YieldPoint
Sensing the future

d-GMM (SPECTRE)

Instruction Manual

YieldPoint Inc.

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Warranty and Service Policy

Product Warranty

YieldPoint Inc warrants the instruments described in this manual to be free from defects in materials and factory workmanship to the original buyer. This warranty is contingent upon proper use of the equipment, and does not cover equipment that has been modified or has been subjected to abusive physical or electrical stresses. YieldPoint Inc., agrees to repair or replace, at its sole discretion, any instrument that fails to perform as specified within 6 months after date of the original shipment from the factory, or 3 months after the date of installation, whichever date comes first.

Yieldpoint Inc., reserves the right to make substitutions and modifications in the specifications of equipment that do not materially or adversely affect the performance of the equipment.

New equipment may be returned within 30 days of shipment with prior approval. New items which are less than thirty days old after shipment may be returned for credit, less a minimum restocking and testing charge of twenty percent of the list price upon factory approval only, provided the customer pays all shipping and handling charges. Specially ordered, or modified goods, or goods which have been used or have been unpacked, or goods which have been shipped more than thirty days prior are not returnable.

The information contained in this manual is subject to change without notice. YieldPoint Inc. makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Further, YieldPoint Inc., assumes no responsibility for any errors that may appear in this manual and makes no commitment to update, or keep current, the information contained in this manual.

Service Policy

Units within the warranty period returned for repair, test, and recalibration are serviced at no charge in accordance with the terms of the warranty policy. The Customer pays all transportation and other charges to the factory.

Units out of warranty returned for repair, test, and/or recalibration are handled on a time and material basis. If requested, or if costs exceed 50% of current list price, YieldPoint Inc., advises the customer prior to making the repairs. Such repairs are performed at the customer's expense. Typical test, recalibration, and repairs are 25% of the instrument's current list price. Transportation charges both ways are at the customer's expense.

Please be sure all returns are shipped with the following information included:

1. Your company Name with Billing and Shipping Addresses.
2. A complete description of your problem, or re-calibration data.
3. The contact person at your company, with their telephone and facsimile numbers.
4. Non-Warranty returns additionally need your Purchase Order Number.

Please pack your returned instruments in their original shipping cartons, or in equivalent strong protective shipping cartons.

The ***d*-GMM (SPECTRE)** is a digital ground movement monitoring instrument based on YieldPoint's SPECTRE technology. The instrument consists of two separate components: the electronic probe and the yellow aluminum target with an enclosed ring magnet. There is no physical connection between these, **hence** we refer to the sensor as being 'non-contact' in design, and
because the electronic probe unit can be hermetically sealed, it will function indefinitely underwater, Also with no integral moving parts, it is virtually immune to blast vibration.

On-board the ***d*-GMM(SPECTRE)** the following digital operations are conducted;
1. A displacement sensor, monitors the relative position of the hermetically sealed electronic probe and a ring magnet which is usually housed inside a yellow aluminum target.
2. A digital temperature sensor monitors temperature.
3. A microcontroller applies signal processing: digital filtering, temperature compensation and linearization..
4. The microcontroller outputs a digital signal on a single wire that are directly related to real world units.
5. These signals can be transmitted over long lead wire lengths, and are accurately decoded by another micro-controller in the Manual Interrogation Unit(***d*-READER**), ***d*-LOGGER** data-logger or DESTINY networking system.

A digital approach is better because:

1. Information can be sent over long lead-wire lengths (comparable to 4-20mA loops), and orders of magnitude further than analog voltage signals.
2. By using a time-domain multiplexing scheme, many channels of information can be sent along a single signal wire, which reduces price and minimizes the time required for any repair.
3. If accidentally severed, lead-wires can be twisted together as a temporary fix.
4. Expensive A/D conversion has already been performed in the sensor so that Data Acquisition can be built around low cost micro-controller.
5. Output in real world units decreases the cost of data interpretation and expands the number of personnel who can use the data. Many times data gets trapped in an engineer's spreadsheet program.

Preparation:

Customers use ***d*-GMM (SPECTRE)**s in a wide range of applications not just attached to a rock bolt as a GMM. Therefore if the ***d*-GMM(SPECTRE)** is to be attached to a rock bolt the ring magnet needs to be epoxied into the yellow aluminum target at the end which is <u>not</u> internally threaded (i.e at the far end from that which will thread onto the rockbolt). A plastic centralizer is provided for this purpose.

