NET SAFETY MONITORING INC.

MILLENNIUM II
Toxic Gas Sensor

Ammonia (NH3) Solid State Sensor
User Manual

Model: ST371X-300-ASSY

ISO 9001:2000

QMI REGISTERED

Part Number: MAN-0092 Rev 03
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If further language translation for this manual is required please contact:

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TABLE OF CONTENTS

INTRODUCTION **5**

THE PRODUCT *5*

THE MANUAL *5*

Transmitter and sensor Housing Dimensions 6

SECTION 1: Plan **8**

1.1 Locate Sensor *8*

1.2 Sensor Non-Separated *8*

1.3 Sensor Separated *8*

SECTION 2: Installation **9**

2.1 Unpack *9*

2.2 Mount *9*

2.3 Wiring *9*

2.3.1 Field Installation 9

Earth Grounding *9*

2.3.2 Sensor Wiring 10

SECTION 3: Operation **10**

3.1 Configuration Settings *10*

3.2 Sensor Power Up *10*

3.3 Sensor Communication *11*

SECTION 4: Output **11**

4.1 Alarm and Fault Outputs *11*

4.1.1 Other Available Outputs 11

4.1.2 Modbus registers 11

SECTION 5: Maintaining **12**

5.1 Calibration Procedure *12*

5.1.1 Calibrating with the Millennium II Basic Transmitter. 12

5.1.2 Calibrating with the Millennium II Transmitter 13

5.1.3 Cross sensitivity 15

5.2 Sensor Replacement Procedure *15*

5.3 Troubleshoot *16*

5.4 Spare Parts / Accessories *16*

5.5 How to Return Equipment *17*

Appendix **18**

Appendix A: Electrostatic Sensitive Device (ESD) *18*

Appendix B: Resistance Table *19*
Appendix C: Millennium II Toxic Solid State Ammonia Sensor Specifications *20*

INTRODUCTION

The ST371 Toxic Solid State gas sensor is designed specifically for use with any Millennium II series transmitters. This state of the art "Smart" sensor is both versatile and reliable for fast, accurate and continuous monitoring of gases in extreme environments.

