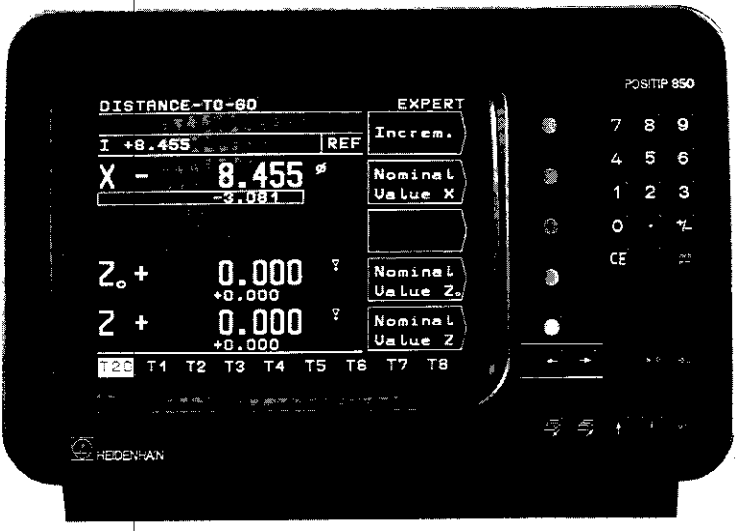
HEIDENHAIN

Operating Instructions

POSITIP 850
Programmable Digital Readout for Lathes



4/92

Items Supplied

- POSITIP 850 Display Unit
- Power Cable
- Operating Instructions
- Certificate of Inspection

Optional

- Connector, 25-pole, for D-subminiature socket X41 (EXT) external functions (Id.-Nr. 249154ZY)
- Data transfer cable, 25-pole, for D-subminiature socket X31 data output (Id.-Nr. 274545 01)
- Angle bracket (Id.-Nr. 258 26101)

Selecting Milling/Turning

As delivered, the POSITIP 850 can be set up for either milling or turning applications. The following screen appears after the **first** power-up:

After pressing the 1 key, the program for turning is permanently set (i.e., is not affected by power interruptions), and thi screen display cannot be accessed again. Selection of the mil ling function is then only possible via parameter P99.0 "Millin Turning" (see "Parameters", section 4.2).

Manufacturer's Certificate

We hereby certify that the above unit is radioshielded in accordance with the German official register decree 1046/1984. The German postal authorities have been notified of the issuance of this unit and have been granted admission for examination of the series regarding compliance with the regulation

Note

If this unit is incorporated by the user into a system, then the complete system must comply with the above regulations.

This description is valid for software 05.

Progr. 246XXX**05**

Sticker on rear panel

Contents

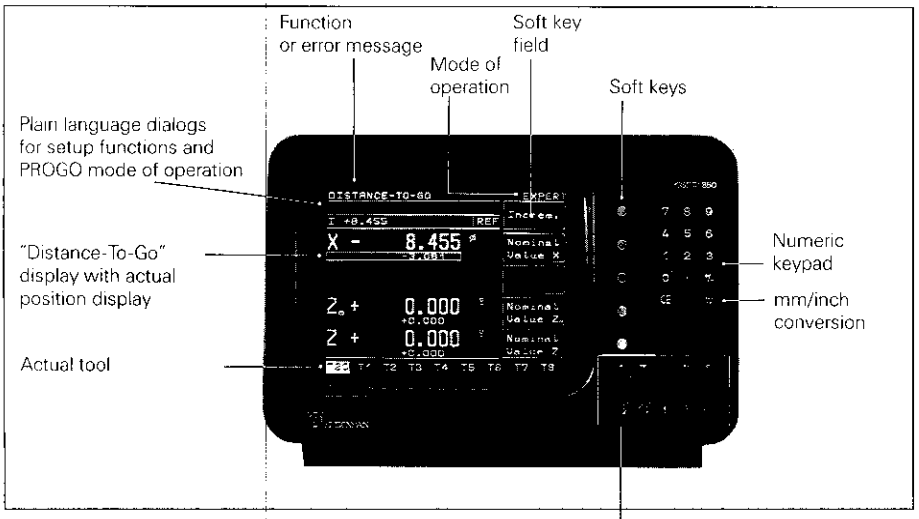
Contents (cont'd.)

Pag

Working with the POSITIP 850 For Lathes

This part of the Operating Instructions illustrates the most important procedures for operation of the POSITIP 850. For detailed explanations simply call the HELP functions.

1 Controls and Screen Displays



Symbol behind the display value: Ø: Diameter display
!: Scaling factor active
!: Oversize (only active with Distance-To-Go function)

With these keys you select the tools from T1 to T20 and the data interface (FE, EXT)

INFO

Selection of pocket calculator functions, stopwatch and taper calculator

HELP

Explanation of all operating modes, current screen contents, and error messages

For paging through the individual screens

Return to the previous menu or

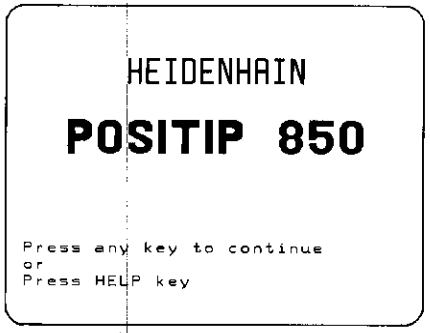
Return to the main menu

MOD

Select user parameters

2 Switch-On

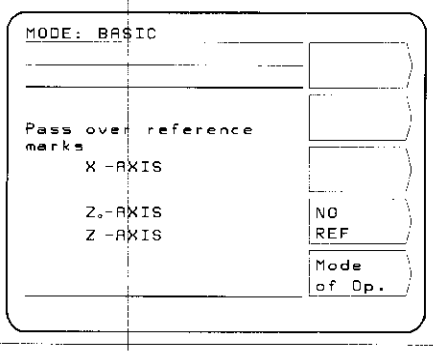
Before initial switch-on, please read the information in the chapter "Installation".
The power switch is located on the rear panel.



After approx. 5 seconds the opening screen appears and POSITIP conducts a memory test.

Adjust brightness if necessary (control on rear panel).

▶ **Press any key**



POSITIP is in the mode of operation which was last selected (in this case, BASIC).

3 POSITIP Operating Modes:

BASIC Mode

Position display for simple machining tasks

- Actual value display with setting and resetting for up to 20 tools

EXPERT Mode

Position display with expanded functions

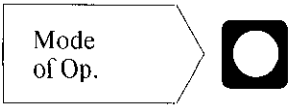
- Distance-To-Go display with oversize compensation
- Note/Set function
- Datum

PROGO Mode

Programmable position display

- 20 different programs can be stored
- Easy programming with conversational guidance, subprograms and program section repeats
- Input and output of programs over the RS-232-C/V.24 interface.

Select operating mode

Press 

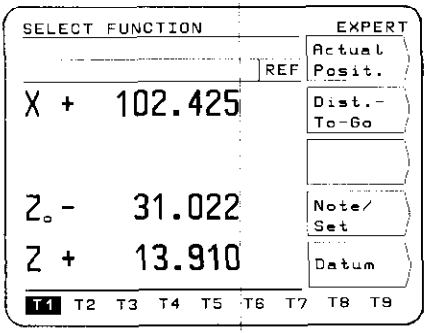
soft key and select desire mode of operation

4 Cross Over Reference Marks

When a reference mark is crossed, a signal is generated which identifies that position as a machine datum.
Crossing over the reference marks re-establishes the relationship between axis slide positions and display values which was last set.

After a power interruption, the reference marks must be crossed in all axes.

After crossing the reference marks in all axes:



The main menu appears for the selected mode of operation. The abbreviation **REF** in the entry line indicates REF mode. The position data are referenced to the highlighted tool.

If you do not wish reference mark evaluation:

Press NO REF soft key

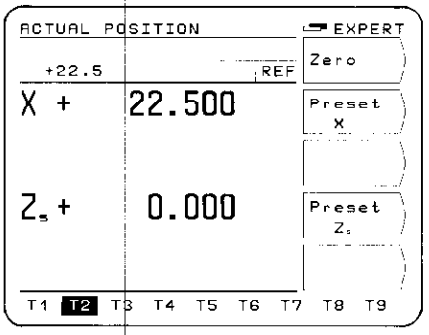
If **NO REF** is selected, positions and display values will be lost after a power interruption.

5 Keys For User Guidance

HELP

The HELP function can guide you through the operation of the POSITIP 850. Think of it as integrated operating instructions. At **any time** during operation you can call up an explanation of the current screen image by pressing the HELP key. The HELP function can also tell you how to proceed when an **error message** occurs.

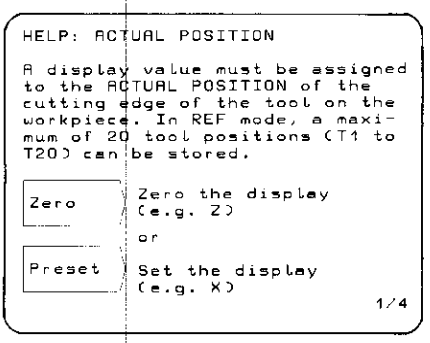
Calling the HELP Function



Example: POSITIP is in the main menu of the EXPERT operating mode.

▶ **Call HELP:**

Press HELP



An explanation of ACTUAL POSITION appears on the screen.

A HELP text can consist of several pages. The current page and the total number of pages is displayed in the lower right-hand corner of the screen.

▶ **Page further:**

Press  to page forward

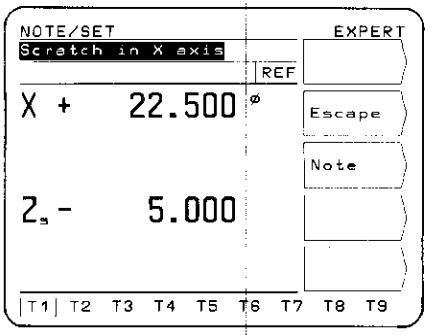
Press  to page backward

▶ **Depart HELP:**

Press HELP once again.

POSITIP returns to the original screen.

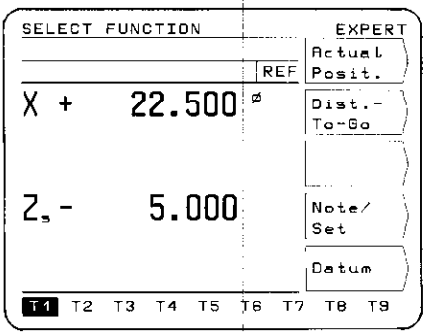
Return to main menu of selected mode of operation (EXPERT or PROGO).



Example: Operating mode EXPERT, the NOTE/SET function has been selected for the X axis.

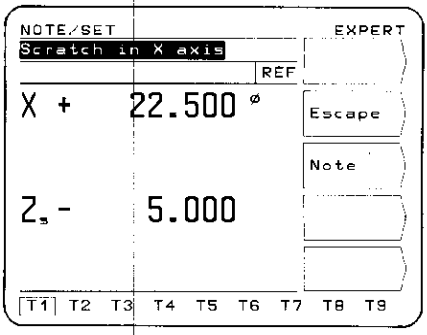
► **Select main menu:**

Press 



POSITIP returns to the main menu of the EXPERT operating mode.

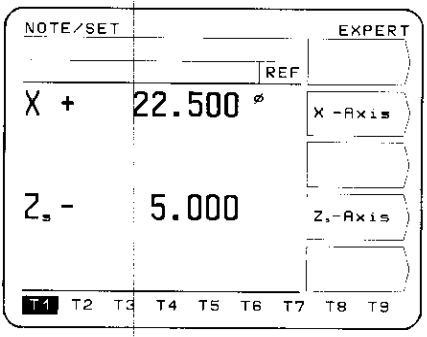
Return to previous work screen



Example: Operating mode EXPERT, the NOTE/SET function has been selected for the X axis.

