

WL3100

User Manual

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I Disclaimer

The information provided in this manual was deemed accurate as of the publication date. However, updates to this information may have occurred.

This manual does not include all of the details of design, production, or variation of the equipment nor does it cover every possible situation which may arise during installation, operation or maintenance. HyQuest Solutions shall not be liable for any incidental, indirect, special or consequential damages whatsoever arising out of or related to this documentation and the information contained in it, even if HyQuest Solutions has been advised of the possibility of such damages.

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II Safety Instructions

- Read the user manual including all operating instructions prior to installing, connecting and powering up the HyQuest Solutions WL3100. The manual provides information on how to operate the product. The manual is intended to be used by qualified personnel, i.e. personnel that have been adequately trained, are sufficiently familiar with installation, mounting, wiring, powering up and operation of the product.
- Keep the user manual on hand for later reference!
- If you encounter problems understanding the information in the manual (or part thereof), please consult the manufacturer or its appointed reseller for further support.
- HyQuest Solutions WL3100 is intended to be used in hydrometeorological or environmental monitoring applications.
- Before starting to work, you have to check the functioning and integrity of the system.
 - Check for visible defects on the WL3100, this may or may not include any or all of the following mounting facilities, connectors and connections, mechanical parts, internal or external communication devices, power supplies or power supply lines, etc.
 - If defects are found that jeopardize the operational safety, work must be stopped. This is true for defects found before starting to work as well as for defects found while working.
- Do not use the HyQuest Solutions WL3100 in areas where there is a danger of explosion.
- The present user manual specifies environmental/climatic operating conditions as well as mechanical and electrical conditions. Installation, wiring, powering up and operating the HyQuest Solutions WL3100 must strictly comply with these specifications.
- Perform maintenance only when tools or machinery are not in operation.
- If guards are removed to perform maintenance, replace them immediately after servicing.
- Never make any electrical or mechanical diagnostics, inspections or repairs under any circumstances. Return the product to the manufacturer's named repair centre. You can find information on how to return items for repair in the relevant section of the HyQuest Solutions website.



-  Disposal instructions: After taking the HyQuest Solutions WL3100 out of service, it must be disposed of in compliance with local waste and environmental regulations. The HyQuest Solutions WL3100 is never to be disposed in household waste!



-  Inputs and outputs of the device are protected against electric discharges and surges (so-called ESD). Do not touch any part of the electronic components! If you need to touch any part, please discharge yourself, i.e. by touching grounded metal parts.

1 Introduction

Thank you for choosing our product. We hope you will enjoy using the device.

HyQuest Solutions manufactures, sells, installs and operates quality instrumentation, data loggers and communication technology. Products are designed with passion for environmental monitoring and with a deep understanding of the quality, accuracy and robustness needed to fulfil the requirements of measurement practitioners in the field.

The present User Manual will help you understand, install and deploy the device. If, however, you feel that a particular information is missing, incomplete or confusing, please do not hesitate to contact us for further support!

WL3100 is a dry/dry differential pressure transducer. The difference between the pressure on the high and low pressure ports is linearised and converted to a usable 4-20 mA current output and made available as a digital serial SDI-12 output.

When used in conjunction with a Hyquest Solutions Dry Bubble Unit, Model HS-23 or the HS-55 or HS-40 Compressor Units, it allows the measurement of water head to a fine degree of accuracy and repeatability.



Note: All units are factory calibrated over their full operating temperature and pressure range in our Environmental Chamber and Ruska Pressure Calibrator. A calibration certificate is supplied with each Sensor.

2 Installation

Before connecting the power to the pressure transducer, you need to connect the instrument line to the pressure transducer as follows:

Undo the nut and remove the ferrules from inside the fitting.

1. Place the nut through the tube and then place the ferrules as shown in the figure Pressure Transducer Installation- Part (a)

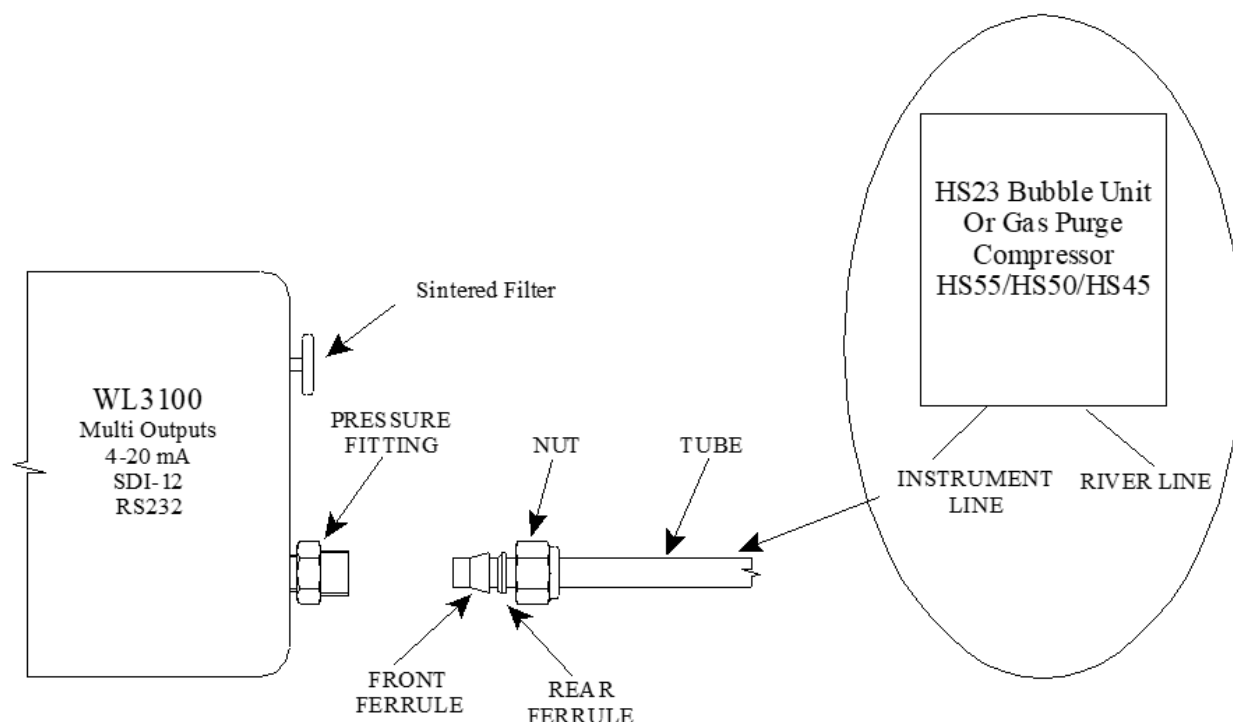


Figure 1 - Pressure Transducer Installation- Part (a)

2. Tighten the nut as shown in the figure Pressure Transducer Installation- Part (b) below.

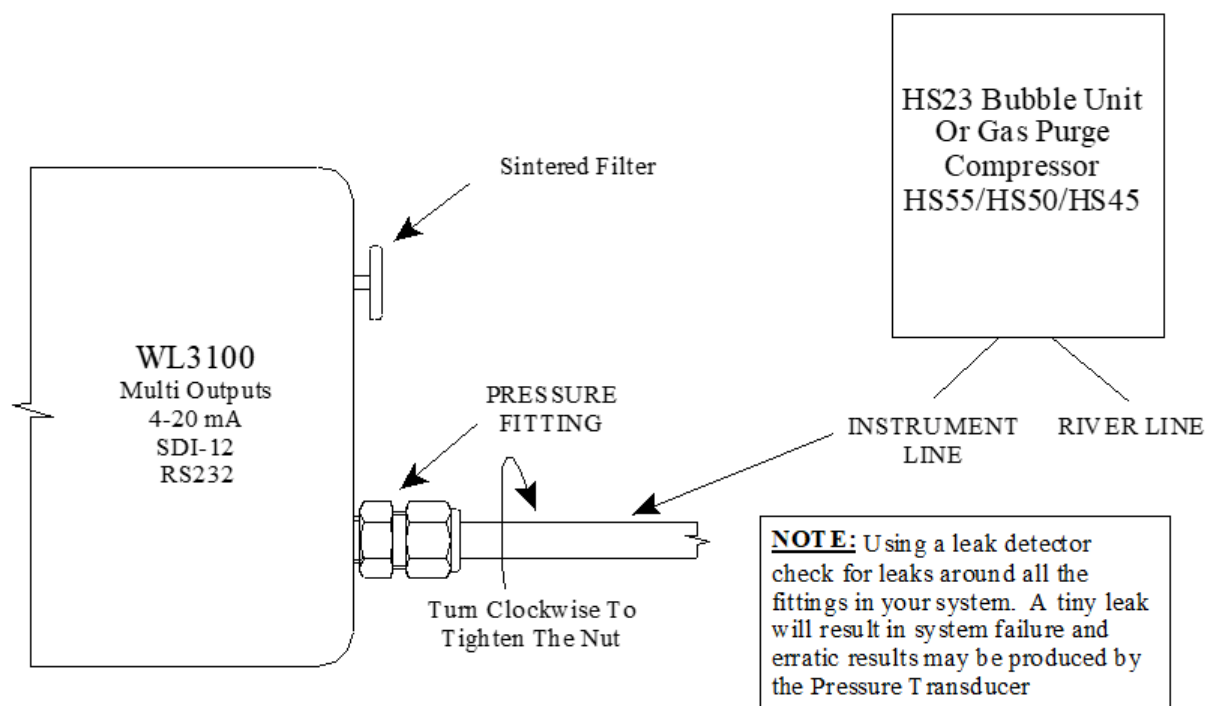


Figure 2 - Pressure Transducer Installation- Part (b)

1. Using a leak detector, check for leaks.
2. You are ready now to connect the power and run your WL3100.

Note: A pressure leak anywhere in the system will affect your level reading and produce erratic results.

