TECHNICAL DOCUMENTATION

INSTALLATION AND USER GUIDE FOR

GASSONIC OBSERVER-H

ULTRASONIC GAS LEAK DETECTOR

GASSONIC
A General Monitors Company

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Table of Contents

1.0 TECHNICAL DATA ON THE GASSONIC OBSERVER-H

ACOUSTIC SPECIFICATIONS

Microphone unit:

Detector frequency range: 25kHZ – 70 kHz

Dynamic range: 58 db – 104 dB

TEST SOUND SOURCE

Test frequency: 40 kHz ± 3 kHz

Sound Pressure: 100 dB, 68 mm from the sound

POWER REQUIREMENTS

Input voltage: 15 – 36 VDC

Um = 250 Vrms

15 volts maximum current consumption: 250 mA

24 volt maximum current consumption: 170 mA

OUTPUT CURRENT

Analog 4-20 mA interface

(maximum permitted load resistance is 600 Ω)

0 mA: Start up

1 mA: Pulsed Acoustic error

0 mA: Other Errors

3 mA: Unit inhibit

4-20 mA: 58 dB – 104 dB

Source or Sink output

RELAYS

Relay 1 – Error/fault indication (normally energized):

8 A @ 250 VAC

Relay 2 – Indication of alarm trigger level reached.

8 A @ 250 VAC

INPUT SIGNALS

Alarm relay reset Open or ground

Alarm test Open or ground

GAS LEAK DETECTION COVERAGE (REF = METHANE)

Ultrasonic background noise < 74 dB (low nose areas)

12m radius @ leak rate = 0.1 kg/sec

8m radius @ leak rate = 0.03 kg/sec

Ultrasonic background noise <84 dB (high noise areas)

8m radius @ leak rate = 0.1 kg/sec

4m radius @ leak rate = 0.03 kg/sec

CERTIFICATIONS

ATEX/IECEx: Ex d ia IIB+H2 T6 Gb, Ex tb IIIC T85°C Db (Ta = -40°C to +60°C)

FM 11ATEX0003X IECEx FMG 11.0003X

II 2 G D

FM/CSA: Class I, Div. 1, 2 Groups B.C.D

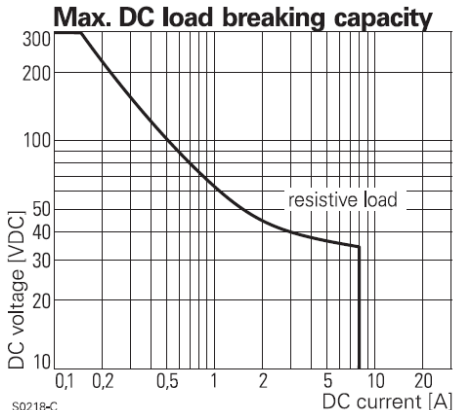
Class II/III Div. 1, 2 Groups E,F,G (Ta = -40°C to +60°C)

Functional Safety per IEC 61508

HART Protocol Rev 6, Emerson AMS Aware

INGRESS PROTECTION

IP66, Type 4X



CONSTRUCTION

Stainless steel AISI 316L

Weight: 7.5 kg

LED OUTPUT

On for alarm

SERIAL DIGITAL COMMUNICATION

Dual Modbus or Single Modbus and HART

HART Input Impedance

Source C 1.2 nf 177 K

Sink C 4.0 nf 178 K

DIMENSIONS

Diameter: 203mm

Width: 203mm

Height: 201mm

RF EMISSIONS AND IMMUNITY

Tested according to: EN 61000-6-2, EN 61000-6-4

ENVIRONMENTAL DATA

Operational temperature range: -40°C to 60°C

Humidity: 0 to 95% non condensing

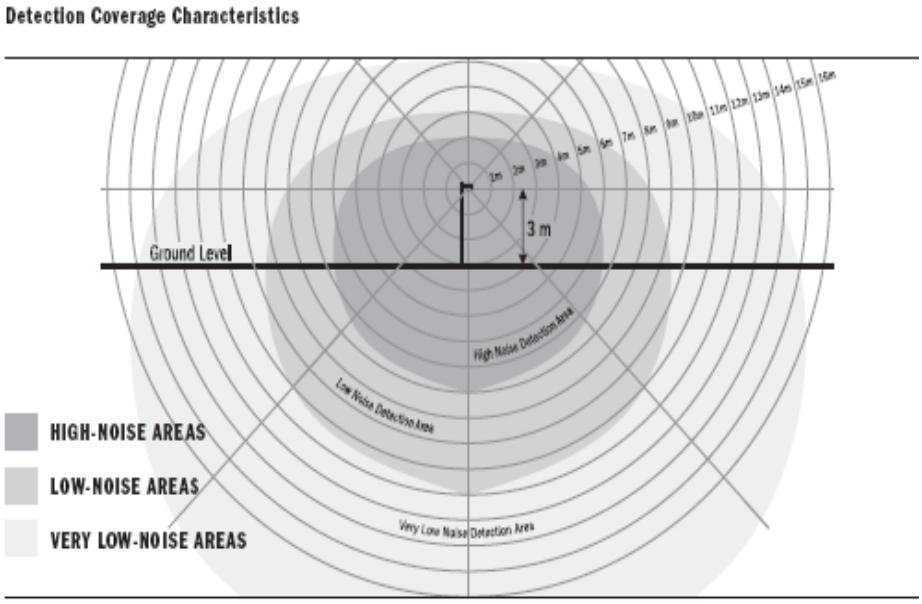
2.0 INTRODUCTION

The Gassonic Observer-H is an ultrasonic gas leak detector for detecting pressurized gas leaks. The Observer-H utilizes advanced acoustic technology to detect gas leaks and incorporates a patented Senssonic self-test system for failsafe operation. Industry standard output and communications options are included in the Observer-H to provide flexible integration in a broad range of applications. This user manual describes the installation, operation, and maintenance of the Observer-H to ensure optimal performance.

3.0 GENERAL DESCRIPTION AND FEATURES

The Gassonic Observer-H detects leaks from pressurized gas systems by sensing the airborne ultrasound produced by the gas escaping. This detection method is omni-directional. It can function in extreme weather conditions and is ideal for monitoring leaks from valves and flanges in complex pipeline systems, both onshore and offshore. The detector has the following certifications: ATEX, IECEx, FM, CSA, HART, and IEC 61508. The detector housing is casted AISI 316L, acid-proof stainless steel and the ingress protection is IP66 with a NEMA rating of Type 4X.

The performance of the Gassonic Observer-H as a safety device is not covered by the ATEX certificate.



HIGH-NOISE AREAS	**Typical areas:** - Turbo compressor areas - Complete open offshore weather deck - Next to very noisy machinery
LOW-NOISE AREAS	**Typical areas:** - Areas with no machinery - Areas with low frequency machine made noise
VERY LOW-NOISE AREAS	**Typical areas:** - Onshore wellhead areas in calm environment - Salt dome gas storage facilities in calm environment

Figure 1: Detector Coverage Characteristics

3.1 AREA MONITORED BY THE GASSONIC OBSERVER-H

The detection coverage of the Gassonic Observer-H is determined by the ultrasonic noise levels in the area of installation. Experience has shown that most process environments can be divided into three overall noise levels. This is illustrated in the image above. The detection coverage characteristics are based on live tests and show the minimum coverage of the Gassonic Observer-H detector in areas without solid physical obstructions between the detector and the leak. For further instructions on installation, Gassonic A/S can be consulted.

3.2 DETECTOR OUTPUTS

The Gassonic Observer-H detector has several output methods:

- Analog 4–20 mA interface - Sink or Source (Factory setting = Source)*
- Digital outputs are Modbus or optional HART.
- Modbus provides control information in a RS485 physical layer and a Modbus protocol.
- HART (optional) is digital information over the analog output. Thus, a user can use an existing three wire cable and obtain control information without rewiring.
- One Modbus is always present. The second Modbus is also present but maybe overridden by an optional HART.
- Alarm relay
- The Alarm relay is controlled by an adjustable trigger level in 5 dB steps, from 59 to 99 dB and has an adjustable internal alarm delay from 0 to 600 seconds. It is necessary to introduce an alarm delay of at least 10 seconds either internally or in the control system. (Factory setting - 79 dB and 10 seconds delay)
- Error relay
- The error relay is normally energized and de-energized for error

* Sink - The detector receives a current loop. Source - The detector sends out a current loop.

4.0 INSTALLATION

4.1 MECHANICAL CONSTRUCTION

The Gassonic Observer-H consists of two chambers. Both chambers are certified as flameproof (Ex d) and Explosionproof (XP). The cables are connected through M20 x 1.5 6H cable entries in the top chamber using approved Ex d glands or approved conduit with seal installed within 18” of the detector. The inner cores of the cable penetrating the detector should be at least 25 cm long. This will ensure no tension on the wires and connector PCB when the top chamber is opened. The two mounting bolts are on the top chamber of the detector and this means that the cables will enter on the fixed part of the detector. The bottom part is attached to the top by means of six Allen screws with lock washers. Unscrewing these screws will expose the connector PCB in the top chamber. These screws will be fixed by retaining washers to the bottom part. The bottom part of the detector is supported by the Load-strap, which is connected to the top.

The bottom chamber contains integral associated intrinsically safe apparatus limiting energy to an intrinsically safe microphone and piezo source, mounted to the exterior of the enclosure.

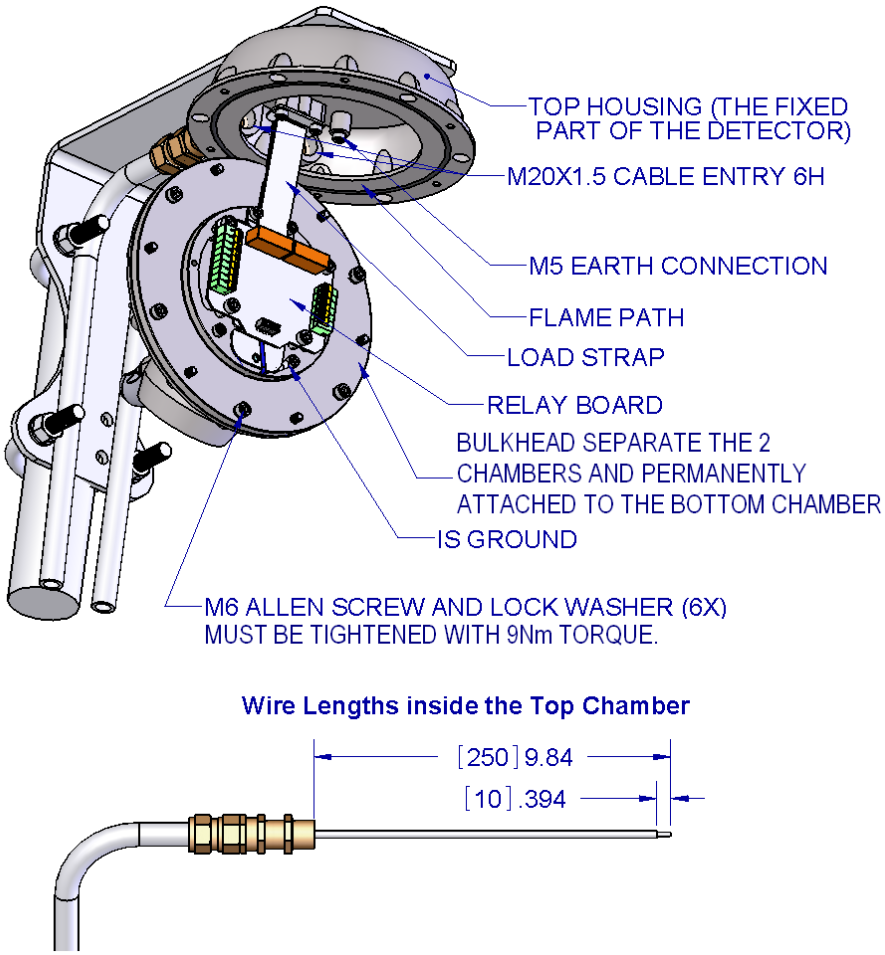


Figure 2: Mechanical Construction – Internal

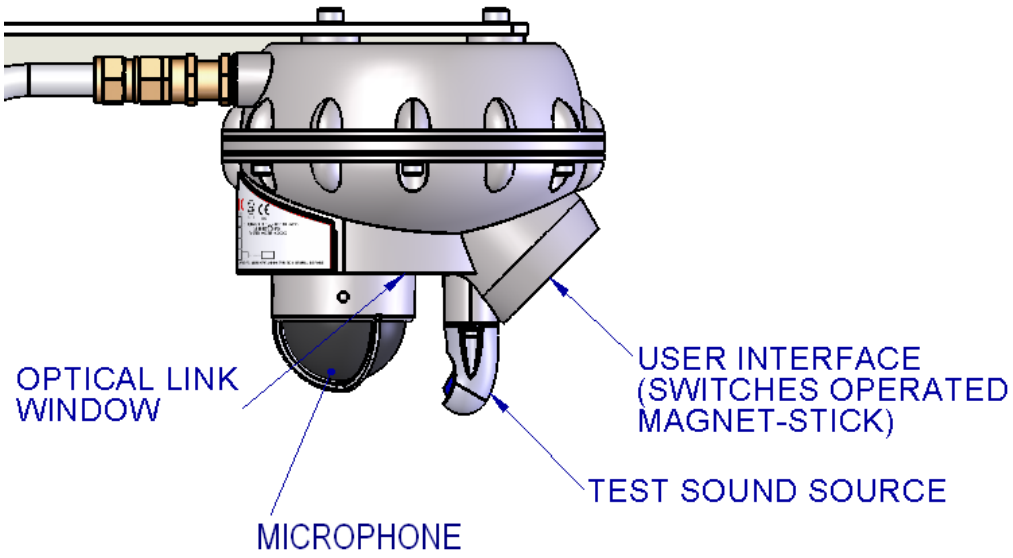


Figure 3: Mechanical Construction – External

4.2 MECHANICAL OPERATION AND SAFETY

When closing the top chamber ensure that the Load-strap and wires are not caught between the bulkhead and the top part of the detector. Check the status of the O-ring and the flame path. Replace the O-ring if damaged. Send the unit to GM Service Repair for repair if the flame path is damaged.

NOTE: The ambient temperature is limited to -40ºC to +60ºC. The performance of the Gassonic Observer-H Ultrasonic Gas Leak Detector, as a safety device per clause 1.5 of Annex II of the ATEX Directive 94/9/EC, is not covered by this certificate.

4.2.1 SPECIFIC CONDITIONS OF USE

- The Class A2-70 M6x1x20 screws connecting the bulkhead flange joints must be tightened to 9 Nm using a torque wrench.
- For Division 1 installations, the piezo source contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken into account during installations and use to prevent impact or friction.
- Consult the manufacturer if dimensional information on the flameproof joints is necessary.

WARNING: The inner six screws should not be unscrewed and the bottom chamber should not be opened. The warranty will be void if the bottom chamber is opened.

4.3 MOUNTING

Two M8 stainless steel bolts (not supplied), 88mm apart, attached to the top of the detector are used to fix the Gassonic Observer-H in its operating position. These bolts may penetrate the detector top by a maximum of 14 mm. The detector can be mounted to a freestanding pole or wall, using the Gassonic mounting bracket 80601-1. This bracket is an optional accessory and is supplied with two M8 mounting U-bolts which can fit around a pole with a maximum dimension of 63 mm. It is possible to mount the detector directly onto non-vibrating structural beams or cable-trays. The microphone should face downwards and if tilting of the detector is necessary, the angle of incline should not exceed 45°. Avoid when mounting the detector within a half meter from a solid structure for example a wall or a big vessel, to point the acoustic test sound source into the direction of this structure. The sound source should be pointing into free space as far as possible.

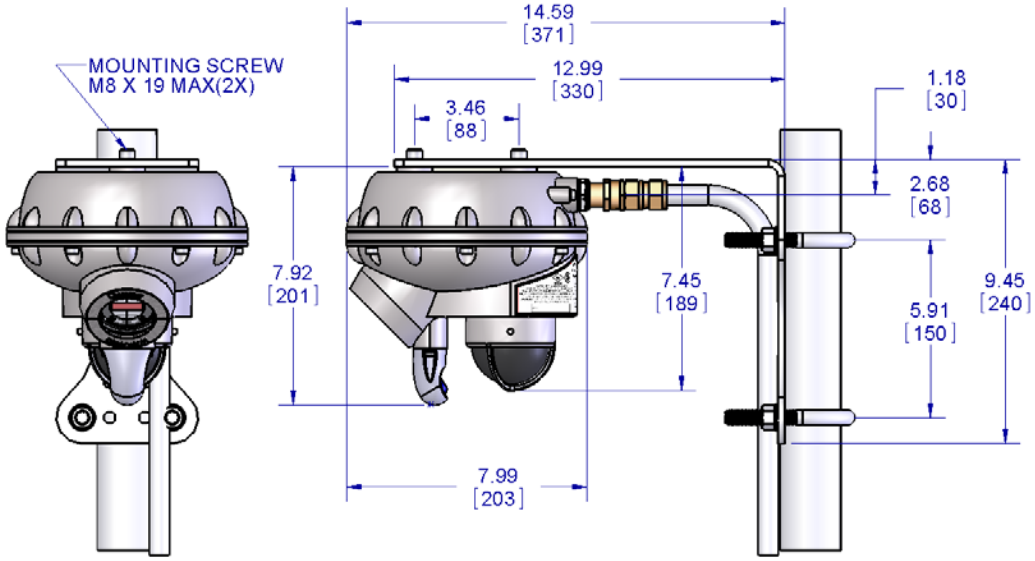


Figure 4: Mounting Diagram

4.4 WIRING DIAGRAM

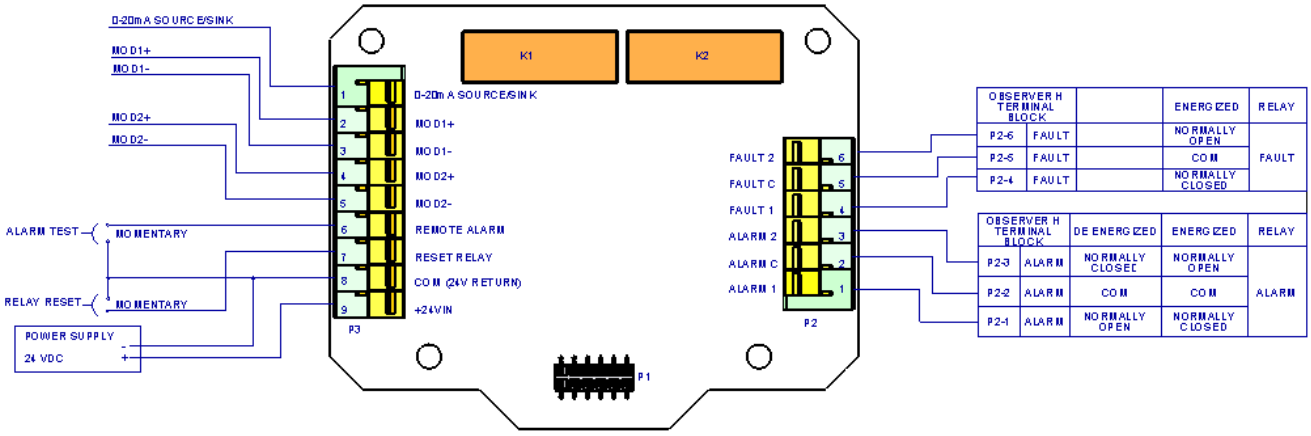


Figure 5: Wiring Diagram

4.5 PROTECTIVE EARTH GROUNDING

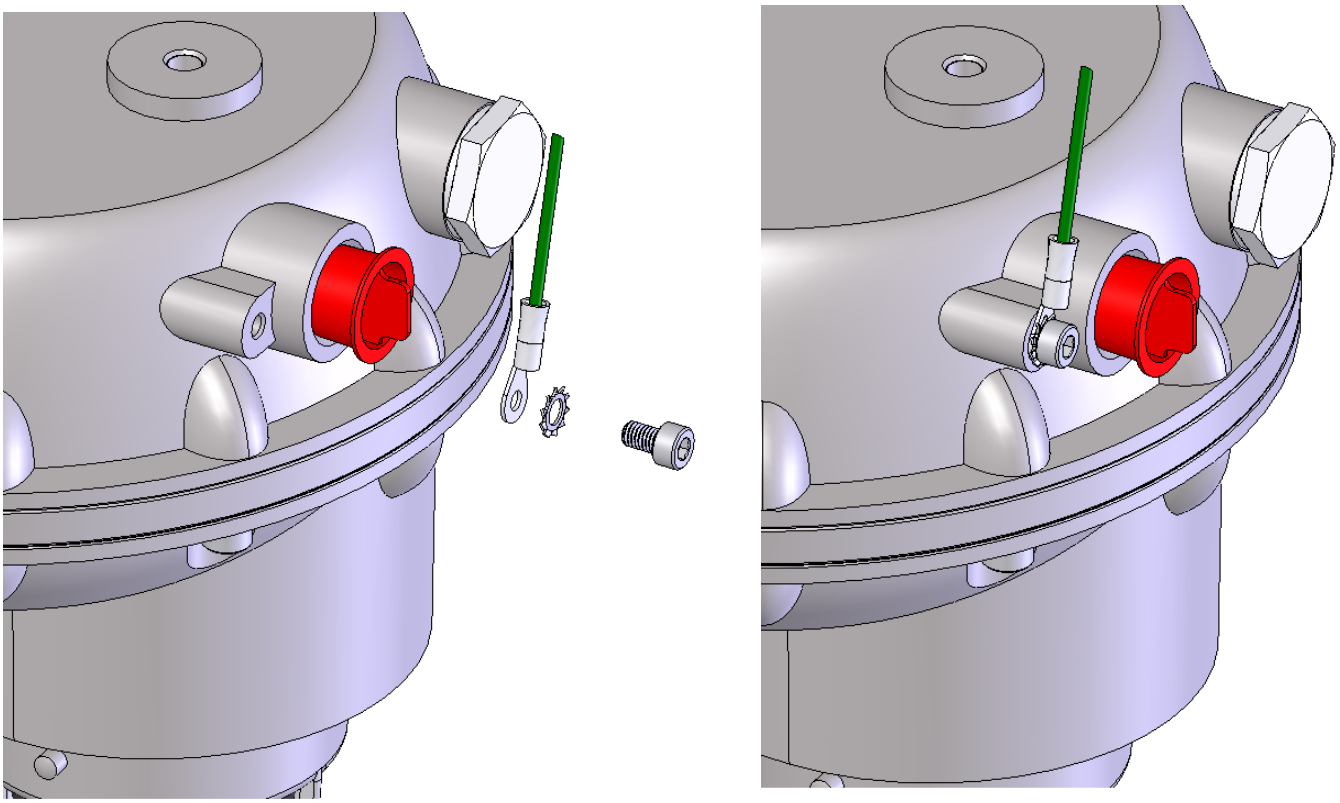


Figure 6: External Earth Terminal

The protective earth ground terminal requires the use of an M5 ring lug and star washer. The wire gauge should be less than or equal to the gauge of the power supply wires.

