

IBR VERSACOUNT

OPERATIONS MANUAL



Version: Versacount 020906

Warranty

Seller's Products: Seller warrants all apparatus manufactured by it to be as described herein and to be free from defects in material and workmanship under normal use and services. Seller's obligation under any warranty is limited to and Buyer's exclusive remedy shall be, repair or replacement, F.O.B. Seller's factory, of any defective parts, when returned to Seller by the buyer, transportation prepaid, which Seller's examination discloses to have been factory defective. This warranty is in lieu of any warranty of merchantability, or fitness, or of any other warranty, express or implied. The time limit of this warranty is one year from date of shipment of new apparatus unless specified in seller's catalog. Seller shall not be liable for consequential damages, in any event.

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This warranty is void if the user has made unauthorized repairs, improper installation, or improper use of this instrument. Expendable items: This warranty does not cover expendable items such as lamps, fuses, etc.

Return for Repair

To facilitate efficient handling of instruments returned for repair, a Return Authorization Number (RMA) is required. Telephone the Customer Service Department at 734-222-6090 to request a Return authorization Number. Have information on the type /model of instrument and the nature of malfunction handy. Mark the assigned Return Authorization Number on the outside of the package and prepay the freight. Pack the instruments carefully, using the original container and the packing material or its equivalent. Instruments received that were damaged in transit, or with no malfunctions found, shall be subject to an inspection charge at the prevailing rate for such equipment.

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Warning: To reduce the risk of electric shock, do not remove the cover or the back assemblies while the instrument is powered. Refer all servicing of this instrument to qualified service personnel.

Prior to operating this instrument read the Operations Manual to become familiar with the operation of this instrument. Failure to follow the operating procedures may result in damage of this instrument and voiding of this warranty.

This instrument requires the operator to be familiar with the operation of analytical instrumentation and have an understanding of particle counting applications.

NOTE: This instrument has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the instrument is operated in a commercial environment. This instrument generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Operation Manual, may cause harmful interference to radio communications. Operation of this instrument in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense. This instrument is installation Category II, as defined by IEC 1010-1, Annex J.

Table of Contents

1.0 GETTING STARTED.....	1
1.1 VERSACOUNT MODELS.....	1
1.2 INSPECTION/UNPACKING	3
1.3 EXTERNAL POWER	3
1.4 BATTERY INSTALLATION.....	3
1.5 BAR CODE SCANNER	4
1.6 LONG TERM STORAGE.....	4
2.0 GENERAL INFORMATION.....	5
2.1 INTRODUCTION	5
2.2 STATUS INDICATORS	7
2.3 FRONT PANEL KEYS	14
2.4 ALPHANUMERIC DISPLAY ERROR MESSAGES.....	16
2.5 BAR CODES AND BAR CODE SCANNING	17
3.0 SET-UP INFORMATION	18
3.1 PRE-PROGRAMMED OPERATIONS	18
3.2 CUSTOM BAR CODE DEVELOPMENT.....	19
3.3 CUSTOM STATION BAR CODES	21
3.4 DATA STORAGE AND RETRIEVAL	23
3.5 DATA SECURITY	26
4.0 SYSTEM PARAMETERS.....	27
4.1 SPECIFICATIONS	27
4.2 COMMUNICATIONS	29
4.3 PRESSURE TRANSDUCER MODE AND REGULATORY ADJUSTMENTS	33
4.4 ROUTINE SENSOR CLEANING.....	34
5.0 ACCESSORIES AND REPLACEMENT PARTS	37
APPENDIX A: CLEANING.....	38

1.0 Getting Started

IMPORTANT

This section contains general information necessary for installation and setup of the Versacount. Before you begin operating the Versacount, read this chapter.

1.1 Versacount Models

There are three models of the IBR Versacount: VCNT-W, VCNT-O and VCNT-A. The differences are described below:

VCNT-W (water only)

1. Pulls a water sample from **zero pressure** sources such as bottles or reservoirs. If it is necessary to sample from a pressurized source, an optional pressure regulator system is available.
2. Pump protection filter is located outside the Versacount unit that protects the pump gears from sample fluid contamination.
3. Internal pressure transducer will signal a HIGH or LOW flow condition.

Wetted Materials:

Teflon tubing (all flow tubing)

Viton (Sensor O-Rings)

Stainless Steel (Fittings)

Graphite (Pump Gear)

Teflon (Pump Seal)

Nylon (External Bowl Filter)

Buna-N (O-Ring on Bowl Filter)

Flow Transducer Material: polyetherimide, silicon, flourosilicone, silicone, EPDM, and neoprene seals.

VCNT-O (oil only)

1. Used for testing fluids other than water such as oil, hexane, alcohol etc. The particular fluid that is to be used will depend on the customers specifications.
2. Pulls a sample from zero pressure sources such as bottles or reservoirs. If it is necessary to sample from a pressurized source, an optional pressure regulator system is available.
3. Pump protection filter is located outside the Versacount unit that protects the pump gears from sample fluid contamination.
4. There is no pressure transducer to signal a flow HIGH or LOW condition because of possible incompatibility of materials and different viscosities. The flow rate must be periodically checked with graduated cylinder and stopwatch. The Versacount will always assume a 60cc/min flow rate.

Wetted Materials:

Stainless Steel (all fittings and filter)
Teflon (all tubing)
Viton (pump seal)
Graphite (Gear)

VCNT-A (aggressive fluids)

Built to customers specification for a particular type of aggressive sample fluid.

1.2 Inspection/Unpacking

The Versacount is shipped in a single shipping carton. (An optional carrying case is also available) This carton should be retained for shipping. The operator should give the carton a visual inspection for signs of external shipping damage. Deficiencies should be brought to the attention of the shipper. All materials received in the shipment of the Versacount should be verified against the shipping papers to assure receipt of all materials.

An internal inspection of the carton is necessary to determine if there has been any damage to the contents or if items are missing. Damage to contents should be brought to attention of the shipper. If any items are missing, contact a representative at NASEC.

1.3 External Power

The Versacount is shipped with an external 18VDC power supply which not only runs the Versacount, but also can charge the Versacount's internal battery. The external power supply connects to the Versacount through the d-c power port in the rear panel of the Versacount.

Note: Verify that the facility's power is compatible with the Versacount. The Versacount's power supply is compatible with most a-c service outlets; however, modification of the power plug may be required.

Warning: Do not use the Versacount's external power supply with the remote printer. The current delivered by the external power supply will damage the printer. The printer should only be powered by the power supply furnished for the printer by the manufacturer.

1.4 Battery Installation

The Versacount is shipped without the lead acid battery in the unit. After inspecting the packaging and verifying that all required parts have been shipped, the operator should install the battery.

