

# Storm3

## GETTING STARTED GUIDE

The information contained in this manual is subject to change without notice.

Effort has been made to make the information in this manual complete, accurate, and current.

The manufacturer shall not be held responsible for errors or omissions in this manual.

Consult **[YSI.com](http://YSI.com)** for the most up-to-date version of this manual.

Thank you for purchasing a YSI Storm3 Data Logger. This manual is a brief overview of the Storm3 and its basic features. Additional communication options, including cellular modems and GOES satellite transmitter support, are not included in this guide.

The basic package includes the following:

- Storm3 Data Logger
- Sensor/Power/Communication Terminal Blocks: four 4-position, two 3-position, and two 2-position
- USB Communication Cable (standard USB-A connector to mini-B connector, 6 feet)
- Wireless (Wi-Fi) USB Adaptor
- Dust Caps for the RS-232 Port and USB Ports

## Safety Information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all precautionary statements. Failure to do so could result in serious injury to the operator or damage to the equipment. Do not use or install this equipment in any manner other than that specified in this manual.

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

## Precautionary Symbols

**NOTE:** Information that requires special emphasis

**NOTICE:** Indicates a situation which, if not avoided, may cause damage to the instrument

 **CAUTION:** Indicates a potentially hazardous situation that may result in minor or moderate injury

 **WARNING:** Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury

## Product Components

Carefully unpack the instrument and accessories and inspect for damage. If any parts or materials are damaged, contact YSI ISS at 727-565-2201 or authorized YSI distributor.

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THIS IS AN  
INTERACTIVE DOCUMENT

When viewing this document as an Adobe™ PDF, hovering your cursor over certain phrases will bring up the finger-point icon. Clicking elements of the Table of Contents, website URLs, or references to certain sections will take you automatically to those locations.



# 1. Get to Know Your Storm3

## 1.1 Introduction

Storm3 is a mid-range data logger with an ideal cost-to-performance ratio. Built with communications in mind, the Storm3 supports both an internal cellular modem and an external GOES satellite radio. Its balanced set of connections includes four analog inputs, four independently configurable digital I/O's, SDI-12, +12Vswd, RS-485, and RS-232 serial connections. Storm3 requires no special software and is easily configurable through a direct USB connection or a Wi-Fi interface supporting all standard web browsers whether on PCs, tablets, laptops, or smartphones.

The Storm3 data logger offers several key features including:

- Simple and intuitive browser based graphical user interface (GUI)
- Connect wirelessly (Wi-Fi) or with a USB direct connection (requires driver)
- Library-based sensor setup options

