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Practice Section 10807800 Rev A

HYDROGEN / PROPANE GAS DETECTOR

MODEL 10807800



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1. GENERAL

1.01 This practice provides application, specification, circuit and mechanical description, maintenance, installation, and warranty information relating to Accurate Electronics' Hydrogen / Propane Gas Detector, Model 10807800.

1.02 The Model 10807800 Gas Detector (figure 1) and associated sensors, provides for the detection of hydrogen and propane gas. The gas detector supplies alarm and control functions for two hydrogen sensors and two propane sensors.

1.03 Alarms are transmitted to a monitoring site using separate relay outputs for each gas and an additional relay output to indicate a failed sensor. An optically isolated input allows for remote reset of the detector.

1.04 Three relay contacts are provided to activate local fans and alarm lights. Each gas has a relay output for separate fans. An additional set of relay contacts is available to operate a local warning light. This relay opens and closes at one second intervals upon detection of either gas. All three relay outputs are rated for 10 amps at 240VAC.

1.05 The front panel includes LEDs to indicate the status of the alarms and sensors, an audible alarm and alarm mute switch, a local reset switch and access to the sensor calibration potentiometers.

1.06 An RS232 interface (DCE) reports the status of each sensor and may also be used to reset the detector remotely. The interface connector is a RJ45 modular jack located on the front panel.

1.07 The Gas Detector is enclosed in a 19 inch rack mount chassis 1 ¾ inch high (1U).

1.08 The Gas Detector operates from a -48VDC power source but is available in other voltages as an option (120VDC and 24VDC).

1.09 All wiring connections are made at the rear panel using de-pluggable screw down terminal blocks.

2. APPLICATION

2.01 The Model 10807800 Gas Detector is designed for use with Figaro Engineering Inc. TGS813 gas sensors. This sensor consist of a semiconductor material formed on an alumina ceramic tube with a heater coil located inside the tube. Heater voltage (V_H) is applied to the coil and circuit voltage (V_C) is applied to the sensor element. Once the sensor is stabilized a detected gas is indicated by a drop in sensor element resistance which will result in an increase in sensor output voltage (V_{RL}).

2.02 The gas detector may be used to detect hydrogen and/or propane gas. An internal jumper is used to select detection of propane gas only, hydrogen gas only or both. After installation and power-up, the detector begins normal operation, monitoring each installed sensor for detection of a gas.

2.03 Each sensor detects gas individually with a dedicated LED for each sensor to indicate its status. The sensor LED indicates three states by the following colors:

Green: Sensor present and functioning with no gas detected.

Red: Gas detected at or above the 50% lower explosive limit (LEL).

Amber: Sensor failure or sensor removed.

All of the sensors LEDs will initially be illuminated amber, but will change to green as the corresponding sensors heat up.

2.04 An alarm is triggered when either gas is detected or when a sensor fails. There are two sensors used for each gas type being detected. Both sensors operate individually but either will trigger the same alarm output.

2.05 The detector has three alarm outputs. These are normally open relay contacts which close in the alarm condition. One for propane gas, one for hydrogen gas and one for a failed sensor. Associated with each alarm relay is a front panel LED (red) which is illuminated when the corresponding alarm is activated.



2.06 The detector has three power relays to activate building fans and an external alarm lamp. Each gas type has an associated set of fan relay contacts. Either gas alarm will activate the lamp alarm relay. The wiring connections to these relays are located at the rear panel inside a removable cover. The cover is equipped with “knock-outs” to accept electrical conduit.

2.07 The gas detector may be reset and cleared of all alarms using a remote reset input or the front panel local reset push button.

2.08 If a sensor failure is detected the detector will take the following actions:

1. Immediately turn the specific sensor LED to amber.
2. Continue to poll all sensors for a change in status for the next five minutes.
 - If the sensor changes from failed to normal within the five minute validation period operation returns to normal.
3. If the sensor has failed for a time period longer than five minutes, the sensor failed relay output is closed and the front panel sensor failed alarm LED is illuminated.
 - The sensor fail relay output and the local sensor fail alarm LED will remain activated until the detector is reset.

