
AC1/MC1

Instruction Manual (ZR402)

1.0 MOUNTING OF THE CALIBRATION SYSTEM (AC1 OR MC1)

There are two types of calibration systems. The Auto Calibration unit, model AC1, uses solenoids that automate the calibration system. The solenoids are wired to the ZR402, and during the calibration mode, the solenoids are activated by the ZR402, and the gas flows to the ZR22 detector, without the user opening the valve or adjusting flowrates. The Manual Calibration unit, model MC1, is not electrically activated by the ZR402. During the calibration mode, the user opens the valve and adjusts the flowrate of the gas, as instructed by the ZR402. Both the MC1 and AC1 calibration units provide one point of control for the calibration system.

1.1 LOCATION

The following guidelines should be used when selecting a location for the calibration unit.

- 1) Easily accessible for maintenance and inspections.
- 2) As close to the ZR22 probes as practical, this will minimize the amount of tubing required for plumbing. The MC1 is mounted near the ZR402 converter.
- 3) Ambient temperature does not exceed 131°F (55°C).
- 4) Humidity is moderate and no corrosive gases are present.

NOTE: Use air purge for the AC1 enclosure if corrosive gas or high dust present.

- 5) Minimal vibration area.
- 6) Instrument Air is available.

1.2 Mounting (AC1)

The AC1 unit is designed for wall mounting by securing the four standoffs with bolts.

Allow sufficient room to connect the cal gas and reference air tubing. Input gases (zero gas and instrument air) are connected to the LEFT side, while all probe connections (cal lines and reference air) are on the RIGHT side. Mount the unit so that the terminal strip is easily visible for wiring purposes. The AC1 unit is available with Nema 4 or Nema 4X enclosures and is provided with a key.

IMPORTANT NOTE: Unit must be mounted level, to ensure the accuracy of flowrates.

1.3 Mounting (MC1)

The MC1 unit should be mounted as close as practical to the ZR402 oxygen converter since the ZR402 displays calibration instructions for opening valves during a calibration. The MC1 unit is designed for wall mounting by securing the four standoffs with bolts. Allow sufficient room to connect cal gas and reference air tubing. Input gases (zero gas and instrument air) are connected to the LEFT side, while all probe connections (cal lines and reference air) are on the RIGHT side.

IMPORTANT NOTE: Unit must be mounted level, to ensure the accuracy of flowrates.

PIPING

1.4 CALIBRATION AND PIPING

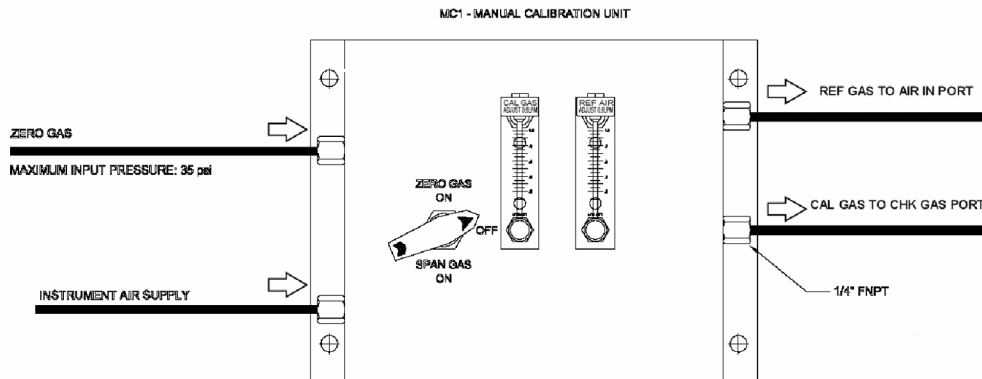


Figure 1: MC1 Piping Diagram

PIPING

1.5 CALIBRATION GAS - Zero Gas

Never use pure Nitrogen. Typically, 1% oxygen balanced in Nitrogen is used, however, an oxygen mixture between 0.4 % and 8% is acceptable. A compressed gas cylinder containing certified gas mixtures fitted with a dual stage regulator should be used. The maximum working pressure of the calibration box is 35 PSI.

NOTE: Compressed Gas Cylinder must have the same CGA connection fitting as the dual stage regulator.

