1   Features

- 3-axis accelerometer
- ±2g or ±1.25g modes
- 15-bit resolution
- User selectable sample rate of 8, 16, 32, 64, 128, 256, or 512 Hertz
- Internal Li-Poly battery charges via USB
- Accurate time stamped data using Real Time Clock (RTC)
- Convenient on/off button
- Data recorded to a removable microSD card (8GB included)
- Easily readable comma separated text data files
- Data transfer compatible with Windows or Linux via Universal Serial Bus (USB) interface (no special software)
- System appears as USB Mass Storage Device to Windows and Linux OS's.
- LED indicator lights for system status
- Weight 1.3oz (48g)
- Size 1x1x4.1 inch (26x26x104 mm)

2   Applications

The X2-2 is applicable to:
- Structural vibration monitoring
- Earthquake monitoring
- Determining tilt angle

3   Description

The USB Accelerometer model X2-2 data logger uses a high sensitivity, low noise, 3-axis accelerometer. Acceleration is collected in X, Y, and Z axes at a user selectable rate of up to 512Hz. Data is time stamped and recorded to a microSD flash memory card. When connected via the USB to a personal computer, the X2-2 appears as a standard mass storage device containing the comma delimited data files and user setup files. The internal lithium-polymer battery charges using the USB power and provides approximately 10 hours of data recording at 512Hz.
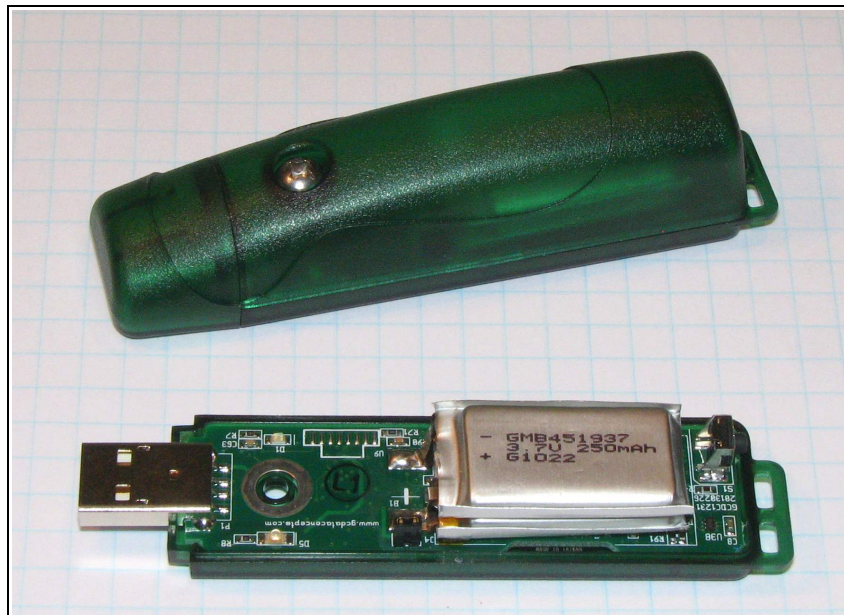

Figure 1: X2-2

3.1 Operating Instructions

The following instructions outline the steps to begin using the X2-2.

Step 1: Ensure the internal lithium-polymer battery is fully charged by plugging the X2-2 into a computer USB port. The red LED3 will turn off when the battery is fully charged (see section 3.2.3).

Step 2: Plug the X2-2 into a computer and allow the computer operating system to register the device as a Mass Storage Device.

Step 2: Configure the X2-2 by editing the appropriate tags in the config.txt file using a simple text editor. In Windows, do not use Notepad as the editor does not terminate new lines properly. GCDC recommends Windows Wordpad or Notepad++ to edit the config.txt file. Refer to section 3.2.4 for a complete list of configuration options.

Step 3: If necessary, initialize the RTC clock by creating a time.txt file (see section 3.2.6). Once the time.txt file is saved, immediately unplug the logger and press the on/off button to activate. The logger will load the time.txt file and initialize the clock. Initializing the RTC ensures the data files include the correct year, month, and day and that the data samples can be correlated to absolute time.

Step 4: After removing from the USB port, attach the X16-1D logger to the target object. The logger is small and light weight so double-sided tape, Velcro, or a spot of cyanoacrylate glue are sufficient methods of attachment.

Step 5: Press the button located at the rear of the enclosure to initiate data recording, (see Figure 2). The red LED1 will blink as the configuration file is accessed. If the time.txt file is present, the RTC is initialized with the time written in the file. The blue LED2 will begin to blink at a 1 second interval indicating the system is operating. The red LED1 will blink periodically as data is written to the microSD card.

