



MicroBio Operating Manual

MB1 and MB2 Models



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Regulatory Compliance

EC DECLARATION OF CONFORMITY

This is to certify that **MicroBio MB1** and **MB2** products manufactured from January 2006 meet with the following European Community Directives:

Electromagnetic Compatibility (EMC) Directive **89/336/EEC** repealed by **2004/108/EC** to the following standards:

EN 61000-6-3 - Generic Residential & Light Industrial Emissions

EN 61000-6-1 - Generic Residential & Light Industrial Immunity

Signed:



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as manufacturer of the appliance.

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RoHS

We have taken the step of ensuring our products meet these requirements as part of our commitment to manufacturing goods with the least environmental impact.

WEEE & Recycling

Applicable to all EC States only:

At the end of this product's useful life, please dispose at an appropriate recycling collection point provided in your country, or return to your distributor who is obliged to take the product for safe recycling and disposal under the European Directive 2003/108/EC.

Outside of the European Community, consult your local regulations or local distributor.

Introduction

The MB1 and MB2 MicroBio air samplers are the most economical samplers in the world for monitoring airborne micro-organisms or bioaerosols.

They have been fully validated by the UK Department of Trade and Industry Validation of Analytical Methods (VAM) programme to meet the standards required for a reference sampler.

These samplers collect airborne micro-organisms by drawing a stream of air at a constant flow rate of 100 litres per minute through a series of small holes in a metal head. The air stream then impinges onto a sterile culture medium in a 55mm contact plate or 90mm Petri dish. After exposure to the air stream for a fixed period, the contact plate is removed and incubated. The numbers of colonies which develop are counted, enabling a calculation to be made of the concentration of micro-organisms in the air (CFU/m³ - colony forming units per cubic metre).

Technical Specification

	MicroBio MB1	MicroBio MB2
Flow Rate:	100 l/min	100 l/min
Sample Volume:	25 to 1,500 litres in 14 preset steps	25 to 10,000 litres in 25 litre steps
Sampling Volume Capacity:	Up to 30,000 litres before recharge*	Up to 60,000 litres before recharge*
Sample Delay range	-	10 seconds to 3 hours
d50 Particle size	1.7µm (220 x 1mm hole head)	1.7µm (220 x 1mm hole head) 1.35µm (400 x 0.7 mm hole head)
Mean particle velocity	9.62m/s (220 x 1mm hole head)	9.62m/s (220 x 1mm hole head) 10.7m/s (400 x 0.7 mm hole head)
Other Features:	Auto switch off 4-digit 7-seg LED display Sample cancel feature Padded carry bag supplied	User programmable preset volumes Delay start sampling 16 character x 2 line backlit LCD display Tripod mounting bracket Padded carry bag supplied Audible indication of operation/status Sample cancel with volume taken display
Weight (excluding charger and carry bag):	650g	700g
Dimensions:	196 x 100 x 110mm (inc. head) 196 x 100 x 40mm (case only)	196 x 100 x 110mm (inc. head) 196 x 100 x 40mm (case only)
Power:	4 x AA Cells Alkaline or NiMh 6V at 350mA (maximum)	4 x AA Cells Alkaline or NiMh 6V at 250mA (maximum)
Noise Level:	< 75dB @ 1m	< 75dB @ 1m
Environmental Operating Range:	-10 to 40°C up to 90% RH	-10 to 40°C up to 90% RH
Sampling Plate :	55mm contact plate or 90mm Petri dish	55mm contact plate or 90mm Petri dish
Sampling Head:	316 grade stainless steel 220 x 1mm diameter holes	316 grade stainless steel 220 x 1mm diameter holes or anodised aluminium 400 x 0.7mm diameter holes

* Based upon random volume samples at varying intervals until low battery warning given. These tests were undertaken on units fitted with new and fully charged Ansmann Max-e NiMh cells. Actual battery life may vary due to volume taken per sample, interval between samples, age of cells, and other environmental effects, such as humidity and temperature. Results obtained from other brands of cells may vary.

Warranty

The manufacturer warrants this product to be free from defects in materials and workmanship for 12 months from the date of purchase. Your local distributor may offer extended warranties in addition to this period.