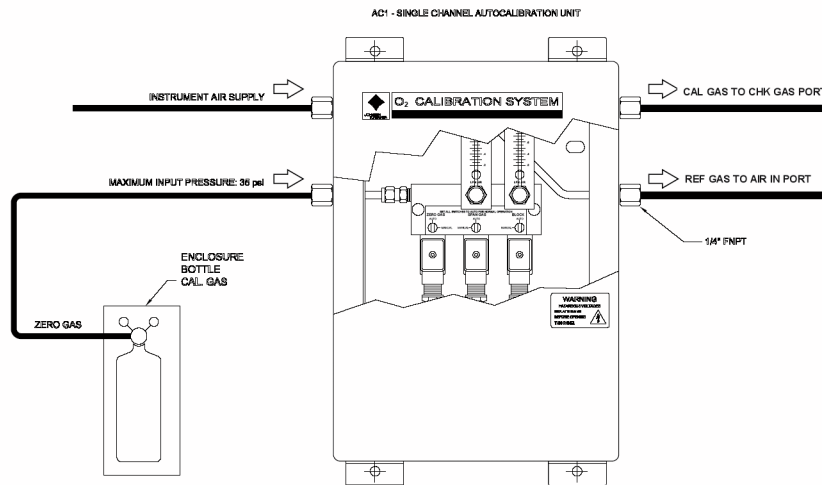


Figure 2: AC1 Piping Diagram

1.6 Span Gas

A clean, dry air source is recommended, such as instrument air. Install an in-line filter before the calibration unit to remove any moisture or dirt. A regulator must be attached to the instrument air source to provide the appropriate working pressure for the calibration unit. The maximum pressure is 35 PSI.

1.7 Reference Gas

Reference air is from the same source as the span gas, which is clean, dry instrument air. The reference air flows to the backside of the zirconia cell, and is used at all times. The calibration unit is plumbed to provide a continuous flow rate of the reference air, as well as, calibration gas flow during calibration.

1.8 Piping of Gases to Cal Unit

Plumbing is required from the instrument air line and zero gas cylinder to the calibration unit. Standard 1/4 inch". O.D. is recommended, stainless steel is preferred. Separate tubing for both the instrument air and zero gas are connected to the 1/4 inch" FNPT fittings on the LEFT side of the calibration unit.

PIPING

2.0 PIPING TO ZR22 PROBE

Tubing to the ZR22 probe is from the RIGHT side of the calibration unit. Run 1/4 inch" tubing from the auto cal unit to the 1/4 inch" NPT fitting on the ZR22 probe. The Reference Air tubing is connected to the AIR IN port at the probe, and the Cal Gas tubing is connected to the CHK GAS port on the probe. The AIR IN and CHK GAS ports are located on the bottom of the probe junction box near the cable gland holes. These ports require a 1/4 inch" NPT fitting. Any unused ports must have a Teflon taped plug. All probes have independent plumbing from other probes and are not to be teed at any point. Teflon tape or a suitable substitute is required to make an airtight seal.

IMPORTANT NOTE: To prevent leakage, all threaded fittings should have teflon tape (or suitable alternate) and all compression fittings should be installed per manufacturer's recommendations. In addition, a check valve is usually installed on the cal gas inlet of the probe to protect the cal tubing from moisture contamination.

2.1 INITIAL FLOW RATE SETUP (AC1)

Ensure that the cal gas and reference air are properly plumbed to the left side of the AC1 auto cal unit. The zero gas and instrument air should be set at approximately 20 + 2 PSIG. Power is not needed to set the flow rates.

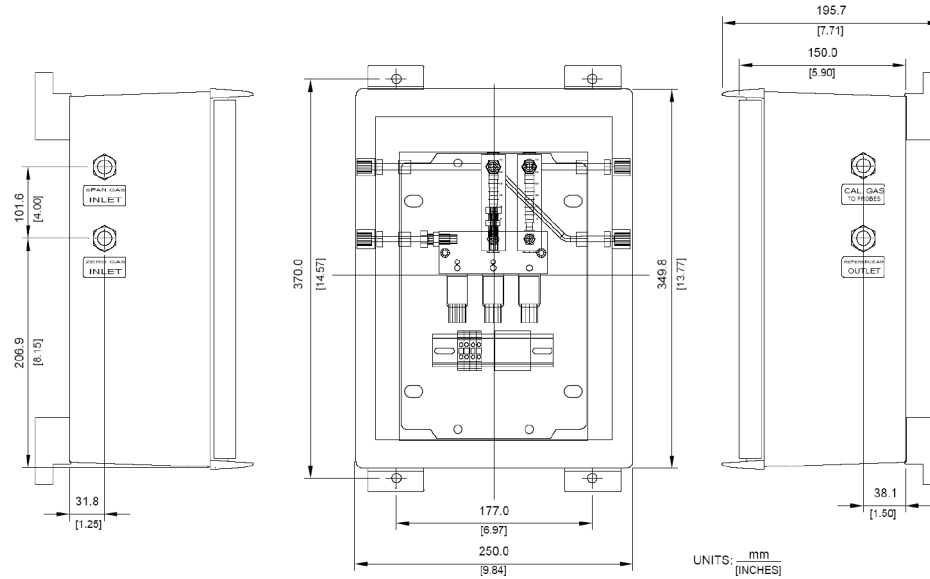


Fig 3: AC1

2.2 Setting the Reference Air Flow Rate

Locate the reference air flowmeters. Adjust the flow adjustment knob on the REFERENCE AIR FLOWMETER to 0.8 LPM or 800 ml/min.

