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ABACUS™ 301
Operations Manual

Particle Measuring Systems, Inc.
5475 Airport Boulevard
Boulder, CO 80301
(303) 443-7100
Customer Support: 1-800-557-6363

P/N 10255-4

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ABACUS™ 301 Operations Manual
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First Edition, October 1998

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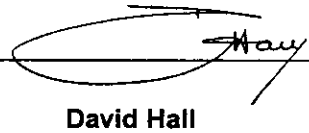
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Declaration of Conformity

Application of Council Directive(s):	**89 / 336 /EEC, 73 / 23 /EEC**	
Standard(s) to which Conformity is Declared:	**EMC**	**EN 55011, EN 50082-1**
	Safety	**EN 61010:1993 (IEC 1010-1:1990)**
Manufacturer's Name:	**Particle Measuring Systems, Inc.**	
Manufacturer's Address:	**5475 Airport Boulevard, Boulder, CO 80301 USA**	
Manufacturer's Telephone / FAX:	**(303) 443-7100 / (303) 449-6870**	
Distributor's Name:	**Particle Measuring Systems Europe, LTD.**	
Distributor's Address:	**Grovewood Road, Enigma Science Park**	
	Malvern Worcester WR14 1XZ	
	England	
Distributor's Telephone / FAX:	**011-44-1684-581000 / 011-44-1684-560337**	
Type of Equipment:	**Particle Monitoring**	
Model No.:	**ABACUS**	

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s).

Signature:		**Signature:**	
Full Name:	**Kristi Urquidi**	**Full Name:**	**David Hall**
Position:	**Vice President Operations**	**Position:**	**Managing Director**
Place: Boulder	**Date: January 12, 1998**	**Place: Malvern**	**Date: July 17, 1998**

Warning: All I/O cables and accessories must meet current factory specifications in order for this unit to remain in compliance with CE marking requirements. Consult factory for details.

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These terms have specific meanings in this manual:

WARNING: information to prevent personal injury.

CAUTION: information to prevent damage to the equipment.

NOTE: important general information.

Hazard Symbols

The meaning of hazard symbols appearing on the equipment is as follows:

Symbol	Nature of Hazard	Reference in Manual
	**Dangerous High Voltage**	**Page iv**
	**Static Sensitive Components**	**Page v**

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CAUTION **General Conditions for Use**

This instrument is designed to comply with the requirements of EN 610101/IEC 10101, for Class 1 portable equipment and is for use in a Pollution Degree 2 environment. The equipment is designed to operate from an Installation Category 2 supply.

Equipment should be protected from the ingress of liquids and precipitation such as rain, snow, etc. When moving the instrument from a cold to a hot environment, it is important to allow the temperature of the instrument to stabilize before it is connected to the supply to avoid condensation forming. The instrument must only be operated within the environmental conditions specified in Chapter 4.

This product is not approved for use in hazardous atmospheres. If the instrument is to be used in a safety related application, the suitability of the product must be assessed and approved for use by a competent person.

WARNING **Electrical Hazards**

External Power Pack

This equipment conforms with IEC Safety Class 1, meaning that is provided with a protective grounding lead. To maintain this protection the supply lead must always be connected to the source of the supply via a socket with a grounded connection.

The AC supply filter contains capacitors that may remain charged after the equipment is disconnected from the supply. Although the stored energy is within the approved safety requirements, a slight electrical shock may be felt if the plug pins are touched immediately after removal.

WARNING **Removal of Equipment Covers**

Disconnect the supply before removing the covers so as to avoid the risk of exposing high voltage parts. If any internal adjustment or servicing has to be carried out with the AC supply on, it must be only performed by a skilled person who is aware of the hazard involved.

WARNING **Toxic Hazards**

Some of the components used in this equipment may include resins and other materials which give off toxic fumes if incinerated. Take appropriate precautions, therefore, in the disposal of these items.

WARNING **Lithium**

Lithium is used in the construction of the nonvolatile data backup batteries used in the equipment. This material, if incorrectly handled, could cause a danger to health. Refer to local regulations on the handling and disposal of these batteries.

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WARNING **NIMH**

NIMH (Nickel Metal Hydride) is used in the equipment. This material, if incorrectly handled, could cause a danger to health. Refer to local regulations on the handling and disposal of these batteries.

CAUTION **Static Sensitive Components**

This equipment contains static sensitive components which may be damaged by handling. Refer to the equipment service manual for proper handling of these sensitive components.

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Ces termes ont une signification particuliere dans ce manuel:

AVERTISSEMENT: information pour éviter des blessures aux personnes.

ATTENTION: information pour éviter d'endommager l'appareil.

NOTE: Information générale importante.

Symboles de risque

Des symboles représentant les risques sont placés sur l'appareil. Leur signification est la suivante :

Symbole	Nature du risque	Référence au manuel
	**Danger Electricite**	**Page viii**
	**Composants Sensibles a L'Electricite Statique**	**Page ix**

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ATTENTION **Conditions générales d'utilisation**

Cet instrument est conforme aux exigences des normes EN610101/IEC10101, pour les équipements portables de Classe 1 pouvant etre utilisés en environnement pollué de degré 2. L'appareil est concu pour etre alimenté a partir d'une installation électrique de catégorie 2.

L'appareil doit etre protégé contre les infiltrations de liquides et les projections d'eau (*pluie, neige,* etc.). Apres un déplacement d'un environnement froid vers un environnement chaud, il est important de laisser l'appareil se stabiliser en température avant de le mettre sous tension, afin d'éviter la formation de condensation. Il ne doit etre utilisé que dans les conditions d'environnement décrites au chapitre 4.

Cet équipement n'est pas prévu pour fonctionner dans des atmospheres dangereuses. Dans le cadre d'une utilisation soumise a des regles de sécurité, la compatibilite du produit doit etre évaluée et approuvée par un personnel compétent.

AVERTISSEMENT **Risques électriques**

Batterie Externe

Cet équipement est conforme avec les regles de sécurité IEC Classe 1, ce qui signifie qu'il dispose d'une liaison de protection a la terre. Afin d'assurer cette protection, le cable d'alimentation doit toujours etre connecté sur une prise secteur possédant une mise a la terre.

Le filtre d'alimentation AC contient des condensateurs qui peuvent rester chargés apres la déconnexion du cordon secteur. Bien que l'énergie résiduelle ainsi stockée ne dépasse pas les limites de sécurité, une légere décharge électrique est perceptible si l'on touche les broches de la prise du cordon, immédiatement apres l'avoir retirée du secteur.