2.09 Once an alarm condition has been detected for either hydrogen or propane gas the detector takes the following actions independently for each gas:

1. Immediately turn specific sensor LED to red.
 - Continue to poll all sensors for a change in status for the next five minutes.
 - If gas is no longer detected within the five minute validation period, operation returns to normal.
2. If gas is detected for a time period longer than five minutes, the following actions are taken:
 - The corresponding gas relay fan contact closes and remains closed until the detector is reset.
 - The station audible alarm is activated and remains activated until the detector is reset or the front panel audible alarm push button is pressed.
 - When activated the audible alarm is on for one second and off for four seconds.
 - The audible alarm button will mute the audible alarm for fifteen minutes after which time the alarm will sound again if no action has been taken.
 - The external light alarm is activated and remains activated until the detector is reset.
 - When activated the external light alarm relay contact is closed for one second and open for one second.
 - The corresponding gas alarm output contact is closed and the associated front panel LED is illuminated.
 - The gas alarm output and front panel LED cycles through an alarm condition of ten minutes on and one minute off. This cycle will continue until gas is no longer detected or the detector is reset.

2.10 An RS232 port is available at the front panel. This is an RJ45 style modular jack. The interface runs at 9600 baud and reports the status of each sensor as well as its corresponding voltage. The detector may be reset by sending the “%” character and then sending a “y” in response to the query “Are you sure you want to reset?”

Settings for the port are:

Baud Rate:	9600
Stop Bits:	1
Data Bits:	8
Parity:	None
Flow Control:	None

The port configuration is DCE with pin-out as follows:

Pin	Signal	Signal Direction	
		DTE	DCE
4	GND		
5	RXD	INPUT	OUTPUT
6	TXD	OUTPUT	INPUT

Remaining pins are not connected.

3. SPECIFICATIONS

3.01 Electrical

Physical Number of Positions: two (2)
 Edge Connector: bifurcated gold-plated contact
 Input / Output Wire-wrap terminals:
 56 pins at the rear of the edge connector
 protected by a removable, clear plastic barrier

3.02 Environmental

Operating Temperature: 0 - 55° C
 Humidity: up to 95% R.H. / no condensation

3.03 Physical

Panel Dimensions: 17.300”W x 1.750”H x 7.200”D
 43.942 cmW x 4.445 cmH x 18.288 cmD
 Mounting Depths: flush, 1.75”, 3.50” (flush, 4.445 cm, 8.890 cm)
 Mounting Width:
 19” racks: 18.31”W x 1.25”H (46.507 cmW x 3.175 cmH)
 (1.25” EIA spacing)
 23” racks: 22.34”W x 1.25”H (56.744 cmW c 3.175 cmH)
 (1.25” EIA spacing)
 Mounting Hardware: (4) 12/24 x 3/4 phillips,
 (4) #12 hex nuts, (4) #12 flat washers
 Weight: 1.0 lbs. / 0.45 kg.
 Finish: black anodized / white lettering

4. CIRCUIT DESCRIPTION

4.01 See FIGURE 1.

4.02 This circuit description is intended to familiarize you with the 10807800 Gas Detector for engineering and application purposes only. Attempts to troubleshoot the unit internally are not recommended and may void your warranty. Refer to Figure 1 as an aid in following this circuit description.

4.03 The gas detector is designed to use sensors provided by Figaro Engineering Inc. The sensors consists of a metal oxide semiconductor and an electrical heating coil enclosed within a base and cover arranged to fit a 7-pin miniature tube socket. The case has openings covered with a steel mesh which exposes the sensor element to the ambient air. In operation, the sensor is located in the area to be monitored and a voltage is applied to the heating coil (VH) and the semiconductor sensor element (VC). The sensor element is the series component of a voltage divider with the shunt component, consisting of a fixed and a variable resistance, located in the 10807800 Gas Detector. The voltage (VRL) across the shunt component is used by the 10807800 Gas Detector as an indication of gas concentration levels. As gas concentrations increase in the monitored area, the resistance of the sensor semiconductor element decreases and the sensor output voltage (VRL) increases.



4.04 The gas detector incorporates a single chip microcontroller (U3). The controller includes an analog front end and analog to digital converter. The output from the sensor (VRL) is applied to the analog input ports of the microcontroller. Controller firmware directs all responses to these inputs and controls all outputs and indications from the 10807800 Gas Detector. A microprocessor supervisory chip (U1) provides a watchdog timer, power-on-reset and power supply monitoring. Level conversion and ESD protection for the serial port is supplied by an RS232 transceiver (U2).

4.05 Operating voltages are derived from the applied DC power input at the rear panel terminal block TB7. Following an input fuse (F1) and polarity protective diode (D6), the input voltage is applied to a DC/DC converter with a 5 volt output. This 5 volt bus powers the external gas sensors (VH and VC) and all internal circuits of the 10807800 Gas Detector with the exception of the audible alarm. The alarm uses the 12 volt output of a small (1.5W) DC/DC converter whose input is the main 5 volt bus. The external gas sensor heater and circuit voltages are connected to the 5 volt bus through PTC resistors which protect the bus from faults which may occur on the external wiring. Likewise, the wetting voltage for the remote reset input at TB6 is supplied through a 20 ohm, 2 watt resistor for fault protection of those lines.

