

Sidewinder Pumps Inc.

GEN2: DC Timer/Controller



****This document replaces any and all documents prior to this date****

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1. Warnings

1.1. 12 VDC operation

1.1.1. Your Sidewinder DC Pump and Timer/Controller is designed to connect to a standard 12VDC solar charged battery system. It will not run on alternate voltages. (10.5 minimum to 14.4 maximum VDC suggested range of use)

1.2. Shock Hazard

1.2.1. **While the system is a 12VDC system and should not present a shock hazard, high current levels are available in the system and caution should be used while connecting and disconnecting any components. ALWAYS disconnect the (-) or GROUND leads first! There are no user serviceable parts inside the timer. Disassembly of the timer voids any remaining warranty from Sidewinder on that timer.**

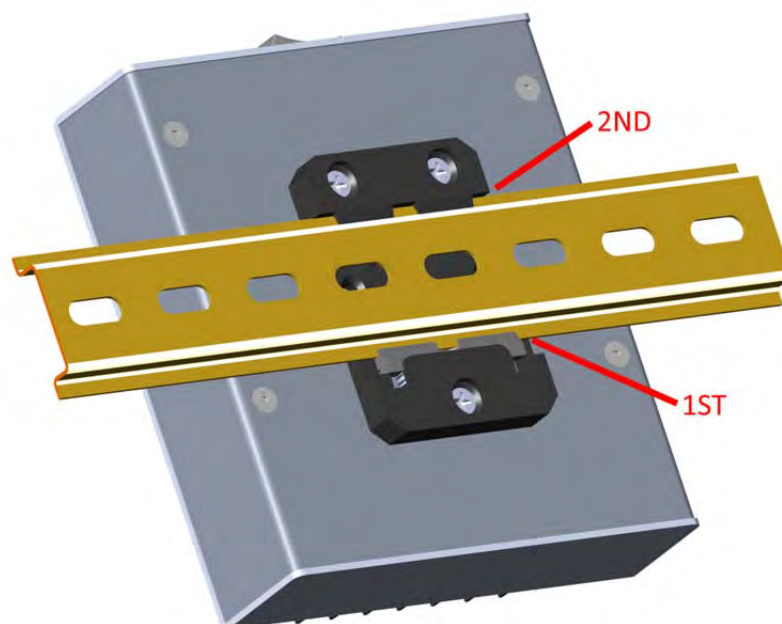
2. Unpacking, Installation, and Connection of the Timer/Controller

2.1. What's in the box?

2.1.1. Your Sidewinder DC Timer/Controller is designed to be used as an on/off and pump rate controller for Sidewinder's Solar Pump. It is NOT designed to be mounted directly in an exposed exterior location. It IS designed to be mounted inside the battery box which is part of the solar pump package or a separate exterior rated enclosure. The timer comes with a standard 33mm DIN Rail mount affixed to its back or rear side that is spring loaded and will securely mount the timer. *An alternate mount bracket is available from Sidewinder if you prefer to affix the timer permanently to a backplane in an electrical enclosure. (Part Number: SE-STBPM-1)*

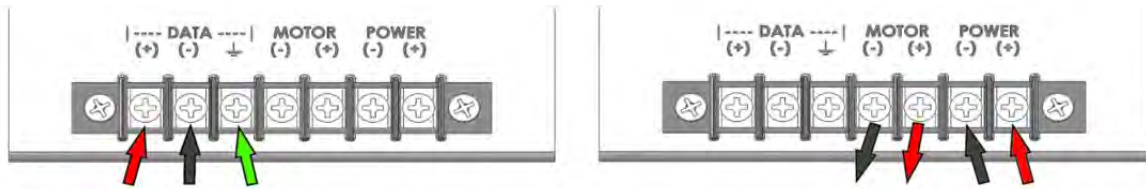
2.2. Mount the timer/controller inside the Solar Pump Battery enclosure on the provided DIN Rail.