- [Wiring Details](#) ⁷
- [Field Setup Procedure](#) ⁸

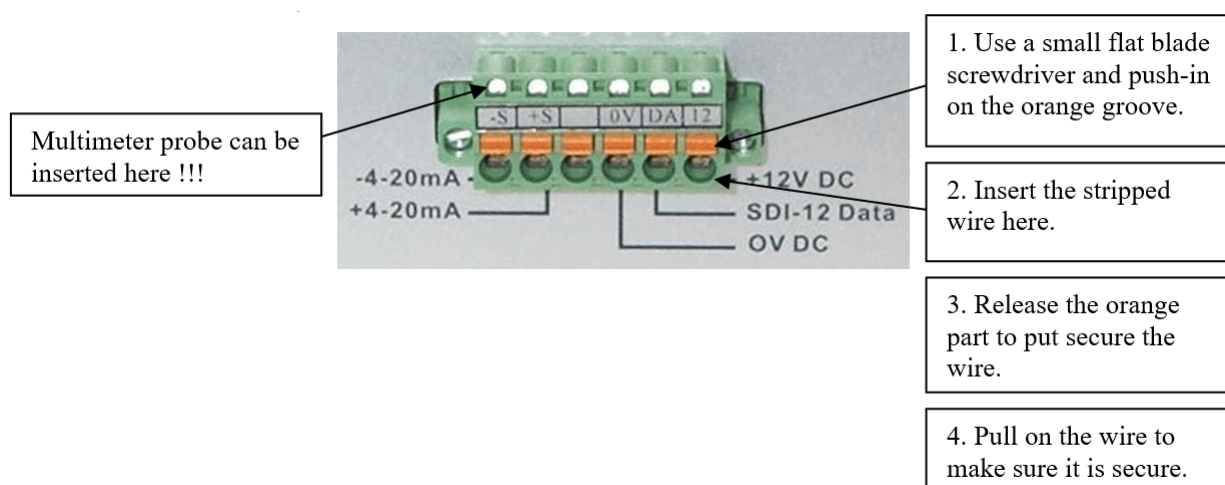
2.1 Wiring Details

This chapter contains the following subsections:

- [Screwless Terminals](#) ⁷
- [External Power](#) ⁷

2.1.1 Screwless Terminals

The plug in terminal block shown is a screwless terminal that keeps a constant tension on the wire that is inserted. (The mating socket on the front panel of the WL3100 is sealed with a waterproofing gasket.)

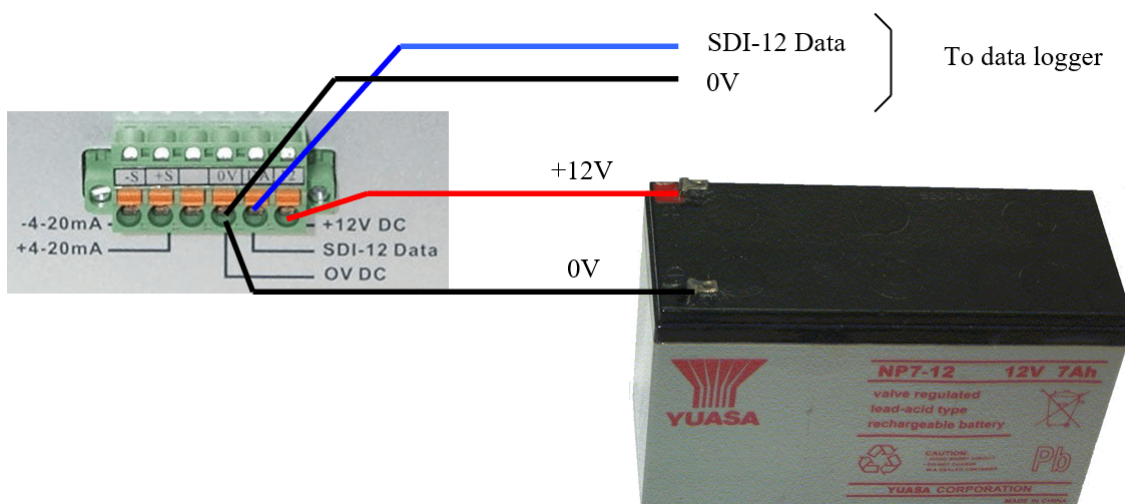


2.1.2 External Power

The WL3100 will only be able to make a water level measurement if +12VDC (9.0V to 16VDC) power is connected.

An adequate 12VDC (9 to 30VDC) battery and charger option should be used if the optically isolated 4-20 mA current loop is to be powered continuously and independently of the telemetry module or data logging equipment.

The easiest way to see if +12V is present is to press one of the WL3100 buttons and check that the backlighting comes on.



4-20mA Interface

The 4-20mA interface in the WL3100 is optically isolated from the 0V and +12VDC on the right hand end of the connector. The 4-20mA circuitry must be powered by the loop.

There are 2 ways to take 4-20mA measurements:

1. **“Continuous Meas” set to Off (S/W Rev 7.1 and lower)**
“Sampling Mode” set to Single (S/W Rev 7.2 and higher)

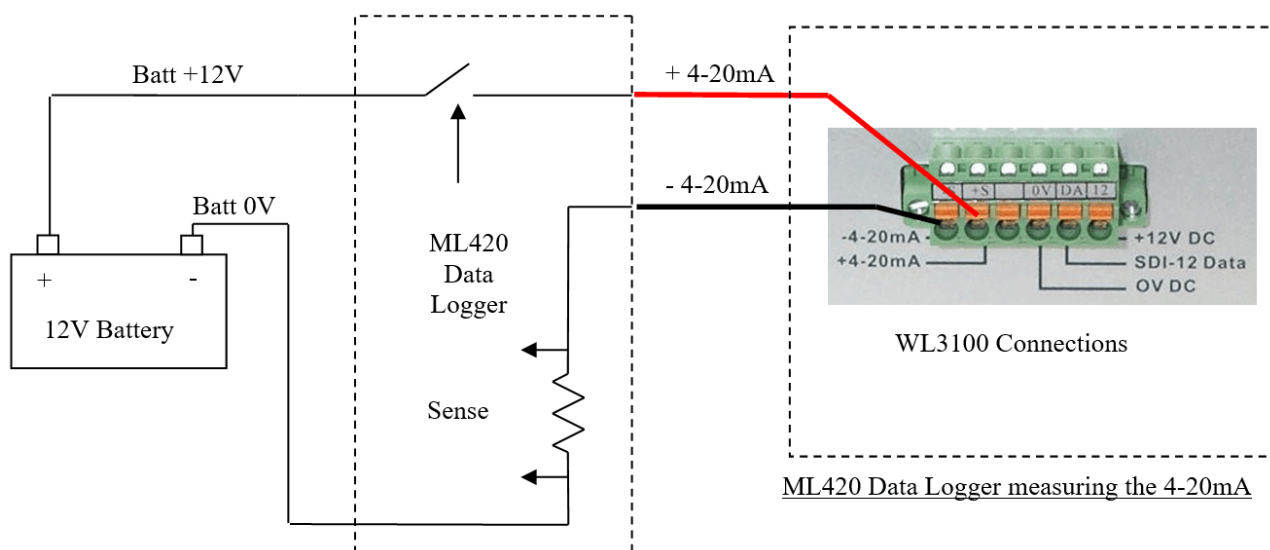
When the WL3100 detects loop power, it initiates a water level measurement – this takes 12 seconds – the 4-20mA current is updated at the end of the measurement and the data logger can measure the current. Therefore the data logger must be set for transducer “warm-up” of about 15 secs.

2. **“Continuous Meas” set to On (S/W Rev 7.1 and lower)**
“Sampling Mode” set to Contin+Avg X (S/W Rev 7.2 and higher)

The WL3100 is set to take a measurement continuously (every 12 secs). When the WL3100 detects loop power, it updates the 4-20mA current within 100mS - with the water level previously measured within the last 12 secs. Therefore the data logger can be set for a transducer “warm-up” of about 1 sec.

The following diagram shows how the 4-20mA interface must be loop powered.

(This example uses the Hyquest Solutions ML420 Data Logger.)



Please note: The SDI-12 interface and the 4-20mA interface can be used at the same time by 2 different devices. For example, a data logger can be connected to the SDI-12 interface while an RTU is connected to the 4-20mA interface!!!

2.2 Field Setup Procedure

1. Install the WL3100 Multi Output Dry Transducer as per mechanical installation procedures.
2. Press either of the two push buttons on the dry transducer to activate the LCD display.
3. Use the scroll button to scroll through the menu to “Set Level” and press the select button.
4. Use the select button to move the blinking cursor to the desired digit position (that needs to be changed), and use the scroll button to increment the value. When the rightmost digit is at the desired value press the select button to save the value. Press select button again to start with the left most digit again.
5. After the select button is used to save a value ie. Water level, date, etc., then pressing the scroll button will continue to step you through the menu as before.
6. The 4-20mA current loop will be continuously updated as the various parameters are changed.
7. The 4mA water level and the 20mA water level can be set separately. (See the menu tree structure in the LCD Operation section)
8. The various parameters may also be set by the SDI-12 “special command” set, via the SDI-12 Input connection, or the RS-232 connection if a laptop is available using a simple terminal emulation program whereby ASCII characters are typed (adhering to the SDI-12 Ver 1.3 protocol). Note: If the commands are being typed by the operator, the “Comms Type” must be set to RS232. In this mode the strict SDI-12 timing is ignored. An adapter cable needs to be used in this mode. See section Appendix B.

3 External Power

Even though the Multi Output Dry Transducer has an internal lithium battery, an analog measurement can only be made if +12VDC (9.0V to 16VDC) power is connected. This supplies power to the analog measurement circuitry.

