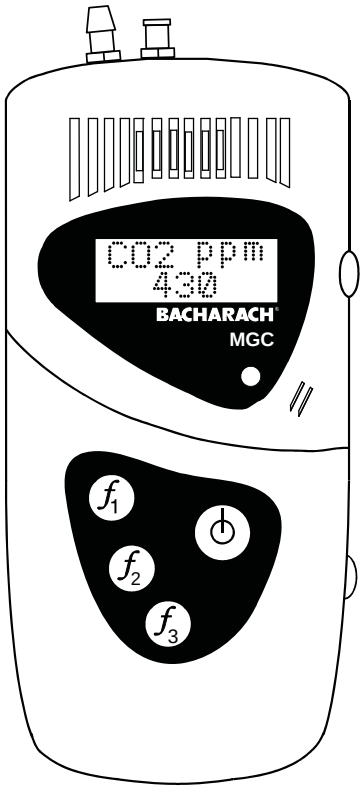
MGC 100 / 200

Instruction 0019-9322
Operation & Maintenance

Rev. 2 – May 2010



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1.0 INTRODUCTION

1.1 General

Bacharach analyzers are easy to use, but it is essential that these Operating Instructions be read and understood by all operators and maintenance personnel prior to using or servicing the instrument.

The Bacharach MGC series of monitors are versatile handheld instruments that are designed to measure N_2O, CO_2 and CO from piped medical-gas outlets.

Available in two models:
- *MGC 100* – Measures N_2O
- *MGC 200* – Measures CO_2 and CO

Both models feature data-logging, run-and-charge capability, and a user-zero function for all gases.

Power is provided by a long-life NiMH battery, which is capable of providing up to 10 hours of continuous operation from one charge.

The MGC 100 has built-in memory that allows it to store 'snapshot' readings (pressing the *f1* button stores the current reading in memory), while the MGC 200 can automatically store up to 200 sets of gas readings in memory at predetermined intervals. Readings can later be downloaded to a personal computer for analysis via its integral IrDA communications link and the optional BACH-COM software.

1.2 Features

- Up to 10 hours of operation on one charge
- Convenient zero function for all gas sensors
- Internal pump
- Battery capacity display
- Quick charge capability—2 hours
- IrDA link for downloading stored data to a personal computer
- Charge-and-run capability for long-term monitoring
- Flow restrictor that limits inlet pressure to 2 psig
- Manual storage (snapshot) of current gas reading (MGC 100)
- Both snapshot and automatic data-logging of up to 200 sets of readings (MGC 200)
- Peak reading mode (MGC 200)

1.3 Applications

• Piped medical gas checking

1.4 Instruction Manual

Unless otherwise noted, all paragraphs in this instruction manual describe the operation and maintenance of both the MGC 100 and MGC 200. For example, the heading *2.9 Battery Charge Display (MGC 100)* indicates that the information under this heading pertains only to the MGC 100.

1.5 Measuring Ranges

Measurement	**Range / Resolution**
N_2O (MGC 100)*	40 to 100% / 0.1%
CO_2 (MGC 200)	0 to 10,000 ppm / 10 ppm
CO (MGC 200)	0 to 500 ppm / 1 ppm

* Although the MGC 100 can display readings below 40% N_2O, the instrument is most accurate between 40 and 100%.

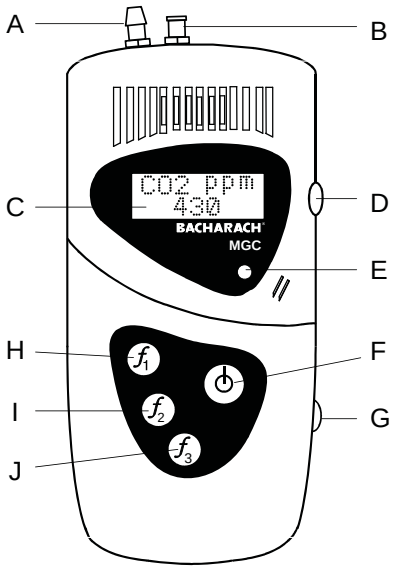
2.0 OPERATION

2.1 Important Note

Always ensure that the instrument's gas outlet (Figure 1, Item B) is unobstructed and open to the atmosphere.

