



## AIR PARTICLE MONITOR (INFRARED SMOKE DETECTOR)

### USER MANUAL

Models:

MLP-AR-APM-OP

MLP-AR-APM-OP-X

MLP-AR-APM-OP-SS-X

MLP-AR-APM-NOP

&

(All available options)

Optical Protection (OP) version shown



MLP-AR-APM-OP

ISO 9001:2000



Part number: MAN-0077 Rev 03  
March 25, 2010

## **IMPORTANT INFORMATION**

This manual is for informational purposes only. Although every effort has been made to ensure the correctness of the information, technical inaccuracies may occur and periodic changes may be made without notice. Net Safety Monitoring Inc., assumes no responsibility for any errors contained within this manual.

If the products or procedures are used for purposes other than as described in the manual, without receiving prior confirmation of validity or suitability, Net Safety Monitoring Inc., does not guarantee the results and assumes no obligation or liability. No part of this manual may be copied, disseminated or distributed without the express written consent of Net Safety Monitoring Inc.

Net Safety Monitoring Inc., products are carefully designed and manufactured from high quality components and can be expected to provide many years of trouble free service. Each product is thoroughly tested, inspected and calibrated prior to shipment. Failures can occur which are beyond the control of the manufacturer. Failures can be minimized by adhering to the operating and maintenance instructions herein. Where the absolute greatest of reliability is required, redundancy should be designed into the system.

## **Warranty**

Net Safety Monitoring Inc., warrants its APM Sensor against defective parts and workmanship for a period of 24 months from date of purchase; other electronic assemblies for 36 months from date of purchase. No other warranties or liability, expressed or implied, will be honoured by Net Safety Monitoring Inc. Contact Net Safety Monitoring Inc., or an authorized distributor for details.

We welcome your input at Net Safety Monitoring. If you have any comments please contact us at the phone/address below or visit our web site and complete our on-line customer survey: [www.net-safety.com](http://www.net-safety.com).

## **Contact Information**

Net Safety Monitoring Inc.  
2721 Hopewell Place NE  
Calgary, AB  
Canada  
T1Y 7J7  
Telephone: (403) 219-0688 Fax: (403) 219-0694  
[www.net-safety.com](http://www.net-safety.com)  
E-mail: [nsmsales@net-safety.com](mailto:nsmsales@net-safety.com)  
Copyright © 2005 Net Safety Monitoring Inc.  
Printed in Canada

## Table of Contents

IMPORTANT INFORMATION .....	1	SEAL .....	8
Warranty .....	1	MOUNT .....	8
Contact Information.....	1	Connecting Wires .....	8
INTRODUCTION.....	4	Figure 5: Securing wires .....	8
THE PRODUCT.....	4	Board Assembly.....	9
THE MANUAL.....	4	Figure 6: Millennium Module Boards.....	9
STEP 1 — PLAN.....	5	WIRING — APM SENSOR AND CONTROLLER .....	9
Figure 1: Locate APM Sensor and Controller – Typical Installation.....	5	Figure 7: Wiring— APM Sensor and Controller .....	10
LOCATE CONTROLLER / APM .....	5	SENSOR AND CONTROLLER.....	10
Figure 2: Dimensional Drawing—Controller and.....	6	Table 1: APM Sensor and Controller Terminal Connections ..	10
APM Sensor .....	6	SENSOR SEPARATION.....	11
Figure 3: Dimensional Drawing—APM Sensor and .....	6	Figure 8: Wiring—APM Separation .....	11
Multi-purpose Junction Box .....	6	CURRENT OUTPUT.....	12
STEP 2 — INSTALL .....	7	Figure 9: Jumper Position .....	12
UNPACK.....	7	NON-ISOLATED AND ISOLATED POWER CONFIGURATIONS .....	12
Figure 4A: Components .....	7	Figure 10: Current Source and Sink Drawing.....	12
THE CONTROLLER .....	7	STEP 4 — OPERATE .....	13
THE APM SENSOR.....	7	Figure 11: Controller Functionality .....	13
Figure 4B: ATEX APM sensor.....	7	Table 2: Status LED's, Display Messages and Current Loop..	14
STEP 3 — WIRE.....	8	SET-UP BUTTON .....	14
FIELD INSTALLATION.....	8	MAGNETIC REED SWITCH.....	14
		THE MAIN MENU.....	14

Accessing the Main Menu .....	15	RESPONSE CHECK .....	18
Main Menu Functionality .....	15	TROUBLESHOOT .....	19
CURRENT LOOP MEASUREMENT (TEST JACKS).....	15	CLEANING .....	19
POWER UP.....	15	HOW TO RETURN EQUIPMENT .....	19
STEP 5 — ZERO.....	15	SPARE PARTS /ACCESSORIES.....	20
STEP 6 — MONITOR.....	16	Table 4: Part Numbering.....	20
Table 3: Display Messages .....	16	Addendum: Duct Monitoring.....	21
SENSITIVITY SETTINGS .....	16	Appendix A: ELECTROSTATIC SENSITIVE DEVICE (ESD) .....	22
SET RELAY OPTIONS .....	17	Appendix B: RESISTANCE (OHMS).....	23
APM FAULT .....	17	Appendix B: Resistance Table (cont'd).....	24
ALARMS .....	17	Appendix C: SPECIFICATIONS .....	25
Clean Window/Dirty Chamber .....	17		
Smoke Alarm.....	17		
RESET .....	18		
Remote Reset .....	18		
Manual Reset.....	18		
REVIEW RELAY SETTINGS.....	18		
NORMAL .....	18		
OUTPUTS .....	18		
Relays .....	18		
Current .....	18		
STEP 7 — MAINTAIN .....	18		

# INTRODUCTION

## THE PRODUCT

The APM is an infrared optical detector, used in hazardous industrial applications, to monitor ambient air for the presence of particulate matter from products of combustion such as carbon, smoke or ash. The Millennium Controller (Transmitter) is an environmentally protected electronic package contained within an explosion-proof housing. With its scrolling 8-character display and status LEDs it provides instructions and status alerts. The APM Sensor is mounted where airborne particles are anticipated to accumulate while the Millennium Controller is located conveniently at eye level. The product is available in Aluminum and Stainless Steel (SS).

There are two APM versions:

**OP (Optical Protection)** - This version is used when there is a reflective surface or objects moving through the path, within 1.5 meters of the sensor. The two types of APM sensors available with Optical Protection are the CSA certified and ATEX certified models.

**NOP (No Optical Protection)** - This version is used when there are no reflective surfaces or objects moving through the path, within 1.5 meters of the sensor. The NOP version is now obsolete.

**Note:** In order for the APM to detect particulate in the air, the particulate must reach the sensor. It will not detect particulate at a distance.

## THE MANUAL

The manual has been designed to make installation of the Millennium product easy. To ensure proper installation, follow the simple steps outlined in the following pages. If you encounter problems during operation, consult the troubleshooting section or contact your sales representative.

**Step 1 — PLAN**

**Step 2 — INSTALL**

**Step 3 — WIRE**

**Step 4 — OPERATE**

**Step 5 — ZERO**

**Step 6 — MONITOR**

**Step 7 — MAINTAIN**

## STEP 1 — PLAN

### LOCATE CONTROLLER / APM

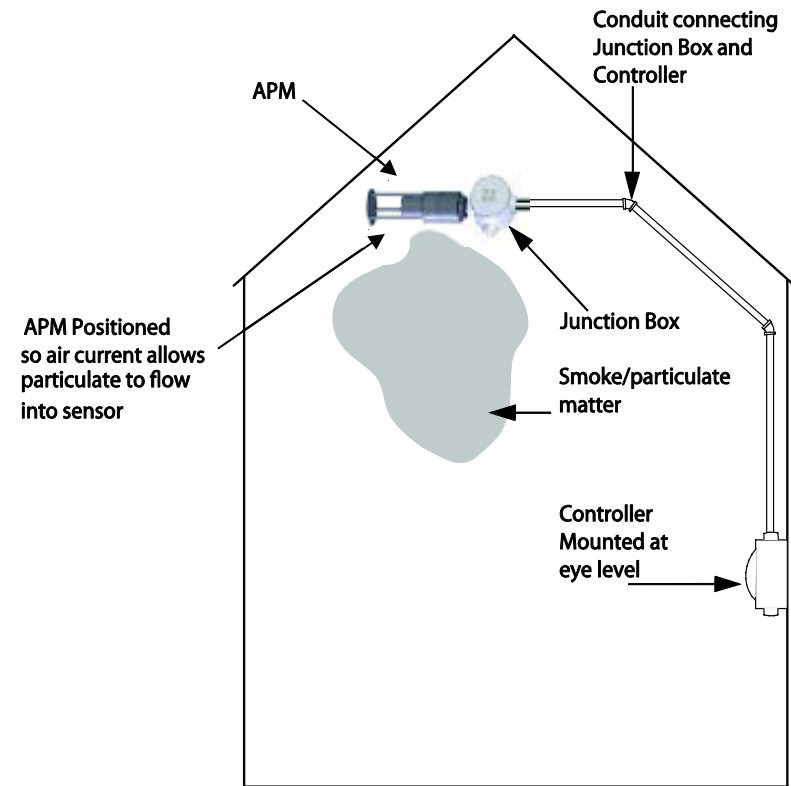
Prior to the installation process, a location plan for placing the APM Sensor and Controller should be developed. Proper location of the APM Sensor is essential for providing maximum protection. The most effective placement and number of detectors varies depending upon conditions. The following points should be considered when planning the installation.

