

# MAGNETIC EXTENSOMETER

**MODEL 1900**



**OPERATING PRINCIPLE**

The Model 1900 Magnetic Extensometer is designed to measure settlement or heave of soft ground under the influence of loading or unloading due to the construction of embankments, fills, buildings, and structures.

A reed-switch probe is used in conjunction with magnetic anchors positioned at various depths in a borehole drilled in soft ground or positioned inside fill material as it is placed on the original ground surface. A 1" schedule 80 PVC access tube or a 70 mm OD Inclinator casing passes through the various anchors and

allows the reed-switch probe to be lowered inside the tube on the end of a nylon-coated steel graduated tape.

The steel tape contains two conductors which connect the reed switch inside the probe to a light and a buzzer located inside the tape reel. When the probe is positioned opposite an anchor, the magnet in the anchor causes the reed switch to close and the buzzer to sound. The tape (which is graduated in 1/10 in or mm) is then read opposite an index mark located at the top of the access tube or inclinometer casing.

**ADVANTAGES AND LIMITATIONS**

The design of the Model 1900 Magnetic Extensometer provides a means for determining the total displacement and the displacement for each inter-anchor zone.

In most cases, the bottom of the access tube, or inclinometer casing, is deep enough to be located in solid ground. A datum magnet anchored to the bottom of the access tube or inclinometer casing provides a stable benchmark to which all other measurements are referred.

The absolute settlement of each anchor point relative to the benchmark can be calculated.

If the bottom of the access tube or inclinometer casing cannot be located in the solid ground, then it will be necessary to reference the position of each anchor to the top of the access tube or inclinometer casing. Then to transfer this elevation to an external benchmark by normal level surveying techniques.

**APPLICATIONS**

The Model 1900 Magnetic Extensometer is designed for the measurement of settlement or heave of soft ground in or around:

- Excavations
- Foundations
- Dams
- Embankments
- Sheet piles and slurry walls
- Tunnels



Model 1900-5A (left) and Model 1900-5B (right) Datum Ring Magnets.

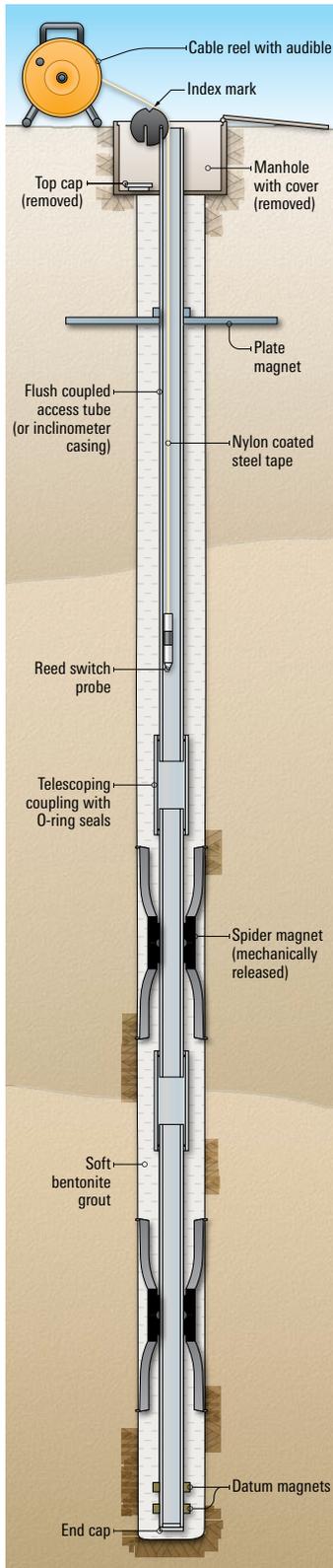


Model 1900-7A Anchor, shown before and after release on 1" access tube.



Model 1900-7B Anchor, shown before and after release on 6600 Inclinator casing.

## SYSTEM COMPONENTS



A typical Model 1900 installation.

Three types of anchors are available. In fills, square or circular plate magnets are used. "Spider" anchors, with six mechanically activated leaf springs, are used in boreholes. The leaf springs are closed until the anchor is at its correct location inside the borehole when a release mechanism is actuated, causing the springs to open and grip the sides of the borehole.

The third type of anchor is similar to the spider type, except that it has only three springs. This type is installed inside the borehole using setting rods to push it down the access tube until it is at the correct depth. The leaf springs exert a continuous outward force and scrape along the borehole walls as they are pushed into the hole.