2.2 Switching the Instrument ON/OFF

Switch ON the instrument by momentarily pressing the ⏻ button (Figure 1, Item F). Switch the instrument OFF by pressing the ⏻ button for at least 3 seconds, or until the display goes blank. When first switched ON, there is a warm-up period of approximately 5 minutes for the MGC 100 and a 1 minute warm-up period for the MGC 200 before gas readings are displayed. Note that normal fresh-air background readings of CO_2 is approximately 340 ppm.



A - Gas inlet fitting

B - Gas outlet fitting (MGC 200 only)

C - LCD Display

D - IrDA link

E - Pump ON light / Alarm indicator

F - Press once to switch instrument ON; press once to start and stop pump; hold 3 seconds to switch instrument OFF (⏻)

G - Battery charging socket

H - *MGC 100/200*: Press once to store 'snapshot' of gas reading
MGC 200: Press and hold to start and stop data-logging *(f_1)*

I - Press once for battery level; hold to start calibration *(f_2)*

J - *MGC 100*: Button is enabled only during a span calibration
MGC 200: Press once to toggle between CO_2 and CO displays; hold for peak gas reading *(f_3)*

Figure 1. Components of the MGC 100/200

2.3 Connecting Instrument to Medical Gas Outlet

Before proceeding, turn ON the instrument and allow it warm-up per Section 2.2. The pump should be OFF at this time.

After warming up, connect the instrument's gas inlet through the supplied flow restrictor to the medical gas outlet as follows:

> **CAUTION:** *Never apply gas directly from the medical gas outlet to the instrument, as internal damage to the instrument can result. The maximum pressure that can be applied to the instrument is 2 psig, which corresponds to a flow of between 100–200 cc/min.*

1. Attach the threaded end of the flow restrictor (supplied with instrument) to a standard medical gas outlet fitting, then attach fitting to gas outlet on wall.

2. Connect a 2 to 3 foot length of clear, flexible $^{1}/_{8}$" tubing (user supplied) to the barbed end of the flow restrictor .

3. Attach the other end of the plastic tubing to the instrument's gas inlet fitting (Figure 1, Item A). **Important!** *If the quality of the gas sample is suspect, protect the instrument by inserting the supplied PTFE particulate filter in-line using appropriate fittings and tubing.*

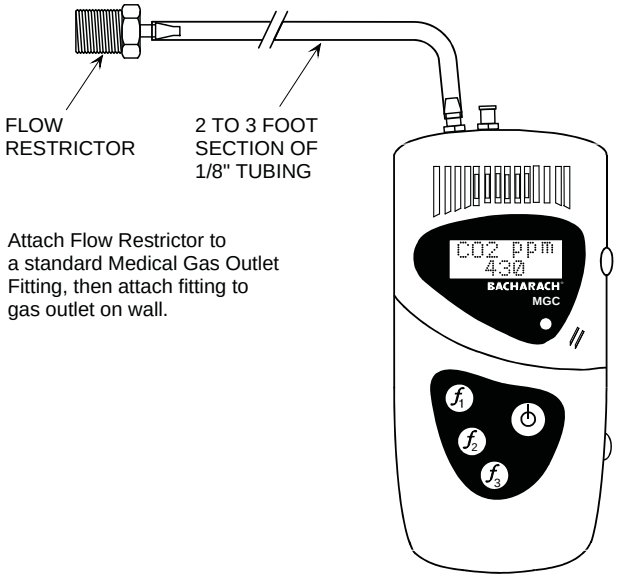


Figure 2. Connecting Instrument to a Medical Gas Outlet

2.4 Starting and Ending a Test

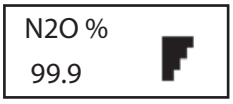
With the instrument turned ON and connected to the medical gas outlet per Sections 2.2 and 2.3, begin testing with the pump OFF. Read the display as described in Sections 2.5 and 2.6.

