Operator's Guide

AeroMate™ WSC – 1x1 Valve Controller

Non-Incendive, Intrinsically Safe for
Class I, Division 1 Hazardous Locations

Introduction

Multi-Function Hardware
The AeroMate 1x1 Valve Controller is a multi-function module that includes a pressure sensor, a digital switch input and a single pneumatic solenoid valve.

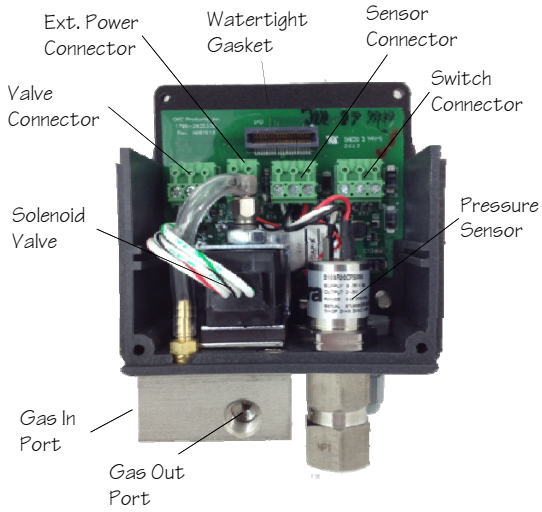
Customizable Programming
Using the Integrated Device Manager (IDM) the 1x1 valve module is fully customizable to meet any application.

Flexible Valve Control
The pneumatic solenoid valve control includes count-down timers, time-of day (TOD) and day-of-week (DOW) control.

Integral Sensor w/ SS Fitting
The integral 2000 psi pressure sensor includes both High/Low gage control and data logging capabilities. Sensor hookup uses a industry standard Female 1/4-NPT Stainless Steel fitting.

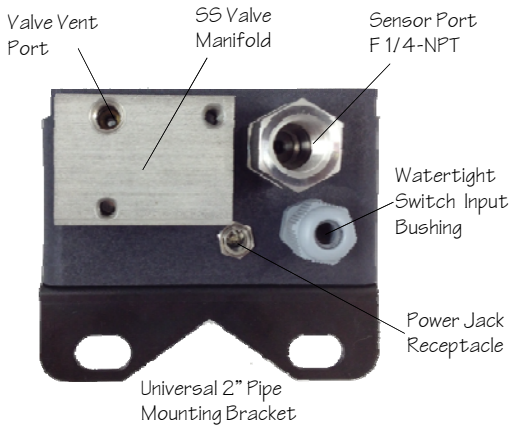
Configurable Switch I/O
The digital switch connection includes and auxiliary +12V power source. Switch configuration allows for normally open (NO) or normally closed (NC) switches and Time Constant control.

1x1 Valve Module Connections



The 1x1 Valve module includes a dual-port, latching solenoid valve with 1/4-NPT female gas In and Out ports, a integral pressure transducer and 3-terminal switch sensor connector with auxiliary power out.

1x1 Valve Module Ports



The 1x1 Valve module includes a SS valve manifold, 1/16-NPT female gas vent port, a SS 1/4-NPT female pressure port, a external power jack receptacle, a 1/8-NPT watertight bushing for switch sensor cable and a universal 2" pipe or motor valve mounting bracket

Manual Override

The first SET key display provides a manual valve override control. Pressing the “UP” or “Down” key will toggle the solenoid valve between OFF and ON timer cycles. This action starts the timing for the time cycle.

SET

```
Manual Override
Ready  V1 OFF
```

```
Manual Override
GoTo   V1 ON
```

Use these keys to shift valve state. ▲ ▼

Valve Cycle Timing

The solenoid valve is primarily controlled through the use of cycle timers. Five standard time cycles are provided in the 1x1 Valve configuration.

