Model 4046 SDI Sensor
Instruction Manual 60-0004046-00

1.0 INTRODUCTION

1.1. General Description:

The model 4046 SDI Sensor provides an interface to convert inputs from two (2) analog sensors and one (1) tipping bucket to an SDI serial data interface. The 4046 also provides internal measurements of battery voltage and ambient temperature.

1.2. Specifications:

Size	3.5″LX0.75″WX2.1″H
Weight	1.9 oz.
Operating Temperature	-30-60Degrees Centigrade
Power requirements	12 VDC
	<200 uA during sleep
	<1 A for sensor power
Mounting:	Din Rail
Connections:	Screw Terminal
Wire Size	#24-#14 AWG
Inputs:	Gnd, + 12VDC, (2) Analog 0- 5VDC
	Tipping Bucket (contact closure to ground
Communication:	SDI -12 (version1.1 compliant)
Sensor Power:	12VDC or 5.00VDC (jumper selectable)

2.0 OPERATION

The 4046 responds to all basic SDI commands. The sensor power is switched on after successfully decoding a ″Start Measurement″ command and switched off at the completion of the measurement. The duration (sensor warm-up time is programmable using SDI commands. The 4046 will go into low power sleep state when it is not being polled. User values for Slope (multiplier) and Offset (adder) are programmable for both analog channels and tipping bucket. The tipping accumulator can be set to zero by SDI command.

2.1. Connections:

Analog inputs from the (2) external sensors are connected to **ANA in1** and **ANAin2** respectively with the common (ground reference) connection at **ANA Gnd.** Take care to observe polarity and limit the voltage input to 5V dc. The input **ANAin1** corresponds to SDI parameter 0 (first) and its Slope and Offset values correspond to "A". Input **ANAin2** corresponds to SDI parameter 1 (second) and its Slope and Offset values correspond to "B". The **EVNT In** corresponds to SDI Parameter 2 (third) and its Slope and Offset correspond to "C". Sensor Power (either 12VDC or 5.00VDC) is switched on before the Analog measurement takes place. The sensor warm-up time is user programmable. **External power sources for the sensor other than the switched power may cause problems with the Analog measurement if they are energized before the internal switched power is activated.**

3.0 SDI COMMANDS

All input and response characters are in ASCII format, 1200 baud, even parity.

'a' denotes the sensor address.

Note: If second command is sent to the sensor after starting a measurement, but before the measurement is ready, the sensor will abort the measurement.

Acknowledge Active: Returns a response acknowledging that the sensor unit is active.

command   **a!**   sensor response   **a<CR><LF>**

Send Identification: Returns SDI version, company name, sensor model #, sensor version#.

command   **aI!**   sensor response   **allccccccccmmmmmmvvv<CR><LF>**
II= SDI version   cccccccc=8 character vender ID   mmmmmm=6 character model ID vvv= 3 character sensor version

Address Query: Returns address for sensor. (Note Only one sensor may be on the buss for this query)

command   **?!**   sensor response   **a<CR><LF>**

<u>Start Verification</u>: Returns a string that imitates a checksum.

command **aV!** sensor response **a0011**<CR><LF>

<u>Change Address:</u> Change the address of the sensor unit. Valid addresses are those in the range 'O' to '9', A to Z'.

command **aAb!** sensor response **b**<CR><LF>
b is the new sensor address.

<u>Start measurement</u>: The unit reads five sensor devices: two external analog sensors, a tipping bucket counter, a battery voltage sensor, and an on-board temperature sensor. These are divided into two measurement groups.
Group 1 contains data from the **two analog sensors and the tipping bucket.**
Group 2 contains data from the **internal temperature sensor** and **battery voltage.**

To collect data from the group 1 sensors: command: **aM!**
sensor response: **attt3**<CR><LF>
3 Measurements will be ready in ttt seconds. Upon completion of the measurements a service request will be issued. **a**<CR><LF>
To collect data from the Group 2 sensors: command: **aM1!**
sensor response **A0012**<CR><LF
2 Measurements will be ready in 1 second. Upon completion of the measurements a service will be issued.

<u>Send Data</u>: The format of the data is determined by the preceding command. If Group 1 measurement results are being returned then data can contain three numbers. If Group 2 measurement results are being returned then the data will contain two numbers. All numbers in a data group are preceded with the sign of the number, either '+' or '-'.

command **aDO!** sensor response **axxxx...xx**<CR><LF>
xxx.xx up to 32 characters

The input **ANAin1** corresponds to SDI parameter o (first) and its Slope and Offset values correspond to "A". Input **ANAin 2** correspond to SDI parameter 1 (second) and it Slope and offset values correspond to "B". The **EVNT IN** corresponds to SDI parameter 2 (third) and its Slope and Offset correspond to "C'

<u>Change temperature Scale :</u>   The default scale is Fahrenheit.

