® **Badger Meter Europa GmbH**

PC 100

INSTALLATION AND OPERATION MANUAL

August 2007

IND_PC100_Bedienungsanleitung_0708_e.doc

1. Unpack and install the PC100

Note: If damage to the shipping container is obvious, request that the carrier be present when the product is unpacked. All claims for equipment damage during transit are the sole responsibility of the recipient.

1.1   Unpacking
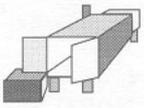
After carefully unpacking the unit, check for any visible sign of damage. If found, notify the carrier for insurance purposes and call the factory for possible replacement. Keep all packing material in the event that the unit must be returned to the factory.

1.2   Assembly
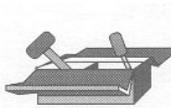
The PC100 can be installed on the flow meter, on a wall or shelf, or in an instrumentation panel. The picture below shows the exploded view of a meter or wall mounted unit. In this configuration, the PC100 is shipped separately and must be installed as shown. (See wiring diagrams for proper transmitter signal connections.)

The basic unit is equipped for panel mount. To install:
1)   Measure and cut mounting hole to the dimensions shown.
2)   Install gasket around the mounting bezel.
3)   Pass the unit through the front panel cutout.
4)   Secure the unit to the panel with the mounting clips.
5)   Complete wiring and reassemble unit.
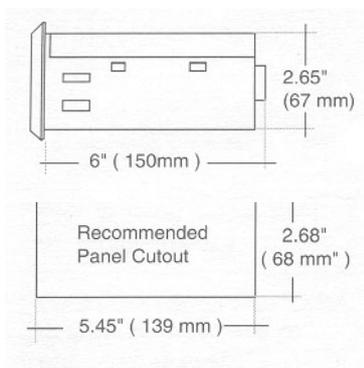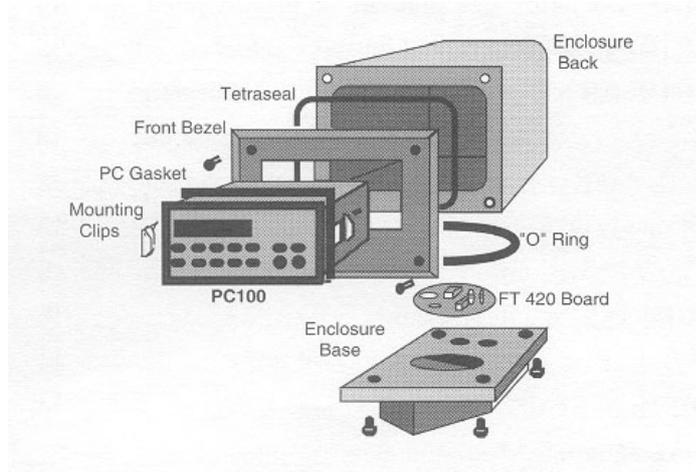
Note: Operating temperature is 32°F to 130°F (0° to 55°C) with a maximum humidity of 85% non-condensing.
Always select a mounting location with proper ventilation and environment protection.

IND_PC100_Bedienungsanleitung_0708_e.doc

2. Wiring procedures

The rear panel of the PC100 controller contains 36 screw terminals for connecting #28 to #18 gauge insulated wire (#18 gauge stranded twisted pair shielded cable is recommended.)

A wire stripper and a small screwdriver are the only tools required. Detailed diagrams in this section illustrate the proper wiring procedures for all standard and optional functions. At installation, be sure to comply with the following requirements:

- Disconnect power to the unit before attempting any connection or service to the unit.
- Avoid using machine power service for AC power. When possible, a dedicated or lighting circuit is recommended
- Do not bundle or route signal lines with power lines.
- Keep all lines as short as possible.
- Use twisted pair shielded wire for all input wiring.
- Observe all applicable local electrical codes.

Terminal Identification List

No	Function	No	Function
1	Reset Cycle Counter	19	DC Power Input
2	Resume Remote Input	20	15 VDC Power Output
3	Stop Remote Input	21	DC Common
4	Reset Totalizer	22	Relay K1 Contact NC
5	Transistor Output 1	23	Relay K1 Contact C
6	Transistor Output 2	24	Relay K1 contact NO
7	Transistor Output 3	25	AC Power Input
8	Transistor Output 1A	26	AC Power Input
9	Transistor Output 2A	27	AC Power Input
10	Transmitter Input 2	28	AC Power Input
11	Low Frequency 2	29	Relay K2 Contact NC
12	DC Common	30	Relay K2 Contact C
13	Low Frequency 1	31	Relay K2 contact NO
14	Transmitter Input 1	32	Chassis Ground
15	Function Inhibit	33	Serial Data Input (-)
16	Print Command	34	Serial Data Input (+)
17	Start Command	35	Serial Data Output (+)
18	Pulse Input Doubler	36	Serial Data Output (-)

Note: K1 relay coil jumper is factory wired to terminal 8. K2 relay coil jumper is factory wired to terminal 9. At the end of the batch, transistor outputs 2 and 2A (terminals 6 and 9) are energized. At prewarn, terminal outputs 1 and 1A (terminals 5 and 8) are energized.

3. Assembly and installation of the PC100XP

This section deals with the procedures and recommendations on how to install Badger's PC100XP electronic batch controller in hazardous locations.

Except for the assembly and installation procedures, all other instructions are identical to the standard PC100 and should be referred to in this manual.

3.1   Description

The PC100XP is a standard batch controller mounted in an explosion proof enclosure. The enclosure is FM approved for CLASS 1, DIVISION 1, GROUPS C & D and CLASS II, GROUPS E, F and G environments. The enclosure complies with CSA and UL standards. It is also rated for NEMA 3, 4, 7 & 9 (watertight).

3.2   Operation

The operation of the PC100XP is identical to that of the PC100 controller. On the PC100XP model, programming of functions and control commands is done mechanically through explosion proof push buttons.
Note: To prevent accidental or unauthorized tampering, deactivate all programming or command functions (except for those required during production operation) using functions #41.

3.3   Unpacking

The PC100XP is shipped from the factory disassembled. The standard PC100 and the XP enclosure are shipped separately to facilitate installation and wiring.

3.4   Assembly

Always follow local codes and manufacturer's instructions when installing this and other types of equipment in hazardous environments.
Note: Operating temperature is 32°F to 130°F with a maximum humidity of 85% non-condensing. Select a mounting location with proper ventilation.
Warning:To prevent the danger of electrical shock or explosion, turn off the power in any circuits that may introduce power to the wiring during the installation of this controller.

3.5   Step-by-step installation

The following step-by-step installation instructions should be regarded only as a guideline for proper installation. Local codes or practices may require additional functions to be performed in order to assure safety of installation and operation.

1.   Using a 1/2" allen wrench, remove the cover bolts from the front cover. Carefully place the cover over a level surface.
2.   Unscrew the mounting plate screws and remove the mounting plate.
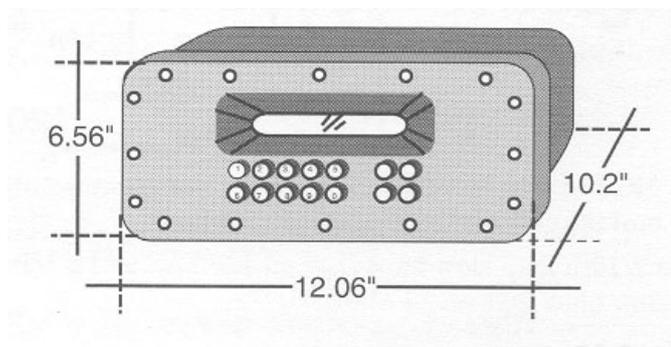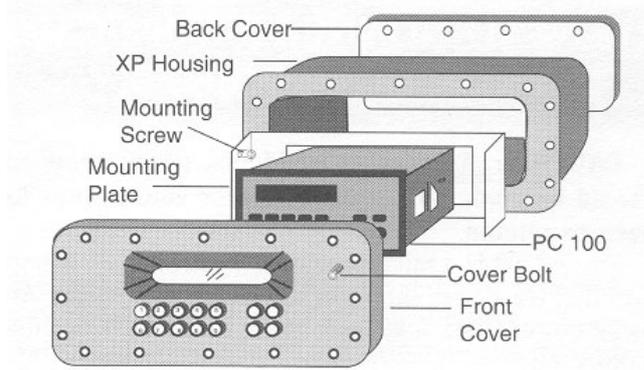
3.   Open the PC100 carton and remove the unit. Use the enclosed mounting clips to mount the PC100 to the mounting plate.
4.   Using the bottom and/or side tapped holes, mount the XP housing onto a firm platform, cabinet or the wall.
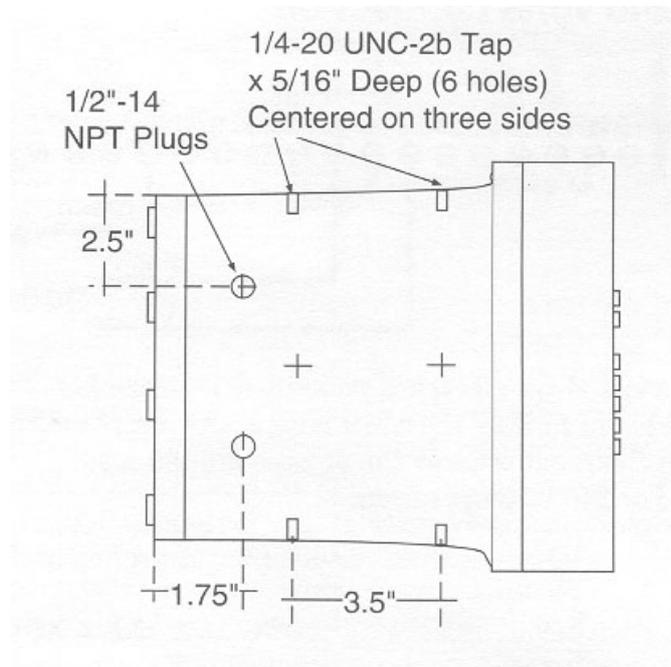
Upon completion of all wiring, tightly close all enclosures within the system.
Before applying power to the system:
•   All electrical connections must be secure.
•   All seals must be properly poured and completely cured and their seal fittings tightly closed.
•   All joints in the conduit run must be tight.
•   All enclosures in the system must be tightly closed.
Apply power to the controller and test operation in a manner that is suitable for the particular application. Exercise extreme caution!
For technical assistance during or after installation, please call our sales department or contact the Badger Meter representative in your area.