AVERTISSEMENT **Démontage des capots de l'appareil**

Déconnecter l'alimentation secteur avant de retirer les capots afin d'éviter le risque d'exposition a des parties alimentées en haute tension. Si des réglages internes doivent etre faits avec l'appareil sous tension, ils ne doivent etre effectués que par du personnel forme et qualifié pour évaluer les risques encourus.

AVERTISSEMENT **Risques Toxiques**

Certains des composants utilisés dans cet équipement peuvent contenir des résines et autres matériaux qui degagent des fumées toxiques lorsqu'ils sont incinérés. Par conséquent, prendre les précautions nécessaires lors du rejet ou de la destruction de ces éléments.

AVERTISSEMENT **Lithium**

Le Lithium est utilisé dans la fabrication des batteries de sauvegarde des mémoires non volatiles. Une mauvaise manipulation de cet élément peut présenter un danger pour la santé. Se reporter aux réglementations locales en vigueur concernant la manipulation et le rejet de ces batteries.

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ATTENTION **NIMH**

NIMH (Nickel Metal Hydride) Est utilisé dans L'instrument. Une mauvaise manipulation de cet element peut presenter un danger pour la sante. Se reporter aux reglementations locales en vigeur concernant la manipulation et le rejet de ces batteries.

ATTENTION **Composants sensibles a l'électricité statique**

Cet appareil contient des composants sensibles a l'électricité statique, qui peuvent etre endommagés par simple manipulation. Se référer au Manuel de maintenance de l'appareil pour connaitre les regles de manipulation de ce type de composants.

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Diese Ausdrucke haben in diesem Handbuch besondere Bedeutungen:

WARNUNG: Bei Gefahr von Personenschaden

ACHTUNG: Bei Gefahr von Sachbeschadigungen

HINWEIS: Allgemeine wichtige Informationen

Warnschilder

Die, an dem Gerat angebrachten Warnschilder haben folgende Bedeutungen:

Symbol	Gefahrenart	Referenz im Handbuch
	**Achtung Hochspannung**	**Seite xii**
	**Statisch empfindliche Bauteile**	**Seite xiii**

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ACHTUNG **Allgemeine Gebrauchshinweise**

Das Gerat entspricht den Bestimmungen EN610101/IEC10101 fur tragbare Gerate der Klasse 1 und ist bestimmt fur den Einsatz in einer Umgebung mit einem Verschmutzungsgrad 2. Es ist fur eine Stromversorgung der Kategorie 2 ausgelegt.

Gerat vor eindringender Flussigkeit, wie zum Beispiel Regen, Schnee usw.schutzen. Bei einem Standortwechsel (z.B. von kalt nach warm) muB sich die Temperatur des Gerates vor einem AnschluB an die Stromversorgung erst stabilisieren, um die Bildung von Kondensat zu vermeiden. Die in Kapitel 4 definierten Umgebungsbedingungen sind fur den Betrieb des Gerates zu beachten.

Das Produkt ist nicht fur den Gebrauch in einer gefahrlichen Umgebung geeignet. Bei sicherheitsrelevanten Anwendungen muB das Gerat durch eine zustandige Person zugelassen und genehmigt werden.

WARNUNG **Elektrische Risiken**

Externe Stromversorgung

GemaB den IEC Sicherheitsbestimmungen Klasse 1 ist das Gerat mit einem Sicherheitserdleiter ausgerustet. Stromkabel immer uber einen Stecker mit Erdungsschutz an die Stromversorgung anschlieBen.

Der Wechselstromfilter enthalt Kondensatoren, die nach Trennen des Gerates von der Stromversorgung noch unter Spannung stehen konnen. Obwohl die gespeicherte Energie innerhalb der Sicherheitsbestimmungen liegt, kann es zu einem leichten elektrischen Schlag kommen, wenn die Steckerkontakte unmittelbar nach Herausziehen des Steckers beruhrt werden.

Entfernen der Sicherheitsabdeckungen

Vor Entfernen der Sicherheitsabdeckungen Gerat von der Stromversorgung trennen, um einen Kontakt mit Hochspannungsteilen zu vermeiden. MuB die Stromversorgung bei Einstellungen oder Wartungsarbeiten eingeschaltet bleiben, sind diese Arbeiten nur von einer eingewiesenen, geschulten Person durchzufuhren, die sich des Risikos bewuBt ist.

WARNUNG **Gefahr durch Giftstoffe**

Einige der Baugruppen des Gerates enthalten Harze und andere Materialien, bei deren Entzundung giftige Dampfe frei werden. Bei der Entsorgung dieser Baugruppen sind entsprechende VorsichtsmaBnahmen zu treffen.

WARNUNG **Lithium**

Bei den Batterien des nicht fluchtigen Speichers wird Lithium eingesetzt. UnsachgemaBe Handhabung kann zu Gesundheitsschaden fuhren. Die ortlichen Bestimmungen bzgl. der Handhabung und Entsorgung dieser Batterien sind zu beachten.

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WARNUNG **NIMH**

NIMH (Nickel Metal Hydride) Wird in diesem Gerät verwendet. Die ortlichen Bestimmungen bzgl. Der Handhabung und Entsorgung dieser Batterien sind zu beachten.

ACHTUNG **Statisch empfindliche Bauteile**

Das Gerat enthalt statisch empfindliche Bauteile, die durch unsachgemaBe Handhabung beschadigt werden konnen. Die Anweisungen in dem Wartungshandbuch sind zu beachten.

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Qusti termini hanno significati precisi in questo manuale:

ATTENZIONE:	informazione per prevenire pericoli personali
AVVERTENZA:	informazione per prevenire danneggiamenti agli strumenti
NOTA:	informazione generale importante

Simboli di pericolo

Il significato dei simboli di pericolo che appaiono sugli strumenti il seguente:

Simbolo	Natura del pericolo	Riferimento nel anuale
	**Tensione Pericolosa**	**Pagina xvi**
	**Componenti sensibili a campi elettrostatici**	**Pagina xvii**

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AVVERTENZE **Condizioni Generali per lutilizzo**

Questo strumento e progettato per soddisfare le richieste delle norme UNI EN 610101/IEC 1010-1, relative alla classe I degli strumenti pertatili e per essere usati in classe 2 del grado di inquinamento L' apparecchio e progettato per funzionare nella categoria di installazione (categoria di sovratensione) II

L' apparecchio dovrebbe essere protetto contro l' ingresso di liquidi e contro le precipitazioni come quelle della pioggia, della neve ecc. Quando lo strumento viene spostato da un ambientefreddo ad uno caldo e importante permettere alla temperatura dello strumento di equilibrarsi prima di alimentarlo per evitare che si formi condensa. Lo strumento deve operare solamente all' interno delle condizioni ambientali specificate nel capitolo 4.