Step 6: To stop recording, press and hold the button for about 3 seconds. The red LED1 and blue LED2 will blink rapidly for 2 seconds and then turn off. Release the button and the X2-2 turns off. Data recording is restarted by pressing the button again.

Step 7: The data recorded to the files must be converted to determine acceleration in "g" units. In low gain, divide the Ax, Ay, Az columns by 6554. In high gain, divide the data by 13108. See section 3.2.5.2 for a complete discussion of data conversion.

Figure 2: Starting the X2-2

3.2 Electrical

The X2-2 is protected from general handling conditions by the plastic enclosure but is not protected from adverse environmental conditions, such as rain, sweat, splashes, and water submersion. The temperature range is limited primarily by the lithium-polymer battery capabilities.

Table 1: Operating Conditions

Parameter	Value
Temperature Range (Operating)	-5°F ~ 130°F (-20°C ~ 55°C)
Temperature Range (Storage)	-5°F ~ 80°F (-20°C ~ 25°C)
Relative Humidity (Operating and Storage)	<90%

3.2.1 Sensor

The X2-2 uses the Kionix KXRB5-2050 3-axis accelerometer sensor. Table 2 lists the basic sensor and logger performance parameters but refer to Kionix for detailed sensor specifications. The sensor output is oversampled and processed through a Finite Impulse Response (FIR) filter. See section 3.2.5.2 for a detail description of the data format. Sensor orientation is illustrated in Figure 3.

Table 2: Accelerometer Sensor Characteristics

Parameter	Condition	Min	Typical	Max	Units
Acceleration range	Low Gain		2		g
	High Gain		1.25		g
Resolution	Low Gain		6,554		count/g
	High Gain		13,107		count/g
Non-Linearity	X, Y, Z axis		0.1		%FS
Zero-g Offset Level Accuracy	X, Y, Z axis	100		100	mg
Sensitivity Variation from RT over Temperature	X, Y axis		0.01		%/°C
	Z axis		0.02		%/°C
Cross-Axis Sensitivity			2		%
Operating Temperature		-10		55	°C

> *The accelerometer sensor is based on microelectromechanical systems (MEMS) technology and is not affected by magnetic fields. Glue a magnet to the bottom of the plastic enclosure to facilitate easy attachment to iron surfaces.*
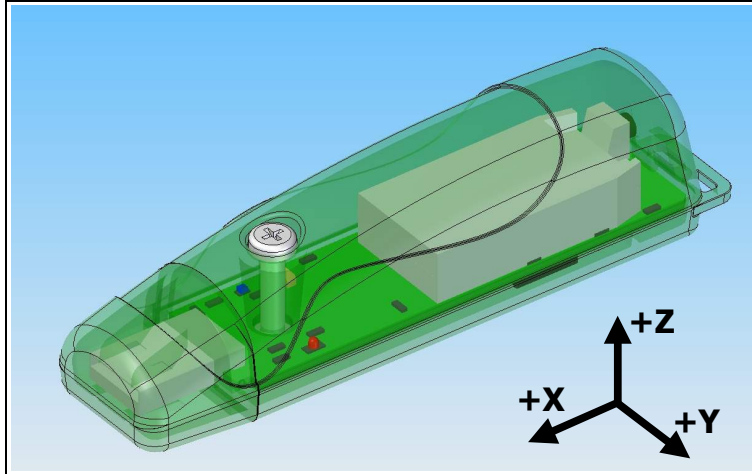
www.gcdataconcepts.com

Figure 3: X2-2 Accelerometer Sensor Orientation

3.2.2 Indicator LEDs

System status is indicated by three LEDs (see Figure 4). The blue LED2 blinks once per second indicating a properly operating system. The red LED1 blinks when data is written or read from the microSD memory card. In data logging mode, the period at which the red LED1 blinks depends on the sample rate and other configuration settings. The red LED3 will light when the lithium-polymer battery is charging and it will turn off when the battery is fully charged. The blue LED2 and red LED1 will flicker during user initiated shutdown. The "statusindicators" tag in the system configuration file turns off or changes the brightness of the red LED1 and blue LED2 status indicators (see section 3.2.4.11).
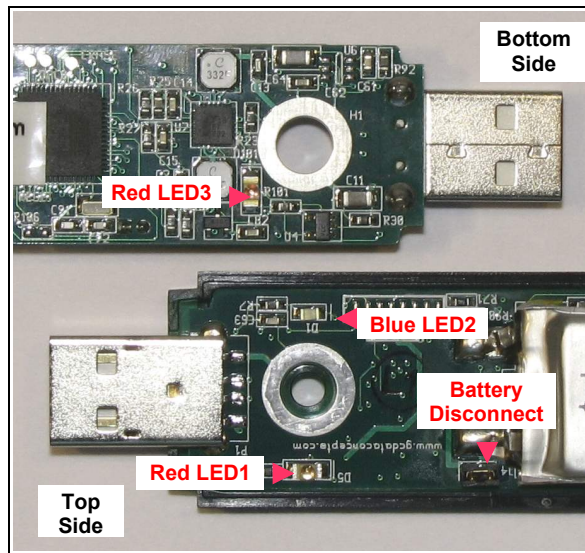

