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FLOWMETER-DISPLAY

PD 4000 / 340

Manual

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1 General information.

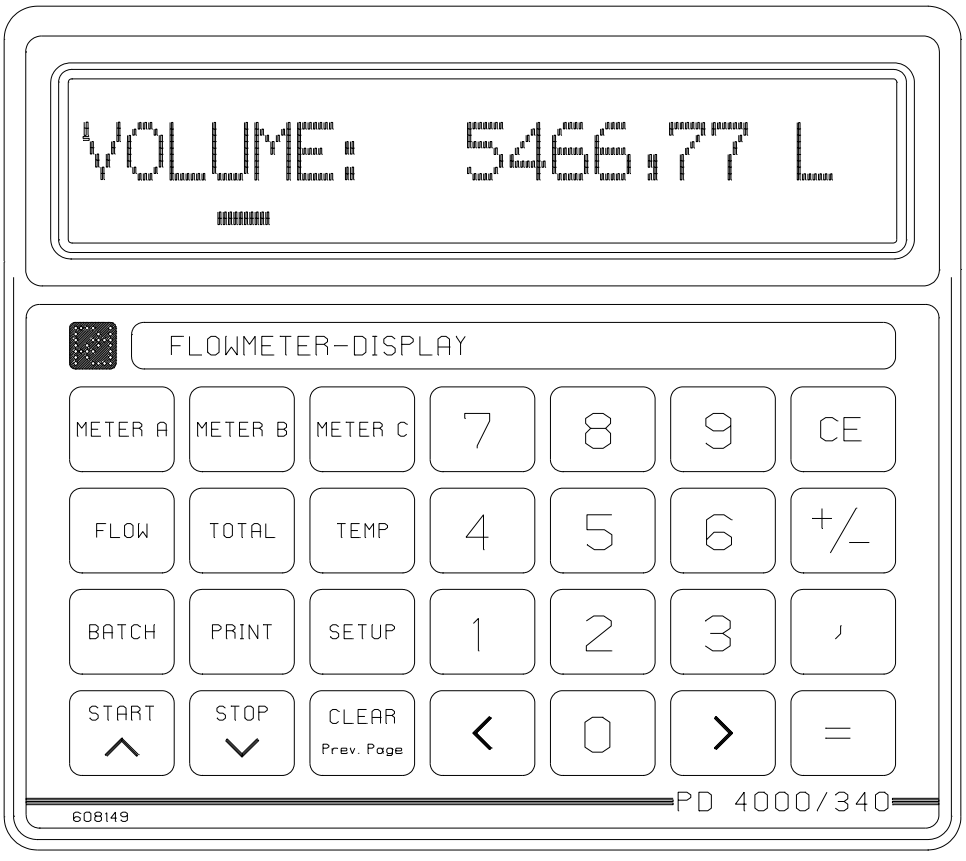
1.1 Introduction.

The Flowmeter-Display is designed to collect and display data from PD 340 flow transmitters. Furthermore, it is possible to modify data and to select various functions within the flow transmitters.

If a PD3940 P-NET/RS232 Converter module is connected to the system, a printer with RS232 interface can also be included. A printer ticket showing the measurement result, together with related customer data, can then be printed (see page 9).

The keys on the Flowmeter-Display consist of both number keys and function keys. The primary data from a flow transmitter e.g. actual flowrate or measured volume, may be selected and displayed by pressing a single function key.

The configuration of the Flowmeter-Display, calibration of the flow transmitter modules and configuration of the PD3940 P-NET/ RS232 Converter module are all performed via the SETUP menu.



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Keyboard layout

A total configuration of a PD 340 flow transmitter may be performed automatically, simply by pressing the "SETUP" key and then selecting the "AUTO SETUP" (see page 15). The automatic configuration may be adjusted to match a specific customer requirement.

The actual configuration for each of the selected flow transmitters may be listed in clear text on the display, or printed out.

Two design tools have been developed for the flowmeter system. The first is a database program, for setting up a customer database (see page 23), and the second is a design program for the easy creation of printer tickets layouts(see page 22). Both programs are installed on a standard PC running Windows 95. A particular ticket layout or a customer database, are downloaded to the PD4000/340 Flowmeter-Display via a P-NET interface. The facilities offered by these programs provides the customer with a high degree of flexibility to choosing the type of printer that is appropriate for the system.

The Flowmeter-Display includes all the facilities offered by the PD 210 Display Unit. For further information about the PD 210 Display Unit, consult the "Flow Transmitter PD 340 Manual" (PD-number 50 20 10).

1.2 Features.

- Simultaneous supervision of up to three flow transmitters
- Automatic configuration of a connected flow transmitter
- Type approved system, certified as legal for trade in Denmark, system ID is "IV-302".
- Option for connecting a printer through a PD3940 P-NET/RS232 Converter module
- PC based Printer Ticket Design tool, Windows 95
- PC based Customer Database, Windows 95
- Printout of daily totals
- Battery back-up on the displayed volume counter values.
- Comprehensive error detector and alarm function
- Menu based display selection
- Easy set up of connected flow transmitters
- Built in Batch Control
- Calculation of an Average Temperature
- Creation of a NodeList of the modules connected to the Fieldbus
- Completely sealed construction
- Membrane click-switch keyboard
- Back lit graphical LCD display
- P-NET Fieldbus communication, EN50170 vol. 1
- Real time clock
- EMC approved (89/336/EEC)
- Vibration approved (IEC 68-2-6 Test Fc)

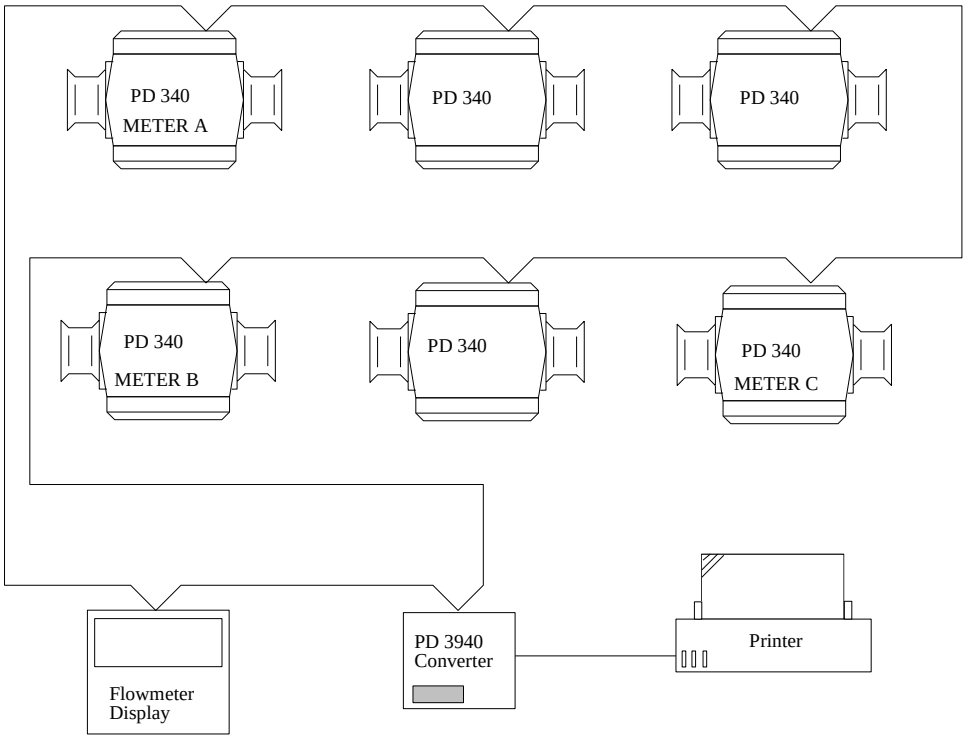
1.3 Advanced applications.

The Flowmeter-Display is connected to the flow transmitters in a P-NET Fieldbus system.

Communication between the flow transmitter modules and the indication unit is performed via P-NET. Up to 125 master and slave units may be connected to the bus, where a unit may be a PD340 flow transmitter, a PD4000/340 Flowmeter-Display or another P-NET module.

A maximum of three flow transmitters may be selected and supervised simultaneously. In large systems, having more than three flow transmitters connected, these can be selected and displayed by means of their node addresses. See further details on page 16.

A flowmeter system with additional flow transmitters and a printer connected, is shown below.



Example of a Flowmeter system.

2 System description.

The Flowmeter-Display utilises the PD 4000 P-NET Controller. The PD 4000 is a standard display and controller element. To transform a base controller into a Flowmeter-Display, a special program is downloaded into the controller's FLASH memory.

The Controller is completely sealed, and is therefore suitable for use in any industrial environment. The compact design and the outstanding environmental features of the Controller, makes it exceptionally suitable for mounting on machines and for use in mobile applications.

