

VORTEX Standard 2 & VORTEX Timer 2 SAMPLING PUMPS

User Manual

HB 3260-06

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CASELLA CEL

CASELLA CEL
Regent House
Wolseley Road
Kempston
Bedford
MK42 7JY, United Kingdom
Phone: +44 (0) 1234 844 100
Fax: +44 (0) 1234 841 490
E-mail info@casellagroup.com
Web: www.casellagroup.com

CASELLA USA
17 Old Nashua Road #15
Amherst
NH 03031
U.S.A.
Toll Free: +1 800 366 2966
Fax: +1 603 672 8053
E-mail info@casellaUSA.com
Web: www.casellaUSA.com

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1. INTRODUCTION

This handbook is designed to introduce you to the basic operation and features of the Casella VORTEX Standard 2 and VORTEX Timer 2 personal sampling pumps.

Both pumps may be used for air sampling applications using flow rates between 0.5 and 3.5 litres/min. They are ideally suited to many of the “Total” and “Respirable” dust sampling techniques as detailed within the Health and Safety Executive’s publication MDHS14.

The VORTEX Timer 2 includes an LCD display that indicates the sample run time in minutes. This facilitates accurate calculation of the sampled volume without the need for a separate clock or timer.

The information contained in this handbook relates to the operation of Casella sampling equipment only, and is not intended to advise or influence your adopted sampling strategy. For information regarding appropriate sampling methods, reference should be made to local legislation and guidelines as dictated by the relevant national health and safety organisations.

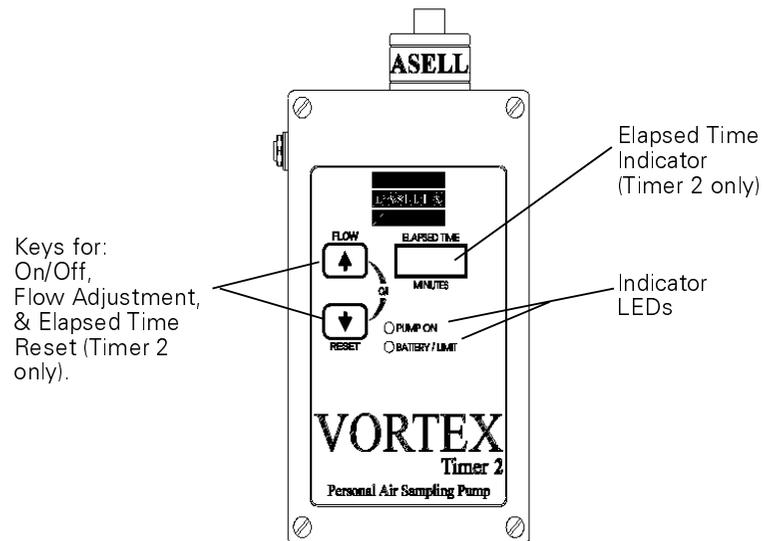
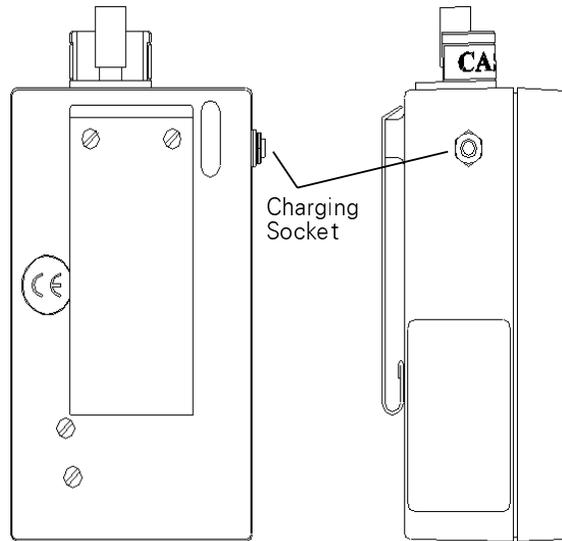
CASELLA CEL are able to offer a wide range of training courses and analytical services specifically suited to users of air sampling equipment. Please contact CASELLA CEL for further information.



