



StormX Model 1000 USER GUIDE

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1. Introduction

The StormX unit is an advanced wireless monitoring system that integrates a piezo-ceramic Triax accelerometer into a small form factor battery powered housing. It also supports a wide variety of analog inputs through its expansion port. It is capable of simultaneous sampling 4 channels of external analog data and 3 channels of internal XYZ data at rates up to 20kHz, and 6 channels of external DC data. A seamless connection for external inputs is provided through an expansion port.

The unit runs stand alone with batteries or an external DC power supply, and switches automatically between low power battery modes and mains operational modes. The battery back is field replaceable. High performance, high temp non-rechargeable lithium batteries are employed in the design. The expansion port allows larger external batteries, rechargeable batteries, DC power supplies, or power harvesting/solar solutions to augment or replace the internal battery.

The wireless unit communicates with the base station via long range 900Mhz radio.

The STORMX unit includes a high performance digital signal processor (DSP) that allows advanced analysis programs. This includes data compression, encryption, and error correction for the wireless link, and the ability to do advance frequency domain analysis on the unit.

On board memory of 2 mega sample allows sample times of up to 3 hours at low sample rates, and 1 minute at the maximum rate.

The StormX unit provides input buffering and filtering on the AC channels, including programmable low and high pass filters and an onboard decimation filter. Low frequency signals near DC can be measured with a direct coupled input setting.

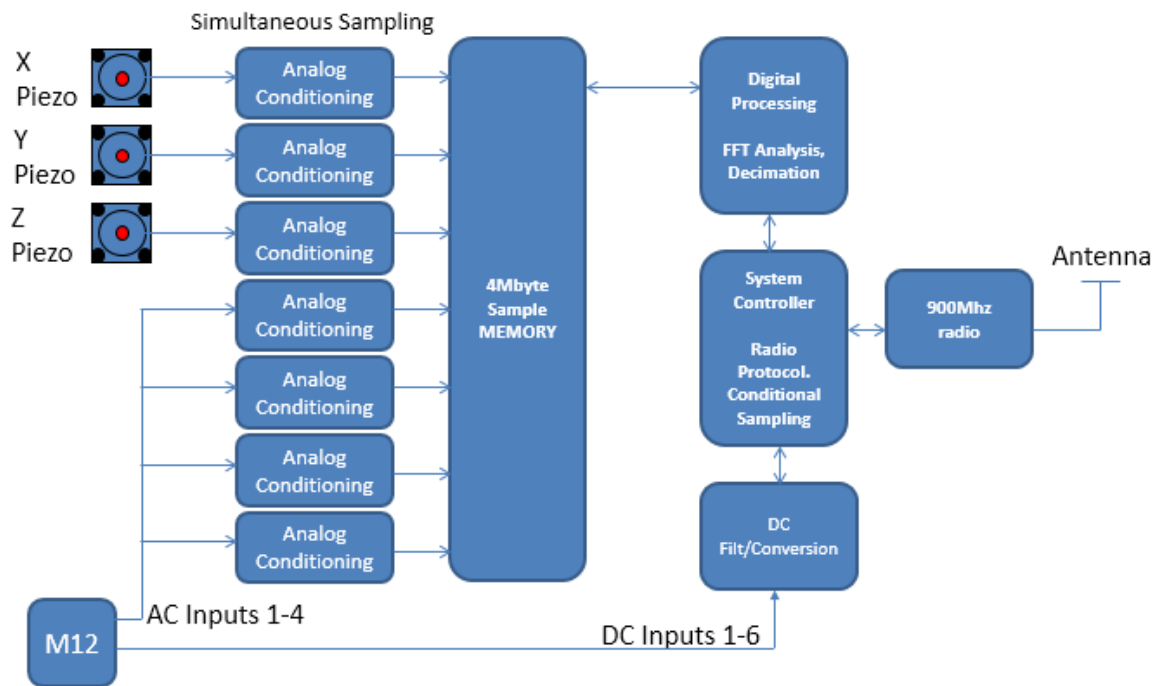
2. Key Features

StormX has the following features:

- ❖ 3 Internal acceleration channels, XYZ direction.
- ❖ High accuracy PiezoElectric triaxial accelerometer
- ❖ Support for 4 external analog AC inputs through an expansion port [future product].
- ❖ Support for 6 external DC/process inputs through an expansion port [future product].
- ❖ Simultaneous sampling of 3 internal acceleration channels and 4 external channels at rates of 64Hz up to 20kHz.
- ❖ Onboard decimation filter and alias filter.
- ❖ Long range wireless connectivity using a high powered advanced 900MHz radio. Ranges of up to 2 miles in outdoor environments.
- ❖ On board sample memory allowing 2 million samples at sample rates from 64Hz to 20kHz.
- ❖ On board digital processing for advanced functions (spectrum analysis, alarms). [Requires user customization].
- ❖ Water and weatherproof durable casing sealed to IP67 standards and including standard M12 connector for expansion port.
- ❖ Anti caustic casing made from stainless and resistant plastics.
- ❖ Battery or mains operation.
- ❖ High temp design target of 185F.

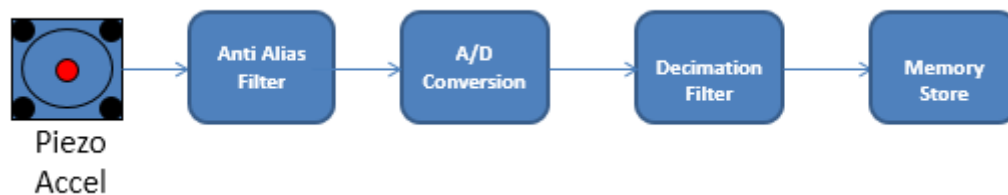
3. Overview

An overview of the STORMX unit is shown in the figure below. AC signals come from internal Piezo sensors or from the external expansion port (M12 connector). The input signals pass through a conditioning block, then to an A/D converter, and then are placed into system memory. The Digital Processing block collects sampled data and provides additional functions such as decimation and frequency analysis. The system controller communicates over the radio interface to send and receive commands and data. External DC inputs are received through the external M12 port and are filtered and sampled and sent over the radio interface on command.



Analog Conditioning

The analog conditioning block is shown in the figure below. This circuit is duplicated once per analog input. AC signals come from an internal accelerometer or external M12 connector and then pass through filtering before being converted by a high precision A/D converter. The digital samples are filtered and decimated before being stored to memory.



4. Internal Accelerometer Specifications

The internal accelerometers can be factory configured to support +-22g, +-45g, +-95g, +-190g, +-450g

The following specifications are for the standard +-22g model

Parameter	Value	Comments
Freq response	2 to 6,000Hz	
Range	+-22g	Factory Setting
Broadband noise	110uV	2hz-6,000Hz
Spectral noise	120 ug/root Hz	@10Hz
Spectral noise	40 ug/root Hz	@100Hz
Spectral noise	20 ug/root Hz	@1000Hz
Operating Temp	-40 to +125C	
Sensing element	Piezo-Ceramic	Shear mode
Power	<22uA	

5. External AC Signal Input Specifications

The external AC signals have input requirements as shown below. Uptime solutions provides a conversion module that allows external ICP accelerometers to be conditioned and connected to the M12 port.

Parameter	Value	Comments
Sample rate	64 to 20,000Hz	Software Configuration
Low pass filter	25 to 8,000Hz	Automatic
High pass filter	0.2 Hz	Factory Setting
DC bias voltage	20V/4ma	Factory Setting
Resolution	16 bits at the highest sample rate	Higher resolutions can be achieved at lower sample rates
Input impedance	>100K ohms	
Signal Input Voltage	0 to 2.5V	
AC Signal voltage	+/-1.20V with DC offset required of 1.25V	

6. External DC Input Specifications

Uptime solutions provides a conversion module that allows external DC sensors to be conditioned and connected to the M12 port.

7. External Power Supply Specification

The external power supply has signals requirements as shown below. Uptime solutions provides an IP67 power supply that meets this requirement. Multiple nodes can be powered by a single power supply.

Parameter	Value	Comments
Input Voltage	4.3V	+ -1%
Input Current	200ma	maximum

8. 900MHz Radio Specification

The 900MHz radio module has the following specifications.