5. MECHANICAL OUTLINE

5.01 See FIGURE 2.

6. INSTALLATION

MOUNTING

6.01 The gas detector mounts in one rack position (1U) of a 19 inch rack.

6.02 Four (4) 12/24 x 3/4 phillips screws, four (4) #12 hex nuts and four (4) #12 flat washer are furnished with each shelf to mount it firmly to the relay rack.

6.03 Reversible and adjustable mounting ears allow for the shelf to be mounted in either 19" or 23" wide relay racks. The mounting ears also allow for the unit to be mounted in the flush, or 1.75 and 3.50 forward positions. Please see FIGURE 2.

INSPECTION

6.04 The 10807800 Gas Detector should be visually inspected upon arrival to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the detector should be visually inspected again prior to installation.

JUMPER SETTINGS

6.05 Before mounting the detector in the rack the top cover should be removed and the internal configuration jumper at JP1 positioned. This jumper selects the types of gas the detector will respond to. It may also be used to select fast clock test modes. The jumper positions are outlined as follows

POSITION	LABEL	FUNCTION
1	PRO	Propane detection only Normal clock speed
2	HYD	Hydrogen detection only Normal clock speed
3	BOTH	Propane and hydrogen detection Normal clock speed
4	FAST PRO	Propane detection only Fast clock speed. (Test only)
5	FASY HYD	Hydrogen detection only Fast clock speed. (Test only)
6	FAST BOTH	Propane and hydrogen detection Fast clock speed. (Test only)

Place the jumper at the appropriate position for the installation.

6.06 JP2 and JP3 are used to program the microcontroller (U3) and will normally not be used. The jumper at **JP3** should be in the NORMAL position.

6.07 Replace the top cover.

SENSOR WIRING

6.08 All sensor are wired to the detector at rear panel de-pluggable screw down terminal blocks (five position) and follow the same pin-outs. Hydrogen sensor 1 is wired to TB1, hydrogen sensor 2 is wired to TB2, propane sensor 1 is wired to TB3 and propane sensor 2 is wired to TB4. Pin-outs are as follows:

TERMINAL	SIGNAL
1	Signal GND (Supply GND)
2	VH (+5VDC)
3	VC (+5VDC)
4	VRL (Output from sensor)
5	Earth GND (Shield GND)

6.09 To assist wiring, if the sensors are housed in the Accurate Electronics Inc. Model 10808200 Gas Sensor Enclosure the enclosure pin-outs are outlined below:

Model 10808200 Gas Sensor Enclosure Pin-outs (TB1)	
TERMINAL	SIGNAL
1	VH (+5VDC)
2	Signal GND (Supply GND)
3	VRL (Output from sensor)
4	VC (+5VDC)

ALARM CONTACT WIRING

6.10 Alarm contact outputs (Normally Open) are wired at rear panel de-pluggable screw down terminal block TB5 (six position). Pin-outs are as follows:

TERMINAL	SIGNAL
1, 2	Hydrogen Alarm Contacts
3, 4	Propane Alarm Contacts
5, 6	Sensor Fail Alarm Contacts

REMOTE RESET INPUT

6.11 The remote reset input is wired at rear panel de-pluggable screw down terminal block TB6 (two position). The simplest configuration for a reset input is a contact closure. Contact wetting is supplied at Terminal 1 (+) of TB6 which is connected to the internal +5VDC supply through a 20 Ω, 2 W resistor. Terminal 2 (-) of TB6 is the input to the opto-isolator. (See Figure 1.)



POWER INPUT

6.12 Input power for the detector is applied at rear panel terminal block TB7 (three position). Pin-outs are as follows:

TERMINAL	SIGNAL
1	GND
2	-48VDC (-36VDC to -76VDC)
3	FG (Frame GND/EGND)

FAN/ALARM LAMP RELAY WIRING

6.13 Power relay terminal blocks are located inside a removable enclosure at the rear panel. The enclosure features pre-drilled holes (fitted with hole plugs) to accept electrical conduit. Remove the hole plug at the desired location for conduit entry.

6.14 The fan and alarm lamp relay contacts are normally open contacts rated for 10 amps at 240VAC. Each set of fan contacts is associated with the corresponding gas. The alarm lamp contacts are intended to activate an external warning lamp.

