PROTEUS

Inclination Logging & Reporting

For Proteus Crawlers

Instruction Manual

Version C

minicam

IMPORTANT - PLEASE NOTE

The inclination feature is for use only to show the estimated general trend of the pipe slope. Due to varying conditions such as pipe type, environments, vibration, sensor technologies, etc. Minicam cannot be held responsible for any inaccuracies or consequences arising from the use of the inclination feature, logged inclination data, or generated inclination reports.

Inclination Logging

Before commencing the Inclination Logging

NOTE!
Before commencing the inclination logging, follow the on screen calibration instructions, ensuring this is done on a reasonably level, flat surface.

NOTE!
Inclination surveys are always best carried out **in reverse**, **after** completing your survey.

Inclination Sensing

Some Proteus crawlers are fitted with a sensor for inclination. The inclination measures the "slope" of the pipe as the crawler is driving along. The CCU, or a PC running suitable software applications (such as Win-Can), can log the values of the crawler inclination during the survey. From the logged value, the CCU (or PC) can produce a graph showing the inclination slopes that the crawler experienced while driving along.

What inclination is for

Inclination is used to show the general trend in slopes within a pipe. It is not for accurate measurement, and can't accurately detect bumps such as pipe joints.
Mainly it is used to look for signs of where there might be dips or peaks in the pipe which could become water or silt traps.

Recommended Conditions for Inclination Logging

The quality of the inclination log depends upon many influences. When logging inclination, Minicam recommends the inclination is logged:

- in a clean pipe, so that the crawler does not lose traction
- when the crawler is reversing out of the pipe (to minimise shaking due to the crawler pulling on the cable)
- at a medium speed, without stopping the crawler, after the observation survey has been completed.

It is possible to perform inclination logging when driving the crawler forwards, though if the crawler is regularly stopped and restarted, this will affect the inclination log quality.

Inclination Logging on the CCU

(If logging inclination using a PC application, please see the instruction manual for that application.)

Setting up the Crawler

Setting the Inclination Polarity

Some Proteus crawlers produce an inclination signal which works upside-down ('reversed'). For these crawlers you can tell the CCU to swap the signal around.

- When you lift the front of the crawler, the inclination values shown on the CCU screen should show POSITIVE values.

- When you lift the rear of the crawler, the inclination values shown on the CCU screen should show NEGATIVE values.

If you find that this is not true for your crawler, you may need to change the "Inclination Polarity".

- To change the Inclination Polarity, press ⚒ for Setup.

- Then select the menu item Survey / Inclination.

- Then the menu item Inclination Polarity.

- From there you can select Standard or Reversed, then press **OK** .

Inclination Zero Calibration

The inclination sensor on some Proteus crawlers should be 'calibrated', Minicam recommends that this is done before every inclination survey.
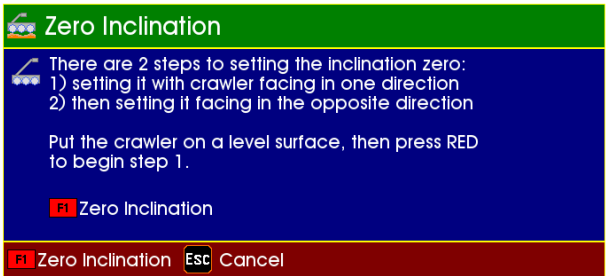
Power on your crawler, and press the Tools 🛠️ key, then select "Survey / Inclination".
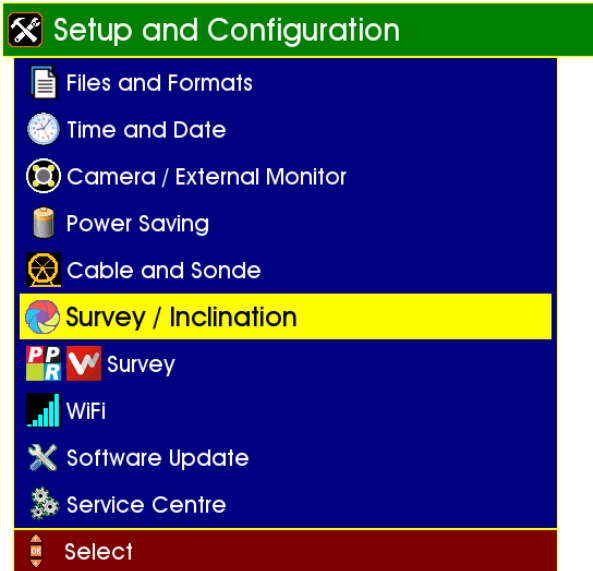
If your crawler supports inclination zero calibration, you will see a menu item "Zero Inclination". If it does not support inclination zero calibration, you can ignore the rest of this setup.
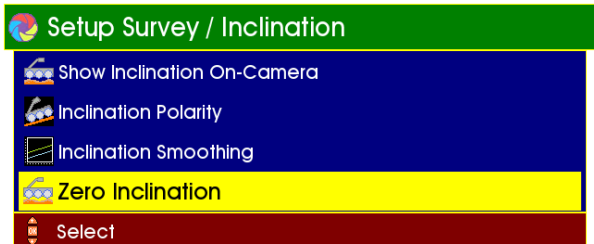
Select "Zero Inclination" and the first stage of the zero calibration begins:

Zero Inclination

There are 2 steps to setting the inclination zero:
1) setting it with crawler facing in one direction
2) then setting it facing in the opposite direction

Put the crawler on a level surface, then press RED
to begin step 1.

F1 Zero Inclination

F1 Zero Inclination **ESC** Cancel

There are two stages to performing the inclination zero calibration.
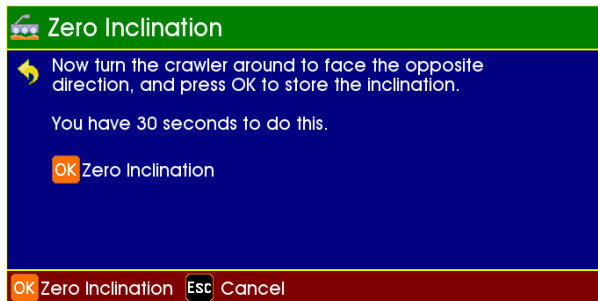
Stage 1
Place the crawler on a reasonably flat level surface (it does not need to be
completely level).
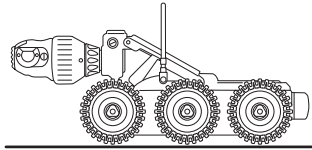
Now press the Red F1 [F1] key to perform the first stage of the

calibration, and the CCU then moves on to Stage 2.

Stage 2
The CCU shows:

Zero Inclination

Now turn the crawler around to face the opposite
direction, and press OK to store the inclination.

You have 30 seconds to do this.

OK Zero Inclination

OK Zero Inclination **ESC** Cancel

Pick up the crawler and turn it around through 180° so it faces in the opposite
direction, and place it in the same place on the same reasonably flat level
surface. **You have 30 seconds in which to do this**.
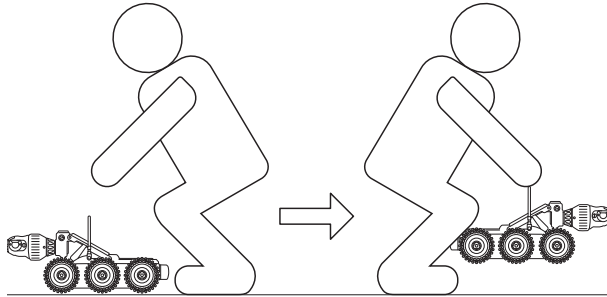
Press **OK** to complete the calibration.

The inclination zero has then been calibrated, and the crawler is then
ready for use.