2.2.1. Hook the DIN Rail mount (back of the timer) onto the bottom side of the DIN Rail. Press up on the spring loaded bottom part of the DIN Rail mount (back of the timer) and hook the upper part of the DIN Rail mount onto the DIN Rail. Release pressure on the spring loaded DIN Rail mount, and the timer should stay securely in place.



2.3. Data I/O connections (if applicable)

2.3.1. Secure spade connectors to your data cables. You must provide a (+) signal, and (-) signal, and a ground wire. The terminal strip is clearly marked as to where connections are to be made. (See left side of next image)



2.4. Motor and Power connections.

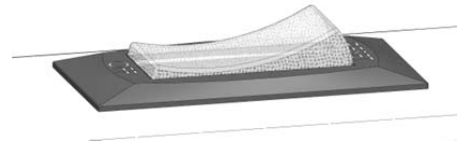
2.4.1. Motor Connections. Power to the motor must be minimum 14ga wire for up to 10 ft. distances, but shall be sized to accommodate voltage drop considerations for longer runs.

2.4.2. Supply power to the timer must be via 14ga minimum wire, and be from a standard 12VDC system. Again, voltage drop issues must be considered. The terminal strip on the timer is clearly marked indicating which terminals are for (+/- 12VDC input) and for motor connections. (See right side of above image)

3. Understanding the control panel

3.1. On-Off Switch and circuit protection

3.1.1. This switch functions as both an on-off switch and also provides a resettable circuit breaker function.



3.2. MENU button – stops pump function immediately, and enables programming and setting access. (NOTE: if no button is pressed, the pump will resume operation after 1 minute.)

3.3. SCROLL button – used to toggle between various setting areas.

3.4. Left & Right Arrows – used to change settings.



3.5. 3-Digit LED Display

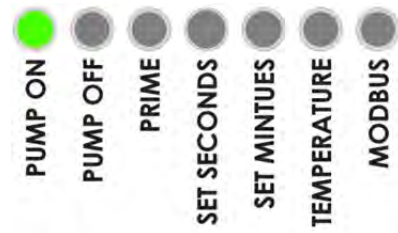
3.5.1. This display shows setting values, and during operation counts down as the pump cycles on and off.



3.6. Individual LEDs.

3.6.1. There are (7) individual LEDs.

3.6.1.1. PUMP ON – Lights any time the pump is running. Flashes when the controller is in “SECONDS ON” or “MINUTES ON” setting mode.



3.6.1.2. PUMP OFF – Lights when the pump is in a non-running portion of the cycle. Flashes when the controller is in “SECONDS OFF” or “MINUTES OFF” setting mode.

- 3.6.1.3. PRIME – Lights when the prime function is being used. (Described in section 5 below.)
- 3.6.1.4. SET SECONDS - Flashes when the controller is in the “SET SECONDS” mode. Lights when in run mode and seconds are counting down.
- 3.6.1.5. SET MINUTES – Flashes when the controller is in the “SET MINUTES” mode. Lights when in run mode and minutes are counting down.
- 3.6.1.6. TEMPERATURE – Lights when the temperature mode is “ON” and temperatures are at or below the set point. Flashes when the temperature mode is “ON” but temperatures are above the set point.
- 3.6.1.7. MODBUS – Lights when accessing MODBUS address function.