Figure 4: LED Indicators

3.2.3 Battery

The X2-2 is powered by a internal, hardwired 500mAh lithium-polymer rechargeable battery. The internal battery management system recharges the battery when the X2-2 is plugged into a USB port or attached to a USB 5v power adapter. The red LED3 turns on when the battery is charging and off when the battery reaches full charge. The battery provides approximately 10 hours of operation sampling at 512Hz with the deadband set to zero (maximum data recording capability). Reducing the sample rate does not increase the operating life significantly. The battery is not used when the system is connected to a computer USB port.

> *A 5v supply via the USB connector provides extended operation of the device independent of the internal battery. Common USB power adapters or USB battery packs for consumer electronics can provide the required 5v supply. The logger does not implement power saving features when connected to an external power supply so power consumption will be higher than when using the internal battery.*

> *The data logger may draw up to 250mA from the USB supply to recharge the battery. Plugging multiple data loggers into a USB hub can exceed the power capacity of the hub. This can cause "brown-outs" of the logger and possibly damage the microSD card.*

> *The logger is always "on" maintaining the real time clock and will eventually discharge the battery completely after several months. The battery must be charged occasionally or remove the battery disconnect jumper to completely deactivate the device for long-term storage. Keep in a cool (20°C/ 68°F) dry environment to avoid damage of the battery.*

3.2.4 System Configuration Options

The X2-2 is configured using a set of tags and settings stored in a text file named "config.txt", which is located in the root directory of the microSD card. The system reads the configuration file at boot time. Table 3 lists the configuration file tags. A tag is followed by an equal sign ("=") and an applicable tag setting. A line finishes with a newline character (0x0A). Tags are not case sensitive. Tab and space characters are ignored. Lines starting with a semicolon (";") are treated as comments and ignored by the system. The system will use the default settings listed in Table 3 if the config.txt file is not found.

> *Do not use the Windows Notepad editor because it does not terminate new lines properly. GCDC recommends Windows Wordpad or Notepad++ to edit the config.txt file.*

Table 3: Configuration File Tags and Descriptions

Tag	Valid Settings	Default	Description
deadband	An integer between 0 and 32767	0	Sets the deadband to a range expressed in "counts". A new sample is recorded if any sensor axis exceeds the previous recorded reading by the deadband value
deadbandtimeout	An integer between 0 and 65535	3	Specifies the period in seconds when a sample is recorded regardless of the deadband setting. This feature ensures periodic data is recorded during very long periods of inactivity.
dwell	An integer between 0 and 65535	1	The number of samples recorded after a deadband threshold triggered event
gain	"low" or "high"	Low	Sets the range to ±1.25g (high) or ±2g (low)
microres	-	Off	The presence of this tag sets the device to record time stamps with 0.1ms effective precision.
rebootondisconnect	-	off on disconnect	The presence of this tag causes the system to start recording after disconnect from a USB port.
samplesperfile	An integer greater than 0	28896	The number of lines of data per data file before a new file is created
samplerate	8, 16, 32, 64, 128, 256, or 512	16	Sets the rate at which data is collected and recorded to the microSD card.
starttime and stoptime	See section 3.2.4.9	-	Defines when to start and stop recording
stoponvusb	-	Off	Stops data logging if 5v USB power is present (see section 3.2.4.10)
statusindicators	"Normal", "High", "Off"	Normal	LED status indicators can be activated with normal brightness (Normal), activated with high brightness (High), or completely deactivated (Off).

3.2.4.1   deadband

"deadband" defines the minimum difference between recorded sensor readings. A new sample from the accelerometer sensor must exceed the previous recorded reading before the device records the data. The deadband setting is expressed in "counts" units and is applied to the output of each axis. There are 6554 counts per g in low gain and 13108 counts per g in high gain. The deadband value can be set to an integer between 0 and 32767. The deadband function is an effective way to reduce the amount of data collected by defining the granularity of the data. The deadband functions as a event threshold limit when used in conjunction with the "dwell" feature.

