CANTIUM SCIENTIFIC

MicroBio MB2, MB2-HiFlow and MB2-RSH Bioaerosol Sampler Operating Manual

MicroBio MB2
Bioaerosol Sampler

Operating Manual

Applicable to MB2 standard, HiFlow and RSH models

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Regulatory Compliance

EC Declaration of Conformity

This is to certify that MicroBio MB2 products manufactured from **April 2017** comply with the essential requirements of the following European Community Directives when used according to their intended purpose:

Electromagnetic Compatibility (EMC) Directive 2014/30/EU

BS EN 61326-1:2013	Scientific, Test and Measurement Equipment

Referencing:

BS EN 55011/CISPR11	Emissions for Industrial, Scientific and Medical Equipment
BS EN 61000-4-2	Immunity to Electrostatic Discharge
BS EN 61000-4-3	Radiated Immunity

Restriction of the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment (EEE) Directive (2011/65/EU)

BS EN 50581:2012

Signed:

S Plumridge CEng MIET FRSA
Director, Cantium Scientific Limited

WEEE and Recycling

At the end of this product's life, please recycle responsibly.

Within the EU, take to an approved recycling centre, local authority collection point, or return to your local distributor who is obliged to take the product for safe recycling and disposal under the Waste Electrical and Electronic Equipment Directive 2012/19/EU.

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

The MicroBio MB2 key parts are manufactured from the following:

Enclosure	Material	Recyclable
Blower housing	Aluminium	Yes
Air blower	Glass reinforced nylon	Yes (limited facilities)
Enclosure	ABS Plastic	Yes
Display window	Polycarbonate	Yes
Tripod mount	Aluminium	Yes
Circuit board *	Various	Partially
Sampling heads	Stainless steel or aluminium	Yes
Carry case	ABS Plastic	Yes
Packaging	Cardboard and PET	Yes
Documentation	Paper	Yes
Batteries *	NiMH	Partially

* These items must be taken to approved recycling centres equipped to handle such waste and recover the metals used in their manufacture. Some elements of these parts cannot be recycled.

Warranty

The manufacturer warrants this product to be free from defects in materials and workmanship for **24 months** from the date of purchase.

If your product is found to be defective within that period, please contact Cantium Scientific Limited or 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 cells supplied with the sampler.

Damage caused by cleaning materials and methods not recommended by the manufacturer, use beyond the specification, use in wash down areas (unless used in approved protective bags), or modifications without prior permission from the manufacturer will invalidate the warranty.

This warranty does not affect your statutory rights.

MicroBio MB2 Technical Specification

Flow Rate:	100 L.min^{-1} ‡
Sample Volume:	10 to 10,000 litres in varying steps
Sampling Volume Capacity:	~ 60,000 litres before recharge*
d50 Particle size:	1.7 μm (220 x 1mm hole head) 1.35 μm (400 x 0.7mm hole head)
Mean particle velocity:	9.62 ms^{-1} (220 x 1mm hole head) 10.7 ms^{-1} (400 x 0.7mm hole head)
Weight (excluding charger and carry bag):	780 g (inc. battery and petri dish)
Dimensions:	196 x 100 x 110mm (inc. head)
Power:	4 x AA NiMh Cells 6V at 250mA (maximum)
Noise Level:	< 75dB @ 1m
Environmental Operating Range:	-10 to 50°C up to 90% RH‡
Sampling Plate:	55mm/65mm contact plate **or** 90mm petri dish
Sampling Head:	316 grade stainless steel 220 x 1mm holes **or** Anodised aluminium 400 x 0.7mm holes

* Based upon random samples until low battery warning given. These tests were undertaken on units fitted with new and fully charged Ansmann Max-e 2500 mA.Hr 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.

‡ Calibrated at 1013mbar 20ºC. Environmental conditions will affect air pressure thus mass/volumetric flow rates.

MicroBio MB2-HiFlow Technical Specification

Flow Rate:	180 L.min^{-1} ‡
Sample Volume:	10 to 10,000 litres in varying steps
Sampling Volume Capacity:	~ 40,000 litres before recharge*
d50 Particle size:	1.71 μm
Mean particle velocity:	9.55 ms^{-1}
Weight (excluding charger and carry bag):	840g (inc. battery and petri dish)
Dimensions:	196 x 100 x 110mm (inc. head)
Power:	4 x AA NiMh Cells 6V at 600mA (maximum)
Noise Level:	< 80dB @ 1m
Environmental Operating Range:	-10 to 50°C up to 90% RH‡
Sampling Plate:	90mm petri dish
Sampling Head:	Stainless Steel 400 x 1.0mm holes

* Based upon random samples until low battery warning given. These tests were undertaken on units fitted with new and fully charged Ansmann Max-e 2500 mA.Hr 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.

‡ Calibrated at 1013mbar 20ºC. Environmental conditions will affect air pressure thus mass/volumetric flow rates.