To select the Celsius scale: command   **aXTC!**
                                        sensor response   **a0011<CR><LF>**

To select the Fahrenheit scale: command   **aXTF!**
                                        sensor response   **a0011<CR><LF>**
                                        service request   **a<CR> <LF>**

Results retrieved using a send data command **(aD0!)**
                  afahrenheit<CR><LF> or **aCelius <CR><LF>**

<u>Change Sensor Warm-up Time:</u>   The analog sensors have a variable warm-up
time. The sensor warm-up time can be 1to 255 seconds. The default time is 4
seconds.

                                        command   **aXSWttt!**
where ttt is the new sensor warm-up time.
                                        sensor response   **a0011<CR><LF>**
                                        service request   **a<CR><LF>**

The data is retrieved using a Send Data command   (aDO!):
Warmup=tttsec<CR><LF>

<u>Clear Tipping Bucket Accumulator</u> This command will "zero" the "precip" count.
                                        command: **aXZP!**
                                        sensor response: **a0011<CR><LF>**
                                        service request   **a<CR><LF>**

Results retrieved using a Send Data command (**aDO!**):
a Tip=0 **Offset** =(offset value)**Slope** = (slope value)<CR><LF>

Turn Analog Power ON: This command will "Switch ON" the 12V power output to the external analog sensor(s).

command	**aXON!**
sensor response	**a0001<CR><LF>**
service request	**a<CR><LF>**

Results retrieved a send data command **(aDO!): aVsw on for 25 sec**
Analog power will remain on for at most 25 seconds or until the next read of the sensor.

Turn Analog Power OFF: This command will "Switch Off" the 12 V power output to the external analog sensor(s).

command	**aXOFF!**
sensor response	**a0001<CR>LF>**
service request	**a<CR><LF>**

Results retrieved using a send data command **(aDO!) : a Vsw OFF**

Write User Defined Slope: The analog sensors and the tipping bucket have user defined slope (scaling) factors. The scaling factors can be real numbers in the range. Default slope values are 1.000.

command	**aXWScsxxxxxxx!**
sensor response	**a0011<CR><LF>**
service request	**a<CR>LF>**

where c is the channel selector: A=channel A,channel B, c for EVNTin (tipping bucket),**s** is the sign of the number: +or -,x is the numeric value. The response shows 1 data value will be ready in 1second upon which time a service request is issued by the sensor.

Write User Defined Offset: The analog sensors have a user defined offset value. The default value is 0.000

command	**aXWOcsxxxxxxx!**
sensor response	**a0011<CR><LF>**
service request	**a<CR><LF>**

where **c** is the channel selector: **c** =A for ANAin1, B for ANAin 2, C for EVNTin (tipping bucket), **s** is the sign of the number (+ or -), **x** is the numeric value. The response shows 1 data value will be ready in 1 second upon which time a service request is issued by the sensor.

<u>Read User Defined Offset</u>: Puts the value of the user defined offset value in the data return buffer. The data is retrieved by a return data command.

| command | **a XROc!** | | sensor response | **a0011<CR><LF>** |
| | | | service request | **a<CR><LF>** |

Where c is the channel selector: **c**= A for channel A, B for channel B,
                                                    C for EVNTin (tipping bucket)
The response shows that 1 data value will be ready in 1 second upon which time a service request is issued by the sensor.

4.0 <u>RETURNS</u>

Call us for tech support: 800-876-1172 or 916-638-3429 (many problems can be solved over the phone). Fax: 916-638-3270 or Email: globalw@globalw.com.

Be prepared to describe the problem being experienced including specific details of the application and installation and any additional pertinent information.

In the event that the equipment needs to be returned to the factory for any reason, please call to obtain a RMA # (Return Material Authorization). Do not return items without a RMA # displayed on the outside of the package.

Include a written statement describing the problems.

Send the package with shipping prepaid to our factory address. Insure the shipment, as the warranty does not cover damage incurred during transit.

When calling for tech support, please have the following information ready;

1.   Model #.
2.   Unit serial number.
3.   P.O.# the equipment was purchased on.
4.   Global Water's sales number or the invoice number.
5.   Repair instructions and/or specific problems relating to the product.

5.0 <u>WARRANTY</u>

Global Water Instrumentation, Inc. warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from date of shipment from factory. Global Water's obligations under this warranty are limited to, at Global Water's option: (I) replacing or (II) repairing; any products determined to be defective. In no case shall Global Water's liability exceed the products original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by Global Water Instrumentation, Inc., or which has been subject to misuse, negligence or accident. It is expressly agreed that this warranty will be in lieu of all warranties of fitness and in lieu of the warranty of merchantability.

The warranty begins on the date of the product's invoice.