To install the battery:

1. Unscrew the stainless steel spring-screw on the black door located on the left side of the Versacount's rear panel.
2. Open the black door.
3. Slide the battery pack into the Versacount. Look for "This side up" sticker on the battery. The battery contacts should be pointed into the Versacount.
4. Continue sliding the battery pack into the Versacount until the pack secures in the fork-like contacts inside the Versacount. Then close the black door and secure the spring-screw. The door holds the battery pack in the Versacount's contacts.

Never attempt to hook up the battery pack to the optional printer! Use only the power supply recommended for the printer by the manufacturer.

The battery lifetime is approximately 5 hour of running time. The Versacount has a “sleep” mode in order to save battery life; if 5 minutes pass in which a key is not pressed or a bar code is not scanned, the Versacount will shut off. When the Versacount is turned on again, the Versacount will display the last information displayed.

Warning: Before servicing the Versacount, remove the battery! The battery’s current is hazardous and personal injury could result. In addition, the Versacount’s electronics may be damaged.

1.5 Bar Code Scanner

The Versacount’s bar code scanner is attached to the Versacount and is stored on the bar code wand clip found on the side of the Versacount. When the Versacount is turned ON, the bar code wand is active.

When the bar code scanner is active, a red (non-laser) light will be emitted from the tip of the wand.

1.6 Long Term Storage

Before storing the Versacount for long periods of time, the operator should “backflush” the Versacount to remove fluid resident in the system. Backflushing will remove the fluid from the Versacount, ensuring that the Versacount will be stored or transported dry.

2.0 General Information

2.1 Introduction

This section describes the theory of operation, function, and operational description of the Versacount. The Versacount is a simple to use, full-featured and flexible eight channel liquid particle Versacount, can count and size particles down to a 2 μm diameter. The standard Versacount has an HRLD-400 sensor, but the Versacount can also be purchased with an optional HRLD-150 sensor installed; this sensor allows counting sizing of particles down to diameters of 1.2 μm . The Versacount possesses a 300 sample memory that can be downloaded to a computer.

The Versacount is capable of sizing particles with diameters from 2-200 μm . However, in especially clean situations (with few particles); the Versacount can count particles up to 400 μm in diameter. The sensor passage is 1000 μm x 400 μm , so in theory the range of particles extends to 400 μm . However, it is possible to clog the sensor with particles from 200-400 μm . If the operator clogs the sensor, the Versacount features both automatic and manual procedures for clearing blockage. Follow the backflush procedures presented in Chapter 4 of this manual.

Note: for the optional HRLD-150 sensor, the sizing range from 1.2-150 μm .

Theory of Operation

The Versacount uses an internal gear pump to pull liquid samples through an inlet probe connected to the particle sensor inlet port on the back of the Versacount. The sample first flows through the particle sensor then through the external pump protection filter and finally through the internal gear pump and out the drain tube to an appropriate waste container.

Sample liquid enters into the Versacount through the INLET port at a flow rate of 60 ml/min (+/- 5%). The liquid then passes through the central region of a laser diode beam. Particles within the liquid will block light from reaching a photodetector (located at the opposite side of the liquid channel from the diode) as they traverse the laser beam. This reduction in beam intensity is detected at the photodetector, which converts the optical signal to an electrical signal. The Versacount electronics processes the electric signal to generate pulses used for threshold sizing of particles. The microprocessor counts the pulses in each of the Versacount's eight size channels.

The operator may choose one of two ways to view the count data in real time:

1. Viewing the total cumulative counts of all particles as they accumulate over the entered sample time.
2. Viewing the total cumulative count data normalized to particles/ml.

The digital count data is always stored in the Versacount's memory after a sample run, but the operator may transfer this data to a computer through the RS-232 communications port or print out data to a printer.

The operator programs the microprocessor-controlled Versacount by scanning either the Versacount's bar codes or a pre-programmed site bar code. All of the Versacount's bar codes are located on the front panel. The operator enters the bar code information by removing the bar code scanner from the bar code clip and scanning the bar code on the front panel.

The operator can make program modifications by scanning a pre-programmed bar code located at the sample site. Pre-programmed custom bar code parameters may be changed at any time prior to a run or during a run (the run will be aborted), even when the lock feature is not active. Custom bar coding is discussed in more detail in chapter 3.

Versacounts operating parameters may be "locked" by using the lock (password) function, preventing user modification during sampling operations. When the lock function is activated, the Versacount will display all data available; however, the operation parameters (SMPL ID, SMPL DELAY, ect.) cannot be modified until the lock function has been disabled.

Note: There are certain passwords for the lock function that **will** allow modification of the SAMPLE ID when the Versacount is locked.

Log Removal

The Versacount performs a log removal calculation at the end of each pair of runs. The Versacount's log removal function is configured with the assumption that the operator will take measurements first from the cleaner sample location, then from the dirtier sample location. That is, the first sample should be taken from the filter (system) effluent, then the second sample should be taken from the filter (system) influent. This practice will prevent dirt from contaminating the cleaner samples and giving a false (too dirty) reading for the samples. The log removal calculation is

$$\text{Log removal} = \log_{10} [(\text{Counts per ml in this run} / \text{Counts per ml in last run})]$$

The Versacount can display the log removal calculation, along with the correct mathematical sign, in the main display at the conclusion of the second run by toggling the [MODE] key until the LOG RMVL indicator light for that channel will light, and the channel size will appear in the small alphanumeric display located below the main display. The operator obtains log removal information for other channels by toggling the [DATA] key.

Basic Operations

The Versacount design allows the operator to program the Versacount using the 8 front panel keys and a set of bar codes. When ready to enter information, the operator scans a bar code with the Versacount's scanning wand. The Versacount loads into its memory the digital information contained in the bar code; the Versacount's scanner can recognize both feature-specific and custom site-specific bar codes.

The Versacount has two modes of operation: Ready Mode and Program Mode. In the Ready Mode the Versacount is ready to operate, while in the Program Mode the Versacount will accept modifications to the operation and application parameters.

The user can exit, save program modifications, and immediately begin sampling by pressing the [START/STOP] key at any time.

2.2 Status Indicators

COUNTING

This indicator lights when the Versacount is taking a sample.

TOTAL CNT

When this indicator is lit, the Versacount displays the total cumulative count data for the sample.

CNT/ml

This Versacount indicator will be lit when the operator wants the display to reflect the particle counts per ml. When the Versacount is taking a sample, the default display field is CNT/ml.

MEM FULL

The MUM FULL indicator appears when the Versacount's internal memory is full. The Versacount can store up to 300 samples; above this limit, the Versacount will overwrite (and therefore erase) the oldest data in memory. Versacount data will be erased chronologically, the newest data being the last to be erased.