OFF	time	- primary close or shut-in cycle
FALL	time	- modifier to hold ON override
BakUp	time	- alternate “missed plunger” shut-in
ON	time	- primary open or flow cycle
DELAY	time	- plunger arrival afterflow time

Cycle Time Setup

Each cycle timer is set in HRS:MIN:SEC. A zero time (000:00:00) set disables timing for that cycle, except for DELAY. A “zero time” cycle will remain in the cycle until a control override terminates the cycle.

```
/ Press <> for
  TIMER  Setup
```

◀ ▶

```
SET   OFF
Time  002:00:00
```

SET

```
SET   FALL
Time  000:00:00
```

SET

```
SET   BakUp
Time  006:15:00
```

SET

```
SET   ON
Time  000:30:00
```

SET

```
SET   DELAY
Time  000:05:00
```

Use these keys to change selections. ◀ ▶ ▲ ▼

Setting the DELAY time to zero (000:00:00) forces the controller to “shut-in” on plunger arrival.

Advanced Features Setup

Several “Advanced” features called “PopUP” and “Fast Plunger” are included in the standard 1x1 Valve program.

```
/ Press <> for
  ADVANCE Setup
```

◀ ▶

```
SET PopUp Try:3
TIME  000:00:00
```

SET

```
Fast Pngr CNT:2
TIME  000:00:00
```

Use these keys to change selections. ◀ ▶ ▲ ▼

PopUp is a feature that “Pops Up” a plunger stalled in an oversized master valve into the lubricator for arrival sensing. Set the maximum time to wait for a plunger and how may times to try to pop up the plunger before resuming the normal ON cycle timeout.

Fast Plunger is a feature that detects a abnormally fast plunger and shuts-in the well to prevent damage to the wellhead. Set the minimum plunger arrival time and how may times to allow a fast plunger arrival before shutting in the well. Once shut-in, a manual reset is required to resume normal well operation.

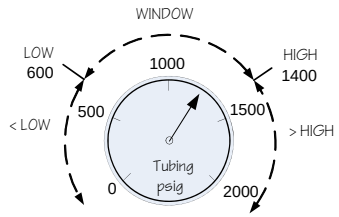
Sensor Gage Setup

Whatever the pressure sensor is connected to, the digital gage feature provides numeric set points to control the shut-in cycle and flow cycle timeout.

SET

```
GAGE HIGH LOW
SET  1400 0600
```

Use these keys to change selections. ◀ ▶ ▲ ▼



High/Low Pressure Gage

The digital gage provides “High” ON and a “Low” OFF set points. The “High” is active during the OFF or shut-in cycle. The “Low” is active during the ON cycle if DELAY time is set to zero (000:00:00), otherwise it is active only during the DELAY or afterflow cycle.

Clear Stored Data

Well performance data are computed and stored for display under the DATA key functions. The SET key's "Clear Stored Data" display provides a means to clear all stored well performance data at one time.

SET → CLEAR Stored Data No

CLEAR Stored Data Yes

Use these keys to clear stored data. ▲ ▼

Press the "Up" or "Down" key to clear stored data. The "No" status indicator will briefly show as a "Yes" to acknowledge that the command was executed. This function clears both Plunger Data and Totals Data at the same time.

Note that this function does not affect or alter setup parameters entered using the SET key, including timer, advanced and gage setup. All SET key setup information is automatically stored in a non-volatile memory every 15 seconds for safe keeping.

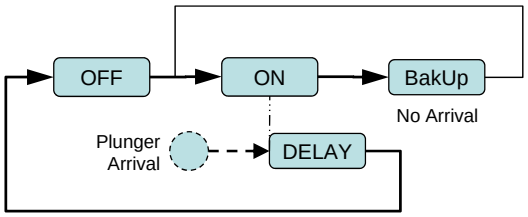
Status Displays

The first two data displays report what timer cycle is active and the timing cycle's remaining time.

1st Press. DATA → / DELAY ... ToGo 000:05:37

2nd Press. DATA → | Plunger OFF Sensor 0328.3

The typical timing cycle sequence is as illustrated below. Normal operation with a plunger arrival is OFF, ON, DELAY and back to OFF.



If a plunger arrival is not sensed by the end of the ON cycle, control goes to the BakUp or missed plunger shut-in cycle and then back to ON.

Plunger History

The 1st Plunger Data display tracks the most recent plunger arrival time, the number of successful arrivals (YES) and the number of missed arrivals (NO).

DATA → Press <> for PLUNGER Data

◀ ▶ → /PLUNGER YES NO 000:07:38 068 02

DATA → PLUNGER 0 Time 000:08:16

⋮

DATA → |PLUNGER 9 Time 000:06:45

Subsequent displays show the previous 10 plunger arrival times beginning with the last arrival (0) and ending with the 10th previous arrival (9). Using the SET key's "Clear Totals" setup screen, the plunger data can be cleared or reset. A zero (000:00:00) arrival time indicates no plunger arrival was sensed and is counted as a "missed" plunger.

