Operator's Guide

AeroMate™ WSC – 4x Analog Output Router

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

Introduction

Multi-Function Hardware

The AeroMate Analog Output Router is a multi-function module that includes two digital switch I/O's and four analog voltage outputs.

Customizable Measurement and Processing

Using the Integrated Device Manager (IDM) and web based version control system, the Analog Output module is fully customizable to meet any simple or complex application.

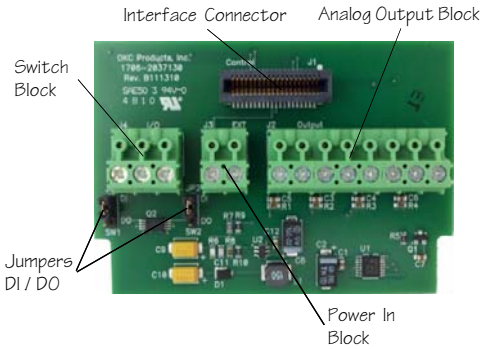
Configurable Analog Outputs

Configurable analog outputs use stable, high resolution 5V, 12-Bit Digital-to-Analog (DAC) converters. Calibration includes zero offset voltage, maximum voltage range and display units scaling to interface with any industry standard SCADA system and available wellhead controllers.

Configurable Switch I/O

Two digital switch I/O's are jumper selectable for input or output functions. Switch configuration allows for normally open (NO) or normally closed (NC) states as well input Time Constant and Pulse Width output control.

Router Module Board

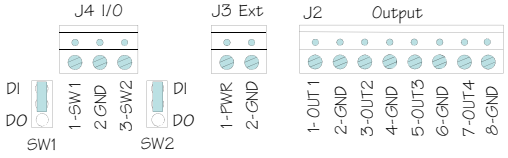


Removable, screw terminal blocks allow convenient hook up with 18 to 24 AWG wire. Eight terminal analog output block provides signal output and ground to interface with other equipment.

Jumpers select switch input (DI) or output (DO) for Switch Block SW1 and SW2 connections.

Power In Block is used to connect solar charger or other external power source for battery charging.

Hook Up Connections



J2 OUTPUT	OUT1 – Voltage output number 1. GND - Common ground connection.
J2 OUTPUT	OUT2 – Voltage output number 2. GND - Common ground connection.
J2 OUTPUT	OUT3 – Voltage output number 3. GND - Common ground connection.
J2 OUTPUT	OUT4 – Voltage output number 4. GND - Common ground connection.
J3 EXT	PWR - Solar / External power GND - Common ground connection.
J4 I/O	SW1 - Switch input/output terminal. GND - Common ground connection. SW2 - Switch input/output terminal.
SW1 / SW2	DI – J4 Switch input. DO – J4 Switch output.

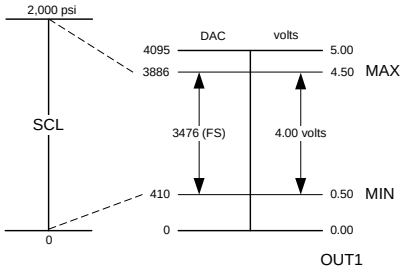
4x Analog Output Model

The 4x Analog Output includes four, 0-5 Vdc analog output ports. Analog outputs are fully scalable over the 0-5 Vdc output range for minimum and maximum voltage output. Module also includes two dual purpose switch I/O's for either input switch sensing or output switch control.

Applications include sensor voltage conversion, digital switch gauge and wireless routing to SCADA systems. This module provides a perfect solution for any analog voltage conversion or routing application.

Analog Output Conversion

Analog output conversion converts a numeric value to an equivalent, proportional voltage output. An example of the conversion process is to convert and scale a pressure sensor reading to an arbitrary voltage output range.



In the above example, a 2000 psi full scale pressure transducer's readings are converted and scaled over a 0.5 Vdc to 4.5 Vdc output range. Thus the analog output (OUT1) voltage will vary from 0.5 Vdc to 4.5 Vdc in direct proportion to changes in the 0-2000 psi pressure transducer's scaled output value.

What's Being Converted?