► **Return to the previous work screen:**

Press 

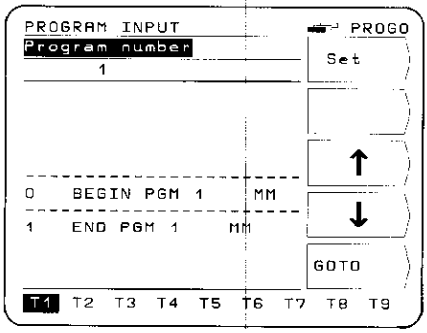


POSITIP returns to the previous work screen.

Each time you press the  key you jump back by one menu level, until you reach the main menu of the selected mode of operation.

Paging forward and backward, selection of work screens and *soft key assignment.*

Selection of Work Screens

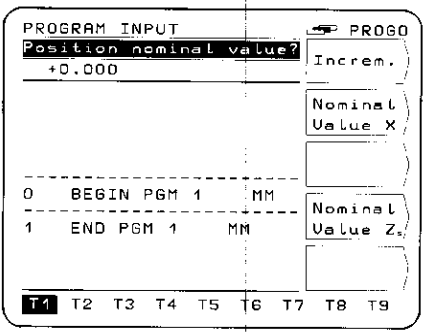


POSITIP is in the PROGRAM INPUT main menu.

The ☞ symbol indicates the currently-selected page (here, page 1).

► Select page 2:

Press 

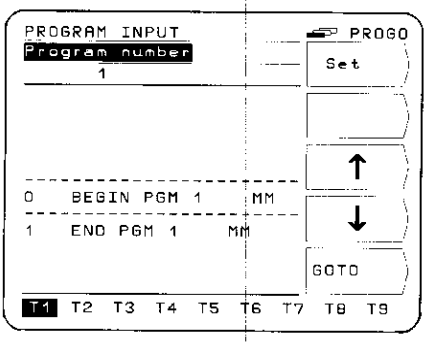


The second page of the PROGRAM INPUT main menu has been selected.

The ☞ symbol now indicates page 2 as current page.

► Return to page 1:

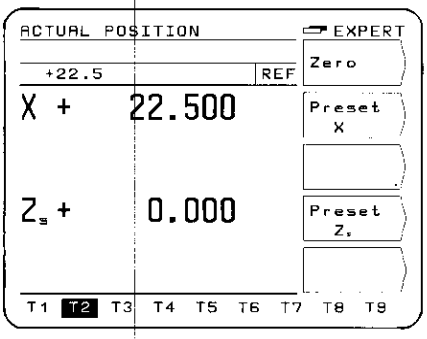
Press 



Display returns to the first page of PROGRAM INPUT.

Selection of Tools (T1 – T20) and Data Transfer Protocol

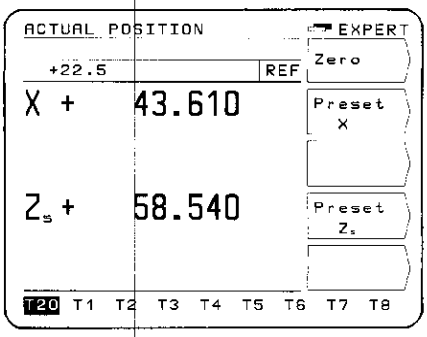
Selection of Tools



Example: POSITIP is in the EXPERT operating mode.
Tool T2 has been selected.

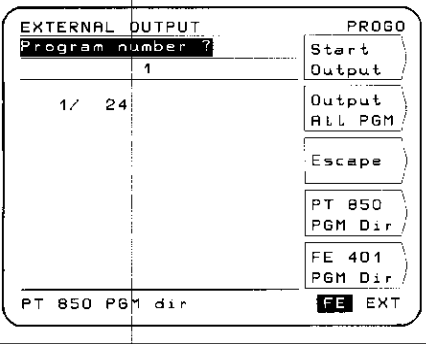
► **Select new tool, e.g. T20:**

Press  or hold down until tool T20 is highlighted. The screen displays 9 tools at a time out of a total of 20.



Tool T20 is selected.

Selection of Data Transfer Protocol



Example: In the operating mode PROGO, the function EXTERNAL OUTPUT has been selected. The data transfer protocol is set for the FE 401: Display FE

► **Set data transfer protocol to EXT, e.g. for printer:**

Press 

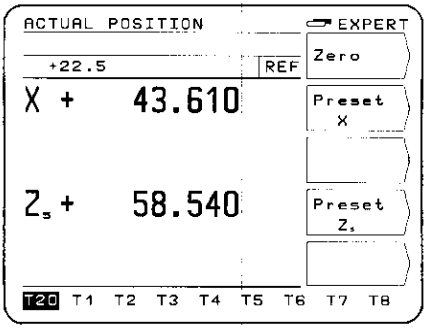
MOD User Parameters

POSITIP features non-volatile parameter storage: the parameters become effective immediately upon switch-on. The parameters are divided into two groups: user parameters and operating parameters.

User parameters are parameters that can be changed during operation by pressing the MOD key.

Operating parameters concern machine characteristics and are given a fixed setting. For more information on operating parameters see Parameters section.

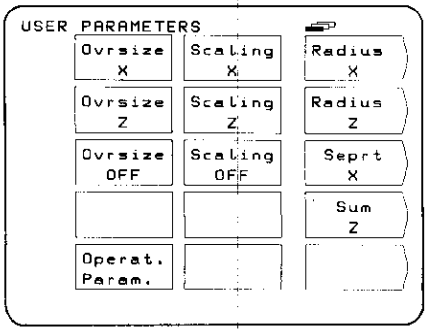
User Parameters



Example: The ACTUAL POSITION function has been selected.

▶ **Call user parameters:**

Press MOD



An overview of available parameters appears on the screen.

▶ **Change parameter:**

Select desired column

▶ **Call parameter:**

Press soft key

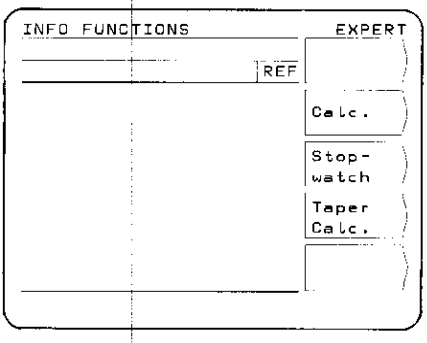
▶ **Depart user parameters:**

Press MOD once again

INFO Functions

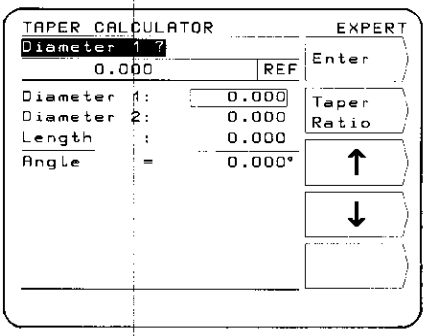
The INFO functions can be selected from any menu level by pressing the INFO key. The following functions are then available: pocket calculator, stopwatch, and taper calculator.

Example: Calling the Taper Calculator



▶ **Call taper calculator**

Press Taper Calc. soft key



The TAPER CALCULATOR function assists you in calculating the taper angle.

Pressing the HELP key displays an explanation of this function.

▶ **Depart INFO:**

Press INFO once more

POSITIP returns to the work screen.

6 Working Aids for Turning

Using the functions ACTUAL POSITION and NOTE/SET, the data for 20 tools (T1 – T20) can be set on the machine and stored.
If the workpiece datum changes, for example after a tool change, it can be reset with the DATUM function. All preset tool data will then automatically refer to the new datum and do not need to be changed.

6.1 Tool Presetting

- ▶ In order that all tool data are stored in non-volatile storage, the reference marks must be crossed over after switch-on. REF must appear in the entry line (see section 4, "Cross Over Reference Marks").
- ▶ The **diameter display** should be selected for the X axis. The symbol Ø appears after the display value (see "Parameters", section 1).
- ▶ For machines with compound axes (e.g. saddle and top slide), you must select the **sum display** (see "Parameters", section 1).

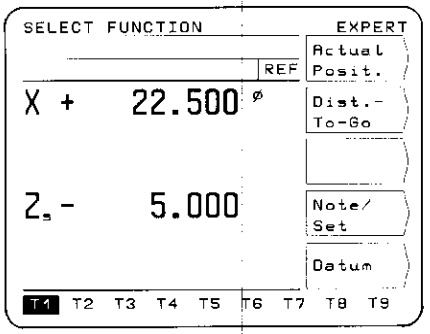
ACTUAL POSITION (BASIC, EXPERT, PROGO)

In the ACTUAL POSITION function, the display value can be set or reset for a maximum of 20 tools.

NOTE/SET (EXPERT, PROGO)

The function NOTE/SET is helpful when determining tool data by probing the workpiece. In order that the position value is not lost when retracting the workpiece for measuring purposes, the position value can be stored beforehand ("Note").
After measurement of the workpiece, the measured value can be assigned to the stored position as the display value ("Set").

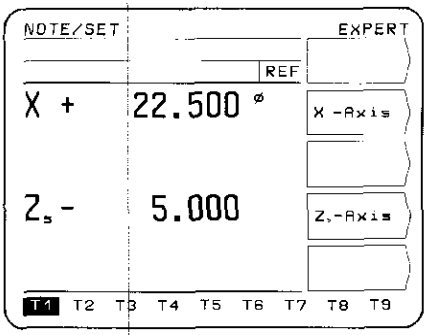
Example: Determining and setting the tool data with NOTE/SET



The main menu is selected in the operating mode EXPERT (otherwise press the key).

▶ Select the NOTE/SET function:

Press Note/ Set soft key



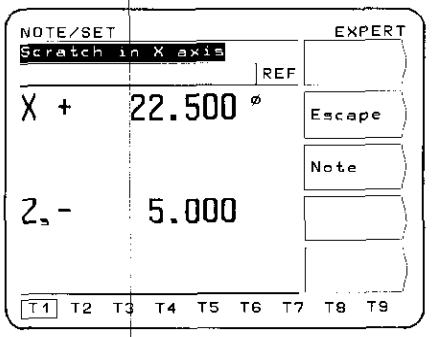
The NOTE/SET function appears on the screen.

► **Select tool T1:**

Press ← → or hold down until T1 is highlighted.

► **Select X axis:**

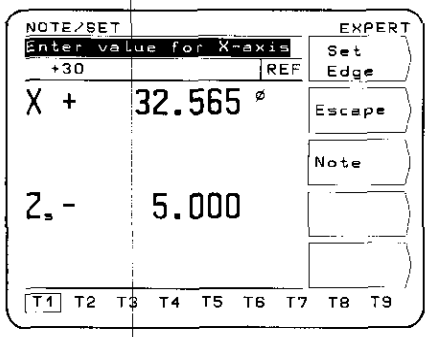
Press X-Axis soft key



The command Scratch in X axis appears on the screen.

► **Probe the workpiece edge with tool T1 in the X axis.**

► **Store the probed position with Note.**



The command Enter value for X-axis appears on the screen. The X axis can be **retracted for measuring** the workpiece (the display value remains frozen).

► **Enter value for tool diameter:**

Press Set Edge soft key

The tool position for tool T1 in the X axis is now stored in non-volatile memory.

The next machine axis can now be selected on the screen (e.g. Z_S axis), or the next tool.

► **Repeat the procedure until all tools are preset.**

► **Depart NOTE/SET:**

Press ↑

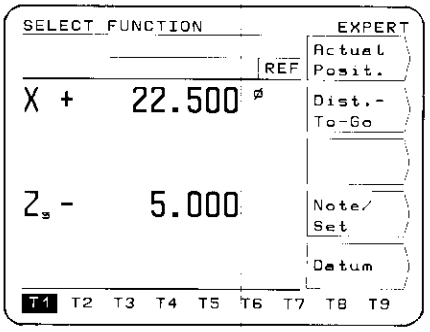
6.2
Workpiece Datum

After the workpiece has been clamped, the zero point or the datum for workpiece machining is set.

