AquiStar® GDL (SDI-12 & Modbus®)

INTERFACE SPECIFICATION / 1/9/2015 / 9B1340r4

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Specifications

Power supply voltage: 9.0 – 16.0VDC
Power supply current – Active: 3.5mA Typ. @ 12.0V (slightly higher with DO or Pulse board)
Power supply current – Sleep: 60µA Typ. @ 12.0V (slightly higher with DO or Pulse board)
Measurement Latency: Depends on warm-up time set in sensor
Default SDI-12 Address: 0

SDI-12 Command Nomenclature

a= Sensor address
{crc} = SDI-12 compatible 3-character CRC
<cr> = ASCII carriage return character
<lf> = ASCII line feed character
highlighted values indicate variable data

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Channel Setup Using Aqua4Plus

Standard SDI-12 commands are limited to returning a maximum of nine values. The GDL, depending on how it is configured, may have as many as 15 channels. For this reason, Aqua4Plus contains an SDI-12 setup utility to allow you to define which channels are returned for the M or C, M1 or C1, M2 or C2, and M3 or C3 commands.

Open the SDI-12 setup utility from Aqua4Plus by clicking on the Configure Menu and then selecting Advanced. From the flyout menu, select SDI-12 Setup.
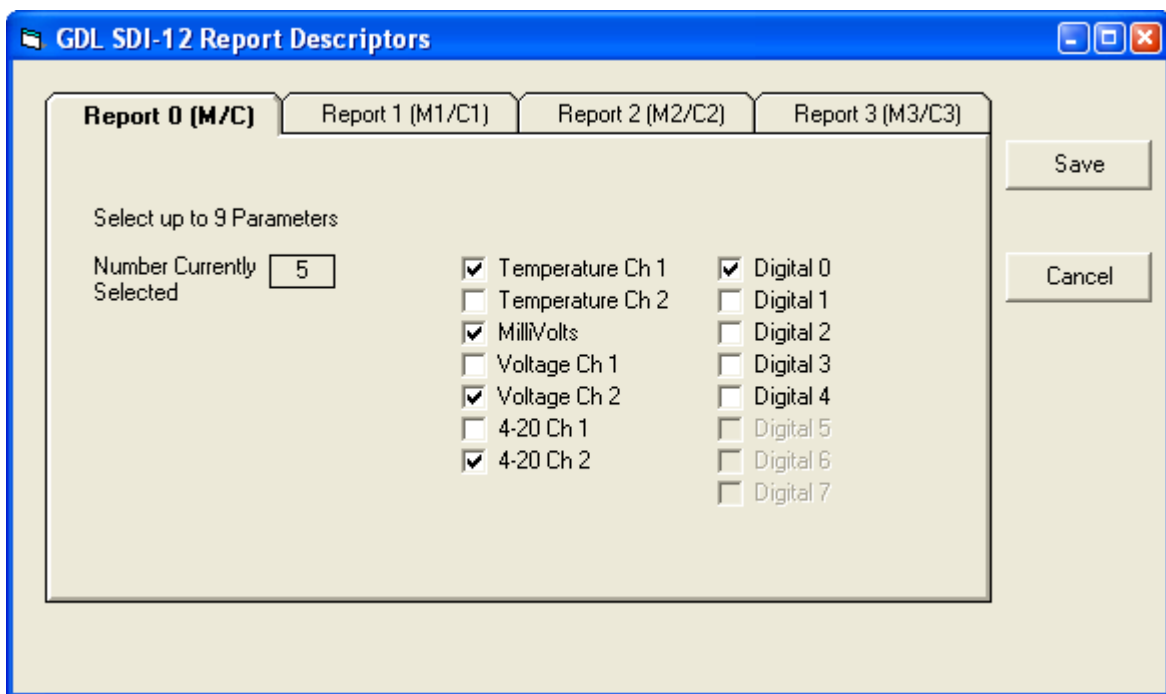
Use the SDI-12 Setup window in Aqua4Plus to define what values are returned for specific SDI-12 commands.

This window consists of four tabs, one for the M and C commands, one for the M1 and C1 commands, one for the M2 and C2 commands, and one for the M3 and C3 commands.

On the tab for the command you want to define, checkmark the channels to be returned using this command. A maximum of nine channels can be selected for any command.

Once you have selected the channels for each command you want to use, click on OK to save the information to the logger.

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SDI-12 Commands

Setup Commands

Name	Command	Response
Sensor Identification	aI!	a13 INWUSA TempHi2.6sssssssssss\<cr>\<lf> *Note: 2.6 will change to reflect current firmware revision,* *sssssssssss = device serial #*
Acknowledge Active	a!	a\<cr>\<lf>
Address Query	?!	a\<cr>\<lf>
Change Address	aAb!	b\<cr>\<lf> Change address from a to b

Measurement Commands

Note: The default units settings are:

Temperature channels	*Degrees Celsius*
mV channel	*mV*
Voltage channels	*Volts*
4-20 mA channels	*mA*
Digital Channels	*User defined*

To change these, use the Direct Read Units option under the Configure | Advanced menu in the Aqua4Plus Control Software.

