

Specifications for: [OSOP Raspberry Shake 3D](#)

- Your 3D Personal Seismograph -

An IoT home-automation device

Born on: February, 2017

<http://shop.raspberrysshake.org/>

sales@raspberrysshake.org

Last updated: 16-november-2017

Unit

The Raspberry Shake 3D Personal Seismograph is an all-in-one, IoT plug-and-go solution for personal seismology- [OSOP, S.A.](#) integrates a 3 orthogonal velocity sensors, the digitizers, the hyper dampers, and the computer into *a single box*. The Raspberry Shake 3D Personal Seismograph is manufactured in Volcán, Panamá using cutting-edge 3D printing and laser-cutting technology.

Warranty: 1 year from ship date

Specifications subject to change without notice.

| Parameter | Value |
|----------------------------|--|
| Raspberry Shake 3D Version | V3 |
| Dimensions (estimated) | 140x130x60 mm |
| Weight (estimated) | 0.6 kg |
| Immersion rating | <i>Standard enclosure: IP10</i> <i>IP67 enclosure available upon request at additional cost</i> |
| Connectors | <i>Standard enclosure: Ethernet (RJ45), Power Micro USB (5V, 2.5 Amps), USB 2 ports x4, HDMI, Micro SD, CSI Camera port, Composite video and audio output jack</i> |

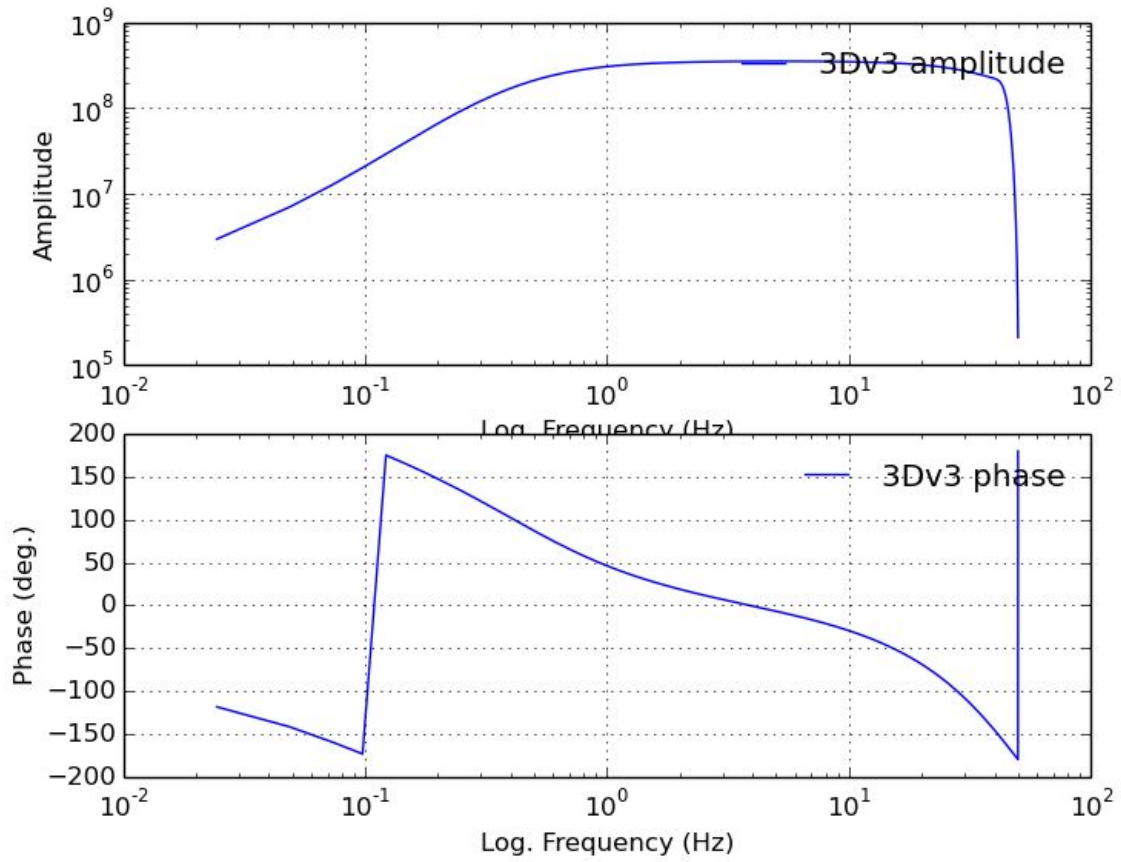
| | |
|-----------------------------|---|
| | <i>IP67 enclosure: Ethernet (RJ45), Power</i> |
| Installation Considerations | Designed for plug-and-go installation |
| Operating Temperature | 0 to 60 C (limited by RPi, the Raspberry Shake itself can go to -40C) |
| On Board Computer | Wifi-enabled Raspberry Pi 3 Model B |
| Storage Device | <p>8 Gb or + micro SD card</p> <p><u>Est. # days of disk space:</u></p> <p>OS/ software: ~3 Gb</p> <p>Remaining space for data: ~5 Gb</p> <p># days (15 Mb/ day/ channel [x3]): ~110, more if you use a bigger SD</p> |
| Timing | Network Timing Protocol, NTP |
| Timing Quality | NTP timing quality remains within 1 sample of accuracy versus startup accuracy: +/- 10 ms or better @ 100 sps |