Figure 4 illustrates the deadband feature filtering out small changes in acceleration from the recorded data. Only when the deadband limit is exceeded will a new data sample be pushed to the file. Note that this feature will result in samples with inconsistent time periods. Therefore, the data sets should be re-sampled to establish uniform time periods.
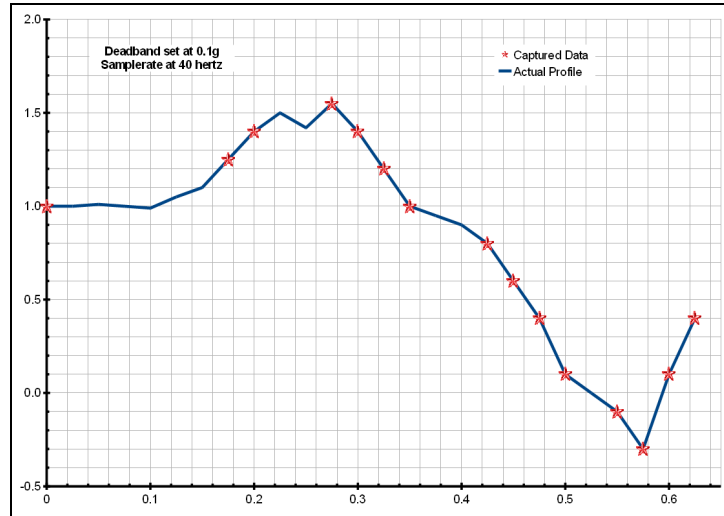
Figure 5: Graphical Illustration of the Deadband Feature

3.2.4.2   deadbandtimeout

"deadbandtimeout" defines the period in seconds when a sample is recorded by the device regardless of the deadband setting. This feature ensures periodic data is recorded during extended periods of inactivity. A valid setting for the deadbandtimeout is an integer between 0 and 65535.

3.2.4.3   dwell

The "dwell" tag defines the number of consecutive samples recorded at the set sample rate after a deadband threshold event. The deadband threshold event occurs when a sensor reading exceeds the last recorded value by the deadband setting. A valid dwell setting is an integer between 0 and 65535.
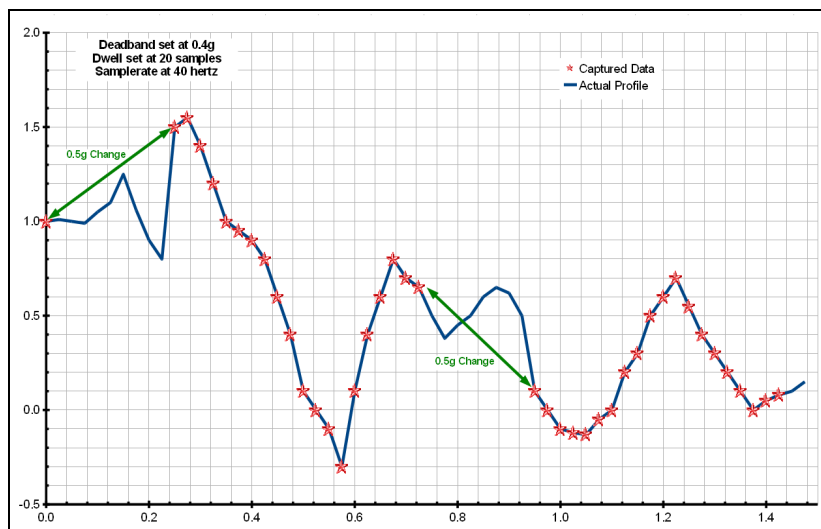

Figure 6: Graphical Illustration of the Dwell Feature

3.2.4.4   gain

The X2-2 provides a high and low sensitivity mode that sets the range to ±2g or ±1.25g, respectively. Set "gain = low" for ±2g range or "gain = high" for ±1.25g range. See Section 3.2.5.2 for instructions regarding data conversion.

3.2.4.5   microres

The "microres" option sets the device to record time stamps with 0.1ms precision. In micro-resolution mode, the time stamps are recorded as XX.YYYYZZ where XX are seconds, YYYY are 0.1 milliseconds, and ZZ are spurious digits that should be ignored. The micro-resolution option should be implemented at sample rates greater than 256 hertz to provide the best timing precision. The power saving features of the X2-2 are disabled in micro-resolution mode and battery life is shortened accordingly.

> *Micro-resolution is best suited for applications requiring precise timing, such as vibration analysis, and is recommended for sample rates above 256 Hz. The standard timing precision (default) of 1 milli-second is suitable for most general applications, such as monitoring human motion.*

3.2.4.6   rebootondisconnect

The X2-2 incorporates an on/off button for initiating and terminating the data recording process. Data recording is automatically started upon disconnect from a computer USB port if the tag word "rebootondisconnect" is included in the configuration file.

3.2.4.7   samplesperfile

"samplesperfile" defines the number of data lines each file can have before a new file is created. This tag controls the size of the data files into easily manageable lengths for later processing. This setting is loaded as a signed 32-bit integer, which can translate into very large data files. The user should exercise caution before setting large files and test the end-user application for data limitations.

