Pribusin Inc.

Manufacturers of Process Controls and Instrumentation

Instruction Manual

Model: *PCS-400-XY*

Function: *Pump Controller*

Input:
- ☐ X=2: 4-20 mA
- ☐ X=5: 1-5 VDC
- ☐ X=6: 0-10 VDC
- ☐ X=7: _____

Output:
- ■ 4 Pump Control Relays
- ■ 1 Alarm Relay
- ■ 1 Signal Fail
- ☐ Y=2: 4-20 mA
- ☐ Y=5: 1-5 VDC
- ☐ Y=6: 0-10 VDC
- ☐ Y=7: _____

Power:
- ☐ 120 VAC, 60 Hz, 48 VA
- ☐ 240 VAC, 60 Hz, 48 VA
- ☐ 24 VDC, 1A max.
- ☐ _____

Serial #: _____

(If special or required)

For Technical Assistance And Questions Call
USA: (734) 677-0459 CANADA: (905) 660-5336

Restocking Policy

All product returned to Pribusin Inc. in prime condition (not damaged, scratched or defaced in any way) within seven (7) months from the original date of shipment is subject to a 50% restocking charge. All product must be accompanied by a Return Authorization number (RA number) which must be obtained from Pribusin Inc. prior to returning any product.

After seven (7) months from the original date of shipment, products cannot be returned for restocking.

Custom designed products, modified products or all non-standard products may not be returned for restocking.

Warranty Policy

Pribusin Inc. warrants equipment of its own manufacture to be free from defects in material and workmanship, under normal conditions of use and service, and will replace any component found to be defective, on its return to Pribusin Inc., transportation charges prepaid, within one year of its original purchase. Pribusin Inc. will extend the same warranty protection on equipment, peripherals and accessories which is extended to Pribusin Inc. by the original manufacturer. Pribusin Inc. also assumes noliability, expressed or implied, beyond its obligation to prelace any component involved. Such warranty is in lieu of all other warranties, expressed or implied.

Pribusin Inc.

Manufacturers of Process Controls and Instrumentation

Model: PCS-400-XX

Programmable Pump Controller

Standard Features:

Controls up to 4 Pumps

Sequential or Alternating Mode of Operation

Industry Standard Input & Output

4 Digit LED Input Level Display (Scalable)

4 'C' Relay Contacts for Pump Control

1 Analog Re-transmit Output

Auxiliary Alarm Level with Contact & Horn

Pump On & Off Delays

Fully Programmable via Keypad

No Calibration Required

Microprocessor Controlled for High Accuracy

Power: 117 VAC 50/60 Hz (Optional 24 VDC)

High Noise Rejection

CSA and NRTL Approved (LR51078)

Function:

The PCS-400 is a universal pump controller that can control up to 4 pumps. It has a single analog input that can be connected to a field transmitter either as a 2-wire or 3-wire input. The 4 digit LED display is scalable to any range from 0000-9999 (plus decimal point).

Pumps can be configured to operate on a rising input signal (e.g. to drain a well) or on a falling input signal (e.g. to fill a tank). Each pump has its own programmable start and stop level as well as a start and stop delay.

The PCS-400 can operate pumps in a sequential mode where pump no.1 is always the first pump to start or in an alternating mode where the start pump is different for every cycle.

An auxiliary alarm level with its own contact output and horn is also available. A signal re-transmit output provides a process signal for further use.

Specifications:

Accuracy: +/- 0.1% typ., +/-0.2% max.
Operating Temperature: -4°F to +140°F (-20°C to +60°C)
Relay Contacts: 10A 1/8Hp @ 125VAC
6A 1/8Hp @ 277VAC
Power: 117 VAC, 60/50 Hz, 24VDC Available
Enclosure: NEMA4X

Model Designation:

PCS-400-XX

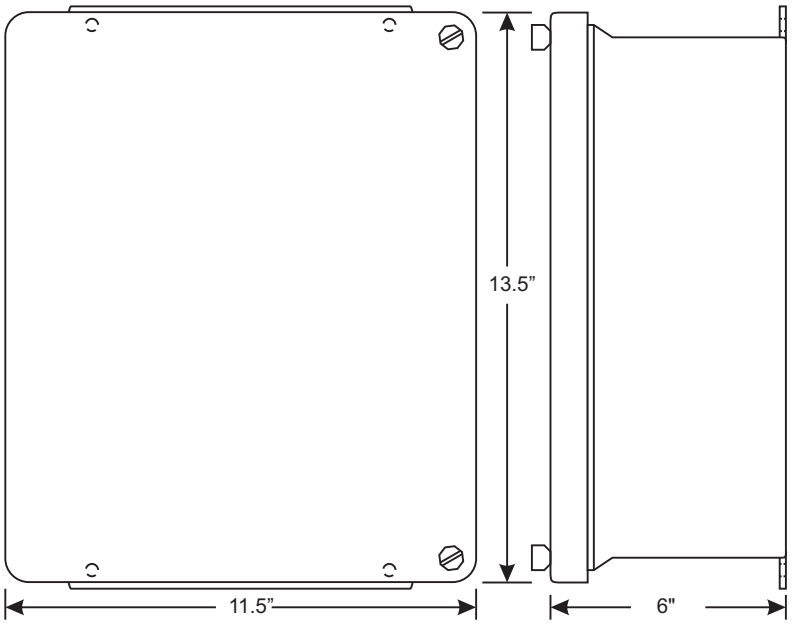
Input	Output
2: 4-20 mA(Zin=250 Ohm)	2: 4-20 mA (750 Ohm Drive)
5: 1-5 VDC (Zin=1Meg Ohm)	5: 1-5 VDC (Zout=250 Ohm)
6: 0-10 VDC (Zin=1Meg Ohm)	6: 0-10 VDC (Zout=500 Ohm)
7: Special Input	7: Special Output

