MG1000
Handheld Multi-Gas Analyzer
Users' Manual

Warnings, Cautions, and Notes

Warnings, cautions, and notes are used throughout this User's Manual to give you additional information about the Monitoring System. The warnings and cautions included in this safety section refer to the equipment in general.

Warning:

A "warning" calls attention to the user of imminent hazard to people if proper procedures are not followed.

- For continued safe use of this equipment, it is necessary that the listed instructions are followed. Instructions in this manual in no way supersede established medical procedures.
- Explosion Hazard - Do not use this equipment in the presence of flammable anesthetics.
- Alarms - Do not rely exclusively on the audible alarm system for patient monitoring. Adjustment of alarm volume to a low level or off during patient monitoring may result in patient jeopardy. Remember that the most reliable method of patient monitoring combines close personal surveillance with correct operation of monitoring equipment.
- This equipment is only intended for use in healthcare facilities by trained healthcare professionals.
- This product is not intended for home use.
- Exposure of electrical contracts or connections to saline or other liquids and gels is dangerous. Electrical contacts and connections such as cable connectors, power supplies, parameter module plug-in connections and rack connections must be kept clean and dry. Thoroughly dry and electrical connections that become contaminated with liquids. If additional decontamination is required please contact your biomedical department.

- Although this equipment is shielded against Electromagnetic Interference (EMI), it is recommended to avoid the use of electrically radiating devices in close proximity to this equipment.

Caution

A “caution” calls attention to a condition or possible situation that could cause injury to the user

- Ventilation Requirements – Failure to meet ventilation requirements may cause equipment failure and, in turn, jeopardize the functions of automated monitoring. Do not locate equipment in enclosed area which could restrict heat dissipation.
- Maintenance – Failure on the part of the responsible individual, hospital or institution employing the use of this equipment implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.
- Replacement Parts – It is highly recommended that only the factory recommended parts and accessories be used with this equipment. Failure to do so may result in the degradation of performance. Accessories and parts for individual modules and components are listed at the back of the appropriate section in this manual.

Table of Contents

Overview

1.1 Introduction

This device is an anesthesia agent analyzer used to measure EtCO2, FiCO2, RR, EtN2O, FiN2O, EtAA, FiAA. This monitor is suitable for people and animals and may be applied in general ward, including, but not limited to, ICU, CCU or ambulance and so forth.

WARNING This equipment must be operated by professional medical doctors or trained healthcare professionals. Anybody who is not authorized or trained should not use this apparatus for monitoring procedure.

NOTE The illustrations in this manual maybe slightly different from your monitor,

1.2 About the device (side-stream module shown)

1.2.1 Main components

Main unit

AG sensor

Water trap

Sampling line

dry-line

airway connector

1.2.2 Front panel

1. Alarm LED (Red and Yellow)
2. 5 inch colorful LCD display
3. Power On/Off Button
4. Return/Cancel Key

If you are in the configuration dialog, pressing this key will go back to the main dialog and the settings will be enabled

5. Down Key, Move focus forward.
6. Up/Silence Key

If you are in the configuration dialog, press this key to move the focus backward. If not, pressing this key will suspend or resume alarm speaker.

7. Menu/OK Key

If you are in the configuration dialog, pressing this key will enter its child dialog or start to edit a control. If not, pressing this key enters the Main Menu dialog.

