

SPCI

Engineering Operation & Maintenance



WILDEN®

A **DOVER** COMPANY

SPCI

SOLENOID PUMP CONTROLLER

Pump Controller

PRINTED IN THE USA

TT2985

EOM-SPCI 3/03
REPLACES EOM-SPCI 9/00

THE SOLENOID PUMP CONTROLLER I

The Solenoid Pump Controller I (SPC I) is designed to provide an intuitive interface between you and your Wilden Accu-Flo™ pump. In simplest terms, this device energizes and de-energizes the solenoid coil at a programmed rate to control Wilden solenoid-operated Accu-Flo™ pumps. The pump speed can easily be adjusted by simply pushing the appropriate (increase or decrease) buttons on the keypad. To expedite your pump speed selection, three programmable “presets” are provided.

The back lit LCD screen and LEDs (light emitting diodes) keep you informed. These indicators display operational status which allows you to control the pump from a remote location. The preset number, the stroke interval in seconds (pump speed), the stroke counter, and stroke totalizer are indicated on the LCD screen. A leak detection LED informs you of the optional Wil-Gard leak detection device status. The SPC I will

stop pump operation if a leak is detected by the Wil-Gard diaphragm monitoring system.

An external input can be utilized to remotely start and stop the pump to customize the application. Proximity switches, temperature switches, etc. can easily interface with the SPC I by simply wiring the external component to the terminal strip and selecting the external input mode on the SPC I. The SPC I also has the capability to accept input from liquid level switches to fully automate tank filling applications.

The SPC I can be powered by three different voltages which are selectable on the terminal strip: 110 VAC, 220 VAC, and 12 VDC. This device utilizes an internal power supply and when needed, is shipped with various international plug adapters for safe and easy installation. The output voltage of the SPC I is 12V DC which must be used with Wilden's Nema 4 or Nema 7 solenoid-operated Accu-Flo™ pumps.

WILDEN SOLENOID-OPERATED PUMP TECHNOLOGY

Wilden Accu-Flo™ pump technology utilizes compressed air as a driving force to displace process fluid while electric signals control pump speed. Inherent characteristics allow solenoid-operated pumps to excel in difficult pumping applications where other pump types fail.

The Wilden Accu-Flo™ solenoid valve uses electrical impulses to stroke the pump. This valve is a two-position, four-way solenoid valve that has a single operator and spring return. When electric

power is applied, the solenoid shifts to allow an air chamber to be pressurized with air. When the electric power is removed, the spring return mechanism shifts the solenoid valve to a position where the pressurized air chamber is exhausted while the opposite air chamber is pressurized. By alternately applying and removing electrical power, the pump reciprocates much like a standard Wilden pump. The faster the electrical impulses are provided to the pump, the faster the pump operates.

CAUTIONS / WARNINGS

The Solenoid Pump Controller I is designed to be used with Wilden's Nema 4 or Nema 7 12V DC solenoid-operated pumps only. Do not power other coil options available from Wilden Pump & Engineering Company with the SPC I.

- Incorrect electrical connection may cause damage
- Unit is designed to power a 12V DC solenoid coil only.
- Vibration and shock to this equipment should be avoided.
- Disconnect all power sources prior to opening control module.
- Don't mount in splash area.
- The unit can have high voltages present inside the enclosure. **Never** power the SPC I with the cover off.
- Use caution when programming FCSII to ensure that automatic, pre-programmed pump operation cannot

cause injury or damage.

