

# Technical Note

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## EC-FX NH<sub>3</sub> Sensor Installation and Calibration Procedure for replacement of M-507975 Sensor in an EC-F9/F2.

This is a one-time procedure for installing a new EC-FX NH<sub>3</sub> sensor into an EC-F9/F2 that was originally setup with an M-507975 ammonia sensor for 100ppm, 200ppm, or 250ppm NH<sub>3</sub>.

Note: The EC-FX sensor will be more sensitive than the M-507975; therefore the gain pot must be lowered near where the span would be @ 100/250ppm NH<sub>3</sub> for a 20mA output otherwise the “zero” will not be near 4mA. This would cause an initial “zero” to look too high when the sensor is installed causing extreme settling times and false alarms. A one-time zeroing step is necessary when an M-507975 sensor is replaced with an EC-FX for an initial one-time adjustment before a final calibration can be performed.

### FOR AN EC-F9 NH<sub>3</sub> INSTALLATION:

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1. Remove the old M-507975 Sensor.
2. Place the unit in factory calibration mode by pressing the button for 10 seconds or until the green LED flashes fast, or for units equipped with an LCD option, unplug the LCD ribbon cable from the main board (same board the sensor is connected to). This allows functionality of the onboard button.
3. Adjust the Span pot down around 5 to 30 turns counter clockwise until a faint clicking sound occurs. This should be the lowest gain setting.
4. Then turn the span pot 4 full turns up clockwise.
5. Ensure there is NOT a sensor electrically connected to the EC-F9.
6. Press the button 8 times quickly without pausing between presses; the yellow LED should blink slowly for 2 min. If the yellow LED doesn't turn on, the button press timing was too erratic, try the 8 time button press again until the yellow LED blinks slowly.

Note: If at any time in step 6, all three LEDs slowly blink simultaneously, then the 4-20mA calibration was initiated accidentally because the button presses were too slow or not consistent. To exit this mode, press the button for 1s until the unit reverts back to “run” mode, or when the LEDs stop blinking and the Green LED is on solid. The unit will have to be placed back in factory calibration mode and step 8 will have to be repeated.

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7. After the yellow LED turns off, check the mA output and ensure it is  $4\text{mA} \pm 0.05\text{mA}$ .

Note: If the mA reading is not in range, the 4-20mA output may need to be re-calibrated.

To re-calibrate the mA loop output:

Press button 5 times. All 3 LED's should blink slowly simultaneously and in sync. Adjust the 4-20 mA output to  $4.0\text{ mA} \pm .02\text{ mA}$ . This is accomplished by double-pressing the button quickly in .5 second intervals. If the double-press interval is too fast, the output will not change. This delay allows the output to stabilize before a disposition is reached for each button press. The 4–20 mA output will increase by .01 mA steps for each double-press up to about 4.2 mA, and then begin a round-robin increment starting from about 3.7 mA. Should there be overshooting on this adjustment, simply continue to double-press the button until the range ramp reduces to  $\approx 3.7\text{ mA}$ . Then, double-press the button the appropriate number of times to increase the mA output once again until a solid  $3.95\text{ mA}$  to  $4.05\text{ mA}$  output is reached. Once complete, press and hold the button until just the green LED is on solid. This will exit out of the mA adjustment mode. The unit must be placed back into Factory Calibration mode before proceeding to the next step. (Pressing the button for 10 seconds or until the green LED flashes fast.)

8. Connect the EC-FX 100/250 LT sensor electrically to the EC-F9.

9. Wait until the output reaches a stable  $4\text{mA} \pm 0.5\text{mA}$ , this could take upwards of 5 to 10 min. depending on the temperature, environment, and ambient air flow.

Note: Keep hands away from the sensor in order for a stable output to be achieved, as moisture and air flow can affect stability.

10. Place the EC-FX calibration adaptor on the sensor by ensuring it is fully-seated and aligned. Gas with full-scale span gas  $\text{NH}_3$  mixed in AIR @ 0.3 L/min. until the 4-20mA output signal rise appears to slow down to around 0.1mA/sec. If the output signal rises above 20mA, immediately begin adjusting span pot to lower mA output signal as maximum output is 26mA. The rise in 4-20mA output signal will begin to slow down around 10 to 30 seconds after gas is applied as it begins to approach a peak value. Turn the span pot until output reaches  $20\text{mA} \pm 0.5\text{mA}$  ( $200\text{mV} \pm 5\text{mV}$ ) even though the signal may be slowly changing, then remove the calibration adaptor and shut off the gas. Do not gas the sensor for more than 2.5 minutes. If the mA output signal begins to drop quickly during the gassing phase, (0.2mA/sec.) too much gassing time has passed and the process will need to be repeated.