## 1.2 What's in the Box

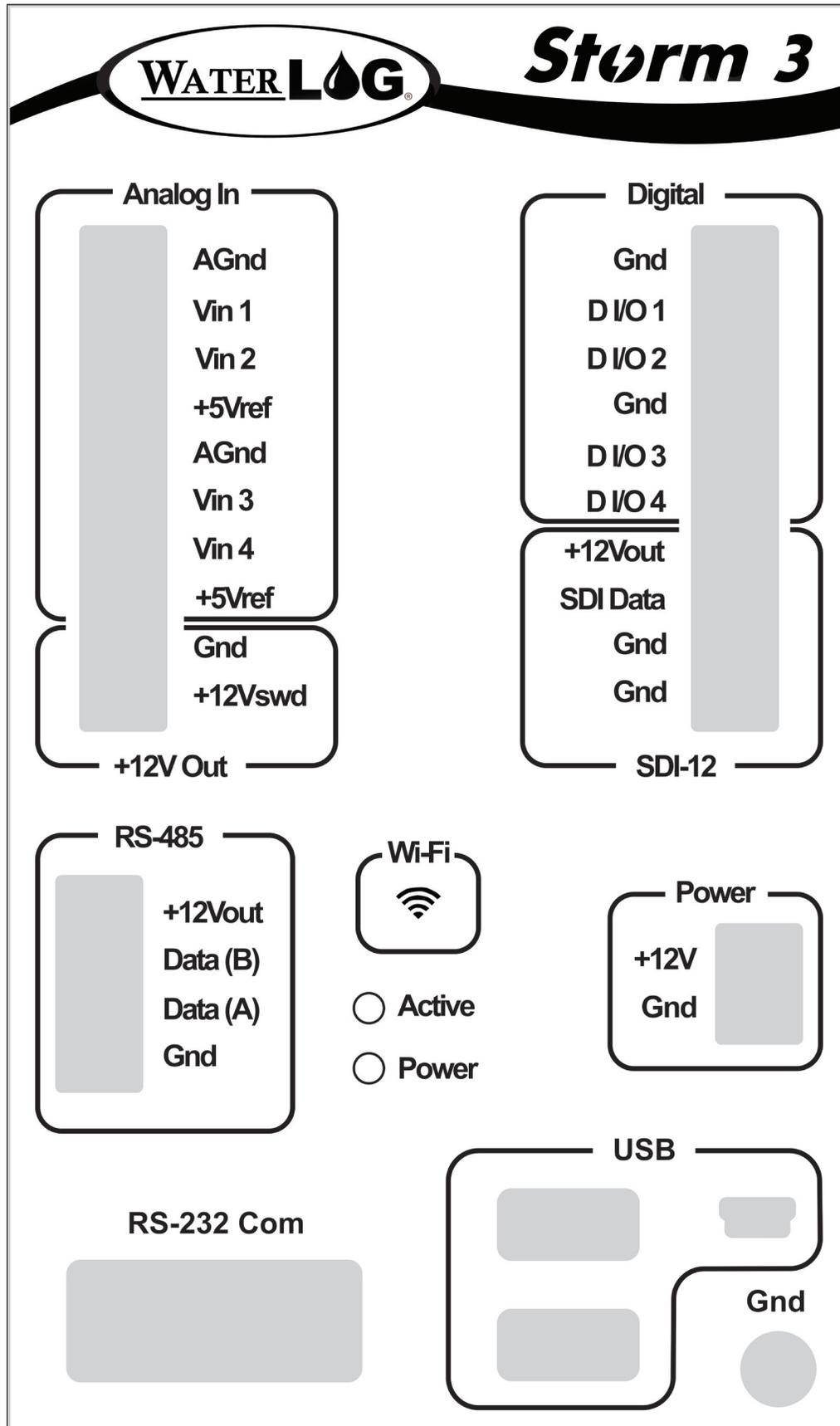
When unpacking your Storm3, make sure all the components ordered are received and undamaged from shipping.

The basic package includes the following:

- Storm3 Data Logger
- Sensor/Power/Communication Terminal Blocks: four 4-position, two 3-position, and two 2-position
- USB Communication Cable (standard USB-A connector to mini-B connector, 6 feet)
- Wireless (Wi-Fi) USB Adaptor
- Dust Caps for the RS-232 Port and USB Ports

# 1.3

## Hardware Overview



<p><b>Analog</b></p>	<p>There are four analog input channels labeled Vin1 to Vin4. They are grouped in sets of two with each set having a common ground and +5Vref terminal connection. The standard input range for all channels is 0 to 5 volts. The Analog to Digital converter is highly accurate and can accurately measure low level (microvolt) signals.</p> <p>There are two analog ground connection points. In order to preserve signal integrity the analog section is electrically isolated from the rest of Storm3. Only analog sensors should be connected to the analog section. Digital sensors are electrically noisy. If a digital sensor is connected to the analog section or uses an analog ground the noise from the digital sensor will adversely affect the analog readings.</p> <p>The +5Vref output is used for analog sensors requiring a precision reference voltage. The maximum output current is 10 mA. The Analog to Digital converter uses this excitation for its reference to provide a ratio-metric relationship for sensors using this excitation.</p>
<p><b>+12Vswd</b></p>	<p>The Switched +12 volt excitation is a programmable 12 volt supply who's settings are on, off, or on only during a measurement. The default setting is off.</p>
<p><b>RS-485</b></p>	<p>A four position terminal block is provided for the RS-485 connection. This port is primarily used for Modbus communication but can be programmed to communicate with RS-485 sensors.</p>
<p><b>Active and Power LEDs</b></p>	<p>The Active LED will blink when the system is performing some activity. The Power LED will blink about every five seconds when proper power has been applied to the system.</p>
<p><b>RS-232</b></p>	<p>The RS-232 port provides a connection to a cellular modem, GOES transmitter, remote display, or other standard serial sensors and communication equipment. It can also be configured for Modbus communication.</p> <p>The port is configured as a Data Terminal Equipment (DTE) device. This means it will plug directly into a Data Circuit Terminated (DCE) device like a modem, but will require a NULL modem adaptor and gender changer if connected to a PC (DTE device).</p>
<p><b>Digital I/O</b></p>	<p>The Digital I/O connections can be configured independently as inputs or outputs. In input mode, the signal has an internal pull up resistor of 47 KOhms. This allows a switch closure to ground to activate the input which can be configured as a tipping bucket rain gauge input.</p> <p>It can also be driven using normal 5 volt logic levels. As an output, a 100 Ohm protection resistor limits the drive capability. The output will still be about 4 volts with a load of 10 mA or less.</p>

