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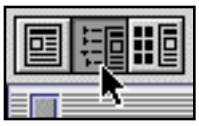

DET-TRONICS®

INSTRUCTIONS

Combustible Gas Controller

R8471H

12/98 **Form 95-8475**

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INSTRUCTIONS

Combustible Gas Controller

R8471H

IMPORTANT

Be sure to read and understand the entire instruction manual before installing, operating or servicing the gas detection equipment.

WARNING

Do not open the PointWatch junction box with power applied unless it is verified that no combustible gases or vapors are present. A portable gas detection instrument should be used to ensure that the area is clear of any combustible gases. Calibration or maintenance should not be performed if there is any indication of the presence of combustible gas at the sensor.

CAUTION

The wiring instructions in this manual will provide safe and proper functioning of the device under normal conditions. However, local variations in wiring codes and regulations exist, and total compliance with these ordinances cannot be guaranteed. Be certain that all wiring complies with the IEC/NEC as well as all local ordinances. If in doubt, consult the local authority having jurisdiction before wiring the system.

Section I
Installation and Startup

INSTALLATION

SENSOR LOCATION

Proper sensor positioning is essential to ensure maximum gas detection capability. Optimum sensor placement and density varies depending upon the conditions at the job site. The system designer and installer must examine the specific area to be protected and identify the most likely leak sources and gas accumulation areas to determine the best sensor locations.

The following factors should be considered for every installation:

1. What kind of gas is to be detected? If it is lighter than air (Acetylene, Hydrogen, Methane, etc.), place the sensor above the potential gas leak. Place it close to the floor for gases that are heavier than air (Benzene, Butane, Butylene, Propane, Hexane, Pentane, etc.) or for vapors resulting from flammable liquid spills. Careful analysis of both the vapor hazard and the application is required — first to determine the feasibility of detection and then to ensure that proper sensor locations are selected.

2. How rapidly will the gas diffuse into the air? Locate the sensor as close as practical to the anticipated source of a gas leak.

3. Ventilation characteristics of the immediate area must also be considered. Air movement can cause the gas to accumulate more heavily in one area than another. Smoke generator tests are useful in identifying typical air current patterns as well as "dead" air spots for both indoor and outdoor applications. The sensors should be placed where the most concentrated accumulation of gas is anticipated.

4. The sensor should be located in an area where it is safe from potential sources of contamination.

5. The sensor should be pointed down to prevent the buildup of contaminants on the gas inlet.

6. The sensor must be accessible for testing and calibration.

7. Exposure to excessive heat or vibration can result in pre-mature failure of electronic devices and should be avoided if possible. Shield the sensor from intense sunlight to reduce solar heating.

IMPORTANT

All diffusion-based gas sensors must contact the target gas in order to provide an accurate gas measurement. This must always be remembered when selecting locations for gas sensor installation.

For additional information on determining quantity and placement for sensors in a specific application, refer to Instrument Society of America (ISA) Transaction Volume 20, Number 2, titled "The Use of Combustible Detectors in Protecting Facilities from Flammable Hazards."

GENERAL WIRING REQUIREMENTS

Wire Size and Type

In applications where the wiring cable is installed in conduit, the conduit must not be used for wiring to other electrical equipment.

Three wire shielded cable is highly recommended for connecting the PointWatch to the controller. A foil shield is recommended.

The maximum wiring distance between the PointWatch and controller is limited by the gauge of the wire being used. **Refer to the PointWatch manual for specific information on maximum loop resistance**.

CONDUIT SEALS, DRAINS, AND BREATHERS

When installing the PointWatch in hazardous areas where explosion-proof equipment certification is required, explosion-proof conduit seals should be installed within 18 inches (46 cm) of the junction box to prevent the passage of vapors or flames through the conduit. Seals are recommended even if they are not required by local wiring codes.

Conduit systems are never completely air-tight. As a result, significant amounts of condensation can form within the conduit system. Therefore, it is important to take proper precautions during installation to ensure that accumulated moisture will not cause damage to the components of the system.

Conduit raceways should be inclined so that water will flow to low points for drainage and will not collect on conduit seals or inside enclosures. If this is not possible, install conduit drains above the seals to prevent the collection of water, or install a drain loop below the detector with a conduit drain at the lowest point of the loop.

Conduit drains should be installed at water collection points to automatically drain accumulated moisture. Conduit breathers should be installed at upper locations to provide ventilation and allow water vapor to escape. At least one breather should be used with each drain.

When using steel wire armored or mineral-insulated copper-sheathed cable, select an approved gland with a watertight compression stage and an overall gland shroud for outdoor applications. A sealing washer must be fitted between the gland and the conduit/cable entry to ensure IP66 rating.

CONTROLLER WIRING

Field Wiring Connector

The controller is furnished with a field wiring connector backplate that incorporates pressure type screw terminals for connecting the external wiring and a circuit board edge connector for attaching to the controller. The use of a mounting rack is recommended for mounting the controller. The backplate is attached to the back of the rack to allow easy removal of the controller without disturbing the wiring. See Figures 1 and 2.

The controller is designed for installation in a non-hazardous area.

Figure 3 shows the terminal configuration for the R8471H Controller.

Terminals 1 and 2 – 4 to 20 ma dc output.

Non-Isolated Current Output - If the 4 to 20 ma current loop is to be non-isolated, wire the system as shown in Figure 4. Note that terminal 2 is not used with a non-isolated current loop. Program the unit for a non-isolated current loop as described in the "Controller

CONTROLLER POSITIONS FOR		HT:	DIM. (A)		DIM. (B)		DIM. (C)		DIM. (D)		DIM. (E)		WEIGHT	
FLAME	GAS		INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	LB	KG
8	16	4U	19.00	482.6	18.30	464.8	17.36	440.9	4.00	101.6	6.97	177.1	9.3	4.2
6	12	4U	15.06	382.6	14.36	364.7	13.42	340.9					7.6	3.5
4	8	4U	11.13	282.6	10.43	264.9	9.49	241.1					5.9	2.7
3	6	4U	9.16	232.7	8.46	214.9	7.52	191.0					5.1	2.3
2	4	4U	7.19	182.7	6.49	164.9	5.55	141.0					4.2	1.9
1	2	4U	5.22	132.6	4.52	114.8	3.58	90.9					3.1	1.4
	16	3U	19.00	482.6	18.30	464.8	17.36	440.9	2.25	57.15	5.22	132.6	9.3	4.2
	12	3U	15.06	382.6	14.36	364.7	13.42	340.9					7.6	3.5
	8	3U	11.13	282.6	10.43	264.9	9.49	241.1					5.9	2.7
	6	3U	9.16	232.7	8.46	214.9	7.52	191.0					5.1	2.3
	4	3U	7.19	182.7	6.49	164.9	5.55	141.0					4.2	1.9
	2	3U	5.22	132.6	4.52	114.8	3.58	90.9					3.1	1.4

