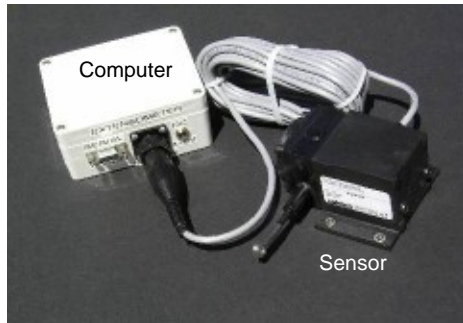


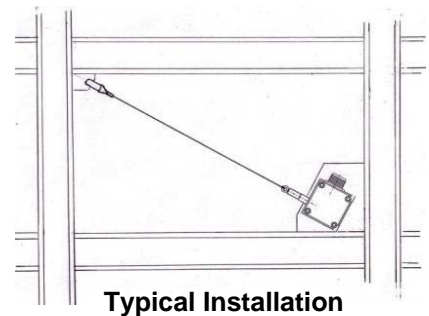
New Recording Extensometer Gives You a Time History of Structural Deformation!



The Earthquake is Over...Is the Structure OK? How do you find out? You can inspect, which takes time and money. You can interpret the accelerometer records, double integrate and then subtract two large numbers to estimate maximum drift. You can run the computer model once again, if you have one. Or you can measure drift directly with a recording extensometer!

DD-4 Seismic Displacement Recorder

- Quick and easy installation
- Can store up to five separate seismic distortion records
- Range of ± 5 inches standard, up to ± 25 inches available.
- Sampling every .10 seconds for a complete time history.
- One year battery life.
- Zero maintenance for one full year, battery replacement only after that.
- Compact and user-friendly
- Extremely accurate and sensitive.



Description

The DD-4 seismic displacement recorder is a self contained data acquisition system that provides up to five time histories of structural distortion during an earthquake. A very small environmentally sealed computer system captures data from a reel type potentiometer that has an output signal of zero to five volts d.c. This signal is captured by an A/D converter within the computer and converted to a series of 14 bit digital words. A non-volatile memory in the computer stores two minutes of data every time an earthquake triggers the system. The displacement level that triggers the recorder can be adjusted by the user. The suggested value is 5% of the maximum displacement, as this level is unlikely to be exceeded during microseisms, traffic and other transients, or wind excitation.

The end result is a two minute history of displacement vs. time for each event. Sampling interval is .010 seconds which is more than adequate as the minimum expected structure period is .50 seconds. Maximum error is .15% of the full stroke range.

When installed inside a building this instrument provides a full time history of interstory drift during each seismic event. It can provide similar measurements for a bridge, or for a structure on base isolators. These applications would require a greater range of motion and as much as ± 125 inches is available.

When installed across a viscous damper or other energy absorbing element this instrument will provide a complete stroke/time history.

The basic version of the Displacement Recorder has USB output and a battery power supply. Many options are available, like a recharging cable which taps into a local power line, dial-up or modem interrogation and wireless download.

Both the computer and the reel type potentiometer are environmentally sealed and can withstand any expected range of temperature as well as other weather conditions that could be expected.

Specifications DD-4 Seismic Displacement Recorder

Set-up and Configuration

The user can set up the trigger level, time and date, and notes to appear on each record. Everything else is automatic.

Sensor

The sensor is a reel type potentiometer with a thin film element (infinite resolution) made by Celesco. A number of displacement ranges are available from ± 1.0 inch to ± 50 inches. Output signal is zero to 5.0 volts with a maximum inaccuracy of .3% of full stroke capacity. The sensor is environmentally sealed.

GENERAL

Full Stroke Ranges	0-2 to 0-50 inches
Output Signal	14 bit word every .10 seconds
Accuracy	$\pm 0.10\%$ of full stroke
Repeatability	$\pm 0.02\%$ full stroke
Resolution	essentially infinite
Measuring Cable	0.019-in. dia. nylon-coated stainless steel
Enclosure Material	ABS plastic and black anodized aluminum
Sensor	plastic-hybrid precision potentiometer
Weight	1 lb. max
Storage Capacity	Five events each 2.0 minutes long
Power Requirement	One 6.0 volt battery

ENVIRONMENTAL

Enclosure Design	NEMA 4, IP67
Operating Temperature	-30 to 200°F
Vibration	10 G's to 2000 Hz maximum

More information

The recording extensometer is a very special purpose ultra-compact computer hitched up to a high quality commercially available reel type extensometer made by Celesco. This type of instrument is readily available from a number of sources and we selected the best we could find.

The ultra-compact computer is unique. Karl Svaty, a structural engineer who instruments bridges, designs and makes these computers, at least the prototypes. Karl's work in instrumenting bridges led him to develop his own transducers and processing equipment. Over the past 20 years he has created some very sophisticated computer systems to do this. His special computers feature very small size, one year minimum battery life, 14 to 16 bit accuracy, rugged construction, and complete environmental protection.

These computers are very small, about the size of a wooden box that might hold a pack of playing cards. They are environmentally sealed and hardened to withstand abuse. Special low power circuits provide at least one year of operation on a standard battery. If AC power is available for battery recharging the device can function indefinitely.

The computer in each instrument sits there in hibernation mode waiting for an earthquake. It triggers when it senses motion, a difference in readings by a preset margin within a preset interval. It then records two minutes of time history minimum, more if the event continues past then.

Custom Computers

Naturally a computer of this type can be used for many purposes and with many types of transducers. You could use a slightly different version of the same computer with a pressure transducer, or a set of strain gages or load cells, or any sensor with an output somewhat similar to the extensometer. You could also vary the time scale to measure crack propagation remotely. The computer can be built with any kind of output; UBS, WiFi, dial-up modem, DSL. Its flash card can also be made removable for reading in any desktop computer.

Other Applications

BRB

One major problem with the Buckling Restrained Brace is what to do after a seismic event. Should they all be replaced, or can at least some of them stay in place? This is a major decision. Right now there is no way to tell how much life is left in them after an event.

A recording extensometer across any one of a number of BRB's in a set of bays in a structure with a fairly rigid diaphragm can provide the needed information. The engineer now has an exact record of cumulative stroke and number of cycles. This can be compared to the 10 full stroke cycles that most BRB's can withstand. It is most unlikely that any credible earthquake will come close to this much cumulative travel.

Viscous Dampers

A recording extensometer across a viscous damper will permit interpretation of both stroke and force, due to the velocity dependence of the damper function. It acts like a combined force transducer and displacement transducer. This can provide information for subsequent modeling of structure behavior, as well as verification of structural integrity.

Base Isolators

A set of three or four recording extensometers across the moat at widely separated locations can pick up both rotation and translation.

Expansion Joints

The extensometer can record action motion during an event, including pounding if it occurs.

Any Other Ideas?

Give us a call or write or email us with your own concepts and suggestions.



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