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***CDA Logger Manual  
Software Version 1.0***

***Seismic Stuff Technology Pte.  
Ltd.***



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**Revision      1.0**  
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## 1. Introduction

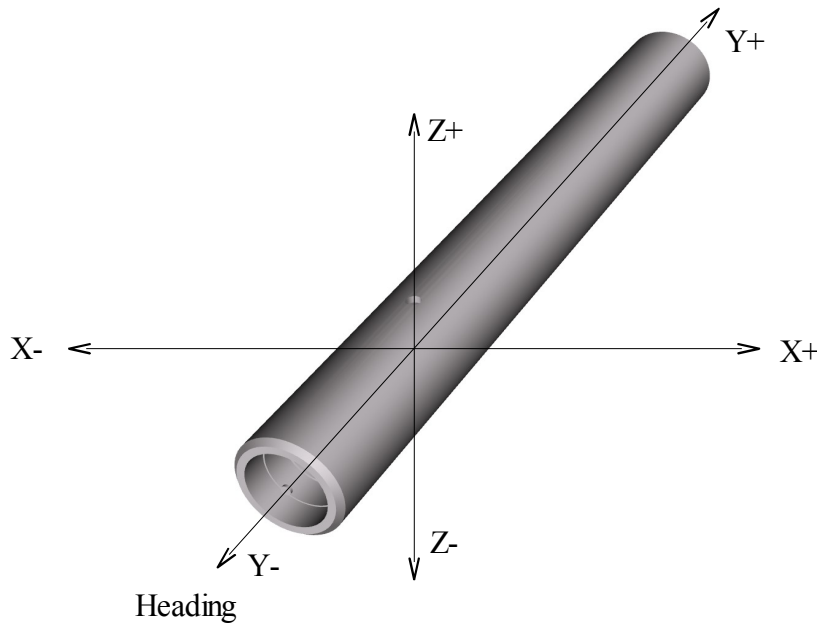
The CDA Logger allows long term remote autonomous logging of heading, depth and acceleration data which can then be downloaded for further analysis once the logger has been retrieved.

The Logger is housed inside a small waterproof tubular enclosure machined from white Delrin. With a diameter of 38mm and length of 320mm the logger can be mounted in a variety of remote locations.

## 2. Orientation of the Logger

The logger has an orientation indentation marking the front, top of the device at 80mm from one end of the tube.

The below image shows the orientation of the accelerometers and the heading data relative to the orientation indentation.



*Fig. 1 Orientation of the Logger*

### 3. Status Indicator

The orientation indentation is illuminated with a status LED from inside the logger. The status LED flashes a pattern every 15 seconds indicating the memory status of the device, and also showing the device is operational. When the logger memory is full, no more data is recorded until the memory is erased.

The following are the possible flash patterns: -

- Memory 0-25% full
- Memory 25-50% full
- Memory 50-75% full
- Memory 75-100% full
- Memory full

### 4. End Caps

The end caps seal can be removed with a 17mm socket or ring spanner and are sealed with two -118 Nitrile Shore A 70 o-rings.

The head end cap is perforated with a small orifice for the depth transducer – this end cap should not be confused with the tail end cap which is sealed.

