

## INSTRUCTION SHEET FOR DETECT-GMM.

The DETECT GMM is a digital ground movement monitoring instrument based on YieldPoint's DETECT technology. The sensor consists of two separate components the electronic probe and the aluminum target between which there is no physical connection. Thus we refer to the sensor as being 'non-contact' in operation, and because the electronic probe unit can be hermetically sealed, it will function indefinitely underwater and, with no moving parts is virtually immune to blast vibration.

On-board the DETECT-GMM the following digital operations are conducted;

1. The displacement sensor, a long-range eddy current sensor, monitors the relative position of the hermetically sealed electronic probe and the aluminum target. This signal is a square wave train with transitions between 0-5V or a 0-1 logical state at a frequency corresponding to displacement over 126mm.
2. A temperature transducer outputs a square wave train with transitions between 0-5V or a 0-1 logical state at a frequency proportional to temperature.
3. A micro-controller sequentially counts the number of 0-5V (0-1) transitions /sec for both sensors. Based on these results temperature compensation is applied and transformations between frequency and "real world units", typically mm and °C, are conducted. All sensors are individually calibrated and the calibration coefficients are stored in FLASH memory on-board the micro-controller.
4. The micro-controller outputs a frequency signal on a single wire that are directly related to real world units ( $100\text{Hz}/\text{mm}$  or  $10\text{Hz}/^{\circ}\text{C}$ ).
5. These signals can be carried over long lead wire lengths, and are accurately decoded by another micro-controller in the Manual Interrogation Unit.

Digital 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-sharing 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 increases the number of personnel who can use the data. Many times data gets trapped in an engineer's spreadsheet program.

**For Installation the following items are required:**

1. DETECT-GMM + Manual Interrogation Unit (MIU)
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.

### Installation Procedure.

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

#### STEP 1 IMPORTANT

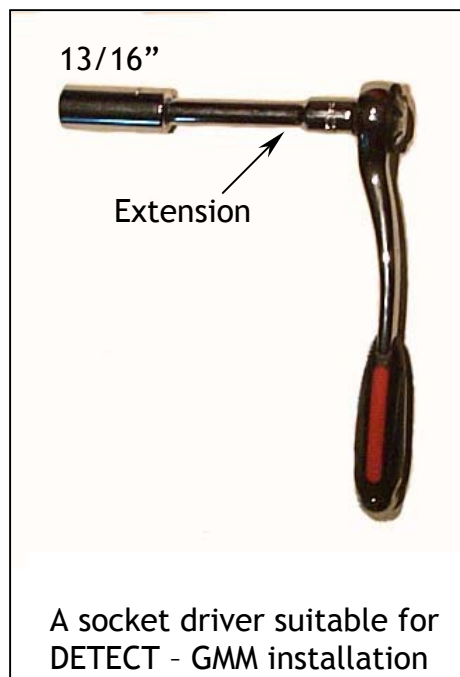
DETECT technology can be influenced by very conductive rocks at the borehole wall. To test whether the rock type at the collar of the borehole wall is too conductive for application:

- Remove the probe from its aluminum target.
- Plug the probe into the MIU
- The displacement should indicate "Hi Range"
- Insert the probe (without aluminum target into the collar of the hole).
- Wait for two full reading cycles and check that the displacement is still "Hi Range" in which case deployment of the sensor is OK
- If the sensor indicates a displacement value (called the null displacement value) deployment is not recommended. If the sensor is deployed, be record the null displacement value, and contact YieldPoint personnel for assistance.
- Unplug the sensor from MIU.

YieldPoint technicians are currently developing algorithms which will allow DETECT technology to be used even in highly conductive rock types.

#### STEP 2

The aluminum Target should be treaded and tightened onto a 5/8 " mechanical rock 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.



### STEP 3

Install the rock bolt into the borehole so that the collar of the aluminum target is 3 inches (75mm) from the collar of the borehole. Using a 13/16" socket (spark plug wrench can be used) to grip the aluminum target tighten so that the bolt is secure.