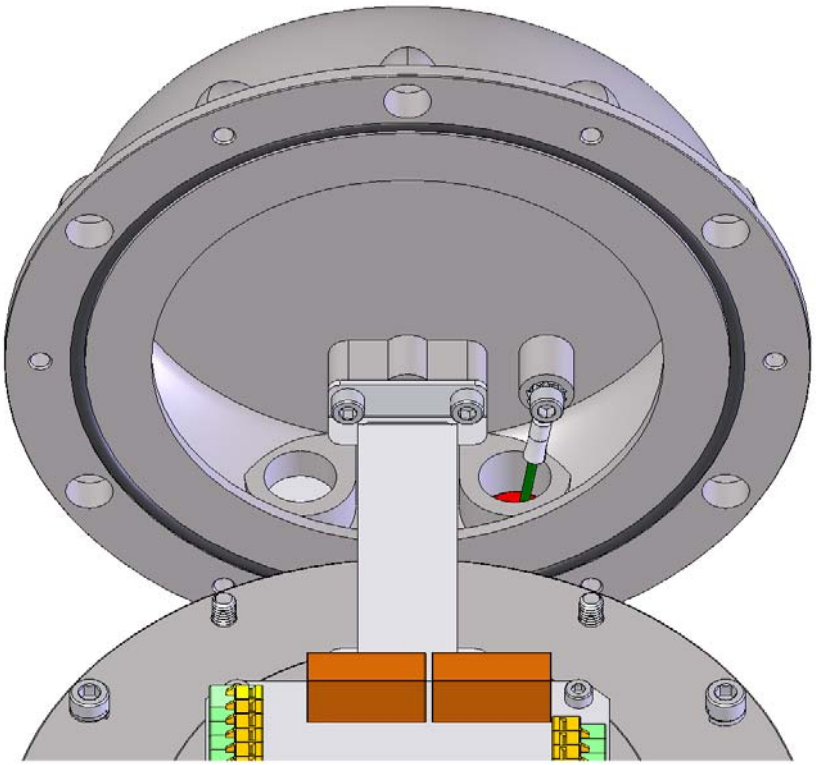


Figure 7: Internal Earth Terminal

5.0 OPERATION AND SETUP

5.1 RECEIPT OF EQUIPMENT

All equipment shipped by General Monitors is packaged in shock absorbing containers, which provide considerable protection against physical damage. The contents should be carefully removed and checked against the packing list. If any damage has occurred or there is any discrepancy in the order, please notify General Monitors as soon as possible. All subsequent correspondence with General Monitors must specify the equipment part number and the serial number.

5.2 NORMAL OPERATION

- **Power up** of the Gassonic Observer-H The unit will perform an initialization of the micro-controller, internal tests and then goes into normal operation mode within a few seconds. The output current will be 0.0 mA. The display will show the software revision and "test"
- **Normal** The real-time ultrasonic sound level will be shown on the display. The corresponding 4-20 mA value will be set on the analog output.
- **Alarm** The Alarm relay is a single pole double throw.
- **Error** The Error relay is a single pole double throw. It is normally energized.
- **Modbus** The Modbus digital interface is ready to receive a command.
- **Self Test** The acoustic Self-test is done at regular intervals.

5.3 SETUP

The setup can be done in three ways. The display/magnet is a user input that only requires a magnet as an external tool. It is best used in simple systems. HART is a method that requires a HART modem

and supporting software. It is best used where there is existing wiring and control information is desired. Modbus requires a separate pair of wires and a RS-485 to PLC converter. It is best used for large systems.

5.3.1 TRIGGER LEVEL

The trigger level should be at least 6 dB higher than the background noise. The Alarm relay is controlled by an adjustable trigger level in 5 dB steps, from 59 to 99.

The factory default setting is 79 dB.

5.3.2 TIME DELAY

An alarm delay time is implemented to eliminate spurious alarms due to short background noise peaks. This delay time can be set internally from 0 to 600 seconds. The factory default setting is set to 01 (10 seconds).

5.3.3 ALARM RELAY ENERGIZED/DE-ENERGIZED

The alarm relay can be normally energized or normally de-energized. In either energized state the single pole double throw allows for opening or closing a contact for an alarm. The normally energized state is a failsafe method. If an alarm or power outage occurs an alarm condition will be indicated.

The factory default setting is normally de-energized.

5.3.4 ALARM RELAY LATCH/NON-LATCHED

The alarm relay can be latched. This is used to retain the alarm condition even if the gas leak goes away. The relay can be reset via the display magnets, HART or Modbus.

The factory default setting is non-latched.

5.3.5 MODBUS

Modbus is an optional serial information channel used to obtain control information. The Observer-H has dual Modbus. Each one is configured separately. The second Modbus can be changed to an optional HART.

- Baud rate 2400, 4800, 9600, 19200

  Factory default is 19200

- Format

  Factory default is 8-N-1

- Address

  Factory default is Channel 1 Address 1 and Channel 2 Address 2

5.3.6 HART ENABLE

- Selects whether channel 2 is Modbus or HART

  Factory default is if HART is installed HART is enabled & current is normal.

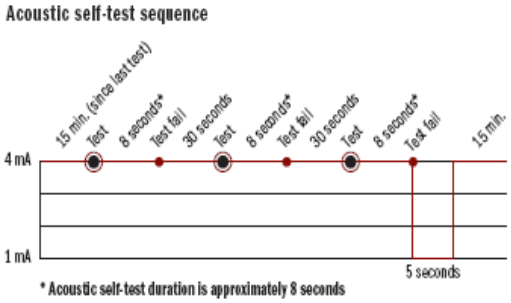
5.3.7 HAZARDWATCH

HazardWatch is used when the Observer-H is part of a HazardWatch Fire and Gas System manufactured by General Monitors.

Factory default is disabled

5.4 ACOUSTIC SELF-TEST

An acoustic self-test (named Senssonic™) is done every 15 minutes and takes approximately 8 seconds. A test signal with a frequency sweep at constant amplitude is transmitted by the ultrasonic sound source to the microphone. The detector analyzes the result of the sweep and stores the highest dB value. This value is compared to a factory reference value and the result must be within a predefined tolerance. If the test signal is out of the predefined tolerance, the Observer-H will do a new acoustic self-test 30 seconds after the first failed test. If this test signal is still out of tolerance a new acoustic self-test is done again 30 seconds later. If the third test signal is still out of tolerance, the Gassonic Observer-H will go into acoustic error mode. In acoustic error mode the code “ERAC” will be displayed, the Error Relay will be de-energized, and the user can acquire the relay status via the Modbus or HART digital communication interfaces. Furthermore, the 4-20 mA output will indicate 1 mA for 5 seconds and return to normal ultrasonic background noise level until the next acoustic test failure. This sequence will repeat until the acoustic fault is repaired.



There could be a number of causes for this error:

- There is an obstacle blocking the sound path.
- The sound source is faulty and needs replacement.
- The microphone is faulty and needs replacement.

If none of the above is true, the unit can be tested by means of a ”Gain Test” with a Gassonic 1701 Portable Test and Calibration Unit, before sending the unit back to General Monitors for service.

When the detector is performing the Acoustic Self-test the last dB level is displayed on the user interface and sent to the 4-20 mA output. During this time a green LED will be illuminated and can be seen through the optical link window.

5.5 INPUTS

- **Remote Alarm Reset:** The Observer-H has provisions for a remote relay reset switch. This is provided so the operator has a handy remote switch and does not have to climb up to the Observer-H and reset the relays.
- **Restore Defaults:** The remote reset pin is also used to reset Modbus address trigger levels etc back to the default values. This is done by grounding the pin and turning the power on. The pin must remain grounded for one minute after the power is turned on.
- **Alarm test:** The Observer-H has provisions for a remote alarm test. This is useful to test out the external system wiring. By grounding the alarm test pin the Observer-H will go to alarm and stay there until the alarm test pin is removed. If the grounding time is longer than 30 seconds, the device will go into fault.

5.6 OUTPUT METHODS

The Gassonic Observer-H has 4 major output methods:

- Alarm Relay Output.
  Can be configured as normally energized/de-energized
- Errors Relay Output.
  Relay is always configured as normally energized.
- 4-20 mA Analog Output.

Can be configured as source or sink

- Serial Digital Communication.
  Configurable as Dual Modbus or Single Modbus and HART (optional)

The users need to determine the output method suited for their use.

5.6.1 RELAY RATINGS

- 8 A @ 250 VAC
- See graph in section 1.0 for DC ratings

5.6.2 ALARM RELAY OUTPUT

When using this method, an internal trigger level and delay time must be set. The trigger level should be at least 6 dB higher than the background noise. The trigger level can be set in steps of 5 dB from 59 dB to 99 dB and the factory setting is 79 dB. An alarm delay time is implemented to eliminate spurious alarms due to short background noise peaks. This delay time can be set internally from 0 to 600 seconds. The factory setting is set to 01 (10 seconds). The delay can alternatively be set in the ”Fire and Gas Panel”.

When a gas leak occurs in the detector’s coverage area, the trigger level will be reached, the LED in optical link window will be illuminated and the alarm relay timer will be started. When the delay times out, the unit will go into alarm mode, which will result in the following:

- The dB value preceded by an “A” will flash on the display.
- The alarm relay will activate.
- An event will be recorded.

5.6.3 4-20MA OUTPUT

The 4-20 mA output is factory and field configurable to either Source or Sink current. At normal operation the output will be between 4 and 20 mA. When using this output method, a trigger level at least 6 dB higher than the background noise and an alarm delay time > 10 seconds should be set in the fire & gas system.

The output value in mA corresponding to the sound pressure in dB can be calculated by the following formula:

$$\{[(n - 58) * 16] / 46\} + 4 = x$$

The transposed formula:

$$\{[(x - 4) * 46] / 16\} + 58 = n$$

n: Sound Level in dB
x: Output value in mA

The 0 to 20 mA output is a current signal that corresponds to the following signals:

Condition	Modbus (Current)	HART (Normal)	HART (Special)
START UP	0 mA	3.5 ± 0.2 mA	1.25 ± 0.2 mA
FAULT	0 mA	3.5 ± 0.2 mA	1.25 ± 0.2 mA
ACOUSTIC ERROR	1.0* mA	3.5* ± 0.2 mA	1.25* ± 0.2 mA

Condition	Modbus (Current)	HART (Normal)	HART (Special)
OFFLINE	3.0 mA	3.5 ± 0.2 mA	3.0 ± 0.2 mA
≤ 58 DB	4.0 mA	4.0 ± 0.2 mA	4.0 ± 0.2 mA
59 DB	4.3 mA	4.3 ± 0.2 mA	4.3 ± 0.2 mA
64 DB	6.1 mA	6.1 ± 0.2 mA	6.1 ± 0.2 mA
69 DB	7.8 mA	7.8 ± 0.2 mA	7.8 ± 0.2 mA
74 DB	9.6 mA	9.6 ± 0.2 mA	9.6 ± 0.2 mA
79 DB	11.3 mA	11.3 ± 0.2 mA	11.3 ± 0.2 mA
84 DB	13.0 mA	13.0 ± 0.2 mA	13.0 ± 0.2 mA
89 DB	14.8 mA	14.8 ± 0.2 mA	14.8 ± 0.2 mA
94 DB	16.5 mA	16.5 ± 0.2 mA	16.5 ± 0.2 mA
99 DB	18.3 mA	18.3 ± 0.2 mA	18.3 ± 0.2 mA
≥ 104 DB	20.0 mA	20.0 ± 0.2 mA	20.0 ± 0.2 mA

Table 1: Analog Output Levels

* See acoustic self-test sequence in Section 5.4.

When HART is selected, the output current changes to comply with the HART Foundation requirements. The HART Foundation does not specify current below 3.5 mA. In normal HART mode, the actual current does not go below 3.5 mA. Modbus reports the analog output as if HART was not there,. This allows users to use a constant Modbus program. When the alarm relay is latched but, the current and display follows the present DB. The relay will return to normal after the relay reset is activated via Modbus, HART, or remote switch.

The unit will have an Inhibit output when Setup, Calibrate, or acoustic test is activated. This activation can take place via display magnets, HART, or Modbus.

1 Source - The detector sends out a current loop. 2 Sink - The detector receives a current loop.

5.6.4 ERROR / FAULT OUTPUT

Error/fault conditions are indicated in many ways:

- On the User Interface display.
- Through the 4-20 mA analog output.
- The Error/ Fault relay will de-energize.
- The HART digital information will show an error.
- The Modbus digital information will show an error.
- A fault event will be recorded every 30 seconds.

Error / Fault	Display	AO	Modbus	Error relay	User action	Gas overrides
Low supply	ERV-	0 mA*	0 mA	De-energized	Restore proper operating voltage	Yes
Acoustic Error	ERAC	1 mA **	0 mA	De-energized	Check sound path from piezo to microphone	Yes
Remote alarm switch stuck	EAST	0 mA*	0 mA	De-energized	Check switch wiring	Yes
Remote relay reset switch stuck	ERST	0 mA*	0 mA	De-energized	Check switch wiring	Yes
Magnetic sensors stuck	EMAG	0 mA*	0 mA	De-energized	Remove magnet	Yes
Internal voltage error	EINV	0 mA*	0 mA	De-energized	Return to factory	No
Critical memory error	ECRT	0 mA*	0 mA	De-energized	Return to factory	No
User memory error	EUSR	0 mA*	0 mA	De-energized	Recycle power and restore user defaults.	No
HART memory error	EHRT	0 mA*	0 mA	De-energized	Recycle power and restore HART information.	No
Event memory error	EEVT	0 mA*	0 mA	De-energized	Recycle power event data maybe accurate.	No

Table 2: Error / Fault Indications

* See acoustic self-test sequence in Section 5.4. ** See HART output current in Table 2.

Low Supply

This fault occurs if the supply voltage at the Observer-H drops below +12.5 VDC. When the supply returns to normal the Observer-H will go back to start up.

Action - Ensure that the supply voltage is at least +14 VDC at the Observer-H.

Acoustic Error

The Observer-H has failed the acoustic test.

Action - Make sure the foam and all acoustic parts are clean.

Remote Alarm Switch Stuck

The “remote alarm” is closed for 60 Seconds.

Action - Check the wiring on the remote alarm. Once the short circuit is cleared, the unit will return to normal operation.

Remote Relay Reset Switch Stuck

The “remote reset” is closed for 30 Seconds.

Action - Check the wiring on the remote reset switch. Once the short circuit is cleared, the unit will return to normal operation.

Magnetic Sensors Stuck

The “magnetic sensor stuck” is closed for 60 Seconds.

One of the four magnet switches or a cable is shorted.

Action - If the magnetic switch is shorted, the unit must be returned to the factory or authorized service center for service.

Internal Voltage Error

The possible errors are an internal voltage is not at the proper value or a circuit is not functioning properly.

Action - An internal error has occurred. The unit must be returned to the factory for service.

Critical Memory Error

This is a main memory error and the Observer-H may not function correctly.

Action – The unit must be returned to the factory or authorized service center for repair.

User Memory Error

User memory includes the trigger level, delay time, latched /non-latched, energized/ non-energized, Modbus setting, or any other user changeable settings. This error indicates one or more of these values is wrong.

Action – Cycle power. The error will go away, but the data is still not correct. The user must restore all user settings.

HART Memory Error

A HART memory register has an error. These registers contain HART user settings. This error indicates one or more of these values are incorrect.

Action – Cycle power. The error will go away but the data is still not correct. The user must restore all HART information.

Event Memory Error

Event memory has an error. Some or all of the event information is incorrect. This error indicates one or more of these values are wrong.

Action – Cycle power. The error will go away, but the data is still not correct.

The Observer-H has four different memory blocks that are periodically checked. The user is notified via this Error / Fault Output function if an error occurs with any of these memory locations.

When HART is selected, the output current changes to comply with the HART Foundation requirements. The HART Foundation does not specify current below 3.5 mA. In normal HART mode, the actual current does not go below 3.5 mA. Modbus reports the analog output as if HART was not there. This allows users to use a consistent Modbus program. When the alarm relay is latched, the current and display follows the present dB. The relay will return to normal after the relay reset is activated via Modbus, HART, or remote switch.

The unit will have an Inhibit output when Setup, Calibrate, or Acoustic Test Mode are activated. This activation can take place via display magnets, HART, or Modbus.

5.7 USER DISPLAY & MAGNET INTERFACE

The User Interface consists of a four-digit LED display window and four magnetic switches to enable a local operator to confirm or change settings without opening the unit. When the user interface is used the Observer-H will change to setup mode. The setup mode consists of the following tests: Analog Output=3.5mA (HART Enable), 3.0mA (HART Disable).

The Observer-H User Menu Diagram is captured on the following page.