MicroBio MB2-RSH Technical Specification

Flow Rate:	100 L.min^{-1} ‡
Sample Volume:	10 to 10,000 litres in varying steps
Sampling Volume Capacity:	~ 60,000 litres before recharge*
d50 Particle size:	1.7 μm (220 x 1mm hole head) 1.35 μm (400 x 0.7mm hole head)
Mean particle velocity:	9.62 ms^{-1} (220 x 1mm hole head) 10.7 ms^{-1} (400 x 0.7mm hole head)
Weight (excluding charger and carry bag):	1680 g (inc. controller, head unit, battery, cable, petri dish)
Dimensions:	196 x 100 x 40mm (control unit) 140 x 100 x 100mm (head unit)
Power:	4 x AA NiMh Cells 6V at 250mA (maximum)
Noise Level:	< 75dB @ 1m
Environmental Operating Range:	-10 to 50°C up to 90% RH‡
Sampling Plate:	55mm/65mm contact plate **or** 90mm petri dish
Sampling Head:	316 grade stainless steel 220 x 1mm holes **or** Anodised aluminium 400 x 0.7mm holes

* Based upon random samples until low battery warning given. These tests were undertaken on units fitted with new and fully charged Ansmann Max-e 2500 mA.Hr 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.

‡ Calibrated at 1013mbar 20ºC. Environmental conditions will affect air pressure thus mass/volumetric flow rates.

Introduction

The MicroBio MB2 is part of the MicroBio range of bioaerosol samplers and is one of the most economical hand-held samplers in the world for monitoring airborne micro-organisms or bioaerosols. It is available with a standard flow rate of 100 litres per minute or the HiFlow model with a flow rate of 180 litres per minute.

The MicroBio range meets the standard required for a reference sampler, as fully validated by the UK Department of Trade and Industry Validation of Analytical Methods (VAM) programme.

The sampler collects airborne micro-organisms by drawing a stream of air at a constant flow rate through a series of small holes in a metal head. Particles suspended in the air stream impinge onto the surface of a sterile culture medium in a contact plate or petri dish.

After exposure to a set volume of air, the contact plate or petri dish is removed and incubated. The number of colonies which develop are counted, enabling a calculation to be made to determine the concentration of micro-organisms in the air (CFU/m^3 - colony forming units per cubic metre).

Installing Battery

The battery is held in a compartment at the back of the MicroBio MB2. The unit is supplied with 4 x AA NiMH rechargeable cells. The cells must be removed for re-charging.

To open the battery compartment press firmly on the “OPEN” marking on the battery compartment lid near the serial number label and then slide downwards.

The orientation of the cells is indicated within the battery compartment.

Carefully replace the lid with an upwards sliding motion ensuring the “OPEN” marking on the lid is towards the serial number label.

NOTE:

Please read the instructions supplied with the charger before charging the NiMh cells. To avoid corrosion, we recommend cells are removed from the unit if it is to be left unused for extended periods and fully charged before use.

Battery Management

The air blower in the MicroBio MB2 requires the use of cells that are capable of high current drain. Low cost alkaline or budget rechargeable cells are often not capable of delivering the required power while maintaining their terminal voltage and the sampler may stop operating without warning.

We recommend using the NiMH cells supplied with the sampler kits, or equivalent high quality cells with suitably low impedance. Alternatively, non-rechargeable alkaline cells may be used, but must be high quality, such as Duracell, Energizer or Varta industrial range. If using alkaline cells, the battery type needs to be manually set. Please see the ‘Settings’ section of this manual for instructions.

As cells age through time and use, their internal electrical resistance (impedance) increases. This will reduce the amount of time the sampler can be used on a single charge. Old cells may, at random, when under load drop their terminal voltage too low and the sampler will switch off. If this happens, the cells must be replaced. If this occurs during sampling, the sample must be discarded and a new one taken.

All cells at the end of their life should be recycled or disposed of responsibly in accordance with local regulations.

Sampling

The selection of the sample volume is important for reliable sampling. If the contact plate or petri dish 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 setting. Each sample should be repeated several times and a statistical mean value and confidence value determined.

Selection of Media

The agar media used in the contact plate or petri dish should be chosen to suit the micro-organisms being monitored. For a wide range of micro-organisms, consider using tryptone 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), consider using malt extract agar (MEA) or rose bengal agar (RBA). **Appendix C** details various culture media types.

IQ / OQ / PQ

Documentation templates are available from Cantium Scientific Limited or your local distributor to support in-house Installation, Operational and Performance Qualification.

Inserting a Contact Plate or Petri Dish

Carefully remove the sampling head cover from the MicroBio MB2, unless it is being carried separately in a sterile container. Only hold the edge of the head. **Do not touch the perforated or inside surfaces.**

With the sampling head removed, insert a petri dish/contact plate inside the springs, so that its base sits firmly on the support plate, then re-fit the sampling head.