For Installation the following items are required:
1. ***d*-GMM(SPECTRE)** + Manual Interrogation Unit (***d*-READER**)
2. Ratchet socket driver with 13/16" socket
3. 2 rolls of electrical tape.
4. Expansive foam or rock bolt epoxy
5. Drain tube for wet holes (a drinking straw will usually suffice)

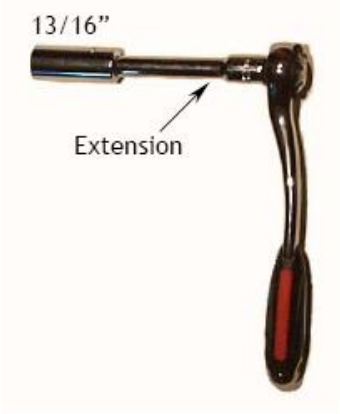
In typical applications the ring magnet will be attached to the aluminum target using an epoxy resin. This should be done ahead of time.

Installation Procedure.

The ***d*-GMM(SPECTRE)** is designed for installation in a 1 3/8" diameter (33mm) or larger percussion drill hole.

STEP 1

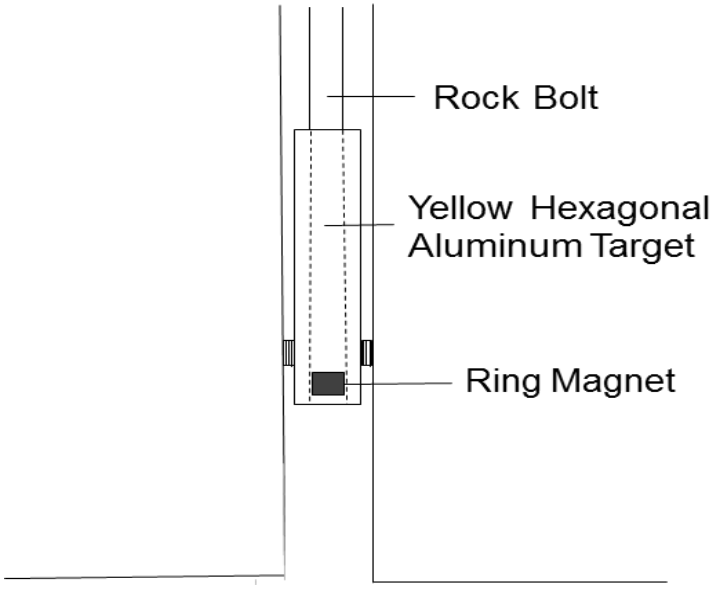
The yellow aluminum target (with magnet attached) should be threaded and tightened onto a 5/8 " mechanical rock bolt (a coupler exists for a ¾" bolt). The best tool to accomplish this is a professional quality ratchet socket driver (see below) with an extension and a 13/16" socket. Tip: In a pitch, use a spark plug driver.



The Extension and 13/16" socket can be obtained from Yield

STEP 2

Install the rock bolt into the borehole so that the collar of the yellow target is 3.5 inches (90mm) from the collar of the borehole. Using a 13/16" socket to grip the yellow aluminum target, tighten the expansion shell until the bolt is secure.