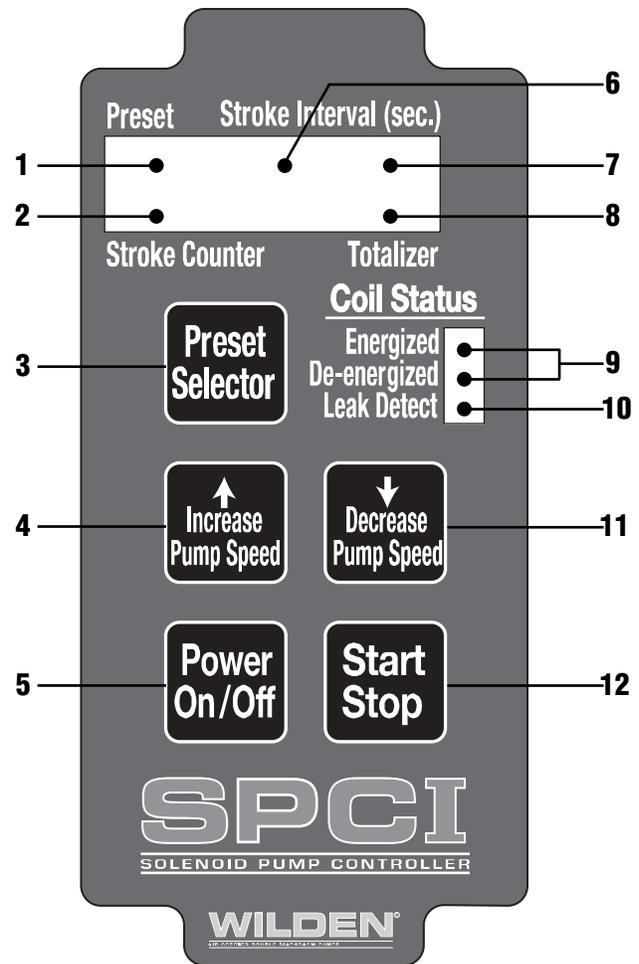
- The input to the unit requires a dry contact (SPST normally open). **Never** apply a voltage to the inputs.
- The jumper used to select AC or DC **MUST** be set before the voltage is applied or the unit can be damaged.
- The unit's output is fused, but an external fuse should be used to safeguard the equipment.
- Totalizer will roll-over to zero at a count of 10,000,000 strokes.
- Never connect to both 12V DC and either 115 or 230 VAC at same time.
- When operating auto function, a redundant float switch above the top one (N.O.) may be connected to “Leak Det.” terminals for added protection.



WARNING: Unit may cause electric shock if used or installed improperly.

KEYPAD FUNCTIONS

- PRESET SELECTION INDICATOR:** The LCD readout displays the chosen preset (1, 2, 3, or E). E represents "External Input" mode. When the Preset Selector button is pushed while in run mode, the pump will be stopped and the Preset Selection Indicator will display the selected preset.
- STROKE COUNTER:** This LCD readout displays the number of stroke signals given to the pump since the START button or the External Input was activated. The counter will pause when the unit is stopped and will reset and begin counting from zero when the pump is re-started.
The SPC I counter automatically saves stroke counts in multiples of 256 without user input. If power is removed before the unit is stopped or the unit registers 256 strokes, the counter will revert to the last saved count.
- PRESET SELECTOR:** This button may be pressed to expedite your pump speed (stroke interval) selection. Advance through the preset options (1, 2, 3, E) by repeatedly pressing the "Preset Selector" button. When the stroke interval is changed by depressing the "increase" or "decrease" button, the current preset is automatically programmed with the new stroke interval.
- INCREASE PUMP SPEED:** This button is used to increase your pump speed by decreasing the stroke interval. As the stroke interval (seconds between pump strokes) decreases, the pump speed increases. When button is depressed for more than 3 seconds, the scrolling speed is accelerated.
- POWER ON/OFF:** Used to turn the unit on and off. All programmed data will be saved when the unit is turned off or unplugged. If "Auto On" feature is in the OFF position (On/Off), the unit will be switched on and off via the "Power On/Off" button. If "Auto On" feature is in the ON position, the unit will be in ON mode whenever power is applied.
- STROKE INTERVAL:** This LCD readout displays the time interval between pump strokes. A pump stroke is defined as the discharge of one liquid chamber. The stroke interval is stated in seconds. Range: .05–3600 seconds.
- MODE:** This LCD readout displays either RUN or STOP mode. RUN indicates that the controller is sending signals to pump based on data input.
- TOTALIZER:** This LCD readout displays the number of stroke signals given to the pump since the last time the totalizer was reset. The totalizer will be paused in stopped mode and will continue counting when the pump is started. The totalizer will roll-over to zero at 10,000,000. The totalizer is reset when the unit's power is turned off, then the "Preset Selector" is held down while the unit's power is turned back on by depressing the "Power On/Off" button.