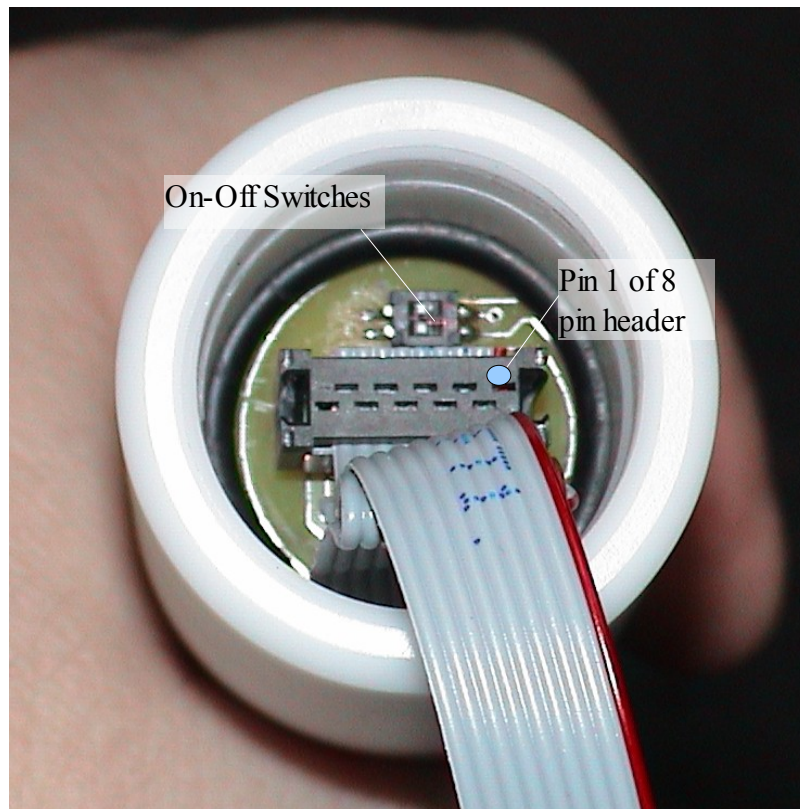
The head end cap also has a 1/4" NPT thread to allow fitting of an air fitting to allow calibration with an external pressure source.

The Head end cap should never need to be removed in normal operation.

The Tail end cap needs to be removed to turn the device on, when downloading data, setting up the device, or when changing batteries.

## 5. Turning the Device On and Connecting to a PC

Under the tail end cap can be seen two small switches which allow the device to be turned on or off. Each of the two switches connect one cell of the two batteries installed in the device. Also under this cap is an 8 pin header from which the device can be connected to a host PC.



*Fig. 2 Switches to turn the logger on and off and connection header*

The pinout of the 8 pin header is shown below: -

Pin Location 7 5 3 1  
8 6 4 2

Connection: -

1. NC
2. GND
3. PGD (Reserved for Firmware Programming)
4. RS232 TX
5. MCLR (Reserved for Firmware Programming)
6. RS232 RX
7. PGC (Reserved for Firmware Programming)
8. 3.3V (Reserved for Firmware Programming)

A 2m cable is provided to provide a connection from the 8 pin header to a 9 pin D Sub connector allowing the connection of the Logger to a host PC.

On the host PC a terminal program such as Hyperterminal or similar can be used to operate and control the logger.

Terminal settings should be as follows: -

115200 8-N-1 (115200 Baud, 8 bit, no parity, 1 stop bit)  
VT100 Emulation is preferred.

With the cable correctly configured and connected Hyperterminal can be used to interact with the logger.

## 6. Startup and Main Menu

If the device was off, then turning it on will display a menu similar to the following: -

```
CDAT Logger  
( c ) 2009 Seismic Stuff Technology Pte Ltd
```

```
SN:,1  
Version,1  
Log Interval,120  
x +1g,529  
x -1g,489  
y +1g,529  
y -1g,492  
z +1g,527  
z- 1g,488  
0 Bar,48  
1 Bar,88  
Rec. G Trigger,2  
Rec. Seconds on G Trigger,10  
Rec. Seconds on Alarm Trigger,0  
Alarm On,1  
Start  
Finished  
Log Entries=233 Recordings=12
```

```
Menu  
42 Percent Free  
----  
1.) Get Logged Data  
2.) Get Accelerometer Recordings  
3.) Recording/Logging Parameters  
4.) Setup and Calibrate Logger  
5.) Erase EEPROMS  
6.) Quit
```

Upon power on the unit displays the serial number and software version for the logger attached. This is followed by the current calibration values and data acquisition parameters.

Log Interval is the number of seconds between each saved log entry. Valid time are from 1 second to 3600 seconds.

x +1g is the data value logged when +1g is applied to the x axis

x -1g is the data value logged when -1g is applied to the x axis

y +1g is the data value logged when +1g is applied to the y axis

y -1g is the data value logged when -1g is applied to the y axis

z +1g is the data value logged when +1g is applied to the z axis

z -1g is the data value logged when -1g is applied to the z axis

0 Bar is the data value logged when the depth transducer is at normal atmospheric pressure

1 Bar is the data value logged when the depth transducer has 1 Bar above normal atmospheric pressure applied to it.

Rec. G Trigger is the number of G required to trigger a recording.