An adequate 12VDC battery and charger option should be used if the 4-20 mA current loop is to be powered continuously and independently of the telemetry module or data logging equipment.

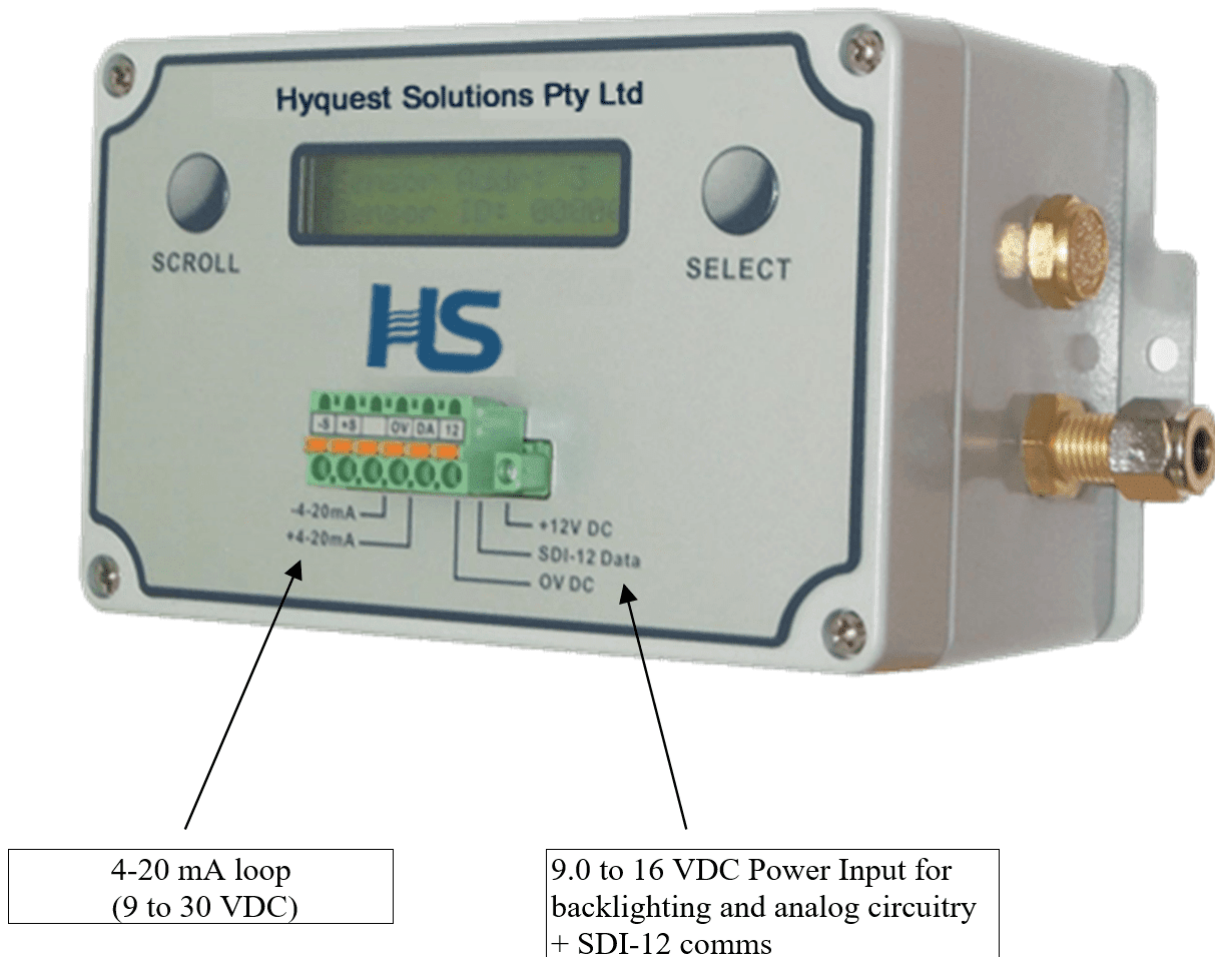
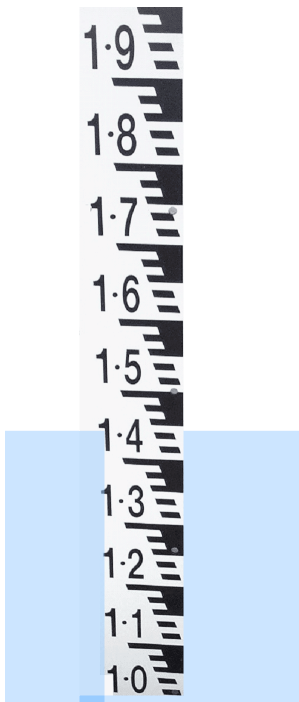


Figure 3 - External Power Connections

4 Configuration

1. If using the SDI-12 interface, set the required address by stepping to the "Sensor Addr" menu, and pressing the "Select" button and then use the "Scroll" button to set the address from 0 to 9.
2. If using an SDI-12 logger, make sure the "Comms Type" is set to SDI-12. If using an RTU with an SDI-12 to RS232 adapter then set the "Comms Type" to RS232.
3. Use the staff gauge in the river to measure the water level (1.450m).
4. Step to the "Set Level" menu and set it to 1.450m.
If operating in SDI-12 mode, setup is complete.
If operating in 4-20mA mode then continue with step 5.
5. Estimate the range over which the water level will change (eg. Min level = 1.000m: Max Level = 8.000m).
6. Step to the "4mA / 20mA Level" menu.
Set the 4mA level to 1.000m.
Set the 20mA level to 8.000m.
When the water level is at 1.000m the 4-20mA current will be 4.000mA.
When the water level is at 4.500m the 4-20mA current will be 12.000mA.
When the water level is at 7.000m the 4-20mA current will be 20.000mA.
7. The range in this example is $8.000 - 1.000 = 7.000\text{m}$.
Set the logger range to 7.000m (eg. ML420 range is set with TxR=7.000).
8. The offset in this example is 1.000m.
Set the logger offset to 1.000m (eg. ML420 offset is set with RvHR=1.000).
9. Set the logging interval and transducer warmup period in the data logger. There are 2 ways to set the transducer warmup period - if the "Continuous Meas" is set to YES, then the warmup can be set as low as 1 sec. (Slightly more power is drawn in this mode as the WL3100 continually takes measurements.) If however, the "Continuous Meas" is set to NO, then the warmup must be set for about 15 secs (eg. Say ML420 interval is 15mins and warm up is 1 sec then TXI=015/01).



Note: Setting the 4-20mA range to the smallest possible will give the best resolution on a 4-20mA interface!

5 Operation

The WL3100 Multi Output Dry Transducer powers up and takes a measurement at the following times:

- When the **LEVEL** is displayed on the LCD, a reading is taken every 12 seconds and the Level on the LCD is updated.
- When the 4-20mA current loop has power applied, a reading is taken every 12 seconds. The 4-20mA current loop is updated at the same time.
- When the SDI-12/RS232 interface requests a measurement using the **M** or **C** commands.
- When the LCD menu **CONTINUOUS MEAS** is set to **YES**, a measurement is taken every 12 secs.
- LCD Screen [17](#)
- Power Consumption [18](#)

5.1 LCD Screen

There are 7 main LCD screens available. Some screens display internal data and some allow parameters to be changed. The screens are:

LCD SCREEN	Description
WL3100 S/W 7.2 Level 9.392 m	Display model, S/W Rev and present river level.
Sensor Addr: 2 Sensor ID: A-345	Display Sensor SDI-12 address and 5 digit ID.
Comms Type: SDI-12	Allows the comms type to be selected SDI-12 or RS232.
4-20mA Level: 0.0-10.0 m	Indicates the 4mA Level and the 20mA Level.
Set Level: 12.392 m	Allows the present River Level to be preset - internally calculates an offset.
Calc Offset: 0.003 m	Displays the internally calculated offset generated through the previous Set Level.
Sampling Mode: Single	Contin+Avg 3 => the river level is continuously measured and the last 5 values are averaged. Single=> the river level is only measured when requested.