Checking the Inclination

First, perform the steps for Calibrating the Inclination

After the Inclination has been Calibrated, perform these steps to check
it:

1. Place the crawler facing UPWARDS on a slope, and note the value
shown on the CCU screen for the inclination.

Crawler upwards on slope
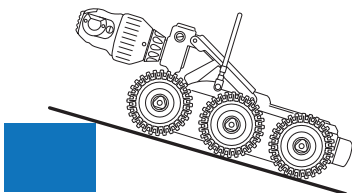
Note: the value of the
inclination, and that it
should be a *POSITIVE*
value.

2. Now turn the crawler around to face DOWNWARDS on the same slope, and note the value shown on the CCU screen for the inclination.


Crawler downwards
on same on slope
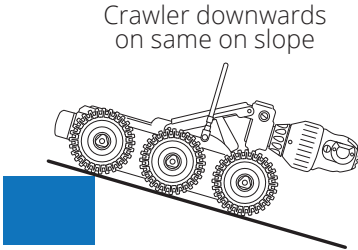
Note: the value of the inclination, and that it should be a *NEGATIVE* value.

3. If the Inclination is Calibrated correctly, the POSITIVE and NEGATIVE values should be approximately the same.
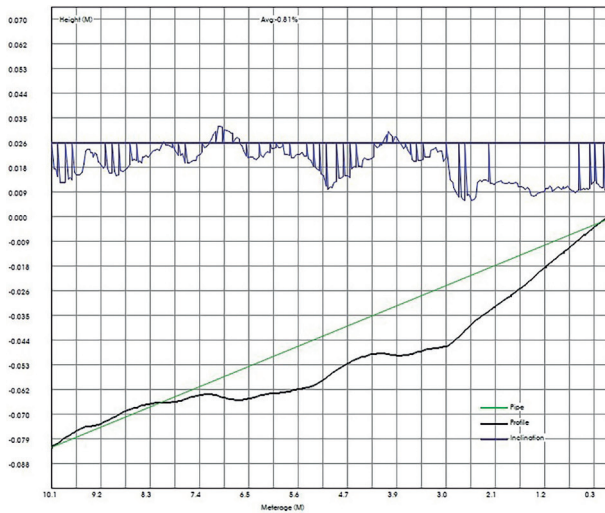
Setting the Inclination Smoothing

As the crawler drives along the pipe it encounters bumps, unevenness and vibrations which can affect the sensor readings that are logged. When this is subsequently plotted onto a graph, those inaccuracies can show as spikes and bumps on the graph lines.
You can choose whether to have the CCU apply a "smoothing" to the sensor readings, to help to flatten out the bumps, unevenness and vibrations. Then the plotted graphs will have much smoother lines. Normally you may wish to have smoothing enabled.

- To enable or disable Inclination Smoothing, press [⚒] for Setup.
- Then select the menu item Survey / Inclination.
- Then the menu item Inclination Smoothing.
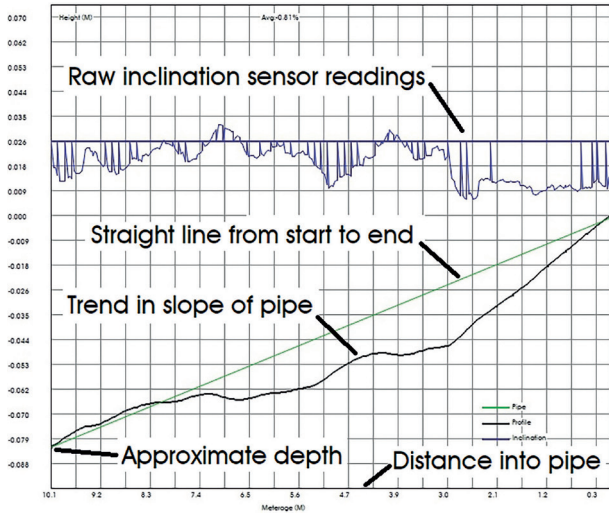- From there you can select Disable or Enable, then press **OK** .
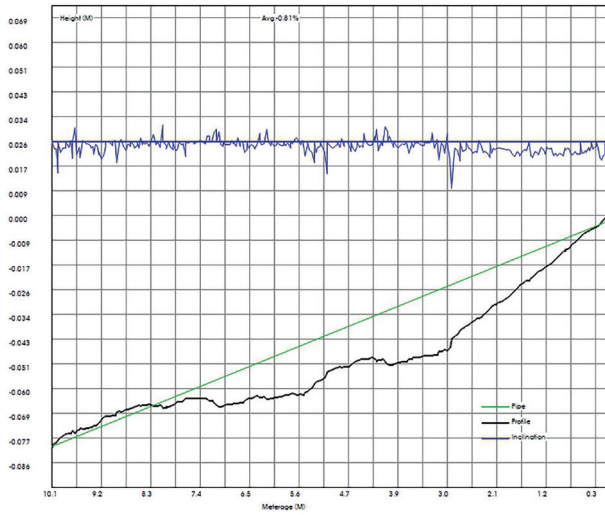
This graph was produced *WITHOUT* smoothing.

