KIPP & ZONEN
SINCE 1830

BD 300

Data acquisition recorder

Instruction Manual

IMPORTANT USER INFORMATION

Reading this entire manual is recommended for a full understanding of this product.

The exclamation mark within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance instructions in the literature accompanying the instrument.

KIPP & ZONEN reserve the right to make changes in the specifications without prior notice.

WARRANTY AND LIABILITY

KIPP & ZONEN guarantees that the product delivered has been thoroughly tested to ensure that it meets its published specifications. The warranty included in the conditions of delivery is valid only if the product has been installed and used according to the instructions supplied by KIPP & ZONEN.
Modifications made by the customer or on customer request can affect the validity of the CE declaration.

KIPP & ZONEN shall in no event be liable for incidental or consequential damages, including without limitation, lost profits, loss of income, loss of business opportunities, loss of use and other related exposures, however caused, arising from the faulty and incorrect use of the product.

Manual version: 0802

Declaration of Conformity

According to EC guideline 89/336/EEC 73/23/EEC

We **KIPP & ZONEN B.V.**
Delftechpark 36
2628 XH Delft
The Netherlands

declare under our sole responsibility that the product

Type: BD 300
Name: DATA ACQUISITION RECORDER

to which this declaration relates is in conformity with the following standards

Imissions

EN 50082-1	Groupstandard	
IEC 1000-4-2	IEC 801-2	8 kV
IEC 1000-4-3	IEC 801-3	3 V/m
IEC 1000-4-4	IEC 801-4	1 kV

Emissions

EN 50081-2	Groupstandard
EN 55011	

Safety standard:
IEC 1010-1

following the provisions of the directive.

B.A.H. Dieterink
President
KIPP & ZONEN B.V.

CONTENTS

1 SAFETY

Read this page carefully before installation and use of the instrument.

1.1 INTRODUCTION

The instrument described in this manual is designed to be used by properly trained personnel only. Adjustment, maintenance and repair of the exposed equipment shall be carried out only by qualified personnel who are aware of the risks involved.

1.2 SAFETY PRECAUTIONS

For the correct and safe use of the instrument it is essential that both operating and servicing personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual. Specific warning and caution statements, where they apply, will be found throughout the manual. Where necessary, the warning and caution statements and/or symbol are marked on the apparatus.

1.3 CAUTION AND WARNING STATEMENTS

Caution: Is used to indicate correct operating or maintenance procedures in order to prevent damage to or destruction of the equipment or other property.

Warning: Calls attention to a potential danger that requires correct procedures or practices in order to prevent personal injury.

1.4 SYMBOLS

(yellow/black)

To preserve the instrument from damage the operator must refer to an explanation in the operating manual.

1.5 IMPAIRED SAFETY-PROTECTION

Whenever it is likely that safe operation is impaired, the instrument must be made inoperative and secured against unintended operation. The appropriate servicing authority must then be informed.

2. GENERAL INFORMATION

2.1 INTRODUCTION

The Kipp & Zonen BD 300 recorder is a multichannel industrial recorder that meets high specification standards. With the availability of the BD 300 recorder, a new age of multichannel recording has started. Kipp & Zonen has introduced the stepper motor in pen positioning and said goodbye to the servo system concept. This change increased the average lifetime of the Kipp & Zonen recorders dramatically. This all became possible by using distributed digital processing. The hybrid technology used in the BD 300 offers many I/O facilities and yields a virtually infinite variety of possibilities in use. The BD 300 is available as 4, 6 or 8 channel model. In this manual an 8 channel model is described: the 4 and 6 channel models are completely equal, except for the number of channels.

The BD 300 can monitor 8 channels simultaneously and has standard pen offset compensation (POC) built in. Each input can accept either voltage or current (both DC and AC RMS), frequency or thermal information from a large number of different temperature sensors (see appendix C).

A transformation can be applied to the input data. Normally a pen plots the data from its corresponding input, however, a computation can be applied to different inputs, while the result can be recorded by any pen. Conditional alarms can be activated and timed events can be set, which makes the BD 300 particularly suited for signal surveillance applications in general.

Configuring the BD 300 consists of five different types of action within the user interface menu system: channel, system, chart, display and printer. There is a separate chapter dealing with each of them. Changing settings in one part of the UI sometimes affects settings in other parts. In order to get a good understanding of all the possibilities of the BD 300 recorder and their relationship, it is recommended that novice users read all chapters of this manual. Bear in mind that the notes are just as important as the main text.

2.2 SYSTEM DESCRIPTION

In default status the BD 300 can be regarded as eight independent recorders sharing one common chart drive. We will refer to the combination of input, data processing and pen output as a channel. With the extended possibilities of the user interface, more complex configurations are possible. For example, calculated combinations of inputs can be linked to pens at will. This subject will be covered in the corresponding section.

The signals to be monitored are fed into the BD 300 via the input unit (the backpack). This input unit is connected to the recorder by means of a three feet long cable, which allows for flexible positioning. Inside the input unit the signals are digitised, in which form they are sent to the recorder. At that digital stage the signals are called process data.

Immediately after the first "power on", all instrument settings are factory default settings. User settings can be saved and restored. Because they are stored, the settings remain available, after switching off the recorder. When the optional disk drive is installed, the settings can also be kept on floppy. Although the BD 300 offers a wealth of possibilities, the BD 300 is ready for plotting as soon as it has initialised and performed a self-test. However, in order to get the desired representation of the original signal, normally a number of choices and selections have to be made.

Once the BD 300 has been configured, operating the recorder is very easy and mainly consists of four basic actions:

A. Activating and de-activating the channels
B. Lowering and lifting the pens
C. Starting and stopping the chartdrive
D. Starting and stopping the recording process

2.3 FRONT PANEL DESCRIPTION

All selections are made and commands are given with the keys and the selector wheel on the front panel. All channels can be activated or deactivated or have their pens parked independently, whilst pen up or down and paper transport are combined functions. The front panel access to the UI is described in the following section. The front panel is equipped with 24 keys and one selector wheel. For a description of the keys we have divided the front panel into five areas, as indicated in figure 2.1.

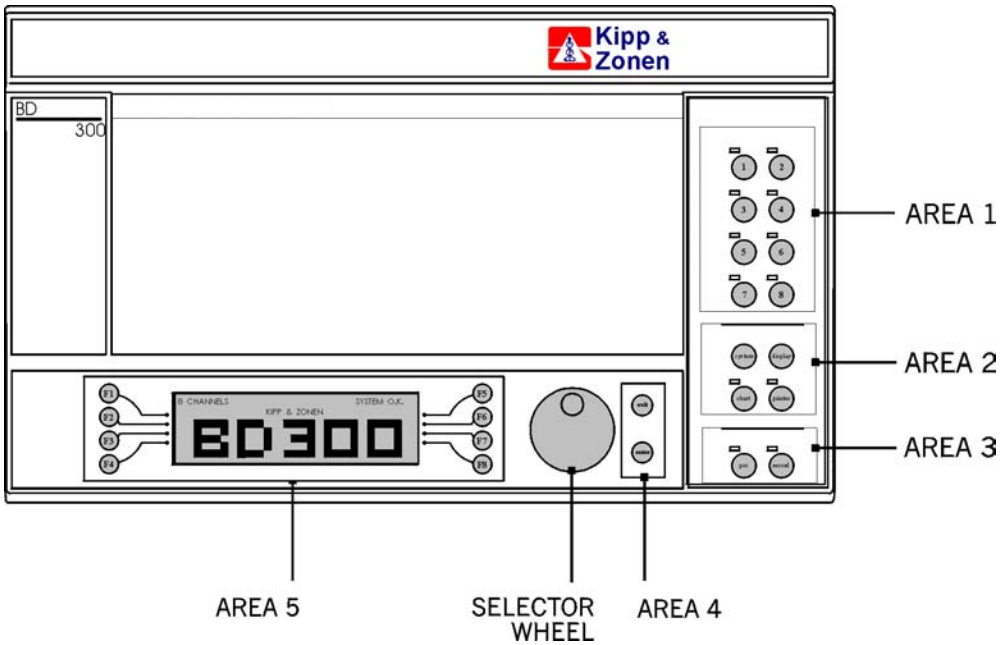


Figure 2.1. Front panel keys

There are three ways of operating the keys, but not all three are applicable to each of the keys at any time. Pressing the keys is sometimes referred to as "clicking". The three possible ways of operating the keys are as follows:

1. Clicking the key shorter than 2 seconds.
2. Clicking the key and keeping it pressed down for longer than 2 seconds.
3. Double clicking the key within 1 second.

The last option is only available for the keys in area 1 and 2.

AREA 1: *Description of the Channel keys*

When any of the keys in area 1 is clicked, the main menu of the corresponding channel is shown on the display. Parameter setting for that channel can then be started using the keys in area 5.
Double clicking a key from area 1 also shows the main menu and causes the channel to switch between the active state and the park state. When a channel is active, this is indicated by its LED, which is located just above its key in area 1. Actually double clicking here is a shortcut to the 'pen' function (F7) in the channel main menu.

AREA 2: *Description of the System configuration keys*

Clicking the 'system' key displays the 'system' main menu. Double clicking this key causes the recorder to switch between the pen up state and pen down state. This is a shortcut to the 'pens' function (F1) in the 'system' main menu.

Clicking the 'Display' key displays the 'display mode' screen. Double clicking this key has no effect.

Clicking the 'Chart' key displays the 'chartdrive' screen. Double clicking this causes the chartdrive to switch between the on state and the off state. This is a shortcut to the 'chart' function (F1) in the 'chartdrive' main menu. When the chartdrive is 'on', this is indicated by a green led just above the chart key.

Clicking the 'Printer' key displays the 'printer main menu'. Double clicking this key toggles between the printer 'on' state and the printer 'off' state. This is a shortcut to the 'printer' function (F1) in the 'printer set-up' main menu. When the printer is 'on' this is indicated by a green LED just above the printer key. When the printer is not installed this is shown in the printer menu, with the text: 'PRINTER NOT INSTALLED'.

AREA 3: *Description of the Special keys*

The 'POC' key is used to switch the pen offset compensation (POC) on and off. The 'record' key can be regarded as the master switch for starting and stopping the recording process. This involves both recording on paper and data logging. Pen offset compensation and recording both are indicated with a LED. Because these switches are toggle switches double clicking the keys in this area has no effect, it only switches the function on and off.

AREA 4: *Description of the Decision keys*

The 'enter' key should be pressed whenever the user wants to confirm the choice he has made. To cancel such a choice the 'exit' key has to be pressed.

Note: Actually pressing any other key than 'enter' will automatically accept the choice. This allows for fast configuring and ease of use.

Note: Keeping 'enter' Pressed and then pressing 'exit' increases the contrast of the display. Keeping 'exit' Pressed and then pressing 'enter' decreases the contrast of the display.

AREA 5: *Description of the Function keys around the display*

The eight function keys in this area, together with those in area 4 and the selector, are used to navigate through the menu system and for setting parameters. Their actual

function depends on the type of information that is displayed on the display and what action is to be taken.

Note: For stepping through the possible values for a field, one can use the selector wheel or press the function key in question several times.

2.4 THE INPUT UNIT

The input unit, sometimes referred to as 'backpack', accepts the external signals and pre-processes them. The result is a stream of digital information that is handled further as 'processed data' inside the actual recorder. The main function of the input unit is the analogue to digital conversion of voltage, current or frequency input values, but it also supports the use of a wide range of thermal sensors. Both thermocouples and Pt-100 may be used. The different types of sensors that can be used and how to connect them is discussed in appendix C. Each thermocouple input is equipped with a cold junction compensation, which can be activated or de-activated for each channel independently.

2.5 MAXIMUM OVER RANGE ON INPUTS

The maximum over Voltage on any input is ten times the selected range (-5 to +5) with a maximum of 250 Volt for the 50 Volt range.

The maximum over range for the current input is ten times the selected range (-5 to + 5) with an absolute maximum of 1 A.

MAXIMUM VOLTAGE / CURRENT ON INPUTS VERSUS GROUND				
RANGE	V AC/DC	I AC/DC	SENSE	SOURCE
> 200 mV	250 Veff.	1V / 1A	40 Veff.	32 Veff
<= 200 mV	40 Veff.	1V / 1A	40 Veff.	32 Veff
TC	40 Veff	1V / 1A	40 Veff.	32 Veff
Pt 100	40 Veff.	1V / 1A	40 Veff.	32 Veff
1-500 mA	250 Veff.	1V / 1A	40 Veff.	32 Veff
Freq.	40 / 250 Veff*	1V / 1A	40 Veff.	32 Veff

All mentioned voltages and currents are referred to measuring ground.

*) During frequency measurement the sensitivity of the frequency input is set with the Voltage range in the (frequency) input submenu. This maximum also changes at the 200 mV range.

During play-back of a recorded file the inputs are set in the same range as during recording. Therefore it is advised to remove all inputs before activating a play-back, or make sure that all attached inputs are below the maximum specified levels.

During power off all inputs are switched to the most insensitive state.

To prevent damage to the more sensitive inputs during measurements with higher Voltages (> 32V), these inputs can be blocked with so called safety caps.
These safety caps can be ordered by for instance: R&S part no: 226-3118.

Safety class for the inputs is according to installation category II.

2.6 MAXIMUM RATED VOLTAGE TO EARTH.

The maximum rated Voltage from any input to earth is 2 kV.
Between channels the maximum Voltage is 4 kV.

Note: See also Appendix D for correct input connections and safety precautions to prevent damage to the inputs.

3. FIRST TIME USE

3.1 UNPACKING THE RECORDER

Check the contents of the shipment for completeness (see below) and note whether any damage has occurred during transport. If there is damage, a claim should be filed with the carrier immediately. In this case, and also if the contents are incomplete, the Kipp & Zonen Sales or Service organisation should be notified in order to facilitate the repair or replacement of the instrument.

Included in the shipment is a small box that contains:

- Mains supply cable.
- 3 pens per channel.
- Packet of Z-fold paper.
- Packet of fuses.

The BD 300 is enclosed between two pieces of reusable and recyclable foam. If the BD 300 is to be sent back to the factory, it should be in its original packing to protect it from damage. Take care that the back pack is mounted in the right way (the input plugs may not face the spacer between recorder and back pack).

Note: The optimum performance of the recorder can only be guaranteed if the correct consumables are used. This means paper, pens and ink cartridges such as advised by KIPP & ZONEN.

The BD 300 software versions can be found on the start-up screens. The very first screen shows "internal self-test" and the User-interface software version (UI: V2.19).
The second screen after power-on shows the BD 300 main software.
In the top right-hand corner the main software version is shown: V2..55 or higher.

Figure 3.1 Start-up screen

3.2 PREPARATION

When the BD 300 is shipped, the paper guide and printer are secured with wire ties. The chartdrive subsystem with the paper tray is secured with one lock nut, a bolt and a ring. Before the recorder can be used these items have to be removed. First open the recorder by pulling the front door towards you and lowering it until it is in a horizontal position. The location of the lock nut is indicated in figure 3.2 (6). The spacer is located under the chart cassette and can be removed by pulling the chart cassette out.

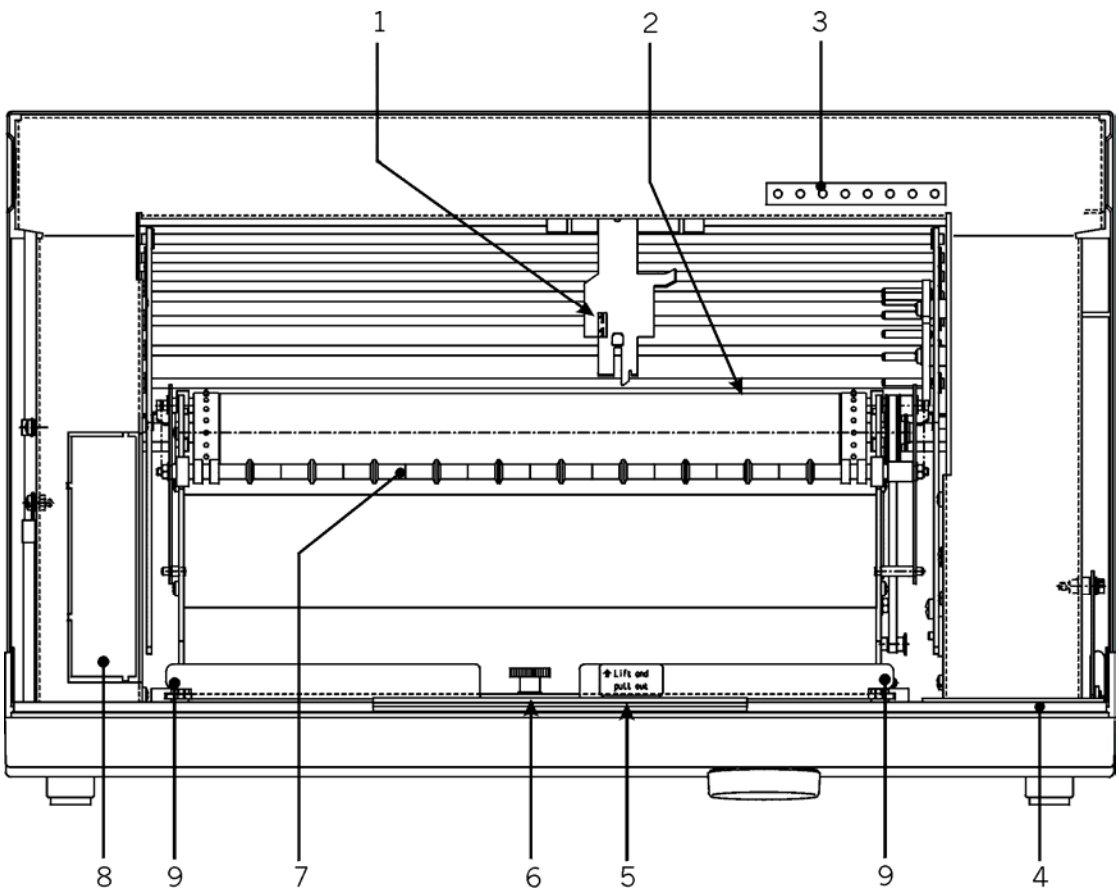


Figure 3.2 BD 300 with open front panel

1 Channel identification
2 Paper out sensor
3 Pen cap storage
4 Pen change button
5 Lifting lever
6 Lock nut, washer(2x), spacer, washer and screw
7 Paper guide
8 Disk drive (optional)
9 Tabs to pull the paper tray

3.2.1 Safety instructions for power connection

Before connecting the equipment to the mains, ensure that the protective mains earth is functioning correctly. Before any other connection is made, the instrument should be connected to a protective earth conductor via the three-core mains cable. The mains plug should be inserted only into a socket outlet provided with a protective earth contact. The protective action should not be negated by use of an extension cord without protective conductor.

The BD 300 safety class is according to category II.

WARNING: ***Any interruption of the protective conductor inside or outside the instrument, or disconnection of the protective earth terminal, is likely to make the instrument dangerous. Intentional interruption is prohibited.***

The recorder may be operated at 230 V or 115 V. Optional a 12 or 24 Volt DC power supply is available. Before switching on the recorder, make sure that the required fuses are installed. Operating the recorder at 115 V or 230 V requires 2 x 3.15 A (IEC 127-2/V) fuses. The mains on/off switch is located on the back of the recorder. Make sure that only fuses of the required current rating and type are used for renewal. The use of repaired fuses, and/or the short-circuiting of fuse holders, is prohibited. Fuses should only be renewed by a qualified person, who is aware of the risks involved.

Note : If the mains plug has to be adapted to a local situation, it should only be done by a qualified person.

WARNING: ***The instrument shall be disconnected from all sources when a fuse is to be renewed.***

Note: The minimum time between power off and power on needs to be 5 seconds, to ensure proper reset of the system.

3.3 INSTALLING THE PENS

To obtain easy access to the pen holders, press the ‘pen change’ button. This button is located at the right hand inside of the front cover, as indicated in figure 3.2. Pushing this button once brings pen 1 through 4 into a position that allows for easy pen change. All felt pens are identical, except for their colour. The felt pens can be interchanged freely.

Before a felt pen can be mounted, the small white cap must be removed. These caps can be stored in the small holes, which are indicated in figure 3.2. The felt pens are mounted with the coloured stripe facing the user. First the bottom side of the felt pen is hooked into the small metal ridge, after which the felt pen is pushed under the metal clip at the top of the pen holder.

The next four pens can be accessed by pushing the ‘pen change’ button once more. Pushing this button one more time brings the printhead in front or when this option is not mounted, restores the recorder to its normal operating state. When the recorder is in the ‘pen change’ mode, pressing any key on the front will also bring it back to normal operating state.

Note: If the pens are 'parked', which is the case when the recorder has just been switched on, then they remain at the right hand side of the paper. The factory default 'zero position' of operation is located at the left side of the paper.

Note: When the recorder is not used for an extended period of time (more than 24 hours), it is recommended to remove the felt pens and to replace the caps, to prevent them from drying up. It is recommended to remove the print cartridge as well, when not in use, to prevent leakage.

3.4 LOADING PAPER

To load the recorder with paper, the paper tray has to be pulled forward. This can be done by lifting the lever indicated in figure 3.2, and simultaneously pulling the ridge at the bottom of the paper tray, preferably with both hands. Then pull towards you the paper guide and lower it all the way. Put the new pack of paper into the rear compartment of the paper tray in such a way that the printed side of the paper is on top when you pull the edge of the paper over the sprocket feed shaft, in order to lead the paper into the front compartment, the larger sprocket holes should be on the right hand side. It is recommended that you pre-fold some paper into the front compartment.

Put the holes in the paper over the sprocket wheels, beginning at the left side. Make sure that the paper is straight and runs flat over the paper guide body, and put back the paper guide. Now the chartdrive can be put back into its operating position by pushing it all the way to the rear side of the recorder. (It clicks in position)

Note: When the paper is not running flat over the paper guide body, or if the recorder is out of paper, this condition is signalled by the 'paper out sensor'. The location of this sensor is indicated in figure 3.2. The absence of paper is indicated by a blinking chart LED.

3.5 A QUICK CHECK

A quick check of all channels can be performed by connecting in turn each of the inputs to a voltage source, preferably a variable one and activating the channel by double clicking the corresponding key in area 1 (see figure 2.1). The pen position must now correspond to the applied voltage. You can lower the pens by double clicking the 'system' key and the chart drive can be started by double clicking the 'chart' key. When record is on the recorder will write the applied signal on paper. Double clicking is explained in section 2.3.

Note: If the recorder is operated without any further configuring after start up, each channel has a span of 50 Volt, with 'zero' located at the left-hand side of the paper.

4. CHANNELS

4.1 GENERAL

At any time when one of the keys in area 1 is pressed, the channel main menu appears. This may look as shown in figure 4.1

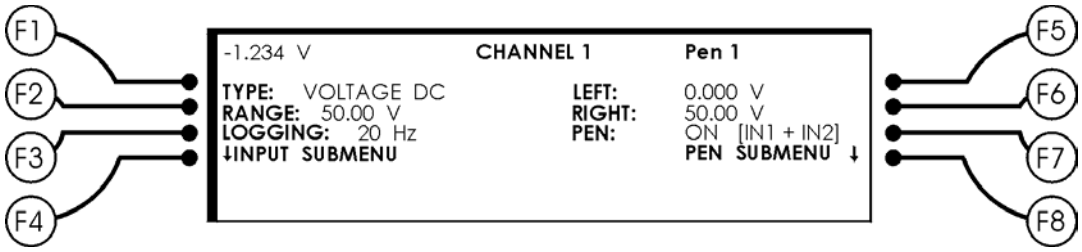


Figure 4.1 Channel menu

Note: In appendix B, a well-ordered flow chart of the menu structure is given.