After completing a test, disconnect the sample tubing from the gas outlet. Purge out any residual gas by first disconnecting the flow restrictor, and then turning ON the pump by momentarily pressing the ⏻ button. Allow the pump to run for approximately 2 minutes before proceeding to the next test.

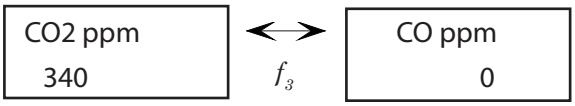
2.5 Current Reading Display Mode

Depending on which model of the MGC is being used, the instrument is capable of displaying the current N_2O, or CO_2 and CO gas readings on its LCD (Figure 1, Item C) as follows:

MGC 100 – Displays N_2O plus battery capacity.



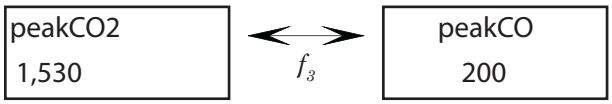
MGC 200 – Displays either CO_2 or CO. Each measurement is displayed separately on the instrument's LCD. Toggle the display between the two gas readings by momentarily pressing the f_3 button.



2.6 Peak Reading Display Mode (MGC 200)

The MGC 200 can display either current or peak gas readings. Note that a peak reading is the highest reading taken since the instrument was switched ON.

Activate the peak-reading mode by pressing and holding the f_3 button for 3 seconds. Once in the peak-reading mode, toggle the display between "peak CO2" and "peak CO" by momemtarily pressing the f_3 button.



To return the instrument to its current-reading mode, again press and hold the f_3 button for 3 seconds.

To reset the peak gas readings back to the current readings, switch the instrument OFF and then back ON.

2.7 Storing Readings

There are two data storage modes availiable:
- Snapshot
- Continuous Data Logging

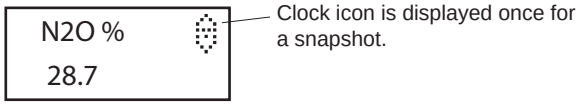
Readings can be stored by either saving the currently displayed reading (MGC 100 and 200), or starting a continuous data-logging process that saves the readings at predetermined intervals (MGC 200 only).

The stored data can later be downloaded to a personal computer for analysis using the instrument's IrDA link and the optional BACH-COM software. This software can also be used to alter the data-logging interval, and save the data to a file for further analysis.

The procedures for storing gas readings for both the MGC 100 and 200 are described in Sections 2.7.1 and 2.7.2.

2.7.1 MGC 100 – Snapshot

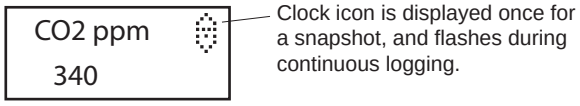
After obtaining a steady reading, momentarily press the f_1 button to store (take a snapshot of) the reading shown on the display along with the current time and date.



2.7.2 MGC 200 – Snapshot & Data-Logging

After obtaining a steady reading, momentarily press the f_1 button to store (take a snapshot of) the reading shown on the display along with the current time and date.

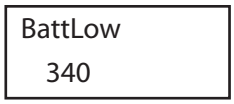
Pressing and holding down the f_1 button for at least 3 seconds starts continuous data logging of the readings at a preset interval (factory set at 15 minutes). To stop data-logging, momentarily press the f_1 button.



The instrument can store up to 200 readings. Once the instrument's storage capacity has been exceeded, the data-logging is terminated.

2.8 Battery Low Display

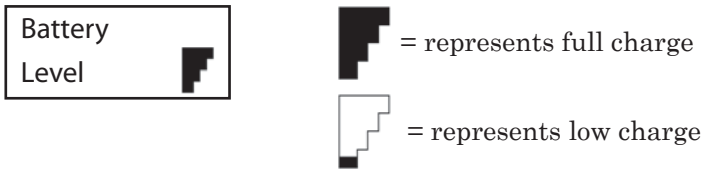
When the battery voltage falls below a pre-determined level, the display will alternate between its current or peak display and



In addition, the beeper will emit three rapid notes every 30 seconds. At this time the instrument should be given a full charge per Section 3.6 as soon as possible.