Questo prodotto non pu essere utilizzato in ambiente pericoloso. Se lo strumento deve essere usato in condizioni di sicurezza ambientale, deve essere valutata l opprtunit del suo utilizzo mediante una persona esperta

ATTENZIONE **Pericoli elettrici**

Batteria Esterna

Questo apparecchio e conforme alla classe 1 delle norme di sicurezza IEC ci significa che e fornito di terra di protezione. Per mantenere questa protezione il cavo di alimentazione dello strumento deve essere collegato alla presa di corrente con connessione a terra.

Il filtro di alimentazione AC contiene condensatori che possono rimanere carichi anche dopo che lo strumento viene sconnesso dalla rete. Sebbene l' energia immagazzinata e dentro i valori di sicurezza stabiliti, pu essere avvertita una scarica elettrica se vengono toccati i capi della spina di alimentazione subito dopo averli staccati.

ATTENZIONE **Rimozione dei coperchi dell apparecchio**

Staccare l' alimentazione prima di rimuovere i coperchi per evitare il rischio di esposizione alle parti sotto tensione. Se devono essere effettuate operazioni di servizio o calibrazioni interne all' apparecchio per cui e richiesta l' alimentazione AC, queste devono essere effettuate da persone specializzate e consapevoli del pericolo

ATTENZIONE **Pericolo di intossicazione**

Alcuni componenti utilizzati in questa apparecchiatura possono includere resine o altri materiali che, se bruciati, emettono fumi tossici. Prendere le opportune precauzioni per lo smaltimento di questi prodotti.

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ATTENZIONE **Litio**

Il litio e utilizzato nella costruzione delle batterie che vengono montate nell apparecchio per mantenere i dati in memoria.Questo materiale, se non viene maneggiato correttamente, puo causare danni alla salute. Fare sriferimento ai regolamenti locali per lo smaltimentodi queste batterie.

ATTENZIONE **NIMH**

NIMH (Nickel Metal Hydride) Utilizzato nel contatore. Questo materiale se non viene maneggiato correttamente puo causare danni alla salute. Fare riferimento ai regolamenti locali per lo smaltimento di queste batterie.

AVVERTENZA **Componenti sensibili al campo elettrostatico**

Questo apparecchio contiene componenti sensibili al campo elettrostatico che si possono danneggiare durante la manipolazione. Fare riferimento al manuale di servizio dello strumento per manipolare in modo appropriato questi componenti

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Deze aanduidingen hebben elk een specifieke betekenis in deze handleiding:

WAARSCHUWING:	informatie om te beschermen tegen persoonlijke verwondingen
VOORZICHTIG:	informatie om schade aan het toestel te voorkomen
NOTA:	belangrijke algemene informatie

Gevarensymbolen

Betekenis van de gevarensymbolen welke op de toestellen vermeld worden :

Symbool	Aard van het gevaar	Referentie
	**Gevaarlijke spanning**	**Pagina xx**
	**Statisch gevoelige componenten**	**Pagina xxi**

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VOORZICHTIG **Algemene gebruiksaanwijzingen**

Dit instrument voldoet aan de eisen van EN61010-1/IEC1010-1, aan Klasse 1 voor draagbare apparatuur en kan gebruikt worden in een omgeving met vervuilingsgraad 2. Het toestel werd ontworpen om te werken op de voeding van een installatie categorie 2.

Het toestel moet beschermd worden tegen insijpeling van vloeistoffen en *precipitatie van* regen, sneeuw, enz.... Indien het toestel verplaatst wordt van een koude omgeving naar een warmere omgeving, is het belangrijk om de temperatuur van het apparaat eerst te laten stabiliseren, voor men het opnieuw aansluit op het net, om condensatie te voorkomen. Het toestel mag enkel gebruikt worden volgens de milieucondities bepaald in hoofdstuk 4.

Dit produkt werd niet goedgekeurd voor gebruik in gevaarlijke omgevingen.Indien het toestel toch gebruikt moet worden in een te beveiligen toepassing, dan moet de geschiktheid van het toestel ingeschat en goedgekeurd worden door een competent persoon.

WAARSCHUWING **Elektrische gevaren**

AC voedingsspanning

Dit toestel voldoet aan de eisen van IEC Veiligheidsklasse 1, wat betekent dat het voorzien is van een geaarde stekker. Om deze bescherming te kunnen handhaven moet het netsnoer steeds aangesloten worden op een netvoeding via een stopcontact met aardingspin.

Het AC voedingsfilter bevat condensatoren die nog geladen kunnen zijn nadat het toestel werd uitgeschakeld. Hoewel de opgeslagen energie binnen de veiligheidseisen valt, kan een lichte elektrische schok ervaren worden wanneer de stekkerpinnen aangeraakt worden onmiddellijk nadat de verbinding met het net werd verbroken.

WAARSCHUWING **Verwijderen van de afdekkap**

Verwijder de stekker uit het stopcontact voor u de kap van het toestel verwijdert om gevaar van blootstelling aan onderdelen op hoge spanning uit te sluiten. Alle interne afstellingen of reparaties die moeten worden uitgevoerd terwijl het toestel op het net is aangesloten, mogen enkel uitgevoerd worden door opgeleide personen die zich bewust zijn van het gevaar.

WAARSCHUWING **Toxisch gevaar**

Bepaalde componenten die in het toestel gebruikt werden, kunnen harsen en andere materialen bevatten die bij verbranding toxische gassen afgeven. Neem daarom de nodige voorzorgen bij de afvalverwijdering van deze elementen.

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WAARSCHUWING **Lithium**

Lithium wordt gebruikt bij de vervaardiging van de niet-vluchtige data back-up batterijen. Bij onoordeelkundig gebruik kan dit materiaal een gevaar zijn voor de gezondheid. Raadpleeg de locale reglementeringen om de batterijen als afval te verwijderen.

WAARSCHUWING **NIMH**

NIMH (Nickel Metal Hydride) is gebruikt in het toestel. Bij onoordeelkundig gebruik kan dit materiaal een gevaar zijn voor de gezondheid. Raadpleeg de locale reglementeringen om de batterijen als afval te verwijderen.

VOORZICHTIG **Statisch gevoelige componenten**

Dit toestel bevat statisch gevoelige componenten. Raadpleeg de onderhouds en reparatiehandleiding voor correcte behandeling van deze gevoelige componenten.