The Versacount will beep when the memory is full and the overwriting of data is occurring.

The operator has two options when the MEM FULL indicator has been lit:

1. The operator can download the sample data via RS-232 communications directly to a personal computer.
2. The operator can print out all of the stored sample data to an optional printer. RS-232 Pinout is given in Section 4.

LOG RMVL

This indicator lights when the results of the log removal calculation are displayed in the main display. Since log removal is calculated for each channel size, the Versacount will display the log removal data for the channel size selected. The channel information will be displayed in the 8 character alphanumeric display located immediately below the main display.

The Versacount automatically performs the log removal calculation at the end of the second sampling. To view the results of the log removal calculation, press the [DATA] key until that field is displayed at the end of a set run.

LOCKED

The LOCKED indicator is displayed when the lock/password function is active. When the lock function is activated, the operator cannot modify the Versacount's operating parameter (sample volume, sample delay, alarms, ect.) without first disabling the numeric locking key code.

The operator activates the lock function by scanning the LOCK bar code, followed by the four numeric bar codes for the password. When the LOCK function bar code is scanned, the LOCK indicator on the lower right side of the Versacount display will light. The operator may not use 0000 as a password, as this password is the default for "unlocked" in the Versacount.

Note: If the operator chooses a password with a leading zero (example: 0674), the Versacount will allow the operator to change the SMPL ID while the Versacount is locked. Passwords without a leading zero lock the SMPL ID also.

The Versacount will prompt the operator to re-scan the four digit code by displaying an "L". The operator must re-scan the fore digit code again. When the confirming locking code is entered, the Versacount will display the locking code, the Versacount will default and return to the Ready Mode

SMPL ID

The SMPL ID indicator is displayed when the operator scans the SMPL ID bar code. When this bar code is scanned, the Versacount will beep. The sample identification is a three digit whole number. Note: for units shipped with Versacount firmware version 4 (January 1994 and later), it is possible (but not necessary) to use a four digit whole number.

The operator can change the location number when the SMPL IN indicator is lit (except when the lock function is active).

Alphanumeric ID Field

The operator can set an alphanumeric identification string of up to eight characters by using a custom bar code. The alphanumeric ID is concatenated with the three (or four) digit sample ID to produce the ID string displayed on printouts and in the Versacount output data stream. If the operator chooses not to set an alphanumeric ID, then the sample ID field contains only the number set with the SMOL ID function. The Versacount is shipped without an alphanumeric ID. The operator must generate code 39 (3 of 9) bar codes to the following format to use the alphanumeric ID function (Note: further information on bar codes and bar code generation appears in Chapter 3 of this manual):

IXXXXXXXX	Where XXXXXXXX represents 1 to 8 alphanumeric characters.
I	Sets the Versacount to not have an alphanumeric ID

If an identification string is set by the operator, it will appear in the alphanumeric display below the main display when the SMPL ID indicator is lit.

SMPL VOL

The sample volume indicator is lit when the operator scans the SMPL VOL bar code. When this bar code is scanned, the Versacount will beep.

The operator can modify the sample volume when the SMPL VOL indicator is lit (except when the lock function is active). The sample volume can be programmed from 1 ml to 2500 ml. The Versacount is shipped with the sample volume set at 60mL.

Setting the sample volume to zero will put the Versacount into manual mode; the Versacount will take an infinite volume run, collection data continuously until the [START/STOP] key is pressed.

SMPL DELAY

When the operator scans the SMPL DELAY bar code, the SMPL DELAY indicator will light.

The operator can modify the delay time before sampling begins when the SMPL DELAY indicator is lit (except when the lock function is active) The SMPL DELAY can be programmed from the second (.01) to ninety-nine minutes and ninety-nine seconds (99.99). The Versacount is shipped with a sample delay of 40 seconds.

If a SMPL DELAY of zero is selected, there will be no delay time before sampling begins.

When the operators has selected a sample delay the SMPL DELAY indicator will blink during the delay time before sample collection. The indicator will continue to blink until the Versacount begins sampling.

A sample delay can be programmed to occur before a group of runs and in between groups of runs (for continuous operation purposes). To change the configuration of the sample delay, scan the SMPL DELAY bar code and press the [SEL] key. Notice that the alphanumeric display message changes between “CONT.” and “SINGLE” as the [SEL] key is pressed. To save the choice, the operator scans another bar code or presses a different key after displaying the desired message.

For example: To run the Versacount continuously with delays between groups of runs, scan the SMPL DELAY bar code, press the [SEL] key until “CONT.” is displayed, then exit to another function. The sample delay value may also be changed when changing the configuration.

RUNS

The # RUNS indicator is lit when the operator scans the # RUNS bar code. The operator can modify the number of runs when the # RUNS indicator is lit (except when the lock function is active). The number of runs is programmable between 1 and 99. If #Runs is set to zero, then the unit will continuously run the sample volume previously entered.

ALARM

The ALARM indicator is displayed when the operators scan the ALARM bar code.

The alarm limits are from 1 to 1,000,000. The Versacount will beep when the particle counts exceed the set alarm value and the ALARM indicator will flash. Setting the ALARM value to 0 will turn off the Versacount’s ALARM function. The user can modify the alarm limit when the ALARM indicator is lit (except when the lock function is active).

Pressing the [DATA] key during the ALARM set function will allow the operator to toggle the alarm assignment among the eight channels. The alarm may not be set for any two particle channels simultaneously.

DISPLAY

The DISPLAY function reviews run data stored in the Versacount's memory. The operator can review the stored data in two formats: a chronological listing of all stored data from oldest to newest run records, or a listing of data for a particular SMPL ID number, from oldest to newest run records. After entering on of the two display formats, the operator views the run data for a particular run record by pressing the [DATA] key. The appropriate indicator light is lit when the information is displayed. The types of information that can be accessed with the display functions are:

DATE	Date of collection
TIME	Time of collection
ALARM	Alarm information (if the alarm was set)
CH #	Channel size and counts information (#=1,2,3...8)
SMPL ID	User defined sample identification number
SMPL VOL	User defined sample volume

The data for a run record is displayed cyclically. For example, pressing the [DATA] key when SMPL VOL is displayed will return the display to the date information. The operator can view the channel count data in either total counts or counts per ML by pressing the [MODE] key. The operator can print out the displayed run record by pressing the [PRINT DATA] key once.

Displaying all stored data

To display all stored data, scan the DISPLAY bar code **twice**. After the second scan of the DISPLAY bar code, the Versacount's main display will show the date information for the oldest run recorded in the memory and the DATE indicator will light.