Seismograph

| Parameter | Value |
|---|---|
| Type | <p>3-component, orthogonally placed 4.5 Hz (electronically extended down to 2 seconds) Sunfull PS-4.5B geophones, 375 Ohm</p> <p><i>Note: These are not the same geophones used in the 1D and 4D versions of Raspberry Shake</i></p> |
| Samples per second | 100 |
| <p><i>Earthquake Early Warning (EEW) compatible</i></p> <p><i>data packets shipped across serial port at a rate of 4 packets/ second (250 ms/ packet)</i></p> | |
| Bandwidth (estimate) | <p>-3dB points at 0.6 to 34 Hz</p> <p><i>Note: We hope to extend this out to 40 Hz (or 80% of Nyquist) before shipping the first round of Raspberry Shakes</i></p> |
| Poles (estimate) | 2.23E+02 +/- 2.95E+02; 3.76E-01; 0 |
| Zeros (estimate) | -1.96E+02 +/- 1.55E+02; 2.65 +/- 6.83E-01 |
| Sensitivity (estimate) | 3.53E+08 counts/ meter/ second +/- 10% precision |
| Clip Level (estimate) | <p>+/- 8,388,608 counts (24-bits)</p> <p>24 mm/s peak-to-peak from 0.1 to 10 Hz</p> |
| Minimum Detection Threshold (estimate) | <p>0.06 μm/ s RMS from 1 to 20 Hz @ 100 sps</p> <p><i>Note: The minimum detectable level is considered to be 10 dB above the noise RMS. Dynamic range is the full scale sinusoid RMS over the noise RMS in dB.</i></p> |

| | |
|----------------------------|---|
| Digitizer Dynamic range | 24-bit ADC Sigma-Delta $\Sigma\Delta$ 144 dB (24 bits) |
| Effective bits (estimate) | <p>20 bits (120 dB) from 1 to 20 Hz @ 100 sps (for the entire analog to digital hardware chain).</p> <p><i>Note: Whereas most manufacturers report this for their digitizer only, we are reporting it for the entire sensor + ADC hardware chain. The effective bits of the digitizer itself are necessarily better.</i></p> <p>This parameter is also commonly known as “Dynamic Range” or “RMS to RMS noise”.</p> |

Velocity Channel Instrument Response:



Software

| Software installed on Raspberry Shake's RPi computer |
|--|
| 100% SeisComP3 compatible Also: AQMS, Antelope, Earlybird, Earthworm, Hydra, ObsPy, SEISAN, ... |
| Native SeedLink Server (source: GEOFON) with OSOP Data Flow Message Router |
| Tight and automatic integration with SeisComP |
| Web-interface (HTML) for easy configuration |
| Software to store continuous seismic data in miniSEED format |
| Web-based helicorder plot generator (source: USGS) |
| Swarm (source: USGS) |
| Software distributed with Docker |
| Automatic updates |
| Operating System: Debian 8 (Linux) |

Communications

| Parameter | Value |
|---|--|
| Digital bandwidth consumption at 100 Hz, 3 channels (estimated) | Incoming rates RX: ~72.0 kbits/s Outgoing rates TX: ~282.0 kbits/s TCP Flow rate: 25.2 kbits/s |
| TCP/IP compatible | |
| Compatible with Wifi, Ethernet, Cell modem, GPRS, Satellite | |

Power

| Parameter | Value |
|--|---|
| Power Supply Voltage | 5 Volts DC (2.5 Amp supply) |
| Power Consumption (RPi + Raspberry Shake, estimated) | $5.14 \text{ Volts} \times 0.270 \text{ A} = 1.4 \text{ Watts}$ |

Calibration Mechanism: Calibration not required over time but can be verified using the [OSOP Calibration Table](#). All seismographs are verified prior to shipping to ensure that their gain is within 10% of the nominal instrument response (up to 10% variation attributable to geophones and capacitors).

Questions?

Email us at sales@raspberrysake.org