2.1 Display.

The display is a fast graphics LCD, providing a wide viewing angle. The display has a resolution of 150 by 20 pixels, enabling a variety of character fonts and graphics to be used, e.g. 3 lines with 25 characters each. The viewing area is 120 mm * 19.2 mm. A LED blacklight is incorporated. The display is covered by non-reflecting glass.

2.2 Keyboard.

The keyboard is a membrane click-switch foil, with metal domes. The keyboard has 28 available keys. The Flowmeter-Display application includes a purpose designed, self adhesive keyboard overlay, with the key functions adapted specifically for the application. This promotes an ideal operator/instrumentation interface.

3 Flowmeter-Display.

3.1 Main functions.

The primary data available from a flow transmitter consists of: actual flow, total volume, batched volume, temperature and setpoint. This data may be displayed by pressing a single function key.

A description of the main functions is given on the following pages.

METER A, METER B and METER C.

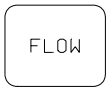
Pressing one of these function keys selects the corresponding flow transmitter data to be displayed. An indicator bar above the key pressed shows which transmitter has been chosen.

If the "METER A" key is pressed, a Volume counter for flow transmitter A is shown. The Volume counter is an internal counter in the Flowmeter-Display and has a range of 9 digits. The Volume counter is calculated from the contents of the Volume2 register within the flow transmitter, which has only a 6 digit range.

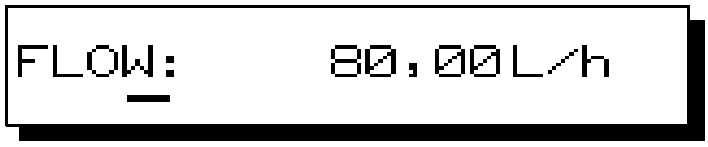
The message "Flowmeter A not connected" is written on the display, if no flow transmitter with the node address selected for flow transmitter A exists within the P-NET system.

The Volume counter for flow transmitter A may be cleared, by simply pressing the "CLEAR" key, but only if no flow has been detected for a specified time (see page 19). The Volume counter is also cleared following a Batch start, selected by means of the Batch "START" function key. The Batch start configuration can be selected in the SETUP menu.

FLOW.



Pressing the "FLOW" key, displays the current flow rate for the liquid in the selected flow transmitter. The flow rate is an averaged value, where the time constant for the filter and the flowrate unit for the read-out, may be selected in the SETUP menu.

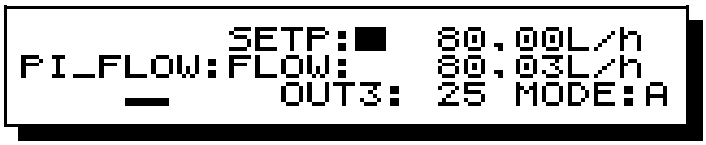


If temperature compensated flow is chosen in the SETUP menu, "TC_FLOW" is written on the display, and the Flowrate, which is now multiplied by a temperature dependant factor, is shown (TCFlow register). For further information, consult the "Flow Transmitter PD 340 Manual" (PD-number 50 20 10).

"PI-FLOW"

If PI-function is chosen for Output3, a display, similar to that shown below, is shown. SETP (Setpoint value), OUT3 (current output in % of FullScale) and MODE can be changed, by moving the cursor to the update field using the cursor keys, keying in the desired value and then pressing the "=" key.

Placing the cursor in the MODE update field and then pressing the cursor up key (START) will change the mode of the PI regulator: A (automatic), M (manual) and I (Input control, manual if input1 is ON). The mode is stored in the flow transmitter by pressing the "ENTER" key, "=".

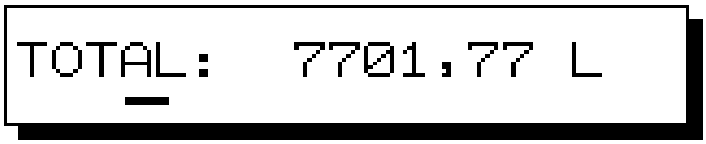


The PI-function is set up in the "SETUP->MANUAL->CONFIG->OUT3" menu. For further information about setting the flow transmitter PI-function, consult the "Flow Transmitter Manual PD 340" (PD-number 50 20 10).

TOTAL.

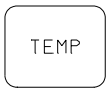
If the "TOTAL" key is pressed, a Total volume counter for the selected flow transmitter is shown. The Total volume counter is an internal counter in the Flowmeter-Display, and has a range of 9 digits. The Total volume counter value is calculated using the Volume1 register in the flow transmitter, which has only a 6 digit range.

The counter increments when the flow direction is positive and decrements when the flow direction is negative.



The TOTAL register may be cleared by pressing and holding the "TOTAL" key and then pressing the "CLEAR" key.

TEMP.



When pressing the "TEMP" key, the temperature register of the selected flow transmitter is shown. Additionally, an internally calculated average temperature is also shown. Temperatures are displayed as values in °C or in °F.

The "Average Temp" value shows the average temperature of a measured volume. The value is calculated when the Volume counter for the corresponding flow transmitter, is anything other than zero. The Volume counter for flow transmitter B is shown when the "METER B" key is pressed.

The calculation of the average temperature will continue until the volume-counter is reset. When *Volume counter = 0, then Average Temp = Temp.*

Calculation of the average temperature is carried out using the following formula:

$$AverageTemp = \frac{\Sigma Temp + Temp(Volume - OldVolume)}{Volume}$$

BATCH.

The PD 340 flow transmitter has built in Batch Control, where a digital output is switched ON while the volume counter is below a user defined Setpoint value. The use of output2 for Batch Control, is selected in the SETUP menu.

When digital Output2, is selected to be used for Batch Control, a Setpoint value may be keyed in. The Setpoint value is entered by moving the cursor to any position in the update field, keying in the new value and pressing the ENTER key, "=".

The Setpoint on the Flowmeter Display includes a Tail value. This Tail value represents the amount that exceeded the required amount (setpoint value).

The Tail value is automatically subtracted from the setpoint value next time the Setpoint is transmitted to the selected flow transmitter. When a Batch has concluded, a new Tail value is calculated as the sum of 75% of the old Tail-value and 25% of the error (Volume - Setpoint). This will reduce the error in dosing to an absolute minimum during the next few Batch runs.

The current Tail and Setpoint values may be displayed/changed in the SETUP -> SYSTEM -> PARAMETER -> BATCH Setup menu. In this menu, it is also possible to enable or disable the automatic Tail correction.

Batching is started either by means of the "START" key or by activating Input1.

START BATCH

Batching is started by pressing the "START" key. It is only possible to start batching when the BATCH menu is displayed, and no flow has been detected in the flow transmitter for a specified time.

STOP BATCH

Batching can be stopped from all menus except the SETUP menu, by pressing the "STOP" key.

PRINT.

PRINT

If a printer is connected to the system, it is possible to produce various kinds of printouts. These include a printed ticket showing the measured result together with matching customer data, a printout of the NodeList, showing all the connected modules (see page 17), or a printout of the actual meter setup for a connected flow transmitter (see page 29).

The same printout design is used for printing from all three flow transmitters: METER A, METER B and METER C.

To printout the results of the last measurement, the Flowmeter-Display must be in one of the main function menus, and no flow should have been detected for a specified time. Pressing the "PRINT" key will open the window, as shown below.

From this window, it is possible to select a customer, either by scrolling the customer database by means of the “\/” and ”/\” keys, or by keying in the customer number. Pressing the “PRINT” key once again, will start printing the configured print-ticket with a pre-selected number of copies. An example of a printed ticket is shown on page 22.

If there is no printer connected, or the correct node address not specified, the message "Printer not connected" is shown on the display. The message remains present for two seconds, following any attempt to perform a printout.

See further details about the connection of a printer to the system on page 24.

START.

The "START" key has various functions, depending on the particular screen or menu in which it is activated.

Pressing the "START" key when in the BATCH menu, will clear the Volume counter and batching will begin for the selected flow transmitter.

If the "START" key is pressed when in the SETUP menu, the cursor moves upwards.

STOP.

The "STOP" key has various functions, depending on the particular screen or menu in which it is activated.

Pressing the "STOP" key when batch control is active, will stop batching for the selected flow transmitter, except when the key is pressed in the SETUP menu.

If the "STOP" key is pressed while in the SETUP menu, the cursor moves downwards.

CLEAR.

The "CLEAR" key has various functions, depending on the particular screen or menu in which it is activated.

The Volume counter is cleared, if the "CLEAR" key is pressed when the Volume menu (selecting keys METER A, METER B or METER C), or the Batch menu, is shown in the display, and no flow has been detected for a specified time. This action will also clear the error buffer.

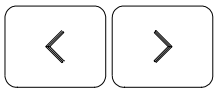
To clear the error buffer without clearing the Volume register, press and hold the "CE" key and then press the "CLEAR" key. In the approved system it is not possible to clear the error buffer without clearing the VOLUME register.

