

Specifications for: [Raspberry Jam](#)

- Universal 24-bit Digitizer -
An IoT device

Born on: October, 2017

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Unit

The “Raspberry Jam” universal 24-bit digitizer is an IoT plug-and-go solution for seismology. The Jam supports 3-channels of **single-ended** and **differential-ended** signal inputs, **passive** and **active** sensors. The Raspberry Jam is manufactured in 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 Jam Version	V4 (Current version: V4)
Dimensions (estimated)	12x9x9 cm
Weight (estimated)	0.6 kg
Immersion rating	IP67
Connectors	<i>IP67 enclosure:</i> Ethernet (RJ45), Power, 10-pin MIL-C sensor cable connector
Installation Considerations	Designed for plug-and-go installation Mounting screw anchor slot provided
Operating Temperature	0 to 60 C (limited by RPi, the Raspberry Jam itself can go to -20C)

<p>On Board Computer</p>	<p>Wifi-enabled Raspberry Pi 3 Model B</p> <p><i>The Raspberry Shake board/ Software is also compatible with:</i></p> <p>00[10,13],900032: Model B+</p> <p>a[01040,01041,21041,22042]: 2 Model B</p> <p>a[02082,22082,32082,52082]: 3 Model B</p> <p>a020d3: 3 Model B+</p>
<p>Storage Device</p>	<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 [x4]): ~80, more if you use a bigger SD</p>
<p>Timing</p>	<p>Network Timing Protocol, NTP (default)</p> <p>GPS timing supported</p>
<p>Timing Quality</p>	<p>NTP timing quality remains within 1 sample of accuracy versus startup accuracy: +/- 10 ms or better @ 100 sps</p>

Digitizer

Parameter	Value
<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>	
Type	24-bit digitizer
# channels	3
Samples per second	100 on all 3-channels
Digitizer Dynamic range	24-bit ADC Sigma-Delta $\Sigma\Delta$ 144 dB (24 bits)
Effective bits (estimated)	V6: 21+ bits (126+ dB) from 1 to 20 Hz @ 100 sps This parameter is also commonly known as "Dynamic Range"; "RMS to RMS noise"; or "noise free bits".
Input supported	Supports 3-channels of single-ended and differential-ended signal inputs, passive and active sensors
Overvoltage protection (est.)	<p>i. For Active Sensors:</p> <p>Configuration/ resistor dependent. Examples:</p> <p style="padding-left: 40px;">$R[a] + R[b] = 5 \text{ k}\Omega$: protected to +/- 45 volts or more.</p> <p><i>Note: If $R[a]$ and $R[b]$ are shorted, the absolute maximum input voltage at either input with respect to ground is 0 to 3.5 volts.</i></p>

	<p>i. For Passive Sensors (e.g., geophones):</p> <p>With a geophone as the input, the absolute maximum input voltage depends on the value of $R[a] + R[b]$. As long as $R[a] + R[b]$ is greater than 2500 Ohms, the input will withstand large voltage pulses (up to +/- 100V). As $R[a]$ and $R[b]$ get larger, or the geophone coil internal impedance increases, the larger the transient input voltage pulse can be.</p> <p><i>Note: If $R[a]$ and $R[b]$ are shorted, the absolute maximum input voltage at either input with respect to ground goes beyond 0 to 3.5 volts, the actual value depending on the geophone coil resistance.</i></p>
<p>Example Passive Sensors Supported</p>	<p>Geotech S-13, GS-13[BH], GS-21</p> <p>Kinometrics SS-1 Ranger</p> <p>Sercel (previously Mark Products) L-4C</p>
<p>Example Active Sensors Supported</p>	<p>Chaparral Model [25,25/21], 50[a], 60/64, 60Vx, 60UHP</p> <p>Geotech KS-[1,2000,5400], PA23, S-230</p> <p>Guralp [3,5T,6,6T,40] Series, Fortis</p> <p>Kinometrics Episensor [2,ES-T,ES-U2]</p> <p>Lennartz LE-3D[lite/5s], MKIII</p> <p>Metrozet PBB, MBB-[1/2]</p> <p>Nanometrics Trillium Compact [PH,AT], Trillium 120 [Q/QA]</p> <p>RefTek (now Trimble) 151B-120, 147A</p> <p>Seismowave LP[ZA,HA], MB3 A</p> <p>Streckeisen STS[2,2.5,5A,6A]</p>

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 Raspberry Shake's 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, 4 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)	Startup: 5 Volts x 0.550 A = 2.8 Watts Run-time: 5 Volts x 0.340 A = 1.7 Watts

Questions?

Email us at sales@raspberrysake.org