MGL Avionics

iEFIS

Altimeter calibration

User manual

Manual dated 1 April 2016

General

This manual describes the altimeter calibration found in the iEFIS system from firmware version G2 3.0.0.1 and G3 1.0.2.8 onwards.

Altimeter calibration

The system features two altimeter calibration entries – one of them is refereed to as the “factory calibration” and the second is the “user calibration”.

The factory calibration should not normally require adjustment. A user calibration is available to allow minor adjustments to the altimeter indication.

You will find these calibration functions in the “Internal and Extender Sensor setup” in case of a iEFIS Lite or the “iBOX functions and sensor setup” menu.

Altimeter altitude measurement

Altitude is derived from the output of an absolute pressure sensor which measures atmospheric pressure at the static port relative to a pure vacuum reference included in the sensor.

The output of this sensor is a voltage that changes with pressure.

The voltage is fed into a high resolution analog to digital converter which performs conversions at a high right into a digital number that represents the voltage level.

This stream of data is then filtered using mathematical methods in order to remove rapid pressure fluctuations caused by turbulence and sound waves and at the same time extract changes in the reading in a manner that can be used to derive vertical speed.

Tolerances in the manufacturing process of the sensor have to be canceled out. The main error factor is called “offset”. This is a small voltage variation of the output of the sensor that is constant over the pressure range.

In the “altimeter calibration factor” a number is entered that is then added or subtracted from the analog to digital converter in order to cancel out the offset,

The “factory calibration” is done at the factory using an accurate reference.

Other errors present in a sensor are “gain errors” and “linearity errors” as well as errors related to the temperature of the sender. None of these tend to be large enough for normal consideration.

Starting with the above mentioned software releases a further user calibration has been added in the instruments setup menu: “Altimeter sensor gain”. This is a value in percent (normally 100.00%). This allows the user to calibrate the gain of the sensor which is done at a higher altitude to help cancel out any drift over time of the sensor gain. For this a reference at higher altitude reference is required such as an aviation pitot-static test set.

Calibrating the altimeter

It is assumed that you have a pitot static test set with the required accuracy available.

You will be using the “user” altimeter calibration and altimeter gain functions.

Note that these adjustments are stored inside the iBOX and are done through the master EFIS if you have more than one EFIS in the panel.

If you have a “Lite” the adjustment is made inside the EFIS panel and if you have more than one “Lite” in the panel you need to perform the adjustment in both panels.

As an aid, the calibration and gain factor readouts show your the altitude measured **WITHOUT** local barometer setting applied (i.e. 1013.25mB or 29.92”Hg).

Start with the altimeter calibration factor.

Adjust your static pressure to be close to sea level pressure. The exact altitude is not important and can be up to several hundred feet. Adjust the calibration factor so the readout shown next to the calibration factor agrees with your pitot static test set.

The resultant number should be fairly small – if not, there may be a problem such as static port leakage or your test set may not be as accurate as it should. There may also be a hardware issue with your EFIS (or iBOX).

Once satisfied that your low level altitude is correct, apply a static pressure that will result in an altitude in the range of 10.000 to 20.000 ft.

Compare the altitude readout next to the altimeter gain setting with that of your reference. If this is different you can adjust the gain until you are happy with the result.

Note: Adjusting the gain also changes the offset of the sensor at your earlier calibration point at low altitude. The system will work out an approximate correction figure and apply it invisibly but it does need to assume that your offset correction was done at a low altitude.

Please recheck your offset after adjusting the gain – if your offset was done at a fairly high altitude (for example to ambient pressure at 4000ft) then the offset will now be slightly incorrect and needs to be adjusted again. Recheck your altitude readout at the higher altitude and if needed slightly adjust the gain again.

The combined adjustments now cater for both offset and gain. The adjustments should be done after allowing the system at least 10 minutes of warm up time. This allows the sensor temperature compensation to cancel out temperature related errors.

The sensors tend to have excellent linearity that is not affected by sensor aging so no adjustment is available for this

Common issues

Please ensure that the pitot static test set has a current calibration certificate from a reputable source (normally NIST traceable) and is rated for the required accuracy.

Using a reference that itself has large errors is not a good idea.

Try not to use other altimeters as reference unless you are really sure they are accurate. This

includes TSO'd (certified) altimeters.

Should you adjust the altimeter calibration factor or gain, please ensure that your procedure and reference complies with legal requirements as may be in force in your country.

Ensure that power supplies during the calibration procedure are supplying sufficient voltage to instruments are operating in normal supply range. Very low supply voltages may affect your readings.