Rec. Seconds on G Trigger is the number of seconds of data to record if triggered by the G Trigger.

Rec. Seconds on Alarm Trigger is the number of seconds of data to record at the alarm time.

Alarm On indicates 1 of on, and 0 if off.

The logger displays “Start” then resynchronizes to the end of the data which can take around a minute or so if the memory is quite full, the the logger displays “Finished” and the number of log entries and accelerometer data recordings.

The main menu is then displayed.

If the device is already on then when a key is pressed the main menu will be displayed.

*Menu*

*42 Percent Free*

*----*

*1.) Get Logged Data*

*2.) Get Accelerometer Recordings*

*3.) Recording/Logging Parameters*

*4.) Setup and Calibrate Logger*

*5.) Erase EEPROMS*

*6.) Quit*

The amount of eeprom storage left on the device is displayed as a percentage free followed by the menu options.

## **7. 1.) Get Logged Data**

Typing '1' will select the “Get Logged Data” menu item. This will dump all the log entries in the eeprom memory to the terminal as comma separated values with one line per entry.

Firstly a header with all the calibration values needed to convert the A to D values into real world numbers. Then the logged data starts with the following column values: -

Year, month, day, hour, minute, second,

followed by the 6 max and min accelerometer a to d values for the x, y & z axis over the period since the last log entry followed by the depth a to d value.

Lastly we have the temperature in 1/10ths of a degree celcius then we have the heading in 1/10ths of a degree, pitch in 1/10ths of a degree and roll in 1/10ths of a degree.

An example log entry is as follows: -

```
09,04,03,14,58,47,523,525,508,512,494,497,47,233,3152,-
11,-553
```

which would be :

```
3rd April 2009 @ 14:58:47
X accelerometer data values from 523-525
Y accelerometer data values from 508-512
Z accelerometer data values from 494-497
Depth data value 47
Temperature data value 233
Heading 315.2 degrees
Pitch -1.1 degrees
Roll -55.3 degrees
```

## 8. 2.) Get Accelerometer Recordings

Typing '2' will select the "Get Accelerometer Recordings" menu item. This will dump all the accelerometer recording files in the eeprom memory to the terminal.

Firstly a header with all the calibration values needed to convert the A to D values into real world numbers are output followed by the individual accelerometer records.

The accelerometer records consist of the x, y & z A to D triple values at 1ms sample interval, the -1,-1,-1, signals the end of the record, then we have a log entry which contains the time stamp of the end of the data record. (as described in the previous section).

An abbreviated example of an accelerometer recording is shown below: -

```
526,519,493,
526,520,493,
526,520,493,
```

525,520,493,  
526,519,493,  
. . .  
525,520,494,  
525,519,494,  
525,521,494,  
-1,-1,-1,  
09,04,03,15,21,33,500,669,493,549,305,523,48,231,2544,2  
37,-677

## 9. 3.) Recording/Logging Parameters

Typing '3' will allow the amendment of the recording and logging parameters.

The following lines will be displayed : -

**Rec. Int. 120 Secs**

Range is from 1 second to 3600 seconds. This is the interval between log entries. 120 seconds (2 minutes) has been selected here.

Typing '+' will increase the number, typing '-' will decrease the number, typing 'q' will quit and move on to the next setting.

**Accel Rec.Len. (Time) 10 Secs**

Range is from 0 to 60 seconds. This is the number of seconds of accelerometer data to record when the fixed time (alarm) function is used. 10 seconds has been selected here.

Typing '+' will increase the number, typing '-' will decrease the number, typing 'q' will quit and move on to the next setting.

**Accel Rec.Len. (Shock) 0 Secs**

Range is from 0 to 60 seconds. This is the number of seconds of accelerometer data to record when the shock threshold trigger function is used.

Typing '+' will increase the number, typing '-' will decrease the number, typing 'q' will quit and move on to the next setting.