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Quality Statement

Particle Measuring Systems, Inc., is a team of creative people who are leaders in the design and manufacture of microcontamination-detection instruments. At PMS we seek to support our valued customers by doing our job right the first time, by providing state-of-the-art products that conform to accepted specifications and standards, and by delivering our products within the committed time schedule.
We rely upon our vendors for their products to conform to their specifications and invite them to join us in the commitment we have to all our customers.

Our quality policy is: to continuously strive to meet or exceed the needs and expectations of our customers, and to pursue improvement on a continuous basis throughout our company in order to produce instruments of exceptional quality while reducing production costs.

At PMS, quality is our culture.

Manual Conventions

NOTE: **A NOTE in the text is used to highlight an item that is of operational importance to the user.**

CAUTION: **A CAUTION in the text is used to highlight an item that, if not done or incorrectly done could damage the instrument and/or any materials or devices affected by the instrument.**

WARNING: **A WARNING in the text is used to highlight an item that, if not done or incorrectly done could result in bodily injury or death.**

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Chapter 1
Introduction

The ABACUS is a handheld 4-channel laser-based aerosol particle counter. It is designed for microcontamination assessment in cleanrooms and other environmentally-controlled areas. Its molded casework has been designed for ease of handling and cleaning. It operates from its own internal battery source as well as the external power supply unit, which provides rapid re-charge of the internal battery pack.

Features:

- Small and can be carried comfortably for long periods
- Simple to use and maintain
- The internal battery pack can be charged rapidly.
- Interfaces with an external PC to allow result analysis (using optional CountWin software)
- Has a wide range of optional accessories

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Chapter 2
Specifications

Laser Type	*Diode laser, 780nm*
Sample flow rate	*0.1 CFM ± 10%*
Purge flow rate	*0.1 CFM ± 10%*
Background counts	*< 1 count/ft^3*
Maximum particle concentration @ 10% coincidence loss	*1,000,000/ CF (10% coincidence)*
Counting efficiency	*50% ± 10% @ 0.30µm*
Viewing volume	*115% ± 10% @ 0.5µm*
Number of size channels	*4*
Channel thresholds	*0.3µm, 0.5µm, 1.0µm, and 5.0µm*
Environmental sensors	*Temperature and humidity probe (optional)* *Vaisala type, 0° to +50° C, 20 – 95% R.H.*
Communications	*RS-232 serial communications port for printing or data link/remote host operation*
Data storage	*500 sample results may be stored for 3 months regardless of battery power*
Environmental limits	*Temperature: 4-35°C* *Humidity: Noncondensing*
Material	*Kydex® injection molded*
Mounting	*Hand-held or mounted using external UNC screw fitting*
Power	*100 – 240 VAC 50/60 Hz with external power supply 15VDC, from external power supply into unit* *Internal batteries, approximately 3 hours + 15 min. per charge in measurement mode – 2 hour recharge* *Rapid external battery charger (optional) 90 – 265VAC, 2 amp charge, 1 hour recharge time*
Dimensions (H x W x D)	*8.7 inches x 3.9 inches x 2.2 inches nominal* *220mm x 100mm x 55mm nominal*
Weight	*2.2 lb/1kg*

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Chapter 3
Unpacking

The ABACUS and standard items are packed in a box containing a foam insert for maximum protection during shipment.

1. Inspect the shipping container for any signs of damage or mishandling. If the container appears damaged, do not open it. Contact the shipper immediately.

2. If the shipping container appears undamaged, carefully open the container and remove the ABACUS, inspecting each item for damage.

3. If any components are damaged, notify the shipper and PMS, and repackage the unit in the original packing materials.

4. If the system is undamaged, store the packing materials. It is important to store packing materials, because warranties may not apply if return shipping containers are inadequate.

The ABACUS is shipped with the following standard items:

- ABACUS particle counter
- ABACUS manual
- Isokinetic probe
- External power pack
- AC power cord
- Calibration certificate

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Chapter 4
Options and Accessories

The following items are optional. Contact your PMS sales representative for more information.

Option	PMS Part Number
PC cable	CD31
External printer	PR37
Carry case	MI503
Spare battery pack	AE2100
External battery charger	AE2135
CountWin software	FW000061
Zero count filter	FL03
Printer paper	PR20
Humidity/temperature sensor	PB28
Power supply for printer (Japanese)	PS139
Power supply for printer (European)	PS140
Power supply for printer (USA)	PS141
Printer cable	CD33
Spare battery pack for printer	EL193

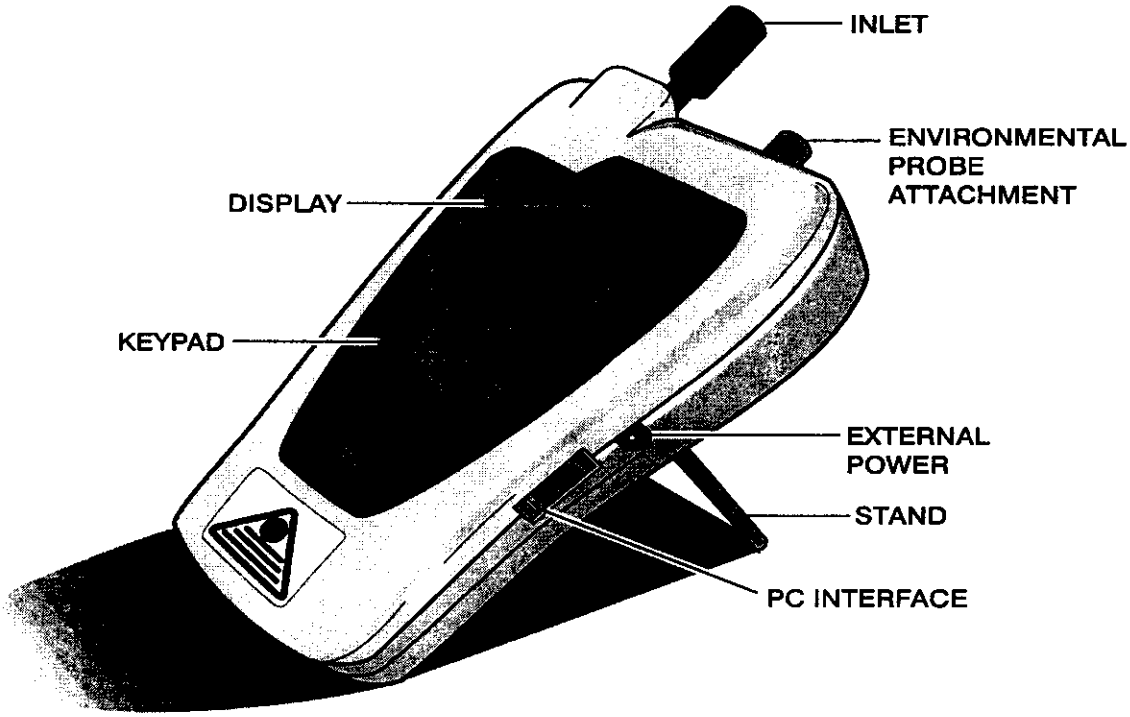
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Chapter 5
Description

The following is a physical description of the ABACUS 301 counter.