Tool data T1 to T20 entered in ACTUAL POSITION or NOTE/SET then automatically refer to the new datum and do not need to be changed.

Datum (EXPERT, PROGO)

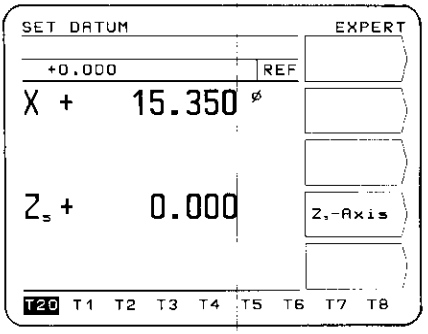
Example: Set new datum with a preset tool



The main menu of the operating mode EXPERT has been selected (otherwise press ↑).

▶ **Select the Datum function:**

Press [Datum] [ ] soft key



The SET DATUM function appears on the screen.

▶ **Select preset tool now inserted, for example: T20:**

Press [←] [→] or hold down until T20 is highlighted.

▶ **Face the workpiece for the new datum, or touch the workpiece face.**

▶ [ ] **Enter value for datum:**

Press [Z_S-axis] [ ] soft key

The datum is now stored in non-volatile memory. All preset tools automatically refer to the new datum.

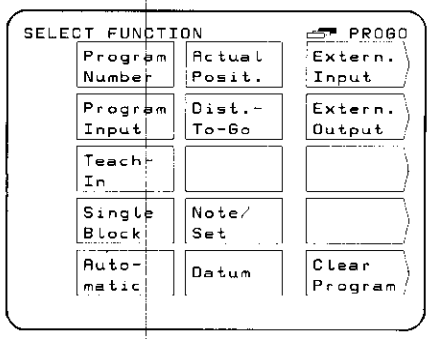
▶ **Depart SET DATUM function.**

Press ↑

7 External Program Output

Using the EXTERNAL OUTPUT function in the operating mode PROGO, you can transfer one or all of the programs in the PT 850 to an external storage device via the RS-232-C data interface. Programs can be archived on diskette with the FE 401 Floppy Disk Unit from HEIDENHAIN.
Printers used with the PT 850 must have a serial RS-232-C interface (for the data format please refer to Data Interface, section 4.2).

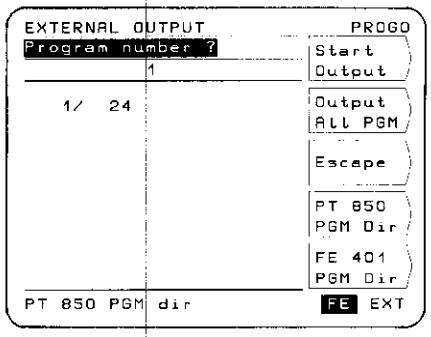
Example: Transferring a Program to the FE 401



The main menu of the PROGO operating mode has been selected.

► **Call "External Output":**

Press the Extern. Output soft key



The EXTERNAL OUTPUT menu appears on the screen.

► **Set the data interface to FE 401:**

Press ← → ("FE" should be highlighted)

Selecting "FE" sets the data interface and the correct baud rate for the FE 401 Floppy Disk Unit.

► **FE:** Data transfer rate is **9600 baud,** regardless of the baud rate set via MOD.

► **EXT:** The baud rate set via **MOD** for printer output is in effect.

Output a single program:

▶ Enter program number

▶ Start Output → Begin program output

Output all programs:

▶ Output All PGM → Begin program output

If there are programs on the diskette with the same PGM number, they will be overwritten.

Directory of programs stored in the POSITIP program memory:

▶ PT 850 PGM Dir → The program number as well as the number of program blocks is displayed.

Directory of programs stored on FE diskettes:

▶ FE 401 PGM Dir → During read-in of the program directory, the dialog Reading FE directory is displayed.

Cancel data transfer:

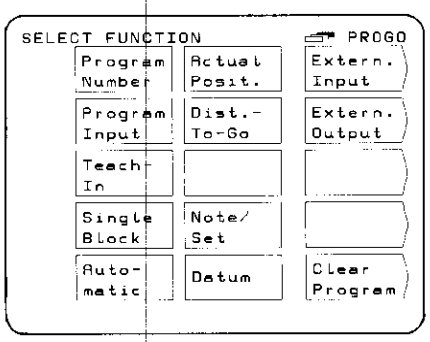
▶ Escape → Data transfer is cancelled.

8 External Program Input

Using the EXTERNAL INPUT function in the operating mode PROGO, you can transfer programs from an external storage device into the PT 850 via the RS-232-C data interface.

Computers used with the PT 850 must have a serial RS-232-C interface (for the data format, please refer to Data Interface, section 4.2).

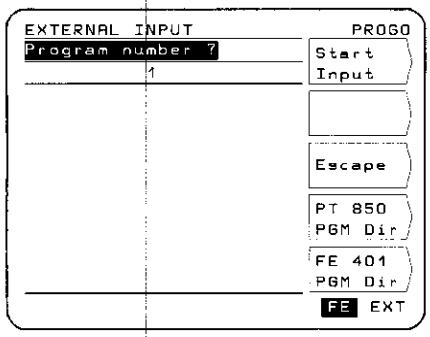
Example: Loading a Program from the FE 401



The main menu of the PROGO operating mode has been selected.

► **Call "External Input":**

Press Extern Input  soft key



The EXTERNAL INPUT menu appears on the screen.

► **Set the data interface to FE 401:**

Press  ("FE" should be highlighted)

Selecting "FE" sets the data interface and the correct baud rate for the FE 401 Floppy Disk Unit.

► **FE:** Data transfer rate is **9600 baud,** regardless of the baud rate set via MOD.

► **EXT:** The baud rate set via **MOD** for printer output is in effect.

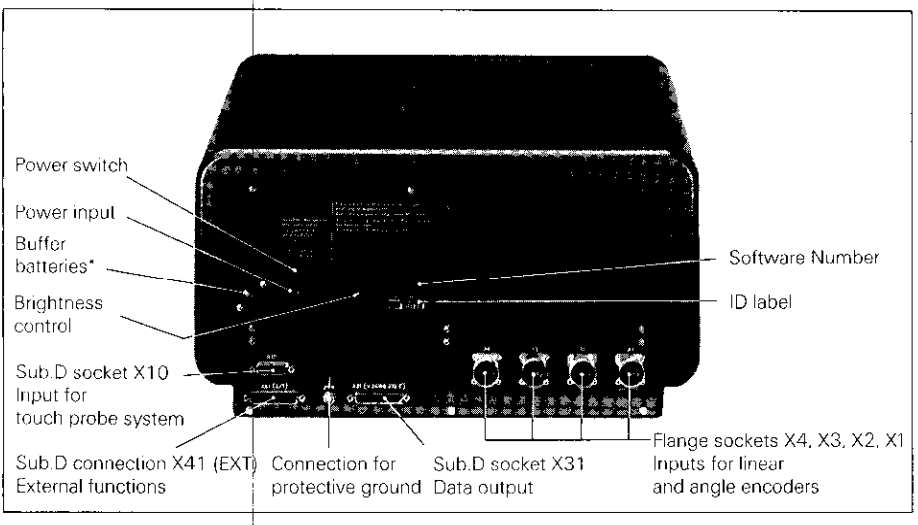
Enter the program number of the program to be transferred. If necessary, call up the directory of programs on the diskette using the soft key **FE 401 PGM Dir** (see "Program Output").

Start Input

Start transfer of program from floppy disk unit to POSITIP.

Commissioning

1 Connections and Controls (Rear Panel)



The buffer batteries (three AA-size 1.5 V batteries) serve as a power supply for the program memory. Exchange the batteries if the error message EXCHANGE BUFFER BATTERY appears.

The unit must remain switched on during battery exchange to prevent erasure of stored programs.

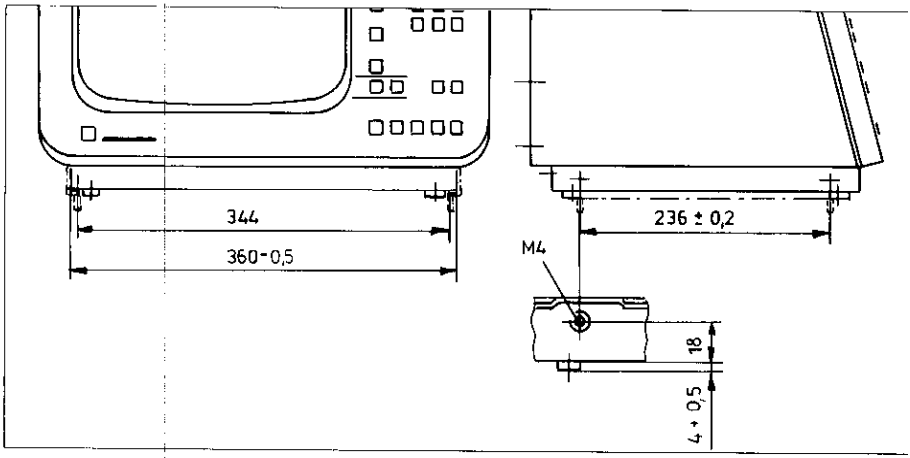
It is very important that you follow this sequence of steps when commissioning the unit.

Do not engage or disengage any connectors while the unit is under power.

2 Mounting the POSITIP 850

▶ Place the unit in its intended location. It can be fixed laterally to a base surface with the M4 tapped fixing holes (see Dimensions, screw size M4 x 6).

An angle bracket for mounting the PT 850 on a table is available from HEIDENHAIN (Id.-Nr. 258 26101).

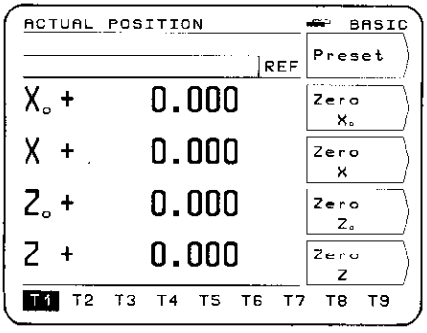


3 Connecting Linear Encoders

▶ Any HEIDENHAIN linear encoders with sinusoidal output signals and single or distance-coded reference marks can be connected to the PT 850.

▶ Up to four machine axes for saddle and top slide as well as cross slide and compound cross slide (if available) can be connected to the rear panel.
Connect the machine axes to the flange sockets according to the following table:

Example:	Machine Axis	Flange Socket	Screen Display
Compound cross slide	→	X1	→
Cross slide	→	X2	→
Top slide	→	X3	→
Saddle	→	X4	→



4 Power Connection

- Check whether there is a protective ground for the power connection. An M5 threaded pin on the rear panel provides an additional connection for protective ground.
- Connect power cable to the power input socket on the rear panel, and switch on power.

5 Switch-On and Function Check

The unit is adapted to the machine tool by means of parameters. See Parameters section. The unit is delivered with **preset parameters** to facilitate commissioning (see Parameters, section 2.4).

Proceed in the following sequence to commission the machine:

- Switch on power.
- Adjust desired screen image brightness with control on rear panel.
- Select desired application (milling or turning). The menu for application selection appears only **once** after initial switch-on.
- Press any key (except the HELP key).
- Choose BASIC mode of operation (see Working with the POSITIP 850).
- Press NO REF soft key. Now you need not cross over the reference marks (ignore error messages).
- Use the MOD key and code number 95148 to access the operating parameters (see Parameters, section 2).
- Optimize operating parameters (see Commissioning, section 6).
- Switch power off and then on again.
- Cross over the reference marks (see Working with the POSITIP 850).

Error Messages

After the reference marks have been crossed over there should be no error message in the display.

If an error message is displayed, press the HELP key for more information and then correct the error. Switch power off and then on again.

If several errors occur at once you can display the error messages one after the other by repeatedly pressing the CE key.