If your product is found to be defective within that period, please contact your local distributor who will arrange for repair of the instrument, or if necessary a replacement.

This warranty does not cover accidental damage, wear and tear, consequential or incidental loss.

The warranty excludes rechargeable batteries supplied with the sampler. Damage caused by use of cleaning materials not recommended by the manufacturer will void the warranty. Any use beyond the specification of the unit will void the warranty. Any modifications to the unit without permission or advice from the manufacturer will void the warranty.

This warranty does not affect your statutory rights.

Notes on using this manual

Operating instructions that follow colour to indicate the following:

RED : **Control panel button**

BLUE : **Display window message**

Sampler Operation

Both MB1 and MB2 models are easy to use hand held instruments.

The MB1 may be hand held or placed on a surface.

The MB2 may be hand held or mounted on a tripod at any height.

Installing Battery

The batteries are held in a small compartment at the back of the MicroBio. The unit is supplied with 4 x AA NiMH high capacity cells. The user can replace these at any time with similar NiMH, NiCd, or even non-rechargeable Alkaline Batteries. The batteries are removed for re-charging in the "plug in the wall charger" supplied.

DO NOT ATTEMPT TO RECHARGE ALKALINE BATTERIES using the supplied charger.

When the batteries need re-charging the display will show the words **LOW BAT** when the unit is first switched on.

We do **NOT** recommend the use of Zinc-Carbon Batteries. These can leak and when left in a discharged state in the battery compartment and can cause corrosion, which can damage the printed circuit board. We also recommend that batteries are removed from the unit if it is to be left unused for extended periods to avoid corrosion.

Ensure any cells used are designed for high drain applications.

NOTE: Please read instructions for the supplied charger before charging the NiMh cells.

Inserting a Plate/Dish

For both MB1 and MB2 models, remove the sampling head cover carefully, unless it is being carried separately in a sterile container. Only hold the edge of the head. Do not touch the front or rear (inside) surface close to the holes. If necessary the head should be sterilised. Insert a contact plate inside the springs so that its base sits firmly on the three support posts; then re-fit the sampling head.



MB1

The MB1 is an extremely simple to use entry level sampler with basic features to get the job done with the minimum of fuss.

Switching On and Off

To switch the unit on press any of the four switches. The display will show the last volume setting used. The unit will switch itself off automatically if not used for 20 seconds.

Setting Sample Volume

To select a volume of air to be sampled use the **+** and **-** buttons to increase or decrease the amount. The MB1 has fourteen pre-set volumes of: 25, 50, 100, 150, 200, 300, 400, 500, 600, 750, 800, 1,000, 1,200 and 1,500 litres.

Starting/Stopping Samples

Press the **START** button to start the sample process. When running, a red LED at the top end of the sampler will illuminate. If at any point it is required to stop sampling early, press the **CANCEL** button. The MB1 will stop sampling when the required volume of air has been sampled. The red light will extinguish at the top of the unit.

MB2

The MB2 provides a rich set of features to provide a flexible sampling solution with increased battery life and sampling capacity.

To switch on, press **ON/OFF** once. The LCD display will show the product name followed by the first menu option of "Take Sample?". Press **ON/OFF** again to switch off the MB2. The MB2 does not have an auto power off facility. The MB2 has a simple menu structure to reach all functions. The options are accessed by pressing the **MENU** button and when the menu item required is displayed on the screen, **START** is pressed to select it.

The main menu options are:

"Take Sample?"

This function performs the sample taking of a given volume of air.

"Delayed Start?"

This function adds a user definable time delay before starting a sample. This gives the ability to leave the MB2 in a sealed environment to start once the operator has left the room.

"User Presets?"

The user can define six commonly used volumes of their own to save time in setting up to take a sample.

"Unit Status?"

This gives information about the MB2 regarding battery, samples taken and version information.

To take a sample, insert a dish as explained earlier, select a volume of air to sample using "Take Sample" and proceed to sample the air as described in the following section.

Note: DO NOT switch off the MB2 when sampling is in progress!