The standard MicroBio MB2 can use 220 or 400 hole sampling heads. The 220 hole sampling head can be used with both 55mm/65mm contact plates or 90mm petri dishes, but only the centre 55mm of the petri dish will collect samples. Using the 400 x 0.7mm hole sampling head will give nearly full coverage of a 90mm petri dish, improving reliability of counts.

The MicroBio MB2-HiFlow model can only use 90mm Petri dishes and the 400 x 1mm hole sampling head.

ALWAYS STERILISE THE SAMPLING HEAD
PRIOR TO EACH USE

Switching On and Off

To switch the unit on press the **ON/OFF** button.

The MicroBio MB2 will initially indicate the battery condition:

```
MicroBio MB2
Battery: OK
```

If the battery is too low, the MicroBio MB2 will issue a warning to change the battery and then automatically switch off. This is to protect the battery pack and not allow samples to be taken that may not complete.

```
LOW BATTERY!
CHANGE BATTERY
```

To switch off the MicroBio MB2, press the **ON/OFF** button. The MicroBio MB2 will automatically switch off after a period of inactivity. Automatic and manual switch off is prevented during sampling, delayed start and sequential sampling. When switching off, a warning will sound and the display will show “switching off” while the MicroBio MB2 saves usage data to memory.

```
Switching off
```

Take a Sample

When switched on the unit immediately enters *Take Sample* mode. This mode can also be selected by pressing **MENU** to show the following screen, then pressing **START**.

Select the volume to be sampled by choosing a preset or manually adjust volume. Press ⊖ button to select preset option or ⊕ to select manual adjustment. Press **START** to confirm selection.

If *Preset Volume* is selected, use ⊕ or ⊖ to select one of nine preset volumes, then press **START** to begin sampling.

If *Adjust Volume* is selected, use ⊕ or ⊖ to set the required volume from 10 to 10000 litres. Press **START** to begin sampling.

During sampling the display will show the sampled volume taken and the time remaining before sampling is complete.

At the end of sampling, the screen will display the total volume sampled and sound a warning tone and flash the top-mounted LED. To clear the warning, press any key. If left, the unit will automatically switch off after 20 seconds.

To cancel sampling at any time press and hold the **MENU** button. The unit will sound a short warning tone and display the volume sampled up to that point.

Delayed Sample

The *Delayed Sample* feature allows the user to set the MicroBio MB2 to start sampling after a given time between 1 minute and 3 hours. Select this option by pressing **MENU**, then pressing **START**.

The delay time is adjusted using ⊕ or ⊖. When set, press **START**.

The sample volume is set as described in *Take Sample.* Pressing **START** will start the delay timer and the screen will show the countdown. During countdown the screen backlight will switch off to conserve battery power.

When the countdown reaches zero, sampling will start. The screen will display the volume sampled and remaining time. When finished, press any button or leave the MicroBio MB2 to automatically switch off.

Sequential Sampling

The *Sequential Sampling* feature allows sampling onto a single plate over an extended period of time. This is achieved by taking a sequence of smaller volumes over a defined amount of time.

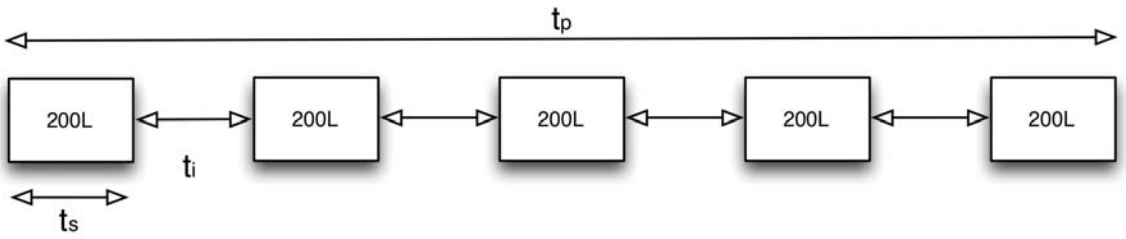
This is useful in clean room environments where contamination levels are normally low, resulting in low counts. Monitoring for short periods could risk missing potential hazards that may occur during the day. The MicroBio MB2 can now be set up and left to work autonomously, sequential sampling up to 10,000 litres over a 24 hour period.

Sequential Sampling – How it works

A cubic meter of air would normally be sampled in 10 minutes using a standard MicroBio MB2. Sequential sampling allows the user to configure the total volume to be sampled, by using an adjustable volume or one of the user preset volumes, over 5 minutes to 24 hours with optional delayed start if required.

To illustrate how sequential sampling works, consider a 1,000 litre sample taken over an 8 hour period (t_p), broken into five separate samples (n). These numbers are entered into the MicroBio MB2 following a simple set of questions. The MicroBio MB2 then calculates how much air needs sampling per sequence (ts being the time to take each sample) and the time between the samples (ti), calculated using the equation below:

$$t_i = \frac{t_p - n \cdot t_s}{n-1}$$



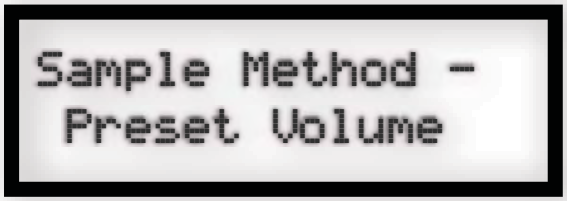
The sampling sequence illustrated below, shows how the sample is broken down into five smaller samples of 200 litres each. t_S for a standard MicroBio MB2 will be 2 minutes for each 200 litres of air.