To observe data within a particular run record, press the [DATA] key. To move to the next run record on memory, scan the DISPLAY bar code. The date information for the next run record will appear in the Versacount's main display. When the end of the stored data is reached, the Versacount will beep and show "EOL" (end of list) in its main display. To exit the display function, scan another function bar code.

Illustrated Example: Using DISPLAY to look at stored data

Suppose data has been collected twice a day for five days, from 7 February 1993 through 11 February 1993. The operator wants to review all data for the second run on 8 February 1993. The following figure illustrates the bar code scans and key presses necessary to access this information.

Bar Code Scanned	Key Pressed	Main Display	DISPLAY indicator +_____
DISP		LAST DATA	
DISP		02.07.93	DATE
DISP		02.07.93	DATE
DISP		02.08.93	DATE
DISP		08.08.93	DATE
	[DATA]	14.47.02	TIME (sample time 2:47pm)
	[DATA]	2308	CH 1 TOTAL CNT
	[DATA]	930	CH 2, TOTAL CNT
	[DATA]	400	CH 3, TOTAL CNT
	[DATA]		4 TIMES FOR CH 4-CH7
	[DATA]	1	CH 8, TOTAL CNT
	[DATA]	4	SMPL ID (identification number)
	[DATA]	25	SMOL VOL (IN ml)
	[DATA]	02.08.93	DATE
DISP		02.09.93	DATE

Figure 1: Chronological Display of All Data

Displaying Data for a particular SMPL ID Number

Scan the DISPLAY bar code, then the SMPL ID bar code. The main display will show the last sample identification number input into the Versacount. Now scan the number bar codes corresponding to the specific sample identification number of interest, followed by another scan of the DISPLAY bar code. The Versacount is now displaying the stored data **for this sample ID number**, from the oldest to the newest run record.

To observe data within a run record, press the [DATA] key. To move to the next run record for this sample identification number, scan the DISPLAY bar code. The date information for the next run record will appear in the Versacount's main display. When the end of the stored data on this sample ID number is reached, the Versacount will beep and show "EOL" (end of list) in its main display. To exit the display function, scan another function bar code.

Illustrated Example: Using DISPLAY to view data from a particular SMPL ID number

Suppose that the operator wishes to view CNT/ml data from a test point labeled by sample ID number 14. The data of interest was collected 23 February 1993.

Bar Code Scanned	Key Pressed	Main Display	DISPLAY indicator +_____
DISP		LAST DATA	
SMPL ID		LAST SMPL ID	SMPL ID
1		1	SMPL ID
4		14	SMPL ID
DISP		02.20.93	DATE
DISP		02.22.93	DATE
DISP		02.23.93	DATE
	[DATA]	10.41.23	TIME (sample time 10:41am)
	[DATA]	3750	CH 1, TOTAL CNT
	[MODE]	150	CH 1, CNT/ml

Figure 2: Display of data Specific SMPL ID

DATE

The date indicator displays when the operator scans the DATE bar code. When the DATE bar code is scanned, the Versacount will display the date in either the international (DD.MM.YY) or North America (DD.MM.YY) format. See Section 4.2 for the bar code that can change the date format.

The operator changes the date by scanning the DATE bar code, followed by the numeric bar code for the date. For example, August 7, 1992 in the North America format is obtained by scanning “0 8 0 7 9 2”; the Versacount automatically enters the decimal points where they belong.

TIME

The time indicator is displayed when the operator scans the TIME bar code. When the TIME bar code is scanned, the Versacount will display the time in the 24-hour clock format HH.MM.SS

The operator changes the time by scanning the TIME bar code, followed by the numeric bar code for the time. For example, 2:45 PM is obtained by scanning “1 4 4 5 0 0 “; the Versacount automatically enters the decimal points where they belong.

FLOW OK

Note: For VCNT-O, the “FLOW OK” light will always be lit since the VCNT-O model does not have a pressure transducer for measuring flow rate.

This indicator lights to verify that liquid is flowing through the Versacount unobstructed and that the flow current is sufficiently stable. If the FLOW OK indicator is not lit while the Versacount is running, the operator must clear the obstruction material from the sensor (see section 4.4).

LOW BAT

This indicator warns user of impending battery failure.

2.3 Front Panel Keys

The front panel keys are used to turn the Versacount on and off, the access operational parameters, and to clear or print stored data.

When a printer is connected and turned on, the Versacount will automatically print data at the end of each run. The Versacount must be on prior to turning the printer on.

Note: The printout can be configured in four different formats; see section 4.2 for more information

CLEAR DATA Key

Pressing the [CLEAR DATA] key can clear the data for a run just completed, all run data from memory, or clear run data from selected stations. To clear data for a run completed, the operator must press the [CLEAR DATA] key within 5 seconds of the end of the run.

If the operator presses the [CLEAR DATA] key after the end of that 5 second period, the Versacount will display the first station number, a “__” and the last station number. To change the range of station numbers [CLEAR DATA] will clear from memory, the operator must enter a different station number range. The operator enters this new range into the Versacount by scanning the RANGE NUMBERS bar code, then entering the low station number range, a colon (:) bar code, and the high station number range. When the operator presses the [CLEAR DATA] key again, all of the data for these station numbers will be cleared from the Versacount’s memory.

WHEN [CLEAR DATA] IS USED, THE ERASED DATA CANNOT BE RECOVERED.

The operator can abort the clear data function by pressing any key other than [CLEAR DATA].

WHEN [CLEAR DATA] IS PRESSED TWICE, ALL DATA STORED IN THE VERSACOUNT’S MEMORY WILL BE CLEARED. THE CLEARED DATA IS IRRETRIEVABLE.

DATA Key

Pressing the [DATA] key will display the data for the last run sequentially for all the channels.

MODE Key

Pressing the [MODE] key toggles the Versacount between the particles/ml count mode, the total particles count mode, and the log removal data (if two runs have been taken). The Versacount displays the selected mode on the front panel.

Select Key [SEL]

Pressing the [SEL] (select) key advances the display to the next sample (unless the Versacount is locked; see page 2-4).

START/STOP Key

Pressing the [START/STOP] key will either start or stop a sample run. Stopping the Versacount will abort the sample run sequence in progress.

Aborted runs are not stored in the Versacount's memory.

When the operator selects a sample volume of zero, the Versacount will operate in manual mode. Pressing the [START/STOP] key will start the Versacount and begin collection of sample data. The Versacount will collect data until the operator presses the [START/STOP] key again.

Manual mode data is stored in the Versacount's memory at the end of the run (when the [START/STOP] key is pressed).

ON/1 Key

Pressing the [ON/1] Key turns on the Versacount.

OFF/0 KEY

Pressing the [OFF/0] key will turn off the Versacount. If the operator turns off the Versacount during a sample run, the Versacount aborts the run and does not store the sample data in memory. All of the sample run parameters, date, time, and previous run data are stored in the memory.