Take Sample

Before setting up to take a sample, remember to have a prepared dish ready in the sampling head.

When **Take Sample** is shown on the display, the user has the option to use one of six preset volumes or manually set a volume. The MB2 remembers the last used manual volume. To toggle between preset or manual mode, use **+** and **-** buttons then press **START** to select the mode.

If in Preset Volume mode, use **+** and **-** to select one of the presets. When ready to use that set volume, simply press **START** again. Sampling will now start and the fan will run and a red LED will illuminate at the top of the sampler.

If in Manual Volume mode, use **+** and **-** to set the required volume of air to be sampled. This may be between 25 and 10,000 litres of air in increments of 25 litres. Pressing **+** and **-** together will set the volume to 100 litres. When ready to take the sample, press **START**.

To exit from either manual or preset volume modes before having started a sample, press **MENU**. At any stage to cancel sampling, press and hold **MENU**.

During sampling, the display will show the volume of air taken so far and how long to go, in seconds, before sampling is complete.

When sampling is complete, the display will show the message **SAMPLING DONE** and the final volume taken. The red LED will flash and a warning tone will be made. To acknowledge the sample, press **START**.

The display will revert back to Take Sample mode.

Delayed Start

The user may wish to undertake sampling remotely.

On some occasions, remote operation of the MB2 is required, such as in sealed clean areas. To avoid problems associated with infra red remote controls, i.e. the operator and sampler may not be in line of sight and windows may not be present, or with wireless types where steel walls may block transmission, the MB2 employs a time delay start for remote operation.

This allows the operator to set a time between 10 seconds and 3 hours, in variable increments, before sampling of a user defined volume commences.

When this menu option has been selected, use **+** and **-** to change the time delay and press **START** when ready. The user can then select the volume required in the same way as in the Take Sample mode described earlier.

When the sample is started, the delay countdown will begin and the LED will flash slowly, a beep will sound every second and the display will indicate in how many seconds sampling will start. Once sampling has started, **MENU** can be pressed as normal to cancel.

At any time in setting a delay, press **MENU** to exit. Pressing **+** and **-** together when setting the delay will set the factory default delay of 60 seconds. The MB2 will remember the last used preset delay for next time, even if the unit has been switched off.

User Presets

Some users find that for almost all the sampling they undertake the volume of air sampled is always the same. At this menu item, the user can set six possible Preset Volumes which are stored even if the MicroBio is switched off and on.

When this menu item is first selected, the user is presented with **Preset Volume [1]** and the current set volume. This value can be adjusted using the **+** and **-** buttons. When the desired volume is reached, press the **START** button to store the value.

The display then moves onto the second preset volume. If a particular preset is not to be altered, skip past by pressing **START** until the required preset is reached. When all preset values have been set and stored, leave this menu option by pressing **MENU**.

Unit Status

When Unit Status mode is selected, use the **+** and **-** keys to navigate between the various screens. Pressing **START** or **MENU** will take you back to the main menu list.

Battery Level

This display gives a percentage indication of battery capacity. It is only an approximation and cannot be used to determine the exact operating hours of volume taking capacity remaining in the battery.

Total Volume Count

This displays the total litres of air the MB2 has taken since the last factory reset. This figure is useful for the manufacturer's maintenance and reliability statistics, and may also be used as an indicator for the user's regular calibration regime.

Total Samples Taken

This is a count of how many samples have been taken by the MB2 since the last factory reset.

This figure is useful for the manufacturer's maintenance and reliability statistics and may also be used as an indicator for the user's regular calibration regime.

Unit Version

This displays the hardware and software revision information for the MB2. It is used by the manufacturer for repair and maintenance purposes. The software in the MB2 cannot be upgraded by the user.

Restore Factory Defaults

When Unit Status mode has been selected, it is possible to perform a factory reset on the MB2 by holding down the + and - buttons simultaneously. The display will show on the top line **** UNIT RESET **** with a row of dots appearing on the bottom line. When sixteen dots appear, the MB2 will restart itself.

This has the effect of restoring all factory defaults to the pre-set user volumes and zeroing the samples taken and total volume counts.