- Carefully locate the APM Sensor in an area where particulate may potentially accumulate.
- The APM Sensor should be located where it is safe from potential sources of contamination. Such as oil film, dirt, etc.
- Locate the controller where it will be accessible and visible.
- Mount the APM Sensor so air currents allow particulate to flow into the sensor.
- If the particulate is expected to be moving horizontally due to air currents, orient the sensor for maximum detection.
- Exposure to excessive heat or vibration can cause premature failure of electronic devices and should be avoided whenever possible.
- Seek advice from experts and refer to various regulatory publications that discuss general guidelines for your industry.

**Note:** If used for the detection of smoke, refer to NFPA 72 guidelines (National Fire Protection Association @ [www.nfpa.org](http://www.nfpa.org))

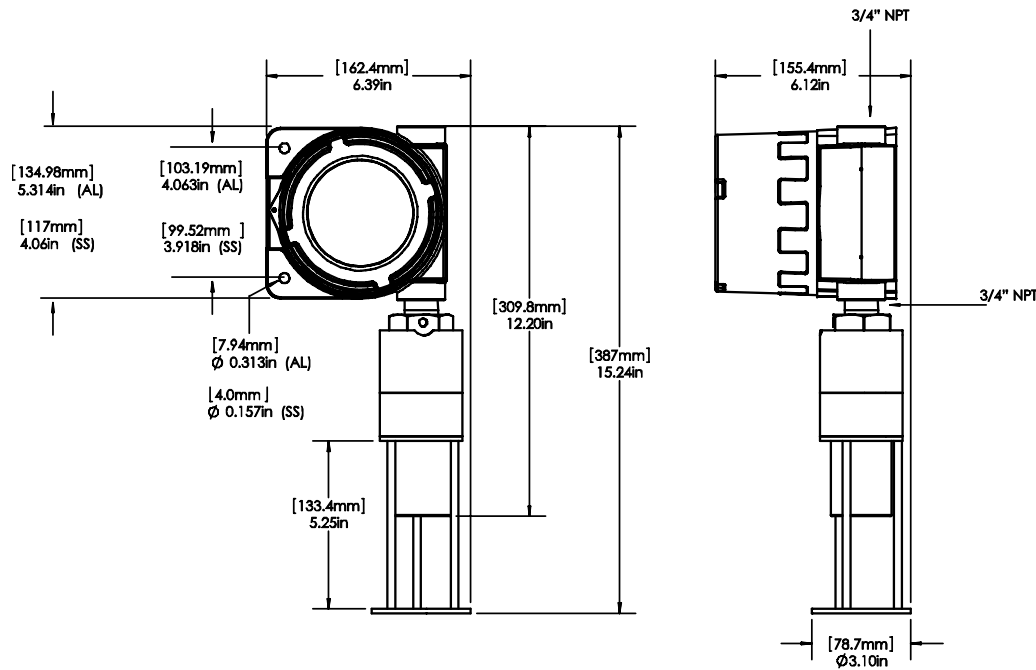
The following illustrates a typical installation of an APM Sensor and Controller. The APM Sensor is mounted separate from the controller using a junction box. The controller is located at eye-level, while the sensor is located where particles are most likely to accumulate. Conduit then connects the two devices. See Figure 1. Also refer to “Wiring - APM Sensor and Controller”.

**Figure1:** Locate APM Sensor and Controller – Typical Installation

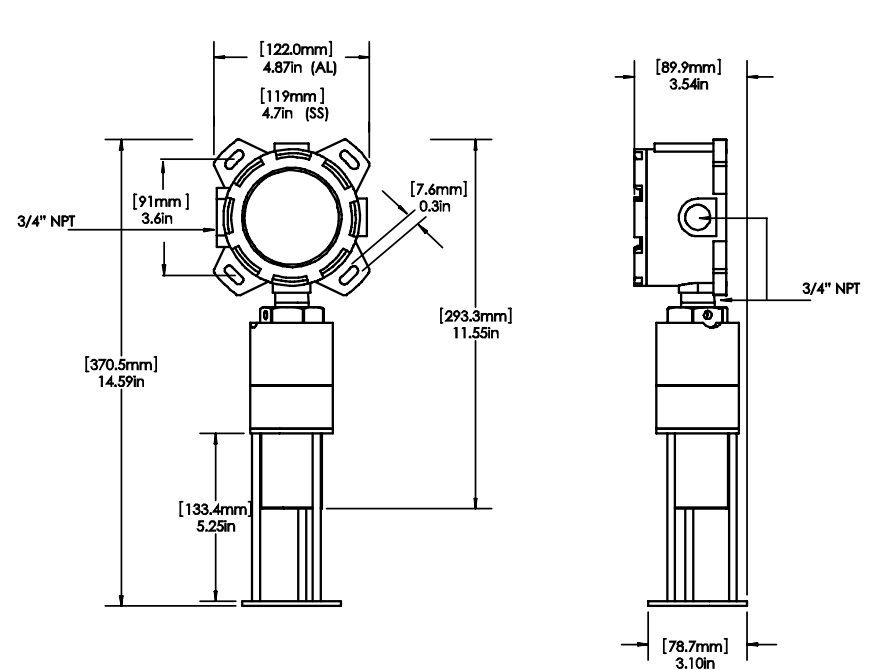


The APM is widely used in applications requiring reliable monitoring of ducts. Refer to “Addendum: Duct Monitoring” for information.

**Figure 2: Dimensional Drawing—Controller and APM Sensor**



**Figure 3: Dimensional Drawing—APM Sensor and Multi-purpose Junction Box**



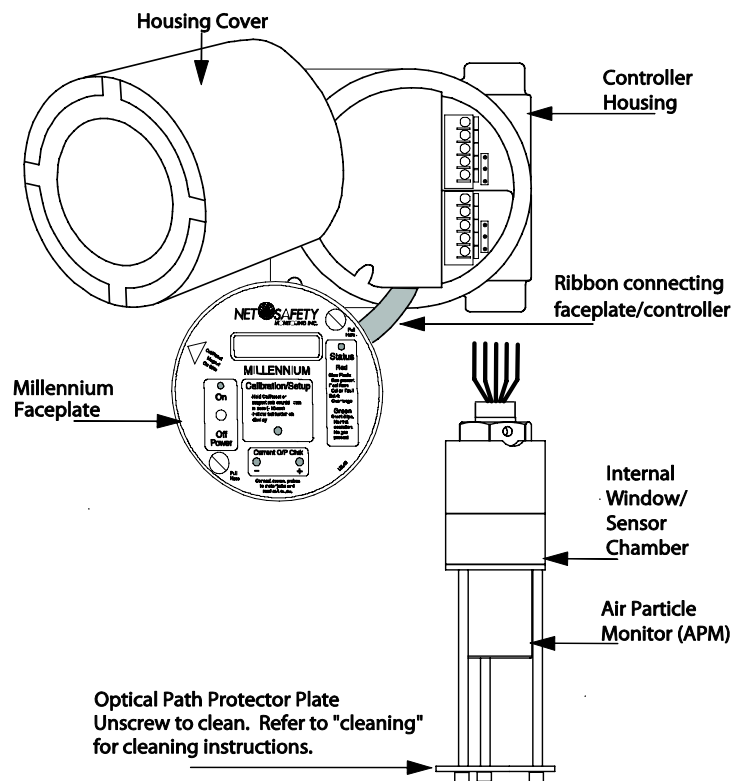
## STEP 2 — INSTALL

### UNPACK

Carefully remove all components from the packaging. Check components against the enclosed packing list and inspect all components for obvious damage such as broken or loose parts.