2.4 Alphanumeric Display Error Messages

The alphanumeric display is used to show fatal error messages. A fatal error is one that renders the data being taken invalid.

CHK SNSR

The display will show this message when the sensor reads a baseline high condition. A baseline high condition occurs when there are particulates trapped within the sensor cell. This could indicate a partial or total blockage of the sensor cell, and this obstruction must be removed before using the Versacount. See section 4.4 for information on sensor cleaning.

HI FLOW, LOW FLOW (for model VCNT-W only)

When the flow rate through the sensor cell is too high for an accurate particle counting then HI FLOW message is displayed. This could be caused by too high of a pump speed, or from using a pressurized sample input. Sample input should be at zero psi as it is when being taken from a bottle. When the flow rate through the sensor is too low for good particle counting technique then the LOW FLOW message is displayed. This could be caused by a blockage in the sensor inlet or somewhere along the flow path. When a HI FLOW or a LOW FLOW is registered during a run, the Versacount will store the run data with a flag indicating the high or low flow condition. To see the data format, turn to section 3.

2.5 Bar Codes and Bar Code Scanning

The bar code scanner is shipped connected to the Versacount. This scanner operates using red light and does not contain a laser. The scanner cannot properly scan any bar code that is not black.

The operator can program the Versacount using bar codes in two ways. The operator can either manually enter operational parameters by scanning the function and numeric input bar codes, or the operator can scan pre-programmed bar codes that program the Versacount automatically. Refer to Section 3 for advanced bar code programming.

The Versacount's bar code scanner will only read "3 of 9" bar codes (commonly called "code 39 bar codes"). The 3 of 9 bar code system finds wide application in industry. The bar code scanner converts the "3 of 9" bar codes into digital information for the Versacount.

To Scan the Bar Code Information

To scan the bar code:

1. Pick up the bar code scanner as if holding a pencil to write, slightly at an angle to the bar code.
2. Place the tip of the scanner approximately 0.25 in. (0.635cm) to either side of the bar code. Scanning is possible from right to left or from left to right. Verify that the scanner is in contact with the bar code panel. It is not necessary to press hard when scanning a bar code.
3. Scan the bar code with a smooth, quick motion, making the scanning wand travel the entire length of the bar code.
4. For best results, keep the bar code flat.

The operator can correct errors in three ways:

1. Scan the BACKSPACE bar code; it will remove the last number entered from the display.
2. Scan the * bar code; it will restore the initially displayed parameters to the display.
3. Scan another function bar code; this exits the active function, but saves the new number information entered for this function.

3.0 Set-Up Information

3.1 Pre-Programmed Operations

The Versacount's applications parameters may be set and modified by scanning the Versacount's bar codes or by scanning a custom "pre-programmed" bar code. The operator can develop a unique application parameter for each collection site. When the operator scans the site bar code, the Versacount will immediately accept the new parameters and beep, informing the operator that the scanner has successfully read the custom bar code.

Bar Code Software

The operator can use general bar code generating software, such as Zebra BAR-ONE, to generate the abovementioned bar code as an indicator of a set of pre-determined parameters.

Custom Bar code Labels

Bar code labels can be printed on any white label stock using most printers. The use of dot matrix printers is not recommended. We suggest that the labels be printed using a laser printer. Dot matrix printers will produce bar codes that degrade quickly. Operators should consider if the bar code labels would be placed in a cleanroom environment.

The operator may simply call the NASEC support line at 734-222-6090 to define the Versacount parameters of the bar code and label required, and the type of label stock desired (cleanroom, standard, or operator defined). The labels will be shipped to the operator by the parcel method specified.

3.2 Custom Bar Code Development

The operator may choose one of the two formats for custom bar coding:

1. Unique sample identification with the Versacount being prompted to initiate collections automatically or manually, without modifying the Versacount's applications parameters.
2. A unique bar code that will install new Versacount parameters at each site and prompt the Versacount to initiate collections automatically or manually.

The format used for custom bar code labels incorporates a fixed field of 12 bar code characters. Each bar code will begin with a letter, either P, Q, R, S, T, U, V, W, X, or Y. The letters P & Q are used for sample identification bar codes. These letters serve two purposes.

1. The Versacount distinguishes the input as a pre-recorded bar code label (rather than a Versacount bar code label).
2. The Versacount identifies selections of:
 - a. either the automatic or manual start function of the unique station bar code:
 - b. the channel number of the automatic or manual start function and the alarm channel designation. This format is for custom bar codes that install application parameters at each collection site.

The custom bar code information has the following formats:

Label Identifier	1 letter: R, S, T, U, V, W, X, and Y. P and Q are simple format identifiers.
Alarm Value	2 digits, the first digit being the most significant value and the second being the exponent.
Number of Runs	2 digits
Sample Delay	2 digits representing a whole number 01-99; the input is in whole minutes only. Sample delay can also be represented in 10 second increments up to 90 seconds by first entering a decimal".", followed by a number 1-9.
Sample Time	2 digits representing a whole number 01-99; the input is in whole minutes only. Sample time can also be represented in a 10 second increments up to 90 seconds by first entering a decimal".", followed by a number 1-9.

Note: sample volume at the 25 ml/min flow rate = [sample time in seconds] / [2.4 (sec./ml)]

Sample ID 3 digits representing a whole number 000-999. Note: as of version 4 of the Versacount firmware, it is possible (but not necessary) to use a 4 digit number. This applies to units shipped after January 1994.

When the operator scans the site bar code, the Versacount will immediately accept the new parameters and beep, informing the operator the scanner has successfully read the custom bar code.

Note: If a pre-programmed bar code contains erroneous data parameters, the Versacount will alarm and beep when the bar code is scanned. The Versacount will then accept the correct bar code parameters. The erroneous bar code parameter will be set to the Versacount's current value. If the custom bar code label was configured to automatically start the Versacount, the Versacount will not perform the automatic start function.

3.3 Custom Station Bar Codes

Custom Application Site- Specific

	Alarm Channel	Alarm M E	Num of Runs	Delay Time	Sample Time	Sample Number
Auto Start	1 = R	XX	XX	XX	XX	XXX
	2 = S					
	3 = V					
	4 = w					
Man Start	1 = T	XX	XX	XX	XX	XXX
	2 = U					
	3 = X					
	4 = Y					

					000-999
					01-99 min. or 10-90 seconds (.1-.9)
					01-99 min. or 10-90 seconds (.1-.9)
					Number of Runs, max. = 99
					Alarm value Example: For alarm value of 500, enter "52" =5x10

Enter one of these letters, which correspond to the alarm channels shown.