Determining Results

Once the sample has been taken, the contact plate or Petri dish should be removed immediately from the MicroBio and the lid replaced on the plate and sealed.

The plate should then be incubated for a period of time and temperature dependant on the requirements of the media. Further information can be found in the Microbiology section of this manual.

Once incubated, the colony growths are then counted, either manually or using an automatic colony counter. Due to the statistical nature of the sampling method and the chance more than one colony impinged at one point on the dish, a count correction needs to be performed. The table in Appendix A gives the corresponding corrected value based on the sampling head used on the MicroBio.

Alternatively, the following equation can be used to determine a corrected count.

$$n_c = n_f \left(\frac{1.075}{1.052 - \frac{n_f}{n_h}} \right)^{0.483}$$

Where n_h is the number of holes on the sampling head, n_f is the number of counted colonies and n_c is the corrected count. If the counted colonies, (n_f) exceeds the number of sampling head holes (n_h), then the mathematics will fail and the results cannot be trusted. If this is the case, then the sample dish can be considered as overloaded with organisms and the user should consider lower sampling volumes.

The colony concentration is then the corrected count, above, per volume of air sampled. The results are normally expressed in colony forming units per cubic metre.

To convert the corrected count to CFU/m³ use the equation:

$$CFU/m^3 = 1000 \cdot \frac{n_c}{V_s}$$

Where n_c is the corrected number of colonies counted and V_s is the sampled volume in litres.

Spreadsheets to automate the correction process and to collate and present results are available for free download from:

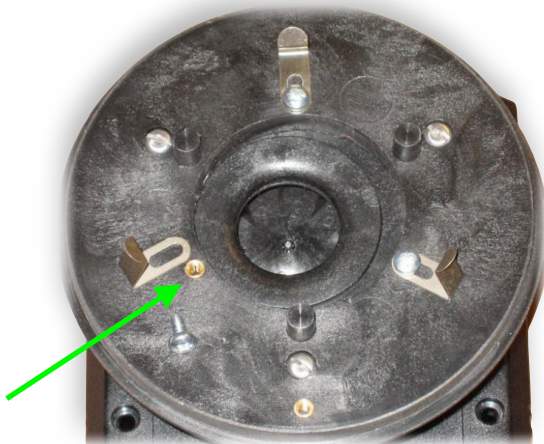
Excel™: <http://www.cantiumscientific.com/downloads/PHCA.xls>

Apple™ Numbers™: <http://www.cantiumscientific.com/downloads/PHCA.numbers>

Change Plate/Dish Type

The MicroBio can accommodate both 55mm contact plates or 90mm Petri style dishes. The MB1 and MB2 samplers are factory fitted with the Petri dish springs, but these can be removed and replaced with contact plate springs (Cantium Scientific Limited part number P0001M007). The springs for both types have slots to allow a degree of adjustment to suit dish/plate manufacturer variations.

The picture below shows the fitting of the contact plate springs.



Care must be taken not to over-tighten or cross-thread any of the screws. The tool required is a small Pozi-head screwdriver (Cantium Scientific Limited part number P0001SCRD). If any screws are lost, they can be replaced with Cantium Scientific Limited part number P0001SCR003.

Cleaning

The sampling head should be sterilised preferably by autoclave, but in the field disinfect with suitable sterilising wipes, recommended VernaCare Tuffie 5 (part number 901SW225TY).

In areas of low bioaerosol levels, observe a disinfection regime between each sample. Always sample from areas of lower contamination towards those of higher contamination. Wash exposed skin and clothing before sampling and avoid drinking, eating or smoking in the test area. All equipment should be handled aseptically.

The MicroBio is suitable for use with Hydrogen Peroxide Vapour (H₂O₂ vapour) bio-decontamination.

Tests have been carried out by Bioquell (UK) Ltd on a range of sensitive electronic equipment to determine effects of such processes. The conditions of these tests were:

Gas Concentration	1000 ppm
Conditioning time	20 minutes
Gassing time	30 minutes
Aeration time	150 minutes

As the MicroBio has a fan within the sampling head head it is recommended that during the decontamination process the MicroBio is set to sample at maximum volume so that the H₂O₂ vapour may be drawn through the head, fan and exhaust for optimum decontamination.