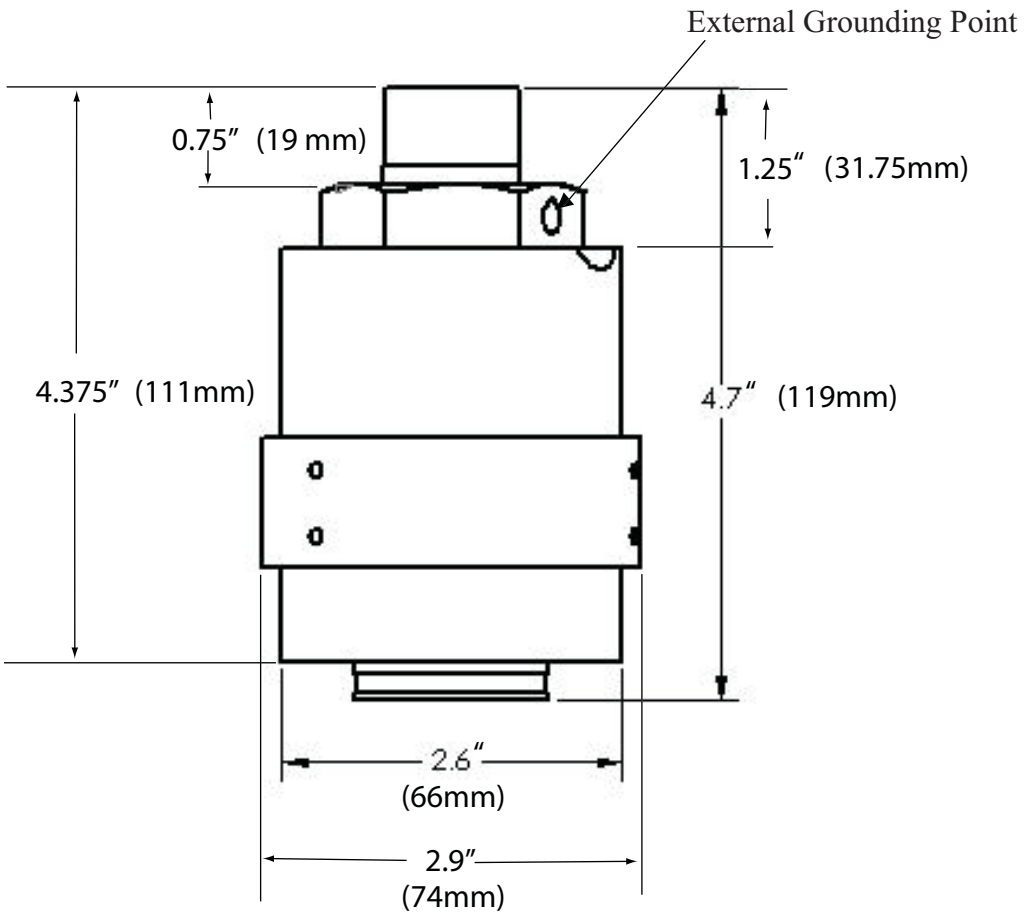
THE PRODUCT

The sensor assembly consists of a factory sealed explosion proof housing rated for hazardous locations and a replaceable toxic sensor module. This sensor is designed to only operate with the Millennium II series Transmitters. If the sensor is connected to any other model transmitters, it will not function and may result in the sensor being damaged.

THE MANUAL

This manual has been designed to ensure the sensor / detector is set-up, operated and maintained properly. If you encounter any problems, see the troubleshooting section of this manual.

Figure 1: Sensor Dimensional Drawing: Measurements are in inches and millimeters(mm).



Transmitter and sensor Housing Dimensions

The tables below give the dimensions of the Millennium II Transmitter Housing with Sensor and Millennium II Basic Transmitter with Sensor. Both transmitter housings and sensors are offered in Aluminum (AL) or Stainless Steel (SS).

Table 1: Millennium II housing and sensor dimensions (**A** through **H**) in Inches(in) and Millimeters(mm)

Millennium II transmitter housing	**A**		**B**		**C**		**D**		**E**		**F**		**G**		**H**	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
Transmitter & sensor(AL)	6.3	160	5.6	142	5.4	137	9.7	246	6.0	152	5.7	145	2.6	66	2.9	74
Transmitter & sensor(SS)	5.9	150	5.1	130	4.6	117	8.9	226	6.0	152	5.8	147	2.6	66	2.9	74

Table 2: Millennium II Basic housing and sensor dimensions (**A** through **J**) in Inches and Millimeters