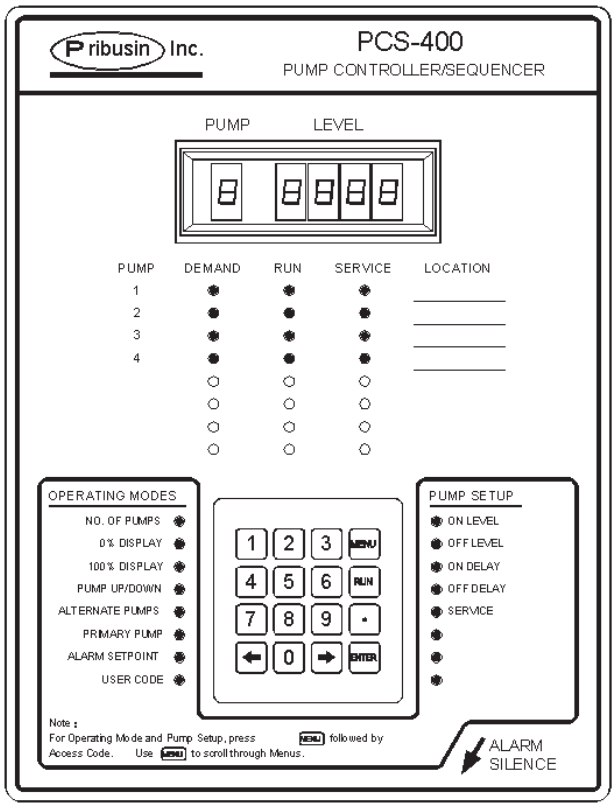
Options:

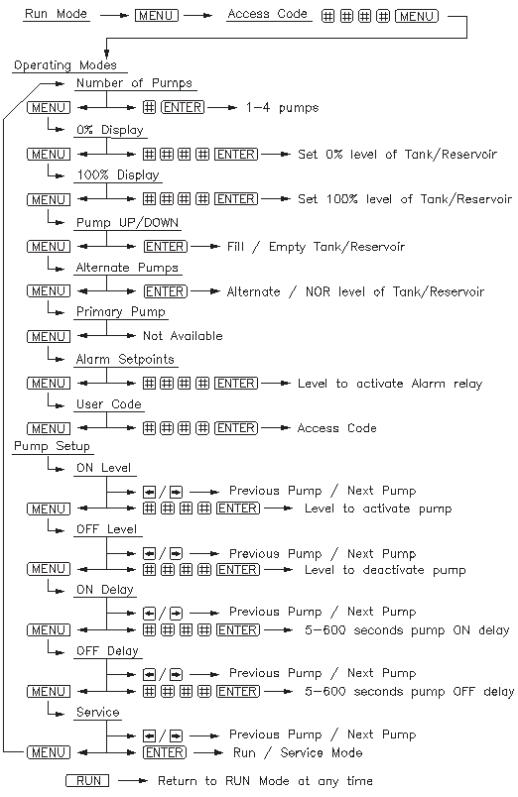
- A: 24VDC Power
- B: 240VAC Power

PCS-400

Enclosures & Dimensions:







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Section 1 – General Information

1.1 Introduction

The PCS-400 Pump controller is a multi-purpose pump controller that can control up to 4 pumps. Its NEMA4X enclosure allows direct installation into wet environments. A see-through cover clearly shows the level display and all pump status indicators.

1.2 Level Display

A 4-digit LED level display shows the current input level and is scalable to any number from 0000 to 9999 with a decimal point at any location. This provides an easy system check for an operator who needs to verify the system operation.

1.2 Status Indicators

Each of the four pumps has three status indicators to show the current activity of the pump. These are: DEMAND, RUN and SERVICE.

DEMAND: *The ON setpoint for this pump has been exceeded and the pump is required to run but may still be off because of an imposed ON DELAY*

RUN: *The pump control relay has activated and the pump is running*

SERVICE: *The pump is being serviced and is temporarily unavailable*

1.3 Alarm Condition

An alarm setpoint may be setup on the PCS-400 to signal an unwanted condition. This is typically used to signal extreme levels such as an impending overflow, etc. An alarm contact will activate to control external devices. In addition a horn will sound on the PCS-400 to signal this event. A silence button on the PCS-400 will silence the audible alarm once it has sounded.

The audible alarm has two modes of operation: Solid Tone & Variable Tone. The Solid Tone mode keeps the horn sounding continuously while the alarm condition is present. The Variable Tone mode sounds the horn in a pulse interval that is related to the amount that the input signal exceeds the alarm setpoint. The farther the level moves beyond the setpoint the longer the horn on-pulse will become.

1.4 Signal Fail Condition

A signal fail relay contact will activate if the input signal drops below 2mA (only if the PCS-400 is configured to operate in the 4-20mA input mode).

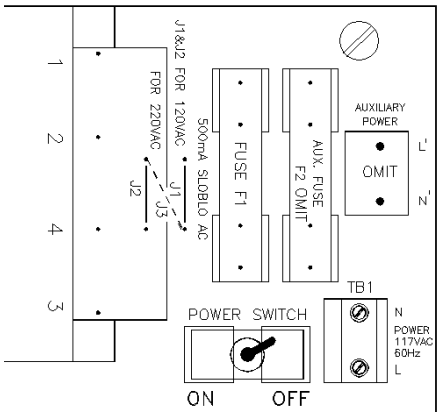
1.5 Signal Re-transmit

An signal re-transmit output provides a signal proportional to the input signal that may be used for other external devices.