<p><b>SDI-12</b></p>	<p>The SDI-12 port operates as a “Master” and is V1.3 compliant and compatible with standard SDI-12 sensors. SDI-12 sensors have a minimum of three wires, which are +12V, Data, and Ground. If connecting several SDI-12 sensors to the system an external bussed terminal strip may be helpful.</p> <p>The +12Vout excitation grouped with the SDI-12 connections is active any time power is applied to the unit. It cannot be turned off. There are two internally connected ground connections for convenience, as some sensors have both a ground and a shield wire. In some cases, the shield wire from the sensor should be connected to the case shield connection point provided (also labeled Gnd).</p>
<p><b>Wi-Fi Button</b></p>	<p>The Wi-Fi button can be pressed to activate the Wi-Fi signal (this is a capacitive button and may not work if using gloves). The USB Wi-Fi adaptor must be plugged into one of the USB Host ports for the Wi-Fi button to work properly. The Active LED will turn on for a couple of seconds when the button is successfully pressed. The Wi-Fi adaptor will power off automatically after three minutes of inactivity.</p>
<p><b>Power Connection</b></p>	<p>The main power input uses a separate 2-position connector, so the power can be disconnected individually.</p>
<p><b>USB</b></p>	<p>Two USB-A connectors and one mini-B connector are provided, allowing direct connection to an external device such as a Wi-Fi adaptor, laptop, tablet, or USB flash drive. USB flash drives can be used to download data, save or load configuration files, and load firmware updates.</p>
<p><b>Ground Lug</b></p>	<p>Proper shield or earth grounding should be used to protect the equipment from exposure to Electrostatic Discharge and other induced interference.</p>

# 2. Connect to the Storm3

## 2.1 Graphical User Interface

Storm3 contains a built-in graphical user interface (GUI), accessible by either Wi-Fi or a cable connection (figure 1). No special software is needed to access the user interface. All computers, laptops, tablets, smart phones, and other equipment containing either a Wi-Fi connection or a USB port can communicate with and configure Storm3. The Wi-Fi connection works automatically, whereas the device cable requires a one-time install of the communication driver on the PC or other device used to communicate with Storm3.