The Total counter is cleared, by holding down the "TOTAL" key while pressing the "CLEAR" key. This will only occur if no flow has been detected in the flow transmitter for a specified period time. If the "CLEAR" key is pressed when in the SETUP menu, the previously used menu will be selected.

3.2 Key functions for user input

A number of keys act as standard function keys, which are used when entering data in connection with configuration and calibration. The number keys, the sign key and the comma key, are all standard keys. The remaining standard keys are described below.

CURSOR left, CURSOR right.



The cursor keys are used within menus to move the cursor in the left direction and in the right direction.

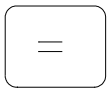
CLEAR ENTER.

The "CE" key has various functions, depending on the key combination in which it is activated.

When used as a single key, the "CE" key will clear the last user input value entered using the number keys. Pressing the "CE" key immediatly before the "ENTER" key, will clear all input data, and the display will revert to showing the previous data.

To clear the error buffer without clearing the Volume register, press and hold the "CE" key and then press the "CLEAR" key. In the approved system, it is not possible to clear the error buffer without clearing the VOLUME register.

ENTER.



The "ENTER" key is used for entering user inputted data into the Flowmeter-Display or the selected Flowmeter. The "ENTER" key is also used to select a sub-menu, by first placing the cursor in the square field positioned after the menu name, and then pressing the ENTER key.

In some sub-menus in the SETUP section, it is possible to scroll between various configuration parameters by means of the START and STOP keys. The "ENTER" key is used to select the displayed configuration parameter.

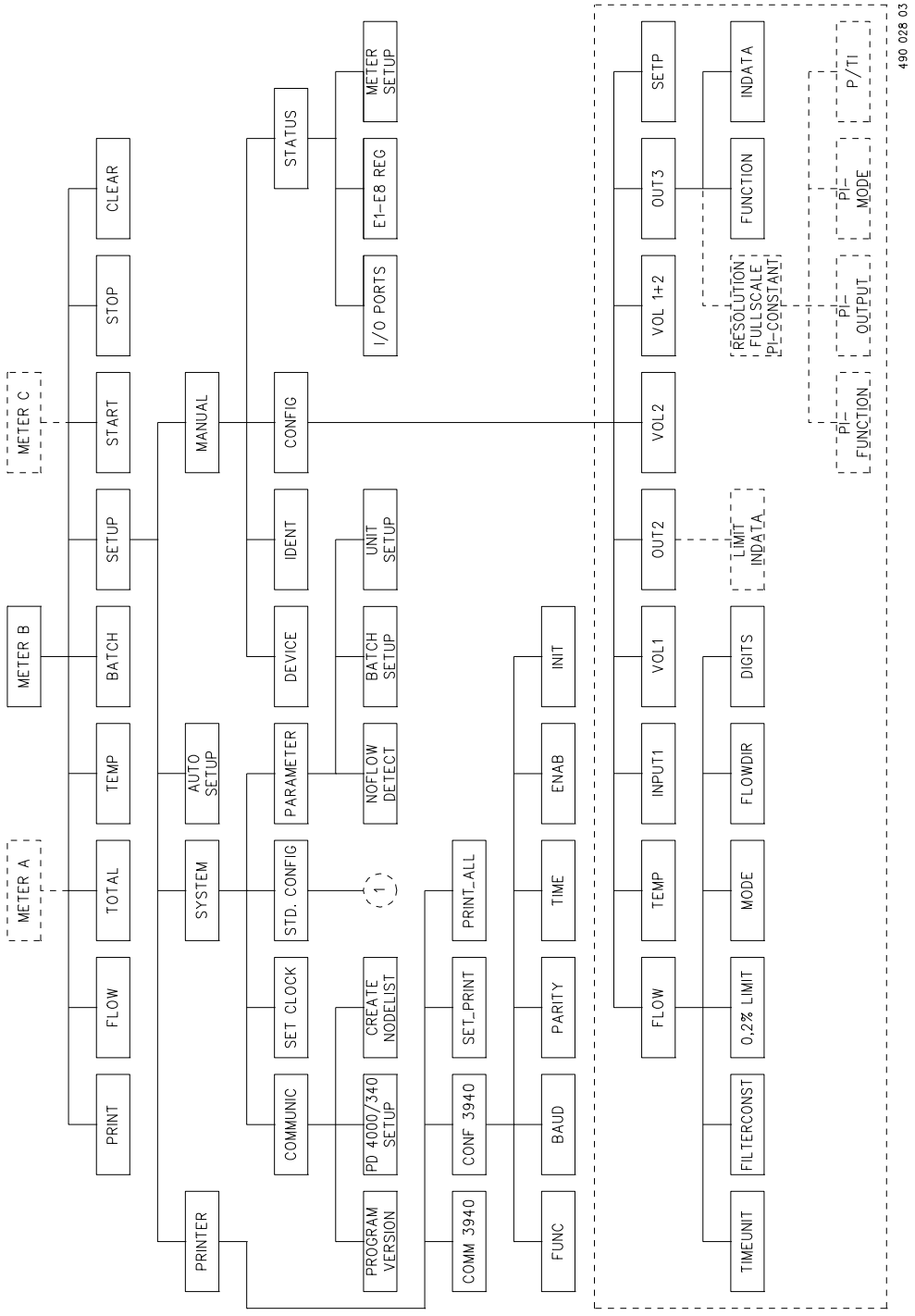
To enter new data, e.g. a new Setpoint, the following must be done:

1 Place the cursor in the data field,
2 Key-in the data,
3 Press the ENTER "=" key.

When keying in the new data, each character will appear in order within the data field and the remaining part of the data field will be filled with "*". If the input data is not confirmed by means of the ENTER key within 15 seconds, then it will be cleared, and the previous data will be displayed again.

3.3 Menu overview.

The figure below gives a schematic view of the menus available on the Flowmeter- Display. **This diagram can be used to navigate through all the facilities offered by the Flowmeter-Display**



① In the "Std. Config" menu, it is possible to select the same menus as in "Config" menu. The selected data will be stored internally in the Flowmeter-Display.

4 Setup menu.

The configuration of the optional functions in a flow transmitter, together with configuration of a PD3940 P-NET/RS232 Converter module for a possible printer connection, and setting of time and date in the Flowmeter-Display, are all performed in the "SETUP" menu.

The SETUP menu includes a number of sub-menus, which provide guidance through the setup procedure. The figure on page 13 provides illustrative assistance for finding appropriate routes through these sub-menus.

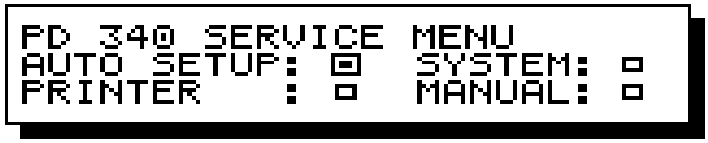
When selecting a sub-menu, the cursor should be placed within the square field which follows the menu name, and then pressing the ENTER.

To select between the available configuration parameters, the "arrow up" and "arrow down" keys should be used to scroll through the possibilities, followed by pressing the ENTER key, to select the displayed value.

The **program enable** switch, "SW1", located in the upper left corner of the flow transmitter terminal box, must be set in the ON position, to configure and calibrate the flow transmitter. After configuration and calibration the switch must be re-set to the OFF position.

SETUP.

The "SETUP" menu is divided in four main sections: AUTO SETUP, SYSTEM, PRINTER and MANUAL.



Selecting "AUTO SETUP" (see page 15) will configure the selected flow transmitter with the customised configuration, which is stored internally within the Flowmeter-Display.

P-NET communication parameters, the internal real time clock setting and the parameters for a standard configuration for a flow transmitter, are all set using the "SYSTEM" menu (see page 16).

The “PRINTER” menu (see page21) holds sub-menus for performing the complete setup of the PD3940 P-NET/RS232 module, defining the number of tickets to be printed each time the “PRINT” key is pressed, and for printing out a day total.

When the “MANUAL” menu (see page 27) is selected in the SETUP menu, it is possible to display and modify the values within the registers for the selected flow transmitter. In the “MANUAL” menu, direct communication with the registers within a connected flow transmitter occurs. To enable this to be done and all changes saved, the program enable switch in the flow transmitter must be switched ON.

4.1 AUTO SETUP.

Selecting "AUTO SETUP" will configure the selected flow transmitter with the customised configuration, which is stored internally in the Flowmeter-Display. The customised configuration is set up in the SETUP->SYSTEM->Std.CONFIG menu (see page 20).

To protect the actual configuration of the registers in the flow transmitter, the AUTO SETUP is required to be confirmed by pressing the "=" key. Pressing any other key will cancel the AUTO SETUP and return the display to the SETUP menu.