If you find any components missing or damaged, notify the distributor or Net Safety Monitoring immediately.

**Figure 4A:** Components



### THE CONTROLLER

The Millennium Controller has an explosion-proof Housing, rated Class 1, Division 1, Groups B, C, and D for hazardous applications. To remove the Housing cover, simply screw the cover counter clockwise.

### THE APM SENSOR

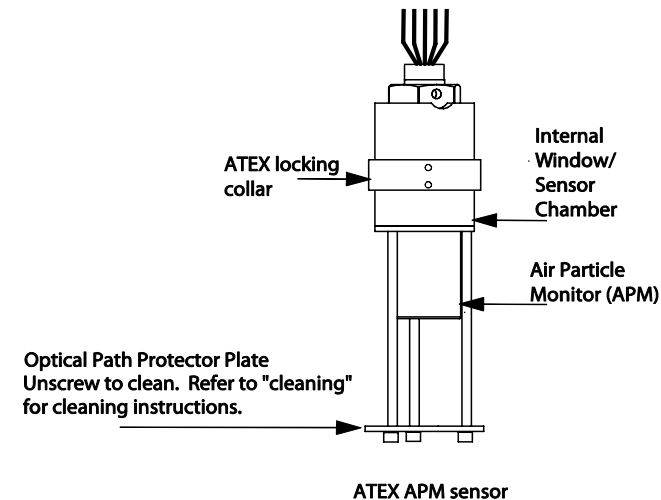
The APM Sensor monitors airborne products of combustion such as carbon, smoke or ash. The sensors available are the CSA certified and the ATEX certified sensors. See Appendix for approval.

The ATEX APM sensor is certified for hazardous locations and is in compliance with EN 60079-0 and 60079-1: 2009. ATEX Certificate # DNV 09 ATEX 66005X.

### Special Conditions for Safe Use:


- 1) The permanently connected cable needs appropriate protection of the free end of the cable.
- 2) The parts of the bushing outside the flameproof enclosure shall be protected in accordance with one of the types of protection listed in EN60079-0.
- 3) The electrical earth bonding of the equipment shall be ensured during installation.

**Figure 4B:** ATEX APM sensor



## STEP 3 — WIRE

### FIELD INSTALLATION

**WARNING:**  Wiring codes and regulations may vary. Compliance with regulations is the responsibility of the installer. Wiring must comply with applicable regulations relating to the installation of electrical equipment in a hazardous area. If in doubt, consult a qualified official before wiring the system.

- If the 4-20 mA signal is not used, connect a jumper between the 4-20 terminal and the Common terminal.
- The use of shielded cable is highly recommended for signal, input, output and power wires to protect against interference caused by extraneous electrical or electromagnetic 'noise'.
- In applications where the wiring cable is installed in conduit, the conduit must not be used for wiring to other electrical equipment.
- The maximum distance between the APM Sensor and Controller is limited by the resistance of the connecting wiring, which is a function of the gauge of the wire being used.
- The controller contains semiconductor devices susceptible to damage by electrostatic discharge. Use caution when handling. For more information on proper ESD handling, refer to Appendix A, "Electrostatic Sensitive Device (ESD)".

### SEAL

The use of seals is recommended to further protect the system against any unwanted water ingress, and equipment should be installed according to applicable local electrical codes. Seals are especially recommended for installations that use high-pressure or steam cleaning devices in proximity to the transmitter and/or sensor.

- Water-proof and explosion-proof conduit seals are recommended to prevent water accumulation within the enclosure.
- Seals should be located as close to the device as possible and not more than 18 inches (46 cm) away.

- Explosion-proof installations may require an additional seal where conduit enters a non-hazardous area. Ensure conformity with local wiring codes.
- When pouring a seal, use a fibre dam to assure proper formation of the seal. Seals should never be poured at temperatures below freezing.
- The jacket and shielding of the cable should be stripped back to permit the seal to form around the individual wires. This will prevent air, particles and water leakage through the inside of the shield and into the enclosure.
- It is recommended that explosion-proof drains and conduit breathers be used. In some applications, alternate changes in temperature and barometric pressure can cause 'breathing' which allows moist air to enter and circulate inside the conduit. Joints in the conduit system are seldom tight enough to prevent this 'breathing'.

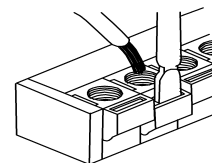
### MOUNT

The controller should be mounted at eye-level and be easily accessible for monitoring and maintenance purposes. The sensor should be placed where particles are likely to accumulate and with the Collector Cone (for NOP versions) pointed in the appropriate direction, or the Optical Path (OP version) across the direction of air flow. To prevent water damage, seal conduit at all points of entry to the controller or junction box.

### Connecting Wires

1. Use a small screw driver to gently press down and hold the spring connector open.
2. Insert appropriate wire into open connector hole.
3. Release screw driver to secure wire.

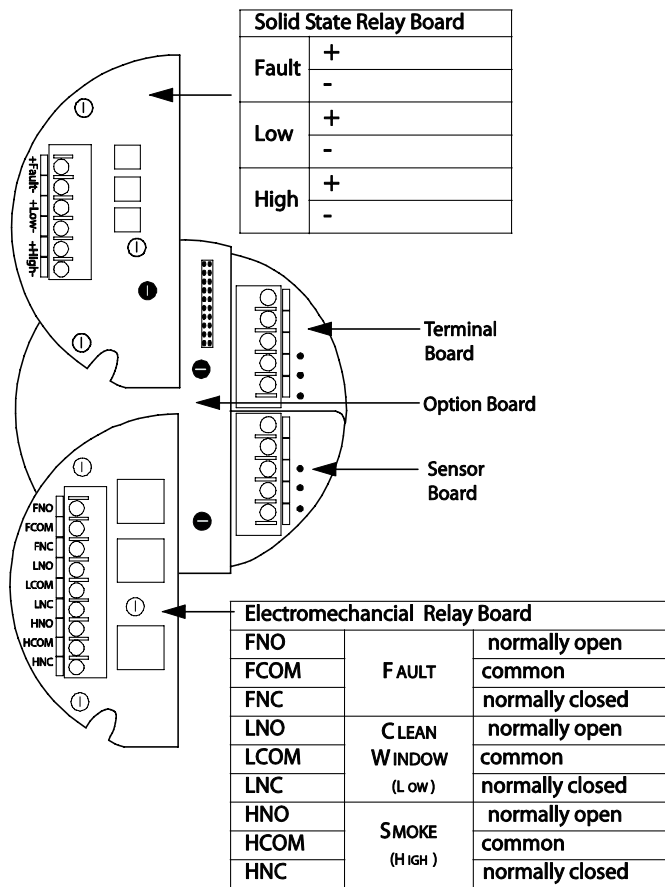
**Figure 5:** Securing wires




## Board Assembly

There are three different fixed boards and two optional relay boards which make up the PCB Assembly. Depending upon requirements, either an Electromechanical or Solid State Relay Board module can be used in the Millennium Controller. Simply loosen the three locking standoffs, remove one board, insert the other board and tighten screws. Boards are susceptible to ESD. Refer to Appendix A, "Electrostatic Sensitive Device (ESD)".

