
BT250: PS/2 Mouse: **Auto Detect**



If the P/S2 mouse is not recognized by the system, it must be enabled in the BIOS by switching from **Disabled** to **Auto Detect**.

The operating system will not recognize the insertion of an external mouse after completed startup because the mouse initialization occurs during the boot phase.

- ☞ **Unless the connected mouse is PS/2-compatible, it cannot be used with the PC PS/2 connection. The BIOS normally reserves IRQ12 for the PS/2 mouse. If there are address conflicts, e.g., if IRQ 12 has already been occupied by another PC expansion card, you should change the IRQ of the expansion card to one that is still free.**

## 6.9 PROFIBUS-DP slave connector

### DP Slave PROFIBUS-DP connector

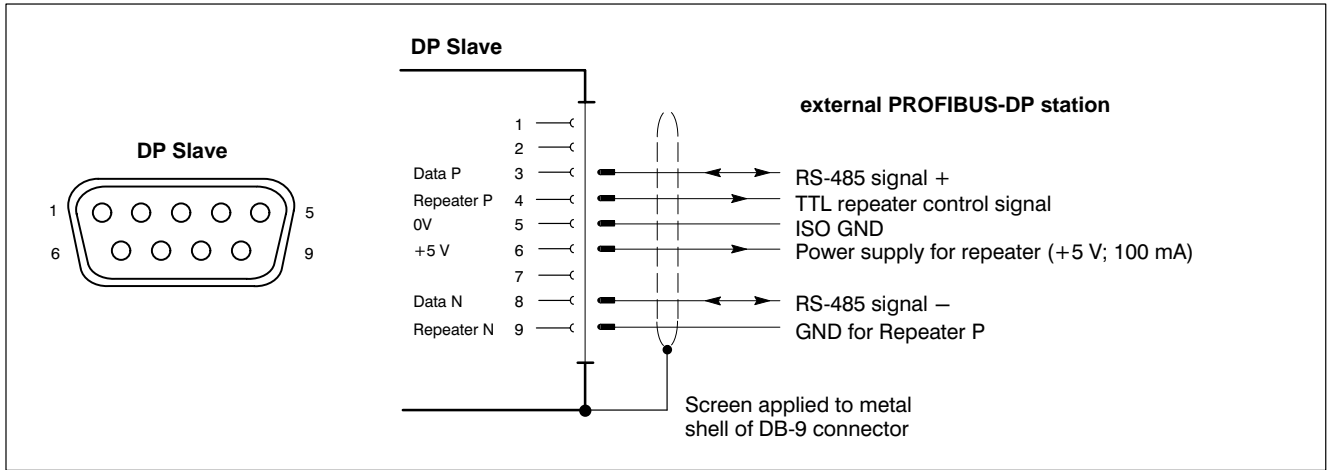
The key codes of the movement keys and softkeys on the front panel are transferred to the DP Slave connector. From there, the key codes can be copied by an external PROFIBUS-DP station for further processing. For keyboard codes, refer to page 7-13.

Female DB-9

Cable length: Depending on baud rate  
(as per EN 19245, Part 3):

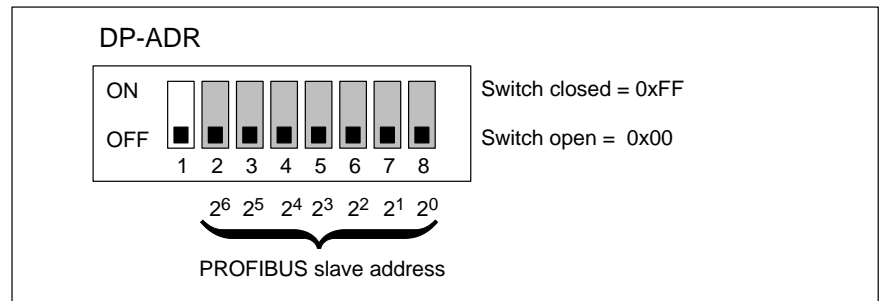
500 kbit/s	400 m
1500 kbit/s	200 m
3000 kbit/s	100 m
6000 kbit/s	100 m
12000 kbit/s	100 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>



### PROFIBUS slave address

The switch segments of the DP-ADR DIP switch (for location, refer to pages 6-2 and 6-3) are used to select the address for the DP-Slave connection. A total of 7 switch segments are reserved for this purpose.



**DIP switch segment 1 must remain in “OFF” position; it controls the keyboard controller.**

**6.10 24 Vout connector**

**24 Vout Output for key codes**

The key codes of the movement keys and softkeys on the front panel are transferred to eight outputs on the 24 Vout connector. From there, the key codes can be copied e.g. by an external INTERBUS-S station for further processing.  
For keyboard codes, refer to page 7-14.

Female DB-15

Cable length: Max. 20 m

Cable type: Screened, min. cross-section 0.14 mm<sup>2</sup>

Working range of digital outputs:

Rated current (HIGH signal): 250 mA

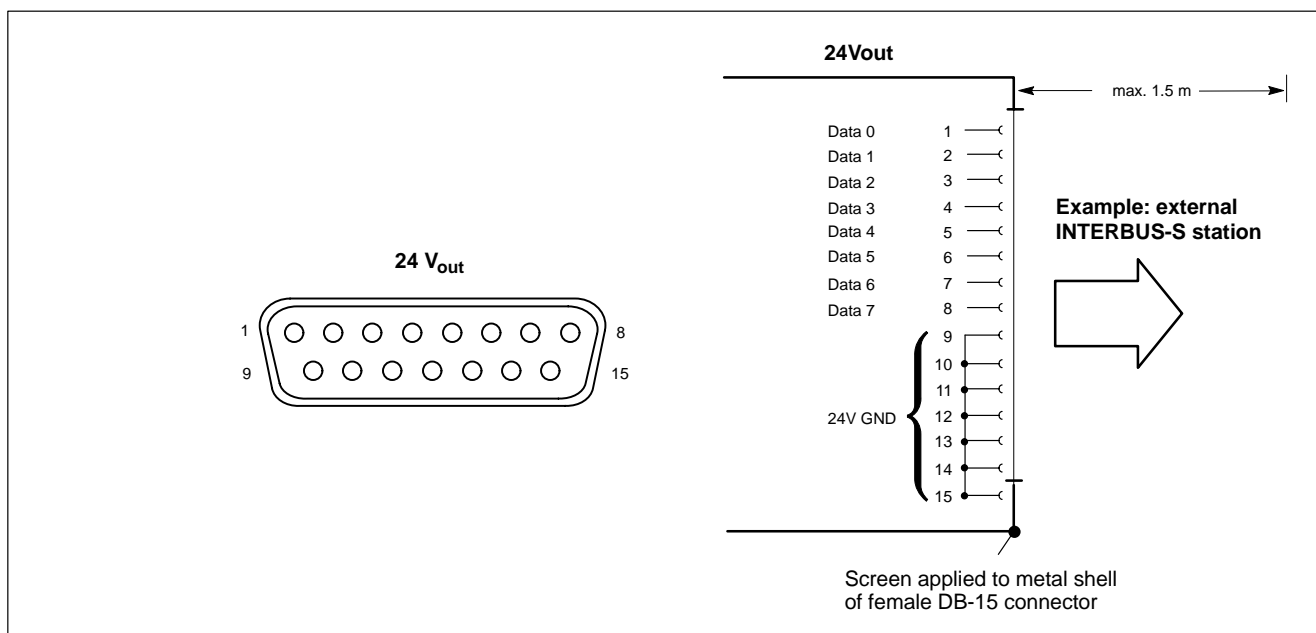
Current range for HIGH signal w/ 24 V (continuous) Max. 300 mA

Voltage drop at 600 mA: Max. 3 V

Leakage current (LOW signal) / with VN340P Max. 2 mA

Short-circuit current at over-temperature: Max. 2.5 A

Switching interval Max. 300 μs



**ⓘ The 24 Vout connector receives 24 VDC power via the X10\_1 power connector. The X10\_1 power connector must also be connected on a control panel featuring a 230 VAC power supply.**

## 6.11 Floppy disk drive connector

### X75 Drive "A:" connector for external floppy disk drive

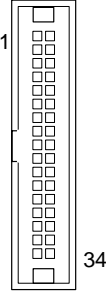
Connector for an external floppy disk drive. The integrated floppy disk controller supports the following types of drives:

- 5.25 in. and/or 3.5 in.
- Double density (360 kB or 720 kB)
- High density (1.2 MB or 1.44 MB)
- Enhanced Floppy mode (2.88 MB)

 **Only one type of drive can be connected at a time.**

Male connector, 34-pin

Type:	3.5 in. HD (standard)
Cable length:	Max. 0.5 m
Cable type:	conductor ribbon cable, screened
Interrupt (IRQ):	empty
I/O address:	300H
BIOS preset:	BT150/BT200: Onboard FDC: <b>AUTO</b> BT250: Floppy disk controller: <b>Enabled</b>

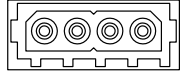
		X75			
		Pin	Assignment	Pin	Assignment
	1	GND	2	Density Select	
	3	GND	4	N/C	
	5	GND	6	N/C	
	7	GND	8	Index	
	9	GND	10	Motor Enable A	
	11	GND	12	Drive Sel B	
	13	GND	14	Drive Sel A	
	15	GND	16	Motor Enable B	
	17	GND	18	Direction	
	19	GND	20	Step	
	21	GND	22	Write Data	
	23	GND	24	Floppy Write Enable	
	25	GND	26	Track 0	
	27	GND	28	Write Protect	
	29	GND	30	Read Data	
	31	GND	32	Head Select	
	33	GND	34	Disk Change	


**X76 Floppy disk drive power**

Power supply for an external floppy disk drive.

Socket, 4-pin

Supply voltages: +5 V, +12 V, 0.9 A max.

X76, socket	Pin	Assignment
1 2 3 4	1	+12 V
	2	GND
	3	GND
	4	+5 V

 **The +5 V and +12 V potentials are monitored for both overvoltage and undervoltage conditions. Faulty voltage will cause instant shutdown of the PC power supply. The -12 V potential is not monitored.**

Two floppy disk drive versions are available:

- Order no.: 1070 081 617  
Floppy disk drive with carrier plate for rear-panel installation and internal connection.
- Order no.: 1070 081 614  
Floppy disk drive with mounting frame and protective flap for in-cabinet installation and connection via a special, screened cable.

Notes:



## 7 Display Elements and Operating Controls

The control terminal incorporates the following display components and control elements:

- Display, touch screen optional
- Keyboard, DIN keyboard connector
- LED displays
- Front panel legends
- Keyboard controller
- Keyboard mouse

### 7.1 Display panel

All displays are supplied as LCD flat-panel versions and in varying sizes. The resolution is selectable. The following settings are recommended for best legibility:

- BT155 (10.4 in. display): 640 x 480 pixels, 65000 colours
- BT205 (12.1 in. display): 800 x 600 pixels, 65000 colours  
**(factory setting for BT155, BT205)**
- BT250 (15 in. display): 1024 x 786 pixels, 65000 colours  
**(factory setting for BT250)**

Brightness and contrast are permanently set on the hardware. A specific colour balance matching the user's application requirements can be adjusted via operating system settings or by means of the application software.

For the purpose of maintenance procedures on the display, the front panel of the control terminal can be folded away toward the front while still installed. For a detailed description of the display removal procedure, refer to section 8.3.

### 7.1.1 Backlight “Suspend” timer function

The fluorescent backlight tube provides the background lighting for the TFT display. As its service life is limited, only 50% of its original brightness will remain after approx. 15,000 operating hours (BT250: 50,000 hours). For a description of the backlight replacement procedure, refer to Section 8.3.

To extend the service life of LCD display and backlight unit, the flat-panel display features a backlight “Suspend” timer function. This function “darkens” the display in the event that no keyboard or mouse input has been detected on the control terminal for a specific interval (adjustable in the BIOS and in the Windows Control Panel).

Any keyboard input, mouse movement or contact with the touch screen will again activate the backlight, and the display will again appear.

#### Activating the backlight timer

- ★ In the BIOS setup program, go to the **Power Management Setup** menu option. Select the **OnBoard LCD Backlight Timer OFF** submenu, and select a time interval between 28 seconds and 14 minutes.
  - ★ In your operating system, install a screen saver such as “Blank Screen” that will switch the display to a “black signal” (blank screen, i.e., no objects visible on the display). Select the “Wait” period after which the screen saver will be activated. The time selected here will be added to the **Backlight Timer OFF** interval that was selected in the PC BIOS.
- ☞ **Ensure that the “Wait” period selected for screen saver activation must be shorter than the interval prior to activation of the backlight “Suspend” timer. If this is not the case, adverse circumstances may result in display reactivation problems.**
- ☞ **On some occasions, when the “Suspend” function has been activated, the display cannot be reactivated through keyboard input, mouse movement or touch screen contact. In this case, it is normally possible to force display reactivation by pressing the <CTRL>+<Tab> key combination.**

## 7.1.2 Touch screen

The model versions BT155T and BT250T feature the touch screen, which facilitates the operation of the application software via the touch-sensitive surface of the display.

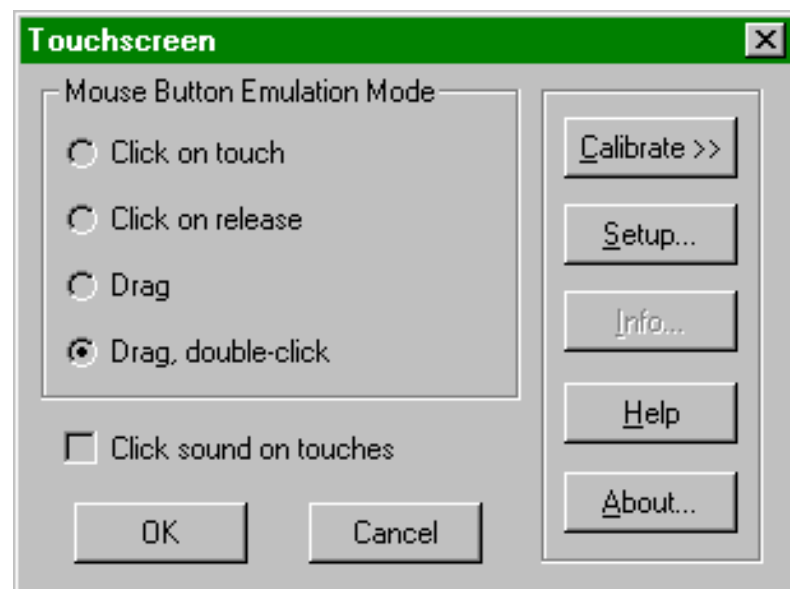
Mechanical considerations prohibit the installation of the touch screen in a control terminal equipped with a 12 in. display.