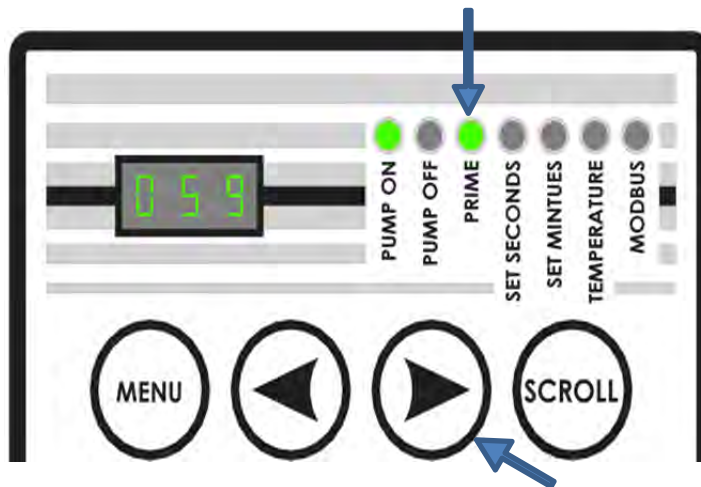
4. Timer/Controller Self-Test

When the timer/controller is first turned on, a small “self-test” is performed. Each digit on the three digit LED display will countdown to 0. During this countdown, the “PUMP OFF” LED will be illuminated. After the self-test is complete, the “PUMP ON” LED will illuminate and the pump will run at the last pump cycle settings. Pressing “MENU” at any time will stop pump operation for 1 minute.

5. Priming the pump

After your DC Pump is plumbed and ready to run, use the prime function to provide a continuous run of the pump motor for priming. PRIME can be accessed only while the controller is in the run mode.

- 5.1.1. Press the right arrow button, and the pump will ignore the cycle settings and run continuously for one minute. (The PRIME LED will turn on.) Note: The prime function will not cause the pump to run if the temp mode is “ON”, and the actual temperature is not low enough to turn the pump on. Turn temp mode off to prime.
- 5.1.2. Press the right arrow again to stop the prime function at any time while the pump is running in the Prime mode. The pump reverts to a normal run mode.



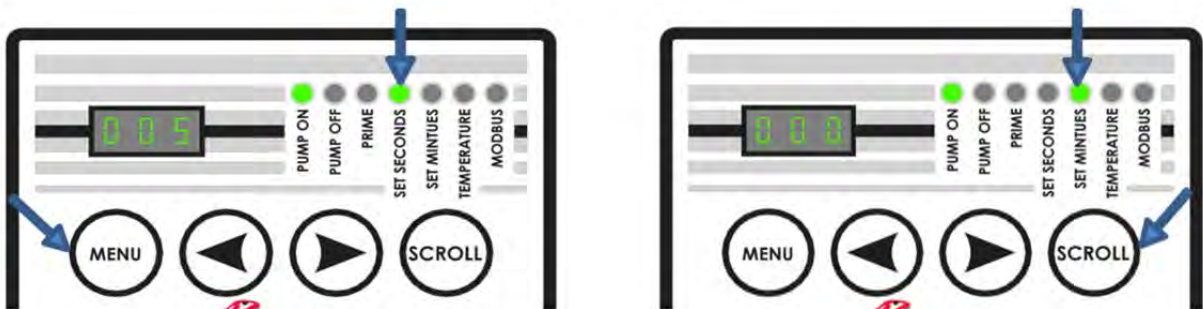
6. Programming for desired pump output

6.1. How it works

6.1.1. Your Sidewinder DC Timer/Controller controls the DC Pump by setting two variables, Cycle "ON" time, and Cycle "OFF" time. Charts are provided that provide estimated outputs based on your setting selections. Output can be set up for intermittent dosing, or for batch type dosing. The chart on **page 10** of this document provides an estimated setting, but Sidewinder strongly recommends that output be verified using a pump calibration gauge. **NOTE: Flow rates less than 1.2 Qts/Day may be achieved by setting "ON TIME" to seconds, and "OFF TIME" to minutes. Contact the factory for more information.**