4. Connecting the AC or DC power

CAUTION: To prevent accidents, power connection should be made only after all other connections have been completed.

The PC100 is a microprocessor controller. It is important that the power supply be as "clean" as possible. Avoid using power lines that feed heavy loads such as pumps, motors, etc.

If dedicated lines are not available, a filtering or isolation system might be required.
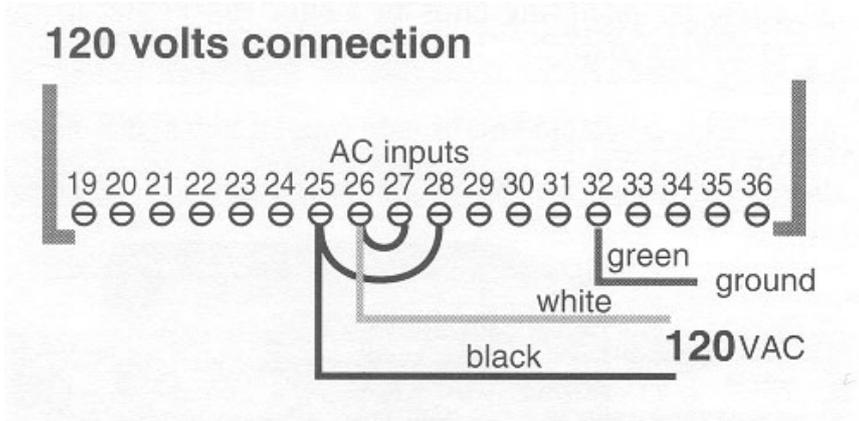
It is recommended that fuse protection be installed. Use a 2/10th amp slow blow fuse on 120 VAC and a 1/10th amp slow blow fuse on 240 VAC supply.
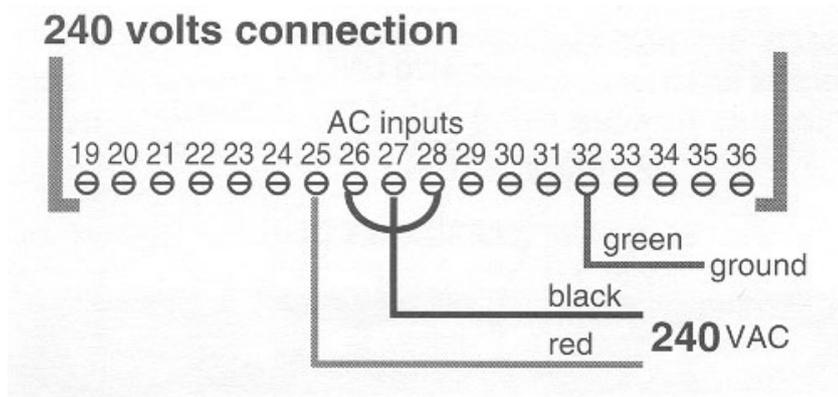
Typical US electrical code identifies the black wire as the hot or hi lead, the white wire as low or neutral lead, and the green wire as the chassis ground lead.

For 240 VAC operation:

USA	Europe
Black	Blue
Red	Brown
Green	Green/yellow

11 to 16 VDC connection
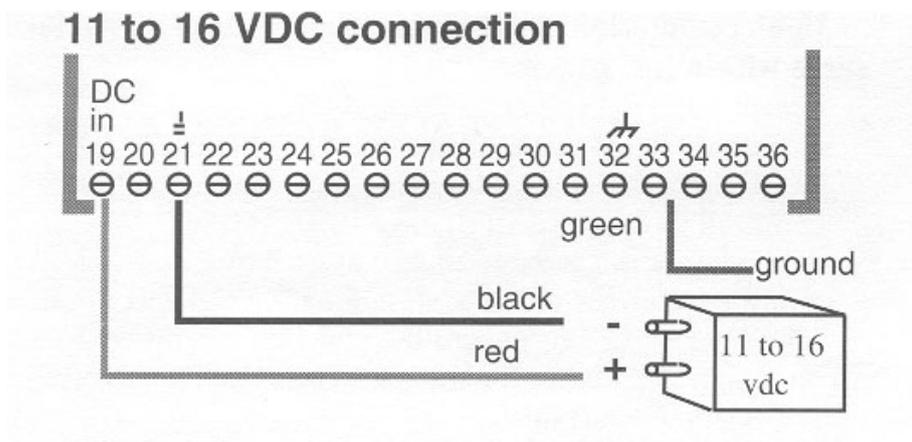
DC supply for mobile operation or as a backup supply can be done with a battery or other DC supply of 11-16 VDC/1amp.

Note: DC supply will not be available form terminal #20 when powering the unit with DC current.

5. Connecting signal transmitter

The following diagrams show how to wire most of the flow transmitters supplied with Badger Meter flow meters. Connection of transmitters from other manufacturers is similar. This section deals with pulse outputs generated by reed switches and by current sinking open collector transistors, the most common types of outputs found in flow meter pulse transmitters.

Note: A jumper between terminals #12 and #18 will double the transmitter output frequency.

Warning!!
Transmitter lines carry very low power signals and are sensitive to external noise. Always use shielded cable and keep AC power lines away from signal lines. Do not bundle or route these together since this may cause erratic operation of the PC100. DO NOT ground the cable shield at the transmitter end.

5.1   Reed switch transmitters (Type A)

Reed switch transmitters close a contact to DC common. Switches of this type have outputs of less than 150 Hz and generate contact bounce.
Therefore, installation of a jumper between terminals #12 and #13 is required. This effectively filters the unwanted extra closures caused by contact bounce. (Jumper terminals #11 and #12 if using transmitter input 2 on terminal #10.)
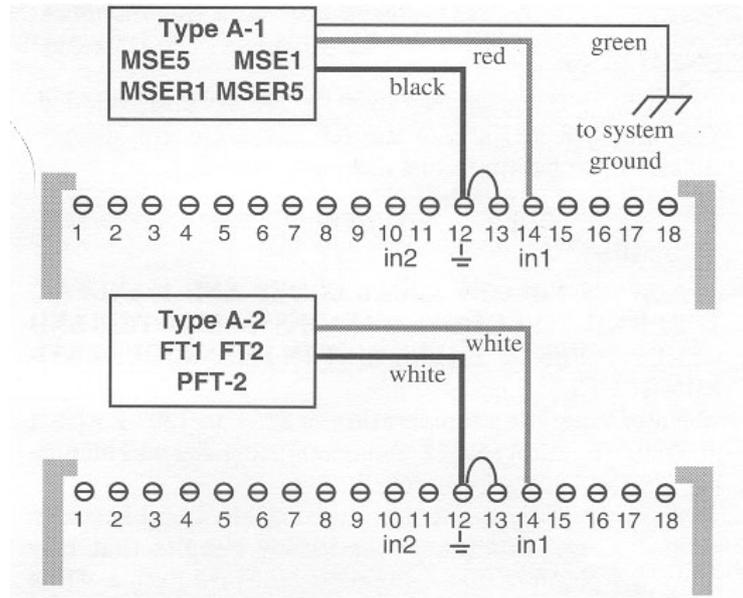
5.2 EPT1 & PEPT1 (Type B)

These models require that a special current regulator supplied with the transmitter be installed exactly as shown. Reversing the polarity will damage the transmitter. No pulses will be detected without it.
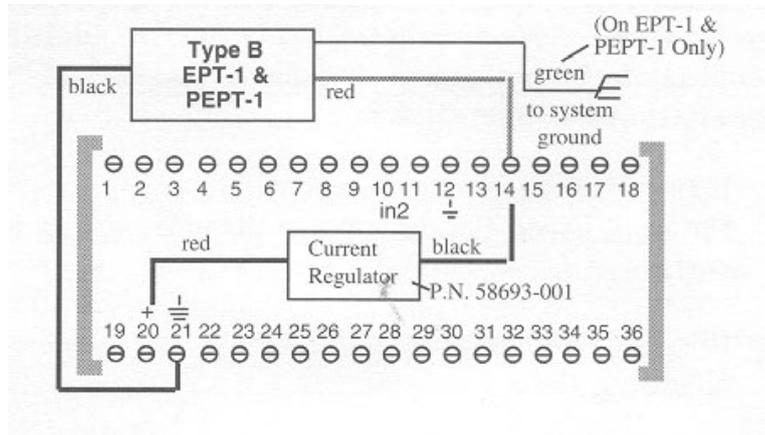
5.3 Open collector output (Type C)

PFT2E, PFT3E, FT1E transmitters and meter mount PC100 sensors generate output signals from a current sinking NPN (open collector) transistor. The PC100 provides the necessary DC power from terminal #20 only when on AC main power.
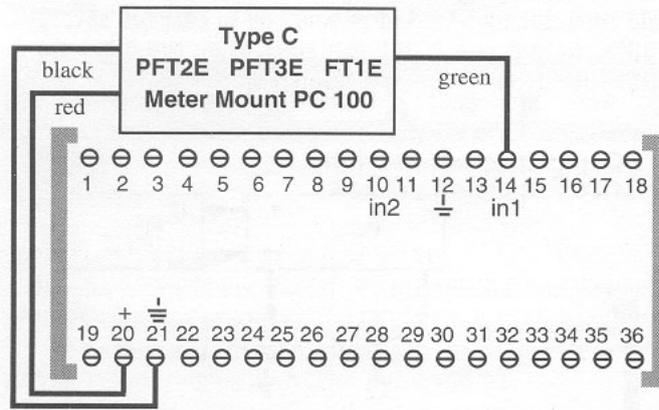
5.4 FT420 (Type D)