### STEP 4

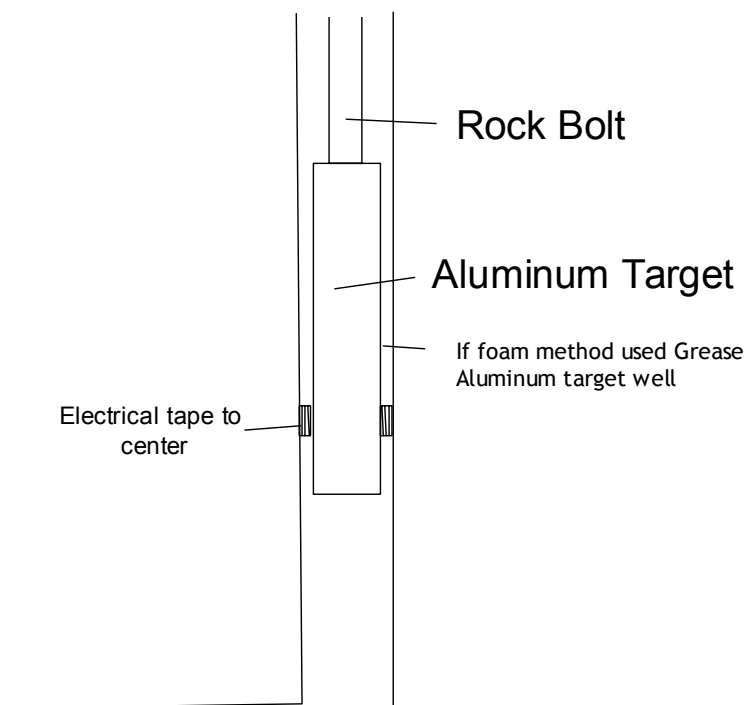
Insert and attach the electronic probe to the borehole collar. Prior to deployment of adhesive the sensor can be wedged in place. An oversize ring of electrical tape wound on the DETECT-GMM works well for all borehole sizes.

1. Using rock bolt resin

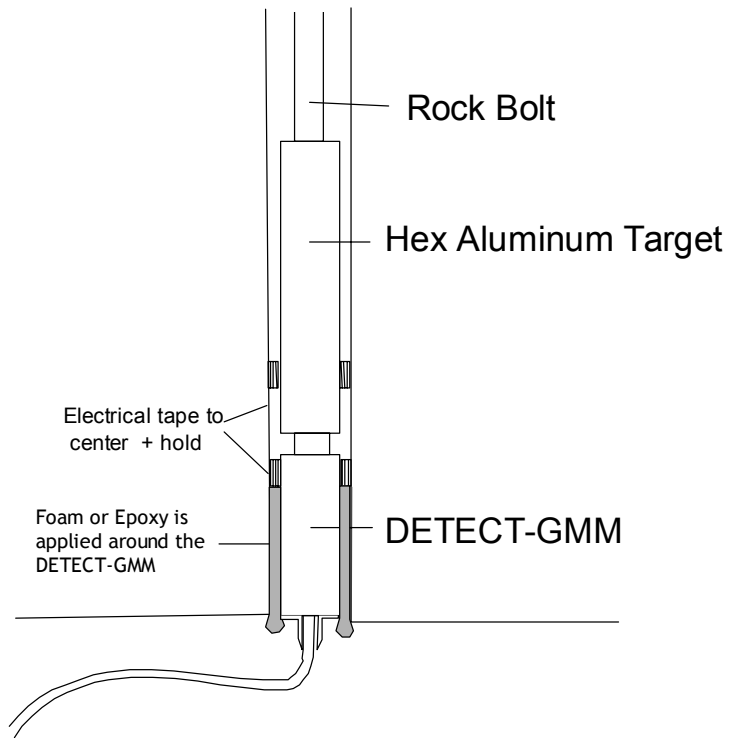
Mould the resin around the body of the sensor (this provides the majority of adhesion) and around the aluminum faceplate.

2. Using expansive foams.

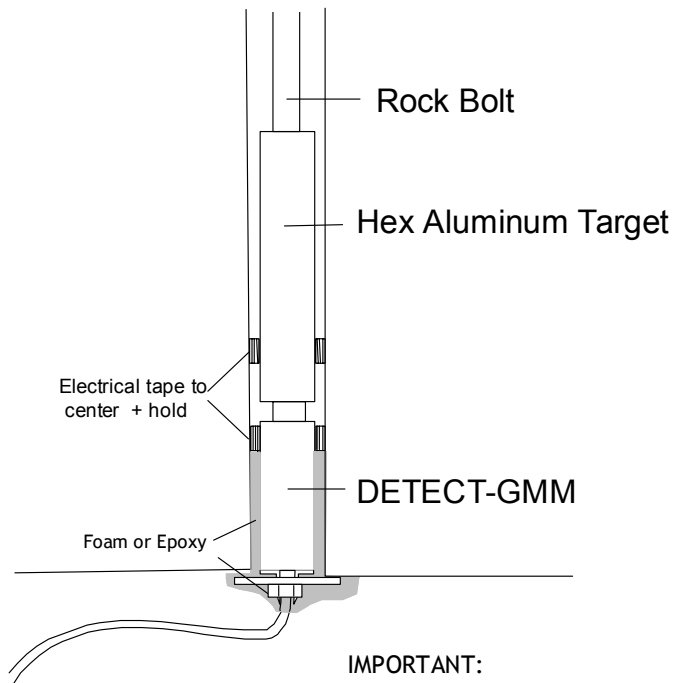
When using expansive foams, first apply a liberal coating of grease to the aluminum target piece. Then position the sensor in the borehole and spray a small amount of the foam (STEP 4-1). Complete the application by filling around the collar of the borehole and enclosing the aluminum face-bar. In wet holes provide a drain hole using the length of tubing provided (STEP 4-2).