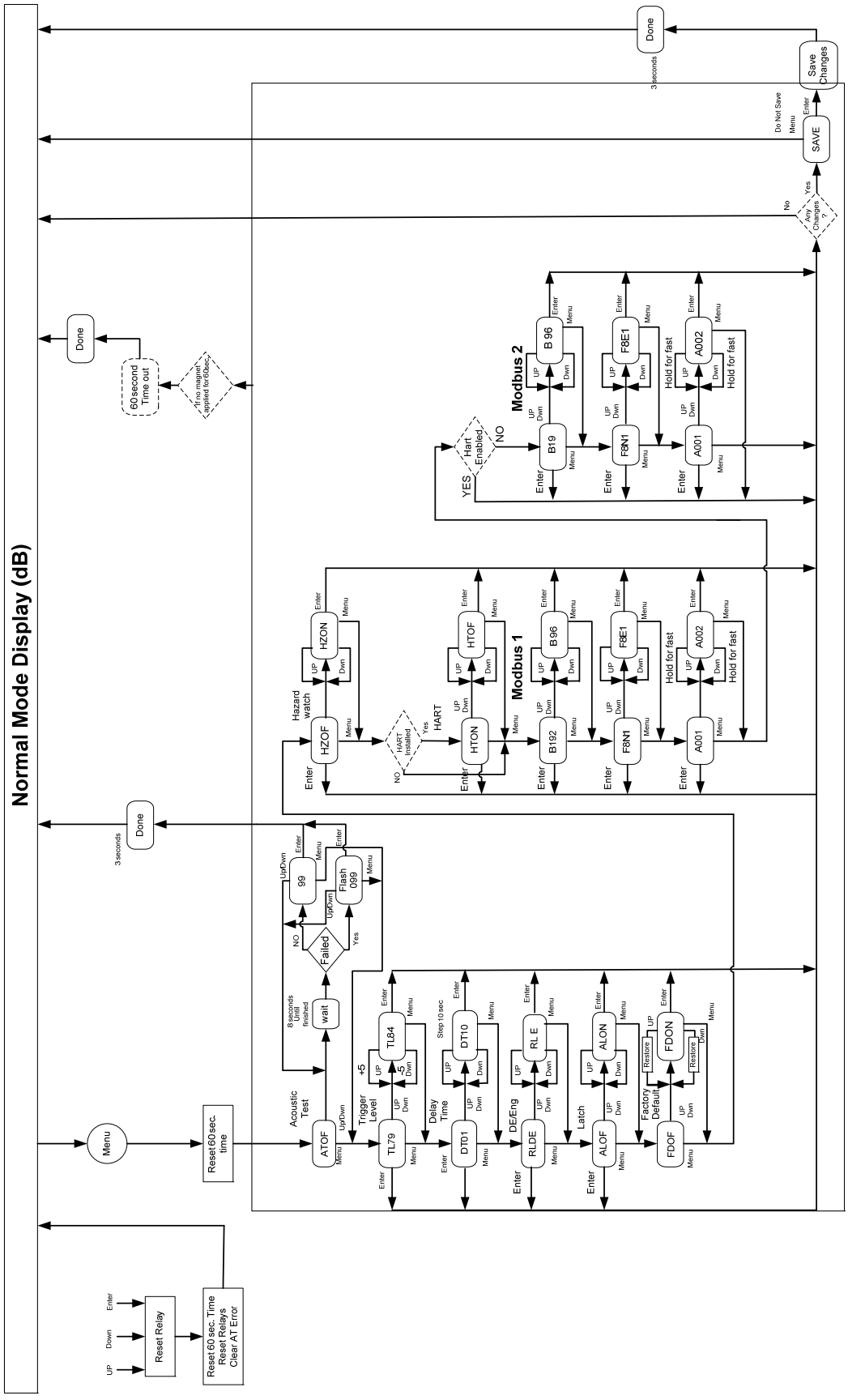
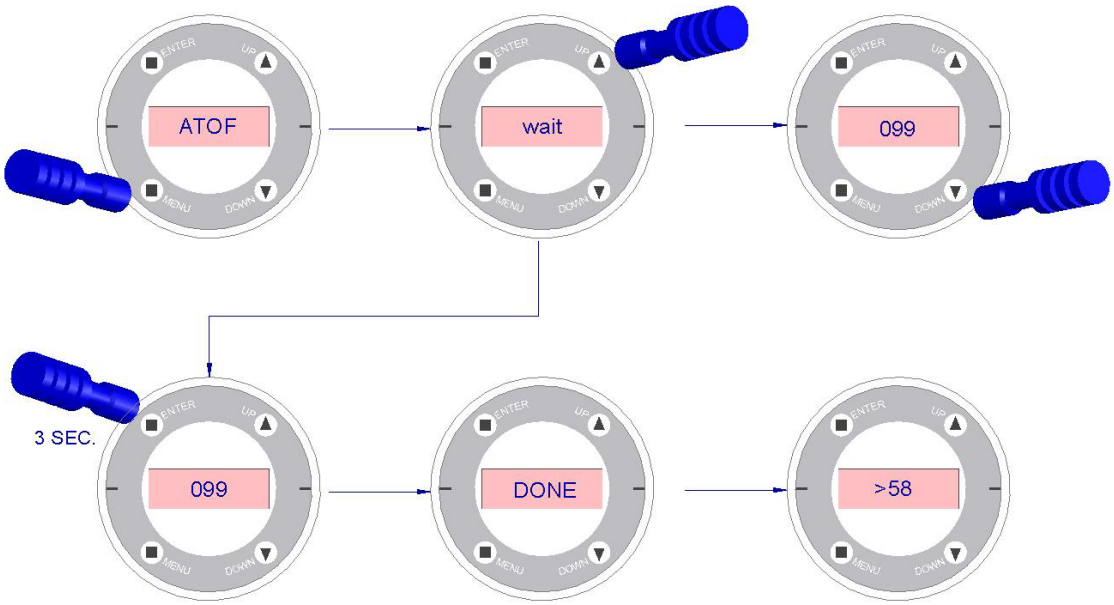


Figure 8: User Menu Diagram

5.7.1 FORCED ACOUSTIC TEST

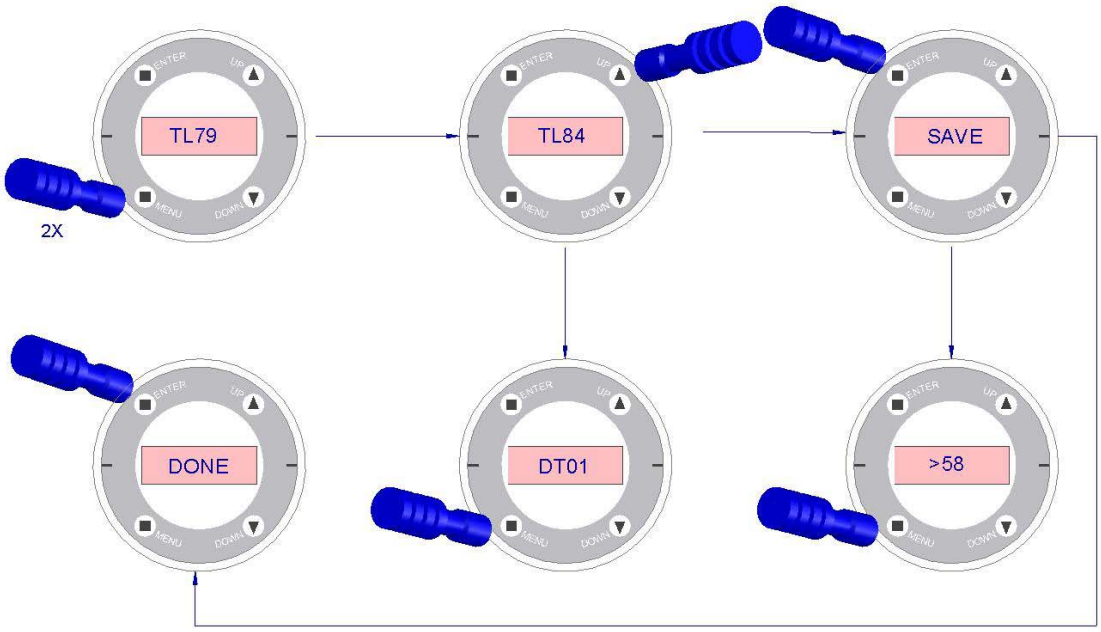
This will enable the local operator to test the acoustic properties of the unit. Activate the MENU switch with the magnet-stick. The code “ATOF” (Acoustic Test Off) will be displayed. Activating the UP switch (▲) will display the “wait” command followed by the sound level detected by the microphone emitted from the sound source. If this value is flashing, the unit is failing the acoustic test. There could be a number of causes for this error, see Section 5.3. for more information. The DOWN switch (▼) will stop the acoustic test and display “ATOF”. Activating the ENTER switch at any time during this operation will display “DONE” and take the unit back to Normal Operation. A maintenance event will be recorded. If no switch is activated for 60 seconds the detector will return to normal operation.



5.7.2 SETTING / CHECKING TRIGGER LEVEL

The trigger level can be set from 59 to 99 dB in steps of 5 dB. The ALARM RELAY will activate at this trigger level changing from open contact to closed (factory default). Activate the MENU switch twice with the magnet-stick. The current trigger level will be displayed (factory setting = 79 dB). Activating the UP switch (▲) will increment the trigger level by 5 dB. Activating the DOWN switch (▼) will decrement the Trigger Level in 5 dB increments. Activating the ENTER switch without changes made, switches the unit back to Normal Operation. Activating the ENTER switch with changes made, will flash “SAVE” on the display. Confirm the save action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the save and switch the unit back to Normal Operation. If ENTER was activated the unit will display “DONE” to confirm that the changes have been saved and return to Normal Operation.

The operator can change the trigger level and if desired move to the next item (delay time) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. If no switch is activated for 60 seconds the detector will return to normal operation without saving the changed settings.

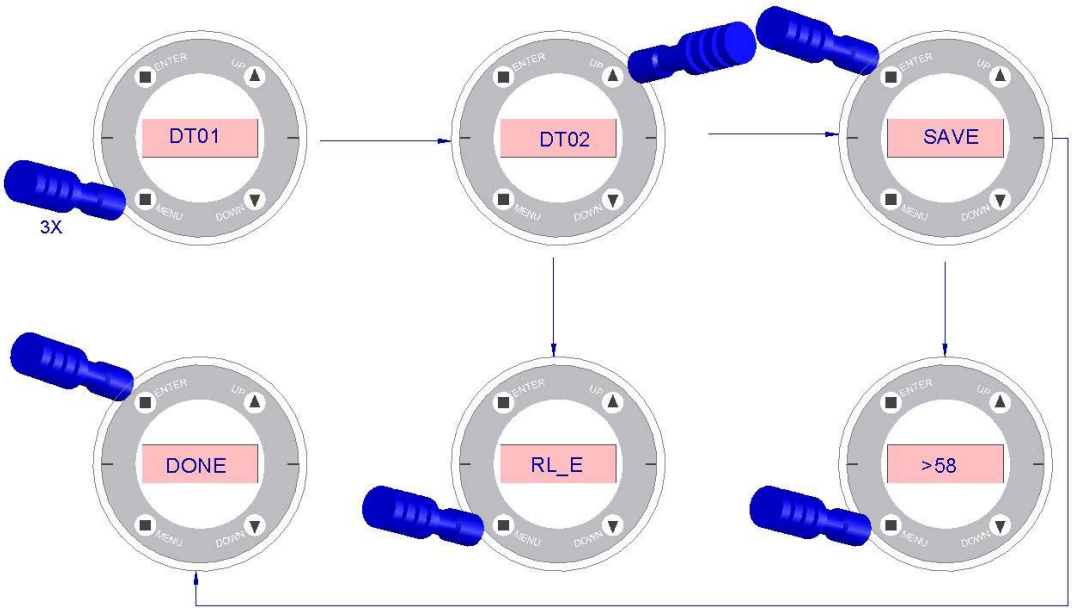


5.7.3 SETTING / CHECKING DELAY TIME

The delay time is linked to the ALARM RELAY. The delay time can be set from 0 to 600 seconds. If the relay output is being used for executive action, it is of utmost importance that the delay time is of a sufficient length to eliminate spurious alarms. Activate the MENU switch three times with the magnet-stick. The current delay time will be displayed (factory setting DT01 = 01 = 10 sec.). Activating the UP switch (▲) will increment the delay time by 10 sec. Activating the DOWN switch (▼) will decrement the delay time by 10 sec. Activating the ENTER switch without changes made, switches the unit back to Normal Operation. Activating the ENTER switch with changes made, will flash “SAVE” on the display. Confirm the save action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the save and switch the unit back to Normal Operation. If ENTER was activated the unit will display “DONE” to confirm that the changes have been saved and return to Normal Operation. The operator can change the delay time and if desired move to the next item (alarm relay energized/de-energized) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. If no switch is activated for 60 seconds the detector will return to normal operation without saving the changed settings.

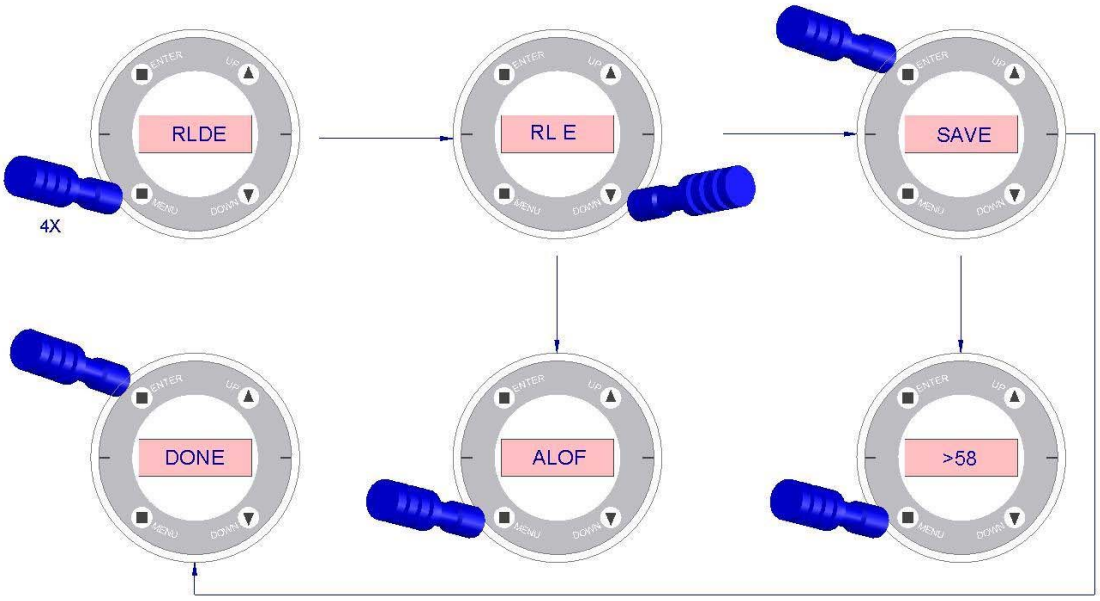
Display	DT00	DT01	DT02	DT03	….	DT 60
Delay Time	0 Sec	10 Sec	20 Sec	30 Sec	….	600 Sec

Table 3: Delay Time Settings



5.7.4 SETTING / CHECKING ALARM RELAY ENERGIZED / DE-ENERGIZED

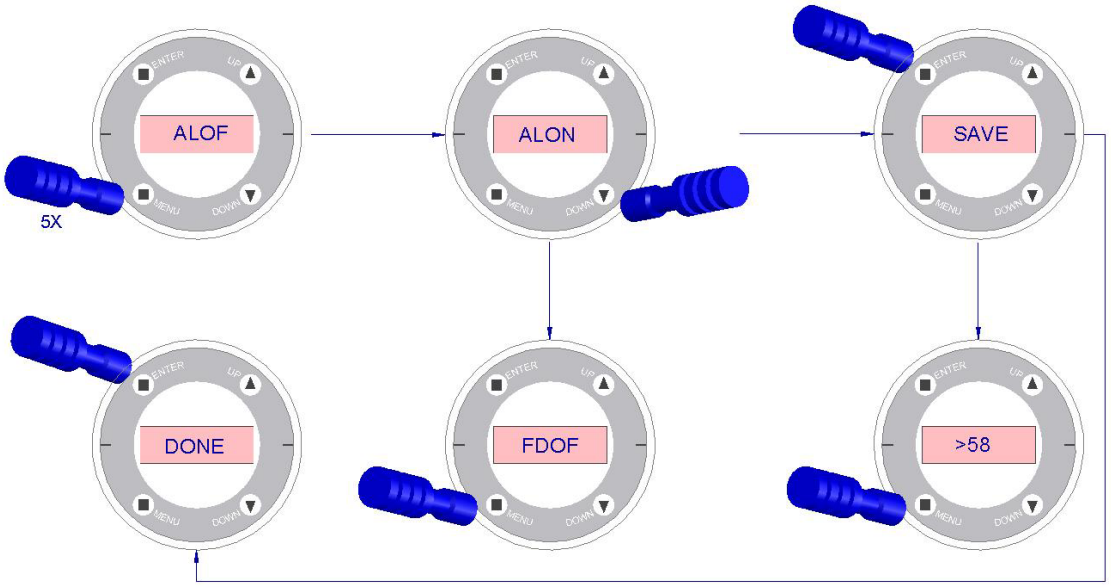
The Alarm Relay is normally de-energized at power up of the unit. The output is an open contact. The output can be changed to closed contact at alarm by energizing the Alarm Relay. Activate the MENU switch four times with the magnet-stick. The current Alarm Relay status will be displayed (factory setting = RLDE = de-energized). Activating the DOWN switch (▼) will switch the Alarm Relay status to energized. Activating the UP switch (▲) will switch the Alarm Relay status back to de-energized. Activating the ENTER switch without changes made, switches the unit back to Normal Operation. Activating the ENTER switch with changes made, will flash “SAVE” on the display. Confirm the save action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing will discard the save and switch the unit back to Normal Operation. If ENTER was activated the unit will display “DONE” to confirm that the changes have been saved and return to Normal Operation. The operator can change the relay energizing settings and if desired move to the next item (alarm latching ON/OFF) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. If no switch is activated for 60 seconds the detector will return to normal operation without saving the changed settings.



5.7.5 SETTING / CHECKING ALARM LATCHING ON / OFF

The Alarm Latching feature gives the local operator the opportunity to latch the alarm relay output in alarm even if the sound level drops below the trigger level. The alarm latching is factory set to OFF. Activate the MENU switch five times with the magnet-stick. The current Alarm Latching status will be displayed (factory setting = ALOF = OFF). Activating the DOWN switch (▼) will switch the Alarm Latching status to ON. Activating the UP switch (▲) will switch the Alarm Latching status back to OFF. Activating the ENTER switch without changes made, switches the unit back to Normal Operation. Activating the ENTER switch with changes made, will flash “SAVE” on the display. Confirm the save action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing will discard the save and switch the unit back to Normal Operation. If ENTER was activated the unit will display “DONE” to confirm that the changes have been saved and return to Normal Operation. The operator can change the latching settings and if desired move to the next item (Factory Default ON/OFF) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. If no switch is activated for 60 seconds the detector will return to normal operation without saving the changed settings.

Reset a Latched Relay
Activating an UP, DOWN, or Enter magnet will reset a latched relay. The relay will not reset if an alarm condition is still present.



5.7.6 SETTING / CHECKING FACTORY DEFAULT ON / OFF

The Factory Default command gives the local operator the opportunity to return all settings to factory default. Activate the MENU switch six times with the magnet-stick. Factory Default OFF (FDOF) will be displayed. Activating the DOWN switch (▼) will switch the Factory Default ON. Activating the UP switch (▲) will switch the Factory Default OFF. Activating the ENTER switch without changing the status to ON, switches the unit back to Normal Operation. Activating the ENTER switch having changed the status to ON, will flash “SAVE” on the display. Confirm the save action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing will discard the save and switch the unit back to Normal Operation. If ENTER was activated the unit will display “DONE” to confirm that all settings have been returned to the Factory Default and return to Normal Operation. Activating the MENU switch a 12th time will switch the unit to Normal Operation, if any changes were made in previous menu items (HazardWatch Mode ON/OFF) the unit will flash “SAVE” on the display. Confirm the save by activating the ENTER switch or discard the save by activating the MENU switch once more. If no switch is activated for 60 seconds the detector will return to normal operation without saving the changed settings.