Critical Note: Make sure the calibration gas flow is in the direction of the arrow shown on the EC-FX calibration adaptor. Ensure the tubing from the regulator is connected to the "Inlet port" side of the EC-FX adaptor according to the air flow direction arrow molded into the plastic housing (Inlet side)  $\circ \rightarrow \circ$  (Exit port side).

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Note: The rise in 4-20 mA output signal will typically begin to slow down around 30 seconds after gas is applied as it approaches a peak value. If the 4-20 mA signal peaks then begins to drop, quickly adjust the span pot to  $20\text{ mA} \pm 0.5\text{ mA}$ . Do not gas for more than 2.5 minutes! If a signal peak is not reached within 2 minutes, the sensor may need additional time to stabilize, the adaptor may not be properly seated on the sensor with the O-ring, or there may be other issues specific to the site or the application.

Note: In some cases, the signal may begin to drop quickly after it peaks, try your best to adjust the span pot until the output reaches  $20\text{ mA} \pm 0.5\text{ mA}$  even though the signal may begin to drop.

11. Remove the calibration adaptor and shut off the gas.
12. Unplug the sensor electrically from the EC-F9 and ensure the mA output is  $4\text{ mA} \pm 0.08\text{ mA}$ . If the output is out of this range, perform "Internal Zero" step #6 again then plug the EC-FX sensor back into the EC-F9.
13. Ensure output decays to a stable  $4\text{ mA} \pm 0.2\text{ mA}$ , this should take about 5 to 15 min.
14. Press the button for 2s to place the unit back into run mode. Green LED on solid.
15. The unit is now ready for operation.

### FOR AN EC-F2 NH<sub>3</sub> INSTALLATION

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1. Remove the old M-507975 Sensor
2. Adjust span pot down around 30 turns counter clockwise sometimes a faint clicking sound will occur when the pot is at the minimum. This should be the lowest gain setting.
3. Then turn the span pot 5 full turns up clockwise.
4. Adjust the "Zero" POT until the 4-20mA output is  $4\text{ mA} \pm 0.02\text{ mA}$
5. Connect the EC-FX 100/250 LT sensor electrically to the EC-F2.
6. Wait until the output reaches a stable  $4\text{ mA} \pm 0.15\text{ mA}$ , this could take upwards of 5 to 10 minutes depending on the temperature, environment, and ambient air flow.

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Note: Keep hands away from the sensor in order for a stable output to be achieved, as moisture and air flow can affect stability.

7. Place the EC-FX calibration adaptor on the sensor by ensuring it is fully-seated and aligned. Gas with full-scale span gas  $\text{NH}_3$  mixed in AIR @ 0.3 L/min. until the 4-20mA output signal rise appears to slow down to around 0.1mA/sec. If the output signal rises above 20mA, immediately begin adjusting span pot to lower mA output signal as maximum output is 30mA. The rise in 4-20mA output signal will begin to slow down around 10 to 30 seconds after gas is applied as it begins to approach a peak value. Turn the span pot until output reaches  $20\text{mA} \pm 0.5\text{mA}$  ( $200\text{mV} \pm 5\text{mV}$ ) even though the signal may be slowly changing, then remove the calibration adaptor and shut off the gas. Do not gas the sensor for more than 2.5 minutes. If the mA output signal begins to drop quickly during the gassing phase, (0.2mA/sec.) too much gassing time has passed and the process will need to be repeated.

Critical Note: Make sure the calibration gas is in the direction of the arrow shown on the EC-FX calibration adaptor. Ensure the tubing from the regulator is connected to the "Inlet port" side of the EC-FX adaptor according to the air flow direction arrow molded into the plastic housing  
(Inlet side)  $\circ \rightarrow \circ$  (Exit port side).