**Figure 6:** Millennium Module Boards

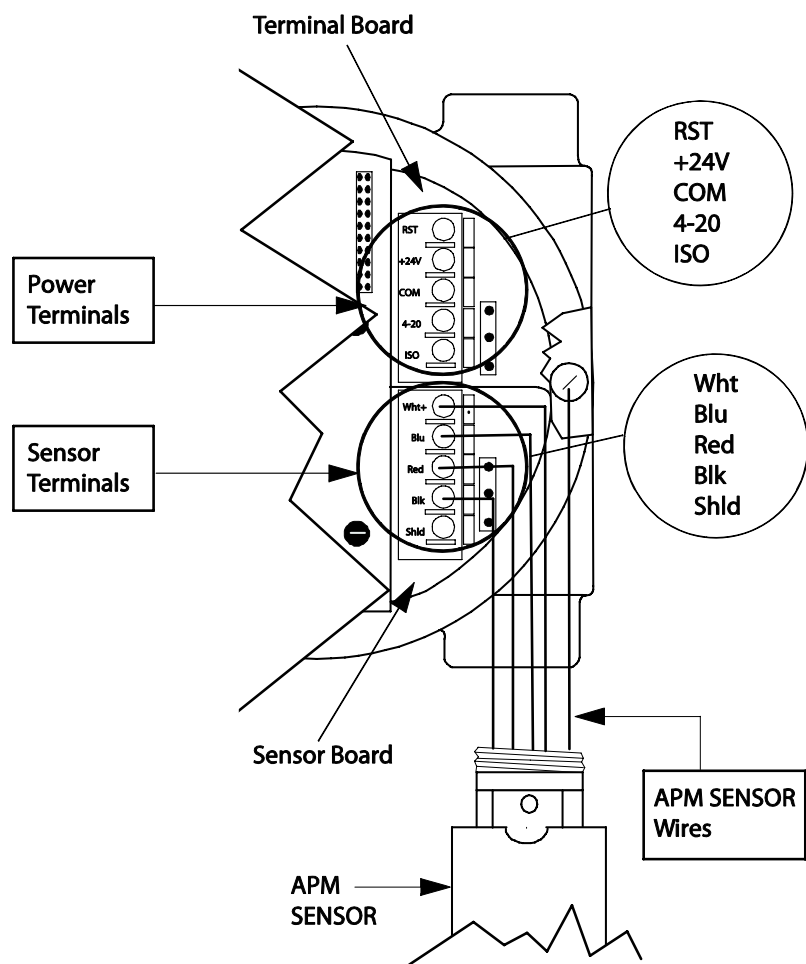


## WIRING — APM SENSOR AND CONTROLLER

**WARNING:**  Power to the unit must be OFF before wiring.


As the APM Sensor must be located where particles are likely to accumulate and the controller where it can be easily reached, it is necessary to "separate" the controller and APM Sensor. This is done with the of the APM separation kit. See "Sensor Separation".

Figure 7: Wiring— APM Sensor and Controller



Note: If the 4-20 mA signal is not used, connect a jumper between the 4-20 terminal and the COM terminal on the terminal board.

## SENSOR AND CONTROLLER

**WARNING:**  Power to the unit must be OFF before wiring. Also ensure area is de-classified before removing housing cover.

**Note:** The APM Sensor may be factory fitted to the controller. If so, you need only connect the Power Terminals. Follow the steps below.

1. Remove the Controller's Housing Cover.
2. Connect the APM Sensor to the Sensor Terminals (if necessary).
3. Connect signal and power wires from power supply to Controller Power Terminals. See Table 1 below.

Table 1: APM Sensor and Controller Terminal Connections

APM Sensor Terminals		Controller Power Terminals	
Wires	Terminal designations	Terminal designations	Power Connections
White	+24VDC	RST	Remote Reset
Blue	SIG A	+24V	Power (+) (+24VDC)
Red	SIG B	COM	Power (-) (-24VDC)
Black	COM(-)	4-20	Current Loop Output (mA)
Shield	Shld	+VISO	+24VDC isolated 4-20 power

**Note:** For APM Separation instructions, see Figure 8, "Wiring— APM Separation."

4. Replace the Controller's Housing Cover.
5. Turn controller on.
6. Ensure display reads **Start Delay**, Status LED is Red Slow Flash and current output displays 3.0 mA. This is the start-up delay sequence which will last approximately 90 seconds.

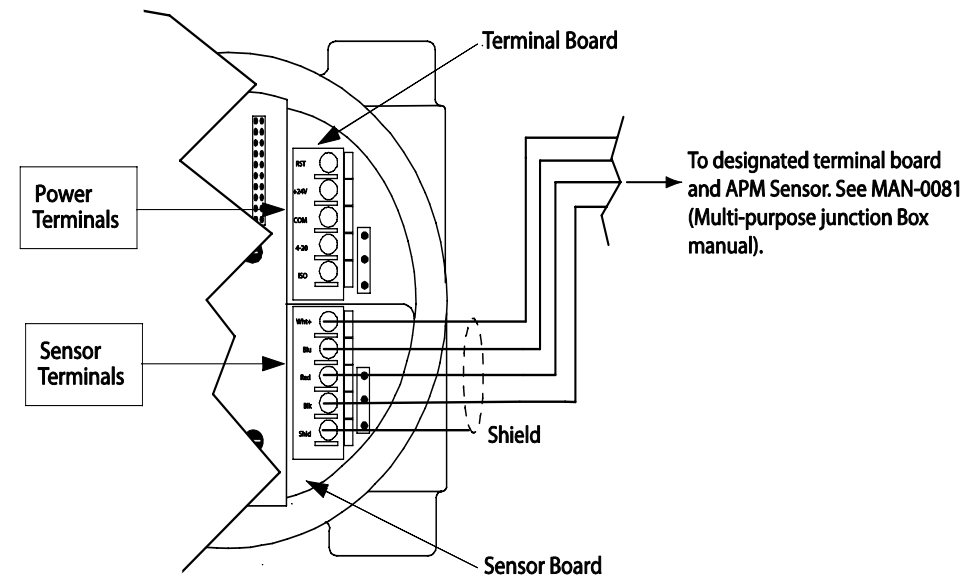
## SENSOR SEPARATION

Since the APM Sensor must be located where it will pick up particulate in an air flow, and the controller where it can be easily reached, it is often necessary to “separate” the controller and sensor. This is done with the aid of the sensor separation kit (SEP). This kit is composed of a junction box and terminal strip. See Option 1, Figure 1 and refer to the **Net Safety Multi-purpose Junction Box manual (MAN-0081) for terminal designation.**

Shielded copper instrument wire (minimum 18 AWG) should be used for separations up to 500 feet. Shielded copper instrument wire (minimum 16 AWG) should be used for separations up to 2000 feet. Ensure that the appropriate wire is used for the Class 1/Division 1, hazardous applications. Consult the factory if a greater separation distance is required.

**Note:** When sensor is separated from controller, always ensure that the controller is supplying the required voltage to the sensor terminals inside the junction box. Refer to Table 1, "APM Sensor and Controller Terminal Connections". Also if the 4-20 mA signal is not used, connect a jumper between the 4-20 terminal and the COM terminal on the Terminal Board.

**Figure 8: Wiring—APM Separation**

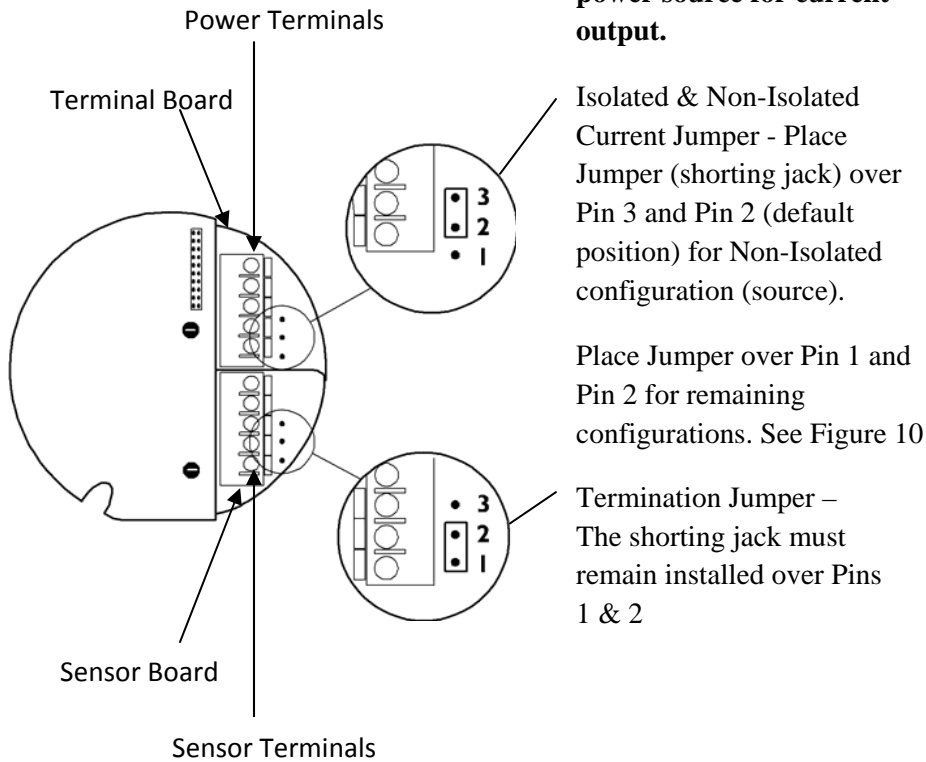


## CURRENT OUTPUT

To set the current output, simply move the jumper located on the Terminal Board near the power terminals, to the isolated or non isolated current position. Refer to Figure 9.