The Observer-H factory default settings are as follows:

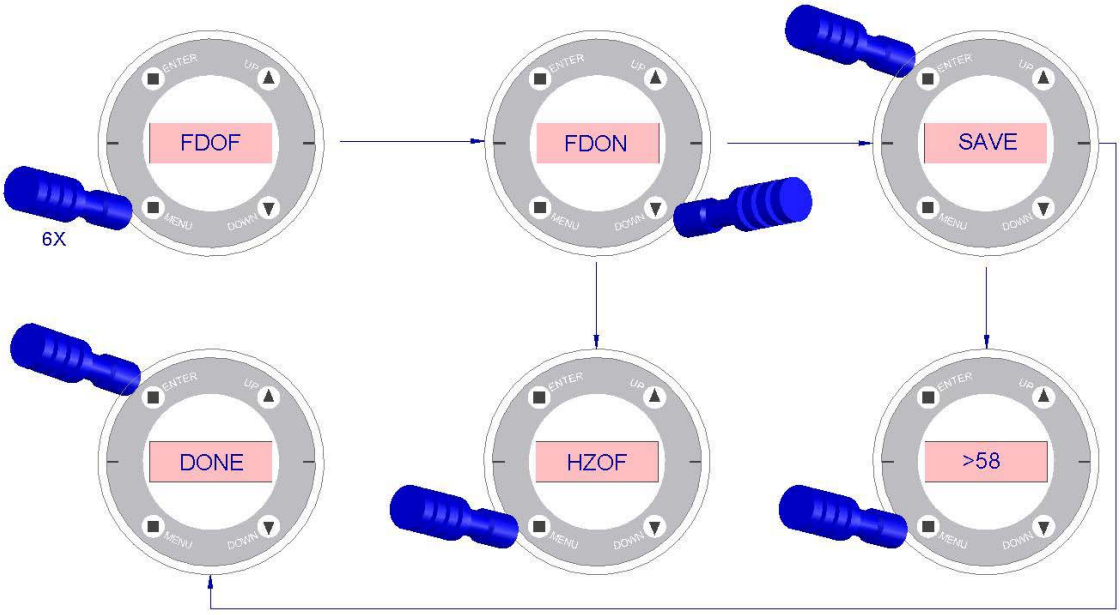
Feature	Setting
Modbus 1	Address 1, 8-N-1, 19200 baud
Modbus 2	Address 1, 8-N-1, 19200 baud
Trigger Level	79 dB
Trigger Delay	10 seconds
Alarm Relay – Energized / De-Energized	De-Energized
Alarm Relay – Latched / Un-Latched	Un-Latched
HART Enable	(Disabled)
HART Current	(Disabled)

Table 4: Dual Modbus Configuration Default Settings

Feature	Setting
Modbus 1	Address 1, 8-N-1, 19200 baud
Modbus 2	(Disabled)
Trigger Level	79 dB
Trigger Delay	10 seconds
Alarm Relay – Energized / De-Energized	De-Energized
Alarm Relay – Latched / Un-Latched	Un-Latched
HART Enable	Enabled
HART Current	3.5 mA for High Range; 1.25 mA for Low Range

Table 5: Single Modbus + HART Configuration Default Settings

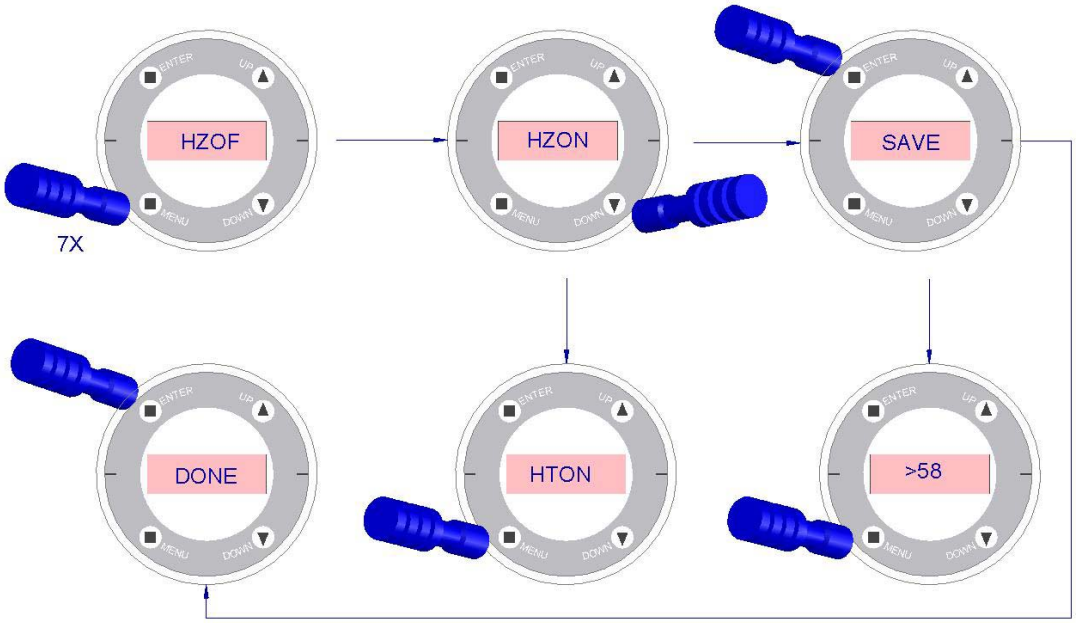
NOTE: There are three other ways to restore the default values. Both Modbus and HART can send a command. The alarm reset switch can restore the default values. (See remote reset switch).



5.7.7 SWITCHING HAZARDWATCH MODE ON/OFF

Activate the MENU switch seven times with magnet stick. Factory default setting (HZOF) will be displayed. Activating the DOWN switch (▼) will switch the factory default ON (FD ON). Activating the UP switch (▲) will switch the factory default OFF. Activating the ENTER switch having changed the status ON/OFF, will flash “SAVE” on the display. Confirm the SAVE action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the SAVE and switch the unit back to normal operation. If ENTER is activated the unit will display “DONE” to confirm that the changes have been saved and return to normal operation. The operator can change the Hazard settings and if desired move to the next item (HART ON/OFF) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by

activating the ENTER switch at any point in the menu structure. If no switch is activated for 60 seconds, the detector will return to normal operation without saving the changed settings.

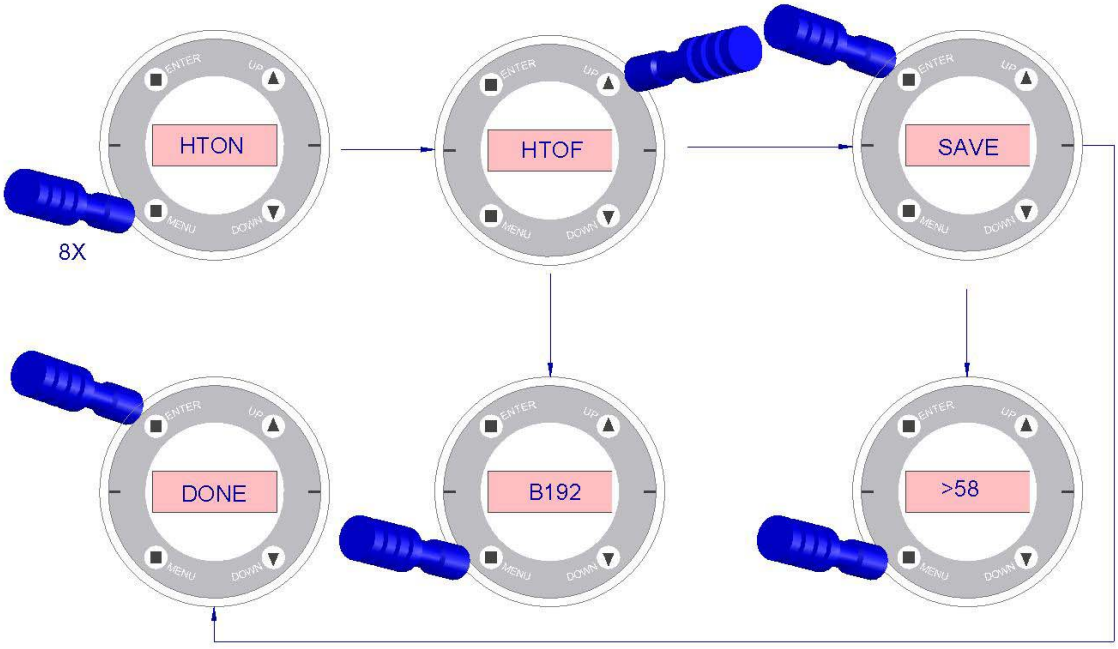


5.7.8 HART ON/OFF

The Observer-H provides the operator the ability to field configure the unit to either Enable/Disable HART communication. When HART communication is enabled, the Observer-H has the following: Single Modbus + HART. When HART is disabled, the Observer-H supports Dual Modbus, but no HART.

Activate the MENU switch eighth times with the magnet stick. Factory default setting (HTON) will be displayed. Activating the UP switch (▲) will switch the factory Default OFF (). Activating DOWN switch (▼) the will switch the factory default ON. Activating the ENTER switch having changed the status ON/OFF, will flash “SAVE” on the display. Confirm the SAVE action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the SAVE and switch the unit back to normal operation. If ENTER is activated the unit will display “DONE” to confirm that the changes have been saved and return to normal operation. The operator can change the HART setting and if desired move to the next item (Baud Rate) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. If no switch is activated for 60 seconds, the detector will return to normal operation without saving the changed settings.

By disabling the HART (HTOF), the channel two option of the Modbus setting will be accessed.

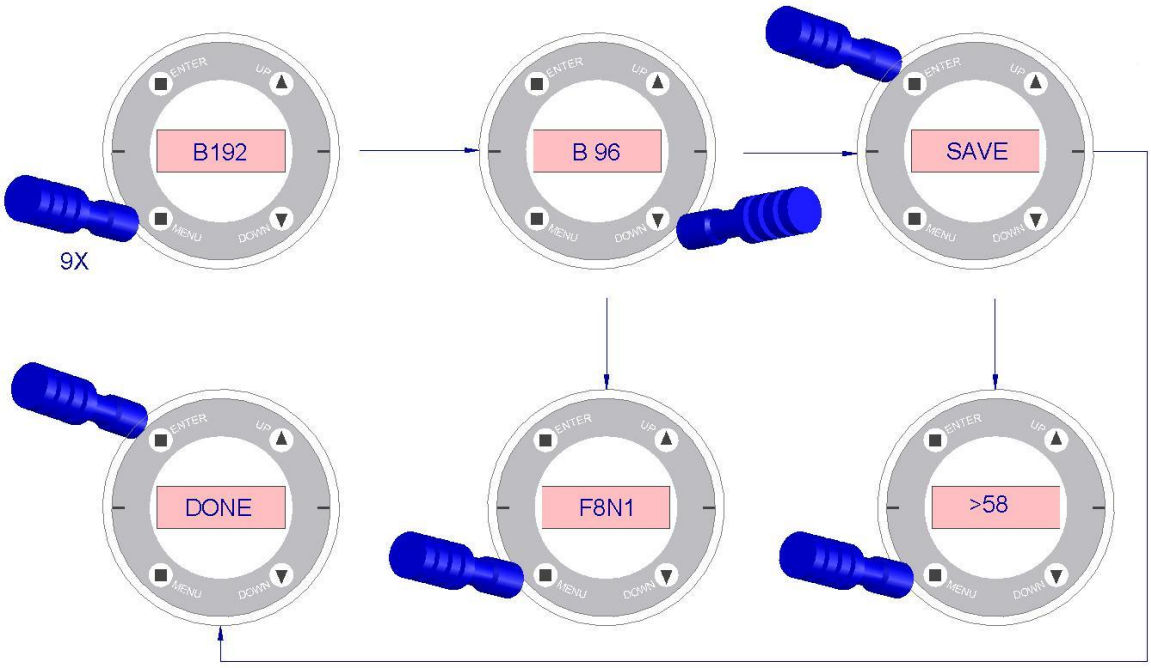


If HART is Enable (HTON): Activating the MENU twelve times will switch the unit to Normal Operation.

If HART is Disable (HTOF): Activating the MENU fifteen times will switch the unit to Normal Operation.

5.7.9 MODBUS SETTING: BAUD (CHANNEL ONE):

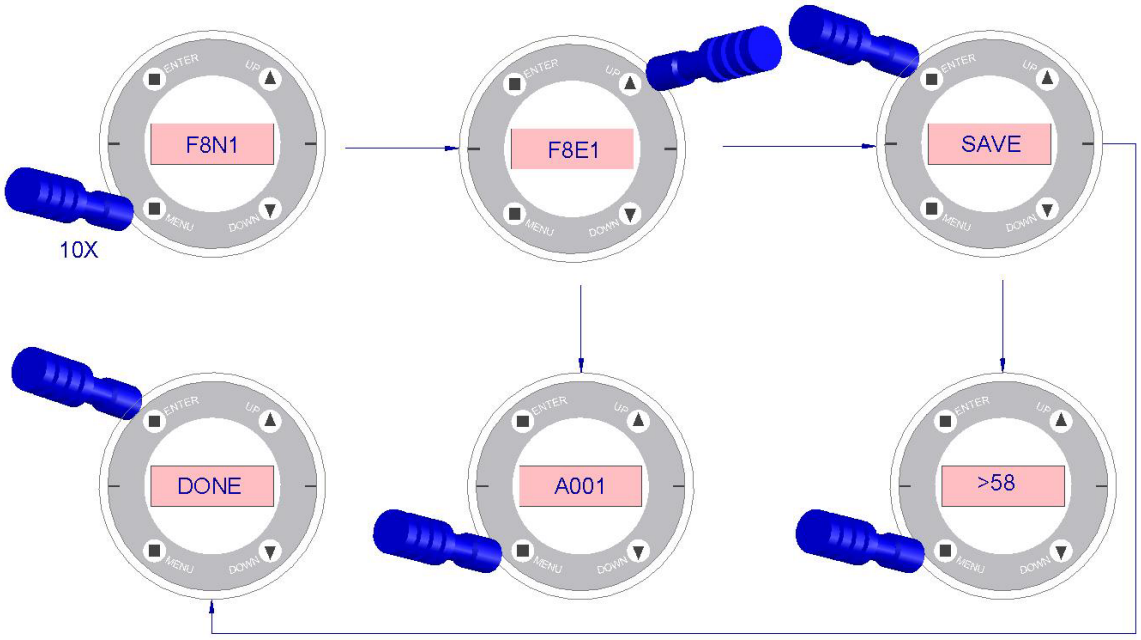
Activating the MENU switch nine times will display the default setting Baud rate “B192” (19200).Using the UP/DOWN switches, the Baud Rate can be selected for the Modbus communication interface. The selectable Baud Rates are 19200, 9600, 4800 or 2400 bits per second. Activating the ENTER switch having changed the status ON/OFF, will flash “SAVE” on the display. Confirm the SAVE action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the SAVE and switch the unit back to normal operation. If ENTER is activated the unit will display “DONE” to confirm that the changes have been saved and return to normal operation. The operator can change the Baud rate and if desired move to the next item (Format) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. More info for Modbus protocol is available in Section 7. If no switch is activated for 60 seconds, the detector will return to normal operation without saving the changed settings.



5.7.10 MODBUS SETTING: FORMAT (CHANNEL ONE):

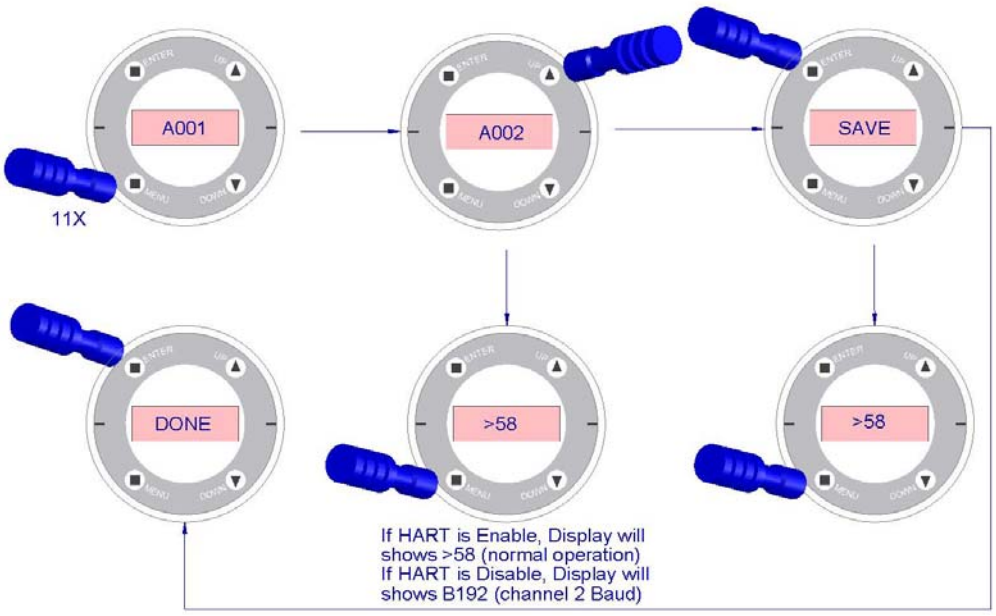
Activating the MENU switch ten times will display the default Modbus setting Format “F8N1” (8-N-1).Using the UP/DOWN switches, the format can be selected for the Modbus communication interface. The selectable formats are: 8-N-1, 8-E-1, 8-O-1, or 8-N-(bits- parity-stop bits).

Activating the ENTER switch having changed the status ON/OFF, will flash “SAVE” on the display. Confirm the SAVE action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the SAVE and switch the unit back to normal operation. If ENTER is activated the unit will display “DONE” to confirm that the changes have been saved and return to normal operation. The operator can change the format settings and if desired move to the next item (Address) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. If no switch is activated for 60 seconds, the detector will return to normal operation without saving the changed settings.

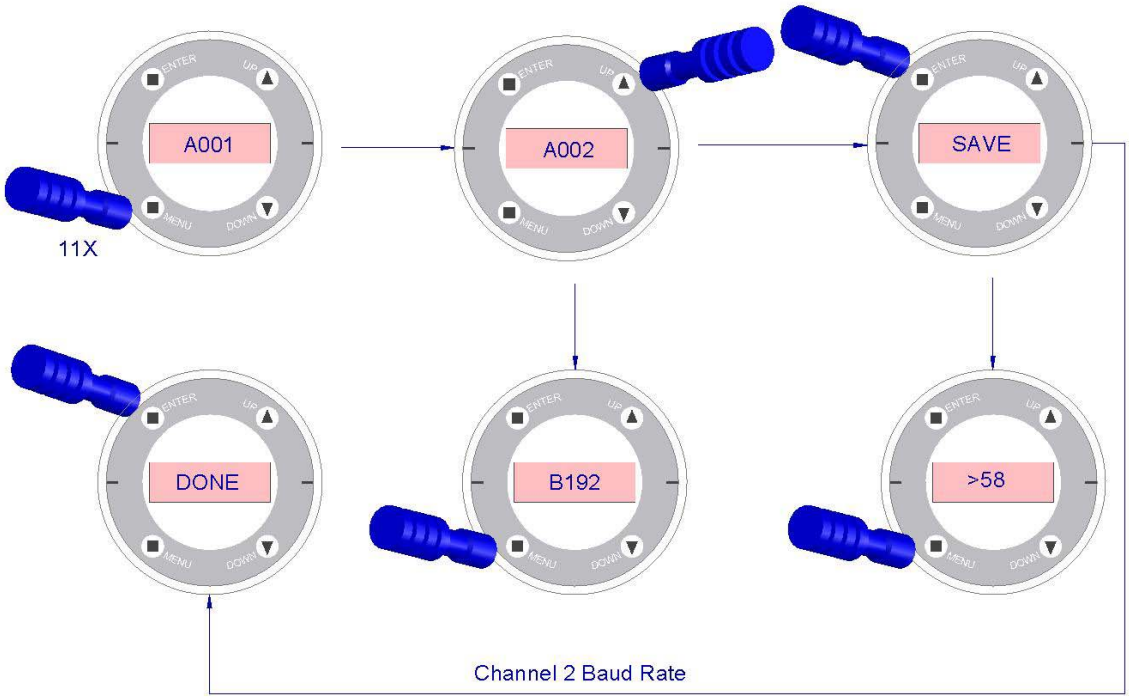


5.7.11 MODBUS SETTING: ADDRESS (CHANNEL ONE):

Activating the MENU switch eleven times will display the current Address of the Modbus (Factory setting is 001). Activating UP switch (▲) will increment the address and activating DOWN switch (▼) will decrement the address the range is 1 to 247. Activating the ENTER switch having changes made, will flash. “SAVE” on the display. Confirm the SAVE action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the SAVE and switch the unit back to normal operation. If ENTER is activated the unit will display “DONE” to confirm that the changes have been saved and return to Normal operation. The operator can change the address settings time and if desired move to the next item (Baud Rate) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. More info for Modbus protocol is available in Section 7. If no switch is activated for 60 seconds the detector will return to normal operation without saving the changed settings.



If HART is enabled (factory default is ON) Channel 2 will not appear. Activating the MENU twelve times will switch the unit to normal operation.

