WPA CO 8000 Cell Density Meter
User Manual

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Unpacking, Positioning and Installation

- Ensure your proposed installation site conforms to the environmental conditions for safe operation:
  Indoor use only
  Temperature 5°C to 35°C
  Maximum relative humidity of 80 % up to 31°C decreasing linearly to 50 % at 40°C

If this equipment is used in a manner not specified or in environmental conditions not appropriate for safe operation, the protection provided by the equipment may be impaired and instrument warranty withdrawn.

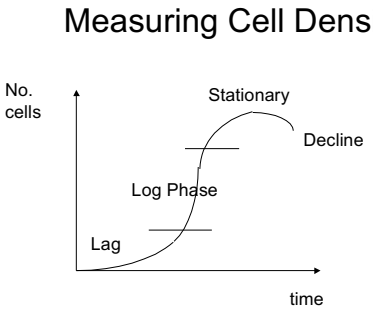
- The instrument is powered by the internal rechargeable battery or by mains electricity using the supplied power-adapter. Using the instrument with the mains adapter will automatically recharge the battery.
  - The battery will last approx. 1 month when fully charged with normal use.
  - A full battery recharge will take approx. 12 hours (overnight).

OPERATION

Introduction

Your cell density meter is a small easy to use instrument that is dedicated to measuring the density of cells in suspension at 600nm. It is suitable for measuring growth rates of all types of cell including *E.coli* and yeast and has been designed to give comparable readings to other spectrophotometers. To use with other cell types, known concentrations / cell counts (with replicates to gauge error limits) should be plotted against measured OD600 to construct a calibration curve. Clumping together of cells will also affect readings, so the medium they are suspended in will also make a difference. The instrument can be used in incubation cabinets and under anaerobic conditions.

The stage of growth of a bacterial culture needs to be monitored to ensure that the cells are harvested at the optimum point for the greatest density of live cells. The growth curve is given below.



Cells should be harvested towards the end of the log phase. The optical density of the sample indicates when this point has been reached. This value varies dependent on the cells being grown.

As bacterial samples are cloudy, they mainly scatter light rather than absorb it. This means that the actual reading obtained is very dependent on the collecting area of the detector after the sample and the optical geometry of the system. These vary depending on the make and model of instrument, so differences in readings between types of instruments are to be expected.

This instrument is dedicated to measuring at 600nm and has been designed to ensure that results obtained are comparable with most other spectrophotometers. Readings taken at 595nm will differ only slightly and such differences are normally insignificant.

A 600nm LED source in combination with a fibre optic is used to obtain the measurement. The instrument can be linked via a serial lead to either a serial printer for hardcopy output or to a PC for download of results to spreadsheet.

Using the Instrument

Keypad	
on/off	**On / off button**
R	**to set reference** to 0.000 OD at 600nm on a reference
T	to **make** a measurement
mem	Memory button
reset	Press twice to clear stored values
recall / print	Print results stored in memory
Display	There is a memory number indicator and a battery indicator

Note that the light beam shines from front to back through the cell chamber; ensure the cell is inserted in the correct alignment.

The following table indicates the absolute minimum volume necessary for the correct function of the unit. The use of disposable plastic cuvettes is recommended.

Cuvette/Tube	**Min Volume (ml)**	**Part number**	**Minimum Depth (approx) from base of cuvette to meniscus (mm)**
Macro Cuvette (max fill volume 4.5ml)	1.0ml	80-2004-53	14mm
Semi-micro (max fill volume 1.4ml)	0.5ml	80-2084-11	13mm
10mm diameter tube	0.9ml	-	16mm
12mm diameter tube	1.1ml	-	15mm
16mm diameter tube	2.2ml	-	15mm

Making a measurement

1. Switch the instrument on by pressing the ON/OFF button.
2. Place a reference sample into the cuvette sample compartment.
3. Press and release the R (reference) button. The display will show 0.00.
4. Remove the reference sample and replace with the sample solution in a cuvette or tube.
5. Press and release the T (test) button. The display will show the OD of the sample in absorbance units.

Multiple samples can be compared with the same reference by placing different samples in the cuvette chamber and making measurements for each one. It is recommended to re-reference with the reference solution every 10 to 15 minutes to avoid any slow instrument drift. If in doubt always re-reference.

Using the memory function

The instrument can store up to 99 readings in the memory. The results can then be viewed, printed or downloaded at a later time. This enables readings to be taken at, for example, an incubator and downloaded to a PC in a different laboratory. The results remain in the memory even when the instrument is switched off.

1. Switch the instrument on by pressing the ON/OFF button.
2. Press MEM button to display MEM (if not already displayed)
3. Place a reference sample into the cuvette sample compartment.
4. Press the R (reference) button. The display will show 0.00 but the memory number will not change.
5. Insert the sample and press the T (test) button. The result will be displayed and the Memory Number will increase by one.
6. To retrieve the results press recall/print. This will print out all of the results held in the memory if the instrument is connected to a PC or printer and cause the memory number to flash. Repeated pressing of the button will display the results in the memory on the screen in reverse order scrolling back to the beginning.
7. Press reset or MEM to go back to the latest result.
8. Pressing reset when the latest result in the memory is showing will cause the screen to flash **rSt** and **?**.