4.2 PEN OFFSET COMPENSATION (POC)

Because any two pens never can be at the same spot at the same time, plots from different channels will be shifted slightly relative to each other along the time axis. The pen offset compensation (POC) solves this problem by buffering and delaying the pen positions in such a way that the effect of the pen distances (2.5mm) is exactly compensated for.

The POC function can be switched on and off by pressing the 'poc' key in area 3. The POC state is indicated with a LED.

Note: The pen movements may be significantly delayed with respect to the input signals, especially when the chart drive is running at low speed. To have more direct feedback about the effects that takes place while configuring a channel, consider switching off the POC temporarily. When the POC is switched off, any data that was in the buffer is lost.

4.3 TEXT INPUT MENU

When selecting a text to enter the string input display appears for easy setting of the text. Figure 4.2 gives string input display.

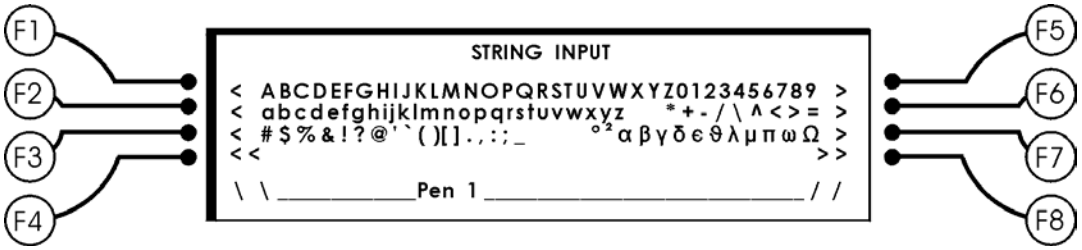


Figure 4.2. String input display

Figure 4.2 gives an example of the string input display. Pressing F1,F2,F3 or F5,F6,F7 selects a line to choose a character from. F4 and F8 are used to select the character to be changed. After pressing F1-F3 or F5-F7 the desired character can be selected by rotating the selector. Then the next character can be edited by pressing F8 (or F4 for the previous one). Pressing F4 for more than 3 seconds returns the original string and pressing F8 for more than 3 seconds sets all blanks. When the setting of the text string is completed, pressing ENTER leaves this menu. Pressing EXIT again leaves the string input display, with the text unchanged.

4.4 CHANNEL MAIN MENU

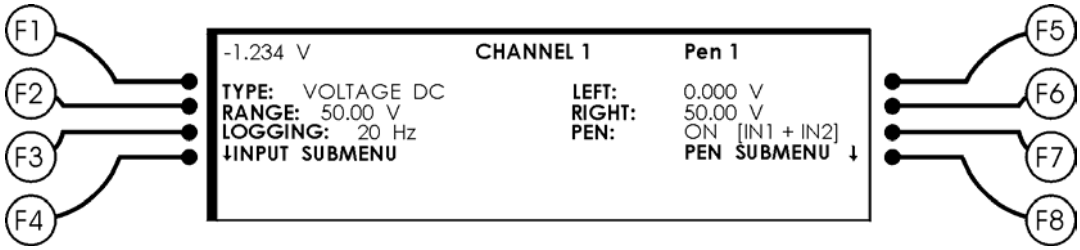


Figure 4.3 Channel menu

For each channel the main menu can be activated at any time by pressing the corresponding key in area 1. The display will then resemble the one in figure 4.3.

Note: The input value of the chosen channel will be shown in the top left hand corner

F1 The type of signal that is accepted for an input value is selected with F1. Figure 4.4 shows a listing with all possible values.

Voltage DC	Thermo-B	Pt-100 2-wire
Current DC	Thermo-E	Pt-100 3-wire
Voltage AC RMS	Thermo-J	Pt-100 4-wire
Current AC RMS	Thermo-K	
Frequency	Thermo-N	
	Thermo-R	
	Thermo-S	
	Thermo-T	

Figure 4.4 Possible inputs

Note: All temperatures can be displayed in °C, °F or K, and Cold Junction Compensation (CJC) can be switched on and off.
CJC can be set after a thermocouple is chosen, in the input submenu with F3 see figure 4.6.

F2 F2 selects the input range. The default value for the input range is 50.00 Volt. The lowest fixed value for the input range is 1.000 mV. You can step up and down in between these values rotating the selector wheel. The values that can be chosen from follow the sequence 1, 2, 5, 10 etc.

F3 By default, logging takes place at a rate of 10 Hz. The lowest sampling rate that can be selected is 0.01 Hz, the maximum is 400 Hz. It may be desirable to select a specific sampling rate when input values are being logged to the serial port or onto (optional) floppy disc.
When logging on external (chart) pulses is selected here the divider can be set.
So every pulse, second pulse or fifth pulse etc. gives a logged data point.

Note: Temperature measurements can be logged at max. 10 Hz.

F4 Pressing F4 gives the input submenu, which will be described in chapter 4.4.1

F5 F6 This sets the left and right margin of the recording area. These values can be set almost continuously. The right margin can be set up to 5 times the selected range. So with a range of 50 Volt the right margin can bet set up to 250 Volt.

Note: When measuring current, the maximum input range remains 0.5 A, due to overheating of the shunt resistor.

F7 The 'pen' field can have four values: off [zero], off [park], on [input] and on [calc]. [calc] shows which of the 4 calculations is used, on[input] shows that the input is directly coupled with the pen, so the pen position represents the input signal. The park position for the pens is at the right-hand side of the paper.

F8 Pressing F8 gives the pen submenu, which will be described in chapter 4.4.6.

4.4.1 Input submenu (Voltage and Current AC/DC)

When in the channel main menu Voltage or Current is selected the following input submenu will be shown:

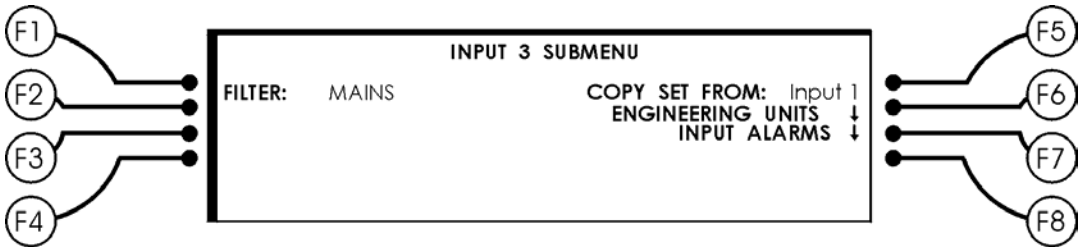


Figure 4.5 Input submenu

F1 By default input signals are filtered to reject mains frequencies. With F1 another type of filtering may be selected. The options are 0.01 Hz,....20 Hz, or mains. The spectral contents of the input signal may impose the choice of one of these filters. All filters are low-pass filters.

F2-F4 Not used

F5 If you want to apply the settings of one input to another channel this can be done with F5. Here you can select the number of the channel that you want the parameters to copy from. The parameters involve all those that can be set from within the input and input submenu.

Note: To copy all settings concerning a channel you should also copy pen settings in the pen submenu.

F6 Pressing F6 activates the 'engineering units' submenu (see 4.4.4)

F7 Pressing F7 activates the 'input alarms' submenu (see 4.4.5)

F8 Not used.

4.4.2 Input submenu (Thermocouple and Pt-100)

See appendix C for Thermocouple specifications.

When in the channel main menu Thermo or Pt-100 is selected (F1 chapter 4.4) the following input submenu will be shown when pressing F4:

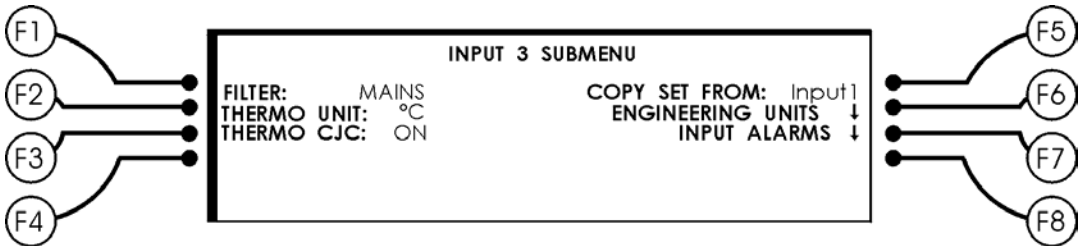


Figure 4.6 Input submenu thermo and Pt-100

F1 See paragraph 4.4.1

F2 Pressing F2 enables you to select the Thermo unit in °C, °F of K.

F3 With F3 the Cold Junction Compensation can be set on or off for thermo couples. This menu item is only available for thermo couples.

F4-F8 These are identical as in paragraph 4.4.1

4.4.3 Input submenu (Frequency)

When in the channel main menu frequency is selected (F1 chapter 4.4) the following input submenu will be shown:

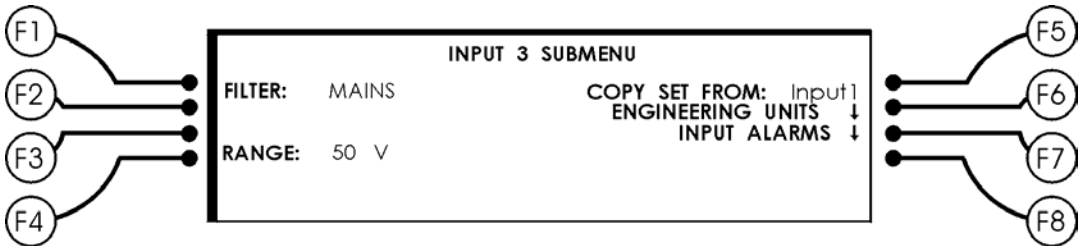


Figure 4.7 Input submenu frequency

F1 Filtering takes place after a frequency has been calculated. So selecting a filter can stabilise the reading of the frequency.

F2-F3 Not used

F4 Pressing F4 gives you the possibility to set the input sensitivity for the frequency measurement. The input ranges are equal to normal Voltage measurement.

F5-F8 These are identical as in paragraph 4.4.1

Note: See also Appendix D for correct input connections and safety precautions to prevent damage to the inputs.

4.4.4 Engineering units

This submenu is activated from within the input submenu with F6. Engineering units may be used to facilitate the interpretation of values that are displayed. Suppose the span of some channel is 20 Volt and the shift equals 5 Volt. If, for example, in some process the 5 Volt value would correspond with a pressure of 1 Bar and the 25 Volt value (right-hand side of the paper) would correspond to a pressure of 7 Bar, then an engineering units setting like the one shown in figure 4.8 would probably be desired.

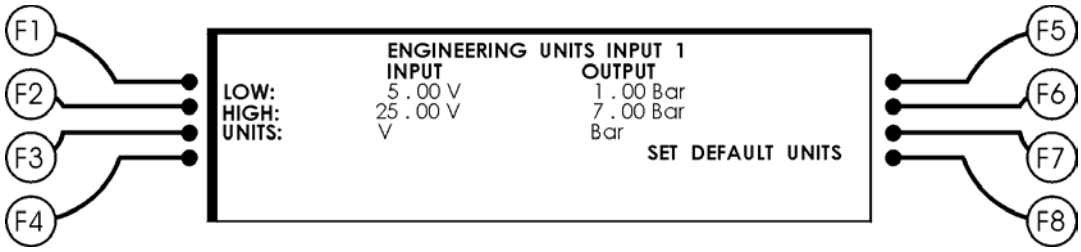


Figure 4.8 Setting engineering units

F1-F2 Set low and high value of the input.

F3-F4 Not used.

F5 The 'low' engineering unit value corresponding to the low input value is set with F5.

F6 The 'high' engineering unit value corresponding to the high input value is set with F6.

F7 The unit itself is a 6 position alphanumeric field that can be given any value. The default value is the original input 'type' value. When F7 is pressed the string input display is showed (see figure 4.2).

F8 The engineering units can be reset to their default values by pressing F8.

Note: When engineering units have been defined they will be used for representing input values wherever appropriate. (Channel main menu, alarms, and printer....)

4.4.5 Input alarms menu

This submenu is chosen from within the input submenu with F7 (see chapter 4.4.1).
An example of how the display will look like is shown in figure 4.9.

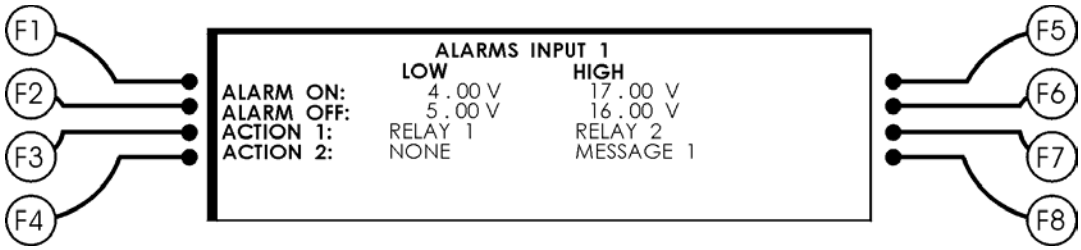


Figure 4.9. Setting alarms

For each channel two different alarms can be set, a 'low' one and a 'high' alarm. Figure 4.9A shows the effect of the example alarms settings in figure 4.9. The alarm settings in standard mode always refer to the input values expressed in their engineering units.

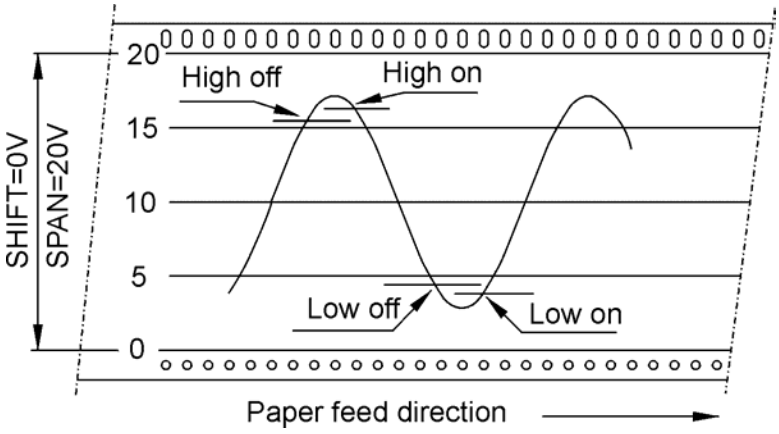


Figure 4.9A Alarms

F1 F2 The ‘low’ alarm can be set with F1 and F2. The ‘low’ alarm is activated when the input signal becomes smaller than the value set with F1 (‘on’ value). The alarm is not deactivated until the input signal rises again above the value set with F2 (‘off’ value). The ‘off’ value must be greater than or equal to the ‘on’ value. Any difference between these values causes hysteresis in the alarm behaviour.

F3-F4 Choose an event action from the list in section 5.2.

F5-F8 Everything that was said about the ‘low’ alarms above, is applicable to the ‘high’ alarms. These ‘high’ alarms are set with F5, F6, F7 and F8.

Note: The low alarm settings must always have a value that is lower than the values of the high alarm settings. Also the ‘on’ value must be smaller than the ‘off’ value with the low alarm. With the high alarm it is just the other way around.

Note: If desired, the same relay can be assigned to both the low and high alarm. When more inputs or pens are selected to set one relay, the relay is only reset when all assigned alarms are off again. (“OR” function)

4.4.6 Pen submenu

The ‘pen’ submenu can be selected from within the channel main menu with F8 (see chapter 4.4). Figure 4.10 gives an example of the display.

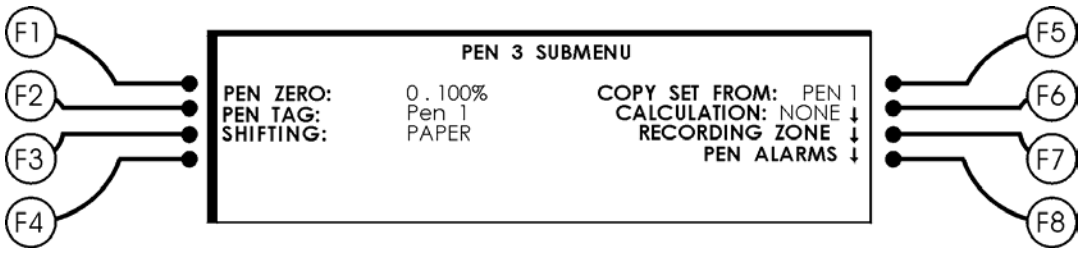


Figure 4.10 Pen submenu

F1 when the value of the zero field equals 0.00%, the zero position is located at the left-hand side of the paper. Changing the field value can be used for exact zero positioning of the pen. It may also be used to locate the zero position somewhere else, within the range of the paper or outside that range. Possible values range from minus -100% to +200%. The paper has a width of 100%. If a recording zone is selected (see 4.4.8) the zero position is defined to be inside the recording zone.

Note: The zero position can be reset to 0.00% by pressing F1 for about 2 seconds. The pen offset is meant to be a fine tuning of the pen position, and is not taken into account by Left / Right margin or axis printing.

F2 The 'tag' is a 6 position alphanumeric field that can be given any value. The default value is 'pen x', where x stands for the number of the current channel. When F2 is pressed once the string input menu will appear, see 4.3. The tag is used for identifying the pens in the menus and screens, as well as in printer output.

F3 When an input value exceeds the maximum span, normally the pen halts at the right hand side of the paper. If recording beyond this point is required, auto shifting can be selected.
Auto shifting can be set to: **paper**
zone
none

With 'paper' shifting the recorder automatically applies an extra shift to the current input range (left/right margin) each time the pen reaches the paper edge. see fig 4.11

Note: Auto shift is functional over a range from 5 x span till +5 x span.

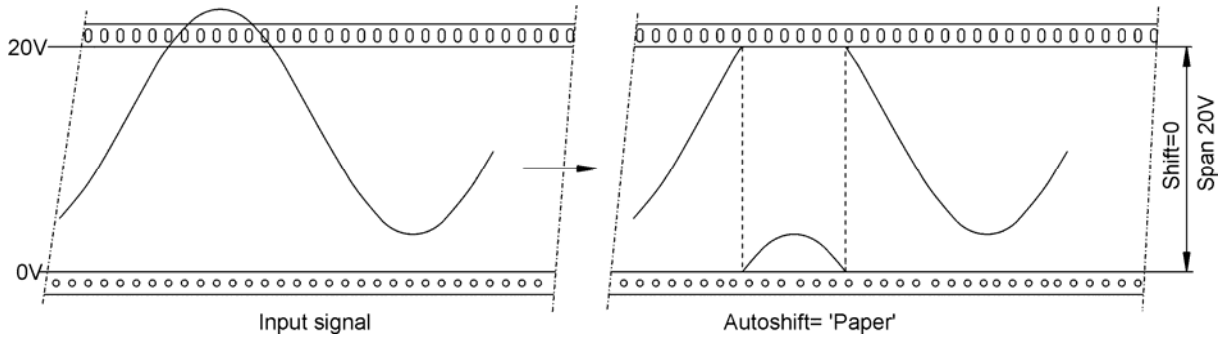


Figure 4.11 Paper shifting

With autoshift set to zone, the pen shifts to the left recording zone when it exceeds the right recording zone, and vice versa. (see fig. 4.14 channel 1)

F5 If you want to apply the settings of one pen to another pen this can be done with F5. Here you can select the number of the channel that you want the parameters to copy from. The parameters involve all those that can be set for the pen from within the channel and pen submenu, except for the pen tag. (tag is a user definable pen name)

F6 Pressing F6 and turning the selector wheel, the type of calculation is selected.
Selections:

none	for direct connection of input and pen
add	for addition of two inputs
mul	for multiplication of two inputs
sub	for subtraction of two inputs
div	for dividing of two inputs

The calculation menu is described in chapter 4.4.7

F7 This activates the recording zone menu as described in chapter 4.4.8

F8 F8 activates the pen alarm menu, described in chapter 4.4.9

4.4.7 Calculation menu

The type of calculation can be selected from within the pen submenu with F6. Figure 4.12 gives an example of calculated pen position settings. As you can see, the relation between pen and inputs can be chosen at will.

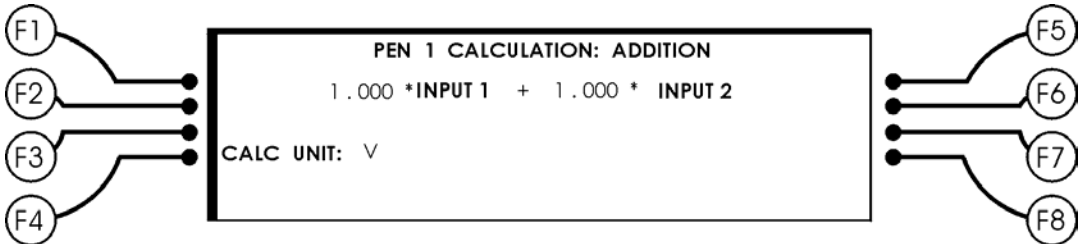


Figure 4.12 Example of setting calculations for 'addition'

F1,F5 Pressing F1 or F5 and turning the selector wheel steps through the possible constants and inputs that can be changed.

F4 The UNIT can be set with F4. Pressing F4 shows the string input screen. (see4.3) for instance the result of the multiplication of Voltage and Current (Ampere) can be given an engineering unit of "Watt".

F2,F3 Not used.

F6-F8 Not used.

4.4.8 Recording zone

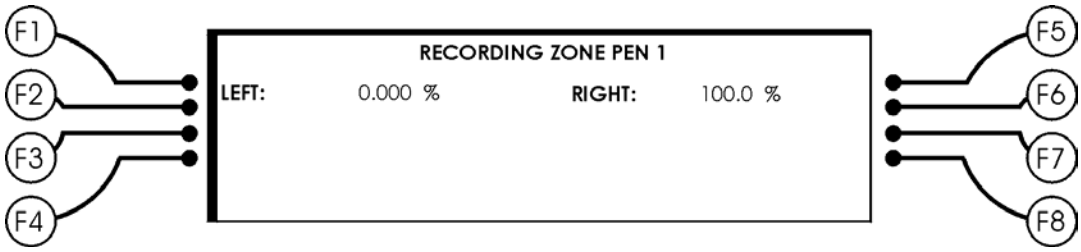


Figure 4.13 Recording zone menu

F1, F5 If we say that the paper width is 100%, then by default the recording zone extends from 0% (left) to 100% (right). If a channel span should correspond to a restricted area of the paper, this can be achieved by selecting the appropriate values for the 'left' and 'right' parameter. When a recording zone has been selected, all plotting takes place in a graphically scaled down way within that zone (for that particular channel). Actually a 'graph mapping' takes place. If desired, all available channels can be plotted next to each other by selecting the appropriate values for 'left' and 'right' for each channel. For instance pen 1 from 0% to 12.5%, pen 2 from 12.5 to 25% etc. Figure 4.14 on the next page gives an example of the principle.

F2-F4 Not used

F6-F8 Not used

Note: If the percentage for left is set larger than for right, then this results in a mirrored pen deflection.