Note: The rise in 4-20 mA output signal will typically begin to slow down around 30 seconds after gas is applied as it approaches a peak value. If the 4-20 mA signal peaks then begins to drop, quickly adjust the span pot to  $20\text{mA} \pm 0.5\text{mA}$ . Do not gas for more than 2.5 minutes! If a signal peak is not reached within 2 minutes, the sensor may need additional time to stabilize, the adaptor may not be properly seated on the sensor with the O-ring, or there may be other issues specific to the site or the application.

Note: In some cases, the signal may begin to drop quickly after it peaks, try your best to adjust the span pot until the output reaches  $20\text{mA} \pm 0.5\text{mA}$  even though the signal may begin to drop.

8. Remove the calibration adaptor and shut off the gas.
9. Unplug the sensor electrically from the EC-F2 and ensure the mA output is  $4\text{mA} \pm 0.03\text{mA}$ . If the output is out of this range, adjust the "Zero" pot again until mA output is  $4\text{mA} \pm 0.02\text{mA}$  then plug the EC-FX Sensor back into the EC-F2.
10. Ensure output decays to a stable  $4\text{mA} \pm 0.2\text{mA}$ , this should take about 5 to 15 min.
11. Unit is now ready for operation.

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## Field Calibration Procedure for an existing EC-FX NH<sub>3</sub> Sensor.

The following procedure is designed for calibration of an EC-FX or an EC-F9/F2 to 100ppm, 200ppm, or 250ppm ammonia (NH<sub>3</sub>). This procedure assumes familiarity with calibration of an EC-F9/F2. For additional detail, refer to the appropriate user manual.

### FOR AN EC-FX/EC-F9 NH<sub>3</sub> CALIBRATION:

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1. Place the unit in calibration mode by pressing the button for 3 seconds until the green LED flashes slowly, or for units equipped with an LCD option, initiate the calibration mode using the front panel push buttons.

Note: Unit will automatically revert back to run mode in 10 min.

2. Ensure the 4-20mA output is a stable 4mA  $\pm$  0.5mA. If it isn't, wait to ensure the signal stabilizes. In some cases, opening doors changes the temperature, environment, and ambient air flow to the sensor which impacts its stability during this procedure.

Note: Keep hands away from the sensor in order for a stable output to be achieved, as moisture and air flow can affect stability.

3. Place the EC-FX calibration adaptor (EC-FX-CA) on the sensor and ensure it is fully-seated and aligned. Gas with full-scale span gas NH<sub>3</sub> mixed in AIR @ 0.3 L/min until the 4-20mA output signal rise appears to slow down to around 0.1mA/sec. When the output signal rises above 20mA, immediately begin adjusting span pot counter clockwise to lower mA output signal as maximum output is 26mA. The rise in 4-20mA output signal will begin to slow down around 10 to 30 seconds after gas is applied as it begins to approach a peak value. Turn the span pot until output reaches 20mA  $\pm$ 0.5mA (200mV  $\pm$  5mV) even though the signal may be slowly changing. Remove the calibration adaptor and shut off the gas. Do not gas the sensor for more than 2.5 min. If the mA output signal begins to drop quickly during the gassing phase, (0.2mA/sec.) too much gassing time has passed and the process will need to be repeated.

Critical Note: Make sure calibration gas flow is in the direction of the arrow shown on the EC-FX calibration adaptor. Ensure the tubing from the regulator is connected to the "Inlet port" side of the EC-FX adaptor according to the air flow direction arrow molded into the plastic housing

(Inlet side) ○→○ (Exit port side).

Note: The rise in 4-20 mA output signal will typically begin to slow down around 30 seconds after gas is applied as it approaches a peak value. If the 4-20 mA signal peaks then begins to drop, quickly adjust the span pot to 20 mA $\pm$ 0.5 mA. Do not gas for more than 2.5 minutes!

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If a signal peak is not reached within 2 minutes, the sensor may need additional time to stabilize, the adaptor may not be properly seated on the sensor with the O-ring, or there may be other issues specific to the site or the application.

Note: In some cases, the signal may begin to drop quickly after it peaks, try your best to adjust the span pot until the output reaches  $20\text{mA} \pm 0.5\text{mA}$  even though the signal may begin to drop.