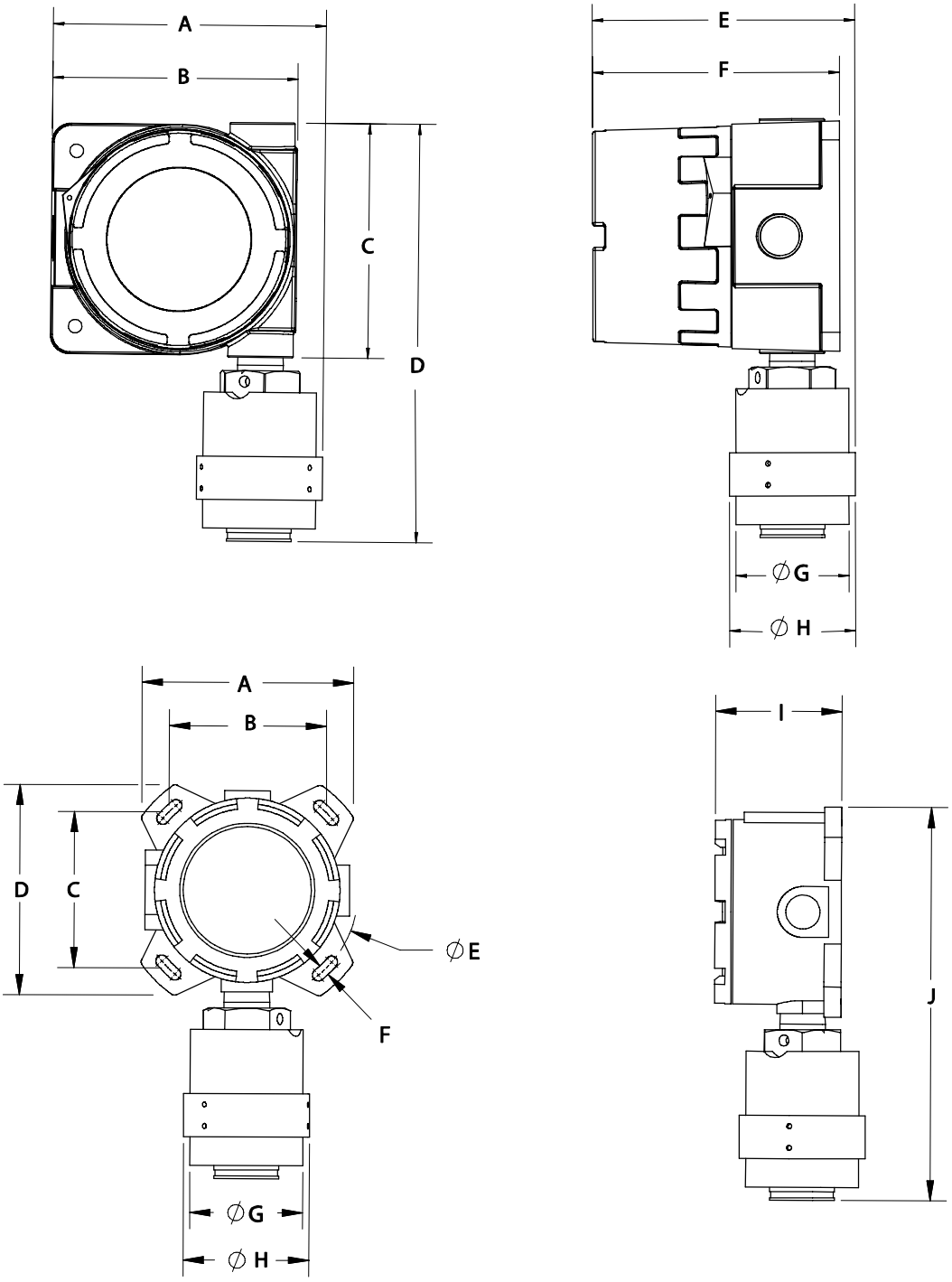
Millennium II Basic & sensor	**A**		**B**		**C**		**D**		**E**		**F**		**G**		**H**	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
Transmitter & sensor(AL)	4.8	122	3.6	91	3.6	91	4.8	122	5.1	130	0.3	7.6	2.6	66	2.9	74
Transmitter & sensor(SS)	4.7	119	3.6	91	3.6	91	4.7	119	5.1	130	0.3	7.6	2.6	66	2.9	74

Table 2(cont'd)

Millennium II Basic & sensor	**I**		**J**	
	in	mm	in	mm
Transmitter & sensor(AL)	3.0	76	9.0	229
Transmitter & sensor(SS)	2.8	71	8.9	226

Figure 2 below, shows the dimensions of the Millennium II transmitter with sensor and the Millennium II Basic transmitter with sensor.

Figure 2: Sensor with Millennium II series transmitter dimensional drawing



SECTION 1: Plan

1.1 Locate Sensor

Prior to the installation process, a location plan for placing the sensor should be developed. Although there are no absolute rules determining the quantity of detectors or location of a sensor, the following points should be considered when planning the installation.

- Carefully locate the sensor in an area where gases may potentially accumulate. (Remember, light gases tend to rise and heavy gases tend to accumulate in low areas).
- Use redundant systems to enhance protection and reliability.
- Consider the air movement patterns within the facility.
- Consider the construction of the facility such as trenches where heavy gases or peaks where light gases, may accumulate.
- Seek advice from experts knowledgeable about the primary gas to be detected.
- Use common sense and refer to the regulatory publications that discuss guidelines for your industry.