For example: The input span is 8 Volt (left 0 V and right 8 V) and the recording zone is set to: left 100% and right 50%.
This results in a mapping of the input:
0 Volt = pen 100%
8 Volt = pen 50%

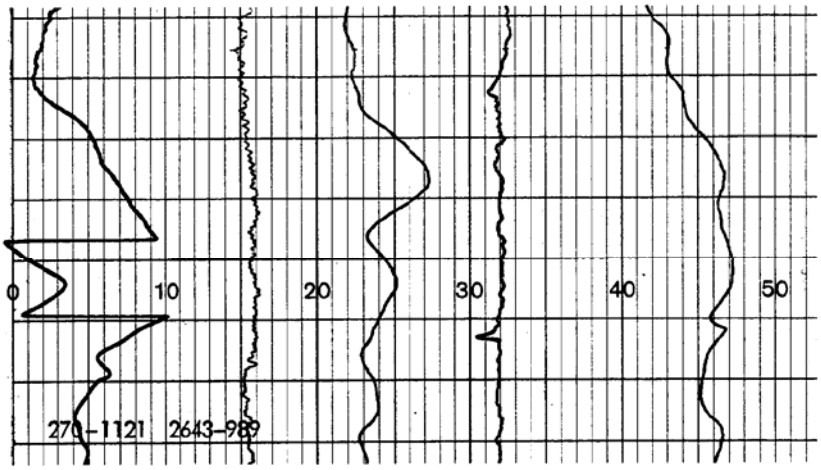


Figure 4.14 Recording zone (ch.1 = 0-10%, ch.2 = 10-20% etc.)

4.4.9 Pen alarm menu

This submenu is chosen from within the pen submenu with F8. An example of how the display will look is shown in figure 4.15.

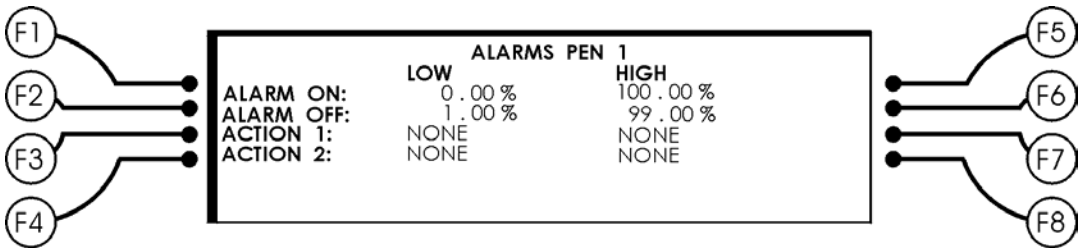


Figure 4.15 Setting alarms

For each pen two different alarms can be set, a 'low' one and a 'high' one. The alarms are set in percentage of the full scale.

*Note: In chapter 4.4.5 the **input** alarm menu is described. Here the **pen** alarms are discussed. Because inputs and pens are completely separated on both input and pen, alarms can be set.*

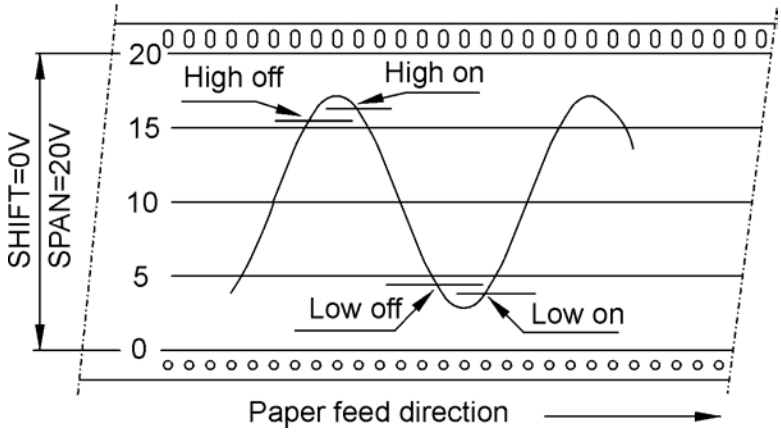


Figure 4.16 Pen alarms

F1-F2 The 'low' alarm can be set with F1 and F2. The 'low' alarm is activated when the (calculated) pen value becomes smaller then the value set with F1 ('on' value). The alarm is not deactivated until the pen value rises again above the value set with F2 ('off' value). The 'off' value must be greater than or equal to the 'on' value. Any difference between these values causes hysteresis in the alarm behaviour.

F3-F4 An alarm is effective only if an action has been assigned with F3 or F4 respectively. A total of 43 different actions are available. These actions are the same as can be set for the events (see 5.2). The relay contacts are accessible through the I/O connector (see appendix D) at the back of the recorder. The pin lay out of the sub D37 connector and the electrical properties of the relays are explained in appendices A and D.
Per low alarm 2 different actions can be selected.

F5-F8 Everything that was said about the 'low' alarms above, is applicable to the 'high' alarms. These 'high' alarms are set with F5, F6, F7 and F8.

Note: The low alarm settings must always have a value that is lower than the values of the high alarm settings. Also the 'on' value must be smaller than the 'off' value with the low alarm. With the high alarm it is just the other way around.

Note: If desired, the same relay can be assigned to both the low and high alarm. When more than one pen is selected to set one relay, the relay is only reset when all assigned alarms are off again. ("OR" function)

5. SYSTEM SETUP

When the 'system' key on the front panel is clicked, this menu is activated. The display will look like the one that is shown in figure 5.1.

Note: Pressing 'system' for more than 3 seconds will result in 'keyboard lock'. This is displayed on the bottom line of the system menu. Pressing 'system' again for more than 3 seconds switches 'keyboard lock' off again.
When the keyboard is locked all screens can be selected, but the parameters can't be changed.

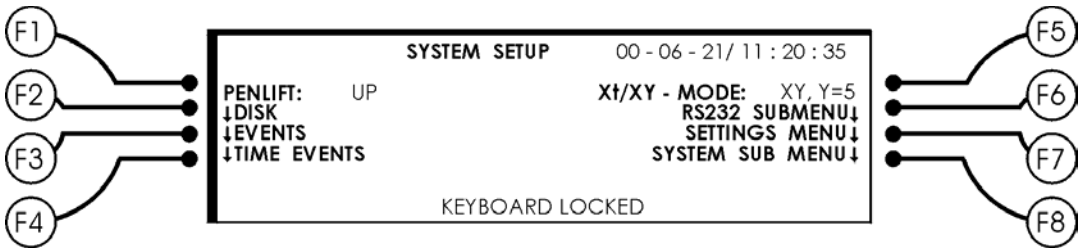


Figure 5.1. System set-up main menu

5.1 SYSTEM MAIN MENU

F1 With key F1 you can switch between 'pen up' and 'pen down'. A shortcut to this is double clicking the 'system' key.

Note: When autopenlift is on (see figure 5.7) the pen can go up even though the menu shows pen down.

F2 Pressing F2 activates the disk drive submenu see chapter 10

F3 Pressing F3 activates the events submenu see 5.2

F4 This key activates the time events submenu see 5.3

F5 There are two types of plotting modes, which can be selected with F5. The usual recording mode is the x-t mode. In this mode the eight pens draw functions along the time axis. The other mode is x versus y. The x-values for the pen positions are always taken from the corresponding channels, whereas the y-value that is used for paper transport is derived from one of the available channels.
In X-Y mode the Y sensitivity (or paper movement in cm/unit) is equal to the X sensitivity in normal X(t) mode. The paper speed in X-Y mode can be up to 250 mm/s. Applied signals with a higher slew rate will be written with an incorrect phase.

Note : See chart menu when operating in X-Y mode for setting Y parameters

F6 Process data can be logged in compressed form to a serial communication device (see appendix D). The choice between logging to RS-232 on and off can be made with key F6. Although logging can be switched on or off for each channel input independently from within the channel menu, operating F6 in this menu allows for overall starting and stopping of RS-232 logging. See also 5.7.

F7 Pressing F7 enters the settings submenu see 5.4

F8 Pressing F8 enters the System submenu see figure 5.7

5.2 EVENTS MENU

This submenu can be activated from within the 'system' menu with F3. Figure 5.2 gives two examples of the display.

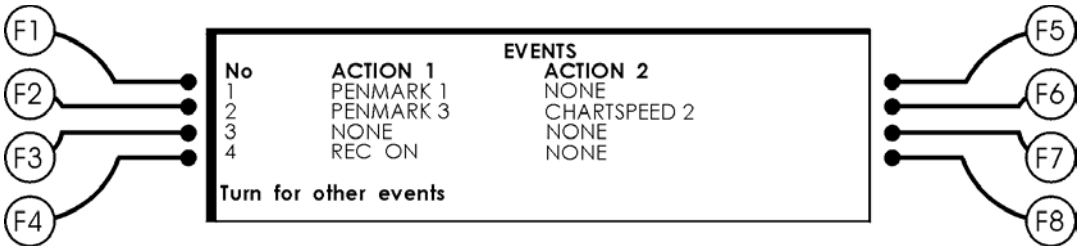


Figure 5.2a. Example 1 of the 'events submenu'

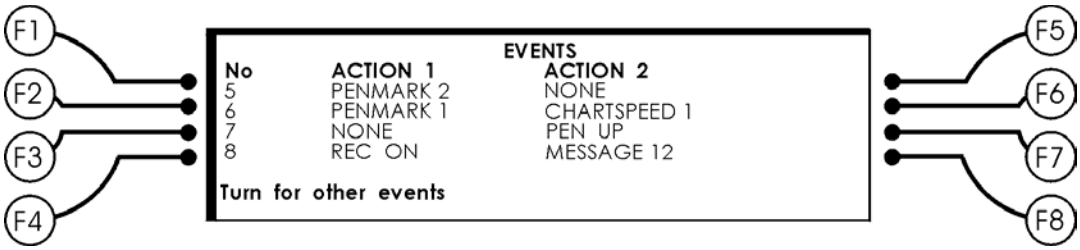


Figure 5.2b. Example 2 of the 'events submenu'

Initially the 'events' screen will show the events numbered 1 through 4. By turning the selector wheel, all the events (1 through 8) can be scrolled into the display window. Which function key has to be used for editing which event, depends on how the selector was turned.

Events have to be fed into the recorder via the I/O connector at the rear side of the recorder. The I/O specifications can be found in appendix D. Eight different input pins correspond with eight related events. Each event can trigger (active low) up to two actions simultaneously, called action 1 and action 2. There are many different types of actions than can be defined. They include pen markers, chart drive and pen lift control and message printing. Figure 5.3 lists all possible settings.

Any device connected to the event connector should be grounded properly to prevent serious damage from occurring to the BD 300. This can be achieved by connecting both protective earths with each other.

NONE	MARK PEN 1-8	MESSAGE 1-16
	CHART OFF	CHART REVERSE
	CHART FORWARD	RELAY 1-8
	PENS UP	PENS DOWN
	CHARTSPEED 1	CHARTSPEED 2
	GOTO HOME	SET HOME
	RECORD ON	RECORD OFF

Figure 5.3. Event settings

The default setting for an event is a NONE.
Pen markers are small shifts applied to pen positions that can easily be recognized observing the plot. Because these types of pen markers are superpositioned on the current pen position, they are referred to as 'in trace event markers'. Activating an event mark gives a positive pulse on the curve and deactivating gives a negative pulse of about 7 mm.
Chartspeed 1 or 2, toggles one of the two pre-set chartspeeds.
The message printing from one of the sixteen pre-programmed messages refers to the printer and is only available when this option is installed.
Messages can be set in the printer submenu.
Record on and off can be used to trigger externally the start of a recording.
Even the relays can be set by an external event. This can be useful to test or simulate an alarm condition.

5.3 TIME EVENTS

To allow unattended operation of the BD 300, this feature will contribute to the stand-alone operation outside the normal working hours. Two time events can be programmed with independent start time, duration and actions.

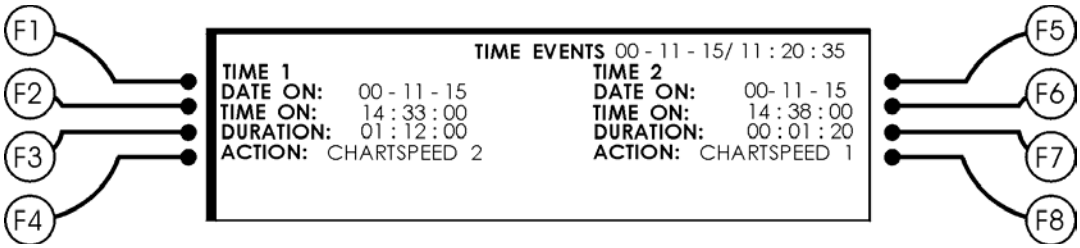


Figure 5.4 Time events menu

F1 Pressing F1 steps through the date fields that can be set with the selector wheel

F2 Pressing F2 steps through the time fields that can be set

F3 Pressing F3 steps through the duration time fields that can be set.
This determines the length of the action (set with F4) that starts on the time and date as set with F1 and F2.

F4 Pressing F4 and rotating the selector wheel selects one of the actions as described in the event menu 5.2

F5-F8 These keys perform exactly the same for the second time event.

5.4 RECALL AND SAVE SETTINGS SUBMENU

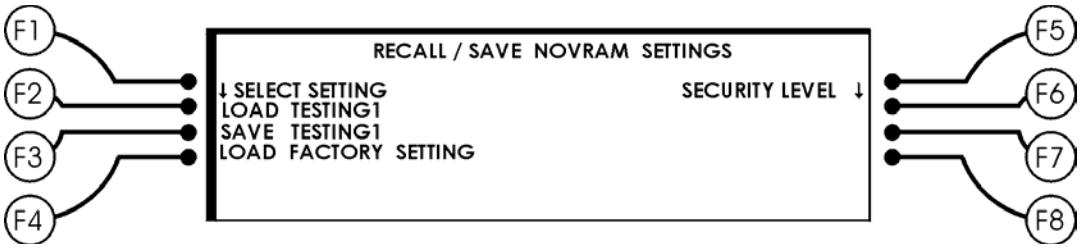


Figure 5.5 Recall / save settings submenu

Since the BD 300 recorder can be configured with quite a complex parameter setting, it has been equipped with a function for saving and recalling these parameter settings. Four different sets can be stored under a user definable name.

F1 Pressing F1 enters the select NOVRAM settings. see 5.5

F2 Pressing F2 loads the setting as selected with F1

F3 Pressing F3 saves the current setting with the name as set with F1

F4 Pressing F4 recalls the factory defaults settings.

Note: The settings used until the moment the recorder is switched off are automatically retrieved the next time the BD 300 is switched on.

F5 Pressing F5 enters the security level menu see 5.4.1

F6-F8 Not used

5.4.1 SECURITY LEVEL MENU

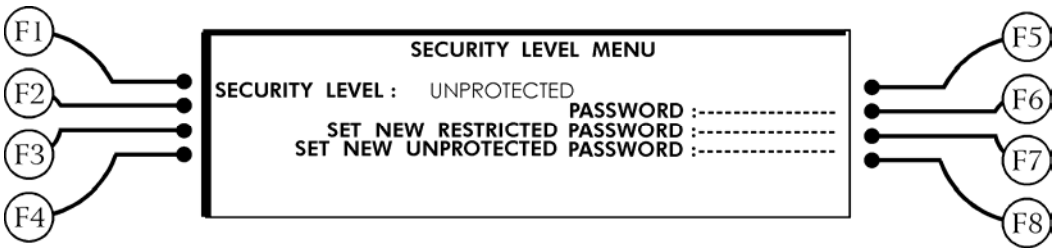


figure 5.4.1 security level menu

The security level is used to give different type of users different access levels to the recorder.
The levels are divided in three stages:

- protected; here only the basic functions are available. No change of input settings can be performed.
- restricted; here normal access is possible, only the service and calibration menu are blocked.
- unprotected; full access to all levels and menu's is possible.

Default the recorder is set to the restricted level and no passwords are entered for all levels. This means that every user can give any password to all levels.

Note: When changing passwords do not forget to write them down (in a secure place).
When a password set by the user cannot be retrieved the recorder has to be send back for update.

F1 F1 is used to change the security level. Turning the selector wheel will show all levels.

F2-F5 Not used.

F6 Pressing F6 allows for entering the password for the chosen level.

F7 Pressing F7 is for entering a new restricted password.
After entering the new password is requested a second time for verification.

F8 Pressing F8 is for entering a new unprotected password.
After entering the new password is requested a second time for verification.

5.5 SELECT NOVRAM SETTINGS

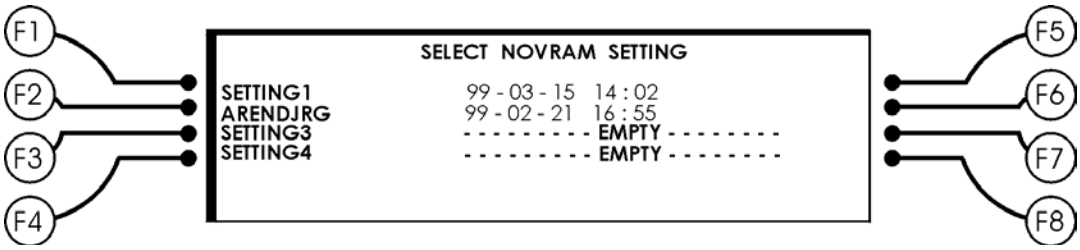


Figure 5.6 Select setting bank

F1-F4 Pressing F1- F4 selects one of the 4 settings that can be loaded or saved from NOVRAM (Non Volatile Random Access Memory).

F5-F8 Pressing F5-F8 enables you to change the name of the setting. Herewith a recognisable name for each setting can be set.

When a setting is stored, the actual time and date are automatically added to the setting name.

5.6 SYSTEM SUBMENU

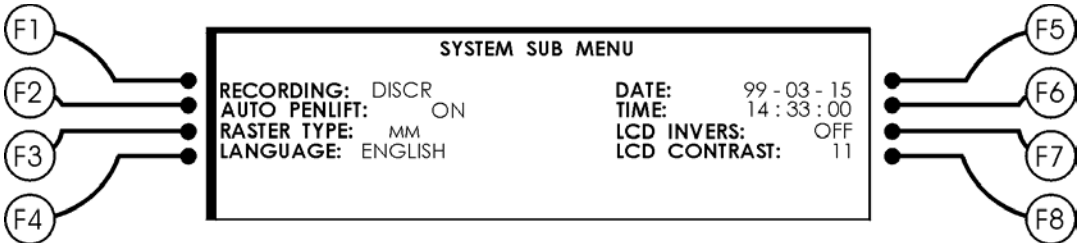


Figure 5.7 System submenu

F1 Recording normally takes place in the servo mode. The chartdrive then operates at a constant speed and all the pens continuously follow the input signals as closely as possible. When the signals that are to be plotted include fast changes (a high slew rate) the pen movements may not be fast enough, resulting in an inaccurate representation of the original signal. This problem can be significantly reduced by choosing the 'discrete' recording mode with key F1. In this mode the chartdrive is temporarily slowed down to allow for the pens to write the full amplitude of the signal. As soon as the signal changes slow down, the chartdrive can increase its speed and synchronise itself with real time.

When the slew rate of the input signal is too high for a too long period (more than 10 - 15 seconds), the internal buffer that allows for this discrete type of recording will get filled. When the recorder is close to an overflow state signal, it automatically empties the buffer in the following way: the chartdrive temporarily operates at twice the original speed and the buffered signals are written down with this speed. The recording of the input signal at that moment,

though, does not stop. After having emptied almost the whole buffer, the operating speed goes back to normal.

If this action results in unwanted effects, the BD 300 can be set with F1 to record in servo mode continuously. The choice between servo mode and discrete mode depends significantly on the spectral contents of your signals and therefore is application dependent.

F2 F2 sets auto penlift on or off. This feature automatically lifts the pens after 30 seconds of no pen movement. When, for instance, with external chartsteps the interval between 2 chart steps is more than 30 seconds this feature can better be switched off. Otherwise the pen will go up every 30 seconds.

F3 Selection between 'mm' or 'inch' raster type is done with F3. The raster type is the unit that is used to define the chart drive speed and printer interval.

F4 With F4 the language can be set. English is standard. French and German language is implemented at a later date.

F5/F6 The current date and time can be set with keys F5 and F6. Repeatedly pressing these keys lets you choose between the three sub-fields of date and time. Turning the selector wheel increments or decrements the selected value. When the selection of date or time is complete, the new value can be accepted by pressing 'enter'. After that, the current date and time are displayed on the top of the display. The edit fields will retain their values from the last edit, when the screen is entered.

F7 Pressing F7 sets logging to time or extern.
With time logging each channel has its own frequency at which the data is transferred to disk, RS-232 or both.
With logging set to external, the chart pulse is used to trigger the logging. In the channel menu (section 4.1) under logging (F3) a divider can be set in this case.

F8 Pressing F8 allows you to invert the LCD screen from black background with white text to white background with black text.

Note: The contrast can be adjusted with simultaneously pressing Exit and Enter see chapter 2.3 (keys in area 4)

5.7 RS-232 INTERFACE (optional)

This submenu can be activated from within the 'system' menu with F6.
Figure 5.7 gives an example of the display.

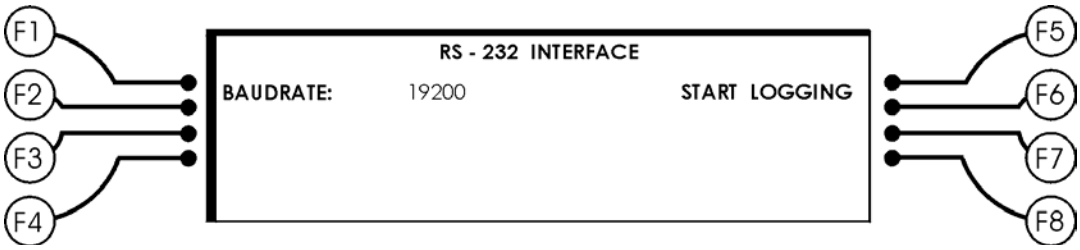


Figure 5.8 RS-232 submenu

Logging process data via the RS-232 serial interface assumes proper setting of the communication parameters. Additional information about the use of the RS-232 interface can be found in appendix D and E.

Fixed settings for the BD 300 are: 8 data bits
no parity bit
1 stop bit

F1 Baud rate selection is made with F1. Possible values are 2400, 9600, 19200, 38400 and 57600 bps.

F5 This field will initially show 'start logging'. Pressing F5 followed by enter will start the logging process to the serial port.
Once the logging is started this field will show 'stop logging'. Pressing F5 again followed by enter will stop logging.

Any device connected to the RS-232 connector should be grounded properly to prevent serious damage from occurring to the BD 300. This can be achieved by connecting both protective earths with each other.

6. CHART DRIVE

When the 'chart' key on the front panel is clicked, the chartdrive menu is activated. Figure 6.1 gives an example of the display.

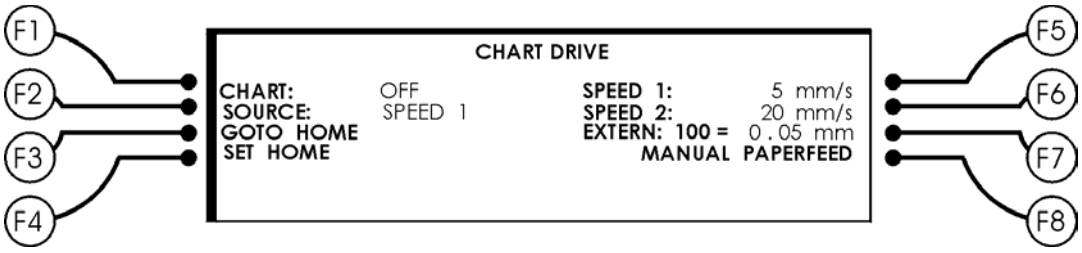


Figure 6.1. Chart drive menu

All keys F1 through F8 are used for selection and parameter setting. There is no chart submenu.

