AquiTron

AT-G-DETECT

Refrigerant Gas Sensing System
Check / Calibration Procedure

CALIBRATION PROCEDURE

aquilar
leak detection solutions

AT-G-DETECT

Gas Sensing System
Check / Calibration Procedure

*Technician use only – This procedure must be carried out by a suitably qualified technician in accordance with these instructions and the standards set down in their particular industry/country.

A. INTRODUCTION

The frequency and nature of testing or calibration may be determined by local regulation or standards.EN378 and the FGAS Regulation require an annual check in accordance with the manufacturer's recommendation.

- For 1 level models, Aquilar recommends an annual check consisting of resetting units electrically to the factory calibration settings and carrying out a bump test to ensure correct operation. A gas calibration should be carried out every three years.
- For 2 level models, Aquilar recommends annual checks by resetting units electrically to the factory calibration settings, a bump test and replacement of the sensors with a pre-calibrated certified sensor every three years. The alternative to replacement is an on-site gas calibration. Sensor replacement may be more cost effective, eliminate end of life concerns and constantly renew the detection system

If the sensor is exposed to a large leak it should be tested to ensure correct functionality by electrically resetting to the factory calibration settings and carrying out a bump test.

There are two concepts that need to be differentiated: bump test and calibration

BUMP TEST

This consists of exposing the sensor to a gas. The objective is to establish if the sensor is reacting to the gas and all the sensor outputs are working correctly. A quantified bump test is one where gas of a know concentration is used.

CALIBRATION

This consists of exposing the sensor to a calibration gas, setting the "Sensor Standby Voltage", the alarm set points "Alarm Threshold Voltages" and checking/adjusting all the outputs so that they are activated at the specified alarm gas concentrations when exposed to this gas.

It is required by EN378 to record the check results in the Logbook

Before you carry out the test or calibration procedure:

1. Advise occupants, plant operators and supervisors
2. Check if the AT-G-DETECT is connected to external systems such as sprinkler systems, plant shut down, external sirens and beacons, ventilation etc. and disconnect as instructed by the customer.
3. For 1 level systems you must deactivate the 3 minute alarm delay, if selected, by removing jumpers JP1 to off position. For 2 level systems upon power up there is a delay of 3 minutes before the green power LED turns on.
4. For bump test or calibration, AT-G-DETECT's should be powered up overnight.
5. If a unit has been powered off for a short time, say due to maintenance, it will normalise within a few minutes. If sensors have been in long term storage or have been turned off for a long period, normalisation would be much slower. However, within 1-2 hours sensors should have dropped below the low alarm level and be operational. You can monitor normalisation progress exactly by monitoring the sensor output, see Table 1.

Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR
+44 (0) 1403 216100
info@aquilar.co.uk
www.aquilar.co.uk

AT-G-DETECT
Gas Sensing System

B. TRICAL RESET / BUMP TEST (EVERY YEAR)

Electrical reset is based on the calibration found on the label on the side of the enclosure and is unique to that sensor.

TOOLS REQUIRED

- A voltmeter – crocodile clips recommended
- Aquilar's set point values, as shown on the rating label
- Estimate 10 minutes per sensor

C. ELECTRICAL RESET OF 1 LEVEL SYSTEM

Reset, if necessary, the Standby and Alarm Threshold Voltage to the factory settings as shown on the calibration label.

First disable the 3 minute alarm delay on a one level system by moving the jumper link at JP1 to the "OFF" position, diagram 1.
Two adjustments are required and they are all performed on the controller unit.
For Sensor Standby Voltage, connect your DC voltmeter between 4(0V) and 2(+V) on CN1, CN2, etc as shown in Diagram 1 and adjusting pot P1 for channel 1, P2 for channel 2, etc.For Alarm Threshold Voltage, connect your DC voltmeter between 4(0V) and 1(+V) on cal header as shown in Diagram 1 and adjusting pot P3 for 1/2channel units and P7 for 4/6 channel units. For CO2 1 Level units there is only one adjustment - the alarm level, as the SSV is fixed. This can be adjusted by connecting your DC voltmeter between 4(0V) and 1(+V) on cal header as shown in Diagram 1 and adjusting pot P3 for 1/2 channel units and P7 for 4/6 channel units.
Carry out a bump test to ensure the sensor is functioning correctly. If the sensor does not go into alarm carry out a gas calibration.
If the factory set point information is not on the calibration label (as with older units) check the serial number of your gas detector on the rating label and sensor PCB and contact Aquilar for the appropriate set point values. Finally return the jumper JP1 to the original position.