Request Measurement

Name	Command	Response
Request measurement: • 1st selected channel • 2nd selected channel • … • Last selected channel	aM! aM1! aM2! aM3!	atttn\<cr>\<lf> *"n" values available after "ttt" seconds* *Sample:* a0023\<cr>\<lf>
Read results	aD0!	aValue1Value2…Valuen\<cr>\<lf> *Value1 = 1st selected channel* *Value2 = 2nd selected channel* *Value3 = …* *Valuen = last selected channel* *Sample*: a+22.0512+12.0512+…+15.343\<cr>\<lf >

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Request Measurement with CRC

Name	Command	Response
Request measurement: • 1st selected channel • 2nd selected channel • … • Last selected channel	MC! MC1! MC2! MC3!	atttn<cr><lf> *"n" values available after "ttt" seconds* *Sample:* a0023<cr><lf>
Read results	aD0!	aValue1Value2…Valuen{crc}<cr><lf> *Value1 = 1st selected channel* *Value2 = 2nd selected channel* *Value3 = …* *Valuen = last selected channel* *Sample*: a+22.0512+12.0512+…+15.343{crc}<cr><lf >

Concurrent Measurement

Name	Command	Response
Request measurement: • 1st selected channel • 2nd selected channel • … • Last selected channel	C! C1! C2! C3!	atttnn<cr><lf> *"nn" values available after "ttt" seconds* *Sample:* a00203<cr><lf>
Read results	aD0!	aValue1Value2…Valuen<cr><lf> *Value1 = 1st selected channel* *Value2 = 2nd selected channel* *Value3 = …* *Valuen = last selected channel* *Sample*: a+22.0512+12.0512+…+15.343<cr><lf >

Concurrent Measurement with CRC

Name	Command	Response
Request measurement: • 1st selected channel • 2nd selected channel • … • Last selected channel	aM! aM1! aM2! aM3!	atttnn<cr><lf> *"nn" values available after "ttt" seconds* *Sample:* a00203<cr><lf>
Read results	aD0!	aValue1Value2…Valuen{crc}<cr><lf> *Value1 = 1st selected channel* *Value2 = 2nd selected channel* *Value3 = …* *Valuen = last selected channel* *Sample*: a+22.0512+12.0512+…+15.343<cr><lf >

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Modbus Register Definitions

Parameter data

Read measurements using Modbus function 03 – Read Holding Registers. Readings are located in two registers each, starting at address 62592. (INW Smart Sensor register addressing is zero based, i.e., starts at zero. If your equipment uses one based addressing, you will need to add one to the register address.

Modbus parameter data is returned as 32-bit IEEE floating point values, high word first, also referred to as big-endian, float inverse, or float AB CD. Each value is 32 bits in length, and therefore occupies two Modbus registers. As a result, the parameter registers must be read as pairs.

Table 1: Register Addresses for GDL Data Logger

Addresses for standard channels

	Zero-Based	One-Based
Temperature 1	62592	62593
Temperature 2	62594	62595
mV	62596	62597
Voltage 1	62598	62599
Voltage 2	62600	62601
4-20 mA 1	62602	62603
4-20 mA 2	62604	62605

For futher addressing information and detailed examples, see INW application note, *"Modbus Direct Read on AquiStar Smart Sensors"* available from our web site at http://www.inwusa.com/appnotes.htm.

Addresses for digital channels

	Zero-Based	One-Based
If Configured for Dissolved Oxygen		
DO 1	62606	62607
DO Temperature 1	62608	62609
DO 2	62610	62611
DO Temperature 2	62612	62613
DO 3	62614	62615
DO Temperature 3	62616	62617
DO 4	62618	62619
DO Temperature 4	62620	62621
If Configured for Heart Rate Monitor		
Heart Rate	62606	62607
If Configured for Tipping Bucket Rain Gauge		
Rainfall	62606	62607
If Configured for Generic Digital Channels		
Digital 1	62606	62607
Digital 2	62608	62609
Digital 3	62610	62611
Digital 4	62612	62613
Digital 5	62614	62615

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Note: The default units settings are:

Temperature channels	*Degrees Celsius*
mV channel	*mV*
Voltage channels	*Volts*
4-20 mA channels	*mA*
Digital	*User defined*

For further addressing information and detailed examples, see INW application note, "*Modbus Direct Read on AquiStar Smart Sensors*" available from our web site at http://www.inwusa.com/appnotes.htm.

GDL's Power On Function

Some devices require a warm-up or stabilization time after application of power before accurate readings can be taken. The GDL provides a means to explicitly turn power on or off to the analog circuit and any devices attached to the switched power output prior to requesting a reading. This same function allows you to specify how long the circuit remains on after a reading has been taken.

There is a "power on" register on the GDL (register 62720 or 0xF500). When a positive value "n" is written to this register, the power is turned on to the sensing probe and remains on for n/4 seconds. When a reading is requested, the timer is reset and the sensing element remains on for another n/4 seconds. To force the power off immediately after a reading, for power savings, write a zero to the register. If the power to the entire GDL sensor is turned off, this value defaults to 30 (or 7.5 seconds).

The recommended procedure to ensure proper warm-up/stabilization and to conserve power is:

- Write Power On value of 30 (30/4 = 7.5 seconds) *
    - Power turns on
    - Starts sampling about two times per second
- Wait 7 seconds then request a reading *
    - Returns most recent sample
    - Resets Power On value to 30 (30/4 = 7.5 seconds) *
- Write Power On value of 0 (zero)
    - Turns power off
    - Retains last reading

* If your attached sensors have a longer warm-up/stabilization time, increase these values.

If You Cannot Write to the Power On Register

If you are reading your sensor using a meter or other device that cannot write the Power On value but simply takes readings on a specified schedule, be sure to set the polling interval to less than 7.5 seconds. This will ensure that the GDL is always providing power to the connected sensors and readings should be fresh and stable. Note that the first reading when you turn on the GDL will be old but will refresh within a second or two.

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Sensor Configuration/Control

Modbus registers are provided for the following configuration and control functions.

Modbus Register	Description
62976=a	Set sensor modbus address = a (Write Only)
64544=b	Set modbus baud rate according to b (Write Only) b=0:38400 b=1:19200 b=2:9600

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