2.3 Balancing Pressure drops in the cal lines

For accurate calibrations, the auto cal system must provide a fixed flow of Zero gas and Span gas (0.6 LPM or 600 ml/min).

To balance the pressure drops, perform the following steps:

These adjustments can be made with a flat tip screwdriver.

1. Locate the BLOCK and SPAN GAS SOLENOID. Using a screwdriver, turn the override screw to the manual position.
2. Use the flow regulator knob on the CAL GAS FLOWMETER to adjust the flow to 1.0 LPM.
3. Switch the override screw of the SPAN GAS solenoid to AUTO.

Turn the override screw for the ZERO GAS solenoid to Manual.

4. Adjust the pressure regulator on the zero gas cylinder for a flow of 1.0 LPM on the Calibration Gas flowmeter.

IMPORTANT: DO NOT USE THE flow regulator knob of the flowmeter to achieve this flow rate!

5. Adjust the flow regulator knob on the Calibration Gas flowmeter until the flowmeter reads 0.6 LPM.

6. Verify that all the manual overrides are set back to AUTO.

Standard operation

- The Reference Air flowmeter indicates 0.8 LPM during normal operation and calibration.
- All manual overrides are set to the AUTO position.
- The Calibration Gas flowmeter will show a flow of 0.6 LPM during Calibration only.

Before considering your calibration unit automated, it is a good practice to check for leaks along the full distance of the cal line tubing in addition to doing a CAL CHECK to confirm that the gases are plumbed correctly to each probe.

2.4 CHECKING FOR LEAKS

- 1) Locate the BLOCK SOLENOID. Turn the override screw on the BLOCK SOLENOID and SPAN SOLENOID to the manual position.
- 2) Use leak detection spray on all compression fittings and bends of the cal and reference line tubing.
- 3) Inspect the full length of the cal line to determine if there is a leak. Repair any leaks.
- 4) After repairing the leaks, if any, return all solenoids to the auto position.

3.0 MC1 FLOW RATE SETUP

Performing a Calibration

For accurate calibrations, the manual cal system must provide a fixed flow of zero gas and span gas (0.6 LPM or 600 cc/min) during calibration. There are two flowmeters and one hand valve adjuster for the MC1. The hand valve is used only during calibration to flow either span gas or zero gas to the probe, using the Cal Gas flowmeter to indicate the flowrate. The Reference Air flowmeter is used to flow the reference air for the ZR22 probe, and remains flowing at all times with a flowrate of 0.8 LPM. The ZR402 display will prompt the User to perform the following steps, when programmed for One Touch (TCH) calibration as follows:

- 1) Position the valve knob to Span Gas On. This will start the flow of Span Gas (or Air) to the probe.
- 2) Adjust the Cal Gas flowmeter to show 0.6 LPM as the flowrate. Also, if necessary, adjust the reference flowmeter to show 0.8 LPM
- 3) To stop the flow of Span gas, position the valve knob to the OFF position.
- 4) To start the flow of zero gas to the probe, position the valve knob to Zero Gas On.
- 5) Adjust the Cal Gas flowmeter to show 0.6 LPM as a flowrate. Also, if necessary, adjust the reference flowmeter to show 0.8 LPM.
- 6) To stop the flow of Zero gas, position the valve knob to the OFF position.

WARNING: If reference air is used during calibration, the reference air must be left on after calibration!

3.1 Checking for Leaks for MC1

- 1) Position the valve to Span.
- 2) Apply a leak detection spray on all compression fittings and bends of the cal line tubing for the probe, the cal unit inlet, cal unit outlet, probe inlet for Cal Gas and reference air. Spray both the reference air and Cal Gas line.
- 3) Inspect the full length of the cal line to determine if there is a leak. Repair any leaks.
- 4) After repairing the leaks, if any, return the valve to the OFF position. Set reference air flowmeter to 0.8 LPM.

4.0 WIRING THE ZR402 AND AC1 SOLENOID WIRING FOR CALIBRATION UNIT (AC1)

The AC1 is the automated calibration unit for the ZR402 which uses solenoids to control the flowrate of the calibration gas and reference air. The solenoids are powered from the ZR402 unit. All adjustments of flowrates for calibration gases can be performed without AC power. 14 AWG, 4-conductor is recommended, run in conduit separate from detector cables.

If conduit is not used, wiring should have a suitable jacket to meet environmental and regulatory codes. The jumper shown in the drawing is used to wire all solenoids at the ZR402 common (120 VAC). Note the manual calibration unit, model MC1, does not use solenoids, and therefore does not require cable.

NOTE: To prevent noise from solenoids from interfering with surrounding electrical lines, we recommend the use of metal conduit or shielded cable grounded at the auto cal unit.