The COM2 serial port is reserved for communications between the touch screen controller and the PC system. The external COM2 port connector must therefore not be used to connect any devices.

The operation of the touch screen requires appropriate software drivers for the respective operating system; these are preinstalled at the factory. Modifications can be made in the **Elo Touchscreen** application program, and/or in the Windows 95 or Windows NT 4.0 Control Panel.

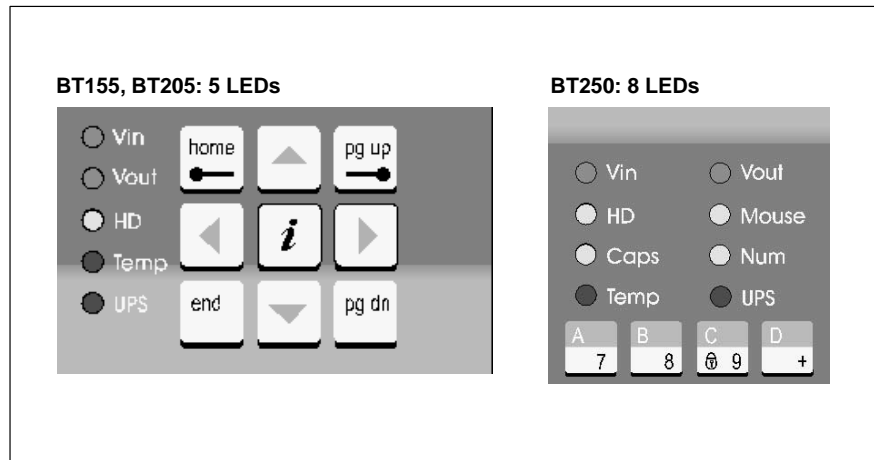
Clicking **Starting Elo Touchscreen** opens a dialog box in which the following options and settings are available:

- Mouse pointer response to touch screen contact (Mouse Button Emulation Mode)
- Calibrating the touch screen by “tweaking” the touch screen coordinates to match the screen coordinates via the **Calibrate** button)
- **Setup** button (COM port, etc.)



 To obtain detailed online Help information, select the “Help” button in the “Touchscreen” dialog box.

## 7.2 LED displays



In the event that one of the following LEDs indicates an error or a specific condition, introduce the appropriate remedial measures:

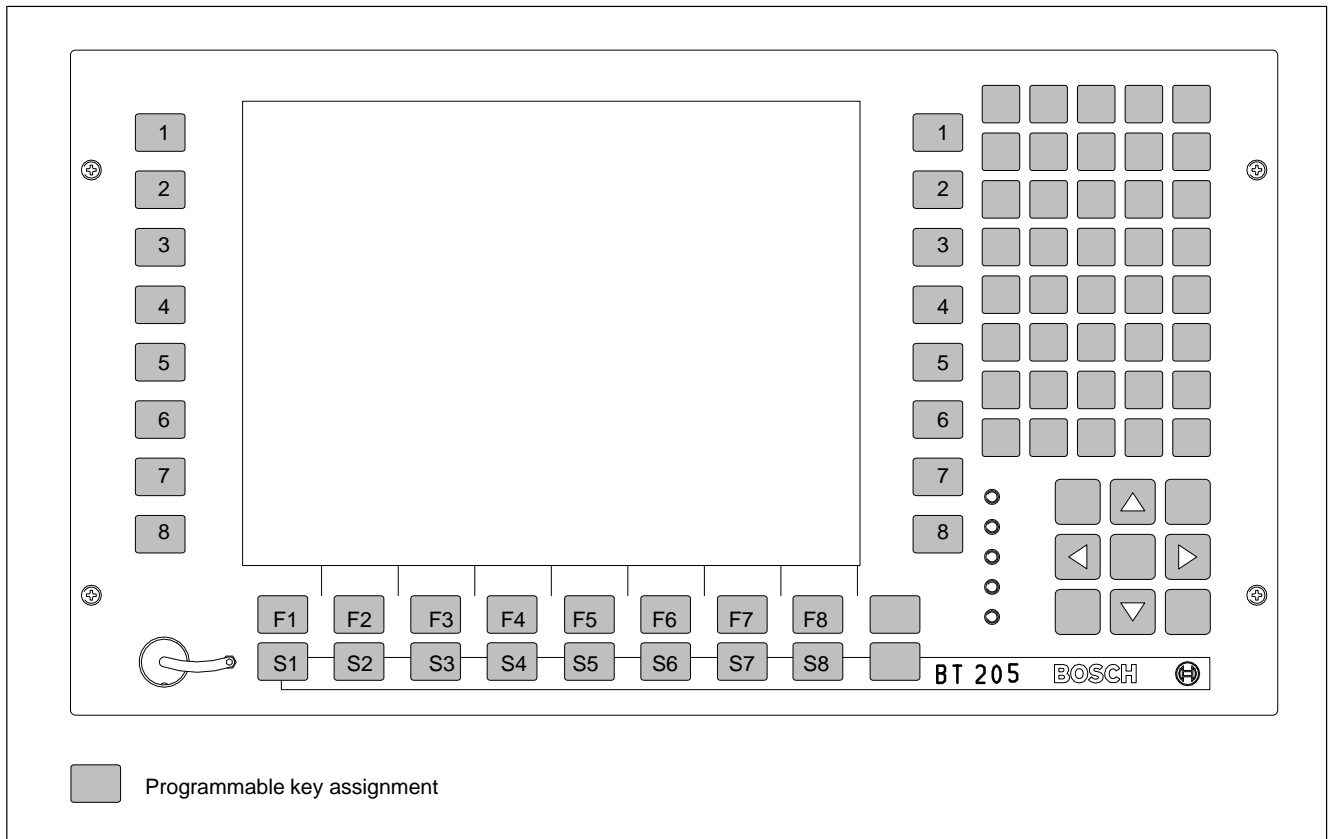
LED	Display	Explanation	Remedial measure
$V_{in}$	LED green	Standard operation	–
	LED Off	No 230/115 VAC or 24 VDC power supply	Check mains power input on power supply!
$V_{out}$	LED green	Standard operation	–
	LED Off	No internal +5 V / +12 V power present	Check mains power input on power supply!
HD	LED yellow	Hard disk access	–
Mouse (BT250)	LED yellow	Keyboard mouse enabled	–
	LED Off	Keyboard mouse disabled	–
Caps (BT250)	LED yellow	Keyboard locked in SHIFT position (caps, etc.)	–
	LED Off	Keyboard in standard position	–
Num (BT250)	LED yellow	Numerical keypad on external keyboard enabled	–
	LED Off	Numerical keypad on external keyboard disabled	–
Temp	LED Off	Standard operation	–
	LED flashes red	Internal housing temperature exceeds 50 °C; shutoff will occur if temperature continues to rise.	Reduce ambient temperature! Check PC fan for proper operation!
UPS	LED Off	Standard operation.	–
	LED Red	Control terminal currently in battery backed operation, i.e., no mains power present!	Restore mains power, initiate a controlled BT restart!
	LED flashes red	Battery pack discharged, defective or not connected	Check battery charge level! Maintain full 5-hour charging time!

### 7.3 Keyboard

#### 7.3.1 Overview

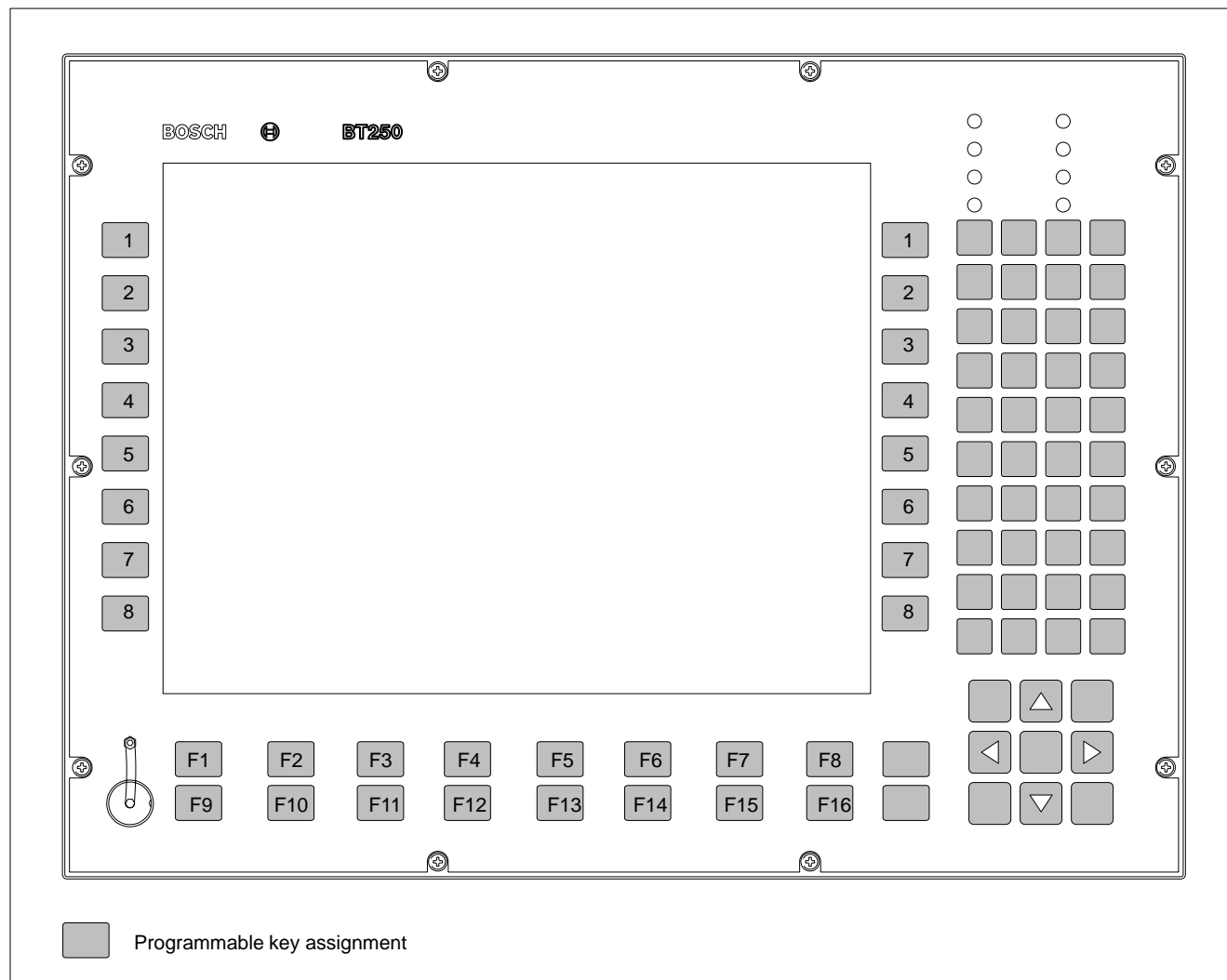
 A female MF2 connector for a DIN keyboard is integrated at the lower left side of the control terminal. See page 6–15 for detailed information.

#### BT155, BT205



## BT250

The keyboard of the BT250 is differentiated from those of the BT155 and BT205 control terminals by its different ASCII keypad arrangement.

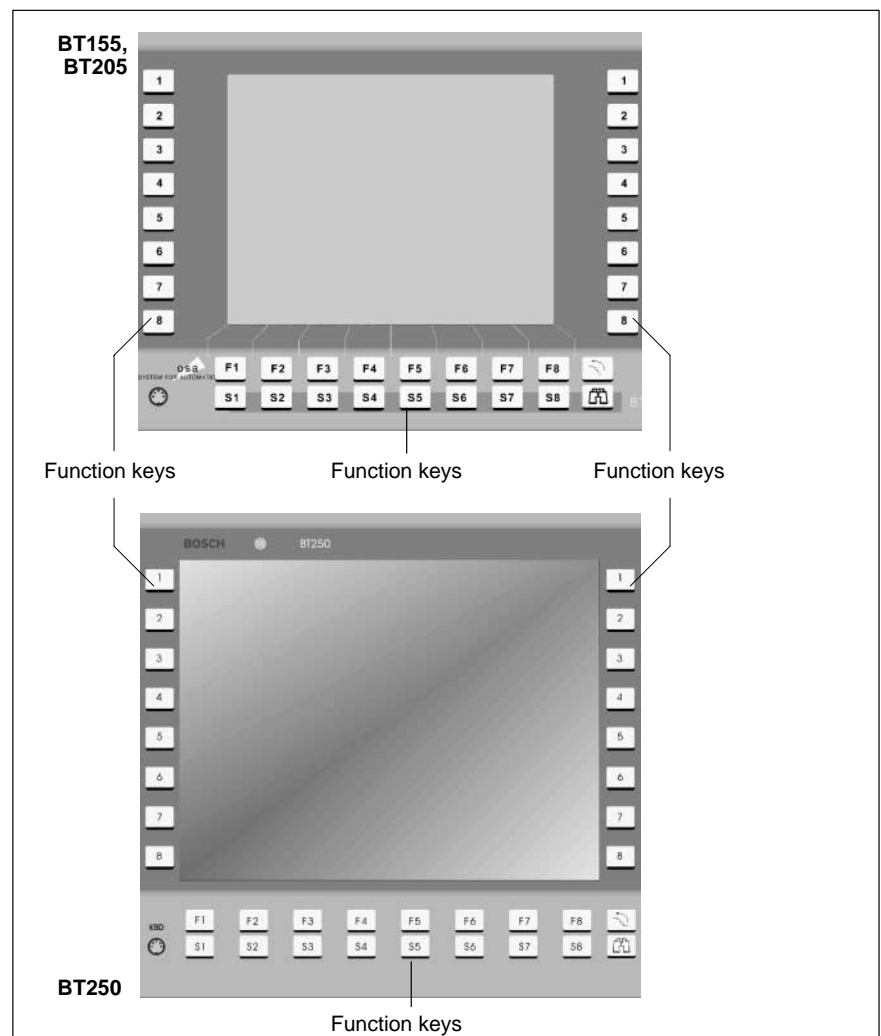


### 7.3.2 Blocks of function keys

All function keys can be programmed from within the **application program**:

#### BT155, BT205, BT250

- 2 vertical columns of 8 keys each, to the right and left of the display.  
Key labels, left-hand key column: 1...8  
Key labels, right-hand key column: 1...8
- 2 horizontal rows of 9 keys each, below the display  
(e.g., for softkey functions)  
Key labels, row 1: F1...F8, Level Return  
Key labels, row 2: S1...S8, ZOOM

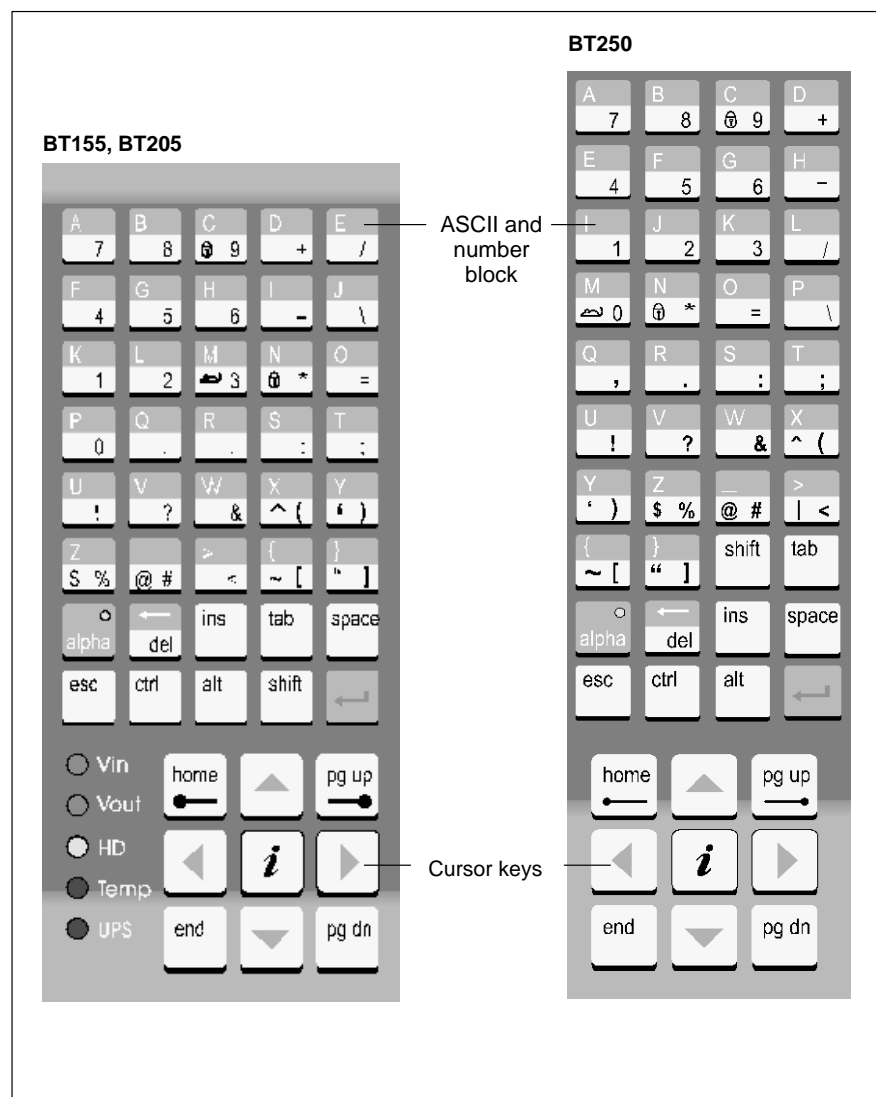


### 7.3.3 ASCII & number block, cursor control block

The following blocks of keys are permanently assigned. However, the assignment can be changed by Bosch as requested by the customer:

- **ASCII and number block** (block of 40 keys at right of display)
- **Cursor control block** (block of 9 keys, bottom right corner beside display)

☞ On the BT250, the arrangement of the ASCII block differs from that on the BT155 and BT205. The key assignment is identical, however.





### ASCII and number block key assignments

- ASCII characters and various special characters
- alpha (access to special characters and special functions, refer to section 7.3.4)
  - del (Delete)
  - ← (Backspace)
  - ins (Insert)
  - tab (Tabulator)
  - space (Space)
  - esc (Escape)
  - ctrl (Control)
  - alt (Alternate)
  - shift (Upper / lower case)
  - ↵ (Return)

### Cursor block key assignments

- Cursor keys: Right Arrow, Left Arrow, Up Arrow, Down Arrow
- home (to Home pos.)
- end (to End pos.)
- pg up (to Top of page)
- pg dn (to End of page)

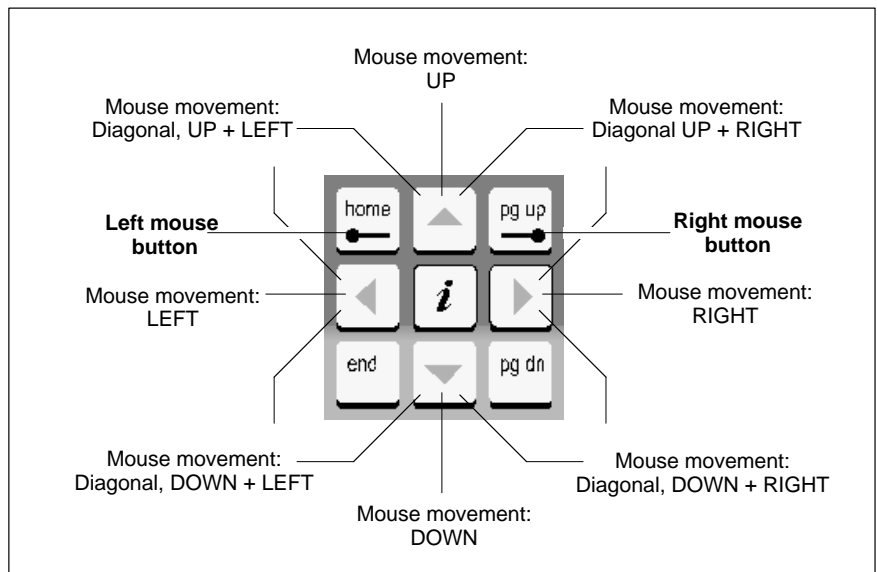
## 7.3.4 Special key functions


The alpha key can be used to invoke the following special functions:

- Keyboard mouse <Alpha> + <M>
- CAPS Lock <Alpha> + <C>
- NUM Lock <Alpha> + <N>

### Keyboard mouse

When enabled, a keyboard mouse replaces the mouse movement by means of the **cursor** keys. The cursor control block function is no longer available.



 In the event that an external mouse is connected during startup or subsequent to a RESET, it will be recognized automatically, and the keyboard mouse disabled. It will then not be possible to reenables the keyboard mouse, not even by removing the external mouse. To activate the keyboard mouse, the control terminal must be restarted.

#### Keyboard mouse on BT155, BT205

**<alpha> + <M>** enables the keyboard mouse. This key function toggles back and forth.

The active keyboard mouse is indicated by the LED of the alpha key in the following manner:

Keyboard mouse	alpha key LED <b>before</b> activating keyboard mouse	Keyboard mouse	alpha key LED <b>after</b> activating keyboard mouse
disabled	Off	Enabled	Flashing: <b>Short On / long Off</b>
disabled	On	Enabled	Flashing: <b>Long On / short Off</b>

#### Keyboard mouse on BT250

**<alpha> + <M>** enables the keyboard mouse. This key function toggles back and forth. The **Mouse** LED confirms when the keyboard mouse has been enabled.

#### CAPS Lock

**<alpha> + <C>** activates CAPS Lock. This key function toggles back and forth.

The function is confirmed by the **Caps** LED.

Enabling the CAPS Lock provides permanent access to upper-case characters, special characters, etc., until it is again disabled.

Pressing the <shift> key disables the CAPS Lock function.

#### NUM Lock

**<alpha> + <N>** activates NUM Lock. This key function toggles back and forth.

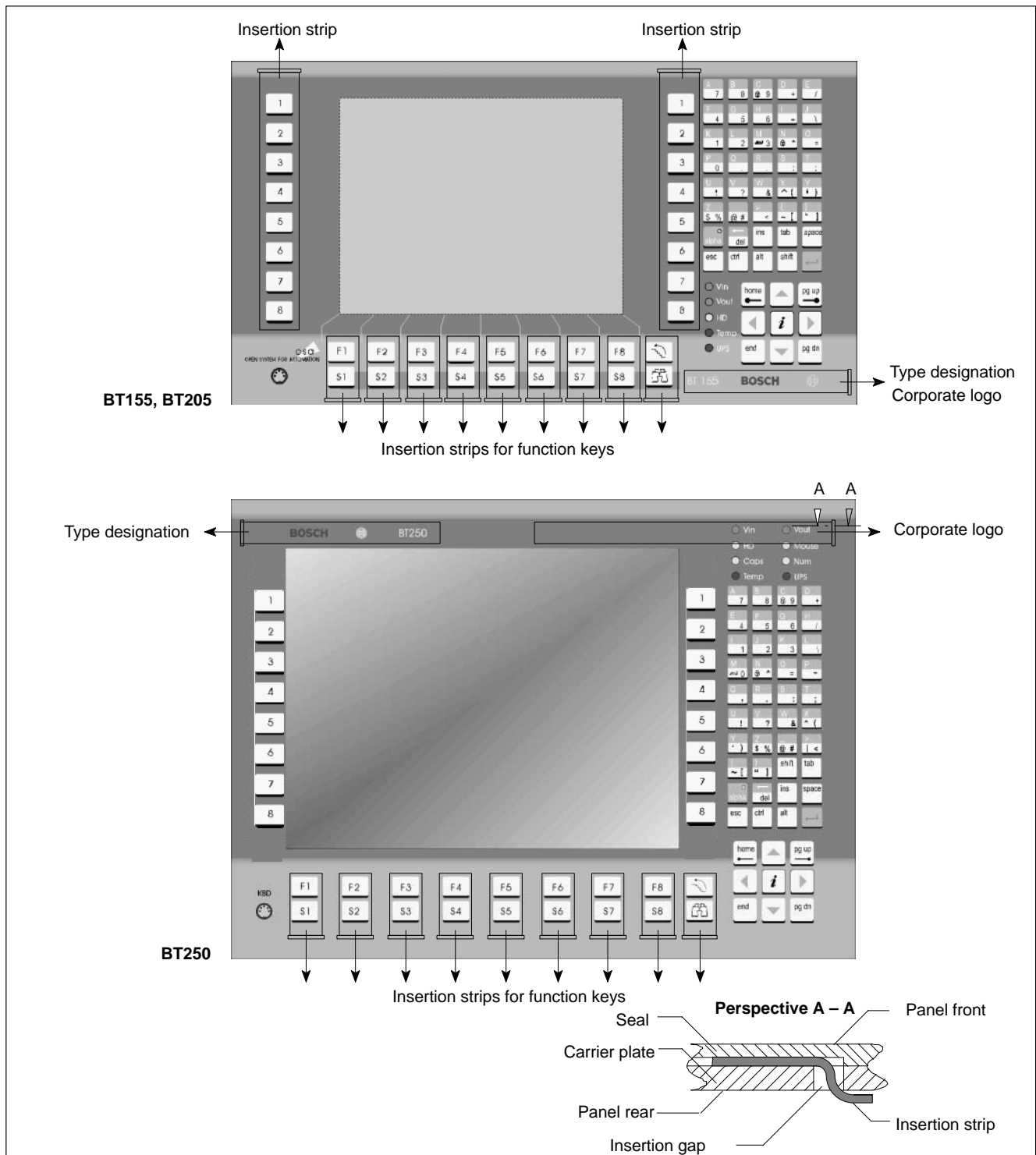
The function is confirmed by the **NUM** LED.

The NUM Lock function activates the numerical keypad on an external DIN keyboard.

### 7.4 Front panel legends

Providing for customer specific terminal legends, individual insertion labels can be inserted at the outside edges, and pushed under the plastic film of the front panel:

- Type designation and corporate logo
- Function key columns to the left and right of the display
- Function key rows below the display



The insertion strips/labels are inserted and pushed through an insertion gap at the rear of the front panel.

- ☞ **When preparing to insert a label, it will be helpful to start by inserting a flexible plastic or metal strip of approx. 0.1 mm thickness that is slightly longer than the label. Remove the strip after installation of the insertion label.**

The table below indicates the dimensions of the various labels.

Label type	Dimensions [mm]
Type designation, corporate logo (BT155, BT205)	124.8 x 18
Keys 1 through 8 (only BT155, BT205)	22 x 195
Function keys	22 x 44.2

### Replacing insertion labels

1. The control terminal must be switched off and deenergized.
2. Remove the mounting screws holding the front panel on the installation frame.
3. If necessary, also remove all cable connections on the BT.
4. The insertion gaps for the insertion labels are located at the rear of the front panel. Replace the old insertion labels with new ones.
5. Installation is in reverse sequence to disassembly described above.
6. Restore power to the system. Ensure that the legend is clearly legible, and that keyboard legends correspond to key functions.

- ☞ **In certain circumstances, faulty labelling may cause operating faults on the connected machine! Check and verify that legends on insertion labels correctly match the functions of labelled keys.**

## 7.5 Keyboard controller

For many industrial applications it is important to determine the key status (pressed/not pressed, key LED ON/OFF) of the front panel keyboard. To this end, a keyboard controller scans the front panel keyboard, and transfers the key codes, switch settings, etc. to various interfaces.

### 7.5.1 Scanning front panel keyboard

The keyboard controller transfers the current status of the front panel keyboard to various interfaces:


- to the PC via MF2
- to the PROFIBUS slave stations
- to the 24 Vout outputs

Via these interfaces, the supplied information can then be further processed by the respective application program.