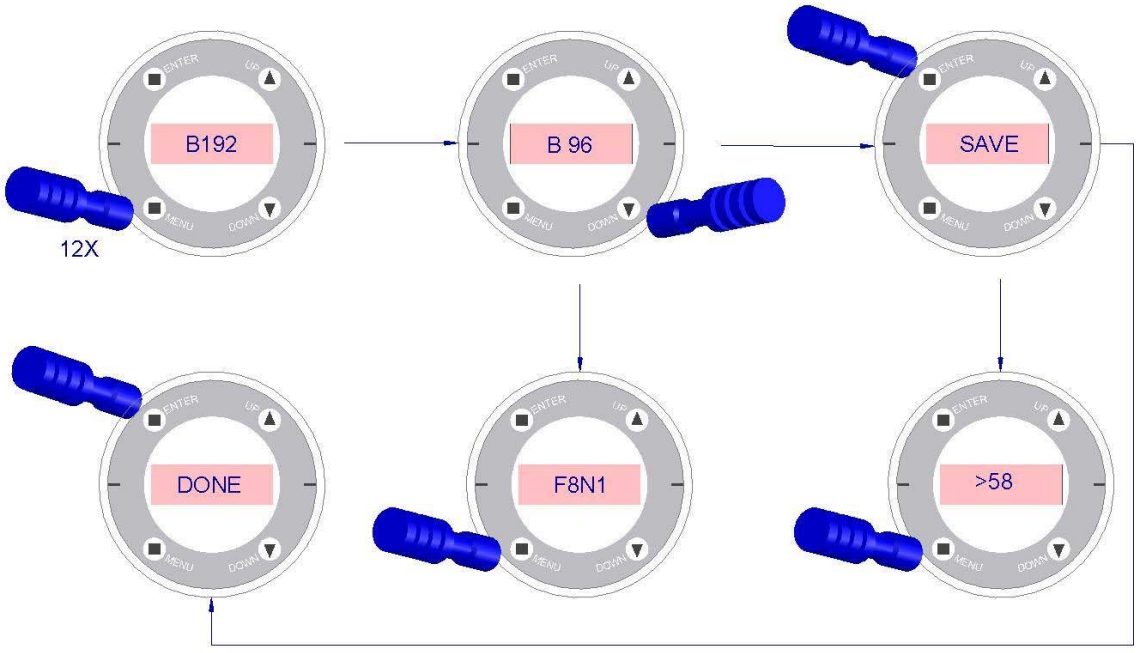


If HART is Disabled the baud rate for Channel 2 will appear

NOTE: If HART is enabled the following channel two items will not appear:

5.7.12 BAUD (CHANNEL TWO):

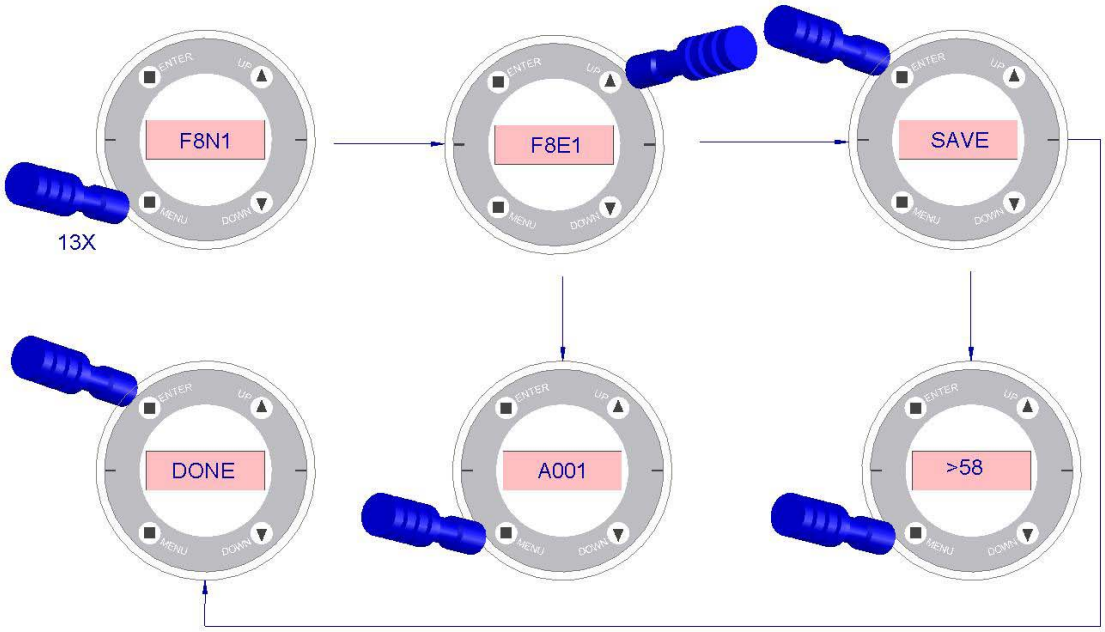
Activating the MENU switch twelve times will display the default setting baud rate “B192” (19200).Using the UP/DOWN switches, the Baud Rate can be selected for the Modbus communication interface. The selectable Baud Rates are 19200, 9600, 4800 or 2400 bits per second. Activating the ENTER switch having changed the status ON/OFF, will flash “SAVE” on the display. Confirm the SAVE action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the SAVE and switch the unit back to normal operation. If ENTER is activated the unit will display “DONE” to confirm that the changes have been saved and return to normal operation. The operator can change the Baud rate and if desired move to the next item (Format) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. More info for Modbus protocol is available in Section 7. If no switch is activated for 60 seconds, the detector will return to normal operation without saving the changed settings.



5.7.13 FORMAT (CHANNEL TWO):

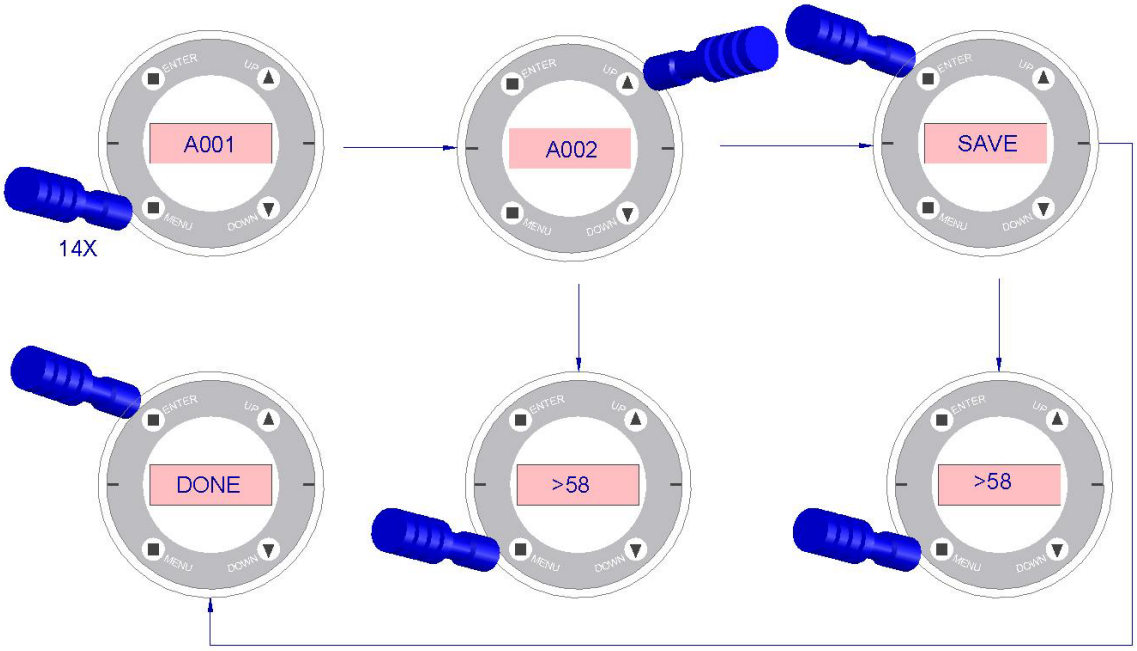
Activating the MENU switch thirteen times will Display the default setting Format “F8N1” (8-N-1).Using the UP/DOWN switches, the Format can be selected for the Modbus communication interface. The selectable Formats are:

8-N-1, 8-E-1, 8-O-1, or 8-N-(bits- parity-stop bits). Activating the ENTER switch by changing the status ON/OFF, will flash “SAVE” on the display. Confirm the SAVE action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the SAVE and switch the unit back to normal operation. If ENTER is activated the unit will display “DONE” to confirm that the changes have been saved and return to normal operation. The operator can change the format settings and if desired move to the next item (Address) in the menu structure by activating the MENU switch straight after the change. The change will be saved at a later stage by activating the ENTER switch at any point in the menu structure. If no switch is activated for 60 seconds, the detector will return to normal operation without saving the changed settings.



5.7.14 ADDRESS (CHANNEL TWO):

Active MENU switch Fourteen times will display the Channel 2 current Address of the Modbus (Factory setting is 001). Activating UP switch (▲) will increment the address and activating DOWN switch (▼) will decrement the address the range is 1 to 247. Activating the ENTER switch having changes made, will flash. “SAVE” on the display. Confirm the SAVE action by activating the ENTER switch once more. Activating the MENU switch while “SAVE” is flashing, will discard the SAVE and switch the unit back to normal operation. If ENTER is activated the unit will display “DONE” to confirm that the changes have been saved and return to Normal operation. More info for Modbus protocol is available in Section 7. If no switch is activated for 60 seconds the detector will return to normal operation without saving the changed settings.



Activating the MENU fifteen times will switch the unit to normal operation.

6.0 GAIN TEST AND CALIBRATION

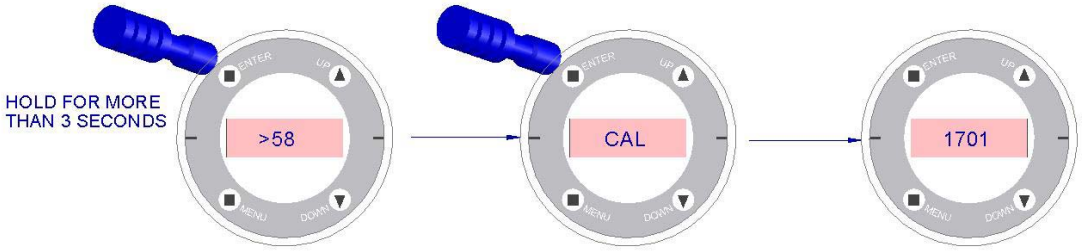
Calibration of the Gassonic Observer-H is only needed when the unit is more than ±3 dB out of tolerance. This can be verified by doing an Observer-H Gain Test on the unit. The Observer-H Gain Test is one of the test sequences of the Gassonic 1701. Calibration is performed with a calibrated Gassonic 1701.

6.1 GAIN TEST

Set the Gassonic 1701 into Observer-H Gain Test (see Gassonic 1701 User Manual for details). Turn the Gassonic 1701 onto the Gassonic Observer-H and activate the Gain Test by pressing the ENTER or TEST button. The Gassonic 1701 will output a constant sound pressure level of 99dB for 8 seconds and then to 0dB for 3 seconds. Thereafter, the sound pressure level will return to 99dB and the sequence will be repeated until a new sound pressure level is selected or the test stopped. To select a new sound pressure level the DOWN button should be pressed. There are four levels; 99dB, 89dB, 79dB and 64dB. The dB readout on the display of the Gassonic 1701 can now be compared with that of the Observer-H.

6.2 CALIBRATION

Set the Gassonic 1701 into Observer-H Gain Test (see Gassonic 1701 User Manual for details). Set the Gassonic Observer-H into Calibration mode by holding the magnet stick on the ENTER switch for more than 3 seconds. The Observer-H will display a flashing ”CAL”. Verify the need for calibration by activating the ENTER switch one more time. The Observer-H will now display a flashing ”1701”. This indicates that the Gassonic Observer-H is ready for calibration and is awaiting communication from the Gassonic 1701 unit.



Turn the Gassonic 1701 onto the Gassonic Observer-H and activate the calibration by pressing ENTER or TEST button. The calibration sequence is automatic. If communication between the Gassonic Observer-H and the Gassonic 1701 is broken ”EER” will be displayed and the unit will return to normal operation. If the calibration sequence was completed successfully and adjustments were made ”ADJ” will be displayed for 2 seconds and the unit will return to normal operation. If the calibration sequence was completed successfully and adjustments were not necessary ”OK” will be displayed for 2 seconds and the unit will return to normal operation. A calibration event will be recorded.

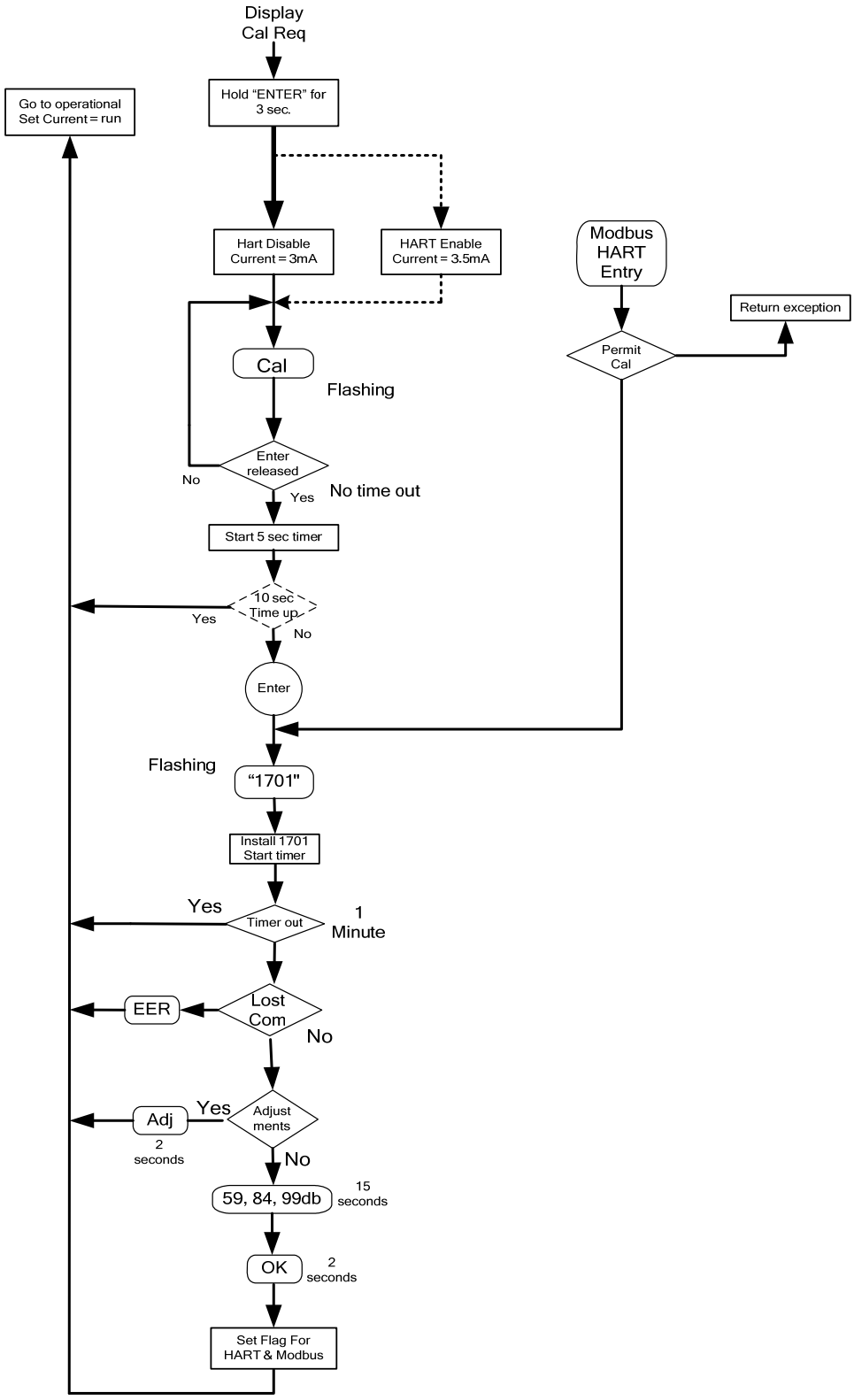


Figure 9: Calibration Routine

7.0 MODBUS DIGITAL INTERFACE

The Observer-H is available in a Dual Modbus configuration and in a Single Modbus + HART configuration. For the Dual Modbus configuration, two independent Modbus communication channels are provided and referred to as Comm 1 and Comm 2. For the Single Modbus + HART configuration, the Modbus channel is referred to as Comm 1.

NOTE: The Dual Modbus configuration disables HART communication.

7.1 BAUD RATE

The Baud Rate is a selectable setting via the Modbus communications interface. The selectable baud rates are 19.2K, 9600, 4800, or 2400 bits per second.

7.2 DATA FORMAT

The Data Format is a selectable setting via the Modbus communications interface. The selectable data formats are as follows:

Data Bits	Parity	Stop Bit	Format
8	None	1	8-N-1
8	Even	1	8-E-1
8	Odd	1	8-O-1
8	None	2	8-N-2

Table 6: Data Format

7.3 MODBUS READ STATUS PROTOCOL (QUERY/RESPONSE)

7.3.1 MODBUS READ QUERY MESSAGE

Byte	Modbus	Range	Referenced to Observer-H
1st	Slave Address	1-247 *	Observer-H ID (Address) (X = 0 or 1 Model Type)
2nd	Function Code	03	Read Holding Registers
3rd	Starting Address Hi**	00	Not Used by Observer-H
4th	Starting Address Lo**	00-FF (Hex)	Observer-H Commands
5th	No. of Registers Hi	00	Not Used by Observer-H
6th	No. of Registers Lo	01	No. of 16 Bit Registers
7th	CRC Lo	00-FF (Hex)	CRC Lo Byte
8th	CRC Hi	00-FF (Hex)	CRC Hi Byte

Table 7: Modbus Query Messages

NOTE*: Address 0 is reserved for broadcast mode and is not be supported at this time.

NOTE:** Start Address can be a maximum of 247 Address Locations (0000-0x00F7).

7.3.2 MODBUS READ RESPONSE MESSAGE

Byte	Modbus	Range	Referenced to Observer-H
1st	Slave Address	1-247* (Decimal)	Observer-H ID (Address)
2nd	Function Code	03 or 04	Read Holding Registers
3rd	Byte Count	02 – FF (Hex)	No. of Data Bytes
4th	Data Hi	00-FF (Hex)	Observer-H Hi Byte Status Data
5th	Data Lo	00-FF (Hex)	Observer-H Lo Byte Status Data
6th	CRC Lo	00-FF (Hex)	CRC Lo Byte
7th	CRC Hi	00-FF (Hex)	CRC Hi Byte

Table 8: Modbus Read Response Messages

NOTE: Address 0 is reserved for broadcast mode and will not be supported at this time.

7.4 MODBUS WRITE COMMAND PROTOCOL (QUERY/RESPONSE)

7.4.1 MODBUS WRITE QUERY MESSAGE

Byte	Modbus	Range	Referenced to Observer-H
1st	Slave Address	1-247* (Decimal)	Observer-H ID (Address)
2nd	Function Code	06	Preset Single Register
3rd	Register Address Hi**	00	Not used by Observer-H
4th	Register Address Lo**	00-FF (Hex)	Observer-H Commands
5th	Preset Data Hi	00-FF (Hex)	Observer-H Hi Byte Command Data
6th	Preset Data Lo	00-FF (Hex)	Observer-H Lo Byte Command Data
7th	CRC Lo	00-FF (Hex)	CRC Lo Byte
8th	CRC Hi	00-FF (Hex)	CRC Hi Byte

Table 9: Modbus Write Query Message

NOTE*: Address 0 is reserved for broadcast mode and is not be supported at this time.

NOTE **: Start Address can be a maximum of 247 Address Locations (0000-0x00F7).

7.4.2 MODBUS WRITE RESPONSE MESSAGE

Byte	Modbus	Range	Referenced to Observer-H
1st	Slave Address	1-247* (Decimal)	Observer-H ID (Address)
2nd	Function Code	06	Preset Single Register
3rd	Register Address Hi**	00	Not used by Observer-H
4th	Register Address Lo**	00-FF (Hex)	Observer-H Commands
5th	Preset Data Hi	00-FF (Hex)	Observer-H Hi Byte Command Data
6th	Preset Data Lo	00-FF (Hex)	Observer-H Lo Byte Command Data
7th	CRC Lo	00-FF (Hex)	CRC Lo Byte
8th	CRC Hi	00-FF (Hex)	CRC Hi Byte

Table 10: Modbus Write Response Message

NOTE*: Address 0 is reserved for broadcast mode and is not supported at this time.