Section 2 – External Connections

2.1 Power Supply

The PCS-400 requires 120 VAC, 50/60Hz, 48 VA. The primary power input is fused with a 500ma Slo-Blo fuse (MDL ½ or equiv.)



The PCS-400 can optionally be wired for 240VAC operation by removing (de-soldering) power jumpers J1 & J2 and installing (soldering) jumper J3. ***When changing the PCS-400 to 240VAC power make sure to change the fuse to half of its value, 250mA.*** This is important since at 240VAC the PCS-400 requires only half the current as if it were powered from 120VAC. Proper protection is only achieved by reducing the fuse value as mentioned above.

WARNING !

Disconnect all power supply lines before servicing the fuse or any other part of the PCS-400.

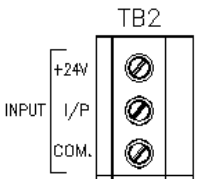
Use only the same type of fuse or direct replacement when exchanging the primary fuse. Failure to do so will void all warranties exclusively or implied and could cause product to fail to perform as designed and/or cause a fire hazard.

2.2 Signal Input

The analog signal input is typically a 4-20/0-20mA input but can optionally be ordered as a 1-5/0-5VDC input. All references in this manual assume a 4-20/0-20mA input type.

The signal input can be either 4-20mA or 0-20mA for the full signal range. This is selectable via parameter jumpers H1-1 (see Section 3).

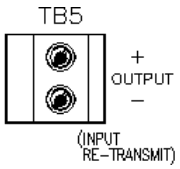
Three terminals are provided on the signal input terminal: +24VDC, I/P and COM. The +24V terminal provides 24VDC, 1A max. to power a field transmitter. The I/P terminal is the +Signal input of the 4-20mA loop. The COM terminal is the return common for both the 24VDC transmitter power supply and for the 4-20mA signal.



2.3 Re-Transmit Signal Output

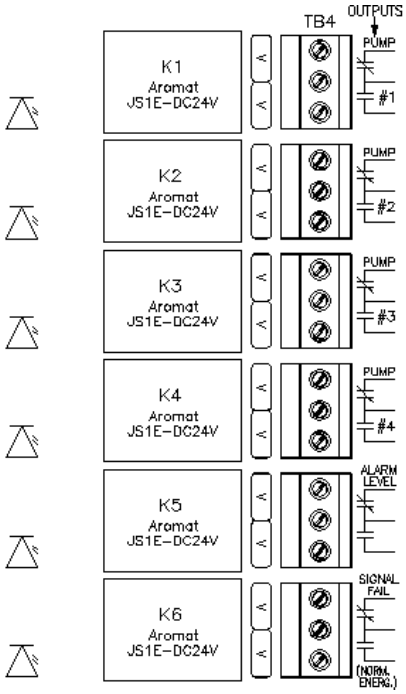
The analog signal re-transmit output is typically a 4-20/0-20mA output but can optionally be ordered as a 1-5/0-5VDC output. All references in this manual assume a 4-20/0-20mA output type.

The signal output can be either 4-20mA or 0-20mA for the full signal range. This is selectable via parameter jumpers H1-2 (see Section 3).



Two terminals are provided on the signal output terminal: +OUTPUT and -OUTPUT. The +OUTPUT terminal is the +Signal output of the 4-20mA loop. The -OUTPUT terminal is the return common for the 4-20mA signal.

2.4 Relay Contacts



The PCS-400 has six relay contact outputs: PUMP#1…PUMP#4, ALARM LEVEL and SIGNAL FAIL. All relays, except SIGNAL FAIL, are normally de-energized in their inactive state. The SIGNAL FAIL relay is normally energized in its inactive state. This provides a fail-safe contact that opens either when the signal input fails or when the PCS-400 loses power.

An indicator light (triangular LED symbol in diagram) beside each relay indicates the current state of the relay. A lit indicator light shows that the relay is currently energized.

The first four relays PUMP#1 through PUMP#4 control the operation of the pumps. The relays activate (energize) when the RUN light on the front panel is on.

The ALARM LEVEL relay activates (energizes) when the alarm level is exceeded. The audible alarm also sounds in conjunction with the activation of this relay. The ALARM LEVEL relay does not de-activate if the audible alarm is silenced. It only de-activates once the alarm condition has subsided.

The SIGNAL FAIL relay activates (de-energizes) if the signal input drops below 2mA. If the input type is selected to be 0-20mA (jumper H1-1=OUT) the SIGNAL FAIL relay is disabled (always energized) since no signal fail determination is possible with a zero-based signal.

Section 3 – Setup & Configuration

3.1 Operating Mode Parameters

Number of Pumps
The PCS-400 can control up to 4 pumps. This parameter sets the number of pumps that are connected to the PCS-400. Allowable values of this parameter are 1, 2, 3, 4.

0% Display Level
The 4-digit LEVEL display can be set to indicate actual empirical data such as a tank level in inches, feet, gallons etc. In some cases it may be required to set the 'zero-signal' level to a value other than '0'. This parameter allows the 'zero-signal' display indication to be set to any value between 0000 and 9999 (including decimal point).

100% Display Level
Similar to the 'zero level' signal adjustment, this parameter sets the display level for a 'full-scale' signal. It may also be set to any value between 0000 and 9999 (including decimal point) but it must be set to a higher value than the '0% Display Level'.

> **NOTE**: The decimal point can only be changed in either the **0%** or **100% Display Level** menu. Changing the decimal point in either of these two menus will change the decimal point for all other relevant level displays.