#### Transferring key codes to the PC via MF2

The 1st input byte contains the following values (in the standard version):

BT155, BT205, BT250	
Key	MF2 key code
Overview:	shift + space
Display basic screen:	ctrl + home
Info:	shift + return
Softkeys F1–F8:	F1–F8
Softkeys S1–S8:	shift + F1–shift + F8
Movement keys 1–4 left of display:	F9–F12
Movement keys 5–8 left of display:	shift + F9–shift + F12
Movement keys 1–4 right of display:	ctrl + F9–ctrl + F12
Movement keys 5–8 right of display:	ctrl + shift + F9–ctrl + shift + F12
Standard ASCII character set	1,2,3,... a,b,c,...
Cursor block	Cursor: Left, Right, Up, Down, home, end, pgup, pgdn
””, \$”,  ”, ’~’, ””, ’^’, ‘@’, ””, are entered with the alpha key enabled.	Alpha active: Alt + ....

 **The alpha key is a latching (toggle) function which does not return a key code. It controls the keyboard controller. When the alpha key is active, the key LED illuminates.**

The alphanumerical keys, and the <ctrl>, <alt> and <shift> keys in particular, have the same function as those on a standard PC keyboard.

## Transfer to PROFIBUS slave station / 24 Vout outputs

By default, the following signals are transferred:

- Movement (motion) keys
- Softkeys

BT155, BT205, BT250	
Key	Key codes to: – PROFIBUS slave – 24Vout output
Softkeys F1–F8:	0x20–0x27
Softkeys S1–S8:	0x28–0x2F
Movement (motion) keys 1–8 (left of display):	0x10–0x17
Movement (motion) keys 1–8 (right of display):	0x18–0x1F
No key pressed:	0x00
Arrow keys:	0xFF
pg up, pg dn:	0xFF

### PROFIBUS slave station

The key transfer used codes via 8 input bytes sent to the PROFIBUS slave.


### 24 Vout outputs

The key codes are output on the 24 Vout outputs in bit-encoded fashion. The value indicated in the preceding table corresponds to the 1st input byte. The respective outputs can then be read via an external PROFIBUS station.


## 7.5.2 Exceptions when keys are pressed simultaneously

When keys are pressed simultaneously, the key code output is supported by special processing logic. Simultaneous key actuation is not supported only in the case of movement keys; only one key may be active at a time:

- 2 movement keys are pressed: Key code of first recognized key is output
- Releasing key that was pressed first: No code is output

 **If a movement key is pressed, all other key actuations will be ignored until a movement key no longer remains pressed.**

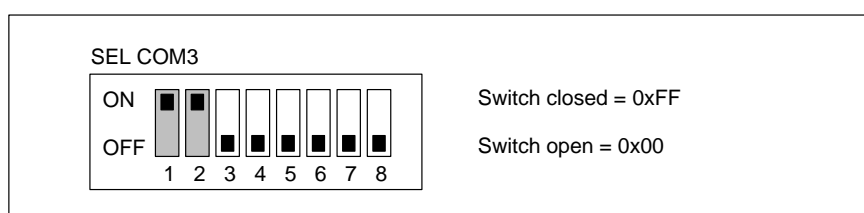
### 7.5.3 Software download for keyboard controller

 **Customer-specific key codes can be downloaded by Bosch upon request and by appointment.**

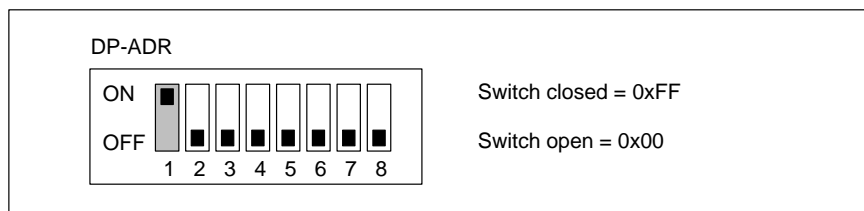
The BT uses the COM3 serial port to download new key codes into the keyboard controller.

In the event that problems are noted when downloading, the first step should be to check and verify the switch segment positions of the SEL COM3 DIP switch.

The SEL COM3 DIP switch is located at the bottom of the control terminal (see pages 6-2 and 6-3). Switch segments 1 and 2 must be in the **ON** position.



If the download continues to fail, a forced download may be initiated. This entails explicitly switching the keyboard controller to Download mode by means of the DP-ADR switch, which is also located underneath the control terminal. Set switch segment 1 to **ON**, then reboot the control terminal to activate the Download mode.



Once the download has been completed successfully, return switch segment 1 of the DP-ADR switch to the **OFF** position.

Notes:



## 8 Maintenance & Replacement

The BT series PC-Based Control Terminals are maintenance-free. However, some components are subject to wear and must be replaced.

### Maintenance schedule

Integrate the following tasks into your existing maintenance schedule:

- Clean the surface of the screen at least once a week with an anti-static cloth or alcoholic window cleaning agent.



#### CAUTION

**Dissolution of sealed key panel surface and display seal through contact with solvents! Do not use any solvents (e.g., paint thinner)!**

- 
- At least once a year, check all plug and terminal connections of components for proper tightness and damage. Check cables for jacket or insulation breakage or pinching. Have damaged parts replaced immediately.
  - Check fan and fan filter mats at least once a year. Clogged and contaminated filter mats reduce the air volumes required for proper ventilation and cooling. Therefore, wash dirty filter mats in soapy water or replace with new mats. Allow washed filter mats to dry thoroughly before reinstalling.



#### DANGER

**Risk of injury through rotating fan impeller!**

**Keep hands and fingers clear, and do not insert any items into the fan impeller.**

- 
- Ensure that the PC-Based Control Terminal is equipped with operational rechargeable batteries. Enable automatic testing of the rechargeable battery during each restart by activating the so-called **Accu Test** option of the UPS control program.

 **For spare parts, functional compatibility is ensured for a minimum of 5 years.**

## 8.1 Replacing the hard disk

The hard disk can be replaced while the control terminal remains in its installed position.



### CAUTION

#### Loss of Data!

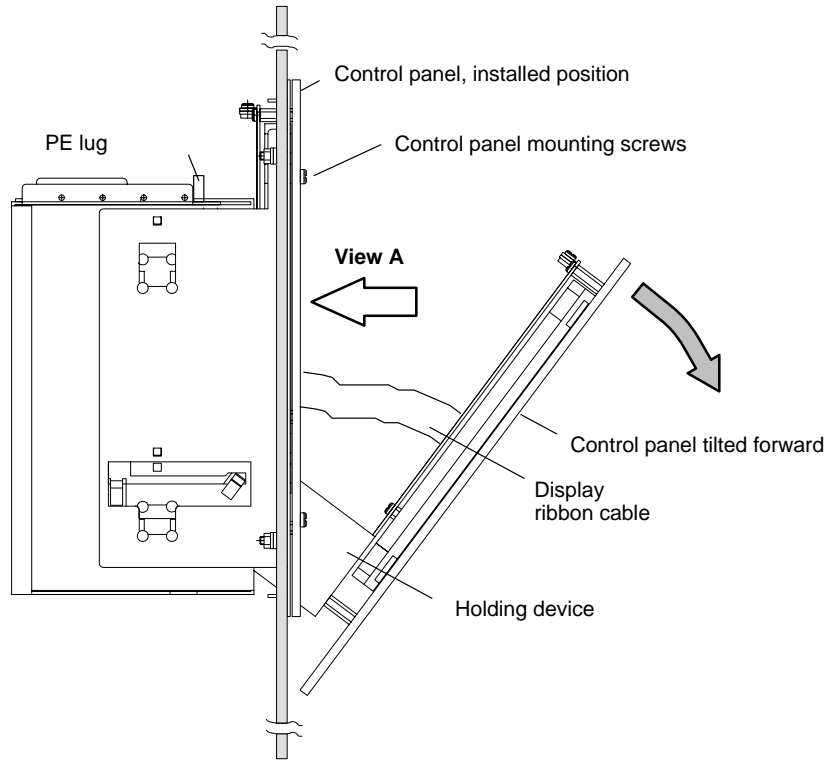
**Back up all required application data and operating system settings to an external storage medium!**

**To safeguard application data, and to avoid the necessity of the time-intensive new installation of operating system (OS) and application programs following a hard disk replacement, the functional program and OS data on the hard disk should be backed up at regular intervals with the use of the Bosch-supplied “Backup Package for Industrial PC”. This process backs up a hard disk image to a Jaz diskette of the supplied IOMEGA Jaz drive. This image must merely be copied back to the newly installed hard disk.**

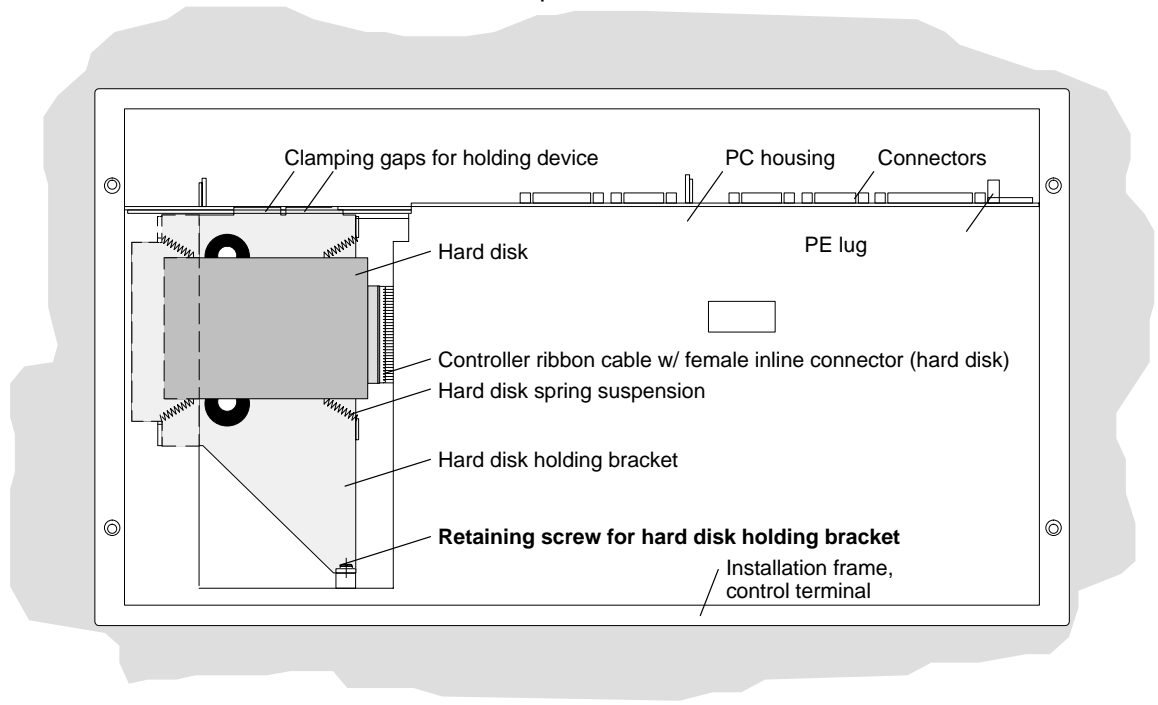
**In the event that there is no external floppy disk drive connected to the BT control terminal, the new hard disk to be installed must feature a preinstalled operating system!  
In any case, the presence on the hard disk of a preinstalled operating system is recommended in order to reduce the required installation time!**

1. Back up all required user and application data, as well as the settings of your operating system, to an external data carrier or on an external host via the network connection!
2. Switch off the power supply.
3. Wait until the power supply switches off automatically subsequent to UPS operation (the **UPS LED** on the control panel illuminates **red** until the UPS shuts down the power supply). If required, remove all plug connectors from the BT control terminal.
4. Remove the 4 Phillips-head screws holding the BT control terminal. Pull out the control terminal by approx. 3 cm, and tilt forward (refer to diagram on page 8-3).
5. Disconnect the ribbon cable for the data/power connection from the hard disk. At both sides, the ribbon cable is secured by a dab of bonding adhesive, which must be cut open prior to deinstallation. The far end of the ribbon cable must be removed from the main board only if the cable is defective.

**Once the plug connector has been reinstalled, the connection must again be secured with a dab of “hot glue” at both sides.**

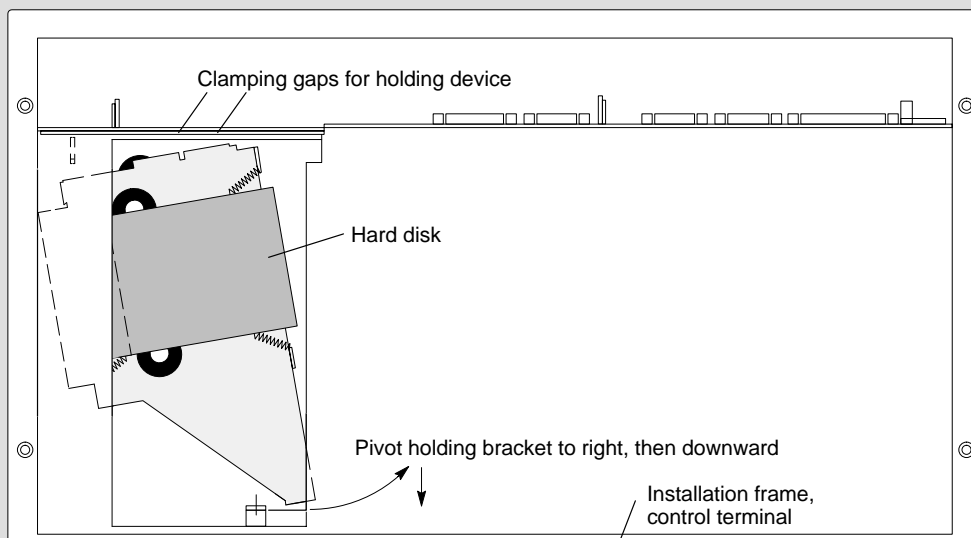
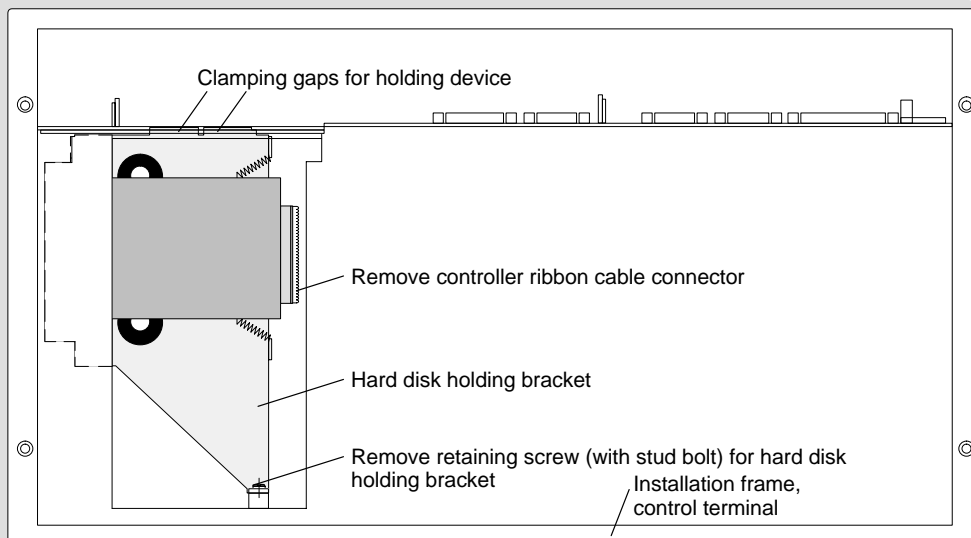


**View A:** Control terminal with control panel folded down



6. A **retaining screw** holding the hard disk in place is located below the hard disk. Loosen the retaining screw (accessing the screw from the front or also from the top rear at the BT control terminal housing), and pivot the hard disk holding bracket slightly to the top right at its base (near the retaining screw). The pivoting motion releases the holding bracket from the clamping gaps at the top side of the housing. Now, pull the holding bracket slightly downward in order to remove it toward the front.
7. The new hard disk is supplied complete with holding bracket. The new hard disk is installed complete with holding bracket in the reverse order of removal.