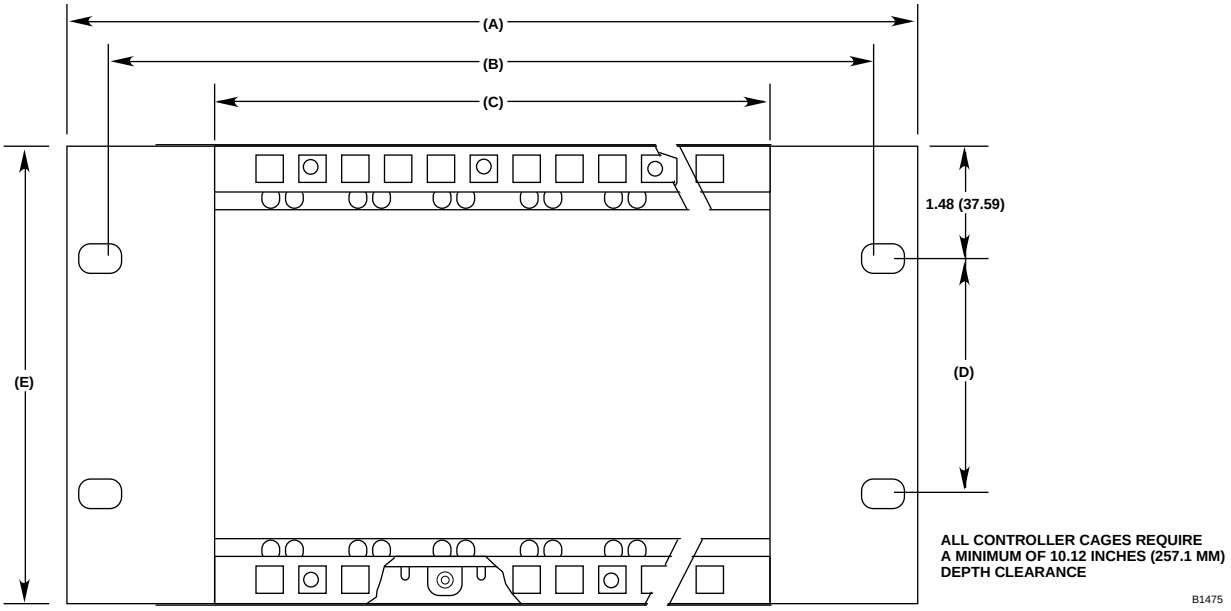
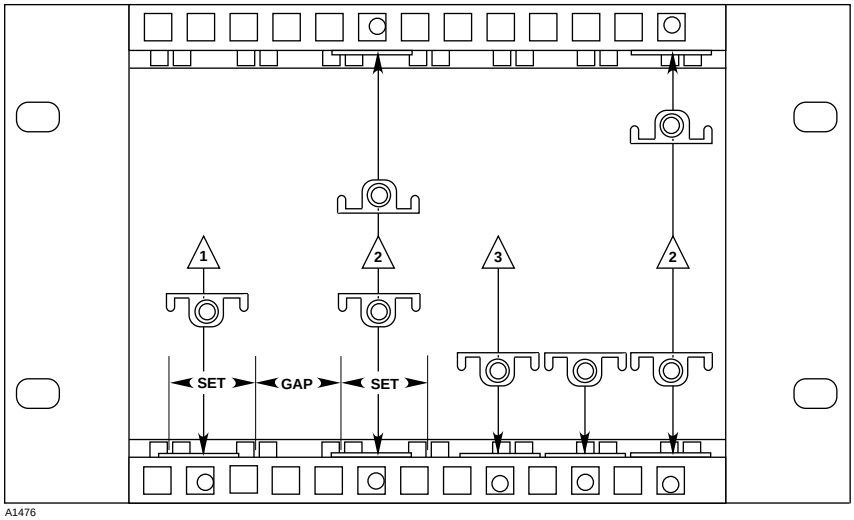


Figure 1—Dimensions of the Q4004 Mounting Rack

THE Q4004 CONTROLLER CAGE HAS BEEN MODIFIED TO ACCOMMODATE EITHER FIRE OR GAS CONTROLLERS OR ANY COMBINATION OF THE TWO. BY FOLLOWING THE INSTRUCTIONS BELOW, THE CAGE CAN BE SET UP TO ANY CONFIGURATION.



1. FIRE CONTROLLERS ARE APPROX. TWO INCHES WIDE AND REQUIRE TWO GUIDE RAILS FOR INSERTION. PLACE THE RETAINING CLIP BETWEEN RAILS TO FORM SETS, LEAVE A GAP BETWEEN SETS.
2. TO INSERT A BLANK PANEL, PLACE A CLIP IN THE TOP BRACKET IN LINE WITH THE CLIP IN THE BOTTOM BRACKET.
3. GAS CONTROLLERS ARE APPROX. ONE INCH WIDE AND REQUIRE ONE RAIL FOR INSERTION. PLACE CLIPS IN LINE WITH GUIDE RAILS, CAGES WILL ACCEPT AS MANY GAS CONTROLLERS AS RAILS PROVIDED.

Figure 2—Clip Positioning for Q4004 Mounting Racks

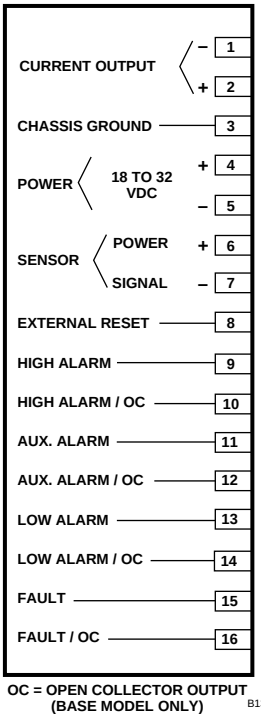


Figure 3—Terminal Configuration for R8471H Combustible Gas Controller

Programming" section of this manual.

Isolated Current Output - If an isolated current loop is desired, wire the system as shown in Figure 5 and program the unit for an isolated current loop as described in the "Controller Programming" section of this manual. Note that this wiring scheme requires an external power source for the isolated current output.

Terminal 3 – Chassis ground. Connect the cable shield to this terminal.

NOTE

If local wiring codes permit and if a ground fault monitoring system is not being used, the minus side of the dc power source can be connected to chassis (earth) ground. Alternatively, a 0.47 microfarad, 100 volt capacitor can be installed (terminal 5 to ground) for best immunity against electromagnetic interference.

Terminal 4 – Connect to the positive (+) side of the 18 to 32 vdc power source.

Terminal 5 – Connect to the negative (-) side of the dc power source.

Terminal 6 – Make no connections to this terminal.

Terminal 7 – 4 to 20 ma dc signal input from PointWatch.