NOTE:** Start Address can be a maximum of 247 Address Locations (0000-0x00F7).

7.4.3 FUNCTION CODES SUPPORTED

Function Code 03 or 04 (Read Holding Registers) is used to read status from the slave unit. Function Code 06 (Preset Single Register) is used to write a command to the slave unit.

7.5 EXCEPTION RESPONSES AND EXCEPTION CODES

In a normal exchange, the master device sends a query to the Observer-H. The Observer-H receives the query and returns a normal response to the master. If a normal communications error occurs, there are 4 possible responses from the Observer-H:

1. If the Observer-H does not recognize the query due to a communications error, then no response is returned from the Observer-H and the master device will eventually process a timeout condition for the query.
2. If the Observer-H receives the query, but detects a communication error (CRC, etc.), then no response is returned from the Observer-H and the master device will eventually process a timeout condition for the query.
3. An exception code is returned when the Observer-H receives the query without a communications error, but cannot process it due to reading or writing to a non-existent or illegal Function Code, Illegal Command Starting Address or Register Address, or Illegal Data Value. The exception response message has two fields that differentiate it from a normal response. See the next section for more information.

7.5.1 EXCEPTION RESPONSES

Byte	Modbus	Range	Referenced to Observer-H
1st	Slave Address	1-247* (Decimal)	Observer-H ID (Address)
2nd	Function Code	83 or 86 (Hex)	MSB is set with Function Code
3rd	Exception Code	01 - 06 (Hex)	Appropriate Exception Code (See below)
4th	CRC Lo	00-FF (Hex)	CRC Lo Byte
5th	CRC Hi	00-FF (Hex)	CRC Hi Byte

Table 11: Exception responses

7.5.2 EXCEPTION CODE FIELD

In a normal response, the Observer-H returns data and status in the data field, requested in the query from the master. In an exception response, the Observer-H returns an exception code in the data field, which describes the condition that caused the exception. Below is a list of exception codes that are supported by the Observer-H:

Code	Name	Description
01	Illegal Function	The function code received in the query is not an allowable action for the Observer-H.
02	Illegal Data Address	The data address received in the query is not an allowable address for the Observer-H.
03	Illegal Data Value	A value contained in the query data field is not an allowable value for the Observer-H.
04	Slave Device Failure	An unrecoverable error occurred while the Observer-H was attempting to perform the requested action.
05	Acknowledge	The Observer-H has accepted the request and is processing it, but a long duration of time will be required. This response is returned to prevent a timeout error from occurring in the master.
06	Device Busy	The Observer-H is engaged in processing a long-duration program command. The master should retransmit the message later when the slave is free.

Table 12: Exception Code Field

7.6 COMMAND REGISTER LOCATIONS

7.6.1 OPERATIONAL MODE COMMANDS

See Section number listed below and reference Section 7.7 for details of each register.

NOTE: The Observer-H has Modbus error reporting. The optional dual Modbus has error reporting for each channel. It can also provide simultaneous block mode.

R - indicates Read Only Access **R/W - indicates Read/Write Access**

Address	Name	Function	Type	I/O Range	R/W
		GENERAL USER REGISTERS			
0x0000	**Analog Output**	Scaled 0-20 mA current output	Numeric Value	0 – 21.7mA expressed in μA	R
0x0001	**Mode**	Set/view operating mode	Bit Map	See description	R/W
0x0002	**Fault Status 1**	User status errors	Bit Map	See description	R
0x0003	**Fault Status 2**	Internal status errors	Bit Map	See description	R
0x0004	**Model No.**	Observer-H model number	Numeric Value	TBD	R
0x0005	**Software Rev Hi**	Embedded software major revision	ASCII chars	Alphanumeric	R
0x0006	**Sound Level**	Sound pressure level (dB)	Numeric Value	~ 45 – 110 dB	R
0x0007	**Peak Sound**	Peak sound level (dB)	Numeric Value	TBD	R
0x0008	**Temperature**	Unit temperature in 0.1 °C	Numeric Value	–40°C – +75°C expressed in 0.1 °C	R
0x0009	**Display Chars Hi**	Display MSD and MID1	ASCII chars	See description	R
0x000A	**Display Chars Lo**	Display MID2 and LSD	ASCII chars	See description	R
0x000B	**Serial No. Hi**	Unit serial number - high word	ASCII chars	See description	R
0x000C	**Serial No. Lo**	Unit serial number - low word	ASCII chars	See description	R
0x000D	**Trigger Level**	Set/view alarm trigger level	Numeric Value	See description	R/W
0x000E	**Alarm Delay**	Set/view alarm delay time	Numeric Value	See description	R/W
0x000F	**CH1 Address**	Set/view channel 1 address	Numeric Value	1 – 247	R/W
0x0010	**CH1 Baud Rate**	Set/view channel 1 baud rate (2.4, 4.8, 9.6, 19.2 kbps)	Code	0, 1, 2, 3	R/W
0x0011	**CH1 Format**	Set/view channel 1 data format (8N1, 8E1, 801, 8N2)	Code	0, 1, 2, 3	R/W
0x0012	**CH2 Address**	Set/view channel 2 address	Numeric Value	1 – 247	R/W
0x0013	**CH2 Baud Rate**	Set/view channel 2 baud rate (2.4, 4.8, 9.6, 19.2 kbps)	Code	0, 1, 2, 3	R/W
0x0014	**CH2 Format**	Set/view channel 2 data format (8N1, 8E1, 801, 8N2)	Code	0, 1, 2, 3	R/W
0x0015	**Software Rev Hi**	Embedded software minor revision	ASCII chars	Alphanumeric	R
0x0016	**Reset Alarms**	Set to clear all alarms	Numeric Value	0	R/W
0x0017	**Cal Sub Mode**	Shows the stages of Calibration	Numeric Value	See description	R
0x0018	**Acoustic Test**	Initiates the acoustic test routine	Numeric Value	0 – 1	R/W
0x0019	**HazardWatch**	Enables HazardWatch flag	Numeric Value	0 -1	R/W
0x001A	**Relay State**	Indicates the state of relays	Bit	See description	R

Address	Name	Function	Type	I/O Range	R/W
			Map		
0x001B	**Alarm Latch**	Set/clear alarm latching state	Numeric Value	0 or 1	R/W
0x001C	**Relay Energize**	Set/clear relay energize state	Numeric Value	0 or 1	R/W
0x001D	**HART Enable**	Enable HART on channel 2	Numeric Value	0 or 1	R/W
0x001E	**HART Test**	Test HART communication	Numeric Value	0, 1, 2	R/W
0x001F	**Cal Abort**	Abort calibration	Numeric Value	1	R/W
0x0020	**Ch1 UART Receive Errors**	Total number of UART channel 1 receive errors	Numeric Value	0 – 65535	R
0x0021	**Ch1 Bus Activity Rate**	Serial Ch1 bus activity rate	Numeric Value	0 – 100	R
0x0022	**Ch1 Function Code Errors**	Number of Modbus channel 1 function code errors	Numeric Value	0 – 65535	R
0x0023	**Ch1 Starting Address Errors**	Number of Modbus channel 1 starting address errors	Numeric Value	0 – 65535	R
0x0024	**Ch1 Register Errors**	Number of Modbus channel 1 register errors	Numeric Value	0 – 65535	R
0x0025	**Ch1 CRC Hi Errors**	Number of Modbus channel 1 Hi CRC errors	Numeric Value	0 – 65535	R
0x0026	**Ch1 CRC Lo Errors**	Number of Modbus channel 1 Lo CRC errors	Numeric Value	0 – 65535	R
0x0027	**Ch1 Parity Errors**	Number of serial channel 1 parity errors	Numeric Value	0 – 65535	R
0x0028	**Ch1 Overrun Errors**	Number of serial channel 1 overrun errors	Numeric Value	0 – 65535	R
0x0029	**Ch1 Framing Errors**	Number of serial channel 1 framing errors	Numeric Value	0 – 65535	R
0x002A	**Ch1 Modbus Receive Errors**	Total number of Modbus channel 1 receive errors	Numeric Value	0 – 65535	R
0x002B	**Factory Defaults**	Set factory defaults for alarm and relay settings	Numeric Value	1	R/W
0x002C	**Clear Ch1 UART Errors**	Clears UART total receive error counters	Numeric Value	0	R/W
0x002D	**Clear Ch1 Modbus Errors**	Clears Modbus total receive error counters	Numeric Value	0	R/W
0x002E	**HART Min AO**	Sets minimum analog output current for HART protocol	Numeric Value	0 – 3.5 mA 1 – 1.25 mA	R/W
0x002F	**HART Present Flag**	Indicates presence of HART hardware	Numeric Value	0 – not present 1 – present	R
		EVENT LOGGING REGISTERS			
0x0030	**Run Time Hi**	Read/Set run-time seconds High word	Numeric Value	0 – 65535	R/W
0x0031	**Run Time Lo**	Read/Set run-time seconds Low word	Numeric Value	0 – 65535	R/W
0x0032	**Real Time Clock Year, Month**	Read/Set year and month of Real-Time Clock (RTC)	Numeric Value	1 – 99 year, 1 – 12 month	R/W
0x0033	**Real Time Clock** **Day, Hour**	Read/Set day and hour of RTC	Numeric Value	1 – 31 day, 0 – 23 hour	
0x0034	**Real Time**	Read/Set minutes and	Numeric	0– 59 minutes 0 – 59 seconds	R/W

Address	Name	Function	Type	I/O Range	R/W
	Clock **Minute, Second**	seconds of RTC	Value		
0x0035	**Power Cycled Flag**	Time Reset After power Cycled	Numeric Value	0 = Time not Reset, 1 = Time Reset	R
0x0036	**Event Index**	Index of Logged Events	Numeric Value	0 – 9	R/W
		Reserved			
0x0037	**Reserved**	Reserved	Numeric Value	0	R
0x0038	**Reserved**	Reserved	Numeric Value	0	R
0x0039	**Reserved**	Reserved	Numeric Value	0	R
0x003A	**Reserved**	Reserved	Numeric Value	0	R
0x003B	**Reserved**	Reserved	Numeric Value	0	R
0x003C	**Reserved**	Reserved	Numeric Value	0	R
0x003D	**Reserved**	Reserved	Numeric Value	0	R
0x003E	**Reserved**	Reserved	Numeric Value	0	R
		Alarm Event Log			
0x003F	**Run Time Hi**	Running Time Hi for Alarm Event log entries	Numeric Value	0 - 65535	R
0x0040	**Run Time Lo**	Running Time Low for Alarm Event log entries	Numeric Value	0 - 65535	R
0x0041	**Clock Time Hi**	Hi byte = year, Lo byte month: Alarm clock time	Numeric Value	1 –99 year, 1– 12 month	R
0x0042	**Clock Time Mid**	Hi byte = Day, Lo byte Hour: Alarm clock time	Numeric Value	1 – 31 day, 0 – 23 hour	R
0x0043	**Clock Time Low**	Hi byte = Minute, Lo byte second: Alarm clock time	Numeric Value	0 – 59 minutes 0 – 59 seconds	R
0x0044	**Reserved**	Reserved	Numeric Value	0	R
0x0045	**Reserved**	Reserved	Numeric Value	0	R
0x0046	**Alarm Count**	Total Alarm Event Count	Numeric Value	0 – 65535	
		Fault Event Log			
0x0047	**Run Time Hi**	Running Time Hi for Fault Event log entries	Numeric Value	0 - 65535	R
0x0048	**Run Time Lo**	Running Time Low for Fault Event log entries	Numeric Value	0 - 65535	R
0x0049	**Clock Time Hi**	Hi byte = year, Lo byte month: Fault clock time	Numeric Value	1 –99 year, 1– 12 month	R
0x004A	**Clock Time Mid**	Hi byte = Day, Lo byte Hour: Fault clock time	Numeric Value	1 – 31 day, 0 – 23 hour	R
0x004B	**Clock Time Low**	Hi byte = Minute, Lo byte second: Fault clock time	Numeric Value	0 – 59 minutes 0 – 59 seconds	R
0x004C	**Fault Cause**	Observer-H-H fault code	Numeric Value	See description	R

Address	Name	Function	Type	I/O Range	R/W
0x004D	**Reserved**	Reserved	Numeric Value	0	R
0x004E	**Fault Count**	Total Fault Event Count	Numeric Value	0 – 65535	
		Maintenance Event Log			
0x004F	**Run Time Hi**	Running Time Hi for Maintenance Event log entries	Numeric Value	0 - 65535	R
0x0050	**Run Time Lo**	Running Time Low for Maintenance Event log entries	Numeric Value	0 - 65535	R
0x0051	**Clock Time Hi**	Hi byte = year, Lo byte month: Maintenance clock time	Numeric Value	1 –99 year, 1– 12 month	R
0x0052	**Clock Time Mid**	Hi byte = Day, Lo byte Hour: Maintenance clock time	Numeric Value	1 – 31 day, 0 – 23 hour	R
0x0053	**Clock Time Low**	Hi byte = Minute, Lo byte second: Maintenance clock time	Numeric Value	0 – 59 minutes 0 – 59 seconds	R
0x0054	**Maint. Code**	Observer-H-H maintenance code	Numeric Value	See description	R
0x0055	**Reserved**	Reserved	Numeric Value	0	R
0x0056	**Maint. Count**	Total maintenance event count	Numeric Value	0 – 65535	
		Calibration Event Log			
0x0057	**Run Time Hi**	Running Time Hi for calibration event log entries	Numeric Value	0 - 65535	R
0x0058	**Run Time Lo**	Running Time Low for calibration event log entries	Numeric Value	0 - 65535	R
0x0059	**Clock Time Hi**	Hi byte = year, Lo byte month: calibration clock time	Numeric Value	1 –99 year, 1– 12 month	R
0x005A	**Clock Time Mid**	Hi byte = Day, Lo byte Hour: calibration clock time	Numeric Value	1 – 31 day, 0 – 23 hour	R
0x005B	**Clock Time Low**	Hi byte = Minute, Lo byte second: calibration clock time	Numeric Value	0 – 59 minutes 0 – 59 seconds	R
0x005C	**Cal Code**	Observer-H-H calibration code	Numeric Value	See description	R
0x005D	**Reserved**	Reserved	Numeric Value	0	R
0x005E	**Cal Count**	Total calibration event count	Numeric Value	0 – 65535	
0x005F	**Clear All Events**	Set to clear all event logs	Numeric Value	0	
		MISCELLANEOUS USER REGISTERS			
0x0060 – 0x006F	**User Info**	User information registers	Numeric Value	0 – 65535	
0x0070	**Ch2 UART Receive Errors**	Total number of UART channel 2 receive errors	Numeric Value	0 – 65535	R
0x0071	**Ch2 Bus Activity Rate**	Serial channel 2 bus activity rate	Numeric Value	0 – 100	R
0x0072	**Ch2 Function Code Errors**	Number of Modbus channel 2 function code errors	Numeric Value	0 – 65535	R
0x0073	**Ch2 Starting Address**	Number of Modbus channel 2 starting address errors	Numeric Value	0 – 65535	R

Address	Name	Function	Type	I/O Range	R/W
	Errors				
0x0074	**Ch2 Register Errors**	Number of Modbus channel 2 register errors	Numeric Value	0 – 65535	R
0x0075	**Ch2 CRC Hi Errors**	Number of Modbus channel 2 Hi CRC errors	Numeric Value	0 – 65535	R
0x0076	**Ch2 CRC Lo Errors**	Number of Modbus channel 2 Lo CRC errors	Numeric Value	0 – 65535	R
0x0077	**Ch2 Parity Errors**	Number of serial channel 2 parity errors	Numeric Value	0 – 65535	R
0x0078	**Ch2 Overrun Errors**	Number of serial channel 2 overrun errors	Numeric Value	0 – 65535	R
0x0079	**Ch2 Framing Errors**	Number of serial channel 2 framing errors	Numeric Value	0 – 65535	R
0x007A	**Ch2 Modbus Receive Errors**	Total number of Modbus channel 2 receive errors	Numeric Value	0 – 65535	R
0x007B	**Reserved**	N/A	Numeric Value	N/A	R
0x007C	**Clear Ch1 UART Errors**	Clears UART total receive error counters	Numeric Value	0	R/W
0x007D	**Clear Ch1 Modbus Errors**	Clears Modbus total receive error counters	Numeric Value	0	R/W
0x007E	**Reserved**	N/A	Numeric Value	N/A	R

Table 13: Modbus Commands

7.7 OBSERVER-H COMMAND REGISTER DETAILS

7.7.1 ANALOG (00H)

A read returns a value which is proportional to the 0-20 mA output current. The current is based on a 16-bit value. The number represents the current in microamps (μA).

7.7.2 MODE (01H)

A read returns the Observer-H status mode

Bit Position	15	14	13	12	11	10	9	8
Fault Description	Not Used	Not Used	Not Used	Not Used	Show Rev	Alarm Mode	Piezo Cal	Cal Pending
Hex Value	0x8000	0x4000	0x2000	0x1000	0x0800	0x0400	0x0200	0x0100
Decimal Value	32768	16384	8192	4096	2048	1024	512	256
Bit Position	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Fault Description	Alarm Test	Not Used	Setup Mode	Fault Mode	Cal Mode	Acoustic Test	Run Mode	Startup Mode
Hex Value	0x0080	0x0040	0x0020	0x0010	0x0008	0x0004	0x0002	0x0001
Decimal Value	128	64	32	16	8	4	2	1

Table 14: Operation Status Mode

READ:
A read request to this register returns the present Observer-H operating mode represented by the enabled bit. Descriptions of the modes are provided below:

- **Startup:** Observer-H initialization during the power-up cycle.
- **Run:** Normal operating mode of the instrument.

- **Acoustic Test:** This bit is set anytime an acoustic test is taking place. The request of the acoustic test can be from the magnet, a timed acoustic test, a HART request or a Modbus request.
- **Calibrate:** This bit is set anytime a calibration is taking place. The request of the calibration test can be from the magnet, a timed acoustic test, a HART request or a Modbus request.
- **Fault:** This bit is set any time the Observer-H has a fault.
- **Setup:** Indicates the user has activated a magnet and is in setup mode.
- **Alarm Test:** This indicates someone has activated the alarm test. This can be done via a remote switch, HART, or Modbus.
- **Calibration Pending:** The Cal pending bit is used to indicate an intermediate state.
- **Piezo Calibration:** This bit is not used in normal operation. It is used only when the piezo or microphone is replaced. It is set when the technician calibrates the piezo.
- **Alarm:** This bit is used when the Observer-H detects dB greater than the trigger level. If the Observer-H is latched it will stay in alarm mode until the reset relay is activated.
- **Show Rev:** This bit is set during the time someone has activated the show rev by using an UP & DOWN magnet.

WRITE:
A write to the mode register (01) with the proper bit set will cause the Observer-H to change modes. Not all modes can be activated in this manner. If an improper bit or the action is not allowed at this time an exception will be returned.

- **Alarm Test:** The alarm bit is a toggle. The first write sets the mode the second write clears the mode.
- **Acoustic Test:** This mode will perform a non continuous acoustic test. The acoustic test will not be allowed if a gas leak is above the trigger level, instead an exception will be returned. The display will show a “COM”.
- **Calibrate:** This will put the Observer-H into calibration mode. It will be ready for the 1701 to be activated. Calibration will not be allowed if a gas leak is above the trigger level instead an exception will be returned.
- **Operational Mode:** Writing an operational mode bit will abort any of the above modes. It will not go back to operational mode until it is safe.

7.7.3 PRIMARY FAULT STATUS/ERROR 1 (02H)

A read returns the errors that are occurring, which are indicated by bit position. This status word is used as the primary status error word. This is the only one that needs to be read to know if there are any errors.