Pump UP/DOWN
The PCS-400 pump controller can be operated in two main pumping modes: PUMP-UP (to fill a tank or reservoir) or PUMP-DOWN (to empty a tank or reservoir). In the PUMP-UP mode a pump will activate if the signal level *drops below* the pump's ON LEVEL thus keeping the tank from becoming empty. Conversely, in the PUMP-DOWN mode a pump will activate if the signal level *rises above* the pump's ON LEVEL thus keeping the tank from overflowing.

Alternate Pumps
In a multi-pump environment it may be desirable to alternate the starting pump so that one pump is operated significantly more than the others. This will ensure more even wear on the pumps. It also keeps all pumps active thereby reducing the risk of pump seizure due to prolonged inactivity.

If this function is selected, the pump that started second in a previous pump cycle will now start first. The pump that started third will start second and so on. A new start pump is selected once all pumps have turned off and the signal level changes once again demanding pump to start pumping once again.

For example: In a three pump system the operating sequence of the pumps would be as follows (provided #1 ON LEVEL < #2 ON LEVEL < #3 ON LEVEL):

Pump cycle #1: Pump1 – Pump2 – Pump3
Pump cycle #2: Pump2 – Pump3 – Pump1
Pump cycle #3: Pump3 – Pump1 – Pump2
Pump cycle #4: Pump1 – Pump2 – Pump3
Etc…

Primary Pump
This function is currently not available on the PCS-400

Alarm Setpoint
This parameter sets the level at which the audible alarm sounds and the alarm relay activates. It depends on the pump mode (see above) whether the alarm condition is triggered on a rising or falling input signal.

In the PUMP-UP mode the alarm will activate if the signal level *drops below* the ALARM LEVEL thus signaling the tank being close to empty. Conversely, in the PUMP-DOWN mode the alarm will activate if the signal level *rises above* the ALARM LEVEL thus signaling the tank being close to overflowing.

User Code
To prevent unauthorized persons from gaining access to the parameter setup the user must first enter a 4-digit user code. Only if the proper code is entered does the PCS-400 enter its programming mode.

3.2 Pump Setup Parameters

On Level
This parameter sets the turn-on point for the pump. It depends on the pumping mode (see above) whether the pump turns on at a rising or falling input signal. In the PUMP-UP mode a pump will activate if the signal level *drops below* the pump's ON LEVEL thus keeping the tank from becoming empty. Conversely, in the PUMP-DOWN mode a pump will activate if the signal level *rises above* the pump's ON LEVEL thus keeping the tank from overflowing. If a pump is required to start it is said to be in demand. The ON LEVEL may be set to any value between the 0% DISPLAY value and the 100% DISPLAY value.

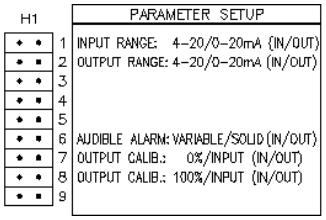
Off Level
This parameter sets the turn-off point for the pump. It depends on the pumping mode (see above) whether the pump turns off at a rising or falling input signal. The OFF LEVEL may be set to any value between the 0% DISPLAY value and the 100% DISPLAY value.

On Delay
In order to reduce pump activation due to a brief transient level change a turn-on delay may be imposed on each pump. This requires the demand for a pump to be present continuously for the time of the delay before the pump will actually turn on. The ON DELAY may be set to any value between 5 and 600 seconds.

Off Delay
To reduce damage to pumps from quick on-off cycles a minimum run time may be imposed on each pump by using the off delay. Once the demand for a pump has subsided the pump will remain running for the time set by the OFF DELAY. The OFF DELAY may be set to any value between 5 and 600 seconds.

Service
If a pump must be serviced or replaced or is not available for pumping for some other reason, it is not necessary to reprogram the entire PCS-400. The SERVICE function allows any pump to be disabled temporarily. A red SERVICE LIGHT on the front panel indicates that a pump is being serviced and is currently unavailable.

3.3 Input, Output & Alarm Type Configuration



The PCS-400 has a set of jumpers H1 that are used to select several operating functions. These functions are typically not changed once the unit is installed and hence they are not accessible via the keypad. The jumpers are located on the main board and can be changed at any time while the unit is operating.

Input Signal Range
The input signal can either be a 4-20mA signal or a 0-20mA signal. This selection is done using jumper H1-1. If the 0-20mA signal range is selected then the SIGNAL FAIL relay is inactive since no signal failure can be detected with a zero-based signal.

H1-1	Input Signal
OUT	0-20mA
IN	4-20mA

Output Signal Range
The output signal can either be a 4-20mA signal or a 0-20mA signal. This selection is done using jumper H1-2. This selection can be made independently from the input signal range