**View A:** Control terminal with control panel folded down



### Testing the new component

8. The new hard disk must be declared in the BIOS of the control terminal. To access the BIOS menu of the PC, press the <F2> function key during the boot phase.

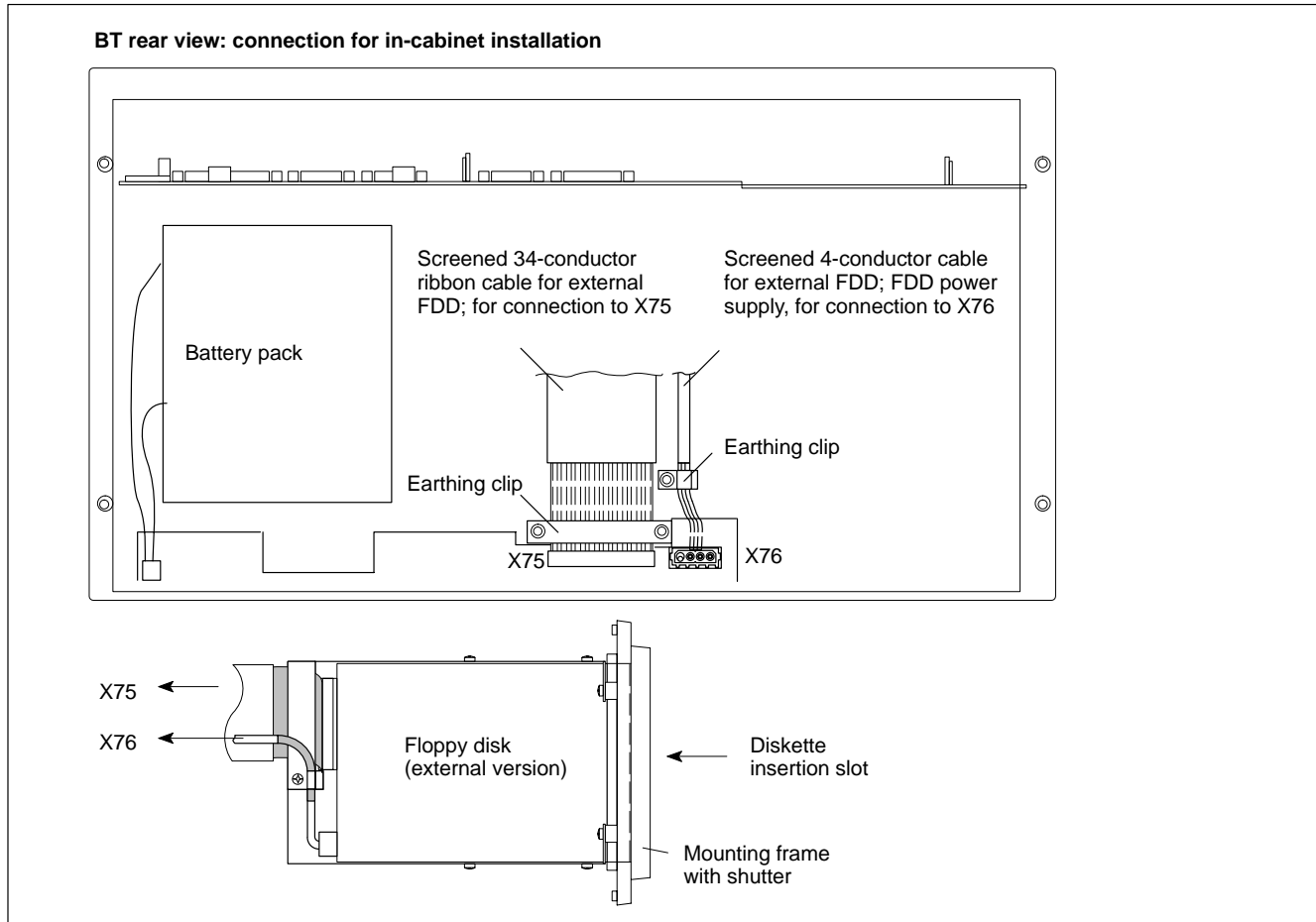
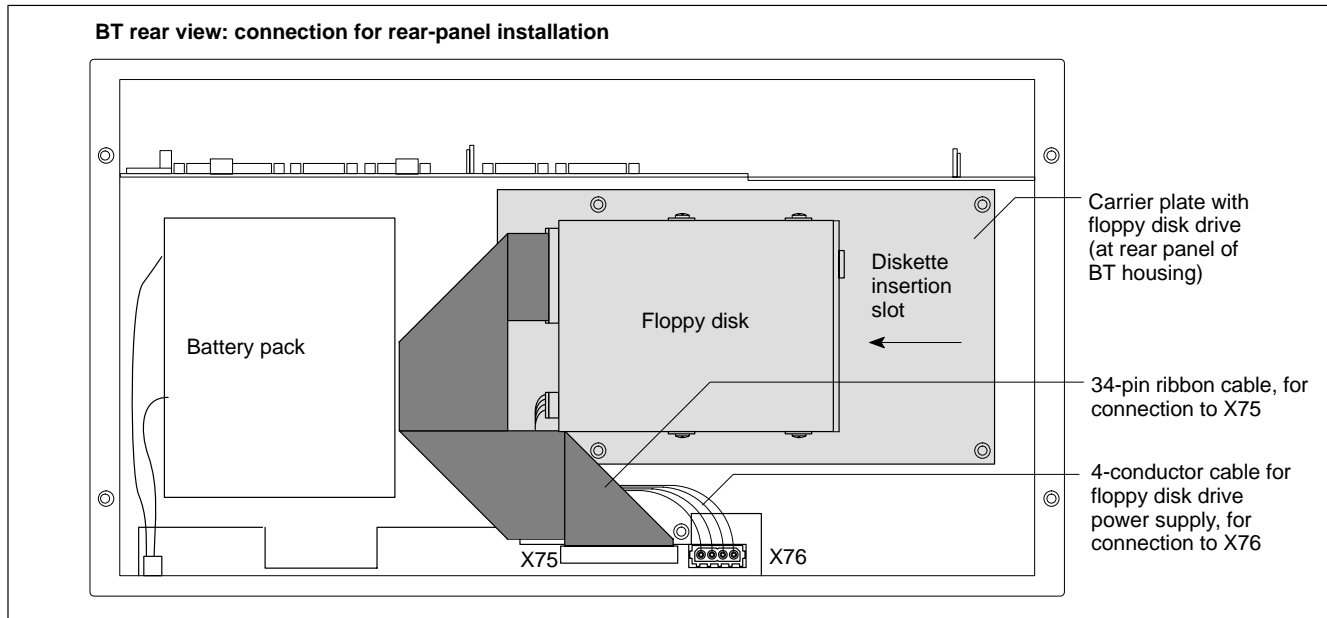
In the main menu, select the **Primary Master** menu command to enable automatic recognition of the new hard disk parameters by the system. In the **Master** submenu, go to the **Transfer Mode** menu option, and select **Fast PIO 3** for the hard disk. In the Exit menu, press F10, **Exit Saving Changes** to save the hard disk parameters prior to exiting the BIOS. To confirm, press the <Z> key (= Yes; on this keyboard of German layout, this will be recognized by the BIOS as a Y = Yes).

9. In the event that the operating system fails to start up the operating system, again interrupt the power supply to the unit for a minimum of 10 seconds, and then reboot.
10. If the system still fails to start, check for the following:
  - Proper connection between controller cable and hard disk.
  - Proper seating of all cables and connectors.
  - Functioning power supply.
11. Once the PC has started properly and completed its boot process, the user data and operating system configuration must again be restored for standard operation.

## 8.2 Installing 3.5" floppy disk drive

Two floppy disk drives are available as optional accessories:

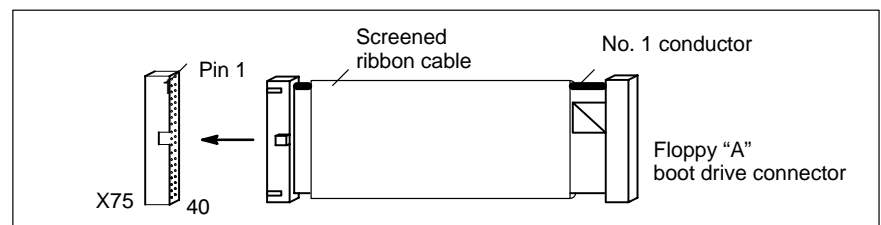
- External unit for installation on the rear panel of the PC housing (Order no.: 1070 081 617)
- External unit with mounting frame and shutter for in-cabinet installation; cable length 1.2 m (Order no.: 1070 081 614)



- ☞ **For in-cabinet installation, both connections must be screened, and the scree must be connected to housing potential at both end.**

## Installation

1. Switch off the power supply.
2. Wait until the power supply switches off automatically subsequent to UPS operation (the **UPS LED** on the control panel illuminates **red** until the UPS shuts down the power supply).
3. Remove the power supply cable from connector X20 or X10\_1.
4. Connect the ribbon cable to FDD connector X75, and the power supply cable to connector X76. Observe the red marking on the ribbon cable, which must always connect to pin 1 of the devices to be connected. In most cases, notches in the mating inline connectors prevent improper connection.



- ☞ **The default setting in the BIOS of the BT series control terminals is for a 3.5 in. floppy disk drive, HD/1.44 MB.**

5. In the event that the user has installed another type of FDD, (e.g., 3.5-in. HD, 2.88 MB), this drive must be declared in the BIOS of the BT control terminal.  
To access the BIOS menu of the PC, press the <Del> key during the boot phase.

**BT250:** In the Main Menu, select the **Diskette 1** option. Select the new floppy disk type. In the Exit menu, press F10, **Exit Saving Changes** to save the hard disk parameters prior to exiting the BIOS.

To confirm, press the <Z> key (= Yes; on this keyboard of German layout, this will be recognized by the BIOS as a Y = Yes).

**BT155, BT205:** In the **Standard CMOS Setup** menu, select **Floppy Drive A**. Select the new floppy disk type. To exit the BIOS, select the **Save Settings and Exit** menu command (saves the hard disk parameters).

To confirm, press the <Z> key (= Yes; on this keyboard of German layout, this will be recognized by the BIOS as a Y = Yes).

6. If the floppy disk cannot be accessed, verify the following:
  - The controller cable is connected properly to the floppy disk.
  - Proper connection between controller cable and floppy disk drive.
  - Proper seating of all cables and connectors.
  - Presence of operating power.

## 8.3 Backlight and display panel

 **Replacing the backlight is possible only on the BT150 and BT250.**

Over time, and with increasing loss of backlight brightness, the readability of the LCD display will steadily deteriorate, providing justification for replacing the backlight source. Both the backlight source and the display panel can be replaced while the BT control terminal remains in its installed position:

1. Switch off the power supply.
2. Wait until the power supply switches off automatically subsequent to UPS operation (the **UPS** LED on the control panel illuminates **red** until the UPS shuts down the power supply).
3. Remove the 4 Phillips-head screws holding the BT control terminal. Pull out the control terminal by approx. 3 cm, and tilt forward (refer to diagram on page 8-9).
4. Remove the 2 display mount retaining screws at the control panel. You can now pull the display including its display mount from the cutout, as far as the display ribbon cable will allow.
5. Remove the 4 display mounting screws.
6. To replace the display: Carefully remove ribbon cable connector from display. Replace old display with new display panel.
7. To replace the backlight source: Remove the backlight from the retainer, and replace with new backlight unit.