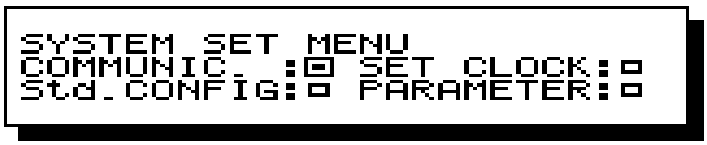
The node address for P-NET communication with a selected flow transmitter, is set up in the SETUP->SYSTEM->COMMUNIC. menu (see page 16). The node address is a unique number which makes it possible for the Flowmeter-Display to communicate with a specific flow transmitter.

If a flow transmitter does not respond to communication attempts from the Flowmeter-Display, the picture below will be shown.

Keying in the Serial number of the specific flow transmitter and pressing "=" will assign the displayed node address to the flow transmitter. Now an AUTO SETUP will be automatically performed.

4.2 SYSTEM.

P-NET communication parameters, the internal real time clock setting and the parameters for a standard configuration for a flow transmitter, are all set through the "SYSTEM" menu. The main menu for "SYSTEM" is shown below.

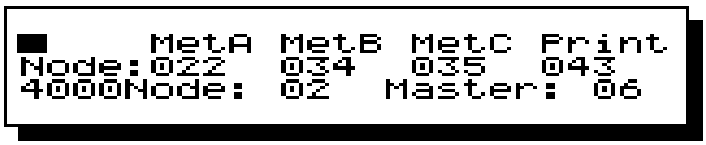


4.2.1 Sub-menu COMMUNIC.

In the COMMUNICATION menu, it is possible to set up the PD4000/340 system, to scan the P-NET to create a NodeList of all connected modules, and to read the program version of the Flowmeter-Display program.

PD4000/340 SETUP.

In this menu, it is possible to select the three flow transmitters required for direct display, together with a possibly connected PD3940 P-NET/RS232 module, by means of their P-NET node addresses. The node address of the Flowmeter-Display, and number of masters included within the system, are also selected in this menu.



The Flowmeter-Display operates as a master in a P-NET communication system. Therefore, it is important that the rules for node addresses and number of masters are respected. This requires that all units connected to the P-NET must have a unique node address, and all masters must have the same value for "number of masters". If the Flowmeter-Display is connected to systems with existing masters, then the Flowmeter-Display must be assigned an unused node address which is reserved for a master.

Example:

If a system already exists which includes 2 masters having node address 2 and 4, and the value for "number of masters" in each of them is 5, then the Flowmeter-Display must use one of the node addresses 1, 3 or 5 and **Master** must also be set to 5.

If no master node address is free for the Flowmeter-Display, then the other masters in the system must have their value for "number of masters" increased, otherwise communication errors will occur.

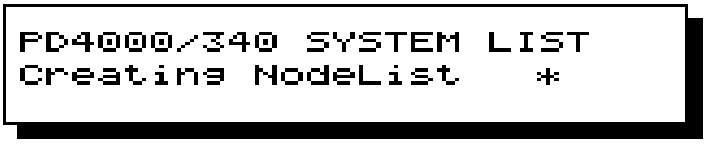
Consequently, **4000Node** and **Master** must be set to match the actual system application, as described above.

NOTE: In the Flowmeter-Display "number of masters" and the "node address" of the display unit, the P-NET/RS232 Converter and the flow transmitter modules, are keyed in and displayed as decimal numbers. In some other PD-modules, e.g. the PD 210 Display, these values are written as hexadecimal numbers which have to be translated as a decimal number, to attain conformity.

CREATE NODELIST.

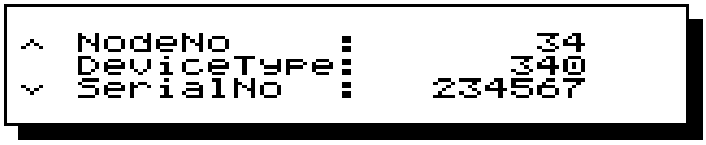
In this menu, it is possible to perform a scan of the P-NET Fieldbus for all node addresses in the range from 0 to 125. When a module answers a request having a specific node address, the Flowmeter-Display will generate an element in the NodeList. This element consists of the node address, the DeviceType and the SerialNumber of this module.

Scanning and generating the NodeList takes about 5 seconds. While scanning is being undertaken, the picture below is shown on the display.



If two modules exist with the same node address, transmission errors can occur. Any occurrence of transmission errors will cancel the generation of the NodeList, and an errorcode will be written on the display.

When scanning has concluded, it is possible to scroll through the NodeList by means of the cursor-up/down keys (START and STOP).



If a PD3940 P-NET/RS232 Converter module and a printer is connected to the system, a printout of the NodeList will be made when the "PRINT" key is pressed when in this menu.

```
***** NODE LIST *****

 NodeNo    :     17
 DeviceType:    340
 SerialNo  : 324322
 Manufact. :PROCES-DATA DENMARK

 NodeNo    :     18
 DeviceType:      1
 SerialNo  :002109-EDG
 Manufact. :EPSON DEUTSCHLAND

 NodeNo    :     35
 DeviceType:    340
 SerialNo  : 234567
 Manufact. :PROCES-DATA DENMARK
```

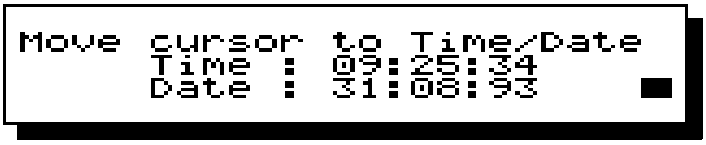
Printout of the nodelist

PROGRAM VERSION.
In this menu, it is possible to read the program version of the program in the Flowmeter-Display.

4.2.2 Sub-menu SET CLOCK.

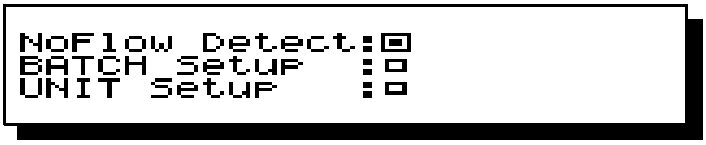
The Real Time Clock and the date stored in the Flowmeter-Display, may be displayed and set in this menu. The Time and Date may be used on printed tickets.

The format for Time is **Hour**:**Minute**:**Second** and the format for Date is **Year**:**Month**:**Day**.



4.2.3 Sub-menu PARAMETER.

This menu holds sub-menus for selecting a NoFlow Detect timer, Batch Control, or Limit Switch parameters and volume units.



The system has a built in "no flow detector", which inhibits the clearing of the VOLUME register and the TOTAL register, when flow is actually occuring through the transmitter. The delay time between the flow having stopped and enabling the registers to be cleared, can be set between 0 to 5 seconds, using this sub-menu. If the delay timer is set to 0 sec., VOLUME and TOTAL can be cleared at any time. In the approved system the delay timer is set to 2 seconds and cannot be changed.

In BATCH Setup, the Setpoint and the Tail for the batch function, can be set. The Tail-value represents the actual measured amount by which the required amount (setpoint value) was exceeded. A new tail value can be automatically calculated after each run of the Batch function to ensure that the required set point value is eventually achieved. This will take place if the Batch function is started by pressing the "START" key. It is possible to enable or disable the automatic calculation of the Tail-value, by placing the cursor in the square field and then pressing the ENTER key.

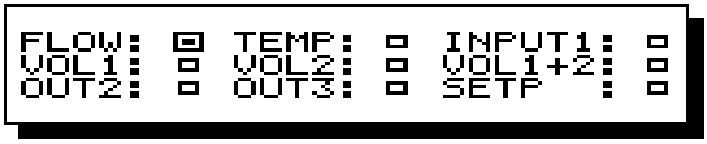
If Output 2 is used as a Limit Switch, the setpoint for the switch has to be keyed in from this menu.

In UNIT Setup, the volume unit shown in display can be set to: "L" (litre), "g" (gallon) or "m" (m^3). When the volume unit has been changed, the value in the SETUP->MANUAL->DEVICE ->MeterSize register also has to be changed. To set the MeterSize, refer to the "flow transmitter PD 340 Manual" (PD-number 50 20 10).

4.2.4 Sub-menu Std. CONFIG.

The Flowmeter-Display contains an internal copy of all the configuration registers in a flow transmitter. From this menu, it is possible to configure these internal registers, and in this way, perform a customised configuration of a flow transmitter.

The customised configuration is copied to the selected flow transmitter (e.g. METER A), if "AUTO SETUP" is chosen.