3.2.4.8   samplerate

The "samplerate" tag defines the interval that data is recorded in Hertz, or samples per second. Valid sample rate settings are 8, 16, 32, 64, 128, 256 and 512 Hz.

3.2.4.9   starttime and stoptime

The X2-2 starts and stops data recording based on the times defined using the "starttime" and "stoptime" tags. The times must be in "mm HH DD" 24-hr format with the three entries separated by a space. Entries marked with "*" operate as a wild card. The X2-2 continues to record after the start

time unless defined otherwise by the stoptime tag. Note that the configuration option does not include the month. Example timing configurations:

> **Example 1**: On the 15th day, start recording at 12:30pm and stop recording at 6:00pm.
>
> > starttime = 30 12 15
> > stoptime = 00 18 15
>
> **Example 2:** Start recording at the beginning of every hour and stop recording 45 minutes later.
>
> > starttime = 00 *
> > stoptime = 45 *

3.2.4.10   stoponvusb

The "stoponvusb" tag stops data logging operations when a 5v supply is detected on the USB connector. Add the "rebootondisconnect" option so the logger will resume recording when removed from the 5v supply. This configuration is convenient for halting data logging while charging the battery from a USB power supply. Without the stoponvusb option (default), the device switches power from the internal battery to the USB 5v and continues to log data.

3.2.4.11   statusindicators

The brightness intensity of the LED status indicators is defined using the "statusindicators" tag and valid settings of "normal", "high", and "off".

3.2.4.12   Example Configuration Files

Example A) The following configuration records data constantly at 128 hertz with the gain set to 2g. The device will boot and begin logging data once removed from a computer USB port. Each data file is 192,000 lines long, which is 25 minutes.

```
; Example X2-2 Config file
; 2g range
gain = low
; set to record constantly at 128Hz
samplerate = 128
deadband = 0
; set file length
samplesperfile = 192000
; LEDs on
statusindicators = normal
; make device start upon USB disconnect
rebootondisconnect
```

Figure 7: Configuration File Example A

Example B) The micro-resolution is activated to provide the best timing precision at the 512 Hz sample rate. If motion exceeds 0.05g (320 counts), the device captures continuous data 512 times a second for 2 seconds or until the change in acceleration falls below 0.05g. This results in at least 2 seconds of data when a event of 0.05g is detected.

```
; Example X2-2 Config file
; 2g range
gain = low
; set to record constantly at 512Hz
samplerate = 512
; turn on micro-resolution
microres
; set threshold >0.05g
; record 2 seconds of data
deadband = 320
dwell = 1024
; force write every 5 minutes
deadbandtimeout = 300
; set file length
samplesperfile = 50000
; LEDs on bright
statusindicators = high
```

Figure 8: Configuration File Example B

3.2.5 Data Files

The X2-2 creates a new data file when the system is booted or when the maximum number of data lines is reached in the previous data file. A system boot condition occurs when the on/off button is pressed, 5v power is restored to the system via the USB connector, or when the X2-2 is removed from a computer USB port with the "rebootondisconnect" feature enabled. Data files are placed in a folder named "GCDC" and are named data-XXX.csv, where XXX is a sequential number starting with 001. The system will create up to 999 files. At the beginning of each file, a header is written describing the system configuration and the current time when the file was created. Figure 9 represents an example data file.

```
;Title, http://www.gcdataconcepts.com, x2-2,Kionix KXRB5-2050
;Version, 638, Build date, Apr 22 2014,   SN:CCDC1002131D68D
;Start_time, 2014-04-23, 10:04:37.000
;Temperature, 25.25, deg C,  Vbat, 4178, mv
;Gain, low
;SampleRate, 32,Hz
;Deadband, 0, counts
;DeadbandTimeout, 0,sec
;Headers, time,Ax,Ay,Az
0.019,-47,185,-6584
0.051,-55,181,-6591
0.082,-60,176,-6593
0.113,-53,176,-6591
0.144,-44,179,-6595
0.176,-38,183,-6591
0.207,-40,191,-6593
0.238,-47,185,-6593
0.269,-53,176,-6591
0.301,-47,183,-6589
0.332,-44,179,-6589
0.363,-45,176,-6599
```

Figure 9: Example Data File

3.2.5.1   Data Format

Data is written to files in comma separated text format starting with the file header information and followed by event data entries. Table 4 lists the valid header tags, although not all tags may occur in the header. Each data line contains a time entry and the raw accelerometer sensor readings from the X, Y, and Z axes. The time entry is seconds elapsed from the start time recorded in the header. Add the elapsed time to the start time to determine the complete time record of the sample.