Using the equation above, the interval between each of these 200 litre samples is calculated as 7,050 seconds or 1 hour, 57 minutes and 30 seconds. At the end of the sampling sequence the MicroBio MB2 displays a finished message and will automatically power off. When the MicroBio MB2 is next switched on, it will display a finished message with the total volume of air sampled.

Sequential Sampling - Configuration

Navigate to this option using **MENU** and press **START**.

Select the volume to be sampled by choosing a preset or manually adjust volume. Press ⊖ button to select preset option or ⊕ to select manual adjustment. Press **START** to confirm selection.



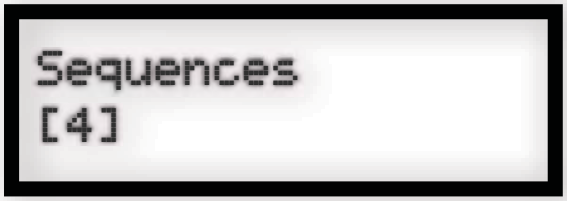
If *Preset Volume* is selected, use ⊕ or ⊖ to select the required preset volume, then press **START**.

If *Adjust Volume* is selected, use ⊕ or ⊖ to set the required volume to be sampled then press **START**. The volume may be set in the range of 10 to 10000 litres.

Next define the time over which sampling is to take place.

Use ⊕ or ⊖ to set the required time, from 5 minutes to 24 hours, then press **START**.

Enter the number of sequences (2 to 100) using ⊕ or ⊖, then press **START**.



Finally, define the time delay before sampling starts. Adjust from 0 for no delay up to 3 hours using ⊕ or ⊖ then press **START**.

The MicroBio MB2 will calculate the volume each sequence is to take and the interval time between each sample.

Sequential Sampling process will commence, displaying a countdown if a delay was set. The first sample will be taken, then wait for the calculated interval before taking the next sample. This will continue until the total volume has been sampled over the required time.

During sequential sampling, the display will show a count of sequences (top-left), the total volume taken (bottom-left), time to next sample (top-right) and time remaining until sequential sampling is complete (bottom-right).

At the end of sequential sampling, the screen will indicate sampling is complete and the total sampled volume. The MicroBio MB2 will automatically switch off.

At any time, either during set-up or sampling, the process can be terminated by holding down **MENU**. If sampling is interrupted, the unit will display a summary of what has been sampled.

User Presets

Factory default preset volumes are 100, 200, 400, 500, 750, 1000, 2000, 5000 and 10000 litres. However, the *User Preset* feature allows modification of the nine preset volumes. Press **MENU** to navigate to this option, then press **START**.

The user is presented with Preset Volume [1] and the current set volume. This value can be adjusted using ⊕ or ⊖.

Users can set the volume between 10 and 10000 litres.

When the desired volume is reached press **START** to store and move on to the next preset. When all required presets have been set, press **MENU** to save and exit this option. Settings are stored in non-volatile memory and are retained when the battery is removed.

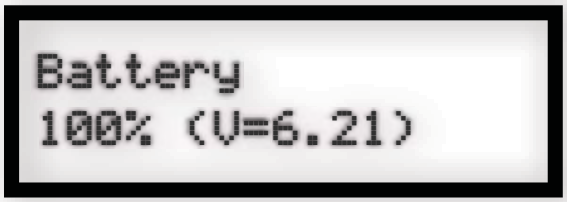
Unit Status

Unit Status displays information about the MicroBio MB2. Press **START** to select this mode, then ⊕ or ⊖ to navigate through the information.

Pressing **MENU** will exit this mode.

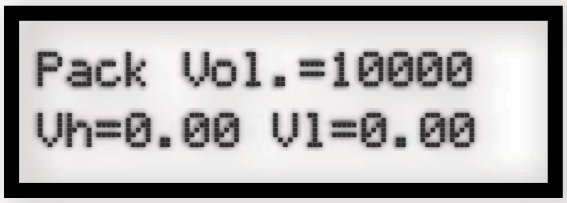
Battery Level

Displays a percentage of battery capacity and voltage at rest. The capacity is only an approximation and cannot be used to determine the exact remaining sampling capacity.



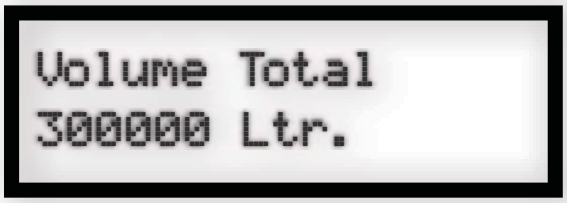
Power Diagnostics

This information is only of use during service and repair of the sampler.