This transmitter has dual output, a 4-20 mA analog signal, and an unscaled open collector transistor pulse.
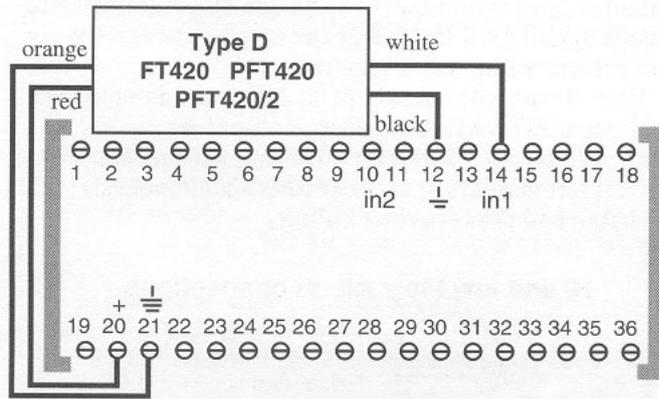
5.5 PFT3 (Type E)

This transmitter consists of a reed switch sensor which generates contact bounce. It is similar in operating to a Type A-2 transmitter.
Therefore, installation of a jumper between terminals #12 and #13 is required. This effectively filters the unwanted extra closures caused by contact bounce. (Jumper terminals #11 and #12 if using transmitter input 2 on terminal #10.)
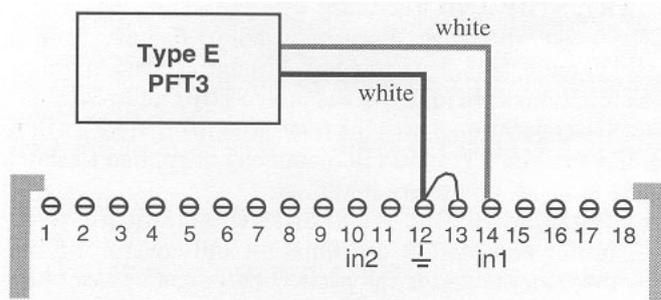
6. Connecting valves, motors, pumps and alarms

The following diagrams show how to wire the (2) relay outputs of the PC100. Each relay has a single set of form C contacts (one normally open and one normally closed). Relay outputs are typically used to energize or de-energize solenoids in valves, motors, pumps and alarms.

CAUTION: Because the relays may be switching high power devices, DO NOT use the PC100 AC power supply to power valves or pumps. This might generate electrical noise and could damage the processor.

6.1 Typical applications

6.1.1 Single stage valve connection
Always use relay K2 when connecting to a single stage valve. At the preset batch point the relay will be de-energized, cutting power to the valve solenoid and causing the valve to shut off.

One stage valve connection

Relay K2

NCC NO

19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

AC Hi

AC NEUTRAL

valve solenoid or pump motor
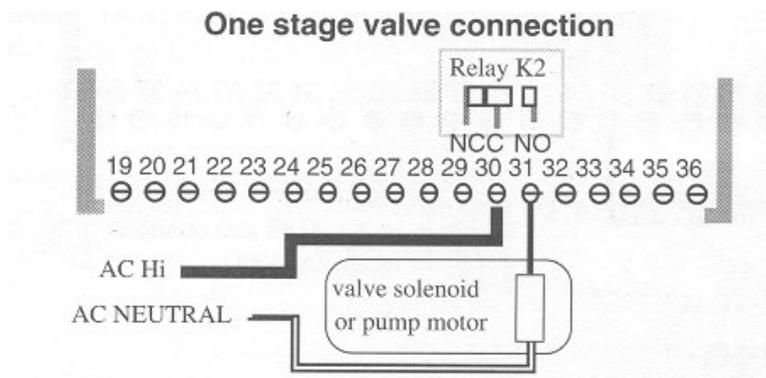
6.1.2 Main pump connection
Relay K2 is connected to the pump motor to energize at the beginning of the batch and de-energize at the end. If used with a one stage valve, use relay K1 and program prewarn to zero (0).

6.1.3 Two stage valve connection
Relay K1 is connected to the first stage valve solenoid to partially close the valve and relay K2 is connected to the second stage for final valve shutdown.

Two stage valve connection

Relay K1   Relay K2

NCC NO

19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

First or Prewarn stage valve solenoid

Second or Shut-off stage valve solenoid

AC Hi

AC NEUTRAL

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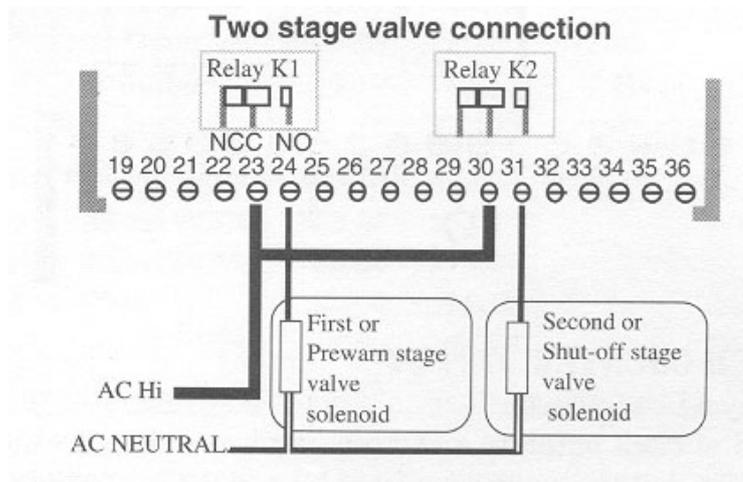
6.2   Optional applications

6.2.1   Feed pump connection
Relay K1 can be connected to a feed pump to inject or add fluids to the main batch on a preset time basis. (Refer to F32.)

6.2.2   Hi and/or low flow alarm
Relay K1 can be connected to an alarm to provide a permanent or temporary warning signal when a low or hi flow preset point has been exceeded. To do this, move wire from terminal #8 and connect to terminal #7.
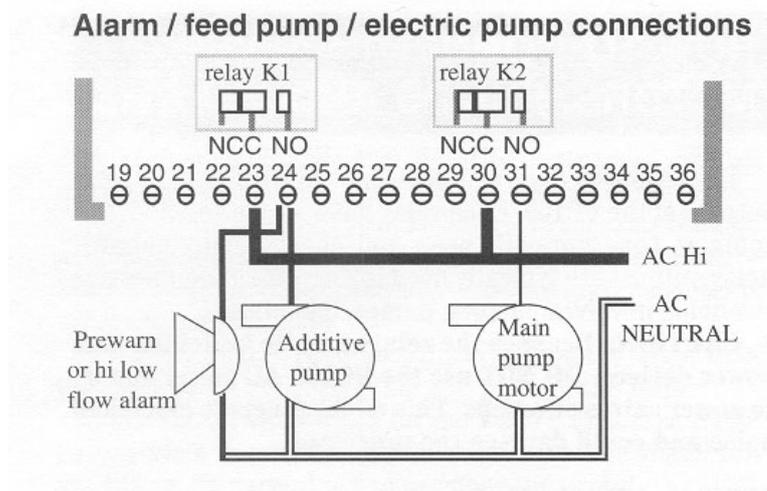
Abb.   2.5
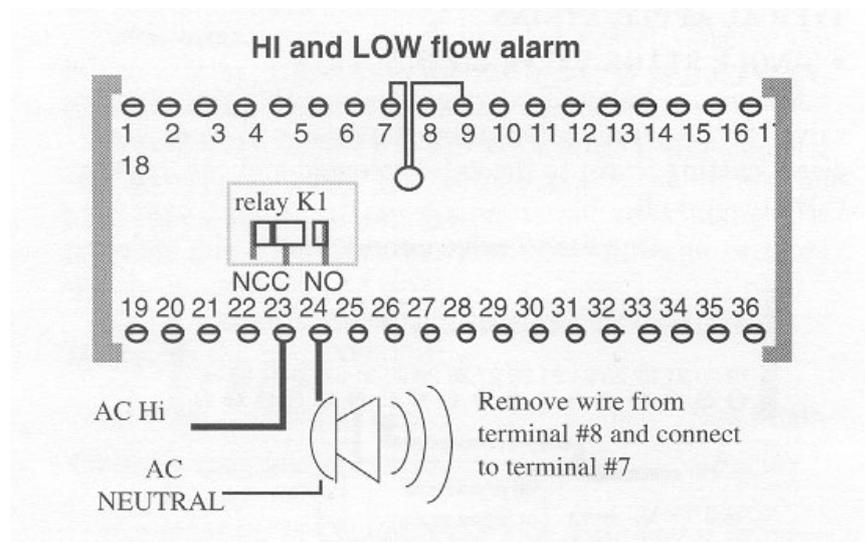
7. Connecting alarms or remote totalizers

7.1   Relay pulse output

Relay K1 can also be used as a dry switch closure pulse output to operate devices such as remote counters or batch control panels (output frequency not to exceed 5 Hz). To do this, move wire from terminal #8 to terminal #7.
See how to program the pulse duration on page.