H1-2	Output Signal
OUT	0-20mA
IN	4-20mA

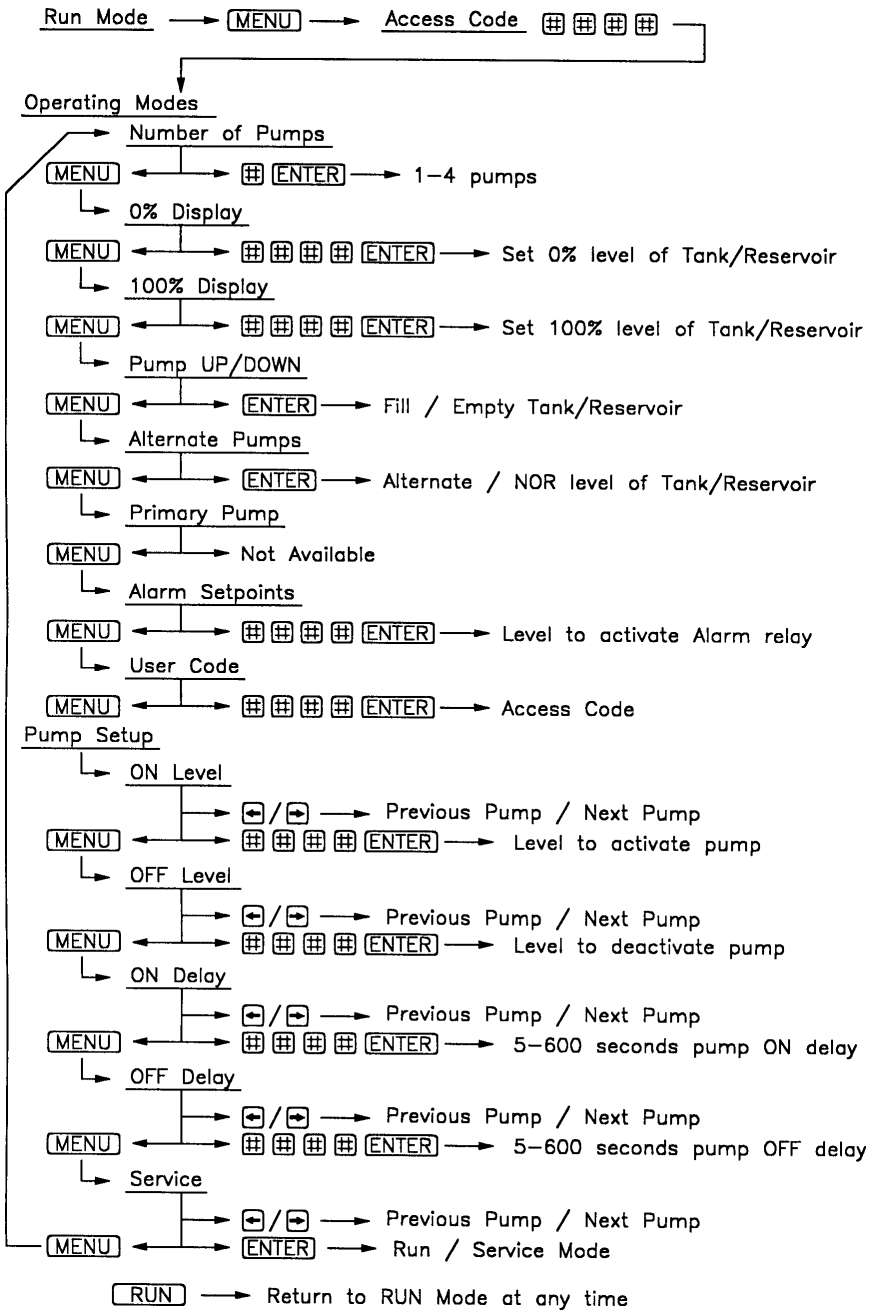
Audible Alarm Type
The audible alarm can be changed to SOLID or VARIABLE mode using jumper H1-6. This affects the horn only and does not affect the Alarm relay.

H1-6	Input Signal
OUT	SOLID
IN	VARIABLE

3.4 Parameter Setup

The PCS-400 has a keypad on its front panel that allows easy access to the Operating Parameters and the Pump Setup. For security reasons a 4-digit access code must first be entered before. The factory default access code is supplied on a separate sheet in this manual (Appendix A) so that it may easily be removed.

The diagram to the right shows a flowchart of the menu structure and the required keystrokes to enter new data.



A Note on Entering Numbers:

The PCS-400 accepts numbers from the left-most digit towards the right. This means the first digit entered is assumed to be in the 1000's position. When entering values that do not require the first digit(s) use leading zero's. For example, type 0100 to enter a value of 100.

When entering levels that have a decimal point be aware that the decimal point position may only be changed in the **0%** and **100% Display Level** menus. All other level menus will not accept a decimal point change. To avoid confusion we suggest that you do not enter a decimal point when entering values for **Alarm Setpoint**, **ON Level** & **OFF Level**. The PCS-400 will automatically provide the decimal point in its proper position when using these three menus.

Example: Assume the 0% Display Level was set to 005.0 (i.e. 5.0) and the 100% Display Level was set to 080.0 (i.e. 80.). To enter an Alarm Setpoint of 60.0 type 0600 without any decimal points.

The following is a step-by-step description of all menu items:

1. Press the MENU key and enter the 4-digit access code. DO NOT PRESS ENTER
2. The NUMBER OF PUMPS menu light will activate and the display shows the number of pumps that the PCS-400 is configured for.

   Change: Enter the new number of pumps (1, 2, 3 or 4) followed by the ENTER key.
3. Press the MENU key
4. The 0% DISPLAY menu light will activate and the display shows the display level for a 0% input signal.

   Change: Enter a new 4-digit display level, including decimal point if required. Press ENTER when done.
5. Press the MENU key
6. The 100% DISPLAY menu light will activate and the display shows the display level for a100% input signal.

   Change: Enter a new 4-digit display level, including decimal point if required. Press ENTER when done.
7. Press the MENU key
8. The PUMP UP/DOWN menu light will activate and the display shows either 'dn' for PUMP-DOWN mode or 'UP' for PUMP-UP mode.

   Change: Press the ENTER key to toggle between 'dn' and 'UP'.
9. Press the MENU key
10. The ALTERNATE PUMPS menu light will activate and the display shows either 'nor' for NORMAL-PUMP mode or 'ALT' for ALTERNATING-PUMP mode.