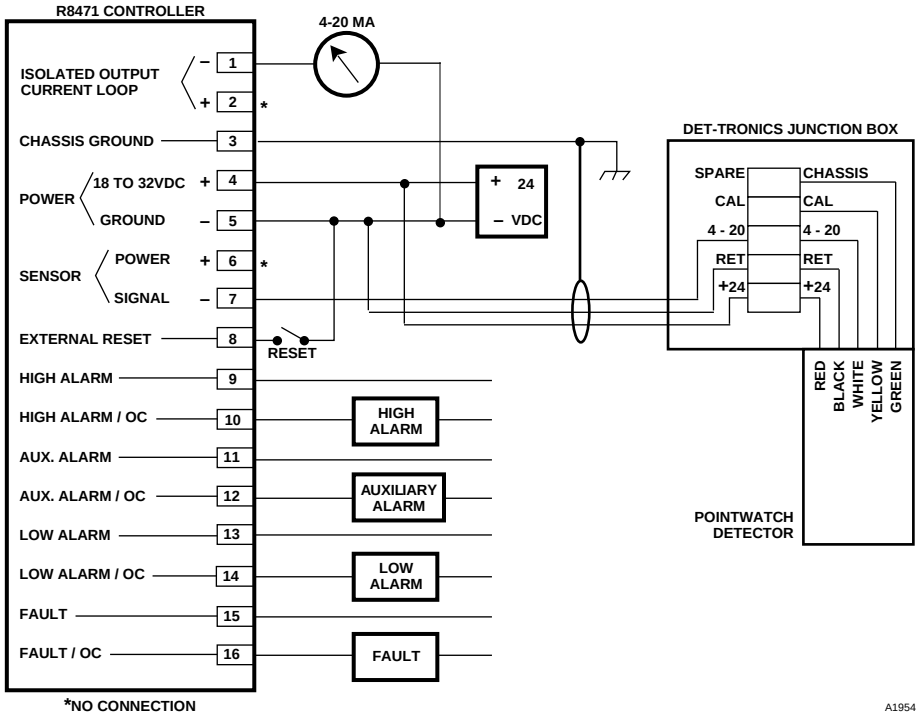


Figure 4—A Typical System with Relay Outputs and Non-Isolated Current Output

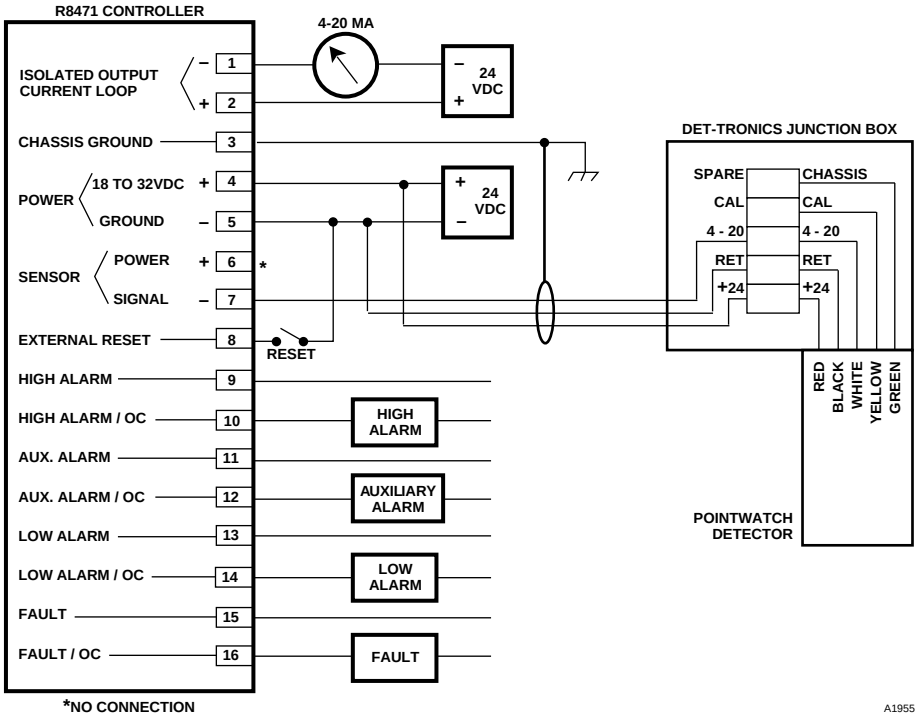


Figure 5—A Typical System with Relay Outputs and Isolated Current Output

Terminal 8 – A normally open momentary closure switch can be connected between this terminal and the negative (-) side of the power source for remote reset.

Terminals 9 and 10 – High Alarm Output.

Terminals 11 and 12 – Auxiliary Alarm Output.

Terminals 13 and 14 – Low Alarm Output.

Terminals 15 and 16 – Fault Output.

Premium Controller – The relay outputs (terminals 9 to 16) are programmed for the desired operation using the procedure described in the "Controller Programming" section of this manual.

Base Controller – Connections to open collector transistor outputs are made at terminals 10, 12, 14, and 16. Terminals 9, 11, 13, and 15 are not used. See Figure 6 for an example of a typical connection to an open collector transistor output.

NOTE

External equipment that can generate transients when switching (such as relays) ***must have a transient suppression device*** *(diode) properly connected across the coil at the time of installation. This will safeguard the output transistors of the controller against possible damage. Figure 6 illustrates an inductive load with a diode used for transient suppression.*

TYPICAL APPLICATION

Refer to Figure 7 for an illustration of an R8471H Controller wired to a PointWatch IR gas detector.

CONTROLLER PROGRAMMING

Refer to Figure 8 to determine the location of programming jumpers and switches. Table 1 shows the selectable options for each relay.

NOTE

All controller jumper plugs must be installed. The controller outputs will not function properly if a jumper plug is missing.

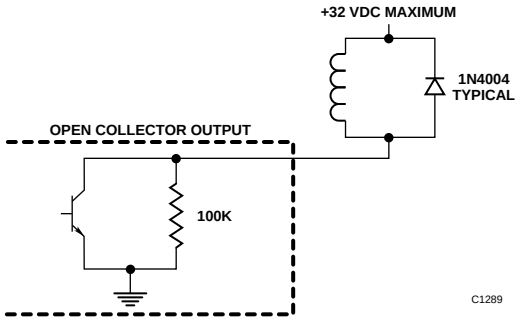


Figure 6—Open Collector Output with Inductive Load and Transient Suppression Device

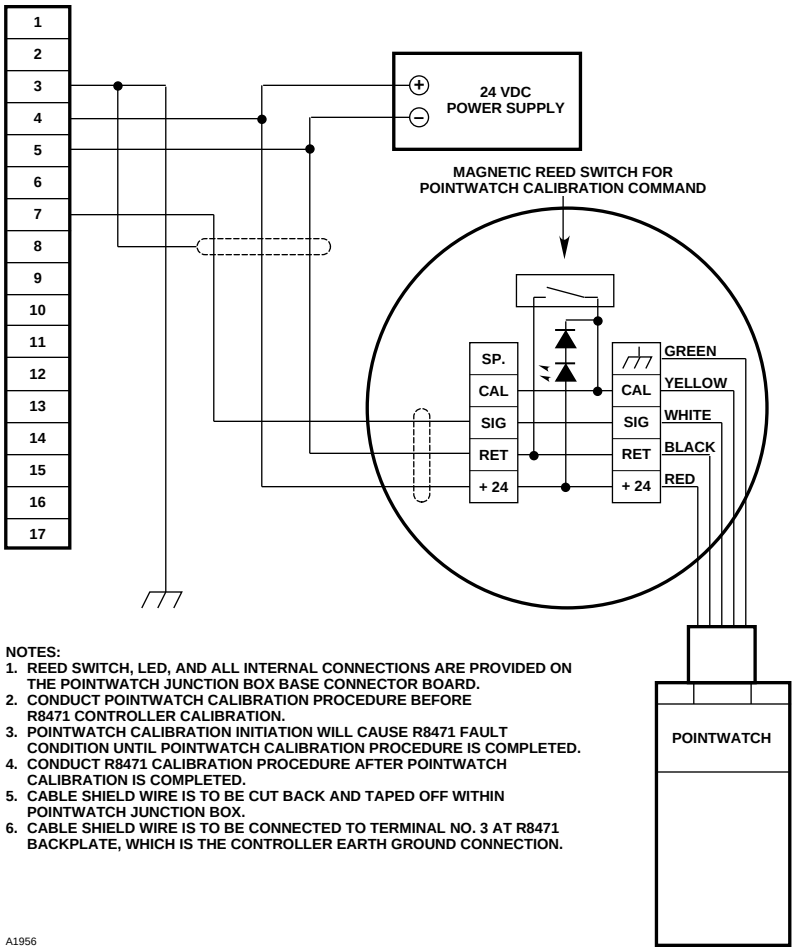


Figure 7—R8471H Controller Wired to a PointWatch Detector

Normally Open/Closed Relays

The four relays are individually programmed for either normally open or normally closed contacts. This is accomplished by placing a jumper plug on the appropriate pair of pins. Each relay has a set of three pins. For normally open operation, place the plug on the NO and center pins. For normally closed operation, place it on the NC and center pins. The pin groups are identified as follows:

J2 – High Alarm
J3 – Auxiliary Alarm
J4 – Low Alarm
J5 – Fault

The controller is programmed at the factory for normally open relay contacts.

Table 1—Selectable Relay Options

Relay	Selectable Normally Open/Closed	Selectable* Normally Energized/ De-Energized	Selectable* Latch/ Non-Latch
Low	Y	Y	Y
High	Y	Y	N[1]
Auxiliary	Y	Y	Y
Fault	Y	N[2]	N[3]

Y = Yes N = No [1]Latching only
[2]Normally Energized [3]No latching option
*Relays selectable as a group.

Latching/Non-Latching Relays

The Low and Auxiliary alarm relays are programmable as a group for latching or non-latching operation. The High alarm relay is always latching. Latching relay operation is programmed using rocker switch 1 at SW1 (SW1-1). For latching operation, place the switch in the closed position. For non-latching operation, place it in the open position. This switch is set at the factory for non-latching relay operation.