Total Volume Count

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



Total Samples Taken

Displays a count of how many samples have been taken by the MicroBio 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

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

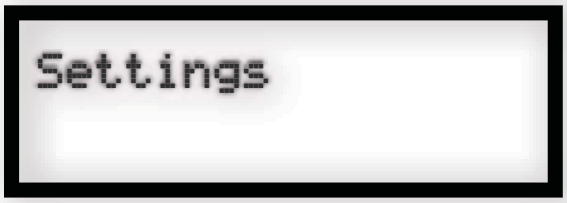
Restore Factory Defaults

When *Unit Status* mode is selected, it is possible to perform a factory reset on the MicroBio MB2 by holding down ⊕ and ⊖ simultaneously.

The sampler will restart and initialise all settings to factory defaults and reset the total counts to zero.

Settings

Unit settings include Language, Battery Type and Auto power-off time.



Press **START** to select this mode, then ⊕ or ⊖ to navigate options.

Pressing **MENU** will exit this mode. Pressing **MENU** at any time when in the settings options will also exit.

Settings - Language

When the language setting option is shown on the screen, press **START** to select it.

Use ⊕ or ⊖ to select the required language, then press **START**.

Settings - Battery Type

The MicroBio MB2 is capable of operating on non-rechargeable alkaline cells or rechargeable NiMH cells. However, these cells have different electrical characteristics and the MB2 needs to know what type is installed so as to properly report on battery level.

The default setting is for NiMH cells, as supplied with the MicroBio MB2.

When the option is shown on the screen, press **START** to select.

Use ⊕ or ⊖ to select the battery type, then press **START** to store the setting.

Selecting the wrong type will not cause any harm to the MicroBio MB2 or the cells, but will give incorrect reporting of capacity.

Settings - Automatic Power Off

By default, the MicroBio MB2 will power off after 60 seconds of inactivity. This can be adjusted if required from 10 seconds to 5 minutes, or disabled.

When the Auto-off option is shown on the screen, press **START** to select.

Use ⊕ or ⊖ to change the auto-off time, then press **START** to store.

To disable the automatic power-off feature keep the ⊖ button held until the display shows disabled.

Tripod Mounting

The MicroBio MB2 incorporates a standard ¼”-20 UNC tripod mount, as defined in ISO1222:2010. Tripods designed for most photographic equipment are compatible with the MicroBio MB2.

Temperature and Humidity

It is useful to measure these at the time of each sample. Temperature and humidity are important factors in the likely concentration and viability of airborne micro-organisms. For example, some bacteria survival rates are 35 to 65 times higher at 80%RH compared to 40%RH.

Determining Results

Once the sample has been taken, the contact plate or petri dish should be removed and sealed with its protective lid. A note should be made on the lid regarding time, location, volume sampled etc., and stored appropriately.

The plate should be incubated for a period of time and temperature dependant on the requirements of the media.

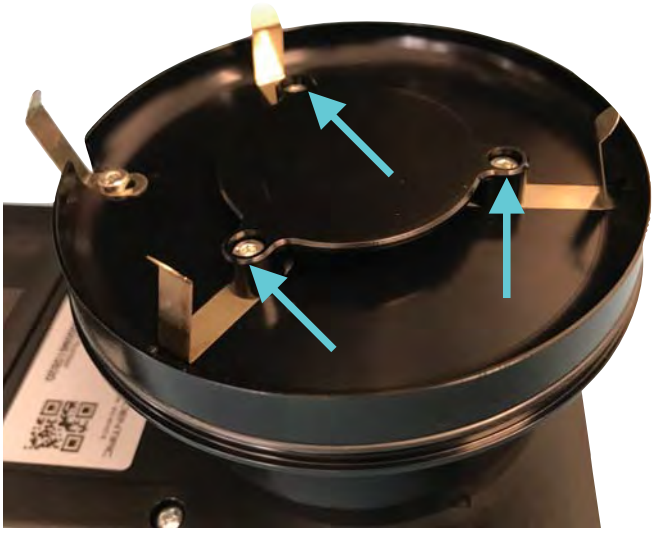
Once incubated, the colony growths are then counted, either manually or using an automatic colony counter. Due to the statistical nature of the sampling method and the chance more than one colony impinged at one point on the dish, a count correction needs to be performed.

The tables in **Appendix A** and **Appendix B** give the corresponding corrections for the 220 and 400 hole sampling heads respectively for uncorrected counts up to 160 CFU.

Change Plate / Dish Type

The MicroBio MB2 can accommodate both 55mm/65mm contact plates or 90mm petri dishes. The MicroBio MB2 is factory fitted with the petri dish springs (Cantium Scientific Limited part number A-00070), but these can be removed and replaced with the supplied contact plate springs (Cantium Scientific Limited part number A-00068).