Front

The front panel of the ABACUS includes a multi-function keypad and display area. This is designed for ease of use and cleanability.

Sides

The right side of the unit includes the DC power jack and RS232 connection to optional printer or external PC (requires optional CountWin software).

CAUTION: **Only the external power pack supplied with the ABACUS may be used. Use of any other power pack could result in permanent damage to the power pack or the ABACUS.**

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Top

The top of the unit includes the particle inlet nozzle and the connection to the optional temperature humidity probe.

NOTE: The inlet nozzle should not be removed by the user, nor should any cleaning device be inserted into the inlet nozzle.

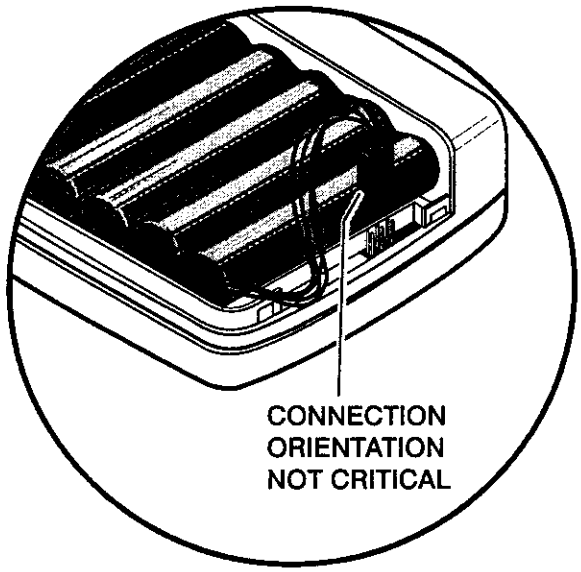
NOTE: The protective caps for the inlet nozzle and optional temperature/humidity probe should be replaced when the ABACUS is not in use.

Battery Compartment

This houses the battery pack used with the ABACUS. The connection from the battery to the connector in the compartment is reversible; either orientation will work.

CAUTION: Only the battery pack supplied with the ABACUS may be used; use of any other battery pack could result in permanent damage to the power pack or the ABACUS.

WARNING: The battery pack must only be used with ABACUS unit and its accessories as prescribed by this manual. Use with any other charger or product could lead to damage and possible hazard to the user.



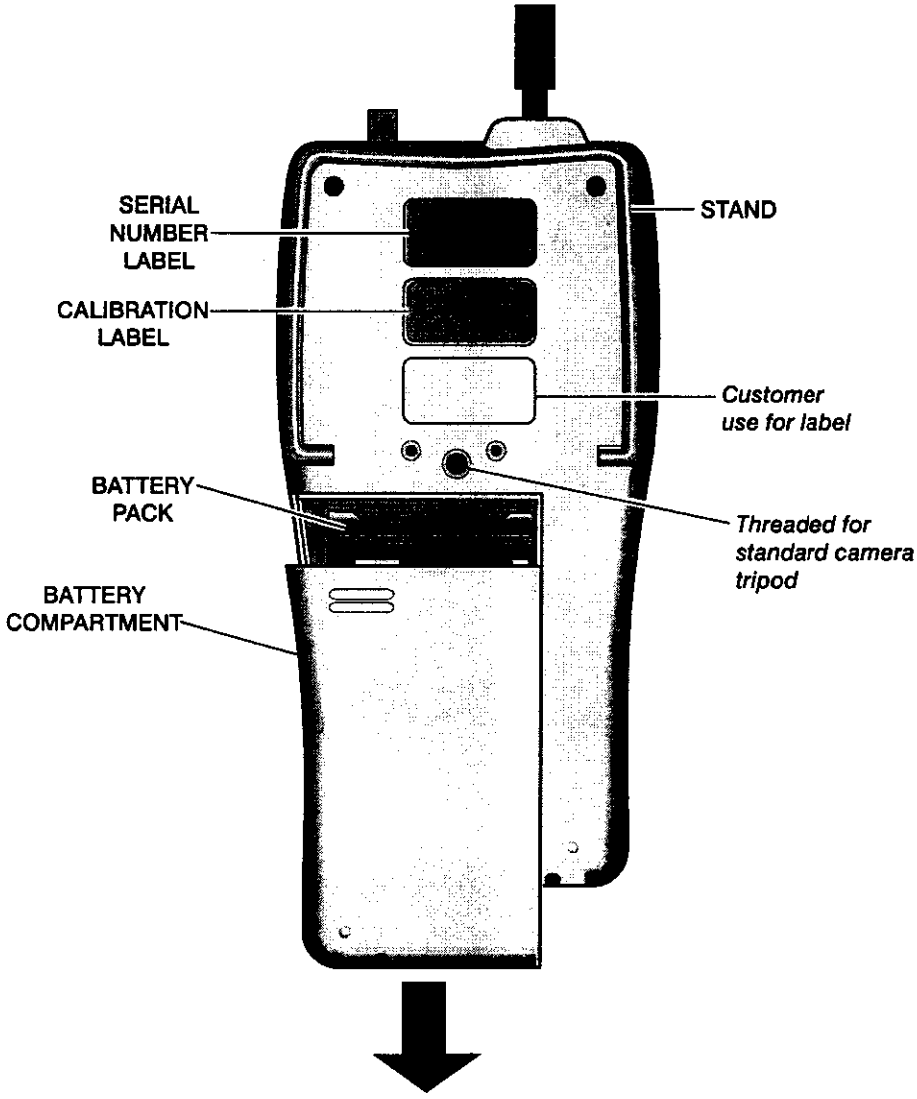
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Rear of Unit

There are three label spaces provided on the rear of the ABACUS. The top label is the calibration label, indicating calibration status and due date. The middle label is the product identification and serial label. The third label space is intended for customer use and is left blank.

