

*PS 5000*

# **Operating Terminal BT 220 Technical Information and Operation**

Version

# **101**

*PS 5000*

# **Operating Terminal BT 220 Technical Information and Operation**

1070 080 037-101 (99.01) GB



Reg. No. 16149-03

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## 1 Safety Instructions

The product described hereunde was developed, manufactured and tested in accordance with the basic safety stipulations of the EC Machine Directive.

**You should nevertheless be aware of residual risks!**

You should therefore read this manual before mounting, setting up, commissioning or programming the system or working with this control system for the first time.

Keep the manual in a place where it is easily accessible to all users!

### Explanation of pictographs and symbols

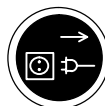
The following warnings and notes may be attached to the **individual hardware components** which are designed to inform the user of certain circumstances.



➤ Warning of dangerous voltages!



➤ Components subject to electrostatic induction!



➤ Disconnect mains plug before opening!



➤ Bolt for connection of the PE (protective earth) conductor only!



➤ For shield conductor only!

There is a certain **hierarchy of warnings** in **this manual**. The warnings are printed in **bold letters** and marked by a warning sign at the margin.

The hierarchy of the warnings is as follows:

1. WARNING
2. ATTENTION
3. NOTE



**WARNING!**

The term **WARNING** will be used wherever **danger is imminent**.  
The possible consequences may be death or severe injury (personal injury).



**ATTENTION!**

The term **ATTENTION** will be used wherever a **dangerous situation is possible**.  
The possible consequences include death, severe or light injury (personal injury) damage to property or environmental hazards.



**NOTE**

The term **NOTE** will be used for making **recommendations on the use**.  
Non-compliance with these recommendations may result in damage to property, e.g. to the machine or the workpiece.

### Warning of magnetic fields

In the environment of resistance welding systems magnetic field strengths have to be expected which usually are below the limits specified in VDE 0848 Part 4; in cases of doubt, the field strength must be measured.

**WARNING!**



When using manual welding guns, the limit values may be exceeded for the extremities. In this case, additional work protection measures must be taken.

---

**WARNING for persons with cardiac pacemakers!**



Warning signs should be posted for protecting persons with cardiac pacemakers because the function of these devices may be disturbed (impulse failure, total failure) and a negative influence on the pacemaker programming or even a total program destruction may occur !!!

---

We recommend posting a warning of the type shown below at all entrances to factory halls containing resistance welding equipment:





## Normal use

In conjunction with the connected PS 5000 weld timer the Operating terminal serves for the

- **Display and change of parameters**
- **Display of faults, warnings and signals**

It is only suitable for

- **industrial applications**

in accordance with DIN EN 50082-2 of Electromagnetic Compatibility (EMC).

It is not intended for any other use!



### ATTENTION!

The use for purposes other than the intended use may result in personal damage to the user or third persons or damage to the equipment, the work-piece to be welded or other hazards.

Therefore, our products should only be used for their intended purpose!

## Qualified personnel

This manual is designed for welding technicians and engineers with special training and specific knowledge of the welding technology. They require profound knowledge of the hardware components, the functions and the programming of the welding equipment.

The term qualified personnel refers to

- engineering personnel familiar with the safety standards of the electrical and automation technology.
- commissioning personnel entitled to commission, earth and label electrical circuits and equipment/systems in compliance with the standards of safety technology.
- operating personnel who have been instructed in operating installations in resistance welding technology and who know the contents of the present documentation as far as operation is concerned.



### WARNING!

#### **An exception are persons with cardiac pacemakers!**

Due to the strong magnetic fields arising from resistance welding, the function of cardiac pacemakers may be disturbed. This may cause the death or considerable health damages to persons with cardiac pacemakers!

Therefore, these persons should avoid the welding system.

Please note our comprehensive range of training courses. More information is available from our **training center** (Phone: ++49 (0)6062 / 78258).

### Retrofits and modifications by the user

Our equipment has been designed and manufactured by us as a safe unit.

**WARNING!**



Retrofits or modifications may have negative effects on the safety of the unit! The possible consequences include death, severe or light injury (personal injury) damage to property or environmental hazards.

Therefore, please contact us prior to retrofits or modifications to the welding system using third-party equipment. This is the only way to determine whether these parts are suitable for use with our product.

---

### Maintenance, repair

**WARNING!**



- Danger of life through electrical voltage!  
Prior to any maintenance work - unless described otherwise - the system must always be switched off! In the event of necessary measurement or test procedures on the active system, the applicable safety and accident prevention regulations must be strictly observed. In any case, suitable insulated tools must be used!
  - Danger of life through inappropriate EMERGENCY-OFF devices!  
EMERGENCY-OFF devices must be operative in all modes of the system. Releasing the EMERGENCY-OFF facility must by no means result in an uncontrolled restart of the system!
- 

**ATTENTION!**



- The right to perform repair/maintenance work on the timer components is reserved to the BOSCH service department or to repair/maintenance units authorized by BOSCH!
  - Only use spare parts/replacement parts approved by BOSCH!
  - If handled improperly, batteries may cause cauterization or explode!  
Therefore:  
Batteries must not be opened forcefully, recharged, soldered at the cell body or thrown into fire!
  - Only use original replacement batteries! Spent batteries or accumulators must be disposed of as hazardous waste.
-

## Installation and assembly



**ATTENTION!**

- Please observe all applicable safety and accident prevention regulations!
  - Danger of damage to property through short-circuits!  
When drilling or sawing out openings, metal burr may get inside modules or plant sections that have already been installed.  
Possible consequences include short-circuits and a destruction of the equipment.  
Therefore, all equipment should be well partitioned prior to any additional work!
  - The units, and especially the operating elements, must be installed so as to be sufficiently protected against unintentional operation or contact.
  - Connection and signal leads should be run so as to avoid disturbance of any equipment functions by capacitive or inductive interference.
  - Equipment designed for installation in housings or switch cabinets must be installed in such enclosures before they may be used or operated!
-

## Units without Monitoring Contact ÜK

**ATTENTION!**

When the ÜK is permanently connected to +24V, the squeeze times are to be selected long enough so as to ensure that the parts to be welded are optimally pressed together before the weld time starts.

---

## Start Simulation

**ATTENTION!**

If the equipment is started remotely, there results a program sequence which can cause hazardous machine movements. So check before remote start up that no one is in the danger zone of the welding equipment!

---

## Fault Reset

**WARNING!**

- Danger of physical injury!  
If the start signal is present on fault reset, the weld timer immediately starts the program sequence! Hazardous machine movements may be the result!  
Therefore, before fault reset, you should make sure that there are no persons in the danger zone of the welding equipment!
  - Danger of bruises through electrode movement!  
All users, line designers, welding machine manufacturers and welding gun producers are obliged to connect the output signal of the Bosch weld timer which initiates the electrode movement so that the applicable safety regulations are complied with.  
The risk of bruises can be considerably reduced by means of, e.g.,
    - two-handed start
    - guard rails
    - light barriers etc.
-

## Working safely



### WARNING!

- During operation of the welding equipment welding splashes are to be expected! The consequence may be injuries to the eyes or burns.  
Therefore:
  - wear protective goggles
  - wear protective gloves
  - wear flame-retardant clothes
- Danger of injury at sheet metal edges and danger of getting burnt at the parts to be welded!  
Therefore:  wear protective gloves



### NOTE

The strong magnetic fields arising in connection with resistance welding may cause lasting damages to wrist watches, pocket watches, or cards with magnetic stripes (e.g. EC cards).  
Therefore, you should not carry any such items on you when working in the direct vicinity of the welding equipment.

## 2 Overview

**NOTE**



For comfortable programming and setting of parameters of the PS 5000 use a PC with the welding software "BOS 5000" installed. In normal operation of the welding unit the complete function range of this package is not really required.

Because of this the BT220 is available to you as a **stationary control terminal** of your PS 5000 (supported control types: PSS 5100.510 and PSS 5200.510; please ask for other supported types).

It is designed for installation in the machine operating panel of the welding unit. So faults, warnings and messages of the PS 5000 can be displayed in clear text and basic welding data may be quickly and easily displayed or changed.



Fig. 2-1: Front View BT220

This manual contains information on

- the mechanics
- the electrical connection and
- the functions of the BT220.

**ATTENTION!**



Danger of malfunctions and damage!  
Wrong installation and faulty connection can lead to unexpected or wrong unit reactions and hence to hazardous situations. So please respect the details in the present manual.

Follow all the instructions in this manual (instructions are identified by the sign "▶"). They are for your own safety and for problem-free commissioning.

*Functions*

- Display of faults, warnings and messages of the PS 5000.  
The BT220 can manage a maximum of 100 events present at the same time in the message memory.
- Display and modification of different welding and process data.
- Diagnostic memory for max. 400 events (ring memory).  
The contents of the diagnostic memory can be output via the serial interface to a printer.

- Constructions*
- BT220-1: with **1** RS232 interface for the connection of  
1 x PS 5000  
**or**  
1 x STK multi-contact interface board.
  
  - BT220-2: with **2** RS232 interfaces for the connection of  
2 x PS 5000  
**or**  
1 x STK multi-contact interface board  
and  
1 x Report printer.
  
  - BT220-3/7: with **1** RS485 and **1** RS232 interface for the connection of  
of  
1 x STK multi-contact interface board (RS485)  
and  
1 x Report printer (RS232).
- Options*
- STK x: Multi-contact interface board for the connection of max. 7 PS 5000 via RS232 interfaces. In the basic design the STK is already prepared for the connection of 3 PS 5000. It can be easily retrofitted with additional plug-in RS232 interface modules.  
For communication with a BT220-x, the multi-contact interface board is optionally available with a separate RS485 or RS232 interface.  
You can find more information on the multi-contact interface board on page 7-1.

*Application Examples*

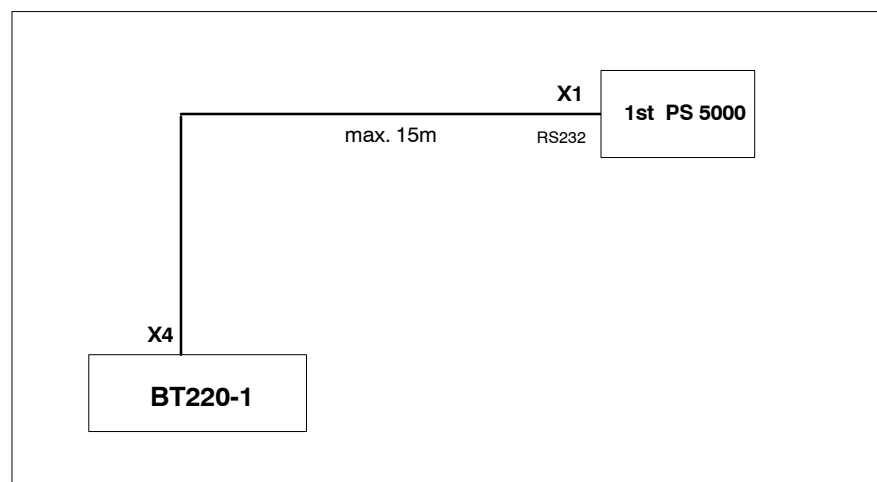


Fig. 2-2: Connection of a PS 5000

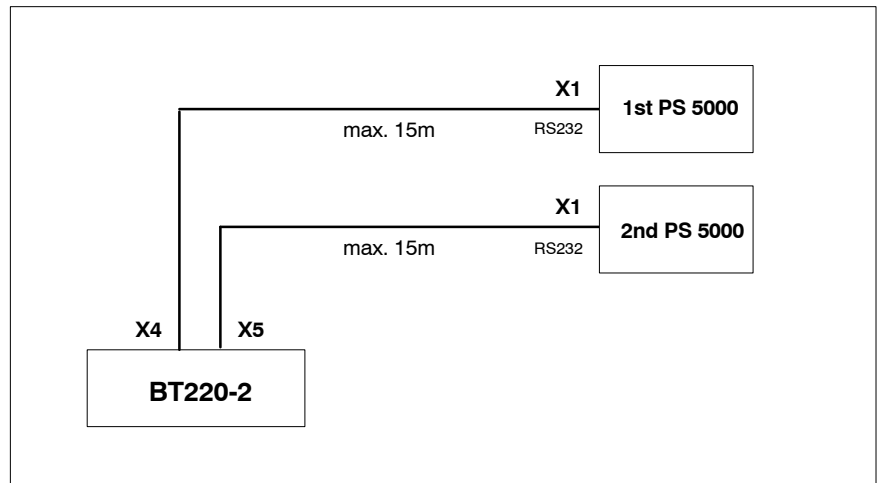


Fig. 2-3: Connection of 2 PS 5000

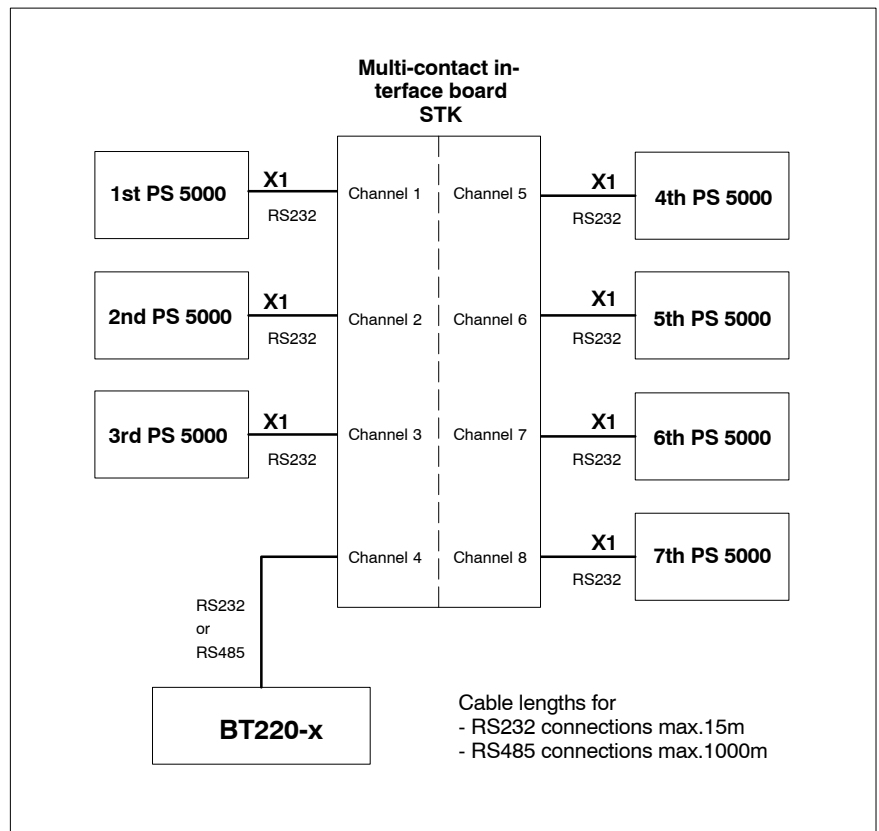


Fig. 2-4: Connection of max. 7 PS 5000 to BT220 via STK multi-contact interface board





### 3 Installation and Assembly

The BT220 is intended for installation in a control panel, a control cabinet or a front plate.