3.4 Data Storage and Retrieval

The Versacount will store up to 300 sample runs with any associated data. The stored data can be transferred to a computer. The Versacount requires that a communications software program, such as IBR's Logger™, be installed on the computer and a communications cable be connected to the Versacount's RS-232 communications port (marked RS-232 and located on the rear panel of the Versacount). Connect the communications cable from the Versacount to the operator defined communications port, usually COM1 or CM2 on the computer.

There are two methods of transferring Versacount data to a computer:

1. The computer will prompt the Versacount for the data through the communications software or through the Versacount's remote command set.
2. The Versacount can be configured to the computer's communications protocol, providing real-time data acquisition to the computer. The data will be sent at the end of each collection; no data is available while the Versacount is collecting a sample.

Communications Software

Standard Windows Hyperterminal program can be used for communication to the Versacount. Special IBR software is also available upon request.

Communications Protocol

The Versacount's communications protocol is standard ASCII: baud rate 9600, no parity, 8 data bits and 1 stop bit.

Remote Command Set

All commands and responses (with the exception of XON and XOF) are terminated with a carriage return character. All characters must be upper case.

Command	Response	Value
S	!S	Start counting
	!S-	If Versacount is currently counting
H	!H	Halt counting
	!H-	If Versacount is not counting
CL*	!CL*	Clear run memory
	!CL-	If Versacount is currently running
T#	!T#	Sets Sample time in seconds
T	!T#	Reads back current sample time
Note: the operator must convert sample time to sample volume; flow rate is 25 ml/min		
D#	!D#	Sets Delay Time in seconds
D	!D#	Reads back current delay time
P	!(The data string)	Resend data
Q		Query for data
	!ND	If no new run data
	!(The data string)	After data is sent, new run data flag is cleared
@ <BAR>	@ <BAR>	Send pre-recorded bar code label string <BAR>
	?ERR	If parameter error or other error
FS	!FS	Select short data string format for reporting of on line run data.
FL	!FL	Select long data string format (printer format) for reporting of on-line run data
U	the data	Request dump off stored data in short format
	!U	This is sent after last data string
	!U-	If Versacount is running
XOF	none	Tell the Versacount to temporarily stop transmitting data (while dumping data in response to U or UL)
Note: XOF is a single character, represented by decimal 19 (<CTRL - S>).		
XON	none	Tell the Versacount to resume transmission of data which was earlier paused using XOF

Note: XON is a single character, represented by decimal 17 (<CTRL - Q>).

“Short” Data String Format

The below data format is used whether the data is produced in response to the U command or whether the data is sent after a run with the “short” format selected.

```
!SMPL_ID,date,time,size1,size2,size3,size4,size5,size6,size7,size8,counts1,counts2,counts3,counts4,counts5,counts6,counts7,counts8,cuml/ml,cuml2/ml,cuml3ml,cuml4/ml,cuml5/ml,cuml6/ml,cuml7/ml,cuml8/ml,SMPL VOL,alarm chan,alarm limit,P/F,OK/HI/LO<CR>
```

Where:

SMPL ID	is the numeric sample id (can be alphanumeric)
Date	is the date of the sample run in mm/dd/yy format
Time	is the time of the run in 24-hour hh:mm:ss format
Size 1-size 8	are the size thresholds of the 8 channels, in um (micrometer until are assumed and not included in the string)
Counts 1 Counts 8	are the actual cumulative counts in each channel.
Cuml1/ml-Cuml8/ml	is the sample volume expressed in ml
SMPL VOL	is the sample volume expressed in ml
Alarm chan	is the alarm channel (1-8)
Alarm limit	is the alarm limit value (a value of 0 or 1 indicates that alarms is disabled)
P/F	is either P or F, and indicates alarm pass or fail (always p if the alarm is disabled)
OK/HI/LO/BF	is the flow indication flag for the run; see page 2-9 for information on the HI/LO alphanumeric display errors; BF signals a baseline fail error in the sensor (Note: if the operator experiences a baseline fail, the sensor may require servicing)

3.5 Data Security

The Versacount has a password or data lock security feature. This feature will prevent the modification of the Versacount's parameters and the erasing of data in the Versacount's memory. When the data lock feature is active, only the operational parameters, the application parameters, and the collected data can be displayed. To access the data, the operator must successfully enter a 4 digit numeric password.

To activate the data lock feature:

1. Scan the LOCK bar code with the bar code scanner. The Versacount display will clear and the LOCK function indicator on the lower right side of the display panel light.
2. Scan any four number bar codes. This will be the password. As each number bar code is scanned, the Versacount will beep.
3. The Versacount will display an "L" after the last number is scanned. The operator must then rescan the four digit password just entered.
4. After confirming that the password has been entered correctly, the Versacount will return to the Ready mode and LOCKED indicator on the upper left side of the display panel will light. This indicator light will remain lit until the data lock feature has been de-activated.

Note: See section 2 for more information about the lock function.

The procedure to de-activate the data lock feature is as follows.

1. Remove the bar code scanner and scan the LOCK bar code. The Versacount display will clear and the LOCK feature indicator on the lower right side of the front panel will light.
2. Scan the four number bar code the are the password. The Versacount will beep as each bar code is scanned.
3. When the last number is scanned, the Versacount will return to the Ready mode and the LOCKED feature indicator will no longer be lit.

Note: IF the scan does not verify the password, the Versacount will audibly alarm, indicating that an incorrect password was scanned, and return to the Ready mode.

4.0 System Parameters

4.1 Specifications

Performance Characteristics

Collection Optics	Extinction
Concentration limits	
Standard sensor	18000 particles/ml
HRLD-150 OPTIONS	18000 particles/ml
Light Source	
Standard sensor	3.5 mw (nominal power) laser diode
HRLD-150 option	4.5 mw (nominal power) laser diode
Sensitivity	
Standard sensor	2.0 pm
HRLD-150 option	1.2 pm

Sample Fluid Limitations

Bottle samples (zero pressure) inlet	
Sample Flow Rate	
Standard sensor	60 ml/min
HRLD-150 options	25 ml/min
Chemical Compatibility:	
Versacount VCNT-W	Most aqueous, non-corrosive fluids
Versacount VCNT-O	Fluid compatible with Viton, Stainless Steel, Teflon and Graphite

Command & Control Communications

Number of Channels	8 fixed channels
Data Transfer Rate	9600 baud
Communications Protocol	ASCII Standard
EIA Standard	RS-232
RS-232/Optional External Printer Connector	DB-9
Number of runs stored in memory	300 Maximum