**Note:** Unless otherwise specified, all models ship with this jumper in the non-isolated current position (Pin 2 and Pin 3 jumpered). Refer to Figure 9.

**Figure 9:** Jumper Position



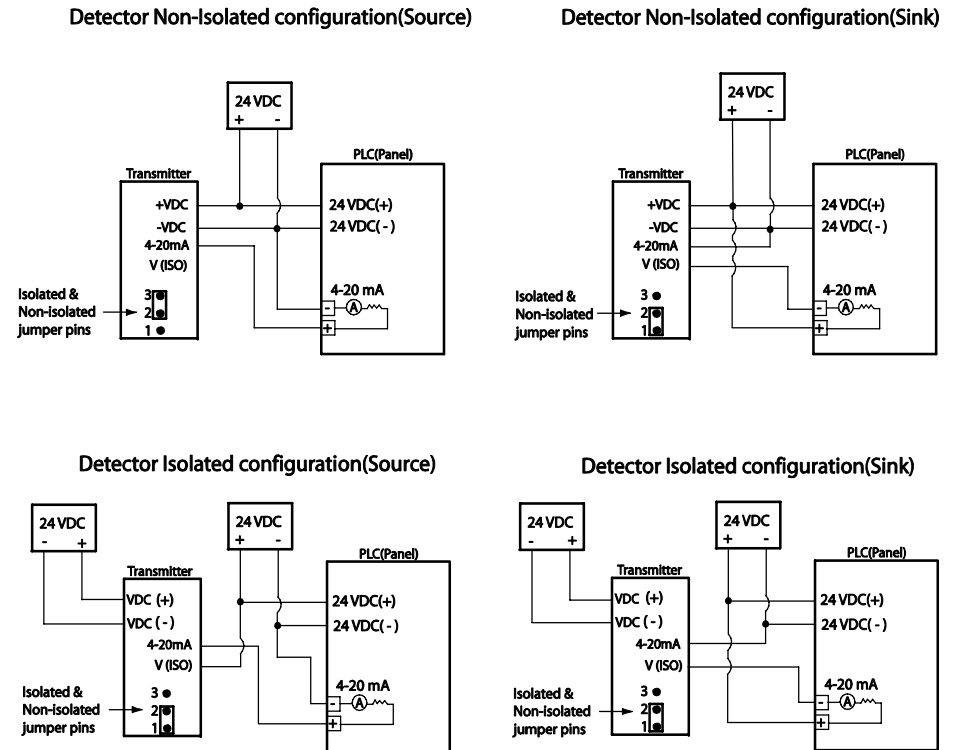
## NON-ISOLATED AND ISOLATED POWER CONFIGURATIONS

For current source using Non-Isolated configuration, the jumper must remain in the default position (Pin 2 and Pin 3 jumpered). The jumper is placed over Pin 1 and Pin 2 for current sink using Non-Isolated configuration.

For Isolated configuration using a separate power supply to isolate the current loop, the jumper must be placed over Pin 1 and Pin 2 for source and sink. See Figure 9 and Figure 10.

Note the Jumper position for each configuration.

**Figure 10:** Current Source and Sink Drawing.



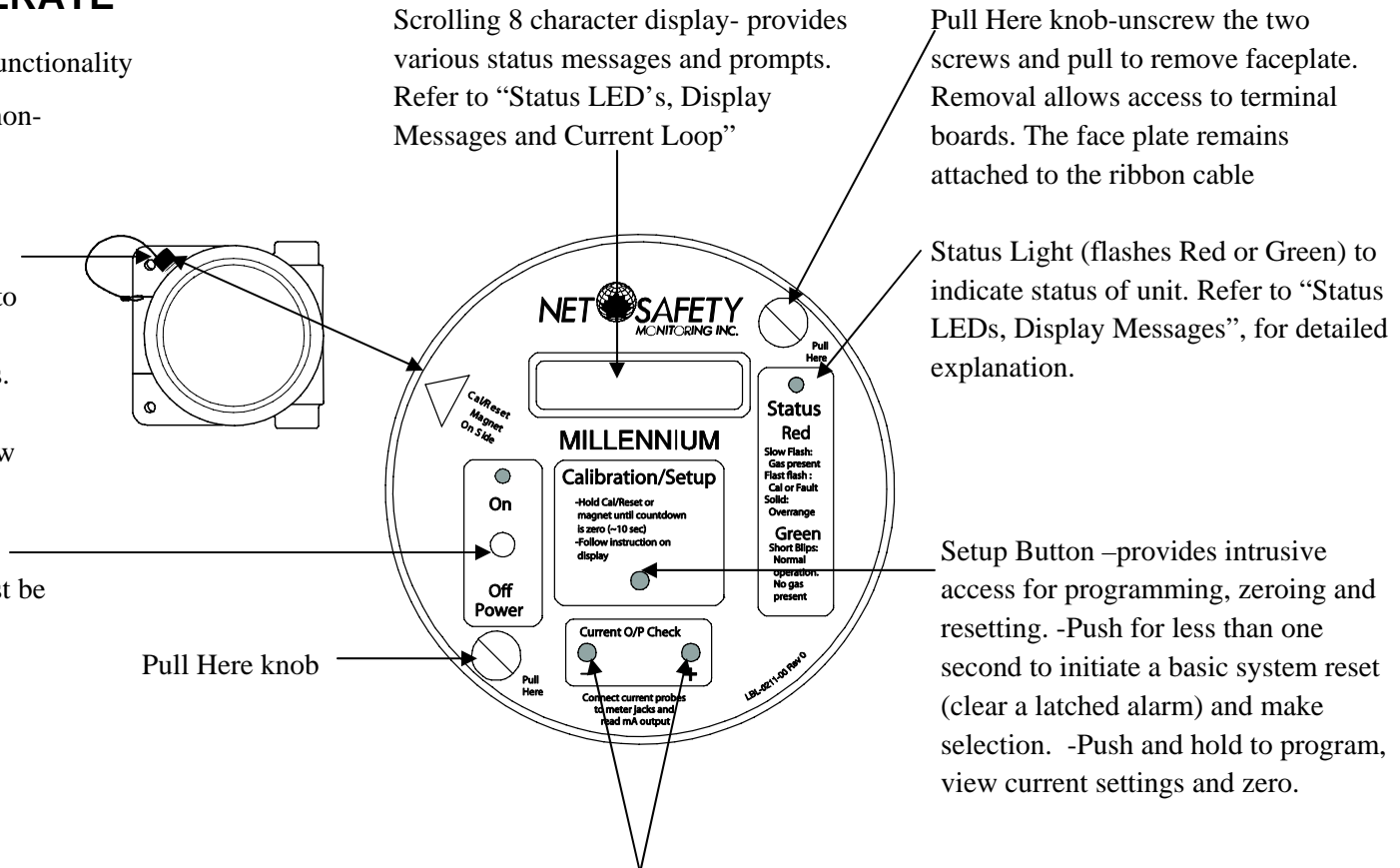
## STEP 4 — OPERATE

**Figure 11:** Controller Functionality

Magnetic Reed Switch –provides non-intrusive access for programming, zeroing and resetting.

-Place magnet against housing as indicated for less than one second to initiate a basic system reset (clear latched alarm) and make selections.  
-Place magnet against housing as indicated and hold to program, view current settings and zero

ON/OFF Switch –used to turn controller on and off. Housing must be removed to access.



Current Output Check –test jacks to facilitate current loop measurements without breaking external current loop. To take current loop measurements, ensure wiring is correct and current loop is closed, and then follow steps below

- Set meter on mA scale and insert meter leads into test jacks.
- Put external devices in bypass, if necessary, to avoid unwanted alarm response.
- Perform simulated tests to check output.
- Remove meter leads from test jacks and return external devices to normal.