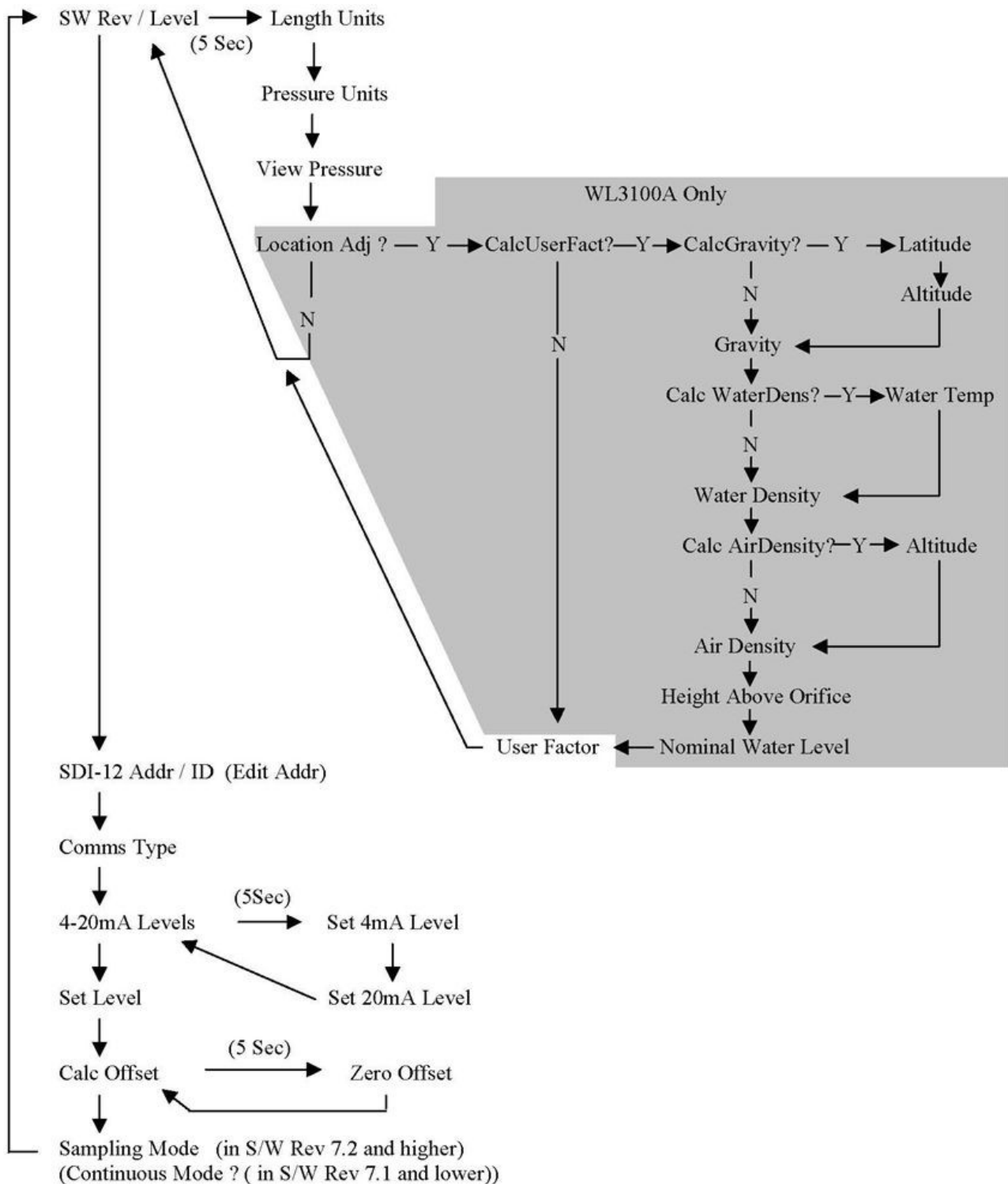
Note: When the River Level is "Set", the difference between the user entered River Level, and the raw data measured from the transducer is calculated. This calculated offset is saved into non-volatile memory, and is added to the raw transducer level each time a measurement is taken. In this way all calculations are made transparent to the operator.

A measurement of the river level is initiated when a button is pressed (LCD is on) OR when "Continuous Meas" is set to Yes and +12V is present OR when 4-20mA current is present, OR when an SDI-12 Measure command is received.

There are many other menu items that allow fine tuning of the calibration if this is required, as well as changing units of measurement (m/ft) and pressure (psi/kPa). Please note the menu tree on the next page should be examined carefully before embarking through it.

Menu Tree

Normally the **SCROLL** button is used to step to the next menu item indicated by an arrow. However, when a time (eg. 5 Sec) is indicated above an arrow, the “Select” button is pressed for the indicated time to access the configuration menu item.



- Sampling Mode - Single, Continuous, Averaging ^[13]
- RS 232/SDI-12 Selection ^[14]

5.1.1 Sampling Mode – Single, Continuous, Averaging

In **S/W Rev 7.1** and lower, the last menu item shown in the [Configuration](#) section is “Continuous Mode?”. This could either be set to YES or NO.

When “Continuous Mode” is set to “NO” the WL3100 only takes a sample when:

1. The water level is displayed on the LCD or
2. An SDI-12 Measure command is received or
3. The 4-20mA loop power is detected.

When “Continuous Mode” is set to “YES” the WL3100 takes a sample:

1. Every 12 secs. (Continuously)
(This is useful if you use the SDI-12 command ORO! as it will immediately return the most recent measurement made within the last 12 secs - which makes the WL3100 SDI-12 interface the same as the AD375A SDI-12 interface. It can also be useful when using the 4-20mA interface, as the 4-20mA loop current will be accurately updated 100mS after loop power is applied - without having to wait 12 secs for a measurement to be made!!)

In **S/W Rev 7.2** and higher, the last menu item shown on page 12 is “Sampling Mode”. This could either be set to Single, Contin+Avg 1, Contin+Avg 2,....., Contin+Avg 20.

When “Sampling Mode” is set to “Single” the WL3100 only takes a sample when:

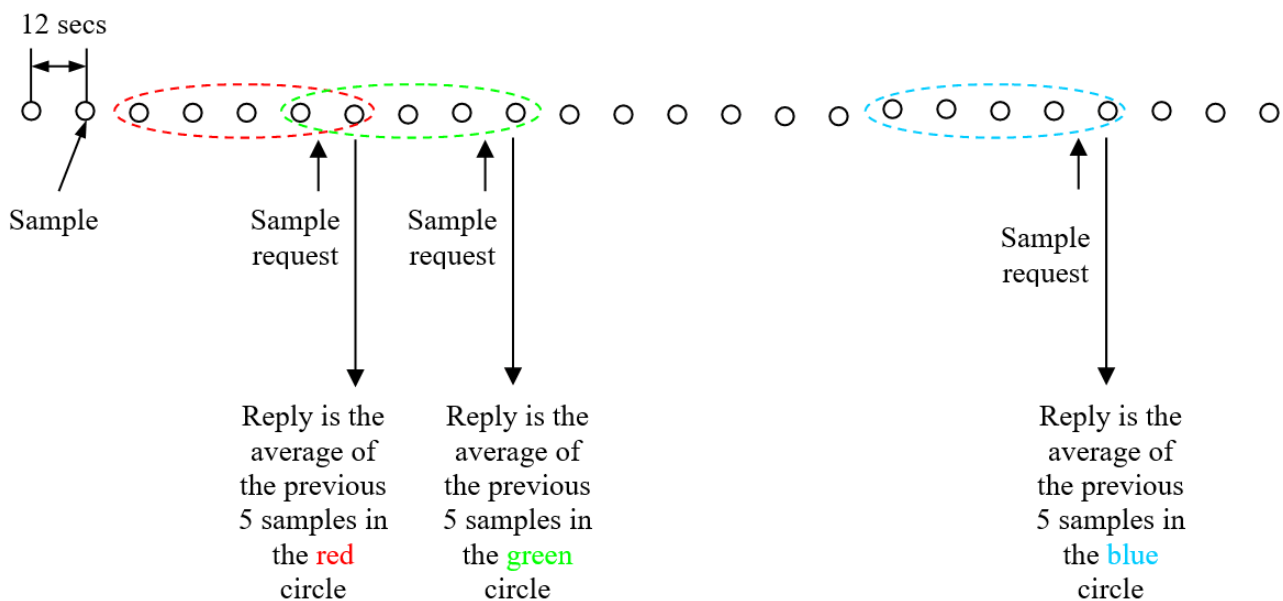
1. The water level is displayed on the LCD or
2. An SDI-12 Measure command is received or
3. The 4-20mA loop power is detected.

When “Sampling Mode” is set to “Contin+Avg X” the WL3100 takes a sample:

1. Every 12 secs. (Continuously)
(When a sample is requested, via the display or via SDI-12 or 4-20mA, the last **X** samples are averaged. If it is known that the water level will change very slowly, it is advantageous to set X to a high number, so that the last say 20 samples will be averaged. Note that 20 samples will take $20 \times 12\text{secs} = 240\text{secs} = 4\text{mins}$. (So the water level is averaged over a 4 minute period) If it is known that the water level changes rapidly, then it would be better to set X to a low number, so that say 2 samples will be averaged.)
The “Contin+Avg 1” mode only averages 1 sample, which at first appearance doesn’t seem to be very useful - this was included to give the same operation as the above described “Continuous Mode” set to “YES”. (Read the description above to see why this mode is useful.)

Averaging

The following diagram shows what happens when the WL3100 is set to average “**5 samples**”. (When in average mode, the WL3100 takes a sample every 12 secs (Each circle represents a “sample” that is a highly filtered, 24 bit high accuracy, temperature compensated value!)



When a sample is requested (via the LCD, SDI-12 M command or 4-20mA), the next periodic sample will reply with an average of the previous 5 samples (obviously the number of samples used to calculate the average will depend upon the setting selected - between 1 and 20).

(If the SDI-12 ORO! command is used, then the samples immediately prior to the command being received are used to perform the average!)

5.1.2 RS 232/SDI-12 Selection

The SDI-12 protocol has very strict timing requirements. The operator may use the SDI-12 to RS232 adaptor cable and then communicate using RS232 from a PC. The "RS232" option must be selected via the LCD and pushbuttons. In this mode all of the timing/break requirements of the SDI-12 are removed. Commands may be typed from a terminal program such as "Hyperterm". (See Appendix B for details of the SDI-12 to RS232 converter)

Note you must use 1200 baud, 7 bits, even parity and no handshaking.

If using an SDI-12 logger you must select the "SDI-12" option via the LCD and pushbuttons.