- ENERGIZED and DE-ENERGIZED COIL STATUS:** When the green LED is lit, electricity is supplied to the solenoid coil. When the yellow LED is lit, electricity is not supplied to the solenoid coil. These LEDs will blink in accordance with the stroke speed.
- LEAK DETECT:** When this LED is lit, the SPC I will continue to run (LEDs blink and counters count) but no power will be applied to solenoid. This condition indicates that the external component (i.e. the Wil-Gard) plugged into the "Leak Detect" input has completed the circuit (meaning a diaphragm failure has occurred).
- DECREASE PUMP SPEED:** This button is used to decrease your pump speed by increasing the stroke interval. As the stroke interval (seconds between pump strokes) increases, the pump speed decreases. When button is depressed for more than 3 seconds, the scrolling speed is accelerated.
- START/STOP:** This button is used to start and stop the pump. The button is inactive when the unit is in "External Input" mode (E). The stroke counter will pause when in stopped mode and then start counting from zero when started. The totalizer will be paused in stopped mode and will resume counting when started.

INSTALLATION

INSTALLATION — General

The Solenoid Pump Controller I is designed to control the speed of Wilden Accu-Flo™ pumps. The SPCI can be powered by a variety of voltages by simply connecting the power cord to the appropriate terminal connector (see figures 1A and 1B).

Voltage and current choices (see figure at right):

- 110–120V AC 50/60 Hz (1A: X and Y).
- 220–230V AC 50 Hz (1A: X and Z).
- 12V DC regulated 1.0 Amps (1B).

The module is splash resistant, but should be mounted in a dry, safe, accessible location. The circuit board has a conformal coating to protect it from inadvertent contact with moisture. To mount module to a wall or other structure, remove lid, secure module with screws through holes provided in back of module, verify the integrity of all connections, tighten cable grip, and attach lid.

The SPC I must be mounted in a “safe area.” The Nema 7 Wilden solenoid-operated pump can be located in Class I, Division I, Categories C and D areas. Verify the Nema 7 coil approval prior to usage.

All electrical specifications are listed on page 1.

Failure to comply with these specifications will result in improper performance or possible damage to the controller and/or the Accu-Flo™ pump. The unit should be installed by a qualified electrician.

INSTALLATION — “Auto On” Feature

The SPC I has an “Auto On” feature. When the “Auto On” feature is in the off position (On/Off), the unit will be switched on and off via the “Power On/Off” button (i.e., the ON/OFF button must be depressed for the unit to be powered). If the “Auto On” feature is in the ON position, the unit will be in ON mode whenever power is applied. This feature works in conjunction with the “External Input” preset to automate your process. To activate the “Auto On” feature, simply position the switch (see Figure 1, Number 2) to the left as indicated on the circuit board.

INSTALLATION — Wil-Gard™ Internal Relay

The SPC I has a terminal for Wil-Gard™ interface. The Wil-Gard™ diaphragm monitoring system activates an audible alarm, a high brightness LED, and a relay contact closure when a leak is detected. The Wil-Gard’s internal relay (N.O. and COM) can be wired directly to the SPC I terminal connector (see Figure 1, Number 3) to suspend pump operation when failure occurs. When the relay is activated, the SPC I will not power the solenoid coil and the red LED will be energized. The stroke counter and the totalizer, however, will not be interrupted.

INSTALLATION — External Input

The SPC I has a terminal (see Figure 1, Number 4A) for external input interface (i.e., start/stop) of signals to pump. An external switch must be connected to these terminal connectors, the jumper must be placed on the “Ex Preset” position (see Figure 1, Number 4A) and the “E preset” must be selected for this feature to operate.