**Table 2:** Status LED's, Display Messages and Current Loop

State	Current O/P	Status LED Red or Green	Display
Main Menu Options (setting 'zero' through to setting 'Display Language')	3.0 mA	Solid Green	Set Zero, Set Sensitivity, Review Relay Settings, Set Relay options, Set display Language
Normal Operation	4.0 mA	Green Blip	Clear
Start-up Delay (90 seconds)	3.0 mA	Slow Red flash	Start Delay
Sensor chamber is dirty ('Clean Window Alarm')	3.3 mA	Fast Red flash	Dirty Chamber
Particulate present ('Smoke Alarm')	20 mA	Red Blip	Smoke
Fault Condition	2.5 mA	Fast Red flash	Fault

## SET-UP BUTTON

The Setup Button provides access to the Millennium's Main Menu, which in turn allows options to be reviewed and set. The Setup Button is also used to zero the controller. Since the controller's housing must be opened to access the button the area must be de-classified before using.


Press and hold the Setup button to zero and access Main menu. Briefly press to make a selection (select YES?).

## MAGNETIC REED SWITCH

The Magnetic Reed Switch is provided to avoid opening the Housing in an environment where gas may be present. The Magnetic Reed Switch functions in the same manner as the Setup Button but in a non-intrusive manner. It is attached to the side of the controller.

When using magnet:

- Place and hold the magnet to the Controller's Housing (10 o'clock position) to zero and access Main Menu.
- Briefly place the magnet to the Controller's Housing (10 o'clock position) to make a selection (select YES?).

**WARNING:**  Opening the Controller's Housing should be avoided if gases may be present (hazardous environment). Do not power up the system, with the housing cover removed, unless the area has been de-classified.

## THE MAIN MENU

The controller must be powered up before the Main Menu is displayed. See "Power Up".

The Main Menu provides access to various functional settings and viewing of current settings. The following are the available options/settings:

- Set Zero - The unit adjusts to current environment.
- Sensitivity Settings - Set to low, medium or high sensitivity levels.
- Review Relay Settings - Review the current Fault, Clean Window and Smoke Alarm settings.
- Set Relay Options - Select the settings for the Clean Window and Smoke Alarms. The Fault Alarm setting is fixed.
- Select Display Language – Allows user to choose English, French or Spanish.

## Accessing the Main Menu

The following are two ways to access the Main Menu:

- Setup Button found on the faceplate (the housing cover must be removed to access)
- Magnetic Reed Switch (a magnet must be used to activate)

## Main Menu Functionality

1. Ensure that the controller has been turned on and no fault is present.
2. Hold the magnet against the Reed Switch or press and hold the Setup Button until the message **Switch On** displays and the countdown (10 to 0) finishes.
3. An option will scroll across the display followed by the prompt **YES?**.
4. To set/view an option, momentarily place the magnet to the Reed Switch or press the Setup Button at the **YES?** prompt.
5. If you do not wish to select that option wait until the next option appears and then select **YES?** .
6. A selection is acknowledged with a flashing **YES**.
7. If no option is selected, the controller returns to **Clear** (normal operation).

## CURRENT LOOP MEASUREMENT (TEST JACKS)

Use a standard meter to measure current loop during various states. The Controller's Housing cover must be removed to access the Test Jacks. Ensure area is de-classified prior to removing housing cover.

## POWER UP

When power is first applied, a 90 second warm-up routine will begin. During this time, the message '**Start Delay Millennium Net Safety**' will display, the Status LED will flash slow Red and the current output will be 3.0 mA.

After the warm-up, the controller will enter normal operation; the message **Clear** displays, the Status LED will blip/blink Green and current output will be 4.0 mA.

## STEP 5 — ZERO

**Note:** It takes less than 1 minute to complete the Zero procedure.

If at any time the background particulate levels change, the controller may be zeroed to the new levels. Zeroing is recommended every 3 months.

After initial power-up, allow the unit to warm up for 2-4 hours before zeroing.

Be sure the APM is powered-up and is not indicating a fault; display reads Clear and Status LED Blip/blink Green and current output is 4.0 mA.

1. Ensure that the sensor is in a normal air environment before beginning the procedure; surrounding air is clean and free of particulate or at the accepted background level for the specific application.
2. Press and hold the Setup Button or the magnet to the Reed Switch to enter the Main Menu; wait for the countdown, from 10 to 0, to end.
3. Release the Setup Button or remove the magnet from the Reed Switch.
4. When **Set Zero YES?** displays press the Setup Button or use the Reed Switch to select.  
The flashing **YES** confirms the selection.
5. The APM has now been zeroed. This means that the existing level of air contamination is considered normal.

## STEP 6 — MONITOR

**Table 3:** Display Messages

Message	Meaning and / Action
Start Delay Millennium Net Safety	Power up sequence in progress
Switch On	Setup Button or reed Switch active
Fault	Fault Alarm tripped-sensor or sensor wiring fault
Smoke	Smoke Alarm-Smoke/Particulate detected
Dirty Chamber	Chamber is dirty. Clean window and chamber
Clear	No particulate present and no fault detected. No action required
Set Zero YES?	Set Zero Level of controller
Set Relay Option YES?	Set Clean Window Alarm or Smoke Alarm
Review Relay Settings YES?	Review current functional settings
Sensitivity Settings YES?	Set for high, medium or low sensitivity
Coil Status Energized/De-Energized	Fixed for Fault Alarm Relay. Set Clean Window or set Smoke Alarm coil status
Latch Status Latching/ Non-Latching	Fixed for Fault Alarm Relay. Set Clean Window or Smoke Alarm condition

**Note:** By default, the Fault Alarm Relay is fixed as Energized and Non-latching and cannot be changed.

## SENSITIVITY SETTINGS

The APM can be set to detect low, medium or high sensitivity levels with high being the most sensitive. By default the sensitivity is set for High Sensitivity at the factory. Follow the steps below when changing sensitivity.

1. Press and hold the Setup Button or the magnet to the Reed Switch to enter the Main Menu; wait for the countdown, from 10 to 0, to end.
2. When **Sensitivity Settings YES?** displays press the Setup Button or use the Reed Switch to select. The flashing **YES** confirms the selection.
3. The following three options will display: Low Sensitivity YES? , Medium Sensitivity YES? and High Sensitivity YES?

When the required setting is displayed, press the Setup Button or use the Reed Switch to select. The selection is acknowledged with flashing **YES**.

**Note:** Put external warning system in by pass to prevent unwanted activation of alarms.

## SET RELAY OPTIONS

Define relay settings for Clean Window and Smoke alarm conditions. Fault Alarm Relay is fixed as energized/non-latching and cannot be changed.

1. Press and hold the Setup Button or the magnet to the Reed Switch to enter the Main Menu; wait for the countdown, from 10 to 0, to end. The current output drops to 3.0 mA.
2. When **Set Relay Options YES?** displays press the Setup Button or use the Reed Switch to select. The flashing **YES** confirms the selection.
3. The message **Set Clean Window Alarm YES?** then displays. Press the Setup Button or use the Reed Switch to select. The flashing **YES** confirms the selection. The microprocessor begins the relay setting procedure.
4. After Clean Window Alarm option is chosen the message **Coil Status** displays and then shows **Energized YES?**.
5. Press the Setup Button or use the Reed Switch to select or wait for next selection option. If selected, a flashing **YES** confirms the selection.
6. The display now shows **De-Energized YES?**
7. Press the Setup Button or use the Reed Switch to select. The selection is acknowledged with a flashing **YES**.

Latching condition can now be set for the Clean Window Alarm.

8. The message **Latch Status** displays and then shows **Latching YES?**.
9. Press the Setup Button or use the Reed Switch to select or wait for the next selection option. If selected, a flashing **YES** confirms the selection.
10. The display now shows **Non-Latching YES?**
11. Press the Setup Button or use the Reed Switch to select. The selection is acknowledged with a flashing **YES**.
12. Repeat Steps 3 through 10 to set the Coil and Latch Status for the Smoke Alarm.

## APM FAULT

To ensure proper response, the Millennium features self-testing circuitry that continuously checks for problems. When power is applied, the system automatically begins a test to ensure proper functionality.

During normal operation, it continuously monitors the signal from the internal APM source. In addition, a "watchdog" timer is maintained to ensure the program is running correctly.

**Note:** The fault detection circuitry does not monitor any external response equipment. It is important that these devices be checked periodically to ensure they are operational.