- [SDI-12 V1.3 Compliant Command Set](#)¹⁴
- [Special SDI-12 Commands](#)¹⁵

5.1.2.1 SDI-12 V1.3 Compliant Command Set

SDI-12 V1.3 Compliant Command Set (CRC commands are implemented)

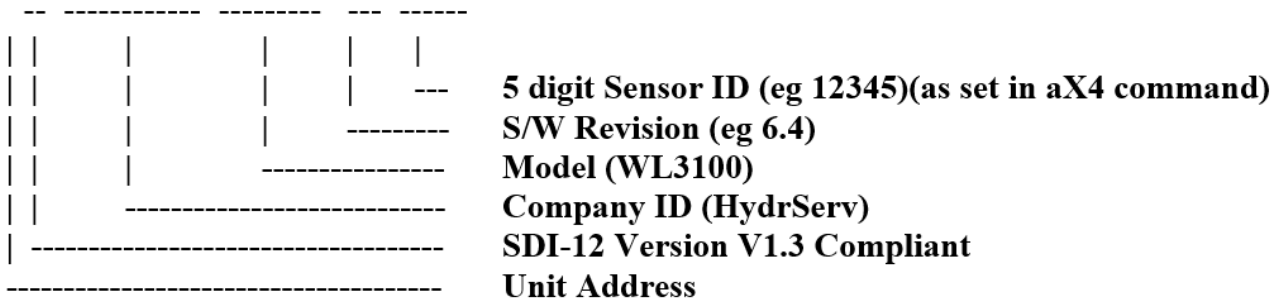
(Please note the letter 'a' in the commands below refer to the SDI-12 address 0, 1, 2,...9)

Name	Command	Response
Break	Continuous spacing for at least 12 milliseconds	None
Acknowledge Active	a!	a<CR><LF>
Send Identification	a!	allccccccmmmmmmvvvxxx...xx<CR><LF> (Refer Note 1.)
Change Address	aAb!	b<CR><LF>
Address Query	?!	a<CR><LF>
Start Measurement	aM! or aMC!	atttn<CR><LF> (Refer Note 2)
Send Data	aDO!	a<value><CR><LF> or a<value><CRC><CR><LF>
Continuous Measurement	aRO! or aRCO!	a<value><CR><LF> (Refer Note 3) a<value><CRC><CR><LF>
Start Verification	aV!	atttn<CR><LF> (Refer Note 4)

Name	Command	Response
Start Concurrent Measurement	aC! or aCC!	atttnn<CR><LF> (Refer Note 2)

Note 1:

a13HydrServWL31006.412345<CR><LF>



Note 2:

The measurement command “M” and the concurrent command “C” will both return a time “ttt” of 012 indicating that the measurement will be ready in 12 seconds. Do not request data within this 12 second window, or an empty reply will be received. (In accordance with the SDI-12 protocol.) When an “M” command is in progress, the dry transducer will issue a service request “a<CR><LF>” when the measurement is complete and ready for a data request. (Again, in accordance with the SDI-12 protocol)

Note 3:

The Continuous Measurement command returns the present River Level.

If the LCD command “Continuous Meas?” is set to “Yes” then the river level is continuously measured when 12V is present and so the aRO! returns the river level without having to issue an aM! Measure command.

Note 4:

aV! Initiate Verify Command

Test the lithium battery.

The Multi Output Dry Transducer returns a0001<CR><LF> indicating that there is 1 measurement available and it will be ready in 0 seconds. When the Data command aDO! is issued the dry transducer will reply with:

a+o<CR><LF>
 |
 ----- **Lithium Battery Condition (0=> Battery OK : 1=> Battery Low)**

Please note:

For more information on SDI-12 commands, go to the www.sdi-12.org website and download the “SDI-12 Protocol Specification” available on the home page.

5.1.2.2 Special SDI-12 Commands

The following commands conform to the SDI-12 protocol, and allow specific parameters within the WL3100 to be configured. Care should be taken with some commands, as they may destroy the factory calibration.

aXn!	Return data associated with command 'n'. The multi output dry transducer will reply with a0001<CR><LF> The aDO! command must be issued to get the actual data.
------	---

aXn+xxxx!	Set parameter for command 'n'. The multi output dry transducer will reply with a0001<CR><LF> The aDO! command must be issued to get the actual data.
-----------	---

Set/Get Current Value

aX0!	Get the river level (River level from last measurement).
aX0+0012.345!	Set the river level to +12.345 m (or ft).

Get Multi Output Dry Transducer Pressure

aX1!	Get the Pressure. eg. +0004.524 psi (or kPa)
------	--

Get/Set the 4mA Level

aX2!	Get the 4mA Level.
aX2+0002.5!	Sets the 4mA Level to 2.5m (or ft) When the water level is 2.5m then the 4-20mA loop will pass 4mA

Get/Set the 20mA Level

aX3!	Get the 20mA Level.
aX3+0020.0!	Sets the 20mA Level to 20.0m (or ft) When the water level is 20.0m then the 4-20mA loop will pass 20mA

Set/Get ID Number

aX4!	Get the dry transducer ID.
aX4+12345!	Set the dry transducer ID. Acceptable values 0-65535. This value appears in the Identify command.

Set/Get Time

aX5!	Get the dry transducer Time.
aX5+0135!	Set the dry transducer Time to 01:35 (24 hour clock)

Set/Get Date

aX6!	Get the dry transducer Date.
aX6+011204!	Set the dry transducer Date to 1-Dec-2004.

Set/Get the User Factor

aX7!	Get the User Factor.
aX7+0.705373!	Set the User Factor to 0.705373 m/psi

Increment the 4mA Calibration

aX96+00!	Examine the present 4mA Calibration without altering it. (This also saves the calibration)
aX96+05!	Increment the 4mA Calibration by 5 steps (This should be done while accurately measuring the current on the 4-20mA loop) (If the calibration is changed, always finish by sending aX96+00! to save it)

Increment the 20mA Calibration

aX97+00!	Examine the present 20mA Calibration without altering it. (This also saves the calibration)
aX97+03!	Increment the 20mA Calibration by 3 step (This should be done while accurately measuring the current on the 4-20mA loop) (If the calibration is changed, always finish by sending aX97+00! to save it)

Set/Get the Lo Pressure

(Note: This command could destroy the factory calibration)

aX98!	Get the value used to set the Low Pressure.
aX98+0000.702!	Set the Low Pressure to 0.702 psi (or kPa) (Perform a measure aM! before setting the low pressure - see note below)

Set/Get the Hi Pressure

(Note: This command could destroy the factory calibration)

aX99!	Get the value used to set the High Pressure.
-------	--

aX99+0016.317!	Set the High Pressure to 16.317 psi (or kPa)
----------------	--

The normal sequence of setting the Lo or Hi pressure would be:

(Note: Accurate pressure measuring equipment is required for this procedure)

1. Set the pressure to the Lo end of the scale and measure with accurate equipment
2. Perform a measure aM!
3. Perform a Get Pressure aX1! and then Get Data aD0!
4. If the pressure is different to that measured, perform a Set Lo (or Hi) Pressure
5. Repeat steps 2, 3 and 4 for Lo pressure until the returned value matches the value on the accurate measuring equipment.
6. Increase the pressure to the Hi end of the scale and repeat steps 1 to 5 for Hi pressure until the returned value matches the value on the accurate measuring equipment

5.2 Power Consumption

There are several different power supply options and the current consumption depends on which option is used.

Note: Analog measurements cannot be taken unless 12V power is connected.

The 4-20mA loop current is supplied by the logger / RTU measuring the 4-20mA and does not draw any current from the SDI-12 12V power supply!

	NO EXTERNAL POWER - NO ANALOG MEASUREMENT	SDI-12 12V POWER (ALLOWS ANALOG MEASUREMENT)	ACTIVE 4-20 mA LOOP CURRENT	
Mode	Internal Lithium Battery (Prior to 2010 only)	Internal Lithium Battery	SDI-12 Power	
Asleep	3 to 30 FA	0	Stays awake when 12V is present 3.5mA continuous (not measuring)	4-20 mA
RS232 Comms	< 2 mA for 45 sec	0	17 mA for 1.5 sec (while measuring) 3.5 mA otherwise	4-20 mA
SDI-12 Comms	< 2 mA for 20 sec	0	17 mA for 1.5 sec (while measuring) 3.5 mA otherwise	4-20 mA
LCD on	< 8 mA for 30 sec	0	70 to 83 mA @ 12V (Backlighting on)	4-20 mA

6 Maintenance

The WL3100 Multi Output Dry Transducer requires no maintenance, however all connected mechanical equipment should be periodically checked for cleanliness and ease of operation.

Models prior to 2010 had internal 3.6V AA size lithium batteries that should be replaced when required (Expected operating life is 3 years minimum).

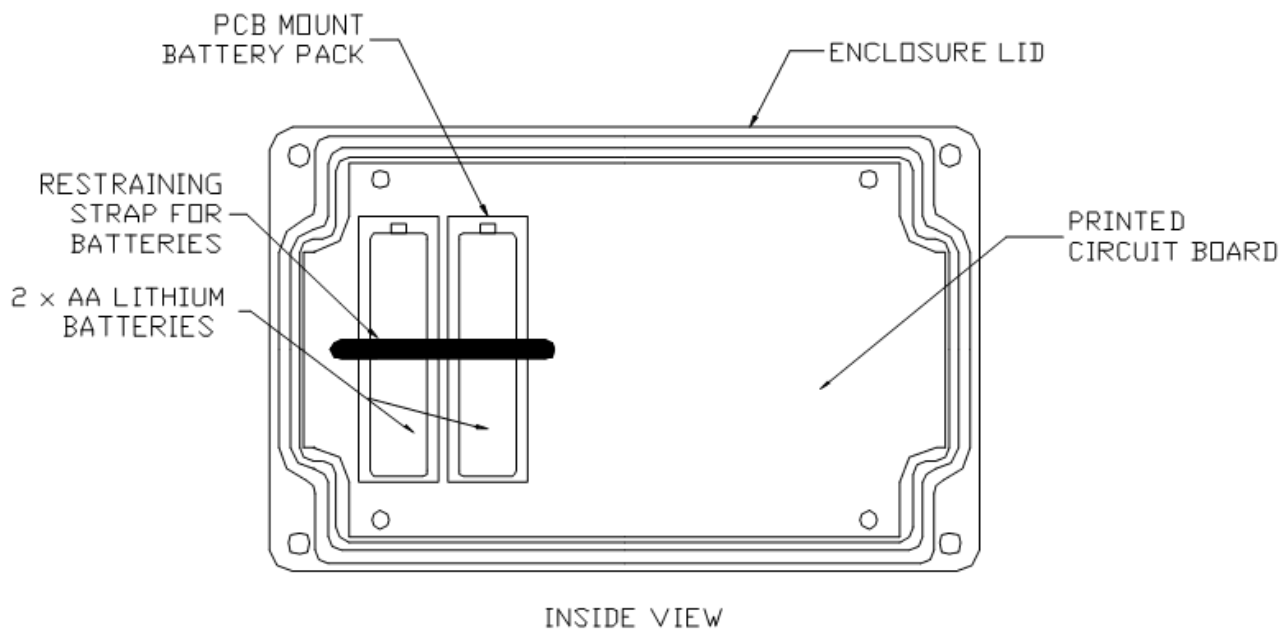


Figure 4 - Internal Battery Replacement

Internal Batteries Replacement Instruction:

1. Loosen the 4 screws on the enclosure lid.
2. Remove the lid.
3. Cut restraining strap.
4. Remove and replace batteries one at a time, ensuring polarity is correct, so that processor is not interrupted (only use 3.6v Lithium AA batteries).
5. Fit a new restraining strap (150mm cable tie).
6. Replace enclosure lid ensuring a proper fit.
7. Tighten the 4 screws.