2.9 Battery Charge Display (MGC 100)

An indication of the battery's charge level is obtained by momentarily pressing the f_2 button. A bar graph in the lower part of this screen shows an approximation of the battery's remaining charge. As the charge reduces, the bar graph decreases in size. Typical operating time from a full charge is approximately 10 hours.



2.10 Fault Condition Warning

Both instruments are capable of alerting the operator of an internal fault condition (i.e., a sensor failure or blockage in the infrared path).

If a fault occurs, the instrument's beeper will sound continuously, and the following message is displayed until the instrument is switched OFF.

If the fault warning is displayed at any time, then the instrument must be returned to Bacharach for evaluation.

2.11 Gas Alarm (MGC 200)

When the detected gas percentage exceeds a predetermined level, the alarm indicator (Figure 1, Item E) flashes and the beeper sounds.

The instrument is shipped with the alarm disabled. An operator, however, can activate the alarm function and set the alarm trip-point using the optional BACH-COM software.

2.12 Powering Instrument from Charger

Both the MGC 100 and 200 can be continuously powered by the charger by connecting the charger to the instrument in the following sequence:

1. Switch ON the instrument *without* the charger attached.

   Note: *Connecting a charger to an instrument that is switched OFF causes the instrument to enter its charging mode, which in turn prevents the instrument from being switched ON.*

2. Plug the charger into the appropriate AC wall socket (or 12 VDC when using the optional in-car charger). Then plug the charger's output connector into the instrument's charging socket (Figure 1, Item G).

The instrument will now continuously run, until the charger is removed and the instrument switched OFF —the monitor will not turn OFF with the charger attached.

3.0 MAINTENANCE

3.1 Cleaning

Keep the instrument clean by wiping it with a soft cloth dampened with a mild detergent solution.

3.2 Sunlight

The unit should not be left out in direct sunlight, or in other areas where excessive heat exists, for long periods since component damage due to overheating may result.

3.3 Servicing

There are no user-serviceable parts inside the instrument. Unauthorized disassembly of the unit will invalidate the warranty.

3.4 Software Version / ID Number

With the instrument switched OFF, and while holding down the f_1 button, switch ON the instrument to display its software version and issue date. Releasing the f_1 button displays the instrument's ID number for 5 seconds.

3.5 Factory Settings

Important! *The instrument should only be returned to its factory settings when advised by a Bacharach Service Representative.*

With the instrument switched OFF, and while holding down the f_2 button, switch ON the instrument. The display will show:

Keep the f_2 button depressed until the display shows:

Release the f_2 button and zero the gas sensor(s) as described in either Section 3.7 or 3.8.

> **WARNING!** *Failure to zero the sensor(s) after resetting the instrument to its factory settings may cause incorrect gas readings to be displayed.*

3.6 Battery Charging

When the "BattLow" message is displayed (refer to Section 2.8), the instrument must be recharged using the supplied battery charger.

> **Important!** *The battery has a long shelf life, but it is recommended that the battery be* ***recharged once a month*** *if left unused. Batteries that have not been charged for several months should be given at least two charge/discharge cycles before using the instrument.*

As with all rechargeable batteries, there are guidelines that should be observed: The battery should normally be charged at room temperature. Charging at temperatures below 54 °F (12 °C) should be avoided since this may cause a false indication of when the battery is charged, and could also damage the battery.

Before beginning the charging process, first ensure that the instrument is switched OFF. Next, plug the supplied charger into the appropriate AC wall socket (an optional 12 VDC charger with cigarette lighter adapter is also available). Then plug the charger's output connector into the instrument's charging socket (Figure 1, Item G).