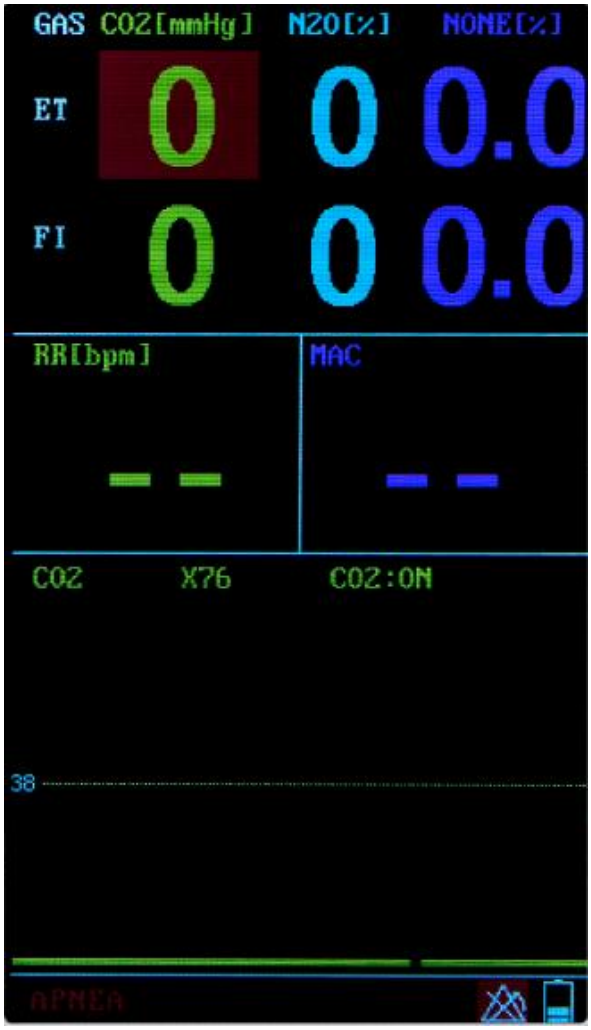
1.2.3 Rear panel

1. Plastic protective sleeve
2. Battery cover (note: 4 pcs 3.7V 2000mAh Li-battery)

1.2.4 Top View

- AG sensor socket
- USB interface
- Charge socket
- Not define

1.3 Main screen



- Status bar
- EtCO2 waveform
- FiCO2 value
- EtCO2 value
- FiN2O value
- EtN2O value
- FiAG value
- EtAG value
- Respiration rate
- MAC value
- Alarm Status

  : Alarm pause

  : Alarm off

  : Alarm on
- Battery status

- Air Pump Status

CO2 : This symbol indicates that the air pump is on. If the system doesn't show this symbol, which says the air pump is off or faulty.

1.4 Working Environment

The working environment of this equipment should avoid noise, shake, dust and corrosive or explosive things and so on.

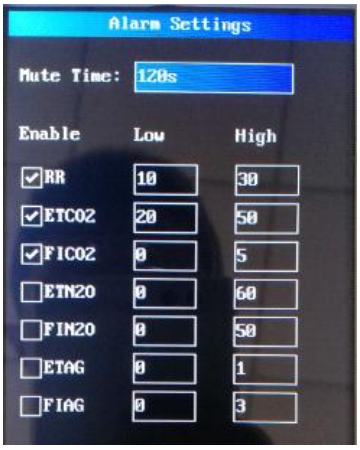
WARNING Make sure that the monitor is working under the proper environment. If not, maybe it causes unexpected damages.

Basic Operation

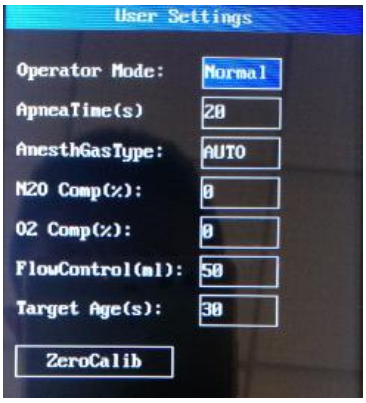
2.1 Main menu

Click the menu button to enter the menu bar, and then rotating flying shuttle, carry out a series of operations and Settings.

- ALARM SETTING



- USER SETTING



- SYSTEM SETTING

- DEVICE INFORMATION

Select this button to enter the menu, the menu is introduced the basic information of the software version and the manufacturer.

2.2 Basic operations

2.2.1 Switching the Monitor On

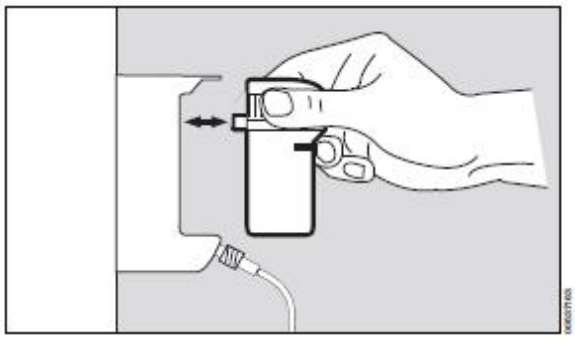
Press the power key for three second to switch the monitor on. The monitor performs a self test including alarm lamps, alarm loudspeaker, measurement modules

and so forth. After that, the start-up picture is shown. System is not ready to monitor until it disappears.

2.2.2 Before monitoring

Make sure the followings before monitoring a patient

- check if sampling line and water trap is connected
- check if machine is set appropriately
  a. set work mode from “standby” to “measure” in setting menu.
  b. If using the mainstream anesthesia gas sensor, select the type of anesthetic agent in setting menu.
- Make sure AC power is connected. Battery lasts for 6-8 hours without connecting to AC power.
- Clip both side of the water-trap and push it towards the socket until a “click” sound is heard.