1.2 Sensor Non-Separated

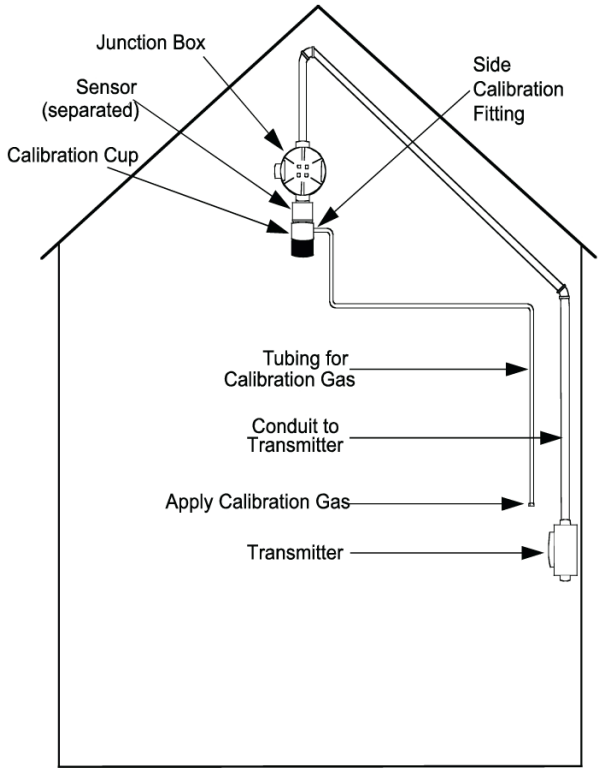
The sensor is attached directly to a transmitter and located in the appropriate location for detecting the gas in question.

Figure 3: Locating Sensor

1.3 Sensor Separated

Locate the sensor separate from a transmitter using a 'junction box / separation kit'. The transmitter is located near eye-level for easy access and the sensor is located where the gas is likely to accumulate. A calibration cup is clipped onto the bottom of the sensor housing and the calibration tubing is attached to the calibration cup and runs to a convenient place for applying calibration gas eliminating the need to access the sensor directly.

To compensate for distance when remotely calibrating, in separation orientation, decrease the tubing diameter or increase the calibration gas flow rate between the gas canister and sensor. On initial install, always confirm tubing run is not affecting calibration. Calibrate the sensor using tubing run and then confirm readings directly at sensor by applying calibration gas and comparing the output results. They should be accurate to the calibration gas concentration used.



SECTION 2: Installation

2.1 Unpack

Carefully remove all the components from the packaging and check them against the enclosed packing list. Inspect all components for any obvious damage such as broken or loose parts. If you find any components missing or damaged, notify the representative or Net Safety Monitoring immediately.

2.2 Mount

The sensor is mounted directly to either transmitter housing or to a separation junction box housing through the ¾" NPT conduit entry. Both the transmitter and separation kit housings have mounting holes to allow mounting to wall or pole as desired. Mounting kit hardware is required when mounting to a pole.

2.3 Wiring

2.3.1 Field Installation

Warning ⚠ Wiring codes and regulations may vary. ATEX requires that supply connection wiring must be rated at least 5°C above the maximum ambient temperature of 85°C. Wiring must comply with all applicable regulations relating to the installation of electrical equipment in a hazardous area and is the responsibility of the installer. If in doubt, consult a qualified official before wiring the system.

Guidelines

When separating the sensor from the transmitter, the use of shielded cable is highly recommended for sensor wiring to protect against interference caused by extraneous electrical or electromagnetic 'noise'. To meet IEC 61000-1, IEC 61000-4 EMI and MIL-W16878D Type B/N, Multi-Conductor Braid Shield Cable is recommended.
In applications where the wiring is installed in conduit, the conduit must not be used for wiring to other electrical equipment.
The maximum distance between the sensor and transmitter is limited by the resistance of the connecting wiring, which is a function of the gauge of the wire being used. We limit 2000 ft with 16 AWG wire for communication.(See Appendix B)

Earth Grounding

An external ground is required. One method is to connect the external ground to the grounding point on the housing. See Figure 1 for location.