The word "CHARGING" appears while the battery is being charged. Charging time is approximately 2 hours.

> **Note:** *If the battery is deeply discharged, the display will remain blank for a few minutes before the battery begins charging.*

Once the battery is fully recharged, the instrument will emit a beeping tone for 30 seconds and display the word "CHARGED". At this time unplug the charger and remove its output connector from the instrument.

3.7 Zeroing the N_2O Sensor (MGC 100)

Zero the N_2O sensor of the MGC 100 as follows:

1. Turn ON the instrument and allow it to warm up per Section 2.2.

2. With the instrument sampling fresh air, turn ON the pump by momentarily pressing the ⏻ button and allow the pump to run to purge out any resident gas. Then turn OFF the pump once a steady reading is obtained (approx. 60 seconds).

   WARNING! *It is essential that the instrument is in fresh air before attempting to zero the sensor. If this condition is not ensured, incorrect gas readings will occur.*

3. Press and hold down the f_2 button until the following displays appear. Note that the instrument beeps 5 times when it enters the User Cal mode, and then emits a steady tone indicating that the f_2 button can now be released.

   An operator can abort this procedure by momentarily pressing the f_2 button.

4. To zero the sensor in ambient air, momentarily press the f_1 button. The instrument will display "Air Cal OK" for 2 seconds if the sensor was successfully zeroed and then reads 0.0%.

   If the procedure was unsuccessful, the message

   will be displayed. If this happens, retry this procedure. If the procedure is still unsuccessful, then return the instrument to a Bacharach Service Center for evaluation.

3.8 Zeroing the CO_2 & CO Sensors (MGC 200)

Zero both the CO_2 and CO sensors of the MGC 200 as follows:

1. Turn ON the instrument and allow it to warm up per Section 2.2.

2. With the instrument sampling fresh air, turn ON the pump by momentarily pressing the ⏻ button and allow the pump to run to purge out any resident gas. Then turn OFF the pump once a steady reading is obtained (approx. 60 seconds).

   WARNING! *It is essential that the instrument is in fresh air before attempting to zero the sensors. If this condition is not ensured, incorrect gas readings will occur.*

3. Press and hold down the f_2 button until the "Air Cal" screen is displayed. Note that battery status is first displayed for approximately 2 seconds.

   ```
   Air Cal
   ```

4. Keep the f_2 button depressed until the display shows:

   ```
   Air Cal
    OK
   ```

   If the procedure was unsuccessful, or if the f_2 button released prematurely, then the message

   ```
   Air Cal
   Failed
   ```

   will be displayed. If this happens, retry the Air Calibration procedure, ensuring that the instrument is only exposed to fresh air. If the procedure is still unsuccessful, then the instrument must be returned to a Bacharach Service Center for evaluation.

3.9 Span Calibration (MGC 100)

A span calibration of the MGC 100 consists of flowing a recommended certified calibration gas of 99.5% N_2O (customer supplied) through the instrument and calibrating the instrument to the applied gas level.

> **WARNING!** *If using a gas concentration other than 99.5%, the instrument's default span gas value* ***must*** *be changed to match the applied gas using the optional BACH-COM software; otherwise, inaccurate gas readings will result.*

> **CAUTION:** *Gas flow through the instrument must not exceed 100–200 cc/min. (corresponds to a pressure of approximately 2 psig), as internal damage to the instrument can occur.*

A Bacharach supplied calibration kit (refer to Section 4.0) can be used to flow calibration gas through the instrument, assuming a standard 17 liter gas cylinder is being used. If a different size cylinder is used, then a flow regulator that fits the cylinder must be supplied by the customer.

1. First zero the N_2O sensor per Section 3.7.
2. Connect a customer supplied certified calibration cylinder of 99.5% N_2O gas to a Bacharach regulator and hose as shown in Figure 3.