Totals Data

Totals data provide a summary of valve operation over time. Total time displays show the total, cumulative time the unit has spent in a timing cycle. Note that the BakUp cycle time is included in the OFF cycle's total time and the DELAY cycle time is included in the ON cycle's total time.

DATA → Press <> for TOTALS Data

◀ ▶ → /OFF 083% 0023 Total 125:54:15

DATA → /ON 017% 0023 Total 007:31:48

There are two total displays – one for shut-in cycle and one for flow cycle. Each total display shows:

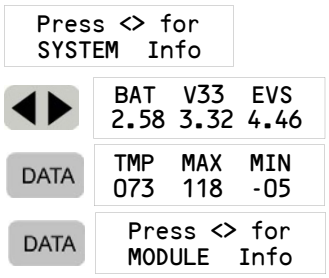
083% - total percentage of time in the cycle.
0023 - the cycle count.
125:54:15 – total time in the cycle.

The valve indicator in the upper left character position shows the current V1 valve status:

| => Valve is closed
/ => Valve is open.

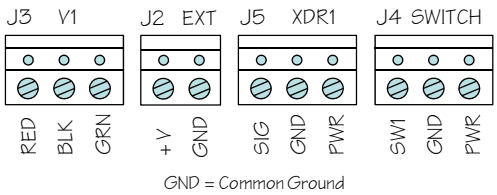
System Information

System Information displays show power, control panel temperature and Module Information. The power display shows battery voltage, wireless module voltage and valve EVS voltage. Temperature display shows current control panel temperature and the historical high and low temperatures since the last time the unit was power cycled.



The EVS voltage is generated by the patented Enhanced Valve Switching system and ensures battery voltage or condition does not adversely affect solenoid valve control.

Hardware Hook Up

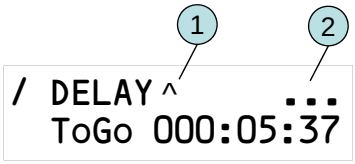


J3 - Valve	RED: Solenoid On control BLK: Solenoid common or ground GRN: Solenoid Off control
J2 - EXT	+V: Battery change input GND: Common or ground
J5 - Sensor	SIG: Sensor output GND: Common or ground PWR: Excitation voltage to sensor
J4 - Switch	SW1: Switch input GND: Common or ground PWR: Power to switch (+12V)

#22 AWG wire is recommended for sensor hook up.

Action Indicators

There are two action display fields in the Status display. The diagram below shows where indicators will show additional information.



1. Plunger arrival indicator. Shows a ^ only when switch sensor input (SW1) is closed indicating the plunger is on the surface.

2. Action Indicators. This will show what action terminated the current production cycle if it was not due to a normal cycle timeout.

…	Normal cycle timeout.
PopUp	PopUp is actively cycling valve.
Fast PGR	Fast Plunger detected.
HP OVR	Gage High set point triggered,
LP OVR	Gage Low set point triggered.
Plunger	Plunger arrival detected.

Accessories

Part Number	*Accessory Description*
9203-2002110	Pipe Mounting Kit 2-1/4 U-Bolt with extra 5/16" nuts . Uses universal mounting plate.
2503-1370315	Watertight Bushing. 1/8 NPT, Gray Nylon. Switch sensor cable entry.
4160-2032120	Universal Mounting Bracket. Black Zinc Plated #16 GA Steel. 2" Pipe or motor valve mount.
1980-2664500	Wireless Kit. (AM4100) Synapse 2.4 GHz RF Module or …. xBee 2.4 GHz RF Module 1000 ft. (300 m) Line of Sight range.
9200-0501770	Ext. 8 Watt Solar Panel w/ stand. 5 Vdc @ 1700 mA charging SolarMade SP8-10B
4008-0124000	NiMH "4/3-A" Battery 1.2Vdc @ 3800 mAh Tenergy NH15-2500-VP
4022-1206300	Utility Wall Socket Charger +6Vdc @ 300mA charge rate AeroMate Power Jack compatible