6 Optimizing the Parameters

You can adapt the functions of the POSITIP to the machine tool by optimizing the parameters. Proceed in the sequence given in the following checklist. Write the axis designations of the connected machine axes onto the checklist, and check off each step when you have completed it.

Parameters which must be frequently changed during machine operation are entered as **user parameters** (see Parameters section).

Checklist	Parameter	Encoder Inputs/Axes			
		X1	X2	X3	X4
		Machine Axes			
▶ Are the **machine axes** assigned to the correct **encoder inputs?** (see section 3)					
▶ Do the **axis designations** X and Z match the machine axes? Change if necessary.	P 50.*	○		○	
▶ The **axis combination** Separate or Sum can be set in parameter P 30.* or as a user parameter.	P 30.*	○		○	
▶ Check **axis definition.** Set connected encoder inputs to linear, unconnected inputs to off.	P 48.*	○	○	○	○
▶ Enter parameter value for **reference marks** (see Parameters, table 3.2).	P 45.*	○	○	○	○
▶ Set **counting direction** of the machine axes. Increasing positive display values must correspond to the positive direction of machine axis traverse in relation to the workpiece.	P 40.*	○	○	○	○
▶ Approach a datum on the workpiece and **set the display value (ACTUAL POSITION** function). Then move individual axes and **compare** the actually traversed **distance** with the **value** displayed on the POSITIP.	P 41.* P 42.*	○	○	○	○
▶ Check **display step** (see Parameters, table 3.1).	P 43.*	○	○	○	○

* The asterisk „*" signifies parameters which are specified according to axis by a number behind the decimal point (e.g. 4.1, 4.2 etc.).

(For parameter descriptions see Parameters, section 1.4).

Parameters

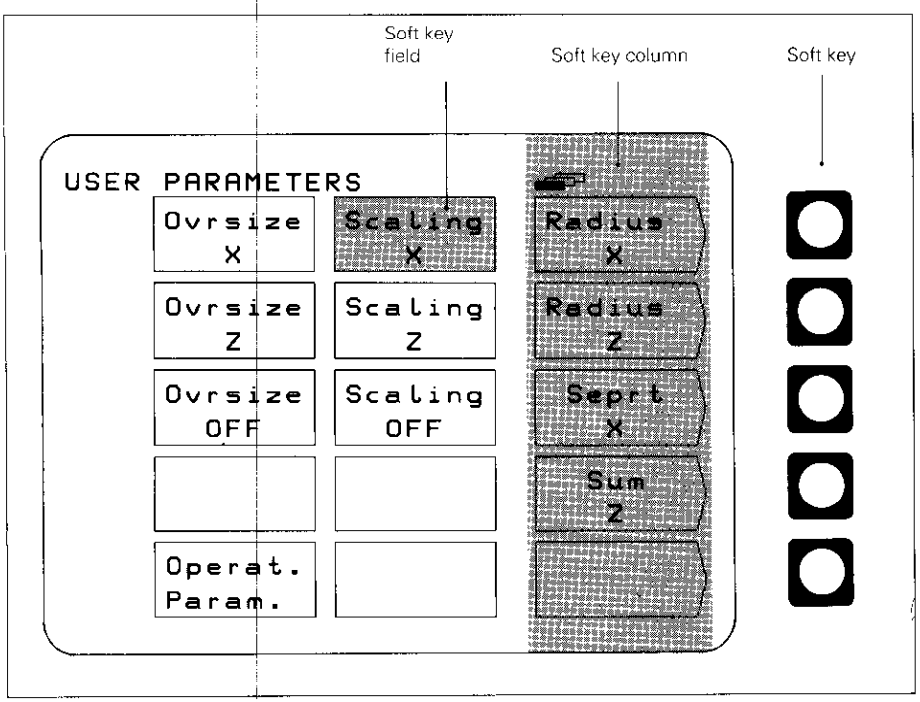
The operational characteristics of the POSITIP 850 can be modified via user parameters and operating parameters. While **user parameters** can be changed at any time by the operator, **operating parameters** are given a fixed setting which corresponds to the details of the specific machine tool. The parameters are given a standard presetting in the factory.

All parameters are in non-volatile storage (i.e., they are not affected by power interruptions). All changes are effective immediately!

1 User Parameters

User parameters are parameters which must be entered or changed frequently during normal machine operation. Press the MOD key to call the menu for user parameters. To leave the menu, press the MOD key again.

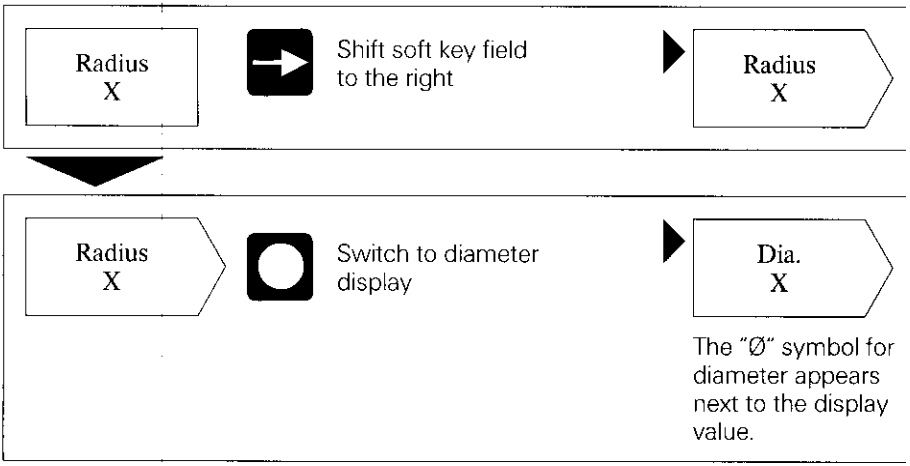
Menu: User Parameters



■ Changing with Soft Keys

Soft keys can be used to change from radius to diameter display, to switch the axis combination from separate to sum, and to select scaling factor ON or OFF and oversize ON or OFF.

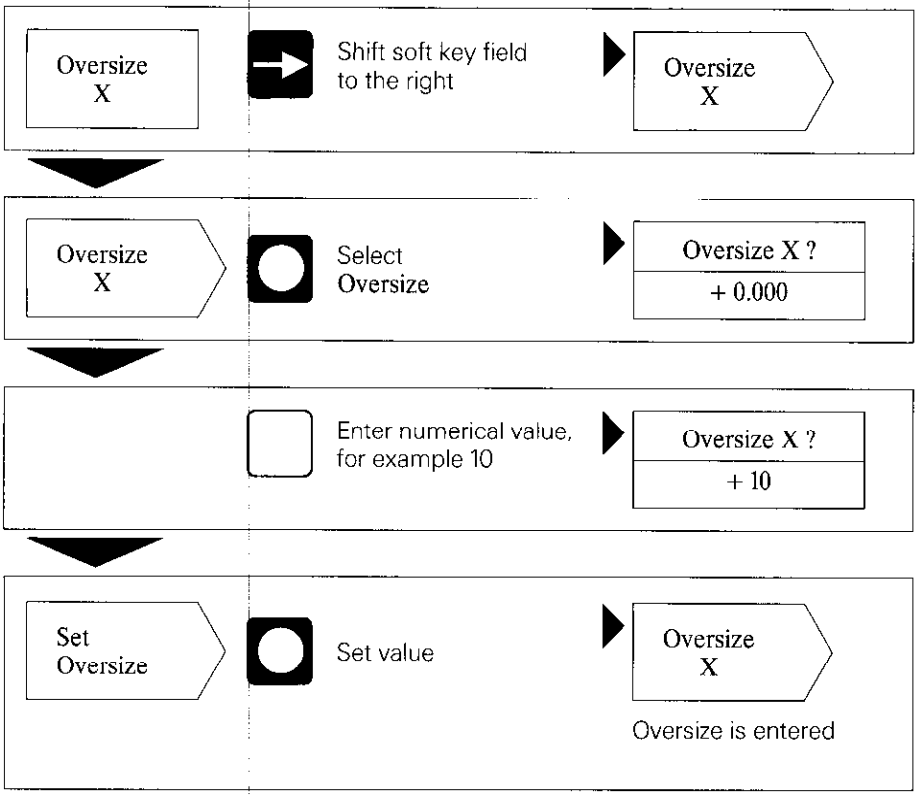
Example: Radius or Diameter Display



■ Changing User Parameters Via Numerical Input

This concerns the input of scaling factors and oversizes.

Example: Oversize



1.2 Overview of User Parameters

Selection via MOD key

Function	Axis	Change	Input
Radius/Diameter	X Z	Soft key	–
Separate/Sum	X Z	Soft key	–
Scaling Factor	X Z	Numerical input	0.100000 to 9.999999
Scaling Factor ON/OFF		Soft key	–
Oversize	X Z	Numerical input	0 to ± 199.999
Oversize ON/OFF		Soft key	

(For descriptions of user parameters see section 4.1)

If "Diameter" or "Scaling Factor ON" have been selected, the following symbols appear behind the display value:

Ø: Diameter display
!: Scaling factor active
!: Oversize active (only with the Distance-To-Go function).

2 Operating Parameters

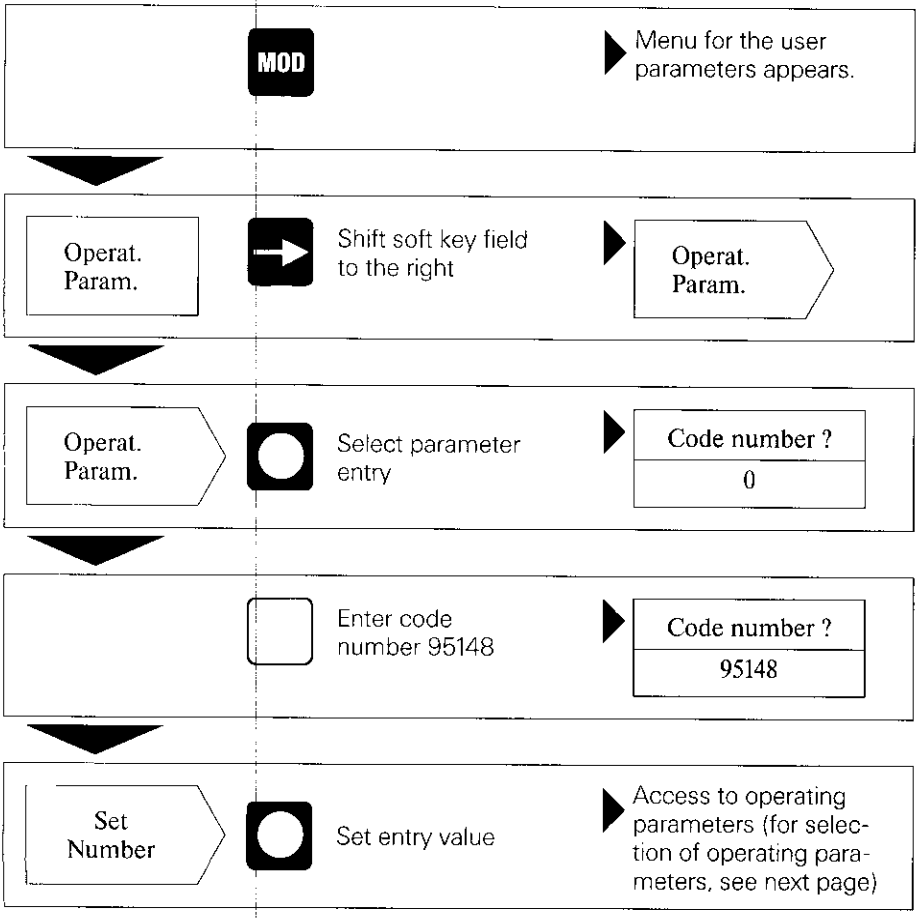
There are three groups of operating parameters:

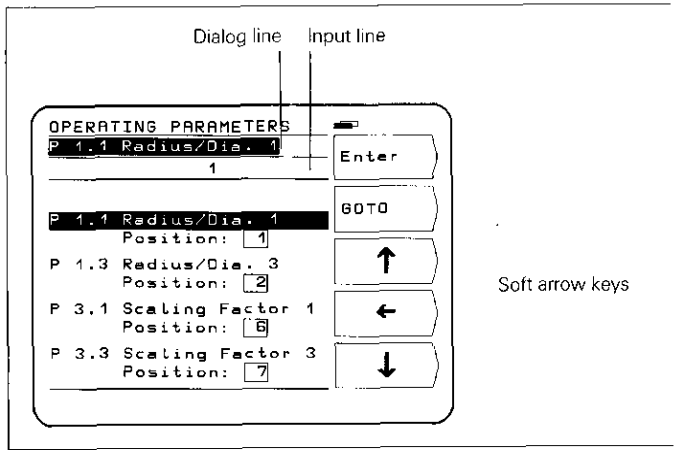
- P 1.1 to P12.0 – configuration of the user parameters
- P21.1 to P32.0 – presetting of the user parameters
- P40.1 to P99.0 – operating parameters for machine interface

These settings are normally made only once during commissioning and then remain fixed.