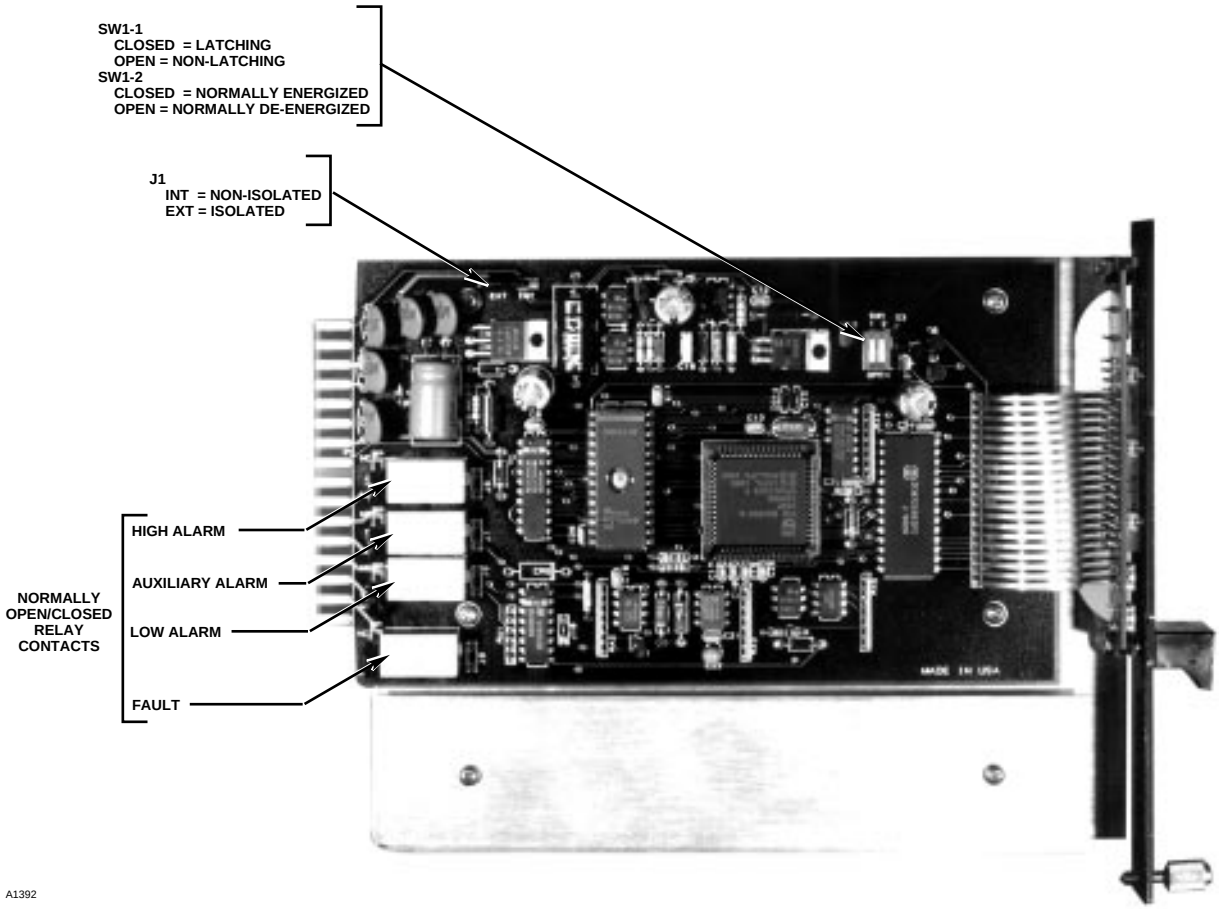


Figure 8—Programming Jumper Plugs and Switches

Normally Energized/De-Energized Relays

The three alarm relays are programmable as a group for normally energized (fail-safe) or normally de-energized operation. This is accomplished by setting rocker switch 2 at SW1 (SW1-2). For normally energized alarm relays, place the switch in the closed position. For normally de-energized operation, place it in the open position. This switch is set at the factory for normally de-energized operation.

The Fault relay is always normally energized, regardless of the setting of SW1-2.

4 to 20 ma Output

Isolated or non-isolated operation of the 4 to 20 ma output is selected using a jumper plug at J1. For non-isolated operation, as illustrated in Figure 4, place the jumper plug in the INT (**int**ernal power source) position. Place the plug in the EXT position for an isolated circuit, as illustrated in Figure 5. The jumper is set at the factory for non-isolated operation.

INSTALLATION CHECKLIST

The following checklist is provided as a means of double checking the system to be sure that all phases of system installation are complete and have been performed correctly.

1. PointWatch detectors are installed following the instructions in the PointWatch manual.
2. Junction boxes are securely mounted and covers are tightly installed.
3. All cable shields are properly grounded.
4. Conduit seals have been installed at all junction box entries (if conduit is being used).
5. PointWatch to controller wiring is correct.
6. Power wiring to the controller is installed and power source is operational.
7. External loads are properly connected to the controller.
8. Controller is programmed as desired. Record this information for future reference.
9. Controller is properly installed in the mounting enclosure.
10. Proper ventilation is provided to prevent overheating of the controller.

Proceed to System Startup, Setpoint Adjustment, and Calibration.

STARTUP PROCEDURE

1. Output loads that are normally actuated by the gas detection system should be secured (remove power from all output devices) to prevent undesired activation.

2. Check all external wiring for proper connection.

3. Before installing the controller in the mounting rack, inspect it to verify that it has not been physically damaged in shipment. Check the jumper plugs and rocker switches on the controller for proper programming, then slide the controller fully into the mounting enclosure.

4. Apply power to the system.

NOTE

The controller has a power-up delay before beginning normal operation after power is applied to the system. During this time the outputs are inhibited, the FAULT LED is illuminated, and the current output indicates a fault condition. This delay allows time for the PointWatch output to stabilize before beginning normal operation.

5. Put the controller in the Setpoint Display mode to determine the present alarm setpoints and calibration gas concentration. If changes are required, perform the Setpoint Adjustment procedure.

6. Perform the calibration procedure. This involves calibrating the PointWatch using the procedure described in the PointWatch manual, then calibrating the controller using the procedure described in the "Calibration" section of this manual.

7. Check the 4 to 20 ma current loop for proper calibration and adjust as required.

8. After calibration is completed, restore the system output loads to ready condition.

SETPOINT ADJUSTMENT

The R8471H Controller has independent Low, High, and Auxiliary alarm setpoints, with corresponding outputs.

The programmed calibration gas concentration in % LFL is also displayed and adjusted with the alarm setpoints.

The adjustment range for the alarm setpoints and calibration gas concentration is as follows:

Low alarm	5 to 50% LFL
High alarm	10 to 60% LFL
Auxiliary alarm	3 to 90% LFL
Calibration gas	30 to 90% LFL

WARNING

Calibration gas concentration must be set at 50% LFL when a PointWatch detector is used with the R8471H Controller. Other calibration gas settings may cause unreliable readings, which could result in a fire or explosion.

The factory settings are:

Low alarm:	20% LFL
High alarm:	50% LFL
Auxiliary alarm:	50% LFL
Calibration gas:	50% LFL

To **check** the present levels, use the "Setpoint Display Mode" described below. To **change** the values, use the "Setpoint Adjustment Procedure".

SETPOINT DISPLAY MODE

1. To enter the Setpoint Display mode, press and hold the Reset button until the Low LED begins to blink (approximately one second). Release the Reset button. The low alarm setpoint will be shown for two seconds on the digital display.

NOTE

The Reset button should be released as soon as the controller has entered the Setpoint Display mode (after one second). If the button is still depressed at the end of the Setpoint Display mode (9 seconds), the controller will automatically enter the Calibrate mode. If the operator is not prepared to perform a calibration, a calibration fault will occur. Recycle power to the controller to exit the calibrate mode without affecting the calibration settings.

2. At the end of the two second interval, the Low LED goes out, the High LED begins to blink, and the digital display shows the high alarm setpoint.

3. Two seconds later the High LED goes out and the Auxiliary LED blinks. The digital display now shows the programmed auxiliary alarm setpoint.

4. Two seconds later the Auxiliary LED goes out and the CAL LED blinks. The digital display now shows the calibration gas concentration. This value should always be set at 50% LFL when a PointWatch detector is used with the R8471H.

5. After displaying the calibration gas concentration for two seconds, the controller automatically leaves the Setpoint Display mode and returns to the Normal operating mode.

