

Anomaly Detector

Operations manual

Table of Contents

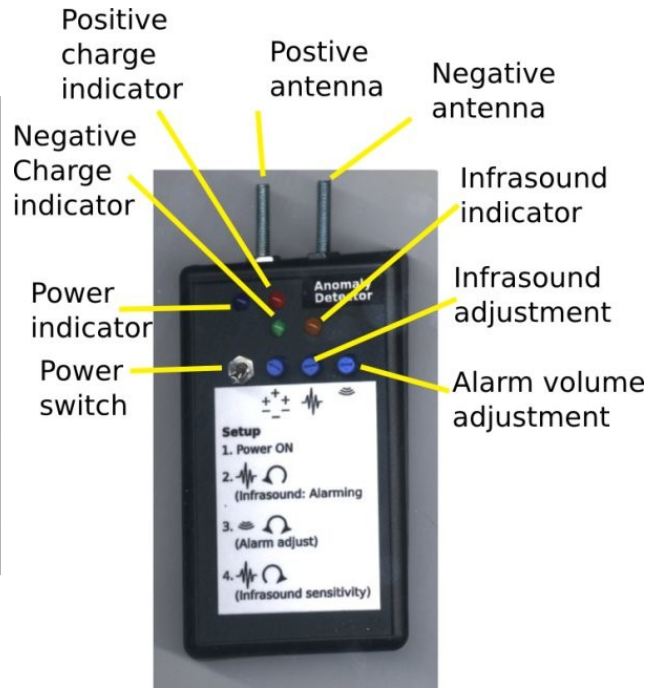
Glossary.....	2
Unit specifications.....	3
Electric Field.....	4
Specifications.....	4
Indication.....	4
Testing.....	4
Reset.....	4
Normal operation and care.....	4
InfraSound detector.....	5
Specifications.....	5
Testing.....	5
Trouble Shooting.....	6
Power indicator blinks too fast.....	6
Electrostatic sensor Circuit failure.....	6
False electrostatic detector alarms.....	6
False InfraSound detector alarms.....	6

Glossary

CCW	Counterclockwise
CW	Clockwise
CMOS	Complimentary Metal Oxide Semiconductor. This sensitive circuit can be used to detect voltages without applying too much load. In the electrical charge sensor, it is particularly useful because it does not discharge the static field too much before the voltage can be detected.
MCU	Micro Controller Unit. This is the programmable circuit that controls the function of the unit

Unit specifications

Electrostatic detector	>±5V with polarity indicators
InfraSound detector	3 Axis with trigger indicator and threshold adjustment
Power	9V battery (supplied) switchable with front panel switch and flashing blue LED power indicator
Alarm	Audible with adjustable volume
Size	2.64" x 5.23" x 1.55"



Power switch	Up for ON, down for OFF. The unit requires a 9V battery (supplied, with spare) replaceable from back of unit.
Power indicator	Flashes very bright blue once per second to indicate proper operation. Fast flashing (7.5 times per second) indicates a failure of the sampling cycle, cycle the power to clear this fault.
Positive and Negative Charge indicators	Red indicator lights up when a positive charge is detected on the positive antenna. Green indicator lights up when a negative charge is detected on the negative antenna. Both indicators will light up when a charge between 0-5V is applied or when an AC charge is applied, like when standing underneath high voltage wires.
Positive and Negative Antennas	These antennas are electrically isolated from the case, but a very high resistance exists in the plastic case body which acts as a ground. Any charge detected in the air or by directly touching the antenna is conducted to the CMOS circuitry through a 10M resistor. A bleed-off circuit automatically resets the charge so that some energy must be expended in order to sense a charge.
Infrasound indicator	Illuminates when any InfraSound is detected along any axis (X,Y,Z).
Infrasound adjustment	Fully CCW reduces the threshold so that internal electrical noise triggers the alarm, this is useful for setting the alarm volume. Fully CW, increases the threshold but will not shut the sensor off.
Alarm volume adjustment	The alarm can be turned off (fully CCW) or made very loud (fully CW). The alarm can be heard from a voice in the case on the right hand side.

Electric Field

Specifications

Two CMOS inputs of the MCU are connected through a high impedance to each antenna are able to detect high voltages in the air that have little energy capacity.

Indication

If a voltage is detected, the appropriate polarity LED will illuminate.

A red LED only means that the voltage is of positive charge.

A green LED only means that the voltage is of negative charge.

In some cases touching the antennas together may cause both LEDs to come on because the sensors are separated by 5V internally.

When the antennas are not touched, both LEDs on, means that an alternating electrical field is being sensed. This can be caused from closeness to an AC electrical high tension wire.

Testing

The electrostatic function can be tested by bringing the unit near a cathode ray television (old style, not LCD). The high voltage on the picture tube should make the RED (+ve) LED illuminate . Bringing the unit away from the TV or shuffling feet on a carpeted floor should make the green light illuminate.