7 Troubleshooting

Error Conditions

If the WL3100 Multi Output Dry Transducer is unable to take a reading (fault condition or loss of +12VDC supply from SDI-12 port), then an error condition is indicated by:

- The LCD displaying **ERROR** as the water level.
- The 4-20mA current loop increasing to 24mA (indicating the error condition).
- An SDI-12 measurement request will return **9999.999** as the **LEVEL**.

All of these readings are outside the normal measurement range.

8 Repair

HyQuest Solutions precision instruments and data loggers are produced in quality-controlled processes. All HyQuest Solutions production and assembly sites in Australia, New Zealand and Europe are ISO 90001 certified. All equipment is factory tested and/or factory calibrated before it is shipped to the client. This ensures that HyQuest Solutions products perform to their fullest capacity when delivered.

Despite HyQuest Solutions most rigorous quality assurance (QA), malfunction may occur within or outside of the warranty period. In rare cases, a product may not be delivered in accordance with your order.

In such cases HyQuest Solutions' return and repair policy applies. For you as a customer, this means the following:

1. Contact HyQuest Solutions using the Repair Request Form made available online:
https://cdn.hyquestsolutions.eu/fileadmin/Services/Downloads/HS-RepairRequestForm_EU.pdf
In response you will receive a reference number that must be referenced on all further correspondence and on the freight documents accompanying your return shipment.
2. Please provide as much information and/or clear instructions within the return paperwork. This will assist our test engineers with their diagnosis.
3. Please do not ship the goods prior to obtaining the reference number. HyQuest Solutions will not reject any equipment that arrives without reference number; however, it may take us longer to process.

Custom requirements for items sent to HyQuest Solutions for warranty or non-warranty repairs: Check with your national customs/tax authorities for details, processes and paperwork regarding tax exempt return of products. Typically, special custom tariff codes are available (such as HS Code = 9802.00) that verify the item is being returned for repair and has no commercial value. Please note that the customs invoice / dispatch documents should also clearly state: "Goods being returned to manufacturer for repair - No Commercial value". It is mandatory to have any returned goods accompanied by a commercial invoice on headed paper. HyQuest Solutions reserves the right to charge the customer for time spent rectifying incorrect customs documents.

Note: Please ensure that your goods are packed carefully and securely. Damage that occurs during transit is not covered by our warranty and may be chargeable.

9 Technical Data

Range	0 - 5 m, 0 - 10 m, 0 - 15 m, 0 - 20 m, 0 - 40 m, 0 - 50 m water head
Accuracy	±0.02 % FS (full temperature compensation)
Overpressure	2.67 × range
Longterm Stability	Typically ±0.05 % FS per annum
Power Supply	Operating: 9.6 - 16 V DC
Outputs	4 - 20 mA, SDI-12 (up to 60 m); RS232 (with optional SDI-12 to RS232 adapter SE231)
Connectors	<ul style="list-style-type: none"> ▪ Standard: pluggable screw termination block ▪ Optional: MIL-SPEC connectors
Enclosure	Powder-coated aluminium
Ingress Protection	IP65
Programmable LCD	<ul style="list-style-type: none"> ▪ Type: 2 × lines × 16 characters ▪ Backlight (powered by external battery) ▪ Displays: range, water level, battery voltage
Pressure Transducer Connection	Pressure Transducer Connection
Operating Temperature	<ul style="list-style-type: none"> ▪ WL3100: -20 °C to 70 °C (transducer only, excludes LCD Display) ▪ WL3100A: -40 °C to 70 °C (transducer and OLED Display)
Operating Relative Humidity Range	0 - 95 % non-condensing
Dimensions and Mass	L × H × D: 180 mm × 105 mm × 100 mm; 1.2 kg

10 Obligations of the Operator and Disposal

This chapter contains the following subsections:

- [Obligations of the Operator](#) ²³
- [Dismantling / Disposal](#) ²³

10.1 Obligations of the Operator

European Union

In the Single European Market it is the responsibility of the operator to ensure that the following legal regulations are observed and complied with: national implementation of the framework directive (89/391/EEC) and the associated individual directives, in particular 2009/104/EC, on minimum safety and health requirements for the use of work equipment by employees at work.

Worldwide

Regulations: If and where required, operating licences must be obtained by the operator. In addition, national or regional environmental protection requirements must be complied with, regardless of local legal provisions regarding the following topics:

- Occupational safety
- Product disposal

Connections: Local regulations for electrical installation and connections must be observed.

10.2 Dismantling / Disposal

When disposing of the units and their accessories, the applicable local regulations regarding environment, disposal and occupational safety must be observed.

Before dismantling

- Electrical Devices:
 - Switch off the units.
 - Disconnect electrical appliances from the power supply, regardless of whether the appliances are connected to the mains or to another power source.
- Mechanical devices:
 - Fix all loose components. Prevent the device from moving independently or unintentionally.
 - Loosen mechanical fastenings: Please note that appliances can be heavy and that loosening the fastenings may cause them to become mechanically unstable.

Disposal

Operators of old appliances must recycle them separately from unsorted municipal waste. This applies in particular to electrical waste and old electronic equipment.

Electrical waste and electronic equipment must not be disposed of as household waste!

Instead, these old appliances must be collected separately and disposed of via the local collection and return systems.

Integrated or provided batteries and accumulators must be separated from the appliances and disposed of at the


designated collection point. At the end of its service life, the lithium-ion battery must be disposed of according to legal provisions.

EU WEEE Directive

As players in the environmental market, KISTERS AG and HyQuest Solutions are committed to supporting efforts to avoid and recycle waste. Please consider:

- Avoidance before recycling!
- Recycling before disposal!



This symbol  indicates that the scrapping of the unit must be carried out in accordance with Directive 2012/19/EU. Please observe the local implementation of the directive and any accompanying or supplementary laws and regulations.

11 Appendices

This chapter contains the following subsections:

- [Appendix A Fine Tuning](#) ^[25]
- [Appendix B SDI-12 to RS232 Interface](#) ^[26]
- [Appendix C Extra SDI-12 Port](#) ^[30]

11.1 Appendix A Fine Tuning

The WL3100 Software Rev 6.5 has many enhancements to improve the performance. These include:

- Measures pressure in psi or kPa - factory calibrated.
- Displays water level in m or ft.
- User scaling factor to take into account local conditions such as gravity, water density, etc.
- Ability to calculate gravity, water density, air density and user factor.
- Factory calibration of the 4mA and 20mA current end points.
- Adjustable 4mA and 20mA water levels.
- Negative levels for the 4mA and 20mA levels - to match the site gauge readings.
- Display of the internally calculated water level offset + ability to zero this offset if required
- Update the 4-20mA current within 100mS of detecting loop power
- SDI-12 Version 1.3 compliant with CRC

The WL3100 measures gauge pressure and applies temperature compensation to correct for errors in the transducer. The measured pressure is converted to a water level through a “User Factor”. Adjustment of this “User Factor” allows for variations introduced by the equipment location in the world, as well as local conditions.

Water Level = Pressure x User Factor + Offset

The User Factor is a function of gravity, water density, air density, equipment height above the orifice, and nominal water level.

(Note that gravity is itself a function of latitude and altitude)