Weight:	approx. 1.5 kg
Installation position:	0° to max. 90° slant
Installation type:	in a desk or hinged frame, sealed as per IP 65
Degree of protection:	IP 65 (front face); IP 40 (back face)
Dimensions:	Required assembly cutout: 262 mm x 92 mm Required installation depth: 110 mm Front dimensions: 277 mm x 112 mm
Temperature:	Operating temperature range: 0°C to +50°C Storage temperature range: -30°C to +70°C
Air humidity:	20% to 80% rel. air humidity

- ◆ Please refer to the information in chapter "Safety Instructions" relative to installation and assembly.
- ◆ Install the BT220 so that ergonomic operation is guaranteed. Also the operator must have a clear view of all moving machine parts at all times! Remember how quickly the front panel can become dirty with an inclined or horizontal installation.
- ◆ Avoid installation places which are exposed to direct sunshine (reduction of display legibility; additional heat).
- ◆ Provide a minimum all-round clearance of 50mm for sufficient ventilation and cable routing.
- ◆ Run all connection cables in loops, and use strain reliefs for all cables.
- ◆ Keep as far away as possible away from sources of interference, however at least 25cm. With strong magnetic fields we recommend the installation of partition plates.
- ◆ Only use silicon-free sealing, adhesive or insulating media.

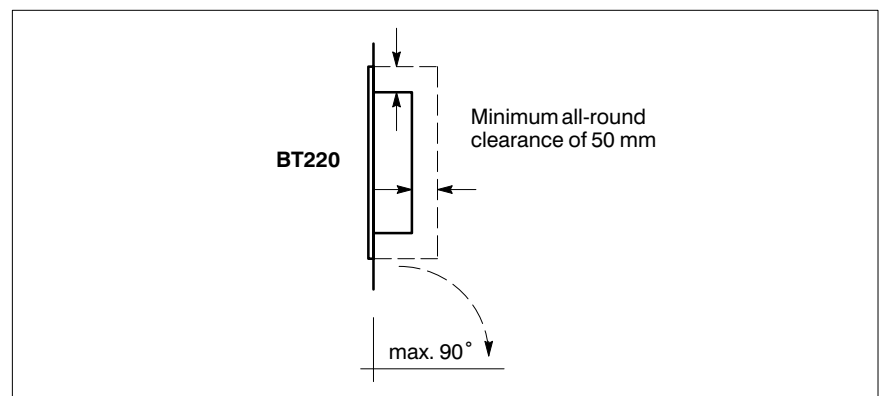


Fig. 3-1: Installation positions and distances

- ◆ Fix the BT220 with the 4 screw terminals. For this purpose, first insert the BT220 into the assembly cutout and then engage the screw terminals in the recesses on the top and bottom sides of the BT220 housing. Then tighten the screw terminals.

## 4 Electrical Connection

Supply inputs, outputs and interfaces are isolated from each other.

- ◆ Disconnect the unit from power before wiring the BT220.
- ◆ Make sure that the circuits of relays or contactors, which are installed in the same installation room as the BT220 include the corresponding free-wheeling diodes or RC spark-quenching devices.

*Position of the Connections*

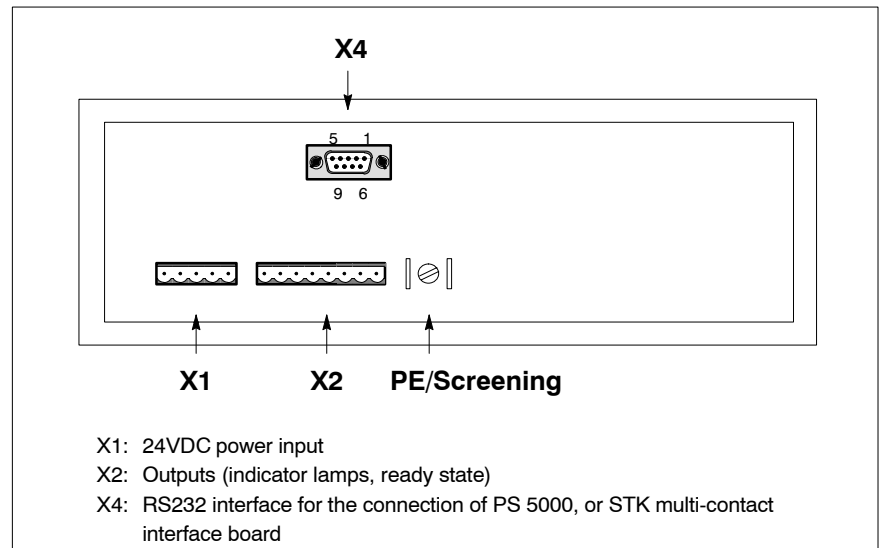


Fig. 4-1: Connections on the BT220-1

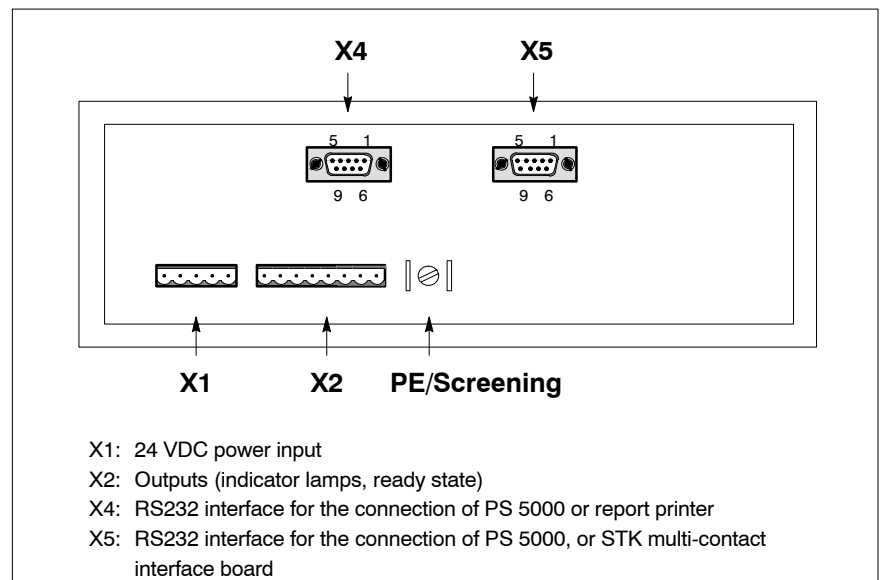


Fig. 4-2: Connections on the BT220-2

### Remarks

BT220-2: If an STK multi-contact interface board is connected to X5, only a report printer may be connected to X4.

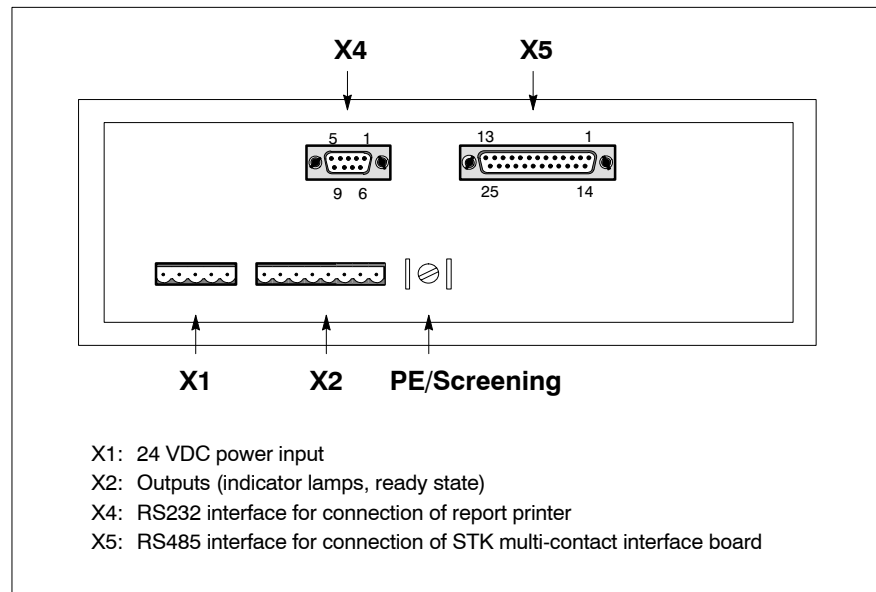


Fig. 4-3: Connections on the BT220-3/7

## 4.1 Power Supply (X1)

Connection:	Screw terminal plugs MSTB 2.5 / 5-ST-5.08
Supply voltage:	19...33 V <sub>DC</sub> ; typ. 24 V <sub>DC</sub>
Current consumption:	< 0.35 A

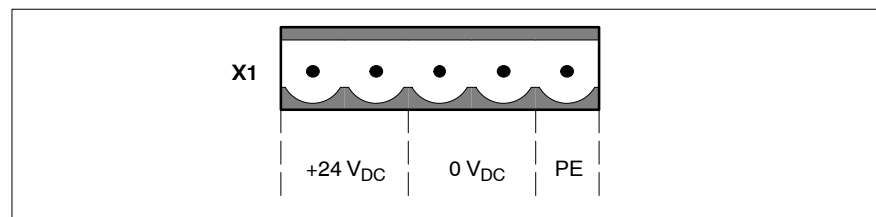


Fig. 4-4: Terminal Assignment X1

### Remarks

If you wish to use the outputs on X2, you must connect the supply voltage to X2 as well.

**4.2 Lamp and Ready Outputs (X2)**

Connection:	Screw terminal plugs MSTB 2.5 / 8-ST-5,08
Output current:	(with 24 VDC supply); permanently short-circuit-proof
Supply voltage:	19...33 V <sub>DC</sub> ; typ. 24 V <sub>DC</sub>

The outputs for the display of warnings and fault messages are functionally identical with the warning (red LED) and fault message (yellow LED) on the front panel of the BT220. The output signals are static (not flashing).

**NOTE**



Overloading the output drivers possible!  
 ♦ Use the outputs only for control of the relays or PLC inputs.

Via the ready output a connected PLC can recognize whether serial communication is functioning properly.

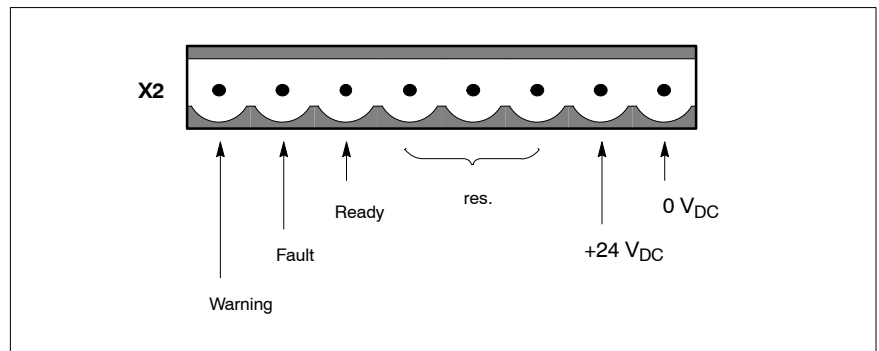


Fig. 4-5: Terminal Assignment X2

### 4.3 RS232 Interfaces

BT220-1:	X4
BT220-2:	X4 and X5
BT220-3/7:	X4
Connection:	Sub-D socket, 9-pin.
Type:	RS232
Lead length:	max. 15m
Lead type:	shielded, core cross-section min. 0.14mm <sup>2</sup>
Transmission rate: adjustable:	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 76800 bits/s
	default: 9600
Parameters:	adjustable: 7 or 8 data bits, even / odd / no parity, 1 or 2 stop-bits
	default: 8N1 (8 data bits, no parity, 1 stop-bit)
Handshake:	adjustable: without, Hardware-Handshake (RTS, CTS), Software-Handshake (X <sub>ON</sub> , X <sub>OFF</sub> ), Software-Handshake + DTR
	default: Software-Handshake (X <sub>ON</sub> , X <sub>OFF</sub> )

Connection:  
 PS 5000 - BT220

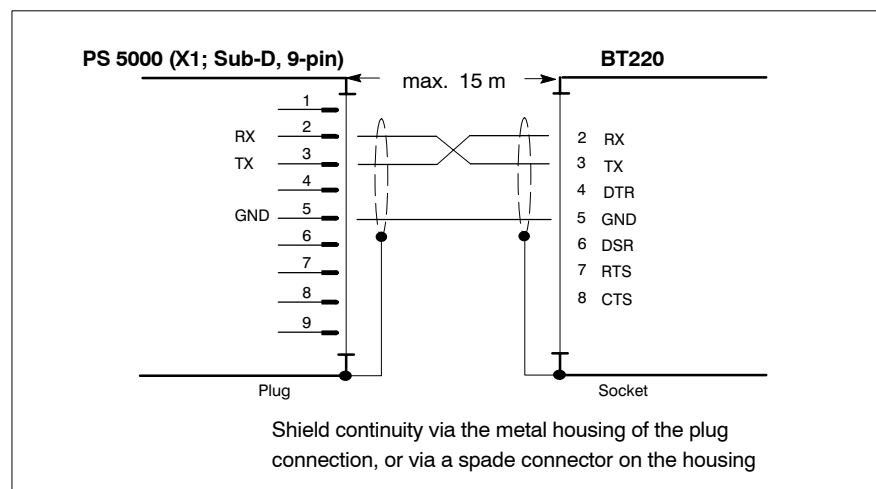


Fig. 4-6: Connection of PS 5000 to BT220

Connection:  
Report Printer - BT220

Prerequisite for shown connection: Hardware-Handshake

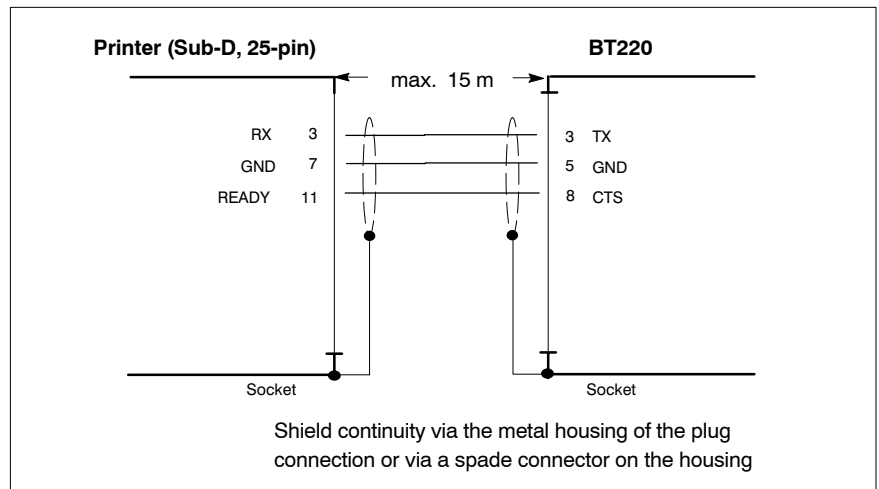


Fig. 4-7: Connection of a Serial Printer

**Remarks**

Many printers output the READY signal to Pin 20. In such cases the CTS input on the BT220 must be connected with Pin 20 on the printer.