6. If adjustments to the setpoints are required, perform the Setpoint Adjustment procedure. When the setpoint levels are acceptable, record this information for future reference and perform the Calibration procedure.

SETPOINT ADJUSTMENT PROCEDURE

1. Determine the required alarm setpoint levels.

2. Press and hold the Set button for one second, then release. The digital display indicates the present low alarm setpoint and the Low LED blinks. Press the Reset button to increase the reading or the Set button to decrease the reading. (Pushing and holding the button will cause the reading to change rapidly.)

3. When no changes to the setpoint level have been made for 5 seconds, the Low LED goes out, the High LED blinks, and the digital display shows the high alarm setpoint. Press the appropriate button (detailed in step 2 above) to obtain the desired reading on the digital display.

4. When no changes to the setpoint level have been made for 5 seconds, the High LED goes out, the Auxiliary LED blinks, and the digital display shows the auxiliary alarm setpoint. Press the appropriate button to obtain the desired reading on the digital display.

5. When no changes have been made for 5 seconds, the Auxiliary LED goes out, the CAL LED blinks, and the digital display indicates the calibration gas concentration. This value should always be set at 50% LFL when a PointWatch detector is used with the R8471H.

6. When no changes have been made for 5 seconds, the controller automatically returns to the Normal operating mode.

7. Record the new values for future reference.

NOTE

The alarm setpoints, calibration gas concentration, and calibration data are stored in non-volatile memory and are retained in the event of a power loss. However, if power is interrupted while performing the Setpoint Adjustment or Calibration procedure, the entire procedure must be repeated when power is restored.

CALIBRATION

The PointWatch IR gas detector is calibrated at the factory for detection of methane gas. Recalibrating the device for detection of methane before placing it into operation is recommended, but not required. If the application involves detection of other gases and requires changing the PointWatch gas selection rotary switch, the PointWatch **must** be recalibrated to ensure accurate measurement.

Infrared gas detectors generally do not require the same frequency of routine calibration as catalytic sensors, however, unusual gas types and applications may require special calibration considerations. Refer to the PointWatch instruction manual for additional information.

CALIBRATION PROCEDURE

Calibration of the R8471H/PointWatch combustible gas detection system is a two step process — calibrate PointWatch, then calibrate the controller.

NOTE

*The **PointWatch** unit must always be calibrated **first**.*

PointWatch Calibration. PointWatch calibration ensures a calibrated linear 4 to 20 ma input to the controller.

PointWatch calibration is totally independent of the R8471H Controller calibration. The PointWatch calibration procedure can be performed by one person, with all adjustments made at the PointWatch.

NOTE

During the time that the PointWatch is in the calibrate mode, the R8471H indicates the status of the PointWatch calibration on its digital display (see Table 2). The controller cannot, however, put the PointWatch unit into the calibrate mode or control its calibration in any way.

Controller Calibration. This procedure calibrates the controller's displays and 4 to 20 ma output. Controller

Table 2—System Status Codes

STATUS	CONDITION
F9X	Initialization failure. (Subcodes are as follows.)
F91	EPROM sumcheck failure.
F92	Sensor failure during startup - current too high or too low.
F93	Watchdog timer failure.
F94	RAM failure.
F95	Internal 5 volt power supply failure during startup.
F96	External 24 volt power supply failure during startup.
F97	Controller type invalid. Error in data from RAM.
F98	Watch dog timer reset the controller.
F70	External reset button has been activated for 15 seconds or longer. Self clearing when button is released.
F60	External 24 vdc power input is not in the 18 to 32 vdc range.
F50	Internal 5 volt power supply is not in the 4.75 to 5.25 volt range.
F40	Sensor fault (after startup). Input is above 35 ma or below 0.5 ma.
F41	PointWatch unit has dirty optics.
F42	PointWatch calibration line fault.
F30	Negative zero drift. Sensor input is -9% full scale or lower.
F2X	Calibration error. (Subcodes are as follows.)
F20	General calibration fault, or calibration aborted due to a higher priority fault. PointWatch calibration aborted.
F21	Time ran out while waiting for calibration gas to be applied to the sensor.
F22	Sensor input is too low. The sensor cannot generate enough offset to get an accurate calibration. Replace sensor. Possible wiring fault.
F23	Sensor is too sensitive for the controller to read 100% full scale. Replace sensor. Possible wiring fault.
F24	Zero gas level too high, or sensor zero input over limit.
F10	Sensor sensitivity problem.
CAL	PointWatch in calibrate mode, doing Zero calibration.
SPn	PointWatch in calibrate mode, doing Span calibration.
CC	PointWatch in calibrate mode, successful calibration completed.

calibration typically requires two people, one at the controller and another at the PointWatch. All adjustments are made automatically by the controller.

The controller calibration procedure involves applying a zero and span gas to the PointWatch, while the controller calibrates its own display and current output to the linear 4 to 20 ma current input provided by the PointWatch. This procedure **does not** calibrate the PointWatch.

CALIBRATING POINTWATCH

To calibrate the PointWatch unit, follow the calibration procedure described in the PointWatch instruction manual.

NOTE

For best calibration results, allow the PointWatch detector to operate for at least an hour to ensure a stable output before performing calibration.

CALIBRATING THE CONTROLLER

The R8471H Controller can be calibrated using either of two methods:

Factory Default Calibration

After the PointWatch has been calibrated, the operator can set the controller for factory programmed calibration default values. The procedure is performed after the initial PointWatch calibration and does not need to be repeated with each subsequent PointWatch recalibration.

The controller is set for the factory default calibration values as follows:

1. Press and hold the Reset button for approximately 9 seconds until the digital display begins flashing **and** the CAL LED is illuminated. Release the Reset button.

2. Press the Set button. The FAULT LED comes on.

3. Press the Reset button. The controller returns to the normal operating mode (after a short time delay).

4. The controller is now set for the factory default values.

Field Calibration Procedure

1. Be certain that the controller is programmed for a 50% LFL calibration gas mixture. (See “Setpoint Adjustment” section.)

2. Be sure that only clean air (0% LFL) is present at the PointWatch. (The microprocessor begins taking Zero readings immediately upon entering the Calibrate mode.) If the possibility of background gases exists, the PointWatch can be purged with clean air to ensure accurate calibration.

3. Place the controller in the calibrate mode by depressing and holding the Reset button until the CAL LED is illuminated **and** the digital display starts to flash (approximately 9 seconds).

4. When the Zero calculations are complete (30 seconds minimum), the digital display stops flashing.

5. Apply 50% LFL calibration gas to the PointWatch. The digital display starts to flash.

6. When the microprocessor has completed the Span adjustments (30 seconds minimum), the digital display stops flashing.

7. Remove the calibration gas. When the gas level falls below the lowest alarm setpoint, the controller automatically exits the Calibrate mode.

If the operator fails to complete the calibration procedure or if a successful calibration cannot be completed, a calibration fault (“F2X” status) will be generated and the controller will automatically revert back to the former calibration settings (after 10 minutes).

CURRENT OUTPUT CALIBRATION

The controller’s 4 to 20 milliampere output is calibrated at the factory, however, it can be recalibrated by performing the following procedure.

1. A dc current meter capable of measuring 4 to 20 milliamperes must be connected to the current loop output. This can be accomplished in one of the following ways:

   — by disconnecting all loads and connecting a dc ammeter between the two 4 to 20 milliampere terminals,

   — by connecting a dc ammeter in series with the load,

   — by connecting a digital dc voltmeter across a known load resistance and calculating the current flow using the formula:

   I = voltage/load resistance.

2. Press and **hold** the Set button, then **immediately** press the Reset button. (The Reset button must be pressed within one second of pressing the Set button.) Release both buttons. The Low LED should flash slowly. The flashing Low LED indicates that the system is now generating a 4 ma output.

3. Press the Reset (increase) or Set (decrease) button to obtain a 4 ma reading on the meter. (Pressing and holding the button will cause the output to change rapidly.)

4. When no adjustments have been made for 7 seconds, the controller automatically switches to a 20 ma output. This is indicated by a flashing High LED. Press the appropriate button to obtain a 20 ma reading.