Conduit Entry Protection

The sensors can be mounted directly onto a certified transmitter via the ¾" NPT nipple through which lead wires are used for connection or separately with the use of certified junction boxes.

2.3.2 Sensor Wiring

Warning ⚠ Do not open the transmitter in a classified area (Do not open when an explosive atmosphere may be present). Ensure the power to the transmitter is switched off before connecting sensor wires.

Warning ⚠ Avoid touching electronic components, as they are susceptible to electrostatic discharge (ESD). Refer to Appendix A, "Electrostatic Sensitive Device (ESD)".

Connect the colored sensor wires to the sensor terminals in the applicable transmitter. Refer to the Table 3 for sensor terminal definitions.

Table 3: Sensor Terminal Definitions of Millennium II Transmitters

Sensor Terminals	Sensor Wire	White	Red	Blue	Black	Green
	Marked	+VDC	Sig A	Sig B	COM	Shld
	Function	10.5 - 32VDC	A	B	Common/Supply ground	Earth Ground

NOTE: When separating sensor from transmitter using **Net Safety separation kit, refer to Multi-purpose Junction Box Manual (MAN-0081)** for terminal designations. Always ensure that the transmitter is supplying the required voltage to the sensor terminals inside the junction box. Refer to table above for sensor voltage requirements.

SECTION 3: Operation

3.1 Configuration Settings

All configuration settings are accessed through the Millennium II series transmitter. This is done by setting dip switches or accessing Modbus Registers depending on the model Millennium II Basic Transmitter. When using the Millennium II Transmitter, settings are accessed by selecting menu options. This sensor has selectable ranges of 50, 100 and 300 PPM. Its default range/upper limit is 300 PPM. Refer to 5.1.1: Calibrating with the Millennium II Basic Transmitter and 5.1.2: Calibrating with the Millennium II Transmitter for information on changing the sensor's range/upper limit.

3.2 Sensor Power Up

When power is applied to the sensor from the controller, a power up routine will begin, where the sensor is being automatically tested to ensure proper functionality. The start- up time for the Solid State sensors is typically 12 to 15 minutes. Refer to applicable Millennium II transmitter manual for status indications during this period. This sensor should be powered up (warmed up) for at least 48 hours prior to the first calibration. Prior to commissioning and during routine calibrations, the sensor should be calibrated at the average operating temperature.

3.3 Sensor Communication

The ST371 sensor uses a proprietary protocol to communicate to the Millennium II transmitter series. The sensor should never be connected to any device other than the Millennium II series transmitters. Selected dip switches and menu options are communicated to the sensor by the transmitter. These configurations are stored in the sensor's memory. If the configuration settings are not done correctly, the sensor will not communicate properly with the transmitter.

SECTION 4: Output

4.1 Alarm and Fault Outputs

Sensor alarm and fault outputs are a generated by the Millennium II transmitter series based on communication with the sensor, however, some output values, registers, etc, may vary depending on sensor type.

4.1.1 Other Available Outputs

All available outputs are associated with the Millennium series transmitters. These outputs are: Current output, Relay Output, RS 485 Modbus (RTU) Output and HART Communication Output. Refer to the specific Millennium II series transmitter manual for more information.

4.1.2 Modbus registers

Table 4 below shows the user accessible Modbus registers and meaning.

Table 4: Modbus registers and meaning

Reg #	Meaning	Readable	Writeable
40001	Concentration value as calculated by sensor	X	
40002	Sensor status	X	
40003	Sensor Temperature	X	
40027	Sensor Range	X	X
40101	Resets the sensor		X
40102	Initialize zero & span *(**to calibrate sensor, enter channel #)***		X
40104	Zero only *(**to zero sensor, enter channel #)***		X

* **Note**: For the Millennium Basic transmitter enter '1' in register 40102 to calibrate the sensor and '1' in register 40104 to Zero the sensor.