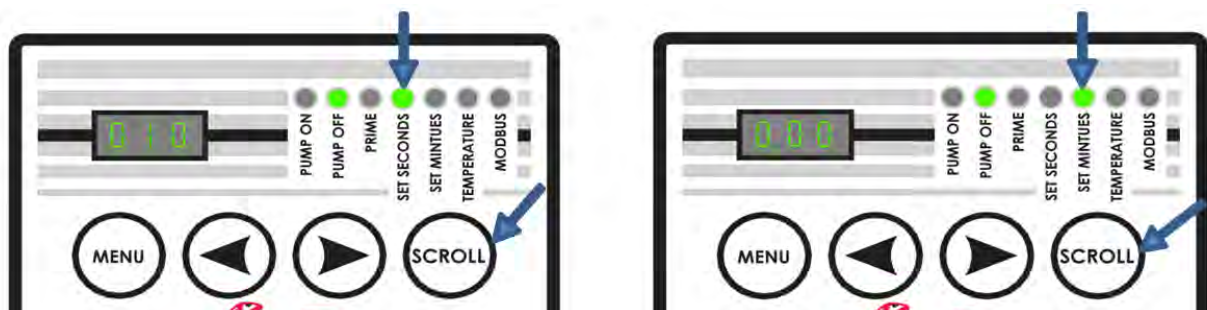
6.2. Set the "ON" time

6.2.1. To set the "ON" time, press "MENU". The "PUMP ON" LED will flash, and the "SET SECONDS" LED will flash. The 3-digit LED will display the current setting. Use the left or right arrows to change the setting for number of seconds "ON". This setting is adjustable from 0 – 59 seconds. Press the "SCROLL" button and the "SET SECONDS" LED quits flashing and the "SET MINUTES" LED will flash. This setting is adjustable from 0 to 60 minutes of on-time.



6.3. Set the "OFF" time

6.3.1. To set the "OFF" time, press "SCROLL" again. The "PUMP OFF" LED will flash, and the "SET SECONDS" LED will flash. The 3-digit LED will display the current setting. Use the left or right arrows to change the setting for number of seconds "OFF". This setting is adjustable from 0 – 59 seconds. Press the "SCROLL" button and the "SET SECONDS" LED quits flashing and the "SET MINUTES" LED will flash. This setting is adjustable from 0 to 60 minutes of off-time. **NOTE: Press "SCROLL" once more to lock the settings in, then press "MENU" to begin pump operation.**

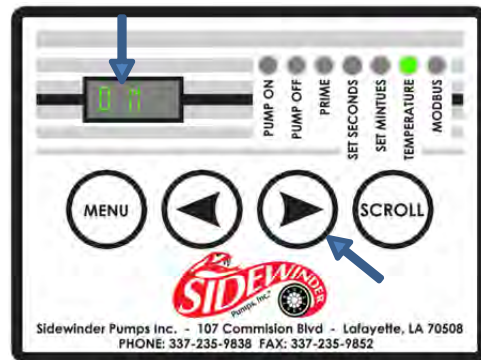
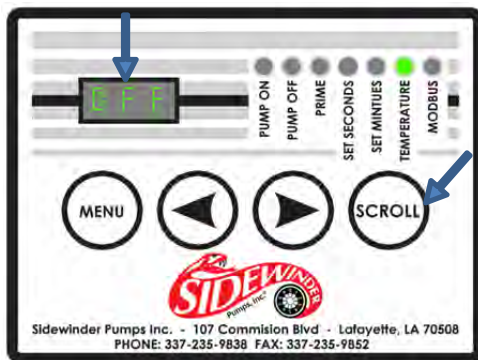


7. Accessing Temperature Controlled Operation

Your Sidewinder DC Pump Timer/Controller can also be set to turn the pump on and run only after the ambient temperature at the timer has reached a temperature selected by you. After the ambient temperature rises past the set point, the pump will turn off and remain off until the temperature is again, at or below the set point. The “TEMPERATURE” led will flash anytime the temperature mode is “ON” and the ambient temperature is above the set point. The “TEMPERATURE” LED will be on (and not flashing), when the ambient temperature is at or below your set point. The pump will run per your on-time, off-time settings.