5. When no adjustments have been made for 7 seconds, the controller generates the current output level for the calibrate mode. This is indicated by a flashing CAL LED. Press the appropriate button to obtain the desired current output level for the calibrate mode.

6. When no changes have been made for 7 seconds, the controller automatically returns to the Normal operating mode and saves the data in non-volatile memory.

7. Remove the meter from the system output.

Section II
Description and Operating Characteristics

FACEPLATE DESCRIPTION

The faceplate of the controller provides LEDs for identifying status conditions, a digital display and bar graph display for indicating the sensor input, and pushbuttons for programming, calibrating and resetting the system. See Figure 9 for the location of indicators and pushbuttons.

1. **Digital Display** - In the Normal mode, the digital display provides a continuous reading of the input from the PointWatch. An input signal less than 4 ma is displayed as a negative reading by the controller. An input signal greater than 20 ma is displayed as an over-range reading by the controller.

   In the event of a fault, the digital display identifies the nature of the fault using an alpha-numeric code. When the PointWatch unit is in the calibrate mode, the display tracks the calibration procedure. In other operating modes it shows the alarm setpoints and programmed calibration gas concentration. Since this display is always lit, it also functions as a power indicator.

2. **Bar Graph Display** - In the Normal mode, the 20 segment bar graph display provides a reading of sensor input in 5% LFL increments.

3. **High Alarm LED** - Flashes in response to a sensor signal that exceeds the high setpoint.

4. **Auxiliary Alarm LED** - Flashes in response to a sensor signal that exceeds the auxiliary setpoint.

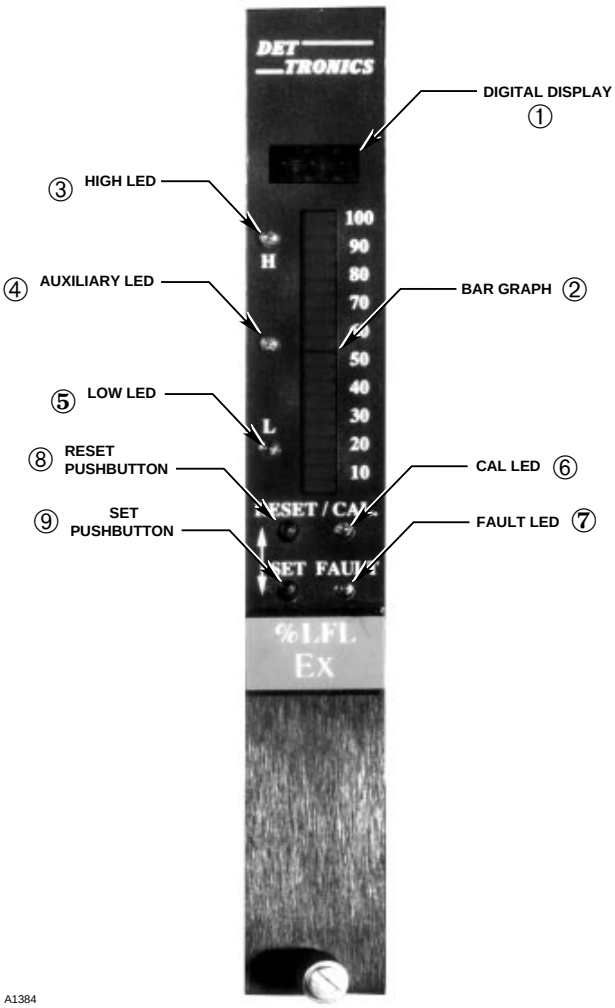


Figure 9—Controller Front Panel

5. **Low Alarm LED** - Flashes in response to a sensor signal that exceeds the low setpoint.

   NOTE

   The alarm LEDs flash when the setpoint is exceeded and are on steady (until reset) when the gas level drops below the setpoint, whether the corresponding alarm output is latching or non-latching.

6. **Cal LED** - Illuminated while the controller is in the calibrate mode.

   NOTE

   In the Setpoint Display or Setpoint Adjust mode, a flashing alarm LED identifies the particular setpoint currently being indicated on the digital display. A flashing Cal LED indicates that the programmed calibration gas concentration (in % LFL) is currently being shown on the digital display.

7. **Fault LED** - Flashes upon detection of a system fault and is on steady during the power-up time delay.

8. **Reset Pushbutton** - Used for various system programming and calibration functions as well as for resetting the controller.

9. **Set Pushbutton** - Used for various system programming and calibration functions.

OUTPUTS

The R8471H Controller is available in a Base version and a Premium version. The differences between the two models are the output configuration and programming options.

Base Model - The base controller is furnished with open collector transistor outputs (rated 100 milliamperes at 32 volts dc) for the Low alarm, High alarm, Auxiliary alarm, and Fault circuits. The normally de-energized alarm outputs are energized when their corresponding setpoints are exceeded. The fault output is normally energized and becomes de-energized upon detection of a system fault.

Premium Model - The premium model is furnished with a set of four relays in place of the four solid state outputs. The relays have SPST contacts rated 5 amperes at 30 vdc or 250 vac.

This model also includes a selectable isolated/non-isolated 4 to 20 ma dc current output for transmitting system information to other monitoring devices. The linear 4 to 20 ma output corresponds to levels from 0 to 100% LFL. If a system fault is detected, the output drops to less than 1.0 ma. The current output can be calibrated in the field to ensure maximum accuracy. (Refer to the “Calibration” section of this manual for details.)

AUTOMATIC DIAGNOSTICS AND FAULT IDENTIFICATION

The microprocessor based controller features self-testing circuitry that continuously checks for faulty sensor or open sensor wiring, low or high input voltage, and other problems that could prevent proper system response. When power is applied, the microprocessor automatically tests memory. In the Normal operating mode, it continuously monitors the input signal from the PointWatch to ensure proper functioning. In addition, a “watchdog” timer is maintained to ensure that the program is running correctly. If a fault should occur:

— The Fault LED flashes.

— The digital display identifies the nature of the fault using an alpha-numeric code. Refer to Table 2 for an interpretation of the codes.

— The normally energized Fault output is de-energized.

— The dc current output drops to less than 1 ma.

NOTE

The fault code will be shown for about 2 seconds out of every 5 seconds. The gas concentration at the sensor will be displayed during the remaining time. If more than one fault should occur, the highest priority fault will be displayed. (Table 2 lists the faults in order of priority.)

An alarm condition will normally over-ride a fault condition unless the fault condition occurred first (except F10, F2X). However, faults that affect the actual function of the controller (F50, F60, F70, F9X) may impair the ability of the controller to maintain an alarm output.

All faults automatically reset except the F9X, F20, and F10 faults. After the fault condition has been corrected, the fault output automatically switches to the normal (energized) state, the dc current output returns to normal, and the Fault LED turns off. Clearing F9X faults requires removing operating power from the controller for approximately one second.

CAUTION

The fault detection circuitry does not monitor the operation of external response equipment or the external wiring to these devices. It is important that these devices be checked periodically to ensure that they are operational.

OPERATING MODES

The controller can operate in any of the following modes. See Figure 10. Operating modes other than Normal are selected by pressing the appropriate pushbutton(s) located on the controller front panel.

NORMAL

In the Normal operating mode with no alarm condition:

— Digital display is on and indicates the sensor input in % LFL.

— Bar graph display reads the same as the digital display.

