

## Calibrating NH3CAN Sensors with the ECM Calibrator 5200

NH3CalibrationInstructions.pdf, September 15, 2022, © ECM, 2022

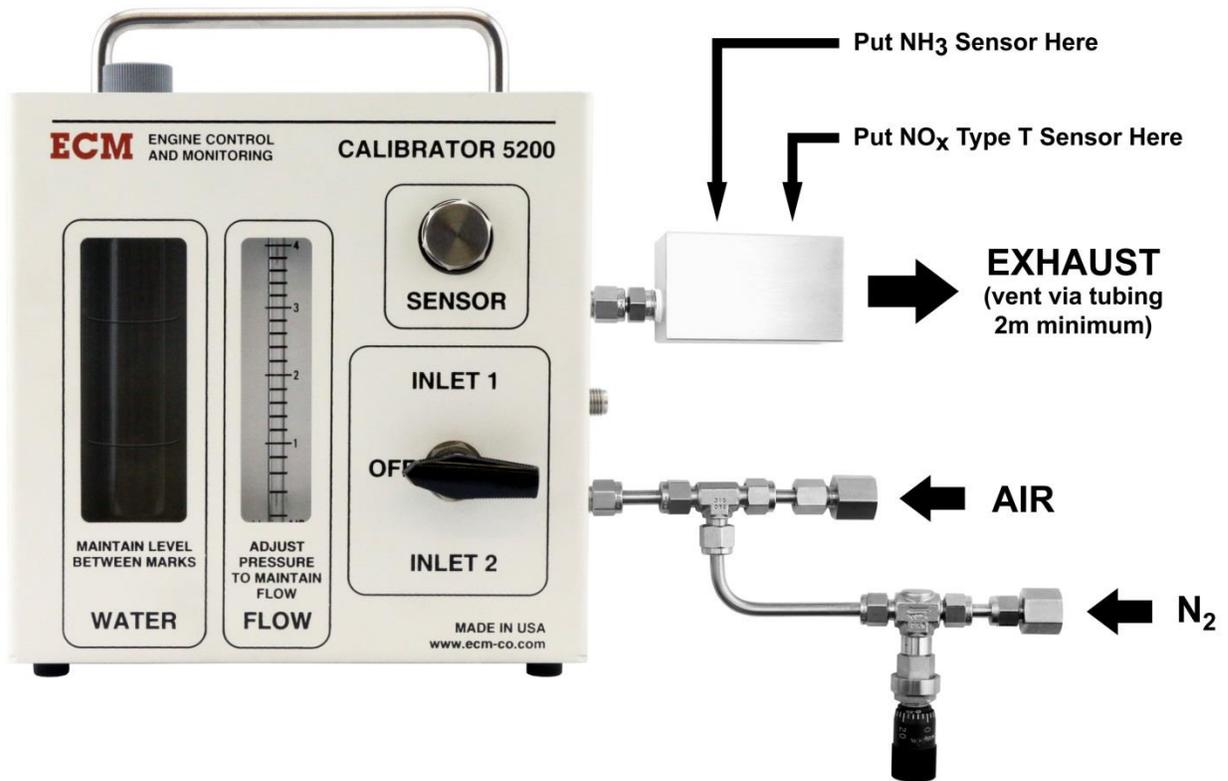
[support@ecm-co.com](mailto:support@ecm-co.com), 408-734-3433 (California, USA)

**Caution:** You will be using ammonium hydroxide (NH<sub>4</sub>OH) during the calibration. 5% to 10% (by volume) ammonium hydroxide diluted by water is commonly used as a cleaner and is easily acquired. Avoid body contact and smelling its fumes. It is best that you handle it in a fume hood. You will be further diluting it with water to approximately 0.3% before use. For example, if you get a bottle of 5% ammonium hydroxide, you will need to dilute it approximately 15:1 with water to get it to 0.3% (for 10% ammonium hydroxide dilute 30:1).

### Calibration Procedure:

1. To perform the calibration of NH<sub>3</sub> sensors, you will need:
  - i. Calibrator 5200 (ECM P/N 14-12T) with the sensor boss plugged
  - ii. NH<sub>3</sub> Sensor Calibrator Option (ECM P/N 14-13)
  - iii. NOxCANt Kit (ie. Type T, not Type G)
  - iv. NH<sub>3</sub>CAN Kit
  - v. AC/DC Power Supply (ECM P/N 04-01) or 12 to 24 VDC (4A) supply
  - vi. USB-to-CAN adapter (ECM P/N 13-06)
  - vii. A PC running ECM's Configuration Software (latest version can be downloaded from [www.ecm-co.com](http://www.ecm-co.com))
  - viii. A tank of compressed air with a regulator to adjust to 25 psig (1.7 bar) and lines and fittings to attach to the calibrator (user supplied)
  - ix. A tank of compressed N<sub>2</sub> with a regulator to adjust to 25 psig (1.7 bar) and lines and fittings to attach to the calibrator (user supplied)
  - x. A line (2m minimum) and fitting from the EXHAUST of the calibrator to a suitable vent (user supplied)
  - xi. Connections for viii, ix, and x on the calibrator are female ¼" NPT. Male ¼" NPT and ¼" ISO tapered will fit into them.
  - xii. A small volume (ex. 100 ml) of ammonium hydroxide diluted with water to 0.3% (user supplied)
  - xiii. An eye dropper (user supplied)
  - xiv. Water (user supplied)
  