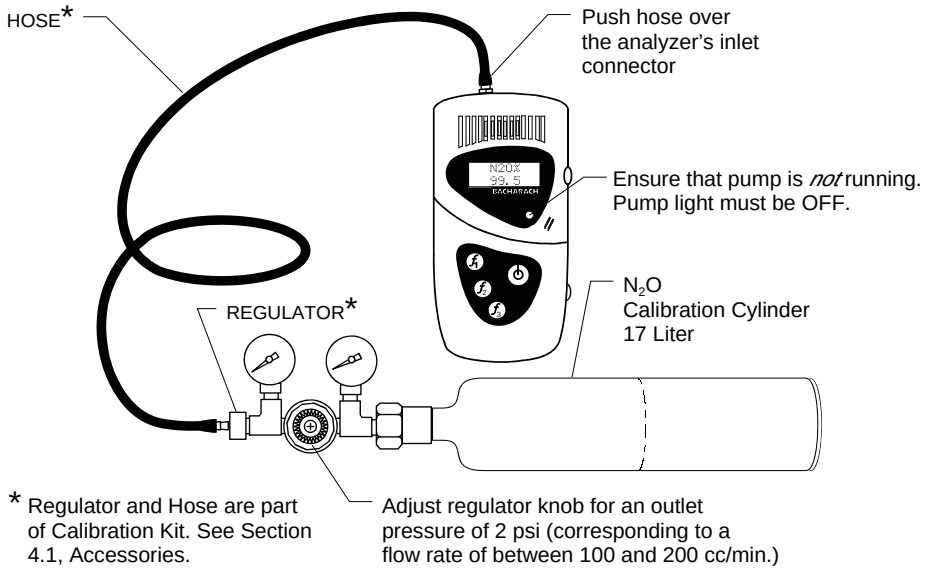
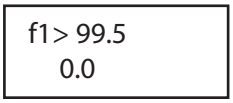


Figure 3. Applying Gas using Bacharach's Calibration Kit

3. Press and hold down the f_2 button until the following displays appear. Note that the instrument beeps 5 times when it enters the User Cal mode, and then emits a steady tone indicating that the f_2 button can now be released.

An operator can abort this procedure by momentarily pressing the f_2 button.

4. To calibrate the instrument using span gas, press the f_3 button. The following display will appear.



The top line represents the preset calibration value that corresponds to the applied percentage of calibration gas. The bottom line represents the current N_2O level. (Note that the calibration level is preset to 99.5%, but this level can be changed using the optional BACH-COM software.)

5. With the instrument's pump turned OFF, open the gas regulator and allow gas to flow until the bottom reading stabilizes; then press the f_1 button.

If the gas calibration procedure was successful, the display will show

If the procedure was unsuccessful, the message

will be displayed. If this happens, retry the Gas Calibration procedure, ensuring that the analyzer is exposed to the correct concentration of calibration gas. If the procedure is still unsuccessful, then the analyzer must be returned to a Bacharach Service Center for evaluation.

6. This completes the Gas Calibration procedure. Turn off the regulator; then remove and store the calibration accessories.

4.0 PARTS & SERVICE

4.1 Replacement Parts and Accessories

Complete Kits

MGC 100 – Includes instrument capable of measuring N_2O, a battery charger, particulate filter, and a flow restrictor 0019-8058
MGC 200 – Includes instrument capable of measuring CO_2 and CO, a battery charger, particulate filter, and a flow restrictor 0019-8059

Replacement Parts

110/240 VAC USA & European Plug Charger 0019-3312
Particulate Filter 0054-0548
Flow Restrictor..... TBA

Accessories

Calibration Kit (with regulator and tubing).....0019-8027
Carrying Case, Large (13 $^1/_2$"L x 10 $^{13}/_{16}$"W x 4"H) 0019-3311
Carrying Case, Small (10 $^5/_8$"L x 8 $^1/_2$"W x 3 $^3/_{16}$"H) 0019-3337
In-Car Charger.....0019-3302
IrDA Interface Kit & BACH-COM Software:
MGC 100 0019-3301
MGC 200 0019-3254
Protective Rubber Boot (MGC 100 only).....0019-3304

4.2 Bacharach Service Centers

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