Default values for the configuration of the customised flow transmitter are set up by Proces-Data. After a master reset the Proces-Data configuration is copied to the customised flow transmitter. The Proces-Data configuration is shown below, in both clear text, as would be displayed on the PD4000 Flowmeter-Display, and in the format of the PD210 Display for registers E1-E8.

```
Ti          : 0,000000
PI Function: Auto
PI Input    : Setp-Data
PI Output   : 0% => 4 mA
Scale       :
Flow ReadOu: 2 Decimals
Vol1 ReadOu: 2 Decimals
Vol2 ReadOu: 2 Decimals
Setp ReadOu: 2 Decimals
Out3 Functi: CurrOutput
Out3 Data   : Flow
Out2 Functi: PulsOutput
Volume Data: Flow
Flow Mode   : NormalMode
Batch Data : No Bat/Lim
TimeConst   : 1 sec
```

Proces-Data configuration, PD4000 format

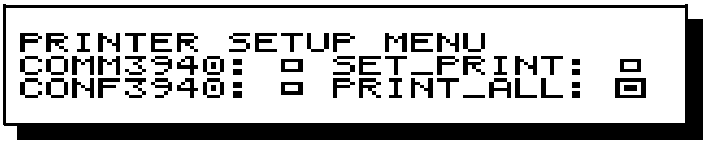
```
E2 Value:    0,000000
E3 Value:      000000
E5 Value:
E6 Value:      222222
E7 Value:      211100
```

Proces-Data configuration, PD210 format

4.3 PRINTER.

This menu holds sub-menus for performing a complete set up of the printer function. This includes setting the node address for a connected PD3940 P-NET/RS232 Converter module, configuration of the RS232 port in the converter module, and defining the number of tickets to be printed each time the “PRINT” key is pressed.

The PRINT_ALL menu holds the facility to perform a printout of all measurements from a specific day.



The PD4000/340 Display holds a predefined printer ticket layout, which is used for a printout from any of the three flow transmitters, METER A, METER B and METER C. The printer ticket layout in the display, can be designed to show the completed measurement results from the connected flow transmitters, together with related customer data.

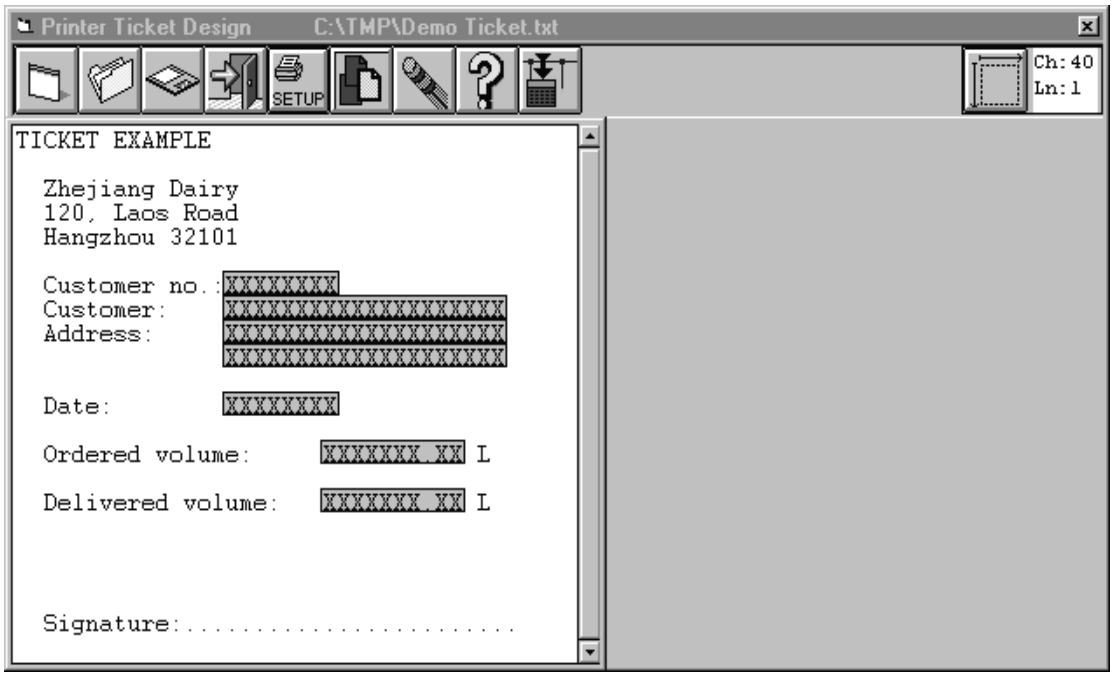
To create a printer ticket layout and a customer database, two design tools have been developed to complement the flowmeter system. Both programs are installed on a standard PC, running Windows 95.

A new printer ticket layout or customer database is downloaded to the PD4000/340 Flowmeter-Display via a P-NET interface. The facilities within these programs provide freedom for the customer to choose the kind of printer that fits the specific system.

A short description of these two programmes are given on the next two pages. For further information about the printer ticket layout program, consult the "Printer Ticket Design Manual" (PD-number 50 20 91), and for the customer database consult the “PDFlow Database Manual” (PD-number 50 20 92).

4.3.1 Printer ticket layout.

The Printer Ticket Design program is a tool for designing printer tickets for the PD4000/340 Flowmeter-Display system. This program makes it possible to create a ticket layout on a PC monitor, and then download this design to the PD4000/340 Flowmeter-Display.



A particular ticket layout can be saved as a text file on the PC hard disc. If corrections have to be subsequently made to the ticket, or if a layout needs to be downloaded to a PD4000/340 Flowmeter-Display, the file can be re-opened by the design editor.

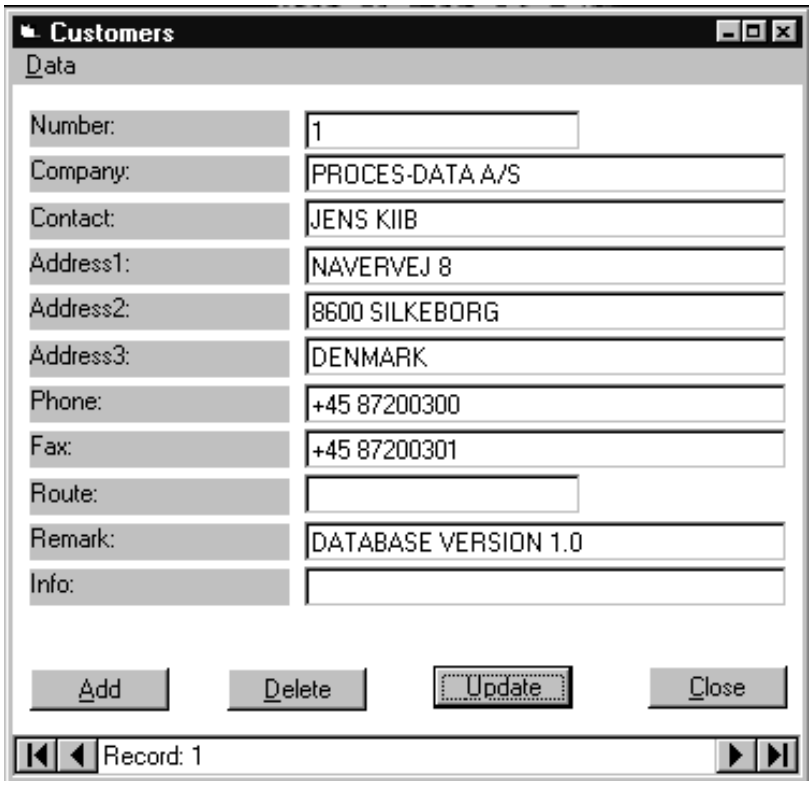
The facilities offered by this program a high degree of flexibility in choosing the type of printer that is appropriate for a system. There are no limitations on paper width or length. The only requirement is that the printer must have an RS232 interface.

Features.

- Printer ticket design using a standard text editor
- Data boxes are positioned simply by dragging them with the PC mouse
- Ticket layouts saved as text files on the PC hard disc
- Upload of ticket layout from the PC hard disc into the design editor
- Configuration of printer start and stop codes
- Easy installation on a standard PC running Windows 95
- Download of ticket layout to the PD4000/340 Flowmeter-Display
- Interface to the P-NET Fieldbus, EN50170 vol. 1

4.3.2 Customer database.

The PDFlow Database program is based on a standard database using the Access 2.0 file format. The program is used as a tool for generating a customer database for the PD4000/340 Flowmeter-Display.



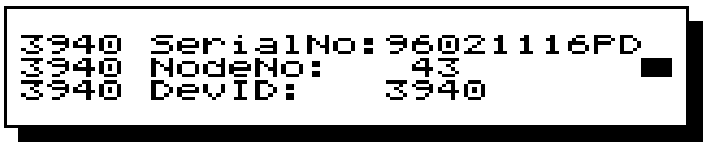
This program enables generation of databases containing up to 100 customers. This information is then downloaded to the PD4000/340 Flowmeter-Display.

Features.

- Database in Access 2.0 file format
- Up to 100 customers
- Facilities for adding, deleting and updating customers
- Easy installation on a standard PC running Windows 95
- Download of database data to the PD4000/340 Flowmeter-Display
- Communication via the P-NET Fieldbus, EN50170 Vol. 1

4.3.3 Sub-menu COMM3940.

The connection of a PD3940 P-NET/RS232 Converter to the system specified in the sub-menu "COMM3940" in the "PRINTER" menu:



This menu shows the serial number, node address and devicetype of the connected PD3940 module.