2. You will be using the Type T NOx sensor's 1:1 sensitivity to ammonia to calibrate the NH<sub>3</sub> sensor. Therefore, prior to calibrating the NH<sub>3</sub> sensor, you need to ZERO and SPAN the NOx sensor using air and an NO + N<sub>2</sub> mixture according to the instructions on the back of the Calibrator 5200. Note that you must use a Type T NOx sensor because a Type G NOx sensor has a more complex and non-1:1 sensitivity to ammonia.
  
3. Install a NH<sub>3</sub> sensor, a calibrated NOx (Type T) sensor, and lines as indicated in picture. Make sure air and N<sub>2</sub> tanks are closed, regulators are turned down, and the calibrator's valve is set to OFF.
  
4. Fill "Water" tank level in calibrator to half way between indicator marks. Let water reach room temperature by letting it sit overnight.

5. Complete connection of the NH<sub>3</sub> and NO<sub>x</sub> sensors to their respective NH<sub>3</sub>CAN and NO<sub>x</sub>CANT kits, power, PC, and then power everything up. NH<sub>3</sub>CAN and NO<sub>x</sub>CANT modules should have the same baud rate but different node ids (NIDs). Set up the Configuration Tool to read NO<sub>x</sub> and O<sub>2</sub> for the NO<sub>x</sub> sensor and NH<sub>3</sub> for the NH<sub>3</sub> sensor. A minute after powering up, check to see that the green lights on the modules are solidly on and that there are no error codes shown for the NH<sub>3</sub>CAN or NO<sub>x</sub>CANT. If a sensor has an error code, it cannot be calibrated or used and must be replaced.
6. Wait until the NH<sub>3</sub> and NO<sub>x</sub> sensors have been on for at least 30 minutes. The block that the sensors are mounted in will get very hot so don't burn yourself.
7. Adjust the air and N<sub>2</sub> cylinder supply regulators and micrometer adjustment valve on the N<sub>2</sub> line to obtain 1~1.2 lpm flowrate (shown on the calibrator) and 14% O<sub>2</sub> as measured by the NO<sub>x</sub> sensor. The pressure regulators will be at approximately 25 psig (1.7 bar). Wait 5 minutes for the O<sub>2</sub> (for the NO<sub>x</sub> sensor) and the NH<sub>3</sub> (for the NH<sub>3</sub> sensor) reading to stabilize and then ZERO the NH<sub>3</sub> sensor.
8. Unscrew the cap from the "Water" tank and using the eye dropper, add a few drops of the 0.3% ammonium hydroxide to the tank. Put the cap back on and wait 5 minutes for the NO<sub>x</sub> and NH<sub>3</sub> readings to rise and stabilize. Check that the flowrate is still at 1~1.2 lpm. Repeat this process until the NO<sub>x</sub> sensor reads a NO<sub>x</sub> ppm level equivalent to the ppm level (of NH<sub>3</sub>) that you want to SPAN the NH<sub>3</sub> sensor at. Then SPAN the NH<sub>3</sub> sensor. For example, if the NO<sub>x</sub> sensor reads 200 ppm NO<sub>x</sub>, SPAN the NH<sub>3</sub> sensor at 200 ppm NH<sub>3</sub>.
9. After SPANing the NH<sub>3</sub> sensor, turn the valve to the OFF position and remove the NH<sub>3</sub> sensor.
10. When you are finished calibrating the NH<sub>3</sub> sensor, close the valves on the air and N<sub>2</sub> tanks, let the gases flow and pressures drop, turn the regulators down, disconnect the lines, and turn off and remove the sensors.
11. The last thing to do is to drain the ammonium hydroxide solution from the bubbler tank and rinse the tank out with clean water before storing the calibrator. You want to get all of the ammonium hydroxide out.



NH<sub>3</sub> Sensor Calibrator Option installed on Calibrator 5200 (P/N 14-12T)



NH<sub>3</sub> Sensor Calibrator Option (ECM P/N 14-13)