

MACURCO GAS DETECTORS

ND1-FCK FIELD CALIBRATION KIT

CONTENTS OF THE KIT:

1. Gas Cylinder of 5ppm nitrogen dioxide.
2. Gas regulator with white cap fitting.
3. These instructions.

GENERAL INFORMATION:

The heart of the ND-1 is a microcomputer. It constantly monitors various internal operating parameters, the ambient temperature, and the Nitrogen Dioxide (NO₂) reading. The NO₂ reading is determined by measuring the voltage across an electro-chemical cell whose chemistry responds to NO₂. The microcomputer takes the NO₂ data, compensates it for temperature, and then compares this data to the alarm set point.

All ND-1 NO₂ Detectors are factory calibrated when they are shipped to the customer. This calibration should be within specifications for 6 months to a year. Some jurisdictions, local standards, or customer preferences require periodic recalibrations. This Kit provides the means to fit those requirements. Macurco recommends checking the operation of the ND-1 every six months, either through use of the procedures given in the operating instructions or this Field Calibration Kit.

WHERE TO DO THE CALIBRATION?

The ND-1 will need to be partially disassembled for this procedure. It will be easiest to do this on a bench in a work area. However, if two people are available, it can be done at the actual working location of the ND-1.

FIELD CALIBRATION PROCEDURE:

NOTE: The ND-1 must have been power continuously for a minimum of 72 hours before proceeding.

1. Open the access door of the ND-1 case.
2. Remove the two bottom screws that secure the interior faceplate, and swing the faceplate up.
3. Ensure that the digital display is "ON" before starting.
4. Turn both the "FAN" and "ALARM" adjustments fully clockwise before proceeding.
5. Connect a multi-meter across R27 (directly left of the large chip), with the positive lead connected to the lead-end with the loop.
6. Adjust RA5 "ZERO" potentiometer (multi-turn type) until the voltmeter reading is 0.00 +/- 0.10 VDC.
7. Wait for the multi-meter display to stabilize. Repeat steps 6 and 7 until the meter reading remains stable.
8. Assemble the gas cylinder to the regulator and the rest of the tubing. Turn-on the NO₂ regulator, and ensure that the tank pressure is sufficient to complete the calibration.
9. Place the white applicator attached to the regulator hose over the electrochemical cell, applying NO₂ to the sensor.
10. Wait for the meter reading and the display to respond - this may take several minutes.
11. Wait 30 minutes, and then adjust the RA4 "GAIN" potentiometer (multi-turn-type).

12. Note the gas mixture value in parts-per-million that is located on the label of the gas cylinder. Adjust the potentiometer (RA4) until the display reading matches the gas mixture being used to calibrate the unit.
13. Remove the NO₂ gas from the sensor, and remove the gas regulator from the cylinder.
14. Wait at least 1 hour on the first adjustment cycle. On subsequent adjustment cycles, this delay may be shortened to 15 minutes.
15. Repeat steps 6 through 14 until the "ZERO" adjustment maintains 0.00 +/- 0.10 Vdc, **and** the "GAIN" adjustment reflects the contents of the gas cylinder +/- 0.1 ppm of NO₂.
16. If a problem occurs while performing this procedure, contact the factory.
17. Set the "FAN" and "ALARM" adjustments to the desired activation levels.
18. Swing the interior faceplate down, and secure it with the screws removed in step 2. Close the exterior door.

GAS TEST

1. Open the front gray cover of the ND-1
2. Remove the two Philips screws located at the bottom of the gold face plate. The face plate should now hinge up to expose the ND-1 printed circuit board
3. Open the FCK. Connect the gas cylinder to the regulator
4. Check the pressure gauge on the regulator. If you have 25 psi or less you will need to replace the gas canister
5. Place the cap from the regulator over the sensor
6. Wait 5 minutes with the gas applied continuously. The ND-1 takes samples every 2 1/2 minutes
7. After the five minutes the digital display should read $5 \pm 10\%$, plus the accuracy of the gas (normally $\pm 2\%$)
8. Once the reading has been taken remove the gas from the sensor. **Note:** If the display did not read within the given parameters, there are three possibilities:
 - a. the gas cylinder is empty, check the pressure gauge. Replace the gas cylinder if 25 psi or less
 - b. the unit needs to be re-calibrated (go through recalibration and re-test)
 - c. the detector is in need of servicing (return unit to factory for servicing)
9. Wait 7 1/2 minutes for the ND-1 to stabilize, with no gas applied to the sensor. You might test another unit at 5 ppm while waiting. If you do not test another unit with the 5 ppm gas disconnect the canister from the regulator
10. When testing is complete disassemble the regulator and cylinder. Note: The specification for repeatability ($\pm 10\%$) is after calibration at 5 ppm. The gas accuracy (normally $\pm 2\%$) needs to be considered also.