Physical Characteristics

Weight	12.8 lbs (5.8kg)
Dimensions	4.3 X 12.5 X 11.6 inches (10.9 X 31.8 x 27.5 cm)
Sensor Inlet/Outlet Connections	VCNT-W: ¼” compression inlet ¼” quickconnect outlet. VCNT-O: ¼ “ compression inlet and outlet

Versacount Power Supply-to-DC conversion

Line Power –to DC conversion	110-240 VAC, 50-60 Hz, 1.2A @18VDC
Removable Versacount Battery	VCR battery pack, 12 v d-c, 2AH
Battery lifetime	5 hours (operating)
Internal RAM battery	3.0 v d-c Lithium (Model BR 2325)

Pump Specifications

Pump drive	magnetically coupled motor
Gear composition	graphite
Wetted Parts	graphite, Stainless Steel, Teflon

Environmental

Temperature Range:	
Operating	50 –100 F (10 – 40 C)
Non-operating	- 40 –150 F (-40 –65 C)
Relative Humidity	18 – 80% RH (Non-condensing)
Atmospheric Pressure:	
Operator	Sea level to 10,000 ft (3050m)
Non-operating	Sea level to 50,000 ft (15240m)

Remote Printer Option

Print system	Serial Dot Matrix
Paper	58 mm (+0/-1mm) wide (2.3 inch), roll Dim. 25mm (0.98 in), roll length 7 m (23ft)
Maximum # of Columns	27 (Normal mode), 13 (enlarge mode)
Character Set	292 characters
Print Speed	0.8 lines/seconds
Weight	14 ounces (400 g)
Dimensions	5.3 x 3.9 x 1.4 inches (13.5 x 10.0 x 3.5cm)
I/O Connector	DB25 RS-232
Input Method	RS-232C
Data Input	Busy
Baud Rate	9600, 8 data bits, 1 stop bit, no parity
Power Requirements	9VAC power supply

Run Averaging

This Versacount contains a special function that calculates the average and standard deviation of a set of runs. To use this function, the operator must set the Versacount to take a number of runs greater than one. A printer must be used. The run data prints out to the printer after each run. After the final run data has printed out, the Versacount prints out the average and standard deviation of the group of runs in cumulative counts per ml.

Note: The average and standard deviation data is not stored with the run data in the Versacount memory.

4.2 Communications

The Versacount will communicate with a personal computer using IBR's Logger™ communications software. A communications cable is supplied with the software. The communications port for the Versacount is located on the rear panel and is labeled "RS-232". This Versacount is a DB-9 connector and the input identification is as follows:

<u>Pin Number</u>	<u>Signal</u>	<u>I/O</u>	<u>Definition</u>
1	DCD	Output	Data Carrier Detect
2	TxD	Output	RS-232
3	RxD	Input	RS-232
4	---	---	N/C
5	GND	Neutral	RS-232
6	DSR	Output	Data Set Ready
7	RTS	In	Request To Send
8	CTS	Out	Clear To Send
9	---	---	N/C

The RS-232 communication protocol is a permanent internal connection which cannot be modified by the user.

Systems Communications

The Versacount has several system messages that will be displayed when a system condition occurs that requires operator assistance or Versacount service. These numeric messages will appear on the Versacount's front panel display.

512	256	128	64	32	16	8	4	2	1
.
.
.	Prom checksum
.	RAM read/write fail
.	Illegal instruction trap(CPU error)
.	Reserved for future use
.	RAM checksum (lost parameter)
.	Reserved for future use
.	Real time clock failure
.	Backup battery failure
.	Corrupted data vector
.	Reserved for future use

<u>Error #</u>	<u>Descriptions</u>
E1	PROM checksum
E2	RAM read/write fail
E4	Illegal instruction trap (CPU error)
E8	Reserved, not active
E16	RAM checksum (lost parameter)
E32	Reserved, not active
E64	Real time clock failure
E124	Backup battery failure
E256	Corrupted data vector
E512	Reserved, not active

Error codes are stacked by the processor, so the system messages are displayed as an additive value.

For Example: E 144 = E 16, backup battery failure and RAM checksum.

Note: This instrument is sensitive to static discharges. The Versacount will lock out all operations if subjected to a static discharge field. Turn off the Versacount for approximately 15 seconds, and then turn the Versacount back on to resume normal operations.

Printout Format

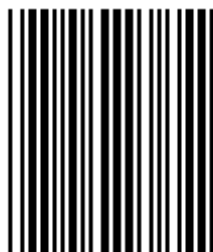
When printing data to a printer while running the Versacount, there are four choices for printout format: the cumulative counts and the cumulative counts per ml, the cumulative counts per ml and the differential counts per ml, the cumulative counts per ml and the log removal data, or the differential counts per ml and the log removal. An example of a printout is shown in the figure below.

```

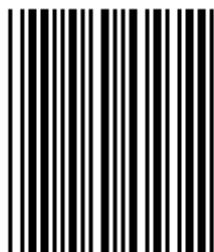
Sample # 1
05/14/93 15:11:26
Size  TOT CULM  CUML/ml
2um   112708  5608.3
5um   19202   796.08
10um  2231      89.240
20um  189       7.560
25um  91        3.640
50um  30        1.200
100um 7        0.280
Sample Volume = 25 mL
    
```

Figure 4 – 1: Sample Printout

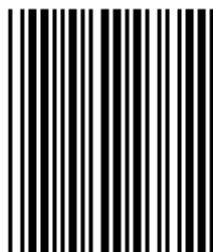
The selection of printout format is made by scanning one of the four following bar codes.



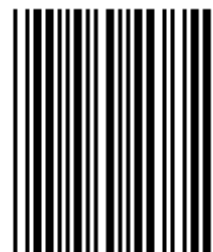
Cum/ml and Log
Removal



Diff/ml and Log
Removal



Cuml/mL and Diff/mL

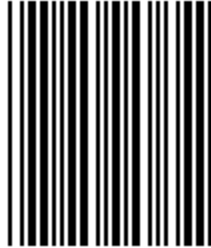


Cuml and Cuml/mL

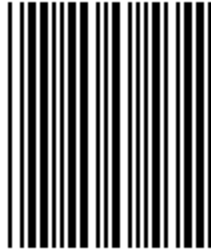
Date Configuration

The format the Versacount will display and send collected data can be configured by scanning the data configuration format bar code:

To display the date in the international **DD MM YY** format, scan the following bar code:



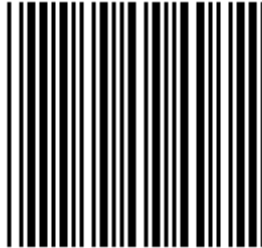
To display the standard **MM DD YY** format, scan the following bar code:



4.3 Pressure Transducer Mode and Regulatory Adjustments

The VCNT-W Water Versacount contains a differential pressure transducer to monitor the flow condition through the unit. The operator can directly view the output readings of the pressure transducer in the main display. To accomplish this, scan the following bar code with the unit stopped (not running a sample)

Note: Then Corrosive Fluid Versacount does not use a pressure transducer.