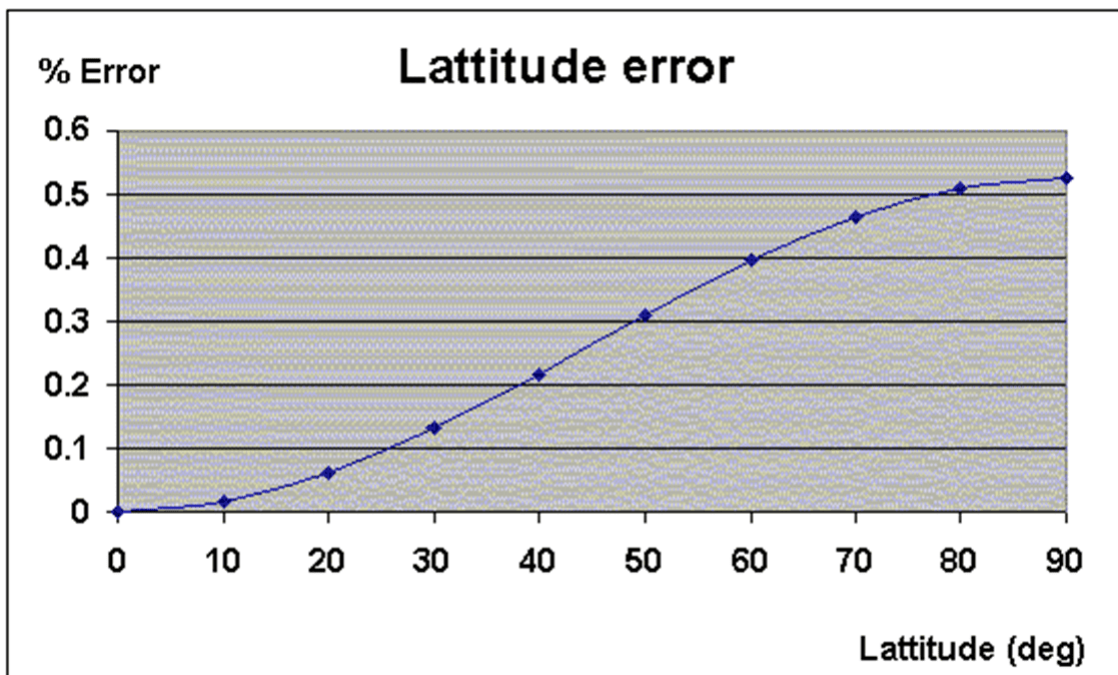
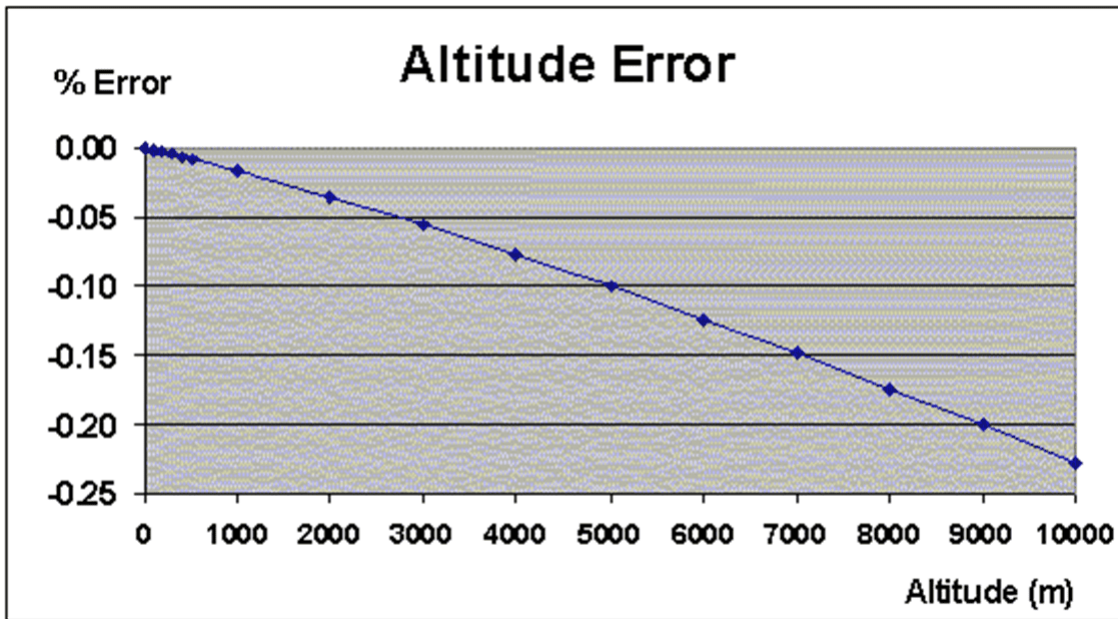
(Note that water density is a function of water temperature)

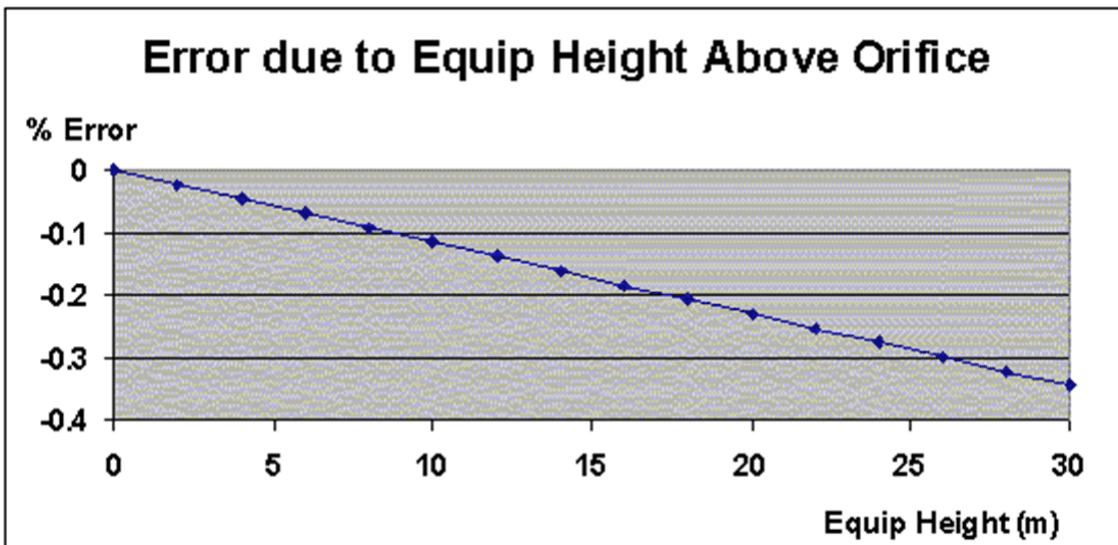
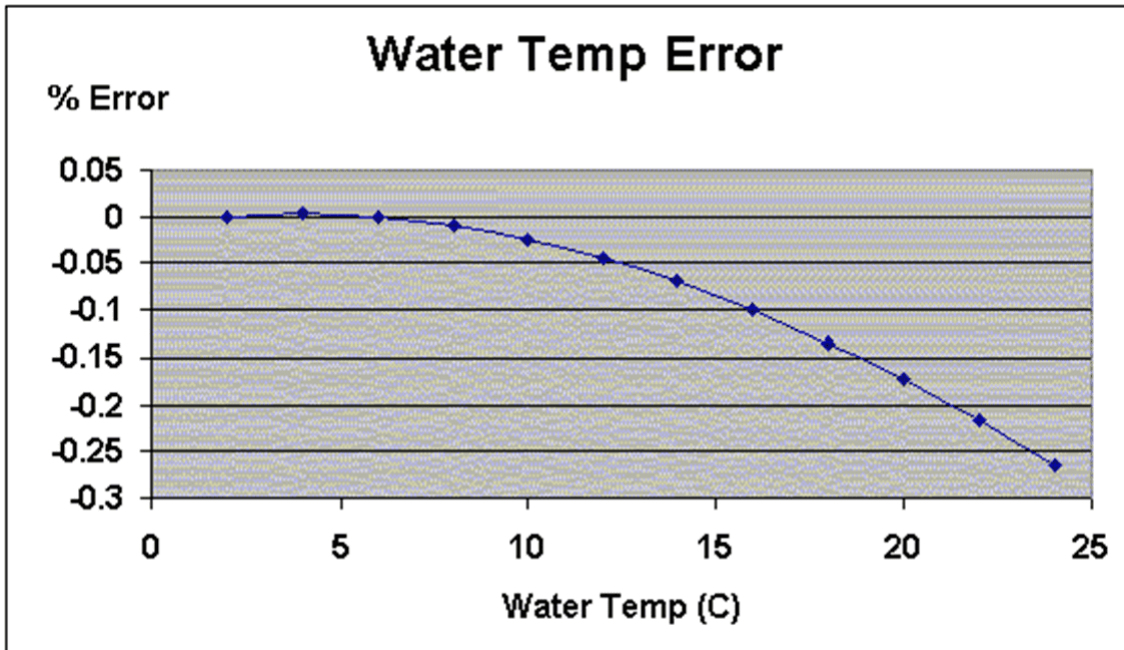
(Note that air density is a function of altitude)

The User Factor may be entered directly into the WL3100, or it can be calculated internally by entering the information listed above (for the WL3100A only). (See the Menu Tree in the LCD Screen section) Various combinations of information may be entered, depending on what is known. For example, the operator could enter the gravity directly - or alternatively the latitude and altitude could be entered and the WL3100A will calculate the gravity for you.

The WL3100 can be configured to measure pressure in psi or kPa - and it can be configured to measure the water height in m or ft. The User Factor is automatically corrected to account for any change in units.

Typical errors that are introduced by the above factors are demonstrated in the graphs on the following pages.





4-20mA Level

The 4-20mA Level parameters in the WL3100 sets the water level required to make 4mA and 20mA appear on the 4-20mA interface. For example, the customer can take a 0-10m range WL3100 and set the 4mA level to 0.000m and the 20mA level to 5.000m thus effectively giving a 0-5m range transducer!!!

That is:

Water Level	4-20mA Current
4mA Level	4.000mA
20mA Level	20.000mA

These levels may be changed by the user by:

1. Use the scroll button to view the 4-20mA Level menu item.
2. Press and hold the select button for 5 seconds until Set 4mA Level appears.
3. Press the select button to make the first digit flash.
4. Press the scroll button to change it. Press select for the next digit etc.

5. When the 4mA Level is complete, press scroll to select the 20mA Level.
6. Repeat steps 3 and 4 to change the 20mA Levels.