2. OPERATION

These samplers are based upon an efficient diaphragm pump whose flow rate is precisely maintained by automatic flow control circuitry.

With the exception of the ELAPSED TIME display, the layout of both VORTEX pumps is identical, as shown below.



2.1 Battery

A rechargeable nickel-cadmium battery provides, typically in excess, of 8 hours continuous operation. The battery charging socket is located on the side of the pump. Using the standard charger, the battery will be fully charged in 14 hours.

To ensure maximum cycle life expectancy of the battery pack, it is recommended that the battery is not left in a fully discharged condition for extended periods of time. Excessive over charging should also be avoided.

2.2 Battery Low Shut Down

A battery low cut-off facility will turn the pump off once the internal battery pack becomes fully discharged. This will prevent "deep discharge" damage and ensures maximum life of the battery pack. Should the pump be switched on with a discharged battery, battery-low warning "bleeps" will be given prior to the pump shutting itself down.

2.3 Switching the Pump ON and OFF

To switch the pump ON, press the "FLOW" and "RESET" keys at the same time. The buzzer will bleep twice and the green LED will switch on, indicating "PUMP ON".

To switch the pump OFF, press the "FLOW" and "RESET" keys at the same time.

2.4 Indicator LEDs

There are two light emitting diodes (LEDs) located on the front panel of the instrument.

PUMP ON

Green indicator: used to indicate that the pump is switched ON and is running. The LED flashes when in flow adjustment mode.

BATTERY LIMIT

Red indicator: used to identify one of two potential error conditions.

Battery Low Warning

When the battery approaches a discharged condition, the red "BATTERY/LIMIT" LED flashes slowly and the audible alarm sounds. Sampling should be terminated and the battery recharged.

Flow Fault Shut Down

The red "BATTERY/LIMIT" LED flashes rapidly and the audible alarm sounds whenever the pump's loading exceeds a pre-set value. This may be due to excessive back-pressure from a tube restriction, filter blockage, or pump fault.

Should the fault condition remain for 8 seconds, the pump will be automatically shut down and the "BATTERY/LIMIT" LED remain lit.

Pressing both keys will cancel the error warning and switch the pump off.

Re-start the pump as normal.

2.5 Setting the Flow Rate

Adjust the pump flow to the desired rate while the pump is running.

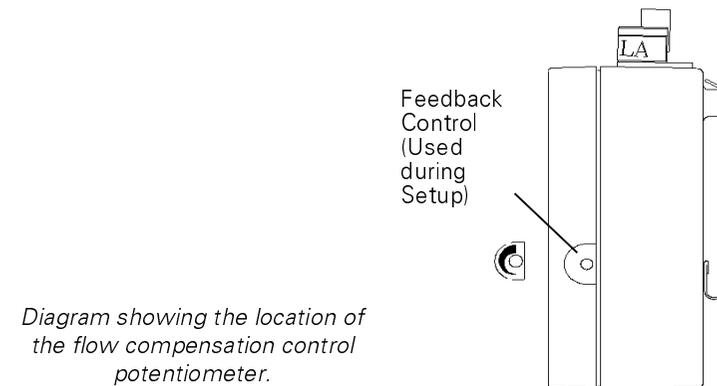
1. Press the "FLOW" key for 3 seconds, the green "PUMP ON" LED will flash.
2. Temporarily release the key, the green LED will continue to flash while the pump is in this mode.
3. Adjust the flow rate, either up or down, by holding down the appropriate key, the adjustment is slow to start then picks up speed.
4. If there is no key press after 4 seconds, the pump will return to normal run mode and the green "PUMP ON" LED will stop flashing.

For optimum stability of flow, it may be necessary to allow the pump to run for a few minutes before use.