IND_PC100_Bedienungsanleitung_0708_e.doc

Remote totalizer/cycle counter connections
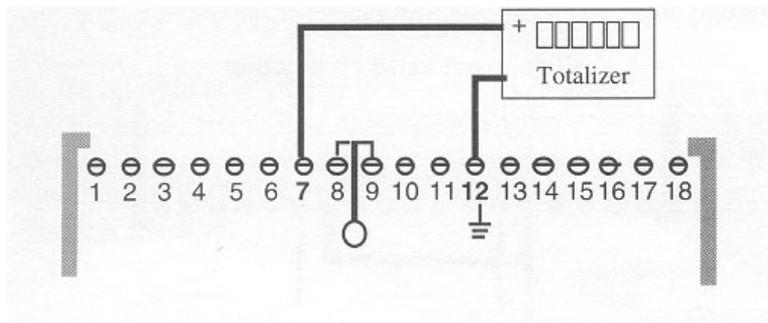
7.2   Batch counter output

Relay K1 can also be used to provide a switch closure at the end of each batch to a remote batch counter or other device. To do this, move wire from terminal #8 to terminal #7. See how to program cycle output on page . The transistor output on terminal #7 can be programmed for one of three functions:
1) To provide a scaled pulse output.
2) To provide a pulse at the end of each batch.
3) To provide a signal whenever the hi or low flow rate setpoints have been exceeded.

See function #33 for detail programming mode and technical brief for transistor output specifications.

7.2.1   Scaled pulse output

Generally used to drive an electronic remote counter or totalizer, or to interface with remote controllers. When using output on this manner you can select a pulse duration of 1 ms to 99 ms depending on the input frequency and the sensitivity of the receiving device.

7.2.2   End of batch signal

Can be used to totalize batches or cycle runs during a period of time, or to cascade several PC100s, so that one PC100 can start when the other finishes. This signal duration is adjustable.

PC cascade connections
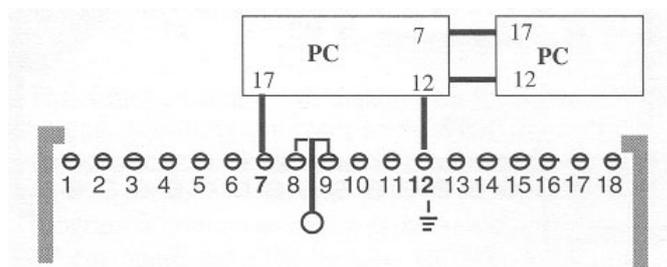
7.3   Flow alarms

Used with a low powered piezoelectric or similar sounding device. It is energized when either the hi or the low flow setpoints have been exceeded and can be programmed to remain active until the end of the batch or to reset if the flow returns within preset limits.

IND_PC100_Bedienungsanleitung_0708_e.doc

Note: Transistor outputs #1 and #1A are de-energized the same as relay K1, and transistor outputs #2 and #2A, the same as relay K2. Therefore, these outputs can be used to drive external relays or other devices simultaneously with the batch and prewarn relay outputs.

Hi and low flow alarm connections
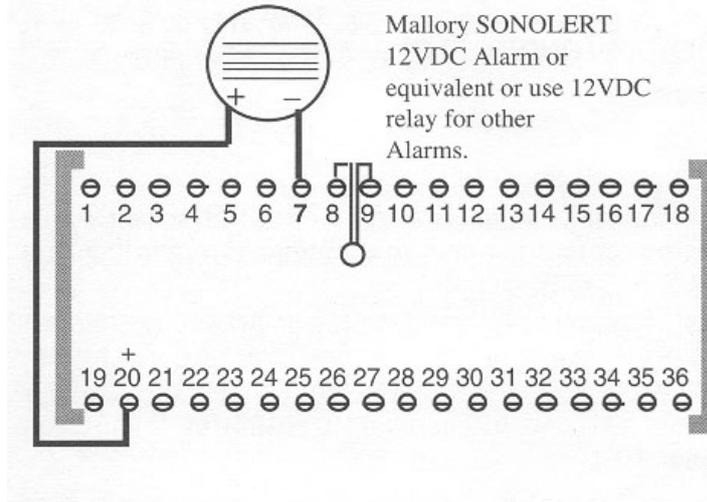
7.4   Start, stop and resume

These operations can be wired remotely for fast emergency override, or for cascading several units. If you inhibit these functions with function #41, only STOP and RESUME will still be operational with the remote control, START will not. If a sustained ground (DC common) is applied to the remote stop, all inputs are inhibited.

- The RESET CYCLE and RESET TOTALIZER are useful for end of shift coordination and control. Both inventory totalizer and cycle counter can be reset to zero.
- The PRINT input allows you to request printed information at any point during the operation, in order to inspect batch, flow, and inventory parameters.
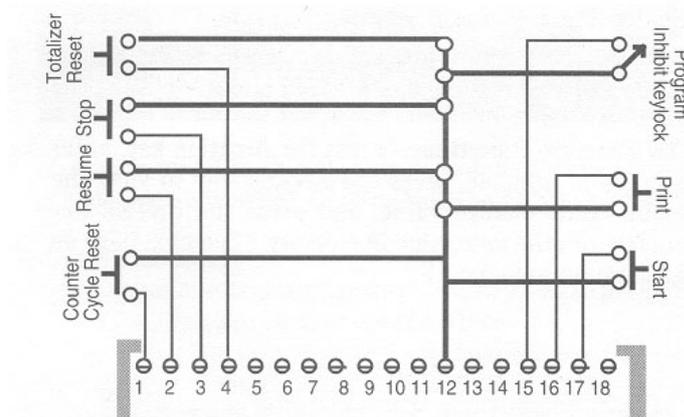
- The INHIBIT input allows you to connect a keylock or jumper in order to disable function #41, which lets you inhibit or uninhibit any or all functions.

8. Connecting a printer

The PC100 has terminals for serial input and output. The type of signal is a 20 mA data loop. The serial output can be used to transmit data to a serial printer. The input-output is used to connect a process controller for two way serial communication (transmit and receive).
Commercial serial printers can be connected to the PC100 to receive and print flow information at the end or start of a batch or on command.
The connection to the PC100 requires that the printer be able to receive a 20 mA serial data loop or that a current to serial converter be used.
Always use twisted pair shielded cable for all serial communications. Keep cable as short as possible and do not place near power wires.
Function #66 may have to be programmed to the appropriate line print delay for the printer in use.

Printer connection
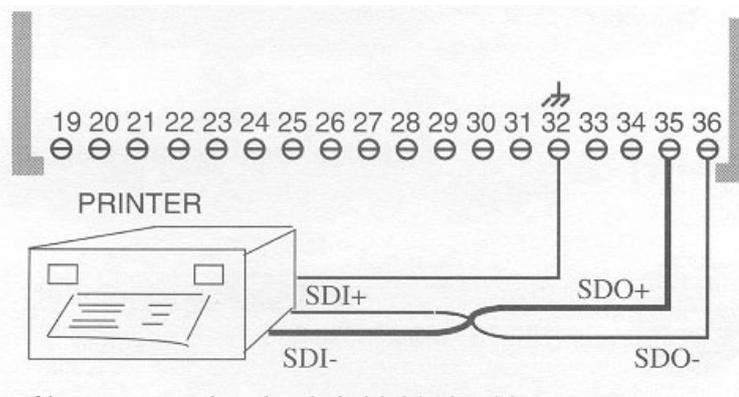
9. Connecting the host computer/process controller

9.1   Connect a controller

The two way serial communication ports allow you to connect the PC100 to a process controller to send and receive data.
The connection requires that the host controller be able to accept a 20 mA data input. Otherwise, a 20 mA to RS signal converter must be used.
To connect more than one PC100 in series, first connect the 20 mA to RS transformer to the serial input of the computer. Then, connect the serial output to the first PC100 as shown. Thereafter, connect the serial output of one PC100 to the serial input of the next unit.
Serial connection will be interrupted to all units if the power supply fails on any one of the PC100s. To prevent this from happening, you may want to connect a communications relay to each unit.
Wiring diagrams on how to connect the relay will be found in the relay packaging.
Up to 99 PC100s can be connected in this manner. Each unit sending and receiving information must be identified with an ID number. (See page 15).
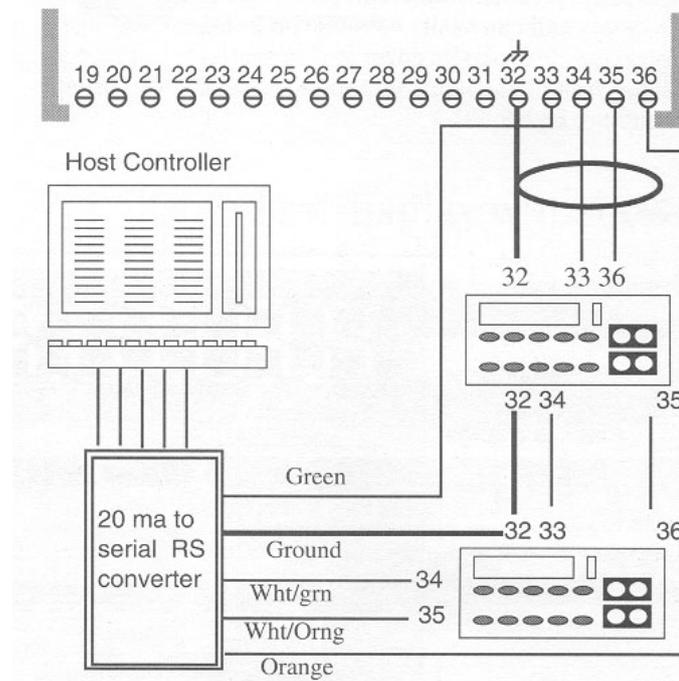
The information below shows the parameters that can be reprogrammed by a host controller as "Information Received" and the parameters that the PC100 will transmit on print or interrogation as "Information Sent"

Information Received	**Information Sent**
P = Fixed Prewarn	Prewarn Setpoint
B = Batch Preset	Batch Setpoint
C = Cycle Preset	Cycle Setpoint
H = Rate High Setpoint	Rate High Setpoint
L = Rate Low Setpoint	Rate Low Setpoint
I = Print (Interrogate)	Scale Factor
F = Scale Factor	Totalizer Count
X = Stop Batch Count	
R = Resume Cycle Count	
S = Start Flow Rate	
V = Parameters That Vary (Counters and Flow Rate)	

9.2   Serial communication characteristics

- Even parity transmission with no check for parity.
- On ID mode all characters are echoed and all lines must start with ID #. (ID number of PC100 to be interrogated.) Example: To change the batch from 150 to 180 on unit #3, you have to transmit #3B180*.
- When not on ID mode, characters are not echoed. All lines to start with line initial. Example: To change prewarn setpoint from 10 to 15, transmit P15*.
- If a line is accepted by the Pc100, the * sign is changed to @. However, if a wrong line is sent to the PC100, an "INVALID REQUEST" message will be transmitted along with the unit ID #. If a wrong value is sent, such as prewarn larger than batch, a "VALUE ERROR" message will be transmitted.