SECTION 5: Maintaining

5.1 Calibration Procedure

Always allow this sensor to warm up for at least 48 hours prior to the first calibration. The sensor should be calibrated at the average operating temperature.

There are specific steps to be followed when calibrating with the Millennium II Basic or the Millennium II transmitter. These steps should be followed if accurate results are to be obtained. The calibration of Solid State sensors requires the presence of oxygen. **An air balance calibration gas should be used for calibration**, otherwise this sensor will not calibrate properly. It is recommended that this sensor be calibrated every month to ensure proper functioning. Calibrations should be performed at the average operating temperature.

5.1.1 Calibrating with the Millennium II Basic Transmitter.

When using the **Solid State Ammonia sensor with the Millennium II Basic Digital Transmitter Model**, the sensor's range can be changed by accessing a specific Modbus Register. The user should write to register 40027 using the preset single register command 0x06. The desired range can then be entered in the register. The ranges available for entry to the Modbus Register are 50, 100 and 300.

When using the **Solid State Ammonia sensor with Millennium II Basic Analog, Analog HART and Relay Transmitter Models**, the sensor's range can be 'changed' to facilitate the need to accurately detect different gas concentrations. This is done by making use of the transmitter's DIP Switch 2 positions as seen in Table 5 below. First select the transmitter's DIP Switch 2 position that gives the range of Ammonia gas to be detected, **then use 50% span of the Ammonia gas to calibrate**. See example, Table 5 and Full Calibration / Normal Calibration Procedure below. If calibration is not successful perform a manual reset. See Millennium II Basic Manual (MAN-0082) for manual reset.

Example: If Ammonia gas below and up to 50 ppm is to be detected, and the sensor has a range of 300ppm, DIP Switch 2 position 1 should be "ON" and positions, 2, 3, 4 "OFF" which corresponds to Range 1 (50ppm), as seen in Table 5 below. The sensor is then calibrated using 25 ppm ammonia gas.

Table 5: Transmitter DIP Switch positions/combinations

DIP Switch 2				
Position 1	Position 2	Position 3	Position 4	Range(Setting)
OFF	OFF	OFF	OFF	**default(factory)setting**
ON	OFF	OFF	OFF	Range 1 (**50ppm**)
OFF	ON	OFF	OFF	Range 2 (**100ppm**)
OFF	OFF	ON	OFF	Range 3 (**300ppm**)
OFF	OFF	OFF	ON	Range 4 (**Not used**)
ON	ON	ON	ON	Range 5 (**Not used**)

If the sensor's range is setup correctly as desired, follow the steps below for Full Calibration / Normal Calibration Procedure.

Millennium II Basic Transmitter Normal Calibration Procedure:

1. Confirm successful power up of Transmitter, (green blip/blink of status LED every second: no fault indicated).
2. Bypass any output alarms (recommended).
3. For analog model connect a standard current meter to the Transmitter's Test Jacks (not required but gives visual confirmation).
4. Press and hold the "**push button**" (or activate the "**Reed switch**" using the magnet) for at least 15 seconds, the status LED flashes green fast, and then goes solid green (first solid green). Keep holding "**push button**" or magnet, after which, status LED goes solid red, release "**push button**" or remove magnet.
5. When the current output is 3 mA (indicated by analog models) and the Status LED is once again solid green (second solid green), apply zero gas (clean air).
6. **Recommendation**: Flow ZERO AIR at a rate of 0.5 liter per minute or more to the sensor.
7. When the current output is 3.3 mA(indicated by analog models) and the Status LED is flashing red, apply specific calibration gas (50% of full span).
8. Flow span gas at a rate of 0.5 liter per minute to the sensor for direct sensor calibrations. If separated and using long tubing runs increase gas flow rate(1.0 liter per minute) to ensure tubing does not affect calibration results.
9. When the current output is 3.6 mA (indicated by analog models) and the Status LED is solid green, remove the gas.
10. Apply zero gas, (clean air), again to purge the system.
11. After the sensor is purged of gas, the detector will return to normal operation.