NOTE: Two to three ND-1s may be calibrated with one FCK. The only limitation is the amount of gas contained in the cylinder. Replacement cylinders are available.

RETURN INSTRUCTIONS:

The calibration kit should be carefully packed (well padded) and returned to:

Macurco
3946 South Mariposa Street
Englewood, Colorado 80110

Please include a note advising the nature of the problem.

MACURCO GAS DETECTORS

Nitrogen Dioxide Detector Field Calibration Kit ND-2

CONTENTS OF THE KIT:

1. Gas Cylinder of 5 ppm Nitrogen Dioxide (NO₂)
2. Gas regulator with about two feet of plastic tubing
3. Calibration hood
4. These instructions

GENERAL INFORMATION:

All the Macurco Nitrogen Dioxide detectors are factory calibrated when they are shipped to the customer. This calibration should be within specifications for 6 months to a year. Some jurisdictions, local standards, or customer preferences require periodic recalibrations. This Kit provides the means to fit those requirements. Macurco recommends checking the operation of the the Macurco Nitrogen Dioxide detector every six months, either through use of the procedures given in the operating instructions or this Field Calibration Kit.

ND-2 FIELD CALIBRATION PROCEDURE:

NOTE: The ND-2 must have been power continuously for a minimum of 72 hours before proceeding

Calibration Equipment Needed

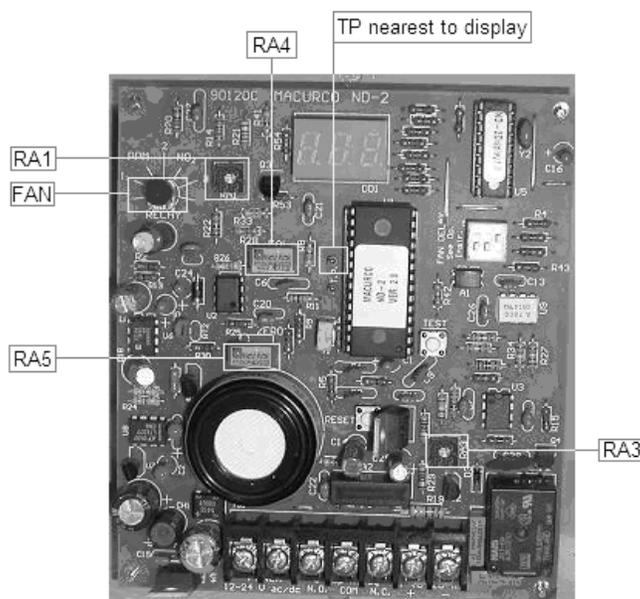
- 1.0 5ppm canister of Nitrogen Dioxide (NO₂)
- 2.0 Digital multimeter, and set to DC volts, adjust for best resolution range (i.e. 2V)
- 3.0 Second meter set to milliamps to 20mA range

Preparation

1. Open the access door of the ND-2 case
2. Remove the two bottom screws that secure the interior faceplate, and swing the faceplate up.
3. Ensure that the digital display is "ON" before starting.
4. Turn "FAN" adjustment fully clockwise before proceeding.

Calibration

- 1.0 Connect meter leads across TP (Red lead + connects to the looped lead, nearest to display)
- 2.0 Adjust RA5 Zero multi-turn 25K Ω pot, until voltmeter reading is close to 0.00V (+/-0.06V) and adjust the milliamp output to 4.0mA +/- .03 via RA3



- 3.0 Wait for reading to stabilize (capacitors cause readings to slightly lag)
- 4.0 Repeat steps 2 and 3 until meter reading is stable
- 5.0 Apply the NO₂ via the regulator to NO₂ sensor adapter cap
 - a. Set meter for 20V range while applying gas
- 6.0 Wait for the meter reading and display to start rising (this may take several minutes). Voltage reading is for stability and reference only
- 7.0 Start adjusting the RA4 Gain 1M Ω multi-turn pot, when voltage stabilizes
 - a. Adjust until the unit Display reading matches the mixture being used (5.0ppm)
 - b. To increase voltage and display reading turn Gain pot clockwise
 - c. Wait until display and voltage readings stabilize, then set the milliamp output to 17.33 mA for 5ppm via RA1
 - d. Remove gas
- 8.0 Reading should begin to drop towards zero (a slight increase may take place when gas is first removed, this is normal)
- 9.0 Wait at least 1 hour, then repeat steps 2 thru 7 until Zero=0.00V, 4mA output (+/-0.06V) and Gain =gas mixture on display including the correct milliamp output (step 7C)
- 10.0 When finished disassemble canister and regulator