Parameter	Value	Units
Operating Frequency	902.2 to 927.8	MHz
Number of Channels	32	Channels
Channel Spacing	750	kHz
Hop Sequence	6	Factory Setting
Data Rate	115	kbps

FCC/CA Approvals

FCC ID: **2ADT3-BA1000**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

Mobile Device RF Exposure Statement:

RF Exposure Statement: This device is only authorized for use in a mobile application. At least 20 cm of separation distance between the StormX Model 1000 device and the user's body must be maintained at all times.

The antenna used for this transceiver must not be co-located or operating in conjunction with any other antenna or transmitter

Canada CA Supplement

"Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférences, et (2) cet appareil doit accepter toute interférence, y compris celles susceptibles de provoquer le fonctionnement du dispositif."

9. Battery Considerations

All features of the StormX unit can be enabled whether on battery power or DC power. Some advanced operational modes are not recommended when on battery power. The unit is capable of sampling long time domain waveforms, and can sample continuously. In battery operation, this will deplete the battery quickly.

The batteries employed are high temperature Lithium-thionyl-chloride batteries rated at an operational temperature of 125C and a peak current of 750ma and continuous current of 375ma with U.L. Component Recognition, MH 12193.

The battery pack supports 7 Amp hours of power, allowing the unit to run continuously with radio for 50-70 hours. Power down modes allow the system to run for multiple years depending on software configuration. The unit delivers a battery status to the SW to indicate remaining power, and Uptime Solutions provides a power estimation chart (TBD) to select appropriate settings.

10. Connectors

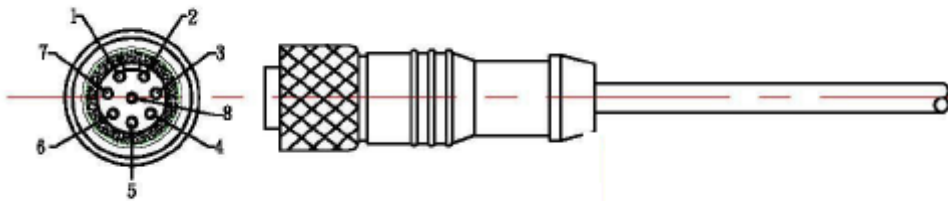
Connector Location

The STORMX has connectors for 8 signals (M12) and antenna (RPSMA).



STORMX M12 Connector

The STORMX process connector provides a seamless connection from STORMX to external power, AC sensors, or DC sensors. The pinout of the connector is shown below.



A standard M12 cable (provided by Uptime Solutions) connects the STORMX unit directly to the external process unit. Each signal in the connector has a unique wire color. The following table shows the pin number, wire color, and signal meaning on the connectors.

Pin Number	Wire Color	Signal Description
1	Black	+4.3V DC, 200ma
2	Brown	External AC channel1
3	Red	Ground
4	Orange	External AC channel2
5	Yellow	Reserved, tie to 4.3VDC
6	Green	External AC channel3
7	Blue	DC Mux
8	White	External AC channel4

11. Safety Precautions

This unit operates from batteries or an external DC feed. Extreme care must be taken to insure this DC feed signal is not crossed with higher voltages (from the mains), and that water or other contaminants at the power supply junction do not allow the mains voltage to feed across to the DC line.

A Class 2 isolated power supply is required *at minimum*, and it should be protected from water ingress.

A GFI circuit is required for the power supply mains feed.

Class 2 Compliance

Class 2 compliance requires a maximum power output availability of less than 100 watts for the component. The NEC is the source of the Class 2 Supply definition. Due to its power, current and voltage limitations, a class 2 circuit considers safety from a fire initiation standpoint and provides acceptable protection against electric shock. Only the load side of a power supply with a nameplate rating of less than 100VA can meet the class 2 circuit requirements. Class 2 requires dry indoor use and is only for non hazardous location areas.

Battery Pack

All lithium thionyl chloride batteries should be disposed of by a certified hazardous waste disposal facility. Contact Uptime Solutions for disposal information or return batteries for proper disposal.