Datum magnets are fixed to the bottom of the access tube or inclinometer casing and serve as a reference or datum that is assumed to be in a fixed position, i.e., below the settlement zone. The positions of all the magnetic anchors above are referenced to the datum magnets to calculate the settlement amount in the various inter-anchor zones. If the datum magnets cannot be located in stable ground, it will be necessary to periodically survey the top of the access tube or inclinometer casing.

The access tube comprises lengths of 1" Sch. 80 flush-coupled PVC pipe. Where large settlements are anticipated, telescoping sections should be incorporated into the access tube column (see illustration at left).

## SPECIFICATIONS

Tape Lengths	30, 50, 100, 150, 200 m; 100, 125, 200, 300 ft
Resolution	1mm
Repeatability	±3 mm
Temperature Range	-30 °C to +80 °C
Probe Material	Stainless Steel
Probe Dimensions	178 × 19 mm (L × Ø)
Access Tube	PVC 1" sch. 80 (33 mm O.D.)
Inclinometer Casing <sup>1</sup>	70 mm O.D.
Telescoping Section	1 m (460 mm fully compressed)
Plate Magnet Material	PVC
Plate Magnet Dimensions	300 mm × 300 mm × 60 mm (9.5 mm Plate)
Spider Magnet Material	(body) ABS Plastic (legs) Hardened 17-7 SS
1900-7A Spider Magnet Dimensions	(closed) 430 × 70 × 34 mm (L × O.D. × I.D.) (released) 410 × 190 × 34 mm (L × O.D. × I.D.)
1900-7B Spider Magnet Dimensions	(closed) 430 × 120 × 73 mm (L × O.D. × I.D.) (released) 410 × 228 × 73 mm (L × O.D. × I.D.)
Leaf Spring (Leg) Stiffness	> 20N
Datum Magnet Material	ABS Plastic
1900-5A Datum Magnet Dimensions	51 × 70 × 34 mm (L × O.D. × I.D.)
1900-5B Datum Magnet Dimensions	51 × 110 × 73 mm (L × O.D. × I.D.)
Borehole Size	102 to 216 mm

<sup>1</sup>Refer to Model 6400, 6500, and 6600 data sheets for inclinometer casing specifications.

## ORDERING INFORMATION

- 1900-1-10: Flush coupled access tube, 1" SCH 80 PVC, 10' / 3 m length standard.
- 1900-1-5: Flush coupled access tube, 1" SCH 80 PVC, 5' / 1.5 m length standard.
- 1900-2: Telescoping coupling, Total length: 1 m (allows for 0.54 m of compression).
- 1900-4: Access tube bottom end cap.
- 1900-5A: Datum Ring Magnet for 1" PVC pipe.
- 1900-5B: Datum Ring Magnet for 2.75" Glue and Snap casing.
- 1900-5C: Datum Ring Magnet for 3.34" Glue and Snap casing.
- 1900-6A: Plate Magnet for 1" PVC pipe.
- 1900-6B: Plate Magnet for 2.75" Glue and Snap casing.
- 1900-6C: Plate Magnet for 3.34" Glue and Snap casing.
- 1900-7A: Spider Magnet (double-ended) for 1" PVC pipe.
- 1900-7B: Spider Magnet (double-ended) for use over 2.75" Inclinometer casing.
- 1900-7C: Spider Magnet (double-ended) for use over 3.34" Inclinometer casing.
- 07-062G-E: Galvanized Aircraft Cable, 1/16"
- 07-062G-M: Galvanized Aircraft Cable, 1/16"
- 1900-10: Access tube top cap.
- 1900-11-30M: Reed switch probe, with 30 meter measurement tape.
- 1900-11-50M: Reed switch probe, with 50 meter measurement tape.
- 1900-11-100M: Reed switch probe, with 100 meter measurement tape.
- 1900-11-150M: Reed switch probe, with 150 meter measurement tape.
- 1900-11-200M: Reed switch probe, with 200 meter measurement tape.
- 1900-11-100E: Reed switch probe, with 100' measurement tape.
- 1900-11-125E: Reed switch probe, with 125' measurement tape.
- 1900-11-200E: Reed switch probe, with 200' measurement tape.
- 1900-11-300E: Reed switch probe, with 300' measurement tape.