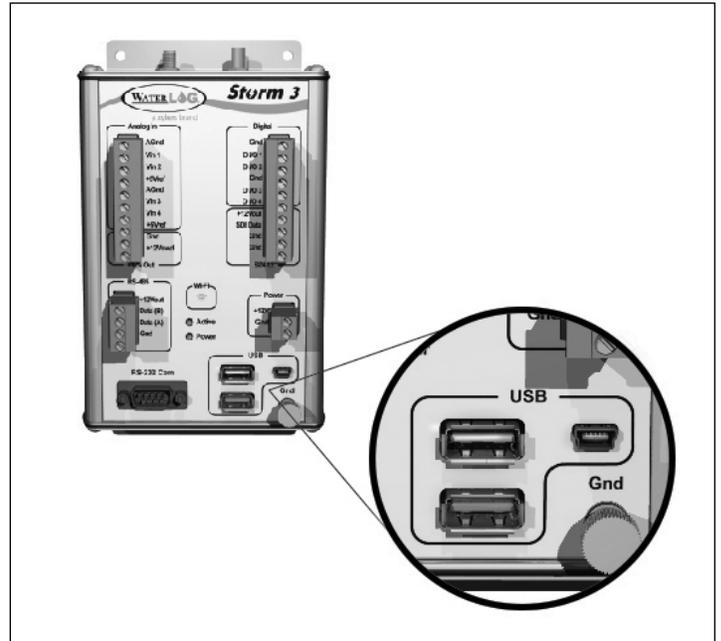


Figure 1: Storm3 Wi-Fi or cable connection ports

## 2.2 LED Indicators

The startup sequence and the 'Power' and 'Active' LEDs detail what is happening internally on Storm3 (figure 2). Upon applying power to Storm3, the Power LED will begin its regular five second blink pattern. Within a few seconds, the Active LED will turn on as well, showing solid initially, and then blinking. When the blinking stops and the Active LED is no longer lit, Storm3 has completed its boot sequence and has entered its low-power sleep. The entire boot sequence typically completes within 30 seconds.

Either the Wi-Fi adaptor or the USB device cable can be used any time after Storm3 has finished booting. Upon connection, the 'Active' LED will Blink Every few Seconds, indicating that Storm3 is awake and ready for communication.

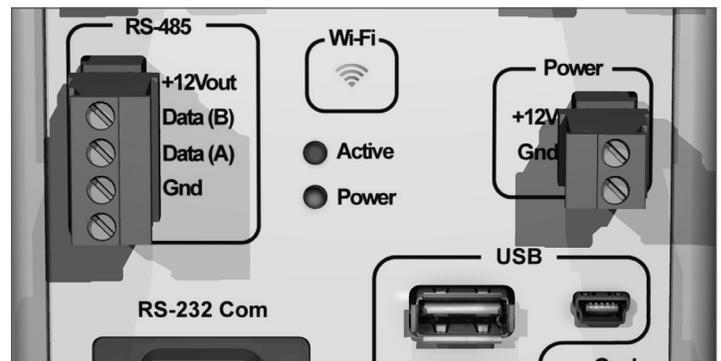


Figure 2: Storm3 Active and Power LED location

## 2.3

# USB Wi-Fi Connection

Plug in the USB Wi-Fi adaptor and press the Wi-Fi button to form a wireless connection with Storm3. In essence the data logger will set up a Wi-Fi hotspot, which is ready when the internal LED on the Wi-Fi adaptor starts blinking. This takes about 10 seconds.

Once the hotspot is active, navigate to the Wi-Fi networks setting of your Wi-Fi-enabled device. Refreshing the list should reveal a Storm3 Wi-Fi hotspot. Connect to the hotspot. Connecting to the hotspot's network generally occurs within ten seconds. After successfully connecting, open a web browser and navigate to <http://172.20.20.20/>. If the hotspot connection was successful, the Storm3 user interface will appear in the browser window.

### IOS

Wireless networks appear under the settings application, listed under the Wi-Fi topic, and are automatically refreshed every few seconds. Simply touch a network to connect to it. A checkmark will appear next to the network once a connection has been made.

Open a web browser and navigate to <http://172.20.20.20/>.

### Windows 7

Wireless networks appear under the 'Network Status' icon in the system tray, next to the clock. Click on the 'Network Status' icon to show available wireless networks. The listing of wireless networks can be refreshed by pressing the 'Refresh' button in the upper right corner. Select the Storm network and press the 'Connect' button (figure 3).

Once the connection has been established, open a web browser and navigate to <http://172.20.20.20/>.

**NOTE:** The user interface will be displayed on only one hardware connection (Wi-Fi or USB device cable) at a time. The USB Wi-Fi connection takes precedence when plugged in. Thus, if using the USB device cable, be sure to have the USB Wi-Fi adaptor unplugged from the data logger. If the USB device cable is active, the Wi-Fi adaptor will have no effect when plugged in (i.e. the Wi-Fi signal will not be activated). The USB device cable supports a single connection, whereas multiple devices can connect to the Wi-Fi adaptor at the same time.