10. Operating the PC100 panel

The PC100 front panel consists of a display of six 7 segment LEDs, four yellow LED indicators, and a numeric/command keypad. Some of the number keys have dual function operation.

The panel provides watertight protection to the internal components and can easily be replaced in case of damage. A protective clear plastic cover is also available to protect the label from dirt, paint, puncture, or scratches.
(Order part number 58689-001).

To view counters or control operation:
Using the front panel you can view a rate of flow, total and batch count, or start, stop and resume operation by simply pressing the keys so labeled.

To program functions:
Press the function key, enter the function number, press the ENTER key to view the present value, change value, press the ENTER key again to store the new value in memory. (See next page on programming sequence).

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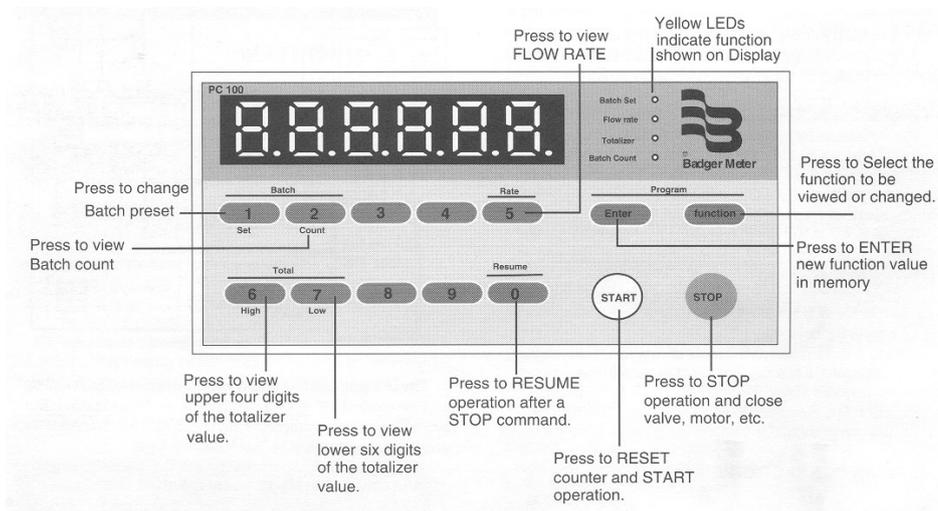
Dual purpose function keys

In addition to serving as numerical keys to program batch or other values, these keys can be used to program or display batch values, totals and rate of flow.

| 1 |
| Set |

The **1** key is used to program a new batch. Press once, enter the batch value, and press the ENTER key

| 2 |
| Count |

The **2** key is used to return the display to batch count.

Rate
| 5 |

The **5** key is used to display the instantaneous flow rate in GPM, LPM, etc.

| 0 |
| Resume |

The **0** key is used to RESUME operation from the point where a STOP command was received.

(START)

START will reset the batch counter and energize both outputs to begin batch operation.

STOP

Press STOP to de-energize both outputs and to stop operation.

Function

Press FUNCTION to start a program operation or to start over if a mistake is made.

| 6 |

High

10-Digit

Total

| 7 |

Low

9999
999999

Press **6** to read the totalizer's four upper digits

Press **7** to read the totalizer's six lower digits. four upper digits

11. Programming the PC100

Programming the PC100 is very simple. Except for programming batch preset, all other functions are programmed the same way.
This section gives:
- Details n how to operate the front panel to program, step-by-step, each of the functions.
- An explanation of the choices that are available for each function.
- Examples to guide you over the critical functions.

Basic programming sequence

Example: Change the fail safe time between pulses from 2 seconds to 5 seconds.

IND_PC100_Bedienungsanleitung_0708_e.doc

The display wil show…

1	Press the FUNCTION key	Function	**00**
2	Press the function number 30	3 0	**30**
3	Press ENTER (display will show present	value) Enter	**30 02**
4	Press the new value	5	
5	Press ENTER	Enter	**30 5**

As we mentioned at the introduction of this manual, many functions are available but only a few must be programmed for the proper operation of the PC100. The functions in this section are not presented in numeric order but instead in order of priority fist, and second, in groups of similar operation, i.e., all batching functions, all rate functions, and all communication functions.

Functions that must be programmed will be marked with a

MUST symbol. Be sure that these functions are properly programmed.

FUNCTION		PAGE	FUNCTION		PAGE
*1	Batch Preset	31	42	Batch or Rate Display Default	25
10	Fixed Prewarn	33	43	Factory Default (All Functions)	30
12	Batch Limit	31	44	Disable STOP	29
13	Batch Autoadjust (Learning Mode)	31	45	Disable RESUME	30
15	Cycle Preset (How Many Batches to Run)	32	46	Disable START	30
16	Viewing Cycle Counter	32	*50	Count Mode (Up, Down, Quadrature)	22
*1 8	Scale Factor	26	*51	Reset or Preset	23
20	Rate Period Units Per Second, Minute or Hour	33	52	Totalizer Reset	35
21	Rate Low Setpoint	34	53	Decimal Point Position	24
22	Rate Hi Setpoint	34	54	Cycle Counter Reset	35
30	Fail Safe (Shutoff if Pulse is Not Received)	23	60	Baud Rate Select	36
31	Autorecycle (Time Between Equal Batches)	32	61	Print Data A Select	37
32	Prewarn Timeout (Prewarn Signal Duration)	33	62	Print Data B Select	38
33	Output 3 Select (Cycle, Totalizer or Alarm)	24	63	Print on START or STOP	36
34	Rate Mode Enable	26	64	Print on command	37
35	Serial Output Select (Pulse or Information)	35	65	Unit Identifier	36
36	Pulse Output Width (1 to 99 ms)	25	66	Line Print Delay for Printers)	36
37	Rate Output Latch	34	67	On Line Message After Power Down	37
41	Enable/Disable Functions	28	* These FUNCTIONS must be programmed when the PC100 is used as a batch controller.		

11.1 Setup functions

Once all wiring has been completed, the unit can be programmed for your application. Those functions marked "MUST" have to be programmed if the PC 100 is being used as a batch controller.

Function #50: Count direction

Factory preset is 2
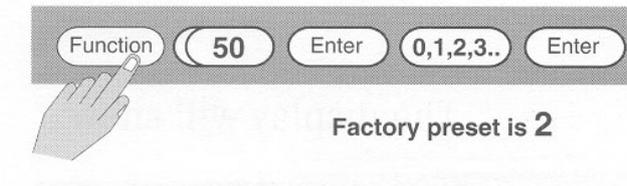
This function allows you to program the way your transmitter input(s) will be counted in the display. Your choices are as follows

0 – Input on terminal #10 will count up, input on terminal #14 will count down.
1 – Input on either terminal will count up.
2 – Input on either terminal will count down.
3 – Inputs on both terminals will count up in quadrature.
4 – Inputs on both terminals will count up in double quadrature.
Unless you are using quadrature transmitters, we recommend always using either code 1 to count up, or code 2 to count down in order to be able to use either input.

Function #51: Reset or preset

Factory preset is 1
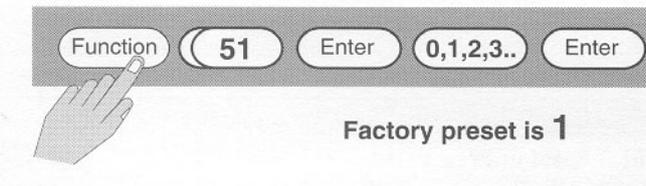
After the count direction has been determined and programmed, you have to decide what the counter should show at the end of the batch. Your choices are as follows:
0 – If counting down, counter will stay at zero.
1 – if counting down, counter will go back to preset value.
2 – If counting up, counter will stay at batch preset.
3 – If counting up, counter will go back to zero.

Example: You may decide to count from the preset down to zero and at the end of the batch stay at zero so that you know that the batch was run. On the other hand, you may want the counter to reset to your batch value so that you may know what the batch was set at before starting a new batch.

Programming this function is important because once you press START the counter will immediately reset to zero on count up, or to batch size on count down, and start the operation. If you set the counter to stay at zero but would like to know what your batch is before the next operation, just press the 1 key and then the ENTER key.

IND_PC100_Bedienungsanleitung_0708_e.doc

Function #30: Fail safe timeout

Function ((30) Enter) 0-99) Enter)

Factory preset is 5
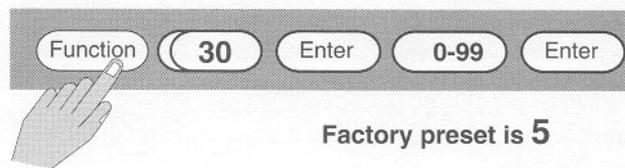
The pulse signal from the transmitter will be interrupted if the transmitter, the meter, the pump or other component fails. Enter 0 to turn off Fail Safe Timeout.
This function allows you to program a period of time from 1 to 99 seconds since the last pulse received. If a pulse is not received in this period, the outputs are de-energized and the operation is stopped. There is also a fixed fail safe for starting operation. If no pulse is received in a 5 second period following the start command, the operation is stopped.
Six zeros will flash to alert the operator of the failure. If a printer is connected, the message "B count NO CNT" will be printed.
To return the unit to normal operation after the problem has been solved, you must press the STOP key first.