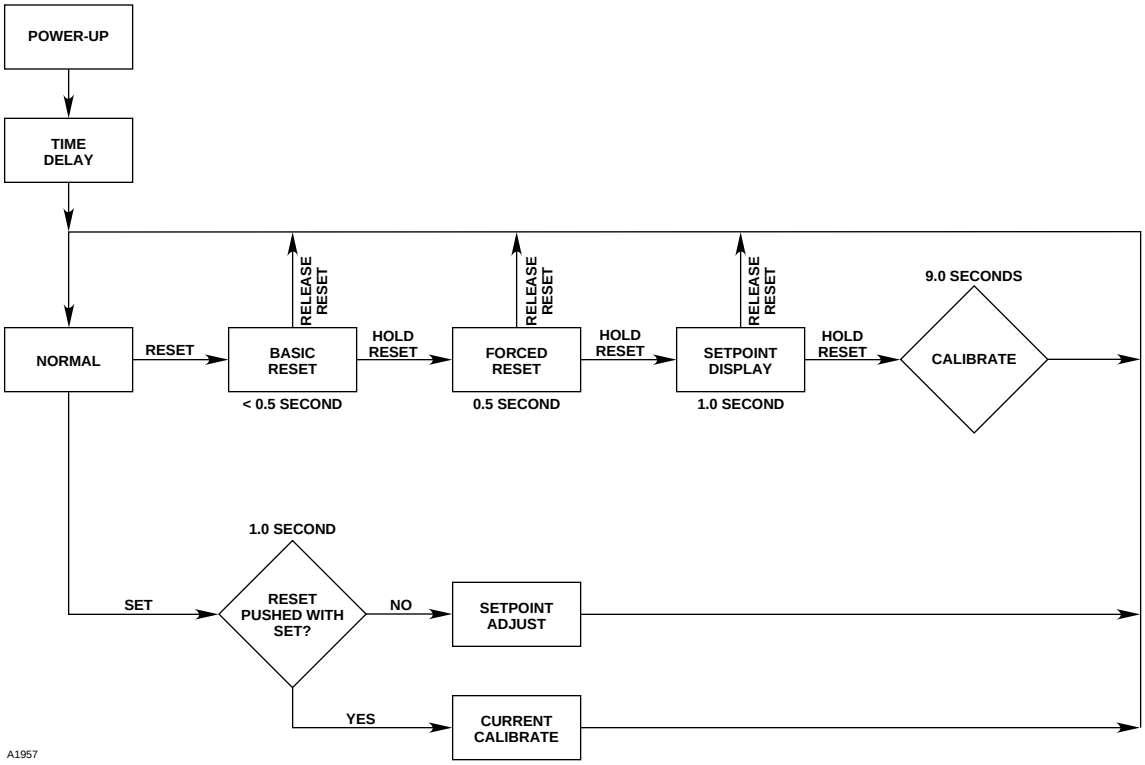


Figure 10—R8471H Controller Flow Chart

— All LEDs are off.

— Alarm outputs are in their normal state (energized or de-energized as programmed).

— Dc current output signal level corresponds to sensor input.

— Fault output is energized.

In the Normal operating mode with a low and/or auxiliary alarm condition occurring:

— Digital display and bar graph display indicate the sensor input in % LFL.

— Low and/or Auxiliary LED flashes.

— Low and/or Auxiliary alarm output changes state.

— Dc current output signal level corresponds to sensor input.

— Fault output energized and LED off.

When the signal decreases below the low or auxiliary setpoint:

— Digital display, bar graph display, and 4 to 20 ma output continue to track the sensor input.

— With latching operation programmed: No change to alarm outputs.

— With non-latching operation programmed: Alarm outputs return to their normal state.

— Low and Auxiliary LEDs are on steady until reset.

In the Normal operating mode and a high alarm condition occurring:

— Same as low or auxiliary alarm, but High LED is on and high alarm output is actuated.

When the signal decreases below the high alarm setpoint:

— The high alarm is always latching and unaffected by the latching/non-latching programming for the low and auxiliary alarms. High LED is on steady until reset.

In the event of a system fault:

— The normally energized Fault output is de-energized and the Fault LED is illuminated.

RESET

The Reset mode is entered by pressing the Reset button located on the front panel of the controller. (See Figure 10.)

When the Reset button is **momentarily depressed**:

With no alarms or faults are occurring — all LEDs turn off and all outputs return to their normal condition (basic reset).

If an alarm or fault condition exists — the basic reset will not reset the outputs.

When the Reset button is **held for 0.5 second**:

If an alarm or fault condition exists — the LEDs turn off and the outputs return to their normal condition (forced reset).

NOTE

If an alarm or fault condition exists, the controller will return to alarm or fault status when the reset button is released.

Remote reset capability is also provided. (Remote reset performs a forced reset.)

NOTE

The remote reset performs a reset function only. It cannot be used for entering other controller operating modes.

OTHER OPERATING MODES

Setpoint Display, Setpoint Adjustment, Calibration, and 4 to 20 ma Current Output Calibration modes are also executed by pressing buttons on the controller faceplate. Refer to the appropriate sections of this manual for details.

SPECIFICATIONS

OPERATING VOLTAGE—
24 vdc recommended. Operating range of 18 to 32 vdc.

POWER CONSUMPTION (controller only, no transmitter or sensor included)—

Base model: 0.7 watt nominal, 1.3 watts maximum (25 ma nominal, 50 ma maximum at 24 vdc.)

Premium model: 1.2 watts nominal, 3.5 watts maximum (50 ma nominal, 145 ma maximum at 24 vdc.)

MAXIMUM SUPPLY VOLTAGE RIPPLE—
Should not exceed 5 volts peak-to-peak. The sum of dcV plus ripple must be ≥18 vdc and ≤ 32 vdc.

TEMPERATURE RANGE—
Operating: +32°F to +140°F (0°C to +60°C)
Storage: -49°F to +185°F (-45°C to +85°C).

OPERATING RANGE—
0 to 100% LFL.

SOLID STATE OUTPUTS (Base model only)—
Open collector transistors with a 100K resistor from the collector to emitter with the emitter grounded, rated 100 milliamperes at 32 volts dc maximum.

RELAY CONTACTS (Premium model only)—
Selectable normally open/normally closed contacts rated 5 amperes at 30 vdc/250 vac. See Table 1 for selectable relay options.

CURRENT OUTPUT (Premium model only)—
4 to 20 milliampere dc current, with a maximum loop resistance of 600 ohms at 24 vdc. User-selectable isolated or non-isolated signal reference from controller input power common return.

DIMENSIONS—
See Figure 11.

SHIPPING WEIGHT (approximate)—
2.0 pounds (0.9 kilogram).

Section III
System Maintenance

TROUBLESHOOTING

Table 3 is intended to serve as an aid in locating the cause of a system malfunction.

NOTE

Record all faults on the Fault Record Sheet supplied with this manual.

The R8471H Controller is not designed to be repaired in the field. If a problem should develop, first carefully check for proper wiring, programming and calibration. If it is determined that the problem is caused by a defect in the controller's electronics, the device must be returned to the factory for repair.

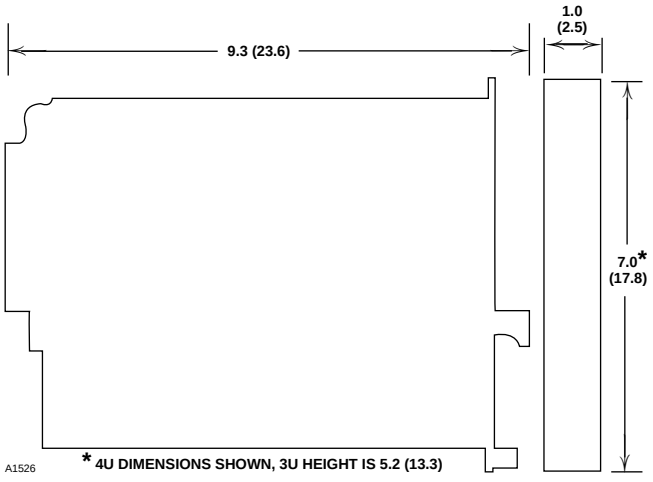


Figure 11—Controller Dimensions in Inches (Centimeters)