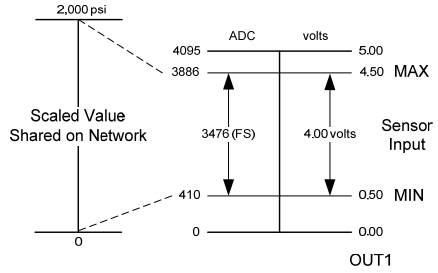
We have been discussing how the 4x Analog Output Router can scale and output sensor data to accommodate the input requirements of other standard control and data acquisition systems. But where does the sensor data come from?

As a component in a local wireless network, the 4x Analog Output Router receives sensor data from other wireless sensors and controls connected to it. Other wireless units that share data with the 4x Analog Output Router include PumpMate 2010 controllers and/or AeroMate sensors and controls, such as Valve, Sensor and Counter application modules. A list of the wireless vTagNet based products that are compatible with the 4x Analog Output Router include:

Module Number	Description	GID.FID
9208-2081000	PumpMate 2010	018.060
9203-2035100	2x Solenoid Valve	018.066
9203-2035200	1x Solenoid Valve	018.067
9203-2036100	2x Transducer	018.055
9203-2036200	1x Transducer	018.082
9203-2036300	1x Flow	018.083
9203-2036400	2x Analog Input	018.084
9203-2038300	3x Digital Counter	034.099

Wireless Data Transfer

Through a wireless network connection, AeroMate sensors and controls measure the voltage from flow, pressure, temperature and other types of sensors. This voltage may be converted to a "Scaled Value" in units of InW, psi and degrees Fahrenheit and shared with the 4x AnalogOutput Router.



In the above example, a 2000 psi full scale pressure transducer's 0.5 Vdc to 4.5 Vdc output is converted to a digital number using an Analog-to-Digital Converter or ADC. The digital number is then converted to the equivalent pressure in units of psi and is shared over the wireless network as a "Scaled Value".

Practical Applications

The 4x Analog Output Router has many practical applications where a flexible voltage output device is needed to translate analog sensor data. Regardless of the a sensor's voltage output characteristics, the 4x Analog Output Router can re-scale its output voltage to match other equipment's voltage input requirements. A few practical examples are outlined below.

1. Translating non-standard voltage sensor outputs to a standard voltage scale. For example, a pressure sensor with a 0.3Vdc to 4.8Vdc voltage output range is sent wirelessly to a 4x Analog Output Router that re-scales the output voltage to a 1.0Vdc to 5.0Vdc voltage range for input to a Fisher ROC SCADA system.

2. Consider the case where 1.0Vdc to 5.0Vdc voltage output pressure sensors are readily available but the well head controller your using only accepts a 0.5Vdc to 4.5Vdc voltage input range. Using the 2x Analog Input Router to read the pressure sensor, the sensor data is wirelessly sent to the 4x Analog Output Router to be re-scaled to the 0.5Vdc to 4.5Vdc voltage range for input to the well head controller.

4x Analog Output Displays

Data displays show current scaled, analog outputs and switch output or input status depending on I/O jumper selections. Other data displays may be used to present data from networked units or for reporting purposes.

DATA
```
Sensor OUT1 OUT2
  psi 0735 1348
```

DATA
```
OUTPUT SW1 SW2
Status OFF ON
```

DATA
```
INPUT  SW1 SW2
Status OFF ON
```

Analog data can originate internally or from networked units. Sample displays below show analog output setup and digital gage set points that may be used for static or differential pressure control functions.

SET
```
AO MIN  MAX  SCL
1 0400 4500 2000
```

SET
```
Gage1 LOW  HIGH
 psi  0035 0100
```

Use these keys to change selections. ◀▶ ▲ ▼

Switch Input Display

Switch inputs (DI) will sense up to 30 Vdc logic signals or dry contact switch actions. Switch input terminals share a common ground. Switch input (DI) status display shows the OFF/ON status of both J3 I/O switch inputs.

DATA
```
INPUT  SW1 SW2
Status OFF OFF
```

ON = Active. *OFF = Not Active.*

Type: Input switch active state.
LOW – Switch is normally open (NC).
HI – Switch is normally closed (NO).