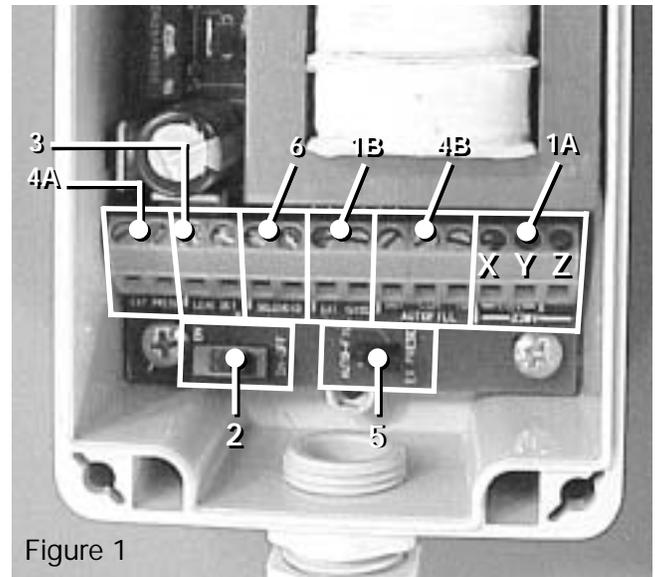


Figure 1

When the external switch is activated (circuit is completed), the pump will operate at the selected speed; when the external switch is not activated (circuit is not complete), the pump will be stopped. Contact requirements: Dry contact rated at 1mA or greater.

The SPCI also has an “Auto Fill” feature as described on page 4. Simply connect the two wires from the top float switch to the terminals labeled “TOP” and “COM” (see Figure 1, Number 4B). The two wires from the bottom float switch need to be connected to the terminals labeled “BOT” and “COM” (see Figure 1, Number 4B). The jumper needs to be positioned in the appropriate position as indicated below (see Figure 1, Number 5).

JUMPER SELECTION (see Figure 1, Number 5)

Auto Fill Mode (used conjunction with terminals in Figure 1, Number 4B)



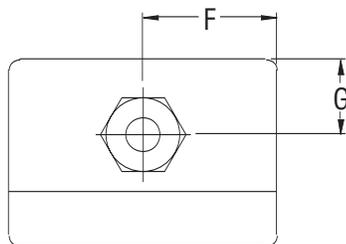
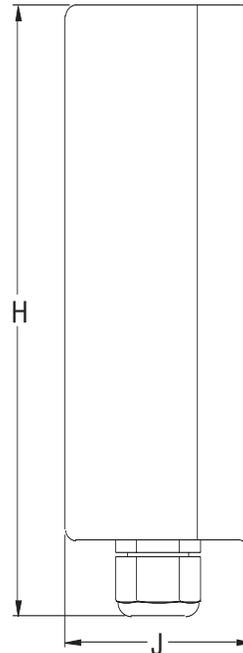
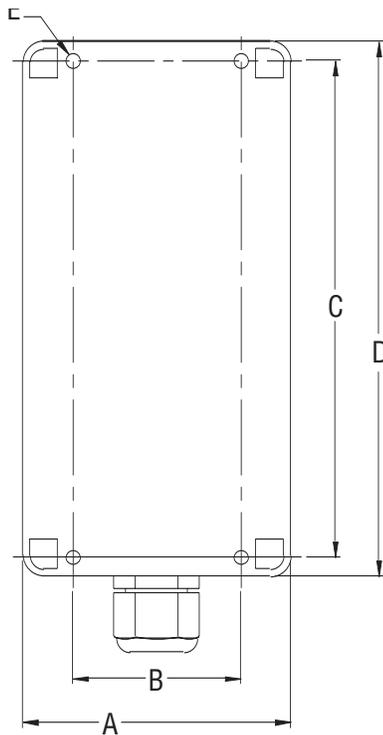
External Preset Mode (used in conjunction with terminals in Figure 1, Number 4A)



INSTALLATION — Solenoid Out

The SPC I has a terminal (see Figure 1, Number 6) for solenoid power out. This output is 12V DC at no greater than .400 Amps. 18 ga. stranded zip cord should be used.

DIMENSIONAL DRAWING WILDEN SOLENOID PUMP CONTROLLER I



| DIMENSIONS — SPC I | | |
|--------------------|-------------|-----------------|
| ITEM | METRIC (mm) | STANDARD (inch) |
| A | 79.8 | 3.14 |
| B | 50.0 | 1.97 |
| C | 148.0 | 5.83 |
| D | 159.5 | 6.28 |
| E | Ø 4.3 | Ø .17 |
| F | 43.4 | 1.71 |
| G | 22.4 | Ø.88 |
| H | 182.1 | 7.17 |
| J | 55.6 | 2.19 |

SPECIFICATIONS

Enclosure: Nema 4X, ABS case with clear polycarbonate cover and stainless steel screws.