Function #53: Decimal point position

Function ((53) Enter) 0,1,2,3..) Enter)

Factory preset is 0

This function must be programmed if the scale factor was set up for fractions of a gallon, liter, etc. To program, simply enter the number of decimal points required on the display.
Example: If measuring in tenths of a gallon, then enter 1. If measuring in hundredths, then enter 2, and so on. The display will show 0.1, 0.02 and 0.003 respectively. The programmed decimal point will also appear in the totalizer and rate of flow indications.

Function #33: Transistor output mode

Function ((33) Enter) 0,1,2,) Enter)

Factory preset is 0
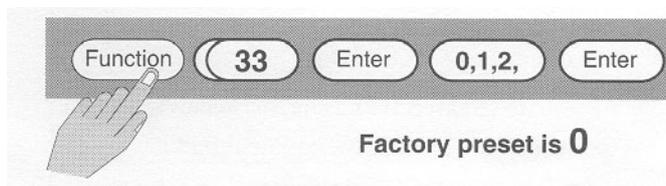
Program this function only if you plan to use the transistor output on terminal #7 for one of these three available options.

0 – Totalizer output. This is a transistor scaled pulse output. It is usually used to connect to remote totalizers or process controllers. The pulse width can be programmed with function #36.

1 – End of batch output. This is a transistor output with a variable pulse width that is activated at the end of each batch. If connected to a remote counter, it can be used to totalize the number of batches run for a period of time (day, week, year or shift). If connected to terminal #17, a second PC100, it can be used to start the second unit in order to cascade operations

2 – Hi an/or low flow rate signal. If you program hi and low rate setpoints, this transistor output is activated when either setpoint is exceeded. The duration of this pulse is determined by programming function #37. Connect to a visual or audible alarm to alert you of irregular flow conditions.

Function #36: Pulse output width

Function (36) Enter (1-99) Enter

Factory preset is **15ms**

Program 1 to 99 ms. Certain electromagnetical devices require wider pulse widths. Factory default is 15 ms which should be adequate for most applications. High frequency output pulses require narrower pulse widths.

Function #42: Default to BATCH or RATE DISPLAY

Function (42) Enter (0 or 1) Enter

Factory preset is **0**
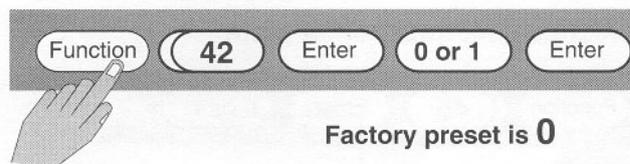
Normally, the PC100 is used to batch. Therefore, the display will always automatically return to batch count after a programming procedure (code 0). IF the PC100 is used mostly for rate of flow indication, program code 1 and the display will return to flow rate instead of batch count.

Function #34: Rate mode enable

Function (34) Enter (0 or 1) Enter

Factory preset is **0**
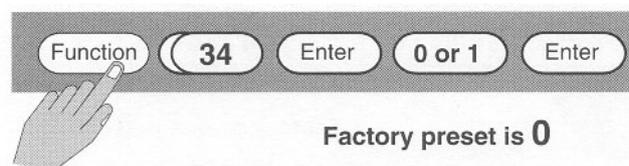
When this function is activated (code 1), the PC100 can only be used as a rate indicator and totalizer. All batch functions will be inactive. The display will default to rate of flow.

Function #18: Scale factor calculation

Factory preset is **1.0000**

The transmitter sends out a finite number of pulses per gallon, liter, etc. In order to display these pulses in engineering units of measure, they must be "scaled" (multiplied by a constant). Function #18 allows you to program this multiplier or SCALE FACTOR.

The table below shows the number of unscaled pulses for each gallon of liquid flowing through the listed Badger flow meters with selected transmitters.
If you want the PC100 to register in whole units, you must divide 1 by the unscaled pulses. Program the decimal point (function #53) for "0".
If you want the PC100 to register in 0.1 units, you must divide 10 by the unscaled pulses. Program the decimal point (function #52) for "1".
If you want the PC100 to register in 0.01 units, you must divide 100 by the unscaled pulses. Program the decimal point (function #53) for "2".
If you are scaling for any other unit of measure such as pounds, liters, ounces, etc., multiply the scale factor (in gallons) by the appropriate conversion factor.

Example: The unscaled pulses/gallon for 2" OP meter with a PFT2" transmitter is 20.56. If you wish to read to the nearest 1/10 of a gallon, divide 10 by 20.56. The scale factor to read to the nearest 1/10 of a gallon would 0.4864.
Note: If you are using a gear type scaled transmitter, or an electronic scaled transmitter, the PC100 scale factor should be 1.0000. In this case, the scaling is done by the transmitter.
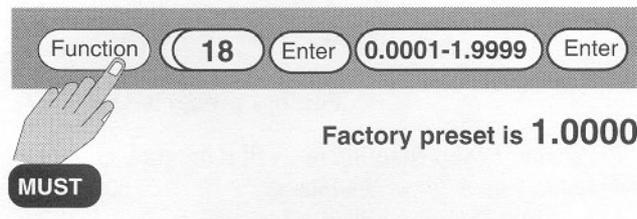
Meter		Transmitter pulses per gallon			
Size	Type	FT1 FT2 PFT2 PFT2E PFT3E	FT420 PFT420	PFT3	PEPT1 EPT1
1/2"	OP	222.96	445.92		1170.54
1"	OP	76.64	153.28		402.36
2"	OP	20.56	41.12		107.94
2"	Turbo	34.72	34.72	17.36	
3"	Turbo	24.80	24.80	12.40	
4"	Turbo	5.12	5.12	2.56	
6"	Turbo	2.16	2.16	1.08	
5/8"	25 Ind RCDL	198.40	396.80		1041.60
3/4"	35 Ind RCDL	126.67	253.34		665.03
1"	40 Ind RCDL	89.80	179.60		471.75
1"	70 Ind RCDL	46.80	93.60		245.70
1 1/2"	120 Ind RCDL	23.80	47.60		124.95
2"	170 Ind RCDL	14.56	29.13		76.46

Error Calibration

To recalibrate the scale factor due to system error caused by meter wear or fluid viscosity changes, follow this procedure:

If necessary, modify the metering system so you can collect the fluid after it flows through the meter during the calibration procedure. You must be able to accurately weigh or measure the fluid that passes through the meter. Be sure there is a sufficient back pressure to assure that the meter is always filled with fluid.

Program a batch value into the PC100 that is larger than the capacity of the vessel that will contain the fluid.

Push the START button on the PC100. Press the STOP button when the fluid nears the capacity of the vessel you are filling. Be careful not to overflow the vessel.

Accurately measure the fluid in the vessel. Observe the PC100 display, and determine the quantity of fluid delivered as determined by the PC100 reading.

Repeat the procedure two or more times to determine if you have repeatability. You cannot recalibrate unless you have repeatability. If your system is not repeatable, it is probably due to mechanical problems with one or more system components.

If your system is repeatable, use the following formula to determine the new scale factor:

$$\frac{\text{Quantity Delivered in Vessel}}{\text{Quantity Indicated on PC100}} \times \frac{\text{Old Scale}}{\text{Factor}} = \frac{\text{New Scale}}{\text{Factor}}$$

Use function #18 to enter the new scale factor into the PC100.

Function #41: Enable, disable functions

This function allows you to enable or disable the operation of any one or combination of functions in order to prevent accidental reprogramming or unwanted tampering of the unit.

Note: Wiring a jumper or keylock switch across terminals #15 and #12 will effectively restrict the use of this function. You will be able to view the functions by scrolling up or down but you will not be able to enable or disable them.

To operate this function, press: FUNCTION 41 ENTER. At this point, you will see three digits to the right. The two digits to the left represent the function and digit to the right of the decimal point is a 1 if a function is enabled or a 0 is disabled.
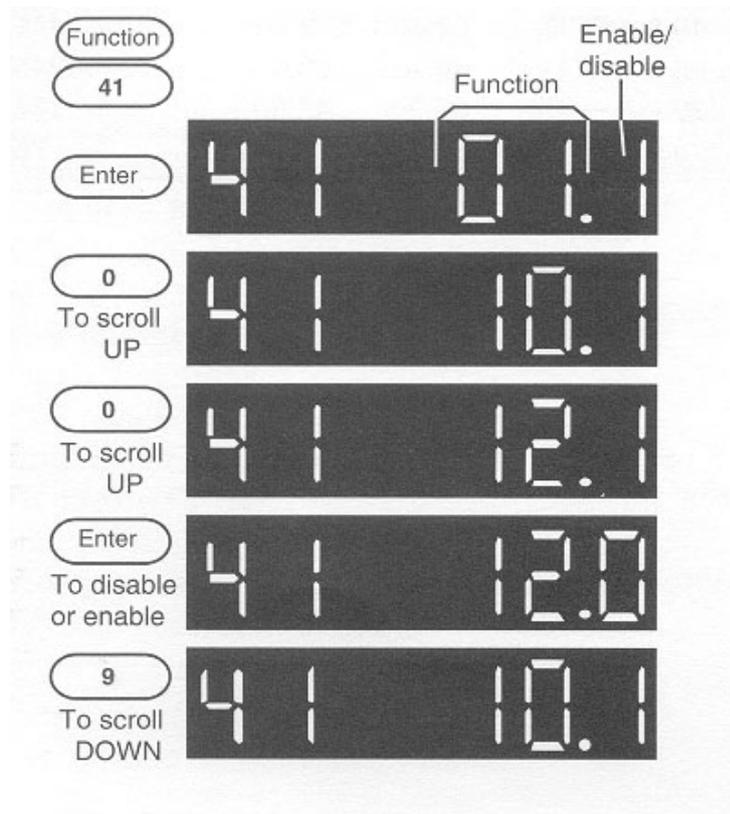
Press 0 to scroll up (functions 01.1, 10.1, 12.1…etc.). Release the key to stop at the desired function. To disable or enable that particular function, press ENTER. The first digit will then change from 1 to 0 or from 0 to 1.
To scroll down (functions 12, 10, 1, 67, 66, etc.), press key 9. Press 2 to return to batch count or FUNCTION to continue programming of other functions.