TERMINAL BLOCK	FUNCTION
TB8	Hydrogen Fan Contacts
TB9	Propane Fan Contacts
TB10	Alarm Lamp Contacts

POWER FUSE

6.15 The input power fuse is located on the rear panel. Replace fuse with fast acting 5A, 250V, 5mm x 20mm type.

7. TESTING AND TROUBLESHOOTING

7.01 The shelf should be thoroughly physically inspected before mounting, however, to ensure that there are no bent or broken connector pins or other visible defects. If trouble is encountered in an operational shelf, ensure that all modules are seated properly and operating correctly and that all wiring is correct. If a shelf is suspected of being defective, a new one should be substituted and the tested conducted again. If the substitute operates correctly, the original should be considered defective and returned to Accurate Electronics for repair or replacement as directed below. We strongly recommend that no internal (component-level) testing or repairs be attempted on Accurate Electronics' equipment. Unauthorized testing or repairs may void its warranty. Note: If equipment must be marked defective or bad, we recommend that it be done on a piece of tape or on a removable stick-on label.

TECHNICAL ASSISTANCE

7.02 Contact Accurate Electronics, Inc. 503.641.0118, FAX: 503.646.3903; Mail: PO Box 1654, Beaverton OR 97075-1654.

RETURN PROCEDURE (FOR REPAIR)

7.03 To return equipment for repair, first contact Accurate Electronics, Inc. Enclose an explanation of the malfunction, your company's name and address, the name of a person to contact for further information, and the purchase order number for the transaction. Accurate Electronics will inspect, repair, and retest the equipment so that it meets its original performance specifications and then ship the equipment back to you. If the equipment is in warranty, no invoice will be issued.

8. MAINTENANCE

8.01 No preventive maintenance is required. General care is recommended.

9. WARRANTY

9.01 All Accurate Electronics Inc. products carry a full FIVE (5) YEAR warranty on materials and workmanship. See WARRANTY in front of catalog.

9.02 If a situation arises that is not covered in the checklist, contact Accurate Customer Service as follows (telephone number are given below):

Contact Accurate Electronic Customer Service

9.03 If a product is diagnosed a defective, follow the replacement procedure in paragraph 9.04 when a critical service outage exists (e.g., when a system of a critical circuit is down and no spares are available). If the situation is not critical, follow the repair and return procedure in paragraph 9.05.

Replacement

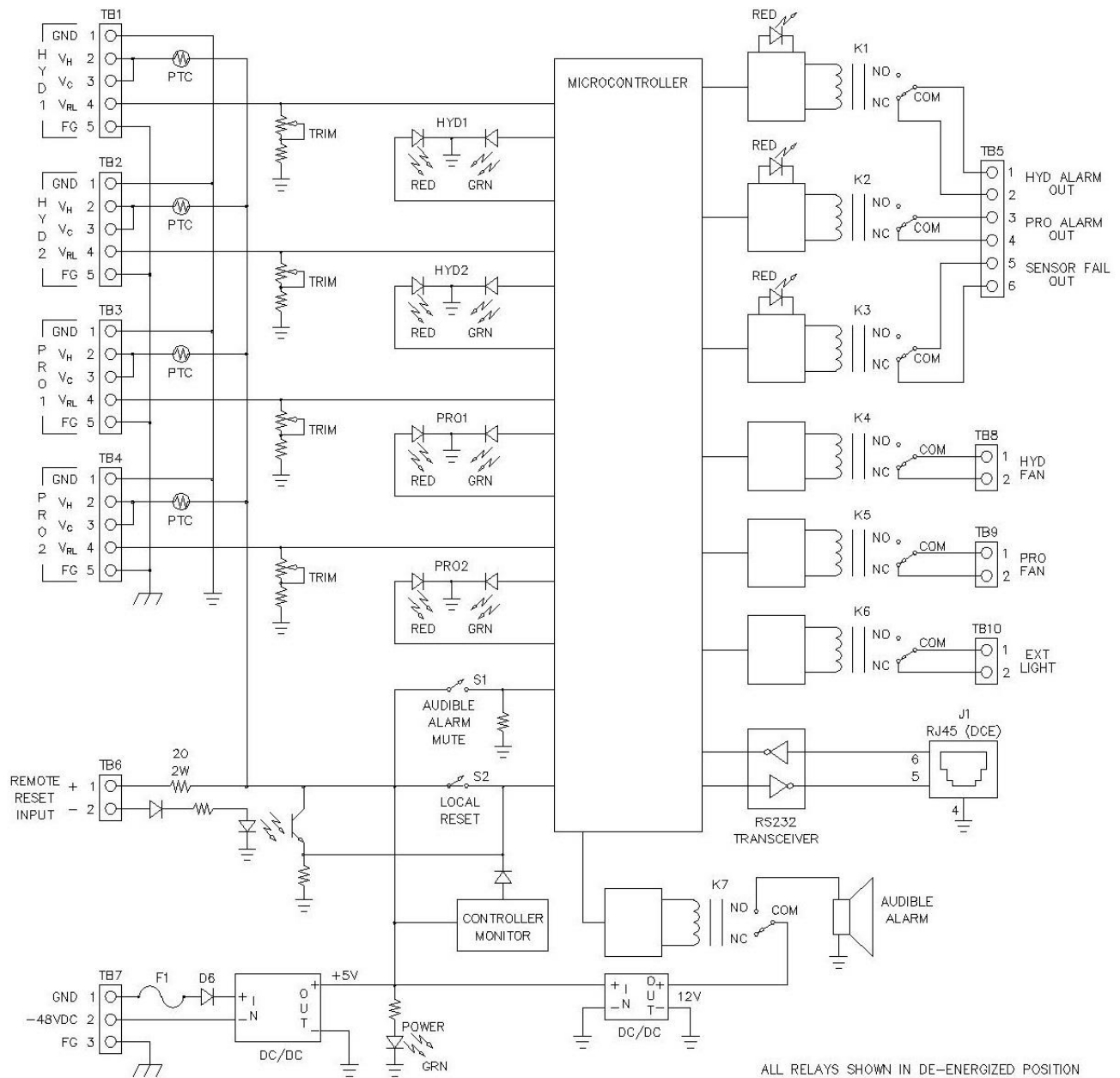
9.04 To obtain a replacement, notify Accurate Electronics. Be sure to provide all relevant information, including the part number that indicates the issue of the product in question. Upon notification, we shall ship a replacement product to you. If the product in question is in warranty, the replacement will be shipped at no charge. Pack the defective product in the replacement product's carton, sign the packing slip included with the replacement, and enclose it with the defective product (this is your return authorization). Affix the preaddressed label provided with the replacement product to the carton being returned, and ship the module prepaid to Accurate Electronics.