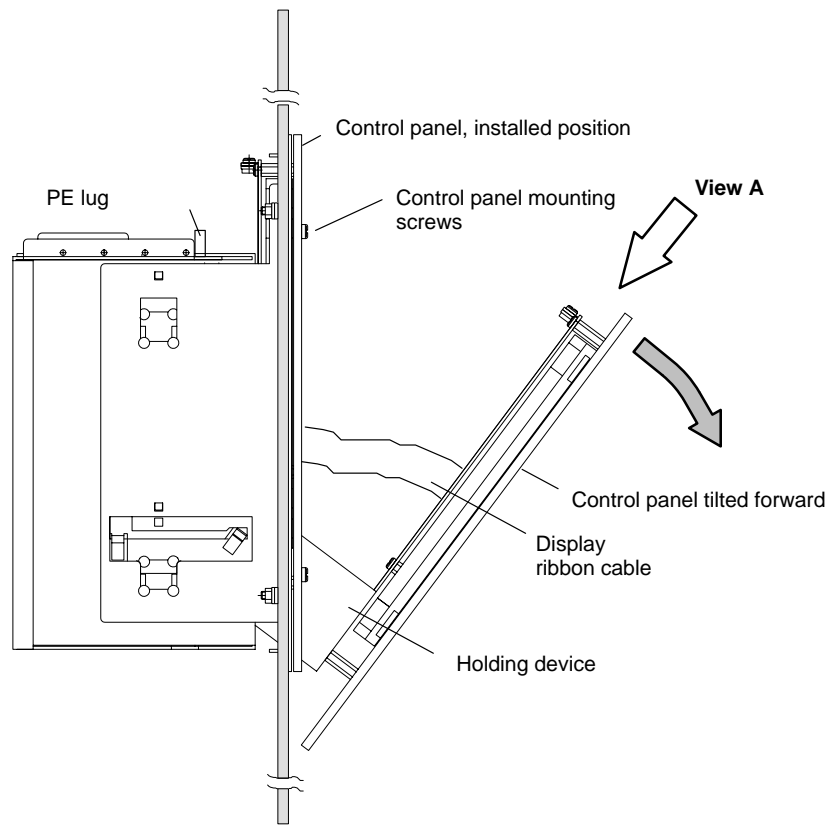
### CAUTION

**Replace a used display only with a display of the same type!  
Replace the backlight unit only with one matching the display!**

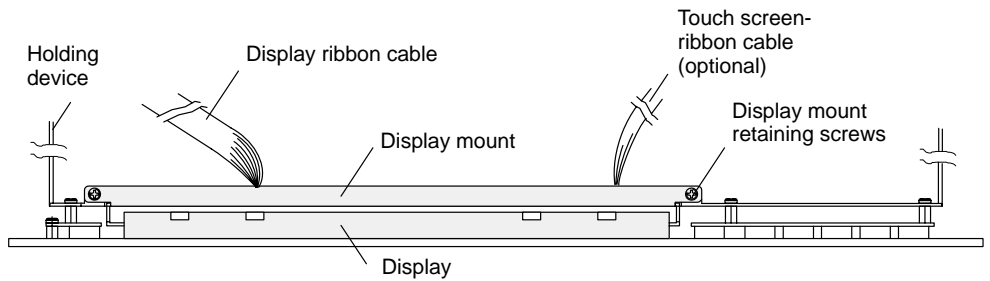
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8. The installation is performed in the reverse order of the removal procedure.
9. In the event that there is no screen display after the system has booted up, check the connection and verify the following:
  - Proper seating and positive contact of display ribbon cable.
  - Proper seating and positive contact of backlight unit.

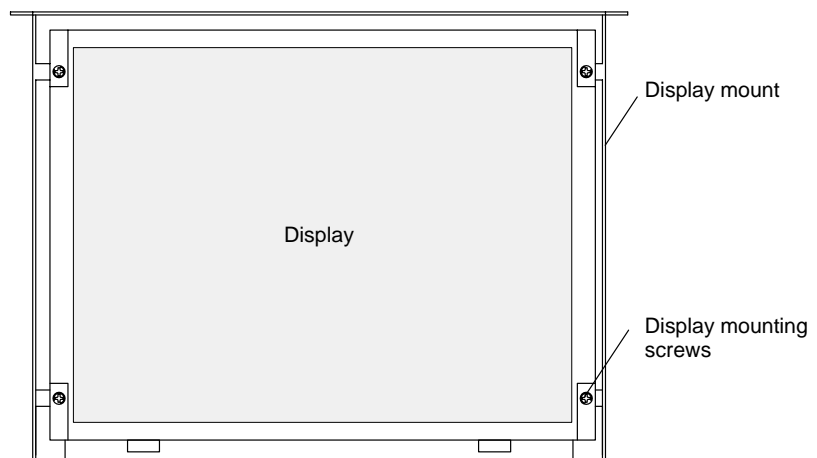




**View A: Control panel with display**



**Front view:  
Display with mount  
(w/ display mount  
removed)**



## 8.4 Rechargeable battery pack




### CAUTION

Prior to commencing replacement procedures, back up important data because of possible voltage dips which may cause data resident in RAM to be lost.

The rechargeable battery pack must be replaced in the following cases:

- The battery test fails during system startup.
- The number of completed charge cycles exceeds 3000 (figure given in **Shutdown Count** field in UPS control program greater than 3000, refer to Page 3-8).
- The red **UPS** LED on the front panel flashes (see page 7-4).

A charge cycle is defined each time the power supply is cycled on and off. As long as the BT control terminal is connected to mains power, a harmful deep-discharge of the rechargeable battery pack is prevented.

-  **The rechargeable batteries used in the battery pack are recyclable and may be returned to Bosch after replacement. They must not be disposed of in standard residential refuse.**

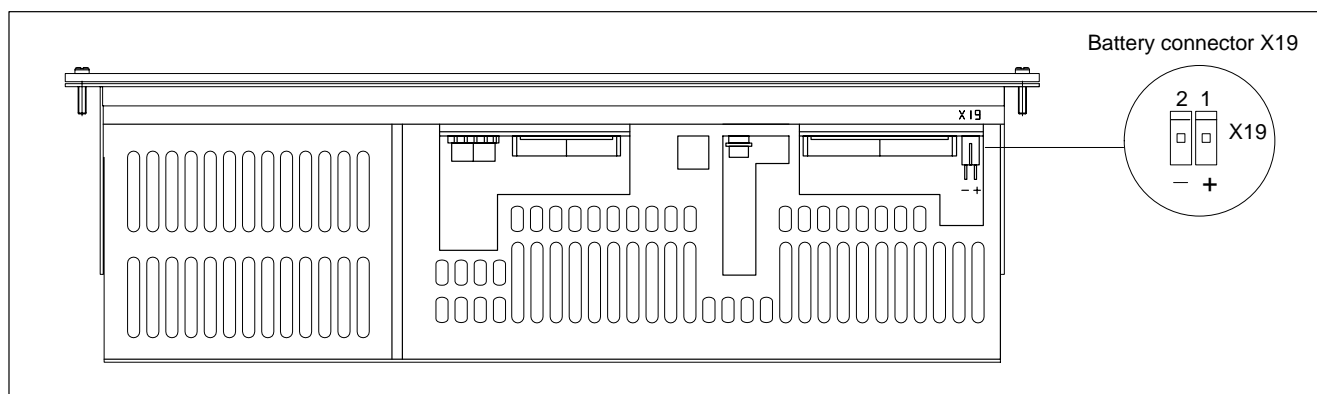
### X19 Connector for rechargeable battery pack

Terminal for connecting an external rechargeable battery pack. Internal rechargeable battery packs are already connected, and may be disconnected only in preparation for a battery pack replacement.

Male 2-pin connector

Cable length: max. 0.5 m

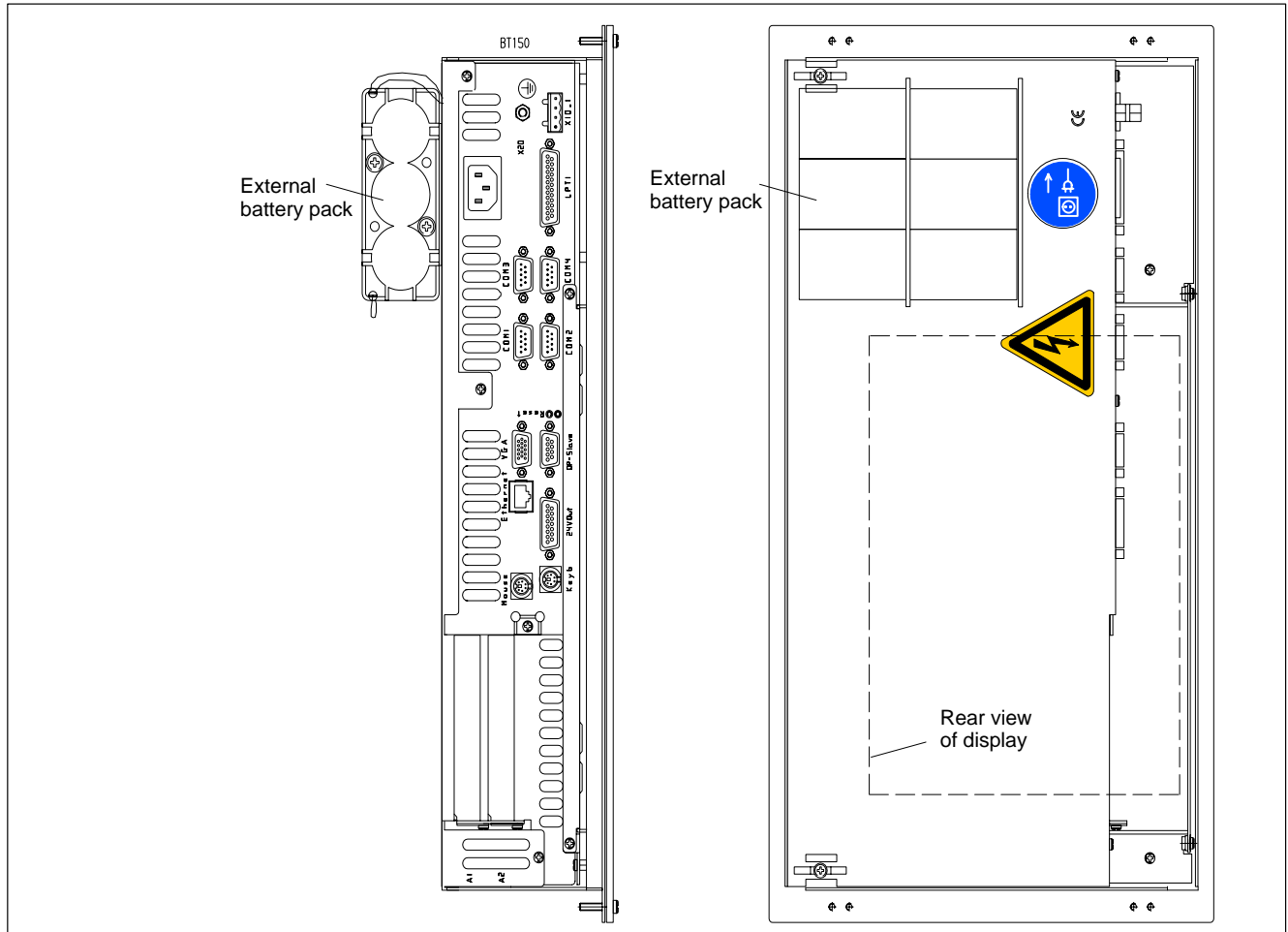
Cable type: Unscreened, min. cross-section 1.5 mm<sup>2</sup>



**External rechargeable battery pack**

The external rechargeable battery pack is used for BT control terminals featuring a small housing:

- For rear-panel installation on the control terminal, with short power cable (20 cm),  
Order no.: 1070 081 653
- For in-cabinet installation, with long cable (200 cm),  
Order no.: 1070 081 652



1. Switch off the power supply. If required, remove all plug connectors from the BT control terminal.
2. Attach the rechargeable battery packs with 2 screws each.
3. Connect the twin-conductor cable to the X19 battery connector.



**CAUTION**

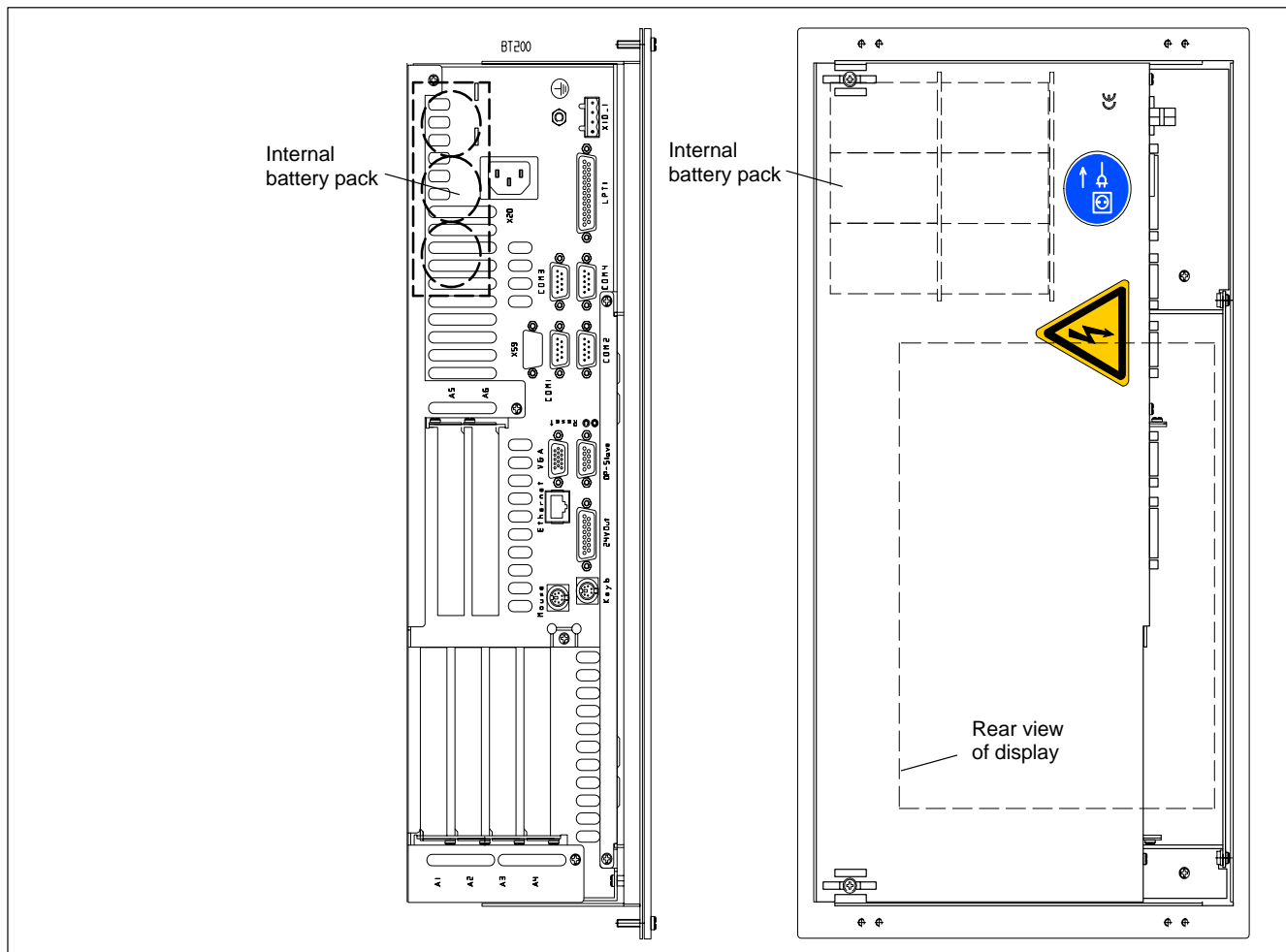
Ensure proper installed polarity of the rechargeable battery packs (refer to diagram on page 8–10).