The springs for both types have slots to allow a degree of adjustment to suit dish/plate manufacturer variations.



To change the spring type remove the three screws as highlighted using the 2mm hex-key supplied with the kit. Lift off the support plate and springs, then refit using the same screws, support plate and the required springs. Care must be taken not to over-tighten or cross-thread any of the screws.

Replacement screws are available from Cantium Scientific Limited, part number A-00232 or contact your local distributor.

Validation

Some industries require sampling equipment to be validated before each use. For the 100 L/min MicroBio MB2 and MB2-RSH this can be achieved using the MicroBio Validation Kit, part number A-00058 available from Cantium Scientific Limited or your local distributor. For the MB2-HiFlow, validation can be achieved using the Qualisair™ qCR kit, Cantium Scientific Limited part number A-00422.

Calibration

It is recommended all models of MicroBio MB2 are 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. Calibration is normally performed at an air pressure of 1013 mbar at 20ºC.

For calibration services please contact Cantium Scientific Limited or your local distributor. For in-house calibration, we recommend the use of the Qualisair™ qCR kit.

Appendix A - 220 Hole Count Correction Table

Count	Corrected	Count	Corrected	Count	Corrected	Count	Corrected
1	1	41	46	81	101	121	175
2	2	42	47	82	102	122	177
3	3	43	48	83	104	123	179
4	4	44	49	84	106	124	182
5	5	45	50	85	107	125	184
6	6	46	52	86	109	126	186
7	7	47	53	87	110	127	188
8	8	48	54	88	112	128	191
9	9	49	56	89	114	129	193
10	10	50	57	90	115	130	196
11	11	51	58	91	117	131	198
12	12	52	59	92	119	132	201
13	13	53	61	93	120	133	203
14	14	54	62	94	122	134	206
15	15	55	63	95	124	135	208
16	16	56	65	96	126	136	211
17	18	57	66	97	127	137	213
18	19	58	67	98	129	138	216
19	20	59	69	99	131	139	219
20	21	60	70	100	133	140	222
21	22	61	71	101	135	141	224
22	23	62	73	102	136	142	227
23	24	63	74	103	138	143	230
24	26	64	76	104	140	144	233
25	27	65	77	105	142	145	236
26	28	66	78	106	144	146	239
27	29	67	80	107	146	147	242
28	30	68	81	108	148	148	245
29	31	69	83	109	150	149	248
30	32	70	84	110	152	150	251
31	34	71	86	111	154	151	254
32	35	72	87	112	156	152	257
33	36	73	89	113	158	153	261
34	37	74	90	114	160	154	264
35	38	75	92	115	162	155	267
36	39	76	93	116	164	156	271
37	41	77	95	117	166	157	274
38	42	78	96	118	168	158	278
39	43	79	98	119	170	159	282
40	44	80	99	120	173	160	285

Note: For counts greater than that shown in the table above, please refer to ‘Determining Results’ section.

Appendix B - 400 Hole Count Correction Table

Count	Corrected	Count	Corrected	Count	Corrected	Count	Corrected
1	1	41	44	81	91	121	144
2	2	42	45	82	92	122	145
3	3	43	46	83	93	123	147
4	4	44	47	84	95	124	148
5	5	45	48	85	96	125	150
6	6	46	49	86	97	126	151
7	7	47	50	87	98	127	153
8	8	48	51	88	100	128	154
9	9	49	53	89	101	129	156
10	10	50	54	90	102	130	157
11	11	51	55	91	103	131	159
12	12	52	56	92	105	132	160
13	13	53	57	93	106	133	161
14	14	54	58	94	107	134	163
15	15	55	59	95	109	135	164
16	16	56	61	96	110	136	166
17	18	57	62	97	111	137	167
18	19	58	63	98	113	138	169
19	20	59	64	99	114	139	170
20	21	60	65	100	115	140	172
21	22	61	66	101	117	141	174
22	23	62	68	102	118	142	175
23	24	63	69	103	119	143	177
24	25	64	70	104	121	144	178
25	26	65	71	105	122	145	180
26	27	66	72	106	123	146	181
27	28	67	74	107	125	147	183
28	29	68	75	108	126	148	184
29	30	69	76	109	127	149	186
30	31	70	77	110	129	150	188
31	33	71	78	111	130	151	189
32	34	72	80	112	131	152	191
33	35	73	81	113	133	153	192
34	36	74	82	114	134	154	194
35	37	75	83	115	136	155	196
36	38	76	85	116	137	156	197
37	39	77	86	117	138	157	199
38	40	78	87	118	140	158	200
39	41	79	88	119	141	159	202
40	42	80	90	120	143	160	204

Note: For counts greater than that shown in the table above, please refer to ‘Determining Results’ section.

Appendix C - Culture Media Types

Some examples of culture media are given in the table below. However, always check with your supplier for the optimum medium to use for your specific application.