RS232 Connection:  
STK - BT220

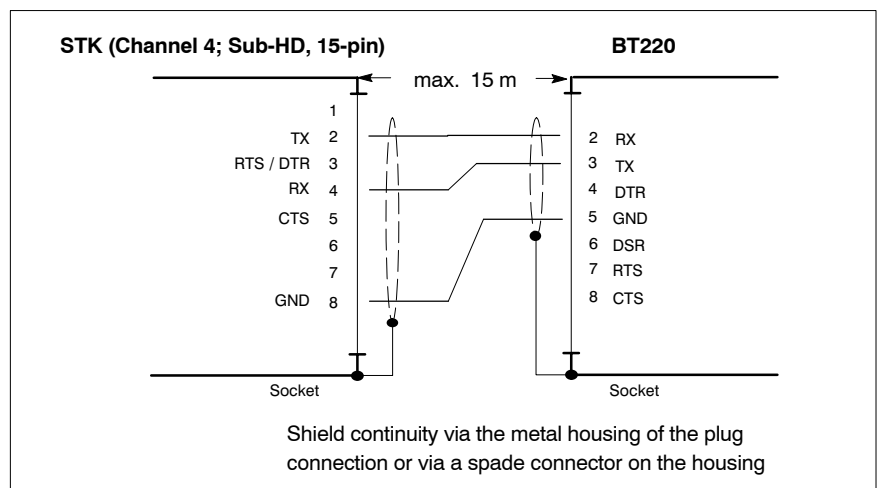


Fig. 4-8: Connection of the STK multi-contact interface board: Channel 4 fitted with RS232 interface



**4.4 RS485 Interface**

BT220-3/7: X5  
 Connection: Sub-D socket, 25-pin.  
 Type: RS485  
 Lead length: max. 1000m  
 Lead type: 2-wire, twisted and shielded, core cross-section min. 0.14mm<sup>2</sup>  
 Transmission rate: adjustable: 38400, 57600, 76800, 115200 bits/s  
 Parameters: 7 data bits, even parity, 1 stop-bit (7E1)

*RS485 Connection:  
 STK - BT220*

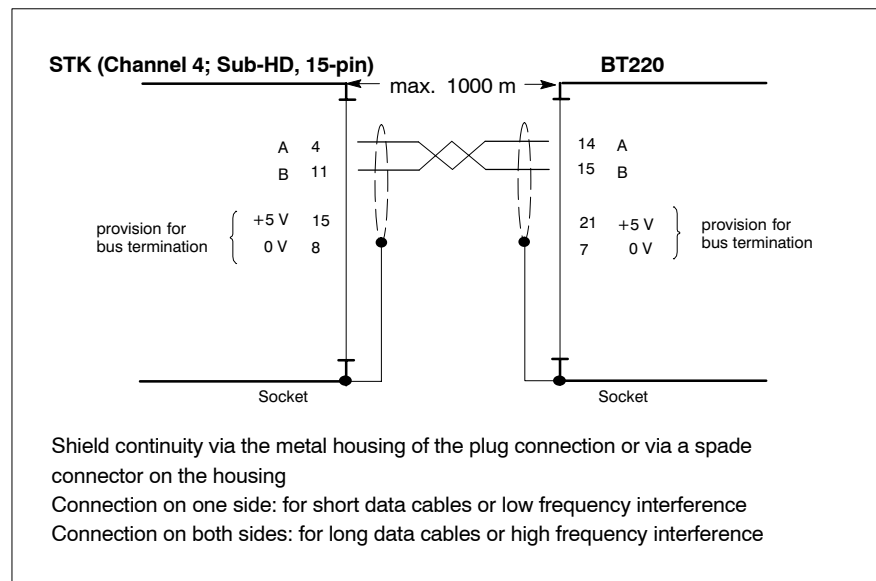


Fig. 4-9: Connection of the STK multi-contact interface board. Channel 4 fitted with RS485 Interface

*RS485 Connection:  
 Bus Termination*

With high transmission rates or long data cables we recommend the use of a bus termination. The necessary resistors can for example be integrated into both plugs of the transmission lead:

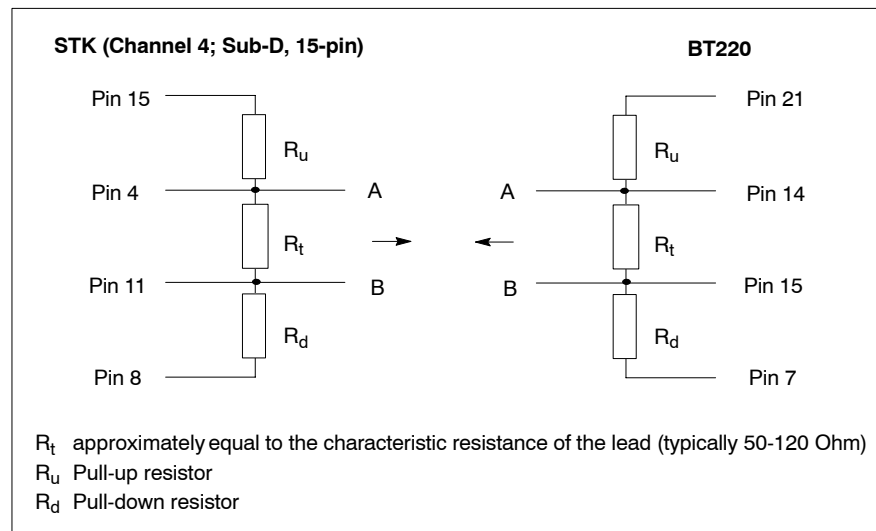


Fig. 4-10: Bus Termination for RS485 Connections

**5 Operation**

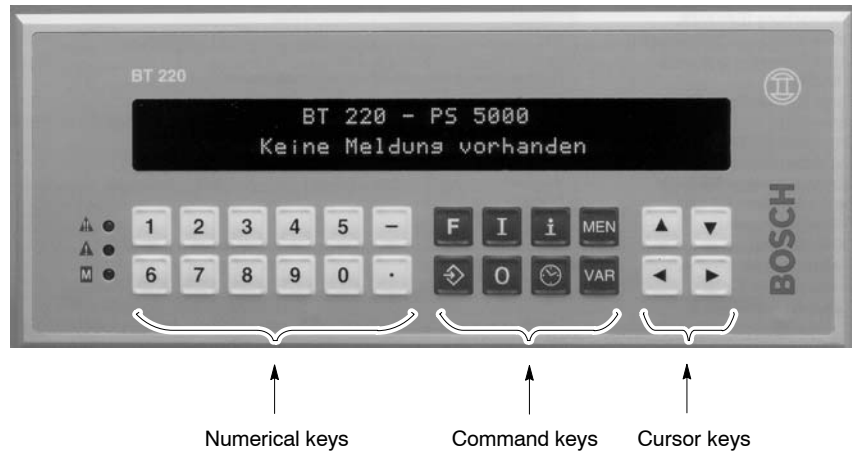


Fig. 5-1: Front View BT220

- Numerical keys** For the input of numerical values (inc. decimal point and minus sign).
- Command keys**
- F** calls up the function key mode. In this mode you have access to welding and process data (see page 5-4).
  - depends on the current state of the BT220:
    - acknowledges events, parameter changes or queries
    - triggers functions
    - branches into sub-menus.
  - I, 0** switches welding specific functions on or off within the function key mode.
  - i** calls up hidden Help texts, depending on the current status.
  - shows the day, date, time and calendar week (see page 5-3).
  - MEN** depending on the current status of the BT220:
    - calls up the Main Menu of the BT220 (for menu tree see page 5-33)
    - cancels parameter changes
    - cancels a function awaiting acknowledgment.
  - VAR** initiates a parameter change.
- Cursor keys**
- depending on the current state of the BT220:
    - scrolls through the messages present
    - scrolls through the diagnostic memory
    - selects a parameter for modification
  - depending on the current state of the BT220:
    - scrolls through menus
    - scrolls through setting options
    - scrolls through texts comprising more than 2 lines.












## 5.1 Display and Acknowledge Events, if necessary



Fig. 5-2: Front View BT220

After it is switched on the BT220 is in **Message Display Mode**. All events which are transmitted by the connected weld timers can be displayed and acknowledged, if necessary.

If no event has occurred, the text “No message” is shown in the display (see Figure).

Whole display text flashes:	An event is present and must be acknowledged with the key  .
	Call up Help on the event: Key 
	Close Help: Key 
Display text does not flash:	An event which does not have to be acknowledged or has already been acknowledged (is logically TRUE) is present. As soon as the event is no longer present, the corresponding display text is automatically deleted.
	Call up Help on the event: Key 
	Close Help: Key 
Fault (red LED flashes):	Fault/error message is present.  Remedy fault and acknowledge with  .
Warning (yellow LED flashes):	A warning is present.  Remedy the cause and acknowledge with  .
Message (green LED):	There is more than 1 event present. You can select the event automatically displayed by the BT220 (see page 5-24). Other events present can be found in the message memory (max. 100) and displayed with the cursor keys  and  . You can find additional information on the message memory on page 5-17.

## 5.2 Display / Change Internal Time Setting of the BT220

The BT220 is fitted with an internal clock.

Whenever an event appears, disappears or is acknowledged, the BT220 stores the current time and date in the diagnostic memory as well as the corresponding text.

◆ Therefore, make sure the clock is set to the right time.

In the following description we assume that the BT220 is in message display mode (see chapter 5.1, page 5-2).

The function may be called up from several other operating states, but on completion always returns to the message display mode.

### *Procedure*

1. Press key .

The first line in the display shows the current value for the day, date, time, calendar week.

The BT220 calculates the details of the day and calendar week automatically from the date value.

2. Values are incorrect: Proceed to Step 3.

Values are correct: Press MEN key.

The BT220 returns to the message display mode.

3. Press VAR key.


The currently changeable figure flashes.

4. Move the cursor with the cursor keys ◀ and ▶ to the figure to be changed and enter the new value

- via the numerical keys or

- via the keys ▲ and ▼.

In this way set the correct date and time.

5. To store current values: press .

To cancel changes: press MEN.

Proceed to Step 2.

## 5.3 Set System Language

The language for message and menu texts can be set. The BT220 offers German and English as standard. Other languages can be added as required (max. 10 in total).

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

### *Procedure*

- 1 Press the MEN key.

The menu item "Diagnostic memory" appears in the second display line.

2. Keep pressing the ▼ key until the text "Change language" is displayed in the second display line.

3. First press the  key, then the VAR key.

4. Use the keys ▲ and ▼ to set the new language.

5. To activate the displayed language: press .

To cancel changing the current language: press MEN.

6. Press the MEN key twice to return to the message display mode.

## 5.4 Displaying / Changing Welding and Process Data

- ◆ Do not change data without instructions. All data is transmitted on-line to the weld timer. Wrongly entered data can cause damage to the equipment or the part to be welded!
- ◆ Make sure that the required welding program and the required weld timer have been correctly selected before you change data. For the selection see page 5-7.

Via the BT220 you have access to the following data:

### Overview

- F1 Help. Options:
  - Display Help text.
- F2 Sequence. Options:
  - Display and change the pre-squeeze time, squeeze time, 1. weld time, 1. heat, 1. cool time, 2. weld time, 2. heat, pulsation, 2. cool time, 3. weld time, 3. cool time, 3. heat, hold time, off time.
- F3 Monitoring. Options:
  - Activate/deactivate current monitoring.
  - Display and change +/- tolerance, "conditional tolerance band", conditional welds, reference current.  
Depending on the selectable mode (STANDARD or MIXED) you have access to the above mentioned parameters for WLD, 1.WLD, 2.WLD or 3.WLD.
- F4 Last weld. Options:
  - Display reference and actual current, average phase angle.
- F5 Slope. Options:
  - Activate/deactivate the slope.
  - Display and change the start and end slope (time and heat, each).
- F6 Pressure Profile. Options:
  - Activate/deactivate control of the pressure regulating valve.
  - Display and change the basic pressure (up to SQZ), welding pressure (from SQZ).
- F7 Stepper Diagnostics. Options:
  - Display the current electrode wear values (for max. 8 electrodes).
  - Acknowledge tip dress, acknowledge electrode change (for one single electrode or for all electrodes collectively by entering electrode number "0").
- F8 FPO\_1 (freely programmable output). Options:
  - Activate/deactivate the output.
  - Display and change 3 high and 3 low times.
- F9 Heat Correction. Options:
  - Display and change heat correction parameters of all electrodes.

To display or change the welding or process data of all programs of the connected PS 5000, switch the BT220 to the "**Function Key Mode**".

**Remarks**

When events are present or occur which have to be acknowledged, the BT220 automatically switches to the message display mode (see chapter 5.1, page 5-2).

Display and modification of the welding or process data is only possible when you have acknowledged all events. The BT220 in this case automatically returns to the last active display level of the function key mode.

In the following description of the procedure we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

The function key mode can also be called up from some other operating statuses, but on completion always returns to the message display mode.

*Procedure:  
Calling up the Function  
Key Mode*

1. Press key F.  
The BT220 now waits for the input of the function number (1 to 9). In the "Overview" section on the previous page you will find all the available functions listed numerically (Fx).
2. Enter
  - the required number using the numerical keys, or
  - press the ▼ key (automatically selects the lowest applicable function number: here "1").
3. Press key ↲.  
BT220 is now in the "Main Menu" of the function key mode. The display shows the previously selected function.

**Remarks**

When at the end of the first display line the character "θ" ("0" with a horizontal line through the middle) is displayed, there is a sub-menu to the function shown.

*Operating Options in  
the Main Menu of the  
Function Key Mode*

- In this operating mode the following actions can be selected :
- Return to the message display mode
  - Step through the Main Menu
  - Select program and/or weld timer for data display/modification
  - Change to the sub-menu of the displayed function (only possible when the character "θ" appears at the end of the first display line)
  - Switching the displayed function on, off, over.