Note: When calibrating with the **Millennium II Basic Transmitter always use 50% span gas (half the scale)**. Calibration gas **MUST** be air balanced for this sensor. Calibration instructions are also accessed using the HART Communicator with the Analog/HART model transmitter. For HART Menu Structure/Tree see Millennium II Basic transmitter manual (MAN-0082).

5.1.2 Calibrating with the Millennium II Transmitter.

The need to accurately detect different concentrations of gases is facilitated by using the Millennium II Transmitter. If the range of the sensor needs to be changed, enter the '*sensor upper limit'* option in the transmitter's menu and select the desired range of concentration of gas to be detected. Refer to the steps below for changing the sensor's range.

1. Enter the Main menu, first by pressing any key to get the *"enter main menu"* prompt, then press ***menu button 1***(***Reed switch 1***) to select *"yes"***.**

2. Select the up arrow key ***menu button 1*** (***Reed switch 1)*** or down arrow key ***menu button 2(Reed switch 2)***, until *"Sensor Upper Limit (Range)"*option is displayed.

3. Select the enter key (press ***Menu button 3*** or select ***Reed switch 3***).

4. Select the Channel (sensor) you wish to adjust. If channel 1's sensor range is to be adjusted select the enter key for Channel 1(***Menu button 3*** or ***Reed switch 3***), if not, scroll down using the down arrow key

(***Menu button 2*** or ***Reed switch 2***) followed by the enter key (***Menu button 3*** or ***Reed switch 3***) for Channel 2.

5. Select the up-down arrow keys (***Menu button 1*** and ***2*** or ***Reed switch 1***and ***2***) to find the desired upper limit (the sensor will provide you with the choices). **Note:** If no selections appear when pressing the up/down arrow keys at this stage, the sensor only has one upper limit, which cannot be altered.

6. Select the enter key (***Menu button 3*** or ***Reed switch 3***) when the desired value is reached.

7. To exit to the main menu, selecting *"Exit"* at each previous option and use the enter key to confirm the selection. Proceed to calibration procedure.

Millennium II Transmitter Normal Calibration Procedure:

If the sensor's upper limit (Range) is setup correctly as desired, follow the steps below for Full Calibration / Normal Calibration Procedure. **Always use 50% span (half the scale) Ammonia gas when calibrating this sensor**. Note that if a calibration is not successful the message *"Span failed"* will be displayed and a manual reset will have to be initiated. Refer to Millennium II Transmitter manual (MAN-0076) for manual reset.

1. Enter the main menu, first by pressing any key to get the *"enter main menu"* prompt, then press/select ***menu button 1***or ***Reed switch 1*** to select *"yes"***.**

2. When *"Calibrate Sensor?"* is displayed, select the enter key (***menu button 3*** or ***Reed switch 3***).

3. When *"Calibrate Sensor #1?"* is highlighted, press the enter key (***menu button 3*** or ***Reed switch 3***) if this is the sensor to be calibrated.

4. If Sensor #2 is to be calibrated, select the down arrow key (***menu button 2*** or ***Reed switch 2***) to scroll to *"Calibrate Sensor #2?"*

5. Select the desired sensor to be calibrated (1 or 2) by activating the enter key (***menu button 3*** or ***Reed switch 3)***.

6. Select *"YES"* (***menu button 1*** or ***Reed Switch 1***) to confirm the selection.

7. Apply clean air when *"Apply Clean Air"* is displayed, then select *"Z & Span"* using (***menu button 1*** or ***Reed Switch 1***) for normal calibration. *"Setting zero"* will be displayed as the sensor is being zeroed. (Ensure no contaminant gases are around if ambient air is being used).

8. Apply 50% calibration gas when prompted.

9. The display will show *"Spanning"* with the gas value (PPM) as the gas is detected.

10. Remove the calibration gas when *"Remove Cal Gas"* is displayed.

11. *"Cal Complete"* will be displayed when calibration is complete.