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

Appendix D - Replacement Parts

Description	Part Number
55mm contact plate holding springs	A-00068
90mm Petri dish holding springs	A-00070
Head retaining spring	A-00071
2mm Hex-key	A-00206
Head screw pack	A-00232
MB2 nitrile head O-ring	A-00227
Battery charger and cells	A-00053
NiMH rechargeable cell pack	A-00320
Mini tripod	A-00061
Full height tripod	A-00185
220 x 1.0mm stainless steel sampling head	A-00021
400 x 0.7mm aluminium sampling head	A-00020
400 x 1.0mm stainless steel sampling head (HiFlow only)	A-00183
Hard carry case	A-00060

Appendix E - Bioaerosols

What is a bioaerosol?

Bioaerosols are airborne particles, solid or liquid. They can be large molecules or volatile compounds. They contain living organisms. They will vary in size from a fraction of a micron to around 100 microns. As with inert “dust” particles, all bioaerosols are governed by the laws of gravity and will be affected by air movements being transported by turbulence and diffusion.

Air will often contain micro-organisms such as viruses, bacteria, and fungi. None of these actually live in the air, the atmosphere tends to kill off most of them. However, they are frequently transported attached to other particles, such as skin flakes, soil, dust, or dried residues from water droplets. Aggregation of cells into clumps can enhance the survival whilst airborne.

Bacterial cells when they become airborne normally rapidly die, within a few seconds, due to the evaporation of water associated with the particle. Thus with higher humidity, higher bioaerosol levels can prevail. Airborne fungal cells (yeasts, moulds, spores) can remain viable for much longer periods, even at low relative humidity and high or low temperature extremes. These can pose health risks for humans and animals.

Sources of Bioaerosols

Outdoor areas: Wind action on soil, agitation of open water and raindrop impaction are major sources of bioaerosols. Farming of land, wastewater and sewage treatment are also significant outdoor sources. Other farming activities, cattle, swine animal houses will generate bioaerosols. Food processing plants, particularly of dairy products can generate higher levels of bioaerosols. With today’s emphasis on renewables, power station biomass storage and industrial scale composting facilities are sources of bioaerosols.

Indoor areas: Many indoor areas are associated with bioaerosol problems. In all food processing plants, hygiene requires that levels of airborne micro-organisms are kept as low as possible. Hospitals and healthcare facilities are not only sources of a variety of organisms, but require that patients are not exposed to any of them. The presence of undesirable bioaerosols is often associated with sick building syndrome, being one of a number of factors which contribute to building related illness.

Monitoring of Bioaerosols

Although the use of simple settle plates can be used for collection of bacteria 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 simplest quantitative method of monitoring is to use sieve impactors, which collect bacteria and fungal spores from air flowing at 100 litres per minute through a series of air inlets, onto an agar filled 55 mm contact plate or 90 mm Petri dish, up to a volume of 2,000 litres.

The agar media used 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) and nutrient agar (NA). There are other selective agars for more specific micro-organisms. For fungi (yeasts and moulds) use is made of malt extract agar (MEA) or rose bengal agar (RBA). After sampling with the MicroBio samplers, the agar plates are incubated for specified times and temperatures (typically 1 to 2 days at 25 to 37 deg C) and the colonies which develop are counted.

A correction is applied to the 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). This is determined from tables or using the MicroBio PC Reporter software supplied with all MicroBio samplers. From the corrected count and the sampling volume used, the number of colony forming units per cubic metre (CFU/m3) can be determined.

Appendix F - MB2-RSH Installation

The first task is to run the connecting cable from where the sampling head is to be positioned to where the control unit is to be located.

A connector is pre-fitted to the cable end to be connected to the remote sampling head.

Fitting the Connector for Unterminated Cables

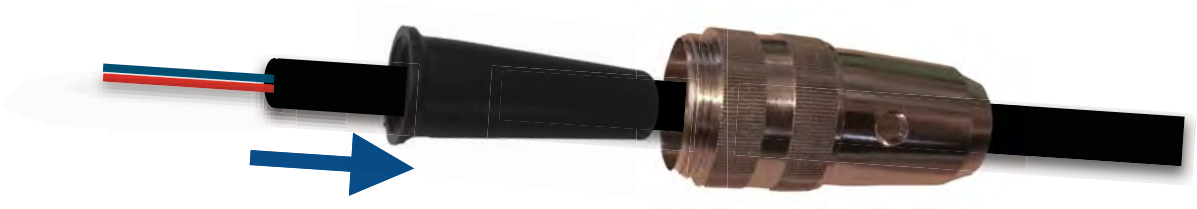
The following tools are required to fit the connector:

1 x Soldering iron and solder (lead free)
1 x 2.5mm slot screwdriver

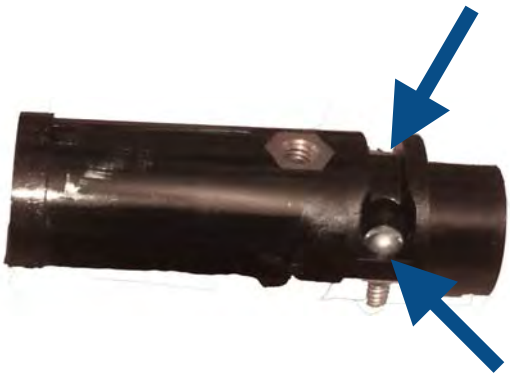
The connector is assembled in the order as shown in the photographs below.