2.6 Flow Compensation

The VORTEX Standard 2 and VORTEX Timer 2 control circuitry is designed to maintain a stable inlet flow rate over varying pressure drop conditions. Small increases in back pressure may occur during sampling due to the gradual increase in filter contamination. All personal samplers are factory calibrated to suit the majority of monitoring applications and should require no further adjustments. If however, the sampler is used over a large range of flow rates or pressure drops, then for optimum stability of a given flow rate, adjustment of the sampler's feedback control may be necessary.

The feedback control is located on the side of the pump under a sealed label. For adjustment of the feedback control it is necessary to remove this label.



An alternative label design is provided should frequent access to the control be desired.

2.6.1 Adjustment Technique

If the sample flow rate drops due to an increase in pressure loading, adjust the "feedback" control with a trimming tool and increase the flow to slightly above the desired flow rate. Reduce the flow back to the desired flow rate using the front panel keys.

If an increase in the applied pressure loading causes the sample flow rate to increase, decrease the flow to below the desired flow rate using the "feedback" control. Increase the flow back to the desired flow rate using the front panel keys.

Repeat the "feedback" adjustment procedure until the sample flow rate remains constant over changes in the operating pressure.

An accessory kit is available to provide adjustable inlet pressure loading. Please contact Casella CEL sales for further information.

2.7 Flow "Shut Down" Adjustment

The flow shut down is factory set to a level ensuring the sampler shuts down if operated with an inlet blockage or beyond its designed operating envelope.

Adjustment of the shut down threshold may be required for operation at higher flowrate or pressure drop conditions (for example, when the sampler is used in conjunction with a low flow constant pressure regulator).

Adjust the shut down threshold value as follows.

1. Loosen the four screws on the face of the sampler and carefully remove the lid.
2. The shut down control is located on the rear of the circuit board as shown below.

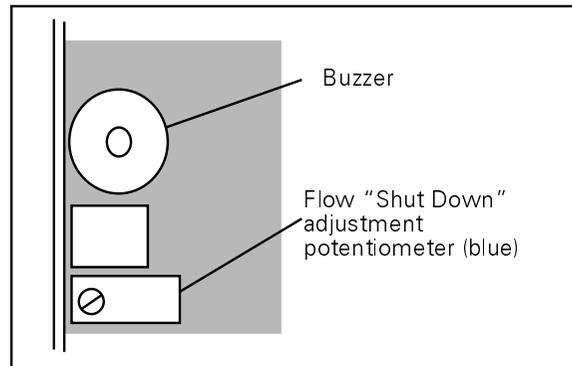


Diagram showing the location of the flow shut down potentiometer

3. Adjust the potentiometer fully clockwise, until it "clicks".
4. Connect the pump via the appropriate sampling head and filter to a flowmeter, and adjust to the required flow rate using the front panel keys.
5. With the pump running and the filter head connected, adjust the potentiometer anti-clockwise until the "BATTERY/LIMIT" LED flashes, then back the adjustment off half a turn.
6. Replace the sampler lid.

2.8 Timer (Timer 2 only)

The LCD timer display situated on the front panel indicates the sample run elapsed time in whole minutes. The timer can be reset to zero by holding down the "RESET" key for 3 seconds. This can be carried out while the pump is on or off.

2.9 Table of Functionality

Function	Required Key Press	LED	Buzzer
Switch ON	Press both keys together.	Green "PUMP ON" LED lit.	Double bleep.
Switch OFF	Press both keys together.	No LEDs lit.	
Flow adjustment mode	Press "FLOW" key for 3 seconds. Release key and then adjust flow up or down.	Green "PUMP ON" LED flashes.	
Exit flow adjustment mode	No key press for 4 seconds.	Green "PUMP ON" LED stops flashing.	
Reset timer (Timer 2 only)	Press "RESET" key for 3 seconds.		

3. SAMPLING

The battery must be fully charged to ensure an 8 hour run, especially for filters producing a high initial pressure drop.

The sampler is designed to work at maximum efficiency for flow rates between 0.5 and 3.5 litres/min. The flow rate is accurately controlled to within 5% for pressure drop variations appropriate to the selected flow rate.