In the event of a reverse-polarity connection, a F10A (5x20) fuse will blow onboard the power supply. UPS operation will then no longer be possible.

4. Test the system (see following section).

## Internal rechargeable battery pack

The internal rechargeable battery pack is integrated in the BT control terminals featuring large housings.



1. Prior to replacing the battery pack, switch off the power supply. If required, remove all plug connectors from the BT control terminal.
2. Remove the male connector with the twin-conductor cable from the battery connection at the bottom of the BT control terminal.
3. Open the rear panel of the housing. On the BT250 and the BT155 / BT205 without a built-in CD-ROM drive and LS120 drive, 5 screws must be removed for this purpose. On the BT155 / BT205 with built-in CD-ROM drive, only the 2 screws on the side near the built-in rechargeable battery pack must be removed (see diagram above). The housing panel can now be removed.
4. Remove the fastening screws (2 on each battery pack), and replace the rechargeable batteries inside the PC housing.
5. Replace the male connector of the connecting cable of the new battery pack in the X19 battery connector.

**CAUTION**

Ensure proper installed polarity of the rechargeable battery packs (refer to diagram on page 8-10).

In the event of a reverse-polarity connection, a F10A (5x20) fuse will blow onboard the power supply. UPS operation will then no longer be possible.

6. Close the housing cover.

7. Installation is in reverse sequence to disassembly described above.



**If the new rechargeable battery pack has not been charged, there will not be adequate UPS protection to effect a controlled shutdown of the PC during the approx. 5 hours required for charging to 2.5 Ah capacity. Therefore, install fully charged batteries if at all possible.**

**Testing the new component**

8. Restore power to the system.

9. Observe the **UPS** LED on the front panel:

- Batteries already charged: **UPS LED OFF**
- Batteries discharged: **UPS LED flashes red**

Wait approx. 5 hours until the rechargeable batteries have been re-charged, and the **UPS LED extinguishes**.

## 8.5 Expansion boards

Depending on the size of the PC housing, a different number of expansion slots for PCI bus and ISA bus are available:

- Small housing with **2 expansion** slots for:
  - 1 PCI bus card (max. length 180 mm)
  - 1 PCI or ISA bus card (combination slot) (max. length 180 mm)
- Large housing with **6 expansion slots** for:
  - 3 PCI bus cards (max. length 180 mm)
  - 2 ISA bus cards (max. length 175 mm)
  - 1 PCI or ISA bus card (combination slot) (max. length 180 mm)



### CAUTION

**Risk of damage to the PC, or corruption of application software due to installation of non-approved expansion cards.**

**Use only approved expansion cards, and have them installed by a specialist.**

---

### 8.5.1 Installing an expansion card

1. Switch off the power supply. If required, remove all plug connectors from the BT control terminal.
2. Wait until the power supply switches off automatically subsequent to UPS operation (the **UPS** LED on the control panel illuminates **red** until the UPS shuts down the power supply).
3. On small-housing BT control terminals, remove the X19 connector at the bottom of the BT control terminal. In this way, when removing the rear housing panel, damage to the X19 male connector is prevented.
4. Open the rear panel of the housing. On the BT250 and the BT155 / BT205 without a built-in CD-ROM drive and LS120 drive, 5 screws must be removed for this purpose. On the BT155 / BT205 with built-in CD-ROM drive, only the 2 screws on the side near the built-in rechargeable battery pack must be removed (see diagram above). The housing panel can now be removed.
5. Remove the mounting screw holding the slot cover.
6. Insert the expansion card, and secure it with the mounting screw.
7. Reinstall the rear housing panel, and reconnect the rechargeable battery packs to X19.

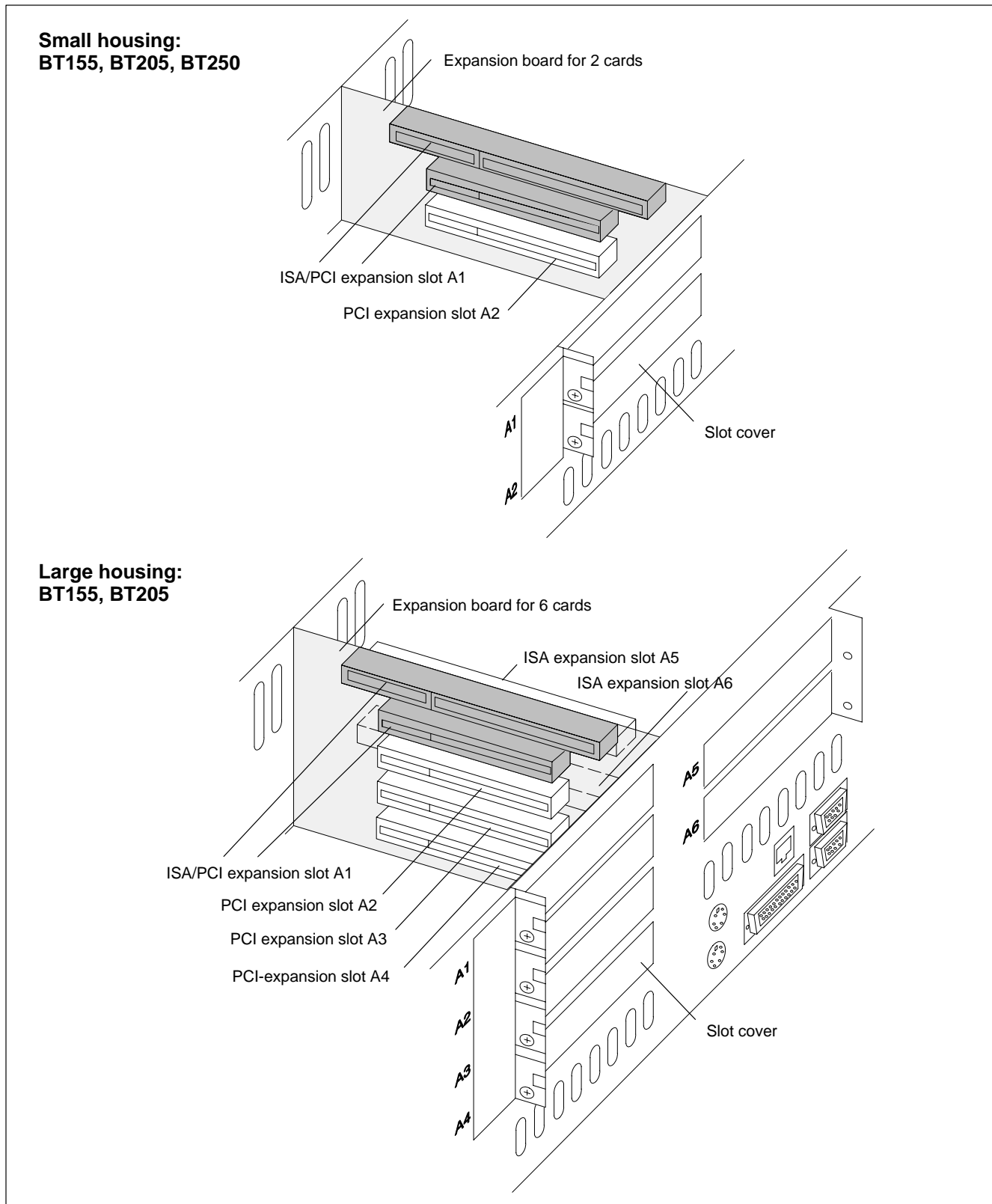
**CAUTION**

Ensure proper installed polarity of the rechargeable battery packs (refer to diagram on page 8-10).

In the event of a reverse-polarity connection, a F10A (5x20) fuse will blow onboard the power supply. UPS operation will then no longer be possible.

---

## Arrangement of expansion slots in the housing

**CAUTION**

**Destruction of expansion board or main board!**

**The PCI/ISA bus combination slot must never be populated with a PCI board and an ISA board at the same time!**



If the board is equipped with a Plug and Play (PnP) function, it will be automatically recognized by the operating system and integrated into the system, provided that hardware conflicts (IRQ, etc.) with other expansion boards or connected devices do not occur.

In the event that, subsequent to a system restart, the features based on the new expansion board are not available, there may be several causes:

- The board is not properly seated in the PCI or ISA slot.
- The installation of the software driver(s) for the card was **not performed**, or the installation was **faulty**.
- IRQ (interrupt) conflict with other PC hardware components.
- The software required for the board has not been installed.




#### CAUTION

**Destruction of mainboard or ISA expansion boards through address conflicts (IRQ, memory addressing, I/O address)!**

**Observe the information supplied by the board manufacturer. It may become necessary to make new configuration settings in both BIOS and operating system (e.g., Control Panel in Windows NT 4.0 or Windows 95).**

## 8.5.2 BIOS settings

 **Because IRQs 3, 4, 5, 7, 10, 11 and 14 are already in use by other functions, they are no longer available for PCI and ISA expansion boards!**

### PCI expansion slot

In the **The Advanced Menu / PCI Configuration BIOS** submenu, an IRQ address can be assigned to each PCI slot. At the same time, the number of the IRQ address defines the priority.

If only PnP boards are used, the **AUTO** setting must be retained.

**BIOS selection:** PCI IRQ line 1, PCI IRQ line 2, PCI IRQ line 3, PCI IRQ line 4

**Option:** Disabled, Auto, IRQ: 3, 4, 5, 7, 9, 10, 11, 12, 14, 15,

**Default:** AUTO

### ISA expansion slot (IRQ)

In the BIOS menu named **The Advanced Menu, PCI Configuration** submenu, **PCI/PNP ISA IRQ Resource Exclusion / IRQx** option, the IRQ address for ISA boards that are not Plug-and-Play compatible (so-called Legacy ISA cards) is **permanently** set.

**BIOS selection:** IRQ 3, 4, 5, 7, 9, 10, 11, 15

**Option:** Available, Reserved

**Default:** Available

**ISA expansion slot (UMB)**

In the BIOS menu named **The Advanced Menu / PCI Configuration** submenu, **PCI/PNP ISA UMB Region Exclusion** option, a specific Upper Memory Block is reserved for Legacy ISA cards.

**BIOS selection:** C800 – CBFF, CC00 – CFFF, D000 – D3FF, D400 – D7FF, D800 – DBFF, DC00 – DFFF

**Option:** Available, Reserved

**Default:** Available

## 9 Software

For the processes of software loading and data backup, an external CD-ROM drive, floppy disk drive, or an Ethernet connection will be required. The drives are available as optional accessories for the BT155 and BT205 control terminals, and are mounted on the rear panel. It is also possible to use external drives which must be ordered separately. The control terminals feature an integrated USB (Universal Serial Bus) interface to handle the connection of external drives. To reload backed-up files, refer to the documentation provided with the respective operating system.

Depending on the intended use, the control terminal is shipped from the factory with a variety of preinstalled software:

- BIOS
- Operating system
- Utility programs
- Application software

### 9.1 BIOS software

The BIOS software is licensed by **Phoenix Technologies Ltd.** The PC requires the BIOS software for its initial boot process to enable it to find and start an operating system which it will use to provide a more user friendly and comfortable platform for running the application software.

### 9.2 Operating system

The BT150 / BT200 PC-Based Control Terminal has been tested and is supplied with one of the following operating systems by Microsoft Corporation:

	Software	BT155, BT155T	BT205	BT250, BT250T
Operating system	Windows 95	●	●	–
	Windows NT4.0	●	●	●

- = available
- = not available

### 9.3 Utility programs

The following utility programs which are not included in the complement of operating software under Windows 95 or Windows NT 4.0, are factory installed on the BT control terminals:

- UPS Charging Cycles
- ELO Touchscreen (only when touch screen display is installed)

## 9.4 Application software

The following Bosch application software is available as separate options:

Application		BT155(T)	BT205	BT250
PCL	Software PLC	•	•	•
rho4	Robot controller software	•	•	O/R
Typ3 osa	CNC operating software	•	•	O/R
PNC	CNC operating software	•	•	•
MMI-MADAP (MADAP Studio)	Systems operation software Diagnostic software	•	•	•
WinSPS	PLC programming software	•	•	•
WinDP	Field bus parameterization for PROFIBUS-DP	•	•	•
WinCan	Field bus parameterization CAN bus	•	•	•
WinStudio		•	•	•