**Shock Threshold 2 G**

Range is from 0 to 15 G. This is the threshold of G on the accelerometers required to trigger an accelerometer recording event.

Typing '+' will increase the number, typing '-' will decrease the number, typing 'q' will quit and move on to the next setting.

**On 13:41**

This indicates the alarm is on or off for time triggered accelerometer recordings. The On or Off status can be changed using 'y' or 'n'. The alarm time can be changed by simply typing the new time, eg '1' '3' '4' '1' would be 13:41. Typing q will quit and return to the menu.

## 10. 4.) Setup and Calibrate Logger

Typing '4' will allow the setup and calibration of the logger.

The following lines will be displayed : -

**18: 6:41**

This is the current time in hours, minutes and seconds. Simply typing the numerals of the new time will set the time. e.g. '1' '8' '0' '6' '4' '1' will set the new time to 18: 6:41

Typing 'q' will quit and move on to the next setting.

**3- 4- 9**

This is the current date in day, month, year format. Simply typing the numerals of the new date will set the date. e.g. '0' '3' '0' '4' '0' '9' will set the new date to 3- 4- 9, or 3<sup>rd</sup> April 2009.

Typing 'q' will quit and move on to the next setting.

**x+529 x-489 (529) Y+529 y-492 (508) Z+527 z-488 (513)**

This is the accelerometer calibration routine where the six accelerometer axis can be calibrated using the earths gravity as the acceleration source. By orienting the logger such that gravity pulls down on the axis to be calibrated ensures 1 G is applied to that axis.

The current accelerometer data values are displayed in () braces. By typing X or x, Y or y, Z or z the device will capture the current accelerometer data for the relevant axis and store in the loggers eeprom.

Typing 'q' will quit and move on to the next setting.

**d0.00 Bar 48 D1.00 Bar 88 (48)**

This is the depth calibration routine where the pressure transducer can be calibrated with an external pressure source.

The current depth data values are displayed in () braces. By typing d or D the device will capture the current pressure data for the relevant axis and store in the loggers eeprom. 'd' is used when the pressure applied is 0.00 Bar and 'D' is used when the pressure applied is 1.00 Bar.

Typing 'q' will quit and return to the menu.

**11. 5.) Erase EEPROMS**

Typing '5' will allow the erasure and testing of the device eeproms. Each of the 4 EEPROMS has 2 Banks and 256 Pages or 256 Bytes, a total of 524288 Bytes (512 K). The erasure is permanent and there is no way to undo this action. The Erase and Test operation is a little time consuming taking a couple of minutes.

**12. 6.) Quit**

Typing '6' will quit the menu and return to data acquisition mode. Leaving the logger idle in menu mode will eventually cause the logger to timeout and return to acquisition mode anyway.

**13. Acquisition Mode**

When the device is in Acquisition Mode it will output a single '.' every time a log entry is created, a '\*' every time a shock recording is triggered and a 'T' when recording is triggered on time/alarm.

**14. Memory Issues**

The device has 524,288 bytes of memory. Each Log entry takes 29 bytes of memory and each second of accelerometer data takes 6000 bytes plus a 7 byte overhead for the record start and end markers and another 29 bytes time stamp/log entry.

This amount of memory allows >18,000 log entries or approximately 87 seconds of accelerometer data to be recorded.

## Specifications

Dimensions: 38mm dia. x 320mm len.  
Battery: 2 x 3.6V Lithium C Cells.  
Operational Time: Approx 60 days.

## Sensors

Compass: 3 axis Magneto Resistive Tilt Compensated  
0.1 degrees resolution  
2 degrees heading accuracy at <15 degrees tilt  
3 degrees heading accuracy at +/- 15 degrees tilt  
4 degrees heading accuracy at +/- 60 degrees

Pitch/Roll MEMS Accelerometer Type  
0.1 degrees resolution  
1 degrees pitch/roll accuracy at +/- 15 degrees tilt  
2 degrees pitch/roll accuracy +/-15 to +/-60 degrees

Accelerometer: +/- 18G MEMS  
1ms sample rate

Depth: 0-100m range  
250m destruction depth

Temperature: -40 to +125 degrees Celcius