Bit Position	15	14	13	12	11	10	9	8
Fault Description	Error Lower level	Not Used	BELOW ATREF	Not Used	Event Memory	Hart Memory	User Memory	Critical Memory
Hex Value	0x8000	0x4000	0x2000	0x1000	0x0800	0x0400	0x0200	0x0100
Decimal Value	32768	16384	8192	4096	2048	1024	512	256
Display Fault Code	N/A				EEVT	EHRT	EUSR	ECRT

Bit Position	7	6	5	4	3	2	1	0
Fault Description	Internal Voltage	Magnet Switch	Reset Switch	Alarm Switch	Not used	Acoustic Test	Not Used	24V Low Line
Hex Value	0x0080	0x0040	0x0020	0x0010	0x0008	0x0004	0x0002	0x0001
Decimal Value	128	64	32	16	8	4	2	1
Display Fault Code	EINV	EMAG	ERSW	EASW		ERAC		ERV_

Table 15: Fault Status/Error 1

See the ERROR OUTPUT Section for explanation of errors. Bit 13 is a special bit for Modbus and HART. If the Observer-H is in acoustic test this bit is a one if the acoustic sound level is above the desired level. It is a zero if it is below the desired level. This allows the system to quickly know if there is an acoustic test problem.

Bit 15 is a "one" if any of the lower level faults are present. The system can now drill down and find the root cause. This is not normally required at the system level only at a test station.

7.7.4 FAULT STATUS/ERROR 2 (03H)

A read-only accessible register contains the bit map for any internal error that is present. The following table shows the faults that are represented by each bit in the register.

Bit Position	15	14	13	12	11	10	9	8
Fault Description	Word 3	Event RAM	HART RAM	System RAM	Critical RAM	Event Flash	HART Flash	System Flash
Hex Value	0x8000	0x4000	0x2000	0x1000	0x0800	0x0400	0x0200	0x0100
Decimal Value	32768	16384	8192	4096	2048	1024	512	256
Display Fault Code	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bit Position	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Fault Description	Critical Flash	CPU RAM	CPU Flash	-5V Ref.	+5V Ref.	-12V Ref.	+12V Ref.	Current Ref.
Hex Value	0x0080	0x0040	0x0020	0x0010	0x0008	0x0004	0x0002	0x0001
Decimal Value	128	64	32	16	8	4	2	1
Display Fault Code	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 16: Fault Status/Error 2

7.7.5 MODEL TYPE (04H)

A read returns the Decimal Value indicating the model number. The Observer-H model number is "6000" Notice: If a newer Observer-H is designed to replace the Observer-H the model number will be different.

7.7.6 SOFTWARE REVISION MAJOR (05H)

A read-only accessible register contains the major (user) alphanumeric revision value of the Observer-H embedded software expressed in 2 ASCII characters (REV "A" appears as a blank and the letter A).

7.7.7 DB LEVEL (06H)

A read-only accessible register contains the value of the measured sound pressure level expressed in decibels.

7.7.8 PEAK SOUND (07H)

A read-only accessible register contains the acoustic test peak sound level expressed in decibels.

7.7.9 UNIT TEMPERATURE (08H)

A read-only accessible register contains the value of internal unit temperature expressed in 0.1°C units. These functions are indicated on the Low Data Byte and the High Data Byte is not used.

7.7.10 MODBUS DISPLAY (09H, 0AH)

09H: A read-only accessible register contains the upper two ASCII characters shown on the Observer-H display.

0AH: A read-only accessible register contains the lower two ASCII characters shown on the Observer-H display.

7.7.11 SERIAL NUMBER (0BH, 0CH)

The serial number is a 32-bit word but the value is only 23 bits long. The upper bits are always zero. This is done to keep the same serial number as the HART serial number. Address 0x16 contains the lower part of the number and address 0X15 contains the upper part.

7.7.12 TRIGGER LEVEL (0DH)

This is a read/write register. A read will return the present trigger level. Since the trigger level can only be incremented by 5, only certain values are allowed.

EXCEPTION - If an illegal data value is entered (must be one of the numbers in the table), then the Exception Code 03 (Illegal Data Value) is returned

Valid Trigger levels	59	64	69	74	79	84	89	94	99	dB

Table 17: Trigger Levels

7.7.13 TRIGGER DELAY (0EH)

This is a read/write register. A read will return the present time delay. The time delay has a range of 0 to 600 seconds. A one represents 10 seconds.

EXCEPTION - If an illegal data value is entered (must be between 0-600), then the Exception Code 03 (Illegal Data Value) is returned

7.7.14 COMM 1 ADDRESS (0FH)

A read returns the Comm 1 address of the Observer-H. A write changes the address to the requested address. The range of the address is 1 to 247 (01 to F7 Hex). After the address has been changed to the slave unit, the Modbus communications will cease because the address has changed; therefore the master will have to change its query address to the slave's new address in order to restart the communications.

EXCEPTION - If an illegal data value is entered (must be between 1-0x00F7), then the Exception Code 03 (Illegal Data Value) is returned.

NOTE: The default Address is 1.

7.7.15 COMM 1 BAUD RATE (10H)

A read returns the Comm 1 baud rate of the Observer-H A write changes the baud rate to the requested baud rate. After the baud rate has been changed to the addressed unit, the Modbus communications will cease because the baud rate has changed; therefore the master will have to change its baud rate to the slave's new baud rate in order to restart the communications.

Baud Rate	Low Data Byte	Access
19.2K	04	Read/Write
9600	03	Read/Write
4800	02	Read/Write
2400	01	Read/Write

Table 18: Comm 1 Baud Rate

This function is indicated on the Low Data Byte (the High Data Byte is not used).

EXCEPTION - If an illegal data value is entered which is not listed above, then the Exception Code 03 (Illegal Data Value) is returned.

NOTE: The default baud rate is 19200.

7.7.16 COMM 1 DATA FORMAT (11H)

A read returns the Comm 1 data format of the Observer-H. A write changes the data format to the requested data format. After the data format has been changed to the addressed unit, the Modbus communications may cease or start producing Comm errors because the data format has changed; therefore the master will have to change its data format to the slave's new data format in order to restart or provide proper communications.

Data	Parity	Stop	Format	Low Data Byte	Access
8	None	1	8-N-1	00	Read/Write
8	Even	1	8-E-1	01	Read/Write
8	Odd	1	8-O-1	02	Read/Write
8	None	2	8-N-2	03	Read/Write

Table 19: Comm 1 Data Format

This function is indicated on the Low Data Byte and the High Data Byte is not used.

EXCEPTION - If an illegal data value is entered which is not listed above, then the Exception Code 03 (Illegal Data Value) is returned.

NOTE: The default Data Format is 8-N-1.

7.7.17 COMM 2 ADDRESS (12H)

A read returns the Comm 2 address of the Observer-H. A write changes the address to the requested address. The range of the address is 1 to 247 (01 to F7 Hex). After the address has been changed to the slave unit, the Modbus communications will cease because the address has changed; therefore the master will have to change its query address to the slave's new address in order to restart the communications.

EXCEPTION - If an illegal data value is entered (must be between 1-0x00F7), then the Exception Code 03 (Illegal Data Value) is returned.

NOTE: The default address is 2.

7.7.18 COMM 2 BAUD RATE (13H)

A read returns the Comm 2 baud rate of the Observer-H. A write changes the baud rate to the requested baud rate. After the baud rate has been changed to the addressed unit, the Modbus communications will cease because the baud rate has changed; therefore the master will have to change its baud rate to the slave's new baud rate in order to restart the communications.

Baud Rate	Low Data Byte	Access
19.2K	04	Read/Write
9600	03	Read/Write
4800	02	Read/Write
2400	01	Read/Write

Table 20: Comm 2 Baud Rate

This function is indicated on the Low Data Byte (the High Data Byte is not used).

EXCEPTION - If an illegal data value is entered which is not listed above, then the Exception Code 03 (Illegal Data Value) is returned.

NOTE: The default Baud Rate is 19200.

7.7.19 COMM 2 DATA FORMAT (14H)

A read returns the Comm 2 data format of the Observer-H. A write changes the data format to the requested data format. After the data format has been changed to the addressed unit, the Modbus communications may cease or start producing communication errors because the data format has changed; therefore the master will have to change its data format to the slave's new data format in order to restart or provide proper communications.

Data	Parity	Stop	Format	Low Data Byte	Access
8	None	1	8-N-1	00	Read/Write
8	Even	1	8-E-1	01	Read/Write
8	Odd	1	8-O-1	02	Read/Write
8	None	2	8-N-2	03	Read/Write

Table 21: Comm 2 Data Format

This function is indicated on the Low Data Byte and the High Data Byte is not used.

EXCEPTION - If an illegal data value is entered which is not listed above, then the Exception Code 03 (Illegal Data Value) is returned.

NOTE: The default Data Format is 8-N-1.

7.7.20 SOFTWARE REV MINOR (15H)

A read-only accessible register contains minor (internal) numeric revision value of the Observer-H embedded software expressed in 2 ASCII characters.

7.7.21 RESET ALARM (16H)

Writing a "1" to this register will reset the alarm relay.

EXCEPTIONS - If an illegal data value is entered (must be between 0-1), then the Exception Code 03 (Illegal Data Value) is returned.

If the Observer-H hears a gas leak greater than the trigger when the command is received a Code 06 (device busy) exception will be returned.

7.7.22 SUB MODE (17H)

This is a read only register. It is used to tell the control system the states of calibrate mode.

Calibrate Sub Mode	Number returned
Apply 1701	0x0001
Calibration in progress	0x0002
Calibration adjustment	0x0004
Calibrate OK	0x0008
Calibrate error	0x0010

Table 22: Calibrate Sub Mode

7.7.23 ACOUSTIC TEST (18H)

This is a write only register. Writing a "1" to this register will activate an acoustic test. This is a one cycle test. During the test the display will show "COM". The current will go to 3.0 mA.

EXCEPTIONS - If an illegal data value is entered (must be between 0-1), then the Exception Code 03 (Illegal Data Value) is returned.

If the Observer-H hears a gas leak greater than the trigger when the command is received a Code 06 (device busy) exception will be returned.

7.7.24 HAZARDWATCH (19H)

HazardWatch indicates when a successful calibration takes place. In HazardWatch mode the current goes to 3.2 mA for 5 seconds then to 4.0 mA. An aborted calibration would go straight to 4.0 mA.

This is a read/write only register. Reading returns the state of the HazardWatch. (ON/OFF). Writing a 1 will turn on HazardWatch, a "0" will disable.

EXCEPTIONS - If an illegal data value is entered (must be between 0-1), then the Exception Code 03 (Illegal Data Value) is returned.

7.7.25 RELAY STATE (1AH)

The relay state register is read only. The bit position shows which relay is on.

Function	Hex Value
Alarm Relay Energized	0x0001
Fault Relay Energized	0x0002
1701 LED Energized	0x0004

Table 23: Relay State

7.7.26 ALARM LATCH (1BH)

The alarm latch register is read/write. A read returns if the alarm latch is enabled or not. A write enables or disables latching. One is latch zero is non – latched.

EXCEPTIONS - If an illegal data value is entered (must be between 0-1), then the Exception Code 03 (Illegal Data Value) is returned. If the Observer-H hears a gas leak greater than the trigger when the command is received a Code 06 (device busy) exception will be returned.

7.7.27 RELAY ENERGIZE (1CH)

The relay energized register is read/write. A read returns if the alarm relay is normally energized or not. One is energized a zero is de-energized.

EXCEPTIONS - If an illegal data value is entered (must be between 0-1), then the Exception Code 03 (Illegal Data Value) is returned. If the Observer-H hears a gas leak greater than the trigger when the command is received a Code 06 (device busy) exception will be returned.

7.7.28 HART ENABLE (1DH)

The HART enable register read/write. This command enables or disables HART. A “0” is HART disabled. A “1” is HART Enabled. This is an option that must be ordered.

EXCEPTIONS - If an illegal data value is entered (must be between 0-1), or if HART is not installed then the Exception Code 03 (Illegal Data Value) is returned.

7.7.29 HART TEST (1EH)

This command is used to test the HART output. It produces constant zeros or constant ones on the HART output. This is only available if the HART option was purchased.

EXCEPTIONS - If an illegal data value is entered (must be between 0-1), or if HART is not installed then the Exception Code 03 (Illegal Data Value) is returned.

Code	Results
0	Normal
1	Constant ones
2	Constant zeros

Table 24: HART Codes

7.7.30 CAL ABORT (1FH)

Writing to the calibrate abort register will abort calibration and return the Observer–H to normal.

7.7.31 COMM 1 TOTAL ILLEGAL NUMBER OF REGISTERS ERRORS (20H)

A read indicates the total illegal number of registers errors on the Comm 1Modbus. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.32 COMM 1 BUS ACTIVITY RATE % (21H)

A read indicates the Comm 1 Bus Activity Rate in percent of this Slave's addressed node versus other addressed nodes. Range of this value is in hex (0-64), which translates to decimal (0-100%).

7.7.33 COMM 1 FUNCTION CODE ERRORS (22H)

A read indicates the number of Comm Function Code Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.34 COMM 1 STARTING ADDRESS ERRORS (23H)

A read indicates the number of Comm 1 Starting Address Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.35 COMM 1 TOTAL RECEIVE ERRORS (24H)

A read indicates the total Modbus Comm 1 Only Receive Errors that occurred in the slave device. These are address, function, etc. type of errors. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.36 RXD CRC ERRORS (25H)

A read indicates the number of RXD CRC Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.37 RXD CRC ERRORS (SAME AS 25H) (26H)

Same as (25h).

7.7.38 COMM 1 PARITY ERRORS (27H)

A read indicates the number of Comm 1 Only Parity Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.39 COMM 1 OVERRUN ERRORS (28H)

A read indicates the number of Comm 1 Overrun Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

NOTE: An overrun error occurs when the next received byte of data tries to overwrite an existing received data byte, which has not been processed. Therefore, the next received byte of data is lost. This can be controlled by implementing the proper DCS or PLC Error Handling Timing Setting (ex. Reply Timeout Setting, Delay Time, and Number of Retries) and proper Baud Rate Setting.

7.7.40 COMM 1 FRAMING ERRORS (29H)

A read indicates the number of Comm 1 Framing Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.41 COMM 1 TOTAL UART RECEIVE ERRORS (2AH)

A read indicates the total Modbus Comm 1 Receive Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again. The total errors are an accumulation of the individual communication errors such as Overrun, CRC, Parity and Framing errors.

7.7.42 FACTORY DEFAULT (2BH)

Writing 1 to this register will load the factory default values for alarm, Modbus and HART settings.

The factory default register is read/write. This command can set all the settings to factory default by writing 1. A read returns “1” if the factory setting is set default or returns “0” if the settings are different than the factory default.

7.7.43 COMM 1 CLEAR ERROR (2CH)

Writing 1 to this register clears all UART receive communication (framing, overrun, parity) error counters on serial channel 1.

7.7.44 CLEAR STATS 1(2D)

Writing 1 to this register clears all Modbus (function, starting register address, number of registers, CRC) error counters on serial channel 1.

7.7.45 HART CURRENT (2E)

Normally in HART mode the low current does not go below 3.5 mA. In order for the current to distinguish between Fault and offline there is a HART setting that allows the current to go as low as 1.25 mA. A read returns “1” or “0”.

Condition	Normal HART Current	HART Expanded Scale	Units
Run	4 to 20	4 ,8, 12,16, 20	mA
Acoustic Fault	1*	1.25*	mA
Fault	3.5	1.25	mA

Table 25: HART Current Levels

EXCEPTIONS - If an illegal data value is entered (must be between 0-1), then the Exception Code 03 (Illegal Data Value) is returned

7.7.46 HART PRESENT (2F)

HART present is a read only register. A “1” indicates HART is installed. A “0” means HART is not installed.

NOTE: HART can be installed and not enabled but it cannot be enabled if not installed.

7.7.47 EVENT LOGGING (30H – 5FH)

The Observer-H logs Alarm, Fault, Calibration, and Maintenance events. Each event group will store a total of 10 events in a first-in-first-out manner. An identifying number and time stamp is also stored for each event.

Faults

- Whenever the fault word changes the time will be recorded (See Primary fault).
- The time of the fault will be saved.
- When the fault is removed, it is not saved and the counter is not incremented.
- A fault event is logged for every 30 seconds recorded.

Alarm

The time the gas level reaches the Alarm level is recorded. Each time this happens a counter is incremented. The end of the event is when the sound level goes 5% below the alarm level.

Calibration

Microphone Calibration

When a calibration is finished a counter is incremented for each calibration attempt. The identifying number stored depends on the ending condition.

Condition	Identifying number
Calibrate OK	4
Calibrate Adjust	5
Calibrate Error	6

Table 26: Calibration Counter

Maintenance

There are a total of 10 maintenance events stored. The number stored with the time stamp will indicate the source of the maintenance event.

Piezo

When a Piezo calibration (seven up: seven times on the UP) is saved a maintenance event will occur. The value stored will be 4. A factory piezo calibration will have the number 9.

Alarm Test

When an alarm test is initiated, a maintenance event will occur. The event code will be 6.

Running Time in Seconds Hi Word (0x30)

This sets/reads hi word of device running time in seconds. This value must be read/written prior to running time low byte (register 0x00B2).

Running Time in Seconds Lo Word (0x31)

This sets/reads hi word of device running time in seconds. This value must be read/written after running time hi byte (register 0x00B1).

Item Number	Description
1	Hi Byte =Year, Low Byte = Month
2	Hi Byte = Day, Low Byte = Hour
3	Hi Byte = Minute, Low Byte = Second

Table 27: Real Time Clock Time Format

Real-time Clock Year, Month (0x32)

This is used to read/write the real time clock. The high byte will be the year minus 2000. The low byte will be a value from 1 to 12. To get or set real time, read or write year/month (0x00B3) first, then day/hour (0x00B4), then min/sec (0x00B5)

Real-time Clock Day, Hour (0x33)

This is used to read/write the real time clock. The high byte will be the day of the month from 1 to 31. The low byte will be the hour from 0 to 23. To get or set real time, read or write year/month (0x00B3) first, then day/hour (0x00B4), then min/sec (0x00B5)

Real-time Clock Minute, Second (0x34)

This is used to read/write the real time clock. The high byte will be the minute from 0 to 59 and the low byte will be the seconds from 0 to 59. To get or set real time, read or write year/month (0x00B3) first, then day/hour (0x00B4), then min/sec (0x00B5)

Power Cycle Flag (0x35)

This reads whether the time of day clock has been reset after power has been re-cycled to the unit. If the time has been reset, this flag will be = 0; otherwise the flag will = 1.

Event Index (0x36)

This is used to indicate which of the stored events the user would like to read. There are 5 event logs: Warning events, Alarm events, Fault events, Calibration events and Maintenance events. Each of these event logs consist of 10 of their most recent occurrences. The user is able to read the logs of each of these by setting this event index followed by a reading of the desired event log. The event index is a number from 0 to 9. Zero refers to the most recent event and 9 refers to the least recent event stored in the log. For example to read time of the most recent Warning event in the Warning event log, set this register to 0 and then read registers 0xB8 and 0xB9 (for the running time in seconds) or read registers 0xBA, 0xBB, and 0xBC (for the clock time).

Reserved (0x37 - 3E)

Alarm Running Time in Seconds, Hi Word (0x3F)

This register reads the high word of the running time in seconds when the alarm event occurred. This time is in seconds since January 1, 2000.

Alarm Running Time in Seconds, Low Word (0x40)

This register reads the low word of the running time in seconds when the alarm event occurred. This time is in seconds since January 1, 2000.

Alarm Clock Time: Year, Month (0x41) Alarm Structure Hi

These registers are described in Table 28 as item number 1.

Alarm Clock Time: Day, Hour (0x42) Alarm Structure Mid

These registers are described in Table 28 as item number 2.

Alarm Clock Time: Minute, Seconds (0x43) Alarm Structure Low

These registers are described in Table 28 as item number 3.

Spare (0x44- 45)

Spare register.

Total Alarm Event Counter (0x46)

This reads the total number of alarm events that have been stored in the unit.

Fault Running Time in Seconds, Hi Word (0x47)

This register reads the high word of the running time in seconds when the fault event occurred. This time is in seconds since January 1, 2000.

Fault Running Time in Seconds, Low Word (0x48)

This register reads the low word of the running time in seconds when the fault event occurred. This time is in seconds since January 1, 2000.

Fault Clock Time: Year, Month (0x49) Fault Structure Hi

These registers are described in Table 28 as item number 1.

Fault Clock Time: Day, Hour (0x4A) Fault Structure Mid

These registers are described in Table 28 as item number 2.

Fault Clock Time: Minute, Seconds (0x4B) Fault Structure Low

These registers are described in Table 28 as item number 3.