Function #44: Disable Stop

Factory preset is 0
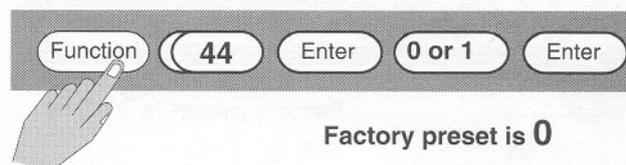
This function is used to disable the front panel STOP command. Disabling the front panel STOP prevents accidental stopping of the process. The remote STOP can be connected for supervised emergency STOP operation.
Program function #44 at 1 to disable. While disabled the STOP command can still be used to clear a FAIL SAFE condition (see function #30).

Function #45: Disable resume

Factory preset is 0

   IND_PC100_Bedienungsanleitung_0708_e.doc
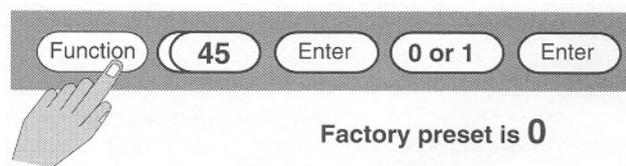
This function is used to disable the front panel RESUME command. Disabling the RESUME command can prevent accidental restarting of a bad batch without supervision. This function can still be controlled remotely. Program the code to 1 to disable.

Function #46: Disable start

Factory preset is 0

This function is used to disable the front panel START command. Program the code to 1 to disable. Once disabled, this function cannot be operated through the front panel nor remotely. Disable START only when using the PC100 as a nonresettable totalizer.

Function #43: Factory default

Factory preset is 0

Programming this function to 1 will reprogram all functions to the values set at the factory:
#18   Scale Factor = 1.0000
#20   Flow Rate In = Units Per Minute (1)
#36   Totalizer Output = 15 ms (1)
#50   Count Mode = DOWN (2)
#51   Reset/Preset = Go to batch on down; go to zero on up
#41   All Functions Enabled (1)

11.2 Programming to batch

Function #1: Programming batch amount

Factory preset is 0
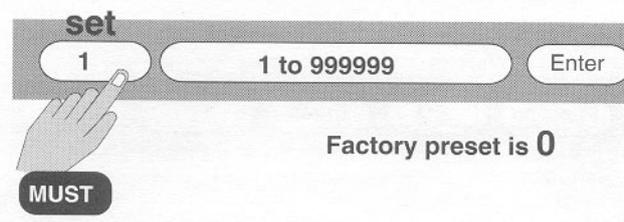
To program the batch, press 1, enter the batch value, and press ENTER.
If you just want to see what your batch is set at, press 1. Press ENTER to return to batch count.

Function #13: Batch autoadjust

Factory preset is 0
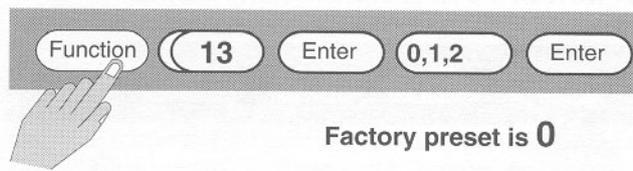
0 – Batch autoadjust disabled. Totalizer input disabled at batch counter coincidence.
1 – Batch autoadjust enabled. The PC100 will compensate for any overrun at the end of the batch. Totalizer input is always enabled.
2 – Batch autoadjust disabled. Totalizer input always enabled.

Function #12: Batch limit

Factory preset is 0

This function is used to program a limit to the size if batch that can be entered. This will prevent over batching. Example: If the largest allowable batch in your operation is 255 gallons, then program the batch limit to 255 gallons.

Note: If the operator tries to enter a batch larger than the limit, when he presses ENTER; the display will revert back to the old value. Program 0 if batch limit is not needed.

Function #31: Batch autorecycyle

Factory preset is 0
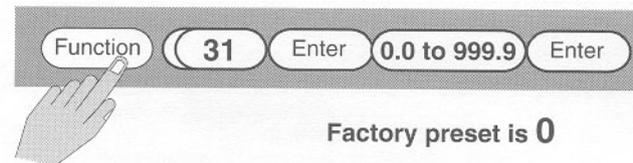
If your operation consists of several batches of the same size, you can program the PC100 to start each batch automatically after a preset period of time (0.0 to 99.9 seconds). This is useful in container filling operations.

Function #15: Cycle preset

Factory preset is 0
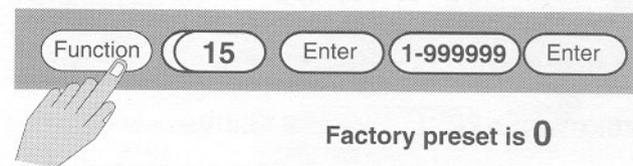
If you are running several batches of the same size using the autorecycle feature, function #15 allows you to preset the number of batches to be run automatically. When the number of batches preset is reached, the unit will stop recycling and wait for another START command. The cycle counter is reset to zero at the end of the CYCLE preset.

IND_PC100_Bedienungsanleitung_0708_e.doc

Function #16: Cycle counter view

Enter 2 to return to Batch Count
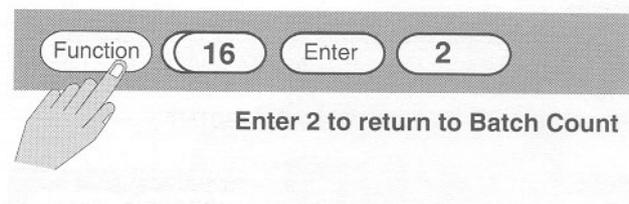
Use this function to view the number of batches run since last reset. To reset the cycle counter to 0, use function #54 and program it to 1.

Function #10: Fixed prewarn preset

Factory preset is 0
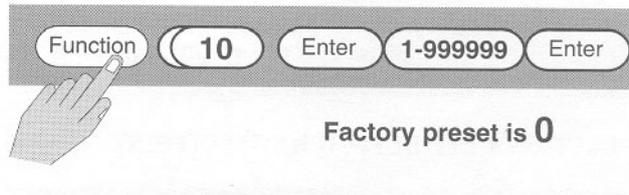
Program this function to control the first stage of a two stage valve or for other prewarn functions (see page 7). The preset point will be fixed. That is, if you program a prewarn of 5 gallons, the signal will be sent 5 gallons before the end of the batch. CAUTION: The prewarn setpoint must be LESS THAN THE BATCH SETPOINT or else six decimal points will light up and prevent further operation. To clear, press STOP and reprogram the prewarn setpoint.

Function #32: Prewarn timeout

Factory preset is 0

Normally, when the prewarn setpoint has been reached, the relay K1 is de-energized until the batch is terminated. However, if the prewarn signal is used to control an alarm or a feed pump, the signal duration can be programmed from 1 to 99 seconds. Never use the time out if K1 is connected to the first stage of a valve.

11.3   Programming for flow rate

Function #20: Flow rate period

Factory preset is 1

This function is programmed to view the rate of flow in units per second, minutes or hours. Code 0 is for seconds, 1 is for minutes, and 2 is for hours. To view rate of flow, simply press key number 5. To return to batch count, press key number.

IND_PC100_Bedienungsanleitung_0708_e.doc

Note: Before programming the next two functions #21 and #22, make sure that function #33 is set for rate output.

Function #21: Low flow setpoint

Function (21) Enter (1-999999) Enter

Factory preset is 0

Use this function to preset a minimum flow rate. If the rate falls below the setpoint, transistor on terminal #7 will be energized. On startup, the PC100 will wait until the minimum flow is reached before activating this function.

Function #22: Hi flow rate setpoint

Function (22) Enter (1-999999) Enter

Factory preset is 0

Use this function to preset a maximum flow rate. If the rate exceeds the setpoint, transistor on terminal #7 will be energized. Use the output to activate an alarm or other indication devices.
Note: Make sure that the low setpoint is lower than the hi setpoint. If not, the display will flash zeros, and if connected to a printer or computer, an ERROR message will be transmitted.

Function #37: Rate output latch

Function (37) Enter (0 or 1) Enter

Factory preset is 0

The choices are two; Code o will cause the output to stop if the rate returns to within setpoints. With code 1, the output will not stop until the end of the batch or until you press STOP. The rate output can be connected to an alarm to indicate overflow or underflow conditions.

11.4   Resetting counters

Function #52: Totalizer reset

Function (52) Enter (1) Enter
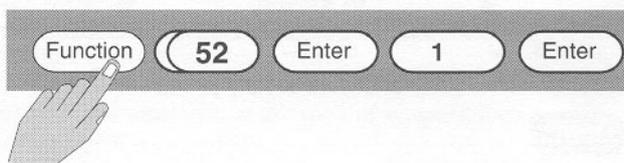
Use function #52 to reset the totalizer to zero. The 10 digit totalizer on the PC100 has a capacity to totalize up to 9,999,999,999 (ten billion). The totalizer must be reset to zero before this number is reached since the totalizer will not roll over automatically.