## ALARMS

### Clean Window/Dirty Chamber

Over an extended period, oily film or particulate build-up may obscure the Infrared (IR) Smoke Detector. When dirty, the Clean Window alarm will trip, the message **Dirty Chamber** displays, the Status LED will flash fast Red and the current output will be 3.3 mA. Refer to "Sensitivity Settings" to define the clean window sensitivity and "Cleaning" for instructions on cleaning.

### Smoke Alarm

With particulate is present in the APM's chamber, the message **Smoke** displays, the Status LED will Blip Red and the current output will be 20.0 mA. If the relay has been set to **Non-Latching**, the unit will reset itself; if set to **Latching**, a Manual or Remote Reset is required to clear the alarm condition. See "Reset".

## RESET

### Remote Reset

The Millennium is capable of remote reset. A normally open Push Button Switch must be connected between the RST terminal and the COM terminal on the terminal board. If relay is set to **Latching**, a Remote Reset is possible.

### Manual Reset

If a relay is set to **Latching**, a Manual Reset is required to clear the alarm condition. Simply place and hold the Magnet against the Reed Switch or press and hold the Setup Button for 3-5 seconds. The unit will return to the normal operation.

## REVIEW RELAY SETTINGS

This is a **read-only mode**; changes cannot be made.

1. Press and hold the Setup Button or the magnet to the Reed Switch to enter the Main Menu; wait for the countdown, from 10 to 0, to end. The output current drops to 3.0 mA.
2. When **Review Relay Settings** displays press the Setup Button or use the Reed Switch to select. The flashing **YES** confirms the selection and the settings are displayed.
3. Fault alarm settings **-fixed** as normally **“Energized”** and **“Non-Latching”**. Clean Window and Smoke Alarm settings are displayed in sequence.
4. After which, the option to **Set Relay Options YES?** is given.

## NORMAL

With no particles present and no fault detected, the display reads **Clear**, Status LED will Blip/blink Green and the current output is 4.0 mA.

## OUTPUTS

### Relays

All relay outputs have Form C SPDT contacts rated 5 amperes at 30 VDC/250 Vac. Relays are dry contacts.

### Current

A 4-20 mA dc current output is used to transmit the alarm status and fault codes to other devices. This output can be wired for isolated or non-isolated operation. A 4.0 mA output indicates normal operation; a 20.0 mA output indicates that the smoke alarm threshold has been exceeded. Current output of 2.5 mA indicates the presence of a system fault. Current output of 3.3 mA indicates a build-up of particulate in the sensor’s chamber or dirty window.

## STEP 7 — MAINTAIN

### RESPONSE CHECK

It is recommended that the APM be checked and tested at least once every 3 months.

1. Spray Smoke Detector Tester™ (or equivalent product) in the direction of the sensor from a distance of two feet. Typically, a one to two second burst is adequate to initiate an alarm level.
2. The display should read **Smoke**, Status LED Blip Red and the current output 20.0 mA to indicate detection of smoke or canned contaminant.
3. After simulation, reset the alarms if latched and zero the APM in clear air free of particulates or at the accepted particulate background level for the specific application.

**Note:** The overuse of artificial smoke or spraying from too close range may impair the operation of the APM due to the accumulation of an oily film on the internal window.

## TROUBLESHOOT

The Millennium Transmitter and APM Sensor are not designed to be repaired in the field. If a problem should develop carefully check for faulty wiring. If it is determined that the problem is caused by an electronic defect, the device must be returned to the factory for repair (refer to "How to Return Equipment" for instructions).

Regular checks should be done on the unit around every 2-3 months to ensure desired operation. Refer to "Response Check" for instructions.

## CLEANING

The APM Sensor should be routinely cleaned. The frequency of cleaning will depend on the application and environment.

When the **Dirty Chamber** or **Smoke** message is displayed, the lens / window and chamber may require cleaning. Follow the steps below when cleaning.

1. Turn of power to the unit.
2. Unscrew bolts at the end of circular plate and connecting rods (OP version) or unscrew top section of housing (NOP version)
3. Using the included window cleaning kit (HDW-0061), clean the inner sides of the sensor's chamber and front side of the lens / window.
4. Ensure that there is no residue left on the lens / window.
5. Put the circular plate into position and screw in bolts at the end of the connecting rods (OP version) or fit and screw top half of housing.
6. Return power to the APM and check for normal operation.
7. Complete the Zero procedure to establish new settings.
8. If problems develop and persist, contact Net Safety Service department or refer to "How to Return Equipment".

## HOW TO RETURN EQUIPMENT

A Material Return Authorization number is required in order to return equipment. Please contact Net Safety Monitoring at **(403) 219-0688** before returning equipment or consult our Service Department to possibly avoid returning equipment.

If you are required to return equipment, include the following information:

1. A Material Return Authorization number provided over the phone to you by Net Safety.
2. A detailed description of the problem. The more specific you are regarding the problem, the quicker our Service department can determine and resolve the problem.
3. A company name, contact name and telephone number.
4. A Purchase Order, from your company, authorizing repairs or request for quote.
5. Ship all equipment, prepaid to: **Net Safety Monitoring Inc**  
**2721 Hopewell Place NE**  
**Calgary, Alberta, Canada**  
**T1Y 7J7**

6. Mark all packages: **RETURN for REPAIR**

Waybills, for shipments from outside Canada, must state:

**Equipment being returned for repair**

**All charges to be billed to the sender**

Also, please ensure a duplicate copy of the packing slip is enclosed inside the box indicating item 1-4 along with the courier and account number for returning the goods.

**All Equipment must be Shipped prepaid. Collect shipments will not be accepted.**

Pack items to protect them from damage and use anti-static bags or Aluminum-backed cardboard as protection from electrostatic discharge.

## SPARE PARTS /ACCESSORIES

**Table 4:** Part Numbering

Description	Net Safety Part Number
Magnet Assembly	Magnet-1
Window Cleaning Kit	HDW-0061
APM with Optical Protection	MLP-AR-APM-OP-SEP
Terminal Board for JB-MPNS-A/S	PCBA-0252B
316 SS Termination JBox (no switch)	JB-MPNS-S
Aluminum Termination JBox (no switch)	JB-MPNS-A
Mech. Relay Board c/w Option Board	ML7-ORL305
Option Board (mates with Relay Board)	ML7-OP100
Mech. Relay Board	ML7-RL305
APM Sensor Assembly	APM-OP-ASSY
Transmitter for MLP-APM	ML7-TX600

## Addendum: Duct Monitoring

The Net Safety Air Particle Monitor (Infrared Smoke Detector) is able to detect and monitor smoke and particulate moving at velocities up to 20 meters per second. This fact is as a result of its open path design and the use of Infrared Technology on which it is built.

### Duct Mount Applications

The APM is widely used in application requiring reliable monitoring of ducts. In such applications it is used along with Net Safety Universal Duct Mounts to detect and monitor smoke and particulate present in ducts. The APM Sensor should be placed at a distance of around five duct widths downstream from duct openings, sharp bends, branch connections or deflection plates. Always 'zero' the APM Sensor in clean ambient air prior to operating. Adjust the sensitivity setting based on the type of application and response desired.

### Duct Mount Description

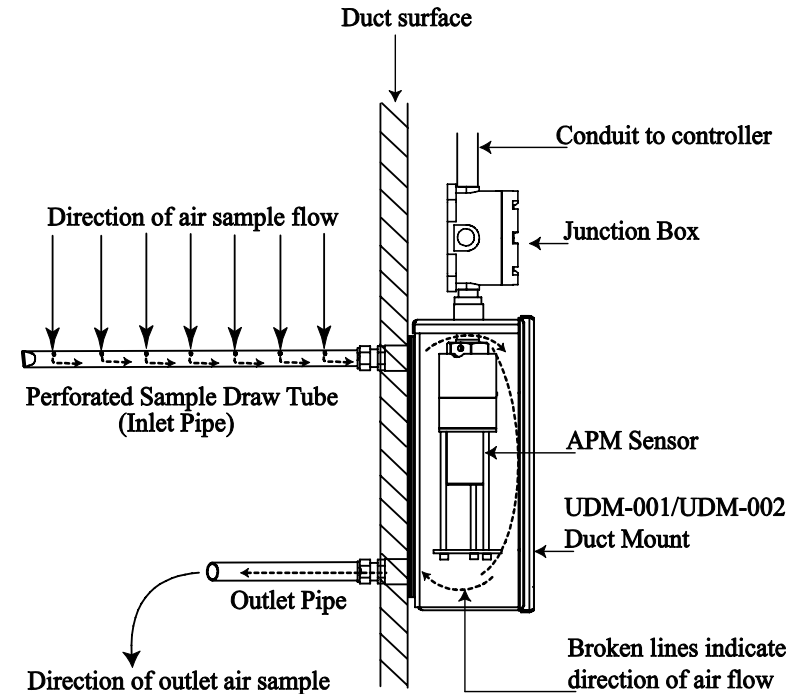
Net Safety recommends that the APM be used with the UDM-001 or UDM-002 Duct Mounts. These Duct Mounts are made with a square enclosure (chamber) which is fitted with a perforated sample draw tube (inlet pipe) and an outlet pipe. The perforated sample draw tube allows a cross sectional sample of air and /or smoke moving through a duct to be acquired and effectively monitored. The length of the sample draw tube (inlet pipe) is based on the width of the duct. The inlet pipe may be cut to the desired length on the job site prior to mounting and installation. The length of the outlet pipe is standard for all applications. See UDM-001/002 Instruction guide (MAN-0116) for more information.