- Connect the tubings
- Connect dry-line with the 3-way connector, make sure the connector towards up to prevent liquid from blocking the sampling line.

connector towards up

- Connect sampling line to dry-line.
- Connect sampling line firmly with water-trap. Measurement may not be accurate in case of gas leakage.

Warning: Make sure gas outlet is unblocked. To prevent harmful gases from harming operators, environmental ventilation is important during monitoring procedure, negative ventilation is highly recommended.

2.2.3 Start monitoring

- Connect your patient to the monitor.
- Check whether alarm limits, alarm loudspeaker volume, patient category and pacemaker status are appropriate for your patient. Change if necessary.
- Make sure gas outlet is unblocked. To prevent anaesthetic gases from harming operators, environmental ventilation is important during monitoring procedure, anaesthetic gas scavenging is highly recommended.

2.2.4 Switching the Monitor Off

When you finish monitoring, follow the steps below:

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1. Disconnect monitor with the patient.
2. Press power key for about 3 seconds to shut down the machine.
3. Dispose of all single use items.

2.3 Alarms

2.3.1 Alarm pause / resume

Press “alarm pause” button to pause all alarms. Press “mute” button to mute all audible alarms. Press again “alarm pause / resume” key to resume audible alarms.

 : alarm pause

 : alarm off

 : alarm on

2.3.2 Switching Individual Alarm On or Off

You can switch off any parameter alarm, when necessary.

Steps:

- Press menu key on the keyboard to enter the Main Menu
- Select Alarm Settings button to enter the Alarm Settings menu
- Make desired settings.

  Forever audible alarm on / off

  60S alarm mute for 60 seconds.

  120S alarm mute for 120 seconds.

Warning keep all alarm on unless unnecessary.

2.3.3 Setting alarm limits

Set appropriate alarm limits before monitoring a patient.

steps:

- Enter main menu by pressing “menu” button.
- Enter “alarm setting” menu.
- Set all alarm limits.

2.4 Relevant settings about gas measure

Relevant settings in “user setting” menu.

2.4.1 Calibration

Sidestream model doesn’t require zero calibration as it is auto zero-calibrated.
Mainstream model needs zero calibration while “zero calibration needed” is shown on status bar.

Steps:

- Press “menu” button.
- Go to “user setting”.
- Select “calibration” and press ok to preform zero calibration. Approximately 15 seconds are needed for zero calibration.
- You will see message ”calibration successful” after zero calibration.

WARNING Before calibration, make sure module is connected appropriately, and no gas from patient’s breathe enters into the module directly, and make sure air pump is on.(side stream only)

2.4.2 Setting sampling rate

According to users’ needs, you can adjust pump sample flow rate, the higher the flow, the more rapid response corresponding to the waveform edge. In most cases, keep the default (50ml), if there are special needs, adjust. For small patients we recommend selecting a flow rate of default (50ml).

Steps:

1. Press menu key on the keyboard to enter the Main Menu dialog
2. Select System Setting button to enter the User Settings dialog.
3. Move to the Flow Contr,choose the value according settings below:

50ml default pump exhaust flow is 50 ml/min

100ml setting pump exhaust flow is 100 ml/min
150ml setting pump exhaust flow is 150 ml/min

2.4.3 Adjust the apnea alarm time

By default, when more than 20s undetectable breathing, the system will trigger the “Apnea” alarm. Conduct apnea alarm time setting, then the system will alarm according to the time you set.

Steps:

1. Press menu key on the keyboard to enter the Main Menu dialog
2. Select System Setting button to enter the System Settings dialog.
3. Move to the Apnea(s) control,then enter the appropriate time interval

• Compensation parameter settings

When monitoring environment changes, you need to apply compensation factors, so the result will be the best measurement accuracy.

Steps

1. Press menu key on the keyboard to enter the Main Menu dialog.
2. Select User Settings button to enter the User Settings dialog.
3. O2 Cop Changing the O2 Compensation
4. N2O Cop Changing the balance gas Compensation

Note: The latest sensors do need compensation settings, please just simply remain default setting.

Battery

3.1 Introduction

No matter the machine is on or off, connecting to the AC power will recharge the battery immediately. When AC power is disconnected, the monitor will continue working with battery.

Battery indicator shown on the screen have the following statuses:

 : Remaining volume is more than 80%

 : Remaining volume is more than 50%

 : Remaining volume is more than 25%

 : Remaining volume is more than 10%, it is recommended to recharge the battery now.