The Versacount Micropump will turn on, the message “P.S.I.” will appear in the alphanumeric display, and the differential pressure will appear in the main display.

When using the Water Versacount in applications requiring use of both grab and pressure modes (e.g. direct sampling from flocculation tanks and pressurized lines), the Versacount output can be inconsistent if the fluid flow rate through the Versacount is not approximately the same in both modes. The operator can set the pressure differential in either mode by adjusting the pressure regulator located inside the Versacount.

Warning: Do NOT take the outer covering off of the Versacount when in the field! Personal injury could result from electrical discharges, and the Versacount electronics can be damaged by excessive contact with dirty water. NEVER AT ANY TIME attempt to disassemble the sensor or remove the sensor from the Versacount. Failure to comply voids any warranty claims.

4.4 Routine Sensor Cleaning

When the FLOW OK indicator is not lit while running a sample, or a flow message appears in the alphanumeric display, the operator should clear any obstruction matter from sensor.

NOTE: The Corrosive Fluid Versacount does not use a pressure transducer, therefore the FLOW OK indicator will always be lit. Flow must be periodically checked by operator to be sure flow rate is correct.

For most sensor blockage, reversing the flow direction through the Versacount will clear the obstructing matter from the sensor. A momentary push-button switch located in the upper left center of the rear panel allows the operator to reverse the pump flow direction without opening the Versacount's case.

To Reverse the flow direction:

1. Make sure the Versacount is not counting a sample; the micropump should be off.
2. Press the momentary push-button and keep it pressed for about 10 seconds.
3. Any contamination clogging the sensor should be expelled from the Versacount through the INLET tube.
4. Any contamination expelled from the Versacount inlet tube is now in the sample fluid container. Therefore this fluid should now be replaced with a clean fluid.
5. Measure the flow rate again to see if flow is back to normal.

PUMP PROTECTION FILTER REPLACEMENT

If the flow rate is still not correct, the pump protection filter element may need to be replaced. This filter is used to protect the pump gears from sample contamination.

For all models of Versacounts, the filter is located on the back panel. Below are instruction for replacing the pump protection filter.

Important: Do not operate Versacount without filter in place. Doing so will damage the internal pump.

Filter Replacement for Versacount Model VCNT-W:

To replace the filter, the battery should first be removed from the unit and the Versacount should be "backflushed" to remove water resident in the system before removing the filter. To backflush the unit, tilt the unit back and press the momentary reverse push button on the rear panel of the Versacount. Water will discharge from the SAMPLE IN port. Continue this procedure until no water comes out of that port

The filter is located on the versacount back panel and has a clear plastic bowl that contains the glass fiber element. This filter element, which is normally white, can be brown in appearance after normal use. If there is any visible clumps of matter in the filter element, it should be replaced.

To replace the filter element, unscrew the clear plastic dome from the filter. (If necessary, the tubing around the filter may be removed for easier access.) Unscrew the black pin on top of the filter element and remove the dirty filter element. Replace with clean element, and tighten the black pin until the filter element is snugly in place. **DO NOT TIGHTEN THE SCREW BEYOND THIS POINT**, as filter performance would be compromised. Replace the plastic dome on the filter reconnect any tubing connections loosened while changing the filter, and secure the Versacount to p before turning the Versacount on. Filter elements are designed to last for at least six months, with normal usage.

Filter Replacement for Versacount Model VCNT-O

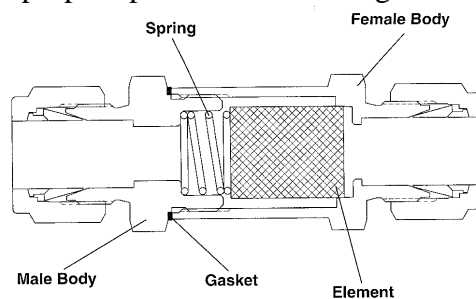
The VCNT-O Model Versacount has a sintered stainless steel filter element with a stainless steel housing and is located on the back panel of the unit. Be careful to note the flow direction on the filter housing when installing.

Disassembly

1. Loosen male and female bodies and disassemble.
2. If replacing filter element, remove used element and discard.

Reassembly

3. Before reassembling the filter, be certain all components are clean and free of contamination.
4. Align the new element parallel to the filter bore of the female body positioning the open end of the element towards the body, and press securely in place.
5. Lubricate gasket with thin film of system-compatible lubricant. Place gasket on body seal surface of male body.
6. Place the spring into the male body.
7. Thread the male and female bodies together finger-tight.
8. Tighten the bodies snugly.
9. Test the filter for proper operation and leak tight sealing.



If the Versacount still cannot be used, the sensor cell may be cleared by hand. Push the special wire tool (included in the accessory kit) into the INLET port on the rear panel of the Versacount. Carefully and slowly move the tool into the port and use the wire to break up the blockage in the liquid channel. Then re-attach the sample line and attempt to use the Versacount.

If the Versacount FLOW OK indicator fails to light and/or the alphanumeric error message appears in the display after the sensor has been cleaned, the laser diode may require servicing. Note that the Versacount model VCNT-O does not use an internal pressure transducer, therefore the FLOW OK light will always be lit and flow rate must be periodically checked using a graduated cylinder.

The life of the laser diode is about 10000 hours, with normal usage.

Should the operator suspect laser failure, contact NASEC at 734-222-6090

5.0 Accessories and Replacement Parts

Accessories

<u>Item</u>	<u>Part Number</u>
Cleaning Shim	083204-01
External Printer	
100-115AC model	200-200-0005
220-240AC model	200-200-0002
Logger™	071x211-01
Operator Manual	720-100-0052

Replacement Parts

<u>Item</u>	<u>Part Number</u>
System RAM Battery	280-120-0002
Printer Paper	710-620-0005
Internal Battery Pack	280-140-0001

Optional:

Internal pressure regulator system is available to allow sampling from a pressurized input.

Appendix A: Cleaning

With use, the exterior of the instrument may become dirty or soiled. If liquid spills on the exterior and the instrument becomes dirty, follow the steps below to clean the instrument.

Note: verify all panels are in place and the interior components are not exposed before starting this procedure.

1. Wipe the exterior surfaces with a moist rag.
2. If the instrument is still not clean, wipe the exterior surfaces with soap and warm water. Rinse thoroughly with water.
3. If the instrument is still not clean, moisten a lint-free tissue with Isopropyl Alcohol. Wipe the exterior surfaces with the moistened tissue.