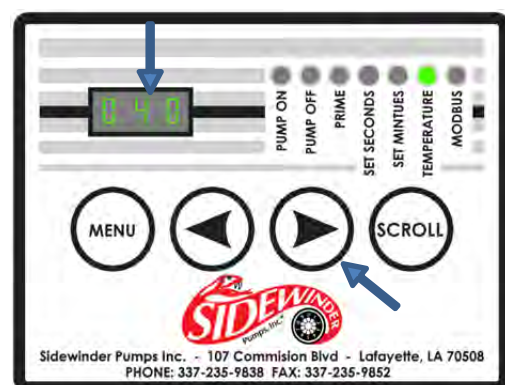
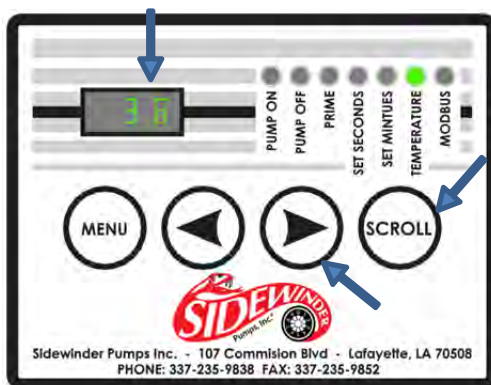
7.1. Turn the Temperature Mode on/off

7.1.1. Press “SCROLL” until the “TEMPERATURE” LED flashes. The three digit LED display will say “ON” or “OFF” depending on the status of the temperature mode. If it is “OFF”, pressing either of the arrow button changes the setting to “ON”.



7.2. Set the desired temperature (The pump will only run at or below this temperature)

7.2.1. When “ON” is displayed, pressing the “SCROLL” button enables setting of the temperature that you want the pump to start running. Press the arrow keys to change the temperature setting. Pressing “SCROLL” again exits the temperature setting mode. Press “MENU” to return to a run mode. Now, the pump will not run until the temperature drops to the set point. At that point, the pump will run, and will continue to run until the temperature rises above the set point, and the pump returns to a non-running mode.



7.3. Temperature sensor calibration

This feature is provided should you determine that the timer's temperature readings differ from the ambient temperatures in the area. This can be caused by several conditions including the location/orientation of the battery box.

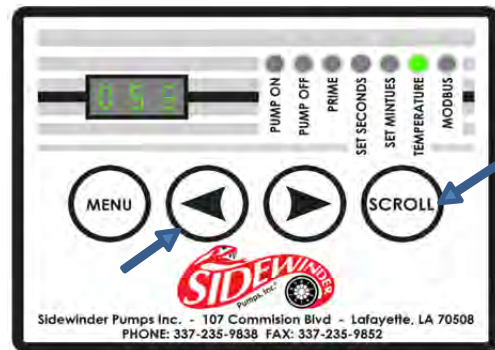
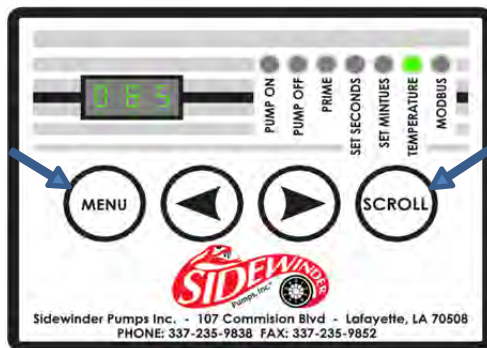
(NOTE: "TEMPERATURE" mode should be in the "ON" setting prior to 7.3.1)

7.3.1. Turn the timer/controller "OFF".

7.3.2. Hold both the "SCROLL" and "MENU" buttons down, and turn the unit "ON".

7.3.3. All LEDs and display segments will flash.

7.3.4. Release "SCROLL" and "MENU".



7.3.5. The unit will perform a self-test, and when complete, it will be in temperature calibration mode. The 3-digit LED display will show its measured temperature. If "OFF" is displayed, the unit was not in "TEMPERATURE" mode. Press either arrow key to enter temp mode. The temperature should now be displayed. Go to step 7.3.6.