If no further action is taken the screen will revert to its normal state after 7 seconds. If reset is pressed again whilst the screen is flashing all of the memory positions will be cleared.

TROUBLE SHOOTING NOTES

ERROR INDICATION	SOLUTION
A flashing Absorbance reading of 2.00 Abs is obtained.	This indicates an Absorbance of more than 1.99 and is therefore out of range. The sample needs to be diluted.
A negative reading is obtained.	In normal measurements the test sample has a positive Absorbance compared to that of the Reference. Negative readings will be obtained if the Reference and Test cuvettes are mixed up.
A flashing Absorbance reading of –0.30 Abs is obtained.	This indicates an Absorbance of less than –0.30 Abs and is therefore out of range. The sample needs to be diluted.
Unexpected results are obtained.	Any bubbles in solution will produce considerable error. Check LED is flashing
REF is displayed when T is pressed	The baseline has not been set. Replace the sample with a blank or reference sample and press T. The samples can then be tested.
No reading is obtained when using the instrument in battery mode.	Check that there is sufficient battery power available. The battery power available is indicted by the battery symbol at the bottom right hand corner of the display. Three bars in the battery indicates that it is fully charged. If only one or no bars are present the battery needs to be recharged. Connect the instrument to the electric power supply using the adaptor/recharge unit. The battery will be fully recharged in 12 hours
The OD600 value is different to that obtained on another instrument in the lab	When you measure turbid solutions you do not measure the absorbance/transmittance of light at the detector, you measure the amount of scattered light that reaches the detector. Thus optical geometry is very important - the further the distance from the sample to the detector, the greater the effect of the scattered light. Thus instead of harvesting at 0.4 OD, for example, you have do it at 0.8 OD. A simple conversion factor can be calculated from the OD600 of your existing instrument compared to that of the cell density meter

IMPORTANT WARNING

Always wear protective clothing when handling bacteria or other cells.

ACCESSORIES

Spreadsheet interface software	80-2112-23
Serial interface cable	80-3001-00
Pack of 100 disposable cells, 1ml minimum volume	80-2004-53
Pack of 100 disposable cells, 0.5ml minimum volume	80-2084-11
Adapter set for 10 and 12mm tubes	80-3000-57

OUTPUT OF RESULTS

Use with PC

Results can be downloaded directly to Excel when the PC has the Spreadsheet Interface Software installed (80-2112-23) and the two are linked with the serial cable (80-3001-00); detailed instructions are supplied with the software. Baud rate is 9600 and the separator should be set to space.

CLEANING AND GENERAL CARE OF THE INSTRUMENT

The instrument has no serviceable parts.
The instrument requires little maintenance, but the following are considered good practice:

1 Keep the instrument clean and dry. Wipe off any spilt liquids immediately. Clean with a slightly damp cloth; a non-abrasive water-based soap or detergent may be used. The instrument may be wiped

2 Remove the cuvettes from the instrument when not in use.

3 Store in a cool place away from corrosive chemicals or fumes.

De-contamination procedure

To decontaminate we recommend that the instrument is wiped with ethanol or other antibacterial detergent as required. A soaked cloth may be inserted into the cuvette chamber or ethanol sprayed directly into the compartment.

The instrument can be sterilised using formaldehyde or ethylene oxide, but not with UV light (due to plastic degradation).

For severe contamination it is possible to remove the 4 screws in the base and separate the top and bottom covers (taking care to not drop the battery inside the instrument). The contaminated areas in the instrument may then be wiped with a suitable anti-bacterial detergent.

SPECIFICATION AND WARRANTY

Wavelength	600nm
Bandwidth	40nm
Range	Optical Density –0.3A to 1.99A
Accuracy	<±0.05A at 1A using Neutral Density Filters
Repeatability	±0.02A at 1A
Cuvette holder	Fixed with drain hole. Accepts 10mm pathlength semi micro and macro cuvettes or 14-17mm round tubes.
Output	RS232
Memory	99 readings
Display	Custom LCD
Power requirements	External power adaptor (110 to 220V, 50/60Hz, 20VA) or internal rechargeable NiMH battery
Approximate dimensions	180 x 150 x 60mm
Weight	0.6kg

Specifications are measured after the instrument has warmed up at a constant ambient temperature and are typical of a production unit. As part of our policy of continuous development, we reserve the right to alter specifications without notice. The product does not fulfil the specific requirements of the IVD.

Warranty

Your supplier guarantees that the product supplied has been thoroughly tested to ensure that it meets its published specification. The warranty included in the conditions of supply is valid for 12 months only if the product has been used according to the instructions supplied. They can accept no liability for loss or damage, however caused, arising from the faulty or incorrect use of this product. This product has been designed and manufactured by Biochrom US, 84 October Hill Road, Holliston MA 01746-1388 USA.