STEP 3



STEP 4-1



**IMPORTANT:**  
If hole is wet use drain tubing

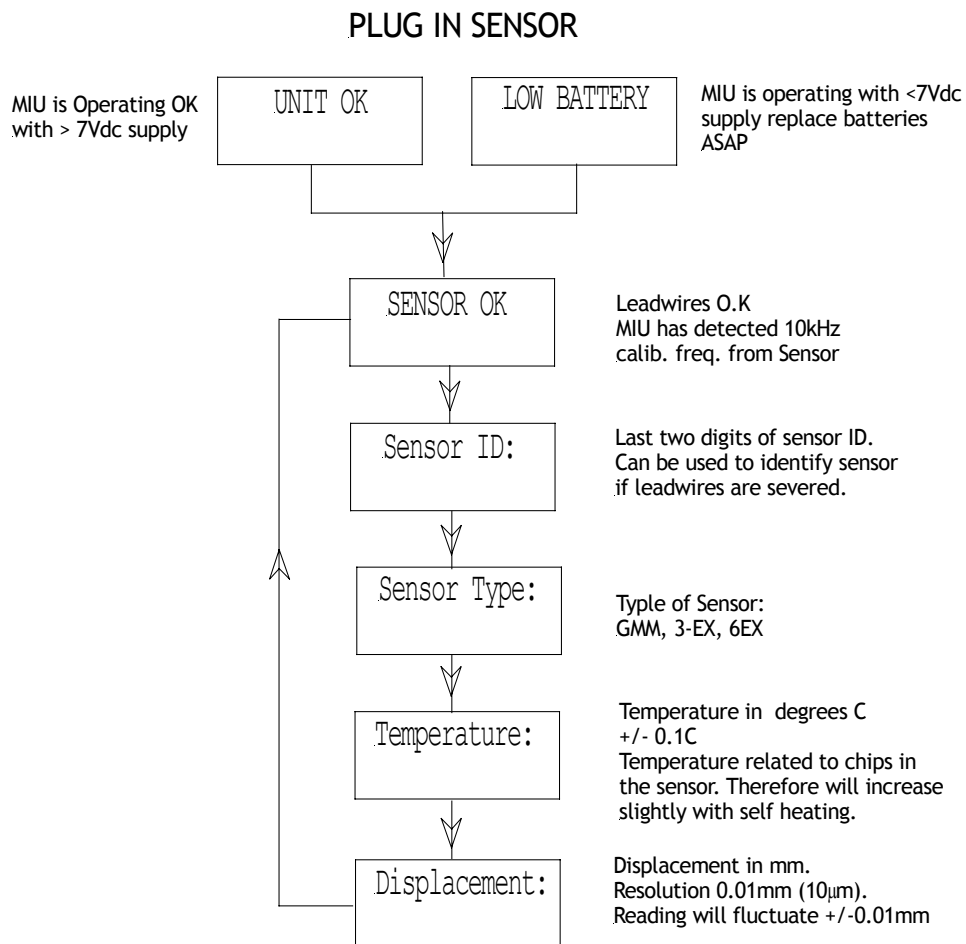
STEP 4-2

## USING THE MANUAL INTERROGATION UNIT (MIU)

The MIU is a micro-controller based interrogation Unit for DETECT Technology. It provides power to the DETECT sensors, provides 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. The sensor data will continue to cycle if the sensor remains plugged in.



### Key Points:

1. The 9V battery should be replaced ASAP if the “LOW BATTERY” condition is indicated.
2. Damaged leadwires will result in the “SENSOR OK” signal never appearing.

3. The temperature reading on the first cycle, is a good indication of ambient temperature.