Cable Grip: Polyamide (nylon) with Buna seal, "liquid tight," 10.15 mm (0.4") cable capacity.

Keypad: Polyester membrane type. Splash proof with tactile interface.

Power Requirements: 110-120V AC 50/60 Hz., 220-230V AC 50 Hz., or 12V DC regulated 1.0 amps.

Pump Output Voltage and Amps: 12V DC at no greater than .750 amps. Solenoid coil DC resistance nominal 16 Ohms.

Contact Requirements for External Input Activation: Dry contact rated at 1 mA or greater.

Wil-Gard Input: Dry contact rated at 1 mA or greater.

Power Cord: U.S.-style non-grounding cord, 1.83m (6') UL/CSA listed.

Solenoid Cord: 18 ga. stranded zip cord, 2.44m (8').

Operating Temperature: 0°C (32°F) to 50°C (122°F).

Storage Temperature: -10°C (14°F) to 60°C (140°F).

Fuse: Internally resettable (non-replaceable). Hold = .65 Amps, Trip = 1.3 Amps, UL, CSA & TUV recognized.

RECOMMENDED WIRE GAUGE:

Power Input Wire: 18 AWG minimum.

Wire to Solenoid Pump: 18 AWG minimum.

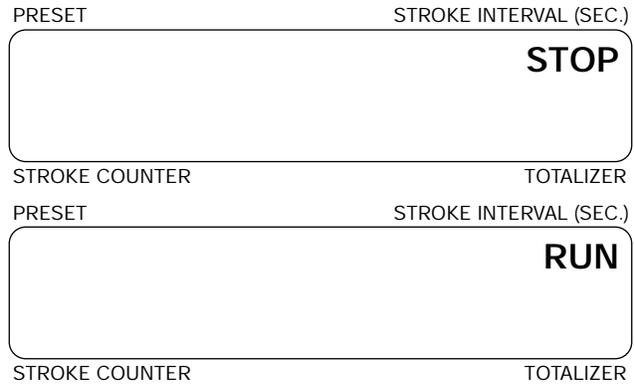
Wil-Gard Input Wire: 24 AWG minimum.

OPERATION

The SPC I is designed to be intuitive and user friendly. Once the SPC I with Accu-Flo™ pump is installed and the AC/DC jumper and "Auto On" switch are set in the appropriate position, the unit can be powered by depressing the ON/OFF button. The message "Wilden SPC" followed by the software revision number "2.0" will be displayed for a couple of seconds before switching to STOP mode. When in STOP mode, choose the appropriate pump speed by depressing the INCREASE PUMP SPEED button or the DECREASE PUMP SPEED button. Depress the START/STOP button to operate pump. The LCD should now display RUN indicating that the unit is in RUN mode. The pump speed can now be adjusted or fine-tuned by further depressing the INCREASE PUMP SPEED button or the DECREASE PUMP SPEED button. The pump output can also be adjusted by increasing or decreasing the liquid discharge head pressure by adjusting a valve installed on the discharge line of the pump (see operation section in the solenoid-operated pump manual).

Pump speed presets are programmed by selecting a preset via the PRESET SELECTOR button. Simply advance through the preset options (1, 2, 3, E) by repeatedly pressing the PRESET SELECTOR button. The preset is selected when the appropriate preset number is displayed on the LCD. Change the pump speed by depressing the INCREASE or DECREASE button. Once your finger leaves the button, that selected preset is programmed. All programmed data will be saved when the unit is turned off by depressing the ON/OFF button or if the unit is unplugged.

When the SPC I is in RUN mode and the PRESET SELECTOR is depressed, the SPC I will stop pump



operation, display STOP, and select the next preset value with programmed stroke interval. When the preset selector displays "E," the START/STOP button is not operational. The external input contact initiates and terminates the signals to the solenoid-operated pump based on the programmed stroke interval.

The STROKE COUNTER LCD readout displays the number of stroke signals given to the pump since the START button or the External Input was activated. The counter will stop when the pump is stopped and will reset and begin counting from zero when re-started.