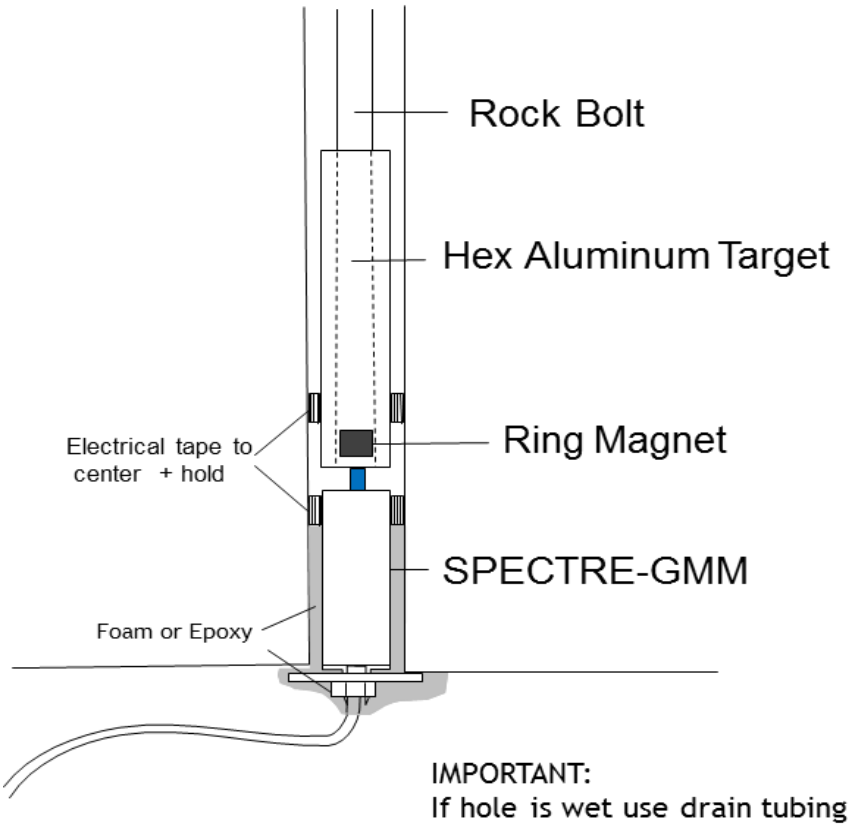
STEP 3

With the bolt secure, insert and attach the electronic probe to the borehole collar so that the initial reading is 15.00mm. During this stage the sensor can be held in place by an oversize ring of electrical tape wound on the ***d*-GMM(SPECTRE)** (see figure below).

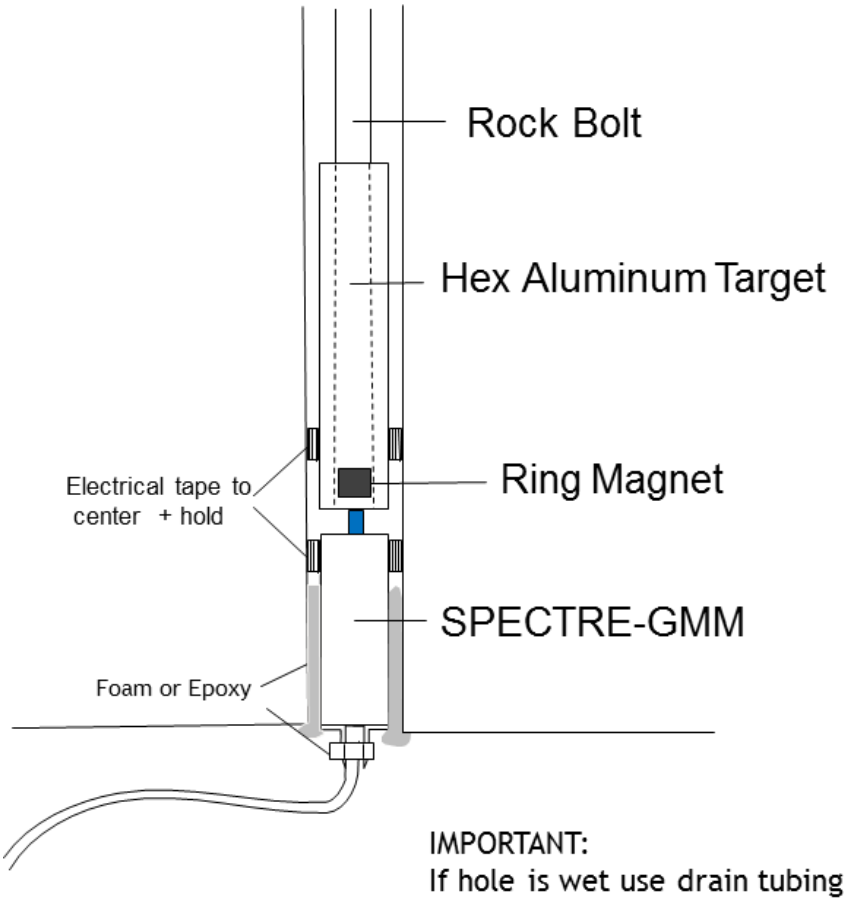
The GMM can be permanently secured in place using either rock bolt resin or expansive foam.