12. Apply zero gas (clean air) to purge system.

Note: Calibration gas **MUST** be air balanced. Calibration instructions are also accessed using the HART Communicator with the single channel Millennium II Transmitter model.

5.1.3 Cross sensitivity

This relates to the fact that certain compounds and or gases can cause a reaction and hence some effects or response from the sensor. Methanol of a concentration of 300 ppm will give a response equivalent to 40 ppm Ammonia, Isobutylene of a concentration of 300 ppm will give a response equivalent to 5 ppm Ammonia and Methane of a concentration of 500 ppm will give a response equivalent to 5 ppm Ammonia. For more information, please contact the manufacturer.

5.2 Sensor Replacement Procedure

When a calibration can no longer be performed or the sensor is not operating properly it will require replacing.

To replace the sensor module:

1. Remove power from sensor.
2. Remove the locking ring by loosening the set crews with Allen Key tool.
3. Remove the bottom part of the sensor housing by turning in a counter clockwise rotation to expose sensor module.
4. Using the Teflon pull tab pull sensor straight down out of the sensor housing until sensor is completely removed from the housing.
5. Align replacement sensor with pins inside top section of the housing and push on outer plastic ring until sensor is seated properly. DO NOT PUSH ON CENTER ELEMENT.
6. Install and tighten the bottom part of the sensor housing by turning in a clockwise rotation.
7. Install the locking ring by tightening the set crews with Allen Key tool.
8. Restore power to sensor.

5.3 Troubleshoot

Sensors and Controllers / Transmitters are not designed to be repaired in the field. If a problem should develop, first check for faulty wiring, confirm proper voltage to detector, and attempt a calibration. If the problem persists, please contact Net Safety's Service Department first by phone to try and resolve the issue. If the issue cannot be resolved, please follow the procedure below on how to return equipment.

5.4 Spare Parts / Accessories

Table 6: Available Spare Parts

Description	Net Safety Part Number
Calibration Cup / Splash Guard	CCS-1
Separation Kit	JB-MPD-A (aluminum) or JB-MPD-S (316 stainless steel)
Dust Filter Assembly	DSC-1
Replacement Toxic Solid State Ammonia(NH3) Sensor	ST371-300

5.5 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 correct 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**.
7. Waybills, for shipment outside Canada, must state: **Equipment being returned for repair**
   All charges to be billed to the sender

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.

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

ALL equipment must be shipped prepaid. Collect shipments will not be accepted.

Appendix

Appendix A: Electrostatic Sensitive Device (ESD)

Definition: 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, ESD shoes or heel grounders to dissipate unwanted static energy.
- Prior to handling boards, dispel any charge in your body or equipment.
- Ensure all 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 Table

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
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

Resistance shown is one way. This figure should be doubled when determining closed loop resistance.

Appendix C: Millennium II Toxic Solid State Ammonia Sensor Specifications

SENSOR	Toxic Solid State Ammonia		
Performance			
Response Time	50 PPM range	100 PPM range	300 PPM range
	T20 ≤ 8.3 seconds T50 ≤ 24.3 seconds	T20 ≤ 10.4 seconds T50 ≤ 20.3 seconds	T20 ≤ 8.4 seconds T50 ≤ 15.1 seconds
Accuracy	+/- 5ppm or 10% of reading, whichever is greater		
Zero Drift	2ppm Full scale over 6 month		
Repeatability	+/- 2ppm or 5% Full Scale, whichever is greater		
Environmental			
Temperature	Operational (-40°C to +65°C) Certified (-40°C to +60°C)		
RH	0 – 90% RH non condensing		
Metallurgy	Aluminum or 316 SS		
IP / Nema Rating	IP64 / NEMA 4X		
Separation			
Separation	Up to 2000 feet / 600 meters		
Approvals			
Approvals	FM C US APPROVED Class I, Div1, Grps BCD; Zone 1, AEx/Ex d IIB+H2, T5, IP64 -40°C < Ta < +50°C. ISA-92.03.01 FM ATEX . CE 0575 Ex II 2G, EEx d IIB+H2, T5, IP64		

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