

Checkout

Module calibration verification

The manufacturer recommends performing this procedure yearly. Use the CO₂ Module Calibration Kit, pn 405910-001 (or equivalent gas fixture with specifications shown below) to successfully complete this verification. See the How to Reach Us... pages at the beginning of this document to order the kit through Accessories and Supplies.

Calibration Gas Mixture	10% carbon dioxide, 25% oxygen, balance nitrogen Minimum accuracy: $\pm 0.05\%$
Regulator	Approximately 1.5 liters per minute Must have CGA valve on cylinder outlet
Tubing	Type: Tygon
Endotracheal Tube (ET) Adapter	Size dependent on airway adapter and tubing size
Airway Adapter	Use CapnoFlex LF Airway Adapter (see "Parts list" on page 17)

Equipment required

- Gas scavenging adapter (pn 9504-016)
- CO₂ module calibration kit (pn 405910-001)
- Water beaker or equivalent
- Flow meter, capable of measuring 0-100 ml/min

Test setup

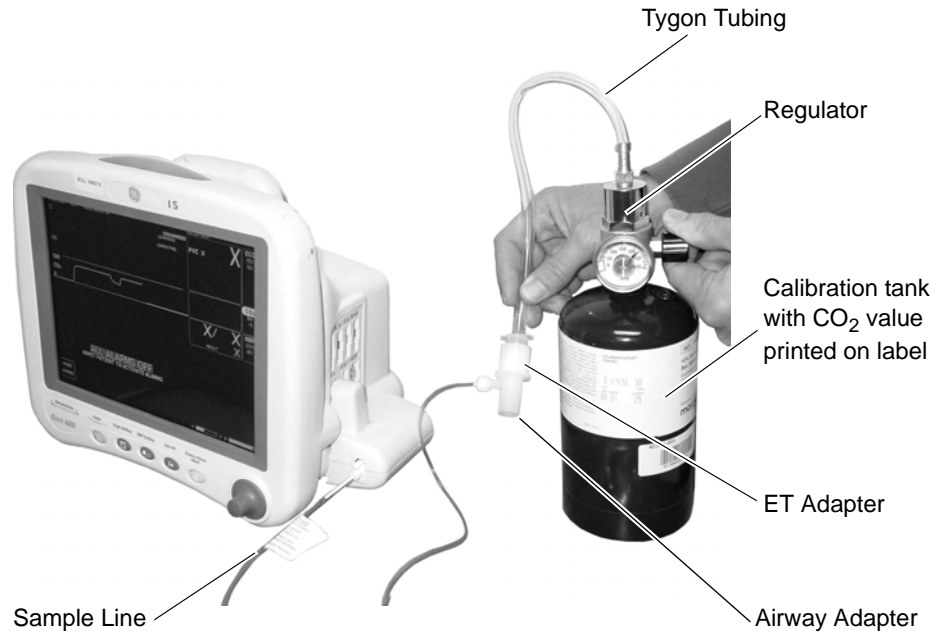
1. Set up the module with the patient monitor as shown below:
 - ◆ For DASH 3000/4000/5000 patient monitors, attach the module with sample line to the DASH patient monitor.
 - ◆ For Solar 8000M/i patient monitors, attach the module with sample line to the adapter plugged into a Solar Mainstream CO₂ module or Dual CO₂ module connected to a Solar 8000M/i patient monitor.

NOTE

If using the Dual CO₂ module, **MAINSTREAM** displays next to the parameter box. If **SIDESTREAM** displays, enter the CO₂ menu and turn the pump off.

2. Make sure the regulator is off by turning it clockwise.
3. Attach regulator to gas cylinder.

- Attach one end of the Tygon tube to the calibration tank regulator and the other end to the calibration adapter. Do NOT connect the sample line to the adapter yet.



003A, 006B

Note the barometric pressure

Barometric pressure is used to calculate the percentage of CO₂ in the patient's airway.

- The DASH 3000/4000/5000 patient monitor has an integrated barometric pressure reading displayed in the **CO₂ SERVICE** window.
- For the Solar 8000M/i patient monitor, determine the barometric pressure using a barometer, or check a local weather web site.

NOTE

If the barometric pressure is displayed in inches (26.577 in.), convert it to millimeters (675.055 mmHg) and round off to the nearest whole number (675 mmHg). The internet has conversion calculators, and some barometric pressure web sites have conversion tables.