The following figure shows you the individual options:

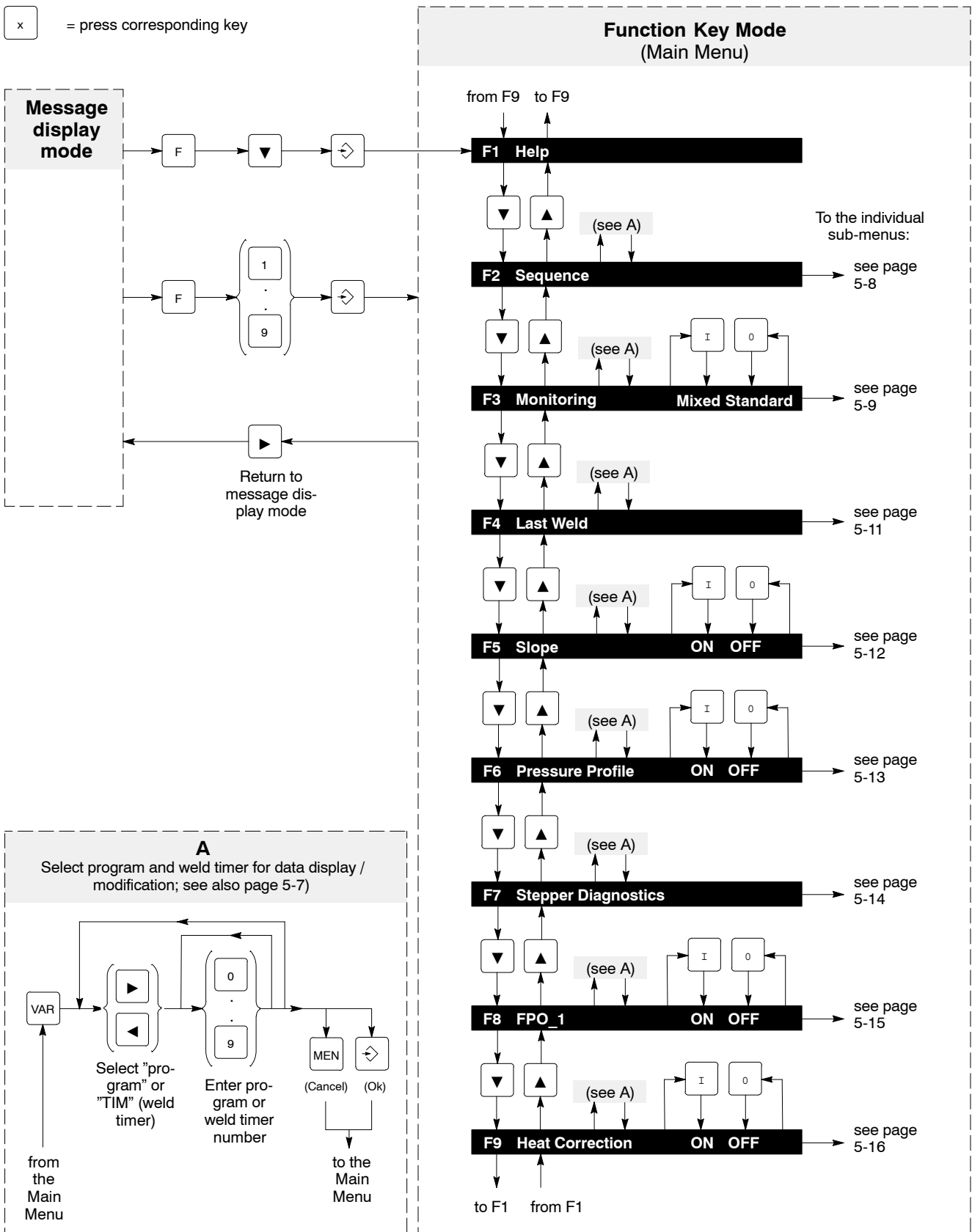


Fig. 5-3: Command Options in the Main Menu of the Function Key Mode

**5.4.1 Selection of Program and Weld timer**

In order to display or change the data of a program stored on a connected weld timer (TIM) via the BT220, you must select both the relevant timer number and the relevant program number.

Values between "0" and "255" are admissible for input as program numbers. The possible timer numbers depend on the number of timers actually connected and start with "1". Depending on the BT220 version used the following assignment applies:

BT220-1 without STK multi-contact interface board: TIM1 = Timer at X4

BT220-2 without STK multi-contact interface board: TIM1 = Timer at X4  
TIM2 = Timer at X5

BT220-x with STK multi-contact interface board  
TIM1 = Timer at Channel 1  
TIM2 = Timer at Channel 2  
TIM3 = Timer at Channel 3  
TIM4 = Timer at Channel 5  
TIM5 = Timer at Channel 6  
TIM6 = Timer at Channel 7  
TIM7 = Timer at Channel 8

**Remarks**

- Please note that channel 4 of the multi-contact interface board is always used for communication with the BT220!
- Numbers of timers not connected (TIMx) are not recognized on selection and not accepted.

In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6).

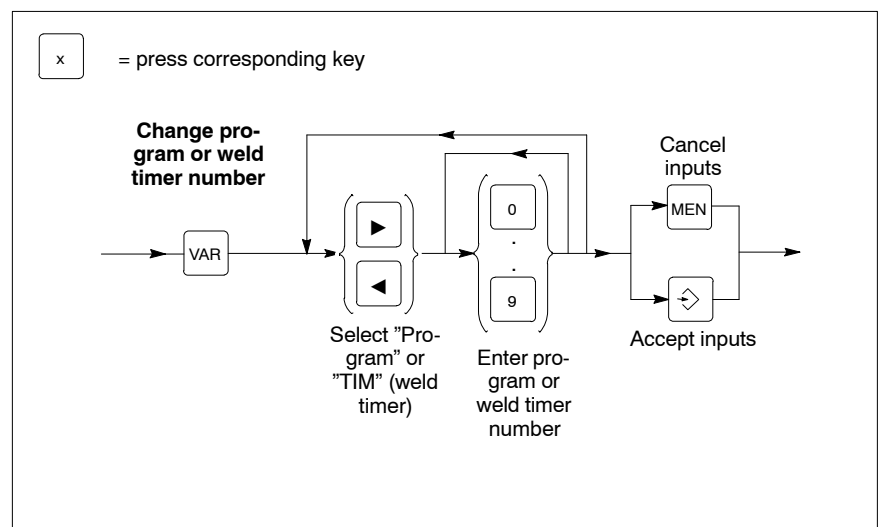


Fig. 5-4: Operating Sequence: Selection of Program and Weld timer



5.4.2 F2: Sequence

Here you have access to basic parameters which determine the sequence of a welding process; e.g.

pre-squeeze time, squeeze time, 1. weld time, 1. heat, 1. cool time, 2. weld time, 2. heat, pulsation, 2. cool time, 3. weld time, 3. cool time, 3. heat, hold time, off time.

In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6) and displays "F2: Sequence".

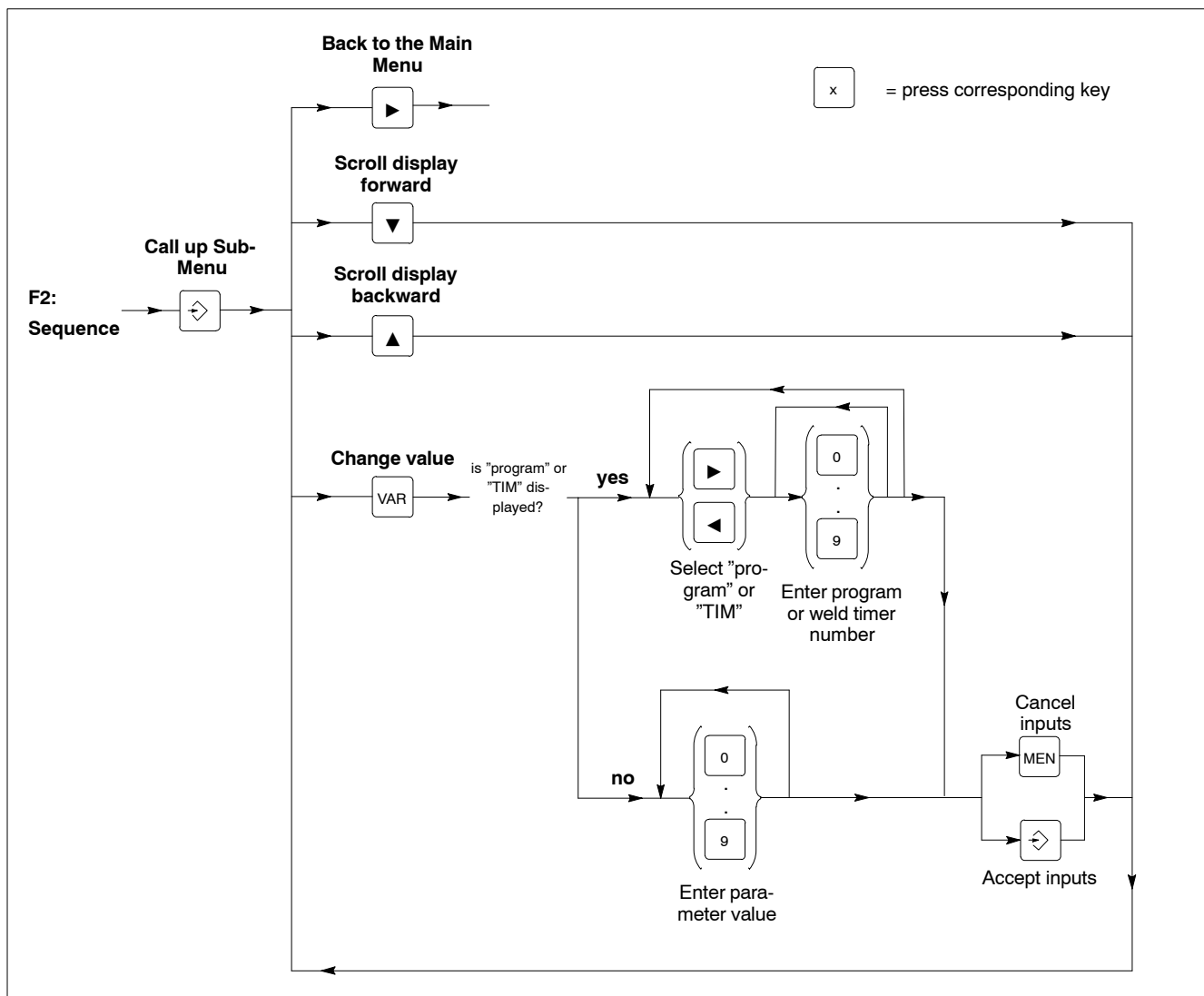


Fig. 5-5: Operating Sequence: F2 Sequence

### 5.4.3 F3: Monitoring

Current monitoring can be switched on or off by selecting the corresponding mode (STANDARD or MIXED) selectively for individual sections of the welding cycle (WLD, 1.WLD, 2.WLD or 3.WLD).

Only when current monitoring is switched on do you have access to the corresponding set of parameters, consisting of: +tolerance, -tolerance, "conditional tolerance", conditional welds, reference current.

**STANDARD mode:** Monitoring can be switched on or off for weld time. Monitoring is deactivated for 1.WLD, 2.WLD and 3.WLD.

**MIXED mode:** Monitoring can be switched on or off for 1.WLD, 2.WLD and 3.WLD independently of one another. Monitoring is deactivated for weld time.

In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6) and displays "F3: Monitoring".

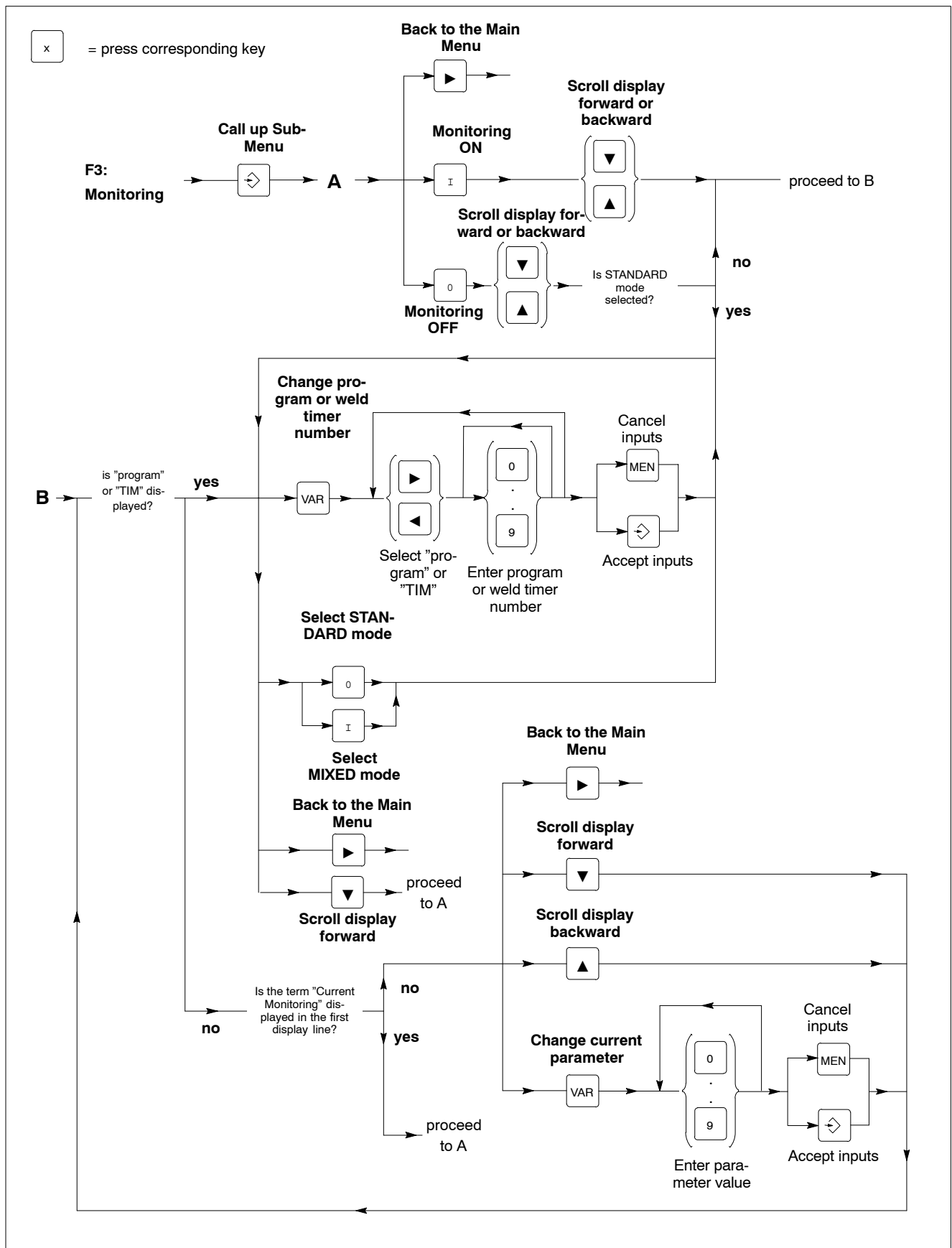


Fig. 5-6: Operating Sequence: F3 Monitoring

**5.4.4 F4: Data of the Last Weld**

This function displays (for WLD, 1.WLD, 2.WLD and 3.WLD) the reference currents, actual currents and average phase angles of the previous welding cycle.

In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6) and displays "F4: Last Weld".