7.3.6. Use the left and right arrows to decrease or increase the temperature displayed in degrees Fahrenheit until the display shows the actual ambient temperature at that location. *The display will show the internal temperature of the timer which may be impacted by the internal electronics, but should stabilize after the unit runs a while. For example, if the actual temperature at the site is 50 degrees, but your unit reads 55 degrees, press the left arrow until the display shows 50 degrees. Press "SCROLL" to lock in the calibrated setting.* The pump will enter a normal run mode. *If you do not press "SCROLL", your changes will not be saved.*

NOTE: It is important to turn the timer on and allow its internal temperatures to stabilize before using this calibration mode. Wait at least 10 minutes of run time before calibrating the temperature shown on the display.

8. Other Features

8.1. While the timer is "ON" and in run mode, pressing "SCROLL" will cause the current battery voltage reading to be displayed. Pressing "SCROLL" again will display the current temperature IF the timer is set where the "TEMPERATURE" mode is "ON".

9. MODBUS Information

9.1. Channel Selection

9.1.1. Press "SCROLL" until the "MODBUS" LED flashes. The 3-digit LED display shows the current MODBUS channel selected. Use the arrows to change the setting. The default value is "16". The other MODBUS settings are:

Baud Rate = 9600

Data Bits = 8

Stop Bits = 1

Parity = none

9.2. Communication Details (MODBUS):

9.2.1. Discrete Input Contacts {Read Function 0x02}

Register 1: Low Battery Flag... 1=Voltage is less than 11.0V

Register 2: Battery Blink Flag... 1=Voltage is less than 10.0V

Register 3: High Temp Flag... 1=Temperature is greater than set point

Register 4: Update Flag... 1=Controller is updating the display

9.2.2. Analog Input Registers {Read Function 0x04}

Register 1: Current Temperature Reading

Register 2: Current Voltage Reading (decimal is assumed)

i.e. 121 = 12.1V

Register 3: Current "ON" time – in seconds

Register 4: Current "OFF" time – in seconds

Register 5: Timeout – amount of time that the controller may be left in "MENU" mode.

9.2.3. Discrete Output Coils {Read Function 0x01}

Register 1: Output (pump) 1=on

Register 2: Temperature Mode 1=on

Register 3: Prime Mode 1=on

Write Single Coil: 0x05

Write Multiple Coils: 0x15

9.2.4. Analog Output Holding Registers {Read Function 0x03}

Register 1: On Timer: Seconds (0 to 59)

Register 2: On Timer: Minutes (0 to 15)

Register 3: Off Timer: Seconds (0 to 59)

Register 4: Off Timer: Minutes (0 to 15)

Temperature Set Point (-40 to 100) Degrees F

Modbus Address (1 to 127)

Elapsed Timer (not saved – starts at 0 on power up)

Write Single Holding Register: 0x06

Write Multiple Holding Registers: 0x16

APPROXIMATE QUARTS PER DAY AT VARIOUS ON-TIME / OFF-TIME SETTINGS

(ALWAYS VERIFY ACTUAL OUTPUT WITH A PUMP CALIBRATION GAUGE)