1. Dismantle the connector by first removing the screw on the side of the connector.

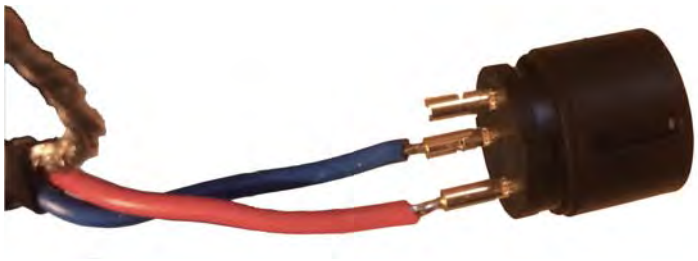
2. Slide the metal connector housing onto the cable end, followed by the strain relief. The strain relief will need pushing on firmly.



3. Remove cable clamp.

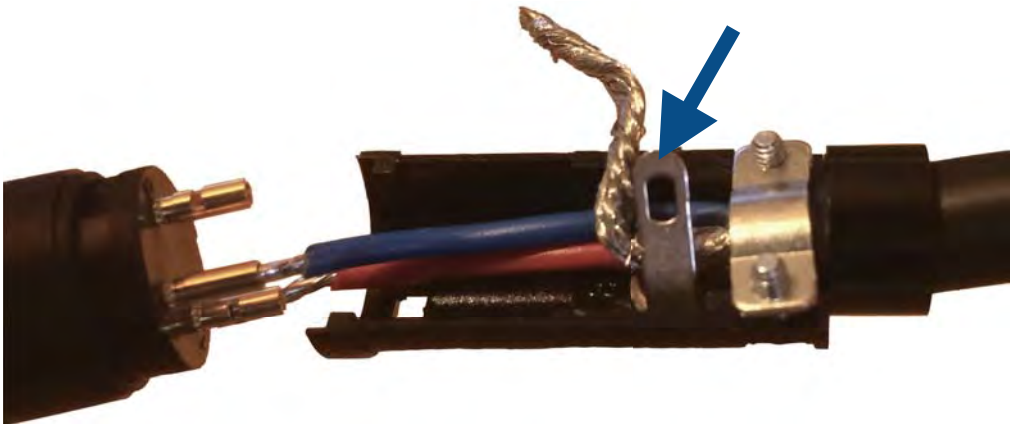


4. Solder cable onto connector pins. The connector body has pin numbers embossed onto the surface adjacent to the pins.



   i. Pin 1: Red
   ii. Pin 2: Blue

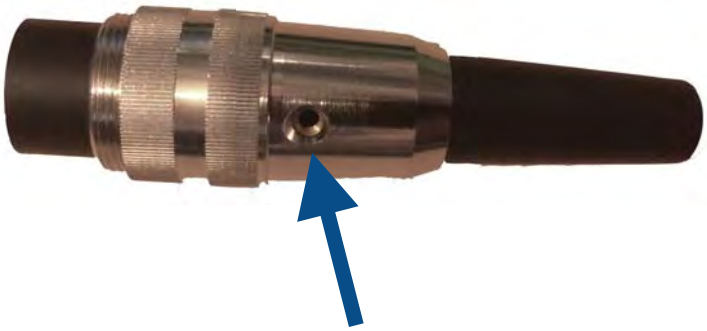
5. Fit frame onto cable end and refit cable clamp. The clamp must clamp on the outer sheath/heat-shrink on the end of the cable. Then solder the screen agains the soldier tab of the frame.



6. Fit the pin housing back onto the frame, noting the raised pegs on the rim of the pin housing that sit into the holes on the frame. Then replace the frame cover.

7. Slide the assembly, strain relief and metal shell together.

8. Align shell so that the brass thread of the frame body can be seen, then replace the housing screw and tighten.



Connecting the Control Unit and remote Sampling Head

The connectors are polarised so that they can only be connected in the correct manner. The remote head unit requires the female connector and the male connector end of the cable connects to the control unit.

Operation

Once installed, the MB2-RSH operates in exactly the same way as a conventional MB2 bioaerosol sampler.

Calibration - *Factory or Service Agent only*

The MB2-RSH can be calibrated in the same manner as any other MicroBio bioaerosol sampler.

Disconnect the head and control unit from the cable and return to the manufacturer or approved agent for calibration. Head units must be thoroughly cleaned, sterilised and free from any potential contaminant before return to a calibration agent. Documented evidence of cleaning must be provided. Please inform the calibration provider of the length of the connecting cable used for the controller and head combination. It may be possible to calibrate in situ. The use of the Qualisair ™ qCR kit is required for this.

NOTES:

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