C. ELECTRICAL RESET OF 2 LEVEL SYSTEM

Reset, if necessary, the Standby and low / high Alarm Threshold Voltages to the factory settings as shown on the calibration label.

For Standby voltage, connect your DC voltmeter between TP5 (0V) and TP4 (+V) as shown in Diagram 2 and adjusting pot RV1.
For low-level alarm voltage, connect your DC voltmeter between TP5 (0V) and TP2 (+V) as shown in Diagram 2 and adjusting pot P8.
For high-level alarm voltage, connect your DC voltmeter between TP5 (0V)and TP1 (+V) as shown in Diagram 2 and adjusting pot P7.
For CO2 2 level units there are 2 adjustments for the alarm levels, again the SSV is fixed and these can be found on the controller. They can be adjusted by connecting your DC voltmeter to the cal header between 4(0V) and 2(+V) low alarm and adjusting P8 and for high alarm between 4(0V) and 1(+V) adjusting P7. If the sensor does not go into alarm exchange the sensor and carry out a gas calibration.If the factory set point information is not on the calibration label (as with older units) check the serial number of your gas detector on the rating label and sensor PCB and contact Aquilar for the appropriate set point values.

Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR
+44 (0) 1403 216100
info@aquilar.co.uk
www.aquilar.co.uk

AquiTron

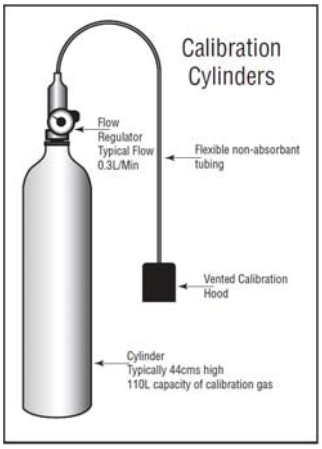
AT-G-DETECT
Gas Sensing System

D. BUMP TEST

Ideally bump tests are conducted on site in a clean air atmosphere.

SEMICONDUCTOR SENSORS

We offer cylinders of calibration gas at known concentration and ampoules for ammonia (NH3) at 100ppm and1.000 ppm and using these constitute a quantifiedbumptest.



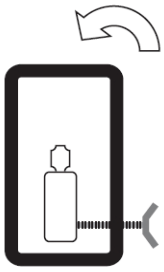
the gas onto the sensor and force it into alarm. Check that alarm lights and relays are activated.

INFRARED SENSORS FOR CO2 DETECTION

For a quantified bump test you can check the infrared sensors for carbon dioxide using Aquilar ampoules filled with CO2 at 2000ppm in air or calibration cylinders. If these are not available, you can carry out a non-quantified bump test by breathing on the sensor. The human breath has enough CO2 to trigger the alarm. If the bump test is not successful then carry out a gas calibration, see below.

E. BUMP TEST USING GAS AMPOULES

1. Make sure that both the ampoules and the calibration beaker are clean and dry.
2. Unscrew the beaker hold screw and place the ampoule so that it sits in the base of the beaker



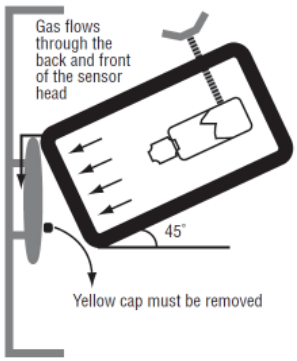
3. Tighten on the screw onto the ampoule without breaking it
4. Remove the enclosure lid of the gas sensor (not in Ex area and in one level units as monitoring of voltage can be done on controller). If this is a CO2unit also remove the yellow cap (if on your model) on the calibration port
5. Connect volt meter to monitor sensor response
6. Place the beaker over the sensor head (using an adaptor if required)or, if an Exd or Remote sensor head version, M35 or M42 thread, screw the beaker on the remote sensor head. It should be as tight a fitting as possible to allow maximum exposure to the gas.
7. CO2 ampoule: hold the beaker in a 45-degree angle as per illustration. This allows gas to flow through the front back of the sensor and though the calibration ports).

Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR
+44 (0) 1403 216100
info@aquilar.co.uk
www.aquilar.co.uk

AquiTron

AT-G-DETECT
Gas Sensing System

8. Tighten on the ampoule until it shatters allowing the content to diffuse in the beaker. It should be left in place for approximately 5 min.
9. Voltage output will increase. This confirms that the sensor is responding. In the case of ampoules a response equivalent to 50% or greater of the ampoule concentration will be satisfactory.
10. Carefully remove any ampoule remains from the gas detector, replace yellow cap (only CO2 sensors), and replace the sensor enclosure.



F. BUMP TEST USING GAS AMPOULES

Remove the enclosure lid of the gas sensor and controller (non applicable to Exd Remote sensor and vent pipe model, 1L units as monitoring of voltage can be done on controller) if this is a CO2 unit also remove the yellow cap on the calibration port, if on your model.Connect the voltmeter to the controller to monitor sensor response. Expose the sensor to gas from the cylinder. You can place the entire sensor into a plastic bag or use a plastic hose/hood to direct gas to the sensor head.

G.CALIBRATION

The alternatives we describe are:
- Exchanging the sensor board – only available for 2 level units
- Gas Calibration

H. EXCHANGING THE SENSOR BOARD

Aquilar recommends exchanging your PCB for a newly pre-calibrated certified unit every 3 years

TOOLS REQUIRED

- A pre-calibrated sensor board
- A voltmeter – crocodile clips recommended
- Estimate 10 min per sensor

EXCHANGINF THE SENSOR

1. Power off the unit and remove lid of sensor enclosure.
2. Note the colour code of the cable in positions 1,2,3,and 4 of the connector block.
3. Undo the cable and 2 screws securing sensor board and remove.
4. Fit the new pre-calibrated sensor and reconnect the cable in the correct colour sequence at positions 1,2,3 and 4.

Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR
+44 (0) 1403 216100
info@aquilar.co.uk
www.aquilar.co.uk

AquiTron

AT-G-DETECT
Gas Sensing System

5. Power on the unit and allow to stabilise for 15 min.
6. Check voltage readings on positions 1,2,3, and 4 as per procedure in Table 1, page 5, to ensure that wiring is correct. Note also in the table how to monitor the sensor as it normalises.
7. Carry out a bump test to confirm the sensor is responding.
8. Keep records of the test date, sensor serial number, and any observation.

I. GAS CALIBRATION

This is the adjustment of the gas detector using calibration gas. Aquilar offers a calibration kit that consists of a Calibration gas cylinder and a flow regulation valve. In some cases this option may be expensive relative to sensor exchange because of the cost of visiting a site, calibration gas and valve, and a surcharge on the freight cost of the calibration gas as it is classified as a hazardous substance (ampoules are not classed as hazardous).The procedure involves electrical set-up followed by adjustment using calibration gases.

EQUIPMENT REQUIRED

- Gas cylinders with the appropriate calibration gas concentrations
- Gas canister with zero air to calibrate / check the Sensor Standby Voltage, required if the sensor environment is not clean.
- Flow gas valve – rate 0.3L/min
- A voltmeter
- Estimate 30 min per sensor.

The procedure differs slightly depending on the number of alarm levels.

ONE LEVEL SYSTEM - CALIBRATION

First disable the 3 minute alarm delay on a one level system by moving the jumper link at JP1 to the off position. Two adjustments are required and they are all performed on the controller unit.

A. Sensor Standby Voltage (SSV)
This is the standby output for the sensor in clean air. When gas is present around the sensor, this voltage will increase.IF SSV is greater than the alarm threshold voltage, as in when a gas leak occurs, then an alarm condition occurs - red LED, siren, relay operates. (When JP1 is in “on” positions there is a 3 minute delay) IF SSV falls below 0.18 V, a fault condition will be shown on the controller - red LED, no siren, relay does not operate. Connect a Voltmeter between Pins 4 (-Ve) & 2 (+Ve) of sensor terminal connector block for each channel in turn (CN1, CN2 Etc.) and adjust calibration pot (P1, P2 Etc.) to the SSV value as per calibration label on side of enclosure.This value should be already set unless age or background has caused drift.

B. Alarm Threshold Voltage (ATV)
ATV is the voltage at which the alarm and relay activate at a given gas concentration. This voltage is normally set 3.5V. Connect a Voltmeter (0-10 volt scale) across pins 4 & 1 of the header marked “CAL” on the controller board.

