

## Shake Event Recorder with Intensity Display



The SER is an effective and low-cost recorder that provides critical information in the aftermath of a large or felt earthquake or shakes. It has no moving parts and nothing to adjust. The SER even decides which recorded events to keep and to discard.

This design philosophy makes the SER hassle-free with reliability to record and preserve the vital data needed to assess structural movement that may result from an earthquake or excitation.

It can be used on education purposes and applications such as Seismic Strong Motion System, Structure Excitation Recording, Landslide Detection System, incinerator or industrial production lines.

For Safety Evaluation Report, it answers such questions as, “How strong was the shaking?” and “How did the building react to the seismic waves?”



### Basic Specifications:

Data resolution:	3-Component Accelerometer & Compass: 16 Bits, approximately <math><0.002\text{g}</math>
Sensor range:	Internal Tri-axial Accelerometers. $\pm 2\text{g}$ and Compass 360deg
Intensity:	Modified Mercalli Intensity (depends on Constant Variables, scale to 12 = XII)
Noise level:	500 micro-g / root-Hz typical
Bandwidth:	DC ~ 20 Hz
Sampling Rate:	100 Hz (Default 100sps)
Timing:	Real-time clock for event identification. Accurate to <math><30</math> minutes/year or NTP.
Memory:	Event lengths up to 3600 seconds. 60 minutes of total storage. Automatic file deletion based on least peak acceleration, FIFO or Never.
Hardware Interface:	USB Type-B and UTP RJ-45 IP network.
Software Interface:	Windows-based data collection and displaying program. Files available in EVT format to allow the use of analysis software
Web Interface:	Setup Configuration, Real-time monitoring, download/delete event file, Raw data stream, backup/restore setup parameter, remote firmware upgrade.
Event:	Up to 30 seconds Pre-event and 120 seconds Post-event recording.
I/O Control:	Alarm Relay control, manual trigger, alarm reset, master/slave interface and etc.
Input Power:	+9VDC to +30VDC, typical 100mA on +12 VDC or USB 5VDC.
Temperature range:	10°C to 50°C
Dimension:	135mm Length X 105mm Width X 35mm Height, 780g Weight.

## The Modified Mercalli Intensity Scale

The lower degrees of the Modified Mercalli Intensity scale generally deal with the manner in which the earthquake is felt by people.

This table gives Modified Mercalli scale intensities that are typically observed at locations near the epicenter of the earthquake.

<b>I. Not felt</b>	Not felt except by very few under especially favourable conditions.
<b>II. Weak</b>	Felt only by a few people at rest, especially on upper floors of buildings.
<b>III. Weak</b>	Felt quite noticeably by people indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
<b>IV. Light</b>	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
<b>V. Moderate</b>	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
<b>VI. Strong</b>	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
<b>VII. Very strong</b>	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
<b>VIII. Severe</b>	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
<b>IX. Violent</b>	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Liquefaction.
<b>X. Extreme</b>	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
<b>XI. Extreme</b>	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipe lines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
<b>XII. Extreme</b>	Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

# The Modified Mercalli Intensity Scale

**I**



Imperceptible to people

**II**



Felt slightly by some people keeping quiet in buildings.

**III**



Felt by many people keeping quiet in buildings.

**IV**



Felt by most people in buildings.

**V**



- Most people are started.
- Hanging objects such as lamps swing significantly.
- Unstable ornaments may fall.

**VIII**



- It is difficult to remain standing.
- Many unsecured furniture moves and may topple over. Doors may become wedged shut.
- Wall tiles and windows may sustain damage and fall.
- In wooden houses with low earthquake resistance, tiles may fall and buildings may lean or collapse.

High earthquake resistance    Low earthquake resistance

**VI**



- Many people are frightened and feel the need to hold onto something stable.
- Dishes in cupboards and items on bookshelves may fall.
- Unsecured furniture may move, and unstable furniture may topple over.

**IX**



- It is impossible to move without crawling. People may be thrown through the air.
- Most unsecured furniture moves, and is more likely to topple over.
- Wooden houses with low earthquake resistance are more likely to lean or collapse.
- Large cracks may form, and large landslides and massif collapses may be seen.

High earthquake resistance    Low earthquake resistance

**VII**



- Many people find it difficult to walk without holding onto something stable
- Dishes in cupboards and items on bookshelves are more likely to fall.
- Unsecured furniture may topple over.
- Unreinforced concrete-block walls may collapse.

**X**



- Wooden houses with low earthquake resistance are even more likely to lean or collapse.
- Wooden houses with high earthquake resistance may lean in some cases.
- Reinforced-concrete buildings with low earthquake resistance are more likely to collapse.

High earthquake resistance    Low earthquake resistance

**XI**



- Bridges destroyed. Broad fissures in ground. Underground pipe lines completely out of service.
- Earth slumps and land slips in soft ground. Rails bent greatly.

**XII**



- Damage total. Waves seen on ground surfaces.
- Lines of sight and level distorted.
- Objects thrown upward into the air.