F1 Paper transport can be switched forward, reverse and off with F1. A shortcut to switching between off and the last active state is double clicking the 'chart' key from area 2 (see section 2.3).

F2 The chartdrive can operate at two alternate speeds. The two respective speeds that are available alternatively, can be set with keys F5 and F6. A third selection that can be made is the use of external chartdrive pulses. These have to be fed into the recorder via the I/O connector at the back. This possibility is discussed in detail in appendix D, section I/O specification. Default each separate pulse makes the paper advance 0.05 mm, with F7 a divider can be set.

F3/F4 Whenever a home position has been set with F4, the BD 300 will remember this location and return there upon activating the 'goto home' key F3.
After power on the current chart position is home.

F5/F6 These keys set the two predefined speeds as selected with F2.

F7 This sets the external chart pulse ratio. This means that a divider can be used for the external chart pulse. The value in the display shows the distance the chart will advance with 100 external chart pulses

F8 When the 'MANUAL PAPERFEED' function has been chosen with F8 the pens can be positioned anywhere along the paper by turning the selector wheel 'clock wise' (c.w.) or 'counter clock wise' (c.c.w.).
The paper speed in this case is related to the rotation speed of the selector.

Note: 'Paper out' is indicated with a blinking chart LED. Also when the paper is not correctly positioned over the sprockets or when the chart cassette is not properly clicked in its place the chart LED will blink.

When the BD 300 is set for XY-recording the chartdrive menu is changed in order to set the Y parameters for the Y movement.

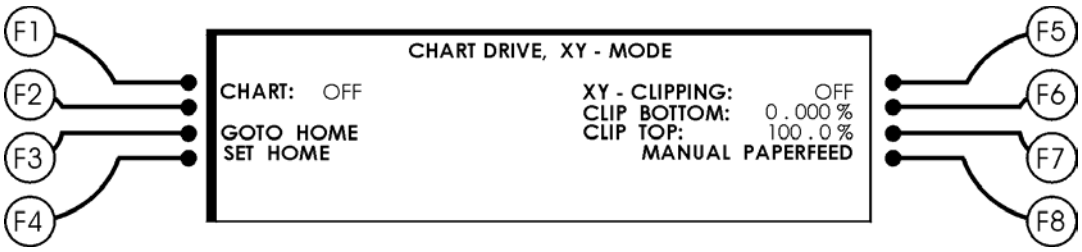


Figure 6.2. Chart drive menu in XY mode

F1 With F1 the chart movement can be switched on and off

F2 No function

F3 Goto the current HOME position

F4 Set the HOME position at the current chart position

F5 Switches XY-clipping on and off.
The Y movement of the chart is equal to the normal pen deflection in X-t mode. To limit the theoretical span of plus or minus 5 times the 250 mm deflection, the XY clipping can be switched on.

F6/F7 The top and bottom clipping margin are effective when XY-clipping is set to on (F5).
Clip bottom can be set from -500 to 0%
Clip top can be set from 0 to +500%
This results in an effective clipping range for the Y axis from -500 to +500%
(1000% * 250mm = 2.50 m)

F8 When the 'MANUAL PAPERFEED' function has been chosen with F8 the pens can be positioned anywhere along the paper by turning the selector wheel 'clockwise'(c.w.) or 'counter clockwise'(c.c.w.).
The paper speed in this case is related to the rotation speed of the selector.

Note: When the BD 300 is set to XY-recording, synchrone printing is not possible.

7. DISPLAY MODE

When the 'display' key on the front panel is clicked, this menu is activated. Figure 7.1 gives an example of the display.

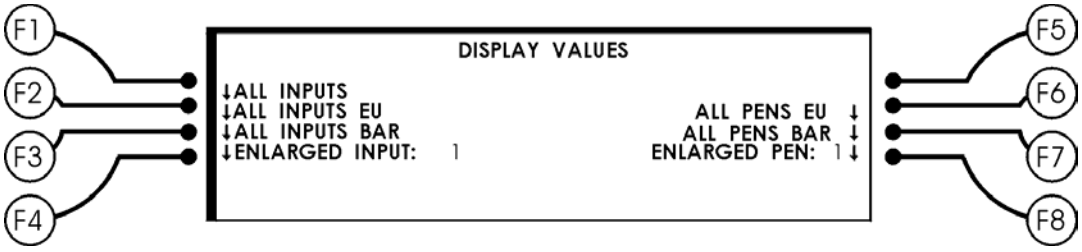


Figure 7.1. Display mode menu

F1 Key F1 activates the 'display inputs' screen. This screen continuously monitors the input values of each of the eight channels. Figure 7.2 gives an example.

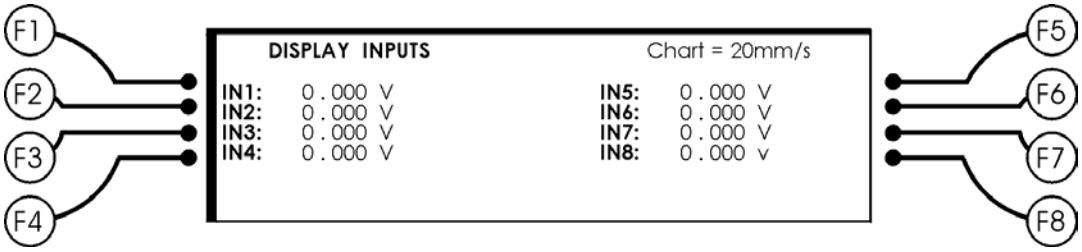


Figure 7.2. Display inputs

F2 Here the inputs are shown recalculated to their applied Engineering units.

F3 Pressing key F3 displays a bar diagram representing the eight input values.
A full bar corresponds with an input of full span. Figure 7.3 gives an example.

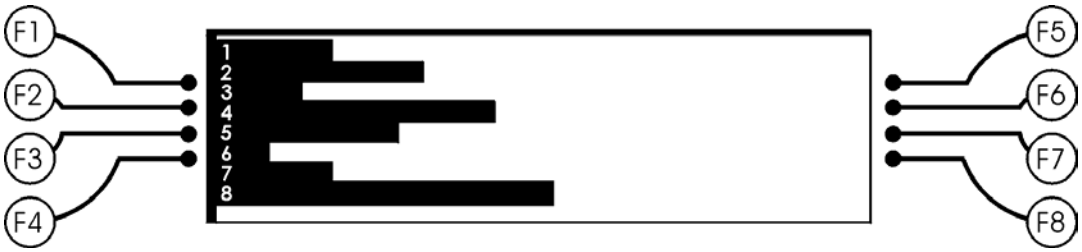


Figure 7.3. Display inputs bar

F4 Pressing key F4 one or more times lets you select which input you would like to display in enlarged mode. The enlarged mode actually appears after pressing Enter. You can return to the 'display mode' screen by pushing the Exit key once. Figure 7.4 gives an example of enlarged input 1.

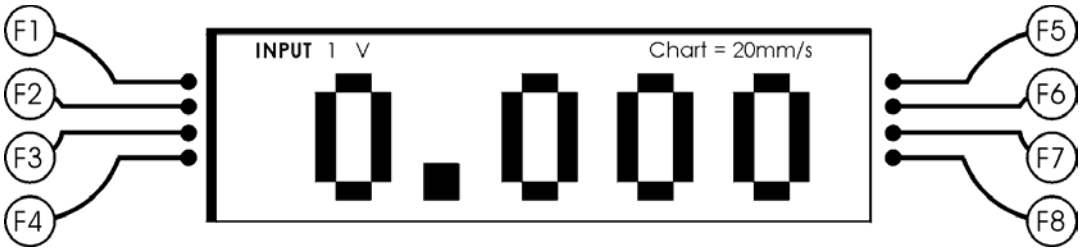


Figure 7.4. Display input enlarged

F5 Not used.

F6 Pressing key F6 will display a table with the values of the pens for each of the eight channels.

F7 Pressing key F7 is used for displaying a bar diagram representing each of the eight pen positions.

F8 Pressing key F8 once or more times lets you select which pen you would like to display in enlarged mode. The enlarged mode actually appears after pressing Enter. You can return to the 'display mode' screen by pushing the Exit key once.

8. PRINTER (optional)

8.1 PRINTER MAIN MENU

When the PRINTER key (in area 2 of figure 2.1) on the front panel is clicked, this menu will be activated. The display will look like the one that is shown in figure 8.1.

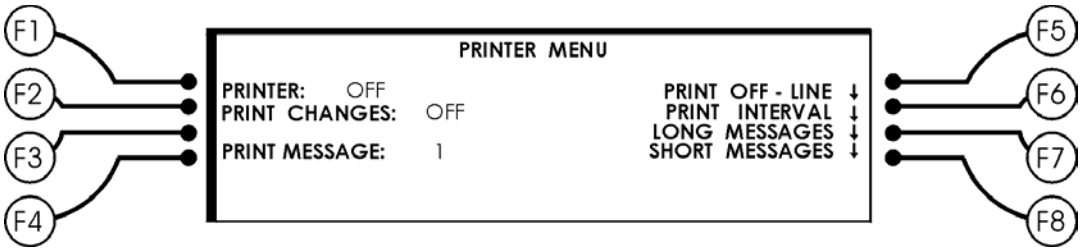


Figure 8.1. Printer main menu

F1 F1 switches the printer to (ON) DIRECT, (ON) SYNCHRONE or OFF. The *direct* or *synchrone* printing mode has only effect at automatically printed messages. The *synchrone* mode compensates the offset of the printer and the pen in the same way the POC (pen offset compensation) does. Channel related messages are printed next to the relevant channel. Other values are printed related to channel 1, independent of the active status of channel 1.

Note: In the XY-mode only the direct printing mode is available.

F2 If F2 is switched to ON, all important changes made during record on are printed. When the printer is in the *synchrone* mode the channel related information is printed next to the relevant channel.

F3 Not used.

F4 With F4 and the selector wheel a message can be selected.
Pressing 'enter' prints the selected message during a recording.

F5 Pressing F5 activates the 'off-line' submenu. (see 8.1.1)

F6 Pressing F6 activates the 'interval' submenu. (see 8.1.2)

F7 Pressing F7 activates the 'set messages' submenu. (see 8.1.3)

F8 Not used.

Messages 6-16 are 20 characters long.

8.1.1 Off-line submenu

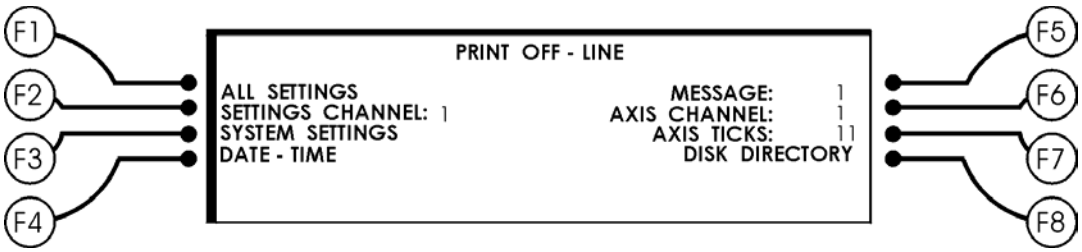


Figure 8.2. Off-line submenu

The 'off-line'-actions can only be activated in the 'record off' mode. In the 'record on' mode the message "NO OFFLINE PRINTING WHEN RECORD IS ON" is shown on the display. When you press the button RECORD the 'off-line printing' actions are shown.

F1 Pressing F1 and then pressing ENTER will result in a print of the *scale settings* of all the channels.

Ch	Tag	Type	Range	Left & Right margin		Zero	Color	Ch
8	Pen 8	THERMO-S K , CJC ON	2000 K	1800 K	2000 K	0.00 %		8
7	Pen 7	PT100 °C	2000 °C	0 °C	2000 °C	0.00 %		7
6	Pen 6	VOLTAGE DC	50.00 V	0.00 V	50.00 V	0.00 %		6
5	Pen 5	CURRENT AC RMS	500.0mA rms	0.0mA rms	500.0mA rms	25.00 %		5
4	Pen 4	VOLTAGE AC RMS	50.00 V rms	0.00 V rms	50.00 V rms	15.35 %		4
3	Pen 3	FREQUENCY	10.00kHz	0.00kHz	10.00kHz	0.00 %		3
2	Pen 2	THERMO-J °C , CJC ON	50.00 °C	250.0 °C	280.0 °C	0.00 %		2
1	Pen 1	VOLTAGE DC	50.00 V	0.00 V	250.0 V	50.00 %		1

Figure 8.3. Print of all (scale) settings

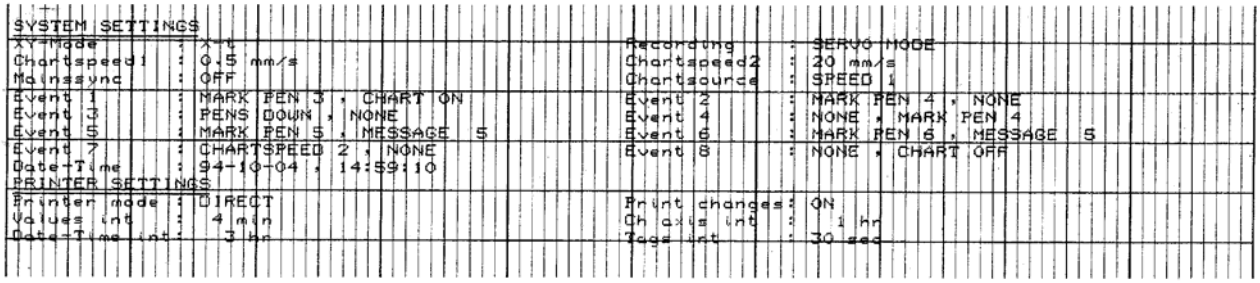
F2 F2 enables you to print all settings for a selected channel. By pressing F2 more times or turning the selector you choose the desired channel. Pressing ENTER prints all settings.

CHANNEL 1 SETTINGS

Type	: VOLTAGE DC	Tag	: Pen 1
Range	: 50.00 V	Zero	: 50.00 %
Left margin	: 0.00 V	Right margin	: 250.0 V
Shifting	: OFF	Filter	: Mains
Recording zone left	: 10.00 %	Recording zone right	: 50.00 %
Alarm low on	: 0.00 V	Alarm low off	: 0.50 V
Alarm high on	: 50.00 V	Alarm high off	: 49.50 V
Pen alarm low on	: 0.00 %	Pen alarm low off	: 1.00 %
Pen alarm high on	: 100.00 %	Pen alarm high off	: 99.00 %
Equation	: 13.48 * input 1 + input 6	EV	]
Eng unit low	: 0.00 V -> 0.00 V		
Eng unit high	: 250.0 V -> 250.0 V		

Figure 8.4. Print of the channel settings of a channel

F3 Pressing F3 and then ENTER results in a print of all relevant system-, chart-, and printer settings.



SYSTEM SETTINGS			
XY-Mode	: X-t	Recording	: SERVO MODE
Chartspeed1	: 0.5 mm/s	Chartspeed2	: 20 mm/s
Mainssync	: OFF	Chartsource	: SPEED 1
Event 1	: MARK PEN 3 , CHART ON	Event 2	: MARK PEN 4 , NONE
Event 3	: PENS DOWN , NONE	Event 4	: NONE , MARK PEN 4
Event 5	: MARK PEN 5 , MESSAGE 5	Event 6	: MARK PEN 6 , MESSAGE 5
Event 7	: CHARTSPEED 2 , NONE	Event 8	: NONE , CHART OFF
Date-Time	: 94-10-04 , 14:59:10		
PRINTER SETTINGS			
Printer mode	: DIRECT	Print changes	: ON
Values int	: 4 min	Ch axis int	: 1 hr
Date-Time int	: 3 hr	Tags int	: 30 sec

Figure 8.5. Print of the system settings

F4 Pressing F4 and then ENTER results in a print of *Time and Date* on the right hand side of the paper.

F5 Pressing F5 and turning the selector wheel gives you the choice of printing message 1 to 16 or all. Pressing ENTER results in the actual print of the selected *message(s)*.

F6 F6 allows you to select a channel or all channels for *axis printing*. The desired axis can be selected by pressing F6 more times or turning the selector wheel. ENTER prints the axis.

F7 Pressing F7 allows you to change the number of *axis marks* of F6. The channel number can be selected with F6. Pressing F7 more times or turning the selector chooses the desired number of axis marks between 2 and 11.

F8 Prints the disk directory of a BD 300 data disk.
All 16 record and setting files with name, time, date, and length are printed.

8.1.2 Interval submenu

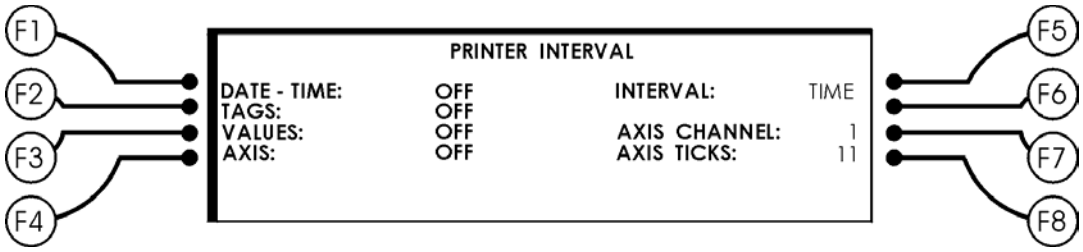


Figure 8.6. Interval submenu

In this submenu you can select one or more items to be printed on regular intervals. The interval is selected separately for every item and can be set to time or distance. The item is selected by the corresponding function button F1 - F8. Then the interval time is selected by pressing the corresponding button once or more again, or turning the selector wheel. Switching to OFF is included in this sequence. Pressing any other key than EXIT will confirm the value.

F1 F1 prints the *Time and Date* on the right-hand side of the paper.

F2 F2 prints the *tags* to identify the curve. This tag-printing only works if the 'synchrone mode' is active. (see 'printer main menu', 8.1, F1). In the 'direct mode' this action is switched off.

F3 Tags and corresponding values are printed when F3 is pressed. In the 'direct mode' these are not related to the curve, but in the 'synchrone mode' they are printed next to the curve.

F4 The axis is printed each time after the interval. A selection of the axis-number or all axes is made by pressing F7.

F5 The interval between the print messages (set with F1-F4) can be set to time or distance. Distance prints the selected messages on the correct positions independent of the chart speed. Distance ranges from 2 cm. to 2.5 m. (or 1 to 90 inches). Time prints the messages at a fixed time interval; the distance is then dependant on the chart speed. This ranges from 30 sec. to 60 hours.

F6 Not used.

F7 Selects the axis which is printed. *All* axis can be selected, too.
When printing all axis is selected, the interval between the first and second time printing axis 1 is n times the selected interval, where n is the number of channels.

F8 Pressing F8 allows you to change the number of tick-marks.
(see 'off-line submenu', 8.1.1, F7)

8.1.3 Set message submenu

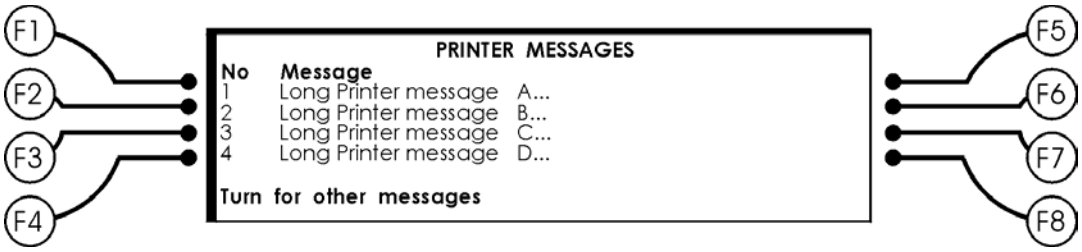


Figure 8.7 Set message submenu

This screen allows you to modify the messages that are printed when an alarm is reached, or an event is given.

Note: Pressing F1 - F4, gives the string input screen. (see 4.3)

Note: When for event, a pen mark and a printer message are combined as a action 1 and 2, the message will be printed synchrone with the channel from the selected pen mark.

For instance: Event 5 action 1 = pen mark 2
action 2 = message 10

When the printer is set to synchrone printing and event 5 is given, the selected message number 10 is printed next to the penmark of pen 2.

9. EXTERNAL USER INTERFACE

9.1 GENERAL DESCRIPTION

The BD 300 can be remote controlled through the serial interface. When a command is given the BD 300 enters the remote control state. Pressing 'system' for more than 2 seconds returns to manual operation.
Every command consists of three letters, preceded by a $ sign or a # sign and followed by a carriage return CHR$(13). The $ command is used to set various options in the BD 300, the # command is used to get the settings of the BD 300. Most commands are followed by a number of parameters. There are a number of different kinds of parameters, which are described in the following list.

[1]	One digit number,	e.g. *2*
[2]	Two digit number,	e.g. *04* or *23*
[F]	Floating point number,	e.g. *1.06785* or *1.456e-03*
[S]	String of characters, e.g.	e.g. *Pen_1* or *Message_12*

The $ commands returns 0 to indicate a successful command, or any other number to indicate an error in the processing of that command. The # commands return a number of values, depending on the specific command sent.
One exception are the values sent when logging is activated ($LOG). The BD 300 sends values at a specified interval with a channel indication byte preceding the channel values. This channel indication byte is a one digit value equal to 139 + channel number. So a value sent by the BD 300 preceded by a byte with the value 144 would mean that the value sent was a value from channel 5.