Operating parameters can only be selected through code number **95148** and should not be changed by the machine operator. We recommend that you keep a written copy of the entry values for the operating parameters or store them on an external data medium.

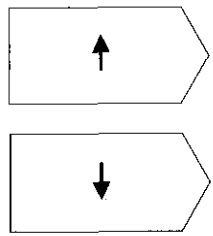
2.1 Accessing the Operating Parameters





Selecting the Operating Parameters

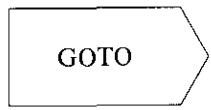
■ Selection via vertical soft arrow keys



Select desired operating parameter with vertical soft arrow keys.

or

■ Selection via GOTO



Press soft key (the last selected parameter number will appear in the input line).

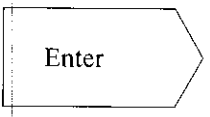
Enter desired parameter number.

Select operating parameter.

Changing Operating Parameters

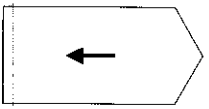
■ Changing operating parameters by entering a numerical value

Example: P 31.1
Enter numerical value (e.g. 1).

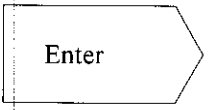


Pressing the soft key **Enter** transfers the entry value; the next parameter is then displayed.

■ Changing operating parameters with the horizontal soft arrow key



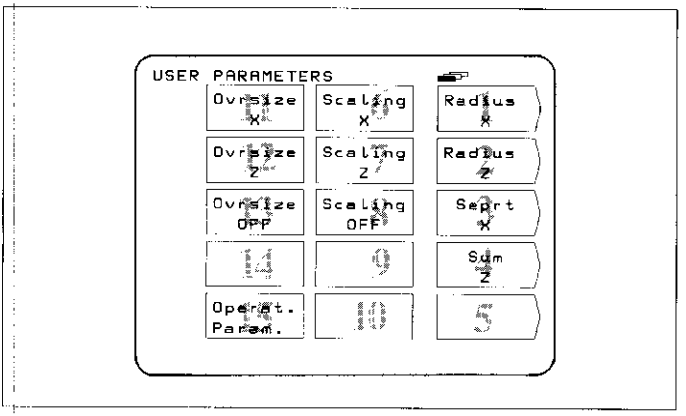
The frame in the parameter line indicates the current parameter entry value. Press the soft key to bring the next parameter entry value into the frame.



Pressing the soft key **Enter** transfers the entry value; the next parameter is then displayed.

2.2 Configuring the User Parameters

Pressing the MOD key calls the user parameters to the display. These parameters are located in soft-key fields in a certain arrangement of field positions. The field positions are indicated by the numbers in the illustration below (factory presetting as it appears after switch-on).



The field position of any user parameter can be changed by means of the operating parameters P 1.1 to P 12.0. (Exception: field position 15 – operating parameters.) By entering a position of 0, the selected user parameter can be locked from access.

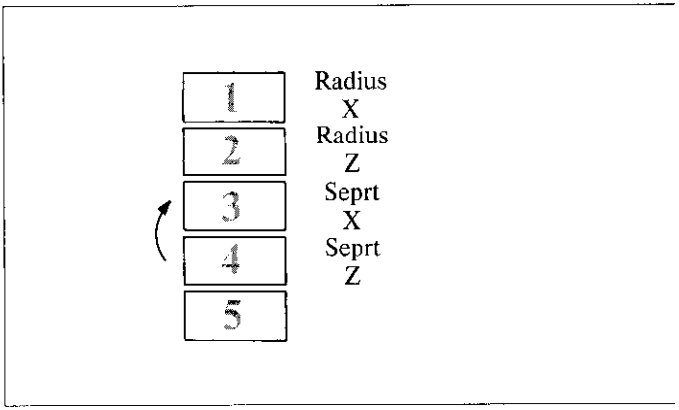
Changing the *Field Position*

► First you must gain access to the operating parameters using the procedure described above in section 2.1. Then select the desired soft-key field.

Example:

You wish to transfer the parameter in field position 4 to field position 3.

Original Display



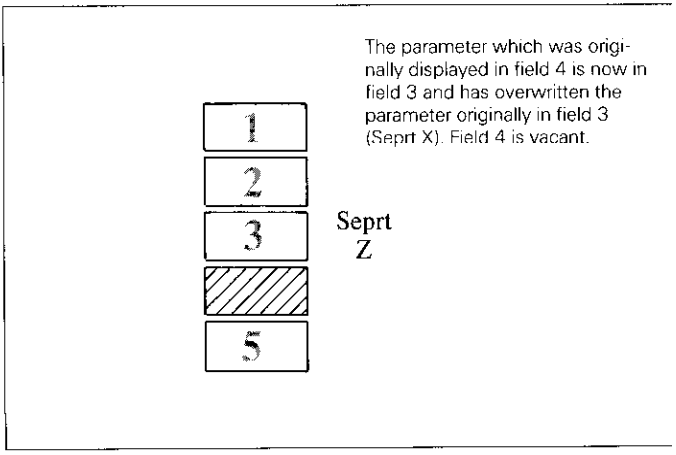
Procedure

► Select the parameter in field position 4 (factory preset to P 10.3).

► Enter the new field position (position 3) with numeric keypad and press the soft key **Enter**.

Pressing the ↑ key recalls the menu for the user parameters.

New Display



The overwritten parameter (Seprt X) can be re-entered into the table as follows:

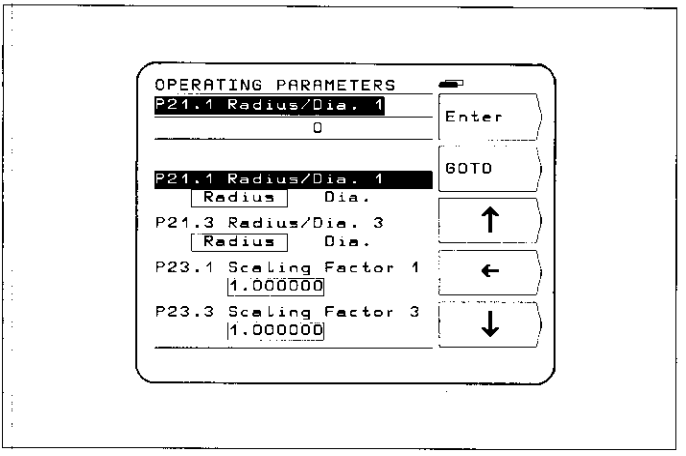
- Repeat procedure for access to operating parameters and select the overwritten parameter (P 10.1 Seprt X). This parameter has assumed the Position: 0.

Access to user parameters via the MOD key can be locked by entering Position: 0.
Note: Locked user parameters can only be changed via the operating parameters P21.1 to P32.0.

If you wish to transfer the locked user parameter (P 10.1) to the vacant field position 4, enter field position 4 for this parameter.

2.3 Presetting the User Parameters

User parameters can also be set with the operating parameters (P21.1 to P32.0). This makes it possible to change locked user parameters. Changing these parameters is effective regardless of whether they are changed in the "User Parameters" menu or the "Operating Parameters" menu.



2.4 *Overview of* Operating Parameters

Function	Parameter	Axis*		Entry**
Radius/Diameter X1/X2	P 1.1	X		**1**
Radius/Diameter X3/X4	P 1.3	Z		**2**
Scaling Factor X1/X2	P 3.1	X		**6**
Scaling Factor X3/X4	P 3.3	Z		**7**
Scaling Factor ON	P 4.0			**8**
Baud Rate RS-232-C	P 7.0			**0**
Line Feed RS-232-C	P 8.0			**0**
Mode of Operation	P 9.0			**0**
Separate/Sum X1/X2	P 10.1	X		**3**
Separate/Sum X3/X4	P 10.3	Z		**4**
Oversize X1/X2	P 11.1	X		**11**
Oversize X3/X4	P 11.3	Z		**12**
Oversize ON	P 12.0			**13**
Radius/Diameter X1/X2	P 21.1	X		**Radius,** Diameter
Radius/Diameter X3/X4	P 21.3	Z		
Scaling Factor X1/X2	P 23.1	X		**1.000000** (0.100000 to 9.999999)
Scaling Factor X3/X4	P 23.3	Z		
Scaling Factor ON	P 24.0			**off,** on
Baud Rate RS-232-C	P 27.0			**9.600** (110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 baud)
Line Feed RS-232-C	P 28.0			**1** (0 to 99)
Separate/Sum X1/X2	P 30.1	X		**Separate,** Sum
Separate/Sum X3/X4	P 30.3	Z		**Separate,** Sum
Oversize X1/X2	P 31.1	X		**0.000**
Oversize X3/X4	P 31.3	Z		(0 to ±199.999)
Oversize ON	P 32.0			**off,** on

Operating Parameters (cont'd.)

Function	Parameter	Axis*		Entry**
Counting Direction X1	P 40.1	X_0		**normal,** inverse
Counting Direction X2	P 40.2	X		
Counting Direction X3	P 40.3	Z_0		
Counting Direction X4	P 40.4	Z		
Signal Period X1	P 41.1	X_0		4 µm, 10 µm, **20 µm,** 40 µm, 100 µm, 200 µm
Signal Period X2	P 41.2	X		
Signal Period X3	P 41.3	Z_0		
Signal Period X4	P 41.4	Z		
Linear Subdivision X1	P 43.1	X_0		100, 80, 50, 40, **20,** 10, 8, 5, 4, 2, 1, 0.8, 0.5, 0.4, 0.2, 0.1 (depends on grating period set)
Linear Subdivision X2	P 43.2	X		
Linear Subdivision X3	P 43.3	Z_0		
Linear Subdivision X4	P 43.4	Z		
Distance Coding X1	P 45.1	X_0		none, 500, **1000,** 2000
Distance Coding X2	P 45.2	X		
Distance Coding X3	P 45.3	Z_0		
Distance Coding X4	P 45.4	Z		

(For description see section 4.2)

* For the sake of simplicity, the axis designations are assumed to be those set in parameter P50.* (X1/X2 = X-axes, X3/X4 = Z-axes).
X1, X2, X3, X4 are the corresponding designations of the encoder inputs (see rear panel).

** Factory presettings are indicated in **bold type.**

Operating Parameters (cont.'d.)