| BATCH DOSING SETTINGS | PLUNGER DIAMETER | ON MIN | OFF MIN | SIMPLEX QTS / DAY | DUPLEX QTS / DAY | PLUNGER DIAMETER | ON MIN | OFF MIN | SIMPLEX QTS / DAY | DUPLEX QTS / DAY | PLUNGER DIAMETER | ON MIN | OFF MIN | SIMPLEX QTS / DAY | DUPLEX QTS / DAY |
|-----------------------|------------------|--------|---------|-------------------|------------------|------------------|--------|---------|-------------------|------------------|------------------|--------|---------|-------------------|------------------|
| | 1/4" | 60 | 0 | 73.5 | 146.9 | 3/8" | 60 | 0 | 165.3 | 330.6 | 1/2" | 60 | 0 | 293.9 | 587.8 |
| | 1/4" | 55 | 5 | 67.3 | 134.7 | 3/8" | 55 | 5 | 151.5 | 303.1 | 1/2" | 55 | 5 | 269.4 | 538.8 |
| | 1/4" | 50 | 10 | 61.2 | 122.4 | 3/8" | 50 | 10 | 137.8 | 275.5 | 1/2" | 50 | 10 | 244.9 | 489.8 |
| | 1/4" | 45 | 15 | 55.1 | 110.2 | 3/8" | 45 | 15 | 124.0 | 248.0 | 1/2" | 45 | 15 | 220.4 | 440.8 |
| | 1/4" | 40 | 20 | 49.0 | 98.0 | 3/8" | 40 | 20 | 110.2 | 220.4 | 1/2" | 40 | 20 | 195.9 | 391.8 |
| | 1/4" | 35 | 25 | 42.9 | 85.7 | 3/8" | 35 | 25 | 96.4 | 192.9 | 1/2" | 35 | 25 | 171.4 | 342.9 |
| | 1/4" | 30 | 30 | 36.7 | 73.5 | 3/8" | 30 | 30 | 82.7 | 165.3 | 1/2" | 30 | 30 | 146.9 | 293.9 |
| | 1/4" | 25 | 35 | 30.6 | 61.2 | 3/8" | 25 | 35 | 68.9 | 137.8 | 1/2" | 25 | 35 | 122.4 | 244.9 |
| | 1/4" | 20 | 40 | 24.5 | 49.0 | 3/8" | 20 | 40 | 55.1 | 110.2 | 1/2" | 20 | 40 | 98.0 | 195.9 |
| | 1/4" | 15 | 45 | 18.4 | 36.7 | 3/8" | 15 | 45 | 41.3 | 82.7 | 1/2" | 15 | 45 | 73.5 | 146.9 |
| | 1/4" | 10 | 50 | 12.2 | 24.5 | 3/8" | 10 | 50 | 27.6 | 55.1 | 1/2" | 10 | 50 | 49.0 | 98.0 |
| | 1/4" | 5 | 55 | 6.1 | 12.2 | 3/8" | 5 | 55 | 13.8 | 27.6 | 1/2" | 5 | 55 | 24.5 | 49.0 |
| 1/4" | 1 | 59 | 1.2 | 2.4 | 3/8" | 1 | 59 | 2.8 | 5.5 | 1/2" | 1 | 59 | 4.9 | 9.8 | |

| INTERMITTENT FLOW SETTINGS | PLUNGER DIAMETER | ON SEC | OFF SEC | SIMPLEX QTS / DAY | DUPLEX QTS / DAY | PLUNGER DIAMETER | ON SEC | OFF SEC | SIMPLEX QTS / DAY | DUPLEX QTS / DAY | PLUNGER DIAMETER | ON SEC | OFF SEC | SIMPLEX QTS / DAY | DUPLEX QTS / DAY |
|----------------------------|------------------|--------|---------|-------------------|------------------|------------------|--------|---------|-------------------|------------------|------------------|--------|---------|-------------------|------------------|
| | 1/4" | 60 | 0 | 73.5 | 146.9 | 3/8" | 60 | 0 | 165.3 | 330.6 | 1/2" | 60 | 0 | 293.9 | 587.8 |
| | 1/4" | 55 | 5 | 67.3 | 134.7 | 3/8" | 55 | 5 | 151.5 | 303.1 | 1/2" | 55 | 5 | 269.4 | 538.8 |
| | 1/4" | 15 | 3 | 61.2 | 122.4 | 3/8" | 15 | 3 | 137.8 | 275.5 | 1/2" | 15 | 3 | 244.9 | 489.8 |
| | 1/4" | 12 | 4 | 55.1 | 110.2 | 3/8" | 12 | 4 | 124.0 | 248.0 | 1/2" | 12 | 4 | 220.4 | 440.8 |
| | 1/4" | 6 | 3 | 49.0 | 98.0 | 3/8" | 6 | 3 | 110.2 | 220.4 | 1/2" | 6 | 3 | 195.9 | 391.8 |
| | 1/4" | 7 | 5 | 42.9 | 85.7 | 3/8" | 7 | 5 | 96.4 | 192.9 | 1/2" | 7 | 5 | 171.4 | 342.9 |
| | 1/4" | 8 | 8 | 36.7 | 73.5 | 3/8" | 8 | 8 | 82.7 | 165.3 | 1/2" | 8 | 8 | 146.9 | 293.9 |
| | 1/4" | 7 | 10 | 30.3 | 60.5 | 3/8" | 7 | 10 | 68.1 | 136.1 | 1/2" | 7 | 10 | 121.0 | 242.0 |
| | 1/4" | 6 | 12 | 24.5 | 49.0 | 3/8" | 6 | 12 | 55.1 | 110.2 | 1/2" | 6 | 12 | 98.0 | 195.9 |
| | 1/4" | 4 | 12 | 18.4 | 36.7 | 3/8" | 4 | 12 | 41.3 | 82.7 | 1/2" | 4 | 12 | 73.5 | 146.9 |
| | 1/4" | 2 | 10 | 12.2 | 24.5 | 3/8" | 2 | 10 | 27.6 | 55.1 | 1/2" | 2 | 10 | 49.0 | 98.0 |
| | 1/4" | 2 | 22 | 6.1 | 12.2 | 3/8" | 2 | 22 | 13.8 | 27.6 | 1/2" | 2 | 22 | 24.5 | 49.0 |
| 1/4" | 1 | 59 | 1.2 | 2.4 | 3/8" | 1 | 59 | 2.8 | 5.5 | 1/2" | 1 | 59 | 4.9 | 9.8 | |