The TOTALIZER LCD readout displays the number of stroke signals given to the pump since the last time the totalizer was reset. The totalizer will be paused in stopped mode and will continue counting when RUN mode is resumed. The totalizer will roll-over to zero at 10,000,000 strokes. The totalizer is reset when the unit is turned ON by pushing the ON/OFF button while the PRESET button is depressed.

AUTO FILL FEATURE

To use the auto fill feature of the SPC I the system requires the input of two float switches. An optional redundant shut-off can be employed to safeguard the system from a costly overflow situation.

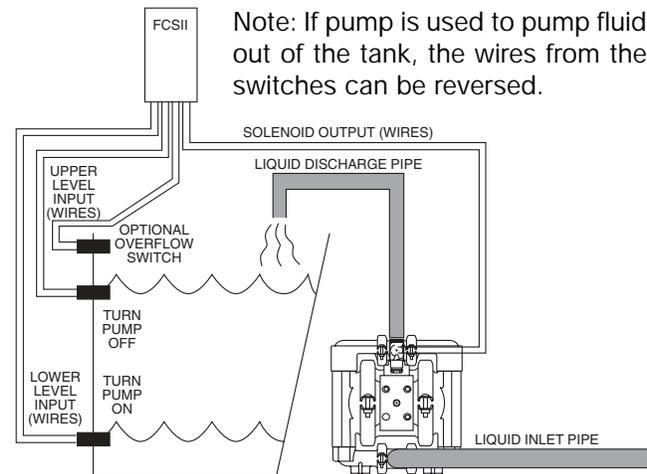
1. The "Bottom" switch which is normally closed (i.e. closed when not buoyed by liquid)
2. The "Top" switch which is normally open (i.e. open when not buoyed by liquid)
3. The optional "Leak Det" switch which is normally open (i.e., open when not buoyed by liquid)

The Bottom switch is placed where you wish the liquid level to start the pump thus refilling the container.

The Top switch is placed where you wish the liquid level to stop the pump when the maximum level is reached.

The Leak Det switch is located above the Top switch and is a redundant shut off in the event that the Top float switch fails.

The bottom and top switches share one common



Note: If pump is used to pump fluid out of the tank, the wires from the switches can be reversed.

terminal marked "COM". The other wire from the top switch is connected to "top" terminal.

The other bottom lead is connected to the "Bot" terminal.

The wires from the redundant switch (not shown) are connected to the two Leak Det terminals and is important in reducing the possibility of an overfill resulting from a failed float switch.

OPTIMAL ACCURACY AND REPEATABILITY

Consistent displacement per stroke of process fluid is the key to insure that repeatable flow rates and batch quantities are achieved. Wilden Accu-Flo™ pumps discharge a repeatable volume of process fluid on each discharge stroke so long as the application parameters are consistent. If any of the following factors listed below change, then the displacement per stroke and batch quantity may change:

- Inlet and discharge lines to be primed at all times. This is accomplished by utilizing a foot valve on suction lift conditions and a check valve on the

discharge line.

- Consistent pump fluid inlet and discharge pressures.
- Consistent air inlet pressure and volume to the pump.
- Consistent viscosity of the process fluid.
- Consistent specific gravity of the process fluid.

NOTE: The SPC I cannot batch quantities of liquid without the use of an external input device installed to the appropriate "Ext Preset" terminal with the "E" preset selected.

TROUBLESHOOTING

The LCD screen is not operable:

- Verify the voltage and current to SPC I.
- Verify that the wires are properly connected to the correct terminal connector.
- Turn the unit off for 10 seconds, then turn back on (cold boot).

The LCD screen is operable, but the pump is not running:

- Verify that the LCD indicates that the unit is in the RUN mode and that the green and yellow LEDs are lighting alternately at the appropriate interval.
- Shut the unit off for 10 minutes to permit the internal fuse to reset.
- Verify that there is a solid electrical connection between the SPC I's output and the solenoid and that the solenoid is functional.
- Verify that sufficient air pressure is supplied to the pump (must be more than liquid discharge pressure).
- Verify that at least 45 psig air supply pressure is supplied to the pump (minimum air pressure requirement).
- Listen for "clicking" noise at solenoid valve when coil is energized or de-energized regardless if air pressure is applied to the pump. If no noise is heard, wiring may be loose or incorrectly installed.