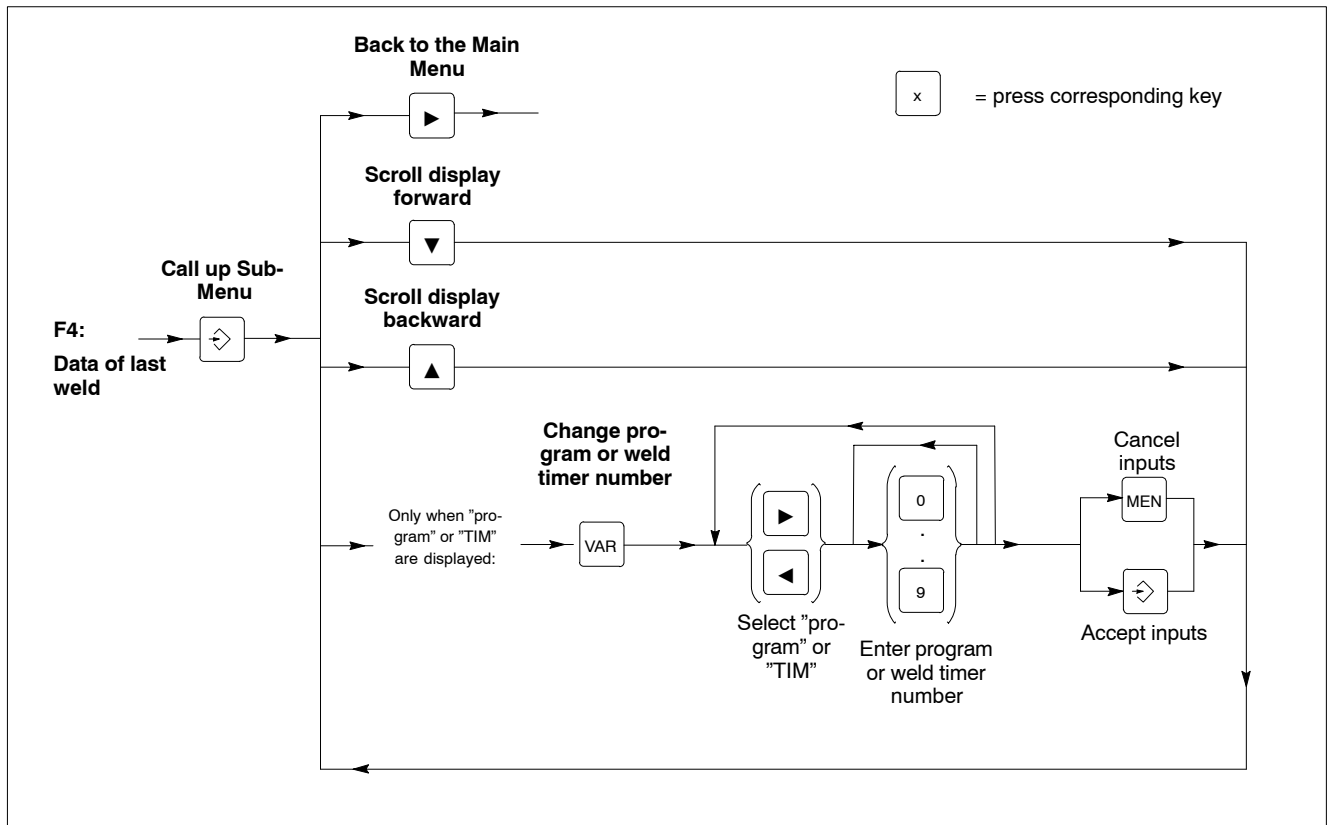


Fig. 5-7: Operating Sequence: F4 Last Weld

5.4.5 F5: Slope

Switches the slope on and off. When the slope function is active, the timer increases (at the start of welding) or decreases (at the end of welding) the welding heat for a definable time period.

When the slope is active, both the duration and the heat values at the beginning and end of welding can be entered for the startslope and endslope.

In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6) and displays "F5: Slope".

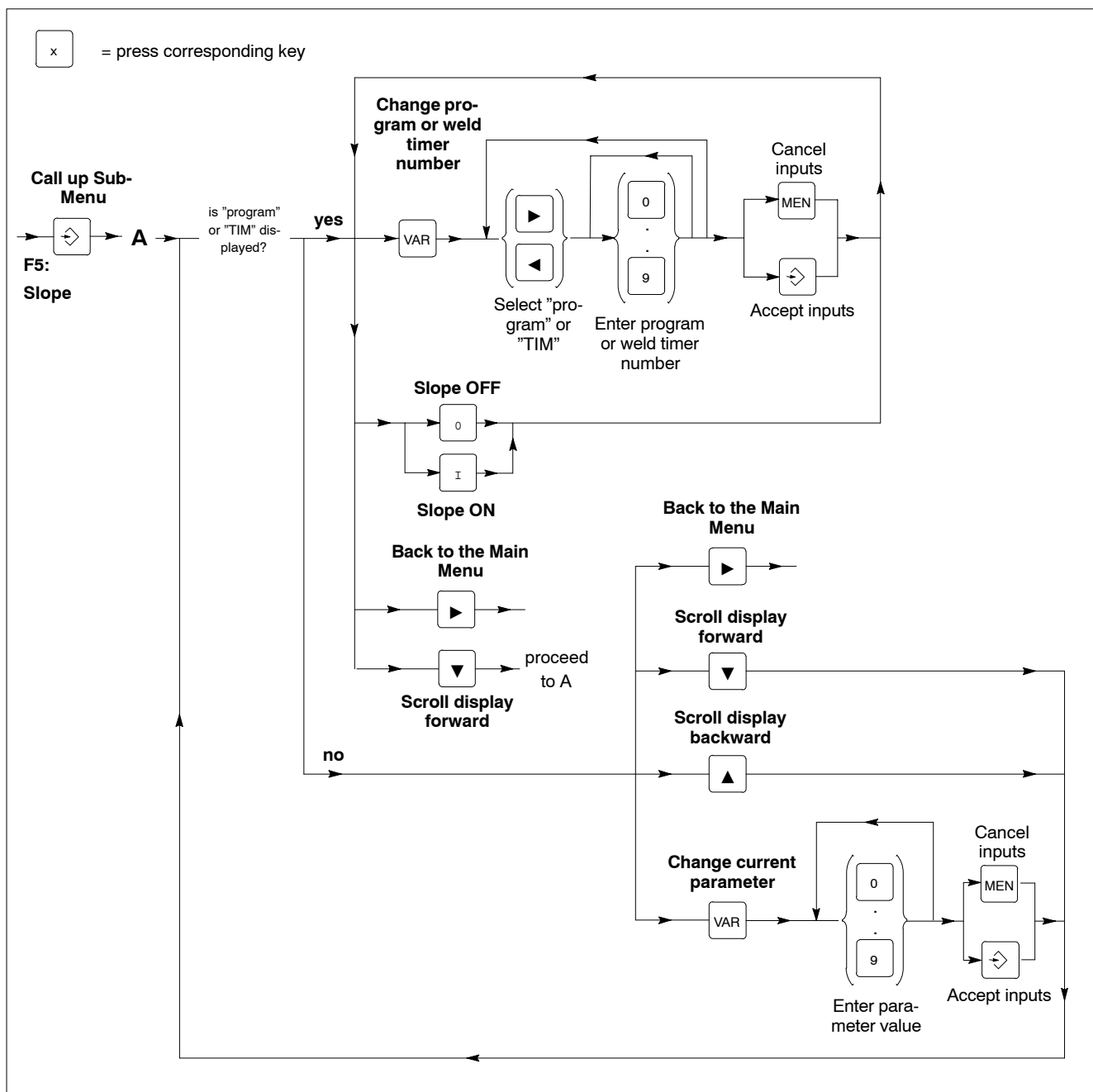


Fig. 5-8: Operating Sequence: F5 Slope

**5.4.6 F6: Pressure Profile**

Switches the pressure control on and off.

Only when the pressure control function is active can the individual pressure parameters be displayed/changed.

In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6) and displays "F6: Pressure Profile".

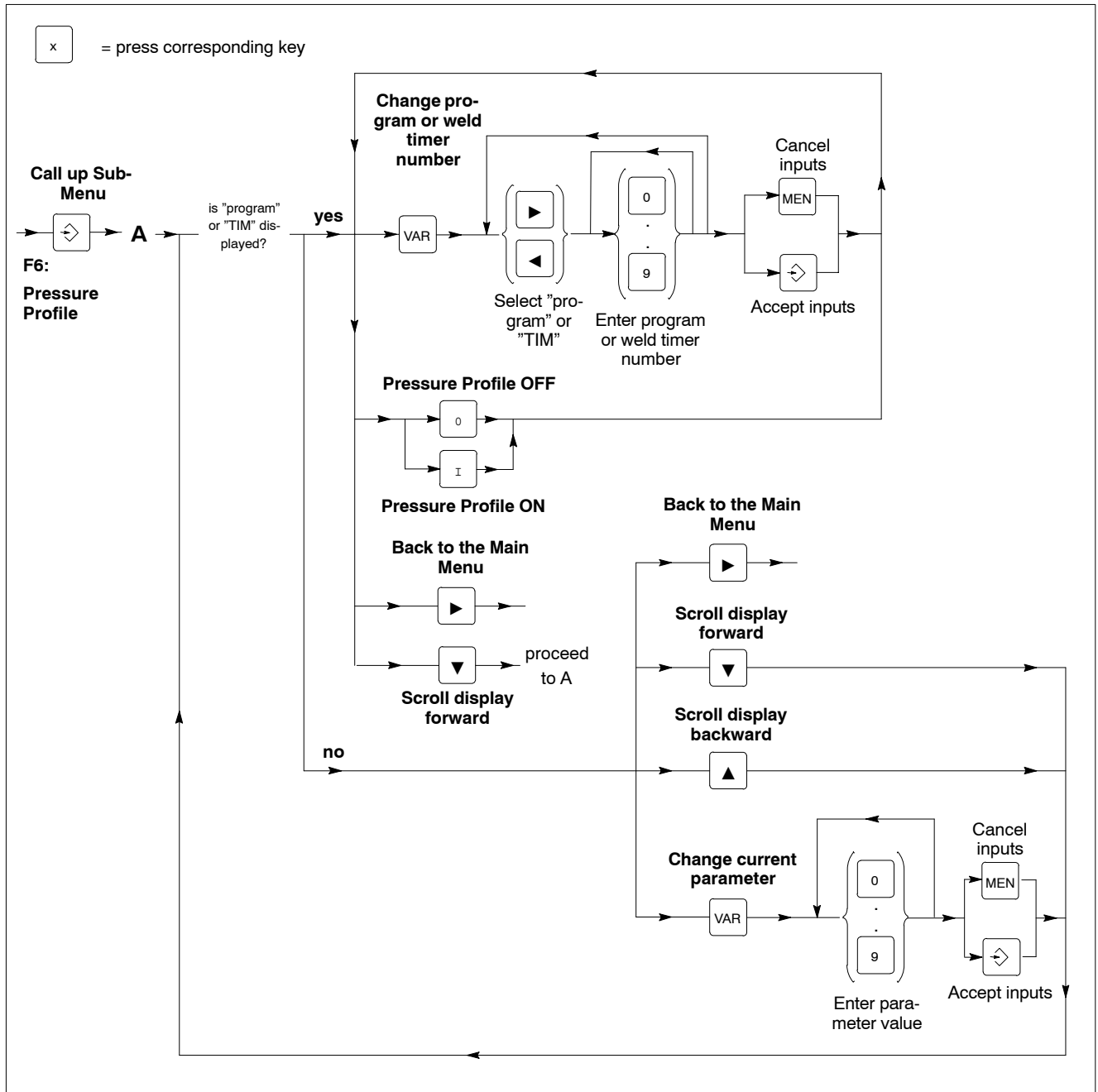


Fig. 5-9: Operating Sequence: F6 Pressure Profile

5.4.7 F7: Stepper Diagnostics

Here you have the following options:

- to display electrode wear (Wr) (for max. 8 electrodes). Only electrodes with a wear value > 0% are displayed. The wear display is in integers.
- to acknowledge "Tip dress" (individual or all electrodes)
- to acknowledge "Electrode Change" (individual or all electrodes)

In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6) and displays "F7: Stepper Diagnostics".

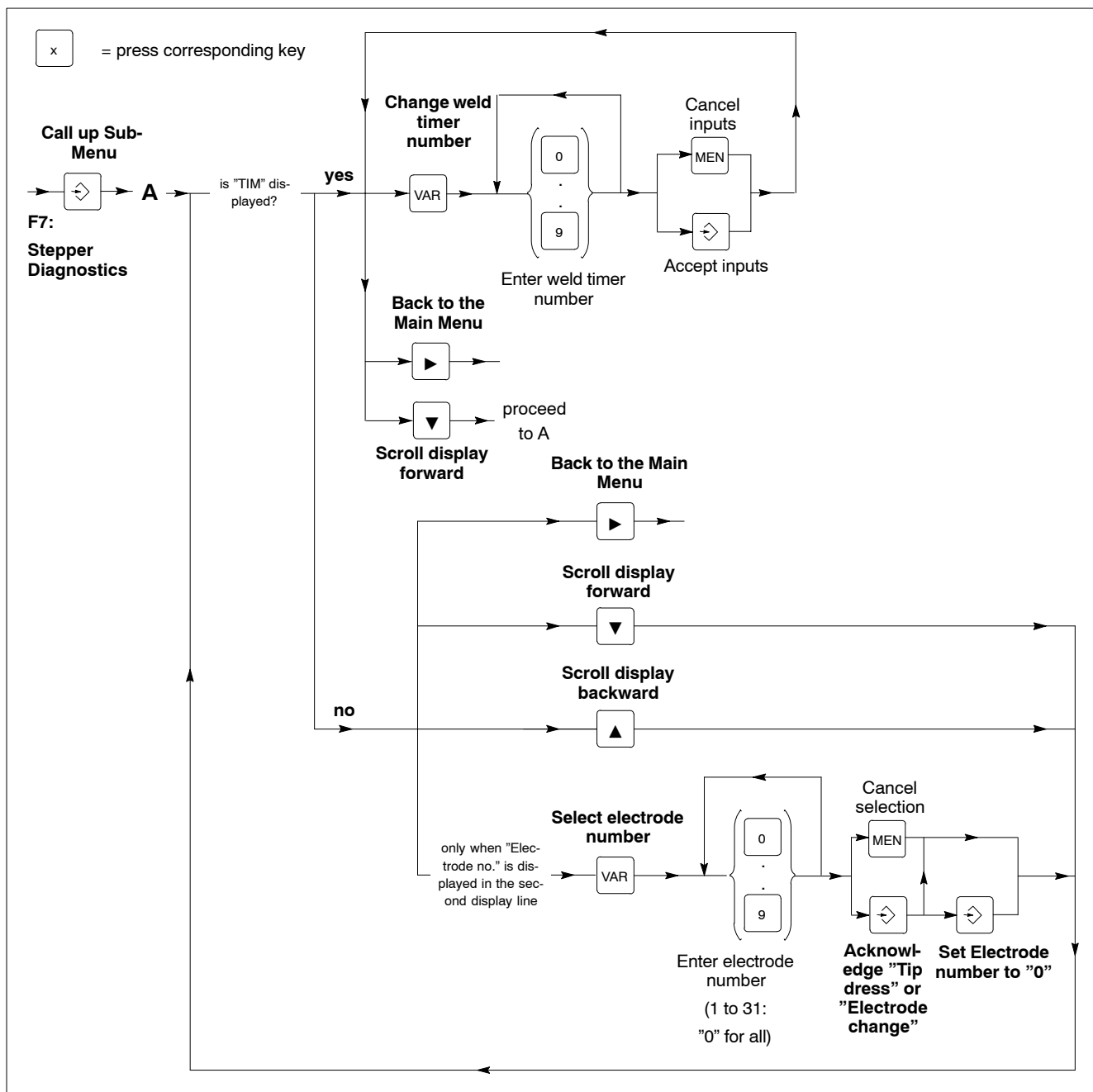


Fig. 5-10: Operating Sequence: F7 Stepper Diagnostics

**5.4.8 F8: FPO\_1 (freely programmable analog output)**

Activation and deactivation of the freely programmable analog output.  
Only when the analog output is activated can the individual parameters be displayed/changed.  
In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6) and displays "F8: FPO\_1".