    Change: Press the ENTER key to toggle between 'nor' and 'ALT'.
11. Press the MENU key
12. The ALARM SETPOINT menu light will activate and the display shows the alarm level.

Change: Enter a new 4-digit alarm level, including decimal point if required. Press ENTER when done.

13. Press the MENU key
14. The USER CODE menu light will activate and the display shows the 4-digit user access code.

    Change: Enter a new 4-digit access code. Press ENTER when done.

15. Press the MENU key
16. The pump ON LEVEL menu light will activate and the display shows the ON LEVEL for pump no.1. Use the ← and → keys to select a different pump.

    Change: Enter a new 4-digit ON LEVEL, including decimal point if required. Press ENTER when done.

17. Press the MENU key
18. The pump OFF LEVEL menu light will activate and the display shows the OFF LEVEL for pump no.1. Use the ← and → keys to select a different pump.

    Change: Enter a new 4-digit OFF LEVEL, including decimal point if required. Press ENTER when done.

19. Press the MENU key
20. The pump ON DELAY menu light will activate and the display shows the ON DELAY in seconds for pump no.1. Use the ← and → keys to select a different pump.

    Change: Enter a new 3-digit ON DELAY in seconds. Press ENTER when done.

21. Press the MENU key
22. The pump OFF DELAY menu light will activate and the display shows the OFF DELAY in seconds for pump no.1. Use the ← and → keys to select a different pump.

    Change: Enter a new 3-digit OFF DELAY in seconds. Press ENTER when done.

23. Press the MENU key
24. The pump SERVICE menu light will activate and the display shows either ‘run’ for NORMAL-PUMP mode or ‘SEr’ for PUMP OUT-OF-SERVICE mode.

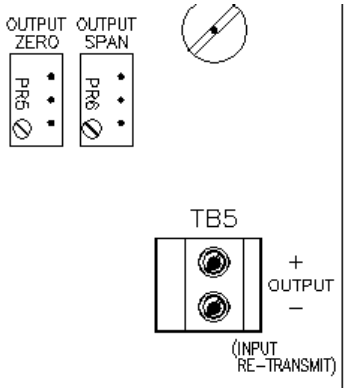
    Change: Press the ENTER key to toggle between ‘run’ and ‘SEr’.

Section 4 – Calibration

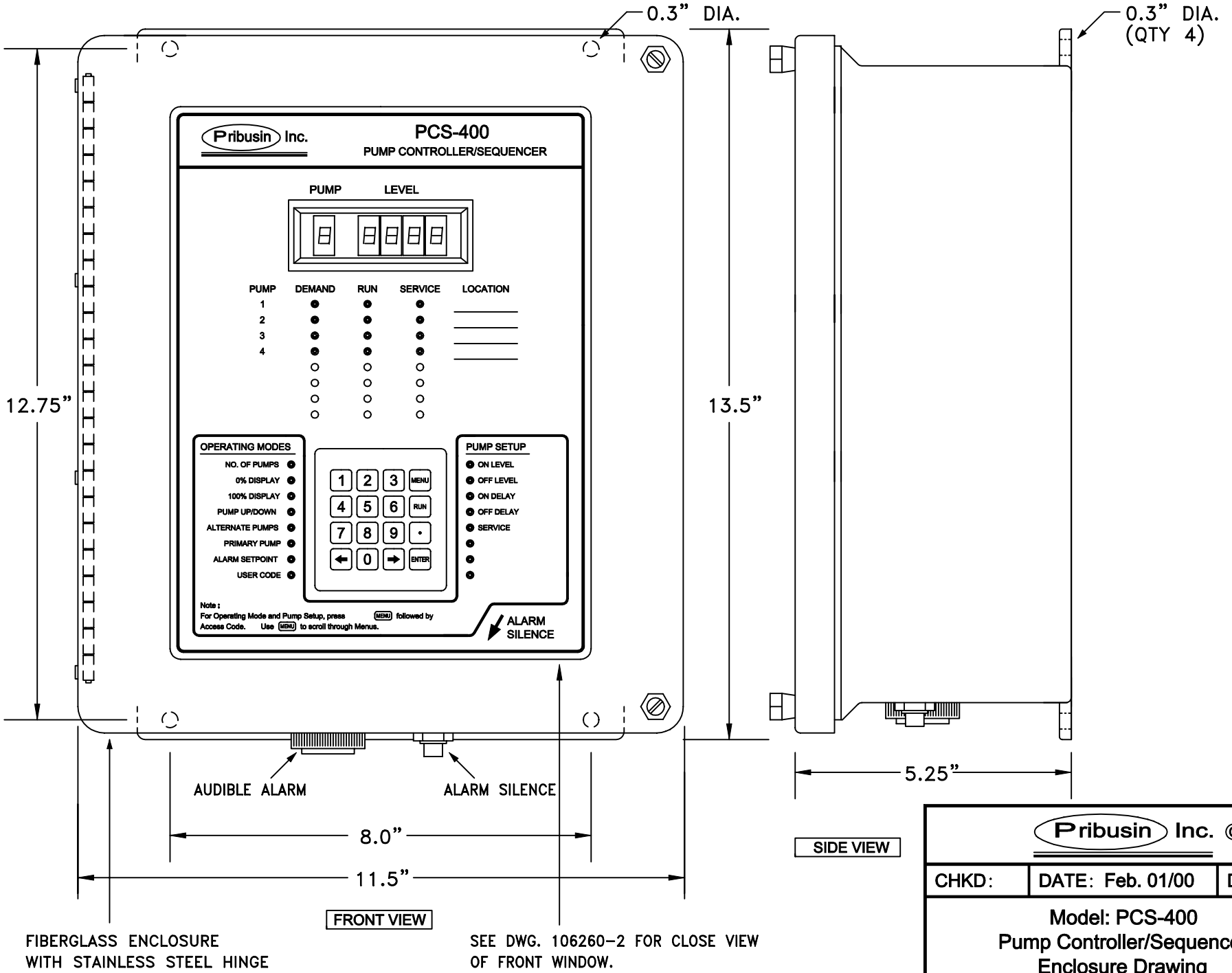
The PCS-400 comes factory calibrated. Since it is microprocessor controlled no periodic calibration is required. The only calibration possible on the PCS-400 is on the output signal.