Tilt Stand

The built-in tilt-stand may be used to stand the instrument up for table-top operation, or may be retracted for use in hand-held mode.



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External Mounting Socket

The built-in UNC mounting socket enables a standard camera tripod or hand-grip to be mounted, as required.

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Chapter 6
Installation and Setup

The following sections describe in detail the installation and setup of the ABACUS.

The procedures that follow are designed to help you make sound decisions about installation. Some of the items are merely guidelines — good general practices. Other items include specific details and should be followed exactly. If you have questions about these items, contact your PMS representative.

Selecting a Location

There are several considerations in choosing a location for the ABACUS 3 that, examined carefully, will greatly improve the overall utility of the unit.

Temperature and humidity	The unit should be operated in normal laboratory conditions, ie. Normal working temperature and humidity.
Mechanical shock	The ABACUS is designed to perform as a rugged, portable measuring instrument. However, it should not be subjected to undue or repeated physical jars or drops while in use, as this could have a long-term effect on the measurements or the reliability of the instrument.
Gross contamination	As the instrument is a sensitive environmental monitor, exposure to major concentrations of airborne contaminants should be avoided, as this could contaminate the delicate optical sensor.
Fluid ingress	The ABACUS is designed to withstand moderate cleaning or wiping down. However, it should not be immersed in liquid, nor should any liquid be spilled into the sample input or any electrical connection ports.
Connections	When the ABACUS is being used with cables connected (for example, when charging from an external charger or downloading results to an external PC) care should be taken to route the cables so that they are not inadvertently snagged.
Electromagnetic fields	The ABACUS should be operated away from strong or localized magnetic or electromagnetic fields.

Charging the Battery

The ABACUS leaves the factory with batteries 60-80% charged. However, due to storage at distribution points, it is recommended that prior to first use, that the battery pack is given a top-up charge. This is accomplished by connecting the ABACUS to the supplied power pack for a 2 hour period. Alternatively, full charge may be achieved using the optional external charger, for a period of one hour. The charge status of the battery pack is shown on the battery status indicator, when the instrument is powered up.

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Where the ABACUS is to be stored for periods of longer than 1-2 months, it is recommended that the battery pack is discharged. This will improve the life of the battery pack.

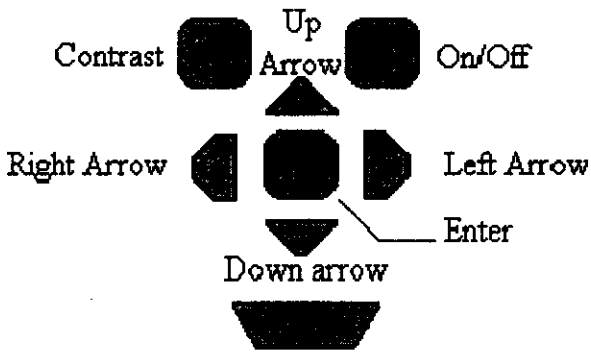
NOTE: NiMH batteries produce full rated power until the end of their charge cycle. This can cause the battery indicator to indicate that the charge higher than it actually is. If the indication shows that the battery is low, you should expedite recharging of the battery.

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Chapter 7
Basic Operation

This section describes the basic operation of the ABACUS. It introduces you to the key elements of the user interface: the keypad and the LCD display. It also describes how to perform basic functions with the unit.

Keypad



The unit's configuration and operation is controlled by the eight keys on the membrane panel, as shown above.

Powering Up

To switch the unit on or off, press the key.

NOTE: If the unit does not respond, check battery and/or electrical power.

When the unit is powered, it will perform a power-on diagnostic check of the unit's functions. The pump will run for a short time. If a fault is detected, a message will be displayed on the screen.

When the power-on diagnostic check is complete, the Main Menu screen will be displayed.

Menu	10:46:33
Measure	
25 C	37%

---Menu designator and current time
---Current operational mode

---Temperature, battery status, and humidity

NOTE: Temperature and humidity are only displayed when optional temperature/humidity probe is installed.

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Battery Strength

Small squares at the bottom of the display indicate the relative strength of the battery.

■■■■	**Battery Charging (via external charger)**
■■■□ *to* ■■■■	**Battery Fully Charged**
■■□□	**Battery OK**
■□□□	**Battery Weak—should be recharged.**

NOTE: If the battery strength does diminish so much as to make measurement unreliable, then a WARNING will be displayed and counting operations will be discontinued.

Temperature and Humidity Sensor

If an external Temperature/Humidity probe is connected (PMS part number PB28) then the temperature (degC) and humidity (percent) will be displayed at the bottom of the screen.

Clock

Time is displayed in hours, minutes and seconds. For information on setting the clock, refer to the section further on in this manual.

NOTE: If the clock is not running, the internal clock battery may be depleted. This can be overcome by charging the unit for a short time.

Display Contrast

If the display contrast is not to your liking, you can set your own level. The contrast is adjusted with two being pressed simultaneously.

Press and hold . Now also press . In a couple of seconds you will see the screen fade in. If you press , the screen will fade out. When you release , the contrast will be set.

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Main Menu

After switching on, the display will show one of a circular list of menus, known as the Main menu. A menu is selected by pressing  or . The first menu is always 'Measure'.
If selected by , the order is as follows:

1. Measure
2. Reset Measure (Resets Location ID only)
3. Sample Set-up
4. Channel Alarms
5. Location Set-up
6. Review Data
7. Comms. Set-up (Should be set at 9600 or Printer enabled)
8. Download to PC (Wait for PC)
9. Print All
10. Reset Memory (Clears data)
11. Clock
12. Self Test
13. Toggle Beep

After a menu has been selected, press  to enter the menu.

If you wish to enter values, this is done by use of , , , or , and pressing  to fix the values.

If it is a function menu, such as 'Measure', pressing  will initiate the function.

Measure

Entering this menu initiates the measurement process, which has its own set of sub-menus. As the sampling procedure progresses, its status is displayed. These are known as the 'sampling progress screens'.

There are four screens: Initialization, Counts, Sensors, Status.

Sampling Initialization Screen

This screen will be either displayed for a few seconds during initialization, continuing with a sampling screen, or default back to the Main Menu with an error message in the event of a fault. If there is a programmed delay, this will be shown. Otherwise, the sampling initialization will begin immediately.

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The operating cycle of the ABACUS-301 corresponds to the following diagram:



The unit will first purge the optical chamber, running the pump and laser for three seconds, with a displayed countdown. If either the pump or laser are not performing correctly, then the unit will discontinue the operation and display a message describing the problem.
If initialization is successful, you will enter the Sampling Screens.