Function	Parameter	Axis*		Entry**
Monitoring X1	P 46.1	X_0		off, **on**
Monitoring X2	P 46.2	X		
Monitoring X3	P 46.3	Z_0		
Monitoring X4	P 46.4	Z		
Linear Correction X1	P 47.1	X_0		**0** to ± 99999 µm/m
Linear Correction X2	P 47.2	X		
Linear Correction X3	P 47.3	Z_0		
Linear Correction X4	P 47.4	Z		
Axis Definition X1	P 48.1	X_0		off, **linear**
Axis Definition X2	P 48.2	X		
Axis Definition X3	P 48.3	Z_0		
Axis Definition X4	P 48.4	Z		
Axis Designation X1/X2	P 50.1	X		A, B, C, U, V, W, **X**, Y, **Z**
Axis Designation X3/X4	P 50.3	Z		
Dialog Language	P 52.0			2 languages can be selected (see section 4.2)
Zero Range X1	P 56.1	X_0		**0** (0 to 99.999 mm)
Zero Range X2	P 56.2	X		
Zero Range X3	P 56.3	Z_0		
Zero Range X4	P 56.4	Z		

Operating Parameters (cont'd.)

Function	Parameter	Axis*		Entry**
Display Freeze	P 57.0			**off,** concurrent, stopped
Distance-To-Go Mode	P 58.0			**graphic,** actual value
Sleep Delay	P 59.0			**15** 5 to 98 (min.) 99 = no protective standby mode
Positioning Aid	P 60.0			**normal,** inverse
Counter Application	P 99.0			milling, **turning**

(For description see section 4.2)

* For the sake of simplicity, the axis designations are assumed to be those set in parameter P50.* (X1/X2 = X-axes, X3/X4 = Z-axes).
X1, X2, X3, X4 are the corresponding designations of the encoder inputs (see rear panel).

** Factory presettings are indicated in **bold type.**

3 Tables

3.1
Display Step, Signal Period and Subdivision Factor for Linear Encoders

Signal Period	4 µm	10 µm	20 µm	40 µm	100 µm	200 µm
Display Step	**Subdivision Factor**					
0.00005 mm/0.000002 in.	80	–	–	–	–	–
0.0001 mm/0.000005 in.	40	100	–	–	–	–
0.0002 mm/0.00001 in.	20	50	100	–	–	–
0.0005 mm/0.00002 in.	8	20	40	80	–	–
0.001 mm/0.00005 in.	4	10	20	40	100	–
0.002 mm/0.0001 in.	2	5	10	20	50	100
0.005 mm/0.0002 in.	0.8	2	4	8	20	40
0.01 mm/0.0005 in.	0.4	1	2	4	10	20
0.02 mm/0.001 in.	–	0.5	1	2	5	10
0.05 mm/0.002 in.	–	0.2	0.4	0.8	2	4
0.1 mm/0.005 in.	–	0.1	0.2	0.4	1	2

3.2
Distance-Coded Reference Marks

Linear Encoder	**Max. Traverse for Recovery of the Datum**	**Parameter**
No distance-coded reference marks	Depends on position of the encoder	P 45.* = none
LS 101C	10 mm	P 45.* = 1000
LS 107C LS 303C LS 403C LS 404C LS 603C LS 704C	20 mm	
ULS 300C/10 ULS 300C/20	10 mm (grating period 10 µm) 20 mm (grating period 20 µm)	
LID 311C LID 351C	20 mm	P 45.* = 2000

4 Parameter Description

4.1 User Parameters

Radius/ Diameter

With this parameter you can select radius or diameter display. If you select diameter, the symbol "Ø" will appear behind the display value.

Separate/Sum

With the parameter Separate/Sum it is possible to display separately or as a sum the position values of saddle and top slide as well as of cross slide and compound cross slide.

Scaling Factor

The scaling factor changes the display value and thus either reduces (input 0.1 to 0.999999) or increases (input 1.000001 to 9.999999) the dimensions of the workpiece to be machined. The scaling factor can be entered either for the X and Z axes together, or separately for each axis.

If the scaling factor is entered with the soft key **Set for all**, it is effective for all axes.

Scaling Factor OFF/ON

By selecting scaling factor OFF, all scaling factors are deactivated. When scaling factor ON is selected, the symbol "!" appears behind the display value.

Oversize

An oversize entered (0 to ± 199.999 mm) is applied to the nominal position value entered in the Distance-To-Go function. An oversize can be entered separately for each axis.

Oversize is only effective with the **Distance-To-Go** function.

When working with POSITIP programs, an oversize should already be taken into account when entering the nominal positions. Using the **Oversize** user parameter with programs is not recommended, since this parameter is continually active when **Oversize ON** is selected (modally effective).

A negative oversize reduces the contour.

Oversize OFF/ON

When Oversize OFF is selected, all oversizes become inactive. When oversize ON is selected, the symbol "!" appears behind the display value.

Special Case: Mode of Operation

This parameter is not configured as a user parameter in the factory presetting. With the **Mode of Operation** parameter you can choose among the **BASIC, EXPERT** and **PROGO** modes of operation via the MOD key without switching the unit off.

The user parameter **Mode of Operation** is only active if operating parameter P 9.0 is configured as a user parameter (see section 4.2).

4.2
Operating Parameters P

In the following description, **axis-specific parameters** are indicated by a parameter number with decimal point and asterisk (example: P 1.*).

The asterisk signifies the axis-specific designation after the decimal point (e.g. P 1.* → P 1.1 or P 1.3 etc.).

Parameters which are **not axis-specific** are indicated by a **0** behind the decimal point (e.g. P 7.0).

P 1.* to P 12.0

The "User Parameters" menu is configured by entering positions in operating parameters P 1.* to P 12.0. The user parameters can be configured in any desired sequence within the positions 1–14. Position: 0 locks the respective parameter from access via the MOD key (see section 2.2).

Special Case: P 9.0 Mode of Operation

In order to prevent an inexperienced operator from making mistakes, the mode selection (BASIC, EXPERT, PROGO) should be made accessible immediately after switch-on and then remain unchangeable during machine operation. Parameter P 9.0 is therefore not active as a user parameter **(position = 0).** If parameter P 9.0 is configured as a user parameter the operating mode can also be selected during machining.

If you wish parameter P 9.0 to be a user parameter, a vacant position should be chosen (such as position = 14).

P 21.1 to P 32.0

User parameters can also be set in the operating parameters (P 21.1 to P 32.0), making it possible to change even locked user parameters. Changing these parameters is effective regardless of whether they are changed in the "User Parameters" or in the "Operating Parameters" menu. (For description, see section 4.1.)

P 40.* Counting Direction

With parameter P 40.* you can set the counting direction separately for each axis.

P 41.* Signal Period

The signal periods of the connected linear encoders are entered in parameter P 41.*.

P 43.*
Linear Subdivision

The subdivision factor is entered in parameter P 43.*. The subdivision factor determines the display step and depends on the setting of the signal period (see Table 3.1).

P 45.*
Distance Coding

Parameter P 45.* defines whether the display unit is to evaluate signals from encoders with single or with distance-coded reference marks. For encoders with single reference marks, select **none**. For distance-coded reference marks, the entry value depends on the encoder model (see Table 3.3).

P 46.*
Monitoring

With parameter P 46.* **on**, the corresponding encoder input signal is checked for the following errors:

- excessive traversing speed
- cable break
- measuring signal error

These errors are then displayed on the screen.

P 47.*
Linear Correction

Machine errors can be measured with the aid of a comparator measuring system (e.g. VM 101 from HEIDENHAIN). These errors can be entered in parameter P 47.* as a linear correction factor in parts per million (ppm) measuring length.

Example:

Measuring length	620 mm
Value actually measured (e.g. via VM 101)	619.876 mm
Difference	= – 124 µm

Conversion to 1 m measuring length

$$\frac{-124\ \mu m}{0.620\ m} = -200\ \mu m$$

Correction factor – 200 µm

Linear Compensation	Parameter Input Range
"Lengthening" the encoder	P47: 0 to + 99999 [µm/m]
"Shortening" the encoder	P47: 0 to – 99999 [µm/m]

P 48.*
Axis Definition

Parameter P 48.* defines whether the axis input is inhibited.

For unused encoder inputs enter **off** in parameter P 48.*.

P 50.*
Axis Designation

Parameter P 50.* defines the assignment of axis names to inputs.
Possible settings: A, B, C, U, V, W, X, Y, Z.

P 52.0
Dialog Language

The dialog language can be chosen from two available languages. Which two languages are available depends on the program number:

Program No.	Languages	
246060..	German	English
246061..	French	English
246062..	Dutch	English
246063..	Italian	English
246064..	Spanish	English
246065..	Danish	English
246066..	Swedish	English
246067..	Finnish	English
246068..	Turkish	English
246069..	German	French
246070..	Dutch	French
246071..	Magyar	English
246072..	Czech	English
246073..	English	French

P 56.*
Zero Range

Parameter P 56.* defines a range around display value "zero" in which a zero crossover signal will be generated (see External Functions).
Input range: 0 to 99.999 mm.

P 57.0
Display Freeze

The current measured value is stored and output over the RS-232-C data interface with every storage procedure (CTRL, pulse, contact). The display on the **screen** can be set with parameter P 57.0:

off: the display is not stopped during a storage signal
concrnt: the display is stopped only for the duration of the storage signal
stopped: the display is stopped, but is updated by every storage signal

P 58.0
Distance-To-Go Mode

In the distance-to-go function, the actual value can be displayed instead of the graphic positioning aid.

graphic: graphic positioning aid
actual value: display of the absolute position in small type beneath the distance-to-go display.

P 59.0
Sleep Delay

Parameter P 59.0 allows input of a delay time (in minutes) for protective standby mode. If no keys are pressed and no axis movements take place for the length of time entered as the delay time, the screen image is reversed. This prevents screen burning.

5 – 98: delay time in minutes
99: no protective standby mode.

P 60.0
Positioning Aid

With parameter P 60.0, the direction of movement of the graphic positioning aid (see P 58.0) can be changed to adapt it to tool movement on the Z axis of lathes.

P 99.0
Counter Application

This parameter sets up the POSITIP 850 either for milling or turning.

Data Interface

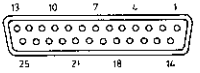
POSITIP is equipped with a data interface according to EIA standard RS-232-C (CCITT standard V.24).

1 Definition of the RS-232-C/V.24 Interface

The data transfer code is ASCII with even parity bit. The RS-232-C data interface is designed for serial data transfer; devices with parallel data interfaces cannot be connected. Levels for TXD and RXD (negative level for "1"):

Logic Level	Working Level
"1": −3 V to −15 V "0": +3 V to +15 V	−5 V to −15 V +5 V to +15 V

2 Pin Layout X31 Signal Description



RS-232-C/V.24 port

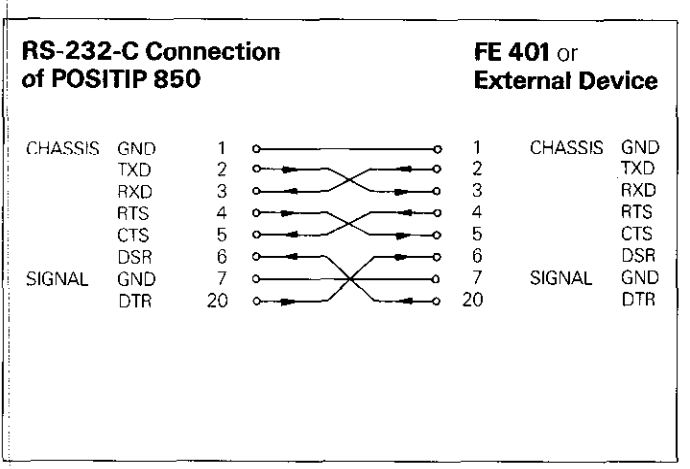
Contact No.	Signal	Meaning
1	CHASSIS GND	Protective Ground
2	TXD	Transmit Data
3	RXD	Receive Data
4	RTS	Request To Send
5	CTS	Clear To Send
6	DSR	Data Set Ready
7	SIGNAL GND	Signal Ground
8–19		(vacant)
20	DTR	Data Terminal Ready
21–25		(vacant)

3 Connection of External Units (Wiring)

The connecting cables must be wired in accordance with the type of data device employed. Pin layouts are sometimes non-standard.