Repair and Return

9.05 Return the defective product, shipment prepaid, to Accurate Electronics Inc. :

ACCURATE ELECTRONICS INC.
ATTN: REPAIR AND RETURN
8687 SW HALL BLVD. #100
BEAVERTON, OREGON 97008 USA

FIGURE 1. Circuit Description.



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FIGURE 2. Mechanical Outline.

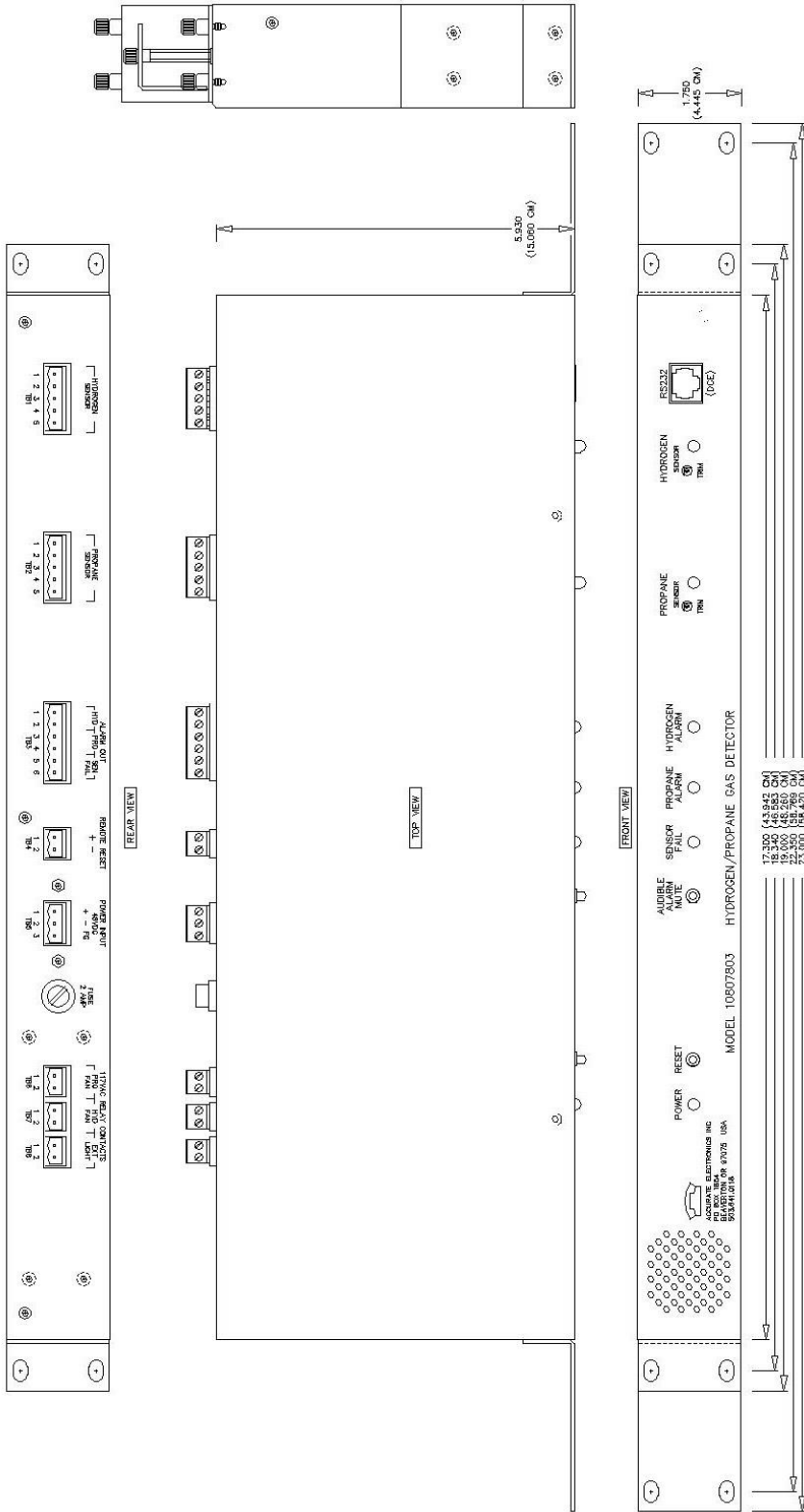




FIGURE 3. Gas Detection Flow Chart.