- Verify that Preset selector does not display "E" when no external input is being utilized.
- Stroke interval may be set too high (i.e. the pump is running, but at a very slow rate).
- Verify that the "Leak Detect" terminal connector is not grounded (red LED should not be lit).

The LCD screen is operable and the pump is shifting, but little or no fluid is being displaced:

- Verify that the pump is located in such a way that it is within the suction lift capability.
- Verify that sufficient air pressure is supplied to the pump (must be more than liquid discharge pressure).
- Verify that sufficient air volume is supplied to the pump (see pump performance chart).
- Verify that valves on the liquid inlet and discharge lines are open and that other possible restrictions are removed.
- Cavitation may be occurring. Slow pump speed down. Flow rate can dramatically increase when stroke rate is decreased. A slower pump speed allows the check balls to close properly and a larger displacement per stroke to be achieved. Stroke interval for maximum flow rate: M.025 — .10; M1 — .10; M2 — .20.
- In an attempt to isolate the problem, disconnect the pump from the piping and test pump operation in isolation.

TOTALIZER USED FOR PREVENTATIVE MAINTENANCE PROGRAM

Preventative maintenance is an effective way to reduce maintenance cost and down time while increasing productivity. Diaphragm pumps have the following major wear parts: elastomers (dia-phragms, valve balls, and O-rings) and the air distribution system (air valve and center section O-rings). The life of these components dramatically differ depending on application specifics which include: air pressure, pump speed, quality of air supply, liquid temperature, abrasiveness, etc. It is very difficult to project the life of these components without empirical data, therefore it is advisable to monitor stroke life to the first

failure. Take this figure and then factor in a safety margin. This new figure is your preventative indicator.

The SPC I totalizes the number of strokes the pump completes since the counter has been reset. When the totalizer indicates your preventative count, it is time for parts replacement. The totalizer is only reset when the unit is turned ON while the PRESET button is depressed. The total number of strokes is displayed on the LCD display and will roll-over at a count of 10,000,000 (software limitation). Please contact your local distributor for more information regarding preventative scheduling.

WARRANTY

Each and every product manufactured by Wilden Pump and Engineering, LLC is built to meet the highest standards of quality. Every pump is functionally tested to insure integrity of operation.

Wilden Pump and Engineering, LLC warrants that pumps, accessories and parts manufactured or supplied by it to be free from defects in material and workmanship for a period of one year from date of startup or two years from date of shipment, whichever comes first. Failure due to normal wear, misapplication, or abuse is, of course, excluded from this warranty.

Since the use of Wilden pumps and parts is beyond our control, we cannot guarantee the suitability of any pump or part for a particular application and Wilden Pump and Engineering, LLC shall not be liable for any consequential damage or expense arising from the use or misuse of its products on any application. Responsibility is limited solely to replacement or repair of defective Wilden pumps and parts.

All decisions as to the cause of failure are the sole determination of Wilden Pump and Engineering, LLC.

Prior approval must be obtained from Wilden for return of any items for warranty consideration and must be accompanied by the appropriate MSDS for the product(s) involved. A Return Goods Tag, obtained from an authorized Wilden distributor, must be included with the items which must be shipped freight prepaid.

The foregoing warranty is exclusive and in lieu of all other warranties expressed or implied (whether written or oral) including all implied warranties of merchantability and fitness for any particular purpose. No distributor or other person is authorized to assume any liability or obligation for Wilden Pump and Engineering, LLC other than expressly provided herein.

PLEASE PRINT OR TYPE AND FAX TO WILDEN

Item # _____ Serial # _____

Company Purchased From _____

Your Company Name _____

Industry _____

Your Name _____ Title _____

Your Address (Street) _____

(City) _____ (State) _____ (Postal Code) _____ (Country) _____

(Telephone) _____ (Fax) _____ (e-mail) _____

Number of pumps in facility? _____ Diaphragm _____ Centrifugal

_____ Gear _____ Submersible _____ Lobe _____ Other _____

Fluid being pumped _____

How did you hear of Wilden Pump? _____ Trade Journal _____ Trade Show

_____ Internet/E-mail _____ Distributor _____ Other _____

ONCE COMPLETE, FAX TO (909) 783-3440

NOTE: WARRANTY VOID IF PAGE IS NOT FAXED TO WILDEN