If there is no printer connected, or if an incorrect node address is specified in the SETUP->SYSTEM->COMMUNIC menu, the text "Key in SerialNo-Printer" is written on the bottom line of the display.

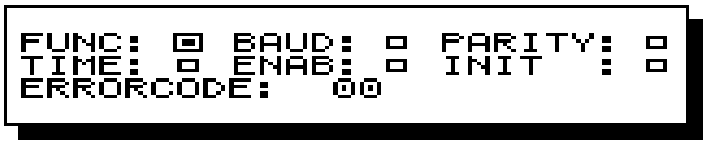
To change the actual node address, move the cursor to the "3940 NodeNo" update field, and key in the new address. If a connected PD3940 module answers to the new node address, the devicetype (“3940") will be displayed on the bottom line.

If no printer answers to a selected node address, it is possible to assign the node address to a printer, by keying in the serial number of the converter.

To key in the serial number, move the cursor to the "3940 SerialNo" update field, and key in the serial number. If a PD3940 module with this number has been connected to the system, the node address will be assigned to it, and the devicetype (“3940") will be displayed on the bottom line.

4.3.4 Sub-menu CONF3940.

A complete configuration of the RS232 port within the PD3940 Converter module, can be performed from the CONF3940 menu. This port needs to be set up to match the input port of the connected printer.



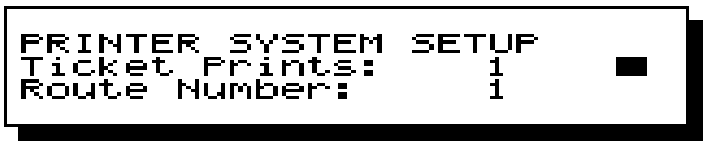
To select a sub-menu, move the cursor to the square field positioned adjacent to the menu name, and then press the ENTER key.

To select various configuration parameters, use the "arrow up" "arrow down" keys to scroll through the offered possibilities. Then press the ENTER key to select the displayed value.

For further information about the configuration of the PD3940 Converter module, refer to the “P-NET to RS232 PD3940 Manual” (PD-number 502081).

4.3.5 Sub-menu SET_PRINT.

Sub-menu SET_PRINT is selected from the PRINTER menu:



In this menu, it is possible to setup the number of tickets printed each time the “PRINT” key is pressed. To change this number, move the cursor to the update field, key in the new number and press the ENTER key.

4.3.6 Sub-menu PRINT_ALL.

With the PRINT_ALL menu, it is possible to produce a printout of all measurements performed on a specific date.

Each time a ticket is printed as a recipe to a customer, the customer data, the related measurement data and the date of the printout, are saved internally in the PD4000/340 Display. To printout all the measurements performed on a particular day, key in the date in the update field of the PRINT_ALL menu, and press the “PRINT” key. A list with all measurements recorded on this date will now be printed.

```
***** DAY TOTAL *****

NUMBER : 930412
COMPANY: PROCES-DATA A/S
DATE   : 96.08.28
TIME   : 08.48.42
VOLUME : 349.23
AV_TEMP: 8.05

NUMBER : 950427
COMPANY: ZHEIJANG DAIRY
DATE   : 96.08.28
TIME   : 09.12.25
VOLUME : 529.10
AV_TEMP: 7.68
```

Printout of day total

The data available on this printout are: Customer number, Company name, Date, Time, Volume and Average temperature.

If more than one measurement and printout is performed for the same customer, only the data from the last measurement will be printed in the day total.

4.4 MANUAL.

When MANUAL is selected in the SETUP menu, it is possible to display the contents of additional registers in a selected flow transmitter, which may not be capable of being displayed by use of the main function keys (see page 4).

This menu is also used for changing the configuration for a selected flow transmitter.

4.4.1 Sub-menu IDENT.

This display shows the type of device, program version and the serial number of the selected flow transmitter.

4.4.2 Sub-menu STATUS.

This menu holds sub-menus for showing the current status of the digital input and the digital outputs, a short form code read-out of all the configuration registers, and a complete list of the selected flow transmitter configuration written in clear text.

Sub-menu "INPUT/OUTPUT PORTS" is selected in the "STATUS" menu. This menu displays the current status of the digital input and the digital outputs signals.

Sub-menu "REGISTER E1 - E8" is selected in the "STATUS" menu. This menu shows a short form code read-out of all the configuration registers. The registers are displayed in the same format as that shown on a PD210 Display unit. It is possible to scroll through the list by means of the cursor up/down keys (START and STOP).

To change the current configuration of the flow transmitter, move the cursor to the "NewValue" update field, key in the new value and press the ENTER ("=") key.

Sub-menu "ACTUAL METER SETUP" is selected in the "STATUS" menu. This menu produces a list, showing the complete configuration of the selected flow transmitter written in clear text. It is possible to scroll through the list by means of the cursor up/down keys (START and STOP keys).

If a printer with P-NET interface is connected to the system, a printout of the actual meter setup for a selected flow transmitter can be made, by pressing the "PRINT" key when in this menu.

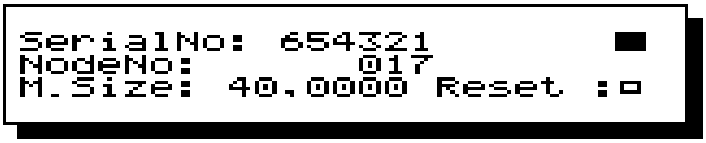
```
** SETUP -  Meter A **

MeterSize  :  40,0000
Ti         : 0,000000
PI Function: Auto
PI Input   : Setp-Data
PI Output  : 0% => 4 mA
MeterNumber: 324322
Scale      :  40,0000
Flow ReadOu: 2 Decimals
Vol1 ReadOu: 2 Decimals
Vol2 ReadOu: 2 Decimals
Setp ReadOu: 2 Decimals
Out3 Functi: CurrOutput
Out3 Data  : Flow
Out2 Functi: PulsOutput
Volume Data: Flow
Flow Mode  : NormalMode
Batch Data : No Bat/Lim
TimeConst  : 1 sec
Time/Unit  : Units/hour
FlowDirect : UniDirecti
0.2%Limit  : 0.2% ignor
```

Printout of the meter setup

4.4.3 Sub-menu DEVICE.

In this menu, it is possible to calibrate the selected flow transmitter. This is performed by changing the value in the Metersize register, by moving the cursor to the update field, and keying in the new value.

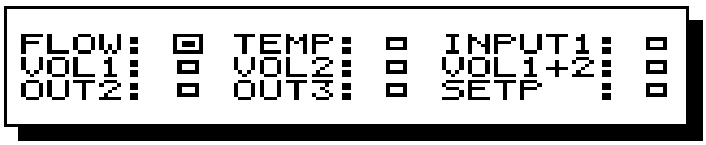


Pressing the "=" key while the cursor is placed in the RESET box, will reset the flow transmitter and clear the internal counter registers.

If no transmitter responds to the node address set up in the SETUP->SYSTEM->COMMUNIC.->PD4000/340 Setup menu, the picture described in the AUTO SETUP (see page 15) will be shown.

4.4.4 Sub-menu CONFIG.

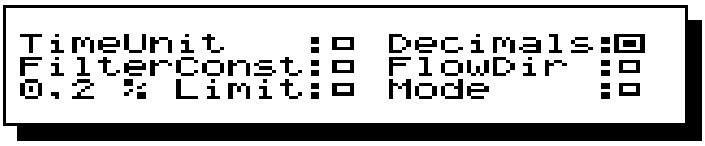
The actual configuration of a flow transmitter may be displayed and changed in this menu.



The examples below illustrate how to navigate through the menus in order to change the configuration of the flow transmitter. At the lowest menu level, it is possible to scroll through various configurations by means of the cursor up/down keys (START and STOP keys), and to key in new values.

Example: Setting the number of decimals for displaying FLOW.

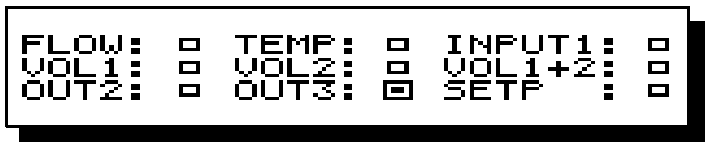
Sub-menu "FLOW" is selected in the "CONFIG" menu:



Sub-menu "Decimals" is selected in the "FLOW" sub-menu:

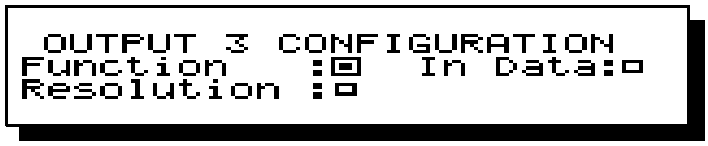
The desired configuration is selected by means of the cursor up/down keys (START and STOP) and the flow transmitter will be programmed by pressing the "=" key.