• = available    O/R = On request

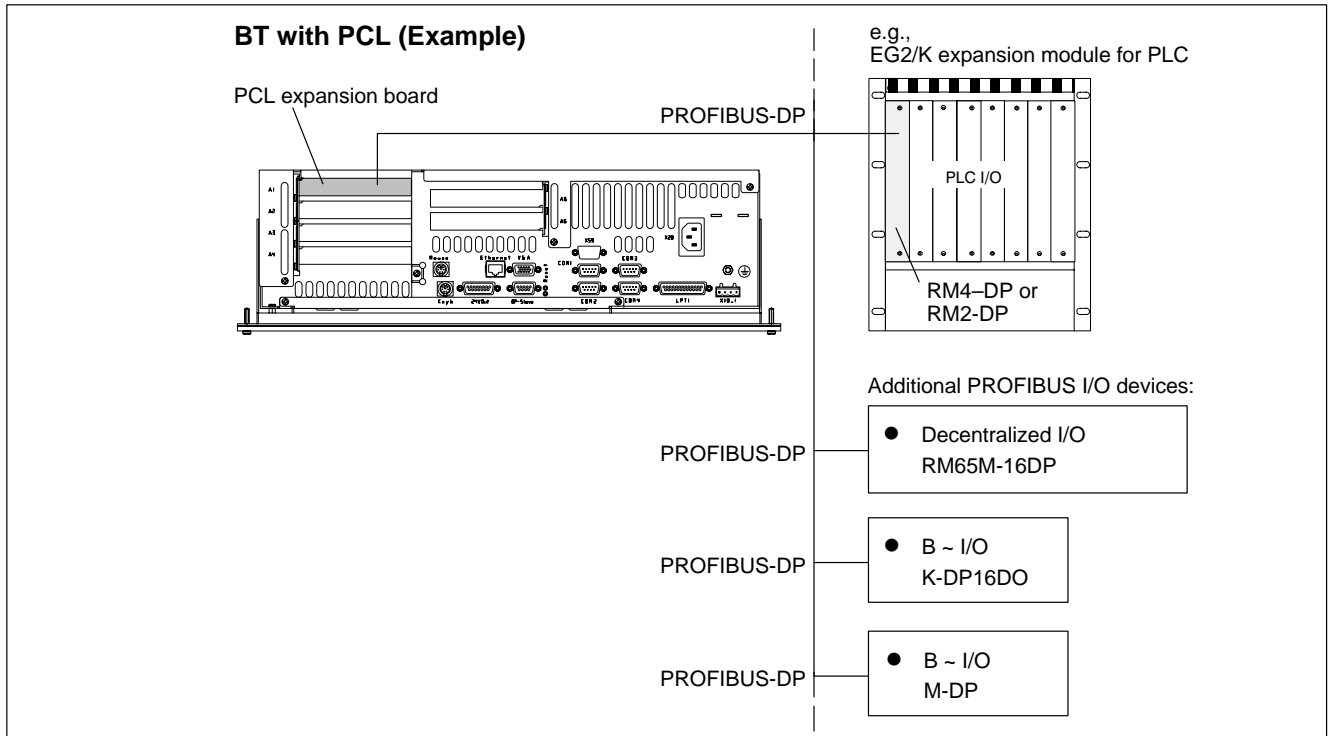
### 9.4.1 PCL (Software PLC)

With the installation of the PCL software PLC, the BT control terminal is provided with the capability to perform PLC functions. The PCL consists of the following components:

- PCL expansion board for PCI bus
- Installation diskette with PCL application program

#### Interconnection

When interconnected with other PLC components (e.g., an I/O rack) via a field bus (PROFIBUS-DP, CAN, InterBus-S), the control terminal becomes a full-featured PLC controller.

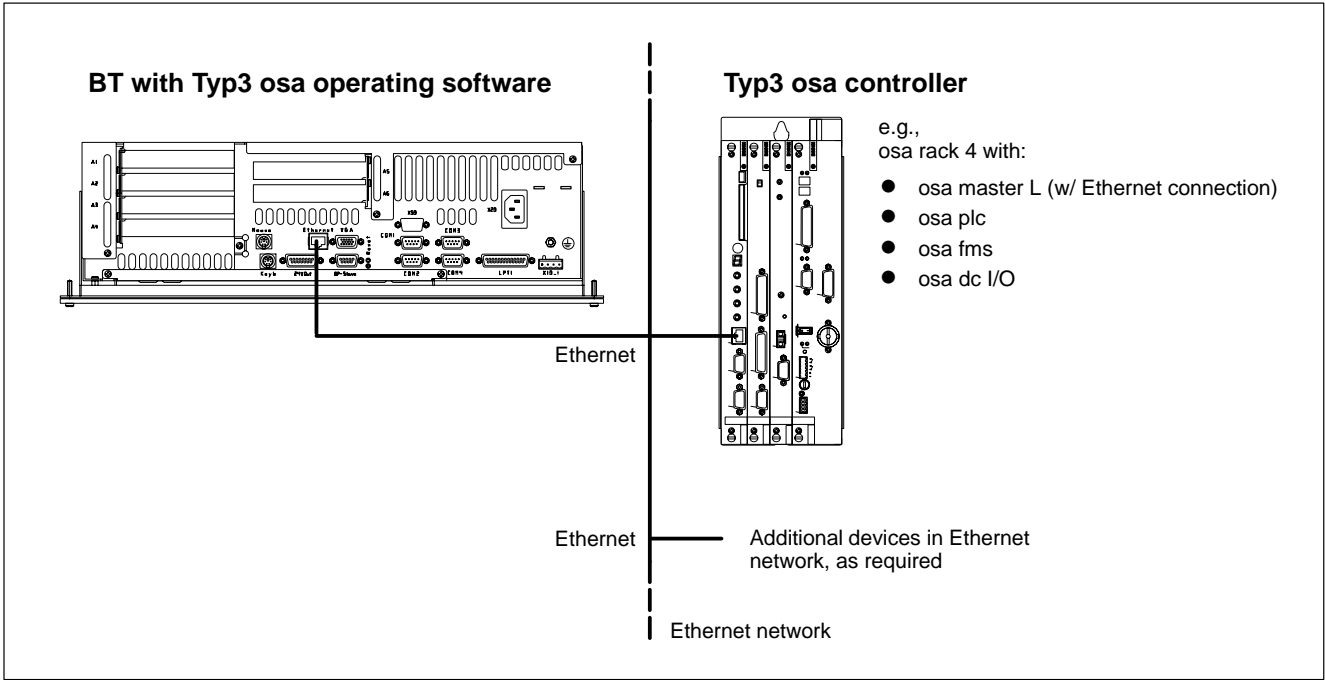


### 9.4.2 Typ3 (CNC operating software)

The BT150 PC-Based Control Terminal is recommended as an operating terminal for the Bosch Typ3 osa controller series.

#### Interconnection

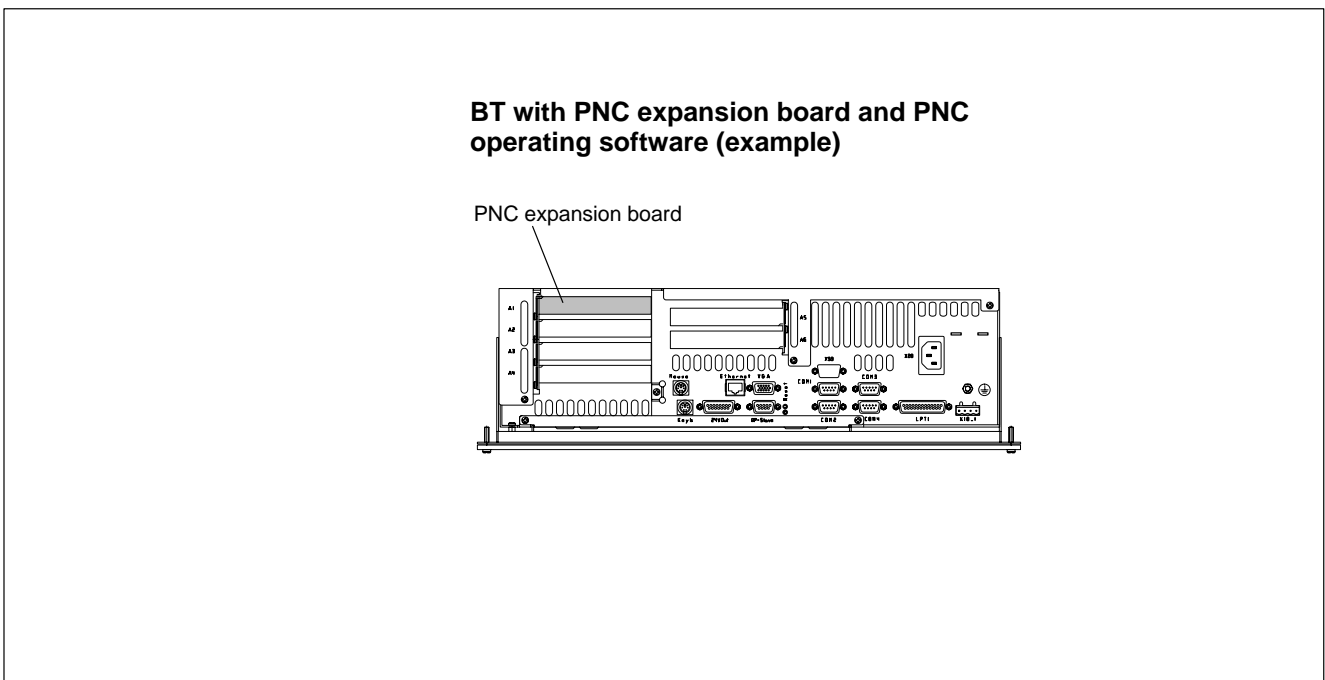
Communications between the user interface and the Typ3 osa controller are handled by means of the TCP/IP protocol via the Ethernet connection between the control terminal and the osa master module of the controller.



### 9.4.3 PNC (CNC operating software)

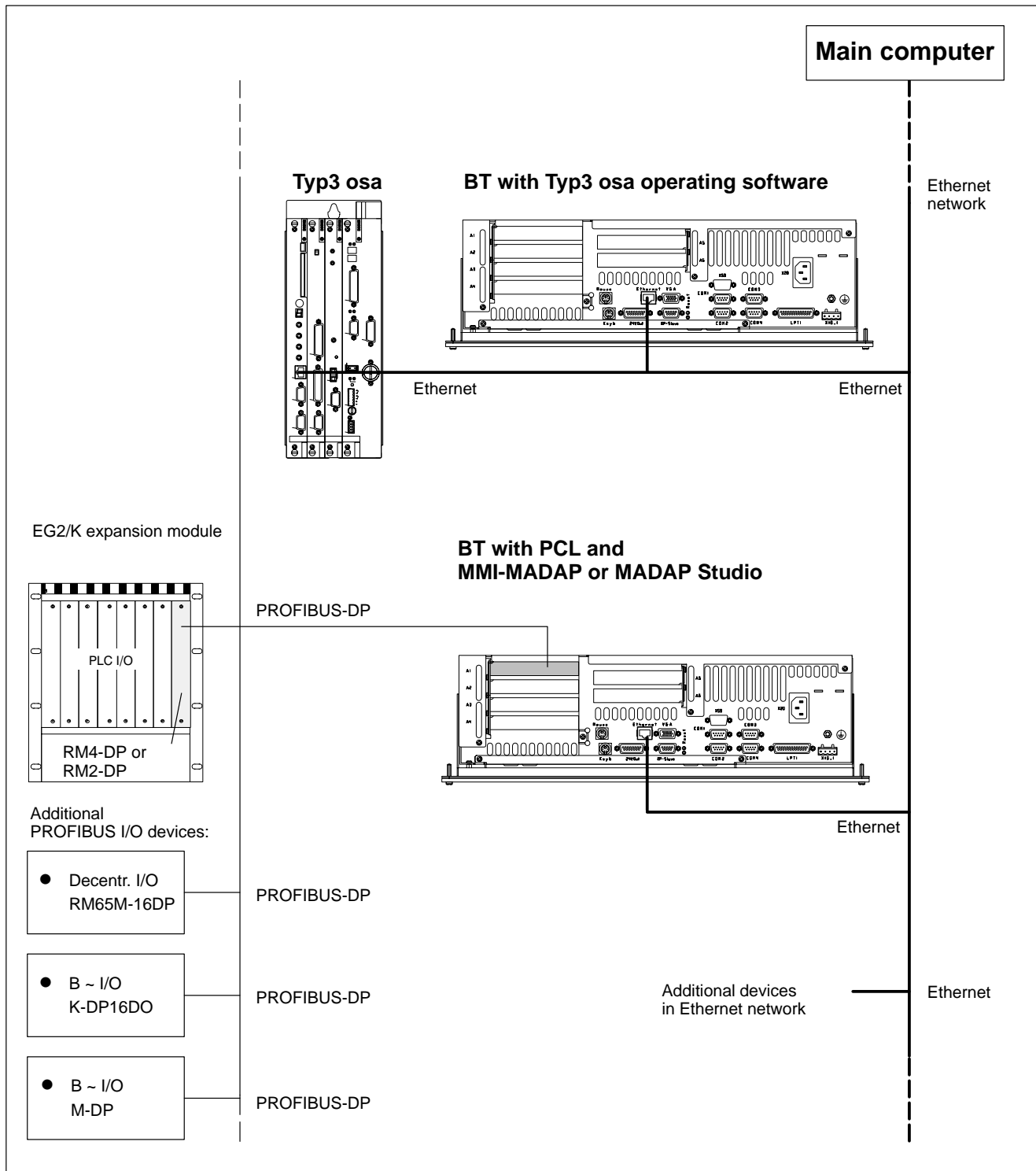
The Bosch PNC numerical control controller series is designed as a PC expansion board which may be accommodated in an expansion slot of the BT155 / BT205. In this way the control terminal becomes a full-fledged NC controller.

Communications between PNC user interface and PNC expansion board are handled via the internal PC bus of the BT155 / BT205 control terminal.



### 9.4.4 MMI-MADAP or MADAP Studio (automatic system diagnostics)

The control terminal does extra duty as a visualization terminal for automatic systems diagnostics. In this way, the systems operator can obtain statistical information (machine data and/or production data acquisition), for example, from any control terminal throughout the system.



Notes:



# A Appendix

## A.1 Abbreviations

BIOS	Basic Initial Operations System
CD-ROM	Optical storage medium
COM x	Serial port x
CRT	Monitor w/ cathode ray tube
EPP	Enhanced Parallel Port (bidirectional)
FD	Floppy disk
GB	Gigabyte
HD	Hard disk
ISA	Industrial Standard Architecture
IDE	Interface for Hard Disk Drive, CD-ROM Drive, etc.
KBD	Abbreviation for "keyboard"
LCD	Liquid Crystal Display (Flat-panel display)
LPT	Line Printer Terminal
MB	Megabyte
MTB	Machine Control Panel
PCI	Peripheral Component Interconnect, PC bus system
RAM	Random Access Memory
SPP	Standard Parallel Port
Slot	PC Slot
TFT	Thin-Film Transistor
USV	uninterruptible power supply
VGA	Video Graphics Array (graphics standard)

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# Bosch Automation Technology

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