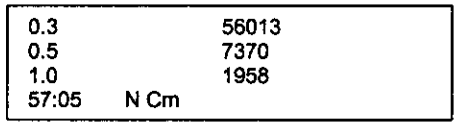
There are four screens: *Count1, Count2, Sensors, Status*. They are selected by ▼ and ▲ keys. The entry screen is the Count1 screen.

To discontinue the sampling, press MENU and return to the Main Menu.

Count Screens

The upper three lines show the particle counts in three classifications, and the count units are shown in the lowest line.

Count1 displays the 0.3µm, 0.5µm, 0.5µm particle count and count units.



The count units are selected by repeated use of ◀ or ▶ keys during sampling.

If selected by repeated ▶, the order is:

1. N Df	Absolute Differential Counts
2. N/cuft Cm	Cumulative Counts per cubic foot
3. N/m3 Cm	Cumulative Counts per cubic meter
4. N/l Cm	Cumulative counts per liter
5. N Cm	Absolute Cumulative Counts
6. N/cu ft Df	Differential Counts per cubic foot
7. N/m3 Df	Differential Counts per cubic meter
8. N/l Df	Differential Counts per liter

If selected by ◀, the order of 2 to 8 is reversed, but still beginning with N Df (Absolute Differential Counts.)

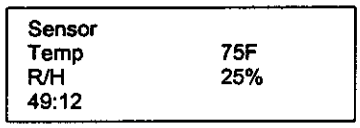
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Count2 is entered by ▼ Count2 is identical to Count1 except that it displays the counts in the 5.0µm channel instead of the 1.0µm channel.

Sensor Screen

Entered from Count2 by ▼

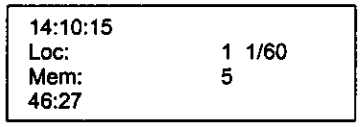
The display shows the temperature and relative humidity.



The ◀ and ▶ keys select whether the temperature is displayed in degrees Centigrade or Fahrenheit.

Status

Entered from Sensor by ▼
This screen displays the time; location Id. No; the sample No and number of samples taken; the percentage of sample record memory used.



Reset Measure

Entering this menu resets Location ID.

Press MENU and then ↵ to reset. This resets Location only.

Sample Set-up

This menu has the following set of sub-menus:

- Sample Time
- Purge Time (Time at beginning of group sample to purge air. This happens once per sample.)
- Delay Time (This happens at the beginning of a series of samples.)
- Interval Time (This is the time between samples within a group.)
- Number of Samples
- Geiger Enable (audible output of particle detection)
- Geiger Channel Select 0.3µm or 0.5µm or 1.0µm or 5.0µm

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To change a value, press  to enter the sub-menu, use  ,  ,  , or  , to change the values, and press  to fix the value.

To escape the sub-menus press  .

Channel Alarms

This menu has the following set of sub-menus:

- Enable Channel Alarms
- 0.3µm total count alarm threshold (0 to 999999)
- 0.3µm Enable
- 0.5µm total count alarm threshold (0 to 999999)
- 0.5µm Enable
- 1.0µm total count alarm threshold (0 to 999999)
- 1.0µm Enable
- 5.0µm total count alarm threshold (0 to 999999)
- 5.0µm Enable
- Print on Alarm
- Sound on alarm

Location Set-up

This has three sub-menus:

- Location ID. (0 to 999)
- Auto-Increment (Yes or No to increment Location Id after every group measurement)

Review Data

This menu causes the results held in internal memory to be displayed, being scrolled by the  keys.

For details of a specific data set, press  .

Comms. Setup

This menu sets up the Baud Rate of the serial interface, which is necessary for the printing of results and communication to PCs, etc.

- Printer Enable (Yes/No)
- Baud Rate (1200, or 2400, or 4800, or 9600)

Download to PC

This menu enables the results held in internal memory to be downloaded to a PC, under 'COUNTWIN'. Please NOTE that the Baud Rate must be set to 9600 under the Comms Setup menu. If unable to download to PC, check that both the PC and the ABACUS baud rate is set to 9600.

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Print All

This menu entry causes the results held in non-volatile ram to be printed out via the serial interface.

Reset Memory

This menu clears the internal memory sample results (clears data collected), if the  (Yes) key is pressed.

Clock

This has four sub-menus:

- Time
- Day
- Month
- Year

Select by the  keys, press  to enter and leave a sub-menu, press  to escape.

Self Test

Entering this menu repeats the self test program that ran at power-up.

Toggle Beep

When a membrane key is pressed, the audible alarm can emit a beep. Entering this menu toggles a Yes/No for the beep.

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Chapter 8
Use with Optional Accessories

External Printer Option

The ABACUS may be used with the external thermal printer, to obtain hard copy results of measurements. The printer may be powered from mains using the printer external supply (PMS parts PS139, PS140, PS141) or the printer battery pack (PMS part EL193). The printer is connected to the comms port of the ABACUS via the printer cable (PMS part CD33). External printer paper can be readily supplied (PMS part PR20).

Setting the DIP switches on the ABACUS external printer

There are three sets of DIP switches, each containing eight switches (24 total) which identify the communication, language and print layout parameters that the printer will use. There are a minimum of 4 switches that must be changed for this printer to be used with the ABACUS which is labeled by " * " below. After following this procedure, the ABACUS will print successfully.

1. Turn the printer off.
2. While holding the "On-Line" button, turn the printer on.
3. The printer will print the current switch settings, followed by:

   "Continue?: Push 'On-Line SW'"

   "Write?: Push 'Paper feed SW'"
4. Push "On-Line" switch.
5. Use the following commands to set switches:

   ON = On-Line Button

   OFF = Feed Button

Please refer to the following page for an example of how the printout will look as switches are being set.

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This is how the printout will look as switches are being set:

[DIP SW setting mode]
Dip SW-1
*** 1 (OFF) : Input = Serial**
2 (ON) : Printing Speed = High
3 (ON) : Auto Loading = ON
4 (OFF) : Auto LF = OFF
5 (ON) : Setting Command = Enable
6 (OFF) : Printing
7 (ON) : Density
8 (ON) : = 100%
Dip SW-2
1 (ON) : Printing Columns = 40
2 (ON) : User Font Back-Up = ON
3 (ON) : Character Select = Normal
4 (ON) : Zero = Normal
5 (ON) : International
6 (ON) : Character
7 (ON) : Set
*** 8 (OFF) : = U.S.A.**
Dip SW-3
1 (ON) : Data Length = 8 bits
2 (ON) : Parity Setting = No
3 (ON) : Parity Condition = Odd
*** 4 (OFF) : Busy Control = XON/XOFF**
*** 5 (OFF) : Baud**
6 (ON) : Rate
7 (ON) : Select
8 (ON) : = 9600

Continue?: Push 'On-Line SW'
Write ?: Push 'Paper feed SW'

6. At this point, push the "Paper feed" button. This printout follows:

   DIP SW setting complete!!