9.2 COMMANDS

9.2.1 Pens

Pen lift

PNL	[1]	Pen lift up/down	
		0	Pens up
		1	Pens down

Pen zero

PNZ	[1],	Pen number
	[F]	Zero position

Pen status

PNS	[1],	Pen number	
	[1]	Pen status	
		0	Pen active
		1	Pen zero
		2	Pen park

Pen margins

PMA	[1],	Pen number
	[F],	Left margin
	[F]	Right margin

Pen recording zone

PRZ	[1],	Pen number
	[F],	Recording zone left
	[F]	Recording zone right

Pen alarms

PNA	[1],	Pen number	
	[1],	Alarm type	
		0	Alarm low
		1	Alarm high
	[2],	Event action 1(see table 4)	
	[2],	Event action 2(see table 4)	
	[F],	Alarm level on	
	[F]	Alarm level off	

Pen shifting

PSH	[1],	Pen number	
	[1]	Shift type	
		0	No shifting
		1	Paper shifting
		2	Zone shifting

Calculation unit string

CUS	[1],	pen number
	[S]	unit string

Pen calculation

PNC	[1],	pen number			
	[F],	gain A			
	[1],	input number A			
	[1],	calculation type	table	0 =	none
	[F],	gain B		1 =	addition
	[1]	input number B		2 =	subtraction
				3 =	multiplication
				4 =	division

Copy settings from pen

CFP	[1],	Pen number
	[1]	Pen to copy from

9.2.2 Inputs

Set input type & range

INM	[1],	Channel number
	[2],	Measurement type, see table measure types (table 8)
	[2]	Input range, see table input ranges (table 7)

Input alarms

INA	[1],	Channel number	
	[1],	Alarm type	
		0	Alarm low
		1	Alarm high
	[2],	Event action 1 number (see table 4)	
	[2],	Event action 2 number (see table 4)	
	[F],	Alarm level on	
	[F]	Alarm level off	

Input filter

INF	[1],	Channel number		
	[2]	Filter type		
	0	0.01	Hz	filter
	1	0.02	Hz	filter
	2	0.05	Hz	filter
	3	0.1	Hz	filter
	4	0.2	Hz	filter
	5	0.5	Hz	filter
	6	1.0	Hz	filter
	7	2.0	Hz	filter
	8	5.0	Hz	filter
	9	10.0	Hz	filter
	10	20.0	Hz	filter
	11	Mains filter		
	12	No filter		

Input CJC on/off

CJC	[1],	Channel number	
	[1]	CJC on/off	
		0	CJC off
		1	CJC on

Engineering units

INE	[1],	Channel number
	[F],	Standard unit low
	[F],	Engineering unit low
	[F],	Standard unit high
	[F]	Engineering unit high

Engineering unit string

EUS	[1],	Channel number
	[S]	EU string

Logging sample rate

LSR	[1],	channel number
	[2]	logging sample rate

Copy from input

CFI	[1],	channel number
	[1]	input number to copy from

Set thermo unit

ITU	[1],	channel number	
	[1]	thermal unit	
		0	°C
		1	°F
		2	K

Frequency voltage level

VAC	[1],	channel number
	[2]	Voltage see table Input ranges (table 7)

Standard unit low high

SUR	[1],	channel number
	[F],	Standard unit low
	[F]	Standard unit high

EU low high

EUR	[1],	channel number
	[F],	EU low
	[F]	EU high

9.2.3 System

XY-Mode

XYM	[1]	Xt or XY mode channel	
		0	Xt-mode
		>0	XY-mode, channel x

XY-Mode clipping

XYC	[1]	Clipping on/off	
		0	Clipping off
		1	Clipping on

XY-Mode clipping margins

XCM	[F],	Lower margin
	[F]	Upper margin

Recording mode

RCM	[1]	Servo or discrete mode	
		0	Servo mode
		1	Discrete mode

Events

EVN	[1],	Event number
	[2],	Event action 1, see table event actions (table 4)
	[2]	Event action 2, see table event actions (table 4)

POC

POC	[1]	POC on/off	
		0	POC off
		1	POC on

Set date and time

CLK	[2],	Year
	[2],	Month
	[2],	Day
	[2],	Hours
	[2],	Minutes
	[2]	Seconds

Save settings

SST	[1]	Settings set

Recall settings

RST	[1]	Settings set	
		0	Recall factory defaults

Leave external UI

RET	Return to local control

Auto penlift

APL	[1]	Auto penlift on/off	
		0	off
		1	on

Raster type

RAT	[1]	Set raster type mm / inch	
		0	mm
		1	inch

Language

LAN	[1]	Language type	
		0	English
		1	Deutsch
		2	Français

Logging time extern

LTE	[1]	logging time/extern	
		0	time
		1	extern

LCD inverse

LCD	[1]	LCD inverse on/off	
		0	off
		1	on

Date time 1 time event

DT1	[2],	Year
	[2],	Month
	[2],	Day
	[2],	Hours
	[2],	Minutes
	[2]	Seconds

Date time 2 time event

DT2	[2],	Year
	[2],	Month
	[2],	Day
	[2],	Hours
	[2],	Minutes
	[2]	Seconds

Duration time event 1

DU1	[2],	Hours
	[2]	Minutes
	[2]	Seconds

Duration timed event 2

DU2	[2],	Hours
	[2]	Minutes
	[2]	Seconds

Action on time event 1

TA1	[2]	event number (see table 4)

Action on time event 2

TA2	[2]	event number (see table 4)

Disk space type

DST	[1]	set remaining disk space off / time / Kbytes	
		0	OFF
		1	Kbytes
		2	time

Disk logging type

DLT	[1]	set disk logging type	
		0	full disk
		1	continuous

9.2.4 Chart

Chart status

CHT	[1]	Chart on/off	
		0	Chart off
		1	Chart on

Record status

REC	[1]	Record on/off	
		0	Record off
		1	Record on

Chart speed

CSP	[1],	Raster type	
		0	mm
		1	Inch
	[2],	Chart speed 1, see table chart speeds (table 3)	
	[2]	Chart speed 2, see table chart speeds (table 3)	

Chart source

CSO	[1]	Chart source	
		0	Chart speed 1
		1	Chart speed 2
		2	Chart speed external

Set home position

SHO	Set the current chart position as home position

Goto home position

GHO	Move the chart to the home position

Chart move

CHM	[F]	Chart distance to move in mm

Chart pulse ratio

CPR	[2]	Divider on external chart pulse		
		0	5	mm/100pulses
		1	2	mm/100pulses
		2	1	mm/100pulses
		3	0.5	mm/100pulses
		4	0.2	mm/100pulses
		5	0.1	mm/100pulses
		6	0.05	mm/100pulses
		7	0.02	mm/100pulses
		8	0.01	mm/100pulses

9.2.5 Printer

Printer status

PRS	[1]	Printer status	
		0	Printer off
		1	Printer direct
		2	Printer synchrone

Set tag

PST	[1],	Pen number
	[S]	Tag string, max. 6 characters

Set message

PSM	[2],	Message number, one byte digit
	[S]	String, max 20 characters

Print changes on/off

PCH	[1]	Changes on/off	
		0	Changes off
		1	Changes on

Print off-line all settings

PAS

Print off-line settings channel

PCS	[1]	Channel number

Print off-line system settings

PSS

Print off-line time/date

PTD

Print off-line message

PME	[2]	Message number

Print off-line axis

PAX	[1],	Channel number
	[2]	Number of axis ticks (min. 2; max. 11)

Print interval time/date

ITD	[2]	Interval, see table printer intervals (table 5, 6)

Pen interval tags

ITA	[2]	Interval, see table printer intervals (table 5, 6)

Pen interval values

IVA	[2]	Interval, see table printer intervals (table 5, 6)

Pen interval axis

IAX	[1],	Channel number	
		0	Cycle through all channels
	[2],	Interval, see table printer intervals (table 5, 6)	
	[2]	Number of axis ticks (min. 2, max. 11)	

Printer on line message

POM	[2]	message number

Printer internal mode

PIM	[1]	0	direct mode
		1	synchrone mode

9.2.6 External logging

Set log rate

SLR [1], Channel number
[F], Log rate, F_{log}=100/(Log rate) [Hz]

Start logging

LOG [1] Start logging type; any command to BD 300 terminates logging
1 Log input values
2 Log pen positions

9.3 TABLES

COMMANDS EXTERNAL UI			
Code	**Description**	**Data**	**Description**
APL	autopenlift	[1]	on, off
CFI	Copy data from input	[1,1]	channel, input to copy from
CFP	Copy data from pen	[1]	pen number
CHM	Chart move	[F]	value in mm
CHT	Chart on/off	[1]	on/off
CJC	Set CJC on/off	[1,1]	channel, CJC on/off
CLK	Set clock	[2,2,2,2,2,2]	date, time
CSO	Chart source	[1]	source
CSP	Chart speed	[1,2,2]	raster type, speed1, speed2
DT1	Date time event1	[2,2,2,2,2,2]	date, time
DT2	Date time event2	[2,2,2,2,2,2]	date, time
DU1	Duration event1	[2,2,2]	time
DU2	Duration event2	[2,2,2]	time
DLT	Disk logging type	[1]	time/extern
DST	Disk space type	[1]	time/kB
EUR	EU low high	[1,F,F]	input, low, high EU
EUS	Engineering unit string	[1,S]	channel, EU string
EVN	Events	[1,2,2]	event, action1, action2
GHO	Goto home position		
IAX	Print interval axis	[1,2,2]	channel, interval, ticks
INA	Input alarms	[1,1,2,2,F,F]	ch, type, action 1, action 2, lvl on, lvl off
INE	Engineering units	[1,F,F,F,F]	channel, org low, EU low, org high, EU high
INF	Input filter	[1,2]	channel, type
INM	Input type, range	[1,2,2]	channel, type, range
IEU	EU value		
ITA	Print interval tags	[2]	interval
ITD	Print interval time-date	[2]	interval
ITU	Thermo unit	[1,1]	input, unit
IVA	Print interval values	[2]	interval
LTE	Logging time/extern		
LAN	Language		

Code	Description	Data	Description
LOG	Start external logging		
LCD	LCD inverse	[1]	on, off
LSR	Logging sample rate	[1,2]	input, sample rate
PAS	Print all settings		
PAX	Print axis	[1,2]	channel, ticks
PCH	Print changes on/off	[1]	on/off
PCS	Print channel settings	[1]	channel
PIM	Printer online message	[2]	message
PMA	Pen margins	[1,F,F]	pen, left margin, right margin
PME	Print message	[2]	message
PNA	Pen alarms	[1,1,2,2,F,F]	pen, type, action 1, action 2, lvl on, lvl off
PNC	Pen calculation	[1,F,1,1,F,1]	pen, A gain, A inp, Calc Type, B gain, B inp
PNL	Pen lift	[1]	up/down
PNS	Pen status	[1,1]	pen, status
PNZ	Pen zero	[1,F]	pen, zero position
POC	POC on/off	[1]	on/off
POM	Printer mode	[1]	mode
PRS	Printer status	[1]	status
PRZ	Pen recording zone	[1,F,F]	pen, left zone, right zone
PSH	Pen shifting	[1,1]	pen, type
PSM	Set message	[2,S]	message, string
PSS	Print system settings		
PST	Set tag	[1,S]	pen, string
PTD	Print time-date (off-line)		
RAT	Raster type	[1]	type
RCM	Recording mode	[1]	type
REC	Record status	[1]	record on/off
RET	Leave external UI		
RST	Recall settings	[1]	set
SEU	Range string		
SHO	Set home position		
SLR	Set logging rate	[1,F]	channel number, logging rate
SST	Save settings	[1]	set

Code	Description	Data	Description
SUR	Left right margin	[1,F,F]	pen, left, right margin
TA1	Time action 1	[2]	action
TA2	Time action 2	[2]	action
VAC	Frequency voltage range	[1,2]	input, range
XCM	XY mode clipping margins	[F,F]	lower margin, upper margin
XYC	XY mode clipping	[1]	clipping on/off
XYM	XY mode	[1]	type

Table 1. Commands external UI

GET DATA COMMANDS EXTERNAL UI				
Code	**Description**	**Input Description**	**Output**	**Description**
ALV	All channel values		[F,..,F]	input values for all channels (4,6,8)
APL	Autopenlift		[1]	actual autopenlift status on/off
CHS	Chart on system		[1]	on / off
CHT	Chart on / off		[1]	on / off
CJC	CJC on / off	[1] channel	[1]	CJC on / off
CKC	Channel count		[1]	number of channels
CKF	Check floppy present		[1]	true / false
CKP	Check printer present		[1]	true / false
CLK	Clock		[2,2,2,2,2,2]	date, time
CPR	Chart extern		[2]	chart extern ratio
CSO	Chart source		[1]	source
CUS	Calc unit string	[1] channel	[S]	eng unit string calc result
DLT	Disk log type		[1]	time / extern logging
DST	Disk space type		[1]	type no / time / kb
DT1	Start time event 1		[D,T]	YY-MM-DD, HH-MM-SS
DT2	Start time event 2		[D,T]	YY-MM-DD, HH-MM-SS
DU1	Duration T-event1		[T]	HH-MM-SS
DU2	Duration T-event2		[T]	HH-MM-SS
ENL	Eng unit low	[1] channel	[F]	from engineering units screen

Code	Description	Input description	Output	Description
ENH	Eng unit high	[1] channel	[F]	from engineering units screen
EUH	Eng units high	[1] channel	[F,F]	original unit, eng unit
EUL	Eng units low	[1] channel	[F,F]	original unit, eng unit
EUS	Eng unit string	[1] channel	[S]	eng unit string calc result
EVN	Event actions	[1] event	[2,2]	action1, action2
IAH	Input alarm high	[1] channel	[2,2,F,F]	act1, act2, level on, level off
IAL	Input alarm low	[1] channel	[2,2,F,F]	act1, act2, level on, level off
IAX	Print interval axis		[1,2,2]	channel, interval, ticks
INF	Input filter	[1] channel	[1]	type
INR	Input range	[1] channel	[2]	range
INT	Input type	[1] channel	[2]	type
ITA	Print interval tags		[2]	interval
ITD	Print interval time date		[2]	interval
ITU	Temperature unit	[1] channel	[1]	dg C, dg F, K
IVA	Print interval values	[1] pen	[2]	interval
LAN	Language	[1] channel	[1]	English, Français, Deutsch
LCD	LCD inversion		[1]	on / off
LSR	Log sample rate	[1] channel	[2]	sample rate index for channel
LTE	Logging type		[1]	time / extern logging
OUH	Org unit high	[1] channel	[F]	from engineering units screen
OUL	Org unit low	[1] channel	[F]	from engineering units screen
PAH	Pen alarm high	[1] pen	[2,2,F,F]	act1, act2, level on, level off
PAL	Pen alarm low	[1] pen	[2,2,F,F]	act1, act2, level on, level off
PCH	Print changes on / off		[1]	on / off
PMA	Pen margins	[1] pen	[F,F]	left margin, right margin
PNC	Calculation	[1] channel	[F,1,1,F,1]	Again, Ainp, op.Bgain, Binp
PNL	Penlift		[1]	up / down
PNS	Pen status	[1] pen	[1]	status
PNZ	Pen zero [1] pen		[F]	value
POC	POC on / off		[1]	on / off
POM	Printer message		[2]	online message number
PRS	Printer status		[1]	status
PRZ	Pen recording	[1] pen	[F,F]	rec zone left, rec zone right
PSH	Pen shifting	[1] pen	[1]	type

Code	Description	Input Description	Output	Description
PSM	Get message	[2] msg	[S]	msg string
PST	Get tag	[1] pen	[S]	msg string
RAT	Raster type		[1]	type
RCM	Recording		[1]	type
REC	Record status		[1]	record on / off
SEU	Range string	[1] channel	[S]	eng unit string
TA1	Action T-event1		[2]	action number
TA2	Action T-event2		[2]	action number
VAL	Input value	[1] channel	[F]	input value
VAC	AC sensit. Freq.	[1] channel	[1]	1 mV ..50 V
XCM	XY mode clip margins		[F,F]	lower margin, upper margin
XYC	XY mode clipping		[1]	clipping on / off
XYM	XY mode		[1]	type

Table 2. Get data commands external UI

CHART SPEEDS					
Code	Speed [mm]	Speed [Inch]	Code	Speed [mm]	Speed [Inch]
00	5 mm/hr	0.2 "/hr	14	20 mm/min	1 "/min
01	10 mm/hr	0.5 "/hr	15	50 mm/min	2 "/min
02	20 mm/hr	1 "/hr	16	100 mm/min	5 "/min
03	50 mm/hr	2 "/hr	17	200 mm/min	10 "/min
04	100 mm/hr	5 "/hr	18	500 mm/min	20 "/min
05	200 mm/hr	10 "/hr	19	0.1 mm/sec	50 "/min
06	500 mm/hr	20 "/hr	20	0.2 mm/sec	0.01 "/sec
07	0.1 mm/min	50 "/hr	21	0.5 mm/sec	0.02 "/sec
08	0.2 mm/min	100 "/hr	22	1 mm/sec	0.05 "/sec
09	0.5 mm/min	200 "/hr	23	2 mm/sec	0.1 "/sec
10	1 mm/min	500 "/hr	24	5 mm/sec	0.2 "/sec
11	2 mm/min	0.1 "/min	25	10 mm/sec	0.5 "/sec
12	5 mm/min	0.2 "/min	26	20 mm/sec	1 "/sec
13	10 mm/min	0.5 "/min			

Table 3. Chart speeds

EVENT ACTIONS			
Code	Event action	Code	Event action
00	None	22	Relay 3
01	Mark pen 1	23	Relay 4
02	Mark pen 2	24	Relay 5
03	Mark pen 3	25	Relay 6
04	Mark pen 4	26	Relay 7
05	Mark pen 5	27	Relay 8
06	Mark pen 6	28	Printer message 1
07	Mark pen 7	29	Printer message 2
08	Mark pen 8	30	Printer message 3
09	Chart FWD	31	Printer message 4
10	Chart RVRS	32	Printer message 5
11	Chart OFF	33	Printer message 6
12	Pens up	34	Printer message 7
13	Pens down	35	Printer message 8
14	Chart speed 1	36	Printer message 9
15	Chart speed 2	37	Printer message 10
16	Record on	38	Printer message 11
17	Record off	39	Printer message 12
18	Set home	40	Printer message 13
19	Goto home	41	Printer message 14
20	Relay 1	42	Printer message 15
21	Relay 2	43	Printer message 16

Table 4. Event actions

PRINTER INTERVALS			
Code	**Interval**	**Code**	**Interval**
0	Off	15	45 min
1	30 sec	16	1 hr
2	1 min	17	2 hr
3	2 min	18	3 hr
4	3 min	19	4 hr
5	4 min	20	5 hr
6	5 min	21	6 hr
7	6 min	22	8 hr
8	8 min	23	10 hr
9	10 min	24	12 hr
10	12 min	25	15 hr
11	15 min	26	24 hr
12	20 min	27	30 hr
13	30 min	28	60 hr
14	40 min		

Table 5. Printer intervals [time]

PRINTER INTERVALS			
Code	**Interval**	**Code**	**Interval**
0	Off	15	250 mm
1	20 mm	16	300 mm
2	30 mm	17	350 mm
3	40 mm	18	400 mm
4	50 mm	19	450 mm
5	60 mm	20	500 mm
6	70 mm	21	600 mm
7	80 mm	22	700 mm
8	90 mm	23	800 mm
9	100 mm	24	900 mm
10	120 mm	25	1000 mm
11	140 mm	26	1500 mm
12	160 mm	27	2000 mm
13	180 mm	28	2500 mm
14	200 mm		

Table 6. Printer intervals [distance]

INPUT RANGES					
Code	**VDC/VAC**	**IDC/IAC**	**Freq.**	**Thermo**	**Code**
00	1 mV	1 mA	10 Hz	50	00
01	2 mV	2 mA	20 Hz	100	01
02	5 mV	5 mA	50 Hz	200	02
03	10 mV	10 mA	100 Hz	500	03
04	20 mV	20 mA	200 Hz	1000	04
05	50 mV	50 mA	500 Hz	2000	05
06	100 mV	100 mA	1 kHz	xxx	06
07	200 mV	200 mA	2 kHz	xxx	07
08	500 mV	500 mA	5 kHz	xxx	08
09	1 V	xxx	10 kHz	xxx	09
10	2 V	xxx	20 kHz	xxx	10
11	5 V	xxx	50 kHz	xxx	11
12	10 V	xxx	100 kHz	xxx	12
13	20 V	xxx	xxx	xxx	13
14	50 V	xxx	xxx	xxx	14

Table 7. Input ranges

MEASURE TYPES	
Code	Measure Type
00	Voltage DC
01	Current DC
02	Voltage AC
03	Current AC
04	Frequency
05	TC B
06	TC E
07	TC J
08	TC K
09	TC N
10	TC R
11	TC S
12	TC T
13	Pt-100 2 wire
14	Pt-100 3 wire
15	Pt-100 4 wire

Table 8. Measure types

10. DISK DRIVE (OPTIONAL)

With the disk drive option of the BD 300, up to 16 complete recorder settings can be stored and recalled on a standard 3.5 inch, high density floppy disk. It will also enable users to log measured data to the floppy disk (up to 16 log files). This data can be played back on the BD 300 or be copied to any standard IBM compatible personal computer. This data can then be processed with appropriate programs, be converted into graphs etc.
The primary functions are save and recall settings, logging and playback. Other options include renaming and deleting setting or logging files, initializing a data disk, optimizing disks and displaying the directory of a BD 300 data disk.
Most disk drive functions involve a setting or a logging file, which is called the currently selected (active) file. This file must be selected by the user before any file oriented functions can be used. The way files are selected will be discussed in section 10.4 and 10.5

10.1 SELECTING DISK OPTION

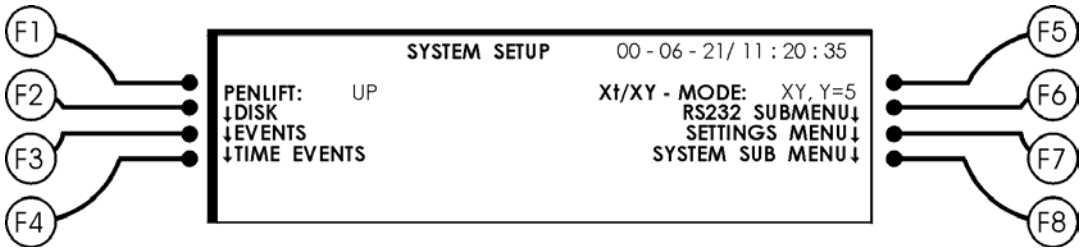


Figure 10.1 System setup main menu

To activate the disk menu, press F2.

10.2 DISK DRIVE MAIN MENU

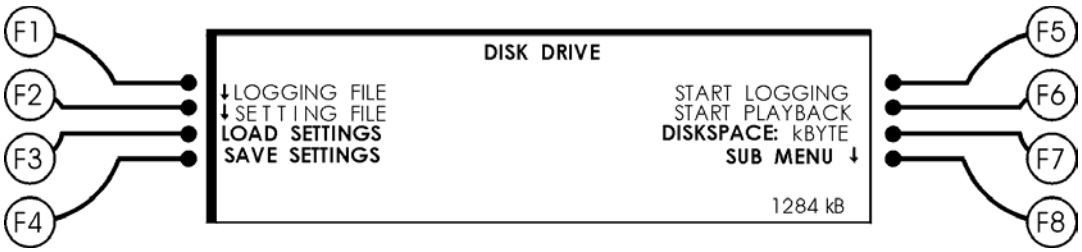


Figure 10.2 Disk drive menu

F1 This line shows the active logging file. When no file is selected pressing F1 enters the logging file sub menu. see 10.4
The active file means that any logging read or write action will be done on this file.

F2 This line shows the active setting file. When no file is selected pressing F2 enters the setting files sub menu. see 10.5
The active file means that any setting read or write action will be done on this file.

F3 Pressing F3 loads a previously saved setting file. The setting file that will be loaded is the currently selected (active) setting file (F2). This file must be selected before the settings can be loaded. If no file is selected, or the selected file is not on the disk, a warning will be displayed and nothing will be loaded.
After the settings are loaded, the checksum of that setting is calculated and checked with the stored checksum.
The settings read are ignored if:

- The checksums are not equal.
- The software version stored with the settings does not correspond with the software version of the current BD 300.

F4 With the function save settings the user can save the current settings of the BD 300 in the currently selected setting file. This file must be selected before settings can be saved. If no file is selected, a warning will be displayed and nothing will be saved. If the selected setting file already exists, the user will be asked if the file may be overwritten. See fig.10.8
After saving the settings to disk, they are read back to verify a successful operation.
A total of 16 recorder settings can be stored on disk.

F5 With the F5 you can start or stop logging input data to a diskette.
The text string in the display will change from "start" to "stop logging", which enables you to stop logging with the same key (F5).
When logging is activated, all channels which have logging enabled will write their data to the diskette. The sample rate can be selected for each channel individually, in the input sub menu. The logging data is stored in the currently selected logging file.
Before logging can start, the user must select a logging file. If no file is selected, a warning will be displayed and logging will not start. If the selected file already exists, the user will be asked if the file may be overwritten. Before logging of the input data starts, the current BD 300 settings are saved at the start of the logging file.
Logging to a diskette is similar to RS-232 logging. Whenever a setting from the table below (fig 10.3) is changed on the BD 300, the new setting is written to the diskette. Also all events will be written to the diskette as they occur. The logging data will only be written to disk when record is active. If record is inactive only the settings are written to the diskette. Logging of data stops either by user request or due to an error (see error and warning handling in section 10.6). If logging is stopped, a string is added to the end of the logging file that explains why logging stopped.