You can also touch your fingers to the antennas while walking on a carpet with plastic shoes and plastic socks.

Reset

Normally the electrostatic sensor antennas will discharge through the internal 5Gohm resistors, however, if the LEDs stay lit, a manual reset may be required by touching the plates with your hand, this grounds out any charge accumulated on the antennas.

Normal operation and care

The device is intended on working in a dry area, and not connected to any electrical circuitry.

The CMOS sensor is fairly delicate so do not connect the antennas to anything. A high voltage electrical charge will naturally be discharged through the internal circuitry, connecting the antenna to anything with more energy may damage the discharge or sensing circuitry.

InfraSound detector

Specifications

The purpose of this sensor is to detect low frequency sounds as described by the witnesses. The device uses an STMicroelectronics LIS3L02AS4 3-axis accelerometer for detection.. The cost of these integrated circuits is reduced because of the recent popularity of gaming systems and automotive applications.

The three axis sensor means that the unit will detect shaking in the up/down, left/right, forward/backwards axis equally. Since the drone can appear at any angle to the sensor, it is important to be able to detect all possible locations.

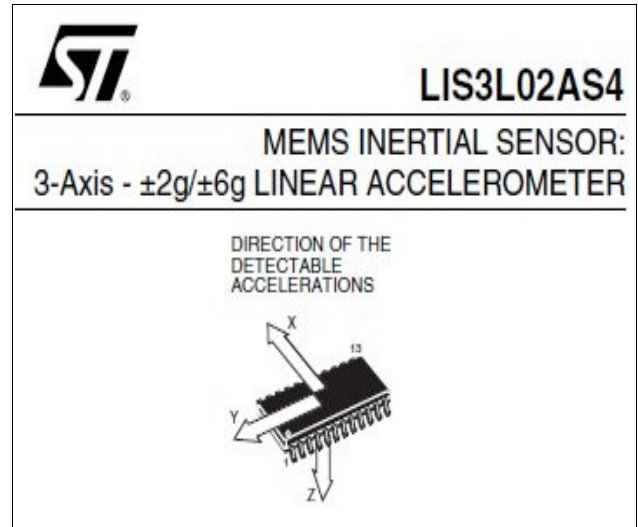


Illustration 1: Accelerometer axis

Testing

1. Decrease the InfraSound threshold, fully CCW, and the Infrasound alarm indicator LED should illuminate due to internal electrical noise.
2. While keeping the unit stable, slowly increase the InfraSound threshold until the light goes off. This is the most sensitive setting.
3. Slowly shake the unit in each direction separately; X, Y, Z for at least one second and the InfraSound indicator should come on.

More elaborate testing can be achieved by turning the volume up on a very loud audio amplifier while the music plays a song with a thumping beat. Beware that this loud sound can damage your ears.

A small amount of jitter is ignored. Basically high frequencies are eliminated in the software of the MCU as shown in Illustration 2.

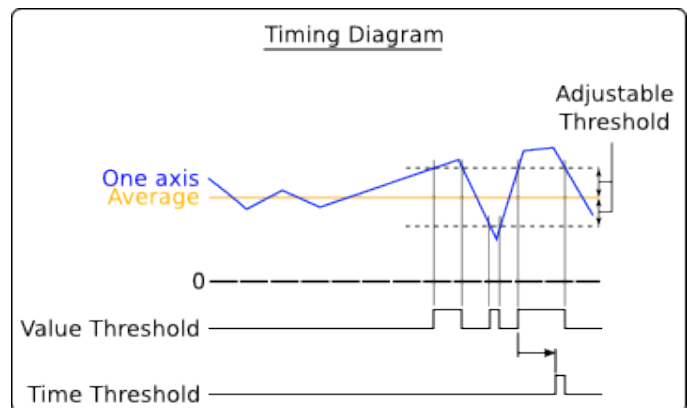


Illustration 2: Reduction of high frequency vibration

Trouble Shooting

Power indicator blinks too fast

In the event that there is a micro-controller error in reading the analog inputs, the blue power LED will blink at a much faster rate (7.5 times per second) instead of the 1 blink per second. This can be reset by shutting the power off for a few seconds.

Electrostatic sensor Circuit failure

If the electrodes are exposed to excessive voltage, the micro-controller may fail temporarily or permanently. Temporary failures can be cleared by switching the power off for a few seconds. Permanent failures will require a replacement micro-controller.

Failure of this circuit will be seen as one or more of the indicator lights either remaining on always or never reacting to a signal.

False electrostatic detector alarms

Currently the Electrostatic sensor does not have its adjustment programmed into the MCU, so there is nothing that can really be done.

False InfraSound detector alarms

If the Infrasonic detector is providing false alarms, you can turn the threshold adjustment CW until the alarms cease. Note, that it will not totally stop all alarms since the maximum threshold is still below the maximum sensor signal.