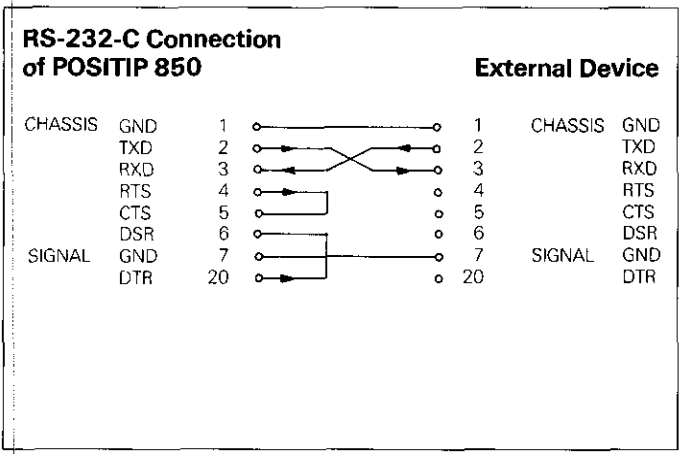
Frequently used wiring:

Complete Wiring



Signals RTS, CTS, DSR and DTR must have working level "1" (–5 to –15 V) for data transfer.

Simplified Wiring



Signals RTS, CTS, DSR and DTR have permanent working level "1" (–5 V to –15 V) due to bridges 4/5 and 6/20.

4 Data Transfer

Measured values, part programs and operating parameters can transferred over the PT 850's RS-232-C data interface. The data interface can operate with two different data transfer protocols:

- ▶ External data transfer protocol (EXT) for printers, punching units, readers and other peripherals.
- ▶ FE data transfer protocol (FE) for the HEIDENHAIN FE 401 Floppy Disk Unit or a suitably adapted computer.

	Data Transfer Protocol*	**Start Data Transfer With**
Measured value output	EXT	RS-232-C interface (CTRL B) Ext. functions (pulse, contact)
Program input	FE or EXT	"EXTERNAL INPUT" menu
Program output	FE or EXT	"EXTERNAL OUTPUT" menu
Input and output of operating parameters	FE or EXT	"OPERATING PARAMETERS" menu

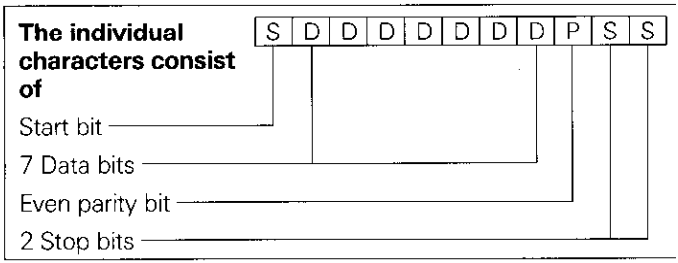
* Select FE or EXT protocol via the arrow keys in the corresponding menus.

4.1 Data Transfer Rate (Baud Rate)

The baud rate indicates the number of bits which can be transferred per second.
Peripheral devices must be fully able to process the selected baud rate in order to avoid errors in data transfer. The desired baud rate is selected in the user parameters (via the MOD key). The selected baud rate must be identical to the baud rate of the peripheral device.

In FE mode (for the FE 401 Floppy Disk Unit from HEIDENHAIN), the data transfer rate is always 9600 baud regardless of the baud rate set via the MOD key.

4.2 Data Format



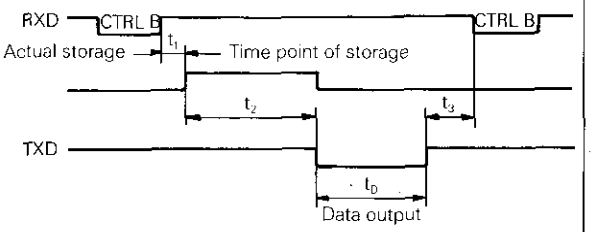
The connected unit must be set to "even parity" because of the error monitoring employed in this output. A data transfer cable (Id.-Nr. 242869..) is available from HEIDENHAIN.

4.3 Measured Value Output

The current display value can be transferred over the RS-232-C data interface to peripheral equipment such as a printer. After an external storage command, the measured value is output (for a maximum of 4 axes) through an internal buffer. The storage signal can be generated via the RS-232-C interface or via the "external functions".

4.3.1 Storage via RS-232-C Interface

When the control character CTRL B (= STX) is transmitted, a storage signal is generated and the measured value is transmitted over the TXD output of the RS-232-C data interface. The duration of data transfer depends on the selected baud rate, the number of axes and the number of line feeds.



$t_1 \leqq 0.5$ ms
$t_2 \leqq 30$ ms
$t_3 \geqq 0$ ms

$$t_D = \frac{187 \times M + (L \times 11)}{\text{Baud rate}} \text{ s}$$

L = Numer of line feeds
M = Number of axes

Interruption of Data Transfer

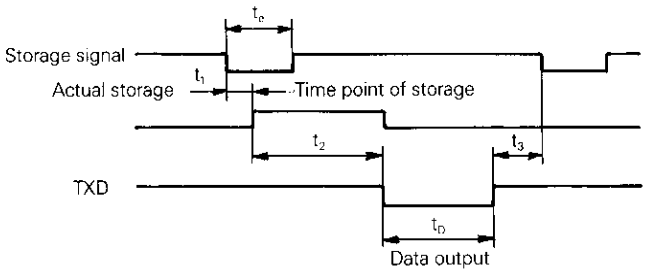
The receiving device can interrupt and restart data transfer by

- Start/stop via the RXD input of the data interface
  DC3 = X OFF = CTRL S: interrupt data transfer
  DC1 = X ON = CTRL Q: resume data transfer
- Control line CTS

After the stop signal CTS or the stop character DC3 has been received, no more than two additional characters can be output.

4.3.2 Storage via External Functions

Contact closing against 0 V on the 25-pole D-subminiature socket X41 causes a storage signal to be generated and the measured value to be transmitted over the TXD output of the RS-232-C interface. The time required for data transfer depends on the selected baud rate, the number of axes, the number of line feeds and the type of storage signal (pulse or contact).



$t_1 \leqq 0.8$ µs — Delay between storage signal and actual storage (pulse)

$t_1 \leqq 4.5$ ms — Delay between storage signal and actual storage (contact)

$t_e \geqq 1.2$ ms — Input signal (pulse)

$t_e \geqq 7$ ms — Input signal (contact)

$t_2 \leqq 30$ ms

$t_3 \geqq 0$ ms

$$t_D = \frac{187 \times M + (L \times 11)}{\text{Baud rate}} \text{ s}$$

L = Number of line feeds

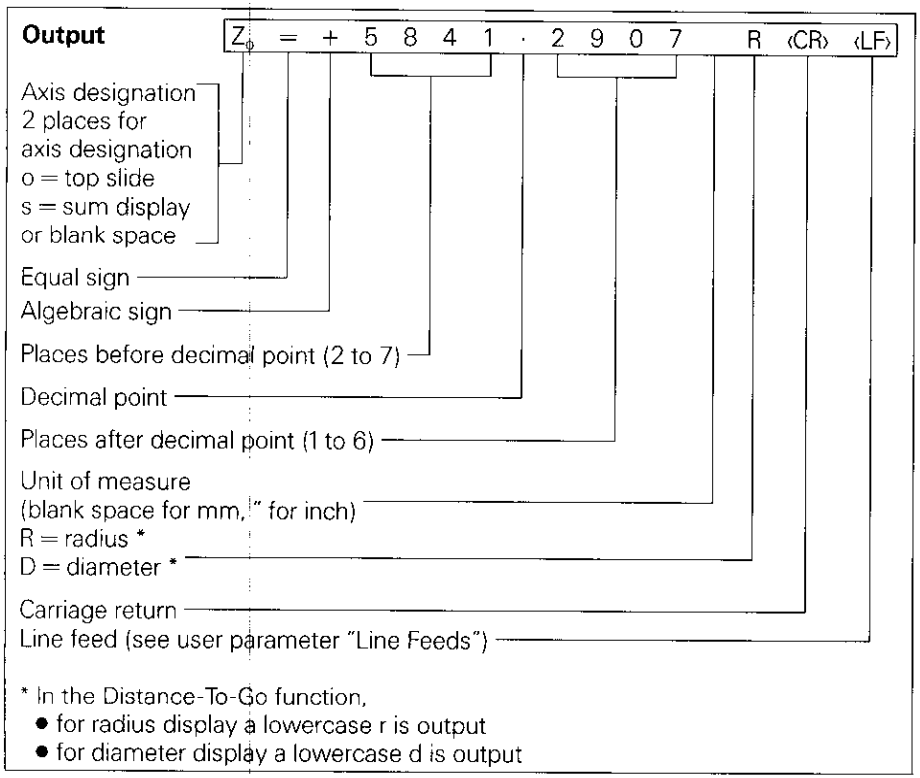
M = Number of axes

The transit time of the encoder signals from input to the internal buffer is approximately 4 µs. The measured value which is stored is therefore the value which existed approximately 4 µs prior to the time point of storage.
(See also External Functions).

4.3.3 Sequence of Character Output

Depending on the axis definition, the characters for measured value output are generated in the following order:

Sequence of Character Output (example for linear axis)



No display values are produced if the linear encoder is defective. In this case, question marks (?) are generated for the algebraic sign and display value.

4.4 External Input/ Output of Programs

In the PROGO mode of operation, it is possible to read programs into or out of POSITIP over the RS-232-C data interface (see Working with the POSITIP 850).

4.5 Input/Output of Operating Parameters

Operating parameters can be input and output over the RS-232-C data interface. Printers connected to the PT 850 must be equipped with a serial RS-232-C interface (for the data format see section 4.2).

Programs and operating parameters with the same program number can be stored with the FE 401 Floppy Disk Unit from HEIDENHAIN. When loading operating parameters, POSITIP automatically generates program number 850 unless a different number is entered.

Sequence:

- ▶ Access operating parameters (see Parameters, section 2).
- ▶ [ ] Select page 2 (menu for parameter input/output).
- ▶ [←] [→] Set interface to **FE** (FE 401 Floppy Disk Unit) or **EXT** (for printer or other peripheral device).

In FE mode, the data transfer rate is always 9600 baud, independent of the baud rate set via MOD. When EXT is selected, the baud rate set via MOD for printer output is effective.

- ▶ **Param. Input** — Operating parameters with program number 850 are read in.
- ▶ **Param. Output** — Operating parameters are read out with program number 850.

If you do not wish to input or output the operating parameters with program number 850, then the desired program number must be entered before pressing the **Param. Input** or **Param. Output** soft keys.

- ▶ **FE 401 PGM Dir** — Displays the program directory of the FE 401. During read-in of the directory, the dialog **Reading FE Directory:** is displayed.
- ▶ **Escape** — Data transfer is terminated.

External Functions

1 Pin Layout X41 (EXT) (25-pole D-Subminiature Socket)

Pin	Assignment		Duration of pulse/ contact closing
1/10		0 V	
2	I	Set axis 1 to zero	$t \geqq 100$ ms
3	I	Set axis 2 to zero	$t \geqq 100$ ms
4	I	Set axis 3 to zero	$t \geqq 100$ ms
5	I	Set axis 4 to zero	$t \geqq 100$ ms
14	O	Zero crossover axis 1	
15	O	Zero crossover axis 2	
16	O	Zero crossover axis 3	
17	O	Zero crossover axis 4	
21	O	EMERGENCY STOP	
22	I	Storage pulse	$t \geqq 1.2$ µs
23	I	Storage contact	$t \geqq 7$ ms

I = Input
O = Output

2 External Zero Reset

The inputs (pins 2, 3, 4, 5) are active LOW (open = high level).
$U_{eH} \geqq 3.9$ V (max. 15 V)
$U_{eL} \leqq 0.9$ V at $-I_{eL} \leqq 6$ mA
Switching via TTL components (e.g. SN 74LSXX) is made possible by an internal **1 kΩ** pull-up resistor. Contact closing against 0 V (pin 1 or 10) clears display of the corresponding axis.