Summary of actions to start logging:

- Setup BD 300 inputs for correct range type etc.
- Select log rate for relevant channels (input sub menu F3)
- Insert BD 300 data disk or initialize a new one
- Select logging filename (disk menu F1)
- Set full disk or continuous logging (disk sub menu F8)
- Start logging (disk menu F5)
- Set record on

Note: For fast switching between logging on/off also record on/off can be used. The only disadvantage is that during record off the recording on paper will also stop.

Input type (incl. CJC)
Log rate
Filter
Events
Record on/off (with time)

Figure 10.3 Settings that will be written to a log file when changed

F6 This function starts or stops playback of previously recorded data. The text string changes from "start" to "stop logging" if playback is activated. Before playback starts, the settings at the start of the logging file are read and record is turned off. To start playback the user must press record. **This allows the user to change the settings of the BD 300 between selecting playback and pressing record.** Playback can be temporarily halted by setting record off. The playback of data will also be temporarily halted when the BD 300 is out of paper or when the chart cassette is removed. The data is read from the currently selected logging file and is sent to the same channel as the channel that logged the data. If no file is selected or the selected file is not on the disk, a warning will be displayed and playback will not start. Playback of data can stop either by user request, when the end of the file is reached or due to an error (see error handling in section 10.6).
All setting changes encountered in logging file are directly set on the BD 300. If an event is encountered in the log file, it is handled just like an external event. This means that the current action for that event is used, this can be different from the action that was set when the event was logged.
The user can also change the settings of the BD 300 during playback. A subset of the settings, which can be found in table 10.4, influence the playback of data. All other settings are ignored until playback is stopped. The input, filter type and logging of a channel are the only settings that can't be changed during playback.
When data is logged at a low logging rate, there is a chance that during playback the recording will show discrete steps. This problem can be avoided by using a sufficiently low chartspeed or by logging at a higher lograte.
When data recorded on a BD 300 is played back on a BD 300 with fewer channels then the one that logged the data, the data for channels that are not available on the playback BD 300 is ignored.

Note: During playback external events are ignored, but the recorded events will be shown.

Input span	Pen park / active / zero	Calculations	Printer settings
Input shift	Pen zero position	XY mode	Event actions
Variable span	Alarm settings	POC	Eng. Units
Input range	Auto shifting	Discrete mode	Calculations
Left & right margin	Recording zones	Chart settings	

Figure 10.4 Settings that influence the playback of data.

F7 With this option, the user can select if and how the remaining disk space on the current diskette is shown. Options are: TIME / kBytes / NONE
If selected, the remaining disk space will be shown on the LCD of the user interfaces at the bottom right hand corner. The disk space will only be shown when disk logging is active, or when one of the disk drive screens is shown. If there is no disk in the drive, the message will show 0 kB or 00m00s. See fig. 10.2
The remaining disk space can be shown either in kilobytes of data left on the diskette or in logging time remaining. The logging time remaining depends on the currently selected logging rates. The time will be displayed in hours, minutes and seconds. The format is hhhh,hhh:mm, or mm:ss.
If continuous logging is selected, the remaining disk space shown will always be the maximum data that can be stored in the selected file. This value will not change during logging. See examples in figure 10.2 and 10.5

F8 This key enters the DISK SUB MENU

Note: During logging and playback several other disk functions are not available at the same time. This will be indicated with the help string "FUNCTION NOT AVAILABLE" on the bottom line of the screen.

10.3 THE DISK SUB MENU

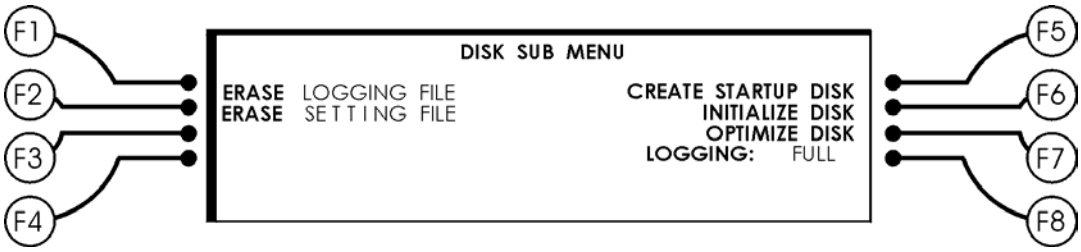


Figure 10.5 Disk sub menu

F1 This function allows the user to erase a logging file from the disk. The user is always asked whether the file must really be deleted. See fig.10.9
Files that are removed are directly available to be used for a new logging, although the space they occupy may not be available directly. If the logging file was the last logging file on the disk, the space is available. If the logging file was not the last logging file on the disk, the space is not directly available. This space can only be made available with the optimize disk function. The filename of the erased file will not be deleted, but will remain as the filename of the empty file.

F2 This function allows the user to erase a setting file from disk. The user is always asked whether the file must really be erased. See fig 10.9

F3/4 No function

F5 With F5 the current settings are saved in a special file on the disk (which is then considered an autodisk). These settings will be used when powering up the BD 300 with an autodisk inserted.
The name of the autostart file is “startup.set”. If a user saves or renames a setting with that name, the disk will also be an autodisk.

F6 This function initializes a diskette for use as a BD 300 data disk. This means that the disk will be formatted for use in MS-DOS compatible computers running MS-DOS 3.0 or higher. After initialization (this takes about 60 seconds) the disk will also contain 16 empty logging files named LOG01.REC - LOG16.REC and 16 empty setting files named SET01.SET - SET16.SET. The name of the disk will be BD 300. This name can be changed on a personal computer by using the ‘label’ command.
Any data on the disk will be lost after initialization!

F7 Optimize disk performs two functions.
First an aborted logging file will be properly closed after the last logged data point. At the end of the logging file a descriptive text will be added which indicates that the file was not properly closed.
This means that a logging session that was aborted due to for instance a power failure has to be closed with optimize before it can be used.
The fact that a disk contains a file that is not properly closed can be recognized in the directory by the text “NOT CLOSED” after the filename. See fig 10.6. If the file header of the logging file is incomplete then the file will be deleted by optimize.
The second function is to remove unused space between files after deleting a file. If a logging file is deleted, and it was not the last logging file on the disk, the space that is occupied by the removed logging file cannot be used.
This can be solved by optimizing the diskette. Optimize moves all the logging files following the deleted logging file, so the remaining disk space can be used by a new logging file.
The reason for this way of file handling is to ensure that the disk doesn’t get fragmented, so the maximum logging rate for all channels can be guaranteed.

Note: A file that is marked “NOT CLOSED” has to be closed with optimize or deleted before a new logging session starts. Otherwise the message “not closed file on disk” will be showed.

Note: Using optimize on a disk with large data files can take up to 60 seconds.

F8 This option allows the user to select continuous logging or full disk. With full disk logging the input data is written to the disk until the user stops logging, an error occurs or the disk is full. With continuous logging selected the logging only stops at user request or when an error occurs. When the disk is full, logging is continued at the beginning of the active logging file. This means that if there is room for 3 hours logging left on the disk, that with continuous logging the logging information of the last 3 hours is always stored on disk.

10.4 THE LOGGING FILES SUB MENU

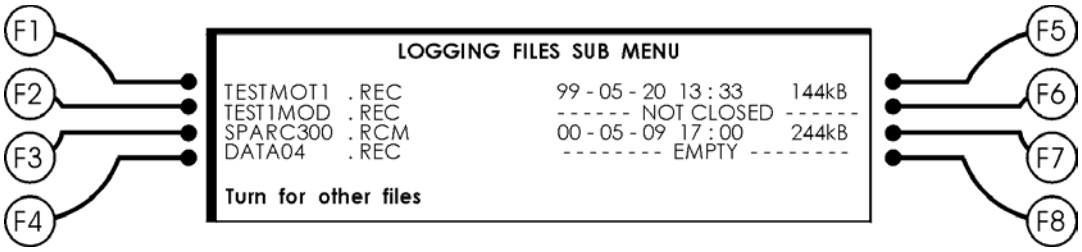


Figure 10.6 Logging files sub menu

This menu is activated from the disk drive menu with F1. Figure 10.6 shows an example of this display.
After initialize this display will show only empty files with file names DATA00.REC through DATA04.REC. By turning the selector wheel, all the files (16) can be scrolled into the window. Which function key has to be used for selecting which file, depends on how the selector was turned.

F1/4 Pressing one of the first 4 function keys selects one of the four names showed on the right hand side of the display. Pressing ENTER leaves this menu and makes the selected file the active logging file. EXIT leaves the menu without changing the filename.

F5/8 To change the name of a file press F5-F8.
Pressing the function key gives the string input screen. (see 4.3)

10.5 SETTING FILES SUB MENU

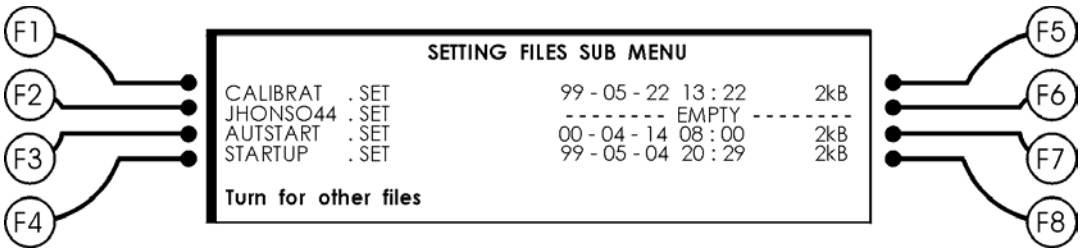


Figure 10.7 Setting files sub menu

This menu is activated from the disk drive menu with F2. Figure 10.7 shows an example of this display.
After initialize this display will show only empty files with file names SET00.SET through SET15.SET. By turning the selector wheel, all (16) files can be scrolled into the window. Which function key has to be used for selecting which file, depends on how the selector wheel was turned.

F1/4 Pressing one of the first 4 function keys selects one of the four names shown on the right hand side of the display. Pressing ENTER leaves this menu and makes the selected file the active setting file.
F5/8 To change the name of a file press F5-F8. Directly after pressing F5-F8 the string input screen will appear to change the text.

Figure 10.8 Overwriting an existing file

Figure 10.9 Deleting a file

10.6 WARNINGS AND ERROR MESSAGES

Figure 10.10 Warning display

Possible warnings with explanation:

- DISK READ ERROR
  - NO DISK IN DRIVE — Insert a BD 300 data disk
  - PLEASE CHECK DISKETTE — General read error. Disk damaged, not formatted or wrong diskette
- DISK WRITE ERROR
  - PLEASE CHECK DISKETTE — General read error. Disk damaged, not formatted or wrong diskette
  - DISK WRITE PROTECTED — Move write protection tab to write position (hole closed)

• NOT A BD 300 DISK	
- PLEASE USE INITIALIZE	Disk formatted but not initialized for BD 300 use
• ERROR IN SETTINGS FILE	
- SETTINGS IGNORED	Data format not according to BD 300 standard
• SETTINGS FILE EMPTY	
- SETTINGS IGNORED	No settings have been saved under this name, file is empty
• VERIFY ERROR	
- PLEASE CHECK DISKETTE	Disk possibly damaged
• NO FILE SELECTED	
- SELECT A LOGGING / SETTING FILE	before performing a primary disk function a logging or setting file has to be selected.
• LOGGING STOPPED	
- DISK FULL	Use an empty BD 300 disk to continue logging
• DISK BUSY	
- CAN NOT PERFORM OPERATION	Disk not ready with previous disk action. Wait until ready
• FILE NAME EXISTS	
- NAME NOT CHANGED	A filename is changed to an already existing name. Choose other name
• LOGGING STOPPED	
- VERIFY ERROR	Disk possibly damaged
- DISK FULL	Log file will be closed with message: file closed due to full disk.
- DISK ERROR	Unable to write data to disk, possible disk damage
• PLAYBACK STOPPED	
- LOGFILE ERROR	Data format not according to BD 300 standard
- END OF FILE	End of playback file reached, playback ready.
- DISK ERROR	Unable to read playback data from disk, possible disk damaged
• DISK ERROR	
- PLEASE CHECK DISKETTE	General disk error, error unknown.

11. BD 300 ILLUMINATION (optional), lamp change

The (optional) chart illumination of the BD 300 consists of 3 light bulbs, which are connected in series. The lamp fitting has a bayonet catch.

To change the lamps, the use of the supplied tool (0333164) is recommended.
After opening the front door, the tool has to be put upwards over the lamp (see figure 11.1).
Apply a little pressure and turn the tool with the lamp counter clockwise. The lamp will come out of the socket with the tool.

To mount a new lamp, put it in the tool (0333164), with the bulb face down. Put the tool with the lamp in the socket and apply a little force (see figure 11.1). Turn the tool with lamp clockwise to fixate it in the socket.
Store the tool for next time use.

Lamp type:	type:	according to H DIN 72601
	voltage:	12 Volt
	current:	100/120 mA
	size:	R = 9 mm
		L = 24mm
	socket:	BA9s

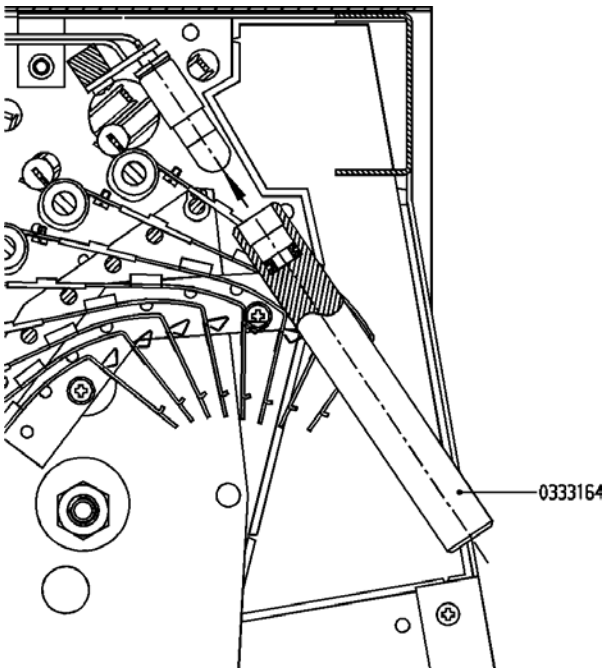
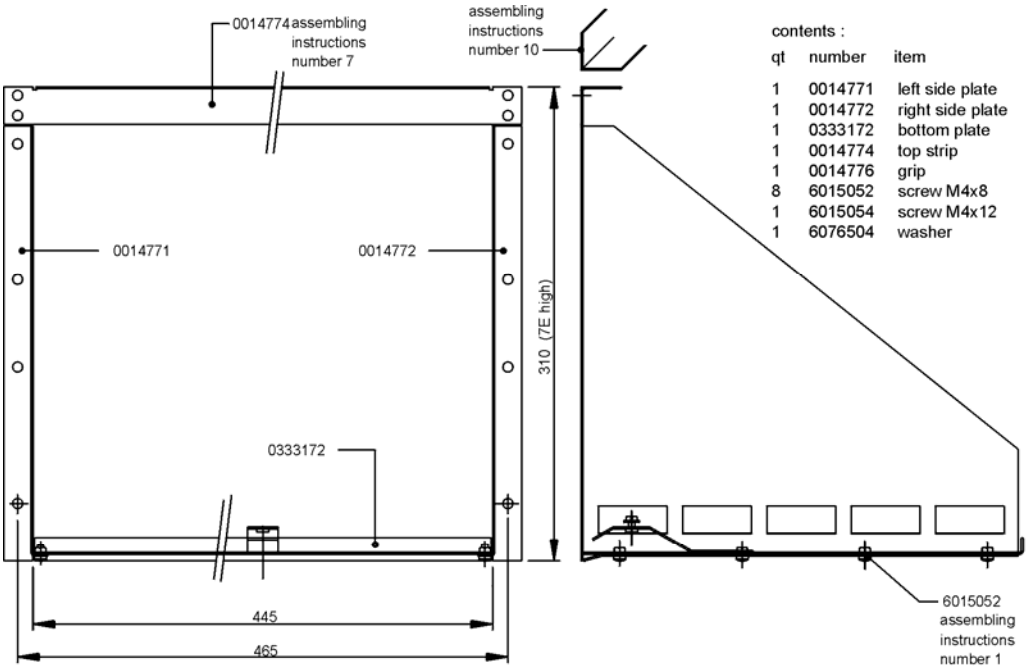


Figure 11.1 BD 300 illumination, lamp change



contents :

qt	number	item
1	0014771	left side plate
1	0014772	right side plate
1	0333172	bottom plate
1	0014774	top strip
1	0014776	grip
8	6015052	screw M4x8
1	6015054	screw M4x12
1	6076504	washer

BD 300 - 19" rack / panel-mount kit

assembling instructions for 19" rack mount:

1 mount the two side plates (0014771/772) on the bottom plate (0333172) with 4 screws (6015052) on both sides.

2 mount the assembly in the 19" rack, and fix it with at least 4 screws to the 19" rack.

3 put the grip (0014776) on the top right hand side of the BD 300 door, for easy access of the door after mounting the recorder in the 19" rack.

4 remove the knobs that secure the inputbox on the right hand side of the recorder.

5 put the recorder in the rack assembly and open the recorder door. pull out the chart cassette by lifting the lever and pulling the cassette towards you.

6 fixate the recorder to the rackmount assembly with screw (6015054) and washer (6076504).

7 mount the top strip (0014774) to close the space above the recorder in the 19" rack.

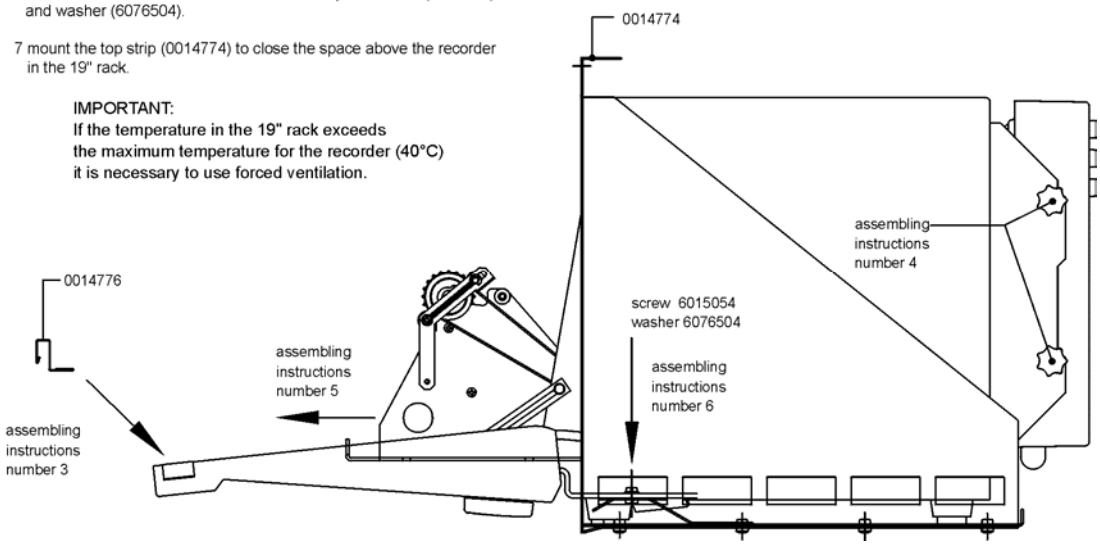
IMPORTANT:
If the temperature in the 19" rack exceeds the maximum temperature for the recorder (40°C) it is necessary to use forced ventilation.

additional instructions for panel mount:

8 panel cut out : (hxw) = 306x450 mm

9 mount assembly in bottom of the panel cut out

10 mount top strip (0014774) upside-down (opposite to 19" rack mount) to close space above the recorder



APPENDICES

APPENDIX A HARDWARE SPECIFICATIONS BD 300

General:

Instrument type	4, 6 or 8 channels.
Mains supply	115/230 Volt ±15%, optional 24 Volt DC.
Power consumption	60, 70 or 80 W for 4, 6 or 8 channels
Operating conditions	0°C..40°C and 20%..80% rH, none condensing.
Dimensions	WxDxH, 444 x 390 x 280 mm.
Weight	14,15 and 16 kg for BD 300 /4 /6 and /8.
Safety	According to IEC 1010, CSA, VDE and CE.
Safety class	Installation category II for power supply and inputs.
Disturbance	Tested according to IEC 801-2,3,4.

Resolution and sample:

Resolution input	20 bits
Resolution pen	0.053 mm in X direction, 16 bits over 250 mm.
Resolution chart	0.013 mm, max. speed 50 mm/s.
Sample rate each channel	400 Hz Max.

Specification input channels:

Volt DC	1 mV...250 V FS
Volt AC	1 mV .. 250 V FS RMS (Crest factor < 5).
Amps DC	1 mA ...0.5 A FS.
Amps AC	1 mA ...0.5 A FS RMS (Crest factor < 5).
°C/F/K	-200°C...2000°C span for: J, K, T, N, B, S, E, R and Pt-100; 2,3 and 4 wires.
CJC	cold junction compensation selectable per channel for thermocouples.
Frequency	10Hz - 100 kHz in steps of 1,2 and 5. (triggerlevel adjustable)
Accuracy	VDC accuracy : 0,1% of reading ± 5µV ± 1 digit
	IDC accuracy : 0,1% of reading ± 5µA ± 1 digit
	VAC accuracy : 0,25% of reading ± 10µV ± 1 digit (for 50/60 Hz)
	IAC accuracy : 0,25% of reading ± 10µA ± 1 digit (for 50/60 Hz)
Thermo-couple:	0.5 ºC , excluding TC inaccuracy
	0.1% of reading ± 1 digit (= VDC accuracy)
	Linearisation error < 0.06 ºC for all ranges
	Cold junction error < 1 ºC
Pt-100 (4wire)	Overall accuracy 0.5 º C,
	Excluding RTD inaccuracy
Zero drift	0.25 µV/°C
Channel separation	2k V no visible crosstalk with freq. < 10 kHz.
Input impedance	1 MOhm for VAC, VDC 1 Ohm for AAC, ADC.
Filter	Off, 0.01,0.02 ... 20 Hz+ mains, low pass filter. in steps of 1,2 and 5.
Shifting	-400% to +400% (full scale or zone, manual or automatic).
Left/right margin	minimal full scale 10 mV, max full scale 495 V (max input 250 V)
Log rate	0.01 .. 400 Hz adjustable per channel.
Zone recording	0..100% adjustable per channel.

Alarm setting	2 alarms per channel with adjustable hysteresis.
Zero position	-100% to +200%.

Chart drive:

Paperspeeds	5 mm/h..... 50mm/s. or 0.2 inch/hr....2 inch/s. (forward and backward)
Dual speed	change triggered by event.
External control	chart controlled by external input with TTL pulses. (divider selectable)
Papertype	Z-foldpaper
Paperfeed	Manual, X-Y and go to home up to 250 mm/s.
Paper out sensor	Chart stopped, logging continued.

Servo system:

Paper width	250 mm.
Pen travel	252 mm
Pen speed	1.2m/s and 20m/sý
Response time	< 0.25 s. 5..95%, In discrete mode temporarily < 0.1s.
Mechanical pen offset	2.5 mm, POC available.
Life time pen	500 m typical 800 m.
Pens	Identical for all channels (8 different colours available).