This graph was produced *WITH* smoothing.

Interpreting the Inclination Graph

The **BLUE** line indicates raw sensor readings, normally you can ignore this line.

The **GREEN** line indicates an ideal straight line from the start depth to the end depth. A perfect pipe would be completely straight and flat and have no dips or bumps – in which case the **GREEN** line would represent the actual bottom of the perfect pipe.

The **BLACK** line is the slope of the pipe measured by the inclination. When the **BLACK** line goes below the **GREEN** line, it means the pipe has a **dip** in it. When the **BLACK** line goes above the **GREEN** line, it means the pipe has a peak in it.

A perfect pipe that had no dips or peaks would draw a **BLACK** inclination line directly over the top of the **GREEN** ideal straight line.
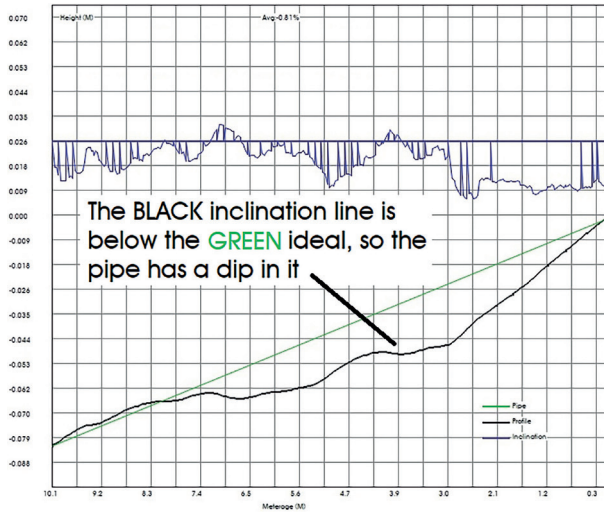
Here the *BLACK* line goes below the *GREEN* line, so it means the pipe has a dip in it.
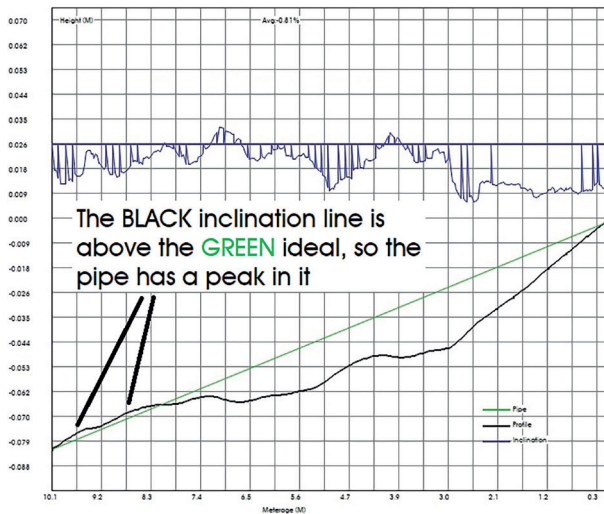
Here the *BLACK* line goes above the *GREEN* line, so it means the pipe has a peak in it.

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