External zero reset is only possible during display of actual position.

3 Storage (*Pulse, Contact*)

Contact closing against 0 V (pin 1 or 10) causes a storage signal to be generated and a measured value to be output over the RS-232-C data interface (see Data Interface, section 4.3).

4 Zero Crossover Signal

A zero crossover signal is produced when the display value of the corresponding axis is zero. A zero recognition range (0 to 99.999 mm) can be entered in parameter P 56.*. If the zero recognition range is moved over quickly, signal duration is approximately 180 ms.

Technical Data

Open-collector output
Zero crossover signal active HIGH (open-collector transistor inhibited).

Permissible Load Types

Resistive load
Inductive load only with quenching diode
High level output voltage $U_{oH} \leqq 32$ V
(32 V = absolute maximum value of the voltage applied over external resistor or relay)
Low level output voltage $U_{oL} \leqq 0.4$ V at $I_{oL} \leqq 100$ mA
Low level output current $I_{oL} \leqq 100$ mA
(100 mA = absolute maximum value)
Signal triggering delay $t_{an} = 60 \pm 20$ ms
Signal duration $t_s = 180$ ms

5 EMERGENCY STOP Signal

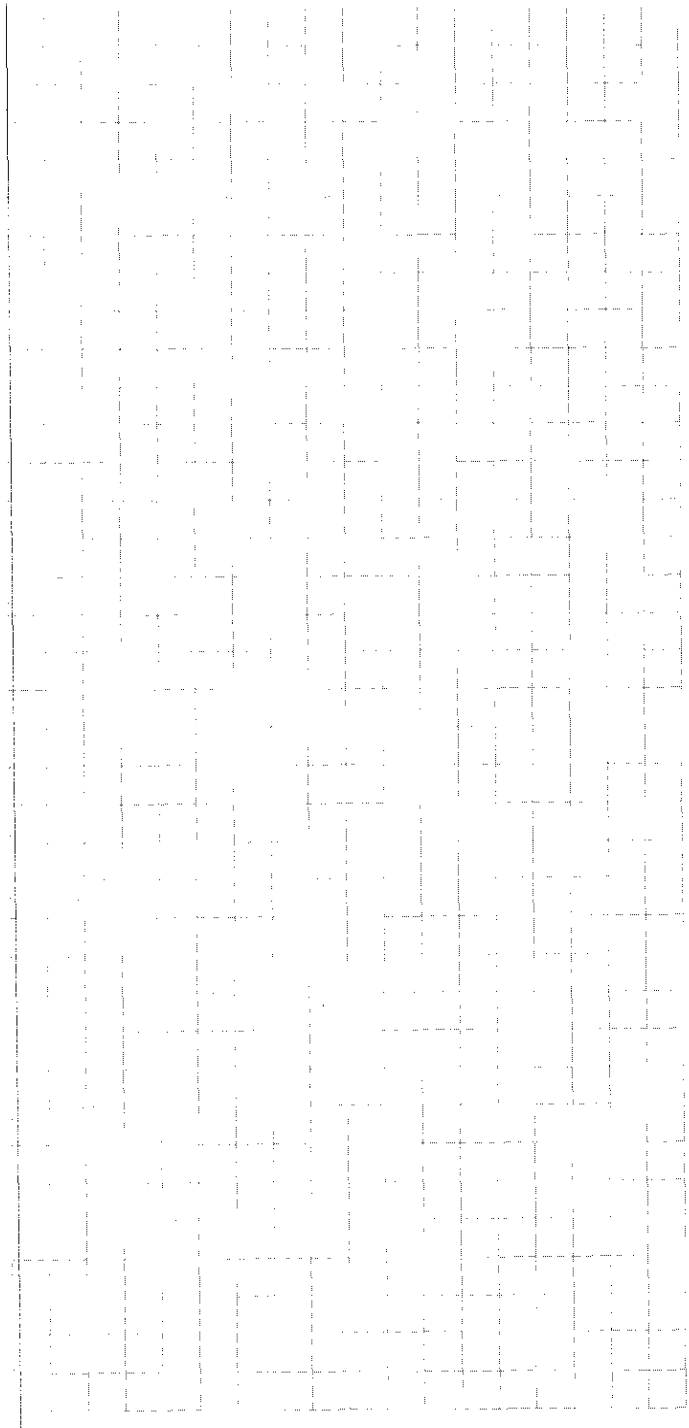
If a critical error occurs within POSITIP, an EMERGENCY STOP signal is sent over an open-collector output.

Technical Data

Open-collector output
EMERGENCY STOP signal active HIGH (open-collector transistor inhibited).

Permissible Load Types

Resistive load
Inductive load only with quenching diode
High level output voltage $U_{oH} \leqq 32$ V
(32 V = absolute maximum value of the voltage applied over external resistor or relay)
Low level output voltage $U_{oL} \leqq 0.4$ V at $I_{oL} \leqq 100$ mA
Low level output current $I_{oL} \leqq 100$ mA
(100 mA = absolute maximum value)
Signal triggering delay $t_{an} \leqq 50$ ms



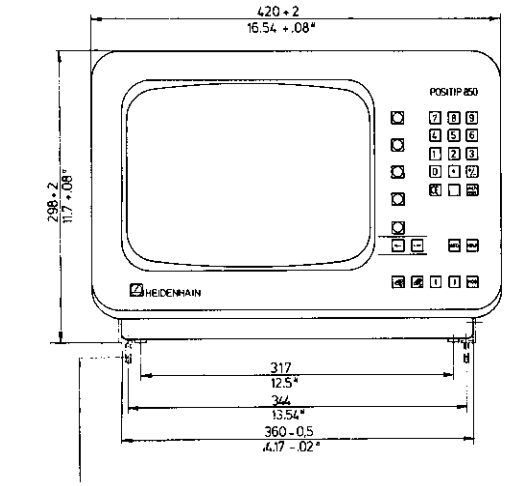
Specifications POSITIP 850 For Lathes

Mechanical Data	
Housing	Tabletop model, sheet metal chassis; Dimensions (W x H x D) 420 mm x 298 mm x 330 mm (16.5 in. x 11.7 in. x 13.0 in.)
Weight	Approx. 11.7 kg (25.7 lb)
Operating Temperature **Storage Temperature**	0 to 45° C (32 to 113° F) – 30 to 70° C (– 22 to 158° F)
Visual Display	12-inch monochrome CRT
Electrical Data	
Power Supply	Primary-clocked variable-voltage power supply 100 V – 240 V (– 15% to + 10%) Line frequency 48 Hz to 62 Hz
Power Consumption	Approx. 31 W
Encoder Inputs Signal amplitudes Permissible input frequency	For all HEIDENHAIN linear encoders with sinusoidal scanning signals, also with distance-coded reference marks 7 to 16 μA_{PP} Max. 100 kHz
Data Interface	RS-232-C/V.24, for measured values, programs and operating parameters 110/150/300/600/1200/2400/4800/9600/19 200/38 400 baud

Features	
Axes	4 axes with the designations: A, B, C, U, V, W, **X,** Y or **Z** Sum display: X_0 and $X = X_S$ Z_0 and $Z = Z_S$
Display Step/ Signal Period	(see Parameters, table 3.1)
Modes of Operation	BASIC, EXPERT, PROGO
Program Memory	20 different programs or 2000 program blocks
Tool Memory	Storage of data for 20 tools in non-volatile memory
Reference Mark Evaluation	For linear encoders with distance-coded reference marks or with one or more reference marks. After a power interruption the relationship between the encoder position and the display value is lost; this relationship is quickly and easily re-established by crossing the reference marks.
Functions	• Distance-To-Go display (traversing to display value 0) • Note/Set (for determining tool data) • Datum • Multipass cycle • Radius/Diameter display in 4 axes • mm/inch display • Scaling factor in 4 axes (0.100000 to 9.999999) • Oversize in 4 axes (0 to ± 199.999 mm) • Linear machine error compensation (0 to ± 99999 µm/m) • INFO: pocket calculator functions, stopwatch, taper calculator • HELP: built-in operating instructions
External Functions	• Zero reset • Storage command • Signal output with display value of zero (zero recognition range: ± 99.999 mm)
Languages	Two languages can be selected (see Parameters, section 4.2)

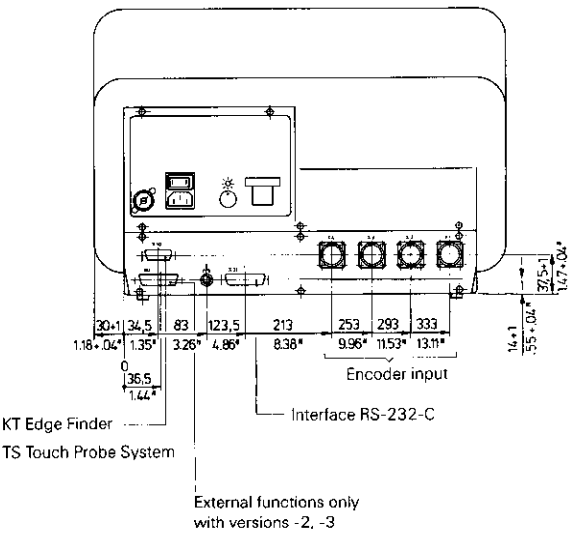
Dimensions mm/inch

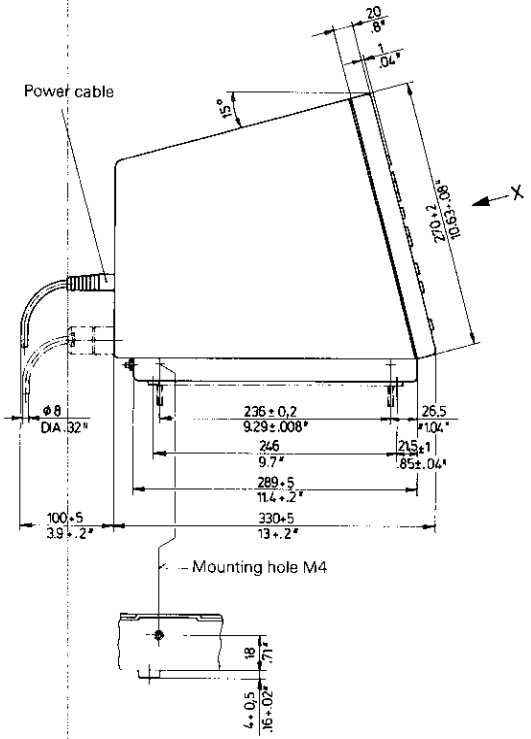
Front

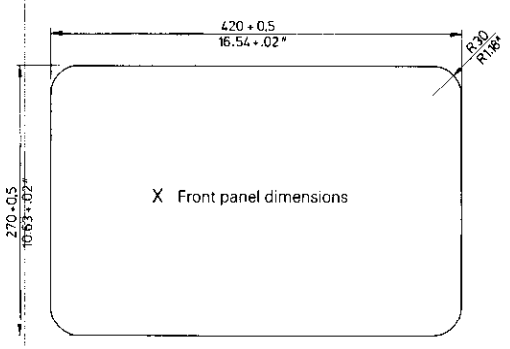


Angle bracket with threaded bolt M5 x 20

Rear




Power cable
15°
20
.8"
1
.04"
270±.2
10.63±.008"
X
ø8
DIA .32"
236±0,2
9.29±.008"
26.5
1.04"
246
9.7"
215±1
8.5±.04"
289±.5
11.4±.2"
100±.5
3.9±.2"
330±.5
13±.2"
Mounting hole M4
18
.71"
4±0,5
.16±.02"


420±0,5
16.54±.02"
R30
R1.18"
270±0,5
10.63±.02"
X Front panel dimensions

HEIDENHAIN

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