Special functions:

Servo mode	Pen follows the input as good as possible (up to 2 Hz, 90% of scale).
Discrete mode	Chartspeed is temporarily slowed down in order to simulate a higher pen response for fast signals.
8 event inputs	TTL inputs or contact closure, with each 43 programmable functions.
Time events	Switches selectable events (also logging/recording), with pre-set time / date and duration.
XY function	One of the input channels is directed to the chart control.
serial interface	RS-232 up to 57600 baud, 25 pins female connector. All recorder functions can be remote controlled.
real time clock / date	factory set, user adjustable
mathematical functions	Possible between input(s) and pen.
save and recall	4 complete system settings with selectable name can be stored and recalled from Novram (plus recall factory default).
8 alarm relays outputs	Contact rating 500 mA / 50 V.
logging to RS-232	PC software supplied on 3.5" disk (optional).
pen change button	All pens and printer cartridge can easily be reached with this button.
autopenlift	autopenlift (with override) to prevent stains on paper when chart stops

Printer	(optional)
type	Inkjet (HP Inkjet cartridge)
speed	80 characters/sec. unidirectional
density	100 characters over full scale (250 mm)
position	**Before pen 1** to allow synchrone mode !
mode - direct	prints information direct at the moment the command is given
-synchrone	Delays the information (like Pen Offset compensation) to synchronize it with the analog input signals
print features:	messages, actual values and time/date on request or interval. settings, axis per channel, changes, alarms, tags and disk contents.

Disk data logging station (optional)

log rate	off / 0.01 - 400Hz in 1,2 and 5 steps, per channel selectable also logging per external chartpulse possible
data storage	compressed. The supplied software decompresses a 1.44 MB disk to 4 MB of ASCII data.
logging destination	selectable to disk, RS-232 or both.
logging type:	
-full disk	data is stored until full disk message is given and logging stops.
-continuous	at full disk the oldest data will be overwritten to have always the most recent information.
data files	up to 16 different datafiles with a selectable name can be stored on disk (like MS Dos file structure). Each file also contains the complete setting of the recorder.
setting files	apart from the datafiles 16 complete settings of the recorder can be stored with a selectable name.
data guard	if case of a power failure all data until power off is retained
disk info	remaining time or disk space showed in display.
playback	original BD 300 or PC data can be (re)written on the BD 300
autodisk	this allows the recorder to start (power on) with prestored setting.
check origin	difference between original and manipulated data can be detected with check origin program (according to GLP requirement)
initialize	formats a disk for use in the BD 300

Rack or panel mount	(optional)
panelmount	panel cutout: 450 x 306 mm
rackmount	19" rack fitting

Definition of A/D resolution and used terminology

To explain the accuracy of pen- and logging data, the terms used in the BD 300 menus and this manual first have to be explained.

INPUT RANGE :	is the initial visible ranges, set in the channel menu (F1) with standard steps of 1,2,5 etc
FS SPAN:	is the full scale deflection for the pens (250 mm). This is right margin minus left margin.
A/D RANGE	This is 10 times the INPUT RANGE.(default) for DC this is 20 bits (16.5 bits for AC)
pen resolution =	$^{2}\log(2^{20} * 1/10 * (\text{FSspan}/\text{ADrange}))$

For logging always the full 20 bits A/D range is available.
To visualize the complete A/D range on paper the auto zero suppression can be set in the pen sub-menu, or LEFT and RIGHT MARGIN can be set to the full A/D range.

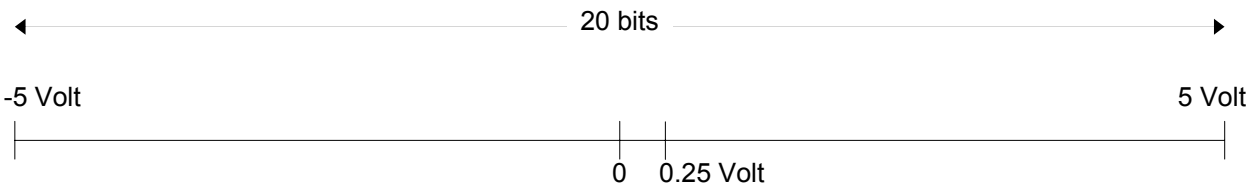
Some examples to explain these definitions:

BD 300 settings:
INPUT RANGE 1 Volt (DC)
LEFT MARGIN 0 Volt
RIGHT MARGIN 1 Volt
Possible Zero suppression -500%, 400% (total 900%)
pen resolution 16.4 bits

BD 300 settings:
INPUT RANGE 1 Volt (DC)
LEFT MARGIN 0 Volt
RIGHT MARGIN 4 Volt
Possible Zero suppression -125%, 25% (total 150%)
pen resolution 18.7 bits

BD 300 settings:

INPUT RANGE 1 Volt (DC)
LEFT MARGIN 0 Volt
RIGHT MARGIN 0.25 Volt
Possible Zero suppression -2000%, 1900% (total 3900%)
pen resolution 14.4 bits



The standard pen resolution is 16 bits although the A/D resolution is 20 bits. The extra 4 bits are used for zero suppression, and noise (50/60 Hz) suppression.

When the zero- and noise suppression are not necessary and the full 16 bits are required for logging and on paper this can be achieved by setting the LEFT and RIGHT MARGIN equal the A/D range.

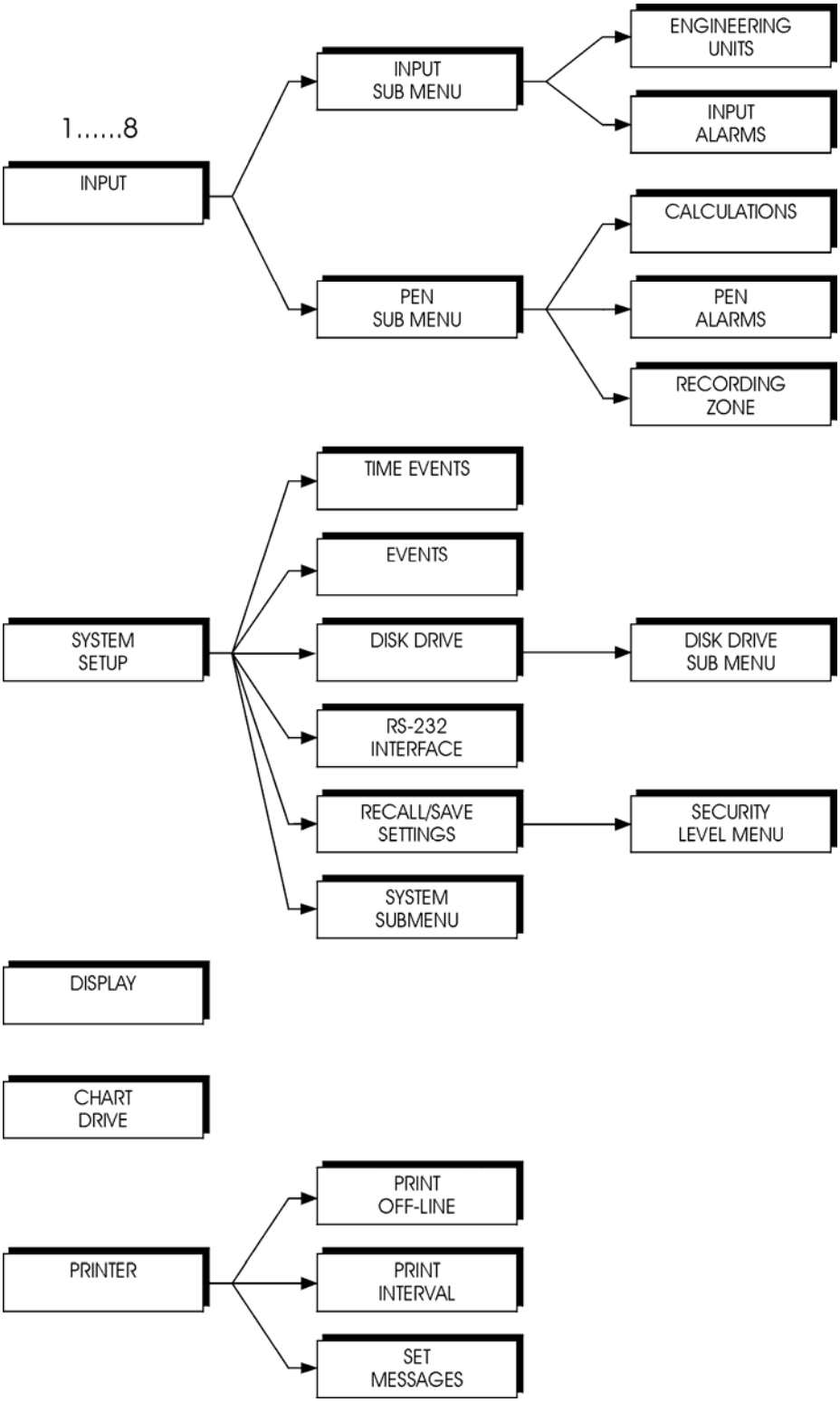
For example:

BD 300 settings:

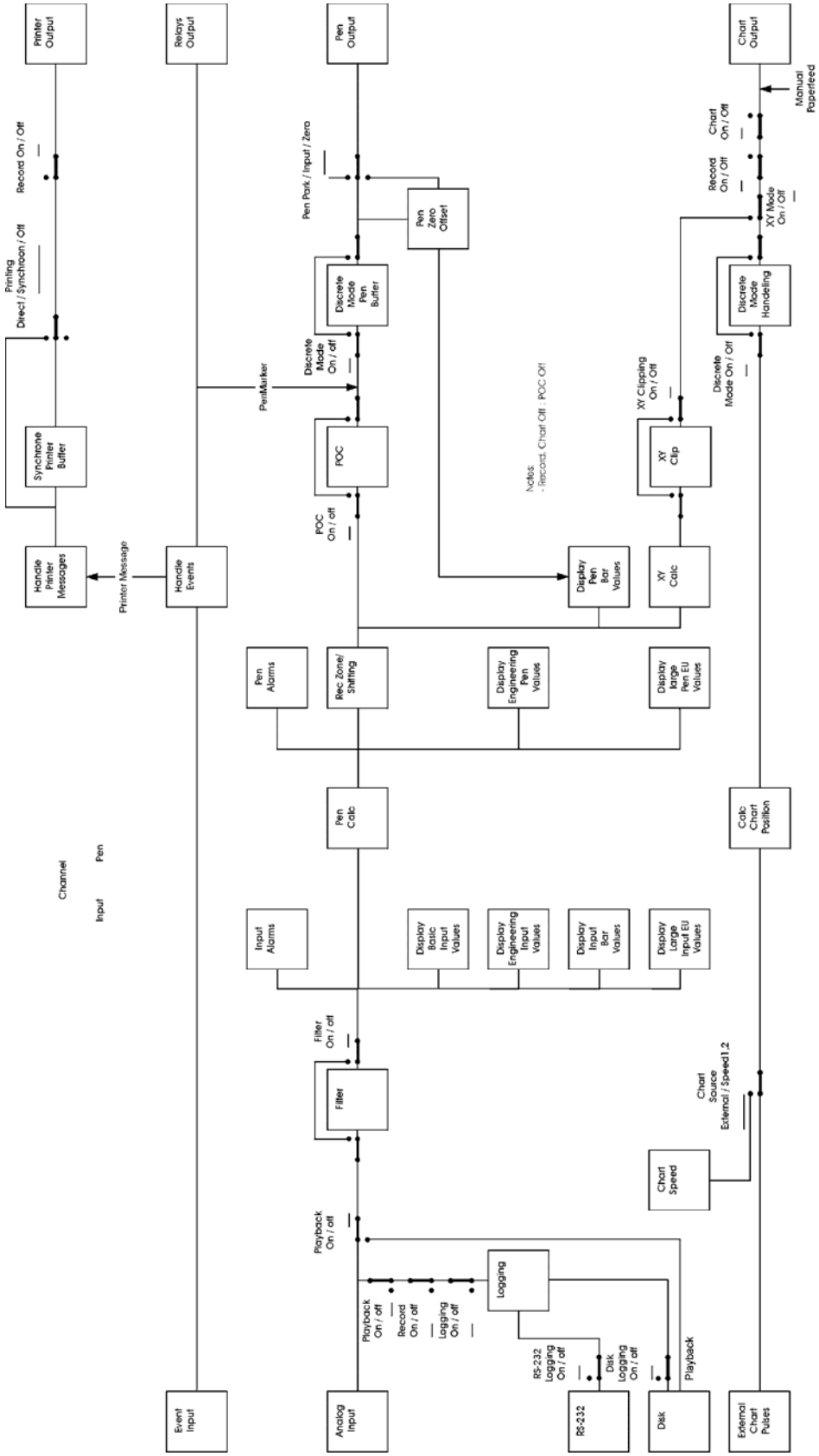
INPUT RANGE 1 Volt
LEFT MARGIN -5 Volt
RIGHT MARGIN 5 Volt
Possible Zero suppression none
pen resolution 20 bits

APPENDIX B STRUCTURE FLOW CHARTS

MENU STRUCTURE FLOW CHART



DATA-FLOW FLOW CHART



APPENDIX C THERMAL SENSORS

Thermocouple linearisation is based on the International Temperature Scale of 1990 (ITS-90). Complete description of the functions and tables used can be found in *NIST Monograph 175: Temperature-Electromotive force reference functions and tables for the letter-designated thermocouple types based on the ITS-90.*

ThermoCouple B:

Alloys	Platinum-30% Rhodium vs. Platinum-6% Rhodium.									
Range	250	to	1820	°C.						
Error	-0.02	to	0.03	°C	in	250	to	700	°C	range.
	-0.01	to	0.02	°C	in	700	to	1820	°C	range.

ThermoCouple R:

Alloys	Platinum-13% Rhodium vs. Platinum.									
Range	-50	to	1768.1	°C.						
Error	-0.02	to	0.02	°C	in	-50	to	250	°C	range.
	-0.005	to	0.005	°C	in	250	to	1200	°C	range.
	-0.0005	to	0.001	°C	in	1200	to	1664.5	°C	range.
	-0.001	to	0.002	°C	in	1664.5	to	1768.1	°C	range.

ThermoCouple S:

Alloys	Platinum-10% Rhodium vs. Platinum.									
Range	-50	to	1768.1	°C.						
Error	-0.02	to	0.02	°C	in	-50	to	250	°C	range.
	-0.01	to	0.01	°C	in	250	to	1200	°C	range.
	-0.0002	to	0.0002	°C	in	1200	to	1664.5	°C	range.
	-0.002	to	0.002	°C	in	1664.5	to	1768.1	°C	range.

ThermoCouple E:

Alloys	Nickel-Chromium vs. Copper-Nickel.									
Range	-200	to	1000	°C.						
Error	-0.01	to	0.03	°C	in	-200	to	0	°C	range.
	-0.02	to	0.02	°C	in	0	to	1000	°C	range.

ThermoCouple J:

Alloys	Iron vs. Copper-Nickel.									
Range	-210	to	1200	°C.						
Error	-0.05	to	0.03	°C	in	-210	to	0	°C	range.
	-0.04	to	0.04	°C	in	0	to	760	°C	range.
	-0.04	to	0.03	°C	in	760	to	1200	°C	range.

ThermoCouple K:

Alloys	Nickel-Chromium vs. Nickel-Aluminium.									
Range	-200	to	1372	°C.						
Error	-0.02	to	0.04	°C	in	-200	to	0	°C	range.
	-0.05	to	0.04	°C	in	0	to	500	°C	range.
	-0.05	to	0.06	°C	in	500	to	1372	°C	range.

ThermoCouple N:

Alloys	Nickel-Chromium-Silicon vs. Nickel-Silicon-Magnesium.									
Range	-200	to	1300	°C.						
Error	-0.02	to	0.03	°C	in	-200	to	0	°C	range.
	-0.02	to	0.03	°C	in	0	to	600	°C	range.
	-0.04	to	0.03	°C	in	600	to	1300	°C	range.

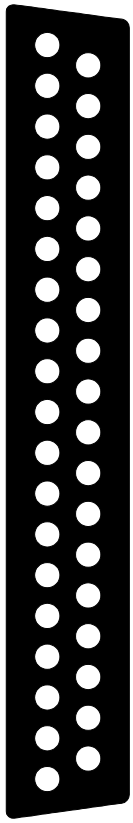
ThermoCouple T:

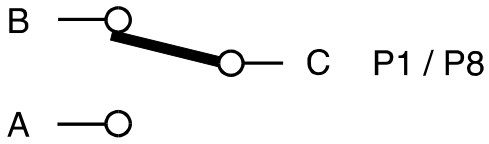
Alloys	Copper vs. Copper-Nickel.									
Range	-200	to	400	°C.						
Error	-0.02	to	0.04	°C	in	-200	to	0	°C	range.
	-0.03	to	0.03	°C	in	0	to	400	°C	range.

APPENDIX D I/O SPECIFICATIONS AND CONNECTIONS

37 PINS LAYOUT FOR RELAYS / EVENTS, I/O CONNECTOR

EVENTS 1	1	20	P3-a
EVENTS 2	2	21	P3-b
EVENTS 3	3	22	P3-c
EVENTS 4	4	23	P4-a
EVENTS 5	5	24	P4-b
EVENTS 6	6	25	P4-c
EVENTS 7	7	26	P5-a
EVENTS 8	8	27	P5-b
400 Hz SYNC	9	28	P5-c
CHART PULSE	10	29	P6-a
GND	11	30	P6-b
GND	12	31	P6-c
GND	13	32	P7-a
P1-a	14	33	P7-b
P1-b	15	34	P7-c
P1-c	16	35	P8-a
P2-a	17	36	P8-b
P2-b	18	37	P8-c
P2-c	19		





The connections for the relay outputs P1..P8 are shown in the power off and alarm state.
If an alarm becomes active the assigned relay contact switches from A to B.
During normal operation when no alarm is active the contacts A and C are connected.

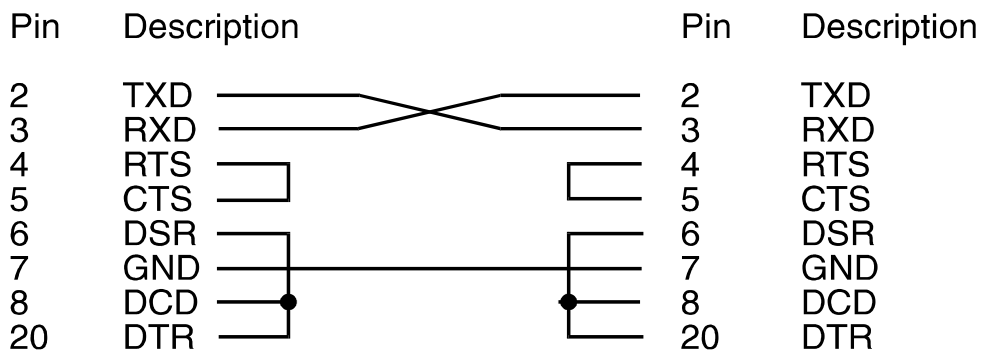
The event inputs are TTL compatible and can be controlled by a TTL "0" or contact closure to ground.

The Chart pulse input accepts frequencies up to 400 Hz, for controlling the chart.

The 400 Hz SYNC is an output for the sample rate frequency, and is only used for testing.

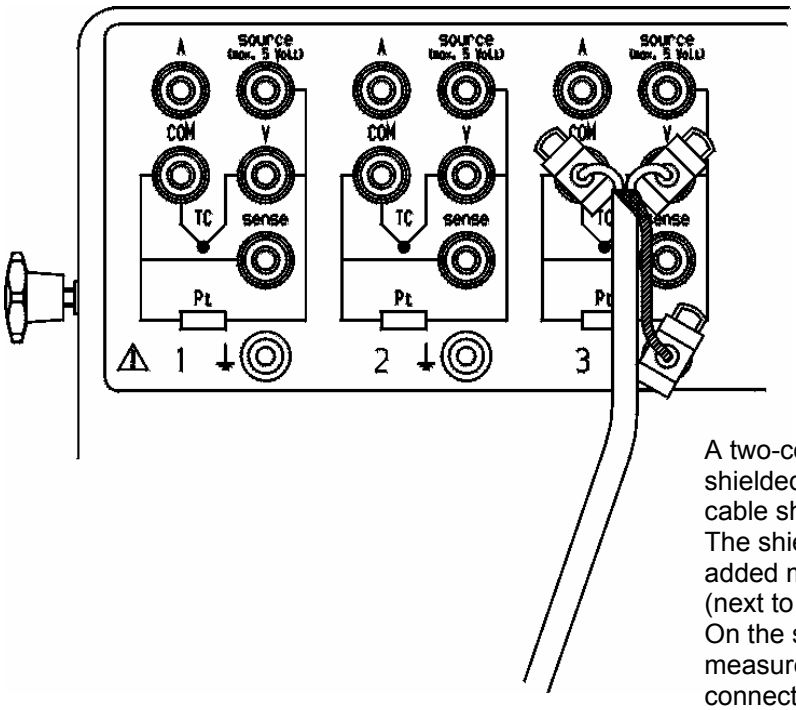
RS-232 Port

The serial RS-232 port is equipped with a 25 pin type female sub D connector with the following connections:



Above connection is recommended for connecting to a PC

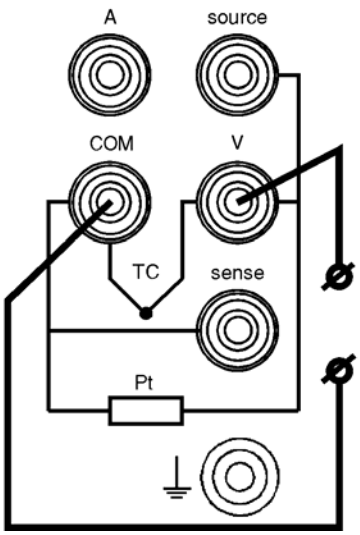
Banana inputs



A two-core (preferably twisted), shielded (braided shield) input cable should be used.
The shielding is connected to the added measuring earth terminal (next to the channel number).
On the side of the signal to be measured the shielding should be connected with the zero of the circuit in question or with the circuit's shielding.

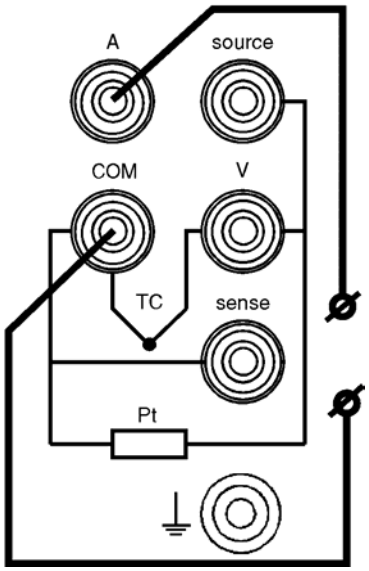
Connecting a Voltage over 50VAC to the Pt-100 source or sense terminal will damage these inputs.

Connections for VAC, VDC, TC and frequency

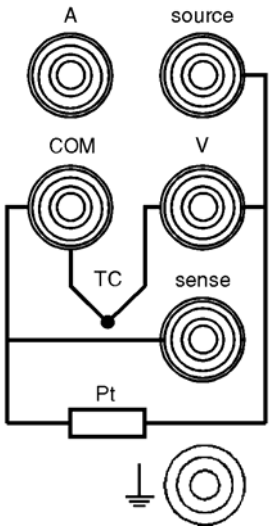


Note: See also 2.4 - 2.6 for correct input connections and safety precautions to prevent damage to the inputs.