- From the Main menu select **MORE MENUS -> MONITOR SETUP -> SERVICE MODE**.
- Enter the password using the **Trim Knob** control to select the day and month from the monitor screen with leading zeros (e.g., July 4 = 0407)

3. Select **CALIBRATE > CO2 SERVICE**.
4. From the **CO2 SERVICE** window:
 - a. If DASH 3000/4000/5000 patient monitor, read the barometric pressure.
 - b. If Solar 8000M/i patient monitor, select **SET THE BAROMETRIC PRESSURE** and enter the pressure.

Verify accuracy

1. Return to **MORE MENUS** and select **CO2** to open the menu.
2. Select **UNITS:** and set to **MMHg**.
3. Select
 - ◆ **CAL SENSOR TO ZERO CELL** on Solar 8000M/i patient monitors or DASH 3000/4000 patient monitors with software v4 or earlier
 - ◆ **CALIBRATE SAMPLE LINE** on DASH 3000/4000/5000 patient monitors with software v5 or v6
4. Select **READY**.
The message **CALIBRATING** displays in the CO2 parameter box.
5. When the **CALIBRATING** message disappears, connect the sample line to the calibration adapter.
6. Turn on the tank regulator for several seconds, then turn it off.
If the **NO BREATH DETECTED** message displays, simulate breathing by turning the regulator on for several seconds, then off for several seconds.
7. Read the **EXP** number.
8. Complete this equation to verify the module's calibration:

$$\text{EXP mmHg} = (\text{CO}_2 \text{ value of the tank}) \times (\text{Barometric Pressure}).$$
 Tolerance = $\pm 8\%$.

If the **EXP** value is outside the range of tolerance, return the module for repair.

Leak test

Perform the following steps to do a leak test before proceeding with a flow check on the CapnoFlex LF CO₂ module.

1. Power up the module and allow it to proceed to normal operation.
2. Connect a length of tubing to the exhaust coupling adapter, then place the other end of the tubing in a beaker of water.
3. Occlude the inlet, then check the exhaust tubing for less than one bubble of air per second. If the bubble rate is greater than one bubble of air per second, there is a leak in the pneumatic circuitry.

If the module fails this test, do *not* use it until approved for use by qualified personnel.

Flow check

1. Power up the module and allow it to proceed to normal operation.
2. Connect a flow meter and measure flow rate.
3. Verify that the flow rate is 50 ml/min, \pm 10 ml/min. If the flow rate is outside this range, do *not* use the module until approved for use by qualified personnel.
4. Occlude the inlet. After about 30 seconds, verify that the message “**CHECK ADAPTER/ADAPTER CAL**” appears on the monitor display.
5. Remove the sample line from the module, then reinsert the sample line. The message will disappear from the monitor display and the normal parameter window values will reappear. The flow rate will return to 50 ml/min, \pm 10 ml/min.

If the module fails this test, do *not* use it until approved for use by qualified personnel.

Troubleshooting

The following table lists screen messages and other indications that there is a problem with the module. See “[Parts list](#)” on page 17 for item numbers and descriptions.

NOTE

Some messages on the Solar 8000M/i patient monitor may be different. See the Solar 8000M/i Patient Monitor Operator’s Manual.

Message	Possible Cause/Solution
<i>CHECK ADAPTER ADAPTER CAL</i>	A failure in the CO ₂ module board or a failure in the flow circuit. Check the flow circuit first. <ol style="list-style-type: none"> 1. Insert cannula/sample line. 2. Perform zero cell calibration. 3. Swap cannula/sample line with known good cannula/sample line. 4. Replace cannula/sample line. 5. Swap module with known good module. 6. Return module for repair.
<i>WARMING UP</i>	Allow device to warm-up for 1 minute. Check if cannula/sample line is properly installed. <ol style="list-style-type: none"> 1. Replace cannula/sample line. 2. Return module for repair.
<i>CAL SENSOR TO ZERO CELL or, CALIBRATE SAMPLE LINE</i>	Perform zero cell calibration. Check if cannula/sample line is properly installed. <ol style="list-style-type: none"> 1. Replace cannula/sample line. 2. Return module for repair.
<i>CAL ERROR SENSOR</i>	<ol style="list-style-type: none"> 1. Replace cannula/sample line. 2. Return module for repair.
<i>SERVICE CO2 SENSOR</i>	Return module for repair.
<i>SERVICE CO2 TEMP</i>	Return module for repair.
<i>CANNOT CALIBRATE</i>	Module thinks it has detected a breath. Wait 2 minutes. <ol style="list-style-type: none"> 1. Perform zero cell calibration. 2. Return module for repair.