Fault Code (0x4C) Fault Cause

This register is described in Table 28.

Spare (0x4D)

Spare register.

Total Fault Event Counter (0x4E)

This reads the total number of fault events that have been stored in the unit.

Maintenance Running Time in Seconds, Hi Word (0x4F)

This register reads the high word of the running time in seconds when the gas check event occurred. This time is in seconds since January 1, 2000.

Maintenance Running Time in Seconds, Low Word (0x50)

This register reads the low word of the running time in seconds when the gas check event occurred. This time is in seconds since January 1, 2000.

Maintenance Clock Time: Year, Month (0x51)

These registers are described in Table 28 as item number 1.

Maintenance Clock Time: Day, Hour (0x52)

These registers are described in Table 28 as item number 2.

Maintenance Clock Time: Minute, Seconds (0x53)

These registers are described in Table 28 as item number 3.

Maintenance Cause (0x54)

There are three maintenance event types:

1. User started acoustic test: code = 9
2. Alarm test: code = 8
3. Piezo calibration: code = 4

Spare (0x55)

Spare register.

Total Maintenance Event Counter (0x56)

This reads the total number of gas check events that have been stored in the unit

Calibration Running Time in Seconds, Hi Word (0x57)

This register reads the high word of the running time in seconds when the calibration event occurred. This time is in seconds since January 1, 2000.

Calibration Running Time in Seconds, Low Word (0x58)

This register reads the low word of the running time in seconds when the calibration event occurred. This time is in seconds since January 1, 2000.

Calibration Clock Time: Year, Month (0x59)

These registers are described in Table 28 as item number 1.

Calibration Clock Time: Day, Hour (0x5A)

These registers are described in Table 28 as item number 2.

Calibration Clock Time: Minute, Seconds (0x5B)

These registers are described in Table 28 as item number 3.

Calibration Code (0x5C)

This returns 1 for zero events and 2 for calibration events.

Spare (0x5D)

Spare register.

Total Calibration Event Counter (0x5E)

This reads the total number of calibration events that have been stored in the unit.

Clear all events (0x5F)

Writing zero (0) to this register clears all event counters.

Setting Clock

Please see the table on the following page.

Address (hex)	Parameter	Function	Data Type	Data range	Access
30	Seconds Time Hi	Seconds Time Hi	Numeric value	0 – 65535	**Timer Sec**
31	Seconds Time Low	Seconds Time	Numeric value	0 – 65535	**Timer sec**
32	Real Time Clock Year, Month	Read/Set year and month of RTC	2 Numeric Values	0-99 year, 1 – 12 month	**Timer Struct**
33	Real Time Clock Day, Hour	Read/Set day and hour of RTC	2 Numeric Values	1 – 31 day, 0 – 23 hour	
34	Real Time Clock Minute, Second	Read/Set minutes and seconds of RTC	2 Numeric Values	0 – 59 minute, 0 – 59 second	**Timer Struct**
35	PowerCycleFlag	Read Power Cycle Flag.	Numeric Value	1 – Time Not Reset; 0 – Time Was Reset	**Flag**
36	Event Index	Event index of Logged Event	Numeric value	0 - 9	**Index**
37	Warn Seconds Time Hi	Seconds Time Hi for warning event log entries	Numeric value	0 – 65535	**Warn**
38	Seconds Time Low	Seconds Time Low for warning event log entries	Numeric value	0 – 65535	**Warn**
39	Structure time Hi	Hi byte – year, low byte – month for warning event log entries	Numeric value	0 – 65535	**Warn**
Address (hex)	Parameter	Function	Data Type	Data range	**Access**
3A	Structure time Mid	Hi byte – day, low byte – hour warning event log entries	Numeric value	0 – 65535	**Warn**
3B	Structure time Low	Hi byte – min, low byte – sec for warning event log entries	Numeric value	0 – 65535	**Warn**
3C	Reserved	Reserved	Numeric value	0	
3D	Reserved	Reserved	Numeric value	0	
3E	Warn Event Count	Warning Event Count	Numeric value	0 – 65535	**Warn**

Address (hex)	Parameter	Function	Data Type	Data range	Access
3F	Alarm Seconds Time Hi	Seconds Time Hi for alarm event log entries	Numeric value	0 – 65535	**Alarm**
40	Seconds Time Low	Seconds Time Low for alarm event log entries	Numeric value	0 – 65535	**Alarm**
41	Structure time Hi	Hi byte – year, low byte – month for alarm event log entries	Numeric value	0 – 65535	**Alarm**
42	Structure time Mid	Hi byte – day, low byte – hour alarm event log entries	Numeric value	0 – 65535	**Alarm**
43	Structure time Low	Hi byte – min, low byte – sec for alarm event log entries	Numeric value	0 – 65535	**Alarm**
44	Reserved	Reserved	Numeric value	0	
45	Reserved	Reserved	Numeric value	0	
46	Alarm Event Count	Alarm Event Count	Numeric value	0 – 65535	**Alarm**
47	Fault Seconds time Hi	Seconds Time Hi for fault event log entries	Numeric value	0 – 65535	**Fault**
48	Seconds time Low	Seconds Time Low for fault event log entries	Numeric value	0 – 65535	**Fault**
49	Structure time Hi	Hi byte – year, low byte – month for fault event log entries	Numeric value	0 – 65535	**Fault**
Address (hex)	Parameter	Function	Data Type	Data range	**Access**
4A	Structure time Mid	Hi byte – day, low byte – hour alarm event log entries	Numeric value	0 – 65535	**Fault**
4B	Structure time Low	Hi byte – min, low byte – sec for fault event log entries	Numeric value	0 – 65535	**Fault**
4C	Fault code	Fault code. Same code as register 2	Numeric value	0 – 65535	**Fault**
4D	Reserved	Reserved	Numeric value	0	
4E	Fault Event Count	Fault Event Count	Numeric value	0 – 65535	**Fault**

Address (hex)	Parameter	Function	Data Type	Data range	Access
4F	Maintenance Seconds time Hi	Seconds Time Hi for event log entries	Numeric value	0 – 65535	**Maintenance**
50	Seconds time Low	Seconds Time Low for event log entries	Numeric value	0 – 65535	**Maintenance**
51	Structure time Hi	Hi byte – year, low byte – month for event log entries	Numeric value	0 – 65535	**Maintenance**
52	Structure time Mid	Hi byte – day, low byte – hour event log entries	Numeric value	0 – 65535	**Maintenance**
53	Structure time Low	Hi byte – min, low byte – sec for event log entries	Numeric value	0 – 65535	**Maintenance**
54	Maintenance code	Cal check	Numeric value	0	**Maintenance**
55	Reserved	Reserved	Numeric value	0	
56	Maintenance Count	Maintenance Count	Numeric value	0 – 65535	**Maintenance**
57	Calibrate Seconds Time Hi	Seconds Time Hi for event log entries	Numeric value	0 – 65535	**Calibrate**
58	Seconds Time Low	Seconds Time Low for event log entries	Numeric value	0 – 65535	**Calibrate**
59	Structure time Hi	Hi byte – year, low byte – month for event log entries	Numeric value	0 – 65535	**Calibrate**
5A	Structure time Mid	Hi byte – day, low byte – hour event log entries	Numeric value	0 – 65535	**Calibrate**
Address (hex)	Parameter	Function	Data Type	Data range	**Access**
5B	Structure time Low	Hi byte – min, low byte – sec for event log entries	Numeric value	0 – 65535	**Calibrate**
5C	Calibrate code	Cal	Numeric value	0	**Calibrate**
5D	Reserved	Reserved	Numeric value	0	
5E	Calibrate Count	Calibrate Count	Numeric value	0 – 65535	**Calibrate**

Address (hex)	Parameter	Function	Data Type	Data range	Access
5F	Reset Event Counters	Reset Event Counters	Numeric value	1	**Reset**

Table 28: Event Logging Registry Table

7.7.48 USER DATA (60H – 6F)

There is a section in memory that allows the user to store information. This is useful if the physical location or other user identification is required. The only restriction on the information is it must be Modbus compatible. Only one word can be written per command. There are a total of 16 words for the user.

7.7.49 COMM 2 BUS ACTIVITY RATE % (71H)

A read indicates the Comm 2 Bus Activity Rate in percent of this slave's addressed node versus other addressed nodes. Range of this value is in hex (0-64), which translates to decimal (0-100%).

7.7.50 COMM 2 FUNCTION CODE ERRORS (72H)

A read indicates the number of Comm 2 Function Code Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.51 COMM 2 STARTING ADDRESS ERRORS (73H)

A read indicates the number of Comm 2 Starting Address Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.52 COMM 2 TOTAL RECEIVE ERRORS (74H)

A read indicates the total Modbus Comm 2 Only Receive Errors that occurred in the slave device. These are address, function, etc. type of errors. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.53 RXD CRC ERRORS HI (75H)

A read indicates the number of RXD CRC Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.54 RXD CRC ERRORS LO (SAME AS HI) (76EH)

NOTE: Hi and Lo CRC errors are reported in the same word. A read from either Hi or Lo will return the same count.

7.7.55 COMM 2 PARITY ERRORS (77H)

A read indicates the number of Comm 2 Parity Flag Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.56 COMM 2 OVERRUN ERRORS (78H)

A read indicates the number of Comm 2 Only Overrun Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

NOTE: An overrun error occurs when the next received byte of data tries to overwrite an existing received data byte, which has not been processed. Therefore, the next received byte of data is lost. This can be controlled by implementing the proper DCS or PLC Error Handling Timing Setting (ex. Reply Timeout Setting, Delay Time, and Number of Retries) and proper Baud Rate Setting.

7.7.57 COMM 2 FRAMING ERRORS (79H)

A read indicates the number of Comm 2 Framing Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.58 COMM 2 TOTAL RECEIVE ERRORS (7AH)

A read indicates the total Modbus Comm 2 Only Receive Errors that occurred in the slave device. The maximum count is 65535 and then the counter rolls over to zero and begins counting again.

7.7.59 MODBUS CAL ERROR (7BH)

Calibrate error register is read only. A “1” shows there was a calibration error.

7.7.60 CLEAR COMM 2 UART ERRORS (7CH)

Writing a 0 to the bit activates the Clear Comm 2 UART Errors function, which resets all of the Modbus UART Error counters to zero. The function is active momentarily and will reset automatically after being used.

7.7.61 CLEAR COMM 2 MODBUS ERRORS (7DH)

Writing a 0 to the bit activates the Clear Comm 2 Modbus Errors function, which resets all of the Modbus Error counters to zero. The function is active momentarily and will reset automatically after being used.

7.7.62 INPUT VOLTAGE (8DH)

The Input voltage register is read only. A read returns the input voltage. This allows the user to remotely read the actual input voltage via Modbus.

8.0 CUSTOMER SUPPORT

8.1 GENERAL MONITORS' OFFICES

Customer Support Area	Phone/Fax/Email
UNITED STATES Corporate Office: 26776 Simpatica Circle Lake Forest, CA 92630	Toll Free: +1-800-446-4872 Phone: +1-949-581-4464 Fax: +1-949-581-1151 Email: info@generalmonitors.com
9776 Whithorn Drive Houston, TX 77095	Phone: +1-281-855-6000 Fax: +1-281-855-3290 Email: gmhou@generalmonitors.com
DENMARK Gassonic Energivej 42 A DK-2750 Ballerup Denmark	Phone: +45-44-700-910 Fax: +45-44-700-911 Email: mail@gassonic.com
UNITED KINGDOM Heather Close Lyme Green Business Park Macclesfield, Cheshire, United Kingdom, SK11 0LR	Phone: +44-1625-619-583 Fax: +44-1625-619-098 Email: info@generalmonitors.co.uk
IRELAND* Ballybrit Business Park Galway Republic of Ireland	Phone: +353-91-751175 Fax: +353-91-751317 Email: info@gmil.ie
SINGAPORE No. 2 Kallang Pudding Rd. #09-16 Mactech Building Singapore 349307	Phone: +65-6-748-3488 Fax: +65-6-748-1911 Email: genmon@gmpacifica.com.sg
MIDDLE EAST LOB12, #G20 P.O. Box 61209 Jebel Ali, Dubai United Arab Emirates	Phone: +971-4-8815751 Fax: +971-4-8817927 Email: gmme@emirates.net.ae

****The Observer-H is manufactured at this location***

Table 29: General Monitors and Gassonic Offices

9.0 APPENDIX

9.1 WARRANTY

General Monitors warrants the Observer-H to be free from defects in workmanship or material under normal use and service within two years from the date of shipment.

General Monitors will repair or replace without charge any such equipment found to be defective during the warranty period. Full determination of the nature of, and responsibility for, defective or damaged equipment will be made by General Monitors' personnel.

Defective or damaged equipment must be shipped to the General Monitors' plant or representative from which the original shipment was made. In all cases this warranty is limited to the cost of the equipment supplied by General Monitors. The customer will assume all liability for the misuse of this equipment by its employees or other personnel.

All warranties are contingent upon proper use in the application for which the product was intended and does not cover products which have been modified or repaired without General Monitors' approval, or which have been subjected to neglect, accident, improper installation or application, or on which the original identification marks have been removed or altered.

Except for the express warranty stated above, General Monitors disclaims all warranties with regard to the products sold, including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of General Monitors for damages including, but not limited to, consequential damages arising out of, or in connection with, the performance of the product.

9.2 SPECIFICATIONS

9.2.1 ELECTRICAL SPECIFICATIONS

Cable Requirements: 3-wire shielded cable. Maximum distance between Observer-H and power source @ 24 VDC nominal with alarm relay energized and 20 mA source.

Voltage	Normal mA	Peak Alarm mA
15	198	300
20	146	217
24	125	103
25	120	184
30	100	161
35	87	148

Table 30: Current vs. Input Voltage

AWG	mm^2	Ohms per Km	Ohms k feet
10	**5.27**	**3.28**	**1.00**
12	**3.31**	**5.21**	**1.59**
14	**2.08**	**8.29**	**2.53**
16	**1.31**	**13.2**	**4.01**
18	**0.823**	**20.95**	**6.39**
20	**0.519**	**33.31**	**10.15**

Table 31: Resistance of Copper Wire

Based on a 24 volt supply and 15 volts at the Observer-H the recommended wire sizes are shown below.

AWG	mm^2	FEET	METERS
10	5.27	15000	4573
12	3.31	9434	2880
14	2.08	5928	1809
16	1.31	2347	1136
18	0.823	2347	715
20	0.519	1478	450

Table 32: 24 VDC Cable Lengths

Use the following formula to calculate the wire size:

Cable drop per wire equals (Ein – voltage at instrument)/2 = (24 -15)/2 **= 4.5 volts per wire**

Resistance maximum equals cable drop divided by Current required by unit at voltage at unit

R = 4.5/0.300 = **15 ohms per cable**

Ohms per cable divided by cable ohms per meter = 15/3.28 = **4573 meters for 10 AWG**

European Union (EU) Approved Applications: PSU noise and ripple voltage 1.0 Vpp max. The customer supplied PSU must comply with IEC 61010-1, limiting current to 8 A under fault conditions in order to comply with the CE Marking requirements.

9.2.2 APPROVALS

CSA/FM: Class I, Div. 1,2 Groups B, C, and D
Class II/III, Div. 1,2 Groups E, F, G
(Tamb=-40°C to +60°C) Type 4X

ATEX/IECEx: Ex d ia IIB+H_2 T6 Gb
Ex tb IIIC T85°C Db
(Tamb=-40°C to +60°C) IP66

Functional Safety: SIL 3 suitable per IEC 61508

HART Registered:

- Approved by the HART Communication Foundation.
- Compatible with Emerson 375 Field Communicator.
- Listed in Emerson Process Management's Aware device list

EMI/EMC: EN 61000-6-2, EN 61000-6-4

9.3 SPARE PARTS AND ACCESSORIES

To order spare parts and/or accessories, please contact the nearest General Monitors Representative or, General Monitors directly, and give the following information:

Part Number of Spare Part or Accessory

Description of Spare Part or Accessory

Quantity of Spare Part or Accessory

9.3.1 INSTALLATION DRAWINGS

805560 Wiring Drawing

9.3.2 CALIBRATION EQUIPMENT

80510-1: 1701 Portable Calibrator

9.3.3 SPARE PARTS

Description	Part Number
Allen Screw M6x20	928-381
Lock Washer	928-651
O-ring	925-5108
Microphone	80332-1
Sound Source Assembly	805554-1
Magnet-stick	80499-1

Description	Part Number
Mounting Bracket and Hardware	80601-1
Windscreen Microphone	80333-1
Relay Board Push	805541-1
Relay Board Screw	805541-2
10mm Relay Board Spacer	928-459
Screw M4 x 16mm Relay Board Mounting	928-393

Table 33: Replacement Parts

9.3.4 MICROPHONE REPLACEMENT:

To replace the microphone remove the windscreen. Loosen the microphone (80332-1) and carefully replace with a new microphone. When removing the microphone be careful not to move or damage the pre-amplifier contact spring, as this can affect the performance of the unit. Also be careful not to cross threads, when replacing the microphone. The microphone should screw in smoothly. Replace the Windscreen and perform a calibration per the calibration procedure.

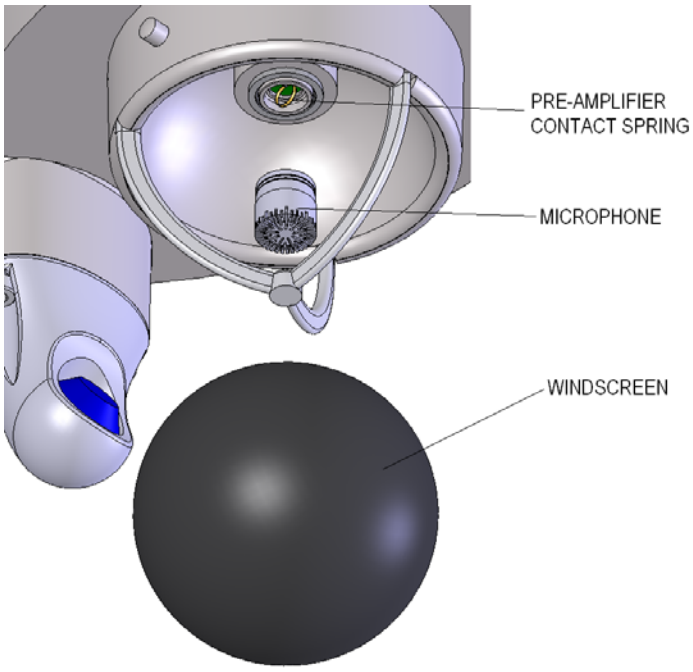


Figure 10: Microphone Replacement

9.3.5 SOUND SOURCE ASSEMBLY REPLACEMENT

To replace the sound source assembly (805554-1), loosen the 2 M4 screws. Remove the old sound source assembly and discard the o-ring. Replace the new o-ring and plug the two pins connector to the sound source assembly. Tighten the two M4 screws. Perform a Piezo Calibration (seven up: tap the magnet 7 times on the UP arrow) and a Forced Acoustic Test, Section 5.6.1

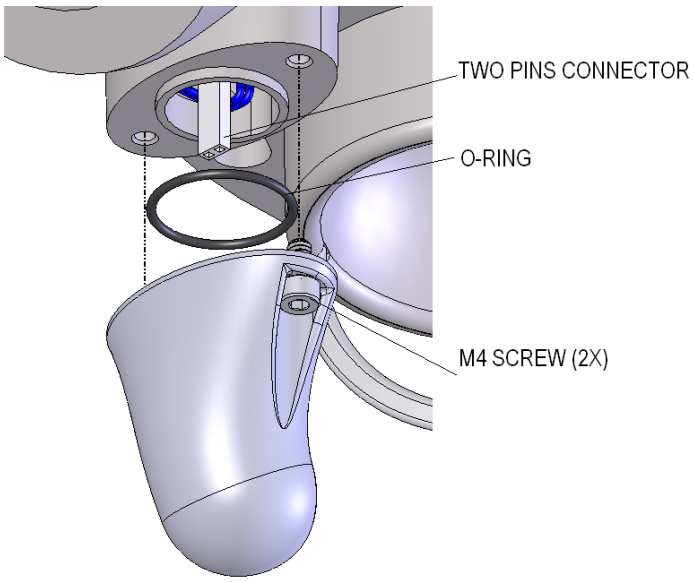


Figure 11: Sound Source Assembly Replacement