The pressure drop limits are also related to the selected flow rate:

Typically 15 cm H₂O max. at 3.5 litres/min, and 40 cm H₂O at 2 litres/ minute.

The sampler is suited to the vast majority of commonly used sampling methods and filter media.

Note: The sampler should never be run without a filter on the inlet.

3.1 Check List Before Sampling

1. Make sure the battery has been fully charged.
2. Ensure that the sampling head is correctly fitted with no leaks.
3. If the flow rate cannot be obtained with similar conditions to previous occasions, a leakage may be present.

4. SERVICING

CASELLA CEL's in house service department offers a comprehensive range of repair and calibration services, designed to effect a fast and efficient back-up for all our products. The Service Department is operated under the scope of our BSI registration for products manufactured by us. We will however, undertake the repair of other manufacturers equipment.

For further information please contact the CASELLA CEL Service Department at our Bedford headquarters. We will be happy to provide quotations for individual repairs or provide annual maintenance under contract.

We recommend factory service by technicians trained and equipped to repair your instrumentation. Should you wish factory repair assistance, send your equipment in a package equivalent to the original packaging.

Insure to full value and ship pre-paid. Include a letter giving full details with your packing list.

Send to:

CASELLA CEL LIMITED
(Service Department)
Regent House
Wolseley Road
Kempston
Bedford
MK42 7JY
United Kingdom

If purchased outside the United Kingdom, please return to your distributor.

5. FAULT FINDING

Typical problems are shown on the following table.

Symptom	Possible Cause	Service Hint
Pump does not switch ON or run (Green LED not lit).	Battery fully discharged or unserviceable.	Recharge for 14 hours.
	Wiring loom disconnected at some point / Fault on joint.	Locate & resolder.
	Circuit / Keypad failure.	Return for repair.
Pump does not run (Green LED lit).	Pump or motor seizure.	Replace pump / motor.
	Broken wire or worn brushes.	Repair connection.
Pump runs but no air drawn.	Diaphragm rubber split.	Replace.
	Tubes between pump and outlet split or disconnected.	Replace.
Pump runs but cannot achieve desired flow rate.	Leak on pump assembly.	Locate & Correct.
	Dirty or damaged valves.	Clean / Replace.
	Inlet filter clogged.	Remove & Clean.
	Excessive pressure drop.	Check sample filter.
Red error LED lit or flashing plus audible alarm.	Battery voltage too low.	Recharge battery.
	Excessive pressure drop or high pump current.	Remove pressure load / Repair pump.
Flow rate not maintained through full working shift.	Incomplete charge.	Re-charge.
	Battery below capacity.	Fully charge & check voltage which should be more than 4.8 V. If below this level, check the output from the charger. Replace battery.
	High current consumption due to mechanical defect in pump.	Locate & correct.
	Filter disc clogged.	Replace.

6. TECHNICAL SPECIFICATIONS

6.1 Common Specifications

Flow Range:	0.5 to 3.5 litres/min.
Flow Control Accuracy:	±5% for selected flow.
Max Pressure Drop:	40 cm H ₂ O at 2 litres/min, 15cm H ₂ O at 3.5 litres/min.
Nominal Battery Voltage:	4.8 volt.
Nominal Battery Capacity:	1.2 Ah.
Run Time:	In excess of 8 hours.
Operating Temperature:	0 to +40°C.
Dimensions:	120 mm x 74 mm x 50 mm.
Weight:	500 g.

6.2 Common Additional Features

- ✘ Low battery shut down.
- ✘ Compact size to cause no significant handicap for the wearer.
- ✘ Low battery indication Visual and audible.
- ✘ Automatic flow fault shut down (due to excessive pressure drops or blockages).
- ✘ Digital flow adjustment.

6.3 Timer 2 Additional Features

- ✘ Six digit elapsed time timer with 1 minute resolution.

7. OPTIONAL ACCESSORIES

158045B	Spare Battery,
158046B	Single way Battery charger,
158047D	5-way Battery charger,
158051A	Pump Calibration Kit.

Alteration Without Notice

Please note that the contents of this manual are subject to change without prior notice.