4.1 Output Calibration

The output signal can be tested and adjusted using two jumpers on the H1 jumper field. These jumpers set the output signal to either 0% or 100% so that the output Zero and Span may be adjusted. **CAUTION:** any equipment connected to the output should first be disconnected before performing a calibration check or adjustment.



1. Insert Jumper H1-2 to change the output range to 4-20mA (if it is not inserted already). Note: An accurate zero adjustment can only be made with a non-zero-based signal.
2. Insert Jumper H1-7
3. The output signal should now be 4mA. Adjust the OUTPUT ZERO potentiometer if necessary.
4. Remove Jumper H1-7 and insert Jumper H1-8
5. The output signal should now be 20mA. Adjust the OUTPUT SPAN potentiometer if necessary.
6. Repeat steps 2 through 5 until the output is correct.
7. Remove Jumper H1-8.
8. If Jumper H1-2 was previously OUT remove it also to return the output range to 0-20mA



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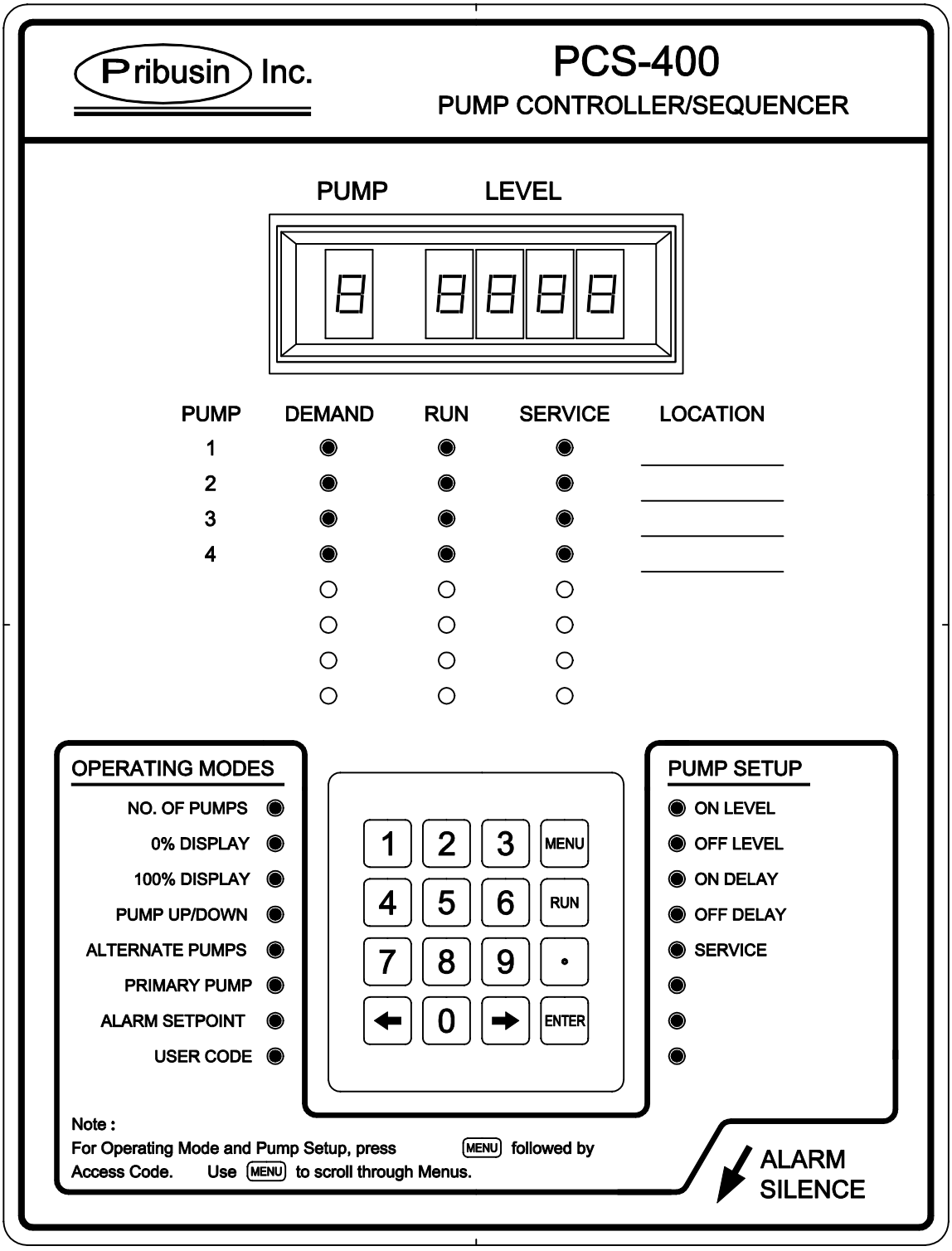
CHKD:	DATE: Feb. 01/00	DRN: KS