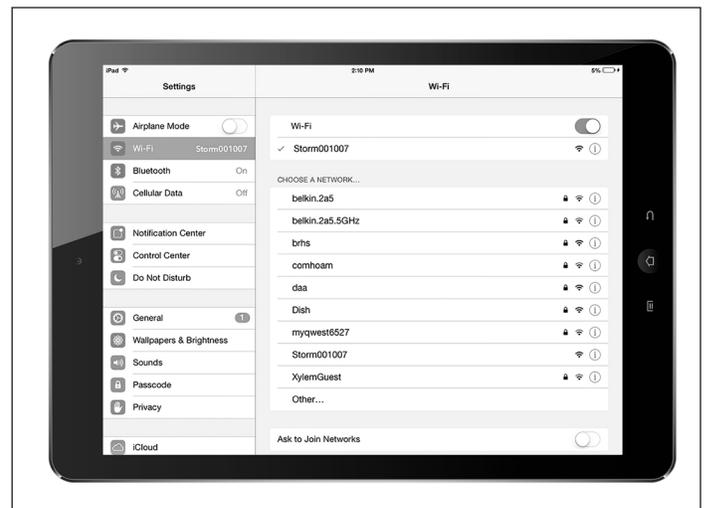


Figure 3: Connect to the Storm3 network

## 2.4 USB Device Cable Connection

To connect directly to Storm3, the supplied USB device cable can be used. The first use of the device cable will require installation of a simple driver. The driver is stored internally on Storm3 and becomes available when the USB device cable is plugged in.

After the driver has been installed, a new network connection will be established with Storm3. This typically occurs within ten seconds. Once the network has been established, open a web browser and navigate to <http://172.20.20.20/>. If the connection was successful, Storm3's GUI will appear in the browser window.

### 2.4.1 Windows 7 Driver Installation

When using Storm3 for the first time with a PC, the computer will attempt to automatically install the Storm3 drivers (figure 4). As the drivers will not be automatically discovered, the driver will need to be manually installed. This can be done by following the steps below:

1. Open the Device Manager and navigate to the Control Panel.
2. Select System and Security > System > Device Manager (or just System > Device Manager if using classic icons).
3. Right click on the RNDIS! label and select 'Update Driver Software'.
4. Select 'Browse my computer for the driver software'.
5. Click the "Browse" button and choose the drive letter listed for 'Removable Disk'. The 'Removable Disk' is created by Storm3 when the USB Device cable is plugged in.
6. Press Next. The Storm3 driver should be found and will begin installing.



Figure 4: Connect to the Storm3 network

A warning window may appear noting 'Windows can't verify the publisher of this driver software'. Select the 'Install this driver anyway' option and the driver installation will complete. The driver only needs to be installed on the first connection. After the driver has finished, disconnect and reconnect the USB device cable to initialize the network connection. Once the connection has been established, open a web browser and navigate to <http://172.20.20.20/>.

# 3. Setup & Operations

Once a connection to the Storm3 has been established, open a web browser and navigate to <http://172.20.20.20/>. The Home page will become available within the opened web browser. The GUI is divided into two main components for easy navigation: navigation tabs and the main page. The status bar along the bottom of the GUI displays the current site ID, scanning status, and connection status.

## 3.1 Basic Navigation

The left side of the screen contains four navigation tabs or four main menus; Home, Sensors, Outputs, and Data. Selecting a main menu reveals additional sub menus. Selecting a main menu or a sub menu loads the relevant content and configurable parameters on the GUI's main page. The current operation in use is highlighted in green (figure 5).

Context help is available with Storm3's information icon 'i' found in the upper right hand corner of the GUI. Selecting this icon will cause several orange information icons to appear around the page. Information on a specific section of the menu is displayed by selecting one of these orange in icons (figure 6).