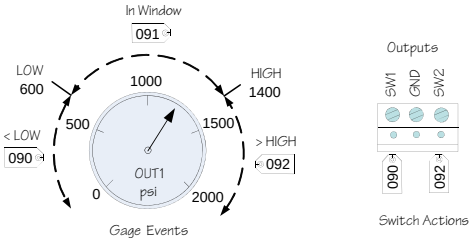
Time Constant: Time input must hold for sensing.
TC can range from 000 up to 999 seconds.
A 000 setting responds to the switch action within a 1 second period.

SET
```
SW1 Type eTag TC
    LOW 013 000
```

Use these keys to change selections. ◀▶ ▲ ▼

Digital Switch Gage

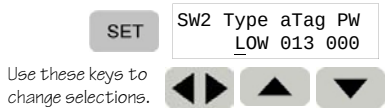
AeroMate programs associate sensor measurement set points with output switch actions by assigning an aTag to the output. This emulates a MurphyGAGE™ switch gage where "LOW" and "HIGH" set points define "< LOW", "In Window" and "> HIGH" regions for output switch control.



As shown above, selecting and analog output as the measurement source reference (Ref1) and assigning output switch action tags (aTag) to match switch gage event tags (eTag), provides a versatile digital switch gage setup. Using a second analog output as a reference (Ref2), also allows switch gage setup for differential measurements.

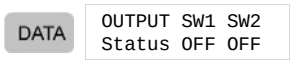
Switch Output Displays

Switch outputs (DO) are robust power switches capable of switching loads up to 20 Vdc at 2 Amperes and act as standard MurphyGAGE™ outputs. Switch outputs have a common ground and should be used to "ground" the load connected to the switch terminal.



TYPE: Output switch active state.
LOW – Switch is normally open (NC).
HI – Switch is normally closed (NO).

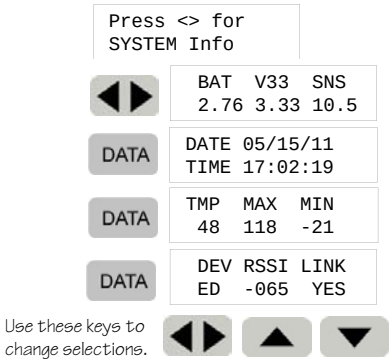
Pulse Width: Time the output will stay active.
PW can be from 000 up to 999 seconds. A 000 setting maintains the active state only as long as switch stays active.



ON = Active. OFF = Not Active.

System Displays

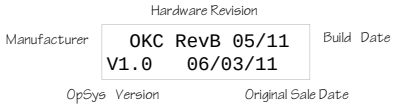
System displays show the current operating status of the device. A power display shows battery (BAT), wireless network module (V33) and sensors (SNS) voltage status.



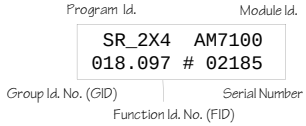
The Date/Time display shows the current real-Time clock settings. The control panels temperature history and wireless link status round out the suite of system LCD displays.

Important Device Information

Each application module has important device related information saved in its non-volatile memory that can be accessed through the LCD display interface. Manufacturing and sales information is included in a single display as shown below.



Device information is also included in a single display as shown below. This includes the unit's program name or identification, unit designation, hardware type code and serial number.



Accessories

Part Number	*Accessory Description*
9203-2002110	Pipe Mounting Kit 2-1/4 U-Bolt with extra 5/16" nuts . Uses universal mounting plate.
6016-PJ22206	Power Jack Cable – 6 foot 2 Conductor, #22 AWG Wire Molded 2.5mm Plug.
2503-1370315	Watertight Bushing. 1/8 NPT, Black Nylon. Direct thread into enclosure.
1980-2032400	Wireless XBee Kit. Maxstream 2.4 GHz Module. 300 ft. (100m) Line of Sight range.
1980-2032401	Wireless XBee-Pro Kit. Maxstream 2.4 GHz Module. 3000 ft. (1km) Line of Sight range.
9200-0490560	Ext. 2 W Solar Panel w/ stand. 4.1 Vdc @ 520 mA charging. 6 ft. Power Jack cable provided.
9200-0501200	Ext. 6 W Solar Panel w/ stand. 5 Vdc @ 1200 mA charging. 6 ft. Power Jack cable provided.