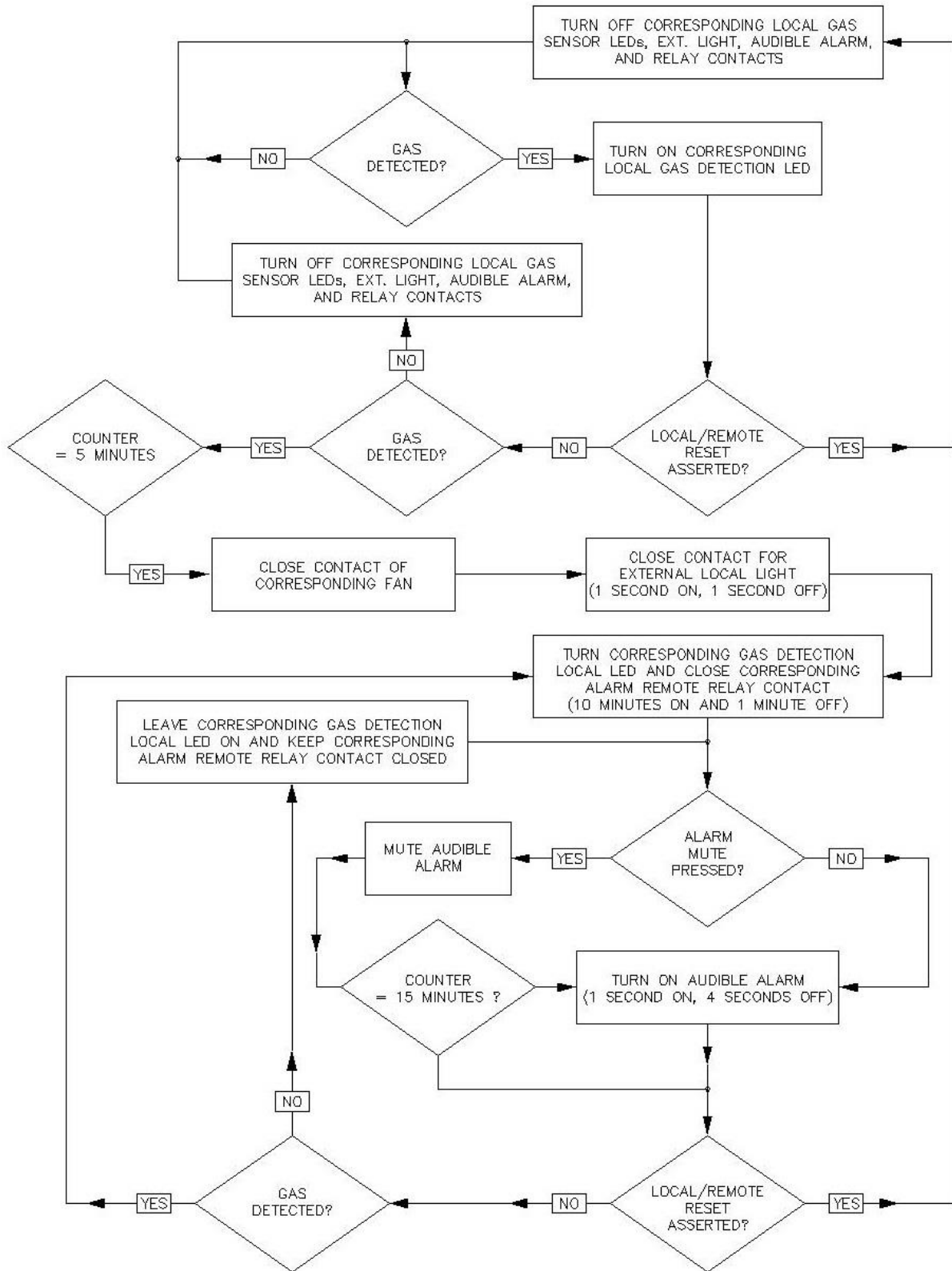




FIGURE 4. Sensor Failure Flow Chart.