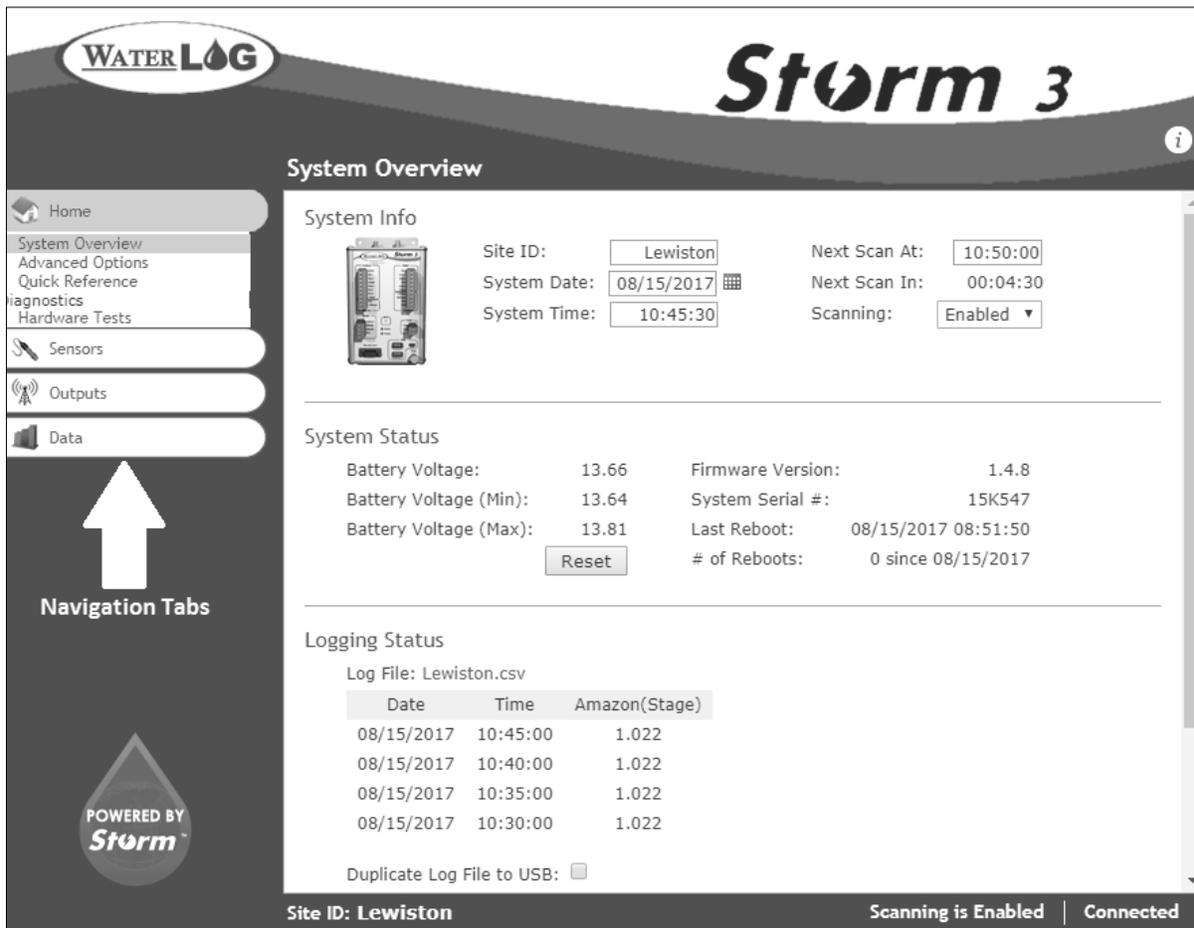


Figure 5: Storm3 Graphical User Interface Home Page

## 3.2 Basic Setup

Setting up Storm3 consists of three parts; System Configuration items, Sensor Setup, and Data Retrieval.

### System Configuration

All of the system configuration options are found within the 'System Overview' sub menu of the 'Home' navigation tab. Here the Site Id is set along with the system date and time. Scanning can also be enabled or disabled here. The Site ID is important because it uniquely identifies a specific site location and is also used as the filename for the logged data.