Note: For an EC-FX sensor with the LCD option, once cal mode is initiated, "Apply gas" will show on the display. Once cal gas begins to flow, a 2 minute reference timer will indicate when the sensor has reached the maximum allowed gassing time. If the signal has not peaked or slowed down to  $0.1 \text{ mA/sec.}$  within this time, the sensor may be defective as indicated in the above notes. After 2 minutes of gassing has occurred, the display will indicate "Spansnr". If the sensor is not ready to span or peaked in signal level when the "Spansnr" is shown on the display, the sensor may need additional time to stabilize or the adaptor may not be properly seated on the sensor. If the sensor was able to span within the 2 minute time period, this mode can be exited at any time by pressing the "scroll" then "accept" button.

4. Remove the calibration adaptor and shut off the gas.
5. Ensure the output decays to a stable  $4\text{mA} \pm 0.2\text{mA}$ , this should take about 5 to 15 minutes.
6. Press the button for 2 seconds to place the unit back into run mode. Green LED on solid, or for units the LCD option, exit out of calibration mode using the front panel push buttons.
7. Unit is now ready for operation.

### **FOR AN EC-F2 NH<sub>3</sub> INSTALLATION**

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1. Ensure the output is a stable  $4\text{mA} \pm 0.15\text{mA}$ . It may take about 5 min to ensure the signal stabilizes as in some cases, opening door changes the temperature, environment, and ambient air flow to the sensor.

Note: If the output doesn't stabilize in this range, unplug the sensor electrically from the EC-F2 and adjust the "Zero" pot until mA output is  $4\text{mA} \pm 0.02\text{mA}$  then plug the EC-FX sensor back into the EC-F2.

Note: Keep hands away from the sensor in order for a stable output to be achieved, as moisture and air flow can affect stability.

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2. Place the EC-FX calibration adaptor on the sensor and ensure it is fully-seated and aligned. Gas with full-scale span gas  $\text{NH}_3$  mixed in AIR @ 0.3 L/min. until the 4-20mA output signal rise appears to slow down to around 0.1mA/sec. If the output signal rises above 20mA, immediately begin adjusting span pot counter clockwise to lower mA output signal as maximum output is 30mA. The rise in 4-20mA output signal will begin to slow down around 10 to 30 seconds after gas is applied as it begins to approach a peak value. Turn the span pot until output reaches  $20\text{mA} \pm 0.5\text{mA}$  ( $200\text{mV} \pm 5\text{mV}$ ) even though the signal may be slowly changing, then remove the calibration adaptor and shut off the gas. Do not gas the sensor for more than 2.5 minutes. If the mA output signal begins to drop quickly during the gassing phase, (0.2mA/sec.) too much gassing time has passed and the process will need to be repeated.

Critical Note: Make sure the calibration gas flow is in the direction of the arrow shown on the EC-FX calibration adaptor. Ensure the regulator hose is connected to the "Inlet port" side of the EC-FX adaptor according to the air flow direction arrow molded into the plastic housing (Inlet side)  $\circ \rightarrow \circ$  (Exit port side).

Note: The rise in 4-20 mA output signal will typically begin to slow down around 30 seconds after gas is applied as it approaches a peak value. If the 4-20 mA signal peaks then begins to drop, quickly adjust the span pot to  $20\text{mA} \pm 0.5\text{mA}$ . Do not gas for more than 2.5 minutes! If a signal peak is not reached within 2 minutes, the sensor may need additional time to stabilize, the adaptor may not be properly seated on the sensor with the O-ring, or there may be other issues specific to the site or the application.

Note: In some cases, the signal may begin to drop quickly after it peaks, try your best to adjust the span pot until the output reaches  $20\text{mA} \pm 0.5\text{mA}$  even though the signal may begin to drop.

3. Remove the calibration adaptor and shut off the gas.
4. Unplug the sensor electrically from the EC-F2 and ensure the mA output is  $4\text{mA} \pm 0.03\text{mA}$ . If the output is out of this range, adjust the "Zero" pot again until mA output is  $4\text{mA} \pm 0.02\text{mA}$  then plug the EC-FX sensor back into the EC-F2.
5. Ensure output decays to a stable  $4\text{mA} \pm 0.2\text{mA}$ , this should take about 5 to 15 min.
6. Unit is now ready for operation.