Throughout the trials, Bioquell demonstrated that bio-decontamination with H₂O₂ vapour does not appear to be detrimental in any way, effect operational aspects or aesthetics of sensitive electronic equipment. For further information on Bioquell H₂O₂ vapour Material Compatibility please refer to their document BDS-3-MATCOMP-V3.2 available from their website www.bioquell.com or contact them on +44 (0)1264 835835.

Calibration

It is recommended that the MicroBio should be regularly calibrated in accordance with specific industry best practice. Typically this will be on the anniversary of the instrument entering service.

The only calibration adjustment on the instrument is the flow rate, by default set to 100 litres per minute.

A validation/calibration kit (Cantium Scientific Limited part number P0059) for the MicroBio MB1 and MB2 sampler is also available from your local distributor, or the sampler may be returned to your local distributor or Cantium Scientific Limited.



MicroBio Air Sampling

Although the use of simple settle plates can be used for collection of bacterial and fungal spores, it can never give a quantitative determination. This passive technique will also fail to enumerate very small particles such as bacteria, which will remain suspended. The MicroBio MB1 or MB2 bioaerosol samplers allow a quantitative measurement to be made.

Sampling

The selection of the sampling volume is important for reliable sampling. If the contact plate is overloaded with colonies it is difficult to make an accurate count. With experience, the user will anticipate the probable bioaerosol concentration in an area, but it may be necessary to make a preliminary survey at a number of sampling volumes to identify the optimum sampling volume. Each sample should be repeated several times and a statistical mean value and confidence value for the value determined.

Hygiene

The sampling head should be sterilised preferably by autoclave, but in the field disinfect with alcohol or proprietary wipes. Wipes or alcohol can also be used to sterilise the MicroBio Box. In areas of low bioaerosol levels, observe a disinfection regime between each sample. Always sample from areas of lower contamination towards those of higher contamination, wash exposed skin and clothing before sampling and avoid drinking, eating or smoking in the test area. All equipment should be handled aseptically.

Temperature & Humidity

Make a note of these values at the time of each measurement. These are important factors in the likely concentration and continuing viability of airborne microorganisms. For example, some bacteria survival rates are 35 to 65 times higher at 80%RH compared to 40%RH.

Selection of Media

The agar media used in the 55mm contact plate or 90mm Petri dish should be chosen to suit the organisms which are being monitored. For a wide range of bacteria, use tryptic soy agar (TSA), casein soy peptone agar (CPSA) or nutrient agar (NA). There are other selective agars for more specific micro-organisms. For fungi (yeasts and moulds), use malt extract agar (MEA) or rose Bengal agar (RBA).

After sampling with the MicroBio Samplers, the agar contact plates are incubated for specified times and temperatures (typically 1-2 days, at 25 – 37°C) and the colonies which develop are counted. A correction is applied to the colony count to allow for the possibility that two organisms going through one sampling hole will result in only one colony growth being observed (positive hole correction). From the corrected count and the sampling volume used, the number of colony forming units per cubic metre (CFU/m³) can be determined.

Micro-organism	Agar Culture Medium	Incubation Temperature
Bacteria:		
Human Flora	Blood Agar	35 - 37°C
Possible Pathogens	Heart Infusion Agar Soya bean-casein digest agar (SCDA)	35 - 37°C
Environmental saprophytic	SCDA or R2A	25 - 30°C
Thermophylic	EMB or Endo Agar	35 - 37°C
Fungi:		
Environmental saprophytes	Malt Extract Agar(MEA)	Room Temp
	Sabouraud Dextrose	Room Temp
	Rose Bengal Agar (RBA)(with streptomycin), Inhibitory Mould Agar	20 - 25°C
Xerophylic	Malt Extract Agar with added NaCl, sucrose or dichloran- glycerol	20 - 25°C

Typical media suitable for air sampling

Media selected can be for general detection or selective to assist identification of organisms after collection. Traditionally Malt Extract and Rose Bengal Agars are used for collection and counts of fungi. Various recipes are available from suppliers. For bacteria, Tryptic Soy Agar, Casein Soy Peptone Agar and nutrient Agar are used. For both fungi and bacteria, various chemicals may be added to the media to give selectivity.