 : Remaining volume of battery is extremely low.

When battery indicator turns green, battery is charging.

CAUTION Please recharge the battery every 1 or 2 months in case of long-term non-operation.

WARNING The battery should be placed out of the reach of children. The battery specified by manufacture is only available

3.1.1 Recharging the Battery

If the power of battery is exhausted, you can recharge the battery. Charge the battery until it is full. Without connecting AC power, a full battery enables the monitor to continue to work for about 8 hours.

3.1.2 Installing Battery

Please follow below steps to install or replace battery

1. power off the device, disconnect AC power and other connection.
2. open battery door on rear panel.
3. take out the battery
4. install new battery according to +- polar.
5. reassemble battery door.

3.1.3 Recycling Battery

If the battery is damaged or the energy of the battery is exhausted, you should replace and recycle it. The disused battery should be disposed properly according to laws or regulations about the management of battery.

WARNING Don’t disassemble and short-circuit the battery or throw it into fire. The battery combustion, explosion or leakage may cause injury to

you.

Maintenance and cleaning

4.1 Machine cleaning

Soft cloth with soapy water, non-corrosive detergent, surfactant, ammonia, or alcoholic detergent can be used to clean the machine. Do not use strong solvent such as acetone or trichloroethylene for machine cleaning.

Clean the TFT screen with care. Prevent liquid from entering the machine or contacting the TFT screen. Prevent any liquid form entering the socket.

CAUTION The device must be switched off during cleaning procedure, prevent liquid from entering the machine. Do not put the machine or its accessories into liquid. Do not spill any liquid on the machine. Do not use polishing materials or bleach when cleaning the machine.

4.2 Disinfecting accessories

Please clean the device before disinfection. Below agents are recommended:

Ingredient	Approved Agents
alcohol	75% ethanol
acetaldehyde	3.6% glutaraldehyde

NOTICE It is not recommended to disinfect the main machine.

Specifications

5.1 Environment Requirement

Main Unit			
Type	Temperature(℃)	Relative humindity	Atmosphere Pressure (KPa)
Working	5~50	0~95%	70.0~106.0
Storage	0~70	0~95%	22.0~120

5.2 Power Specification

Type	Specification
Input Voltage	12V DC
Input Current	2.0 A

5.3 Physical Specification

Parts	Weight	Dimension
Main Unit	0.65Kg	192mm x 106mm x 44mm

5.4 Hardware Specification

TFT Screen	
Type	Colorful TFT LCD
Dimension	5.0 inch

Battery	
Quantity	4
Model	Rechargeable lithium battery
Voltage	3.7 V
Capacity	2200mAh
Working time	10 hours
Recharging time	4 Hours

LED	
Patient Alarm Indicator	Two colors: Yellow and Red

Sound Indicator	
Loudspeaker	Play alarm voices

Interfaces	
Power	12VDC power socket x 1
USB	MINI USB socket x 1

5.5 Measurement Specification

Principle	NDIR single beam optics
Sampling Rate	90mL/min, ±10mL/min
Initialization Time	Waveform displaying in 20 seconds
Range	CO2: 0~99 mmHg 0~13 % N2O: 0~100 VOL% ISO: 0~6VOL% ENF: 0~6VOL% SEV: 0~8VOL% RR: 2~150 bpm
Resolution	CO2: 0~40 mmHg ±2 mmHg 40 ~99 mmHg ±5% of reading N2O: 0~100VOL% ±(2.0 vol% +5% of reading) ISO: 0~6VOL% ±(0.3 vol% +2% of reading) ENF: 0~6VOL% ±(0.3 vol% +2% of reading) SEV: 0~8VOL% ±(0.3 vol% +2% of reading) RR: ±1 bpm
Apnea Alarm Time	20~60s

5.6 MAC value define

1.0 MAC: A Minimum Alveolar Concentration (MAC) is the alveolar concentration of a volatile agent(eg Sevoflurane) at 1 atmosphere at which 50% of patients will not respond to a painful stimulus (eg skin incision). A MAC of 1.3 will eliminate a response in 99% of patients.

When MAC value is 0.4，most patients will wake up.

Anaesthetic agents	MAC1.0
Enflurane	1.68
Isoflurane	1.16
Sevflurane	1.71
Halothane	0.75
N2O	100%

Notice: Desflurane's MAC1.0 values differ with age.
Age: 18-30 MAC1.0 7.25%
Age: 31-65 MAC1.0 6.0%