IND_PC100_Bedienungsanleitung_0708_e.doc

Function #54: Cycle counter reset

Function #54 allows you to reset the cycle counter (number of batches run) at any time. If function #15 is programmed to a preset number, the cycle counter is reset automatically when the preset number is reached. To reset, press FUNCTION-54-ENTER-1-ENTER.

11.5   Serial communication

Function #35: Serial pulse or date

Factory preset is 0

Program 0 to transmit and receive batch data or, program 1 to transmit only scaled pulses in serial form. When programmed to 1, all printer functions are disabled. Use code 1 only if the controller requires a pulse input instead of data.

Function #60: Baud rate

Factory preset is 0

This function must be programmed to match the communications speed rate of the printer or controller.
Program 0 for 1200 baud, 1 for 300 baud, 2 for 100 baud.

Function #65: Unit identifier I.D.

Factory preset is 00

When connecting more than one PC100 to a process controller. program this function to assign an I.D. (1 to 99 to each PC100. The I.D. can then be used to channel communications from and to the host controller.

Function #66: Line print delay

| Function | (66 | Enter | 0 or 1 | Enter |

Factory preset is 0

Printers often require different delay periods between lines of information transmitted. This function must be programmed to match the required line print delay of your printer. Program 0 for 0.1 second and 1 for 1 second.

Function #63: Print on start and/or stop

| Function | (63 | Enter | 0,1,2,3 | Enter |

Factory preset is 0

Program 1 to print on START.
Program 2 to print on STOP.
Program 3 to print both on START and STOP.

Function #64: Print command

| Function | (64 | Enter | 1 | Enter |

Program 1 to print at any time. This function can also be operated remotely, at any time, with a switch connection between terminals #12 and #16.

Function #67: Message enable

| Function | (67 | Enter | 0 or 1 | Enter |

Factory preset is 0
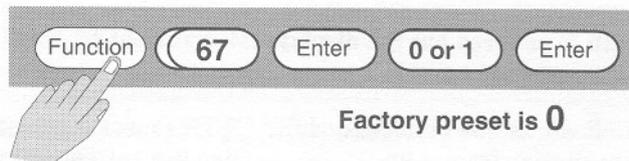
Programming this function to 1 will cause the PC100 to send an "ON LINE" message to the controller or printer as soon as the power is restored after a power failure.

Function #61: Print data select A

| Function | (61 | Enter | Y X | Enter |

Factory preset is 00
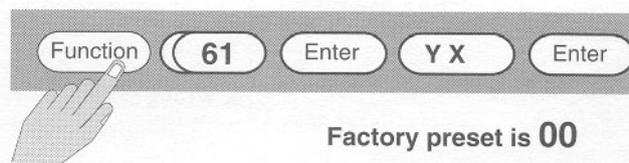
Y select	X select

Y select   X select

0 = K SCALE – FL RATE   0 = INV – C COUNT – B COUNT

1 = K SCALE   1 = INV – C COUNT

2 = FL RATE   2 = INV – B COUNT

3 = nothing   3 = INV

                                      4 = C COUNT – B COUNT

                                      5 = C COUNT

                                      6 = B COUNT

                                      7 = nothing

Function #62: Print data select B

Y select   X select

0 = RTE HI – RTE LO   0 = S CYCLE – S BATCH –PREWARN

1 = RTE HI   1 = S CYCLE – S BATCH

2 = RTE LO   2 = S CYCLE – PREWARN

3 = nothing   3 = S CYCLE

                                      4 = S BATCH – PREWARN

                                      5 = S BATCH

                                      6 = PREWARN

                                      7 = nothing

K SCALE = SCALE FACTOR
FL RATE = FLOW RATE
INV = 10 DIGIT TOTALIZER
C COUNT = CYCLE COUNT
B COUNT = BATCH COUNTER
HI = HIGH FLOW SET
RTE LO = LOW FLOW PRESET
S CYCLE = PRESET CYCLE
S BATCH = PRESET BATCH
PREWARN = PRESET PREWARN

12. Troubleshooting

This section deals with most of the common problems that you may encounter with the PC100, the possible causes and the recommended remedies. Most of the problems are due to improper wiring and or programming procedures. However, the problem may originate in the flow meter, valve, pump, or other piece of equipment.

Make sure other equipment is functioning properly. All PC100s are extensively tested at the factory before shipment. However, the units may get damaged during transit, installation, or errors in wiring. If after all possible solutions have been tried and the problem persists, contact your local representative or call us at +49-7025-9208-0.

PROBLEM	POSSBILE CAUSES	REMEDIES
Unit is powered but the display does not light up.	1. Incorrect AC or DC power wiring.	1. Recheck power wiring, fuses, etc.
Unit works fine but occasionally the display freezes up.	1. Line noise is affecting processor due to a current spike or surge.	1. Use dedicated power or install surge suppression network.
Transmitter is connected but the PC100 does not count.	1. Transmitter wiring is not correct. 2. EPT1 transmitter current regulator. 3. Transmitter is defective. 4. PC100 is defective. 5. Wrong scale factor. 6. Low frequency jumper for slow pulse input is connected.	1. Check wiring diagrams. 2. Install current regulator module. 3. Replace parts or whole. 4. To confirm, connect wire to terminal #12 and short to input terminals #10 or #14. Each contact should produce a visible count on the display when scale factor = 1. 5. Check scale factor calculation, i.e., if programmed .0001 instead of 1.0000, unit will wait for 1000 pulses before decrementing count. 6. Disconnect low frequency jumper from terminals #11 or #13.
Relays do not de-energize at setpoints.	1. Relays are not properly connected. 2. Relay is defective. 3. Connection between transistor outputs #8 & #9 and relay inputs are loose. 4. Relays are not plugged in all the way.	1. Reconnect relay wiring. 2. Replace relay. 3. Check connections 4. Unplug and replug relays.
Counter accumulates too many counts.	1. Switch bounce causing extra pulses. 2. Electrical noise causing extra pulses. 3. Excessive vibration at meter.	1. Install low frequency jumper. 2. Check wiring. Be sure power lines are not bundled with signal lines. Use shielded wire. Connect ground to terminal 32. 3. Dampen vibration.
Some of the keys on the front panel has excessive wear.	1. Defective switches. 2. Unit is programmed to disable certain switch functions.	1. Repair or replace PC100. 2. Check programming functions.

Unit is operational but front panel has excessive wear.	1. Operator using sharp objects to program unit or certain keys are used too often.	1. Connect external remote switches to control frequently used functions and replace front panel.
Five decimal points light up on the display.	1. Prewarn setpoint is larger than batch size.	1. Reprogram preset points.
Cannot program batch size, display revert back to old batch preset.	1. Batch size exceeds batch limit.	1. Reprogram smaller batch or deactivate batch limit.
Cannot program preset points, rate limit base, or scale factor.	1. These cannot be preset unless the unit is on a STOP condition. If you STOP and reprogram, you must START a new batch.	1. STOP unit and program. You cannot RESUME operation.
Cannot program HI or LOW flow setpoints	1. You have programmed Hi lower than Low.	1. Reprogram your setpoints.
The unit closes valves in the middle of a batch run and display flashes six zeroes.	1. Transmitter pulse has been interrupted and fail safe condition is active. 2. Fail safe period is too short.	1. Find reason of pulse interruption. STOP and reprogram fail safe period. 2. STOP and reprogram fail safe.
Pulse output connected to remote counter but it does not count.	1. Pulse width at 1 ms (too fast). 2. Reverse polarity.	1. Reprogram pulse width. 2. Check wiring with diagram.
Totalizer does not match sum of batches run.	1. Totalizer does not stop counting if autoadjust mode is active.	1. Check autoadjust function and also check for leaky valves.
Flow alarm remains on until end of batch instead of turning off when flow rate returns to normal.	1. Function #37 is programmed wrong.	1. Reprogram function #37.

You have now checked all the above mentioned procedures and the unit is still not functioning appropriately. There is the possibility that some internal component has been damaged and it is preventing normal operation. At this point, it is recommended that you run a diagnostic procedure using function #40.

Self Diagnostic Procedure

What this will do is put the PC100 into a self test of all memories and timers.
During a self test all digits and decimal points will light up in ascending sequence. If a failure in the memory banks is detected, then a 4 will flash. If the timers fail, an 8 will flash and if there is a non-volatile memory failure, a 5 will flash. Normally, the malfunction can be corrected by using function #43, Factory Default, to make sure that all values are proper and then recycling power. Program each function again and test the unit in operation. If the malfunction persists, return the PC100 to the factory for evaluation.
Make sure to include a short description of the problem so that we can test the unit for that specific condition.

CAUTION: There are no field replaceable parts inside. Opening the unit will void all warranties.

13. Return of goods for repair / Harmlessness declaration

Please copy, fill in and sign hereafter harmlessness declaration and enclose it for any return of goods you may send back for repair.

No repair will be performed prior to receiving the harmlessness declaration duly filled and signed.

Harmlessness declaration

To   :   _____

Attn.   :   _____

From   :   _____

Dept.   :   _____

Please note that no repair will be performed prior to receiving of this declaration duly signed by you!

Please send all parts clean from medium and inform us about possible medium wastes remaining in the part. For this purpose, please use this form. A security specification sheet of the medium must accompany this declaration in the following cases: Toxical, dangerous or objectionable media, or media belonging to any dangerous materials class. We inform you that uncleaned parts lead to additional costs. Extra clean costs will be charged to you. Furthermore, we reserve us the right to send the parts back to you for cleaning!

Declaration

We herewith confirm that the part(s) sent for repair has/have been cleaned and is/are free of any liquid and/or solid wastes of the medium and/or cleaning medium: Any eventually remaining wastes are:

❍ harmless

❍ dangerous, toxic, etc. – Security specifications are attached

Signature of person in charge: _____

Name of the person in charge in capital letters: _____

Date: _____

Company stamp: _____

Hotline

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Fax   **+49-7025-9208-15**

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