   Printer is ready for use.

7. Turn the ABACUS "Enable Printer" switch ON.

8. Confirm a baud rate of 9600 on ABACUS (9600 is used because this is the default for CountWin).

   If a different baud rate is desired, consult printer manual.

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CountWin Software Option

CountWin is a Windows application that allows importing data from an ABACUS counter's results buffer into a personal computer. This information is displayed as a tree of measurements. Each measurement contains one or more groups or locations. Each group/location contains one or more samples and each sample contains one or more size band values. The use of this display is similar to using Windows File Manager or Explorer.

Clicking on an item shows an associated data summary. For groups and locations this is the mean of the samples. When used for measurements this summary can be a classification. For sample results this is the size band data.

CountWin can perform ISO 14644, BS5295 and Federal Standard 209E classifications on suitable data sets from the particle counter. This occurs automatically upon reading the data.

CountWin can automatically export the results in a form suitable for importing into a spreadsheet application. .CSV files will open in EXCEL.

CountWin can print a simple summary report.

Installing CountWin

Minimum PC requirements to run CountWin are an IBM PC 486 or greater, 4MB RAM, Windows 95, Windows 3.11 and Windows for Workgroups. Prior to installation, it is recommended to close down all applications. Insert the CountWin disk into drive A, using the start button, select run and type **a:\setup.exe**. The setup program will then step through the installation process. An icon is created in the PMS group which can be opened on the desktop if desired.

Connecting the PC to the ABACUS

Switch off the ABACUS before plugging into the PC. Use the PC cable (PMS part CD31). When connecting, ensure that the connectors are firmly plugged into the ABACUS and the PC. Screw down the PC connection. Ensuring that the PC is on, switch on the ABACUS and begin the transfer.

Data download and transfer

The on-line help files on CountWin can provide necessary help on data download and export to other applications.

Zero-count Filter Option

The zero-count filter allows periodic zero-count tests to be made. Connection to the ABACUS is via tubing. Care should be taken to avoid using the zero-count filter in a contaminated environment, as this could cause undue clogging of the filter. Similarly, the zero-count filter should be stored away from particle contaminants (eg. in a sealed bag) when not in use, as contamination could impair operation as a zero-count filter.

Battery Charger and Spare Battery Pack Option

The external battery charger is capable of charging the ABACUS battery pack in 1 hour from a discharged state. It enables the ABACUS to be continuously available as a portable instrument whenever needed. To use, plug into the mains supply, and connect the battery to the charger. The battery charger and battery pack have been designed so that the orientation of the connection is not critical.

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There are three indicators on the external charger. The power indicator shows connection to the main power source. The fast charge indicator shows the battery pack is undergoing full charge. The trickle indicator shows the battery pack is fully charged and being topped-up in trickle-charge mode.

Humidity and Temperature Sensor Option

The bayonet sensor provided plugs straight into the ABACUS unit at the top. The probe connects on by aligning the red dots on the connection and pushing the probe home. To remove the probe, retract the sleeve on the bottom of the probe. Once the probe is connected, the temperature and humidity values will be displayed on the ABACUS measure menu. Care should be taken with the probe to avoid contamination of the sensor with liquid.

Carry Case Option

Designed to hold the ABACUS and the main accessories as a set.

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Chapter 9
Maintenance

The ABACUS is designed to be sturdy and trouble-free. Certain periodic maintenance will preserve the operation and appearance of the unit.

Cleaning

Clean the external surfaces of the unit using a mild soap and water solution and a soft, lint-free cloth. The ABACUS has been designed to withstand application of harsh solvents such as ethanol. Care should be taken to avoid ingress of liquid of any kind within the ABACUS.

Calibration

The ABACUS is designed for calibration on an annual basis and leaves the PMS facility calibrated. The calibration status of the ABACUS is indicated on the rear of the unit. ABACUS calibration should always be performed by approved PMS representatives who have the necessary training to undertake this work.

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Chapter 10
Troubleshooting

ABACUS will not turn on	Battery missing Battery discharged Charger not connected Charger not powered up	Check the presence and connection of the internal battery pack. Charge the battery. Make sure the charger is on and the charger power cable is plugged in.
ABACUS display is dark or not on	Contrast incorrectly set.	Turn power off and back on. Adjust the contrast setting to achieve the required display level.
Keypad does not respond	Processing lock-up	Cycle power. Turn unit off. Wait 10 seconds and turn back on. Ensure connection to any PC has followed the recommendations in the "CountWin" section
Pump error reported	Obstruction to flow on inlet	Check for obstruction. Do not insert anything into the inlet nozzle as this could damage the sensitive optics.
Printer does not function	Printer not turned on Incorrect DIP settings on printer Connections faulty	Ensure printer powered up. Ensure DIP settings are as per this manual.
TRH probe does not function	Improper connection Incorrect software menu	Ensure the probe is pushed fully home. Ensure the measure menu is being used for TRH readings.

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PMS
Customer Support Center
United States and Canada
1-800-557-6363

Please have the following information ready:

- *the product model*
- *whether it is an aerosol or liquid particle counter*
- *the serial number*

Central United States and Central Canada, or if not listed

Boulder, Colorado
(Corporate Headquarters)
(303) 443-7100
(303) 449-6870 FAX

Western Regional Service Center

Fremont, California
(510) 490-9301
(510) 490-8213 FAX

Southern United States

Austin, Texas USA Service Center
(512) 416-0508
(512) 445-2544 FAX

Northeastern United States and Eastern Canada

Jeffersonville, Pennsylvania USA Service Center
(610) 630-0914
(610) 630-9266 FAX

Boise, Idaho USA Service Center

(208) 331-0505
(208) 331-0707 FAX

Hillsboro, Oregon USA Office

(503) 380-7014

Europe (UK)
PMS Europe, LTD

011-44-1684-58-1000
011-44-1684-56-0337 FAX

Asia (Singapore)
PMS Asia Pacific Private Limited

011-65-8460-500
011-65-8460-700 FAX

Current as of 4/7/99

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