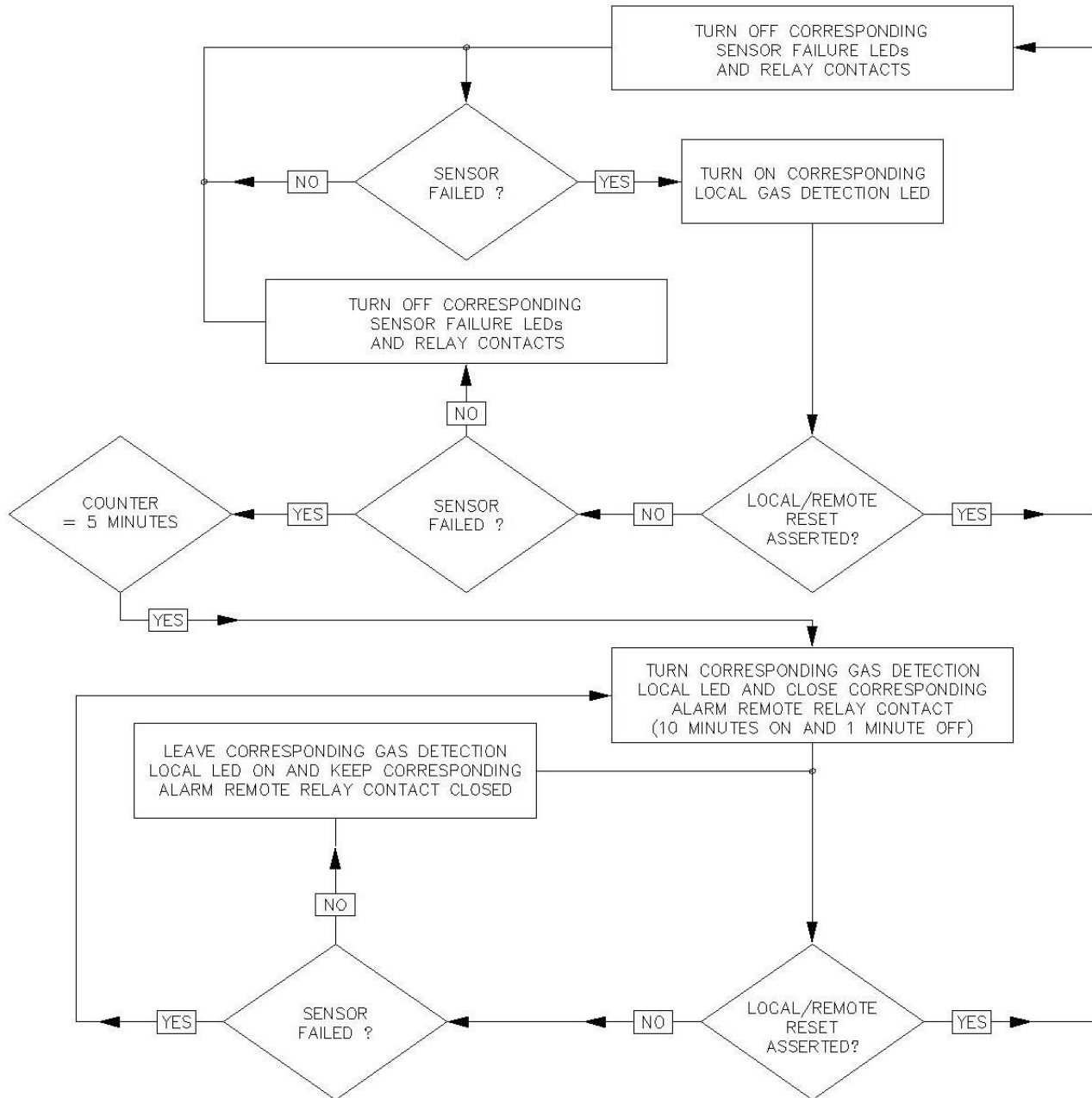
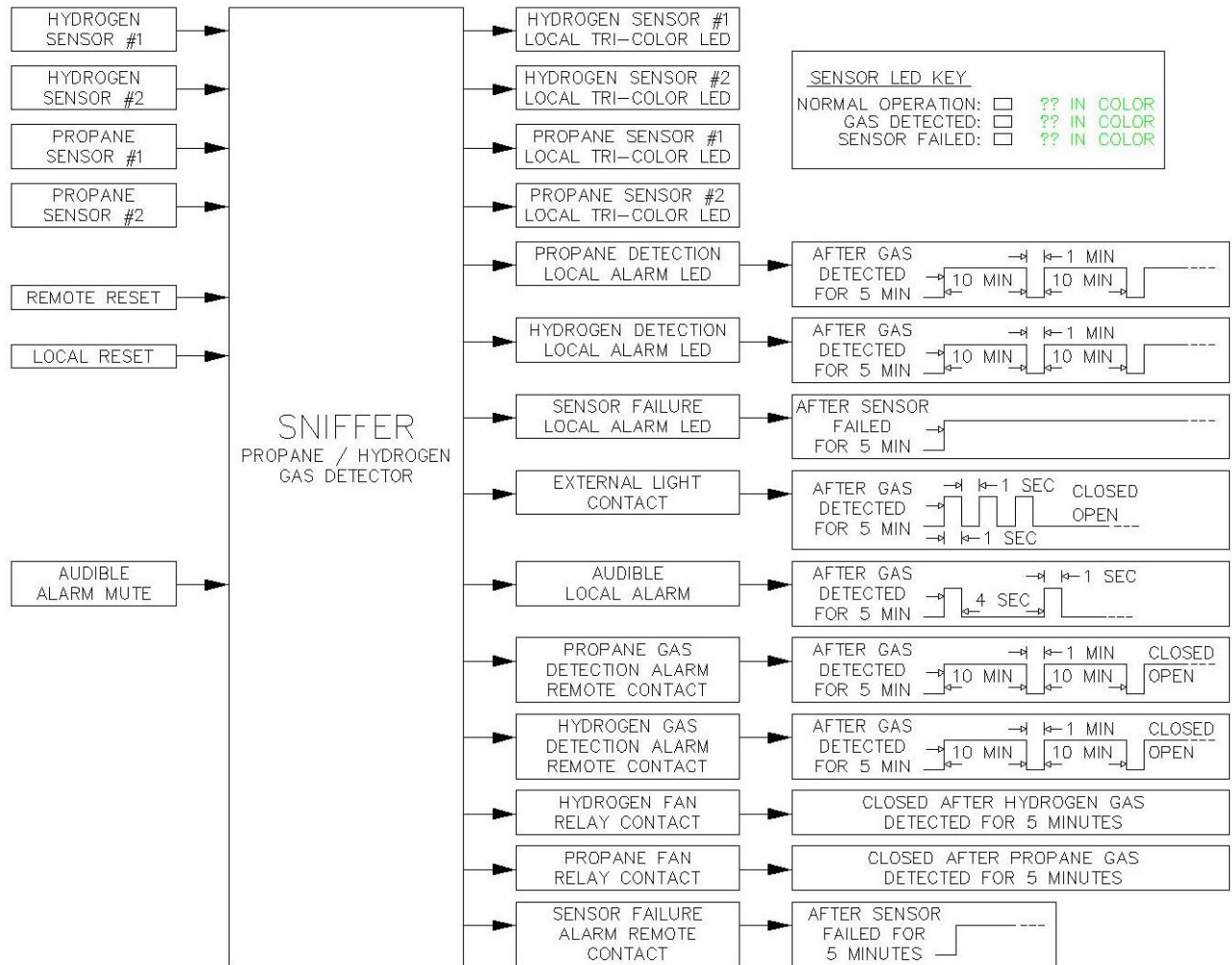




FIGURE 5. Sniffer Block Diagram.





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