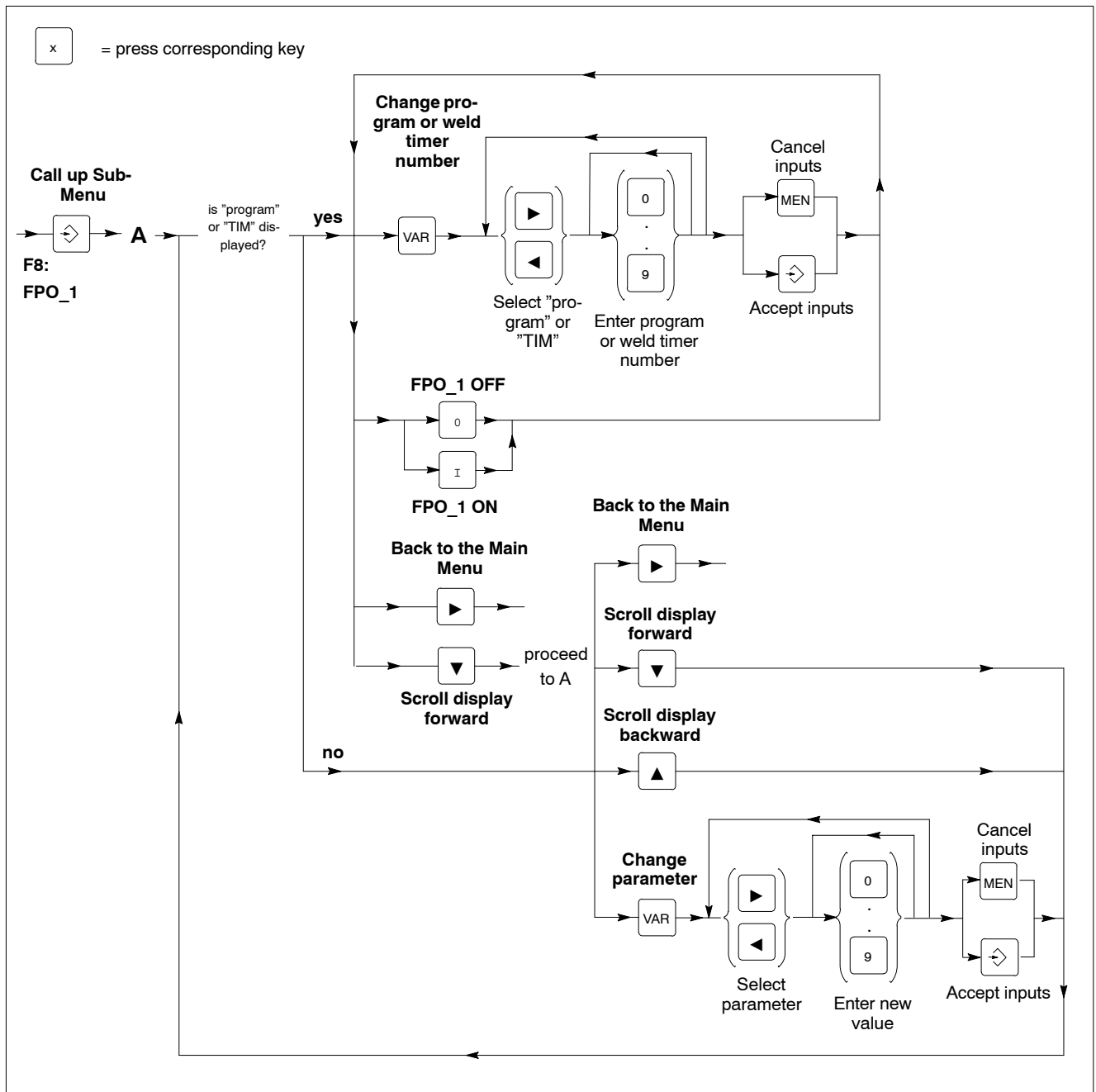


Fig. 5-11: Operating Sequence: F8 FPO\_1 (freely programmable analog output)



5.4.9 F9: Heat Correction

Display and change the heat correction values of individual electrodes.

**NOTE**



The current values are only read out from the connected timers after the BT220 has been switched on. If data has been changed via an additionally connected programming unit, the BT220 will not display the modified data before it has been re-initialized (cycling power) or communication between BT220 and the weld timer has been re-established.

In the following description of the operating sequence we assume that the BT220 is in the Main Menu of the function key mode (see page 5-6) and displays "F9: Heat Correction".

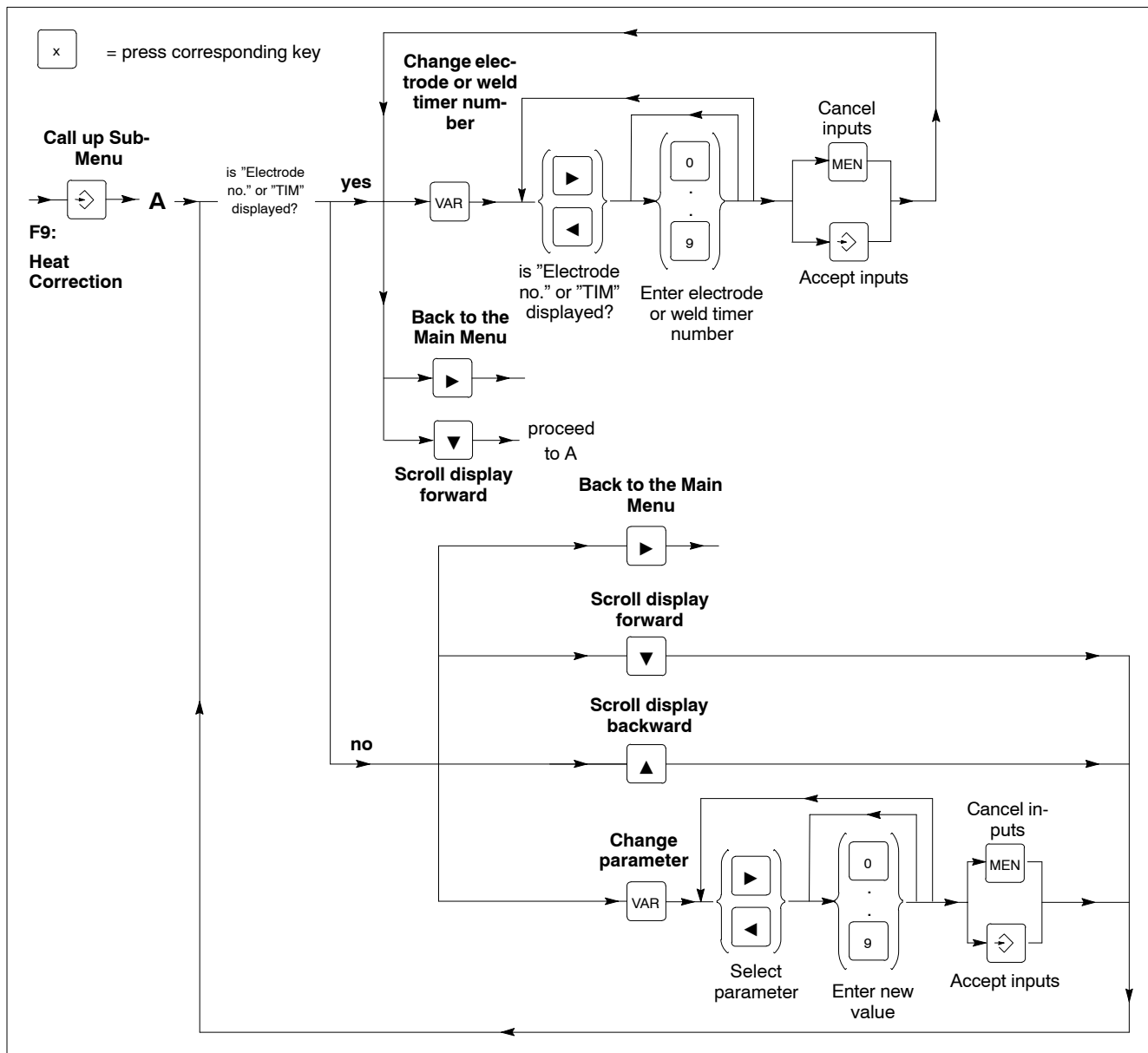


Fig. 5-12: Operating Sequence: F9 Heat Correction

## 5.5 Deleting the Message Memory


Events are logged in

- the diagnostic memory (see page 5-18) and entered in
- the message memory.

The message memory with battery back-up acts as a "collecting tank" for maximum 100 events, which are logically TRUE, or have to be acknowledged.

If the message memory contains more than one entry, the green message LED on the front panel of the BT220 flashes.

Entries in the message memory are only deleted when

- an event which does **not** have to be acknowledged changes again into the state "logically FALSE" (=Depart message), or
- an event which has to be acknowledged is acknowledged by you with the  key.

Normally each entry is removed again from the message memory in this way.

As an exception it can happen that the BT220 may not receive a "Depart message" for an event present.

This effect may for example happen when during an event the communication between BT220 and PS 5000 is interrupted for some reason and during the interruption the event again changes to logically FALSE; the corresponding entry was never removed from the message memory.

Using the function "Close all messages" you delete **all entries** in the message memory.



### ATTENTION!





Events which have to be acknowledged are deleted!

Random deletion of events which must be acknowledged can impair the safety of the unit or severely disturb or even interrupt the production process.

- ◆ Make sure that no negative effects on the safety or the production process are to be expected before you delete the message memory!

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

#### *Procedure*

1. Press MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Press key .
3. Press key . The text "Close all messages" appears in the second display line.
4. Press key .
5. To delete the message memory: first press VAR key then .  
To cancel the function Press MEN.
6. Press MEN key to return to the message display mode.

## 5.6 Display Diagnostic Memory

To log all events the BT220 has a diagnostic memory with a battery back-up. It is structured as a ring memory and comprises a maximum of 400 entries. Should the memory be completely full the oldest entry is overwritten by the new entry.

Each entry consists of 2 information blocks:
















- Max. 2 lines for the event message in clear text
- 2 lines for the event number and time tags (for appearance, disappearance and acknowledgment of the event).

You can have the contents of the diagnostic memory displayed on the monitor step-by-step.

Here the definition of a "Time for evaluation" is possible. Only entries with time tags within this time period are then considered for the display.

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

### *Procedure*

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Press key  twice.  
The text "All entries **from...**" inc. the date and time of the oldest entry appears in the first display line. The cursor flashes in the input field "Day". Should the diagnostic memory not contain any entries you receive a corresponding message. Then acknowledge the message with  and press the MEN key. The BT220 returns to the message display mode.  
▶ If you do **not** want to limit the evaluation time:  
Press key . Proceed to step 6.
3. Move the cursor with the cursor keys  and  to the figure to be changed and enter the new value via
  - the numerical keys or
  - the keys  and .In this way you define the **beginning** of the evaluation time.
4. Press key .
5. Move the cursor with the cursor keys  and  to the figure to be changed and enter the new value via
  - the numerical keys or
  - the keys  and .In this way you define the **end** of the time.
6. Press key .
7. At this point you have several control options:
  - to scroll 1 entry forward or backward: press  or 

Should you reach the beginning or end of the diagnostic memory, the BT220 displays the message "Selected time period exceeded!" (see Figure below).

- to change between both information blocks of an entry: press ▲ or ▼
- to return to the message display mode: press MEN key twice.
- to enter a new time period for evaluation: first press the MEN key then press the ↗ key. Proceed to step 3.

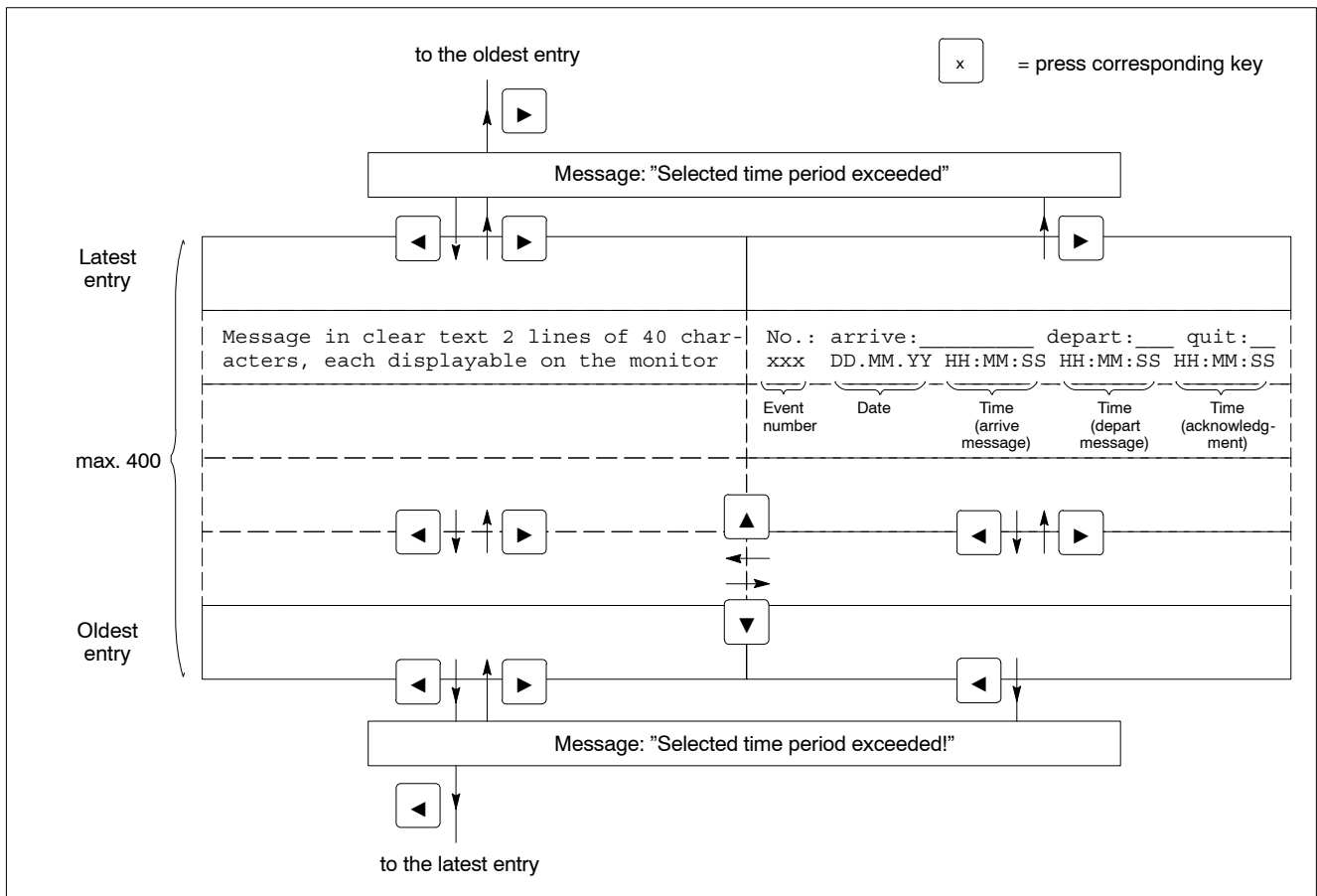


Fig. 5-13: Display Structure of the Diagnostic Memory

**Remarks**

To

- print the diagnostic memory: see page 5-20
- delete the diagnostic memory: see page 5-23

## 5.7 Printing the Diagnostic Memory

### Remarks

In principle all BT220 variants are able to control a connected printer. With the BT220-1, however, only 1 serial interface is available which is required for the connection of the PS 5000.