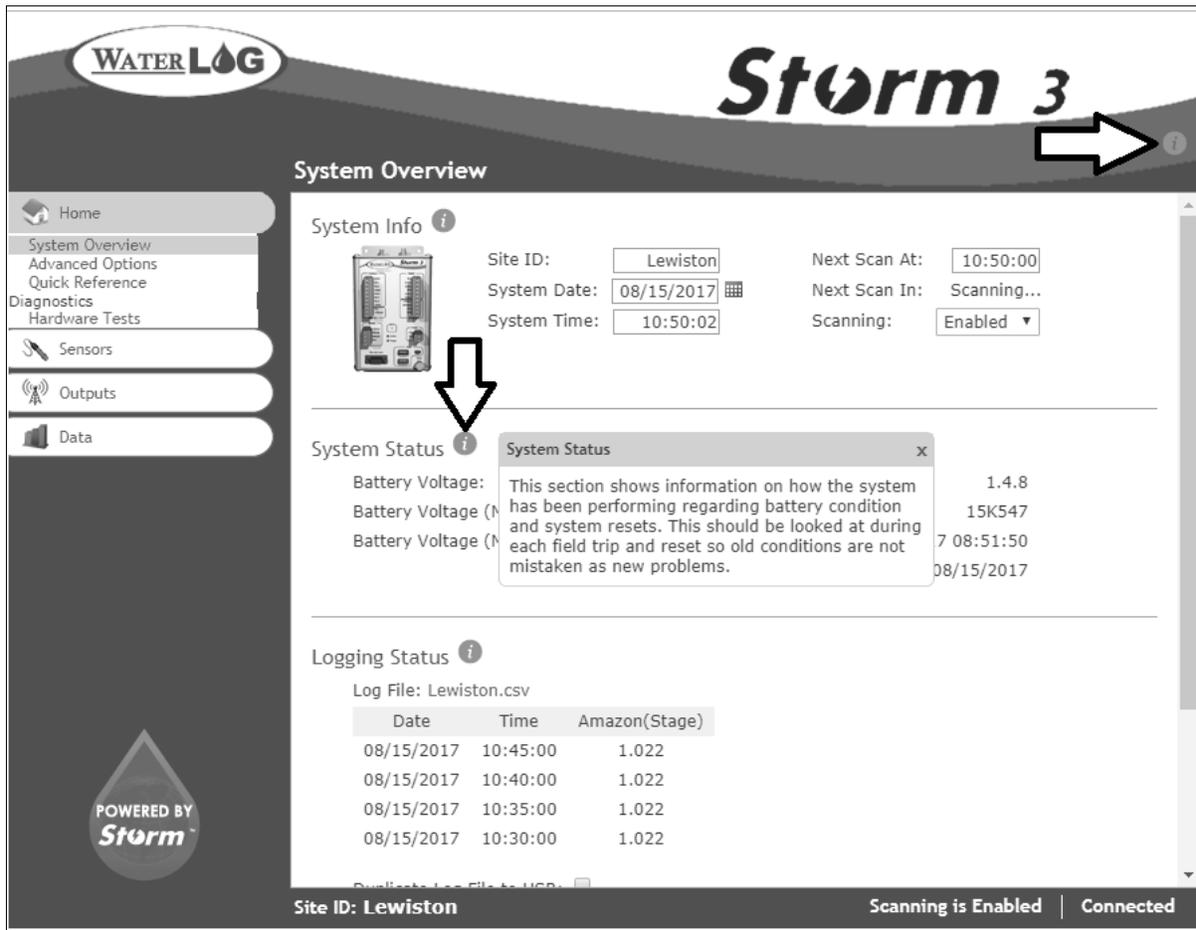


Figure 6: Storm3 Graphical User Interface context help

As you enter the Site ID, notice the color of each character. A red colored character is not accepted, a blue character is acceptable. Space is limited to sixteen (16) characters, no spaces, periods, or any non-text characters.

The 'System Overview' page also allows the user to inspect status parameters like battery levels, number of reboots, the current firmware version and serial number. The last four lines of the current log file are also

displayed allowing verification that data is being logged correctly without needing to download the data file.

To change any of the settings, simply click on the current setting and type in a new value.

To save the values, press 'Enter' or click outside of the entry box.

Advanced options, Quick Reference, and Hardware Tests are all sub menus of the 'Home' navigation tab. The Advanced Options menu provides options for setting data and time formats, loading and saving configurations and uploading new firmware.

The Quick Reference menu provides explanations of available menu options. The Hardware Tests menu provides some diagnostic testing for the different hardware sections of Storm3.