Example: Setting OutPut3 to pulse output.
Sub-menu "OUT3" is selected in the "CONFIG" menu:



In the "OUT3" sub-menu, the complete configuration of the output can be undertaken. This includes the **Function** of the output, the input data (**InData**), and the **Resolution,** which determines the frequency of pulses.

Sub-menu "Function" is selected in the "OUT3" sub-menu:



The pulse output function is selected by means of the cursor up/down keys and the flow transmitter will be programmed by pressing the "=" key.

Selecting the pulse output function for Output3, will automatically set "**In Data**" to FLOW. This will cause the frequency of the pulses on Output3 to be proportional with the actual flowrate in the flow transmitter. "**Resolution**" is automatically set to give the maximum number of pulses per volume unit.

For more detailed guidance about the calculation of the resolution value and the configuration of the flow transmitter, refer to the "Flow transmitter PD 340 Manual" (PD-number 50 20 10).

Test mode.
In test mode, it is possible to key a value into the FLOW register. For further information about test mode configuration, consult the "Flow Transmitter PD 340 Manual",
(PD-number 50 20 10).

If the transmitter is in test mode, the display will show "TEST MODE" on the bottom line.

No error messages will be displayed for a flow transmitter in test mode.

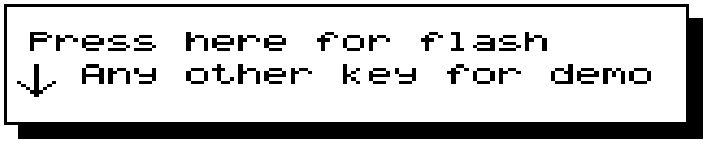
4.5 Master reset.

Performing a master reset on the Flowmeter-Display will clear the RAM memory. All the user defined data that will have been keyed in, will be erased or overwritten. The printer layout and the customised flow transmitter (see page 20), will be set to the default Proces-Data configuration.

A master reset of the Flowmeter-Display is performed by separating the "Interface unit for RS-485" from the display/keyboard unit. The interface unit is the square box attached to the back of the controller. The 4 screws must be removed before the units can be separated. The power supply unit must be dismounted for at least 15 seconds before mounting again.

NOTE: the power supply must be switched OFF before the units are separated.

When the power supply is restored after a master reset, the following text will appear on the display.



The Flowmeter-Display program is stored in flash memory, and the **"MeterA"** key must be pressed to select this program. Any other key will select a demo-program. If, by accident, the demo-program is selected, then another master reset must be performed.

After selecting the Flowmeter-Display program by pressing the **"MeterA"** key, the following text will be displayed.

Reset the Flowmeter-Display by switching off the power supply. When power is switched on again, the Flowmeter-Display is ready for use.

5 Error detection.

The system includes a comprehensive error detector and alarm function.

The flow transmitter will register possible internal errors. If an error occurs, an error code is generated within the flow transmitter. When reading data from the flow transmitter the response message will contain the actual error status. Any error code present in the flow transmitter will cause an error message to be written in clear text on the bottom line of the display.

Only errors from the flow transmitter that is currently selected, will appear on the display. If an error occurs in a transmitter, which is not currently selected, the error text will not be displayed until that transmitter is selected.

If an error occurs in a Flow transmitter, the error text will be indicated in clear text on the bottom line.

5.1 Displayed errors in the Flowmeter system.

5.1.1 Errors generated by the flow transmitter.

'Power Fail: F0'
The flow transmitter has been reset due to a power cut.

'Softw.Reset: F2'
The flow transmitter has been reset from the Flowmeter-Display or another controller.

'Internal Err: xx'
The errorcode 'xx' can be one of the following numbers F4, F3, F1, 83, 82, 81, 80, 76, 75, 54, 52, 44, 43 and 42. If the flow transmitter continues to indicate one of these error codes, following a reset and a clear of the error register, the flow transmitter is likely to require repair. For further information about these errors, consult the "Flow transmitter PD 340 Manual" (PD-number 50 20 10).

'TempDisconn.: xx'
The errorcode 'xx' can be one of the numbers: 24, 62, 63 and 64. The error codes 63 and 64 appear if the temperature detector is incorrectly connected. Numbers 24 or 62 appear if the detector is disconnected.

'Temp.> 130°C: 23'
The temperature is above 130 °C.

'Overrun Volu: 8'
There has been an overrun on the Volume counter and counting has restarted from zero.

'Overrun Tota: 7'
There has been an overrun on the Total counter and counting has restarted from zero.

'Flow Disable: 5'
Input 1 has been activated and the volume counters have been inhibited.

'Pipe Empty: 4'
The metering pipe in the flow transmitter is empty.

'Flow > Max: 3'
The flow through the flow transmitter has exceeded the maximum allowable limit.

'Overfl. Out2: 2'
The frequency of the pulses on output 2 has exceeded 10 Hz.

'Overfl. Out3: 1'
The frequency of the pulses on output 3 has exceeded 1000 Hz.

5.1.2 Communication errors on the P-NET.

The Flowmeter-Display supervises the P-NET connection between the Flowmeter-Display and the flow transmitters. Occurance of possible transmission errors results in the display of error text, followed by a four digit code describing the type of error.

'TransError: 0020'
The P-NET is short-circuited.

'TransError: 0040'
There is a controller module connected having a Node Number set to a higher value than the Number Of Masters.

'TransError: 0800'
There has been a synchronisation error on the P-NET. This error will occur if additional masters, having a different “Number Of Masters” setting, are connected to the P-NET.

'TransError: 4000'
The answering module is not a PD340 Flow transmitter.

If more than one error occurs at the same time, only the error with the highest error code will be saved and displayed. Communication errors have the highest priority.

5.2 Clear error.

When clearing the VOLUME register by pressing the "CLEAR" key, the error buffer will also be cleared for the selected flow transmitter. To clear the error buffer without clearing the Volume register, press and hold the "CE" key and then press the "CLEAR" key. In the type approved system it is only possible to clear an error when NoFlow has been detected for a period of 2 sec. Clearing the error buffer will also clear the VOLUME register.

6 Connecting a flow transmitter to the system.

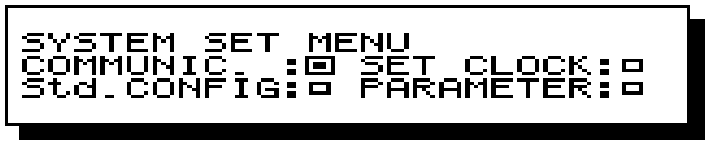
The installation of a flow transmitter can be carried out using two alternative methods. The first method (a), is to connect the transmitter to the system, ensuring it has the correct node address, and subsequently, performing an autosetup of the transmitter. With the second method (b), the transmitter is connected to the system, but without changing the actual configuration of the flow transmitter.

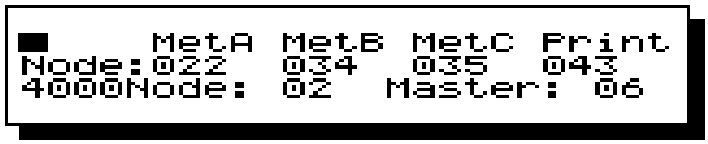
6.1 Installation procedure.

The procedure described below should be followed during the installation of a new system, or when a new flow transmitter is added to the system. The first two steps must always be carried out. The later steps will vary, depending on whether autosetup is required.

1 First, select "PD340 SERVICE MENU" by pressing the "SETUP" key.

2 Then, select "SYSTEM". After that, select "COMMUNIC.", followed by selecting "PD4000/340 setup".





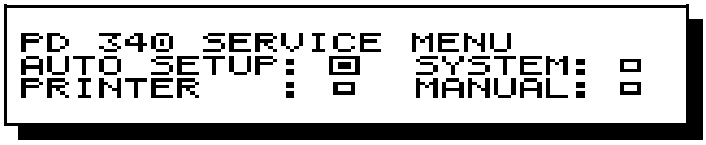
In this menu, it is possible to set up the P-NET node address of the three flow transmitters and eventually, an PD3940 module. The node address and number of masters for the

Flowmeter-Display, is also selected in this menu. For further information see page 16.

To see whether the selected flow transmitter responds to the keyed in P-NET node address, the install procedure can be interrupted at this stage. To check the response from the flow transmitter, press the "FLOW" key. If there is no response, the text "Flowmeter *X* not Connected" is written in the display. Continue with step 3 of the installation procedure to connect the flow transmitter to the system.

3a Install with AutoSetup.

Pressing the "SETUP" key, followed by "AUTO SETUP", will perform an automatic set up of of the selected flow transmitter, using the customised configuration.



If the flow transmitter does not respond to the communication from the Flowmeter-Display, the picture below will be shown.