Troubleshooting

The MicroBio should give many years of trouble-free service with minimal routine maintenance. However, below are some common questions and answers relating to the use of the MicroBio MB1 and MB2 Air Sampler.

Q. The unit will not switch on.

A. Check the batteries are inserted correctly and fully charged. If this does not resolve the situation, please contact the manufacturer.

Q. (MB1 Only) When setting the volume to be sampled and then pressing start, the fan seems to run slow and the display dims.

A. This may well be due to exhausted batteries, or use of low quality batteries not supplied by the manufacturer. Some AA cells have a higher internal resistance than others, particularly budget alkaline cells. When the fan starts in the instrument there is a high surge current that will cause the voltage of the batteries to momentarily dip causing the fan to run slow. Try using a new set of high quality alkaline or freshly charged NiMh cells. The brands of alkaline cells we have found to work well are Duracell, Energizer and Varta.

Q. The sampler cuts out and switches off during sampling.

A. This is due to exhausted or low quality batteries. Replace batteries or recharge.

Q. The sampling head fits loosely.

A. There is a retaining spring inside the sampling head area that keeps the head tight. This may, with time and use, have moved. Loosen the screw, slide the spring to the edge of the sampling head plate and re-tighten. Try this until a secure fit is obtained.

Q. The contact plate or Petri dish fit loosely.

A. With time the springs that hold them in place may have loosened. Undo the screws, move the springs and re-tighten until a secure hold of the plate/dish is obtained. There is variation in the outside diameter of plates from one manufacturer to another. The MicroBio holding springs can be adjusted to accommodate this variation.

MB2 Only

Q. Unable to adjust properly user pre-set sample volumes or sample volume and samples records appear to be corrupted.

A. This is a rare event that may possibly happen if the unit is switched off during sampling or just as sampling completes. The unit should never be switched off until the user acknowledges the end of sampling or cancels sampling using the keypad. If this does occur, select "UNIT STATUS" from the menu, press **START**, then hold down the **+** and **-** buttons simultaneously until the display indicates the unit is "RESETTING". The MB2 will re-boot to factory default values and clear any problems.

Technical Support

The first point of call for technical support should be your local distributor. If you do not have a distributor in your country, please visit our website at <http://cantiumscientific.com/Distributors.html>.

Appendix A

Count	Corrected	Count	Corrected	Count	Corrected	Count	Corrected
1	1	41	45	81	101	121	176
2	2	42	47	82	103	122	178
3	3	43	48	83	104	123	180
4	4	44	49	84	106	124	182
5	5	45	50	85	107	125	185
6	6	46	52	86	109	126	187
7	7	47	53	87	111	127	189
8	8	48	54	88	112	128	192
9	9	49	55	89	114	129	194
10	10	50	57	90	116	130	197
11	11	51	58	91	117	131	199
12	12	52	59	92	119	132	202
13	13	53	61	93	121	133	204
14	14	54	62	94	123	134	207
15	16	55	63	95	124	135	209
16	17	56	65	96	126	136	212
17	18	57	66	97	128	137	214
18	19	58	67	98	130	138	217
19	20	59	69	99	132	139	220
20	21	60	70	100	133	140	223
21	22	61	71	101	135	141	225
22	23	62	73	102	137	142	228
23	24	63	74	103	139	143	231
24	25	64	76	104	141	144	234
25	27	65	77	105	143	145	237
26	28	66	78	106	145	146	240
27	29	67	80	107	147	147	243
28	30	68	81	108	149	148	246
29	31	69	83	109	151	149	249
30	32	70	84	110	152	150	252
31	33	71	86	111	155	151	255
32	35	72	87	112	157	152	258
33	36	73	89	113	159	153	262
34	37	74	90	114	161	154	265
35	38	75	92	115	163	155	268
36	39	76	93	116	165	156	272
37	41	77	95	117	167	157	275
38	42	78	96	118	169	158	279
39	43	79	98	119	171	159	282
40	44	80	99	120	173	160	286

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