This voltage (3.5V normal factory setting) is set using:
1 or 2 channel system controllers - the threshold pot “P3”
4 or 6 channel system controllers - the threshold pot “P7”

Connect a Voltmeter between Pins 4 (-Ve) & 2 (+Ve) of the sensor terminal connector block for each channel in turn (CN1, CN2 Etc.) Apply calibration gas of the desired concentration e.g. 1000 ppm in air to the sensor and wait until the sensor output signal stabilises, then adjust the pot that corresponds to the channel being calibrated, i.e. P1for channel 1, P2 for channel 2, etc.

There are a number of advantages to sensor exchange. It is simpler and quicker than gas calibration. Aquilar guarantees the correct calibration and functioning of the new sensor, which is supplied with a calibration certificate and finally, you won’t face any problems of sensor deterioration or end-of-life.

Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR
+44 (0) 1403 216100
info@aquilar.co.uk
www.aquilar.co.uk

AT-G-DETECT
Gas Sensing System

This should be adjusted until the sensor goes into alarm - the red LED turns on (a voltage of approximately 3.55V). Remove the calibration gas and allow the sensor to return to its standby voltage. Record this voltage reading and keep on record for subsequent electrical set –ups. This is now calibrated for the gas concentration used.Repeat for any subsequent channels. Finally return jumper JP1 to its pre calibration position.

TWO LEVEL SYSTEM - CALIBRATION

The delay on a 2L system is approximately 25 seconds and cannot be deactivated. All adjustments are performed on the sensor PCB and there are three elements to be adjusted: the Standby Voltage and two Alarm Thresholds.

A. Sensor Standby Voltage (SSV)
The factory settings are shown on the calibration label on the side of the enclosure. Connect the voltmeter between TP5 (0V) & TP4 (+Ve) and adjust pot RV1 for 0.3V.
This value should be already set correctly unless age or background has caused drift.

B. Alarm Threshold Voltage (ATV)

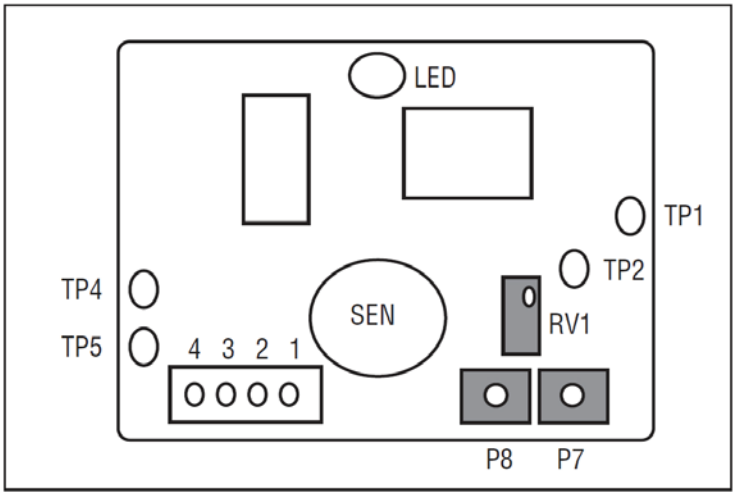
- Low Treshhold: Connect voltmeter between TP5 (0V) & TP2 (+Ve), set the voltage asshown on the calibration label by adjusting pot “P8”.
- High Threshold: Connect voltmeter between TP5 (0V) & TP1 (+Ve), set the voltage as shown on the calibration label by adjusting pot “P7”.

Please remember there is an inbuilt delay response to an alarm of approx. 25 seconds on both alarm levels

Monitor voltage between TP5 (0V) & TP4 (+Ve).Apply the low concentration calibration gas to the sensor and wait until the sensor output signal stabilises. Record this voltage. Apply the high concentration calibration gas to the sensor and wait until the sensor output signal stabilises. Record this voltage. If the voltages recorded for the low and high alarms differ from the factory settings shown on the calibration label then adjust P8 and P7 as above to the new values. Record and use these new values for subsequent electrical set-ups.