The last line of the final data file records the reason for the termination, such as "shutdown: switched off", "shutdown: low battery", "shutdown: max files exceeded", "shutdown: vbus disconnect", or "connected to computer". The line is designated as a comment with a semicolon (";").

Table 4: Data File Header Tags

Tag	Description
Deadband	A new sample from the sensor must exceed the last reading by the deadband value
DeadbandTimeout	The period in seconds when a sample is recorded regardless of the deadband setting
Headers	The names of each column of data in the file
SampleRate	Rate at which data is recorded to the microSD card
Start_Time	The current time when the data file was created
Temperature	Temperature of sensor in °C when data file was created
Title	The name of the USB Accelerometer X2-2 unit and sensor type
Vbat	Battery voltage measured at the file start time
Version	The version control information of the firmware, including unique serial number

3.2.5.2   Data Conversion

Raw data from the analog-to-digital converter is recorded to the file in signed "counts" units. In low gain mode (default), divide the raw data by 6554 to determine g. In high gain mode, divide the raw data by 13108 to determine g. Positive values correspond to acceleration in the direction of the axis.

The X2-2 logger uses a 12bit analog-to-digital converter to sample the output signals from the Kionix sensor. The 12bit AD converter over-samples the sensor 8 times the selected sample rate requested in the config.txt file. The over-sampled data is processed through a Finite Impulse Response filter (64 tap N4R4M2). The resulting 15bit data, or 32,768 discreet counts, covers the full range of the input voltage (0 to 2.5 volts). Therefore, each discreet count equates to 2.5/32768 = 0.00007629volts/count.

Typically, the Kionix KXRB5-2050 sensor is operated at 3.3 volts and provides 660mV/g sensitivity. The X2-2 logger operates the Kionix sensor at 2.5 volts, which results in a smaller sensitivity factor of 500 mV/g. Therefore, the logger sensitivity is 0.500/0.00007629=6554 counts/g (or 0.00015 g/count).

The data file from the X2-2 logger contains signed 15bit counts data. In low gain mode, divide the raw counts by 6554 to convert the data to g's. Positive data corresponds to motion in the positive axis direction. Zero counts is mid-scale of 1.25 volts, which in an ideal case is 0 g's. Analog sensors typically exhibit an offset error so the mid-scale may not be exactly 1.25 volts. This offset error results in the raw data indicating a non-zero value for the mid-range (0 g).

The X2-2 supports a high gain mode. Add "gain = high" in the config.txt file to double the AD converter sensitivity. The logger sensitivity becomes 13108 counts/g so the 15-bit AD converter (±16384 counts) limits the range to ±1.25g in each axis.

Table 5 lists the converted data using the example data in Figure 9.

Table 5: Example Data Conversion

Raw Data (Low Gain)				Converted Data (g)			
Time	Ax	Ay	Az	Time	Ax	Ay	Az
0.019	-47	185	-6584	2014-04-23, 10:04:37.019	-0.007171	0.028227	-1.004577
0.051	-55	181	-6591	2014-04-23, 10:04:37.051	-0.008392	0.027617	-1.005645
0.082	-60	176	-6593	2014-04-23, 10:04:37.082	-0.009155	0.026854	-1.005951
0.113	-53	176	-6591	2014-04-23, 10:04:37.113	-0.008087	0.026854	-1.005645
0.144	-44	179	-6595	2014-04-23, 10:04:37.144	-0.006713	0.027312	-1.006256
0.176	-38	183	-6591	2014-04-23, 10:04:37.176	-0.005798	0.027922	-1.005645
0.207	-40	191	-6593	2014-04-23, 10:04:37.207	-0.006103	0.029143	-1.005951
0.238	-47	185	-6593	2014-04-23, 10:04:37.238	-0.007171	0.028227	-1.005951
0.269	-53	176	-6591	2014-04-23, 10:04:37.269	-0.008087	0.026854	-1.005645
0.301	-47	183	-6589	2014-04-23, 10:04:37.301	-0.007171	0.027922	-1.005340
0.332	-44	179	-6589	2014-04-23, 10:04:37.332	-0.006713	0.027312	-1.005340
0.363	-45	176	-6599	2014-04-23, 10:04:37.363	-0.006866	0.026854	-1.006866

To determine acceleration in g's, divide the raw data by 6554 (low gain) or by 13108 (high gain). A "g" is 32.174 ft/sec^2 or 9.807 m/sec^2.

3.2.6 Real Time Clock

A real time clock (RTC) is integrated into the X2-2 and is used to determine time for each line of data recorded. The RTC is set using a text file named "time.txt" located in the root directory of the microSD card. The system looks for the time.txt file upon booting. If the file exists, the time stored in the file is loaded to the RTC and the time.txt file is deleted. The time information in the time.txt file must be in the exact "yyyy-MM-dd HH:mm:ss" 24-hour format, occur on the first line, and end with a newline character.