Table 3—Troubleshooting Guide

Problem	Possible Cause
No faceplate indicators illuminated.	1. Wiring to external power source. 2. Input power failure.
FAULT LED on, digital display blank.	1. Power-up time delay (up to 5 minutes). 2. If condition continues after 5 minutes, repeat power-up. If problem continues, replace controller.
F91 to F98 Status	1. Initialization failure. Repeat power-up. If successful, re-program and re-calibrate. If not, replace controller.
F92 Status	1. Sensor failure (during startup) - current is over 35 ma or below 0.5 ma.
F94 Status	1. RAM failure. Repeat power-up. If not successful, return to factory for repair. Do not press RESET button. If RESET is pressed, recalibrate and check setpoints.
F96 Status	1. Input power problem (should be 18 to 32 volts). Check operation of power source and power wiring.
F97 Status	1. Controller type invalid. Error in data from RAM. Repeat power-up. If not successful, return to factory for repair. Do not press RESET button. If RESET is pressed, recalibrate and check setpoints.
F70 Status	1. External reset activated for over 15 seconds. Check external switch and wiring.
F60 Status	1. Input power out of tolerance. Check operation of power source and power wiring.
F50 Status	1. Internal power supply problem. Replace controller.
F40 Status	1. Sensor output (after startup) is over 35 ma or below 0.5 ma. Check PointWatch wiring and calibration. 2. Faulty sensor. Replace and calibrate.
F41 Status	1. PointWatch has dirty optics. Refer to PointWatch manual.
F42 Status	1. PointWatch calibration line fault.
F30 Status	1. Negative zero drift. Calibrate sensor. 2. Faulty sensor. Replace and calibrate.
F20, F21 Status	1. Calibration error. Re-calibrate.
F22, F23 Status	1. Sensor sensitivity out of tolerance. Calibrate PointWatch. If problem continues, replace sensor and calibrate.
F24 Status	1. Wrong gas for zero calibration. 2. Background gas affecting the zero calibration. 3. Sensor zero input over limit, re-calibrate PointWatch.
F10 Status	1. Sensor sensitivity problem.

NOTE

When replacing a controller, be sure that the jumper plugs and rocker switches of the replacement are the same as the original. Remove power before removing the device from the mounting cage or plugging in the replacement unit.

ROUTINE MAINTENANCE

The gas detection system requires virtually no routine maintenance, except for periodic checks to assure proper system function and calibration. The frequency of these checks is determined by the requirements of the particular installation.

MANUAL CHECK OF OUTPUT DEVICES

Fault detection circuitry continuously monitors for a sensor problem, excessive negative zero drift, wiring problems, and various other problems that could prevent proper response to a dangerous level of gas. It does not monitor external response equipment or the wiring to these devices. It is important that these devices be checked initially when the system is installed, as well as periodically during the ongoing maintenance program.

CHECKOUT IN NORMAL MODE

The system must be checked periodically in the Normal mode to ensure that those items not checked by the controller diagnostic circuitry are functioning properly.

CAUTION

Be sure to secure all output devices that are actuated by the system to prevent unwanted activation of this equipment, and remember to place these same output devices back into service when the checkout is complete.

POINTWATCH MAINTENANCE

Refer to the PointWatch instruction manual for information regarding maintenance or repairs to the PointWatch unit.

It is recommended that power be removed prior to performing maintenance, repair or replacement.

A Recommended Test Form is supplied at the back of this manual for recording maintenance performed on the system.

DEVICE REPAIR AND RETURN

Prior to returning devices or components, contact the nearest local Detector Electronics office so that an RMI (Return Material Identification) number can be assigned. A written statement describing the malfunction must accompany the returned device or component to expedite finding the cause of the failure, thereby reducing the time and cost of the repair.

Pack the unit or component properly. Use sufficient packing material in addition to an anti-static bag or aluminum-backed cardboard as protection from electrostatic discharge.

Return all equipment transportation prepaid to the Minneapolis location.

OFFICE LOCATIONS

6901 West 110th Street
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Telephone (612) 941-5665 or (800) 765-FIRE
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Bangalore – 560095
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Detector.electronics@gnblr.globalnet.ems.vsnl.net.in

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Facsimile 431-52236

Detector Electronics Corporation
C/O Kidde International Protection Systems
143 Cecil Street
#15-01 G. B. Building
SINGAPORE 0106
Telephone (65) 220-1355
Facsimile (65) 226-6305

Detector Electronics Middle East
C/O Kidde International
P O Box 30791
BUAMEEM II Building
Umm Hureir Road
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Telephone 971 4 372498
Facsimile 971 4 375088

Det-Tronics South America.
Calle 72 con Avenida 3H
Centro Comercial “Las Tinajitas”
Local No. 18
2do. Nivel
Maracaibo, VENEZUELA
Telephone 58-61-926885
Facsimile 58-61-926525

Detector do Brasil
Avenida Geremario Dantas 493
Rio de Janeiro 22740-011
BRAZIL
Telephone (55) 21 392 9633
Facsimile (55) 21 392 5568

ORDERING INFORMATION

The PointWatch Detector must be ordered separately from the controller. When ordering please specify:

R8471H Combustible Gas Controller
Specify base or premium model, 3U or 4U height.

MOUNTING RACKS

A mounting rack is required for controller installation. 3U racks are slightly shorter in height than the 4U models, and are not rack-compatible with flame controllers. 4U racks can house gas or flame controllers in any combination. See Figures 1 and 2. Rack sizes are available to handle up to 8 flame controllers or up to 16 gas controllers.

GAS DETECTOR

- PointWatch Infrared Hydrocarbon Gas Detector
- Junction box for PointWatch Detector

CALIBRATION KITS

Calibration Kit includes regulator, hose, calibration cup, and two cylinders of calibration gas. Available gases are:

Methane - 50% LFL
Ethane - 50% LFL
Ethylene - 50% LFL
Propane - 50% LFL

Replacement Parts for Calibration Kit

Regulator
3 foot hose

Replacement Cylinders

Methane (50% LFL)
Ethane (50% LFL)
Ethylene (50% LFL)
Propane (50% LFL)
Air (0% LFL)

For assistance in ordering a system to meet the needs of a specific application, please contact:

Detector Electronics Corporation
6901 West 110th Street
Minneapolis, Minnesota 55438 USA
Telephone (612) 941-5665
Telex 6879043 DETEL UW
Cable Detronics
Facsimile (612) 829-8750

APPENDIX A – FACTORY MUTUAL RESEARCH CORPORATION (FMRC) APPROVAL DESCRIPTION

MODEL R8471H COMBUSTIBLE GAS CONTROLLER

- Operating Temperature Limits 0°C to +60°C.
- Storage Temperature Limits –45°C to +85°C.
- Relative Humidity Range: 15 to 90% RH.
- Combustible Gas Performance verified for 0 to 100% LFL methane-in-air atmospheres per FM 6310/6320.

NOTES:

- The Model R8471H Combustible Gas Controller must be connected to an FMRC Approved stand alone 4-20 mA combustible gas detection transmitter. The transmitter must be calibrated according to the manufacturer's instructions and the controller must be calibrated using the procedure described in this manual.
- FMRC Approval of the 4-20 mA input does not include or imply approval of the gas detection apparatus connected to the controller. In order to maintain FMRC Approval of the system, the 4-20 mA gas detection instruments connected to the input must also be FMRC Approved.

APPENDIX B – CANADIAN STANDARDS ASSOCIATION (CSA) APPROVAL DESCRIPTION

MODEL R8471H COMBUSTIBLE GAS CONTROLLER

- Operating Temperature Limits 0°C to +60°C.
- Storage Temperature Limits –45°C to +85°C.
- Relative Humidity Range: 15 to 90% RH.
- Combustible Gas Performance verified for 0 to 100% LFL methane-in-air atmospheres per CSA C22.2 #152.

NOTES:

- The Model R8471H Combustible Gas Controller must be connected to a CSA Certified stand alone 4-20 mA combustible gas detection transmitter. The transmitter must be calibrated according to the manufacturer's instructions and the controller must be calibrated using the procedure described in this manual.
- CSA Certification of the 4-20 mA input does not include or imply approval of the gas detection apparatus connected to the controller. In order to maintain CSA Certification of the system, the 4-20 mA gas detection instruments connected to the input must also be CSA Certified.

Fault Record Sheet

Date	Time	Detector Affected	System Status	Operator	Comments

Recommended Test Form

Detector Number	Detector Location	Date Installed	Date Checked	Date Calibrated	Remarks

DET-TRONICS®

INSTRUCTIONS

Combustible Gas Controller

R8471H

12/98 **Form 95-8475**