1. Rock bolt resin
Mould the resin around the body of the sensor (this provides the majority of adhesion) and around the aluminum faceplate.

2. Expansive foams.
When using expansive foams apply a liberal coating of grease to the aluminum target piece. Then position the sensor in the borehole and spray a small amount of the foam . Complete the application by filling around the collar of the borehole and enclosing the aluminum face-bar. In wet holes provide a drain hole using a length of tubing.



Install the d-GMM so that it has a initial reading of around 15mm. The aluminum faceplate can be omitted.



USING THE MANUAL INTEROGATION UNIT (*d*-READER)

The ***d*-READER** is a micro-controller based readout unit. It provides power to the ***d*-GMM(SPECTRE)** , applies signal conditioning and displays the results on a backlit LCD. By simply plugging a sensor the MIU is activated. Therefore it cannot be left on, or turned on accidentally. Information will be scrolled out on the LCD as indicated below.

- Firmware version eg. DESTINY Ver 5.0
- Battery Voltage (9.5 new to 7.5 low battery limit)
- Sensor ID
- SensorType (d-GMM)
- Channel 0 Temperature in deg C
- Channel 1 Displacement in mm

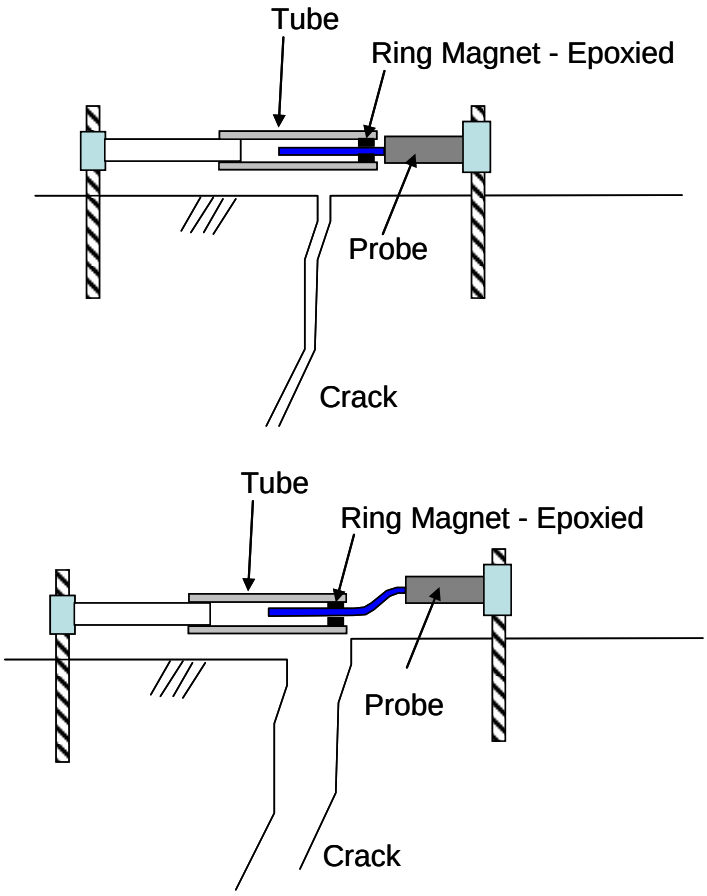
The sensor data will continue to cycle through the channel data until unplugged

Key Points:
1. The 9V battery should be replaced immediately if the “LOW BATTERY” condition is indicated. This occurs at 7.5V.

2. Damaged lead wires will result in the “SensorID” signal never appearing. In other words the battery voltage will just be indicated.

USING THE SPECTRE GMM TO MONITOR A PIT WALL.

The ***d*-GMM(SPECTRE)** is very well suited to monitoring of cracks in a pit wall. They have been employed in the scenario at the Dome Pit in Timmins. The setup is shown below.



Advantages offered by the ***d*-GMM(SPECTRE)** are:

1. High stability with respect to temperature.
2. On board temperature sensor allows temperature correction.
3. Hermetically sealed unit compared to a potentiometric application
4. The flexibility of the probe allows shear movements to be accommodated.
5. Digital Signals can be sent over 500m.

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