Connections for IDC and IAC

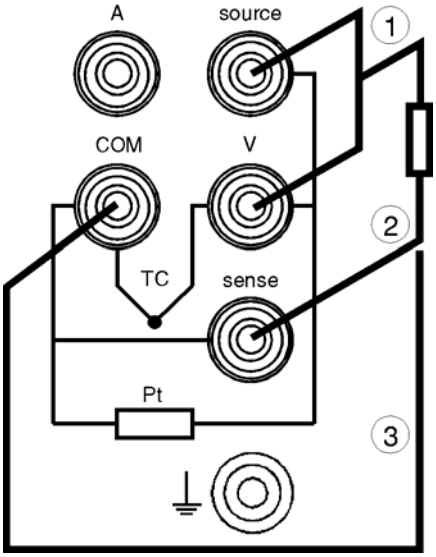


Pt-100 4 wire connection

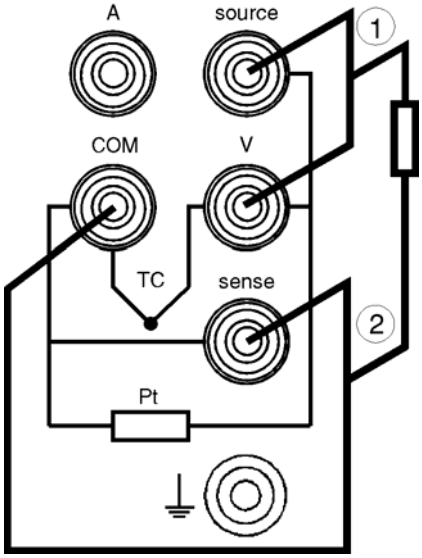


Connecting a voltage over 50VAC to the Pt-100 source or sense terminal will damage these inputs.

Pt-100 3 wire connection



Pt-100 2 wire connection

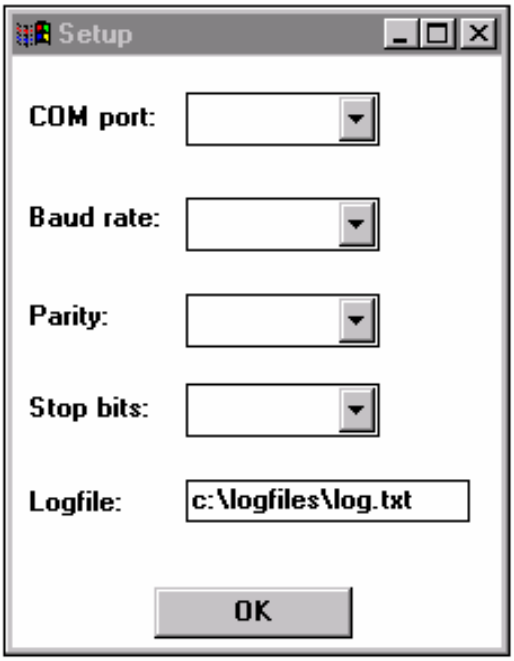


Connecting a voltage over 50VAC to the Pt-100 source or sense terminal will damage these inputs.

APPENDIX E PC SOFTWARE OPTION FOR LOGGING TO RS-232

The software to log to your PC is supplied in the optional connectivity package, together with the cable to connect the BD 300 to your serial port.
The software runs under Windows 3.11 or 95 and can be started by double clicking the file WLOG.exe. For faster startup the file can better be copied onto the harddisk.

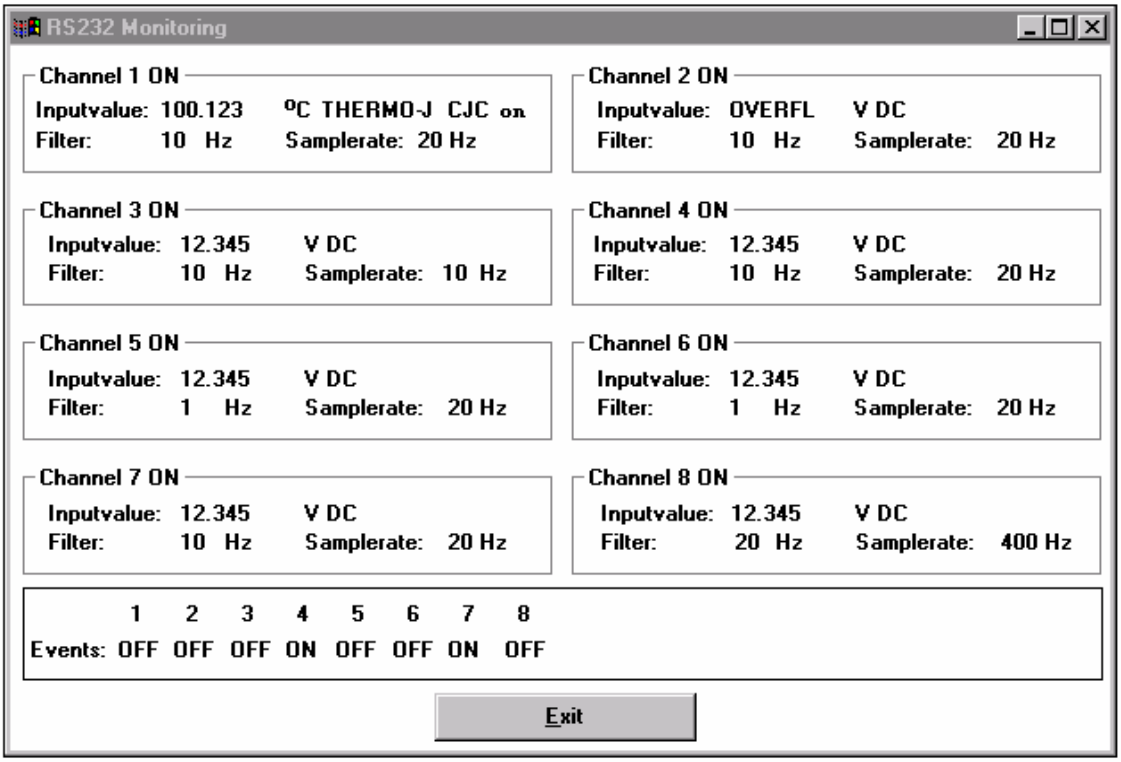
First a startup screen is showed to set the filename and to initialise the COM port.
Make sure that the baudrate on the PC and BD 300 are the same.
In order to show all initial settings, make sure that first the PC program is started before the BD 300 logging is activated.
Another way of sending the initial values is to switch Record off/on, on the BD 300.



Preferred values are:	19200 baud, no parity 1 stop bit

If no log file name is entered, no logging to file takes place.
The file is closed when in the next screen the exit button is clicked.

The next screen that will appear show the actual value for the different channels and their settings.
On the bottom line the event status is showed.
The Exit bar closes the logging file on the PC.



Data throughput for logging to PC

2100	baud:	30	samples/s
9600	baud:	120	samples/s
19200	baud:	240	samples/s
38400	baud:	480	samples/s
57600	baud:	720	samples/s

example for 19200 baud:

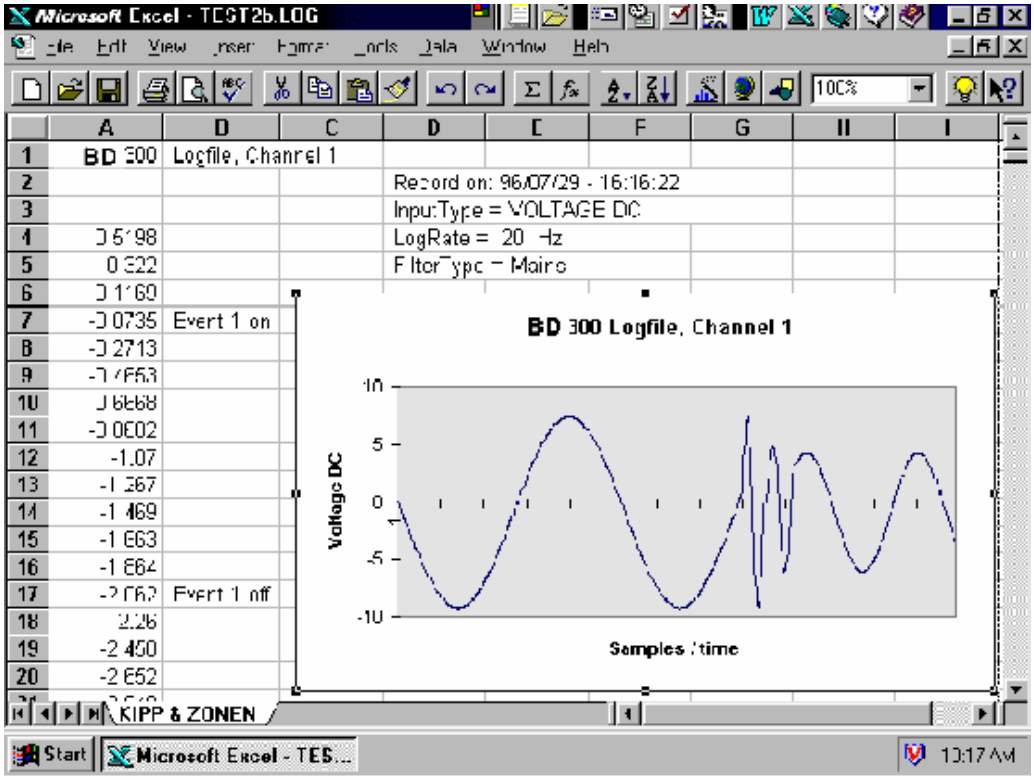
ch. 1	lograte	100	Hz
ch. 2-5	lograte	20	Hz (4x)
ch. 6	lograte	50	Hz
ch. 7-8	lograte	5	Hz (2x)

---
240 samples/s

Example of logged data stored as ASCII text in a file on the PC

```
BD 300 Logfile, Channel 1  # Record on: 96/06/29 - 16:16:22
               # InputType    = VOLTAGE DC
               # LogRate      = 20  Hz
               # FilterType   = Mains
  0.5198
  0.3220
  0.1169
 -0.0735         # Event 1 on
 -0.2713
 -0.4653
 -0.6668
 -0.8682
  -1.070
  -1.267
  -1.469
  -1.663
  -1.864
  -2.062         # Event 1 off
  -2.260
  -2.458
  -2.652
  -2.849
  -3.043
  -3.238         # Log Rate = 10 Hz
  -3.424
  -3.622
  -4.263
  -2.329         # FilterType = 0.1 Hz
  -2.594
  -2.767         # Record off: 96/06/29 - 16:17:32
```

Example of data in the spreadsheet Excel under Windows



APPENDIX F PC SOFTWARE FOR USE WITH THE DISK DRIVE OPTION

Appendix F PC software for use with the disk drive (option)

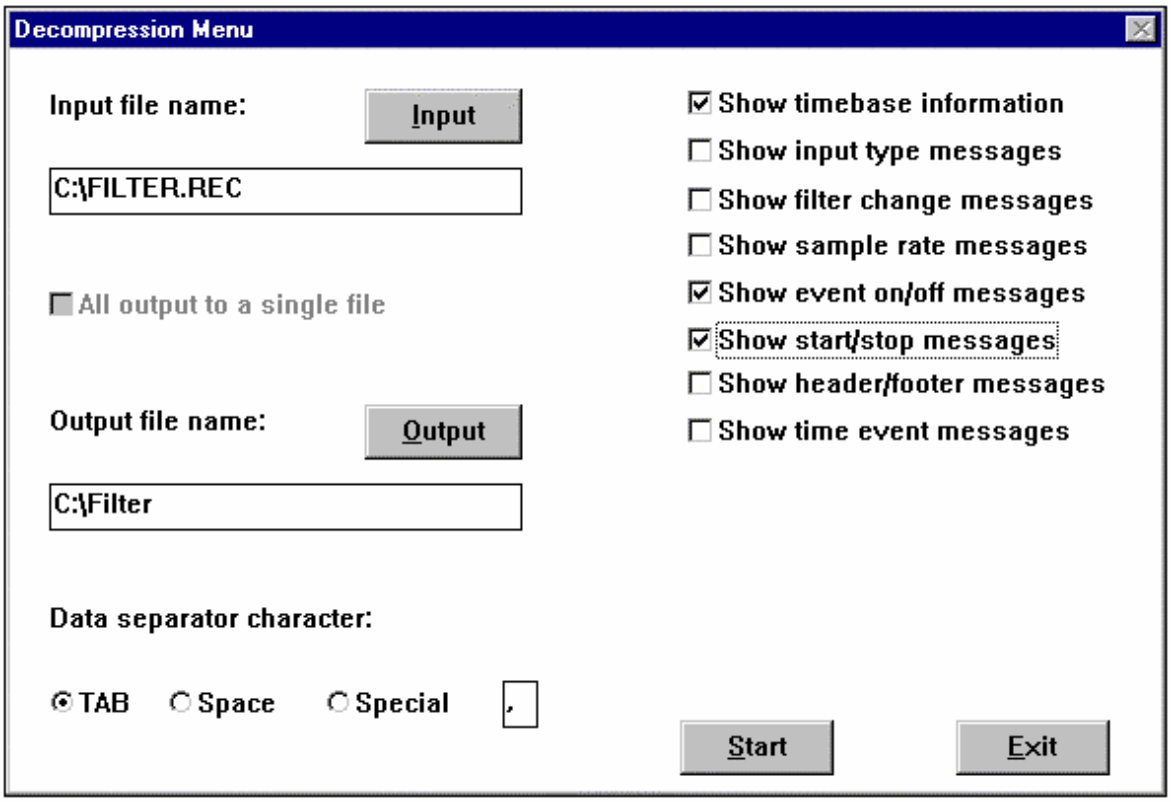
Together with the Logging option on the BD 300 there is a disk supplied with PC software to decompress and manipulate the data.

The program is called WTOOLS.exe and runs under Windows 3.1 and 95©.
For best performance the program has to be copied to hard disk, and can be started by double clicking the program icon.

When the program is started the program options can be selected by clicking the file menu.

The options are:

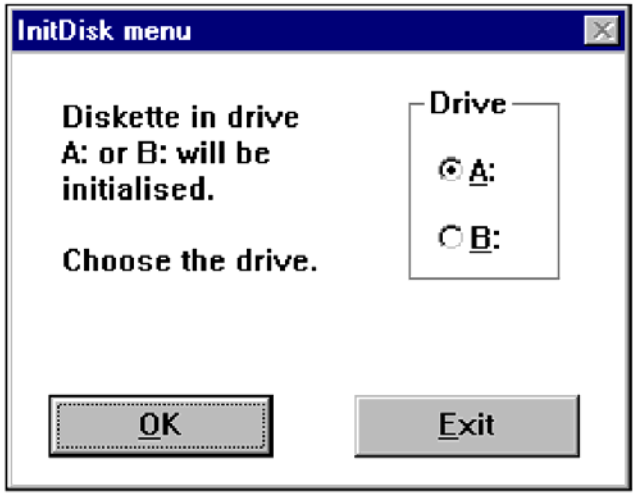
Decompress	decompress data on the PC
InitDisk	prepare a disk for use in BD 300
CheckOrg	verify integrity of BD 300 data
CopySet	copy settings to a BD 300 data disk
DelLog	delete a logging file from BD 300 disk
MakeLog	compress data for playback on BD 300
Exit	exit Wtools



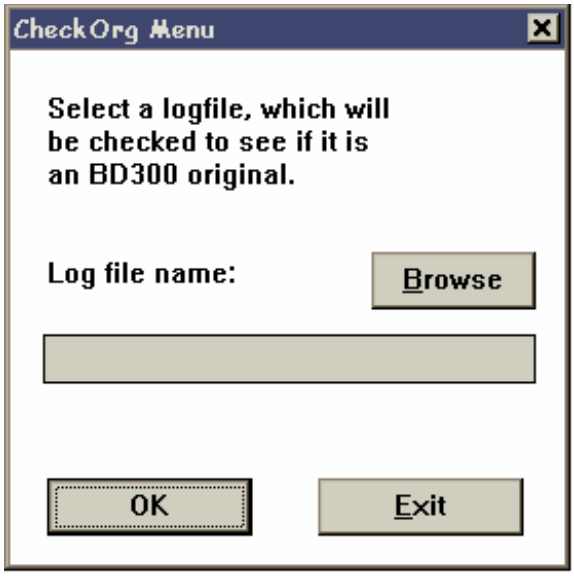
Decompress
This item is used to decompress the BD 300 data disk files to ASCII format.
In the decompression menu the format of the ASCII data can be set. Unnecessary information can be eliminated in the output file.
When entering the output filename do not give an extention.
With the option all output to a single file on, automatically the extention .all is given.
With the option all output to a single file off, the extenchions of the files are: ch1, ch2, ch3 etc.

InitDisk
This item is used to initialise a new disk for use in the BD 300

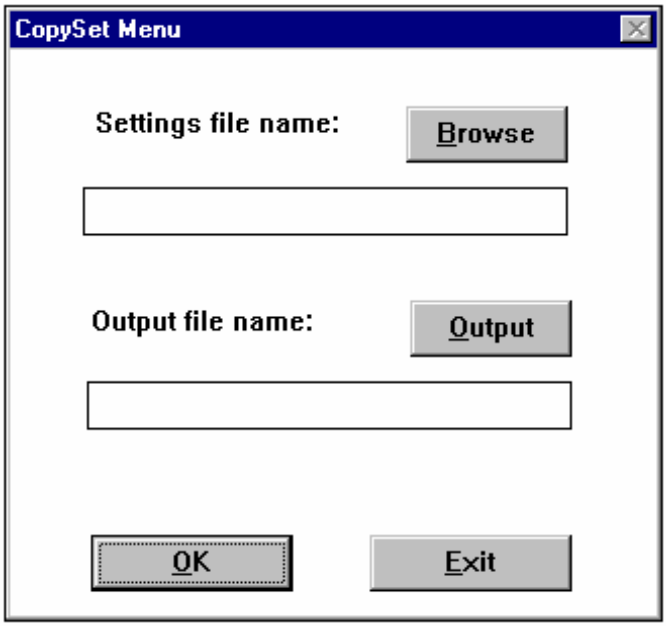
This can also be done in the BD 300 itself in the Disk drive sub menu.



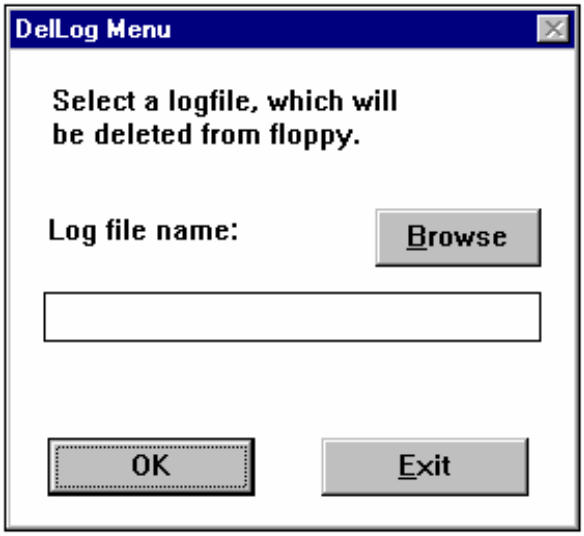
CheckOrg
This item checks the integrity of the data file. Once a file is changed this check will determine that the data file has been manipulated.



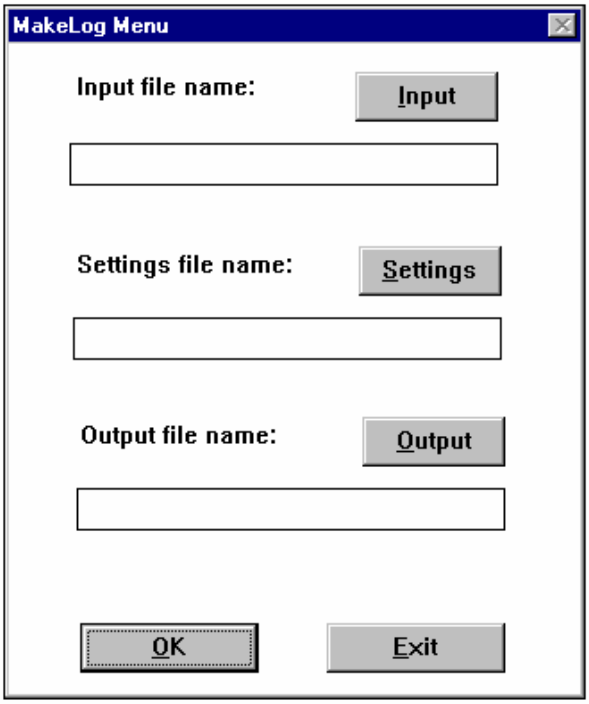
CopySet
This will copy a setting file to a BD 300 data disk.



DelLog
This item will delete a specified file from a BD 300 data disk.



MakeLog
This item will compress data to a BD 300 data file (*.RCM) for playback on the recorder.
All channel files in the given directory (*.ch?) plus the specified setting file (*.set) will be compressed to a BD 300 data file (*.RCM).



Exit
This item closes the Wtools program.

APPENDIX G ACCESSORIES AND SPARES

mains cord	USA	**2570042**	
mains cord	EUROPE	**2570041**	
mains cord	UK	**3444293**	
1 ink cartridge for printer		**4 410 634**	
3 fibre pens	red	**2 643 838**	
	green	**2 643 839**	
	blue	**2 643 840**	
	black	**2 643 841**	
	brown	**2 643 842**	
	violet	**2 643 843**	
	orange	**2 643 844**	
	pink	**2 643 845**	
10 packets Z-fold paper 15m	zero left	**2 643 851**	
1 safety banana plug	red	**2 523 597**	
	black	**2 523 598**	
1 37-pin sub-D assembly for extended control		**0333625**	**(connector + cable)**
fuse 3.15A slow (High Breaking Capacity)		**2655251**	**(IEC 127-2/V)**
Instruction manual		**0333310**	
Service manual		**0333311**	

APPENDIX H CALIBRATION

RE-CALIBRATION SERVICE

BD 300 Data Acquisition Recorder

Kipp & Zonen recorders systems comply with the most demanding international standards. In order to maintain the specified performance of these instruments, Kipp & Zonen recommends calibrating their instruments annually.

Recorders that are used in applications for which the initial factory specifications are not required, can be calibrated against a standard with the same accuracy as the initial recorder specification.

Instruments used in certified laboratories or institutions and applications that require optimal precision need to be calibrated against a high quality standard. Calibration to the highest standard is done by using a calibration standard with at least three (3) times better specifications.

The Kipp & Zonen calibration facility allows calibration to the highest standard which is traceable to the (Inter) National Standard.
After recalibration to this standard, Kipp & Zonen provides a Calibration Certificate with all relevant data about instrument accuracy and calibration conditions.

For more information about re-calibration complete the following form and fax it to Kipp & Zonen.

Name :
Company :
Address :
Postal/Zip code :
Phone number :

Instrument :
City :
Country :
Fax number :

☐ **I would like to receive a price list for re-calibration service.**

☐ **I would like to submit my instrument for re-calibration.**

FAX: +31 15 2620351

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Our customer support remains at your disposal for any maintenance or repair, calibration, supplies and spares.

Für Servicearbeiten und Kalibrierung, Verbrauchsmaterial und Ersatzteile steht Ihnen unsere Customer Support Abteilung zur Verfügung.

Notre service 'Support Clientèle' reste à votre entière disposition pour tout problème de maintenance, réparation ou d'étalonnage ainsi que pour les accessoires et pièces de rechange.

Nuestro apoyo del cliente se queda a su disposición para cualquier mantenimiento o la reparación, la calibración, los suministros y reserva.

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