- ◆ When switched on, the PS 5000 should not be disconnected from the BT220-1!
- ◆ For this reason use the BT220-2 or BT220-3/7 if you want to use the "Print" function.

For printing you need a printer with a **serial** interface. On page 4-5 you will find instructions for connecting a printer.

- ◆ Switch off the printer before you connect or separate either unit!
- ◆ If both units are connected you can switch the printer on.
- ◆ Make sure that the interface parameters on the printer are set to the following values :  
8 data bits, no parity, 1 stop-bit,  
hardware-handshake
- ◆ Make sure that the font size of the printer is set to "12 CPI" (= 96 characters per line) and there is sufficient paper.  
Align the paper to start on a new page.
- ◆ Switch the printer On-line, should this be necessary to receive data (see Printer manual).

You have the option of printing the contents of the diagnostic memory

- unsorted (= all entries in chronological order) or
- sorted (= according to event numbers, chronologically within a number).

In both cases the definition of a "Time for evaluation" is possible. Only entries with time tags within this time period are then considered for printing.

In the following description we assume that the BT220 is in message display mode (see chapter 5.1, page 5-2).

### Procedure

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Press the ▼ key. The text "Print" appears in the second display line.
3. Press the ↗ key.  
The text "Diagnostic memory unsorted" appears in the second display line.
  - ◆ If you want to print the unsorted memory: Proceed to step 4.
  - ◆ If you want to print the sorted memory: Press the ▼ key.  
Proceed to step 4.
4. Press the ↘ key.  
The text "All entries **from** ..." inc. date and time of the oldest entry is displayed in the first display line. The cursor flashes in the input field "Day".  
If the diagnostic memory does not contain any entries you receive a

corresponding message. Acknowledge the message with  $\rightarrow$  and then press the MEN key. The BT220 returns to the message display mode.

◆ If you do **not** want to limit the evaluation time:

Press key  $\rightarrow$ . Proceed to step 8.

5. Move the cursor with the cursor keys  $\leftarrow$  and  $\rightarrow$  to the figure to be changed and enter the new value via
  - the numerical keys or
  - the keys  $\blacktriangle$  and  $\blacktriangledown$ .

In this way you define the **beginning** of the evaluation time period.

6. Press key  $\rightarrow$ .

The text "All entries to ..." inc. date and time of the latest entry appears in the first display line. The cursor flashes in the input field "Day".

7. Move the cursor with the cursor keys  $\leftarrow$  and  $\rightarrow$  to the figure to be changed and enter the new value via
  - the numerical keys or
  - the keys  $\blacktriangle$  and  $\blacktriangledown$

den neuen Wert ein.

In this way you define the **end** of the time period.

8. Press key  $\rightarrow$ .

If you have selected "unsorted":

Proceed to step 10.

If you have selected "sorted":

Proceed to step 9.

9. Select the range of event numbers in question. For this purpose, move the cursor with the cursor keys  $\leftarrow$  and  $\rightarrow$  to the figure to be changed and enter the new value via
  - the numerical keys or
  - the keys  $\blacktriangle$  and  $\blacktriangledown$  .

- to cancel the dialog without printing: Press the MEN key twice.  
The BT220 returns to the message display mode.

- to acknowledge the displayed values: Press key  $\rightarrow$ .

10. The BT220 initializes its printer interface.

Then it asks you to confirm the printer status:

Press key  $\rightarrow$ .

The printing process starts.

**Unsorted (= only in chronological order)**

	No.:	arrive:	depart:	quit:
TIM 1: Weld without command	81	21.04.98 20:19:44	20:19:50	20:19:49
TIM 1: Sequence inhibited program 2	94	21.04.98 20:20:06	20:20:11	20:20:10
TIM 1: Power unit not ready	83	21.04.98 20:20:46	20:21:26	20:20:53
TIM 1: Emergency stop open / 24V= error	80	21.04.98 20:21:33	20:21:42	20:21:41
TIM 1: External weld off	102	21.04.98 20:21:33	20:21:37	20:21:39
PS5 error: TIM1: coupling error (function key mode) <QUIT> = continue	5	21.04.98 22:40:35		22:40:54
	5	21.04.98 22:47:41		22:53:00
	5	21.04.98 22:53:01		22:53:03
	5	21.04.98 22:53:27		22:53:38
	5	21.04.98 22:54:01		22:56:30
	5	21.04.98 23:01:27		23:04:54
	5	21.04.98 23:05:22		23:05:54
	5	22.04.98 12:09:16		12:11:56
	5	22.04.98 12:13:07		12:13:10
Diagnostic memory unsorted print ended		22.04.98 12:13:41		Week: 17

**Sorted (= according to order of event numbers)**

All entries from message 1 to 2047				
	No.:	arrive:	depart:	quit:
PS5 error: TIM1: coupling error (function key mode) <QUIT> = continue	5	21.04.98 22:40:35		22:40:54
	5	21.04.98 22:47:41		22:53:00
	5	21.04.98 22:53:01		22:53:03
	5	21.04.98 22:53:27		22:53:38
	5	21.04.98 22:54:01		22:56:30
	5	21.04.98 23:01:27		23:04:54
	5	21.04.98 23:05:22		23:05:54
	5	22.04.98 12:09:16		12:11:56
	5	22.04.98 12:13:07		12:13:10
	5	22.04.98 12:13:34		12:14:38
TIM 1: Emergency stop open / 24V= error	80	21.04.98 20:21:33	20:21:42	20:21:41
TIM 1: Weld without command	81	21.04.98 20:19:44	20:19:50	20:19:49
TIM 1: Power unit not ready	83	21.04.98 20:20:46	20:21:26	20:20:53
TIM 1: Sequence inhibited program 2	94	21.04.98 20:20:06	20:20:11	20:20:10
TIM 1: External weld off	102	21.04.98 20:21:33	20:21:37	20:21:39

Fig. 5-14: Examples: Diagnostic Memory Print-Outs

## 5.8 Deleting the Diagnostic Memory

Normally the diagnostic memory with battery back-up need not be deleted. Due to its internal ring structure it stores up to 400 entries before the oldest entry is overwritten by a new incoming one.

Nevertheless, it may be useful to delete the diagnostic memory at certain times.

**NOTE**



Loss of important report data!





If you delete the diagnostic memory you will lose the logged data which may be used for subsequent error diagnostics or quality assurance.

◆ Therefore, you should print the diagnostic memory contents before the deleting if the memory contains important data (for printing see page 5-20).

---

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

*Procedure*

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Press the  key.
3. Keep pressing the  key until the text "Delete diagnostic memory" appears in the second display line.
4. Press the  key.
5. To delete the diagnostic memory: first press the VAR key then .  
The BT220 displays: "Diagnostic memory will be deleted!"  
To cancel the function: press the MEN key.
6. Press the MEN key to return to the message display mode.



## 5.9 Adapting the BT220 Display

In this section you find all internal display functions of the BT220.

◆ Set these functions during commissioning.

### 5.9.1 Setting the Message Display Mode

In case of several active events, the BT220 automatically shows one event on the display. The event automatically displayed can be defined in accordance with the following criteria:

Last value with priority:	the latest event with the highest priority is displayed first (default setting)
Last value without priority:	the latest event is displayed first
First value with priority:	the oldest event with the highest priority is displayed first
First value without priority:	the oldest event is displayed first.

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

#### *Procedure*

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Keep on pressing the ▼ key until the text "Special function" is displayed in the second display line.
3. Press the ↗ key.
4. Keep on pressing the ▼ key until the text "System functions" is displayed in the second display line.
5. Press the ↗ key three times.
6. The current setting is displayed behind the text "Mode".  
To change the message display mode: Press the VAR key.  
To cancel the function: Press the MEN key twice.
7. Select the required mode using the keys ▲ and ▼.
8. To activate the selected mode: Press the ↗ key.  
To keep the current setting: Press the MEN key.  
Proceed to step 6.

### 5.9.2 Setting the Flash Rate

Events which have to be acknowledged are shown in the display as flashing text.

The times for the on and off phases are adjustable.

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

*Procedure*

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Keep on pressing the ▼ key until the text "Special function" is displayed in the second display line.
3. Press the ↗ key.
4. Keep on pressing the ▼ key until the text "System functions" is displayed in the second display line.
5. Press the ↗ key twice.
6. Keep on pressing the ▼ key until the text "Flash rate" is displayed in the second display line.
7. Press the ↗ key.
8. The current setting is displayed behind the text "Flash rate".  
To change values: Press the VAR key.  
To cancel function: Press the MEN key twice.
9. Move the cursor with the cursor keys ◀ and ▶ to the figure to be changed and enter the new value (range: 0.1 to 3.9 sec.) via
  - the numerical keys or
  - the keys ▲ and ▼ .Define both times in this way.
10. To activate selected values: Press the ↗ key.  
To keep the current setting: Press the MEN key.  
Proceed to step 8.

### 5.9.3 Setting "Automatic Message Scrolling"

In case of events with a text of more than 2 lines, the BT220 only shows the first 2 lines initially. The remaining text can then be made visible in the following way:

- manually using the keys ▲ and ▼ (these call up the previous and the next two lines) or
- automatically using the "Message Scroll" function (display of the next two lines within a certain time period).

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

*Procedure*

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Keep pressing the ▼ key until the text "Special function" is displayed in the second display line.
3. Press the ↗ key.
4. Keep on pressing the ▼ key until the text "System functions" is displayed in the second display line.
5. Press the ↗ key twice.
6. Press the ▼ key until the text "Autom. message scroll" is displayed in the second display line.
7. Press the ↗ key.
8. The current setting is displayed in the first line.  
To change values: Press the VAR key.  
To cancel the function: Press the MEN key twice.
9. Move the cursor with the cursor keys ◀ and ▶ to the entry to be changed and enter the new value using the keys ▲ and ▼ (scroll time range: 1 to 99 sec.).
10. To activate selected values: Press key ↗.  
To keep the current setting: Press the MEN key.  
Proceed to step 8.

#### 5.9.4 Display Parameters

This function is used to set the display brightness.

- ◆ Set the brightness so that the display can be optimally read at any time of the day. Please note that a reduced brightness protects the VFD tube of the display monitor.

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

*Procedure*

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Keep pressing the ▼ key until the text "Special function" is displayed in the second display line.
3. Press the → key.
4. Keep on pressing the ▼ key until the text "System functions" is displayed in the second display line.
5. Press the → key twice.
6. Press the ▼ key until the text "Display parameter" is displayed in the second display line.
7. Press the → key.
8. The current setting is displayed in the first line.  
To change values: Press the VAR key.  
To cancel the function: Press the MEN key twice.
9. Enter the new value using the keys ▲ and ▼ (30%, 50%, 75% or 100%; standard: 75%).
10. To activate selected values: Press key →.  
To keep the current setting: Press the MEN key.  
Proceed to step 8.

## 5.10 Testing the BT220 Keyboard

If need be you can test the keyboard for proper functioning.

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

*Procedure*

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Keep pressing the ▼ key until the text "Special function" is displayed in the second line.
3. Press the ↗ key.
4. Keep on pressing the ▼ key until the text "Test functions" is displayed in the second line.
5. Press the ↗ key twice.  
The test mode is active.  
The code of a pressed key is displayed in the first display line.  
Exception: MEN key (reserved for canceling the test).
6. To cancel the keyboard test: Press the MEN key twice.

**5.11 Configuring the Printer Interface (X4)**

**Remarks**

With BT220-1: the settings of the interface described below are only active when you print out the diagnostic memory.  
The BT220-1 in this case automatically changes the interface parameters. After the printing process the parameters necessary for communication with the PS 5000 (19200 bits/s; 8 data bits; even parity; 1 stop-bit) are set again.

Communication with a peripheral unit is only possible when

- the connection cable is correctly wired (inc. any necessary Handshake leads),
- the interface parameter settings of both units are identical.

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

*Procedure*

1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
2. Keep pressing the ▼ key until the text "Special function" is displayed in the second line.
3. Press the ↗ key.
4. Keep on pressing the ▼ key until the text "System functions" is displayed in the second display line.
5. Press the ↗ key.
6. Keep on pressing the ▼ key until the text "Print parameter" is displayed in the second display line.
7. Press the ↗ key twice.
8. The current parameters are displayed in the first display line.  
To change values: Press the VAR key.  
To cancel the function: Press the MEN key twice.
9. Move the cursor with the cursor keys ◀ and ▶ to the setting to be changed and enter the new value using the keys ▲ and ▼. Value range:  
Baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 76800  
Handshake: without = no flow control  
Hardware = flow control through CTS, RTS leads  
Xon/Xoff = flow control with control symbol Xon/Xoff  
Xon/Xoff + DTR = inc. testing of the DSR input  
Protocol: 7O1, 7E1, 7N2, 7O2, 7E2, 8N1, 8O1, 8E1, 8N2  
1st character: Number of data bits  
2nd character: O = odd parity  
E = even parity  
N = no parity  
3rd character: Number of stop-bits
10. To activate selected values: Press key ↗.  
To keep the current setting: Press the MEN key.  
Proceed to step 8.

## 5.12 Inhibiting the Control Function

To protect the BT220 from unauthorized access a 4-digit freely definable key code can be assigned both to the

- menu items within the BT220 (see page 5-33) and to the
- menu items in the function key mode (see page 5-6).

Access to a protected menu level is only possible when the correct key code is entered.

Here you can decide for the menu items of the function key mode whether **access** to a menu item or only **changes** within a menu items should be protected by a key code.

Various strategies can be considered for access protection:

- User group oriented:  
Define a specific key code for each user group (e.g. system administrator, master, technician etc.).  
Depending on the privileges/tasks of the individual user group you may then assign the relevant key code to the individual menu items.  
Disadvantage: a user with extensive privileges must generally know all key codes of the lower-level user groups.
- Function oriented:  
Define a specific key code for each "critical" function area (from a safety point of view) (e.g. changing welding parameters, deleting diagnostic or message memory, changing key codes (!) etc.).  
Depending on the function areas you may then assign the relevant key code to the individual menu items.  
Disadvantage: any user with comprehensive machine-related tasks has to know all - or at least several - key codes of the individual function areas.



### ATTENTION!

Unauthorized alteration of or prying into key codes possible!

- ◆ Use a separate key code for protecting the menu item "Change key code" (for menu structure see page 5-33).
- ◆ Only make this key code known to authorized people. People who know this key code can display all key codes stored and also change them!



### NOTE

Deleting or overwriting the BT220 internal data is possible!

Via the menu item "Text management" (for menu structure see page 5-33) functions can be called up which delete or overwrite the internal data of the BT220.

- ◆ Therefore, you should protect the menu item "Text management" from unauthorized access.
- ◆ Only make this key code known to authorized people. Unauthorized people who know this key code could damage the BT220.

In the following description we assume that the BT220 is in the message display mode (see chapter 5.1, page 5-2).