Figure 7: Add a new sensor by manufacturer

## Sensor Setup

Adding a sensor to Storm3 is done under the 'Add New Sensor' sub menu of the 'Sensor's' navigation tab. Sensors are sorted by Manufacturer or type. Storm3 has a built in library of sensors from several manufactures.

### *Add Sensor - On Manufacturer List*

If the sensor being added comes from one of the manufactures on the list select the manufacturer, then select the correct sensor from the list and select 'Add Sensor' (figure 7).

### *Add Sensor - Not On Manufacturer List*

If the manufacture or sensor is not found in the library, then the sensor is added by sensor type; Analog, SDI-12, Digital Counter and so forth. Pick the correct sensor type and select 'Add Sensor' (figure 7).



Figure 8: Sensor Setup page

When a new sensor is added a Sensor Setup screen (figure 8) will appear with additional setup options for the new sensor. SDI-12 sensors are different in that they will display a list of available parameters that can be individually selected for logging.

The new sensor will become available under the 'Defined Sensors' section in the navigation tabs under 'Sensors'. The names of all added sensors will be displayed within this section. For convenience and easy identification, the source of each sensor will also be listed in parentheses at the end of the sensor's name. To view or change the options for any sensor, simply click the sensor name.

The Sensor Setup page has four sections; Configuration, Settings, Processing, Schedule, and Outputs. Each sensor will have the same Sensor Setup options, with the exception of the 'Settings' section. To successfully configure the sensor, start with 'Configuration' at the top of the page and work down to 'Outputs' at the bottom of the page making appropriate changes to the editable fields.

## Configuration

Here the sensor can be given a unique name. Storm3 will assign a default name for every sensor, but if you would like to rename the sensor, letters and numbers are approved characters. As you enter the name, notice the color of the characters. Blue is approved, but red characters are not valid. The limit for each name is twenty (20) characters.

A sensor may be enabled or disabled at any time by checking or unchecking the 'Enabled' box. By disabling a sensor, the sensor will no longer be scanned for data.

A sensor's source is determined by the port it's connected to on the wiring panel of Storm3. Once a sensor has been selected and added, the source selections are available by clicking the drop down arrows. Select which source the sensor is connected to (or will be connected to) and follow the wiring diagram to connect the sensor (figure 9).

Once a sensor's source is selected, a wiring diagram is included to ensure a proper connection. Click 'View' to see the diagram.



Figure 9: Sensor wiring diagram

## Settings

The Settings section will change to accommodate the different styles of sensors. For example, the settings for an SDI-12 sensor will differ from those of an Analog sensor.

## Processing

This section of the Sensor Setup page deals with anything related to the measured value from the sensor. Slope and Offset is assigned here as well as how many digits passed the decimal will be recorded. There is also a 'Use Function' section if additional mathematical manipulation of the sensor's measured value is desired. The Raw Value and the Processed Value from the sensor are displayed. The Processed Value is the value logged and or transmitted.

## Schedule

The rate the sensor will be measured (the scan rate) is entered here. The scan order is also displayed and or adjusted here.

## Outputs

This sections determines what is done with the data once it's received by Storm3. Data can be logged internally to Storm3's log file (this is selected by default). Data can also be transmitted via Cellular Modem, Modbus, or GOES radio (figure 10).

Now that the new sensor is added, fully configured, and connected navigate back to the 'Home' navigation tab and the 'System Overview' submenu. Enable scanning and Storm3 will begin measuring and logging data from the added sensor at the specified scan rate.

## Data Retrieval

To retrieval data or download data navigate to the 'Data' navigation tab. The 'File Operations' screen will open and display the collected data in a graphical view as well as provide options for downloading, renaming, or deleting the selected file. Collected data can be easily downloaded directly to your PC or to an attached USB flash drive. The complete file can be downloaded or the download can be selected to start form a specific date. Select 'To PC' or 'To USB' from the drop down menu for either the complete file or from a specified Date/Time and select the 'Save' button.



Figure 10: Sensor Setup (Outputs)

# Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

**For more information on how Xylem can help you, go to [www.xylem.com](http://www.xylem.com)**



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