The time file method of setting the RTC does not require special communication drivers so it can be implemented using any text editor. Direct initialization of the RTC is possible but requires specific device drivers and software from Gulf Coast Data Concepts.

The RTC maintains ±5ppm accuracy (-40°C to +85°C), which means that it will drift accuracy about 1 second every 2 days. The RTC is powered by the lithium-polymer battery or the USB power when available and continues operating even when the logger is "off".

> *Initializing the RTC ensures that the start time and data time stamps can be correlated to an absolute time – the year, month, day, hour, minute, second, and fractional second.*

> *After unplugging the logger from the USB port, the logger will load the time.txt file when it is activated either by pressing the on/off button or if the "rebootondisconnect" option is active. Therefore, there is a delay between when the time.txt was created and when the logger actually loads the time information. For most applications, this simple method of initializing the clock results in sufficient accuracy.*

3.2.7 Memory Card

The X2-2 stores data to a removable 8GB microSD flash memory card and is compatible with microSD and microSDHC type cards. The X2-2 functions as a Mass Storage Device to computer operating systems when transferring data to and from the microSD memory card. The Mass Storage Device interface is supported by all desktop operating systems and special device drivers are not required. Tablet computers may not recognize the X2-2 due to USB device limitations set by the tablet manufacturer.

The logger needs only the config.txt file to operate. The X2-2 will use default configuration settings if the config.txt is not present. The "config.txt" and "time.txt" files must occur in the root directory (see section 3.2.4 and section 3.2.6). The X2-2 will create a folder called "GCDC", if not already present, to place the data files (see section 3.2.5).

> *Interrupting the power to the logger can result in corruption of the microSD card. For example, removing the logger from the USB port during file transfers to the PC. Reformat the card if it becomes corrupted (FAT32 file structure). If data transfers to/from the card become slow, consider formatting the card using "SD Card Formatter" software provided by the SD Association (www.sdcard.org).*

3.3 Mechanical

The X2-2 electronics are enclosed in a three-part semi-transparent blue plastic enclosure. The top and bottom enclosure components and the printed circuit board are secured together with a 0.75" long #6-32 screw and nut. A slip-on cap protects the USB connector. The X2-2 weighs 1.3oz (48g).

> *The X2-2 is small and very light weight so attachment methods do not need to be substantial. Double-sided tape, a spot of cyanoacrylate glue (contact cement), zip-ties, magnetic base, or adhesive putty are example methods of attachment. These methods do not cause adverse signal attenuation considering the relatively low frequency bandwidth of the X2 logger. Command Poster Adhesive strips by 3M offer excellent temporary attachment of the logger to most surfaces.*
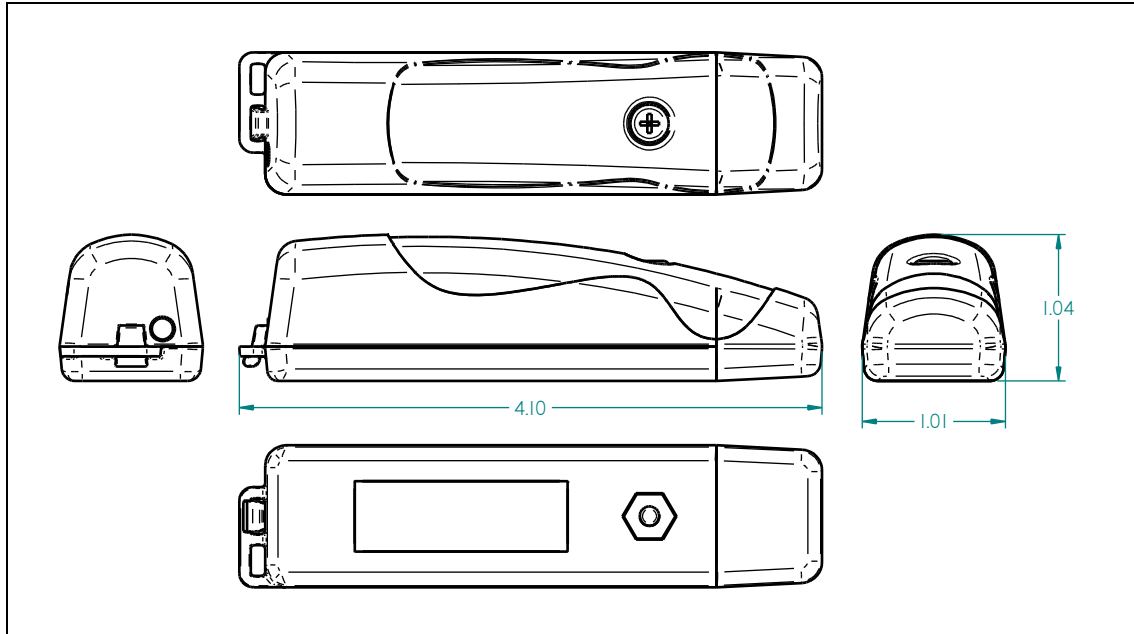
3.3.1 Dimensions