MAXIMUM PRESSURES: 1/4" - 5000 PSI, 3/8" - 2500 PSI, 1/2" 1250 PSI

10. Pump Output Table (NOTE: Output rates less than 1.2 Qts/day can be achieved by setting "ON TIME" to seconds and "OFF TIME" to minutes. Contact the factory for more information.)

11. Calculating Approximate Outputs

V1 = Quarts per stroke

1/4" plungers ... V1 = 0.000850339

3/8" plungers ... V1 = 0.001913263

1/2" plungers ... V1 = 0.003401357

T1 = On time

T2 = Off time

C1 = Cycles /Day (if seconds)

**C1 = 86,400 / (T1 + T2) i.e. If T1 = 5 sec and T2 = 5 sec
C1 = 86,400 / (5 + 5) = 8,640 Cycles/Day**

C1 = Cycles /Day (if minutes)

**C1 = 1440 / (T1 + T2) i.e. If T1 = 10 min and T2 = 10 min
C1 = 1440 / (10 + 10) = 72 Cycles/Day**

(Note: These calculations assume 1 full stroke per second of motor run. At lower pressures more than one stroke per second may be achieved.)

Q1 = QUARTS PER DAY = V1 x C1 x T1

In Example:

For a Simplex Pump with a 1/4" plunger, T1 = 10 sec, T2 = 5 sec

C1 = 86,400 / (10 + 5) = 5760 cycles/day

Q1 = 0.000850339 quarts/stroke x 5760 x 10 = 48.98 Quarts/Day

For a Simplex Pump with a 1/2" plunger, T1 = 10 min, T2 = 20 min

C1 = 1440 / (10 + 20) = 48 cycles/day

Q1 = 0.003401357 x 48 x 10 = 1.63 Quarts/Day

For Duplex Pumps pumping to the same location, add the two pumps totals, or multiply by (2) if both sides of the pump have the same size plunger.

Please NOTE: These calculations provide an estimated output. Sidewinder strongly recommends that you use a pump setting gauge to insure accurate daily output.

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Manufacturer Disclaimer

Manufacturer recommends not using poly tubing, copper tubing, or seamed tubing as a discharge line. Manufacturer recommends using 316 SS seamless tubing rated for maximum discharge pressure of the specific pump model being used. Use of incorrect material may result in discharge line failure leading to personal injury, death, and/or compromise to intended injection objectives. Good engineering practices and the manufacturer recommend placement of a properly sized pressure relief valve on pump discharge line for safety purposes.