The High threshold voltage must be set higher than the low threshold, or the unit will not function correctly

2 Level Sensor

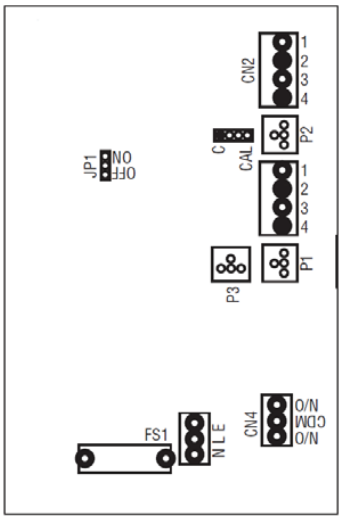


Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR
+44 (0) 1403 216100
info@aquilar.co.uk
www.aquilar.co.uk

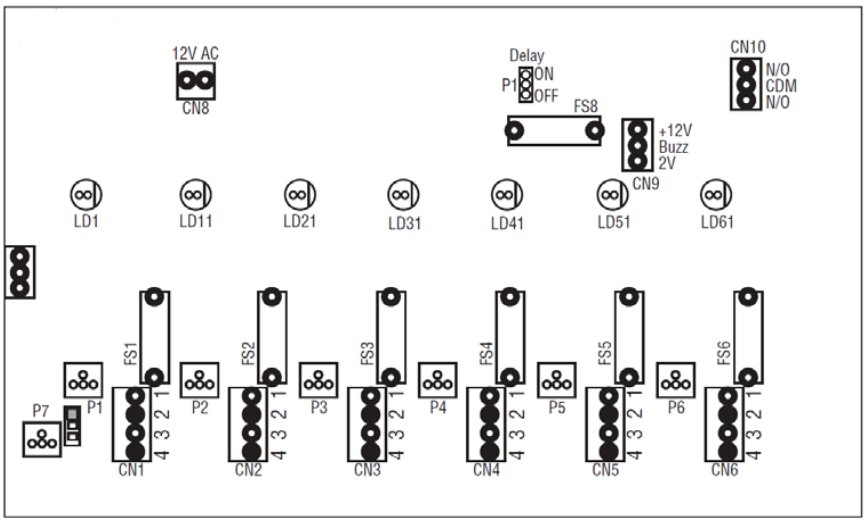
AquiTron

AT-G-DETECT
Gas Sensing System

J. AT-G DETECT 1 OR 2 CHANNEL UNIT



K. AT-G-DETECT 4 OR 6 CHANNEL UNIT



L. ADDITIONAL RECOMMENDATIONS

False Alarms
If false alarms are being triggered by background gases, paint fumes, etc, or extreme humidity or temperature conditions, you may adjust the settings to compensate.

One Level Systems
You should reduce the SSV level in 0.5V increments until the condition clears.

Two Level Systems
You should adjust the relevant alarm threshold upwards in 0.2Volt increments until the condition clears.

Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR
+44 (0) 1403 216100
info@aquilar.co.uk
www.aquilar.co.uk

AT-G-DETECT
Gas Sensing System

M. DOUBLE CHECK CONNECTIONS ARE CORRECT

To make sure the gas detectors are wired up correctly you can check the voltages at the sensor cable terminal blocks on the controller PCB or sensor PCB using a 0-10V voltmeter as outlined below in Table 1.

Place the negative probe on terminal position 4 and with the positive on1, 3, 2, check the Volts values. The readings are lower at the sensor due to power drop in the line.

The terminals should have the under listed values:

Position Number	At the sensor	Controller	Without sensor fitted
4	Is the negative side of the power supply	Negative	Negative
1	Power Supply 7.2V minimum, unless you have power drop reduction	+10V	+12 – 15V
3	Approximately 4-5V	+4.8 – 5V	+5V
2	One level system – sensor standby voltage* as shown on the calibration label on the side of the enclosure. Two level system – typical internal reference values, approximately	(0=Fault) +0.4V +1.6V +2.8V	0 Sensor in standby Low Alarm Condition High Alarm Condition

* The voltage signal from the sensor will on power up start high and gradually fall (in clean air) to the SSV value shown on the calibration label.

You can monitor this as follows:

1 level systems: Connect a Voltmeter and monitor voltage between Pins 4 (-Ve) & 2 (+Ve) of the sensor terminal connector block for each channel in turn (CN1,CN2 Etc.)

2 level systems: Connect voltmeter and monitor voltage between TP5 (0V) & TP4 (+Ve).

Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR
+44 (0) 1403 216100
info@aquilar.co.uk
www.aquilar.co.uk