TempHion Technical Bulletin
SDI-12 & Modbus® Interface Specs

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Specifications

Power supply voltage: 9.0 – 16.0VDC
Power supply current – Active: 3.5mA Typ. @ 12.0V
Power supply current – Sleep:60µA Typ. @ 12.0V
Measurement Latency: Approx. 1.4s
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

SDI-12 Commands

Setup Commands

Name	Command	Response
Sensor Identification	aI!	a13 INWUSA TempHi2.4ssssssssss<cr><lf> *Note: 2.4 will change to reflect current firmware revision, ssssssssss = device serial #*
Acknowledge Active	a!	a<cr><lf>
Address Query	?!	a<cr><lf>
Start Verification	aV!	a0000<cr><lf>
Change Address	aAb!	b<cr><lf> Change address from a to b

Measurement Commands

Note: The default units setting for temperature is Celsius. To change this, use the Direct Read Units option under the Configure | Advanced menu in the Aqua4Plus Control Software. When using the M!, MC!, C!, or CC! command, all mV channels will report in either pH, ppm, or Eh, depending on channel type (pH = pH, ISE = ppm, ORP = Eh). When using the M1!, MC1!, C1! or CC1! command, all mV channels will report in mV.

Note: *For firmware version 2.0 – 2.3, the M1 and M1! commands are swapped. Likewise for the MC!/MC1!, C!/C1!, and CC!/CC1! commands.*

Request Measurement

Name	Command	Response
Request measurement: temperature pH ISE ORP	aM!	atttn<cr><lf> *"n" values available after "ttt" seconds* *Sample:* a0024<cr><lf>
Read results	aD0!	aValue1Value2Value3Value4<cr><lf> *Value1 = temperature* *Value2 = pH in pH units* *Value3 = ISE in ppm* *Value4 = ORP in Eh* *Sample*: a+21.345+7.181+.053+.459.431<cr><lf>

Request measurement: temperature pH in mV ISE in mV ORP in mV	aM1!	atttn<cr><lf> *"n" values available after "ttt" seconds* Sample: a0024<cr><lf>
Read results	aD0!	aValue1Value2Value3Value4<cr><lf> *Value1 = temperature* *Value2 = pH in mV* *Value3 = ISE in mV* *Value4 = ORP in mV* *Sample*: +21.34-134.458+100.48+.84.404<cr><lf >

Request Measurement with CRC

Name	Command	Response
Request measurement: temperature pH ISE ORP	aMC!	atttn<cr><lf> *"n" values available after "ttt" seconds* *Sample:* a0024<cr><lf>
Read results	aD0!	aValue1Value2Value3Value4{crc}<cr><lf> *Value1 = temperature* *Value2 = pH in pH units* *Value3 = ISE in ppm* *Value4 = ORP in Eh* *Sample*: a+21.345+7.181+.053+.459.431{crc}<cr><lf>
Request measurement: temperature pH in mV ISE in mV ORP in mV	aMC1!	atttn<cr><lf> *"n" values available after "ttt" seconds* Sample: a0024<cr><lf>
Read results	aD0!	aValue1Value2Value3Value4{crc}<cr><lf> *Value1 = temperature* *Value2 = pH in mV* *Value3 = ISE in mV* *Value4 = ORP in mV* *Sample*: a+21.34-134.458+100.48+.84.404{crc}<cr><lf >

Concurrent Measurement

Name	Command	Response

Request measurement:
    temperature
    pH
    ISE
    ORP
	aC!	atttnn<cr><lf>
		"nn" values available after "ttt" seconds
		Sample: a00204<cr><lf>

Read results	aD0!	aValue1Value2Value3Value4<cr><lf> *Value1 = temperature* *Value2 = pH in pH units* *Value3 = ISE in ppm* *Value4 = ORP in Eh* *Sample*: a+21.345+7.181+.053+.459.431<cr><lf>

Request measurement:
    temperature
    pH in mV
    ISE in mV
    ORP in mV
	aC1!	atttnn<cr><lf>
		"nn" values available after "ttt" seconds
		Sample: a00204<cr><lf>

Read results	aD0!	aValue1Value2Value3Value4<cr><lf> *Value1 = temperature* *Value2 = pH in mV* *Value3 = ISE in mV* *Value4 = ORP in mV* *Sample*: a+21.34-134.458+100.48+.84.404<cr><lf >

Concurrent Measurement with CRC

Name	Command	Response

Request measurement:
    temperature
    pH
    ISE
    ORP
	aCC!	atttnn<cr><lf>
		"nn" values available after "ttt" seconds
		Sample: a00204<cr><lf>

Read results	aD0!	aValue1Value2Value3Value4{crc}<cr><lf> *Value1 = temperature* *Value2 = pH in pH units* *Value3 = ISE in ppm* *Value4 = ORP in Eh* *Sample*: a+21.345+7.181+.053+.459.431{crc}<cr><lf>

Request measurement:
    temperature
    pH in mV
    ISE in mV
    ORP in mV
	aCC1!	atttnn<cr><lf>
		"nn" values available after "ttt" seconds
		Sample: a00204<cr><lf>

Read results	aD0!	aValue1Value2Value3Value4{crc}<cr><lf> *Value1 = temperature* *Value2 = pH in mV* *Value3 = ISE in mV* *Value4 = ORP in mV* *Sample*: a+21.34-134.458+100.48+.84.404{crc}<cr><lf >

Modbus Register Definitions

Modbus® Register Definitions
All Modbus data is accessed as holding registers (4xxxxxx), using the Read Holding Registers (command type 3) and Preset Multiple Holding Registers (command type 0x10) Modbus commands.

Parameter data
Modbus parameter data is returned as 32-bit ieee floating point values. Each value is 32 bits in length, and therefore occupies two Modbus registers. As a result, the parameter registers must be read as pairs.

For firmware 2.5 and higher:

Modbus Register	Data Address	Description
462593	0xF480 (62592)	Temperature
462595	0xF482 (62594)	pH in pH units
462597	0xF484 (62596)	ISE in ppm
462599	0xF486(62598)	ORP in Eh
462601	0xF488 (62600)	pH in mV
462603	0xF48A (62602)	ISE in mV
462605	0xF48C (62604)	ORP in mV

For firmware prior to 2.5:

Modbus Register	Data Address	Description
462593	0xF480 (62592)	Temperature
462595	0xF482 (62594)	pH in mV
462597	0xF484 (62596)	ISE in mV
462599	0xF486(62598)	ORP in mV
462601	0xF488 (62600)	pH in pH units
462603	0xF48A (62602)	ISE in ppm
462605	0xF48C (62604)	ORP in Eh

Note: The default units setting for temperature is Celsius. To change this, use the Direct Read Units option under the Configure | Advanced menu in the Aqua4Plus Control Software. When reading the registers 462595, 462597, or 462599, values will report in mV. When reading the registers 462601, 462603, or 462605, values will report in either pH, ppm, or Eh, depending on channel type. (pH = pH, ISE = ppm, ORP = Eh)

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

Modbus Register	Data Address	Description
462977=a	0xF600 (62976)	Set sensor Modbus address = a (Write Only)
464545=b	0xFC20 (64544)	Set Modbus baud rate according to b (Write Only) b=0:38400 b=1:19200 b=2:9600

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