Calculated Offset

When the “Set Level” function is performed, the WL3100 calculates an offset between the measured water level and the desired water level. That is:

Displayed (desired) Water Level = Measured Water Level + Calculated Offset

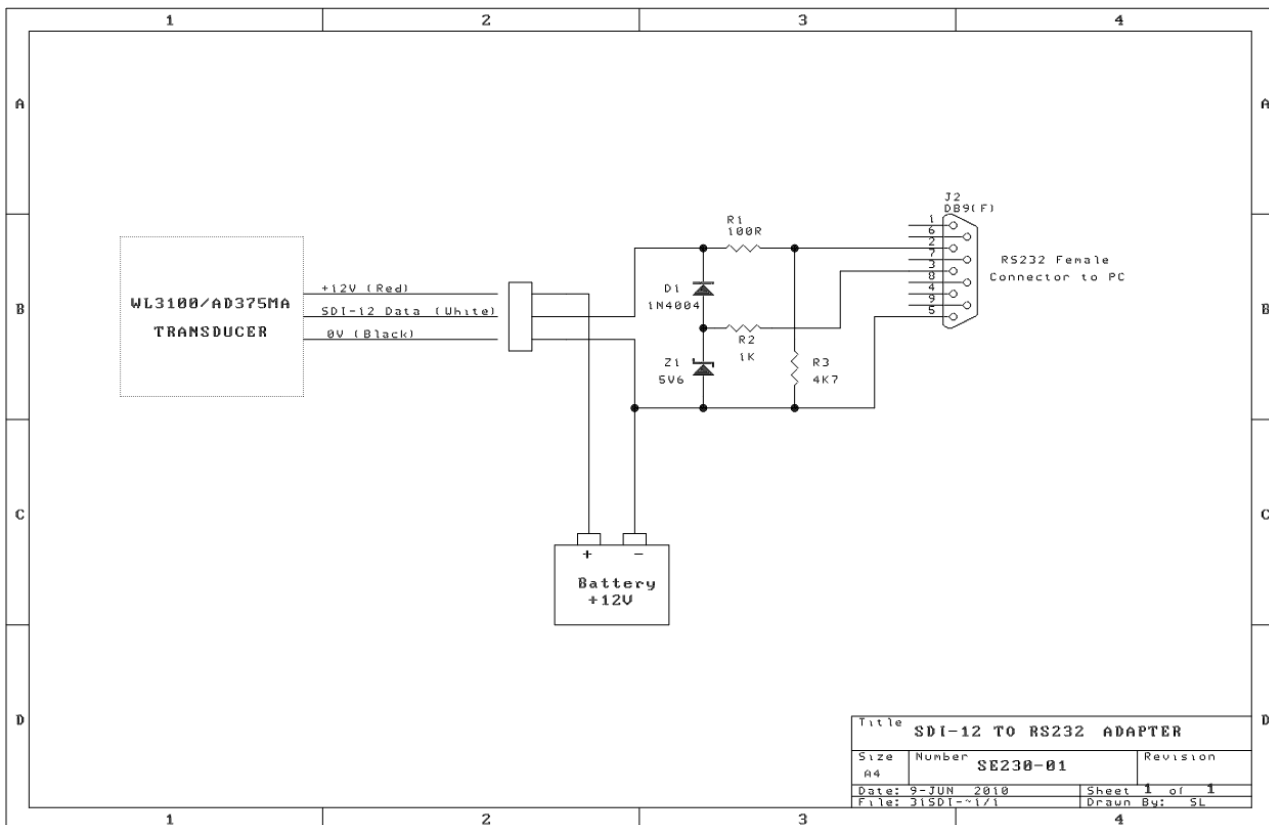
This calculated offset can now be viewed in the “Calc Offset” menu. (This is for reference only, and serves no other purpose)

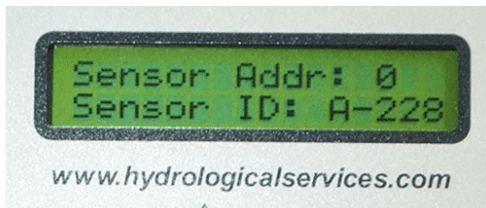
If the user wishes to force this offset to 0, then simply press and hold the select button for 5 seconds while “Calc Offset” is displayed.

11.2 Appendix B SDI-12 to RS232 Interface

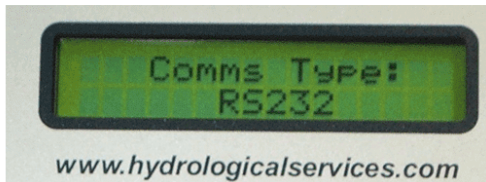
The following schematic is for an SDI-12 to RS232 adapter that can be used for any Hyquest Solutions SDI-12 transducer.

The adapter will allow a transducer to be connected to a PC, and will communicate at 1200 baud, 7 bits and even parity. To bypass the strict timing requirements of SDI-12, simply change the “Comms Type” on the LCD to RS232.





Set SDI-12 Address to 0

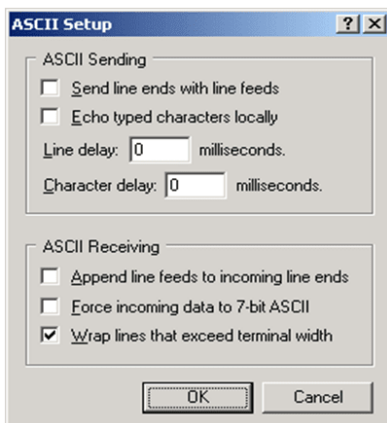
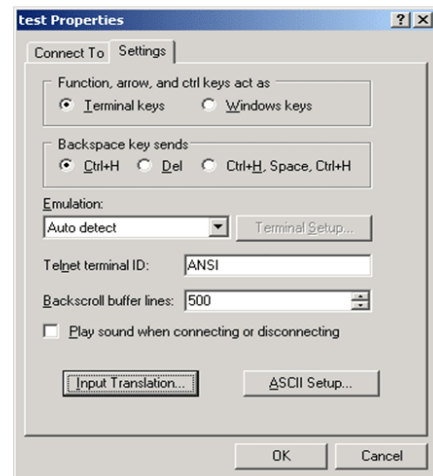
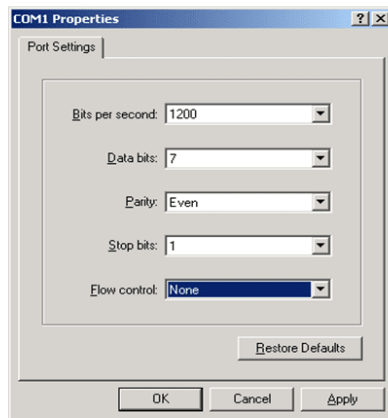


Set Comms Type to RS232

Settings for Hyperterminal



Comm Port depends on your PC



Sample SDI-12 comms session:

(commands sent to the WL3100 are in "red" and the WL3100 replies are in "black")

?! 0	(What address are you? reply indicating 0)
O! 013HydrServWL3100	(ID command – product ID reply)

7.0A-001	
OM! 00121 0	(Measure command - reply indicating 1 measurement ready in 12 secs) (Service Request indicating measurement is ready from address 0)
ODO! 0+0001.234	(Data command - reply indicating water level is 1.234m)
ORO! 0+0001.234	(Continuous Measure - same result as an M and D command combination - when "Continuous Meas" is set to YES (Rev 7.1) or "Sampling Mode" is set to Contin+Avg (Rev 7.2))

(Compliance with SDI-12 Spec V 1.3 (implementing the CRC) occurs in WL3100 S/W Rev 6.2 and higher)

OMC! 00121 0	(Measure command with CRC request - reply 1 meas ready in 12 secs) (Service Request indicating measurement is ready from address 0)
ODO! 0+0001.028Kb	(Data command - reply indicating water level is 1.028m with a CRC of "Kb " according to the SDI-12 specification)
ORCO! 0+0001.028Kb	(Continuous measure with a CRC request - same result as an M and D command combination with a CRC of "Kb " - when "Continuous Meas" is set to YES (Rev 7.1) or "Sampling Mode" is set to Contin+Avg (Rev 7.2))

11.3 Appendix C Extra SDI-12 Port

The WL3100/S has an extra SDI-12 port, which uses the spare pin on the 6 way connector. The main SDI-12 port and the extra SDI-12 can be used at the same time by different independent equipment, returning the same results. This extra port implements all of the standard SDI-12 V1.3 commands shown on page 14 - but it does implement any of the Extended commands.

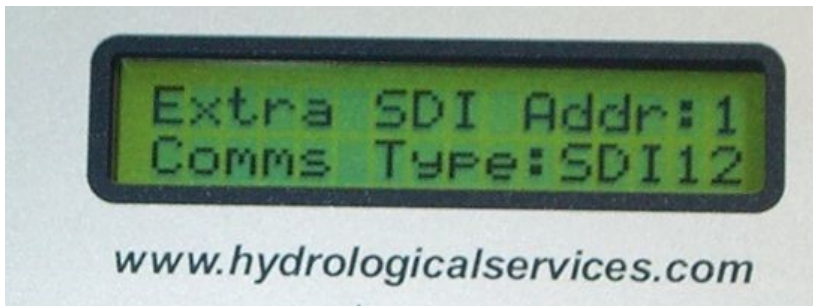
- [Operation](#) 
- [Selection](#) 
- [Current Consumption](#) 

11.3.1 Operation

When the PCB containing the extra SDI-12 port is fitted to the WL3100 running S/W Rev 7.1 or higher, it is automatically detected on power up, and inserts an additional menu to the normal menu sequence. This menu shows the extra port SDI-12 address and the extra SDI-12 port type (SDI-12 or RS232). Setting the port type to RS232 removes all of the normal timing associated with SDI12, allowing the operator to communicate to the WL3100 via an RS232 to SDI-12 port adapter as shown in Appendix B.

11.3.2 Selection

Press the **SCROLL** button to step to this menu. When the **SELECT** button is pressed, either the Address "1" will start flashing, (or the type "SDI12" will start flashing). Press the **SCROLL** button to select a different address (or toggle between SDI12 and RS232). Press the **SELECT** button again to save the selection. If the **SELECT** button is pressed again, and the "address" was flashing last time, then the "type" will flash this time!


















If the SDI-12 address is changed via the "A" command on the SDI-12 port, then it will update what is displayed on the LCD.

11.3.3 Current Consumption

When the extra SDI-12 port is installed in the WL3100, the current consumption will increase. The quiescent, or continuous operating current will increase from 3.5mA to 7.2mA. The current consumed for 1.5 secs while taking a measurement will increase from 17mA to 20mA.

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