### Duct Mount Air Sample Flow Principle

With the perforated sample draw tube facing the air sample flow (air stream), the sample is drawn by differential pressure into a smoke

chamber (Duct Mount enclosure) where the APM is mounted. The outlet pipe then returns the sampled air/smoke to the duct. The differential pressure should be 0.025 to 2.0 inches of water as measured by a manometer.

### Air Flow Drawing



### Maintenance

The APM Sensor should be routinely checked for dust and particulate accumulation. It should be cleaned routinely. See 'Cleaning'. Net Safety recommends that zeroing of the APM Sensor be done every 3 months. The UDM-001 or UDM-002 Duct Mount enclosure and pipes should also be routinely checked and cleaned as required. The frequency of which depends on the application.

## Appendix A: ELECTROSTATIC SENSITIVE DEVICE (ESD)

Electrostatic discharge (ESD) is the transfer, between bodies, of an electrostatic charge caused by direct contact or induced by an electrostatic field. The most common cause of ESD is physical contact. Touching an object can cause a discharge of electrostatic energy—ESD! If the charge is sufficient and occurs near electronic components, it can damage or destroy those components. In some cases, damage is instantaneous and an immediate malfunction occurs. However, symptoms are not always immediate —performance may be marginal or seemingly normal for an indefinite period of time, followed by a sudden failure.

To eliminate potential ESD damage, review the following guidelines:

- Handle boards by metal shields—taking care not to touch electronic components.
  - Wear grounded wrist or foot straps, or ESD shoes or heel grounders to dissipate unwanted static energy.
  - Prior to handling boards, dispel any charge in your body or equipment.
  - Ensure components are transported and stored in static safe packaging.
  - When returning boards, carefully package in the original carton and static protective wrapping.
  - Ensure ALL personnel are educated and trained in ESD Control Procedures.
- In general, exercise accepted and proven precautions normally observed when handling electrostatic sensitive devices.

A warning label is placed on the packaging, identifying product using electrostatic sensitive semiconductor devices.



## Appendix B: RESISTANCE (OHMS)

Distance (Feet)	AWG #20	AWG #18	AWG #16	AWG #14	AWG #12	AWG #10	AWG #8
100	1.02	0.64	0.40	0.25	0.16	0.10	0.06
200	2.03	1.28	0.80	0.51	0.32	0.20	0.13
300	3.05	1.92	1.20	0.76	0.48	0.30	0.19
400	4.06	2.55	1.61	1.01	0.64	0.40	0.25
500	5.08	3.20	2.01	1.26	0.79	0.50	0.31
600	6.09	3.83	2.41	1.52	0.95	0.60	0.38
700	7.11	4.47	2.81	1.77	1.11	0.70	0.44
800	8.12	5.11	3.21	2.02	1.27	0.80	0.50
900	9.14	5.75	3.61	2.27	1.43	0.90	0.57
1000	10.20	6.39	4.02	2.53	1.59	1.09	0.63
1250	12.70	7.99	5.03	3.16	1.99	1.25	0.79
1500	15.20	9.58	6.02	3.79	2.38	1.50	0.94
1750	17.80	11.20	7.03	4.42	2.78	1.75	1.10
2000	20.30	12.80	8.03	5.05	3.18	2.00	1.26
2250	22.80	14.40	9.03	5.68	3.57	2.25	1.41
2500	25.40	16.00	10.00	6.31	3.97	2.50	1.57
3000	30.50	19.20	12.00	7.58	4.76	3.00	1.88
3500	35.50	22.40	14.10	8.84	5.56	3.50	2.21
4000	40.60	25.50	16.10	10.00	6.35	4.00	2.51
4500	45.70	28.70	18.10	11.40	7.15	4.50	2.82
5000	50.10	32.00	20.10	12.60	7.94	5.00	3.14



## Appendix B: Resistance Table (cont'd)

Distance (Feet)	AWG #20	AWG #18	AWG #16	AWG #14	AWG #12	AWG #10	AWG #8
5500	55.80	35.10	22.10	13.91	8.73	5.50	3.46
6000	61.00	38.30	24.10	15.20	9.53	6.00	3.77
6500	66.00	41.50	26.10	16.40	10.30	6.50	4.08
7000	71.10	44.70	28.10	17.70	11.10	7.00	4.40
7500	76.10	47.90	30.10	19.00	12.00	7.49	4.71
8000	81.20	51.10	23.10	20.20	12.70	7.99	5.03
9000	91.40	57.50	36.10	22.70	14.30	8.99	5.65
10000	102.00	63.90	40.20	25.30	15.90	9.99	6.28

**Note:** Resistance is one way. This figure should be doubled when determining closed loop.

## Appendix C: SPECIFICATIONS

### APM Sensor SPECIFICATIONS

Certified Temperature Range	-40°C to 75°C (-40F to +167F)
Power Consumption	2.5W
Weight	Aluminum: 0.9 kg (2.0 lbs) / 316 SS: 1.4 kg (3.0 lbs)
Enclosure Material	Aluminum / 316 SS
Certifications	<p>CSA and NRTL/C certified for hazardous locations Class 1, Division 1 Groups B, C and D, temperature code T5. IEC Rating Ex d IIB+H2 T5, NEMA 4X ATEX model: DNV ATEX:  0575  II 2 G Ex d IIB + H2 T5 (-40°C &lt; Ta &lt; +75°C) DNV 09 ATEX 66005X</p>

### Controller (Transmitter) SPECIFICATIONS

Model	Millennium Premium Relay
Operating Temperature Range	-40°C to 85°C (-40F to +185F)
Power Consumption @ 12 VDC	Maximum 3.24W (with APM Sensor)
Power Consumption @ 24 VDC	Maximum 3.6W (with APM Sensor)
Humidity Range	0 to 100% Relative humidity, non-condensing
Operating voltage Range	10.5 to 32 VDC when measure at the controller/transmitter
Enclosure Material	Copper free Cast Aluminum / 316 SS
Weight (with APM Sensor)	Aluminum: 1.8 kg (4.0 lbs) / 316 SS : 4.2 kg (9.5 lbs)
Current Output	4-20 mA – into a maximum loop impedance of 800 Ohms at 32 VDC or 150 Ohms at 10.5 VDC Isolated or Non-Isolated loop supply.
Intrusive/Non intrusive Calibration	Yes
Certifications	CSA and NRTL/C certified for hazardous locations Class 1, Division 1 Groups B, C and D T4A, Type 4X. IEC Rating Ex d IIB T4, maximum 85°C.
	Electronics only – CSA and NRTL/C certified for hazardous locations Class 1, Division 2 Groups A, B, C and D.



Net Safety Monitoring Inc.

2721 Hopewell Place NE, Calgary, AB Canada T1Y 7J7

1-866-FIREGAS (347-3427) | ph. (403) 219-0688 | fx. (403) 219-0694

<http://www.net-safety.com> | Email: nsmsales@net-safety.com

#### PRODUCT SERVICES CONTACT INFORMATION

Telephone [ 8am - 5pm MDT ]: (403) 769-6074 | (403) 717-8219

Fax: (403) 219-0694 Email: [productservices@net-safety.com](mailto:productservices@net-safety.com)

[http://www.net-safety.com/service/product\\_services.html](http://www.net-safety.com/service/product_services.html)