Figure 10: Enclosure Dimensions
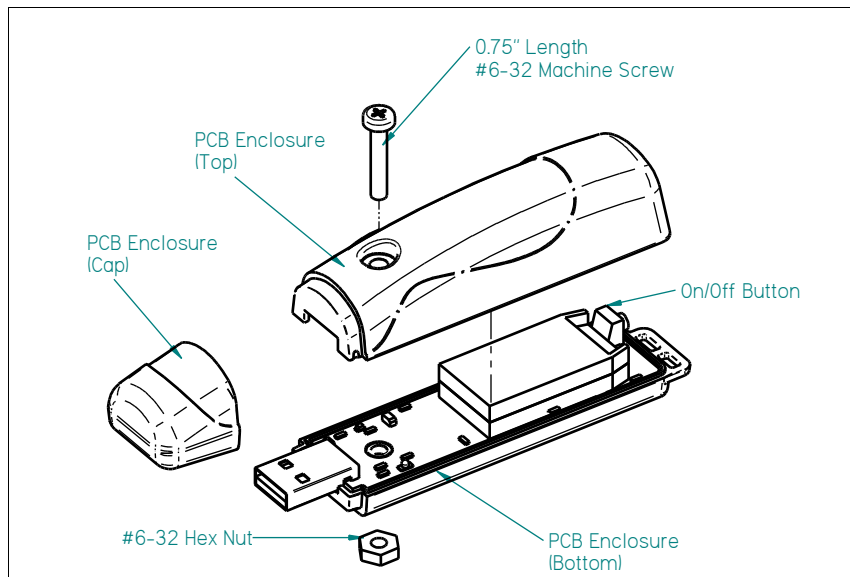
3.3.2 Assembly

Figure 11: Exploded View of the X2-2

4 Software

The X2-2 records data to comma delimited text files and uses text based files for configuration settings. Therefore, no special software is required to utilize the X2-2. For data analysis, Gulf Coast Data Concepts recommends using a commercial or open source mathematics package, such as MatLab, Mathcad, Microsoft Excel, OpenOffice Calc, Octave, R, or similar applications.

5 Troubleshooting

Problem	Resolution
I press the on/off button but the logger does not appear to activate and no LEDs blink.	Make sure the battery is charged.
	Check the battery disconnect jumper is set properly.
	The logger could be operating correctly but the status indicators are turned off. Check the "statusindicator" option in the config.txt file.
I press the on/off button, the blue LED blinks once per second but the red LED does not indicate logging.	The deadband setting is set too high and the logger is waiting to detect an event.
	The logger is in standby mode waiting for a start time to occur. Check the config.txt file for the start/stop settings.
The blue LED blinks slowly.	The microSD card is not present or is corrupted. Check that the card is inserted properly and the card is not corrupted.
I press the on/off button but the logger records only for a short period of time.	Check that the battery is fully charged.
	The microSD card is full and data files must be deleted.
I plug the logger into a USB port but the PC does not indicate an external drive present.	The microSD card is not present in the logger or is not inserted properly. Check that the card is fully inserted into the logger.
	The microSD card is corrupted or damaged. Reformat the card or replace the card.
	The on/off button could be jammed in the plastic enclosure and the logger is stuck in the "off" state. Check that the button moves freely and "clicks" when pressed.
	The USB connection could be faulty or the extender cable (if present) could be faulty. Remove the extender cable and plug the logger into another USB port.

Problem	Resolution
The logger seems to ignore the config.txt file and use default settings.	Check that the config.txt file is properly formatted and not corrupted. Each setting should occur on a separate line.
	Some IT organizations implement an automatic encryption of all removable media devices. This will encrypt the config.txt file and the logger will not be able to access the file. Do not allow encryption of the device.
The start time in the data file header is incorrect.	Initialize the RTC.
The Z-axis data is missing in the file.	No, it's present but the column headers are shifted in your spreadsheet due to the presence of the "headers" tag.
The logger is stationary but it registers 1g.	This is normal and indicates Earth's gravity is operating correctly. Huzzah!
But the logger actually registers something other than 1g when stationary.	The sensor will exhibit a slight offset error. Add or subtract the appropriate amount to correct the error. A 3-axis tumble calibration test is the best method to determine the sensor offset error for all three axis.