Keying in the Serial number of the flow transmitter and pressing "=" will assign the node address to the flow transmitter. An AUTO SETUP can now be automatically performed (see page 15).

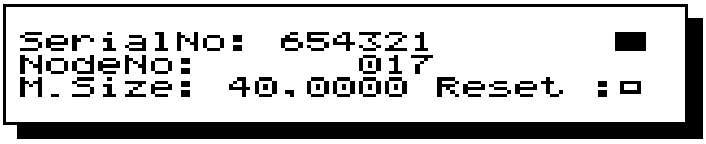
3b Install without AutoSetup.

To connect a flow transmitter by changing the node address in the Transmitter, press the "SETUP" key to select the "PD340 SERVICE" menu. Now select "MANUAL", followed by selecting "DEVICE".

If the flow transmitter does not respond to the communication from the Flowmeter-Display, the picture below will be shown.

Keying in the Serial number of the flow transmitter and pressing "=" will assign the node address to the flow transmitter, and the flow transmitter will now be connected to the system.

A display showing SerialNumber, NodeNumber and MeterSize is shown when the flow transmitter has been correctly connected.



7 Type approved flowmeter system

The flowmeter system is available as a type approved system, which is certified as legal for trade in Denmark. The system is approved for the measurement of milk products and other products, having the same characteristics as water. The type approved system complies with the specifications in OIML 4th preliminary Draft - "Measuring systems for liquids other than water". The system ID is "**IV-302**".

The system can be installed as a stationary system, or as a mobile system mounted on a tanker.

Before the system is approved for use in trade, the connected meters (a maximum of three) and the display unit, have to be verified and sealed by the authorities.

Some of the main functions of the type approved system are described below. For further information, consult the "Typegodkendelsesattest" number 1993-4163-0378.

7.1 Timer functions in the approved system mode.

The approved system has the same abilities as the non-approved system, for displaying FLOW, TOTAL, TEMPERATURE etc, but a built-in timer function will always switch to display the VOLUME register on MeterA. The display change will be performed if there has been no keyboard activity for 15 sec.

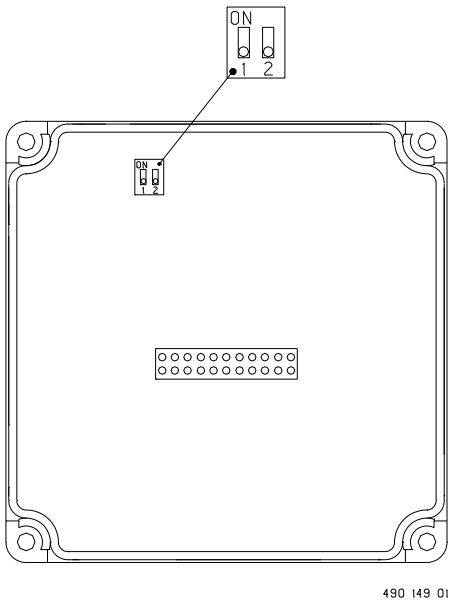
The timer value for the NoFlow detector in the approved system is fixed. This means that no flow will have to have been detected for a period of 2 sec., before the clearing of the Volume-counters is possible. See further details on page 19.

7.2 Setting the display unit in the approved system mode.

Switch 1 on the PD4090 (Interface unit for RS-485) must always be set to the "OFF" position. This will prevent the FLASH memory being overwritten.

When the system is used as an approved system, switch 2 on the PD4090 "Interface unit for RS-485" must be set in position "OFF".

To change the switch 2 ON/OFF position, disconnect the 24 V power supply and separate the interface unit and the controller unit. Now change the switch position and re-assemble the two units.



If the two units have been separated for more than 15 sec. a master reset will be performed. See further details on page 33.

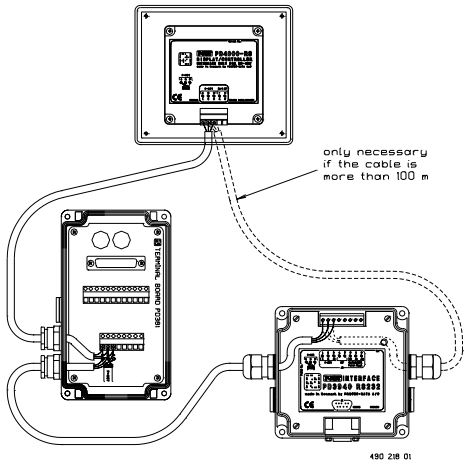
8 Installation.

PD 340 flow transmitters utilizing P-NET communication, requires the "Extended Version".

P-NET is a multi-drop fieldbus, which is connected in a physical ring. Up to 125 units can be connected to the bus, where a unit may be a PD 340 flow transmitter, a PD 4000/340 Flowmeter-Display or any other P-NET interface module. The P-NET interface is galvanically isolated. The bus cable is a twisted pair with shield. The shield is used as a potential equalizer between the driver/receiver circuits in the nodes connected to the bus.

A P-NET unit is connected to the bus by means of 3 terminal-connections. The A terminal, the B terminal and the S terminal.

The connection from one unit to the next unit is performed by connecting A to A, B to B and S to S. If the length of the cable is more than 100 m, the bus cable will have to be connected from field device to field device, forming a physical ring.



All modules, PD340 flow transmitters and PD4000/340 Flowmeter-Displays, must be powered from a 24 V DC power supply. The connection of the power supply is shown clearly on the modules.

Electrical specification for P-NET:

Bus structure:	A physical ring without termination.
Medium:	Shielded twisted pair cable with minimum .22 mm² area conductors and characteristic impedance of 100-120 ohm. For example TWINAX IBM part No. 7362211 with 105+/-5 ohm, 51 pF/m.
Bus length:	Max 1200 m (EIA RS 485).

NOTE: The Flowmeter-Display must be configured with a suitable node address and number of masters, following electrical installation. See further details on page 16.

9 Construction, Mechanical.

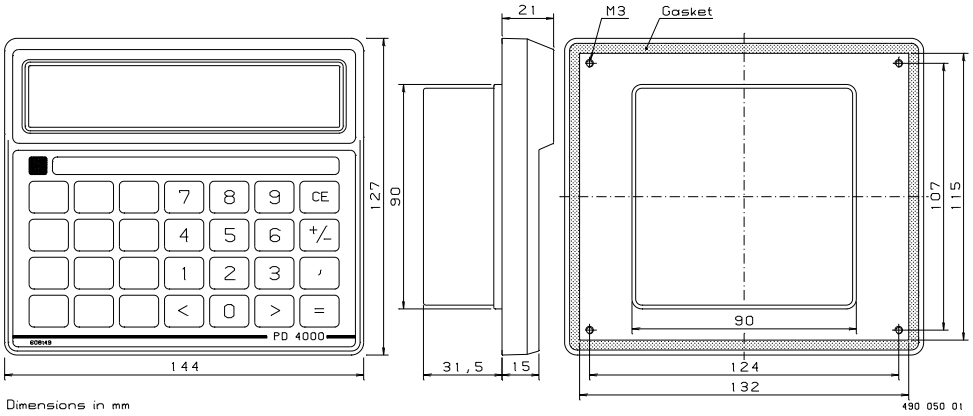
The PD4000 Controller is housed in a black injection moulded plastic enclosure. The entire Controller is completely filled with silicone. This construction makes it extremely resistant to water, dust and vibrations.

The case measures W x H x D = 144.0 x 127.0 x 52.5 mm (tolerance to DIN 16901).

The module is designed for panel mounting. The module incorporates one snap connector, which provide the terminals for power and communications.

The module may be removed for service, without interfering with operational activities on the rest of the network.

Scale drawing (in mm):



Materials

Case:	Black NORYL GFN (injection moulded)
Front foil:	Polycarbonate.

10 Specifications.

All electrical characteristics are valid at an ambient temperature of -25 °C to +70 °C, unless otherwise stated.

All specifications apply within the range of approved EMI conditions. EMC test specifications for PD 4000 are available in a separate document, PD no. **506 022**.

10.1 Power supply.

Power supply DC:	nom.	24.0 V
	min.	20.0 V
	max.	28.0 V
Ripple :	max.	5 %
Power consumption :	max.	2 W
Current at power up :	max.	250 mA

10.2 Ambient Temperature.

Operating temperature :	-25 °C - 70 °C
Storage temperature :	-40 °C - 85 °C

10.3 Humidity.

Relative humidity :	max.	95 %

10.4 Approvals.

Compliance with EMC-directive no.:	89/336/ECC
Generic standards for emission:	
Residential, commercial and light industry	EN 50081-1
Industry	EN 50081-2
Generic standards for immunity:	
Residential, commercial and light industry	EN 50082-1
Industry	EN 50082-2
Vibration (sinusoidal):	IEC 68-2-6 Test Fc

Type approved system, certified as legal for trade in Denmark, complies with:
OIML 4th preliminary Draft - "Measuring systems for liquids other than water".

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