- Procedure*
1. Press the MEN key.  
The menu item "Diagnostic memory" appears in the second display line.
  2. Keep pressing the ▼ key until the text "Special function" is displayed in the second line.
  3. Press the ↗ key.
  4. Keep on pressing the ▼ key until the text "System functions" is displayed in the second display line.
  5. Press the ↗ key.
  6. Press the ▼ key until the text "Change key code" is displayed in the second display line.
  7. Press the ↗ key.
  8. The text "Menu" appears in the second display line.
    - To cancel the function: Press the MEN key.
    - To change key codes of
      - internal menu items of the BT220: press the ↗ key and proceed to step 9.
      - functions of the function key mode: proceed to step 14.
  9. The currently selected BT220 menu item and the key code assigned to it appear in the first display line ("Code").  
Code "0000" means: menu item is not protected.
  - 10.- To cancel the function: Press the MEN key twice.
    - To select menu items (for structure see page 5-33): Press ▲ or ▼
    - To change the key code: Press the VAR key.
  11. Move the cursor with the cursor keys ◀ and ▶ to the figure to be changed and enter the the required key code via
    - the numerical keys or
    - the keys ▲ and ▼ .
  12. To activate the displayed key code: Press the ↗ key.  
To cancel the changes: Press the MEN key.
  - 13.- To process further internal menu items of the BT220: proceed to 10.
    - To process menu items of the function key mode: Press MEN.
  14. Press the ▼ key.  
The text "Function keys/Symbols" appears in the second display line.
  15. Press the ↗ key.  
The "Entry number" flashes.  
An entry must contain the following details:
    - function number (F1 - F50) in the function key mode, which should be protected
    - whether a key code must be entered for access or for a modification (Query..=> Call up / change)
    - the assigned key code.  
Code "0000" means: function number is not protected.

You can see from the function number displayed directly behind the entry number (e.g.: "1 : F2") whether an entry already contains data.  
A total of 50 entries can be stored.



- 16.- To select an entry: Press ▲ or ▼.
- To change the data of the selected entry: Press the VAR key.
  - To cancel the function: Press the MEN key twice.
17. The cursor flashes in the first line.
- To change the function number: Keep pressing the ► key until the cursor flashes in the first possible location behind the entry number. Then select the required function number with ▲ or ▼. Should the selected function number already exist in another entry, it is automatically deleted there as soon as the changes to the current entry are activated.
  - To delete the function number: Place the cursor behind the function number using ► . Then press the ◀ key.
  - To change the query type: Keep pressing the ► key until the text "Call up" or "Change" flashes. Then select the required type with ▲ or ▼.
  - To change the key code: Keep pressing the ► key until the cursor flashes behind the text "Code". Then enter the required key code with the numerical keys or with ▲ or ▼ .
  - To activate changes: Press the ⇨ key and proceed to step 16.
  - To cancel the changes: Press the MEN key and proceed to step 16.

**5.13 Overview: BT220 Specific Functions and Parameters**

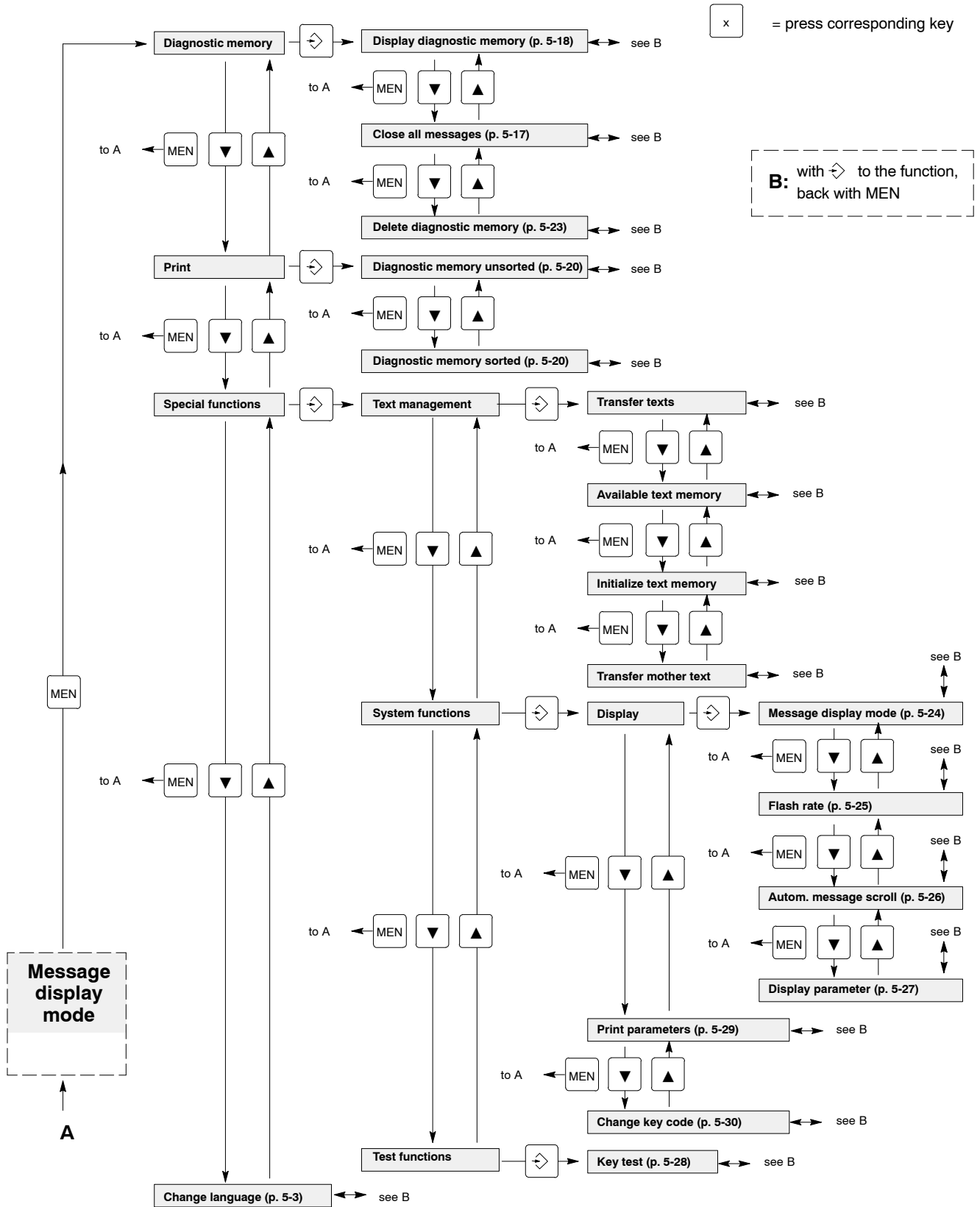


Fig. 5-15: Menu Tree of the BT220 Specific Functions and Parameters



## 6 Maintenance

### 6.1 Battery

A battery is necessary to back up the internal memory modules. Depending on the operating environment, the battery must be changed after certain cycles.

Battery type: Lithium-Thionylchloride (Sonnenschein SL-160)  
hermetically sealed

Size: AA (R6, UM-3)

Capacity: 1.9 Ah

Storage capability: Capacity loss <10% after 10 years at 25°C

Data retention: > 2.5 years over the whole temperature range (0°C to +50°C)

> 7.5 years at 40°C

> 15 years at 20°C

#### Remarks

When the battery is replaced, the contents of the diagnostic memory and message memory are deleted.

#### Changing Battery

1. Switch the unit off.
2. Remove all connection cables from the BT220.
3. Make sure that the BT220 cannot fall out of the assembly cutout and loosen the screw terminals on the top and bottom of the BT220 housing. Take out the screw terminals and draw the unit out of the assembly cutout.
4. Lay the BT220 front side facing down on a soft, even surface. Loosen the 4 screws (1) and pull the housing upwards. The battery (3) is on the underside of the main circuit board.

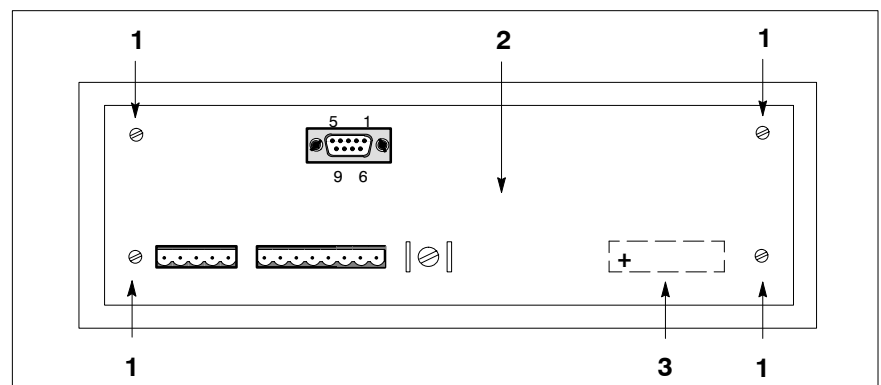


Fig. 6-1: Changing the Battery

5. Unsolder the battery from the solder support points. Ensure correct polarity and solder in the new battery.
6. Put the housing carefully back on and screw it tight.
7. Reinstall the BT 220 and plug in all the cables again.

## **6.2 Reset**

Should a software reset of the BT220 be necessary (e.g. after faults of the BT220), proceed as follows:

1. Switch off the BT220 power supply.
2. Press and hold down keys "1" and ▲ at the same time.
3. Switch the BT220 power supply back on.

Then you can release the keys.

## **6.3 Software release**

To display the current software status of the BT220:

1. Press the MEN key.
2. Press the key *i*.  
(Software status: the last 3 digits in the first display line)
3. To return to the message display mode:

Press key *i* then  
press the MEN key.

## 7 Appendix

### 7.1 Information on the STK multi-contact interface board

Power Supply (to X1) Connection: Screw terminal plug  
MSTB 2.5 / 3-ST-5.08

Supply voltage: 24 VDC

Current consumption: approx. 1 A

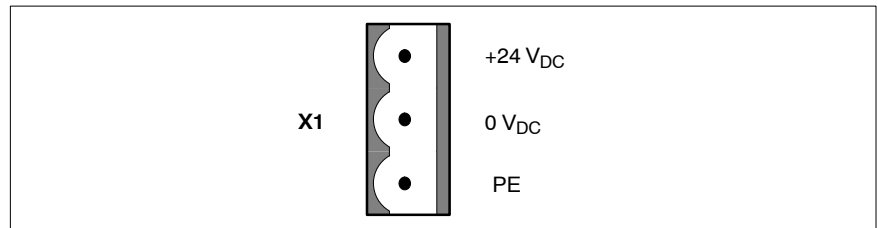


Fig. 7-1: Terminal Assignment X1

*Setting the "Baud Rate" and "Number of Connected PS 5000"*

For the setting use DIP switch block S1. The Baud rate setting is only effective for the interface at channel 4 (connection to the BT220).

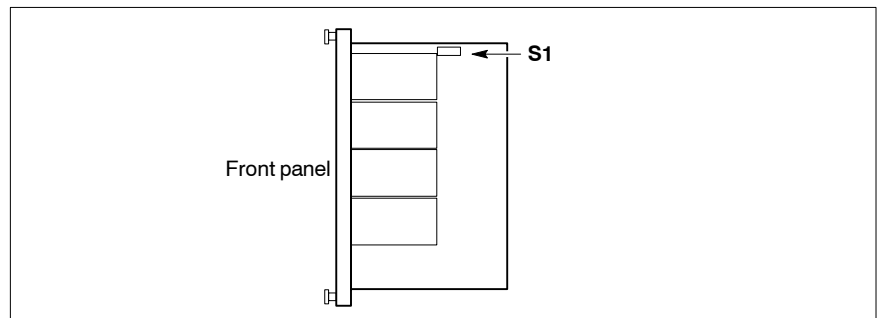


Fig. 7-2: Position of S1

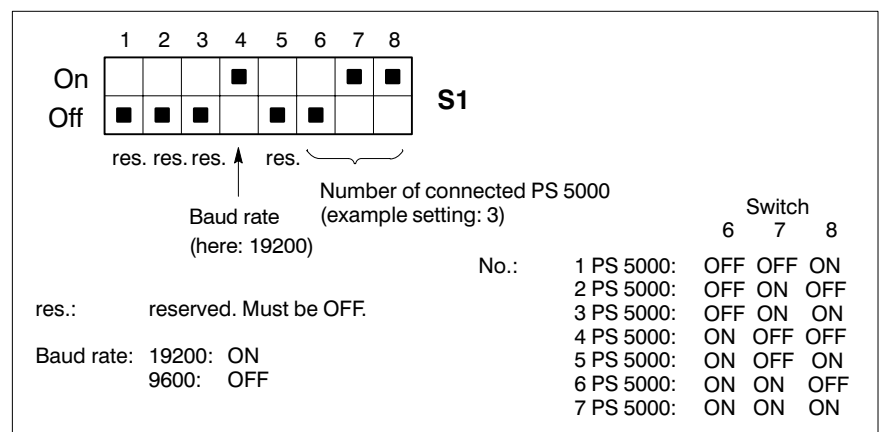


Fig. 7-3: Setting the Baud Rate and Number of Connected PS 5000

◆ Make sure that the selected Baud rate is identical with that on the BT220.

*Connection:* For the connection of max. 7 PS 5000 the multi-contact interface board can be fitted with RS232 interface modules.  
*STK - PS 5000* All interface leads are isolated from the power supply to X1.

Connection: Sub-HD socket, 15-pin  
Type: RS232  
Cable length: max. 15m  
Cable type: shielded, core cross-section min. 0.14mm<sup>2</sup>  
Transmission rate: 19200 bits/s  
Parameters: 8E1 (8 data bits, even parity, 1 stop-bit)  
Handshake: Software handshake (X<sub>ON</sub>, X<sub>OFF</sub>)

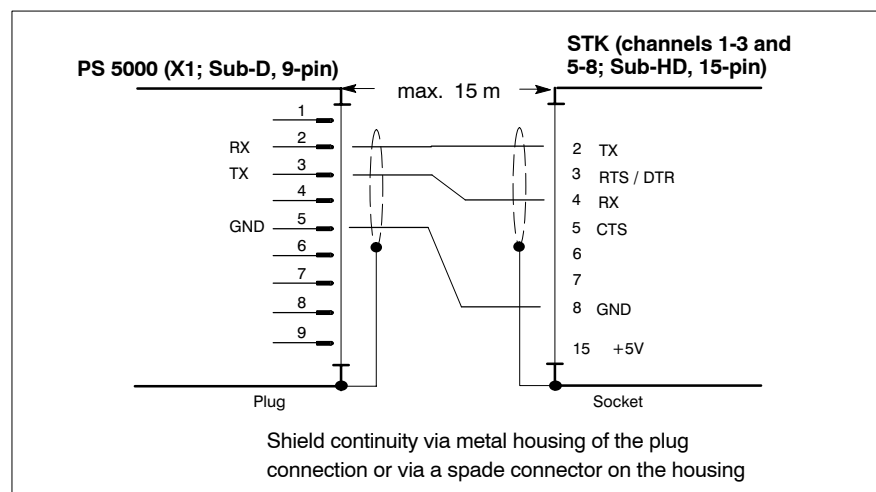


Fig. 7-4: Connection of PS 5000 to the STK multi-contact interface board



**ATTENTION!**

Malfunctions and damage are possible!  
Pin 15 of the Sub-HD socket is connected to a 5V auxiliary voltage.  
◆ Make sure that pin 15 is not wired. No external consumer should be connected without consulting us.

*Connection:* Communication between STK and BT220 is established via a separate interface module (RS232 or RS485) on the multi-contact interface board (channel 4).  
*STK - BT220* Information on the wiring is available in  
- chapter 4.3 from page 4-4 (for RS232 connection) or in  
- chapter 4.4 on page 4-6 (for RS485 connection).

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