Model: PCS-400
Pump Controller/Sequencer
Enclosure Drawing

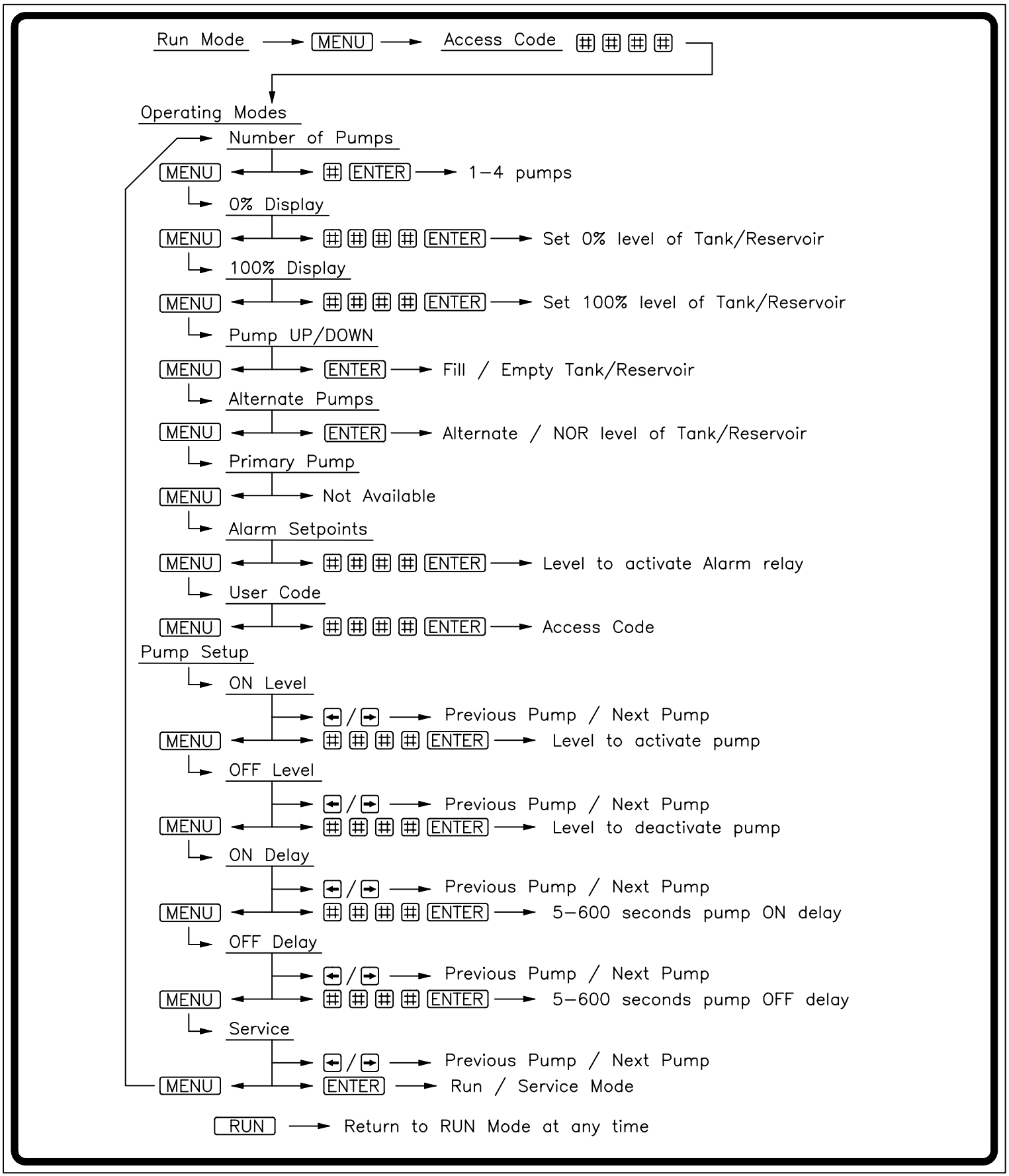
DWG. NO. : 106260-1	REV. A



NOTES:

1. SEE DWG. 106260-1 FOR ENCLOSURE AND MOUNTING DETAILS.

Pribusin Inc. ©		
CHKD:	DATE: Feb. 01/00	DRN: KS
Model: PCS-400 Pump Controller/Sequencer Close View of Front Window		
DWG. NO. : 106260-2		REV. A


Run Mode
MENU
Access Code
# # # #
Operating Modes
Number of Pumps
MENU
ENTER
1–4 pumps
0% Display
MENU
ENTER
Set 0% level of Tank/Reservoir
100% Display
MENU
ENTER
Set 100% level of Tank/Reservoir
Pump UP/DOWN
MENU
ENTER
Fill / Empty Tank/Reservoir
Alternate Pumps
MENU
ENTER
Alternate / NOR level of Tank/Reservoir
Primary Pump
MENU
Not Available
Alarm Setpoints
MENU
ENTER
Level to activate Alarm relay
User Code
MENU
ENTER
Access Code
Pump Setup
ON Level
← / →
Previous Pump / Next Pump
MENU
ENTER
Level to activate pump
OFF Level
← / →
Previous Pump / Next Pump
MENU
ENTER
Level to deactivate pump
ON Delay
← / →
Previous Pump / Next Pump
MENU
ENTER
5–600 seconds pump ON delay
OFF Delay
← / →
Previous Pump / Next Pump
MENU
ENTER
5–600 seconds pump OFF delay
Service
← / →
Previous Pump / Next Pump
MENU
ENTER
Run / Service Mode
RUN
Return to RUN Mode at any time